AECOM

Rix's Creek Pty Ltd
10 April 2013

Rix's Creek Rail Loop

Section 75W Modification Environmental Assessment

Appendix A

Mine Approvals

Appendix A Mine Approvals

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

DETERMINATION OF A DEVELOPMENT APPLICATION PURSUANT TO SECTION 92

I, the Minister for Urban Affairs and Planning, pursuant to Section 91 of the Environmental Planning and Assessment Act, 1979 ("the Act") and clause 8 of State Environmental Planning Policy No. 34 - Major Employment Generating Industrial Development, determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in Schedule 2.

The reasons for the imposition of the conditions are set out in Schedule 2. The reason for the imposition of conditions generally is to minimise any adverse effects from the development, consistent with the objectives of the Act.

Craig Knowles
Minister for Urban Affairs and Planning

Sydney, 19 October 1995 File No. N90/00356

Schedule 1

Application made by:	Bloomfield Collieries Pty Ltd ("the Applicant").
To:	The Minister for Urban Affairs and Planning ("the Minister").
In respect of:	Coal Lease 352 and land subject to Coal Lease Application No. 17 Singleton.
For the following:	Construction and operation of surface coal mine extensions ("the development").
Development Application:	DA49/94 lodged with Department of Urban Affairs and Planning on 30 November, 1994 accompanied by an Environmental Impact Statement prepared by HLA-Envirosciences Pty Ltd dated 29 November, 1994, and a supplement dated April 1995.

(1) To ascertain the date upon which the consent becomes effective, refer to section 93 of the Act.

(2) To ascertain the date upon which the consent is liable to lapse, refer to section 99 of the Act.

(3) Section 97 of the Act confers on an applicant who is dissatisfied with the determination of a consent authority a right of appeal to the Land and Environment Court exercisable within 12 months after receipt of this notice.

SCHEDULE 2
CONDITIONS OF CONSENT

Red type represents February 1999 modification
Blue type represents December 2003 modification
Green type represents June 2004 modification
Orange type represents August 2009 modification

General

1. The Development is to be carried out generally in accordance with the:
   (i) Environmental Impact Statement prepared by Envirosciences Pty Limited, dated November 1994;
   (ii) Supplementary Document prepared by Envirosciences Pty Limited, dated April 1995;
   (iii) Correspondence from Bloomfield Collieries Pty Limited accompanying the application seeking a modification to the development consent, dated 12 November 1998;
   (iv) Information provided by Rix's Creek Mine accompanying the application seeking a modification to the development consent, dated 20 November 2003;
   (v) Information prepared by Hunter Development Brokerage Pty Ltd accompanying the application seeking a modification to the development consent, dated 14 April 2004;
   (vi) the modification application "Rix's Creek Mine Cut and Cover Tunnel, New England Highway: Statement of Environmental Effects", prepared by Sinclair Knight Merz and dated May 2009; and
   (vii) the conditions of this consent.

   If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this consent shall prevail to the extent of any inconsistency.

Duration

2. Approval in respect of coal extraction is limited to a period of 21 years from the date of this consent or from the date of issue of a mining lease in satisfaction of Mining Lease Application No. 17 Singleton wherever is the later.

Statutory Requirements

3. The Applicant shall ensure that all statutory requirements including but not restricted to those set down by the Local Government Act, 1993, Pollution Control Act, 1970, Clean Air Act, 1961, Clean Water Act, 1970, Noise Control Act, 1975, Protection of the Environment Administration Act, 1991 and all other relevant legislation, Regulations, Australian Standards, Codes, Guidelines and Notices, Conditions, Directions, Notices and Requirements of the Department of Environment, Climate Change and Water (DECCW), Department of Industry and Investment (DII), and Roads and Traffic Authority (RTA), are fully met.

Production Level

4. Mining plans for submission to DII shall be based on a total movement of materials in mining not exceeding fifteen (15) million bank cubic metres in any year.

Transmission Line Relocation

5. The Applicant shall relocate any TransGrid transmission lines within the mining lease to the satisfaction of TransGrid and at a mutually agreed time.

Reasons: To ensure that the development is constructed and operated in the manner set out in the application and in accordance with the relevant statutory requirements.

Visual Amenity

6. The Applicant shall:
   (i) within six (6) months of the date of this consent or within such further period as the Singleton Council ("the Council") may permit, submit for Council's approval:
      (a) An updated detailed landscaping plan covering all portions within the proposed mining area and associated lands owned by the Applicant. The Applicant shall engage a suitably qualified person to assist in preparing the landscaping plan. The plan shall provide for the establishment of trees and shrubs and the construction of mounding. The plan shall incorporate appropriate erosion control and sediment control practices for earthworks associated with the development.
      (b) Details of the visual appearance of all buildings, structures, facilities or works (including paint colours and specifications). Buildings and structures shall be designed and constructed/renovated so as to present a neat and orderly appearance and to blend as far as possible with the surrounding landscape.
      (c) A comprehensive plan of landscape management which shall include detailed plans, specifications for the maintenance of all landscape works and plantings, and maintenance of building materials and claddings, proposed screen plantings and mounding along the New England Highway and mine overburden dumps.
   (ii) apply a surface sealant such as bitumen emulsion, straw or seed within 30 days of its construction to any mounding or bunding as directed by DECCW.
   (iii) comply with the requirements of Council in respect to any supplementary tree planting and visual amenity enhancement works within or immediately outside the mining lease area which may be identified by the Council in consultation with relevant land holders as necessary for the maintenance of satisfactory visual amenity in the local area.

Reasons: To enhance the landscape quality in the vicinity of the mine.

Flood Lighting

7. The Applicant shall screen or direct all on-site flood lighting and vehicular lights away from residences and roads, to the satisfaction of the Council.

Fire Protection

8. The Applicant shall provide adequate fire protection works on site. This shall include one (1) fully equipped fire fighting unit on standby and annual hazard reduction works with particular attention to boundaries of adjoining land holdings.

Traffic Management

9. The Applicant shall prepare and implement a Traffic Management Plan for the development, to the satisfaction of the Director-General. The Plan must:
   (i) be submitted to the Director-General for approval prior to commencement of construction of the cut and cover tunnel;
   (ii) be prepared in consultation with the RTA and Singleton Shire Council;
   (iii) include procedures for regular monitoring of compliance with this plan; and
   (iv) include a Construction Traffic Management Plan for the construction of the cut and cover tunnel, including:
   - traffic control measures for vehicle movements along the New England Highway;
   - measures that would be implemented to minimise traffic and road safety impacts during the period when traffic is diverted onto a side track, and
   - vehicle speed limits, particularly through the diversion.

9A. The Applicant shall obtain all necessary approvals from the Roads and Traffic Authority prior to commencing construction.

Noise Levels

10. The Applicant shall
   (i) comply with L_A 10 daytime noise level design goals set out below:

The Retreat	42dB(A)
Singleton Heights	42dB(A)
Maison Dieu Road	38dB(A)

   (ii) comply with L_A I0 night time noise level design goals set out below:

The Retreat	40dB(A)
Singleton Heights	40dB(A)
Maison Dieu Road	38dB(A)

These goals relate to average conditions (neutral atmosphere) and not to inversion conditions.

Noise and Vibration Monitoring and Management

11. The Applicant shall:
   (i) measure, record and report the L_A 10,15 min noise level over a representative 72 hour period at four (4) locations determined by the DECCW from five (5) nominated locations closest to the mining operations. The report shall include a record of the meteorological conditions at the time of monitoring and shall be conducted on a quarterly basis. Monitoring shall commence immediately after the date of this Consent.
   (ii) submit a management plan for information of the Council and approval by DECCW, detailing noise safeguards and procedures for dealing with noise episodes which exceed the above established L_A 10 noise levels;
   (iii) establish noise monitoring stations in the vicinity of Maison Dieu Road, as required by DECCW;
   (iv) upon receipt of a written request from an owner or occupier of a dwelling on property in the vicinity of Maison Dieu Road, make arrangements for and bear the cost of independent noise monitoring at that residence. The monitoring is to be

carried out by a qualified independent person or team approved by the Director in consultation with the Council, DECCW and the Applicant. The approved person or team will report directly to the Director and Applicant on a quarterly basis. Monitoring shall commence within one (1) month from receipt of the written request to determine the contribution of noise emanating from the mine to the surrounding acoustical environment over at least two (2) consecutive 15 minute periods, twice by day and twice by night over a 72 hour period. For the first six (6) months following this Consent the interval between two (2) consecutive monitoring periods shall not exceed four (4) weeks. Thereafter, the interval between two (2) consecutive monitoring periods shall not exceed three (3) months.

(v) if a request for independent noise monitoring is made by an owner or occupier of a dwelling on property in the vicinity of Maison Dieu Road who has previously been monitored and received two (2) consecutive negative tests under sub-clause (iv), further independent investigations shall cease if the Director-General or his/her nominee, in consultation with the DECCW, is satisfied that the relevant consent limits are not being exceeded and are unlikely to be exceeded in the future.

(vi) upon the receipt of a written request from an owner or occupier that has received two (2) consecutive negative results under sub-clause (iv), the Applicant shall also justify to the Director-General or his/her nominee, in consultation with the DECCW whether an investigation is required.

(vii) survey and investigate noise reduction measures from plant and equipment every three (3) years or as otherwise directed by DECCW and carry out remedial measures as directed by DECCW.

Blasting

12. The Applicant shall:

(i) ensure that noise and vibration monitoring and control is generally carried out in accordance with the recommendations of Australian Standard AS-2187-1993 and in terms of ANZECC Guidelines and to satisfaction of the DECCW.

(ii) not blast within 500m of the New England Highway or any approved deviation of the highway while either are open for traffic.

(iii) design all blasts based on the results of monitored blasts designed to minimise air blast overpressure and ground vibration using the Nonel or equivalent system such that anyone (1) blast has less than a five per cent (5%) probability of exceeding an air blast overpressure of 115dBA and vibration with a peak particle velocity of 5mm/sec at the closest residence not owned by the applicant outside the mining lease.

(iv) determine appropriate weather data by taking measurements immediately prior to blasting and from the data shall predict whether noise levels outside the project area are likely to be increased above the levels expected under neutral meteorological conditions. The data shall be recorded by the Applicant as part of its monitoring data.

(v) not blast if the predictions in sub-clause (iv) herein indicate that noise level design goals given in Condition 10 are likely to be exceeded or as otherwise advised by DECCW.

(vi) monitor all blasts and record the overpressure and peak particle velocity at locations to be agreed by DECCW and the DII and as provided in Condition 11(iv).

(vii) upon written request of the owner of any property located within two (2) kilometres of the boundaries of the proposed pits, and made within 6 months of issue of this Consent or after a large vibration event (likely to have exceeded 120 dB(L) overpressure and/or 10mm/sec ground vibration) at the residence, arrange at its own cost, for the inspection by a technically qualified person agreed to by both

parties, to record the material condition of any structure on such property. The Applicant shall supply a copy of any inspection report, certified by the person who undertook the inspection, to the relevant property owner within 14 days of receipt of same and if warranted, shall undertake further action;

(viii) immediately upon receipt of a written request from a resident within one (1) km of any blast site, record that resident's request for notification of blasts and henceforth notify that resident of any blasts from which they are potentially affected.

Reasons: To protect the acoustic amenity of residents adjacent to the mine and to provide for monitoring of noise and vibration.

Air Quality

13. The Applicant shall:
    (i) install and utilise wind direction, velocity monitoring and recording station(s) at a non protected location immediately adjacent to the area to be mined in the vicinity of Maison Dieu Road and Middle Fallbrook Road over each ensuing 12 month period as directed by DECCW.
    (ii) use the data collected by the wind monitoring and recording station referred to in subclause (i) above to determine when and how the mine operation is to be modified to minimise the potential for dust emissions.
    (iii) install 30 dust deposition gauges and in each calendar month shall determine the dust deposition rate in gm/m^2/month such that the 4gm/m^2/month isopleth for dust deposition is able to be plotted on an annual basis.
    (iv) continue meteorological monitoring as well as the monitoring of dust deposition rates and concentrations of total suspended particulates for the life of the mine subject to sub-clause (i). The extent and location of dust monitoring network to be specified by the DECCW.
    (v) have three (3) high volume samplers equipped to sample particles of less than 10 microns located in positions approved by the DECCW. Sampling is to be undertaken on a 24hr 6 days per week cycle with averaging periods (annual means) as well as monitoring equipment/procedures to follow AS2724.3 and AS3508.9.6.
    (vi) provide to the Director of Urban Affairs and Planning ("the Director"), DECCW, DII, and the Council results and analysis of air quality monitoring on an agreed basis.
    (vii) cease those mining operations located within 1000m of the limit of mining at such times when the average hourly wind velocity exceeds 10 metres per second and the operations are resulting in visible dust emissions blowing in a direction of the mining lease boundary so as to cross onto lands in non-company ownership.
    (viii) cease mining operations at any time when the driver visibility or traffic safety on the New England Highway is adversely affected, in accordance with the requirements of the RTA.

Dust Suppression

14. The Applicant shall:
    (i) maintain sufficient equipment with the capacity to apply water to all unsealed trafficked areas at the rate of at least one (1) litre per square metre per hour or apply an equally effective dust suppressant;
    (ii) ensure the prompt rehabilitation of all disturbed areas to minimise the generation of wind erosion dust, in accordance with the requirements of DII;
    (iii) install automatic water sprays on the coal stockpiles such that the stockpiles are sprayed when the wind speed from any direction exceeds 5.6m/s;

Reasons: To protect the air quality adjacent to the mine and to provide for monitoring of dust deposition and concentration.

Greenhouse Gas Emissions

14A. The Applicant shall implement all reasonable and feasible measures to minimise:
(i) energy use associated with the development; and
(ii) greenhouse gas emissions produced by the development,
to the satisfaction of the Director-General.

Water Management Plan

15. The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Director-General. This Plan must:
(i) be prepared in consultation with the Office of Water by a suitably qualified expert whose appointment has been approved by the Director-General;
(ii) be submitted to the Director-General by 31 March 2010; and
(iii) include:
- a site water balance for the development, which includes details of sources and security of water supply, on site water use and management and off site water transfers and investigates and describes measures to minimise water use by the development.
- details on the diversion of Rix's Creek, including updates on monitoring and rehabilitation;
- a surface water monitoring program with:
  - detailed baseline data of surface water flows and quality in the watercourses that could be affected by the development;
  - surface water impact assessment criteria, including trigger levels for investigating potentially adverse surface water impacts of the development;
  - a program to monitor surface water flows and quality in the watercourse that could be affected by the development.
- a groundwater monitoring program with:
  - detailed baseline data of groundwater levels, yield and quality in the region, and privately owned groundwater bores, which could be affected by the development;
  - groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts of the development; and
  - a program to monitor:
    - groundwater inflows to the open cut mining operations; and
    - impacts of the development on the regions aquifers, any groundwater bores, and surrounding watercourses, including monitoring to the western boundary of the mine lease ; and
- a surface and groundwater response plan which describes the measures and/or procedures that would be implemented to:
  - respond to any exceedances of the surface water and groundwater assessment criteria;
  - offset the loss of any baseflow to the surrounding watercourse and/or associated creeks caused by the development;
  - compensate landowners of privately-owned land whose water supply is adversely affected by the development; and
  - mitigate and/or offset any adverse impacts on groundwater dependent ecosystems or riparian vegetation.

Erosion and Sediment Control Plan

15A. The Applicant shall prepare and implement an Erosion and Sediment Control Plan. This Plan must:

(i) be consistent with the requirements of the *Managing Urban Stormwater: Soils and Construction Manual* (Landcom 2004, or its latest version);

(ii) identify activities that could cause soil erosion and generate sediment;

(iii) describe measures to minimise soil erosion and the potential for transport of sediment to downstream waters;

(iv) describe the location, function, and capacity of erosion and sediment control structures; and

(v) describe what measures would be implemented to monitor and maintain the structures over time.

Rixs Creek Diversion

16. The Applicant shall:

(i) liaise with Office of Water DECCW and meet their requirements for the design, construction and maintenance of any diversion of Rixs Creek;

(ii) not divert Rixs Creek in the southern mining area;

(iii) not mine within 20m of the bank of Rixs Creek in Pit 2 and Pit 3.

Reasons: To protect water quality in Rixs Creek and to provide for water management measures at the site.

Landscape Management

16A. The Applicant shall prepare and implement a detailed Landscape Management Plan for the development to the satisfaction of the DII and the Director-General. This plan must:

(i) be prepared in consultation with DECCW, the Office of Water and Singleton Shire Council by suitably qualified expert/s whose appointment/s have been approved by the Director-General;

(ii) include a:

- Rehabilitation Management Plan to be submitted for approval by the Director-General by 31 March 2010;
- Final Void Management Plan to be submitted for approval by the Director-General by 31 December 2011; and
- Mine Closure Plan to be submitted for approval by the Director-General by 31 December 2011.

Rehabilitation Management Plan

16B. The Rehabilitation Management Plan must include:

(i) the objectives for rehabilitation of the site of the development;

(ii) a description of the short, medium, and long term measures that would be implemented to rehabilitate the development and the remnant vegetation and habitat on the site;

(iii) detailed performance and completion criteria for the rehabilitation of the site;

(iv) a detailed description of how the performance of the rehabilitation of the mine would be monitored over time to achieve the stated objectives;

(v) a detailed description of what measures would be implemented over the next 3 years, including the procedures to be implemented for:

- minimising and rehabilitating disturbed areas;
- protecting vegetation and soil outside the disturbance areas;

- undertaking pre-clearance surveys;
- managing impacts on fauna;
- landscaping the site to minimise visual impacts;
- conserving and reusing topsoil;
- collecting and propagating seed for rehabilitation works;
- salvaging and reusing material from the site for habitat enhancement;
- controlling weeds and feral pests;
- controlling access; and
- bushfire management;

(vi) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;

(vii) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and

(viii) details of who is responsible for monitoring, reviewing, and implementing the plan.

Final Void Management

16C. The Final Void Management Plan must:

(i) incorporate design criteria and specifications for the final void based on verified groundwater modelling predictions and a re-assessment of post-mining groundwater equilibration;

(ii) assess the potential interactions between creeks on the site and the final void; and

(iii) describe what actions and measures would be implemented to:

- minimise any potential adverse impacts associated with the final void; and
- manage and monitor the potential impacts of the final void.

Mine Closure Plan

16D. The Mine Closure Plan must:

(i) define the objectives and criteria for mine closure;

(ii) investigate options for the future use of the site, including the final void/s;

(iii) investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local employment levels;

(iv) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the development; and

(v) describe how the performance of these measures would be monitored over time.

Acquisition of Affected Lands

17.

17A. Affected Lands defined in the Development Consent of 19 October, 1989.

The Applicant shall forthwith upon receipt of a request to purchase land identified as being within the area of affectation defined in the development consent for Rixs Creek Coal Mine of 19 October 1989 and owned by any of:
R J Eveleigh
Wendy Bowman & G R Elder
Estate I H. Bowman
Elizabeth S. Bowman
Durian Holdings
purchase such land.

In the event of failure to complete the purchase within six (6) months, clause 17C(iv) below, applies.

17B. Affected Lands other than those defined in the Development Consent of 19 October, 1989

(i) The Applicant shall within six (6) months of receipt of a written request from any of the owners of the properties listed in Attachment 1 of this Consent, purchase the whole of the properties. In the event of failure to complete the purchase within six (6) months, clause 17C(iv) below, applies.

(ii) Where acquisition has not been sought of a property subject to sub-clause 17B(i) an owner or occupier of a dwelling on the property may request the Applicant to carry out measures at the dwelling to mitigate the impact upon the residence of dust fallout/concentration, noise, and vibration, emanating from the mine in excess of the criteria set out in this Consent. The Applicant shall forthwith carry out such measures at its own expense.

(iii) In the event that within one (1) month of a request instigated under sub-clause 17B(ii), the Applicant and the owner or occupier cannot agree upon the measures to be carried out, either party may refer the matter to the Community Consultative Committee. The Applicant shall forthwith carry out the measures which may be required by the said Committee.

17C. Potentially Affected Lands

(i) In the event that the DECCW determines that noise from the mining operations at any residence (built or with building approval at the date of this Consent) or more than 25% of any property in the vicinity of Maison Dieu Road is in excess of the relevant noise level design goals set out in clause 10 of this Consent for two (2) consecutive monitoring periods, the Applicant shall purchase such property within six (6) months of receipt of a written request from the owner of the affected property.

(ii) In the event that the DECCW determines that dust from the mining operations increases the dust deposition rate by more than 2 gm/m^2/month averaged over any six (6) month period, at any residence (built or with building approval at the date of this Consent) or over more than 25% of any property in the vicinity of Maison Dieu Road is the Applicant shall purchase such property within six (6) months of receipt of a written request from the owner of the affected property.

(iii) In respect of a request to purchase land arising under subclause 17A, 17B, 17C(i) or 17C(ii), the Applicant shall pay the owners the acquisition price which shall take into account and provide payment for:

a) a sum not less than the current market value of the owner's interest in the land or part thereof (as the case may be) having regard to the existing use ofthe land whosoever is the occupier and all improvements thereon immediately prior to the granting of this consent as if the land was unaffected by the development proposal. The provisions of this subclause do not apply to the holder of an authority under the Mining Act, 1992.

b) the owners reasonable compensation for disturbance allowance and relocation costs within the Local Government Areas of Singleton or Muswellbrook.

c) the owners reasonable costs for obtaining legal advice and expert witnesses

for the purposes of determining the acquisition price of the land and the terms upon which it is to be acquired.

(iv) In the event that the Applicant and any owner referred to in subclause 17(A) and 17(B)(i) and 17(C) cannot agree within the time limit upon the acquisition price of the land and/or the terms upon which it is to be acquired, then:

a) either party may refer the matter to the Director who shall request the President for the time being of the Australian Institute of Valuers and Land Economists to appoint a qualified independent valuer, suitably experienced in compensation issues, who shall determine, after consideration of any submissions from the owners and the Applicant, the acquisition price as described and referred to in subclause (iii) herein.

b) in the event that the independent valuer requires guidance on any contentious legal, planning or other issues, the independent valuer shall refer the matter to the Director, recommending the appointment of a qualified panel. The Director, if satisfied that there is need for a qualified panel, shall arrange for the constitution of the panel. The panel shall consist of:

1) the appointed independent valuer,
2) the Director, or her nominee,
and/or
3) the President of the Law Society of NSW or his nominee.

The qualified panel shall on the advice of the valuer determine the issue referred to it and advise the valuer.

The panel may recommend to the Director to request the Institution of Surveyors (NSW) to appoint an independent surveyor to determine the part of the land to be acquired in relation to the area of affectation which may reasonably be subdivided and acquired having regard to topography, provisions of planning instruments and other associated matters;

c) The Applicant shall bear the costs of any valuation or survey assessment requested by the Director in accordance with subclauses (a) and (b) herein.

d) Upon receipt of a valuation arising pursuant to subclauses (a) and (b), the Applicant shall offer to acquire the relevant land at a price not less than the said valuation. Should be Applicant's offer to acquire not be accepted by an owner within six (6) months of the date of such offer, the Applicant's obligations to such owner pursuant to this Clause shall cease.

e) Upon settlement of the acquisition referred to in this Clause the Applicant shall also pay to the owner the costs and compensation assessed pursuant to subclause (iii) herein including the owner's reasonable costs in the event of a subdivision.

All acquisitions of land under this condition shall be reported in the Annual Report. Once sub-clauses 17A, 17B and 17C have been complied with they shall not be reapplied for the duration of the development consent. This applies to lands already purchased under the development consent of 19 October, 1989.

Reasons: To provide for acquisition of affected land.

Environmental Officer

18. The Applicant shall employ an Environmental Officer whose qualifications are acceptable to the DII who shall report to the Mine Manager and be responsible for ensuring that all environmental safeguards proposed for the development and as required by this consent and other statutory approvals, are enforced and monitored from the commencement of construction of the extensions to the mine.

Environmental Management Plan Report

19. The Applicant shall:
    (i) prepare and submit to DII for approval an Annual Environmental Management Plan Report. The report shall include:
        (a) short, medium and long-term mining plans;
        (b) rehabilitation report in respect of open cut operations;
        (c) a review of effectiveness of environmental management of the subject area in terms of DECCW and DII requirements;
        (d) a review of performance in terms of the conditions of development consent;
        (e) results of environmental monitoring in respect of air, water and noise pollution;
        (f) a listing of any variations obtained to approvals applicable to the subject area during the previous year;
        (g) the outcome of the water budget for the year, the quantity of clean water used from water storages. Details of the disposal of any contaminated water on site or into water courses;
        (h) set out environmental management targets for the next year.
    (ii) consult with the Director during report preparation concerning any additional requirements.
    (iii) ensure that copies of the annual Environmental Management Plan Report are submitted to the Director, DECCW, Office of Water, DII, and the Council.
    (iv) ensure that the first report is completed and submitted within twelve (12) months of this consent, at a date to be determined in consultation with DII, and thereafter.

Complaints

20. The Applicant shall observe all requirements of the DII complaints protocol and refer to complaints received in the Annual Report (Condition 19).

Reasons: To provide for environmental monitoring and performance reporting.

Community Consultative Committee

21. The Applicant shall:
    (i) participate and co-operate in the establishment by the Council of a Community Consultative Committee including four (4) community representatives to monitor compliance with conditions of this consent during the term of the development. The Committee, initially chaired by the Council, shall be convened every four (4) months or as required at the request of any representative to discuss compliance matters.
    (ii) The Applicant shall at its own expense:
        (a) nominate two (2) representatives to attend all meetings of the Committee;
        (b) provide to the Committee copies of the latest Environmental Management Plan Report, referred to in Condition 19;

(c) promptly provide to the Committee such other information as the Chairman of the Committee may reasonably request concerning the environmental performance of the development;
(d) provide access for site inspections by the Committee;
(e) take and distribute minutes of Committee Meetings and provide meeting facilities for the Committee.

Reasons: To provide community access to environmental monitoring and performance

Financial Contributions

22. The Applicant shall pay to the Council a financial contribution pursuant to Section 94 of the Environmental Planning and Assessment Act 1979 in the amount of $900.00 per additional employee (as identified within the EIS and Supplementary Document) according to the requirements of the Council's Section 94 Contributions Plan No. 1. The Applicant shall pay the contribution to Council within six (6) months of acting upon this consent;

Reasons: To meet the requirements of the Act in relation to community infrastructure contributions.

Closure of the New England Highway for blasting

23. The Applicant shall:
    (a) The Applicant shall provide road deviations adjacent to the highway in accordance with Figure 34 of the EIS to the satisfaction of the RTA and the Council unless a valid Management Plan is in operation. These deviations shall be constructed at the Applicant's cost and be constructed to allow two-way traffic movement and to an all weather gravel standard for a design speed of forty (40) kilometres per hour.
    (b) The Applicant shall conduct all closures of the New England Highway for blasting in accordance with the Management Plan included in Appendix 2 of the EIS Supplementary Document to the satisfaction of the RTA and the Council.
    (c) In the event that the RT A, after consultation with the Applicant and the Council deems that the requirements of the Management Plan are not being met, the Applicant shall cease blasting within 500 metres of the highway.

Closure/Relocation of Middle Falbrook Road

24. The Applicant shall liaise with the Council in regard to the future closure/relocation of Middle Fallbrook Road in order to provide an alternative road link and proceed to construct such alternative road link as required, in conjunction with potential alternative road link to be provided by other mines to the north of the development. Any relocation shall be designed and constructed to the Council's bitumen sealed rural roads standard.

Reasons: To provide for road relocations in the event of road closures.

Dispute Resolution

25. In the event that the Applicant and the Council or a Government body other than the Department, cannot agree on the specification or requirements applicable under this consent, other than in subclause 17C(iv), the matter shall be referred by either party to

the Director or if not resolved, to the Minister, whose determination of the disagreement shall be final and binding on the parties.

Reasons: To provide for dispute resolution in respect to conditions of consent.

Independent Environmental Audit

26. Within 12 months from the date of Consent, the Applicant shall make arrangements for and bear the total cost of an independent comprehensive environmental audit for the development. Further independent audits are to be conducted every fifth year (ie. from year 6 from the date of Consent) or as directed by the Director. The Applicant shall conduct an environmental audit of the mining and infrastructure areas of the development and submit the report to the Director who shall provide a copy to the Council.

    The audit shall be conducted by a duly qualified independent person or team approved by the Director in consultation with Council.

    The Director may, after considering any submission made by Council on the report, notify the Applicant of the Director's reasonable requirements with regard to any measures arising from or recommended by the independent environmental report. The Applicant shall comply with those reasonable requirements within such time as the Director may reasonably require.

Reason: To provide for periodic independent environmental audits.

Waste

27. The Applicant shall:
    (i) monitor the amount of waste generated by the project;
    (ii) investigate ways to minimise waste generated by the project;
    (iii) implement reasonable and feasible measures to minimise waste generated by the project;
    (iv) ensure irrigation of treated wastewater is undertaken in accordance with DECC's *Environmental Guideline for the Utilisation of Treated Effluent*; and
    (v) report on waste management and minimisation in the Annual Environmental Management Plan Report,
    to the satisfaction of the Director-General.

Note: This approval does not relieve the Applicant of the obligation to obtain any other approval under the Local Government Act, 1993 as amended, the Ordinance made thereunder including approval of building plans, or any other Act.

New South Wales Government

Department of Planning

Remington Centre
175 Liverpool Street, Sydney 2000
Box 3927 G.P.O. Sydney 2001
D.X. 15 Sydney

Telephone: (02) 266 7111 Ext.
Fax No: (02) 266 7599

Contact:

Our reference:

Your reference: 81/818

10 OCT 1989

The Project Manager
PO BOX 4
EAST MAITLAND 2323 262

Dear Sir

Proposed Rixs Creek Coal Mine

Reference is made to the development application of 14 June 1988 which was lodged with the Council by Bloomfield Collieries Pty Ltd seeking consent to the above development.

2. Pursuant to a direction under Section 101 of the Environmental Planning and Assessment Act, 1979, the subject development application was referred by Singleton Shire Council for determination by the Minister for Planning, with a request for an Inquiry under Section 199 of the Act.

3. It is advised that the Minister has determined the development in accordance with Section 101 (8) of the Act by granting consent subject to certain conditions. These conditions have been imposed to minimize the adverse impact the development may cause through noise, traffic generation, dust pollution, provide for environmental monitoring and reporting and set requirements for infrastructure provision.

4. A copy of the signed determination by the Minister is enclosed for your use. Pursuant to Section 101 (9)(b) of the Environmental Planning and Assessment Act, the development consent takes affect from the date of this letter, being the date of notification to the Applicant under Section 101 (10) of the act.

Yours faithfully

R L Pincini
Secretary

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

DETERMINATION OF A DEVELOPMENT APPLICATION PURSUANT TO SECTION 101

I, the Minister for Planning, pursuant to Section 101, Environmental Planning and Assessment Act 1979 ("the Act"), hereby determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in Schedule 2.

The reasons for the imposition of the conditions are:

i) to minimise the adverse impact the development may cause through noise, traffic generation, and dust pollution;

ii) to provide for environmental monitoring and reporting;

iii) to set requirements for infrastructure provision.

DAVID HAY
Minister for Local Government and
Minister for Planning

Sydney, 19th October, 1989

Schedule 1

Application made by:	Bloomfield Collieries Pty Ltd
To:	Singleton Shire Council
In respect of:	Coal Lease Application No.185, on land described in the following attachment.

For the following

Construction and operation of a surface coal mine, associated transport and coal loading facilities, including coal preparation plant.

NOTE: (1) to ascertain the date upon which the consent becomes effective, refer to section 93 of the Act.

(2) to ascertain the date upon which the consent is liable to lapse, refer to section 99 of the Act.

SCHEDULE 2

General

1. The development is to be carried out generally in accordance with the Environmental Impact Statement dated 14 June 1988 prepared by Croft & Associates Pty Limited ("EIS") certified in accordance with Section 77(3) of the Act, supplemented by the documents listed in Appendix 5.1 of the Report of the Commissioners of Inquiry, dated July, 1989, as may be modified by the conditions set out herein.

Duration

2. This consent shall lapse 21 years from the date of granting this development consent.

Heritage Items

3.(i) The coke ovens site identified in the EIS shall be protected from intrusion by mining in accordance with the requirements of the Department of Minerals and Energy ("the Department").

(ii) Within three (3) months of the date of granting consent, the Applicant shall prepare and submit to the Heritage Council of New South Wales ("Heritage Council") and the Singleton Shire Council ("the Council") a conservation plan ("the plan") in respect of the coke ovens' protection area as shown in Figures 3 and 18 of the EIS. The plan shall contain photographs and shall deal with the curtilage of the area, protection of historic artefacts and conservation of the area.

Water Supply

4. The Applicant shall obtain all necessary approvals from the Department of Water Resources for importation of water to the site.

Landscaping

5.(a) Within 6 months of the date of granting this consent or within such further period as the Council may permit, the Applicant shall submit for the Council's approval:

(i) A detailed landscaping and land use plan covering all portions of land within the proposed coal lease area. The Applicant shall engage a qualified landscape architect to assist in the landscape design. The plan shall provide for the establishment of trees and shrubs during the construction stage and shall also address the disposal of solid wastes from colliery operations.

The plan shall incorporate appropriate erosion control and sedimentation control practices for any earthworks associated with the development.

(ii) proposals for the visual appearance of the structural components of the development including paint colours and specifications. Buildings and structures shall be designed so as to present a neat and orderly appearance and to blend as far as possible with the surrounding landscape.

(iii) a comprehensive plan of landscape management which shall include detailed plans, specifications and staged work programs to be undertaken, maintenance of all landscape works and plantings, and maintenance of building materials and cladding.

(b) Within two years of the granting of this consent the Applicant shall construct and vegetate the bunds as shown in Figure 3, Volume 3 of the EIS. The bund plan shown in Figure 3, Volume 3 of the EIS shall be modified by:

(i) extending the bund on the northern side of the New England Highway for a distance of 400m at the same height as that bund along the eastern side of Middle Falbrook Road; and

(ii) by constructing a bund immediately to the north of the southern mining area extending from the bund on the southern side of the New England Highway at the same height as that bund to within 20 metres of the bank of Rixs Creek.

(c) The Applicant shall apply to all out-of-pit overburden areas, a surface sealant such as bitumen emulsion/straw/seed within 30 days of completion and all other disturbed areas of the mine site including in-pit areas which exceed 0.5 hectares in area and which will not be further worked for a period in excess of 30 days.

(d) The Applicant shall apply a surface sealant such as bitumen emulsion/straw/seed within 30 days of its construction to any bund which will not be revegetated within that time.

Visual Amenity

6. The Applicant shall comply with the requirements of the Council in respect to any supplementary tree planting and visual amenity enhancement works immediately outside the proposed coal lease area, which may be identified by the Council as necessary for the maintenance of a satisfactory visual amenity in the local area.

Affected Lands and Residences

7.(a) The Applicant shall:

(i) Within 6 months of receipt of a request to purchase from an owner of land wholly within the area of affectation shown on the attached plan, purchase such land;

(ii) Within 6 months of receipt of a request from any of the following owners:

- HA and LA Olek (Residence No. 58)
- DS and VF Bright (Residence No. 65)
- D Castledine
- W Bowman (Residence No. 67)

to purchase the whole of the properties which fall partly within the area of affectation purchase such land;

(iii) Within six months of receipt of a request to purchase land or part of land from an owner of land which is partly within the area of affectation, not being land referred to in subclause (ii) herein, purchase that part of the land.

(b) In respect of a request to purchase land arising under subclause 7(a)(i) or (ii) or (iii) herein, the Applicant shall:

(i) pay all owners not less than market value for the land having regard to existing use of the land whosoever is the occupier and all improvements thereon immediately prior to the granting of this consent as if the land was unaffected by the proposed development. The provisions of this subclause do not apply to the holder of an authorisation or concession under the Coal Mining Act, 1973;

(ii) pay the owners reasonable compensation for disturbance and relocation within the Shire of Singleton, within the general area of Singleton;

(iii) pay the owners reasonable costs for obtaining legal advice and expert witnesses for the purposes of determining the purchase price of the land and the terms upon which it is to be acquired.

(c) In the event that the Applicant and any owner referred to in subclause 7(a) herein cannot agree within the time limit upon the purchase price of the land and/or the terms upon which it is to be acquired, then:

(i) either party may refer the matter to the Director of the Department of Planning ("the Director") who shall request the President for the time being of the Australian Institute of Valuers to appoint an independent valuer who shall determine the current market value of the land as if it was not affected by the proposed development, together with the amount of costs and compensation referred to in subclause (b) herein;

(ii) in the event of a dispute between the Applicant and an owner as to that part of a property which is to be acquired under subclause (a)(iii) herein, either party may refer the matter to the Director who shall request the President for the time being of the Institution of Surveyors (NSW) to appoint an independent surveyor to determine the part of the land to be acquired in relation to the area of affectation which may reasonably be subdivided and acquired having regard to topography, provisions of planning instruments and other associated matters;

(iii) the Applicant shall bear the costs of any valuation or survey assessment requested by the Director in accordance with subclauses (i) and (ii) herein;

(iv) upon receipt of a valuation arising pursuant to subclauses (i) or (ii) herein, the Applicant shall offer to purchase the relevant land at a price not less than the said valuation. Should the Applicant's offer to purchase not be accepted by an owner within six months of the date of such offer, the Applicant's obligations to such owner pursuant to this Clause 7 shall cease;

(v) upon settlement of a purchase referred to in this clause 7 the Applicant shall also pay to the owner the costs and compensation assessed pursuant to subclause 7(c) herein including the owner's reasonable costs in the event of a subdivision.

(d) In the event that the owner or occupier of a dwelling situated on land in the area of affectation which the Applicant is not required to acquire under this clause 7 requests the Applicant to carry out measures to mitigate the impact of dust and/or noise and/or blasting upon the dwelling, the Applicant shall forthwith carry out such measures at its own expense. In the event that within three months of such request by an owner or occupier, the Applicant and the owner

or occupier cannot agree upon the measures to be carried out, either party may refer the matter for determination by the Council's Health and Building Surveyor. The Applicant shall bear the costs of such determination and shall carry out the measures which may be required by the Surveyor, forthwith.

Main Northern Railway

8. (i) Within six months of the date of this consent being granted, the Applicant shall submit plans satisfactory to the State Rail Authority in respect of the modification of the Thornton rail loading/unloading facility.

(ii) The Applicant shall consult with the State Rail Authority before commencing mining of the Year 7 block shown in the EIS in respect to the implementation of any additional protection measures for the main northern railway and carry out such measures in accordance with that Authority's requirements.

Crown Lands

9. Prior to commencement of mining, the Applicant shall negotiate with the Crown Lands Office for purchase by the Applicant of Crown Lands within the coal lease area.

State Pollution Control Commission Approvals

10. Prior to the commencement of construction of the proposed development, the Applicant shall obtain from the State Pollution Control Commission ("the Commission") all statutory approvals and licences as may be required under the Clean Air Act 1961, the Clean Waters Act 1970 and the Noise Control Act 1975 together with such other approvals or licenses as may be required under future legislation or regulations for the conduct of the proposed development. The Applicant shall conduct the development in accordance with the terms of such approvals and licences.

Public Authorities

11. The Applicant shall meet the requirements of all public authorities having statutory responsibilities in respect of the proposed development.

Noise Control

12. (i) The Applicant shall investigate, design and construct a bund wall approved by the Commission to acoustically shield residences in Maison Dieu Road from the southern mining area. The bund shall provide a minimum predicted reduction of noise level of 5dBA at residences numbered 17 to 23 inclusive, 27 and 28 under neutral meteorological conditions during years 7 to 21 inclusive of the conduct of the mining in the southern mining area. The bund shall be

constructed south of the southern mining area and run from the New England Highway to a point 50m west of the western extremity of mining in the southern area. The bund wall shall be constructed not less than 20m from Rixs Creek and shall be suitably overlapped at that location, and shall be constructed and vegetated a minimum of 2 years prior to commencement of any mining in the area it is to shield.

(ii) Upon any day in which mining operations are permitted the Applicant shall not haul coal within the coal lease application area before 6:30 a.m. nor after 8:00 p.m.

(iii) The Applicant shall comply with the L10 day-time noise level design goals set out below using 'worst case' conditions for the following areas, as follows:

Bridgman Road	: 38DBA
Singleton Heights - South	: 40dBA
Singleton Heights - North	: 40dBA

(iv) The Applicant shall comply with the L10 day-time noise level design goals set out below using neutral meteorological conditions as defined by the Commission for the following area in the absence of any bund to mitigate the effects of noise.

Maison Dieu Road	: 38dBA

Tailing Dams

13. The Applicant shall meet the requirements of the Soil Conservation Service ("the Service") in respect of the design, construction, maintenance and filling of any tailings dams at the site.

Rixs Creek Diversion

14. (i) The Applicant shall liaise with the Department of Water Resources and the Soil Conservation Service and meet their requirements for the design, construction and maintenance of any diversion of Rixs Creek.

(ii) The Applicant shall not divert Rixs Creek in the southern mining area.

(iii) The Applicant shall not mine within 20m of the bank of Rixs Creek in the southern mining area.

Blasting

15. (i) The Applicant shall not blast within 500m of the New England Highway or any approved deviation of the highway while either are open for traffic.

(ii) The Applicant shall design all blasts to minimise airblast overpressure and vibration using the NONEL system or equivalent.

(iii) The Applicant shall design all blasts based on the results of monitored blasts designed to minimise airblast overpressure and vibration using the NONEL system such that any one blast has less than a five (5) per cent probability of exceeding airblast overpressure and vibration design goals as set by the Commission for affected property excluding historic buildings.

(iv) The Applicant shall determine the appropriate weather data by taking measurements immediately prior to blasting and from that data shall predict whether noise levels outside the area of affectation are likely to be increased above the levels expected under neutral meteorological conditions. The said data shall be recorded by the Applicant as part of its monitoring data.

(v) The Applicant shall not blast if the predictions in subclause (iv) herein indicate that the Commission's noise goals (excluding those for historic buildings) are likely to be exceeded.

(vi) The Applicant shall monitor all blasts, to the satisfaction of the Department.

(vii) The Applicant, in respect of the coke ovens structure, shall:

(a) ensure that initial blasting controls are implemented such that a peak particle velocity of 5mm/sec is not received at the coke ovens structure with more than a five (5) percent probability of being exceeded.

(b) monitor the effects of blasting on the coke ovens structure in such a manner that the peak particle velocity received by the coke ovens structure is able to be related to any observable structural damage occasioned to the ovens. Should damage become evident, the Applicant shall appropriately modify the blasting techniques.

(c) submit a report detailing the effects of blasting on the coke ovens structure to the Council and the Heritage Council after each of the first five blasts and then at three monthly intervals or as otherwise agreed to by the Council and the Heritage Council.

Coal Transportation

16. (i) The Applicant shall transport all coal from the site by rail but may transport coal by road from Rixs Creek to its Bloomfield Colliery at East Maitland for a period not exceeding 2 years from the date of first delivery.

(ii) The Applicant shall give written prior notice to the Council of the date of the first delivery of coal from the site. After the expiration of 2 years from the first delivery of coal from the site the road transport of coal from the site shall cease unless an extension is granted by the Council or recommencement applied for on account of emergency requirements.

(iii) The Applicant shall not road-haul coal in excess of 300,000 tpa from Rixs Creek.

(iv) The Applicant shall upgrade the intersections required for coal truck egress and ingress in respect of the New England Highway at Rixs Creek and at Thornton to the requirements of the Roads and Traffic Authority ("the Authority").

(v) The Applicant may road haul coal off site only between the hours of 7.00 a.m. and 2.00 p.m., Mondays to Fridays inclusive, Saturdays, Sundays, Public Holidays excluded.

(vi) The Applicant shall not load coal to road haul vehicles before 7.00 am on any day.

(vii) The Applicant shall use only the New England Highway for the road transport of coal between the proposed egress and ingress points at Rixs Creek and Thornton.

Roads

17. (i) The Applicant shall design and construct a NAASRA Type C Intersection at the junction of Rixs Creek Lane and the New England Highway according to the requirements of the Authority.

(ii) The Applicant shall meet the reasonable requirements of the Authority in relation to any future diversion of the New England Highway, especially in regard to ground levels and compaction densities of fill.

Flood Lighting

18. The Applicant shall construct flood lighting to mitigate direct sight lines of on-site flood lighting and vehicle headlights onto dwellings to the satisfaction of the Council. Direct flood lighting shall not be directed to dwellings.

Transmission Lines

19. The Applicant shall undertake the relocation of any electrical transmission lines which may be required due to the operations of the proposed development to alignments satisfactory to the Shortland County Council.

Environmental Monitoring - General

20. (i) The Applicant shall undertake and implement environmental monitoring in respect of soil rehabilitation as may be required by the Service and the Department and in respect of ground water levels and quality, as may be required by the Department of Water Resources.

(ii) The Applicant shall ensure that all environmental safeguards proposed for the development and required by this consent and other statutory approvals are enforced.

(iii) The Applicant shall provide to the Department, the Commission and the Council for public release, results and analyses of environmental monitoring undertaken in pursuance of the provisions of subclause (i) herein and subclause 22(i), (iv), (v) and (vi) herein. Such results and analyses shall be provided on a quarterly basis, for review by the responsible government bodies.

Annual Report

21.(i) Within six (6) months of the commencement of construction of the proposed development, the Applicant shall ascertain the requirements of the Director in relation to an annual report to be submitted to the Director, the Commission and the Council in respect of the performance of the development. Each report shall be in respect of the calendar year ending 31 December and the first such report shall be submitted by 31 March 1991.

(ii) The annual report shall provide the following information:

(a) the performance of the development;

(b) the implementations and effectiveness of the environmental controls and conditions relating to the development;

(c) results of environmental monitoring in respect of air, water and noise pollution;

(d) mining operations undertaken during the preceding 12 months;

(e) workforce characteristics of the development;

(f) modifications to mining operations, if any, to mitigate any adverse environmental impacts.

Environmental Monitoring - Specific Requirements

22. (i) The Applicant shall install and utilise a wind direction and velocity monitoring and recording station at the highest non-protected location immediately adjacent to the area to be mined over each ensuing 12 month period in the north mining area, as directed by the Commission.

(ii) The Applicant shall relocate the wind monitoring and recording station referred to in clause (i) at 12 monthly intervals, as directed by the Commission.

(iii) The Applicant shall use the data collected by the wind monitoring and recording station referred to in subclause (i) herein to determine when and how the mine operation is to be modified in accordance with subclauses 23(i) and (ii) herein.

(iv) The Applicant shall install dust deposition gauges and in each calendar month shall determine the dust deposition rate in $gm/m^2/mth$ such that the $+2gm/m^2/mth$ incremental isopleth for dust arising from mining operations is able to be plotted on an annual basis, with baseline defined by the Commission.

(v) The Applicant shall measure and record the L90 noise level over a 72 hour period at least twice per year such that the 40dBA day-time and 35dBA night-time noise level isopleths related to the mining operations are able to be plotted in respect of the area from The Retreat through Singleton Heights to the location where Maison Dieu Road crosses Rixs Creek.

(vi) The Applicant shall analyse to the satisfaction of the Commission all waters other than uncontaminated stormwater to be discharged from the mining, coal preparation or water storage areas of the mine site.

(vii) The Applicant shall obtain the prior approval of the Commission before discharging of any waters other than uncontaminated stormwater from the mining, coal preparation or water storage areas of the mine site.

Air Quality

23. (i) The Applicant shall cease all mining operations at any time when the average hourly wind velocity from any direction exceeds 10 metres per second.

(ii) The Applicant shall cease all out-of-pit overburden dumping and shaping, topsoil stripping and placement and bund wall and earthworks construction at any time when the average hourly wind velocity exceeds 5.6 metres per second from the segment due west clockwise through to north east.

(iii) The Applicant shall cease all mining operations at any time when visibility is impaired on the New England Highway as a result of mining operations in accordance with the requirements of the Council.

(iv) The Applicant shall design the raw coal dump station and coal breaker to minimise the emission of coal dust in accordance with the requirements of the Commission.

Dust Suppression

24. (i) The Applicant shall provide a standby water cart for each operating water cart proposed in the EIS at each stage of mining.

(ii) The Applicant shall install automatic water sprays on coal stockpiles such that the stockpiles are sprayed when the wind speed from any direction exceeds 5.6m/s.

Environmental officer

25. Prior to the commencement of any construction or operations in the coal lease application area the Applicant shall appoint an on-site environmental officer responsible directly to the Mine Manager, whose qualifications are to the satisfaction of the Department.

Hours of Operation

26. (i) The Applicant shall ensure that major items of plant equipment such as bulldozers, scrapers, haul trucks, dump trucks and loaders shall not be started or operated prior to 6.30 a.m. on the first shift of each day.

(ii) The Applicant shall not carry out mining operations on weekends or public holidays.

Joint Rail Loading Facility

27. In the event that development consent is granted for construction of a joint rail loading facility, the following conditions shall apply:

(i) Within 3 months of the date of granting development consent for the mine, the Applicant give a written undertaking to the Joint Coal Board ("the Board") that it will use a joint rail loading facility outside the proposed coal lease area for Rixs Creek.

(ii) Upon the granting of such development consent the Applicant shall forthwith enter into such agreements with the Board as may be required by the Board for the construction of a joint rail loading facility.

(iii) The Applicant shall use such facility for the transport of all coal immediately upon the completion of the facility.

(iv) If for reasons beyond the control of the Applicant the joint facility cannot be constructed then the provisions of clause (v) herein shall apply.

(v) No coal loading facility for the mine shall be constructed within the proposed Rixs Creek coal lease area unless the Minister approves such construction. Rail spur access to the main railway line would be permitted within the coal lease area.

(vi) The washed coal stockpile for the Rixs Creek mine shall be adjacent to the coal loading facility and not within the Rixs Creek coal lease area unless the Minister otherwise grants approval.

Road Access

28. (i) The Applicant shall seal Rixs Creek Lane from its intersection with the New England Highway to its junction with any site access road prior to the use of Rixs Creek Lane for any access to the site.

(ii) The site access road from the site entry point to the employee and visitor car park(s) shall be sealed prior to commencement of any operations other than roadworks on site.

(iii) For the initial two years of mining when road haulage of coal is permitted, the Applicant shall seal roads as follows:

(a) those sections of the on-site roads in areas outside the mine plan;

(b) those sections of the haul road in areas in the mine plan which have been rehabilitated to the final landform, or otherwise, so as to leave no more than 300m of unsealed road which is traversed by coal haulage vehicles at any one time, all to the satisfaction of the Commission

Water Management

29. (i) The Applicant shall liaise with those landowners who presently use water from Rixs Creek to ascertain the full range of uses of the water and to then formulate in conjunction with relevant government bodies, a water management plan for Rixs Creek, which takes account of those uses.

(ii) The Applicant shall obtain the approval of the Commission for the water management plan referred to in subclause (i) herein before commencement of mining.

Financial Contributions

30. The Applicant shall pay a financial contribution to the Council, pursuant to Section 94 of the Act.

In the event that the Applicant and the Council cannot agree on the total amount of such contribution, the Minister shall determine the said amount, after referring the dispute to a Commissioner of Inquiry and after receiving the Commissioner's recommendations.

Off site Effects

31. In the event that impact of dust from the mining operations at residences outside the area of affectation is in excess of the amenity criteria of the Commission, the Applicant shall modify the mining operations or undertake such works as may be required by the Commission to mitigate those impacts.

Working Areas

32.(i) The Applicant shall not clear vegetation in advance of mining in Stage 1, in excess of 1 hectare.

(ii) The Applicant shall not clear vegetation in advance of mining in Stage 2 in excess of 100m, nor have a total area in excess of 5.0 ha cleared in advance of mining at any one time in respect of both the north and south mining areas.

Production Levels

33.(i) The production levels of ROM coal shall not exceed those levels set out in the EIS in any one year.

(ii) The Applicant shall annually notify the Council by 28 January of the total quantity of Run-of-Mine coal mined and the total quantity of saleable coal produced from the mine for each month in the preceding calendar year.

Participating in Coal Industry Projects

34. The Applicant shall participate in any financial arrangements (including financial arrangements with other coal industry members) in accordance with the requirements of the Government of New South Wales for sharing the capital costs of infrastructure such as rail rolling stock, rail track, coal loader and other related infrastructure to be used jointly by participating coal industry members.

Dispute Resolution

35. In the event that the Applicant and the Council or a government body, other than the Department, cannot agree on the specification of requirements applicable under this Consent, other than provided for in clause 30, the matter shall be referred to the Director whose determination of the disagreement shall be final and binding on the parties.

NOTE: This approval does not relieve the applicant of the obligation to obtain any other approval under the Local Government Act, 1919 as amended, the ordinances made thereunder (including approval of building plans), or any other Act.

DESCRIPTION OF LANDS WITHIN THE PROPOSED COAL LEASE

AT RIXS CREEK SINGLETON

(A) Lands that embrace the surface and land below thereof to an unlimited depth.

Lots 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13 and part Lot 7 in Deposited Plan 251001, Lot 1 in Deposited Plan 599113, part Lot 2 in Deposited Plan 599113 (being that part of the aforementioned lot that is generally west of the prolongation of the eastern boundary of Portion 4 to the northern boundary of Portion 202, Parish of Darlington), Lots 1 & 2 in Deposited Plan 598097, Lots 1, 3 & 4 in Deposited Plan 573333, Lot 1 in Deposited Plan 449426, Lot 58 & part Lot 57 in Deposited Plan 252692, Lot 15 in Deposited Plan 251617, Lot 10 in Deposited Plan 251618, suburban Portions 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66 & 67, in the Village of Auckland, Parish of Auckland, part Portion 85, Parish of Auckland (being that part of of Portion 85 that is south of Latitude 32° 30' and generally east of the New England Highway), part Portion 83, Parish of Auckland (being that part of Portion 83 that is west of the Main Northern Railway line), part Portion 139, Parish of Darlington, part Portion 150, Parish of Darlington (being that part of Portion 150 that is west of the Main Northern Railway line), Portion 4 Parish of Darlington, part Lot 102 in Deposited Plan 740380 (being that part of Lot 102 situated in the north western corner of the subject lot, that is south of Lot 2 in Deposited Plan 599113 and east of suburban Portions 62 and 63 within the Village of Auckland), part Lot 1 in Deposited Plan 170704 (being the whole of aforementioned Lot 1, excepting thereout the lands within a radius of 200 metres of the house located on the subject lot and situated adjacent to the junction of the Middle Falbrook Road and the New England Highway, together with those lands within a 50 metre radius of a dam located on the aforementioned Lot 1 and being adjacent to the New England Highway), part Portions 23, 89 & 137 in the Parish of Darlington (being those parts of the aforementioned portions that are south of Latitude 32° 30' south), part Lot 12 in File Plan 900136 (being those lands within the north eastern corner of the aforementioned lot and being to the east of suburban Portions 46 & 47 within the Village of Auckland and south of Lot 56 in Deposited Plan 252692), Lot 4 in Deposited Plan 581908,

part Lots 2 & 3 in Deposited Plan 581908 (being those parts of the aforementioned lots that are south of Latitude 32° 30' south), part of the former Main Northern Railway that is south of Latitude 32° 30' south and being west of Longitude 151° 09' east, part Portion 82 & 97 in the Parish of Darlington (being the lands situated west of Longitude 151° 09' and south of Latitude 32° 30' south), part Lot 2 in Deposited Plan 555356 (being that part of the aforementioned lot located west of Longitude 151° 09' east).

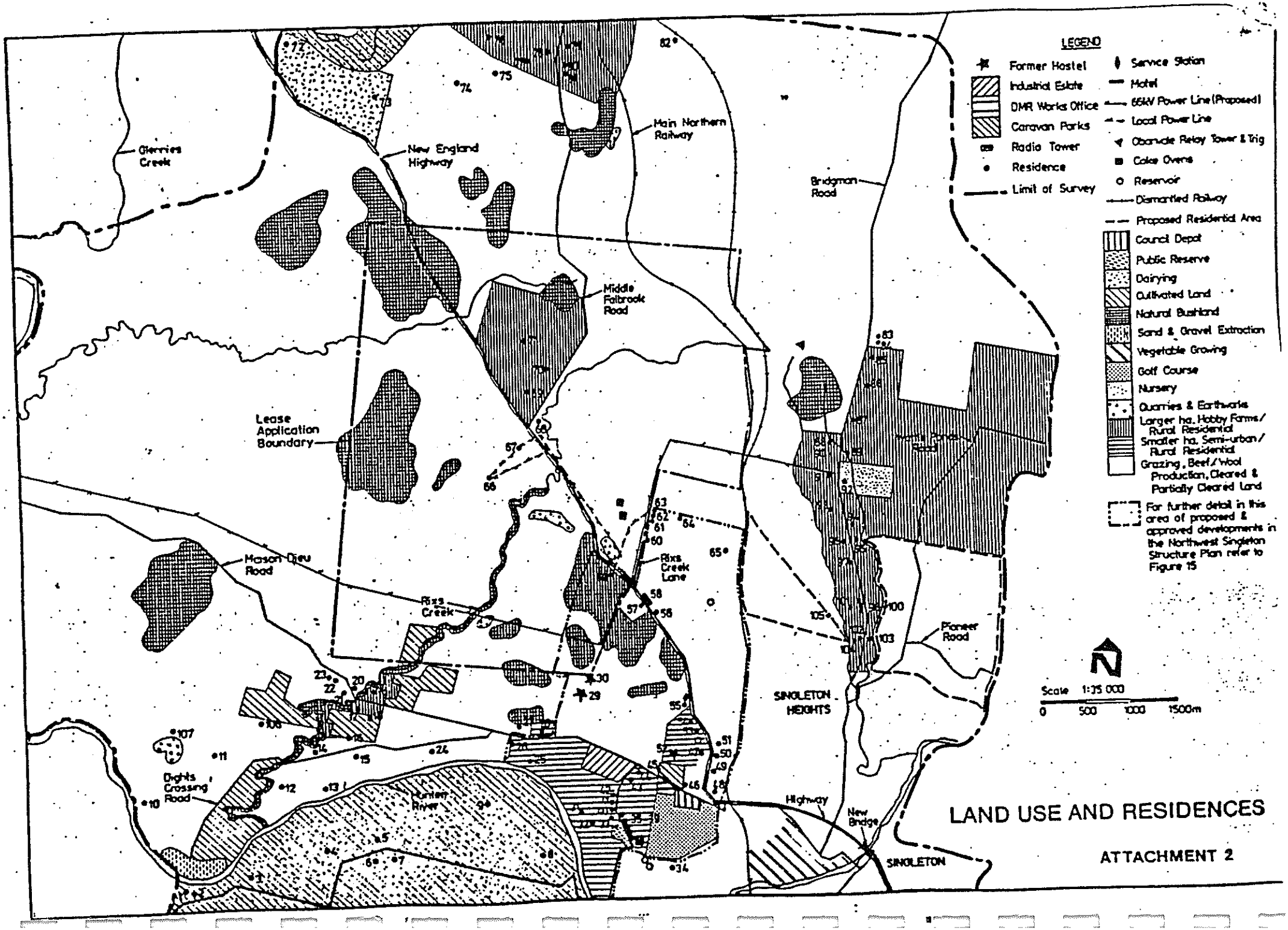
Unalienated Crown lands that are located adjoining and to the south of the New England Highway and being east of Lots 57 & 58 in Deposited Plan 252692 and west of Lot 2 in Deposited Plan 599113 together with the unnamed roads within the Village of Auckland, Parish of Auckland, road east of suburban Portions 62 & 63, road west of suburban Portions 58 & 67, road west of Portions 50 & 51, road west of Portions 46 & 47, road north of suburban Portions 47, 48, 51, 53, 54, 57, 67, 66 & 65, together with that piece of land situated adjoining the New England Highway and Lot 1 in Deposited Plan 598097.

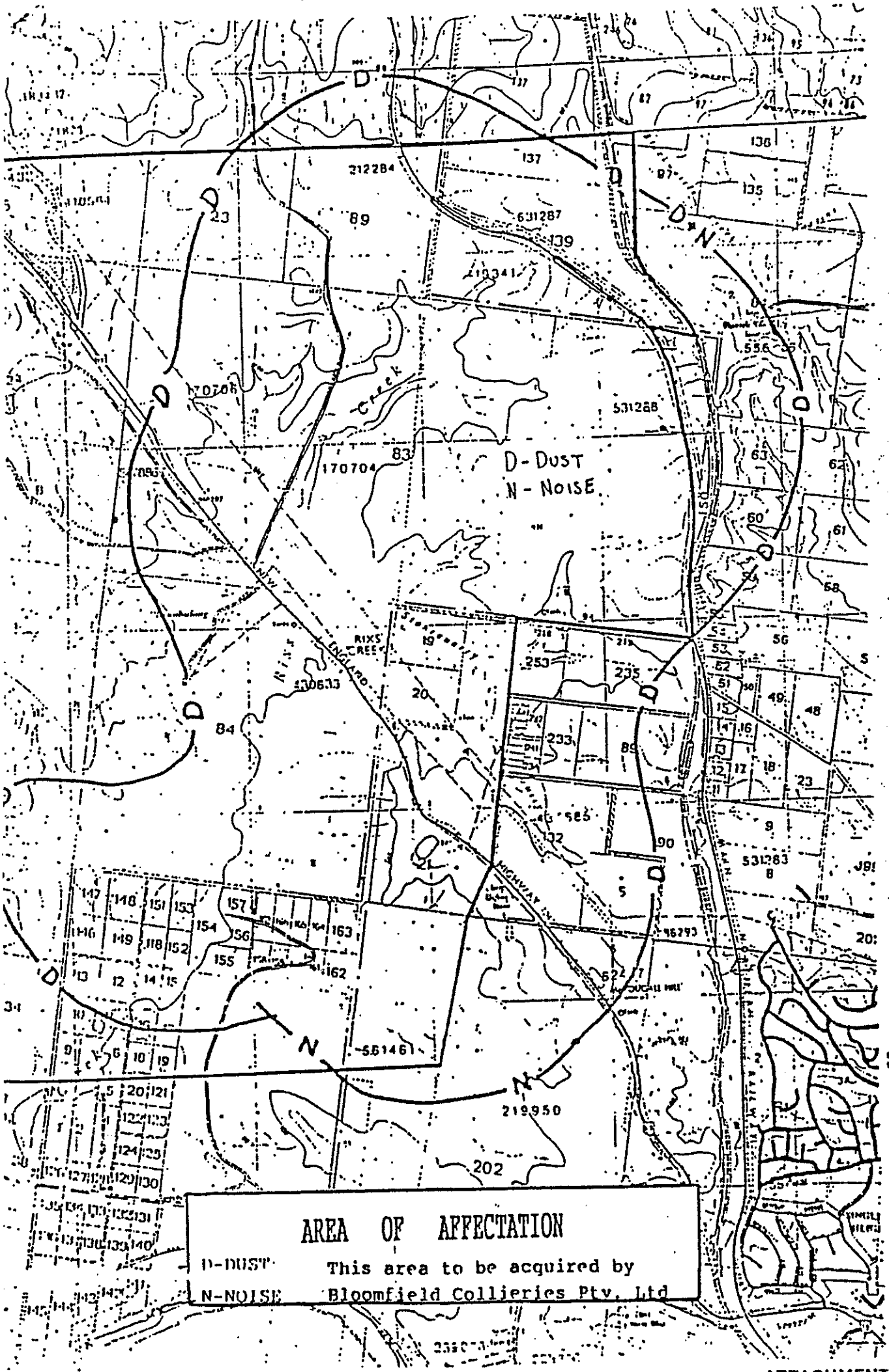
(B) Lands that have a surface exception of 20 metres and an unlimited depth restriction.

Suburban Portions 9, 10, 11, 12, 13, 14, 15, 16 & 17 within the Village of Auckland, part suburban Portions 6, 7, 8, 18 & 19 within the Village of Auckland (being north of Latitude 32° 32' 40" south), part of TS and CR No.2799, within the Village of Auckland and adjoining the Parish of Darlington (being that part of the aforementioned TSR that is north of Latitude 32° 32' 40" south), part Lot 12 in Deposited Plan 900136 (being that part of the aforementioned lot that is north of Latitude 32° 32' 40" south and east of Longitude 151° 06' 23" east), part Lot 102 in Deposited Plan 740380 (being that part of the aforementioned lot that is north of Latitude 32° 32' 40" south), part Lot 55 in Deposited Plan 252692 (being that part of the aforementioned lot that is east of Longitude 151° 06' 23" east), part Lot B in Deposited Plan 404824 and part Lot 56 in Deposited Plan 252692 (being that part of the aforementioned Lots B & 56 situated to the east of Longitude 151° 06' 23" east), Lots 1 & 2 in Deposited Plan 413053, part Lot A in Deposited Plan 404824 (being that part of the aforementioned lot situated east of Longitude 151° 06' 23" east), Lot 7 in Deposited Plan 251618, part Portion 88 in the Parish of Auckland (being that part of the aforementioned portion that is north east of the New England Highway and to the west of Lot 7 in Deposited Plan 251618), part Portion 85 (being that part of the aforementioned portion that is east of Longitude 151° 06' 23" east and south of Latitude 32° 30' south and west of the New England Highway), part Lot 1 in Deposited Plan 170704 (being that part of the aforementioned lot that is within a radius of 200 metres of a dwelling located on the subject lot and adjacent to the junction of the Middle Falbrook Road and New England Highway), part Lot 1 in Deposited 170704 (being those lands with a radius of 50 metres of a dam located on the subject lot and being adjacent to the New England Highway), part Lot 7 in Deposited Plan 251001 (being that part of the aforementioned lot that is within a radius of 200 metres of a dwelling located on Lot 1 in Deposited Plan 170704 and situated adjacent to the junction of the Middle Falbrook Road and the New England Highway, that part of the road known as the Middle Falbrook Road that is located north of its junction with the New England Highway and south of Latitude 32° 30' 00" south, also that part of the New England Highway that is located south east of Latitude 32° 30' 00" south to the western alignment of the junction of the road known as Rixs Creek Lane, that part of the existing main Northern Railway line that is located south of Latitude 32° 30' 00" south to its intersection with the northern boundary of Portion 83, Parish of Auckland,

those unnamed roads within the Village of Auckland and being located north of suburban Portions 12, 13, 14 & 15 and west of suburban Portions 9, 10 & 13, north of suburban Portions 7 & 9, east of suburban Portions 14, 16 & 18, the road south of suburban Portion 18 that is north of Latitude 32° 32' 40" south, the road west of suburban Portion 8 that is north of Latitude 32° 32' 40" south.

All the above described lands on this and the previous 3 pages are within the Parishes of Auckland and Darlington, County of Durham, Shire of Singleton.


LEGEND
Former Hostel
Industrial Estate
DMR Works Office
Caravan Parks
Radio Tower
Residence
Limit of Survey
Service Station
Motel
66kV Power Line (Proposed)
Local Power Line
Obanvale Relay Tower & Trig
Coke Ovens
Reservoir
Dismantled Railway
Proposed Residential Area
Council Depot
Public Reserve
Dairying
Cultivated Land
Natural Bushland
Sand & Gravel Extraction
Vegetable Growing
Golf Course
Nursery
Quarries & Earthworks
Larger ha. Hobby Farms / Rural Residential
Smaller ha. Semi-urban / Rural Residential
Grazing, Beef / Wool Production, Cleared & Partially Cleared Land
For further detail in this area of proposed & approved developments in the Northwest Singleton Structure Plan refer to Figure 15
Glennies Creek
New England Highway
Main Northern Railway
Bridgman Road
Middle Falbrook Road
Lease Application Boundary
Mason Dieu Road
Rixs Creek
Rixs Creek Lane
Pioneer Road
SINGLETON HEIGHTS
Dights Crossing Road
Hunter River
Highway
New Bridge
SINGLETON
Scale 1:25 000
0 500 1000 1500m
LAND USE AND RESIDENCES
ATTACHMENT 2



ATTACHMENT 1

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Rix's Creek Rail Loop

Section 75W Modification Environmental Assessment

Prepared for

Rix's Creek Pty Ltd

Prepared by

AECOM Australia Pty Ltd
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ABN 20 093 846 925

10 April 2013

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

Quality Information

Document Rix's Creek Rail Loop

Ref 60266677

Date 10 April 2013

Prepared by Simon Murphy

Reviewed by Troy Collie / Catherine Brady

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	10-Dec-2012	Draft for peer review	Simon Murphy Environmental Planner	
B	13-Dec-2012	Draft for client review	Simon Murphy Environmental Planner	
C	20-Dec-2012	Draft for DP&I review	Simon Murphy Environmental Planner	
D	10-Apr-2013	Final	Simon Murphy Environmental Planner	

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Certification

Submission of Environmental Assessment (EA) prepared under the *Environmental Planning and Assessment Act 1979* Section 75F

EA prepared by		
Name:	Simon Murphy	Catherine Brady
Qualifications:	Master of Social Science (Env & Planning) Bachelor of Env. Science University of Newcastle Senior Environmental Planner	Master of Urban and Regional Planning Bachelor of Arts (Hons) Technical Director - Environment
Address:	AECOM Australia Pty Ltd (AECOM) 17 Warabrook Boulevard Warabrook NSW 2304	AECOM Australia Pty Ltd (AECOM) 420 George Street Sydney NSW 2000
in respect of	A proposed rail loop and coal loading facility at Rix's Creek Mine.	
Project application:	AECOM Australia Pty Ltd (AECOM)	
Applicant name:	Rix's Creek Pty Ltd	
Applicant address:	PO Box 4 East Maitland NSW 2323	
Land to be developed:	Lot 219, 235, 94 and 150 D.P. 752442;	
Lot no., DP/MPS, vol/fol etc:	Lots 1 and 2 DP 1139094; Lot 1 D.P. 1156072; Lot 1 D.P. 211399; and Lot 238 DP 829334	
Proposed project:	Proposed construction and operation of a rail loop and loading facility. Map(s) attached	
Environmental Assessment	An Environmental Assessment (EA) is attached.	
Certification	I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.	
		
	Signature Name: Simon Murphy Date: 10 April 2013	Signature Name: Catherine Brady Date: 10 April 2013

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Executive Summary

Background

Rix's Creek Mine is located approximately 70 km northwest of Newcastle and 4 km to the north of Singleton in the Hunter Valley, NSW. The site is accessible from Rixs Creek Road via the New England Highway. The site is located in an area dominated by agricultural and mining land uses. The nearest residential areas in Singleton are located approximately 1km to the southeast of the site.

The Rix's Creek mining lease was renewed in 2011 and the projected life of the Rix's Creek Mine is currently 20 years, with current operation set to culminate in 2031. The Mine has historically accessed the rail loop on the neighbouring Integra Mine to deliver its coal to Port. Access to the Integra Loop was originally controlled through a rail loop access licence with the owners of the Integra Mine. This licence with a 21 year life expired in 2011. Ongoing negotiations have failed to reach an agreement regarding the conditions of a new licence and mine operations are compromised by Integra not extending any future licence beyond a 10 year timeframe.

Forward planning for the Mine requires a higher level of certainty than would not be provided by a 10 year licence agreement that could be cancelled at any time. In order to continue investing the required capital to allow the Mine to reach its full development potential, greater transport certainty is required.

Given the uncertainty that currently exists around rail access for the Mine, the option to construct and operate its own rail loop has been chosen. This will allow The Bloomfield Group to continue investing capital into the Mine to develop the known resources of the site throughout the projected lifespan of the Mine.

Description of the Project

The proposed rail loop includes the construction and operation of:

- A 5.6km rail loop from the Main Northern Line;
- Proposed rail loading facility;
- Clean coal stockpile (280m x 140m);
- Overland conveyer (410m) from the existing Coal Handling and Preparation Plant (CHPP);
- Stacker conveyor (260m); and
- Reclaim tunnel and conveyor (460m) to rail load out bin.

Other necessary infrastructure will be required to service the proposed facilities including access roads along the rail loop alignment.

Statutory Planning

Development approval for the Mine was granted in 1989 by the Minister pursuant to Section 101 of the *Environmental Planning and Assessment Act 1979* for an operation extending for 20 years to 2010, with first coal being extracted from the site in 1990. The 1989 consent has now lapsed. The mine operates under Coal Lease 352. Development Application (DA) 49/94 was issued for expansion of the Mine in 1995. Current operations fall under both the 1989 and 1995 consents.

Since approval of the Rix's Creek Mine, the *Environmental Planning and Assessment Act 1979* has undergone multiple amendments. As such, a number of transitional arrangements have been included in the *Environmental Planning and Assessment Act 1979* and *Environmental Planning and Assessment Regulation 2000* to manage the way modification applications are assessed.

Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000* provides that for the purposes of modification only, the approval can be taken to be an approval under Part 3A (repealed) of the *Environmental Planning and Assessment Act 1979*. The project approval can therefore be modified by Section 75W of the *Environmental Planning and Assessment Act 1979*.

Consultation

Consultation was undertaken with the following agencies during the preparation of this Environmental Assessment:

- Department of Planning and Infrastructure;
- NSW Office of Environment and Heritage;
- NSW Department of Primary Industries;
- Roads and Maritime Services;
- NSW Office of Water;
- Australian Rail Track Corporation;
- Hunter Catchment Management Authority; and
- Singleton City Council.

Results of the consultation were used to scope and prepare specialist studies and confirm assessment requirements. Agency comments have been addressed throughout the EA to demonstrate that comments have been considered, and the assessment undertaken as required.

Environmental Impact Assessment

Air Quality

Air quality impacts during construction may occur as a result of dust and exhaust fumes from the movement and operation of plant and equipment. Construction impacts would be short term and mitigated by existing measures that apply to the operation of plant on the mine site.

The components of the proposed rail loop that would potentially result in dust emissions during operation include:

- Transfer points on the conveyors;
- Unloading of the product coal from the processing plant to the rail loop facility; and
- Wind erosion from the product coal stock pad at the rail loop facility.

Modelling undertaken to examine the potential impact of these activities found that the proposed rail loop would result in negligible detectable change in dust levels at potentially sensitive receptors, as the dust emissions are minor and the proposed rail loop and load out facility is located approximately 1 km south-southwest of the existing Camberwell rail load out facility. The results of monitoring conducted to date on the existing facility do not report any discernible effect on nearby receptors.

Dust generation at source should be reduced as a result of an overall net reduction in load because the new rail loop would prevent the need for coal to be road hauled by truck to the Integra Loop for loading.

Noise

The area surrounding Rix's Creek Mine and the proposed rail loop area is predominantly rural, with the main sources of noise being from transport routes (the New England Highway and the Main Northern Line) and from mining activities. Receptors that are potentially noise sensitive are located to the east and southeast of the existing mine. Specifically, potentially sensitive receptors located on Retreat Road, Bridgman Road and in the suburb of Singleton Heights may be affected. One representative receptor of each of these areas was considered for further technical assessment.

Modelling undertaken to determine predicted construction noise impacts related to works in the loading and clean coal stockpile area identified no exceedances of project specific noise criteria at any sensitive receptor during the day and evening periods, however only standard hour construction works are proposed. These results are based on the worst-case construction activity (bulk earthworks).

Other on site construction tasks such as conveyor and rail loading facility construction would require far less noise emitting plant than the earthworks, and would occur in the general vicinity of the existing Coal Handling and Preparation Plant. No increase to existing site noise levels is expected as a result of these activities. Modelling found there is potential for exceedances of construction noise criteria of up to 20dBA during construction works

when they are undertaken at their closest point to the sensitive receptors in Singleton Heights, i.e. during construction at the southern section of the rail spur near the take-off from the Main Northern Line. Predictions reduce below the criteria during the day period by the time construction reaches the end of the spur. Consultation would be carried out prior to commencing work in areas where exceedance of the construction noise criteria may occur, and best practice management techniques would be implemented to minimise noise impact.

During operation of the rail loop and loading infrastructure exceedances were identified for night time periods under worst case meteorological conditions i.e. night time temperature inversion and north-westerly winds. With the exception of the stockpile dozer, infrastructure associated with the proposal would operate with relatively constant noise and it is unlikely that noise emanating from the additional infrastructure would be noticeable to residents in the assessment area. Operating the stockpile dozer on the western side of the stockpiles, at heights below the top of the stockpile during enhancing meteorological conditions, should reduce rail infrastructure sound power levels by 3 to 4 dB during the night period.

With the temporary nature of main construction noise emissions, the limited nature of potential operational impacts and the range of mitigation measures listed in this EA implemented, noise impacts would generally be within acceptable criteria levels. Where levels would be exceeded reasonable and feasible mitigation measures to minimise noise would be put in place.

Ecology

There is a mix of highly modified vegetation communities subject to past clearing and disturbance from grazing, despite there now being limited grazing across the mine site.

The proposed clearing action (for construction of the rail loop) will result in the loss of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* Ecologically Endangered Community (EEC) and *Central Hunter Grey Box – Ironbark Woodland EEC*. These EECs are of varying quality with heavily disturbed understories. Seven- part tests pursuant to section 5A of *the Environmental Planning and Assessment Act 1979* indicated that the proposal would not pose significant impacts on the two EECs.

No threatened flora species where identified as occurring within the development footprint.

Nine threatened fauna species were assessed as having a medium or high likelihood to occur in the study area and a medium risk of significant impact from the proposed project. Seven-part tests concluded that the proposed clearing is small scale and the proposed project would be unlikely to result in any significant impacts on these species.

Assessments of significant impact pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* undertaken for the Grey-headed Flying-fox and Regent Honeyeater concluded the project would not have a significant impact on these species.

No significant impacts to any migratory species were identified as a result of the Project.

Indigenous Heritage

A total of 12 new Aboriginal archaeological sites were identified and one previously recorded AHIMS site (37-6-2287) was relocated during the course of the survey, comprising stone artefact scatters and isolated artefacts. This is consistent with the known archaeological resource of the wider Hunter region. None of the archaeological sites identified within the Project Area can therefore be considered rare or unique within a regional context. Of the newly identified archaeological sites, only one (Rix's Creek Rail Loop AS4), an artefact scatter, has been identified as being of moderate archaeological significance on the grounds of research potential and integrity.

The Project will result in disturbance to nine archaeological sites, all of which are artefact scatters or isolated artefacts. Generally speaking these scatter and artefacts are of low significance in the context of the wider indigenous heritage of the region with higher value finds of greater archaeological significance existing regionally. Due to the limited value that the impacted sites contain, the impacts to these sites can be successfully mitigated through salvage, including surface artefact collection and test excavation. Salvage and recording of these sites would be undertaken in consultation with the local indigenous community and OEH.

Much of the archaeological resource of the Project Area is not identifiable by surface survey alone. To gain a greater understanding of potential subsurface artefactual information, it is recommended that a small program of subsurface testing would be undertaken to improve understanding of the nature and extent of Aboriginal archaeology in identified areas of potential sensitivity within the Project Area that would be directly impacted by the Project, including newly identified archaeological site Rix's Creek Rail Loop AS4. That site has been

assessed as being of moderate significance on the grounds of research potential and integrity. The program of test excavation should be developed in consultation with registered Aboriginal stakeholders. The test excavation program should utilise the results of the archaeological survey, including identified areas of archaeological sensitivity, to develop an appropriate scientific research methodology. In accordance with Section 85A(1)(c) of the *National Parks and Wildlife Act*, all artefacts recovered during the test excavation should be transferred to the care of an appropriate Aboriginal person/s or organisation/s under a Care and Control Agreement.

Non-Indigenous Heritage

As a result of the proposed project works, varying levels of impact would occur to four historic sites ranging from partial to total destruction:

1) Historic sandstone excavation area;

2) Rail siding associated with Rixs Creek Coke Ovens and associated works;

3) Abandoned section of rail corridor from the Main North Line with cutting and abutting wall; and

4) Rixs Creek platform and associated historic artefact scatter.

Assessments of the significance of the heritage items identified that the works could proceed, subject to approval. Detailed archival recording of the heritage items would be undertaken, prior to impact and in consultation with the Heritage Branch, within the Office of Environment and Heritage.

Traffic

Current traffic generation from ongoing mining activities is primarily light vehicle movements from employees entering and leaving the site at the start and end of shifts. Approximately 75 employees are onsite at any one time. All Mine traffic accesses the Mine via Rixs Creek Lane.

No coal is transported from the mine by truck. Oversized loads may occasionally be required to deliver or remove plant from the site. Loads requiring separate Roads and Maritime Services notification or permits are moved by licensed haulage contractors once necessary permits are obtained. Movement of oversized load is undertaken at times which reduce impacts on the operation of the surrounding road network.

Traffic generation during the construction of the project is expected to average at 42 light vehicle movements per day and peak at 58. All construction traffic would utilise Rixs Creek Lane and leave via the Rixs Creek Lane and New England Highway Intersection.

An analysis was undertaken of this intersection by Parsons Brinkerhoff (2011) for ARTC as part of the Nundah Bank Third Track Environmental Assessment. The traffic assessment found that under construction traffic loadings from that project all intersection movements would be within acceptable Levels of Service (LoS) of A or B during peak times for all movements except right-out from Rixs Creek Lane, to the New England Highway during the morning peak. This movement would deteriorate to LoS F in the morning peak.

As any morning peak traffic generated by construction would be travelling into Rix's Creek Lane, it would not be effected by, or impact upon, right-out movements from Rix's Creek Lane. Left and right in movements which are currently operating at LoS A and B would indicate there is capacity to accept this additional load. Whilst delays through this movement are largely a result of existing traffic levels on the New England Highway during the morning peak, mitigation measures would be put in place to manage delays.

Operational traffic will be minor and consist of primarily light vehicles accessing the site for maintenance and upkeep of the proposed infrastructure. Therefore ongoing traffic impacts would be negligible.

Visual Impact

Visual impact from the existing operation are generally localised and result from the immediate infrastructure of road from the mine site. In order to estimate impacts on nearby residential receptors in the vicinity of Singleton Heights, an assessment was undertaken at the potential worst case receptor which was identified at 21 Lester Close, Wattle Ponds. Computer modelling and the renderings shown in the supporting analysis found that there would be negligible visual effect at this receptor location not taking into account further mitigating effects of vegetation.

In addition to the modelled receiver, views were also considered towards the project site from:

- From Bridgman and Retreat Road, Wattle Ponds located to the east; and
- McMahon Way, Singleton Heights, located to the south east.

Due to intervening topography, stands of vegetation and the proposed visual bund, visual impacts as a result of the proposal would be negligible.

Land Resources

The land over which the proposed rail loop alignment passes is owned by the mine and does not represent high quality agricultural land that is being taken out of production.

Earthworks represent the greatest possible impacts on the proposed Site. Excavation works will be required to achieve the correct level through sections of the rail loop alignment for elements of the rail loading area including for structure footings and an area named the reclaim tunnel. Similarly, areas will need to be built up where they are currently lower than the level required for the rail loop. Both these cut and fill areas will result in exposed soils. Appropriate measures will be put in place to minimise the disturbance and mobilisation of top soils to preserve soil structure and aid regrowth where appropriate.

Waste

Waste would be generated during the construction phase. Waste soils and rock would be used for visual bund construction or as select fill where possible. Remaining portions would be handled in accordance with the mines existing material storage and management areas to achieve final levels. Other waste e.g. packaging materials for plant and machinery would be managed in accordance with the waste hierarchy as would be detailed in the Construction Environmental Management Plan.

Operational wastes are expected to be minimal.

Other Environmental Issues

The social and economic implications of the proposal were examined and the project would have positive benefits as a result of short term employment and spending in the regional economy during the construction stage. In the longer term, the project would protect the productivity of the mine by securing access to end markets.

The proposal would have minimal impact on planned rehabilitation as the proposed infrastructures would be largely outside areas currently being rehabilitated.

Justification and Conclusion

The EA has fully considered the beneficial and adverse effects of the proposed Project, with full consideration of the principles of Ecologically Sustainable Development (ESD). With the implementation of environmental mitigation measures, it is unlikely that significant adverse impacts would occur within the area of the proposed Facility or within the surrounding environment.

The Proposed Project, operated in accordance with the Statement of Commitments, is in accordance with the principles of ESD and the objects of the Environmental Planning and Assessment Act. The rail loop and loading facility would provide economic benefits to the region by creating jobs through both the construction and operational stages and by providing a level of operational security to Rix's Creek Mine, ensuring it has access to markets and that the businesses and jobs it supports, in turn, are secure.

In summary, the Mine requires its own facilities to transport coal to Port to support the long term viability of the operation and the positive economic effects that flow from it at both local and regional levels.

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1.0 Introduction

1.1 Purpose of this Document

Rix's Creek Mine (the Mine) is an existing open cut coal mine owned and operated by Bloomfield Colliery Pty Ltd (Bloomfield). The Mine is located approximately 4km north of Singleton and approximately 70km from Newcastle. The Mine currently utilises a rail loop owned and operated by the neighbouring Integra mine to transport coal product. With changes of ownership to the Integra mine and access contacts to the Integra rail loop soon to expire, it has become necessary for Rix's Creek to construct and operate is own rail loop.

This Environmental Assessment (EA) has been prepared for Rix's Creek Pty Ltd (Rix's Creek) to accompany an application under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify development consent number DA49/94 issued in 1995 (Refer **Appendix A**). The modification seeks consent for the construction of a rail loop from the Main Northern Rail Line, clean coal storage stockpile and associated infrastructure (the proposal) for the loading of coal trains.

Consultation was undertaken with the NSW Department of Planning and Infrastructure (DP&I) in January 2012 (refer **Appendix B**) to confirm the appropriate approval path and environmental assessment requirements for the proposed rail loop. DP&I indicated that a modification to the existing 1995 consent under Section 75W was required. DP&I did not issue project specific Director General Requirements (DGR's) for the project, rather the Department referred to its generic DGR's and indicated the EA would need to cover consideration appropriate to the project.

This EA provides a detailed assessment of the key environmental issues associated with the proposed project and has been prepared in accordance with the generic DGRs.

1.2 Mine Background

1.2.1 Site Location

Rix's Creek Mine is located north of Singleton in the Hunter Valley, NSW. The site is accessible from Rixs Creek Road via the New England Highway. The location of the site is shown in **Figure 1**.

The site is located in an area dominated by agricultural and mining land uses. Residential areas in Singleton are located approximately 4km to the south and southeast of the site. The proposed rail loop would connect to the Main Northern Line which runs north-south along the eastern boundary of the Mine and services the coalfields of the Hunter Valley and the Gunnedah Basin, as well as providing passenger services.

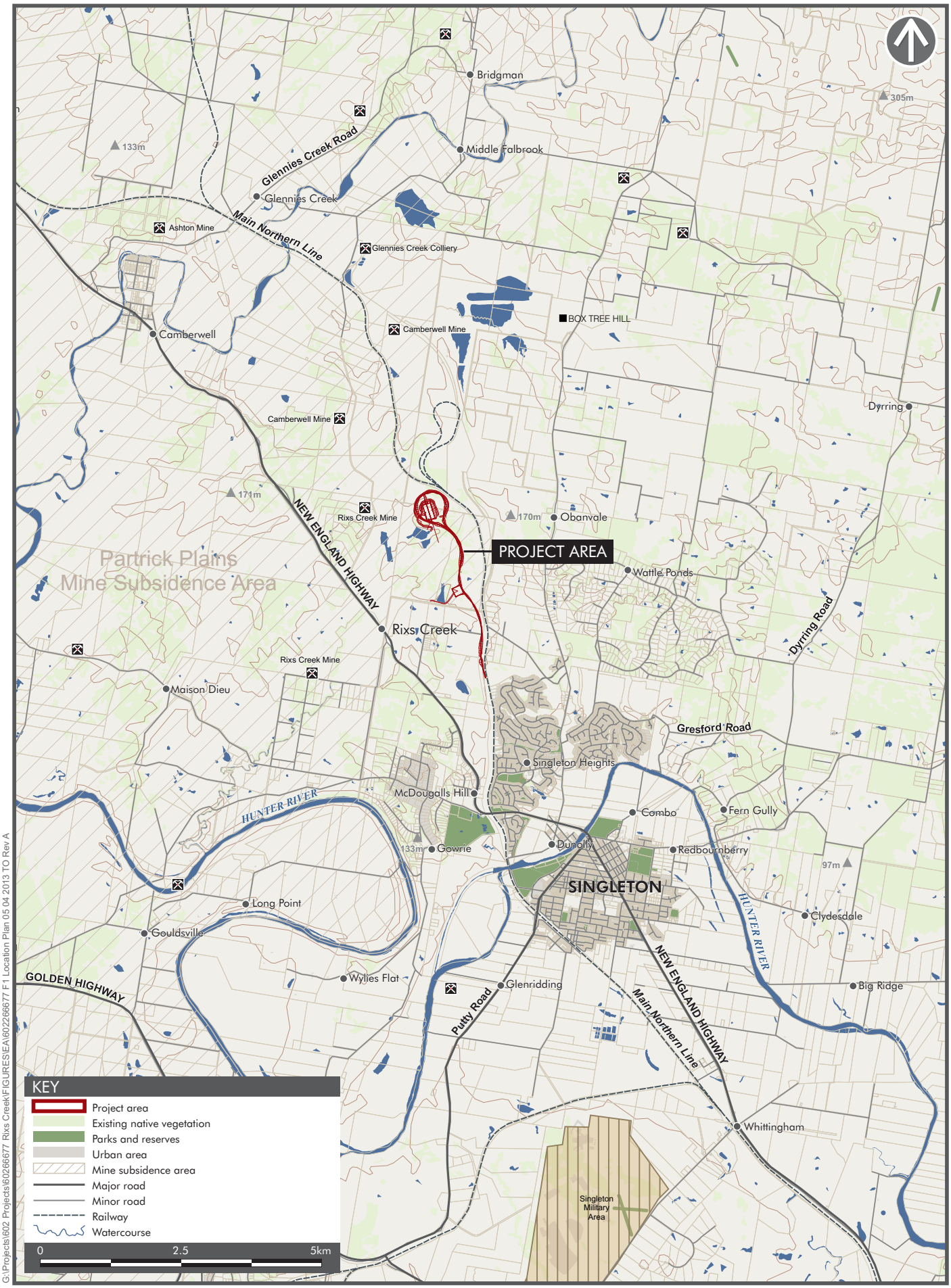
1.2.2 Proponent

The Mine is owned and operated by the Bloomfield Group. The Bloomfield Group operates two coal mines in the Hunter Valley. Bloomfield Colliery located at East Maitland, and the Rix's Creek Mine. All Bloomfield operations are run in accordance with the groups Environmental Management Policy.

1.2.3 Mine History

The original approval for the Mine was issued by the Minister for Planning in October 1989 for an operation extending for 20 years to 2010, with first coal being extracted from the site in 1990. The 1989 consent has now lapsed. Development Application (DA) 49/94 was issued for continuation of the Mine in 1995. DA 49/94 provides approval for the movement of a maximum of materials of 15 million bank cubic metres in any year, including 2.5 million tonnes per annum (Mtpa), amounting to an average saleable production rate of 1.5Mtpa. Current operations fall under the 1995 consent with the proposed s75W modification applicable to the 1995 consent. It should be noted however that references to the originally approved rail loop refer to the loop proposed in the 1989 approval, but never built.

Copies of the original and current mine approvals are attached at **Appendix A**.



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\EA\602266677 F1 Location Plan 05 04 2013 TO Rev A

AECOM

LOCATION PLAN

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 1

1.3 Project Background

1.3.1 Existing Coal Transport

The 1989 approved development application included provision for the construction and operation of a rail loop on the Mine site that would provide direct connection to the Main Northern Rail Line. The Joint Coal Board at a Commission of Enquiry held during the assessment of the proposal recommended that a joint coal loading facility be constructed for the Rix's Creek, Camberwell and Glennies Creek coal mines.

The Mine was subsequently approved with a condition (Condition 27) providing that the Rix's Creek mine proposed rail loop could only be constructed in the event that the preferred joint rail loop is not constructed. A joint rail loading facility was never constructed.

In order to transport its own coal, the Camberwell mine constructed a rail loop on receipt of development consent for the construction and operation of the mine, including rail spur, in 1990.

In the absence of a joint rail loading facility, Rix's Creek mine entered into a Rail Group License Agreement with Camberwell Mine to use the Camberwell Rail Loop to transport coal from Rix's Creek mine. This agreement saw the Rix's Creek mine pay a share of the initial capital costs as well as annual reimbursement of operating costs. Annual operating costs are based on a pro rata tonnage of railed coal, with a margin added.

Coal is transported to the Camberwell rail loading facility from Rix's Creek mine via semitrailer on internal haul roads. No coal is transported over public roads.

Recently the Camberwell and Glennies Creek mines merged to create the Integra Mine (Integra). Integra is now under the majority ownership of Vale which operates the Integra mine, including rail facilities.

1.3.2 Need for Alternative Rail Access

The Rix's Creek mining lease was renewed in 2011 and the projected life of the Rix's Creek Mine is currently 20 years, with current operations culminating in 2031. As discussed above the Mine has historically accessed the rail loop on the neighbouring Integra Mine to deliver its coal to Port. Access to the Integra Loop was originally controlled through a rail loop access licence which had a 21 year life and expired in 2011.

In anticipation of the expiration of the Agreement, negotiations began in December 2005 between Integra and Rix's Creek but negotiations have not reached an agreement for future operations. Furthermore Integra would not extend any future licence beyond a 10 year timeframe. In order to ensure immediate and continued access to the rail loop, the Rix's Creek mine entered into an interim agreement with Integra in early 2012, with a 10 year lifespan backdated to 2011, to allow continued use of the rail loop.

A condition of the interim Agreement allows termination by Integra at any time with three years notice. This agreement also has an increased cost rate per tonne of coal transported, leading to higher transport costs for Rix's Creek.

Forward planning for the Mine however requires a higher level of certainty than would be provided by a 10 year licence agreement that could be cancelled at any time. In order to continue investing the required capital to allow the Mine to reach its full development potential, greater transport certainty is required. This will allow The Bloomfield Group to continue investing capital into the Mine to develop the known resources of the site throughout the projected lifespan of the Mine.

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2.0 Proposed Modification

2.1 Existing and Approved Operations

The current Rix's Creek Mine operation was granted development consent pursuant to Section 101 of the EP&A Act on 19 October 1989 and first coal was produced from the site in 1990. This original mine approval included approval for the construction and operation of a rail loop and a rail loading facility on the Rix's Creek mine site.

Following initial operations, a second development consent (DA49/94) was approved in 1995 under Section 92 of the EP&A Act. This second consent was approved allowing construction and operation of surface mining and related infrastructure. Subsequent to the original approval in 1989, the approved rail loop was never constructed as alternative coal transport opportunities were realised as described in **Section 1.3.1**.

Rix's Creek mine currently operates an Environmental Management System, under which a range of management plans operate in accordance with DA 49/94, including:

- Traffic Management Plan;
- Noise, Vibration and Blasting Monitoring and Management;
- Air Quality Monitoring and Management, including ongoing dust suppression activities;
- Water Management Plan;
- Rehabilitation and Landscape Management Plan; and
- Final Void Management and Mine Closure Planning.

Due to the age of the original Mine approval, limited information exists in relation to the environmental impacts of the original rail and loading facility layout. As such, there is limited ability to provide a comparison of environmental impacts between the approved and proposed rail loops. This EA will therefore focus on assessing the potential impacts from the current design and focus on minimising impacts through its construction and operation.

A comparison of the locations of approved and proposed rail loop locations is shown on **Figure 2**.

2.2 Land Ownership and Legal Description

The land holdings and ownership of holdings over which the rail loop is proposed are listed in **Table 2**. All land holdings are owned by Bloomfield Coal except Lot 1 DP 211399.

Table 1 Land Ownership Details

Land Description	Land Owner
Rail Line	
Lot 219 DP 752455	Rix's Creek Pty Limited (outside colliery holding)
Lot 235 DP 752455	Rix's Creek Pty Limited (outside colliery holding)
Lot 94 DP 752442	Four Mile Pty Limited (outside colliery holding)
Lot 150 DP 752442	Four Mile Pty Limited (outside colliery holding)
Lot 1 DP 211399	Australian Rail Track Corporation
Rail Loop and stockpile area	
Lot 1 DP 1139094	Four Mile Pty Limited (inside colliery holding)
Lot 2 DP 1139094	Four Mile Pty Limited (inside colliery holding)
Lot 238 DP 829334	Four Mile Pty Limited (inside colliery holding)
Visual bund area	
Lot 1 D.P. 1156072	Four Mile Pty Limited (inside colliery holding)

Rix's Creek Pty Limited and Four Mile Pty Limited are subsidiary Companies of the Bloomfield Group.

The mine operates under Coal Lease 352 as shown on **Figure 2**.

2.3 Project Elements

The proposed rail loop and loading facility will occupy a development footprint of 52.7ha, incorporating all elements of the loading facility which will primarily be located within the balloon loop of the rail line.

During construction, a temporary Construction Compound area and associated access road will be established approximately half way along the proposed rail loop alignment to provide construction access for the rail corridor. The Construction Compound and access are shown on **Figure 2**. Access to the remaining construction areas would be via established mine access routes and through the rail loop corridor itself.

Construction stockpile areas would be located adjacent to the rail corridor is areas to be determined by the construction contractor. As described in **Section 6.9**, a detailed sediment and erosion plan would be prepared for the construction phase detailing stockpile areas and appropriate erosion and sediment controls to be implemented for these areas.

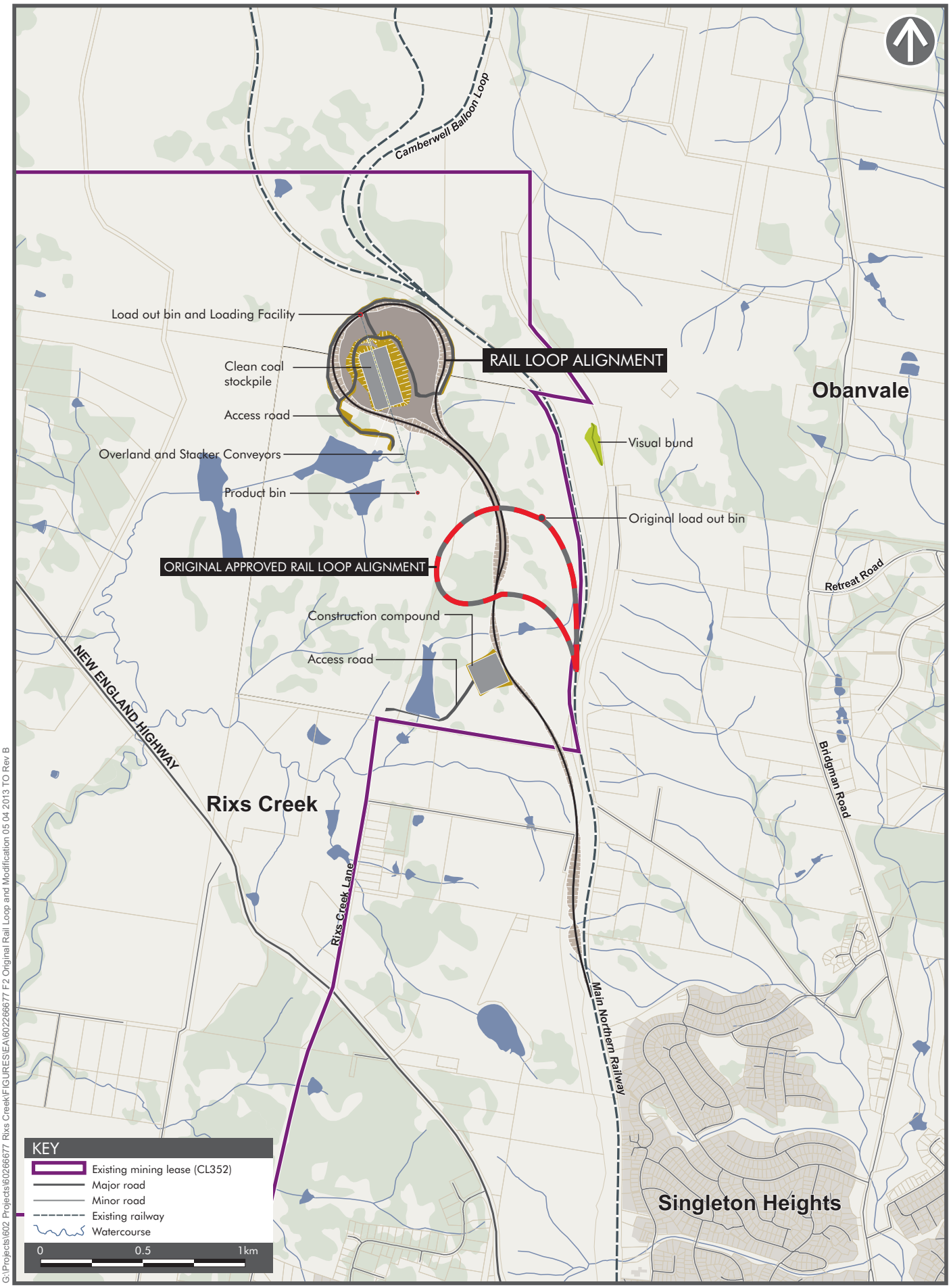
The proposed rail loop illustrated in **Figure 3** includes the construction of:

- A 5.6km rail loop from the Main Northern Rail Line ;
- Proposed rail loading facility (Load Out Bin);
- Clean coal stockpile (280m x 140m) of nominal 350,000 tonne capacity;
- Overland conveyer (9410m) from the existing CHPP product bin;
- Stacker conveyor (260m) connecting the overland conveyor to the clean coal stockpile; and
- Reclaim tunnel with conveyor (460m) to rail load out bin.

Each of these elements is discussed further below.

Other necessary infrastructure will be required to service the proposed facilities including power and signalling connections, and access roads along the rail loop alignment. The project elements are shown in **Figure 3**. Project elements are shown in the concept designs attached at **Appendix C**.

Full details regarding the environmental aspects of each of the project elements are described in **Section 6.0.**



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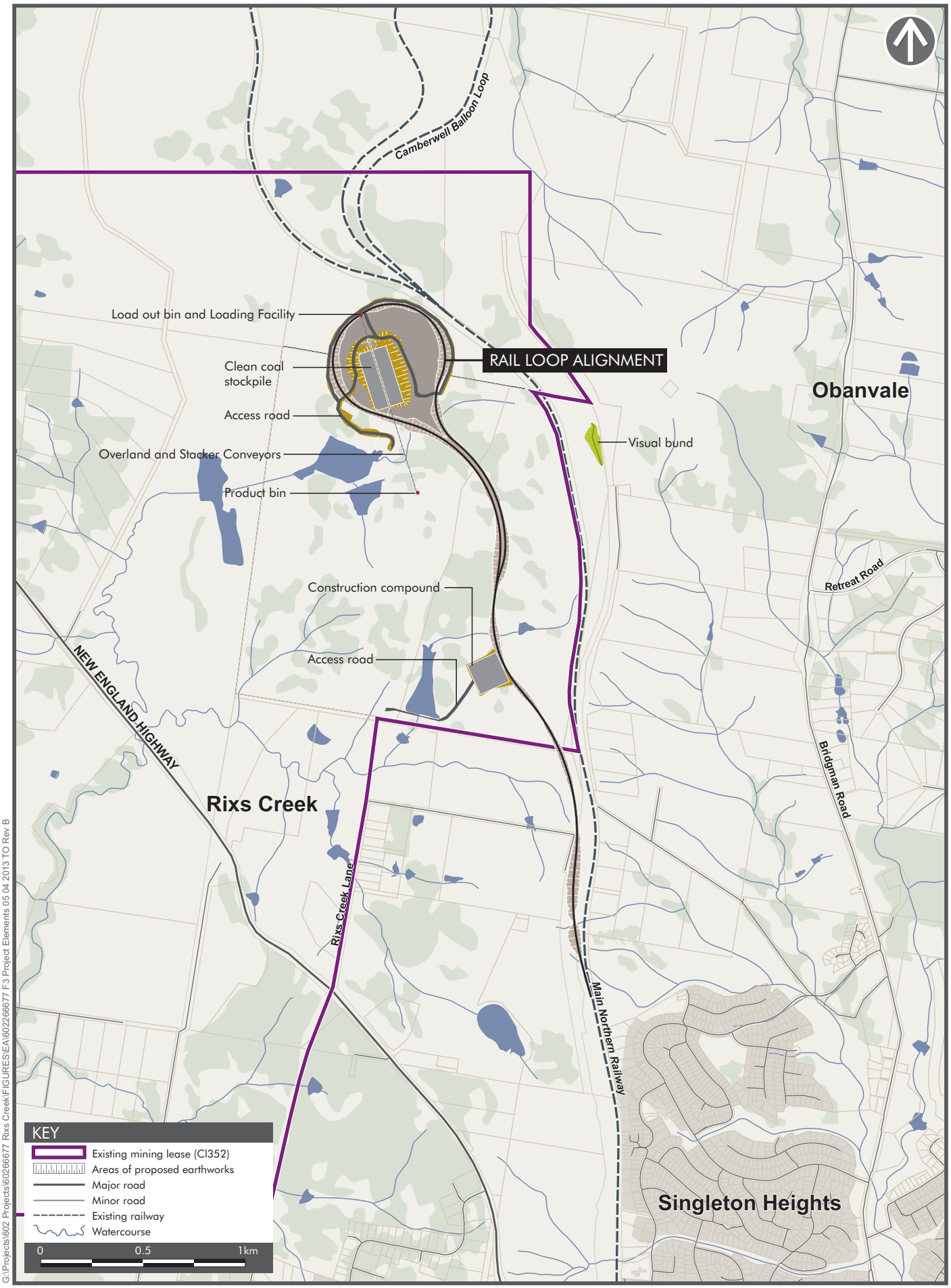
AECOM

ORIGINAL RAIL LOOP AND MODIFICATION

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 2



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AECOM

PROJECT ELEMENTS

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 3

2.3.1 Rail Loop

The rail loop comprises a track, signalling infrastructure and a parallel services road and associated drainage for the length of the loop. A corridor of approximately 20m wide will be required for the corridor with variations required for the cut and fill needed to obtain appropriate design levels. The rail loop will leave the Main Northern Rail Line approximately 3 km to the south of the existing coal product bin, and travel in a northerly direction parallel to the Main Northern Rail Line. The proposed line will loop around immediately to the north of the existing CHPP, travel north and then loop back to the east of the CHPP to provide trains forward access back onto the Main Northern Rail Line heading east to Newcastle. The entire loop will be 5.6 km in length.

The chosen location for the connection of the proposed loop to the Main Northern Rail Line has been designed in consultation with the Australian Rail Track Corporation (ARTC), who advised that this would be the only suitable location for the loop to connect to the existing network due to the topography of the site.

Figure 3 shows a comparison of the proposed rail line against the originally proposed alignment from 1989. For various reasons, such as the location of mine infrastructure since the original approval, and the need to accommodate current rail logistical, environmental and operational requirements, the original loop design is no longer operationally feasible.

2.3.2 Clean Coal Stockpile and Rail Loading Facility

From the existing CHPP, coal will move by overland conveyor to a Clean Coal Stockpile located in the middle of the proposed loop where it will be stored ready to be loaded onto waiting rail wagons. The rail loading facility would operate in the following manner:

1) Product coal would be taken from the existing CHPP via an overland conveyor;
2) Coal would transfer to a Skyline stacker conveyor to deposit the coal over the stockpile area. The stockpile has been designed to hold 350,000 tonnes of clean coal and is located entirely within the rail loop;
3) A reclaim tunnel located under the stockpile area contains a conveyor that would then move coal to a surge bin; and
4) The nominal 2,000 tonne capacity surge bin would be located over the rail loop to fill rail wagons.

The rail loading facility would have a capacity of at least 3,500 tonne per hour.

2.3.3 Workforce

The current workforce at Rix's Creek Mine comprises approximately 150 employees working continuously in shifts. The onsite workforce peaks daily during standard business hours with the attendance of office and administration staff.

It is anticipated that on average a workforce for the rail loop, of 50 people will be required daily during construction and would peak at approximately 70 people depending on project elements, rail possession timing etc. Rail possessions (number to be confirmed based on availability and length) will be required for the connection to the Main Northern Rail Line. The workforce will peak during these times to take advantage of the possessions. It is expected that up to 50 construction workers may be required per shift during the possession, with the number of shifts required dependent on the length of possession available.

Additional offsite personnel would be required for the ongoing upkeep and maintenance of the proposed systems. These personnel would be contractors who would come to site on an as-needs basis.

The operational workforce would largely be redirected from existing coal transport activities within the mine itself.

2.3.4 Hours of Operation

The rail loop will operate 24 hours a day, 7 days a week as required by operations. This is consistent with current rail loading operations.

2.3.5 Construction Program

Rix's Creek consultant, in 2012 prepared a detailed construction methodology with details of major construction milestones, plant and equipment and time frames. A copy is attached in **Appendix D** and summarised below.

The consultant proposes an 11 month construction program broken down into the major constituent components in chronological order being:

- Earthworks;
- Civil works;
- Trackwork;
- Signalling (refer **Appendix E**); and
- Conveyor and train loading system installation.

Some commissioning works would be required following the completion of the major construction elements. Commissioning activities would be limited to the functional testing and checking of installed system and not involve any major construction works.

Details regarding site preparation, environmental controls and a Construction Method Statement are in **Appendix D**. Where potential for environmental impacts has been identified discussion, and the identification of appropriate mitigation measures may be found in **Section 6.0**.

2.3.6 Capital Investment

It is anticipated that a capital investment of approximately AU $57M would be required for the proposed works. Further refinement of this figure will occur during final design and detailed construction costing. This costing has assumed the following component cost breakdown:

- Reclaim tunnel - $5.5 million;
- Reclaim tunnel conveyor - $4.3 million;
- Coal valves and associated equipment - $3.63 million;
- Train Loading System - $5.5 million;
- Stacker Conveyor and Overland Conveyor - $17.7 million; and
- Rail Loop - $20.6 million.

2.4 Alternatives

2.4.1 Re negotiate Existing Integra Rail Loop Access

Rix's Creek has been in continual talks with the Integra Mine to renegotiate a new rail loop access agreement since 2005. To date only an interim agreement has been reached which provides the Mine with the ability to continue use of the rail loop until alternative arrangements can be made.

Despite ongoing discussions and the potential for a new agreement this option is not a viable alternative due to untenable contractual arrangement requirements including:

- increased rate per tonne costs;
- potential for future tonnage rate to increase;
- lack of certainty due to:
    - any agreement being limited to a 10 year timeframe;
    - cancellation clauses; and
    - any agreement being non-transferable.

2.4.2 Alternative Rail Loop Location

Initial investigations and consultation was undertaken with ARTC. ARTC advised that that only location possible for a loop to connect to the Main Northern Rail Line, in proximity to the Rix's Creek Mine, is in the location proposed. This is due to topographical and surrounding land use constraints as well as operational rail requirements.

2.4.3 Alternatives to Rail Transport

The only alternative to the transport of coal by rail is by road. Truck transportation of coal by road could take the form of mine to port transport, or transport to an alternative rail loop.

Any road transport option would require coal to be transported via the public road network including the New England Highway. This would cause significant impact to the public including traffic congestion, noise, dust and potential damage to road infrastructure.

2.4.4 'Do Nothing'

As described in **Section 1.3.1** the Mine currently relies on the adjoining Integra mine for access to a rail loading facility. A secure rail connection provides the Mine with access to end users via the Port of Newcastle. Without a rail connection the mine would not be able to export coal.

The 'do nothing' option would involve continuing the use of the existing Integra Rail Loop until the current access agreement expires. Attempts at renewing the license have failed and current access only occurs through an interim agreement which will expire in ten years from 2011. This interim agreement can be terminated by Integra with three years notice.

Rix's Creek has an anticipated mining life of at least 20 years from 2012. Continuing with the 'do nothing' approach represents a high level of risk to the operational viability of the Mine, as there would be no certainty that coal transport can continue. For this reason the 'do nothing' approach is not acceptable.

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3.0 Statutory Planning

3.1 Commonwealth Planning Context

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

Actions that may significantly affect matters of National Environmental Significance (NES) require assessment and/or approval from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The EPBC Act lists matters of NES that must be addressed when assessing the environmental impacts of a proposal.

Actions likely to impact on matters of NES require approval from the Commonwealth Minister under Part 6 of the EPBC Act. As shown in **Table 2** it is anticipated that the proposed rail loop would not have a significant impact on any of these matters of NES. Accordingly, a referral to the DSEWPC is not necessary.

Table 2 Consideration of Matters of National Environmental Significance

***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	
NES Matters	**Comment**
Australia's World Heritage properties	There are no properties currently on the DSEWPC Heritage Register on the subject site or in the study area.
National Heritage Places	There are no National Heritage Places on the subject site or in the study area
Ramsar wetlands of international importance	There are no wetlands of international importance on the site or in the study area. Erosion and sedimentation control works would be undertaken during earthworks to minimise any potential impacts to water quality.
Nationally threatened species and ecological communities	It is unlikely that there would be any impact on Commonwealth-listed threatened species or ecological communities.
Migratory species listed under the EPBC Act	It is unlikely that there would be any impact on Commonwealth listed migratory species or migratory species protected under international agreements.
Commonwealth marine areas	The Project is not located within or adjacent to a Commonwealth marine area. There would be no direct or indirect impact upon a Commonwealth marine area.
Great Barrier Reef Marine Park	The Project is not located within or adjacent to the Great Barrier Reef Marine Park. There would be no direct or indirect impact upon the Great Barrier Reef Marine Park.
Nuclear actions, including uranium mining	The Project would not involve a nuclear action.

3.2 State Planning Context

3.2.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provide the framework for environmental planning in NSW and include provisions to ensure that proposals which have the potential to impact the environment are subject to detailed assessments, and the public have opportunity for involvement.

Development consent for the Mine was granted in 1989 by the Minister pursuant to Section 101 of the *EP&A Act* enabling mining for a 21 year duration to 2010. In 1995 the Minister approved an application for the continuation of mining pursuant to Section 91 of the EP&A Act and State Environmental Planning Policy No. 34 – Major Employment Generating Industrial Development (since repealed). Since approval of the Rix's Creek mine, the EP&A Act has undergone multiple amendments. As such, a number of transitional arrangements have been included in the EP&A Act and EP&A Regulation to manage the way modification applications are assessed.

Clause 8J(8) of the Environmental Planning and Assessment Regulation NSW 2000 provides that:

> *(8) For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:*
>
> *(a) a development consent granted by the Minister under section 100A or 101 of the Act,*
>
> *(b) a development consent granted by the Minister under State Environmental Planning Policy No 34—Major Employment-Generating Industrial Development,*
>
> *(c) a development consent granted by the Minister under Part 4 of the Act (relating to State significant development) before 1 August 2005 or under clause 89 of Schedule 6 to the Act,*
>
> *(d) a development consent granted by the Land and Environment Court, if the original consent authority was the Minister and the consent was of a kind referred to in paragraph (c).*

A consent for continuation of mining was granted in 1995 under State Environmental Planning Policy No. 34 – Major Employment Generating Industrial Development, for the purposes of modification only, the approval can be taken to be an approval under Part 3A of the EP&A Act. Section 75W of the EP&A Act can therefore be used to modify the approval.

This is further reinforced by Clause 12 of Schedule 6A of the EP&A Act:

> *12 Continuing application of Part 3A to modifications of certain development consents*
>
> *Section 75W of Part 3A continues to apply to modifications of the development consents referred to in clause 8J (8) of the Environmental Planning and Assessment Regulation 2000, and so applies whether an application for modification is made before or after the commencement of this clause.*

Therefore, the modification can be assessed pursuant to section 75W of the EP&A Act.

Section 75W of the EP&A Act provides as follows:

> *(2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
>
> *(3) The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
>
> *(4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.*

This Environmental Assessment has been prepared in support of an application to be lodged with the Director General in respect of a modification to the 1995 Mine Approval. As discussed earlier on request for the DGRs for this EA, the DP&I provided its generic DGRs and advised they should be addressed as relevant to the proposed modification. An environmental assessment including the potential impacts of the modification and measures to minimise those impacts may be found in **Section 6.0** of this report.

Despite the proposed modification being to the 1995 approval, consideration should be given to the 1989 approval, Condition 27 Schedule 2 relates to the rail loop as originally approved. Condition 27 is detailed in **Table** 3 along with an explanation of how the proposed modification is consistent with the original approval.

Table 3 1989 Approval, Condition 27

Condition 27 – Joint Rail Loading Facility	Comment / Consistency with current proposal
In the event that development consent is granted for construction of a joint rail loading facility, the following conditions shall apply:	
(i) Within 3 months of the date of granting development consent for the mine, the applicant give a written undertaking to the Joint Coal Board (The Board) that it will use a joint rail loading facility outside the proposed lease area for Rix's Creek	NA

Condition 27 – Joint Rail Loading Facility		Comment / Consistency with current proposal
(ii)	Upon granting of such development consent the Applicant shall forthwith enter into such agreements with the Board as may be required by the Board for the construction of a joint rail loading facility.	No joint rail loading facility was ever developed.
(iii)	The applicant shall use such facility for the transport of all coal immediate upon the completion of the facility.	No facility was built therefore this condition does not apply.
(iv)	If for reasons beyond the control of the Applicant the joint facility cannot be constructed then the provisions of Clause (v) herein shall apply.	The joint loading facility never proceeded for reasons beyond the control of the applicant, therefore Clause (v) would be applicable.
(v)	No coal loading facility for the mine shall be constructed within the proposed Rix's Creek coal lease area unless the Minister approves such construction. Rail spur access to the main railway line would be permitted within the coal lease area.	This Environmental Assessment accompanies an application to the Minister for the construction and operation of a loading facility. Should the Minister grant approval the project would proceed in accordance with this condition.
(vi)	The washed coal stockpile for the Rix's Creek Mine shall be adjacent to the coal loading facility and not within the coal lease area unless the minister otherwise grants approval.	The proposed location of the clean coal stockpile is immediately adjacent to the proposed loading facility. This is within the lease area however should the Minister grant approval, as is being sought by this application, the current proposal would be consistent with this condition.

Whilst the content of condition 27 as shown in **Table 3** do not necessarily apply due to changes in industry regulation and operation (e.g. requirements surrounding a joint facility), the 1995 consent may be modified to include a new condition permitting the construction and operation of a rail loop and coal loading facility as detailed in this Environmental Assessment.

3.2.2 State Environmental Planning Policies

State Environmental Planning Policy (State and Regional Development) 2011

Following the repeal of Part 3A of the EP&A Act 1979 the State Environmental Planning Policy (State and Regional Development) (State and Regional Development SEPP) was introduced to provide a mechanism for the assessment and approval of certain infrastructure and development projects of State and regional significance. General State Significant Development (SSD) is defined in Schedule 1 of the State and Regional Development SEPP. In relation to rail facilities, Schedule 1, Clause 19 defines State significant rail and transport facilities as being:

19 Rail and related transport facilities

(1) Development that has a capital investment value of more than $30 million for any of the following purposes:

(a) heavy railway lines associated with mining, extractive industries or other industry,

(b) railway freight terminals, sidings and inter-modal facilities.

(2) Development within a rail corridor or associated with railway infrastructure that has a capital investment value of more than $30 million for any of the following purposes:

(a) commercial premises or residential accommodation,

(b) container packing, storage or examination facilities,

(c) public transport interchanges.

Under the State and Regional Development SEPP the project meets SSD criteria due to its capital investment value of $57million. Despite this the proposed rail loop is being assessed as a modification to the existing project approval, as described in **Section 3.2.1**, therefore the State and Regional Development SEPP does not apply to this proposal.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive industries) 2007

SEPP (Mining, Petroleum Production and Extractive Industries (The Mining SEPP) aims to provide for the proper management of resources and facilitate the orderly and economic development of resources through the establishment of appropriate planning controls.

Part 3 of the Mining SEPP provides specific matters for consideration by a consent authority during its assessment of a development proposal. Part 3 includes consideration of the following factors:

- Compatibility of proposed mine, petroleum production or extractive industry with other land uses;
- Compatibility of proposed development with mining, petroleum production or extractive industry;
- Natural resource management and environmental management;
- Resource recovery;
- Transport; and
- Rehabilitation.

As the proposed modification does not include the further recovery of resources, but rather the means to transport resources that are already approved for recovery, further consideration of these matters is only required in relation to handling and transport. Other matters have been considered during the original mine planning and approval. The following transport matters for consideration therefore apply:

16 Transport

(1) Before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:

(a) require that some or all of the transport of materials in connection with the development is not to be by public road,

(b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,

(c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

(2) If the consent authority considers that the development involves the transport of materials on a public road, the consent authority must, within 7 days after receiving the development application, provide a copy of the application to:

(a) each roads authority for the road, and

(b) the Roads and Traffic Authority (if it is not a roads authority for the road).

(3) The consent authority:

(a) must not determine the application until it has taken into consideration any submissions that it receives in response from any roads authority or the Roads and Traffic Authority within 21 days after they were provided with a copy of the application, and

(b) must provide them with a copy of the determination.

(4) In circumstances where the consent authority is a roads authority for a public road to which subclause (2) applies, the references in subclauses (2) and (3) to a roads authority for that road do not include the consent authority.

While transport of material and workers for the construction of the rail loop will be required, once constructed its operation will ensure that no coal from the Mine will require transport by any road, including public roads.

State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP)

The aim of this Policy is to facilitate the effective delivery of infrastructure across the State by:

a) Improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services;

b) Providing greater flexibility in the location of infrastructure and service facilities;

c) Allowing for the efficient development, redevelopment or disposal of surplus government owned land;

d) Identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development);

e) Identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development; and

f) Providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.

Approval for a rail loop was provided as part of the original development consent issued in 1989 with the current alignment proposed as an amendment to that application to be assessed under Section 75W of the EP&A Act 1979. Therefore, additional approval for the rail infrastructure facilities is not required under Part 3, Division 15 of the Infrastructure SEPP. Despite this, other sections of the Infrastructure SEPP require consideration.

For the purposes of Clauses 85 and 86 of the Infrastructure SEPP, the proposal could be considered development that is in, or immediately adjacent to, the rail corridor and involves the excavation in and adjacent to the rail corridor. Pursuant to these Clauses, the consent authority must notify the chief executive officer of the rail corridor authority (ARTC), and take into consideration any comments received within 21 days.

As detailed in **Section 4.0**, the proponent has been in ongoing consultation with ARTC during the design and planning of the proposed rail loop. ARTCs comments and input have been incorporated into the rail loop design and connection to the Main Northern Rail Line.

State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44)

SEPP 44 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koala to ensure permanent free-living population over their present range and reverse the current trend of decline.

There are three historic Koala records within 10 km to the north of the subject site. The study area does not contain a known population of Koalas or any Koala feed trees. Therefore, it does not constitute 'core Koala habitat' or 'potential Koala habitat' as defined by SEPP 44.

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55)

SEPP 55 promotes the remediation of contaminated land to reduce the risk of harm to human health or other environmental systems. Clause 7 of SEPP 55 requires a consent authority to consider whether the land is contaminated and whether it is suitable (or can be made suitable) for the proposed development.

The area in the vicinity of the proposed works is in a suitable condition for the proposed use, given the:

- Historical use of the site;
- Land not being within an identified investigation area;
- Land not being identified as being contaminated in Rix's Creek's land management systems; and
- A search of the Environment Protection Authority (EPA) notified contaminated sites register did not identify any contaminated site in close proximity to the proposed rail loop.

Therefore no further consideration of SEPP 55 is required in relation to the proposal.

3.2.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) prohibits any person from causing pollution of waters or air, and provides penalties for pollution offences relating to water, air and noise.

The POEO Act provides a regulatory framework for the licensing of activities listed in Schedule 1 to the Act that have the potential to impact on the environment.

The mine currently operates under Environmental Protection Licence (EPL) 3391 as a scheduled activity under Schedule 1, Clauses 10 and 28:

10 Coal works

(1) This clause applies to coal works, meaning any activity (other than coke production) that involves storing, loading or handling coal (whether at any coal loader, conveyor, washery or reject dump or elsewhere) at an existing coal mine or on a separate coal industry site.

(2) The activity to which this clause applies is declared to be a scheduled activity if:

(a) it has a capacity to handle more than 500 tonnes per day of coal, or

(b) it has a capacity to store more than 5,000 tonnes of coal (not including storage within a closed container or building).

28 Mining for coal

(1) This clause applies to mining for coal, meaning the mining, processing or handling of coal (including tailings and chitter) at underground mines or open cut mines.

(2) The activity to which this clause applies is declared to be a scheduled activity if:

(a) it has a capacity to produce more than 500 tonnes of coal per day, or

(b) it has disturbed, is disturbing or will disturb a total surface area of more than 4 hectares of land by:

(i) clearing or excavating, or

(ii) constructing dams, ponds, drains, roads, railways or conveyors, or

(iii) storing or depositing overburden or coal (including tailings and chitter).

The Proposed Project does not seek to vary existing quantities of coal being transported form the site. The addition of *railway systems activities* to the Rix's Creek site would be likely to require a variation to EPL 3391 for the construction of the rail infrastructure and operation of rolling stock, under Schedule 1, Clause 33 which relates to railway systems activities:

33 Railway systems activities

(1) This clause applies to railway systems activities, meaning:

(a) the installation, on site repair, onsite maintenance or on site upgrading of track, including the construction or significant alteration of any ancillary works, or

(b) the operation of rolling stock on track.

(2) However, this clause does not apply to any of the following:

(a) an activity in a railway workshop (including the use of fuel burning equipment),

(b) re-fuelling of rolling stock,

(c) an activity at a railway fuel depot,

(d) repair, maintenance or upgrading of track away from the track site,

(e) an activity at a railway station building (including platforms and offices),

(f) loading of freight into or onto, and unloading of freight from, rolling stock,

(g) an activity at a freight depot or centre,

(h) operation of signalling, communication or train control systems.

(3) The activity to which this clause applies is declared to be a scheduled activity.

(4) For the purposes of subclause (1) (b), rolling stock that is operated on track is taken to be operated by the occupier of the land on which the track is situated.

3.2.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal relics.

Section 86 of the NP&W Act identifies offences relating to Aboriginal objects, including harming or desecrating Aboriginal objects or places. Section 87(1) of the NP&W Act requires a permit to be obtained to remove any artefacts, while section 90(2) of the NP&W Act requires consent from the Director General of the Office of Environment and Heritage (OEH) to knowingly destroy, deface or damage a relic or Aboriginal place. However, a Section 90 permit is not required for Part 3A approvals under Section 75U of the EP&A Act. Potential impacts to Aboriginal heritage objects resulting from the proposed modifications are detailed in **Section 6.4**.

Impacts to artefacts will be mitigated through the collecting and recording of artefact details in accordance with the Aboriginal Heritage Information Management System (AHIMS) in consultation with local indigenous community members.

3.2.5 Heritage Act 1977

The *Heritage Act 1977* aims to protect and conserve non-Aboriginal cultural heritage, including scheduled heritage items, sites and relics. The *Heritage Act 1977* is administered by the Heritage Council of NSW.

The *Heritage Act* makes provision for a place, building, work, relic, moveable object, precinct, or land to be listed on the State Heritage Register. If an item is the subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under Section 58 of the Heritage Act for works or activities that may impact on these items.

A detailed Non-Indigenous Heritage Assessment has been prepared for the project. Refer to **Appendix F**. Whilst no listed heritage items were identified as being effected by the proposal, four additional non-listed items were found following a site inspection. These items are:

1) Historic sandstone excavation area;

2) Rail siding associated with Rixs Creek Coke Ovens and associated works;

3) Abandoned rail corridor from the Main North Line with cutting and abutting wall; and

4) Rixs Creek platform and associated historic artefact scatter.

Potential impacts to these items are described further in **Section 6.5**. A research, salvage and recording methodology has been developed. This methodology is attached to **Appendix F** and has been prepared in accordance with OEH guidelines and requirements. Salvage and recording of these items would occur prior to any works which may impact them.

3.2.6 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* outlines the protection of threatened species, populations, ecological communities and critical habitat in NSW. The Act is administered by OEH. The main objectives of the *Threatened Species Conservation Act 1995* are to:

- Conserve biological diversity and promote sustainable development;
- Prevent the extinction of native plants and animals;
- Protect habitat that is critical to the survival of endangered species;
- Eliminate or manage threats to biodiversity;
- Properly assess the impact of development on threatened species; and
- Encourage co-operative management in the conservation of threatened species.

Under Part 3A of the EP&A Act, an assessment of significance (7-part test) may be required to determine the likely significance of impacts on threatened species, populations of ecological communities. Full consideration of the provisions of the *Threatened Species Conservation Act 1995* in relation to the project are provided in **Section 6.3** and **Appendix K**.

3.2.7 Water Management Act 2000

The Mine is located within the Hunter Regulated River Water Sharing Plan are therefore consideration of the application of the *Water Management Act 2000* is required.

No Controlled Activities or proposed water extraction is proposed for the construction of the rail loop. Water use during construction would primarily relate to the use of water carts for dust suppression. Water would be sourced from existing Mine dams and water storages and there would be no extraction from any watercourse.

The proposed works footprint would not impact any permanent water with the only ephemeral 1st order drainage depressions being traversed. Nevertheless works would be carried out as per the NSW Office of Water Controlled Activities Guidelines 2010/2011 where applicable, in particular the *Controlled Activities: Guidelines for In-stream Works* (NSW Office of Water, 2010).

3.2.8 Water Act 1912

The *Water Act 1912* regulates both the use and management of water resources in NSW. The Act is gradually being replaced by the Water *Management Act 2000*. As the project site is within the Hunter Regulated River Water Sharing Plan, no further consideration of the *Water Act 1912* is required.

3.2.9 Rail Safety Act 2008

The *Rail Safety Act 2008* was introduced to manage, control and improve safety regarding the risks associated with the operation and maintenance of rail infrastructure.

Only operators who are accredited for the provision of rail services under this Act would be engaged to provide rail operation services to on the proposed rail loop.

3.3 Local Planning Context

3.3.1 Singleton Local Environmental Plan 1996

The proposed rail loop is located wholly within the 1(a) Rural Zone under the Singleton Local Environmental Plan 1996. The objectives of the zone are:

a) to protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use,

b) to promote the protection and preservation of natural ecological systems and processes,

c) to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining,

d) to maintain the scenic amenity and landscape quality of the area,

e) to provide for the proper and co-ordinated use of rivers and water catchment areas,

f) to promote provision of roads that are compatible with the nature and intensity of development and the character of the area.

The proposed rail loop is consistent with the objectives of the Singleton LEP 1996, in particular objective (c) as the rail loop will be constructed in support of an approved mine which has been operating within environmental conditions. The mine plan also includes provision for land to be satisfactorily rehabilitated following mining.

3.3.2 Singleton Land Use Strategy

The Singleton Land Use Strategy provides a consistent approach to strategic land use decision making in the Singleton Shire. It has been prepared to allow for flexibility in order to respond and adapt to actual growth and land use requirements over time.

Section 8.3 of the Strategy provides coal mining specific objectives which are to:

- *Recognise that coal mining will remain a major land use within the Singleton Local Government Area (LGA) for the foreseeable future, especially in the Rural West planning area; and*
- *Ensure that incompatible land uses are not permitted within coal mining areas, and appropriate buffers to protect environmental amenity are applied.*

Rix's Creek is an established mine which was operational prior to the preparation of the Land Use Strategy. The Land Use Strategy recognises the need for key industries in the Shire to operate in unison and for land use conflict between incompatible land uses to be minimised through by providing appropriate separation distances where necessary.

By virtue of land use zoning, urban development in the Singleton Heights and Wattle Ponds areas remains buffered from the Mine. The proposed rail loop is consistent with the Land Use Strategy as it will be placed between the existing Main Northern Rail Line and the mine site in a manner that does not unduly impact on the amenity of adjoining land users. The use of visual buffers and noise mitigation are proposed to minimise the potential for land use conflicts to occur. The rail loading facility will be located centrally within the mining area and is compatible with the surrounding mining land use.

3.3.3 Singleton Development Control Plan

Due to the nature of the proposal the Singleton Development Control Plan does not apply to the proposed rail loop.

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4.0 Stakeholder Consultation

4.1 Formal Consultation

Prior to the preparation of this EA, Rix's Creek contacted the D&PI to confirm that the project could be assessed as a modification to the existing mine approval, and to confirm the assessment requirements to guide the preparation of the EA. In an email on 7 March 2012 DP&I confirmed this approach (see **Appendix B**).

DP&I provided a generic version of the DGRs issued for such proposals. DP&I advised that the DGRs provided are meant to be a guide for the type of information that should be provided in an environmental assessment for the modification with discretion to be given to the level of information provided in response to certain requirements due to the nature of the proposal.

The generic or guiding DGRs are listed in **Table 4** below along with references to the section of this report which provides assessment. Where specific information has not been provided an explanatory comment has been added.

Table 4 Environmental Assessment Requirements (DGRs)

Matter	Section of EA
General Requirements	
The EA must include:	
- detailed description of:	Executive Summary
• historical operations on the site;	Section 2.0
• existing and approved operations and infrastructure on site, including a copy of all statutory approvals that apply to these operations and infrastructure; and	Section 1.2 Appendix A
• the existing environmental management and monitoring regime on site;	Section 1.2 and for each environmental aspect in Section 6.0
- detailed description of the modification, including the:	
• need for the modification;	Section 1.3.2
• alternatives considered and justification for the proposed layout;	Section 2.4
• likely interactions between existing and approved mining operations in the vicinity of the site;	Section 2.1
• likely staging of the modification; and	NA
• plans of any proposed building works;	Appendix C
- consideration of all relevant environmental planning instruments, including Part 3 of the *Mining, Petroleum Production and Extractive Industry State Environmental Planning Policy 2007*, and identification and justification of any inconsistencies with these instruments;	Section 3.0
- risk assessment of the potential environmental impacts of the proposal, identifying the key issues for further assessment, including:	Sections 5.0 and 6.0
• Land Resources;	
• Water Resources;	
• Biodiversity;	
• Aboriginal Heritage;	
• Noise;	
• Air Quality;	
• Traffic and Transport;	
• Visual;	
• Waste;	
• Hazards;	
• Social and Economic;	
• Rehabilitation;	
- detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes:	Section 6.0
• a description of the existing environment, using sufficient baseline data;	
• a comparison of the potential impacts of the modification with the impacts of	

Matter	Section of EA
General Requirements	
the existing approved development; • an assessment of the potential impacts of all stages of the proposal, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and • a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the proposal, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and	Section 8.0
- consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EA.	Section 8.0
Key Issues	
- Land resources	Section 6.8
- Water resources	Section 6.9
- Biodiversity	Section 6.3
- Heritage	Section 6.4 and 6.5
- Air Quality	Section 6.1
- Noise, Vibration and Blasting	Section 6.2
- Visual	Section 6.7
- Social and Economic	Section 6.11
- Rehabilitation	Section 6.11
Plans and Documents	
- The EA must include all relevant plans. Architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. These documents should be included as part of the EA rather than separate documents.	Appendix C
Consultation	
During the preparation of the EA you should consult with the relevant local, State and Commonwealth Government Authorities, service providers, community groups and affected landowners. In particular you should consult with the: - Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPAC); - Office of Environment and Heritage; - DTIRIS Division of Resources and Energy - Department of Primary industries (Offices of Water and Agriculture) - Roads and Maritime Service; - Australian Rail and Track Corporation (ARTC); - Hunter Rivers Catchment Management Authority; and - Singleton Shire Council.	Section 4.0
References	
- The assessment of the key issues listed above must take into account relevant guidelines, policies and plans as identified.	Section 10.0

4.2 Agency Consultation

The environmental assessment requirements provided an indicative list of government agencies and bodies which may need to be consulted during the preparation of the EA. **Table 5** lists those government agencies consulted during the preparation of this EA, any matters that agency raised during consultation and where these matters have been addressed in this document.

Table 5 Agency Consultation

Agency	Issues	Comment / Reference in EA
Department of Planning and Infrastructure	Refer **Section 4.1**.	Refer **Section 4.1**.
NSW Office of Environment and Heritage	No response received.	Note that specific consultation was undertaken with OEH in regards to indigenous Heritage. This consultation is detailed in full in the Indigenous Heritage Impact Assessment, **Appendix G.**
NSW Department of Primary Industries	No response received.	NA
Roads and Maritime Services	Requested that a comprehensive Traffic Impact Study (TIS) be prepared for the proposal.	A Traffic Assessment including estimated traffic generation and impacts is provided in **Section 6.6**.
NSW Office of Water	Request that it be advised of the project through information from the DP&I. No specific comments raised regarding the proposed project.	Consideration of water impacts is included in **Section 6.9**.
Australian Rail Track Corporation	ARTC has nominated the point at which the rail loop can connect to the Main Northern Rail Line.	Discussions have been ongoing between ARTC and rail loop designers Rhomberg for the duration of the design to address ARTC design requirements. ARTCs design requirements have been built into the project design.
Hunter Catchment Management Authority	No response received.	Consideration of water impacts is included in **Section 6.9** and land use resource impacts in **Section 6.8**.
Singleton City Council	No response received.	Consideration of the local planning requirements is provided in **Section 3.3**.

On the advice of DP&I, no Preliminary Environmental Assessment was required to be prepared or circulated for the proposed modification prior to the preparation of this EA. Regardless, this EA has sought to provide the appropriate level of information necessary for the assessment of this proposal in the relevant sections as detailed in **Table 5**.

Reference is made to **Appendix B** for copies of correspondence received from agencies during the preparation of the EA.

4.3 Other Consultation

No specific Community Consultation was held for the purposes of inclusion in this Environmental Assessment.

Public exhibition of this EA will provide the community opportunity to review the proposal and provide comments which would be subsequently considered and addressed in a Submissions Report.

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5.0 Prioritisation of Issues

A risk analysis was undertaken to rank potential environmental risks associated with the Project.

5.1 Risk Matrix

Potential impacts are ranked according to the risk matrix (refer to **Table 6**) as being High, Medium, Low or Very Low risk to the environment.

Potential Consequences:

1) Broad scale environmental impact.
2) Regional environmental impact.
3) Local environmental impact.
4) Minor environmental impact.
5) Insignificant environmental impact.

Likelihood of adverse impact:

A) Almost certain.

B) Likely.

C) Possible.

D) Unlikely.

E) Rare.

Table 6 Risk and Consequence Matrix

	Likelihood of adverse impact					
Potential Consequence		A	B	C	D	E
	1	High	High	Medium	Low	Very Low
	2	High	High	Medium	Low	Very Low
	3	Medium	Medium	Medium	Low	Very Low
	4	Low	Low	Low	Low	Very Low
	5	Very Low	Very Low	Very Low	Very Low	Very Low

5.2 Risk Analysis

The prioritisation of potential environmental issues related to the proposed project is provided in **Table 7**.

This ranking aims to allow the prioritisation of matters for assessment and does not consider the application of mitigation measures to manage the environmental effects. In all cases, appropriate and proven mitigation measures chosen based on experience with other similar projects, would be used to minimise and manage potential impacts identified in this risk analysis. These measures are described throughout **Section 6.0** of this EA and summarised in **Section 8.0**.

Table 7 Risk Ranking - Overview

Environmental Aspect	Potential Environmental Issue	Consequence	Likelihood	Ranking
Air Quality (Construction)	Generation of fugitive emissions and dust during construction.	3	B	Medium
Air Quality (Operation)	Train emissions during operation.	3	D	Low
GHG Emissions (Construction)	Generation of GHG from construction equipment.	5	C	Very Low
GHG Emissions (Operation)	Generation of GHG from train operation.	5	C	Very Low
Soil and Water	Uncontrolled erosion and sedimentation of local waterways	4	D	Low
Noise	Generation of noise during construction and operation, audible at sensitive receptors and rail noise.	3	B	Medium
Hazard and Risk	Construction works and operation of rail loop	3	D	Low
Waste Management	Standard construction waste generation expected	3	E	Very Low
Social and Economic Effects	Employment generating opportunity (50 construction staff over 1 month) and securing existing mine employment.	3	B	Medium
Traffic and Transport	Construction traffic generation on the New England Highway and local road network	4	D	Low
Visual	Potential visibility at sensitive receptors.	4	C	Low
Heritage	Additions to current mine infrastructure cleared footprint	3	C	Medium
Landuse	Additions to current mine infrastructure cleared footprint	4	C	Low
Fauna and Flora	Additions to current mine infrastructure cleared footprint	3	C	Medium
Rehabilitation	Land Clearing ad disturbance	3	D	Low

5.3 Key Issues

Based on the risk analysis presented above, the key issues requiring detailed assessment within this EA were identified and include:

- Air Quality;
- Noise;
- Heritage; and
- Flora and fauna.

These key issues are assessed in **Section 6.0** of this EA. Other issues considered to have lesser, or only minor impacts, are also addressed in **Section 6.0** commensurate with the level of risk applicable to the proposed project.

6.0 Environmental Impact Assessment

6.1 Air Quality

6.1.1 Existing Conditions

The ambient air quality of the locality is typical to that of rural areas surrounding Singleton, with existing sources contribution to the air pollution including:

- Coal mining;
- Agriculture;
- Urban development from areas in and around Singleton;
- Emissions from motor vehicles on the local and national (New England Highway) road networks, and emissions from trains on the Main Northern Rail Line ; and
- Emissions from the power stations in the Upper Hunter Valley.

Rix's Creek Mine operates a dust monitoring network which can be used to examine the existing air quality of the site and surrounding land. The results of dust deposition monitoring conducted between 2000 and 2010 are presented in **Appendix H**. Monitoring results indicate that annual average dust deposition in the vicinity of Rix's Creek Mine areas all within the cumulative OEH criterion (i.e. 4 grams per square metre per month [g/m^2/month]). In particular, recent monitoring results (2009 and 2010) demonstrate that all sites are in compliance with the OEH criterion.

Background air quality data indicates generally consistent levels from 2000 to 2010 and no clear trend of increasing concentrations at offsite dust gauges.

It is noted that the proposal does not seek to increase the current coal production rate of 1.5Mtpa, or change the current management of waste rock, mining methods, or the mine fleet, therefore ongoing operational air quality for mining activities would remain unchanged.

6.1.2 Predicted Impacts

Emissions to air during construction may occur as a result of dust and exhaust fumes from the movement and operation of plant and equipment. Construction emissions would be short term and mitigated by existing measures that apply to the operation of plant on the mine site including the ongoing scheduled maintenance of all plant and equipment and turning equipment off to prevent excessive periods of idling.

The components of the proposed rail loop that would potentially result in dust emissions during operation include:

- Transfer points on the conveyors;
- Unloading of the product coal from the processing plant to the rail loop facility; and
- Wind erosion from the product coal stock pad at the rail loop facility.

The maximum annual dust emissions (TSP) from the proposed rail loop have been estimated based on the proposed coal production rate of 1.5 Mtpa and are summarised in **Table 8**. The emissions estimation techniques used are consistent with those presented in Holmes Air Sciences (HAS) now PAEHolmes (1994).

Table 8 Rail Loop TSP Emissions Estimates.

Activity	TSP Emissions (kg/annum)
Conveyor transfer point for washed coal to gantry	759
Unloading coal to stock pad	759
Conveyor transfer point for coal feed valves to rail load out bin	759
Unloading from rail load out hopper to trains	759
Stock pad	819

In addition the discontinuation of use of Camberwell rail loop for transport of product coal will result in a decrease in dust emissions at the Mine. The estimated reduction in dust emissions from transfer of product coal at the Camberwell rail loop is approximately 810 kg/yr. This was the only dust emission associated with product coal dispatch at the Camberwell rail loop in HAS (1994).

There will be further reductions from hauling of product coal to the Integra rail loop as the proposed conveyor transfer of product coal to the new rail loop will have considerably less dust emissions compared to haulage of product coal to the Integra rail loop by semi-trailer on haul roads. Therefore, the overall increase in dust emissions as a result of the proposed rail loop is expected to be less than the estimated emission rate of 3,856 kg/yr.

The proposed rail loop would therefore result in negligible, undetectable change in dust particulate concentrations at sensitive receptors, as the dust loads are small and the proposed rail loop and load out facility is located approximately 1 km south-southwest of the existing Camberwell rail load out facility. The results of monitoring conducted to-date have not revealed any discernible elevation in ambient air quality at nearby receptors in Singleton Heights and Wattle Ponds.

Greenhouse Gas

There would be no net increase in diesel emissions from train engines as a result of the proposed rail loop. The same quantity of coal would continue to be moved by train meaning that same number and type of trains would continue to be required by the Mine.

Some additional greenhouse gas generation would occur during the construction of the rail loop and associated infrastructure. Presently the Mine transports coal to the Integra Rail loading facility by truck. These truck movements will no longer be required once the proposed rail loop is functioning. The reduction of greenhouse gases caused by the opening of the loop will assist offsetting the greenhouse gases generated during construction over the life of the rail loop.

6.1.3 Mitigation Measures and Conclusion

A review of the dust emissions arising from the proposal to construct a new rail loop and associated infrastructure shows that the estimated dust emissions from the operation of the rail loop are low, relative to the total emissions from the Mine. Potential dust emissions during construction would be short term. Once the construction is complete, the operation of the facility would not change the total dust load of the Mine in any significant or detectable way.

Despite there being a minimal change in the predicted air quality during the period of the rail loop construction, the following measures would be implemented during construction and, if appropriate, during the operational phase to minimise potential for dust and airborne pollution:

- Access for vehicles would be limited to stabilised areas as far as practicable to reduce dust generation;
- Establishment and enforce an appropriate onsite vehicle speed limit of 20 km/hr which would be reviewed depending on meteorological conditions or safety requirements;
- Cover vehicle loads transporting loose materials to site;
- Implement dust minimisation measures on exposed stockpiles and unsealed construction areas as appropriate, including water spraying;
- Regularly service vehicles and machinery and maintain in an efficient condition to minimise emissions. The plant would also be operated in a proper and efficient manner;
- During weather events where wind speeds exceed 10 m/s and where dust generation cannot be effectively minimised, dust generating works would cease until adequate controls can be implemented or until such weather conditions abate;
- Limit clearing to the minimum required for safe construction to limit exposed areas and vegetation removal;
- Stabilise exposed areas as soon as reasonably practicable with seeding and planting;
- Confine vehicles and activities to designated work areas to prevent any inadvertent encroachment or otherwise into exposed and stripped areas of ground; and
- All emission controls used on vehicles and construction equipment would comply with standards listed in Schedule 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2010.*

6.2 Noise and Vibration

6.2.1 Existing Conditions

The area surrounding Rix's Creek Mine and the proposed rail loop area is predominantly rural, with the main sources of noise being predominantly from transport routes (the New England Highway and the Main Northern Rail Line) and from mining activities. The closest residential receptors are located at Bridgman and Retreat Road to the east and Singleton Heights to the southeast.

In order to examine existing noise conditions an assessment of nearby sensitive receptors was undertaken, with sites located to the east and southeast of the existing mine. Specifically, receptors located on Retreat Road, Bridgman Road and in the suburb of Singleton Heights may be potentially affected by the proposal and therefore have been considered. One representative site in each of these areas has been considered for this assessment. Sensitive receptors south of the Rix's Creek West Pit in the Maison Dieu area have not been included as these are considered to be located at sufficient distance from the proposed rail infrastructure that noise impact from the proposal is highly unlikely. The location of sensitive receptors in proximity to the Rix's Creek Mine and the proposed rail loop are shown in **Figure 4**.

SLR Consulting Australia Pty Ltd (SLR Consulting) was commissioned by Rix's Creek to undertake background noise logging in the Retreat Road and Singleton Heights areas. Unattended noise logging was conducted at 5 Partridge Close, Singleton Heights, and the intersection of Bridgman and Retreat Roads during May and June 2011. Data recorded at Retreat Road was affected by nearby dust monitoring equipment and was deemed invalid. It is considered that background levels in the absence of mining noise in the Retreat Road area would be less than L_{A90} 30 dB in more than half of all time periods. Therefore, a Rating Background Level (RBL) of L_{A90} 30 dB has been adopted for deriving noise criteria at this location. The project sensitive receptors, their locations and RBLs are listed in **Table 9**.

Table 9 Sensitive Receptors and Rating Background Levels

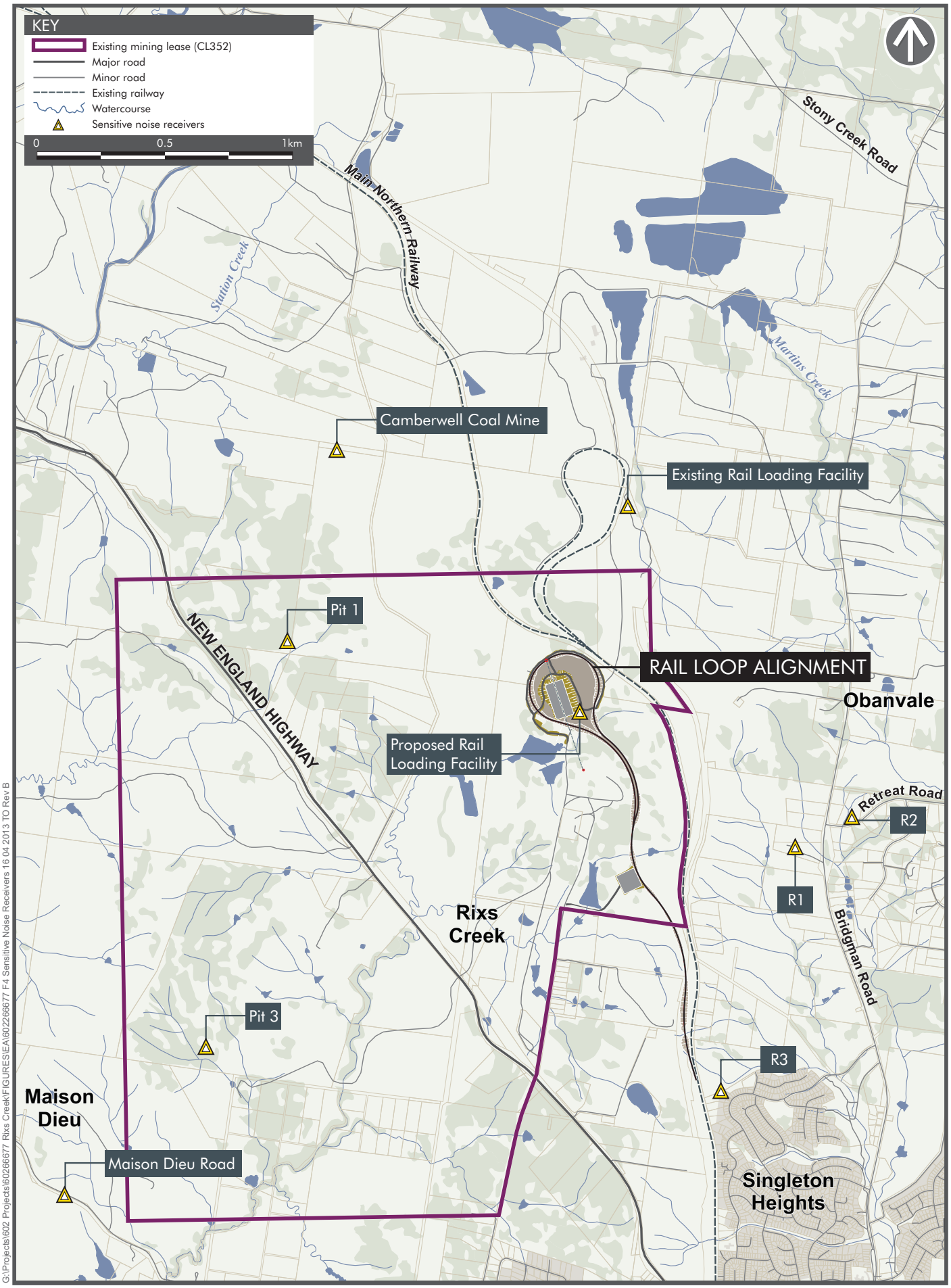
Receptor ID	Location & approx. distance to coal loader (m)	Rating Background Level (RBL) (dB)		
		Day	Evening	Night
R1	427 Bridgman Road – 2km	30	30	30
R2	22 Retreat Road – 2km	30	30	30
R3	120 Gardener Circuit – 3km	31	32	30

6.2.2 Methodology

The *Rixs Creek Coal Mine Proposed Rail Loop and Loading Facility Environmental Noise Assessment* was prepared by Global Acoustics (2012) to provide an assessment of the predicted impacts of the construction and operation of the proposed Rail Loop on nearby receptors. A copy of this report is attached at **Appendix I**. Modelled plant construction scenarios were developed from the scenarios in the Construction Methodology document attached at **Appendix D**.

In order to determine the impact of meteorological conditions on noise transmission, a comprehensive assessment of meteorological data was conducted by Global Acoustics (2012) in accordance with the Industrial Noise Policy (INP) guidelines. Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions - that is, no wind or temperature gradient. Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receptor due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed (absolute and/or relative) with height.

Based on the analysis of meteorological data, the conditions listed in Table 3.1 of **Appendix I** are included in this assessment as prevailing meteorological conditions. These conditions represented the maximum calculated (worst case scenario) meteorological conditions that could lead to increased impacts at each sensitive receptor.



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\EA\602266677 F4 Sensitive Noise Receivers 16 04 2013 TO Rev B

AECOM

LOCATIONS OF MODELLED NOISE RECEIVERS

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 4

6.2.3 Construction and Operational Noise Criteria

Utilising existing background noise levels as described in **Section 6.2.1**, project specific noise criteria have been calculated for construction and operational noise, in accordance with:

- Interim Construction Noise Guideline' (ICNG) (OEH, 2009; and
- The NSW Industrial Noise Policy (INP) (DECC, 2000).

For the purposes of assessing construction noise, the assessment has split potential construction noise impacts into the following components, as described in **Appendix I**:

- Off-Site Construction Noise – Noise generated by construction activities away from the existing mine operation that is considered a separate activity from the existing mine operation i.e. rail line construction works for the rail loop at and near the junction with the Main Northern Rail Line. Off-site construction noise impacts have been assessed in accordance with the ICNG. Due to the linear nature of the offsite construction area, the offsite work area is divided up into 100m segments for this assessment; and
- On-Site Construction Noise – Noise generated by construction activities that are within the existing mine activity area, and are considered, for the purposes of the noise modelling, to be part of the noise generation of the mine. On-site construction noise has therefore been assessed against the project specific (operational) noise criteria as derived from the INP.

Offsite Construction Criteria

Criteria for construction noise have been adopted in accordance with the requirements of the ICNG, as described in Section 1.6.1 of **Appendix I**. Offsite construction noise criteria are listed in **Table 10**.

Table 10 Off Site Construction Noise Criteria

Period	RBL	Applicable Adjustment to RBL (dB)	Construction Criterion (dB)
Retreat Road Area (R1 and R2)			
Day	30	+10	40
Evening	30	+5	35
Night	30	+5	35
Singleton Heights (R3)			
Day	31	+10	41
Evening	32	+5	37
Night	30	+5	35

Operational and Onsite Construction Criteria

On site noise is consistent with, and has been modelled as, existing noise from the operating mine. Onsite construction noise would therefore be assessed in accordance with noise criteria as described by the NSW Industrial Noise Policy (INP). Noise criteria for onsite construction, and operational noise, are listed in **Table 11**.

Table 11 On Site Construction Noise Criteria

Period	Acceptable Amenity Criterion L_{Aeq} dB	RBL	Intrusiveness Criterion L_{Aeq} dB[1]	Project Specific Criterion $L_{Aeq,15min}$ dB[2]
Retreat Road Area (R1 and R2)				
Day	50	30	35	35
Evening	45	30	35	35
Night	40	30	35	35

Period	Acceptable Amenity Criterion L_{Aeq} dB	RBL	Intrusiveness Criterion L_{Aeq} dB[1]	Project Specific Criterion $L_{Aeq,15min}$ dB[2]
Singleton Heights (R3)				
Day	50	31	36	36
Evening	45	32	37	37
Night	40	30	35	35

[1] *L_{Aeq} dB = represents the equivalent continuous (energy average) A-weighted sound pressure level of the source*

[2] *$L_{Aeq,15min}$ dB = represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.*

6.2.4 Construction Noise Impacts

Offsite Construction Noise

Table 12 presents model predictions for offsite construction during prevailing meteorological conditions. Results are provided as a range of $L_{Aeq,15minute}$ levels; the range being the lowest and highest predictions from the series of 100-metre rail segments considered within the offsite construction area as described in **Appendix I**.

Table 12 Off Site Construction Noise Levels - $L_{Aeq, 15\ minute}$ dB (Global Acoustics, 2012)

Receptor		Criterion	Predictions (Furthest - Closest to the receptor)		
ID	Location	D/E/N	Day	Evening	Night
R1	Bridgman Rd	40	34-47	34-47	35-53
R2	Retreat Rd	40	29-43	29-43	30-49
R3	Gardiner Cct	41	31-61	31-61	41-66

**D/E/N = Day /Evening / Night*

Predictions for Receptors R1 and R2 exceed the construction criterion by 7 and 3 dB respectively during the day period when construction occurs in the most exposed location. Note that night time levels have been provided for comparison and are higher at night due to meteorological conditions, however construction work is only proposed during standard hours.

Predictions for Receptor R3 (representative of Singleton Heights) exceed the construction criterion by up to 20 dB during the day period when construction occurs at the closest rail segment, which is approximately 250m from the residence. However, these levels would only occur when construction is performed on the southern section of the rail spur near the take-off from the main line. This may consist of sporadic work over several months. Predictions reduce to $L_{Aeq,15minute}$ 31 dB during the day period by the time construction reaches the start of the rail loop (end of the spur). Furthermore an exceedance of 20 dB is a conservative estimate for the following reasons:

- The exceedance is based on the worst case construction scenario modelled which was for bulk earthworks. The majority of works at the closest point to residents is track work associated with connecting the rail loop to the Main Northern Rail Line;
- Trackworks for connections would be highly intermittent with large periods of respite with major works only being undertaken during rail possessions which can only occur on the NML four times a year;
- The 20dB exceedance represents a worst case 'peaking' exceedance and would not be a constant exceedance. i.e. typical noise levels during construction would be lower for the majority of the time;
- Works at the location closet to the sensitive receiver would not be for the whole construction period; and
- There would be no out-of-hours construction works.

Consultation would be carried out prior to commencing work in areas where exceedance of the construction noise criterion may occur, and best practice management techniques implemented to minimise noise impact. A construction noise management plan would be developed to outline work practices that will be implemented to

minimise noise, and would describe a noise complaints handling protocol. Relevant sections of this plan would be communicated to applicable residents during consultation.

Onsite Construction Noise

Table 13 presents model predictions for onsite construction during prevailing meteorological conditions. Results are provided as a range of $L_{Aeq,15minute}$ levels; the range being the lowest and highest predictions from the series of 100-metre segments considered within the onsite construction area as described in **Appendix I**.

Table 13 On Site Construction Noise Levels - $L_{Aeq, 15\ minute}$ dB (Global Acoustics, 2012)

Receptor		Criterion	Predictions		
ID	Location	D/E/N*	Day	Evening	Night
R1	Bridgman Rd	35/35/35	25-34	25-34	28-50
R2	Retreat Rd	35/35/35	22-31	22-31	25-48
R3	Gardiner Cct	36/37/35	18-29	18-29	23-42

**D/E/N = Day /Evening / Night*

No exceedances of project specific noise criteria are predicted at any sensitive receptor during the day and evening periods. These results are based on the worst-case construction activity (bulk earthworks). Works would not be undertaken during the night period, however, the lower end of the ranges of results indicate that bulk earthworks could be undertaken outside of standard hours, although only when undertaken in non-exposed areas. Night predictions are higher than day due to the effect of prevailing night-time meteorological conditions.

Other on site construction tasks such as conveyor and rail loading facility construction would require far less noise emitting plant than the earthworks, and would occur in the general vicinity of the existing CHPP. No increase to existing site noise levels is expected as a result of these activities.

6.2.5 Operational Noise Impacts

To determine operational noise impacts Global Acoustics (2012) modelled a typical operational scenario which included the operation of the following project elements:

- Rail loop;
- 8,500 tonne trains operating on the rail loop including arrival, loading and departure;
- Train loading bin;
- Coal reclaim and conveyor to service the loading bin;
- Stockpile dozer;
- Skyline stacker conveyor; and
- Conveyor from existing CHPP to stockpile area.

Sound Power Levels (SPLs) for the various pieces of plant and machinery were either measured from existing machinery on the Rix's Creek site, taken from measurements of similar equipment at other mines in the Hunter Valley, or derived from known SPLs for various pieces of plant.

Modelling of the operational noise emissions was undertaken for both neutral and worst cast meteorological conditions to determine the likelihood of criteria exceedances shown in **Table 14** and **Table 15** respectively.

Table 14 Predicted operational noise levels – neutral conditions

Receptor		Criteria (dB)		Prediction (dB)		
ID	Location	D/E/N*	Exceedance	Existing Site	Proposed Loadout only	Existing Site Plus Proposed Rail
R1	Bridgman Rd	35/35/35	None	31	21	31
R2	Retreat Rd	35/35/35	None	28	19	28
R3	Gardiner Cct	36/37/35	None	25	16	25

**D/E/N = Day /Evening / Night*

Table 15 Predicted operational noise levels – worst case conditions

Receptor		Criteria	Prediction (dB)			Exceedance (dB)		
	Location	D/E/N*	Day	Evening	Night	Day	Evening	Night
Existing Site[#]								
R1	Bridgman Rd	35/35/35	31	31	38	Nil	Nil	3
R2	Retreat Rd	35/35/35	28	28	40	Nil	Nil	5
R3	Gardiner Cct	36/37/35	25	25	37	Nil	Nil	2
Proposed Loadout Only								
R1	Bridgman Rd	35/35/35	21	21	39	Nil	Nil	4
R2	Retreat Rd	35/35/35	19	19	36	Nil	Nil	1
R3	Gardiner Cct	36/37/35	16	16	33	Nil	Nil	Nil
Existing Site Plus Proposed Loadout								
R1	Bridgman Rd	35/35/35	31	31	41	Nil	Nil	6
R2	Retreat Rd	35/35/35	28	28	41	Nil	Nil	6
R3	Gardiner Cct	36/37/35	25	25	39	Nil	Nil	4
Change Due To Proposed Loadout								
R1	Bridgman Rd	35/35/35	0	0	3	Nil	Nil	3
R2	Retreat Rd	35/35/35	0	0	1	Nil	Nil	1
R3	Gardiner Cct	36/37/35	0	0	2	Nil	Nil	2

**D/E/N = Day /Evening / Night*

[#]Existing exceedances are being managed separately through a Pollution Reduction Program (PRP) being prepared for Rix's Creek in consultation with the EPA. Project specific mitigation measures would be applied separately, and in addition to the PRP.

These noise impacts are illustrated in the noise contour maps attached to **Appendix I**. Results in **Table 14** show predictions under neutral atmospheric conditions are less than the project specific noise criteria. Results in **Table 15** shows that for the worst case meteorological conditions can be summarised as follows relevant to each of the modelled sensitive receptors:

Bridgman Road:

- Existing SPLs are predicted to already exceed the PSNC by 3 dB during the night period; no exceedances are predicted during the day or evening periods; and
- The addition of the proposed loadout infrastructure would cause an increase of 3 dB during the night period, with no increase predicted for the day or evening periods. A 3 dB increase represents a doubling in noise energy, however, it would be unlikely to be perceptible to the human ear.

Retreat Road:

- Existing SPLs are predicted to already exceed the PSNC by 5 dB during the night period with no exceedances during the day or evening periods; and
- The addition of the proposed loadout infrastructure would result in an increase of 1 dB during the night period, with no increase predicted for the day or evening periods. An increase of 1 dB is generally imperceptible to the human ear.

Gardiner Circuit (Singleton Heights):

- Existing SPLs are predicted to already exceed the PSNC by 2 dB during the night period. No exceedances are predicted during the day or evening periods; and
- The addition of the proposed loadout infrastructure would cause an increase of 2 dB during the night period, with no increase predicted for the day or evening periods. A 2 dB increase would most likely not be noticeable and is not considered significant.

Despite the relatively minor exceedances which are only predicted to occur during the worst case meteorological conditions, mitigation measures have been recommended as listed in **Section 6.2.7** to minimise noise. It is also noted that changes of 1 – 2 dB are relatively minor and not perceptible to the human ear.

Sleep Disturbance

The assessment of the potential for sleep disturbance from future site operation was undertaken in accordance with The '*Environmental Noise Control Manual*' (ENCM, EPA 1985) which recommends a sleep disturbance criterion of 15 dB above the night period background level. The night period background noise level of L_{A90} 30 dB applies to all receptors in this assessment. Therefore, a sleep disturbance criterion of $L_{A1,\ 1\ minute}$ 45 dB has been adopted for all sensitive receptors.

Table 16 presents results of the sleep disturbance assessment. Results are $L_{A1,1minute}$ levels and are based on the stockpile dozer maximum result combined with the remainder of the site. Compliance with the sleep disturbance criterion is predicted.

Table 16 Sleep disturbance criteria.

Receptor		Criterion	Prediction	Exceedance
ID	Location	Night	LA1,1minute (dB)	
R1	Bridgman Rd	45	45	Nil
R2	Retreat Rd	45	44	Nil
R3	Gardiner Cct	45	41	Nil

As can be seen in **Table 16** night-time sleep disturbance noise goals are predicted to be met. Construction works would occur during standard hours and therefore not impact on sleep disturbance.

Low Frequency Noise (LFN)

Evaluation of LFN was carried out by comparison of total predicted C-weighted levels at receptor locations with an upper limit criterion. This method is in accordance with recommendations published in *A Simple Method for Low Frequency Noise Emission Assessment* (Broner, 2010), published in the Journal of Low Frequency Noise (LFN), Vibration and Active Control, Volume 29 Number 1 2010. In this assessment, the desirable limit for residential receptors of L_{Ceq} 60 dB has been adopted. Using this criteria, results of the assessment of LFN on the sensitive receptors is shown in **Table 17**.

Table 17 Operational Low Frequency Noise Levels $L_{Ceq,\ 15\ minute}$ dB

Receptor		Criteria	Prediction			Exceedance		
ID	Location	D/E/N	Day	Evening	Night	Day	Evening	Night
Existing Site								
R1	Bridgman Rd	65/60/60	54	54	58	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	53	53	57	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	49	49	54	Nil	Nil	Nil
Proposed Loadout Only								
R1	Bridgman Rd	65/60/60	39	39	47	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	37	37	46	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	34	34	42	Nil	Nil	Nil
Existing Site Plus Proposed Loadout								
R1	Bridgman Rd	65/60/60	54	54	58	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	53	53	57	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	49	49	54	Nil	Nil	Nil

Receptor		Criteria	Prediction			Exceedance		
ID	Location	D/E/N	Day	Evening	Night	Day	Evening	Night
Change Due To Proposed Loadout								
R1	Bridgman Rd	65/60/60	0	0	0	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	0	0	0	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	0	0	0	Nil	Nil	Nil

Importantly, LFN associated with proposed loadout infrastructure does not cause any increase to existing LFN levels.

6.2.6 Vibration Impacts

Vibration intrudes on both human comfort and can cause damage to buildings and structures. Some vibration intensive equipment may be used during the construction phase. Recommended safe working distance for both human comfort and cosmetic damage is shown in **Table 18**.

Table 18 Recommended safe working distances for vibration intensive plant

Plant	Rating/Description	Safe working distance*	
		Cosmetic damage	Human response
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15-20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (> 18 t)	25 m	100 m
Small Hydraulic Hammer	(300 kg – 5-12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12-18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1,600 kg – 18-34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2–20 m	20 m
Pile Boring	≤ 800 mm	2 m	N/A
Jackhammer	Handheld	1 m nominal	Avoid contact with structure

**Cosmetic Damage and Human Response safe working distances derived from British Standard BS7385-2:1993, OEH's Assessing Vibration: A Technical Guideline and measured data from AECOMs internal database.*

As can be seen the most vibration intensive piece of equipment, an 18t vibratory roller, may impact human comfort at distances of up to 100m. As the nearest sensitive receptor is approximately 1km away impacts from vibration would be negligible.

Cumulative noise and vibration impacts

The INP prescribes detailed calculation methods for establishing "project specific" $L_{Aeq(15minute)}$ intrusive criteria and $L_{Aeq(Period)}$ amenity criteria at potentially affected receptors for a development. Background noise levels, including noise from the existing mine, have been taken into consideration in the calculation of criteria to provide inbuilt cumulative impact consideration.

6.2.7 Mitigation Measures and Conclusion

Exceedances of construction noise criteria of up to 20dBA may occur during construction works when they are undertaken at the closest point (segment) to the sensitive receptors in Singleton Heights, during construction of the take-off point from the Main Northern Rail Line. No other exceedances were predicted to occur for onsite construction works, or during operation of the Rail Loop and coal handling / loading infrastructure during neutral atmospheric conditions.

Exceedances to operation of the rail loop and loading infrastructure were only identified for night time periods under worst case meteorological conditions. With the exception of the stockpile dozer, infrastructure associated with the proposal would operate with relatively constant noise output. It is unlikely the additional infrastructure would be noticeable to near-by receptors. Operating the dozer on the western side of the stockpiles, as low as possible during enhancing meteorological conditions, should reduce rail infrastructure levels by 3 to 4 dB during the night period.

Construction Noise Mitigation Measures

Construction noise impacts would be managed through the preparation of a Construction Environmental Management Plan (CEMP). The CEMP would include a noise complaint recording and managing protocol, and include the following mitigation measures:

- Community consultation would be undertaken prior to any offsite construction (the rail spur);
- Noise intensive construction works would be carried out during standard construction hours. If works are required outside of standard working hours approval would be sought from DP&I;
- Appropriate plant would be selected for each task, minimising the noise impact. Where possible smaller plant would be chosen;
- Deliveries would be carried out during standard construction hours;
- Non-tonal reversing alarms would be fitted on all construction equipment and mobile plant where possible;
- No simultaneous operation of two or more noisy plant items would occur in close vicinity and adjacent to residential receptors;
- Noisy equipment would be orientated away from residential receptors where possible;
- Structures would be used to shield residential receptors from noise sources, where possible;
- Construction trucks would travel via major roads and routes where possible and would not queue near residential dwellings;
- Within the stockpile and storage area, the noisiest works, such as stockpiling, would take place at a location furthest away from the nearest sensitive receptor;
- Other Interim Construction Noise Guidelines (ICNG 2009) mitigation measures that would be relevant to the construction works include:
    - Avoid dropping materials from a height;
    - Avoid metal-to-metal contact on equipment;
    - Ensure periods of respite are provided in the case of unavoidable maximum noise level events; and
    - Regularly inspect and maintain equipment to ensure it is in good working order and check the condition of mufflers.

Operational Noise Mitigation Measures

- Operation of the rail loop should be avoided during evening and night time when temperature inversion and south-easterly winds occur;
- The last approximately 250m of the loop is in a cutting, which provides good topographical shielding to the east. This location should be used for trains to idle if required to wait for other trains to clear the track; and
- Operation of the stockpile dozer would be avoided during noise enhancing meteorological conditions (temperature inversion or north-westerly winds), or if necessary, limited to the western side of the stockpile area.

6.3 Ecology

6.3.1 Existing Conditions

The following flora and fauna assessments have been prepared in support of this environmental assessment to describe the existing environment and assess the potential impacts of the proposed Rail Loop:

- Assessment of Vegetation for expansion of Rix's Creek Mine, Hunter Valley (Eastcoast Flora Survey, August 2011); and
- Fauna Habitat Assessment for the Proposed Rix's Creek Rail Loop (AECOM 2012).

The flora and fauna reports can be found in **Appendices J** and **K** respectively.

Flora

The site contains a mix of highly modified vegetation communities subject to past clearing and disturbance from grazing, despite there being now limited grazing across the mine site. Those vegetation communities are summarised in **Table 19**.

Table 19 Rix's Creek Mine Vegetation Communities

Vegetation community	Area (ha)
Spotted Gum – Iron bark – Redgum Forest[1]	92.76
Grey Box Forest[2]	16.15
Rough-barked Apple Grassy Woodland[2]	2.72
Bulloak Low Forest	2.50
Spotted Gum – Red Ironbark Forest[1]	1.88
Swamp Oak Forest	0.84
Riparian Redgum Forest[3]	0.63
Spiny Rush	0.55

[1] *Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions*

[2] *Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions*

[3] *Hunter Lowlands Redgum Forest*

A list of all vascular plants recorded during site surveys is **in Appendix J**. No threatened species were noted. Several individuals of *Grevillea montana* were recorded across the entire mine area, but this species is relatively common in the mid to lower Hunter Valley, and is also secure in conservation reserves (Bell 2001, 2008; Peake 2006). Despite the time of survey, 34 species of native grass were recorded, suggesting good quality grasslands are present.

Almost all of the areas examined by Eastcoast Flora Survey (2012) support regrowth vegetation following past clearing. Regrowth stems from retained paddock trees, and often results in monocultures of canopy species (*Eucalyptus moluccana* or *Eucalyptus crebra*) rather than a re-establishment of the original mix of canopy species. As a consequence, it is difficult to place all such areas within any defined community with certainty. Structurally, the best vegetation occurs on the hill in the south-western portion of the Mine (to the west of the New England Highway), where some larger *Eucalyptus moluccana* are present.

Thirty-nine weed species were recorded across the Mine, with the Prickly Pears *(Opuntia aurantiaca, Opuntia stricta* var. *stricta* and *Opuntia humifusum*) particularly common in the more heavily grazed areas. Spiny Rush (*Juncus acutus* subsp. *acutus*) has become established in some drainage lines where all woody vegetation has been removed, and European Olive (*Olea europea* subsp. *cuspidata*) is scattered throughout the site.

Fauna

The box-gum and ironbark forest and woodlands on the subject site are immature and generally not old enough to have hollow-bearing trees. Most trees are smaller than 20 cm diameter at breast height (dbh). The structural complexity of the subject site is generally low, as the shrub layer has not regenerated in most woodland areas. There are some Spotted Gum woodland areas where there is a leaf litter covered ground layer.

Hollows are potential roosting and nesting habitat for a number of woodland bird and micro-bat species. There are also occasional mature trees with loose bark that may provide roosting habitat for microbats.

One White-winged Chough (*Corcorax melanorhamphos*) nest was recorded in a tree in the subject site. Loose large rocks were recorded, which may provide reptile habitat. Both the nest tree and rock pile are shown on **Figure 5**.

There are several drainage lines and small dams within the study area with marginal aquatic habitat for amphibians and water birds. The Eastern Common Froglet (*Crinia signifera*) was heard calling from some waterbodies.

Common bird species observed during the site walkover include:

- Eastern Rosella;
- White-winged Chough;
- Galah;
- Black-shouldered Kite;
- Australian Raven;
- Australian Magpie;
- Pigeon;
- Noisy Miner;
- Grey Fantail;
- Superb Fairy-wren; and
- Eastern Yellow Robin.

Other fauna species observed include Goanna, Eastern Grey Kangaroo and Red-necked Wallaby.

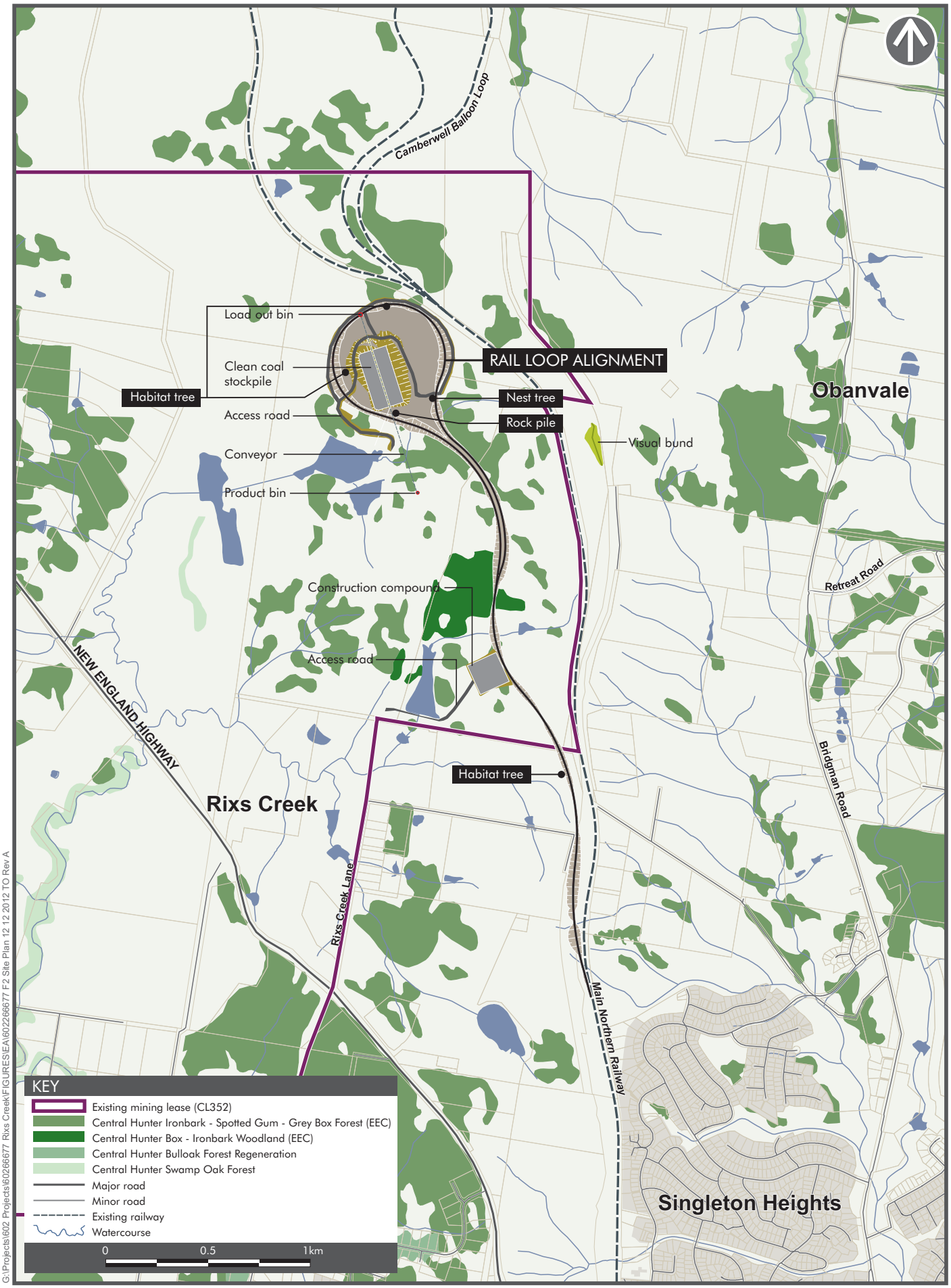
The database searches (OEH and EPBC) revealed 24 threatened fauna species that have been recorded previously or are predicted to occur within a 10 km radius of the subject site (the search area). The likelihoods that these species occur in the study area and the risk of significant impact by the proposed project are assessed in **Appendix K** and summarised below:

- Fifteen species with a low likelihood of occurrence in the study area and therefore a low risk of significant impact from the proposed project were not assessed further.
- Nine species with a medium or high likelihood to occur in the study area and a medium risk of significant impact from the proposed project included:
    - Speckled Warbler *Chthonicola sagittata*
    - Grey-crowned Babbler *Pomatostomus temporalis temporalis*
    - Brown Treecreeper *Climacteris picumnus*
    - Varied Sittella *Daphoenositta chrysoptera*
    - Diamond Firetail *Stagonopleura guttata*
    - Regent Honeyeater *Anthochaera phrygia*
    - Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*
    - Eastern Freetail-bat *Mormopterus norfolkensis*
    - Grey-headed Flying-fox *Pteropus poliocephalus*.

The subject site does not contain any of the following protected areas or habitats:

- World Heritage Areas;
- National Heritage Areas;
- SEPP 14 or Ramsar wetlands;

- State Protected Areas;
- Critical Habitat;
- Wildlife corridors; or
- ‘Core Koala habitat’ or ‘potential Koala habitat’ as defined by SEPP 44.



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AECOM

ECOLOGICAL CONSTRAINTS

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

Vegetation Data Source: Hunter-Central Rivers Catchment Management Authority (2006)

FIGURE 5

6.3.2 Predicted Impacts

The proposed rail loop and associated loading infrastructure would have a development footprint (disturbance area) of 52.74ha.

Flora

The disturbance area associated with the proposed rail loop will result in the permanent loss of 8.45 ha of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* Endangered Ecological Community (EEC) and 2.25 ha of *Central Hunter Grey Box – Ironbark Woodland EEC*. The balance of land within the total 52.74 ha disturbance area comprises 42.04 ha grasslands dominated by native or exotic pasture species ('derived grasslands').

Seven-part test were undertaken for each of the EEC's. These are included in **Appendix K**.

*Central Hunter Ironbark - Spotted Gum – Grey Box Forest (*CHISGGBF)

A total of 8.45 ha of CHISGGBF will be cleared for the proposed rail loop, representing ~9% of land mapped for all those investigated at Rix's Creek and ~0.05% of the total mapped Hunter Valley distribution by Peake (2006).

Stands of CHISGGBF within the proposed disturbance area are already highly fragmented as a result of past clearing associated with grazing activities, and do not form a contiguous mass of vegetated forest. Consequently, the proposed action will not fragment or isolate areas of CHISGGBF. Understorey condition is rated as poor.

CHISGGBF was one of the most widespread communities defined in the study of Peake (2006), comprising 30% of all remnant vegetation studied. Removal of ~0.05% of this vegetation type from its Hunter Valley distribution under the proposed action is not significant. In the locality, CHISGGBF occurs in remnant vegetation on all sides of the proposed disturbance area.

Central Hunter Grey Box – Ironbark Woodland (CHGBIW)

A total of 2.25 ha of CHGBIW will be cleared for the proposed rail loop, representing ~12% of land mapped for all those investigated at Rix's Creek mine and ~0.02% of the total mapped Hunter Valley distribution by Peake (2006).

Stands of CHGBIW within the proposed disturbance area are already highly fragmented as a result of past clearing associated with grazing activities, and do not form a contiguous mass of vegetated forest. Consequently, the proposed action will not fragment or isolate areas of CHGBIW. Understorey condition is rated as poor.

CHGBIW was one of the most widespread communities in the Hunter defined by Peake (2006), comprising 24% of all remnant vegetation studied. Removal of ~0.02% of this vegetation type under the proposed action is not significant. In the locality, CHGBIW occurs to the south-west of the proposed disturbance area, with further more distant stands to the west and south.

As described in **Section 6.3.1** no threatened flora species were identified within the development footprint.

Fauna

Nine threatened fauna species are assessed as having a medium or high likelihood to occur in the study area and a medium risk of significant impact from the proposed project. Therefore, 7-part tests pursuant to the *Threatened Species Conservation Act 1995* (TSC Act) were undertaken for these species. Assessments of significant impact pursuant to the EPBC Act were undertaken for the Grey-headed Flying-fox and Regent Honeyeater. The conclusions of these tests are presented below.

Woodland birds (Regent Honeyeater, Brown Treecreeper, Varied Sittella, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail)

The 7-part test concluded that the proposed project would result in the removal of approximately 11 ha of potential foraging habitat and potential breeding sites within treed over storey of CHISGGBF and *CHGBIW vegetation communities.*

Despite this, the clearing is small scale and the proposed project would be unlikely to result in any significant impacts on these woodland birds.

Microbats (Eastern Bentwing-bat, Eastern Freetail-bat)

The 7-part test concluded that the proposed project would result in the removal of 11 ha of potential foraging habitat and potential breeding sites. Despite this, the clearing is not extensive and the small scale of the proposed project would be unlikely to result in any significant impacts on these microbats.

Grey-headed Flying-fox

The 7-part test and the EPBC assessment concluded that the proposed project would result in the removal of 11 ha of potential foraging habitat for the Grey-headed Flying-fox. Nevertheless, the proposed project would be unlikely to have a significant impact on a local population of the species.

EPBC Migratory and Marine Species

Thirteen fauna species listed as migratory and/or marine under the EPBC Act were identified as potentially occurring in the search area. None of the listed species are likely to be reliant on habitats in the study area during any part of their lifecycles. Therefore, the proposed project would be unlikely to have a significant impact on any listed migratory bird species.

Other potential impacts apart from the removal or modification of habitat include potential impacts of noise, dust, weeds, pathogens and impacts to waterways.

Noise

The proposed noise levels in the railway corridor will vary but may be high at times with the passage of locomotives and trains and as a result resident animals may be affected by intermittent elevated noise levels. The subject site is currently affected by noise from mining activities and train movements and as it provides limited habitat for native fauna species, the potential impacts of noise during construction on resident animals will be minimal.

Dust

The proposed construction activities would include earthworks that might temporarily generate elevated dust levels that may reduce primary productivity of nearby plants and trees. However, a temporary elevation of dust levels would be unlikely to have a significant impact on the health of individual plants or fauna species reliant on vegetation.

Sedimentation and Pollution of Aquatic Environments

The proposed construction activities would include earthworks that would temporarily generate dust and expose soils to erosion risks. Construction activities inevitably involve a level of potential pollutants, such as fuels, oils and detergents. This could lead to increased sedimentation and/or pollution of downstream environments, either from stormwater run-off or by precipitation of dust, however measures have been included in **Section 6.1.3** to minimise these impacts.

Spread of Weeds and Pathogens

The proposed construction activities would involve the clearing of vegetation and earthworks in areas with existing weed infestation. Movement of soil by machinery and/or water can lead to transport of weeds (seeds and propagules) and pathogens. Disturbance of soils can increase the amount of suitable habitat for the establishment and spread of weeds, a key threatening process. Weed invasion can degrade fauna habitats and result in a reduction of plant species diversity. Weed thickets may reduce native wildlife diversity and can harbour feral animals such as foxes and rabbits.

These potential impacts can be appropriately managed through the implementation of the mitigation measures listed in **Section 6.3.3**.

6.3.3 Mitigation Measures and Conclusion

Biodiversity Offset

In order to offset vegetation disturbance areas a biodiversity offset area of 53.7ha has been identified as shown on **Figure 5**. The offset area contains a mixture of vegetation consistent with that being disturbed for the construction of the project. A breakdown of the vegetation communities and EECs within the proposed offset compared to the proposed disturbance area of the project is listed in **Table 20**.

Table 20 Offset area vegetation

	Proposed Rail Loop Disturbance areas (ha)	Vegetation communities within proposed Offset Area (ha)				Difference
		Spotted Gum - Ironbark - Redgum Forest	Rough-barked Apple Grassy Woodland	Grey Box Forest	Total	
Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC	**8.45**	6.72	0	0	**6.72**	**-1.73**
Central Hunter Grey Box-Ironbark Woodland EEC	**2.25**	0	0.63	0.44	**1.07**	**-1.18**
Sub Total	**10.7**	6.72	0.63	0.44	**7.79**	
Derived Grassland	**42.04**	-	-	-	**45.91**	**3.87**
Total	**52.74**	-	-	-	**53.7**	**0.96**

While there is less coverage of both EECs within the proposed offset, the balance of derived (from CHISGGBF and CHGBIW) grassland provides ample opportunity to match offset and disturbance areas through rehabilitation.

It is also noted that the proposed offset area has only been subject to management through light grazing since purchased by the Mine in the mid-1980s. Grazing was permanently excluded from this area in 2011. As a result regrowth has, and will continue to, increase over time in this area, adding to the value of the offset.

In order to manage the proposed offset area Rix's Creek Mine would update their existing site management plans to incorporate the proposed offset. This would also include actively rehabilitating appropriate sections of the offset (to be determine by an ecologist for maximum benefit) to achieve not less than a 1:1 offset ratio for both CHISGGBF and CHGBIW.

In relation to potential impacts resulting from project activities, the following measures would be included in the project CEMP to protect ecological values:

Vegetation Clearing

The following measures would be put in place to minimise impacts from vegetation clearing:

- The minimum feasible area of vegetation clearing would be conducted for construction purposes; this includes ground-layer vegetation; and
- Clear marking and delineation (i.e. signage and barrier fencing) would be placed between the works areas and any vegetation that is to be retained, prior to the commencement of construction.

Tree Protection

The following measures would be put in place to protect trees outside of the development area:

- A Tree Protection Zone will be established around trees to be retained close to the construction zone, including compound locations, with barriers; and
- The Tree Protection Zone will protect the lower branches of trees and be placed just outside the drip line.

Woodland Fauna

The following measures would be put in place to minimise impacts on woodland fauna species:

- Clearing of vegetation in the subject site would be carried out under the supervision of an appropriately experienced and licenced ecologist;
- Immediately prior to clearing, canopy trees are to be visually inspected for the presence of fauna by a suitably qualified ecologist. If fauna species are detected in a tree scheduled for clearing, the tree is to be nudged prior to felling to encourage the fauna to vacate the tree prior to felling. If threatened fauna are located in trees to be cleared, clearing would be halted until the fauna has relocated;

- Felled trees would be left in-situ for at least 24 hours to allow fauna species to relocate;
- Hollow-bearing trees and mature trees would be retained where feasible;
- Hollows that are removed would be recycled and supplemented with fauna nesting boxes secured to nearby mature trees at a replacement ratio of 2:1; and
- New fencing along the rail corridor would be designed to not impede the movement of gliders, and barbed wire fencing would only be used where necessary.

Weed Management

The following measures would be put in place to manage weeds:

- Weed control measures (e.g. herbicide spraying) would be undertaken prior to construction in areas where high densities or infestations of weeds occur. This would help to reduce the risk of weeds being spread as a result of the proposed project;
- Earth-working equipment would be cleaned of excess soil prior to arrival and prior to departure from work areas to minimise the spread of weed seeds, weed propagules and plant pathogens;
- Sediment fences and sediment traps would be put in place during construction to prevent sediments that might contain weed seeds, weed propagules and plant pathogens from leaving the site;
- Soil excavated for earthworks would only be stockpiled in delineated and fully bunded work areas within the designated development footprint. These areas would be kept away from low points and stormwater runoff paths;
- Disturbed areas would be kept to a minimum and revegetated as soon as practically possible. This would minimise opportunities for colonisation by weeds and minimise the potential for erosion and sediment transport;
- Weeds (including vegetation, fruit and seed) removed during vegetation clearing would be destroyed or disposed of by suitable means; and
- A detailed stormwater management plan, if weeds are present in the construction area, would include provision to minimise the risk of weeds spreading into waterways via stormwater run-off during the construction.

Protection of Waterways

The following measures would be put in place to minimise sediment mobilisation during construction on aquatic environments:

- A sediment and erosion management plan in accordance with the Blue Book (Department of Housing and Landcom, 2004) would be prepared as part of the CEMP;
- Various stormwater management structures would be located down slope of the proposed works to intercept surface water run-off during the construction phase. These structures would be established prior to the commencement of construction and combined with other temporary stormwater management measures such as sandbags, sediment fences and berms, to manage sediment laden runoff and other construction pollutants entering downstream aquatic systems;
- During construction, potential chemical pollutants (e.g. fuels, oils, lubricants, paints, etc.) would be stored in appropriate containers in bunded areas within the construction compound to minimise the risk of spillages and mobilisation of any pollutants into local waterways;
- Building materials would be placed within the construction compound or within the rail corridor where necessary; and
- All excavated soil and spoil would be stockpiled in a designated and fully bunded work stockpile area.

6.4 Indigenous Heritage

6.4.1 Existing Conditions

The existing indigenous heritage conditions of the site, was determined following, desktop and field investigations in consultation with local indigenous community members in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (OEH, 2010).* Details on the outcomes of these investigations are discussed below and the Indigenous Heritage Assessment is attached at **Appendix G**.

AHIMS Database Search

A search of OEH's Aboriginal Heritage Information Management System (AHIMS) database on 1 May 2012 for a 2 x 4 km area encompassing the Project Area identified a total of 28 Aboriginal archaeological sites. The AHIMS search results are provided in **Appendix G**. A breakdown of these sites is provided below in **Table 21**.

Table 21 AHIMS Database Search Results

Site Type	Count
Artefact scatter	21
Isolated artefact	6
Scarred tree	1
Total	**28**

Of the sites registered with the AHIMS database in the vicinity of the Project Area, artefact scatters are the dominant site type, comprising 75% of the total, far outnumbering the next most common site type – isolated artefacts.

Of the 28 sites identified, only one site has been recorded as being located within the immediate vicinity of the Project Area. AHIMS Site 37-6-2287 is recorded as being located within the proposed rail loop alignment, approximately 610m north-west of where the rail loop leaves the Main Northern Rail Line. Three other sites (37-6-1206; 37-6-1207; 37-6-1208) have been recorded within 100m of the proposed rail loop, also in the southern end of the Project Area, close to where the rail loop leaves the Main Northern Rail Line. These three sites are located more than 70m away from the proposed rail loop, and as such are not at risk from the proposed works.

Archaeological Survey

Archaeological survey of the Project Area was undertaken on 27 July 2012. Survey was conducted by a field team of two AECOM archaeologists (Rochelle Coxon and Dr Darran Jordan) and 12 Aboriginal stakeholder representatives. A list of representatives in attendance is provided in **Appendix G**.

All survey was undertaken on foot, with the archaeological survey team walking abreast of one another at 10m intervals. The linear transect widths ranged from 80m to 100m. This transect width was maintained throughout the survey, ensuring appropriate survey coverage was achieved for the extent of the pegged railway loop alignment, and the land immediately adjacent to it on either side. Landform, soils and surface exposure characteristics along transects were recorded through descriptive notes and photographs.

Survey Aim and Objectives

The aim of the archaeological survey was to identify, record and map Aboriginal heritage values within the Project Area. These values include both the tangible remains of past Aboriginal activity (i.e. archaeological evidence) as well as intangible cultural values. More specific survey objectives were as follows:

- To relocate and re-record all previously recorded Aboriginal archaeological sites within the Project Area;
- To comprehensively survey by pedestrian transects land within the Project Area;
- To inspect, where appropriate, areas of known or potential Aboriginal cultural value, including AHIMS sites, and areas identified by Aboriginal stakeholder representatives; and
- To provide sufficient data to facilitate the development of appropriate management and mitigation measures for identified Aboriginal sites and areas of archaeological sensitivity.

The survey strategy employed involved undertaking pedestrian transects over the Project Area. Prior to the commencement of survey, the alignment of the railway loop and the location of the Clean Coal Stockpile Area were clearly demarcated using surveyors pegs by Mine personnel. These survey pegs provided the route followed by the survey participants to ensure maximum coverage of the Project Area, and the land immediately adjacent which could also be subject to impacts from the Project, was achieved.

Survey Results

A total of 12 Aboriginal archaeological sites were identified and one previously recorded AHIMS site (37-6-2287) was relocated during the course of the survey. All Aboriginal archaeological sites identified during survey were recorded to a standard comparable to that required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (NSW Department of Environment Climate Change & Water 2010c). For each site located or re-visited, individual artefact locations were captured by Differential GPS (DGPS). Associated site data (e.g. location, type, content, artefact dimensions) was documented using AECOM's standard open site dictionary within the DGPS. Attribute data recorded for identified chipped stone artefacts varied by technological type, with additional attributes recorded for complete flakes, cores and implements. However, as a minimum, recorded attributes comprised raw material, technological type and maximum linear dimension. Detailed photographic records of each site were also maintained.

The topography of the Project Area was observed during the field survey to be predominantly characterised by low, gently undulating hills. The predominant landform through which the proposed rail loop alignment passes comprises flats and lower slopes. The northern section of the Project Area, including the Clean Coal Stockpile Area, is dominated by lower slopes, with mid to upper-slopes also present in the north and north-east. The north-western section of the Project Area was found to be highly disturbed, comprising a rehabilitated overburden emplacement area. All five tributaries of Rixs Creek which intersect the proposed rail loop alignment were subject to inspection. Terrain associated with the tributaries was generally quite flat.

Ground Surface Visibility (GSV) across the Project Area was, on average, poor to fair. The tributaries of Rixs Creek afforded excellent GSV due to erosional processes, particularly sheet erosion, which had exposed the ground surfaces along the creek banks and in adjacent areas. The length of the proposed rail loop alignment generally afforded fair GSV, with areas of good exposure present in several locations due to erosion, lack of grass cover, and exposed areas resulting from land-use disturbance, notably the presence of a transmission line easement across the northern section of the rail loop alignment. Much of the southern portion of the proposed rail loop alignment afforded poor GSV due to the presence of extensive and dense pasture grasses. Areas of exposure resulting from erosional processed did, however, afford several areas throughout this section, many of which were quite sizable, with excellent GSV.

Summary of Existing Environment

Key observations drawn from a review of the existing environment of the Project Area are as follows:

- Environmental conditions discussed above, such as climate, access to fresh water, flora and fauna indicate that land within and in the vicinity of the Project Area was sufficient to support occupation by Aboriginal people;
- Evidence of occupation is likely to be found concentrated along/adjacent to creeklines where there would have been easy access to fresh water and aquatic food resources. Lower artefact densities might be expected along ephemeral tributaries and drainage lines.
- In topographic terms, the majority of the Project Area can be characterised as being suitable for past occupation by Aboriginal people. Landforms most suited to repeated or intensive occupation activity, however, include level to gently undulating/inclined flood/drainage plains and gently inclined footslopes (i.e. low gradient land surfaces).
- The Hunter River is located approximately 3.5km south of the southernmost-extent of the Project Area. Stone suitable for the production of stone tools is therefore locally available, as the Hunter River gravels contain rocks suitable for stone tool manufacture, including indurated mudstone/tuff and silcrete. In the more immediate vicinity of the Project Area, suitable raw materials for stone tool manufacture may also have been available from the gravels of Rixs Creek and its tributaries.
- Native vegetation within the Project Area has been extensively modified as a result of European land use practises, with native vegetation clearance widespread across the Project Area. If, however, mature paddock

trees are present, they could potentially exhibit scars resulting from cultural modification by Aboriginal people.

- Prior to European occupation, the floral and faunal resources of the Project Area would have been sufficient to facilitate and sustain occupation by Aboriginal people; and
- Erosion is common throughout the Project Area, most likely resulting from vegetation clearance of the area for agricultural and mining purposes. As a result of this, areas where erosion is evident will generally offer excellent GSV, but poor potential for stratified archaeological deposits.

Existing archaeological features are shown in **Figure 6**.

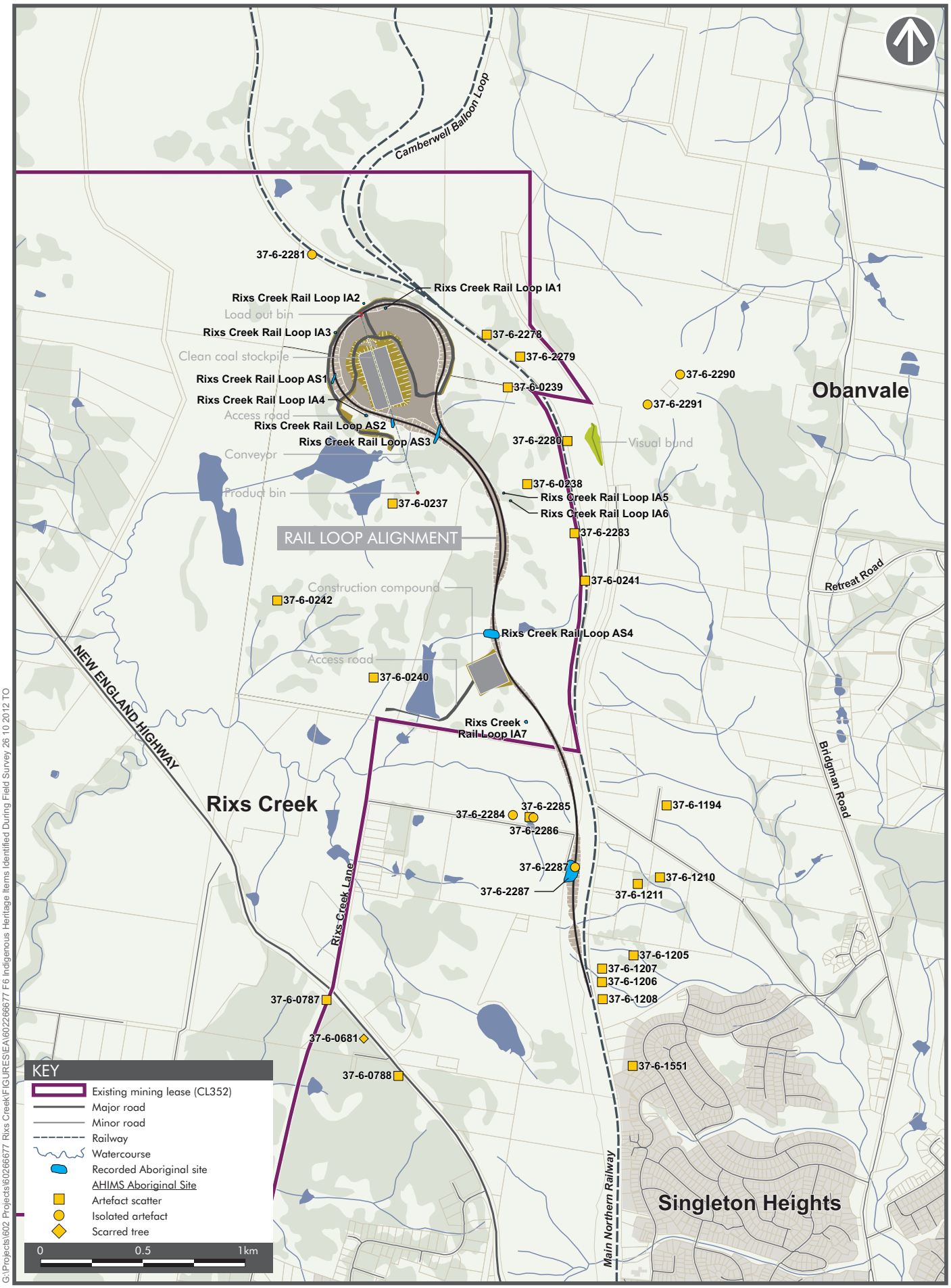
6.4.2 Predicted Impacts

Table 22 presents a summary of impacts to known Aboriginal sites within the Project Area, their site, type, significance and potential to be impacted by the proposal.

Table 22 Summary of Impacts to Known Aboriginal Sites

Impact	Site ID	Site Type	Significance*
Rail Loop *Significance Tally* High – 0 Moderate – 1 Low – 8	SCO1 (AHIMS 37-6-2287)	Artefact scatter	Low
	Rix's Creek Rail Loop AS1	Artefact scatter	Low
	Rix's Creek Rail Loop AS2	Artefact scatter	Low
	Rix's Creek Rail Loop AS3	Artefact scatter	Low
	Rix's Creek Rail Loop AS4	Artefact scatter	Moderate
	Rix's Creek Rail Loop IA1	Isolated artefact	Low
	Rix's Creek Rail Loop IA2	Isolated artefact	Low
	Rix's Creek Rail Loop IA3	Isolated artefact	Low
	Rix's Creek Rail Loop IA4	Isolated artefact	Low
Visual Bund *Significance Tally* High – 0 Moderate – 0 Low – 1	Rix's Creek Rail Loop IA8	Isolated artefact	Low
Sites Indirectly Impacted *Significance Tally* High – 0 Moderate – 0 Low – 3	Rix's Creek Rail Loop IA5	Isolated artefact	Low
	Rix's Creek Rail Loop IA6	Isolated artefact	Low
	Rix's Creek Rail Loop IA7	Isolated artefact	Low

- ***High** significance* is usually attributed to sites, which are so rare or unique that the loss of the site would affect our ability to understand aspects of past Aboriginal use / occupation for an area. In some cases, a site may be considered highly significant because its type is now rare due to destruction of the archaeological record through development.
- ***Moderate** significance* can be attributed to sites that provide information on an established research question or on the basis of moderate rareness.
- ***Low** significance* is attributed to sites that cannot contribute new information about past Aboriginal use / occupation of an area. This may be due to site disturbance or the nature of the site's contents.



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\EA\602266677 F6 Indigenous Heritage Items Identified During Field Survey 26 10 2012 TO

AECOM

INDIGENOUS HERITAGE ITEMS IDENTIFIED

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 6

Known Resource

The known archaeological resource of the region encompassing the Project Area has been analysed in **Appendix G**. This analysis indicates that the majority of identified archaeological sites identified across the Hunter region comprise stone artefact scatters and isolated artefacts. These sites are very common and widely documented and recorded throughout the Hunter region. Several sites have been subject to salvage and their assemblages made available for further research.

Stone artefact scatters and isolated artefacts were the only archaeological site types identified during the field survey component of the current assessment. This is consistent with the known archaeological resource of the wider Hunter region. None of the archaeological sites identified within the Project Area can therefore be considered rare or unique within a regional context. This is further reinforced by the fact that of the 28 previously recorded sites identified during the AHIMS database search for a 2 x 4 km search area encompassing the Project Area, artefact scatters comprised 75% of the total, while isolated artefacts comprised 21.4%. This brings the combined total for artefact scatters and isolated artefacts in the local area to 96.4%. An examination of the site cards for these identified sites indicates that several comprise better examples of these site types than those which will be impacted by the Project, with larger and more complex assemblages. Of the newly identified archaeological sites, only one (Rix's Creek Rail Loop AS4) has been identified as being of moderate archaeological significance on the grounds of research potential and integrity.

The Project will result in the destruction of ten archaeological sites, all of which are artefact scatters and isolated artefacts. While the destruction of these sites cannot be avoided, it can be successfully mitigated through salvage, including surface artefact collection and test excavation.

In the absence of appropriate management and mitigation measures, such as surface artefact collection and test excavation, the impacts of the Project on the known Aboriginal archaeological resource of the region would be relatively low. With the implementation of appropriate management and mitigation measures, such as are set out below in **Section 6.4.3**, the impacts of the Project on the known archaeological resource of the region would be reduced to very low.

Potential Resource

Despite the vast quantity of archaeological investigations undertaken within the Hunter region to date, in consideration of predictive modelling of Aboriginal site locations and environmental considerations, much of the region represents a potential resource, not yet identified or subject to systematic recording and documentation.

An analysis of aerial imagery for an area of approximately 50km radius centred on the Rix's Creek Mine area indicates that areas in which the Aboriginal archaeological resource is unlikely to survive, including mining areas, urbanised areas, and roads and other infrastructure, has affected approximately a relatively small proportion of the area. The majority of the area comprises low-intensity agricultural and rural land use, including grazing land, where Aboriginal archaeological materials are more likely to survive, although often having experienced some minor levels of disturbance (vegetation clearance, erosion, and cattle trampling, for example). Large areas of state forest and national parks are also located within the area, including the Yengo National Park, Pokolbin State Forest and Coricudgy State Forest to the south-west, and the Mount Royal National Park, Barrington Tops National Park, and Masseys Creek State Forest to the north-east. There is a higher chance for the presence of intact archaeological sites and materials in these parks and forests as the archaeological record is less likely to have been subject to land-use related disturbances.

In light of these observations, it is evident that there are numerous environmental contexts of comparable, and increased, potential for the presence of Aboriginal archaeological sites and materials within the region. From these observations, it can be inferred that archaeological sites and artefacts of similar nature and distribution will occur throughout these areas across the Hunter region. While the disturbance of the potential archaeological resource of the Project Area cannot be avoided, it can be successfully mitigated through the implementation of an appropriate program of test excavation.

The analysis of the potential archaeological resource of the Project Area therefore supports the conclusion that the impacts of the Project on the potential archaeological resource of the Project Area will be relatively low within a regional context, prior to the implementation of appropriate mitigation measures, and very low subsequent to the implementation of appropriate management and mitigation measures.

6.4.3 Mitigation Measures and Conclusion

Ten Aboriginal archaeological sites would be impacted by the Project, resulting in their destruction, or partial destruction. Three Aboriginal archaeological sites (Rixs Creek IA5, Rixs Creek IA6, and Rixs Creek IA7) have the potential to be indirectly impacted as part of ongoing works. To mitigate the impacts of the Project, and in recognition of the request to salvage all sites as recommended by the Wanaruah Local Aboriginal Land Council, surface artefact collection of the following sites should be undertaken prior to the commencement of construction works:

- SCO1 (AHIMS 37-6-2287);
- Rix's Creek Rail Loop AS1;
- Rix's Creek Rail Loop AS2;
- Rix's Creek Rail Loop AS3;
- Rix's Creek Rail Loop AS4;
- Rix's Creek Rail Loop IA1;
- Rix's Creek Rail Loop IA2;
- Rix's Creek Rail Loop IA3;
- Rix's Creek Rail Loop IA4;
- Rix's Creek Rail Loop IA5;
- Rix's Creek Rail Loop IA6;
- Rix's Creek Rail Loop IA7; and
- Rix's Creek Rail Loop IA8.

Post-collection, recovered artefacts would be subject to appropriate forms of analysis. Registered Aboriginal stakeholder groups should be involved in the collection of surface artefacts. Appropriate long-term management options for recovered artefacts would be developed in consultation with Aboriginal stakeholders. In accordance with Section 85A(1)(c) of the NPW Act, all artefacts recovered during the surface collection would be transferred to the care of an appropriate Aboriginal person/s or organisation/s under a Care and Control Agreement.

Test Excavation

In recognition that much of the archaeological resource of the Project Area is not identifiable by surface survey alone, and that all archaeological sites hold significance for the local Aboriginal community, a program of subsurface testing would be undertaken. This program would be undertaken to obtain a better understanding of the nature and extent of Aboriginal archaeology in identified areas of sensitivity within the Project Area that would be directly disturbed by the Project, being the newly identified archaeological site Rix's Creek Rail Loop AS4.

The program of test excavation would be developed in consultation with registered Aboriginal stakeholders. The test excavation program would utilise the results of the archaeological survey, including identified areas of archaeological sensitivity, to develop an appropriate scientific research methodology. In accordance with Section 85A(1)(c) of the NPW Act, all artefacts recovered during the test excavation would be transferred to the care of an appropriate Aboriginal person/s or organisation/s under a Care and Control Agreement.

Summary of Management and Mitigation Measures

The mitigation measure recommended for each of the identified artefacts or scatters is presented in **Table 23**.

Table 23 Summary of Management and Mitigation Measures

Management and Mitigation Measures	Site ID	Site Type
Surface Collection	SCO1 (AHIMS 37-6-2287)	Artefact Scatter
	Rix's Creek Rail Loop AS1	Artefact Scatter
	Rix's Creek Rail Loop AS2	Artefact Scatter
	Rix's Creek Rail Loop AS3	Artefact Scatter
	Rix's Creek Rail Loop IA1	Isolated Artefact
	Rix's Creek Rail Loop IA2	Isolated Artefact
	Rix's Creek Rail Loop IA3	Isolated Artefact
	Rix's Creek Rail Loop IA4	Isolated Artefact
	Rix's Creek Rail Loop IA5	Isolated Artefact
	Rix's Creek Rail Loop IA6	Isolated Artefact
	Rix's Creek Rail Loop IA7	Isolated Artefact
	Rix's Creek Rail Loop IA8	Isolated Artefact
Surface Collection and Test Excavation	Rix's Creek Rail Loop AS4	Artefact Scatter
Test Excavation	N/A	Areas of Subsurface Sensitivity

During construction works there is potential for artefacts which have not been previously identified to be uncovered. In order to manage potential finds, the construction contractor would apply the following management practises:

- The persons responsible for management on site would ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Section 86 of the *National Parks and Wildlife Act 1974* states that:
  - *"A person must not harm or desecrate an object that persons knows is an aboriginal object, or*
  - *Harm or desecrate an aboriginal place.*
  - *It is an offence to knowingly destroy, deface or damage, or cause or permit the destruction or defacement of or damage to, an object or Aboriginal place without first obtaining the consent of the DECCW".*
- If any Aboriginal sites or relics should be found during the construction phase of the development, all work would cease and the archaeologist, members of the Aboriginal community and the DECCW must be contacted.
- Decisions about the management of sites and potential archaeological deposits would be made in consultation with the appropriate local Aboriginal community.

6.5 Non-Indigenous Heritage

6.5.1 Existing Conditions

As part of the detailed investigations into the non-indigenous heritage of the project area a Non-Indigenous Heritage Impact Assessment was prepared and is summarised in this section of the EA. This report is attached at **Appendix F**. Investigations into the potential for non-indigenous heritage items within the general vicinity of Rixs Creek and the proposed Rail Loop vicinity were conducted through both desktop and field investigations and were made in accordance with the NSW Heritage Office publications *Assessing Historical Significance, Assessing*

Significance for Historical Archaeological Sites and Relics (NSW Heritage Branch, 2009) and *Statements of Heritage Impact* (NSW Heritage Office, 2002). This included undertaking the following:

- a search of the following registers for heritage sites in the study area:
    - Commonwealth Heritage List;
    - National Heritage List;
    - Register of the National Estate;
    - NSW State Heritage Register;
    - NSW State Heritage Inventory;
    - S170 Registers;
    - Singleton Local Environmental Plan 1996; and
    - Relevant Regional Environmental Plans.
- desktop review of previous non-Indigenous heritage reports relevant to the local area that are accessible to AECOM, including previous EAs and existing conservation management plans;
- archaeological survey, conducted simultaneously with Indigenous survey by two AECOM archaeologists; and
- GIS mapping of known non-Indigenous heritage and archaeologically sensitive areas.

Heritage Inventory Searches

No listed heritage items were identified within the study area. There are three items located in the surrounding region that are listed in registers. These included:

- Middle Falbrook Bridge over Glennies Creek, located approximately 5945m north of the northernmost extent of the study area (Register of the National Estate, S170 Registers and the NSW State Heritage Register);
- Camberwell Glennies Creek underbridge, located approximately 4900m northwest of the northernmost extent of the study area(S170 Registers); and
- Rixs Creek Coke Ovens and associated works located 1230m west of the southern-most extent of the study area (Singleton Local Environmental Plan 1996).

Field Investigations

During the field survey four historic sites were identified. These included:

1) Historic sandstone excavation area;
2) Rail siding associated with Rixs Creek Coke Ovens and associated works;
3) Abandoned section of rail corridor from the Main North Line with cutting and abutting wall; and
4) Rixs Creek platform and associated historic artefact scatter.

Detailed descriptions of these identified sites are provided in **Appendix F** with brief statements relating to their historical significance provided below.

Historic sandstone excavation area

This historic sandstone excavation area is of potential local historical significance as it provides an example of an activity employed sometime between the early, formative years of farming and settlement in the Upper Hunter region and the development of Rix's Creek Coal Mine in 1989. It provides physical evidence of former land use patterns and activity.

Rail siding associated with Rixs Creek Coke Ovens and associated works

The railway siding is of local significance as it relates specifically to the Rixs Creek Coke Ovens and the larger connection of local industry to the transport route of the Main North Line.

Abandoned section of rail corridor from the Main North Line with cutting and abutting wall

The railway corridor is of local significance as it relates to the people and industries of Rixs Creek who used this section of rail until the 1952 diversion. It also relates to the larger historic transport route of the Main North Line that was an important connection for Rixs Creek to external places and markets.

Rixs Creek platform and associated historic artefact scatter

Rixs Creek platform is of local significance and has the potential to contain information in the associated material record (potential subsurface deposits and surface scatters of historic artefacts) to yield information about both the rail industry and its interface with local industry at Rixs Creek between 1885 and 1938. The extent of the material that may be located at the site will have been limited by the small capacity and infrequent use of the platform during its years of operation.

The location of these non-indigenous heritage finds is shown on **Figure 7**.

6.5.2 Predicted Impacts

The development of the Project will result in direct impacts to all four items identified during the field survey as they fall within the bounds of the proposed rail loop and rail loading facility area. Specifically predicted impacts are:

Historic sandstone excavation area

The potential sandstone excavation area is situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of the item.

Rail siding associated with Rixs Creek Coke Ovens and associated works

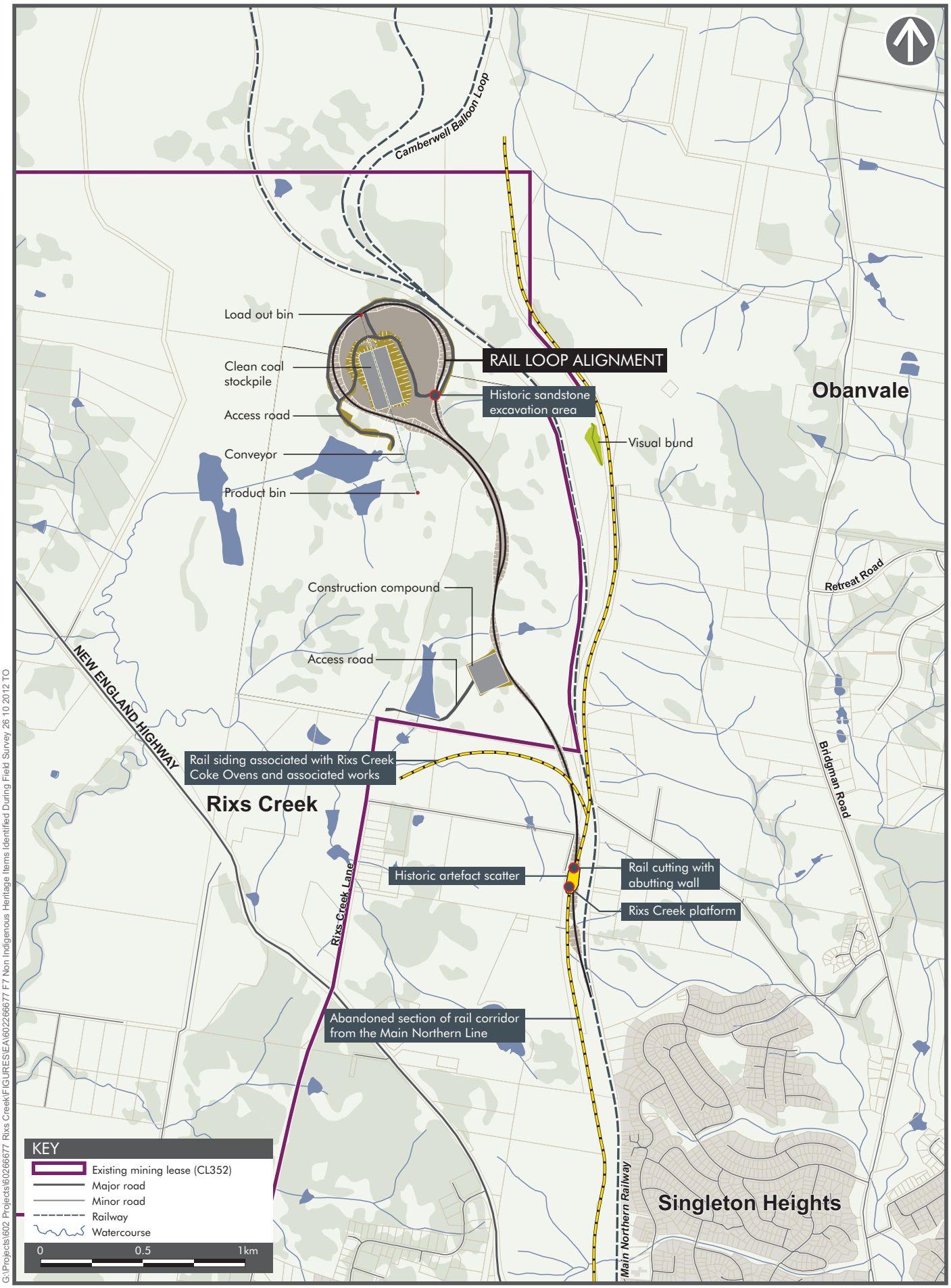
A section of the rail siding associated with Rixs Creek Coke Ovens is situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of a 60m section of the siding. It is estimated that the total length of the disused siding is approximately 1 km in length, meaning the area of impact to this item represents 6% of the total.

Abandoned rail corridor from Main North Line with cutting and abutting wall

A section of the abandoned portion of the Main North Line corridor (disused after the line was slightly diverted in 1952) is situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of a 230m portion of the item. The total length of the disused corridor is approximately 3,360m in length, meaning the area of impact to this item represents 6.85% of the total. One unique feature within the corridor however will be destroyed, that being the cutting with abutting wall.

Rixs Creek platform and associated historic artefact scatter

The Rixs Creek platform and associated historic artefact scatter are situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of this item. Extant features such as the rail platform, survey marker, surface scatter and any archaeological deposits associated with the platform will be destroyed. This site was found to have local significance under criteria a, b, e and g (refer to **Appendix F** for detailed criteria description). It has been assessed as having the potential to yield information to enhance the understanding of local rail operations in the area between 1885 and 1938.



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AECOM

NON-INDIGENOUS HERITAGE ITEMS IDENTIFIED DURING FIELD SURVEY

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 7

6.5.3 Mitigation Measures and Conclusion

Where engineering design measures are unable to avoid impacts to items of heritage significance, mitigation and management measures for each impact are proposed to reduce the magnitude of the impacts as far as practicable.

Directly Impacted Items

The four heritage items identified within the proposed rail loop disturbance footprint will all be impacted by the proposed works, with destruction to that portion of the site that is within the study area. Photographic archival recording would be undertaken for all four items, given their age and historical significance. In addition, the platform site and cutting with abutment feature would be recorded through scaled drawings prior to the commencement of works. If it is possible to preserve the abutting wall and rail platform these features should be fenced during works for their protection.

Recording and surface collection of historic artefacts would be carried out at the scatter site located in proximity to the rail platform and that monitoring would take place during ground disturbing works in this area. All recordings should comply with the Heritage Branch, within the Office of Environment and Heritage, guidelines: *How to Prepare Archival Records of Heritage Items* (NSW Heritage Office, 1998b) and *Photographic Recording of Heritage Items using Film or Digital Capture* (NSW Heritage Office, 2006).

Historical Heritage Management

The management of the historical heritage within and adjacent to the study area should be undertaken with reference to a list and map indicating the location of sites identified within the study area and relevant adjacent heritage items (as provided in the Non-indigenous Heritage report, **Appendix F**). The following management measures are proposed:

1) The abutting wall and platform in the rail corridor would be preserved if possible. If they can be avoided from direct impacts they should be fenced during works for their protection. If it is not possible to preserve these features then no works should occur until they have been subject to full archival recording.

2) Full archival recording, including scaled drawings, GPS coordinates and photographs would be taken for the cutting with abutting wall, the Rixs Creek platform, the artefact scatter site associated with the platform and the sandstone excavation area. This work would be undertaken by a qualified archaeologist.

3) Surface collection would be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek platform prior to construction works. GPS positions and photographs would be taken for each artefact prior to collection. The artefacts would be analysed by a historic heritage expert and a report produced of the results. Monitoring is to be undertaken by a qualified archaeologist during ground disturbing works in proximity to the Rixs Creek platform.

4) The full extent of the rail siding associated with the Rixs Creek Coke Ovens would be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work would be undertaken by a qualified archaeologist.

5) The full extent of the original rail alignment corridor of the Main North Line would be plotted with GPS coordinates and photographs taken to document its full extent. This work would be undertaken by a qualified archaeologist.

6) The research methodology document attached to **Appendix F** should be used to guide the recommended salvage, monitoring and archival recording works.

7) In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc.), building foundations and earthworks of unknown origin (i.e. not associated with BMC operations). The procedures are:

    - All work in the area is to cease immediately;
    - Alert the Environmental Specialist to the find;
    - If necessary, protect the area with fencing;
    - Engage a suitably qualified archaeologist to undertake an assessment of the find/s;

- The assessment should be undertaken using the guidelines Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch, 2009);
- On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch for a Section 140 excavation permit or exception;
- Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and
- Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area.

8) Should human remains be found during construction or operation the following procedure should be followed.

   The procedures take into account the following documents:

   - *Burials - Exhumation of Human Remains* NSW Health Policy Directive PD2008_022 (NSW Health, 2008) available at : http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf
   - *Manual for the Identification of Aboriginal Remains* (NSW Department of Environment & Conservation, 2006);
   - *Skeletal Remains – Guidelines for the management of human skeletal remains under the Heritage Act 1977* (NSW Heritage Office, 1998a); and
   - *The Aboriginal Cultural Heritage Standards and Guidelines Kit* (NSW National Parks and Wildlife Service, 1997).

In the event that operations reveal possible human skeletal material (remains), the procedures to be followed are detailed in **Appendix F**.

6.6 Traffic and Transport

As part of the planning for the Nundah Bank Third Track Project (NBTTP), a Traffic Impact Assessment (TIA) was prepared by Parsons Brinkerhoff (February, 2011). The NBTTP utilised Rixs Creek Lane as one of two access points to the rail corridor to undertake the proposed upgrade works. Where applicable the NBTTP TIA has been referenced in this Section to assess potential impacts from the proposed project.

6.6.1 Existing Conditions

Existing Mine Traffic

Current traffic generation from ongoing mining activities is primarily light vehicle movements from employees entering and leaving the site at the start and end of shifts. Approximately 75 employees are onsite at any one time. All Mine traffic accesses the Mine via Rixs Creek Lane.

No coal is transported from the mine by truck. Oversized loads may occasionally be required to deliver or remove plant from the site. Loads requiring separate RMS notification or permits are moved by licensed haulage contractors after obtaining any necessary permits. Movement of oversized loads is undertaken at times which reduce impacts on the operation of the surrounding road network.

Regional and Local Road Network

All site access for construction and operations will be via the existing mine access on Rixs Creek Lane which is a 6 – 8m wide sealed road with no line-making and a posted speed limit of 60km/hr. Rixs Creek Lane is a no through road which provides access to the Mine and several rural properties, all but one of which are owned by the Mine.

Rixs Creek Road connects to the New England Highway, a National Highway. The Rixs Creek Lane intersection (the Intersection) with the New England Highway is located approximately 4 km north of Singleton and currently manages all mine traffic including any oversize loads required by the mine. The New England Highway is the primary route of heavy vehicle and oversized traffic accessing the Hunter Valley coalfields from the east.

Traffic levels on the New England Highway vary throughout the day with morning and afternoon peak hours occurring during changes of shifts at surrounding mines in addition to standard morning and afternoon peak loadings.

The existing New England Highway – Rixs Creek Lane intersection is a CHR type intersection with:

- 40m left turn in slip lane;
- 100m right turn in slip lane; and
- 200m left turn out acceleration lane.

Right-turn out movements from Rixs Creek Lane to the New England Highway are also permitted. Drivers leaving Rixs Creek Lane at the intersection with the New England Highway have adequate visibility in either direction for several hundred metres to make a safe turn.

Road Network Performance

Traffic counts undertaken as part of the NBTTP identified peak traffic movements at the intersection of Rix's Creek Lane and the New England Highway as shown in **Table 24**. These traffic movements include existing mine traffic which is the major source of traffic on Rixs Creek Lane.

Table 24 Rixs Creek Road Peak Traffic Movements

Rix's Creek Road AM and PM peak traffic movements*			
Road	**Movement**	**AM (6:30 – 7:30 peak)**	**PM (17:30 – 18:30 peak)**
New England Highway	Left in (eastbound)	20	11
	Right in(west bound)	105	50
Rixs Creek Lane	Right out	60	10
	Left out	10	70

**NBTTP EIS (PB, 2011).*

Performances of road networks are largely governed by the capacity of their intersections to accommodate traffic demand. Acceptable intersection performance is defined as follows:

- Level of Service (LoS) D or better, refer **Table 25**;
- Degree of Saturation (DoS) less than or equal to 0.8 at priority controlled intersection, and 0.95 at signal controlled intersection; and
- 95th percentile back of queue does not interfere with other traffic movements.

Table 25 Intersection Levels of Service*

Level of Service (LoS)	Average Delay per vehicle (secs/veh)	Give way or Stop Sign intersections
A	<14	Good Operation
B	15 to 28	Acceptable delays
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to 70	At capacity
F	70 +	Over Capacity

**Adopted from Table 4.2 of RMS's Guide to Traffic generating Developments.*

The performance of the Intersections was modelled in the software package SIDRA by Parsons Brinkerhoff (2011) as part of the NBTTP. The analysis was based on the 2010 traffic volumes and scaled up for 2012 conditions based on historical traffic growth. The results are shown in **Table 26**.

Table 26 Rixs Creek Road – Existing New England Highway intersection summary results (PB, 2011)*

Peak hour	Degree of Saturation (DoS)	Delays (seconds)	LoS	Queue (m)
AM	0.54	24	B	3
PM	0.32	19	B	1

**Nundah Third Track EIS (PB, 2011)*

Further analysis was undertaken by PB (2011) to identify the LoS for all traffic movements at the Intersection during peak periods under 2012 conditions. The results of this analysis are shown in **Table 27**.

Table 27 Rixs Creek Road – Existing New England Highway movement summary results*

Peak hour	Approach	Movement	DoS	Delays (s)	LoS	Queue (m)
AM 6:30 – 7:30	South	Through	0.55	0	A	0
		Right	0.07	23	A	3
	East	Left	0.01	8	A	0
		Right	0.01	24	B	1
	North	Left	0.00	10	A	1
		Through	0.23	0	A	0
PM 5:30 – 6:30	South	Through	0.26	0	A	0
		Right	0.02	19	C	1
	East	Left	0.01	8	A	0
		Right	0.00	17	B	1
	North	Left	0.01	12	A	1
		Through	0.32	0	A	0

**Nundah Third Track EIS (PB, 2011)*

Analysis of the existing traffic conditions concludes that NEH/ Rixs Creek Lane intersection is operating satisfactorily, with LoS B or better during both the morning and afternoon peak hours. The intersection has sufficient capacity and acceptable delays under the existing conditions.

Notably all traffic survey information collected by PB (2011) includes traffic generated by the Mine. As there are no other major traffic generators on Rixs Creek Lane, there is no through traffic and there have been no major changes to Mine operations since the collection of this data, any changes in intersection performance would only be negligible.

Existing Rail Movements

There are currently no rail facilities within the Rix's Creek mine. As detailed in **Section 1.3** Rix's Creek mine currently utilises the rail loop on the neighbouring Integra Mine.

6.6.2 Predicted Impacts

The TIA prepared by Parsons Brinkerhoff (2011) examined the effects of construction traffic for the NTTBP on the intersection. The expected traffic generation of the NTTBP and that predicted as part of the proposed project is shown in **Table 28**.

Table 28 NTTBP v Proposed Project traffic generation*

Project Construction Traffic – Rixs Creek Lane	Volumes per day (vehicles)[1]	
	Average	Peak
Nundah Bank Third Track [2]	20	30
Rix's Creek Rail Loop (the proposed project)*	42	58
Difference	**+22**	**+28**

**assuming a car occupancy rate of 1.2. 1. Construction traffic comprising 50-70 workers 2 Source: PB (2011)*

Intersection Performance

The anticipated intersection LoS performance resulting from construction traffic generated by the NBTT project is shown in **Table 29**.

Table 29 Rixs Creek Road – New England Highway construction scenario intersection summary results (PB, 2011)*

Peak hour	Degree of Saturation (DoS)	Delays (s)	Level of Service (LoS)	Queue (m)
AM	0.56	238	F	4
PM	0.32	21	B	1

Intersection performance is further broken down into LoS for each movement at the intersection in **Table 30**.

Table 30 Rixs Creek Road - New England Highway movement summary results(PB, 2011)

Peak hour	Approach	Movement	DoS	Delays (s)	LoS	Queue (m)
AM 6:30 – 7:30	South	Through	0.56	0	A	0
		Right	0.10	21	B	4
	East	Left	0.01	8	A	0
		Right	0.07	238	**F**	3
	North	Left	0.01	10	A	1
		Through	0.25	0	A	0
PM 5:30 – 6:30	South	Through	0.27	0	A	0
		Right	0.03	23	B	1
	East	Left	0.01	8	A	0
		Right	0.03	18	B	1
	North	Left	0.01	12	A	1
		Through	0.32	0	A	0

Whilst **Table 29** indicates that NBTTP levels of construction traffic would result in an LoS of F during the morning peak, **Table 30** clarifies that this LoS would only be experienced by right-out movements from Rixs Creek Lane for traffic approaching from the east. All other movements during both AM and PM peaks would continue to operate at LoS of A or B indicating that they operate satisfactorily and with spare capacity. All traffic movement outside the Am and PM peaks would operate during construction with spare capacity. It is considered that would be limited for the following reasons:

- Access is provided to three rural properties owned by the mine. Residents would generally use left-out movements during the AM peak to access Singleton and therefore not be impacted;
- There are no other dwellings or businesses that can be accessed via Rixs Creek Lane therefore the only traffic to be impacted would be construction traffic;

- A mere 42 vehicles would be accessing the site for construction; and
- Impacts would only occur during the construction period, reverting to background levels once construction is finalised.

As described in **Table 28** the proposed project would result in approximately 28 additional peak movements than was modelled for the NTTBP. As any morning peak traffic generated by construction would be travelling into Rixs Creek Lane, it would not be effected by, or impact upon, right-out movements from Rixs Creek Lane. Left and right in movements which are currently operating at LoS A and B would indicate there is capacity to accept this additional load.

Despite these findings, any of the three residents wishing to turn right out of Rixs Creek Lane during the morning peak may experience a LoS of F and therefore extended delays. Whilst delays through this movement are largely a result of existing traffic levels on the NEH during the morning peak, recommendations have been made in **Section 6.6.3** to ensure construction traffic does not exacerbate delays.

Predicted Rail Traffic

The proposed rail loop will not lead to a net increase in rail traffic utilising the Main Northern Line between Singleton and the Port of Newcastle. Rather the operation of the proposed rail loop will see rail traffic that was previously transferring coal for Rix's Creek mine form the Integra loop, through the proposed loop.

Rail traffic utilising the loop will be able to make use of similar space within the rail corridor for the transportation of coal, as is currently used. Signalling designs for the connection of the rail loop to the Main Northern Line will be constructed and operated in accordance with ARTC operating requirements.

6.6.3 Mitigation Measures and Conclusion

In order to manage and mitigate potential traffic impacts, a Traffic Management Plan would be prepared. This plan would include as a minimum:

- Maps and plans showing traffic routes, light and heavy vehicle parking, laydown areas, no standing areas and construction site gates;
- Management of traffic flows along Rixs Creek Lane as required (for example during peak construction times, large loads etc.);
- Road Safety Aspects – any project specific signage and controls;
- Community consultation details, including notification processes for residents of any disruptions to Rixs Creek Lane and notification of construction start times;
- Details of emergency accesses;
- Requirement for heavy / large loads to be transported to site outside of peak times and if necessary outside standard hours. Requirement for coordination of heavy loads from Mine activities and construction activities to prevent multiple heavy loads simultaneously;
- All activities, including the delivery of materials would not impede traffic flows along roads and Highways or property accesses; and
- Provision for dilapidation inspections of Rixs Creek Lane to check construction traffic does not adversely affect the wearing surface. Any defects caused by construction traffic would be rectified as soon as practically possible after being identified.

In addition the Traffic Management Plan would make provisions for investigation working hour adjustments outside the AM and PM peak times should they be required. Site clock on and off times may also be adjusted to stagger shift time with the Mine to prevent any cumulative traffic impacts.

6.7 Visual

6.7.1 Existing Conditions

Currently product coal from the Rix's Creek CHPP is transported across the mine site by trucks to a rail loading facility 1.8 kilometres away. The facility uses a rail loop owned by Integra on the eastern side of the Main Northern Rail Line.

The mining technique is a multi-seam bench system which mines up to nine seams and splits. The mine uses a suite of Caterpillar and Hitachi equipment for overburden removal and coal movement. Run-of-Mine coal is processed by the CHPP.

6.7.2 Predicted Impacts

The proposal is to replace the current stockpile and rail loading facility. The proposal will replace the existing truck and road system with a conveyor to a new stockpile location. A tripper conveyor system will be used to stockpile the coal to a nominal 350,000 tonne capacity.

A reclaim tunnel below the stockpile will be used with conveyors to transport the coal from the stockpile to the nominal 2000 tonne train loading bin.

The proposal also consists of the construction of approximately 5.6 kilometres of rail line including a balloon loop within the Rix's Creek's Colliery Holding.

The rail line, conveyor, stockpiling facility and bin are all at reduced elevations compared to the existing rail loading facility and are located in a basin protected by prominent ridge lines.

The new development is to be lit at night using a series of floodlights along the sides of the stacker that will be shielded to ensure they are not seen from neighbouring residences.

Geo-Spectrum (Australia) Pty Limited was engaged to fly 1:10,000 scale (12cm ground sampling distance) digital colour aerial photography on 4 January 2012 of an area outlined by Rix's Creek Pty Limited as their area of interest for a visual amenity study. This aerial photography, controlled by airborne GPS and pre-targeted ground control was set up photogrammetrically to establish a seamless co-ordinated image of an area encompassing the proposed loading facility and the receivers at Wattle Ponds. This information was used to produce a three dimensional digital terrain model of the existing environment to an accuracy of 0.15m horizontally and vertically.

For all calculations the assumption was applied that all stands of trees would be ignored in the "line of sight" measurements, so a worst possible case would be considered. However all standing trees outside of work areas would be retained.

It was established that the highest viewpoint within the visual catchment of the Mine, is a dwelling at 21 Lester Close, Wattle Ponds. Refer **Figure 8** and **Figure 9**. This residence is a two storey dwelling with balconies at the second floor level. The closest balcony to the proposed site was chosen as an indicative viewpoint at 2m above the balcony floor to simulate a six foot person standing on the balcony looking towards the proposed site. Numerous other sites were tested by Geo-Spectrum and proven to have a reduced perspective over the proposed development area. Refer **Appendix L**.

The visual modelling and assessment found that there would be a negligible impact on the modelled receptor as a result of the proposal. As the modelled receptor is taken to be the worst case receptor for the proposal, impacts to other receptors within the visual catchment can also be interpreted to be negligible.

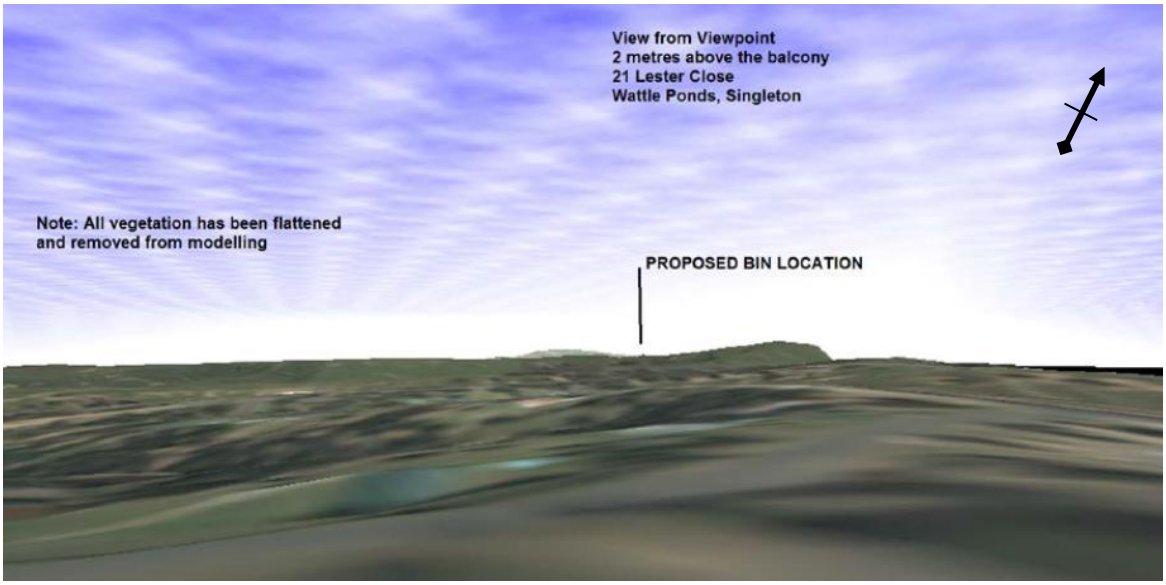


Figure 8 Modelled visual receptor in relation to the proposed rail loop and loading infrastructure

In addition to the modelled receiver, Appendix 1 of in the Visual Impact Assessment in **Appendix L** also considered views from other locations towards the project site. These locations are:

- The corner of Bridgem and Retreat Roads, Wattle Ponds; and
- McMahon Way, Singleton Heights.

Distance and topography modelling indicated the proposal wouldn't be visible from these locations, therefore no further assessment was undertaken. As these two sites represent the closest residential areas to the project site, and with other residential areas of Singleton generally being of lower topography, visual impacts on receptors would be negligible.

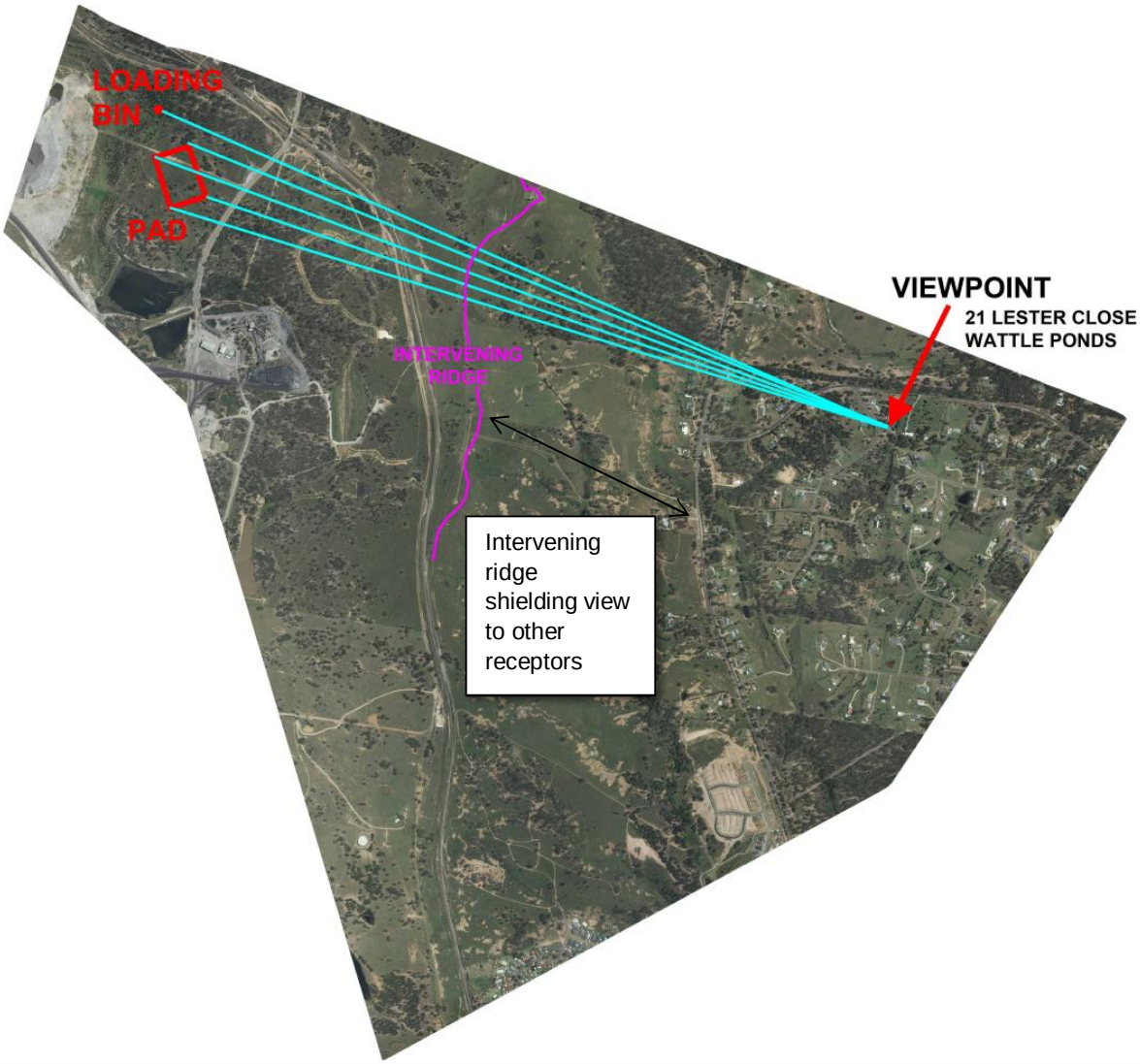


Figure 9 Modelled view corridor from receptor to facility (Note PAD = the Stockpile footprint)

6.7.3 Mitigation Measures and Conclusion

Three dimensional (3D) viewshed modelling indicated that there would be negligible visibility from the modelled viewpoint. Modelling did not take into account further mitigation in the form of vegetation between the proposed development site and receptors. Furthermore an earthen bund will be constructed (refer **Figure 3**), using excess material from the NBTTP, in between the modelled receptor and the proposed rail loading facilities to further reduce any impacts. This visual bund would also have the benefit of obstructing views from future dwellings which may be constructed within the area.

Disturbed areas would be vegetated in accordance with planned mine rehabilitation plans to replace vegetation cover following construction where feasible.

Visual impacts as a result of the proposal would be negligible owing to undulating topography notably a ridgeline, and stands of vegetation.

6.8 Land Resources and Soils

6.8.1 Existing Conditions

Soils within NSW are categorised under the Rural Land Capability Classes scheme developed by the former NSW Soil Conservation Service (now the Office of Environment and Heritage) as shown in **Table 31**. Under this scheme, land is categorised into eight separate classes depending on biophysical factors and their potential impact on land uses. Land in the lower classes tend to be the most suited to a wide range of potential agricultural uses, whereas land in the higher classes tend to be increasingly limited by soil erosion and a decreasing versatility of agricultural uses. Existing land uses with the proposed rail loop are shown in **Figure 10**.

Table 31 Rural Land Capability Classes

Class	Land use	Management options
I	Mainly cropping	Wide variety of uses - vegetables and fruit production, grain crops, energy crops and fodders, sugar cane. No special soil conservation works or practices necessary.
II	Mainly cropping	Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation.
III	Mainly cropping	Structural soil conservation works such as graded banks and waterways are necessary, together with soil conservation practices as in Class II.
IV	Mainly grazing	Occasional cultivation, better grazing land. Soil conservation practices such as pasture improvement, stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture, maintenance of good ground cover.
V	Mainly grazing	Similar to Class IV, structural soil conservation works such as diversion banks and contour ripping, together with the practices in Class IV, like the maintenance of good ground cover.
VI	Grazing	Not capable of cultivation, less productive grazing, can have saline areas. Soil conservation practices including limitation of stock, broadcasting of seed and fertiliser, promotion of native pasture regeneration, prevention of fire and destruction of vermin. This may require some structural works and maintenance of good ground cover.
VII	Tree cover	Land best protected by trees. Very important habitat areas for protecting biodiversity. Timber production or honey is possible.
VIII	Unsuitable for agriculture	Cliffs, lakes or swamps or other lands where it is impractical to grow agricultural produce or timber.

**NSW Agriculture, 2002. AGFACTS: Agricultural Land Classification. Available at: http://www.dpi.nsw.gov.au/__data/assets/pdf_file /0004/189697/ag-land-classification.pdf. Accessed on 22 September 2011.*

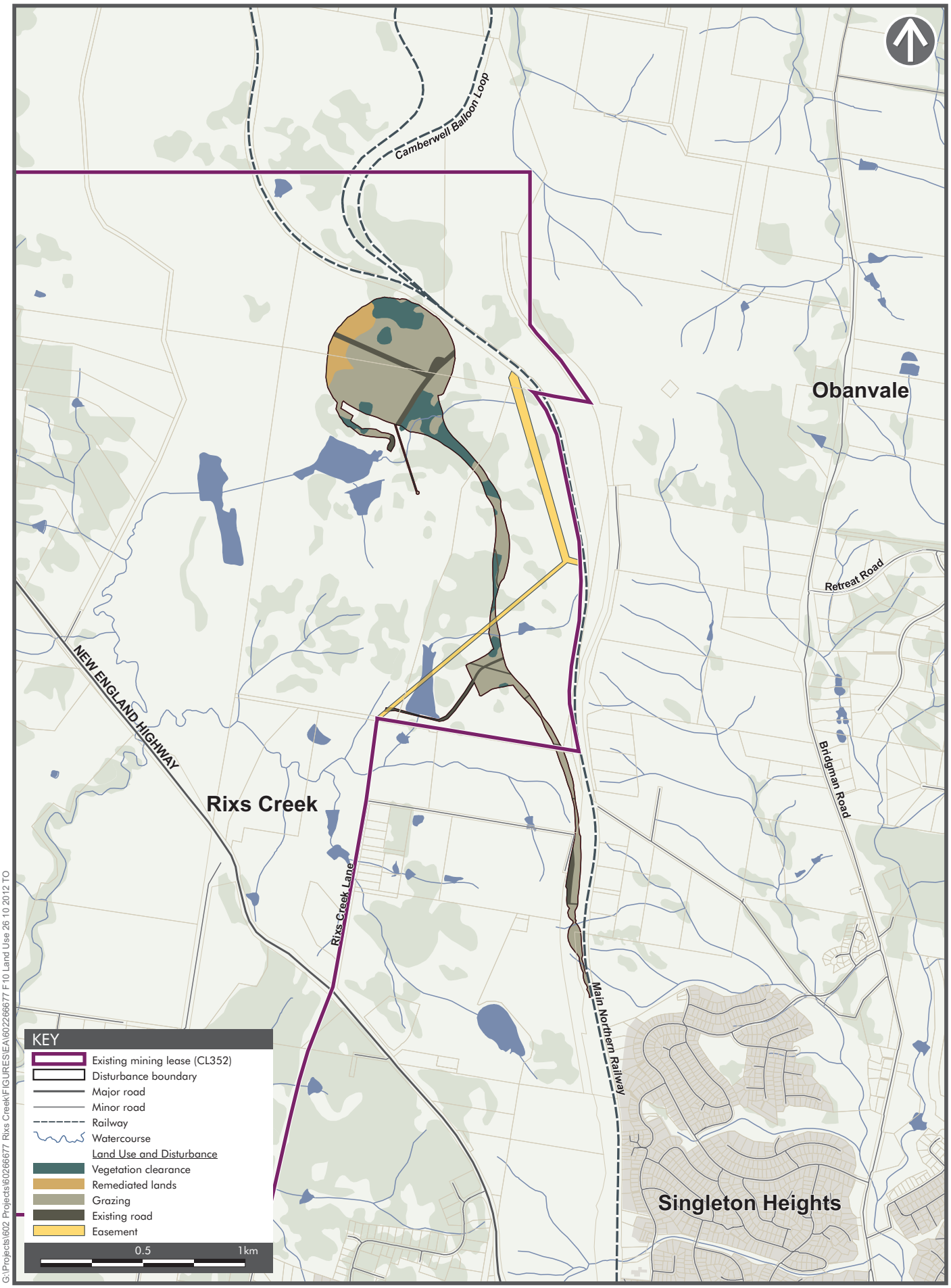
#DPI: Tocal College. Land Capability Classes. Available at: http://www.tocal.nsw.edu.au/farms/Tocals-e-farm/landscapes/land-capability-classes. Accessed on 22 September 2011.

The mine area and the wider regional are also identified in the Upper Hunter Strategic Land Use Plan (DP&I, 2012). Under the plan the mine area is described as:

- An existing mine area;
- An area of high Coal Seam Gas potential;
- Not identified as an area of biophysically Strategic Agricultural Land (SAL) for either;
    - Viticulture; or
    - Equine industry.

The Project would therefore not impact on any areas of strategic agricultural values.

The soils of the area are described as Grey Kurosols with sandy loan surface layers and sandy loam sublayers. These soils have weak pedality, high erosion potential and are often sodic or dispersive. When dry these soils are typically hardsetting and water repellent (NSW Resource Atlas, 2012). Some erosion is evident around exposed and disturbed areas.



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LAND USE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 10

Based on the site soil characteristics, topography and historical agricultural pursuits, the subject site can be classed predominantly as a Class V capability type. Within the Singleton Shire higher Classes of land may be found on the Hunter River Flood Plain where more intensive agricultural land uses occur.

6.8.2 Predicted Impacts

The following actions would result in the movement and exposure of soil and subsequently increase the potential for erosion and mobilisation of soil by wind and water action:

- Earthworks;
- Access track construction;
- Stockpile and storage area creation;
- Vegetation clearance for the new track alignment;
- Culvert works;
- Top drain construction; and
- Removal, stockpiling and installation of general fill material from within the rail corridor as required.

The earthworks represent the greatest possible impacts on the proposed Site. Excavation works would be required to achieve the correct levels through the rail loop alignment and loading infrastructure area. Similarly areas will need to be built up where they are currently lower than the level required for the rail loop. Both these areas will result in exposed soils.

Soil mobilisation by wind or water may increase turbidity and suspended sediment loads, and otherwise reduce water quality of surrounding water bodies and drainage lines. Sediment-laden water also has the ability to block stormwater drainage structures and result in localised flooding, although given the topography, this would be unlikely. With potentially highly erosive soils the proposed works could exasperate erosive processes.

6.8.3 Mitigation Measures and Conclusion

Prior to construction, Rix's Creek (or the contractor chosen to undertake the works) would develop and implement an Erosion and Sediment Control Plan to manage site risks and mitigate potential impacts. This would form part of the CEMP and would be developed in accordance with Managing Urban Stormwater: Soils and Construction (Landcom 2004) and according to 'Blue Book' standards.

Aside from the design and location of the compound and storage area, measures proposed to mitigate potential impacts on soils during construction are detailed below. By implementing these mitigation measures sedimentation and erosion impacts including on local drainage lines will be minimised.

- Should work areas remain inactive for periods of greater than two weeks, temporary stabilisation measures would be applied such as soil stabilisers or covering with a geo-fabric cover such as jute mesh;
- Site access would be stabilised to reduce the likelihood of vehicles tracking soil onto public roads and to ensure all-weather access and egress. The use of rumble grids or similar would be considered, at all points of egress;
- Areas subject to earthworks and construction disturbance would be revegetated with an appropriate native grass, shrub and tree mix as soon as practically possible following achieving of final levels;
- Exposed residual soils and non-working stockpiles would be covered with a suitable material (such as topsoil or an appropriate mulch mix and treated with a hydroseeding application) to minimise erosion potential; and
- The area to be disturbed by construction activities would be minimised as far as possible and appropriate erosion and sediment control measures would be constructed as soon as practicable following clearance, e.g. use of water carts to supress dust.

Prior to construction, Rix's Creek (or the contractor chosen to undertake the works) would develop and implement an Erosion and Sediment Control Plan (ESCP) to manage site risks and mitigate potential impacts. This would form part of the CEMP and would be developed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and according to 'Blue Book' standards.

6.9 Soils and Water

6.9.1 Existing Conditions

The existing Main Northern Rail Line runs in a north-south manner along the edge of a low ridgeline. To the east of the ridgeline water flows south through a number of unnamed first and second order streams before entering the Hunter River close to Singleton.

Water flowing to the west of this ridgeline enters the Rixs Creek catchment. The proposed rail loop and associated infrastructure site lie on the western side of the ridgeline in the Rixs Creek catchment. The proposal footprint bisects a number of first order streams which are primarily ephemeral and lack any permanent water. The majority of the water leaving the catchment is first collected by a number of farm and mine dams within the confines of the mine boundary.

Due to the compacted nature of the soil across the site, runoff can drain quickly during rain events, leading to flow in the otherwise ephemeral streams. Due to the hard nature of the ground and the presence of near surface and exposed rock in a number of locations, permeation into groundwater is reduced.

Due to the topography of the site and the elevated ridgeling through which most of the rail corridor traverses, groundwater is generally at depths beyond proposed project excavation depths.

6.9.2 Predicted Impacts

Earthworks required during construction may lead to exposed soils with the potential for an increase in sedimentation of drainage lines throughout the subject site. The sedimentation can lead to increased stream flow rates which can lead to further in-stream erosion. Erosion and sedimentation activities may ultimately lead to a reduction in downstream water quality if not appropriately managed.

Once operational the increase in less permeable surfaces such as all-weather access tracks and railway ballast areas may lead to an increase in runoff. Increased runoff may lead to higher flow rates in drainage lines during large enough storm events which can in turn lead to further erosion. Collection and use on site will mitigate minor increases in runoff as a result of increased impermeable surfaces.

Due to the location of the proposed works relative to topography, and deeper ground water levels, impacts to groundwater are expected to be negligible.

6.9.3 Mitigation Measures and Conclusion

During construction works compounds, storage and stockpile areas would be located at least 40 m from drainage areas to minimise any impacts of erosion and sedimentation on the surrounding drainage lines:

- Specific mitigation measures identified during the detailed geotechnical investigation (to be undertaken as part of the detailed design) would be taken into account in finalising the design of the stormwater and erosion management structures;
- Prior to construction commencing, an Erosion and Sediment Control Plan would be prepared for inclusion in the CEMP for the proposed works. This would include emergency procedures for high rainfall events that could exacerbate soil erosion during construction. All controls would be in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and 'Blue Book' standards;
- Prior to construction, the contractor would be required to install appropriate erosion and sedimentation control measures such as sediment fences and straw bales along the down slope edges of working areas to limit sediment laden stormwater runoff from entering creeks;
- The Site Supervisor would ensure that erosion and sediment control measures are checked and maintained each day;
- Measures would include construction methodologies that limit disturbances to the water filled depression and drainage areas which reduce the amount of sediment transported downstream. The CEMP would also include measures for the prevention of work creep into these areas. This would be controlled by the erection of temporary fencing or markers (wooden pole with coloured top) along the boundary of the work areas; and
- During operation runoff from impermeable areas would be directed into the mine water management system of capture ponds and dams and be managed in accordance with the site Water Management Plan.

6.10 Waste Management

6.10.1 Existing Conditions

Activities associated with the construction phase of the proposed works have the potential to generate waste materials. Waste streams and types likely to be generated include:

- Excavated material (spoil and rock) unsuitable and/or not required for backfilling and restoration;
- Construction and process waste – surplus materials from construction of the new rail loop and general site works. Materials would likely comprise concrete, gravels, sands, sand bags, fencing and barricades;
- General waste – domestic refuse (litter) generated by onsite personnel and construction workers;
- Green waste – vegetation and other such organic materials from clearance when grubbing;
- Human waste – mobile site toilets (sewage); and
- Maintenance waste – waste generated from site plant and vehicle maintenance e.g. oil and wash down wastewater.

Operational wastes would be minimal and would primarily be produced by future maintenance activities.

6.10.2 Predicted Impacts

The nature and volume of waste generated during the construction and operation of the proposed works has the potential to impact on the local environment if not managed appropriately. Inappropriately managed waste may have potential adverse impacts on the following:

- Visual amenity and aesthetic quality of the site;
- Water quality of local drainage lines and watercourses; and
- Potential to attract pest and vermin to the site.

Through the implementation of the measures listed in **Section 6.10.3**, wastes produced as a result of both the construction and operational phases of the proposal would have negligible environmental impacts.

6.10.3 Mitigation Measures and Conclusion

Each of the waste streams would be managed throughout the duration of the proposed works to satisfy three main aims:

- Appropriate disposal of chemical, fuel and lubricant containers, solid and liquid wastes (e.g. waste water from staff facilities) that conforms to requirements of the OEH;
- Undertake resource recovery and recycling (through the implementation of the waste hierarchy and waste stream separation) wherever possible; and
- Continual update and improvement of waste management throughout the development of the proposed works.

The following control measures would be put in place to minimise waste:

- All waste would be classified in accordance with the *Waste Classification Guidelines* (DECC, 2008);
- The handling, storage and transport of hazardous materials (if any) and waste would be in accordance with the National Code of Practice and the relevant Material Safety Data Sheet (MSDS) for the product;
- Various components of each of the waste streams would be kept separate, where possible;
- All general inert and solid waste generated would be stored in waste containers located at designated points, isolated from surface water drains;
- At regular intervals, waste to be disposed of off-site would be brought to a waste facility that is licensed under the POEO Act to receive waste of that type; and
- Compilation of a waste data form for recording waste movement including; solid and inert waste materials, provision of a description of the waste types, physical nature of wastes, proposed treatment, dates of movement, transporters and waste destination details.

Waste management strategies developed for the project would be managed in accordance with the *Waste Avoidance and Resource Recovery Act 2001* and by adopting the Resource Management Hierarchy principals (in order of priority) of avoidance, resource recovery and disposal. These principles would be embodied in a Resource and Waste Management section in the CEMP.

The Resource and Waste Management section would cover the following:

- Quantity and classification of waste materials;
- Disposal or reuse strategies for each type of material;
- Details of how waste would be stored on site;
- Identification of all non-recyclable waste;
- Identification of strategies to avoid, reduce, reuse and recycle (The Waste Hierarchy); and
- Procedures and disposal arrangements for unsuitable excavated material.

6.11 Other Factors and Considerations

In addition to the environmental aspects already identified in **Section 6.0**, the DGRs also identified the need for an assessment of impacts on relation to social and economic factors and rehabilitation.

Social and economic

The project has a capital investment value of approximately $57million. During construction a number of construction employment positions would be generated over a period of 11 months.

During operation, employment opportunities will be maintained through the ongoing operation of the rail loop and coal loading facility which will facilitate and support ongoing mining operations. In addition contractors will be required for the continual upkeep and maintenance of the infrastructure.

The construction of the rail loop and loading facility will provide greater security for the Mine. This provides existing mine employees with added employment security and supports ongoing economic benefits both regionally through spending (direct and indirect), and at a State level through continued royalties. The proposal would also support increased investment in the mine by its owners given that they have secured ongoing access to end markets.

Rehabilitation

The proposed construction works would primarily be confined to the rail loop corridor with the majority of the loading infrastructure to be contained within the rail loop. Areas disturbed during construction would be rehabilitated in accordance with the recommendations of this EA to minimise sedimentation and erosion and encourage regrowth of native plant cover where it will not impede on the functioning of the rail loop.

Ongoing and planned mine rehabilitation programs already programed as part of the Mine Operation Plan (MOP) will not be impacted by the proposal, rather they will be complementary. Where applicable the requirements of the MOP would be extended to those areas adjacent to the rail loop and loading infrastructure. Upon closure of the Mine and removal of the rail loop rehabilitation would be undertaken in accordance with an approved Mine Closure Plan. This closure plan will provide specific details of rehabilitation proposed for the development footprint.

7.0 Residual Risk Analysis

The Environmental Risk Analysis for the Proposed Project is based on a process adapted from *Australian Standard AS 4369:1999 Risk Management*. The process is qualitative and is based on the Residual Risk Matrix shown in **Table 34**.

Residual Environmental Risk is assessed on the basis of the significance of environmental effects of the Proposed Project and the ability to confidently manage those effects to minimise the risk of harm to the environment.

The significance of environmental effects of given a numerical value between one and five, based on:

- The receiving environment (its sensitivity and values).
- The level of understanding of the type and extent of impacts.
- Likely community response to the environmental consequences of the Project.

The manageability of environmental effects is similarly given a numerical value between one and five based on the complexity of mitigation measures, the known level of performance on the safeguards proposed, and the opportunity for adaptive management. The numerical value allocated for each issue is based upon the following prescription.

Table 32 Significance of Effects

No	Significance	Receiving Environment
5	Extreme	Undisturbed receiving environment, type or extent of impacts unknown, substantial community concern.
4	High	Sensitive receiving environment, type or extent of impacts not well understood; high level of community concern.
3	Moderate	Resilient receiving environment, type and extent of impacts understood; community interest.
2	Minor	Disturbed receiving environment; type and extent of impacts well understood; some local community interest.
1	Low	Degraded receiving environment; type and extent of impacts fully understood; uncontroversial project.

Table 33 Manageability of Effects

No	Significance	Mitigation Measures
5	Complex	Complicated array of mitigation measures required; safeguards or technology are unproven; adaptive management inappropriate.
4	Substantial	Significant mix of mitigation measures required; past performance of safeguards is understood; adaptive management feasible.
3	Straightforward	Straightforward range of mitigation measures required; past performance of safeguards is understood; adaptive management easily applied.
2	Standard	Simple suite of mitigation measures required; substantial track record of effectiveness of safeguards; adaptive management unlikely to be required.
1	Minimal	Little or no mitigation measures required; safeguards are standard practice; adaptive management not required.

The chosen numbers are added together to provide a result which provides a ranking of potential residual effects of the Project when the safeguards identified in this EA are implemented.

Table 34 Residual Risk Matrix

Significance of Effects	Manageability of Effects				
	5 Complex	**4 Substantial**	**3 Straightforward**	**2 Standard**	**1 Minimal**
1 Low	6 Medium	5 Low/Medium	4 Low/Medium	**3 Low**	**2 Low**
2 Minor	7 High/Medium	6 Medium	5 Low/Medium	4 Low/Medium	**3 Low**
3 Moderate	8 High/Medium	7 High/Medium	6 Medium	5 Low/Medium	4 Low/Medium
4 High	**9 High**	8 High/Medium	7 High/Medium	6 Medium	5 Low/Medium
5 Extreme	**10 High**	**9 High**	8 High/Medium	7 High/Medium	6 Medium

7.1 Analysis

The analysis of residual environmental risk for issues related to the Proposed Project is shown in **Table 35**. This analysis indicates the environmental risk profile for the Proposed Project based on the assessment of environmental effects, the identification of safeguards, and the Statement of Commitments shown in this EA.

Table 35 Risk Profile – Proposed Modification

Issue	Significance	Manageability	Residual Risk*
Air Quality	2	2	4 Low/Medium
GHG Emissions	1	1	2 Low
Soil and Water	1	2	3 Low
Noise	3	2	5 Low/Medium
Hazard and Risk	2	1	3 Low
Waste Management	1	1	2 Low
Social and Economic Effects	1	1	2 Low
Traffic and Transport	1	2	3 Low
Visual	1	1	2 Low
Heritage	3	2	5 Low/Medium
Landuse	1	1	2 Low
Fauna and Flora	2	1	3 Low
Rehabilitation	2	1	3 Low

It should be noted that while **Table 7 recorded items as Very Low, a ranking of 2/Low is the lowest possible ranking in **Table 34**.*

7.2 Conclusion

The residual risk analysis indicates that with the recommendations and safeguards recommended by this EA implemented, the proposed Rail Loop and loading facility would result in predominantly low to low/medium risk in relation to the identified environmental issues.

8.0 Statement of Commitments

In accordance with the generic Director-General's Requirements (**Appendix B**), the following draft Statement of Commitments (**Table 36**) states Rix's Creek environmental commitments and provides a summary of the environmental management measures to be undertaken for the project.

Rix's Creek commits to the preparation and implementation of the environmental management and mitigation measures detailed in the Statement of Commitments for the proposed project.

Table 36 Statement of Commitments

Issue	Commitments
Mitigation Measures	
Air Quality	- Access for vehicles will be limited to stabilised areas as far as practicable; - Establishment and enforce an appropriate onsite vehicle speed limit of 20 km/hr to be reviewed depending on meteorological conditions or safety requirements; - Cover vehicle loads transporting loose materials to site; - Implement dust minimisation measures on exposed stockpiles and unsealed construction areas as appropriate; - Regularly service vehicles and machinery. Operate plant in a proper and efficient manner; - During weather events where wind speeds exceed 10 m/s and where dust generation cannot be effectively minimised, dust generating works will cease until adequate controls can be implemented or until such weather conditions abate; - Limit clearing to the minimum required for safe construction; - Stabilise exposed areas as soon as reasonably practicable with seeding and planting; - Confine vehicles and activities to designated work areas to prevent any inadvertent encroachment or otherwise into exposed and stripped areas of ground; and - All emission controls used on vehicles and construction equipment will comply with standards listed in Schedule 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2010.*
Noise and Vibration	*Construction Noise Mitigation Measures* Construction noise impacts will be managed through the preparation of a Construction Environmental Management Plan (CEMP). The CEMP will include a noise complaint recording and managing protocol, and include the following mitigation measures: - Community consultation will be undertaken prior to any offsite construction (the rail spur); - Noise intensive construction works will be carried out during standard construction hours. If works are required outside of standard working hours approval will be sought from DP&I; - Appropriate plant will be selected for each task, minimising the noise impact; - Deliveries will be carried out during standard construction hours; - Non-tonal reversing alarms will be fitted on all construction equipment and mobile plant where possible; - No simultaneous operation of two or more noisy plant items will occur in close vicinity and adjacent to residential receptors; - Noisy equipment will be orientated away from residential receptors where possible; - Structures will be used to shield residential receptors from noise sources, where possible; - Construction trucks will travel via major roads and routes where possible and will not queue near residential dwellings; - Within the stockpile and storage area, the noisiest works, such as stockpiling, will take place at a location furthest away from the nearest sensitive receptor; - Other Interim Construction Noise Guidelines (ICNG 2009) mitigation measures that will be relevant to the construction works include: • Avoid dropping materials from a height; • Avoid metal-to-metal contact on equipment; • Ensure periods of respite are provided in the case of unavoidable maximum

<table>
<tr><th>Issue</th><th>Commitments</th></tr>
<tr><td colspan="2">Mitigation Measures</td></tr>
<tr><td></td><td>noise level events; and
• Regularly inspect and maintain equipment to ensure it is in good working order and check the condition of mufflers.
Operational Noise Mitigation Measures
- Operation of the rail loop should be avoided during evening and night time when temperature inversion and south-easterly winds occur;
- The last approximately 250m of the loop is in a cutting, which provides good topographical shielding to the east. This location will be used for trains to idle if required to wait for other trains to clear the track; and
- Operation of the stockpile dozer will be avoided during noise enhancing meteorological conditions (temperature inversion or north-westerly winds), or if necessary, limited to the western side of the stockpile area.</td></tr>
<tr><td>Ecology</td><td>Biodiversity Offset
Clearing of native vegetation will be offset in accordance with the areas identified in the following table:

Offset area vegetation:
<table>
<tr><th></th><th>Proposed Rail Loop Disturbance areas (ha)</th><th colspan="4">Vegetation communities within proposed Offset Area (ha)</th><th>Difference</th></tr>
<tr><th></th><th></th><th>Spotted Gum - Ironbark - Redgum Forest</th><th>Rough-barked Apple Grassy Woodland</th><th>Grey Box Forest</th><th>Total</th><th></th></tr>
<tr><td>Central Hunter Ironbark-Spotted Gum-Grey Box Forest EEC</td><td>8.45</td><td>6.72</td><td>0</td><td>0</td><td>6.72</td><td>-1.73</td></tr>
<tr><td>Central Hunter Grey Box-Ironbark Woodland EEC</td><td>2.25</td><td>0</td><td>0.63</td><td>0.44</td><td>1.07</td><td>-1.18</td></tr>
<tr><td>Sub Total</td><td>10.7</td><td>6.72</td><td>0.63</td><td>0.44</td><td>7.79</td><td></td></tr>
<tr><td>Derived Grassland</td><td>42.04</td><td>-</td><td>-</td><td>-</td><td>45.91</td><td>3.87</td></tr>
<tr><td>Total</td><td>52.74</td><td>-</td><td>-</td><td>-</td><td>53.7</td><td>0.96</td></tr>
</table>
Vegetation Clearing
The following measures will be put in place to minimise impacts from vegetation clearing:
- Clearing of vegetation will be minimised where possible; and
- Clear marking and delineation (i.e. signage and barrier fencing) will be placed between the works areas and any vegetation that is to be retained, prior to the commencement of construction.
Tree Protection
The following measures will be put in place to protect trees outside of the development area:
- A Tree Protection Zone will be established around trees to be retained close to the construction zone, including compound locations, with barriers; and
- The Tree Protection Zone will protect the lower branches of trees and be placed just outside the drip line.
Woodland Fauna
The following measures will be put in place to minimise impacts on woodland fauna species:
- Clearing of vegetation in the subject site will be carried out under the supervision of an appropriately experienced and licenced ecologist;</td></tr>
</table>

Issue	Commitments
Mitigation Measures	
	- Immediately prior to clearing, canopy trees will be visually inspected for the presence of fauna by a suitably qualified ecologist; - Felled trees will be left in-situ for at least 24hours to allow fauna species to relocate; - Hollow-bearing trees and mature trees will be retained where feasible; - Hollows that are removed will be recycled and supplemented with fauna nesting boxes secured to nearby mature trees at a replacement ratio of 2:1; and - New fencing along the rail corridor will be designed to not impede the movement of gliders, and barbed wire fencing will only be used where necessary. *Weed Management* The following measures will be put in place to manage weeds: - Weed control measures (e.g. herbicide spraying) will be undertaken prior to construction in areas where high densities or infestations of weeds occur. - Earth-working equipment will be cleaned of excess soil prior to arrival and prior to departure from work; - Sediment fences and sediment traps will be put in place during construction; - Soil excavated for earthworks will only be stockpiled in delineated and fully bunded work areas within the designated development footprint; - Disturbed areas will be kept to a minimum and revegetated as soon as practically possible; and - Weeds (including vegetation, fruit and seed) removed during vegetation clearing will be destroyed or disposed of by suitable means. *Protection of Waterways* The following measures will be put in place to minimise sediment mobilisation during construction on aquatic environments: - An Erosion and Sediment Control Plan will be prepared in accordance with the Blue Book (Department of Housing and Landcom, 2004) will be prepared as part of the CEMP; - Stormwater management structures will be located down slope of the proposed works; - During construction, potential chemical pollutants (e.g. fuels, oils, lubricants, paints, etc.) will be stored in appropriate containers in bunded areas within construction compounds; - Building materials will be placed within the site compound and turnout assembly area or within the rail corridor where necessary; and - All excavated soil and spoil will be stockpiled in the designated and fully bunded work stockpile area.

<table>
<tr><th>Issue</th><th>Commitments</th></tr>
<tr><td colspan="2">Mitigation Measures</td></tr>
<tr><td>Indigenous Heritage</td><td>
Undertake the following measures listed in the following table:
<table>
<tr><th>Management Measure</th><th>Site ID</th><th>Site Type</th></tr>
<tr><td rowspan="12">Surface Collection</td><td>SCO1 (AHIMS 37-6-2287)</td><td>Artefact Scatter</td></tr>
<tr><td>Rix’s Creek Rail Loop AS1</td><td>Artefact Scatter</td></tr>
<tr><td>Rix’s Creek Rail Loop AS2</td><td>Artefact Scatter</td></tr>
<tr><td>Rix’s Creek Rail Loop AS3</td><td>Artefact Scatter</td></tr>
<tr><td>Rix’s Creek Rail Loop IA1</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA2</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA3</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA4</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA5</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA6</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA7</td><td>Isolated Artefact</td></tr>
<tr><td>Rix’s Creek Rail Loop IA8</td><td>Isolated Artefact</td></tr>
<tr><td>Surface Collection and Test Excavation</td><td>Rix’s Creek Rail Loop AS4</td><td>Artefact Scatter</td></tr>
<tr><td>Test Excavation</td><td>N/A</td><td>Areas of Subsurface Sensitivity</td></tr>
</table>
- All staff, contractors and others involved in construction and maintenance related activities will be made aware of the statutory legislation protecting sites and places of significance. Section 86 of the *National Parks and Wildlife Act 1974* states that:
“*a person must not harm or desecrate an object that persons knows is an aboriginal object, or*
Harm or desecrate an aboriginal place.
It is an offence to knowingly destroy, deface or damage, or cause or permit the destruction or defacement of or damage to, an object or Aboriginal place without first obtaining the consent of the DECCW”.
- If any Aboriginal sites or relics are found during the construction phase of the development, all work will cease and the archaeologist, members of the Aboriginal community and the DECCW must be contacted.
- Decisions about the management of sites and potential archaeological deposits will be made in consultation with the appropriate local Aboriginal community.
</td></tr>
<tr><td>Non-Indigenous Heritage</td><td>
Directly Impacted Items
- Photographic archival recording will be undertaken for all four heritage items identified within the proposed rail loop disturbance footprint, given their age and historical significance.
- The platform site and cutting with abutment feature will be recorded through scaled drawings prior to the commencement of works. If it is possible to preserve the abutting wall and rail platform these features should be fenced during works for their protection.
- Recording and surface collection of historic artefacts will be carried out at the scatter site located in proximity to the rail platform and monitoring will take place during ground disturbing works in this area. All recordings will comply with *How to Prepare Archival Records of Heritage Items* (NSW Heritage Office, 1998b) and *Photographic Recording of Heritage Items using Film or Digital Capture* (NSW Heritage Office, 2006).
</td></tr>
</table>

Issue	Commitments
Mitigation Measures	
	Historical Heritage Management - The abutting wall and platform in the rail corridor will be preserved if possible. If they can be avoided from direct impacts they should be fenced during works for their protection. If it is not possible to preserve these features then no works should occur until they have been subject to full archival recording. - Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the cutting with abutting wall, the Rixs Creek platform, the artefact scatter site associated with the platform and the sandstone excavation area. This work should be undertaken by a qualified archaeologist. - Surface collection will be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek platform prior to construction works. GPS positions and photographs will be taken for each artefact prior to collection. Monitoring will be undertaken by a qualified archaeologist during ground disturbing works in proximity to the Rixs Creek platform. - The full extent of the rail siding associated with the Rixs Creek Coke Ovens should be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work should be undertaken by a qualified archaeologist. - The full extent of the original rail alignment corridor of the Main North Line should be plotted with GPS coordinates and photographs taken to document its full extent. This work should be undertaken by a qualified archaeologist. In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc.), building foundations and earthworks of unknown origin (i.e. not associated with BMC operations). The procedures are: - All work in the area is to cease immediately; - Alert the Environmental Specialist to the find; - If necessary, protect the area with fencing; - Undertaken the assessment using the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009); - On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch for a Section 140 excavation permit or exception; - Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and - Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area. Should human remains be found during construction or operation reference will be made to procedures in: - *Burials - Exhumation of Human Remains* NSW Health Policy Directive PD2008_022 (NSW Health, 2008) available at : http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf - *Manual for the Identification of Aboriginal Remains* (NSW Department of Environment & Conservation, 2006); - *Skeletal Remains – Guidelines for the management of human skeletal remains under the Heritage Act 1977* (NSW Heritage Office, 1998a); and - *The Aboriginal Cultural Heritage Standards and Guidelines Kit* (NSW National Parks and Wildlife Service, 1997).

Issue	Commitments
Mitigation Measures	
Traffic	A Traffic management Plan will be prepared addressing: - Traffic routes, light and heavy vehicle parking, laydown areas, no standing areas and construction site gates; - Management of traffic flows along Rixs Creek Lane with the use of a lollipop man system, as required; - Project specific road safety signage and controls; - Notification processes for residents of any disruptions to Rixs Creek Lane and construction start times; - Details of emergency accesses; - Covering truck loads during transportation; - Transportation of heavy / large loads to site outside of peak times and if necessary outside standard hours; and - Timing of shifts. Dilapidation inspections of Rixs Creek Lane will be carried and defects caused by construction traffic will be rectified as soon as practically after being identified.
Visual	A visual bund will be constructed to the east to the loading facility. Disturbed areas will be vegetated in accordance with planned mine rehabilitation plans.
Land Resources	- Should work areas remain inactive for periods of greater than two weeks, temporary stabilisation measures will be applied such as soil stabilisers or covering with a geo-fabric cover such as jute mesh; - Site access will be stabilised to avoid vehicles tracking soil onto public roads; - Areas subject to earthworks and construction disturbance will be revegetated with an appropriate native grass, shrub and tree mix as soon as practically possible following achieving of final levels; - Exposed residual soils and non-working stockpiles will be covered with a suitable material (such as topsoil or an appropriate mulch mix and treated with a hydroseeding application); and - The area to be disturbed by construction activities will be minimised as far as possible.
Water	- Prior to construction commencing, an Erosion and Sediment Control Plan will be prepared for inclusion in the CEMP for the proposed works. In accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and 'Blue Book' standards; - Prior to construction, the contractor will be required to install appropriate erosion and sedimentation control measures; and - The Site Supervisor will ensure that erosion and sediment control measures are checked and maintained each day.
Waste	The following control measures will be put in place to minimise waste: - All waste will be classified in accordance with the *Waste Classification Guidelines* (DECC, 2008); - The handling, storage and transport of hazardous materials and waste will be in accordance with the National Code of Practice and the relevant Material Safety Data Sheet (MSDS) for the product.; - Various components of each of the waste streams will be kept separate, where possible; - All general inert and solid waste generated will be stored in waste containers located at designated points, isolated from surface water drains; - At regular intervals, waste to be disposed of off-site will be brought to a waste facility that is licensed under the POEO Act to receive waste of that type; and - Compilation of a waste data form for recording waste movement including; solid and inert waste materials, provision of a description of the waste types, physical nature of wastes, proposed treatment, dates of movement, transporters and waste destination details.

Issue	Commitments
Mitigation Measures	
Other (Socio-economic and rehabilitation)	- Where possible labour and resources for the project will be sourced locally to support local business and employment generation.
Environmental Management	
Construction Environmental Management Plan (CEMP)	- A CEMP will be prepared prior to the construction of the proposed works, and adhered to throughout the duration of construction; - This will detail the strategies and management methods (as outline in this Statement of Commitments) to be used to deliver the environmental management requirements for the construction phase of the proposed works. This should aim to prevent pollution, comply with legislative requirements; and - Registers or schedules will be developed as part of the CEMP to provide a record of site conditions and activities. Audits and site inspections should also be carried out during construction to ensure compliance with the measures contained within the CEMP.

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9.0 Justification and Conclusion

9.1 Project Justification

As discussed in detail in **Section 1.3**, the project is required to support the long term operation and economic success of the Mine. The project is considered justified as it would secure the ongoing operation of the mine through the provision of a secure means of delivery coal to the Port of Newcastle and onto end markets. The Mine requires its own facilities to transport coal to Port to ensure the long term viability of the operation and the positive economic effects that flow from it at both local and regional levels.

9.2 Ecologically Sustainable Development

Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* EP&A Regulation defines ecological sustainable development (ESD) as including four principles. The principles of ESD have been incorporated into this EA, and examples of the integration of these principles are discussed below:

(4) The principles of ecologically sustainable development are as follows:

*(a) the **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

*(b) **inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*

*(c) **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*

*(d) **improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

9.2.1 Precautionary principle

The precautionary principle has been demonstrated by the investigatory approach undertaken throughout the Environmental Assessment of this Project. Specialist assessments have been used to assess the impacts of the proposal in relation to ecology, noise, traffic, heritage, air quality and visual impacts. The survey has reduced the risk of unexpectedly impacting threatened species during the construction works by recommending mitigation measure to minimise impacts. The precautionary principle has also been demonstrated by recommending that research of unlisted heritage items be undertaken to preserve and record past activities of the site for the ongoing benefit of the wider community.

9.2.2 Inter-generational equity

Intergenerational equity is centred on the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. There is a moral obligation to ensure that today's economic progress, which will benefit both current and future generations, is not offset by environmental deterioration.

Emphasis has been placed on anticipation and prevention of potential adverse impacts upon the local environmental and community, as opposed to undertaking later remedial action, through the management and monitoring strategies summarised in **Section 8.0**.

These initiatives, along with various environmental reporting, auditing and consultation activities, will assist in ensuring that current and future generations can enjoy equal and equitable access to social, environmental and economic resources. Notably the construction of the rail loop will help allow future generations access the resources of the site and minimise disruption to resource recovery thereby securing the wider economic benefits of the Mine.

9.2.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity should be a fundamental consideration for development proposals. The potential for environmental impacts, including upon ecological communities and habitat values, has been assessed within this EA and measures to reduce such impacts have been identified.

Specialist studies have been undertaken to determine the biological and ecological extent and quality of the site. Any potential impacts to ecological values would be minimised through the implementation of control measures and rehabilitation and reinstatement works. Due to the previously disturbed nature of the site, and having implemented the mitigation measures recommended by the EA, there are expected to be no significant impacts on biodiversity and ecological integrity.

9.2.4 Improved valuation, pricing and incentive mechanisms

Improved valuation and pricing of resources has been considered throughout the environmental assessment process. This EA has not directly valued environmental resources; however an indirect measure of the value of such resources is the cost of the proposed mitigation measures, which have been considered in light of the viability of the proposed works.

The principle of Improved Valuation, Pricing and Incentive Mechanisms deems that environmental factors should be included in the valuation of assets and services. The cost associated with using or impacting upon an environmental resource is seen as a cost incurred to protect that resource.

While there are no certain methods of measuring such mechanisms, the Project optimises the valuation and pricing of the coal resources by optimising the use of an existing operation, and securing its ability to provide coal resources to markets in to the future.

9.3 Conclusion

This environmental assessment presents details of the Proposal, assesses the existing natural and social environments, describes the potential impacts on the environment and presents safeguards to minimise and/or avoid these potential impacts.

The Proposed Project, operated in accordance with the Statement of Commitments, is in accordance with the principles of ESD and the objects of the EP&A Act. The rail loop and loading facility would provide economic benefits to the region by creating jobs through both the construction and operational stages and by providing a level of operational security to Rix's Creek Mine, ensuring it has access to markets and that the businesses and jobs it supports in turn are secure.

This EA has fully considered the beneficial and adverse effects of the proposed Project, with full consideration of the principles of ESD. With the support of environmental mitigation measures outlined in this EA, the proposal would have minimum impact on the receiving environment.

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Appendix B

Consultation

Appendix B Consultation

Murphy, Simon

From:	Jodie Dabovic <Jodie.Dabovic@water.nsw.gov.au>
Sent:	Friday, 15 June 2012 10:39 AM
To:	Murphy, Simon
Cc:	Peter Johns
Subject:	Invitation for comment - Rix's Creek Mine rail Loading Facility, Rixs Creek, NSW.

Hello Simon,

In regard the to the letter dated 7 June 2012 for the Invitation for comment - Rix's Creek Mine rail Loading Facility, Rixs Creek, NSW.

The NSW Office of Water at this time is unable to provide any comment until a referral is provided by the Department of Planning and Infrastructure which includes a Prelimanary Environmental Assessment which describes what the project involves and potential impacts.

Regards
Jodie

Dr Jodie Dabovic | Planning and Assessment Coordinator | Major Projects, Mines and Assessment
Department of Primary Industries | NSW Office of Water
Level 3 | 26 Honeysuckle Drive | Newcastle West NSW 2302
PO Box 2213 Dangar NSW 2302
T: 02 49042571 | M: 0457503551 | F: 02 49042503 | E: jodie.dabovic@water.nsw.gov.au
W: www.water.nsw.gov.au

Murphy, Simon

From:	Kane Winwood <Kane.Winwood@planning.nsw.gov.au>
Sent:	Wednesday, 7 March 2012 12:27 PM
To:	SGrassby@bloomcoll.com.au
Cc:	Howard Reed
Subject:	Fwd: Rixs Creek Mine Proposed Rail Loading Facility
Attachments:	General Requirements.doc; Part 4 Modification Form.rtf

Simon,

As discussed, a modification to the Rixs Creek Mine consent would be assessed under section 75W of the EP&A Act. A the moment, online application is not available for a modification of a development consent issued under Part 4, as is the case with Rix's Creek. Therefore, a form will need to be filled in and lodged with the Department when the environmental assessment is ready to be submitted. I have attached a blank form for your completion.

I have attached a version of the Director-General's Requirements typically issued for a mine proposal which has been modified to be a little more relevant to your proposal. These are not absolute requirements and I have probably been a little conservative with the level of information required. They are meant to be a guide for the type of information that should be provided in an environmental assessment for the modification. If you or your consultants have any questions about the information in the document, please contact me to discuss.

Regards,
Kane

Kane Winwood
A/Manager Mining Projects
NSW Department of Planning & Infrastructure | GPO Box 39 | Sydney NSW 2001
T 02 9228 6298 E kane.winwood@planning.nsw.gov.au

>>> Simon Grassby <SGrassby@bloomcoll.com.au> 2/15/2012 2:04 pm >>>
Stephen,

Following from our phone call regarding the proposed Rail Loading Facility for Rixs Creek Mine in which you requested an initial description of the project, please find a description of the project attached.

Rixs Creek Mine is seeking conformation of initial advice from the Department of Planning and Infrastructure that the proposed rail loading facility will involve a modification of the current Part 4 Consent under section 75W of the EP&A Act.

Please let me know if you require any further information.

Regards
Simon

Simon Grassby
General Manager Technical Services
Bloomfield Collieries Pty Ltd
Ph. 02 49302631
M. 0419210478

NSW GOVERNMENT | Office of Environment & Heritage

Your reference: DA 49/94
Our reference: Doc12/23479; Lic06/228-02
Contact: Robert Gibson (02) 4908 6851

Mr Simon Murphy
Environmental Planner
AECOM
PO Box 73
HUNTER REGION MAIL CENTRE NSW 2310

Dear Mr Murphy

RE: INVITATION TO COMMENT ON PROPOSED, RIX'S CREEK COAL MINE RAIL LOADING FACILITY, RIX'S CREEK, NSW (MODIFICATION TO DA 49/94)

I refer to your letter dated 7 June 2012 requesting comments from the Office of Environment and Heritage (OEH) on a proposed modification to Rix's Creek Coal Mine Development Consent to enable the construction of a proposed rail loading facility, a new clean coal stockpile and associated infrastructure. OEH understands that the proponent has yet to lodge the application with the NSW Department of Planning and Infrastructure (DP&I) and that the generic Director General's Requirements issued by DP&I included the recommendation to contact other government agencies during the preparation of the Environmental Assessment (EA) that may accompany any application to modify the existing consent (DA 49/94).

Few details have been provided to OEH of the proposed modification, and as such the recommended matters for consideration provided in **Attachment 1** are generic in nature. The proponent should ensure that the EA is sufficiently comprehensive to enable the OEH to determine the extent of the impact(s) of the proposal. In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in **Attachments 2 and 3** and relevant best practice management guidelines. OEH will provide further formal comments during the subsequent assessment phases of the proposal.

If you require any further information regarding this matter please contact Robert Gibson, Regional Biodiversity Conservation Officer, on 4908 6851.

Yours sincerely

21 JUN 2012

LUCAS GRENADIER
A/Head – Hunter Planning Unit
Conservation and Regulation, North East

Encl: Attachment 1 – OEH Recommended matters for consideration in the Environmental Assessment (EA) for the proposed Rail Loading Facility at Rix's Creek Coal Mine, Rix's Creek, NSW – DA49/94
Attachment 2 – Guidance Material
Attachment 3 – Checklist of information required when utilising the Biobanking Assessment Methodology (DRAFT)

PO Box 488G Newcastle NSW 2300
117 Bull Street, Newcastle West NSW 2302
Tel: (02) 4908 6800 Fax: (02) 4908 6810
ABN 30 841 387 271
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Attachment 1- OEH Recommended matters for consideration in the Environmental Assessment (EA) for the proposed Rail Loading Facility at Rix's Creek Coal Mine, Rix's Creek, NSW – Part 3A (DA49/94)

TABLE OF CONTENTS

1 Environmental impacts of the project

1. Impacts related to the following environmental issues need to be assessed, quantified and reported on:
   - Aboriginal cultural heritage
   - Biodiversity
   - Greenhouse gasses
   - Flooding

   Environmental impact statements (EISs) should address the specific requirements outlined below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment 2**.

2 The Proposal

The objectives of the proposal should be clearly stated and refer to:

- the size, scale and type of the activity / development;
- all anticipated environment impacts, both direct and indirect, including level of vegetation / habitat clearing;
- threatened species, populations, ecological communities and / or habitats impacted upon;
- the staging and timing of the proposal; and
- the proposal's relationship to any other proposal and/or developments.

SPECIFIC ISSUES

3 Aboriginal Cultural Heritage

OEH recommends that the following Aboriginal cultural heritage issues be addressed by the proponent in preparing the EIS.

Existing Aboriginal cultural heritage values

OEH acknowledges the existence of numerous registered Aboriginal sites in the regional locality. It is recommended that the proponent consider any potential impacts of the proposal on any known Aboriginal sites/objects, the sensitivity and significance of these sites to the traditional Aboriginal knowledge holders and any relationship that may exist between these sites and any Aboriginal cultural heritage values of the project area.

Impacts of the project on Aboriginal cultural heritage values

Standard requirements:

1. The EIS must address and document the information requirements set out in the draft '*Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*' (Department of Environment and Conservation 2005). This document is available from Department of Planning and Infrastructure upon request.

2. The EIS must include surveys by suitably qualified archaeological consultants in consultation with all of the local Aboriginal knowledge holders.

3. The EIS should identify the nature and extent of impacts on Aboriginal cultural heritage values across the project area and clearly articulate strategies proposed to avoid/minimise these impacts. If impacts are proposed as part of the final development, clear justification for such impacts should be provided.

4. The EIS must assess and document the archaeological and Aboriginal significance of the site's Aboriginal cultural heritage values.

5. Describe the actions that will be taken to avoid or mitigate impacts of the project on Aboriginal cultural heritage values. This must include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented. Any proposed methodology for Aboriginal cultural heritage investigation should reflect best practice standards recommended by OEH in the '*Code of Practice for Archaeological Investigations of Objects in New South Wales (2010)*'.

6. The EIS must provide documentary evidence to demonstrate that effective community consultation with Aboriginal communities has been undertaken in assessing impacts, developing protection and mitigation options and making final recommendations. OEH supports broad-based Aboriginal community consultation and as a guide OEH's '*Aboriginal cultural heritage consultation requirements for proponents 2010*' provides a useful model to follow. This requirement is available on OEH's website at: http://www.environment.nsw.gov.au/licences/consultation.htm.

7. If impacts on Aboriginal cultural heritage values are proposed as part of the final development, an assessment of the proposed impacts in the context of '*inter generational equity*' and cumulative impact must be undertaken. This assessment must examine both cultural and archaeological perspectives equally at both the local and regional levels, with consideration given to the site level and broader landscape level.

Note: If the EIS is relying on past surveys it is critical to confirm that the surveys are consistent with the requirements of the above Major Project application guidelines. Further, whilst there may be no requirement for obtaining an Aboriginal Heritage Impact Permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act) for projects approved under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979,* there are other sections of the NPW Act which remain valid. This includes the requirement to obtain a Care Agreement for salvaged objects (Section 85) and reporting to OEH on the status of new or impacted Aboriginal sites (Section 89A).

4 Biodiversity

Biodiversity impacts can be assessed using **either** the BioBanking Assessment Methodology (scenario 1) or a detailed biodiversity assessment (scenario 2). The requirements for each of these approaches are detailed below.

The BioBanking Assessment Methodology can be used **either** to obtain a BioBanking statement, or to assess impacts of a proposal and to determine required offsets without obtaining a statement. In the latter instances, if the required credits are not available for offsetting, appropriate alternative options may be developed in consultation with the OEH and in accordance with OEH policy.

Scenario 1 - Where a proposal is assessed using the BioBanking Assessment Methodology (BBAM DECC 2008):

1. Where a BioBanking Statement is being sought under Part 7A of the *Threatened Species Conservation* Act 1995 (TSC Act), the assessment must be undertaken by an accredited BioBanking assessor (as specified under Section 142B (1)(c) of the TSC Act 1995) and done in accordance with the *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (DECC 2009a). To qualify for a BioBanking Statement a proposal must meet the improve or maintain standard.

1a. The EIS should include a specific Statement of Commitments that reflects all requirements of the BioBanking Statement including the number of credits required and any DG approved variations to impact on Red Flags.

2. Where the BioBanking Assessment Methodology is being used to assess impacts of a proposal and to determine required offsets, and a BioBanking Statement is not being obtained, the EIS should contain a detailed biodiversity assessment and all components of the assessment must be undertaken in accordance with the *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (DECC 2009a).

2a. The EIS should include a specific Statement of Commitments which:
- is informed by the outcomes of the proposed BioBanking assessment offset package;
- sets out the ecosystem and species credits required by the BioBanking Assessment Methodology and how these ecosystem and/or species credits will be secured and obtained;
- if the ecosystem or species credits cannot be obtained, provides appropriate alternative options to offset expected impacts, noting that an appropriate alternative option may be developed in consultation with OEH officers and in accordance with OEH policy;
- demonstrates how all options have been explored to avoid red flag areas;
- includes all relevant 'BioBanking files (e.g. *.xml output files), data sheets, underlying assumptions (particularly in the selection of vegetation types from the vegetation types database), and documentation (including maps, aerial photographs, GIS shape files, other remote sensing imagery etc. [as per Attachment 3]) to ensure that OEH can conduct an appropriate review of the assessment.

3. Where the '*NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects*' (OEH 2011) is being used then the proponent must stipulate which level(s) of offset is being offered. In accordance with the interim policy, justification must be provided as to why it is appropriate to apply the Tier 2 ('no net loss') or Tier 3 ('mitigated net loss') outcomes. In considering whether the mitigated net loss standard is appropriate, justification must be provided on: (i) whether the credits required by the calculator are available on the market; (ii) whether alternative offset sites (other than credits) are available on the market; and (iii) the overall cost of the offsets and whether these costs are reasonable given the circumstances'. This must be to satisfaction of and in consultation with OEH. Tier 2 and Tier 3 offset proposals will likely require a larger area of remnant vegetation to be offered in the offset package than if Tier 1 ('improve or maintain') had been met.

4. Where appropriate, likely impacts (both direct and indirect) on any adjoining and/or nearby OEH estate reserved under the *National Parks and Wildlife Act 1974* or any marine and estuarine protected areas under the *Fisheries Management Act 1994* or the *Marine Parks Act 1997* should be considered. Please refer to the *Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water* (DECCW 2010).

5. With regard to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the assessment should identify and assess any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.

Scenario 2 - Where a proposal is assessed outside the BioBanking Assessment Methodology:

1. The EIS should include a detailed biodiversity assessment, including assessment of impacts on threatened biodiversity, native vegetation and habitat. This assessment should address the matters included in the following sections.

2. A field survey of the site should be conducted and documented in accordance with relevant guidelines, including:
- the *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna - Amphibians* (DECCW, 2009b)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004), and

- Threatened species survey and assessment guideline information on www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm.

If a proposed survey methodology is likely to vary significantly from the above methods, the proponent should discuss the proposed methodology with OEH prior to undertaking the EIS, to determine whether OEH considers that it is appropriate.

Recent (less than five years old) surveys and assessments may be used. However, previous surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or
- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species,

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the surveys. If a previous survey is used, any additional species listed under the TSC Act since the previous survey took place, must be surveyed for.

Determining the list of potential threatened species for the site must be done in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004) and the *Guidelines for Threatened Species Assessment* (Department of Planning, July 2005). The OEH Threatened Species website http://www.environment.nsw.gov.au/threatenedspecies/ and the *Atlas of NSW Wildlife* database must be the primary information sources for the list of threatened species present. The BioBanking Threatened Species Database, the Vegetation Types databases (available on DECCW website at http://www.environment.nsw.gov.au/biobanking/biobankingtspd.htm and http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm, respectively) and other data sources (e.g. PlantNET, Online Zoological Collections of Australian Museums (http://www.ozcam.org/), previous or nearby surveys etc.) may also be used to compile the list.

OEH notes that the PEA indicates that the proposal contains highly modified land and vegetation, including rows of mature planted trees, and a range of non-woody vegetation communities. As such OEH would expect all communities to be adequately sampled and assessed, including the application of an appropriate offset strategy that compensates for the loss of all impacted habitats.

3. OEH notes the following known and/or predicted threatened species, populations and ecological communities (based on OEH *Atlas of NSW Wildlife* database, vegetation mapping and potential habitat) which have broad habitat matches to that of the site occur on or areas nearby (approx. 10-20 km radius) to the proposal. These should be targeted during surveying (but not be limited to just these):

FLORA

Slaty Red Gum (*Eucalyptus glaucina*) is a tree to 30 metres tall with smooth white or grey bark that sheds in large plates. It is distinguished from other Red Gums by its glaucous juvenile leaves and flower buds (Harden 2002).

Trailing Woodruff (*Asperula asthenes*) is a delicate trailing perennial herb with stems to about 30 cm long and commonly has short recurved hairs on the leaf and stipule margins and mid veins. Plants typically flower in spring and often grow along drainage lines (Harden 1992). Fruit are required in order to tell species of *Asperula* from vegetatively similar species of *Galium* (Thompson, 2009)

FAUNA

Amphibians:
Green and Golden Bell Frog (*Litoria aurea*)*

Reptiles:

Stephen's Banded Snake (*Hoplocephalus stephensi*)

Birds:
Australasian Bittern (*Botaurus poiciloptilus*)*
Gang-gang Cockatoo (*Callocephalon fimbriatum*)
Glossy Black Cockatoo (*Calyptorhynchus lathami*)
Spotted Harrier (*Circus assimilis*)
Brown Treecreeper (*Climacteris picumnus* subsp. *victoriae*)
Barred Cuckoo-shrike (*Coracina lineata*)
Varied Sittella (*Daphoenositta chrysoptera*)
Little Lorikeet (*Glossopsitta pusilla*)
Little Eagle (*Hieraaetus morphnoides*)
Swift Parrot (*Lathamus discolor*)*
Powerful Owl (*Ninox strenua*)
Flame Robin (*Petroica phoenicea*)
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*)
Speckled Warbler (*Pyrrholaemus sagittatus*)
Diamond Firetail (*Stagonopleura guttata*)

Mammals:
Spotted-tailed Quoll (*Dasyurus maculatus*)*
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
Little Bentwing-bat (*Miniopterus australis*)
Eastern Bent-wing Bat (*Miniopterus schreibersii* subsp. *oceanensis*)
Eastern Freetail bat (*Mormopterus norfolkensis*)
Large-footed Myotis (*Myotis adversus*)
Squirrel Glider (*Petaurus norfolcensis*)
Koala (*Phascolarctos cinereus*)*
Brush-tailed Phascogale (*Phascogale tapoatafa*)
Grey-headed Flying-fox (*Pteropus poliocephalus*)*
Yellow-bellied Sheathtailed Bat (*Saccolaimus flaviventris*)
Greater Broad-nosed Bat (*Scoteanax rueppellii*)

* = EPBC Act listed species

Endangered Populations
- *Acacia pendula* population in the Hunter catchment
- *Cymbidium canaliculatum* R. Br. in the Hunter Catchment
- *Eucalyptus camaldulensis* population in the Hunter catchment

Endangered ecological communities
- Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions
- Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions;
- Hunter Valley Weeping Myall Woodland of the Sydney Basin
- Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions
- Warkworth Sands Woodland in the Sydney Basin Bioregion Central Hunter Swamp Oak Forest

Vulnerable
- Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion

4. The EIS should contain the following information as a minimum:
   a. The requirements set out in the *Guidelines for Threatened Species Assessment* (Department of Planning, July 2005).
   b. Description and geo-referenced mapping of study area (and spatial data files), e.g. overlays on topographic maps, satellite images and /or aerial photos, including details of map datum, projection and zone, all survey locations, all vegetation communities, key habitat features and

reported locations of threatened species, populations and ecological communities present in the subject site and study area.

c. Description of survey methodologies used, including timing, location and weather conditions.
d. Details, including qualifications and experience of all staff undertaking the surveys, mapping and assessment of impacts as part of the EIS.
e. Detailed description of all vegetation communities (both forested and non-woody [e.g. derived grasslands], including classification and methodology used to classify) and including all plot data. Plot data should be supplied to the OEH in electronic format (e.g. MS-Excel) and organised by vegetation community;
f. Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status.
g. Description of the likely impacts of the proposal on biodiversity and wildlife corridors, including direct and indirect and construction and operation impacts. Wherever possible, quantify these impacts such as the amount of each vegetation community or species habitat to be cleared or impacted, or any fragmentation of a wildlife corridor. The proposal should provide an assessment of the cumulative impacts of the proposal in relation to other nearby developments, such as (but not limited to) the T4 coal loader on Kooragang Island.
h. Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposal to avoid or minimise impacts, including details about alternative options considered and how long term management arrangements will be guaranteed.
i. Description of the residual impacts of the proposal. If the proposal cannot adequately avoid or mitigate impacts on biodiversity, then a biodiversity offset package is expected (see the requirements for this at point 6 below).
j. Provision of specific Statement of Commitments relating to biodiversity.

5. An assessment of the significance of direct and indirect impacts of the proposal must be undertaken for threatened biodiversity known or considered likely to occur in the study area based on the presence of suitable habitat. This assessment must take into account:
   a. the factors identified in s.5A of the EP&A Act, and
   b. the guidance provided by *The Threatened Species Assessment Guideline – The Assessment of Significance* (DECC 2007) which is available at: http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf

6. Where an offsets package is proposed by a proponent for impacts to biodiversity (and a BioBanking Statement has not been sought) this package should:
   a. Meet OEH's *Principles for the use of biodiversity offsets in NSW*, which are available at: www.environment.nsw.gov.au/biocertification/offsets.htm.
   b. Identify the conservation mechanisms to be used to ensure the long term protection and management of the offset sites.
   c. Include an appropriate Management Plan (such as vegetation or habitat) that has been developed as a key amelioration measure to ensure any proposed compensatory offsets, retained habitat enhancement features within the development footprint and/or impact mitigation measures (including proposed rehabilitation and/or monitoring programs) are appropriately managed and funded.

   With respect to managing and conserving a proposed offset in perpetuity, OEH considers and supports the following as appropriate conservation mechanisms:
   - The establishment of biobanking sites with biobanking agreements under the *Threatened Species Conservation Act 1995* (TSC Act);
   - The dedication of land under the *National Parks and Wildlife Act 1974* (NPW Act);
   - A Conservation Agreement under the NPW Act;
   - A Trust Agreement under the *Nature Conservation Trust Act 2001*; or
   - A Planning Agreement under s 93F of the *Environmental Planning and Assessment Act 1979*.

   Note: OEH no longer supports public positive covenant under s88E of the *Conveyancing Act 1919* as an appropriate conservation mechanism to secure and/or manage biodiversity offsets.

7. Where appropriate, likely impacts (both direct and indirect) on any adjoining and/or nearby National Parks and Wildlife Service estate reserved under the *National Parks and Wildlife Act 1974* or any marine and estuarine protected areas under the *Fisheries Management Act 1994* or the *Marine Parks Act 1997* should be considered. Refer to the *Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water* (DECCW 2010). The OEH notes The Hunter Wetlands National Park is within 3 km to the north of the proposal, and as such any direct or indirect impacts need to be documented and assessed.

8. With regard to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the assessment should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.

References

DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities: Draft.* Department of Environment and Conservation, Hurstville; available at: http://www3.environment.nsw.gov.au/pdfs/tbsa_guidelines_draft.pdf.

DECC (2007) *Threatened Species Assessment Guidelines: The Assessment of Significance. August 2007.* Department of Environment and Climate Change (NSW).

DECC (2008) *BioBanking Assessment Methodology*. Department of Environment and Climate Change NSW.

DECC (2009a) *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians*. April 2009. Department of Environment and Climate Change (NSW), Goulburn Street, Sydney.

DECC (2009b) *BioBanking Assessment Methodology and Credit Calculator Operational Manual*. Department of Environment and Climate Change NSW, Sydney; available at: http://www.environment.nsw.gov.au/resources/biobanking/09181bioopsman.pdf.

DECCW (2010) *Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water.* DECCW, Sydney.

DoP (2005) *Guidelines for Threatened Species Assessment.* Department of Planning, Sydney, July 2005.

Harden, G.J. (ed.) (1990-2002) *Flora of New South Wales: Volumes 1 - 4.* New South Wales University Press, Kensington.

OEH (2011) NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects. NSW Office of Environment and Heritage, Sydney, June 2011.

Thompson, I.R. (2009) A revision of *Asperula* and *Galium* (Rubieae: Rubiaceae) in Australia. *Muelleria*, **27(1)**: 36-112.

5 Greenhouse gas

1. The EIS should include a comprehensive assessment of, and report on, the project's predicted greenhouse gas emissions (tCO_2e). Emissions should be reported broken down by:
   a. direct emissions (scope 1 as defined by the Greenhouse Gas Protocol – see reference in Attachment 2),
   b. indirect emissions from electricity (scope 2), and
   c. upstream and downstream emissions (scope 3)

   before and after implementation of the project, including annual emissions for each part of the project (construction, operation and decommissioning).

2. The EIS should include an estimate of the greenhouse emissions intensity (per unit of production). Emissions intensity should be compared with best practice if possible.

3. The emissions should be estimated using an appropriate methodology, in accordance with NSW, Australian and international guidelines (see Attachment 2).

4. The proponent should also evaluate and report on the feasibility of measures to reduce greenhouse gas emissions associated with the project. This could include a consideration of energy efficiency opportunities or undertaking an energy use audit for the site.

6 Flooding

The EIS should include an assessment of the following (where applicable) referring to the guidelines in Attachment 2:

1. Whether the proposal is consistent with any floodplain risk management plans.

2. Whether the proposal is compatible with the flood hazard of the land.

3. Whether the proposal will significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.

4. Whether the proposal will significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

5. Whether the proposal incorporates appropriate measures to manage risk to life from flood.

6. Whether the proposal is likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

7. The EIS needs to provide full details of the flood assessment and modelling undertaken in determining any design flood levels (if applicable), including the 1 in 100 year flood levels.

In addition, the assessment should include a sensitivity assessment of the potential impacts of an increase in rainfall intensity and runoff (10%, 20% and 30%) due to climate change on the flood behaviour for the 1 in 100 year design flood.

Attachment 2 – Guidance Material

Title	Web address
Relevant Legislation	
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Threatened Species Conservation Act 1995	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
Greenhouse Gas	
The Greenhouse Gas Protocol: Corporate Standard, World Council for Sustainable Business Development & World Resources Institute	http://www.ghgprotocol.org/standards/corporate-standard
National Greenhouse Accounts (NGA) Factors, Australian Department of Climate Change (Latest relEISse),	http://www.climatechange.gov.au/publications/greenhouse-acctg/national-greenhouse-factors.aspx
National Greenhouse and Energy Reporting System, Technical Guidelines (latest relEISse)	http://www.climatechange.gov.au/en/government/initiatives/national-greenhouse-energy-reporting/tools-resources.aspx
National Carbon Accounting Toolbox	http://www.climatechange.gov.au/government/initiatives/ncat.aspx
Australian Greenhouse Emissions Information System (AGEIS)	http://ageis.climatechange.gov.au/
Aboriginal Cultural Heritage	
Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (2005)	Available from DoP.
Aboriginal Cultural Heritage Consultation Requirements for Proponents (EPA, 2010)	http://www.environment.nsw.gov.au/licences/consultation.htm
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (EPA, 2010)	http://www.environment.nsw.gov.au/licences/archinvestigations.htm
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm
Aboriginal Heritage Information Management System (AHIMS) Registrar	http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Biodiversity	
BioBanking Assessment Methodology (DECC, 2008)	http://www.environment.nsw.gov.au/resources/biobanking/08385bbassessmethod.pdf
BioBanking Assessment Methodology and Credit Calculator Operational	http://www.environment.nsw.gov.au/biobanking/operationalmanual.htm

Title	Web address
Manual (EPA, 2008)	
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna -Amphibians (EPA, 2009)	http://www.environment.nsw.gov.au/resources/Threatenedspecies/09213amphibians.pdf
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC, 2004)	http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
Guidelines for Threatened Species Assessment (Department of Planning, July 2005)	Draft available from DoP
EPA Threatened Species website	http://www.environment.nsw.gov.au/Threatenedspecies/
Atlas of NSW Wildlife	http://wildlifEIStlas.nationalparks.nsw.gov.au/wildlifEIStlas/watlas.jsp
BioBanking Threatened Species Database	http://www.environment.nsw.gov.au/biobanking/biobankingtspd.htm
Vegetation Types databases	http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm
PlantNET	http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	http://www.ozcam.org/
Threatened Species Assessment Guideline - The Assessment of Significance (EPA, 2007)	http://www.environment.nsw.gov.au/resources/Threatenedspecies/tsaguide07393.pdf
Principles for the use of biodiversity offsets in NSW	http://www.environment.nsw.gov.au/biocertification/offsets.htm
OEH Estate	
Land reserved or acquired under the NPW Act	
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksEISchatoz.aspx
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (EPA, 2010)	http://www.environment.nsw.gov.au/resources/protectedareas/10509devadjEPA.pdf

Attachment 3: Checklist of information required when utilising the Biobanking Assessment Methodology (DRAFT)

A hard copy and soft copy of all requirements:

- BioBanking Assessment Report. The Biobanking Assessment Report should include:
  - a description of the proposed development,
  - measures to avoid and mitigate the impacts of development,
  - an assessment of indirect impacts,
  - a statement of onsite measures,
  - a description of the application of the biobanking assessment methodology, including details on and assumptions made in utilising the methodology, such as (but not limited to) placement of assessment circles, remnant value, connectivity and reasoning behind selection of vegetation types in the BVT database,
  - plot and transect values including a list of the indigenous plant species identified in each of the plots,
  - a description of targeted threatened flora and fauna surveys, and any general baseline surveys (incl. vegetation specific surveys). These should be also be provided schematically, and
  - the Biobanking Credit Report.
- Where required, the BioBanking Assessment Report should also include:
  - expert reports,
  - an application for a determination on red flag areas,
  - more appropriate use of local data for vegetation types, benchmarks or threatened species,
  - environmental contributions accompanied by a BioBanking Agreement Credit Report (if applicable), and
  - application for deferred retirement arrangements (if applicable).
- copy of the xml. File(s) exported for the proposal from the BioBanking Credit Calculator.
- copies of completed field data sheets, and updated with correct plant taxonomy in instances where field names have been used.
- maps (soft copy as A4 or as jpgs), preferably named:
  - Property boundary
  - development footprint
  - vegetation zones
  - Asset protection zones or other management zones
- separate shape files should be supplied for all the maps mentioned above plus:
  - plots and transects
  - assessment circles
  - species polygons

NOTE:

(i) All maps must include:
  - a title (as per the names above),

- the site's name, location and lot/DP numbers,
- the scale and grid,
- the date it was prepared, and
- a legend.

(ii) Boundaries and zones must be confirmed on the site using a GPS. This information should be digitised onto an ortho-rectified aerial photo or SPOT-5 image. Maps must be easily readable and submitted to OEH as a Geographic Information System (GIS) file that is ESRI compatible.

(iii) Shapefiles must use the **GDA94 datum**. Name each shapefile as: 'development site name_descriptor', for example, 'Hill Farm_vegetation zones'.

Transport
Roads & Maritime
Services

21 June 2012

SF2012/015953
MJ

Aecom Australia Pty Ltd
PO Box 73
Hunter Region MC NSW 2310

Attention: Mr Simon Murphy

NEW ENGLAND HIGHWAY (HW): RIX'S CREEK MINE RAIL LOADING FACILITY, RIX'S CREEK

Dear Mr Murphy

I refer to your letter dated 7 June 2012 regarding your request for issues to be considered in the preparation of an Environmental Assessment (EA) for the subject project.

RMS Responsibilities

RMS' primary interests are in the road network, traffic and broader transport issues. In particular, the efficiency and safety of the classified road network, the security of property assets and the integration of land use and transport.

In accordance with the *Roads Act 1993*, RMS has powers in relation to road works, traffic control facilities, connections to roads and other works on the classified road network. The New England Highway (HW9) is a classified State road and part of the National Land Transport Network. RMS concurrence is required for connections to this road with Council consent, under Section 138 of the Act. Council is the roads authority for this road and all other public roads in the area.

RMS Response and Requirements

RMS has reviewed the information provided and would require the applicant to undertake a comprehensive Traffic Impact Study to identify the likely impacts and any subsequent traffic management and road upgrade requirements, for the construction and operational phases of the project. The study shall be prepared in accordance with the RTA's *Guide to Traffic Generating Developments* and is to include, but not be limited to, the following:

- Identify all relevant vehicular traffic routes and intersections for any accesses to / from the sites for each stage of the construction process.

- Current traffic counts for the above traffic routes and intersections.

- Estimated light and heavy vehicular traffic generation and distribution for each stage of the construction process.

- Traffic analysis of any major / relevant intersections impacted, using SIDRA or similar traffic model, including:
    - Current traffic counts
    - 95th percentile back of queue lengths on all legs.
    - Delays and level of service on all legs.
    - Use of SIDRA or similar traffic model.
    - Electronic input / output date files for RTA review.

- Any other impacts upon the regional and state road network and bridges, including consideration of pedestrian, cyclist and public transport facilities shall be addressed.

- A comprehensive Construction Traffic Management Plan shall be prepared to identify measures to minimise the impacts of construction traffic on the road network.

RMS encourages the proponent to discuss the above issues early in the EIS process, with RMS and Singleton Council and other relevant authorities. Further details and requirements will be provided on receipt of the above information.

If you have any queries please contact Dave Young on (02) 4924 0688.

Yours sincerely

Colin Nunn
Manager, Development North
Infrastructure Development Division

Cc General Manager
Singleton Council

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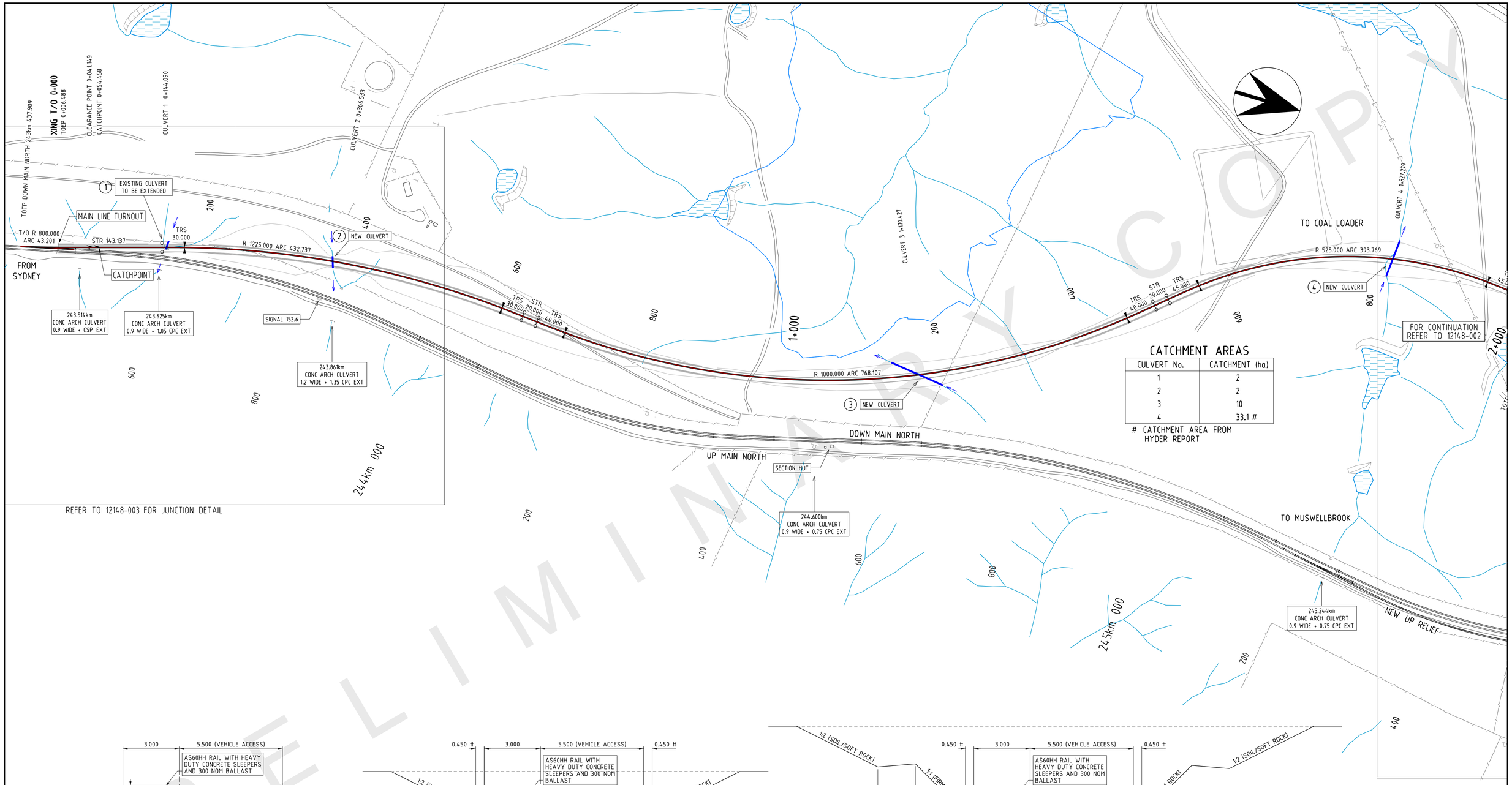
Appendix C

Concept Design

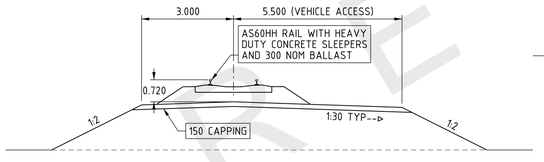
Appendix C Concept Design



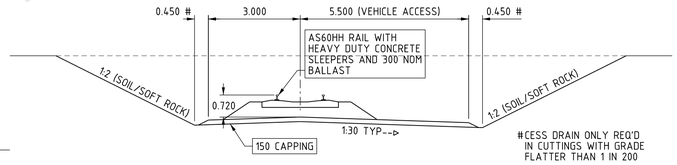
CATCHMENT AREAS

CULVERT No.	CATCHMENT (ha)
1	2
2	2
3	10
4	33.1 #

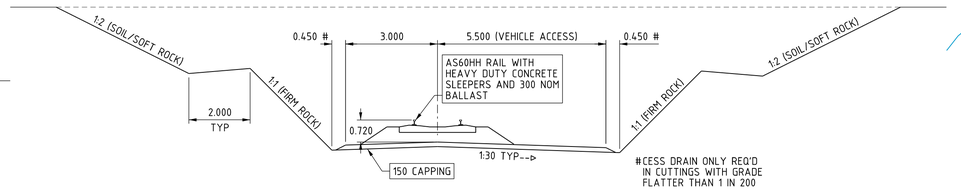
CATCHMENT AREA FROM HYDER REPORT



TYPICAL CROSS SECTION - FILL
SCALE 1:100



TYPICAL CROSS SECTION - CUT (WITHOUT BENCHING)
SCALE 1:100



TYPICAL CROSS SECTION - CUT (WITH BENCHING)
SCALE 1:100

LEGEND
- NEW TRACK
- REVISION 2 ROUTE
- DAM PERIMETER
- EXTENT OF CUT/FILL

REV	BY	DATE	DESCRIPTION	APPD
7	RDP	15-11-12	TYPICAL CROSS SECTIONS REVISED	AJP
6	RDP	09-10-12	CULVERTS UPDATED. DWG No CHANGED. TYP X-SECTIONS ADDED.	AJP
5	TD	02-08-12	CULVERT DETAILS UPDATED	AJP
4	RDP	26-07-12	ALIGNMENT REVISED. CULVERT DETAILS SHOWN.	AJP
3	RDP	09-05-12	LAYOUT REVISED	AJP
2	RDP	24-08-11	LOOP LAYOUT REVISED. SHEET ADDED.	AJP
1	RDP	12-08-11	FOR CLIENT REVIEW	AJP

CLIENT
THE Bloomfield GROUP

SCALES
0 50 100 METRES 200
1 TO 2500
0 1 5 10
METRES 1 TO 100

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email: info@rhombergrail.com.au www.rhombergrail.com.au

	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE
JOB No: 12148

DRAWING TITLE
PROPOSED COAL LOADING FACILITY
OPTION 1
BALLOON LOOP LAYOUT
CONCEPT DESIGN

STATUS: CONCEPT
DRG No: 12148-001
REV: 7
SIZE: A1

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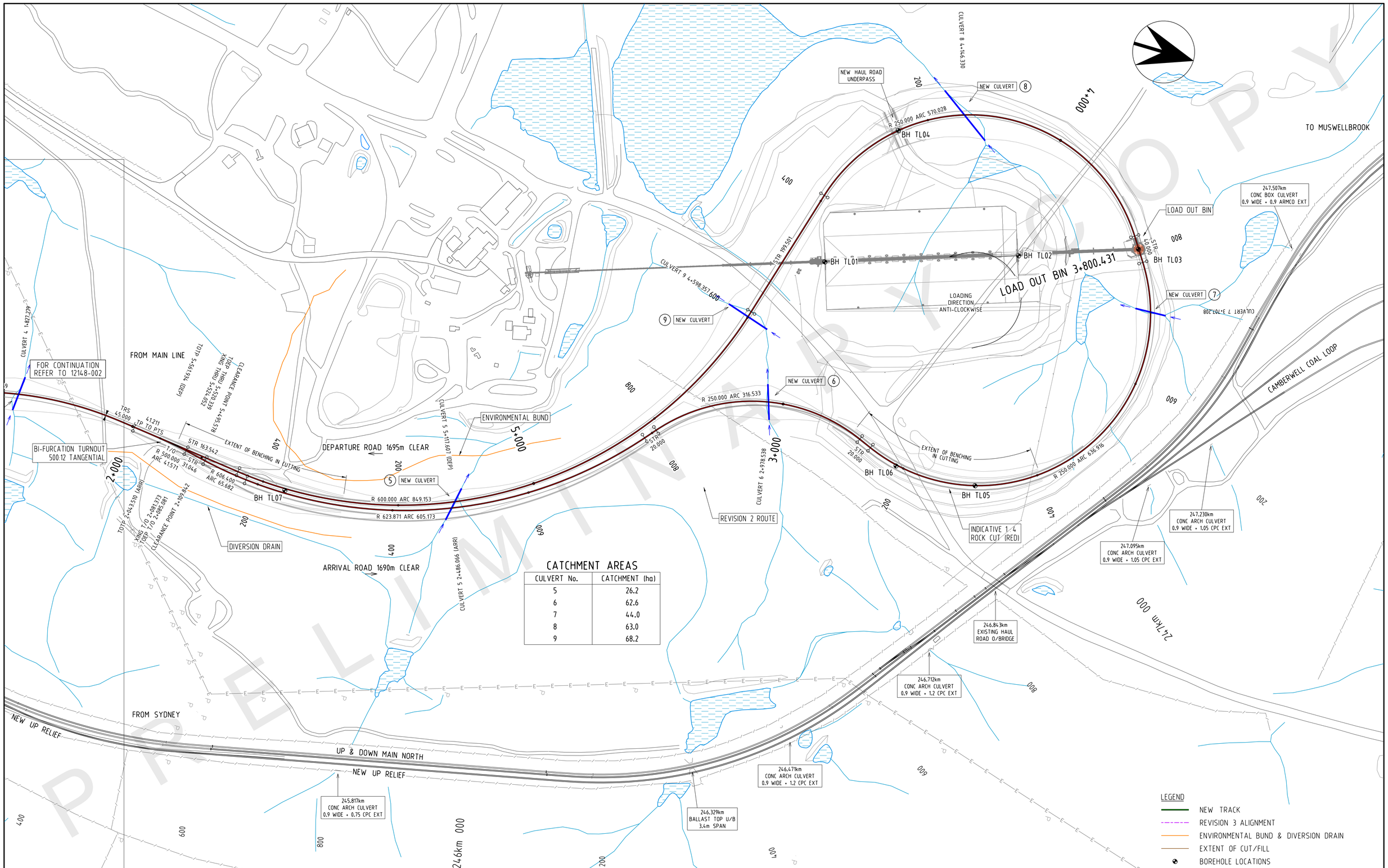

CATCHMENT AREAS

CULVERT No.	CATCHMENT (ha)
5	26.2
6	62.6
7	44.0
8	63.0
9	68.2

LEGEND

- NEW TRACK
- REVISION 3 ALIGNMENT
- ENVIRONMENTAL BUND & DIVERSION DRAIN
- EXTENT OF CUT/FILL
- BOREHOLE LOCATIONS

REV	BY	DATE	DESCRIPTION	APPD
7	RDP	15-11-12	HAUL ROAD UNDERPASS AND MINE INFRASTRUCTURE SHOWN	AJP
6	RDP	09-10-12	CULVERTS UPDATED. DWG No CHANGED. BOREHOLES SHOWN.	AJP
5	TD	02-08-12	CULVERT DETAILS UPDATED	AJP
4	RDP	26-07-12	ALIGNMENT REVISED. CULVERT DETAILS SHOWN.	AJP
3	RDP	09-05-12	LAYOUT REVISED	AJP
2	RDP	23-08-11	LOOP LAYOUT REVISED. SHEET ADDED.	AJP
1	RDP	12-08-11	FOR CLIENT REVIEW	AJP

CLIENT

THE Bloomfield GROUP

SCALES

0 50 100 METRES 200

1 TO 2500

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	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE — JOB No 12148

DRAWING TITLE
PROPOSED COAL LOADING FACILITY
OPTION 1
BALLOON LOOP LAYOUT
CONCEPT DESIGN

STATUS: CONCEPT — DRG No 12148-002 — REV 7 — SIZE A1

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JUNCTION ARRANGEMENT

LEGEND

NEW TRACK

SLEWED TRACK

REV	BY	DATE	DESCRIPTION	APPD
8	RDP	15-11-12	TURNOUT RADII CLARIFIED	AJP
7	RDP	04-09-12	CULVERT DETAILS UPDATED. DRAWING NUMBER CHANGED.	AJP
6	TD	02-08-12	CULVERT DETAILS UPDATED	AJP
5	RDP	26-07-12	CULVERT DETAILS ADDED	AJP
4	RDP	09-05-12	LOOP LAYOUT REVISED	AJP
3	RDP	30-08-11	OPTION FOR 4.5m MAIN LINE CENTRES ONLY REQUIRED	AJP
2	RDP	24-08-11	LOOP LAYOUT REVISED. SHEET ADDED.	AJP
1	RDP	12-08-11	FOR CLIENT REVIEW	AJP

CLIENT

THE Bloomfield GROUP

SCALES

0 10 50 METRES 100

1 TO 1000

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email: info@rhombergrail.com.au www.rhombergrail.com.au

	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE — JOB No 12148

DRAWING TITLE

PROPOSED COAL LOADING FACILITY

OPTION 1

JUNCTION LAYOUT

CONCEPT DESIGN

STATUS: CONCEPT — DRG No. 12148-003 — REV 8 — SIZE A1

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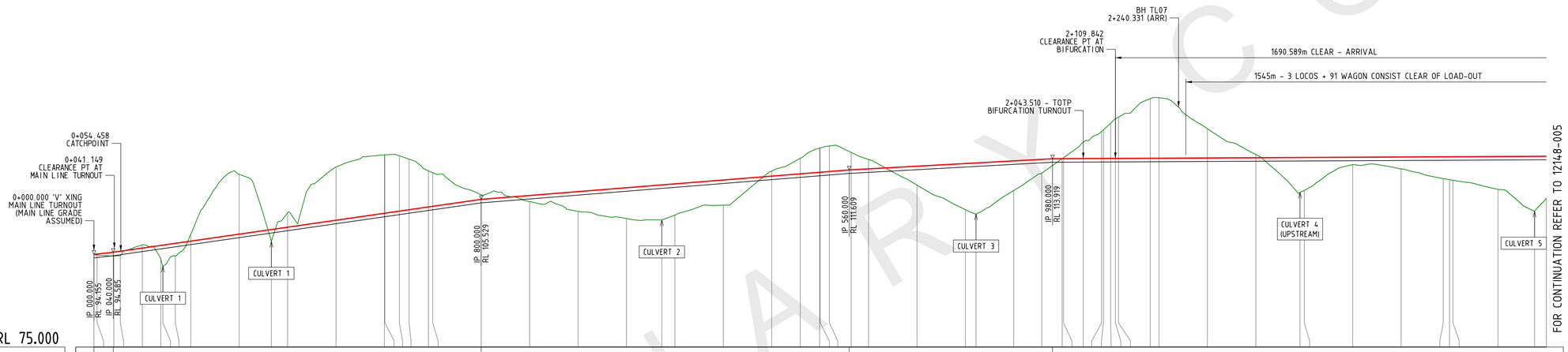

DATUM RL 75.000

PROPOSED GRADES:	L 40.000 GRADE 1.075% · L 760.000 GRADE 1.440% · L 760.000 GRADE 0.800% · L 420.000 GRADE 0.550% · L 2340.000 GRADE 0.050%
PROPOSED RAIL LEVEL:	94.155 94.225 94.601 94.793 95.449 98.329 99.287 99.769 101.209 102.649 102.662 103.094 103.382 103.958 104.089 105.529 106.329 107.129 107.929 108.513 108.729 109.529 110.329 110.801 111.121 111.289 111.631 111.829 112.379 112.929 113.050 113.479 113.797 113.929 113.930 113.971 113.979 113.984 113.987 114.020 114.029 114.079 114.129 114.174 114.179 114.229 114.279 114.322 114.329 114.352 114.379 114.417 114.429
PROPOSED FORMATION LEVEL:	93.435 93.505 93.881 94.073 94.729 97.609 98.567 99.049 100.489 101.929 101.942 102.374 102.662 103.238 103.369 104.809 105.609 106.409 107.209 107.793 108.009 108.809 109.609 110.081 110.401 110.469 110.541 110.911 111.109 111.659 112.209 112.330 112.759 113.077 113.209 113.210 113.250 113.251 113.259 113.264 113.267 113.300 113.369 113.359 113.409 113.454 113.459 113.509 113.559 113.602 113.609 113.612 113.659 113.697 113.709
DEPTH OF FILL:	0.058 0.212 2.119 3.648 1.879 1.719 0.543 3.352 5.640 6.520 5.743 4.483 3.185 8.810 9.840 5.394 2.122 6.473 6.070 0.808 1.738 3.787 4.014 4.138 6.056 10.633 7.933
DEPTH OF CUT:	0.649 0.528 1.383 2.139 13.090 3.678 11.723 12.794 12.788 12.162 11.183 8.196 7.667 1.673 1.782 3.938 5.727 5.708 6.198 4.318 2.667 0.747 0.944 4.125 6.655 7.997 8.932 9.265 13.045 13.349 6.772 1.399
EXISTING SURFACE LEVELS:	94.084 94.033 93.823 93.861 96.112 93.160 91.692 93.832 98.308 110.699 96.848 102.727 112.212 114.723 114.730 114.556 113.845 111.434 111.036 106.482 105.066 103.057 101.569 101.273 102.266 104.326 111.391 114.019 116.128 116.556 116.596 115.229 113.776 108.474 103.399 102.490 107.365 110.955 113.956 114.154 117.250 119.906 121.256 122.196 122.532 126.345 126.352 120.131 114.808 106.981 107.389 112.701 111.821 109.815 109.595 109.474 107.603 103.064 105.776
HORIZONTAL ALIGNMENT:	STR 143.137 · TRS 30.000 · R 1225.000 ARC 432.737 · TRS 30.000 · STR 20.000 · TRS 40.000 · R -1000.000 ARC 768.107 · TRS 45.000 · STR 20.000 · TRS 40.000 · R 525.000 ARC 393.769 · TRS 45.000 · R 500.000 ARC 41.571 · STR 31.046 · STR 40.721 · R -606.400 ARC 65.682 · R -623.871 ARC 605.173 · STR 20.000 · R 250.000 ARC 316.533
METRAGE:	XING 0+000.000 · TOEP 0+006.488 · CLRP 0+041.149 · CPTS 0+054.458 · 0+100.000 · TP 0+138.176 · CULV 0+142.469 · TRS 0+168.176 · 0+200.000 · 0+300.000 · CULV 0+366.533 · 0+400.000 · 0+500.000 · 0+600.000 · TRS 0+600.913 · TP 0+630.913 · TP 0+650.913 · TRS 0+690.913 · 0+700.000 · 0+800.000 · 0+900.000 · 1+000.000 · 1+100.000 · CULV 1+173.050 · 1+200.000 · 1+300.000 · 1+400.000 · TP 1+459.020 · TP 1+499.020 · 1+500.000 · TP 1+539.020 · TRS 1+564.020 · 1+600.000 · 1+700.000 · 1+800.000 · CULV 1+822.042 · 1+900.000 · TRS 1+957.789 · 2+000.000 · TP 2+002.789 · TOTP 2+043.510 · XING 2+085.081 · TOEP 2+100.000 · CLRP 2+109.842 · TP 2+116.127 · CTP 2+181.809 · 2+200.000 · 2+300.000 · 2+400.000 · CULV 2+491.181 · 2+500.000 · 2+600.000 · 2+700.000 · TP 2+786.982 · 2+800.000 · TP 2+866.982 · 2+900.000 · CULV 2+975.660 · 3+000.000

LEGEND

- EXISTING SURFACE LEVEL
- PROPOSED RAIL LEVEL
- PROPOSED FORMATION LEVEL

REV	BY	DATE	DESCRIPTION	APPD
5	RDP	09-10-12	DRAWING NUMBER CHANGED. BOREHOLES SHOWN.	AJP
4	RDP	26-07-12	ALIGNMENT REVISED. CULVERT DETAILS ADDED.	AJP
3	RDP	11-05-12	HORIZ LAYOUT AND GRADES REVISED	AJP
2	RDP	23-08-11	LOOP LAYOUT REVISED. SHEET ADDED.	AJP
1	RDP	12-08-11	FOR CLIENT REVIEW	AJP

CLIENT: THE Bloomfield GROUP

SCALES

VERTICAL SCALE 1 TO 500 — 0 5 10 15 20 25 50 METRES

HORIZONTAL SCALE 1 TO 5000 — 0 50 100 150 200 250 500 METRES

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email: info@rhombergrail.com.au www.rhombergrail.com.au

	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE — JOB No 12148

DRAWING TITLE
PROPOSED COAL LOADING FACILITY
OPTION 1
DEPARTURE ROAD
CONCEPT VERTICAL ALIGNMENT

STATUS: CONCEPT — DRG No 12148-004 — REV 5 — SIZE A1

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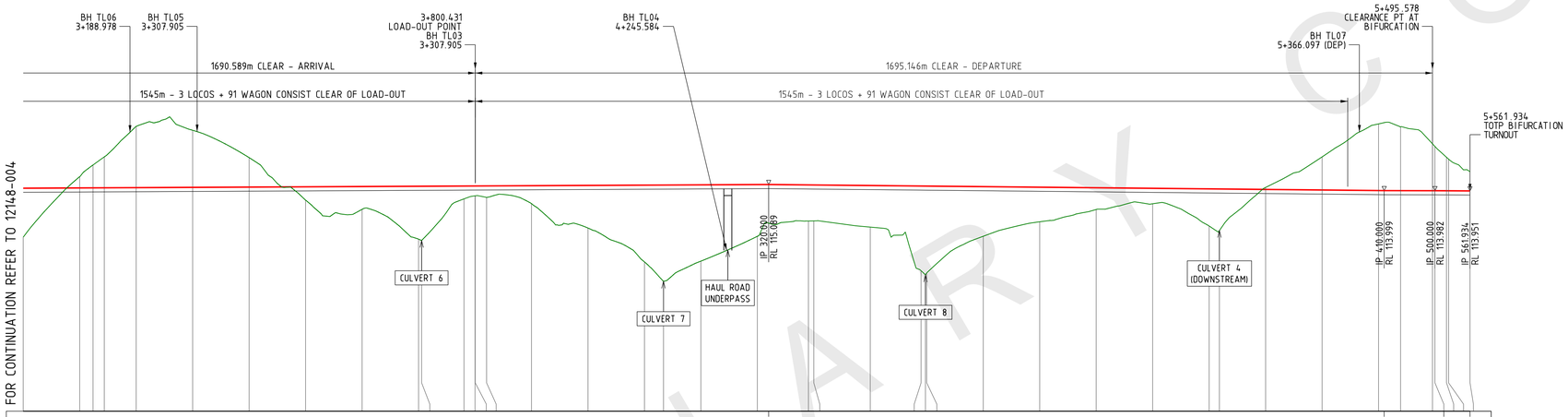
SHEET 1 OF 2



DATUM RL 75.000

PROPOSED GRADES:	L 234.000 GRADE 0.050%; L 1090.000 GRADE -0.100%; L 90.000 GRADE -0.078%; L 61.934 GRADE -0.060%
PROPOSED RAIL LEVEL:	114.429 · 114.479 · 114.491 · 114.501 · 114.529 · 114.579 · 114.629 · 114.679 · 114.729 · 114.779 · 114.782 · 114.819 · 114.829 · 114.839 · 114.879 · 114.929 · 114.979 · 114.996 · 115.029 · 115.079 · 115.018 · 115.009 · 114.909 · 114.819 · 114.811 · 114.809 · 114.709 · 114.609 · 114.509 · 114.409 · 114.309 · 114.291 · 114.209 · 114.109 · 114.009 · 113.993 · 113.982 · 113.982 · 113.971 · 113.951
PROPOSED FORMATION LEVEL:	113.709 · 113.759 · 113.771 · 113.781 · 113.809 · 113.859 · 113.909 · 113.959 · 114.009 · 114.059 · 114.062 · 114.099 · 114.109 · 114.109 · 114.119 · 114.159 · 114.209 · 114.259 · 114.276 · 114.309 · 114.359 · 114.298 · 114.289 · 114.189 · 114.099 · 114.091 · 114.089 · 113.989 · 113.889 · 113.789 · 113.689 · 113.589 · 113.571 · 113.489 · 113.389 · 113.289 · 113.273 · 113.262 · 113.262 · 113.251 · 113.251 · 113.231
DEPTH OF FILL:	7.933 · 1.633 · 3.317 · 8.642 · 8.878 · 1.559 · 1.029 · 1.023 · 1.326 · 2.456 · 6.820 · 12.862 · 16.323 · 12.775 · 8.436 · 5.667 · 5.633 · 6.636 · 14.264 · 14.998 · 14.646 · 8.057 · 5.395 · 3.124 · 2.008 · 5.843 · 6.621
DEPTH OF CUT:	2.723 · 4.772 · 6.193 · 11.561 · 10.821 · 5.928 · 1.079 · 6.578 · 12.514 · 12.025 · 9.030 · 8.554 · 6.657 · 6.672 · 4.725
EXISTING SURFACE LEVELS:	105.776 · 116.482 · 118.543 · 119.974 · 125.370 · 124.680 · 119.837 · 112.326 · 110.692 · 105.417 · 105.184 · 112.540 · 113.080 · 113.086 · 112.793 · 111.703 · 107.389 · 101.397 · 97.953 · 101.534 · 105.923 · 108.631 · 108.656 · 107.553 · 99.835 · 99.093 · 99.443 · 105.932 · 108.494 · 110.665 · 111.681 · 107.746 · 106.950 · 114.568 · 119.967 · 125.803 · 125.298 · 122.292 · 121.816 · 119.908 · 119.576 · 117.356
HORIZONTAL ALIGNMENT:	R 250.000 ARC 316.533 · STR 20.000 · R -250.000 ARC 636.916 · STR 40.000 · R -250.000 ARC 570.028 · STR 199.501 · R 600.000 ARC 849.153 · STR 122.820
METRAGE:	3+000.000 · 3+100.000 · TP 3+123.515 · TP 3+143.515 · 3+200.000 · 3+300.000 · 3+400.000 · 3+500.000 · 3+600.000 · 3+700.000 · CULV 3+705.455 · TP 3+780.431 · 3+800.000 · LOAD 3+800.431 · TP 3+828.431 · 3+900.000 · 4+000.000 · 4+100.000 · CULV 4+133.803 · 4+200.000 · 4+300.000 · TP 4+390.459 · 4+400.000 · 4+500.000 · TP 4+589.961 · CULV 4+597.751 · 4+600.000 · 4+700.000 · 4+800.000 · 4+900.000 · 5+000.000 · 5+100.000 · CULV 5+118.278 · 5+200.000 · 5+300.000 · 5+400.000 · TP 5+439.113 · CLRP 5+495.578 · 5+500.000 · TOEP 5+520.339 · XING 5+536.352 · TOTP 5+561.934

LEGEND

- EXISTING SURFACE LEVEL
- PROPOSED RAIL LEVEL
- PROPOSED FORMATION LEVEL

REV	BY	DATE	DESCRIPTION	APPD
5	RDP	15-11-12	HAUL ROAD UNDERPASS SHOWN	AJP
4	RDP	09-10-12	DRAWING NUMBER CHANGED. BOREHOLES SHOWN.	AJP
3	RDP	26-07-12	ALIGNMENT REVISED. CULVERT DETAILS ADDED.	AJP
2	RDP	11-05-12	HORIZ LAYOUT AND GRADES REVISED	AJP
1	RDP	23-08-11	FOR CLIENT REVIEW	AJP

CLIENT: THE Bloomfield GROUP

SCALES

VERTICAL SCALE 1 TO 500 — 0 5 10 15 20 25 50 METRES

HORIZONTAL SCALE 1 TO 5000 — 0 50 100 150 200 250 500 METRES

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Telephone: +61 2 9644 6044 Facsimile: +61 2 9644 6055
email: info@rhombergrail.com.au www.rhombergrail.com.au

	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE — JOB No 12148

DRAWING TITLE
PROPOSED COAL LOADING FACILITY
OPTION 1
DEPARTURE ROAD
CONCEPT VERTICAL ALIGNMENT

STATUS: CONCEPT — DRG No 12148-005 — REV 5 — SIZE A1

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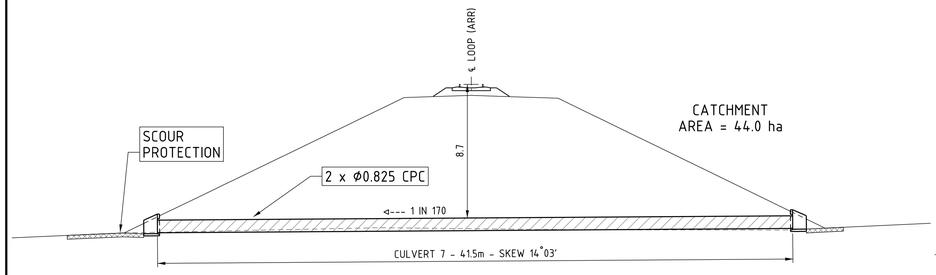
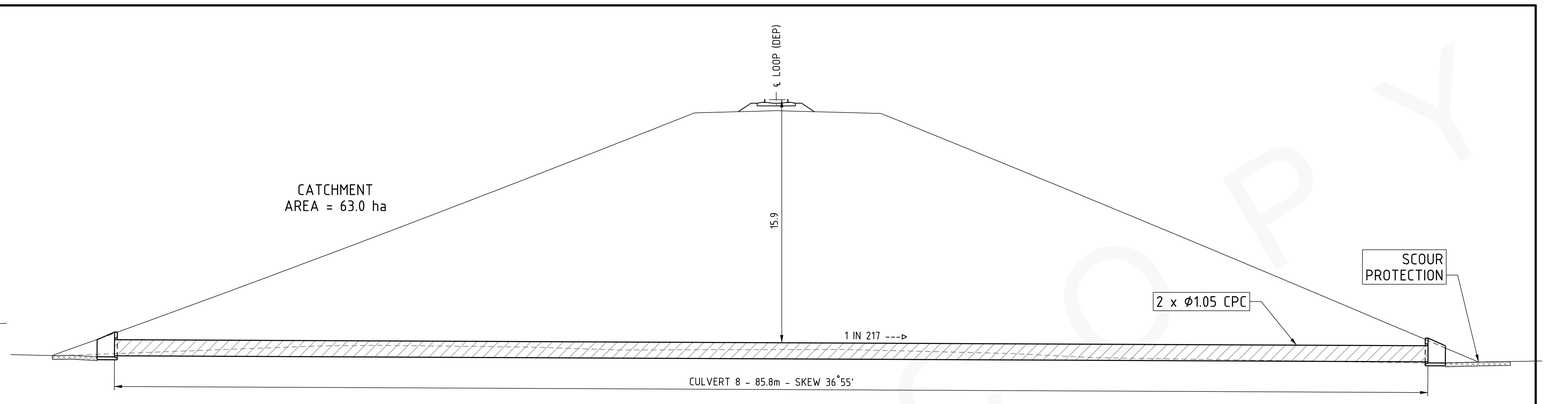
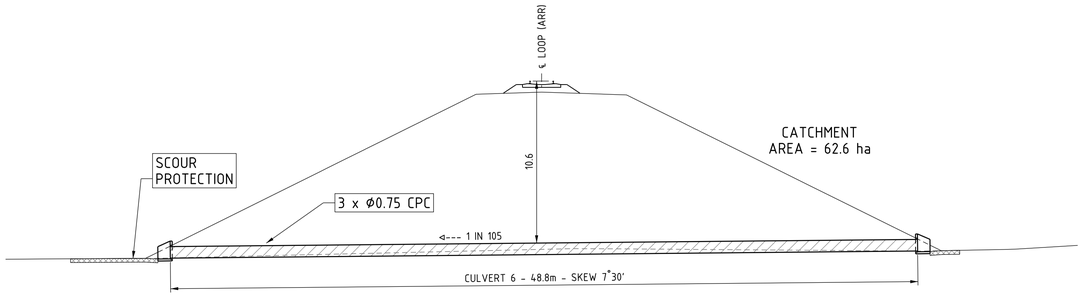


CULVERT 7 - 3+707.208



CULVERT 8 - 4+146.330



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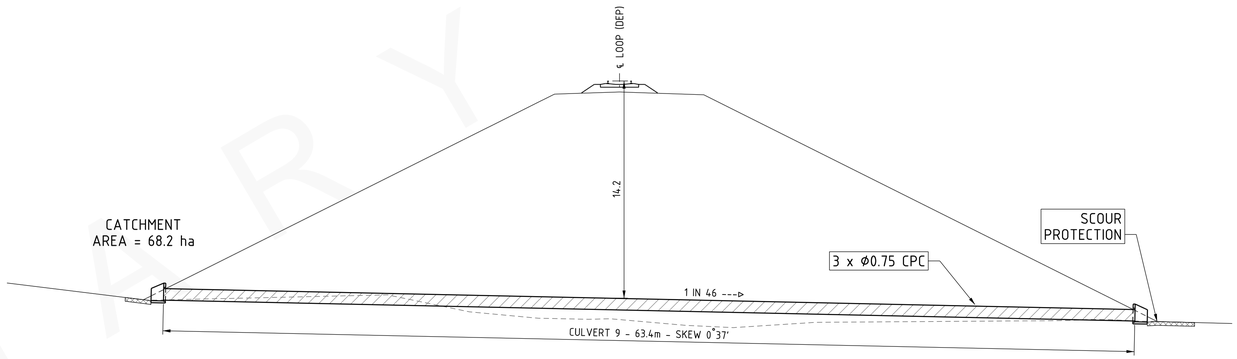

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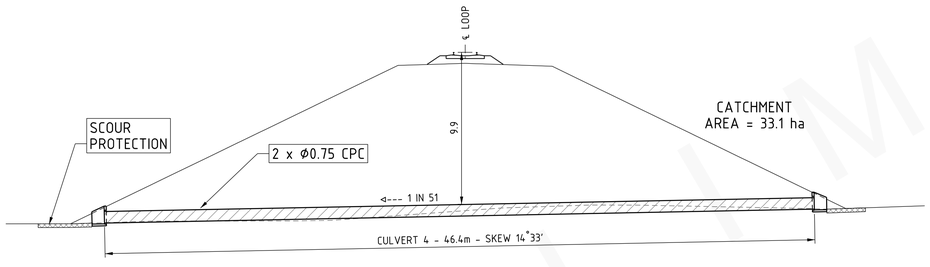

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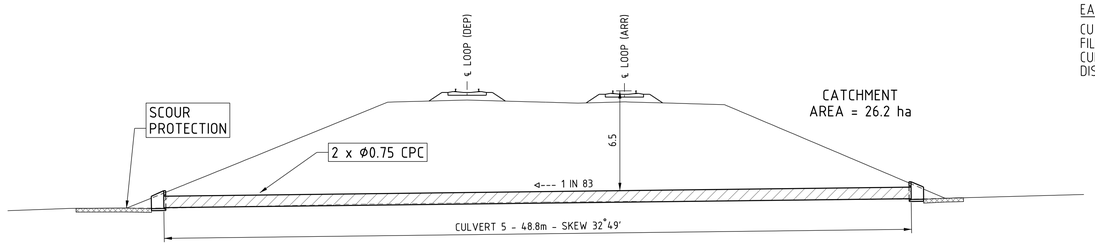
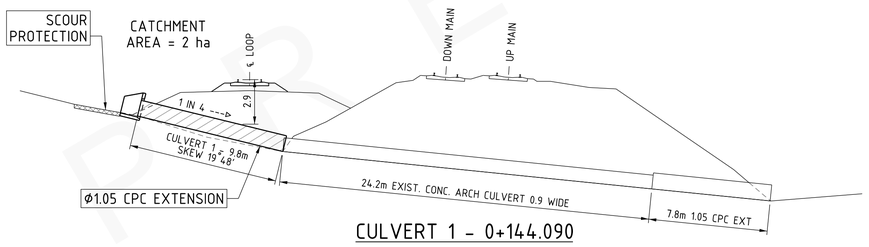


CULVERT 5 - 2+486.066 (ARR) 5+117.607 (DEP)

EARTHWORKS BATTER SLOPES

CUT 1:1½
FILL 1:2
CULVERT CROSS SECTIONS MAY APPEAR DISTORTED DUE TO SKEW ANGLE.



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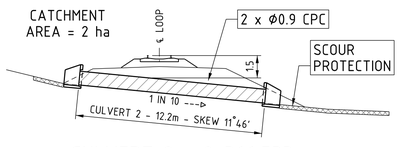
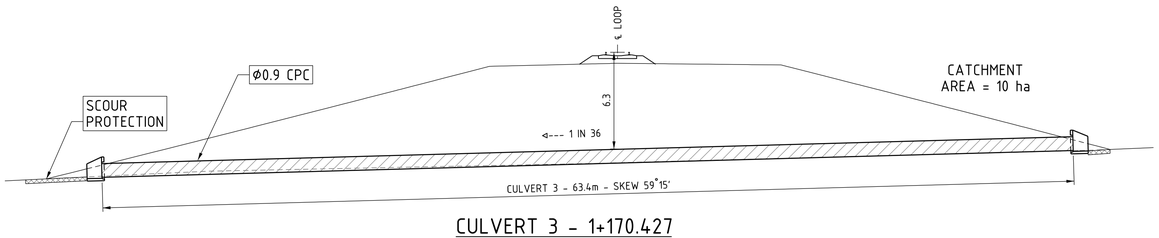


CULVERT 2 - 0+366.533



CULVERT 3 - 1+170.427

NOTES

1. ALL PIPES TO BE CLASS 4 WITH TYPE HS3 TRENCH SUPPORT.
2. SCOUR PROTECTION TO BE ROCK FILLED REVETMENT MATTRESS TYPE OR EQUIV.
3. REFER TO HYDER REPORT F0001-AA005403-AAR-01 FOR ALTERNATE RCBC SIZES.

REV	BY	DATE	DESCRIPTION	APPD
1	RDP	09-10-12	FOR REVIEW	AJP

CLIENT

THE Bloomfield GROUP

SCALES

0 5 10 20
METRES 1 TO 200

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	PREPARED BY	CHECKED BY
DESIGN	RDP	
DRAFTING	RDP	
APPROVED	DATE	

PROJECT: RIXS CREEK MINE — JOB No 12148

DRAWING TITLE
PROPOSED COAL LOADING FACILITY
OPTION 1
PROPOSED CULVERTS
CROSS SECTIONS

STATUS: CONCEPT — DRG No 12148-006 — REV 1 — SIZE A1

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Plotted 10/10/2012 - 11:43:52 AM By: rparsons

Appendix D

Construction Methodology

Appendix D Construction Methodology

Abigroup
Constructing Australia's Future

Construction Methodology

Proposed Rixs Creek Rail Loop
& Associated Infrastructure

Contents

Appendices

Abbreviations

Acronyms	Glossary
AHD	Australian Height Datum
ANZECC	Australian & New Zealand Environment & Conservation Council
AS/NZS	Australian and New Zealand Standard
CEEC	Critically Endangered Ecological Communities
CHMP	Construction Heritage Management Plan
CHPP	Coal Handling & Preparation Plant
CLMP	Contaminated Land Management Plan
Cth	Commonwealth
CTP	Compliance Tracking Program
DSEWPAC	Department of Sustainability, Environment, Water, Population and Communities (Cth)
DoPI	Department of Planning and Infrastructure (NSW)
DPI	Department of Primary Industries (Fisheries, NSW)
EA	Environmental Assessment
EEC	Endangered Ecological Community
Eg	For example
EIN	Environmental Improvement Notice
EIR	Environmental Incident Report
EMP	Environmental Management Plan
EMS	Environmental Management System (as defined under AS/NZS 14001)
ER	Environmental Representative
EPA	Environmental Protection Authority (NSW)
FFMP	Flora and Fauna Management Plan
GPS	Global Positioning System
ISO	International Organisation for Standards
MCoA	Ministers Conditions of Approval
MSDS	Material Safety Data Sheets
NPWS	National Parks and Wildlife Service (NPWS) (incorporated in OEH)
NSW	New South Wales
NoW	NSW Office of Water (NSW)
NVMP	Noise and Vibration Management Plan
RMS	Roads and Maritime Services (RTA, NSW)
OEH	Office of Environment and Heritage (NSW)
SoC	Statement of Commitments
SWMP	Soil and Water Management Plan
WMS	Work Method Statement
WRMP	Waste and Reuse Management Sub-Plan
ESCP	Erosion & Sediment Control Plan
CEMP	Construction Environmental Management Plan

1.0 Introduction & Project Scope

1.1 Introduction

Rixs Creek Mine is proposing the construction of a 5.6km Rail Loop which departs from the Northern Line at approximately 223km 500m. A new train load-out facility and reclaim tunnel would be connected to the existing CHPP via a conveyor. This Construction Methodology document details the construction methods, major plant and equipment, material management arrangements, hours of work, environmental issues and site access.

A Preliminary Programme of Works and a drawing showing proposed construction ancillary facility (site compound, amenities, material laydown, stockpiles, car parking) locations and site access routes are provided in the Appendices.

1.2 Major Construction Activities

Construction and Management activities comprise:

Pre-Construction

Project Management Plans development:

- plans include overarching Project Management Plan(PMP), Work Health & Safety Plan(WHS), Construction Environmental Management Plan(CEMP) specific for the project and in accordance with scope of works and technical criteria, design, and project conditions of approval. A diagram is identifying the typical project management plans and the relations of those plans with Abigroup's integrated management system is provided in Appendix C;
- securing approvals required prior to the commencement of construction, including Early Works EMP if required; and
- providing construction programme and environmental management information for community consultation requirements.

Preliminary activities include:

- establishment site access roads and site compound;
- identification and signage of site services;
- fencing of CEEC's and Heritage sites;
- fencing of the Project Boundary;
- install erosion and sediment controls; and
- construction of transverse (clean water) drainage.

Construction

- Rail Deviation Construction including:
  - clearing vegetation within the nominated construction footprint;
  - stripping & stockpiling topsoil;
  - construction of internal haul roads;
  - bulk earthworks – cut to fill within the rail alignment;
  - bulk earthworks – cut to spoil to designated spoil area;
  - excavation, lay and backfill of drainage pipe culverts;
  - construction of a new concrete culvert to access inside loop;
  - construct visual bund;
  - construction of rail track for loop ;
  - cut and embankment batter stabilisation;
  - landscaping following construction;
- Possession of Railway:
  - Tie-in the new rail deviation to the existing Main Northern Rail corridor;
  - Recondition the existing formation at tie in;

- Post Possession Works including:
  - remove existing track and stack track components for reuse;
- Conveyor, train load out bin, reclaim tunnel;
- Other Construction Work:
  - Site stabilisation and rehabilitation;
  - Landscaping**;**
- Finishing works:
  - Removal of temporary construction compounds;
  - Remove and restore temporary construction compounds; and
  - General site clean-up.

2.0 Construction Method Statement

2.1 Site Establishment & Preparation

2.1.1 Release of Areas Subject to Environmental/Archaeological Inspection

A regime shall be established with the Superintendent's Representative regarding the release of areas subject to environmental/archaeological inspection.

These areas shall be identified at project commencement and fenced/barricaded off and signposted. The workforce will be advised of the locations where access is restricted at the project induction. Written evidence (Hold Point release or similar) shall be provided of the release of these areas prior to construction commencing in these areas.

2.1.2 Ancillary Facilities

The primary site compound with amenities, lunch rooms, training and meeting facilities and associated bathroom amenities will be located as shown on Appendix A. Construction personnel and visitor carparking is also identified on the map in Appendix A.

An additional satellite compound is proposed to be located inside the rail loop and will comprise of a small office, lunch room and bathroom amenities.

Laydown areas, plant and machinery parking & maintenance areas, and stockpile locations will be cleared with a suitable surface established and signposted as part of the Site Establishment programme.

Access tracks will be routed to avoid impact on existing native vegetation and endangered ecological vegetation communities where practical and in accordance with project approvals.

The installation of clean water drainage and diversions as well as erosion and sediment controls as part of the site establishment will ensure early set up of controls that will ensure impacts are kept to a minimum. Similarly the early fencing, barricading

2.2 General Earthworks

2.2.1 Establish Survey Control and Set-out

Survey control will be setup at the commencement of the project by competent surveyors. The set out will be carried out using electronic design information received from the design consultants.

2.2.2 Clearing & Grubbing

The footprint area will be cleared and grubbed as required using a bulldozer and mulching equipment. The mulch will be moved to stockpile sites for later reuse, including for use as erosion and sediment control material during the earthworks phase of the project, as per CEMP.

Where necessary, beneath the formation, grubbing will occur up to a depth of 500mm below natural surface to remove all stumps and tree roots.

2.2.3 Strip Topsoil & Stockpile

Stripping of topsoil will be in accordance with requirements on the drawings; topsoil will be stripped with and transported to nominated stockpile sites within the works.

Topsoil stockpile will be wheel rolled during the stockpiling process to ensure the sides are compacted and stable. All necessary erosion controls will be installed around the topsoil stockpiles in accordance with the Erosion and Sediment Control Plans. Stockpiles may be seeded with a mix of suitable grass species to stabilise the surface and water carts will be available for dust control as required.

2.2.4 Foundation Preparation

Foundation will be jointly inspected by Earthworks Foreman, Geotechnical Representative and Client's Representative following the removal of topsoil, to determine the suitability of the foundation. Any unsuitable material will be removed at this time. After the foundation has been approved, it shall be ripped and compacted to a depth of 150mm.

2.2.5 Removing Unsuitable (Spoil)

All unsuitable areas will be removed by excavator and will be carted using dump trucks to a spoil stockpile. Unsuitable material will be removed as directed by the Geotechnical Representative and Client's Representative.

2.2.6 Access Tracks, Haul Roads

Minimum numbers of haul roads and tracks will be provided to carry out the works in order to minimise the disturbance to the surrounding areas. The major haul route will be along the new rail corridor. Haul roads, where applicable, will require bunds to be constructed on the edges to prevent any vehicle run off and to control stormwater. All haul roads will be adequately built to carry the type of plant utilised for the works. Graders and water carts will be utilised to maintain haul roads, to ensure both the efficiency of the haul, to minimise generation of dust and to maintain drainage to minimise erosion and sediment transport.

A temporary coal haul road will be constructed around and through the works to maintain deliveries to the existing coal loading loop.

A drawing detailing this haul road is included at Appendix A.

2.2.7 Protection of the Work

All works will be protected as necessary during the course of the contract to ensure full compliance with contract specifications. Any identified damage during the course of works to the existing or finished surfaces will be maintained to the satisfaction of principal's representative.

2.2.8 Materials

At this stage it is unknown as to what pavement type materials will be won and processed on site. Depending on the agreed design the materials similar to the types listed below will have to won and processed on site or imported.

- Structural Zone, CBR >30%;
  - RS wall backfill; and
  - General fill, visual bund.
- Stormwater drainage backfill;
  - Capping Layer, CBR > 50%;
  - Drainage blanket rock; and
  - Ballast.

A more detailed material management plan, including the source material to be used and the method of processing, should be produced prior to commencing works. All the materials will be assessed and tested as described in specifications and geotechnical report for the project.

2.2.9 Mass Haul & Material Management

Following an analysis of in-situ materials for the construction a mass haul diagram should be produced to determine the following:

- Location and quantity of material in each structural zone;
- Location and quantity of material required for each embankment;
- Requirements for import material;
- Stockpiling areas; and
- Potential uses for spoil material and disposal provisions.

2.2.10 Blasting

It is likely that hard rock will be encountered and blasting will be necessary through some of the cuttings. A blasting plan will be developed in conjunction with the operations personnel at Rixs Creek and blasting subcontractor. .

2.2.11 Batter Stabilisation

A Geotechnical Consultant will determine if any batter stabilisation will be required.

2.2.12 Timing

The timing for individual activities can be determined from the overall draft Construction Programme. A copy of our programme is included at Appendix B.

2.2.13 Major Plant & Equipment

In general, top soil will be removed by scrapers, with assistance from graders as required. Excavators and moxies will be used to de-silt existing water courses and areas of deeper spoil.

The bulk earthworks will be moved by scrapers, with dozers used to assist loading, as well as dump trucks and excavators.

Compaction will be carried out predominantly using compactors and pad foot rollers. The rolling pattern will be trialled after commencing on site to determine the most effective compaction method.

Graders and water carts will be used for maintaining haul roads, spreading material in the embankments, applying water for conditioning, compaction purposes and dust control.

2.3 Track Works

The main lines adjacent to the works shall be operational during off-line works (except during possessions).

Where works are required adjacent to the operational railway or within the rail corridor, additional controls will be required as follows:

- The rail corridor will be managed as a restricted entry and secure area within the project site. Fencing will be put in place to clearly identify the restricted entry areas;
- All entry and works within the rail corridor will only be undertaken with appropriate safe working arrangements in place and under the control of an appropriate safe working officer;
- All works that are near or may affect the operational railway will be accessed and appropriate safe working arrangements will be put in place prior to the work starting;
- All persons required to work in the rail corridor area will have appropriate certification and inductions; and
- Protection officers as required will be supplied for all activities to manage the safety of railway operations.

Cranes and other plant shall be positioned failsafe to the open roads so that in the event of failure or mishandling, the furthest extent of jib/ boom cannot fall within three metres of the nearest operational line.

2.3.1 Track Construction

On completion of the earthworks and as it becomes available under a staged hand over, bottom ballast installation shall commence by taking delivery of new ballast by road truck and offload directly on to the finished formation A GPS controlled grader is used to trim the ballast to required level and line and the ballast is compacted with a roller.

Sleeper installation shall follow on from bed ballast installation. Sleepers will be delivered by road truck and offloaded by loader in piles to new formation. An excavator and sleeper grab will be used to place sleepers at the correct alignment and spacing on bottom ballast.

The rail will be distributed along the alignment by loader and then lifted in position on the sleepers by excavators. The rails will be clipped up and temporarily jointed.

Top ballast installation shall follow on from the rail placement. Ballast delivered by road to stockpile will be loaded in to moxies to place the ballast along the tracks. The ballast will be positioned by hirailed excavator and ballast regulator ready for tamping of the track.

The tamper will be delivered by road and craned on to the track. The tamper will then place the track to final design line and level. The ballast regulator will profile the ballast to the final shape and then broom the track. The tamper and regulator will be craned between the tracks.

Welding and rail adjusting shall follow on from tamping.

2.3.2 Work in Rail Possession

All work in possessions will be carried out under the required safe working arrangements controlled by suitably qualified safe working officers and with signalling support to ensure the integrity of the signalling system. The possessions used will depend on the possessions available. The following is based on the best information available at the present time.

It is intended to use two possessions to carry out track works.

Possession 1 would be used to carryout formation and install a turnout in the down track. This will involve the removal and replacement of existing track by cutting the rails, removing the rails by excavator and loader, removing the sleepers by excavator and loader and then excavating the existing track using excavators and moxies to allow for the new formation and capping.

The structural material will be placed in two compacted layers on the floor of the excavation that has been trimmed by excavator and proof rolled by roller. Moxies will be used to deliver the material from stockpiles, excavators used to spread the material and an excavator used to trim the layers ready for compacting by roller.

The capping layer will be placed in the same manner and trimmed to final levels and crossfall.

New bottom ballast will be placed and compacted as for track construction.

The sleepers will be placed as for track construction and the rails similarly placed.

Top ballast will be placed as for track construction.

The tracks will be tamped to line and level with the tamper and the ballast profiled to shape and broomed by the ballast regulator.

The rails will then be welded and stress adjusted.

The area of shoulder widening adjacent to the formation reconditioning area will be done during the possession by pulling the ballast shoulder up on the track, boxing out the capping area by excavator then placing capping to the widened area. Capping will be delivered by moxie, spread by excavator, trimmed by traxcavator and compacting by roller.

The shoulder ballast is then replaced by excavator and profiled by the ballast regulator.

The track is then certified for traffic, the signalling system tested and the possession handed back.

Possession 2 will be used to carry out the formation reconditioning and turnout installation on the up track and will follow the same process as above.

2.4 Drainage

Drainage works shall be carried out as soon as possible to enable the site to be well draining and reduce susceptibility to wet weather.

Installation of clean water open drains shall be installed where possible along with the establishment of erosion and sediment controls at the start of the bulk earthworks.

Transverse drainage shall be installed as soon as possible subject to depth of cover over the drainage line, etc.

Stormwater drainage headwalls and outlet structures will be installed progressively along with the pipes, to ensure lines are completed with minimum distribution to the earthworks and follow pavements.

Drainage works within the existing rail corridor will be done under rail possession or appropriate safe working arrangements.

2.5 Signalling

The actual signalling works required will be dependent upon the design in line with the approved ARTC Signalling Functional Specification. This will detail the types of components required to be installed. All signalling civil installation will be carried out carried out in conjunction with the civil works under a joint programme to ensure that all activates are completed in a timely manner to allow commissioning to be carried out at the correct time and to prevent unnecessary rework. This will include the installation of cable routes; signal bases; location bases; relay room bases; train detection systems; and main cable installation etc.

Cable terminations, pre testing, final testing, commissioning, and systems integration will be carried out by the nominated Signalling Design Contractor approved by ARTC. It is expected that these works will be carried out in an existing ARTC main line possession but this will be dependent upon the final complexity of the signalling design.

All signalling is to be installed and tested in as for as possible to be ready for commissioning during the second track possession.

3.0 Conveyor & Train Loading System

The key to the successful construction of this element will be the management of the procurement of the long lead key items. An access route through the Operations Area may be required for some of the larger fabricated items however most deliveries should use the new rail alignment. The area under the proposed coal stockpile would be ideal as a lay-down area for the assembly of the structures.

Reclaim Tunnel would be constructed using the cut and cover method and backfilled using free draining select quality material.

Large concrete footings would be required to support the gantry trestles.

A large lattice boom crawler crane and yard crane and several elevated work platforms would operate during the installation of the phase of the gantry, overhead conveyors and Coal Loading Bin.

4.0 Environmental Requirements

4.1 Control of Erosion & Sedimentation

Prior to commencement of any work, Erosion and Sediment Control measures will be implemented as per the ESCP prepared by specialist Soil Conservationist and approved by client representative ensuring that all existing and finished surfaces are protected from damage due to work activities, contamination from site conditions and any climate conditions, and ensuring no damage would occur beyond the disturbance boundary downstream side of works area. ESCP will always be in place during the course of individual operation and will be amended accordingly with site conditions to suit the works.

All necessary drain paths will be identified to separate clean and dirty water on site and works will be performed for the diversion, restriction or management of any flow or seepage of surface or ground water around the works for water runoff. The plan will be prepared to show dispersing of clean water either in stable areas or natural watercourses, while all measures (sediment traps, basins) will be taken to collect dirty water and re-use it for site works.

4.2 Temporary Drains

Catch drains will be formed along haul roads and access tracks for any potential hazards due to their steepness or soil erodibility. All drains will be formed to intercept and divert run off from roads to stable outlets. The configuration of these drains will include check dams, sand bags to decelerate runoff to non-erosive velocities.

All drains will be formed with adequate plant type, capacity to perform the works.

4.3 Temporary Sedimentation Control Works

Temporary sediment trapping devices will be installed downstream of the embankment works area within the Disturbance Boundary. They will be provided during construction to filter sediment-laden runoff or water from dewatering operations. They will be positioned to filter sediment before crossing the Disturbance Boundary and entering the natural watercourses downstream of the works area.

4.4 De-Watering

All water will be sampled, analysed and results assessed to ensure that any dewatering will comply with any Environment Protection Licence and/or the requirements of Section 120 of the Protection of the Environment Operations Act 1997. All dewatering activities will be in accordance with the Dewatering Procedures within the Soil & Water Management Plan and subject to a Dewatering Permit issued by the Environmental Coordinator. All dewatering activities are monitored with records maintained by the Environmental personnel.

5.0 Testing & Inspection

A quality plan will be submitted prior to the commencement of works.

A NATA accredited testing authority will be employed to undertake all testing of earthworks and concrete on site.

All select materials to be incorporated into the works will be tested and certificates attached to quality documents.

6.0 Dust Control

All works will be conducted as per CEMP, for the suppression of dust control; any exposed areas which allow revegetation to be used as dust control barrier, (Stockpiles, Mounds) will be applied as soon as practical, otherwise, a water cart will be allocated for works in areas, where dust control during earthworks operations is required.

7.0 Noise Mitigation

As the works include large sized plant and equipment, a noise control plan will also be implemented to ensure works are conducted within given time frames, affording no disturbance to the surrounded community.

If required the works to be conducted outside of times, then the affected community will be notified prior to works conducted and with Principal's representative's approval.

Construction Activity	Plant & Machinery	Daily Use
Site Establishment & Preparation	Franna telescopic crane	2
	Semi-trailers	5
	Light trucks	2
	Light vehicles	6
	Excavator 30t	2
	Dozer D6	1
	Grader 14	1
Clearing & Grubbing	Excavator/Cutter 30t	1
	Dozer D6	1
	Mulcher	1
Topsoils Stripping & Stockpiling	Wheeled Roller	1
	CAT 637 Scrapers	2
	Grader 14	1
	Excavator 30t	2
	Water Cart	1
Removing Unsuitable	Excavator 30t	2
	Dump trucks 30t Moxy	2
Access Track & Haul Roads	Graders 14	1
	Water Cart	1
Bulk Earthworks	CAT 651 Scrapers	6
	Dozer D11	1
	Dump trucks 30t Moxy	2
	CAT 825 Compactors	2
	Pad Foot Rollers	2
	Light Vehicles	6
	Excavator 30t	2
	Water Cart	2
Track Construction	Truck & Dog trucks	4
	Excavator 30t	2
	Roller	2
	Loader	2
	Komatsu PC228 Hirailed Excavator	1
	Jackson Tamper	1
	Ballast Regulator	1
	Crane 100t	1
	Dump trucks 30t Moxy	4
Drainage	Excavator 30t	2
	Semitrailers	2
	Crane 20t	1

Construction Activity	Plant & Machinery	Daily Use
Conveyor & Train Loading System	Yard Crane	2
	Lattice Boom Crawler	2
	Semitrailers	4
Revegetation	Hydromulcher/Seeder	1
	Light vehicles	2
	Water Cart	1

8.0 Revegetation

Revegetation of disturbed areas and any areas beyond the embankment footprints will take place as soon as any of the area is available, to reduce any chances of erosion and to have permanent vegetation as a barrier for water runoff.

Hydro seeding will be applied by an approved process and will include one application over each area. It will commence as soon as topsoiling is completed.

Storage tanks, containers and equipment used in the hydro seeding and mulching will be clean and free of contamination from previous operations.

Mulch placement methods will be approved by the Principal's Representative prior to the commencement of mulching.

9.0 Plant & Equipment

9.1 Earthworks and Drainage

For the cut to fill operation, the earthmoving equipment used would most probably incude:

- 651 and 637 Scrapers;
- Dump Trucks;
- D11 or D6 bulldozers;
- Water Carts;
- Cat 825 compactors; and
- Cat 14 graders.

Other equipment, such as rollers, excavators, articulated dump trucks, backhoes and loaders and tippers will also be required.

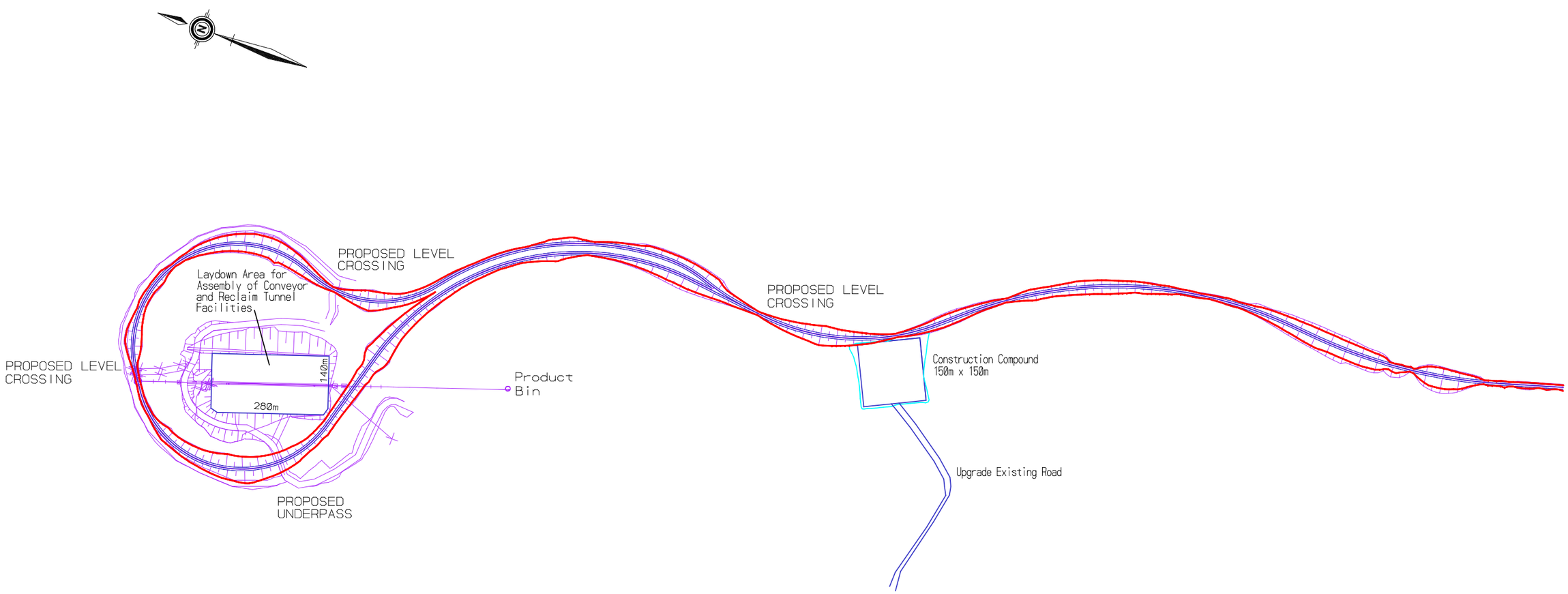
9.2 Rail Works

Specialised rail equipment will be required for the ballast, sleeper laying and rail works. This will utilize a Jackson Tamper, ballast regulator and Komatsu PC228 hirail excavator.

Where required, these will be supplemented by other equipment for the rail possession works. Plant required for these operations includes excavators, moxie dump trucks and compactors.

Appendix A

Layout Drawing



REV	ZONE	AMENDMENTS	APP'D	DATE

GENERAL NOTES / REFERENCES

Abigroup
Hunter Regional Office
Unit 2/4 Birraba Ave
Beresfield NSW 2322
Ph 02 4028 6690

SURVEYED / DRAWN BY

CHECKED

VERIFIED

H:10000 V:10000

PLOT DATE: Wed Aug 01 12:10:14 2012 LOCATION :

RIXS Creek Rail Loop

DRAWING STATUS | DRAWING No. | REV.

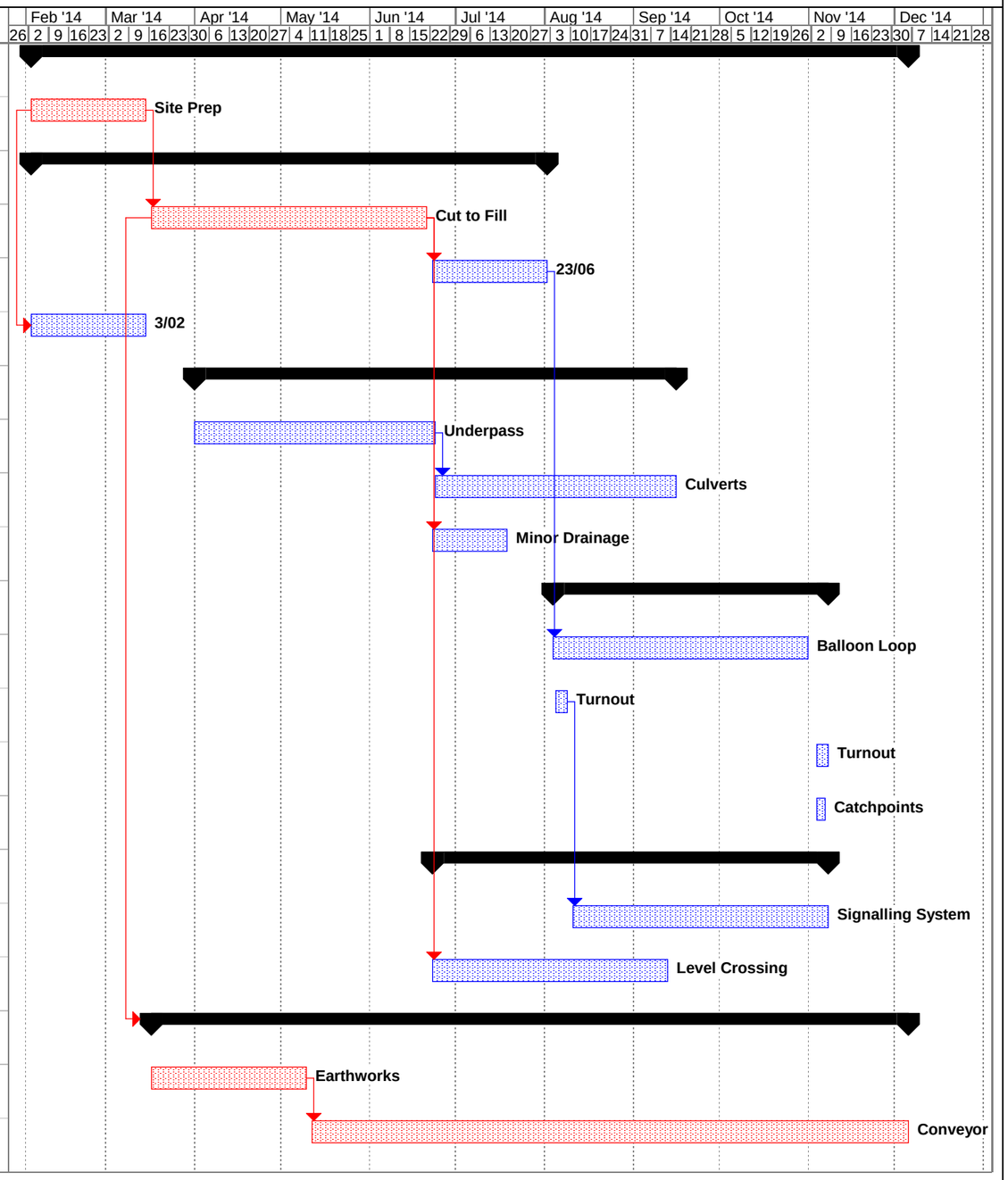
ABIGROUP STANDARD DRAWING EDITION 17/01/2012

Appendix B

Draft Programme – Level 1

ABIGROUP CONTRACTORS
Rixs Creek Rail Loop

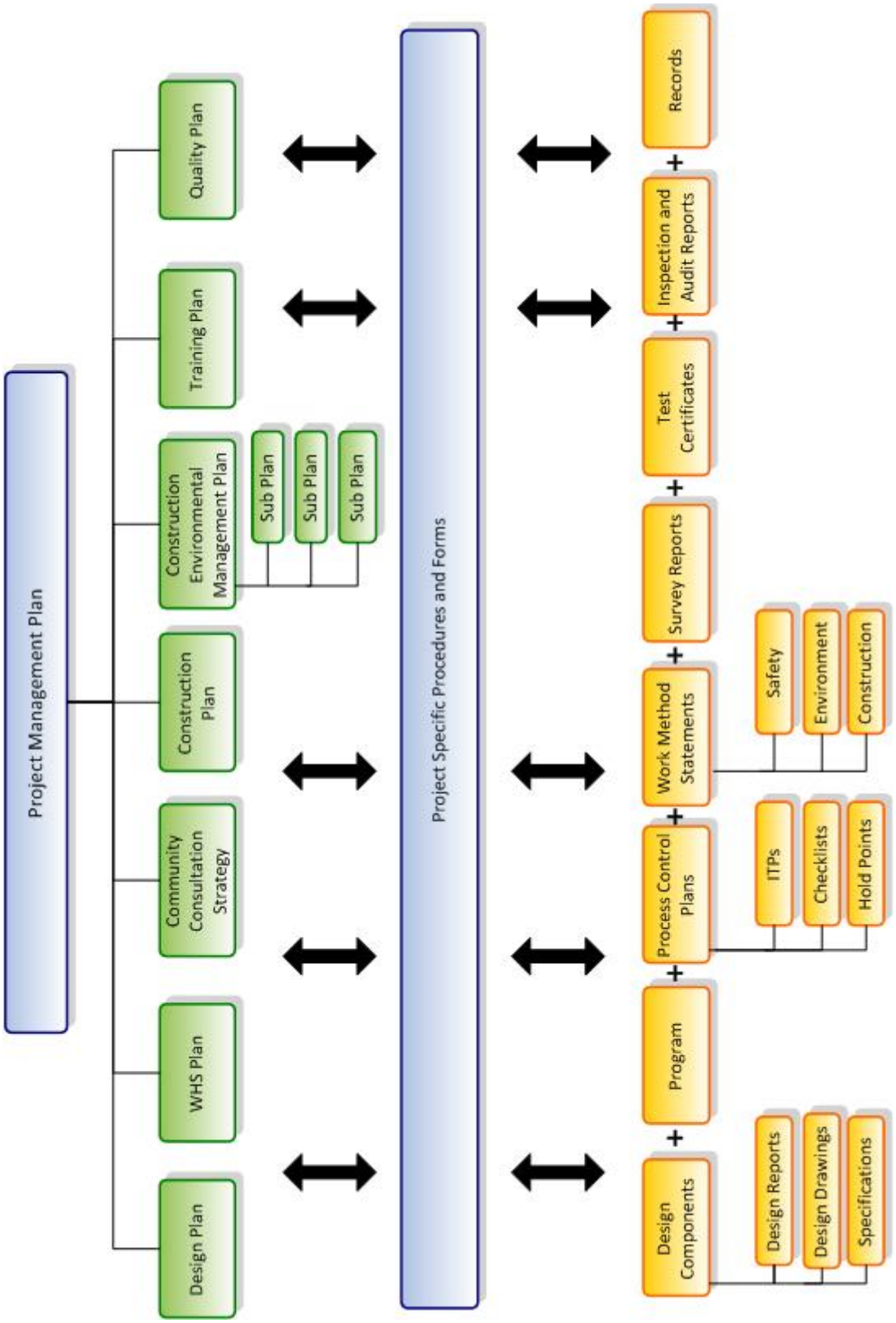
ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	**Project Duration**	**220 days**	**3 Feb**	**5 Dec**		
2	Site Preparation Works	30 days	3 Feb	14 Mar		Site Prep
3	**Earthworks**	**130 days**	**3 Feb**	**1 Aug**		**Earthworks**
4	Cut to Filll (500,000m3)	70 days	17 Mar	20 Jun	2	Cut to Fill
5	Import, place and compact capping (30,000m2)	30 days	23 Jun	1 Aug	4	capping
6	Corridor Fencing (8km)	30 days	3 Feb	14 Mar	2SS	fencing
7	**Civil Works**	**120 days**	**1 Apr**	**15 Sep**		**Civil Works**
8	Large Underpass for loop access	60 days	1 Apr	23 Jun		Underpass
9	New Draianage Culverts (x 5)	60 days	24 Jun	15 Sep	8	Culverts
10	Minor drainage and batter stabilisation	20 days	23 Jun	18 Jul	4	Minor Drainage
11	**Trackwork**	**70 days**	**4 Aug**	**7 Nov**		**Trackwork**
12	Track (Spur and Balloon Loop 5600m)	65 days	4 Aug	31 Oct	5	Balloon Loop
13	Possession 1	4 days	5 Aug	8 Aug		Turnout
14	Possession 2	4 days	4 Nov	7 Nov		Turnout
15	New Catchpoints	3 days	4 Nov	6 Nov		Catchpoints
16	**Signalling**	**100 days**	**23 Jun**	**7 Nov**		
17	New Signalling System	65 days	11 Aug	7 Nov	13	Signalling System
18	Level Crossings x 3	60 days	23 Jun	12 Sep	4	Level Crossing
19	**Conveyor and Train Loading System**	**190 days**	**17 Mar**	**5 Dec**	**4SS**	
20	Earthworks and Drainage	40 days	17 Mar	9 May		Earthworks
21	Conveyor, bins and Train Loading system	150 days	12 May	5 Dec	20	Conveyor



Appendix C

Example Project Management Plan Integration

Figure 1: Example Project Management Plan and Management System Integration



Appendix E

Signalling Report

Appendix E Signalling Report

Rix's Creek Loop

for

Rhomberg Australia

Version	Date	History
0.1	21 Nov 2012	Draft
0.2	23 Nov 2012	Issued

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Table of Contents

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1 The Brief

To estimate the effect of the planned Rix's Creek Loop on the headway and hence capacity of the existing main line.

2 Methodology

An OpenTrack model of Rix's Creek Loop was constructed using data provided by Rhomberg (see assumptions sheet for details). The Rix's Creek Loop model was then spliced into the existing OpenTrack Defined Interstate Network model.

Five OpenTrack single train runs were performed and data to determine resulting headways recorded. Data recorded included velocity versus distance, time versus distance, train diagrams, track occupancy and signal states.

The 5 single train runs consisted of

- A Northbound empty through coal train on the main line.
- A Southbound loaded through coal train on the main line.
- An empty coal train arriving at Rix's creek loop loader.
- A loaded coal train departing Rix's creek loop loader with the departing train having to stop at the loop exit signal (for 0 seconds) before restarting and proceeding onto the main line.
- A loaded coal train departing Rix's creek loop loader with the loop exit signal set to green at a time such that the departing coal train does not have to slow at all for the exit signal.

Northbound trains where started far back enough to ensure that they were doing maximum speed (given constraint of physics and speed limits) by the time they passed Singleton.

Southbound trains where started far back enough to ensure that they were doing maximum speed (given constraint of physics and speed limits) by the time they passed Camberwell Junction.

Results for the 5 runs are contained in speed versus distance diagrams for each run (this is Attachment 1), blocking time stairways train diagram for each run (this is Attachment 2), and a signal aspect chart for each run (this is Attachment 3).

For this report headway for trains on the Down Main are calculated as the time for the signal (CL1) before the Rix's Creek loop turnout to cycle from green to red through to green again. Headway for trains on the Up Main are calculated as the time for the signal (1526) before the turnout from Rix's Creek loop via the Down main to cycle from green to red through to green again.

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3 Results

The table below shows the headways required at the 3 down main signals nearest to the Rix's Creek loop turnout. Times have been rounded up to the nearest minute. Headways have been calculated using the signal aspect charts in Attachment 6.

Table of Down main signal headways required

Train run	Headway at Down Main Signal (minutes)			Largest headway required (out of 3 signals before loop)
	Signal 1489	Signal 1497	Signal CL1	
Northbound empty through coal train	6	7	7	7
Empty coal train inbound to Rix's Creek loop loader	5	4	3	5
Loaded outbound coal train departing Rix's Creek loop - which has to stop at loop exit signal	7	7	7	7
Loaded outbound coal train departing Rix's Creek loop - which does not have to stop at loop exit signal	7	7	7	7

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The table below shows the headways required at the 3 up main signals nearest to the cross over from Rix's Creek loop turnout. Times have been rounded up to the nearest minute. Headways have been calculated using the signal aspect charts in Attachment 6.

Table of Up main signal headways required

Train run	Headway at Up Main Signal (minutes)			Largest headway required (out of 3 signals before crossover from loop)
	Signal 1536	Signal CL2	Signal 1526	
Southbound empty through coal train	3	7	5	7
Loaded outbound coal train departing Rix's Creek loop - which has to stop at loop exit signal	5	8	8	8
Loaded outbound coal train departing Rix's Creek loop - which does not have to stop at loop exit signal	5	8	8	8

4 Summary

Unloaded Northbound through coal trains on the down main require a headway of 7 minutes between Singleton and the proposed Rix's Creek loop. Unloaded coal trains heading to Rix's Creek loop loader require a headway of 5 min between Singleton and the Rix's Creek loop.

This means that unloaded coal trains inbound to Rix's Creek loop requires a headway on the down main that is 2 minutes less than through coal trains require.

Loaded Southbound through coal trains on the up main require a headway of 7 minutes between Camberwell Junction and Rix's Creek loop. Loaded coal trains outbound from Rix's Creek loop would require a headway on the up main of 8 minutes which is one minute more than for a through coal train on the up main.

Loaded coal trains outbound from Rix's Creek loop would also require a headway on the down main of 7 minutes.

Thus the major operational change that would result from trains servicing Rix's Creek loop would be to increase the required down main headway by 7 minutes per Rix's Creek loop outbound train.

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This study has not looked at Camberwell loop but it should be noted that coal trains servicing Camberwell loop are expected to have a similar effect on headway to those serving the proposed Rix's Creek loop, so that the line capacity through is not likely to be effected differently by coal trains servicing Rix's Creek loop compared to coal trains already servicing Camberwell loop.

Camberwell loop is on the opposite side of the line to the proposed Rix's Creek loop, so that in the case of Camberwell loop it is the inbound empty trains which create delay for though trains on the up main, rather than outbound loaded trains which create delay for down main trains as in the case of Rix's creek loop.

It is concluded that the construction of Rix's Creek loop should not have any adverse impact on corridor capacity.

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Attachment 1 Speed versus distance diagrams

The following speed versus distance diagrams are graphs of train speed versus train location (or distance). The distance axis is the distance of the train from the original of the train's journey, it is not the kilometrage. The zero kilometre point is simply a point chosen so as to ensure the train is doing maximum speed by the time it passes signals of interest.

The green lines in the following speed versus distance graphs are the train's actual speed, while the black lines are the line speeds.

Not shown is the wagon max speed which was 65 km/h for loaded trains and 80 km/h for unloaded trains.

See assumption sheet for consist details.

Under each graph distance axis the locations of signals and stations (or timing points) is indicated.

Speed vs. distance diagram are provided for

- An unloaded through coal train from Singleton to Mt. Walker.
- A loaded through coal train from Mt. Walker to Singleton.
- An unloaded coal train from Singleton to Rix's Creek Coal Loader.
- A loaded coal train from Rix's Creek Coal Loader to Singleton - No stop at loop exit signal.
- A loaded coal train from Rix's Creek Coal Loader to Singleton – Stopping at loop exit signal.

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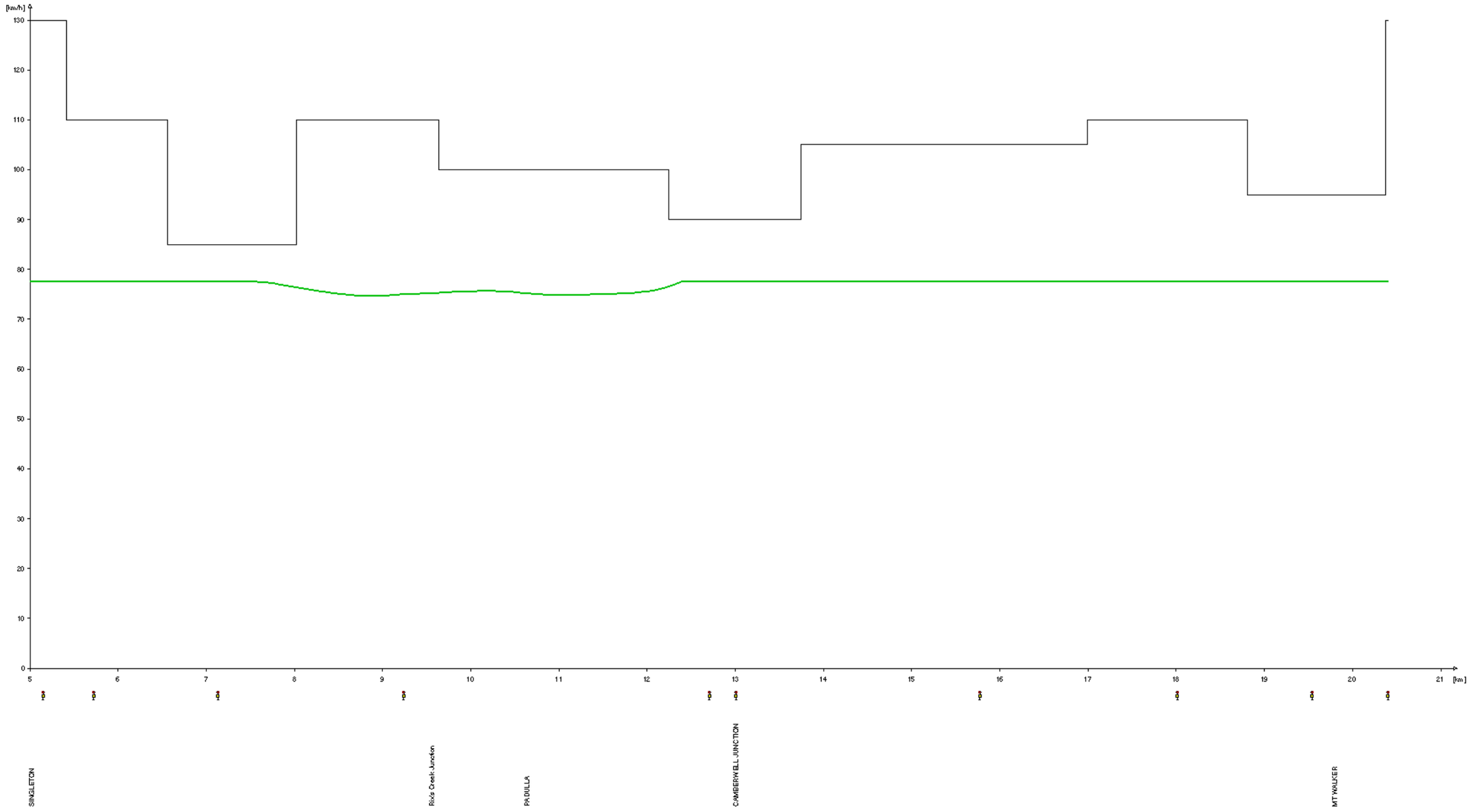
Speed vs. distance diagram for unloaded through train from Singleton to Mt. Walker



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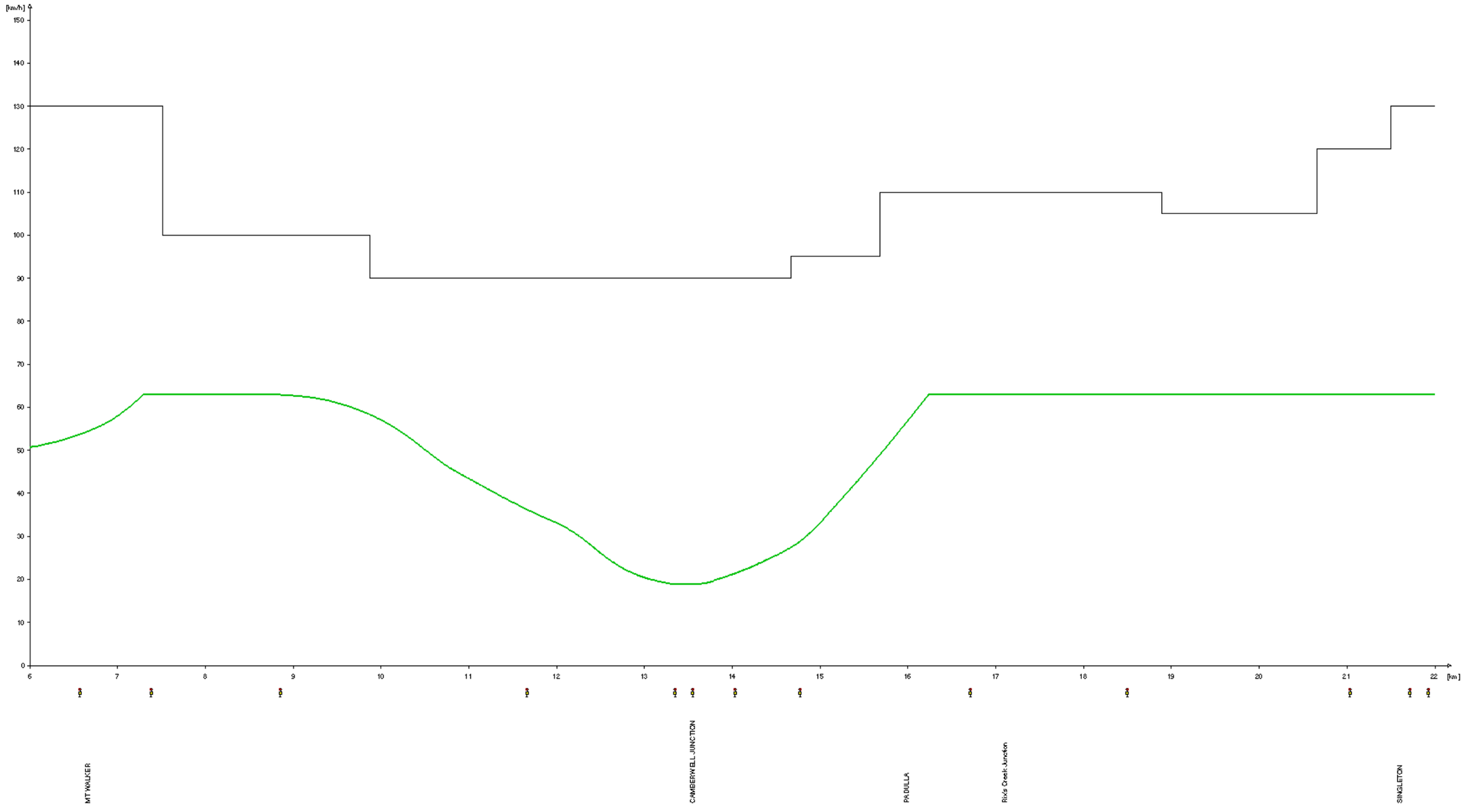
Speed vs. distance diagram for loaded through train from Mt. Walker to Singleton



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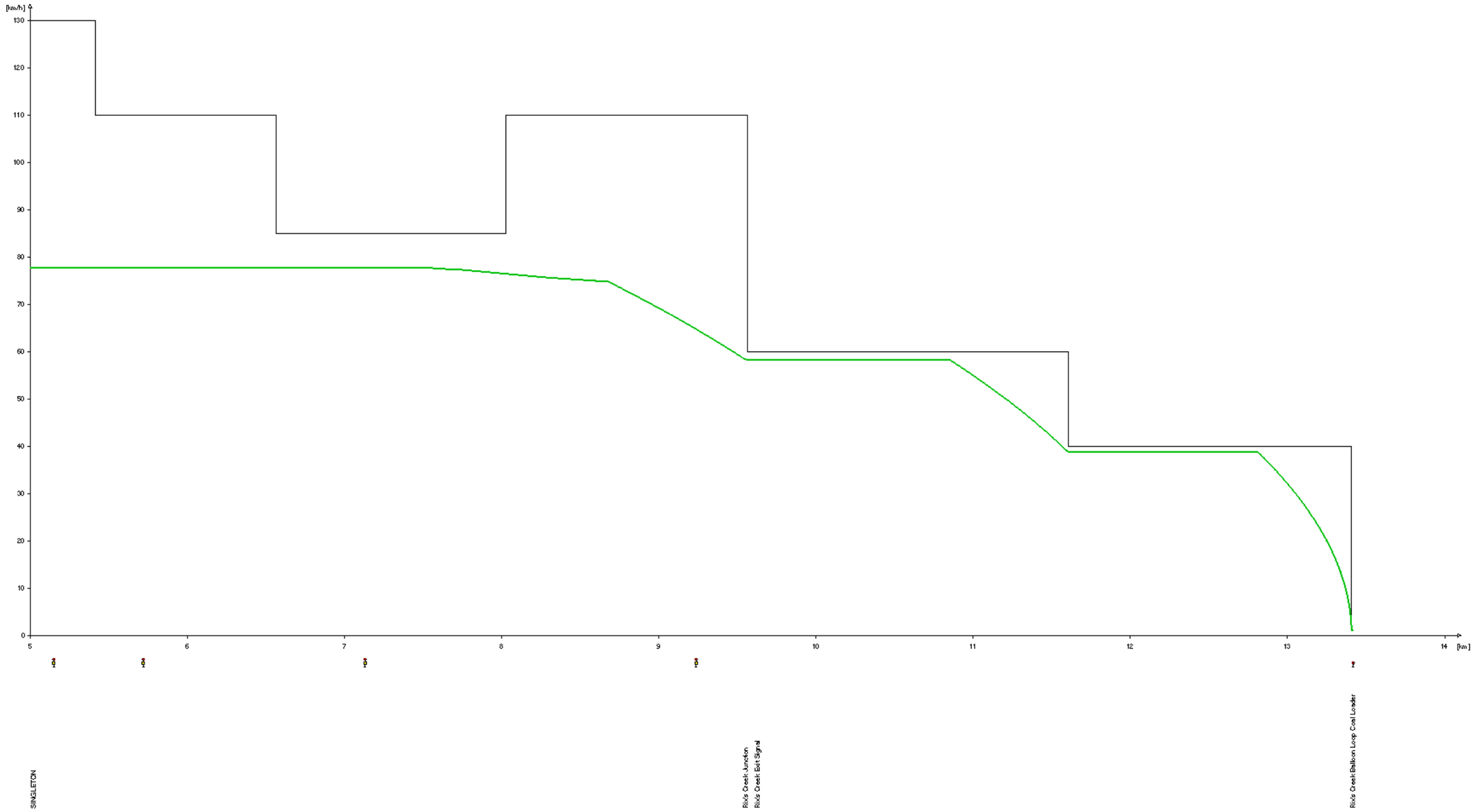
Speed vs. distance diagram for unloaded train from Singleton to Rix's Creek Coal Loader



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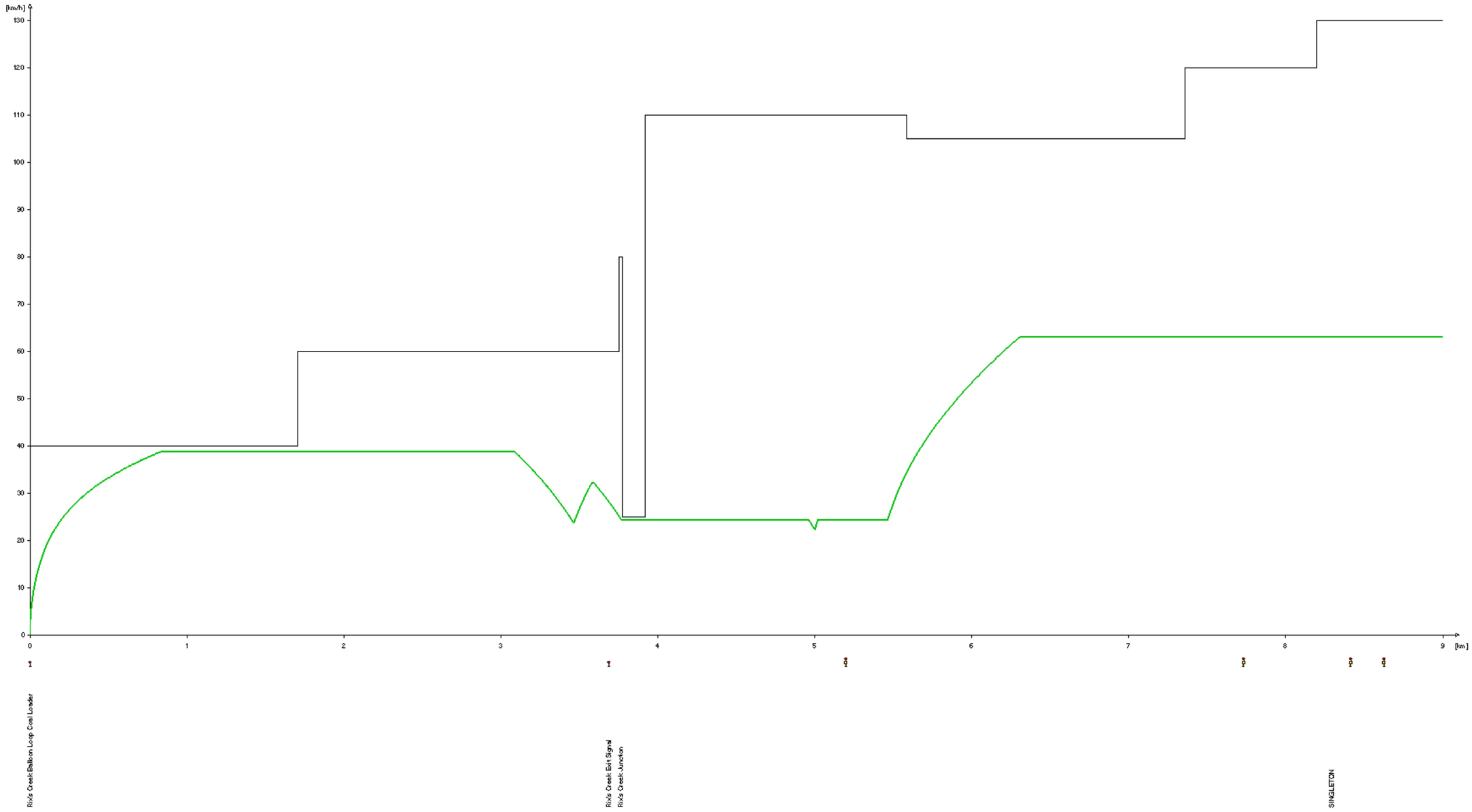
Speed vs. distance diagram for loaded train from Rix's Creek Coal Loader to Singleton - No stop at loop exit signal.



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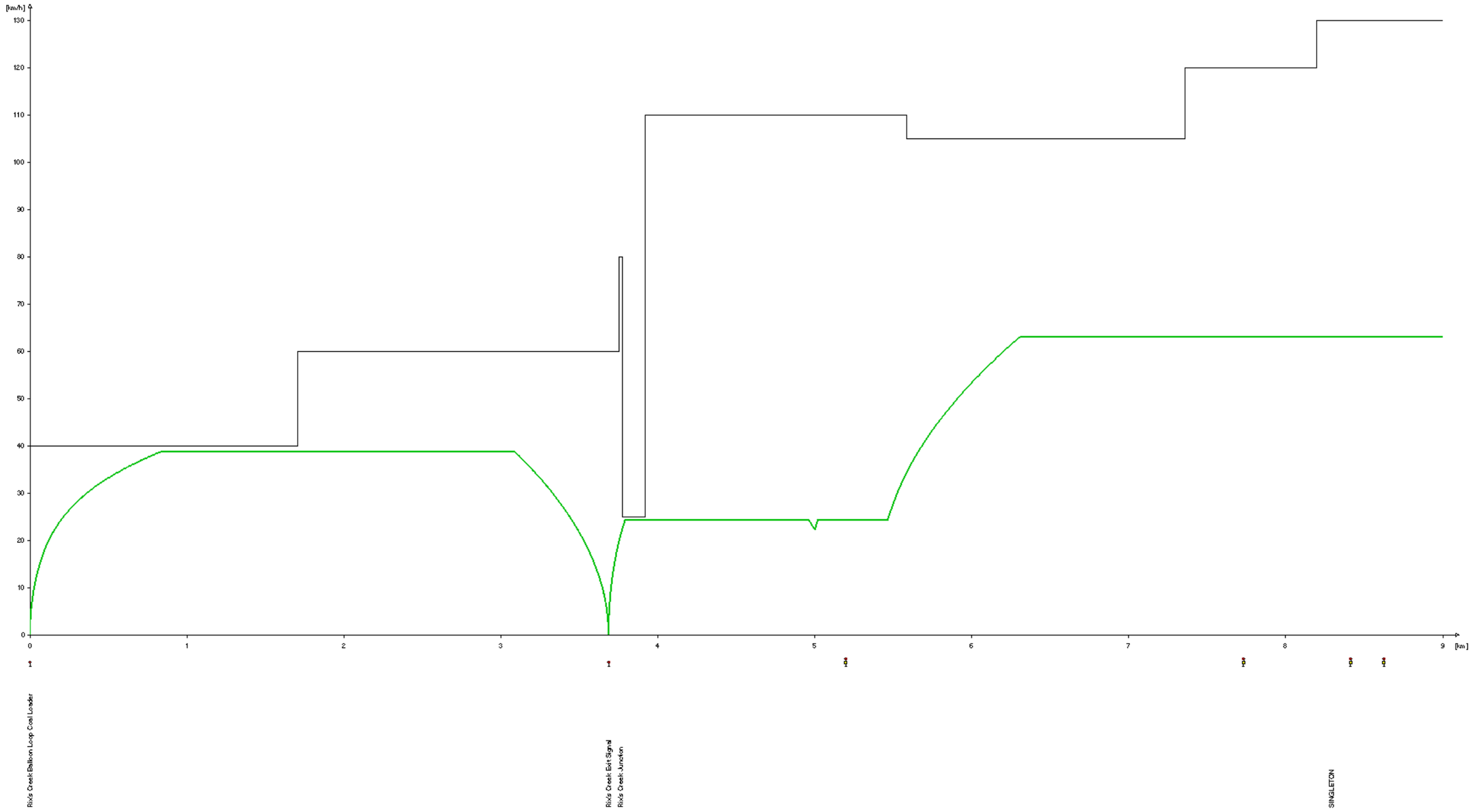
Speed vs. distance diagram for loaded train from Rix's Creek Coal Loader to Singleton – Stopping at loop exit signal



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Attachment 2 Blocking time stairways diagrams

The following blocking time stairways diagrams are graphs of train distance versus time combined with a green shaded area which indicates which section of track was reserved for the train at each instant in time.

The vertical axis of the graphs is distance along the track while the horizontal axis is time.

The horizontal tops of the “stairs” correspond to signal locations (distance at which signal is located).

The vertical slopes on the “stairs” correspond to points in time at which the section of track up to the signal has been reserved for use by the train or when it has been released from use by the train.

Blocking time stairways diagrams are provided for

- An unloaded through coal train from Singleton to Mt. Walker.
- A loaded through coal train from Mt. Walker to Singleton.
- An unloaded coal train from Singleton to Rix’s Creek Coal Loader.
- A loaded coal train from Rix’s Creek Coal Loader to Singleton - No stop at loop exit signal.
- A loaded coal train from Rix’s Creek Coal Loader to Singleton – Stopping at loop exit signal.

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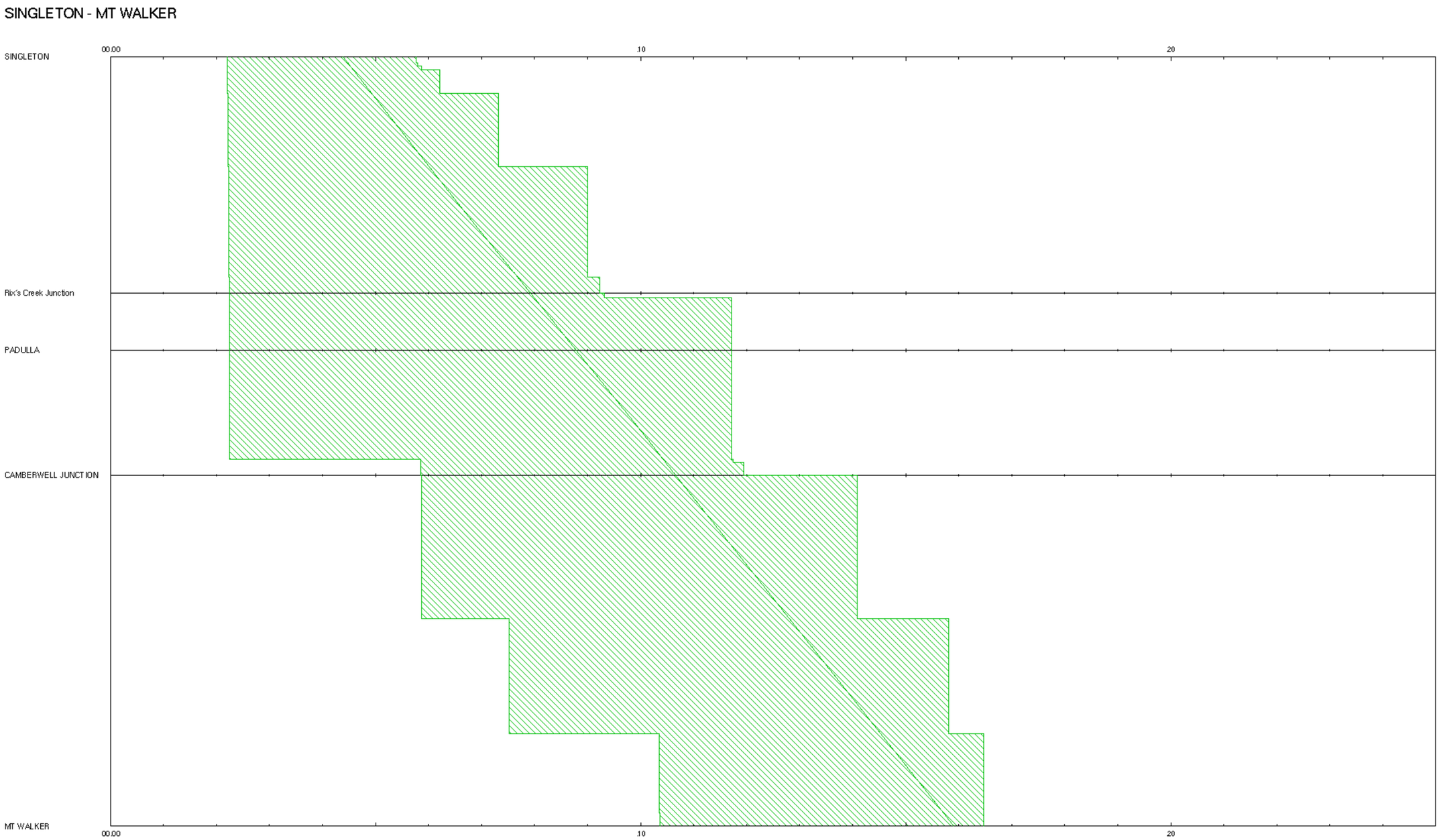
Blocking time stairways diagram for unloaded train from Singleton to Mt. Walker



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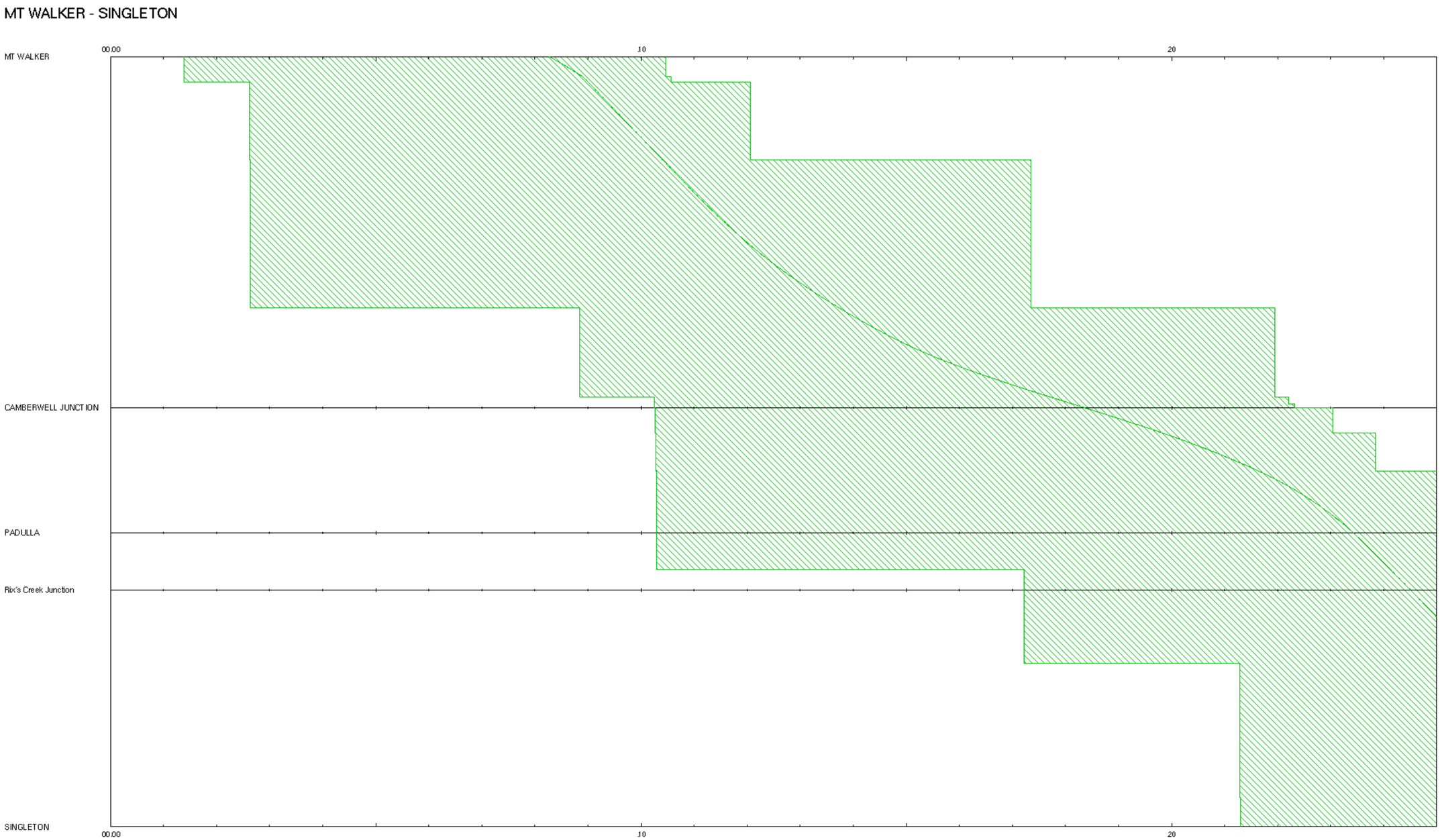
Blocking time stairways diagram for loaded train from Mt. Walker to Singleton



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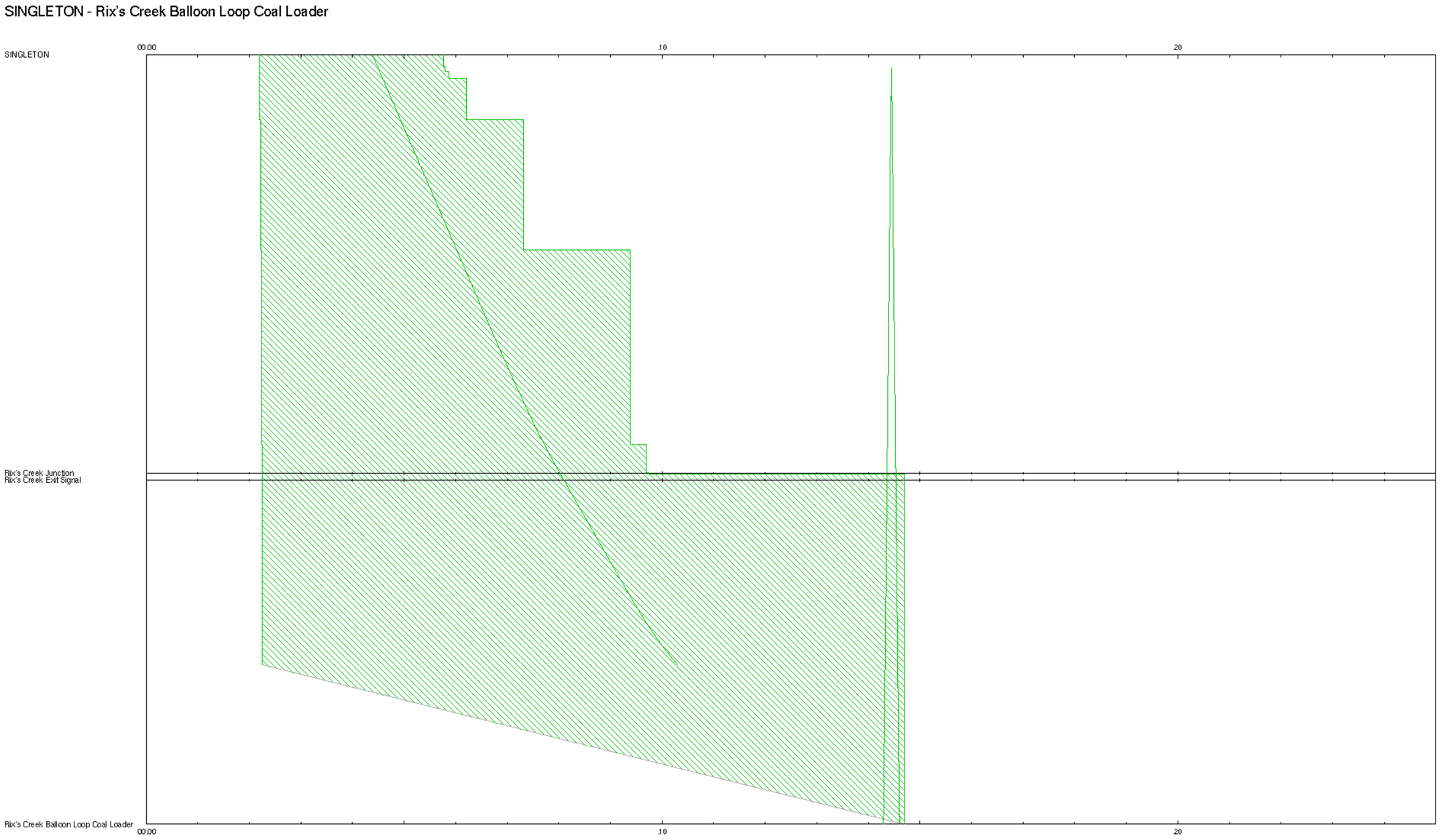
Blocking time stairways diagram for unloaded train from Singleton to Rix's Creek Coal Loader



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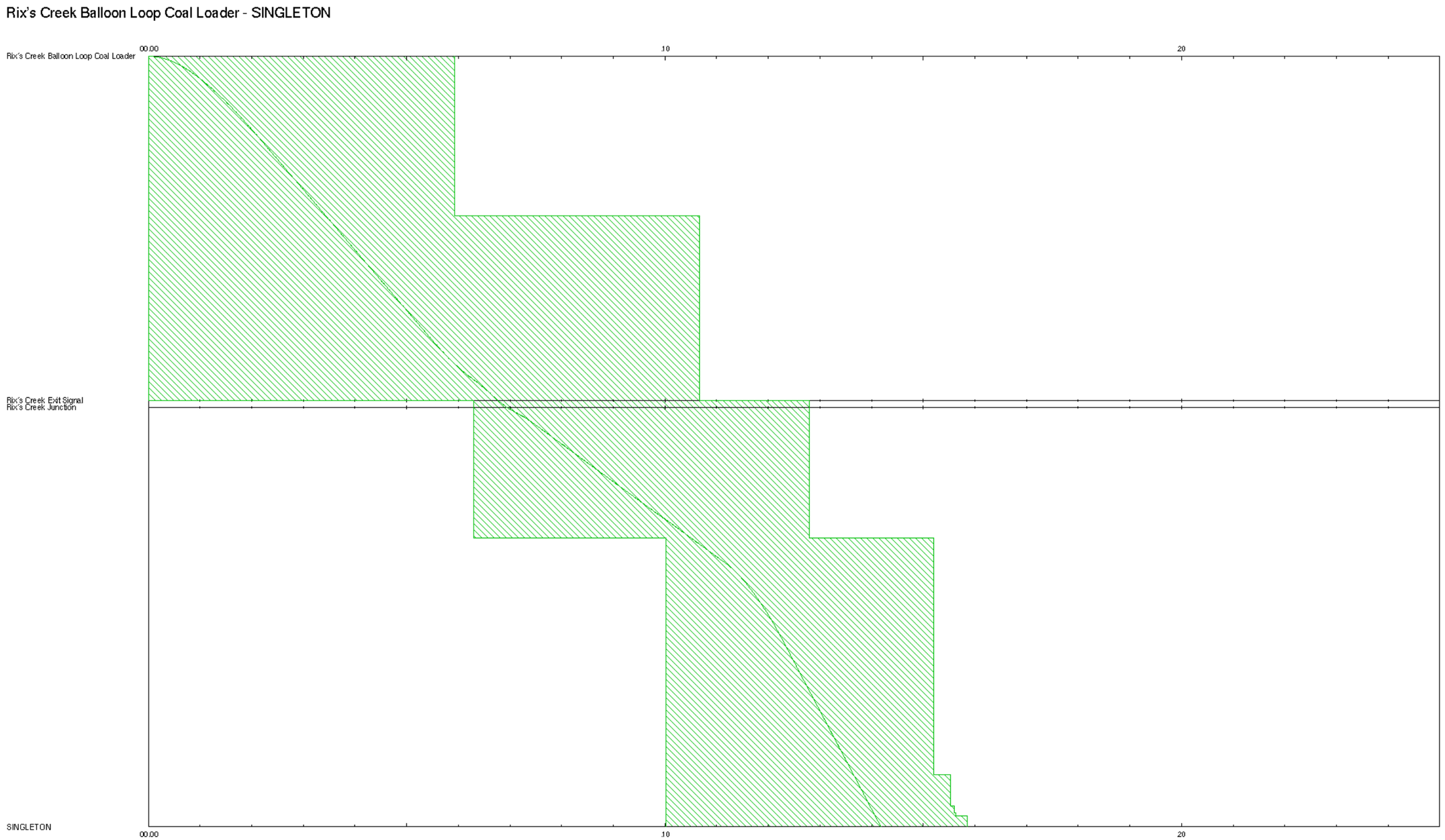
Blocking time stairways diagram for loaded train from Rix's Creek Coal Loader to Singleton



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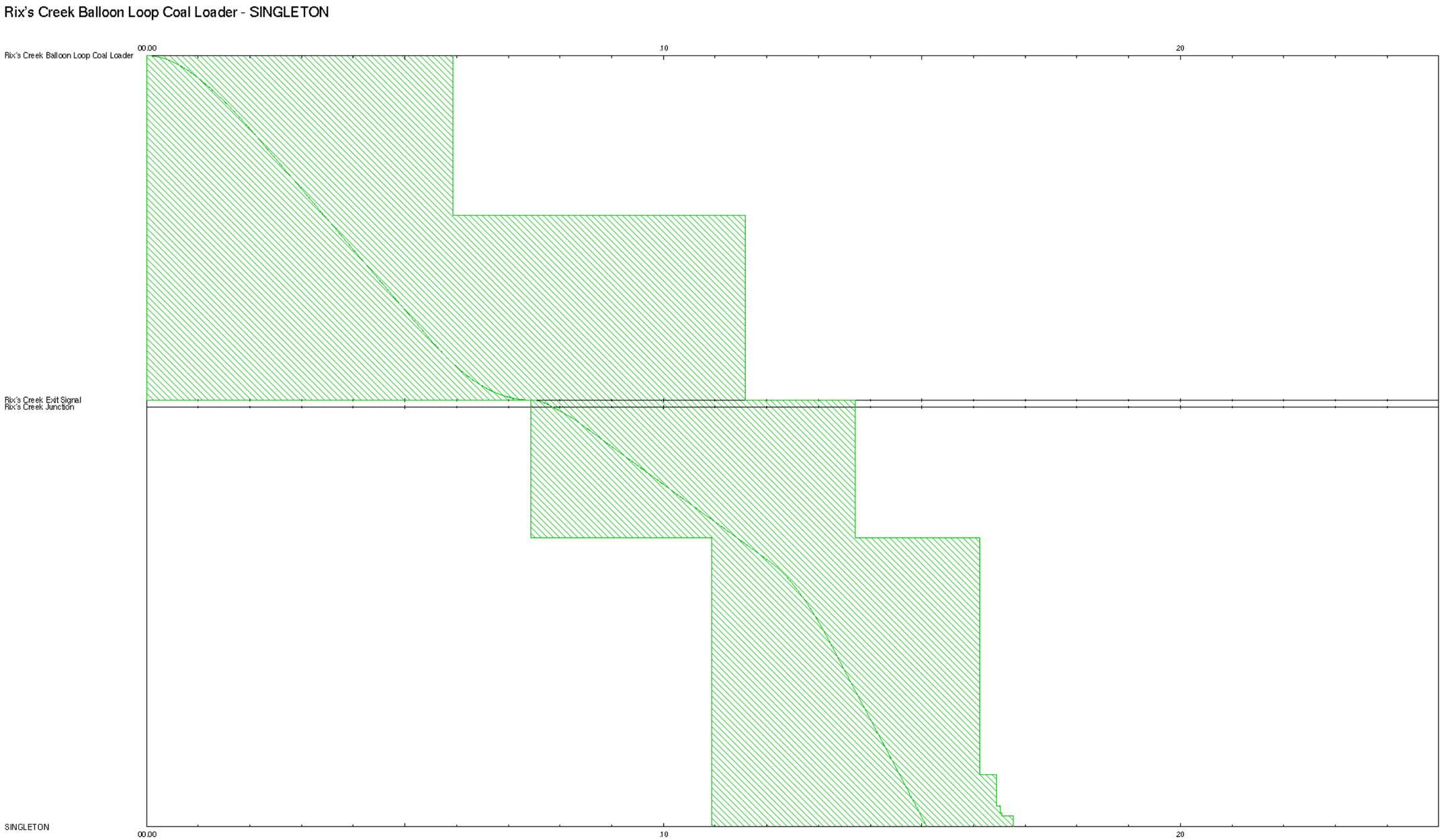
Blocking time stairways diagram for loaded train from Rix's Creek Coal Loader to Singleton – Stopping at Junction Exit Signal



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Attachment 3 Aspect Signal Chart

The following signal aspect charts show how signal state changes as the train moves along the track.

The vertical axis is time and the horizontal axis is distance.

The green curve is the train's location (the front of the train) at each instant in time.

Under the horizontal axis signal locations and names are indicated.

Green and red bars above each signal indicate each signals state at each point in time. The left side of the bar corresponds to the state of the top light in the signal and the right side of the bar corresponds to the state of the bottom light in the signal.

The signal colors shown correspond to signal states as follows.

Red over Red means Stop the next block section is occupied.
Green over Red means Caution the next signal is at stop.
Green over Yellow means Medium the next signal is at Caution.
Green over Green means all Clear.

Aspect signal charts are provided for

- An unloaded through coal train from Singleton to Mt. Walker.
- A loaded through coal train from Mt. Walker to Singleton.
- An unloaded coal train from Singleton to Rix's Creek Coal Loader.
- A loaded coal train from Rix's Creek Coal Loader to Singleton - No stop at loop exit signal.
- A loaded coal train from Rix's Creek Coal Loader to Singleton – Stopping at loop exit signal.

All diagrams show signal states for the signals on the main line as that is where headway is to be calculated.

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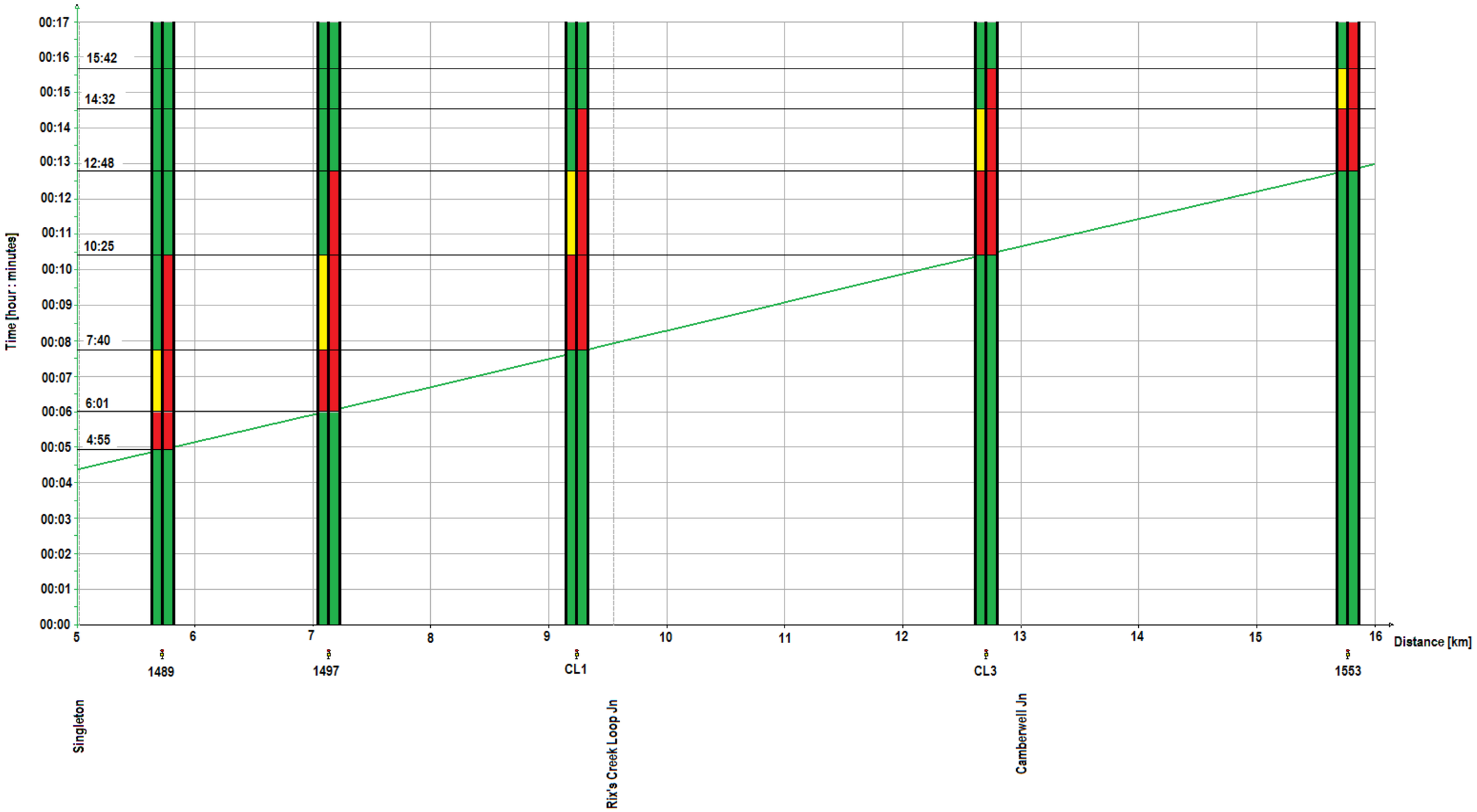
Signal aspect chart for unloaded through train from Singleton to Camberwell Junction



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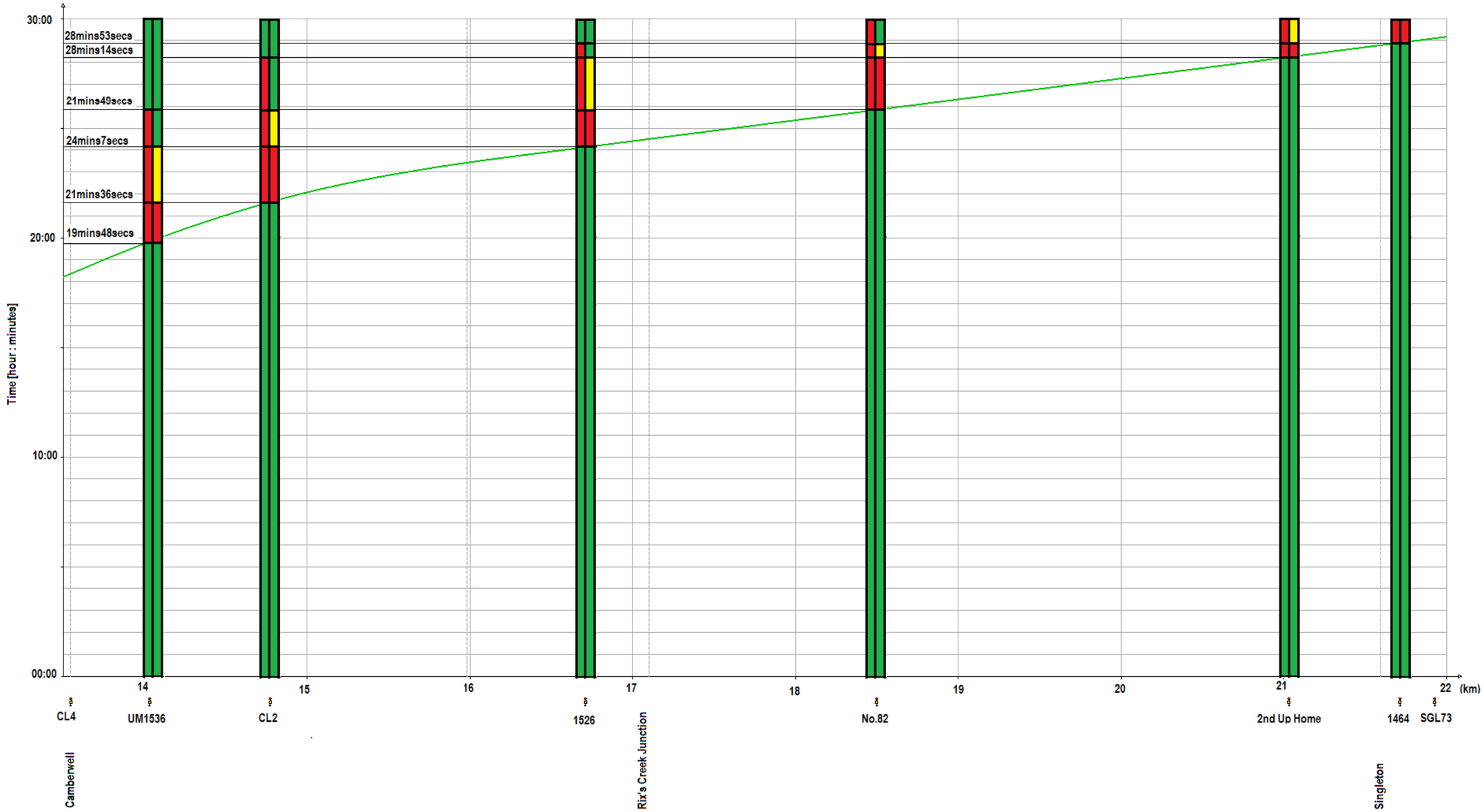
Signal aspect chart for loaded through train from Camberwell Junction to Singleton



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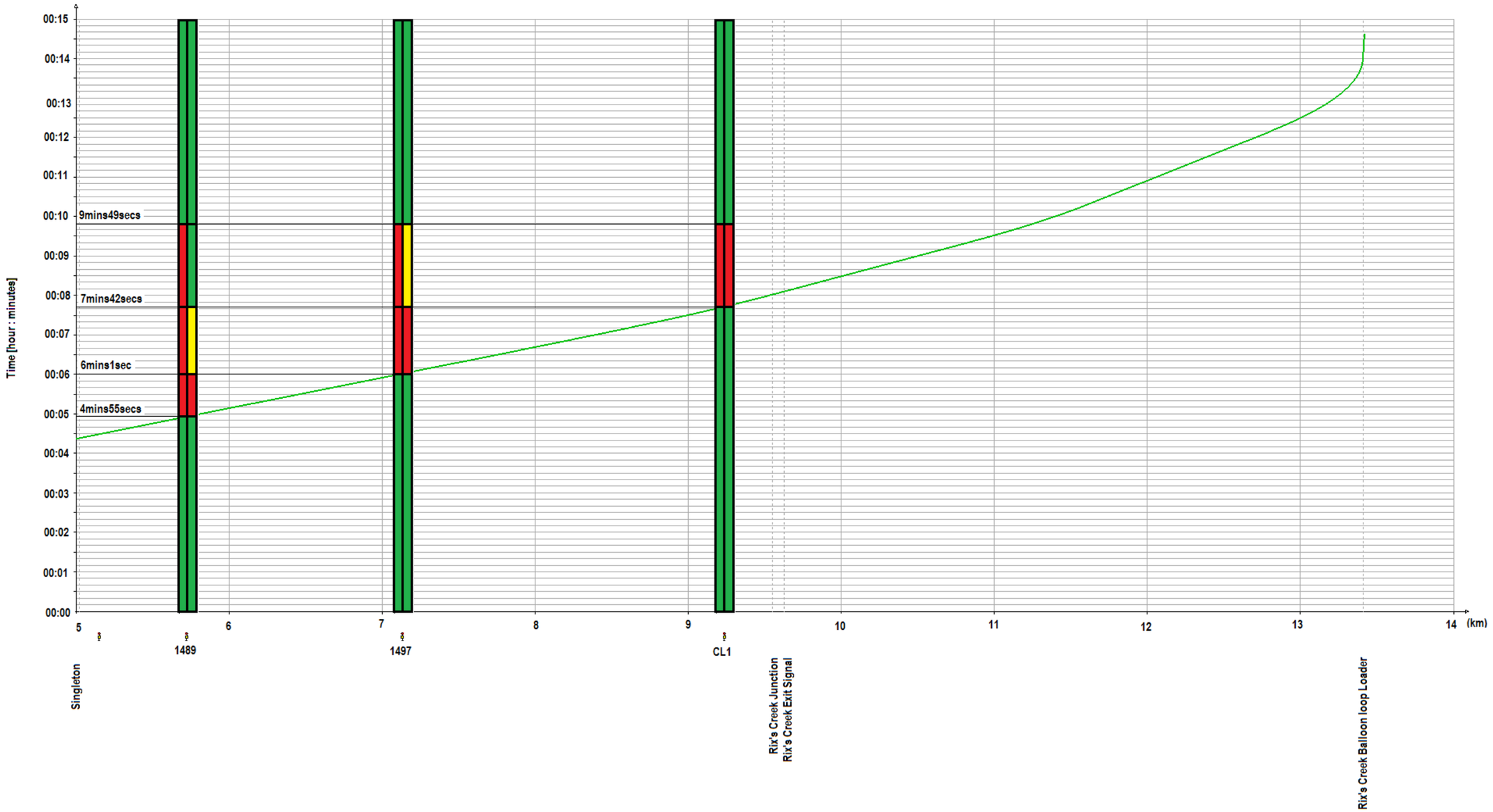
Signal aspect chart for unloaded train from Singleton to Rix's Creek Coal Loader



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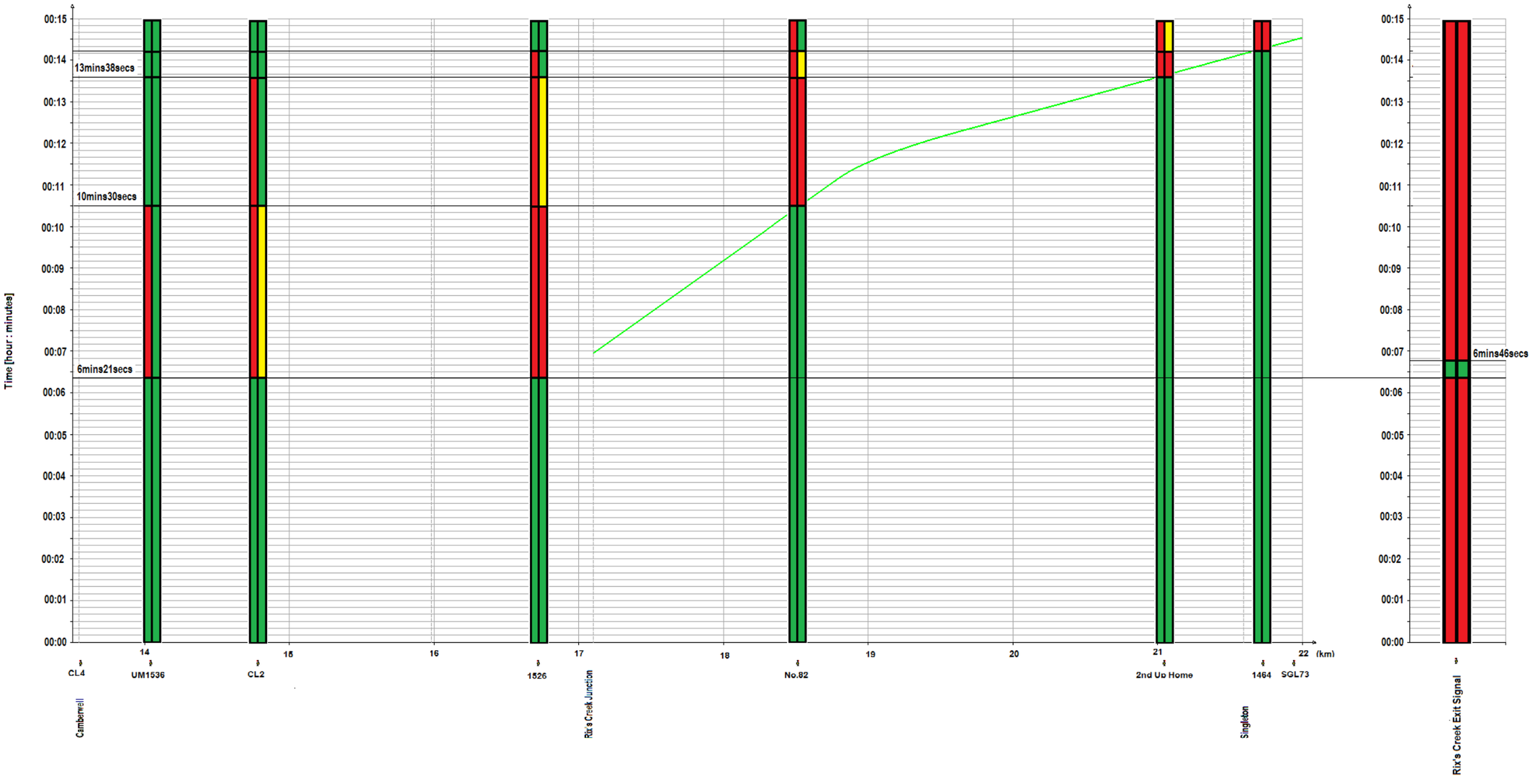
Signal aspect chart for loaded train from Rix's Creek Coal Loader to Singleton on the Main Down Line (Loop Exit Signal at green – train does not stop at exit signal)



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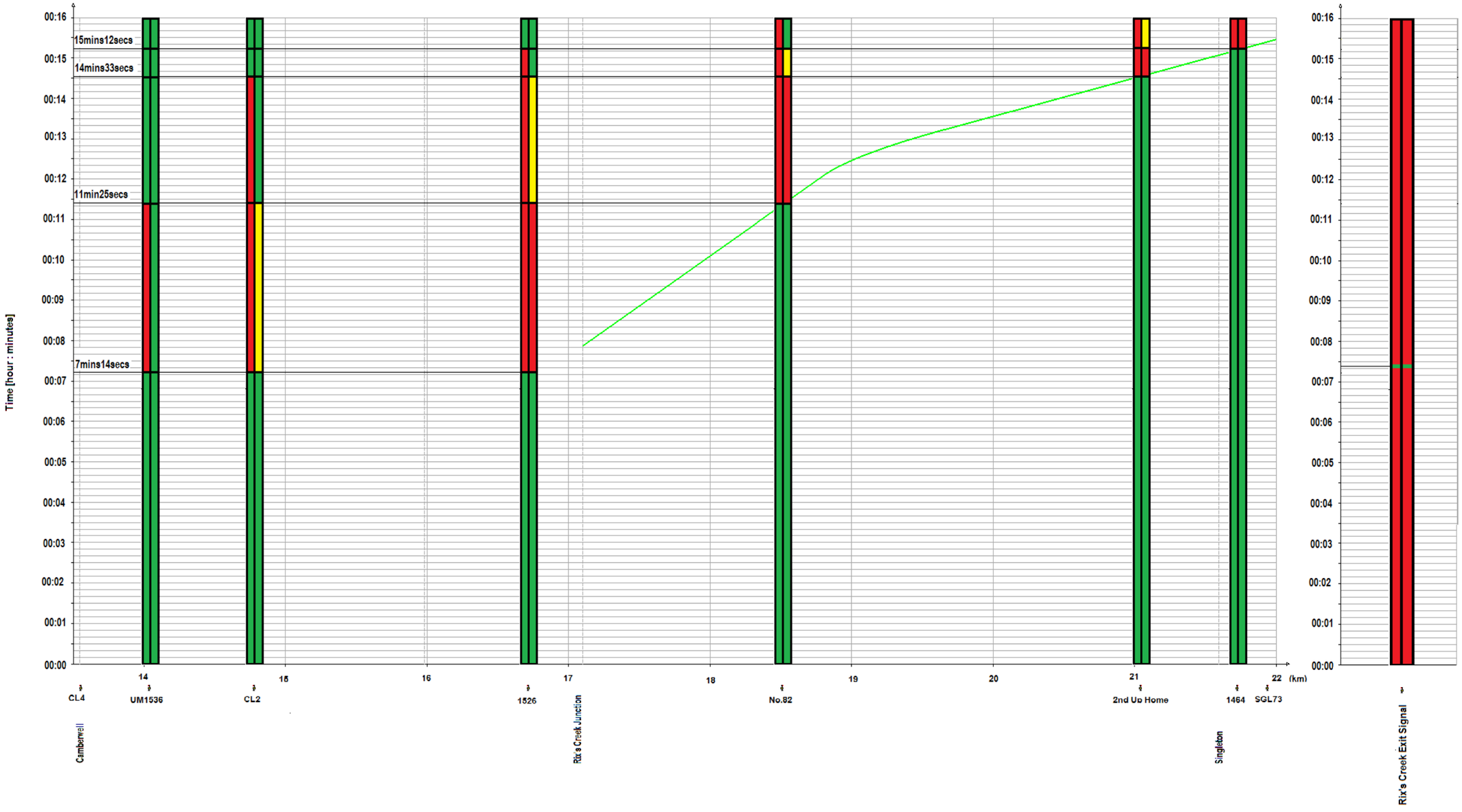
Signal aspect chart for loaded train from Rix's Creek Coal Loader to Singleton on the Main Down Line (Loop Exit Signal at red – train stops at exit signal)



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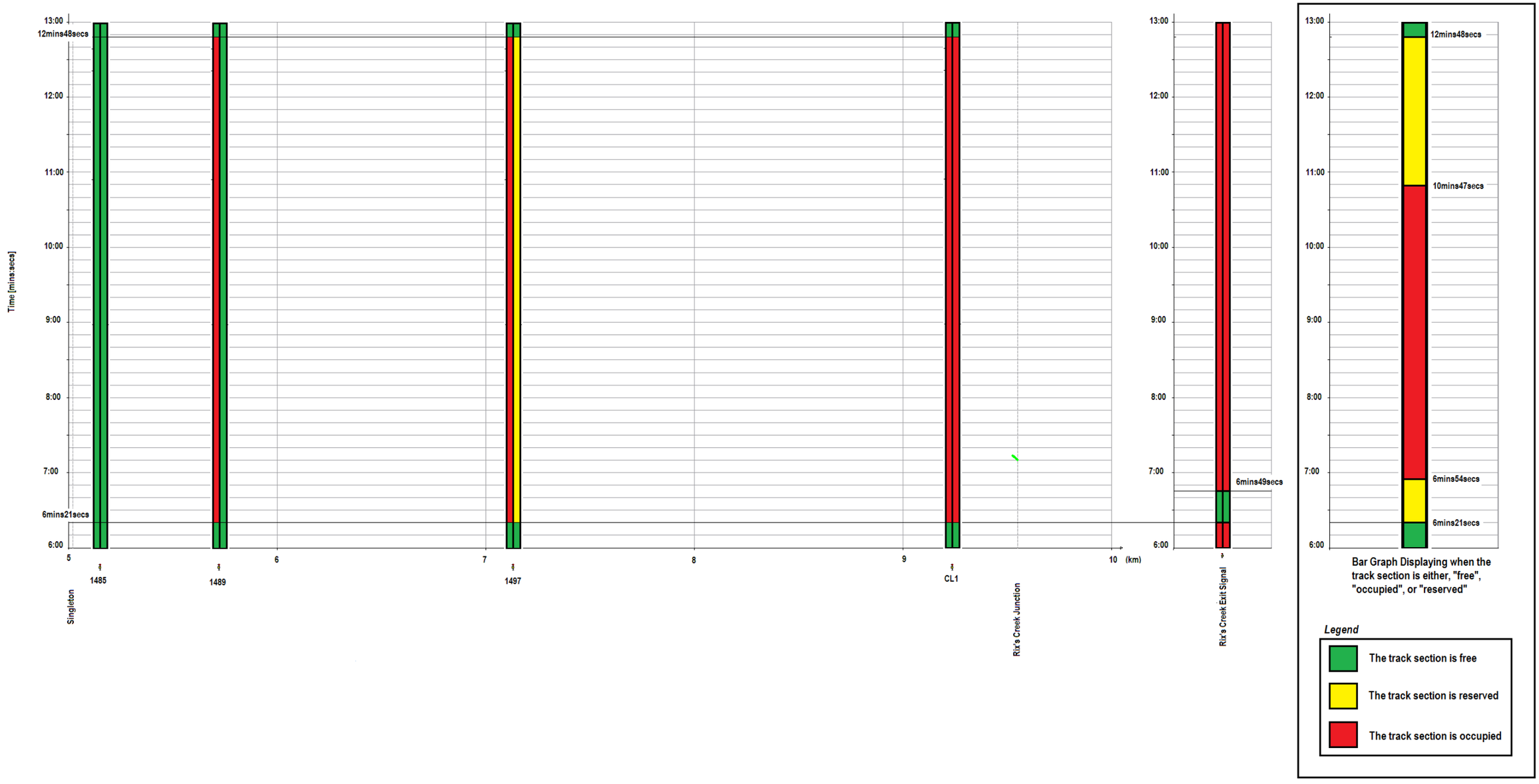
Signal aspect chart for loaded train from Rix's Creek Coal Loader to Singleton on the Main Up Line (Loop Exit Signal at green – train does not stop)



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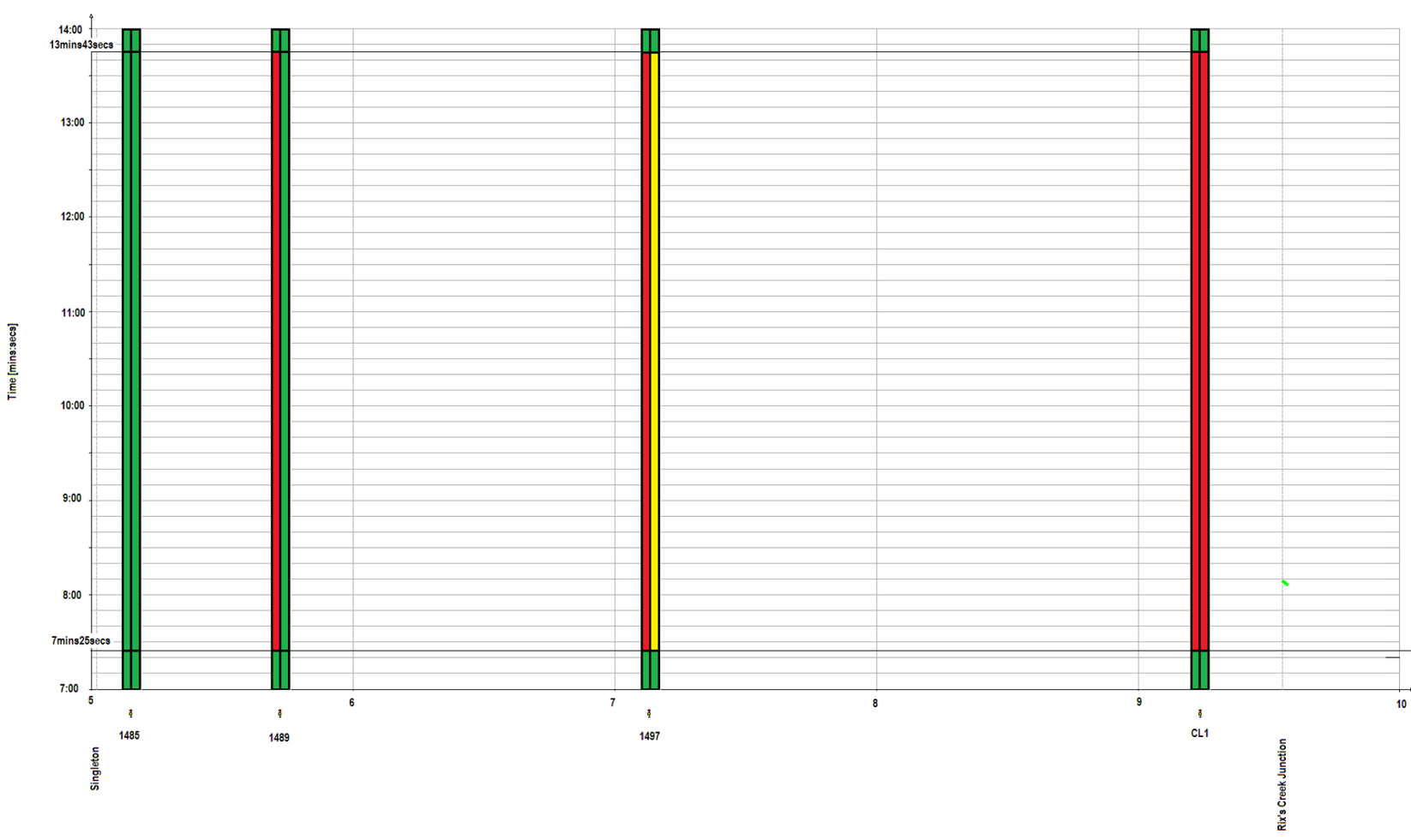
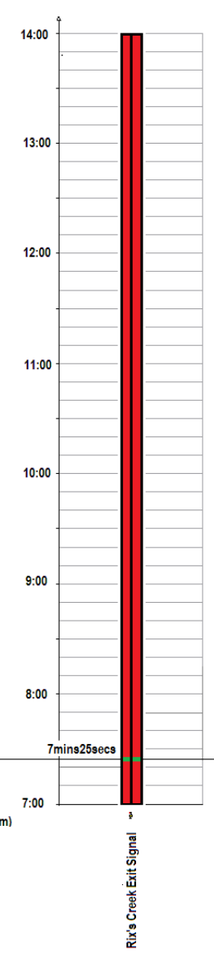
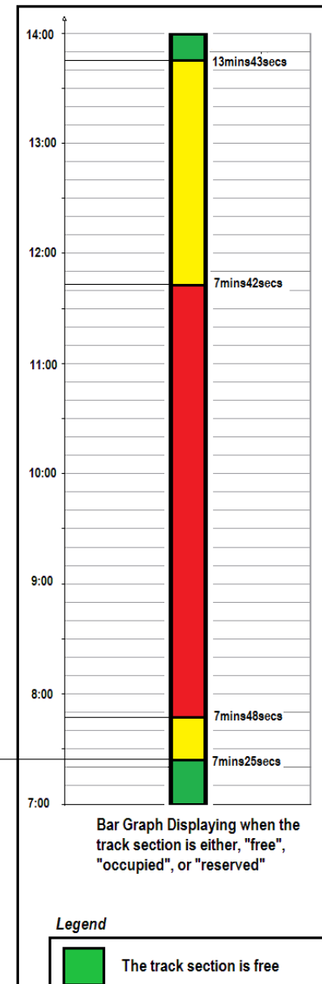
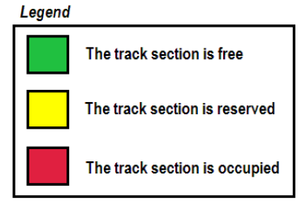
Signal aspect chart for loaded train from Rix's Creek Coal Loader to Singleton on the Main Up Line (Loop Exit Signal at red – train does stop)







Bar Graph Displaying when the track section is either, "free", "occupied", or "reserved"



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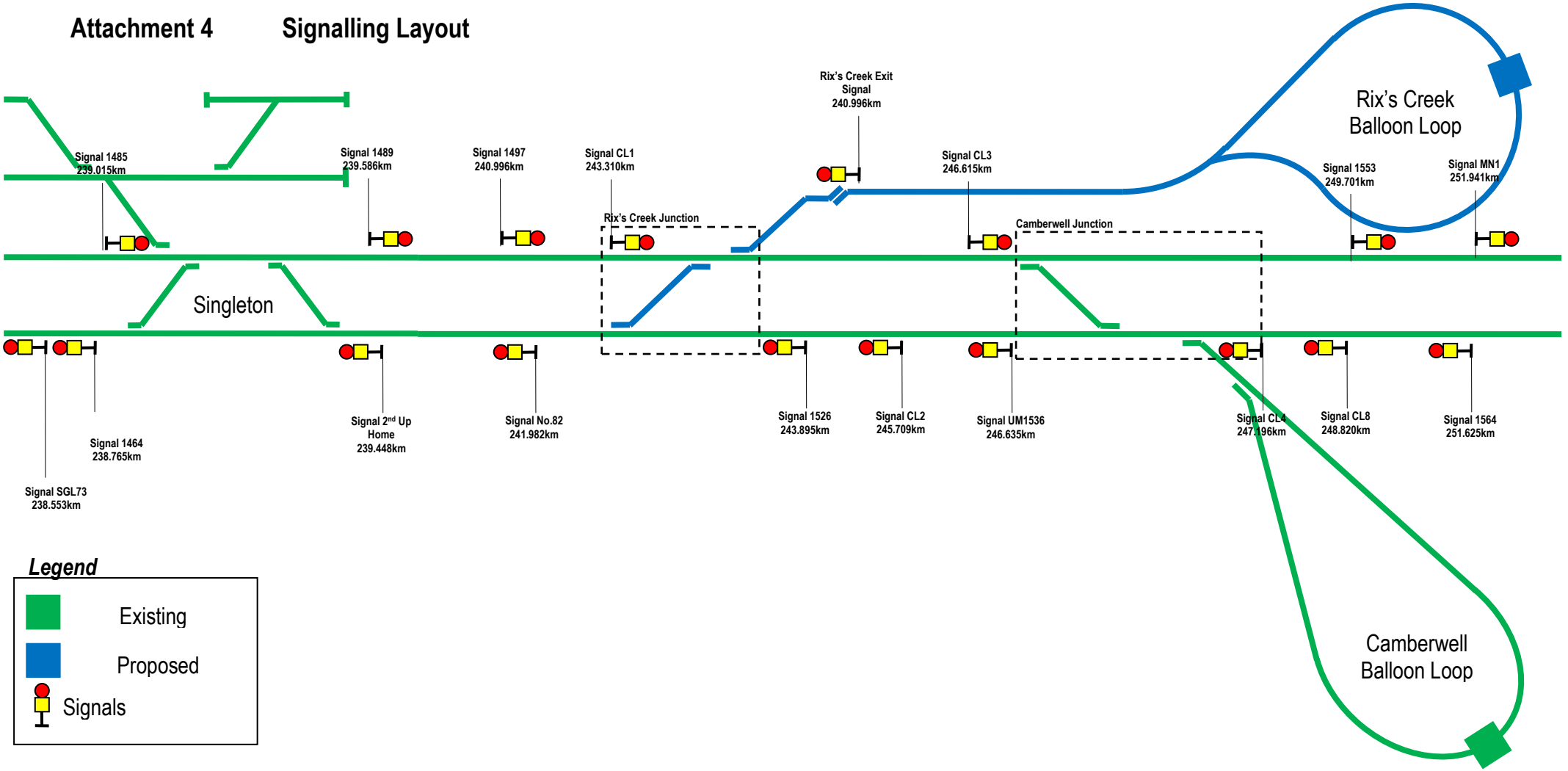
Attachment 4 Signalling Layout



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OPENTRACK SINGLE TRAIN RUNS

Project Details	
Client	Rhomberg Australia
Project	Rix's Creek Balloon Loop
Project Purpose & Outcomes	Determine Occupational time on main line whilst train loads within balloon loop
Route	Singleton – Rix's Creek Balloon Loop Coal Loader – Singleton
Date of TSRs	No TSRs to be included
New Consists Required?	No ☐ Yes ☒ See consist details following.
Outputs Required	Time-Distance graphs Timetables Occupational times between selected signals

Up Direction – Loaded to Singleton		
Consist #1		
Stops	1	Rix's Creek Balloon Loop Coal Loader
	2	Exit Signal Before junction to Main Line
	3	Singleton
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	

Down Direction – Unloaded to Rix's Creek Balloon Loop Coal Loader		
Consist #1		
Stops	2	Singleton
	1	Rix's Creek Balloon Loop Coal Loader

#See pages 3-4 for details of each consist.

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FOR CONFIRMATION

Train Driving Style These assumptions determine whether the output times should be those typically achievable by a careful and conservative driver (Normal), or the best possible (Best).					
Options	Normal	Best	Normal	Best	*Other Value*
Max. Tractive Effort	97%	100%	☒	☐	
Braking Method	Dynamic	Air/Dynamic	☒	☐	
Braking Rate	-0.1m/s^2	-0.3m/s^2	☒	☐	
Other Handling Assumptions	Normal	Aggressive	☒	☐	

Train Characteristics - Technical		Confirm	Amend	*Amended Value*
Resistance Factor (Strahl Formula)	3.2999	☒	☐	
Rotating Mass	1.0599	☒	☐	

Courses		Confirm	Amend	*Amended Value*
Timetable Version	N/A (single train only)	☒	☐	
Stop Dwells	0 seconds	☒	☐	
Loops	Trains run on main line, then proceeds through balloon loop for loading	☒	☐	

Signalling & Safeworking		Confirm	Amend	*Amended Value*
Safeworking System	N/A (single train only)	☒	☐	
Default Signal Sighting Distance	200m	☒	☐	
Train Operation Rules	N/A (single train only)	☒	☐	
Priority Rules (if any)	None (single consist)	☒	☐	
Road Reservation (Sections)	N/A	☒	☐	
Speed Board Treatment	End of train clears speed board before accelerating.	☒	☐	

Delays		Confirm	Amend	*Amended Value*
TSRs	N/A	☒	☐	
Other Track Delays	N/A	☐	☐	
Rollingstock Delays	N/A	☐	☐	
Departure Delays	N/A	☐	☐	

Plateway Pty Ltd
6/3 Sutherland Street, Clyde, NSW, 2142
Ph (02) 9637 5830
Fax (02) 9637 6350

TECHNICAL DETAILS (PLATEWAY USE)

Project Details		
Simulation Date	15/11/12	
OpenTrack Version	1.6.6	
Technician	Brad Waterson	
Modeller	Brad Waterson	15 / 11 / 12
Final Review	Rodney Allan	

Infrastructure Data	
Base Model	NSW [Mn Nth20] (194510-407981)
Model Description	Proposed Balloon Loop for Coal Loading at Rix's Creek
Date of Model	14/11/12
Variations Required	Building of infrastructure – Proposed Balloon Loop at Rix's Creek
Route Length	16.85km (Balloon Loop inclusive of Main Line to Singleton) 5.058km (Balloon Loop only)

Infrastructure Source Data	
Source	Details
Rhomberg Aust.	Drawing 12148-003. Used for layout and kilometrages at junction
Rhomberg Aust.	Drawing 12148-001. Used for layout and kilometrages for the Main branchline.
Rhomberg Aust.	Drawing 12148-002. Used for layout, kilometrages and locations on balloon loop.
Rhomberg Aust.	Drawing 12148-004. Used for gradient and curve figures on branchline
Rhomberg Aust.	Drawing 12148-005. Used for gradient and curve figures on balloon loop
ARTC	TOC Waiver 11189. Used for consist details.

Signalling Source Data	
Source	Details
RIC Singleton 23092003	Up Main 3 aspect signal – 283.765 km
RIC Singleton 23092003	Down Main 3 aspect Signal – 239.015 km
RIC Singleton 23092003	Up Main single aspect Signal – 239.035 km
Rhomberg Australia	Up Main 3 aspect Signal – 239.448 km (2nd Up Home)
RIC Singleton 23092003	Down Main 3 aspect signal – 239.586 km
RIC Singleton 23092003	Down Main 3 aspect signal – 240.996 km
Rhomberg Australia	Up Main 3 aspect signal – 241.982 km (Signal 82. Up home No. 1)
ARTC Safe Notice 2-1682	Down Main 3 aspect signal – 243.310 km
ARTC Safe Notice 2-1682	Up Main 3 aspect Signal – 243.895 km
ARTC Safe Notice 2-1682	Up Main 3 aspect Signal – 245.709 km
ARTC Safe Notice 2-1682	Down Main 3 aspect signal – 246.615 km
ARTC Safe Notice 2-1682	Up Main 3 aspect Signal – 246.635 km

Speed Board Source Data	
Source	Details
ARTC TOC Manual – Northern Pages (Correct as at 12th October 2012)	All speed boards according to those published
ARTC TOC Waiver 12115	Crossover speed change to 80km/h

Temporary Speed Restrictions	
No. of TSRs	0

Simulation Details	
Calculation Frequency	1s
Manual Interventions	N/A
Iterations	N/A
Random Number Seeding	N/A
Run Outputs	• Speed Vs Distance • Blocking time stairways diagram • Signal aspect chart

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CONSIST DETAILS

New Consists

Description		Wagon Type/ Speed	Origin	Destination	Trailing Tonnes	Total Length (m)	Motive Power
Rix's River	Coal Train	NHRH 80km/h (unloaded) 65km/h (loaded)	Singleton	Rix's Creek Balloon Loop and return	8800 (91x100 t wagons)	1545m	3 x TT Class (9000 HP)

Appendix F

Non-Indigenous Heritage Assessment

Appendix F Non-Indigenous Heritage Assessment

Non-Indigenous Heritage Assessment

Rix's Creek Coal Mine Rail Loop Project

Non-Indigenous Heritage Impact Assessment

Rix's Creek Coal Mine Rail Loop Project

Prepared for

Rix's Creek Coal Mine

Prepared by

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5 December 2012

60266677

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

Quality Information

Document Non-Indigenous Heritage Impact Assessment

Ref 60266677

Date 5 December 2012

Prepared by Dr Darran Jordan

Reviewed by Simon Murphy

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
1	5-12-2012	Original	Simon Murphy	
2				
3				
4				

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by The Bloomfield Group to undertake a non-Indigenous heritage impact assessment for the Rix's Creek Coal Mine Rail Loop Project (the Project). This assessment formed part of an Environmental Assessment (EA) to accompany an application to the NSW Department of Planning and Infrastructure (DP&I) for a proposed modification to the Rix's Creek Coal Mine Development Consent, being the development of a rail loop, rail loading facility and visual bund in the area of Rix's Creek Coal Mine. Searches of all relevant heritage registers identified that there were no listed heritage items within the study area.

A field survey of the study area was undertaken by Rochelle Coxon and Dr Darran Jordan of AECOM on Friday 29 July 2012. A second survey was undertaken by the same team on Friday 19 October 2012. They were escorted within the Rix's Creek Coal Mine area by mine representatives John Hindmarsh (Senior Environmental Officer) and Jason Desmond (Environmental Officer). During the field surveys four historic sites were identified. These were:

1. Historic sandstone excavation area;
2. Rail siding associated with Rixs Creek Coke Ovens and associated works;
3. Abandoned section of rail corridor from the Main North Line with cuttings and abutting wall; and
4. Rixs Creek platform and associated historic artefact scatter.

These items are of historical significance on a local scale and provide representation of industry, transport development and land use in the Rixs Creek region. All four items will be highly impacted as a result of the construction and operation of the Project.

The management of the historical heritage within and adjacent to the study area should be undertaken with reference to a list and map indicating the location of sites identified within the study area and relevant adjacent heritage items. The following recommendations were made for the management of historical heritage within the study area:

1. The abutting wall and platform in the rail corridor should be preserved if possible. If they can be avoided from direct impacts they should be fenced during works for their protection. If it is not possible to preserve these features then no works should occur until they have been subject to full archival recording as per recommendation number 2 (below).
2. Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the cutting with abutting wall, the Rixs Creek platform, the artefact scatter site associated with the platform and the sandstone excavation area. This work should be undertaken by a qualified archaeologist.
3. Surface collection is to be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek platform prior to construction works. GPS positions and photographs are to be taken for each artefact prior to collection. The artefacts are to be analysed by a historic heritage expert and a report produced of the results. Monitoring is to be undertaken by a qualified archaeologist during ground disturbing works in proximity to the Rixs Creek platform.
4. The full extent of the rail siding associated with the Rixs Creek Coke Ovens should be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work should be undertaken by a qualified archaeologist.
5. The full extent of the original rail alignment corridor of the Main North Line should be plotted with GPS coordinates and photographs taken to document its full extent and any features such as cuttings. This work should be undertaken by a qualified archaeologist.
6. A research methodology document should be produced to guide the recommended salvage, monitoring and archival recording works.
7. In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone,

ceramic, brick, metal, etc), building foundations and earthworks of unknown origin (i.e. not associated with BMC operations). The procedures are:

- All work in the area is to cease immediately;
- Alert the Environmental Specialist to the find;
- If necessary, protect the area with fencing;
- Engage a suitably qualified archaeologist to undertake an assessment of the find/s;
- The assessment should be undertaken using the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009);
- On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch for a Section 140 excavation permit or exception;
- Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and
- Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area.

8. Should human remains be found during construction or operation the following procedures should be followed.

The procedures take into account the following documents:

- *Burials - Exhumation of Human Remains* NSW Health Policy Directive PD2008_022 (NSW Health, 2008) available at : http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf
- *Manual for the Identification of Aboriginal Remains* (NSW Department of Environment & Conservation, 2006);
- *Skeletal Remains – Guidelines for the management of human skeletal remains under the Heritage Act 1977* (NSW Heritage Office, 1998a); and
- *The Aboriginal Cultural Heritage Standards and Guidelines Kit* (NSW National Parks and Wildlife Service, 1997).

In the event that operations reveal possible human skeletal material (remains), the following procedure is to be followed:

- When suspected human remains are exposed, all construction work is to cease immediately in the near vicinity of the find location and the General Manager on site is to be immediately notified. The General Manager will contact the Police at the earliest reasonable time;
- An area of 5 m radius is to be cordoned off by temporary fencing around the exposed human remains site - work can continue outside of this area as long as there is no risk of interference to the human remains or the assessment of human remains. Assessment of risk may utilise the risk matrix provided within the NSW Health Policy directive on the exhumation of human burials;
- Contact the OEH Environment line on 131 555 and the Heritage Branch on 02 9873 8500; and
- A physical or forensic anthropologist should be commissioned by Rix's Creek Coal Mine to inspect the remains in situ (unless otherwise directed by the police), and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or modern), then:

a) if the remains are identified as modern the area is deemed as crime scene; or

b) if the remains are identified as Aboriginal, the Environmental Specialist will notify OEH and representatives of the local Aboriginal community and appropriate management measures will be determined through consultation with them. Representatives of the Aboriginal community will be present during all investigations of Aboriginal remains; or

c) if the remains are as non-Aboriginal (historical) remains, the site is to be secured and the Heritage Branch is to be contacted.

The above process functions only to appropriately identify the remains and secure the site. From this time, the management of the area and remains is to be determined through one of the following means:

- If the remains are identified as a modern matter, liaise with the police and/or the Coroner's Office and/or NSW Health with respect to the exhumation of the remains;
- If the remains are identified as Aboriginal, liaise with OEH and Aboriginal stakeholders;
- If the remains are identified as non-Aboriginal (historical), liaise with the Heritage Branch; and
- If the remains are identified as not being human then work can recommence without delay.

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by The Bloomfield Group to undertake a non-Indigenous heritage impact assessment for the Rix's Creek Coal Mine Rail Loop Project (the Project). This assessment will form part of an Environmental Assessment (EA) to accompany an application to the NSW Department of Planning and Infrastructure (DP&I) for a proposed modification to the Rix's Creek Coal Mine Development Consent, being the development of a rail loop and rail loading facility in the area of Rix's Creek Coal Mine.

There are no specific guidelines relating to the development of Environmental Assessments (EAs). This project will therefore follow the NSW Heritage Office publications *Assessing Historical Significance, Assessing Significance for Historical Archaeological Sites and Relics* (NSW Heritage Branch, 2009) and *Statements of Heritage Impact* (NSW Heritage Office, 2002). The assessment of heritage will include the following tasks to address relevant aspects of the NSW Heritage Branch guidelines:

- a search of the following registers for heritage sites in the study area:
  - Commonwealth Heritage List (CHL)
  - National Heritage List (NHL)
  - Register of the National Estate (RNE)
  - NSW State Heritage Register (SHR)
  - NSW State Heritage Inventory (SHI)
  - S170 Registers
  - Singleton Shire Council Local Environmental Plan (LEP)
  - Relevant Regional Environmental Plans
- desktop review of previous non-Indigenous heritage reports relevant to the local area that are accessible to AECOM, including previous EAs and existing conservation management plans;
- archaeological survey, to be conducted simultaneously with Indigenous survey by two AECOM archaeologists; and
- GIS mapping of known non-Indigenous heritage and archaeologically sensitive areas.

1.1 Punctuation note

Regarding the punctuation of this report, please note that both the place Rixs Creek and the watercourse Rixs Creek do not have an apostrophe within the correct presentation of their name. The name of the mine site, however, is correctly presented in this report as Rix's Creek Coal Mine, as per the presentation used in official mine documentation by The Bloomfield Group.

1.2 Project Description

The Rix's Creek Coal Mine is located at Rixs Creek, approximately four kilometres to the north of Singleton (see Figure 1). Part of The Bloomfield Group, the mine was granted development consent in 1989 with the first coal produced in 1990. The mine was granted development consent for an expansion in 1995, with coal extraction approved for a 21 year period from the date of consent (up to 2016).

The Rix's Creek Coal Mine rail loop and rail loading facility project (the Project) is a proposed modification to the Rix's Creek Coal Mine development consent. The Project comprises the construction of a rail loop and the construction of a Clean Coal Stockpile. The Clean Coal Stockpile will include an overland conveyor from the existing Coal Handling and Preparation Plant (CHPP), a reclaim tunnel, a stacker conveyor, rail loading facility and other associated infrastructure.

The proposed rail loop will connect to the Main North Line outside of the Rix's Creek Coal Mine land holding. The section of rail line located outside the Colliery Holding is on Lot 219 and Lot 235 DP 752455, as well as Lot 94 and Lot 150 DP 752442. These areas are on land owned by The Bloomfield Group. The remainder of the rail line, the rail loop and stock pile area with rail loading facility are within the bounds of the Rix's Creek Coal Mine in Lot 1

and Lot 2 DP 1139094 and Lot 238 DP 829334. The clean coal stockpile area will be located within the circle section of the proposed rail loop.

The proposed rail loop has been designed on the western side of a ridge line in order to provide a visual buffer between it and the Singleton Heights and Retreat residential areas. The length of the proposed rail loop is 5.8 kilometres in length, with construction proposed to remove 384,000 m^3 of soil and deposit 264,000 m^3 of fill to enable the correct grade for the entire rail line. The clean stockpile area has been designed to be capable of holding up to 200,000 tonnes of clean coal for shipment. A visual bund has been designed for construction on the eastern side of the existing rail line to provide a further visual buffer for residents located off Bridgman Road.

1.3 Study Area

The study area was defined by The Bloomfield Group as inclusive of the subject site and those areas adjacent to the subject site that might be indirectly impacted by the proposed works. The subject site comprised the development footprint which included a rail line approximately 5.8 kilometres in length, linking to the Main North Line at its southern end and terminating in a rail loop at its northern end. The subject site also included a stock pile area with rail loading facility, contained within the circle of the rail loop at the northern extent of the proposed rail extension. Other subject site inclusions were a coal conveyor, access roads, an outer perimeter access track, a visual bund and a development compound. Maps of the defined study area were provided by The Bloomfield Group and the full extent of this defined study area is shown on Figure 2.

1.4 Project Team

The Project was managed by Simon Murphy (AECOM Professional Environmental Planner). The heritage component of the Project was managed Dr Susan Lampard (AECOM Archaeologist) who coordinated project logistics. Fieldwork was undertaken by Rochelle Coxon (AECOM Archaeologist) and Dr Darran Jordan (AECOM Archaeologist). Dr Darran Jordan conducted heritage assessments and authored this report. Simon Murphy provided technical and QA review. Unless otherwise specified, John O'Sullivan (Designer, AECOM) created all figures within this report. Jodie Glennan (IAP Team Secretary, AECOM) and Josephine George (IAP Team Secretary, AECOM) provided administrative support throughout the assessment process.

1.5 Limitations

Within this report predictions have been made about the probability of subsurface archaeological materials occurring within the study area based on surface indications and environmental contexts. However, it is possible that materials may occur in areas without surface indications and in any environmental context.

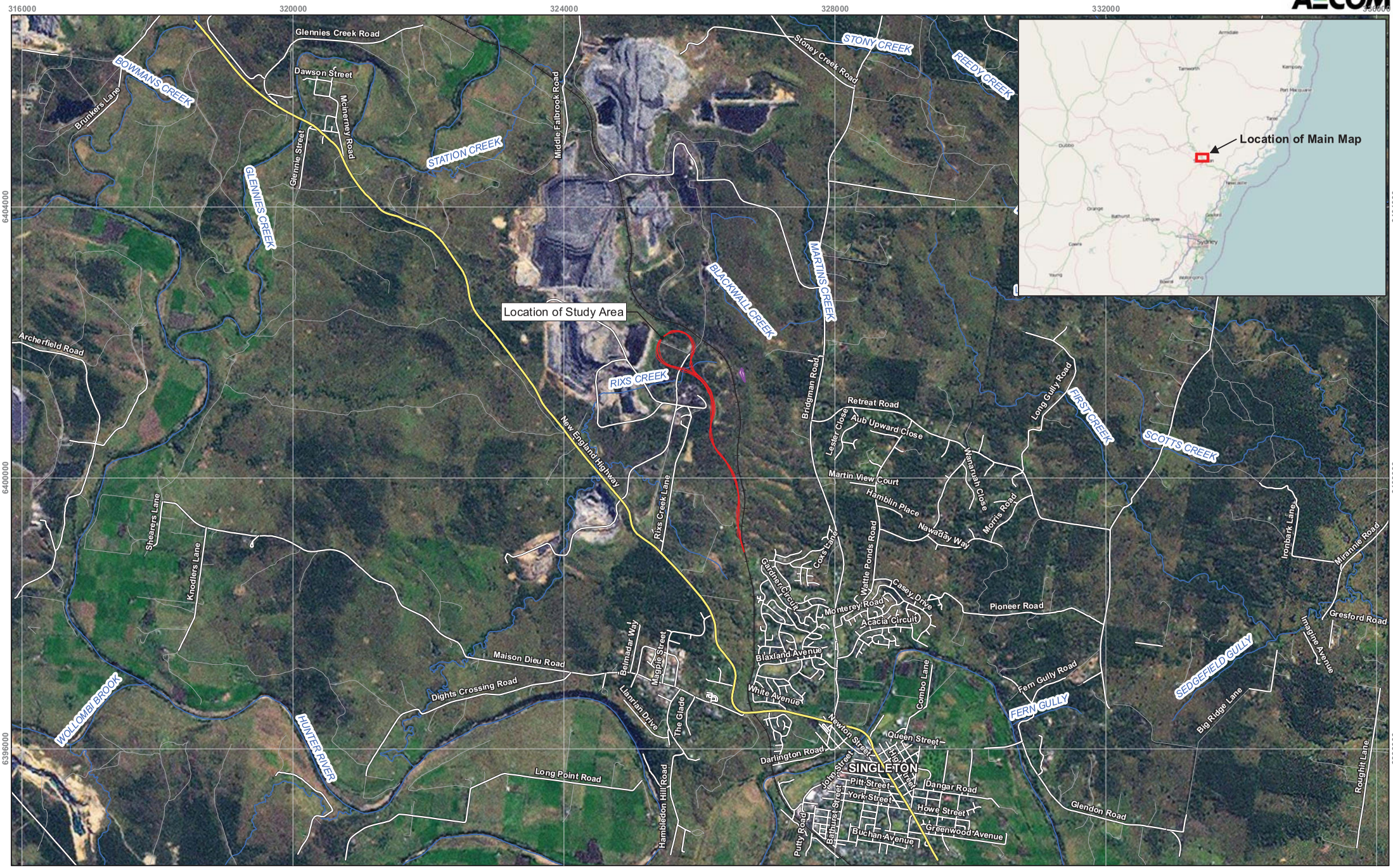
A summary of the statutory requirements regarding non-Indigenous heritage is provided in Section 2.0. This is provided based on experience with the heritage system in New South Wales (NSW) and does not purport to be legal advice. It should be noted that legislation, regulations and guidelines change over time and users of the report should satisfy themselves that the statutory requirements have not changed since the report was written.

This assessment does not address areas outside of the identified study area for the Project.

1.6 Related Studies

The studies which are to be read in conjunction with this assessment include the following:

- The Rix's Creek Coal Mine Rail Loop Environmental Assessment (EA);
- The Rix's Creek Coal Mine Rail Loop Ecology assessment; and
- The Rix's Creek Coal Mine Rail Loop Aboriginal Cultural Heritage Assessment.


316000
320000
324000
328000
332000
336000
6404000
6400000
6396000
Location of Main Map
Location of Study Area
Glennies Creek Road
Dawson Street
Mcinerney Road
Glennie Street
Middle Falbrook Road
Stoney Creek Road
Brunkers Lane
Archerfield Road
Shearers Lane
Knodlers Lane
Maison Dieu Road
Dights Crossing Road
Long Point Road
Hambledon Hill Road
New England Highway
Rixs Creek Lane
Bridgman Road
Retreat Road
Aub Upward Close
Lester Close
Martin View Court
Hamblin Place
Nawaday Way
Wanarah Close
Morris Road
Long Gully Road
Ironbark Lane
Mirannie Road
Gresford Road
Imagine Avenue
Big Ridge Lane
Roughrit Lane
Glendon Road
Fern Gully Road
Pioneer Road
Casey Drive
Acacia Circuit
Monterey Road
Wattle Ponds Road
Cox's Lane
Gardner Circuit
Blaxland Avenue
White Avenue
Belmadar Way
Magpie Street
Llanrian Drive
The Glade
Combo Lane
Newton Street
Darlington Road
Queen Street
King Street
John Street
Pitt Street
York Street
Bathurst Street
Putty Road
Howe Street
Dangar Road
Buchan Avenue
Greenwood Avenue
SINGLETON
STONY CREEK
REEDY CREEK
BOWMANS CREEK
STATION CREEK
GLENNIES CREEK
BLACKWALL CREEK
MARTINS CREEK
RIXS CREEK
FIRST CREEK
SCOTTS CREEK
SEDGEFIELD GULLY
FERN GULLY
WOLLOMBI BROOK
HUNTER RIVER
Study Area
Principal Road
Minor Road
Track
Waterway
Railway
Visual bund
RIXS CREEK
Fig. 1 Regional Locality
Source: LPMA, (2011)
0
1
2
4
km
Datum: GDA94 Zone 56
N
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AECOM \\ausyd1fp002\Groups\GIS\7_Small_Jobs\JO\20120816_DJordan_60266677_Rixs_Creek\4.7_GIS\02_Maps\G001_01_RegionalLocality_120817.mxd Updated 31/10/2012

Study Area
Principal Road
Minor Road
Track
Railway
Waterway
Contour (10m)
Visual bund

RIXS CREEK
Fig. 2 Study Area
Source: LPMA, (2011)

0 200 400 800 m

N

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2.0 Statutory Controls

A number of planning and legislative documents govern how heritage is managed in NSW and Australia. The following section provides an overview of the requirements under each as they apply to the Project.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) took effect on 16 July 2000.

Under Part 9 of the EPBC Act, any action that is likely to have a significant impact on a matter of National Environmental Significance (known as a controlled action under the Act), may only progress with approval of the Commonwealth Minister for the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). An action is defined as a project, development, undertaking, activity (or series of activities), or alteration. An action will also require approval if:

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

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Indigenous and non-Indigenous historic cultural heritage items. Under the Act protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). While the RNE has been suspended and is no longer a statutory list, it remains available as an archive.

The heritage registers mandated by the EPBC Act have been consulted and there are no items within the study area on these registers.

2.2 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) and the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) provide the framework for environmental planning in NSW and include provisions to ensure that proposals that have the potential to impact upon the environment are subject to detailed assessment and provide opportunity for public involvement. In NSW, environmental impacts are interpreted as including impacts to cultural heritage.

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

Upon repeal of Part 3A of the EP&A Act on 1 October 2011, the Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011 inserted a new Division 4.1 into Part 4 of the EP&A Act.

Division 4.1 provides for a new planning assessment and determination regime for State Significant Development (SSD). Section 89C of the EP&A Act stipulates that a development will be considered SSD if it is declared to be such by the new State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD).

Under Clause 8(1) of SEPP SRD, a development is declared to be a State Significant Development if:

a) the development on the land concerned is, by the operation of an environmental planning instrument, permissible with development consent under Part 4 of the EP&A Act; and

b) the development is specified in Schedule 1 or 2 of SEPP SRD.

The Project is SSD as it meets both of these criteria, namely:

- it is permissible with development consent on the land on which it is located; and
- it is development that is specified in Schedule 1 of SEPP SRD.

Development Consent for the Rix's Creek Coal Mine was granted on the 19th October 1989 by the Minister for Planning pursuant to section 101 of the Environmental Planning and Assessment Act 1979 (EP&A Act). A second development consent was granted by the Minister for Urban Affairs and Planning on the 19th October 1995, pursuant to section 92 of the EP&A Act. The Bloomfield Group is seeking an Approval for this Project under Clause 8J(8) of the Environmental Planning and Assessment Regulation 2000, which allows modifications of

State Significant Development Consents issued under Part 4 of the Environmental Planning and Assessment Act 1979, to be modified through Section 75W of the Act.

2.3 Director-General's Environmental Assessment Requirements

This assessment has been prepared to form part of an Environmental Assessment (EA) for submission to the Department of Primary Industries (DP&I) for the approval of the Project. All applications for Project Approval carried out under Part 4 of the EP&A Act must be supported by an EA. The EA is to be prepared in accordance with the Director-General's Environmental Assessment Requirements (EARs). This assessment, which forms part of the EA, addresses the EARs relating to non-Indigenous heritage. Table 1 lists the EAR that is relevant to this assessment and the sections in this report where this EAR is addressed.

Table 1 Director-General's Environmental Assessment Requirements

Key Issue	Requirement	Report Section
Heritage	Assessment of potential impacts on non-Indigenous heritage values of the locality related to its settlement by Europeans and its pastoral history	Section 3.0, 0 and 6.0

As required by the EARs, the following guidelines and policies were considered when preparing this assessment:

- NSW Heritage Manual (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996a); and
- The Burra Charter (International Council on Monuments and Sites).

In addition to the policies identified in the EARs, the following policies and guidelines were considered in this assessment:

- NSW Heritage Manual (1996a);
- The Burra Charter (the Australia ICOMOS charter for places of Cultural Significance)(ICOMOS (Australia), 1999);
- Assessing Heritage Significance (NSW Heritage Office, 2001);
- Heritage Curtilages (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996b); and
- Levels of Heritage Significance (NSW Heritage Office, 2008).

2.4 The Heritage Act 1977

The *Heritage Act 1977* was enacted to conserve the environmental heritage of NSW. Under section 32, places, buildings, works, relics, moveable objects or precincts of heritage significance are protected by means of either Interim Heritage Orders (IHO) or by listing on the State Heritage Register (SHR). Items that are assessed as having State heritage significance can be listed on the SHR by the Minister on the recommendation of the Heritage Council.

Archaeological relics (any relics that are buried) are protected by the provisions of section 139. Under this section it is illegal to disturb or excavate any land knowing or suspecting that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. In such cases, an excavation permit under section 140 is required. Note that no formal listing is required for archaeological relics; they are automatically protected if they are of local significance or higher.

Proposals to alter, damage, move or destroy places, buildings, works, relics, moveable objects or precincts protected by an IHO or listed on the SHR require an approval under section 60. Demolition of whole buildings will not normally be approved except under certain conditions (section 63). Some of the sites listed on the SHR or on LEPs may either be 'relics' or have relics associated with them. In such cases, a section 60 approval is also required for any disturbance to relics *associated* with a listed item.

Under Section 170 of the *Heritage Act*, NSW government agencies are required to maintain a register of heritage assets. The register places obligations on the agencies, but not on non-government proponents, beyond their responsibility to assess the impact on surrounding heritage items. AECOM has searched s.170 registers to determine whether there are listed items within the study area. The findings from these searches are presented in Section 3.0.

2.5 Singleton Local Environmental Plan (1996)

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

A person shall not, in respect of a building, work, relic, tree or place that is a heritage item, except with the consent of council:

- demolish or alter the building or work;
- damage or move the relic, or excavate for the purpose of exposing the relic;
- damage or despoil land on which the building, work or relic is situated or land which comprises the place;
- erect a building on or subdivide land on which the building, work or relic is situated or on the land which comprises the place; or
- damage any tree on the land on which the building, work or relic is situated or on the land which comprises the place.

The Council shall not grant consent to a development application required by this clause unless it has made an assessment of:

- the significance of the item as a heritage item;
- the extent to which the carrying out of the development in accordance with the consent would affect the heritage significance of the item and its site;
- whether the setting of the item and, in particular, whether any stylistic, horticultural, or archaeological features of the setting should be retained;
- whether the item constitutes a danger to the users or occupiers of that item or to the public; and
- measures to be taken to conserve heritage items, including any conservation plan prepared by the applicant.

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

2.6 Hunter Regional Environmental Plan (Heritage) (1989)

The Hunter regional Environmental Plan (REP) was deemed a *State Environmental Planning Policy* (SEPP) on 1 July 2009. The aims of the Hunter REP are threefold:

- To conserve the heritage of the Hunter Region;
- To promote the appreciation and understanding of the variety of items; and
- To encourage the conservation of townscapes that are desirable to conserve.

To this end, Schedule 1 lists items of State significance, Schedule 2 items of regional significance and Schedule 3 items of local significance within the Region. Schedule 4 includes items requiring further investigation to determine their level of significance.

Clause 6 requires LGAs to include provisions for significant items within LEPs, while Clause 7 provides for the development of heritage items. It requires that applications to alter, damage, remove or construct in the vicinity, be accompanied by a Statement of Heritage Impact, which addresses the impact to the significance of the item.

Survey transects
Principal Road
Minor Road
Track
Study Area
Railway
Waterway
Contour (10m)
Visual bund

RIXS CREEK
Fig. 3 Survey Transects
Source: LPMA, (2011)

0 200 400 800 m

N

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3.0 Heritage Inventory Results

As discussed in Section 2.0, Commonwealth, State and local governments maintain inventories of items of historical significance within each jurisdiction. The following section discusses listed heritage items within the study area.

3.1 Heritage Inventory Searches

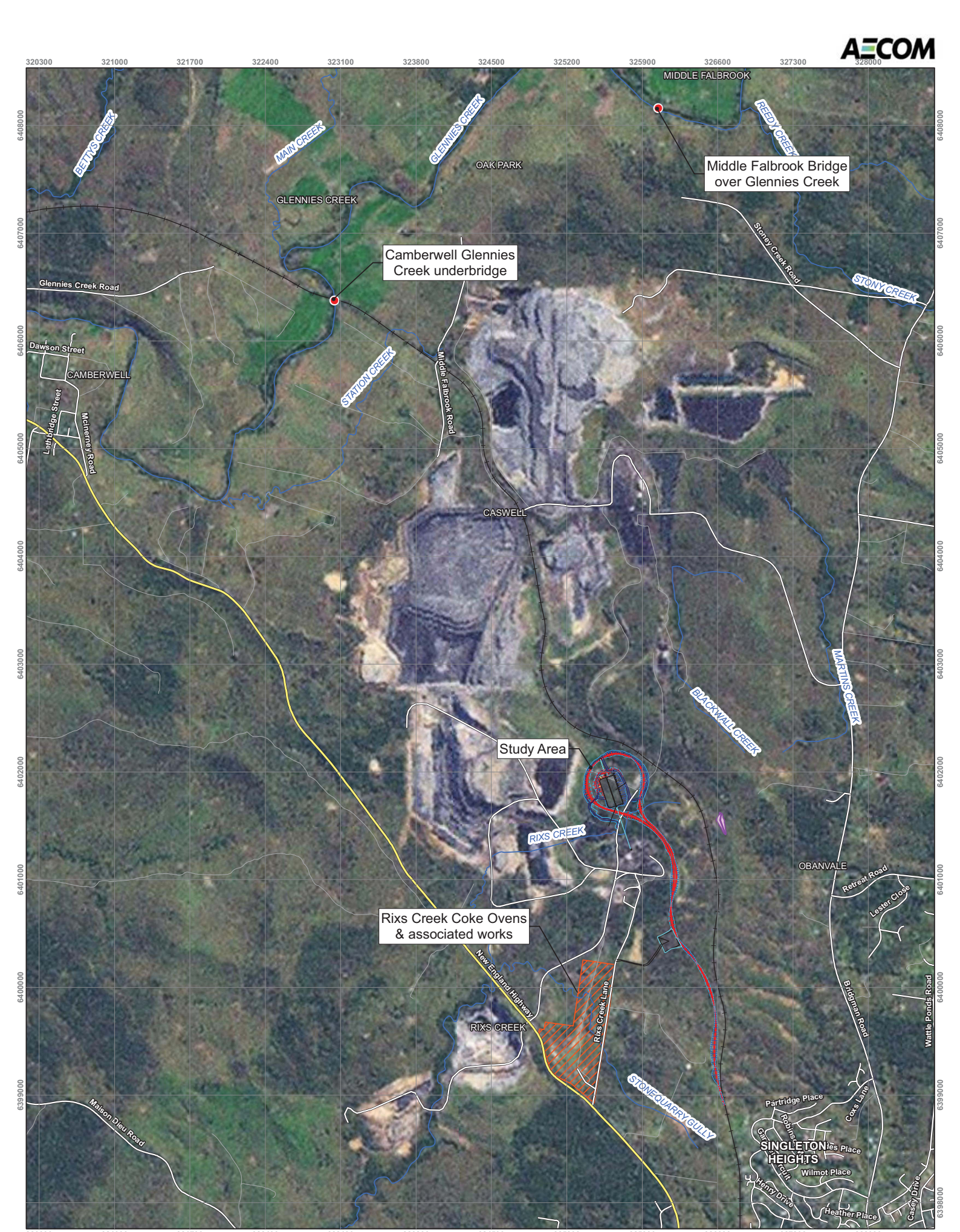
AECOM undertook a search of relevant heritage inventories on 26 July 2012. Table 2 summarises the heritage resource as currently listed on statutory registers. There are no listed heritage items within the study area. There are three items located in the surrounding region that are listed in registers. These included:

- Middle Falbrook Bridge over Glennies Creek, located approximately 5945 m north of the northernmost extent of the study area;
- Camberwell Glennies Creek underbridge, located approximately 4900 m northwest of the northernmost extent of the study area; and
- Rixs Creek Coke Ovens and associated works located 1230 m west of the southernmost extent of the study area.

The location of these items in relation to the Project is shown on Figure 4.

Table 2 Heritage Items Identified on Heritage Inventories

Register	Items within Study Area	Items in surrounding region of Study Area
Commonwealth Heritage List	0	0
National Heritage List	0	0
Register of the National Estate	0	Middle Falbrook Bridge over Glennies Creek
NSW State Heritage Register	0	Middle Falbrook Bridge over Glennies Creek
NSW State Heritage Inventory	0	0
S170 Registers	0	Camberwell Glennies Creek underbridge Middle Falbrook Bridge over Glennies Creek
Singleton Shire Council LEP	0	Rixs Creek Coke Ovens and associated works
Hunter Regional Environmental Plan	0	0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MIDDLE FALBROOK
REEDY CREEK
BETTYS CREEK
MAIN CREEK
GLENNIES CREEK
OAK PARK
GLENNIES CREEK
Middle Falbrook Bridge over Glennies Creek
Stoney Creek Road
STONY CREEK
Camberwell Glennies Creek underbridge
Glennies Creek Road
Dawson Street
CAMBERWELL
Lathbridge Street
Moinemeny Road
STATION CREEK
Middle Falbrook Road
CASWELL
MARTINS CREEK
BLACKWALL CREEK
Study Area
RIXS CREEK
OBANVALE
Retreat Road
Lester Close
Rixs Creek Coke Ovens & associated works
New England Highway
Rixs Creek Lane
RIXS CREEK
Bridgman Road
Wattle Ponds Road
STONEQUARRY GULLY
Maison Dieu Road
Partridge Place
Robins Place
Cors Lane
SINGLETON HEIGHTS
Wilmot Place
Heather Place
Casey Drive
Heritage Inventory Item
Principal Road
Minor Road
Track
Rixs Creek Coke Ovens & associated works
Railway
Waterway
Study Area
Visual bund
RIXS CREEK
Fig. 4 Items identified on Heritage Inventories
Source: LPMA, (2011)
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4.0 Historical Context

4.1 Introduction

The historical context of an area is important in understanding the type of sites likely to be identified and their potential distribution. The following section provides a brief overview of the history of the Hunter Valley, before focusing on the study area.

4.2 Early European Exploration

The Hunter region was initially identified as an area of rich resources in 1797 when Lieutenant John Shortland found coal at the mouth of the Hunter's River, as it was then known. A convict settlement was established at the mouth of the River in 1801 to gather coal and timber and burn shells for lime (Hunter, 2010: 6).

The 1810s saw increased pressure on land around Sydney, especially following several years of drought. The farmers on the Hawkesbury River around Windsor petitioned Governor Macquarie to allow exploration inland. In 1819, Macquarie authorised men to find an overland route into what is now the Hunter Valley. The leader of this party, Windsor chief constable John Howe, stated it was the best pasture he had seen since leaving England. Confirmation of the overland route was undertaken in 1820 (Hunter, 2010: 7). Macquarie rewarded the men in this second party with land grants around what is today Singleton.

Land was quickly surveyed and by 1823 grants along rivers and creeks had been issued. Settlement, however, occurred at a slower pace. A traveller in 1827 said that the area was inhabited by single shepherds with their flocks (Hunter, 2010: 8).

4.3 Rixs Creek History

Known historical industry developments in the Rixs Creek area were associated with mining and farming. William Longworth was employed by the Bowman family to sink a shaft to test for coal in 1847. Longworth's report that the coal was not of sufficient quality to warrant mining led to the closure of the shaft soon after (Noble, n.d.).

A coal pit was opened at Rixs Creek in 1860, where reportedly two men were employed during winter and one during summer. Coal from the mine was sold to Singleton "at 10/- a ton at the pit or 17/6 delivered at Singleton". Described in 1869 as "one of the most promising industries in the neighbourhood of Singleton", the distance from the mine to the railway terminus was cited as limiting the coal mine from competing with others located closer to Newcastle (Jervis, 1953). The proprietor of the Rixs Creek mine in 1869 was James Singleton, and it was stated that he had spent a total of 1000 pounds on the works for the mine (Jervis, 1953). Other coal mines at Rixs Creek included William Longworth's Whodathoughtit mine for steaming coal, opened in the 1870s following his return to the area after a stint in the gold fields, and the New Park coal mine opened in 1881 by a syndicate formed by Dr Richard Read (Noble, n.d.).

The same syndicate that opened the New Park mine also opened the Rixs Creek Coke Ovens (Noble, n.d.). A battery of coke ovens were built at Rixs Creek in the 1880s, with a second battery of ovens constructed in 1900. Both batteries were cited as being visually discernible from Rixs Creek and the coke produced there was described in 1890 as "the best available" (Armstrong, 1983). A rail siding is shown on the 1912 Parish Map of Darlington leading from the Main North Line toward the Coke Ovens, but appears to be incomplete, only extending part of the way across a 50 acre block owned by S. Noble. The 1923 Parish Map of Darlington however shows the same rail siding corridor extended right across the S. Noble land and across the parcel to the west of it, reaching the Alexander Gardner owned land parcel where the Coke Ovens were situated. A major business in the area, the remnant coke ovens and associated works have since been listed in the Singleton LEP. Some of the other historic businesses noted at Rixs Creek in the 1880s included three hotels, two stores, one church and a sports ground. The total population situated at Nundah and Rixs Creek was over six hundred people in the 1880s, with Rixs creek reported at that time to have had "the best brass band in the north of the state" (Noble, n.d.).

Data about the residents of Rixs Creek from the 1860s to the 1920s is documented in church records and Post Office directories, describing the names and occupations of locals during this time. Records from the 1860s list storekeepers, labourers, carriers, farmers, settlers, a coal driver and a publican all based at Rixs Creek. Farmers included names like Martin Marr, James Paul, Patrick Grady and Alexander Gardener. Settlers in the area included Peter and Martha Armstrong, James and Martha Wilson, and Joseph and Elizabeth Aberfield. The local

storekeepers in 1864 were Samuel and Caroline Carson and the local publican in 1867 was James Quigan (Bailliere's Post Office, 1867).

Landholders at Rixs Creek in 1885 included John Elliot (who was listed as owning three horses, three cattle and two pigs), A. Wilson (who was listed as owning ten horses) and Mrs Price (listed as owning 400 acres, 12 horses, 88 cattle, 33 sheep and six pigs) (Singleton Legislative Council, 1885). There were also 37 residents by 1884 who listed their occupation as miner, as well as William Lindsay who listed himself as an engineer. Other farming families during 1884 included James Dobie, John Price, Richard Price and William Price (Sands Country Directory, 1884). By 1922 the Price name was still active in the area with John Price registered as owning grazing land and operating a dairy farm at Rixs Creek. As well as miners, farmers and labourers, one Donald Coates was listed as living in the area and working as an engine driver (Shire of Patrick Plains, 1922). The 1923 and 1929 Parish Maps of Darlington show Rixs Creek Public School located on the same land as the Rixs Creek Coke Ovens, a 110 acre block owned by Alexander Gardner (see Plate 1).

The Main North Line was utilised to transport both goods and people to and from Rixs Creek between 1885 and 1938. The full extent of the Main North Line started at Sydney and extended north to the town of Wallangarra on the Queensland border, with the main northern trunk line carrying freight and passengers between Sydney and Maitland. At the time of writing this report the Main North Line remains an active and important piece of transport infrastructure in NSW. Between 1885 and 1938 it was an important piece of historic infrastructure that connected the goods, produce and people of Rixs Creek to external markets and places. Industries in the area during that period included farms (dairy and pastoral), coal mines, stores and the coke ovens. The Rixs Creek platform was opened in 1885 to service the Main North Line and was in use up until the closure of the platform in November 1938. The 1930 Local Appendix lists it as station number N23A and states that it consisted of a platform only (there were no other station structures). The platform did not have permanent staff and was used only infrequently (New South Wales Government Railways, 1930). It is shown on the 1929 parish map of Darlington as being located in the rail corridor next to a 58 acre lot owned by F. L. Mackay (see Plate 1). In December 1952 the Main North Line was deviated slightly (approximately 90 m further east) in the area of Rixs Creek, with the disused platform located on the original alignment (Bozier, 2012). Also located on the original alignment in this area was a rail siding that had extended from the Main North Line to the Rixs Creek Coke Ovens, to better facilitate the transportation of material to and from the ovens. The rails were removed from the siding after the ovens closed down. The rails were also removed from the original section of rail corridor for the Main North Line, with the remnant corridor used since then as a vehicle track (Bozier, 2012).

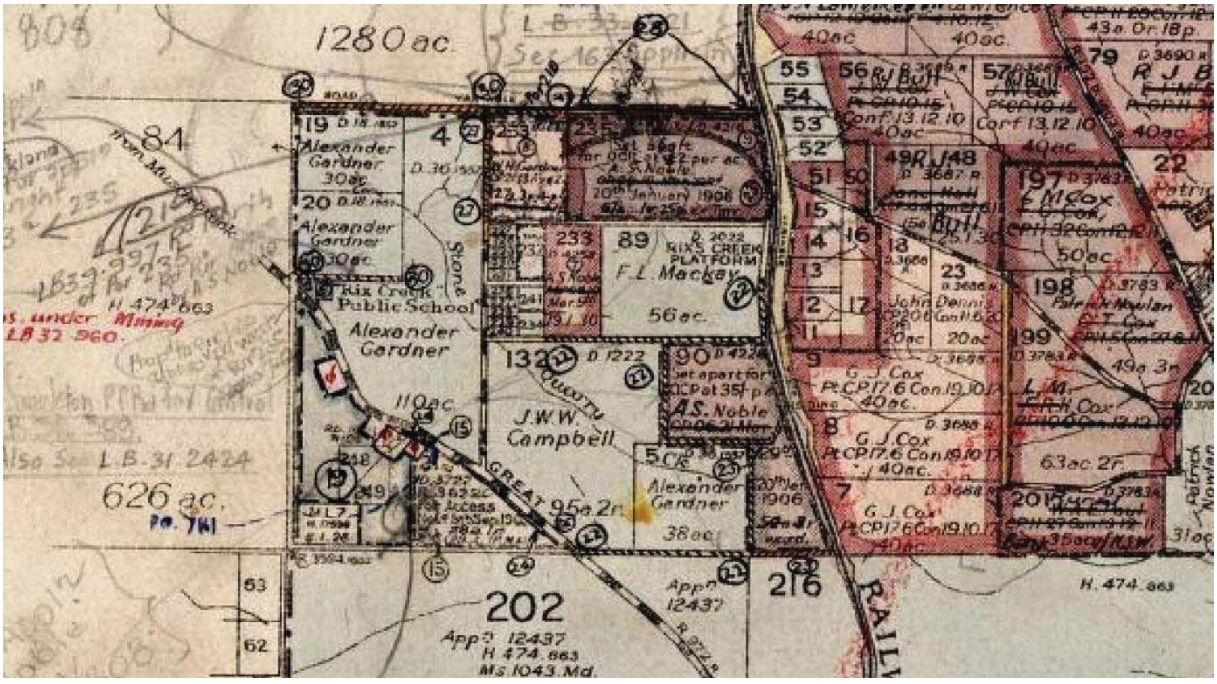


Plate 1 Detail of the 1929 Parish Map of Darlington

4.4 Land Settlement and Development

European settlement in the general Singleton area commenced in the c. late 1820s. Early land development was associated with wheat cropping, tobacco production dairy farming and timber cropping. From the c.1870s onwards the land in the vicinity of Rixs Creek was cleared, predominantly for mining activities. Subsequently the area within, and in the vicinity of, the study area, has been used for both mining and grazing activities, which have significantly affected the physical environment of the area.

Much of the surface soil in the local area has been disturbed as a result of native vegetation clearance. Sheet and gully erosion has resulted in some areas from clearing and subsequent grazing activities. This has been exacerbated by the highly erosional nature of the soils in the area. Sheet erosion is generally evident on lower slopes. This has resulted in the loss of topsoil, particularly across the lower to mid slope sections, which collect water runoff from higher ground during times of rain. Rixs Creek and its tributaries are generally in a rather degraded state in the vicinity of the study area, with stream bank erosion and gullying evident along drainage lines in the local area. The construction of dams, in conjunction with mining activities undertaken in the area, has also significantly altered the previous drainage regimes in the vicinity of the study area.

As a result of the past land uses, land disturbance within the study area can be summarised as follows:

- Native vegetation clearance;
- Trampling from cattle grazing;
- Fencing works;
- Earthworks and excavation for damming;
- Erosion, particularly along creeklines;
- Landscape disturbances from the construction of vehicle tracks;
- Landscape disturbances from the construction of infrastructure; and
- Landscape disturbances from coal mining activities.

3.0 Methodology

A field survey was undertaken by Rochelle Coxon and Dr Darran Jordan of AECOM on Friday 29 July 2012. A second survey was undertaken by the same team on Friday 19 October 2012. They were escorted within the Rix's Creek Coal Mine area by mine representatives John Hindmarsh (Senior Environmental Officer) and Jason Desmond (Environmental Officer). The following sections describe the methodology used during the field survey.

3.1 Field Survey Methodology

Historical research prior to the fieldwork had not identified any areas of interest within the bounds of the study area.

The objective of the field survey was to assess the defined study area and to determine if there were any sites of heritage significance present. The field survey of the study area was a pedestrian survey covering the rail line alignment out to a distance of 50 m either side of the proposed rail line (100 m width in total). This covered and, in some areas exceeded, the extent of the defined study area. The interior of the circular area contained by the rail loop at the northern end of the study area was also surveyed via pedestrian transects. The areas covered are shown in Figure 3.

The following method of investigation was undertaken with each site identified on the survey:

- Rix's Creek Coal Mine Senior Environmental Officer John Hindmarsh was asked for any known information regarding each site;
- The structures and/or features at the site were identified and recorded;
- The structures and/or features were assessed for historical significance;
- Photographs of the structures and/or features were captured and details were recorded in a photo log; and
- The position of the item/s was recorded with a GPS.

3.2 Analysis Method

The GPS data was provided to AECOM's GIS analyst for mapping. The field notes were then typed into Heritage Inventory Sheets for each of the sites inspected during the field survey. During this process, the physical evidence was analysed in light of the item's historical context and the item's significance was then assessed. The process of determining significance is described further in Section 3.3. The significance of each item and the information collected in the field are key components in determining what impact, if any, the Project may have on the items. Based on the significance of the item and the level of potential impact, management recommendations were developed.

3.3 Significance Assessment Criteria

In order to understand how development will impact on a heritage item, it is essential to understand why an item is significant. An assessment of significance is undertaken to explain why a particular site is important and to enable the appropriate site management and curtilage to be determined. Cultural significance is defined in the Australia ICOMOS Charter for the conservation of places of cultural significance (the Burra Charter) as meaning "aesthetic, historic, scientific or social value for past, present or future generations" (Article 1.1). Cultural significance may be derived from a place's fabric, association with a person or event, or for its research potential. The significance of a place is not fixed for all time, and what is of significance to us now may change as similar items are located, more historical research is undertaken and community tastes change.

The process of linking this assessment with a site's historical context has been developed through the NSW Heritage Management System and is outlined in the guideline *Assessing Heritage Significance* (NSW Heritage Office, 2001), part of the NSW Heritage Manual (NSW Heritage Office & NSW Department of Urban Affairs and Planning, 1996a). The *Assessing Heritage Significance* guidelines establish seven evaluation criteria (which reflect four categories of significance and whether a place is rare or representative) under which a place can be evaluated in the context of State or local historical themes. Similarly, a heritage item can be significant at a local level (i.e. to the people living in the vicinity of the item), at a State level (i.e. to all people living within NSW) or be significant to the country as a whole and be of National or Commonwealth significance.

Following amendments to the *Heritage Act* in 2009, to be of State significance an item must meet two or more of the criteria below. Items can be deemed of local significance if they meet one or more criteria.

Criterion (a) – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of significant human activity or maintains or shows the continuity of historical process or activity. An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (b) – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).

The site must show evidence of significant human occupation. An item is excluded if it has been so altered that it can no longer provide evidence of association.

Criterion (c) – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

An item can be excluded on the grounds that it has lost its design or technical integrity or its landmark qualities have been more than temporarily degraded.

Criterion (d) – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

This criterion does not cover importance for reasons of amenity or retention in preference to proposed alternative.

Criterion (e) – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area). Significance under this criterion must have the potential to yield new or further substantial information.

Under the guideline, an item can be excluded if the information would be irrelevant or if it only contains information available in other sources.

Criterion (f) – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area). The site must show evidence of the element/function, etc, proposed to be rare.

Criterion (g) – an item is important in demonstrating the principal characteristics of a class of NSW's:

- cultural or natural places; or
- cultural or natural environments.

An item is excluded under this criterion if it is a poor example or has lost the range of characteristics of a type.

The Heritage Council requires the summation of the significance assessment into a succinct paragraph, known as a Statement of Significance. The Statement of Significance is the foundation for future management and impact assessment.

4.0 Field Survey Results and Significance Assessment

During the field survey four historic sites were identified. These included:

1. Historic sandstone excavation area;
2. Rail siding associated with Rixs Creek Coke Ovens and associated works;
3. Abandoned section of rail corridor from the Main North Line with cuttings and abutting wall; and
4. Rixs Creek platform and associated historic artefact scatter.

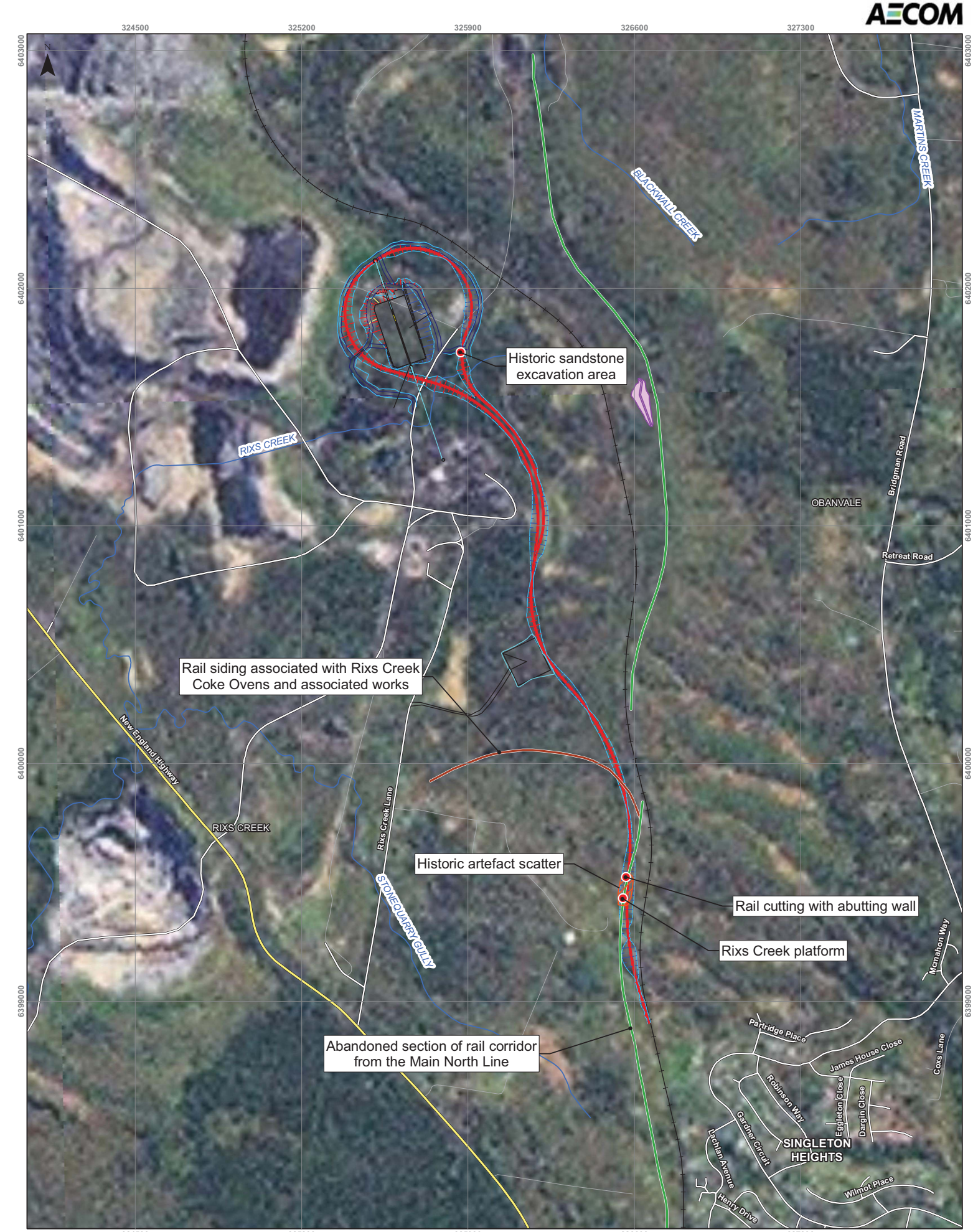
Contemporary structures and features such as fence lines, 11kV line covers, an abandoned car, vehicle tracks and roads associated with the current mine were noted as present on the survey, but were not recorded due to their contemporary nature. Aboriginal archaeological sites were also noted on the survey. Of significance to this study was an Aboriginal artefact scatter site identified at the same location as the historic scatter of artefacts associated with the Rixs Creek platform. The Indigenous component of the project is discussed in a separate report (AECOM Australia Pty Ltd, 2012). The following section describes each of the four historic sites identified within the study area. The descriptions consider the criteria outlined in section 3.3 to determine heritage significance and provide a Statement of Significance. The locations of the items identified during the survey are shown on Figure 5.

4.1 Location coordinates

The table below (Table 3) contains coordinates for the historic features identified during the survey. The table includes centroid coordinates; these should not be taken to represent the entirety of the feature. In the case of the rail alignment and siding the coordinates given here are for the northern and southern ends of that section of the alignment that is contained within the study area. For indication of the full geographic extent of these features please refer to Figure 5.

Table 3 Location coordinates

Historic feature	Easting GDA 94 (Zone 56)	Northing GDA 94 (Zone 56)
Historic sandstone excavation area	325870mE	6401731mN
Rail siding associated with Rixs Creek Coke Ovens and associated works – northern extent – southern extent	 326526mE 326562mE	 6399938mN 6399895mN
Abandoned section of rail corridor from the Main North Line (crossing proposed rail line) – northern extent – southern extent – abutting wall	 326595mE 326547mE 326560mE	 6399645mN 6399455mN 6399522mN
Abandoned section of rail corridor from the Main North Line (crossing proposed visual bund area) – northern extent – southern extent – cutting	 326674 326702 326702	 6401609 6401461 6401466
Rixs Creek platform – centroid Artefact scatter – northern extent Artefact scatter – southern extent	326553mE 326551mE 326551mE	6399433mN 6399534mN 6399415mN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MARTINS CREEK
Historic sandstone excavation area
RIXS CREEK
Bridgman Road
OBANVALE
Retreat Road
Rail siding associated with Rixs Creek Coke Ovens and associated works
New England Highway
RIXS CREEK
Rixs Creek Lane
STONEQUARRY GULLY
Historic artefact scatter
Rail cutting with abutting wall
Rixs Creek platform
Mcmahon Way
Partridge Place
James House Close
Coxs Lane
Robinson Way
Eggleton Close
Dargin Close
Gardner Circuit
Lachlan Avenue
SINGLETON HEIGHTS
Wilmot Place
Henty Drive
Abandoned section of rail corridor from the Main North Line
Heritage item
Historic artefact scatter
Principal Road
Minor Road
Track
Rail siding associated with Rixs Creek coke ovens and associated works
Abandoned section of rail corridor from the Main North Line
Railway
Waterway
Study Area
Visual bund
RIXS CREEK
Fig. 5 Heritage Items Identified during Field Survey
Source: LPMA, (2011)
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4.2 Historic sandstone excavation area

4.2.1 Description

The site consisted of a section of sandstone ridge that appeared to have evidence of small scale excavation of sandstone. The area was approximately 20 m by 10 m in size, within which smaller pieces of sandstone had been exposed. There were no visible pick marks or other historic markers to definitively identify the area, but it is possible that some small scale sandstone excavation took place at this location. Rix's Creek Coal Mine escort John Hindmarsh stated that the area of possible sandstone excavation predated mining activity in the area (pre-1989). This site was located at 325870mE 6401731mN GDA 94 (Zone 56). It was located on the midslope section a sandstone ridge.

Plate 2 **Historic sandstone excavation area**

Plate 3 **Historic sandstone excavation area**

4.2.2 Historical Context

There is no specific historical information available pertaining to this site. The Singleton 1:250000 topographic map and the Parish maps of Darlington from 1912 to 1972 identify Stone Quarry Gully as a natural feature located in the Rixs Creek area, between Rixs Creek Lane and the New England Highway, approximately 1.8 kilometres south of this site. The name attributed to the gully suggests that the quarrying of stone may have been undertaken historically in the area, possibly during the formative years of farming and settlement in the Upper Hunter region. Sandstone was used in the construction of structures at Rixs Creek, including the Rixs Creek Cove Ovens (The Amateur Geological Society of the Hunter Valley, 2009: 7). This site could therefore possibly be related to the settlement or the Ovens. This is a speculative observation only as it has not been possible to date this site or provide more than this general historical context. According to the 1912 to 1972 Parish Maps of Darlington this site was located close to the southern border of a 200 acre block of land owned by The Union Bank of Australia Limited. There is no evidence recorded on the parish maps of quarrying in this area.

4.2.3 Significance Assessment

APPLICATION OF CRITERIA	
Historical significance SHR criteria (a)	This item is of potential local historical significance as it provides an example of an activity (stone quarrying), that probably took place in the formative years of farming and settlement in the Upper Hunter region.
Historical association significance SHR criteria (b)	This item is not of historical association significance on a State or local level as it does not have a strong or special association with the life or works of a person, or group of persons, of importance in state or local cultural history.
Aesthetic significance SHR criteria (c)	This item is not of aesthetic significance on a State or local level as it does not demonstrate aesthetic characteristics and/or a high degree of technical achievement in the state or the local area.
Social significance SHR criteria (d)	This item is not of social significance on a State or local level as it does not have a strong or special association with a particular community or cultural group in the state or local area for social, cultural or spiritual reasons.
Technical/Research significance SHR criteria (e)	This item is not of technical/research significance on a State or local level as it does not possess the potential to yield information that will contribute to or enhance our understanding of state or local cultural history.
Rarity SHR criteria (f)	This item does not possess uncommon, rare, or endangered aspects of State or local cultural history and so does not qualify as significant under this criterion.
Representativeness SHR criteria (g)	This item is not of representativeness significance as it is not important in demonstrating the principal characteristics of a class of State or local places or environments.

4.2.4 Statement of Significance

This historic sandstone excavation area is of potential local historical significance as it provides an example of an activity employed sometime between the early, formative years of farming and settlement in the Upper Hunter region and the development of Rix's Creek Coal Mine in 1989. It provides physical evidence of former land use patterns and activity.

4.3 Rail siding associated with Rixs Creek Coke Ovens and associated works

4.3.1 Description

A section of rail siding was identified crossing the study area between 326526mE 6399938mN and 326562mE 6399895mN GDA 94 (Zone 56). The rail lines were not present on this section of siding corridor and there were no visible signs of historic material on the surface. It consisted of the built up, mounded area that the tracks had previously been mounted on. Based on aerial images and the oral testimony of mine representative John Hindmarsh (Senior Environmental Officer), the siding was tentatively identified as being associated with the site of the Rixs Creek Coke Ovens and associated works. The available evidence suggests that this siding was used historically to link the Rixs Creek Coke Ovens to the Main North Line. A length of approximately 60 m of the rail siding falls within the impact area of the proposed rail loop corridor.

Plate 4 **Rail siding, view northwest towards Rixs Creek Coke Ovens**

Plate 5 **Rail alignment, view southeast toward the original alignment of the Main North Line**

4.3.2 Historical Context

The Main North Line transported material and people to and from Rixs Creek. The rail siding that extended from the Main North Line to the Rixs Creek Coke Ovens was part of the historical transport route that linked the Singleton LEP listed coke ovens with external markets.

4.3.3 Significance Assessment

APPLICATION OF CRITERIA	
Historical significance SHR criteria (a)	The railway corridor and siding are of local historical significance as a historic transport route and tangible evidence of historic local industry practices.
Historical association significance SHR criteria (b)	This item has no historical associative significance at a local level.
Aesthetic significance SHR criteria (c)	This item is not of aesthetic significance on a State or local level as it does not demonstrate aesthetic characteristics or a high degree of creative or technical achievement.
Social significance SHR criteria (d)	This item is not of social significance on a State or local level as it does not have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.
Technical/Research significance SHR criteria (e)	This item is not of State or local research significance as it does not have the potential to yield information that could contribute to or enhance our understanding of railway infrastructure of the period.
Rarity SHR criteria (f)	This item does not qualify as significant under this criterion as it is not rare.
Representativeness SHR criteria (g)	This item is not of representative significance as it does not demonstrate the principal characteristics of a class of State or local cultural places or environments.

4.3.4 Statement of Significance

The railway siding is of local significance as it relates specifically to the Rixs Creek Coke Ovens and the larger connection of local industry to the transport route of the Main North Line.

4.4 Abandoned section of rail corridor from the Main North Line with cutting and abutting wall

4.4.1 Description

An abandoned section of the original alignment of the Main North Line was identified in the southern portion of the study area and in the area of the visual bund. This section of the line was diverted in December 1952 (Bozier, 2012) and the tracks have since been removed from the extant rail corridor. At the time of inspection sections of it were being used as a vehicle track. A cutting with an abutting brick wall was identified at 326560mE 6399522mN GDA 94 (Zone 56) (see **Plate 6**). Another cutting was identified at 326702mE 6401466mN.

The total portion of the abandoned rail corridor that is located within the proposed rail loop corridor is approximately 185 m long. It runs from north to south from 326595mE 6399645mN to 326547mE 6399455mN GDA 94 (Zone 56).

The total portion of the abandoned rail corridor that is located within the proposed visual bund area is approximately 175 m long. It runs from north to south from 326674mE 6401609mN to 326702mE 6401461mN GDA 94 (Zone 56). A bolt and three ceramic insulators were identified in association with this section of the abandoned rail corridor. There was no evidence of further non-Aboriginal cultural material or deposits.

Plate 6 **Rail loop area - Rail siding cutting with abutting wall, view northwest along the original alignment of the Main North Line**

Plate 7 **Rail loop area - Original alignment of the Main North Line, view north towards cutting with abutting wall**

Plate 8 **Visual bund area - View north along the original alignment of the Main North Line**

Plate 9 **Visual bund area - view south along the original alignment of the Main North Line to a rail cutting**

4.4.2 Historical Context

The Main North Line transported material and people to and from Rixs Creek. It was an important piece of historic infrastructure that connected the industry of Rixs Creek to external markets. In 1952 the Main North Line was deviated slightly (approximately 90 m to the east) and this corridor portion represents an extant piece of its original alignment.

4.4.3 Significance Assessment

APPLICATION OF CRITERIA	
Historical significance SHR criteria (a)	The railway corridor and siding are of historical significance at a local level as a historic transport route utilised by the people and industries of Rixs Creek until the 1952 diversion.
Historical association significance SHR criteria (b)	This item does not have historical association significance.
Aesthetic significance SHR criteria (c)	This item is not of aesthetic significance on a State or local level as it does not demonstrate aesthetic characteristics or a high degree of creative or technical achievement.
Social significance SHR criteria (d)	This item is not of social significance on a State or local level as it does not have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.
Technical/Research significance SHR criteria (e)	This item does not have technical or research significance.
Rarity SHR criteria (f)	This item does not qualify as significant under this criterion as it is not rare.
Representativeness SHR criteria (g)	This item is not of representative significance as it does not demonstrate the principal characteristics of a class of State or local cultural places or environments.

4.4.4 Statement of Significance

The railway corridor is of local significance as it relates to the people and industries of Rixs Creek who used this section of rail until the 1952 diversion. It also relates to the larger historic transport route of the Main North Line that was an important connection for Rixs Creek to external places and markets.

4.5 Rixs Creek platform and associated historic artefact scatter

4.5.1 Description

At the location of the Rixs Creek platform there was brick facing and a survey marker positioned alongside the original section of rail corridor. Historic records date the use of the platform between 1885 and 1938 (Bozier, 2012). A scatter of historic artefacts was identified on the survey. It was spread either side of the historic section of rail corridor from the original alignment of the Main North Line. The historic artefact scatter included broken glass (including purple glass), broken bottle bases, a fork, a dog spike and broken ceramic insulators. The scatter spread from north to south, from the area of the rail cutting with abutting wall (see **Plate 6**) down to the Rixs Creek platform at 326553mE 6399433mN GDA 94 (Zone 56) (see **Plate 15**). The historic artefacts identified are likely to be associated with the operation period of the Rixs Creek platform. The presence of purple glass fragments identified on the survey suggest a possible date of material between 1890 and 1916, being the commonly accepted manufacture date for purple (solarised amethyst) glass (Bolton, 2005). There may potentially be subsurface deposits of historic material associated with the platform, but these are likely to be limited due to the infrequent use of the platform and the fact that there were no other official rail structures at the location. An Aboriginal artefact scatter was also noted in the same area as the scatter of historic material, which had been disturbed by the cutting of the original rail corridor.

Plate 10 Broken bottle base, purple glass fragments and ceramic insulator fragment in the historic artefact scatter

Plate 11 Dog spike in the historic artefact scatter

Plate 12 Ceramic fragment from rail line insulator in the historic artefact scatter

Plate 13 Fork in the historic artefact scatter

Plate 14 Survey marker set into brick platform at abandoned Rixs Creek platform (Sharman, 2007)

Plate 15 Remnant of brick platform at abandoned Rixs Creek platform (Sharman, 2007)

4.5.2 Historical Context

The Rixs Creek platform was opened in 1885 to service the Main North Line and was in use until November 1938 when the platform was closed. The Main North Line continued to run past the abandoned platform until December 1952, when the line was deviated slightly (Bozier, 2012). After 1952 this section of abandoned rail corridor has been used as a vehicle track. There are no known structures apart from the platform. As it was not a crossing station, with no permanent staff and only used infrequently during its period of operation (New South Wales Government Railways, 1930) the potential deposits and surface scatter can be expected to contain less material than other busier stations. This site is representative of a particular period of time (1885 to 1938) and has the potential to contain evidence of the transportation links for the Rixs Creek community and local industry, which utilised the platform as a contact point to reach external markets and places.

4.5.3 Significance Assessment

APPLICATION OF CRITERIA	
Historical significance SHR criteria (a)	The Rixs Creek platform and associated scatter of artefacts is of local significance as an example of the continued development of the local industry and transportation contacts to external markets during the period of 1885 to 1938.
Historical association significance SHR criteria (b)	This item is of historical associative significance on a local level as it does have special association with the rail industry workers of the Rixs Creek area, including platform attendants and engine drivers. It is also associated with the Rixs Creek community who used the platform between 1885 and 1938 as a connecting point for travel and the transportation of goods.
Aesthetic significance SHR criteria (c)	This item is not of aesthetic significance on a state or local level as it does not demonstrate aesthetic characteristics or a high degree of creative or technical achievement.
Social significance SHR criteria (d)	This item is not of social significance.
Technical/Research significance SHR criteria (e)	This item is of local research significance as it has the potential to yield information that could contribute to or enhance our understanding of local rail operations between 1885 and 1938, with the scatter of historic material and potential subsurface deposits in the vicinity of the platform relating both to the running of the platform and connections between local industry and community with external markets and places.
Rarity SHR criteria (f)	This item does not qualify as significant under this criterion as it is not rare.
Representativeness SHR criteria (g)	This item is of local representative significance as it does demonstrate the principal characteristics of a local class of rail platform, representative of the time period from 1885 to 1938.

4.5.4 Statement of Significance

Rixs Creek platform is of local significance and has the potential to contain information in the associated material record (potential subsurface deposits and surface scatters of historic artefacts) to yield information about both the rail industry and its interface with local industry at Rixs Creek between 1885 and 1938. The extent of the material that may be located at the site will have been limited by the small capacity and infrequent use of the platform during its years of operation.

5.0 Issues and Potential Impacts

The following section draws upon information provided in Section 4.0 to address the issues and potential impacts on identified heritage items during the construction and operation phases of the Project.

5.1 Direct Impacts

The development of the Project will result in direct impacts to all four items identified during the field survey as they fall within the bounds of the proposed rail loop and rail loading facility area. These items are:

1. Historic sandstone excavation area;
2. Rail siding associated with Rixs Creek Coke Ovens and associated works;
3. Abandoned rail corridor from Main North Line with cutting and abutting wall; and
4. Rixs Creek platform and associated historic artefact scatter.

The potential sandstone excavation area is situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of the item.

A section of the rail siding associated with Rixs Creek Coke Ovens is situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of a 60 m section of the siding. It is estimated that the total length of the disused siding is approximately 1 km in length, meaning the area of impact to this item represents 6% of the total.

A section of the abandoned portion of the Main North Line corridor (disused after the line was slightly diverted in 1952) is situated within the proposed rail loop corridor and visual bund area. The construction of the Project will result in the destruction of a 230 m portion of the item within the rail loop corridor. It will result in potential disturbance to approximately 175 m in the visual bund area. The total length of the identifiable sections of the extant portions of disused corridor is approximately 6270 m in length, meaning the area of impact to this item represents 6.46% of the total. One unique feature within the corridor however will be destroyed, that being the cutting with abutting wall.

The Rixs Creek platform and associated historic artefact scatter are situated within the proposed rail loop corridor. The construction of the Project will result in the destruction of this item. Extant features such as the rail platform, survey marker, surface scatter and any archaeological deposits associated with the platform will be destroyed. This site was found to have local significance under criteria a, b, e and g. It has been assessed as having the potential to yield information to enhance the understanding of local rail operations in the area between 1885 and 1938.

6.0 Mitigation and Management

Where engineering design measures are unable to avoid impacts to items of heritage significance, mitigation and management measures for each impact are proposed to reduce the magnitude of the impacts as far as practicable.

6.1 Directly Impacted Items

The Bloomfield Group is seeking an Approval for this Project under Clause 8J(8) of the Environmental Planning and Assessment Regulation 2000, which allows modifications of State Significant Development Consents issued under Part 4 of the *Environmental Planning and Assessment Act 1979*, to be modified through Section 75W of the Act. As such, heritage items may be disturbed without the need for the proponent to obtain permits under the *Heritage Act 1977*.

The four heritage items identified within the proposed rail loop disturbance footprint will all be impacted by the proposed works, with destruction to that portion of the site that is within the study area. It is recommended that a photographic archival recording be undertaken for all four items, given their age and historical significance. In addition, it is recommended that the platform site and cutting with abutment feature be recorded through scaled drawings prior to the commencement of works. If it is possible to preserve the abutting wall and rail platform these features should be fenced during works for their protection. It is also recommended that the recording and surface collection of historic artefacts be carried out at the scatter site located in proximity to the rail platform and that monitoring take place during ground disturbing works in this area. All recordings should comply with the Heritage Branch, within the Office of Environment and Heritage, guidelines: *How to Prepare Archival Records of Heritage Items* (NSW Heritage Office, 1998b) and *Photographic Recording of Heritage Items using Film or Digital Capture* (NSW Heritage Office, 2006).

6.2 Historical Heritage Management Recommendations

The management of the historical heritage within and adjacent to the study area should be undertaken with reference to a list and map indicating the location of sites identified within the study area and relevant adjacent heritage items (as provided in this report). The following recommendations are made:

1. The abutting wall and platform in the rail corridor should be preserved if possible. If they can be avoided from direct impacts they should be fenced during works for their protection. If it is not possible to preserve these features then no works should occur until they have been subject to full archival recording as per recommendation number 2 (below).
2. Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the cutting with abutting wall, the Rixs Creek platform, the artefact scatter site associated with the platform and the sandstone excavation area. This work should be undertaken by a qualified archaeologist.
3. Surface collection is to be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek platform prior to construction works. GPS positions and photographs are to be taken for each artefact prior to collection. The artefacts are to be analysed by a historic heritage expert at AECOM and a report produced of the results. Monitoring is to be undertaken by a qualified archaeologist during ground disturbing works in proximity to the Rixs Creek platform.
4. The full extent of the rail siding associated with the Rixs Creek Coke Ovens should be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work should be undertaken by a qualified archaeologist.
5. The full extent of the original rail alignment corridor of the Main North Line should be plotted with GPS coordinates and photographs taken to document its full extent and any features such as cuttings. This work should be undertaken by a qualified archaeologist.
6. A research methodology document should be produced to guide the recommended salvage, monitoring and archival recording works.
7. In the event that unexpected historic finds are identified during construction, all works should immediately cease. The following procedure guides the management of unexpected and previously unidentified finds during the course of operations. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc), building foundations and earthworks of unknown origin (i.e. not associated with BMC operations). The procedures are:

- All work in the area is to cease immediately;
- Alert the Environmental Specialist to the find;
- If necessary, protect the area with fencing;
- Engage a suitably qualified archaeologist to undertake an assessment of the find/s;
- The assessment should be undertaken using the guidelines Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch, 2009);
- On the advice of the archaeologist, if necessary, prepare an Impact Assessment and Research design and methodology to submit to the Heritage Branch for a Section 140 excavation permit or exception;
- Undertake the archaeological mitigation in accordance with the prepared documents and the permit/exception issued by the Heritage Branch; and
- Once the site has been mitigated to the satisfaction of the archaeologist and the Heritage Branch, works may resume in the area.

8. Should human remains be found during construction or operation the following procedure should be followed.

The procedures take into account the following documents:

- *Burials - Exhumation of Human Remains* NSW Health Policy Directive PD2008_022 (NSW Health, 2008) available at : http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf
- *Manual for the Identification of Aboriginal Remains* (NSW Department of Environment & Conservation, 2006);
- *Skeletal Remains – Guidelines for the management of human skeletal remains under the Heritage Act 1977* (NSW Heritage Office, 1998a); and
- *The Aboriginal Cultural Heritage Standards and Guidelines Kit* (NSW National Parks and Wildlife Service, 1997).

In the event that operations reveal possible human skeletal material (remains), the following procedure is to be followed:

- When suspected human remains are exposed, all construction work is to cease immediately in the near vicinity of the find location and the General Manager on site is to be immediately notified. The General Manager will contact the Police at the earliest reasonable time;
- An area of 5 m radius is to be cordoned off by temporary fencing around the exposed human remains site - work can continue outside of this area as long as there is no risk of interference to the human remains or the assessment of human remains. Assessment of risk may utilise the risk matrix provided within the NSW Health Policy directive on the exhumation of human burials;
- Contact the OEH Environment line on 131 555 and the Heritage Branch on 02 9873 8500; and
- A physical or forensic anthropologist should be commissioned by Rix's Creek Coal Mine to inspect the remains in situ (unless otherwise directed by the police), and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or modern), then:

d) if the remains are identified as modern the area is deemed as crime scene; or

e) if the remains are identified as Aboriginal, the Environmental Specialist will notify OEH and representatives of the local Aboriginal community and appropriate management measures will be determined through consultation with them. Representatives of the Aboriginal community will be present during all investigations of Aboriginal remains; or

f) if the remains are as non-Aboriginal (historical) remains, the site is to be secured and the Heritage Branch is to be contacted.

The above process functions only to appropriately identify the remains and secure the site. From this time, the management of the area and remains is to be determined through one of the following means:

- If the remains are identified as a modern matter, liaise with the police and/or the Coroner's Office and/or NSW Health with respect to the exhumation of the remains;
- If the remains are identified as Aboriginal, liaise with OEH and Aboriginal stakeholders;
- If the remains are identified as non-Aboriginal (historical), liaise with the Heritage Branch; and
- If the remains are identified as not being human then work can recommence without delay.

7.0 Conclusion

Based on the information drawn from the field survey, historical research and other technical study aspects, the conclusions of the non-Indigenous assessment for the Project are summarised below.

There are no listed heritage items within the bounds of the study area. Four heritage items were identified in the field survey:

1. Historic sandstone excavation area;
2. Rail siding associated with Rixs Creek Coke Ovens and associated works;
3. Abandoned rail corridor from Main North Line with cutting and abutting wall; and
4. Rixs Creek platform and associated historic artefact scatter.

These items are of local historical significance and provide a good representation of industry, transport development and land use in the Rixs Creek region. All four items will be impacted as a result of the construction and operation of the Project.

Due to the significance of the items and the proposed impact, it is recommended that each item be documented, in accordance with the relevant guidelines, to capture an accurate record of industry, transport development and land use at Rixs Creek. It is also recommended that surface collection take place at the Rixs Creek platform site, monitoring take place there during works and that a report be produced containing the results of artefact analysis.

8.0 References

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NSW Heritage Office. (2008). *Levels of Heritage Significance* (pp. 1–5). Parramatta: Heritage Office. Retrieved from http://www.heritage.nsw.gov.au/docs/levels_of_heritage_significance_2008.pdf

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Appendix A

Heritage Inventory Sheets

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Project Name	Rix's Creek Coal Mine Rail Loop Project	**Inventory No.**	N/A
Site Name/Identification	Historic sandstone excavation area		
Location	325870mE 6401731mN GDA 94 (Zone 56)		
Site Type	Possible historic quarry/sandstone excavation area		

Photograph

Historical Notes

There is no specific historical information available pertaining to this site. Rix's Creek Coal Mine escort John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer) stated that the area of excavation predated mining activity in the area (pre-1989).

Information Sources

Written	There are no written sources relating to this site.
Oral	John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer)
Graphic	The Singleton 1:250000 topographic map identifies Stonequarry Gully as a natural feature located in the Rixs Creek area, between Rixs Creek Lane and the New England Highway. The name attributed to the gully suggests that the quarrying of stone may have been undertaken historically in the area, possibly during the formative years of farming and settlement in the Upper Hunter region.

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historic Themes	Farming/ settlement/ development	**Level**	Low
Integrity	Good	**Condition**	Good

Heritage Listings

No heritage listing for this site

Period

1823 – 1989

SIGNIFICANCE	REPRESENTATIVE	RARE
Aesthetic	No	No
Historic	Low local	No
Scientific	No	No
Social	No	No

Level of Significance: S = State R = Regional L = Local

Statement of Significance

This historic sandstone excavation area is of limited historical significance on a local level as it provides an example of an activity employed sometime between the early, formative years of farming and settlement in the Upper Hunter region and the development of Rix's Creek Coal Mine in 1989. It provides physical evidence of former land use patterns and activity.

Recommended Action for Conservation/Management

Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the sandstone excavation area. This work should be undertaken by a qualified archaeologist.

Other Information

N/A

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Project Name	Rix's Creek Coal Mine Rail Loop Project	**Inventory No.**	N/A
Site Name/Identification	Rail siding associated with Rixs Creek Coke Ovens and associated works		
Location	From 325732mE 6399940mN to 326612mE 6399785mN GDA 94 (Zone 56)		
Site Type	Rail corridor		

Photographs/Plan

The below blue line shows the approximate corridor for the rail siding. The above images taken 27 July 2012 standing in corridor of rail siding.

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historical Notes

The tracks were not present and there were no visible signs of historic material on the surface. It consisted of the built up, mounded area that the tracks had previously been mounted on. Based on aerial images and the oral testimony of mine representative John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer), the siding was tentatively identified as being associated with the site of the Rixs Creek Coke Ovens and associated works. The available evidence suggests that this siding was used historically to link the Rixs Creek Coke Ovens to the Main North Line. The rail siding that extended from the Main North Line to the Rixs Creek Coke Ovens were part of the historical transport route that linked the Singleton LEP listed coke ovens with external markets.

Information Sources

Written	These written sources have information on the coke ovens which this rail siding attached to. Armstrong, J. (1983). Shaping the Hunter: a story of engineering contribution to the development of the present shape of the Hunter Region, its river, cities, industries and transport arteries. Australia: Institution of Engineers. Noble, L. M. (n.d.). The Glennies Creek Story. The Amateur Geological Society of the Hunter Valley. (2009). "Geo-Log" 2009: Journal of the Amateur Geological Society of the Hunter Valley. Singleton LEP
Oral	John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer)
Graphic	N/A

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historic Themes	Industry/ transport	**Level**	Low
Integrity	Good	**Condition**	Good

Heritage Listings

Singleton Local Environmental Plan Heritage Schedule lists the Rixs Creek Coke Ovens and associated works that the rail siding connected to. There is no listing for the rail corridor.

Period

1885 – 1952

SIGNIFICANCE	REPRESENTATIVE	RARE
Aesthetic	No	No
Historic	Low local	No
Scientific	No	No
Social	No	No

Level of Significance: S = State R = Regional L = Local

Statement of Significance

The railway siding is of local significance as it relates specifically to the Rixs Coke Coke Ovens and the larger connection of local industry to the transport route of the Main North Line. Rixs Creek Coke Ovens and associated works are listed as an item of local significance on the Singleton LEP.

Recommended Action for Conservation/Management

The full extent of the rail siding associated with the Rixs Creek Coke Ovens should be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work should be undertaken by a qualified archaeologist.

Other Information

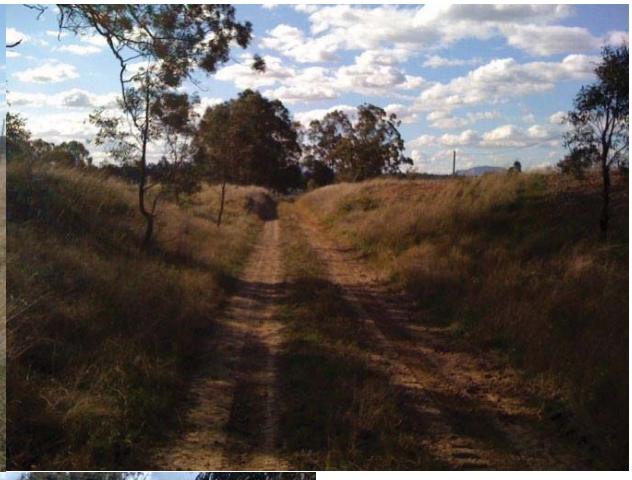
N/A

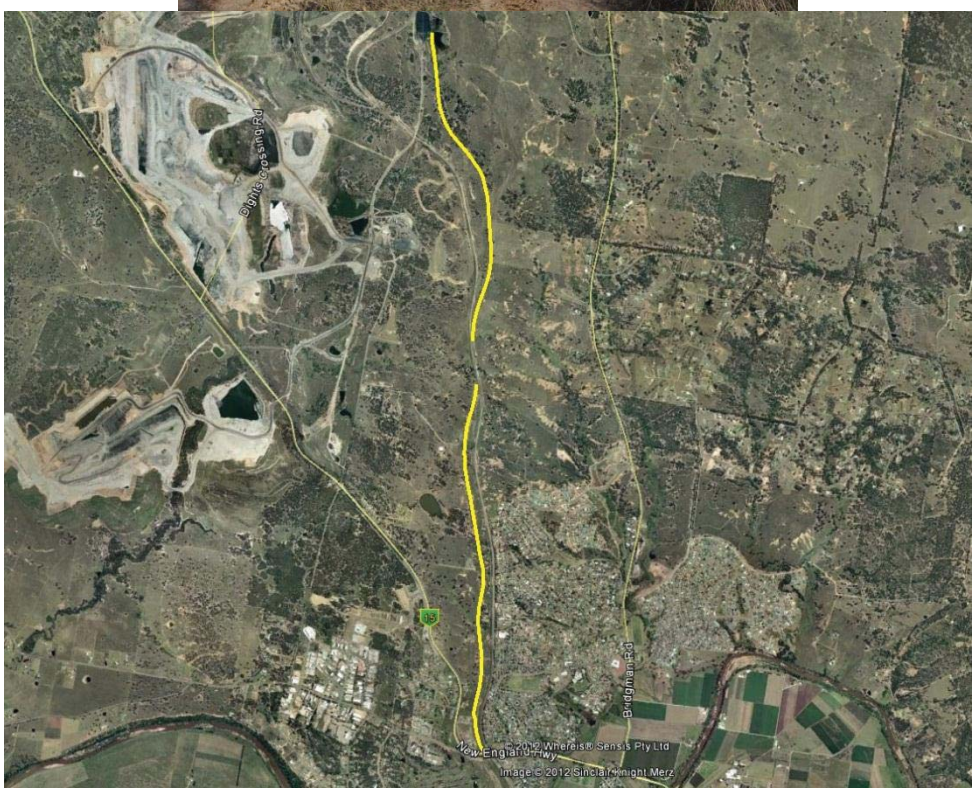
HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Project Name	Rix's Creek Coal Mine Rail Loop Project	**Inventory No.**	N/A
Site Name/Identification	Abandoned section of rail corridor from the Main North Line with cuttings and abutting wall		
Location	From 326630mE 6399840Mn to 326754mE 6396543mN GDA 94 (Zone 56)		
Site Type	Rail corridor		

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Photographs/Plan





Yellow line on above aerial shows approximate extent of extant original rail corridor. Cutting with abutting wall in first photo.

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historical Notes

An abandoned section of the original alignment of the Main North Line was identified in the southern portion of the study area, extending north on the opposite side of the train line. This section of the line was diverted in December 1952, approximately 90 m to the east in the southern portion and ranging out to 200 m to the west in the northern portion. The tracks have since been removed from the extant rail corridor. At the time of inspection it was being used as a vehicle track in sections. A cutting with an abutting wall was identified at 326560mE 6399522mN GDA 94 (Zone 56). Another cutting was identified in the northern portion.

Information Sources

Written	Bozier, R. (2012). NSWrail.net. Retrieved August 10, 2012, from http://www.nswrail.net/
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Oral	John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer)
Graphic	N/A

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historic Themes	Industry/ transport	**Level**	Low local
Integrity	Good	**Condition**	Good

Heritage Listings

There are no heritage listings for this site

Period

1885 – 1952

SIGNIFICANCE	REPRESENTATIVE	RARE
Aesthetic	No	No
Historic	Low local	No
Scientific	Low local	No
Social	No	No

Level of significance: S = State R = Regional L = Local

Statement of Significance

The railway corridor is of low local significance as it relates to the people and industries of Rixs Creek who used this section of rail until the 1952 diversion. It also relates to the larger historic transport route of the Main North Line that was an important connection for Rixs Creek to external places and markets. Examination of the cutting feature with the abutting wall has the potential to contribute to our understanding of railway infrastructure of the period.

Recommended Action for Conservation/Management

The full extent of the original rail alignment corridor of the Main North Line should be plotted with GPS coordinates and photographs taken to document its full extent. Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the cutting with abutting wall. This work should be undertaken by a qualified archaeologist.

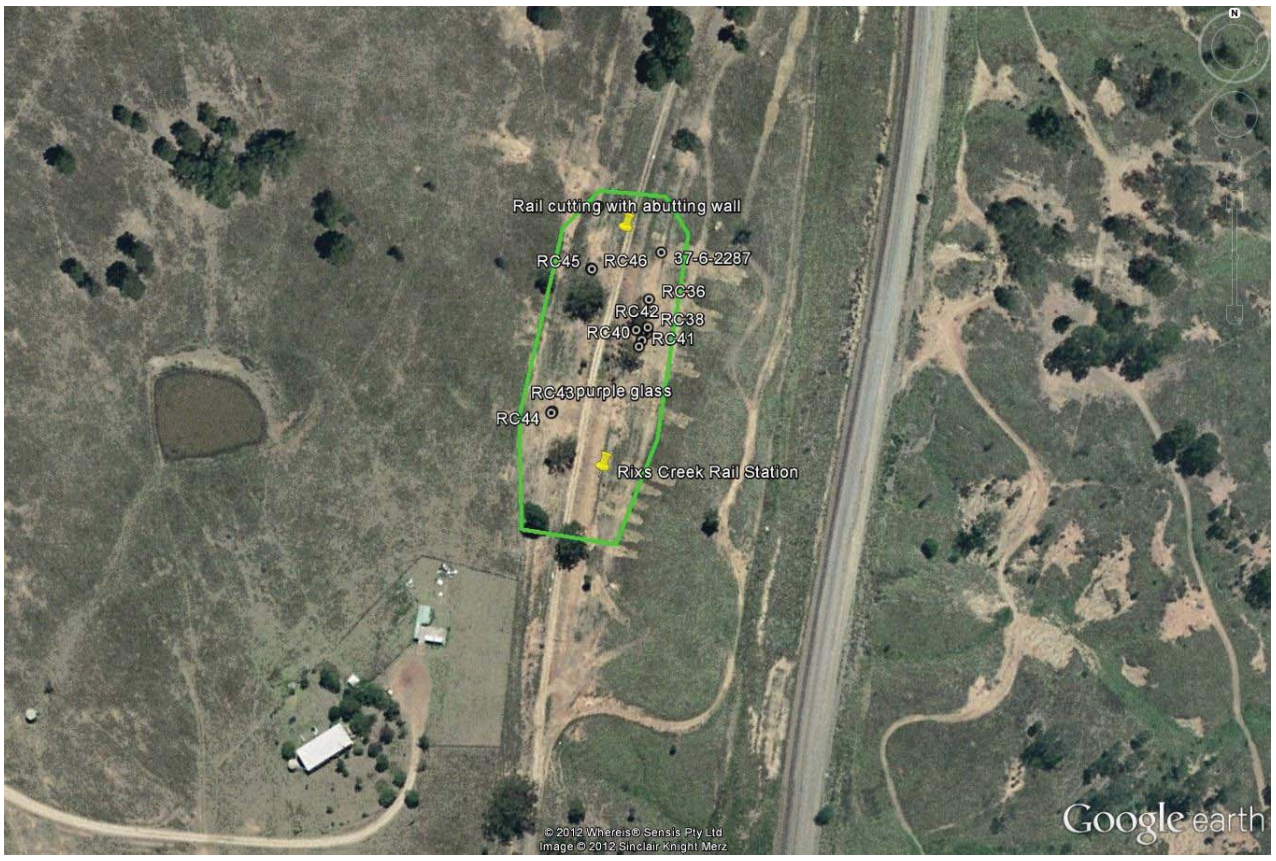
Other Information

N/A

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Project Name	Rix's Creek Coal Mine Rail Loop Project	**Inventory No.**	N/A
Site Name/Identification	Rixs Creek rail station and associated historic artefact scatter		
Location	Rixs Creek rail station at 326553mE 6399433mN GDA 94 (Zone 56) Historic artefact scatter associated with Rixs Creek rail station from 326551mE 6399534mN to 326551mE 6399415mN		
Site Type	Historic artefact scatter and disused rail station platform		

Photographs/Plan



The green outline shows the approximate surface extent of the historic artefact scatter. The rail cutting with abutting wall and rail station platform are both within the same area. Photos 4 and 5 by: Sharman, J. (2007). Rixs Creek Station. Retrieved August 14, 2012, from http://www.nswrail.net/locations/show.php?name=NSW:Rixs+Creek

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historical Notes

The Rixs Creek rail station was opened in 1885 to service the Main North Line and was in use until November 1938 when the station was closed. The Main North Line continued to run past the abandoned station until December 1952, when the line was deviated slightly. After 1952 this section of abandoned rail corridor has been used as a vehicle track. There are no known structures apart from the platform. As it was not a crossing station, with no permanent staff and only used infrequently during its period of operation the potential deposits and surface scatter can be expected to contain less material than other busier stations. This site is representative of a particular period of time (1885 to 1938) and has the potential to contain evidence of the transportation links for the Rixs Creek community and local industry, which utilised the station as a contact point to reach external markets and places.

Information Sources

Written	Bozier, R. (2012). NSWrail.net. Retrieved August 10, 2012, from http://www.nswrail.net/
	New South Wales Government Railways. (1930). Local Appendix to the Working Timetable and Instructions Supplementary to those contained in the Book of Rules and Regulations in the General Appendix: Northern Division. Sydney: Alfred James Kent, ISO, Government Printer.
Oral	John Hindmarsh (Rix's Creek Coal Mine Senior Environmental Officer)
Graphic	N/A

HISTORIC SITE INVENTORY SHEET – PHYSICAL EVIDENCE

Historic Themes	Industry/ transport	**Level**	Low local
Integrity	Good	**Condition**	Good

Heritage Listings

There is no heritage listing for this historic site, although there is an isolated artefact Aboriginal site in the same area listed in the OEH AHIMS database

Period

1885 – 1938

SIGNIFICANCE	REPRESENTATIVE	RARE
Aesthetic	No	No
Historic	Low local	No
Scientific	Low local	No
Social	Low local	No

Level of Significance: S = State R = Regional L = Local

Statement of Significance

Rixs Creek rail station is of local significance and has the potential to contain information in the associated material record (potential subsurface deposits and surface scatters of historic artefacts) to yield information about both the rail industry and its interface with local industry at Rixs Creek between 1885 and 1938. The extent of the material that may be located at the site will have been limited by the small capacity and infrequent use of the station during its years of operation.

Recommended Action for Conservation/Management

Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the Rixs Creek rail station platform and the artefact scatter site associated with the rail station. This work should be undertaken by a qualified archaeologist. Surface collection is to be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek rail station prior to construction works. GPS positions and photographs are to be taken for each artefact prior to collection. The artefacts are to be analysed by a historic heritage expert at AECOM and a report produced of the results.

Other Information

N/A

Rix's Creek Coal Mine Rail Loop Project Archaeological Monitoring Research Design and Methodology

Rix's Creek Coal Mine Rail Loop Project Archaeological Monitoring Research Design and Methodology

Prepared for

The Bloomfield Group

Prepared by

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AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

Quality Information

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Ref	60266677
Date	5 December 2012
Prepared by	Darran Jordan
Reviewed by	Simon Murphy

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	5-Dec-2012	Final	Simon Murphy	

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Figures

1.0 Introduction

1.1 Punctuation note

Regarding the punctuation of this report, please note that both the place Rixs Creek and the watercourse Rixs Creek do not have an apostrophe within the correct presentation of their name. The name of the mine site, however, is correctly presented in this report as Rix's Creek Coal Mine, as per the presentation used in official mine documentation by The Bloomfield Group.

1.2 Background

AECOM Australia Pty Ltd (AECOM) was commissioned by The Bloomfield Group to undertake a non-Indigenous heritage impact assessment for the Rix's Creek Coal Mine Rail Loop Project (the Project). This assessment formed part of an Environmental Assessment (EA) to accompany an application to the NSW Department of Planning and Infrastructure (DP&I) for a proposed modification to the Rix's Creek Coal Mine Development Consent, being the development of a rail loop, rail loading facility and visual bund in the area of Rix's Creek Coal Mine. Searches of all relevant heritage registers identified that there were no listed heritage items within the study area.

A field survey of the study area was undertaken by Dr Darran Jordan and Rochelle Coxon of AECOM on Friday 29 July 2012. A second inspection was undertaken by the same team on Friday 19 October 2012. They were escorted within the Rix's Creek Coal Mine area by mine representatives John Hindmarsh (Senior Environmental Officer) and Jason Desmond (Environmental Officer). During the field survey, four historic sites were identified. These were:

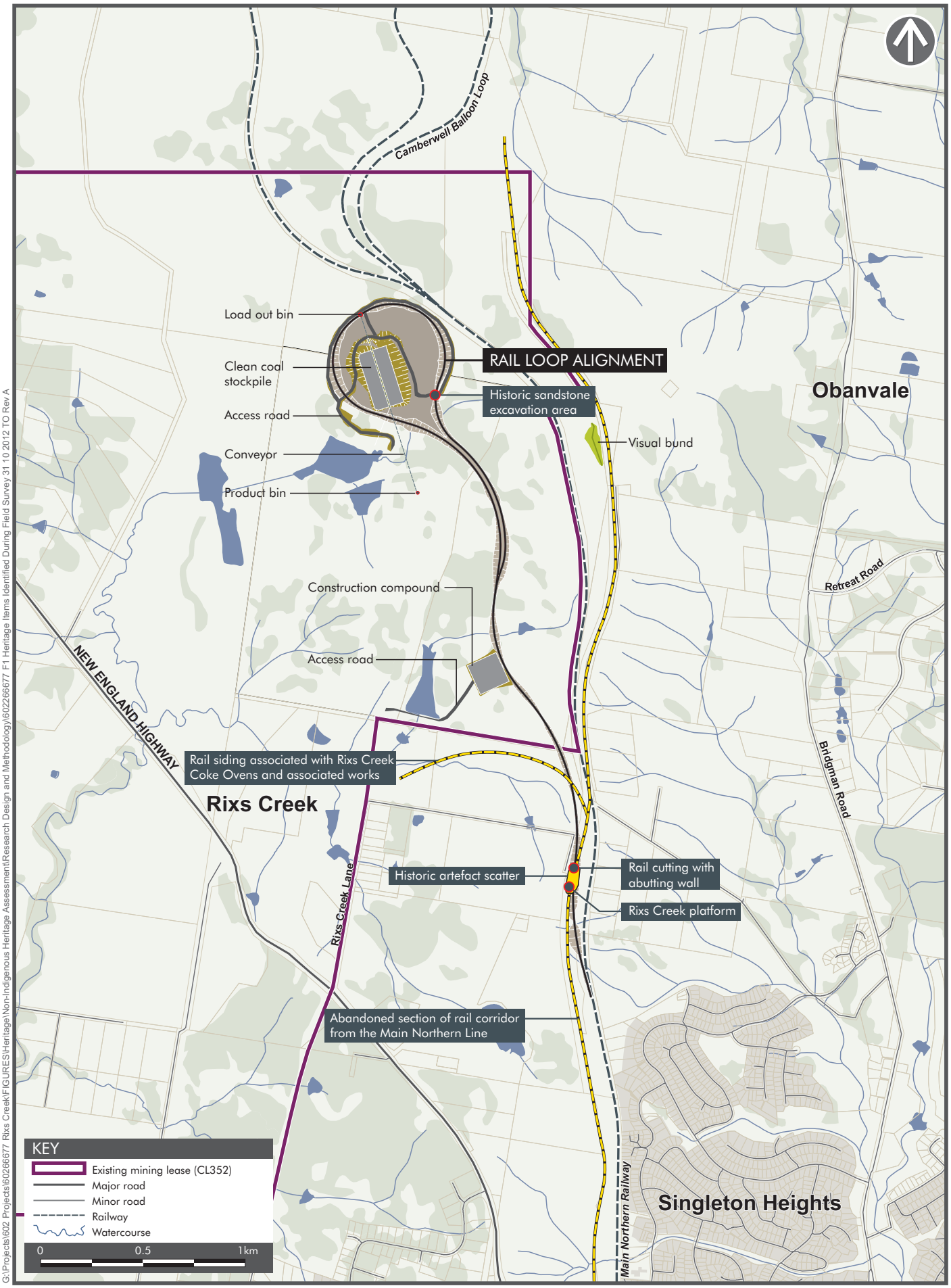
1. Historic sandstone excavation area;
2. Rail siding associated with Rixs Creek Coke Ovens and associated works;
3. Abandoned section of rail corridor from the Main North Line with cuttings and abutting wall; and
4. Rixs Creek platform and associated historic artefact scatter.

These items are of historical significance on a local scale and provide representation of industry, transport development and land use in the Rixs Creek region. All four items will be highly impacted as a result of the construction and operation of the Project. The heritage assessment report that identified these sites (AECOM Australia Pty Ltd, 2012) recommended that:

- Protective fencing be used to protect the abutting wall/cutting and rail platform features during development works (if preservation for the historic features is possible);
- Monitoring be undertaken during excavation works in proximity to the rail platform and the associated artefact scatter;
- Surface collection be undertaken for the historic artefact scatter associated with the Rixs Creek platform;
- Full archival recording, including scaled drawings, GPS coordinates and photographs should be undertaken for all identified heritage features at the four historic sites; and
- An Archaeological Research Design and Methodology document be produced to manage the recommended heritage works.

This document forms the recommended Archaeological Research Design and Methodology. It is proposed that this document be submitted to DP&I as an appendix to, and read in conjunction with, *Non-Indigenous Heritage Assessment Rix's Creek Coal Mine Rail Loop Project* (AECOM Australia Pty Ltd, 2012). The aforementioned document is to be referred to for the following information:

- Detailed project description;
- Detailed historical background;
- Detailed site description; and
- Significance assessments using NSW Heritage Branch guidelines *Assessing Heritage Significance* (NSW Heritage Office, 2001a).



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Heritage\Non-Indigenous Heritage Assessment\Research Design and Methodology\602266677 F1 Heritage Items Identified During Field Survey 31 10 2012 TO Rev A

AECOM

HERITAGE ITEMS IDENTIFIED DURING FIELD SURVEY

Rix's Creek Mine Rail Loading Facility
Research Design and Methodology

FIGURE 1

1.3 Purpose of this document

A research design and methodology is produced to guide the investigation process and ensure that the archaeological record is preserved or mitigated in a manner that will enable the retrieval of information with a minimum of damage. The default position is always to preserve the archaeology *in situ* if possible.

This document provides the research design and archaeological monitoring and collection methodology, which is requested by the NSW Heritage Council. It is to be submitted to DP&I for their consideration of the proposed modification to the Rix's Creek Coal Mine Development Consent.

1.4 Impact to Archaeological Potential

The Project comprises the construction of a rail loop, visual bund and a Clean Coal Stockpile. The Clean Coal Stockpile will include an overland conveyor from the existing Coal Handling and Preparation Plant (CHPP), a reclaim tunnel, a stacker conveyor, rail loading facility and other associated infrastructure.

The proposed rail loop will connect to the Main North Line outside of the Rix's Creek Coal Mine land holding. The section of rail line located outside the Colliery Holding is on Lot 219 and Lot 235 DP 752455, as well as Lot 94 and Lot 150 DP 752442. These areas are on land owned by The Bloomfield Group. The remainder of the rail line, the rail loop and stock pile area with rail loading facility are within the bounds of the Rix's Creek Coal Mine in Lot 1 and Lot 2 DP 1139094 and Lot 238 DP 829334. The clean coal stockpile area will be located within the circle section of the proposed rail loop.

The proposed rail loop has been designed on the western side of a ridge line in order to provide a visual buffer between it and the Singleton Heights and Retreat residential areas. The length of the proposed rail loop is 5.8 kilometres in length, with construction proposed to remove 384,000 m^3 of soil and deposit 264,000 m^3 of fill to enable the correct grade for the entire rail line. The clean stockpile area has been designed to be capable of holding up to 200,000 tonnes of clean coal for shipment. The visual bund has been designed for construction on the eastern side of the existing rail line to provide a further visual buffer for residents located off Bridgman Road.

A survey was conducted 29 July 2012 by AECOM comprising a pedestrian inspection of the proposed Project area (AECOM Australia Pty Ltd, 2012). A second survey was undertaken on Friday 19 October 2012 of the visual bund area. Four historic sites were identified on the survey, as listed in Section 1.2. The only historic site identified as having the potential for subsurface deposits was Rixs Creek platform and the associated historic artefact scatter. It was recommended that surface collection take place prior to development works commencing and monitoring take place during ground disturbing works in proximity to this site, in order to mitigate impacts to archaeological potential.

2.0 Research Design

2.1 Archaeological Potential and Integrity

The archaeological potential of a site can be defined as the potential of a site to contain archaeological relics, as defined by the *Heritage Act 1977.* The potential is determined by conducting research into the history of the site to determine the previous uses and what archaeological expression these may have left. This is then balanced by a consideration of what has occurred on the site, together with a physical inspection of the site to determine the integrity of the potential archaeological record. Integrity is an evaluation of what impact subsequent use and disturbance of the site may have had on the potential archaeological record. It considers how much of the potential archaeological record is likely to remain and whether it is intact enough to answer archaeological questions about the site and its use.

The archaeological potential of the Project Area was assessed in Section 4.0 of *Non-Indigenous Heritage Assessment Rix's Creek Coal Mine Rail Loop Project* (AECOM Australia Pty Ltd, 2012). In summary, it was concluded that the only identified area with potential historic deposits within the study area was in association with Rixs Creek platform where a surface expression of associated historic artefacts had been identified.

2.2 Archaeological Significance

Archaeological significance was assessed for each of the heritage features identified during the survey. A summary of each is included below.

Historic sandstone excavation area: This area was assessed as unlikely to contain historic subsurface deposits. It has low potential for in situ subsurface historic relics or features.

Rail siding associated with Rixs Creek Coke Ovens and associated works: This area was assessed as unlikely to contain historic subsurface deposits. It has low potential for in situ subsurface historic relics or features.

Abandoned section of rail corridor from the Main North Line with cuttings and abutting wall: This area was assessed as unlikely to contain historic subsurface deposits. It has low potential for in situ subsurface historic relics or features.

Rixs Creek platform and associated historic artefact scatter: Rixs Creek platform is of local significance and has the potential to contain information in the associated material record (potential subsurface deposits and surface scatters of historic artefacts) to yield information about both the rail industry and its interface with local industry at Rixs Creek between 1885 and 1938. The extent of the material that may be located at the site will have been limited by the small capacity and infrequent use of the platform during its years of operation.

The only area identified with potential subsurface deposits was the Rixs Creek platform and associated historic artefact scatter. This section examines the archaeological significance of the Rixs Creek platform site, using Heritage Branch guidelines *Assessing Significance for Sites and 'Relics'* (2009) and *Statements of Heritage Impact* (NSW Heritage Office, 2002). The guideline suggests two approaches to assessing archaeological significance. The first is a traditional approach, which is focused on determining whether archaeological investigation is likely to "add to the knowledge of the past in an important way, rather than merely duplicating known information or information that might be more readily available from other sources such as documentary records or oral history." This can be determined by addressing a set of three questions, outlined below. The second is a broader approach, which examines the site as a whole. This second approach is not considered appropriate, given the narrow area assessed as holding archaeological potential.

1. **Can the site contribute knowledge that no other resource can?**

The artefact scatter and potential archaeological deposits at this site have the potential to contribute to our knowledge of Rixs Creek platform with respect to the material culture. The Rixs Creek platform was opened in 1885 to service the Main North Line and was in use until November 1938 when the platform was closed. The Main North Line continued to run past the abandoned platform until December 1952, when the line was deviated slightly (Bozier, 2012). After 1952, this section of abandoned rail corridor has been used as a vehicle track. The archaeological resource may be able to provide information regarding who utilised the platform and for what purpose. It may also contain material culture that could elucidate life in Rixs Creek during the years that the platform was operational. There is only limited documentation available referring to the existence of the platform. There is no known documentation recording specific information about the periods or types of use of Rixs Creek platform. The material evidence can provide data that otherwise does not exist in documentary form.

2. Can the site contribute knowledge that no other site can?

The site has the potential to contribute knowledge about the use of the platform and the transportation of goods and people to and from Rixs Creek along the Main North Line between 1885 and 1938. This specific information cannot be obtained from other sites. The potential material culture of the site is likely to be similar to that obtainable from other rail station and platform sites and as this was an irregularly utilised platform the associated material record may be less in quantity than at other more regularly utilised station and platform sites along the Main North Line. This platform represents use during a specific period of time (1885 to 1938). It has remained largely undisturbed since the realignment of the Main North Line in 1952 and has the potential for *in situ* deposits that can contribute knowledge about the Rixs Creek locality during the period 1885 to 1938.

3. Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?

This question asks whether the potential knowledge from the artefact scatter and potential archaeological deposits at Rixs Creek platform are relevant to general questions about Australian or human history or other research questions. This needs to be analysed in light of the historical themes which the historic archaeological site can address. The themes have been developed to enable the consideration of items within their historical context (NSW Heritage Office & Department of Urban Affairs & Planning, 1996). The themes that can be addressed by the potential archaeological record associated with Rixs Creek platform and its associated artefacts are provided in Table 1 (NSW Heritage Office, 2001b).

Table 1 Historical themes addressed by the archaeological potential of the site

National Theme	State Theme	Local Theme
Building settlements, towns and cities	Transport	Potential archaeological evidence of the rail transport to and from Rixs Creek which contributed to the building of the town
Developing local, regional and national economies	Mining (coal) and Pastoralism	Potential archaeological material culture associated with the development of local economies through the transportation of goods to and from Rixs Creek

By addressing historical themes, Rixs Creek platform and its material culture deposits have the ability to address questions regarding Australian, human and/or more general research questions. The Main North Line was a linking transport for the people and industries of Rixs Creek. It was utilised to transport both goods and people to and from Rixs Creek between 1885 and 1938. The full extent of the Main North Line started at Sydney and extended north to the town of Wallangarra on the Queensland border, with the main northern trunk line carrying freight and passengers between Sydney and Maitland. At the time of writing this report, the Main North Line remains an active and important piece of transport infrastructure in NSW. Between 1885 and 1938 it was an important piece of historic infrastructure that connected the goods, produce and people of Rixs Creek to external markets and places. Industries in the area during that period included farms (dairy and pastoral), coal mines, stores and the coke ovens. The Rixs Creek platform was opened in 1885 to service the Main North Line and was in use up until the closure of the platform in November 1938. The potential archaeological material at this site has the potential to contribute knowledge about Australia's transport history in relation to the Main north Line as well as the development of local industry at Rixs Creek.

2.3 Research Questions

The area of archaeological potential within the site area has been assessed as being of local historical and archaeological significance. The impacts to the area can potentially be limited so as to retain the structural features of the platform and cutting with abutment wall. The following questions have therefore been developed for the artefact scatter and potential archaeological deposits at the Rixs Creek platform site. These require collection, as the proposed development works will otherwise destroy them.

a. What does the material culture reveal about the function of the Rixs Creek platform?

b. Who used the platform and associated material, when was it used and what purpose was it used for?

c. What were the depositional patterns at the site?

d. Were there periods of intensive use and periods of disuse at the platform?

e. Can the material culture be associated with particular phases of use?

f. What is the integrity of the archaeological deposits?

g. What disturbance has occurred at this site in the past?

h. Is there material evidence of the construction phases of this section of line and the platform?

i. Is there material evidence relating to the closure of the platform and the removal of this section of the Main North Line and the time of diversion?

j. What were the construction techniques for the platform and the rail line?

k. What types of material were used by the people of Rixs Creek? Does the material culture represent local production of goods or the importation of material via the rail line?

3.0 Methodology

3.1 Introduction

This section provides details regarding the manner in which surface collection will occur, how the features are to be protected, how the site will be monitored during construction works and how archival recording is to be undertaken. Monitoring has been recommended within the vicinity of the Rixs Creek platform. Should unexpected relics, features or deposits be found outside of these areas, an unexpected finds and human remains procedure has been included in Sections 3.3 and 3.4.

3.2 Proposed Methodology

There are no specific guidelines relating to the development of Environmental Assessments (EAs). This project will therefore follow the NSW Heritage Office publications *Assessing Historical Significance, Assessing Significance for Historical Archaeological Sites and Relics* (NSW Heritage Branch, 2009).

The management of the historical heritage within and adjacent to the study area should be undertaken with reference to a list and map indicating the location of sites identified within the study area and relevant adjacent heritage items.

3.2.1 Archival Recording

Full archival recording, including scaled drawings, GPS coordinates and photographs should be taken for the cutting with abutting wall, the Rixs Creek platform, the artefact scatter site associated with the platform and the sandstone excavation area. This work should be undertaken by a qualified archaeologist with reference to the appropriate guidelines (NSW Heritage Branch, 2009).

The full extent of the rail siding associated with the Rixs Creek Coke Ovens should be plotted with GPS coordinates, with photographs taken to document its full extent and its relationship with the Rixs Creek Coke Ovens. This work should be undertaken by a qualified archaeologist.

The full extent of the original rail alignment corridor of the Main North Line should be plotted with GPS coordinates and photographs taken to document its full extent and any features such as cuttings. This work should be undertaken by a qualified archaeologist.

The following recording program will be implemented:

- Establish a survey datum to record the location of the features, deposits and/or relics;
- Archaeological cleaning with hand tools, as required, in order to define the feature, deposits and/or relics;
- Production of scaled plans and cross-sections, as required;
- Photographically record all phases of the archival recording with an appropriate photographic scale and photographic log;
- Photographically record all relics, features or deposits and record them with an appropriate photographic scale and photographic log; and
- Complete a context recording form for each feature, which should be sequentially numbered and record the location, dimensions and characteristics of the feature, context and/or spit. This information is the result of monitoring works only. No archaeological excavation is proposed for this project.

3.2.2 Surface Collection and Monitoring

Surface collection is to be undertaken by a qualified archaeologist at the artefact scatter site associated with the Rixs Creek platform prior to construction works. GPS positions and photographs are to be taken for each artefact prior to collection. The artefacts are to be analysed by a historic heritage expert and a report produced of the results. Artefacts should be bagged according to the feature, context and/or spit from which they were retrieved.

Monitoring is to be undertaken by a qualified archaeologist during ground disturbing works in proximity to the Rixs Creek platform. Excavation is to occur by machine with a smooth-edged bucket and observed by an appropriately qualified archaeologist. If deposits containing historic artefacts or structures are uncovered, the construction works are to cease and the monitoring archaeologist is to continue with hand excavation until the historic material

has been uncovered. These hand tools and methods will minimise damage to potential archaeological deposits and features. All subsurface artefacts that are uncovered are to be collected following the same procedure as with surface artefacts, including GPS coordinates, photographs and analysis for each artefact with the results to be presented in a report. See section 3.2.1 for further details on the recording procedure.

If any additional structures are identified these are to be assessed by the archaeologist and the Heritage Branch is to be consulted. If the significance of the structure is not sufficient to warrant preservation, and/or preservation is not possible, all structural features are to have full archival recording undertaken for them prior to destruction. Archival recording is to be undertaken as per section 3.2.1.

Should archaeological monitoring reveal substantial, intact or significant archaeological features, deposits and/or relics, construction will cease and the NSW Heritage Branch will be contacted.

3.2.3 Protective Fencing

The cutting with abutting wall and the rail platform should be preserved if possible. If they can be avoided from direct impacts they should be fenced during works following archival recording, for their protection. If it is not possible to preserve these features then no works should occur until they have been subject to full archival recording as per section 3.2.1 (below).

If preservation of these historic features is possible, temporary fencing is to be placed around the two identified heritage features, being the Rixs Creek platform and the rail corridor cutting with abutting wall. This temporary fencing is for the protection of these features during the proposed construction works. Fencing is to be erected prior to the proposed works and removed once works in the vicinity of these heritage features has been completed. The temporary fencing is to consist of star pickets and high-visibility coloured mesh fencing. Signage is to be placed on the fence clearly identifying the area as containing a historic site. The signage is also to label the area as having access restricted to heritage personnel and authorised mine staff only. An archaeologist is to supervise during the placement and removal of the temporary fencing and signage.

The approximate length of the abutting wall feature is 17.5 m. The area subject to temporary fencing is to include an approximate buffer of 10 m surrounding this heritage item. The approximate length of the Rixs Creek platform is 36 m. The area subject to temporary fencing is to include an approximate buffer of 10 m surrounding this heritage item. The purpose of the fencing is to protect the identified heritage structure during the construction phase of the proposed rail loop.

3.2.4 Artefact Analysis

Should artefacts be uncovered during the monitoring, they will be cleaned according to their material type (such as washing for glass and ceramic, dry brushing for bone and metal). Surface artefacts that are collected are to be cleaned and recorded by the same procedure.

The artefacts retrieved will be entered into a database containing the following as a minimum:

1. Unique artefact number;
2. Locational information;
3. Material type;
4. Form/function;
5. Colour/decoration;
6. Dimensions;
7. Weight; and
8. Additional comments if necessary.

The artefact database will be developed with regard to quantity and nature of the material retrieved. The qualified archaeologist responsible for the study is to catalogue and analyse the artefacts. During the analysis phase the artefacts should be kept by the qualified archaeologist in a secure location. Once the analysis has been completed and a report produced the artefacts should be returned to The Bloomfield Group who are responsible for their on-going care.

3.2.5 Reporting

A report will be produced detailing the monitoring, including the implementation of the methodology, the results of the monitoring, analysis of artefacts retrieved (if any) and an assessment of the ability of the information to answer the research questions provided in Section 2.3, together with discussion of answers provided. The following headings will be used as a minimum:

1. Executive Summary;
2. Introduction;
3. Site History;
4. Research Design;
5. Methodology;
6. Surface collection results, including descriptions of features and artefacts identified (if any);
7. Monitoring results, including descriptions of features and artefacts identified (if any);
8. Analysis;
9. Conclusion and future management recommendations (if required).

3.3 Unexpected Finds Procedure

The following procedure guides the management of an unexpected and previously unidentified finds during the course of development works outside of the area to be monitored. Finds includes artefact scatters (glass, animal bone, ceramic, brick, metal, etc), building foundations, earthworks of unknown origin (i.e. not associated with construction). If any unexpected, previously unidentified finds are located during construction:

- All work in the area is to cease immediately;
- Alert the General Manager to the find;
- If necessary, protect the area with fencing;
- Engage a suitably qualified archaeologist to undertake an assessment of the find/s;
- The assessment should be undertaken using the guidelines *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009);
- Notify the NSW Heritage Branch, if warranted;
- On the advice of the archaeologist, if necessary, prepare an Impact Assessment and/or Research Design and Methodology to submit to the Heritage Branch;
- Undertake the archaeological mitigation in accordance with the prepared documents and the NSW Heritage Council response; and
- Once the site has been mitigated to the satisfaction of the archaeologist and the NSW Heritage Office, works may resume in the area.

3.4 Management of Human Remains

This section outlines the procedures to be undertaken in the case that human remains are discovered during operations. The procedures take into account the following documents:

Burials - Exhumation of Human Remains NSW Health Policy Directive PD2008_022 ((NSW Health, 2008)) available at : http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf

Manual for the Identification of Aboriginal Remains ((NSW Department of Environment & Conservation, 2006));

Skeletal Remains – Guidelines for the management of human skeletal remains under the Heritage Act 1977 (NSW Heritage Office, 1998); and

The Aboriginal Cultural Heritage Standards and Guidelines Kit ((NSW National Parks and Wildlife Service, 1997)).

In the event that construction reveals possible human skeletal material (remains), the following procedure is to be followed:

- When suspected human remains are exposed, all construction work is to cease immediately in the near vicinity of the find location and the General Manager on site is to be immediately notified. The Construction Manager will contact the Police at the earliest reasonable time;
- An area of 5 m radius is to be cordoned off by temporary fencing around the exposed human remains site - work can continue outside of this area as long as there is no risk of interference to the human remains or the assessment of human remains. Assessment of risk may utilise the risk matrix provided within the NSW Health Policy directive on the exhumation of human burials;
- Contact the OEH Environment line on 131 555 and the Heritage Branch on 02 9873 8500; and
- A physical or forensic anthropologist should be commissioned to inspect the remains *in situ* (unless otherwise directed by the police), and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or modern);
- If the remains are identified as modern the area is deemed as crime scene; or
- If the remains are identified as Aboriginal (archaeological), the Heritage Specialist will notify OEH and representatives of the local Aboriginal community and appropriate management measures will be determined through consultation with them. Representatives of the Aboriginal community will be present during all investigations of Aboriginal remains; or
- If the remains are as non-Aboriginal (historical) remains, the site is to be secured and the Heritage Branch is to be contacted.
- The above process functions only to appropriately identify the remains and secure the site. From this time, the management of the area and remains is to be determined through one of the following means:
    - If the remains are identified as a modern matter, liaise with the police and/or the Coroner's Office and/or NSW Health with respect to the exhumation of the remains;
    - If the remains are identified as Aboriginal (archaeological), liaise with OEH and Aboriginal stakeholders;
    - If the remains are identified as non-Aboriginal (historical), liaise with the Heritage Branch; and
    - If the remains are identified as not being human then work can recommence without delay.

4.0 References

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Appendix G

Indigenous Heritage Assessment

Appendix G Indigenous Heritage Assessment

Rix's Creek Mine Rail Loading Facility

Aboriginal Archaeological and Cultural Heritage Impact Assessment

Rix's Creek Mine Rail Loading Facility

Aboriginal Archaeological and Cultural Heritage Impact Assessment

Prepared for

The Bloomfield Group

Prepared by

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21 December 2012

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AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

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Date	21 December 2012
Prepared by	Rochelle Coxon
Reviewed by	Dr Andrew McLaren

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			Name/Position	Signature
1	30-May-2012	DRAFT	Simon Murphy Professional Environmental Planner	
2	09-November-2012	DRAFT	Simon Murphy Professional Environmental Planner	
3	21-December-2012	FINAL	Simon Murphy Professional Environmental Planner	

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1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been commissioned by the Bloomfield Group to undertake an Aboriginal archaeological and cultural heritage impact assessment for the Rix's Creek Mine Rail Loading Facility Project (the Project). This assessment forms part of an Environmental Assessment (EA) being prepared for submission to the NSW Department of Planning and Infrastructure (DP&I) for the approval of the Project. The Bloomfield Group is seeking an Approval for the Project under Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000*, which allows State Significant Development Consents issued under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to be modified through Section 75W of the Act.

This assessment has been undertaken in accordance with the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW Department of Environment & Conservation 2005) and with reference to the NSW Office of Environment and Heritage's (OEH's) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (NSW OEH 2011).

The scope of work completed by AECOM for this assessment included:

- Searching OEH's Aboriginal Heritage Information Management System (AHIMS) register;
- Describing the existing environment within and surrounding the Project Area;
- Reviewing relevant archaeological and ethno-historic information for the Project Area and surrounding area;
- Preparing a predictive model for Aboriginal archaeological sites within the Project Area;
- Identifying, notifying and registering Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and / or places in the Project Area;
- Providing registered Aboriginal parties with information about the Project;
- Undertaking an archaeological survey of the Project Area and reporting on the findings;
- Facilitating a process whereby registered Aboriginal parties were able to:
    - Contribute culturally appropriate information to the assessment methodology;
    - Provide information that will enable the cultural significance of Aboriginal objects and / or places within the Project Area to be determined; and
    - Provide input into the development of any cultural heritage management options.
- Preparation of an Aboriginal archaeological and cultural heritage impact assessment with input from registered Aboriginal parties.

1.1 Project Description

Rix's Creek Mine, part of the Bloomfield Group, is situated at Rixs Creek[1], approximately 4km north of Singleton and 90km northwest of the Port of Newcastle in the Hunter Valley of New South Wales (NSW). Rix's Creek Mine, including the Project Area, falls entirely within the Singleton Local Government Area (LGA) (Figure 1).

Rix's Creek Mine currently has an arrangement with the neighbouring Vale Integra Mine to use their coal loading facility, including the Rail Loop, to transport coal to the Port of Newcastle. Due to increasing production and resulting delays on the Rail Loop, it is no longer viable for the Rix's Creek Mine to continue to operate under this arrangement. The Bloomfield Group therefore proposes a modification to the Rix's Creek Mine Development Consent in order to enable the construction of a Rail Loading Facility dedicated to the Rix's Creek Mine site.

The Project will comprise the construction of a new Rail Loop, a Clean Coal Stockpile, and a Visual Bund. The construction of the Clean Coal Stockpile will include the following:

- an overland conveyor from the existing Coal Handling and Preparation Plant (CHPP);

[1] Please note that both the place Rixs Creek and the watercourse Rixs Creek do not have an apostrophe within the correct presentation of their name. The name of the mine site, however, is correctly presented in this report as Rix's Creek Coal Mine, as per the presentation used in official mine documentation by the Bloomfield Group.

- a stacker conveyor;
- a reclaim tunnel; and
- other associated infrastructure.

The entire rail loop will be 5.8km in length, while the Clean Coal Stockpile area will be capable of holding approximately 350,000 tonnes of clean coal for shipment. The construction of the rail loop will involve the removal of approximately 384,000m^3 of material, and the placement of 264,000m^3 of fill material to obtain the correct grade for the entire length of the rail line. While the Project is situated on the western side of a ridge line, which will largely shield it from nearby residential areas, the construction of the visual bund on the eastern side of the Main Northern Rail Line will ensure that the rail bin is shielded from the Singleton Heights and Retreat residential areas to the east.

Development Consent for the Rix's Creek Mine was granted on the 19th October 1989 by the Minister for Planning pursuant to section 101 of the EP&A Act. A second development consent was granted by the Minister for Urban Affairs and Planning on the 19th October 1995, pursuant to section 92 of the EP&A Act. This Approval permits the construction and operation of surface mine extensions and gives approval for coal extraction for a 21 year period from the date of consent.

The Bloomfield Group is seeking an Approval for the Project under Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000*, which State Significant Development Consents issued under Part 4 of the *Environmental Planning and Assessment Act 1979*, to be modified through Section 75W of the Act.

1.2 Project Area

The Project will be wholly constructed on land owned by the Bloomfield Group. The proposed rail loop will leave the main northern rail line outside of the Rix's Creek Colliery Holding, with the rail loop and clean coal stockpile area being located within the Colliery Holding (see Figure 2). The section of the rail line outside the Colliery Holding is also situated on land owned by the Bloomfield Group, including Lot 219 and 235 DP752455, Lot 94 and 150 DP752442. The loop and stockpile area is situated on land owned by the Bloomfield Group within the Colliery Holding, including Lot 1 and DP1139094 and Lot 238 DP 829334.

The rail line will leave the main northern rail line and travel in a north westerly direction. The actual loop will be situated immediately North West of the present Coal Handling and Preparation Plant (CHPP). The clean stockpile area will be located entirely within the confines of this rail loop area. The entire rail loop would be 5.8km in length, while the clean coal stockpile area would be capable of holding approximately 350,000 tonnes of clean coal for shipment.

The Project is situated on the western side of a ridge line, which provides a visual shield for the Project from the Singleton Heights and Retreat residential areas. The construction of a visual bund on the eastern side of the Main Northern Rail Line, on land also owned by the Bloomfield Group, will ensure that the rail bin is also shielded from view from the Singleton Heights and Retreat residential areas.

For the purposes of this assessment, the 'Project Area' is the development footprint of the Project, including the section of the railway to be built, the clean coal stockpile area, and all other areas that would be directly impacted by the works, including an outer perimeter access track.

- The 'Project Area' includes the subject site and the areas adjacent to the subject site that might be indirectly impacted by the proposed works.
- The 'Search Area' (for the purposes of the desktop surveys) refers to the surrounding area up to 10 km from the Project Area.

1.3 Project Team

This archaeological assessment was managed by AECOM archaeologists Dr Susan Lampard and Geordie Oakes. AECOM archaeologist Rochelle Coxon co-ordinated project logistics, undertook Aboriginal community consultation, undertook archaeological fieldwork, and authored this report. Archaeological fieldwork was undertaken by Rochelle Coxon and Dr Darran Jordan (Archaeologist, AECOM). Luke Kirkwood (Senior Archaeologist, AECOM) provided QA review of all assessment outputs. Unless otherwise specified, Tim Osborne

(Designer, AECOM) created all figures within this report. Jodie Glennan (IAP Team Secretary, AECOM) provided administrative support throughout the assessment process.

1.4 Report Structure

This report is structured as follows:

- Section 2.0 outlines the relevant statutory framework for the assessment;
- Section 3.0 discusses the Aboriginal consultation processes adopted, the archaeological survey strategy and Aboriginal cultural values;
- Section 4.0 describes the existing environment within and surrounding the Project Area (including land use) and outlines the key archaeological implications;
- Section 5.0 summarises relevant ethnographic information for the Project Area and its surrounds;
- Section 6.0 details the archaeological context of the Project Area and its surrounds on both a regional and local scale, and presents a predictive model for Aboriginal archaeology within the Project Area, specifying probable site type occurrence, content, distribution and integrity;
- Section 7.0 describes the archaeological survey including objectives, field team members, survey strategy and methodology, Aboriginal archaeological sites recorded and an evaluation of the predictive model;
- Section 8.0 outlines the scientific (i.e. archaeological) and cultural significance of identified Aboriginal archaeological sites within the Project Area;
- Section 9.0 provides an assessment of the potential impacts of the Project on the sites identified;
- Section 10.0 details appropriate management options and / or recommendations for identified Aboriginal archaeological sites within the Project Area; and
- Section 11.0 lists the references cited in-text.

1.5 Related Studies

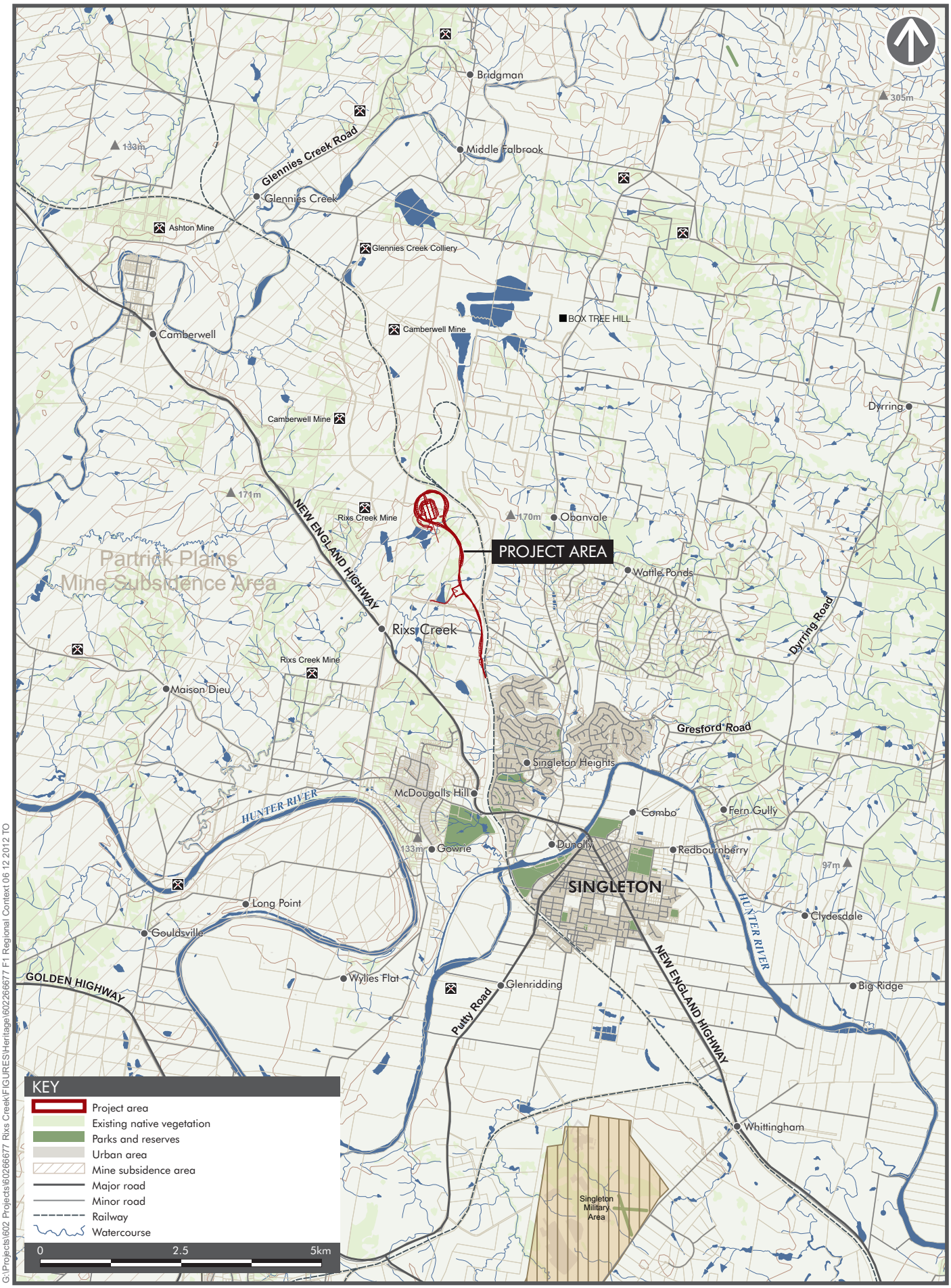
The following studies are to be read in conjunction with this assessment:

- The EA Surface Water Impact Assessment;
- The EA Soils and Land Capability Impact Assessment; and
- The EA Ecology Impact Assessment

1.6 Acknowledgements

AECOM wishes to thank the following individuals for their assistance during fieldwork and reporting:

- Simon Murphy (Professional Environmental Planner, AECOM)
- John Hindmarsh (Senior Environmental Officer, Rix's Creek Pty Limited)
- Jason Desmond (Environmental Officer, Rix's Creek Pty Limited).



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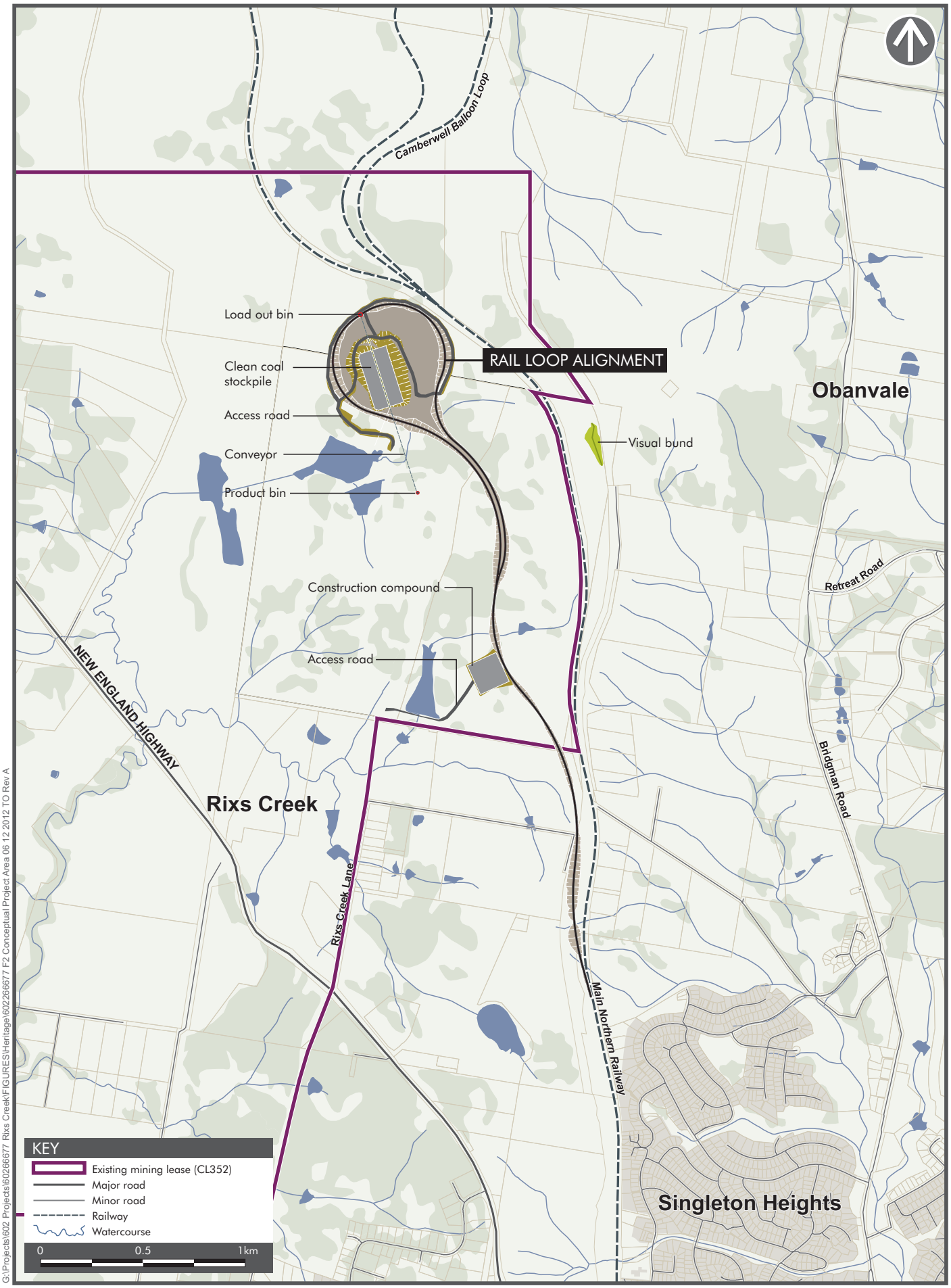
AECOM

REGIONAL LOCATION

Rix's Creek Mine Rail Loading Facility
Aboriginal Archaeological and Cultural Heritage Impact Assessment

FIGURE 1



G:\Projects\602 Projects\602266677 Rixs Creek\FIGURES\Heritage\602266677 F2 Conceptual Project Area 06 12 2012 TO Rev A

AECOM

CONCEPTUAL PROJECT AREA

Rix's Creek Mine Rail Loading Facility
Aboriginal Archaeological and Cultural Heritage Impact Assessment

FIGURE 2

2.0 Applicable Policy and Legislation

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

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

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

For the purposes of the Act, an area or object is considered to be injured or desecrated if:

- In the case of an area:
  - it is used or treated in a manner inconsistent with Aboriginal tradition;
  - the use or significance of the area in accordance with Aboriginal tradition is adversely affected;
  - passage through, or over, or entry upon, the area by any person occurs in a manner inconsistent with Aboriginal tradition
- in the case of an object:
  - it is used or treated in a manner inconsistent with Aboriginal tradition.

The ATSIHP Act can override state and territory laws in situations where a state or territory has approved an activity, but the Commonwealth Minister prevents the activity from occurring by making a declaration to protect an area or object. However, the Minister can only make a decision after receiving a legally valid application under the ATSIHP Act and, in the case of long term protection, after considering a report on the matter. Before making a declaration to protect an area or object in a state or territory, the Commonwealth Minister must consult the appropriate Minister of that state or territory (section 13).

2.1.2 Environment Protection and Biodiversity Conservation Act

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

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

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

The EPBC Act defines 'environment' as both natural and cultural environments and therefore includes Aboriginal and historic heritage items. Under the Act, protected heritage items are listed on the National Heritage List (items of significance to the nation) or the Commonwealth Heritage List (items belonging to the Commonwealth or its agencies). These two lists replaced the Register of the National Estate (RNE). The RNE has been suspended and is no longer a statutory list.

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

2.2 State Legislation

2.2.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provide the framework for environmental planning in NSW and include provisions to ensure that proposals that have the potential to impact upon the environment are subject to detailed assessment and provide opportunity for public involvement. In NSW, environmental impacts are interpreted as including impacts to cultural heritage.

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

Upon repeal of Part 3A of the EP&A Act on 1 October 2011, the *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* inserted a new Division 4.1 into Part 4 of the EP&A Act.

Division 4.1 provides for a new planning assessment and determination regime for State Significant Development (SSD). Section 89C of the EP&A Act stipulates that a development will be considered SSD if it declared to be such by the new *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD).

Under Clause 8(1) of SEPP SRD, a development is declared to be State Significant Development if:

a) the development on the land concerned is, by the operation of an environmental planning instrument, permissible with development consent under Part 4 of the EP&A Act; and

b) the development is specified in Schedule 1 or 2 of SEPP SRD.

Development Consent for the Rix's Creek Mine was granted on the 19th October 1989 by the Minister for Planning pursuant to section 101 of the Environmental Planning and Assessment Act 1979 (EP&A Act). A second development consent was granted by the Minister for Urban Affairs and Planning on the 19th October 1995, pursuant to section 92 of the EP&A Act. The Bloomfield Group is seeking an Approval for this Project under Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000*, which allows State Significant Development Consents issued under Part 4 of the *Environmental Planning and Assessment Act 1979*, to be modified through Section 75W of the Act.

2.2.2 National Parks and Wildlife Act 1974

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

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

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

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

2.3 Local Government

2.3.1 Singleton Local Environmental Plan 1996

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

A person shall not, in respect of a building, work, relic, tree or place that is a heritage item, except with the consent of council:

- demolish or alter the building or work;
- damage or move the relic, or excavate for the purpose of exposing the relic;
- damage or despoil land on which the building, work or relic is situated or land which comprises the place;
- erect a building on or subdivide land on which the building, work or relic is situated or on the land which comprises the place; or
- damage any tree on the land on which the building, work or relic is situated or on the land which comprises the place.

The Council shall not grant consent to a development application required by this clause unless it has made an assessment of:

- the significance of the item as a heritage item;
- the extent to which the carrying out of the development in accordance with the consent would affect the heritage significance of the item and its site;
- whether the setting of the item and, in particular, whether any stylistic, horticultural, or archaeological features of the setting should be retained;
- whether the item constitutes a danger to the users or occupiers of that item or to the public; and
- measures to be taken to conserve heritage items, including any conservation plan prepared by the applicant.

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

3.0 Aboriginal Community Consultation

3.1 Introduction

Aboriginal community consultation acknowledges the right Aboriginal people to be involved, through direct participation, on matters that affect their cultural heritage. Involving Aboriginal stakeholders in all aspects of the assessment process ensures that they are given adequate opportunity to share information about cultural value, and to actively participate in the development of appropriate land use and management options. The successful identification, assessment, and management of Aboriginal cultural heritage values are dependent on an inclusive and transparent consultation process.

The Project is seeking approval under State Significant Development Consents issued under Part 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As required by Department of Planning and Infrastructure, Aboriginal community consultation for the Project was conducted in accordance with the Department of Environment Climate Change and Water (DECCW) Part 3A guidelines, '*Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' (2005),* and '*Interim Community Consultation Requirements for Applicants' (2004)*. In addition to this, the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW Department of Environment Climate Change & Water 2010b) were also referred to and used as a framing document for elements of the consultation process not covered by the Part 3A Guidelines. The key stages of the consultation process undertaken for the Project are summarised below, and the Aboriginal Community Consultation Log for the Project is provided in Appendix A.

3.2 Consultation: Stage 1

3.2.1 Project Notification and Registration of Interest

In accordance with Section 4.1.2 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010b), the following agencies were notified of the Project and requests made to provide assistance for identifying and notifying Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places within the Project Area:

- OEH North East Regional Office (Coffs Harbour)
- Wanaruah Local Aboriginal Land Council (Wanaruah LALC);
- NSW Department of Aboriginal Affairs – Office of the Registrar;
- National Native Title Tribunal (NNTT);
- Native Title Services Corporation Limited (NTSCorp Ltd);
- Singleton Shire Council (SSC); and
- Hunter-Central Rivers Catchment Management Authority (HCRCMA).

Notifications were issued in writing to agencies on 1 May 2012.

Responses to the agency notifications were received from the Office of the Registrar, the National Native Title Tribunal, the Wanaruah LALC, and OEH. The Office of the Registrar identified that there are no Registered Aboriginal Owners pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (NSW) within, or in the vicinity of the Project Area. The National Native Title Tribunal search results indicated that there are two registered Native Title Claims in the local area. These are not, however, within, or in the immediate vicinity of, the Project Area and so will not be affected by the proposed Project.

The Wanaruah Local Aboriginal Land Council and OEH both provided a list of contact details for known Aboriginal groups with an association to the area in response to the notification request on the 7 May and the 10 May respectively. Wanaruah LALC identified a total of 32 groups, while OEH identified a total of 52 groups. The groups identified in the list provided by Wanaruah LALC were duplicated in the list provided by OEH.

3.2.2 Newspaper Advertisement

Notification of the Project was provided in the public notices section of the Singleton Argus on the 4 May 2012. This public notice appeared in both the print and online editions of the newspaper. This notification was published in accordance with Section 4.1.3 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010b) to identify and seek registration from Aboriginal stakeholders who wished to be consulted in regard to the Project (Appendix B).

In response to the public notice in the Singleton Argus a total of seven groups registered an interest in being consulted during the Project, and have subsequently been involved in the Aboriginal community consultation program for the Project.

3.2.3 Aboriginal Stakeholder Registration of Interest

A letter inviting the identified stakeholder groups to register their interest in being involved in the consultation process during the Project was mailed to all 52 Aboriginal stakeholder groups identified by the Wanaruah LALC and OEH on the 23 May 2012. A confirmation of registration letter was also sent on this date to those Aboriginal stakeholders who had already registered an interest in the Project in response to the newspaper advertisement (n=7).

In response to the letters, a total of 25 groups advised that they wished to be consulted in relation to the Aboriginal archaeological and cultural heritage assessment for the Project. This took the total number of Registered Aboriginal Parties (RAPs) for the Project to 32. All of the RAPs advised during the registration process that they wished to participate in both the cultural heritage and archaeological survey components of the assessment. A summary of all of the RAPs for the Project is provided below in Table 1 and written registrations of interest received from the RAPs are provided in Appendix C.

Table 1: Registered Aboriginal Groups

Ref	Registered Aboriginal Party	Primary Contact
1	Wanaruah Local Aboriginal Land Council	Mr Noel Downs (CEO)
2	Wanaruah Custodians Aboriginal Corporation	Mr Reginald J. Eveleigh
3	Gomery Cultural Consultant	Mr David Horton
4	Roger Noel Matthews Consultancy	Mr Roger N. Matthews
5	Deslee Talbot Consultant	Ms Deslee Matthews
6	Galamaay Consultants	Ms Karen Matthews
7	Muswellbrook Cultural Consultants	Mr Brian Horton
8	Breeza Plains Culture and Heritage	Mr Terry Matthews
9	Warragil Cultural Services	Mr Aaron Slater
10	Kawul Cultural Services	Ms Vicky Slater
11	Waabi Gabinya Cultural Consultancy	Ms Elizabeth Howard
12	Cacatua Culture Consultants	Ms Donna Sampson
13	Yarrawalk (A Division of Tocomwall Pty Ltd)	Mr Scott Franks
14	Barkuma Neighbourhood Centre trading as Gidawaa Walang Cultural Heritage Consultancy	Ms Ann Hickey
15	Ungooroo Aboriginal Corporation	Ms Jessi Garland
16	D F T V Enterprises	Mr Derrick Vale Senior
17	Wattaka Wonnarua Cultural Consultancy Services	Mr Des Hickey
18	Wonnarua Traditional Owners	Mr Des Hickey
19	Culturally Aware	Ms Tracey Skene
20	Hielamon Cultural Consultants	Mr Clifford Johnson
21	KL.KG Saunders Trading Services	Ms Krystal Saunders
22	Yinarr Cultural Services	Ms Kathleen Steward Kinchela
23	Widescope Indigenous Group	Mr Steven Hickey
24	Wallangan Cultural Services	Mrs Maree Waugh

Ref	Registered Aboriginal Party	Primary Contact
25	Hunter Valley Cultural Surveying	Mr Luke Hickey
26	Independent Stakeholder	Mrs Esther Tighe
27	Ngarramang-Kuri Aboriginal Culture and Heritage Group	Mr Abie Wright
28	Wonnarua Nation Aboriginal Corporation	Mr Laurie Perry
29	T&G Culture Consultants	No contact provided
30	Myland	Mr Warren Schillings
31	DRM Cultural Management	Ms Helen Faulkner
32	Giwiirr Consultants	Ms Michelle Stair

3.3 Consultation: Stage 2

3.3.1 Notification of Registration to Office of Environment and Heritage and Wanaruah Local Aboriginal Lands Council

In accordance with Section 4.1.6 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010b), a copy of the following documentation was provided to OEH and the WLALC on 12 June 2012:

- A copy of the public notice published in the Singleton Argus on 4 May 2012;
- A copy of the letter issued to all identified Aboriginal groups providing notification of the assessment for the Project; and
- A record of registered Aboriginal groups whom have expressed interest in the Project.

As specified in Section 4.1.5 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010b), each of the registered Aboriginal stakeholder groups were given the opportunity to withhold their information from being provided to OEH and the WLALC, if requested. One group requested that their details not be forwarded to the WLALC. In accordance with Section 4.1.5 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (NSW DECCW 2010b), AECOM respected and complied with this request.

3.4 Consultation: Stage 3

3.4.1 Consultation regarding Survey Strategy and Conservation Values

All RAPs were issued a hard copy of the draft archaeological survey methodology developed by AECOM on 14 June 2012. This draft methodology provided a description of the Project, the proposed archaeological survey methodology and other requirements. Aboriginal stakeholder representatives from each RAP were encouraged to provide comments and raise any concerns in relation to the Project, the draft archaeological survey methodology or cultural heritage issues more generally. See Section 7.1 for further details of the methodology adopted for the archaeological survey.

3.4.2 Summary of Responses

A cover letter was sent out with all copies of the draft archaeological survey methodology requesting that any responses and/or comments please be received by the 13 July 2012. In response to the draft methodology, a total of five responses were received. These are summarised in Table 2. Written responses received from RAPs regarding the draft methodology are provided in Appendix D.

Table 2: Summary of Responses received from RAPs in regards to the draft archaeological survey methodology.

RAP	RAP Representative	Summary of Response
Waabi Gabinya Cultural Consultancy	Ms Elizabeth Howard	Waabi Gabinya Cultural Consultancy has read and is in agreement with the contents of the draft methodology.
Barkuma Neighbourhood Centre trading as Gidawaa Walang Cultural Heritage Consultancy	Ms Ann Hickey	Barkuma Neighbourhood Centre trading as Gidawaa Walang Cultural Heritage Consultancy has read and is in agreement with the contents of the draft methodology.
Wonnarua Nation Aboriginal Corporation	Mr Laurie Perry	Wonnarua Nation Aboriginal Corporation has read and is in agreement with the contents of the draft methodology.
Cacatua Culture Consultants	Ms Donna Sampson	Cacatua Culture Consultants have read and discussed the draft methodology and are in agreement with the contents thereof.
Yarrawalk (A Division of Tocomwall Pty Ltd)	Mr Scott Franks	Mr Scott Franks called during the review period to discuss queries that he had regarding the contents of the draft methodology. Mr Franks' concerns were addressed.

3.4.3 Community Participation in the Field Assessment

Due to logistical and OH&S considerations, it was not possible for representatives from all 32 RAPs to be present during the fieldwork component of the Project. From the 32 Aboriginal groups registered in the consultation program, eight groups were able to participate in the fieldwork component of the Project conducted on the 27 July 2012. These groups were selected at random from the 32 RAPs. Each RAP was personally contacted by email and via Australia Post one week in advance of the scheduled fieldwork date to confirm their availability and provide an outline of the fieldwork process and details. From this, a field roster was developed for the archaeological survey.

In accordance with the survey methodology prepared by AECOM, the archaeological field survey was completed over one day, on the 27 July 2012. Due to changes to the proposed mine design made subsequent to the initial survey, an additional half day site inspection was required to inspect the proposed Visual Bund component of the Project Area on 19 October 2012. Three RAPs who participated in the initial survey were able to provide field representatives to participate in this site inspection. All RAPs involved in the archaeological survey provided valid insurances and attended an induction prior to commencing work. During fieldwork, the two AECOM archaeologists who were present conversed with the RAPs in relation to the cultural and archaeological heritage significance of the Project Area. No cultural heritage issues particular to the Project Area were identified as part of this process.

A summary of Aboriginal representatives who participated in the fieldwork component of the assessment, and the RAPs that they were representing, is presented in Table 3. A discussion of the field survey is presented in Section 7.1.

Table 3: Summary of RAPs who participated in the archaeological field survey component of the Project.

RAP	Fieldwork Representative	Fieldwork Date
Wanaruah Local Aboriginal Land Council	Steven Hands	27 July 2012
	Nerida Saunders	19 October 2012
Waabi Gabinya Cultural Consultancy	Tony Waugh	27 July 2012
Cacatua Culture Consultants	George Sampson	27 July 2012
	Adam Sampson	19 October
Culturally Aware	Anthony Waugh	27 July 2012
Barkuma Neighbourhood Centre trading as Gidawaa Walang Cultural Heritage Consultancy	Annie Hickey	27 July 2012
Wonnarua Nation Aboriginal Corporation	Rebecca Lester	27 July 2012
Yarrawalk (A Division of Tocomwall Pty Ltd)	Danny Franks	27 July 2012
	Malcolm Franks	19 October 2012
Wallangan Cultural Services	Maree Waugh	27 July 2012

3.5 Consultation: Stage 4

3.5.1 Draft Aboriginal Archaeological Assessment Review

The draft Aboriginal archaeological assessment was circulated to RAPs via Express Post on the 5 December 2012. RAPs were encouraged to provide feedback on the contents of the report by the 20 December 2012, with follow up phone calls made to RAPs between the 13 and 14 December 2012. No comments were received from the RAPs during the review period regarding the content of the draft report.

One response was later received from the Wanaruah Local Aboriginal Land Council on the 29 January 2013. This response can be found in Appendix F of this report. The Wanaruah Local Aboriginal Land Council's comments and feedback on the draft report are quoted below as follows:

- *The Rail Loop AS4 site is considered to be of moderate significance and it is the Land Council's recommendation (in agreement with the draft report) that this site is to be subject to surface collection and test excavation.*
- *It is also recommended that all 12 remaining sites will need to be salvaged as it cannot be guaranteed in the future that Rail Loop sites IA5, IA6 and IA7 will not be impacted in the future.*

4.0 Existing Environment

The nature and distribution of Aboriginal archaeological sites are closely connected to the environments in which they occur. Environmental variables, such as topography, geology, hydrology, and native fauna and flora, will have played a critical role in influencing how Aboriginal groups moved around and utilised tracts of land. Accordingly, any attempt to predict or interpret the character and distribution of Aboriginal sites in a given landscape must take environmental factors into consideration. Similarly, an assessment of historic and current land uses allows predictions to be made concerning the likely presence or absence of sites, and, where appropriate, their archaeological integrity.

4.1 Climate

The climate of the Singleton region is characterised by hot, humid summers and mild to cool winters. Data available from the Singleton Army weather station (station 061275), in operation from 1969-1990, and the Singleton Water Board station (station 061371), in operation from 1991-2002, indicates that average summer temperatures range from 16^{o} – 30.6^{o} C, and winter temperatures average between 4.8^{o} – 20.1^{o} C. Rainfall is substantial across all seasons, with the highest average rainfall occurring in the summer months (94.3mm) and the lowest in winter (28.2mm) (Bureau of Meteorology website, accessed 8 August 2012).

It should be noted that the climate of the Hunter region has not been static throughout time, including throughout the Aboriginal occupation of the region, and that the climate of the past century is not necessarily representative of the climatic conditions that would have been experienced by Aboriginal people in earlier periods. Climatic variations would have significantly affected the availability and distribution of floral and faunal resources over time, which in turn would have affected patterns of Aboriginal land-use and occupation of the region.

4.2 Topography and Hydrology

The topography of the Project Area is characterised predominantly by undulating low hills, with elevations of 60-170m. Slope gradients are about 6%, with slope lengths ranging from 500-800m. Local relief is low, ranging from 49-60m. The alignment of the proposed rail loop corridor is intersected by five unnamed first order tributaries of Rixs Creek. These tributaries are not permanent water courses, flowing only during periods of heavy rain. All flow downhill in an east-west direction towards Rixs Creek. Rixs Creek and the local drainage regimes associated with it in the general vicinity of the Project Area have been modified as a result of mining activities and the construction of dams.

4.3 Soils and Geology

The Project Area is located within the Sedgefield soils landscape, which encompasses the undulating, low hills north of Singleton. The soils of the Sedgefield soil landscape comprise yellow Soloths on upper to mid-slopes, with yellow Solodic soils on lower slopes and in drainage lines (Kovac et al. 1991:371). The topsoil of this soil landscape comprises hard-setting, yellow to brown sandy loam with weak to moderate structure, which overlies brown sandy loam. These soils are quite shallow and susceptible to erosion. The subsoil comprises dull, yellowish brown clay with strong structure (Kovac et al. 1991:372). The topsoil and subsoil overlay the Permian mudstone, lithic sandstone, conglomerate, siltstone, shale and coal which are typical of the Singleton Super Group.

At the base of the Singleton Super Group is the Saltwater Creek formation, a shoreline deposit which separates the underlying marine sediments of the Maitland Group from the terrestrial sediments of the basal coal bearing sequence of the Wittingham Coal Measures. The Saltwater Creek Formation contains a massive, erosion resistant sandstone bed known as Caswell Sandstone. This sandstone forms a conspicuous ridge which separates and screens the Rix's Creek Mining area from the nearby residential area of Singleton Heights.

4.4 Flora and Fauna

Prior to European settlement the Project Area would have been part of a woodland environment, comprising an Ironbark community of narrow leaved red ironbark (*Eucalyptus crebra*), red ironbark (*E. sideroxylon*), and broad-leaved red ironbark(*E. fibrosa*), with some grey box (*E. moluccana*) and rough-barked apple (*Angophora floribunda*) also present. Swamp oak (*Casuarina glauca*) is also known to be present in local drainage areas. While significant portions of the Project Area and environs have been cleared of native vegetation for mining and grazing purposes, a significant quantity of woodland, predominantly in the form of regrowth vegetation, is currently present within the Project Area.

Native fauna would have once provided abundant food resources for the Aboriginal people of the region, with the Eastern Grey Kangaroo (*Macropus giganteus*), brush tailed possum (*Trichosurus vulpecula*), the echidna (*Tachyglossus aculeatus*) and the grey headed flying fox (*Pteropus poliocephalus*) all common throughout the region. Native birds included the Pacific Black Duck (*Anas (anas) superciliosa*) and the Australian wood duck (*Chenonetta jubata*). Lizards, such as the bearded dragon (*Pogona barbata*), snakes such as the eastern brown snake (*Pseudonaja textilis*), and frogs, such as the Common eastern froglet (*Crinia signifera*), are also native and commonly occurring species throughout the region.

4.5 Land Use and Disturbance

European settlement in the general Singleton area commenced in the c. late 1820s. Early land development was associated with wheat cropping, tobacco production dairy farming and timber cropping. From the c.1870s onwards the land in the vicinity of Rixs Creek was cleared predominantly for mining activities. Subsequently the area within, and in the vicinity of, the Project Area, has been used for both mining and grazing activities, which have significantly affected the physical environment of the area.

Much of the surface soil in the local area has been disturbed as a result of native vegetation clearance. Sheet and gully erosion has resulted in some areas from clearing and subsequent grazing activities. This has been exacerbated by the highly erosional nature of the soils in the area. Sheet erosion is generally evident on lower slopes. This has resulted in the loss of topsoil, particularly across the lower to mid slope sections, which collect water runoff from higher ground during times of rain. Rixs Creek and its tributaries are generally in a degraded state in the vicinity of the Project Area, with stream bank erosion and gullying evident along drainage lines in the local area. The construction of dams, in conjunction with mining activities undertaken in the area, has also significantly altered the previous drainage regimes in the vicinity of the Project Area.

As a result of the past land uses, land disturbance within the Project Area can be summarised as follows:

- Native vegetation clearance;
- Trampling from cattle grazing;
- Fencing works;
- Earthworks and excavation for damming;
- Erosion, particularly along creeklines;
- Landscape disturbances from construction of vehicle tracks;
- Landscape disturbances from the installation/construction of infrastructure; and
- Landscape disturbances from coal mining activities.

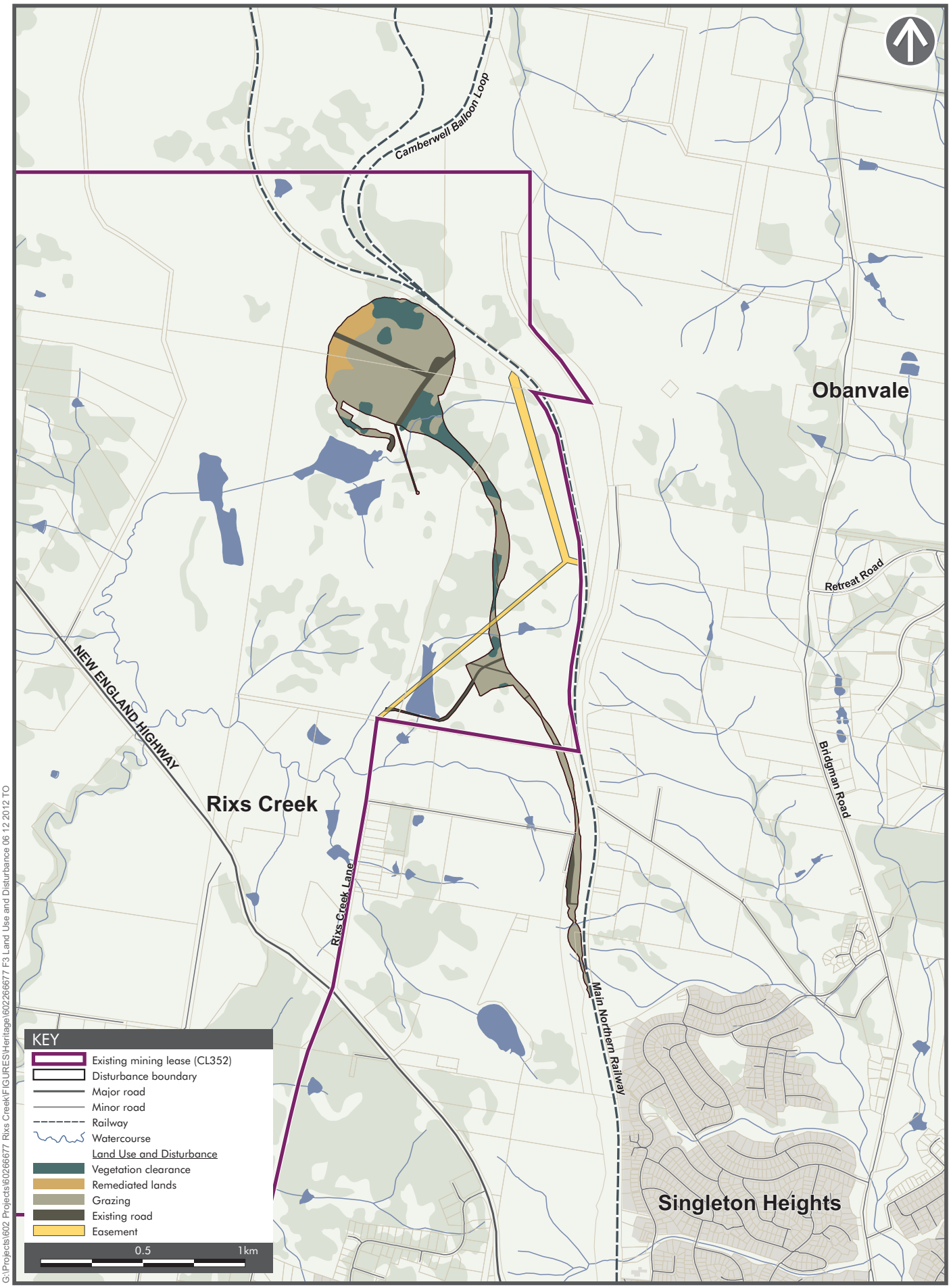
4.6 Summary of Environmental Context and its Implications for Aboriginal Archaeology and Cultural Heritage

Key observations drawn from a review of the existing environment of the Project Area are as follows:

- Environmental conditions discussed above, such as climate, access to fresh water, flora and fauna provide indicate that land within and in the vicinity of the Project Area was sufficient to support occupation by Aboriginal people;
- Evidence of occupation is likely to be found concentrated along/adjacent to creeklines where there would have been easy access to fresh water and marine food resources. Lower artefact densities might be expected along ephemeral tributaries and drainage lines.
- In topographic terms, the majority of the Project Area can be characterised as being suitable for occupation by Aboriginal people. Landforms most suited to repeated or intensive occupation activity, however, include level to gently undulating/inclined flood/drainage plains and gently inclined footslopes (i.e. low gradient land surfaces).
- The Hunter River is located approximately 3.5km south of the southernmost-extent of the Project Area. Stone suitable for the production of stone tools is therefore locally available, as the Hunter River gravels contain rocks suitable for stone tool manufacture, including indurated mudstone/tuff and silcrete. In the

more immediate vicinity of the Project Area, suitable raw materials for stone tool manufacture may also have been available from the gravels of Rixs Creek and its tributaries.

- Native vegetation within the Project Area has been extensively modified as a result of European land use practises, with native vegetation clearance widespread across the Project Area. If, however, mature paddock trees are present, they could potentially exhibit scars resulting from cultural modification by Aboriginal people.
- Prior to European occupation, the floral and faunal resources of the Project Area would have been sufficient to facilitate and sustain occupation by Aboriginal people; and
- Erosion is common throughout the Project Area, most likely resulting from vegetation clearance of the area for agricultural and mining purposes. As a result of this, areas where erosion is evident will generally offer excellent ground surface visibility, but poor potential for stratified archaeological deposits.



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LAND USE AND DISTURBANCE

Rix's Creek Mine Rail Loading Facility
Aboriginal Archaeological and Cultural Heritage Impact Assessment

FIGURE 3

5.0 Ethnographic Context

5.1 Introduction

Information regarding the ways in which Aboriginal people used pre-contact landscapes is available to archaeologists through two primary sources: archaeological data and ethnohistoric records. Section 6.0 summarises the archaeological context of the Project Area on both a regional and local scale. This section provides the foundation for the archaeological data by summarising relevant ethnohistoric information for the Project Area and its environs.

As in other parts of Australia, Europeans living in the Hunter regions began to document Aboriginal culture from first contact, with explorers, missionaries, settlers and the like recording their encounters with, and observations of Aboriginal people and their material culture in letters, journals and official reports. Most of these accounts are overtly Eurocentric in tone and content and the veracity of some is, at best, questionable. Nonetheless, taken together, they form an important source of information on Aboriginal lifeways at the time of British colonisation and can, in conjunction with available archaeological data, be used to generate working predictive models of Aboriginal land use practices.

5.2 The Wonnarua

Prior to European settlement, the Muswellbrook district is thought to have been inhabited by people of the *Wonnarua* language group (many spelling variations include *Wanaruwa*, *Wanarua*, *Wannarawa*, *Wannerawa*, *Wonarua*, *Wonnah Kuah*, *Wonnuaruah*). Key published sources for the Wanaruah language and peoples include primary ethnographic resources such as Threlkeld (in Gunson 1974), Howitt (cited in Brayshaw 1966), Mathews (1898; 1903), Enright (1901), Curr (1886), Fawcett (1898), and Miller (1887). A summary of some key features of the Wonnarua's way of life and material culture is provided below.

The Wonnarua language group covered a relatively small area of some 5,200 km^2 which, according to Tindale (1974), straddled the Upper Hunter Valley and extended from just west of Maitland and Kurri Kurri to the Dividing Range (just west of Widden Brook). The Wonnarua's lands border the Darkinjung territory to the south near Wollombi, the Worimi and Awabakal of the Lower Hunter to the east near Maitland, and the Geawegal to the north near Muswellbrook.

While there is general acceptance of the boundaries of the Wonnarua, there is some evidence to suggest the Geawegal and Wonnarua were part of the Kamilaroi. Ethnographic accounts by Threlkeld (cited in Gunson 1974) and Mathews (1903) suggest Kamilaroi territory extended as far south as Jerrys Plains, into what is now referred to as Wonnarua territory. However, other early sources make a clear distinction between the two groups such as Howitt (cited in Brayshaw 1966) who states 'the Wonnarua, who were closely affiliated with the Kamilaroi, occupied the Valley from here to Merriwa in the Goulburn Valley'. Despite the conflicting evidence, it is almost certain that Aboriginal people living in the Muswellbrook or Jerrys Plains area were linked culturally, if not directly, to their Kamilaroi neighbours.

The population density for the Wonnarua is difficult to estimate, and certainly pre-European numbers have not been estimated with any accuracy. Various historical accounts of early European interactions with the Wonnarua, cited by Brayshaw (1987), suggest relatively low numbers for that language group. For example, five individuals were observed by John Howe near Jerrys Plains in 1819. In 1824, fifteen Aborigines visited Dangar's camp at Dart Brook, and soon after a group of 150 attacked his party just beyond the Liverpool Range. These figures tend to correlate with the population numbers based on the social groupings discussed above. However, Brayshaw (1987) suggests that actual numbers were higher than this with reports of groups of 200 and 300 able-bodied men observed in separate groups. Curr (1886) states that the Wonnarua numbered 500 individuals in 1841, a number supported by Fawcett (1898).

The social organisation of the Wonnarua prior to European settlement is difficult to establish. As Brayshaw (1987) suggests, it was not until the second half of the 19th century, after significant breakdown of traditional Aboriginal life, that people such as A.W.Howitt, R.H.Mathews and W.J.Enright began to show interest and note Aboriginal social organisation. Despite this, utilising available information on the Wonnarua and drawing on broader knowledge of Aboriginal society it is possible to make general statements about the social organisation of the Wonnarua.

The Wonnarua's social structure was likely comprised of many self-governing units, with the smallest residential units known as hearth groups. These typically consisted of a man, his wife or wives and their dependent children.

Several hearth groups camped together temporarily forming slightly larger residential units of perhaps 40 to 60 people (Lourandos 1977; O'rourke 1997), who cooperated in hunting and gathering. The largest residential groupings consisted of either seasonal (summer) band aggregations or irregular ceremonial band aggregations forming local communities of at least 150 people. Residential units formed clans which were closely linked to the land they ranged. The tribe consisted of an agglomeration of clans, and the members of each tribe shared the same language, social customs and territory situated within specific but elastic geographical units (Vinnicombe 1980).

Patterns of habitation for the Wonnarua are equally difficult to interpret due to a paucity of evidence. However, Fawcett (1898), in a key statement discussing the Wonnarua, states that in choosing their campsites the Wonnarua considered, 'proximity to fresh water was one essential, some food supply a second, while a vantage ground in case of attack from an enemy was a third'. Archaeological evidence available for the Hunter Valley, which indicates proximity to creeklines i.e., potable water sources, was the key determinant in the Wonnarua's choice of campsite, is suggestive that Fawcett was correct in his assessment. Mathews (cited in Brayshaw 1966) also makes an observation of the Aboriginal people camping near Broke that they camped 'in a romantic spot' on the bank of Wollombi Brook'.

The Wonnarua consumed a variety of animal and plant resources, in what was likely a seasonal dietary cycle. Fawcett (1898) notes a number of animals exploited by the Wonnarua including kangaroos, emus wallabies, bandicoots, kangaroo rats, opossums, rats, emus, snakes, lizards, fish, caterpillars, grubs, lava of wasps and other inspects, birds and reptiles. These they either roasted, or baked in heaps of cinders or stone, as a form of oven (Miller 1886). Various plant foods were also exploited for food and medicine including bush fruits, roots, and yams (see Archer et al. 2004; Brayshaw 1987; 1966; Fawcett 1898).

Available ethno-historic records attest to the manufacture and use of a diverse range of material culture utilised by the Wonnarua peoples. Brayshaw quotes a number of ethnographic sources including Threlkeld (in Gunson 1974), Caswell (1841) and Dawson (1830) (cited in Brayshaw 1966) who describe the use of huts or 'gunyers', constructed from bark, as the most widely used habitation structure. These accounts describe how large sheets of bark were cut or stripped from tea, box or stringy bark trees, heated on a fire, and supported by three forked sticks to form a shelter. A similar process is said to have been used to obtain bark for canoes (Threlkenld in Gunson 1974). Enright (cited in Brayshaw 1966) notes that generally canoes were cut from large river gum trees (*Eucalyptus spp*) and also the kurrajong (*Brachychiton spp*).

Brayshaw (1966) cites a large list of items, largely from Enright's collection of implements, as utilised by the Wonnarua. These include a variety of spears for fishing, hunting and war, probably from the grass tree *Xanthorrhea arborea*; wommeras or spear throwers, usually about three feet in length; boomerangs, both returning and non-returning; yam-sticks; shields, of both wood and bark; waddys or clubs made of hard wood, probably mangrove (*Avicennia officinalis)* or white ironbark (*Eucalyptus paniculata*); axe heads (of basalt), both hafted non-hafted axes (see Fitzpatrick cited in Brayshaw 1966) used for cutting toe-holds to aid tree climbing, removing bark for huts and canoes, cutting possums out of trees, and removing bandicoots or kangaroo rats from hollow logs; stone implements, including gouges, knives and scrapers constructed from a variety of raw material; koola-man or wooden bowls for holding water, seeds, grubs etc; nets (turrila) and fishing line from the bark of various trees including the cabbage-tree (*Livistona australis*) and the kurrajong (*Brachychiton populneus*) for catching fish; fish hooks from oyster shells; a variety of bone implements including needles for sowing; and clothing made from opossum skins, including cloaks.

Spiritual authority was vested in a large number of supernatural beings. Throughout south-eastern Australia, one of the most important was a belief in a sky diety *Baiami* ('The Great Shaper,' 'Thunder-God' or 'Great One'). Baiami formed the world by shaping the cosmos from a pre-existing primeval void (O'Rourke 1997). According to Berndt (1947), he had two wives, Biragnulu and Gunambali, and a son called Daramalan. Both Baiame and Daramalan were thought to return to earth during certain initiation rituals (Berndt 1947), and are often depicted in rock engravings or paintings (see Attenbrow 2010).

The Wonnarua are known to have utilised several methods to dispose of their dead, each involving varying degrees of ritual (Brayshaw 1966). The most common method recorded, as supported by archaeological evidence (see Dyall and Bentley 1973, 1975 cited in Brayshaw 1987; Donlon et al. 2003), was burial in the earth. Brayshaw (1966) notes the position of the body was varied and could be extended or flexed, face down, on its side or face up and the use of bark as a burial shroud was widespread. In some instances, articles belonging to the deceased have been were buried with them (see Donlon et al. 2003).

6.0 Archaeological Context

6.1 Regional Context

6.1.1 Archaeological Evidence

Formal archaeological interest in the Aboriginal archaeological record of the Hunter River Valley can be traced to the early 1940s (McCarthy & Davidson 1943). However, concentrated investigation of this record did not begin until the mid-to-late 1970s, a period marked by a rapid growth in the Valley's coal mining industry as well as affiliated development (see Moore 1967, 1969, 1970 for important early survey and excavation work). Intensive development activities since this time have secured the Hunter Valley's place as one of the most intensively investigated archaeological regions in Australia, with hundreds of Aboriginal archaeological investigations involving survey and/or excavation having been undertaken. The vast majority of these investigations have been undertaken as part of larger Environmental Impact Assessments associated with coal mining projects in the Central Lowlands subregion (Story et al. 1963). Not surprisingly, these investigations have varied significantly in scale and scope, ranging from targeted small-scale surveys to complex, multi-phase survey and excavation projects over large areas. Nonetheless, together, they have revealed a rich and diverse record of past Aboriginal occupation, with thousands of Aboriginal archaeological sites now registered on OEH's Aboriginal Heritage Information Management System (AHIMS) database. Fortunately, several useful syntheses of previous Aboriginal archaeological work within the Hunter Valley are now available (e.g., ERM 2004; Hughes 1984; Koettig 1990; MacDonald & Davidson 1998). Together with Dean-Jones and Mitchell's (1993) pioneering environmental study, these syntheses provide a suitable interpretive framework for the current assessment. Key findings are detailed in brief below under three thematic sub-headings.

6.1.2 Open Artefact Sites: Distribution, Contents and Definition

Surface distributions of stone artefacts, variously referred to as artefact scatters, open sites, open camp sites, are by far and away the most common and widely distributed form of Aboriginal archaeological site in the Hunter Valley (ERM 2004; Hughes, 1984;Koettig, 1990; MacDonald & Davidson, 1998). Other site types, such as scarred trees, shell middens, quarries, grinding grooves, burials and rockshelters with deposit and/or art or PAD, have also been identified but are comparatively rare. Accordingly, open artefact sites remain the most intensively investigated component of the Aboriginal archaeological record of the Hunter Valley, with site distribution, contents and definition forming key research/discussion topics. Internal site structure has also generated some interest (e.g., Brayshaw & Haglund, 1984; Koettig, 1994;Rich, 1992) but remains to be investigated in detail.

As highlighted by Hughes (1984), and reiterated by numerous other researchers (e.g., ERM 2004;Koettig & Hughes, 1983, 1985; Koettig 1992,1994;Kuskie, 2000; Rich, 1992) consideration of the distribution of open artefact sites within the Hunter Valley indicates a strong trend for their presence along watercourses, specifically, on river/creek banks, terraces and adjacent 'flats' (i.e., flood/drainage plains). Although this patterning is, to a significant degree, a product of both geomorphic dynamics and archaeological sampling bias i.e. extensive fluvial erosion activity along watercourses resulting in generally higher levels of surface visibility and subsequently the focus of archaeological survey. Nevertheless, despite these factors, this pattern of site distribution is supported by the results of several large scale Aboriginal archaeological salvage projects incorporating surface collection and excavation (e.g. Haglund 1992; Koettig 1992, 1994; Kuskie 2000; MacDonald & Davidson, 1998; Rich 1992).

Moreover, these projects have indicated that assemblage size and complexity tend to vary significantly in relation to both the proximity and permanency of potable water sources as well as landform, with larger, more complex assemblages (i.e., those containing a wider variety of raw materials and technological types and/or higher mean artefact densities and features such as hearths and knapping floors) concentrated on landform elements adjacent to major watercourses. Artefact distributions associated with ephemeral watercourses and other non-adjacent landform elements (e.g., mid- and upper slopes, ridgelines), meanwhile, have typically taken the form of a low-density artefact scatters often referred to as 'background scatter'.

Flaked stone artefacts dominate archaeological assemblages from recorded open artefact sites within the Hunter Valley (Hiscock 1986). However, items such as complete and fragmentary grindstones, charcoal, animal bone, shell and ochre have also been recorded at some sites. With the notable exception of 'knapping floors', a relatively common component of the open artefact site record of the Hunter Valley, associated archaeological features (i.e. hearths and pits) are rare (e.g., Koettig, 1992). Defined in slightly different ways by different researchers, following White (1999: 152), knapping floors can be broadly defined as "activity areas in which primacy was given to the reduction of one or more blocks of stone". Recorded knapping floors vary considerably in size and complexity, with some examples (e.g., Koettig, 1994; Rich, 1992) containing thousands of artefacts

and attesting to the reduction of multiple blocks of differing raw materials. Backed artefacts (i.e. Bondi points and geometric microliths) are a common feature of knapping floors. At Narama, near Ravensworth, a detailed analysis of the contents of knapping floor and non-knapping floor assemblages revealed significant differences between the two, including variation in the frequency of backed artefacts, other retouched and/or utilised tools, cores and the application of different reduction strategies (Rich 1992). Together with differences in the spatial distribution of the two forms of assemblage, this evidence was used to suggest that backed artefact production within the Narama landscape was a highly structured activity, and that knapping floors assemblages were the product of a more restricted range of behaviours than more generalised scatters. Although limited to a single landscape, evidence from other parts of the Valley (e.g., Hiscock 1986; Koettig 1992, 1994) supports the suggestion that backed artefact manufacture was a highly structured activity.

Although relevant to a variety of site types, geomorphic processes such as soil erosion and deposition are of particular relevance to the identification and definition of open artefact sites. As in other archaeological contexts (e.g., Fanning & Holdaway 2004; Fanning *et al*. 2009; Holdaway *et al*. 2000), it is now widely accepted by archaeologists working in the Hunter Valley that the visibility and preservation of open artefact sites in this region are, to a significant extent, products of contemporary, historic and prehistoric geomorphic processes which have, and continue to act variously to exposure, obscure and destroy them (Dean-Jones & Mitchell 1993). As demonstrated by numerous large scale salvage projects in the Valley (e.g., Haglund 1992; Koettig 1992, 1994; Kuskie 2000; MacDonald & Davidson, 1998; Rich 1992) surface artefacts invariably represent only a fraction of the total number of artefacts present within recorded open artefact 'sites', with the majority occurring in subsurface contexts. Artefact exposure, unsurprisingly, is highest on erosional surfaces and lowest on depositional ones (cf. Fanning & Holdaway 2004; Fanning *et al*. 2009). Furthermore, in many areas, surface artefacts have been shown to form part of more-or-less continuous subsurface distributions of artefacts, albeit with highly variable artefact densities linked to environmental variables such as distance to water, stream order and landform (e.g., Kuskie & Clarke 2004; Rich 1992).

6.1.3 Bondaian Stone Tool Technology

Chipped stone artefacts are a ubiquitous element of the Aboriginal archaeological record of the Hunter Valley. As in other parts of the state (e.g., Attenbrow 2010;Shiner 2008), this ubiquity has not only resulted in a long history of research but also guaranteed stone artefacts a prominent position in archaeological reconstructions of past Aboriginal land use in the region. To date, hundreds, if not thousands of surface-collected and excavated chipped stone assemblages from the Valley have been analysed, with individual assemblage sizes, research questions, aims, analytical methodologies and terminological schemes varying significantly between researchers and projects. Studies to date have ranged from basic descriptive accounts of assemblage composition in typological terms to detailed reconstructions of specialised knapping strategies through technological and metric attribute analyses, conjoining and, in some instances, experimental research. Particularly informative and/or influential analyses in the context of the Hunter Valley include those by Hiscock (1986a, 1986b,1993), Koettig (1992, 1994) and Moore (1997, 2000).

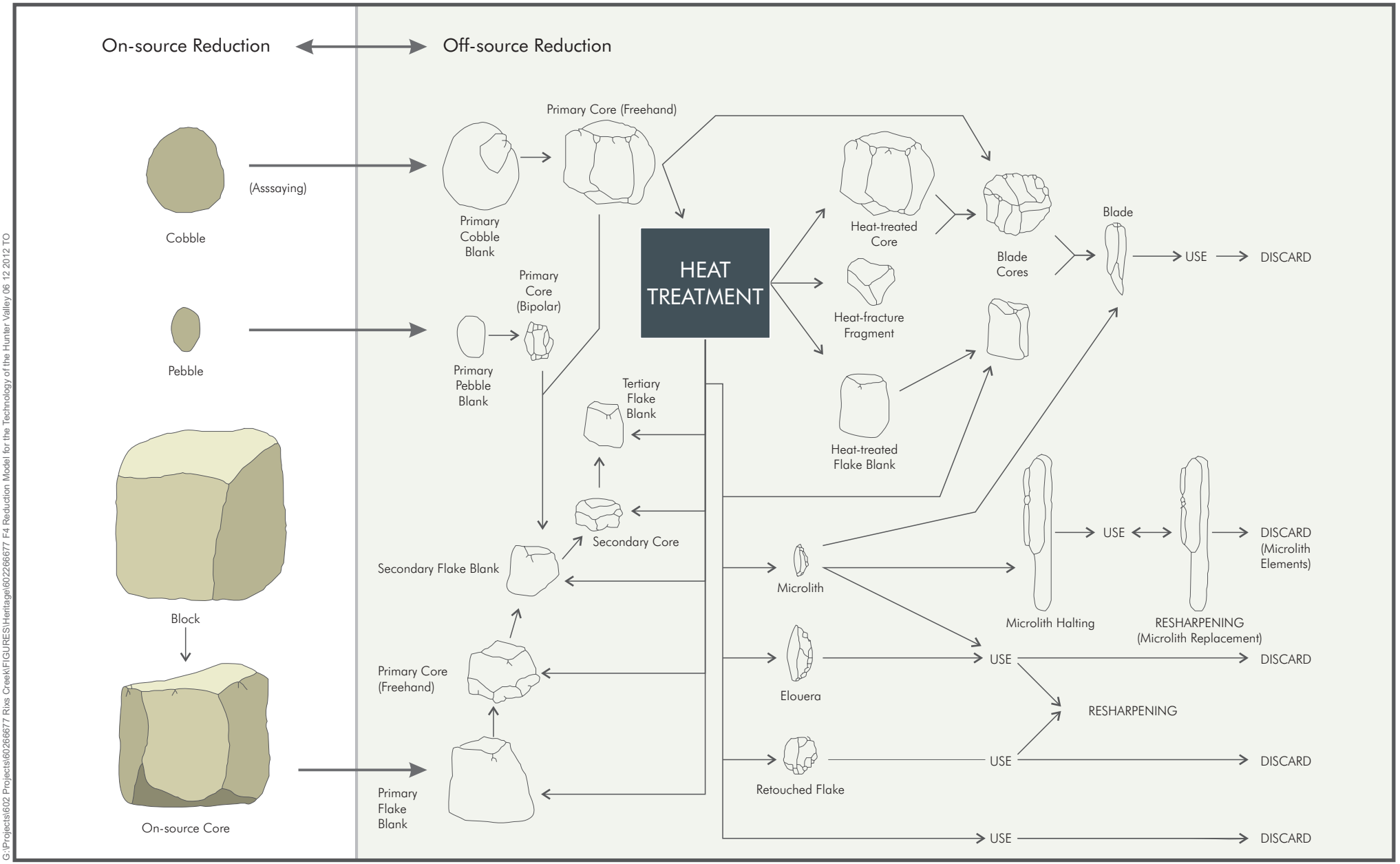
As highlighted by Koettig (1994) and others (e.g., Hiscock 1986a; Hughes 1984), available technological and typological data for surface collected and excavated chipped stone artefact assemblages from the Hunter Valley suggest that the vast majority of these assemblages belong to what is known as the 'Australian Small Tool Tradition'. This term was coined by Gould (1969) to signal the appearance, in mid-Holocene, of a new suite of chipped stone tool forms in the Aboriginal archaeological record of Australia, including Bondi points, geometric microliths, adzes and points, both unifacially and bifacially flaked. Complex hierarchically-organised reduction sequences associated with the production of these tools contrast markedly with the simple chaining of earlier periods (Moore 2011). Tools of the 'Australian small tool tradition', it has been suggested, formed part of a portable, standardised and multifunctional tool kit aimed specifically at risk reduction (Hiscock 1994; 2006). Stone artefact assemblages from late Pleistocene and early Holocene contexts, in contrast, are described by archaeologists as belonging to the 'Large Core and Scraper Tool Tradition', a term first used by Bowler *et al*. (1970) to describe the Pleistocene assemblages recovered from Lake Mungo in western New South Wales. Bowler *et al*. (1970) saw the main components of these assemblages - core tools, steep-edged scrapers and flat scrapers - as characteristic of early Australian Aboriginal assemblages and as being of a distinctly different character to those appearing in the mid-Holocene around 6,000 BP and persisting into the contact period (i.e., the last 200 years). In eastern Australia, including the Hunter Valley, these later assemblages (i.e., those belonging to Gould's (1969) 'Small Tool Tradition') are referred to as 'Bondaian' assemblages (after McCarthy 1967).

Mid-to-late Holocene Aboriginal knappers in the Hunter Valley utilised a diverse range of lithic raw materials for chipped stone artefact production (Hughes 1984). However, two rock types - silcrete and indurated mudstone - were clearly favoured for this task (Hiscock 1986a). Alongside other, less commonly exploited raw materials,

including quartz, quartzite, petrified wood, chalcedony, chert, porcellanite and local volcanics, both are available in the gravels of the Hunter River and its tributaries, occurring in pebble, cobble and, in the case of silcrete, boulder form (Raggatt 1938; see also Hiscock 1986a:14-16). Notably, studies by Esteves (1998) and MacDonald and Davidson (1998) have indicated spatial variability in the availability of silcrete and mudstone gravels along the Hunter River, with neither rock type continuously distributed, but rather, available at localised points. This evidence notwithstanding, on the basis of available data, it would appear that gravels associated with the Hunter River and its major tributaries functioned as *the* primary source of lithic raw materials for Aboriginal chipped stone artefact manufacture during mid-to- late Holocene. Other exploited sources are known (e.g., AECOM 2011; Dean Jones 1990, 1992; Mills 2000). However, reduction evidence at these locations has tended to take the form of a low density background scatter of flaked cobbles and flakes, suggesting relatively non-intensive on-source reduction (e.g., AECOM 2011; Mills 2000).

In the Hunter Valley, asymmetrical and symmetrical backed artefacts dominate the retouched components of surface collected and excavated chipped stone assemblages. Accordingly, the technology of backed artefact manufacture has been a particular focus of research (e.g., Baker 1992; Hiscock 1993; Koettig 1992; 1994a). Studies by Hiscock (1986a, 1993), Moore (1997; 2000) and others (e.g., (Baker 1992; Koettig 1992; Witter 1995; 1999) have demonstrated that backed artefact manufacture in the Hunter Valley was a highly structured activity involving a complex system of raw material procurement, transportation, preparation and reduction. Differences in the technological character of recovered cores and conjoin sets across the Valley indicate a significant degree of variability in the strategies used by Aboriginal knappers to produce blanks for backed artefact manufacture (Figure 4). Heat treatment, significantly, appears to have been integral component of the backed artefact manufacturing process in the Hunter Valley, with evidence for the thermal alteration of stone packages prior to reduction both abundant and widespread. As Hiscock (1993:66) has observed, “the thermal alteration of Hunter Valley silcrete drastically improves flaking qualities and increases the lustre and smoothness of the fracture surface”. Compared with silcrete, evidence for the thermal alternation of indurated mudstone blanks is rare (e.g., Koettig 1992) and likely reflects the naturally higher flaking quality of this material.

Alongside the reconstruction of backed artefact manufacturing processes, the identification of diachronic change in Bondaian lithic technology in the Hunter Valley has received considerable analytical and interpretive attention (e.g., Baker 1992, Dean Jones 1992; Haglund 1989; Hiscock 1986a, 1986b; Koettig 1992; Rich 1991). Hiscock’s (1986b) pioneering attribute analysis of a sample of unretouched mudstone flakes recovered from Sandy Hollow 1 rockshelter (Moore 1970) is of particular significance in this regard and can be considered the foundation upon which all other studies have been undertaken. This analysis sought to test a tripartite division of the Sandy Hollow 1 (SH1) assemblage made on the basis on chronological changes in backed artefact frequency (Hiscock 1986b:42). Three phases were recognised: Pre-Bondaian, Phase I Bondaian and Phase II Bondaian. Attribute analysis of a sample of 742 complete mudstone flakes from Square AA revealed technological changes consistent with this division, including, but not limited to, changes in the relative frequency of platform preparation and overhang removal as well as flake shape and platform size. Having established the validity of the three phase Bondaian sequence at SH1, Hiscock (1986b) applied the same attribute analysis to a series (n = 15) of chipped stone assemblages recovered from open artefact sites on the Mount Arthur North and Mount Arthur South coal leases and found that individual assemblages could be assigned to one of the three Bondaian phases recognised at SH1. On the basis of this evidence, Hiscock (1986b) proposed that the attribute analysis employed at SH1 could serve as a relative dating system for open sites in the Hunter Valley. Given the number of such sites within the region, this argument was particularly groundbreaking and has prompted several archaeologists to apply Hiscock’s analysis to assemblages from other areas, albeit with mixed success (e.g., Baker 1992; Dean Jones 1992; Haglund 1989; Koettig 1992; Rich 1991). Difficulties in replicating Hiscock’s results, Holdaway (Holdaway 1993:29) notes, can be linked, at least in part, to spatial variability in the methods used by Aboriginal knappers to reduce stone, variability itself prompted variables such as raw material type and accessibility, site function and stylistic differences between Aboriginal groups. As Hiscock (1984) himself has observed, different stone artefact technologies are likely to have both temporal *and* spatial components.



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Heritage\602266677 F4 Reduction Model for the Technology of the Hunter Valley 06 12 2012 TO

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Source: Moore's (2000) reduction model for the technology of Hunter Valley microlith assemblage (after Moore 2000: 29, Figure 5)

MOORE'S REDUCTION MODEL FOR THE TECHNOLOGY OF THE HUNTER VALLEY MICROLITH ASSESMBLAGE

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FIGURE 4

6.1.4 Chronology and Texture-contrast Soils

With some modification, McCarthy's (1967) *Eastern Regional Sequence* (ESR) of stone artefact assemblages remains the dominant chronological framework for Aboriginal prehistory in the Hunter Valley. The ERS hypothesises a three phase sequence of 'Capertian' (earliest), 'Bondaian*'* and 'Eloueran' assemblages and was developed on the basis of McCarthy's (1948; 1964) pioneering analyses of stratified chipped stone assemblages from Lapstone Creek rockshelter (McCarthy 1948), on the lower slopes of the Blue Mountains eastern escarpment, and Capertee 3 rockshelter (McCarthy 1964), in the Capertee Valley north of Lithgow. Hiscock's (1986b) three phase sequence notwithstanding, McCarthy's ESR is routinely characterised by archaeologists working within the Hunter Valley as a four-phase sequence, with the term Capertian retained and 'Bondaian' subdivided into three phases: Early Bondaian, Middle Bondaian and Late Bondaian[2] (Figure 5). The tripartite division of the Bondaian is based principally on the introduction and subsequent decline of backed artefact manufacture. However, other factors, such as changes in the abundance of bipolar and quartz artefacts, and the presence/absence of edge-ground axes are also relevant.

As in other parts of the state (e.g. Attenbrow 2010) evidence for Pleistocene and/or early Holocene Aboriginal occupation of the Hunter Valley is rare, with confirmed or potential terminal Pleistocene and/or early Holocene assemblages obtained from just five sites (Baker 1994; Hughes et al. 2000; Hiscock et al. 2000; Koettig 1986b; Kuskie 1999), one of which (i.e., Moffats Swamp Dune: Baker 1994) is located within the Valley's Coastal Plain. Significantly, studies by Koettig (1990), Baker (1994) and Kuskie (in prep), suggest that the chipped stone technology employed by Aboriginal knappers occupying the Hunter Valley during the terminal Pleistocene/early Holocene was part of the 'Large Core and Scraper tool Tradition'. This technology appears to have been focused on the opportunistic or non-specific reduction of early reduction cores (*sensu* Moore 2000) - some of which were very large. Core reduction appears simply to have geared towards the production of robust flakes for immediate use or retouch into simple scrapers, with no evidence for the complex hierarchically reduction sequences typical of the mid-to-late Holocene. Tool edges, Moore (2000:36) notes, were refurbished by unifacial retouching. A preference for volcanic materials over silcrete and mudstone has also been noted (Baker 1994; Koettig 1990, 1992:5). Heat treatment, meanwhile, is not reported for the early Hunter Valley assemblages.

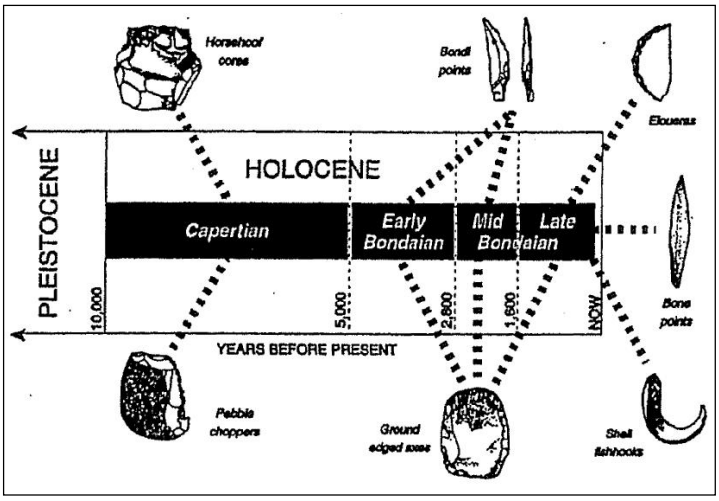


Figure 5: McCarthy's Eastern Regional Sequence (ERS) (from MacDonald and Davidson 1998: 105, Figure 5.1)

Critical to discussions concerning the chronology of Aboriginal occupation within the Hunter Valley is the genesis of the texture contrast or duplex soils that are associated with the vast majority of identified open artefact sites within the region (Dean Jones and Mitchell 1993). As Kuskie and Clarke (2004: 228) have pointed out, an understanding of the genesis of these soils, defined by Hughes (1984: 26) as those consisting of "an A horizon of massive, sandy to silty material which gives way abruptly down the profile to clayey material with a blocky structure", is critical for determining both the potential antiquity and integrity of any Aboriginal archaeological materials contained within them. Of particular relevance to archaeologists is the observation that whilst the 'A' and 'B' horizons of some texture contrast soils do, in fact, form a pedogenetical entity, having formed from *in-situ* weathering of parent materials, this is not always the case, with some 'A' horizons representing later colluvial

[2] The Late Bondaian is equivalent to McCarthy's Eloueran phase.

deposits (Dean Jones and Mitchell 1993). In the Hunter Valley, available radiocarbon determinations and typological data for chipped stone assemblages recovered from excavated 'A' soil horizons provide overwhelming support for Hughes' (1984:28) widely cited suggestion that these soil horizons are sedimentary in origin and accumulated over the last 5,000 years. In contrast, Pleistocene dates for archaeological material in the Hunter Valley, confirmed through carbon dating of charcoal, have been associated with B unit soils (see Koettig 1986).

This said, as highlighted by Kuskie and Clarke (2004: 232), the paucity of data currently available on 'A' soil horizons between the last glacial maximum and the late Holocene, precludes definitive comment on the maximum potential age of archaeological material within these horizons. As they suggest, it is important that each locality be assessed independently given the complex interplay of pedogenetic and sedimentological processes that may have operated on the 'A' horizon within it. In contrast, Pleistocene dates for archaeological material in the Hunter Valley, confirmed through carbon dating of charcoal, have been associated with B unit soils (see Koettig 1986).

Drawing, in particular, on Mitchell's (1988) model for the genesis of duplex soils on hillslopes in the Sydney Basin, Dean Jones and Mitchell (1993) have suggested that rainwash (i.e., raindrop agitated surface flow) and bioturbation are crucial to the formation of texture contrast soils in these contexts. Following Mitchell (1988), they identify rainwash as the primary sediment transport mechanism operating on slopes but argue that, in isolation, slope transport will not result in a texture contrast profile. Duplex profiles, they suggest, will only form in situations where slope transport "combines with rapid rates of shallow bioturbation, especially soil mixing and mounding by organisms such as ants, termites and earthworms" (Dean Jones and Mitchell 1993: 43). Interestingly, Dean Jones and Mitchell (1993:43) attribute the development of stone layers between A and B horizons, a widespread geomorphological phenomenon in the Hunter Valley, to the down profile movement or 'sinking', over time, of stones through bioturbation. Stone layers, they suggest, will form at the level where bioturbation agents cease operating. Bringing this and other observations to bear on the Aboriginal archaeological record the Hunter Valley, Dean Jones and Mitchell (1993:44) have suggested that the key archaeological implications of Mitchell's (1988) genesis model are as follows:

1. Duplex soils do not necessarily indicate great age;
2. Open sites located on texture contrast soils can never be truly stratified in a chronologically useful sense;
3. Stone artefacts on open sites will behave in the same way as natural stones on a hillslope and will be subject to surface dispersion, downslope movement, and differential burial or exposure, by bioturbation agents and will commonly form a stone layer; and
4. The only possible means of dating open sites in any meaningful way will be from artefact cultural sequences developed on the basis of stratified assemblages and/or intact hearths. All other dates, especially those based on detrital charcoal, will be spurious.

More broadly, Dean Jones and Mitchell (1993) and Hughes (2000) have highlighted a series of geomorphic contexts within the Hunter Valley that they believe represent favourable locations for the preservation of Pleistocene and/or early Holocene archaeological evidence. These include:

- Rockshelters and large middens;
- Source bordering dunes;
- The distal portions of low angle alluvial fans;
- Stream junctions where each tributary has a different rate of sediment supply; and
- Colluvial deposits at the base of steeply inclined surfaces.

6.1.5 Occupation Models

Existing models for Aboriginal site occupation in the Hunter Valley region are summarised in Table 4.

Table 4: Existing Models for Aboriginal Site Occupation in the Hunter Valley Region

Researcher(s)	Location	Summary of Model
Dyall 1980	Mt Arthur	Dyall proposed that creek confluences or junctions were most commonly used landforms for Aboriginal campsites.
Hughes 1984	Hunter Valley	Hughes proposed the often-quoted model of Aboriginal campsite location as commonly being found within 50 m of watercourses. Hughes argues that site sizes will diminish as the size of the watercourse decreases.

Researcher(s)	Location	Summary of Model
Koettig 1994	Central Lowlands	Utilising the results of salvage excavations at Camberwell and Bulga and ethnographic accounts from central Australia, Koettig proposes camps were ordered according to strict rules based on: the location of water sources, the size and composition of the group or groups camping, and the length of the stay. Koettig further proposes: • Where occupation is infrequent, archaeological features at a site may be widely distributed and relatively infrequent. • If, over time, occupation episodes are overprinted at the same site, then the evidence from different activity areas would be closer together and even superimposed. • The longer the stay of groups at a campsite the more types of activities should be reflected and the greater should be the disturbance of occupation debris on the ground.
Witter 1995	Hunter Valley	Witter proposed that most open artefact scatters as being, for the most part, peripheral to one or more base camps near the Hunter River or its major tributaries.
Dean-Jones, Pam & Mitchell 1993	Hunter Valley	Dean-Jones and Mitchell found that while the large majority of sites in the Hunter Valley have been distributed along drainage lines, there is potential for occupation to be associated with ridgelines as they provide linkage routes across the landscape. Elevated positions, particularly adjacent to fresh water supply are also noted as favourable occupation sites. Other landscapes such as terraces and mid slopes are also given preference, particularly during colder months when lower terrain may have been subject to frost hollow effects, and insects. Larger sites were noted to occur in valleys, as a result of greater resources.
Rich 1995	Mt Pleasant	Rich argued that Aboriginal people making use of the Mt Pleasant area used technological solutions in conjunction with other strategies for survival. Groups were mobile occupying residential bases for one or several days. At such locations, they may have carried out a range of activities including stone tool production and maintenance, use of stone tools to make and maintain items, food processing and cooking, and other social/domestic tasks. From these residential bases, they might have made trips to the surrounding areas to produce food and various materials.
Kuskie 2000a	Mt Arthur North	Kuskie's work indicated that the entire landscape was utilised by Aboriginal people to varying extents. Kuskie refines Hughes' (1984) model that relates Aboriginal occupation sites adjacent to watercourses, by proposing that level to gently inclined landforms were preferred. Kuskie also finds that occupation sites are more commonly associated with 3rd and 4th order creeks. Vantage points are noted as important features for Aboriginal occupation sites. Kuskie found that Aboriginal people used and occupied the entire Mt Arthur North area but at varying intensities and at different times.

6.2 Local Context

6.2.1 AHIMS Database Search

A search of OEH's Aboriginal Heritage Information Management System (AHIMS) database on 1 May 2012 for a 2 x 4 km area encompassing the Project Area identified a total of 28 Aboriginal archaeological sites. The AHIMS search results are provided in Appendix E. A breakdown of these sites is provided below in Table 5.

Table 5: AHIMS Database Search Results

Site Type	Count	% of Count
Artefact scatter	21	75%
Isolated artefact	6	21.4%
Scarred tree	1	3.6%
Total	**28**	**100%**

Of the sites registered with the AHIMS database in the vicinity of the Project Area, artefact scatters are the dominant site type, comprising 75% of the total, far outnumbering the next most common site type – isolated artefacts – which account for 21.4% of the total. Scarred trees were the least common site type identified in the vicinity of the Project Area, with only one item identified, comprising 3.6% of the total sites identified.

Of the 28 sites identified, only one site has been recorded as being located within the immediate vicinity of the Project Area. AHIMS Site 37-6-2287 is recorded as being located within the proposed rail loop alignment, approximately 610m north-west of where the rail loop leaves the main northern rail line. Three other sites (37-6-1206; 37-6-1207; 37-6-1208) have been recorded within 100m of the proposed rail loop, also in the southern end of the Project Area, close to where the rail loop leaves the main northern rail line. These three sites are located more than 70m away from the proposed rail loop, and as such are not at risk of being impacted upon by the proposed works (see Figure 6).

Table 6: AHIMS Registered Sites adjacent to/within the immediate vicinity of the Project Area

AHIMS ID	Site Name	MGA E	MGA N	Site Type	Recorder	Distance to Project Area
37-6-2287	SC01	326576	6399518	Isolated Artefact	Mr Dominic Brady (Biosis Research)	Approximately 30m east of the Project Area
37-6-1206	SC/73	326607	6398787	Artefact Scatter	Ms Penny McCardle (McCardle Cultural Heritage Pty Ltd)	Approximately 70m east of the Project Area
37-6-1207	SC/74	326607	6398851	Artefact Scatter	Ms Penny McCardle (McCardle Cultural Heritage Pty Ltd)	Approximately 85m east of the Project Area
37-6-1208	SC/75	326612	6398706	Artefact Scatter	Ms Penny McCardle (McCardle Cultural Heritage Pty Ltd)	Approximately 85m southeast of the Project Area

AHIMS Site 37-6-2287 comprises an isolated red silcrete artefact located in an erosional exposure on a gently inclined flat. The artefact was recorded in 2010 by Biosis Research archaeologist Mr Dominic Brady. The maximum dimension of the artefact was recorded as being 43.2mm, while relevant land-use and disturbance factors were noted as including native vegetation clearance, power pole installation, and vehicle traffic associated with a nearby unsealed and grassy vehicle track. Due to the close proximity of AHIMS Site 37-6-2287 to the Project Area, the site will be need to be ground-truthed during archaeological field survey to ascertain its exact location and determine which mitigation and management measures, if required, are appropriate.

6.2.2 Previous Archaeological Assessments

Background research, including a search of the OEH AHIMS database, indicates that a number of Aboriginal archaeological and/or cultural heritage assessments incorporating archaeological surveys have been conducted in the Rixs Creek area. The results of studies conducted within a local context and of relevance to the Project Area are summarised in Table 7.

Table 7: Previous Archaeological Assessments

Author	Year	Assessment Type	Project	Results	Relationship to Project Area
Helen Brayshaw	1981	Archaeological Survey	Archaeological Survey of Authorisation 89, Proposed Site of Bloomfield Collieries Coal Mine at Rixs Creek.	This study comprised the initial archaeological survey conducted for the proposed Rix's Creek Open Cut Coal Mine. During this survey efforts were concentrated along watercourses and on their adjacent erosional features, as these were known to have revealed significant quantities of artefacts at other locations in the Hunter. A total of eighteen sites were identified, all of which comprised open artefact scatters and isolated artefacts. The sites were found to occur in areas where the ground surface was exposed by a lack of vegetation, or where it has been lowered by erosion or otherwise disturbed. Artefacts generally comprised flakes, cores and flaked pieces or 'chips' of silcrete and chert, which were often identified eroding out of the 'A Horizon'. Two sites were identified along the length of Rixs Creek, while the others were identified along tributaries and upper slopes. In all instances, the sites were identified in areas where the surface soil was actively eroding, or had been previously disturbed by the construction of dams or levees.	The Study Area encompasses the current Project Area.
Helen Brayshaw	1982	Additional Survey Information pertaining to Consent to Destroy sites	Additional Information relating to Authorisation 89, Proposed Site of Bloomfield Collieries' Coal Mine at Rix's Creek, Singleton, NSW	This is a supplementary report to that conducted by Brayshaw at Rixs Creek in 1981 for the proposed Rix's Creek Open Cut Coal Mine. This report provides detailed descriptions of the 18 sites identified by Brayshaw (1981) which were identified in the initial assessment as likely to be impacted by mining operations. Particular attention was given to nine sites, comprising seven artefact scatters and two isolated artefacts, for which a Consent to Destroy was to be sought (AHIMS Sites 37-6-0237, 37-6-0238, 37-6-0239, 37-6-0240, 37-6-0241, 37-6-0242, 37-6-0245). Brayshaw noted that the sites were mostly found on the tributaries of Rixs Creek, often high up near the source. Brayshaw also, however, speculated that this could be a function of ground surface visibility rather than a true reflection of Aboriginal occupation, as most of the erosion occurred on higher ground near the source of the creeklines. The study was undertaken in conjunction with members of the Awabakal, Bira Ban and Darkinjung Aboriginal Co-ops. On the basis of the contents of this report 'Consent to Destroy' applications were forwarded to NPWS for the seven affected sites. NPWS requested salvage to be undertaken prior to granting the 'Consent to Destroys'.	The Study Area is immediately adjacent to the current Project Area to the west. The Study Area partially encompasses/overlaps the northern part of the current Project Area.

Author	Year	Assessment Type	Project	Results	Relationship to Project Area
Helen Brayshaw	1983	Archaeological Salvage	Archaeological Salvage Investigations at Rixs Creek, Singleton, NSW	This archaeological salvage involved the collection of artefacts from four sites and recording artefacts at 3 others, all of which were previously identified by Brayshaw (1981, 1982). The salvage work was conducted as a requirement of the National Parks and Wildlife Service (NPWS) prior to 'Consent to Destroy' being granted. Smaller quantities of artefacts were recovered during the salvage investigations at Rixs Creek than at other sites in the Hunter region. Only one site had more than 100 artefacts. All sites were identified on upper reaches of creeks or tributaries. Mudstone was the dominant material overall, followed by silcrete. Other than silcrete, all materials identified were locally available. While flake shape and dimensions varied, most were 1-3cm in length. Modified artefacts were rare, accounting for only 2.7% of the total. Of the modified artefacts identified, backed implements were a notable feature, including Bondi points and geometric microliths. Mudstone was the preferred material for these artefacts. Traces of knapping floors were also found at two sites, with all artefacts appearing to erode out of the A-Horizon.	The Study Area encompasses the current Project Area.
Sue Effenberger	1994	Archaeological Survey	Archaeological Assessment Re-Survey Coal Lease Extension Bloomfield Colliery Rixs Creek, Singleton, NSW	A total of eight archaeological sites were identified during survey, comprising seven artefact scatters and one isolated artefact. All sites were found within 200m of creeklines. Effenberger noted that most of the sites appeared to be in-situ, and speculated that these sites may represent locations where stone tools were manufactured and maintained. There was evidence of microblade technology evident at some of the sites, and it was observed that the technology appeared to be driven by raw material availability, with indurated mudstone and silcrete dominating the assemblages.	The Study Area is located approximately 1.75km south-west of the current Project Area, on the southern side of the New England Highway.
Denis Byrne	1996	Archaeological Survey	Further archaeological survey of proposed passing lane, Rix's Creek Lane Vicinity, New England Highway, Singleton, NSW	A survey conducted in April 1996 identified two Aboriginal artefact scatters. Subsequently, during follow-up field survey at the same location in October 1996, a further two sites, also comprising artefact scatters, were identified. Both sites comprised large, low density artefact scatters. One site was located on a transmission line easement, and the other across a Hillslope. The site extents of both sites were dependent on the ground surface visibility in the area at the time. Both sites were observed to have been disturbed by a number of factors, including activities associated with the installation of the transmission line.	The Study Area is located on the southern side of the New England Highway, approximately 1.6km south-west of the current Activity Area

Author	Year	Assessment Type	Project	Results	Relationship to Project Area
Giles Hamm	2004	Archaeological Survey	Archaeological Assessment of Lands at Pioneer Road, Singleton, NSW	A total of ten artefact scatters and 33 isolated finds were identified during the archaeological survey. Together, these sites contained 441 Aboriginal artefacts. Most of the artefact scatters were very low density, comprising less than five artefacts. Four sites were identified which comprised more than 50 artefacts. All of these larger artefact scatters were located within 100m of creeks and drainage lines. Nearly all of the sites had been subject to disturbance, including cattle grazing and erosion. Ground surface visibility was noted as an issue, with visibility averaging 0-25% across the survey coverage.	The Study Area is located approximately 3.75km south-east of the current Project Area.
Biosis Research Pty Ltd	2010	Archaeological Survey	Archaeological Assessment of the Nundah Bank Third Track and Ancillary Infrastructure, Nundah Bank, Singleton, NSW	A total of 18 previously unrecorded Aboriginal archaeological sites were identified during the field survey. Of these sites, 17 were within the Study Area, while one fell outside it. The identified sites comprised nine artefact scatters and eight isolated artefacts. A number of disturbance factors were noted, including the construction of the Main Northern Rail Line, mining rehabilitation areas, and the construction of access roads. Ground surface visibility was observed to be an issue, with visibility described as being consistently poor across the Study Area during the field survey, due mostly to dense grass cover.	The Study Area partially encompasses/overlaps the eastern part of the current Project Area.

6.3 Predictive Model

Consideration of the environmental, archaeological, and ethnographical context of the Project Area allows a series of predictions to be made concerning the nature and distribution of Aboriginal archaeological sites within it. Predictions are made concerning the type of sites likely to occur within the Project Area, as well as their likely content, distribution and integrity. The validity of all predictions made will be assessed against the results of the archaeological survey component of this assessment.

Table 8 below outlines the Aboriginal archaeological site types that are considered likely to occur within the Project Area, and provides a series of basic predictions concerning the likely distribution, content and integrity of these site types.

These predictions will be evaluated against the results of the archaeological survey detailed in Section 7.0.

Table 8: Key predictions for site distribution, content and integrity

Site type	Description	Distribution	Content	Integrity
Isolated artefacts	Isolated artefacts are individual stone artefacts found with no obvious association with any other archaeological material. More often than not these comprise chipped stone artefacts, although groundstone implements such as axes and grindstones, and hammerstones are also common. Stone artefacts were used for a variety of purposes by Aboriginal people, and the presence of an isolated artefact indicates that Aboriginal people may have occupied or passed through an area. Isolated artefacts can occur in any landform but are most likely to occur within 100m of drainage lines.	The majority of isolated artefacts will occur within 200m of a creekline (**1a**). The majority of isolated artefacts will be located on one of two landforms: gently inclined footslopes and level to gently undulating/inclined flood/drainage plains (**1b**). The majority of isolated artefacts will occur on low to very low gradient land surfaces (**1c**).	The majority of isolated artefacts will comprise chipped stone artefacts. Ground-edge hatchet-heads and grindstones may also occur (**2a**).	The majority of isolated artefacts will exhibit poor to fair integrity due to past and/or present land uses (**3a**).
Artefact scatters	Artefact scatters are the most commonly identified archaeological site type in Australia. Chipped stone artefacts generally dominate archaeological assemblages from this site type. Materials such as complete and fragmentary groundstone implements, charcoal, animal bone, shell and ochre may, however, also be present. Artefact scatters are generally found on the ground surface, however the exposure and physical extent of these scatters is invariably linked to the nature and extent of on-	The majority of artefact scatters will occur within 200m of a creekline (**4a**). The majority of artefact scatters will be located on one of two landforms: gently inclined footslopes and level to gently undulating/inclined flood/drainage plains (**4b**). The majority of artefact scatters will occur on low to very low	Chipped stone artefacts will be the most common form of artefact present within identified scatters. Edge-ground hatchet-heads made from local/non-local raw materials may also occur (**5a**). The majority of scatters will contain less than 15 artefacts. (**5b**). Scatters with more	The majority of artefact scatters will exhibit poor to fair integrity due to past and/or present land uses (**6a**).

Site type	Description	Distribution	Content	Integrity
	site anthropogenic disturbances (e.g. erosion following vegetation removal, road construction). As such, their presence is often indicative of associated subsurface materials. Stone artefacts were used for a variety of purposes by Aboriginal people, and the presence of an artefact scatter indicates that Aboriginal people occupied or passed through an area. Artefact scatters can occur in any landform but are most likely to occur within 100m of drainage lines or water sources.	gradient land surfaces (**4c**).	than 50 artefacts will be rare (**5c**). Indurated mudstone and silcrete will be the dominant raw materials for chipped stone artefact manufacture (**5d**). Most, if not all of the raw materials utilised for chipped stone artefact manufacture will have been sourced locally (**5e**). Flake debitage (*sensu* Andrefsky 2006) will dominate the artefact assemblages (**5f**). Chronologically diagnostic tool types will be largely restricted to backed artefacts (**5g**). Sites found in association with higher order creeklines (≥2nd order) will contain a higher number of artefact types than those found in association with 1st order streams (**5h**).	

Table 9 below outlines the Aboriginal archaeological site types that have limited potential to occur within the Project Area, and provides a series of basic predictions concerning the likely distribution, content and integrity of these site types.

Table 9: Key predictions for site types that have limited potential to occur within the Project Area

Site Type	Description	Distribution	Content	Integrity
Scarred trees	Scarred trees are anthropologically modified trees which have scars on their trunk associated with the production of cultural items/implements such as coolamons, shields and canoes. The scar is caused by the removal of bark over time. Generally these scars are of particular shapes and dimensions which are easily recognisable, however, over time accurate identification can become difficult to discern from natural scarring events such as fire or a branch fall.	The majority of scarred trees will occur within 200 m of a creekline (**7a**) The majority of scarred trees will occur within 200m of other site types (**7b**)	The majority of scars will occur on eucalypts and box species (**8a**). 'Curved' scars (after Long 2005) will be the most common scar form identified. Other forms will be rare (**8b**).	Scarred trees
Burials	Aboriginal burials are places where Aboriginal skeletal material is buried and/or where mortuary practices occurred. These sites typically consist of concentrations of human bone or teeth in disturbed sub-surface contexts. Surrounding soil matrixes may be stained with charcoal or ochre. Grave goods or mortuary/burial markers may also be present. Burials tend to be found in soft soils and sandy locations, such as along watercourses, particularly in the vicinity of creeks and rivers. They can also be found in, or associated with, middens and shelters.	The majority of burials will occur within 200m of a creekline in soft soils and sandy locations (**10a**).	The majority of burials will comprise concentrations of human bone or teeth in disturbed sub-surface contexts (**11a**) The presence of burials will be indicated by colour differences in soil matrixes resulting from charcoal or ochre stains (**11b**).	Burials

7.0 Results

7.1 Archaeological Survey

Archaeological survey of the Project Area was undertaken on 27 July 2012, with an additional day of survey of the proposed Visual Bund component of the Project Area undertaken on 19 October 2012. The survey undertaken on the 27 July 2012 was conducted by a field team of two AECOM archaeologists (Rochelle Coxon and Dr Darran Jordan) and 12 Aboriginal stakeholder representatives. The additional survey undertaken on the 19 October 2012 was conducted by a field team of two AECOM archaeologists (Rochelle Coxon and Dr Darran Jordan) and three Aboriginal stakeholder representatives. A list of representatives in attendance is provided in Section 3.4.3.

All survey was undertaken on foot, with the archaeological survey team walking abreast of one another at approximately 10m intervals. The linear transect widths ranged from 80m to 100m. This transect width was maintained throughout the survey, ensuring appropriate survey coverage was achieved for the extent of the Project Area. Landform, soils and surface exposure characteristics along transects were recorded through descriptive notes and photographs.

7.1.1 Survey Aim and Objectives

The aim of the archaeological survey was to identify, record and map Aboriginal heritage values within the Project Area. These values include both the tangible remains of past Aboriginal activity (i.e. archaeological evidence) as well as intangible cultural values. More specific survey objectives were as follows:

- To relocate and re-record all previously recorded Aboriginal archaeological sites within the Project Area;
- To comprehensively survey by pedestrian transects land within the Project Area;
- To inspect, where appropriate, areas of known or potential Aboriginal cultural value, including AHIMS sites, and areas identified by Aboriginal stakeholder representatives; and
- To provide sufficient data to facilitate the development of appropriate management and mitigation measures for identified Aboriginal sites and areas of archaeological sensitivity.

The survey strategy employed involved undertaking pedestrian transects over the Project Area. Prior to the commencement of survey, the alignment of the railway loop and the location of the Clean Coal Stockpile Area were clearly demarcated using surveyors pegs by Rix's Creek Mine personnel. These survey pegs provided the route which the survey participants followed to ensure that maximum coverage of the Project Area, and the land immediately adjacent to it which could also be subject to impacts from the Project, was achieved.

7.1.2 Survey Results

A total of 12 new Aboriginal archaeological sites were identified and one previously recorded AHIMS site (37-6-2287) was relocated during the course of the survey. These sites are discussed in sections 7.1.3 and 7.1.4 below. All Aboriginal archaeological sites identified during survey were recorded to a standard comparable to that required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (NSW Department of Environment Climate Change & Water 2010c). For each site located or re-visited, individual artefact locations were captured by Differential GPS (DGPS). Associated site data (e.g. location, type, content, artefact dimensions) was documented using AECOM's standard open site dictionary within the DGPS. Attribute data recorded for identified chipped stone artefacts varied by technological type, with additional attributes recorded for complete flakes, cores and implements. However, as a minimum, recorded attributes comprised raw material, technological type and maximum linear dimension. Detailed photographic records of each site were also maintained.

The topography of the Project Area was observed during the field survey to be predominantly characterised by low, gently undulating hills. The predominant landform through which the proposed rail loop alignment passed comprised flats and lower slopes. The northern section of the Project Area, including the Clean Coal Stockpile Area, was dominated by lower slopes, with mid to upper-slopes also present in the north and north-east. The north-western section of the Project Area was found to be highly disturbed, comprising a rehabilitated overburden emplacement area. All five tributaries of Rixs Creek which intersect the proposed rail loop alignment were subject to inspection. Terrain associated with the tributaries was generally quite flat.

Ground Surface Visibility (GSV) across the Project Area was, on average, poor to fair. The tributaries of Rixs Creek afforded excellent GSV due to erosional processes, particularly sheet erosion, which had exposed the ground surfaces along the creek banks and in adjacent areas. The length of the proposed rail loop alignment was

variable, but generally afforded fair GSV, with areas of good exposure present in several locations due to erosion, lack of grass cover, and exposed areas resulting from land-use disturbance, notably the presence of a transmission line easement across the northern section of the rail loop alignment. GSV was relatively poor in the proposed Visual Bund part of the Project Area to the east, primarily due to the presence of dense pasture grasses across the area. Much of the southern portion of the proposed rail loop alignment afforded poor GSV due to the presence of extensive and dense pasture grasses. Exposures resulting from erosional processes did, however, afford several areas throughout this section, many of which were quite sizable, with excellent GSV.

Plate 1 **Pedestrian transect – Survey of Proposed Rail Loop Alignment 27 July 2012 (view northwest)**

Plate 2 **Pedestrian Transect – Site Inspection of Proposed Visual Bund Area 19 October 2012 (view north)**

7.1.3 Previously Recorded AHIMS Site

During the search of OEH's AHIMS database, conducted on 1 May 2012 for a 2 x 4 km area encompassing the Project Area, a total of 28 Aboriginal archaeological sites was identified. Of these 28 sites identified, one, AHIMS Site 37-6-2287, was recorded as being located within the proposed rail loop alignment, approximately 578m north-west of where the rail loop leaves the main northern rail line. This site was recorded with the AHIMS database as site 'SC01' by Biosis Research in 2010. The site was recorded as comprising a single isolated artefact situated on a very gently inclined flat. The artefact was described as a red silcrete artefact, with a maximum linear dimension (MLD) of 4.32cm.

Upon revisitation of the co-ordinates provided in the AHIMS site card, the artefact recorded as 37-6-2287 was relocated. This artefact was found to comprise a red silcrete complete flake, measuring 4.7 x 2.6 x 1.0cm. Upon survey of the surrounding area, a further 11 previously unrecorded artefacts were identified within 50m of the site. This site extends across the proposed rail loop alignment in the southern section of the Project Area. An updated site card will be submitted to AHIMS for site 37-6-2287 to incorporate the newly identified artefacts. A revised description of site 37-6-2287 is provided below.

7.1.3.1 SCO1 (AHIMS 37-6-2287)

Site type: Artefact Scatter

Co-ordinates: *(Centroid)* 326554mE 6399481mN GDA 94 (Zone 56)

Site Area: approx. 3,890m²

Survey Landform: Gently inclined flat

Distance to Nearest Water: 350m

Site Description: SCO1 (AHIMS 37-6-2287) is a low density surface artefact scatter comprising twelve chipped stone artefacts. The site is situated on a gently inclined slope approximately 600m north-west of where the proposed rail loop alignment departs from the main northern rail line, and approximately 82m west of the existing alignment of the main northern rail line. Two water-courses are located within the general vicinity of the site, with an ephemeral drainage line located approximately 350m to the east of the site, and a first order creekline, which intersects the proposed rail loop alignment, approximately 450m to the north. The site is bisected by the former alignment of the Main Northern Railway line, and shares its site area with that of the former Rixs Creek Railway Station (see accompanying Historical Archaeological Assessment, AECOM 2012). Four artefacts are located on the western side of the rail siding, while a further eight artefacts are located on the eastern side.

The artefacts identified comprised three complete flakes, two retouched flakes (one of which is broken, but appears to be the proximal end of a backed implement), three unretouched proximal flakes, and four angular shatter fragments. IM/Tuff was the dominant raw material identified (n=7), accounting for 58.3% of the total artefacts identified. Silcrete was also well represented (n=4), comprising 33.3% of the total. Quartz was the least well represented material type present (n=1), comprising only 8.4% of the total.

GSV across the site was good to excellent, averaging approximately 75%. Erosional processes and a lack of vegetation cover have contributed to this GSV, resulting in a large expanse of exposed ground. The areas of exposed ground are, however, limited to the vicinity of the railway siding, extending alongside it for approximately 30m. Outside of this area, dense pasture grasses predominate, reducing GSV significantly (0-10%). There are a few isolated trees located within the site boundary on both sides of the railway siding, however the area has been extensively cleared of native vegetation for agricultural purposes and no mature native trees were present in the vicinity. The boundaries and extent of this Aboriginal archaeological site overlap those of a historic artefact scatter. The historic artefact scatter comprises shards of purple, blue and brown glass, fragments of historical ceramic electrical insulators, items of cutlery, and rusted nails. It is possible that this historic site is associated with the historical railway siding.

The updated location of site 37-6-2287 is shown in Figure 6. As shown, the site extends across the proposed rail loop alignment in the southern section of the Project Area.

Plate 3 **37-6-2287 – Artefact detail**

Plate 4 **37-6-2287 – Artefact detail**

Plate 5 **37-6-2287 – Artefact detail**

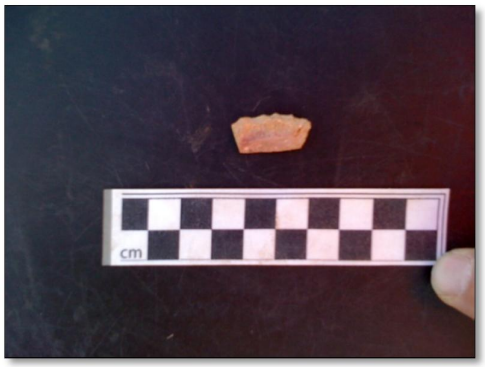


Plate 6 **37-6-2287 – Artefact detail**

Plate 7 **Rixs Creek Rail Loop AS6 – Site location shot.**

7.1.4 Newly Identified Aboriginal Archaeological Sites

As noted in Section 7.1.2, 12 new Aboriginal archaeological sites were identified within the Project Area (Figure 6). As shown in Figure 6, five of the newly identified sites are located within the proposed Project Area, while six fall outside it. A description of each of these newly identified sites is provided below.

7.1.4.1 Rixs Creek Rail Loop IA1

Site Type: Isolated Artefact

GDA Coordinates: 325628mE 6402146mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Midslope

Distance to nearest water: 32m

Site description: Rixs Creek Rail Loop IA1 comprises an isolated indurated mudstone/tuff proximal flake located in a small clearing on the midslope of a lightly vegetated hillside in the northern section of the Project Area. The artefact is red/maroon in colour, and measures 3.0 x 2.5 x 0.75cm. The flake has broken just below the bulb of percussion, which is still clearly visible, although only a small section of the proximal end of the artefact remains intact. Approximately 32m west of the site is an ephemeral drainage line, in which there are areas of exposed sandstone, although no outcropping sandstone was identified within the immediate vicinity of the site. The artefact is located on the edge of a small clearing in a lightly forested area. Vegetation comprises native regrowth. No mature vegetation was identified in the immediate vicinity of the site. GSV across the site is fair (40-60%), with leaf litter, sparse native grass cover, and other vegetation debris providing some visual obstructions. Despite this, much of the ground surface in the immediate vicinity is exposed, providing favourable circumstances for artefact identification. Site integrity appears to be good, with disturbance factors limited largely to vegetation clearance and erosion. The site is located approximately 140m south of the Main Northern Rail Line, and is approximately 1.5m south of the proposed rail loop alignment, outside of the proposed Project Area, as shown in Figure 6. No other artefacts were identified in the vicinity during the survey.

Plate 8 Rixs Creek Rail Loop IA1 – Artefact detail

Plate 9 Rixs Creek Rail Loop IA1 – Site location shot.

7.1.4.2 Rixs Creek Rail Loop IA2

Site Type: Isolated Artefact

GDA Coordinates: 325524mE 6402165mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Disturbed (Remediated hill created from overburden emplacement area)

Distance to nearest water: 82.75m

Site description: Rixs Creek Rail Loop IA2 comprises an isolated indurated mudstone/tuff flake located on a gently inclined midslope in a highly disturbed context in the northern section of the Project Area. The artefact is a sizable, unretouched flake, red/brown in colour, measuring 5.0 x 6.5 x 1.0cm. The flake is largely intact, with a small section of the distal termination appearing to have broken off. There is no evidence of retouch or usewear on the artefact. The site is located in a highly disturbed context, on the midslope of a large, remediated hill, created from an overburden emplacement area. As such, the site is not in-situ, but has most likely been redeposited here from another location within Rixs Creek Mine at the time the overburden emplacement area was created. The entire landform in which the site is located is composed entirely of displaced soil, and has been subsequently rehabilitated, with regrowth vegetation, including native grasses and trees providing light but even coverage across the hill. An ephemeral drainage line is located approximately 82m to the east/south-east of the site. GSV across the site and in the surrounding area is very poor (0-20%) due primarily to dense grass and weed coverage, including clover, and leaf litter, although there are small exposures where the ground surface is visible. Site integrity is nil, being located within a highly disturbed, entirely man-made landform, comprising a rehabilitated overburden emplacement area. The site is located approximately 145m south of the Main Northern Rail Line, and is approximately 10m north of the proposed rail loop alignment, outside of the Project Area, as shown in Figure 6. No other artefacts were identified in the vicinity during the survey, with the closest identified site being Rixs Creek Rail Loop IA1, located approximately 106m to the south-east.

Plate 10 Rixs Creek Rail Loop IA2 – Artefact detail

Plate 11 Rixs Creek Rail Loop IA2 – Site location shot.

7.1.4.3 Rixs Creek Rail Loop IA3

Site Type: Isolated Artefact

GDA Coordinates: 325390mE 6402026mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Disturbed

Distance to nearest water: 97m

Site description: Rixs Creek Rail Loop IA3 comprises an isolated, fine-grained indurated mudstone/tuff multidirectional core. Like Rixs Creek Rail Loop IA2, this site is located within a highly disturbed, entirely man-made landform, being located on the upper slope of a rehabilitated overburden emplacement area. As such, the site is not in-situ, but has most likely been redeposited at this location from elsewhere within the Rixs Creek Mine at the time the overburden emplacement area was created. The artefact is multidirectional, with a total of four striking platforms identified upon inspection in the field. Very little cortex remains on the core, comprising <10%. The artefact is a creamy light brown/tan colour, with the cortex being a slightly darker brown with a different texture. The artefact is complete, and measures 6.5 x 4.5 x 3.0cm. The artefact was identified in a small exposure on the northern side of an unsealed, predominantly grassed access track running in a NW-SE direction from the haul road to the open cut mining area. The area in which the site is located is grassed, but is otherwise clear of vegetation, with no trees within 10m of the site. Trees in the general vicinity comprise regrowth native vegetation planted as part of the remediation program for the overburden emplacement area. GSV is very poor across the site (<10%) and in the surrounding area, with grass and weed cover providing dense ground coverage. Some small exposures are scattered across the area, predominantly in association with the access track. The site is located approximately 120m east of the existing open cut mining area, and 320m south of the Main Northern Rail Line. The site is located within the Project Area, situated within the proposed access road corridor which runs adjacent to the proposed rail loop alignment in the north-west section of the Project Area (see Figure 6). No other artefacts were identified in the vicinity during the survey, with the closest identified site being Rixs Creek Rail Loop IA2, located approximately 192m to the north-east.

Plate 12 Rixs Creek Rail Loop IA3 – Artefact detail

Plate 13 Rixs Creek Rail Loop IA3 – Site location shot.

7.1.4.4 Rixs Creek Rail Loop IA4

Site Type: Isolated Artefact

GDA Coordinates: 325546mE 6401637mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Lower slope

Distance to nearest water: 145m

Site description: Rixs Creek Rail Loop IA4 comprises an isolated silcrete flake located on a lower slope in the north-west section of the Project Area. The artefact is fine grained, brown/tan in colour and measures 5.5 x 2.3 x 1.2cm. The artefact appears to be a split flake, where the flake is broken longitudinally through the centre of the bulb of percussion. There is edge damage to the right margin of the flake, however there is no evidence of retouch or usewear. The artefact was identified on the edge of a clearing in a lightly forested area. The area to the north and north-west of the site is cleared, but to the south and south-east regrowth native vegetation is present. No mature native vegetation was identified in the vicinity of the site. GSV across the site is good, due to active erosional processes and a lack of grass and vegetation cover, resulting in favourable conditions for site identification. The site is located approximately 125m north of a large dam, 160m west of the haul road, and approximately 7.5m south of the proposed rail loop alignment, outside of the Project Area (see Figure 6). No other artefacts were identified in the vicinity during the survey, with the closest identified site being Rixs Creek Rail Loop AS1, located approximately 125m to the east.

Plate 14 Rixs Creek Rail Loop IA4 – Artefact detail

7.1.4.5 Rixs Creek Rail Loop IA5

Site Type: Isolated Artefact

GDA Coordinates: 326206mE 6401280mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Gently inclined flat

Distance to nearest water: 77m

Site description: Rixs Creek Rail Loop IA5 comprises an isolated indurated mudstone/tuff flake located on a gently inclined flat/footslope in the northern section of the Project Area. The artefact is a square shaped flake with a hinge termination, and is red/maroon in colour, and measures 2.1 x 2.1 x 0.5cm. The artefact was identified in a small clearing within a lightly forested area, comprising predominantly regrowth native vegetation. No mature native vegetation was identified in the vicinity of the site. The artefact was identified in a small erosion scald with excellent GSV (80-100%). GSV within the exposure was excellent, but dropped off slightly in the surrounding area due predominantly to patchy native grass cover and leaf litter. The site is located approximately 75m south-west of a drainage line, which appears to be a natural creekline which has been modified for the construction of a large dam, located 172m east of the site. The site is located approximately 30m east of the proposed rail loop alignment and falls outside of the Project Area (see Figure 6). No other artefacts were identified in the vicinity during the survey, with the closest identified site being Rixs Creek Rail Loop IA6, located approximately 50m to the south-east.

Plate 15 Rixs Creek Rail Loop IA5 – Artefact detail

Plate 16 Rixs Creek Rail Loop IA5 – Site location shot.

7.1.4.6 Rixs Creek Rail Loop IA6

Site Type: Isolated Artefact

GDA Coordinates: 326238mE 6401245mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Gently inclined flat

Distance to nearest water: 80m

Site description: Rixs Creek Rail Loop IA6 comprises an isolated silcrete angular shatter fragment, located on a gently inclined flat, approximately 50m south-east of Rixs Creek Rail Loop IA5. The artefact retains 1-50% cortex, and has a maximum linear dimension of 4.5cm. The artefact was identified eroding out of what appears to be a bank of a former ephemeral creek channel in a lightly forested area. There are no trees located within 10m of the site, and all vegetation in the surrounding area comprises native regrowth, with no mature trees identified in the immediate vicinity. GSV across the site was good (averaging 60-80%), due predominantly to erosional processes acting on the site, and a lack of dense ground cover. Ground cover was limited mostly to sparse native grasses and leaf litter, affording favourable conditions for site identification in the local area. The site is located approximately 62m north-west of a drainage line which appears to be a slightly modified creekline, which feeds a sizable dam, located approximately 132m to the east of the site. The site is located 290m west of the Main Northern Rail Line, and 45m east of the proposed rail loop alignment, falling outside of the Project Area (see Figure 6). No other artefacts were identified in the vicinity during the survey, with the closest identified site being Rixs Creek Rail Loop IA5, located approximately 50m to the north-west.

Plate 17 Rixs Creek Rail Loop IA6 – Artefact detail

Plate 18 Rixs Creek Rail Loop IA6 – Site location shot.

7.1.4.7 Rixs Creek Rail Loop IA7

Site Type: Isolated Artefact

GDA Coordinates: 326330mE 6400201mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Gently inclined flat

Distance to nearest water: 5m

Site description: Rixs Creek Rail Loop IA7 comprises an isolated silcrete flake located in a large erosion patch in a grassed paddock in the central section of the Project Area. The artefact is quite sizable, measuring 5.5 x 5.8 x 1.5cm, and is bright red/orange in colour, making it easily identifiable against the surrounding ground surface. There is no evidence of any retouch or usewear on any edge of the artefact. The paddock is almost entirely clear of native vegetation, having undergone extensive clearing for agricultural purposes, specifically cattle grazing. There are no trees at all located within 10m of the site. The majority of the paddock has extremely poor GSV due to the presence of dense, tall pasture grass. Within the erosion exposure where the artefact was identified was, however, excellent (90-100%). There are a number of erosional exposures within the vicinity of the site, and all were subject to inspection, but no other artefacts were identified during the field survey. The areas of exposure are associated with two ephemeral creeklines, both of which likely only run in times of heavy rainfall, at which time they would drain in a southerly direction, where they merge prior to joining a tributary of Rixs Creek. The site is located on the eastern bank of the more easterly of the two ephemeral creeklines. The site is located approximately 230m west of the Main Northern Rail Line and 80m west of the proposed rail loop alignment, falling outside the Project Area (see Figure 6). No other archaeological sites have been identified within the immediate vicinity of this site. The closest archaeological site identified during the present survey is Rixs Creek Rail Loop AS4, located approximately 450m to the north-west, while two previously identified AHIMS sites (37-6-2284 and 37-6-2285) are located approximately 450m to the south. Despite searches of all exposures within the vicinity of this site, no further artefactual material was identified during the current survey.

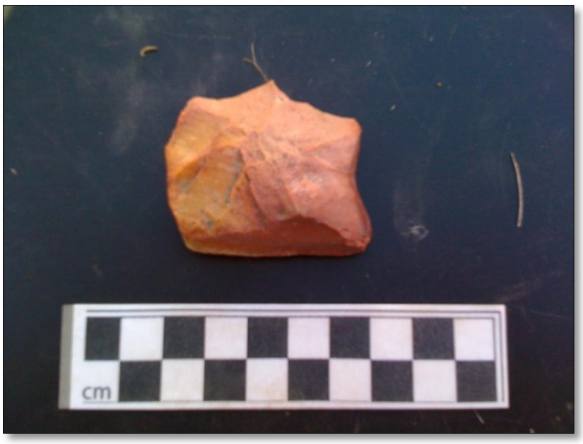


Plate 19 Rixs Creek Rail Loop IA7 – Artefact detail

7.1.4.8 Rixs Creek Rail Loop IA8

Site Type: Isolated Artefact

GDA Coordinates: 326642mE 6401569mN GDA 94 (Zone 56)

Site area: 1m²

Survey Landform: Mid-slope

Distance to nearest water: 250m

Site description: Rixs Creek Rail Loop IA8 comprises an isolated mudstone flake located in a grassed paddock in the north-eastern part of the visual bund section of the Project Area. The artefact measures 2.5 x 2.2 x 0.75cm, and is tan in colour, making it quite distinct amongst the grass and ground surface. There is no evidence of any retouch or usewear on any edge of the artefact. The paddock is predominantly cleared of native vegetation, having undergone extensive clearing for agricultural purposes, specifically cattle grazing. There are no trees at all within 10m of the site, with the nearest tree being an isolated specimen approximately 16m to the west. The majority of the paddock has quite poor GSV due to the presence of dense, tall pasture grass. While the grass is sparser in the vicinity of the site than in other areas, GSV is still limited to approximately 25%. There are no creek or drainage lines within the vicinity of the site, with the nearest, an ephemeral drainage line which likely only runs in times of heavy rain, being located approximately 250m to the east. The site is located on a mid-slope. The ground slopes upwards to the east, up towards the former alignment of the Main Northern Rail Line. The site is located approximately 45m west of the former Main Northern Rail Line alignment, and approximately 170m east of the current alignment of the Main Northern Rail Line. The closest recorded Aboriginal archaeological site to Rixs Creek Rail Loop IA8 is AHIMS site 37-6-2280, which is located approximately 142m West South-West from the site. AHIMS site 37-6-2291 is located approximately 280m to the North-East.

Plate 20 Rixs Creek Rail Loop IA8 – Artefact detail

Plate 21 Rixs Creek Rail Loop IA8 – Site location shot.

7.1.4.9 Rixs Creek Rail Loop AS1

Site Type: Artefact Scatter

GDA Coordinates: *(Centroid)* 325388mE 6401809mN GDA 94 (Zone 56)

Site area: 225m²

Survey Landform: Flat

Distance to nearest water: <5m

Site description: Rixs Creek Rail Loop AS1 comprises a low density surface artefact scatter in the north-west of the Project Area, which extends for approximately 45m along the eastern bank of an unnamed drainage line which drains in a southerly direction into a large dam. Site orientation is NE-SW, following that of the drainage line on which it is located. During the field survey, a total of four artefacts were identified. The artefacts identified comprised two silcrete proximal flakes, one of which exhibited possible retouch, one complete flake of indurated mudstone/tuff, and one multidirectional chert core. Silcrete was the dominant raw material identified, comprising 50% of the total (n=2). Chert and Indurated mudstone/tuff each comprised 25% of the total, with one artefact present of each of these material types.

The western side of the drainage line is a highly disturbed, comprising an entirely man-made, rehabilitated overburden emplacement area. The eastern bank of the drainage line has not been subject to the same levels of disturbance, with vegetation clearance, agricultural activities, and erosional processes constituting the primary disturbance factors for this area. The immediate area in which the site was identified appears to have been subject to native vegetation clearance in the past. No mature vegetation was identified in the vicinity, but there is significant native regrowth, along with water-based plants within the drainage line itself, including reeds and grasses. The site is likely to be in-situ, and taking the relevant disturbance factors into consideration, site integrity has been assessed as fair. GSV across the site was fair (50%) at the time of survey, with some patches of excellent exposure due primarily to erosion. The majority of the area in the vicinity of the site was, however, partially obscured by grass cover, reeds, leaf litter and other vegetative debris.

The site is located approximately 188m east of the open cut mining area, and approximately 420m west of the Rixs Creek Mine haul road. The closest identified archaeological site is Rixs Creek Rail Loop IA3, located approximately 195m north of the most northerly of the identified artefacts in Rixs Creek Rail Loop AS1. This site is located entirely within the proposed rail loop alignment (see Figure 6).

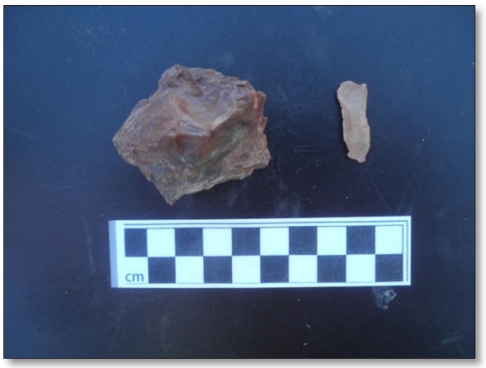


Plate 22 Rixs Creek Rail Loop AS1 – Artefact detail

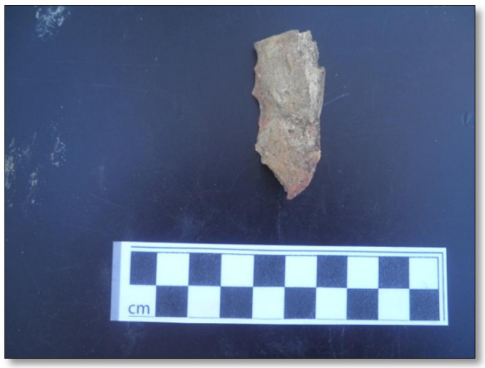


Plate 23 Rixs Creek Rail Loop AS1 – Artefact detail

Plate 24 Rixs Creek Rail Loop AS1 – Site location shot.

7.1.4.10 Rixs Creek Rail Loop AS2

Site Type: Artefact Scatter

GDA Coordinates: *(Centroid)* 325671mE 6401603mN GDA 94 (Zone 56)

Site area: 990m²

Survey Landform: Lower slope

Distance to nearest water: 170m

Site description: Rixs Creek Rail Loop AS2 comprises a low density surface artefact scatter on the western side of the Rixs Creek Mine haul road, in the north-west of the Project Area. The site is orientated in a NW-SE direction, roughly parallel to the alignment of the Rixs Creek Mine haul road. During the field survey a total of seven artefacts were identified at this location. Five of the artefacts were concentrated in a group in the northern part of the site, while two outliers were identified further to the south-east. The main concentration of artefacts is located approximately 35m west of the haul road, while the two outliers are slightly closer, being situated approximately 18m from the road. The artefacts identified during the field survey comprised three complete flakes, two proximal flakes, one multidirectional core, and one fragment of angular shatter. Indurated mudstone/tuff was the dominant recorded material type, comprising 57.1% of the total (n=4). Chert, silcrete and quartz were also represented, each accounting for one artefact and thereby each comprising 14.3% of the total (n=1 of each material type).

The site extends across a relatively cleared, exposed area. The primary disturbance factors include native vegetation clearance, erosion, and the construction of the haul road, located approximately 35m east of the main concentration of artefacts. The site was identified in a predominantly cleared area. Some light vegetation cover, comprising native regrowth, is located within the immediate vicinity of the site. No mature native vegetation was identified in the area. GSV was very good across the majority of the area (80%), largely due to erosion. Native grasses, leaf litter and other vegetative debris decreased GSV in some areas in the vicinity of the site, however overall GSV afforded favourable conditions for site identification. The site appears to be in-situ, and retains poor to fair integrity.

The site is partially located within the proposed rail loop alignment. The main artefact concentration of five artefacts in the north is located within the proposed rail loop alignment. The two outliers fall outside of the proposed rail alignment, but are within 10m of the location of the proposed conveyor belt (see Figure 6).

Plate 25 Rixs Creek Rail Loop AS2 – Artefact detail

Plate 26 Rixs Creek Rail Loop AS2 – Artefact detail

Plate 27 Rixs Creek Rail Loop AS2 – Site location shot.

7.1.4.11 Rixs Creek Rail Loop AS3

Site Type: Artefact Scatter

GDA Coordinates: *(Centroid)* 325888mE 6401543mN GDA 94 (Zone 56)

Site area: 1,900m²

Survey Landform: Disturbed

Distance to nearest water: 175m

Site description: Rixs Creek Rail Loop AS3 comprises a low density surface artefact scatter in a highly disturbed context, with four artefacts identified distributed along the length of a transmission line easement for a distance of approximately 88m in the northern part of the Project Area. The site is orientated in a NE-SW direction, following that of the transmission line easement alignment. All artefacts identified were found in association with the transmission line easement and not the relatively undisturbed land to either side of it, indicating that the site is not in-situ, but that the artefacts have most likely been redeposited at this location following the installation of the easement. As such, the site retains poor integrity. A total of four artefacts were identified during the survey, comprising two indurated mudstone tuff flakes and one indurated mudstone/tuff flake shatter fragment, and one petrified wood unidirectional core. All of the indurated tuff/mudstone artefacts were red and red/orange in colouration. Indurated mudstone/tuff was therefore the dominant raw material, comprising 75% of the total (n=3), while petrified wood comprised 25% (n=1).

GSV along the transmission line easement was excellent (90-100%), but decreased somewhat either side of it (50-60%) due to an increase in grass cover, leaf litter, and other vegetative obstructions. Overall, however, the conditions were favourable for site identification. There is no vegetation present along the easement itself, or either side of it, for a distance of approximately 5m. The surrounding area is, however, lightly vegetated, predominantly comprising native regrowth, although there are occasional specimens of mature vegetation to be found as well, although not in the immediate vicinity of the site.

The site is located approximately 170m east of the Rixs Creek Mine haul road, and approximately 175m west of an unnamed drainage channel which feeds a large dam to the south-east. The three northern-most artefacts within this site (the two indurated mudstone/tuff flakes and the petrified wood unidirectional core) are located within the proposed rail alignment, while the southernmost artefact (indurated mudstone/tuff flake shatter) falls outside of it (see Figure 6).

Plate 28 Rixs Creek Rail Loop AS3 – Artefact detail

Plate 29 Rixs Creek Rail Loop AS3 – Site location shot.

Plate 30 Rixs Creek Rail Loop AS4 – Artefact detail

Plate 31 Rixs Creek Rail Loop AS4 – Artefact detail

7.1.4.12 Rixs Creek Rail Loop AS4

Site Type: Artefact Scatter

GDA Coordinates: *(Centroid)* 326162mE 6400615mN GDA 94 (Zone 56)

Site area: 2,736m²

Survey Landform: Lower slope

Distance to nearest water: <5m

Site description: Rixs Creek Rail Loop AS4 comprises a low density surface artefact scatter eroding out of the banks of an east-west orientated first order tributary of Rixs Creek in the central section of the Project Area. This was the largest site identified during the field survey, comprising a total of 14 artefacts. Artefacts were identified on both the northern and southern banks of the creek, and extended along the creek for a distance of approximately 60m. It appears that this creek only flows during periods of rainfall. At the time of survey there was water present within the creek, but it was not flowing. The artefacts identified comprised four complete flakes (one of which may be a split flake, see Plate 29), four proximal flakes, three fragments of angular shatter, and two unidirectional cores, both made on flakes and both made of indurated mudstone. Indurated mudstone/tuff was the dominant raw material type overall, comprising 85.7% of the total (n=12). Silcrete was also represented, comprising 14.3% of the total (n=2).

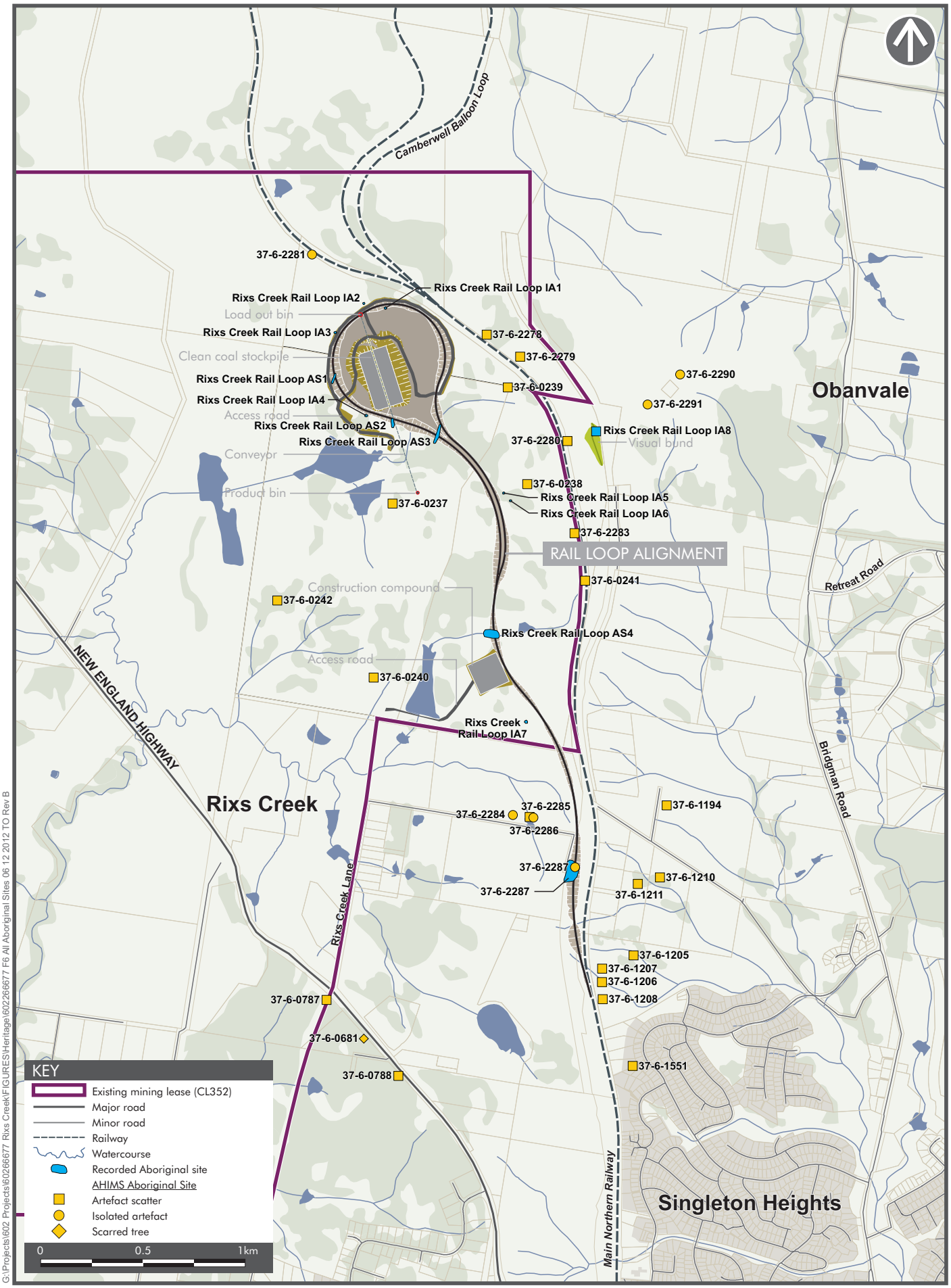
The general area has been subject to only minor disturbances, predominantly involving vegetation clearance, cattle grazing, and erosion. The site appears to be largely in-situ and retains good integrity, further supported by the presence of artefacts eroding out of the banks of the creek. There is very little vegetation within 10m of the site. There is very limited vegetation present on the northern bank, while the southern bank is lightly forested with native regrowth. No mature vegetation was identified in the vicinity of the site. GSV was good at the time of survey (60-80%). It was excellent in areas of erosion, particularly along the creek banks, however these erosional areas were patchy, and visibility decreased in areas outside of them due predominantly to the presence of native and introduced pasture grasses, but also due to leaf litter and other vegetative debris. For much of the extent of the creek, however, conditions were favourable for site identification at the time of the survey.

The site is located approximately 110m west of a sizable dam built on the same creekline the site is located on. It is also situated 422m west of the Main Northern Railway Line alignment, and approximately 353m east of Rixs Creek Lane. The site partially extends into the Project Area, extending in an east-west direction across the proposed rail loop alignment at this location (see Figure 6).

Plate 32 Rixs Creek Rail Loop AS5 – Artefact detail

Plate 33 Rixs Creek Rail Loop AS5 – Artefact detail

Plate 34 Rixs Creek Rail Loop AS5 – Site location shot.



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AECOM

ALL ABORIGINAL SITES

Rix's Creek Mine Rail Loading Facility

Aboriginal Archaeological and Cultural Heritage Impact Assessment

FIGURE 6

7.2 Reassessment of Predictive Model

Section 6.3 outlined a predictive model for Aboriginal archaeology in the Project Area. Table 10 compares the predictions made with the results of the archaeological survey undertaken as basis for informing future archaeological investigations within and around the Project Area.

Table 10: Evaluation of predictive model

Prediction	Survey result
Site types *likely* to occur within the Project Area include artefact scatters, isolated artefacts, and scarred trees.	Open artefact sites (i.e., artefact scatters and isolated artefacts) dominated the surface archaeological record of the Project Area, accounting for 100% (n = 12) of confirmed sites. No scarred trees were identified during the field survey component of the assessment.
The majority of isolated artefacts will occur within 200m of a creekline (**Prediction 1a**).	The results of the current survey support this prediction. All but one of the isolated artefacts (n=7) were located within 200m of the nearest creekline.
The majority of isolated artefacts will be located on gently inclined footslopes and level to gently undulating/inclined flood/drainage plains (**Prediction 1b**).	The results of the current survey support this prediction. 50% (n=4) of isolated artefacts identified were located within one of these landforms.
The majority of isolated artefacts will occur on low to very low gradient land surfaces (**Prediction 1c**).	The results of the current survey support this prediction. 100% (n=8) of isolated artefacts were located on low to very low gradient land surfaces (<1-10%).
The majority of isolated artefacts will comprise chipped stone artefacts. Ground edge-hatchets and grindstones may also occur (**Prediction 2a**).	The results of the current survey support this prediction. 100% (n = 8) of isolated artefacts identified during survey comprise chipped stone artefacts. No ground edge-hatchets or grindstones - complete or fragmentary - were identified during the survey.
The majority of isolated artefacts will exhibit fair to poor archaeological integrity due to past and/or present land uses (**Prediction 3a**).	The results of the current survey support this prediction. Relevant disturbance factors include remediated land, native vegetation clearance, vehicular traffic, stock movement, erosion and dam/vehicle track construction.
The majority of artefact scatters will occur within 200m of a creekline (**Prediction 4a**).	The results of the current survey support this prediction. 80% (n = 4) of confirmed scatters were located within 200m of a creekline. One artefact scatter (37-6-2287) was located over 200m from the nearest creekline/watercourse.
The majority of artefact scatters will be located on gently inclined footslopes or level to gently undulating/inclined flood/drainage plains (**Prediction 4b**).	The results of the current survey support this prediction. 80% (n =4) of confirmed scatters (n = 5) were located within these landforms.
The majority of artefact scatters will occur on low to very low gradient land surfaces (**Prediction 4c**).	The results of the current survey support this prediction. 100% of confirmed scatters (n=5) were located on low to very low gradient land surfaces (<1-10%).
Chipped stone artefacts will be the most common form of artefact present within identified scatters. Edge-ground hatchets made from local or non-local raw materials may also occur (**Prediction 5a**).	The results of the current survey support this prediction. All artefacts identified during the survey comprised chipped stone artefacts.
The majority of scatters will contain less than 25 artefacts. Scatters with more than 50 artefacts will be rare. (**Prediction 5b**).	The results of the current survey support this prediction. 100% of confirmed artefact scatters (n = 5) contain less than 25 artefacts.
Scatters with more than 50 artefacts will be rare (**Prediction 5c**).	The results of the current survey support this prediction. No artefact scatters were identified during the survey which comprised more than 50 artefacts.

Prediction	Survey result
Hunter Valley Mudstone and silcrete will be the dominant raw material for chipped stone artefact manufacture (**Prediction 5d**).	The results of the current survey support this prediction. A total of 48 artefacts were identified during the survey. Indurated mudstone/tuffartefacts account for 64.6% of the total survey assemblage (n = 31), while silcrete accounts for 25% (n=12).
Most, if not all of the raw materials utilised for chipped stone artefact manufacture will have been locally sourced (**Prediction 5e**).	Most of the raw materials used for stone artefact manufacture within the Project Area are locally obtainable from the Hunter River gravels, which comprise widely distributed surface deposits of pebble/cobbles suitable for stone tool manufacture, including indurated mudstone/tuff. In the more immediate vicinity of the Project Area, suitable raw materials for stone tool manufacture, including indurated mudstone/tuff and silcrete, may also have been available from the gravels of Rixs Creek and its tributaries.
Flake debitage (*sensu* Andrefsky 2006) will dominate the survey assemblage (**Prediction 5f**)	The results of the current survey support this prediction. Flake debitage accounts for 66.7% (n=32) of the total survey assemblage (n=48).
Chronologically diagnostic tool types will be largely restricted to backed artefacts (**Prediction 5g**).	The results of the current survey support this prediction. Identified tool types comprised miscellaneous retouched flakes and a broken backed implement.
Sites found in association with higher order creeklines (≥2nd) will contain a higher number of artefact types than those found in association with 1st order streams (**Prediction 5h**).	Not applicable as all creeks subject to survey were first order streams.
The majority of artefact scatters will exhibit poor to fair archaeological integrity due to past and/or present land uses (**Prediction 6a**).	The results of the current survey support this prediction. Relevant disturbance factors include infrastructure installation, vegetation clearance, cattle movement, soil erosion and construction of dams and vehicle access tracks.
The majority of scarred trees will occur within 200m of a creekline (**Prediction 7a**).	Not applicable as no scarred trees were identified during the archaeological field survey.
The majority of scarred trees will occur within 200m of other site types (**Prediction 7b**).	Not applicable as no scarred trees were identified during the archaeological field survey.
The majority of scars will occur on box species (**Prediction 8a**).	Not applicable as no scarred trees were identified during the archaeological field survey.
Curved (pre-form) scars (after Long 2005) will be most common scar form identified. Other scar types will be rare (**Prediction 8b**).	Not applicable as no scarred trees were identified during the archaeological field survey.
The majority of scarred trees will exhibit fair to good archaeological integrity (**Prediction 9a**).	Not applicable as no scarred trees were identified during the archaeological field survey.
The majority of burials will occur within 200m of a creekline in soft soils and sandy locations **(Prediction 10a)**.	Not applicable as no burial sites, or potential burial locations, were identified during the archaeological field survey.
The majority of burials will comprise concentrations of human bone or teeth in disturbed sub-surface contexts **(Prediction 11a)**.	Not applicable as no burial sites, or potential burial locations, were identified during the archaeological field survey.
The presence of burials will be indicated by colour differences in soil matrixes resulting from charcoal or ochre stains **(Prediction 11b)**.	Not applicable as no burial sites, or potential burial locations, were identified during the archaeological field survey.
The majority of burials will exhibit fair to good integrity **(Prediction 12a)**.	Not applicable as no burial sites, or potential burial locations, were identified during the archaeological field survey.

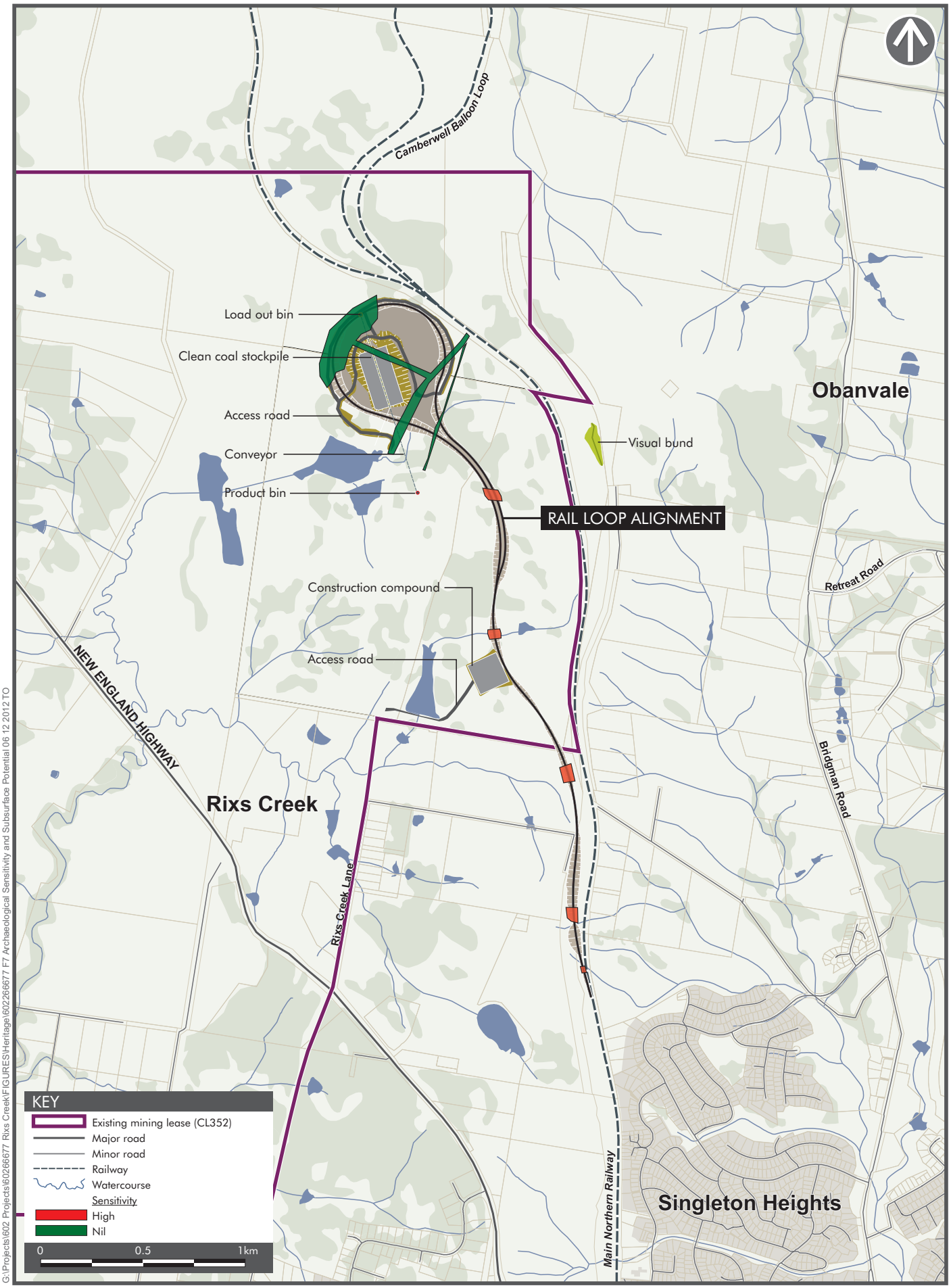
7.3 Archaeological Sensitivity: Subsurface Archaeological Potential

Three levels of archaeological sensitivity are recognised on the basis of observed archaeology (i.e., its distribution and character), levels of past land disturbance, and the predicted complexity of deposits within each category. These three levels are summarised briefly in Table 11 below.

Table 11: Archaeological Sensitivity Rating Scheme

Rating	Definition	Finding
Nil	Land with no potential for subsurface archaeological deposit(s) due to past ground disturbance(s).	Areas of nil archaeological sensitivity within the Project Area are those which have been subject to significant landscape disturbances and modification resulting from earthworks and excavation, the installation/construction of infrastructure; and from coal mining activities.
Low	Subsurface archaeological deposit(s) may be present. Relative to areas of high sensitivity, lower artefact counts, densities and assemblage richness values expected. Integrity of deposit(s) will be dependent on the nature of localised land disturbances.	Areas of low archaeological sensitivity within the Project Area are those which have not been subject to significant landscape disturbances and modifications, and which are not associated with creeklines.
High	Subsurface archaeological deposit(s) may be present. Relative to areas of low sensitivity, higher artefact counts, densities and assemblage richness values expected. Integrity of deposit(s) will be dependent on the nature of localised land disturbances.	Areas of high archaeological sensitivity within the Project Area within the Project Area have been identified as flat to gently inclined areas associated with the five first order tributaries of Rixs Creek which intersect the Project Area.

Figure 7 presents AECOM's assessment of the archaeological sensitivity of land within the Project Area. As shown in Figure 7, the majority of land within the Project Area has been assessed as being of low archaeological sensitivity with low subsurface archaeological potential. These areas predominantly comprise flats and the lower to mid-slope areas of gently undulating hills which are not directly associated with creeklines or other watersources which would have provided focal areas for past Aboriginal activities and occupation (see Figure 7). Areas of nil archaeological sensitivity are concentrated in the northern section of the Project Area and comprise areas which have been grossly disturbed, including the remediated hill constructed from the mine's overburden emplacement area, haul roads, and transmission line easements (see Figure 7). Areas of high archaeological sensitivity, with high subsurface archaeological potential, are focussed on the five first order tributaries of Rixs Creek which intersect the proposed rail loop alignment (see Figure 7). These areas of high archaeological sensitivity were identified on the basis of surface distribution of artefacts and a review of previous assessments, both locally and regionally, which indicate that creeklines such as those located within the Project Area are archaeologically sensitive.



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AECOM

ARCHAEOLOGICAL SENSITIVITY AND SUBSURFACE POTENTIAL

Rix's Creek Mine Rail Loading Facility

Aboriginal Archaeological and Cultural Heritage Impact Assessment

FIGURE 7

8.0 Archaeological Significance Assessment

8.1 Introduction to the Principles of Assessment

Heritage sites and places hold value for different communities in a variety of different ways. As recently highlighted by Burke and Smith (Burke et al. n.d.: 227), one of the primary responsibilities of cultural heritage practitioners is determine which heritage sites and places are worthy of preservation and management (and why) and, conversely, which are not (and why). This, by necessity, requires an assessment of relative cultural significance.

In Australia, the primary guide to the assessment of cultural significance is the *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (1999), informally known as the *Burra Charter*, which defines it as the "*aesthetic, historic, scientific, social or spiritual value for past, present or future generations*" of a site or place. With respect to Aboriginal sites and places, it is possible to identify two major streams in the overall significance assessment process: the assessment of scientific significance by archaeologists and the assessment of cultural or social significance by Aboriginal people.

8.2 Scientific (Archaeological) Significance

Scientific value refers to the contribution that the heritage resource (i.e. an Aboriginal site or archaeological distribution) can make to knowledge and understanding of the past. It is assessed according to the rarity, representativeness or research potential of a site. These factors are inter-related. The degree to which the heritage resource can contribute to knowledge is summed up in the notion of significance, which increases according to the degree of research potential and rarity of a site or area.

8.2.1 Levels of Scientific (Archaeological) Significance

To adequately assess significance, evidence is required, which includes information about the presence of subsurface deposits, integrity of these deposits, nature of site contents and extent of the site. A review of information about previously recorded sites within the local area and region enables the rarity and representativeness of a site to be assessed.

- *High significance* is usually attributed to sites, which are so rare or unique that the loss of the site would affect our ability to understand aspects of past Aboriginal use / occupation for an area. In some cases, a site may be considered highly significant because its type is now rare due to destruction of the archaeological record through development.
- *Moderate significance* can be attributed to sites that provide information on an established research question or on the basis of moderate rareness.
- *Low significance* is attributed to sites that cannot contribute new information about past Aboriginal use / occupation of an area. This may be due to site disturbance or the nature of the site's contents.

8.2.2 Research Potential

Research potential, or demonstrated research importance, is considered according to the contribution that a heritage site can make to present understanding of human society and the human past. Heritage sites, objects or places of high scientific significance are those that provide an uncommon opportunity to inform us about the specific age of people in an area, provide a rare glimpse of artistic endeavour or provide a rare chronological record of changing life through deep archaeological stratigraphy.

The capacity of a site to address research questions is predicated on a definition of what the key research issues are for a region. In the Hunter Valley such questions will revolve around stone tool manufacture, settlement patterning; how regional resources were used; how uses changed throughout the Holocene; and how these changes manifested in the archaeological record.

Some archaeologists suggest that the value of a place / object can be judged by answering the following questions:

- Can the site contribute knowledge that no other resource can?
- Can it provide information not available on other sites?
- Can it answer pertinent research questions?

8.2.3 Rarity and Representativeness

Rarity and representativeness are related concepts. The comparative rarity of a site is a consideration in assessing scientific significance; a certain site type may be "one of a kind" in one region, but very common in another. Artefacts of a particular type may be common in one region, but outside the known distribution in another.

8.2.4 Integrity

The integrity of a site is also a consideration in determining scientific significance. While disturbance of a topsoil deposit with artefacts does not entirely diminish research value, it may limit the types of questions that may be addressed. A heavily cultivated paddock may be unsuited to addressing research questions of small-scale site structure, but it may still be suitable for answering more general questions about artefact distribution and raw material logistics.

8.2.5 Application of the Significance Assessment for the Project

A significance assessment has been undertaken for all newly identified Aboriginal sites within the Project Area. Table 12 presents a summary of these findings.

Table 12: Summary of Significance Assessment

Site Name	Site Type	Significance Rating	Rationale
SCO1 (AHIMS 37-6-2287)	Artefact Scatter	Low	SCO1 (AHIMS 37-6-2287) is unlikely to contribute knowledge not available from another resource or site. While it is a reasonable example of a common site type (i.e., open artefact site), better examples of this site type, with greater artefact densities and more complex assemblages, exist both locally and regionally. Site condition and integrity is poor to fair, with notable disturbances to the ground surface within, and in the immediate vicinity of, the site. Due to these disturbance factors, the potential for stratified subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop AS1	Artefact Scatter	Low	Rixs Creek Rail Loop AS4 is unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition is poor. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop AS2	Artefact Scatter	Low	Rixs Creek Rail Loop AS2 is unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition is poor. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop AS3	Artefact Scatter	Low	Rixs Creek Rail Loop AS3 is unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition is poor. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.

Site Name	Site Type	Significance Rating	Rationale
Rixs Creek Rail Loop AS4	Artefact Scatter	Moderate	Rixs Creek Rail Loop AS4 has potential to contribute knowledge not available from another resource or site in the local area. The site extends along the banks of a first order tributary of Rixs Creek, and it is possible that this this was a focal activity and resource zone for Aboriginal people camping in and passing through the local area. The site appears to retain moderate subsurface archaeological potential, with artefacts visibly eroding out of the creek banks. Data obtained through the excavation of this site could possibly be used to address research questions regarding past Aboriginal settlement and stone tool technology on a local scale. While comparatively smaller and with a more limited array of artefact/tool types than other sites in the region, this site is a reasonable example of its type on a local scale.
Rixs Creek Rail Loop IA1	Isolated Artefact	Low	Rixs Creek Rail Loop IA1 is highly unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition and integrity is poor as the artefact was identified in a highly disturbed landform. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop IA2	Isolated Artefact	Low	Rixs Creek Rail Loop IA2 is highly unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition and integrity is poor as the artefact was identified in a highly disturbed landform. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop IA3	Isolated Artefact	Low	Rixs Creek Rail Loop IA3 is highly unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition and integrity is poor as the artefact was identified in a highly disturbed landform. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop IA4	Isolated Artefact	Low	Rixs Creek Rail Loop IA4 is highly unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition and integrity is poor as the artefact was identified in a highly disturbed landform. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.
Rixs Creek Rail Loop IA8	Isolated Artefact	Low	Rixs Creek Rail Loop IA8 is highly unlikely to contribute knowledge not available from another resource or site. It is a poor example of a locally and regionally common site type (i.e., open artefact site). Better examples of this site type exist both locally and regionally. Site condition and integrity is poor as the artefact was identified in a disturbed landform. The potential for subsurface archaeological deposit(s) within the mapped boundaries of this site is considered to be low.

8.3 Cultural/Social Significance

Social or cultural values, within an Aboriginal Cultural Heritage Assessment refer to the spiritual, traditional, historical or contemporary associations and attachments a place or area has for Aboriginal people (NSW OEH 2011). Social or cultural values are applicable to sites, items and landscapes. Aboriginal sites with archaeological evidence are all of value to the Aboriginal community because they represent a tangible connection with pre-European Aboriginal life. As such, Aboriginal people are in the best position to provide comment on the cultural value(s) and significance of the Project Area. The cultural values and social significance of the Project Area can only be identified through consultation with Aboriginal people. Accordingly, throughout the assessment process, AECOM have sought the opinions of Aboriginal stakeholders on this matter, both verbally and in writing. Opportunities for the provision of cultural information have been provided at all stages of the assessment process.

No written responses were received from RAPs in regards to the cultural/social significance of the Project Area. While AECOM has not received written feedback regarding specific cultural heritage values on individual archaeological sites, places, or objects from the RAPs, the general consensus received throughout the consultation process, and which was particularly expressed during the fieldwork component of the Project, is that all archaeological sites hold social and cultural significance for the Aboriginal community. Archaeological sites provide a tangible link for the Aboriginal community to their history and traditional lands, and all sites are regarded as being culturally significant. Cultural values are not necessarily viewed in terms of individual sites, but in the ways in which these sites are part of a wider cultural landscape. This in turn is part of an ongoing, dynamic process by which modern Aboriginal people connect and engage with their shared history and traditional lands.

Throughout the consultation process, all RAPs stated their interest in being consulted in regard to the management of Aboriginal sites and value the opportunity and experience of directly engaging with their heritage through field inspections and surveys, salvage excavations, and surface collection of artefacts and cultural material.

9.0 Impact Assessment

9.1 Project Construction Details and Impacts

As outlined in Section 1.0, the Bloomfield Group is seeking approval for the construction of a Rail Loading Facility dedicated to the Rix's Creek Mine site under Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000*, which allows SSD Consents issued under Part 4 of the EPA Act 1979, to be modified through Section 75W of the Act.

The Project comprises the construction of a new Rail Loop, a Clean Coal Stockpile and a Visual Bund. A discussion is made below of each proposed activity and its potential impact on Aboriginal archaeological and cultural heritage values within the Project Area.

9.1.1 Rail loop

The entire rail loop will be 5.8km in length. Its construction will involve considerable earthworks, including the removal of approximately 384,000m^3 of material from within the rail loop alignment, and the placement of 264,000m^3 of fill material to obtain the correct grade for the entire length of the rail line. Aboriginal archaeological sites located within the proposed rail loop alignment, and within 20m of the alignment, will be destroyed by the Project. These sites include:

- SCO1 (AHIMS 37-6-2287);
- Rixs Creek Rail Loop AS1;
- Rixs Creek Rail Loop AS2;
- Rixs Creek Rail Loop AS3;
- Rixs Creek Rail Loop AS4;
- Rixs Creek Rail Loop IA1;
- Rixs Creek Rail Loop IA2;
- Rixs Creek Rail Loop IA3; and
- Rixs Creek Rail Loop IA4.

9.1.2 Clean coal stockpile

The Clean coal stockpile area will be capable of holding approximately 350,000 tonnes of clean coal for shipment. The construction of the clean coal stockpile will include an overland conveyor from the existing Coal Handling and Preparation Plant (CHPP), a stacker conveyor, a reclaim tunnel, and other associated infrastructure, including access tracks.

No Aboriginal archaeological sites would be impacted by the construction of the Clean Coal Stockpile area.

9.1.3 Visual Bund

The visual bund will shield the rail bin from the Singleton Heights and Retreat residential areas. Aboriginal archaeological sites located within the proposed visual bund area will be destroyed by the Project. One site was identified within the impact area of the proposed visual bund:

- Rixs Creek Rail Loop IA8.

9.1.4 Sites Indirectly Impacted

The following Aboriginal archaeological sites are located over 25m from the proposed Project Area, and as such would be indirectly impacted by the Project:

- Rixs Creek Rail Loop IA5
- Rixs Creek Rail Loop IA6
- Rixs Creek Rail Loop IA7

9.2 Summary of Impacts

Table 13 presents a summary of impacts to known Aboriginal sites within the Project Area. Recommendations regarding management of the sites which will be impacted by the Project are provided below in Section 10.0.

Table 13: Summary of Impacts to Known Aboriginal Sites

Impact	Site ID	Site Type	Significance
Rail Loop *Significance Tally* High – 0 Moderate – 1 Low – 8	SCO1 (AHIMS 37-6-2287)	Artefact scatter	Low
	Rixs Creek Rail Loop AS1	Artefact scatter	Low
	Rixs Creek Rail Loop AS2	Artefact scatter	Low
	Rixs Creek Rail Loop AS3	Artefact scatter	Low
	Rixs Creek Rail Loop AS4	Artefact scatter	Moderate
	Rixs Creek Rail Loop IA1	Isolated artefact	Low
	Rixs Creek Rail Loop IA2	Isolated artefact	Low
	Rixs Creek Rail Loop IA3	Isolated artefact	Low
	Rixs Creek Rail Loop IA4	Isolated artefact	Low
Visual Bund *Significance Tally* High – 0 Moderate – 0 Low – 1	Rixs Creek Rail Loop IA8	Isolated artefact	Low
Sites Indirectly Impacted *Significance Tally* High – 0 Moderate – 0 Low – 3	Rixs Creek Rail Loop IA5	Isolated artefact	Low
	Rixs Creek Rail Loop IA6	Isolated artefact	Low
	Rixs Creek Rail Loop IA7	Isolated artefact	Low

9.3 Cumulative Impact Assessment

In NSW, the NPW Act provides the legislative framework for the protection of Aboriginal objects and places. Section 2A(2) of the NPW Act stipulates that such protection is to be achieved by applying the principles of Ecologically Sustainable Development (ESD). ESD requires the integration of *economic* and *environmental* considerations (including cultural heritage) in decision-making processes and, in the context of Aboriginal cultural heritage in NSW, can be achieved through the implementation of two key principles: intergenerational equity and the precautionary principle.

9.3.1 Intergenerational Equity

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. With regards to Aboriginal heritage, intergenerational equity can be assessed in terms of cumulative impacts to Aboriginal objects and places in a region. Central to any assessment of intergenerational equity is the proposition that regions with fewer Aboriginal objects and places necessarily retain fewer opportunities for future generations of Aboriginal people to enjoy their cultural heritage. Accordingly, information regarding the known and potential Aboriginal heritage resource within a given region lies at heart of any assessment of intergenerational equity.

9.3.2 The Precautionary Principle

The precautionary principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

In NSW, the precautionary principle is relevant to OEH's consideration of potential impacts to Aboriginal cultural heritage in situations where:

- The proposed development involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

In these instances, OEH has indicated that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to Aboriginal objects and/or places.

9.3.3 Known Resource

The known archaeological resource of the region encompassing the Project Area has been analysed in Section 6.1. This analysis indicates that the majority of identified archaeological sites identified across the Hunter region comprise stone artefact scatters and isolated artefacts. These sites are very common and widely documented and recorded throughout the Hunter region. Several sites have been subject to salvage and their assemblages made available for further research.

Stone artefact scatters and isolated artefacts were the only archaeological site types identified during the field survey component of the current assessment. This is consistent with the known archaeological resource of the wider Hunter region. None of the archaeological sites identified within the Project Area can therefore be considered rare or unique within a regional context. This is further reinforced by the fact that of the 28 previously recorded sites identified during the AHIMS database search for a 2 x 4 km search area encompassing the Project Area, artefact scatters comprised 75% of the total, while isolated artefacts comprised 21.4%. This brings the combined total for artefact scatters and isolated artefacts in the local area to 96.4%. An examination of the site cards for these identified sites indicates that several comprise better examples of these site types than those which will be impacted by the Project, with larger and more complex assemblages. Of the newly identified archaeological sites, only one (Rixs Creek Rail Loop AS4) has been identified as being of moderate archaeological significance on the grounds of research potential and integrity.

As discussed in Sections 9.1 and 9.2 above, the Project will result in the destruction of ten archaeological sites, all of which are artefact scatters and isolated artefacts. While the destruction of these sites cannot be avoided, it can be successfully mitigated through salvage, including surface artefact collection and test excavation.

In the absence of appropriate management and mitigation measures, such as surface artefact collection and test excavation, the impacts of the Project on the known Aboriginal archaeological resource of the region would be relatively low. With the implementation of appropriate management and mitigation measures, such as are set out below in Section 10.0, the impacts of the Project on the known archaeological resource of the region would be reduced to very low.

9.3.4 Potential Resource

Despite the vast quantity of archaeological investigations undertaken within the Hunter region to date, in consideration of predictive modelling of Aboriginal site locations and environmental considerations, much of the region represents a potential resource, not yet identified or subject to systematic recording and documentation.

An analysis of aerial imagery for an area of approximately 50km radius centred on the Rixs Creek Mine area indicates that areas in which the Aboriginal archaeological resource is unlikely to survive, including mining areas, urbanised areas, and roads and other infrastructure, has affected approximately a relatively small proportion of the area. The majority of the area comprises low-intensity agricultural and rural land use, including grazing land, where Aboriginal archaeological materials are more likely to survive, although often having experienced some minor levels of disturbance (vegetation clearance, erosion, and cattle trampling, for example). Large areas of state forest and national parks are also located within the area, including the Yengo National Park, Pokolbin State Forest and Coricudgy State Forest to the south-west, and the Mount Royal National Park, Barrington Tops National Park, and Masseys Creek State Forest to the north-east. There is a higher chance for the presence of

intact archaeological sites and materials in these parks and forests as the archaeological record is less likely to have been subject to land-use related disturbances.

In light of these observations, it is evident that there are numerous environmental contexts of comparable, and increased, potential for the presence of Aboriginal archaeological sites and materials within the region. From these observations it can be inferred that archaeological sites and artefacts of similar nature and distribution will occur throughout these areas across the Hunter region. While the disturbance of the potential archaeological resource of the Project Area cannot be avoided, it can be successfully mitigated through the implementation of an appropriate program of test excavation.

The analysis of the potential archaeological resource of the Project Area therefore supports the conclusions of Section 9.3.3 above, that the impacts of the Project on the potential archaeological resource of the Project Area will be relatively low within a regional context prior to the implementation of appropriate mitigation measures, and very low subsequent to the implementation of appropriate management and mitigation measures.

10.0 Management Recommendations

10.1 Statutory Requirements

As indicated in Section 1.0, this Aboriginal archaeology and cultural heritage impact assessment forms part of an EA being prepared by AECOM to support the Bloomfield Group's Application for Approval for the construction of a Rail Loading Facility dedicated to the Rix's Creek Mine site under Clause 8J(8) of the *Environmental Planning and Assessment Regulation 2000*, which allows modifications of State Significant Development Consents issued under Part 4 of the *Environmental Planning and Assessment Act 1979*, to be modified through Section 75W of the Act.

OEH's *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECCW 2005) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010) detail the relevant requirements for Aboriginal cultural heritage impact assessments conducted for Part 4 Project Applications. While not statutorily binding for Part 4 Aboriginal heritage assessments, OEH's recently released *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) provide 'best practice' documents for Aboriginal archaeological and cultural heritage impact assessments in NSW.

Each of these guidelines has been utilised in the preparation of this Aboriginal archaeology and cultural heritage impact assessment.

10.2 Management Strategy

10.2.1 AHIMS Site Cards

AHIMS sites cards will be completed and submitted to OEH for all newly recorded sites at the completion of the assessment.

10.2.2 Surface Artefact Collection (Salvage)

Ten Aboriginal archaeological sites would be impacted by the Project, resulting in their destruction, or partial destruction. Three Aboriginal archaeological sites (Rixs Creek IA5, Rixs Creek IA6, and Rixs Creek IA7) have the potential to be indirectly impacted as part of ongoing works. To mitigate the impacts of the Project, and in recognition of the request to salvage all sites as recommended by the Wanaruah Local Aboriginal Land Council, surface artefact collection of the following sites should be undertaken prior to the commencement of construction works:

- SCO1 (AHIMS 37-6-2287);
- Rixs Creek Rail Loop AS1;
- Rixs Creek Rail Loop AS2;
- Rixs Creek Rail Loop AS3;
- Rixs Creek Rail Loop AS4;
- Rixs Creek Rail Loop IA1;
- Rixs Creek Rail Loop IA2;
- Rixs Creek Rail Loop IA3;
- Rixs Creek Rail Loop IA4;
- Rixs Creek Rail Loop IA5;
- Rixs Creek Rail Loop IA6;
- Rixs Creek Rail Loop IA7; and
- Rixs Creek Rail Loop IA8.

Post-collection, recovered artefacts should be subject to appropriate forms of analysis. Registered Aboriginal stakeholder groups should be involved in the collection of surface artefacts. Appropriate long-term management options for recovered artefacts should be developed in consultation with Aboriginal stakeholders. In accordance

with Section 85A(1)(c) of the NPW Act, all artefacts recovered during the surface collection should be transferred to the car of an appropriate Aboriginal person/s or organisation/s under a Care and Control Agreement.

10.2.3 Test Excavation

In recognition that much of the archaeological resource of the Project Area is not identifiable by surface survey alone, and that all archaeological sites hold significance for the local Aboriginal community, it is recommended that a small program of subsurface testing be undertaken. This program should be undertaken to obtain a better understanding of the nature and extent of Aboriginal archaeology in identified areas of sensitivity within the Project Area that will be directly impacted by the Project, including newly identified archaeological site Rixs Creek Rail Loop AS4, which has been assessed as being of moderate scientific significance on the grounds of research potential and integrity.

The program of test excavation should be developed in consultation with registered Aboriginal stakeholders. The test excavation program should utilise the results of the archaeological survey, including identified areas of archaeological sensitivity, to develop an appropriate scientific research methodology. In accordance with Section 85A(1)(c) of the NPW Act, all artefacts recovered during the test excavation should be transferred to the car of an appropriate Aboriginal person/s or organisation/s under a Care and Control Agreement.

10.2.4 Summary of Management and Mitigation Measures

Table 14: Summary of Management and Mitigation Measures

Management and Mitigation Measures	Site ID	Site Type
Surface Collection	SCO1 (AHIMS 37-6-2287)	Artefact Scatter
	Rixs Creek Rail Loop AS1	Artefact Scatter
	Rixs Creek Rail Loop AS2	Artefact Scatter
	Rixs Creek Rail Loop AS3	Artefact Scatter
	Rixs Creek Rail Loop IA1	Isolated Artefact
	Rixs Creek Rail Loop IA2	Isolated Artefact
	Rixs Creek Rail Loop IA3	Isolated Artefact
	Rixs Creek Rail Loop IA4	Isolated Artefact
	Rixs Creek Rail Loop IA5	Isolated Artefact
	Rixs Creek Rail Loop IA6	Isolated Artefact
	Rixs Creek Rail Loop IA7	Isolated Artefact
	Rixs Creek Rail Loop IA8	Isolated Artefact
Surface Collection and Test Excavation	Rixs Creek Rail Loop AS4	Artefact Scatter
Test Excavation	N/A	Areas of Subsurface Sensitivity

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Appendix A

Aboriginal Community Consultation Log

Aboriginal Consultation Process

Project No.: 60266677/1.3
Project Name: Rixs Creek Mine Rail Loading Facility EA

Stage 1 - Notification of Project Proposal & Registration of Interest

(a.) Requests for Relevant Stakeholder Information

Agency	Contact	Date Sent	Comment
Office of Environment and Heritage (OEH)	Rosalie Neve	01-May-12	Scanned copy of response received via email. Original in todays mail (10/05/2012). Total of 52 RAPs identified.
Office of the Registrar	Tabatha Dantoine	01-May-12	Response received 08 May 2012 (letter dated 03 May 2012). Search of the Register of Aboriginal Owners returned no registered Aboriginal owners pursuant to Division 3 of the *Aboriginal Land Rights Act* 1983 (NSW).
National Native Title Tribunal	Sylvia Jagtman	01-May-12	Response received 04 May 2012. Register of Native Title Claims returned 2 claims within the vicinity of the Project Area, but not within or adjacent to the Project Area itself. (Claims are for Ashton Coal (NC10/2) and Camberwell mine (NC10/3 - Scott Franks) areas). Nil results from the searches of the Schedule of Applications, National Native Title Register, Register of Indigenous Land Use Agreements, and Notified Indigenous Land Use Agreements.
Native Title Services Corporation Limited (NTSCorp Ltd)	No contact provided	01-May-12	No response received to date.
Hunter Central Rivers CMA	No contact provided	01-May-12	No response received to date.
Singleton Council	No contact provided	01-May-12	No response received to date.
Wanaruah Local Aboriginal Lands Council	Noel Downs (CEO)	01-May-12	Response received 07 May 2012. Attached a list of current stakeholders within the Wanaruah LALC boundary. Also advised that the Wanaruah LALC wish to be consulted in regard to the project and participate by providing a fieldworker to assist in the assessment of cultural heritage values for the project area.
Newspaper Advertisement			
The Singleton Argus		02-May-12	Advertisement appeared in the Singleton Argus on Friday 04 May 2012.

(b.) Aboriginal Stakeholder Registration of Interest
Notifications to Agency Identified Aboriginal Stakeholder Groups Sent: (*23/05/2012*)
Closing Date for Registration of Interest: (*06/06/2012*)

Organisation	Contact person	Date Registered	Comments
Wanaruah Local Aboriginal Lands Council	Noel Downs (CEO)	07-May-12	Response received 07 May 2012. Advised that the Wanaruah LALC wish to be consulted in regard to the project and participate by providing a fieldworker to assist in the assessment of cultural heritage values for the project area.
Wanaruah Custodians Aboriginal Corporation	Reginald J. Eveleigh	06-May-12	Response dated 06 May 2012. Received via post 11 May 2012. Registered interest in project in response to the newspaper advertisement.
Gomery Cultural Consultant	Dave Horton	16-May-12	Dave called at 11:30am to register his interest in being involved with this project. Heard about it from his cousin. Accepted his registration as we have worked with the Hortons before and know they are from country. Fax received 17 May 2012 confirming in writing his interest in project.
Roger Noel Matthews Consultancy	Roger Noel Matthews	17-May-12	Letter received dated 10 May 2012. Registered interest in project in response to the newspaper advertisement.
Deslee Talbot Consultant	Deslee Matthews	17-May-12	Letter received dated 10 May 2012. Registered interest in project in response to the newspaper advertisement.
Galamaay Consultants	Karen Matthews	17-May-12	Fax received. Registered interest in project in response to the newspaper advertisement. Same fax as David Horton.
Breeza Plains Culture and Heritage	Terry Matthews	20-May-12	Letter received dated 16 May 2012. Registered interest in project in response to the newspaper advertisement.
Warragil Cultural Services	Aaron Slater	28-May-12	Registration of interest in project received via email.
Kawul Cultural Services	Vicky Slater	28-May-12	Registration of interest in project received via email.
Waabi Gabinya Cultural Consultancy	Elizabeth Howard	28-May-12	Registration of interest in project received via email.
Cacatua Culture Consultants	Donna Sampson	29-May-12	Registration of interest in project received via email.
Yarrawalk (A Division of Tocomwall Pty Ltd)	Scott Franks	29-May-12	Phone call. Registered interest in project in response to letter. Scott will be sending a formal letter to confirm registration. Written confirmation of registration of interest received on 04 June 2012.
Barkuma Neighbourhood Centre trading as Gidawaa Walang Cultural Heritage Consultancy	Ann Hickey	29-May-12	Registration of interest in project received via fax.
D F T V Enterprises	Derrick Vale Snr	29-May-12	Registration of interest in project received via email.
Wattaka Wonnarua Cultural Consultancy Services	Des Hickey	30-May-12	Registration of interest in project received via fax.
Wonnarua Traditional Owners	Des Hickey	30-May-12	Registration of interest in project received via fax.
Culturally Aware	Tracey Skene	30-May-12	Registration of interest in project received via email.
Hielamon Cultural Consultants	Clifford Johnson	30-May-12	Registration of interest in project received via fax.
KL.KG Saunders	Ms Krystal Saunders	30-May-12	Registration of interest in project received via fax.
Yinarr Cultural Services	Kathleen Steward Kinchela	01-Jun-12	Registration of interest in project received via email.
Widescope Indigenous Group	Steven Hickey	01-Jun-12	Registration of interest in project received via email.
Maree /TA Wallangan Cultural Services	Mrs Maree Waugh	01-Jun-12	Registration of interest in project received via email.
Hunter Valley Cultural Surveying	Luke Hickey	01-Jun-12	Registration of interest in project received via phone call at 12:52.
Independent Stakeholder	Esther Tighe	01-Jun-12	Registration of interest in project received via phone call at 13:15.
Ngarramang-Kuri Aboriginal Culture and Heritage Group	Abie Wright	01-Jun-12	Registration of interest in project received via email. Requested that his details **NOT** be forwarded on to the WLALC.
Wonnarua Nation Aboriginal Corporation	Laurie Perry	03-Jun-12	Registration of interest in project received via email.
T&G Culture Consultants	No contact provided	04-Jun-12	Registration of interest in project received via phone call and fax.
Myland	Warren Schillings	05-Jun-12	Registration of interest in project received via email.
DRM Cultural Management	Helen Faulkner	05-Jun-12	Registration of interest in project received via email.
Giwiirr Consultants	Michelle Stair	08-Jun-12	Registration of interest in project received via email.
Muswellbrook Cultural Consultants	Brian Horton		Registration of interest in project received via fax.
Ungooroo Aboriginal Corporation	Jessi Garland		

(c.) Notification of OEH & LALC's of Registered Aboriginal Stakeholders
Notifications sent to OEH & LALC's: *13/06/2012*

Organisation	Contact person	Date	Comments
Wanaruah Local Aboriginal Lands Council	Mr Noel Downs (CEO)	13-Jun-12	Mr Abie Wright, of Ngarramang-Kuri Aboriginal Culture and Heritage Group, requested that his details not be forwarded to the Wanaruah Local Aboriginal Land Council. AECOM complied with his request.
OEH - Planning and Aboriginal Heritage Section (North East)	Ms Rosalie Neve	13-Jun-12	Details of all registered Aboriginal parties forwarded to OEH.

Stage 2 - Gathering Information about Cultural Significance (Methodology)
Closing Date for Feedback to Methodology to be Received: *13/07/2012*

Organisation	Contact person	Date Sent	Feedback Received & Date
Yarrawalk (A Division of Tocomwall Pty Ltd)	Scott Franks	14-Jun-12	Has read and supports the draft methodology.

Waabi Gabinya Cultural Consultancy	Elizabeth Howard	14-Jun-12	Has read and fully supports the draft methodology.
Gidawaa Walang	Ann Hickey	14-Jun-12	Has read and fully supports the draft methodology.
Wonnarua Nation Aboriginal Corporation	Laurie Perry	14-Jun-12	Has read and fully supports the draft methodology.
Cacatua Culture Consultants	Donna Sampson	14-Jun-12	Has read and fully supports the draft methodology.
Wanaruah Local Aboriginal Lands Council	Noel Downs (CEO)	14-Jun-12	No response received in regards to the draft methodology.
Wanaruah Custodians Aboriginal Corporation	Reginald J. Eveleigh	14-Jun-12	No response received in regards to the draft methodology.
Gomery Cultural Consultant	Dave Horton	14-Jun-12	No response received in regards to the draft methodology.
Roger Noel Matthews Consultancy	Roger Noel Matthews	14-Jun-12	No response received in regards to the draft methodology.
Deslee Talbot Consultant	Deslee Matthews	14-Jun-12	No response received in regards to the draft methodology.
Galamaay Consultants	Karen Matthews	14-Jun-12	No response received in regards to the draft methodology.
Breeza Plains Culture and Heritage	Terry Matthews	14-Jun-12	No response received in regards to the draft methodology.
Warragil Cultural Services	Aaron Slater	14-Jun-12	No response received in regards to the draft methodology.
Kawul Cultural Services	Vicky Slater	14-Jun-12	No response received in regards to the draft methodology.
D F T V Enterprises	Derrick Vale Snr	14-Jun-12	No response received in regards to the draft methodology.
Wattaka Wonnarua Cultural Consultancy Services	Des Hickey	14-Jun-12	No response received in regards to the draft methodology.
Wonnarua Traditional Owners	Des Hickey	14-Jun-12	No response received in regards to the draft methodology.
Culturally Aware	Tracey Skene	14-Jun-12	No response received in regards to the draft methodology.
Hielamon Cultural Consultants	Clifford Johnson	14-Jun-12	No response received in regards to the draft methodology.
KL.KG Saunders	Ms Krystal Saunders	14-Jun-12	No response received in regards to the draft methodology.
Yinarr Cultural Services	Kathleen Steward Kinchela	14-Jun-12	No response received in regards to the draft methodology.
Widescope Indigenous Group	Steven Hickey	14-Jun-12	No response received in regards to the draft methodology.
Maree /TA Wallangan Cultural Services	Mrs Maree Waugh	14-Jun-12	No response received in regards to the draft methodology.
Hunter Valley Cultural Surveying	Luke Hickey	14-Jun-12	No response received in regards to the draft methodology.
Independent Stakeholder	Esther Tighe	14-Jun-12	No response received in regards to the draft methodology.
Ngarramang-Kuri Aboriginal Culture and Heritage Group	Abie Wright	14-Jun-12	No response received in regards to the draft methodology.
T&G Culture Consultants	No Contact Provided	14-Jun-12	No response received in regards to the draft methodology.
Myland	Warren Schillings	14-Jun-12	No response received in regards to the draft methodology.
DRM Cultural Management	Helen Faulkner	14-Jun-12	No response received in regards to the draft methodology.
Giwiirr Consultants	Michelle Stair	14-Jun-12	No response received in regards to the draft methodology.
Muswellbrook Cultural Consultants	Brian Horton	14-Jun-12	No response received in regards to the draft methodology.
Ungooroo Aboriginal Corporation	Jessi Garland	14-Jun-12	No response received in regards to the draft methodology.
Stage 3: Review of Draft Cultural Heritage Assessment Report			
Closing Date for Feedback on the Draft Report: *20/12/2012*			
Organisation	Contact person	Date Sent	Feedback Received & Date
Yarrawalk (A Division of Tocomwall Pty Ltd)	Scott Franks	05-Dec-12	No response received in regards to the draft methodology.
Waabi Gabinya Cultural Consultancy	Elizabeth Howard	05-Dec-12	No response received in regards to the draft methodology.
Gidawaa Walang	Ann Hickey	05-Dec-12	No response received in regards to the draft methodology.
Wonnarua Nation Aboriginal Corporation	Laurie Perry	05-Dec-12	No response received in regards to the draft methodology.
Cacatua Culture Consultants	Donna Sampson	05-Dec-12	No response received in regards to the draft methodology.
Wanaruah Local Aboriginal Lands Council	Noel Downs (CEO)	05-Dec-12	No response received in regards to the draft methodology.
Wanaruah Custodians Aboriginal Corporation	Reginald J. Eveleigh	05-Dec-12	No response received in regards to the draft methodology.
Gomery Cultural Consultant	Dave Horton	05-Dec-12	No response received in regards to the draft methodology.
Roger Noel Matthews Consultancy	Roger Noel Matthews	05-Dec-12	No response received in regards to the draft methodology.
Deslee Talbot Consultant	Deslee Matthews	05-Dec-12	No response received in regards to the draft methodology.
Galamaay Consultants	Karen Matthews	05-Dec-12	No response received in regards to the draft methodology.
Breeza Plains Culture and Heritage	Terry Matthews	05-Dec-12	No response received in regards to the draft methodology.
Warragil Cultural Services	Aaron Slater	05-Dec-12	No response received in regards to the draft methodology.
Kawul Cultural Services	Vicky Slater	05-Dec-12	No response received in regards to the draft methodology.
D F T V Enterprises	Derrick Vale Snr	05-Dec-12	No response received in regards to the draft methodology.
Wattaka Wonnarua Cultural Consultancy Services	Des Hickey	05-Dec-12	No response received in regards to the draft methodology.
Wonnarua Traditional Owners	Des Hickey	05-Dec-12	No response received in regards to the draft methodology.
Culturally Aware	Tracey Skene	05-Dec-12	No response received in regards to the draft methodology.
Hielamon Cultural Consultants	Clifford Johnson	05-Dec-12	No response received in regards to the draft methodology.
KL.KG Saunders	Ms Krystal Saunders	05-Dec-12	No response received in regards to the draft methodology.
Yinarr Cultural Services	Kathleen Steward Kinchela	05-Dec-12	No response received in regards to the draft methodology.
Widescope Indigenous Group	Steven Hickey	05-Dec-12	No response received in regards to the draft methodology.
Maree /TA Wallangan Cultural Services	Mrs Maree Waugh	05-Dec-12	No response received in regards to the draft methodology.
Hunter Valley Cultural Surveying	Luke Hickey	05-Dec-12	No response received in regards to the draft methodology.
Independent Stakeholder	Esther Tighe	05-Dec-12	No response received in regards to the draft methodology.
Ngarramang-Kuri Aboriginal Culture and Heritage Group	Abie Wright	05-Dec-12	No response received in regards to the draft methodology.
T&G Culture Consultants	No Contact Provided	05-Dec-12	No response received in regards to the draft methodology.
Myland	Warren Schillings	05-Dec-12	No response received in regards to the draft methodology.
DRM Cultural Management	Helen Faulkner	05-Dec-12	No response received in regards to the draft methodology.
Giwiirr Consultants	Michelle Stair	05-Dec-12	No response received in regards to the draft methodology.
Muswellbrook Cultural Consultants	Brian Horton	05-Dec-12	No response received in regards to the draft methodology.
Ungooroo Aboriginal Corporation	Jessi Garland	05-Dec-12	No response received in regards to the draft methodology.

Appendix B

Aboriginal Community Consultation Stage 1: Newspaper Advertisement in the *Singleton Argus*.

classifieds

ACCOMMODATION WANTED / VACANT | ANNOUNCEMENTS | AUTO | BUY, SELL AND EXCHANGE | GENERAL SERVICES | JOBS | LIVESTOCK | MISCELLANEOUS | PROPERTY | PUBLIC NOTICES AND BUSINESS OPPORTUNITIES

Results - Displaying Classifieds 1 to 20 of 25

Aboriginal Stakeholder Consultation
Aboriginal Archaeological and Cultural Heritage Assessment Rix's Creek Mine Rail Loading Facility Project, Rix's Creek, NSW AECOM Australia Pty Ltd (AECOM), on behalf of The Bloomfield Group, is seeking to identify Aboriginal persons or organisations who wish to be consulted in relation to an Indigenous Archaeological Impact Assessment for the Rix's Creek Mine Rail Loading Facility Project (the Project).
Rix's Creek Mine is situated at Rix's Creek, approximately 4km north of Singleton and 90km north-west from the Port of Newcastle. The Project involves a proposed modification to the Rix's Creek Mine Development Consent for the construction of a proposed Rail Loading Facility. The Project would comprise the construction of a new Rail Loop and a Clean Coal Stockpile on the Rix's Creek Mine site. The entire Rail Loop would be 5.8km in length, while the Clean Coal Stockpile area would be capable of holding approximately 350,000 tonnes of clean coal for shipment. The construction of the Clean Coal stockpile would include the following:
an overland conveyor from the existing Coal Handling and Preparation Plant (CHPP);
a stacker conveyor;
a reclaim tunnel; and
other associated infrastructure.
The Indigenous Archaeological Impact Assessment will form part of an Environmental Assessment (EA). The EA will be submitted with an application to the NSW Department of Planning and Infrastructure (DP&I) to seek approval for the proposed modification to the Rix's Creek Mine Development Consent for the Project.
Interested Aboriginal persons or stakeholders are requested to register their interest in writing to:
Rochelle Coxon
AECOM
Level 8, 420 George Street,
Sydney, NSW 2000
Ph: +61 2 8934 0000
Fax: +61 2 8934 0001
Email: rochelle.coxon@aecom.com
Expressions of interest should include current contact details. The closing date for registration is COB Friday 18 May 2012.
NB: Registration does not guarantee employment during fieldwork.

PUBLIC NOTICES AND BUSINESS OPPORTUNITIES : PUBLIC NOTICES
4/05/2012 Singleton Argus

Annual Christian
Womens Dinner
Monday 21 May 2012
6.30pm for 7.00pm
Senior Citizens Centre

Appendix C

Written Registrations of Interest from Aboriginal Stakeholders

Brian Horton
Muswellbrook Cultral Consultant:
10 scott st Muswellbrook
2333
Ph: 0458744828

To Rochelle Coxon

I Brian Horton of Muswellbrook cultral Consultants would like to put in Intrest of Expression for the Rixs Creek Mine Railloading facility Project If you have any questions you can contact me on the abave nomber

Thanks
Brian Horton.

Cacatua Culture Consultants

Entity of Carcatchua Pty Ltd

ABN: 87 145 082 480 ACN: 145 082 480

28 May 2012

Rochelle Coxon
Aecom
Level 8, 420 George St
Sydney NSW 2000

RE: **Aboriginal Archaeological and Cultural Heritage Assessment Rix's Creek Mine Rail loading Facility Project, Rix Creek NSW**

Ms. Rochelle,

Thank you for your letter dated 23 May 2012, with regards to the Aboriginal Archaeological – Rix's Creek Mine Rail Loading Facility Project, Rix's Creek NSW. Cacatua Culture Consultants would like to register their interest in being involved in the assessment process.

We aim to provide both quality Aboriginal cultural heritage assessment work and reporting while ensuring compliance to work specific practices. Our company is fully insured and registered with OEH/EPRG. Our staffs are skilled in all aspects of Aboriginal Cultural heritage work on a wide range of sites.

If you require any more information please call Donna on 0403 765 019.

Yours truly

Donna Sampson

Donna Sampson
Reports Manager

Email: cacatua@resetdsl.net.au

UNIT 1b, 11 Glenwood Drive THORNTON NSW 2322 Ph: 02 4028 6942 Fax: 02 4028 6943

65 Jaeger Avenue, GUNNEDAH NSW 2380 Mob: 0403 765 019 Fax: 02 6742 1491

22 Ibis Parade WOODBERRY NSW 2322 Ph: 02 4964 4685 Fax: 02 4964 4635

Kawul Cultural Services

28//5//2012

Luke Kirkwood / Senior Archaeologist.

Rochelle Coxon / Archaeologist

AECOM Australia Pty Ltd

PO Box Q 410

QVB Post Office NSW. 1230

Rix's Creek Mine Rail Loading Facility Project, Rixs Creek, NSW

Please include.

Kawul Cultural Services wishes to Register an Interest in the above and all Cultural & Heritage Works.

We are Registered with DEEC/ OEH, as Traditional Owners and are Registered Native Title Claimants.

We have Public Liability insurance and Workers Compensation cover for our employees.

Please include our Business on your list of interested and Registered Stakeholders.

Regards

Rod Hickey

Vicky Slater-

Kawul Cultural Services

P.O.BOX 817, Singleton NSW 2330,

Phone: 0431 720 887

email: Kawul-Culturalservices@hotmail.com .

ABN: 20 546166580

Coxon, Rochelle

From: Elizabeth Howard <elizabeth.howard@hotmail.com>
Sent: Monday, 28 May 2012 3:39 PM
To: Coxon, Rochelle; Kirkwood, Luke
Subject: Registration of Interest - Rix's Creek Mine Rail Loading Facility Project

Hi Rochelle & Luke,

As per the letter I received, I would like to register my company - Waabi Gabinya Cultural Consultancy, Interest in the project.

Below is my company details

Company Name: Waabi Gabinya cultural consultancy
ABN: 466 521 812 20
Mailing Address: 19 Foley Street, Muswellbrook NSW 2333
Mobile: 0409 898 876
Email: elizabeth.howard@hotmail.com

Please do not hesitate to contact me if you have any queries.

Kind Regards,

Elizabeth Howard

Coxon, Rochelle

From: Aaron Slater <warragil_c.s@hotmail.com>
Sent: Monday, 28 May 2012 12:27 PM
To: Coxon, Rochelle
Subject: expression of intrest
Attachments: warragil insurances.pdf; rix creek warragil.docx

To Rochelle

I Aaron Slater Manager of Warragil Cultural Services would like to put my expression of intrest in the Rix's Creek Mine Rail Loading Facility Project.

Attached is my Expression of Intrest and also my Insurance and Workers Compinsation

Thanks for your time

Aaron Slater - Manager Of Warragil Cultural Services

HIELAMON CULTURAL CONSULTANTS

ABN: 83 364 806 356

Monday, 28 May 2012

Clifford Johnson
16B Mahogany Ave
MUSWELLBROOK NSW 2333
PH: 0478828745
EM: cliffi84@hotmail.com

Rochelle Coxon
Archaeologist
AECOM

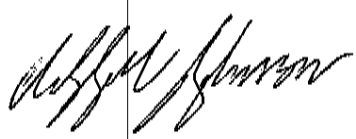
RE: Rix's Creek Mine Rail Loading Facility Project,Rixs Creek, NSW

Dear Rochelle

I am a registered stake holder for the Gunnedah and Upper Hunter areas and I would like to express an interest in consultation and possible fieldwork for your project.

I have current workers comp and public liability insurances and have enclosed these letters of currency to you if you would like any further information you can contact me on the above number.

YOURS SINCERELY



Clifford Johnson

CERTIFICATE OF CURRENCY

GPO BOX 3915
SYDNEY NSW 2001

MRCJOHNSON
16 B MAHOGANY AVE
MUSWELLBROOK
NSW 2333

Dear Sir/Madam,

1. STATEMENT OF COVERAGE

The following policy of insurance covers the full amount of the employer's liability under the Workers Compensation Act 1987.

This Certificate is valid from 24/05/2012 to 24/05/2013

The information provided in this Certificate of Currency is correct at: 25/05/2012

2. EMPLOYERS INFORMATION

POLICY NUMBER	WC504260157	GROUP NUMBER
LEGAL NAME	JOHNSON	
TRADING NAME		
ABN	83364806356	

WorkCover Industry Classification number (WIC)	Industry	Numbers of Workers+	Wages*
782200	SurveyingServices	1	10000

+ Number of workers includes contractors/deemed workers
* Total wages estimated for the current period

3. IMPORTANT INFORMATION

Principals relying on this certificate should ensure it is accompanied by a statement under section 175B of the Workers Compensation Act 1987. Principals should also check and satisfy themselves that the information is correct and ensure that the proper workers compensation insurance is in place ie. Compare the number of employees on site to the average number of employees estimated; ensure that the wages are reasonable to cover the labour component of the work being performed; and confirm that the description of the industry/industries noted is appropriate.

A Principal contractor may become liable for any outstanding premium of the sub-contractor if the principal has failed to obtain a statement or has accepted a statement where there was reason to believe it was false.

Phone: 13 10 10 Fax: 1300 666 346

NSW WorkCover Scheme

Business Insurance

C JOHNSON
16 B MAHOGANY AVE
MUSWELLBROOK
NSW 2333

This is not a request for payment.

Page 1
3

CERTIFICATE OF CURRENCY AS AT 25/05/2012

This is to certify that the policy detailed below is in force until the expiry date shown, subject to the payment of the premium.

All Enquiries: BUSINESS INSURANCE CENTRE
GPO BOX 1387 MELBOURNE 3001
Phone: 13 10 10

Policy Number: GS00245127
Date Issued: 25/05/2012

APPROVER ID: J851 /352

BUSINESS INSURANCE - POLICY SUMMARY

If the Policy covers more than one Situation, the Policy Sections shown below as INSURED may not apply to every Situation.

SECTIONS INSURED	SECTIONS NOT INSURED
* PUBLIC & PRODUCTS LIABILITY	* FIRE AND OTHER DAMAGE
* TAX AUDIT	* BUSINESS INTERRUPTION
	* ACCIDENTAL DAMAGE
	* BURGLARY
	* MONEY
	* GLASS
	* GOODS IN TRANSIT
	* FRAUD & DISHONESTY
	* EQUIPMENT BREAKDOWN
	* GENERAL PROPERTY
	* PERSONAL ACCIDENT AND ILLNESS

Please refer to the following page(s) for details of your insurance.

UNGOOROO
ABORIGINAL
CORPORATION

Rochelle Coxon
Archaeologist
AECOM Australia Pty Ltd

Tuesday, 29 May 2012

Dear Rochelle,

Registration of Interest for Cultural Heritage Impact Assessment – Rix's Creek Mine Rail Loading Facility Project

Ungooroo Aboriginal Corporation would like to register our interest in being consulted in relation to Indigenous Cultural Heritage Impact Assessment pertaining to Rix's Creek Mine Rail Loading Facility Project.

For further information please contact us on 6571 5111.

Yours Sincerely

J. Garland

Jessi Garland
Admin Officer
Ungooroo Aboriginal Corporation
admin@ungooroo.com.au

UNGOOROO ABORIGINAL CORPORATION
ABN 64 020 872 467
TELEPHONE 02 6571 5111 FAX 02 65 715777
EMAIL admin@ungooroo.com.au
26 George Street
PO Box 3095
Singleton NSW 2330
www.ungooroo.com.au

Barkuma Neighbourhood Centre Trading as...

Gidawaa Walang

Wiradjuri Meaning ~ Goanna Turning the Stone

Cultural Heritage Consultancy

...To keep our Culture...

ABN: 58 290 659 800
76 Lang Street,
Kurri Kurri NSW 2327
Phone: (02) 4937 1094
Fax: (02) 4936 4449
Mobile: 0411 196 991

Fax Cover

To: ROCHELLE COXON

From: AECOM

Date: 29.5.2012.

No. of Pages: 2 (including header)

HELLO ROCHELLE

REGISTRATION OF INTEREST FOR RIX'S CREEK MAIN RAIL LOADING FACILITY PROJECT.

THANK YOU.

Barkuma Neighbourhood Centre Trading as...

Gidawaa Walang

Wiradjuri Meaning - Goanna Turning the Stone

Cultural Heritage Consultancy

...To keep our Culture...

ABN: 58 290 659 800
76 Lang Street,
Kurri Kurri NSW 2327
Phone: (02) 4937 1094
Fax: (02) 4936 4449
Mobile: 0411 196 991

28th May 2012

Rochelle Coxon
Aecom Australia Pty Ltd
Level 21, 420 George Street
Sydney, NSW 1230

Dear Rochelle,

Re: Invitation to register Interest – Rix's Creek Mine Rail Loading Facility Project. Rix's Creek, NSW.

Gidawaa Walang Cultural Heritage Consultancy would like to register our interest in the above project. Our interest comes from various members of the community including Elders.

Our organisation is made up of members, staff, management and community from various tribal boundaries.

I would like to thank you for the opportunity to register our interest in the project and look forward to meeting you in the future.

Yours sincerely

Ann Hickey
Project Officer

Wattaka Wonnarua Cultural Consultancy Services
Des Hickey Manager 4 Kennedy St Singleton 2330 NSW
Email-deshickey@bigpond.com ABN-57914734912
Ph: 0432977178 Fax: 02 65712609

29/5/2012

To: AECOM Australia Pty Ltd

Ph: 02 8934 0423
Fax: 02 8934 0001

Attn: Luke Kirkwood, Senior Archaeologist

Re: Invitation to Register-Rix's Creek Mine Rail Loading Facility Project, Rixs Creek, NSW

Dear Luke

Wattaka WCCS wish to be consulted and involved in the above said project . Please call or email me if you require any further information.

Yours sincerely

Des Hickey
Manager WWCCS

Wonnarua Traditional Owners
Des Hickey Director PO Box 749 Singleton NSW 2330
Ph: 0432977178 ABN: 57914734912 BN-98444164
Email: wonnaruato@bigpond.com

29/5/2012

To: AECOM Australia Pty Ltd

Ph: 02 8934 0423
Fax: 02 8934 0001

Attn: Luke Kirkwood Senior Archaeologist

Re: Invitation to Register-Rix's Creek Mine Rail Loading Facility Project Rixs Creek, NSW

Dear Like

Wonnarua TO wish to be consulted and involved in the above mentioned Project.

Yours sincerely
Des Hickey
Director WTO

Coxon, Rochelle

From: DECKA VALE <deckavale@hotmail.com>
Sent: Tuesday, 29 May 2012 2:07 PM
To: Coxon, Rochelle; Kirkwood, Luke
Subject: Rix's Creek Project registration of interest

Follow Up Flag: Follow up
Flag Status: Completed

G'day Luke And Rochelle

It was good to speak with you on the phone today Luke.
Thank you for information about the proposed Rix's Creek Project.

Please consider DFTV Enterprises registration of interest for Aboriginal heritage assessment for a proposed modification to the Rix's Creek Mine Development by the Bloomfield Group.

I look forward to working with you on this project.

Talk soon.

DERRICK VALE SR

D F T V Enterprises
5 Mountbatten Close
Rutherford NSW 2320
Mobile. 0438812197
Email.deckavale@hotmail.com

Coxon, Rochelle

From: Tracey Skene <anigunya@hotmail.com>
Sent: Wednesday, 30 May 2012 9:59 AM
To: Coxon, Rochelle; Kirkwood, Luke
Subject: Rix's Creek Mine Rail Loading Facility Project,Rix's Creek NSW

Follow Up Flag: Follow up
Flag Status: Completed

Good Morning Rochelle and Luke,

I have received your letter in the post and would like to be consulted in all aspects of this project I'm a Wonnarua woman and familiar with this locations and its surrounding Cultural landscape if any further information is required please don't hesitate contacting me via email or on my mobile 0428010077.

Thanks
Tracey Skene
Culturally Aware

Nerida Saunders
06 Bowfield Place
Muswellbrook NSW 2333
Mobile. 0434553307

ABN.35611096814
Bank: Commonwealth Bank
Account Name: Krystal L Saunders
Account No: 10137639
Bsb: 06 2581

KL.KG Saunders Trading Services

Dear Rochelle,
AECOM Australia Pty Ltd
Archaeologist
Level 21, 420 George Street
PO Box Q410
Sydney NSW 2000

RE: Registration of Interest – Rix's Creek Mine Rail Loading Facility Project Rix's Creek, Nsw

Thank you for your letter dated 29 May 2012 asking KL.KG Saunders Trading Services we would be interested in being consulted with regards to the above study

Please also be advised that KL.KG Saunders Trading Services wishes to be consulted in this project and to participate by providing an experienced fieldworker to assist in the assessment of cultural heritage values. We look forward to hearing from you in due course and please do not hesitate to contact me on the above number.

Kind regards,

K Saunders.

31-5-2012

Krystal Saunders
KL.KG Saunders Trading Services

Yinarr Cultural Services
Discover Preserve Protect

31st May 2012

Rochelle Coxon
Archaeologist
AECOM Australia Pty Ltd
Level 21, 420 George Street
PO Box Q410
QVB Post Office NSW 1230
Australia

Dear Rochelle,

RE: Invitation to Register Interest – Rix's Creek Mine Rail Loading Facility Project, Rixs Creek, NSW

Yinarr Cultural Services would like to express its interest for the above project as well being consulted and placed on the Aboriginal Stakeholder Register with AECOM Australia Pty Ltd and for future works that may arise.

I have pleasure in forwarding an application to be listed as a register stakeholder as a traditional owner and Native Title Descendant. I do so because I am an aboriginal person who continues to maintain a deep respect for their ancestral belief system and traditional lore and custom who recoginises my responsibilities and obligations to protect and conserve our culture and heritage and I care for my traditional lands or country. I have the trust of my community, knowledge and understanding of my culture.

Ms Kathie Kinchela and Norm Archibald are very acknowledgeable people who have been involved with numerous fieldwork jobs carried out by Yinarr Cultural Services and numerous other Aboriginal cultural groups that they have worked for. Some of the fieldwork that Kathie and Norm has been involved with include Anvil Hill Project, Bulga Project, Ashton Coal, Xstrata Mangoola, Liddell Coal Operations, Bayswater, Mt Arthur, Mt Penny and Ravensworth Operations Muswellbrook Coal just to mention a few. Kathie and Norm has also worked along side with Umwelt, Hansen Bailey, GSS Environmental, Wells Environmental Services, ENSR/ECOM, Insite Heritage, and Coal and Allied just to name a few.

As a registered and confirmed Aboriginal Stakeholder and ancestor of Wonnarua and Gamilaroi. Kathie and Norm have been living in the community all their lives and are acknowledged by the Aboriginal community; Kathie and Norm also have experience working on various sites. Kathie and Norm are our skilled field officer's who have current induction cards and are very fit and have been doing site work such as excavation work, grader scrapes, test pits, site surveys at various work sites for over 18 years and are very experienced, Kathie is currently studying Indigenous Archaeology through UNE.

Yinarr Cultural Services aim is to preserve and protect items that are of significance to the Culture and Heritage of the Aboriginal people and as Aboriginal objects which may be affected, and Yinarr

Cultural Services primary vision and aim is to discover, preserve and protect the aboriginal people and to protect the cultural heritage of our ancestors.

Please find enclosed Yinarr Cultural Services current and up to date insurance certificates. Our Company is fully insured and registered with DECC.

Yinarr Cultural Services also have other traditional site workers holders who hold knowledge of the Hunter Valley and surrounding areas. Yinarr Cultural Services site workers have all required PPE when working on site. We would also recommend that if possible we would like to be part of the artifact analysis within this project and when work is completed.

Kathie has completed a training course which was conducted and held by Mr. Glen Morris from National Parks and Wildlife. This involved such things as recognising artefacts, identifying artefacts, recording of artefacts and completing written reports on fieldwork completed including artefacts found and identified, what she believes to be the best outcome for the site surveyed. Kathie also has experience working on various sites if there was something Kathie wasn't sure about she is very grateful and willing to contact people such as Mr. Glen Morris to discuss things and have their input and assistance.

Kathie and Norm are both reliable and punctual, and are always actively involved with all work conducted, they are always keen to learn more and be involved more whenever possible. Kathie and Norm will openly admit if they are not sure about something or believe that it is not of their expertise or knowledge. Kathie and Norm are also a board member's of Wanaruah Local Aboriginal Land Council (WLALC), members of Hunter Valley Aboriginal Corporation, Kathie is a board member of Aboriginal Development Consultative Committee (ADCC) they are very active within the community

On all these grounds I believe that Kathie and Norm would be a very adequate people to participate in any works/jobs offered. Kathie and Norm are very friendly, outgoing, easy people to work with this alone is a great asset to any position filled.

Yinarr Cultural Services would like the opportunity to work with GML AECOM Australia Pty Ltd to give our views on the area to be surveyed where we will comment on specific area that we believe that are significant. Within the area in general is highly significant and is very sacred to our people and the community our descendants not only travelled through the area but are still in the area today.

Kathie Kinchela's contact no is (Mobile) 043 272 0623, (Home) 0265 476077, (Fax) 0265 4760145, and email is yinarrculturalservices@gmail.com

Thank you once again for the opportunity and we look forward to working with you. Should you wish to discuss any of the above issues, please do not hesitate to contact me on 0265 476077 or 0432720623. I look forward in hearing from you.

Yours sincerely,

Kathleen Steward Kinchela
Stakeholder
Yinarr Cultural Services

Coxon, Rochelle

From: Abie Wright <abie@yarnteen.com.au>
Sent: Friday, 1 June 2012 11:19 AM
To: Coxon, Rochelle
Subject: My EOI for Rix's Ck Project

Follow Up Flag: Follow up
Flag Status: Completed

Hi Rochelle!

I would like to express my interests as an Aboriginal Party for the Rix's Creek Project(ACHA). I have traditional family connections to the area & would greatly appreciate it if you would include me & my company. "Ngarramang-Kuri Aboriginal Culture & Heritage Group". My current contact details are -21 Bancroft St, Glendale. NSW. 2285. My email address is - abie@yarnteen.com.au. My mobile number is - 0466589238. I would greatly appreciate it if you didn't forward my details onto the Wanaruah Local Aboriginal Land Council.

Yours in Culture,
Abie Wright

Coxon, Rochelle

From: maree waugh <mareewaugh30@hotmail.com>
Sent: Friday, 1 June 2012 12:01 PM
To: Coxon, Rochelle
Subject: Expression of interest
Attachments: scan0002.pdf; scan0003.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Dear ...Rochelle……

I would like to submit my expression of interest in for the ……Recom-Rix's Creek Mine Rail Loading Facility Project……..

SUMMARY

Maree /TA Wallangan Cultural Services are a new established Cultural Company that assures protection and works in the best interest of the Aboriginal Communities and holds cultural knowledge and has worked on Aboriginal Culture and Heritage investigation within the Wonnarua Region for several years.

1. Maree / TA Wallangan Cultural Services' Field workers, and myself is highly experienced in Aboriginal Cultural Investigations.

2. Staff has the relevant experience and hold cultural knowledge of the area. Each of these members has been trained in Cultural Fieldwork.

3. Maree /TA Wallangan Cultural Services daily rates are $550 per day, minimum of 4 hours. Our hourly rate is $75 per hour and $275 for half day.

4. Have valid Public Liability Insurance and Workers Compensation.

Yours Sincerely

Mrs Maree Waugh

29 Anzac Ave Cessnock 2325

ABN 89512505007

Coxon, Rochelle

From: WIDESCOPE . <widescope.group@live.com>
Sent: Friday, 1 June 2012 9:52 AM
To: Coxon, Rochelle
Subject: Widescope EOI

Follow Up Flag: Follow up
Flag Status: Completed

Widescope Indigenous Group
Contact : Steven Hickey
Address H/O: 73 Russell St, Emu Plains NSW 2750
E-mail :**Widescope.group@live.com**
Mobile : 0425230693

Rochelle Coxon,
Thank you for your consideration, Widescope would like to register their interest in the cultural heritage Consultation, assessment and any up coming survey fieldwork at Rix's Creek Mine Rail Loading Facility Project Creek NSW.
Please feel free to contact me on the details supplied above, I look forward to hearing from you.

Thank you
Steven Hickey

Coxon, Rochelle

From: Laurie Perry <l.perry@optusnet.com.au>
Sent: Sunday, 3 June 2012 2:30 PM
To: Coxon, Rochelle; maree waugh; Tracey Skene; Rebecca lester; Sandra Jones
Subject: Fw: Rix's Creek Mine Rail Loading Facility Project
Attachments: IMG_0001.pdf; IMG_0002.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hi Rochelle, got your email right this time.
Cheers
Laurie

From: Laurie Perry
Sent: Sunday, June 03, 2012 1:57 PM
To: rochelle.coxon@aecon.com ; maree waugh ; Tracey Skene ; Rebecca lester ; Sandra Jones ; bw820@iprimus.com.au
Subject: Rix's Creek Mine Rail Loading Facility Project

Hi Rochelle

Thank you for sending me the letter and we would like to be consulted for this project as we have traditional knowledge of this area, I have included the rest of the WNAC culture and heritage team in this email.

Cheers

Laurie Perry
CEO
Wonnarua Nation Aboriginal Corporation
Ground Floor 254 John St Singleton NSW
PO BOX 3066
Singleton Delivery Centre 2330
Ph: 02 6571 8595
Fax: 02 6571 8551
Mob : 0412 593 020
Email: wonnarua@bigpond.com.au
Home : l.perry@optusnet.com.au
Website: www.wonnarua.org.au

TOCOMWALL

Tocomwall PTY LTD
ACN 137 694 618
ABN 13 137694618
PO Box 76
CARINGBAH NSW 1495
yarrawalk@tpg.com.au

Trading as Yarrawalk

4th June 2012

Attention: Luke Kirkwood
Luke.kirkwood@aecom.com
Via email

Dear Luke,

RE: Expression of Interest for Rix's Creek Rail Loading Facility Project Rixs Creek NSW

Tocomwall Pty Ltd is seeking *primary involvement* in all consultation meetings and field work for the upcoming project which lies within our traditional boundaries.

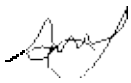
Scott Franks and Robert Lester are the applicants for NC10/3 Plains clans of the Wonnarua People's Claim which was successfully registered with the NNTT in November 2010.

If any persons or groups indicate that they are a party to, or involved in this claim, could you please ensure that you contact either me or Robert Lester so we that can provide you with written confirmation. We do not accept or support any persons or organisation, unless confirmed in writing by myself or Robert Lester, who comment regarding this area.

Please also be advised that this Aboriginal organisation does not do volunteer work or attend unpaid meetings.

All correspondence should be emailed to the following scott@tocomwall.com.au or to the above postal address.

Yours faithfully



Scott Franks
Native Title Claimant
Director & Aboriginal Heritage Manager

Tocomwall
Creating Quantum Change

Coxon, Rochelle

From: Kirkwood, Luke
Sent: Tuesday, 5 June 2012 1:53 PM
To: Coxon, Rochelle
Subject: Fwd: Rixs Creek Project

Sent from my iPhone

Begin forwarded message:

> From: Warren Schillings <schillo@yarnteen.com.au>
> Date: 5 June 2012 12:28:22 PM ACST
> To: <luke.kirkwood@aecom.com>
> Subject: Rixs Creek Project
>
> My name is Warren Schillings I would like to express an interest in registering as an Aboriginal party for the
> `Rix's Creek Mine Rail Loading Facility Project, Rixs Creek, NSW.
> My company name is Myland Cultural & Heritage Group and the ABN Number is 15 836 072 108, I also have the relevant
> Insurances in place. My interest in the project is having Traditional Custodial interest and as such would like to be part of the process.
> Please advise my Registration and possible involvement in the proposed salvage and Cultural Heritage Management Program.
>
> Yours in Culture
>
> Warren F Schillings
> MYLAND CULTURAL & HERITAGE GROUP
> 30 Taurus Street
> ELERMORE VALE NSW 2287
> Mobile : 0431 392 554 Email : schillo@yarnteen.com.au

Warren F Schillings
MYLAND CULTURAL & HERITAGE GROUP
30 Taurus Street
ELERMORE VALE NSW 2287
Mobile : 0431 392 554 Email : schillo@yarnteen.com.au

Coxon, Rochelle

From: Michele Stair <michelestair@hotmail.com>
Sent: Friday, 8 June 2012 2:47 PM
To: Coxon, Rochelle
Subject: rix creek mine rail loading project

Follow Up Flag: Follow up
Flag Status: Completed

Giwiirr Consultants would like to register an interest in this project thankyou Michele stair

Dear Rochelle Coxon

I Karen Matthews would like to put an Interest in the Rixs Creek Mine Rail loading facility project
My company name is galamaay cultural consultants

K. Matthews

0412859 860

Attention Rochelle Coxon

Hi

My name is David Horton of 12 Okeefe place gunnedah N.S.W 2380. Davehorton@hotmail.com.au.

My company name is gomery cultural consultant wish to put in an Interest in the Survey work Rixs creek Mine Rail Loading facility project.

If you have any questions don't hesitate to ring me on Mobile 0458532707 or email please

thankyou for your correspondance.

D Horton

ph 0458532707

Contact:
81 Wansbeck Valley Rd
Cardiff 2285
0412 369661
Email: drm.cm@hotmail.com

ABN: 60 583 065 953

Dear Rochelle

We would like to register an interest in the Rix's Creek Mine Rail Loading Facility Project, as we have an ancestry connection to the Wonnarua country. We have the relevant insurances in place. If you require any further information please do not hesitate to contact me on 0412 369661.

Yours in Culture
Helen Faulkner
Manager

Esther Tighe
1/86 Edward Street
GUNNEDAH NSW 2380

Mr Luke Kirkwood

I, Esther Tighe, wish to register my interest in being consulted in the field walk and methodology assessment process associated with the Rix's Creek Mine Rail Loading Facility Project.

I have ancestoral connections to the area and also a strong cultural responsibility and interest in Aboriginal Culture & Heritage.

Yours in Unity

Esther Tighe
Ph: 02 67427105 or 0422648350
Fax 02 67422125
Email: esther.tighe@bigpond.com
ABN: 43 553 281

Appendix D

Registered Aboriginal Party Written Responses to the Draft Methodology

Coxon, Rochelle

From: Elizabeth Howard <elizabeth.howard@hotmail.com>
Sent: Saturday, 23 June 2012 10:57 PM
To: Coxon, Rochelle
Subject: Rix's Creek Mine Rail Loading Facility Project - Methodology

Hi Rochelle,

At this stage after reading through the Draft Methodology for the Rix's Creek Mine Rail Loading Facility Project I am quite pleased, however I will call you on Monday as I have a few things that I would like to discuss/clarify further before agreement is made.

Thank you

Kind Regards,

Elizabeth Howard

Barkuma Neighbourhood Centre Trading as...

Gidawaa Walang

Wiradjuri Meaning - Goanna Turning the Stone

Cultural Heritage Consultancy

...To keep our Culture...

ABN: 58 290 659 800
76 Lang Street,
Kurri Kurri NSW 2327
Phone: (02) 4937 1094
Fax: (02) 4936 4449
Mobile: 0411 196 991

Fax Cover

To: Rochelle Coxon

From: AECOM

Date: 28.6.2012
No. of Pages: 2 (including header)

Hello Rochelle,

Comment on Rixs Creek Methodolgy

Thank you

Barkuma Neighbourhood Centre Trading as...

Gidawaa Walang

Wiradjuri Meaning ~ Goanna Turning the Stone

Cultural Heritage Consultancy

...To keep our Culture...

ABN: 58 290 659 800
76 Lang Street,
Kurri Kurri NSW 2327
Phone: (02) 4937 1094
Fax: (02) 4936 4449
Mobile: 0411 196 991

28th June 2012

Rochelle Coxon
Archaeologist
AECOM Australia Pty Ltd
Sydney NSW 2000

Dear Rochelle,

Re: Rixs Creek Mine Rail Loading Facility Project, Rixs Creek, NSW- Indigenous Archaeology Impact Assessment DRAFT Methodology.

Gidawaa Walang Cultural Heritage Consultancy supports the methodology for the above project.

Yours sincerely

Ann Hickey
Project Officer

Coxon, Rochelle

From: Laurie Perry <l.perry@optusnet.com.au>
Sent: Monday, 2 July 2012 8:48 AM
To: Coxon, Rochelle; Kirkwood, Luke
Subject: Rix's Creek Rail load facility project

Importance: High

Hi Rochelle

I have read the draft methodology and agree with the current report please keep me updated on further consultation.

Cheers

Laurie Perry
CEO
Wonnarua Nation Aboriginal Corporation
Ground Floor 254 John St Singleton NSW
PO BOX 3066
Singleton Delivery Centre 2330
Ph: 02 6571 8595
Fax: 02 6571 8551
Mob : 0412 593 020
Email: wonnarua@bigpond.com.au
Home : l.perry@optusnet.com.au
Website: www.wonnarua.org.au

Cacatua Culture Consultants

Entity of Cacatua Pty Ltd ABN: 87 145 082 480 ACN: 145 082 480

9 July 2012

Rochelle Coxon
Archaeologists
AECOM Australia Pty ltd

Email: Rochelle.coxon@aecom.com

RE: Rix's Creek Mine Rail Loading Facility Project – Draft Methodology for Registered Aboriginal Party (RAP) Review

We have read and discussed the contents of the information that was forwarded to us on the 14th June 2012, Cacatua has been present in this location and we are fully aware of the impact that will take place as a result of the above project.

Cacatua is in full support of all the information that has been supplied, with regards to the draft methodology.

Yours truly

Donna Sampson
Reports Manager

Email: cacatua@resetdsl.net.au

UNIT 1b, 11 Glenwood Drive THORNTON NSW 2322 Ph: 02 4028 6942 Fax: 02 4028 6943

Appendix E

Aboriginal Heritage Information Management System (AHIMS) Search Results

AHIMS Web Services (AWS)
Search Result

Your Ref Number : 60265656/1.3 (Rixs Ck)

Client Service ID : 68728

AECOM Australia Pty Ltd (previously HLA-Envirosciences)
level 8 17 York Street
SYDNEY New South Wales 2000

Attention: Rochelle Coxon

Email: rochelle.coxon@aecom.com

Date: 01 May 2012

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 56, Eastings : 324860 - 327066, Northings : 6398459 - 6402459 with a Buffer of 0 meters. conducted by Rochelle Coxon on 01 May 2012

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

28	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : 60265656/1.3 (Rixs Ck)

Client Service ID : 68728

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
37-6-0787	McDougall Hill 4;	AGD	56	325300	6398680	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Denis Byrne					**Permits**		
37-6-0237	Rixs Creek;	AGD	56	325573	6401033	Open site	Valid	Artefact : -	Open Camp Site	132
	Contact	**Recorders**	ASRSYS					**Permits**		
37-6-0239	Rixs Creek (Singleton)	AGD	56	326111	6401592	Open site	Valid	Artefact : -	Open Camp Site	98,132
	Contact	**Recorders**	ASRSYS					**Permits**		
37-6-0240	Rixs Creek (Stone Quarry Gully)	AGD	56	325497	6400208	Open site	Valid	Artefact : -	Open Camp Site	132
	Contact	**Recorders**	ASRSYS					**Permits**		
37-6-0241	Rixs Creek Stone Quarry Gully	AGD	56	326494	6400684	Open site	Valid	Artefact : -	Open Camp Site	98,132
	Contact	**Recorders**	ASRSYS					**Permits**		
37-6-0681	Scarred Tree;	AGD	56	325480	6398500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**		
37-6-0788	McDougall Hill 3	AGD	56	325647	6398327	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Denis Byrne,Barry French,John Mathews					**Permits**		
37-6-1205	SC/72	AGD	56	326755	6398916	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1206	SC/73	AGD	56	326607	6398787	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1207	SC/74	AGD	56	326607	6398851	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1208	SC/75	AGD	56	326612	6398706	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1210	SC/78	AGD	56	326874	6399287	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1194	SC/91	AGD	56	326900	6399628	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1211	SC/79	AGD	56	326769	6399254	Open site	Valid	Artefact : -		
	Contact	**Recorders**	MCH - McCardle Cultural Heritage Pty Ltd					**Permits**		
37-6-1551	Pioneer Road Site 43	AGD	56	326760	6398393	Open site	Valid	Artefact : 31		101827
	Contact T Russell	**Recorders**	Mr.Giles Hamm					**Permits**		
37-6-0238	Rixs Creek (singleton)	AGD	56	326211	6401136	Open site	Valid	Artefact : -	Open Camp Site	98,132

Report generated by AHIMS Web Service on 01/05/2012 for Rochelle Coxon for the following area at Datum :GDA, Zone : 56, Eastings : 324860 - 327066, Northings : 6398459 - 6402459 with a Buffer of 0 meters.Additional Info : An archaeological impact assessment for a proposed rail loading facility at Rixs Creek Mine.. Number of Aboriginal sites and Aboriginal objects found is 28

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref Number : 60265656/1.3 (Rixs Ck)

Client Service ID : 68728

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	ASRSYS					Permits		
37-6-0242	Rixs Creek-singleton	AGD	56	325033	6400565	Open site	Valid	Artefact : -	Open Camp Site	98,132
	Contact	Recorders	ASRSYS					Permits		
37-6-2278	NBTT05	GDA	56	326111	6402028	Open site	Destroyed	Artefact : 2		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2279	NBTT06	GDA	56	326272	6401927	Open site	Destroyed	Artefact : 3		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits		
37-6-2280	NBTT07	GDA	56	326504	6401532	Open site	Partially Destroyed	Artefact : 9		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2281	NBTT08	GDA	56	325274	6402393	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2283	NBTT10	GDA	56	326545	6401097	Open site	Destroyed	Artefact : 2		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2284	RCLE01	GDA	56	326275	6399759	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2285	RCLE02	GDA	56	326355	6399751	Open site	Destroyed	Artefact : 2		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2286	RCLE03	GDA	56	326373	6399748	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits	3462	
37-6-2287	SC01(Singleton)	GDA	56	326575	6399517	Open site	Valid	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits		
37-6-2290	TTAR03	GDA	56	327034	6401856	Open site	Valid	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits		
37-6-2291	TTAR04	GDA	56	326882	6401711	Open site	Valid	Artefact : 1		
	Contact	Recorders	Biosis Research Pty Ltd Sydney Office,Mr.Dominic Brady					Permits		

Report generated by AHIMS Web Service on 01/05/2012 for Rochelle Coxon for the following area at Datum :GDA, Zone : 56, Eastings : 324860 - 327066, Northings : 6398459 - 6402459 with a Buffer of 0 meters.Additional Info : An archaeological impact assessment for a proposed rail loading facility at Rixs Creek Mine.. Number of Aboriginal sites and Aboriginal objects found is 28

Appendix F

Response to the Draft Report from the Wanaruah Local Aboriginal Land Council

LOCAL ABORIGINAL LAND COUNCIL
WANARUAH

P.O. BOX 127
19 MAITLAND STREET,
MUSWELLBROOK 2333
ABN 33 251 730 169

PH: (02) 6543 1288
(02) 6543 1962
FAX: (02) 6542 5377
EMAIL: wanarua@bigpond.net.au

29 January 2013

Mr L Kirkwood
Senior Archaeologist
AECOM Australia Pty Ltd
Level 8 17 York Street
SYDNEY NSW 2000
(Sent by email: luke.kirkwood@aecom.com)

Dear Luke

RE: DRAFT REPORT FOR COMMUNITY REVIEW – RIXS CREEK RAIL LOOP

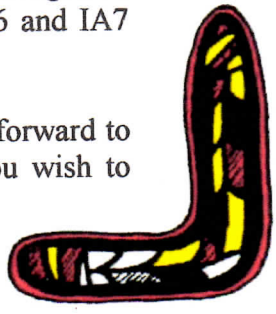
Thank you for the opportunity to review the draft Aboriginal Archaeological and Cultural Heritage Impact Assessment for the Rix's Creek Mine Rail Loading Facility.

Steven Hands and Nerida Saunders represented the Wanaruah LALC during the fieldwork component of the project in July and October 2012. It is noted that 12 site were recorded and one previously recorded sites re-discovered, which included isolated finds and small artefact scatters and all except for Rixs Creek Rail Loop AS4 site are considered to have low archaeological significance.

- The Rail Loop AS4 site is considered to be of moderate significance and it is the Land Council's recommendation (in agreement with the draft report) that this site is to be subject to surface collection and test excavation.

- It is also recommended that all 12 remaining sites will need to be salvaged as it cannot be guaranteed in the future that Rail Loop sites IA5, IA6 and IA7 will not be impacted in the future.

Thank you once again for this opportunity to make comment and we look forward to continuing the consultation process with you on this project. Should you wish to



discuss our comments further, please do not hesitate to contact Noel Downs on (02) 6543 1288.

Yours sincerely

Suzie Worth
Indigenous Archaeologist for the
Wanaruah Local Aboriginal Land Council

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Appendix H

Air Quality Impact Assessment

Appendix H Air Quality Impact Assessment

20 June 2011

John Hindmarsh
Environmental Officer
Rix's Creek Pty Ltd
Email: jhindmarsh@rixs.com.au

RIX'S CREEK – AIR QUALITY ASSESSMENT FOR RAIL LOOP AND LOADOUT

Dear John,

Please find below our assessment of the potential air quality impacts of the proposed rail loop and load out to the Rix's Creek Coal Mine (the Modification).

1 INTRODUCTION

The Rix's Creek Coal Mine (RCM) is situated approximately 2.7 kilometres (km) northwest of Singleton Heights, New South Wales (NSW).**Figure 1.1**shows the location of RCM and the surrounding areas.

RCM consists of three pits and the mine infrastructure included a coal handling and preparation plant (CHPP). Currently, Run of Mine (ROM) coal is washed and transported by semi-trailers to the Camberwell rail line and rail loop located 2 km north of the site, for the transportation to Newcastle.

The proposed Modification involves the construction of a new rail loop and associated infrastructure onsite. The disturbance footprint of the proposed infrastructure would be relatively small and would only include surface infrastructure.

The processing of the ROM coal at the CHPP will remain unchanged. Product coal will be transferred via conveyors to the new rail loop and transportation by road to the Camberwell rail loop will cease.The location of the Camberwell rail load out facilities and the proposed rail loop and associated infrastructures are shown in **Figure 1.1**.

PAEHolmes

SYDNEY

Suite 203, Level 2,
Building D
240 Beecroft Road,
Epping 2121
Ph: + 61 2 9874 8644
Fax: + 61 2 9874 8904

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www.paeholmes.com

BRISBANE

GOLD COAST

TOOWOOMBA

A PEL COMPANY

Queensland Environment Pty Ltd
Trading as PAEHolmes
ABN: 86 127 101 642

Figure 1.1: Aerial Photograph of the Rix's Creek Coal Mine and Surrounds

1.1 Previous Air Quality Assessments

In 1994, Holmes Air Sciences (HAS) (now PAEHolmes) conducted an air quality assessment for the proposed Rix's Creek open cut mine (**HAS, 1994**)[1].The results of air dispersion modelling indicated that the impacts of the Rix's Creek mining operations would be contained within the RCM mining lease, except for some slight impacts into the Camberwell mining lease to the north and the south in Year 15 and Year 22.

[1] Holmes Air Sciences (HAS) (1994) "*Air Quality Assessment: Proposed Rix's Creek Open Cut Mine, Near Singleton, NSW*". Prepared by Holmes Air Sciences for Rix's Creek Pty Ltd, November 1994.

1.2 Overview of Modification

A summary of the components of the proposed rail loop that would potentially impact on dust emissions is provided below:

- Construction of a rail loop and load out facility on-site, located approximately 1 km south-southwest of the existing Camberwell load out facility;
- Conveyor transfer points for the transport of product coal from the CHPP to the rail load out facility;
- Operations at the rail load out facility including unloading of product coal to trains;
- Wind erosion from the product coal stock pad; and
- Removal of the need for haulage and transfer of product coal to the Camberwell rail loop.

The following would remain unchanged as a result of the Modification and would not result in a change to dust emissions:

- Product coal production rate (1.5 Mtpa);
- Currently approved open cut mining methods, production rates, mine fleet or waste rock management practices; and
- Currently approved coarse rejects and tailings management practices.

2 OVERVIEW OF EXISTING ENVIRONMENT

2.1 Location

Residences in the vicinity of Rix's Creek are predominately located to the southeast near the village of Singleton Heights and east near the village of Obanvale (**Figure 1.1**). Camberwell mine is located to the north.

2.2 Dispersion Meteorology

Meteorological data collected at the Rix's Creek meteorological station for 1991, 1992 and 1993 were analysed in **HAS** (**1994**). The dominant winds for the area are from the southeast, south-southeast and north-northwest annually. The annual windroses for 1991, 1992 and 1993 are shown in **Attachment A**.

Current meteorological data was not available for this assessment. However, the annual wind pattern in the area is not expected to have change significantly. In particular, the general annual wind pattern characteristic of the Hunter area is along the southeast/north-northwest axis.

2.3 Ambient Air Quality

Three air quality monitoring stations currently monitor TSP and PM_{10}, using High Volume Air Samplers (HVAS) (run on a one-day-in-six run cycle)(**Figure 2.1**). In addition, 30 additional dust gauges are installed at locations shown on **Figure 2.1**. A number of these dust gauges are located within the RCM mining leases.

2.3.1 Dust Deposition

The results of dust deposition monitoring conducted between 2000 and 2010arepresented in **Table 2.1**. Monitoring results indicate that annual average dust deposition in the vicinity of RCM is all within the cumulative Office of Environment and Heritage (OEH) criterion (i.e. 4 grams per square metre per month [g/m^2/month]). In particular, recent monitoring results (2009 and 2010) demonstrate that all sites are in compliance with the OEH criterion.

The annual average dust deposition data presented in **Figure 2.2** indicates generally consistent levels from 2000 to 2010 and no clear upward trend at offsite dust gauges.

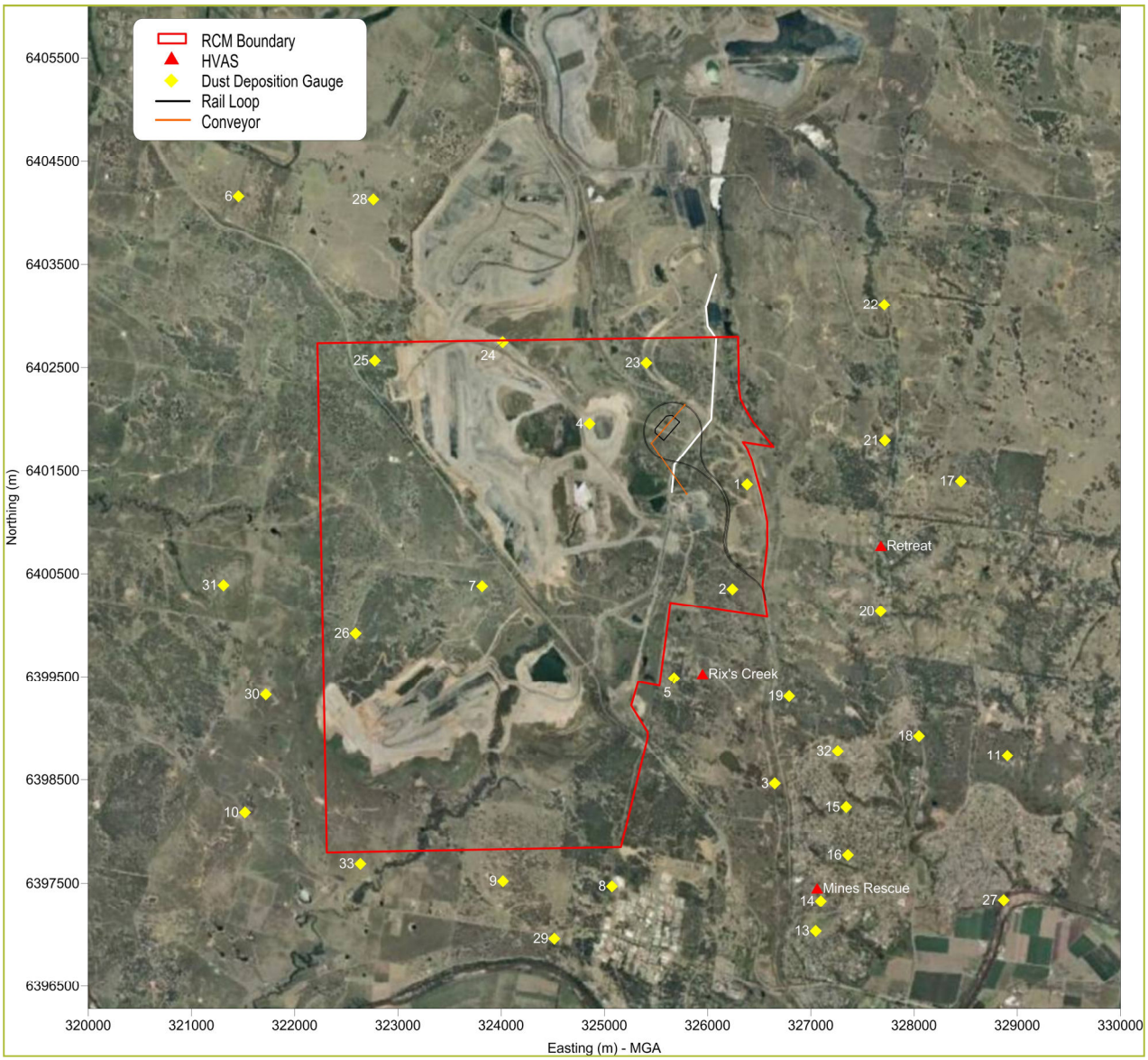


Figure 2.1: Locations of Air Quality Monitoring Sites

Table 2.1: Annual Average Dust Deposition (g/m²/month) Monitoring Results

Year	G1	G2	G3	G5	G6	G7	G8	G9	G10	G11	G13	G14	G15	G16	G17	OEH Criterion
2000	2.3	1.9	2.8	2.9	1.7	2.1	1.0	0.9	0.8	1.7	1.0	2.0	1.5	1.8	1.0	4
2001	1.9	2.3	1.7	2.6	1.9	1.8	1.7	1.3	1.4	2.5	1.2	2.0	1.8	2.0	1.1	4
2002	2.2	2.0	2.0	2.7	1.9	2.6	1.5	1.5	1.2	2.6	1.6	2.5	2.3	1.6	1.6	4
2003	1.5	1.5	1.5	1.9	2.0	1.5	0.9	1.1	1.1	2.3	1.3	2.0	1.5	1.6	1.3	4
2004	1.5	2.2	1.3	2.5	1.9	1.9	1.2	1.7	1.3	2.7	1.3	3.7	1.8	1.6	1.3	4
2005	1.4	1.3	1.3	1.9	1.9	1.8	1.2	1.4	1.2	2.5	1.4	1.6	1.3	1.5	1.2	4
2006	1.4	1.6	1.7	1.8	2.6	2.9	1.5	1.1	1.3	1.6	1.7	2.2	1.9	2.2	1.3	4
2007	1.4	1.5	1.4	1.6	2.2	2.3	1.2	1.0	1.4	1.7	1.5	1.8	1.6	1.8	1.2	4
2008	2.5	1.6	1.5	1.6	1.9	2.2	1.2	1.0	1.7	2.2	1.2	1.6	1.7	1.4	1.2	4
2009	2.1	2.0	1.9	2.3	4.0	2.3	1.7	1.6	1.3	1.3	1.6	2.4	2.6	2.1	1.6	4
2010	2.4	1.5	1.4	1.8	3.8	2.0	0.9	1.0	1.1	1.1	1.5	1.5	1.7	1.5	1.3	4
Year	**G18**	**G19**	**G20**	**G21**	**G22**	**G23**	**G25**	**G26**	**G27**	**G28**	**G29**	**G30**	**G31**	**G32**	**G33**	**OEH Criterion**
2000	1.2	1.4	2.3	1.6	2.1	2.4	1.9	1.3	2.6	2.3	1.4	1.2	1.2	-	-	4
2001	1.4	2.6	1.6	1.6	2.0	2.7	2.1	1.1	3.6	2.5	1.1	1.3	1.4	-	-	4
2002	1.5	2.4	2.1	2.1	2.0	3.5	2.5	1.1	3.3	2.8	1.7	1.5	1.8	1.6	1.7	4
2003	1.2	2.1	1.3	1.5	1.4	2.9	2.0	1.1	1.4	2.7	1.0	1.5	1.6	1.8	1.6	4
2004	1.4	3.6	1.9	1.7	1.5	3.3	1.6	1.4	2.0	2.9	1.8	1.5	1.4	1.7	2.1	4
2005	1.0	1.2	2.0	1.6	1.5	2.7	2.2	1.5	1.1	3.1	1.6	1.6	1.8	1.5	2.4	4
2006	1.3	1.4	1.6	1.8	1.8	2.7	2.2	2.3	1.7	2.3	1.7	1.7	2.2	1.8	2.2	4
2007	1.1	1.7	1.5	1.4	1.5	2.2	2.0	2.1	1.5	2.0	1.3	1.9	1.7	1.5	2.1	4
2008	1.3	2.9	1.9	1.5	1.4	2.2	1.7	1.3	1.5	1.7	1.1	1.4	2.2	1.2	1.4	4
2009	1.4	2.4	2.3	1.9	1.8	2.9	3.8	2.4	1.8	3.2	1.5	3.8	2.6	2.3	1.8	4
2010	1.3	1.6	1.8	1.5	1.6	2.6	3.4	1.6	1.8	2.0	1.1	1.4	1.5	1.9	1.4	4

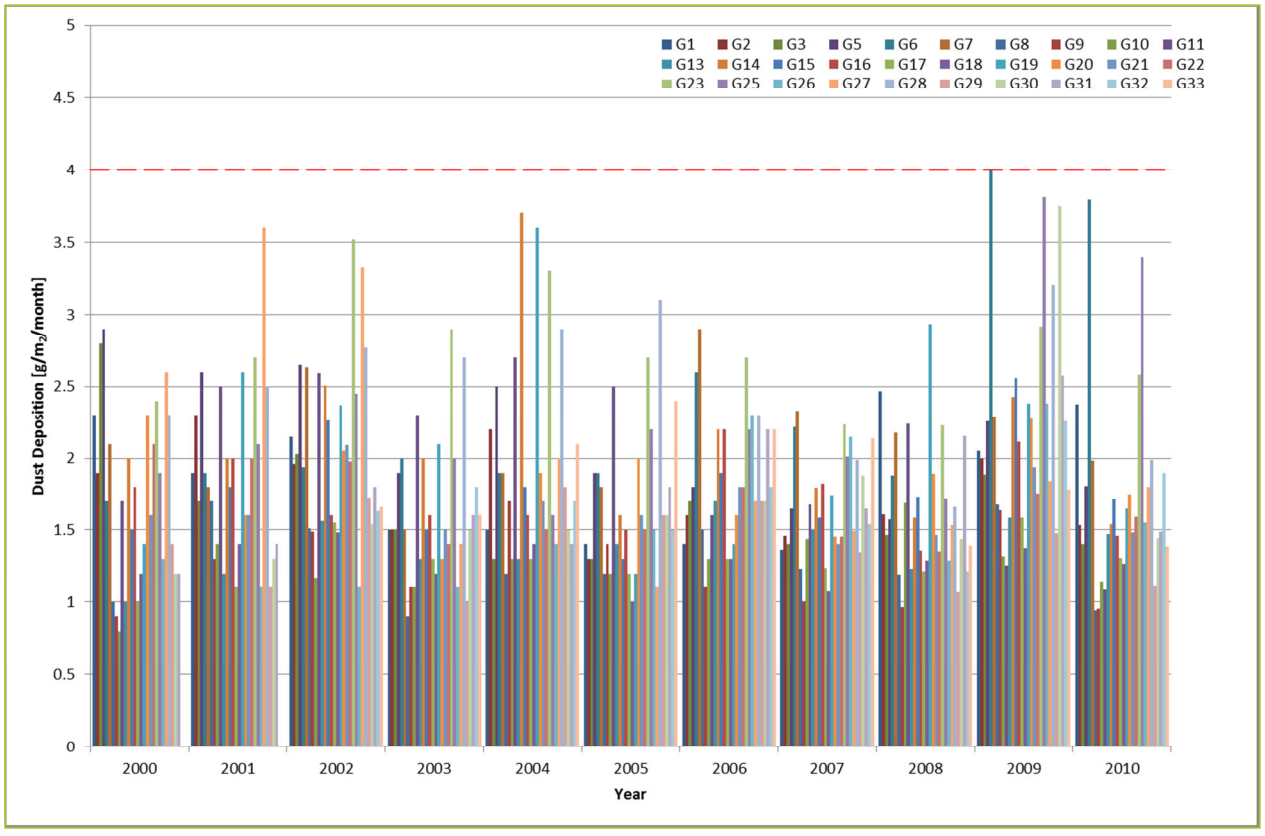


Figure 2.2: Annual Average Dust Deposition

2.3.2 TSP

TSP concentrations are measured by HVAS at three locations (**Figure 2.1**). Annual average TSP concentrations recorded at each site from 2000 to 2010 are shown in **Table 2.2**. All results demonstrate compliance with the DECCW annual average TSP criterion (i.e. 90 micrograms per cubic metre [µg/m^3]).

Table 2.2: Annual Average TSP Concentration (µg/m^3) Monitoring Results

Year	Retreat	Mines Rescue	Rix's Creek	OEH Criterion
2000	51.2	45.5	54.0	90
2001	63.0	44.6	54.3	90
2002	70.6	60.5	86.1	90
2003	72.4	56.8	49.6	90
2004	55.2	63.6	84.1	90
2005	52.7	62.3	66.2	90
2006	63.2	61.0	77.7	90
2007	63.4	57.6	75.5	90
2008	55.8	61.5	66.4	90
2009	68.9	60.2	76.2	90
2010	62.3	50.1	65.0	90
Average	**60.2**	**59.5**	**73.0**	**90**

2.3.3 Annual Average PM_{10}

PM_{10} concentrations are measured by TEOMs at three locations (**Figure 2.1**). Annual average PM_{10}concentrations recorded at each site from 2000 to 2010 are shown in **Table 2.3**and **Figure 2.3**. All results demonstrate compliance with the OEH annual average PM_{10}criterion (i.e. 30 micrograms per cubic metre [µg/m^3]), except for the Mines Rescue monitor in 2008.

Table 2.3: Annual Average PM_{10} Concentration (µg/m^3) Monitoring Results

Year	Retreat	Mines Rescue	Rix's Creek	OEH Criterion
2000	15.2	17.3	16.8	30
2001	15.0	20.3	18.3	30
2002	21.0	18.0	23.0	30
2003	21.6	15.1	23.7	30
2004	20.7	12.3	20.6	30
2005	21.3	10.5	25.8	30
2006	22.4	19.7	23.9	30
2007	29.1	14.7	26.5	30
2008	28.5	**38.0**	29.8	30
2009	20.5	27.1	25.7	30
2010	20.8	23.1	24.1	30
Average	**21.4**	**19.6**	**23.5**	**30**

NOTE: Exceedances of the OEH Criterion are Bolded.

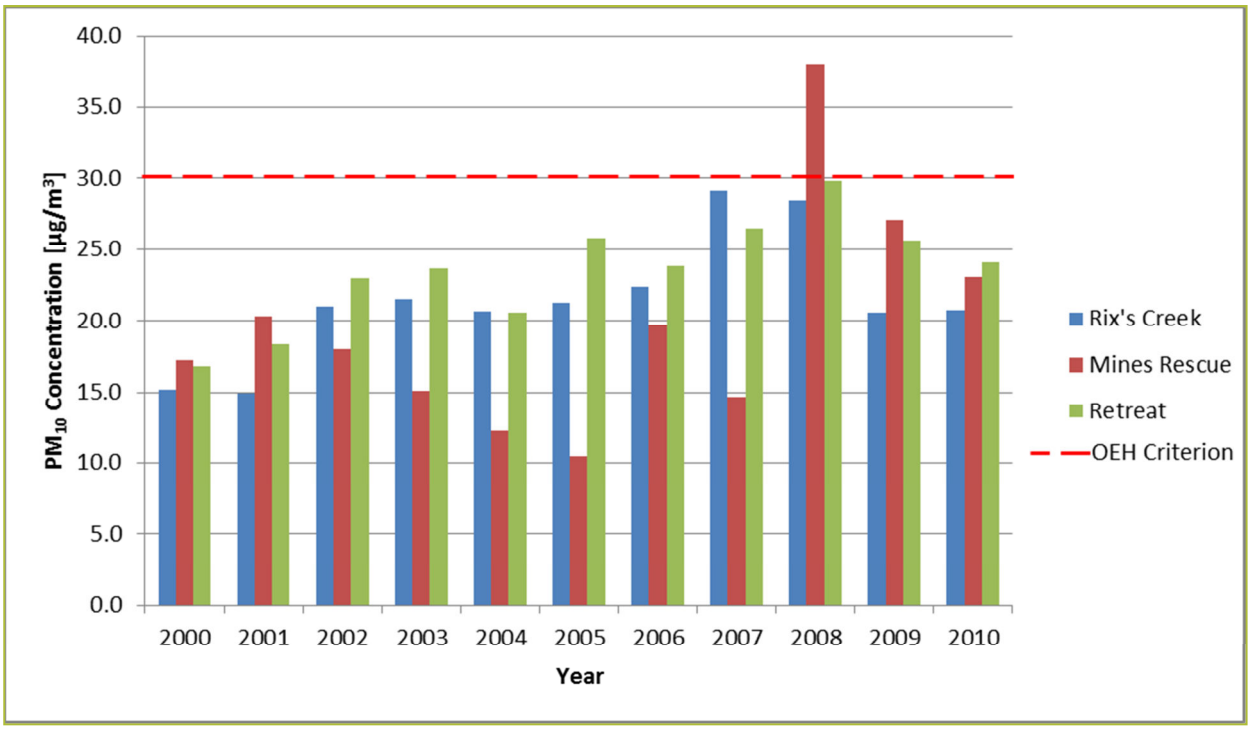


Figure 2.3: Annual Average PM_{10} Concentrations

Rix's Creek and Mines Rescue are located generally downwind of Rix's Creek mining operations based on the annual prevailing wind direction. Retreat is not located downwind of Rix's Creek mining operations based on the prevailing wind direction, and may not be as heavily influenced by RCM's activities.

There was one exceedance of the annual average PM_{10} criterion at Mines Rescue in 2008. This exceedance was due to building re-construction at the Mines Rescue Station and PM_{10} concentrations decreased upon completion.

Therefore, it was concluded that there were no exceedances of the PM_{10} criterion as a result of the operations at RCM.

3 IMPACT ASSESSMENT

The operation and construction of the proposed rail loop infrastructure would not impact on air quality to any significant extent. The proposed rail loop is essentially limited to a relatively small area on-site. Additionally, the majority of the potential air quality impacts would be during the construction phase which will be short term.

As described in **Section 1.2**, the components of the proposed rail loop that would potentially impact on dust emissions during operation include:

- Transfer points on the conveyors;
- Unloading of the product coal from the processing plant to the rail loop facility; and
- Wind erosion from the product coal stock pad at the rail loop facility.

The maximum annual dust emissions (TSP) from the proposed rail loop have been estimated based on the proposed coal production rate of 1.5 Mtpa and are summarised in **Table 3.1**. The emissions estimation techniques used are consistent with those presented in **HAS** (**1994**).

Table 3.1: Rix's Creek Rail Loop TSP Emission Estimates

Activity	TSP Emissions (kg/annum)
Conveyor transfer point for washed coal to gantry	759
Unloading coal from gantry to stock pad	759
Conveyor transfer point for Coal feed valves to rail load out bin	759
Unloading from rail load out hopper to trains	759
Stock Pad	819

As the rail loop is proposed to commence once approval is received, the estimated maximum annual dust emissions from the Modification have been compared with the **HAS** (**1994**) estimated dust emissions for Year 15 (2009) and Year 22 (2016) of RCM (**Table 3.2**).The shovel option in the **HAS** (**1994**) assessment was used for comparison as this was the option modelled. The total emissions from the proposed rail loop would result in a slight increase (approximately 0.1%) in the total estimated annual dust emissions from RCM. This is a very minor increase and would not be detectable in any monitoring data.

Table 3.2: Annual TSP Emissions Estimates

HAS (1994) Year 15 (kg/annum)	HAS (1994) Year 22 (kg/annum)	Proposed Rail Loop (kg/annum)
3,350,187	3,140,612	3,856

In addition to the above, the discontinuation of using the Camberwell rail loop for transport of product coal will result in a decrease in dust emissions at RCM. The estimated reduction in dust emissions from transfer of product coal at the Camberwell rail loop is approximately 810 kg/y. This was the only dust emission associated with product coal dispatch at the Camberwell rail loop in **HAS** (**1994**).

However, there will be further reductions from hauling of product coal to the Camberwell rail loop as the proposed conveyor transfer of product coal to the new rail loop will have considerably less dust emissions compared to haulage of product coal to the Camberwell rail loop. Therefore, the overall increase in dust emissions as a result of the proposed rail loop is expected to be less than 3,856 kg/y.

The proposed rail loop would not result in any detectable change in dust levels at sensitive receivers, as the dust emissions is minor and the proposed rail loop and load out facility is located approximately 1 km south-southwest of the existing Camberwell rail load out facility. Additionally, the results of monitoring conducted to date do not reveal any discernable impact on nearby receivers due to RCM (**Section 2.3**).

4 CONCLUSIONS

A review of the dust emissions arising from the proposal to construct a new rail loop and associated infrastructure shows that the estimated dust emissions from the operation of the rail loop are negligible relative to the total emissions from the Rix's Creek Project itself. Potential dust impacts during construction will be short term. Once the construction is complete, the operation of the facility would not change the emission total dust burden of Rix's Creek Project in any significant or detectable way.

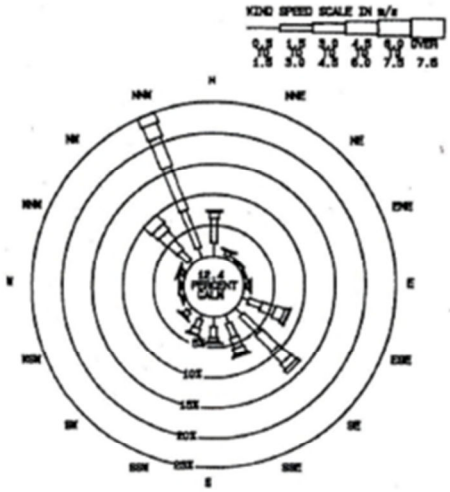
On the basis of current monitoring data and previous modelling predictions, the proposed rail loop is unlikely to result in any adverse impacts in terms of dust and particulate impacts at the nearest private residences.

It is concluded, therefore, that the development of an additional rail loop at the Rix's Creek Project would not cause any measurable change to dust levels in the area, relative to the approved Rix's Creek Project as a whole.

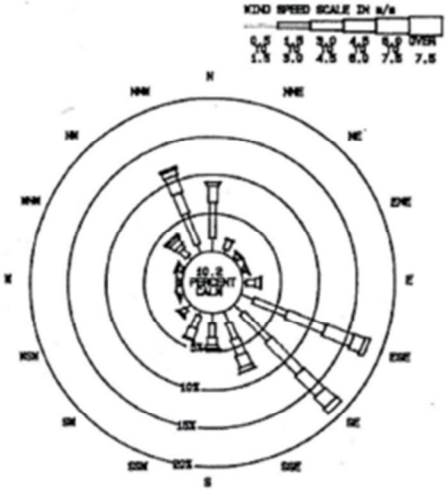
ATTACHMENT A

Rix's Creek 1991, 1992 and 1993 Windroses

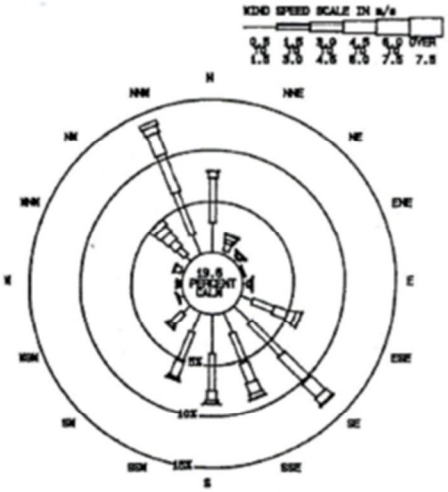
ANNUAL AND SEASONAL WINDROSES 1991



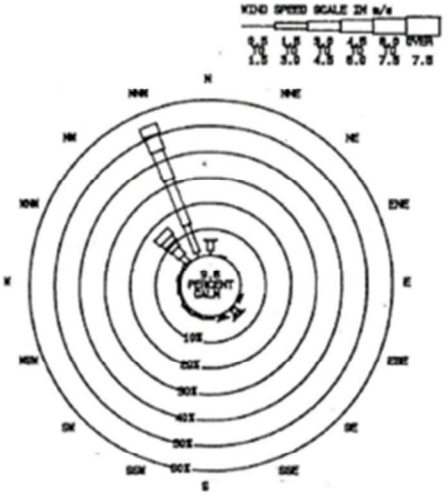
DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1991 Annual



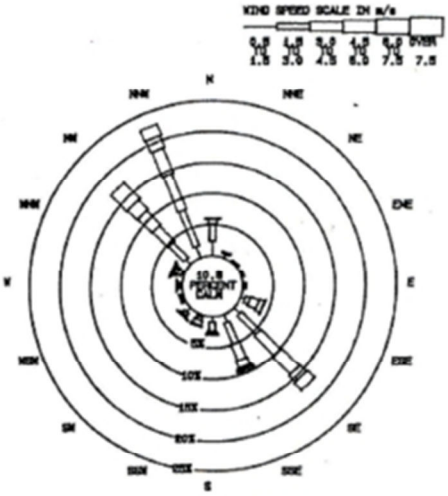
DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1991 Summer



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1991 Autumn

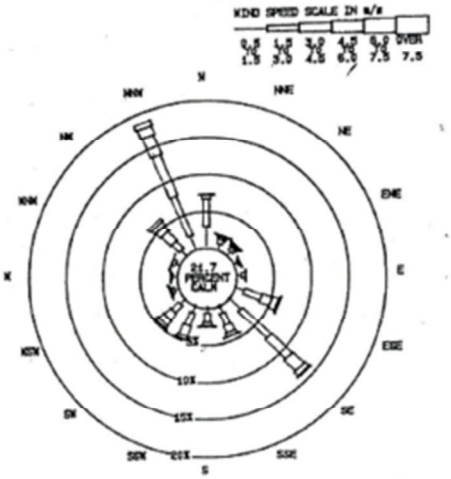


DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1991 Winter



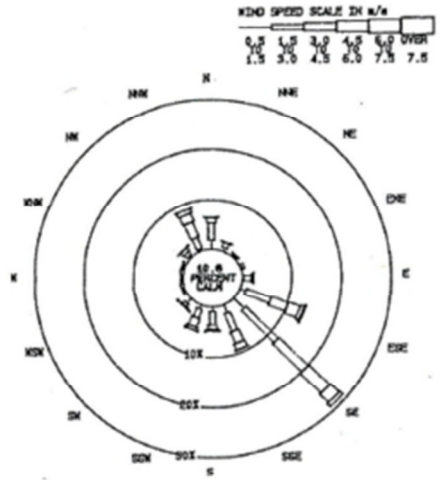
DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1991 Spring

FIGURE 4.



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek Annual 1992

ANNUAL AND SEASONAL WINDROSES 1992



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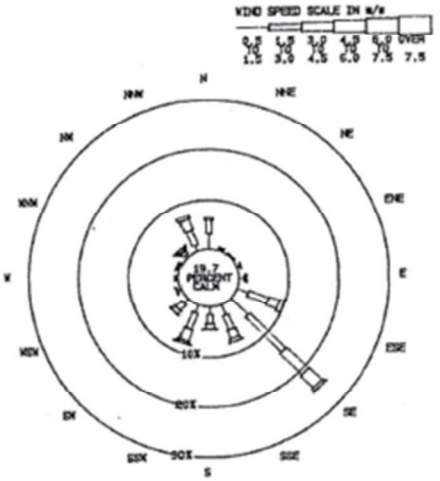
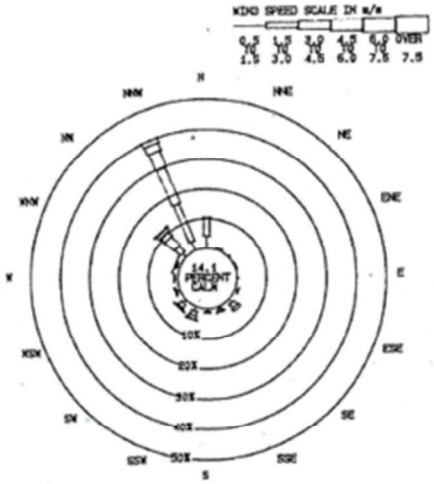
Rixs Creek Summer 1992



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek Autumn 1992



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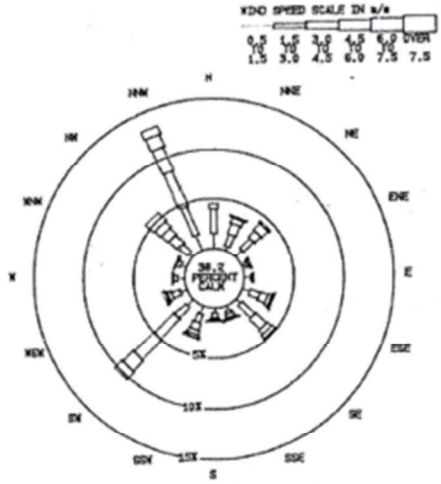
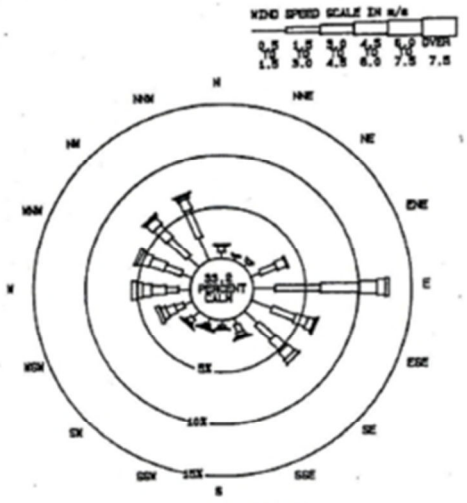
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek Winter 1992



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek Spring 1992

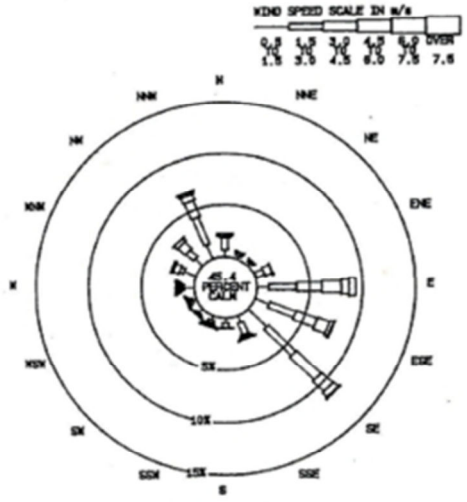
FIGURE 5.



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1993 - Annual

ANNUAL AND SEASONAL WINDROSES 1993

(refer to text concerning missing data for autumn and winter)



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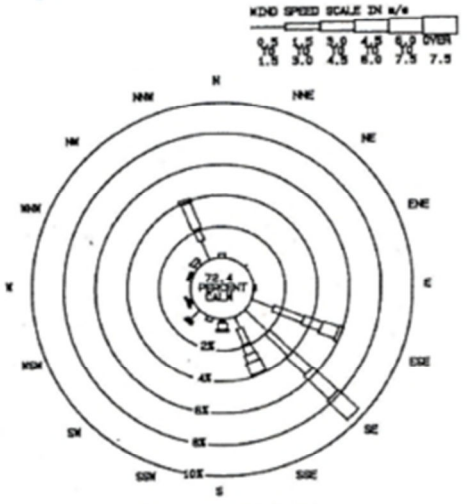
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1993 - Summer



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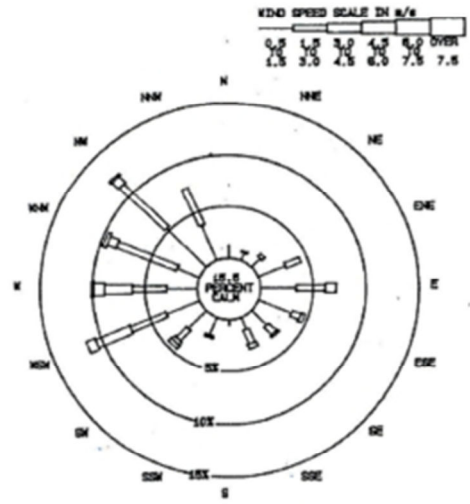
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1993 - Autumn



DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1993 - Winter

DISTRIBUTION OF WINDS
FREQUENCY OF OCCURRENCE IN PERCENT
Rixs Creek 1993 - Spring

FIGURE

Appendix I

Noise Impact Assessment

Appendix I Noise Impact Assessment

Rixs Creek Coal Mine

Proposed Rail Loop and Loading Facility

Environmental Noise Assessment

Prepared for

Rixs Creek Pty Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

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Rixs Creek Coal Mine

Proposed Rail Loop and Loading Facility

Reference: 12323_R03

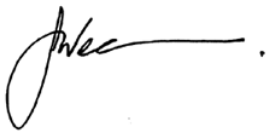
Report date: 22 March 2013

Prepared for

Rixs Creek Pty Limited
PO Box 4
East Maitland NSW 2323

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Jeremy Welbourne
Civil Engineer (Acoustics)

QA Review: Tony Welbourne
Director

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

EXECUTIVE SUMMARY

Rixs Creek engaged Global Acoustics to undertake an environmental noise impact assessment for a proposal to develop a rail loop and loading facility adjacent to the CHPP at the Rixs Creek mine. The proposed modification is being sought under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Noise sensitive receptors (NSR) located on Retreat Road, Bridgman Road and in the suburb of Singleton Heights have potential to be impacted; one location representative of each of these areas has been assessed. NSR located south of Rixs Creek West Pit in the Maison Dieu area are considered to be at sufficient distance from the proposed rail infrastructure that noise impact from the Proposal is highly unlikely; these NSR have not been assessed.

Rixs Creek operate under DA N90/00356. Criteria in the Approval are L_{A10} based; L_{A10} criteria are one of the former ways of assessing noise impacts. It is anticipated that as a result of this assessment, the regulatory authorities will seek to contemporise the noise criteria for Rixs Creek. Project Specific Noise Criteria (PSNC) were determined based on background noise levels in accordance with INP guidelines.

Noise levels were predicted using RTA Technology's Environmental Noise Model. Results were calculated for prevailing meteorological conditions determined from a meteorological station in the area.

Predictions under neutral atmospheric conditions are less than PSNC for all scenarios. There is no increase to existing site noise emissions predicted due to operation of proposed loadout infrastructure during these conditions.

Results indicate PSNC are already exceeded due to operation of the existing site during enhancing meteorological conditions. Existing site predictions for the night period range from $L_{Aeq,15minute}$ 37 to 40 dB. In accordance with Section 10 of the INP, where noise levels exceed PSNC, the regulator and noise source manager may need to negotiate achievable noise limits for the operation. The achievable noise limits may be greater than PSNC. Noise limits are typically set after reasonable and feasible noise mitigation strategies have been considered. The EPA has requested Rixs Creek undertake a Pollution Reduction Program (PRP); noise mitigation strategies will be comprehensively assessed in the PRP. However, in the interim, it is suggested that achievable noise limits for the existing operation and the Proposal are based on results presented in this assessment.

With the exception of the stockpile dozer, the remaining infrastructure associated with the Proposal would operate with relatively constant noise output. It is unlikely the additional infrastructure would be noticeable to residents in the assessment area. Operating the dozer on the western side of the stockpiles, as low as possible, during enhancing meteorological conditions should reduce loadout infrastructure levels by 3 to 4 dB during the night period.

In overall terms, the proposed loadout infrastructure would likely cause a minor increase to Rixs Creek noise levels to receptors in the assessment area. Rail loadout noise generated by the Proposal is generally low level, and it is unlikely it to be noticeable at modelled NSR locations.

It should be noted that the predictions in this assessment represent absolute worst-case impact for the following reasons:

- The train on the rail loop is modelled in the most exposed location on the loop. At other stages during the loading cycle, train contributions would be significantly less;
- The stockpile dozer is modelled in the most exposed location high on the eastern side of the stockpiles. The dozer would often work in less exposed locations, and dozer contributions would typically be less than modelled;
- Predictions are for worst case prevailing meteorological conditions. While it is acknowledged these meteorological conditions occur on a regular basis, the situation where the worst-case alignment of plant mentioned above coinciding with these conditions would likely not occur very often. As such, the predictions represent the likely upper limit of received levels rather than the typical case.

Rixs Creek maintain a complaints register; only two noise complaints have been received from the Retreat Road, Bridgman Road and Singleton Heights areas in the last ten years. The lack of complaints suggests noise from Rixs Creek is not a cause of concern to residents in these areas. It is noted that the Main Northern Railway, which frequently generates noise levels well above those generated by Rixs Creek, passes between Rixs Creek and these NSR.

Assessment of low frequency noise indicates existing low frequency noise levels are less than the desirable low frequency criterion adopted in this assessment. No increase to existing low frequency noise is predicted as a result of the Proposal.

No exceedance of the sleep disturbance criterion is predicted.

Off site construction (the rail spur) was assessed against the ICNG. Exceedances of the standard construction hours criterion are predicted when construction occurs in the most exposed locations. It is recommended community consultation be undertaken prior to commencing work in areas where exceedance of the construction noise criterion may occur, and best practice management techniques are implemented to minimise noise impact. A construction noise management plan should be developed to outline work practices that will be implemented to minimise noise, and describing a noise complaints handling protocol.

On site construction (the rail loop, conveyors and rail loading infrastructure) was assessed against PSNC. No exceedances of PSNC are predicted at any NSR during the day and evening periods due to the worst-case construction scenario considered. Bulk earthworks are not scheduled for the night period, however, the lower end of the range results indicates that

this a feasible option when undertaken in non-exposed areas. Other on site construction tasks such as conveyor and rail loading facility construction would require far less noise emitting plant than the earthworks, and would occur in the general vicinity of the existing CHPP. No increase to existing site noise levels is expected as a result of these activities. Tasks with potential to cause sleep disturbance should be avoided during the night period.

Global Acoustics Pty Ltd

Table of Contents

Appendices

1 INTRODUCTION

Rixs Creek Pty Limited (Rixs Creek) propose to develop a rail loop and loading facility (the Proposal) adjacent to the Coal Handling and Preparation Plant (CHPP) at their open cut coal mine located approximately 5 km northwest of Singleton, NSW. The proposed modification is being sought under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Rixs Creek engaged Global Acoustics to undertake an environmental noise impact assessment (NIA) for the Proposal.

1.1 Proposal Description

Rixs Creek currently utilise a rail loading facility owned and operated by Integra Coal to transport product coal to the port of Newcastle. Coal is transported from the Rixs Creek CHPP to the rail loading facility via rear dump trucks. Possible contractual changes with Integra Coal have prompted Rixs Creek to seek approval to construct and operate a rail loading facility located on the Rixs Creek mining lease, to be owned and operated by Rixs Creek. No additional rail movements are required as a result of the Proposal; only the location of loading is to be changed. However, additional infrastructure would be required at Rixs Creek to enable rail loading to occur on site.

Acoustically significant infrastructure associated with the Proposal include:

- Balloon rail loop and spur approximately 5.6 km in length;
- 8500 tonne trains operating on the balloon loop, including arrival, loading and departure;
- Train loading bin;
- Coal reclaim tunnel and conveyor to service the loading bin;
- Stockpile dozer;
- Stacking gantry; and
- Conveyor from existing CHPP to the stockpile area.

This NIA considers operational noise, construction noise, rail noise, and sleep disturbance associated with the Proposal. Operational noise levels due to both existing and proposed plant and infrastructure are assessed. Assessment is in accordance with the NSW Industrial Noise Policy (INP) (DECC[1], 2000).

[1] Now the Environment Protection Authority

1.2 Receptor Locations

Noise sensitive receptors (NSR) located east and southeast of the existing CHPP have potential to receive increased noise impact due to the Proposal. Specifically, NSR located on Retreat Road, Bridgman Road and in the suburb of Singleton Heights may be impacted; one location representative of each of these areas has been assessed. Additionally, indicative noise contours have been generated covering the Singleton Heights, Bridgman Road and Retreat Road areas.

Modelled NSR are listed in Table 1.1, and shown in Figure 1.

Table 1.1 RECEPTOR LOCATIONS

Receptor ID	Location
R1	427 Bridgman Road
R2	22 Retreat Road
R3	120 Gardener Circuit

The selection of each receptor is justified below:

R1: There is a scattering of NSR on the western side of Bridgman Road. Out of these, R1 was chosen, as it is the closest and most exposed. R1 is located atop a ridge that runs parallel and to the west of Bridgman Road; all other NSR in the group are east of this ridge, which provides shielding from site noise.

R2: This NSR is approximately the closest of an extensive group of residences stretching away to the east from Bridgman Road. There are a couple of NSR east of Bridgman Road and closer to site than R2, however, these were not adopted as receptors as local topographic shielding should result in lower site noise levels there (not considered representative of the majority).

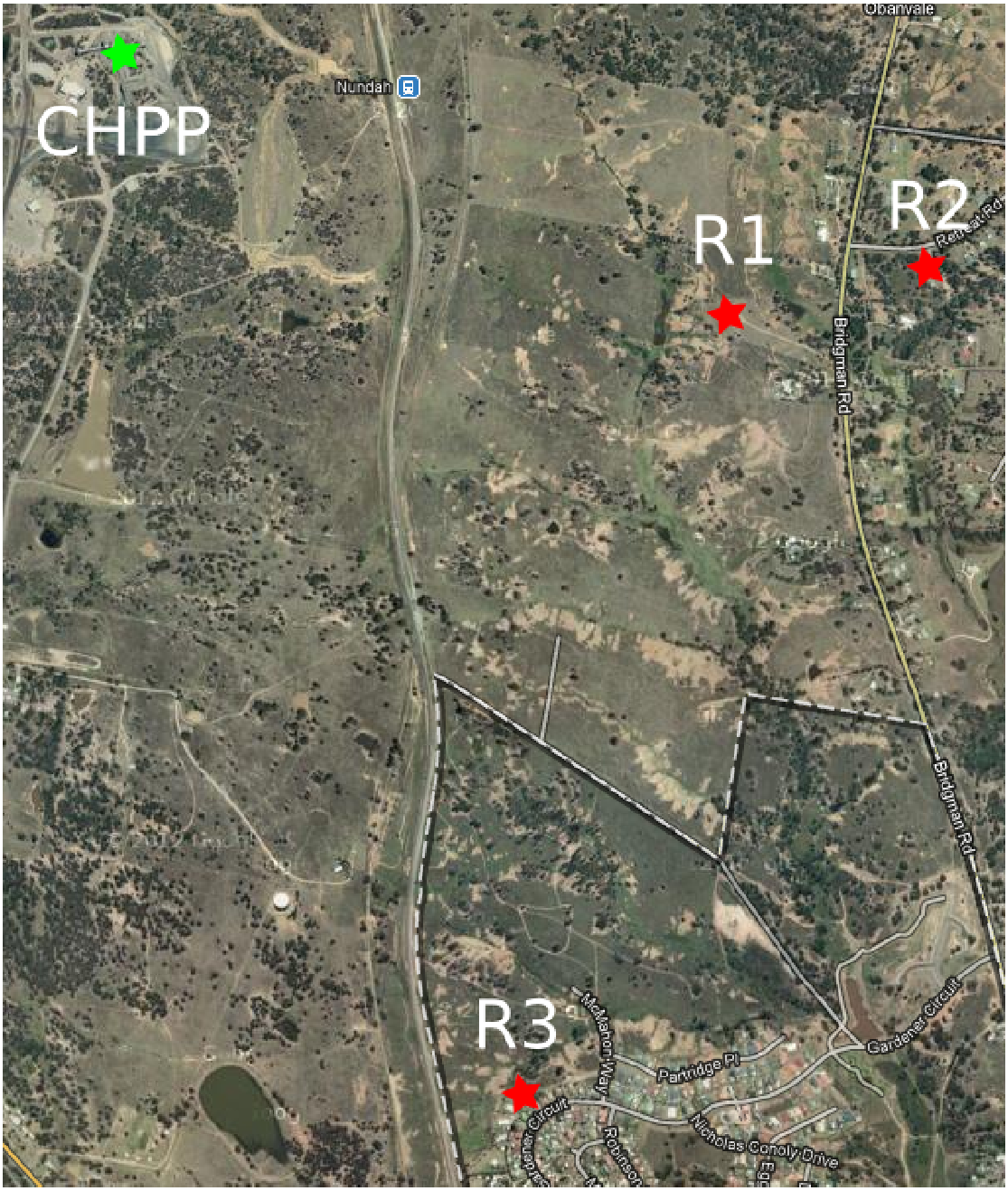
R3: Singleton Heights is a suburb of Singleton located southeast of the site. R3 is the nearest and most exposed residence in the suburb.

NSR south of Rixs Creek West Pit in the Maison Dieu area are considered to be located at sufficient distance from the proposed rail infrastructure that noise impact from the Proposal is highly unlikely; these NSR have not been assessed.

1.3 Terminology

Some definitions of acoustic terminology are as follows:

- L_A, the A-weighted root mean squared (RMS) noise level at any instant;
- L_{A1}, the noise level which is exceeded for 1 per cent of the time;
- $L_{A1,1\ minute}$, corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms, this represents the maximum measured level, and is often used to assess sleep disturbance;
- L_{A10}, the noise level which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels;
- L_{A90}, the level exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes;
- L_{Aeq}, the average noise energy during a measurement period;
- L_{pk}, the unweighted peak noise level at any instant;
- dB(A), noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise;
- sound power level (L_W denotes linear, L_{WA} denotes A-weighted), 10 times the logarithm of energy radiated from a source (as noise) divided by a reference power, the reference power being 1 picowatt;
- sound pressure level (L_p), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals;
- sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second.;
- Hertz (Hz), cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together;
- ABL, the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period;
- RBL, the background noise level for a period (day, evening or night) determined from ABL data;
- PPV or peak particle velocity, a measure of vibration, typically in units of millimetres per second. This descriptor is commonly used to quantify blast vibration measured in the ground as it has been found to correlate best to structural damage; and
- Overpressure is a transient pressure wave generated by blasting. It is measured on the decibel scale as an un-weighted peak.



Source: Google Maps

Figure 1 Residence Locations

2 INTRODUCTION

Rixs Creek operate under DA N90/00356 approved by the Minister for Urban Affairs and Planning in October 1995. The following extract presents existing noise criteria from the DA.

10. The Applicant shall

(i) comply with the L_{A10} daytime noise level design goals set out below:

The Retreat	*42 dB(A)*
Singleton Heights	*42 dB(A)*
Maison Dieu Road	*38dB(A)*

(ii) comply with the L_{A10} night-time noise level design goals set out below:

The Retreat	*40 dB(A)*
Singleton Heights	*40 dB(A)*
Maison Dieu Road	*38 dB(A)*

The goals relate to average conditions (neutral atmosphere) and not to inversion conditions.

L_{A10} criteria are one of the former ways of assessing noise impacts. The INP addresses noise impacts in terms of energy average, the current descriptor being $L_{Aeq,15minute}$. It is anticipated that as a result of this assessment, the regulatory authorities will seek to contemporise noise criteria for Rixs Creek.

2.1 Operational Noise Criteria

2.1.1 Background Noise Levels

SLR Consulting Australia Pty Ltd (SLR Consulting) was commissioned by Rixs Creek to undertake background noise logging in the Retreat Road and Singleton Heights areas. Unattended noise logging was conducted at 5 Partridge Close, Singleton Heights, and, the intersection of Bridgman and Retreat Roads during May and June 2011. Data recorded at Retreat Road was affected by nearby dust monitoring equipment and was deemed invalid. In our opinion, background levels in the absence of mining noise in the Retreat Road area would be less than L_{A90} 30 dB in more than half of all time periods. Therefore, an RBL of L_{A90} 30 dB has been adopted for deriving noise criteria at this location. RBL determined by SLR consulting has been adopted for Singleton Heights.

RBL adopted in this assessment are shown in Table 2.2.

2.1.2 Industrial Noise Policy

Rixs Creek is an existing facility; the CHPP and has been operational since 1993. The INP provides a method for assessing existing premises against noise criteria. The method is essentially the same as for a new development, where project specific criteria are determined, and proposed (or current) operations are assessed against these criteria, with the exception that, should the predicted levels exceed any criterion, an assessment should be made of feasible and reasonable noise mitigation strategies, and negotiated achievable noise levels

may be agreed upon between the noise source manager and the regulator.

The INP states that objectives for environmental noise are '*to account for intrusive noise and … to protect the amenity of particular land uses*'. To achieve these objectives, limits are specified where the '*intrusiveness criterion essentially means that the equivalent continuous (energy-average) noise level of the source should not be more than 5 decibels (dB) above the measured background level*'. Amenity is protected by '*noise criteria specific to land use and associated activities*'. Amenity criteria '*relate only to industrial-type noise and do not include road, rail or community noise*'.

Applicable intrusiveness and amenity limits are derived independently. These are then compared to determine project specific criteria.

The intrusiveness criterion is expressed as:

$$L_{Aeq,15\ minute} \leq RBL + 5$$

where $L_{Aeq,15\ minute}$ is the L_{Aeq} noise level from the source, measured over 15 minutes and RBL is the rating background level. Where the RBL is less than L_{A90} 30 dB, a value of L_{A90} 30 dB can be adopted.

Amenity criteria caps industrial noise levels. Recommended amenity limits from the INP for residences in a rural area are shown in Table 2.1.

Table 2.1 RECOMMENDED AMENITY CRITERIA, LAeq dB

Period	Acceptable	Maximum
Day	50	55
Evening	45	50
Night	40	45

2.1.3 Project Specific Noise Criteria

Table 2.2 summarises the intrusiveness and amenity criteria that apply for day, evening and night periods. In accordance with INP guidelines, the lower of the two (intrusiveness or amenity) apply and are normally adopted as Project Specific Noise Criteria (PSNC).

Table 2.2 PROJECT SPECIFIC NOISE CRITERIA

Period	Acceptable Amenity Criterion L_{Aeq} dB	RBL	Intrusiveness Criterion L_{Aeq} dB	Project Specific Criterion $L_{Aeq,15min}$ dB
Retreat Road Area (R1 and R2)				
Day	50	30	35	35
Evening	45	30	35	35
Night	40	30	35	35
Singleton Heights (R3)				
Day	50	31 [1]	36	36
Evening	45	32 [1]	37	37
Night	40	30 [1]	35	35

Notes: 1. Singleton Heights RBL determined by SLR Consulting.

The above project specific criteria are mainly intended as a planning control for new facilities. However, this site has been in operation for approximately 20 years and can be considered a part of the existing acoustic environment.

It should also be noted that the Great Northern Railway passes through the assessment area between the Proposal and all NSR. Noise from trains will be, at times, considerably higher than criteria for the proposal. Further, the trains themselves, besides being frequent, are very long and powered by multiple locomotives. This information is presented here to provide context for later discussion about predicted results.

Section 10 of the INP requires that for existing facilities, existing noise levels be compared against derived PSNC. Existing CHPP noise levels are therefore assessed and compared against, in following sections, limiting PSNC indicated in Table 2.2.

2.1.4 Sleep Disturbance Criterion

The INP does not provide guidelines for determining sleep disturbance criteria. The general consensus in documents that do discuss sleep disturbance is that effects of noise on sleep are not well understood, and further research is required. Reference to three NSW documents that discuss sleep disturbance criteria follow:

- The '*Environmental Noise Control Manual*' (ENCM, EPA 1985) recommends a sleep disturbance criterion of 15 dB above the night period background level.
- With regard to reducing the possibility of sleep disturbance, the '*NSW Road Noise Policy*'

(RNP, DECCW 2011) guidelines recommend that the internal L_{Amax} needs to be limited to 55 – 50 dB. An exterior criterion of L_{Amax} 60 dB results if a 10 dB loss through open windows is adopted (as suggested in the policy). An alternative L_{Amax} criterion of background levels + 15dB is also discussed in the ECRTN.

- Although the INP does not specifically address sleep disturbance, the EPA have published a '*Noise Guide for Local Government*' (NGLG, DECCW[2] 2010), which states: '*where sleep disturbance is being assessed, $L_{A1,60\ seconds}$ or L_{Amax} noise level is most appropriate, and the measurement position might be outside the bedroom window. Sleep may be disturbed if the source noise level exceeds the background noise by more than 15dBA'.*

Of the above recommendations, the most conservative criterion is an $L_{A1,1\ minute}$ noise level of 15 dB above the night period background level; this criterion has been adopted in this assessment.

The night period background noise level of L_{A90} 30 dB applies to all receptors in this assessment. Therefore, a sleep disturbance criterion of $L_{A1,1\ minute}$ 45 dB has been adopted for all NSR.

2.2 Rail Noise Criteria

Rail noise generated by trains utilising the on site rail loop contribute to the sites operational noise, therefore PSNC outlined in Table 2.2 are applicable.

Rail noise generated by trains utilising the rail spur (approaching/departing the loop) is not attributable to the sites operational noise, therefore acceptable amenity criteria outlined in Table 2.1 are applicable. There will be no increase to rail movements required relative to the existing rail movements to the Integra Coal loading facility. The diversion of Rixs Creek trains onto the proposed rail spur, which runs approximately parallel to, but further west of the main line, should result in no appreciable change to rail noise relative to the existing movements on the Main Northern Railway. Rail noise due to the proposed rail spur is not discussed further in this assessment.

2.3 Construction Noise Criteria

Separate criteria have been adopted for off site and on site construction tasks. More than half of the rail spur (from the take off point from the main line to the start of the loop) will be located outside the colliery holding, and as such is "off site". For simplicity of assessment, the entire rail spur has been treated as off site construction, from the take off point from the main line to the start of the loop. Construction activities north of the start of the rail loop, including construction of conveyors and rail loading facilities are considered "on site".

2.3.1 Off Site Construction

[2] Now the Environment Protection Authority

Whilst construction associated with mining projects is typically required to comply with operational noise criteria, construction of the rail spur to the start of the loop is a discrete activity that is generally well removed from the site. Such construction when not part of a mining project is typically assessed against criteria outlined in the '*Interim Construction Noise Guideline*' (ICNG) (DECC[3], 2009). The estimated duration required to complete all elements of the construction program is eleven months. Given that off site construction works are only temporary, it is not unreasonable that offsite construction for the Proposal be assessed against the ICNG.

Criteria for construction work prescribed in the ICNG are:

- $L_{Aeq,15minute}$ equal to background plus 10 dB during standard construction hours; and
- $L_{Aeq,15minute}$ equal to background plus 5 dB for work outside the standard construction hours.

The guideline specifies standard construction hours as:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

Therefore, adopting the background levels mentioned above, criteria listed in Table 2.3 would apply.

Table 2.3 CONSTRUCTION NOISE CRITERIA - $L_{Aeq,15minute}$

Period	RBL	Applicable Adjustment to RBL	Construction Criterion
Retreat Road Area (R1 and R2)			
Day	30	+10	40
Evening	30	+5	35
Night	30	+5	35
Singleton Heights (R3)			
Day	31 [1]	+10	41
Evening	32 [1]	+5	37
Night	30 [1]	+5	35

Notes: 1. Singleton Heights RBL determined by SLR Consulting.

All off site construction work is scheduled to occur during standard construction hours; therefore, day period criteria listed in Table 2.3 would apply.

[3] Now the Environment Protection Authority

2.3.2 On Site Construction

On site construction tasks can be considered to be part of the mining operation, and are assessed the operational noise criteria (PSNC) listed in Table 2.2. It is noted that major noise generating work such as bulk earthworks would likely be restricted to the day period in order to comply with PSNC. However, less critical tasks such as construction of the conveyors and load out infrastructure could occur 24 hours per day if required, subject to managing noise within relevant criteria.

The sleep disturbance criterion of $L_{A1,1minute}$ 45 dB would apply to any construction undertaken during the night period.

2.4 Low Frequency Noise Criteria

Two methodologies have been adopted for assessment of LFN:

- Evaluation of LFN through comparison of C-weighted and A-weighted predicted total noise levels at receptors, as per INP guidelines. In this method, the difference between C–weighted and A-weighted levels at receptor locations is calculated, and if the difference is greater than or equal to 15 dB, a 5 dB penalty (modifying factor) is added to predicted levels; and

- Evaluation of LFN through comparison of total predicted C-weighted levels at receptor locations with an upper limit criterion. This method is in accordance with recommendations published in *A Simple Method for Low Frequency Noise Emission Assessment* (Broner, 2010), published in the Journal of Low Frequency Noise, Vibration and Active Control, Volume 29 Number 1 2010. The author of the document recommends outdoor criteria for LFN assessment; the following extract from the document presents recommended criteria. If the total predicted C– weighted noise level at a receptor exceeds the relevant criterion a 5 dB penalty (modifying factor) is added to predicted levels. In this assessment, the desirable limit for residential receptors of L_{Ceq} 60 dB has been adopted.

Table 2.4 LOW FREQUENCY NOISE CRITERIA – BRONER METHOD

Land Use	Sensitive Receiver	Range	Criterion L_{Ceq} dB
Residential	Night time or plant operation 24/7	Desirable Maximum	60 65
	Daytime or Intermittent (1 – 2 hours)	Desirable Maximum	65 70
Commercial/Office	Night time or plant operation 24/7	Desirable Maximum	70 75
Industrial	Daytime or Intermittent (1 – 2 hours)	Desirable Maximum	75 80

Source: A Simple Method for Low Frequency Noise Emission Assessment by N. Broner

3 METHODOLOGY

3.1 Operational Noise Modelling Assessment

Noise levels were predicted using RTA Technology's Environmental Noise Model (ENM), a computer based environmental noise model, to determine the acoustic impact of operational and construction noise. The model takes into account geometric spreading, atmospheric absorption, and, barrier and ground attenuation.

Results were calculated for prevailing meteorological conditions determined from a meteorological station in the area. This method is in accordance with the guidelines detailed in the INP and predicts noise levels for prevailing meteorological conditions. The INP defines prevailing conditions as those that occur more than 30 percent of any time period, in any season. Temperature inversion conditions are to be considered if there is more than 30 percent occurrence of stability classes F and G during winter nights (18:00 to 07:00). A discussion of meteorological data analysis is included below.

ENM Terrain Category 2, representing a rural land environment, was adopted for model input.

Assessed model scenarios are discussed in Section 4.2.

3.2 INP Modifying Factors

Section 4 of the INP requires consideration of modifying factors. These are characteristics of noise received at receptor locations that could result in more annoyance than would normally occur from that level. The modifying factors are tonal noise, low frequency noise, impulsive noise, intermittent noise and duration (if single event).

Years of environmental noise monitoring of open cut mining by Global Acoustics has shown that these factors are rarely if ever applicable. In this Proposal, the CHPP and idling locomotives present a potential source of LFN. Evaluation of LFN in this assessment is through comparison of total predicted C-weighted levels at receptor locations with an upper limit criterion as described above.

3.3 Sleep Disturbance

Sleep disturbance is typically assessed by predicting maximum noise levels from plant items known to generate noise levels and which stand out above the general mining continuum. The stockpile dozer has been identified as the noise source on site most likely to cause sleep disturbance. A maximum sound power of L_W/L_{WA} 124/120 dB has been used in this assessment to determine sleep disturbance impacts from the stockpile dozer.

Sleep disturbance results are presented in Section 1.1.

4 NOISE MODEL PARAMETERS

4.1 Meteorology

Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions - that is, no wind or temperature gradient. Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receiver due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed (absolute and/or relative) with height.

Noise levels are increased when the wind blows from source to receiver or under temperature inversion conditions (both of which are sometimes referred to as adverse weather conditions), and decreased when the wind blows from receiver to the source or under temperature lapse conditions.

One full year of meteorological data from a weather station in the local area was analysed to determine prevailing meteorological conditions. Data from a nearby Mount Owen meteorological station was analysed. There were 84,857 15-minute records out of a possible 87,456 between September 2008 to February 2011, representing 97 percent data capture. The determined prevailing conditions are typical of the Hunter Valley. Sigma-theta data was analysed, in accordance with procedures in Appendix E of the INP, to determine the appropriate stability class and associated vertical temperature gradient for each weather record.

4.1.1 Prevailing Meteorological Conditions

Section 5 of the INP provides procedures for considering meteorological effects. The effects of gradient winds, drainage flow winds and temperature inversions need to be considered.

Wind effects need to be assessed when wind is considered to be a feature of the area. Wind is considered a feature of the area when source-to-receiver wind speeds (at 10m height) of 3 m/s or less occur for more than 30 percent of the time in any time period, in any season.

Temperature inversions need to be assessed when there is more than a 30 percent occurrence during winter nights (June, July, August). The time period used for this assessment is 18:00 to 07:00 as per INP guidelines. Default values are provided for temperature inversion and drainage flow wind speed for use when required. Alternatively, actual measured values may be used (INP, 2000). It is our understanding the EPA now prefer a vertical temperature gradient of 4 degrees per 100 metres be assessed in lieu of the INP default value of 3 degrees per 100 metres; on this basis, 4 degrees per 100 metres has been adopted in this assessment for assessment of temperature inversion conditions.

The INP defines drainage flow wind as the localised drainage of cold air under the influence of local topography and travels in one direction only (direction of decreasing altitude).

Inspection of the topography in the assessment area reveals that an intervening ridge of land would prevent cold air drainage from occurring from the CHPP area to the NSR. As such drainage flow winds have not been included in this assessment.

A comprehensive assessment of meteorological data has been conducted in accordance with INP guidelines. Based on the analysis of meteorological data, the conditions listed in Table 4.1 are included in this assessment as prevailing meteorological conditions. Results presented in this assessment are the maximum calculated result at each NSR for each of the meteorological conditions listed in Table 4.1 for the relevant time period.

Table 4.1 METEOROLOGICAL CONDITIONS INCLUDED IN ASSESSMENT AS PREVAILING CONDITIONS

Temperature OC	Humidity %	Wind Speed m/s	Wind Direction Degrees	VTG °/100m
		Night Period		
10	80	0	-	-0.5
10	80	3	0	-0.5
10	80	2.25	135	-0.5
10	80	2.25	157.5	-0.5
10	80	3	337.5	-0.5
10	80	0	-	4
		Evening Period		
10	80	0	-	-0.5
10	80	2.25	90	-0.5
10	80	2.25	112.5	-0.5
10	80	2.25	135	-0.5
10	80	2.25	157.5	-0.5
		Day Period		
10	80	0	-	-0.5
10	80	2.25	157.5	-0.5
10	80	3	90	-0.5
10	80	3	112.5	-0.5
10	80	3	135	-0.5

4.2 Operational Scenarios

Two model scenarios representing existing operations, and, proposed rail infrastructure were assessed. Figure 2 shows the layout of proposed rail infrastructure.

4.2.1 Existing operations

Noise from existing operations was predicted to estimate the current level of noise impact at modelled NSR locations. Operations in North Pit and West Pit are considered to be located at sufficient distance from modelled NSR that influence on predicted levels from sources operating in those pits would be insignificant; these pits were not included in the assessment.

Existing noise levels at modelled NSR locations would primarily be generated by the CHPP and associated infrastructure. Noise sources included in the existing operations scenario for the CHPP were:

- Washery;
- Breaker;
- CHPP conveyors and conveyor drives;
- Reject haul to West Pit; and
- ROM coal haul from West Pit to the ROM. Three trucks were modelled on this route.

4.2.2 Proposed rail infrastructure.

Rixs Creek currently utilise a rail loading facility owned and operated by Integra Coal to transport product coal to the Port of Newcastle. Coal is transported from the Rixs Creek CHPP to the rail loading facility via rear dump trucks. Possible contractual changes with Integra Coal have prompted Rixs Creek to seek approval to construct and operate a rail loading facility located on the Rixs Creek mining lease, to be owned and operated by Rixs Creek.

Noise sources associated with the Proposal that were included in the proposed infrastructure model scenario include:

- Balloon rail loop and spur approximately 5.6 km in length;
- 8500 tonne trains operating on the balloon loop, including arrival, loading and departure;
- Train loading bin;
- Coal reclaim tunnel and conveyor to service the loading bin;
- Stockpile dozer;

- Stacking gantry; and
- Conveyor from existing CHPP to stockpile area.

The locomotives were modelled as a series of segments, representing a series of 15-minute loading intervals from the bin to the end of the loop. Each segment was 250m long, representing a loading speed of 1000m per hour.

4.3 Construction Scenarios

Construction noise scenarios developed in this assessment are based on information provided in a tender document for construction titled "*Construction Methodology – Proposed Rixs Creek Rail Loop and Associated Infrastructure*" prepared by Abigroup. The following extract lists primary construction activities:

Construction

- Rail Deviation Construction including:
  - clearing vegetation within the nominated construction footprint;
  - stripping & stockpiling topsoil;
  - construction of internal haul roads;
  - bulk earthworks – cut to fill within the rail alignment;
  - bulk earthworks – cut to spoil to designated spoil area;
  - excavation, lay and backfill of drainage pipe culverts;
  - construction of a new concrete culvert to access inside loop;
  - construct visual bund;
  - construction of rail track for loop ;
  - cut and embankment batter stabilisation;
  - landscaping following construction;
- Possession of Railway:
  - Tie-in the new rail deviation to the existing Main Northern Rail corridor;
  - Recondition the existing formation at tie in;
- Post Possession Works including:
  - remove existing track and stack track components for reuse;
- Conveyor, train load out bin, reclaim tunnel;
- Other Construction Work:
  - Site stabilisation and rehabilitation;
  - Landscaping;
- Finishing works:
  - Removal of temporary construction compounds;
  - Remove and restore temporary construction compounds; and
  - General site clean-up.

Chapter 7 of the Construction Methodology lists indicative plant types and quantities to be utilised during each stage of construction. Bulk earthworks requires the greatest amount of

noise generating plant, and has therefore been adopted as the worst-case construction activity for assessment of construction noise. Track construction will also require a significant quantity of noise generating plant; however, the total sound power of plant required is less than for the bulk earthworks; therefore noise generated during that phase of construction should be less than the predictions for the earthworks.

The proposed rail loop and spur is approximately 5.6km long, therefore the degree of noise impact will vary depending on the proximity of construction at any given time relative to NSR.

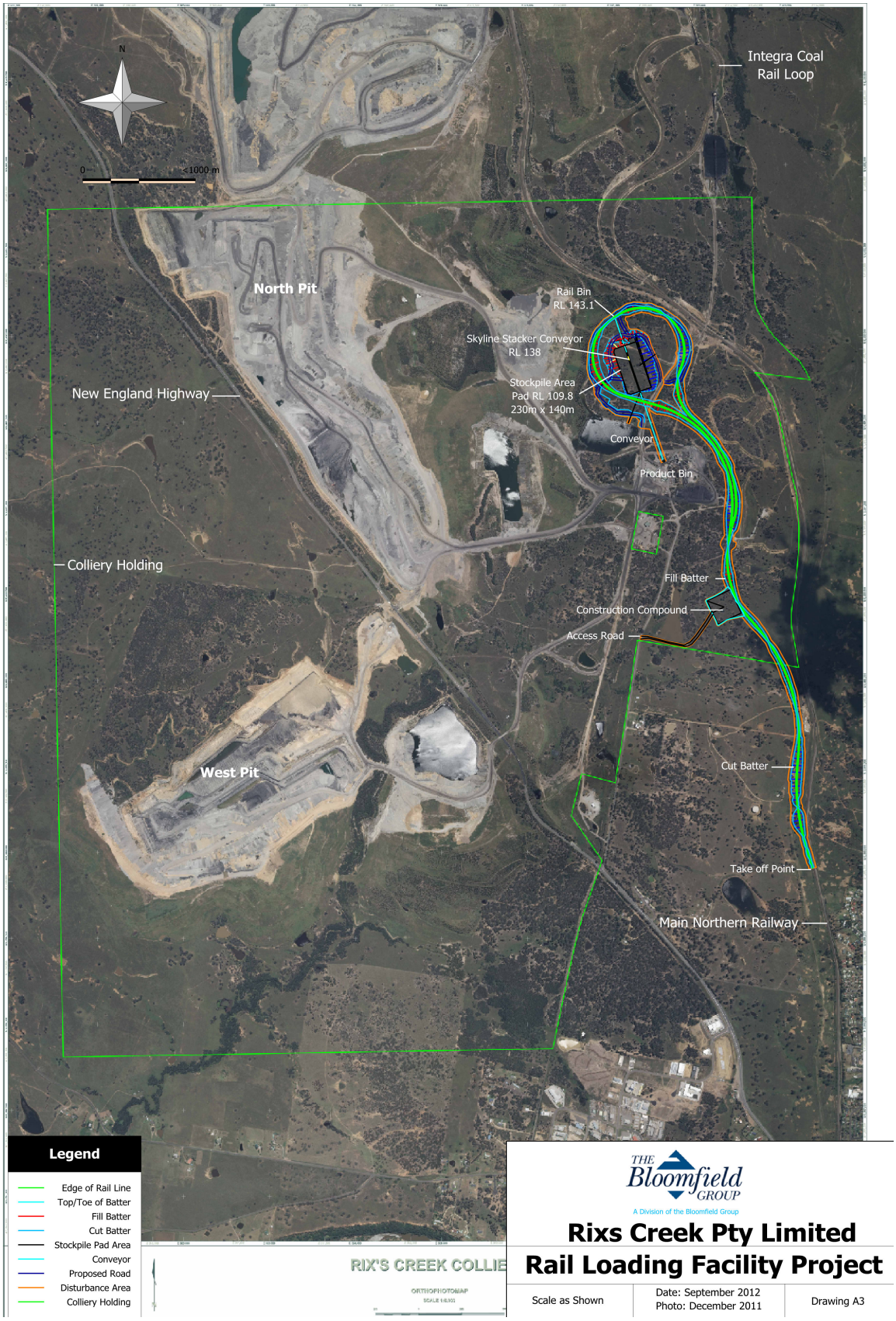
For the rail spur (off site construction), each 100-metre interval from the take off point to the start of the rail loop was considered independently. It was conservatively assumed that all scheduled earthworks plant would operate within the 100m intervals; plant was distributed equally over each 100-metre length. A plant utilisation rate of eighty percent was assumed. Worst-case impact was determined by taking the highest result determined from all of the segments modelled.

The same approach was adopted for the rail loop; each 100-metre segment from the start of the loop to the proposed load out bin on the eastern side of the loop was modelled.

Table 4.2 lists quantities of construction plant included in the model.

Table 4.2 CONSTRUCTION PLANT INCLUDED IN MODELS

Description	Quantity
Dozer (D11)	1
Dump Truck (30t)	2
Excavator (30t)	2
Compactors	2
Roller	2
Scraper	6
Water Cart	2



Source: Rixs Creek, 2012

Figure 2 Rail Infrastructure Layout

4.4 Plant Sound Power

$L_{Aeq,15minute}$ sound power data was used for model inputs for all sources other than the train, coal haul trucks, and reject trucks. For these items, the acoustic energy was averaged over the length of the operating route under consideration by creating a string of points to represent their path.

Truck sound powers were incorporated into haul routes by creating haul route strings consisting of an equivalent 30 second sound power for all haul trucks on each haul route. This methodology distributes the acoustic energy of the haul trucks along the length of the haul route. Routes comprised a string of segments of varying lengths, each having an $L_{Aeq,30second}$ sound power determined by the following:

- Sound power for type of trucks on route. Trucks travelling down ramps greater than 5% grade were allocated a reduced sound power;
- Number of each truck type on route in 15-minute period, based on loading unit load capacity;
- Speed of truck on segment grade toward dump/ROM; and
- Speed of truck on segment grade from dump/ROM.

Truck speeds are relative to grade in direction of travel and were allocated in accordance with truck speed data collected from mine sites in the Hunter Valley. Speed determined the spacing of each segment, an important variable when calculating L_{Aeq} for a specific time period.

Train sound powers were incorporated by creating strings of points representing the sections of track the train would travel in each 15-minute period. The sound power of each string point was determined using the speed of the train at each point.

Sound power for the washery and breaker was from data measured by Global Acoustics at Rixs Creek during September 2012.

Sound power for the locomotives was from data measured by Global Acoustics at Bloomfield Colliery during September 2012.

Sound power for conveyors, drives, rail bin, and dozer were based on representative sound power for similar items in service in the Hunter Valley.

Sound power for coal and reject haul trucks were based on standard (un-attenuated) Caterpillar 793 trucks.

Sound power for construction plant was based on sound power of representative plant items

in service in the Hunter Valley, measured by Global Acoustics.

Sound powers used in modelling are shown in Table 4.3.

Table 4.3 SOUND POWER DATA

	Octave Band Sound Power Spectrum, L_{eq} dB									Total Leq dB	
Description	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Operational Plant											
Washery - north façade	130	123	113	111	110	108	105	99	87	**131**	**113**
Washery - east façade	134	122	115	113	114	108	104	98	88	**134**	**114**
Washery - west façade	131	124	113	111	110	108	105	99	87	**132**	**113**
Washery - south façade	127	122	113	111	110	108	105	99	87	**129**	**113**
Breaker - north façade	121	119	117	113	116	112	107	98	88	**125**	**117**
Breaker - east façade	121	119	117	113	116	112	107	98	88	**125**	**117**
Breaker - west façade	122	116	115	112	112	109	104	94	82	**124**	**114**
Breaker - south façade	122	116	115	112	112	109	104	94	82	**124**	**114**
Caterpillar 793 haul truck	-	119	123	116	116	113	111	107	104	**126**	**119**
Stockpile dozer	107	109	118	115	112	111	107	101	94	**122**	**115**
Locomotives (3) idling	116	118	112	103	102	100	96	89	79	**121**	**105**
Conveyors per metre	-	77	77	76	76	73	69	61	53	**83**	**78**
Conveyor drives	-	87	86	94	94	90	85	80	85	**99**	**95**
Rail loadout bin	-	110	107	98	97	97	98	91	79	**112**	**103**
Construction Plant											
Dozer (D11)	-	116	118	115	117	116	112	103	96	**124**	**120**
Dump Truck (30t)	-	105	111	110	104	100	99	94	103	**115**	**108**
Excavator (30t)	-	102	115	105	99	97	94	89	86	**116**	**104**

Table 4.3 SOUND POWER DATA

	Octave Band Sound Power Spectrum, L_{eq} dB									Total Leq dB	
Description	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Compactors	-	105	109	108	106	107	100	93	102	**115**	**110**
Roller	-	105	109	108	106	107	100	93	102	**115**	**110**
Scraper	-	110	119	119	113	110	109	105	101	**123**	**117**
Water Cart	-	102	99	96	93	95	94	88	86	**106**	**100**

5 RESULTS

5.1 Operational Noise Results

Table 5.1 and Table 5.2 present model predictions for neutral and prevailing meteorological conditions respectively; results are $L_{Aeq,15minute}$ levels. Results in Table 5.2 are based on the worst-case meteorological condition occurring during each time period. Results include all plant listed in Section 4.2, are based on the highest predictions for rail noise, and consider the stockpile dozer in a worst-case operating location high on the eastern side of the stockpiles. In the tables:

- *Existing Site* refers to the CHPP, including washery, breaker, existing conveyors and drives, and, the ROM and reject hauls;
- *Proposed Loadout* refers to all infrastructure associated with the proposed rail loop, including conveyors and drives from the existing product bin north, rail loadout bin, stockpile dozer and locomotives on loop; and
- *Site Plus Rail* refers to the two above scenarios combined.

Table 5.1 OPERATIONAL NOISE LEVELS, NEUTRAL METEOROLOGICAL CONDITIONS - $L_{Aeq, 15\ minute}$ dB

Receptor		Criteria	Prediction		
ID	**Location**	**D/E/N**	**Existing Site**	**Proposed Loadout Only**	**Existing Site Plus Proposed Rail**
R1	Bridgman Rd	35/35/35	31	21	31
R2	Retreat Rd	35/35/35	28	19	28
R3	Gardiner Cct	36/37/35	25	16	25

Results in Table 5.1 show predictions under neutral atmospheric conditions are less than PSNC for all scenarios. There is no increase to existing site noise emissions predicted due to operation of proposed rail infrastructure during these conditions.

Table 5.2 OPERATIONAL NOISE LEVELS, PREVAILING METEOROLOGICAL CONDITIONS - $L_{Aeq,\ 15\ minute}$ dB

Receptor		Criteria	Prediction			Exceedance		
ID	**Location**	**D/E/N**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**
Existing Site								
R1	Bridgman Rd	35/35/35	31	31	38	Nil	Nil	3
R2	Retreat Rd	35/35/35	28	28	40	Nil	Nil	5
R3	Gardiner Cct	36/37/35	25	25	37	Nil	Nil	2
Proposed Loadout Only								
R1	Bridgman Rd	35/35/35	21	21	39	Nil	Nil	4
R2	Retreat Rd	35/35/35	19	19	36	Nil	Nil	1
R3	Gardiner Cct	36/36/35	16	16	33	Nil	Nil	Nil
Existing Site Plus Proposed Loadout								
R1	Bridgman Rd	35/35/35	31	31	41	Nil	Nil	6
R2	Retreat Rd	35/35/35	28	28	41	Nil	Nil	6
R3	Gardiner Cct	36/37/35	25	25	39	Nil	Nil	4
Change Due To Proposed Loadout								
R1	Bridgman Rd	35/35/35	0	0	3	Nil	Nil	3
R2	Retreat Rd	35/35/35	0	0	1	Nil	Nil	1
R3	Gardiner Cct	36/37/35	0	0	2	Nil	Nil	2

Results in Table 5.2 indicate the following:

Bridgman Road

- Existing site levels are predicted to already exceed PSNC by 3 dB during the night period; no exceedances are predicted during the day or evening periods;
- Addition of proposed loadout infrastructure would cause an increase of 3 dB during the night period, with no increase predicted for the day or evening periods. A 3 dB increase represents a doubling in noise energy, however, would probably not be noticeable.

Retreat Road

- Existing site levels are predicted to already exceed PSNC by 5 dB during the night period; no exceedances are predicted during the day or evening periods;
- Addition of proposed loadout infrastructure would cause an increase of 1 dB during the night period, with no increase predicted for the day or evening periods. An increase of 1 dB is generally imperceptible to the human ear.

Gardiner Circuit (Singleton Heights)

- Existing site levels are predicted to already exceed PSNC by 2 dB during the night period; no exceedances are predicted during the day or evening periods;
- Addition of proposed loadout infrastructure would cause an increase of 2 dB during the night period, with no increase predicted for the day or evening periods. A 2 dB increase would most likely not be noticeable and is not considered significant.

5.2 Operational Noise Contours

Indicative operational noise contours have been generated covering the Singleton Heights, Bridgman Road and Retreat Road areas. For consistency with the single point results in Table 5.2, contours have been generated for:

- The existing site;
- Proposed rail loadout infrastructure only; and
- The existing site combined with proposed rail loadout infrastructure.

"Maximum Envelope" contours have been provided for each time period. These contours represent the worst-case impact considering all prevailing meteorological conditions that apply to the relevant time period. Additionally, noise contours have been provided for the two primary meteorological conditions determining worst-case predictions for the night period, these being temperature inversion conditions, and north-northwest wind at 3 metres

per second. Noise contour figure are presented in Appendix A.

5.3 Sleep Disturbance Results

Table 5.3 presents results of the sleep disturbance assessment. Results are $L_{A1,1minute}$ levels, and are based on the stockpile dozer maximum result combined with the remainder of the site. No exceedance of the sleep disturbance criterion is predicted.

Table 5.3 SLEEP DISTURBANCE RESULTS

Receptor		Criterion	Prediction	Exceedance
ID	**Location**	**Night**	**$L_{A1,1minute}$**	**dB**
R1	Bridgman Rd	45	45	Nil
R2	Retreat Rd	45	44	Nil
R3	Gardiner Cct	45	41	Nil

5.4 Low Frequency Noise Assessment Results

Table 5.4 presents LFN results for operational noise. Results are $L_{Ceq,15minute}$ levels for the worst-case meteorological condition occurring during each time period.

It is noted that C-weighted totals for the existing site presented in Table 5.4 exceed the A-weighted totals presented in Table 5.2 by more than 15 dB. In accordance with current INP policy, a 5 dB LFN penalty should be applied to A-weighted predictions prior to comparing with criteria (in accordance with INP guidelines). However, it is our opinion that assessment of A-weighted and C-weighted totals does not provide an accurate assessment of potential LFN impact. Therefore, the determination of potential LFN impact in this assessment is based on the Broner method described in Section 2.4, where comparison of C-weighted totals is made with a desirable upper limit.

Comparison with the desirable LFN limit shows all C-weighted predictions are less than $L_{Ceq,\ 15\ minute}$ 60 dB. On this basis, operational LFN is not considered likely to cause impact.

Importantly, LFN associated with proposed loadout infrastructure is significantly less than for the existing site, and does not cause any increase to existing LFN levels.

Table 5.4 OPERATIONAL LFN NOISE LEVELS $L_{Ceq,\ 15\ minute}$ dB

Receptor		Criteria	Prediction			Exceedance		
ID	**Location**	**D/E/N**	**Day**	**Evening**	**Night**	**Day**	**Evening**	**Night**
Existing Site								
R1	Bridgman Rd	65/60/60	54	54	58	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	53	53	57	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	49	49	54	Nil	Nil	Nil
Proposed Loadout Only								
R1	Bridgman Rd	65/60/60	39	39	47	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	37	37	46	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	34	34	42	Nil	Nil	Nil
Existing Site Plus Proposed Loadout								
R1	Bridgman Rd	65/60/60	54	54	58	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	53	53	57	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	49	49	54	Nil	Nil	Nil
Change Due To Proposed Loadout								
R1	Bridgman Rd	65/60/60	0	0	0	Nil	Nil	Nil
R2	Retreat Rd	65/60/60	0	0	0	Nil	Nil	Nil
R3	Gardiner Cct	65/60/60	0	0	0	Nil	Nil	Nil

5.5 Construction Noise Results

5.5.1 Off Site Construction

Table 5.5 presents model predictions for off site construction during prevailing meteorological conditions. Results are provided as a range of $L_{Aeq,15minute}$ levels; the range being the lowest and highest predictions from the series of 100-metre segments considered (refer to Section 4.3 for details).

Table 5.5 OFF SITE CONSTRUCTION NOISE LEVELS - $L_{Aeq,\ 15\ minute}$ dB

Receptor		Criterion	Predictions		
ID	**Location**	**D/E/N**	**Day**	**Evening**	**Night**
R1	Bridgman Rd	40	34-47	34-47	35-53
R2	Retreat Rd	40	29-43	29-43	30-49
R3	Gardiner Cct	41	31-61	31-61	41-66

Predictions for Receptors R1 and R2 exceed the construction criterion by 7 and 3 dB respectively during the day period when construction occurs in the most exposed location.

Predictions for Receptor R3 (representative of Singleton Heights) exceed the construction criterion by 20 dB during the day period when construction occurs at the closest point, which is approximately 250m from the residence. However, these levels would only occur when construction is performed on the southern section of the rail spur near the take off from the main line. Predictions reduce to $L_{Aeq,15minute}$ 31 dB during the day period by the time construction reaches the start of the rail loop (end of the spur).

It is recommended community consultation be undertaken prior to commencing work in areas where exceedance of the construction noise criterion may occur, and best practice management techniques are implemented to minimise noise impact. A construction noise management plan should be developed to outline work practices that will be implemented to minimise noise, and describing a noise complaints handling protocol.

5.5.2 On Site Construction

Table 5.6 presents model predictions for on site construction during prevailing meteorological conditions. Results are provided as a range of $L_{Aeq,15minute}$ levels; the range being the lowest and highest predictions from the series of 100-metre segments considered (refer to Section 4.3 for details).

Table 5.6 ON SITE CONSTRUCTION NOISE LEVELS - $L_{Aeq, 15\ minute}$ dB

Receptor		Criterion	Predictions		
ID	**Location**	**D/E/N**	**Day**	**Evening**	**Night**
R1	Bridgman Rd	35	25-34	25-34	28-50
R2	Retreat Rd	35	22-31	22-31	25-48
R3	Gardiner Cct	36	18-29	18-29	23-42

No exceedances of PSNC are predicted at any NSR during the day and evening periods. As discussed in Section 4.3, these results are based on the worst-case construction activity (bulk earthworks). It is highly unlikely that bulk earthworks would be required to be undertaken during the night period, however, the lower end of the ranges of results indicate that this a feasible option when undertaken in non exposed areas.

Other on site construction tasks such as conveyor and rail loading facility construction would require far less noise emitting plant than the earthworks, and would occur in the general vicinity of the existing CHPP. No increase to existing site noise levels is expected as a result of these activities. Tasks with potential to cause sleep disturbance should be avoided during the night period.

6 DISCUSSION

6.1 The Proposal

During neutral and non-enhancing meteorological conditions, the Proposal is not predicted to increase noise levels above those currently generated by the site. During enhancing meteorological conditions, a maximum predicted increase of $L_{Aeq,15minute}$ 3 dB results. Analysis of model results shows the stockpile dozer is predicted to generate the majority of noise associated with the Proposal. Sensitivity modelling shows that when the dozer operates in more shielded locations, such as on the western side of the stockpile, or at the base of the stockpile, significant reductions in dozer generated noise results. Results in Table 5.1 and Table 5.2 are based on an exposed operating position for the dozer, as this represents the worst-case. By way of noise control it is recommended consideration be given to selecting a dozer with low sound power, minimal track slap noise, restricting operation to 1st gear during adverse weather and at night, and, operating on the west side of the stockpile when possible during adverse weather.

Analysis of rail model results shows a segment from approximately 750m to 500m from the end of the loop represents the worst section of the rail loop, as the track is on an elevated embankment at that stage. Contributions to total predicted levels from the locomotive alone are $L_{Aeq,15minute}$ 33, 30 and 20 dB for receptors R1, R2 and R3 respectively. Predictions while operating on the remainder of the loop are less than these levels.

The last approximately 250m of the loop is in a cutting, which provides good topographical shielding to the east. The highest prediction while idling in the cutting is $L_{Aeq,15minute}$ 21 dB. It is recommended this location be used for trains to idle if required to wait for other trains to clear the track

With the exception of the stockpile dozer, infrastructure associated with the Proposal would operate with relatively constant noise output. It is unlikely the additional infrastructure would be noticeable to residents in the assessment area. Operating the dozer on the western side of the stockpiles, as low as possible during enhancing meteorological conditions, should reduce rail infrastructure levels by 3 to 4 dB during the night period.

In overall terms, the proposed loadout infrastructure would likely cause a minor increase to Rixs Creek noise levels to receptors in the assessment area. Rail loadout noise generated by the Proposal is generally low level, and it is unlikely it to be noticeable at modelled NSR locations.

It should be noted that the predictions in this assessment represent absolute worst-case impact for the following reasons:

- The train on the rail loop is modelled in the most exposed location on the loop. At other stages during the loading cycle, train contributions would be significantly less;

- The stockpile dozer is modelled in the most exposed location high on the eastern side of the stockpiles. The dozer would often work in less exposed locations, and dozer contributions would typically be less than modelled;

- Predictions are for worst case prevailing meteorological conditions. While it is acknowledged these meteorological conditions occur on a regular basis, the situation where the worst-case alignment of plant mentioned above coinciding with these conditions would likely not occur very often. As such, the predictions represent the likely upper limit of received levels rather than the typical case.

6.2 Noise Limits

Results in Table 5.2 indicate PSNC are already exceeded due to operation of the existing site during enhancing meteorological conditions. Existing site predictions for the night period range from $L_{Aeq,15minute}$ 37 to 40 dB, which is generally in line with the existing noise criterion of L_{A10} 40 dB; L_{A10} levels could reasonably be expected to be 1 to 2 dB higher than L_{Aeq} levels for a site such as Rixs Creek that generally operates with fairly constant noise output from the CHPP.

PSNC derived in accordance with the INP in Section 2.1 are mainly intended as a planning control for new facilities. However, this site has been in operation for approximately 20 years and can be considered a part of the existing acoustic environment. In accordance with Section 10 of the INP, where noise levels exceed PSNC, the regulator and noise source manager may need to negotiate achievable noise limits for the operation. The achievable noise limits may be greater than PSNC. Noise limits are typically set after reasonable and feasible noise mitigation strategies have been considered. The EPA has requested Rixs Creek undertake a Pollution Reduction Program (PRP); noise mitigation strategies will be comprehensively assessed in the PRP. However, in the interim, it is suggested that achievable noise limits for the existing operation and the Proposal are based on results presented in this assessment.

Rixs Creek maintain a complaints register; only two noise complaints have been received from the Retreat Road, Bridgman Road and Singleton Heights areas in the last ten years. The lack of complaints suggests noise from Rixs Creek is not a cause of concern to residents in these areas. It is noted that the Main Northern Railway, which frequently generates noise levels well above those generated by Rixs Creek, passes between Rixs Creek and these NSR.

A likely explanation (an assumption) for the lack of complaints is that in context of the overall acoustic environment of the area, noise from Rixs Creek is, while at times likely to exceed usual annoyance levels, relatively benign in comparison with the regular passage of trains which are closer and more exposed. Rail noise levels are expected to be significantly higher than Rixs Creek during all meteorological conditions. Any atmospheric conditions that enhance noise from the direction of the Proposal will similarly enhance rail noise, both sources being west of the NSR. It is acknowledged that temperature inversions can sometimes result in more distant sources being enhanced more than those closer, however, in this case, the expected difference between rail noise and Rixs Creek is likely to be such (rail noise somewhat higher) that occasions when the latter would approach similar levels should be rather infrequent (if occurring at all).

Certainty with regard to this assumption could only result from monitoring of rail noise in the area. However, this was not undertaken, the criteria derivation process for industrial noise sources does not factor in levels from transportation noise events.

7 SUMMARY

Rixs Creek engaged Global Acoustics to undertake an environmental noise impact assessment for a proposal to develop a rail loop and loading facility adjacent to the CHPP at the Rixs Creek mine. The proposed modification is being sought under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Noise sensitive receptors (NSR) located on Retreat Road, Bridgman Road and in the suburb of Singleton Heights have potential to be impacted; one location representative of each of these areas has been assessed. NSR located south of Rixs Creek West Pit in the Maison Dieu area are considered to be at sufficient distance from the proposed rail infrastructure that noise impact from the Proposal is highly unlikely; these NSR have not been assessed.

Rixs Creek operate under DA N90/00356. Criteria in the Approval are L_{A10} based; L_{A10} criteria are one of the former ways of assessing noise impacts. It is anticipated that as a result of this assessment, the regulatory authorities will seek to contemporise the noise criteria for Rixs Creek. Project Specific Noise Criteria (PSNC) were determined based on background noise levels in accordance with INP guidelines.

Noise levels were predicted using RTA Technology's Environmental Noise Model. Results were calculated for prevailing meteorological conditions determined from a meteorological station in the area.

Predictions under neutral atmospheric conditions are less than PSNC for all scenarios. There is no increase to existing site noise emissions predicted due to operation of proposed loadout infrastructure during these conditions.

Results indicate PSNC are already exceeded due to operation of the existing site during enhancing meteorological conditions. Existing site predictions for the night period range from $L_{Aeq,15minute}$ 37 to 40 dB. In accordance with Section 10 of the INP, where noise levels exceed PSNC, the regulator and noise source manager may need to negotiate achievable noise limits for the operation. The achievable noise limits may be greater than PSNC. Noise limits are typically set after reasonable and feasible noise mitigation strategies have been considered. The EPA has requested Rixs Creek undertake a Pollution Reduction Program (PRP); noise mitigation strategies will be comprehensively assessed in the PRP. However, in the interim, it is suggested that achievable noise limits for the existing operation and the Proposal are based on results presented in this assessment.

With the exception of the stockpile dozer, the remaining infrastructure associated with the Proposal would operate with relatively constant noise output. It is unlikely the additional infrastructure would be noticeable to residents in the assessment area. Operating the dozer on the western side of the stockpiles, as low as possible, during enhancing meteorological conditions should reduce loadout infrastructure levels by 3 to 4 dB during the night period.

In overall terms, the proposed loadout infrastructure would likely cause a minor increase to Rixs Creek noise levels to receptors in the assessment area. Rail loadout noise generated by the Proposal is generally low level, and it is unlikely it to be noticeable at modelled NSR locations. It should be noted that the predictions in this assessment represent absolute worst-case impact for the following reasons:

- The train on the rail loop is modelled in the most exposed location on the loop. At other stages during the loading cycle, train contributions would be significantly less;
- The stockpile dozer is modelled in the most exposed location high on the eastern side of the stockpiles. The dozer would often work in less exposed locations, and dozer contributions would typically be less than modelled;
- Predictions are for worst case prevailing meteorological conditions. While it is acknowledged these meteorological conditions occur on a regular basis, the situation where the worst-case alignment of plant mentioned above coinciding with these conditions would likely not occur very often. As such, the predictions represent the likely upper limit of received levels rather than the typical case.

Assessment of low frequency noise indicates existing low frequency noise levels are less than the desirable low frequency criterion adopted in this assessment. No increase to existing low frequency noise is predicted as a result of the Proposal.

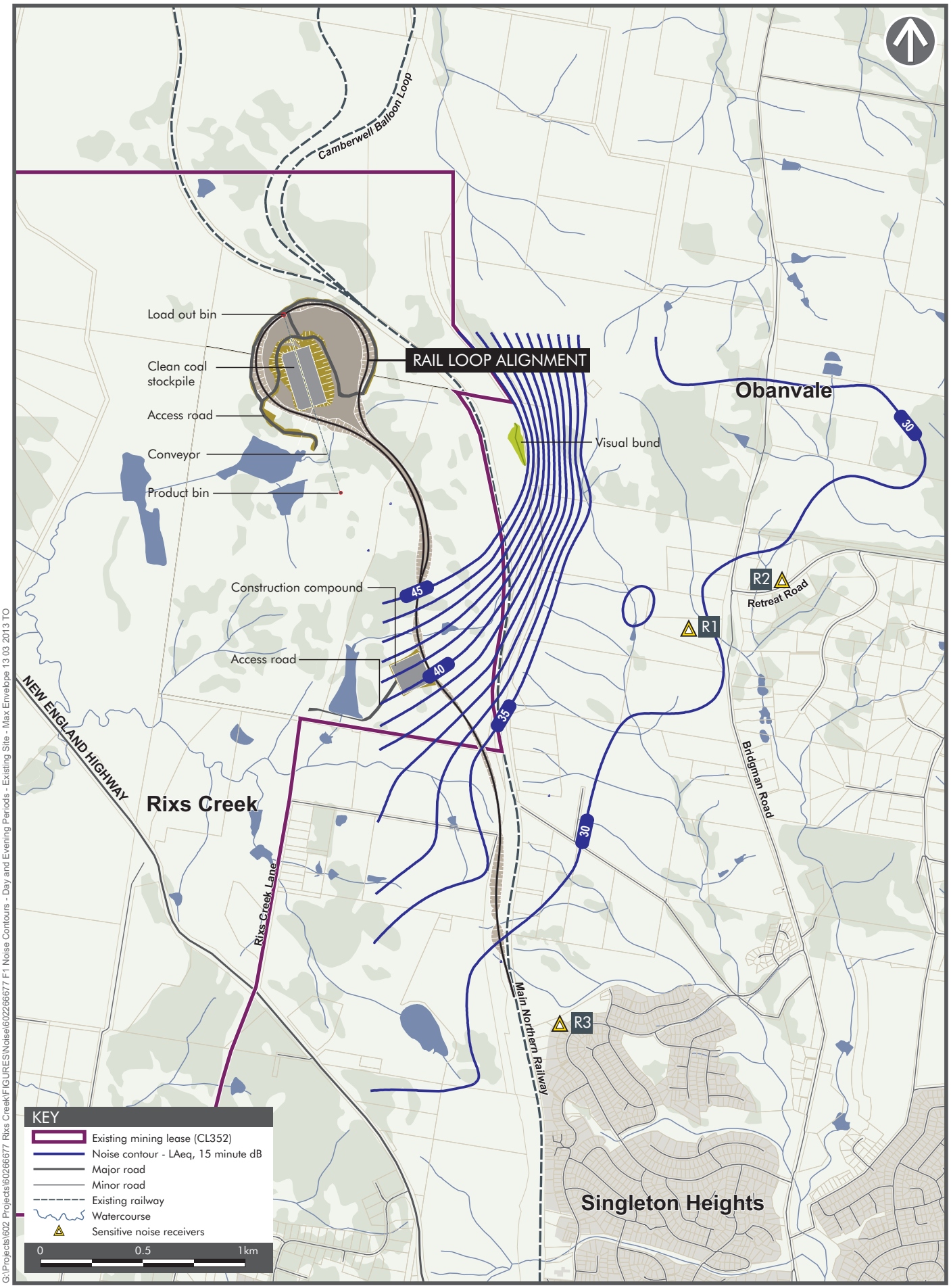
No exceedance of the sleep disturbance criterion is predicted.

Off site construction (the rail spur) was assessed against the ICNG. Exceedances of the standard construction hours criterion are predicted when construction occurs in the most exposed locations. It is recommended community consultation be undertaken prior to commencing work in areas where exceedance of the construction noise criterion may occur, and best practice management techniques are implemented to minimise noise impact. A construction noise management plan should be developed to outline work practices that will be implemented to minimise noise, and describing a noise complaints handling protocol.

On site construction (the rail loop, conveyors and rail loading infrastructure) was assessed against PSNC. No exceedances of PSNC are predicted at any NSR during the day and evening periods due to the worst-case construction scenario considered. Bulk earthworks are not scheduled for the night period, however, the lower end of the ranges results indicate that this a feasible option when undertaken in non exposed areas. Other on site construction tasks such as conveyor and rail loading facility construction would require far less noise emitting plant than the earthworks, and would occur in the general vicinity of the existing CHPP. No increase to existing site noise levels is expected as a result of these activities. Tasks with potential to cause sleep disturbance should be avoided during the night period.

Global Acoustics Pty Ltd

A. OPERATIONAL NOISE CONTOURS



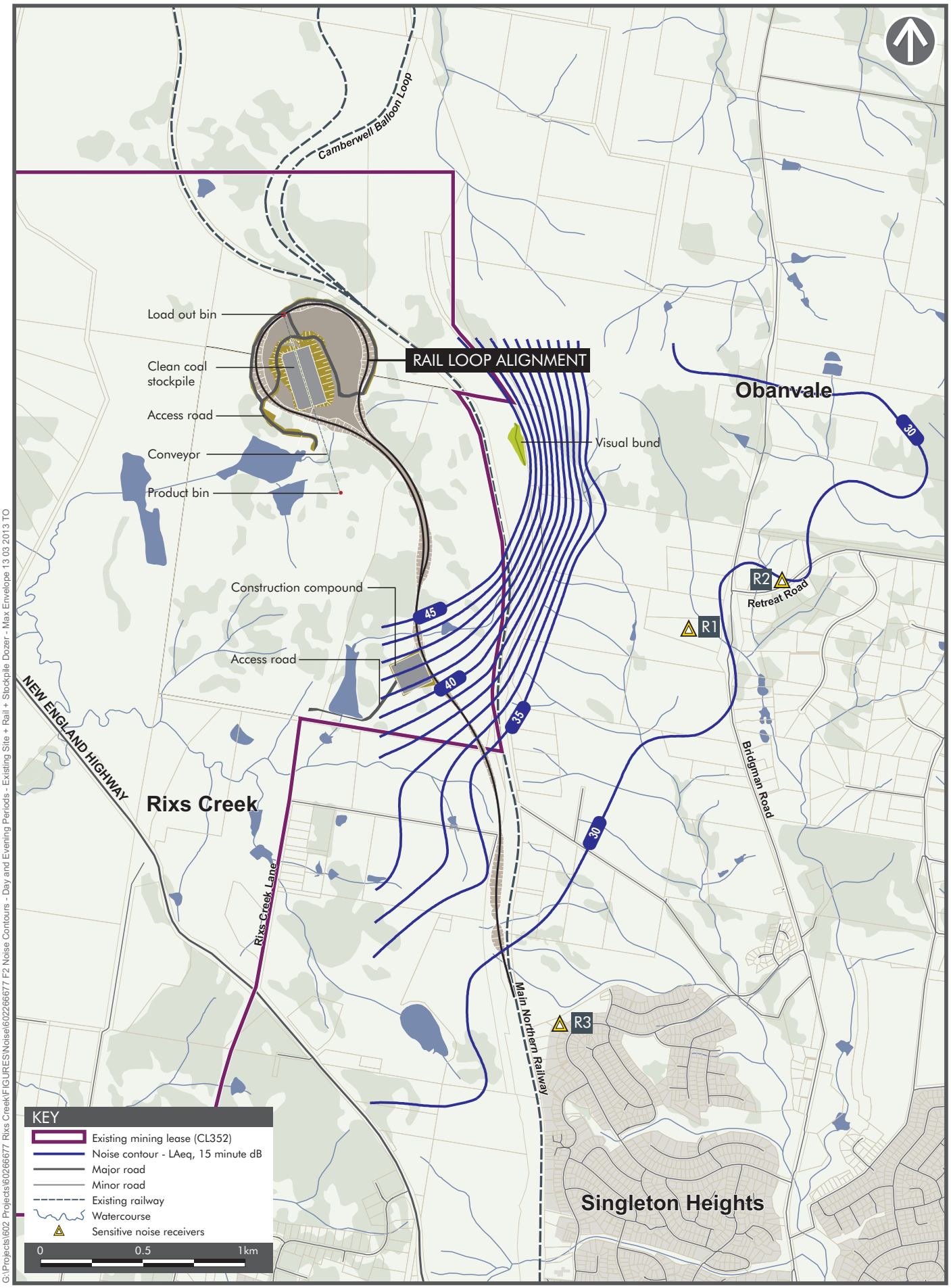
G:\Projects\602 Projects\602266677 Rixs Creek\FIGURES\Noise\602266677 F1 Noise Contours - Day and Evening Periods - Existing Site - Max Envelope 13 03 2013 TO

AECOM

NOISE CONTOURS - DAY AND EVENING PERIODS - EXISTING SITE - MAX ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 1



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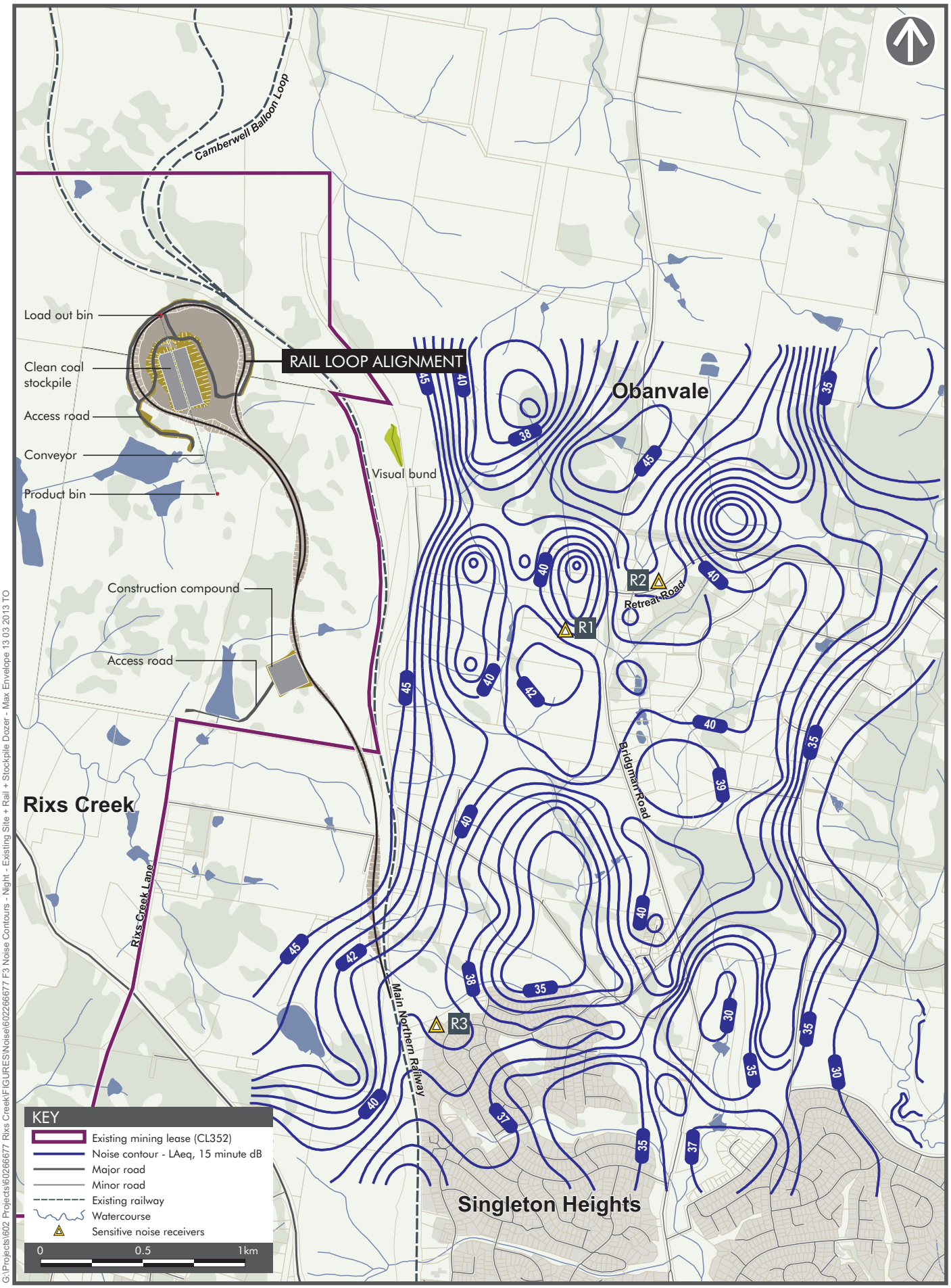
AECOM

NOISE CONTOURS - DAY AND EVENING PERIODS - EXISTING SITE + RAIL + STOCKPILE DOZER - MAX ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 2



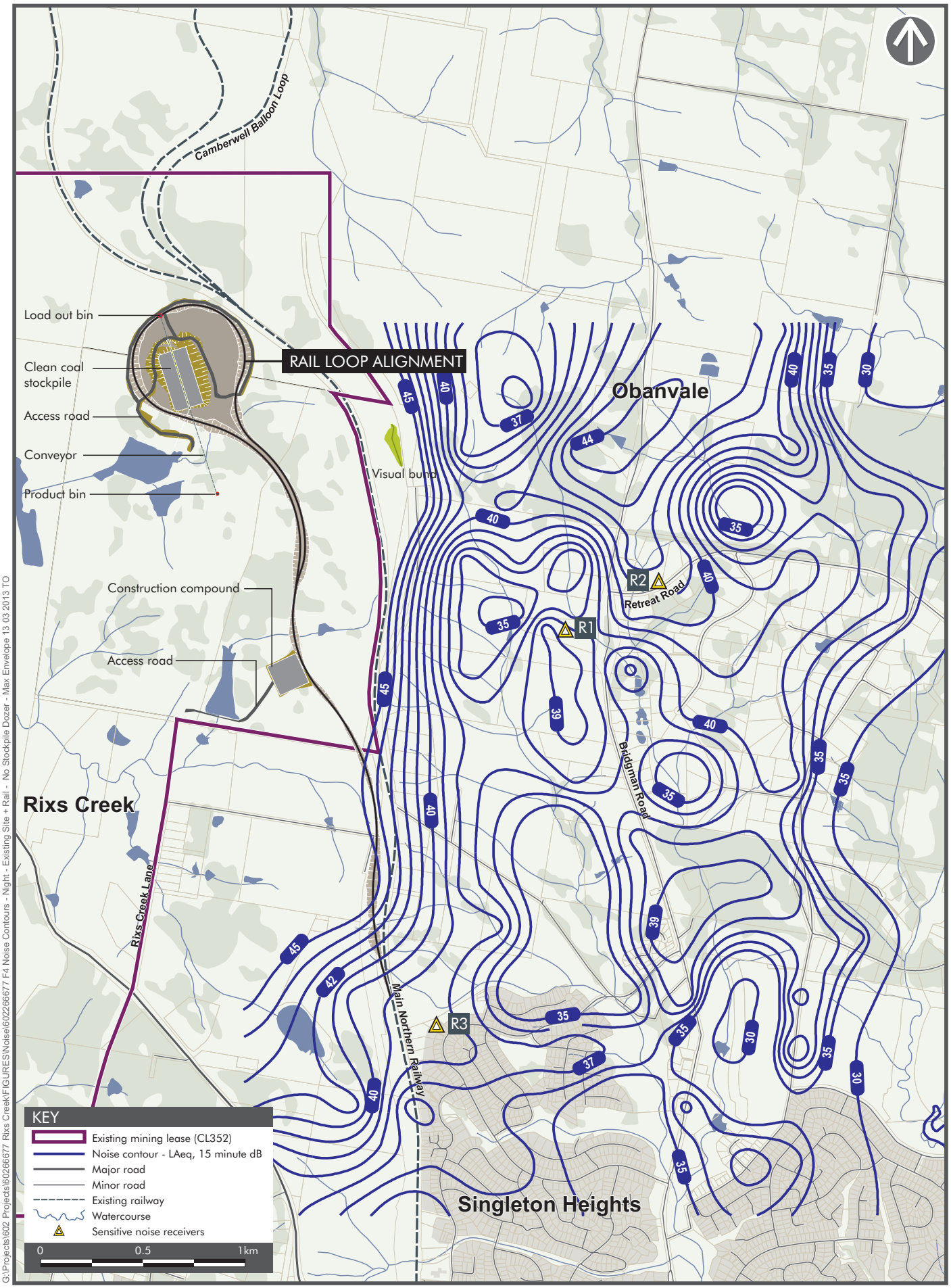
G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Noise\602266677 F3 Noise Contours - Night - Existing Site + Rail + Stockpile Dozer - Max Envelope 13 03 2013 TO

AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE + RAIL + STOCKPILE DOZER - MAX ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 3



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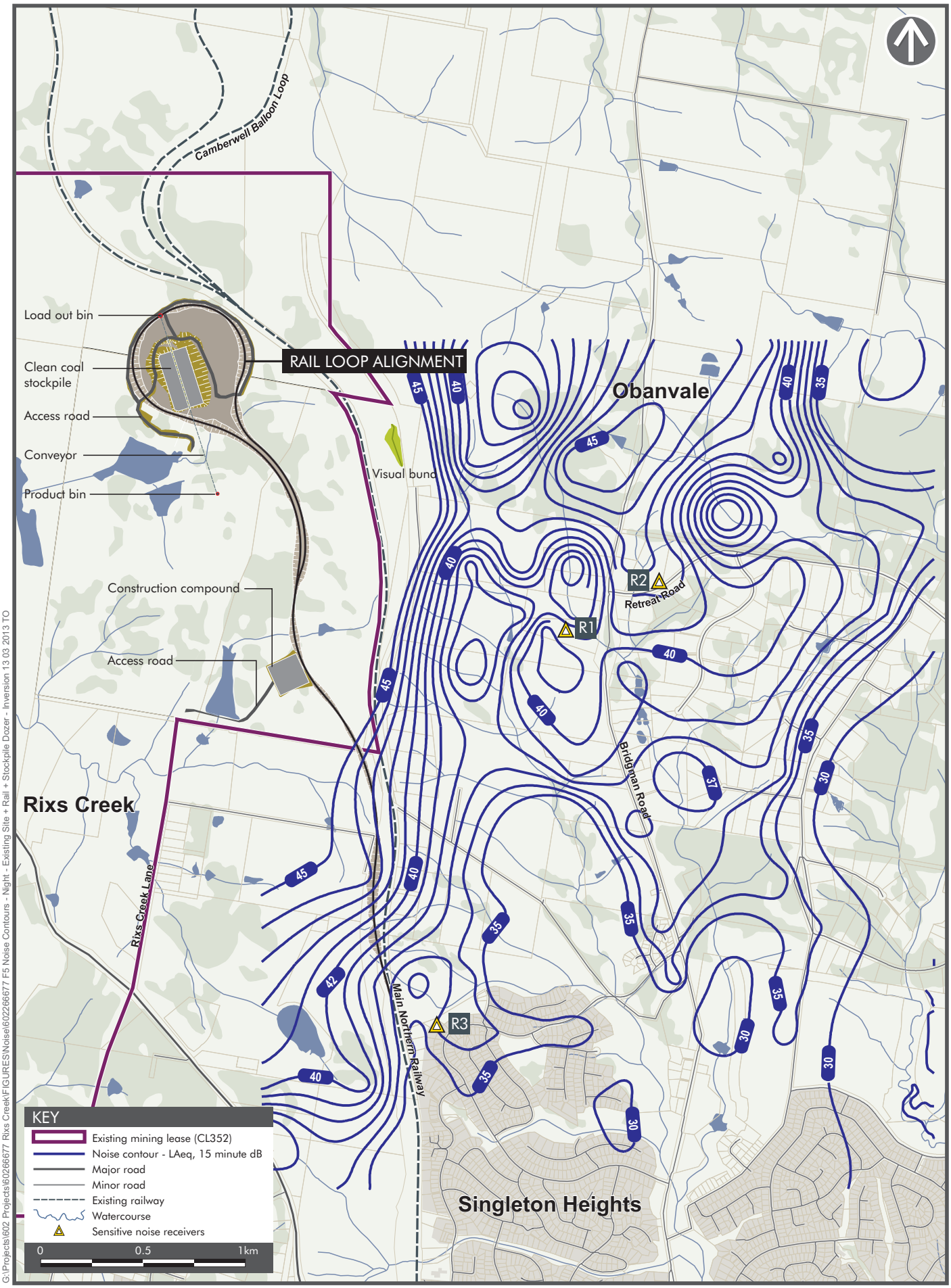
AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE + RAIL - NO STOCKPILE DOZER - MAX ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 4



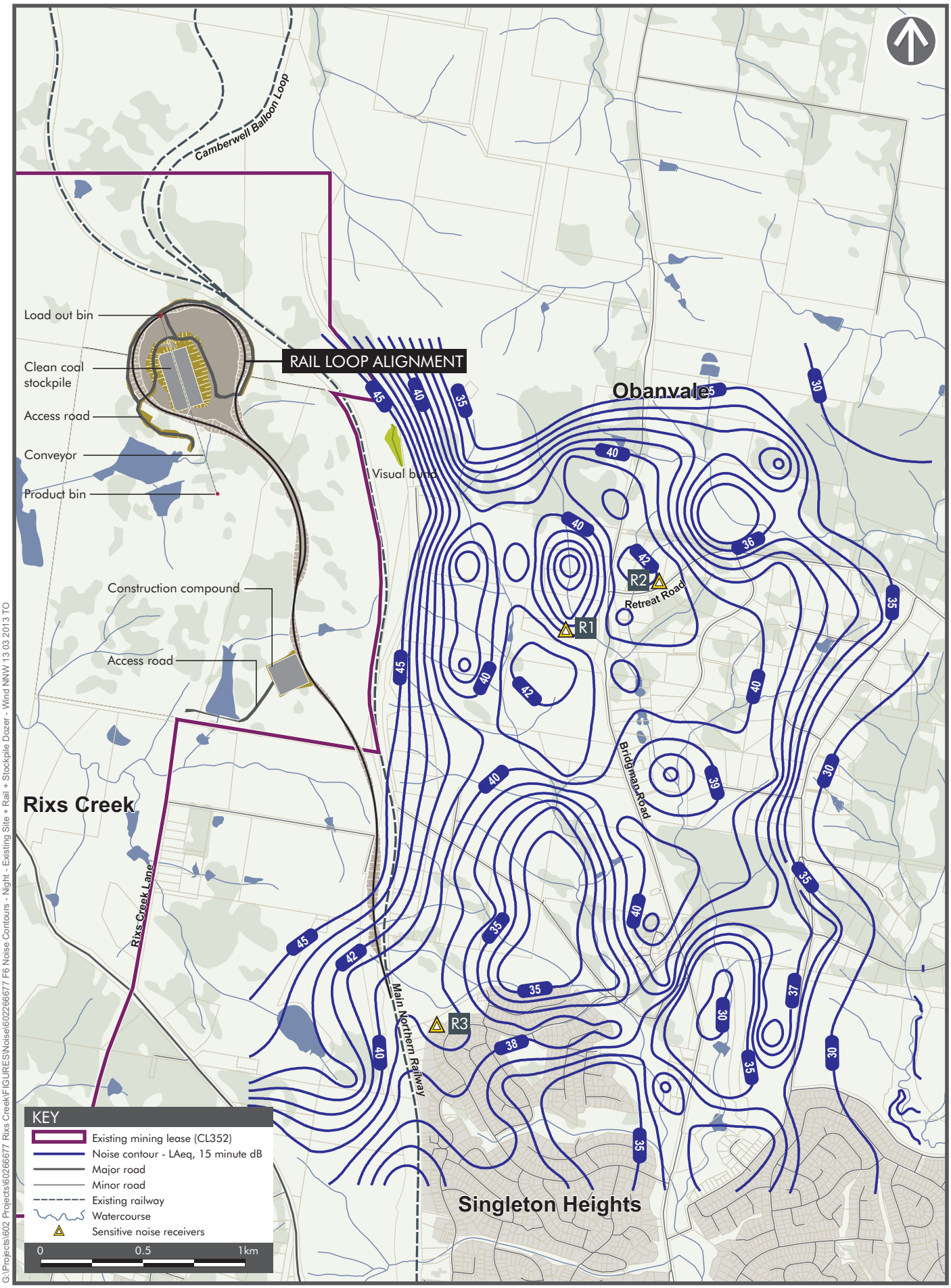
G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Noise\602266677 F5 Noise Contours - Night - Existing Site + Rail + Stockpile Dozer - Inversion 13 03 2013 TO

AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE + RAIL + STOCKPILE DOZER - INVERSION

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 5



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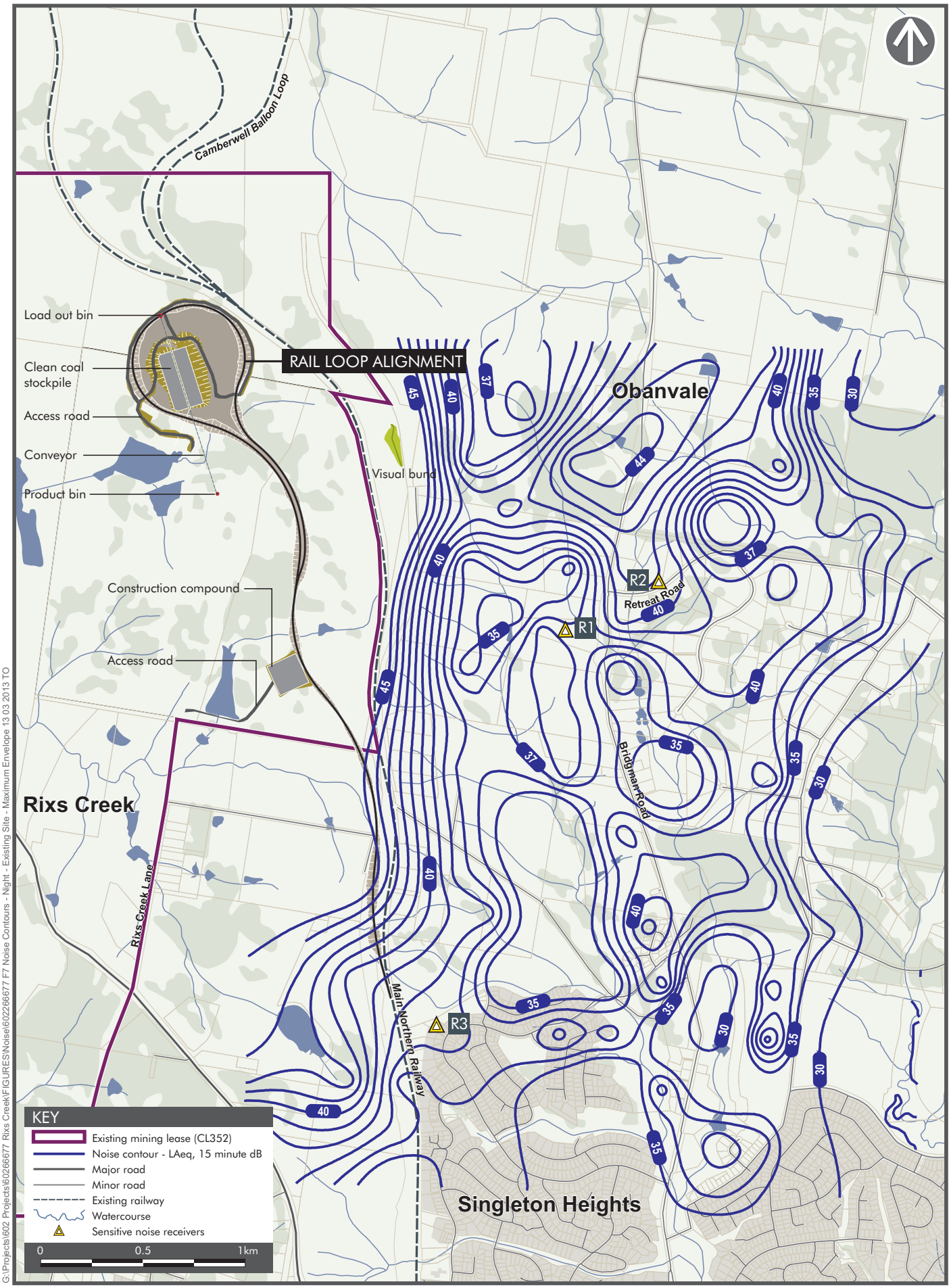
AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE + RAIL + STOCKPILE DOZER - WIND NNW

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 6



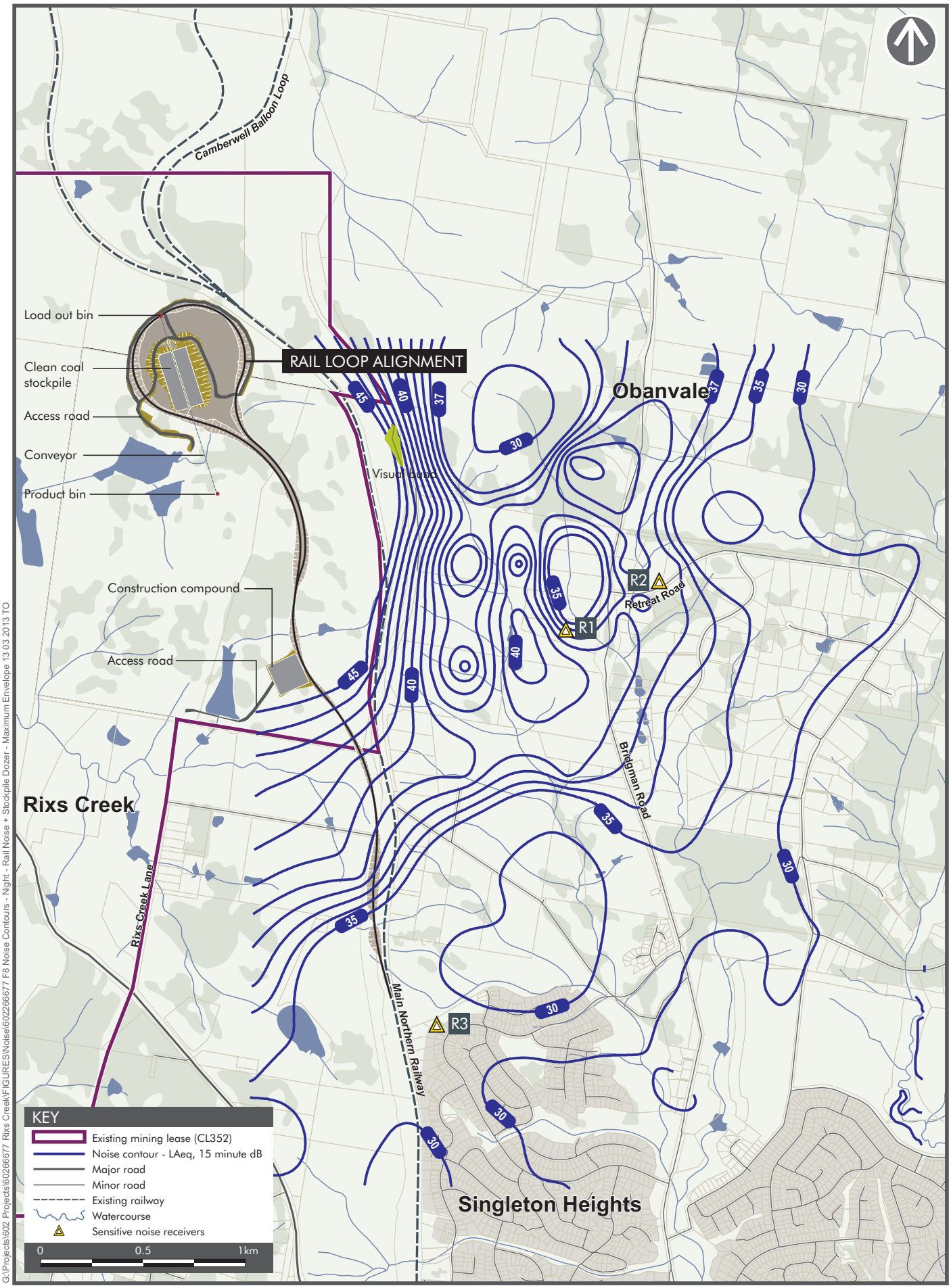
G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Noise\602266677 F7 Noise Contours - Night - Existing Site - Maximum Envelope 13 03 2013 TO

AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE - MAXIMUM ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 7



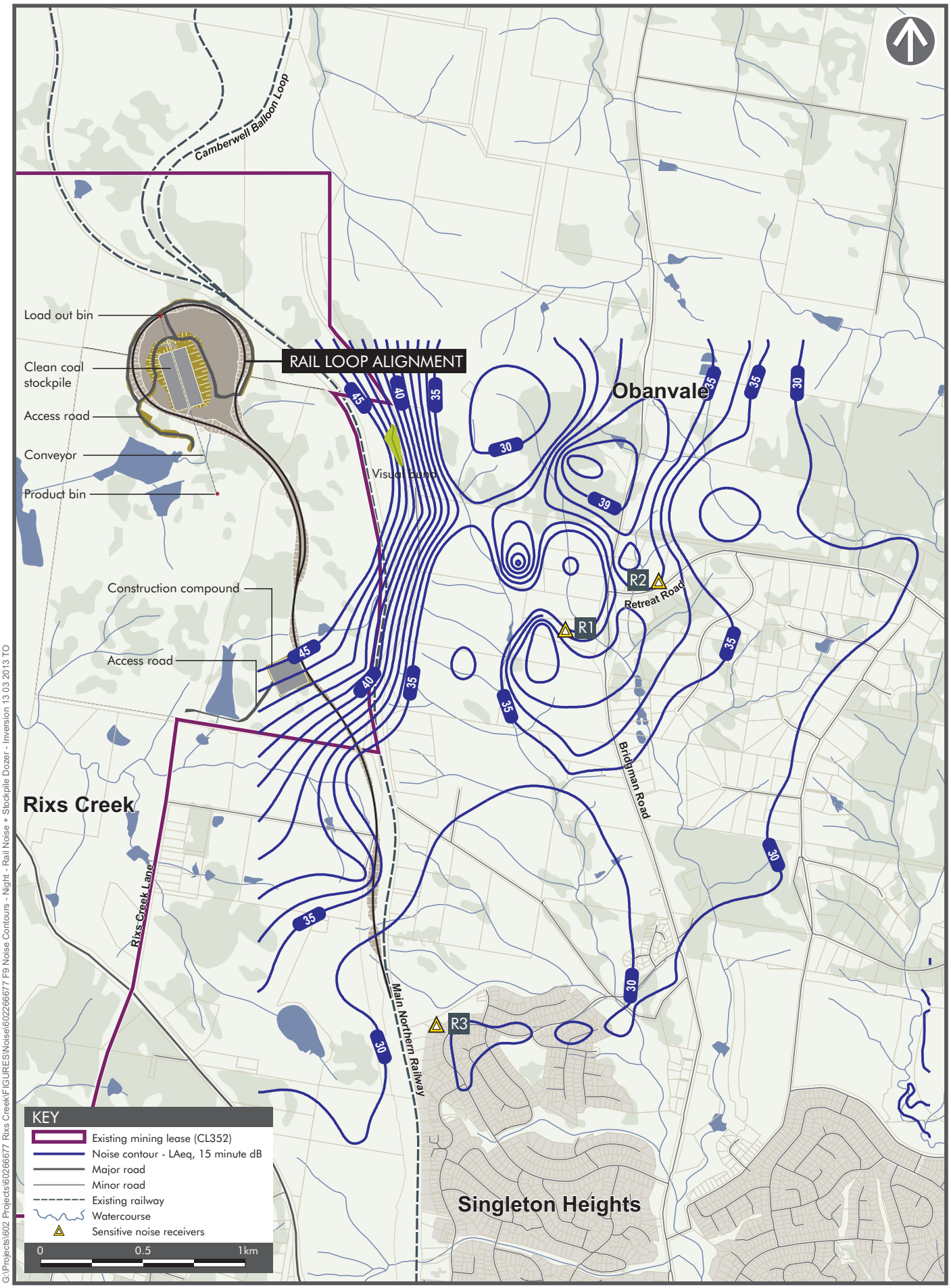
G:\Projects\602 Projects\602266677 Rixs Creek\FIGURES\Noise\602266677 F8 Noise Contours - Night - Rail Noise + Stockpile Dozer - Maximum Envelope 13 03 2013 TO

AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE - RAIL NOISE + STOCKPILE DOZER - MAXIMUM ENVELOPE

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 8



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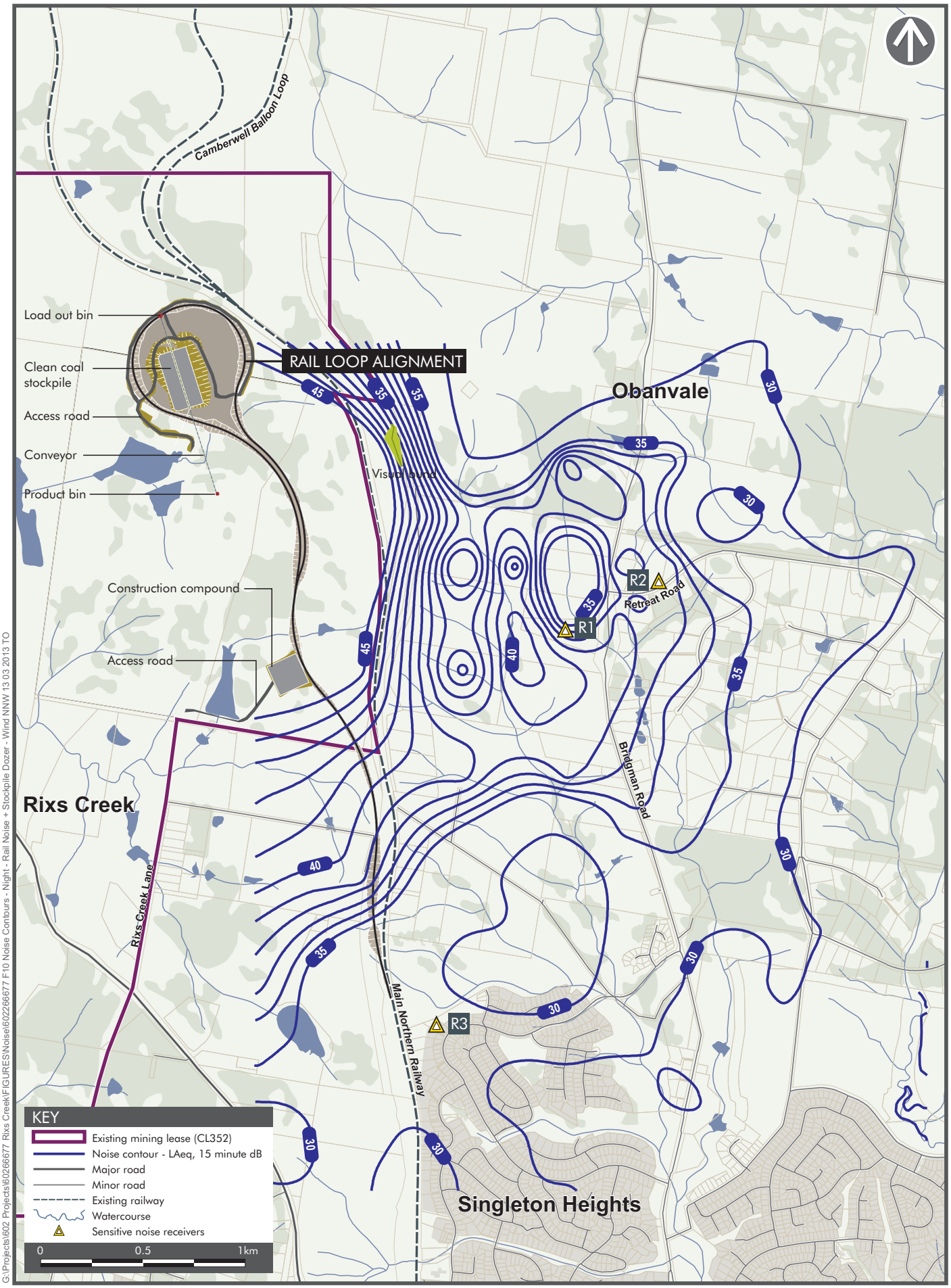
AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE - RAIL NOISE + STOCKPILE DOZER - INVERSION

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 9



G:\Projects\602 Projects\60266677 Rixs Creek\FIGURES\Noise\602266677 F10 Noise Contours - Night - Rail Noise + Stockpile Dozer - Wind NNW 13 03 2013 TO

AECOM

NOISE CONTOURS - NIGHT - EXISTING SITE - RAIL NOISE + STOCKPILE DOZER - WIND NNW

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

FIGURE 10

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Appendix J

Flora Assessment

Appendix J Flora Assessment

2012

Assessment of vegetation for expansion of Rix's Creek Mine, Hunter Valley

2 November 2012

Report to

Rix's Creek Pty Limited
New England Hwy
Singleton NSW 2330

Stephen Bell

Eastcoast Flora Survey
PO Box 216
Kotara Fair NSW 2289

Table of Contents

1. Background

Rix's Creek Pty Limited plans to expand their existing coal extraction operations at Singleton over the coming years. This expansion involves the continuation of the extraction of the coal resource as originally planned in the 1980's. The current development consent will expire in 2016, and Rixs Creek Pty Ltd plans to gain a further consent to continue mining in line with the original project plan. This continuation may also include the construction of a rail loop within the existing Coal Lease, which was earmarked under the original project twenty years previously.

Eastcoast Flora Survey has been engaged by Rix's Creek Pty Limited to undertake a preliminary flora assessment of the proposed expansion area and a potential conservation offset area. The objectives of the study were to:

- Undertake a vegetation survey of specified portions of the existing mine site, as a preliminary step towards the next consent application which will be required prior to October 2016.
- Identify and delineate any vegetation communities that equate to listed Threatened Ecological Communities, and which may present a constraint to further vegetation clearing.
- Assess options for ecological offsets should Threatened Ecological Communities be present.
- Present a report and map of the vegetation present within specified portions of the Rix's Creek Mine lands

2. Study Area

Rix's Creek Coal Mine is located approximately 5km north-west of Singleton in the Hunter Valley. The New England Highway currently bisects the existing mine lease, with coal extraction occurring on both the northern and southern side of this Highway. For the purposes of the current investigation and assessment, four areas have been examined (Figure 1). Area 1 (~106 ha) occurs immediately adjacent and north of the southern pit and is planned to be mined. Area 2 (~223 ha) is a proposed conservation offset area, and lies north of the New England Highway and between Rix's Lane and the Main Northern Railway. Area 3 (~98 ha) is located immediately east of the existing coal washery and office complex, and is also proposed for conservation. Area 4 (~32 ha) is a proposed rail loop and clean coal stockpile area immediately south of the Main Northern Railway.

All four areas have been partially cleared and grazed in the past, with Area 2 still being used for low intensity cattle grazing. All stock has been removed from Area 3 for 2-3 years.

3. Previous Studies

Few detailed and comprehensive studies on the vegetation of the Hunter Valley have been undertaken in the past. The Hunter Remnant Vegetation Project (Peake 2006) is the most current, and the mapping associated with that project included the Rix's Creek area. Three vegetation communities were depicted by Peake (2006) for the areas currently under investigation:

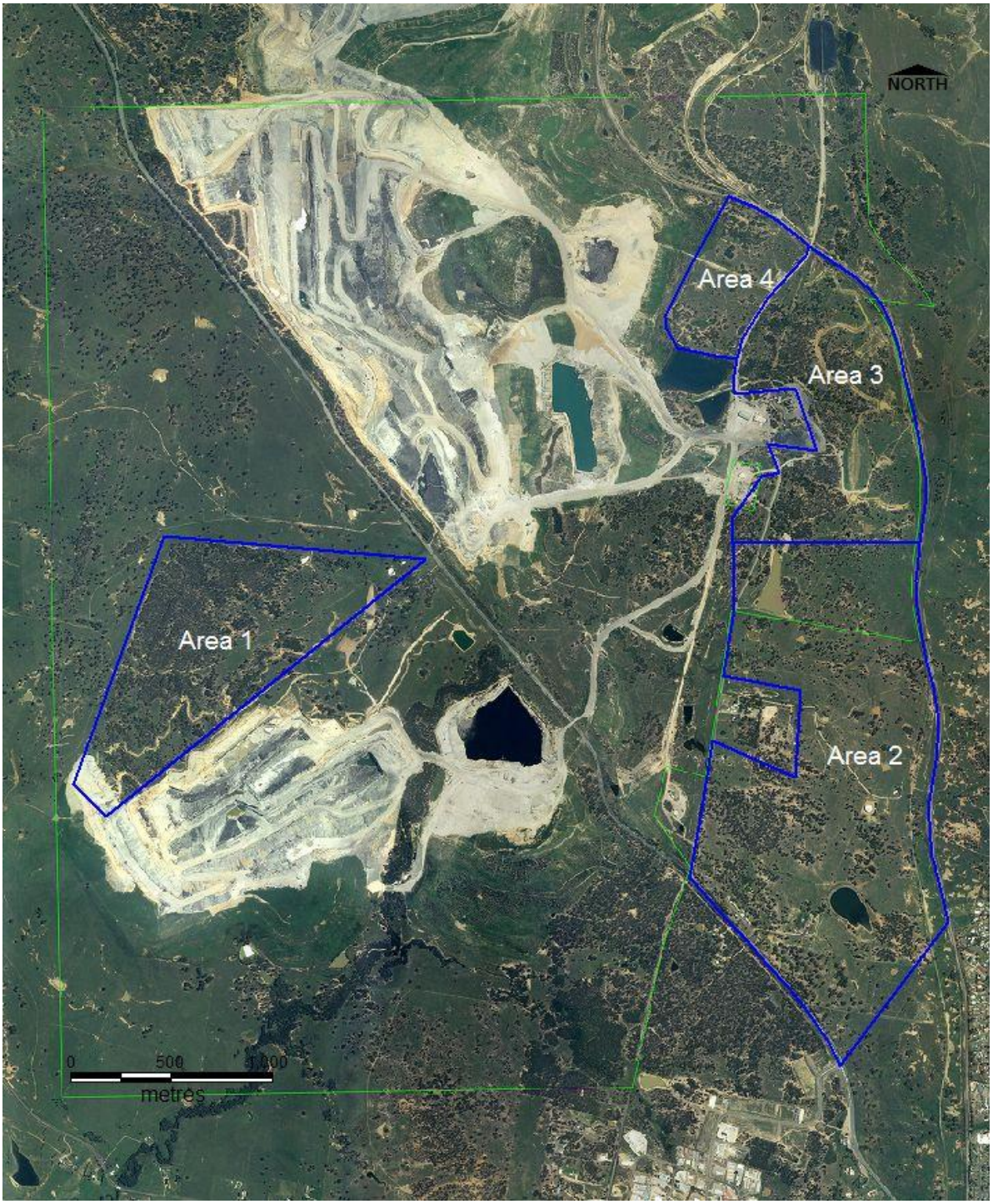

Figure 1 Rix's Creek areas of investigation.

- Central Hunter Ironbark – Spotted Gum – Grey Box Forest (Areas 1, 2, 3 & 4)
- Central Hunter Box – Ironbark Woodland (Areas 2 & 3)
- Central Hunter Swamp Oak Forest (Area 1)

The Central Hunter Ironbark-Spotted Gum-Grey Box Forest (CHISGGBF) and the Central Hunter Box-Ironbark Woodland (CHBIW) have since been listed as Endangered Ecological Communities (EECs) on the NSW *Threatened Species Conservation Act 1995*. Floristically, the main distinguishing features between these two closely related communities are the co-dominance of *Corymbia maculata* in the CHISGGBF, and some differences in the understorey and ground layer species.

Red Ironbark (*Eucalyptus fibrosa*) is included within the description for CHISGGBF, however this species is also a co-dominant and characteristic canopy species within the Lower Hunter Spotted Gum-Ironbark Forest EEC (LHSGIF). It is possible that portions of the CHISGGBF are more closely related to the LHSGIF, forming a complex of floristic types related to annual rainfall from throughout the Hunter Valley. The composition of the LHSGIF is currently under review (unpubl. data, and see Bell 2009), and two full floristic sample plots were previously collected from elsewhere on the Rix's Creek lease in 2009 as part of that review.

4. Methods

4.1 Field Inspections

Field inspections were undertaken during April, May, July 2011, and October 2012. While Spring is widely recognized as the most appropriate time of year to assess grassy woodland environments (Burrows 2004), sufficient above-ground biomass was available across the site to enable a comprehensive assessment of vegetation communities to be made.

Specific searches were undertaken for threatened plant species known from similar habitats in the Central Hunter Valley, including *Acacia pendula, Bothriochloa biloba, Cymbidium canaliculatum, Eucalyptus camaldulensis* and *Eucalyptus glaucina*. Within the proposed rail loop corridor running through Areas 2-4, a targeted survey for threatened terrestrial orchids was undertaken. In particular, searches for *Diuris tricolor* and *Prasophyllum* sp. Wybong (C.Phelps ORG5269) were completed on 2 October 2012, at a time when known populations of these species were flowering in the Muswellbrook area. The entire route of the proposed rail corridor was walked (with the exception of the area immediately adjoining the existing railway in the south of Area 2), and tracks recorded in a handheld Garmin GPS unit. Walked transects were between 30 and 50m apart.

4.2 Vegetation Mapping

Vegetation mapping of the study area was undertaken through aerial photographic interpretation, with the support of Rapid Data Points (RDP's) collection. RDP's are essentially summaries of floristic information recorded at specific points in the field. At specific and regular locations, summaries of the vegetation are noted and waypointed in the GPS, and later transferred to the GIS for mapping. Information recorded includes:

- Canopy layer dominant species
- Shrub layer dominant species
- Ground layer dominant species
- Miscellaneous notes & condition

Vegetation polygons were digitised directly on-screen to create the draft vegetation map layer. A draft map showing the distribution of vegetation variability (or vegetation 'strata'), based on RDP data, was prepared prior to full floristic survey, and guided selection of sample plots for the full survey (Section 4.3).

4.3 Floristic Survey

Following preparation of a draft vegetation 'strata' map, standard floristic survey quadrats (0.04ha, or 20 x 20m) were preferentially sampled within representative and homogeneous locations. At each quadrat, all vascular plant species were recorded and attributed an index of abundance using a modified Braun-Blanquet cover abundance scale (Poore 1955: see Table 1). Other characteristics of the site were also recorded, such as soil type, fire history, aspect, slope, structural details of each layer, etc. Estimates of height in metres were made for each vegetation layer present. Specimens of uncertain or unknown identification were collected for further investigation, or lodgement at the National Herbarium of New South Wales. Survey methods employed are consistent with the DECCW Interim Type Standard (Sivertsen 2010), and to those used in the Hunter Remnant Vegetation Project (Peake 2006).

Table 1 Modified Braun-Blanquet cover abundance scale.

Code	Cover (within 0.04ha plot)
1	less than 1% cover
2	cover between 1-5%
3	cover between 6-25%
4	cover between 26-50%
5	cover between 51-75%
6	cover between 76-100%

4.4 Data Analysis

Floristic sample (quadrat) data was entered into a licenced copy of the NSW OEH vegetation survey database, running on a Microsoft Access© platform. Analysis of data was undertaken using the Primer statistical package (Clarke & Gorley 2006), to assist in understanding the trends present in the vegetation at Rix's Creek. Data was subjected to a taxonomic review prior to analysis, and weed species were included or ignored in separate analyses. An unweighted pair-group arithmetic averaging clustering strategy (UPGMA), using the Bray-Curtis association measure, was applied to the data matrix to derive a hierarchical classification, and the default beta value of –0.1 was used. Dissimilarity between individual sites and groups of sites were illustrated through the generation of dendrograms, which trace the relationship of all sites with one another. Non-metric Multiple Dimension Scaling ordination (nMDS) was also performed in Primer, enabling the spatial arrangement of each vegetation type to be inspected more clearly. SIMPER analysis provided lists of diagnostic plant species for each defined community.

5. Results

5.1 Survey Effort

Figure 2 shows the level of survey effort expended across the four areas of investigation. In total, 317 Rapid Data Points were collated within the study area, detailing dominant plant species and other habitat characteristics. Twenty-six full floristic sampling plots were also completed, located preferentially within observable variations in the vegetation.

Figure 3 shows the extent of targeted orchid survey within the proposed rail loop. Note that the extreme north-western portion of the proposed loop is planted mine rehabilitation and was not searched. Also, the southern section where the proposed loop joins the existing Main Northern Railway could not be accessed on the day of survey.

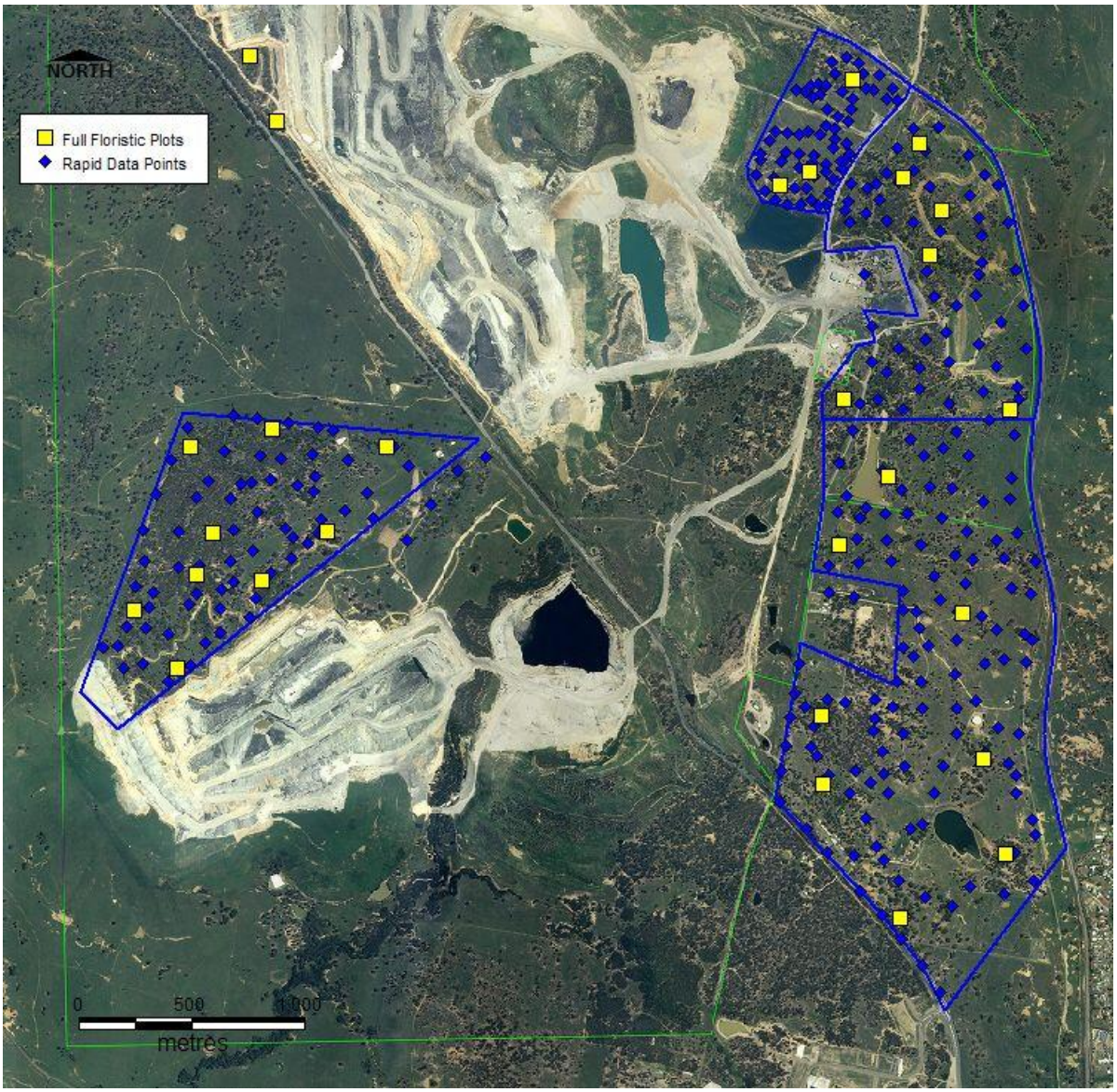

Figure 2 Survey effort expended across the three investigation areas at Rix's Creek.

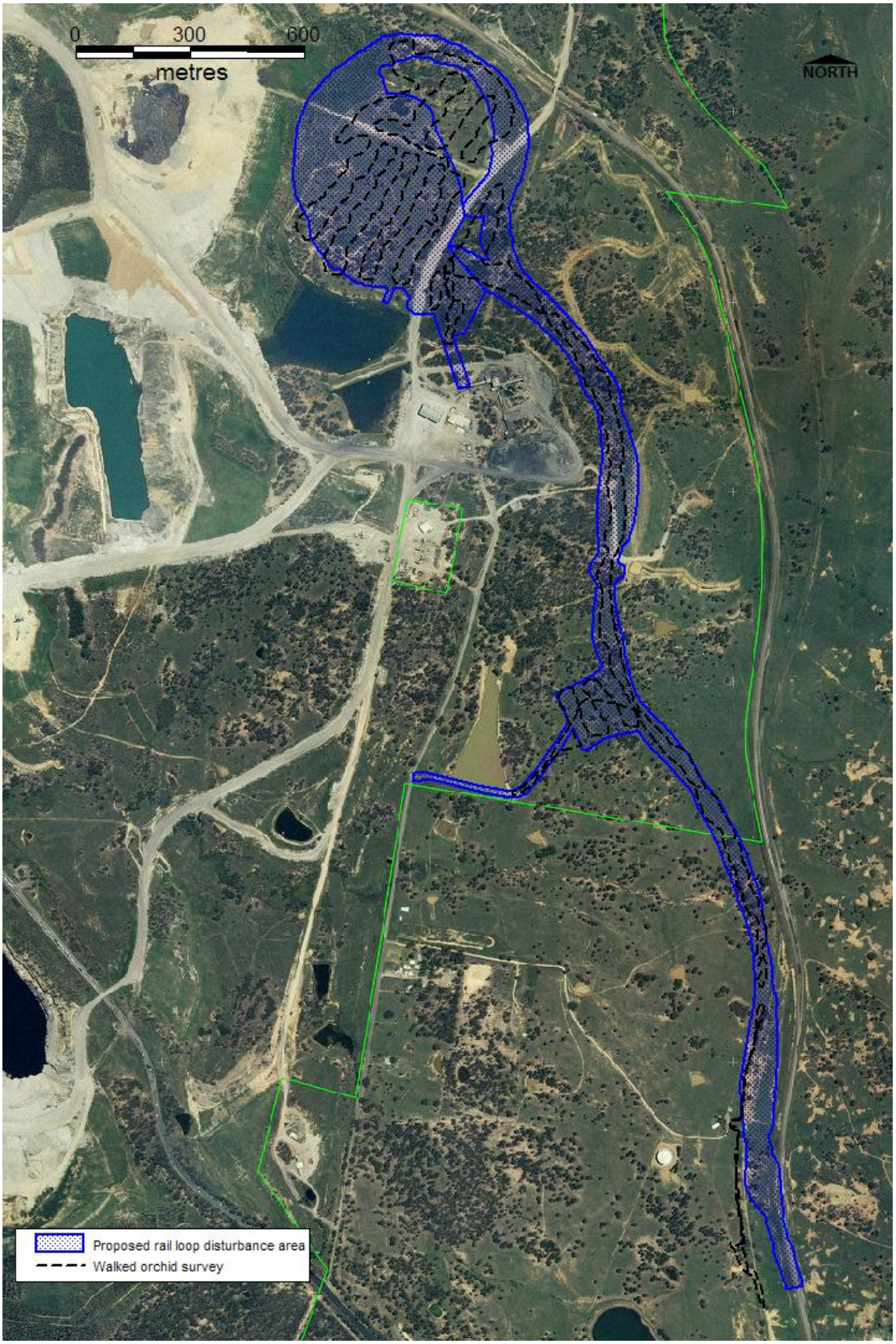

Figure 3 Survey effort expended for threatened orchids within the proposed rail loop.

5.2 Species Diversity & Condition

Appendix 1 lists all vascular plant species recorded during the survey, encompassing over 200 taxa. No threatened species were noted, although there is some potential for threatened terrestrial orchids to be present in some of the better grasslands outside of the proposed rail loop in Area 3 (See Section 7). Several individuals of the rare *Grevillea montana* were recorded within Area 1, but this species is relatively common in the mid to lower Hunter Valley, and is also secure in conservation reserves (Bell 2001, 2008; Peake 2006). Despite the time of survey, thirty-four species of native grass were recorded, suggesting good quality grasslands are present.

Thirty-nine weed species were also recorded across the four areas, with the Prickly Pears *(Opuntia aurantiaca, Opuntia stricta* var. *stricta* & *Opuntia humifusum*) particularly common in the more heavily grazed parts of Area 2. Spiny Rush (*Juncus acutus* subsp *acutus*) has become established in some drainage lines where all woody vegetation has been removed, and European Olive (*Olea europea* subsp. *cuspidata*) is scattered throughout the site.

Almost all of the four areas examined support regrowth vegetation following past clearing. Such regrowth stems from retained paddock trees, and often results in monocultures of canopy species (*Eucalyptus moluccana* or *Eucalyptus crebra*) rather than a re-establishment of the original mix of canopy species. As a consequence, it is difficult to place all such areas within any defined community with certainty. Structurally, the best vegetation occurs on the hill in the south-western portion of Area 1, where some larger *Eucalyptus moluccana* are present.

No threatened terrestrial orchids were recorded within the proposed rail loop corridor, with only the common *Diuris aurea* and *Microtis unifolia* detected.

5.3 Vegetation Communities

In total, 28 sample plots were available for analysis from Rix's Creek: two pre-existing samples from earlier investigations (unpubl. data) and 26 samples collected as part of the current study. Sampling and analysis of the vegetation (including weeds) showed there to be seven communities present within the Rix's Creek property, together with small patches of unsampled Swamp Oak Forest (Table 2). The most widespread community (Spotted Gum – Ironbark – Redgum Forest) supported several observable variations in floristic composition, particularly in the canopy. However, despite targeted sampling and analysis of these variations, only that dominated by Rough-barked Apple (*Angophora floribunda*) was shown to warrant recognition as a separate community. In addition, the closely related Spotted Gum – Red Ironbark Forest and Grey Box Forest displayed sufficient floristic differences to be here delineated as separate communities from the Spotted Gum – Ironbark – Redgum Forest.

Appendix 1 lists all species recorded across the study area, while Appendix 2 provides further details of the eight defined communities.

Figure 4 shows the sample dendrogram from the cluster analysis of the Rix's Creek data, using the Bray-Curtis association measure on cover abundance data. At around 41% similarity (the vertical dotted line), seven groups are evident comprising (from the top) Riparian Redgum Forest, Spiny

Rush, Bulloak Low Forest, Spotted Gum – Ironbark - Redgum Forest, Spotted Gum – Red Ironbark Forest, Rough-barked Apple Grassy Woodland and Grey Box Forest. The same data are shown spatially in the nMDS ordination plot in Figure 5, which produced a stronger portrayal of data relationships.

Table 2 Vegetation communities present at Rix's Creek.

Code	Community	Extent (ha)				
		Area I	Area II	Area III	Area IV	Total
1	Spiny Rush	-	0.34	0.09	0.12	**0.55**
2	Bulloak Low Forest	1.95	-	0.45	0.10	**2.50**
3	Spotted Gum – Red Ironbark Forest	0.52	0.41	-	0.95	**1.88**
4	Spotted Gum – Ironbark – Redgum Forest	42.06	22.55	24.56	3.59	**92.76**
5	Rough-barked Apple Grassy Woodland	1.15	-	1.37	0.20	**2.72**
6	Grey Box Forest	3.00	10.65	0.39	2.11	**16.15**
7	Riparian Redgum Forest	-	0.63	-	-	**0.63**
8	Swamp Oak Forest	-	-	0.84	-	**0.84**
Total	**(all vegetation)**	**48.68**	**34.58**	**27.70**	**7.07**	**118.03**

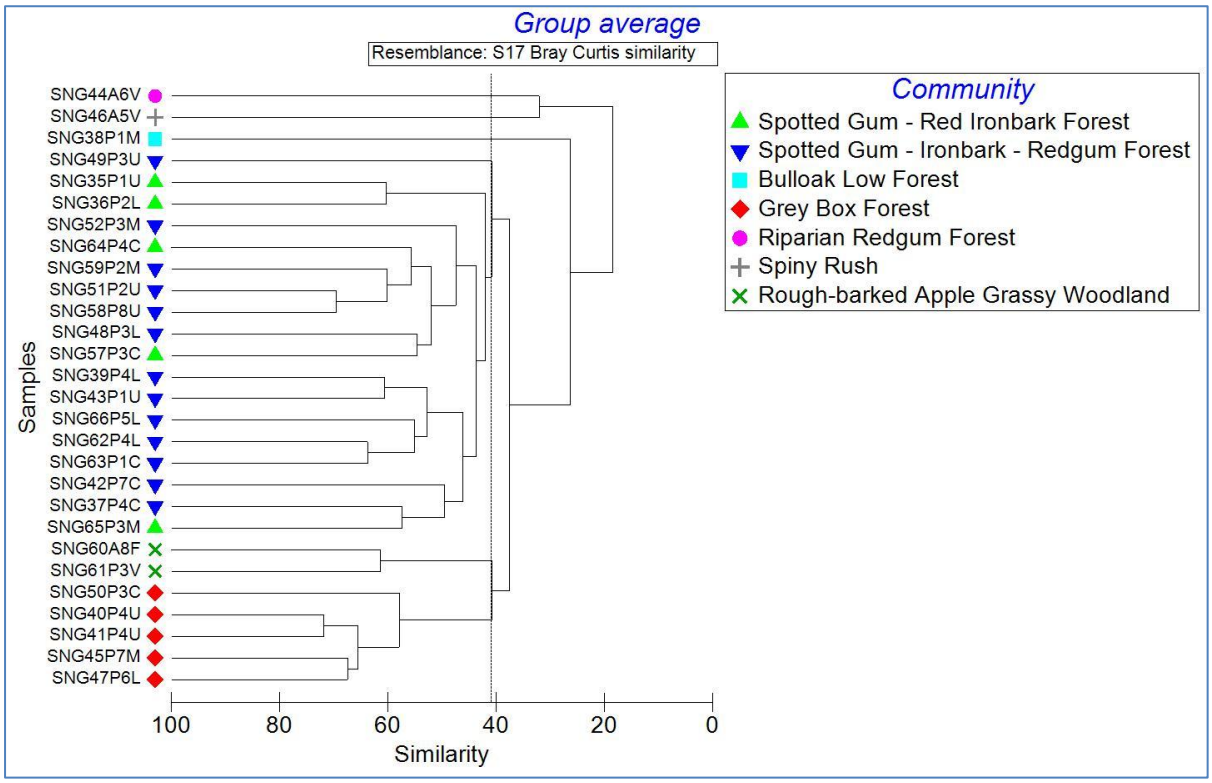

Figure 4 Cluster dendrogram of full floristic plots at Rix's Creek.

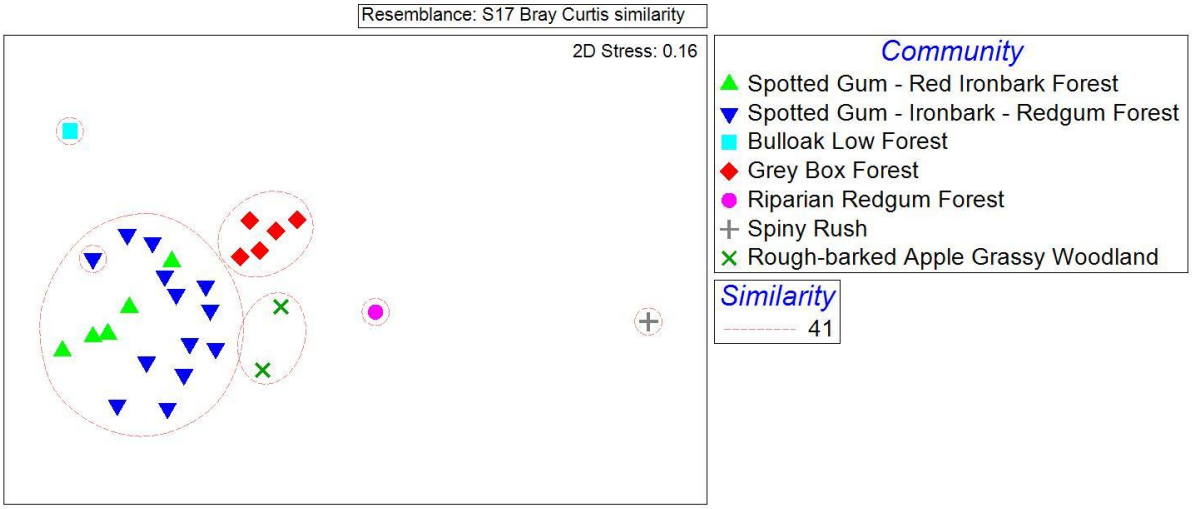

Figure 5 Non-metric Multidimensional Scaling ordination of full floristic plots at Rix's Creek. Similarity (41%) also shown from the cluster dendrogram in Figure 3.

5.4 Vegetation Mapping

Figures 6-8 show the distribution of the eight vegetation communities present within the Rix's Creek investigation areas.

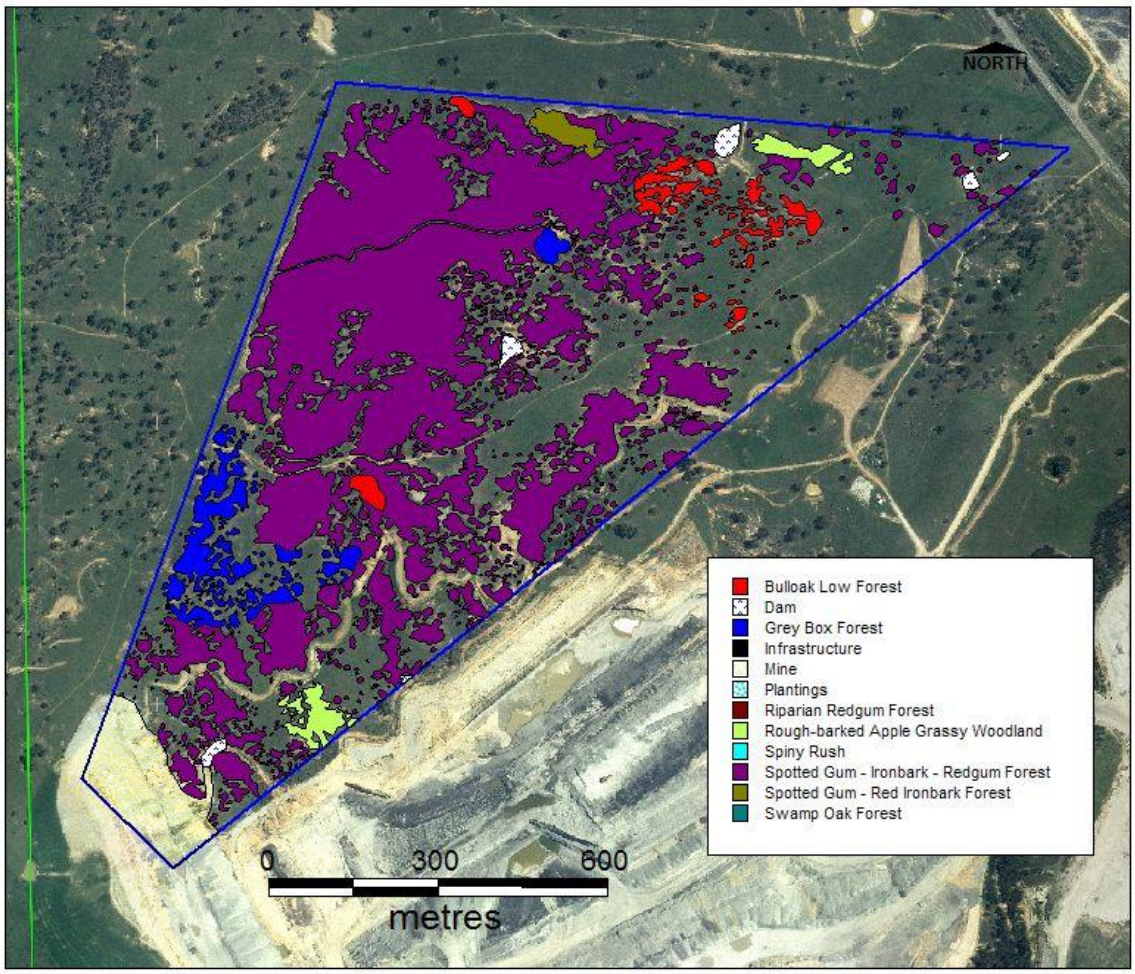

Figure 6 Vegetation communities within Area 1, Rix's Creek.

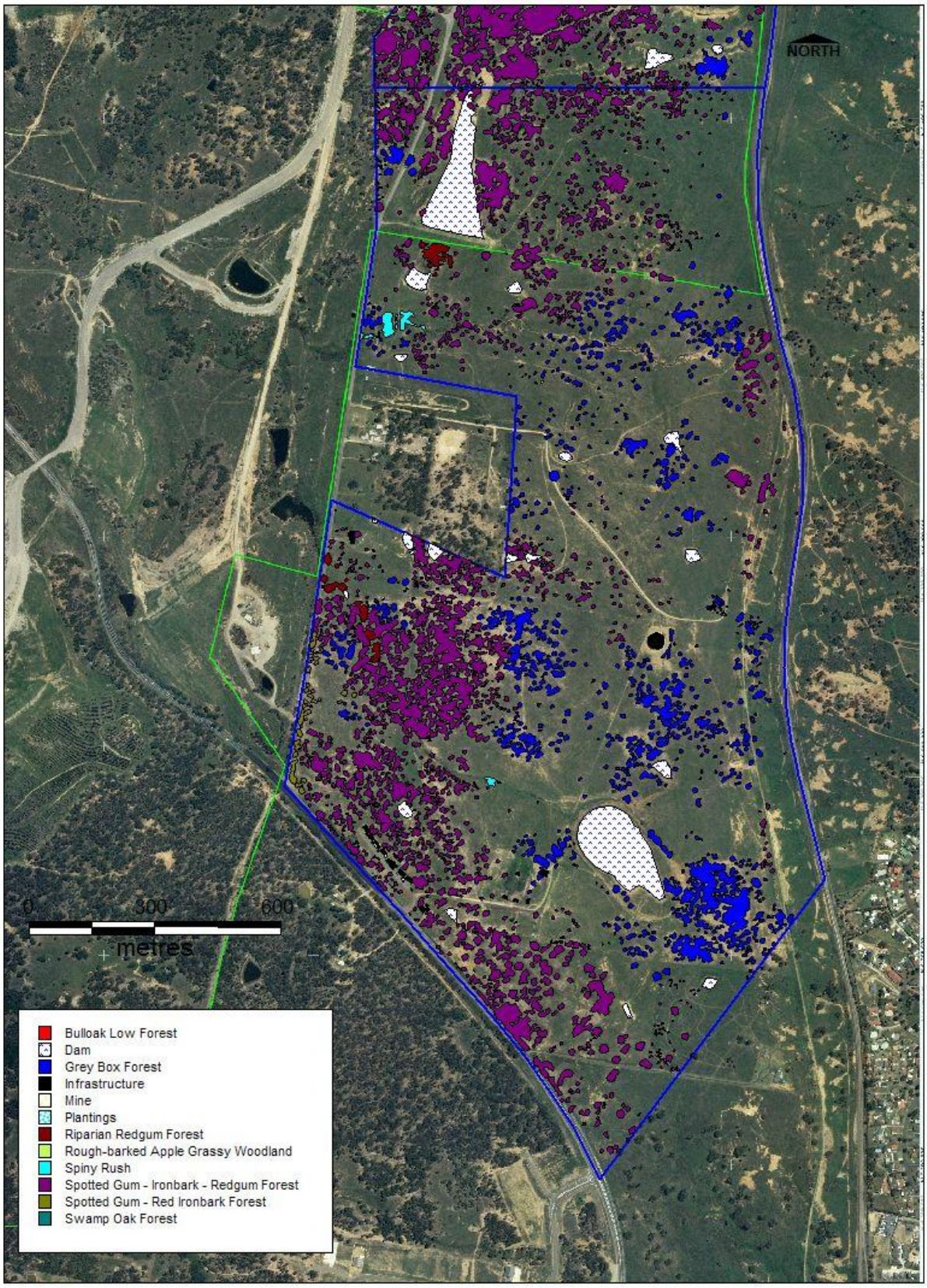

Figure 7 Vegetation communities within Area 2, Rix's Creek.

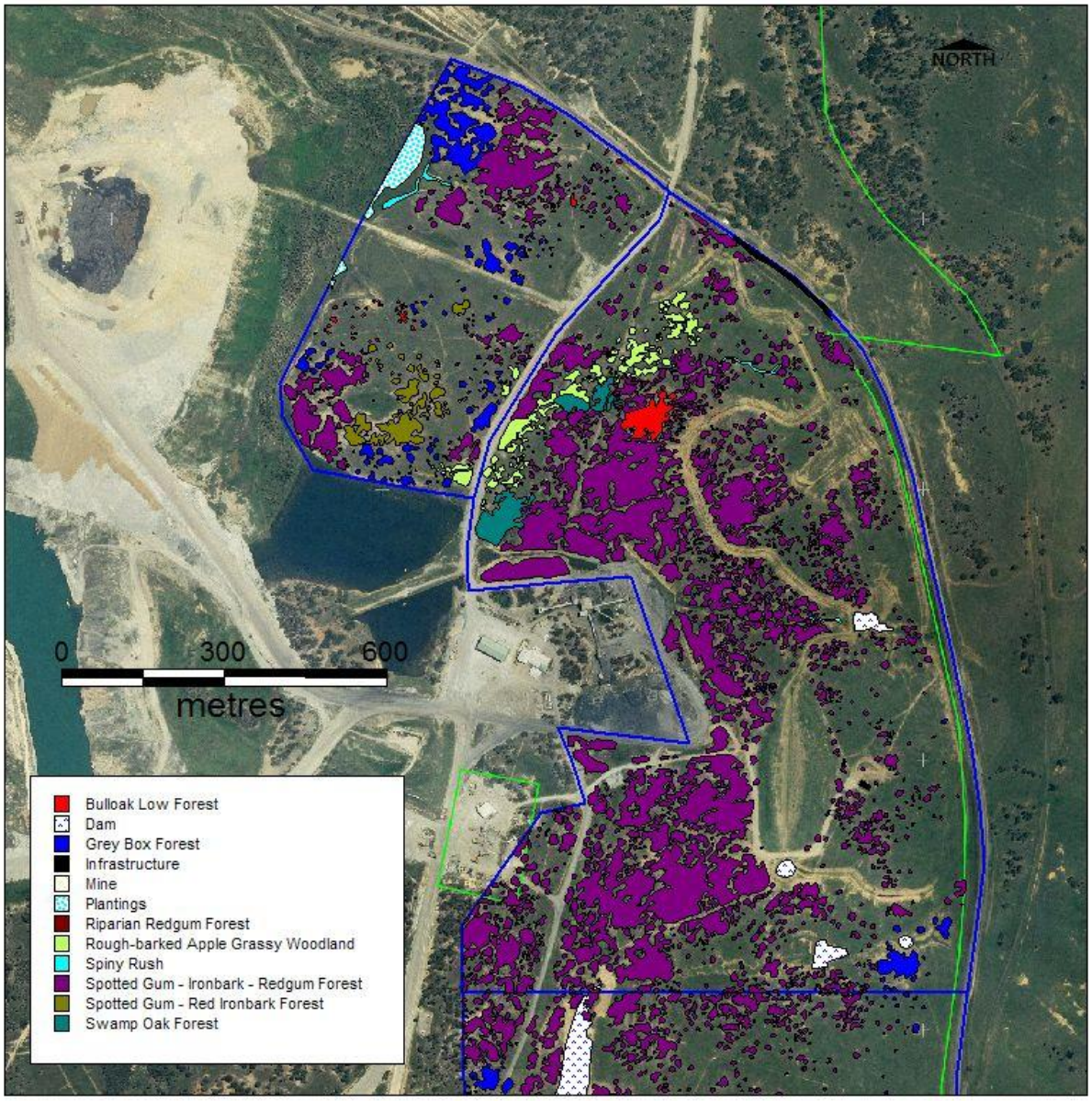

Figure 8 Vegetation communities within Areas 3 and 4, Rix's Creek.

6. Discussion

6.1 Rix's Creek Vegetation

Excluding grasslands, survey, analysis and mapping of vegetation within 460 ha of land at Rix's Creek coal mine has shown there to be eight definable communities, ranging from rushland to open forest and woodland. In general terms, all of these communities commonly occur throughout the central and upper Hunter Valley region, but most are listed as Threatened Ecological Communities in New South Wales (see Section 6.2).

As with elsewhere in the Hunter Valley, past land-use has dramatically impacted upon the original vegetation communities, particularly in regard to the floristic composition of woodland and forest types. A long history of partial clearing and grazing has altered the abundance and distribution of shrubs, grasses and herbs, so that the distinction between adjacent communities has become difficult to define. Current-day distribution of canopy species is also a reflection of regeneration from retained paddock trees, so that monocultures of a single species are a common occurrence. For example, where a single *Eucalyptus tereticornis* was left to provide shade for stock 30 years previously, a regenerating forest of this species now dominates that landscape, to the exclusion of other species. This phenomenon has been recognized elsewhere (eg: Ramos et al. 2008; Burns et al. 2011), and will result in long-term change to biodiversity and ecosystem dynamics as grazing lands are destocked and set aside for conservation.

The eight vegetation communities defined and mapped for Rix's Creek align well with previous classification and mapping of the Hunter Valley (Peake 2006). Spotted Gum – Red Ironbark Forest and Spotted Gum – Ironbark – Redgum Forest, as defined for Rix's Creek, could equate to either the Central Hunter Ironbark – Spotted Gum – Grey Box Forest or Central Hunter Box – Ironbark Woodland of Peake (2006), but for convenience are collectively referred to as the former. In addition, the Spotted Gum – Red Ironbark Forest may in fact comprise an Upper Hunter form of the Lower Hunter Spotted Gum – Ironbark Forest, given preliminary results from data analysis undertaken as part of a revision of that community (unpubl. data). Rough-barked Apple Grassy Woodland potentially represents a previously undefined community allied to the Central Hunter Box – Ironbark Woodland (Peake 2006), and is one that is apparent at some other sites within the Central Hunter Valley (unpubl. data).

Table 3 shows how each of the eight Rix's Creek communities compares with those defined by Peake (2006) for elsewhere in the Hunter Valley.

Table 3 Peake (2006) community equivalents for Rix's Creek.

Rix's Creek Community	Equivalent Peake (2006) Community
1. Spiny Rush	not defined
2. Bulloak Low Forest	Central Hunter Bulloak Forest Regeneration (unit 32)
3. Spotted Gum – Red Ironbark Forest 4. Spotted Gum – Ironbark – Redgum Forest	Central Hunter Ironbark – Spotted Gum – Grey Box Forest (unit 27)
5. Rough-barked Apple Grassy Woodland 6. Grey Box Forest	Central Hunter Box – Ironbark Woodland (unit 10)
7. Riparian Redgum Forest	Hunter Lowlands Redgum Forest (unit 24)
8. Swamp Oak Forest	Central Hunter Swamp Oak Forest (unit 28)

6.2 Conservation Significance

Threatened Ecological Communities - Under current threatened species legislation in New South Wales, nearly all of the vegetation in Areas 1-4 of the current study area at Rix's Creek may be considered part of listed Threatened Ecological Communities (TECs). Only the small areas where Spiny Rush and Bulloak Low Forest occur are excluded, although the latter may arguably also fall within the circumscription of Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions (Table 4).

Table 4 Threatened Ecological Community equivalents for Rix's Creek.

Rix's Creek Community	Threatened Ecological Community
3. Spotted Gum – Red Ironbark Forest 4. Spotted Gum – Ironbark – Redgum Forest	*Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions*
5. Rough-barked Apple Grassy Woodland 6. Grey Box Forest	*Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions*
7. Riparian Redgum Forest	*Hunter Lowlands Redgum Forest*

Within Area 1, a combined total of 46.73 ha of vegetation equating to listed TECs is present; in the proposed conservation offsets (Areas 2 & 3), 60.56 ha is present; and 6.85 ha occurs in Area 4 (Table 5, Figures 9-11). As required under relevant legislation (ie: Section 94 *Threatened Species Conservation Act;* Section 5A *Environmental Planning & Assessment Act*; Section 220Z *Fisheries Management Act*), 'seven-part tests' will be required for the *Central Hunter Ironbark - Spotted Gum – Grey Box Forest, Central Hunter Grey Box – Ironbark Woodland* and *Hunter Lowlands Redgum Forest* EEC's. EEC assessments will need addressing once proposed disturbance zones have been finalized. For the proposed rail loop traversing Area 2 and Area 3, these have been included as Appendix 3 to this report.

Table 5 Extent of Threatened Ecological Communities at Rix's Creek.

Threatened Ecological Community	Area I	Area II	Area III	Area IV	Total (ha)
Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions	42.58	22.96	24.56	4.54	94.64
Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	4.15	10.65	1.76	2.31	18.87
Hunter Lowlands Redgum Forest	-	0.63	-		0.63
Total TEC (ha)	46.73	34.24	26.32	6.85	114.14

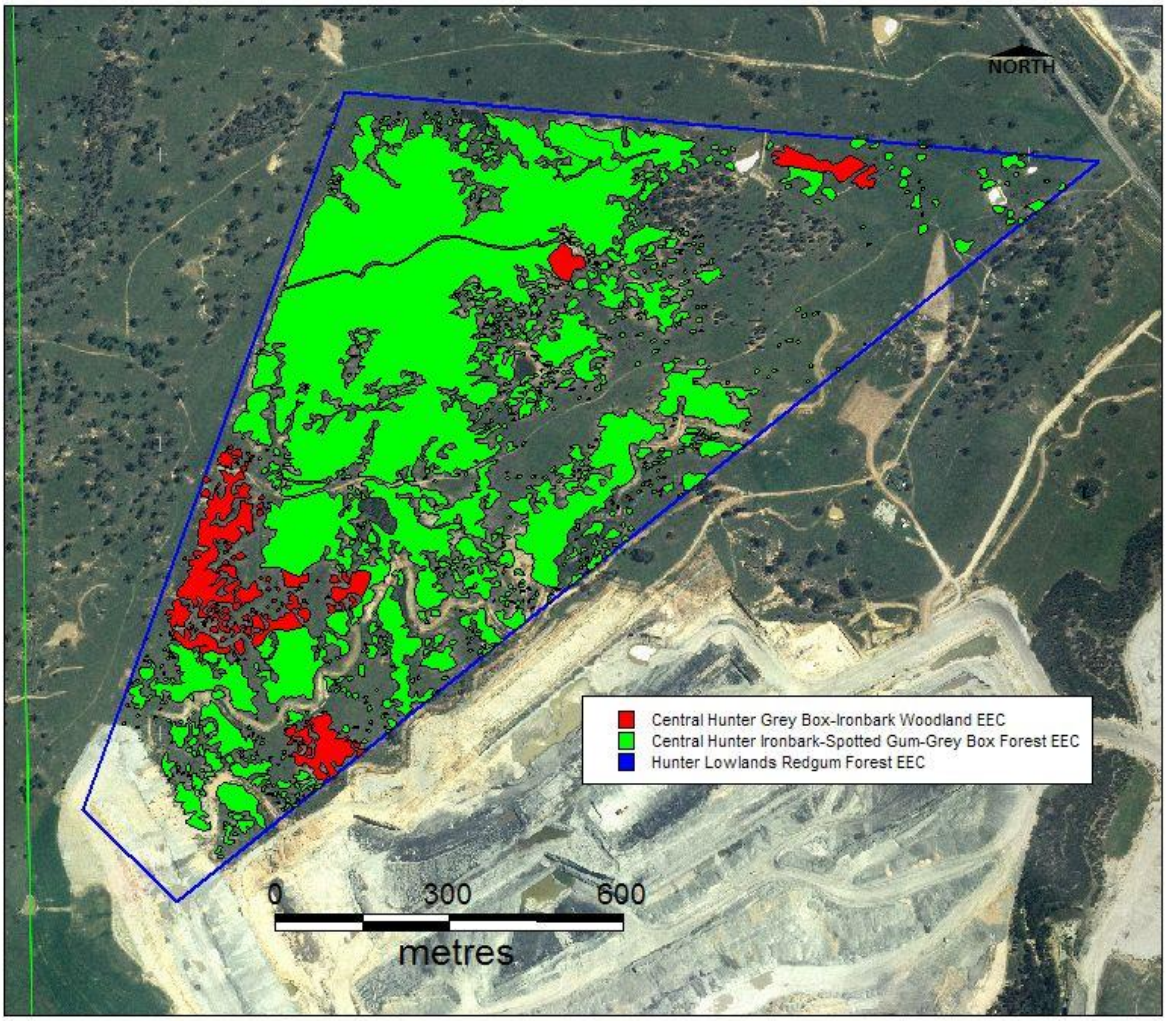

Figure 9 Threatened Ecological Communities in Area 1, Rix's Creek.

Threatened Plant Species - No threatened species or Endangered Populations, as listed on the Act, are present on the site and consequently will not require impact assessment.

BioBanking – In July 2008, the New South Wales government established the BioBanking Scheme under Part 7A of the *Threatened Species Conservation Act 1995*. Under this scheme, it is hoped that biobanking sites can be established under agreements between the Minister for Climate Change and the Environment and the relevant landowners; that biodiversity credits (calculated using the biobanking methodology) for management action can be created to improve or maintain biodiversity values of a site; that the trading of biodiversity credits can occur; and that biodiversity credits may be used to offset development impacts (NSWDECC 2009).

A specific methodology has been established for the biobanking scheme, which covers a range of biodiversity elements including vegetation condition, fauna habitat, floristic diversity etc, each of which are measured against set benchmarks for different vegetation types (NSWDECC 2009). A few key points summarise the assessment of vegetation under the scheme:

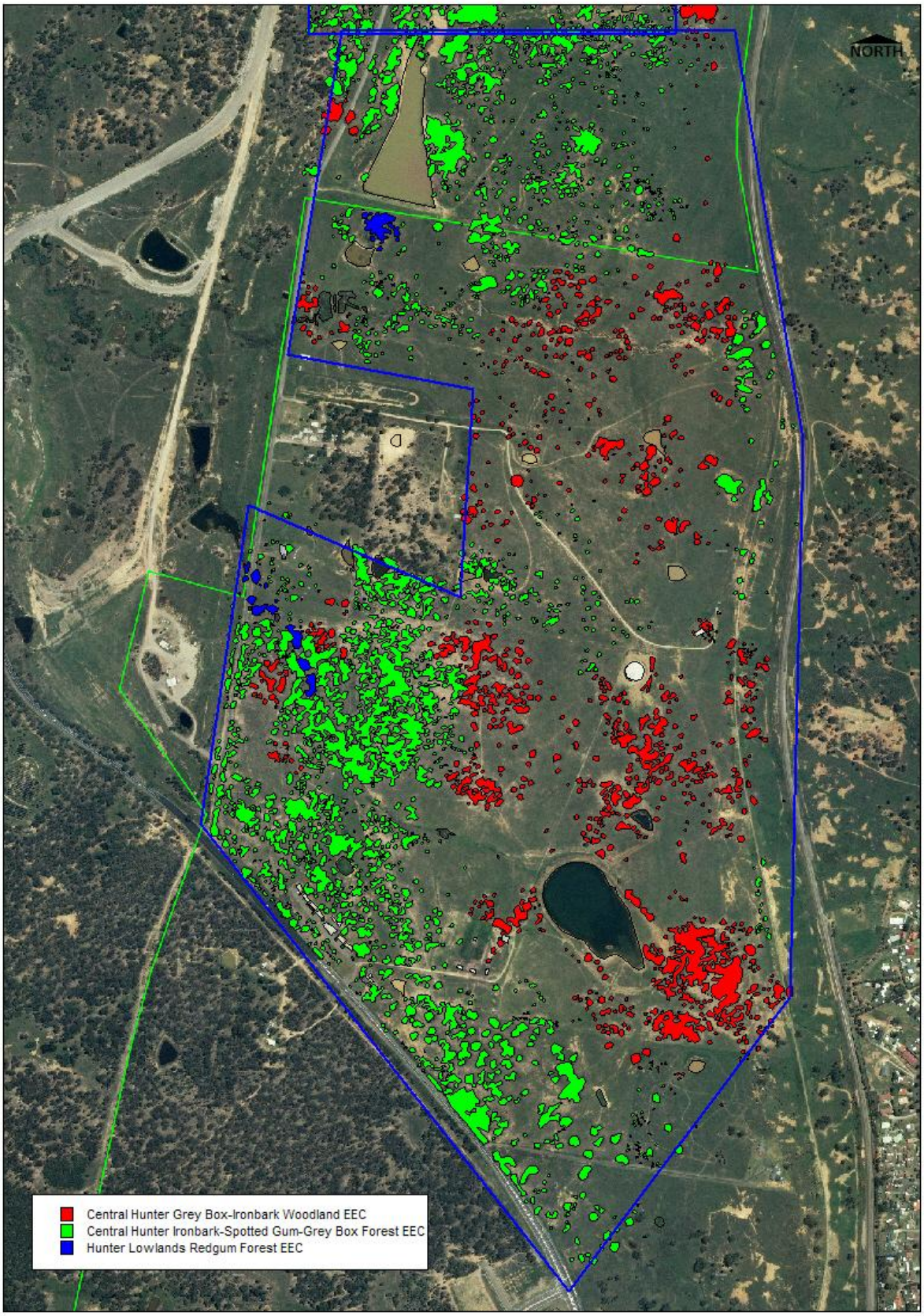

Figure 10 Threatened Ecological Communities in Area 2, Rix's Creek.

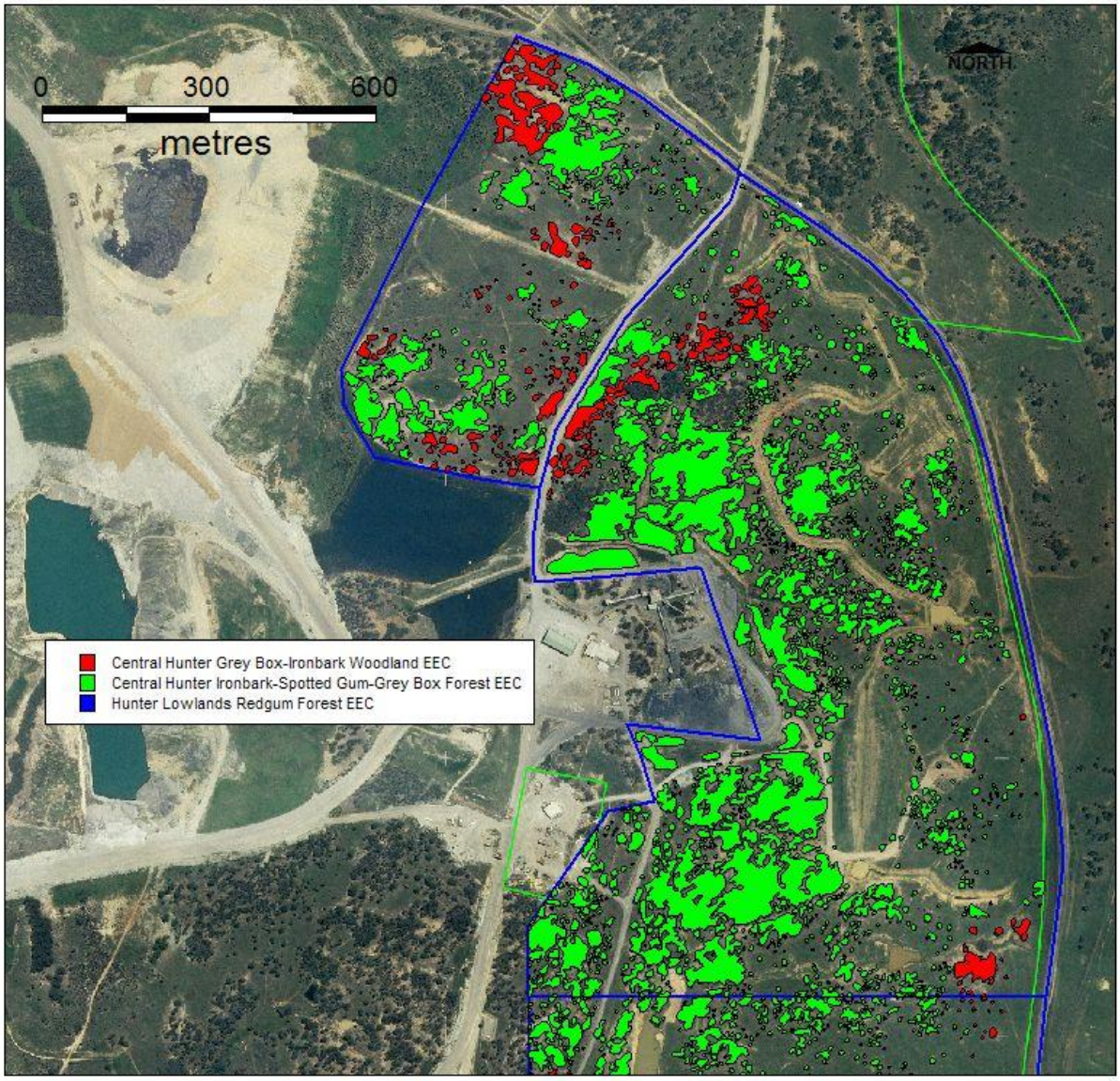

Figure 11 Threatened Ecological Communities in Areas 3 and 4, Rix's Creek.

- a particular site is stratified into vegetation zones, typically on the basis of aerial photographic interpretation;
- a minimum number of sample quadrats are randomly placed within each vegetation zone relative to their areal extent, and according to a set sampling density;
- the number of native plant species present within each quadrat are recorded;
- vegetation communities are compared against the NSW Vegetation Types Database, and the type of best fit chosen.

Minimum sampling effort for each vegetation zone must meet or exceed the values shown in Table 6. Sampling undertaken for the current assessment will have addressed a component of the

BioBanking methodology, however a full assessment will be required at a later date should that avenue be further explored.

Table 6 Minimum sampling effort as required under the BioBanking Scheme.

Vegetation Zone (ha)	Minimum Sampling Effort (No. of quadrats)	
	Standard	Low condition
0 – 4	1 per 2ha (or part thereof)	1
4 – 20	3	2
20 – 50	4	3
50 – 100	5	3
100 – 250	6	4
250 – 1000 *	7	5
> 1000 *	8	5

* more may be required if vegetation condition is variable across a zone

7. Recommendations

The following recommendations are made to further advance vegetation assessments at Rix's Creek:

- undertake further targeted searches for the Vulnerable terrestrial orchid *Diuris tricolor* (and any other relevant species) outside of the proposed rail loop area during the limited flowering period (late September – early October), given the availability of suitable habitat particularly in Areas 1, 3 & 4;
- in combination with the above, undertake a survey of grasslands across the four investigation areas, to ascertain their conservation value relative to other sites in the Hunter Valley;
- should BioBanking be further considered, undertake a full BioBanking assessment of the two proposed conservation offset land parcels (Areas 2 & 3), using a qualified BioBanking assessor, to ascertain the number of biobanking credits applicable to the site;
- complete assessments of significance ('seven part tests') for the proposed development zone in Areas 1 & 4, in order to meet current legislative requirements.

8. References

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Appendix 1 – Species List

Family	Genus & Species	CommonName
Acanthaceae	*Brunoniella australis*	Blue Trumpet
Adiantaceae	*Cheilanthes distans*	Bristly Cloak Fern
	Cheilanthes sieberi subsp. sieberi	Rock Fern
Aizoaceae	*Galenia pubescens* *	Galenia
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
	Alternanthera sp. A	
	Gomphrena celosioides *	Gomphrena Weed
Anthericaceae	*Arthropodium minus*	Small Vanilla Lily
	Arthropodium sp. B	
	Laxmannia gracilis	Slender Wire Lily
Apiaceae	*Centella asiatica*	Indian Pennywort
	Cyclospermum leptophyllum *	Slender Celery
	Daucus glochidiatus	Native Carrot
Apocynaceae	*Gomphocarpus fruticosus* *	Narrow-leaved Cotton Bush
Asteraceae	*Aster subulatus* *	Wild Aster
	Bidens pilosa *	Cobbler's Pegs
	Brachyscome formosa	Pillaga Daisy
	Calocephalus citreus	Lemon Beauty-heads
	Calotis cuneifolia	Purple Burr-Daisy
	Calotis dentex	Burr-daisy
	Calotis lappulacea	Yellow Burr-daisy
	Cassinia arcuata	Sifton Bush
	Cassinia uncata	Sticky Cassinia
	Centipeda minima var. minima	
	Chrysocephalum semipapposum	Clustered Everlasting
	Cirsium vulgare *	Spear Thistle
	Conyza bonariensis *	Flaxleaf Fleabane
	Cymbonotus lawsonianus	Bear's Ear
	Eclipta platyglossa	Yellow Twin-heads
	Epaltes australis	Spreading Nut-heads
	Euchiton sphaericus	Star Cudweed
	Gamochaeta americana *	Cudweed
	Glossocardia bidens	Cobbler's Tack
	Hypochaeris radicata *	Catsear
	Lagenophora stipitata	Common Lagenophora
	Minuria leptophylla	
	Ozothamnus diosmifolius	White Dogwood
	Schkuhria pinnata var. abrotanoides *	Dwarf Marigold
	Senecio madagascariensis *	Fireweed
	Solenogyne bellioides	Solengyne

Family	Genus & Species	CommonName
	Soliva sessilis *	Bindyi
	Sonchus oleraceus *	Common Sowthistle
	Taraxacum officinale *	Dandelion
	Vernonia cinerea var. cinerea	
	Vittadinia pterochaeta	Rough Fuzzweed
	Vittadinia sulcata	
Brassicaceae	*Lepidium africanum* *	Common Peppercress
	Lepidium bonariense *	Argentine Peppercress
Cactaceae	*Opuntia aurantiaca* *	Tiger Pear
	Opuntia humifusa *	Creeping Pear
	Opuntia stricta var. stricta *	Common Prickly Pear
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
	Wahlenbergia gracilis	Sprawling Bluebell
	Wahlenbergia stricta subsp. stricta	Austral Bluebell
Caryophyllaceae	*Paronychia brasiliana* *	Chilean Whitlow Wort, Brazilian Whitlow
	Spergularia rubra *	Sandspurry
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
	Allocasuarina luehmannii	Bulloak
	Casuarina glauca	Swamp Oak
Celastraceae	*Maytenus silvestris*	Narrow-leaved Orangebark
Chenopodiaceae	*Atriplex semibaccata*	Creeping Saltbush
	Chenopodium pumilio	Small Crumbweed
	Einadia hastata	Berry Saltbush
	Einadia nutans subsp. linifolia	Climbing Saltbush
	Einadia nutans subsp. nutans	Climbing Saltbush
	Einadia trigonos subsp. leiocarpa	
	Enchylaena tomentosa	Ruby Saltbush
	Maireana microphylla	Small-leaf Bluebush
Commelinaceae	*Commelina cyanea*	Native Wandering Jew
Convolvulaceae	*Convolvulus erubescens*	Pink Bindweed
	Dichondra repens	Kidney Weed
	Evolvulus alsinoides var. decumbens	
Cyperaceae	*Carex inversa*	Knob Sedge
	Cyperus aggregates *	
	Cyperus gracilis	Slender Flat-sedge
	Cyperus sesquiflorus *	
	Eleocharis acuta	
	Ficinia nodosa	Knobby Club-rush
	Fimbristylis dichotoma	Common Fringe-sedge

Family	Genus & Species	CommonName
Dilleniaceae	*Hibbertia obtusifolia*	Hoary Guinea Flower
Droseraceae	*Drosera auriculata*	A sundew
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed
Fabaceae (Faboideae)	*Bossiaea prostrata*	
	Chorizema parviflorum	Eastern Flame Pea
	Daviesia acicularis	
	Daviesia genistifolia	Broom Bitter Pea
	Daviesia ulicifolia subsp. ulicifolia	
	Desmodium brachypodum	Large Tick-trefoil
	Desmodium gunnii	Slender Tick-trefoil
	Desmodium varians	Slender Tick-trefoil
	Glycine clandestina	Twining glycine
	Glycine tabacina	Variable Glycine
	Hardenbergia violacea	False Sarsaparilla
	Indigofera australis	Australian Indigo
	Pultenaea microphylla	A Bush Pea
	Templetonia stenophylla	Leafy Templetonia
	Trifolium repens *	White Clover
	Zornia dyctiocarpa var. dyctiocarpa	Zornia
Fabaceae (Mimosoideae)	*Acacia amblygona*	Fan Wattle
	Acacia decora	Western Silver Wattle
	Acacia falcata	
	Acacia paradoxa	Kangaroo Thorn
	Acacia parvipinnula	Silver-stemmed Wattle
	Acacia saligna *	Western Golden Wattle
	Acacia ulicifolia	Prickly Moses
Geraniaceae	*Geranium homeanum*	
Goodeniaceae	*Goodenia pinnatifida*	Scrambles Eggs
	Goodenia rotundifolia	
Haloragaceae	*Haloragis heterophylla*	Variable Raspwort
Juncaceae	*Juncus acutus subsp. acutus* *	Sharp Rush
	Juncus cognatus *	
	Juncus continuus	
	Juncus homalocaulis	
	Juncus prismatocarpus	
	Juncus usitatus	
Lamiaceae	*Ajuga australis*	Austral Bugle
	Mentha diemenica	Slender Mint
	Mentha satureioides	Native Pennyroyal

Family	Genus & Species	CommonName
Lobeliaceae	*Pratia concolor*	Poison Pratia
	Pratia purpurascens	Whiteroot
Lomandraceae	*Lomandra confertifolia subsp. pallida*	Matrush
	Lomandra filiformis subsp. coriacea	Wattle Matt-rush
	Lomandra glauca	Pale Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
	Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush
Loranthaceae	*Dendrophthoe vitellina*	
Malvaceae	*Abutilon oxycarpum*	Straggly Lantern-bush
	Modiola caroliniana *	Red-flowered Mallow
	Sida corrugata	Corrugated Sida
	Sida rhombifolia *	Paddy's Lucerne
	Sida subspicata	
Myoporaceae	*Eremophila debilis*	Amulla
	Myoporum montanum	Western Boobialla
Myrsinaceae	*Anagallis arvensis* *	Scarlet Pimpernel
Myrtaceae	*Angophora floribunda*	Rough-barked Apple
	Corymbia maculata	Spotted Gum
	Eucalyptus crebra	Narrow-leaved Ironbark
	Eucalyptus fibrosa	Red Ironbark
	Eucalyptus moluccana	Grey Box
	Eucalyptus tereticornis	Forest Red Gum
Oleaceae	*Notelaea microcarpa var. microcarpa*	
	Olea europaea subsp. cuspidate *	African Olive
Orchidaceae	*Diuris aurea*	
	Microtis unifolia	
	Pterostylis spp.	Greenhood
Oxalidaceae	*Oxalis perennans*	
Phormiaceae	*Dianella longifolia var. longifolia*	A Blue Flax Lily
	Dianella revoluta var. revoluta	A Blue Flax Lily
	Dianella tasmanica	
Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush
	Phyllanthus virgatus	Wiry Spurge
Plantaginaceae	*Plantago debilis*	Shade Plantain
	Plantago lanceolata *	Lamb's Tongues
	Veronica plebeia	Trailing Speedwell
Poaceae	*Aristida jerichoensis var. jerichoensis*	Jericho Wiregrass

Family	Genus & Species	CommonName
	Aristida ramosa	Purple Wiregrass
	Aristida vagans	Threeawn Speargrass
	Austrodanthonia bipartita	Wallaby Grass
	Austrodanthonia caespitosa	Ringed Wallaby Grass
	Austrodanthonia racemosa var. racemosa	A Wallaby Grass
	Austrodanthonia tenuior	A Wallaby Grass
	Austrostipa scabra subsp. falcata	Rough Speargrass
	Austrostipa verticillata	Slender Bamboo Grass
	Axonopus fissifolius *	Narrow-leafed Carpet Grass
	Bothriochloa decipiens var. decipiens	Pitted Bluegrass
	Chloris truncata	Windmill Grass
	Cymbopogon refractus	Barbed Wire Grass
	Cynodon dactylon	Common Couch
	Dichanthium sericeum subsp. sericeum	Queensland Bluegrass
	Dichelachne micrantha	Shorthair Plumegrass
	Digitaria diffusa	Open Summer-grass
	Digitaria divaricatissima	Umbrella Grass
	Digitaria ramularis	Finger Panic Grass
	Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass
	Echinopogon ovatus	Forest Hedgehog Grass
	Elymus scaber var. scaber	Common Wheatgrass
	Enteropogon acicularis	Curly Windmill Grass
	Entolasia stricta	Wiry Panic
	Eragrostis brownii	Brown's Lovegrass
	Eragrostis elongata	Clustered Lovegrass
	Eragrostis leptostachya	Paddock Lovegrass
	Eriochloa pseudoacrotricha	Early Spring Grass
	Melinis repens *	Red Natal Grass
	Microlaena stipoides var. stipoides	Weeping Grass
	Notodanthonia longifolia	Long-leaved Wallaby Grass
	Panicum effusum	Hairy Panic
	Paspalidium distans	
	Paspalum dilatatum *	Paspalum
	Poa labillardierei var. labillardierei	Tussock
	Setaria parviflora	
	Sporobolus creber	Slender Rat's Tail Grass
	Themeda australis	Kangaroo Grass
Rubiaceae	*Asperula conferta*	Common Woodruff
	Opercularia diphylla	Stinkweed
	Psydrax odorata subsp. buxifolia f. buxifolia	
	Richardia stellaris *	
Sapindaceae	*Dodonaea viscosa subsp. angustifolia*	
Scrophulariaceae	*Gratiola pedunculata*	
Solanaceae	*Solanum cinereum*	Narrawa Burr
	Solanum nigrum *	Black-berry Nightshade
	Solanum prinophyllum	Forest Nightshade

Family	Genus & Species	CommonName
Stackhousiaceae	*Stackhousia muricata*	Stackhousia
Sterculiaceae	*Brachychiton populneus subsp. populneus*	
Thymelaeaceae	*Pimelea curviflora var. sericea*	
Typhaceae	*Typha spp.*	Cumbungi
Violaceae	*Hybanthus monopetalus*	Slender Violet-bush

* = exotic/ weed species

Appendix 2 – Vegetation Community Profiles

Community profiles of each vegetation community present within Rix's Creek study area have been developed to assist end-users in the interpretation of delineated map units, and to allow the general reader with at least some basic knowledge of common plant species to identify the different vegetation types.

The derivation of diagnostic species for each community has been defined using the SIMPER routine in *Primer* (Clarke & Gorley 2006). SIMPER analysis provides the relative contributions of each species to the Bray-Curtis similarity within each of the defined vegetation communities. Only those species contributing to a total cumulative contribution of 90% of the average similarity (ie: the value shown at the top of each table) for each community are listed. These species can be described of as *typical* of that community, and have a consistently large presence within the data as reflected in the ratio of their contribution to the standard deviation (the Sim/SD field in each table) across the within-group similarities (the average similarity). Community groups with less than two samples (ie: Spiny Rush, Bulloak Low Forest, Riparian Redgum Forest, Swamp Oak Forest) cannot be analysed in this way. Instead, the full species list from the single plot in each community is shown, in decreasing cover abundance value. An indicative list only is included for Swamp Oak Forest, as no data has been collected in that community.

In the tables in each profile:

- Average similarity — is the within-group similarity for all pairs of sample plots comprising the community, shown under the Group heading. Higher average similarity indicates a better defined community. Communities of less than 2 samples do not show this figure.
- Av.Abund — is the average cover abundance of that species within sample plots comprising the community
- Av.Sim — is the average similarity (contribution) made by each species to the within-group similarity (the overall average similarity).
- Sim/SD — is the ratio of average similarity to standard deviation for each species across all pairs of samples. A high ratio represents a good discriminating species. At least three samples are required for this ratio to be calculated.
- Contrib % — is the percentage contribution of each species to the overall average similarity for the community.
- Cum % — is the cumulative percentage contribution of each species to the overall average similarity for that community.

1. Spiny Rush

Group: Spiny Rush
Less than 2 samples in group

Species	Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Juncus acutus subsp. acutus	6	-	-	-	-
Cynodon dactylon	4	-	-	-	-
Senecio madagascariensis	3	-	-	-	-
Juncus continuus	2	-	-	-	-
Solanum nigrum	2	-	-	-	-
Eriochloa pseudoacrotricha	2	-	-	-	-
Sonchus oleraceus	2	-	-	-	-
Trifolium repens	2	-	-	-	-
Paspalum dilatatum	2	-	-	-	-
Centella asiatica	2	-	-	-	-
Gamochaeta americana	2	-	-	-	-
Conyza bonariensis	2	-	-	-	-
Pratia concolor	2	-	-	-	-
Plantago lanceolata	2	-	-	-	-
Soliva sessilis	2	-	-	-	-
Veronica plebeia	1	-	-	-	-
Juncus cognatus	1	-	-	-	-

Group: Spiny Rush Less than 2 samples in group					
Oxalis perennans	1	-	-	-	-
Calotis cuneifolia	1	-	-	-	-
Aster subulatus	1	-	-	-	-
Carex inversa	1	-	-	-	-
Setaria parviflora	1	-	-	-	-
Cirsium vulgare	1	-	-	-	-
Sporobolus creber	1	-	-	-	-
Alternanthera sp. A	1	-	-	-	-

Notes: Restricted to drainage lines and channels in severely cleared landscapes.

2. Bulloak Low Forest

Group: Bulloak Low Forest
Less than 2 samples in group

Species	Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Allocasuarina luehmannii	5	-	-	-	-
Einadia nutans subsp. linifolia	2	-	-	-	-
Cyperus gracilis	2	-	-	-	-
Digitaria diffusa	2	-	-	-	-
Glycine tabacina	2	-	-	-	-
Senecio madagascariensis	1	-	-	-	-
Austrodanthonia tenuior	1	-	-	-	-
Eucalyptus crebra	1	-	-	-	-
Lomandra confertifolia subsp. pallida	1	-	-	-	-
Eremophila debilis	1	-	-	-	-
Einadia trigonos subsp. leiocarpa	1	-	-	-	-
Aristida vagans	1	-	-	-	-
Austrostipa scabra subsp. falcata	1	-	-	-	-
Lomandra multiflora subsp. multiflora	1	-	-	-	-
Calotis cuneifolia	1	-	-	-	-
Brunoniella australis	1	-	-	-	-
Commelina cyanea	1	-	-	-	-

Notes: Regeneration of Bulloak is occurring widely in the Hunter Valley with the removal of grazing stock, and results in monospecific stands of this species with low diversity understorey. Potentially forms part of the Spotted Gum – Ironbark – Redgum Forest.

3. Spotted Gum – Red Ironbark Forest

Group Spotted Gum - Red Ironbark Forest
Average similarity: 49.21

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Eucalyptus fibrosa	3.8	5.45	5.03	11.08	11.08
Dianella revoluta var. revoluta	2.0	3.02	8.24	6.15	17.23
Lomandra multiflora subsp. multiflora	2.0	3.02	8.24	6.15	23.37
Microlaena stipoides var. stipoides	2.0	2.39	3.26	4.85	28.22
Cymbopogon refractus	1.8	2.36	3.62	4.80	33.02
Aristida ramosa var. ramosa	1.6	1.95	1.15	3.96	36.98
Aristida vagans	1.6	1.85	1.14	3.75	40.73
Paspalidium distans	1.8	1.85	1.14	3.75	44.48
Lomandra confertifolia subsp. pallida	1.8	1.83	1.14	3.72	48.20
Desmodium gunnii	1.2	1.51	8.24	3.07	51.27
Brunoniella australis	1.4	1.45	1.04	2.94	54.21
Acacia amblygona	2.4	1.33	0.52	2.70	56.91
Dichondra repens	1.4	1.27	1.03	2.59	59.50
Corymbia maculata	1.6	1.18	0.61	2.40	61.90
Einadia nutans subsp. linifolia	1.2	1.08	1.00	2.19	64.09
Lomandra filiformis subsp. coriacea	1.2	1.07	1.05	2.17	66.26
Cheilanthes sieberi subsp. sieberi	1.2	1.04	1.10	2.12	68.38

Group Spotted Gum - Red Ironbark Forest Average similarity: 49.21					
Enteropogon acicularis	1.2	1.04	1.10	2.12	70.49
Stackhousia muricata	1.2	0.98	1.07	1.99	72.49
Cyperus gracilis	1.0	0.92	1.14	1.86	74.35
Pultenaea microphylla	1.2	0.92	0.62	1.86	76.21
Calotis lappulacea	1.0	0.87	1.15	1.77	77.98
Calotis cuneifolia	1.2	0.87	0.62	1.77	79.75
Eremophile debilis	1.0	0.85	1.15	1.73	81.48
Glycine tabacina	1.0	0.85	1.15	1.73	83.21
Austrodanthonia tenuior	1.0	0.67	0.58	1.36	84.57
Templetonia stenophylla	1.0	0.64	0.56	1.30	85.87
Digitaria diffusa	1.0	0.61	0.59	1.24	87.10
Goodenia rotundifolia	1.0	0.57	0.59	1.15	88.26
Indigofera australis	0.6	0.46	0.62	0.93	89.19
Solanum prinophyllum	0.6	0.44	0.62	0.88	90.07

Notes: Highly restricted within the current investigation areas to a single site on the northern edge of Area 1, and a further patch within Area 4. Both sites have been previously logged and mainly young trees are present. Some older trees occur however in Area 4.

4. Spotted Gum – Ironbark – Redgum Forest

Group Spotted Gum - Ironbark - Redgum Forest
Average similarity: 46.90

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Eucalyptus crebra	2.9	3.11	1.58	6.63	6.63
Lomandra multiflora subsp. multiflora	2.0	2.98	7.09	6.35	12.98
Aristida ramosa var. ramosa	2.2	2.81	4.27	6.00	18.98
Cymbopogon refractus	2.0	2.32	2.05	4.96	23.93
Calotis cuneifolia	1.9	2.29	2.07	4.88	28.81
Paspalidium distans	1.6	1.97	1.76	4.21	33.02
Lomandra confertifolia subsp. pallida	1.7	1.87	1.44	4.00	37.02
Cheilanthes sieberi subsp. sieberi	1.5	1.71	1.14	3.64	40.66
Brunoniella australis	1.5	1.64	1.14	3.49	44.15
Dianella revoluta var. revoluta	1.5	1.40	1.28	2.99	47.14
Austrodanthonia tenuior	1.4	1.40	1.30	2.99	50.13
Microlaena stipoides var. stipoides	1.4	1.26	0.86	2.68	52.81
Eremophile debilis	1.1	1.26	2.17	2.68	55.49
Bothriochloa decipiens var. decipiens	1.5	1.21	1.01	2.58	58.07
Dichondra repens	1.4	1.17	0.88	2.49	60.56
Digitaria diffusa	1.3	1.16	0.87	2.47	63.03
Glycine tabacina	1.2	1.16	1.37	2.47	65.51

Group Spotted Gum - Ironbark - Redgum Forest Average similarity: 46.90					
Einadia nutans subsp. linifolia	1.2	1.12	0.80	2.39	67.89
Eragrostis leptostachya	1.3	1.01	0.73	2.15	70.05
Acacia amblygona	1.0	0.89	1.11	1.90	71.94
Stackhousia muricata	1.0	0.72	0.70	1.55	73.49
Allocasuarina luehmannii	1.1	0.71	0.87	1.51	75.00
Themeda australis	0.9	0.63	0.70	1.34	76.34
Chrysocephalum semipapposum	0.9	0.61	0.68	1.31	77.64
Laxmannia gracilis	1.1	0.60	0.53	1.28	78.93
Desmodium varians	0.9	0.55	0.58	1.17	80.09
Cheilanthes distans	1.0	0.53	0.55	1.13	81.22
Aristida vagans	0.9	0.52	0.56	1.10	82.33
Chloris truncata	1.0	0.49	0.58	1.04	83.36
Cyperus gracilis	0.9	0.45	0.45	0.97	84.33
Austrostipa scabra subsp. falcata	0.9	0.45	0.57	0.96	85.30
Pratia purpurascens	0.7	0.41	0.58	0.87	86.16
Calotis lappulacea	0.9	0.41	0.46	0.86	87.03
Eragrostis brownii	0.7	0.32	0.36	0.68	87.71
Templetonia stenophylla	0.5	0.29	0.48	0.62	88.33
Daviesia ulicifolia subsp. ulicifolia	0.5	0.29	0.48	0.62	88.95
Dianella tasmanica	0.5	0.28	0.47	0.60	89.55
Arthropodium sp B	0.5	0.27	0.48	0.58	90.13

Notes: Variation in canopy dominance within this community is a reflection of past land-use history, specifically relating to the identities of retained paddock trees and subsequent regeneration. Representatives of this community may be variously dominated by *Eucalyptus crebra, Corymbia maculata,* or *Eucalyptus tereticornis*, or any combination of the above. Understorey and ground composition is relatively consistent despite differences in canopy.

7. Rough-barked Apple Woodland

Group Rough-barked Apple Grassy Woodland
Average similarity: 61.42

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Angophora floribunda	4.0	6.30	-	10.26	10.26
Microlaena stipoides var. stipoides	4.0	6.30	-	10.26	20.51
Bothriochloa decipiens var. decipiens	2.5	3.15	-	5.13	25.64
Calotis cuneifolia	2.0	3.15	-	5.13	30.77
Carex inversa	2.0	3.15	-	5.13	35.90
Cheilanthes sieberi subsp. sieberi	2.0	3.15	-	5.13	41.03
Cymbopogon refractus	2.0	3.15	-	5.13	46.15
Cynodon dactylon	2.0	3.15	-	5.13	51.28
Dichondra repens	2.0	3.15	-	5.13	56.41
Digitaria diffusa	2.0	3.15	-	5.13	61.54
Eragrostis leptostachya	2.0	3.15	-	5.13	66.67
Oxalis perenans	2.0	3.15	-	5.13	71.79
Pratia purpurascens	2.5	3.15	-	5.13	76.92
Veronica plebeia	2.0	3.15	-	5.13	82.05
Austrodanthonia racemosa var. racemosa	1.5	1.57	-	2.56	84.62
Austrostipa scabra subsp. falcata	1.5	1.57	-	2.56	87.18
Chrysocephalum semipapposum	1.5	1.57	-	2.56	89.74

Group Rough-barked Apple Grassy Woodland Average similarity: 61.42					
Eucalyptus crebra	1.5	1.57	-	2.56	92.31

Notes: This community occurs typically as localized patches, however best development is in Area 3 and Area 4.

6. Grey Box Forest

Group Grey Box Forest
Average similarity: 63.38

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Eucalyptus moluccana	4.0	5.31	14.52	8.38	8.38
Bothriochloa decipiens var. decipiens	3.4	3.98	14.52	6.29	14.67
Chloris truncata	2.8	3.03	5.71	4.79	19.46
Cyperus gracilis	2.4	2.80	5.02	4.42	23.88
Aristida ramosa var. ramosa	2.2	2.66	14.52	4.19	28.07
Brunoniella australis	2.0	2.66	14.52	4.19	32.26
Dichondra repens	2.2	2.66	14.52	4.19	36.45
Einadia nutans subsp. linifolia	2.2	2.66	14.52	4.19	40.64
Eragrostis leptostachya	2.0	2.66	14.52	4.19	44.83
Oxalis perenans	2.0	2.66	14.52	4.19	49.02
Sporobolus creber	2.0	2.66	14.52	4.19	53.22
Paspalidium distans	1.8	2.13	2.95	3.36	56.58
Glycine tabacina	1.8	2.09	3.66	3.29	59.87
Maireana microphylla	1.8	2.09	3.66	3.29	63.16
Eremophile debilis	1.6	1.74	2.43	2.75	65.91
Austrodanthonia tenuior	1.8	1.64	1.16	2.59	68.51
Enchylaena tomentosa	1.6	1.64	1.16	2.59	71.10

Group Grey Box Forest Average similarity: 63.38					
Carex inversa	1.6	1.61	1.16	2.54	73.64
Cymbopogon refractus	1.6	1.60	1.16	2.52	76.16
Asperula conferta	1.6	1.52	1.16	2.39	78.55
Enteropogon acicularis	1.4	1.24	1.01	1.96	80.50
Phyllanthus virgatus	1.4	1.24	1.01	1.96	82.46
Chrysocephalum semipapposum	1.4	1.21	1.06	1.91	84.37
Goodenia pinnatifida	1.4	1.21	1.02	1.90	86.28
Calotis cuneifolia	1.2	0.75	0.62	1.19	87.47
Glossocardia bidens	1.2	0.75	0.62	1.19	88.65
Microlaena stipoides var. stipoides	1.2	0.75	0.62	1.19	89.84
Stackhousia muricata	1.0	0.50	0.58	0.79	90.63

Notes: Good examples of this community occur on the high ridgeline within Area 1, where some older trees have been retained. Younger regrowth stands are also present in Areas 2, 3 and 4.

7. Riparian Redgum Forest

Group: Riparian Redgum Forest
Less than 2 samples in group

Species	Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Cynodon dactylon	5	-	-	-	-
Eucalyptus tereticornis	4	-	-	-	-
Solenogyne bellioides	3	-	-	-	-
Plantago lanceolata	3	-	-	-	-
Dichondra repens	3	-	-	-	-
Senecio madagascariensis	2	-	-	-	-
Richardia stellaris	2	-	-	-	-
Pratia concolor	2	-	-	-	-
Paspalum dilatatum	2	-	-	-	-
Paspalidium distans	2	-	-	-	-
Oxalis perennans	2	-	-	-	-
Microlaena stipoides var. stipoides	2	-	-	-	-
Juncus prismatocarpus	2	-	-	-	-
Juncus continuus	2	-	-	-	-
Hypochaeris radicata	2	-	-	-	-
Haloragis heterophylla	2	-	-	-	-

Group: Riparian Redgum Forest Less than 2 samples in group					
Glycine tabacina	2	-	-	-	-
Fimbristylis dichotoma	2	-	-	-	-
Eleocharis acuta	2	-	-	-	-
Eclipta platyglossa	2	-	-	-	-
Desmodium varians	2	-	-	-	-
Cyperus sesquiflorus	2	-	-	-	-
Conyza bonariensis	2	-	-	-	-
Centella asiatica	2	-	-	-	-
Carex inversa	2	-	-	-	-
Brunoniella australis	2	-	-	-	-
Bothriochloa decipiens var. decipiens	2	-	-	-	-
Axonopus fissifolius	2	-	-	-	-
Austrodanthonia tenuior	2	-	-	-	-
Aster subulatus	2	-	-	-	-
Asperula conferta	2	-	-	-	-
Aristida ramosa	2	-	-	-	-
Sporobolus creber	1	-	-	-	-
Sida rhombifolia	1	-	-	-	-
Setaria parviflora	1	-	-	-	-
Paronychia brasiliana	1	-	-	-	-
Lepidium bonariense	1	-	-	-	-
Gratiola pedunculata	1	-	-	-	-
Gomphocarpus fruticosus	1	-	-	-	-
Eucalyptus moluccana	1	-	-	-	-
Eremophila debilis	1	-	-	-	-
Eragrostis leptostachya	1	-	-	-	-
Eragrostis elongata	1	-	-	-	-
Cirsium vulgare	1	-	-	-	-
Cheilanthes sieberi subsp. sieberi	1	-	-	-	-
Centipeda minima var. minima	1	-	-	-	-
Austrodanthonia racemosa var. racemosa	1	-	-	-	-
Anagallis arvensis	1	-	-	-	-
Alternanthera denticulata	1	-	-	-	-

Notes: Restricted to major drainage lines in Areas 2 and 3, but all have been severely impacted upon by stock grazing.

8. Swamp Oak Forest

Group: Swamp Oak Forest
Less than 2 samples in group (indicative list only)

Species	Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
Casuarina glauca	-	-	-	-	-
Eucalyptus tereticornis	-	-	-	-	-
Cynodon dactylon	-	-	-	-	-
Dichondra repens	-	-	-	-	-
Senecio madagascariensis	-	-	-	-	-
Oxalis perennans	-	-	-	-	-
Microlaena stipoides var. stipoides	-	-	-	-	-
Hypochaeris radicata	-	-	-	-	-
Conyza bonariensis	-	-	-	-	-
Aster subulatus	-	-	-	-	-
Sida rhombifolia	-	-	-	-	-
Eragrostis leptostachya	-	-	-	-	-
Austrostipa verticillata	-	-	-	-	-
Anagallis arvensis	-	-	-	-	-

Appendix 3 – Impact Assessment on Proposed Rail Loop & Bund

A1. Background

Subsequent to the completion of the vegetation assessment across the proposed expansion and offset areas at Rix's Creek mine, a stronger commitment to the construction of a rail loop has been achieved. In addition to the proposed rail loop, a small visual bund on the eastern side of the existing Main Northern Railway is to be constructed. Using the information and data gathered for the original report, together with data contained in the adjacent Nundah Bank third rail line (Parsons Brinckerhoff 2011), an assessment of significance has now been undertaken on threatened flora and vegetation communities, and is presented in this Appendix.

A2. Location of Proposed Rail Loop & Bund

Figure A1 shows the proposed location of the rail loop relative to the existing Main Northern Railway, together with the visual bund. In total, it is expected that 52.74 ha of land will be disturbed to support the new rail loop and associated infrastructure, and 0.9 ha for the bund. Remnant native vegetation is present across the former grazing lands in which the proposed rail loop and bund are to be located, some of which equates to the listed Endangered Ecological Communities:

- *Central Hunter Ironbark - Spotted Gum – Grey Box Forest EEC*
- *Central Hunter Grey Box – Ironbark Woodland EEC*

As required under relevant NSW legislation (ie: Section 94 *Threatened Species Conservation Act;* Section 5A *Environmental Planning & Assessment Act*; Section 220Z *Fisheries Management Act*), 'seven-part tests' are required to assess potential impacts on these communities. No threatened species or Endangered Populations, as listed on the Act, are present on the site and consequently do not require impact assessment.

A3. Impact Assessment

The disturbance area associated with the proposed rail loop will result in the loss of 8.45 ha of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* EEC and 2.25 ha of *Central Hunter Grey Box – Ironbark Woodland EEC*. The balance of land within the total 52.74 ha disturbance area (42.04 ha) comprises grasslands dominated by native or exotic pasture species ('derived grasslands'). There is no specific mention in either determination that these derived grasslands are included within the EECs, and these grasslands have not been surveyed or mapped in any detail.

Based on survey and mapping completed by Parsons Brinckerhoff (2011), the site of the proposed visual bund supports Derived Grassland, with a small patch of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* EEC immediately to the north. The proposed bund is located only within the derived grassland, and hence will not impact on any EEC (Figure A2).

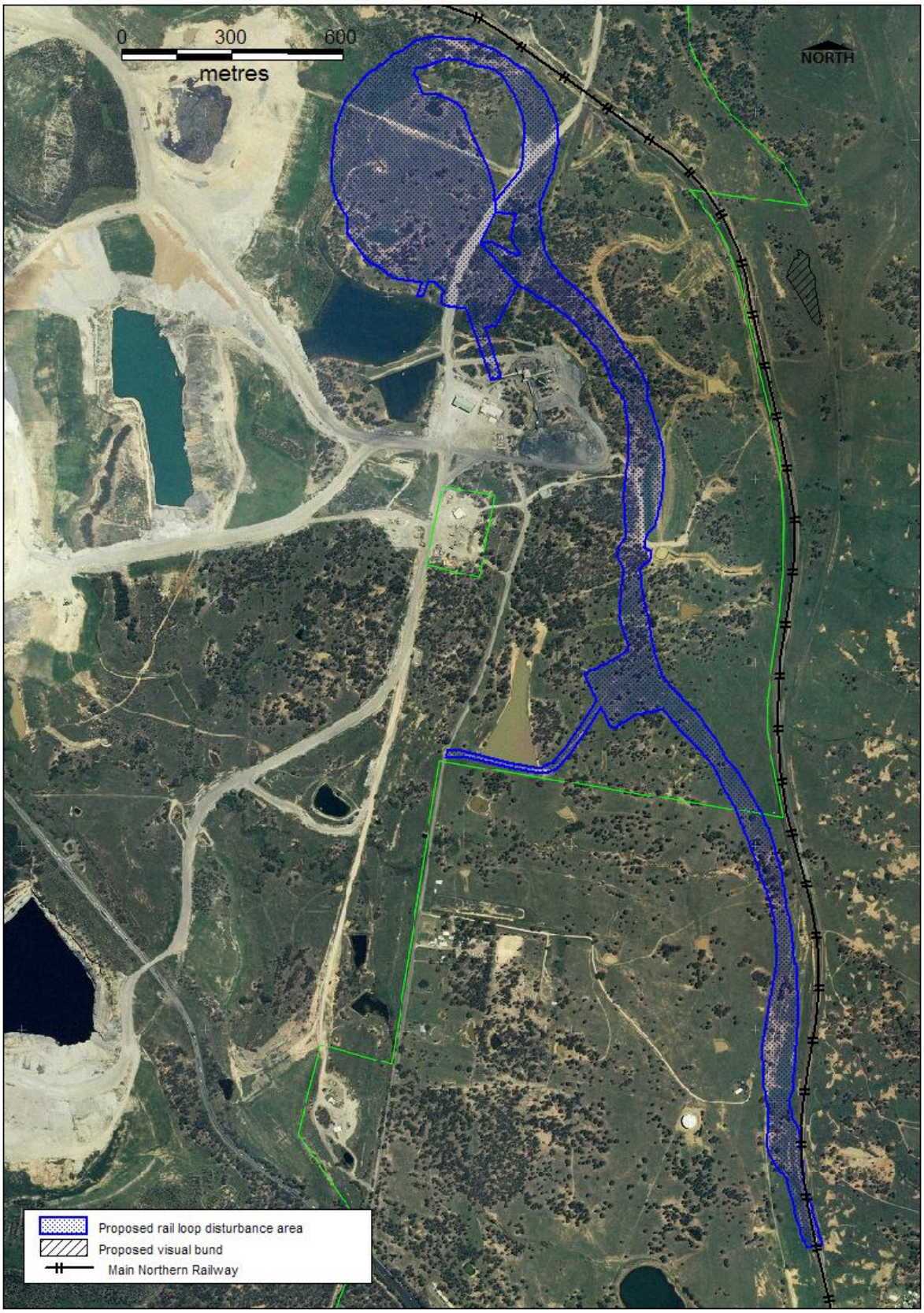

Figure A1 Location of the proposed rail loop and visual bund, relative to the existing Main Northern Railway.

Figure A2 Location of the proposed visual bund, relative to mapping of Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC completed by Parsons Brinckerhoff (2011) for the Nundah Bank rail project.

A3.1 Central Hunter Ironbark – Spotted Gum – Grey Box Forest

A total of 8.45 ha of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* EEC (CHISGGBF) is present within the proposed rail loop and is subject to clearing.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

CHISGGBF is not a threatened species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

CHISGGBF is not an endangered population.

(c) in the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(i) CHISGGBF occupies 94.64 ha of the immediate environs investigated at Rixs' Creek mine, including 47.52 ha in the proposed conservation offsets (Areas 2 & 3). A loss of 8.45 ha of CHISGGBF represents a loss of 8.9% in the immediate area. Peake (2006) reported that in excess of 18,000 ha of CHISGGBF occurred in the Hunter Valley, representing around 30% of all remnant vegetation that he studied. Within a local context, Rix's Creek mine lies in the centre of a large expanse of this EEC, all of which can be considered in a local context due to its contiguous nature (Figure A3).

(ii) Substantial modification to the composition of CHISGGBF will occur through this proposal. However, given the presence of this community widely in the local area, including 47.52 ha within conservation offsets, there is little risk of extinction.

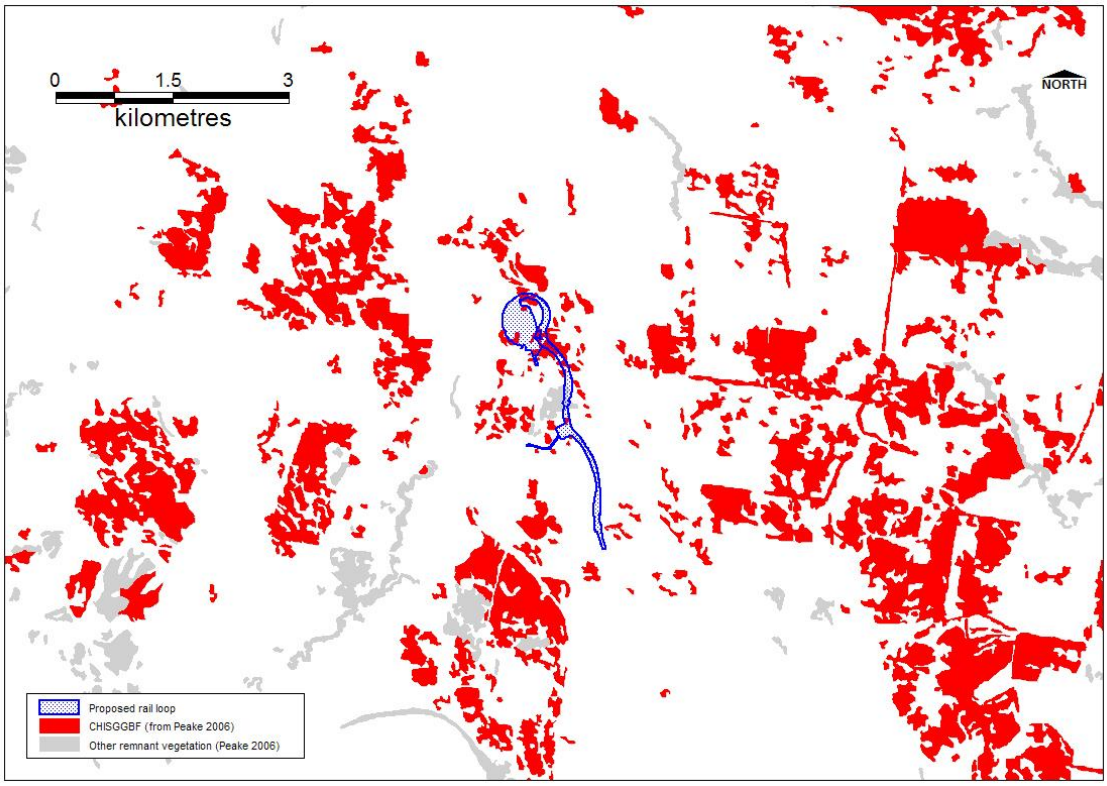

Figure A3 Distribution of Central Hunter Ironbark – Spotted Gum – Grey Box Forest around the proposed rail loop (vegetation data from Peake 2006).

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

(i) A total of 8.45 ha of CHISGGBF will be removed for the proposed rail loop, representing ~9% of that mapped for all investigated lands at Rix's Creek and ~0.05% of the total mapped Hunter Valley distribution of Peake (2006).

(ii) Stands of CHISGGBF within the proposed disturbance area are already highly fragmented as a result of past clearing associated with grazing activities, and do not form a contiguous mass of vegetated forest (see Figure A3 above). Consequently, the proposed action will not fragment or isolate areas of CHISGGBF.

(iii) CHISGGBF was one of the most widespread communities defined in the study of Peake (2006), comprising 30% of all remnant vegetation studied. Removal of ~0.05% of this vegetation type under the proposed action is insignificant. In the locality, CHISGGBF occurs in remnant vegetation on all sides of the proposed disturbance area (see Figure A3 above).

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has yet been declared for CHISGGBF under Part 3 Division 1 of the *Threatened Species Conservation Act 1995*.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan, threat abatement plan or priority action statement (PAS) prepared specific to CHISGGBF.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposed action constitutes or contributes to several potential key threatening processes, including;

- Anthropogenic climate change
- Clearing of native vegetation
- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)

- Invasion of native plant communities by African Olive (*Olea europaea* L. subsp. *cuspidate*)
- Invasion of native plant communities by exotic perennial grasses
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees

A3.2 Central Hunter Grey Box - Ironbark Woodland

A total of 2.25 ha of *Central Hunter Grey Box – Ironbark Woodland* EEC (CHGBIW) is present within the proposed rail loop and is subject to clearing.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

CHGBIW is not a threatened species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

CHGBIW is not an endangered population.

(c) in the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(i) CHGBIW occupies 18.87 ha of the immediate environs investigated at Rixs' Creek mine, including 12.41 ha in the proposed conservation offsets (Areas 2 & 3). A loss of 2.25 ha of CHGBIW represents a loss of 11.9% in the immediate area. Peake (2006) reported that 14,818 ha of CHGBIW occurred in the Hunter Valley, representing around 24% of all remnant vegetation that he studied. Within a local context, CHGBIW at Rix's Creek occurs as an outlier, although other stands occur nearby to the southwest (Figure A4).

(ii) Only 2.25 ha of CHGBIW will be disturbed as a result of the proposed action, and other stands of this vegetation type are present in the locality, including 12.41 ha in proposed offset lands. CHGBIW will not be placed at risk of extinction.

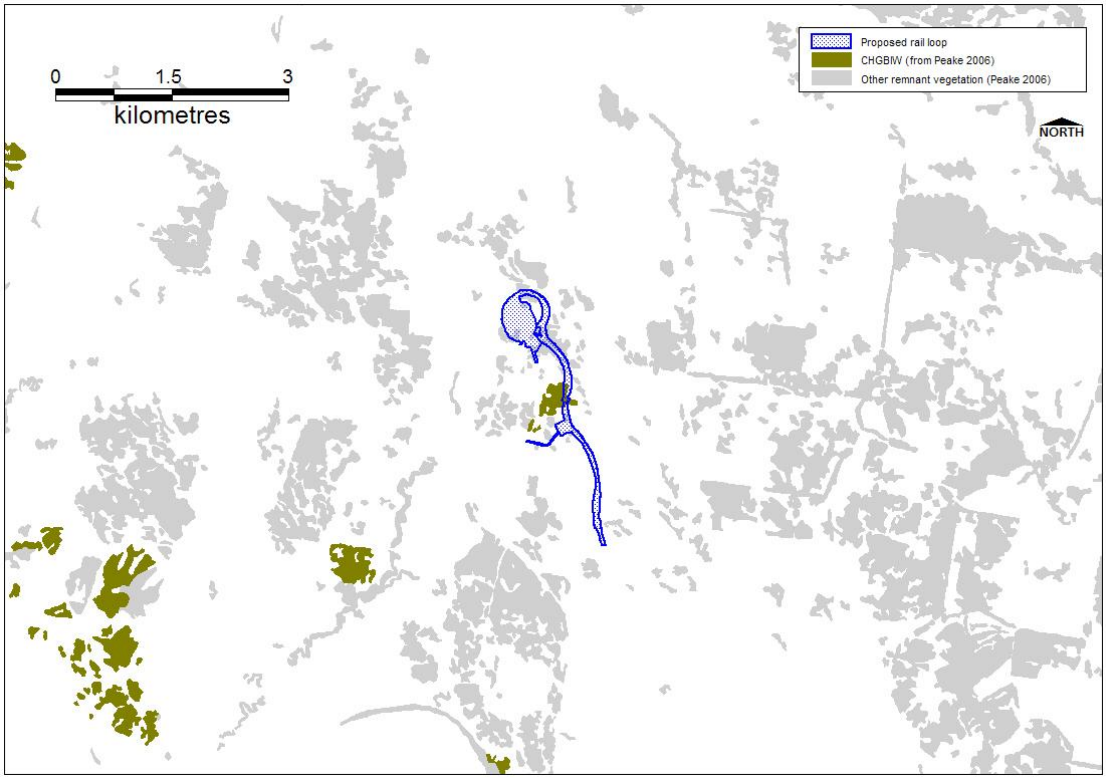

Figure A4 Distribution of Central Hunter Grey Box – Ironbark Woodland around the proposed rail loop (vegetation data from Peake 2006).

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

(i) A total of 2.25 ha of CHGBIW will be removed for the proposed rail loop, representing ~12% of that mapped for all investigated lands at Rix's Creek and ~0.02% of the total mapped Hunter Valley distribution of Peake (2006).

(ii) Stands of CHGBIW within the proposed disturbance area are already highly fragmented as a result of past clearing associated with grazing activities, and do not form a contiguous mass of vegetated forest (see Figure A4 above). Consequently, the proposed action will not fragment or isolate areas of CHGBIW.

(iii) CHGBIW was one of the most widespread communities defined in the study of Peake (2006), comprising 24% of all remnant vegetation studied. Removal of ~0.02% of this

vegetation type under the proposed action is insignificant. In the locality, CHGBIW occurs to the south-west of the proposed disturbance area (see Figure A4 above), with further more distant stands to the west and south.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat has yet been declared for CHGBIW under Part 3 Division 1 of the *Threatened Species Conservation Act 1995*.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

There is no recovery plan, threat abatement plan or priority action statement (PAS) prepared specific to CHGBIW.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposed action constitutes or contributes to several potential key threatening processes, including;

- Anthropogenic climate change
- Clearing of native vegetation
- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*)
- Invasion of native plant communities by African Olive (*Olea europaea* L. subsp. *cuspidate*)
- Invasion of native plant communities by exotic perennial grasses
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees

A4. Conclusion

The proposed action (construction of a rail loop and visual bund) will result in the loss of 8.45 ha of *Central Hunter Ironbark - Spotted Gum – Grey Box Forest* EEC and 2.25 ha of *Central Hunter Grey Box – Ironbark Woodland EEC*. These losses have been assessed under the relevant NSW legislation and found to pose insignificant impacts on the two EECs.

A5. Reference

Parsons Brinckerhoff (2011) *Proposed new rail track at Nundah Bank: Ecological Assessment*. Unpublished Report to ARTC (UHVA Alliance). March 2011.

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Appendix K

Fauna Assessment

Appendix K Fauna Assessment

Fauna Assessment

Rail Loop

Fauna Assessment

Rail Loop

Prepared for

Rix's Creek

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AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

Quality Information

Document Fauna Assessment

Ref 60266677

Date 8 June 2012

Prepared by Rochelle Lawson

Reviewed by Troy Collie

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	8-Jun-2012	Draft for Review	Simon Murphy Professional Environmental Planner	
B	05-Dec-2012	Draft for Department of Planning Review	Simon Murphy Professional Environmental Planner	
C	26-Mar-2013	Final report	Simon Murphy Professional Environmental Planner	

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1.0 Introduction

1.1 Project Purpose

This Fauna Assessment has been prepared for Rix's Creek Pty Ltd (Rix's Creek) as part of the Environmental Assessment (EA) to accompany an application under Section 75W of the E*nvironmental Planning and Assessment Act 1979* (EP&A Act) to modify existing 1989 Development Consent (as modified) to allow for the construction of a rail loop from the main northern line, clean coal storage stockpile and associated infrastructure for the loading of coal trains.

Rix's Creek mine (the mine) is an existing open cut coal mine owned and operated by The Bloomfield Group (Bloomfield). The mine currently utilises a rail loop owned and operated by the neighbouring Integra mine. With changes of ownership to the Integra mine and access contacts to the Integra rail loop soon to expire, it has become necessary for Rix's Creek to construct and operate their own rail loop.

Consultation was undertaken with the NSW Department of Planning and Infrastructure (DoPI) in January 2012 to confirm the appropriate approval path and environmental assessment requirements for the proposed rail loop. DoPI indicated that a modification to the existing consent under Section 75W was required.

This Fauna Assessment provides an assessment of the key fauna and fauna habitat issues associated with the proposed project, and has been prepared in accordance with generic Director-General's Requirements.

1.2 Site Location

The site is situated approximately 4 km north of Singleton and approximately 90 km from Newcastle. It is in the Singleton Local Government Area (LGA). The proposed rail loop is located wholly within the 1(a) Rural Zone under the Singleton Local Environmental Plan (LEP) 1996. Full details of this LEP are included in the Environmental Assessment.

The land use surrounding the Rix's Creek mine includes:

- The Integra Coal mine to the north;
- The Ashton Coal Mine to the south and west;
- Agricultural land to the south, east and west;
- Residential areas of Singleton Heights located approximately 3 km from the nearest coal mining activities to the southeast; and
- Rural residential properties at Wattle Ponds approximately 2 km from the mine.

The following definitions are used throughout this report to refer to locations in the project area:

- The 'subject site' is the development footprint, including the section of the railway to be built, and all other areas that would be directly impacted by the works, including an outer perimeter access track.
- The 'study area' includes the subject site and the areas adjacent to the subject site that might be indirectly impacted by the proposed works.
- The 'search area' (for the purposes of the desktop surveys) refers to the surrounding area within 10 km of the subject site.

1.3 Proposed Project

The proposed rail loop would be constructed to the immediate east of the mine. The rail loop will connect to the main northern line approximately 3 km to the south of the mine.

The proposed project includes the construction of:

- A 5.8 km rail loop from the main northern line;
- Proposed rail loading facility;
- Clean coal stockpile;

- Overland conveyer from the existing Coal Handling and Preparation Plant (CHPP);
- Stacker conveyor; and
- Reclaim tunnel.

Other necessary infrastructure will be required to service the proposed facilities including power connections and access roads along the rail loop alignment.

A full project description is provided in **Section 2.4** of the Environmental Assessment.

1.4 Objectives of this Fauna Habitat Assessment

This Fauna Habitat Assessment has been conducted to assess the potential impacts on the ecological values within the study area. Specifically, it aims to:

- Determine if there would be or is likely to be any significant impacts to critical habitat, threatened fauna species, populations, or their habitats protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the *Threatened Species Conservation Act 1995* (TSC Act) or the *Fisheries Management Act 1994* (FM Act).
- Recommend measures to minimise any potential impacts to protected ecological values.
- Recommend any additional assessments that may be required.

2.0 Relevant Legislation

This section provides a brief overview of legislation relevant to this Fauna Assessment. Further details regarding the relevant legislation and the required assessment and permitting processes are provided in **Sections 3.1, 3.2 and 3.3** of the EA.

2.1 Commonwealth Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act governs the Commonwealth environmental assessment process. It provides protection for eight matters of National Environmental Significance (NES), which include:

- Listed threatened species and ecological communities;
- Migratory species protected under international agreements;
- Ramsar wetlands of international importance;
- The Commonwealth marine environment;
- World Heritage properties;
- National Heritage places;
- Great Barrier Reef Marine Park; and
- Nuclear actions.

Approval under the EPBC Act is required from the Commonwealth Environment Minister if the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (formerly the Department of Environment, Water, Heritage and the Arts (DEWHA)) determines the proposal to be a controlled action that would have or is likely to have a significant impact on a matter of NES.

2.2 NSW State Legislation

2.2.1 Threatened Species Conservation Act 1995

The TSC Act outlines the protection of threatened species, populations, ecological communities and critical habitat in NSW. The Act is administered by OEH. The main objectives of the TSC Act are to:

- Conserve biological diversity and promote sustainable development;
- Prevent the extinction of native plants and animals;
- Protect habitat that is critical to the survival of endangered species;
- Eliminate or manage threats to biodiversity;
- Properly assess the impact of development on threatened species; and
- Encourage co-operative management in the conservation of threatened species.

Under Part 3A of the EP&A Act, an assessment of significance (7-part test) may be required to determine the likely significance of impacts on threatened species, populations or ecological communities.

2.2.1.1 State Environmental Planning Policy No. 44 – Koala Habitat Protection

The aim of *State Environment Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure that permanent free-living populations remain over their present range and to reverse the current trend of Koala population decline. Schedule 1 of SEPP 44 identifies the specific LGAs to which it applies.

Under SEPP 44, ‘core Koala habitat’ and ‘potential Koala habitat’ are defined and required to be protected. ‘Core Koala habitat’ is an area of land with a resident population of Koalas. ‘Potential Koala habitat’ is an area of native

vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

2.2.2 Fisheries Management Act 1994

The FM Act provides for the conservation, protection and management of fisheries, aquatic systems and habitats in NSW. The Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) manages the majority of the FM Act, although OEH has some responsibilities relating to endangered species and habitats. The FM Act applies in relation to all waters that are within the limits of the State, and regulates certain activities that have the potential to impact on aquatic habitats.

The objects of the FM Act are:

- To conserve fish stocks and key fish habitats.
- To conserve threatened species, populations and ecological communities of fish and marine vegetation.
- To promote ecologically sustainable development, including the conservation of biological diversity.

Under the FM Act, development proponents are required to provide notification of proposed works to DTIRIS. Permits issued under the Act are required for:

- Works that would block the passage of fish in a bay, inlet, river or creek.
- Dredging or reclamation works.
- The construction of structures within aquatic habitats (e.g. bridges, roads, causeways, pipelines).
- Works that would cause harm to marine vegetation.

2.3 Local Government Legislation

2.3.1 Singleton Land Use Strategy

The Singleton Land Use Strategy provides a consistent approach to the for land use community decision making in the Singleton Shire. It has been prepared to allow for flexibility in order to respond and adapt in actual growth and land use requirements over time.

The aims and objectives of the Singleton Land Use Strategy are:

a) to provide a framework for controlling and co-ordinating development within the Singleton local government area;

b) to ensure the most appropriate and efficient use or management of land and natural resources;

c) to co-ordinate economic development so that there is optimum and equitable economic and social benefit to the local community;

d) to ensure that the environmental impact of development is adequately assessed, including the consideration of alternatives;

e) to establish a pattern of broad development zones as a means of:

   (i) separating incompatible uses;

   (ii) minimising the cost and environmental impact of development; and

   (iii) maximising efficiency in the provision of utility, transport, retail and other services;

f) to retain options for alternative land use strategies so that flexibility to allow economic, social and environmental change can be accommodated;

g) to encourage adoption of land management practices which are sustainable over long periods of time without degradation of natural environmental systems;

h) to provide adequate protection and minimise risk for the community (as far as possible) from environmental hazards, including flooding, soil erosion, bush fires and pollution;

i) to enable public involvement and participation in environmental planning and assessment; and

j) to progress development in an ordered and economic manner.

2.3.2 Singleton Local Environmental Plan 1996

The proposed rail loop is located wholly within the 1(a) Rural Zone under the Singleton Local Environmental Plan 1996. The objectives of the zone are:

a) to protect and conserve agricultural land and to encourage continuing viable and sustainable agricultural land use;

b) to promote the protection and preservation of natural ecological systems and processes;

c) to allow mining where environmental impacts do not exceed acceptable limits and the land is satisfactorily rehabilitated after mining;

d) to maintain the scenic amenity and landscape quality of the area;

e) to provide for the proper and co-ordinated use of rivers and water catchment areas; and

f) to promote provision of roads that are compatible with the nature and intensity of development and the character of the area.

The proposed rail loop is consistent with the objectives of the Singleton LEP 1996, in particular objective (c) as the rail loop will be constructed in support of an approved mine which is approved and has been operating within acceptable environmental limits. The mine plan also includes provision for land will be satisfactorily rehabilitated flowing mining.

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3.0 Methodology

3.1 Desktop Investigation and Literature Review

Threatened fauna species and populations considered in this assessment are those identified in the schedules of the TSC Act, the FM Act and the EPBC Act as threatened (extinct, critically endangered, endangered or vulnerable).

Searches of the National Parks and Wildlife Service (NPWS) *Atlas of NSW Wildlife* and the EPBC Act *Protected Matters Search Tool* were conducted to identify threatened fauna species and populations listed under the TSC Act or EPBC Act that have been recorded or predicted to occur within a 10 km radius of the subject site.

Before any further analysis, the lists have been vetted to remove species that could never occur in the study area (primarily marine and pelagic species and rare vagrants to NSW) and as such would not be impacted directly or indirectly as a result of the project. The likelihood of occurring in the study area and risk of significant impact by the development are assessed for each of the threatened species identified from the database searches. These assessments are based on a comparison of previous records in the search area, known distribution and habitat preferences for each species against the location and habitat attributes of the study area. Information to support the assessments was sourced from the threatened species profiles and other information on the *Threatened Species* website provided by OEH (2012), the *Species Profiles and Threats Database* provided by DSEWPC (2012), and other sources as cited.

Local vegetation mapping (Bell, 2011) and vegetation community descriptions were reviewed to identify if any threatened ecological communities and the habitat that they provide for threatened fauna species occur in the search area.

3.2 Field Survey

An ecological site inspection was conducted by an AECOM Ecologist on 7 June 2012 to identify and assess the ecological values within the study area, determine the likely potential impacts of the proposed works and inform the provision of recommendations to avoid or minimise significant potential impacts.

Given the limited extent of habitat available on site and the extent of the proposed activities, a detailed field survey of fauna species was not undertaken. The potential fauna habitats in the study area were assessed by recording the key habitat features and characteristics that were present. This included the presence and frequency of:

- food plants;
- vegetation structure;
- hollow-bearing trees;
- fallen trees and timber;
- rocky outcrops; and
- water sources.

All fauna species and animal signs opportunistically observed during the field survey (e.g. droppings, tracks and bones) were recorded.

3.3 Assumptions and Limitations

The field survey and assessments conducted were subject to the environmental conditions at the time. In small habitat patches, animals may move transiently through an area. A lack of observations or records of particular threatened species is not necessarily an indication that they do not inhabit the study area. Therefore, the precautionary principle has been applied, and it is assumed that threatened species might occur if the study area is within their usual range and it contains suitable habitat. Consequently, this assessment focuses on analysing the distribution and habitat requirements of threatened species that could potentially occur in the area.

4.0 Existing Environment

4.1 Study Area

The site is located in the Singleton LGA, which is in the Sydney Basin Bioregion. The site is drained by tributaries of the Hunter River, and is therefore in the Hunter Sub-catchment of the Hunter-Central Rivers Catchment Management Authority area.

The subject site was cleared for use for grazing historically and consists of open grassland (Plate 1). A mix of pasture and native grasses dominate the ground layer. The woody vegetation regrowth present (Plate 2) is mostly of a uniform age and is the result of de-stocking at the time the land was purchased by Rix's Creek.

There are several drainage lines and ephemerally wet areas within the subject site (Plate 3). Fallen timber and piles of rocks provide some structure and potential fauna habitat (Plates 4 and 5). Some smooth-barked trees had claw scratches, indicating the likely presence of Goanna (*Varanus varius*).

Plate 1 **Typical open woodland/grassland in southern area**

Plate 2 **Dense stand of regenerating Spotted Gum – Ironbark – Red Gum Forest**

Plate 3 **Aquatic habitat in drainage lines**

Plate 4 **Occasional coarse woody debris in grassland**

Plate 5 **Pile of rocks – potential reptile habitat**

Plate 6 **Scratches on tree – evidence of Goanna**

4.2 Protected Areas

4.2.1 World Heritage Areas

There are no World Heritage Areas or National Heritage Areas within 10 km of the study area.

The project is not located within the Great Barrier Reef Marine Park or within any of its catchments.

4.2.2 Wetlands

The Hunter Estuary Wetlands is a Wetland of International Significance (Ramsar) and is in the Hunter sub-catchment, 80 km from the site.

There are no SEPP 14 wetlands in the study area.

There are several farm and mining related dams and drainage lines crossing the study area.

4.2.3 State Protected Areas

There is one State Forest within 10 km of the study area – Ravensworth State Forest.

4.2.4 Critical Habitat

No areas or habitats in the study area have been declared as critical habitat for any threatened species, populations or ecological communities under either the EPBC Act or the TSC Act.

4.2.5 SEPP 44 Koala Habitat

There are three historic Koala records within 10 km to the north of the subject site. The study area does not contain a known population of Koalas or any Koala feed trees. Therefore, it does not constitute 'core Koala habitat' or 'potential Koala habitat' as defined by SEPP 44.

4.2.6 Wildlife Corridors

There are no mapped wildlife corridors in the study area.

4.3 Vegetation

Vegetation was not assessed as part of this report. However, a recent report by Eastcoast Flora Survey (Bell, 2011) identified and mapped the vegetation present in the study area. The results of that survey are summarised below.

4.3.1 Vegetation Communities

According to the Eastcoast Flora report, there are eight vegetation communities in the study area. Six of these occur in the subject site, three of which are classed as endangered ecological communities (EEC) under the TSC Act.

The Eastcoast Flora Survey report identified three EECs occurring on the site as follows:

- Central Hunter Grey Box-Ironbark Woodland;
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest; and
- Hunter Lowlands Redgum Forest.

Table 1 Vegetation communities present in study area – adapted from Bell (2011)

Rix's Creek Community	Equivalent Peake (2006) Community	EECs listed under the TSC Act
1. Spiny Rush	Not defined	-
2. Bulloak Low Forest	Central Hunter Bulloak Forest Regeneration (unit 32)	-
3. Spotted Gum – Red Ironbark Forest 4. Spotted Gum – Ironbark – Redgum Forest	Central Hunter Ironbark – Spotted Gum – Grey Box Forest (unit 27)	Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions
5. Rough-barked Apple Grassy Woodland 6. Grey Box Forest	Central Hunter Box – Ironbark Woodland (unit 10)	Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions
7. Riparian Redgum Forest	Hunter Lowlands Redgum Forest (unit 24)	Hunter Lowlands Redgum Forest
8. Swamp Oak Forest	Central Hunter Swamp Oak Forest (unit 28)	-

4.3.2 Threatened Flora

According to the Eastcoast Flora Survey report, no threatened flora species are present on the site. The report states specific species searches were undertaken for threatened plant species known from similar habitats in the area, including *Acacia pendula, Bothriochloa biloba, Cymbidium canaliculatum, Eucalyptus camaldulensis* and *Eucalyptus glaucina.* The Eastcoast Flora Survey report recommends targeted searches for the vulnerable terrestrial orchid *Diuris tricolor* (and any other relevant species) be undertaken during the limited flowering period (late September – early October), which has not yet be been undertaken. Therefore, the presence or absence of this species at Rix's Creek has not been confirmed.

4.4 Fauna

4.4.1 Fauna Habitats

The box-gum and ironbark forest and woodlands on the subject site are immature and generally not old enough to have hollow-bearing trees. Most trees are smaller than 20 cm diameter at breast height (dbh). The structural complexity of the subject site is generally low, as the shrub layer has not regenerated in most woodland areas. There are some Spotted Gum woodland areas where there is a leaf litter covered ground layer.

Three hollow-bearing live trees and one hollow-bearing dead tree (stag) were recorded within the subject site (Figure 1). Hollows are potential roosting and nesting habitat for a number of woodland bird and micro-bat species. There are also occasional mature trees with loose bark that may provide roosting habitat for microbats.

One White-winged Chough (*Corcorax melanorhamphos*) nest was recorded in a tree in the subject site (Figure 1).

Two piles of loose large rocks were recorded, which may provide reptile habitat (Figure 1).

There are several drainage lines and small dams within the study area with marginal aquatic habitat for amphibians and water birds. The Eastern Common Froglet (*Crinia signifera*) was heard calling from some waterbodies.

Common bird species observed during the site walkover include:

- Eastern Rosella
- White-winged Chough
- Galah
- Black-shouldered Kite
- Australian Raven
- Australian Magpie
- Pigeon
- Noisy Miner
- Grey Fantail
- Superb Fairy-wren
- Eastern Yellow Robin.

Other fauna species observed include Goanna, Eastern Grey Kangaroo and Red-necked Wallaby.

4.4.2 Threatened Fauna

The database searches revealed 24 threatened fauna species that have been recorded previously or are predicted to occur within a 10 km radius of the subject site (the search area). The likelihoods that these species occur in the study area and the risk of significant impact by the proposed project are assessed in **Table 1**.

The 24 threatened species assessed in **Table 1** fall into the following two categories:

- Fifteen species with a low likelihood to occur in the study and therefore a low risk of significant impact from the proposed project are not assessed further.
- Nine species with a medium or high likelihood to occur in the study area and a medium risk of significant impact from the proposed project are assessed further in **Section 5**. The nine species are:
    - Speckled Warbler *Chthonicola sagittata*
    - Grey-crowned Babbler *Pomatostomus temporalis temporalis*
    - Brown Treecreeper *Climacteris picumnus*
    - Varied Sittella *Daphoenositta chrysoptera*
    - Diamond Firetail *Stagonopleura guttata*
    - Regent Honeyeater *Anthochaera phrygia*
    - Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*
    - Eastern Freetail-bat *Mormopterus norfolkensis*
    - Grey-headed Flying-fox *Pteropus poliocephalus*.

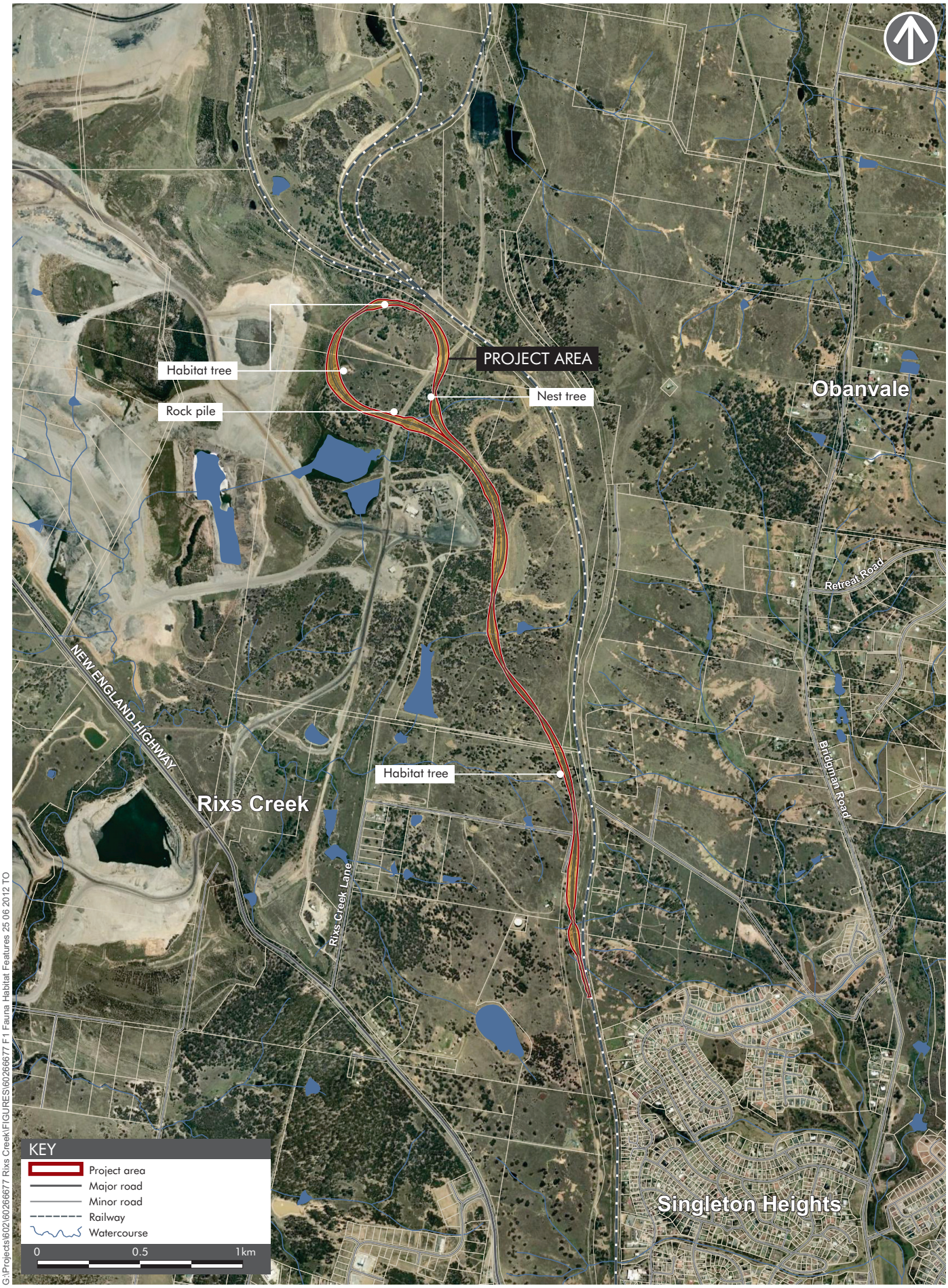
4.4.3 Endangered Populations of Fauna

The desktop searches did not identify any endangered fauna populations listed under the TSC Act that are likely to occur in the study area.

4.4.4 EPBC Migratory and Marine Species

The EPBC *Protected Matters Database* search identified 13 species listed under the EPBC Act as migratory and/or marine species that might potentially occur in the study area. All of these are species of birds (**Table 2**).

Based on the habitat attributes present in the study area, it is unlikely that any of the identified migratory bird species would be reliant on the study area for breeding, foraging, roosting or migratory stop-overs.



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FAUNA HABITAT FEATURES

FIGURE 1

Table 2 Assessment of threatened fauna species previously recorded or predicted to occur in a 10 km radius of the subject site

This table assesses threatened species listed under the TSC Act and the EPBC Act and endangered populations listed under the TSC Act for their likelihood to occur in the subject site and the risk of significant impact from the proposed project.

Notes:

1 Threatened species status under the TSC and EPBC Acts: CE = critically endangered; E = endangered; V = vulnerable; EP = endangered population (TSC Act only); Ex = extinct.

2 Distribution and habitat information based on OEH (2011) and DSEWPC (2011), unless stated otherwise.

3 The likelihood to occur in the broader study area (both within the subject site and the adjacent area) is assessed based on species' distribution, habitat requirements and previous records (ranked as low, medium or high). Reason for assessment: D+ = distribution matching; D? = distribution possibly matching; D- = distribution not matching; H+ = suitable habitat present; H? = marginal habitat present; H- = suitable habitat absent.

4 The risk of impact by the proposed project is assessed on consideration of the likelihood of occurrence within the subject site, possible direct and indirect impacts from the project design, and the species' characteristics (ranked as low, medium or high).

* = Refer to **Section 5.2** for further details of the assigned risk ranking.

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Amphibians					
Litoria aurea Green and Golden Bell Frog	E	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Distributed along the NSW coast from Brunswick Heads S to Vic. Inhabits marshes, dams and stream-sides, particularly those containing *Typha* spp. or *Eleocharis* spp. Optimum habitat includes water-bodies that are unshaded, free of predatory fish, near grassy foraging areas and diurnal sheltering sites.	Low (D?, H-)	Low
Litoria booroolongensis Booroolong Frog	E	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Restricted to NSW and NE Vic, predominantly along W-flowing streams of the Great Divide. Occurs on permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelters under rocks or amongst vegetation near the ground on the stream edge.	Low (D?, H-)	Low

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Mixophyes iteratus Giant Barred Frog	E	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Occurs on coast and ranges from SE Qld to the Hawkesbury R., particularly the Coffs Harbour-Dorrigo area of NE NSW. Has disappeared S of the Hawkesbury. Inhabits deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest. Breeds around shallow, flowing rocky streams from late spring to summer.	Low (D-, H-)	Low
Birds					
Anthochaera phrygia, Xanthomyza phrygia Regent Honeyeater	CE	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Widely but sparsely distributed in SE Aust. Migratory visitor to coastal districts in autumn and winter Prefers woodlands that support a high abundance and diversity of bird species, generally with large numbers of mature trees, high canopy cover and an abundance of mistletoes. On the coast, requires eucalypt forests and woodlands with prolific and regular winter-flowering eucalypts and paperbarks. Breeds in specific inland areas in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak.	Medium (D?, H+)	Medium
Botaurus poiciloptilus Australasian Bittern	E	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Widespread but very patchy in SE Australia. Most of NSW except the far NW. Inhabits larger permanent freshwater wetlands with tall, dense vegetation, particularly Bulrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Low (D?, H-)	Low

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Chthonicola sagittata *Pyrrholaemus saggitatus* Speckled Warbler	V	-	The Wildlife Atlas contains no records for the search area and 2 records in the vicinity of the study area. The Protected Matters search tool does not predict that the species or its habitat might occur. Patchily distributed in E Aust from SE Qld to Vic. Most frequently in the hills and tablelands of the Great Divide, rarely in coastal districts. Inhabits a range of eucalypt forests and woodlands with a dense shrub layer and grassy understorey, often on rocky ridges or in gullies.	High (D+, H+)	Medium
Climacteris picumnus Brown Treecreeper	V	-	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. E and Central NSW to W Plains, including the Great Divide and tablelands. It is less commonly found on coastal plains and ranges. Dry and semi arid eucalypt woodlands (including Box-Gum Woodland) and dry open forests. Prefers woodlands with rough-barked eucalypts and an open grassy understorey with or without shrubs. Also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) forest bordering wetlands. Fallen timber is an important habitat component for foraging.	Medium (D?, H+)	Medium
Daphoenositta chrysoptera Varied Sittella	V	-	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. Inhabits most of mainland Aust with a nearly continuous NSW distribution from coast to far W. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums, mallee and *Acacia* woodland. Feeds on arthropods gleaned from crevices and bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy.		
Lathamus discolor Swift Parrot	E	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Breeds in Tas and migrates to the SE mainland between March and September. On the mainland it occurs where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box.	Low (D?, H?)	Low

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Leipoa ocellata Malleefowl	-	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Occurs throughout semi-arid regions of southern Aust. Occurring west of the Great Divide in NSW. Inhibits shrublands, low woodlands dominated by mallee vegetation and Eucalypt woodlands.	Low (D-, H-)	Low
Pomatostomus temporalis temporalis Grey-crowned Babbler (E subspecies)	V	-	The Wildlife Atlas contains no records for the search area and 10 records in the vicinity of the study area. The Protected Matters search tool does not predict that the species or its habitat might occur. Occurs from Cape York Qld, NSW and Vic. Occurs in NSW on W Slopes of Great Divide, and on W plains reaching Louth and Balranald. Occurs in woodlands in Hunter Valley and several locations on the N Coast NSW. May be extinct in the S, C and New England Tablelands. Inhabits a variety of drier woodlands.	High (D+, H+)	Medium
Rostratula (benghalensis) australis Australian Painted Snipe, Painted Snipe	E	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Wide but scattered distribution throughout Aust. Usually found in shallow inland wetlands, usually freshwater, either permanent or temporary. It requires the fringes of extensive swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst reedy vegetation near water, and feeds on exposed mudflats.	Low (D?, H-)	Low
Stagonopleura guttata Diamond Firetail	V	-	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. Occurs in E Aust from central Qld to SA. Mostly in semi-arid inland districts and rarely in coastal districts. Inhabits grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands, open forest, mallee and grasslands. Often in riparian areas and sometimes in lightly wooded farmland. Apparently sedentary.		

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Mammals					
Chalinolobus dwyeri Large-eared Pied Bat	V	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Occurs from Rockhampton Qld S to the S Highlands of NSW. Mainly inhabits areas with extensive cliffs and caves. Roosts in caves, crevices in cliffs, old mine workings, and the disused mud nests of the Fairy Martin. Forages in low to mid-elevation dry open forest and woodland close to roosting habitats.	Low (D+, H-)	Low
Falsistrellus tasmaniensis Eastern False Pipistrelle	V	-	The Wildlife Atlas contains no records for the search area and 1 record in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. SE coast and ranges of Aus, from S Qld to Tas. Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but also under loose bark on trees or in buildings. Hunts flying insects above or just below the tree canopy. Often associated with coastal floodplain wetland, including those fringing estuaries.	Low (D+, H?)	Low
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	V	-	The Wildlife Atlas contains no records for the search area and 2 records in the vicinity of the study area. The Protected Matters search tool does not predict that the species or its habitat might occur. Occurs along the E and NW coasts of Aust. Roosts in caves primarily but also derelict mines, storm-water tunnels, buildings, etc. Forms large maternity colonies in caves in spring and summer. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in S Aust. Hunts in forested areas, catching moths and other flying insects above the tree tops.	Medium (D+, H+)	Medium

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Mormopterus norfolkensis Eastern Freetail-bat	V	-	The Wildlife Atlas contains no records for the search area and 2 records in the vicinity of the study area. The Protected Matters search tool does not predict that the species or its habitat might occur. Found along the E coast from S Qld to S NSW. Occur in dry sclerophyll forest and woodland E of the Great Divide. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Solitary and probably insectivorous. Known from coastal floodplain wetlands in the Hunter-Central Rivers CMA.	Medium (D+, H+)	Medium
Nyctophilus bifax Eastern Long-eared Bat	V	-	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Found from Cape York through E Qld to NE NSW. In NSW it is confined to the coastal plain and nearby coastal ranges, extending S to the Clarence R area, with a few records S to Coffs Harbour. Lowland subtropical rainforest and wet and swamp eucalypt forest and adjacent moist eucalypt forest. Coastal rainforest and patches of coastal scrub are favoured.	Low (D-, H-)	Low
Petrogale penicillata Brush-tailed Rock-wallaby	E	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Occurs from SE Qld to W Vic along the Great Divide. Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing N.	Low (D?, H-)	Low

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Phascolarctos cinereus Koala	V	-	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. In NSW it mainly occurs on the Central Coast and NSW N Coast with some populations W of the Great Divide. It now occurs in sparse and possibly disjunct populations. It inhabits eucalypt woodlands and forest, and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species. Habitat suitability is influenced by patch size, tree size and composition, soil nutrients, climate and disturbance history. Important food trees vary regionally, but coastal NSW they include *Eucalyptus tereticornis, E. microcorys*, *E. robusta, E. punctata, E. haemastoma* and *E. signata.*	Low (D?, H-)	Low
Phascogale tapoatafa Brush-tailed Phascogale	V	-	The Wildlife Atlas contains no records for the search area and 2 records in the vicinity of the study area. The Protected Matters search tool does not predict that the species or its habitat might occur. Patchy distribution in E Aust from central Qld S to SE SA as well as N Aust and the SW. Widely distributed in E NSW, though mainly E of the Great Divide. Arboreal, inhabiting dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also heath, swamps, rainforest and wet sclerophyll forests.	Low (D+, H-)	Low
Pseudomys novaehollandiae New Holland Mouse	-	V	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Fragmented distribution in NSW, Vic and Tas. In NSW, occurs in coastal districts from the far NE S to at least Sydney. Prefers vegetation with a heathy layer containing abundant perennial legumes, sparse ground cover and soft sandy soils. Favours areas in early and mid stages of regeneration after fire.	Low (D-, H-)	Low

Species name	Status[1]		Distribution and habitat[2]	Likelihood to occur[3]	Risk of impact[4]
	TSC Act	EPBC Act			
Pseudomys oralis Hastings River Mouse	E	E	The Wildlife Atlas contains no records for the search area and no records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Patchy distribution spanning the Great Divide from the Hunter River NSW to the Bunya Mts in SE Qld, at elevations between 300 m and 1,100 m. Inhabits a variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as rocky outcrops. Nests may be in either gully areas or on ridges and slopes.	Low (D?, H-)	Low
Pteropus poliocephalus Grey-headed Flying-fox	V	V	The Wildlife Atlas contains no records for the search area and 2 records in the vicinity of the study area. The Protected Matters search tool predicts that the species or its habitat might occur. Distributed within 200 km of the E coast from Bundaberg Qld S to Melbourne Vic. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Medium (D+, H+)	Medium

This table lists the EPBC-listed migratory species known or predicted to occur in the search area (i.e. identified by the DSEWPC protected matters database search).

Table 3 EPBC-Listed Migratory and Marine Species

Species name	Common name
Terrestrial and aerial birds	
Apus pacificus	Fork-tailed Swift
Anthochaera phrygia	Regent Honeyeater
Haliaeetus leucogaster	White-bellied Sea-eagle
Hirundapus caudacutus	White-throated Needletail
Leipoa ocellata	Malleefowl
Merops ornatus	Rainbow Bee-eater
Monarcha melanopsis	Black-faced Monarch
Myiagra cyanoleuca	Satin Flycatcher
Rhipidura rufifrons	Rufous Fantail
Wetland and coastal birds	
Ardea alba	Great Egret
Ardea ibis	Cattle Egret
Gallinago hardwickii	Latham's Snipe
Rostratula (benghalensis) australis	Painted Snipe

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5.0 Impact Assessment

5.1 Potential Impacts

The potential impacts discussed in this section are based on a desktop assessment of the study area and field investigations. Potential impacts to fauna and their habitat in the study area during the proposed construction phase may include the following.

5.1.1 Clearing of Vegetation

The proposed works would result in the removal of 53 ha of vegetation comprised of regenerating forest and woodland communities, including two EECs:

- Central Hunter Grey Box-Ironbark Woodland (2.25 ha); and
- Central Hunter Ironbark-Spotted Gum-Grey Box Forest (8.45 ha).

An assessment of the impacts associated with clearing of vegetation is beyond the scope of this fauna habitat assessment and is covered elsewhere in the EA.

5.1.2 Noise Levels

The proposed noise levels in the railway corridor will vary but may be high at times with the passage of locomotives and trains, so any resident animals would be somewhat affected by ongoing high noise levels. The subject site is currently affected by noise from mining activities and train movements and as it provides limited habitat for native fauna species, the potential impacts of noise during construction on resident animals will be minimal.

5.1.3 Dust Levels

The proposed construction activities would include earthworks that might temporarily generate elevated dust levels that may reduce primary productivity of nearby plants and trees. However, a temporary elevation of dust levels would be unlikely to have a significant impact on the health of individual plants or fauna species reliant on vegetation.

5.1.4 Sedimentation and Pollution of Aquatic Environments

The proposed construction activities would include earthworks that would temporarily generate dust and expose soils to erosion risks. Construction activities inevitably involve a level of potential pollutants, such as fuels, oils and detergents. This could lead to increased sedimentation and/or pollution of downstream environments, either from stormwater run-off or by precipitation of dust.

5.1.5 Spread of Weeds and Pathogens

The proposed construction activities would involve the clearing of vegetation and earthworks in areas with existing weed infestation. Movement of soil by machinery and/or water can lead to transport of weeds (seeds and propagules) and pathogens. Disturbance of soils can increase the amount of suitable habitat for the establishment and spread of weeds, a key threatening process. Weed invasion can degrade fauna habitats and result in a reduction of plant species diversity. Weed thickets may reduce native wildlife diversity and can harbour feral animals such as foxes and rabbits.

5.2 Ecological Values

5.2.1 Protected Areas

No Commonwealth, State or local government protected areas or protected habitats are known to occur adjacent to the subject site.

5.2.2 Endangered Populations

No endangered populations of fauna listed under the TSC Act are known to occur in the subject site.

5.2.3 Fauna Habitat

The study area contains habitat that is suitable for a range of fauna species such as woodland birds, reptiles, amphibians and mammals.

5.2.4 Threatened Fauna Species

Twenty-one threatened fauna species were identified in the desktop searches as potentially occurring in the search area. They are assessed in **Table 2** and classified into two categories.

Six threatened fauna species are assessed as having a medium or high likelihood to occur in the study area and a medium risk of significant impact from the proposed project. Therefore, 7-part tests pursuant to the TSC Act to assess these species are provided in **Appendix A**. Assessments of significant impact pursuant (DEWHA, 2009) are provided in **Appendix B** for the Grey-headed Flying-fox and Regent Honeyeater, which are listed as threatened under the EPBC Act. The conclusions of these tests are presented below.

5.2.4.1 Woodland birds (Regent Honeyeater, Brown Treecreeper, Varied Sittella, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail)

The 7-part test concluded that the proposed project would result in the removal of 11 ha of potential foraging habitat and potential breeding sites. Despite this, the clearing is not extensive and the small scale of the proposed project would be unlikely to result in any significant impacts on these woodland bids.

5.2.4.2 Microbats (Eastern Bentwing-bat, Eastern Freetail-bat)

The 7-part test concluded that the proposed project would result in the removal of 11 ha of potential foraging habitat and potential breeding sites. Despite this, the clearing is not extensive and the small scale of the proposed project would be unlikely to result in any significant impacts on these microbats.

5.2.4.3 Grey-headed Flying-fox

The 7-part test and the EPBC assessment concluded that the proposed project would result in the removal of 11 ha of potential foraging habitat for the Grey-headed Flying-fox. Nevertheless, the small scale of the proposed project would be unlikely to have a significant impact on a local population of the species.

5.2.5 EPBC Migratory and Marine Species

Thirteen fauna species listed as migratory and/or marine under the EPBC Act were identified as potentially occurring in the search area. None of the listed species are likely to be reliant on habitats in the study area during any part of their lifecycles. Therefore, the proposed project would be unlikely to have a significant impact on any listed migratory bird species.

6.0 Mitigation Measures

A Construction Environmental Management Plan (CEMP) will be developed to provide specific details on measures to avoid, minimise, mitigate, manage and, if required, offset residual environmental impacts of the proposed construction works. The following measures are recommended for inclusion in the CEMP.

6.1 Vegetation Clearing

The following measures would be put in place to minimise impacts from vegetation clearing:

- The minimum feasible amount of vegetation clearing would be conducted for construction purposes; this includes ground-layer vegetation.
- Clear marking and delineation (i.e. signage and barrier fencing) would be placed between the works areas and any vegetation that is to be retained, prior to the commencement of construction.

6.2 Tree Protection

The following measures would be put in place to protect trees outside of the development area:

- A Tree Protection Zone will be established around trees to be retained close to the construction zone, including compound locations, with barriers.
- The Tree Protection Zone will protect the lower branches of trees and be placed just outside the drip line.

6.3 Woodland Fauna

The following measures would be put in place to minimise impacts on woodland fauna species:

- Clearing of vegetation in the subject site would be done under the supervision of an appropriately experienced and licenced person.
- Immediately prior to clearing, canopy trees are to be visually inspected for the presence of fauna by a suitably qualified ecologist. If fauna species are detected in a tree scheduled for clearing, the tree is to be nudged prior to felling to encourage the fauna to vacate the tree prior to felling. If threatened fauna are located in trees to be cleared, clearing would be halted until the fauna has relocated itself.
- Felled trees would be left in-situ for at least 24 hours to allow fauna species to relocate.
- Hollow-bearing trees and mature trees would be retained where feasible.
- Hollows that are removed would be recycled and supplemented with fauna nesting boxes secured to nearby mature trees at a replacement ratio of 2:1.
- New fencing along the rail corridor would be designed to not impede the movement of gliders, and barbed wire fencing would only be used where necessary.

6.4 Weed Management

The following measures would be put in place to manage weeds:

- Weed control measures (e.g. herbicide spraying) would be undertaken prior to construction in areas where high densities or infestations of weeds occur. This would help to reduce the risk of weeds being spread as a result of the proposed project.
- Earth-working equipment would be cleaned of excess soil prior to arrival and prior to departure from work areas to minimise the spread of weed seeds, weed propagules and plant pathogens.
- Sediment fences and sediment traps would be put in place during construction to prevent sediments that might contain weed seeds, weed propagules and plant pathogens from leaving the site.
- Soil excavated for earthworks would only be stockpiled in delineated and fully bunded work areas within the designated development footprint. These areas would be kept away from low points and stormwater runoff paths.

- Disturbed areas would be kept to a minimum and revegetated as soon as practically possible. This would minimise opportunities for colonisation by weeds and minimise the potential for erosion and sediment transport.
- Weeds (including vegetation, fruit and seed) removed during vegetation clearing would be destroyed or disposed of by suitable means.
- A detailed stormwater management plan, if weeds are present in the construction area, would include provisions to minimise the risk of weeds spreading into waterways via stormwater run-off during the construction and operational phases.

6.5 Protection of Aquatic Environments

The following measures would be put in place to minimise impacts during construction on aquatic environments:

- A sediment and erosion management plan in accordance with the Blue Book (Department of Housing and Landcom, 2004) would be prepared as part of the CEMP.
- Various stormwater management structures such as silt traps and bioswales would be located down slope of the proposed works to intercept surface water run-off during the construction phase. These structures would be established prior to the commencement of construction and combined with other temporary stormwater management measures such as sandbags, sediment fences and berms, to manage sediment laden runoff and other construction pollutants entering downstream aquatic systems.
- During construction, potential chemical pollutants (e.g. fuels, oils, lubricants, paints, etc.) would be stored in appropriate containers in bunded areas within construction compounds to minimise the risk of spillages and mobilisation of any pollutants into aquatic environments.
- Building materials would be placed within the site compound and turnout assembly area or within the rail corridor where necessary.
- All excavated soil and spoil would be stockpiled in the designated and fully bunded work stockpile area (refer to **Figure 1**).

7.0 Conclusions

This assessment has determined that the proposed project is unlikely to have significant impacts on any matters protected or identified for consideration under the TSC Act, NPW Act, FM Act, SEPP 14 or SEPP 44. Consequently, the assessment and approval of the proposed project by Rix's Creek under Part 3A of the EP&A Act is not constrained by any of the matters covered in this Fauna Assessment.

This assessment has determined that the proposed project is unlikely to have any significant impacts on any matters protected under the EPBC Act. Consequently, a referral to the Commonwealth DSEWPC or approval from the Commonwealth Environment Minister would not be required to proceed with the project.

Mitigation measures are provided in **Section 6** to avoid, minimise, mitigate and manage the potential impacts of the proposal, and to proceed compliantly.

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8.0 References

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Appendix A

Seven-Part Tests

Woodland Bird Species

Regent Honeyeater *Xanthomyza phrygia* / *Anthochaera phrygia*

The Regent Honeyeater is listed as endangered under the TSC Act and the EPBC Act.

The range for the Regent Honeyeater has declined dramatically and has become extremely disjointed. The total population is believed to contain fewer than 1,500 individuals (NPWS, 1999). There are only three known key breeding regions remaining: northeast Victoria (Chiltern-Albury) and in NSW at Capertee Valley and the Bundarra-Barraba region (OEH, 2012). In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. However, in some years non-breeding flocks converge on flowering coastal woodlands and forests (OEH, 2012).

The Regent Honeyeater occurs in eucalypt woodlands and open forest. Most records of the species are from box-ironbark eucalypt forest and woodland, lowland coastal forests that are dominated by Swamp Mahogany *Eucalyptus robusta* and Spotted Gum *Corymbia maculata* and riparian forests of River She-oak *Casuarina cunninghamiana* (OEH, 2012). These woodlands have large numbers of mature trees, high canopy cover and an abundance of mistletoes (OEH, 2012). Bird movements are thought to be dependent on spatial and temporal flowering and other resource patterns (OEH, 2012).

Nectar comprises the main diet of the Regent Honeyeater, with 16 species of eucalypt and two species of mistletoe browsed. However, three species of eucalypt make up the predominant nectar sources: Red Ironbark *Eucalyptus sideroxylon*, White Box *Eucalyptus albens* and Yellow box *Eucalyptus melliodora* (Webster and Menkhorst, 1992). Lerps and honeydew comprise a large proportion of the diet when nectar is scarce. Insects comprise a smaller dietary component but are important for nestlings (OEH, 2012).

Brown Treecreeper *Climacteris picumnus*

Brown Treecreeper *Climacteris picumnus* is listed as vulnerable under the TSC Act.

The Brown Treecreeper is found on the inland plains and slopes of the Great Dividing Range and less commonly found on coastal plains and ranges. It prefers dry and semi-arid eucalypt woodlands and dry open forests, with rough-barked eucalypts and an open grassy understorey. Fallen timber is an important habitat component for foraging.

Varied Sittella *Daphoenositta chrysoptera*

The Varied Sittella *Daphoenositta chrysoptera* is listed as vulnerable under the TSC Act.

The Varied Sittella inhabits most of mainland Australia with a nearly continuous NSW distribution from coast to the far west. It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods found in crevices in bark, dead branches, standing dead trees and on twigs in the canopy. This species builds its nest in the fork of a tree high in the living canopy, often reusing the same nesting location in subsequent years (Debus and Soderquist, 2008).

Grey-crowned Babbler *Pomatostomus temporalis temporalis*

Grey-crowned Babbler *Pomatostomus temporalis temporalis* is listed as vulnerable under the TSC Act.

The Grey-crowned Babbler occurs on the western slopes of the Great Dividing Range and in the Hunter Valley and on the NSW North Coast. Its preferred habitat is box-gum woodlands, box-Cypress Pine and open box woodlands on alluvial plains (OEH, 2011).

Speckled Warbler *Pyrrholaemus saggitatus*

Speckled Warbler *Pyrrholaemus saggitatus* is listed as vulnerable under the TSC Act.

The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100 ha survive. Habitat preferences include Eucalypt communities with a grassy understory (OEH, 2012).

Diamond Firetail *Stagonopleura guttata*

Diamond Firetail *Stagonopleura guttata* is listed as vulnerable under the TSC Act.

It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Diamond

Firetail is found in grassy eucalypt woodlands, including box-gum woodlands and grasslands. The species appears to be sedentary (OEH, 2012).

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed project would not impact directly on any aspect of the life cycle of these woodland bird species (e.g. breeding, migration and dispersion, gene flow, etc.). It may impact indirectly through the removal of habitat.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

(i) The proposed action would remove up to 11 ha of box-gum and ironbark woodland, which is potential habitat for many woodland bird species. Trees in the woodland habitats of the subject area may contain hollows, and therefore provide potential breeding habitat for hollow-nesting woodland birds.

(ii) The potential habitat offered by the subject site is already affected by edge effects from the railway corridor, roads, mining areas, and grazing lands. Woodland bird species are highly mobile and wide-ranging and are able to make movements through all sorts of landscapes, including highly cleared and fragmented landscapes. The relatively small amount of clearing of canopy trees proposed is not likely create further fragmentation in the existing landscape on a scale that would impact on woodland bird species.

(iii) The potential habitat proposed to be removed is unlikely to be important to the long-term survival of the species or local populations of the species.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat has been declared for any of the above woodland birds.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There are no Recovery Plans for any of the above woodland birds (OEH, 2012).

The proposed project would not be inconsistent with the objectives of any relevant threat abatement plan.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Of the 35 key threatening processes listed for NSW by OEH (2012), the following are relevant to the location, the proposed project and the species:

1) Clearing native vegetation.

2) Removal of dead wood and dead trees.

The proposed project has some potential for contributing to the above points. However, the small scale of the proposed project would be unlikely to make a significant contribution.

Conclusion

The proposed project would result in the removal of 11 ha of potential habitat for woodland bird species. Nevertheless, the small scale of the proposed project would be unlikely to have a significant impact on local populations of the species.

References

Debus, S.J.S. and Soderquist, T.R. (2008). Report for Review of Species for the NSW Scientific Committee: Varied Sittella *Daphoenositta chrysoptera.*

NPWS (1999). *Threatened Species Information Sheet: Regent Honeyeater*. NSW National Parks and Wildlife Service, Hurstville, NSW.

OEH (2012). *Threatened species, populations and ecological communities of NSW*. Available at: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx. Accessed June 2012.

Webster, R. and Menkhorst, P. (1992). *The Regent Honeyeater (*Xanthomyza phrygia*): Population status and ecology in Victoria and New South Wales*. Arthur Rylah Institute for Environmental Research Technical Report No. 126. Victorian Department of Conservation and Natural Resources, Melbourne.

Microchiropteran Bat Species

Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*

The Eastern Bentwing-bat *Miniopterus schreibersii oceanensis* is listed as vulnerable under the TSC Act.

Eastern Bentwing-bats occur along the east and north-west coasts of Australia. It uses caves as a primary roosting habitat but is also known to utilise derelict mines, storm-water tunnels, buildings and other manmade structures. It disperses from maternity caves within a range of approximately 300 km. It hunts in forested areas on moths and other flying insects above the tree canopy (OEH, 2012).

Eastern Freetail-bat *Mormopterus norfolkensis*

The Eastern Freetail-bat *Mormopterus norfolkensis* is listed as Vulnerable under the TSC Act.

The Eastern Freetail-bat is distributed along the east coast from south Queensland to southern NSW. It occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species mainly uses tree hollows to roost but will also make use of loose bark or man-made structures (OEH, 2012).

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed project would not impact directly on any aspect of the life cycle of any of these bat species (e.g. breeding, migration and dispersion, gene flow, etc.). It may impact indirectly through the removal of habitat.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

(i) The likelihood that hollow-bearing trees, rock crevices, caves and other suitable roosting areas would be removed for the proposed works is low. The vegetation to be removed is potential foraging habitat for insectivorous micro-bat species.

(ii) The vegetation that would be removed is limited to a narrow strip along the rail corridor. The clearing would not create a barrier to the movements of these micro-bat species.

(iii) The additional clearance would be unlikely to have a significant impact on the species or reduce their long-term survival in the area.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat has been declared for the above micro-bat species.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There are no Recovery Plans for any of the above micro-bat species (OEH, 2012).

The proposed project would not be inconsistent with the objectives of any relevant threat abatement plan.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Of the 35 key threatening processes listed for NSW by OEH (2012), the following are relevant to the location, the proposed project and the species:

1) Clearing of native vegetation.
2) Removal of dead wood and dead trees.

The proposed project has some potential for contributing to the above key threatening processes. However, the small scale of the proposed project would be unlikely to make a significant contribution.

Conclusion

The proposed project would result in the removal of 11 ha of potential habitat for micro-bat species. Nevertheless, the small scale of the proposed project would be unlikely to have a significant impact on a local population of these species.

References

OEH (2012). *Threatened species, populations and ecological communities of NSW*. Available at: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx. Accessed June 2012.

Grey-headed Flying-fox *Pteropus poliocephalus*

The Grey-headed Flying-fox *Pteropus poliocephalus* is listed as vulnerable under the TSC Act.

The Grey-headed Flying-fox is endemic to the east coast of Australia with a distribution from Bundaberg in Queensland to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast (Eby, 2000). The population of the Grey-headed Flying-fox has declined by 30% over a 10 year period up to 1999 (Tidemann *et al*., 1999).

The Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources (Eby, 1991). The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and inhabits rainforest, woodlands, paperbark swamps and Banksia woodlands. This species feeds in particular on the nectar and pollen of native trees, especially Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-headed Flying-fox forages on fruit crops and cultivated gardens.

The Grey-headed Flying-fox congregates in large colonies of up to 200,000 individuals in the summer season (Churchill, 1998). Camp sites are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, paperbark woodland, casuarina forest or mangroves (Eby, 2000). These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as a diurnal refuge from predators (Tidemann *et al.*, 1999). Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The proposed project would not impact directly on any aspect of the life cycle of this species (e.g. breeding, migration and dispersion, gene flow, etc.). It may impact indirectly through the removal of habitat.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed; and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action; and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

(i) The proposed project would involve the removal of approximately 11 ha of vegetation comprising native dominated woodland, potential foraging habit for the species.

(ii) The removal of vegetation would be in a linear design along the rail corridor, and would not fragment the habitat further. No habitat would be isolated as a result of the proposed project.

(iii) As there is abundant habitat suitable for Grey-headed Flying-foxes in the search area, the removal of a small amount of foraging habitat would not have a significant impact on the long-term survival of the Grey-headed Flying-fox in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat has been declared for the Grey-headed Flying-fox.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The Draft National Recovery Plan for the Grey-headed Flying-fox (DECCW, 2009) contains three overall objectives:

1) To reduce the impact of threatening processes on Grey-headed Flying-foxes and arrest decline throughout the species' range;

2) To conserve the functional roles of Grey-headed Flying-foxes in seed dispersal and pollination; and

3) To improve the standard of information available to guide recovery of the Grey-headed Flying-fox, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species.

The proposed project would not be inconsistent with the objectives of any relevant threat abatement plan.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Of the 35 key threatening processes listed for NSW by OEH (2011), the following are relevant to the location, the proposed project and the species:

- Clearance of native vegetation.

The proposed project has some potential for contributing to the above point. However, the small scale of the proposed project would be unlikely to make a significant contribution to any key threatening processes.

Conclusion

The proposed project would result in the removal of 11 ha of potential habitat for the Grey-headed Flying-fox. Nevertheless, the small scale of the proposed project would be unlikely to have a significant impact on a local population of the species.

References

Churchill, S. (1998). *Australian Bats*. New Holland Publishers, Sydney.

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Tidemann, C.R., Eby, P., Parry-Jones, K.A and Vardon, M. (1999). 'Grey Headed Flying Fox', in A. Duncan, B.G. Baker and N. Montgomery (eds). *The Action Plan for Australian Bats.* Environment Australia, Canberra.

Appendix B

EPBC Act Assessments of Significant Impact

Grey-headed Flying-fox

The Grey-headed Flying-fox *Pteropus poliocephalus* is listed as vulnerable under the EPBC Act.

This assessment of impact significance has been conducted according to the DSEWPC Guidelines (DEWHA, 2009) for vulnerable species.

The Grey-headed Flying-fox is endemic to the east coast of Australia with a distribution from Bundaberg in Queensland to Melbourne in the south, from the western slopes of the Great Dividing Range to the coast (Eby, 2000). The population of the Grey-headed Flying-fox has declined by 30% over a 10 year period up to 1999 (Tidemann *et al*., 1999).

The Grey-headed Flying-fox is a highly mobile species whose migration patterns are determined by the availability of flowering food resources (Eby, 1991). The species is a canopy-feeding frugivore, blossom-eater and nectarivore, and inhabits rainforest, woodlands, paperbark swamps and Banksia woodlands. This species feeds in particular on the nectar and pollen of native trees, especially Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. During times when native food resources are limited, Grey-headed Flying-fox forages on fruit crops and cultivated gardens.

The Grey-headed Flying-fox congregates in large colonies of up to 200,000 individuals in the summer season (Churchill, 1998). Camp sites are generally located next to rivers or creeks, and occur in a range of vegetation communities including rainforest, wet sclerophyll forest, paperbark woodland, casuarina forest or mangroves (Eby, 2000). These sites have a dense canopy, providing them with the moist, humid microclimate they require. Campsites are critical for mating, birthing, rearing of young and as a diurnal refuge from predators (Tidemann *et al.*, 1999). Urban gardens, cultivated fruit crops and roadside verges may also provide temporary roosting habitat for this species.

Would the action lead to a long-term decrease in the size of an important population of a species?

An important population of the species is not known in the study area or its vicinity.

Would the action reduce the area of occupancy of an important population?

If the Grey-headed Flying-fox is present in the subject site the small scale of the proposed project would be unlikely to reduce the area of occupancy of a local population. The proposed project would involve vegetation clearing of only a small area of approximately 11 ha.

Would the action fragment an existing important population into two or more populations?

If the Grey-headed Flying-fox is present in the subject site, it is unlikely that the proposed project would fragment the population into two populations because the site is already dissected by railway corridors, roads and infrastructure.

Would the action adversely affect habitat critical to the survival of a species?

No critical habitat has been declared for the Grey-headed Flying-fox.

Would the action disrupt the breeding cycle of an important population?

The proposed project would not impact directly on any aspect of the life cycle of the Grey-headed Flying-fox (e.g. breeding, roosting, dispersal, local fire regimes, etc.).

Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Approximately 11 ha of potential habitat for Grey-headed Flying-fox would be cleared for the proposed project. This vegetation is already disturbed and fragmented and is immature. This small-scale reduction in habitat would be unlikely to result in the species' decline.

Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposed project would not result in the introduction of any harmful or invasive species being introduced to the study area.

Would the action introduce disease that may cause the species to decline?

The proposed project would not lead to the introduction of any diseases that are potentially harmful to the Grey-headed Flying-fox.

Would the action interfere substantially with the recovery of the species?

The proposed project would not interfere substantially with the recovery of the Grey-headed Flying-fox.

Conclusion

Suitable potential habitat for the Grey-headed Flying-fox exists in an area of 11 ha that would be removed. The small scale of the proposed project would be unlikely to have a significant impact on this species. More suitable foraging habitat exists outside the study area and the immature trees of the subject site would not provide primary habitat. Therefore, a referral to DSEWPC is not required in relation to the Grey-headed Flying-fox.

References

DEWHA (2009). *Matters of National Environmental Significance, Significant Impact Guidelines 1.1, Environment Protection Biodiversity and Conservation Act 1999.* Department of the Environment, Heritage, Water and the Arts, Canberra.

DSEWPC (2012). *Species Profile and Threats Database.* Available at: http://www.environment.gov.au/sprat. Accessed June 2012.

OEH (2012). *Threatened species, populations and ecological communities of NSW*. Available at: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx. Accessed June 2012.

Regent Honeyeater

The Regent Honeyeater *Anthochaera phrygia* is listed as endangered under the EPBC Act.

This assessment of impact significance has been conducted according to the DSEWPC Guidelines (DEWHA, 2009) for endangered species.

The range for the Regent Honeyeater has declined dramatically and has become extremely disjointed. The total population is believed to contain fewer than 1,500 individuals (NPWS, 1999). There are only three known key breeding regions remaining: northeast Victoria (Chiltern-Albury) and in NSW at Capertee Valley and the Bundarra-Barraba region (OEH, 2012). In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. However, in some years non-breeding flocks converge on flowering coastal woodlands and forests (OEH, 2012).

The Regent Honeyeater occurs in eucalypt woodlands and open forest. Most records of the species are from box-ironbark eucalypt forest and woodland, lowland coastal forests that are dominated by Swamp Mahogany *Eucalyptus robusta* and Spotted Gum *Corymbia maculata* and riparian forests of River She-oak *Casuarina cunninghamiana* (OEH, 2012). These woodlands have large numbers of mature trees, high canopy cover and an abundance of mistletoes (OEH, 2012). Bird movements are thought to be dependent on spatial and temporal flowering and other resource patterns (OEH, 2012).

Nectar comprises the main diet of the Regent Honeyeater, with 16 species of eucalypt and two species of mistletoe browsed. However, three species of eucalypt make up the predominant nectar sources: Red Ironbark *Eucalyptus sideroxylon*, White Box *Eucalyptus albens* and Yellow box *Eucalyptus melliodora* (Webster and Menkhorst, 1992). Lerps and honeydew comprise a large proportion of the diet when nectar is scarce. Insects comprise a smaller dietary component but are important for nestlings (OEH, 2012).

Would the action lead to a long-term decrease in the size of an important population of a species?

An important population of the species is not known in the study area or its vicinity.

Would the action reduce the area of occupancy of an important population?

If the Regent Honeyeater is present in the subject site the small scale of the proposed project would be unlikely to reduce the area of occupancy of a local population. The proposed project would involve vegetation clearing of only a small area of approximately 11 ha of Ironbark woodland or forest.

Would the action fragment an existing important population into two or more populations?

If the Regent honeyeater is present in the subject site, it is unlikely that the proposed project would fragment the population into two populations because the site is already dissected by the railway corridors, road and infrastructure.

Would the action adversely affect habitat critical to the survival of a species?

No critical habitat has been declared for the Regent Honeyeater.

Would the action disrupt the breeding cycle of an important population?

The proposed project would not impact directly on any aspect of the life cycle of the Regent Honeyeater (e.g. breeding, dispersal, migration, local fire regimes, etc.).

Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Approximately 11 ha of potential habitat for Regent Honeyeater would be cleared for the proposed project. This vegetation is already disturbed and fragmented. This small-scale reduction in habitat would be unlikely to result in the species' decline.

Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposed project would not result in the introduction of any harmful or invasive species being introduced to the study area.

Would the action introduce disease that may cause the species to decline?

The proposed project would not lead to the introduction of any diseases that are potentially harmful to the Regent Honeyeater.

Would the action interfere substantially with the recovery of the species?

The proposed project would not interfere substantially with the recovery of the Regent Honeyeater.

Conclusion

Suitable potential habitat for the Regent Honeyeater exists in an area 11 ha that would be removed. The small scale of the proposed project would be unlikely to have a significant impact on this species. Therefore, a referral to DSEWPC is not required in relation to the Regent Honeyeater.

References

DEWHA (2009). *Matters of National Environmental Significance, Significant Impact Guidelines 1.1, Environment Protection Biodiversity and Conservation Act 1999.* Department of the Environment, Heritage, Water and the Arts, Canberra.

DSEWPC (2012). *Species Profile and Threats Database.* Available at: http://www.environment.gov.au/sprat. Accessed June 2012.

OEH (2012). *Threatened species, populations and ecological communities of NSW*. Available at: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx. Accessed June 2012.

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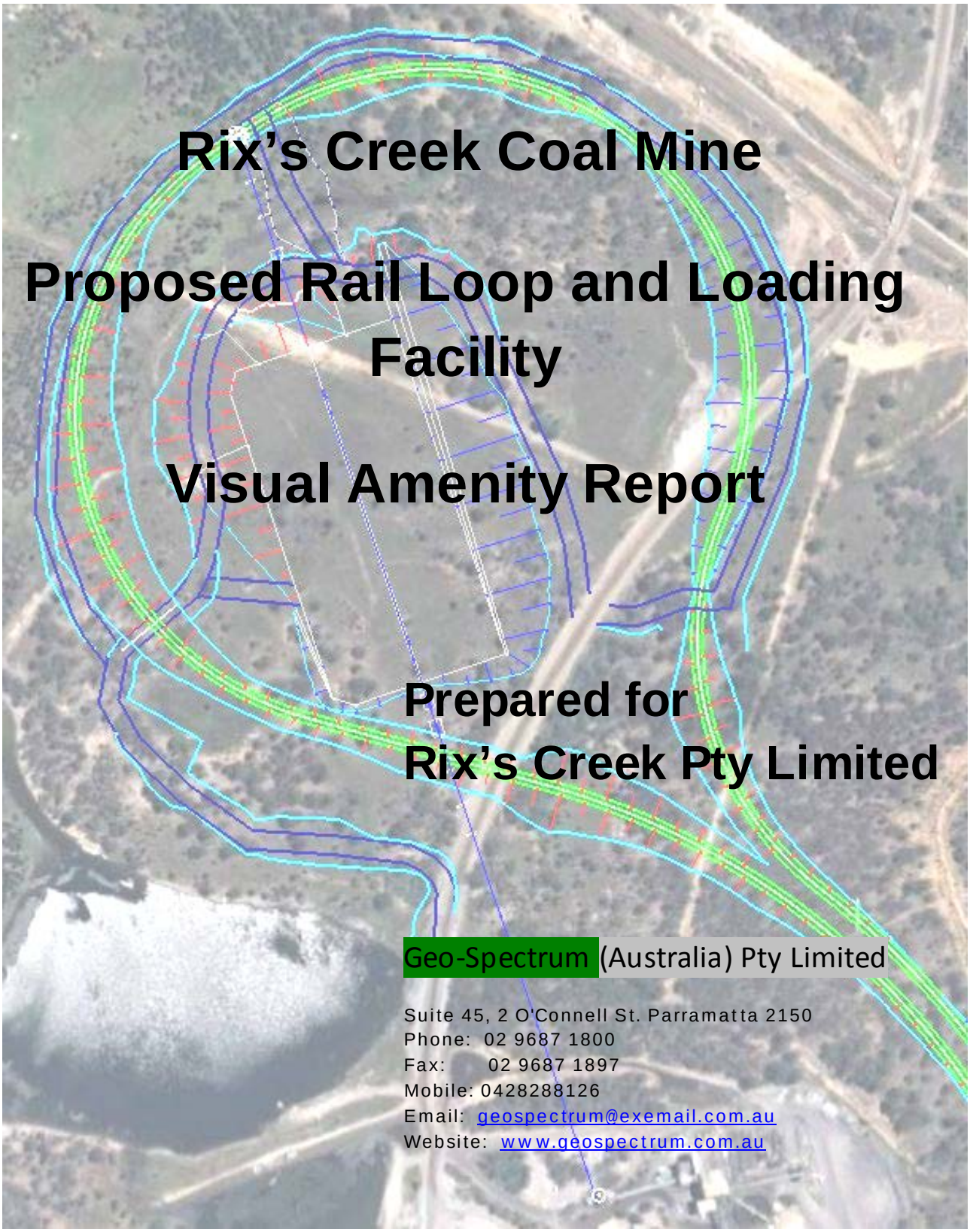
Appendix L

Visual Impact Assessment

Appendix L Visual Impact Assessment

Geo-Spectrum (Australia) Pty Limited



Rix's Creek Coal Mine

Proposed Rail Loop and Loading Facility

Visual Amenity Report

Prepared for
Rix's Creek Pty Limited

Geo-Spectrum (Australia) Pty Limited

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Rix's Creek Coal Mine

Proposed Rail Loop and Loading Facility

Report date: 29 November 2012

Prepared for

Rix's Creek Pty Limited
P O Box 4
EAST MAITLAND NSW 2323

Prepared by

Geo-Spectrum (Australia) Pty Limited
Suite 45, 2 O'Connell St
PARRAMATTA NSW 2150

Ralph Bennett
Managing Director
Geo-Spectrum (Australia) Pty Limited

Geo-Spectrum (Australia) Pty Limited has been offering services in the photogrammetric mapping field throughout Australia and the region since the establishment of the company in 1971, and under its current ownership since 1984.

Table of Contents

List of Figures

1. Scope

Geo-Spectrum (Australia) Pty Limited has been commissioned by Rix's Creek Pty Limited to prepare a Visual Amenity Report (VAR) for the proposed operation of a rail loading facility and stockpiling system at the Rix's Creek mine site.

Geo-Spectrum (Australia) being a leading specialist company offering photogrammetric mapping solutions since 1971.

The Visual Amenity Report will determine the section of roads or residences with the maximum potential vision to the proposal on the basis of having all vegetation removed from potential lines of sight.

The Visual Amenity Report will determine the maximum height of development available in the proposed stockpile area to remain shielded from surrounding residences and roads as well as the proportion of any other infrastructure that will be visible.

The Visual Amenity Report will be used as a design input to future engineering design for the project and as a supporting document for the assessment process.

2. Development Overview

In order to secure the mining operation's long term viability and reduce environmental impacts it has been proposed to construct a rail loading facility on the Rix's Creek site adjacent to the Coal Handling and Preparation Plant (CHPP).

The rail terminal and associated facilities will include

- Construction of approximately 6 kilometres of railway line including a balloon loop on the western side of the Main Northern Railway
- Establish a stockpile area to the north of the Rix's Creek CHPP in the middle of the proposed balloon loop
- Erection of conveyors from the Rix's Creek CHPP and a skyline tripper conveyor system along the stockpile
- Construction of a reclaim tunnel below the stockpile and the erection of a conveyor to charge the nominal 2000 tonne rail loading bin
- Construction of various access roads to service and maintain the proposed rail load out and stockpiling facility
- Installation of other associated infrastructure including floodlighting, stormwater management structures and utility connections

3. Site Information

Rix's Creek coal mine is an open cut operation located 5 km northwest of Singleton. The first coal was produced in 1990 and the mine continues to produce both thermal coal and high quality, semi-soft coking coal for overseas and domestic customers.

The mining technique is a multi-seam bench system which mines up to nine seams and splits. The mine uses a suite of Caterpillar and Hitachi equipment for overburden removal and coal movement. Run-of-Mine coal is processed by the onsite coal handling and preparation plant (CHPP).

Currently product coal from the Rix's Creek CHPP is transported across the mine site by trucks to a rail loading facility. All coal produced is railed from the site.

4. Proposed Development Information

Rix's Creek open cut coal mine is currently producing about 1.5 million tonnes of saleable coal per annum with all coal being railed from the site.

Currently product coal from the Rix's Creek CHPP is transported across the mine site by trucks to a rail loading facility 1.8 kilometres away. The facility uses a rail loop owned by Integra on the eastern side of the Main Northern Railway.

The proposal is to replace the current stockpile and rail loading facility. The proposal will replace the existing truck and road system with a conveyor to a new stockpile location. A tripper conveyor system will be used to stockpile the coal to a nominal 350,000 tonne capacity.

A reclaim tunnel below the stockpile will be used with conveyors to transport the coal from the stockpile to the nominal 2000 tonne train loading bin.

The proposal also consists of the construction of approximately 6 kilometres of rail line including a balloon loop within the Rix's Creek's Colliery Holding.

The rail line, conveyor, stockpiling facility and bin are all at reduced elevations compared to the existing rail loading facility and are located in a basin protected by prominent ridge lines.

The new development is to be lit at night using a series of floodlights along the sides of the stacker that will be shrouded to ensure they are not seen from neighbouring residences.

5. Methodology for determining design heights for Visual Amenity Study

Geo-Spectrum (Australia) Pty Limited was engaged to fly 1:10,000 scale (12cm ground sampling distance) digital colour aerial photography on the 4th January 2012 of an area outlined by Rix's Creek Pty Limited as their area of interest for a visual amenity study. This aerial photography, controlled by airborne GPS and pre-targetted ground control was set up photogrammetrically in our office to establish a seamless co-ordinated image of the whole VAR site. This information was used to produce a 3 dimensional digital terrain model of the existing environment to an accuracy of 0.15m horizontally and vertically.

Information from the proposed Nundah Bank rail project was patched in to this digital terrain model.

For all calculations the assumption was applied that all stands of trees would be ignored in the "line of sight" measurements, as such a worst possible case would be considered.

It was established that the highest viewpoint within the VAR area of interest was a house at 21 Lester Close, Wattle Ponds, Figure 1. This residence is a two storey dwelling with balconies at the second floor level. We chose the closest balcony to the proposed site and made the viewpoint 2 metres above the balcony floor to simulate a 6 foot + person standing on the balcony looking towards the proposed site. Numerous other sites were tested and proven to have a reduced perspective over the proposed development area, see Appendix 1 for additional locations and images.

Figure 1. View of 21 Lester Close Wattle Ponds

The main physical obstacle between the viewpoint and the proposed site is a ridge, approximately 1,766m from the viewpoint, Figure 2. The highest infrastructure of the proposed development is the

rail load out bin and skyline stacker conveyor which are an additional 1,360m and 1,070m respectively further away from the viewing point than the ridge line. Point samples were generated along this ridge for use in determining the potential development height limit for the stockpile area.

Figure 2. View from Lester Close roadway showing ridgeline.

The 3D design layout of the proposed stockpile pad and loading bin provided to Geo-Spectrum were overlaid onto the stereo model.

A line was generated from the proposed rail load out bin to the existing clean coal bin at the CHPP. This line was then sampled at a vertices spacing of 10 metres with rays being generated back to the viewpoint, Figure 3. Each of these rays was then draped to the intervening ridge. The rays were then extended past the proposed stockpile area and a digital terrain model generated of the resulting surface. We also "flew" along each ray with our fly through software to make sure that the rays rested on the ridge.

Resultant contours of the shielded development elevation potential are depicted in Appendix 1 for the stockpile and rail loading bin area.

Computer modelled views have been generated from the viewpoint at the standard height (Figure 4) along with a view 60 metres above the view point (Figure 5) to demonstrate the visual impact potential for the proposed development.

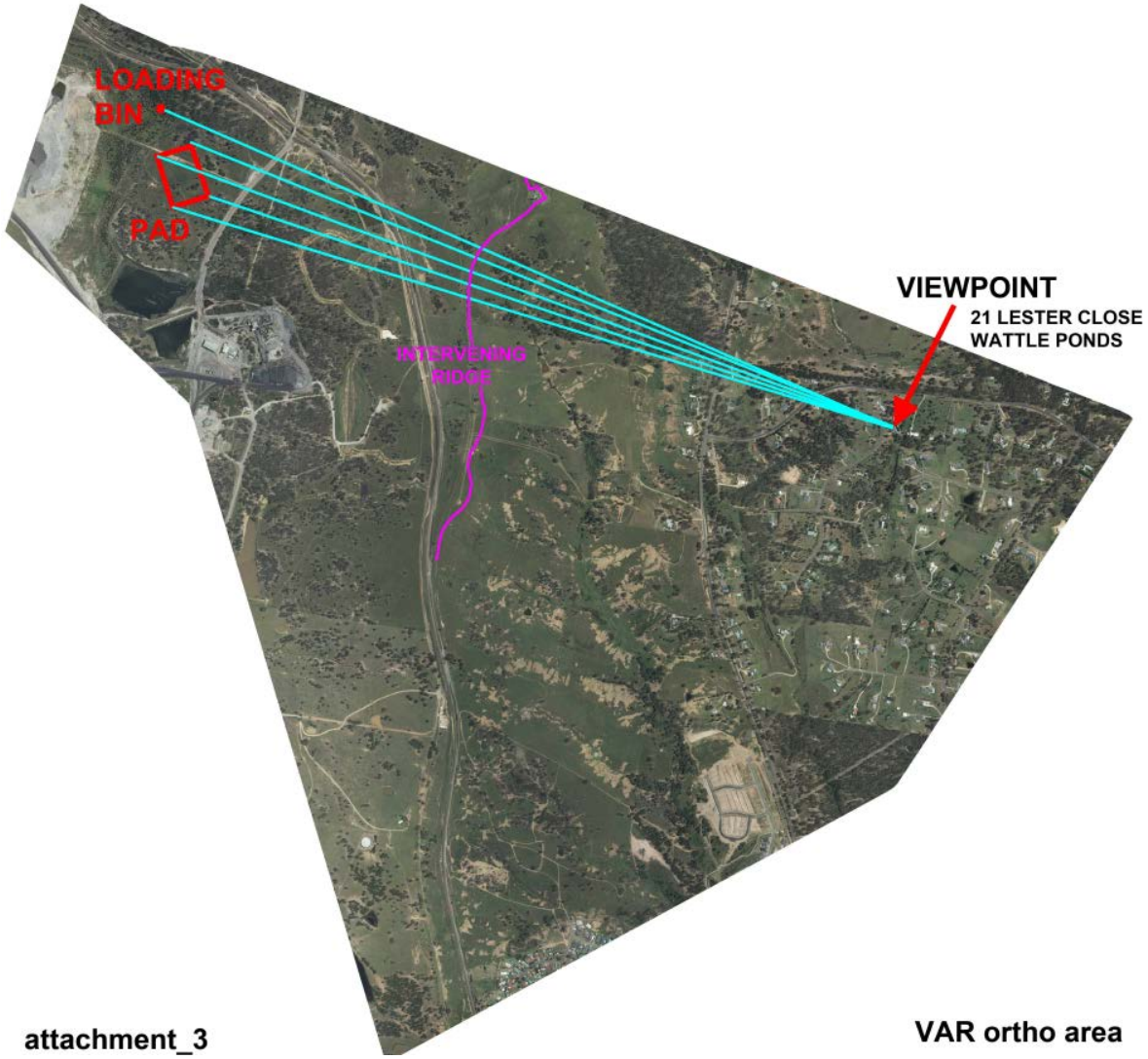


Figure 3. Plan view showing 21 Lester Close and development.

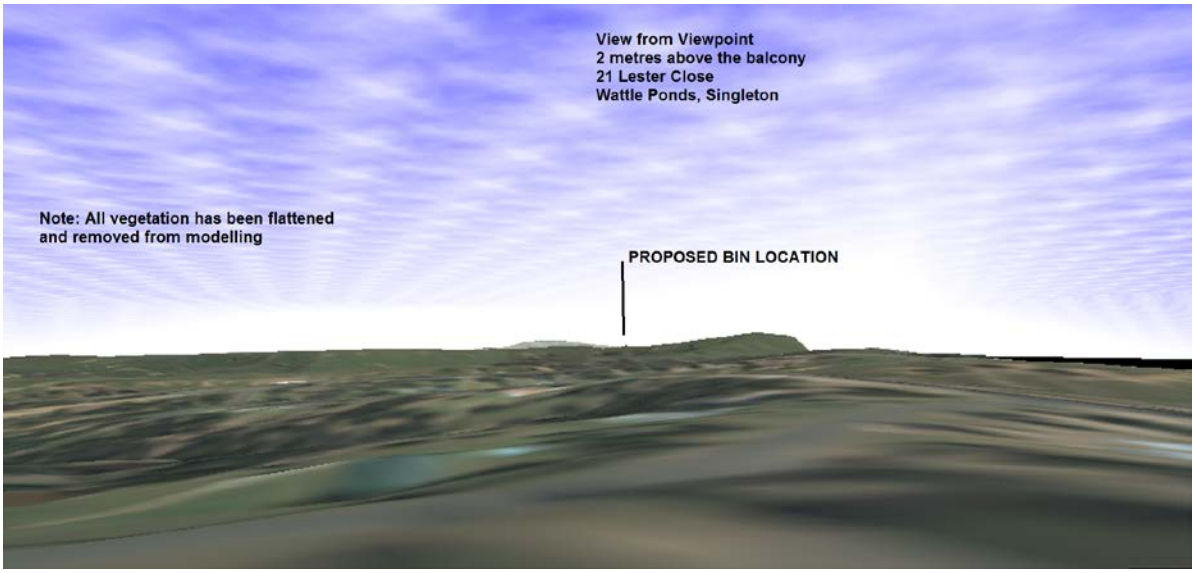


Figure 4. View towards development from 2m above the balcony at 21 Lester Close Wattle Ponds.

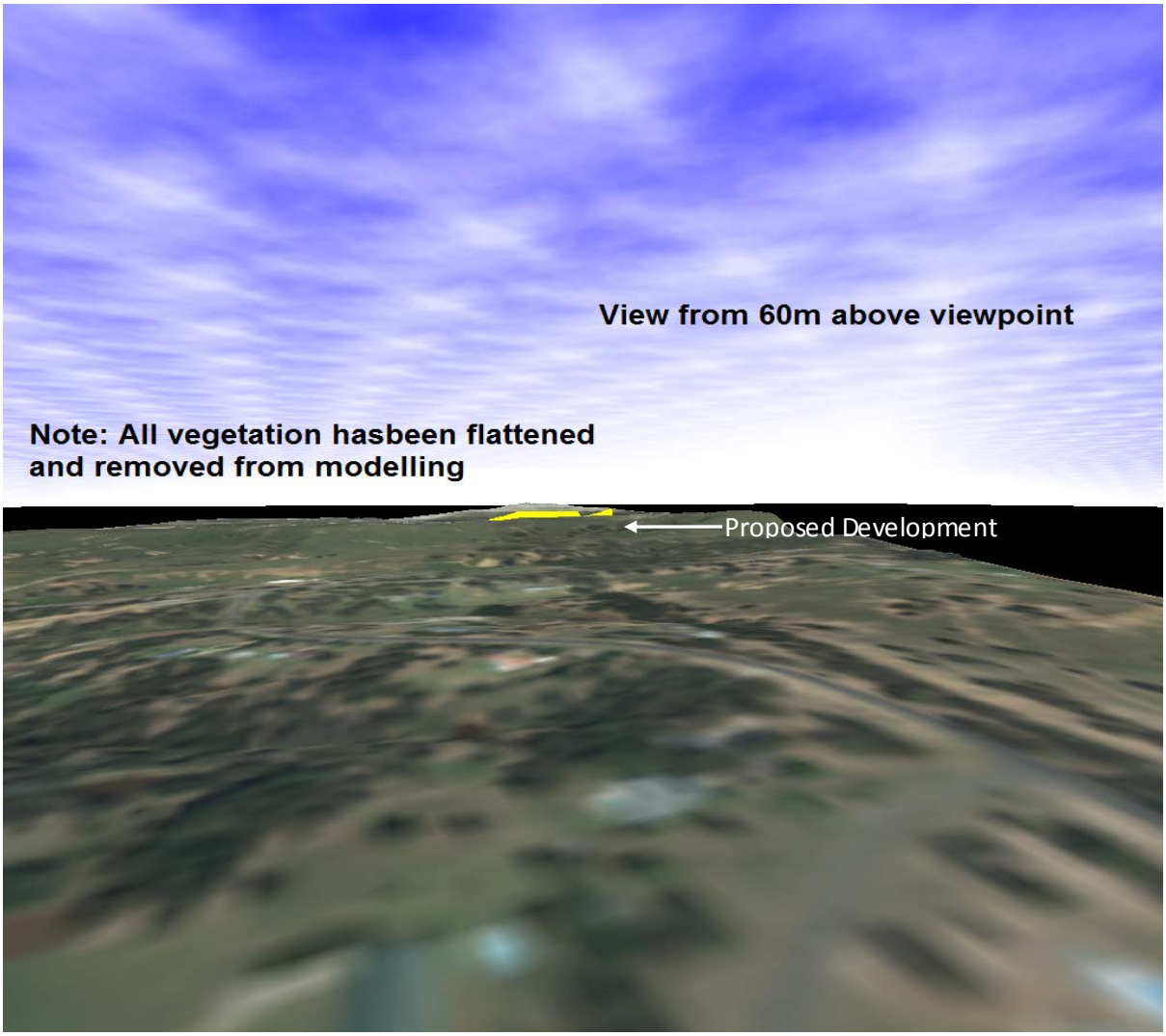


Figure 5. View towards development from 60m above 21 Lester Close with all vegetation flattened.

6. Conclusion

The location with the greatest potential to view the proposed rail loading and stockpiling facility is at 21 Lester Close, Wattle Ponds (the viewpoint).

Provided the proposed development is maintained below the contours depicted in Appendix 1, it will not be visible from the viewpoint.

It is also noted that there are substantial stands of trees in the view path, particularly across the road from the viewpoint, (Figure 6).

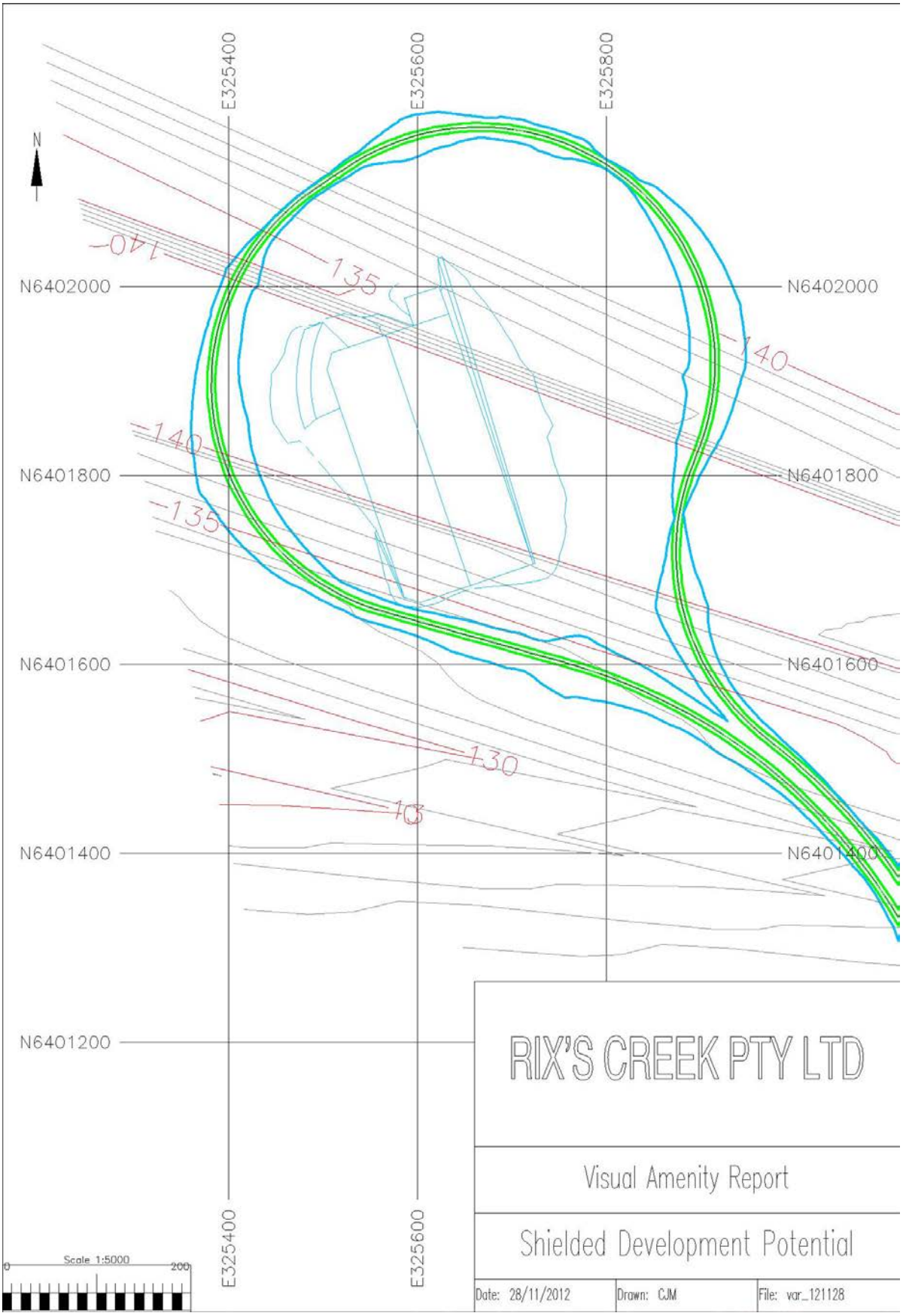
Figure 6. View from roadway in front of 21 Lester Close showing vetetation blocking view to developemnt.

No other residence or road within the VAR limit area supplied by Rix's Creek Pty Limited has any view of the proposed development to these design heights.

The development will conform with the existing landscape and be suitably coloured for site specific visual amenity purposes.

Appendix 1.

Additional Views from Other Locations Towards Proposed Development.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Visual Amenity Report
Shielded Development Potential
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Figure 7. Intersection of Bridgeman Rd and Retreat Rd.

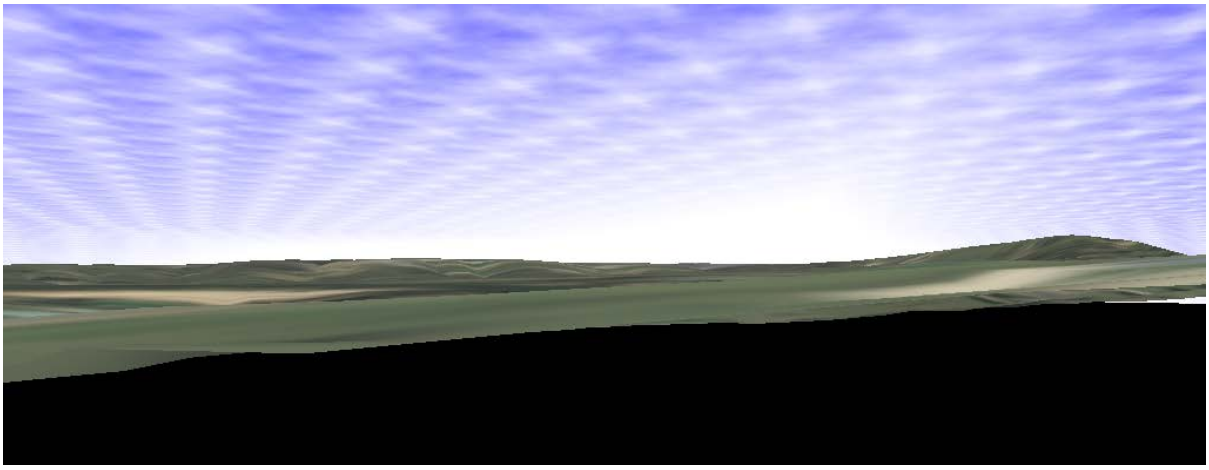


Figure 8. Generated view for intersection of Bridgeman Rd and Retreat Rd - Development not visible.

Figure 9. Bridgeman Rd.

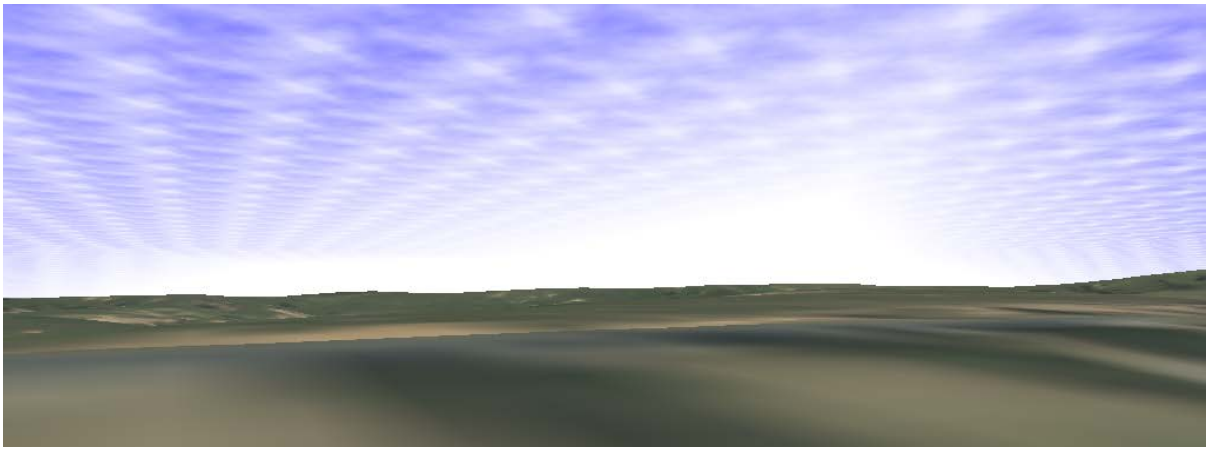


Figure 10. Generated View from Bridgeman Rd - Development not visible.

Figure 11. McMahon Way.

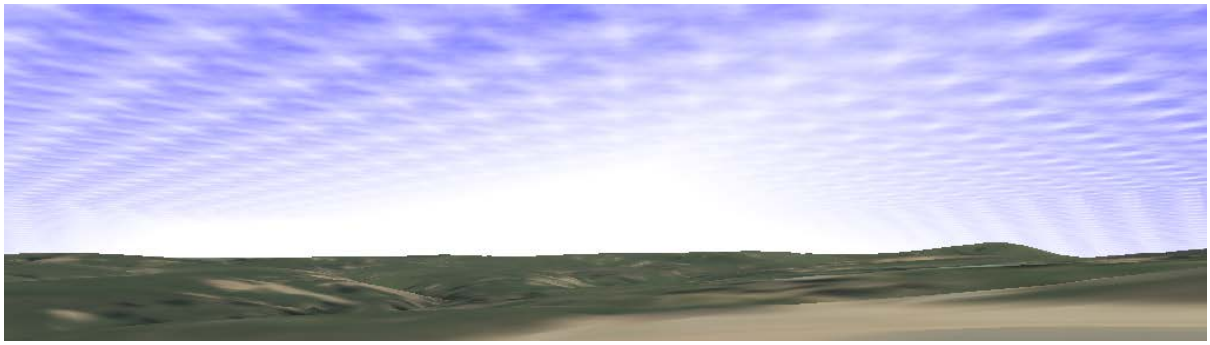
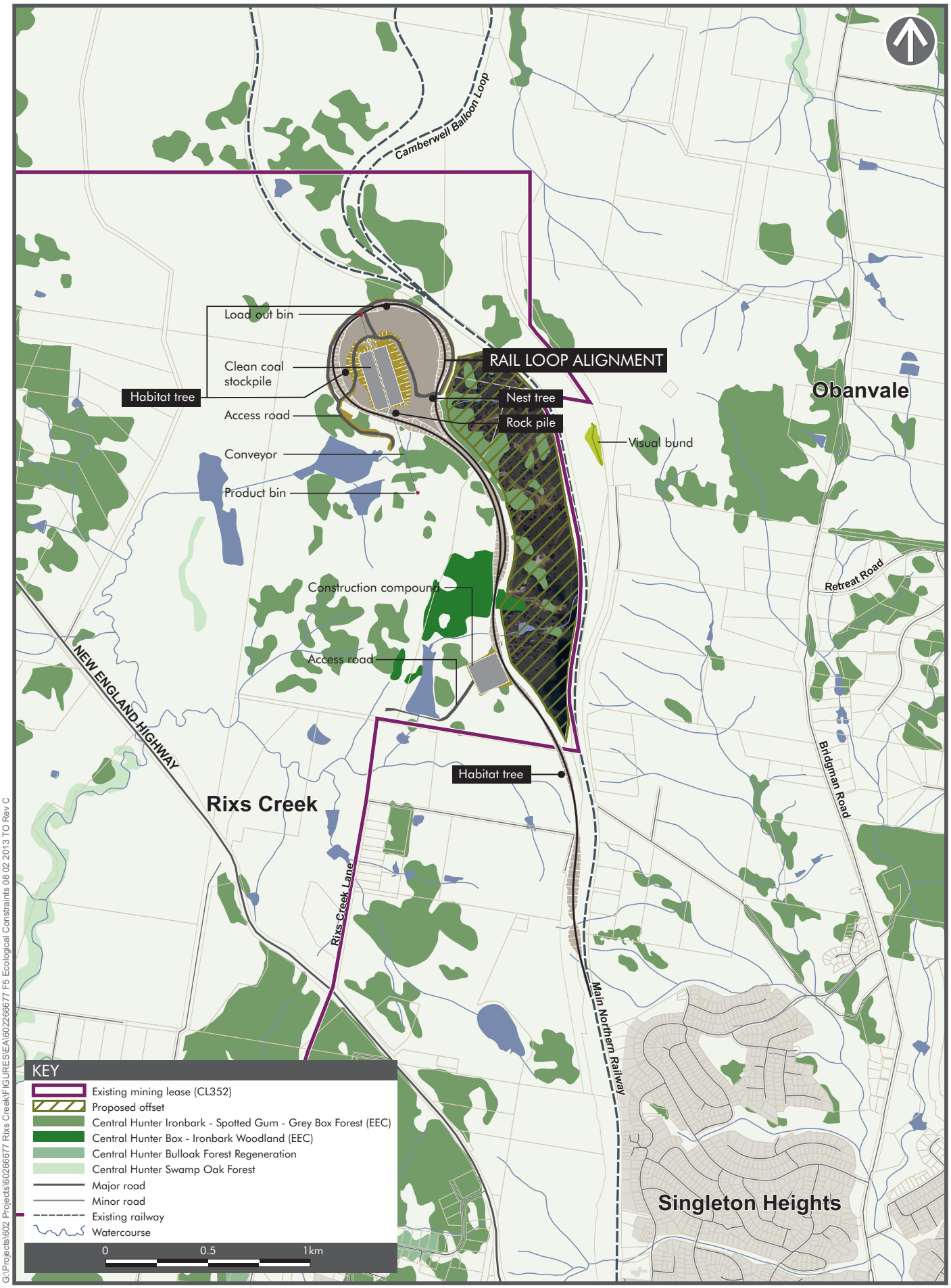


Figure 12. Generated View from McMahon Way - Development not visible.



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AECOM

ECOLOGICAL CONSTRAINTS

Rix's Creek Mine Rail Loading Facility
Environmental Assessment

Vegetation Data Source: Hunter-Central Rivers Catchment Management Authority (2006)

FIGURE 5