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Midal Cables International Pty Ltd

Report for Proposed Cables Manufacturing Facility

Greenhouse Gas and Climate Change Risk Assessment

July 2011

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Executive summary

This greenhouse gas and climate change risk assessment has been undertaken by GHD Pty Ltd on behalf of Midal Cables International Pty Ltd, as part of the Environmental Assessment, for the Development of the Cables Manufacturing Facility (the project). This report has been prepared to estimate the energy consumption and greenhouse gas emissions associated with the Cables Manufacturing Facility, to develop greenhouse gas mitigation measures to minimise impacts of the project and to identify potential climate change risks.

The energy and greenhouse gas assessment has been prepared with consideration of:

- The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard developed by the World Business Council for Sustainable Development and the World Resources Institute (GHG Protocol).
- The Commonwealth Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts (NGA) Factors, July 2010.
- DCCEE National Greenhouse and Energy Reporting System Measurement – Technical Guidelines for the estimation of greenhouse gas emissions by facilities in Australia, June 2010.

A greenhouse gas assessment was undertaken to estimate the operational emissions associated with on-site fuel consumption, electricity consumed at the project site, embodied emissions of materials, disposal of waste in landfill and distribution of product for the Cables Manufacturing Facility.

The assessment was restricted to the operational phase of the project as the construction related emissions for the Cables Manufacturing Facility are likely to be minor compared to the emissions over the life of the project.

Scope 1 and Scope 2 greenhouse gas emissions were estimated as 52,000 ± 3,000 t CO_2-e per annum during operation of the Cables Manufacturing Facility. This included 25,000 t CO_2-e Scope 1 emissions and 27,000 t CO_2-e Scope 2 emissions. Scope 3 emissions were estimated as 975,000 t CO_2-e per annum. The embodied emissions associated with the molten aluminium contributed 950,000 t CO_2-e per annum of Scope 3 emissions.

Energy consumption, based on on-site fuel use and electricity consumption was estimated as 590 TJ per annum.

The climate change risk assessment desktop assessment has been prepared using the following:

- Commonwealth Scientific and Industrial Research Organisation Climate Change in Australia Technical report 2007, which is based on the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007).
- ISO 31000-2009; Risk Management – Principles and Guidelines.
- Identifying adaptation options report by United Kingdom Climate Impacts Programme (2007).

From these materials the assessment was completed as a desktop assessment and only covered direct climate impacts.

The assessment highlighted that the site could be vulnerable to temperature, bushfire risk and sea level rise impacts. Climate impacts that the site demonstrated potential resilience against were rainfall variability, increases in windspeed, evaporation and humidity.

Glossary

Glossary of terms and abbreviations

AR4	Fourth assessment report for the Intergovernmental Panel on Climate Change
AS/NZS	Australian Standard/New Zealand Standard
CO_2-e	Carbon dioxide equivalent emissions (emissions of other greenhouse gases are multiplied by their Global Warming Potential so that their effects can be compared to emissions of carbon dioxide)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEE	Department of Climate Change and Energy Efficiency
EEO	Energy Efficiency Opportunities
EF	Emission factor
GHD	GHD Pty Ltd
GHG Protocol	The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard developed by the World Business Council for Sustainable Development and the World Resources Institute
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LPG	Liquefied Petroleum Gas
Midal	Midal Cables International Pty Limited
NGA	National Greenhouse Accounts
NSW	New South Wales
TAC	Tomago Aluminium Company
UKCIP	United Kingdom Climate Impacts Programme

1. Introduction

1.1 Overview

GHD Pty Ltd (GHD) was commissioned by Midal Cables International Pty Ltd (Midal) to conduct a greenhouse gas and climate change risk assessment of the proposed Cables Manufacturing Facility to be located at Tomago, New South Wales (NSW). This greenhouse gas and climate change desktop first pass risk assessment forms part of an Environmental Assessment for the project.

1.2 Scope and structure of report

A quantitative energy and greenhouse gas assessment was undertaken with consideration of the proposed operation of the Cables Manufacturing Facility.

The purpose of this greenhouse gas assessment was to:

- Quantify the energy consumption and greenhouse gas emissions associated with on-site fuel use, electricity, embodied energy of materials, waste disposal and product distribution from the operational phase of the Cables Manufacturing Facility.
- Identify potential greenhouse gas mitigation opportunities.

A first pass desktop climate change risk assessment was completed to assess the changes to the climate in the region in 2030, 2050 and 2070 from publicly available data. The objective of the assessment was to highlight generic vulnerabilities that should be considered in the development and construction process and provide some example control measures that could be used for the highlighted hazard type.

The purpose of the climate change risk assessment was to:

- Provide future climate projections for the region relevant to the project;
- Provide general asset vulnerabilities for the project and possible control measures that could be used to mitigate these effects; and
- Form the basis for a future formal risk assessment process (if required).

The methodology, results of the assessment and potential mitigation measures are outlined in the following sections.

2. Project description

The proposed project involves construction and operation of an aluminium rod and conductor manufacturing facility in Tomago, NSW. The site will be located on a 2.8 ha parcel of land adjacent to the existing Tomago Aluminium Company (TAC) Smelter.

The proposed facility will produce aluminium rods and conductors from molten aluminium sourced from the aluminium smelter, which will be delivered in crucible trucks. The primary production process will involve natural gas fired holding furnaces, tilting furnaces, casting machines, rolling mills, wire coilers, ovens and packaging units. Secondary processes include wire drawing, wire stranding, packing and cooling. The facility will process 50,000 tonnes of aluminium per year.

The following buildings and structures are proposed:

- Casting and Coil Storage Shed of approximately 35 m wide by 98 m long.
- Wire Drawing and Stranding Shed of approximately 46 m wide by 124 m long.
- Administration Building.
- Workshop and Stores Building.
- Compressor House.
- Electrical Substation/Motor Control Centre.
- In ground storage tanks.
- General earthworks will include building and infrastructure works, such as:
  - Site preparation and levelling;
  - Construction of access roads and infrastructure, including a haul road from Tomago Aluminium to the north of the Midal site;
  - Construction of site buildings; and
  - Construction of car parking areas.

3. Existing environment

3.1 Study area

The site of the proposed facility is on industrial land within the Tomago Industrial Area, approximately 6 km from the Port of Newcastle and immediately adjacent to the Tomago Smelter. This land comprises lots 5 and 6 in DP 270328 and has an area of approximately 2.8 ha.

The site has been subject to previous industrial usage as a manufacturing facility and parts of the site have been subject to sand mining activities. The existing building on the site, located in the southern half of the site, will be demolished as part of the construction activities.

Access to the south of the site is provided by a sealed road off School Drive and the existing gravel road leading up to the current building will be reformed and sealed as part of the proposal. The haul road will be constructed from the smelter and enter the site on its northern boundary. This haul road will be constructed on land owned by the TAC but maintained by Midal. The existing industrial buildings to the west are similar in size to those proposed on the Midal site.

The site is generally flat with a slight incline in the northern edge towards the northern boundary. Grass and occasional small trees and shrubs exist across the site with a majority of the trees located along the northern boundary.

The proposed site lies within the industrial buffer area surrounding the TAC smelter.

4. Methodology

4.1 Greenhouse gas assessment

The scope and methodology for conducting the assessment has been based on the general principles of:

- The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard developed by the World Business Council for Sustainable Development and the World Resources Institute (GHG Protocol).
- The Commonwealth Department of Climate Change and Energy Efficiency (DCCEE) National Greenhouse Accounts (NGA) Factors, July 2010.
- DCCEE National Greenhouse and Energy Reporting System Measurement – Technical Guidelines for the estimation of greenhouse gas emissions by facilities in Australia, June 2010.

These are considered to represent current good practice in Australian greenhouse gas accounting.

4.1.1 Boundary of the assessment

Project system boundary

The boundary for the assessment included:

- Energy used on the site.
- Electricity energy 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 phase of the project as the construction related emissions are likely to be minor compared to the emissions over the life of the project.

Greenhouse gases considered

The greenhouse gases considered in this assessment are:

- Carbon dioxide.
- Nitrous oxide.
- Methane.

The development is unlikely to store, generate or use any perfluorocarbons and sulfur hexafluoride and uses negligible quantities of hydrofluorocarbons for refrigeration and air conditioning during operation. These gases have therefore been excluded from the assessment.

4.1.2 Emission scopes

Emissions have been separated into Scopes 1, 2 and 3 in accordance with the Greenhouse Gas Protocol. These scopes are defined as follows:

1. 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.
2. 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.
3. 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.

Scope 1 emissions are produced by the combustion of fuels such as natural gas at the development site, and by vehicles and plant equipment which the Proponent owns and has operational control over. Note that only the direct combustion of the fuels is considered as Scope 1. Scope 2 emissions arise from the consumption of electricity at the development site, in plant equipment that is owned and operated by the Proponent. Emissions arising from the extraction, processing and transportation and distribution of fuels and electricity are classified as Scope 3, since these activities are not within the operational control of the end user.

All other emissions associated with the Proposal are defined as Scope 3, since they are produced outside the development site, and the Proponent does not have operational control of the facilities from which they originate. The Proponent does not own or operate any of the vehicles that transport raw materials to the site. As such, the emissions resulting from the combustion of fuels for this transportation are classified as Scope 3.

4.1.3 Data collection and calculation procedures

Quantities of fuel, electricity, materials and wastes were provided by Midal.

Emission factors that are used in the greenhouse gas assessment are outlined in Appendix A. Where possible, factors have been sourced from the *National Greenhouse Accounts (NGA) Factors, July 2010*. If factors have been sourced elsewhere then source references have been provided in Section 4.1.4 and Appendix A.

When data was unavailable, assumptions and approximations were made in order to obtain a reasonable estimate of activity levels or emission factors. For example, fuel consumption for some site vehicles was not readily available, and these were estimated based on the best available information. Recognised standards, such as the Greenhouse Gas Protocol, were used to assist in these estimations whenever appropriate. All assumptions are detailed in Section 4.1.4.

All energy consumption and emissions data has been converted into quantities of carbon dioxide equivalent as shown in Appendix A. The emission values have been summed to reach an estimate of the total greenhouse gas emissions.

Uncertainty in the greenhouse gas emissions were calculated using the procedures outlined in the *DCCEE National Greenhouse and Energy Reporting System Measurement – Technical Guidelines for the estimation of greenhouse gas emissions by facilities in Australia, June 2010* with the following exceptions:

- Uncertainty in activity data was estimated as 7.5%. Data was based on measured data from a similar plant and the uncertainty was based on criterion BBB as a conservative estimate.

- Uncertainties for Scope 3 emissions are not provided in the NGER Measurement Determination and were not estimated.
- Uncertainties for Scope 2 emissions are not provided in the NGER Measurement Determination. Uncertainty for Scope 2 electricity emission factor was assumed to be 5%. This is the same as the uncertainty in the carbon dioxide emission factor for black coal.

4.1.4 Exclusions and assumptions

Exclusions

Exclusions from the GHG assessment are:

- Emissions associated with construction activities. These emissions were considered minor over the entire life of the project.
- Emissions associated with minor consumables. These emissions were considered minor compared to the total operational emissions.
- Transportation of materials to site and waste from site. These emissions were considered minor compared to the total operational emissions.

Assumptions

Assumptions used in estimating the activity levels and associated energy use and greenhouse gas emissions for the project are listed in Table 1.

Table 1 Greenhouse gas assumptions for the Cables Manufacturing Facility

Parameter measured	Assumptions
Energy	
Electricity from grid	Quantity of electricity estimated as 30 GWh per annum based on a demand of 4,000 kVA, a power factor of 0.9, the plant operating 350 days per years and 24 h per day. This was considered a conservative estimate for electricity consumption. As per the methodology described in Section 4.1.3 Emission Factors (EFs) were sourced from the DCCEE NGA Factors (July 2010) for electricity for NSW (Scopes 2 and 3, Table 40).
LPG	Quantity of LPG estimated as 507 kL based on seven forklifts with a 5 t capacity operating 24 h per day, 350 days per year and consuming 4.4 kg of LPG per hour. The density of LPG was assumed to be 510 kg/kL. EFs sourced from Tables 3 and 39 of NGA Factors (July 2010).
Natural gas	Quantity of natural gas estimated as 465,150 GJ per annum based on 1,329 GJ per day and 350 days per year. EFs sourced from Tables 2 and 38 of NGA Factors (July 2010).

Parameter measured	Assumptions
Materials	
Boron	Quantity estimated as 26 t per annum. It was assumed that the boron alloy material was 100% boron. EF sourced from the SimaPro Australian Database.
Chromium	Quantity estimated as 8 t per annum. It was assumed that the chromium alloy material was 100% chromium. EF sourced from the SimaPro EcoInvent Database.
Copper	Quantity estimated as 62 t per annum. It was assumed that the copper alloy material was 100% copper. EF sourced from the SimaPro Australian Database.
Iron	Quantity estimated as 62 t per annum. It was assumed that the iron alloy material was 100% iron. EF sourced from the SimaPro Australian Database.
Magnesium	Quantity estimated as 110 t per annum. It was assumed that the magnesium ingots were 100% magnesium. EF sourced from the SimaPro EcoInvent Database.
Molten aluminium	Quantity estimated as 50,000 t per annum. EF sourced from SimaPro Australian Database for aluminium. It was assumed that the embodied emissions of molten aluminium would be similar to aluminium ingots.
Silicon	Quantity estimated as 25 t per annum. EF sourced from the SimaPro IDEMAT Database.
Water	Quantity estimated as 66,500 m^3 per annum. For the purpose of this assessment it was assumed that all water was potable. EF sourced from SimaPro Australian Database for potable water supply and distribution.
Waste	
Commercial and industrial waste	Quantity estimated as 115 t per annum based on 667 m^3 and a density of commercial and industrial waste of 0.172 t/m^3. Density was estimated from Department of Environment, Climate Change and Water (2010) *Disposal based survey of the commercial and industrial waste stream in Sydney*. EF sourced from Table 43 of NGA Factors (July 2010).
Product distribution	
International (south east Asia)	It was assumed that 25,000 t of product will be transported to South East Asia each year. The product will be transported to Newcastle Port by truck and then to South East Asia (7,800 km from Newcastle) by ship.

Parameter measured	Assumptions
Domestic	It was assumed that 25,000 t of product will be distributed within Australia each year. For the purpose of this assessment it was assumed that 5,000 t of product will be transported to Brisbane, Sydney, Melbourne, Adelaide and Perth by rigid truck.

Unless otherwise stated, road distances have been estimated using Google Earth Pro and shipping distances have been estimated using http://www.portworld.com/map/. Emissions for road transportation assumed a rigid truck EF sourced from SimaPro and is based on Australian data for rigid trucks. EF for shipping was sourced from SimaPro and is based on Australian data for international shipping.

4.2 Climate change risk assessment

The scope, methodology and information/data requirements for the desktop first pass climate change risk assessment were based on the guidance and standards 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 many studies from around the globe.
- 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 that was most relevant Australian standard prior to the ISO release.
- The United Kingdom Climate Impacts Programme (UKCIP) Adaptation tools.

These are considered to represent current good practice in climate change research and risk assessment methodology.

4.2.1 Type of assessment and limitations

This risk assessment information is provided as general guidance, and as core information that may be used to guide further investigation of impacts and asset resilience. This does not constitute a full assessment. Therefore these projections, vulnerabilities and control measures are not exhaustive.

The level of any risk assessment should always be appropriate to the stage of development or guided by the level of risk that the responsible party is willing to accept as both known and unknown. At this stage a desktop assessment to highlight potential risks is a proactive step to ensure the climate risks are considered in the project.

4.2.2 Climate impacts included in this study

The following future climate impacts were investigated for this study:

- Temperature change (^{o}C);
- Extreme heat – projected number of days above 35^{o}C;

- Rainfall change – Annual (%);
- Windspeed (%);
- Relative humidity (%);
- Solar radiation;
- Evaporation increase (%);
- Very High or greater bushfire risk days/yr; and
- Sea Level Rise.

4.2.3 Model 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 to an environmental focus). For the limits of each model upper limits are used to ensure a conservative approach is produced by considering higher impacts, and therefore risk.

5. Greenhouse gas assessment

5.1 Results

Annual greenhouse gas emissions were calculated based on Scope 1, 2 and 3 emissions. The greenhouse gas assessment indicated annual Scope 1 and Scope 2 emissions of approximately 52,000 t CO_2-e per annum. Scope 3 emissions were estimated as 975,000 CO_2-e per annum. Scope 1, 2 and 3 emissions are summarised in Table 2. The uncertainty in the Scope 1 and Scope 2 greenhouse gas emissions was estimated as 6% or 3,000 t CO_2-e. Uncertainty in the Scope 3 emissions was not estimated.

Energy consumption based on on-site fuel use and electricity during operation of the plant was estimated as 590 TJ per annum.

Table 2 Summary of Scope 1, 2 and 3 Emissions for the Project

Scope	Quantity (t CO_2-e)
1	25,000
2	27,000
3	975,000
Total	**1,027,000**

The total annual greenhouse gas emissions for NSW reported in the DCCEE State and Territory Greenhouse Gas Inventories 2009 were 161 Mt/a. The estimated Scope 1 and Scope 2 emissions associated with the Project are approximately 0.03% of the total greenhouse gas emissions for NSW.

Emissions were also categorised as energy used on site, process materials, waste sent to landfill and transportation of the product

Embodied emissions of process materials were estimated to contribute 93% of total Scope 1, 2 and 3 emissions. The embodied energy of molten aluminium was estimated to contribute 950,000 t CO_2-e of the total emissions. The project is not likely to increase emissions at the aluminium smelter as there will be no change in production output from the smelter as a consequence of the project. Therefore the emissions associated with molten aluminium should not be considered an impact of the project, however, have been included for completeness. The embodied emissions of the remaining process material contribute less than 0.2% of the total emissions.

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%).

The total emissions inventory is given in Appendix A.

5.2 Mitigations measures

The management of adverse impacts arising from the project has been addressed according to the hierarchy of avoidance, mitigation and offsetting of adverse impacts.

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. These emissions are beyond the control of the Proponent and will occur in the absence of the project. As such, mitigation measures should focus on the reduction of emissions from natural gas and electricity which contribute approximately 6% of total Scope 1, 2 and 3 emissions or 86% of emissions if molten aluminium is excluded from the assessment.

Impacts of the project on greenhouse gas emissions have been avoided or minimised where possible through the planning and design process. For example, natural gas generates less greenhouse gas emissions compared with alternative solid or liquid fossil fuels, or electricity from black coal power stations.

The consumption of natural gas and electricity is a necessary requirement of the project. A small reduction in the quantity of natural gas consumed may be achievable through optimisation of activities and logistics or more efficient furnaces. Opportunities to recover waste heat from the furnaces should be investigated and implemented where practical.

The energy efficiency of electrical equipment and lighting should be investigated to identify potential reduction measures. Renewable energy opportunities such as roof top solar photovoltaic should be investigated, however, these measures are not likely to significantly reduce electricity consumption and may not be financially viable given the current uncertainty with a carbon pricing mechanism and feed-in tariffs.

Based on the conservative assumptions used in this assessment to estimate electricity consumption, the facility may exceed the threshold (0.5 PJ) for mandatory participation in the Australian Government's Energy Efficiency Opportunities (EEO) program at full plant capacity. The plant is expected to achieve full capacity after 3-5 years from commencement. A requirement of the EEO program is to undertake detailed energy studies to identify reduction opportunities.

6. Climate change risk assessment

6.1 Context setting

There is now significant scientific evidence to show that climate change is occurring and that these changes are associated with the release of greenhouse gases from human activities, namely the burning of fossil fuels. The CSIRO has estimated that Australia's mean surface temperature has increased by 0.9°C since 1910. Temperature increases are not the only potential impacts of climate change, changes in rainfall, wind patterns, extreme events (floods, drought, and fire) and many other aspects of weather and climate variability are being observed across Australia.

"In summary, the message is that global warming is real, humans are very likely to be causing it, and it is very likely that there will be changes in the global system in the centuries to come larger than those seen in the recent past. Future changes have the potential to have a major impact on human and natural systems throughout the world including Australia." (CSIRO Climate Change in Australia Technical Report 2007).

This assessment will enable the better understanding of climate change impacts on the project such that potentially costly changes to address climate change impacts in the future may be avoided.

6.2 Future climate projections – impacts

Since the location of the project is not within close vicinity of the city summaries presented in the CSIRO technical report, then the impacts associated with the current baseline for the closest city are presented. The bushfire risk and sea level rise impacts are relevant to the site, but for the other impacts the regional variation is shown so that the variability of these impacts can be assessed. This study adopted the A1B (medium emissions) & A1F1(high emissions) models from IPCC AR4, which assume both Globalisation (homogenous world – not regional different operations, which does allow for world wars or trade embargos), and rapid economic growth (rather than a world environmental focus).

Table 3 Climate Change Projections for the Sydney metropolitan region.

Climate Change Variable	Present Climate	2030	2070
		A1B (H)	A1F1 (H)
Temperature change[1,2](^{o}C)	Average maximum: 25.6	+1.3	+4.3
Extreme heat – projected number of days above 35^{o}C[1]	3.5 days	5.1 days	12.0 days
Rainfall change – Annual [1] (%)	96 mm/yr	+3% (-16% Spring, +9 Summer)	+10% (-50% Spring, +35 Summer)
Windspeed [1] (%)	n/a	+4%	+12%

Climate Change Variable	Present Climate	2030	2070
		A1B (H)	A1F1 (H)
Relative humidity [1,3] (%)	63[1]%	0.4%	+1.3%
Solar radiation[1]	n/a	+1.9%	+6.0%
Evaporation increase[1] (%)	n/a	+5%	+15%
Very High or greater bushfire risk days/yr [4] (Using Williamtown, NSW)	10.3 days	12.8 days	17.8 days
Sea Level Rise[5]	0 (datum)	0.4 m (2050)	0.9 m (2100)

6.3 Regional variability in future climate scenarios

The variability of climate impacts can be seen in Chapter 5 of the CSIRO Climate Change in Australia Technical report. The variability of these impacts was investigated to ascertain whether there was substantial difference between the city summary and the proposed site. Most climate impacts were found to be relatively constant between Sydney and the site (further detail is provided in the references below). Due to the small amount of regional variability, the projected impacts are considered appropriate for this level of risk assessment.

The impacts observed to have little to no regional variability are:

- Temperature; and
- Solar radiation.

The impacts where more variability is found between the Sydney region and the proposed site at Tomago are:

- Precipitation;
- Humidity;
- Evaporation; and
- Seasonal variation in wind speed.

More detail of the regional variability can be found in the CSIRO technical report:

- Temperature: Figure 5.2–5.6.

1 CSIRO Climate Change in Australia Technical report 2007, Appendix B City Summaries

2 Bureau of Meteorology, Sydney Airport temperature record

3 Bureau of Meteorology, Sydney Airport humidity record, this figure is made from the average at 9am and 3pm

4 Lucas, C., Hennessy, K., Mills, G. & Bathols, J. (2007) Bushfire Weather in South-eastern Australia: Recent Trends and Projected Climate Change Impacts. Consultancy report prepared for the Climate Institute of Australia

5 Department of Environment, Climate Change and Water NSW [DECCW] (2009), NSW Sea Level

Rise Policy Statement, DECCW 2009/708, October, ISBN 978-1-74232-464-7

- Precipitation: Figure 5.21.
- Solar radiation: Figure 5.28–5.29.
- Relative Humidity: Figure 5.30–5.32.
- Potential Evapotranspiration: Figure 5.34–5.35.
- Windspeed: Figure 5.36–5.42.
- Hail Risk: Figure 5.52.

6.4 Asset vulnerabilities

Asset vulnerabilities were assessed using desktop sources only, such as maps and information about general building materials and strengths, then the 'Identifying adaptation options report' by UKCIP (2007) was used to provide general adaptation options.

6.4.1 Temperature

Average temperature rise

No known issues should arise from changed average temperatures or adjusted daily temperature ranges.

Increasing number of extreme heat days

This may affect temperature sensitive equipment such as heat exchangers, electrical transformers, material maximum temperatures, staff comfort, standard staff processes and safety. There may also be increased wear of materials (especially external building materials) due to expansion and contraction from increased temperature variability (daily and seasonal).

Possible control measures

Changing material types (concrete mixes, steel blends) to ensure that these materials can withstand increased temperature exposure.

6.4.2 Rainfall

Increase in rainfall

Tomago is known to have predominantly sandy soils, which will have a low likelihood of any impact from standing stillwater, or from soil saturation.

Decrease in rainfall

The site is reliant on the supply of relatively small volumes of water, when compared to other industries (e.g. power station, brewery).

Possible control measures

Increased rainfall: analyse the site drainage and improve if needed.

Decreased rainfall: organise a backup water supply, whether this is onsite through storage or offsite through understanding municipal supply redundancies (and ensuring the site is adequately prioritised).

6.4.3 Windspeed

The site should consider the possibility of an increase of windspeed. Therefore the design requirements of all tall or unprotected elements of the asset should be checked.

Possible control measures

Design strengths of all these areas should be checked. Generally these are much stronger than is necessary by the Australian guidelines.

6.4.4 Hail risk

The consideration of increased frequency, intensity and size of hail will probably not impact the project, as the site is not heavily glazed or has roof issues. Internal box gutters should be checked for capacity as the hail can freeze in these areas and build up in weight and possibly cause roof damage or collapse.

Possible control measures: check building designs and ensure there are no internal box gutters especially above critical areas.

6.4.5 Bushfire

The site is located in an area with nearby surrounding by bushland, therefore the possibility of increased bushfire risk impacting the site is a possibility.

Possible control measures

The design of the project and the relevant procedures and assistance for bushfire should be investigated, increasing fire control through increasing fire breaks or back-burning around the site.

6.4.6 Evaporation and humidity

Increases in evaporation and changes in humidity should have a relatively small impact on the site.

Possible control measures

Any use of particularly sensitive equipment should also consider alternatives that may have a greater operational range.

6.4.7 Sea level rise

The site located quite close to a body of water that interacts with the ocean. The borders of the industrial estate are approximately 500 m from the river, and the area is relatively flat. The greatest impact of sea level rise is the upstream impacts from the combination of increased river flow and higher standing stillwater levels at sea (which often occurs in heavy storms). This may cause substantial increases to river flow, depth, and widening but both the high permeability of the soils in the area, and the length of the river will attenuate the effects (as the most serious impacts will occur closer to the river mouth) and these factors should mitigate most flooding effects.

Possible control measures

The vertical and horizontal distance of the river to any equipment that would be damaged in such an event should be explored. Coastal modelling may aid in understanding more realistic impacts (in a full risk assessment process, should this be conducted). If these do highlight vulnerabilities then it may be worth protecting the site with protective barriers.

7. Conclusions

This greenhouse gas and climate change risk assessment has been undertaken by GHD on behalf of Midal, as part of the Environmental Assessment, for the development of the proposed Cables Manufacturing Facility. This report has been prepared to:

- Estimate the energy consumption and greenhouse gas emissions associated with the Cables Manufacturing Facility:
- Develop potential mitigation measures to minimise impacts of the project; and
- Understand future climate impacts, asset vulnerabilities and typical control measures for adaptation.

The GHG assessment was undertaken in accordance to the Greenhouse Gas Protocol and the DCCEE NGA Factors.

Scope 1 and Scope 2 greenhouse gas emissions were estimated as 52,000 ± 4,000 t CO_2-e per annum during operation of the Cables Manufacturing Facility. This included 25,000 t CO_2-e Scope 1 emissions and 27,000 t CO_2-e Scope 2 emissions. Scope 3 emissions were estimated as 975,000 t CO_2-e per annum. The embodied emissions associated with the molten aluminium contributed 950,000 t CO_2-e per annum of Scope 3 emissions.

Energy consumption, based on on-site fuel use and electricity consumption was estimated as 590 TJ per annum. The estimated energy consumption would exceed the threshold for the mandatory participation in the Energy Efficiency Opportunities program at full capacity. Exceeding the threshold would require a detailed energy study to be undertaken by the Proponent to identify reduction opportunities.

The climate change risk assessment overview highlighted that the site could be vulnerable to temperature, bushfire risk and sea level rise impacts. Climate impacts that the site demonstrated resilience against were rainfall variability, increases in windspeed, evaporation and humidity.

Appendix A

Greenhouse gas inventory

Component	Value		Scope 1 Emission Factor	Scope 2 Emission Factor	Scope 3 Emission Factor	Total Emission Factor		Source	Method	Scope 1 Emissions	Scope 2 Emissions	Scope 3 Emissions	Total Emissions	Proportion of Total Inventory
	(Q)	Units	t CO_2-e / units	t CO_2-e / units	t CO_2-e / units	t CO_2-e / units	Units			(t CO_2-e)	(t CO_2-e)	(t CO_2-e)	(t CO_2-e)	%
Energy														
Electricity from grid	30	GWh	0.00	0.0009	0.0002	0.00107	kWh	Table 40, DCCEE NGA Factors July 2010	Q x 1,000,000 x EF	0	27,216	5,141	32,357	3.2%
LPG	507	kL	1.54	0.0000	0.1285	1.67	kL	Tables 3 & 39, DCCEE NGA Factors July 2010	Q x EF	781	0	65	846	0.1%
Natural gas	465,150	GJ	0.051	0.0000	0.015	0.066	GJ	Tables 2 & 38, DCCEE NGA Factors July 2010	Q x EF	23,876	0	6,977	30,853	3.0%
Total for energy										24,657	27,216	12,183	64,056	6.2%
Materials														
Boron	26	t	0.0	0.0	19.0	19.0	t	SimaPro Australian Database	Q x EF	0	0	494	494	0.0%
Chromium	8	t	0.0	0.0	24.4	24.4	t	SimaPro Ecoinvent Database	Q x EF	0	0	195	195	0.0%
Copper	62	t	0.0	0.0	5.5	5.5	t	SimaPro Australian Database	Q x EF	0	0	342	342	0.0%
Iron	62	t	0.0	0.0	1.9	1.9	t	SimaPro Australian Database	Q x EF	0	0	118	118	0.0%
Magnesium	110	t	0.0	0.0	6.1	6.1	t	SimaPro Ecoinvent Database	Q x EF	0	0	668	668	0.1%
Molten aluminium	50,000	t	0.0	0.0	19.0	19.0	t	SimaPro Australian Database	Q x EF	0	0	950,000	950,000	92.6%
Silicon	25	t	0.0	0.0	5.4	5.4	t	SimaPro IDEMAT Database	Q x EF	0	0	136	136	0.0%
Water	66,500	m^3	0.0	0.0	0.00011	0.00011	m^3	SimaPro Australian Database	Q x EF	0	0	7	7	0.0%
Total for materials										0	0	951,960	951,960	92.7%
Waste														
Commercial and industrial waste	115	t	0.0	0.0	1.1	1.1	t	Table 43, DCCEE NGA Factors July 2010	Q x EF	0	0	126	126	0.0%
Product distribution														
International (south east Asia)	25,000	t	0.0	0.0	0.05	0.05	t	SimaPro Australian Database	Q x EF	0	0	1,170	1,170	0.1%
Domestic	25,000	t	0.0	0.0	0.37	0.37	t	SimaPro Australian Database	Q x EF	0	0	9,126	9,126	0.9%
Total for product distribution										0	0	10,296	10,296	1.0%
GROSS GHG EMISSIONS										24,657	27,216	974,566	1,026,439	

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	A Maddocks M Bell	S Trahair		S Trahair		23/6/11
Final	A Maddocks M Bell	S Trahair	* *S Trahair*	S Trahair	* *S Trahair*	6/7/11