REPORT

Erskine Park Landfill Greenhouse Gas Assessment

Submitted to:

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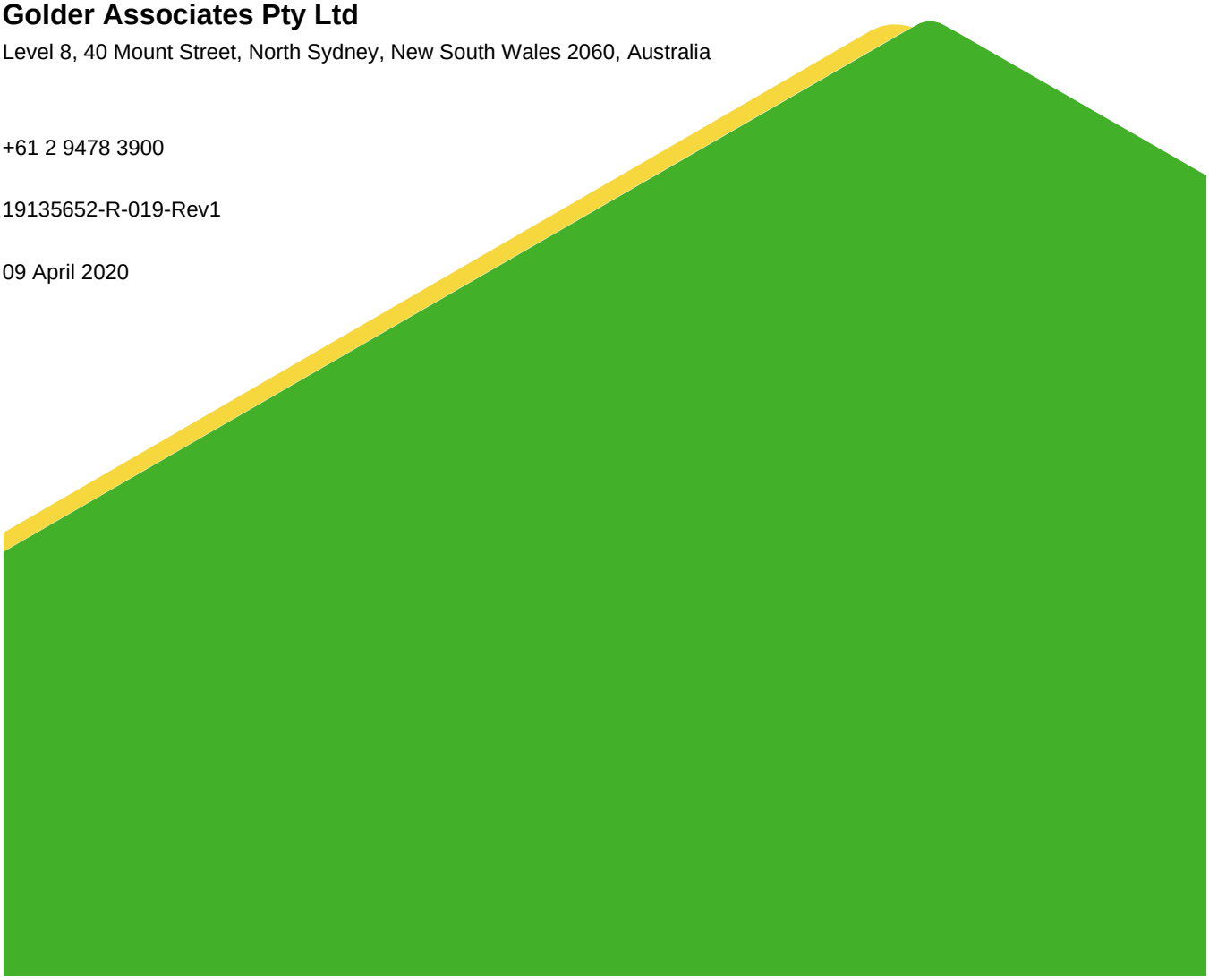

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1.0 INTRODUCTION

Enviroguard Pty Ltd (Enviroguard) engaged Golder Associates Pty Ltd (Golder) to prepare a greenhouse gas (GHG) emissions assessment for the Erskine Park Landfill the Mechanically Stabilized Earth (MSE) retaining wall Project.

Enviroguard operates a Solid Waste Class 2 Landfill at Erskine Park, NSW and is licensed to receive suitable non-putrescible wastes from domestic and commercial sources.

The site operates in accordance with the requirements of Development Consent (DA 05/1740) as amended on 8 August 2019 (DA 05/1740.01) and Environment Protection Licence (EPL) No 4865 issued by the NSW Environmental Protection Authority (EPA).

The site was granted development consent in December 2010 (DA 10/0429) for a landfill gas management system at the Site.

In 2014 development consent was granted (DA13/0655) for the installation of a 4.7km gas pipeline between the site to the Austral brick manufacturing plant at Horsley Park. The pipeline recovers all landfill gas from the Erskine Park landfill and is utilized to fire kilns used for brick manufacturing. It should be noted that this development consent was not issued to Enviroguard but to the Austral Bricks at Horsley Park.

1.1 Scope of Work

A desktop assessment of potential greenhouse gas emissions produced by the MSE Wall Project.

The technical assessment will include:

- Estimate Scope 1 and Scope 2 emissions using input data (diesel, electricity usage etc.)
- Establish the Project's projected contribution annual Australian / global GHG emissions.
- Determine greenhouse gas management measures relevant to the project.

2.0 OVERVIEW OF SITE HISTORY AND EXPANSION DESIGN

Landfill is located wholly within the former quarry void formed through the mining of breccia from the Erskine Park diatreme. Activities on the site include the receival of waste, use of cover material and waste compaction. Non-putrescible waste is permitted to be received at a rate not exceeding approximately 1 Million tonnes per annum (Mtpa).

The landfill is approaching the end of its life and Enviroguard is looking to extend the life of the landfill. To provide additional airspace of approximately 420,000 cum, it is proposed to design and construct a MSE retaining wall around the west, south and south-east of the existing landfill.

3.0 GREENHOUSE GAS ASSESSMENT METHODOLOGY

3.1 Regulatory Guidance

The following regulatory guidance was used in preparing GHG emissions at Erskine Park landfill.

- National Greenhouse and Energy Reporting (NGER) (Measurement) Determination 2008 incorporating the National Greenhouse and Energy Reporting (Measurement) Amendment (2018 Update) Determination 2018
- National Greenhouse Energy Reporting Guideline for estimating emissions and energy from solid waste and landfill biogas management (July 2019)
- NGER Solid Waste Calculator 2018-19.

3.2 Assessment Boundary

The assessment boundary is confined to emissions resulting from the operation of the Project including emissions from:

- Waste;
- Electricity usage from site office and leachate treatment plant (LTP); and
- Fuel usage from plant and equipment.

3.3 Landfill Gas (LFG) Generation

A landfill gas generation estimate has been undertaken for the proposed additional 420,000 cum of waste to be accepted at the site by using a first order decay model to provide an order of magnitude estimate of landfill gas production. The model used was the National Greenhouse and Energy Reporting (NGER) solid waste emission calculator 2018-2019. The model uses annual tonnages accepted into the landfill as the main input as well as percentages of waste types to estimate landfill gas production.

Waste input data

i) For this assessment, waste input parameters for NGER model were adopted from the Statement of Environmental Effects for a Landfill Gas Management System at the Erskine Park Landfill (Enviroguard, 2010) for consistency with previous studies.

ii) Approximate airspace gain is 420,000 m^3 over 3 years (assumed to be 2021, 2022, 2023)

iii) Unit weight of new waste is 16 kN/m^3 (per Enviroguard).

A collection efficiency of 65% has been adopted for this assessment as per Corkery, 2012.

4.0 MODEL RESULTS

The estimated gas generation curve is shown in Figure 1.

The model indicates that current LFG generation rate due to additional waste in the first year is approximately 341 m^3/hour and 119 m^3/hour after landfill gas recovery. The maximum LFG generation rate due to additional waste is approximately 928 m^3/hour and 325 m^3/hour after landfill gas recovery in the year 2024.

To estimate the total landfill gas generation and total landfill gas capture at the Site, the landfill gas generation curve presented in Corkery (2012) was used and the landfill gas generation from the proposed new waste numerically added. The total LFG is estimated to be at maximum 3778 m^3/hour in the year 2024.

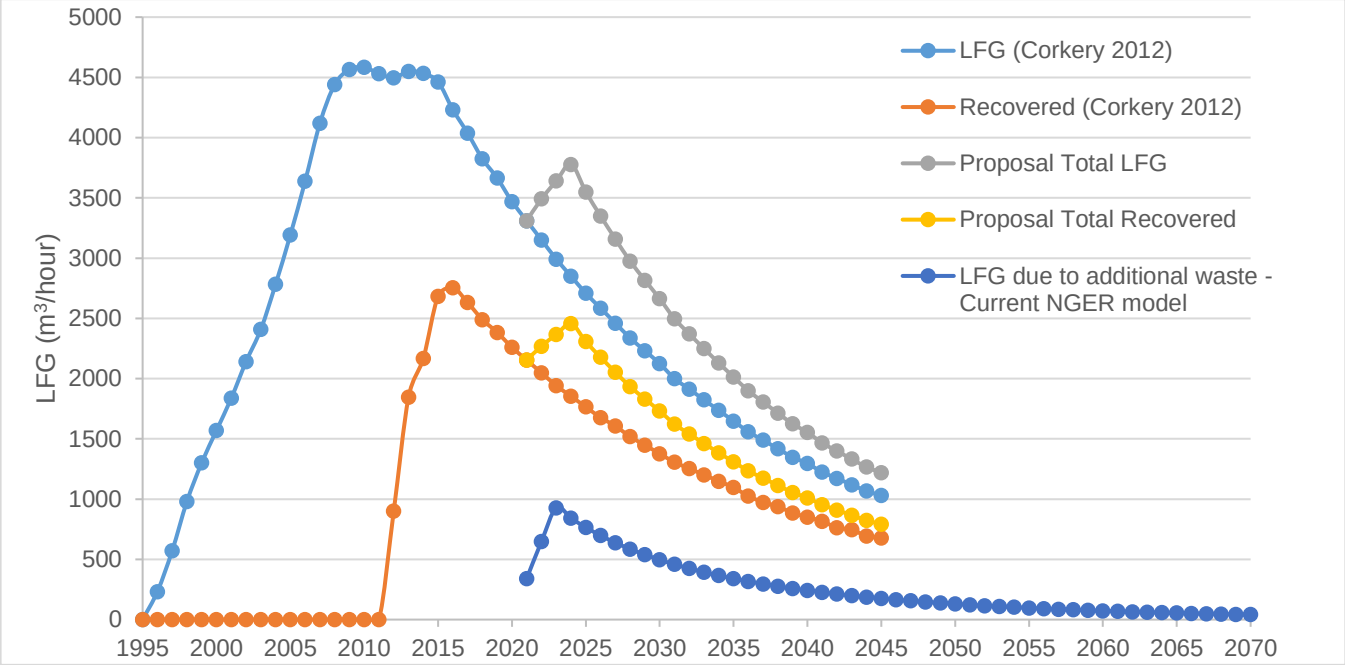

Figure 1: LFG Generation

It should be noted that only a portion of generated LFG can be effectively collected and managed. The percentage of the generated gas that is collected is referred to as the capture efficiency. Recovered LFG percentage adopted is an average of 65% as per Corkery (2012) (Figure 1).

4.1 Fuel and Electricity Emissions

Annual electricity and fuel emissions are not expected in increase as a result of the Project. Operations ie the volume of waste received and plant and equipment and facility operations will not change as a result of the Project.

Fuel use per the Enviroguard NPI report dated 24 September 2018 has a fuel usage of 88.2 tonnes per year (combined use of diesel and petrol (ULP)).

4.2 Annual Net Estimated Emissions

The LFG generation rate for the total site after additional waste is placed is approximately 3492 m^3/hour for year 2022. Emissions with mitigation are reduced to 1222 m^3/hour in the first year.

The results of the GHG Assessment estimate a maximum generation of 3778 m^3/hour for the total site in the year 2024. These emissions with mitigation are reduced to 1322 m^3/hour.

The LFG generation rate due to additional waste is approximately 341 m^3/hour for year 2022. Emissions with mitigation are reduced to 119 m^3/hour in the first year.

The maximum generation of LFG due to additional waste is 928 m^3/hour in the year 2024. These emissions with mitigation are reduced to 325 m^3/hour.

The estimated annual emissions from the Site and emission from the additional waste after capture for the first 4 years for the Site is given in Table 1.

Table 1: Estimated annual emissions by NGER model

Year	Total emissions (CO_{2-e}) (t) (after 65% capture)	Emissions from additional waste (CO_{2-e}) (t) (after 65% capture)
2021	0	0
2022	85,580	8354
2023	89,223	15904
2024	92,597	22749

5.0 ENERGY EFFICIENCY MITIGATION MEASURES

Capture and combustion of landfill gas greatly reduces the greenhouse gas emissions as a result of the Project.

In 2013 consent was granted for the installation of a 4.7 km gas pipeline between the Erskine Park Landfill and the Austral Bricks Manufacturing Plant at Horsley Park. The pipeline is constructed and delivers landfill gas to supplement natural gas to the brick firing kilns. Any gas not delivered to the Austral site is directed to the flare for burning, including during shutdown or maintenance the system. The maximum landfill gas generation from the site is below the maximum gas requirement of the Austral site.

The landfill gas collection system would be extended into the new waste as a result of the Project. It is anticipated expansion into the new waste area would commence after 1 year of waste placement.

Greenhouse gas emissions are therefore effectively reduced by the landfill gas capture and combustion practices at the Site. The landfill gas from additional waste associated with the Project can be effectively managed through existing energy recovery and/or combustion practices at the Site.

6.0 CONCLUSION

A GHG Assessment has been undertaken for the Project.

The results of the GHG Assessment estimate the maximum generation from the Site in the fourth year of the Project (i.e. year 2024) of 3778 m^3/hour. Emissions with mitigation are reduced to 1322 m^3/hour in the fourth year.

The maximum generation of LFG due to additional waste is 928 m^3/hour in the year 2024. These emissions with mitigation are reduced to 325 m^3/hour.

Greenhouse gas emissions are effectively reduced by the landfill gas capture and combustion practices at the site. The landfill gas production from addition waste associated with the Project can be effectively managed through existing practices at the site. No further mitigation measures are required.

7.0 REFERENCES

Corkery (2012), Statement of Environmental Effects, prepared for The Austral Brick Company Pty Ltd by R. W. Corkery & Company Pty Ltd, report number: 863/02(P)

Enviroguard (2007), Erskine Park Landfill Environmental Management Plan, prepared by Enviroguard Pty Ltd, dated September 2007.

Enviroguard (2010), Statement of Environmental Effects for a Landfill Gas Management System at the Erskine Park Landfill dated 3 March 2010.

National Greenhouse and Energy Reporting (NGER) (Measurement) Determination (2008), Clean Energy Regulator

National Greenhouse and Energy Reporting (Measurement) Amendment (2018 Update) Determination 2018

National Greenhouse Energy Reporting Guideline for estimating emissions and energy from solid waste and landfill biogas management (July 2019)

NGER Solid Waste Calculator 2018-19, Clean Energy Regulator

NPI Report for 17/18 Enviroguard Erskine Park Landfill 1282 Financial Year dated 24 September 2018

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https://golderassociates.sharepoint.com/sites/120150/project files/6 deliverables/19135652-019-r-greenhouse gas/19135652-r-019-rev1 ghg.docx

APPENDIX A

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