ATLAS-CAMPASPE MINERAL SANDS PROJECT

OPTIMISATION MODIFICATION

APPENDIX D

VEGETATION CONDITION ASSESSMENT

TRONOX

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Project No. CMA-18-07
Document No. 00987790

1 INTRODUCTION

The Atlas-Campaspe Mineral Sands Project (the Project) is being developed by Tronox Mining Australia Limited (Tronox). Development Consent (SSD_5012) for the Project was issued under the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* in 2014.

The Project includes the development of a mineral sands mining operation (herein referred to as the Atlas-Campaspe Mine), together with the construction and operation of a rail loadout facility located near the township of Ivanhoe (herein referred to as the Ivanhoe Rail Facility).

Tronox is seeking to modify the Project under section 4.55(2) of the EP&A Act. The Project Optimisation Modification (the Modification) would include changes to the approved Ivanhoe Rail Facility, resulting in a modified surface development footprint (Figure 1). There would be a net reduction (approximately 12 hectares [ha]) in the amount of native vegetation clearance associated with the modified Ivanhoe Rail Facility (Figure 1).

1.1 PURPOSE

This report has been prepared to document the condition of the vegetation in the additional surface development area associated with the modified Ivanhoe Rail Facility (approximately 10.2 ha), compared to the condition of the vegetation in the surface development area associated with the approved Ivanhoe Rail Facility that would no longer be required to be cleared (approximately 22.1 ha).

2 METHODS

2.1 VEGETATION MAPPING

Flora surveys of the approved Ivanhoe Rail Facility surface development area were conducted by Australian Museum Business Services (AMBS) in October 2012 (AMBS, 2013). The surveys were undertaken using standard techniques (quadrats, rapid data points, vegetation mapping, condition assessment and threatened species searches) in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Department of Environment and Conservation, 2004).

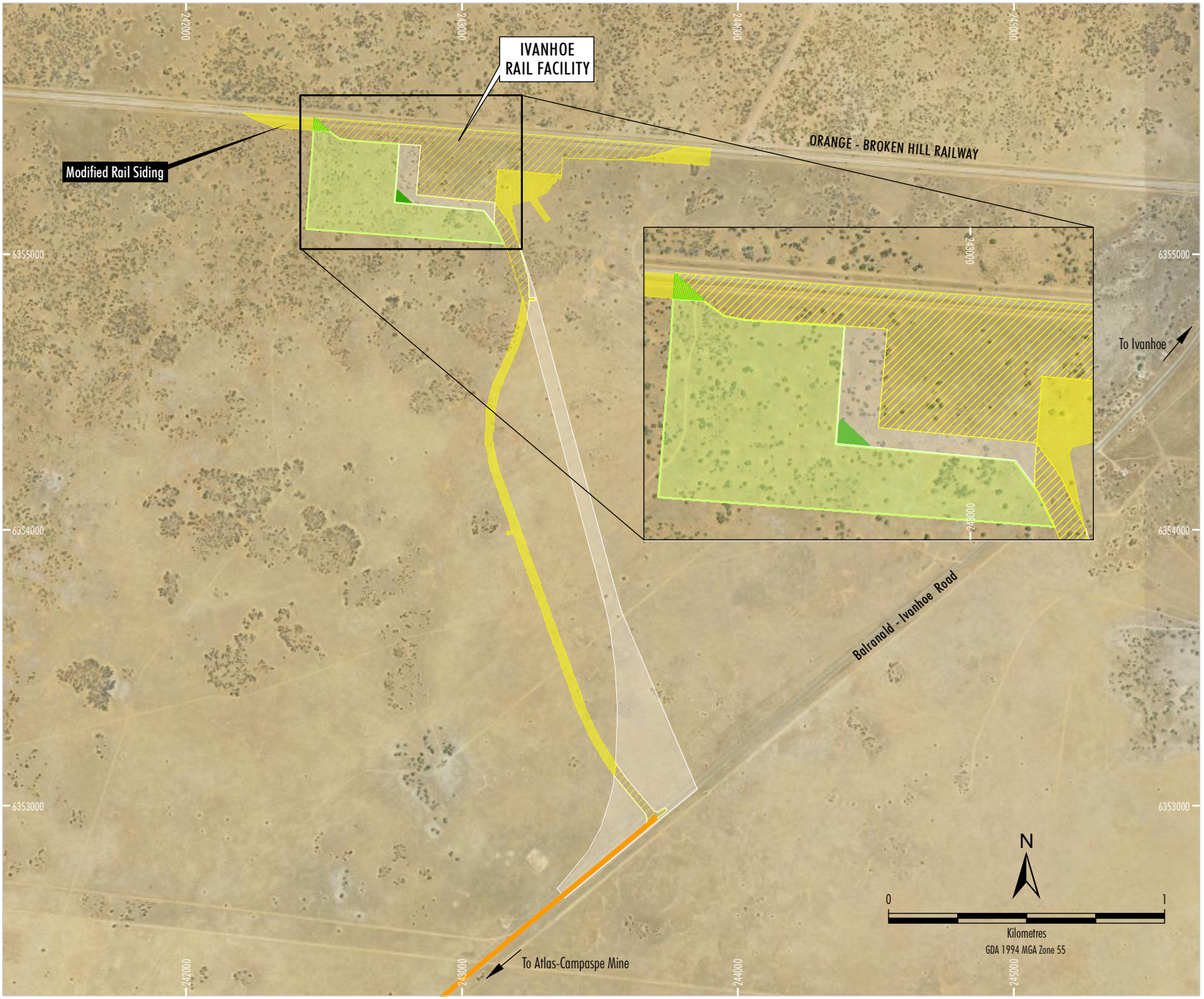
Regional mapping of Plant Community Types (PCTs) (Office of Environment and Heritage [OEH], 2019a) was considered in the assignment of vegetation communities mapped by AMBS (2013) to PCTs as per the BioNET Vegetation Classification (OEH, 2019b).

The Ivanhoe Rail Facility is located in the Darling Depression IBRA Subregion of the Murray Darling Depression IBRA Region (Commonwealth Department of Environment and Energy, 2012). It is also located in the Ivanhoe – Nangara Sandplains Mitchell Landscape (OEH, 2018).

2.2 VEGETATION CONDITION

A vegetation condition assessment of the modified Ivanhoe Rail Facility surface development area was carried out by Botanist Greg Cranston (GHD) on 19 and 20 June 2019. The assessment consisted of nine vegetation plots; five located in the approved Ivanhoe Rail Facility surface development area no longer required, and four located in the modified Ivanhoe Rail Facility surface development area (Figure 2). The number of vegetation plots and data collected at each plot was in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017).

A vegetation integrity score (VIS) was then calculated using the data obtained by GHD for each of the plots using the BAM Calculator. The calculations were carried out by Jamie Gleeson (Resource Strategies) (assessor accreditation number 0056).



LEGEND

- Approved Surface Development Area Required
- Additional Surface Development Area
- Approved Surface Development Area not Required
- Approved Mineral Concentrate Transport Route*
- Approved Vegetation Management Area
- Approved Vegetation Managment Area to be Replaced
- Replacement Vegetation Management Area

* MSP Process Waste Transport Route following cessation of operations at the Ginkgo and Snapper Mines

Source: Cristal Mining Australia (2015); Tronox (2019) Orthophoto: © NSW Department of Finance, Services & Innovation (2017)

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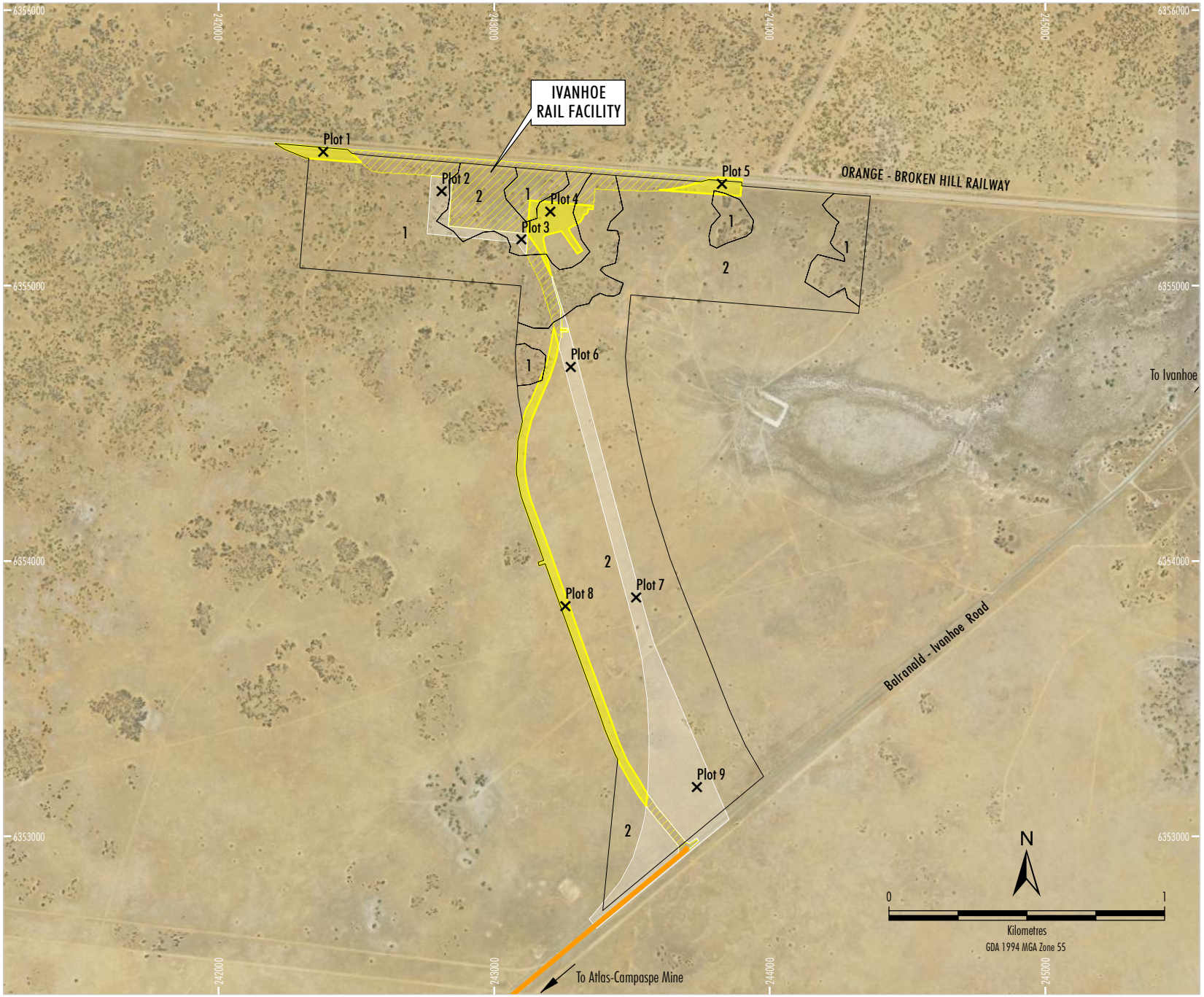
OPTIMISATION MODIFICATION

Modified Ivanhoe Rail Facility - Surface Development Area

Figure 1

CMA-18-07 AC OM App VC_201B



LEGEND

- Approved Surface Development Area Required
- Additional Surface Development Area
- Approved Surface Development Area not Required
- Approved Mineral Concentrate Transport Route*

Vegetation Communities

- 1 Belah-Rosewood/Acacia Woodland
- 2 Native Grassland/Sparse Acacia/ Chenopod Shrubs
- × Survey Location

* MSP Process Waste Transport Route following cessation of operations at the Ginkgo and Snapper Mines

Source: Cristal Mining Australia (2012); AMBS (2012); Tronox (2019) and GHD (2019)
Orthophoto: © NSW Department of Finance, Services & Innovation (2017)

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OPTIMISATION MODIFICATION

Modified Ivanhoe Rail Facility - Vegetation Communities

Figure 2

CMA-18-07 AC OM App VC_202B

3 RESULTS

The same vegetation communities/PCTs recorded in the approved Ivanhoe Rail Facility surface development area (i.e. Native Grassland/Sparse Acacia/Chenopod Shrubs (PCT 166) and Belah-Rosewood/Acacia (PCT 57) are present in the modified Ivanhoe Rail Facility surface development area (Figure 2). No threatened ecological communities under the *Biodiversity Conservation Act, 2016* Act or *Environment Protection and Biodiversity Conservation Act, 1999* occur in either the approved or modified surface development areas. It is unlikely that rare or threatened flora species would occur in the paddock due to the high level of disturbance from agricultural practises.

The vegetation condition plot data for the modified Ivanhoe Rail Facility surface development area is provided in Appendix A and for the approved Ivanhoe Rail Facility surface development area no longer required is provided in Appendix B.

Outputs from the BAM Calculator included scores for composition, structure and function attributes (Table 1). The modified Ivanhoe Rail Facility surface development area has a VIS of 31.3 for PCT 57 and 31 for PCT 166, while the approved Ivanhoe Rail Facility surface development area no longer required has a VIS of 21.3 for PCT 57 and 21 for PCT 166 (Table 1).

Table 1
Ivanhoe Rail Facility Vegetation Integrity Scores

PCT	Area (ha)	BAM Calculator Output			
		Composition Condition Score	Structure Condition Score	Function Condition Score	VIS[1]
Modified Surface Development Area (Plots 1, 4, 5 and 8)					
57[2]	1.7	66.6	16.6	27.7	31.3
166[3]	8.5	71.3	13.5	-	31.0
Approved Surface Development Area (No Longer Required) (Plots 2, 3, 6, 7 and 9)					
57[2]	1.8	62.9	14.5	10.6	21.3
166[3]	20.4	75.6	5.8	-	21.0

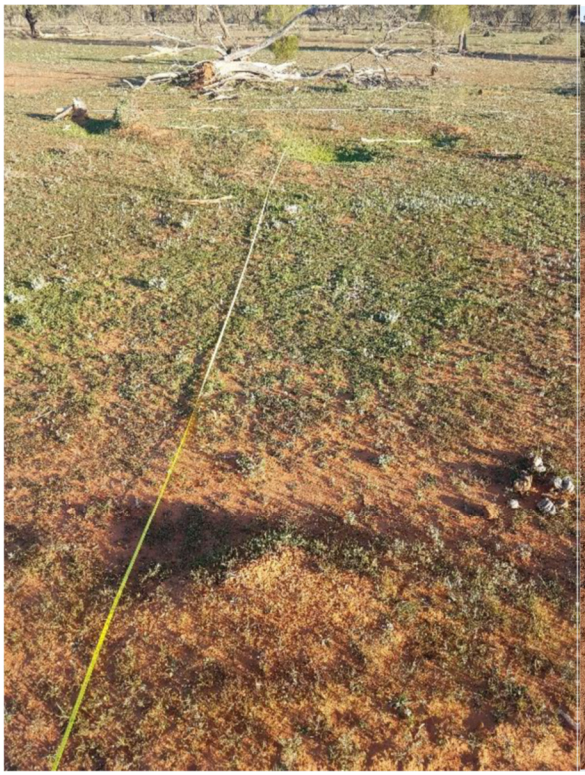
[1] The vegetation integrity score is the measure of vegetation integrity as calculated in the BAM Calculator using input from plot data. Vegetation integrity is the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

[2] PCT 57 – Belah/Black Oak – Western Rosewood – Wilga woodland of central NSW including the Cobar Peneplain Bioregion.

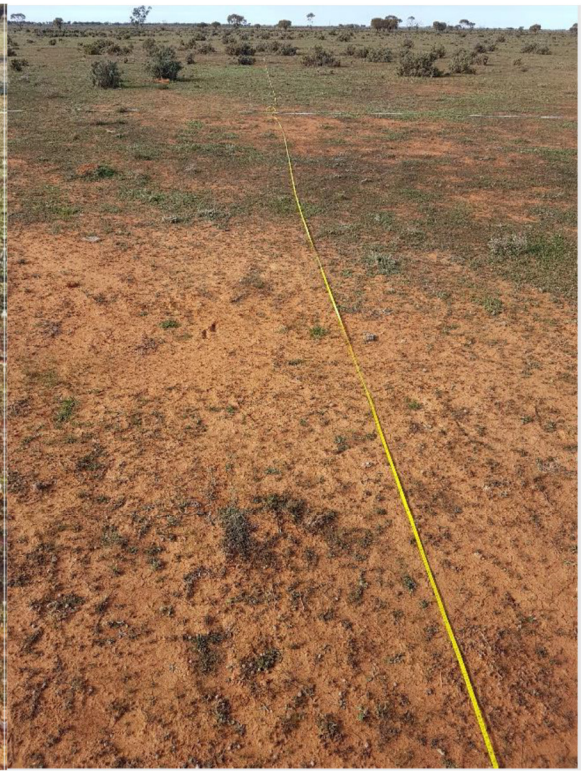
[3] PCT 166 – Disturbed annual saltbush forbland on clay plains and inundation zones mainly of south-western NSW.

The apparent differences in the calculated VIS between the modified Ivanhoe Rail Facility surface development area and approved Ivanhoe Rail Facility surface development area no longer required is likely natural variation and not an actual measure that the vegetation is in better condition in the modified Ivanhoe Rail Facility surface development area. The reasons for this are:

- the quantities of vegetation clearance are so small such that the BAM (OEH, 2017) only requires minimal plots to be sampled (e.g. <2 ha clearance of PCT 57 is sampled by a single BAM plot in accordance with the BAM [OEH, 2017]);
- there are no obvious differences in the vegetation of the respective areas (Plates 1 to 4 and 5 to 9); and
- the vegetation in the paddock is subject to the same agricultural practises and thus has been subject to the same disturbances such as grazing by goats, introduction of non-native vegetation and clearing.



Plot 1 – PCT 57



Plot 4 – PCT 166

Plot 5 – PCT 166

Plot 8 – PCT 166

Plates 1 to 4 Modified Ivanhoe Rail Facility Surface Development Area

Plot 2 – PCT 57

Plot 3 – PCT 166

Plot 6 – PCT 166

Plot 7 – PCT 166

Plot 9 – PCT 166

Plates 5 to 9 Approved Ivanhoe Rail Facility Surface Development Area no Longer Required

4 CONCLUSION

The following conclusions are made:

- less native vegetation clearance would be required for the modified Ivanhoe Rail Facility, resulting in retention of 0.1 ha of PCT 57 and 11.9 ha of PCT 166 that would otherwise be cleared;
- the VIS calculated using the BAM Calculator indicate that there is a slight difference in the condition of the vegetation, however the apparent differences in the calculated VIS between the modified Ivanhoe Rail Facility surface development area and approved Ivanhoe Rail Facility surface development area no longer required is likely natural variation and not a material measure that the vegetation is in better condition in the modified Ivanhoe Rail Facility surface development area; and
- even if the apparent differences in the calculated VIS between the modified Ivanhoe Rail Facility surface development area and approved Ivanhoe Rail Facility surface development area no longer required are real, the approximate 12 ha reduction in native vegetation clearance required for the modified Ivanhoe Rail Facility would lead to an overall net reduction of impacts on native vegetation.

5 REFERENCES

Australian Museum Business Services (2013) *Atlas-Campaspe Mineral Sands Project Flora Assessment.* Report prepared for Cristal Mining Australia Limited.

Department of Environment and Conservation (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft).*

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GHD (2019) Vegetation integrity plot data for the Ivanhoe Rail Facility. Tabulated data. Unpublished.

Office of Environment and Heritage (2018) *NSW (Mitchell) Landscapes – version 3.1*.

Office of Environment and Heritage (2019a) *NSW State Vegetation Type Map: Central West / Lachlan Region Version 1.3.*

Office of Environment and Heritage (2019b). *BioNet Vegetation Classification.* Website: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx?ReturnUrl=%2fNSWVCA20PRap%2fdefault.aspx.
Website Accessed: January 2019.

APPENDIX A

VEGETATION CONDITION PLOT DATA FOR THE MODIFIED IVANHOE RAIL FACILITY SURFACE DEVELOPMENT AREA

Vegetation Condition Data for the Modified
Ivanhoe Rail Facility Surface Development Area

Plot	Zone	PCT	Easting	Northing	Bearing	Patchsize	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
1	55	57	242380	6355487	180	100	0	8	0	4	0	0	0	13.3	0	2.1	0	0	0	0	4	23	0	1	1	0	0	0	35.4
4	55	166	243204	6355269	185	100	0	12	0	1	0	0	0.0	21.2	0.0	0.1	0.0	0.0	0	0	3.8	0.0	0	0	0	0	0	0	14.0
5	55	166	243827	6355369	180	100	0	7	1	5	0	0	0.0	12.5	0.2	6.6	0.0	0.0	0	0	4.0	0.0	1	1	0	0	0	0	40.0
8	55	166	243259	6353835	270	100	0	5	0	5	0	0	0.0	9.9	0.0	6.1	0.0	0.0	0	0	1.0	0.0	0	0	0	0	0	0	24.0

APPENDIX B

VEGETATION CONDITION PLOT DATA FOR THE APPROVED IVANHOE RAIL FACILITY SURFACE DEVELOPMENT AREA

Vegetation Condition Data for the Approved Ivanhoe Rail Facility
Surface Development Area no Longer Required

Plot	Zone	PCT	Easting	Northing	Bearing	Patchsize	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
2	55	57	242810	6355343	180	100	0	7	1	3	0	0	0.0	12.4	0.2	1.3	0.0	0.0	0	0	7.4	4.0	0	1	1	0	0	0	51.0
3	55	166	243099	6355167	180	100	0	10	0	1	0	0	0.0	10.3	0.0	0.5	0.0	0.0	0	0	2.8	0.0	0	0	0	0	0	0	41.0
6	55	166	243278	6354704	90	100	0	6	1	5	0	0	0.0	10.0	1.0	12.1	0.0	0.0	0	0	4.2	0.0	0	0	0	0	0	0	17.0
7	55	166	243516	6353867	260	100	0	7	0	4	0	0	0.0	4.6	0.0	12.3	0.0	0.0	0	0	1.0	0.0	0	0	0	0	0	0	12.1
9	55	166	243736	6353180	270	100	0	5	0	7	0	0	0.0	3.4	0.0	7.4	0.0	0.0	0	0	2.0	0.0	0	0	0	0	0	0	29.0