



CLIENTS | PEOPLE | PERFORMANCE

Midal Cables International Pty Limited

Tomago Aluminium Rod and Conductor
Manufacturing Facility

Environmental Assessment - Volume 1

February 2012

Certification by the author

This Environmental Assessment has been prepared under Section 75H of the *Environmental Planning and Assessment Act 1979*.

Environmental Assessment prepared by	Name:	Peter Carson
	Qualifications:	Bachelor of Science (Honours)
	Address:	GHD Pty Ltd Level 15, 133 Castlereagh Street Sydney NSW 2000
	In respect of:	Tomago Aluminium Rod and Conductor Manufacturing Facility
Development Application	Applicant Name:	Midal Cables International Pty Ltd
	Applicant Address:	c/- GHD Pty Ltd Level 3, GHD Tower 24 Honeysuckle Drive, Newcastle NSW 2310
	Land to be developed:	The project is to be carried out on land as shown in the Environmental Assessment
	Lot and DP	Lots 5 & 6 DP 270328 Part Lot 301, DP 634539 and Part Lot 3232, DP 618103
Environmental Assessment	An Environmental Assessment is attached.	
Certificate	I certify that I have prepared the contents of this Environmental Assessment and to the best of my knowledge: - It is in accordance with the requirements of Part 3A; - It contains all available information that is relevant to the Environmental Assessment of the development; and - That the information contained in the Environmental Assessment is neither false nor misleading.	
Signature		
		
Name		Peter Carson
Date		8 February 2012

Contents

Certification by the author	3
Executive summary	i
1. Introduction	1
1.1 Overview	1
1.2 Location of the project	1
1.3 The proponent	5
1.4 The need for the project	5
1.5 Overview of the approval process	5
1.6 Structure of this Environmental Assessment	5
2. Statutory framework	7
2.1 Environmental Planning and Assessment Act 1979	7
2.2 Permissibility of the project	12
2.3 Consideration of other legislation	15
2.4 Port Stephens Development Control Plan 2007	18
3. Stakeholder and community consultation	27
3.1 Community consultation	27
3.2 Consultation with the Aboriginal community	28
3.3 Consultation with utilities	28
3.4 Government agency consultation	29
4. Description of the site and surrounds	32
4.1 Context of the site	32
4.2 Description of the site	32
4.3 Historical use of the site	34
5. Strategic context, project need and alternatives	35
5.1 Strategic planning drivers	35
5.2 Regional drivers	35
5.3 Project need	36
5.4 Alternatives considered and justification of the preferred option	36
6. Description of the project	37
6.1 Overview of the project	37

6.2	Cable and conductor manufacturing process	37
6.3	Ancillary services and infrastructure	43
6.4	Construction activities and likely staging	48
7.	Environmental risk assessment	51
7.1	Risk assessment method	51
7.2	Potential impacts	54
8.	Air quality	59
8.1	Existing environment	59
8.2	Air quality goals	65
8.3	Methodology	67
8.4	Impact assessment	68
8.5	Mitigation measures	77
9.	Surface water and groundwater	79
9.1	Existing environment	79
9.2	Impact assessment	84
9.3	Mitigation measures	91
10.	Noise	94
10.1	Methodology	94
10.2	Existing environment	94
10.3	Noise criteria	96
10.4	Impact assessment	100
10.5	Mitigation measures	107
11.	Biodiversity	109
11.1	Methodology	109
11.2	Existing environment	111
11.3	Impact Assessment	129
11.4	Groundwater dependent ecosystems (GDEs)	137
11.5	Mitigation measures	146
12.	Soils and contamination	150
12.1	Existing environment	150
12.2	Impact assessment	154
12.3	Mitigation measures	155
13.	Waste	156

13.1	Existing environment	156
13.2	Impact assessment	156
13.3	Mitigation measures	157
14.	Traffic and transport	158
14.1	Existing environment	158
14.2	Future traffic conditions	163
14.3	Impact assessment	167
14.4	Mitigation measures	174
15.	Bushfire	175
15.1	Methodology	175
15.2	Existing environment	175
15.3	Impact assessment	177
15.4	Mitigation measures	178
16.	Hazards analysis	180
16.1	Methodology	180
16.2	Preliminary risk screening	180
16.3	Hazard identification	183
16.4	Quantitative risk analysis	190
16.5	PHA risk assessment	191
17.	Greenhouse gas and climate change	198
17.1	Methodology	198
17.2	Existing environment	199
17.3	Modelling results	199
17.4	Mitigation measures	202
18.	Heritage	204
18.1	Indigenous heritage	204
18.2	Non-Indigenous heritage	206
19.	Visual amenity	208
19.1	Existing environment	208
19.2	Impact assessment	208
19.3	Mitigation measures	208
20.	Environmental management	209
20.1	Environmental management plans	209

20.2	Proposed environmental reporting	212
21.	Draft Statement of Commitments	213
22.	Justification and conclusions	217
22.1	Consistency with the provisions of the EP&A Act	217
22.2	Consistency with the PSLEP and Economic Development Plan	219
22.3	Conclusion	220
23.	References	221
24.	Glossary of terms	225
25.	List of abbreviations	227
26.	Units of measure	231

Table Index

Table 2-1	Summary of Director-General's requirements	9
Table 2-2	Application of relevant provisions of the Port Stephens DCP 2007	18
Table 3-1	Summary of issues raised by government agencies	29
Table 6-1	Expected water demand	46
Table 6-2	Typical advanced secondary treatment package plant water quality targets	47
Table 7-1	Likelihood and probability of occurrence	51
Table 7-2	Consequences of occurrence	52
Table 7-3	Risk assessment matrix	53
Table 7-4	Environmental risk assessment	55
Table 8-1	Identified sensitive receptors	59
Table 8-2	Assessment criteria for air quality	65
Table 8-3	Mass emission rates – metal fume plus natural gas	67
Table 8-4	Impact assessment criteria and predicted concentration levels of CO (with percentage of assessment criterion)	69
Table 8-5	Maximum predicted NO ₂ GLCs (µg/m ³) (with percentage of assessment criterion)	70
Table 8-6	Maximum predicted SO ₂ GLCs (µg/m ³) (with percentage of assessment criterion)	71
Table 8-7	1-hour SO ₂ impact and background – Receiver 2	73
Table 8-8	Total VOC breakdown from natural gas combustion	74

Table 8-9	Maximum Predicted 1-hour VOC impact	75
Table 8-10	Maximum predicted PM ₁₀ GLCs (with percentage assessment criterion)	75
Table 8-11	Clean Air Regulation 2010 – predicted concentrations	77
Table 9-1	Existing groundwater quality data (pH and electrical conductivity)	83
Table 9-2	Existing groundwater fluoride concentration data	84
Table 9-3	Expected water demand	86
Table 9-4	Use of effluent by irrigation buffer distances	89
Table 10-1	Unattended noise monitoring results comparison at 5 Graham Drive, Tomago	96
Table 10-2	Construction noise criteria at sensitive receivers	97
Table 10-3	Operational noise criteria – residential receiver R1, dB(A)	99
Table 10-4	Operational noise criteria – residential receivers R2 to R5, dB(A)	99
Table 10-5	Sleep disturbance criteria – residential receivers R1 to R5, dB(A)	100
Table 10-6	Traffic noise criteria at residential receivers, dB(A)	100
Table 10-7	Construction equipment and predicted noise levels	101
Table 10-8	Site noise source sound power levels L _w (re: 20µPa) dB(A)	102
Table 10-9	Modelled sound pressure levels at sensitive receivers - [dB(A) (Leq)]	105
Table 10-10	Modelled sound pressure levels at sensitive receivers - [dB(A) (Lmax)]	105
Table 10-11	Predicted traffic noise emission increase	106
Table 10-12	Relative effectiveness of various forms of noise control dB(A)	107
Table 14-1	Intersection performance – existing peak conditions (2011)	162
Table 14-2	Average annual daily traffic (AADT) volumes on Tomago Road	163
Table 14-3	Traffic generated by the Redlake development	164
Table 14-4	Existing traffic levels along Tomago Road (2011)	165
Table 14-5	Tomago Road with the Redlake development in the AM peak (2011)	165
Table 14-6	Tomago Road with the Redlake Development in the PM peak (2011)	166
Table 14-7	Tomago Road / McIntyre Road intersection performance	166

Table 14-8	Tomago Road / School Drive intersection performance	166
Table 14-9	Midal construction period traffic generation	168
Table 14-10	Midal operational period traffic generation	169
Table 14-11	Summary of estimated traffic generation	169
Table 14-12	Intersection performance (2011) with construction traffic	170
Table 14-13	Intersection performance (2011) with operational traffic	170
Table 14-14	2021 Tomago Road/McIntyre Road intersection performance - with all developments	171
Table 14-15	2021 Tomago Road/School Drive intersection performance - with all developments	172
Table 14-16	Guidelines for minimum parking requirements	172
Table 15-1	Minimum APZ width for the site	177
Table 16-1	Dangerous goods storage screening	181
Table 16-2	Estimated vehicle movement of dangerous good	182
Table 16-3	Hazard identification	184
Table 16-4	NSW individual fatality risk criteria	192
Table 16-5	Effects on heat radiation	193
Table 16-6	Calculated frequency and consequence values	193
Table 16-7	Scenario risk of individual fatality	194
Table 16-8	Scenario risk of individual injury	195
Table 16-9	Scenario risk of property damage	196
Table 17-1	Summary of Scope 1, 2 and 3 emissions for the project	200
Table 17-2	Climate change projections for the Sydney Metropolitan region	201
Table 20-1	Monitoring requirements during construction	211
Table 20-2	Monitoring requirements during operation	212
Table 21-1	Statement of Commitments	213

Figure Index

Figure 1.1	Regional context of the site	2
Figure 1.2	Local context of the site	3
Figure 1.3	Layout of the site	4
Figure 6.1	Site layout plan	38
Figure 6.2	Production process for aluminium and aluminium alloy rod	41
Figure 6.3	Production process for aluminium and aluminium alloy conductor	42
Figure 6.4	Site water balance	45

Figure 8.1	Sensitive receptors in the vicinity of the site	60
Figure 8.2	Beresfield 1-hour maximum NO ₂ ambient air data	62
Figure 8.3	Beresfield 1-hour maximum SO ₂ ambient air data	63
Figure 8.4	Beresfield 24-hour average PM ₁₀ ambient air data (anomalies removed)	63
Figure 8.5	TAC 1-hour SO ₂ concentration levels 2009 – 2011	64
Figure 8.6	TAC 24-hour average SO ₂ concentration levels 2009 – 2011	65
Figure 8.7	24-hour cumulative SO ₂ impacts, 2011	74
Figure 9.1	Existing and proposed surface water flow paths	80
Figure 9.2	Accumulated annual residual rainfall for Raymond Terrace BOM station no. 61031	81
Figure 9.3	Water balance	85
Figure 10.1	Sensitive receivers and noise logging locations in the vicinity of the site	95
Figure 10.2	Plan view of modelled noise sources and buildings	104
Figure 11.1	Site layout and study area	110
Figure 11.2	Threatened flora within 10km of the site (OEH)	117
Figure 11.3	Threatened fauna within 10km of the site (OEH)	118
Figure 11.4	Vegetation of the study area	119
Figure 11.5	Vegetation condition of the study area	120
Figure 11.6	Hollow bearing trees on the site	122
Figure 11.7	New Holland Mouse records and modelled biomass	127
Figure 11.8	Direct impacts on native vegetation cover	131
Figure 11.9	Study area and impact on groundwater dependent ecosystems	140
Figure 11.10	Change in steady state groundwater (scenario 2)	145
Figure 12.1	Borehole, test pit and cone penetration test locations	152
Figure 14.1	Site access, located off Private Road	158
Figure 14.2	Access route	159
Figure 14.3	Tomago Road (looking west towards approach to McIntyre Road)	160
Figure 14.4	McIntyre Road (looking towards Tomago Road)	160
Figure 14.5	School Drive, view looking east towards turnoff to Tomago Road	161
Figure 14.6	Private Road looking north from School Drive	161
Figure 14.7	Location of the Redlake development	164
Figure 15.1	Bushfire hazard map	176

Appendices

- A Director-General's requirements
- B Correspondence with government agencies
- C Air quality assessment
- D Site water and groundwater assessment
- E Noise assessment
- F Biodiversity assessment
- G Phase 2 contamination site assessment
- H Traffic and transport assessment
- I Bushfire constraints analysis
- J Preliminary hazard analysis
- K Greenhouse gas and climate change assessment
- L Archaeological assessment

Executive summary

Introduction

Midal Cables International Pty Ltd (Midal) propose to construct an aluminium rod and conductor manufacturing facility on a 2.8ha parcel of land adjacent to the Tomago Aluminium Smelter at Tomago in the Port Stephens local government area (LGA). This is referred to as 'the project' for the purposes of this Environmental Assessment.

The project would process molten aluminium produced by the Tomago Aluminium Smelter and would add value to the smelter's existing output. It would produce products not currently manufactured in Australia which would reduce imports into Australia of aluminium conductors that are used for electricity transmission. It would also provide an opportunity to export aluminium rod.

This Environmental Assessment has been prepared by GHD Pty Limited (GHD) on behalf of Midal. It accompanies a Major Project Application to the Department of Planning and Infrastructure (DP&I), for the project to be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The proponent

Midal is an Australian registered company and forms part of the Midal Group of companies that are based in the Kingdom of Bahrain. Midal specialises in manufacturing and supplying aluminium and aluminium alloy rod, wires and conductors, aluminium clad steel, aluminium sections and tubes which are exported to a large number of countries including Australia. Midal only uses virgin molten metal sourced directly from smelters to manufacture their products.

Location of the project

The project would be located on industrial land within the Tomago industrial area approximately 6 km from the Port of Newcastle and immediately adjacent to the Tomago Smelter (Figure E.1 and E.2). This land comprises Lot 5 and 6 in DP 270328 and a corridor of land to the north comprising part of Lot 301, DP 634536 and part of Lot 3232, DP 618103. This land has a combined area of approximately 2.8 ha and is subsequently referred to as 'the site'. The site has previously been used for industrial purposes and parts have been subject to sand mining.

Figure E.1 Local context of the site



Figure E.2 Regional context of the site



The project

The project would process approximately 50,000 tonnes of molten aluminium per year. This aluminium would be cast into rods with half the product being exported and half being further processed into aluminium conductors.

The main features of the project include:

- An approximately 150 m long dedicated haul road to link with the Tomago Aluminium Smelter.
- Two buildings to accommodate the rod and conductor manufacturing processes and storage of finished products.
- Several smaller buildings providing workshop facilities, storage and other ancillary facilities and infrastructure.
- Car parking.
- Infrastructure for efficient drainage, water reuse and sewage treatment.
- Associated ancillary infrastructure.

The layout of the key components of the project is shown in E.3.

The Environmental Assessment process

Midal is seeking Project Approval from the Minister for Planning and Infrastructure under Part 3A of the EP&A Act. The Minister for Planning declared the project to be a major project on the 18 March 2010 and confirmed it is to be assessed under Part 3A of the EP&A Act due to the application of Section 75B(2) of that Act. The Environmental Assessment has been prepared to address requirements issued by the Director-General of the Department of Planning and Infrastructure on 12 April 2011. Although Part 3A was repealed on 1 October 2011, the project would continue to be assessed under Part 3A as it is a transitional Part 3A Project.

On 22 August 2011, a referral was submitted to the Department of the Sustainability, Environment, Water, Population and Communities (DSEWPC) to determine whether the project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 29 September 2011, DSEWPC decided that the project is not a controlled action requiring approval under the EPBC Act.

Consultation

A government agency, community and stakeholder consultation program was implemented for the project. The consultation aimed to create awareness about the project and identify issues to be considered during preparation of the Environmental Assessment. Consultation involved a range of methods including information brochures, letters and meetings.

Figure E.3 Layout of key project components



Project need

The Tomago Aluminium Smelter currently produces 530,000 tonnes per year of aluminium product and has recently gained approval to increase production to 575,000 tonnes per year utilising the existing plant and infrastructure. Virtually all product is exported and used to manufacture items such as conductors and aluminium shapes, some of which are then imported back into Australia.

The project would reduce the volume of material exported from Tomago by approximately 10% and has the potential to substantially reduce the amount of finished aluminium conductors imported into Australia.

The project is needed as it would enable value to be added to existing production by the Tomago Aluminium Smelter.

Site description

The site is located within a buffer zone around the Tomago Aluminium Company (TAC) smelter. The buffer zone was established as a condition of consent and was designed to accommodate the operational impacts of the smelter. It functions as an environmental management zone which aims to reduce land uses that are incompatible with the operations of the smelter.

The site is legally identified as Lot 5 and 6 DP270328, part of Lot 301 DP 634536 and part of Lot 3232 DP 618103 and has an area of 2.8 ha. The site has been substantially modified by previous land uses and fragments of disused hardstands areas are situated throughout the central and southern portions of the site. A Colorbond shed is in the southern portion of the site with associated wash bays and covered storage areas.

Grasses, scattered shrubs and trees are within the northern and central portions of the site.

The site is elongated and is relatively flat with a general slope of approximately 2 percent from the north to the south.

Land immediately to the west of the site is occupied by a large industrial facility, land immediately to the east is currently vacant and has previously been used for industrial activities. Land to the north has previously been subjected to sand mining and is part of the TAC buffer zone. A small area of bushland lies immediately to the south and separates the site from industrial development.

Environmental assessment

Air quality

Construction

The main potential impact on air quality would be dust generated by earthworks during construction of the project. These impacts would be localised and managed by implementing mitigation measures.

Operation

Primary emissions from the project would be related to plumes from molten aluminium and the combustion of natural gas (NO₂, SO₂, CO, PM10 and VOCs). Principal sources of emissions would be the holding furnace and tilt furnace flues.

Air emissions weren modelled and the results indicate that:

- ▶ The maximum predicted 15-minute, 1-hour and 8-hour average incremental impacts of CO are predicted to be less than the OEH criteria at all nearby sensitive receptors.

- ▶ The maximum predicted 1-hour and annual average cumulative impacts of NO₂ are predicted to be less than the OEH assessment criteria at all nearby sensitive receptors.
- ▶ The incremental concentration levels of SO₂ at the most sensitive receptors are predicted to be significantly below the OEH criteria. The highest predicted 1-hour average incremental SO₂ concentration level was less than 2% of the criterion, while the 24-hour incremental concentration level was predicted to be 1% of the criterion.

TAC conducts SO₂ monitoring at a number of locations surrounding the smelter. Monitoring results indicated that the background SO₂ concentration levels are generally high and have exceeded the 1-hour and 24-hour average criteria on a number of occasions throughout 2009, 2010 and 2011. A cumulative impact assessment was undertaken for the project which indicated that, although the incremental impacts are very minor, there is potential for an additional exceedance of the 24-hour SO₂ criterion. There is not expected to be any additional exceedances of the 1-hour SO₂ criterion with the operations of the project.

The air quality assessment concluded that:

- ▶ Predicted results for concentration levels of VOCs suggest compliance of all VOC species over all averaging time periods.
- ▶ Predicted results show the maximum 24-hour average PM₁₀ incremental concentration levels to be approximately 11% of the OEH criteria. The maximum predicted GLCs of PM₁₀ indicate that the cumulative impact would comply with OEH criteria at all of the identified receptors over all time intervals.
- ▶ Predicted results for concentration levels of VOCs suggest compliance of all VOC species over all averaging time periods.
- ▶ Odorous emissions during construction and operation are expected to be negligible.
- ▶ In-stack concentration levels for each of the stacks indicate that the goals recommended in the Clean Air Regulation (2010) would be met.

Site water and ground water

The site is serviced by Hunter Water Corporation (HWC). There are no sewer provisions currently servicing the site. A site visit conducted on the 6 June 2011 confirmed that there are no water bodies, water courses or riparian vegetation on, or adjacent to, the site. Port Stephens Council Flood Prone Land Maps indicate that the site is not flood prone land.

The site is situated near the south western extent of the Quarternary unconsolidated sand deposit known as the Tomago Sandbeds. The Tomago Sandbeds is a shallow unconfined groundwater source that provides approximately 20% of the Lower Hunter's drinking water supply.

Construction

During construction, impacts on surface and groundwater would be associated with the potential for erosion and sedimentation to occur following disturbance of the ground surface. Chemical or fuel spills also have the potential to impact water quality if not appropriately managed. Deeper excavations such as the footings for the cooling tower may also need to be dewatered.

Controls would be implemented during construction to reduce the impact of the project on water quality. These measures would be detailed in the Spoil and Fill Management Plan (SFMP) that would form part of the Construction Environmental Management Plan (CEMP).

Operation

An integrated system would be implemented to manage surface water and wastewater generated during operation of the project. This would involve:

- ▶ Roofwater being collected and stored in two 100 kL tanks prior to being reused as process water in the manufacturing process. This would reduce the project's potable water demand.
- ▶ Surface water from hardstand areas being directed to gross pollutant traps, prior to being discharged to infiltration zones to enable the water to enter the groundwater system. The underground infiltration zones would minimise the surface water flows on the site. Should flows exceed the capacity of the infiltration zones, water would be discharged from the site via an existing culvert. This is consistent with the existing flow paths on the site.
- ▶ A package sewage treatment plant would be installed to treat wastewater from the site. This would have capacity to treat up to 4.5kL per day. The treated wastewater would be used for subsurface irrigation in accordance with the Environmental Guidelines for Use of Effluent by Irrigation (2003). The irrigation zone would be approximately 1,000m² and would contain grasses such as kikuyu that would utilise the nutrients in the treated wastewater to minimise the likelihood of the groundwater accumulating elevated concentrations of nutrients. The grasses would be harvested periodically to encourage growth. Using the treated effluent for irrigation would substitute for the use of potable water for landscaping requirements on the site.

Noise

Construction

A quantitative assessment of construction noise was undertaken in accordance with the Interim Construction Noise Guideline (DECCW 2009). The results of the assessment indicate that construction activities are anticipated to comply with the noise criteria for residential receivers in the vicinity of the site.

A construction noise management plan would be prepared as part of the construction environmental management plan to detail how construction impacts would be minimised and managed.

Operation

Operational noise levels have been modelled and are expected to comply with the project specific criteria calculated in accordance with the Industrial Noise Policy (EPA, 2000) at all nearby receivers under neutral and adverse weather conditions.

Assessments also indicate that traffic noise impacts at surrounding identified receivers would comply with criteria calculated in accordance with the Environmental Criteria for Road Traffic Noise (1999).

Biodiversity

The site has been substantially modified by previous industrial land uses and the majority of the site is exotic open grassland (2.76 ha) or hardstand (1.36 ha). One native vegetation type was identified within the study area and is described as Smooth Barked Apple Red Bloodwood shrubby open forest on the 'NSW Vegetation Types Database' (EPA, 2011). This vegetation coincides with the proposed haul road

that links the project with the Tomago Aluminium Smelter. Approximately 1.00 ha of this community occurs within the site.

By area the exotic open grassland is the largest land cover feature of the site and this coincides with previously disturbed industrial land use where disturbance levels are high. This land has been cleared for a considerable period with limited evidence of prior natural vegetation formations.

The majority of threatened plant species identified by the Wildlife Atlas Database (EPA, 2011), EPBC Act Protected Matters Search Tool (PMST) and BioBanking Assessment Tool (BAT) were targeted during surveys to identify whether they were present within the impact area. None of the threatened flora species or their habitats are found within native or non-native vegetation types described within the site. This finding is consistent with the results of extensive surveys within the same vegetation type and mapping conducted by Bell and Driscoll (2006) for the Tomago sand beds.

Targeted surveys for *Diuris praecox* were not completed as it was considered that there is no suitable habitat for this species within the site. Similarly, no targeted survey was completed for *Diuris arenaria*. This threatened species was, at the time of conducting surveys, identified as having a distribution restricted to the Tomaree Peninsular at least 18 km to the east of the site. Neither the literature review, habitat analysis or database searches (i.e. BAT database, literature review, Wildlife Atlas Database) identified suitable habitat. The project is not expected to impact these species due to the absence of suitable habitat. However, OEH has advised that the precautionary principle should be applied to these species on the basis of a new record for *Diuris arenaria* approximately 4km north of the site. A small corridor of land adjacent to the western boundary of the site is possible habitat for these species. Targeted searches would be undertaken during the flowering season for these species prior construction commencing on this portion of the site to confirm whether these species are present.

Habitat analysis identified suitable habitat for threatened fauna species within the naturally vegetated parts of the site. Three threatened fauna species, the New Holland Mouse (*Pseudomys novaehollandiae*), Eastern Freetail Bat (*Mormopterus norfolkensis*) and Grey-headed Flying Fox (*Pteropus poliocephalus*) were recorded within the study area during field surveys. The New Holland Mouse is listed as a vulnerable species under the EPBC Act but is not listed as threatened under the TSC Act. The Grey-headed Flying Fox is listed as a vulnerable species under both the EPBC and TSC Acts and the Eastern Freetail Bat is listed as a vulnerable species under the TSC Act.

Clearing native vegetation would be confined to Smooth-barked Apple Red Bloodwood shrubby open forest along the proposed haul road. The project is estimated to have a total direct impact on 0.68 ha of this vegetation type. Smooth Barked Apple Red Bloodwood shrubby open forest is not classified as a threatened ecological community listed under the TSC Act and/or EPBC Act. This vegetation type is not classified as overcleared for the Hunter Central Rivers CMA.

Impacts on other non-native vegetation/land cover features include:

- ▶ 1.20 ha of exotic closed grassland.
- ▶ 1.05 ha of hardstand.

There would be no direct impacts on residual native vegetation identified within the study area, including any natural or artificial watercourses. No areas of semi-permanent or permanent water are to be disturbed or removed by the project.

The haul road connecting the facility with the smelter is the only component of the project that would result in a direct impact on native vegetation and associated flora and fauna habitats. A review of the

biodiversity constraints resulted in the haul road being redesigned from a straight to curved road to minimise impacts on high value habitat for the New Holland Mouse.

The surface water and groundwater assessment considered the project's potential indirect impacts on ecosystems dependant on groundwater resources. The project has been designed to avoid impacts on the internationally important Hunter Estuary Wetlands Ramsar site and minimise impacts on SEPP 14 wetlands.

The project's direct and indirect impacts on State listed threatened biota likely to occur within the site and relevant Matters of National Environmental Significance (MNES) listed under the EPBC Act were considered. The indirect impacts arising from net change in groundwater is predicted to be restricted to native vegetation located near the site including vegetation classified as EECs. The impacts on this vegetation is considered minor (ie within the natural variation for these communities) (Bell and Driscoll, 2006) and as such the impacts are considered as negligible (ie no measurable biodiversity losses). The assessment concluded the project is unlikely to have a significant impact on threatened biota listed under the TSC Act or EPBC Act. A referral prepared under the EPBC Act was assessed by the DSEWPac (referral number 2011/6085) and it was decided that the project is not a controlled action under the EPBC Act.

A biodiversity offset is proposed to address the project's residual impacts on biodiversity. A Biodiversity Offsets Package would be prepared using the BioBanking Assessment Methodology and the Interim Offsetting Policy for Part 3A Projects. A total of 33 ecosystem credits would be required to achieve an in perpetuity conservation outcome for the 0.68 ha of native vegetation lost through the site development.

Soil and contamination

Geotechnical investigations indicate that subsurface conditions at the site comprised a thin layer of fill overlying upper and lower alluvial sand strata, with an interceding 0.55m to 0.9m thick layer of very soft to soft silt which was encountered across the majority of the site between 3.7m and 6.6m depth. Indurated sand (coffee rock) lenses and lenses of sand that have undergone partial induration were encountered in some locations.

Free groundwater was encountered at between 1.5m and 2.3m depth during test pit excavation and borehole drilling.

A Phase 2 contamination investigation was undertaken and analytical results revealed that concentrations of heavy metals were below the HIL "F" threshold which indicates that the site is suitable for industrial use. Concentrations of metals exceeding the maximum EILs or HIL "A" values were recorded in several locations from soil surface samples. The location of samples exceeding the EILs and HIL "A" corresponded with the location of surface soils of the former metal fabrication site (central and southern regions). It is likely that surface soil contamination is associated with the surface fill materials and previous site use.

TPH C₆-C₉, TPH C₁₀-C₃₅, BTEX, PAHs, OCP and PCB concentrations were reported below the nominated soil investigation levels for all samples analysed. No hydrocarbon impacts were identified in the vicinity of the former bunded oil storage area and field screening indicated a low potential for the occurrence of acid sulphate soils at the site.

Potential impacts associated with soils and contamination would primarily be related to excavation as part of earthworks to create a suitable building platform and construct footings. Impacts may expose contaminated soils and lead to erosion and sedimentation prior to the surface being stabilised. Potential

impacts would be managed by implementing the mitigation measures that would be detailed in a construction and operational environmental management plan.

Waste

Waste would be generated during both the construction and operation phases of the project. Construction waste is anticipated to consist of steel and timber off-cuts, masonry block waste, packaging (plastic, cardboard and timber pallets) and general building waste.

Operation waste would consist of:

- ▶ Approximately 400m² of non-hazardous/domestic waste per annum.
- ▶ Approximately 102,000 litres of waste emulsion oil per annum from the Rolling Mill and the Wire Drawing machine. This emulsion consists of between 15 -20% of oil mixed with water.
- ▶ Approximately 900 litres of waste machine oil per annum.
- ▶ Approximately 1,250 tonnes of dross per annum. Dross is a mass of solid impurities skimmed from the top of the molten aluminium in the furnaces and comprises approximately 35% aluminium.

A Waste Management Plan would be implemented that would detail measures to mitigate impacts associated with waste generated during construction and operation. All waste would be managed and disposed of in accordance with the requirements of the Waste Classification Guideline (DECC, 2008).

Traffic and transport

At maximum capacity, the project would involve two, 12 hour shifts comprising 42 employees each per shift with 35 administration staff for a total employment of approximately 119 persons. It is anticipated that no more than 70 employees would be on site at any one time.

The project is expected to result in a marginal increase in traffic flow along Tomago Road, McIntyre Road and School Drive during the weekday peak periods. The current intersection arrangements at the intersection of McIntyre Road with Tomago Road operates satisfactory under 2011 peak period conditions and has available capacity to accommodate both construction traffic and operational traffic generated from the project.

A large industrial subdivision known as the Redlake development has been approved in the vicinity of the site. The three stages of the Redlake development directly impacts on operation of Tomago Road during peak periods, and would increase traffic by between 27%-39% (Stage 1) and 172%-287% (Stage 3).

The intersection of McIntyre Road with Tomago Road is directly impacted by increases in traffic associated with all three stages of the Redlake development and results in the intersection performing unsatisfactorily and requires upgrading to a seagull intersection treatment) in Stage 1 and eventually traffic signals under Stage 3.

Stage 3 of the proposed Redlake development impacts on both the performance of the intersection at Tomago Road with School Drive and Tomago Road at McIntyre Road and requires upgrading of the intersection with School Drive to traffic signals and second through traffic lane in each direction on Tomago Road approaches to McIntyre Road).

Background traffic over the next 10 years has been estimated to increase by 2.7% per annum and is understood to be directly associated with the development of employment lands situated in close proximity to the airport and other Tomago Road industrial sites.

The assessment of the intersection of McIntyre Road and Tomago Road under 2021 traffic conditions with the delivery of Stage 1 Redlake development and the Midal development indicates that the intersection is required to be upgraded to either a roundabout or traffic signals.

The assessment of cumulative impacts in 2021 indicated that the upgrades to the intersections in the vicinity of the site that are required to accommodate traffic generated by the Redlake development would have the capacity to accommodate traffic generated by the Midal development without any additional upgrades.

The total of 82 spaces, including four visitor spaces and two disabled spaces would be provided to comply with RTA guidelines and Port Stephens DCP requirements. This is sufficient to accommodate the expected upper limit of 70 staff onsite at any one time.

Bushfire

The site is classified as bushfire prone land (Vegetation Category One), according to a Bush Fire Prone Land map certified by the Commissioner of the NSW Rural Fire Service for the Port Stephens LGA. Vegetation within and adjoining the site constitutes a potential bushfire threat, with adjoining lands also classified as bushfire prone or bushfire buffer.

A bushfire risk assessment was undertaken for the project. The assessment concluded that access construction standards and services are sufficient to minimise the bushfire threat to the project. Bushfire protection measures that would be implemented as part of the project, including asset protection zones and a vegetation management plan.

Hazards analysis

A preliminary risk screening of the project was undertaken for the project in accordance with the requirements of State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33). The methodology for the preliminary risk screening is outlined in the Department of Planning (1994) guideline *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*.

Preliminary screening revealed that the project is not considered potentially hazardous with respect to transportation screening. However, the project is considered potentially hazardous with respect to storage screening due to the quantity/inventory of aluminium dross (Class 4.3 dangerous goods) exceeding the screening threshold. Therefore a Preliminary Hazard Analysis (PHA) was prepared for the project.

The PHA concluded that the calculated risk of personal injury at the site boundary is well below the Hazardous Industry Planning Advisory Paper (HIPAP) criteria of industrial land use. There is a negligible risk of injury offsite.

The risk of property damage was calculated to be below the HIPAP criteria of adjacent industrial land use. There is also a negligible risk of property damage at neighbouring residential land use sites.

A number of risk management and mitigation measures would be implemented during construction and operation of the project to minimise these risks (refer to Section 16.5.3).

Greenhouse gas and climate change

Estimated annual Scope 1 and Scope 2 greenhouse gas emissions would be approximately 52, 000 t CO₂-e per annum. Scope 3 emissions attributed to production of molten aluminium at the Tomago

Aluminium Smelter would be 975, 000 CO₂-e per annum. The estimated Scope 1 and Scope 2 emissions would contribute 0.03% of the total annual greenhouse gas emissions for NSW.

The embodied energy of molten aluminium was estimated to contribute approximately 93%, or 950,000 t CO₂-e per annum, of total Scope 1, 2 and 3 emissions. The project is not likely to increase emissions at the aluminium smelter as there would be no change in production output from the smelter as a consequence of the project.

Energy consumption at the site was estimated to contribute 6% of total Scope 1, 2 and 3 emissions followed by product distribution (1%) and waste sent to landfill (<0.1%).

To reduce the amount of greenhouse gasses being released into the atmosphere, Midal would:

- ▶ Investigate opportunities to recover waste heat from furnaces.
- ▶ Investigate potential renewable energy opportunities for electrical equipment and lighting.
- ▶ Undertake a detailed energy study to investigate potential methods to achieve compliance with the Australian Government's Energy Efficiency Opportunities program.

Desktop studies indicate that the project may be vulnerable to threats posed by changing climatic conditions including bushfire and sea level rise. Mitigation measures would be implemented during the design of the project to minimise these risks.

Heritage

A heritage assessment was undertaken for the project by Insite heritage Consultants. A search of the Aboriginal Heritage Information Management System (AHIMS) found that there are nine sites within 20 square kilometres surrounding the site, however there are no known items or sites within the site. Field surveys were undertaken and local Indigenous groups were consulted which concluded that there is no evidence to suggest that there are items or sites of archaeological significance within the site.

The project would not impact on any items of non-Indigenous heritage significance.

Visual amenity

The site is located within an existing industrial estate adjacent to the Tomago Aluminium Smelter. There are no sensitive receivers in the surrounding area, such as residences, that have views of the site.

The project would involve constructing a number of industrial buildings, including two up to approximately 8m high. These buildings would be generally consistent with the scale and built form of the existing industrial buildings immediately adjacent to the west of the site and other buildings and development within the surrounding industrial area.

The buildings would be largely screened from views from the nearest residences by industrial buildings on adjacent sites and the existing small area of bushland to the south of the site. The main viewpoint to the project would be from vehicles approaching the site along the private road. It is considered that the project would have negligible impact on visual amenity within the locality.

Draft Statement of Commitments

The Environmental Assessment provides Midal's commitments for environmental mitigation, management and monitoring. The draft Statement of Commitments includes mitigation measures to reduce and avoid identified impacts and would be finalised following exhibition of the Environmental Assessment.

The next steps

Midal is seeking approval from the Minister for Planning and Infrastructure for the project. The next steps in the process are:

- ▶ Exhibit this Environmental Assessment is placed for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this period, written submissions on the Environmental Assessment are able to be provided to the DP&I.
- ▶ **Consideration of submissions** that are received by the Director-General of the Department of Planning and Infrastructure. Midal is then required to prepare and submit:
 - A Submissions Report, which responds to issues in the submissions, and/or further design development.
 - A Preferred Project Report, outlining any proposed changes to the project to minimise its environmental impacts (if necessary).
 - A revised Statement of Commitments.
- ▶ **Determination of the Environmental Assessment.** The Director-General of DP&I provides an assessment report on the Environmental Assessment to the Minister for Planning and Infrastructure, who then makes a decision on the project and, if approved, can issue Conditions of Approval.

Project justification and conclusions

The project is considered to be justified because:

- ▶ It is consistent with the objectives of the EP&A Act.
- ▶ It is consistent with the strategic directions of the Port Stephens Local Environmental Plan and Economic Development Plan.

The project would take advantage of an opportunity to add value to existing production at the Tomago Aluminium Smelter by sourcing molten aluminium to manufacture aluminium rods and conductors. This would reduce the volume of aluminium rods and conductors imported to Australia.

Key environmental issues have been progressively evaluated and assessed when developing the design and preparing the Environmental Assessment. This involved consultation with government agencies and stakeholders that would have a role in licencing or granting approvals for the project. The outcomes of consultation have also informed development of the Statement of Commitments that would be implemented to manage potential adverse impacts and enhance benefits during the construction and operational phases. The Statement of Commitments would reduce the duration, extent and severity of potential impacts.

While the project has the potential to result in some residual adverse impacts, these would be adequately managed by implementing the Statement of Commitments. On balance, the benefits of the project substantially outweigh adverse impacts. It is concluded that the project is unlikely to result in significant environmental impacts provided the draft Statement of Commitments are implemented.

1. Introduction

1.1 Overview

Midal Cables International (Midal) propose to construct an aluminium rod and conductor manufacturing facility on a 2.8ha parcel of land adjacent to the Tomago Aluminium Smelter at Tomago in the Port Stephens local government area (LGA). This is subsequently referred to as 'the project' for the purposes of this Environmental Assessment.

Midal has entered into a long term contract to purchase 50,000 tonnes per annum of molten aluminium from the Tomago Aluminium Company (TAC) smelter at Tomago. Midal would cast the molten aluminium into rods that are not currently manufactured in Australia. Approximately half the production would be processed into aluminium conductors that would be used for electricity transmission purposes and the other half would be formed into aluminium rod and exported. The project would add value to the smelter's existing output and reduce the volume of aluminium products imported into Australia.

The main elements of the project include:

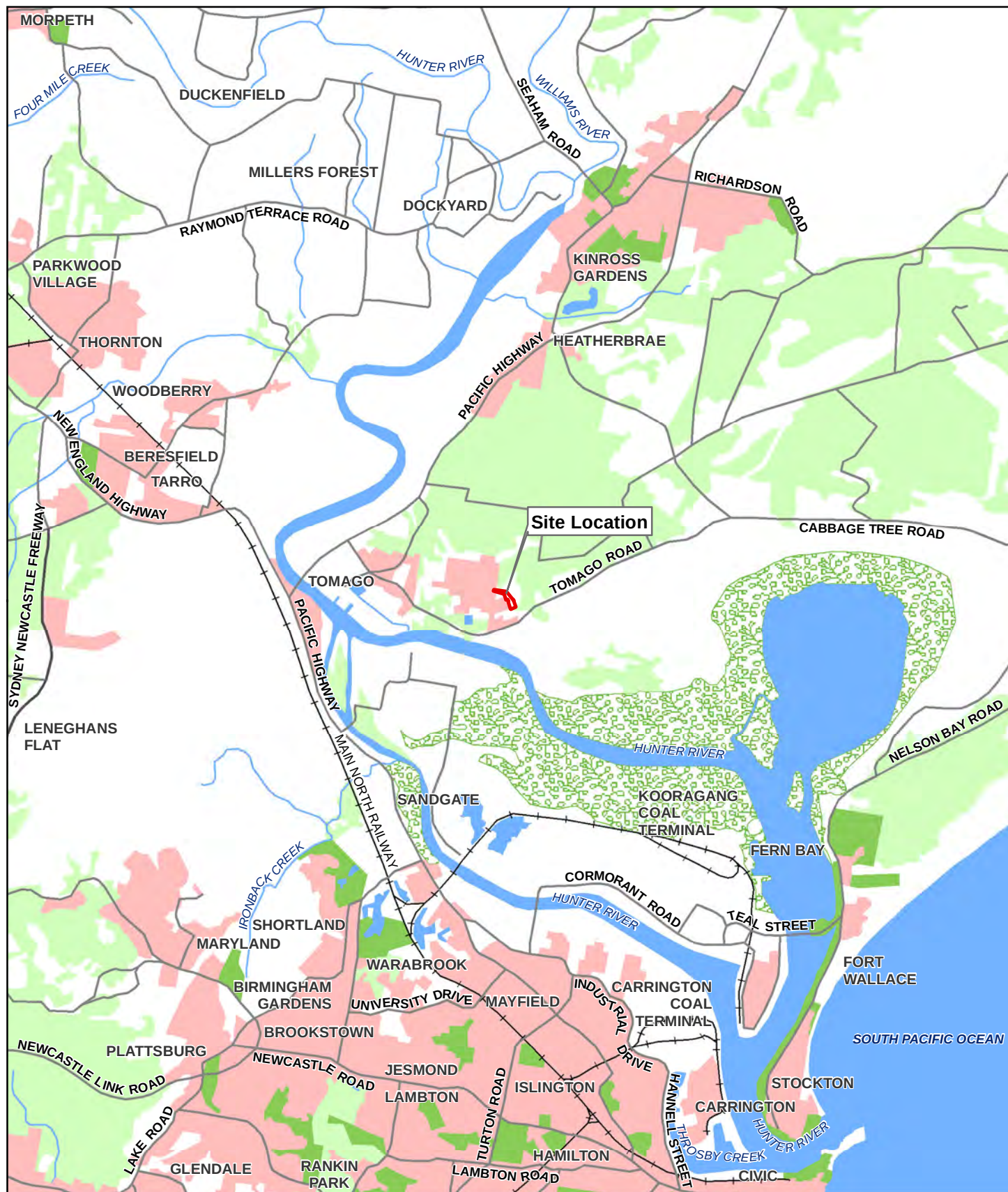
- ▶ A 150 m long dedicated haul road from the Tomago Aluminium Smelter to the project.
- ▶ Two buildings to accommodate the rod and conductor manufacturing processes and store finished products.
- ▶ Several smaller buildings providing workshop facilities and storage.
- ▶ Car parking.
- ▶ Infrastructure for efficient drainage, water reuse and sewage treatment.
- ▶ A range of infrastructure, services and utilities that is ancillary to the manufacturing process.

A description of the project is provided in Section 6.

1.2 Location of the project

The project would be located on industrial land within the Tomago Industrial Area approximately 6 km from the Port of Newcastle and immediately adjacent to the Tomago Smelter (Figure 1.1, Figure 1.2 and Figure 1.3). This land comprises all of Lot 5 and 6 in DP 270328 and a corridor of land to the north comprising part of Lot 301 DP 634536 and part of Lot 3232 DP 618103. This land is subsequently referred to as 'the site'.

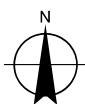
The site has been heavily modified by previous industrial land use and parts have been used for sand mining. It is characterised by cleared areas and remnant infrastructure from previous industrial use.



LEGEND

- | | | | |
|----------|------------------|------------------|-----------------|
| Freeway | Watercourse | Recreation Areas | Mangrove |
| Roads | Watercourse Area | Forestry Reserve | Forest Or Shrub |
| Railways | Built Up Areas | Extent of Works | |

1:100,000 (at A4)
0 375 750 1,500 2,250 3,000
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number 22-15280
Revision A
Date 12 OCT 2011

Regional Context Plan

Figure 1.1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

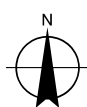
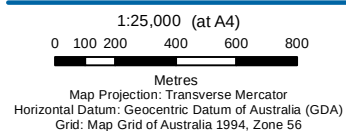
G:\22\15280\GIS\Maps\Deliverables\EA\2215280_EA_001_RegionalContext_20110713_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia. 250k Topographic Data Series 3 - 2006. Created by: fmacKay, tlmorton



LEGEND

Extent of Works



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number	22-15280
Revision	A
Date	12 OCT 2011

Local Context Plan

Figure 1.2

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\EA\2215280_EA_002_LocalContext_20110713_A.mxd

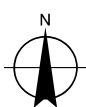
© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and NEARMAP make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and NEARMAP cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Nearmap: Imagery - 2011. Created by: fmackay, tmorton



LEGEND

- Proposed Car Park
- Proposed Building Footprint
- Proposed Haul Road
- Extent of Works
- Cadastre

1:2,500 (at A4)
 0 10 20 40 60 80
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia (GDA)
 Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
 Tomago Rod and Conductor Manufacturing Facility
 Environmental Assessment

Job Number	22-15280
Revision	A
Date	12 Oct 2011

Site Layout

Figure 1.3

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\EA\2215280_EA_01_3_SiteLayout_20110713_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and NEARMAP, LPMA make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and NEARMAP, LPMA cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
 Data Source: NearMap: PhotoMap - 2011; LPMA: DTDC - 2007. Created by: fmackay, tmorton, mbarnier

1.3 The proponent

Midal is an Australian registered company and forms part of the Midal Group of companies that is based in the Kingdom of Bahrain. Midal specialises in manufacturing and supplying aluminium and aluminium alloy rod, wires and conductors, aluminium clad steel, aluminium sections and tubes which are exported to a large number of countries including Australia. Midal uses only virgin molten metal sourced directly from smelters to manufacture their products.

1.4 The need for the project

The Tomago Aluminium Smelter currently produces 530,000 tonnes per year of aluminium product and has recently gained approval to increase production to 575,000 tonnes per year utilising the existing plant and infrastructure. Virtually all this production is exported and used to manufacture items such as conductors and aluminium shapes, some of which are then imported back into Australia.

The project is needed as it would take advantage of an opportunity to add value to existing production by the Tomago Aluminium Smelter. This would reduce the amount of material exported from Tomago by approximately 10% and substantially reduce the amount of finished aluminium conductors imported into Australia.

1.5 Overview of the approval process

This Environmental Assessment has been prepared by GHD on behalf of Midal. It accompanies a Major Project Application to the Department of Planning and Infrastructure (DP&I), for the project to be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Schedules 1 and 2 of the *State Environmental Planning Policy 2005 (Major Development)* identify the types of development that require approval under Part 3A. The project meets the definition of metal, mineral or extractive material processing included in Schedule 1, and is therefore a project to which Part 3A applies.

The Minister for Planning declared the project to be a major project on the 18 March 2010 and confirmed it is to be assessed under Part 3A of the EP&A Act due to the application of Section 75B(2) of that Act. The Environmental Assessment has been prepared to address requirements issued by the Director-General of the Department of Planning and Infrastructure on 12 April 2011. Although Part 3A was repealed on 1 October 2011, the project would continue to be assessed under Part 3A as it is a transitional Part 3A Project.

The project was referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 18 August 2011 to determine if the project was a controlled action. On the 29 September 2011 DSEWPaC decided that the project was not a controlled action requiring further assessment under the EPBC Act (referral number 2011/6085).

Further information on the assessment requirements for the project is provided in Chapter 2.

1.6 Structure of this Environmental Assessment

The Environmental Assessment is structured as follows:

Volume 1 – Environmental Assessment (main report)

The following chapters of this Environmental Assessment are structured as follows:

- **Chapter 2** outlines the statutory and strategic framework
- **Chapter 3** provides information on stakeholder consultation undertaken during preparation of the Environmental Assessment
- **Chapter 4** describes the site and surrounds
- **Chapter 5** describes the strategic planning drivers, the project need and alternatives considered
- **Chapter 6** describes the project, including plans of proposed building works, cable and conductor processes, and indicative construction activities
- **Chapter 7** outlines environmental risk analysis that was undertaken to identify key potential environmental issues
- **Chapters 8 – 19** assess the potential environmental impacts of the project in accordance with the Director-General's requirements
- **Chapters 20 - 22** conclude the Environmental Assessment by providing information on the management and mitigation measures and the draft Statement of Commitments to be implemented to minimise potential environmental impacts.
- Appendix A Director-General's requirements
- Appendix B Correspondence with government agencies
- Appendix C Air quality assessment
- Appendix D Site water and groundwater assessment
- Appendix E Noise assessment

Volume 2

Volume 2 contains:

- Appendix F Biodiversity assessment
- Appendix G Phase 2 contamination site assessment
- Appendix H Traffic and transport assessment
- Appendix I Bushfire constraints analysis
- Appendix J Preliminary hazard analysis
- Appendix K Greenhouse Gas and Climate Change assessment
- Appendix L Archaeological assessment

2. Statutory framework

This chapter outlines the legislative requirements that apply to the project and defines the environmental assessment process. It:

- Confirms the application of Part 3A of the EP&A Act and notes specific requirements.
- Considers other legislation and environmental planning instruments and identifies other approvals that may apply to the project.

2.1 Environmental Planning and Assessment Act 1979

The EP&A Act provides the statutory framework for planning approval and environmental assessment in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning and Infrastructure, statutory authorities and local councils.

The EP&A Act contains three schemes that impose requirements for planning approval:

- Part 3A provides for control of projects that require approval from the Minister for Planning and Infrastructure. Part 3A was repealed on 1 October 2011 however some projects would continue to be assessed under transitional arrangements for Part 3A projects.
- Part 4 provides for control of 'local development' that requires development consent from the local Council.
- Part 5 provides for control of 'activities' that do not require approval or development consent.

The need or otherwise for development consent is set out in environmental planning instruments – State Environmental Planning Policies (SEPPs), Regional Environmental Plans (REPs), or Local Environmental Plans (LEPs).

As indicated in Section 2.2.2, the project is subject to approval under Part 3A of the EP&A Act as it is a metal manufacturing works that has a capital investment value of over \$30 million and would employ over 100 people, therefore meeting the definition of a major project under Schedule 1 of State Environmental Planning Policy (SEPP) Major Development.

2.1.1 Environmental Planning and Assessment Act 1979 as amended

Amendments to the EP&A Act came into force on 1 October 2011 to repeal Part 3A of the EP&A Act. Schedule 6A of the EP&A Act as amended defines transitional arrangements to enable certain types of projects to continue to be assessed under Part 3A.

Clause 2 of Schedule 6A of the EP&A Act relates to transitional Part 3A projects and states that:

(1) For the purposes of this Schedule, the following are transitional Part 3A projects:

(a) an approved project (whether approved before or after the repeal of Part 3A),

(b) a project for which environmental assessment requirements were notified or adopted before the repeal of Part 3A,

(c) a project that is the subject of a Part 3A project application and that the regulations declare to be a transitional Part 3A project.

(2) However, a transitional Part 3A project does not include any of the following:

(a) a project that ceases to be a project to which Part 3A of this Act applies by the operation of State Environmental Planning Policy (Major Development) Amendment 2011,

(b) a project that ceases to be a project to which Part 3A of this Act applies by the operation of any other State environmental planning policy, of this Schedule or of a regulation under this Act.

The project is a transitional Part 3A project as environmental assessment requirements were issued on 12 April 2011, prior to the repeal of Part 3A on 1 October 2011.

2.1.2 Application of other provisions of the EP&A Act

Under Section 75R(3) of the EP&A Act, environmental planning instruments (other than State environmental planning policies) do not apply to or in respect of an approved project. Section 75J(3) states that the Minister may (but is not required to) take into account the provisions of any environmental planning instrument that would not (because of section 75R) apply to the project if approved. As such, it is at the Minister's discretion whether the provisions of the Port Stephens Local Environment Plan (LEP) 2000 are to be taken into account.

2.1.3 Approvals that do not apply

Section 75U(1) of the EP&A Act specifies certain authorisations which are not required for an approved project under Part 3A, namely:

- (a) the concurrence under Part 3 of the Coastal Protection Act 1979 of the Minister administering that Part of the Act,*
- (b) a permit under Section 201, 205 or 219 of the Fisheries Management Act 1994,*
- (c) an approval under Part 4, or an excavation permit under Section 139, of the Heritage Act 1977,*
- (d) an Aboriginal heritage impact permit under Section 90 of the National Parks and Wildlife Act 1974,*
- (e) an authorisation referred to in Section 12 of the Native Vegetation Act 2003 (or under any Act to be repealed by that Act) to clear native vegetation or State protected land,*
- (f) a permit under Part 3A of the Rivers and Foreshores Improvement Act 1948,*
- (g) a bush fire safety authority under Section 100B of the Rural Fires Act 1997,*
- (h) a water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the Water Management Act 2000.*

Section 75A defines 'approved project' as 'a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given'.

Consequently, these approvals would not be required if the Minister grants Project Approval to carry out the project under Part 3A.

2.1.4 Approvals to be applied consistently

Under Section 75V(1) of the EP&A Act, the following authorisations cannot be refused if necessary to carry out an 'approved project' and are to be substantially consistent with an approval to carry out the project given under Part 3A:

- (a) *An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997; and*
- (b) *an aquaculture permit under Section 144 of the Fisheries Management Act 1994,*
- (c) *an approval under Section 15 of the Mine Subsidence Compensation Act 1961,*
- (d) *a mining lease under the Mining Act 1992,*
- (e) *a production lease under the Petroleum (Onshore) Act 1991,*
- (f) *an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in Section 43 of that Act),*
- (g) *a consent under Section 138 of the Roads Act 1993,*
- (h) *a licence under the Pipelines Act 1967.*

2.1.5 Director-General's requirements

Under clause 75F of the EP&A Act, the Director-General of DP&I is required to prepare and issue the proponent with requirements for undertaking the environmental assessment. These identify key issues to be addressed and the level of assessment required.

The Director-General's requirements for the project were issued on 12th April 2011 (refer to Appendix A). Table 2-1 summarises the Director-General's requirements and refers to the section of the Environmental Assessment in which they are addressed.

Table 2-1 Summary of Director-General's requirements

Issues category	Requirement	Document reference
General requirements	Executive summary	Executive summary
	Detailed Description of:	
	<i>Historical operations/activities</i>	Section 4.3
	<i>Existing and approved operations/facilities</i>	Chapter 4
	Detailed description of the project:	
	<i>Need for the project</i>	Section 5.3
	<i>Proposed modifications or upgrades to activities or infrastructure</i>	Chapter 6
	<i>Alternatives considered</i>	Section 5.4
	<i>Components and stages of the project</i>	Section 6.3
	<i>Interactions between existing and proposed operations and other land uses in the vicinity of the site</i>	Section 6.3
	<i>Plans of proposed building works</i>	Section 6.1

Issues category	Requirement	Document reference
	Risk assessment of potential environmental impacts	Chapter 7
	Detailed assessment of key issues:	
	A statement of commitments	Chapter 21
	A conclusion justifying the project	Chapter 22
	A signed statement from the author	Certification by the author
Key issues	Air quality and odour	Chapter 8
	Impacts from construction and operation, particularly in relation to odour, fugitive dust and sulphur dioxide	Sections 8.4.1 and 8.4.2
	Detail of mitigation measures	Section 8.5
	Cumulative impacts	Section 8.4.2
	Soil and Water	Chapters 9 and 12
	Detail of the proposed water requirements and sources	Section 9.2.1
	Assessment of potential soil, surface and groundwater impacts	Sections 9.2 and 12.2
	Assessment of potential soil contamination	Section 12.2
	Mitigation to prevent leakage of fuel and/or other chemicals	Section 12.3
	Erosion and sediment controls	Sections 9.3.1 and 12.3.1
	Water requirements, sources, usage and efficiency, wastewater management, stormwater management, spill containment and bunding.	Chapter 9
	Noise and vibration	Chapter 10
	Construction, operation and traffic noise	Section 10.4
	Flora and fauna	Chapter 11
	Measures to avoid impacts	Section 11.5
	Details of proposed vegetation to be cleared	Section 11.5.1
	Impacts on threatened species and ecological communities	Section 11.5.3
	Justification of the proposed layout and access and consideration of alternatives	Section 11.6
	Measures to minimise impacts	Section 11.6.1

Issues category	Requirement	Document reference
	Details of conservation areas.	Section 11.6.3
	Waste	Chapter 13
	Details of onsite sewage, effluent and waste treatment	Section 9.2.3
	Detail the sources of waste	Section 13.2
	Proposed wastewater management regime	Section 9.2.3
	Traffic	Chapter 14
	Traffic types and volume likely to be generated	Section 14.2
	Predicted impacts on road safety and capacity	Section 14.2
	Assessment of offsite infrastructure works	Section 14.2.2
	Hazards and risks	Chapter 15 and 16
	Potential hazards and risks associated with the project and adjacent industries	Sections 16.2 and 16.3
	Assessment of bushfire risk	Section 15.3
	Greenhouse gas and energy efficiency	Chapter 17
	Assessment of potential greenhouse gas emissions	Section 17.3.1
	Detailed description of mitigation measures	Section 17.4
Other issues	Heritage	Chapter 18
	Visual amenity	Chapter 19
Consultation	Consultation with nominated agencies, stakeholders and the community	Chapter 3

Exhibition of the Environmental Assessment

This Environmental Assessment is placed on public exhibition for a minimum period of 30 days in accordance with the requirements of the EP&A Act. During this period, the written submissions on the Environmental Assessment are able to be provided to DP&I. These submissions must be addressed to:

Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

The Department may request Midal to respond to issues raised in the submissions. Midal may modify the project and the draft Statement of Commitments to minimise impacts on the environment if required.

If the project or Statement of Commitments are modified in response to issues raised in submissions, a preferred project report would be prepared to describe the scope of the revised project. The Director-General would make this report public.

Assessment and determination

Following the exhibition period the Department would, on behalf of the Minister, review the environmental assessment, any preferred project report, and submissions received. Once the Department has completed its assessment, a draft assessment report would be prepared for the Director-General. This report may include conditions of approval.

If the project attracts fewer than 25 submissions and Council does not object, it would be determined by the Department of Planning and Infrastructure. Otherwise, it would be determined by the Planning and Assessment Commission (PAC).

The PAC's determination and the Director-General's report would be published on the Department of Planning and Infrastructure's website immediately following determination.

2.2 Permissibility of the project

2.2.1 Port Stephens Local Environmental Plan 2000

The site is located entirely within the Port Stephens Local Government Area (LGA), and therefore the Port Stephens Local Environmental Plan 2000 (PSLEP 2000) is the relevant local environmental planning instrument. As indicated in Section 2.1, as the project is subject to approval under Part 3A of the EP&A Act, it is at the Minister's discretion whether the provisions of the Port Stephens Local Environment Plan (LEP) 2000 are to be taken into account.

Subject to Clause 5 of SEPP Major Development, any inconsistencies between SEPP Major Development and another environmental planning instrument, SEPP Major Development prevails.

Permissibility

The site is zoned 4(a) Industrial – General under the PSLEP 2000. The objectives of this zone are:

- (a) to enable the development of a wide range of industrial, service and storage activities and a limited range of business and retail activities.*
- (b) to allow industrial development only after comprehensive hazard analysis and risk assessment provide adequate safeguards designed to protect the surrounding environment and ecological balance.*
- (c) to regulate industries in proximity to urban localities and to ensure that adequate buffers are provided in the vicinity of adjacent zones, so that activities near the boundary of an adjacent zone will not have a significant detrimental effect on the amenity of that zone, and*
- (d) to enable the most efficient and effective industrial development of waterfront industrial land by encouraging associated waterfront land uses sympathetic to the environment and ecology of the waterfront lands.*

(e) to allow commercial, retail, residential, or other development only where it is associated with, ancillary to, or supportive of, industrial development.

(f) to limit development for the purpose of bulky goods salesrooms or showrooms.

(g) to encourage a high standard of design and amenity in industrial areas.

The project is consistent with the objectives of the PSLEP 2000.

Permissibility of development on land zoned 4(a) Industrial – General is outlined in clause 23 of the PSLEP. Item 4 indicates that development ‘permissible with consent’ is any development not listed in Item 3 or 5. Item 3 applies to exempt development while Item 5 applies to ‘prohibited development’.

The project does not meet the definition of ‘exempt development’ in Item 3 or ‘prohibited development’ in Item 5 and is therefore permissible with Council consent. Section 2.2.2 reflects that SEPP Major Development prevails over the PSLEP and the consent authority is the Minister. As such, Council’s consent is not required.

Clause 51A Development on land identified on Acid Sulfate Soils Planning Map

Clause 51A applies to all land identified on the Acid Sulfate Soils Planning Map and classified as either 1, 2, 3, 4 or 5 land and requires that Council’s consent must be obtained to carry out certain types of works.

The acid sulphate soil planning map prepared by Port Stephens Council and the Department of Lands (2007) shows the site as class 4 land. Under clause 51A of the PSLEP, development that involves works more than two metres below the natural ground surface or works that are likely to lower the watertable to a depth of more than two metres below the natural ground surface require Council’s consent.

The project would require excavation in excess of two metres below the natural ground surface to enable footings to be constructed. As indicated above, Council’s consent is not required for the project as it requires approval under Part 3A of the EP&A Act.

Section 12 indicates that geotechnical investigations undertaken on the site indicated a low likelihood of acid sulphate soils being present on site. If acid sulphate soils are encountered, mitigation measures would be implemented to manage potential impacts.

2.2.2 State Environmental Planning Policy (Major Development) 2005

The Major Development SEPP identifies development to which the development assessment and approval process under Part 3A of the EP&A Act apply. Schedule 1 of SEPP Major Development outlines ‘classes of development’ which trigger assessment under Part 3A of the EP&A Act, for which the Minister is the consent authority. Clause 9a of Schedule 1 relates to metal, mineral or extractive material processing and enables development that meets the following definition to be assessed under Part 3A of the EP&A Act:

Development that has a capital investment value of more than \$30 million or employs 100 or more people for any of the following purposes:

(a) metal or mineral refining or smelting; metal founding, rolling, drawing, extruding, coating, fabricating or manufacturing works; metal or mineral recycling or recovery,

The project is subject to assessment under Part 3A of the EP&A Act as it would be a metal manufacturing works that would employ 161 people and have an estimated capital investment of \$40 million. The project therefore meets the criteria of Schedule 1, clause 9a of SEPP Major Development.

2.2.3 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) requires the consent authority to consider whether an industrial proposal is a 'potentially hazardous industry' or a 'potentially offensive industry'. A hazard assessment is completed for potentially hazardous developments to assist the consent authority to determine acceptability. Applying SEPP 33 (Department of Planning, July 2008), provides guidance on how SEPP 33 is to be applied and circumstances in which a project should be considered to be 'potentially hazardous industry' or a 'potentially offensive industry'.

Applying SEPP 33 states that 'potentially hazardous industries' are those which pose a physical risk, such as explosive or fire. The project does not pose any physical risk such as explosion or fire and is therefore not considered a 'hazardous industry'.

Applying SEPP 33 indicates that any project which requires a 'licence under any pollution control legislation' should be considered 'potentially offensive' within the meaning of SEPP 33. As discussed in Section 2.3.1, the project would require an environment protection licence (EPL) under the *Protection of the Environment Operations Act 1997* (POEO Act), and should therefore be considered 'potentially offensive'. However, the guideline indicates that if the assessment can demonstrate that the offence can be controlled to a level that is not significant and if an EPL would be issued, then the industry would not be considered offensive.

The Environmental Assessment assesses environmental impacts and identifies mitigation and management measures to be implemented during the construction and operation of the project. A Preliminary Hazard Assessment (PHA) has been completed that demonstrates that the project can operate within acceptable pollution and safety criteria and is therefore not considered a hazardous or offensive industry as defined by SEPP 33.

2.2.4 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 (Koala Habitat Protection) (SEPP 44) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas. SEPP 44 applies to the extent that in any local government area which is listed in the SEPP, the relevant council is restricted from granting development consent for proposals on land identified as core Koala habitat without a plan of management being prepared. The Port Stephens local government area is included in Schedule 1 of the SEPP and therefore SEPP 44 is relevant to the project.

According to SEPP 44, it is necessary to determine whether a site subject to a proposal is considered 'potential Koala habitat'. The ecological assessment included in Appendix F considered the potential for koala habitat to be impacted by the project.

The site is located in the Tomago sand beds Koala Management Unit (PSC 2002). Coastal Sand Apple Blackbutt Forest is regarded to be supplementary habitat for the Koala under this plan. This vegetation community is present on the site and features a number of small (to 15 m tall) *Angophora costata* trees which are identified by the Port Stephens Comprehensive Koala Plan of Management (CKPoM) as important feed trees for Koalas in the Port Stephens area (PSC 2002). However, there was no evidence that Koalas were actively using the site as foraging habitat.

The ecological assessment undertaken for the project concludes that the Smooth-barked Apples on the site are unlikely to provide habitat of local importance for the Koala (refer to Chapter 11). Section 8.2 of Appendix F outlines how the project has addressed the performance criteria detailed in the CKPoM. The site does not provide any connectivity between patches of preferred or supplementary habitat located south or west of the site (ie habitat severance by proximal industrial development and man proof fencing).

2.2.5 State Environmental Planning Policy No. 55 –Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) applies to the whole of NSW and provides a state-wide planning approach to the remediation of contaminated land.

Clause 7 of SEPP 55 states that:

A consent authority must not consent to the carrying out of any development on land unless:

(a) It has considered whether the land is contaminated.

(b) If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out.

(c) If the land required remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose.

A Phase 2 Contaminated Site Assessment has been completed and is included in Appendix G. A review of historical data indicates that the site was part of a larger farming property which has been subdivided a number of times. Title deeds acquired from 1878 to present suggest that the site was largely used for farming purposes between 1878 and 1968 and for industrial uses from the 1970s to present.

The Section 149 certificates for Lot 5 and Lot 6 DP 270328 indicate that Port Stephens Council is aware of potential site contamination that may restrict development on the land. Site inspections carried out during the assessment indicated that it was likely that contaminated soil could be present on the site in areas previously used for sand blasting or welding and also in areas adjacent to, or down gradient from areas used to store fuels and oil. Soil samples from 17 locations were collected and tested and the results indicate that all concentrations of heavy metals were below the ecological investigation levels (EIL) 'F' threshold and accordingly the site is suitable for industrial use.

2.3 Consideration of other legislation

2.3.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes the NSW environmental regulatory framework, and includes licensing requirements for certain activities.

Environment protection licences (EPL) are a central means to control the impacts of pollution in NSW. They aim to reduce risks to human health and prevent the degradation of the environment by using mechanisms that promote:

- ▀ Pollution prevention and cleaner production.
- ▀ The reduction to harmless levels of the discharge of substances likely to cause harm to the environment.

- ▶ The reduction in the use of materials and the re-use or recycling of materials.
- ▶ The making of progressive environmental improvements, including the reduction of pollution at source.
- ▶ The monitoring and reporting of environmental quality on a regular basis.

The POEO Act lists activities that require an EPL (under Schedule 1 of the POEO Act). Item 26 of Schedule 1, refers to Metallurgical Activities being:

'Metal processing, meaning the processing of metals by heating, rolling, melting or casting metal'

Any activity involving aluminium production which has the capacity to process more than 10,000 tonnes of alumina per year would require a licence.

The project would process approximately 50,000 tonnes of aluminium per year and is therefore a scheduled activity requiring a licence under the POEO Act. As indicated in Section 2.1.2, an EPL cannot be refused for a project approved under Part 3A of the EP&A Act.

2.3.2 Roads Act 1993

The *Roads Act 1993* is administered by the NSW Roads and Maritime Services (RMS) (formerly the Roads and Traffic Authority - RTA), councils or the Department of Lands. The RMS has jurisdiction over major roads, councils over minor roads and the Department of Lands over road reserves or Crown roads.

Under Section 138, Part 9, Division 3 of the *Roads Act 1993*, a person must not impact or carry out work on or over a public road other than with the consent of the appropriate roads authority. No works are planning to be carried out on public roads as part of the project.

2.3.3 Threatened Species Conservation Act 1995

The NSW Office of Environment and Heritage (OEH) is responsible for administering the *Threatened Species Conservation Act 1995* (TSC Act). The TSC Act requires that significance assessments be completed for all endangered ecological communities, threatened populations and species listed under the TSC Act that would be directly or indirectly affected by the project.

An ecological assessment was undertaken for the project which is included in Appendix F and summarised in Chapter 11. The assessment concluded that the project is unlikely to have a significant negative effect on any species, communities or populations listed under the TSC Act.

2.3.4 Water Management Act 2000

The *Water Management Act 2000* is administered by NOW. The project involves a range of activities that meet the definition of activities requiring approval under the *Water Management Act 2000*, including:

- ▶ Water use approval – Section 89 of the *Water Management Act 2000*;
- ▶ Water management work approval – Section 90 of the *Water Management Act 2000*; and
- ▶ Controlled activity approval – Section 91 of the *Water Management Act 2000*.

As the project is subject to Part 3A of the EP&A Act, Section 75U(1) applies and these approvals are not required.

2.3.5 Water Act 1912

The project may involve dewatering deeper excavations such as those required for the cooling tower. A licence for this activity may be required under the *Water Act 1912*. The need to obtain a licence for dewatering would be determined in consultation with NOW during the detailed design phase.

2.3.6 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities and heritage items.

The approval of the Commonwealth Minister of Sustainability, Environment, Water, Population and Communities (SEWPaC) is required for:

- ▶ An action which has, would have or is likely to have a significant impact on 'matters of National Environmental Significance' (NES matters). NES matters include:
 - The world heritage values of a declared World Heritage property.
 - The National Heritage values of a listed National Heritage place.
 - The ecological character of a declared Ramsar wetland.
 - Listed threatened species and ecological communities.
 - Listed migratory species.
 - The Commonwealth marine environment.
 - The Great Barrier Reef Marine Park.
 - Nuclear actions.
- ▶ An action by the Commonwealth or a Commonwealth agency which has, would have or is likely to have a significant impact on the environment;
- ▶ An action on Commonwealth land which has, would have or is likely to have a significant impact on the environment.
- ▶ An action which has, would have or is likely to have a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

There is no Commonwealth land affected by the project.

The project would not impact on any World Heritage Areas, National Heritage Places, Commonwealth marine areas or the Great Barrier Reef Marine Park. The project would not involve any nuclear actions.

There is one Ramsar site (the Hunter Estuary wetlands) within the locality of the site (DSEWPaC 2011). The Ramsar site comprises the Kooragang Nature Reserve which is located in the estuary of the Hunter River, and Shortland Wetlands which are located in the Ironbark Creek Catchment in the suburb of Shortland, 2.5 km south of Kooragang Nature Reserve. The boundary of the Kooragang Nature Reserve Ramsar site is over 1 km south of the site. Ecological investigations, summarised in Chapter 11, indicated that there would be no direct impacts on Ramsar sites from the project.

The potential impact on threatened species and ecological communities listed under the EPBC Act has been considered in the flora and fauna assessment provided at Appendix F and summarised in Chapter 11. The project has the potential to impact on the New Holland Mouse which is listed under the EPBC

Act and was recorded on the site during investigations undertaken for the project. The assessment concludes that the project is unlikely to result in 'a significant effect' on any MNES.

On 22 August 2011, a referral was submitted to the DSEWPC to determine whether the project is a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 29 September 2011, DSEWPC decided that the project is not a controlled action requiring approval under the EPBC Act (referral number 2011/6085) on 29 September 2011.

2.4 Port Stephens Development Control Plan 2007

As the project is being assessed under Part 3A of the EP&A Act, The Port Stephens Development Control Plan (DCP) does not apply to the project. Relevant aspects of the DCP have been addressed when developing the concept design and further consideration would be given to these aspects as the project is refined during the detailed design phase. This would include finalising details relating to:

- Car parking areas
- Buildings, including materials and finishes
- Sewage treatment plant and associated subsurface irrigation system
- Waste management
- Landscaping plan

Table 2-2 Application of relevant provisions of the Port Stephens DCP 2007

Clause	Requirement	Application to the project
Environmental character		
B2.C1	Development must be designed, constructed, operated and maintained so as to prevent or mitigate the effect of any polluting emission.	Chapters 8 to 21 outline the measures that would be implemented to ensure the project is designed, constructed and operated to minimise pollution.
B2.C2	Development must meet the objectives, and comply with the provisions, of relevant legislation.	Section 2.3 discusses legislation that is relevant to the project
Water Quality Management		
B2.3	Development must comply with the provisions of Council's Urban Stormwater and Rural Water Quality Management Plan.	Section 6.3.7 describes the integrated water management system that would be implemented and Chapter 9 assesses the impacts of this system.
Acid Sulphate Soils		
B2.4	Development applicants should refer to Port Stephens Local Environmental Plan 2000 section 51A - Development of Land Identified on Acid Sulfate Soils for relevant development standards.	As indicated in Section 2.2.1, acid sulphate soil mapping indicates that the site is class 4 land. Council's consent is not required as the project is subject to approval under Part 3A of the EP&A Act.
Vegetation Management		
B2.C14	Clearing must not be carried out as an activity in itself for an unspecified end-use. Clearing must only be considered where it is necessary to enable a land use permitted on the land.	The project is consistent with this control as clearing would only be undertaken to enable a permitted use to be developed at the site.

Clause	Requirement	Application to the project*
B2.C15	Development must provide filter and protection strips to natural drainage lines, watercourses, streams, foreshores of constructed drainage corridors, riparian habitat strips and exclusion zones for preserving vulnerable and/or significant remnant vegetation and species.	There are no natural drainage lines or water courses at the site.
B2.C16	Development near watercourses must provide riparian buffer of up to 40m.	The site is not within 40m of a watercourse.
B2.C17	Council may require a Vegetation Management Plan (VMP) prepared by a suitably qualified person, for proposals to clear land and or remove tree(s). A VMP must include analysis of impacts on vegetation, strategies for preservation, protection and restoration of vegetation and a proposal for the management and monitoring of vegetation over the long term.	A vegetation management plan is not proposed as the area of vegetation to be cleared has been minimised by project design and the site has been substantially modified by previous industrial land use.
B2.C18	Development must contain nutrient and sediment flows and minimise weed dispersal in non-urban zones or on sites adjoining remnant bushland or semi-natural open spaces using permanent mitigation measures (such as bund walls, catch drains, swales and settling ponds).	Chapter 9 reflects that an integrated water management strategy would be implemented to control runoff from impervious surfaces. Chapter 12 reflects that the potential for erosion and sedimentation would be managed by implementing control measures generally in accordance with Managing Urban Stormwater, Soils and Construction (Landcom 2004).
B2.C19	The proposed means of clearing must be appropriate to soil type, species of understorey or tree to be retained. Details must be provided with the development application.	Vegetation would be cleared from the construction zone. The final detailed of the equipment to be used to clear the vegetation would be confirmed by the contractor undertaking the works.
B2.C20	Erosion and sediment controls during and after construction should have minimal impact on watercourses and remnant bushland.	Chapter 12 reflects that the potential for erosion and sedimentation would be managed by implementing control measures generally in accordance with Managing Urban Stormwater, Soils and Construction (Landcom 2004).
B2.C21	Development should reuse cleared material wherever possible.	Where practicable, cleared material would be reused in site landscaping. If it is unable to be reused, it would be disposed of in accordance with the DECC Waste Classification Guidelines.
B2.C22	Development must avoid erosion and sediment controls and use of exotic grass species in conservation zones along or near watercourses and in remnant bushland.	The site does not contain any conservation zones or watercourses.
B2.C23	Development must provide buffer zones as screening to roads or for the protection of identified core habitats, koala habitat buffer area and Endangered Ecological Communities.	As the site does not contain any core koala habitat or EECs, buffer zones are not proposed.
B2.C24	The proposed means of any clearing works must minimise soil disturbance and compaction and damage to species to be retained.	Clearing would be restricted to a defined area and fencing would be used to separate the construction zone from vegetation that is to be retained.
B2.C25	Development must provide temporary tree/vegetation protection measures prior to any clearing works.	Tree protection measures are not proposed as clearing would be restricted to the construction zone.
B2.C26	All millable timber must be retrieved. Waste vegetation must be recycled as chip, tub grindings or mulch. The use of woodchip, topsoil and tub grindings for on site mulching or seedbank regeneration is preferred.	The site does not contain any millable timber. Where practicable, waste vegetation would be reused in site landscaping.

Clause	Requirement	Application to the project*
B2.C27	Development must provide full time supervision of clearing works to protect environmental values.	A Construction Environmental Management Plan (CEMP) would be prepared that would detail measures to be implemented to monitor construction.
B2.C28	Development must include rehabilitation or revegetation works for any areas adversely affected by clearing or construction works.	Disturbed areas would be rehabilitated following completion of construction.
B2.C29	Development must include effective measures to mitigate any potential adverse impacts from soil erosion, siltation of watercourses, and alteration to drainage patterns, the spread of weeds, rubbish dumping and incursion by domestic or feral animals.	Chapter 9 reflects that an integrated water management strategy would be implemented to control runoff from impervious surfaces. Chapter 12 reflects that the potential for erosion and sedimentation would be managed by implementing control measures generally in accordance with Managing Urban Stormwater, Soils and Construction (Landcom 2004).
B2.C30	A separate approval for vegetation clearance may be required from the Catchment Management Authority (CMA) in accordance with the <i>Native Vegetation Act 2003</i> . The applicant should consult with the CMA prior to lodging an application with Council.	The project does not require approval under Section 12 of the <i>Native Vegetation Act 2003</i> as it is subject to approval under Part 3A of the EP&A Act.
B2.C31	An application for clearing should include a copy of any draft or final Property Vegetation Plan prepared in accordance with the requirements of the <i>Native Vegetation Act 2003</i> .	The project application is not for clearing. The clearing is ancillary to development of the site.
B2.C32	Clearing for the purposes of a development must be selective and minimized through the siting of any structures.	Section 11.3 reflects that the project has been designed to minimise the area of vegetation that would be cleared. This has resulted in the alignment of the haul road being revised.
B2.C33	Clearing for required Asset Protection Zones must be demonstrated on a plan, showing all trees to be removed and retained. The development shall retain as many shrubs and trees as possible in the Asset Protection Zone, while still achieving bushfire outcome.	No clearing is required for Asset Protection Zones (APZ). The APZ would be within areas cleared to enable construction of handstand areas and other ancillary infrastructure (refer to Chapter 15).
Tree Management		
B2.C45	Tree removal must be in accordance with the provisions of the Port Stephens Tree Preservation Policy (1998).	Trees would be removed from within the construction zone.
B2.C46	Tree and vegetation removal must comply with the provisions of the Native Vegetation Act (2003).	The project does not require approval under Section 12 of the <i>Native Vegetation Act 2003</i> as it is subject to approval under Part 3A of the EP&A Act.
B2.C47	An Arborist's Report prepared by a suitably qualified Consulting Arborist and/or ecologist must be provided when development includes: ▶ The removal of trees for the construction of Asset Protection Zones. ▶ The removal or retention of tree(s) on development sites. ▶ The reassessment of tree removal as part of the Tree Preservation Order.	An arborist report has not been prepared. Impacts associated with removing trees within the construction zone are assessed in Appendix F.

Clause	Requirement	Application to the project*
B2.C48	Arborist's Report must provide: ▶ A tree assessment including site plan with all trees numbered, drawn to scale and identified by canopy width, trunk diameter at breast height number, scientific name, common name, Safe Useful Life Expectancy (SULE) values, age class and natural and cultural significance. ▶ Assessment of impact of development works on existing trees, including excavations, level changes, imported materials, groundwater changes ▶ Options for tree retention and recommendations for development, including tree protection zones and structures, modifications to building, drainage or fencing design, site management during construction, and necessary tree works (such as pruning, mulching, irrigation).	An arborist report has not been prepared. Impacts associated with removing trees within the construction zone are assessed in Appendix F.
B2.C49	The Arborist's Report must conform to the International Society of Arboriculture Hazard Assessment Form and be accompanied by supporting photographs.	An arborist report has not been prepared. Impacts associated with removing trees within the construction zone are assessed in Appendix F.
Waste Water		
B2.C55	The development of land for residential, retail, commercial or industrial use based on an effluent pump-out system (tanker removal) will not be permitted. The installation of effluent pump-out systems will only be permitted by Council where: ▶ An existing dwelling/building is operating a system of sewage management with on-site disposal that has been determined by Council staff to be no longer functioning in a manner considered appropriate due to environmental and/or health related concerns; or ▶ An existing undeveloped allotment is less than 4000 square metres in size and it has been determined by Council staff that the on-site disposal of effluent is not achievable and/or does not meet the appropriate standards or guidelines.	An onsite sewage management system would be installed that includes a package treatment plant and associated infiltration system (refer to Section 6.3.7).
B2.C57	The fundamental design of all on-site sewage management systems must represent best practise management for both the treatment and disposal of the effluent. Site-specific constraints that have the potential to impact on the environment or public health must be accounted for in the capability of the treatment system and the design of the land application area. Council may refuse to permit development where it is determined that environmental impacts and/or health related risks are considered too great.	The onsite sewage management system is described in Section 6.3.7 and has been designed to minimise environmental impacts.

Clause	Requirement	Application to the project*
B2.C58	The design of the system of sewage management (including land application area or disposal drain) must meet the requirements of: - Port Stephens Council (draft) Technical Specification – Effluent Management for Un-sewered Development. - Australian Standard AS1547:2000 – On-site Domestic Wastewater Management. - Environment and Health Protection Guidelines – On-site sewage management for single households. - Standard Designs for On-site Wastewater Management Systems in Tilligerry Creek, Whitehead and Associates, October 2005. - Environmental Guideline – Use of Effluent by Irrigation, Department of Environment and Conservation (Non-domestic situations only).	The onsite sewage management system is described in Section 6.3.7. The treatment plant would exceed the performance standards of the Port Stephens Council (draft) Technical Specification – Effluent Management for Un-sewered Development. The irrigation scheme has been designed to meet the intent of Environmental Guideline – Use of Effluent by Irrigation, Department of Environment and Conservation.
B2.C59	The location of the on-site sewage management land application area must comply with prescribed buffer distances as detailed in the document "Environment and Health Protection Guidelines – On-site sewage management for single households". The prescribed buffer distances may be varied should it be determined appropriate to do so by Council staff.	The design meets all the recommended buffer distances except for the distance to drains and driveways. The buffer distances meet the Port Stephens Council "Standard Design for On-Site Wastewater Management Systems" by providing an advanced secondary treatment system with raised subsurface irrigation. Advanced secondary treatment system with raised subsurface irrigation were not considered in the 1998 "Environment and Health Protection Guidelines - On-site sewage management for single households".
B2.C60	The construction of a system of sewerage management (including land application area) is not permitted within a coastal wetland classified under State Environmental Planning Policy 14 (SEPP14).	The site is not within a SEPP 14 wetland.
B2.C61	The construction of a system of sewerage management on allotments permissible for development within a potable water catchment or special area of the Hunter Water Corporation (as defined under Hunter Water Act, 1991) will be subject to stringent minimum design requirements determined by Council.	The site is not located within a potable water catchment.
B2.C62	Where a system of sewage management producing secondary treated, disinfected effluent (or equivalent or better) has been installed, the design of the land application area must be based on the sub-surface irrigation of the treated effluent. Proprietary available sub-surface irrigation pipework and associated hardware/fittings must be of a type specifically designed for use with treated wastewater. The surface (spray) irrigation of secondary treated and disinfected effluent will only be considered in specific circumstances as detailed in Port Stephens Council (draft) Technical Specification – Effluent Management for Un-sewered Development.	The irrigation system would use pipework and fittings designed for use with treated wastewater.

Clause	Requirement	Application to the project*
B2.C63	Primary or secondary treated effluent that has not undergone an approved active disinfection process by either chemical or physical methods must be disposed at a depth greater than 300 mm below finished ground level (Sub-soil disposal – Wisconsin mound, trench, bed or ETA/ETS in accordance with AS1547: 2000 and Standard Designs for On-site Wastewater Management Systems in Tilligerry Creek, October 2005). Secondary treated effluent (or better) that has undergone an approved active disinfection process by either chemical or physical methods may be disposed at a depth between 100 – 300 mm below finished ground level (sub-surface disposal – trench, trickle or drip) OR by surface (spray) irrigation if approved by Council.	The project would disinfect treated wastewater and would be disposed at a depth of between 100 – 300mm below the finished ground level.
B2.C64	In accordance with the Local Government Act, 1993 Section 68C (5), an application to install, alter or construct a waste treatment device or human waste storage facility must be submitted to Councils Wastewater Management Officer for determination.	Noted
B2.C65	An application to install, alter or construct a waste treatment device or human waste storage facility must meet the requirements of the Local Government (General) Regulations, 2005 (Division 4).	Noted
B2.C66	An application to install, alter or construct a waste treatment device or human waste storage facility is subject to a fee payable to Council in accordance with s80 Local Government Act, 1993 and Councils schedule of fees and charges.	Noted
B2.C68	The operation of a system of sewage management (as defined) is a prescribed activity requiring an approval from Council (Approval to Operate) in accordance with the Local Government Act, 1993 (Section 68C(6)). Approvals are subject to annual renewal for which a prescribed fee (in accordance with Council's schedule of fees and charges) is payable. The continued operation of the system of sewage management must comply with the operating conditions attached to the annual approval to operate.	Noted

Clause	Requirement	Application to the project*
B2.C69	Greywater is defined as domestic wastewater excluding toilet waste. For premises connected to a reticulated sewer operated by the local water and sewer authority the treatment and disposal of greywater must comply with NSW Guideline for Sewered Residential Premises (Single Households) Greywater Reuse NSW Department of Energy, Utility and Sustainability. For premises not connected to a reticulated sewer operated by the local water and sewer authority (i.e. properties operating an on-site sewage management facility) the treatment and disposal of greywater must comply with NSW Guideline for Sewered Residential Premises (Single Households) Greywater Reuse (NSW Department of Energy, Utility and Sustainability) and Council specific requirements.	Greywater would be treated using the onsite sewage management system is described in Section 6.3.7. The treatment plant would exceed the performance standards of the Port Stephens Council (draft) Technical Specification – Effluent Management for Un-sewered Development. The irrigation scheme has been designed to meet the intent of Environmental Guideline – Use of Effluent by Irrigation, Department of Environment and Conservation.
B2.C70	The discharge of un-treated greywater from any source to a waterway, watercourse (whether permanent or intermittent), stormwater drain, drainage channel or ground surface is not permitted.	Noted
Erosion and Sediment Control		
B2.C71	Erosion and sediment control measures for development works must be prepared in accordance with the Erosion and Sediment Control Regional Policy and Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom 2004).	Chapter 12 reflects that the potential for erosion and sedimentation would be managed by implementing control measures generally in accordance with Managing Urban Stormwater, Soils and Construction (Landcom 2004).
B2.C72	Erosion and sediment control measures must be maintained at all times during the construction period.	Noted
Construction Waste		
B2.C73	A Waste Management Plan must be provided for all development requiring construction works on site. The level of detail in the plan will reflect the scale of development being undertaken but will generally include details of: • The volume and type of waste to be generated. • How waste is to be stored and treated on site. • How residual material is to be disposed.	Section 13.3 reflects that a construction waste management plan would be prepared as part of the CEMP.
B2.C74	The Waste Management Plan must be accompanied by drawings with specific details showing: • On site sorting and storage areas. • Access for collection vehicles. • Vegetation to be removed or retained.	Noted
B2.C75	The Waste Management Plan must maximise recycling and minimise waste to landfill. The owner/applicant must provide relevant evidence to Council or the accredited certifier of compliance with the specified arrangements.	Noted

Clause	Requirement	Application to the project*
Parking traffic and transport		
B3.C2 – B3.C52	These controls stipulate the design criteria and requirements for parking, traffic and transport and include specific requirements relating to industrial development.	The site access and parking arrangements have been designed to comply with Council's design criteria.
Street Character		
B5.C5	Entries to offices or display rooms must face onto the street, be protected by a small awning and identified by business signage.	Office entrances have been designed to comply with Council requirements.
B5.C6	Buildings must face the street with clear entry points.	Administration buildings would have clear entry points
B5.C7	Parking and driveway areas must not occupy more than 60% of site frontage.	Parking and driveway areas would be partially screened and are not expected to exceed 60% of the site frontage.
B5.C8	Development must provide generous scale landscape planting sufficient to screen carparks and service areas from the street and reduce the visual impact of buildings.	Landscaping has been incorporated where suitable to reduce the visual impact of the project.
Building Height		
B5.C10	Development must not exceed a height of 15m.	The maximum building height would be less than 15m.
B5.C11	Development must not exceed 2 storeys except where it is clearly demonstrated that a higher building is required to accommodate the proposed industrial use.	The project would not exceed two storeys.
Side and Rear Setbacks		
B5.C13	Buildings must be setback a minimum of 6 m from the front property boundary.	The minimum setbacks would be provided.
B5.C15	Building must be setback a minimum of 1.5 m from the boundary of land zoned 7(c) Water Catchment Area, and any drainage reserve or drainage easement.	The site is not adjacent to any water catchment areas or drainage reserves.
Building Design Elements		
B5.C16	Weather protection awnings must be provided to all building entrances.	Awnings would be provided on building entrances.
B5.C17	Buildings design must be sympathetic with the general profile and roofline of surrounding buildings.	The buildings would be similar in size and scale to those in the surrounding industrial estate.
B5.C18	External building colours and materials must be sympathetic to the natural environment and the existing street context. Reflective surfaces and fluorescent colours are not acceptable for buildings or signage.	External building colours and materials would be selected during the detailed design phase. The materials would be selected to ensure the project is sympathetic to the surrounding environment and would not include reflective surfaces or fluorescent colours.
B5.C19	Building design must ensure access to sunlight for open spaces within and around buildings.	There are no public open spaces within or around buildings.
Parking and Access		

Clause	Requirement	Application to the project*
B5.C20	Parking spaces must be located behind the building line setback and a minimum of 6m from the front boundary line.	The parking would be setback 5m from the front boundary line. The car park has been sited to minimise conflicts between staff and production vehicles, and also to ensure that appropriate access for fire fighting vehicles is available. The 6m setback is unable to be achieved.
B5.C21	Vehicles must enter and leave the site in a forward direction.	The site access would enable vehicles to enter and leave the site in a forward direction.
B5.C22	Car parking between the building and the front of development must be a maximum of 20% of the site and a maximum of 60% of the frontage.	Carparking between the building and the front of the site would not exceed Council requirements. Landscaping would reduce the area of car park visible from the street.
B5.C23	All carparking spaces must be adequately drained, marked and designated upon the site.	The project would comply as car parking spaces would be appropriately drained and marked.
Landscape		
B5.C25	Landscape planting must cover a minimum of 20% of the site area. Planting areas less than 1.5m in width will not be included in the calculation of total landscape area.	The landscape plan would be prepared during the detailed design phase. This would involve confirming the proportion of the site available for landscape planting.
B5.C26	Landscape design must retain and protect significant site trees.	The project has been designed to retain trees where practicable. Trees to be retained are primarily located north of the haul road.
B5.C27	Planting design should ensure low maintenance requirements and low water demand.	The planting design would be confirmed during detailed design. As the project involves infiltration zones and an irrigation area, appropriate species would be selected for these areas.
B5.C28	All areas within setbacks must be landscaped except for approved driveway crossings and pedestrian entries at the boundary.	The front setback would be landscaped. Landscaping along the remaining boundaries is not proposed as these boundaries adjoin industrial lands.
B5.C29	Landscape planting design must be integral to the carpark design. Landscape works must provide adequate screening from the street, adequate shading to pavement areas and good pedestrian sightlines, through a combination of low plantings up to 900 mm high and broad canopy clean-stemmed trees.	Landscape planting design would be confirmed during detailed design and would include a combination of low vegetation and canopy trees.
B5.C30	Landscape design must provide for low maintenance and low water demand including appropriate plant selection, heavy mulching and drip or trickle type irrigation.	The planting design would be confirmed during detailed design. As the project involves infiltration zones and an irrigation area, appropriate species would be selected for these areas.
B5.C31	Landscape planting must include advanced evergreen trees that would provide shade to 50% of parking spaces in 5 years.	Landscape planting design would be confirmed during detailed design canopy trees to partially shade car parking areas.
B5.C32	Predominantly local indigenous species must be used on sites that are located close to natural bushland and conservation or environmental protection areas.	Landscape planting design would be confirmed during detailed design and would include a combination of low vegetation and canopy trees.
B5.C35	A comprehensive Landscape Plan prepared by a qualified Landscape Designer or Landscape Architect must be submitted with the Development Application.	A landscape plan has not been prepared. Details regarding site landscaping would be confirmed during detailed design.
B5.C34	Landscaping must be installed and maintained for the life of the development by the property owner.	The landscaping would be installed and maintained by Midal for the life of the project.

3. Stakeholder and community consultation

This chapter describes the consultation undertaken with the community and government stakeholders during preparation of the Environmental Assessment and the key issues raised during the consultation process.

3.1 Community consultation

3.1.1 Aim of the community consultation

Community consultation for the project aimed to:

- ▶ Provide information about the project.
- ▶ Provide opportunities and mechanisms for community feedback and comments.
- ▶ Provide opportunities for Midal to liaise with neighbours about the project.
- ▶ Identify key issues and concerns about the project for consideration during preparation of the Environmental Assessment.

3.1.2 Key stakeholders

The site is within an extensive and active industrial area and is located on two lots within a community title subdivision. The key stakeholders in the locality include:

- ▶ Those owners and proprietors within the Community Association forming all lots within DP 270328.
- ▶ Other industries in the neighbourhood, including: Tomago Aluminium Company, Vana Abrasive Blasting and Protective Coatings, Varley Kitchens, Redicrete, Compass Pools Australia Pty Ltd, Minmet Operations Pty Ltd, Ross Tyres, Strang, SMB Engineering, Minebay, Ozsteel Manufactured Products, Brent and Warburton Engineering Solutions, Alen E Clode Pty Ltd, AJ Mayr, Wheeler Cranes and McFadyen's Haulage and Excavation.
- ▶ Government departments and Port Stephens Council.

3.1.3 Community management committee

GHD addressed the annual meeting of the Community Management Committee on the 13 May 2011. This committee administers the Community Plan which details all the bylaws relevant to the Community Title subdivision of which Lots 5 and 6 DP 270328 form part. The only issue raised at that meeting was the potential for damage to the private road, which is community property, during construction.

An information brochure was provided to all the owners of land included within the area covered by the community plan including a request for any feedback. The information brochure prepared for the Community Management Committee meeting was also letter box dropped to other surrounding industries asking for feedback to be provided during May 2011.

No response to the information brochure has been received.

3.2 Consultation with the Aboriginal community

3.2.1 Aboriginal stakeholder identification

To identify potential cultural knowledge holders relevant to the study area, Insite Heritage followed the DEC 2005 consultation guidelines as per the Director-General's requirements. Letters requesting the contact details of potential stakeholders were sent to:

- ▶ Department of Environment, Climate Change and Water (DECCW) now the Office of Environment and Heritage (OEH).
- ▶ Native Title Services.
- ▶ Office of the Registrar.
- ▶ Port Stephens Council.
- ▶ Worimi Local Aboriginal Land Council (Worimi LALC).

The project was advertised in the Newcastle Herald on the 13th September 2010.

3.2.2 Consultation activities and responses

Project notifications and invitations to register as stakeholders were sent to all those on the list supplied by DECCW. These were:

- ▶ Mrs Viola Brown.
- ▶ Nu-Run-Gee Pty Ltd.
- ▶ Mur-Roo-Ma Inc.
- ▶ Worimi Aboriginal Traditional Elders and Owners Group Inc.
- ▶ Mrs Carol Ridgeway-Bisset of Maaiangal Aboriginal Heritage.

Responses were received from Nu-Run-Gee, and Mur-Roo-Ma. Cacatua Cultural Consultants also registered as a result of the advertisement.

A site inspection was undertaken with representatives of the Worimi LALC, Nu-Run-Gee Pty Ltd and Mur-Roo-Ma Inc and a draft report was supplied to all stakeholders for comment. No issues were raised and the community's comments are included in the Archaeological Assessment Report in Appendix L.

3.3 Consultation with utilities

Consultation with the relevant service authorities for the supply of gas, electricity and water has commenced and is ongoing. These authorities include Jemena (gas), Ausgrid (electricity) and Hunter Water Corporation (water). Each authority has provided preliminary advice to confirm that there is sufficient capacity to service the project. Further consultation with each service provider would be undertaken as the project progresses to determine detailed design requirements.

3.4 Government agency consultation

Government agencies have been consulted at various stages when preparing the environmental assessment process. When preparing the Director-General's requirements, the following agencies were consulted by the then Department of Planning:

- ▶ DECCW now the OEH.
- ▶ NSW Office of Water (NOW).
- ▶ Road and Traffic Authority (RTA), now the Roads and Maritime Services (RMS)
- ▶ Port Stephens Council.

As required by the Director-General's requirements, subsequent consultation was undertaken with these organisations to identify issues to be addressed in the Environmental Assessment. This consultation involved a combination of meetings, emails and telephone conversations. Port Stephens Council declined meeting and directed GHD to their letter submitted to the Department of Planning and Infrastructure that provided input to the Director-General's requirements.

Consultation with government agencies confirmed the need to address the issues listed in the Director-General's requirements. Table 3-1 summarises issues raised during consultation with government agencies.

The draft Environmental Assessment was submitted to the DP&I for adequacy review prior to being placed on exhibition. As part of the adequacy review process, DP&I invited OEH, RMS, NOW, and the Hunter Water Corporation to review and comment on the draft report. Following receipt of the adequacy review comments, GHD consulted with each organisation to discuss the issues raised and confirm additional information and /or clarification that was required. The Environmental Assessment, including some specialist studies, was amended to address these issues.

Midal would continue to liaise closely with relevant government agencies as the project is refined during detailed design. This would include targeted consultation regarding licences and permits required to construct and operate the project.

Table 3-1 Summary of issues raised by government agencies

Issue raised	Where addressed in the Environmental Assessment
Office of Environment and Heritage	
Impacts on air quality.	Section 8
Impacts on noise amenity.	Section 10
Water quality and quantity impacts.	Section 9
Wastewater management.	Section 9
Managing possible existing site contamination.	Section 12
Impacts on threatened species, populations, ecological communities and their habitat.	Section 11

Issue raised	Where addressed in the Environmental Assessment
Impacts on Aboriginal cultural values.	Section 18.1
NSW Office of Water	
Identification of site water demands.	Sections 6 and 9
Confirmation that adequate and secure water supply is available for the life of the project.	Sections 6 and 9
Existing and proposed water licensing requirements are in accordance with the <i>Water Act 1912</i> , <i>Water Management Act 2000</i> and Water Sharing Plan for the Tomago Tomaree Stockton Groundwater Sources 2003.	Section 9
Baseline monitoring/data of all surface and groundwater sources and dependent ecosystems.	Sections 9 and 11.4
Adequate mitigating and monitoring programs to address impacts.	Section 9
Roads and Maritime Services	
The RMS requested that a traffic and transport study be prepared in accordance with the RTA's Guide to Traffic Generating Developments and include the following:	Section 14
▀ Current traffic counts. ▀ Anticipated additional vehicular traffic generated by the project. ▀ Consideration of traffic impacts and capacity of existing and proposed intersections. ▀ Identify upgrades to road network infrastructure. ▀ A SIDRA intersection analysis to determine the need for intersection and road capacity upgrades. ▀ Consideration of construction traffic on the road network. ▀ Cumulative assessment of traffic impacts taking into account traffic from Redlake development at Tomago.	
Port Stephens Council	
Consideration of the objectives of Zone No 4(a)-Industrial General 'A' in the Port Stephens LEP 2000.	Section 2.2.1
The Port Stephens LEP 2000 and the Port Stephens DCP 2007 – B5 Industrial Development.	Section 2.2.1
Design buildings and car parking in accordance with the general principles and objectives of Crime Prevention through Environmental Design.	Section 6.3.4

Issue raised	Where addressed in the Environmental Assessment
The RFS's Planning for Bushfire Protection 2006.	Chapter 15
Adequate provision of sewage services for the project.	Section 6.3

4. Description of the site and surrounds

4.1 Context of the site

The site is located on 2.8 ha of industrial land within the Tomago Industrial Area, approximately 6 km north of the Port of Newcastle and immediately adjacent to the Tomago Smelter (Figure 1.1, Figure 1.2 and Figure 1.3). It is located within the TAC Buffer Zone which was established as a condition of consent for the Tomago Aluminium smelter. The zone acts as an environmental management zone which aims to reduce land uses that are incompatible with the operations of the smelter.

Land immediately to the west of the site is occupied by a large industrial facility and land immediately to the east is currently vacant but has previously been used for industrial activities. Land to the north has previously been used for sand mining and is part of the TAC buffer zone. A small area of bushland lies immediately to the south and separates the site from industrial development.

The surrounding development comprises a wide range of industrial activities dominated by the Tomago Aluminium Smelter. The surrounding industrial environment includes substantial buildings similar in scale to that proposed for the Midal facility (Photo 4.1).

Access to the site is provided by sealed and unsealed roads connecting to School Drive (Photo 4.2). A dedicated haul road would link the Tomago smelter with the northern portion of the site (Photo 4.3).

4.2 Description of the site

The site is legally identified as Lot 5 and 6 DP 270328 and is approximately 2.8 ha in area, including the proposed haul road corridor to the north, located on part of Lot 301 DP 634536 and Lot 3232 DP 618103. The northern and central portions of the site consist of grasses, scattered shrubs and trees and have been extensively used for past industrial purposes.

Fragments and disused hardstand areas from previous industrial uses are present in Lots 5 and 6.

A Colorbond shed in poor condition is located in the southern portion of the site with associated wash bays and covered storage areas (Photo 4.4). This would be removed as part of the project. South of the shed was a large hardstand area with concrete anchor points, metal casting/weld fragments and also several resinous stains/patches.

The site is elongated and is relatively flat with a general slope of approximately 2% from the north to the south.

The central portion of the site is grassed with low points/depressions and scars/hardstand areas from previous racking and storage. This area is scattered with workshop waste/debris. In the southern central portion of the property (north of the existing shed) there were concrete hardstand areas with metal castings/weld fragments and blue discolouration of the surface rocks and gravels. Metal tracks are also evident in the area. Previous investigations have indicated the presence of a former bunded oil storage area in this location.

An access road is located along the southern boundary.



Photo 4.1 Existing industrial development adjacent to the western boundary of the site



Photo 4.2 Existing gravel roads providing access to the site



Photo 4.3 Location of proposed haul road looking east from Tomago smelter



Photo 4.4 View of the site looking north showing the existing colorbond shed

4.3 Historical use of the site

The interpretation of the historical searches indicated that the site was likely to have been bush land or used for farming purposes until the 1970s when Lots 5 and 6 were cleared and subsequently used for metal fabrication during the 1980s. Development on the site has predominantly involved constructing hard stand and storage rack areas and sheds. These lots are likely to have been used for industrial purposes from the 1970s to present. The site of the haul road was extensively modified by sand mining.

5. Strategic context, project need and alternatives

This chapter summarises the strategic framework that influenced development of the project. It also describes the need for the project and the alternatives that were considered and assessed during the project development process.

5.1 Strategic planning drivers

5.1.1 NSW strategic planning drivers

Lower Hunter Regional Strategy 2006-2031

The NSW Government's Lower Hunter Regional Strategy 2006-2031 (LHRS) is a planning strategy that compliments and informs other relevant State planning instruments. Its purpose is to ensure that adequate land is available and appropriately located to sustainably accommodate the projected housing and employment needs, and associated support services and infrastructure, over the next 25 years. The LHRS works with the State Government's Regional Conservation Plan to ensure that future growth of the Lower Hunter makes a positive contribution to the protection of sensitive environments and biodiversity.

The project would comply with the directions in the Strategy by providing employment during construction and operation as well as long-term economic benefits through the improved efficiency associated with producing aluminium rod and conductor locally.

5.2 Regional drivers

Port Stephens Economic Development Strategy Report 2007

Port Stephens Council released the *Port Stephens Economic Development Strategy Report* in October 2007. The report outlines the current economic condition of Port Stephens and outlines areas of focus to ensure that Port Stephens achieves its full potential as a place to live, work, to operate a business and to visit.

Port Stephens LGA has experienced a steady growth of around 9% in the labour force between 2001 and 2006. Strong job performance is attributed largely to the growth of metals and engineering employment at Tomago, which has been driven by the recent resources boom. Manufacturing is considered a major employment activity for Port Stephens and accounts for 17% of employment in the LGA. The Tomago locality accommodates 73% of manufacturing activities within the Port Stephens LGA.

Although recent records indicate consistent economic growth in Port Stephens LGA, there is a concern regarding employment opportunities for a growing population. Statistics indicate that fulltime employment opportunities in Port Stephens LGA would need to increase by 10,154 by 2031 to sustain the expected rate of population growth over the same period.

To ensure there are sufficient employment opportunities for the future residents of Port Stephens, and surrounding government areas, the expansion of manufacturing operations in Tomago is necessary and can be readily accommodated within the existing zoned industrial land.

5.3 Project need

The Tomago Aluminium Smelter produces 530,000 tonnes per year of aluminium product and has recently gained approval to increase this production to 575,000 tonnes per year utilising the existing plant and infrastructure. Virtually all this production is exported and used to manufacture items such as conductors and aluminium shapes, some of which are then imported into Australia.

The project is needed as it would value add to the output of the Tomago Aluminium smelter, reduce the amount of material exported from Tomago by approximately 10% and substantially reduce the amount of finished aluminium conductors imported into Australia.

5.4 Alternatives considered and justification of the preferred option

The proposed manufacturing process requires direct access to a molten metal source. The project has been developed to take advantage of an opportunity to source molten metal from Tomago Aluminium in an efficient and cost-effective manner. By using already molten metal, the energy requirements for the process are substantially reduced. The site is therefore considered to be suitable as there are very few sites that would provide access to molten aluminium with appropriate zoning and related infrastructure.

During the course of ecological investigations for the Environmental Assessment, it was identified that vegetation in the vicinity of the haul road alignment provides habitat for the New Holland Mouse which is listed under the EPBC Act. A range of alternative haul road alignments were considered to minimise the area of potential habitat for this species that would be impacted. The options were limited by geometrical parameters for the road design, as well as the need to maintain adequate separation distance between the haul road and the adjacent properties. The haul road alignment was selected in consultation with TAC and is considered to be an optimal compromise between the need to minimise impacts on New Holland Mouse habitat, and the hazard and safety considerations associated with operation of the haul road.

A 'do nothing' approach is not proposed as it would not take advantage of local value-adding opportunities that would increase employment.

The project described in Section 6 is considered to be justified as:

- ▶ It is located on a suitable site
- ▶ The investigations undertaken as part of this Environmental Assessment indicate that the potential environmental impacts are able to be managed so that there are unlikely to be any significant environmental impacts provided that the Statement of Commitments is implemented.

6. Description of the project

6.1 Overview of the project

The project involves developing a facility to manufacture aluminium rods and conductors from molten aluminium sourced from the Tomago Aluminium Smelter. An indicative site layout plan is shown in Figure 6.1 and the key features include:

- ▶ A haul road approximately 150m long that would be used to transport molten aluminium from the Tomago Smelter.
- ▶ A building approximately 98m by 35m and 8m high (referred to as Building 1) to house the gas fired furnace and rolling mill that would manufacture aluminium rod. Ancillary infrastructure such as the gas fired furnace and rolling mill control rooms, and undercover rod storage would also be within this building.
- ▶ Cooling towers and infrastructure associated with the gas fired furnace and rolling mill.
- ▶ A building approximately 124m by 46m and 8m high (referred to as Building 2) to house wire drawing machines, stranding machines and associated facilities.
- ▶ Laboratories and administration buildings.
- ▶ Stores building, electrical and mechanical workshops.
- ▶ Hardstand movement, loading areas, and car parking.
- ▶ Stormwater detention and nutrient control devices that would form part of a water management system that would maximise water reuse in the manufacturing process.
- ▶ Stormwater detention and nutrient control devices that would form part of a water quality treatment system.
- ▶ Onsite sewage treatment plant with onsite subsurface irrigation of the landscaping areas.

The site is part of a Community Title subdivision and all lots within the subdivision are serviced by a private road on Community Land. The unsealed part of the road would be rebuilt and sealed as part of the project.

The project requires no modification to the operations of the smelter other than the transport of molten metal to the Midal project via a dedicated haul road.

6.2 Cable and conductor manufacturing process

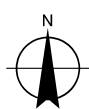
The project involves undertaking three manufacturing activities within the facility. These are the formation of aluminium rod within Building No 1, and manufacturing aluminium wire and aluminium conductors within Building No 2. The location of these buildings is shown in Figure 6.1. Approximately 50,000 tonnes of molten would be processed every year with half expected to be exported and the other half to be processed into wire and stranded into conductors. The main steps in the process to produce aluminium rods and conductors are outlined in the following sections.



LEGEND

- Proposed Car Park
- Proposed Building Footprint
- Proposed Haul Road
- Extent of Works
- Cadastre

1:2,500 (at A4)
0 10 20 40 60 80
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number	22-15280
Revision	A
Date	22 Dec 2011

Site Layout

Figure 6.1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntmail@ghd.com.au W www.ghd.com.au

N:\AUNewcastle\Projects\22\15280\GIS\Maps\Deliverables\EA\2215280_EA_01_3_SiteLayout_Chapter6.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and NEARMAP, LPMA make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and NEARMAP, LPMA cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: NearMap: PhotoMap - 2011; LPMA: DTDC - 2007. Created by: Imackay, Imorton, mbarnier

6.2.1 Rod production

The main steps to turn molten aluminium into aluminium rods are displayed in the flow chart in Figure 6.2. This process would be undertaken within Building 1.

Molten aluminium would be produced at the Tomago smelter and delivered to the site in crucibles with a capacity of approximately 10 tonnes that are mounted on specialised small articulated trucks. The same trucks and crucibles are used in existing operations at the smelter. Each crucible would be accompanied by an analysis certificate. Once the certificate has been checked and the quality of the molten metal has been found to be within the desired limits, the crucible would be lifted from the truck and the molten metal poured into the holding furnace. The project would use gas fired furnaces.

When the holding furnace is full, the temperature of the metal would be maintained between 650°C and 820°C. The metal in the furnace would be degassed if required, and any floating oxides removed.

After the metal has been cleaned, samples would be taken from the two furnace doors for spectro-analysis. If the analysis confirms the metal meets the specification, the metal is then transferred to the tilt furnace. During transfer the alloying elements would be added and further analysis of the metal is undertaken.

Once the tilt furnace is full, the metal would be maintained between 700°C and 820°C and degassed and drossed as required.

From the tilt furnace, the liquid metal would be transferred to the casting wheel and cast at a maximum temperature of 715°C. The incoming cooling water for the casting wheel would be maintained between 20°C and 40°C. Following this, the bar would be rolled through the rolling mill to gradually reduce the cross-section of the bar until a 9.5mm diameter rod is formed. The rod is then coiled onto drums with a capacity of approximately 2000kg using automatic coilers.

Once the rod is produced, it would be checked and tested for quality, weighed and packed with shrinkable polyethylene sheets and palletised. The finished product would either be transported by truck to domestic markets, the Newcastle port for export, or moved into the wire drawing and stranding building to where it would be used to produce conductors.

6.2.2 Wire production

The process to turn aluminium rods into aluminium conductors are displayed in the flow chart in Figure 6.3. This process would occur within Building 2.

The 9.5mm diameter aluminium rod coils from the automatic coilers would be accompanied by a work order which states the tensile and conductivity of the rods. The work order would specify the wire diameter to be drawn and this would be programmed into the wire drawing machine. Wire drawing involves the rod being pulled through varying sizes of die series which reduces the diameter of the rod to the required size. Once the rods are drawn to the prescribed diameter, the wire is then drawn onto bobbins.

The temperature of the coiled rods during the drawing process would not exceed 70°C for aluminium and 55°C for alloy. The lubricant temperature would not exceed 130°C.

Quality assurance processes sample every tenth bobbin and test the failure of the wire. If testing indicates the wire does not meet the specifications, failed wires would be removed and rejected tags attached.

Alloy wires would be taken to the heat ageing oven to receive thermal treatment. Ageing parameters of time and temperature depend on the diameter and quantity of wire charged into the oven in a single batch.

Once aluminium wire has been drawn and alloy wire has been thermally treatment, the wire would be tested to ensure it meets specified values before being taken for stranding.

6.2.3 Conductor production

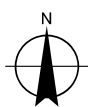
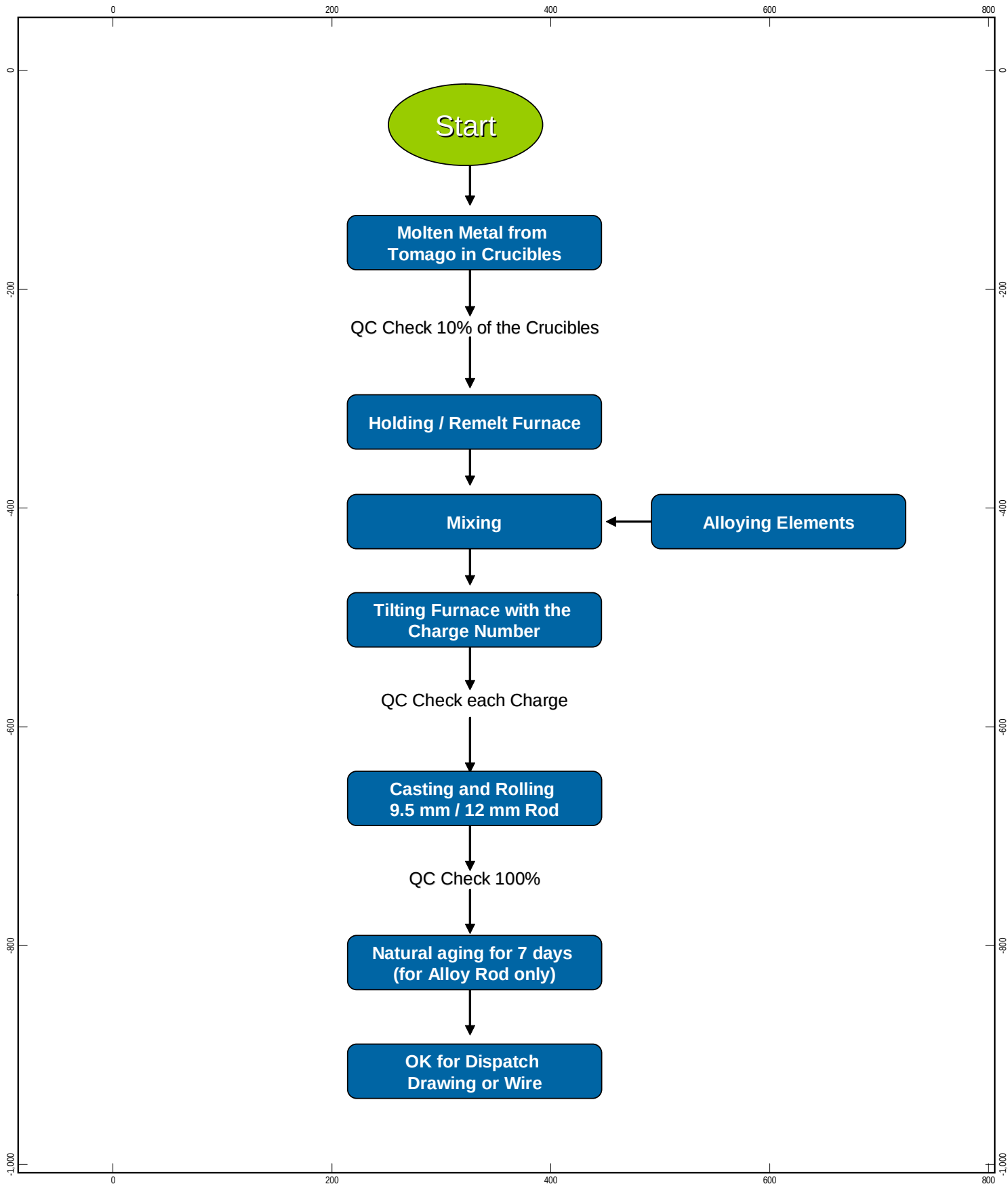
Bobbins from the wire production process described in Section 6.2.2 would be loaded into stranding carriages. The carriages within the stranding machine would be rotated in an alternate direction so the wires are stranded in a close helix. Tension between the stranding carriages must be kept uniform to maintain a uniform circular surface.

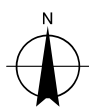
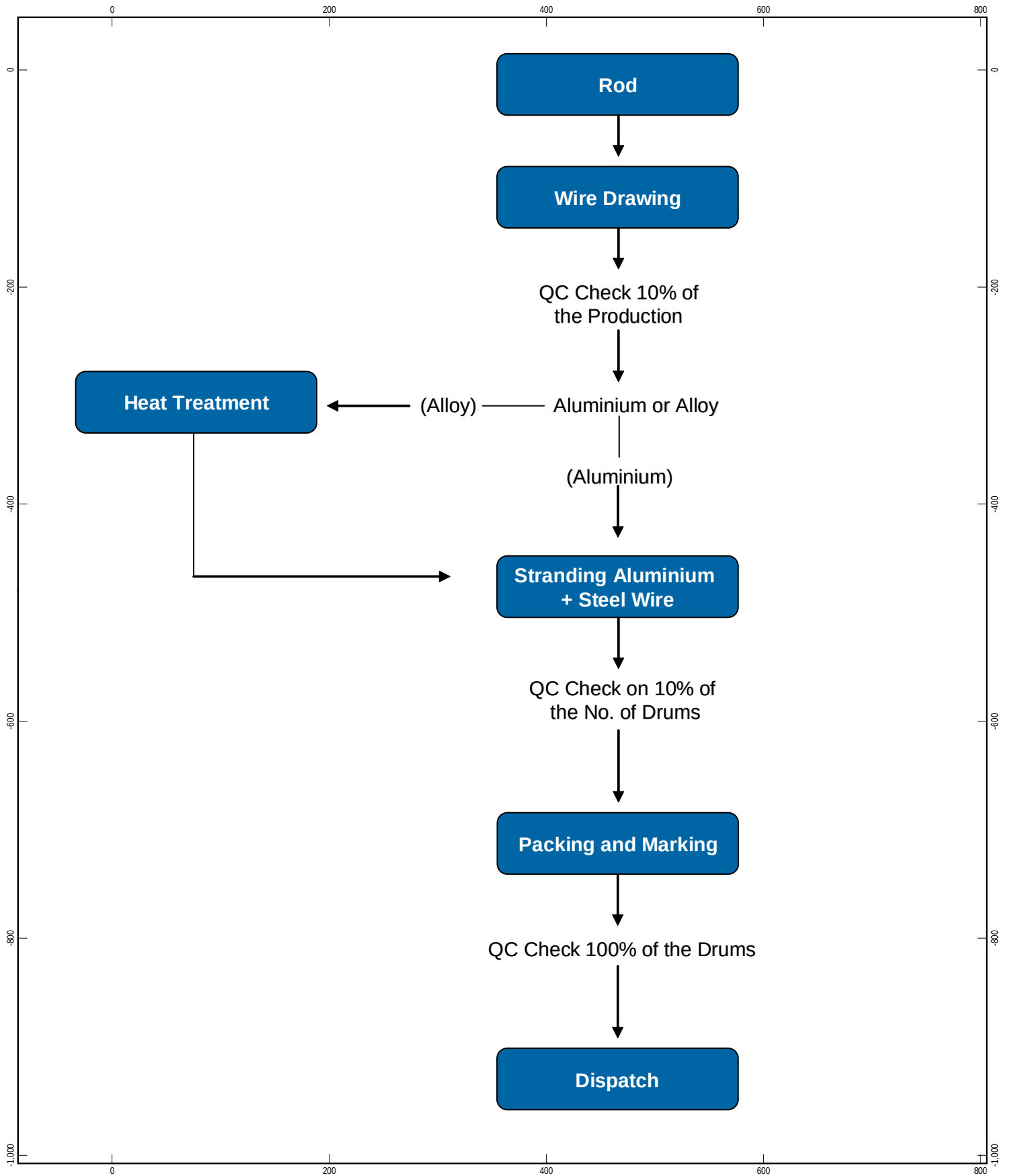
Once the bobbins are in place, the wires would be strung up to the forming die. Roller settings would be adjusted to minimise the spring back of the wire when the conductor is cut. During the stranding process, care is taken to ensure that the forming die is set so that the conductor is tight in the groove of the forming die. During multiple layer stranding, care is taken to ensure that the direction of each lay complies with the requirements of the work order.

Once the wire has been stranded to the required length, the completed conductor drum is removed.

The project would produce the following types of conductors:

- ▶ All Aluminium Conductor (AAC). In this conductor, all the wires in all layers would be Electrical Conductor (EC) Grade Aluminium.
- ▶ Aluminium Conductor Steel Reinforced (ACSR). In this conductor, the core would be high tensile galvanized steel wire. The outer layer would be aluminium.
- ▶ Aluminium Conductor Aluminium Clad Steel Reinforced (ACSR AS). In this conductor, the core would be aluminium clad steel wire. The outer layer would be EC Grade Aluminium.
- ▶ All Aluminium Alloy Conductor (AAAC). In this conductor, all the wires would be aluminium alloy wires.
- ▶ Aluminium Conductor Alloy Reinforced (ACAR). In this conductor, the inner core would be aluminium alloy wire and the outer layers would be EC grade aluminium wire.





6.3 Ancillary services and infrastructure

6.3.1 Access

Access to the site would be from the Private Road that extends off School Drive. This road has a combination of sealed and gravel surface sections. The gravel pavement would be rebuilt and sealed as part of the project. The site access would be designed to comply with relevant standards.

Molten aluminium would be delivered to the site via a dedicated haul road linking the northern boundary of the site to the adjacent smelter. Finished product would be transported from the site via trucks using the Private Road.

The design of hardstand areas and internal roads would ensure that fire fighting vehicles have unobstructed access to hydrants.

6.3.2 Buildings and landscaping

The project would include a range of structures, including those housing the aluminium rod manufacturing plant, and that housing the wire and conductor manufacturing plant. In addition, there would be a number of buildings to provide ancillary services such as laboratories, administration, storage and workshops. Final details relating to the specifications of the buildings would be confirmed during detailed design. This would involve consideration of relevant aspects of the Port Stephens Development Control Plan 2007, such as strategies to minimise visual impact by using non-reflective materials and colours and providing weather protection awnings on building entrances.

A landscaping plan would be prepared during detailed design and this would also take into account relevant provisions in the Port Stephens Development Control Plan 2007.

6.3.3 Office and amenities

Office space and staff amenities would be located in the southern portion of Building No 2. This would include office, lunch room and ablutions facilities.

6.3.4 Car parking

A total of 82 car parking spaces would be provided for staff and visitors in the southern portion of the site, adjacent to Building No. 2. Access to car parking would be via the Private Road. The number of car parking spaces complies with the requirements of the Port Stephens DCP.

Temporary parking would be provided onsite during the construction period for construction workers.

All car parking and hardstand areas would include appropriate drainage systems.

6.3.5 Power supply

The electrical demand for the project is estimated to be 4133 kVA. Consultation with Ausgrid indicates that electricity infrastructure in the vicinity of the site is being upgraded and this is expected to be completed by late 2011. It is anticipated that there would be sufficient capacity within the network to accommodate the power requirements of the project.

An application for an Electrical Connection has been submitted to Ausgrid, along with payment for design information, design certification and administration. If Ausgrid's capital works are delayed, it is anticipated that the project would utilise a load limited network connection.

6.3.6 Communications

The site is covered by mobile service network and a telephone line is parallel to the southern boundary. The project would connect to this existing communications infrastructure.

6.3.7 Integrated water management

An integrated approach to site water management would be implemented. This strategy has been developed based on an assessment of the interrelationships of potable water, stormwater, groundwater and wastewater flows, and a number of different water management options were investigated. These were modelled and assessed to provide the most suitable water management options for the site so that:

- ▶ Impacts on groundwater dependant ecosystems are minimised
- ▶ Stormwater is reused where practicable and treated and discharged to local standards
- ▶ Wastewater is treated to a high standard and utilised on site in a sustainable and safe manner.

The integrated water management strategy to be implemented is summarised in Figure 6.4 and indicates that:

- ▶ Runoff from roofs would be directed to 100kL storage tanks, and treated for reuse as process water.
- ▶ Water from the onsite sewer treatment system would be treated and re-used for onsite subsurface irrigation (refer to Section 9.2.5).
- ▶ Runoff from paved areas would be treated by gross pollutant traps and directed to infiltration zones. In larger storm events, high flows would bypass the Gross Pollutant Trap and would be discharged to the area south of the site.

Process water reject would be stored separately and tankered and disposed at a facility licenced to accept trade waste.

Details of the stormwater system design and sediment controls are outlined in Chapter 9. Surface water flow paths and infiltration areas are shown in Figure 9.1.

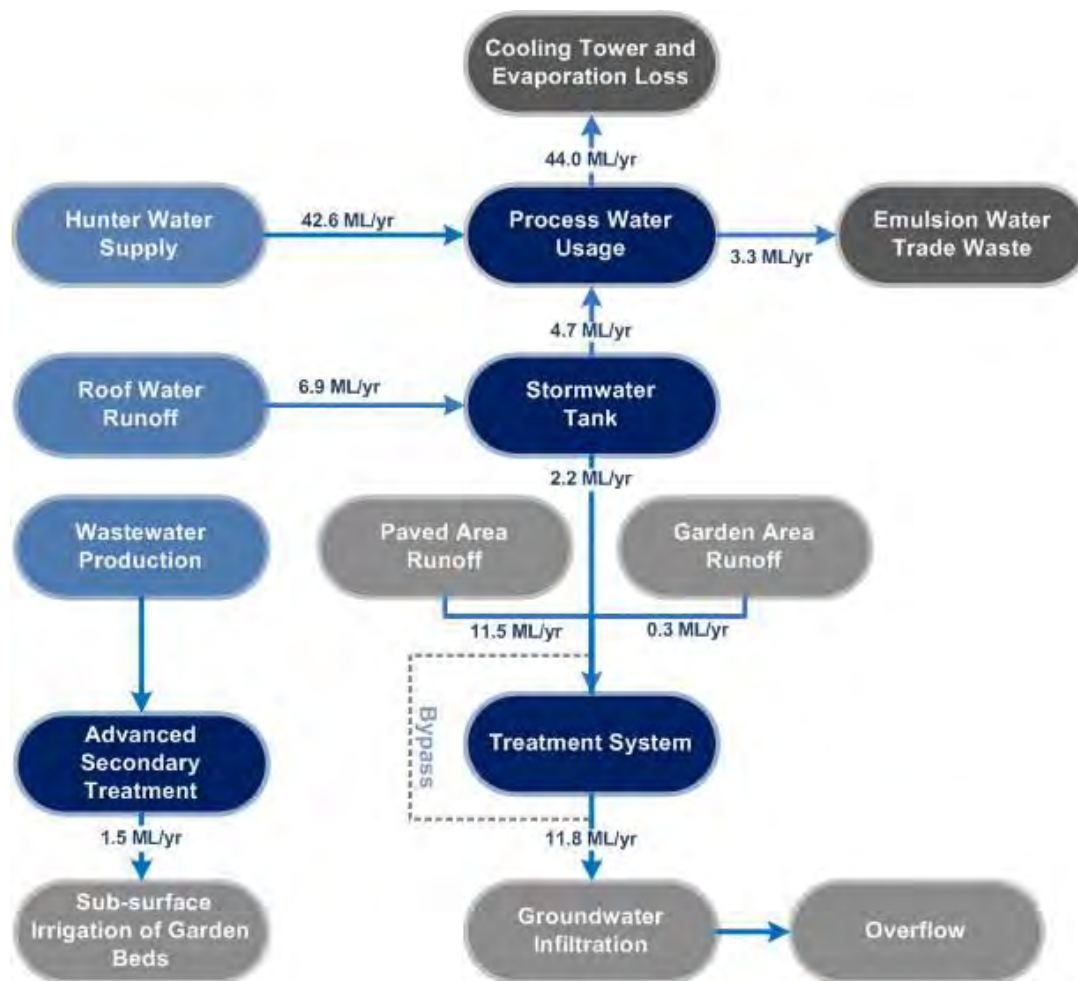


Figure 6.4 Site water balance

Potable water supply

An existing 150mm diameter Hunter Water Corporation main would supply potable water to the site. The existing main is fed by a 500mm diameter main that runs along Tomago Road. The expected average and peak water demands are shown in Table 6.1.

Rainwater would be collected from the building roofs and stored in two 100kL tanks prior to being used in the manufacturing process. Fire fighting water would require an instantaneous flow of 20L/s.

Table 6-1 Expected water demand

	Expected average demand		Expected peak demand	
	ML/year	kL/d	kL/h	L/s
Process demand	47	129	30	9
Potable demand	4.2	11.5	18	10
Total demand	49.2	140.5	48	19

The site visit on the 6 June 2011 confirmed that there are no water bodies, water courses or riparian vegetation on, or adjacent to, the site. The nearest water body is the Hunter River, located to the south of the site.

Stormwater system design

The project includes surfaces that are impervious and a drainage system would be provided to manage stormwater. Runoff from hardstand areas would be collected and directed to underground stormwater infiltration areas within the site. Runoff from paved areas would be collected via a conventional pit and pipe network design to 1 in 10yr ARI and discharged to groundwater, with high flows being discharged via a constructed stormwater overflow into the watermain easement to the south of the site.

The stormwater would undergo basic treatment to remove oil and grit through a combination of pit inlet baskets and gross pollutant traps (GPTs) or equivalent before being directed to the underground infiltration areas to minimise stormwater flows from site. This capacity of the infiltration system was determined based on the outcomes of the analysis of impacts on groundwater dependent ecosystems which concluded that, on balance, an average infiltration rate of 50m³/day would be the optimal infiltration volume. This is approximately equal to infiltrating the first 15mm of daily rainfall from the site on an annualised basis.

Flows greater than the capacity of the infiltration system would follow the existing stormwater flow paths. The stormwater would first pass through the existing culvert (replaced as part of the road upgrade), before infiltrating near the 1,350 mm diameter water main easement area. Any remaining surface flows would infiltrate into the land area south of the easement.

As the system would be fitted with a GPT to treat the 'first flush' runoff, the excess runoff is expected to be relatively clean. The GPT units would be maintained in accordance with the manufacturer's guidelines. Water quality treatment devices would be designed for a 1 in 3 month ARI rainfall in accordance with industry standard practice and water treatment removal would target to achieve OEH reduction guidelines.

Wastewater management

The site is currently not sewered or serviced by Hunter Water Corporation. Surrounding industries currently rely on onsite treatment and pump out or infiltration systems to manage sewage.

Sewage loads for the project were calculated to be as follows:

- ▶ Expected daily flow = 4.5 kL/d
- ▶ Expected peak instantaneous flow = 0.6 L/s

Sewage from the project would be managed using a package sewage treatment plant (STP) sized for an average daily flow of 5kL/day and a peak instantaneous flow of 1 L/s with eight hours of emergency buffer storage. The system would be designed to treat wastewater to a higher standard than Council's guidelines. It would treat wastewater to an advanced secondary level with disinfection to substitute potable water for on-site landscaping requirements through subsoil irrigation in accordance with the Environmental Guidelines: Use of Effluent by Irrigation (DECC 2003).

The package STP would include a balance tank, alteration chamber, settling chamber, sludge tank and a disinfection unit. Proprietary units may include a primary settling tank, septic tank or screening system within the package system. Waste sludge would be collected by the sludge tank and pumped out every three to 12 months, depending on the tank size and wastewater flows.

A typical package plant for the treatment of domestic wastewater to an advanced secondary level with disinfection is expected to have water quality targets summarised in Table 6-2.

Table 6-2 Typical advanced secondary treatment package plant water quality targets

Parameter	Typical water quality target (mg/l)
Biological oxygen demand	<10
Total suspended solids	<10
Faecal Coliforms	<10 (org/100ml)

The package STP would require access to pump out the sludge tank and enable periodic monitoring and servicing. The subsurface irrigation system has been designed to meet the Environmental Guidelines, Use of Effluent by Irrigation, (DECC 2003) and the Australian Standard for On-site Domestic Wastewater Management (AS 1547:2000). Based on the guideline values, the effluent disposal subsurface irrigation system was designed to provide a sustainable disposal method with a net negative hydraulic and nutrient balance.

A shallow subsurface drip system would be installed at a typical depth in the soil of 150 -200mm in grassed or other suitably vegetated areas. It would utilize a system of dosed distribution of effluent from perforated small-diameter pipes or dripper lines. The typical groundwater level would be approximately 1.5 to 2m below the ground level of the irrigation areas.

The irrigation area of approximately 1000 m² would have a minimum depth of 1 metre of imported topsoil to store the applied effluent and to support the growth of vegetation to maximize nutrient uptake and evapotranspiration. The exact species of vegetation would be refined during detailed design, however they would include high yield grasses (including natives) that are able to be harvested periodically and are appropriate for the surrounding environment.

6.3.8 Dangerous goods storage

All dangerous goods would be stored, handled and transported in accordance with the requirements of relevant guidelines and standards, including the Australian Dangerous Goods Code and the Australian Standards. This would involve ensuring that storage and refuelling areas are appropriately bunded to prevent spills from entering the drainage system or being discharged offsite.

6.3.9 Gas

An extension to the existing Jemena gas main located in the southern part of the Private Road would be required to service the site. Jemena has confirmed that this main can supply the anticipated demand of 55.4 gl/hr required for the project.

6.3.10 Lighting

As the project would operate 24 hours per day, lighting would be installed to provide a safe working environment.

6.3.11 Hours of operation

It is proposed that the facility would operate 24 hours a day, seven days a week.

6.3.12 Workforce

At its maximum capacity the project would involve two, 12 hour shifts comprising 42 employees per shift with 35 administration staff for a total employment of approximately 119 persons.

6.4 Construction activities and likely staging

Construction is expected to consist of the following components:

- ▶ Rod and conductor manufacturing and storage buildings.
- ▶ Dedicated haul road.
- ▶ Hardstand and carparking areas.
- ▶ Upgrading existing road.
- ▶ Utility upgrades and connections.

Construction would occur over a period of approximately 10 months. The exact construction methods and sequence would be determined by the construction contractor and the following sections provide an overview of indicative construction activities.

As the site is vacant, no modifications or upgrades to activities or infrastructure on the site would be required.

The project would not be staged apart from the normal construction sequence for this type of project.

Construction is unlikely to interaction with any other land uses within the vicinity of the site aside from a temporary increase in traffic movements.

6.4.1 Preliminaries, site preparation, earthworks and civil infrastructure

Site preparation

Site preparation would involve installing sediment and erosion control measures, fencing, vegetation clearing, establishing laydown and bunded storage areas. Facilities would also be installed for the construction workforce, including site offices, lunchrooms, material storage and amenities.

Bulk earthworks

Bulk earthworks would level the site by cut and fill. It is anticipated that cut and fill would be balanced and there is unlikely to be a need to import fill. Earth would be compacted below pavements and structural areas.

Topsoil would be removed and stockpiled for reuse during landscaping of the site.

6.4.2 Building infrastructure

Once bulk excavation is completed and areas have been profiled to finished levels, footings, and drainage and service channels would be excavated. Excavations for footings would generally be shallow (approximately 1m deep), however the cooling tower would require substantial footings that would extend to a depth of approximately 9m. Deep excavations would need to be dewatered to enable the footings to be constructed and water is likely to be discharged to the site and allowed to infiltrate.

Once the footings are complete, formwork would be constructed and concrete slabs would be poured. It is likely that the concrete would be batched offsite and delivered to site ready to be poured. In areas where filling is needed, construction techniques such as piling may be needed to support buildings and floor slabs.

Structural steelwork and steel cladding would be fabricated offsite and delivered by truck prior to being erected using cranes or other similar equipment.

6.4.3 Haul road

The dedicated haul road would connect the TAC eastern access road to the northern portion of the site. The haul road would be 9 m wide within a cleared easement accommodating services and lighting.

During construction, the haul road would be an all-weather, unpaved road. Construction of the haul road corridor would employ standard road construction techniques and activities may include:

- ▶ Installation of sediment and erosion control measures.
- ▶ Clearing vegetation for a 19 m wide corridor.
- ▶ Removal and stockpiling topsoil.
- ▶ Earth compaction.
- ▶ Installation of drainage works.
- ▶ Road surfacing.
- ▶ Rehabilitation along the road corridor.

6.4.4 Installing equipment

Mechanical processing equipment would be assembled offsite and delivered to the site by truck for installation. It is envisaged that the majority of equipment would be delivered prior to completion of the building roof and wall cladding to allow equipment to be positioned on the concrete slab floors using cranes.

6.4.5 Commissioning

Commissioning is likely to be undertaken in two stages:

- ▶ Mechanical and electrical commissioning (dry commissioning).
- ▶ Process commissioning (wet commissioning).

The initial phase of commissioning is likely to involve start-up and operation of process and sorting equipment both as individual items of plant and then the facility as a whole. Once dry commissioning has been successfully completed, process (wet) commissioning would commence. Small quantities of molten aluminium would be introduced to the process lines to test if equipment works correctly. Some minor corrections and adjustments required are carried out at this stage to ensure the equipment is operating effectively and efficiently.

6.4.6 Other activities

Other construction activities that would be undertaken may include:

- ▶ Installation of lighting.
- ▶ Linemarking and sign-posting of roads and new facilities.
- ▶ Upgrading the existing Private Road that provides access to the site
- ▶ Miscellaneous finishing works.

6.4.7 Hours of construction

In accordance with Department of Environment and Climate Change and Water (DECCW) *New South Wales Interim Construction Noise Guidelines (ICNG) (July 2009)*, construction is likely to be limited to the following hours, where practicable:

- ▶ Monday to Friday: 7 am to 6 pm.
- ▶ Saturday: 8 am to 1 pm.
- ▶ No work on Sundays or Public Holidays.

Ancillary activities that may occur outside the standard construction hours include, but may not be limited to, oversize truck movements and deliveries of certain plant and equipment on an occasional basis. Works may also be undertaken outside these hours in the event of a direction from Police or other relevant authority for safety reasons, or emergency work to avoid the loss of life, property and/or prevent environmental harm.

7. Environmental risk assessment

7.1 Risk assessment method

The environmental risk assessment was carried out in accordance with AS/NZS ISO 31000:2009, Risk Management – Principles and Guidelines. This involves:

- Evaluating likelihood of occurrence.
- Evaluating consequence.
- Assigning a risk rating.

The purpose of the risk assessment was to identify the key issues for further assessment as part of the environmental assessment process.

7.1.1 Evaluating likelihood

The likelihood of an impact occurring can be described in terms of probability. Overlaying this is the need to recognise the uncertainty that may be associated with the possible impacts, particularly during the initial risk assessment process. Where there is scientific uncertainty, a cautious approach would assign a higher level of risk.

Each identifiable impact can be assigned a likelihood between remote and almost certain. In simplifying the possible impacts for the purpose of a risk assessment an element of subjectivity is introduced. The purpose of the risk assessment is not necessarily to agree on the probability of any particular impact, but to facilitate an understanding of the relative probability of different impacts.

Table 7-1 summarises the possible likelihood categories used in the risk assessment.

Table 7-1 Likelihood and probability of occurrence

Likelihood	Description	Probability
Almost Certain	Expected to occur	>85%
Likely	Probably will occur	50-85%
Possible	May Occur	21-49%
Unlikely	Not expected to occur in most circumstances	1-20%
Remote	May occur in exceptional circumstances	<1%

7.1.2 Evaluating consequence

Evaluating the consequences of an impact requires a degree of subjective assessment as the likely consequences of an impact may consist of several elements.

The elements that have been considered in this risk assessment are described in Table 7-2.

Table 7-2 Consequences of occurrence

Consequence		Catastrophic	Major	Moderate	Minor	Minimal
Magnitude	Spatial	Whole of region	The site and surrounding areas	The whole site	A part of the site	A small isolated area
	Intensity	Lethal/extreme for individuals or communities	Lethal impacts on some species	Acute / moderate impact on growth, recruitment or survival rates	Acute impacts on some species	Chronic/low level behavioural, lifespan or condition effect
Temporal	Duration	Permanent	Long term effect (multiple generations)	Medium term	Short term impact (single generation)	Single incident transient event
	Timing (periodic events)	Permanent interruption of ecosystem cycle	Regularly interrupts life cycle	Interrupts one life cycle	Occasional interruption of feeding or breeding	Occurs outside of breeding times
Ecological	Values	Wilderness or nationally threatened species	Conservation area or listed species	Native flora or fauna	Parkland	Previously disturbed areas
	Sensitivity	Would not recover	Significant change to ecosystem function	Moderate change to ecosystem function	Would recover with some changes	Would recover completely
Social	Number of people	Loss of life	Large number of people directly impacted	Several people directly impacted, or many indirectly	Some people directly impacted, or many indirectly	Some people indirectly affected
	Heritage considerations	Major degree of impact on place(s) or object(s) with an exceptional	Major degree of impact on significant place(s) or object(s) with	Substantial degree of impact on significant place(s) or	Impact on place(s) or object(s) with limited levels of	Impact on place(s) or object(s) assessed below

Consequence		Catastrophic	Major	Moderate	Minor	Minimal
		level of significance	a high level of significance	object(s)	significance, or, minor impact to significant place(s) or object(s)	significance threshold
Economic	General	Several million dollars in lost revenue or remediation costs	A million dollars in lost revenue or remediation costs	Half a million dollars in lost revenue or remediation costs	Several thousands of dollars on lost revenue or remediation costs	Minimal losses
	Financial / business costs	\$10,000,000	<\$10,000,000	<\$1,000,000	<\$100,000	No loss

7.1.3 Risk assessment matrix

Based on the assessment of likelihood and consequence (as described above), foreseeable impacts can be assigned a risk rating. Table 7-3 summarises the risk assessment.

Table 7-3 Risk assessment matrix

	Consequence				
Likelihood	Catastrophic	Major	Moderate	Minor	Minimal
Almost Certain	Significant	Significant	Very high	High	Medium
Likely	Significant	Very high	High	Medium	Low
Possible	Very high	High	Medium	Low	Very low
Unlikely	High	Medium	Low	Very low	Negligible
Remote	Medium	Low	Very low	Negligible	Negligible

7.2 Potential impacts

Table 7-4 shows the results of the environmental risk assessment for the project. This, combined with the Director-General's requirements (which identified key issues for consideration) was used to determine the key issues for the project. These issues have been assessed in the Environmental Assessment:

- ▶ Air quality and odour
- ▶ Geotechnical
- ▶ Surface water and groundwater
- ▶ Noise
- ▶ Biodiversity (flora and fauna impacts)
- ▶ Contamination
- ▶ Waste
- ▶ Traffic and transport
- ▶ Bushfire hazard
- ▶ Dangerous and hazardous goods
- ▶ Greenhouse gas and climate change
- ▶ Heritage
- ▶ Visual amenity

Table 7-4 Environmental risk assessment

Issue	Potential Impacts	Likelihood	Consequence	Assessed risk level	Comment/response
Air quality and odour	Release of toxic gases from furnaces during operations. Dust emissions from construction activities. Odour emissions emitting from furnace towers and escaping from buildings.	Likely	Moderate	High	Dispersion of air pollutants would be considered in the design of the project. The project includes dust management/mitigation techniques during construction. Odour impacts were considered but are not likely to be significant. Air quality and odour were identified in the Director-General's requirements as a key issue and are therefore considered in the Environmental Assessment.
Soil	Disturbance of soils during construction and hence potential sediment movement. Contamination of soils.	Likely	Minor	Medium	Soils would be disturbed during construction. This would be managed by implementing a sediment and erosion control plan. The transportation and storage of hazardous materials may lead to the contamination of soil due if there are spills. Soil disturbance and contamination are therefore considered key issues and are considered in the environmental assessment.

Issue	Potential Impacts	Likelihood	Consequence	Assessed risk level	Comment/response
Surface water and ground water	Lowering groundwater levels. Contaminating surface water and groundwater.	Likely	Minor	Medium	Runoff from the hardstand areas would be directed to the designated stormwater infiltration areas. Impacts to groundwater levels are expected to be minor. Potential contamination of groundwater would be minimised by implementing an emergency spill response plan and monitoring.
Noise	Noise emissions from site activities during construction or operation exceed noise limits and affect sensitive receivers.	Possible	Moderate	Medium	Construction activities would generate noise emissions. During operation, plant and equipment would be mostly operated within buildings, but there would be additional traffic noise and some equipment noise.
Biodiversity	Effects on threatened or vulnerable species through removal of vegetation and destruction of habitat.	Likely	Moderate	High	The project would require a portion of the site to be cleared of vegetation. Some threatened species have been identified on site. Therefore the project has the potential to impact on biodiversity.
Waste	Generation of industrial waste.	Likely	Minor	Medium	Waste would be generated during both the construction and operational phases of the project.
Traffic	Increase in heavy and light vehicle traffic to the site leading to traffic impacts on local road network	Possible	Minor	Low	The project would increase heavy and light vehicle traffic to the site, but there would be minimal impact on local road networks.

Issue	Potential Impacts	Likelihood	Consequence	Assessed risk level	Comment/response
Hazards and Bushfire	Vulnerability to bushfire. Storing and transporting dangerous or hazardous goods poses a risk to people, property and the environment.	Unlikely	Moderate	Low	The project would be designed to minimise potential bushfire vulnerability. A preliminary hazard assessment has been undertaken to determine the threat of dangerous and hazardous goods.
Greenhouse gas and energy efficiency	Emissions from processing molten aluminium, and fuel and electricity use during construction and operation contributing to global warming.	Likely	Minor	Medium	Energy efficiency measures would be incorporated into the design of the new facilities where practicable.
Indigenous heritage	Disturbance of Indigenous heritage items during construction.	Unlikely	Minor	Very low	The site has been disturbed due to previous land use and does not contain any known sites of Indigenous heritage significance.
Non-Indigenous heritage	Encounter and disturb items of non-Indigenous heritage significance during construction.	Remote	Minimal	Negligible	Impacts on non-Indigenous heritage are considered unlikely due to the distance of the identified items from the project. However non-Indigenous heritage has been identified in the Director General's requirements as requiring consideration. Hence non-Indigenous impacts have been addressed in the environmental assessment.

Issue	Potential Impacts	Likelihood	Consequence	Assessed risk level	Comment/response
Visual amenity	Visibility of proposed new buildings	Possible	Minimal	Very low	The project is expected to be visible from very few external locations due to the siting of new buildings on the site. Building colours would be selected so as to blend into the landscape, and architectural design principles would be used to ensure that the buildings are visually consistent with the surroundings.
Land use and property	Detrimental change to land use of the site or surrounds.	Remote	Minor	Negligible	The project would be located within the Tomago Industrial Area and the site has been previously used for industrial purposes. There would be no direct land use impacts on adjoining properties during operation of the project.
Socio-economic	Effects on employment. Cost of infrastructure and operations.	Remote	Minor	Negligible	The project would generate around 119 jobs during operation and a peak of about 35 jobs during construction. Minor upgrades to the private access road are proposed to accommodate additional traffic loads. The project would value add to local aluminium industry by manufacturing rods and conductors.
Utilities and infrastructure provisions	Demand for utilities exceeds supply available and places a burden on existing infrastructure.	Unlikely	Minimal	Negligible	It is expected that there would be no significant impact on utilities and related infrastructure.

8. Air quality

The information presented in this chapter summarises the air quality assessment undertaken for the project by GHD and the full report is included in Appendix C.

8.1 Existing environment

8.1.1 Overview

The site is located within the Tomago Industrial Area adjacent the TAC Smelter. The largest single source of air pollutants in the area is the TAC smelter. Other industries and potential sources of impacts to local air quality in the area include chemical manufacturing facilities, such as Omega Chemicals and Minmet Operations Tomago as well as Hunter Galvanising. Motor vehicles on the surrounding road network also contribute to the ambient levels of particulate matter.

The nearest residential dwelling is located approximately 230 metres south and southeast of the site.

A number of commercial and industrial facilities also surround the site. The sensitive receptors identified for the purpose of this assessment are detailed in Table 8-1. These identified receptors have been chosen to represent the locations with the greatest potential for adverse impacts, as well as showing the effects of dispersion of air emissions over varying distances from the site. Identified receptors are shown in Figure 8.1.

Table 8-1 Identified sensitive receptors

Receptor	Receptor Type	Description	Coordinates (Easting, Northing)
R1	Residence	5 Graham Drive. 1800 metres east-northeast of the site	E 382724, N 6367829
R2	Residence	41 School Drive. 250 metres east of the site	E 381369, N 6367140
R3	Residence	29 School Drive. 230 metres south of the site	E 381199, N 6366860
R4	Residence	423 Tomago Road. TAC monitoring station. 350 metres south-southeast of the site	E 381338, N 6366782
R5	Residence	Tomago Detention Centre, 590 Tomago Road. 1100 metres west-southwest of the site	E 379977, N 6366683



Figure 8.1 Sensitive receptors in the vicinity of the site

8.1.2 Meteorological conditions

The chosen data set was a synthesised data set centred at Tomago for the calendar year 1986. This dataset was produced by GHD based on instrument measured data and is considered to be representative of meteorological conditions in the study area.

The Tomago data was validated against meteorological data obtained from the TAC automatic weather station, located within 1 km of the site. Three years of TAC data was obtained and the most complete data set was from the year 2008.

Wind speed and direction

The prevailing wind at Tomago is from the northwest quadrant. Winds from the northwest comprise 18% of annual winds, followed in frequency by winds from the west-northwest (12% of annual winds) and north-northwest (10% of annual winds). This pattern reflects the westerly synoptic flow experienced at mid-latitudes, especially for months near the time of the winter solstice. It is also a function of the Hunter Valley having a northwest-southeast orientation.

The incidence of light winds, which are related to poor emission dispersion is also highest from the northwest quadrant. Winds from the northwest comprise approximately 20% of total winds in the 0.1 – 2.0 m/s range.

There is a clear difference in wind direction between the winter and summer seasons at the site. This is reflective of increased temperatures during summer inducing a sea breeze from the south-eastern

quadrant and easterly component synoptic flows as sub-tropical ridges migrate south of the Australian continent during the peak of summer.

During the spring and autumn months the sea breeze is present, but is less frequent. The prevailing wind remains from the northwest with an increase in winds from the south-eastern quadrant as compared to winter.

Stability

Atmospheric turbulence is an important factor in plume dispersion. Turbulence acts to increase the cross-sectional area of the plume due to random motions, thus diluting or diffusing a plume.

The Pasquill/Gifford scale consists of the following six atmospheric stability classes:

- ▶ Category A - strongly unstable.
- ▶ Category B – moderately unstable.
- ▶ Category C – slightly unstable.
- ▶ Category D – neutral.
- ▶ Category E – slightly stable.
- ▶ Category F – moderately stable.

The annual and seasonal roses for the data set indicate that 32% of hours are stability category D, suggesting that there would be a relatively rapid dispersion of plume in this area. Stable Categories E and F combined comprise approximately 33% of atmospheric conditions which would result in poor dispersion.

8.1.3 Ambient air quality

Air quality in the Newcastle area meets the standard set in the National Environment Protection Measure (NEPM) for ambient air quality. Industrial, domestic and transportation sources are all significant contributors to adverse air quality in Newcastle and the surrounding areas.

The National Pollutant Inventory (NPI) holds a database of facilities and emissions to air in the Newcastle and Tomago region. A search of the NPI for a 5 kilometre radius around the site indicated that there are five reporting facilities in the area that emit various substances including Volatile Organic Compounds (VOCs), particulate matter (dust), carbon monoxide (CO), sulfur dioxides (SO₂), oxides of nitrogen (NO_x) and hydrogen fluoride (HF).

The largest single source of pollutants near the site is the TAC Smelter. Aluminium smelters typically have significant fluoride and sulfur dioxide emissions. An environmental buffer zone has been established around the smelter which is a special environmental management zone where ambient levels of pollutants may be above OEH guideline values. The buffer zone boundaries lie at a radius of approximately 2 km to 4 km from the centre of the smelter. The site and many sensitive receptors lie within this buffer zone. Residential properties within the buffer zone have been included when assessing air quality impacts from the project.

To develop an understanding of the existing air quality in the locality, a variety of ambient air monitoring data has been referenced. The expected emissions to air during the project include CO, NO_x, SO₂, particulate matter and VOCs. Ambient air monitoring data for these pollutants has been sourced from the NSW OEH ambient air monitoring database and also from compliance monitoring by TAC.

NSW OEH monitoring

The NSW OEH operates an ambient air quality monitoring station at Lawson Avenue, Beresfield. The Beresfield monitoring station is located approximately 6 km northwest of the Tomago site and collects data for ambient PM₁₀, NO₂, and SO₂ which are relevant to this study.

Figure 8.2 and Figure 8.3 display the 1-hour maximum NO₂ and SO₂ concentrations at Beresfield throughout 2009 and 2010. There were no exceedances of the NO₂ or SO₂ 1-hour OEH criteria throughout this time period.

Figure 8.4 presents the 24-hour average PM₁₀ concentrations for Beresfield during 2009 and 2010. The data is presented without anomalous concentration levels likely to be caused during events such as bushfires or dust storms (e.g. September 2009 recorded a 24-hour PM₁₀ concentration of 1999 µg/m³) to provide more representative ambient PM₁₀ levels. Excluding anomalous data, the highest 24-hour average concentration is 41 µg/m³ and the annual average is 22 µg/m³.

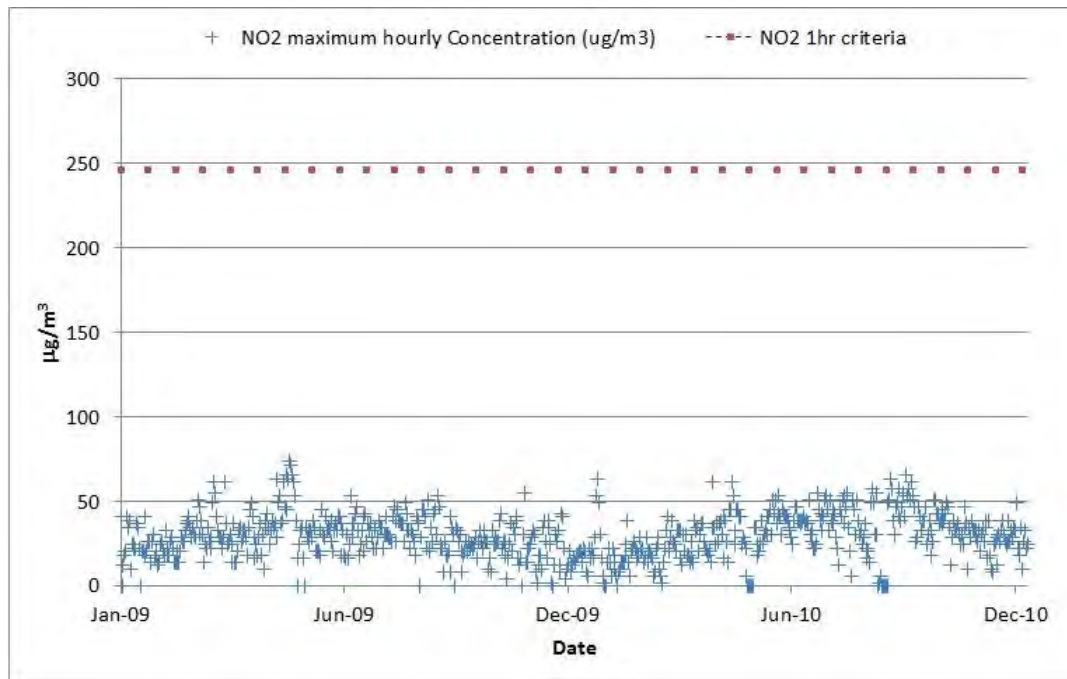


Figure 8.2 Beresfield 1-hour maximum NO₂ ambient air data

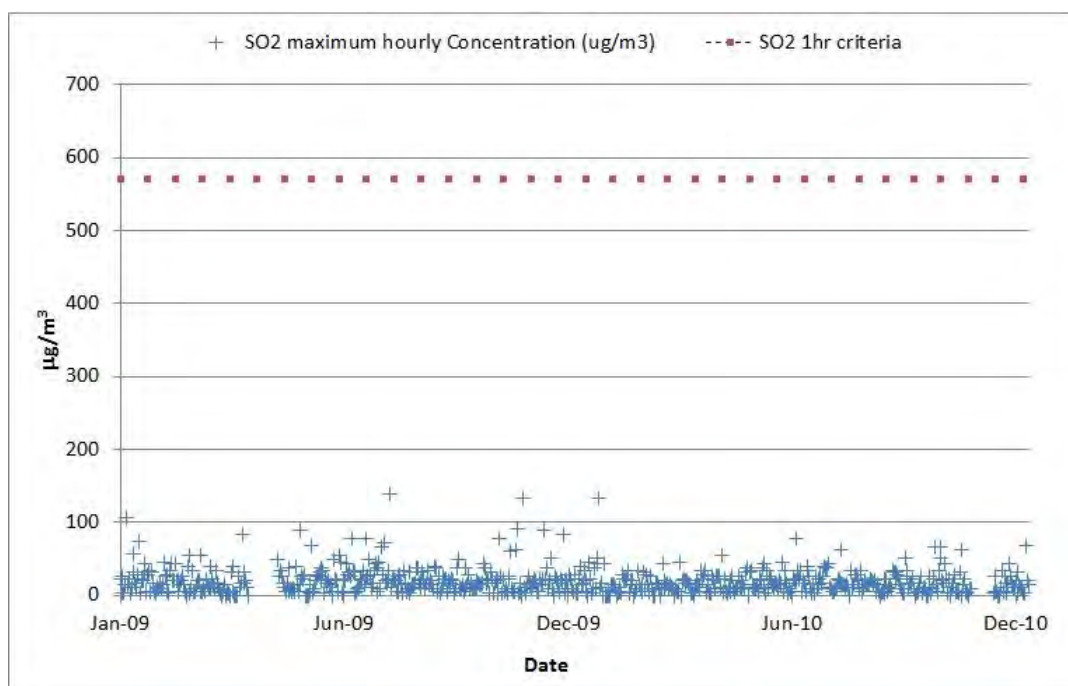


Figure 8.3 Beresfield 1-hour maximum SO₂ ambient air data

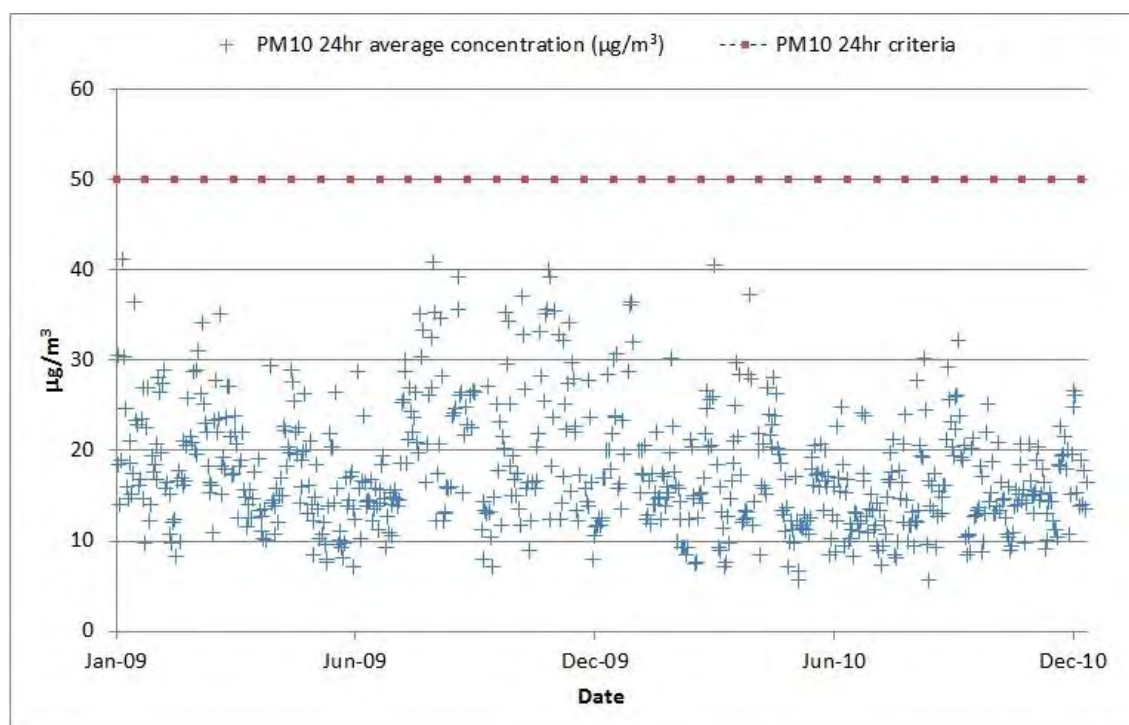


Figure 8.4 Beresfield 24-hour average PM₁₀ ambient air data (anomalies removed)

8.1.4 TAC air monitoring

Ambient concentrations of fluoride and SO₂ are monitored by TAC in the area surrounding the smelter. TAC operates eight sites to monitor fluoride and results are compared to the ANZECC guidelines in the *Approved Methods* (refer to Table 8-2). Generally, the levels of fluoride complied with the recommended guidelines; however two of the monitoring sites (site 84 and 181) have recorded short-term fluoride concentration levels that exceeded the ANZECC guidelines. Both of these sites are located well inside the industrial buffer zone around TAC, which was established in recognition that some locations would experience fluoride levels in excess of the guidelines. Fluoride emissions are associated with the aluminium smelting process and are not expected to be an emission from the cable manufacturing plant.

TAC monitors SO₂ levels in the vicinity of the smelter. SO₂ monitoring was undertaken at two sites during 2009 and since then monitoring has commenced at a further three sites. The most applicable sites for this assessment are 41 School Drive and 'Tomago Farm', Tomago. A location map of the monitoring sites is shown in Appendix A of the air quality report (Appendix C).

Monitoring results are summarised in Figure 8.5 and Figure 8.6 and the results indicate that the 1-hour and 24-hour SO₂ concentration criteria are exceeded on a number of occasions. Analysis of weather conditions indicate that these exceedances occurred during periods of persistent west and north-west winds.

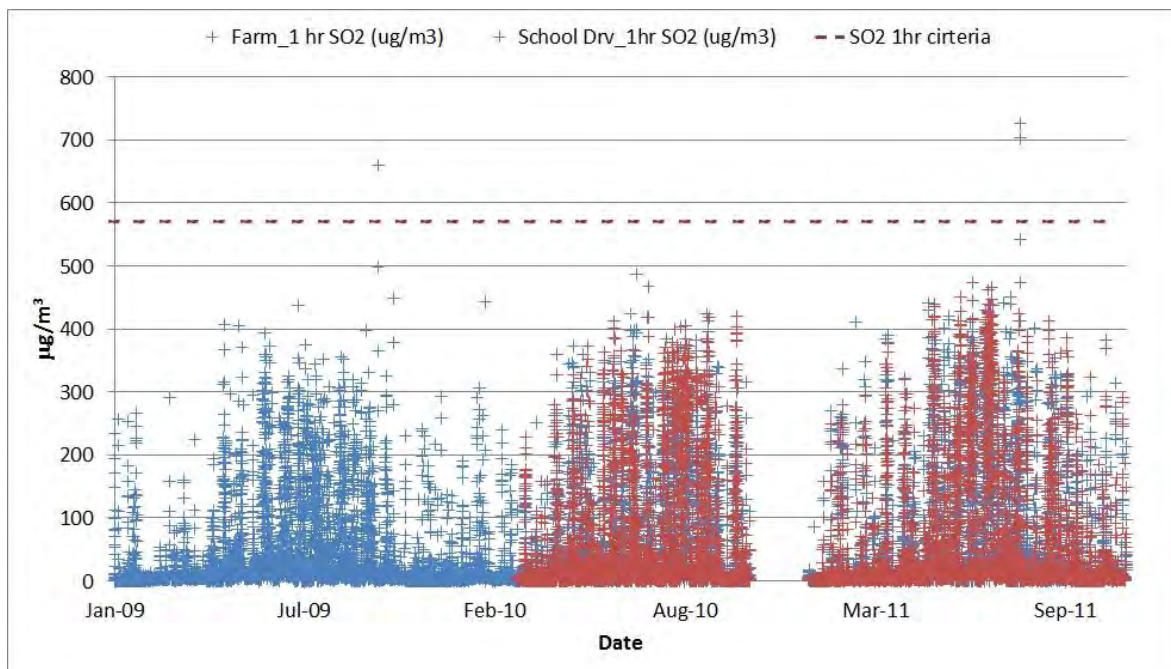


Figure 8.5 TAC 1-hour SO₂ concentration levels 2009 – 2011

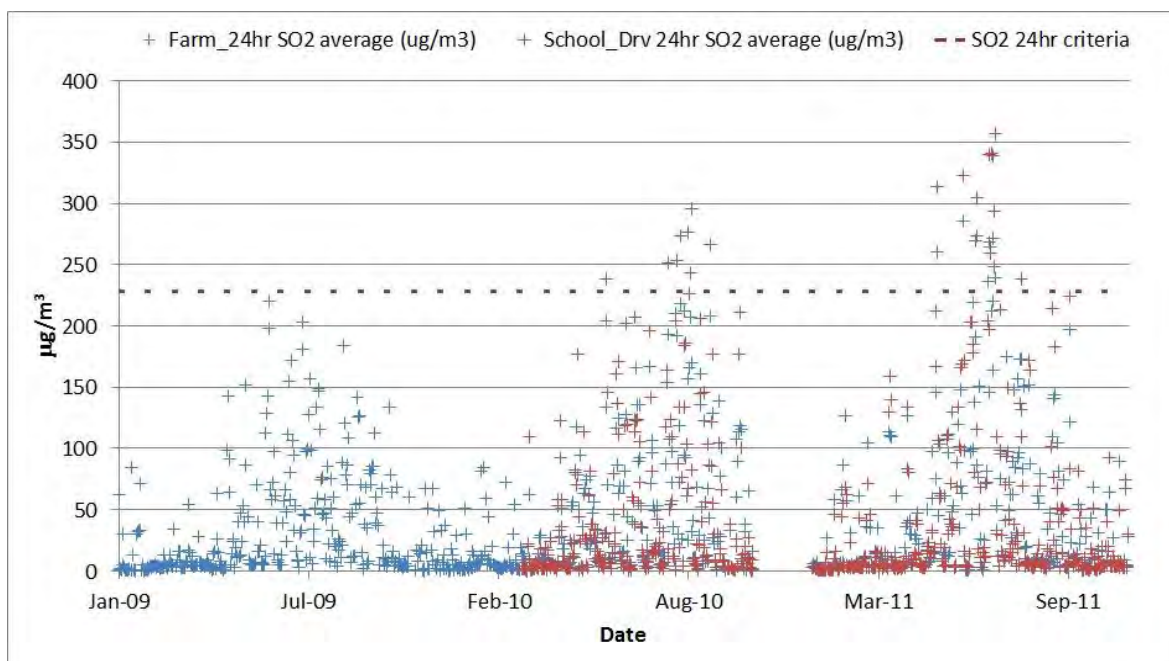


Figure 8.6 TAC 24-hour average SO₂ concentration levels 2009 – 2011

8.2 Air quality goals

Air quality impact assessment criteria are prescribed within the NSW *Approved Methods*. The *Approved Methods* largely adopt the air pollution standards set by the National Environment Protection Council (NEPC) for ambient air quality.

To ensure the environmental outcomes are achieved, emissions from a premise have been assessed against the criteria in Table 8-2. The impacts of each pollutant must be combined with the existing background level before comparison against the relevant impact assessment criteria.

Table 8-2 Assessment criteria for air quality

Pollutant	Averaging Period	Concentration		Source
		pphm ⁽¹⁾	µg/m ³	
Sulfur dioxide (SO ₂)	10 minutes	25	712	NHMRC (1996)
	1 hour	20	570	NEPC (1998)
	24 hours	8	228	NEPC (1998)
	Annual	2	60	NEPC (1998)
Nitrogen dioxide (NO ₂)	1 hour	12	246	NEPC (1998)
	Annual	3	62	NEPC (1998)
Ozone (O ₃)	1 hour	10	214	NEPC (1998)
	4 hour	8	171	NEPC (1998)

Pollutant	Averaging Period	Concentration		Source
		pphm ⁽¹⁾	µg/m ³	
Lead (Pb)	Annual	-	0.5	NEPC (1998)
PM ₁₀	24 hours	-	50	NEPC (1998)
	Annual	-	30	EPA (1998)
TSP	Annual	-	90	NHMRC (1996)
		g/m ² /month ⁽²⁾	g/m ² /month	
Deposited dust	Annual	2	4	NERDDC (1998)
		ppm	mg/m ³	
Carbon monoxide (CO)	15 minutes	87	100	WHO (2000)
	1 hour	25	30	WHO (2000)
	8 hours	9	10	NEPC (1998)
		µg/m ³ ⁽³⁾	µg/m ³ ⁽⁴⁾	
Hydrogen fluoride (HF)	90 days	0.5	0.25	ANZECC (1990)
	30 days	0.84	0.4	ANZECC (1990)
	7 days	1.7	0.8	ANZECC (1990)
	24 hours	2.9	1.5	ANZECC (1990)
		ppm ⁽⁶⁾	µg/m ³ ⁽⁷⁾	
Polycyclic aromatic hydrocarbons (as benzo[a]pyrene) ⁽⁵⁾	1 hour	NA	0.4	Victorian Government Gazette 2001
Benzene	1 hour	0.009	29	Victorian Government Gazette 2001 (health)
Toluene	1 hour	0.09	0.36	Victorian Government Gazette 2001 (odour)
Ethyl benzene	1 hour	1.8	8000	Victorian Government Gazette 2001 (health)

Pollutant	Averaging Period	Concentration		Source
		pphm ⁽¹⁾	µg/m ³	
Xylenes	1 hour	0.04	0.19	Victorian Government Gazette 2001 (odour)

(1) Parts per hundred million (pphm).

(2) Maximum Increment. Maximum cumulative impact of 4 g/m²/month.

(3) General land use, which includes all areas other than specialised land use.

(4) Specialised land use, which includes all areas with vegetation sensitive to fluoride.

(5) PAHs should be assessed as toxic equivalents of benzo(a)pyrene.

(6) For toxicants units are ppm.

(7) For toxicants units are µg/m³.

8.3 Methodology

Atmospheric dispersion modelling was conducted AUSPLUME Version 6.0 to predict the maximum ground level concentrations resulting from emissions to air from the project. The predicted ground level concentrations were then assessed against the relevant criteria.

8.3.1 Emissions inventory

The emissions inventory for the site is focused on emission sources during the process operations, such as holding of molten aluminium, rolling, wire drawing and wire stranding as well as emissions from the combustion of natural gas used to power the furnaces and ovens.

Molten aluminium product would be supplied to the project in crucibles via a haul road linking the site to the adjacent TAC smelter. Fluoride and silicate emissions from aluminium manufacturing typically occur during the reduction process which would occur solely within the smelter. Therefore, fluoride and silicate emissions from the project have been assumed to be negligible for the purpose of this assessment.

The total mass emission rates for metal fume and natural gas emissions are summarised in Table 8-3. These mass emission rates represent the worst-case emissions from the plant, based on the highest in-stack concentrations provided in the test reports from the Bahrain facility. These mass emission rates have been used as input to the plume dispersion model. Appendix C discusses the components of the emission inventory.

Table 8-3 Mass emission rates – metal fume plus natural gas

Activity	Source	Pollutants – mass emission rates				
		CO	NO _x	SO ₂	PM ₁₀	VOC
		kg/hr	kg/hr	kg/hr	kg/hr	kg/hr
Normal operations	Holding furnaces	2.10	1.61	0.07	0.19	0.14
Normal operations	Tilting furnaces	0.77	0.48	0.04	0.06	0.04

Activity	Source	Pollutants – mass emission rates				
		CO	NO _x	SO ₂	PM ₁₀	VOC
		kg/hr	kg/hr	kg/hr	kg/hr	kg/hr
Normal operations	Ovens	0.01	0.01	0.0009	0.001	0.0007
Normal operations	Rolling mill	0.0002	0	0	0.0003	0.002
Degassing	Holding furnace	2.12	1.64	0.08	0.29	0.15
Degassing	Titling furnace	0.79	0.49	0.05	0.08	0.05

Particulate matter emissions from vehicle movements within the site should be negligible compared to both the stack emissions and the (paved road) emission source of the nearby Tomago Road. Emissions from vehicle exhausts should also be negligible given the limited number of movements and separation distance to the nearest receptors. Fugitive vehicle emissions have not been considered in the dispersion modelling and assessment of impacts but a discussion on this aspect is included as Appendix C.

8.4 Impact assessment

8.4.1 Construction

The main potential source of dust would be that generated during construction, mainly as a result of earthworks. There are a number of activities involved in this process including:

- Clearing vegetation, rock and soil material
- Pneumatic rock-breaking, if required
- Loading and dumping cleared material
- Levelling and grading disturbed soil surfaces
- Passage of construction and administrative vehicles over unsealed sections of road or localised unconsolidated soil surfaces
- Haul truck movements for the delivery and installation of plant items
- Wind erosion of unstable/uncovered stockpiles and other surfaces.

The use of a water cart onsite during the construction phase would reduce these emissions substantially.

The transport and dispersion of the dust emissions during the site preparation would be influenced by prevailing wind that would alter both diurnally and seasonally.

Vehicle exhaust emissions during the project have the potential to impact on air quality. This impact is likely to be negligible given the short time period and limited number of vehicles.

Given the nature of the proposed activities, the application of standard mitigation measures to reduce dust generation is expected to provide adequate protection to the nearest residences.

8.4.2 Operation

A Level 2 impact assessment was undertaken for the project with consideration to the NSW *Approved Methods*. The sections below assess the predicted GLCs against the adopted air quality goals for the individual pollutants relevant to the project.

Air quality impacts from the project have been predicted for normal operations ('normal') and de-gassing operations ('de-gassing'). Due to model limitations and for conservatism, de-gassing emissions were assumed to occur continuously for the 'de-gassing' model run. This is highly conservative given that de-gassing operations are expected to occur for approximately 10 minutes every 3 hours.

Typical background concentration levels of NO₂, SO₂ and PM₁₀ were added to the predicted incremental impacts before comparison with the adopted criteria. There was no background air quality data available for CO.

Carbon monoxide (CO)

Predicted off-site CO concentrations from the cable manufacturing plant emissions were assessed against OEH criteria, and the results are given in Table 8-4. Predicted 15-minute, 1-hour and 8-hour average incremental impacts of CO were found to be at least an order of magnitude below the OEH criteria at all nearby sensitive receptors. It is therefore considered that the CO levels generated by the project would not impact on the local amenity. With negligible incremental impact, it is also considered that the cumulative impact (incremental plus background) will comply with OEH criteria.

Table 8-4 Impact assessment criteria and predicted concentration levels of CO (with percentage of assessment criterion)

Receptor	Averaging Period	Criterion (mg/m ³)	Maximum Predicted Concentration (mg/m ³)	
			Normal	De-gassing
R1	15 minutes	100	0.08 (<0.1%)	0.08 (<0.1%)
	1 hour	30	0.06 (<0.1%)	0.06 (<0.1%)
	8 hour	10	0.01 (<0.1%)	0.01 (<0.1%)
R2	15 minutes	100	0.19 (<0.1%)	0.19 (<0.1%)
	1 hour	30	0.17 (0.6%)	0.17 (0.6%)
	8 hour	10	0.11 (1.1%)	0.11 (1.1%)
R3	15 minutes	100	0.18 (<0.1%)	0.18 (<0.1%)
	1 hour	30	0.16 (0.5%)	0.16 (0.5%)
	8 hour	10	0.11 (1.1%)	0.11 (1.1%)
R4	15 minutes	100	0.15 (<0.1%)	0.15 (<0.1%)
	1 hour	30	0.13 (<0.1%)	0.13 (<0.1%)
	8 hour	10	0.07 (1.1%)	0.07 (1.1%)

Receptor	Averaging Period	Criterion (mg/m ³)	Maximum Predicted Concentration (mg/m ³)	
			Normal	De-gassing
R5	15 minutes	100	0.12 (<0.1%)	0.12 (<0.1%)
	1 hour	30	0.10 (<0.1%)	0.10 (<0.1%)
	8 hour	10	0.02 (<0.1%)	0.02 (<0.1%)

Nitrogen dioxide (NO₂)

The testing reports provided from the Bahrain facility note mixtures of NO, NO₂ and NO_x emissions from some sources. Where NO and NO₂ concentrations were provided, both were included in the total NO₂ assessment. The OEH outlines various methods for assessing the oxidation of NO to NO₂ in the atmosphere. As a conservative measure it was assumed 100% conversion of NO_x to NO₂.

Table 8-5 shows the predicted incremental NO₂ concentrations for 1-hour average and annual average periods at each of the identified receptors. De-gassing operations have been included in the annual average predictions.

Table 8-5 Maximum predicted NO₂ GLCs (µg/m³) (with percentage of assessment criterion)

Receptor	Averaging Period	Incremental Impact		Adopted Background	Highest Cumulative Impact	Criterion
		Normal	De-gassing			
R1	1 hour	32 (13%)	33 (13%)	74 ⁽¹⁾	107 (43%)	246
	Annual	-	<1 (2%)	2 ⁽²⁾	<3 (5%)	62
R2	1 hour	99 (40%)	100 (41%)	74	174 (71%)	246
	Annual	-	5 (8%)	2	7 (11%)	62
R3	1 hour	98 (40%)	100 (41%)	74	174 (71%)	246
	Annual	-	5 (8%)	2	7 (11%)	62
R4	1 hour	83 (34%)	84 (34%)	74	158 (64%)	246
	Annual	-	4 (6%)	2	6 (10%)	62
R5	1 hour	55 (22%)	56 (23%)	74	130 (53%)	246
	Annual	-	<1 (2%)	2	<3 (5%)	62

(1) Taken as the maximum 1-hour concentration throughout 2009 and 2010 at Beresfield.

(2) The annual average throughout 2009 and 2010 – based on 24 hour average levels.

Predicted 1-hour and annual average cumulative impacts of NO₂ were found to be less than the OEH assessment criteria at all nearby sensitive receptors. It is considered that the NO₂ levels generated by the project would not impact on the local amenity.

The maximum predicted GLCs were highest at Receptors 2 and 3, where predicted incremental concentrations were approximately 41% of the OEH 1-hour criterion. When this increment is combined with the adopted background level the resultant impact is approximately 71% of the impact assessment criterion. These results are based on conservative assumptions with highest hourly background concentration level adopted and 100% conversion of NO_x to NO₂ assumed for the tilting furnaces and natural gas combustion.

The neighbouring TAC smelter contains a significant source of NO_x emissions in the bake ovens. The adopted background levels taken from the Beresfield station do not account for this emission source as the ambient monitoring site is more than 5 km distance from the source. No other ambient air monitoring data was available for NO_x in the area as TAC are only required to perform fluoride and SO₂ monitoring for licence compliance purposes. Air quality assessments from the TAC smelter do not generally identify NO_x as a significant emission and have not identified any exceedances of the OEH criterion. Therefore, given that the highest incremental impact from the project is 41% of the 1-hour criterion, it is unlikely that additional (if any) cumulative impacts will occur.

Sulfur dioxide (SO₂)

Predicted incremental SO₂ concentration levels at the nearest sensitive receptors are shown in Table 8-6. De-gassing operations have been included in the annual average predictions. The maximum predicted GLCs of SO₂ from the project alone are well below the OEH impact assessment criteria, with the maximum 1-hour average concentration level during de-gassing operations being less than 2% of the OEH criterion. Daily (24-hour) and annual average incremental impacts are also shown to be a fraction of the OEH criteria.

Table 8-6 Maximum predicted SO₂ GLCs (µg/m³) (with percentage of assessment criterion)

Receptor	Averaging period	Incremental impact		Criterion
		Normal	De-gassing	
R1	10 minute	3.8 (0.5%)	4.5 (0.6%)	712
	1 hour	2.8 (0.5%)	3.3 (0.6%)	570
	24 hour	0.2 (0.1%)	0.2 (0.1%)	228
	Annual	-	<0.1 (0.2%)	60
R2	10 minute	8.3 (1.2%)	9.8 (1.4%)	712
	1 hour	7.3 (1.3%)	8.7 (1.5%)	570
	24 hour	2.0 (0.9%)	2.4 (1%)	228
	Annual	-	0.3 (0.5%)	60
R3	10 minute	7.8 (1.1%)	9.3 (1.3%)	712
	1 hour	6.7 (1.2%)	8.0 (1.4%)	570
	24 hour	2.1 (0.9%)	2.5 (1.1%)	228

Receptor	Averaging period	Incremental impact		Criterion
		Normal	De-gassing	
	Annual	-	0.4 (0.7%)	60
R4	10 minute	6.6 (0.9%)	7.9 (1.1%)	712
	1 hour	5.5 (1%)	6.5 (1.1%)	570
	24 hour	1.3 (0.6%)	1.6 (0.7%)	228
	Annual	-	0.4 (0.7%)	60
R5	10 minute	5.4 (0.8%)	6.5 (0.9%)	712
	1 hour	4.2 (0.7%)	5.0 (0.9%)	570
	24 hour	0.5 (0.2%)	0.5 (0.2%)	228
	Annual	-	<0.1 (0.2%)	60

Cumulative SO₂ emissions

The maximum incremental 1-hour SO₂ impact from the project was predicted to be less than 2% of the OEH criteria. To assess the cumulative impacts of SO₂ emissions, the predicted incremental impacts were added to the corresponding measured background concentration from the most representative monitoring location. The assessment of cumulative impacts is made to determine if the operation of the project would result in any additional exceedances of the SO₂ assessment criteria.

The cumulative impact assessment has been undertaken for the most impacted sensitive receptor over a 1-hour averaging period, being Receptor 2. Table 8-7 shows the ten highest measured 1-hour SO₂ concentrations with the corresponding predicted incremental impact for the project. Measured SO₂ concentrations have been taken from the highest readings at the School Drive and Tomago Farm monitoring stations throughout the time period of January 2009 to September 2011. Both these stations are located within the vicinity of Receptor 2.

Incremental impacts from the project were predicted using meteorological data files generated from the TAC weather station data corresponding to the day and time of the highest background SO₂ measurements.

The location of the existing TAC smelter and the project relative to Receptor 2 means that maximum impact from each facility may occur under similar weather conditions. That is, relative to Receptor 2, both sources are aligned in the same direction. Maximum impact at Receptor 2 from each of the two sources (TAC smelter and project) was found to occur under northwest and west-northwest winds.

The results in Table 8-7 indicate that the addition of the incremental impact from the project does not cause additional exceedances of the OEH 1-hour average SO₂ criteria. This methodology is consistent with the Approved Methods guidance in dealing with elevated background concentrations (section 5.1.3, *Approved Methods*) for when existing ambient concentrations already exceed the impact assessment criterion.

Table 8-7 1-hour SO₂ impact and background – Receiver 2

Date, timer	SO ₂ 1-hour average (µg/m ³)			OEH criteria
	Highest background	Predicted increment	Total	
12/08/2011, 5:00	725	0.3	725.3	570
12/08/2011, 3:00	703	2.5	705.5	570
5/10/2009, 22:00	659	3.5	662.5	570
12/08/2011, 4:00	542	0	542	570
5/10/2009, 21:00	498	0	498	570
4/07/2010, 8:00	486	0.04	486	570
23/06/2011, 1:00	473	2.1	475.1	570
12/08/2011, 6:00	473	0.7	473.7	570
17/07/2010, 10:00	467	0.2	467.2	570
13/07/2011, 7:00	465	0.01	465	570

The maximum predicted 24-hour SO₂ impact from the project was predicted to be approximately 1% of the OEH criteria. TAC SO₂ monitoring results from the School Drive and Tomago Farm stations indicated that there were 8 days in 2010 and 19 days in 2011 where the 24-hour SO₂ concentration was higher than the OEH criteria of 228 µg/m³. The next highest background concentration levels were 226.3 µg/m³ on 25/08/2010 and 224.6 µg/m³ on 30/09/2011, both at School Drive. These concentration levels were found to occur under consistent light winds from the west-northwest, which are the same weather conditions that were found to cause the maximum predicted incremental concentration of 2.5 µg/m³ from the project. Therefore, the addition of these levels (226.3 + 2.5 = 228.8 µg/m³) would cause one additional exceedance of the 24-hour SO₂ criterion. At 0.8 µg/m³, the exceedance is marginal with the overwhelming contribution from the TAC smelter. Figure 8.7 shows the incremental contribution against the 25 highest background SO₂ levels recorded at the Tomago Farm and School Drive monitoring stations during 2011 so far. It can be seen that the incremental impact from the project is insignificant compared to the existing measured levels. Based on the 2011 SO₂ monitoring data and the maximum predicted incremental impact, there would not be an additional exceedance of the 24-hour criterion.

If the measured background level is very close to the criterion, it is possible that an additional exceedance of the 24-hour SO₂ criterion may occur from the operations of the project. However, this conclusion should be viewed in the context that the maximum incremental contribution from the project over a 24-hour period is approximately 1% of the OEH criterion. The remaining background concentration levels are primarily made up of emissions from the TAC smelter. Therefore, the incremental impact from the project is considered to be very minor.

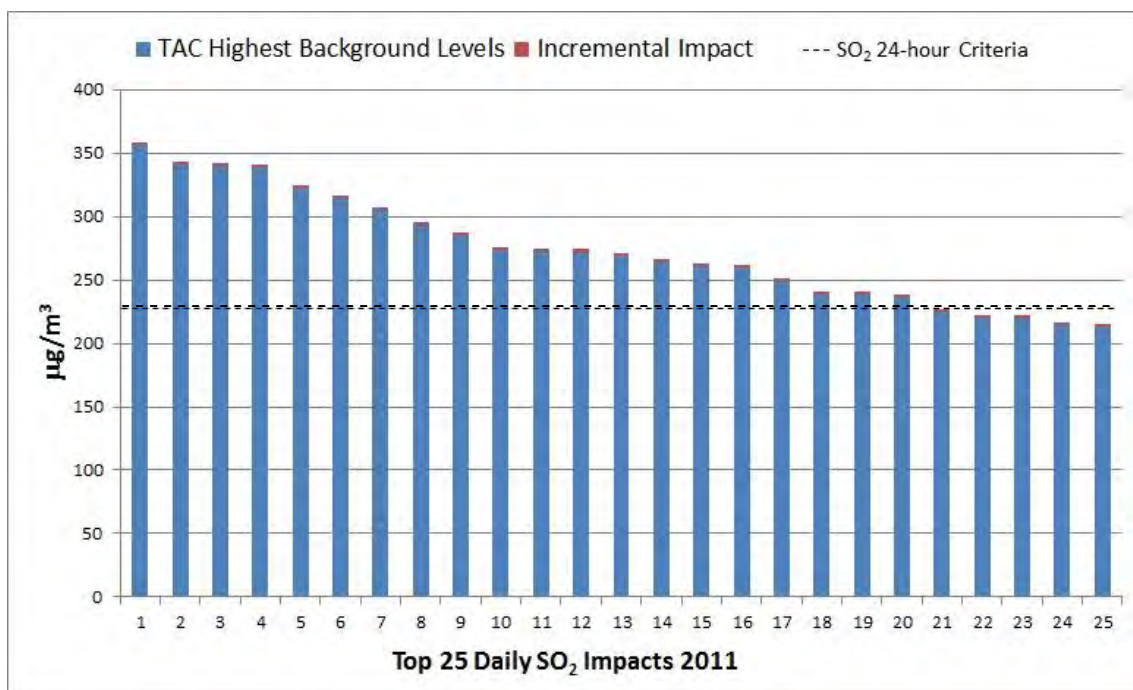


Figure 8.7 24-hour cumulative SO₂ impacts, 2011

VOCs

VOC emissions from the project are primarily produced from the combustion of natural gas, with a small proportion from the metal fume. As the breakdown of VOCs within the metal fume was unknown, propane was adopted as a surrogate for conversion from ppm to mg/m³. The total VOC's were then used as input to the dispersion model. The United States Environment Protection Agency's SPECIATE Version 3.2¹ model identifies the VOC speciation for combustion of natural gas.

Table 8-8 shows the breakdown of VOCs from combustion of natural gas and the OEH criteria for each species. Conservative estimates of the emissions have been made during de-gassing operations.

Table 8-8 Total VOC breakdown from natural gas combustion

Species	Weight per cent	OEH criteria 1-hour (mg/m ³)
Benzene	4	0.029
Cyclohexane	1	0.26
Formaldehyde	8	0.02
N-pentane	6	33
Toluene	2	0.36

Table 8-9 displays the predicted 1-hour incremental concentration levels for total VOC's at the identified receptors. If all of this combined VOC emission is modelled as benzene, it can be conservatively compared to the assessment criterion. Predicted model results indicated a maximum 1-hour average concentration level of total VOCs at Receptor 3 (the most affected receptor) to be 0.011 mg/m³. This value is approximately half of any of the OEH criteria, suggesting compliance of all VOC species. Therefore, it is considered that the levels of VOC emissions generated by the project would not impact on the local environment.

Table 8-9 Maximum Predicted 1-hour VOC impact

Receptor	Predicted 1-hour Incremental Impact (mg/m ³)	
	Normal	De-gassing
R1	0.003	0.003
R2	0.009	0.010
R3	0.009	0.011
R4	0.007	0.008
R5	0.005	0.005

Particulate matter (PM₁₀)

Table 8-10 shows the predicted incremental impact for 24-hour average and annual average PM₁₀ at each of the identified receptors. PM₁₀ emissions from the project were then added to the adopted background levels and assessed against OEH criteria. De-gassing operations have been included in the annual average predictions. Predicted concentration levels show the maximum 24-hour average PM₁₀ incremental impact to be approximately 11% of the OEH criteria. The maximum predicted GLCs of PM₁₀ indicate that the cumulative impact (incremental plus background) would comply with OEH criteria at all of the identified receptors over all time intervals.

Table 8-10 Maximum predicted PM₁₀ GLCs (with percentage assessment criterion)

Receptor	Averaging Period	Incremental Impact (µg/m ³)		Adopted Background (µg/m ³)	Cumulative Impact (µg/m ³)	Criterion (µg/m ³)
		Normal	De-gassing			
R1	24 hour	0.2 (0.4%)	0.3 (0.6%)	41	41.3 (83%)	50
	Annual	-	<0.1 (0.3%)	22	22.1 (74%)	30
R2	24 hour	3.6 (7.2%)	5.4 (10.7%)	41	46.4 (93%)	50
	Annual	-	0.6 (2.0%)	22	22.6 (75%)	30

Receptor	Averaging Period	Incremental Impact ($\mu\text{g}/\text{m}^3$)		Adopted Background ($\mu\text{g}/\text{m}^3$)	Cumulative Impact ($\mu\text{g}/\text{m}^3$)	Criterion ($\mu\text{g}/\text{m}^3$)
		Normal	De-gassing			
R3	24 hour	3.2 (6.4%)	4.7 (9.4%)	41	45.7 (91%)	50
	Annual	-	1.0 (3.3%)	22	23.0 (77%)	30
R4	24 hour	2.2 (4.5%)	3.3 (6.7%)	41	44.3 (89%)	50
	Annual	-	0.8 (2.7%)	22	22.8 (76%)	30
R5	24 hour	0.6 (1.3%)	1.0 (1.9%)	41	42.0 (84%)	50
	Annual	-	<0.1 (0.3%)	22	22.1 (74%)	30

Odorous emissions

The aluminium smelting process removes oxides and impurities from the metal. As a result, molten aluminium arriving at the manufacturing plant would have minimal levels of impurities, including sulphur compounds, and corresponding odorous emissions. Additionally, any odour from the molten material would be several orders of magnitude lower than the neighbouring smelter.

The expected air emissions from the project are NO_x , SO_2 , CO, VOCs and PM_{10} . Of the expected emissions, individual species of VOCs are the only pollutants listed in the Approved Methods as odorous. The concentration levels of individual VOCs are expected to be well below the assessment criteria. Based on the above, the impact of odorous emissions from the project is expected to be negligible.

Protection of the Environment Operations (Clean Air) Regulation 2010

In-stack pollutant concentrations have been assessed against the OEH *Protection of the Environment Operations (Clean Air) Regulation 2010*. Part 5 of the regulation applies to industries and deals with emission of air impurities from activities and plant. In particular, the Regulation:

- Sets maximum limits on emissions from activities and plant for a number of substances, including oxides of nitrogen, smoke, solid particles, chlorine, dioxins, furans and heavy metals.
- Imposes operational requirements for certain afterburners, flares, vapour recovery units and other treatment plant.
- Deals with the transport and storage of volatile organic liquids.
- Restricts the use of high sulfur liquid fuel.

Since operations would commence after September 2005, under the Clean Air Regulation, the project is classified as Group 6.

In-stack concentration levels for metal fume emissions were supplied to GHD by Midal. These were then added to the calculated emissions from natural gas combustion to give total in-stack concentration levels.

All concentration levels have been converted to a normalised basis, using a temperature conversion to a standardised 0°C.

There is no Group 6 emission limit for SO₂ for general activities or plant. The only SO₂ limit in the Clean Air Regulations applies to the manufacture of sulphuric acid exclusively. Therefore, SO₂ emissions have been excluded from the assessment against the Clean Air Regulations.

Table 8-11 summarises the predicted stack concentration levels and the Clean Air Regulation criteria. The results indicate that all emissions would be well below the assessment criteria. As emissions from burning natural gas outweigh emissions from metal fume, the de-gassing operations do not significantly increase total in-stack concentrations.

Table 8-11 Clean Air Regulation 2010 – predicted concentrations

Emission Source	In-stack Concentration (mg/m ³)		
	Solid particles (total) ²	NO ₂	VOC ³ (n-propane)
Holding furnace - normal	24	205	17
Holding furnace – de-gassing	36	208	19
Tilting furnace - normal	24	205	19
Tilting furnace – de-gassing	35	208	22
Gas oven	15	112	7
Rolling mill	3	0	23
POEO limits (mg/m³)¹	50	300	40

1. Concentration goals from Schedule 3: Standards of concentration for scheduled premises - activities and plant for specific purposes. SO₂ concentration goal taken from Schedule 4: Standards of concentration for scheduled premises – general activities and plant.

2. Based on PM₁₀ emission rate only.

3. Based on total VOCs.

8.5 Mitigation measures

8.5.1 Construction

A dust management plan would be prepared as part of the construction environmental management plan (CEMP) and would detail measures to control dust generation and reduce fugitive dust emissions, including:

- ▶ Water-down material prior to being loaded for haulage
- ▶ Aim to minimise the size of stockpiles
- ▶ Limit cleared areas of land and clear only when necessary
- ▶ Control on-site traffic by designating specific routes for haulage and access and limiting vehicle speeds to below 25km/h. Water sprays would also be used on unsealed roads where appropriate.

- ▶ All trucks hauling material would be covered before exiting the site and would maintain a reasonable amount of vertical space between the top of the load and top of the trailer.
- ▶ Excavation in soil with low moisture content would be suspended during high wind speed events or water sprays would be used to control dust.

8.5.2 Operation

As off-site impacts are expected to comply with OEH emission criteria at all identified receptors, additional operational mitigation measures are not proposed.

If approved, the project would be issued with an EPL which would likely require emissions from the site to be monitored on a regular basis. Stack testing monitoring may initially be required once or twice per year. If it is demonstrated that the plant is always under the EPL limits, the monitoring requirements may be reduced or ceased after a few years, subject to agreement with the EPA.

9. Surface water and groundwater

This chapter provides information on the existing surface water and groundwater environment of the site and the potential impacts from the project. The site water and groundwater assessment report is included in Appendix D.

9.1 Existing environment

9.1.1 Site water environment

The site is serviced by Hunter Water Corporation (HWC). HWC assets in the area include a 500 mm trunk water main that runs parallel to Tomago Road and a 150 mm diameter line that services McIntyre Road and the site. There are no existing water users at the site.

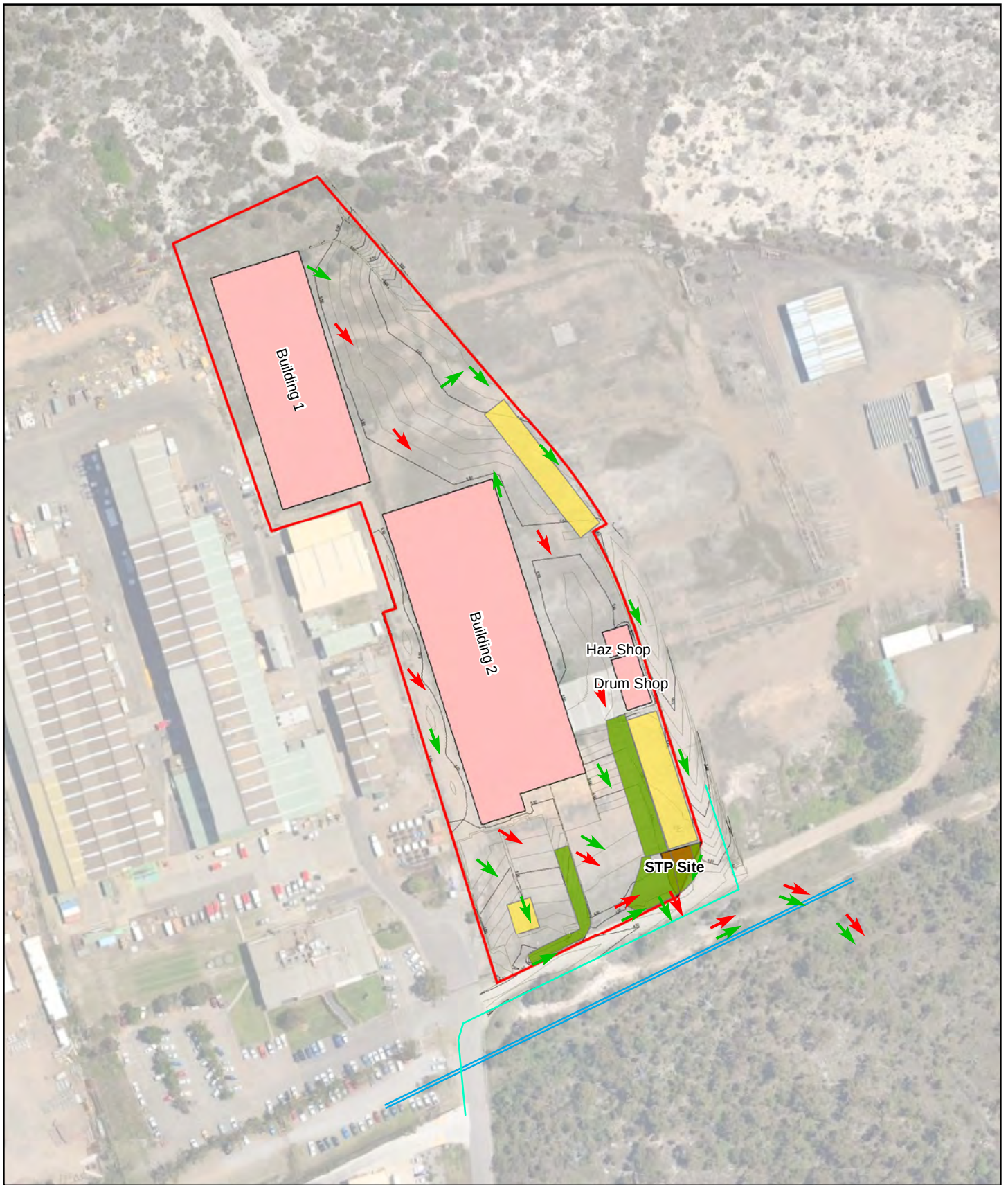
There are no sewer provisions servicing the site. The closest reticulated sewer system is currently under construction and would be located 6.8 km away at the corner of Tomago Road and Cabbage Tree Road. Surrounding industries including the TAC smelter rely on package treatment plants, septic systems, pump out and infiltration systems to dispose of sewage.

9.1.2 Surface water and hydrology environment

A site visit conducted on the 6 June 2011 confirmed that there are no water bodies, water courses or riparian vegetation on, or adjacent to, the site. Port Stephens Council Flood Prone Land Maps indicate that the site is not flood prone land.

Around 20% of the site is impervious due to hardstand areas being present, while the rest of the site is comprised of a deep sand/soil underlay. It is anticipated that very little overland flow occurs across the site. There is no evidence to suggest that significant stormwater flows occur on or in proximity to the site.

Figure 9.1 illustrates the current approximate stormwater path traversing the site. Site inspections identified a shallow stormwater channel and a damaged culvert on the southern boundary of the site. The soil and vegetation in the culvert and channel showed little evidence of recent stormwater flows.



LEGEND



Stormwater Flow Existing



Stormwater Flow Proposed

Water Services

— WATER MAIN 1350 DIA

— WATER MAIN 150 DIA

Approximate Sub Surface Irrigation Zones

Approximate Infiltration Zones

Package Sewage Treatment Plant (STP) Site

Building Footprints

Design Surface Contours

— Contour Major

— Contour Minor

1:2,000 Paper Size A4

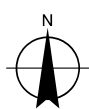
0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment
Water, Stormwater & Sewer Layout
Existing & Proposed

Job Number 22-1528031
Revision 4
Date 22 Dec 2011

Figure 9.1

G:\22\15280\GIS\Maps\Working\22_15280_01_StormwaterDrainage_RevA.mxd

Level 3, 24 Honeysuckle Drive, Newcastle NSW 2300, Australia T 61 2 4979 9999 F 61 2 4979 9988 E nfmil@ghd.com W www.ghd.com

© 2011. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:mabarnier

9.1.3 Groundwater environment

The site is situated near the south western extent of the Quarternary unconsolidated sand deposit known as the Tomago Sandbeds that are characterised by fine to medium grain sand comprising beach, dune and shelly deposits. The Tomago Sandbeds cover an area of approximately 152 km².

The sand at the site is approximately 15 to 20 m thick and underlain by unconsolidated clay (Medowie Clay) up to 30 m thick. The thickness of the sand reduces in a westerly direction towards a bedrock outcrop of the Permian Tomago Coal Measures, approximately 1.2 km west of the site.

The Tomago Sandbeds are a shallow unconfined groundwater source that provides approximately 20% of the Lower Hunter's drinking water supply. The hydraulic conductivity is understood to range between 10 and 20 m/d. The underlying Meadowie Clay is relatively impermeable.

A groundwater divide is identified within the sand aquifer to the north of the site, oriented in an east-north-east to west-south-west direction. Groundwater in the vicinity of the site flows in a southerly direction from the divide and discharges into the Hunter River.

Groundwater recharge occurs primarily by direct rainfall infiltration and varies both spatially and temporally between 20% and 80% of average annual rainfall.

9.1.4 Rainfall analysis

Historical daily rainfall data from Raymond Terrace (Bureau of Meteorology station number 61031) was used to assess precipitation levels at the site. From this data, an Accumulative Residual Rainfall (ARR) graph was produced and is presented in Figure 9.2.



Figure 9.2 Accumulated annual residual rainfall for Raymond Terrace BOM station no. 61031

9.1.5 Groundwater elevation

Groundwater elevation data reported over the period January 2005 to December 2010 at TAC monitoring bores and one HWC bore in the vicinity of the site is presented in the site water and groundwater assessment report (Appendix D). Over this period, groundwater elevations have generally ranged from approximately 3 m to 5 m AHD in close proximity to the site (based on data for bores 254, 255, 256 and

312) while groundwater elevations along the groundwater divide to the north and northeast of the site have ranged from approximately 4 m to 6 m AHD (based on data for bores SK3499, 219, 220 and 221). Based on available data, the hydraulic gradient in the vicinity of the site is typically 0.002. Assuming a horizontal hydraulic conductivity of 10m/d and effective porosity of 0.3, the horizontal groundwater velocity in the vicinity of the project site is 0.067m/d or 24m/year.

Temporal change in groundwater elevation appears to closely reflect the change in ARR.

Based on the ARR graph, it was considered that March 2005 groundwater levels adequately represent steady state conditions for the area because the ARR at this time was only -0.4 mm. Based on TAC data, the groundwater elevation in the vicinity of the site was about 3.3 to 3.8 m AHD in March 2005. This indicates a depth to groundwater of approximately 3.2 m below ground level at the north western corner of the site (nearest to TAC), to 1.2 m below ground level at the southern end of the site.

9.1.6 Groundwater quality

TAC undertakes monthly groundwater monitoring for pH, electrical conductivity and fluoride at two locations shown in Figure 2 of Appendix D. TAC provided GHD with groundwater data from 2005 to 2010 and this is summarised in Table 9-1 and Table 9-2. Groundwater in the vicinity of the site is generally fresh and slightly, to moderately, acidic. Groundwater pH and electrical conductivity are generally consistent across the site, although appear to increase slightly in a southerly direction towards the Hunter River as groundwater begins to interact with estuarine water.

Time series plots of available groundwater quality data in the vicinity of the site are presented in Appendix D. Temporal pH variation at each monitoring location is relatively small, with only a 0.2 to 0.5 pH unit difference in the 20th percentile and 80th percentile pH at each bore. Temporal variation in electrical conductivity appears to be slightly higher closer to the Hunter River, likely as a result of interaction with estuarine water and tidal variation.

Average fluoride concentrations at most monitoring bores exceeded the Australian Drinking Water Guideline (NHMRC, 2004) health based guideline for fluoride of 1.5 mg/L and appeared to increase in recent years. The concentration of fluoride at the monitoring bores closest to the site exceeds the drinking water guideline by up to three times in 2009 (Table 9-2).

Available fluoride data from Hunter Water are limited to results reported between 1997 and 2004 at monitoring bores 508 and BL046, west of the site. 20th and 80th percentile concentrations are 0.02 mg/L and 0.05 mg/L for bore 508 and 0.4 mg/L and 0.1 mg/L for bore BL046. These concentrations are lower than the Australian Drinking Water Guideline (NHMRC, 2004) health based guideline for fluoride of 1.5mg/L.

Limited groundwater sampling has been undertaken by Coffey Geotechnics to the north of the site (Coffey Geotechnics, 2011). No petroleum hydrocarbons were detected, while exceedences above fresh water trigger values for the protection of 95% aquatic ecosystems were reported for dissolved chromium III + VI (slightly above the trigger value for chromium VI), iron and zinc.

Table 9-1 Existing groundwater quality data (pH and electrical conductivity)

TAC Monitoring Bore	pH					EC (µS/cm)				
	Min	Max	Mean	20%	80%	Min	Max	Mean	20%	80%
219	4.1	5.8	4.6	4.4	4.7	180	290	223	210	238
220	4.3	5.9	5.1	4.9	5.3	110	330	195	170	220
221	4.0	5.5	4.8	4.6	5.0	130	320	178	150	200
237	4.0	6.1	5.6	5.5	5.8	160	480	313	270	370
238	4.2	6.1	5.2	5.0	5.5	150	600	309	200	400
254	4.2	6.5	5.2	5.0	5.4	110	240	141	120	150
255	4.1	5.9	5.0	4.9	5.2	240	470	315	272	350
256	4.2	6.3	5.6	5.5	5.7	370	1200	589	490	668
311	4.2	5.8	5.4	5.2	5.6	100	580	232	150	286
312	4.6	6.2	5.4	5.2	5.6	100	640	317	102	502

Table 9-2 Existing groundwater fluoride concentration data

TAC Monitoring Bore	Fluoride (mg/L)				
	2005	2006	2007	2008	2009
219	0.11	0.11	0.12	0.12	0.12
220	0.61	1.09	0.75	1.97	2.27
221	1.49	1.09	2.26	4.30	4.41
237	0.16	0.12	0.26	0.47	0.13
238	4.95	5.04	4.33	2.43	2.11
254	0.44	0.57	1.85	3.18	3.17
255	1.31	1.23	2.16	3.46	3.94
256	0.76	0.64	1.32	1.88	1.72
311	-	-	-	13.0	11.0
312	-	-	-	4.65	4.29

9.2 Impact assessment

9.2.1 Water balance

An integrated water management strategy has been prepared to address the various water management issues relating to the site and project. A number of different water management options were investigated and the proposed water management strategy is shown in Figure 9.3 and discussed below. A range of options were modelled to assess potential impacts on groundwater levels and the proposed strategy is considered to provide the most suitable water management option as it enables:

- ▶ Impacts on groundwater dependant ecosystems to be minimised
- ▶ Stormwater to be reused where possible and treated and discharged to local standards
- ▶ Wastewater to be treated to a high standard and utilised on site in a sustainable and safe manner.

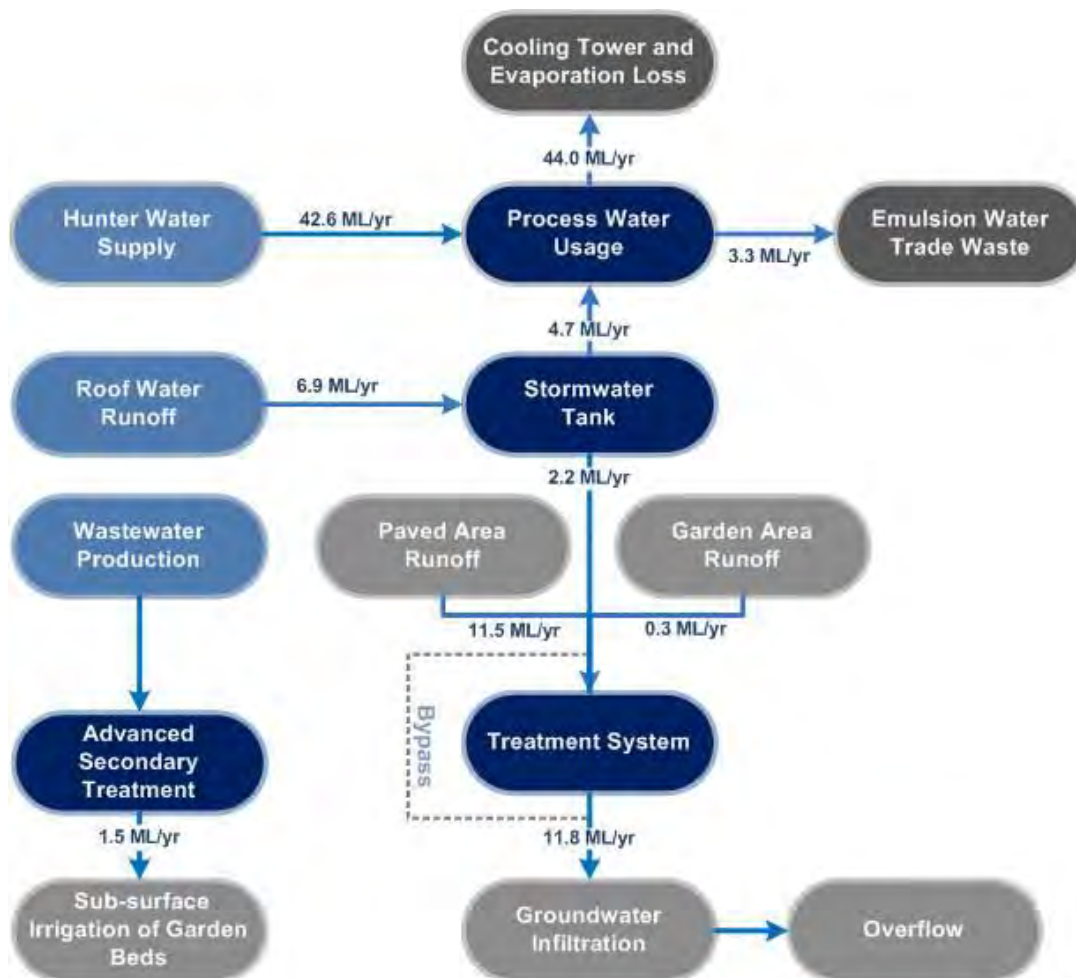


Figure 9.3 Water balance

This strategy includes the following elements:

- First flush stormwater from pavements would be treated by a GPT. Flows that exceed the capacity of the GPT would bypass the GPT.
- Stormwater runoff (pavement and gardens) that has been treated by the GPT or bypassed the GPT would be discharged to infiltration zones.
- Wastewater would be treated to a secondary level before reuse in site subsoil landscaping irrigation. If the volume of treated wastewater exceeds the capacity of the irrigation zone, surplus water would be mixed with the stormwater runoff and directed to the infiltration zones. In the event that there is excess treated wastewater, this is likely to be small in volume compared to the stormwater.
- Roofwater would be collected and stored in tanks prior to reuse as process water. If there is insufficient tank water to meet the process requirements, additional water would be sourced from the HWC potable supply.

9.2.2 Water demands and sources

During construction, potable water would be required for temporary site offices and for use in the construction process. The water would be sourced from the 150 mm diameter service line maintained by HWC.

During operation the project is anticipated to employ a maximum of 119 employees per day and have a building area of approximately 1 ha. Potable water demands were calculated based on a category of light industrial water demand for a building of 1 ha in area using the HWC Water Supply Code of Australia (WSA 03-2002). The expected average peak flows are shown in Table 9-3.

Expected peak flows were based on the need to refill a 30m³ emulsion tank in one hour on top of the expected potable demand peak during a shutdown period. Fire fighting would require an instantaneous demand of 20L/s.

As the 150mm diameter potable service line is in close proximity to the 500 mm trunk main, the expected flow and pressure demands would be able to be supplied using the existing potable water network.

Table 9-3 Expected water demand

	Expected average demand		Expected peak demand	
	ML/year	KL/d	KL/h	L/s
Process demand	47	129	30	9
Potable demand	4.2	11.5	18	10
Total demand	49.2	140.5	48	19

9.2.3 Stormwater

The project would increase the impervious area at the site which would increase stormwater flows. To manage this issue, underground stormwater infiltration areas would be provided within the site to detain, retain and infiltrate stormwater.

Over 50% of the proposed development site would be paved for hardstand and parking areas. Given that oil and grit would be likely to be contained in surface flows, basic treatment to remove these contaminants would be required at each surface inlet pit prior to flows entering the stormwater system.

The stormwater runoff from paved areas would be treated through a combination of pit inlet baskets and GPTs/CDS units (or equivalent units) before being directed to the underground infiltration areas. Details regarding the specifications of the GPTs would be confirmed during the detailed design phase. The GPTs would be maintained in accordance with the manufacturer's guidelines.

The stormwater system would detain the first 15 mm of rainfall. This relates to the 85th percentile of daily rainfall for days with greater than 2 mm of rain. The stormwater infiltration capacity has been determined based on the outcomes of the GDE impact analysis which determined that an average infiltration rate of 50m³/day is the preferred infiltration volume and this is approximately equal to the infiltration of the first 15mm of daily rainfall from the site on an annualised basis. Stormwater flows greater than the capacity of the infiltration system would overflow from the system and be discharged through culverts under the

access road to site into the adjacent easement. As the system would be fitted with a GPT to treat the 'first flush' runoff, the excess runoff is expected to be relatively clean.

Monitoring would be undertaken to ensure that stormwater management measures are working effectively. Monitoring would rely primarily on visual inspections and sampling and would be undertaken for stormwater conveyance structures. If required, sampling would occur downstream of the GPT, prior to surface water being discharged from the site. An inspection log detailing the monitoring program would be kept.

The project is not expected to impact on the Tomago Sandbeds as it is approximately 600 m downstream of the HWC Special Area.

9.2.4 Roof rainwater

The combined roof area from both main buildings is approximately one third of the site area. As a first flush system would be installed on the downpipes from the roofs, flows after the 'first flush' are likely to be relatively clean and would be suitable for use as process water with basic treatment. The roof water would be stored in two 100kL tanks.

9.2.5 Wastewater

Approach to wastewater management

As there is no sewerage system in the area and there are no plans by HWC to service the area in the near future, an onsite sewage treatment system would be installed to treat the wastewater generated at the site. Consideration was given to the reuse potential of the treated wastewater, however due to the health risks and minimal flows from the wastewater system, reuse as process water or as a third pipe into the office amenities is not proposed.

The site does not fall within the Hunter Water Corporation drinking water catchment and is 600m downstream of the HWC Special Area of the Tomago Sandbeds.

Some of the industries surrounding the site employ onsite wastewater treatment systems that use septic tanks for treatment and Wisconsin mounds for infiltration. These onsite treatment systems are designed based on the Port Stephen Council On-Site Sewage Framework and the Port Stephen Council "Standard Designs for On-site Wastewater Management Systems in Tilligerry Creek, 2005". The guidelines specify the use of septic tanks and Wisconsin mounds for treatment systems that are over 100m from creeks/waterways and state that "The designs presented in this document have proven highly effective in very similar environments to the Tilligerry Creek catchment for as long as 30 years".

Based on the above information, and to ensure minimal impact on the groundwater and downstream waterways, the system has been designed to treat wastewater to a higher standard than the Council guidelines and the surrounding industries. The system would treat wastewater to an advanced secondary level with disinfection to enable it to be used as a substitute for potable water for on-site landscaping requirements. Treated wastewater would be directed to a subsoil irrigation area.

The limited load of heavy metals associated with wastewater generated by hand washing and showers would be removed in the sewage treatment system through settling in the primary treatment chamber, bio-accumulation in the secondary aerated chamber and settling in the clarification chamber. The trace concentrations of metals would be unlikely to impact on the groundwater system or the GDEs.

Wastewater irrigation system

The subsurface irrigation system has been designed as per the Environmental Guidelines, Use of Effluent by Irrigation, (DECC 2003) and the Australian Standard for On-site Domestic Wastewater Management (AS 1547:2000). At this stage, the irrigation system is indicative and final details would be confirmed during detailed design. This would involve ensuring that the irrigation area and associated vegetation is sufficient to remove the nutrients contained in the wastewater to comply with the intent of the Council's guidelines and the Environmental Guidelines, Use of Effluent by Irrigation (DECC 2003).

A shallow subsurface drip system would be installed at a typical depth in the soil of 150 -200mm in grassed or other suitably vegetated areas. It would distribute effluent from perforated small-diameter pipes or dripper lines. Only commercially available pressure compensating subsurface irrigation pipework specifically designed for the dispersal of treated wastewater would be installed. The typical groundwater level would be approximately 1.5 to 2m below the ground level of the irrigation areas.

The irrigation area would have a minimum cover of 1 metre of imported topsoil and this is expected to be adequate to store the applied effluent and support the growth of vegetation to maximize nutrient uptake and evapotranspiration. The exact species of vegetation would be confirmed during detailed design, however it would include high yield grasses that would be able to be harvested periodically and be appropriate for the surrounding environment. The system would be installed with appropriate set-back distances required by the Port Stephens Council.

The landscaped area to be irrigated would be predominantly in three sections at the southern end of the site, in between the car parks and the site boundary as well as around the sewage treatment plant site area. The total irrigation area would be just over 1,000 m² and is shown in Figure 9.1. A more detailed figure of the irrigation area is provided in Appendix C of Appendix D.

The hydraulic calculations show that based on set irrigation area, the weekly Design Irrigation Rate (DIR) would be 31mm/week on average and would peak at 50mm/week during the winter months. The AS 1547:2000 Standards specify a conservative maximum application rate on sandy loam soils to be 50mm/week for secondary treated wastewater with characteristics of BOD <20 mg/l and TSS <30 mg/l. The wastewater would be treated to an advanced secondary level with characteristics of BOD <10 mg/l and TSS <10 mg/l, which is two to three times better than the AS 1547:2000 criteria. The application rate would be on average 40% lower than the AS the AS 1547:2000 criteria. The advanced treatment level and low application rate would ensure that the hydraulic design of the irrigation system is sustainable. Details of the hydraulic monthly balance, including rainfall and evapotranspiration are provided in Appendix D of Appendix D.

The nutrient balance calculations show that the site would have a net negative organic loading (BOD) and nitrogen balance and a positive phosphorus balance. Based on a conservative sorption capacity of the imported soil, the irrigation system is expected to last for 86 years before the phosphorus capacity of the soil may be reached. The nutrient balance calculations were based on the Environmental Guidelines: Use of Effluent by Irrigation, 2003 and are shown in Appendix D.

Table 4.9 of the Environmental Guideline Use of Effluent by Irrigation Guidelines outlines recommended buffer distances between sensitive areas and areas irrigated using treated effluent. Table 9-4 summarises the recommended buffer distances and where relevant comments on the proposed buffers that have been included in the design.

Table 9-4 Use of effluent by irrigation buffer distances

Sensitive Area	Recommended Buffer Distance (low strength effluent)	Actual Buffer Distance	Comments
Natural waterbodies (e.g. rivers, lakes)	50 m	1 km to Hunter River	Well outside the buffer distance required.
Other waters (e.g. artificial waters with beneficial uses, small streams, intermittent streams, water distribution and drainage channels, farm dams)	Site-specific	5m to stormwater drain	Water treated to advanced secondary level with disinfection minimise the potential for adverse effect on downstream water quality.
Domestic well used for household water supply	Site-specific	N/A	Hunder Water provides potable water to the area. No household bores in area
Town water supply bores	Site-specific	N/A	No town water supply bores in area
Where spray irrigation gives rise to aerosols near houses, schools, playing fields, roads, public open space and waterbodies	50 m	N/A	No spray irrigation used
Other sensitive areas (e.g. waters in drinking water catchments, aquatic ecosystems with high conservation value, wetlands, native stands of vegetation)	Site-specific (250m for medium or high strength)	N/A	The sub-soil irrigation area is approximately 800m downstream of the boundary with the HWC drinking water catchment.

Compliance and monitoring

The sewage treatment system and sub-surface irrigation system would be installed by a qualified contractor to the AS 1547 standard. All On-site Sewage Management Systems are required to be registered and owners must lodge an application for an 'Approval to Operate' with Port Stephens Council as part of the Council's On-Site Sewerage Management Strategy.

The system would commence operation once Council has given written approval. The approval would include verification of performance targets during commissioning and proof of performance testing as per AS 1547:2000.

A monitoring system would measure the performance of the system. The results of the monitoring would identify the need to implement actions to ensure the system is operating satisfactorily.

The wastewater treatment system would be serviced, monitored and certified quarterly by a Port Stephens Council accredited service provider. The servicing would include inspection and routine cleaning of the treatment chambers, UV system and effluent filter. The treated wastewater quality would be sampled and sent to a NATA laboratory to check performance against the treatment plant requirements. The wastewater quality and quantity (from the online flowmeter) would provide an estimate of the loading rate applied to the irrigation area.

The soil would be sampled annually by a qualified person to monitor any changes in soil structure or accumulation of nutrients. The vegetation would be harvested as per the routine landscaping servicing of the site and this would remove the nutrients and promote growth. The treatment and irrigation systems would require an annual approval from Port Stephens Council.

9.2.6 Water bodies, watercourses and riparian vegetation

No impacts are expected as there are no water bodies, watercourses or riparian vegetation on or adjacent to the site.

9.2.7 Erosion and sediment control

Sedimentation and erosion are expected to occur as a result of surface disturbance during construction. This has the potential for soil material to be transported off site and would be controlled by implementing the mitigation measures set out in Section 9.3.

9.2.8 Groundwater quantity impacts

The site water management strategy involves capturing runoff from impervious surfaces and infiltrating it to the groundwater system. A preliminary steady state hydrogeological numerical model was used to assess the impact of the project on groundwater levels within the unconfined sand aquifer. The model was developed with reference to the Murray-Darling Basin Commission Groundwater Flow Modelling Guideline (Murray-Darling Basin Commission, 2000).

Data requirements for the model were divided into hydrogeological framework data and hydrological stress data. Hydrogeological framework data includes extent, thicknesses and boundaries of geological (and aquifer) units, and aquifer properties (hydraulic conductivity, porosity, specific yield etc.).

The results of the steady state hydrogeological numerical model showed the detention of the first 15 mm of stormwater runoff which is equivalent to an infiltration rate of 50 m³/d resulted in an increased groundwater elevation of approximately 0.1 – 0.15 m at the site boundary and 0.01 m at approximately 1.5km. This infiltration rate gave an optimal balance between minimising offsite groundwater mounding whilst maintaining a reasonable capacity for the management of surface water captured within the site. This figure predicted no impact on downstream SEPP 14 wetland areas and only minor impacts on downstream GDEs (refer to Section 11.4).

Since an increase in groundwater elevation is expected throughout the modelling domain, there would not be a reduction in groundwater availability for basic landholder rights or licensed groundwater extraction in the vicinity of the site. In addition, the relatively minor changes in ground water elevation are not expected to adversely affect hydraulic gradients or groundwater velocity.

During construction, it is likely that deeper excavations beneath elements such as the cooling tower would intercept groundwater. Impacts of dewatering excavations during construction would be short term and localised.

9.2.9 Groundwater quality impacts

Potential impacts on groundwater quality may result from accidental spills/leaks of fuels and oils and general runoff of petroleum hydrocarbons from hardstand areas. Runoff from paved areas would be collected in drainage systems and would undergo basic treatment to remove oil and grit through a combination of pit inlet baskets and GPT/CDS units or equivalent. This treatment would occur prior to runoff being discharged to the infiltration zones. Spill response procedures would also be implemented to

ensure that spills and leaks are contained and cleaned up. This would minimise the potential for hydrocarbons from the site to enter the groundwater system.

There is also the potential for groundwater quality to be impacted by treated wastewater. Wastewater would be treated to a secondary level and then used for subsurface irrigation. During detailed design, the irrigation system would be refined to ensure compliance with Council's guidelines and the Environmental Guidelines of Reuse of Effluent by Irrigation (2003). Details regarding the surface area of the irrigation zone and the type of vegetation would be confirmed to ensure that there is sufficient nutrient uptake to minimise the potential for groundwater quality to be impacted by the project.

If the volume of treated wastewater exceeds the capacity of the subsurface irrigation zone, the surplus treated wastewater would be mixed with runoff from paved areas and directed to infiltration zones. This is expected to have minimal impact on groundwater quality as this scenario would occur infrequently and the treated wastewater would be diluted as it would be a small volume compared to the runoff from paved surfaces.

It is anticipated that the impacts on groundwater quality would be minimal if the control measures outlined in Section 9.3 are implemented.

9.3 Mitigation measures

9.3.1 Erosion and sediment control

Temporary measures to minimise erosion and sedimentation during construction would be detailed within the Spoil and Fill Management Plan (SFMP) that would form part of the CEMP. The SFMP would include measures generally in accordance with *Managing Urban Stormwater, Soils and Construction Volume 1* (Landcom, 2004), including:

- ▶ Minimise the area of disturbance.
- ▶ Temporary catch and diversion drains to divert runoff from upslope land and reduce erosion hazard.
- ▶ Temporary diversions would outlet to stable discharge areas and additional erosion protection would be provided as necessary.
- ▶ Progressively revegetate disturbed areas to encourage infiltration.
- ▶ Direct sediment laden runoff through a sediment trap or basin to minimise discharge of pollutants to the downstream environment.
- ▶ Direct smaller volumes of sediment laden runoff to sediment filters such as straw bale filters and sediment fences.
- ▶ Locate stockpiles clear of stormwater drainage areas.
- ▶ Stabilise stockpiles that are to be in place for longer than 10 days.
- ▶ Divert flows around stockpiles by using bunding or diversion drains.
- ▶ Place sediment fences downstream of work areas to capture sediment and minimise sediment discharge to downstream environment.
- ▶ Project team members involved in the construction of the project would be made aware of their environmental responsibilities and the measures to minimise impacts.

- ▶ Establishment of the works compound, including the machinery, fuel and chemical storage areas with bunded areas away from drainage lines.
- ▶ Appropriate storage of construction materials on site as to prevent leaching, leaking or other transfer of material into groundwater or onto land.

A range of standard mitigation measures would be included in the OEMP to minimise the potential for erosion and sedimentation during the operational phase, including:

- ▶ Catch and diversion drains would be provided to divert runoff from upslope land and reduce erosion hazard.
- ▶ Outlet to diversion drains would be stabilised with erosion protection measures as necessary.
- ▶ Disturbed areas would be revegetated to encourage infiltration.
- ▶ Stockpiles would have maximum batter slope of 1 vertical to 2 horizontal and be stabilised by vegetation.

9.3.2 Emergency response plan

An emergency response plan would be prepared as part of the CEMP and OEMP to detail the steps required in the event that erosion and sedimentation control measures are found to be ineffective. This emergency response plan would also outline response measures other potential pollution incidents such as a chemical spill. Spill kits would be kept on site at all times and all dangerous goods to be handled in accordance with the relevant legislation and Dangerous Goods Code.

Refuelling of plant and machinery would be undertaken either by fuel trucks with spill trays or within bunded areas or off site in appropriate areas wherever possible. Where topography and track elevations allow, consideration would be given to providing a secondary containment measure to limit the discharge of spills.

9.3.3 Groundwater monitoring plan

A groundwater monitoring plan (GMP), incorporating a response plan, would be prepared prior to construction and detail monitoring requirements pre-construction, during construction and during the operation of the project.

Monitoring

Groundwater monitoring would be undertaken at a location up gradient of the site and at two locations down gradient of the site and down gradient of the infiltration areas. The monitoring bores would be screened within the unsaturated zone and across the groundwater surface so that light petroleum based compounds would be detected.

Electrical conductivity, pH levels and depth to groundwater would be monitored monthly, while quarterly monitoring would be undertaken for total petroleum hydrocarbons (with silica gel cleanup). Monitoring of major cations/anions and dissolved heavy metals would be undertaken if required based on trend analysis of pH and electrical conductivity data.

Trigger values and response

Although pH and electrical conductivity values are expected to remain within the range background levels, an annual review of pH and electrical conductivity would be undertaken along with a non-

parametric trend analysis. Based on the results of this annual review, a trigger and response plan would be implemented as follows:

- ▶ If a statistically significant decreasing trend in pH is evident, undertake quarterly monitoring for dissolved heavy metals until the cause is identified.
- ▶ If a statistically significant increasing trend in electrical conductivity is evident, undertake major cation and anion monitoring on a quarterly basis until the cause is identified.
- ▶ Should petroleum based compounds be detected in groundwater, the source and likely volume of leak/spill should be identified. If dissolved concentrations exceed 600 µg/L (Dutch intervention level for mineral oil in groundwater), undertake natural attenuation modelling to assess whether natural attenuation processes are sufficient to remediate the spill.
- ▶ Groundwater hydrographs would be reviewed annually to verify that actual groundwater elevation changes are consistent with changes predicted in this assessment. Should increases in groundwater elevation be greater than expected, impacts on groundwater dependent ecosystems would be reassessed.

10. Noise

The information presented in this chapter is based on the findings of the noise assessment undertaken by GHD and the full report is included in Appendix E.

10.1 Methodology

The noise assessment involved the following tasks:

- ▶ Identifying noise sensitive receivers.
- ▶ Unattended noise monitoring was undertaken between 29/03/2011 and 10/04/2011 at an existing residential location considered to be representative of the ambient noise environment.
- ▶ Attended noise monitoring was undertaken to supplement unattended noise monitoring and assess existing noise levels.
- ▶ Establishing construction and operational noise criteria based on OEH's guidelines and the results of noise monitoring.
- ▶ Assessing potential construction, operation and traffic noise impacts, by:
 - Modelling to predict the potential for impacts at sensitive receivers.
 - Assessing predicted impacts against noise criteria.
 - Considering relevant guidelines including the Interim Construction Noise Guideline (2009), Industrial Noise Policy (2000) and Environmental Criteria for Road Traffic Noise (1999).
- ▶ Providing mitigation and management measures to minimise potential impacts.

10.2 Existing environment

As indicated in Section 4, the site is located within an established industrial precinct. The Port Stephens Council Local Environment Plan (LEP) 2000 indicates the areas immediately surrounding the site are predominantly industrial with some residential receivers located on land zoned as 'Industrial 4a' and 'Residential agriculture 1a'. The main noise sources within the area surrounding the site include machinery associated with industrial activities and vehicle noise generated by traffic along Tomago Road.

10.2.1 Noise sensitive receivers

Noise sensitive receivers in the vicinity of the site include residential dwellings located along School Drive, Tomago Road and Graham Road. The nearest residential dwelling is located approximately 230 metres south and southeast of the site.

The site, sensitive receivers and unattended monitoring location (adjacent R1) are shown in Figure 10.1. The identified sensitive receivers include five residential (R1-R5), two industrial (R6-R7) and one commercial (R8) land uses.

10.2.2 Noise monitoring

Unattended monitoring

Unattended background noise monitoring took place at 5 Graham Drive, Tomago which is considered to be representative of the existing ambient noise environment and was identified as being a safe and secure place for monitoring equipment to minimise the risk of theft or vandalism. The monitoring location is shown in Figure 10.1. Although the logger was installed near a pool, site observations and discussions with the land owner indicated that the swimming pool was not in use and the pool pump was not operational during the monitoring period. The noise logger was programmed to accumulate L_{A90} , L_{A10} , L_{Aeq} and L_{Amax} noise levels continuously over sampling periods of 15 minutes for the entire monitoring period. Further information on the monitoring undertaken and detailed results are provided in Appendix E.



Figure 10.1 Sensitive receivers and noise logging locations in the vicinity of the site

Analysis of the data indicated the night-time background noise levels were consistently 39 dB(A) for each night period. Later inspection of the noise logger instrumentation revealed an electronic fault whereby the noise floor of the instrument was found to be approximately 39 dB(A). As such, the noise data obtained by GHD is considered invalid, especially during night-time periods when background noise levels were potentially less than 39 dB(A).

As the unattended noise logger data is considered invalid, data was obtained from the *Newcastle Gas Storage Facility Project (NGSFP) Environmental Assessment (Coffey), May 2011*. For this assessment, Atkins Acoustics (Report reference: 41.6592.R1:CFCD5 Rev 5) conducted unattended background noise

monitoring at the same location as the GHD monitoring, at 5 Graham Drive, Tomago. A comparison between the two data sets is provided in Table 10-1 and the results indicate relatively close agreement with a variance ranging between 1-2 dB(A). As such, it is reasonable to assume that the existing noise levels at the monitoring location does not fall below 39 dB(A) for sufficient lengths of time to influence the overall results significantly.

Nonetheless, the NGSFP noise monitoring data is considered representative of the existing acoustic environment and therefore has been used to set the project specific noise goals for this assessment.

Table 10-1 Unattended noise monitoring results comparison at 5 Graham Drive, Tomago

Data	Background noise levels L_{A90} dB(A)			Ambient noise levels L_{Aeq} dB(A)		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
GHD monitoring	41	40	39	54	50	47
NGSFP EIS monitoring	42	39	37	56	51	49
Variance	-1	+1	+2	-2	-1	-2

Attended noise monitoring results

The attended noise measurements indicated that:

- ▶ Traffic noise on Tomago Road generally dominates the acoustic environment in the area.
- ▶ Existing industrial noise at R1 (5 Graham Road) was generally inaudible during the daytime, however it was barely audible between traffic passbys as a distant hum being less than the background noise level during attended evening and night-time periods.
- ▶ Existing industrial noise hum at R3 (29 School Drive) was audible during the daytime. A chemical manufacturing facility located at 25 School Drive was clearly audible during the attended evening and night periods.
- ▶ Insect noise was audible at both locations during attended evening and night periods.

10.3 Noise criteria

10.3.1 Construction noise management levels

Construction noise criteria are sourced from the *Interim Construction Noise Guideline (ICNG)* (2009).

The recommended standard construction hours are as follows:

- ▶ Monday to Friday: 7 am to 6 pm.
- ▶ Saturday: 8 am to 1 pm.
- ▶ No work on Sundays or Public Holidays.

The ICNG acknowledges that the following activities have justification to be undertaken outside the recommended construction hours:

- ▶ The delivery of oversized plant or structure.
- ▶ Emergency work.
- ▶ Works for which it can be demonstrated that there is a need to operate outside the recommended standard hours.

Based on the noise logging data, the construction noise criteria for the recommended standard hours at each receiver are shown in Table 10-2. The ICNG construction noise criteria for commercial or industrial land use are independent of the rating background level (RBL).

Table 10-2 Construction noise criteria at sensitive receivers

Receiver Area	Receiver Type	Background Level, L _{A90} (15min) dB(A)	ICNG Management Level, L _{Aeq} (15min) dB(A)
R1 to R5	Residence	42	Noise Affected – 52 Highly noise affected – 75
R6 and R7	Industrial	Not Applicable	75
R8	Commercial	Not Applicable	70

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. For residential premises, the *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

For residential premises, the highly noise affected level represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, any feasible and reasonable ways to reduce noise below this level should be carefully considered. If no quieter work method is feasible and reasonable, the impacted residence should be clearly explained the duration and anticipated noise levels of the works and any respite periods that would be provided.

10.3.2 Operational noise criteria

The NSW Department of Environment, Climate Change and Water *Industrial Noise Policy* (2000) (INP) provides guidance on the assessment of operational noise impacts. The guideline includes both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level, and to limit the total noise level from all sources near a receiver. The INP noise criteria are planning levels and are not mandatory limits required by legislation, however the noise criteria assist the regulatory authorities to establish licensing conditions.

Intrusive criteria

The intrusive noise criteria controls the relative audibility of operational noise compared to the background level at residential receivers. The intrusive criteria is calculated by adding 5 dB to the measured (or adopted) background level with a minimum of 35 dB(A). The INP recommends that the

intrusive noise criteria for the evening period should not exceed the daytime period and the night-time period should not exceed the evening period. The intrusive noise criteria are only applicable to residential receivers.

This assessment has adopted background noise level (RBL) from the unattended noise monitoring location at 5 Graham Drive, where industrial noise was not influencing the existing background noise levels. Unattended noise measurement data from the monitoring location at 5 Graham Drive was obtained from the *AGL Newcastle Gas Storage Facility Noise Assessment* due to a fault with the GHD logger.

Amenity criteria

The amenity criteria limit the total level of extraneous noise for all receiver types. The amenity criteria are calculated based on the overall acoustic characteristics of the receiver area and the existing level of noise, excluding other noises that are uncharacteristic of the usual noise environment.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses and the existing level of noise from industry, commerce, and road traffic. With consideration to the INP 'Noise Amenity Area' classification, the residential receivers identified in this assessment have been classified as 'Urban' given the proximity to industrial areas and road traffic noise.

Cumulative Noise Impacts

To account for cumulative industrial noise impacts at sensitive receivers in close proximity to existing industry, this assessment adopted background noise level (RBL) and ambient noise level (L_{Aeq}) from the unattended noise monitoring location at 45 School Drive. The unattended noise measurement data from the monitoring location at 45 School Drive has been referenced from the *AGL Newcastle Gas Storage Facility Noise Assessment (NGSFNA)*.

As stated in the NGSFA, Atkins Acoustics reviewed *Tomago Aluminium Company (TAC) – Production Capacity Increase Statement of Environmental Effects* prepared by ENSR/Aecom, May 2009, to assist in establishing existing industrial noise levels and determining amenity noise goals in accordance with the INP Section 2. – Table 2.2. Industrial contributions of L_{Aeq} 38dBA at Graham Drive (R2) and 43dBA at School Drive (R3) were utilised based on noise contributions from the Tomago Aluminium Smelter (ENSR/Aecom, May 2009).

Project specific noise criteria

The project specific noise criteria reflect the most stringent noise level requirements derived from the intrusive and amenity criteria. For residential receivers, the noise criteria are provided in Table 10-3 and Table 10-4. As the project would operate 24 hours per day, the most stringent night-time criteria would apply.

For commercial or industrial receivers, the amenity noise criteria are $L_{Aeq(Period)}$ 65 dB(A) and $L_{Aeq(Period)}$ 70 dB(A) respectively. This should aim to be achieved when the land is in use.

Table 10-3 Operational noise criteria – residential receiver R1, dB(A)

	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Rating background level, $L_{A90}(\text{Period})$	42	39	37
Intrusiveness criteria, $L_{Aeq}(15\text{min})$	47	44	42
Existing Industrial Noise Contribution $L_{Aeq}(\text{Period})$	38		
Amenity criteria (urban), $L_{Aeq}(\text{Period})$ INP Table 2.2 Adjusted	60	50	45*
Project Specific Criteria	47	44	42

* Note: INP Table 2.2 adjustment included

Table 10-4 Operational noise criteria – residential receivers R2 to R5, dB(A)

	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Rating background level, $L_{A90}(\text{Period})$	46	44	44
Intrusiveness criteria, $L_{Aeq}(15\text{min})$	51	49	49
Existing $L_{Aeq}(\text{Period})$	43		
Amenity criteria (urban), $L_{Aeq}(\text{Period})$ INP Table 2.2 Adjusted	60	50	41*
Project Specific Criteria	51	49	41

* Note: INP Table 2.2 adjustment included

Since the project would operate 24 hours per day, the most stringent night-time criteria would apply.

10.3.3 Sleep disturbance

The Noise Guide for Local Government (NGLG) (DECCW, 2010) provides guidelines for assessing sleep disturbance from short-term noise events. To assess potential disturbance during night-time hours (10.00pm to 7.00am), Section 2.4.5 of the NGLG recommends that $L_{A1,1\text{min}}$ levels outside a bedroom window should not exceed the background level by more than 15dB.

Table 10-5 presents the sleep disturbance assessment goals developed from night time RBL in Table 10-1.

Table 10-5 Sleep disturbance criteria – residential receivers R1 to R5, dB(A)

Receiver ID	Description	Existing night RBL	Sleep disturbance criteria, $L_{A1,1min}$
R1	5 Graham Drive	37	52
R2	41 School Drive	44	59
R3	29 School Drive	44	59
R4	423 Tomago Road.	44	59
R5	Tomago Detention Centre	44	59

10.3.4 Operational traffic noise criteria

The *Environmental Criteria for Road Traffic Noise (ECRTN)* (1999) provides traffic noise levels for land use developments with potential to create additional traffic on collector and local roads. Tomago Road has been considered as a collector road. School Drive and McIntyre Road have been considered as local roads. The road traffic noise criteria are presented in Table 10-6. Where the criteria are already exceeded, the road traffic noise from the development should not increase the existing noise levels by more than 2 dB(A).

Table 10-6 Traffic noise criteria at residential receivers, dB(A)

Roads	Type of Development	Day (7am – 10pm)	Night (10pm – 7am)
Tomago Road	Land use developments with potential to create additional traffic on collector road	60 $L_{Aeq}(1hr)$	55 $L_{Aeq}(1hr)$
McIntyre Road	Land use developments with potential to create additional traffic on local road	55 $L_{Aeq}(1hr)$ Peak Hour	50 $L_{Aeq}(1hr)$ Peak Hour
School Drive	Land use developments with potential to create additional traffic on local road	55 $L_{Aeq}(1hr)$ Peak Hour	50 $L_{Aeq}(1hr)$ Peak Hour

10.4 Impact assessment

10.4.1 Construction noise

Construction noise modelling

A quantitative assessment of construction noise was undertaken in accordance with the *Interim Construction Noise Guideline* (DECCW 2009).

The construction noise assessment involved consideration of the construction program and likely construction activities (as outlined in Section 6.3). The equipment anticipated to be used onsite and estimated noise levels (based on AS 2436 - 2010) are outlined in Table 10.6. Acoustic modelling was undertaken using CadnaA v4.0 to predict the propagation of construction noise.

The model assumed that all construction equipment listed in Table 10-7 would operate at maximum levels at the same time. In practice, construction machinery would likely move about the site altering noise impacts with respect to individual receivers. During any given period, the machinery items to be used at the site would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at maximum sound power levels at any one time and certain types of construction machinery would be present at the site for only brief periods during construction. Therefore the predictions are considered to be conservative estimates.

Table 10-7 Construction equipment and predicted noise levels

Construction Phase	Equipment	Sound Power Level dB(A)	Sound Pressure Level dB(A) L_{Aeq}				
			R1	R2	R3	R4	R5
Contractor Mobilisation	Delivery truck	104	11	33	41	32	17
Earth Works	Excavator 20T	102	10	33	37	29	15
	Roller	100	9	30	34	26	14
	Truck	104	11	31	36	28	16
Civil Works	Concrete truck	107	14	34	37	30	19
	Concrete pump	90	0	16	16	12	2
Building Works	Mobile crane	99	6	24	23	20	4
	Truck	104	12	34	36	29	13
	Hand tools	100	7	25	25	22	5
	Welder	95	7	25	24	21	5
Total	All	112	20	41	45	38	24

Table 10-7 indicates the predicted noise level at all nearest sensitive receivers are expected to comply with the highly noise affected level of 75 dB(A). Furthermore, model results suggest compliance with the *noise affected level* of 52 dB(A) at all residential receivers. Although construction noise is not expected to impact on amenity, the mitigation measures detailed in Section 10.5 would be implemented where feasible and reasonable to reduce noise impacts.

Construction truck movements

The proposed truck route to the site, via the Tomago Road / McIntyre Road intersection and School Drive, is adjacent to receivers that are generally commercial or industrial.

The existing volumes of heavy vehicles using Tomago Road is 72 vehicles per hour during AM peak hour. The generated heavy vehicle movements due to the development during the construction phase is expected to be four vehicles during AM peak hour, therefore the increase in traffic noise levels due to construction truck movements is predicted to be less than 0.5 dB(A). As such, construction related truck movements are not expected to be noticeable to receivers and meet the requirements of the ECRTN.

10.4.2 Operation noise

Operation noise modelling

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the effects of site related noise from the project. Noise source emissions included in the noise model were based on information provided by Midal and the GHD noise source database. Table 10-8 details the main items of plant likely to generate noise that have been included in the model. Figure 10.2 shows a plan view of the noise source locations based on information provided by Midal.

The model configuration for the noise sources was as follows:

- ▀ The sound power levels for the equipment located within the buildings were used to generate an internal reverberant sound pressure level based on the volume and absorption coefficient of the internal surfaces of the building.
- ▀ The building materials were based on 0.48 mm steel cladding with sound reduction index R_w 20. Doorways as indicated on the drawings were considered open to provide a measure of conservatism.
- ▀ Heights of Building 1 and 2 were both considered as 8.5 m on the lowest point of the roof to 10.8 m for the central ridge of the roof.
- ▀ Cooling towers height was assumed as 10 m above ground level.
- ▀ As the facility would process 50,000 tonnes of aluminium per year and each crucible holds approximately 7 tonnes, it is estimated that 20 crucibles per day would be required. To provide a measure of conservatism, the crucible carrier volume was assumed to be two vehicles per hour.
- ▀ The crucible carrier was assumed to operate along the internal haul road between TAC and Midal at a speed of 10 km/hr. The sound power level was based on the vehicle operating at maximum engine revolutions per minute (RPM) to provide a measure of conservatism.
- ▀ Light and heavy vehicle volumes were based on peak hour data provided in Section 14.3.
- ▀ Light vehicles were modelled as moving point sources and assumed to be travelling at 30 km/hr.
- ▀ Heavy vehicles manoeuvring around the site were modelled as moving point sources and assumed to be running at low engine RPM and vehicle speed of 30 km/hr.

Table 10-8 Site noise source sound power levels L_w (re: 20 μ Pa) dB(A)

Noise Source	Octave Centre Frequency (Hz) (A-weighted)									L_w dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Crucible carrier	74	79	93	94	99	103	103	98	92	108
Crucible crane	27	41	54	63	72	75	75	70	60	80
Holding furnace	48	53	63	75	86	84	80	75	73	89
Tilt furnace	48	53	63	75	86	84	80	75	73	89
Cooling tower 1 side	53	69	80	84	85	85	83	79	69	91
Cooling tower 1 top	56	72	83	87	88	88	86	82	72	94

Noise Source	Octave Centre Frequency (Hz) (A-weighted)									L _w (dB)
Cooling tower 2 side	51	67	78	82	83	83	81	77	67	89
Cooling tower 2 top	54	70	81	85	86	86	84	80	70	92
Cast rolling mill	51	56	66	78	89	87	83	78	76	92
Rolling mill crane	27	41	54	63	72	75	75	70	60	80
Wire drawing	58	63	73	80	86	94	90	85	83	97
Heat oven	51	56	66	73	79	87	83	78	76	90
Strand machine	51	56	66	73	79	87	83	78	76	90
Forklift	54	67	71	83	84	85	87	81	72	92
Car (low speed)	49	63	69	73	79	81	77	72	64	85
Car start	64	69	78	76	83	93	94	92	85	98
Car door shut	56	61	73	83	90	93	90	88	81	97
Truck (low RPM)	69	74	77	83	90	93	89	82	80	96
Truck 2000 RPM	73	78	92	93	98	102	102	97	91	107
Compressors	51	60	66	69	71	73	74	59	43	79
Dryers	47	56	62	65	67	69	70	55	39	75

Note - Sound Power Levels based on Safety, Health and Environmental Information (Source: Midal Cables Ltd - QSSHE Department)

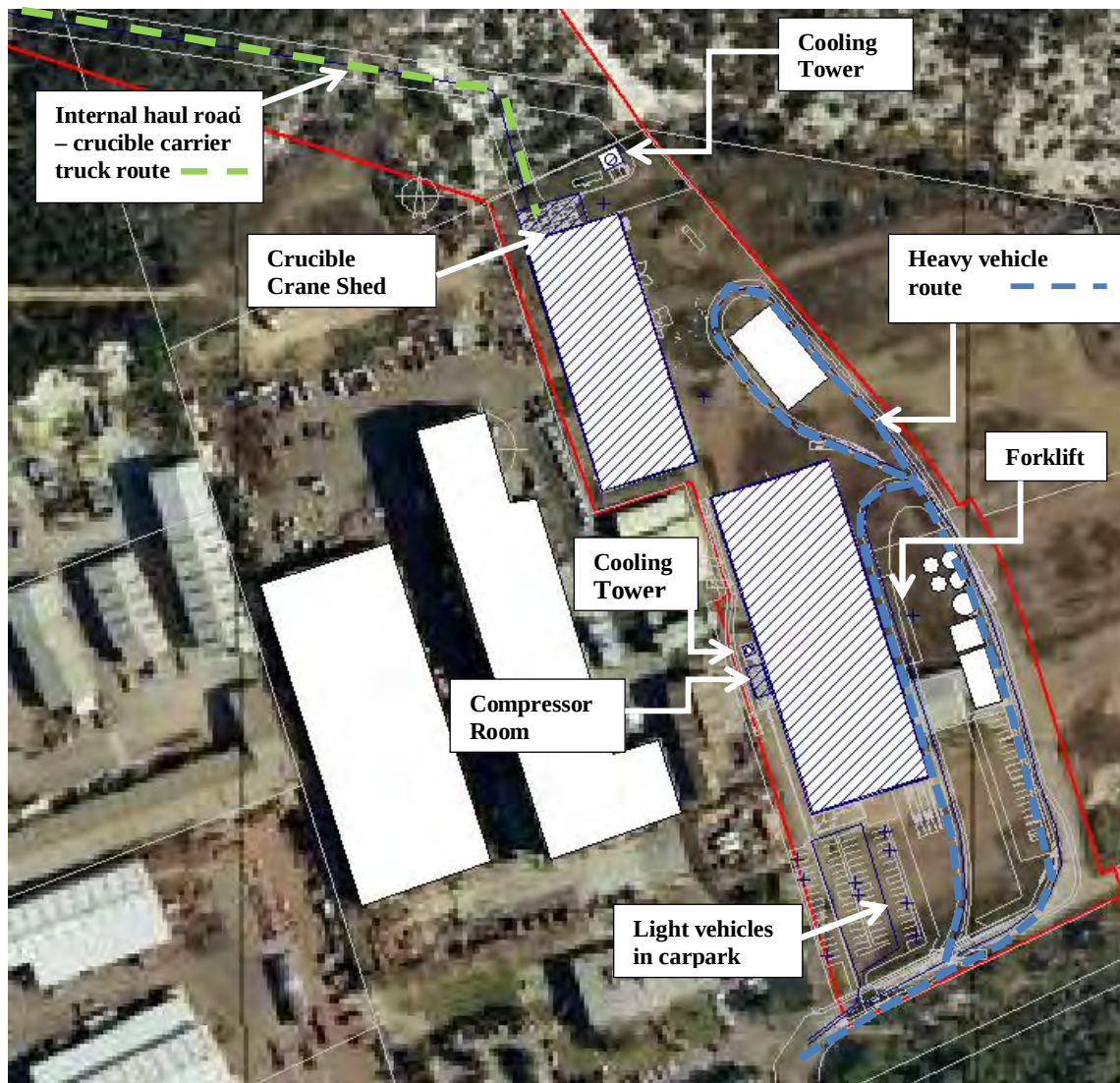


Figure 10.2 Plan view of modelled noise sources and buildings

Modelling results

A summary of the predicted sound pressure levels at the nearest identified receivers due to the project is shown in Table 10-9. As the night-time criterion is the most stringent criteria, it is shown in the table of results for comparative purposes. The modelling results indicate that noise levels are expected to comply with the project specific criteria at all receivers under neutral and adverse weather conditions.

Table 10-9 Modelled sound pressure levels at sensitive receivers - [dB(A) (Leq)]

Receiver		Criteria	Predicted sound pressure levels dB(A)	
		Night-time	Neutral weather conditions	F Class Inversion + 3m/s NW wind
R1	Residence	42	13	18
R2	Residence	41	36	38
R3	Residence	41	33	36
R4	Residence	41	29	32
R5	Residence	41	21	21
R6	Industrial	70	38	40
R7	Industrial	70	57	57
R8	Commercial	65	40	40

Sleep disturbance

As the project would operate 24 hours per day, there is potential for sleep disturbance at the nearest sensitive receivers. The most likely dominant noise source to potentially cause sleep disturbance is delivery trucks occurring after hours (between 10:00pm to 7:00am).

Maximum noise levels due to truck operation at the site were predicted at the nearest sensitive receivers using Cadna-A noise modelling software. The maximum passby sound power level was derived from British Standard BS5228:2009 *Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise*. A summary of the predicted maximum sound pressure levels at the nearest identified receivers due to the operation of a delivery truck is shown in Table 10-10 which indicates that received noise levels are expected to comply with the sleep disturbance criteria at all receivers under neutral and adverse weather conditions.

Table 10-10 Modelled sound pressure levels at sensitive receivers - [dB(A) (Lmax)]

Receiver	Type	Criteria	Predicted sound pressure levels dB(A)Lmax	
		Sleep Disturbance Night-time	Neutral weather conditions	F Class Inversion + 3m/s NW wind
R1	Residence	52	16	21
R2	Residence	59	46	49
R3	Residence	59	47	51
R4	Residence	59	41	45
R5	Residence	59	20	20
R6	Industrial	-	-	-

Receiver	Type	Criteria	Predicted sound pressure levels dB(A)Lmax	
		Sleep Disturbance Night-time	Neutral weather conditions	F Class Inversion + 3m/s NW wind
R7	Industrial	-	-	-
R8	Commercial	-	-	-

(-) denotes sleep disturbance not applicable for industrial and commercial receivers

Operational traffic noise

Possible access routes to the Midal site during operation are anticipated to be along Tomago Road, McIntyre Road and School Drive. Section 14.3 outlines the existing and predicted generated traffic volumes for each road as result of the project in a worst case scenario.

Acoustic modelling was undertaken using CadnaA to predict the effects of traffic noise due to the project. Table 10-11 presents the predicted increase in traffic noise emission for each road in a worst case scenario. The results represent the predicted noise level at 1 metre in front of the most exposed façade of the building. The results do not include the 2.5 dB(A) façade reflection.

Table 10-11 Predicted traffic noise emission increase

Receiver	Relevant road	ECRTN criteria dB(A) Leq,1hr (peak hour)	Existing traffic noise level dB(A) Leq,1hr	Predicted traffic noise level (with development) dB(A) Leq,1hr	Noise emission level increase, dB(A)
R1	Tomago Rd	60	57.9	58.2	0.3
R2	Tomago Rd	60	58.8	59.1	0.3
R3*	School Drive	55	48.0	51.7	3.7
	Tomago Rd	60	64.4	64.4	-
	School Drive and Tomago Rd	60	64.5	64.7	0.2
R4	Tomago Rd	60	57.7	57.8	0.1
R5	Tomago Rd	60	66.3	66.5	0.2

* Since receiver R3 is exposed to changes in volume on School Drive (local road) and Tomago Road (arterial road), noise contributions from each road is provided. Although R2 is exposed to School Drive, the proposed traffic route for additional traffic is not directly exposed to R2.

The traffic noise modelling indicates that:

- ▶ Existing traffic noise levels at R1, R2, R3 (School Drive) and R4 are all under the ECRTN noise criteria.
- ▶ Existing traffic noise levels at R3 (Tomago Rd) and R5 currently exceed the ECRTN criteria. As model predictions indicate the additional operational traffic on Tomago Road is expected to increase noise levels by less than 2 dB(A), the operational traffic noise impact is considered acceptable with consideration to the ECRTN.
- ▶ No residential receiver has been identified as being exposed to traffic noise from McIntyre Road.

10.5 Mitigation measures

10.5.1 Construction

A construction noise management plan would be prepared as part of the construction environmental management plan to detail how construction impacts would be minimised and managed. The following measures would be included:

- ▶ Where feasible and reasonable, construction activities would be scheduled during the ICNG recommended construction hours.
- ▶ Generators would have acoustic enclosures and be located as far away from residences as possible.
- ▶ To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) would be used for all site equipment. Satisfactory compliance with occupational health and safety requirements would need to be achieved and a safety risk assessment may need to be undertaken to confirm that safety is not compromised.
- ▶ All equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made. Table 10-12 presents noise control methods and indicative noise reductions according to Australian Standard AS 2436 – 2010 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

Table 10-12 Relative effectiveness of various forms of noise control dB(A)

Noise Control Method	Typical noise reduction dB(A)	Maximum noise reduction dB(A)
Distance	Approximately 6 per doubling of distance	
Screening	5 to 10	15
Acoustic enclosures	15 to 25	50
Engine silencing	5 to 10	20

10.5.2 Operation

No specific operational mitigation measures are proposed as the project is expected to comply with the noise criteria.

11. Biodiversity

This chapter summarises the flora and fauna assessment undertaken by GHD and the full report is included in Appendix F.

11.1 Methodology

Desktop and field investigations were undertaken to assess the project's impacts on biodiversity in accordance with the Draft Guidelines for Threatened Species Assessment under part 3A of the EP&A Act (DEC and DPI 2005). The assessments considered the:

- ▶ Site which is defined in Section 4.2
- ▶ Study area which consists of the site and adjoining native vegetation. The study area is shown Figure 11.1 and comprises an area of 14.7 ha.
- ▶ Locality which includes lands within a 10km radius of the site and represents the local context. Information on biodiversity within the locality has been used to broadly profile the site's biological values, including identifying threatened biota potentially relevant to the project.

11.1.1 Database searches and literature review

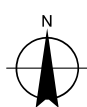
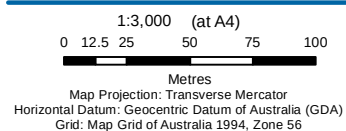
A desktop literature and database review was undertaken to identify flora and fauna, threatened species, populations and ecological communities and migratory species listed under the TSC Act, *Fisheries Management Act 1994* and the EPBC Act that are likely to occur in the vicinity of the site. The following databases were reviewed prior to conducting field investigations:

- ▶ OEH NSW Wildlife Atlas database – records within a 10 km radius of the site were considered.
- ▶ DSEWPaC online search for relevant MNES predicted to occur in the locality (10 km radius), including threatened and migratory species, world heritage areas and Ramsar wetlands.
- ▶ NSW *Fisheries Management Act 1994* online database for threatened aquatic species, populations and communities (10 km radius).
- ▶ Port Stephens Koala Plan of Management (PSC, 2002).
- ▶ SEPP 14 Wetland mapping (Coastal Council of NSW, 1985).
- ▶ Bell and Driscoll (2006) Vegetation of the Tomago and Tomaree Sandbeds, Port Stephens, New South Wales: Management of Groundwater Dependant Ecosystems – Part 1 Vegetation Mapping.
- ▶ Bell and Driscoll (2006) Vegetation of the Tomago and Tomaree Sandbeds, Port Stephens, New South Wales: Management of Groundwater Dependant Ecosystems – Part 2 Groundwater Dependency.
- ▶ NSW BioMetric Vegetation Types Database (DECCW, 2008).
- ▶ Tomago Aluminium (2010). Small Mammal Trapping.



LEGEND

- Proposed Carpark
- Proposed Building Footprint
- Study Area
- Proposed Haul Road
- The Site



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number	22-1528034
Revision	2
Date	12 OCT 2011

Site Layout & Study Area

Figure 11.1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Midal_Referral\22_1528033_011_SiteLayout_20110912_2.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and NEARMAP, LPMA make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and NEARMAP, LPMA cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.

Data Source: NearMap: PhotoMap - 2011; LPMA: DTDC - 2007. Created by: fmackay, tmorton, mbarnier, mabarnier

11.1.2 Field survey

The field survey methods used to prepare the flora and fauna assessment are based on those described in the following flora and fauna survey guidelines:

- ▶ Draft Guidelines for Assessment of Threatened Species under Part 3A of the *Environmental Planning and Assessment Act 1979* (DEC and DPI, 2005).
- ▶ Draft Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (DEC 2004).
- ▶ Lower Hunter Central Coast Regional Environmental Strategy: Flora and Fauna Survey Guidelines (LHCCREMS, 2006).

Vegetation cover was sampled, classified and mapped consistent with NSW Biometric Vegetation Types Database. The area for each vegetation type was used to define the minimum survey effort required for the assessment. Vegetation types were also used to define the likelihood of occurrence for threatened flora and fauna listed under the TSC Act and EPBC Act

A detailed description of the field survey methods used in the flora and fauna impact assessments is provided in Appendix F.

11.1.3 Application of the biobanking assessment methodology

The NSW BioBanking assessment methodology (DECCW, 2009) was used to examine the impacts of the project and calculate the number of biobanking credits that would need to be acquired to ensure the project achieves an improve or maintain outcome in perpetuity. The number of credits were calculated based on conservative simulation data derived from field surveys that describe the impact area and a notional mitigation area (i.e. an undefined location that would receive mitigation). This data was established from field surveys conducted within the study area and included data from the site and areas previously impacted by sand mining.

11.2 Existing environment

11.2.1 Regional context

Bioregion and catchment

The site is located within the North Coast Bioregion (Thackway and Creswell, 1995). The North Coast Bioregion occurs on the east coast of NSW north from the Hunter River to just inside the Queensland border. The total area of the bioregion is 5,924,130 hectares and occupies 7.11 per cent of NSW.

The coastal dunes of the North Coast Bioregion support a vegetation sequence that includes coast tea tree (*Leptospermum laevigatum*) and coastal wattle (*Acacia longifolia*) near the beach, with some areas of beach she-oak (*Casuarina equisetifolia*), scribbly gum (*Eucalyptus signata*), blackbutt (*Eucalyptus pilularis*), red bloodwood (*Corymbia gummifera*) and bastard mahogany (*Eucalyptus umbra*). Banksia and other heath species are found in the dunes and heath and paperbark swamps occur behind the dunes and near the lagoons. Patches of rainforest species can be found where sufficient nutrients have accumulated.

Landscapes and connectivity

The site is located within the Sydney – Newcastle Barriers and Beaches Mitchell Landscape (DECC, 2008). This landscape is characterised by quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. General elevation ranges from 0 to 30 m with local relief of 10 m. Distinct zonation of vegetation and increasing soil development occurs from the beach to the inland dunes.

The site is located on inland dunes where Coast banksia (*Banksia integrifolia*) and old man banksia (*Banksia serrata*) are found and merge with more complex forest containing blackbutt (*Eucalyptus pilularis*), red bloodwood (*Corymbia gummifera*), grass trees (*Xanthorrhoea* sp.) and numerous understorey shrubs on deep sands. Other communities such as *Banksia aemula* heathland and open scrub of coast banksia (*Banksia integrifolia*) comprising coast rosemary (*Westringea fruticosa*), coast tea-tree and grass tree, with smooth-barked apple (*Angophora costata*) and red bloodwood also occur on these older dunes.

Freshwater sedge swamps occur in larger areas of sand with impeded drainage. In the lagoons, salinity varies depending on tidal flushing and they are often surrounded by broad-leaved tea-tree (*Melaleuca quinquenervia*) and swamp oak (*Casuarina glauca*). Water margins are occupied by *Juncus* sp. and common reed (*Phragmites australis*) in fresh water areas. Grey mangrove (*Avicennia marina*) may occur in some tidal inlets.

11.2.2 Native vegetation cover

A large expanse of remnant native vegetation cover occurs to the north and east of the site on Pleistocene sand deposits known as the Tomago sand beds. The site is located at the southwestern limit of the Tomago sand beds. Most of the vegetation within the Tomago sand beds is managed by the Hunter Water Corporation as part of the Newcastle drinking water supply. Vegetation of estuarine and wetland origin occurs south of the site.

The site is located high in the Tomago sand bed sequence where depth to groundwater generally exceeds 3 m with the vegetation formed on these sands characteristically being dry terrestrial environs that are facultatively dependant on groundwater resources. Bell and Driscoll (2006) describe the following vegetation types on dry elevated sands:

- ▶ Tomago Blackbutt-Apple-Bloodwood Forest.
- ▶ Scribbly Gum-Apple-Bloodwood Forest.
- ▶ Peppermint-Apple-Bloodwood Forest.
- ▶ Mesic Blackbutt-Apple Forest.
- ▶ Earp's Gum-Peppermint Scrubby Forest.

None of these vegetation types are considered representative of State or Commonwealth listed threatened ecological communities. However Bell and Driscoll (2006) identified two listed threatened flora species within the Earp's Gum-Peppermint Scrubby Forest vegetation type these being Earp's Gum (*Eucalyptus parramattensis* subsp. *decadens*) and Heart-leaved Stringybark (*Eucalyptus camfieldii*).

Vegetation on the edges of the Tomago sand bed where depth to groundwater approaches 1 m includes swamp forests and sedge woodlands. Vegetation types identified by Bell and Driscoll (2006) as obligate groundwater dependant that are relevant to the project include the following:

- Fringing Baloskion Sedge Woodland.
- **Long Swamp Sedge Woodland.**
- Earp's Gum Sedge Woodland.
- **Paperbark Swamp Forest.**
- **Swamp Mahogany Forest.**
- **Paperbark-Mahogany Low Swamp Forest.**
- **Fringing Paperbark Swamp Forest.**
- Paperbark-Apple-Mahogany Dry Swamp Forest.

Vegetation types identified in bold form part of threatened ecological communities listed under the TSC Act.

11.2.3 Threatened biota

The results of the NSW Wildlife Atlas database search identified a number of threatened flora and fauna species with known local occurrences (OEH, 2011). The EPBC Act Protected Matters Search Tool (PMST) identified 27 threatened species, 42 migratory species, one threatened ecological community and one Ramsar wetland. The BAT identified seven threatened flora species.

The results of these databases searches are discussed in the following sections. Figure 11.2 and Figure 11.3 identify the location of threatened species sourced from the OEH (2011) database search.

Threatened flora

A list of threatened flora species that have been previously recorded or that are predicted to occur within the locality and therefore have a potential likelihood of occurrence on the site, subject to habitat suitability, is provided in Appendix F. Most of the threatened flora species listed in Appendix F require natural soil conditions to occur and the majority of the site does not contain suitable habitat.

Bell and Driscoll (2006) have not identified any threatened flora species within the vegetation types likely to occur within the site. However, Earp's Gum (*Eucalyptus parramattensis* subsp. *decadens*) is known to occur north of the site in an area to be rehabilitated (EcoBiological, 2011).

Threatened fauna

A list of threatened fauna species that have been previously recorded or predicted to occur within the study area is provided in Appendix F. Many of the threatened fauna species have either a pelagic/marine distribution or are reliant on shorelines/mudflats, grassy woodlands or wet/closed forest habitats. The site does not contain these habitats and species attributed to these habitat types are unlikely to occur on the site. These species have been omitted from this assessment.

Based on register searches, threatened fauna species considered in this assessment include:

- Grey-headed Flying Fox (*Pteropus poliocephalus*) – foraging resources present.
- Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) – foraging resources present.
- Eastern Freetail Bat (*Mormopterus norfolkensis*) - foraging/ roosting and breeding resources present.

- Eastern Pygmy Possum (*Cercartetus nanus*) - foraging and breeding resources present.
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – foraging resources present.
- Little Bentwing Bat (*Miniopterus australis*) – foraging resources present.
- Swift Parrot (*Lathamus discolor*) – foraging resources present.
- Regent Honeyeater (*Anthochaera phrygia*) –foraging resources present.
- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) –foraging resources present.
- Long-nosed Potoroo (*Potorous tridactylus tridactylus*) –foraging resources present.
- Koala (*Phascolarctos cinereus*) - foraging supplementary habitat present (PSC, 2002).
- New Holland Mouse (*Pseudomys novaehollandiae*) -foraging and breeding habitat present.

Endangered ecological communities

The Biometric vegetation types database for the Hunter Central Rivers catchment management area indicates the potential for endangered ecological communities to occur within the site. EECs identified within the locality that may possibly occur on the site are:

- Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
- River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.
- Swamp Sclerophyll forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.
- Swamp Oak Floodplain forest of the NSW North Coast, Sydney basin and South East Corner Bioregions.

These EECs have local occurrences on Kooragang Island, around Fullerton Cove and the Hunter River floodplain margins.

The DSEWPac (2011) protected matters search predicted the White Box Yellow Box Blakely's Redgum Woodland and Derived Grasslands Critically Endangered Ecological Community (hereafter termed Box Gum Woodland CEEC) as likely to occur within the locality. This community occurs west from the Muswellbrook district. There are no known occurrences of this community within the Newcastle area.

Migratory species

The EPBC Act Protected Matters Search Tool (PMST) identified 42 migratory species predicted to occur within the study area. Of these, seven are listed as migratory terrestrial species, including the White-bellied Sea-Eagle (*Haliaeetus leucogaster*), White-throated Needletail (*Hirundapus caudacutus*), Rainbow Bee-eater (*Merops ornatus*), Black-faced Monarch (*Monarcha melanopsis*), Satin Flycatcher (*Myiagra cyanoleuca*), Rufous Fantail (*Rhipidura rufifrons*) and Regent Honeyeater (*Anthochaera phrygia*). Twenty five migratory wetland species are known to roost within the locality (generally associated with Kooragang Island).

Koala habitat

The Smooth-barked Apple Red Bloodwood shrubby open forest vegetation is classified by Port Stephens Council CKPoM (PSC, 2002) as 'Supplementary Habitat'. The main Koala forage species that occurs within site vegetation is Smooth-barked Apple, although this vegetation type is considered more valuable to the Koala when Blackbutt (*Eucalyptus pilularis*) occurs as a co-dominant. Blackbutt is not a canopy constituent of the vegetation on site.

The site's capacity to act as a corridor between areas of preferred Koala habitat is limited as the vegetation terminates immediately south of the site and a permanent cyclone wire fence separates the TAC smelter and adjoining industrial estates to the west. Local records indicate that the Koala moves through connected vegetation south of the site and the project would not impact on that vegetation.

SEPP 14 wetlands

SEPP 14 wetlands 815 (Siddon's Swamp), 816 (Blind Harry's Swamp), 817 and 835 (part of the Hunter Estuary Wetland complex) occur within 10 km of the site (see Section 11.4).

Ramsar wetlands

The EPBC Act PMST indicates that the Hunter Estuary Wetlands Ramsar site occurs within 10 km of the site. The Ramsar site comprises the Kooragang Nature Reserve, which is located in the estuary of the Hunter River, and Shortland Wetlands, which are located in the Ironbark Creek catchment in the suburb of Shortland, 2.5 km south from Kooragang Nature Reserve. Kooragang Nature Reserve is located approximately 1 km south of the site on the southern side of the Hunter River.

11.2.4 Survey results

Vegetation cover

The study area comprises a mix of native and exotic vegetation. The two types of vegetation that have been mapped are Smooth-barked Apple Red Bloodwood shrubby open forest (10.58 ha) and Exotic Open Grassland (2.76 ha) (refer to Figure 11.4).

Non-vegetated land-covers also occur within the study area and cover about 1.36 ha. This comprises open ground that is exposed and scattered throughout (such as bare sand), and includes other non-vegetated surfaces such as concrete and gravel areas, gravel tracks and an abandoned industrial shed.

Native flora species

Native vegetation is largely restricted to the northern part of the site and study area and is an area that contains the highest native plant species richness and diversity within the study area (see Appendix F for species list). This vegetation is characterised by Smooth-barked Apple Red Bloodwood shrubby open forest and a total of 89 flora species were observed during surveys, including 15 exotic and 74 native species.

Exotic flora species

The vegetation of the area classified as Exotic Open Grassland is mostly comprised of exotic species including Red Natal Grass (*Melinis repens**), Telegraph Weed (*Heterotheca grandiflora**), Cobbler's Pegs (*Bidens pilosa**) and Plantago (*Plantago lanceolata**).

Telegraph Weed, although not listed as noxious, is a species capable of producing high volumes of seed and is capable of growing in low nutrient sandy soils. Moderate densities of Lantana (*Lantana camera**) exist throughout the Smooth-barked-apple Red Bloodwood shrubby open forest and this is the most

common exotic plant species within the naturally vegetated areas. Whisky Grass (*Andropogon virginicus**) and Red Natal Grass were also frequently observed within naturally vegetated areas, although mostly at the edge of native vegetation cover.

Native vegetation condition

The following four condition classes for native Smooth-barked Apple Red Bloodwood shrubby open forest occur within the site (refer to Figure 11.5):

- Vegetation with high native species diversity (Condition A).
- Vegetation with low native species diversity and few weeds (Condition B).
- Disturbed native vegetation with moderate native species diversity and moderate weed cover (Condition C).
- Disturbed native vegetation with low native species diversity and high weed cover (Condition D).

Site observations indicate that shrub density plays an important role in overall plant species diversity. Areas of highest native species diversity were observed within areas located intermediately between prior sand mining and dense mid storey cover dominated by *Monotoca elliptica*.

Fauna habitats

Tree canopy, mid storey and groundcover

In areas where a native tree canopy exists (Smooth-barked Apple Red Bloodwood Open Forest) the canopy cover is generally less than 5% and at a height of only 5 m – 8 m. These areas generally exhibit greater than 35% mid storey cover dominated by *Monotoca elliptica* and a patchy ground cover of approximately 20%. These structural characteristics vary in accordance with vegetation condition with the more degraded structural characteristics clearly evident in areas of prior sand mining activity. These conditions offer limited suitability for sedentary woodland and forest bird, mammal and reptile species although small ground mammal habitat values are considered high. The varying structural diversity represents a patchy mosaic of habitat suitability for passerine birds with areas of greatest shrub and groundcover structural complexity representing the habitat of highest value for this fauna group.

In the remainder of the site (Exotic Open Grassland), no tree canopy stratum exists. There is an extremely patchy and sparse mid storey stratum (scattered shrubs) combined with a diverse tussocky groundcover comprising mostly exotic plant species. These conditions are generally unsuitable for sedentary woodland and forest bird, mammal and reptile species. The lack of structural diversity also renders these parts of the site of limited value for smaller passerine birds. Only species capable of occupying modified grassland and open habitats are likely to occur within this part of the site.

Hollow-bearing trees and stag trees

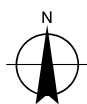
Hollow-bearing trees and stags exist throughout the woodland areas of the site as shown in Figure 11.6. These trees were examined for marks and scratching which would indicate habitat utilisation and were the subject of bat and arboreal fauna surveys. There was limited evidence of current fauna usage particularly in the dead stags. Isolated live trees located north of the proposed haul road contain hollow resources that were observed to have substantial fauna usage.



LEGEND

Freeway	Watercourse	Recreation Areas	Mangrove	Site Location
Roads	Watercourse Area	Forestry Reserve	Forest Or Shrub	10km Buffer
Railways	Built Up Areas			

1:250,000 (at A4)
0 875 1,750 3,500 5,250 7,000
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number | 22-15280
Revision | 1
Date | 12 OCT 2011

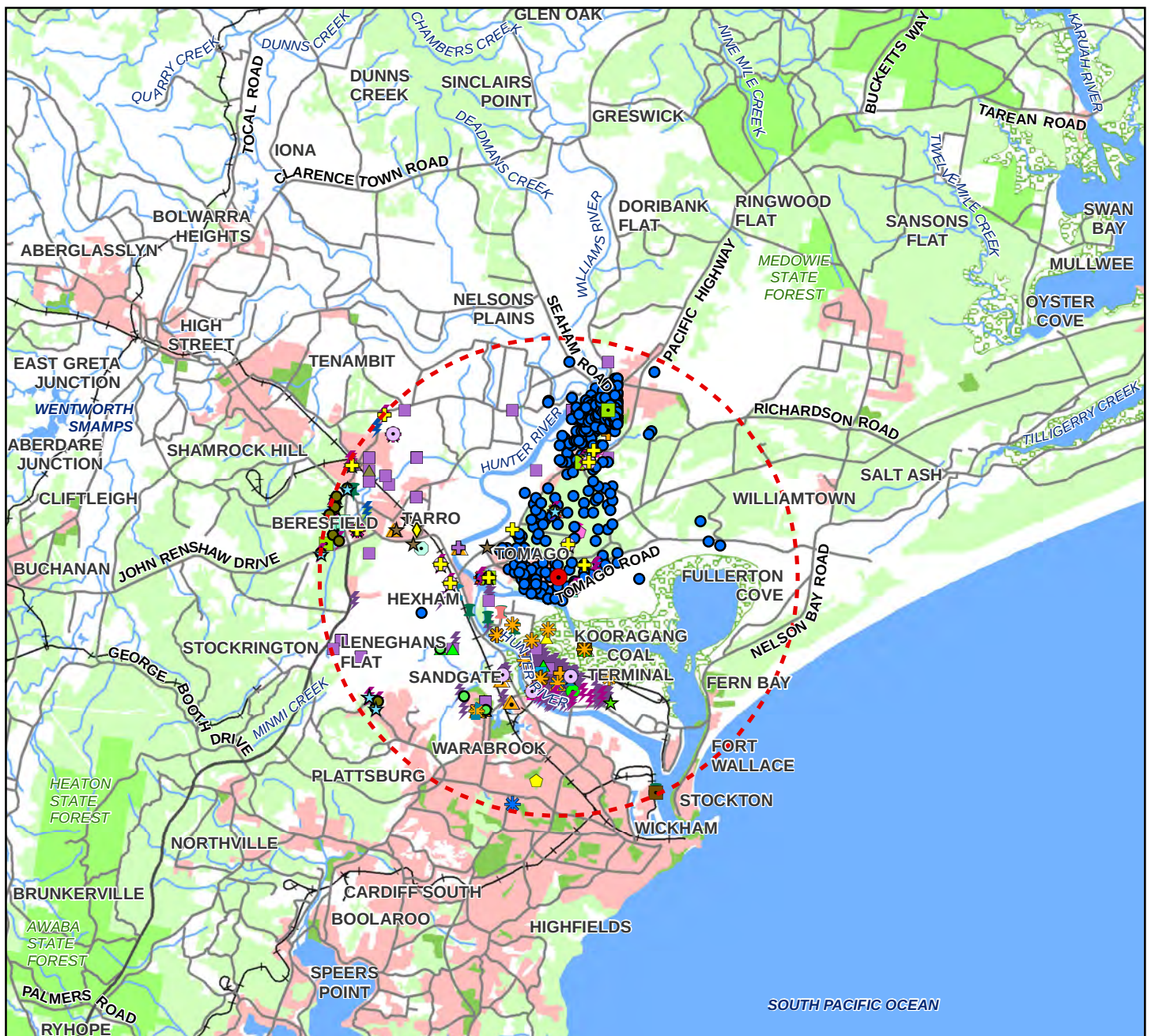
Threatened Flora within 10km
of the Site (OEH 2011)

Figure 11.2

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_004_ThreatFlora_20110811_B.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmackay, tmorton



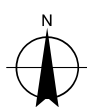
Threatened Fauna recorded within a 10km radius

▲ Australasian Bittern	★ Eastern Bentwing-bat	⚡ Green and Golden Bell Frog	▲ Masked Owl	■ Superb Fruit-Dove
▲ Black Bittern	★ Eastern False Pipistrelle	⚡ Grey-crowned Babbler	▲ Osprey	■ Swift Parrot
▲ Black-breasted Buzzard	★ Eastern Freetail-bat	⚡ Grey-headed Flying-fox	▲ Painted Snipe	■ Terek Sandpiper
▲ Black-chinned Honeyeater	◆ Freckled Duck	⚡ Little Bentwing-bat	▲ Powerful Owl	■ Turquoise Parrot
▲ Black-necked Stork	◆ Gang-gang Cockatoo	● Lesser Sand-plover	▲ Scarlet Robin	▲ Varied Sittella
▲ Black-tailed Godwit	◆ Glossy Black-Cockatoo	● Little Eagle	▲ Southern Myotis	▲ White-fronted Chat
▲ Blue-billed Duck	◆ Gould's Petrel	▲ Little Lorikeet	▲ Spotted Warbler	▲ Wompoo Fruit-Dove
▲ Broad-billed Sandpiper	◆ Great Knot	▲ Little Tern	▲ Square-tailed Kite	▲ Yellow-bellied Sheath-tail-bat
▲ Brush-tailed Phascogale	◆ Greater Broad-nosed Bat	▲ Magpie Goose	▲ Squirrel Glider	
▲ Comb-crested Jacana	◆ Greater Sand-plover			
★ Diamond Firetail				

LEGEND

— Freeway	— Watercourse	■ Recreation Areas	■ Mangrove	● Site Location
— Roads	— Watercourse Area	■ Forestry Reserve	■ Forest Or Shrub	■ 10km Buffer
— Railways	■ Built Up Areas			

1:250,000 (at A4)
0 875 1,750 3,500 5,250 7,000
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number 22-15280
Revision B
Date 12 OCT 2011

Threatened Fauna within 10km
of the Site (OEI 2011)

Figure 11.3

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E intmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_005_ThreatFauna_20110811_B.mxd

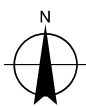
© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmacKay, tmorton



LEGEND

- | | |
|---|---|
| Study Area | Smooth Barked Apple Red
Bloodwood Shrubby Open Forest |
| The Site | Exotic Open Grassland |
| | Hardstand |

1:3,000 (at A4)
0 10 20 40 60 80
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number	22-15280
Revision	A
Date	12 OCT 2011

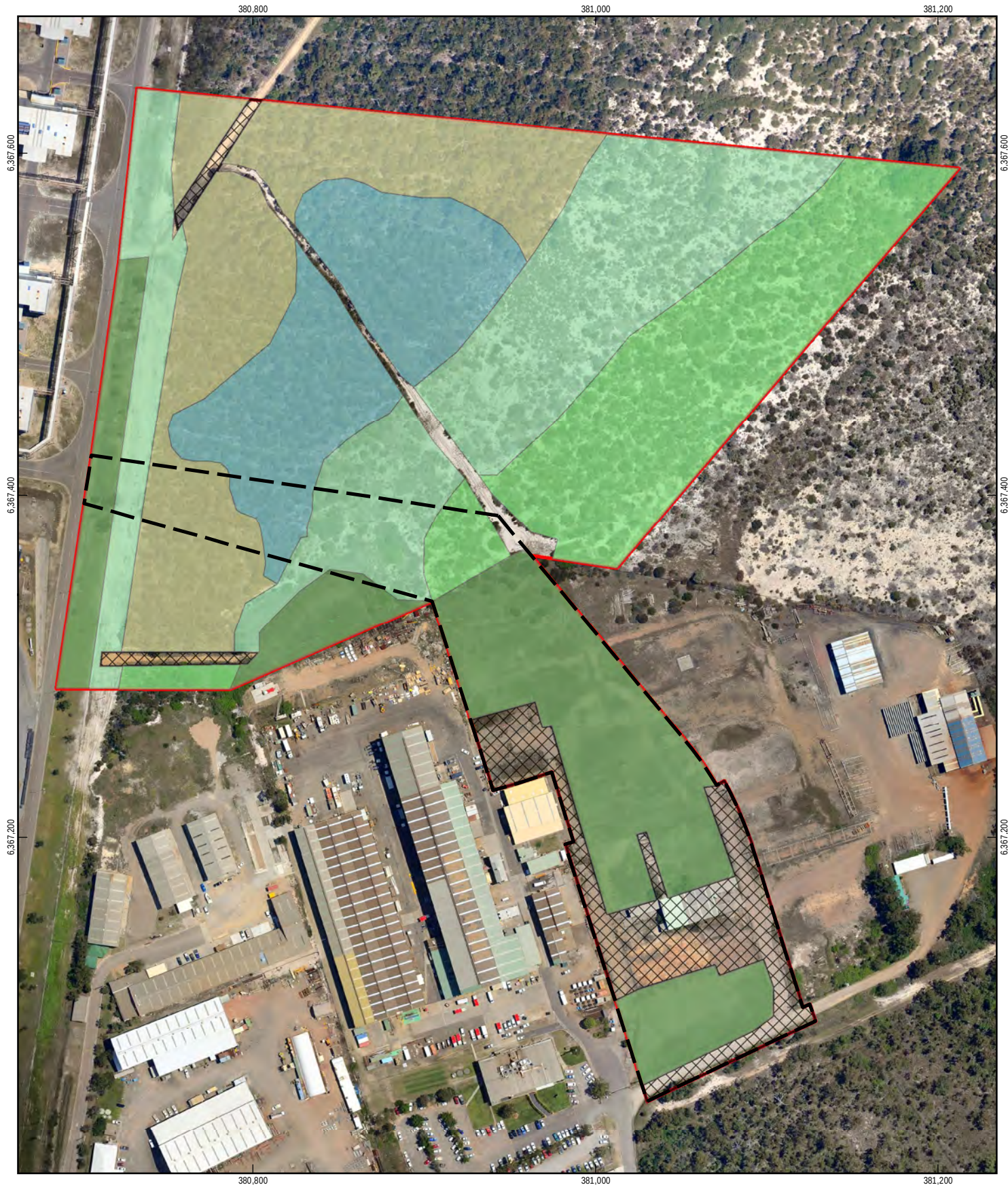
Vegetation of the Study Area

Figure 11.4

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

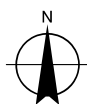
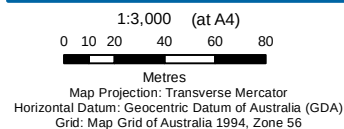
G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_008_Vegetation_StudyArea_20110811_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmackay, tmorton



LEGEND

- | | | | |
|--|---|---|--|
| Study Area | Groundcover Surface | Disturbed native vegetation with moderate native species diversity and moderate weed cover (Condition C) | Exotic Open Grassland |
| The Site | Vegetation with high native species diversity (Condition A) | Disturbed native vegetation with low native species diversity and high weed cover (Condition D) | Hardstand |
| | Vegetation with low native species diversity and few weeds (Condition B) | | |



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number	22-15280
Revision	A
Date	12 OCT 2011

Vegetation Condition of the Study Area Figure 11.5

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 Entlmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_009_VegetationCond_StudyArea_20110811_A.mxd
© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmackay, tmorton

Fallen woody debris

The site contains scattered fallen woody debris of relevance for ground-dwelling fauna. Other scattered concrete and metal and miscellaneous debris also occur throughout the site and provide potential shelter for reptiles and amphibian species. Very few reptiles and no amphibians were detected within the site during the field survey.

Nectar and sap resources

Flowering plants suitable for nectivores and frugivores were restricted to scattered Banksia and Acacia species. These habitat features are conducive to sporadic foraging activity by diurnal birds. Few of these plants were flowering which may account for the low level of bird activity encountered during the survey period. There was no evidence of any winter nectar (ie flowering eucalypts and large shrubs) or important sap resources (eg large diameter Red Bloodwood) within the site.

Water bodies and water resources

No ephemeral, semi-permanent or permanent water bodies or drainages occur within the site. All surface waters draining into the site infiltrate directly into the unsaturated/ saturated zone of the Tomago sand beds with limited ephemeral stormwater movements evident at the southern part of the site (ie only during high rainfall events).

The unsaturated zone of the Tomago sand beds is accessible to surface fauna. Burrowing amphibian species such as the Eastern Banjo Frog (*Limnodynastes dumerulii* subsp. *grayii*) may utilise the naturally vegetated parts of the site due to the soft sand soils and availability of subsurface water resources.

Fauna recorded during field surveys

A total of 41 fauna species were recorded during field surveys within the study area, comprising 21 birds, 18 mammals (including four exotic species) and two reptiles. These species are discussed below along with a general description of habitats available at the site.

Amphibians

The site contains no ephemeral or permanent water resources and as such does not provide breeding habitat for amphibian species. There is no suitable habitat for threatened amphibian species within the site as ephemeral, semi-permanent and permanent water resources were absent.

Reptiles

One reptile species, the Striped Skink (*Ctenotus robustus*), was observed whilst inspecting the underside of scattered rubble and metal objects. There is no suitable habitat for threatened reptile species within the site.

Birds

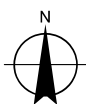
Few birds were observed on the site during the field survey which is a strong reflection of the modified nature and limited habitat value of the Exotic Open Grassland and simplified floristic and structural characteristics of the Smooth-barked Apple Red Bloodwood shrubby open forest. Bird occurrences were largely restricted to areas of native vegetation, particularly small passerine species that require vegetation cover for foraging and to avoid predation. Species observed include the Superb Fairy Wren (*Malurus cyaneus*), White-throated Gerygone (*Gerygone albogularis*), Brown Thornbill (*Acanthiza pusilla*), Eastern Spinebill (*Acanthorhynchus tenuirostris*) and Silvereye (*Zosterops lateralis*).



LEGEND

- Study Area
- The Site
- 🌳 Hollow Bearing Trees

1:3,000 (at A4)
 0 10 20 40 60 80
 Metres
 Map Projection: Transverse Mercator
 Horizontal Datum: Geocentric Datum of Australia (GDA)
 Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
 Tomago Rod and Conductor Manufacturing Facility
 Environmental Assessment

Job Number	22-15280
Revision	A
Date	12 OCT 2011

Hollow Bearing Trees of the Site

Figure 11.6

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E tim@mail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_010_HollowBearingTrees_20110811_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
 Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmackay, tmorton

Mammals recorded during field surveys

Ground mammals

Three exotic mammals were identified on the site; the Black Rat (*Rattus rattus**), House Mouse (*Mus musculus**) and Red Fox (*Vulpes vulpes**), the latter which was identified through a scat. These species are likely to occur within all the habitats found within the site, including those contained within the Exotic Open Grassland where the floristic and structural diversity is considered to severely limit the immigration and persistence of native mammal species.

The native vegetation cover contains a native ground mammal assemblage comprising the Dusky Antechinus (*Antechinus swainsonii*), Brown Antechinus (*A. stuartii*) and New Holland Mouse (*Pseudomys novaehollandiae*). Long term trapping conducted by Tomago Aluminium indicates that the small ground mammal population is robust and healthy (TAC, 2010).

The New Holland Mouse was captured once during the Elliott trapping for the project and was also detected once in the hair tube survey as shown in Figure 11.7. The hair tube survey also showed the House Mouse uses many of the habitats within the site, including habitat contained within the Smooth-barked Red Bloodwood shrubby open forest. The House Mouse is a species that can out-compete the New Holland Mouse when present in high densities (Fox and Haering 1997).

Evidence of macropods was present throughout the naturally vegetated parts of the site (ie scats) although there were no sightings of any kangaroos/ wallabies during the survey period.

Arboreal mammals

The site contains hollow-bearing trees/ stags that are an important pre-requisite for the occurrence of arboreal mammals such as Brush-tailed Possums and gliders. Tree canopy density at the site is sparse and is likely to be a limiting factor in terms of foraging resources such as nectar and sap. Scant evidence of arboreal mammal activity was detected, with one tree showing signs of scratches due to intense utilisation by Brush-tailed Possums.

Arboreal trapping failed to capture any arboreal mammal species. These results are consistent with extensive long term ground trapping programs conducted by the TAC (TAC, 2010).

Microchiropteran bats

The site contains native vegetation with hollow bearing trees/stags adjacent to a large vegetation remnant exceeding 500 ha. These conditions are amenable to regular habitat utilisation by hollow dependant microchiropteran bat species, particularly those that are adapted to dry sclerophyll vegetation of low productivity. Species such as the Eastern Bentwing Bat and Large-eared Pied Bat that use caves and tunnels for roosts may also use the site for foraging purposes only.

Recorded echolocation data (Anabat II) was analysed and identified nine microchiropteran bat species common in the locality. The most commonly recorded species were the White-striped Mastiff Bat (*Tadarida australis*) (a tree roosting species) and Eastern Horseshoe Bat (*Rhinolophus megaphyllus*) (a cave roosting species), with the latter species likely to be roosting locally within a suitable roost contained within the adjoining industrial precinct or large bridge structures. Other bat species identified include the threatened Eastern Freetail Bat (*Mormopterus norfolkensis*), *Mormopterus* sp. 2, Eastern Broadnosed Bat (*Scotorepens orion*), Goulds Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*C. morio*) and forest bats (*Vespadelus regulus* and *V. pumilus*).

Microchiropteran bat species more commonly found in riparian environments and wetter forests, including the threatened Greater Broad-nosed Bat (*Scotaenax rueppellii*) and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) are unlikely to rely on the site.

11.2.5 Threatened biota with the potential to occur within the site

The following section discusses threatened biota that has the potential to occur within the site. This is based on information obtained during desktop studies, field investigations that were undertaken for the project, and reviews of habitat requirements for threatened biota.

Threatened flora

No threatened flora species surveyed during their optimal survey period were detected within the site or study area. These observations are supported by a habitat analysis which indicates that habitat requirements for threatened flora are not present within the site. These findings are consistent with Bell and Driscoll (2006) who identified no threatened flora occurrences within the vegetation type that occurs within the site (Smooth-barked Apple Red Bloodwood shrubby open forest vegetation type of the Tomago sand beds).

Consultation with OEH indicated that further consideration was required to be given to the following threatened flora species:

- ▶ The Leafless Tongue Orchid (*Cryptostylis hunteriana*) was targeted during surveys in February and December 2011 and was not found to occur within the site. On the basis of targeted survey results during the flowering season and habitat analysis, it is concluded that there is no evidence supporting the presence of this species or its habitat within the site.
- ▶ *Rulingia prostrate*. This species occupies ecotone areas between dry sclerophyll (Scribbly Gum dominated vegetation) and swamp sclerophyll forests (Swamp Mahogany dominated vegetation) (Bell and Driscoll, 2006), which do not occur on the site or study area. Notwithstanding, winter surveys targeting non-flowing specimens were completed for this species. In addition targeted survey effort was completed during its flowering season (December). Neither targeted surveys detected this species within the site. On the basis of targeted survey results during the flowering season and habitat analysis it is concluded that there is no evidence supporting the presence of this species or its habitat within the site.
- ▶ The Roughtailed Doubletail (*Diuris praecox*) occurs between Ourimbah and Nelson Bay and grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey (EPA, 2011c). Nearby records of this species are to the east in near coastal conserved habitats within Glen Rock State Conservation Area and Worimi National Park. Targeted surveys were not undertaken during the optimal flowering period for this species (July and August) as it was concluded from the habitat analysis that there was no evidence supporting the presence of this species or its habitat within the site. OEH requested that a precautionary approach be applied and that *Diuris praecox* be considered as potentially occurring onsite within a small area adjoining the power line easement on the western boundary of the site.
- ▶ *Diuris arenaria*. According to the threatened species profile, habitat for *Diuris arenaria* is restricted to the Tomaree Peninsular where it grows in coastal heath and dry grassy eucalypt forest on sandy flats. Umwelt (2011) report this species to occur in dry grassy eucalypt forest on sandy flats at Lavis Lane, Salt Ash where it grows with *Diuris praecox*. Neither the BAT predicted threatened flora list for Smooth-barked Apple Red Bloodwood shrubby open forest or Wildlife Atlas Database search identify

this species as a matter for consideration. On the basis of distribution and habitat it was considered that *Diuris arenaria* is unlikely to occur within the site. Consultation with OEH during the adequacy review period revealed a previously unknown recorded occurrence of this species to the north of the site at Heatherbrae (Steve Lewer, pers com). This new population was detected in September 2011 and is not currently available on the Wildlife Atlas Database. This new record is approximately 18 km west of the previously known limit of distribution for this species and approximately 4 km north of the site. On the basis of this range extension and its proximity to the site, it is considered that there is an increased likelihood of occurrence for *Diuris arenaria* within the site although habitat suitability remains a limiting factor. OEH requested that a the precautionary approach be applied and that a small area of the site that adjoins the power line easement on the western boundary of the site should be considered potential habitat.

- ▶ *Galium australe* According to the NSW Scientific Committee (2005) the habitat of *Galium australe*, as defined by its recorded occurrences in NSW, includes valley floor, alluvial soil beside a creek, heathland in a rocky gully, and the top of an escarpment above a creek. This species is not predicted to occur within 'Smooth-barked Apple – Red Bloodwood Heath Woodland' nor is it predicted to occur within the Hunter Central Rivers CMA (OEH, 2011c). Targeted survey was undertaken for *Galium australe* in December despite this species not being previously found within the locality (OEH, 2011a), Hunter Central Rivers CMA or regional vegetation type. Systematic and targeted surveys completed throughout the site did not identify any *Galium australe* or any other species of Galium. These findings are consistent with those of the Bell and Driscoll (2006) study for the Tomago sand beds where they report no records of any Galium spp. within 6797 rapid data points and 172 full floristic survey plots. Most records of *Galium australe* are south from Sydney where it has been recently rediscovered on the South Coast in Lake Conjola State Recreation Area and Meroo National Park. On the basis of distribution, habitat, local prior surveys and survey results for the study area, it is concluded that there is no evidence of this species or its habitat occurring within the site.
- ▶ *Maundia triglochinosoides*. This species was identified by the OEH) as an additional threatened species also requiring assessment. This species grows in swamps, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. These habitat conditions do not occur on the site and this species is not anticipated to occur on the site.

Threatened fauna

The desktop and site based investigations identified suitable habitat for threatened biota known or predicted to occur within the study area. Species considered relevant to the assessment of the project include:

- ▶ New Holland Mouse (known to occur with the site – foraging and breeding habitat).
- ▶ Brush-tailed Phascogale (*Phascogale tapoatafa*) (suitable foraging and breeding habitat).
- ▶ Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) (suitable foraging).
- ▶ Eastern Freetail Bat (known to occur within the site – foraging and breeding habitat).
- ▶ Eastern Pygmy Possum (*Cercartetus nanus*) (suitable foraging and breeding habitat).
- ▶ Greater Broad-nosed bat (*Scoteanax rueppellii*) (suitable foraging and breeding habitat).
- ▶ Grey-headed Flying Fox (known to occur onsite) (suitable foraging habitat).
- ▶ Koala (*Phascolarctos cinereus*) (supplementary habitat – foraging and movement).
- ▶ Large-eared Pied Bat (*Chalinolobus dwyeri*) (suitable foraging habitat).

- ▶ Little Bentwing Bat (*Miniopterus australis*) (suitable foraging habitat).
- ▶ Squirrel Glider (*Petaurus norfolcensis*) (suitable foraging and breeding habitat).
- ▶ Swift Parrot (*Lathamus discolor*) (marginal foraging habitat).
- ▶ Regent Honeyeater (*Anthochaera phrygia*) (marginal foraging habitat).
- ▶ Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) (marginal foraging habitat).
- ▶ Long-nosed Potoroo (*Potorous tridactylus tridactylus*) (marginal foraging habitat).

Three of the above threatened fauna species were found to occur within the study area. The Grey-headed Flying-fox (listed under the TSC Act and EPBC Act) and New Holland Mouse (listed only under the EPBC Act) were observed on site. The Eastern Freetail Bat is a threatened microchiropteran bat listed on the TSC Act and was detected by an Anabat II recording.

Grey headed Flying Fox

One Grey-headed Flying-fox, a species listed as 'vulnerable' under both the TSC and EPBC Acts, was observed beyond the northern boundary of the site within a dense covering of *Monotoca elliptica*. This individual was likely to have been roosting temporarily and its presence does not indicate any permanent habitation of this species on the site or in the immediate vicinity. Tree species on the site that provide suitable foraging resources for Grey-headed Flying-fox include Smooth-barked Apple and Red Bloodwood although these trees are considered to be of limited value to this species given their the low density and stunted form (close to ground, small canopy). No camp is present on site nor is there a likelihood of a camp occurring within the site as there is not a tall dense wet sclerophyll eucalypt/ rainforest canopy.

Eastern Freetail Bat

The Eastern Freetail Bat was recorded using the Anabat II echolocation detector. Activity by this species within the site was restricted to a few calls and notably during the latter parts of the evening. The low number and late timing of these recordings indicates that the species is likely to be moving into the site from an offsite roost. Foraging is likely to be opportunistic as this species is generally associated with riparian environments, mangroves and taller denser forests. Notwithstanding, the hollows contained within the site are regarded as suitable roost habitat for this species.

New Holland Mouse

Small ground mammal surveys conducted as part of the field surveys on the site (Elliott trapping) identified a single male New Holland Mouse in the location of the proposed haul road. Hair tube results confirmed the occurrence of the New Holland Mouse nearby the trapped location (one positive hair sample). New Holland Mouse detection appears to be coincident with the boundary between native vegetation of condition classes A and C which is the ecotone between quarried and unquarried lands (refer to Figure 11.5).

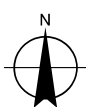
Suitable habitat for this species at the site was defined using a predictive equation for New Holland Mouse biomass developed by Fox and Fox (1978). This biomass model explained 96% of New Holland Mouse biomass variation in an area disturbed by mineral sand mining at Hawks Nest NSW. The model defines habitat based on variables such as plant species diversity, the proportion of heath species present and soil hardness. The results of the habitat characterisation survey for the New Holland Mouse on the site can be found in Appendix F.



LEGEND

- | | | | | |
|---|--|---|--|--|
| Study Area | ★ Hair Tubed New Holland Mouse | NHM Biomass Point | 10 - 15 | 20 - 25 |
| The Site | ★ Trapped New Holland Mouse | 0 - 5 | 15 - 20 | |
| Haul Road | | 5 - 10 | | |

1:3,000 (at A4)
0 10 20 40 60 80
Metres
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment
**New Holland Mouse Records
and Modelled Biomass**

Job Number	22-15280
Revision	A
Date	12 OCT 2011

Figure 11.7

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E entlmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\MapsWorking\2215280_ECO_011_NHMRecModelledBioMass_20110811_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmackay, tmorton

Opportunistic or occasional visitors

Based on an analysis of site characteristics and habitat requirements, it is considered that threatened fauna that may visit the site opportunistically or occasionally as visitors are limited to the Regent Honeyeater, Spotted-tailed Quoll, and Long-nosed Potoroo.

The Regent Honeyeater is typically restricted to two known breeding areas in NSW (the Capertee Valley and the Bundarra-Barraba region), and would not breed or reside in habitats at the site or within the locality. It is occasionally recorded in non-breeding flocks near the coast, presumably due to drought or lack of foraging resources in its usual breeding range, however during these times it is typically observed in highly productive Spotted Gum (*Corymbia maculata*) and Swamp Mahogany (*Eucalyptus robusta*) forests. Such habitats do not occur at the site. Individuals may occur at the site as vagrants or on a sporadic, opportunistic basis to exploit foraging resources, or may use vegetation within the broader study area as a stepping-stone while travelling through the landscape. Habitats at the site would have limited value for these individuals.

The Spotted-tailed Quoll (*Dasyurus maculatus*) and Long-nosed Potoroo (*Potorous tridactylus*) have a very low possibility of occurring within the native vegetation in the Tomago Aluminium buffer zone to the north-west of the study area. The vegetation within the site would represent only marginal habitat for these species due to the proximity to industrial development, the lack of dense understorey required by the Long-nosed Potoroo, and the lack of potential den sites for the Spotted-tailed Quoll. However as these species may occur in the areas of vegetation to the north which are contiguous with the site, they could conceivably occur at the site on an opportunistic basis. The site is surrounded on two sides by development, and is unlikely to be important for individuals moving through the landscape.

Migratory species

Based on the site characteristics and an analysis of habitat requirements, it is considered that migratory species that may use the site on an occasional basis would be limited to the Swift Parrot, Regent Honeyeater, Satin Flycatcher, Rufous Fantail, Black-faced Monarch, White-throated Needletail, Rainbow Bee-eater and White-bellied Sea-eagle.

The Swift Parrot breeds in Tasmania and is only found on the mainland during winter when it is principally recorded within box-ironbark communities on the western slopes. Coastal forests containing winter-flowering eucalypt species are also considered important habitat. The site does not contain any winter-flowering eucalypt species and the canopy species present are considered to have low value for nectarivorous species given their low density at the site and stunted form. Habitats at the site would have little to no value for this species, and it may occur only on an opportunistic or occasional basis.

The Regent Honeyeater is typically restricted to two known breeding areas in NSW (the Capertee Valley and the Bundarra-Barraba region), and would not breed or reside in habitats at the site or within the locality. It is unlikely that the Regent Honeyeater would use the site as a movement corridor between breeding areas.

The Satin Flycatcher, Rufous Fantail and Black-faced Monarch typically occur in denser, wetter forest environments but may occur in more open habitats during migration. These species may therefore occur at the site during migratory movements but would be unlikely to rely on habitats at the site for foraging or breeding. The White-throated Needletail is almost exclusively aerial, and may forage in habitats over the site but is unlikely to be reliant on the vegetation present. This species does not breed in Australia.

The Rainbow Bee-eater and White-bellied Sea-eagle both inhabit coastal sand dune systems and open woodlands (among other habitat types), and may therefore occur in habitats at the site. There is no

breeding habitat for either of these species at the site: the Rainbow Bee-eater builds tunnels in sandy banks or cliffs while the White-bellied Sea-eagle nests in tall open forest or woodland close to water. As White-bellied Sea-eagle typically forages over water but may forage over open habitats on occasion, the site would represent a small area of marginal foraging habitat for this species. Habitats at the site would be too small to support large or semi-permanent populations of any of these species, and individuals would typically occur at the site only to exploit seasonal foraging resources or use habitats as a stepping-stone to assist movement through the landscape. The small area of vegetation to be removed would not represent an important area of habitat for these birds, nor would its removal reduce their ability to move through the landscape.

Endangered ecological communities (EECs)

No EECs were found within the site or the study area. Two EECs have been recorded within the locality and these may potentially be indirectly impacted via changes in depth to groundwater (see Section 9.2). These EECs are:

- ▶ Swamp Sclerophyll forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.
- ▶ Swamp Oak Floodplain forest of the NSW North Coast, Sydney basin and South East Corner Bioregions.

The potential for indirect impacts on these EECs has been considered in Section 11.3.1.

11.3 Impact Assessment

11.3.1 Construction impacts

Direct impacts

The direct impacts of the project on habitat within the site are shown in Figure 11.8 and discussed below.

Smooth-barked Apple Red Bloodwood shrubby open forest

The project would clear 0.68 ha of Smooth-barked Apple Red Bloodwood shrubby open forest and associated habitats. This vegetation does not constitute or form part of an endangered or critically endangered ecological listed under the TSC Act and/or EPBC Act. No threatened flora species are known to or are expected to occur within this vegetation. However, a small area of habitat located adjacent to the power line easement at the western edge of the site has been identified by the OEH as potentially being suitable for *Diuris praecox* and *Diuris arenaria*. These species would be considered on the basis of the precautionary principle.

Suitable habitat for threatened fauna species occurs within the area of Smooth-barked Apple Red Bloodwood shrubby open forest that would be cleared. The direct loss of this habitat (for threatened species with large home ranges (ie > 100 ha) is likely to be inconsequential given the small impact area (0.68 ha) and the likelihood of these species showing low site fidelity for small areas where there is a limited availability of critical lifecycle elements such as roost/ den/ breeding habitat features.

The loss of 0.68 ha of suitable habitat for species with small home ranges such as the New Holland Mouse has the potential to cause mortality and injury to individuals within the construction footprint, and disrupt lifecycles and movement. Linear impacts have the potential to sever habitat and magnifying the habitat area loss.

The project has been refined to minimise potential impacts on habitat for the New Holland Mouse. This involved refining the alignment of the haul road where practicable to aim to avoid habitat that is likely to be more important to this species.

To minimise impacts associated with clearing 0.68 ha of Smooth-barked Apple Red Bloodwood shrubby open forest, fauna would be removed from the construction footprint, fencing would be used to separate impact and non-impact areas. Where practicable, construction would seek to retain habitat with structural diversity and high plant species diversity, high proportions heath species and soft soils within connected vegetation patches capable of supporting numerous individuals.

The potential for a direct disturbance to New Holland Mouse habitat adjacent to the construction zone would be minimised by clearly defining and fencing the construction zone for the haul road. The haul road would be 9m wide and would generally have a 5m wide construction zone on either side. To minimise impacts on habitat for the New Holland Mouse, there would not be a 5m wide construction zone on the northern side of the haul road in the vicinity of habitat that is of greater importance for this species (refer to Appendix F).

Exotic open grassland

Approximately 1.2 ha of Exotic Open Grassland would be cleared. This area provides limited habitat for native flora and fauna species and no habitat values of importance for threatened biota. Given the low native species diversity in this community and habitat values it is considered that the impact of clearing this habitat would be minor and inconsequential.

Indirect impacts

There is the potential for an indirect impact on threatened species with small home ranges. The New Holland Mouse generally occupies a small home range with occupied habitat located adjacent to the haul road. During the construction period it is anticipated that construction noise and vibration have the potential to disrupt this species. No specific measures are proposed to manage construction noise and vibration as these impact sources are temporary and are not considered to have any measurable impacts on the key habitat values of the New Holland Mouse over the long term (ie plant species diversity, heath species proportion and soil softness).

Other potential indirect impacts include dust deposition on vegetation during construction and pollution such as hydrocarbons during construction and operation of the haul road. These impacts would be managed by implementing the mitigation measures outlined in this Environmental Assessment.



LEGEND

 Study Area

 The Site

 Alternative Haul Road

Groundcover Surface

Vegetation with high native species diversity (Condition A)

Vegetation with low native species diversity and few weeds (Condition B)

Disturbed native vegetation with moderate native species diversity and moderate weed cover (Condition C)

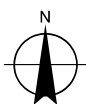
Disturbed native vegetation with low native species diversity and high weed cover (Condition D)

Exotic Open Grassland

Hardstand

1:3,000 (at A4)
0 10 20 40 60 80
Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56



CLIENTS | PEOPLE | PERFORMANCE

Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Direct Impacts on
Native Vegetation Cover

Job Number 22-15280
Revision A
Date 12 OCT 2011

Figure 11.8

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntmail@ghd.com.au W www.ghd.com.au

G:\2215280\GIS\Maps\Deliverables\Ecology\2215280_ECO_012_DirectImpact_VegCover_20110811_A.mxd

© 2011. While GHD has taken care to ensure the accuracy of this product, GHD and GEOSCIENCE AUSTRALIA, DECCW make no representations or warranties about its accuracy, completeness or suitability for any particular purpose. GHD and GEOSCIENCE AUSTRALIA, DECCW cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Geoscience Australia: 250k Topographic Data Series 3 - 2006; DECCW: Atlas of NSW Flora/Fauna - 2011. Created by: fmacKay, tmorton

11.3.2 Operational impacts

Lighting

Lighting would be provided along the haul road to enable safe operation 24 hours per day. Light shed from haul road lighting would be in addition to those due to the smelter which is also lit at night. The potential impacts of night lighting on small ground mammals includes altered behaviours and habitat utilisation plus increased risk of predation by the European Fox and Feral Cat. This impact would be mitigated by using shielded directional lighting along the northern edge of the haul road so that light spills in a southerly direction. This would reduce the impacts of light shed on New Holland Mouse habitat within native vegetation to the north of the haul road.

Noise

The project would increase background noise within areas characterised by native vegetation. Long term monitoring of ground mammal through annual trapping (25 years) conducted by TAC (TAC, 2010) suggests that the effect of noise from the smelter on species such as Antechinus and New Holland Mouse is negligible. Noise from regular but occasional haul trucks (1-2 trucks per hour) is unlikely to have any substantive influence on ground mammal populations in the vegetation that adjoins the haul road. No specific mitigation is required.

Habitat connectivity

The native vegetation of the site is located at the edge of the Tomago sand beds where native vegetation abuts a substantial area of existing utilised industrial lands. These developed industrial lands have severed native vegetation of the Tomago sand beds vegetation located further to the south and west of the site. The project requires a haul road less than 15 m wide and this would partially separate a 1.1 ha patch of vegetation on the southern side of the haul road from a contiguous patch native vegetation exceeding 500 ha in area. The partial separation of this 1.1 ha area of vegetation is of minor significance given the large area of similar habitat on adjacent lands.

Furthermore, the woody vegetation patches located north and south of the proposed haul road would remain functionally connected as the gap between these two patches remains less than the DECCW, (2008) threshold for vegetation discontinuity (ie gaps between woody vegetation patches that exceed 100 m are considered discontinuous).

Species considered most sensitive to reduced vegetation connectivity are those that exhibit small home ranges and high site fidelity. In the case of the New Holland Mouse, areas containing high modelled biomass are located mostly north of the proposed haul road. The alignment of the haul road has been developed to limit habitat loss and fragmentation, thereby reducing direct impacts on high value New Holland Mouse habitat. This avoidance was fundamental in preserving the integrity of high value habitat for the New Holland Mouse by retaining areas of high value modelled biomass in a contiguous patch and reducing the severance of lower value habitat located south of the haul road. The partial severance of native vegetation south of the haul road is regarded as inconsequential for the ongoing survival of this species within the site and study area.

Land management

Potential indirect impacts attributable to land management activities include:

- ▶ Bushfire hazard control.
- ▶ Increased abundance of exotic species.

Management of bush fire hazards throughout the naturally vegetated lands that adjoin the site (ie study area and Tomago Aluminium buffer zone) are likely to improve habitat suitability for the threatened species identified as likely to occur within the study area in particular the New Holland Mouse. The use of fire has the potential to aid in the management of weeds such as Lantana. These considerations would form part of the bush fire management works for the project to enhance habitat suitability within the Smooth-barked Apple Red Bloodwood shrubby open forest vegetation for threatened species such as the New Holland Mouse.

Water management

The strategy to manage site water and groundwater is outlined in Chapter 9. Surface water from impervious surfaces would be collected and infiltrated into the site. This is unlikely to have adverse impacts on native vegetation or threatened species habitat as the quantum of water would be similar to that which currently infiltrates the site. If required, landscape plantings may use native species such as *Lomandra longifolia* that are tolerant of increased soil moisture.

Water intercepted by the haul road would drain to the edges of this road and infiltrate directly into the adjoining soil. This would result in a minor concentrated line of water infiltration along the edge of the haul road where a localised increase in water volume and nutrients would be managed through a gallery planting of appropriate natives such as *Lomandra longifolia*. A low bunded edge would isolate unanticipated pollutants such as hydrocarbon spills along the haul road.

11.3.3 Impacts on threatened biota

The potential impacts of the project on threatened biota and their habitats have been assessed. Detailed assessments of the likely project impacts on threatened biota and their habitats listed under the TSC Act, which are relevant to the project, are presented in Appendix F.

Consultation with OEH identified that a precautionary approach should be applied to a small area adjacent to the powerline easement at western boundary of the site as this area may provide habitat for *Diuris praecox* and *Diuris arenaria*. As targeted surveys were unable to be undertaken for these species during their flowering period, OEH agreed that surveys during the flowering period are required prior to construction commencing in this area.

The project would directly impact on the habitat of the Eastern Freetail Bat and Grey-headed Flying-fox which are two threatened fauna species listed under the TSC Act that have been identified within the study area. The project is unlikely to have a significant negative effect on any local population of the Eastern Freetail Bat or Grey-headed Flying-fox or suitable habitat for threatened fauna species because:

- ▶ The majority of the project's impact would be restricted to Exotic Open Grassland which has reduced fauna habitat values as it has low native plant species diversity, vegetation structure and no hollow-bearing trees.
- ▶ The main areas of suitable threatened species habitat occur north from the haul road and would not be adversely impacted by the project.
- ▶ Known habitat to be removed for a threatened species such as the Eastern Freetail Bat and Grey-headed Flying-fox would be limited to 0.68 ha, which represents less than 0.1% of the available suitable habitat for these species within the locality. As both these species have large home ranges for foraging, the resultant impact on species with large home ranges is likely to be inconsequential.
- ▶ The Grey-headed Flying-fox has low site fidelity as the site is not a camp or roost site.

- ▶ The Eastern Freetail Bat may potentially have high site fidelity as it roosts in tree hollows, however impacts on these habitat features have been limited through avoidance and would be mitigated during the construction and operation phases.

Threatened fauna species that may inhabit Smooth-barked Apple Red Bloodwood shrubby open forest) but were not identified within the site include:

- ▶ Brush-tailed Phascogale (suitable foraging and breeding habitat).
- ▶ Eastern Bentwing Bat (suitable foraging).
- ▶ Eastern Pygmy Possum (suitable foraging and breeding habitat).
- ▶ Greater Broad-nosed Bat (suitable foraging and breeding habitat).
- ▶ Koala (supplementary foraging).
- ▶ Large-eared Pied Bat (suitable foraging).
- ▶ Little Bentwing bat (suitable foraging).
- ▶ Squirrel Glider (suitable foraging and breeding habitat).
- ▶ Swift Parrot (marginal foraging habitat).
- ▶ Regent Honeyeater (marginal foraging habitat).
- ▶ Spotted-tailed Quoll (marginal foraging habitat).
- ▶ Long-nosed Potoroo (marginal foraging habitat).

The predicted loss of 0.68 ha comprising suitable habitat for the above listed threatened species represents a small inconsequential loss. because:

- ▶ The project would not isolate any large or important areas of suitable habitat for a threatened species. The impact area is not regarded as a key movement corridor for threatened species relevant to this assessment.
- ▶ The occupation of the site by threatened fauna species identified in Section 11.2.5 is likely be on an occasional basis with habitat utilisation associated with the impact areas not regarded as critical to the lifecycles of these threatened fauna species.
- ▶ Ecological processes such as pollination, seed fall, seedling recruitment and fauna movement would occur across the gap created by the proposed haul road with partially severed vegetation likely to continue to function as a single viable patch. The minor reduction in native vegetation cover and connectivity would be unlikely to comprise a significant reduction in the extent of a threatened species, population or ecological community and their habitats relevant.
- ▶ Project impacts would be minimised by implementing the mitigation measures in Section 11.5. It is predicted that the use of an appropriately timed ecological burn, fauna clearance, weed management and House Mouse control is likely to result in a maintain or improve outcome for habitats for the New Holland Mouse within the site.

11.3.4 Koala habitat

The site is located in the Tomago sand beds Koala Management Unit (PSC 2002). Coastal Sand Apple Blackbutt Forest is regarded to be supplementary habitat for the Koala under this plan. Within the site, this vegetation community contains a number of small (to 15 m tall) *Angophora costata* trees which are

identified by the CKPoM as important feed trees for Koalas in the Port Stephens area (PSC 2002). Site inspections did not identify any evidence that Koalas were actively using the site as foraging habitat.

Smooth-barked Apple within the site are short and stunted with many showing signs of declining health. These observations are likely to be a consequence of fluoride emissions from the smelter, with numerous dead trees of similar height and basal area considered indicative of fluorides effects on vegetation (Ecoplan, 2009). Within this context it is considered unlikely that the Smooth-barked Apple of the site would provide habitat of local importance for the Koala.

The site does not provide any connectivity between patches of preferred or supplementary habitat located south or west of the site as the habitat has been severed by proximal industrial development and man proof fencing. Local movement between areas of utilised habitat is likely to occur through vegetation east, south and southwest of the study area with core habitat located southwest of the study area likely to be an important destination for local Koalas.

There is no evidence that the project would have any measurable impact on the Koala within the Tomago Koala Habitat Unit for the following reasons:

- There was no evidence of site use by the Koala.
- The site is a small area of supplementary habitat and is unlikely to be used by the Koala.
- The site does not form part of a Koala movement pathway between areas of preferred and/or supplementary habitat.

11.3.5 SEPP 14 wetlands

The proposed infiltration rates for intercepted surface waters into the groundwater aquifer would result in a localised groundwater mound with greatest effect within and immediately adjacent the site. No adverse impacts are expected on SEPP 14 wetlands.

11.3.6 EPBC Act assessment

On the basis of the assessments undertaken, it is concluded that the project is unlikely to result in 'a significant effect' on any MNES. A referral prepared under the EPBC Act was assessed by the DSEWPoC (referral number 2011/6085) and it was decided that the project is not a controlled action under the EPBC Act. MNES subject to this assessment in the referral are discussed as follows.

Threatened biota and migratory species

The following threatened biota was considered as likely to occur within the site:

- New Holland Mouse (known).
- Grey-headed Flying-fox (known).
- Large-eared Pied Bat (low value foraging habitat).

Four species (the Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll and Long-nosed Potoroo) were identified as having a very low potential to occur within the study area or immediate surrounds given the absence of preferred habitat. These species would occur at the site on an opportunistic basis, if at all, and would be unlikely to be reliant on the habitat resources present for their conservation in the locality.

The assessment concluded that the project is unlikely to have a significant impact on threatened biota because:

- ▶ Approximately 0.06 ha of moderately suitable habitat (5-15 g predicted biomass) for the New Holland Mouse would be impacted by the project, with impacts on high value habitat (15-25 g modelled biomass) minimised through altered haul road design.
- ▶ Two hollow-bearing trees would be removed by the project with the altered haul road design resulting in the avoidance of a further two hollow bearing trees.
- ▶ Native vegetation containing suitable habitat for relevant threatened biota directly impacted by the project would be managed through the implementation of a CEMP to minimise direct harm to individuals of an important population notably the New Holland Mouse. Specific management provisions apply to the New Holland Mouse to increase the certainty of this predicted outcome.
- ▶ Important populations of a threatened species of the New Holland Mouse and their habitats are unlikely to be adversely impacted by the project. The project would not contribute to the decline or extinction of these important populations.
- ▶ The project would have no appreciable impact on wildlife corridors or movement opportunities for threatened biota.

The 0.68 ha of woodland habitat to be removed would contain limited foraging resources for up to six migratory 'terrestrial' species, including the Satin Flycatcher, Rufous Fantail and Black-faced Monarch (which may use the habitats during migratory movements only), the White-throated Needletail (which may utilise aerial habitats above the vegetation) and the Rainbow Bee-eater and White-bellied Sea-eagle (which may forage at the site on occasion). There is no breeding habitat present on site for any of these species. The small area of vegetation to be removed does not represent important habitat for any of these species, nor would its removal affect their ability to move through the landscape.

Ramsar sites

There is one Ramsar site (the Hunter Estuary wetlands, within the locality of the site (DSEWPac 2011)). The Ramsar site comprises the Kooragang Nature Reserve, which is located in the estuary of the Hunter River, and Shortland Wetlands, which are located in the Ironbark Creek Catchment in the suburb of Shortland, 2.5 km south from Kooragang Nature Reserve. The boundary of the Kooragang Nature Reserve Ramsar site is over 1 km south of the site, and there would be no direct impacts on this Ramsar site from the project.

The water management strategy would infiltrate wells to retain and infiltrate the first 15 mm of rainfall to the underground aquifer to reduce impacts of increased stormwater runoff on surrounding areas. Rainfall in excess of this volume would be allowed to follow existing drainage conditions. The predicted rise in the groundwater table under this scenario indicates that detectable increases (>0.01 m) in groundwater levels would not impact on sensitive nearby receivers such as the Hunter Estuary Ramsar wetlands. There is unlikely to be any measurable impact on the Hunter Estuary Wetlands.

11.3.7 Key threatening processes

A 'key threatening process' (KTP) is 'a threatening process specified in Schedule 3' of the TSC Act. A 'threatening process' is 'a process that threatens, or may have the capability to threaten the survival or evolutionary development of species, populations or ecological communities'. The following KTPs are likely to have previously operated or are currently operating within the site given the highly modified and disturbed condition of the vegetation and/ or ongoing exposure or disturbances from adjoining land uses:

- ▶ Clearing of native vegetation.
- ▶ Loss of hollow-bearing trees.
- ▶ Removal of dead wood and dead trees.
- ▶ Predation by the European Red Fox (*Vulpes vulpes*).

The project would remove native vegetation and as such would contribute to the operation of the KTP 'Clearing of Native Vegetation'. This would also result in the operation of the 'Removal of dead wood and dead trees' KTP. The extent of native vegetation to be cleared is minimal when compared to large expanse similar vegetation located north and east of the site throughout the Tomago sand beds. The removal of dead wood and trees would be minimised through avoidance followed by removal from construction area and placement in alternative nearby habitats. The project would not contribute to the invasion of native vegetation by exotic grasses or to predation of native fauna by the European Fox. However, the project would not specifically prevent or reduce the predation of native fauna by the European Fox.

The project would remove at least two hollow bearing trees which would contribute to the loss of hollow-bearing trees KTP. This impact would be minimised by removing fauna from the hollow bearing trees to be cleared during construction and installing nest boxes in nearby habitat.

11.4 Groundwater dependent ecosystems (GDEs)

11.4.1 The study area

Modelling worst case infiltration rates at the site resulted in the delineation of an irregularly bounded study area around the site as shown in Figure 11.9. This boundary is mutually exclusive to the mapped boundary of the Hunter Estuary Nature Reserve or RAMSAR site, however, SEPP 14 wetlands were noted within the south eastern boundary of the study area.

11.4.2 NSW State Groundwater Dependent Ecosystems Policy 2002

The *NSW State Government Dependent Ecosystems Policy 2002* defines the planning, regulatory and practical context for identifying, assessing, managing and monitoring Groundwater Dependent Ecosystems (GDEs).

There are five principles stated in the policy that are used to consider GDEs within the context of other competing demands for groundwater, these being:

- ▶ GDEs have scientific, aesthetic, ecological and economic values, including threats and species management requirements, to ensure the protection of vulnerable and valuable systems.
- ▶ Groundwater extractions must be sustainable within the context of biological systems dependant on the related groundwater aquifers.

- ▶ Supply of groundwater resources to protect known GDEs must be maintained particularly those under a high degree of threat from extraction.
- ▶ Apply the precautionary principle to protect GDEs where there is limited scientific certainty.
- ▶ Planning, approval and management of development should aim to minimise impacts on GDEs by maintaining existing GDEs, avoiding the pollution of groundwater resources and rehabilitating degraded groundwater systems.

These principles have been considered when assessing potential impacts on GDEs.

11.4.3 Groundwater dependent ecosystems classification

Vegetated areas within the study area were notionally classified in accordance with the following schema:

- ▶ 0-1 m median depth to groundwater: Obligate wetland or seasonal inundation GDE
- ▶ 1-2 m median depth to groundwater: Obligate GDE
- ▶ 2-3 m median depth to groundwater: Obligate/ Facultative mixed GDE
- ▶ Greater than 3 m median depth to groundwater: Facultative GDE

This was used as the basis for defining impacts on GDEs in particular 'obligate wetland or seasonal inundation GDEs' where predicted net changes in depths to groundwater are likely to have a proportionally larger effect

11.4.4 Groundwater dependent ecosystems importance ranking

The importance of GDEs identified within the study area were ranked using the following measures of conservation status:

- ▶ International importance: Ramsar listed wetlands (EPBC Act).
- ▶ National importance: Threatened biota, including ecological communities and migratory wetland birds, listed under the EPBC Act.
- ▶ State importance: *SEPP 14* wetlands; endangered ecological communities listed on the TSC Act.
- ▶ Local importance: GDEs not conforming to any of the above classifications.

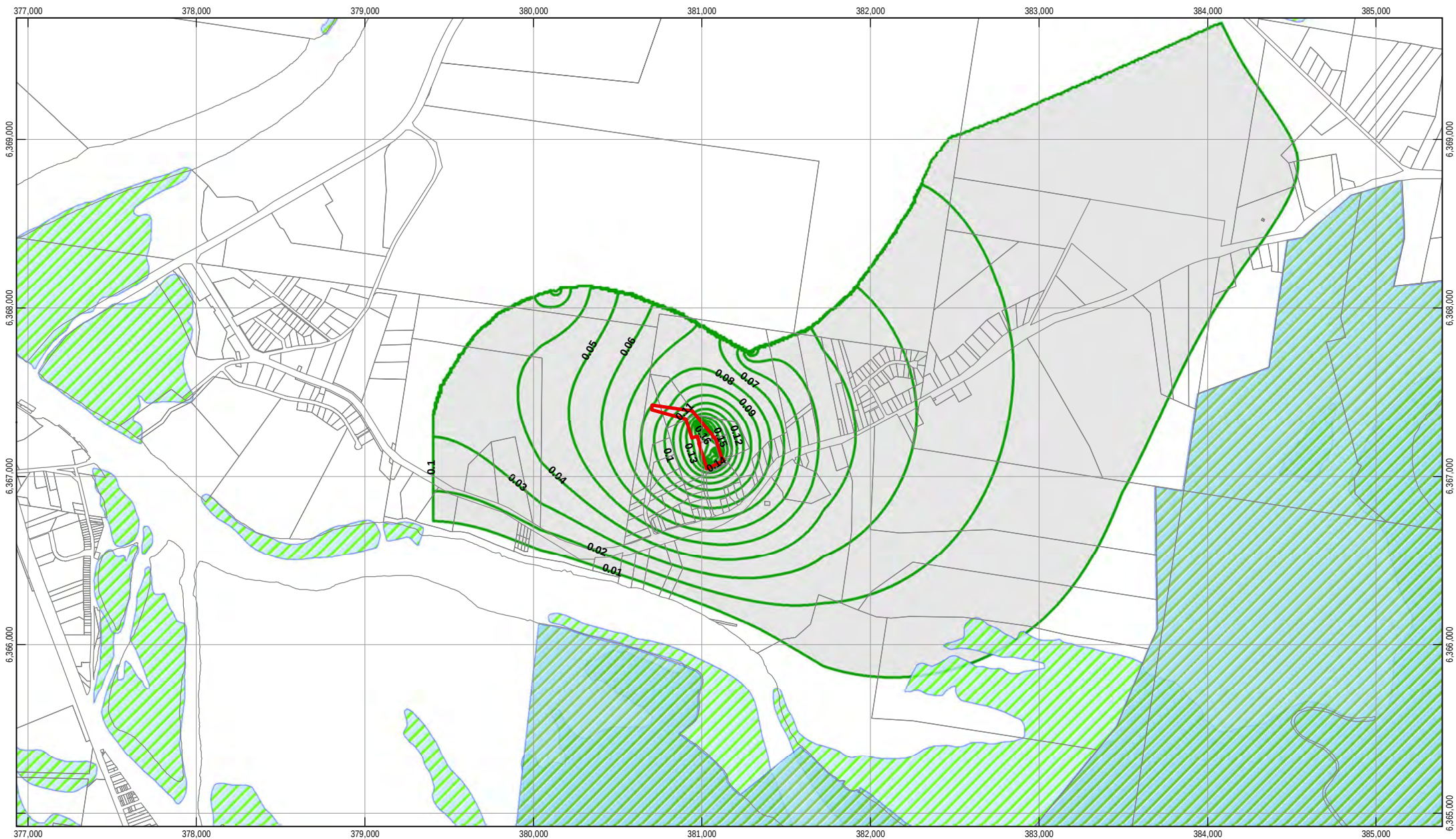
11.4.5 Potential impacts on groundwater dependent ecosystems

The recognised threats to GDEs (Sinclair Knight Merz, 2001) include:

- ▶ Groundwater resource development.
- ▶ Changes in land use – particularly from native vegetation to agriculture or agriculture or native vegetation to plantation forestry.
- ▶ Activation of acid sulphate soils in coastal areas by drainage, dredging or groundwater extraction.
- ▶ Dewatering or water resource development associated with mining.
- ▶ Commercial, urban or recreational developments.

GDEs exposed to these threats may respond by changes in vegetation structure, ecological function and/or biota composition of the ecosystem. Impacts associated with lowered water tables upon GDEs can take place over an extended time and can lead to decline in growth, recruitment and enable invasion by exotic species (Eamus, 2009).

Two threats that may impact on GDEs in the project area are groundwater extraction resulting in changes to groundwater level or changes to water quality. The potential impacts from these threats form the basis of this assessment.



Paper Size A4

0 125 250 500 750 1,000
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



LEGEND

Extent of Works

Cadastrate

Change60 Contours (m)

Change60 Greater than 0.1m

NSW Ramsar Wetlands

Kooragang Island

Myall Lakes National Park

SEPP14



CLIENTS | PEOPLE | PERFORMANCE

Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number 22-15280
Revision B
Date 18 Oct 2011

The Study Area for Groundwater Dependant Ecosystems **Figure 11.9**

G:\22\15280\GIS\Maps\Working\22_15280_01_MidalGroundwaterFig1_RevB.mxd

Level 3, 24 Honeysuckle Drive, Newcastle NSW 2300 Australia T 61 2 4979 9999 F 61 2 4979 9988 E ntmil@ghd.com W www.ghd.com

© 2011. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:mabarnier

11.4.6 Groundwater dependent ecosystems within the study area and their importance

Vegetation cover identified within the Hunter River – Tomago Sandbeds that may classify as a GDE include:

- ▶ Dry sclerophyll woodlands.
- ▶ Wallum heathlands.
- ▶ Swamp Sclerophyll Forest on Coastal Floodplains.
- ▶ Swamp Oak Floodplain Forest.
- ▶ Coastal wetlands.
- ▶ Mangrove Woodlands.
- ▶ Saltmarsh.

The importance of vegetation cover that classify as GDEs within the study area is discussed below.

International importance

The study area boundary does not overlap the mapped area of the nearest Ramsar wetland (refer to Figure 11.9). It is therefore predicted that the project would not have a measurable impact on any GDEs within a Ramsar wetland.

National importance

Areas of Smooth-barked Apple – Red Bloodwood shrubby open forest located within the study area that are known to be utilised by the New Holland Mouse (*Pseudomys novaehollandiae*) are regarded as facultative GDEs of national importance. The New Holland Mouse is a mammal species listed as vulnerable on the EPBC Act. It is a species reliant on dry heathy native vegetation formed on coastal sand beds. Wet heathy woodlands, shrublands and heath on coastal sands are generally unsuitable for the New Holland Mouse with such vegetation generally supporting other native rodent species (e.g. Swamp Rat). Changes in depth to groundwater have the potential to influence vegetation diversity hence habitat suitability (Fox and Fox, 1978).

State importance

SEPP 14 wetlands 815 (Siddon's Swamp), 816 (Blind Harry's Swamp) and 835 (part of the Hunter Estuary Wetland complex) occur adjacent to, but outside the study area boundary. Part of SEPP 14 wetland no. 817 occurs near the southeastern corner of the study area.

Two TSC Act listed EECs classified as 'obligate wetland or seasonal inundation GDEs' (Swamp Mahogany Swamp Forest and Swamp Oak Swamp Forest), which are not mapped as SEPP 14 wetlands, occur within the study area. Access to groundwater is critical for their survival and a description of these GDEs is provided below:

Broadleaved paperbark - swamp mahogany swamp forests

The canopy of this community is dominated by *Melaleuca quinquenervia* (Broadleaved paperbark) and to a lesser extent *Eucalyptus robusta* (Swamp Mahogany) up to 15 metres tall and dense projected crown cover estimated to range between 30-50%. The occasional *Casuarina glauca* (Swamp Oak) may occur, particularly along edges where this vegetation merges with cleared lands. A number of floristic variants occur within the study area including Paperbark Swamp Forest, Swamp Mahogany Forest, Paperbark-Mahogany Low Swamp Forest and Fringing Paperbark Forest.

The midstorey is generally described as moderately sparse and dominated by *Glochidion ferdinandi* (Cheese Tree), *Trema tomentosa* (Native Peach) and *Acacia longifolia* (Coastal wattle). The ground layer is dominated by a large number of ferns, were sedges and rushes forming a patchily dense groundcover. The dominant and most common species include *Gahnia clarkei* (Saw-sedge), *Blechnum indicum* (Water Fern), *Pseudoraphis paradoxa*, *Lomandra longifolia* and *Schoenus brevifolius*. Forbs including *Hydrocotyle peduncularis* (Pennywort) and *Viola hederacea* (Native Violet) were infrequently present and not dominant, with the majority of the forest floor comprising mainly ferns and dead organic matter. Weed occurrences were largely restricted to Crofton Weed (*Ageratina adenophora*) and Lantana (*Lantana camara*).

Bell and Driscoll (2006) identify this vegetation type to be an obligate GDE with depth to groundwater locally ranging between 0.9 and 1.0 m.

Swamp oak forest

Casuarina glauca (Swamp Oak) dominates the canopy cover of this community; however, there are occasional inclusions of *Melaleuca quinquenervia* (Broadleaved paperbark) and to a lesser extent *Eucalyptus robusta* (Swamp Mahogany). This community also extended to a canopy height of approximately 15 m. The projected crown cover was less than the adjoining vegetation type, typically ranging between 50% and 75%. Almost no weed occurrences were noted in this vegetation type aside from occasional occurrences of *Hydrocotyle bonariensis*.

The midstorey contrasts substantially with the Broadleaved paperbark - Swamp Mahogany forest. A variety of ferns dominate this vegetation community with sedges and rushes forming lesser constituents. Forbs including *Hydrocotyle peduncularis* (Pennywort) and *Viola hederacea* (Native Violet) are characteristic groundcover species along with a variety of other soft stemmed herbs.

Local importance

The Smooth-barked Apple – Red Bloodwood shrubby open forest is classified as a facultative GDE and has a partial seasonal reliance on groundwater. This vegetation is not listed as an EEC on either the TSC Act or EPBC Act. Areas where this vegetation does not support the New Holland Mouse classify as a GDE of local importance. This vegetation community is described in Section 11.2.2.

11.4.7 Predicted impacts on groundwater resources

Evaluation of infiltration scenarios

The following four infiltration scenarios were evaluated to select the preferred infiltration rate:

- ▶ Scenario 1: 60 m³/ day average infiltration or first 30 mm of daily rainfall (worst case scenario).
- ▶ Scenario 2: 50 m³/ day average or first 15 mm of daily rainfall.
- ▶ Scenario 3: 40 m³/ day average infiltration or first 7 mm of daily rainfall.
- ▶ Scenario 4: 20 m³/ day average infiltration or first 4 mm of daily rainfall.

As the infiltration would lead to groundwater mounding around the site. modelling was undertaken to compare the relative changes in depth of groundwater from each scenario. This was then compared to the location and characteristics of GDEs to determine the likely impact of each scenario on GDEs.

Scenario 1 was the worst case scenario and involved infiltrating the first 30 mm of daily rainfall. Under this scenarios the project was predicted to have a small impact on SEPP 14 Wetland 817 due to a 0.01 m rise in groundwater. A reduction in the steady state depth to groundwater of 0.01 to 0.03 m was

also predicted to occur for the obligate GDEs identified, these being Broadleaved Paperbark – Swamp Mahogany Forest and Swamp Oak Forest. These impacts were considered likely to result in small measurable changes in plant species diversity although most of these predicted changes are likely to be within the expected variation for these vegetation communities. Predicted reductions in steady state depth to groundwater for facultative GDEs (Smooth-barked Apple – Red Bloodwood shrubby open forest) were predicted to be between 0.01 to 0.10 m, with the majority predicted change occurring between 0.01 and 0.08 m.

Scenarios 2, 3 and 4 were all lesser impact options relative to Scenario 1 as they would infiltrate a smaller volume of daily rainfall. All three alternative scenarios showed no predicted impact on SEPP 14 wetland 817 assuming a 0.01 m cut off for measureable change. As such, Scenarios 2, 3 and 4 are considered unlikely to impact on GDEs within the SEPP 14 wetland areas.

Scenario 2 was selected as the preferred option and forms the basis of the integrated water management strategy described in Section 6.3.7 and assessed in Section 9.2. This would infiltrate the first 15 mm of daily rainfall and showed a substantial contraction in offsite groundwater mounding relative to Scenario 1 whilst maintaining a reasonable capacity to manage surface water captured within the site. Although Scenarios 3 and 4 also showed incremental decreases in offsite groundwater mounding, these options substantially limited surface water management options at the site.

Groundwater elevations

The worst case water infiltration rate scenario (scenario 1) predicted a net change in steady state depth to groundwater of between 0.01 to 0.16 m (refer to Figure 11.9). The midpoint increase in depth to groundwater (0.08 m) occurred up to 300 m from the site boundary with the greatest distance for detectable change (0.01 m) being approximately 4 km to the northeast of the site. The majority of change occurred within approximately 600 m of the site (0.05 m decrease in depth to groundwater).

Alternative Scenarios 2, 3 and 4 showed substantial contraction in groundwater mounding beyond the site boundaries. This is evident in modelling for Scenario 2 where the horizontal effect of groundwater mounding contracted by up to 1.5 km as shown in Figure 11.10. All scenarios show the area of affectation to be greatest within the site and its immediate surrounds.

Groundwater salinity

Salinity intrusions have the potential to have substantial adversely impacts on GDEs not adapted to saline or brackish environments. Salinity intrusions typically occur when groundwater is drawn down. The project would create a groundwater mound centred on the site as water is infiltrated. As such, a salinity intrusion is unlikely to occur due to the project.

Groundwater temperature

An increased infiltration of surface waters harvested from within the site into the groundwater is likely to have some influence on the existing thermal character of the underlying aquifer. Infiltration rates would be governed by gravity feed, thus limiting the potential for rapid changes in groundwater temperatures at the site and throughout the study area. Tangible changes in thermal gradients in the study area's groundwater resources are likely to be localised to the site and are unlikely to have any measurable impacts on sensitive GDEs located within the study area.

Acid sulphate soils (ASS)

The generation of ASS is only likely to occur in cases where groundwater drawdown is predicted. The infiltration of water into the groundwater aquifer would not result in any groundwater drawdown. The generation of ASS as a consequence of the project is considered unlikely.

Summary

The predicted impacts on the groundwater resources are likely to be restricted to a rise in groundwater elevations (i.e. decrease in depth to groundwater). The predicted impacts are widespread; however, the greatest impacts are largely restricted to vegetation nearby the site where greatest change in depth to groundwater is predicted.

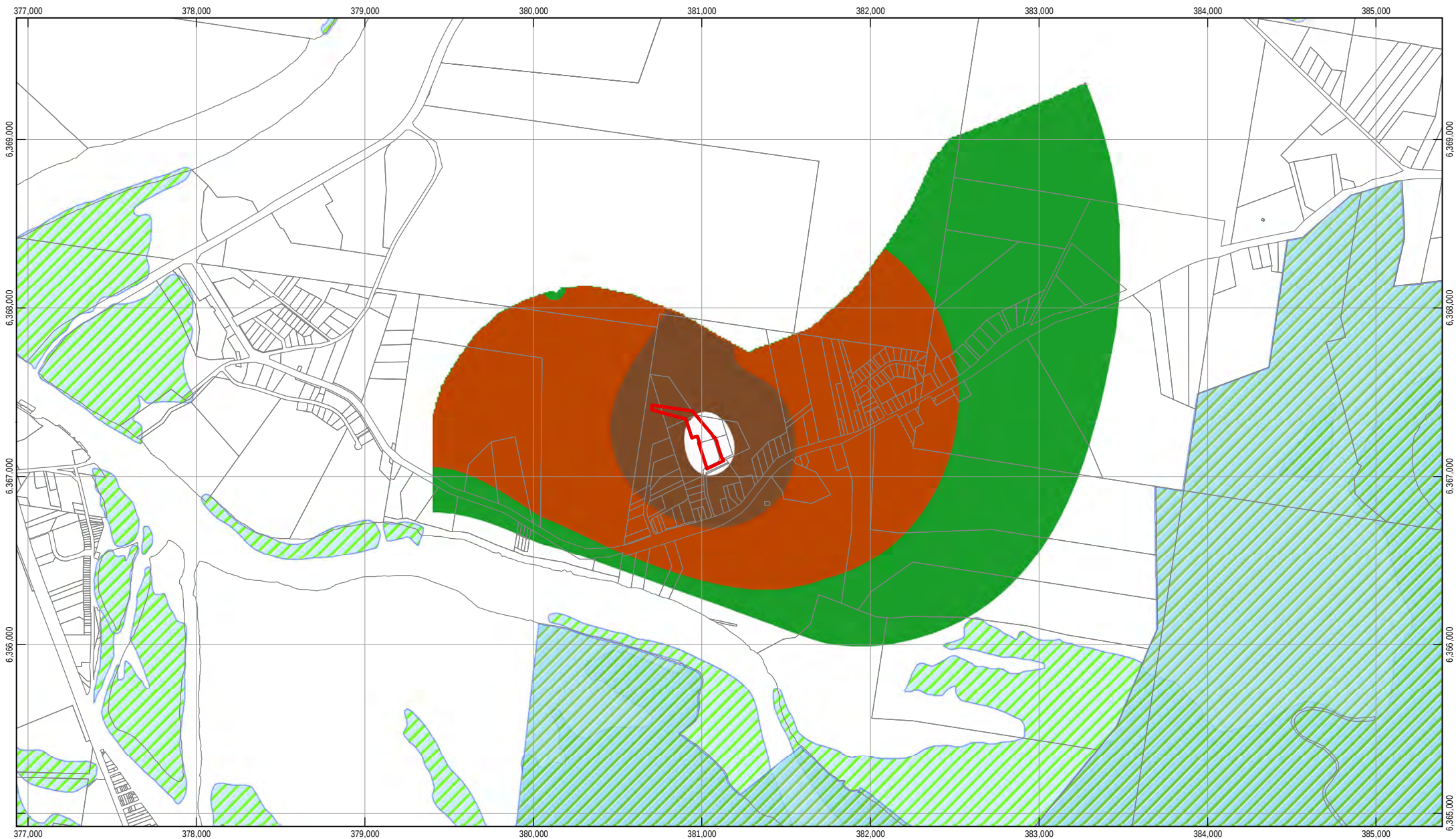
11.4.8 Impacts on groundwater dependent ecosystems

Modelling predicts there would be no measureable impact on Ramsar wetlands (refer to Figure 11.10). However, impacts are predicted on obligate GDEs (Broad-leaved Paperbark Swamp Mahogany Swamp Forest and Swamp Oak Swamp Forest), and a facultative GDE (Smooth-barked Apple Red Bloodwood shrubby open forest). Modelling predicts that a very small area of SEPP 14 wetland 817 may experience a rise in groundwater levels of 0.01 m. This is considered unlikely to impact on the ecological function of this wetland.

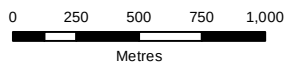
Obligate GDEs

Under Scenario 2, obligate GDEs such as the Broad-leaved Paperbark – Swamp Mahogany Forest and Swamp Oak Forest are likely to experience a reduction in depth to groundwater of between 0.02 to 0.05 m (2-5 % decrease). This net change is considered to be within natural variation, although small permanent changes in floristics and vegetation structure are expected within ecotonal areas.

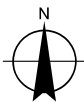
Within the Broad-leaved Paperbark – Swamp Mahogany Forest, changes are likely to be minimal although a successional change toward vegetation classed by Bell and Driscoll (2006) as 'Coastal Wet Sand Cyperoid Heath' may occur as this community has a median depth to groundwater range of 0.5 to 0.8 m). A substantial change towards Coastal Wet Sand Cyperoid Heath is unlikely as this would require a substantially greater decrease in depth to groundwater, possibly exceeding 0.1 m). Predicted changes to Swamp Oak Forest are likely to be limited to a small decrease in floristics with no successional change in vegetation type predicted.



1:30,000 Paper Size A4



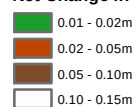
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



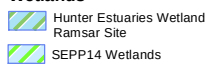
LEGEND



Net Change in Groundwater (m)



Wetlands



CLIENTS | PEOPLE | PERFORMANCE

Midal Cables International Pty Ltd
Tomago Rod and Conductor Manufacturing Facility
Environmental Assessment

Job Number 22-15280
Revision B
Date 18 Oct 2011

Net Change in Steady State
Groundwater - Scenario 2

Figure 11.10

G:\22\15280\GIS\Maps\Working\22_15280_01_MidalGroundwaterFig2_RevB.mxd

Level 3, 24 Honeysuckle Drive, Newcastle NSW 2300 Australia T 61 2 4979 9999 F 61 2 4979 9988 E ntmil@ghd.com W www.ghd.com

© 2011. Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:mabarnier

Facultative GDEs

The facultative GDE 'Smooth-barked Apple Red Bloodwood shrubby open forest' is likely to experience a similar percentage net change in depth to groundwater as predicted for the obligate GDEs (2-5% decrease). Net change in steady state depth to groundwater within this facultative GDE is predicted to range between 0.01 to 0.10 m (< 3%) across the study area, with the majority of the predicted change ranging between 0.01 and 0.08 m (<2.5%).

Predicted reductions in depth to groundwater of up to 0.1 m within this GDE is likely to drive successional change towards a similar vegetation type described as 'Peppermint – Apple – Bloodwood Forest' (Bell and Driscoll, 2006). A noticeable reduction in plant species diversity and heathness would occur if the current vegetation were to experience a depth to groundwater change exceeding 0.10 to 0.20 m. Changes of such magnitude are not widely anticipated and are likely to be restricted to vegetation located immediately south of the site and north of Tomago Road.

Facultative GDEs providing suitable habitat for the New Holland Mouse are also predicted to experience a decrease in depth to groundwater. An adverse impact on habitat for the New Holland Mouse would occur should a substantial decrease in steady state depth to groundwater eventuate. Fox and Fox (1978) identified a strong relationship between New Holland Mouse biomass and plant species diversity/heathness, with reduced plant species diversity and percent plant heathness harming habitat suitability. Areas of the study area utilised by the New Holland Mouse to north of the site are predicted to experience changes in depth to groundwater ranging from 0.05 to 0.10 m, which is likely to result in a small reduction in habitat suitability for this species. These predicted changes are localised and small when considered within the context of mitigation measures that would be implemented to improve habitat for this species, including using fire and planting heath plant seeds to regenerate areas previously disturbed by sand mining.

11.5 Mitigation measures

11.5.1 Impact mitigation

Construction management

The CEMP would include measures to mitigate impacts associated with erosion and sedimentation, modification of habitats, weeds and pollutants. The following measures would be implemented to mitigate impacts on biodiversity values during the construction phase:

- ▶ All construction works, vehicle access, equipment and laydown areas to be contained within the footprint of the proposed haul road, typically comprising a 19 m wide construction corridor. The construction area is to be clearly delineated via fencing to prevent encroachment into adjacent areas of retained vegetation.
- ▶ Construction is to be restricted to the design footprint of the haul road when in the vicinity of high value suitable New Holland Mouse habitat (15-25 g predicted biomass). In these areas there would be no temporary 5 m wide construction zone on the northern margin of this road.
- ▶ The removal of hollow-bearing trees would be avoided wherever practicable. Hollow tree felling protocols are to be developed and implemented to avoid mortality or injury of any resident fauna and to assist the safe relocation of displaced native fauna contained within hollows cleared for the project. Nest boxes to replace hollows removed for the haul road construction are to be installed at a ratio of

at least 2:1 in adjoining habitat areas. It is estimated that 4-10 hollows would be installed in the adjoining study area.

- ▶ Top soil harvesting/ retention would be completed in a manner that limits the potential for erosion and discharge of sediment into native vegetation. This method would also be developed to limit the spread of exotic and or noxious weed species.
- ▶ Procedures would be developed to prevent weed introduction from machinery and vehicles entering the site. Wash down provisions would minimise the introduction of exotic/noxious species into the site.
- ▶ Infiltration of surface waters into the groundwater aquifer is to be managed in accordance with the regime outlined in the surface water and groundwater specialist study to minimise uncontrolled indirect impacts on suitable habitat for threatened species and ecological communities.
- ▶ Any portable habitat features such as fallen timber would be removed from the construction footprint and placed into adjoining habitat areas to the north of the proposed haul road to conserve local habitat resources.
- ▶ Noxious weeds disturbed by construction works are to be disposed of in a manner consistent with management guidelines.
- ▶ Dust suppression measures would be implemented to minimise the transfer of dust and any associated pollution/ nutrients.
- ▶ Delineating the construction footprint with temporary fencing to prevent access of vehicles and machinery or location of stockpiles or equipment in adjoining retained vegetation that is to be avoided by the project.

Fauna clearance

The proposed haul road is to pass through an area of suitable habitat for the New Holland Mouse. A fauna clearance program would be undertaken to remove animals from the impact area prior to the construction of the haul road to minimise the risk of mortality to individuals utilising this area. Animals are to be captured via an intensive Elliott trapping program and relocated into suitable habitat north of the construction zone. Temporary barrier fencing constructed from black building plastic along the northern edge of the construction zone would be provided to reduce the potential for animals to re-enter the construction zone during the construction period.

Lighting

The use of shielded directional lighting designed to minimise light shed into the adjoining native vegetation would minimise adverse impacts on nocturnal fauna behaviour and habitat utilisation. Lighting is to be located along the northern edge of the haul road, particularly where the haul road passes the New Holland Mouse 15-25 g biomass area, to shed light in a southerly direction away from this habitat.

Pre-construction survey

A pre-construction survey is required to determine if *Diuris praecox* and/or *Diuris arenaria* is present within the site. This survey is to be conducted during the flowering season (August) and is to be restricted to the western edge of the site in vegetation that adjoins the powerline easement. This pre-construction survey would allow construction to start without delay on the remainder of the site.

Habitat protection

Additional mitigation actions that would be implemented to protect peripheral habitat values. The objectives of these mitigation actions would be to:

- ▶ To improve native plant species diversity and habitat suitability for native fauna species, including but not necessarily restricted to the New Holland Mouse.
- ▶ To reduce the effects of exotic fauna and flora species on the habitat of native flora and fauna habitats.
- ▶ To improve vegetation structure through an ecological burn to enhance bird, mammal and reptile habitat.

Ecological burn

Fire and its frequency is a vital ecological process responsible for the regulation of plant species diversity and small ground mammal populations such as the New Holland Mouse in fire prone landscapes. An important ecological relationship exists between fire driven successional change in plant species diversity, vegetation structure and ground mammal communities including populations of the New Holland Mouse (Fox et. al. 2003). Increased time intervals between fire events have been shown to decrease plant species diversity and habitat suitability for the New Holland Mouse. Conversely, the New Holland Mouse increases its population numbers and density in areas actively regenerating after disturbance (such as bushfire), reaching highest density approximately 2-6 years afterwards (Wilson & Laidlaw, 2003).

The use of a single appropriately timed ecological burn north from the haul road would increase native plant species diversity and habitat suitability for ground mammals, including the New Holland Mouse. The bushfire constraints assessment for the project recommended a regime of patchy, low intensity autumn burns at intervals of 10 years to maintain a mosaic of habitat types and fuel ages. This regime would be appropriate for the management bushfire risk and maintenance of suitable habitat conditions for the New Holland Mouse.

House Mouse control

Reducing the local population of the House Mouse in combination with habitat modification via an ecological burn would result in improved habitat conditions for the New Holland Mouse. A targeted population control program is recommended using live capture techniques to ensure non-target species are not harmed (eg small mammal trapping using Elliott traps). Where practicable, this control program would occur coincident with the fauna clearance program during construction.

Bush regeneration

Regeneration works would be undertaken to improve vegetation condition and would include weed control and supplementary planting of native flora in conjunction with the ecological burn, to increase plant species diversity and restore a more natural vegetation structure.

11.5.2 Biodiversity Offset Strategy

Impacts on biodiversity have been minimised by redesigning the haul road where practicable such that it passes through areas of lower habitat suitability for threatened biota relevant to the project. Impact mitigation implemented during construction would further reduce direct and indirect impacts.

There would be a residual biodiversity impact comprising the loss of 0.68 ha of Smooth-barked Apple Red Bloodwood shrubby open forest. This residual biodiversity loss would be addressed by providing a biodiversity offset.

The NSW BioBanking Assessment Methodology (the Methodology) (DECCW 2009) was used to determine the quantum of biodiversity offset required. The residual impact area (ie 0.68 ha) was used to calculate the ecosystem credit liability for the loss of Smooth-barked Apple Red Bloodwood shrubby open forest from the site. Field data collected in accordance with the Methodology was used to determine vegetation condition relative to benchmark. This objective scientific analysis of the project impacts notionally indicates a requirement to retire 33 ecosystem credits for the loss of 0.68 ha of Smooth-barked Apple Red Bloodwood shrubby open forest.

A biodiversity offset provided in accordance with the results of the Methodology and Interim Offsetting Policy would provide a 'maintain and improve' outcome for the residual biodiversity impacts identified or the project. A biodiversity offset package identifying the nature of the offset and its delivery would be developed to ensure the delivery of an in perpetuity 'maintain and improve' outcome. It is likely that the offset would be delivered through the BioBanking Scheme. Retiring the offset in this manner is consistent with the Offsetting Guidelines for Part 3A projects. Appropriate biodiversity conservation management actions would apply to the offset area once it has been established.

11.5.3 Groundwater dependent ecosystems monitoring

Monitoring would be conducted coincident with the surface water/ groundwater monitoring program to maximise the discovery of any unpredicted trends or changes. A Before After Control Impact (BACI) monitoring program would be implemented. This would provide an ongoing feedback mechanism enabling a timely response to any unforeseen changes in site vegetation.

12. Soils and contamination

This chapter provides information on the existing subsurface environment of the site and the suitability of the site to support the project. The contamination site assessment report is included in Appendix G.

12.1 Existing environment

12.1.1 Desktop assessment

Regional geology

Geological Series Sheet 9231 'Newcastle Coalfield Regional Geology', published by the Department of Mineral Resources, indicates that the site is underlain by quaternary alluvial sediments, comprising sand in dune and beach environments.

Soil landscape

According to Newcastle Soil Landscape Series Sheet 9232, the site lies within disturbed terrain, surrounded by Tea Gardens landscape variant 'A', comprising Pleistocene sand sheets with wet heath forest. Constraints associated with the Tea Gardens landscape include permanently high watertable, seasonal waterlogging, groundwater pollution, strongly to extremely acidic soils of low fertility and low available water holding capacity.

Previous land use

A search of historical records indicates that the site has been used for metal fabrication and storage since the 1970s. A visual inspection of the site identified shrubs, grasses and trees with a small amount of waste dumping in the northern portion of the site. The central portion of the site featured minor grassed depressions and hardstand areas, which are remnants of previous land use. The south-central and southern portions of the site included hardstand areas, blue discolouration of surface rocks and gravels, metal tracks, a shed with adjoining structures and an access road along the southern boundary.

Acid sulphate soils

The 1:25000 Acid Sulphate Soils (ASS) risk map for Beresfield as published by DLWC in 1997 identifies the site as a low probability of occurrence of acid sulphate soil materials within the soil profile (greater than 3m). The Acid Sulfate Soil Planning Map 2004 as published by Port Stephens Council identifies the site as Class 4.

12.1.2 Field investigations

Geotechnical investigation

A geotechnical investigation was conducted by GHD in 2011 that involved excavating twelve test pits, drilling six boreholes and cone penetration testing (CPT) at ten locations. Test locations are shown in Figure 12.1. This investigation revealed that the subsurface conditions comprised a thin layer of fill overlying upper and lower alluvial sand strata, with an interceding 0.55m to 0.9m thick layer of very soft to soft silt which was encountered across a majority of the site between 3.7m and 6.6m depth.

Indurated sand (coffee rock) lenses were encountered in TP10 and TP11, while lenses of sand that have undergone partial induration were encountered in BH04.

Free groundwater was encountered at depths of between 1.5m and 2.3m during test pit excavation and borehole drilling.

Laboratory analysis of selected soil samples recovered from the boreholes and test pits indicate that the tested sands were fine to medium grained with little or no fines (i.e. clay/silt) and of low to medium plasticity.

Contamination investigation

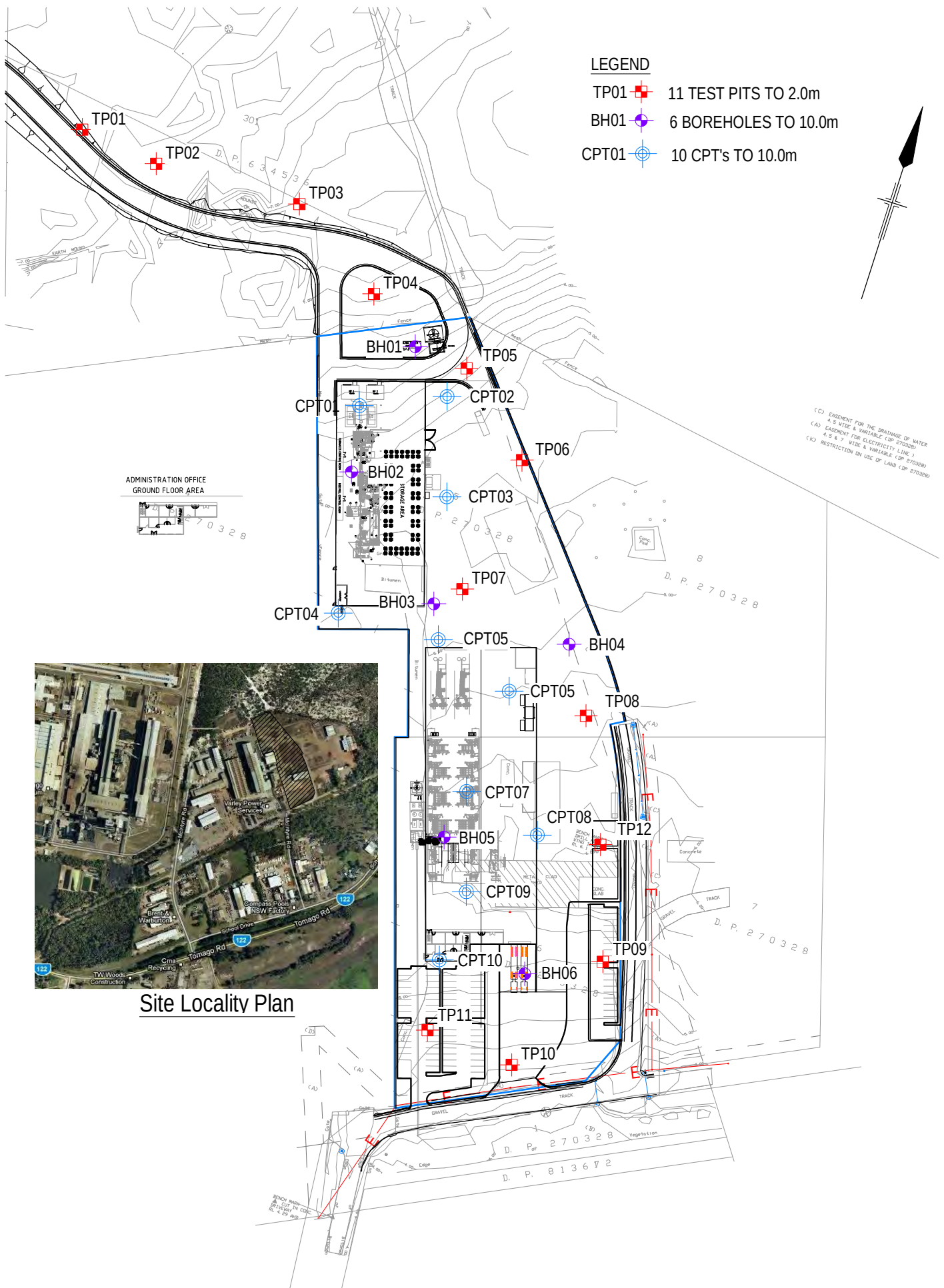
A Phase 2 contamination investigation was undertaken by GHD based on soil samples obtained in association with the geotechnical investigations. Test pit depths were all 2m below ground level and borehole depths ranged between 10.29m and 13.45m below ground level. Surface samples were collected at intervals of 0.5m, or changes in the soil profile, directly from the excavator bucket. Figure 12.1 shows the sampling locations.

Soils penetrated during the investigations were described in accordance with the Unified Soil Classification system.

The Phase 2 investigations involved:

- ▶ Reviewing the Phase 1 Contamination Site Assessment (GHD 2011) for the site which included geological, hydrological and topographical information; historical aerial photographs; Council Section 149 Certificates (Part 2 and 5); development applications and building applications; historical title documents; NSW Work Cover notices; NSW DECC notices under the *Contaminated Land Management Act* (1997) and NSW Office of Water (part of DECCW) database.
- ▶ Collection of soil samples from 11 test pits and six boreholes across the site to target potential areas of environmental concern identified in Phase 1 and also provide systematic coverage of the site.
- ▶ Collection of soil samples from shallow sampling intervals with laboratory analysis of selected samples for heavy metals, total petroleum hydrocarbons, benzene, toluene, ethyl benzene and toluene, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, organochlorine pesticides and acid sulphate soils.
- ▶ Preparation of a report with reference to the Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA, 1997).

Site investigations also revealed several point sources of potential surface contamination. These areas were identified as the hardstand in the central western area, central area and southern area of the site, and the former oil storage area to the north of the shed.



Site Locality Plan



Midal Cables International Pty Ltd
Tomago Cable Plant
Environmental Assessment
Borehole, Test Pit and CPT
Locations

Job Number 22-15280

Revision A

Date OCT 11

Figure 12.1

12.1.3 Contamination assessment criteria

Soil investigation guidelines

The National Environment Protection Measure (NEPM) includes a range of soil investigation levels including ecological investigation levels (EILs) that are largely similar to the environmental investigation thresholds (EITs) listed in the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC/NHMRC 1992). Health investigation levels (HILs) listed in the NEPM are generally the same as the health-based soil investigation levels (HBSILs) listed in the *Guidelines for the NSW Site Auditor Scheme* (NSW DEC, 2006).

The basis on which the HILs (or HBSILs) have been set should be assessed for relevance to the situation under consideration. HILs are provided for a range of different exposure settings or land uses:

- ▶ “A” – standard residential with garden/accessible soil (includes children day-care centres, kindergartens, pre-schools and primary schools).
- ▶ “D” – residential with minimal opportunities for soil access.
- ▶ “E” – parks, recreational open space and playing fields (including secondary schools).
- ▶ “F” – commercial/industrial (includes shops, factories and industrial sites)

To assess potential contamination issues for the site, the analytical results were compared to the EILs as an indication of potential environmental impacts, and to both the residential with accessible soil (HIL setting “A”) and commercial/industrial criteria (HIL setting “F”) as an indication of potential health risks to site users for industrial redevelopment.

A summary of the investigation levels used to assess soil contamination levels is provided in Table 5-1 of the Phase 2 assessment in Appendix G.

Summary of contamination assessment results

Analytical results from subsurface investigations revealed that all concentrations of heavy metals were below the HIL “F” threshold which indicates that the site is suitable for industrial use. Concentrations of metals exceeding the maximum EILs or HIL “A” values were recorded in several locations from soil surface samples. The metal types and locations were:

- ▶ Arsenic (TP7 and TP8).
- ▶ Copper (TP7, BH6, TP8 and TP10).
- ▶ Manganese (BH3, TP7, BH6, TP11, TP8, TP9, BH1, BH2 and TP10).
- ▶ Vanadium (TP8 and TP10).
- ▶ Zinc (BH3, TP7, BH4, BH6, TP11, TP8, BH5, TP12, TP9, TP6, BH1, BH2 and TP10).

The location of samples exceeding the EILs and HIL “A” corresponded with the location of surface soils of the former metal fabrication site (central and southern parts of the site). It is likely that surface soil contamination is associated with the surface fill materials and previous site use.

TPH C₆-C₉, TPH C₁₀-C₃₅, BTEX, PAHs, OCP and PCB concentrations were reported below the nominated soil investigation levels for all samples analysed. No hydrocarbon impacts were identified in the vicinity of the former bunded oil storage area and field screening indicated a low potential for the occurrence of acid sulphate soils at the site.

Although concentrations of metals exceeding EILs indicate some potential for environmental impacts, such as phytotoxicity to sensitive plant species, the majority of the site would be redeveloped for an industrial facility comprising several buildings and hard stand area. It is also noted that the decision-making process for assessing urban redevelopment sites from DEC 2006 does not require consideration of EILs when assessing the suitability of a site for commercial/industrial use.

12.2 Impact assessment

12.2.1 Soil erosion

Construction requires earthworks that would disturb soil across the site. Excavation would be required to allow footings to be constructed, including footings about 9m deep for the cooling tower. Spoil obtained from excavations would be reused to fill parts of the site, including the alignment of the haul road as part of this land would need to be raised by approximately 2m. Disturbance of the land surface has the potential to result in sedimentation and erosion of the soil if it is not appropriately managed.

Long term erosional and sedimentation impacts are not expected during operation of the project because the disturbed areas would be stabilised following completion of construction.

12.2.2 Contamination

Construction and operational activities have the potential to result in soil contamination due to spills or leaks from equipment. This is considered to be a minor impact as the measures outlined in Section 9.3 would be implemented to minimise the potential for leaks to occur and involve implementing an emergency response plan to respond to spills. Any contamination arising from chemical spills would be managed in accordance with the requirements of DECC's Waste Classification Guideline (2008). This would involve removal and disposal of any contaminated spoil at an appropriately licensed facility.

During construction and operation, all dangerous goods would be stored, handled and transported in accordance with the Australian Dangerous Goods Code, Australian Standards, and other relevant guidelines. This would involve bunding storage and refuelling areas. Implementing these design measures minimises the potential for spills and leaks to contaminate the site.

During construction, earthworks would expose material that has low levels of contamination from previous land use. As the site is suitable for industrial use, this material would be reused in the construction process.

12.2.3 Acid Sulfate Soils

As part of geotechnical investigations, acid sulfate soil field pH (pHF) and field peroxide pH (pHFOX) indicator tests were carried out on 26 samples from six locations across the site to provide an indication of the presence of acid sulfate soils. The potential for the presence of ASS was based on the following criteria from Ahern et al. (1998):

- ▶ The strength of the reaction with peroxide.
- ▶ A pHFOX value at least one unit below pHF.
- ▶ pHFOX < 3.

Two samples exhibited reaction strengths of 3 or 4 (vigorous to very vigorous) however initial pH was high (between 6 and 8.6) and the resultant pH change ranged from 2.1 to 0.2 pH units. Most of the higher reaction strengths and pH changes are for surface soils and would be likely attributable to organic

material. It is considered that the potential for acid sulfate soils to occur on this site is low. Summary tables of the test results are provided in Appendix C of the Contamination Assessment (Appendix G).

If works do disturb acid sulphate soils and the soils are oxidised, this has the potential to increase acidity and elevate metal concentrations in water leaching through the soils. Potential impacts would be managed by implementing the mitigation measures.

12.3 Mitigation measures

12.3.1 Soil erosion

As detailed in Section 9.3 measures would be implemented to manage soil and erosion generally in accordance with Managing Urban Stormwater – Soils and Construction (Landcom 2004).

12.3.2 Soil contamination

To minimise the potential for soil contamination from construction activities the contractor would be required to ensure all activities comply with a CEMP that includes measures to:

- ▶ Ensure that all plant and machinery is well maintained to minimise the potential for hydrocarbon leaks.
- ▶ Restrict on-site vehicle movement to dedicated areas where practicable.
- ▶ Utilize hardstand and bunded areas to refuel and maintain plant on site.
- ▶ Locate all construction material within appropriate areas.
- ▶ Ensure no cleaning of plant or machinery, including the wash out of concrete mixers, occurs on site.
- ▶ Respond to spills and leaks.
- ▶ Measures to respond/investigate any anticipated contamination encountered during construction.

The CEMP would detail measures to be implemented if contaminated soil is encountered during construction. The management measures would be determined based on the type and level of concentration encountered. If contaminated soil is to be removed from the site, measures would be developed to manage and dispose of contaminated soil in accordance with DECC Waste Classification Guidelines (2008).

12.3.3 Acid sulphate soil

If potential acid sulphate soils are encountered during construction, procedures would be developed to ensure that the material is managed in accordance with the guidelines in the NSW Acid Sulphate Soil Manual (Acid Sulphate Soil Management Advisory Committee, 1998).

13. Waste

13.1 Existing environment

The site is currently vacant and accordingly no waste is generated.

13.2 Impact assessment

13.2.1 Construction waste

The project would generate small volumes of miscellaneous construction waste that would be managed in accordance with DECC's Waste Classification Guideline (2008). Construction waste would consist of non-putrescible materials including steel and timber off-cuts, masonry block waste, packaging (plastic, cardboard and timber pallets) and general building waste.

Site preparation would involve activities such as removal of vegetation within the construction footprint. The contractor would implement strategies to minimise the area of vegetation cleared.

Should any material spills occur during construction, such as hydrocarbons or concrete, these would be cleaned up and the recovered material classified and disposed of in accordance with DECC's Waste Classification Guidelines (2008).

Domestic waste would be collected and stored in closed-top waste bins and collected weekly by licensed contractors, with disposal at the Port Stephens Council waste disposal centre.

13.2.2 Operational waste

Wastewater

The project would generate wastewater from facilities installed to provide shower and ablution facilities for staff. As indicated in Section 9.2.5, the wastewater would be treated on-site by a package STP and the treated wastewater would be used in a subsurface irrigation system. The STP and irrigation system would be designed to comply with Council's standards and the Environmental Guidelines: Use of Effluent by Irrigation (DECC, 2003). This would ensure that wastewater is appropriately managed and environmental impacts associated with wastewater are minimised.

Process water reject

Process water reject would be stored in a designated tank. It would be removed from site by a tanker and disposed at a facility licenced to accept trade waste as required by the DECCW Waste Classification Guidelines.

Emulsion and machine oil

Approximately 102,000 litres of waste emulsion oil is likely to be generated per annum from the rolling mill and the wire drawing machine. This emulsion consists of between 15 -20% of oil mixed with water. Approximately 900 litres of waste machine oil is also likely to be generated per annum. Impacts from these wastes are considered to be negligible as they would be managed in accordance with the DECCW Waste Classification Guidelines.

Dross

Approximately 1,250 tonnes of dross is likely to be generated per annum. Dross is a mass of solid impurities skimmed from the top of the molten aluminium in the furnaces. It comprises approximately 35% aluminium and is preferably stored undercover to maximise the percentage of aluminium available for extraction and reprocessing. Impact from this waste is considered to be negligible as it would be managed in accordance with the DECCW Waste Classification Guidelines.

Miscellaneous waste

The project is likely to generate non-hazardous/domestic solid waste, including packaging waste, general office waste and lunch room waste). It is estimated that approximately 400m³ of non-hazardous/domestic waste would be generated per annum and this would be managed in accordance with the DECCW Waste Classification Guidelines.

13.3 Mitigation measures

13.3.1 Construction waste

A Construction Waste Management Plan would be prepared as part of the CEMP prior to construction commencing. It would address the waste streams likely to be generated, including any that may contain dangerous goods or hazardous substances, during construction.

The Waste Management Plan would detail measures to be implemented, where practicable, to minimise, re-use and/or recycle any construction and excavation material. Where this is not practicable, wastes would be disposed of in a responsible manner and in full accordance with relevant statutory requirements, utilising licensed waste transport and disposal contractors. The Waste Management Plan would require all wastes generated by the project to be managed in accordance with the DECCW Waste Classification Guidelines.

13.3.2 Operational waste

A Waste Management Plan would be prepared as part of the OEMP to detail the measures to be implemented to ensure that waste generated during operation of the project is managed in accordance with the DECCW Waste Classification Guidelines. This would include measures for the following wastes:

- ▶ Non-hazardous/domestic solid waste (packaging waste, general office waste and lunch room waste)
- These wastes would be stored/separated into appropriate bins and either disposed of to landfill by an appointed contractor or collected by a recycling contractor as appropriate.
- ▶ Emulsion and emulsion oil - This would be stored on site in enclosed tanks and periodically pumped out and disposed of by a licenced contractor. The tanks would be located on a concrete pad and bunded to ensure accidental leak would not result in oil leaving the site.
- ▶ Dross - dross would be broken up and cooled and stored on site in covered bins. These bins would be periodically collected and sent for recycling. TAC currently send their dross to Weston Aluminium for recycling and it is envisaged that a similar recycling operator would be used by Midal.

14. Traffic and transport

This chapter summarises the traffic impact assessment undertaken by GHD and the full report is included in Appendix H.

14.1 Existing environment

14.1.1 Site Location

The site is located in Tomago and is situated within a semi-rural/industrial area of Port Stephens Council in the NSW Hunter Region. The site is 24 km north-west of the Newcastle CBD and approximately 3.4 km east of the Pacific Highway.

Directly west of the site lies the Tomago Aluminium Smelter and numerous other commercial and industrial developments. The site itself is bound by School Drive to the south and McIntyre Road to the south-west. Access to the facility is via McIntyre Road and School Drive. At present, the site is undeveloped and surrounded by numerous commercial and industrial developments (refer to Section 4.1).

Site access

The site is accessed via a Private Road (refer to Figure 14.2) situated off School Drive. The driveway is 12m wide and unsealed with a gravel surface (refer to Figure 14.1).



Figure 14.1 Site access, located off Private Road

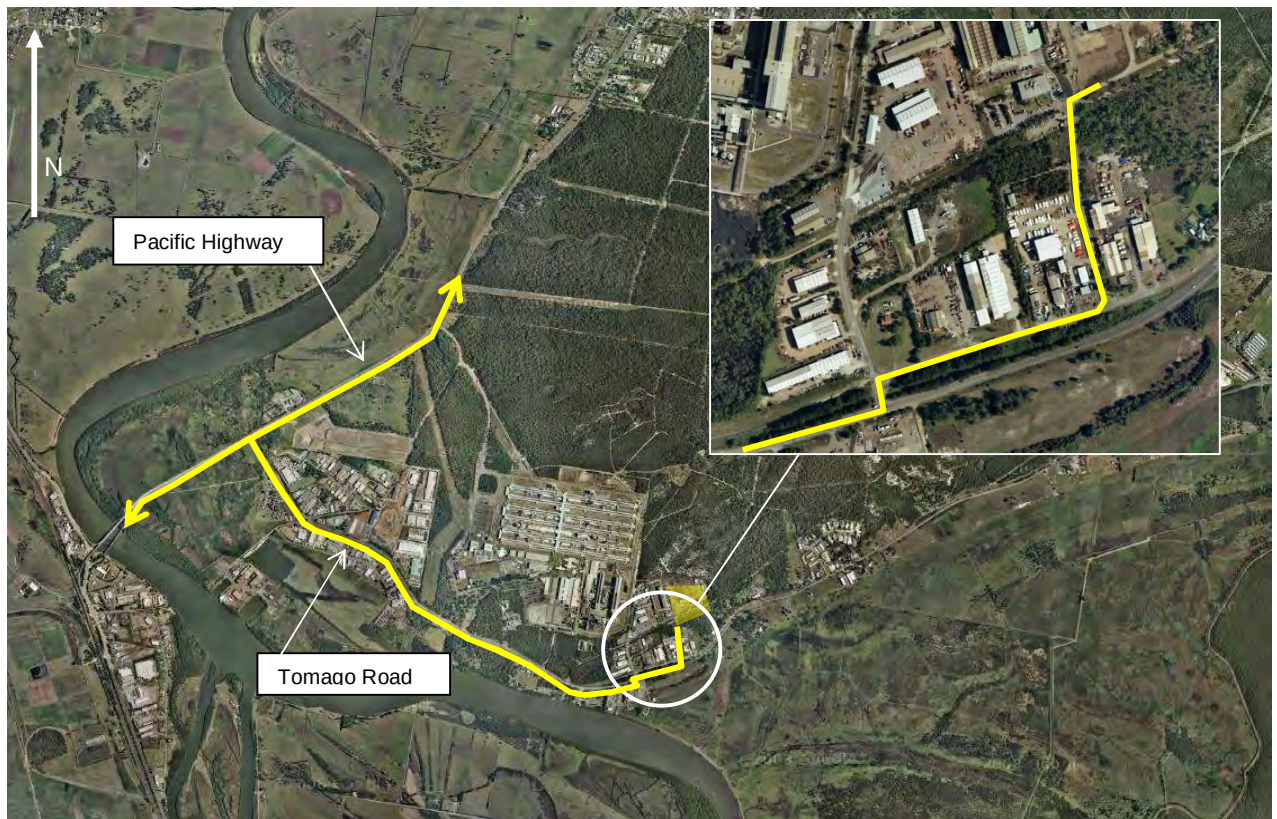


Figure 14.2 Access route

14.1.2 Existing road network

The existing road network shown in Figure 14.2 consists of Tomago Road, McIntyre Road, School Drive and a private road (Private Road).

Tomago Road

Tomago Road is the main east-west road serving the Tomago Industrial Precinct and links directly to the Pacific Highway at its western end and Nelson Bay Road at its eastern end. Tomago Road carries local industrial traffic as well as traffic from the Port Stephens and Williamtown Airport area. Tomago Road is a sealed two lane divided road (one lane per direction) characterised by wide shoulders on both sides with a sign posted speed limit of 80 km/h.

From the intersection counts undertaken in March 2011 Tomago Road was carrying approximately 900 vehicles (both directions) for the AM peak and 1,000 vehicles (both directions) for the PM Peak. Tomago Road can be classified as an Arterial Road.



Figure 14.3 Tomago Road (looking west towards approach to McIntyre Road)

McIntyre Road (west)

McIntyre Road has a sealed two lane carriageway in good condition (refer to Figure 14.4). It provides access to Tomago Smelter and other industrial developments. It carries approximately 250 vehicles per hour (two-way) with some 20, or 8% being heavy vehicles.



Figure 14.4 McIntyre Road (looking towards Tomago Road)

School Drive

School Drive runs parallel to Tomago Road and is located immediately north of Tomago Road. It forms a T-intersection with McIntyre Road at its western end and has a sign posted speed limit of 50km/h. School Drive has a sealed two lane carriageway in a fair condition with wide grass shoulders. It carries approximately 140 vehicles for the AM peak and 160 vehicles for the PM peak.



Figure 14.5 School Drive, view looking east towards turnoff to Tomago Road

Private Road (also referred to as McIntyre Road east)

Private Road is the main road providing access to the site and other various industrial developments situated north of Tomago Road.

Private Road has a sealed two lane carriageway in good condition with wide grass shoulders. The speed environment in that area is estimated to be 50-60 km/h however it is not sign posted.



Figure 14.6 Private Road looking north from School Drive

14.1.3 Existing traffic management controls

The existing road network in the vicinity of the site comprises the following traffic management features:

Give way control

- ▶ School Drive and McIntyre Road West intersection.
- ▶ Tomago Road and McIntyre Road intersection.

Roundabout

- ▶ Tomago Road approximately 2.5km west of the site.

Signalised Traffic Lights

- ▶ Tomago Road and Pacific Highway intersection.

Sign-posted speed limits

- ▶ 60km/h, 80 km/h along Tomago Road.
- ▶ 50km/h along McIntyre Road and School Drive.

14.1.4 Existing intersection performance

The results of the SIDRA analysis for the intersections in the vicinity of the site under existing traffic volumes during the morning and evening peak periods are presented in Table 14-1. These intersections are currently operating with acceptable Levels of Service (LoS) in both the AM and PM peak periods. Field observations during the peak periods indicated that these intersections operate satisfactorily under existing traffic demands, which is consistent with the results of the modelling.

Table 14-1 Intersection performance – existing peak conditions (2011)

Intersection Location	AM peak			PM peak		
	LoS	Degree of saturation	Average delay (seconds)	LoS	Degree of saturation	Average delay (seconds)
Tomago Road / McIntyre Road	C	0.325	35	B	0.396	17.8
McIntyre Road / School Drive	A	0.147	7.9	A	0.096	8.7
School Drive / Private Access Road	A	0.057	8.2	A	0.125	7.1

- The level of service for priority controlled intersections and roundabouts are based on the highest average delay per vehicle for the most critical movement.
- The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.
- The average delay for priority controlled intersections and roundabouts are selected from the movement on the approach with the highest average delay.

14.2 Future traffic conditions

This section provides an overview of future traffic conditions in the vicinity of the site in the absence of the project. It discusses the predicted impact a large subdivision along Tomago Road (referred to as the Redlake development) and expected background daily traffic growth is likely to have on traffic conditions. It outlines improvements to the road network that are likely to be required as a consequence of the Redland development and background traffic growth.

14.2.1 Background traffic growth

This section estimates growth in background traffic for Tomago Road, which has been obtained by reviewing historical traffic growth trends. The findings from this section were used to predict future background traffic growth along the external road network and to assess future traffic conditions.

Table 14-2 provides an understanding of historical daily traffic volumes along Tomago Road based on data from a RTA permanent counting station located along Tomago Road, about 800m east of the intersection of Tomago Road with the Pacific Highway. Recorded traffic volumes during the period from 1995 to 2004 indicate that the annual average growth in traffic was 2.7% per annum. Applying this annual traffic growth rate to current traffic levels along Tomago Road over a 10 year future horizon period indicates that daily traffic would increase to 14,700 vehicles per day by 2021.

Table 14-2 Average annual daily traffic (AADT) volumes on Tomago Road

Station	Location	1995	1998	2001	2004
05.590	Hexham – East of SH10 Pacific Highway	7360	8147	8323	9343

Source: Roads and Traffic Authority, Traffic Volumes Data for Hunter and Northern Regions (2004)

14.2.2 Assessment of the Redlake development

Consultation with the RMS indicated that the Redlake development has been approved adjacent to Tomago Road, about 1 km east of the site. It involves developing 135 hectares of industrial land for an integrated WesTrac facility, a CAT Training Institute and subdivision of land for sale to related and unrelated uses over a number of stages. It would have the following three stages:

- **Stage 1** would consist of approximately 23 hectares to be developed mainly for the WesTrac facility and the CAT Training Institute. The WesTrac Facility would employ about 400 staff and operate 24 hours a day.
- **Stage 2** would involve the subdivision of land for industrial uses and cover approximately 36 hectares.
- **Stage 3** would involve the subdivision of land for industrial uses and cover approximately 48 hectares.

The Redlake development site has direct frontage to Tomago Road and access is proposed via a spine road within the development which is planned to form a new signalised intersection with Tomago Road. The development is expected to increase traffic along Tomago with majority of the traffic (85%) travelling to and from the Pacific Highway and thereby passing via McIntyre Road and Midal site (Refer to Figure 14.7).

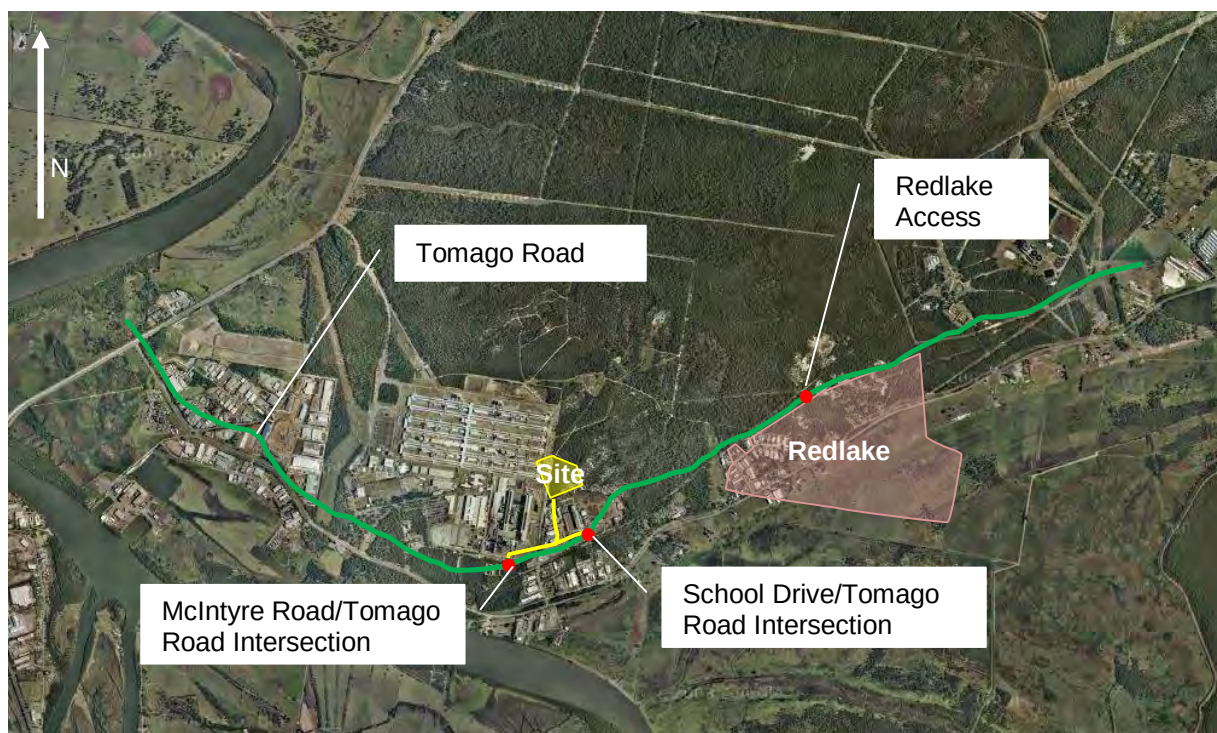


Figure 14.7 Location of the Redlake development

Traffic generated by the Redlake development

The predicted traffic generation by the Redlake development was reported in a Traffic Impact Statement Report, prepared by Better Transport Futures for Redlake Enterprises, and dated September 2007. The traffic generation rates used in the assessment were obtained from the *RTA Guide for Traffic Generating Development*. This document was later supplemented by an Addendum Report dated September 11th, 2008. The addendum revised the traffic generation calculations on the basis of new surveyed traffic generation rates for a similar site. The source data was obtained from the “Assessment of Hunter Valley Business Park Trip Rates” prepared by Maunsell Australia Pty Ltd.

The aforementioned reports indicate that the full development of the Redlake site is expected to generate a total of 1,702 vehicle trips in the AM peak and 1,967 vehicle trips in the PM peak. These traffic volume predictions would increase traffic on Tomago Road to three times its current levels during peak periods and as a result would be likely to require network upgrades. The traffic generated by the Redlake development is summarised in Table 14-3.

Table 14-3 Traffic generated by the Redlake development

	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Stage 1	187	125	312	125	187	312
Stage 2	355	237	592	282	423	705
Stage 3	479	319	798	380	570	950

	AM Peak			PM Peak		
Total	1021	681	1702	787	1180	1967

Source: WesTrac Industrial Subdivision, Addendum Report, Better Transport Futures, 11 September 2008.

Impact on the road network due to the Redlake development

The increase in traffic along Tomago Road associated with the Redlake development is likely to impact on the operational performance of all intersections along Tomago Road. As a result intersections west of the Redlake site would experience a significant increase in through traffic in the order of 868 vehicles in the eastbound direction and 570 vehicles in the westbound direction. Table 14-4 provides an understanding of existing traffic levels along Tomago Road.

Table 14-4 Existing traffic levels along Tomago Road (2011)

	Eastbound	Westbound
AM Peak Existing Volumes	412	310
PM Peak Existing Volumes	388	408

Table 14-5 and

Table 14-6 provide an understanding of the traffic impact on Tomago Road from forecast traffic generated by the Redlake Development in the AM and PM peak, respectively. The results indicate that Redlake development Stages 2 and 3 would significantly increase traffic volumes along Tomago Road and as a result this would impact on the performance of intersections situated between the site and the Pacific Highway.

Table 14-5 Tomago Road with the Redlake development in the AM peak (2011)

Redlake Development	Redlake Traffic	With Tomago Road Traffic	Increase	Redlake Traffic	With Tomago Road Traffic	Increase
	Eastbound			Westbound		
Stage 1	+ 159	571	(39%)	+ 106	416	(34%)
Stage 2	+ 461	873	(111%)	+ 307	617	(199%)
Stage 3	+ 868	1280	(211%)	+ 579	889	(287%)

Table 14-6 Tomago Road with the Redlake Development in the PM peak (2011)

Redlake Development	Redlake Traffic	With Tomago Road Traffic	Increase	Redlake Traffic	With Tomago Road Traffic	Increase
	Eastbound			Westbound		
Stage 1	+ 106	494	(27%)	+ 159	567	(39%)
Stage 2	+ 346	734	(89%)	+ 519	927	(127%)
Stage 3	+ 669	1057	(172%)	+ 1003	1411	(246%)

Intersection performance with the Redlake development

The intersections of McIntyre Road/Tomago Road and School Drive/Tomago Road have been appraised with the additional traffic associated with the Redlake development. The results of the SIDRA Intersection analysis under existing conditions with the staged Redlake development are presented in Table 14-7 and Table 14-8 respectively.

Table 14-7 Tomago Road / McIntyre Road intersection performance

Intersection Location	AM peak			PM peak		
	LoS	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)
Tomago Road / McIntyre Road						
Stage 1	F	0.455	77.8	C	0.626	30.0
Stage 2	F	1.0	>200	F	2.431	>200
Stage 3	F	1.0	>200	F	2.733	>200

Table 14-8 Tomago Road / School Drive intersection performance

Intersection Location	AM peak			PM peak		
	LoS	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)
Stage 1	B	0.314	15.1	A	0.327	13.7
Stage 2	C	0.476	29.8	B	0.525	24.5
Stage 3	F	0.695	>200	F	1.167	>200

It is evident from Table 14-7 and Table 14-8 that the operational performance of the intersections would deteriorate and result in an unsatisfactory level of service, and potential safety and operational implications due to the additional traffic generated by the Redlake development. In summary, the results highlight that:

- ▶ Under a Stage 1 Redlake development scenario (2011) with no changes to the intersection configuration or controls, the intersection of McIntyre Road and Tomago Road experience significant delays and unacceptable traffic conditions during the AM peak and the operating performance of School Drive and Tomago Road deteriorate to a LoS B.
- ▶ The McIntyre Road and Tomago Road intersection performs unsatisfactory in both AM and PM peaks with the inclusion of Stage 2 and Stage 3 traffic from the Redlake development.
- ▶ The Tomago Road and School Drive intersection performs unsatisfactory with the inclusion of proposed Stage 3 Redlake development traffic.

The majority of intersections along Tomago Road are currently under give way signpost control with Tomago Road as the priority movement. In order to cater for additional traffic generated by developments located east of the Midal site, improvements to the priority controlled intersections situated along Tomago Road would be required. Those improvements are directly associated with expected increases in through traffic along Tomago Road.

The above analysis does not allow for future background traffic growth along Tomago Road which is expected to have further impacts on intersection operations. This growth in background traffic is expected to be related to ongoing work at the airport and the development of the Tomago industrial lands.

Options to upgrade intersections to improve performance

A range of options were considered to upgrade the Tomago Road/McIntyre Road intersection to accommodate the predicted increase in traffic along Tomago Road. This indicated that the intersection's operational performance would improve by converting priority controlled intersection to either a CHR or seagull intersection treatment or under roundabout or traffic signal control.

Consideration of options for the Tomago Road/School Drive intersection revealed that with the anticipated increase of traffic along Tomago Road associated with traffic generated by the delivery of Redlake Stage 3, the intersection's operational performance would improve by converting the priority controlled intersection to a roundabout or traffic signals.

SIDRA analysis was undertaken to test four possible intersection upgrade options and is shown in Appendix H.

14.3 Impact assessment

14.3.1 Construction traffic movements

During construction it is expected that additional traffic would be generated by staff movements to/from the site. Staff would include project management, various trades, and general construction staff. Over the full construction period, the peak construction workforce is estimated to be about 35 employees over a 10 month period. Allowing for some car sharing, counter balanced by moderate turnover of traffic throughout the day, around 70 daily trips would be generated by car and van (refer to Table 14-9). Approximately 25% of these are anticipated to occur during the morning and evening peak hours.

The workforce traffic movements are likely to be distributed based on a 100/0 split between arrivals and departures during the morning peak period, and the reverse during the afternoon peak period.

Table 14-9 Midal construction period traffic generation

Vehicle Type	Movements per day	
	Initial two months of construction	Remaining eight months of construction
Light Vehicles	70	70
Heavy Vehicles	30	16

Heavy vehicle traffic would be generated by construction activities. It is estimated that 15 heavy vehicles a day would be used over the first two months of construction. The remaining eight months of the construction period would use eight heavy vehicles daily. Assuming a worst case scenario, this would translate to 30 heavy vehicle movements (or 60 in passenger car equivalent) distributed over an eight hour day. For the purpose of this assessment, it is assumed that 25% of the heavy vehicle movements occur during the peak hour.

14.3.2 Operational traffic movements

Workforce traffic generation

The project would operate 24 hours a day, seven days a week (excluding public holidays). At its maximum capacity, it would operate with two shifts a day comprising of 42 employees per shift. It is expected that during a normal time shift the development would attract 35 administration staff and five contractors. Based on the proposed employee occupancy levels, the site would attract a total daytime employment population of approximately 82 persons.

It is estimated that about 164 daily trips, by light vehicles would be generated by the site. Under a worst case scenario assessment some 42 of these are anticipated to occur during the morning and evening peak hours.

It is assumed the majority of the workforce would arrive during the morning period and depart generally during the afternoon period. The workforce arrival and departure periods represent the worst case peak period traffic generation.

Delivery and service vehicles

It is estimated that the project would have the following staged production capacity:

- ▶ 25,000 tonnes of cable produced in the first year
- ▶ 50,000 tonnes of cable produced per year after five years.

At peak operations, the total truck movements each year generated from transporting products is estimated to be approximately 2,000 trucks. This is based on 50,000 tonnes produced after the fifth year of operation with each truck transporting 25 tonnes of material. Assuming outgoing movements would occur 355 days per year this equates to approximately 12 truck movements per day on the average (refer to Table 14-10).

In addition, the site also requires delivery of material which has been estimated to be 1,065 truckloads per year, which equates to an additional six movements per day based on a 355 day working year.

Table 14-10 Midal operational period traffic generation

			Movements per day	
Vehicle type	Trucks per year	Working days per year	Operational period (transporting cables)	Operational period (delivery of materials/supplies)
Light vehicles	n/a	n/a	82	82
Heavy vehicles	3,065	355	12	6

14.3.3 Summary of total traffic generation

Estimated traffic generation during operation of the project is summarised in Table 14-11.

Table 14-11 Summary of estimated traffic generation

Vehicle movements	Daily movements (car equivalent)	Estimated peak hour volumes			
		Inbound		Outbound	
Construction period		AM Peak	PM Peak	AM Peak	PM Peak
Light vehicle movements	70	35 ²			35 ²
Heavy vehicles movements	60 ¹	4 ³	4 ³	4 ³	4 ³
Total	130	43	4	4	39
Operational period					
Light vehicles movements	164	82 ²			82 ²
Heavy vehicles movements	36 ¹	3 ³	2 ³	2 ³	3 ³
Total	200	85	2	2	85

¹ In car- equivalent (i.e. 1 heavy vehicle = 2 passenger cars)

² It is assumed that the workforce would arrive during the morning period and generally depart during the afternoon peak period. It is also assumed that there would be a hand over period, and as a result arrivals and departures would not occur at the same time.

³ It is assumed that 25% of the movements occur during the peak hour.

14.3.4 Network appraisal

Construction and operational traffic volumes were superimposed on the existing road network to determine operating capacity of key intersections along the surrounding road network. These traffic volumes were then been used as part of SIDRA analysis of key intersections during the peak periods.

The results from the SIDRA appraisals were used to determine the operational performance of the following intersections:

- ▶ Tomago Road and McIntyre Road intersection;
- ▶ McIntyre Road and School Drive intersection; and
- ▶ School Drive and Private Access Road intersection.

The assessment assumed that:

- ▶ All heavy vehicles would enter and exit via the Tomago Road and McIntyre intersection.
- ▶ The total light vehicles would be distributed 80/20 on entry with 80% of the light vehicles from the west entering via Tomago Road and McIntyre Road intersection, with the other 20% from the east entering via School Drive/McIntyre Road (east) intersection. This would be reverse from the PM peak, with light vehicles leaving the site.

Intersection performance

A summary of the results of the intersection analysis for projected traffic volumes at the intersections in the vicinity of the site during the construction and normal operational phase is presented in Table 14-12 and Table 14-13. Based on the intersection analysis, these intersections would operate at a satisfactory level of service and have the capacity to accommodate construction and operational traffic generated by the project. The existing intersection operation would not be appreciably effected by the project.

Table 14-12 Intersection performance (2011) with construction traffic

Intersection location	AM peak			PM peak		
	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Tomago Road / McIntyre Road	0.343	40.9	C	0.475	19	B
McIntyre Road / School Drive	0.175	8.2	A	0.127	8.7	A
School Drive / Private Access	0.076	9.7	A	0.145	7.2	A

Table 14-13 Intersection performance (2011) with operational traffic

Intersection location	AM peak			PM Peak		
	Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Tomago Road / McIntyre Road	0.363	40.4	C	0.562	20.3	B
McIntyre Road / School Drive	0.202	8.3	A	0.097	8.7	A
School Drive / Private Access	0.096	9.6	A	0.167	7.2	A

14.3.5 Cumulative impacts

Section 14.2 details the impact from the approved three staged Redlake development on the intersections of Tomago Road/McIntyre Road and Tomago Road/School Drive. The analysis revealed that both intersections are required to be upgraded as a result of increases in traffic associated with the Redlake development.

Table 14-12 summarises the results of the intersection analysis under existing 2011 intersection configurations, 2011 background traffic and with additional traffic generated by the Midal development site. The results show that without both future background traffic growth and traffic associated with the development of Redlake site, the existing intersections have the capacity to accommodate traffic from the Midal project.

The Tomago Road/McIntyre Road and Tomago Road/School Drive intersections have been appraised with both Redlake Stage 1 development traffic and the Midal project. The results indicate that the intersection performs satisfactorily with the inclusion of both development and an intersection upgrade to a seagull intersection treatment under 2011 traffic conditions.

These intersections have been reappraised with the inclusion of traffic generated by the Redlake development with the inclusion of 2021 background traffic growth along Tomago Road. The purpose of the assessment was to identify if this results in a need to upgrade any infrastructure beyond what is shown under the Redlake development scenario, to cater for the anticipated future traffic growth along Tomago Road and traffic generated by the Midal project. The results of the modelling are shown in Table 14-14 and Table 14-15.

The analysis indicates that no further capacity enhancements are required to the intersection of Tomago Road/School Drive beyond what is shown in Section 14.2.2 to accommodate the Redlake development. The intersection of Tomago Road/McIntyre Road is required to be upgraded to either a roundabout or traffic signals as shown in Section 14.2.2 as a result of background traffic growth along Tomago Road.

Table 14-14 2021 Tomago Road/McIntyre Road intersection performance - with all developments

	Redlake stage	AM peak			PM peak		
		Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Option 2 Seagull	Stage 1	0.548	83.7	F	0.684	30.5	C
Option 3 Roundabout	Stage 1	0.625	21.2	B	0.696	15.8	B
	Stage 2	0.807	28.9	C	1.033	101.8	F
	Stage 3	1.052	109.9	F	1.475	872.9	F
Option 4 : Signal Controlled (no	Stage 1	0.897	25.9	B	0.875	22.7	B

	Redlake stage	AM peak			PM peak		
		Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
major change to intersection layout)	Stage 2	0.948	33.8	C	0.917	44.5	D
	Stage 3	1.213	337.7	F	1.540	623.2	F
Option 5 : Signal Controlled (major change to intersection layout)	Stage 3	0.744	13.2	A	0.814	20.0	B

Table 14-15 2021 Tomago Road/School Drive intersection performance - with all developments

	Redlake stage	AM peak			PM peak		
		Degree of Saturation	Average Delay (secs)	LoS	Degree of Saturation	Average Delay (secs)	LoS
Existing Conditions	Stage 1	0.387	17.8	B	0.398	21.3	B
Option 3 : Roundabout	Stage 3	0.935	41.6	C	0.991	23.6	B
Option 5 : Signal Controlled (with major change to intersection layout)	Stage 3	0.814	11.2	A	0.782	10.2	A

14.3.6 Parking provision

Guidelines for minimum parking requirements for the project are provided in Port Stephens Council's DCP 2007 (Section B3). The RTA's *Guide to Traffic Generating Developments* also provides recommended minimum standards. The guidelines are summarised in Table 14-16:

Table 14-16 Guidelines for minimum parking requirements

Land Use	RTA Guidelines	Port Stephens Council DCP
Factories	1.3 spaces per 100 m ² GFA	1 space per 100 m ² GFA + 1 space per 30 spaces for disabled parking
Warehouses	1 space per 300 m ² GFA	1 space per 200 m ² GFA + 1 space

Gross floor area estimate for the development is in the order of 9,600 m². However, a large proportion of the gross area would be allocated for storage. Assuming a 50% manufacturing space and 50% storage or warehousing split in the gross area and applying the above guidelines, the required parking provision would be:

- ▶ 78 spaces as per the RTA Guidelines; and
- ▶ 75 spaces as per Port Stephens Council DCP.

Staff parking

Parking requirements for staff was calculated based on shift schedules as the staff would work shifts. At its maximum capacity this operation would involve two, 12 hour shifts comprising 42 employees each per shift with 35 administration staff for a total employment of approximately 119 persons. It is anticipated that a maximum of 70 employees are expected to be on site at any one time.

The peak demand for staff parking would occur in between shift changes, i.e. at 7:00 a.m. and 7:00 p.m. Using the conservative assumption of one car per employee, this peak demand for parking would be at around 7:00 pm when 70 staff would still be finishing their shift, and another 42 staff workers plus administration staff would have arrived to start their shift. On this basis, car parking provision requirement is estimated to be a minimum of 70 spaces. The site layout provides 82 spaces which would be sufficient to cater to staff parking.

Visitor parking

A total of four visitor parking spaces would be provided.

Provisions for Disabled Parking

Based on the Port Stephens Council's DCP 2007, a total of two spaces would be allocated for parking by disabled persons.

14.3.7 Summary of impacts

The project is expected to result in a marginal increase in traffic flow along Tomago Road, McIntyre Road and School Drive during the weekday peak periods. The current intersection arrangement at the intersection of McIntyre Road with Tomago Road operate satisfactory under 2011 peak period conditions and has available capacity to accommodate both construction traffic and operational traffic generated from the project.

The three stages of the Redlake development directly impacts on Tomago Road operations during peak periods, and would increase traffic by between 27%-39% (Stage 1) and 172%-287% (Stage 3).

The intersection of McIntyre Road with Tomago Road is directly impacted by increases in traffic associated with all three stages of the Redlake development. It is predicted that the intersection would perform unsatisfactorily and require upgrading to a seagull intersection treatment in Stage 1 and eventually traffic signals under Stage 3.

Stage 3 of the proposed Redlake development would impact on both the performance of the intersection at Tomago Road with School Drive and Tomago Road at McIntyre Road. It is predicted that the intersection would require upgrading to include traffic signals and a second through traffic lane in each direction on Tomago Road approaches to McIntyre Road.

Background traffic over the next 10 years has been estimated to increase by 2.7% per annum and is understood to be directly associated with the development of employment lands situated in close proximity to the airport and other Tomago Road industrial sites.

The assessment of the intersection of McIntyre Road and Tomago Road under 2021 traffic conditions with the delivery of Stage 1 Redlake development and the Midal development indicates that the intersection is required to be upgraded to either a roundabout or traffic signals.

The assessment of cumulative impacts in 2021 indicated that the upgrades required to the road network are directly associated with traffic generation from the 3 Stage Redlake development and 2021 background traffic growth. If these upgrades are implemented, the intersections would have capacity to accommodate traffic generated by the Midal project without any additional upgrades.

14.4 Mitigation measures

Construction

To minimise the impact of truck movements on existing road users during the construction period, the majority of truck movements would be confined within the off-peak periods of traffic movements along the nominated routes.

A Construction Traffic Management Plan (CTMP) would be implemented as part of the construction works. Some of the other initiatives that would be undertaken as part of the CTMP would include:

- ▶ In consultation with RTA, general signposting of the access roads with appropriate heavy vehicle and construction warning signs.
- ▶ Review of speed restrictions along key designated routes and additional signposting of speed limitations, where necessary.
- ▶ Installation of appropriate traffic control and warning signs for areas identified where potential safety risk issues exist.
- ▶ The promotion of car-pooling for construction staff and other shared transport initiatives during the construction phase.

Operation

As there are no significant impacts expected on intersection performance due to the project, no mitigation measures are proposed during operation of the project.

15. Bushfire

This chapter summarises the bushfire assessment for the project prepared by GHD and the full report is located in Appendix I.

15.1 Methodology

A desktop review of available documents was carried out which included the collation and analysis of:

- Bushfire prone land mapping.
- Aerial photography sourced from NSW Land and Property Management Authority.
- Slope assessment from contour information.
- Vegetation, physical relief, tenure, roads and other descriptive feature mapping.

In addition to the desktop review, vegetation mapping and surveys were conducted which comprised:

- Ecological investigations.
- Aerial photography interpretation to map vegetation cover and extent for a distance of 140 metres around the site.
- Confirmation of the vegetation assemblage typology from site inspection carried out as part of GHD's ecological investigations.
- Analysis of the information collated during investigations was conducted with reference to the objectives, intent, performance criteria and solutions for bushfire protection outlined in the NSW Rural Fire Service's *Planning for Bushfire Protection* (NSWRFS 2006).

15.2 Existing environment

15.2.1 Bushfire prone land

The site is classified as bushfire prone land (Figure 15.1). Vegetation within and adjoining the site constitutes a potential bushfire threat, with adjoining lands also classified as bushfire prone (shaded orange) or bushfire buffer (shaded red).

To the north of the site is undeveloped land zoned for environmental management as part of the TAC buffer zone and has previously been subject to bushfire, clearing, sandmining and vehicle access. The land includes a range of exotic grasses and weeds.



Figure 15.1 Bushfire hazard map

15.2.2 Vegetation

Predominant vegetation formations within the site were described in accordance with A2.3 of *Planning for Bushfire Protection* and Table A3.5.1 of the addendum to *Planning for Bushfire Protection* (NSW RFS 2010). Vegetation within the site is comprised of the following communities:

- ▶ Smooth-barked Apple – Red Bloodwood Shrubby Open Forest (Smooth-barked Apple (*Angophora costata*)/ Red Bloodwood (*Corymbia gummifera*)).
- ▶ Exotic open grassland.

Using broadly defined vegetation types identified in *Planning for Bushfire* and Keith (2004), these communities fall into the Dry Sclerophyll Forest – Shrubby subformation and Grassland, which has the following characteristics:

- ▶ Dry Sclerophyll Forest – Shrubby subformation.

- o Dominated by eucalypts 10-30 m with crowns that touch or overlap.
- o Canopy foliage cover in many areas is 20-50%.
- o Understorey dominated by shrubs, including banksias.
- Grassland.
 - o Dominated by grasses and broadleaved herbs.
 - o Lack of woody plants.

15.2.3 Slope

The site has a gentle relief rising slightly from south the north. North of the site is upslope, while south of the site is 0-5° downslope.

15.3 Impact assessment

The aims and objectives of *Planning for Bushfire Protection* (NSWRFS 2006) and *Addendum: Appendix 3* (NSWRFS 2010) apply to industrial development and are considered below.

15.3.1 Asset protection zones

An Asset Protection Zone (APZ) is an area surrounding a development/asset that is managed to reduce the bushfire hazard to an acceptable level. *Planning for Bushfire Protection* provides a consistent and transparent basis for determining minimum requirements for APZs.

The APZ setbacks have been developed to meet the aims and objectives of *Planning for Bushfire Protection*, with *Planning for Bushfire Protection* and *Addendum: Appendix 3* used as a guide. The construction standards of industrial buildings serve to reduce the impacts of bushfire and the infrastructure is not intended for habitation. It is therefore considered that the planned APZ widths for the site are adequate. The APZ width for the site is 20-25 metres with APZs as detailed in Table 15-1.

Table 15-1 Minimum APZ width for the site

Boundary	Vegetation class	Effective slope class	APZ (if a residence)
Northern	Forest	Upslope	20 m
Eastern	Grass	Upslope	Not required
Southern	Forest	>0-5°	25 m
Western	Nil	N/A	Not required

Standards for Asset Protection Zones (NSWRFS 2005) identifies requirements to reduce fuels in APZs. The APZ widths for the project can be incorporated within the site. As the APZ would be formed as hardened surfaces for the operation of the facility, they would exceed the standard required for the maintenance of an APZ.

15.3.2 Access

Site access would be provided via sealed roads to the west at the adjacent Tomago Aluminium Smelter and from the south to Tomago Road. It is considered that these routes exceed the 'Fire Trail – Category 1' standard (BFCC 2003) for access.

Vehicular access in and around the proposed buildings would cater for heavy vehicle movements and would provide adequate access for fire fighting vehicles throughout the developed portion of the site.

15.3.3 Construction standard

As the project would be an industrial development (Class 5, 6, 7 and 8), the *Building Code of Australia* (BCA) bushfire performance requirements or A3959-2009 – *Construction of Buildings in Bushfire Prone Areas* do not apply. These construction provisions relating to access and services have, however, been addressed as acceptable solutions.

15.3.4 Services (water, electricity and gas)

The project is serviced by access to mains water supply.

The following acceptable solutions relate to the provision of new services:

- ▶ Where fire fighting water supply outlets are fitted they have suitable coupling for fire fighting services, are located next to car parks and not located within a carriage way.
- ▶ Reticulated or bottled gas would be installed and maintained in accordance with AS 1596 and the requirements of relevant authorities.
- ▶ Fixed gas cylinders would be located at a minimum distance of 10 m from all flammable materials and are to be shielded from radiant heat.
- ▶ Gas release valves would be located a minimum of 2 m from combustible material and be directed away from buildings. All gas connectors would be metal.

15.4 Mitigation measures

Mitigation measures to be implemented to provide bushfire protection during construction and operation of the project include:

- ▶ A site management plan would be developed that details bushfire prevention measures to be implemented during construction and later for the operation of the facility during the designated bushfire season, including but not limited to:
 - Work involving risk of ignition would not be carried out during total fire bans.
 - Details of the fire suppression equipment available on site.
 - Appropriate storage and maintenance of fuels and other flammable materials.
- ▶ Emergency procedures would be detailed for any persons located at the site during the bushfire season.
- ▶ Local Rural Fire Service Control Centre would be notified of the dates during which construction is to be undertaken and any dates when 'hot works' are to be conducted would be highlighted. This would enable the Rural Fire Service to advise if weather conditions are appropriate to carry out the works proposed.

Retained vegetation within the site (outside the identified APZs) and adjoining the development site (Dry Sclerophyll Forest - Shrubby subformation) would be managed in accordance with the *Bush Fire Risk Management Plan* (Lower Hunter Bush Fire Management Committee (LHBFMC) 2009), the burning intervals identified under the *Bushfire Environmental Assessment Code* (NSW RFS 2006b) and the *Threatened Species Hazard Reduction List* (NSW RFS 2004). The burning interval for Dry Sclerophyll Forest – Shrubby subformation within a designated land management zone (LHBFMC 2009) is one fire within 10 years (NSW RFS 2006b). This prescription would coincide with the burning regime recommended for the New Holland Mouse (*Pseudomys novaehollandiae*) of patchy, low intensity autumn burns at intervals of 10 years to maintain a mosaic of habitat types and fuel ages (TSU 1999).

16. Hazards analysis

The information presented in this chapter is based on the findings of the preliminary hazard analysis undertaken by GHD and the full report is included in Appendix J.

16.1 Methodology

The preliminary hazard analysis (PHA) was prepared consistent with the requirements of *State Environmental Planning Policy 33 – Hazardous and Offensive Development* (SEPP 33) and the publications Hazardous Industry Planning Advisory Paper No. 6 'Guidelines for Hazard Analysis' and No. 4 'Risk Criteria for land Use Safety Planning'.

The analysis was prepared to show that any residual risk levels are acceptable in relation to the surrounding land use, and that potential risks would be appropriately managed. This has been done by:

- ▶ Identifying intrinsic hazards and abnormal operating conditions that could give rise to hazards.
- ▶ Identifying a range of safeguards.
- ▶ Assessing the risks by determining the probability (likelihood) and consequence (effects) of hazardous events for people, the surrounding land uses and environment.
- ▶ Identifying approaches to reduce the risks by eliminating, minimising and/or incorporating additional protective measures.

16.2 Preliminary risk screening

A preliminary risk screening of the project was undertaken to address the requirements of SEPP 33. The need for a PHA is determined by the results of the preliminary risk screening.

16.2.1 Hazardous materials on site

Hazardous materials encompass both dangerous goods and dangerous substances. Dangerous goods are classified on the basis of immediate physical or chemical effects such as fire, explosion, corrosion and poisoning that may affect property, people or the environment, whilst hazardous substances are classified only on the basis of health effects – both medium and long term. The proposed hazardous materials at the project would include:

- ▶ Chromic acid – DG Class 8: causes severe burn upon contact, toxic if inhaled and carcinogenic. It is used for wiping the casting wheel in the casting area, once daily, but is not essential for operations.
- ▶ Hydrochloric acid and Sulphuric acid – DG Class 8: causes tissue burn upon contact. It is used in the laboratory for testing purposes.
- ▶ Nitrogen – DG Class 2.2 (non-flammable and inert): non-toxic but may act as an asphyxiant in an oxygen deficient environment. Nitrogen is used in the tilt furnace (nitrogen wand to stir the molten aluminium).
- ▶ Alumol 195 – DG Class 8: is a low hazardous material with low flammability. It is used as a lubricant during the wire drawing process.
- ▶ Molten aluminium – DG Class 9: is excluded from risk screening (see Table 1: Screening Method to be used, "Applying SEPP 33"), but considered in transportation screening (See Table 2:

Transportation Screening Threshold, “Applying SEPP 33”, p18). It poses high explosion risk upon contact with water.

- ▶ Dross aluminium – DG Class 4.3: potential for emission of a flammable gas when the dross is wet and reacts with water to produce ammonia or acetylene.

16.2.2 Dangerous goods and storage screening

The inventories of hazardous substances and dangerous goods likely to be stored and utilised by the project are listed in Table 16-1. Some of these are defined as Dangerous Goods (DG) in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (ADG Code). The SEPP 33 screening threshold value for each item is also listed and inventory items that exceed the screening threshold are shown in bold.

Table 16-1 Dangerous goods storage screening

Hazardous Material	Maximum Inventory	Threshold	% of Threshold	Comments
Chromic Acid	1.25 kL	50 kL	2.5%	Stored in hazardous good store
HCl & H ₂ SO ₄	0.103 kL	25 kL	0.5%	Stored in hazardous good store
Nitrogen	10 kL	#		Stored in hazardous good store
Wire drawing lubricant Alumol 195	20.5 kL	100 kL	21%	Stored in hazardous good store and banded
Molten Aluminium	140 tonnes	*	N/A	In furnaces and crucibles
Aluminium dross	4 tonnes	1 tonne	400%	Stored indoor to solidify, then outdoor in a skip for recycler collection

*Molten Metal (UN code 3257) is a Class 9 dangerous good and is excluded from risk screening.

Class 2.2 gases are excluded from risk screening.

Table 16-1 shows that with the exception of aluminium dross, all other hazardous materials would be below the threshold for storage. As molten aluminium is a Class 9 dangerous good, it is excluded from the storage screening process as per SEPP 33. The maximum inventory of molten aluminium shown in Table 16.1 and includes inventories in two holding furnaces of 38 tonnes each, two tilt furnaces of 22 tonnes each, and two crucibles of 10 tonnes each (worst case quantity).

The estimated inventory of aluminium dross from the tilt and holding furnaces is 3 tonnes per day with a daily pickup so an allowance for a maximum 4 tonnes storage is assumed, which exceeds the one tonne threshold for storage of Class 4.3 dangerous goods. Therefore the project is considered to be potentially hazardous and a PHA is required to be prepared.

16.2.3 Transportation screening

The likely movement of hazardous materials (both incoming and outgoing) is assessed in Table 16-2 against the transportation screening thresholds in Table 2 of Applying SEPP 33.

Table 16-2 Estimated vehicle movement of dangerous good

Class	Substance	Peak Weekly	Threshold	Min Qty per load	Threshold Load
Packaging Group		(Movements)	(Movements)	(Tonnes)	(Tonnes)
Class 8, PGII	HCl UN Code 1789	0.04	30	0.103	2
Class 8, PGII	H ₂ SO ₄ UN Code 1830	0.04	30	0.103	2
Class 8, PGIII	Chromic Acid UN Code 1755	0.04	30	0.60	2
Class 2.2, PG-I	Nitrogen UN Code 1066 (compressed)	0.24	n/a	2.0	n/a
Class 4.3 PG II or III	Aluminium Dross UN Code 3170	7	12	5	n/a
Class 9	Molten Metal (Aluminium) UN Code 3257	>100	60	No limit	No limit

16.2.4 Level of risk assessment

Based on the assessments in Sections 16.2.2 and 16.2.3, the project exceeds the storage threshold for Class 4.3 dangerous goods (aluminium dross). Aluminium dross can react with water to produce low levels of ammonia and acetylene. The dross generated at the site is expected to contain 1-4% aluminium chlorides, 2-40% of Aluminium Carbide (Al₄C₃), and 1-4% of Aluminium Nitride (AlN) of which the last two are the more active components found in aluminium dross from smelting processes such as at Tomago. The remainder is aluminium or aluminium oxides.

Table 16-2 shows that the estimated vehicle movements for liquid aluminium (Class 9 under the Transportation Screening) exceed the transportation screening threshold. Hence according to SEPP 33, the project is also considered to be potentially hazardous with respect to transportation. Although the transfer of liquid aluminium from the Tomago smelter to the project involves a direct and designated route, SEPP 33 does not differentiate between industrial (private roads) and gazetted routes. If the project is found to be potentially hazardous, according to SEPP 33 a route evaluation study should be completed in accordance with Hazardous Industry Planning Advisory Paper No. 6. SEPP 33 is not considered to apply to the project with respect to transportation screening based on the following analyses/qualifications:

- ▶ Transfer of liquid aluminium involves most direct route within the Tomago Aluminium Corporation Buffer Zone. The buffer zone was developed to ensure that only land uses/activities that are compatible with the operation of the smelter are permitted within the zone.
- ▶ The haul route would use public roads, and would not pass any residential, public areas, schools etc.
- ▶ The haul route is designated for Tomago and Midal transport activities only. The road is fenced, trucks would operate at restricted speeds, and crucibles would be secured to trucks.

Based on the above qualifications, the project is not considered as potentially hazardous with respect to transportation screening. The project is considered potentially hazardous with respect to storage screening due to the quantity/inventory of aluminium dross (Class 4.3 dangerous goods) exceeding the screening threshold. A PHA is required to be prepared with a medium potential for harm requiring a Level 2 – Partially Quantitative Approach.

16.3 Hazard identification

Hazard identification represents a qualitative risk assessment and involves documenting all possible events that could lead to a hazardous incident. It is a systematic process listing potential causes and consequences (in qualitative terms). Reference is also made to proposed operational and organisational safeguards (and their basis) that would prevent such hazardous events from occurring, or should they occur, that would mitigate the impact on the plant, its equipment, people and the surrounding environment. This process enables the establishment, at least in principle, of the adequacy and relevancy of proposed safeguards.

The aim of the hazard identification study process is to highlight any residual risks associated with the interaction of the facility (as a whole) with the surrounding environment. A range of possible hazard scenarios was developed and ranked in terms of consequence and likelihood in consultation with the relevant stakeholders. The results of this hazard identification process are provided in Table 16.3. Reference should be made to Appendix J for a description of the ratings for consequence, likelihood and risk use in the hazard identification in Table 16-3.

Table 16-3 Hazard identification

Plant	Hazard	Scenario	Consequence	Current Controls	Consequence	Likelihood	Risk	Action
Metal transfer launder	Explosion	Some moisture left over after refractory repairs as the caster would not have water cooled moulds	Possible explosion in contact with molten aluminium	Dry and cure all refractories before commissioning with aluminium. Prevent water in area from operations or roof leakage	3	C	H	Negligible off-site risk identified (including damage, fatality or injury)
Crucible transfer from TAC	Spillage and Explosion	Hot metal spills onto wet ground	Possible explosion in contact with molten metal	Ensure transit path is high and dry and the crucible cannot spill or tilt. Rain is not a risk -	3	D	M	Negligible off-site risk identified (including damage, fatality or injury)
Holding/ re-melt furnace	Explosion	Air/fuel ratio	Fuel control system	AS3814 compliant gas fired system	3	C	H	Negligible off-site injury.
		Charging with water leak into the pool of molten aluminium	Possible explosion in contact with molten aluminium					Dry feed before usage.
Tilting furnace	Explosion	Some non aluminium material/water charged into furnace with a molten heel.	Possible explosion in contact with molten aluminium	Screen all alloy feed to plant for water and similar liquids.	3	C	H	Negligible off-site risk identified (including damage, fatality or injury). Limit use of water in area

Plant	Hazard	Scenario	Consequence	Current Controls	Consequence	Likelihood	Risk	Action
	Explosion	Internal aluminium scrap with trapped moisture.	Possible explosion in contact with molten aluminium	Screen all internal scrap feed to plant for moisture containment. Scrap charge into the furnace when the furnace is empty.	3	C	H	Negligible off-site risk identified (including damage, fatality or injury). Limit ingress of water into process
	Sudden emission of gases from impurity	Some contaminant in the feed to the plant	Possible offsite discharge	Pollution control equipment	2	C	M	Pollution control Equipment specified for likely event
Casting wheel	Explosion	Water leakage from cooling water system into caster or from roof	Possible explosion in contact with molten aluminum	Ensure cooling water system is inspected and pressure tested regularly. Prevent water in area from operations or roof leakage	3	C	H	Negligible off-site risk identified (including damage, fatality or injury)
Gas supply		Rupture of pipe	Fire, explosion or personnel injury	Barriers erected around gas pipe in key areas. Main site gas reticulation line should be suspended from the wall or roof above and away from the reach of any Midal mobile equipment.	3	D	M	Possible off-site risk identified (including damage, fatality or injury). Location of gas metering should be away from boundary to neighbours and away from vehicles. Bollards around metering station

Plant	Hazard	Scenario	Consequence	Current Controls	Consequence	Likelihood	Risk	Action
Liquid effluent.	Wastewater	Treated effluent is outside specification	Contamination of nearby water course.	On Site storage, and check before discharge	3	D	M	Some off-site risk to environment
Aluminium dross	Potential for toxic or flammable gas emission (depending on dross make up)	Contact of dross with water on site during collection and internal transport	Generation of ammonia and/or acetylene below toxic or lower flammability limits.	Dross shall be kept away from water and under shelter. Storage of dross to be limited to a maximum of 4T.	2	C	M	Possible on site and off site odour/release
Lubricating oil – wire forming	Loss of containment	Tank leakage or rupture	Leakage of contents into water courses	AS 3780 compliant bunding and tank to prevent loss of containment	1	E	L	Negligible off-site or on-site damage
Potable water	Explosion	Pipe rupture	Water contacting molten aluminium	No water pipes in the furnace area	3	D	M	Negligible off-site or on-site damage
Stormwater drainage	Contamination with chemicals	Pipe rupture or leakage	Leakage of contents into stormwater system	Roof water would be captured and used to supplement process water supply. Water would drain to existing site surface drainage at the south east of the site. General site hard stand and pavement storm water management details to be finalised. Infiltration systems are being considered.	2	D	L	Some off-site risk to environment

Plant	Hazard	Scenario	Consequence	Current Controls	Consequence	Likelihood	Risk	Action
High voltage electrical system	Fire or explosion	Transformer fire or explosion	Plant shutdown, aluminium can be left in furnaces with no danger.	The transformer and sub-station are remote to the main plant, equipment and buildings (in its own enclosure). Regular servicing of switch gear and transformers are undertaken	2	C	M	No off-site risk identified (including damage, fatality or injury)
Low voltage protection system	Electrical fire	Fire in sub station	Plant shutdown, aluminium can be left in furnaces with no danger.	Sub-station remote of plant equipment and buildings in its own enclosure. Regular servicing of switch gear are undertaken	2	C	M	No off-site risk identified (including damage, fatality or injury)
Plant control system	Loss of power	Plant shut down	Plant shutdown, aluminium can be left in furnaces with no danger.	Plant electrical controls housed in Control room and rated electrical cabinets rated to AS	1	C	L	No off-site risk identified (including damage, fatality or injury)
Natural hazards	Storm	Explosion	Water contacting molten aluminium	All furnaces housed inside buildings designed for high wind rating	3	D	M	Negligible off-site risk identified (including damage, fatality or injury)
	Storm	Explosion	Water contacting dross	The aluminum dross is recycled and transported out of the facility during the rod production step. Housed in covered storage.	3	D	M	Negligible off-site risk identified (including damage, fatality or injury)

Plant	Hazard	Scenario	Consequence	Current Controls	Consequence	Likelihood	Risk	Action
	Earthquake	Furnace rupture	Molten metal leaking out of the furnace	Metal spills contained within the metal casting building	3	D	M	No off-site risk identified (including damage, fatality or injury)
	Fire	Plant shut down	Plant shutdown, aluminium can be left in furnaces with no danger.	Plant electrically isolated and no water sprayed into open furnaces.	3	C	H	No off-site risk identified (including damage, fatality or injury)
	Aviation	Aircraft crash	Aircraft crashes into Metal casting building	None	4	E	M	No off-site risk identified (including damage, fatality or injury)
	Flood	Plant shut down	Plant shutdown, aluminium can be left in furnaces with no danger.	Plant electrically isolated and no water sprayed into open furnaces.	3	C	H	No off-site risk identified (including damage, fatality or injury)

16.3.1 Qualitative analysis

Many of the scenarios identified in the hazard identification do not have a risk of offsite, or even on-site damage, fatality or injury. The following scenarios may have the potential for off-site impacts:

- ▶ Molten aluminium-water explosion.
- ▶ Fire, explosion or toxic exposure from the reaction of aluminium dross with water.
- ▶ Discharge of contaminated water from site.
- ▶ Fire/explosion from pipeline/fitting rupture/leak of natural gas supply.
- ▶ Fire/explosion at gas metering station.
- ▶ Leakage of caustic and entrainment within site runoff.

Molten aluminium-water explosion

The scenario of a molten aluminium-water explosion resulting from water contacting molten aluminium in a furnace could conceivably occur if moisture was present in the scrap aluminium feed to the furnace. Aluminium Association data compiled in the past 19 years shows 25 severe molten aluminium-water explosions with 19 associated fatalities worldwide. Impurities if present in scrap aluminium could also increase the risk of explosion. This risk is minimised as the project would use virgin molten aluminium from TAC and would not process external aluminium scrap.

Aluminium dross – water reaction

This scenario could conceivably occur when the available aluminium carbides or aluminium nitrides in the dross held on site come in contact with water. This could potentially generate gas clouds of ammonia (toxic at low concentrations and flammable at high concentrations) and/or acetylene (flammable). The risk is minimised by limiting the storage of dross to four (4) tonnes on the site with daily pickups for further processing at nearby dross processing facility.

Discharge of contaminated water from site

This scenario could conceivably occur with the spillage of caustic and subsequent mixing with water. Given that the molten aluminium should not contact water and minimal additional chemicals would be used, this is not considered likely.

The wastewater system proposed for the site would not be associated with the aluminium processing. It would be designed to engineering standards including adequate capacity for storm and contamination events.

Fire/explosion at branch gas supply line

Fire/explosion resulting from leaks in the gas supply branch pipeline extending from the gas mains to the on-site gas metering station could result in high heat radiation levels with potential for off-site impacts. The likelihood of this occurring is considered to be low as the pipeline would be buried, fully welded and/or situated in a controlled industrial environment. As such it is not considered in the consequence analysis.

Fire/explosion at gas metering station

The branch gas pipeline rises from underground to aboveground at the gas metering station. Here the pressure is reduced from the feed pressure of 1,000 kilopascal pressure (gauge) to a proposed value of 100 kilopascal pressure (gauge) downstream in the reticulation system for gas appliance usage.

The worst-case scenario considered is that of an ignited gas release occurring at the gas metering station. The metering station is considered to have the highest potential risk because of the pressure and exposure to surrounding activities. Likely leak sources include piping connections and flanges. The potential for damage by impact from a vehicle crash on internal roads is also considered.

Leakage of chemicals (acids or oils)

The scenario of acids or oils leaking from an incident on-site was considered to have potential for off-site impacts. Such incidents could include seepage into the water system or into the drains and nearby watercourse. Standard controls such as pipe inspections and containment approaches would be implemented to manage these potential impacts.

16.4 Quantitative risk analysis

Based on the results of the qualitative risk assessment, the following scenarios were identified as being worthy of a quantitative analysis:

- Damage to the above-ground section of the 100 mm nominal bore branch gas pipeline at the gas metering station by vehicle impact.
- Flange leak in the above-ground section of the 100 mm nominal bore branch gas pipeline at the gas metering station.
- Failure or damage to the 50 mm nominal bore fuel gas piping connection on the gas metering station outlet.
- Explosion resulting from the molten aluminium contacting water in a furnace.
- Reaction of the aluminium dross with water creating gas clouds of ammonia or acetylene.

16.4.1 Jet fire

The worst-case scenario considered is that of an ignited gas release from the natural gas metering station. The metering station is considered to have the highest potential risk due to the elevated pressure and the likelihood of damage from surrounding activities.

The consequence analyses to determine the duration and magnitude of the potential jet fires and associated radiation levels are presented in the PHA in Appendix J.

16.4.2 Explosion

The scenario considered involving a molten aluminium-water explosion is that of 1 kg of water contacting molten aluminium. The effect of such an incident would be an explosive overpressure and the projection of missiles from the blast. For the projected missile to have off-site effect, the explosion would have to occur when the furnace lid were off, or through an open aperture of the furnace. Additionally, the

projectile energy would be reduced by the surrounding melt material, air friction (drag) and penetrating the barrier of the surrounding building.

The scenario poses an onsite risk and would be examined during the design development phase of the project.

16.4.3 Reaction of aluminium dross

This scenario involves aluminium dross reacting with water from a rain event. This is examined semi-quantitatively to initially understand the quantity and risk level posed by dross reaction to form ammonia and acetylene. These are exothermic reactions and so would heat up the water and thereby reduce the reaction rate by water evaporation to some extent.

Initial modelling on the conservative (high) values of release indicates an ammonia level of 47ppm at 7.3 metres away from the source. At 15 metres, the concentration is approximately 13ppm. Most boundary points would be about 20 metres away from the likely dross bin source. The occupational exposure limit for ammonia is 50 ppm time weighted average (TWA), Current OSHA Permissible Exposure Limit, and IDLH (immediately dangerous to life and health) of 300-500 ppm are currently used as guidance.

It is possible that the release would be more of a nuisance odour issue at these projected levels of discharge than a toxic issue for personnel nearby. Immediately around a wetted dross bin, the concentrations would require respiratory equipment and adequate personal protective precautions.

This scenario was not modelled further due to the probability and consequence of offsite effects being low. Controls used at TAC are to keep the dross under cover and only transport it in the dry state. Similar controls would be used by the project.

16.5 PHA risk assessment

In setting risk criteria, the underlying principle is that people should not involuntarily be subject to risk from a development that is significant in relation to the background risk associated with the surrounding land use area classification.

16.5.1 Qualitative criteria

The methodology used to review the risks associated with the project addressed the following qualitative criteria:

- ▶ **A** - All identified risks have been avoided and remaining risks have been reduced to as low as practicable.

The qualitative risk analysis has sought to identify all avoidable risks. Table 16.3 summarises how the design and installation of the project mitigates the risks through appropriate safeguards and barriers.

- ▶ **B** - Consequences of the more likely hazardous events are, wherever possible, contained within site boundaries.

The process of likely hazard scenario selection and quantitative assessment of consequence is described in Appendix J.

- **C** - Where there is an existing high risk, then the additional hazardous development does not add significantly to the risk.

The risk assessment process demonstrates that the project would not result in a significant increase in the risk off-site.

16.5.2 Quantitative criteria

A quantitative analysis as detailed in Appendix J was conducted for the following hazard scenarios:

- **Scenario 1:** Gas release from the complete rupture of the above-ground section of the 100 mm nominal bore branch gas pipeline at the metering station due to vehicle impact and consequent jet fire;
- **Scenario 2:** Gas release from a 5 mm flange leak in the 100 mm nominal bore branch gas pipeline at the gas metering station inlet and consequent jet fire; and
- **Scenario 3:** Gas release from the complete rupture of a 100 mm nominal bore piping connection on the outlet of the gas metering station and consequent jet fire.

The assessment criteria for individual fatality risk recommended by the Department of Planning and Infrastructure are summarised in Table 16-4. The criteria have been set on the basis that they represent very low risks compared to other everyday risks associated with the various land uses.

Table 16-4 NSW individual fatality risk criteria

Land Use	Acceptable Criteria (risk in millions per year)
Hospitals, schools, childcare facilities, old age housing	0.5
Residential, hotel, motels, tourist resorts	1
Commercial developments	5
Sporting complexes and active open space	10
Industrial	50

The heat radiation criteria used to identify various risk contours are shown in Table 16-5.

Table 16-5 Effects on heat radiation

Heat Flux (kW/m ²)	Effect
1.2	Received from the sun at noon in summer
2.1	Minimum to cause pain after 1 minute
4.7	Will cause pain in 15-20 seconds and injury after 30 seconds exposure (at least 2nd degree burns will occur)
12.6	Significant chance of fatality for extended exposure (10%, Technica, 1988) High chance of injury thin steel may reach a thermal stress level high enough to cause structural failure
23	Likely fatality for extended exposure and chance of fatality for instantaneous exposure unprotected steel will reach thermal stress temperatures that can cause failure.
35	Significant chance of fatality for people exposed instantaneously.

The results of the frequency and consequence calculations for the three scenarios are summarised in Table 16-6.

Table 16-6 Calculated frequency and consequence values

Scenario	1	2	3
Parameters	100mm diameter pipe (1000kPag)	5mm (1000kPag)	100mm diameter piping (100kPag)
	Pipe rupture	Flange leak	Pipe rupture
Gas flow rate (kg/s)	9.2	0.020	1.68
Release duration (min)	Continuous	Continuous	Continuous
Jet fire length (m)	42	2.1	17.9
Jet fire diameter (m)	3.0	0.15	1.27
Distance to 23kW/m ² (m)	44	2	19
Distance to 12.6kW/m ² (m)	51	3	22
Distance to 4.7kW/m ² (m)	70	4	30

Scenario	1	2	3
Frequency of gas release (p.a.)	3.5×10^{-5}	2.3×10^{-5}	3.5×10^{-5}
Probability of ignition	0.25	0.020	0.25
Frequency of jet fire (p.a.)	8.7×10^{-6}	4.6×10^{-7}	8.7×10^{-6}

Risk of individual fatality

The calculated risk of individual fatality at the site boundary is based on the heat flux contour of 12.6 kW/m², the values relating to which are summarised in Table 16-7.

Table 16-7 Scenario risk of individual fatality

Scenario	1	2	3
Parameters	100mmNB Pipe (1000kPag)	5mm (1000kPag)	100mmNB Piping (100kPag)
	Pipe rupture	Flange leak	Pipe rupture
Distance to 12.6kW/m ² (m)	51	3	22
Frequency of gas release (p.a.)	3.5×10^{-5}	2.3×10^{-5}	3.5×10^{-5}
Probability of ignition	0.25	0.020	0.25
Frequency of jet fire (p.a.)	8.7×10^{-6}	4.6×10^{-7}	8.7×10^{-6}
Probability of fatality at site boundary	0.1	0	0.0
Risk of fatality at site boundary (p.a.)	8.7×10^{-7}	0	0

Only scenario 1 presents an impact distance that could result in a fatality at the site boundary. The calculated risk of fatality at the site boundary (8.7×10^{-7}) is below the HIPAP criteria of 50×10^{-6} for the surrounding land uses (industrial). Additionally, given the extent of the buffer zone (150m) between the north eastern site boundary and the nearest other land user there is negligible risk of individual fatality at the nearest other land use site.

Risk of individual injury

The injury risk is based on the heat flux contour of 4.7 kW/m² at adjacent land uses. At this heat flux level second degree burns may occur after 30 seconds exposure. It is expected that most individuals within this contour would take action to remove themselves from harm's way within 30 seconds. The results are summarised in Table 16-8.

Table 16-8 Scenario risk of individual injury

Scenario	1	2	3
Parameters	100mm NB pipe (1,000k Pag)	5mm (1,000 kPag)	100mm NB piping (100 kPag)
	Pipe rupture	Flange leak	Pipe rupture
Distance to 4.7kW/m ² (m)	70	4	30
Frequency of gas release (p.a.)	3.5×10^{-5}	2.3×10^{-5}	3.5×10^{-5}
Probability of ignition	0.25	0.020	0.25
Frequency of jet fire (p.a.)	8.7×10^{-6}	4.6×10^{-7}	8.7×10^{-6}
Probability of injury at site boundary	1	0	1
Risk of injury at site boundary (p.a.)	8.7×10^{-6}	0	8.7×10^{-6}

The impact distance of scenario 2 falls short of the site boundaries, however scenario 1 exceeds this distance. The radiation level from Scenario 3 would just reach the boundary. Hence the combined calculated risk of personal injury at the site boundary (p.a.) is 17.4×10^{-6} which is well below the Hazardous Industry Planning Advisory Paper criteria of 50×10^{-6} industrial land use. As with the case of individual fatality risk, given the extent of the buffer zone there is negligible risk of injury at the nearest other land use site.

Risk of property damage and accident propagation

The calculated frequency and consequence values (Table 16.6) were used to estimate the risk of damage to property from heat radiation on unprotected steel, i.e. exposure to a heat flux of 23 kW/m². The results are summarised in Table 16-9.

Table 16-9 Scenario risk of property damage

Scenario	1	2	3
Parameters	100mm NB pipe (1,000 kPag)	5mm (1,000 kPag)	100mm NB piping (100 kPag)
	Pipe rupture	Flange leak	Pipe rupture
Distance to 23kW/m ² (m)	44	2	19
Frequency of gas release (p.a.)	3.5×10^{-5}	2.3×10^{-5}	3.5×10^{-5}
Probability of ignition	0.25	0.020	0.050
Frequency of jet fire (p.a.)	8.7×10^{-6}	4.6×10^{-7}	8.7×10^{-6}
Probability of damage at site boundary	1	0	1
Risk of damage at site boundary (p.a.)	8.7×10^{-6}	0	8.7×10^{-6}

The impact distance of scenario 2 falls short of the site boundaries, however scenario 1 would potentially cause damage to property across the site boundary. Scenario 3 could just cause damage at the boundary. The combined risk of property damage caused by scenario 1 and 3 was calculated to be 17.4×10^{-6} (p.a.) and therefore below the HIPAP criteria of 50×10^{-6} adjacent industrial land use. With the addition of the buffer zone to residential areas there is negligible risk of property damage at neighbouring residential land use sites.

Societal risk and risk to the biophysical environment

The Australian Standard AS1940-2004 *The Storage and Handling of Flammable and Combustible Liquids* states that “should alterations on the adjacent property result in a breach of the requirements for separation distance, the installation shall be modified or relocated to restore compliance or would be taken out of service.”

The quantitative risk assessment does not assess the impact on sensitive land users, as there are currently no residential neighbours in close vicinity to the site. Therefore the site was assessed assuming industrial usage of the adjoining areas. The quantitative risk assessment was used to identify the potential zone of effect on the adjoining properties should a jet fire occur.

While this could appear to restrict neighbouring developments occurring within this zone in the future, it should be noted that the associated risks are all less than the respective ‘sporting complexes and active open space’ HIPAP criteria. Other potential high consequence/low frequency events have been reviewed in the hazardous scenario identification. All credible hazard scenarios have been considered.

16.5.3 Mitigation measures

Safeguards would be employed to ensure that loss scenarios involving the failure of pipes and/or fittings at the gas metering station are kept to a minimum. There are three strategies for reducing risk: elimination, management and mitigation. The complete elimination of the potential loss scenario is not an option considered for this development as natural gas is the primary fuel source for the process. Therefore risk management and mitigation procedures need to be employed.

Management procedures would be implemented that incorporate practices that would prevent risk scenarios occurring through:

- ▶ Minimising build-up of combustible materials on-site.
- ▶ Installing bollards/protective barriers around gas metering station.
- ▶ Screening for water containers of any sort before going to the aluminium casting facility.
- ▶ Drying all feed before melting in the recycling plant.
- ▶ Screening for water of all non-internally generated scrap and alloying material from furnace feed.
- ▶ Providing closed skips, or under cover storage for aluminium dross.
- ▶ Separation of, or tightly controlled usage of water around the casting area.
- ▶ Building design to avoid inadvertent water leakage into the casting area.

Emergency management procedures would be developed for response to fire and explosion that may be initiated from either on-site or off-site sources.

The risk of the explosion of water in contact with molten aluminium mainly poses an on-site risk. This would be examined in more detail during the design and construction phase of the project.

17. Greenhouse gas and climate change

This chapter summarises the greenhouse gas and climate change risk assessment undertaken by GHD and the full report is included in Appendix K.

17.1 Methodology

17.1.1 Greenhouse gas methodology

The greenhouse gas assessment was conducted in accordance with the general principles of:

- ▶ The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard developed by the World Business Council for Sustainable Development, March 2004.
- ▶ The Commonwealth Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts (NGA) Factors, July 2010.
- ▶ The DCCEE (2010b) National Greenhouse and Energy Reporting System Guidelines.

The scope and methodology for conducting the assessment was based on the Greenhouse Gas Protocol Scope 1, 2 and 3 emissions. The emissions sources considered included:

- ▶ Energy used on the site.
- ▶ Electricity generated off site.
- ▶ Embodied energy of materials required for cable production.
- ▶ Waste disposed of in landfill.
- ▶ Energy used for product distribution transport.

The assessment was limited to the operational phases of the project as the construction related emissions are likely to be minor compared to the emissions over the life of the project.

17.1.2 Emission scopes

Emissions are separated into Scopes 1, 2 and 3, in accordance with the Greenhouse Gas Protocol for the project. These scopes are defined as follows:

- ▶ Scope 1 emissions are greenhouse gas emissions created directly by a person or business from sources that are owned or controlled by that person or business.
- ▶ Scope 2 emissions are greenhouse gas emissions created as a result of the generation of electricity, heating, cooling or steam that is purchased and consumed by a person or business. These are indirect emissions as they arise from sources that are not owned or controlled by the person or business who consumes the electricity.
- ▶ Scope 3 emissions are greenhouse gas emissions that are generated in the wider economy as a consequence of a person's or business's activities. These are indirect emissions as they arise from sources that are not owned or controlled by that person or business but they exclude Scope 2.

17.1.3 Climate change methodology

The climate change assessment was conducted in accordance with the general principles of:

- ▶ The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) (2007) findings, modelling and relationship of temperature to carbon dioxide which is aggregated from global studies.
- ▶ Commonwealth Scientific and Industrial Research Organisation (CSIRO) Climate Change in Australia Technical Report 2007 and Regional and City Summaries 2008. This provides downscaled information from the IPCC AR4 model to regional and city levels.
- ▶ The current best practice risk assessment standard; ISO 31000-2009 which provides a more universal standard than the AS/NZS 4360:2004 which was the most relevant Australian standard prior to the ISO release.
- ▶ The United Kingdom Climate Impacts Programme (UKCIP) adaption tools.

These are considered to represent current good practice in climate change research and risk assessment methodology. This assessment aims to develop an understanding of climate change impacts on the project, such that potentially costly changes to address climate change impacts in the future may be avoided.

17.2 Existing environment

17.2.1 Greenhouse gas context

The site is currently vacant and does not generate greenhouse gas emissions.

17.2.2 Climate change context

There is significant scientific evidence that climate change is occurring as a result of the release of greenhouse gasses from human induced activities. The CSIRO has estimated that Australia's mean surface temperature has increased 0.9°C since 1910. Climate change does not only result in the increase of temperature, its impacts also lead to changes in rainfall, wind patterns and extreme climatic events including flooding, drought and fire.

17.3 Modelling results

17.3.1 Greenhouse gas emissions modelling

In the context of the project, Scope 1 emissions would include emissions produced by the combustion of fuels at the site and by vehicles and equipment that Midal owns and has operational control over. Scope 2 emissions arise from the consumption of electricity at the site by plant and equipment owned by Midal. Scope 3 emissions are associated with the extraction, processing, transportation and distribution of fuels and electricity, as well as all other emissions that are produced outside of the site that Midal has no operational control.

The estimated Scope 1, 2 and 3 emissions associated with the operation of the project are listed in Table 17-1. Details of the assumptions for modelling, and results, are provided in Appendix K.

Table 17-1 Summary of Scope 1, 2 and 3 emissions for the project

Scope	Quantity (t CO ₂ -e/yr)
1	25,000
2	27,000
3	975,000
Total	1,027,000

Table 17-1 indicates that the estimated annual Scope 1 and Scope 2 would be emissions approximately 52, 000 t CO₂-e per annum, while Scope 3 emissions associated with production of molten aluminium by TAC would be 975, 000 CO₂-e per annum.

The total annual greenhouse gas emissions for NSW reported in the DCCEE State and Territory Greenhouse Gas Inventories 2009 were 161 mega tonnes per annum (Mt/a). The estimated Scope 1 and Scope 2 emissions would contribute 0.03% of the total annual greenhouse gas emissions for NSW.

The embodied energy of molten aluminium was estimated to contribute approximately 93%, or 950,000 t CO₂-e per annum, of total Scope 1, 2 and 3 emissions. The project is not likely to increase emissions at the aluminium smelter as there would be no change in production output from the smelter as a consequence of the project. The emissions associated with the embodied energy of molten aluminium have not been assessed in terms of impacts induced by the project.

Energy consumption at the site was estimated to contribute 6% of total Scope 1, 2 and 3 emissions followed by product distribution (1%) and waste sent to landfill (<0.1%).

17.3.2 Climate change modelling assumptions

The projections chosen for this assessment are the medium and high emissions scenarios (A1B and A1F1 : IPCC AR4 reports), which also rely on the assumptions of a homogenous world with an economic focus (which does not allow for major wars, trade embargos, or a shift in the environmental focus). For the upper limits of each model have been used to ensure a conservative approach is produced by considering higher impacts, and therefore risk.

Table 17-2 Climate change projections for the Sydney Metropolitan region

Climate Change Variable	Present Climate	2030	2070
		A1B(M)	A1F1(H)
Temperature change (°C)	Average maximum 25.6	+ 1.3	+4.3
Extreme heat – projected number of days above 35°C	3.5 days	5.1 days	12 days
Rainfall change – annual (%)	96 mm/yr	+3% (-16% Spring, + 9% Summer)	+10% (-50% Spring, +35% Summer)
Windspeed (%)	N/A	+4%	+12%
Relative humidity (%)	63%	0.4%	+1.3%
Solar radiation	N/A	+1.9%	+6.0%
Evaporation increase (%)	N/A	+5%	+15%
Very high or greater bushfire risk days per annum	10.3 days	12.8 days	17.8 days
Sea level rise	0 (datum)	0.4 m (2050)	0.9 m (2100)

17.3.3 Climate change results

The potential impacts of climate change on the project were assessed in terms of asset vulnerabilities. Asset vulnerabilities were assessed using desktop sources only and the 'identifying adaption options report' by UKCIP (2007) to provide general adaption options.

Temperature

There are no known issues as a result of average temperature rise. An increase in the number of extreme heat days may affect temperature sensitive equipment such as heat exchangers, electrical transformers, material maximum temperatures, staff comfort, standard staff processes and safety. An increase in extreme heat days may also accelerate the wear of materials through expansion and contraction.

Rainfall

Due to Tomago's predominantly sandy soils, there is a low likelihood of any impact from standing surface water or from soil saturation as a result of increased rainfall. Compared to other industries, a reduction in rainfall would have little direct impact on the project as it has a relatively small water demand.

Windspeed

Increased windspeed may impact on tall or unprotected elements of the project, such as vent stacks.

Hail risk

Impacts from increased frequency, intensity and size of hail would probably not impact the project as the site is not heavily glazed.

Bushfire

Increased bushfire risk is a potential impact on the project due to its proximity to bushland.

Evaporation and humidity

Increases in evaporation and changes in humidity are expected to have a negligible impact on the project.

Sea level rise

The site's proximity to a significant water body (Hunter River), and the relatively flat topography of the locality, exposes the project to potential damage from increased river flow, depth and widening as a result of sea level rise. The impacts of increased river flow, depth and widening would be reduced by the high permeability of the soils in the area and the length of the river would attenuate the effects as the most serious impacts would occur closer to the river mouth.

17.4 Mitigation measures

17.4.1 Greenhouse gas mitigation measures

The majority of emissions are Scope 3 emissions associated with the production of molten aluminium. Molten aluminium accounts for approximately 93% of all emissions associated with the project. As these emissions are beyond the control of Midal, mitigation measures would focus on reducing emissions from natural gas and electricity consumption which contribute approximately 6% of the total Scope 1, 2 and 3 emissions. Mitigation measures to be implemented include:

- ▀ Investigate opportunities to recover waste heat from furnaces.
- ▀ Investigate potential renewable energy opportunities for electrical equipment and lighting.
- ▀ Undertake a detailed energy study to investigate potential methods to achieve compliance with the Australian Government's Energy Efficiency Opportunities program.
- ▀ Plant and equipment to be used in the project would be new and supplied by various specialist equipment manufacturers. The equipment would use energy supplied by either gas or electricity and would employ leading industry standard technologies and controls to achieve energy efficiency. Gas

equipment particularly allows for a high level of control of output with optimal performance ensuring good combustion and reducing fuel consumption.

17.4.2 Climate change mitigation measures

To reduce the likely impacts of climate change on the project, the following mitigation measures may be considered during development of the design:

- ▶ Utilise material types that are resistant to increased temperature exposure.
- ▶ Assess options to improve site drainage.
- ▶ Utilise an onsite or offsite backup water supply in the event of decreasing rainfall.
- ▶ To minimise the likelihood of structural failure due to increased load from hail, avoid locating box gutters above critical areas.
- ▶ Maintain asset protection zones to minimise potential fire damage.
- ▶ Assess the vertical and horizontal distance to the river to determine potential inundation and locate vulnerable equipment accordingly.

18. Heritage

The information presented in this chapter is based on the findings of archaeological investigations conducted by Insite Heritage and the full report is included in Appendix L.

18.1 Indigenous heritage

18.1.1 Assessment methodology

The heritage assessment was prepared in accordance with the requirements of the relevant statutory authorities and included:

- ▶ Consultation with the local Aboriginal community, in accordance with the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005b).
- ▶ Search of the DECCW Aboriginal Heritage Information Management System (AHIMS) database, to determine the location and nature of any Aboriginal heritage sites recorded within, or in the vicinity of the site.
- ▶ Review of relevant previous archaeological reports specific to the site, to determine the extent of past archaeological research in the region.
- ▶ Review of relevant contextual environmental information and previous land use history.
- ▶ Site survey to identify and assess potential impacts on any archaeological material.

18.1.2 Existing environment

The site is located on the Pleistocene beach ridges and sandsheets of the Tomago Coastal Plain. The ridges and sandsheets comprise marine and Aeolian quartz sands. Exogenic processes have dominated the local landscape resulting in irregular low sandy rises and broad deflation basins and swales.

Evidence of recent Indigenous occupation has been identified at the nearby wetland margins of Fullerton Cove and the inner meander of the Hunter River at Tomago. The environmental context of the area may be described as low sand dune fronting onto margin wetlands, on to mangroves and salt marsh.

AHIMS search

The AHIMS search found that there were nine sites within 20 square kilometres of the site. These included a scarred tree, seven open camp sites and one area of archaeological potential. Although no identified sites or items of Indigenous significance have been identified on the site, the site may contain smaller artefact scatters associated with transient occupation. A copy of the results of the search is provided in Appendix L.

Previous investigations

Although there are no known previous archaeological investigations undertaken at the site, there are two archaeological studies of particular relevance to the study area. The first was an investigation undertaken by Indigenous Outcomes on a site approximately four kilometres east of the site. The investigations

identified eight separate artefact scatters within the 114 hectare site. Most of these sites were located on low sandy ridges addressing Fullerton Cove.

The second relevant study was undertaken at the Sandvik site, south-west of the site. Investigations revealed an area of high potential archaeological deposition in the northern portion of the site. An area of moderate potential was identified in the western part of the property. Testing of these areas is yet to occur and was postponed until after the approval is obtained for development under Part 3A of the *Environmental Protection and Assessment Act 1979*. Subsequently, a construction heritage management plan has been created which authorises earthworks to be monitored by Aboriginal stakeholders.

Field survey

The field survey was carried out on foot in a series of transects covering the site. Lots 5 and 6 were highly disturbed from previous industrial land use. No artefacts were identified during the survey.

18.1.3 Impact assessment

Given that no artefacts were found in the available assessable area, it is reasonable to assume that the relatively small area of low visibility subject to assessment is unlikely to contain an extensive and complex archaeological site. The impact of development on Lots 5 and 6 would be relatively low with excavation required for the building footings and services only – the roads, hardstand areas and car parks are likely to be raised with fill. The haul road would be cleared prior to construction and this would provide an opportunity to determine the presence or complete absence of surface artefacts and any other cultural material.

Based on the available information, the potential significance of finds that may be made during monitoring of the work is likely to be low to moderate. It is assumed that the small area of low visibility in the northern portion of the site is unlikely to contain any extensive and complex archaeological site.

Project notifications and invitations to register as stakeholders were sent to all those on the list supplied by DECCW. These were:

- Mrs Viola Brown.
- Nu-Run-Gee Pty Ltd.
- Mur-Roo-Ma Inc.
- Worimi Aboriginal Traditional Elders and Owners Group Inc.
- Mrs Carol Ridgeway-Bisset of Maaiangal Aboriginal Heritage.

Responses were received from Nu-Run-Gee, Mur-Roo-Ma. Cacatua Cultural Consultants also registered as a result of the advertisement. No issues were raised relating to the project and the community's comments are included in Appendix L.

The assessment concludes that there is no evidence to suggest that the site is constrained by items or sites of archaeological significance.

18.1.4 Mitigation measures

The following general mitigation measures would be implemented:

- ▶ An Aboriginal Cultural Heritage Awareness Program would be prepared and all personnel and contractors involved in the construction activities within the site would be inducted into the program. Records would be kept of which staff/contractors have been inducted, and when, for the duration of the project. This program would be developed in collaboration with registered Aboriginal parties.
- ▶ Initial ground disturbance works associated with development of the haul road would be monitored by representatives from the registered Aboriginal parties and an archaeologist would be on call to inspect the site, if required.
- ▶ A work method statement would be prepared prior to monitoring that details a methodology that allows work to continue in the case of low significance finds. The method statement would nominate a suitable location to store such finds.
- ▶ If any Aboriginal cultural objects of unknown significance are uncovered during construction, all works would cease in the immediate vicinity of the find to prevent further impacts to objects. A suitably qualified archaeologist and members of the registered Aboriginal parties would be contacted to determine the significance of the find. Any new sites must be registered in the AHIMS and details of the proposed management of these sites must be provided in the information submitted to AHIMS.
- ▶ If human remains were located during construction, all works would cease in the vicinity of the site and the NSW Police, the Aboriginal community and OEH notified.
- ▶ If any Aboriginal objects are uncovered during the project, custodial arrangements would be developed that comply with the provisions of Sections 85A and 89A of the *National Parks and Wildlife Act 1974*. Records would be kept of the support, or otherwise, from all registered Aboriginal stakeholders, of any decisions regarding final custodial arrangements.

18.2 Non-Indigenous heritage

18.2.1 Existing environment

A search was undertaken for any items listed on national, state or local heritage registers and inventories. The following listed items were identified:

- ▶ Tomago House and Tomago Chapel are located along Tomago Road approximately 500 m south of the site. These items are listed on the NSW State Heritage Register under the NSW Heritage Act 1977 and in the Port Stephens LEP 2000.
- ▶ Chichester Dam Model is located approximately 3 km to the north east of the site on the northern side of Tomago Road. This item is listed on the NSW State Heritage Register.

The assessment did not identify any items or places of historic heritage value within the site.

18.2.2 Impact assessment

It is considered unlikely that the project would impact on the listed items given the distance between the identified items and the site.

18.2.3 Mitigation measures

As no impacts are anticipated, no specific mitigation measures are proposed.

19. Visual amenity

19.1 Existing environment

The project is located within an existing industrial development adjacent to the Tomago Aluminium Smelter. The nearest sensitive receiver would be a residence on Tomago Road, approximately 230 m south east of the site. This residence is screened from the site by a substantial vegetated buffer and does not have direct views of the site.

19.2 Impact assessment

The project comprises a number of buildings, two of which would be approximately 8m high with vent stacks extending to approximately 13m above ground level. While these buildings are large they are consistent with the existing scale of industrial buildings immediately adjacent to the west and other buildings and development within the surrounding industrial area.

The buildings would be screened from view at the nearest sensitive receiver by the intervening development and vegetation to the south and would only be seen upon approach along the private road. When travelling along the private road, views would predominantly be of the southernmost building. The buildings would not form a dominant part of any view-sheds from sensitive receivers.

Light-spill impacts are expected to be negligible due to the distance and screening of residences from the site. The project would also be located within an established industrial precinct, adjacent to the TAC smelter which operates 24 hours a day.

19.3 Mitigation measures

No mitigation measures are proposed as the project would have a negligible impact on visual amenity within the locality.

20. Environmental management

This chapter outlines the requirements for environmental management plans that would be implemented during the construction and operational phases of the project to ensure that environmental impacts are appropriately managed. A summary of the environmental monitoring requirements and lists of the approvals and licenses required are also provided.

20.1 Environmental management plans

20.1.1 General structure and contents

Midal would prepare two environmental management plans (EMPs) for the project, one covering the construction phase and one covering the operational phase. Each would include:

- ▶ Environmental goals and objectives.
- ▶ Commonwealth and State statutory requirements including licenses and approvals.
- ▶ Environmental management procedures including:
 - Safeguards to be implemented.
 - List of actions, timing and responsibilities.
 - Reporting requirements.
 - Specifications incorporating environmental safeguards.
 - Training of personnel (both proponent and contractors) in environmental awareness.
 - Environmental accident and incident reporting requirements.
 - Process surveillance and auditing procedures.
 - Environmental complaint handling procedures.
 - Site management and control procedures.
- ▶ Monitoring requirements including a monitoring plan which details location, duration and frequency of monitoring and procedures and conditions to be followed.
- ▶ Emergency response including an emergency response plan incorporating procedures for fire, pollution incidents and accidents. The plan would detail procedures to be followed, responsibilities, equipment and contact details for responsible site staff and emergency authorities.
- ▶ Review and auditing procedures.

The construction and operational EMPs would ensure that all compliance obligations arising from the Minister's Conditions of Approval are addressed.

20.1.2 Construction environmental management plan

A CEMP would be prepared by Midal (or nominated contractor) and would include, but not be limited to, measures from the following management sub-plans:

- ▶ Air quality plan, including:

- Dust suppression measures.
- Stockpile covering.
- Covering of loads during transportation.
- Measures in Section 8.5
- ▶ Waste management plan, including:
 - Wastes generated by the proposal would be classified in accordance with the NSW DECCW Waste Classification Guidelines (2009).
 - Waste management to be in accordance with the principles embodied in the *Waste Avoidance and Resource Recovery Act 2001*.
 - Measures in Section 13.3
- ▶ Hazards and risks plan, including:
 - Safe work practices.
 - Emergency contact numbers.
 - Site first aid contact.
 - Incident reporting procedures.
 - Measures identified in Section 16.5.3
- ▶ Biodiversity management plan, including:
 - Measures identified in Section 11.5.
- ▶ Bushfire plan, including:
 - Measures identified in Section 15.4.
- ▶ Water and soil management plan, including:
 - Measures identified in Sections 9.3 and 12.3.
- ▶ Noise plan, including:
 - Measures identified in Section 10.5.
- ▶ Traffic plan, including:
 - Measures identified in Section 14.4.

Environmental monitoring likely to be required as part of the CEMP is outlined in Table 20-1.

Table 20-1 Monitoring requirements during construction

Issue	Monitoring
Noise	Measure noise levels at the boundary prior to construction, at commencement of construction and monthly during construction.
Biodiversity	Monitor the extent of clearing to ensure it is confined to areas in the environmental assessment.
Waste	Inspect waste receptacles to ensure they are not overfilled and are being collected regularly.
	Monitor waste recycling and disposal procedures to ensure they are being complied with.
Groundwater	Conduct monitoring in accordance with a groundwater monitoring plan as detailed in Section 9.4.7.
Erosion and sediment control	Prior to commencement of each stage of construction, inspect site to ensure that sediment and erosion control devices are in place.
	Inspect sediment control devices to ensure they are installed and operating correctly. Inspect devices particularly during wet weather events to monitor water flows and drainage lines and install new devices as required.
Traffic	Inspect trucks to ensure they are not overloaded, adhere to speed limits, cover their loads, correctly licensed and undertake regular inspections and safety checks.
	Inspect signs and hazards markers to ensure they are used appropriately, are in place and clearly visible.

20.1.3 Operation environmental management plan

An operational environmental management plan (OEMP) would be prepared by Midal and implemented in consultation with relevant agencies, including the Department of Planning and Infrastructure and the Office of Environment and Heritage. The OEMP would include, but not limited to, the same issues for which the management sub-plans would be prepared for the CEMP (Section 20.2.2).

The OEMP would also include a long-term environmental monitoring program. Table 20-2 outlines environmental monitoring that is likely to be required under the OEMP.

Table 20-2 Monitoring requirements during operation

Issue	Monitoring
Air	Monitoring stack emissions
Water	Monitor water in sedimentation dams and receiving waterways on a quarterly basis.
Groundwater	Conduct monitoring in accordance with a groundwater monitoring plan as detailed in Section 9.3.3.
Noise	Conduct noise monitoring at plant during plant commissioning stage and normal operation.
Traffic	Ensure vehicles are adhering to speed limits, weight limits and using defined access roads.

20.2 Proposed environmental reporting

Environmental reporting to DP&I would be carried out as required by the Minister's Conditions of Approval. In addition, reporting to OEH would be carried out in accordance with the requirements of the project's environmental protection licence.

21. Draft Statement of Commitments

Table 21-1 outlines the Draft Statement of Commitments for that would be implemented to mitigate, manage and monitor impacts during construction and operation of the project. The commitments refer to mitigation measures that for specific issues that are outlined in Chapters 8 to 18, and would be addressed in the CEMP and OEMP that are outlined in Chapter 20.

Table 21-1 Statement of Commitments

Issue	Commitments
General management plans	Prepare and implement a CEMP as outlined in Section 20.1.2.
	Prepare and implement an OEMP as outlined in Section 20.1.3.
Air quality	Measures to reduce the potential for air quality impacts would be incorporated into the design of the facility as described in Section 8.5. The specifications provided to prospective equipment suppliers would dictate the technical and environmental performance the equipment would be expected to meet, based on Midal's operational requirements and the conditions of approval for the project. A dust management plan would be prepared as part of the CEMP detailing measures for the control of dust generation.
Site water and groundwater	A Spoil and Fill Management Plan would be incorporated into the CEMP and would include the control measures outlined in Sections 9.3. Although no adverse impacts are expected on groundwater, a Groundwater Monitoring Plan would be prepared prior to construction.
Noise	The project would be designed and operated to ensure that noise criteria are not exceeded. A construction noise management plan would be prepared as part of the CEMP to detail how construction noise impacts would be minimised, including the measures identified in Section 10.5.

Issue	Commitments
Biodiversity	Measures to minimise the impacts of construction on flora and fauna, including those outlined in Section 11.5, would be included in the CEMP. Retire a sufficient quantity of ecosystem credits generated within an approved BioBank as a biodiversity offset for the 0.68 ha of Smooth-barked Apple Red Bloodwood shrubby open forest removed by the project. The biodiversity offset would be consistent with the Interim Offsetting Guidelines for Part 3A Project and would be delivered via the BioBanking Offsets Scheme. Conduct a pre-construction survey for <i>Diuris praecox</i> and <i>Diuris arenaria</i> within the August period specifically for the area adjoining the powerline easement at the western edge of the site. This survey is to determine if these species are present within the impact area. Biodiversity offsetting requirements and/or translocation would apply should these species be impacted by the haul road. If additional threatened species are identified on the site, the Biodiversity Offset Strategy would be revised to ensure potential impacts are adequately offset. Integrate biodiversity mitigation actions involving fauna clearance, House Mouse control, weed management, nest box installation and an ecological burn into the CEMP to minimise the direct and indirect impacts of the project on adjoining biodiversity values. Revegetate the margins of the haul road with <i>Lomandra longifolia</i> to act as a water and nutrient trap thereby minimising indirect impacts on adjoining vegetation through the operational period of the haul road. A fauna clearance program would be conducted during construction of the proposed haul road. Habitat enhancement would be incorporated into the OEMP, including ecological burn, House Mouse control and bush regeneration programs. A groundwater monitoring program, including a trigger response plan, would be undertaken to monitor the impacts of the project on groundwater dependent ecosystems.
Soil and contamination	Measures to minimise soil erosion and contamination, including those outlined in Section 12.3, would be included in the CEMP and OEMP documentation
Waste	Measures would be implemented where practicable to minimise, reuse and/or recycle any excavated and scrap material from construction. A Waste Management Plan would be prepared incorporating the measures of control identified in Section 13.3.

Issue	Commitments
Traffic and transport	To minimise impacts during construction on existing road users, truck movements would be confined to the off-peak periods. A construction traffic management plan would be prepared incorporating the measures of control identified in Section 14.4.
Bushfire	To minimise potential bushfire risk, asset protection zones would be established as outlined in Section 15.3.1. Preparation of a site management plan during construction and operation of the project would also be undertaken to assist in reducing bushfire risk.
Hazards analysis	The risk management and mitigation procedures outlined in Section 16.5.3 would be implemented during operation of the project. Emergency management procedures would be developed to respond to potential fire and explosion scenarios.
Greenhouse gas and climate change	Potential energy efficiency measures including recovering waste heat and utilising renewable energy (as detailed in Section 17.4.1) and avoidance of natural hazards from climate change (as detailed in Section 17.4.2) would be considered in the detailed design phase of the project.

Issue	Commitments
Heritage	An Aboriginal Cultural Heritage Awareness Program would be prepared and all personnel and contractors involved in the construction activities within the site would be inducted into the program. Records would be kept of which staff/contractors have been inducted, and when, for the duration of the project. This program would be developed in collaboration with registered Aboriginal parties. Initial ground disturbance works associated with development of the haul road would be monitored by representatives from the registered Aboriginal parties and an archaeologist would be on call to inspect the site, if required. A work method statement would be prepared prior to monitoring that details a methodology that allows work to continue in the case of low significance finds. The method statement would nominate a suitable location to store such finds. If any Aboriginal cultural objects of unknown significance are uncovered during construction, all works would cease in the immediate vicinity of the find to prevent further impacts to objects. A suitably qualified archaeologist and members of the registered Aboriginal parties would be contacted to determine the significance of the find. Any new sites must be registered in the AHIMS and details of the proposed management of these sites must be provided in the information submitted to AHIMS. If human remains were located during construction, all works would cease in the vicinity of the site and the NSW Police, the Aboriginal community and OEH notified. If any Aboriginal objects are uncovered during the project, custodial arrangements would be developed that comply with the provisions of Sections 85A and 89A of the National Parks and Wildlife Act 1974. Records would be kept of the support, or otherwise, from all registered Aboriginal stakeholders, of any decisions regarding final custodial arrangements.

22. Justification and conclusions

The project is justified because it:

- ▶ Would be consistent with the objectives of the EP&A Act.
- ▶ Would be consistent with the strategic directions of the Port Stephens Local Environmental Plan and Economic Development Plan.
- ▶ Would take advantage of an opportunity to add value to the existing production at TAC's smelter by producing aluminium products that are not currently produced in Australia. This would reduce the proportion of aluminium products imported to Australia.

22.1 Consistency with the provisions of the EP&A Act

22.1.1 Objects of the EP&A Act

The objects of the EP&A Act relevant to the project are:

(a) *to encourage:*

- (i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- (ii) the promotion and co-ordination of the orderly and economic use and development of land,*
- (iii) the protection, provision and co-ordination of communication and utility services,*
- (iv) the provision of land for public purposes,*
- (v) the provision and co-ordination of community services and facilities, and*
- (vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and*
- (vii) ecologically sustainable development, and*
- (viii) the provision and maintenance of affordable housing, and*

The project is consistent with the objects of the EP&A Act as it would promote the orderly and economic use of land by locating an industrial facility within an industrial area. The project would complement operation of TAC's smelter and does not compromise the function of the buffer zone established around the smelter. The assessments undertaken for this Environmental Assessment indicate that, where practicable, the project has been designed to appropriately manage impacts on environmental resources and a range of measures would be implemented during the construction and operational phases to protect the environment.

22.1.2 The principles of ecologically sustainable development

Clause 6 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* lists the principles of ecologically sustainable development as:

- (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.

An assessment of the project against these principles is provided below.

Precautionary principle

A range of environmental studies, as described in Chapters 8 – 19 of this Environmental Assessment, have been undertaken as part of development of the project and the environmental assessment process, to ensure that the potential impacts are understood with a high degree of certainty. The assessment of the potential impacts of the project is considered consistent with the precautionary principle. It is considered that the assessments that have been undertaken are consistent with accepted scientific and assessment methodologies, and have taken into account relevant statutory and agency requirements.

Principle of intergenerational equity

Construction and operation of the project has the potential to lead to some environmental impacts. This includes some temporary disturbance during construction activities. However, the potential for environmental disturbance as a result of construction has to be balanced against the long term benefits the project to both the regional and the country.

The project would value add to the existing aluminium produced from the adjacent Tomago Aluminium Smelter by utilising approximately 10% of the smelters production to manufacture aluminium rods and electrical conductors. Currently all conductors are imported into Australia. The project would reduce the need to import conductors to Australia.

The project would create local employment in a manufacturing industry that complements TAC which is a large employer. This would develop specialist skills within the local workforce and contribute to the economic growth of the local area.

Conservation of biological diversity and ecological integrity

The project requires a short dedicated haul road from the Tomago Aluminium Smelter and this haul road has been located to minimise potential direct and indirect impacts on the biodiversity of the locality, especially in relation to threatened species.

The ecological assessment prepared for the Environmental Assessment concluded that significant impacts on the biodiversity of the area unlikely. The site has been substantially modified as part of previous industrial land use and the ecology assessment found that:

- ▶ In terms of the NSW Part 3A Assessment - the project would maintain or improve biodiversity values given the avoidance of sensitive habitats where possible and the proposed mitigation of potential impacts on sensitive habitats and species.
- ▶ In terms of potential impacts on EPBC Act matters of national environmental significance - although a direct impact on species listed by the EPBC Act would occur (the New Holland Mouse), the assessment concluded that significant impacts on these species would be unlikely.

Therefore it is considered that the project would conserve biological diversity and ecological integrity.

Improved valuation and pricing of environmental resources

The Environmental Assessment has assessed the environmental and other consequences of the project and identified mitigation measures where appropriate to manage adverse impacts. Construction and operation of the project would be in accordance with relevant legislation and the construction and operation environmental management plans. Requirements imposed by implementing these measures would result in an economic cost to Midal. Implementing the mitigation measures would increase both the capital and operational costs of the project. This signifies that environmental resources have been given appropriate valuation.

The project design has been developed with the objective of minimising potential impacts on the surrounding environment. This indicates that the design for the project has been developed with an environmental objective in mind.

The economic costs of the project, including environmental works and management, would be reflected in the pricing of the finished manufactured products.

22.2 Consistency with the PSLEP and Economic Development Plan

The project is consistent with the objectives and requirements of Zone '4(a) Industrial – General' in the Port Stephens LEP 2000. The project would also deliver outcomes consistent with the Port Stephens Economic Development Strategy. The project aligns with the identified opportunity for Tomago to accommodate expanding manufacturing industries.

The project supports the overall strategy of Port Stephens Council to expand industrial operations to provide employment for an increasing population.

22.3 Conclusion

Midal propose to undertake the project to take advantage of an opportunity to add value to existing production at the Tomago Aluminium Smelter by sourcing molten aluminium to manufacture aluminium rods and conductors. This would reduce the volume of aluminium rods and conductors imported to Australia.

This Environmental Assessment has considered the potential impacts of the project. It has been prepared in accordance with the provisions of Part 3A of the EP&A Act and the requirements of the Director-General of the NSW Department of Planning and Infrastructure. The Environmental Assessment documents the potential environmental impacts associated with the project, considering both potential positive and negative impacts, and outlines management and mitigation measures to protect the environment where required.

Key environmental issues have been progressively evaluated and assessed when developing the design and preparing the Environmental Assessment. This has involved consultation with government agencies and stakeholders that would have a role in licencing or granting approvals for the project. The outcomes of consultation have also informed development of the Statement of Commitments that would be implemented to manage potential adverse impacts and enhance benefits during the construction and operational phases. The Statement of Commitments would reduce the duration, extent and severity of potential impacts.

The main impacts associated with the project would relate to:

- Air emissions – these are predicted to comply with relevant criteria
- Noise emissions – these are predicted to comply with relevant construction and operational criteria
- Water management - An integrated water management strategy would be implemented that would minimise potential surface and groundwater impacts, as well as impacts on GDEs
- Biodiversity - Impacts on biodiversity have been minimised by selecting a site that has been heavily modified by previous industrial land use. The project has been designed to minimise the potential for impacts on species and communities of conservation significance and this involved realigning the haul road. Residual impacts associated with clearing 0.68 of Smooth Barked Apple Red Bloodwood shrubby forest would be offset by preparing a Biodiversity Offset Package that would focus on purchasing BioBanking credits. Traffic and transport – traffic attributed to the project would represent a small increase in existing and predicted traffic movements and would have negligible effect on the operation of the road network.
- Waste – waste would be managed in accordance with the DECC Waste Classification Guidelines.
- Hazards – hazards and risks associated with bushfire and the industrial land use are able to be appropriately managed by implementing design elements.

While the project has the potential to result in some residual adverse impacts, these would be adequately managed by implementing the Statement of Commitments. On balance, the benefits of the project substantially outweigh adverse impacts. It is concluded that the environmental impacts associated with the project can be appropriately managed by implementing the draft Statement of Commitments.

23. References

Acid Sulfate Soil Management Advisory Committee, 1998; *Acid Sulphate Soil Manual*

Australian and New Zealand Environment and Conservation Council and National Health and Medical Research Council 1992, *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, ANZECC/NHMRC.

Australian and New Zealand Environment and Conservation Council and National Health and Medical Research Council 2004, *Australian Drinking Water Guidelines*, ANZECC/NHMRC.

Bell S and Driscoll C 2006, Vegetation of the Tomago and Tomaree Sandbeds, Port Stephens, New South Wales: Management of Groundwater Dependent Ecosystems – Part 2 Groundwater Dependency, prepared for Hunter Water Corporation, Kotara Fair, NSW.

Bushfire Coordinating Committee 2007, *BFCC Policy No. 1/2003 – Fire Trails*, adopted by the NSW Bushfire Coordinating Committee – Minute No. 26/2007.

Coffey 2011, *Groundwater Assessment for the Newcastle Gas Storage Facility Project*, report prepared for AGL Pty Ltd by Coffey Natural Systems, Rhodes, NSW.

Department of Environment and Climate Change 2007, *Quarterly Air Quality Monitoring Report*, DECC, Sydney.

Department of Environment, Climate Change and Water 2010; *Noise Guidelines for Local Government*

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

Department of Environment and Conservation 2005, Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, DEC, Sydney.

Department of Environment and Conservation 2005b, Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (draft), DEC, Sydney.

Department of Environment and Conservation and Department of Primary Industries (2005). *Draft Guidelines for Threatened Species* under Part 3A of the *Environmental Planning and Assessment Act 1979*. Department of Environment and Conservation, Hurstville, NSW.

Department of Environment and Conservation 2006, *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme*, DEC, Sydney.

Department of Climate Change and Energy Efficiency 2010, *Australian National Greenhouse Accounts (NGA) Factors*, DCCEE, Canberra.

Department of Climate Change and Energy Efficiency 2010b, National Greenhouse and Energy Reporting (Measurement) Technical Guidelines 2010, DCCEE, Canberra.

Department of Environment, Climate Change and Water 1999, *Environmental Criteria for Road and Traffic Noise*, DECCW, Sydney.

Department of Environment, Climate Change and Water 2000, *Industrial Noise Policy*, DECCW, Sydney DECCW (2008).

http://www.environment.nsw.gov.au/resources/nature/BioMetric_Vegetation_Type_CMA.xls

Department of Environment, Climate Change and Water 2009, *Interim Construction Noise Guideline*, DECCW, Sydney.

Department of Environment and Heritage (DEH) (2006) EPBC Act Policy Statement 1.1.

Significant Impact Guidelines: Matters of National Environmental Significance. Department of the Environment and Heritage, May 2006.

Department of Land and Water Conservation 2002, *The NSW State Groundwater Dependent Ecosystems Policy*, A Component Policy of the NSW State Groundwater Policy Framework Document, DLWC, Sydney.

Department of Planning 1997, Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis, DOP, Sydney.

Department of Planning 2002, Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning, DOP, Sydney.

Department of Planning 2006, *Lower Hunter Regional Strategy*, DOP, Sydney.

Department of Planning 2008, *Applying SEPP 33* (Consultation draft), DOP, Sydney.

Department of Planning 2011, *Multi-Level Risk Assessment Guidelines*, DOP, Sydney.

Eamus, D. 2009, Identifying groundwater dependent ecosystems: a guide for land and water managers, prepared for Land and Water Australia.

Fox B and Fox M 1978, Recolonization of coastal heath by *Pseudomys novaehollandiae* (Muridae) following sand mining, Australian Journal of Ecology, Vol. 3, pp. 447 – 465.

Fox B and Haering R (1997) Habitat use by sympatric populations of *Pseudomys novaehollandiae* and *Mus domesticus* in coastal heathland. Australian Journal of Ecology Volume 22, Issue 1, pages 69–80, March 1997.

GHD 2010, Report for Tuncurry Sand Quarry Licenses: Groundwater Dependent Ecosystems Assessment, unpublished report prepared for Holcim Pty Ltd, Newcastle, NSW.

GHD 2011, Phase 1 Contamination Site Assessment – School Drive, Tomago, unpublished report, Newcastle, NSW.

Keith K and Calaby J (1969) The New Holland mouse, *Pseudomys novaehollandiae*. (Waterhouse), in the Port Stephens district, New South Wales. CSIRO Wildlife Research 13 (1) 45 – 48.

Lower Hunter Bushfire Management Committee 2009, *Bushfire Risk Management Plan*, prepared for the submission to the BFCC

Menkhorst P and Knight F (2001). A Field Guide to the Mammals of Australia. Oxford Press, Melbourne Australia.

Menkhorst P and Knight F (2008). A Field Guide to the Mammals of Australia. Oxford Press, Melbourne Australia.

National Road Transport Commission 1998, Australian Code for the Transport of Dangerous Goods by Road and Rail, Canberra

National Pollutant Inventory Emission estimation technique manual for Combustion in Boilers, Version 3.3 September 2010.

Newcastle City Council 2009, Newcastle State of the Environment Report, NSW.

NSW Environmental Protection Authority 1997, *Guidelines for Consultants Reporting on Contaminated Sites*, EPA, Sydney.

NSW Office of Environment and Heritage (OEH) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, August 2005 (Approved Methods).

NSW Rural Fire Service 2006, Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities and Developers, NSW RFS.

NSW Rural Fire Service 2010, *Addendum: Appendix 3* of the Planning for Bushfire Protection.

Port Stephens Council 2007, Port Stephens Economic Development Strategy Report, PSC, NSW.

Roads and Traffic Authority 2002, *Guidelines to Traffic Generating Developments*, RTA, Sydney.

Thackway R, Cresswell ID (1995) An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserve System Cooperative Program. (Version 4.0 Australian Nature Conservation Agency: Canberra).

Tomago Aluminium Company Annual Environment Report 2009.

Tomago Aluminium (2010) *Small Mammal Trapping Report – 2010*. Unpublished report prepared by Tomago Aluminium, Tomago.

World Business Council for Sustainable Development 2004, *The Greenhouse Gas Protocol*, A Corporate Accounting and Reporting Standard.

24. Glossary of terms

Term	Definition
Cumulative impact	A significant impact created by accumulation or successive additions of individual impacts, which may not in themselves be significant.
Degassed	The removal of excess or unwanted gas.
Drossed	The removal of foreign matter from molten metal.
Ecologically sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Effluent	Liquid industrial waste or wastewater, which may or may not have been passed through a type of purification process.
Emission	The release of material into the atmosphere (e.g gas, noise).
Environmental management plan	A document setting out the management, control and monitoring measures to be implemented during construction (a construction environmental plan) and/or operation (operational environmental management plan) of a development, to avoid or minimise the potential environmental impacts identified during an environmental assessment process.
Flora and fauna	Plants and animals.
Greenhouse gases	Gases that accumulate within the earth's atmosphere (primarily water vapour, carbon dioxide and methane) and contribute to global climatic change/global warming (the 'greenhouse effect').
Greenhouse gases (Scope 1, 2 and 3)	Scope 1: Direct greenhouse gas emissions from sources falling within the operational boundary of the assessment, from sources that are owned and/or operated by the organisation in question. Scope 1 emissions include direct carbon dioxide emissions from the combustion of stationary or transportation fuels (natural gas, coal, petrol and diesel) in boilers, furnaces, vehicles etc, and fugitive emissions of greenhouse gases from chemical processes, such as wastewater treatment and some product manufacturing. Scope 2: Indirect greenhouse gas emissions associated with

Term	Definition
	purchased electricity, heat or steam. These emissions physically occur at the facility where the electricity, heat or steam is generated. Scope 3: All other indirect greenhouse gas emissions associated with the activities considered in the assessment. These emissions occur from sources not owned or controlled by the company. Scope 3 emissions include those associated with production of purchased materials, transport and contractor owned vehicles, waste disposal, product usage and the extraction and processing of fuels.
Hydrology	The science dealing with water on the land or under the surface, its properties and distribution.
L _{aeq}	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
Particulate	Small particles, usually occurring in suspension.
pH	Measure of acidity (or alkalinity).
Project approval	An approval granted under Section 75J of the NSW <i>Environmental Planning and Assessment Act 1979</i> .
Rating background level	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Sewer	A conduit for carrying wastewater.
The project	Tomago Aluminium Rod and Conductor Manufacturing Facility.
The proponent	Midal Cables International Pty Ltd.
Threatened species	Species of animal or plants that are at risk of extinction (also known as 'endangered species') or becoming endangered within the next 25 years ('vulnerable species'), defined by the <i>Threatened Species Conservation Act 1995</i> .
Water balance	Modelling the use of water in a development.

25. List of abbreviations

Abbreviation	Name
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian and New Zealand Environment Conservation Council
APZ	Asset Protection Zone
ASL	Above Sea Level
BCA	Building Code of Australia
CBD	Central Business District
C&I	Commercial and Industrial
C&D	Construction and Demolition
CPRS	Carbon Pollution Reduction Scheme
CSIRO	Commonwealth Science and Industry Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
DECCW	NSW Department of Environment, Climate Change and Water (now OEH)
EC	Electrical Conductivity
SEWPAC	Department of Sustainability, Environment, Water, Population and Communities
DoL	Department of Lands
EMP	Environmental Management Plan
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
EPL	Environment Protection License
GHD	GHD Pty Ltd

Abbreviation	Name
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LOS	Level of Service
NEPC	National Environment Protection Council
NERDDC	National Energy Research, Development and Demonstration Council
NES	National Environmental Significance
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting
NHMRC	National Health and Medical Research Council
NSW	New South Wales
OEMP	Operational Environmental Management Plan
OEH	NSW Office of Environment and Heritage
PBP	Planning for Bushfire Protection
PHA	Preliminary Hazard Analysis
POEO Act	Protection of the Environment Operations Act 1997
PSC	Port Stephens Council
RBL	Rating Background Level
ROTAP	Rare or Threatened Australian Plants
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TSC Act	Threatened Species Conservation Act 1995
TSP	Total Suspended Particulates

Abbreviation	Name
VCR	Volume to Capacity Ratio
WHO	World Health Organisation
WMA	Water Management Act 2000
WSUD	Water Sensitive Urban Design

26. Units of measure

Type	Units	Description
Length	mm	Millimetres
	m	Metres
	km	Kilometres
	RL	Reduced level
Area	m ²	Square metres
	ha	Hectares
Volume	L	Litres
	kL	Kilolitres
	v/v	Volume for volume
	m ³	Cubic metres
Mass	µg	Micrograms
	mg	Milligrams
	G	Grams
	kg	Kilograms
	t	Tonnes
Noise	dB	Decibel – unit of sound measurement
	dB(A)	Unit used to measure 'A-weighted' sound pressure levels
	Hz	Hertz – unit used to measure frequency
	L _N	Noise exceedance level (N = percentage of sampling period)
Time	s	Seconds
	h	Hours
	yr	Years

Type	Units	Description
Odour	ou	Odour units
Carbon	CO ₂ -e	Carbon dioxide equivalents
Miscellaneous	%	Percentage
	\$	Australian dollars
	@	At
	°C	Degrees Celsius
	°	Degree (angle between slope and horizontal)
	pH	Measure of acidity or alkalinity

GHD

Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com.au

© GHD 2011

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Ron Pollock, Paul Burton	Pete Carson		Phillip Pigram		8/2/12