Appendix 10

Greenhouse Gas Impact Assessment

ACOUSTICS AND AIR

MATERIALS RECYCLING FACILITY, MINTO

GREENHOUSE GAS ASSESSMENT

REPORT NO. 12166-GE
VERSION C

MARCH 2019

PREPARED FOR

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	May 2015	Tim Collins	-
B	Final	20 December 2016	Tim Collins	Brian Clarke
C	Final	4 March 2019	Brian Clarke	Neil Gross

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TABLE OF CONTENTS

1 INTRODUCTION

Camolaw Pty Ltd proposes to construct and operate a materials recycling facility at 7 Montore Road, Minto. The site is located within an existing industrial area.

The general operation of the site will consist of raw material deliveries (building waste and sand) followed by crushing, screening, washing as required and then stockpiling of the different grades of product. The finished product will then be loaded on to trucks and transported off site.

The assessment of Greenhouse Gas emissions directly relates to the energy consumption and the associated impact on the environment. In addition our review of other Energy Efficiency issues have been identified which can be taken into account in the design and operation of the project.

2 SITE DESCRIPTION

The proposed resource recovery facility is intended to crush and process building waste material and wash sand. The site will have a total capacity of 450,000 tonnes per annum, which is divided into sand for washing and waste material for crushing.

The site is located on the eastern side of Bow Bowing Creek within an existing industrial area, as shown on Figure 2-1 below.

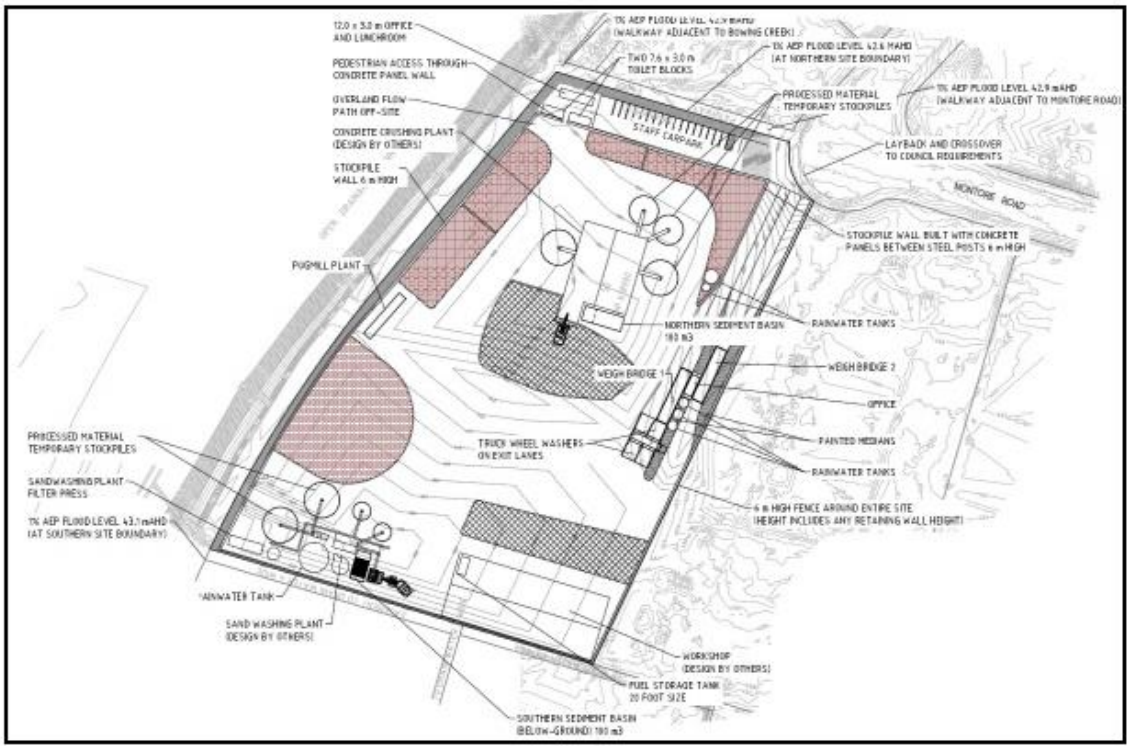
Figure 2-1 Site Location

2.1 Proposed Operations

The proposed site layout is shown in Figure 2-2. The crusher and screen are located in a shed towards the northern boundary of the site and the sand washing plants, also within a smaller shed, is located on the southern end of the site. A pugmill will also be located on the western boundary.

The proposed resource recovery facility is intended to crush and process building waste material and wash sand. The site will have a total capacity of 450,000 tonnes per annum. The proposed facility will receive concrete, brick, asphalt, sandstone and sand from the building and construction industry.

Figure 2-2 Site Layout



The general methodology of site operations is:

- Trucks with raw product (waste material and/or sand) would arrive on site through the industrial area and unload the raw product in the respective stockpile areas. Trucks would then leave the site.
- The oversize concrete waste material would be crushed using a pulveriser attachment on the excavator and then loaded into the primary crusher. The crushing plant is enclosed in a 10-metre-high purpose-built building. Inside the buildings where the crusher and screen is housed, a fogging system would be employed to control dust. The initial processing stage would be conducted by a jaw crusher and conveyed to the cone crusher via the screen. From the screen, processed materials would be transferred by conveyor stackers to product stockpiles of maximum height 8 metres. Product would then be transferred by wheel loader to designated stockpile locations.

- The sand material would be placed in a feed hopper by a wheel loader and then conveyed to the screen located in a shed. Fines are pumped to the sand washing plant (M2500 – AGGMAX), while washed product would be sent to the stockpiles. Sand product would then be transferred by wheel loader to designated stockpile locations.

- Product would be loaded onto delivery trucks by a wheeled loader. The delivery trucks would travel onto the weighbridge and then leave the site.

- In a "typical" day, the Site would receive 1,600 tonnes and deliver 1,600 tonnes of material. This average is based on 5.5 days per week, 48 weeks of the year. The remainder of the time is holidays, break downs and wet weather. In a "maximum" day, the Site would receive 2,500 tonnes and deliver 2,500 tonnes of material.

- On busy days, 3 excavators and 3 front end loaders are required to operate on site at any time.

Deliveries to and from the site will occur daily between (Monday to Saturday). Projected typical weekday inbound and outbound trucks are shown below with reduced numbers on Saturdays:

Product	In	Out
Raw waste materials	89 loaded	89 empty
Processed product from site	80 empty	80 loaded
Other materials for off-site recycling	1 loaded	1 loaded
Residual waste to landfill	1 loaded	1 loaded
Total	**171**	**171**

2.2 Operating Hours

The proposed hours of plant operations, for the site, would be between

6.00am and 7.00pm from Monday to Friday

7.00am and 4.00pm from Saturday

The facility would not operate on public holidays or on Sunday.

3 GREENHOUSE GAS METHODOLOGY

The following greenhouse gases have been identified as significant contributors to global warming:

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous dioxide (N_2O)
- synthetic gases
- Hydrofluorocarbons $(HFCs,\ SF_6,\ CF_4, C_2F_6)$

HFCs and synthetic gases are not relevant to the proposed development.

National Greenhouse Accounts Factors (July 2018) has been used to provide a consistent set of emissions factors, which are suitable for reporting Greenhouse Gas Emissions.

Under the Department of Climate Change and Energy Efficiency protocol GHG emissions are categorized as Scope 1, Scope 2 and Scope 3 emissions, being.

- **Scope 1** -Direct (or point-source) emission factors emissions, are direct emissions from sources owned or operated by the facility. These may be calculated using 'Point Source Emissions Factors' as defined in the AGO Factors and Methods Workbook;
- **Scope 2** - Indirect emission factors - emissions are GHGs released as a result of the generation of electricity, or the production of heat, cooling or steam purchased by the reporting company.
- **Scope 3 -** Various emission factors - emissions are all other GHG emissions that are not covered under Scope1 or Scope 2. Scope 3 emissions can include activities such as: employees commuting to work; extraction, production and transport of fuels, materials and other goods; and use of products manufactured and sold.

3.1 Scope of Assessment

This assessment considers the major greenhouse gas emissions sources based on the design and construction staging information that was available during the design phase. The assessment provides greenhouse gas emissions during the following phases of operation:

Construction Period, comprising of the following:

- Earthworks 4 weeks duration,
- Foundation / Hardstand 6 weeks duration,
- Superstructure 4 weeks duration.
- **Operational Period**

Types of emissions and associated scopes with the construction and operational phases of the project are provided in Table 3-1 and Table 3-2 below.

Table 3-1 Project Construction Emission Scopes

Scope	Emission Sources
Scope 1	• Transportation of materials via heavy vehicles; • Light vehicles for contractor and staff use; • Fuel used by construction and civil equipment; • Fuel usage by on-site generator.
Scope 2	• Consumption of purchased electricity from the grid to power on-site amenities.
Scope 3	• Extraction, production, transmission and distribution of fuel and electricity used onsite; • Waste and waste water generated; • Commute of workers.

Table 3-2 Project Operational Emission Scopes

Scope	Emission Sources
Scope 1	• Transportation of materials via heavy vehicles; • Operational fuel usage in vehicles and equipment.
Scope 2	• Consumption of purchased electricity from the grid to power on-site amenities.
Scope 3	• Extraction, production, transmission and distribution of fuel and electricity used onsite; • Waste and waste water generated; • Commute of workers.

4 ESTIMATION OF GREENHOUSE GAS EMISSIONS

The following section details the estimated emissions associated with the construction and operation of the Materials Recycling Facility.

The site is proposed in an established industrial estate with limited existing vegetation, the predicted loss of carbon sequestration as a greenhouse gas emission source is therefore considered minimal and will be not considered.

Detailed methodology of construction works has not been determined at this stage of the project. Emissions will be highly dependent on many variables such weather, construction methodology, off site fabrication, suppliers etc. Therefore, unlike operational emissions, an estimation of construction related emissions can be highly variable.

4.1 Emissions from Construction

The assessment of the construction period associated with the material recycling facility is limited to site to the following activities:

Truck Movements for Construction

- Removal of Fill totalling 500 trucks.
- Transportation of Construction Materials totalling 280 Trucks.

Machinery and Plant used on site for Construction

- Average of 1 large diesel powered plant in operation for half the construction period.

Expected Construction Workforce

- 4-10 Persons per day depending on construction task.

Electricity Generation for Construction

- Off-site generated mains power for site office.
- On-site diesel generated power for power tools.

Waste and wastewater

- Typical construction waste generated
- Typical waste and waste water generated from persons on-site.

Equivalent CO2-e emission estimations are presented in Table 4-1.

Table 4-1 Emission from Construction Period

Project Component / Source	Emission Sources	Quantity	Greenhouse Gas Emissions (tonnes CO2-e)			
			Scope 1	Scope 2	Scope 3	Total
Diesel fuel consumption – transport Purposes	Diesel for transport (LGV / HGV)	17 kL	46.4	0	0	46.4
Diesel fuel consumption – Mobile Plant	Construction equipment diesel fuel used	9.4 kL	25.9	0	0	25.9
Diesel fuel consumption – Stationary Plant	Construction generators diesel fuel used	0.8 kL	2.3	0	0	2.3
Electricity	Electricity supplied to site offices	9,600 kWh	0	7.9	0	7.9
Construction worker commute	Petrol for transport (light vehicle), bus travel, rail travel	1.6 kL	0	3.8	0.5	3.7
		Total	**74.6**	**11.7**	**0.5**	**86.2**

4.2 Emissions from Operation

The assessment of the operational period associated with the material recycling facility is limited to the following activities:

Truck movements during operational period

- Trucks inbound with product totalling 171 per weekday and 106 per Saturday.
- Trucks outbound with product totalling 171 per weekday and 106 per Saturday.

Machinery and plant used on site during operational period,

- Average of 6 large diesel powered plant in operation at any one time, e.g. 3 excavator and 3 Front End Loader.
- Sand Washing Plant operating every day with a power consumption of 100kw/h.
- Concrete Crushing Plant operating every other day with a power consumption of 200kw/h.
- Pugmill

Expected typical operational workforce on-site

- 15 Persons per day.

Electricity generation for operational period

- Off-site generated mains power for site office, weighbridge and lunchroom.
- On-site diesel generated power for sand washing plant, concrete crushing plant and Pugmill.

Equivalent CO_2-e emission estimations are presented in Table 4-2.

Table 4-2 Emission Sources from Operation Phase

Project Component / Source	Emission Sources	Quantity	Greenhouse Gas Emissions (tonnes CO2-e)			
			Scope 1	Scope 2	Scope 3	Total
Diesel fuel consumption – transport Purposes	Diesel for transport (LGV / HGV)	2014.9 kL	6122.3	0.0	0.0	6122.3
Diesel fuel consumption – mobile plant	On-site Plant diesel fuel used	349.9 kL	952.1	0.0	0.0	952.1
Diesel fuel consumption – stationary plant	On-site equipment diesel fuel used	234 kL	639.2	0.0	0.0	639.2
Electricity	Electricity supplied to site offices	19 200 kWh	0.0	15.7	0.0	15.7
Employee commute	Petrol for transport (light vehicle)	19.5 kL	0.0	0.0	46.5	46.5
		Total	**7634.3**	**15.7**	**46.5**	**7775.8**

4.3 Overall Emissions

The latest National Inventory Report (2016) and State and Territory Greenhouse Gas Inventories detailed Australia's total greenhouse gas emissions in 2013 amounted to 532.971 million tonnes of carbon dioxide equivalent (Million tonnes CO2-e) whilst New South Wales accounted for 130.273 million tonnes of this total.

Therefore, the materials recycling facility will account for less than 0.006% of current NSW emissions.

5 GREENHOUSE GAS MITIGATION MEASURES

5.1 Reducing Greenhouse Gas Emissions from Diesel fuel consumption

Diesel fuel consumption, namely that used in the transportation of product to and from site, generation of on-site power and that used in on-site vehicles represents the source of the major greenhouse gas emissions for the project. Mitigation options to reduce energy consumption and greenhouse gas emissions include:

- Avoid prolonged idling of equipment: Develop a policy about idling times and monitor unnecessary operation,
- Throttle down and switch off equipment when not in use,
- Fill fuel tanks to 95% of capacity to allow for expansion and reduce spillage,
- Perform regular inspection and maintenance,
- Log fuel use by vehicle and machinery to help identify fuel leaks and poorly performing vehicles,
- Consider the use of biofuels (Biodiesel or ethanol),
- Using vehicles with greenhouse gas emissions ratings of a minimum of 7.5 for passenger vehicles and 6 for light commercial vehicles, as described in the Green Vehicle Guide (www.greenvehicleguide.gov.au).

5.2 Reducing Greenhouse Gas Emissions from Electricity Consumption

Mitigation options to reduce energy consumption and greenhouse gas emissions from electricity consumption include:

- Specifying the use of grid-sourced renewable energy supply,
- Increasing solar access availability to the building should. Work areas should be located away from the western side of the development where utility areas such as toilets and showers should be located,
- Utility areas should be naturally ventilated where possible, and if possible be designed to provide good cross-flow potential,
- Light switches will be located at room exits to encourage switching lights off when leaving a room. Separate switches will be installed for special purpose lighting,
- Motion detectors should be used for externally lit non-critical areas,
- The option to use compact fluorescent bulbs is proposed,
- Hot water is likely to be required for tea making and showering facilities. Electric storage hot water systems are the least efficient hot water systems. Instantaneous hot water, solar hot water with an electric boost or gas hot water should be considered,
- Installation of energy saving appliances.

5.3 Reducing Embodied Greenhouse Gas Emissions

Although embodied greenhouse emission was not considered the following measures could be implemented to reduce total emission levels:

- Specifying sourcing of construction materials with lower embodied emissions (where a suitable substitute is available for construction materials with high embodied emissions). This includes low-carbon concrete, recycled metals and recycled construction aggregate,
- Source equipment and materials locally to reduce emissions associated with their transportation.

6 CONCLUSION

A review of the greenhouse gas emissions has been considered for the proposed materials recycling facility at 7 Montore Road, Minto.

The study has identified sources of greenhouse gas (GHG) emissions during both construction and operation of the material recycling facility.

Contribution emissions are highly dependent on the construction methodology and program and as such are an estimate of possible emissions.

In the case of operational stage an emission rate of 17 kg CO2-e/ tonne of product has been established.

Potential measures to reduce emissions have been identified. These measures, where feasible, should be adopted into a site specific environmental management plan.