APA Crib Point Pakenham Pipeline Project

Greenhouse Gas Assessment Report

APA Transmission Pty Limited

Project reference: APA Crib Point Pakenham Pipeline GHG Assessment
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Quality information

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Glossary and Abbreviations

Abbreviation	Term	Definition
AGL	AGL Wholesale Gas Limited	Proponent of upstream project
APA	APA Transmission Pty Limited, a wholly owned subsidiary of the APA Group	The Project proponent
CO_2	Carbon Dioxide	Greenhouse gas
$CO_{2\text{-}e}$	Carbon Dioxide equivalent	Incorporates CO_2 as well as other GHG gases, converted to CO_2 equivalency using respective global warming potentials
CP	Cathodic protection	pipeline primary corrosion protection system
GHG	Greenhouse gas	Any of the atmospheric gases that contribute to the greenhouse effect by absorbing infrared radiation produced by solar warming of the Earth's surface
EEA	Environment Effects Act 1978	An Act to require the environmental effects of certain works to be assessed
EES	Environment Effects Statement	Environment assessment of the potential environmental impacts or effects of a proposed development
EPA Act	Environment Protection Act 1970 (Vic)	An Act to establish an Environment Protection Authority, to make provision with respect to the powers, duties, and functions of that Authority, to make further provision for the protection of the environment and for other purposes
FSRU	Floating Storage and Regasification Unit	Facility used for the vaporisation and pressurisation of natural gas
IPCC	Intergovernmental Panel on Climate Change	International body for assessing the science related to climate change
KP	Kilometre Point	Measurement of point in pipeline length from the origin point
LNG	Liquefied Natural Gas	LNG is natural gas (predominantly methane, CH_4, with some mixture of ethane C_2H_6) that has been converted liquid form by chilling for ease of storage or transport
MLV	Mainline Valves	Used to isolate the pipeline in segments for maintenance, repair, operation, and for the minimisation of gas loss
mmscfd	million standard cubic feet per day	Unit of measurement for gas flow
NGER Act	National Greenhouse and Energy Reporting Act	National framework for reporting and dissemination of information related to GHG emissions, GHG projects, energy production and energy consumption
PoHDA	Port of Hastings Development Authority	The Authority responsible for managing existing trade at the Port of Hastings
RTU	Remote Telemetry Unit	Measurement and monitoring device used in the main pipeline operation

Executive Summary

Project and Scope

APA Transmission Pty Limited ('APA') requires a Greenhouse Gas (GHG) assessment to estimate the annual volume of GHG emissions from the operation of the proposed Crib Point Pakenham pipeline using inputs from the latest stage of the design. Quantifying the volume of GHG emissions will assist the APA to meet their obligations for the Environment Effects Act (EEA) referral.

The assessment focuses on Scope 1 and Scope 2 GHG emissions. Scope 3 emissions resulting from energy supply and vehicle movements have also been estimated. Examples of Scope 1 GHG emissions include the operation and control of on-site vehicles, and fugitive emissions from system leaks and/or deliberate venting of gases. Scope 2 GHG emissions include fossil-fuel generated electricity drawn from the grid to power operations.

Legislation and drivers

The Environment Effects Act 1978 provides for assessment of proposed projects that are capable of having a significant effect on the environment. The Act does this by enabling the Minister administering the Environment Effects Act (EEA) to decide that an Environment Effects Statement (EES) should be prepared.

Relevant to the APA Crib Point Pakenham pipeline project is the potential for the project to emit greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent (tCO_2-e) per annum, which are directly attributable to the operation of the facility.

Scenarios

While the preferred project delivery approach is yet to be resolved, three scenarios have been assessed:

Scenario 1

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 6 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational

Scenario 2

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 4 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational

Scenario 3

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- All 40 cargos will be composed of lean LNG
- Nitrogen will not be required
- Odorant plant operational

Assumptions & limitations

To undertake the assessment a significant number of inputs and assumptions about the operation of the proposed project have been made. They are all set out in detail in this report, and draw on inputs provided by APA via email on 01 August 2018 and further clarified via email on 06 August 2018.

It is likely that through the design and engineering process for the final equipment and operational requirements, the actual emissions of the project will be able to be estimated more accurately and are therefore likely to change.

Results

The assessment shows the likely emissions under all scenarios are well below the EES referral limit and providing there are no significant changes to the design or operation of the project, it is unlikely to exceed the 200,000 tonnes of CO_2-e per annum limit.

Table 1 summarises the estimate of GHG emissions related to each scenario assessed within this study. Scenario 1 is estimated to lead to the highest quantity of scope 1 and scope 2 GHG emissions (2,831 tonnes of CO_2-e pa). Scenario 1 is also the most likely operational scenario. Scenarios 2 and 3 result in less overall emissions, due to the lower demand of nitrogen required for rich LNG deliveries. Under the assumptions used in this assessment, the project is significantly under the 200,000 tonnes of CO_2-e limit.

Table 1: Summary of greenhouse gas emissions under each scenario

Source	GHG Emissions Source	Scenario 1 (tCO_2-e)	Scenario 2 (tCO_2-e)	Scenario 3 (tCO_2-e)
Indirect emissions from electricity				
Scope 2	Grid Electricity	1,720	1,599	1,359
Scope 3	Grid Electricity	161	150	127
Stationary energy emissions				
Scope 1	Natural Gas	389	378	356
Scope 3	Natural Gas	29	29	27
Fugitive emissions				
Scope 1	Natural Gas	637	637	637
Transport fuel emissions				
Scope 1	Diesel Oil	86	58	2
Scope 3	Diesel Oil	7	5	1
Total				
Scope 1		1,112	1,072	994
Scope 2		1,720	1,599	1,359
Scope 3		197	183	155
Total Scope 1+2		**2,831**	**2,672**	**2,353**
Total Scope 1+2+3		**3,029**	**2,855**	**2,508**

1. Introduction

Project overview

APA Transmission Pty Limited, a wholly owned subsidiary of the APA Group (together referred to as APA) is proposing to construct and operate an approximately 56 km in length high pressure gas pipeline which will connect AGL's proposed Gas Import Jetty at Crib Point to the Victorian Transmission System (VTS), near Pakenham.

Upon completion, APA transmission pipeline and AGL's Gas Import Jetty will increase energy security and supply stability to Victoria. In addition, the pipeline will present other long term opportunities for the supply of gas to residential and industrial growth areas along the pipeline route and the potential for future power generation opportunities across the design life of the pipeline. The pipeline will also be designed in manner that will enable reverse flow from the main VTS connection at Pakenham to future customers connected to the pipeline.

The proposed AGL gas importing jetty project will consist of a Floating Storage and Regasification Unit (FSRU) continuously moored at the existing Crib Point Jetty. The FSRU will vaporise the natural gas from a visiting Liquefied Natural Gas (LNG) carrier that will moor directly adjacent to the FSRU. The natural gas will then be transferred to APA's Crib Point Receiving Facility via a marine loading arm and jetty piping. The high pressure gas pipeline will transfer the generated gas from the Crib Point Receiving Facility to the APA Pakenham Delivery Facility where it is conditioned to maintain the operating parameters of the VTS before injection.

Construction is currently scheduled to commence at the Receiving and Delivering Facilities in June –July 2019. The pipeline construction is scheduled to commence in October 2019 with the pipeline system planned to be operational by March 2020. The exact timing is dependent on a number of factors including timing of the required approvals, access agreements with relevant stakeholders and weather conditions.

The construction schedule is driven by the Project objective to receive and transport gas from AGL's first LNG cargo scheduled for first quarter of 2020.

Project description

The Crib Point Pakenham Pipeline project (the project) consists of the following components:

- Approximately 56km of high pressure gas transmission pipeline with a diameter of 600mm with a minimum cover of 1.2 m from ground level.
- Crib Point Receiving Facility situated at landside of the Crib Point Jetty managed by Port of Hastings Development Authority (PoHDA) and include metering, pigging facility, nitrogen storage and injection, odorant plant, gas analysers and a vent stack.
- Pakenham Delivery Facility situated adjacent to the Pakenham East Rail Depot, which is within land owned by Public Transport Victoria and include a scraper station, filtration, metering, heating, pigging facility and a vent stack.
- Two mainline valves (MLVs) will be situated along the pipeline at kilometre point (KP)12 and KP40. MLVs are provided as a means to isolate the pipeline in segments for maintenance, repair, operation, and for the minimisation of gas loss in the event that pipeline integrity is lost. Once isolated, the gas from the relevant pipeline section may be vented prior maintenance taking place. A typical MLV site comprises of 10 m x 10 m fenced compound.
- Cathodic protection (CP) is to be provided via a combination of crossbonds to existing CP system and the installation of an impressed current system at either of the MLVs which will be determined during detailed design. The pipeline primary corrosion protection system shall be its external coating.

The Crib Point Pakenham pipeline has a design life of 60 years. The design life of other pipeline equipment and sub-systems ranges from 15 to 25 years, but with ongoing integrity management, and subject to appropriate commercial drivers, the operational life is expected to be longer.

The pipeline is subject to rigorous strength and leak testing in accordance with AS2885.1 and AS2885 Part 5 (AS2885.5) for hydrotesting. Hydrostatic pressure testing involves filling a section of the pipeline with water and

monitoring the pressure to detect for leaks. Hydrotesting confirms the integrity of the pipe and welding points before commissioning. Flanges are only used connection points (i.e. mainline valves and facility connections). Pipe installed utilising a horizontal direction drilling (HDD) is hydrostatic pre-test prior to pull the pipe back through the pre-bored location. After pull back, the pipe string shall be hydrostatically tested prior to tie-in to the pipeline. Regular maintenance checks are carried out to identify any leaking joints at above ground facilities.

Purpose of this report

APA Transmission Pty Limited ('APA') requires a greenhouse gas (GHG) assessment to estimate the annual volume of GHG emissions from the operation of the pipeline using inputs from the latest stage of the design. Quantifying the volume of GHG emissions will assist the APA to meet their obligations for the Environment Effects Act (EEA) referral.

The assessment was conducted with reference to the:

- Ministerial Guidelines for Assessment of Environmental Effects under the Environment Effects Act 1978 (Seventh edition, 2006)
- Australian Department of Environment and Energy National Greenhouse and Energy Reporting Scheme Measurement (October 2017).

The assessment focuses on Scope 1 and Scope 2 GHG emissions, and also quantifies volumes of Scope 3 emissions resulting from stationary energy supply and vehicle movements. Examples of scope 1 GHG emissions include the operation and control of on-site vehicles, and fugitive emissions from system leaks and/or deliberate venting of gases. Scope 2 GHG emissions include fossil-fuel generated electricity drawn from the grid to power operations.

Study area

The GHG assessment applies to APA's operational boundary of the proposed pipeline for all Scope 1 and Scope 2 emissions. The assessment boundary includes the following;

- APA operations at or associated with the Crib Point receiving facility
- APA operations associated with the pipeline between Crib Point receiving facility and Pakenham delivery facility
- APA operations at or associated with the Pakenham delivery facility

Details of the associated emissions within the study area are described in detail in the Emissions sources section.

Scope of works

The scope of the assessment was informed by a meeting between AECOM and APA held on Monday, 9 July 2018. The assessment process included the following:

Desktop review: Collate available information required to undertake the assessment

Identify potential sources of GHG emissions

- Document limitations regarding the GHG emissions assumptions
- Provide preliminary feedback to APA regarding GHG emissions assumptions via email
- Meet with APA to discuss the approach and initial findings.

Operational GHG emissions assessment: Develop a Microsoft Excel-based GHG assessment spreadsheet of the project including:

- Scope 1 and scope 2 GHG emissions by source

- All relevant operational GHG emissions sources associated with each facility, including plant, equipment and vehicle movements
- Limitations and assumptions of the assessment.

Reporting: Develop a GHG assessment report presenting the methodology, data inputs, and findings from the assessment of the operation of the proposed pipeline. Refine the assumptions and finalise the report.

Limitations

To undertake the assessment a number of assumptions about the design and operation of the proposed project have been made. These assumption are set out in Table 2 of this report, and draw on data provided by APA via email on 01 August 2018 and further clarified via email on 06 August 2018. Once the design and operational requirements have been finalised, a more accurate estimation of greenhouse gas emissions can be made.

Refer Assumptions and limitations section for a full description of the assumptions used in the assessment.

Legislation and policy

Guidelines for assessment under EEA

The *Environment Effects Act 1978* provides for assessment of proposed projects that are capable of having a significant effect on the environment. The Act does this by enabling the Minister administering the Environment Effects Act (EEA) to decide that an Environment Effects Statement (EES) should be prepared.

The Minister might typically require a proponent to prepare an EES when:

- there is a likelihood of regionally or State significant adverse effects on the environment
- there is a need for integrated assessment of potential environmental effects (including economic and social effects) of a project and relevant alternatives, and
- normal statutory processes would not provide a sufficiently comprehensive, integrated and transparent assessment.

Relevant to the APA Crib Point to Pakenham pipeline project is the potential for the project to emit GHG emissions exceeding 200,000 tonnes of carbon dioxide equivalent (CO_2-e) per annum, which are directly attributable to the operation of the facility.

National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) outlines the national reporting framework for corporations and facilities required to report their energy use and GHG emissions. Under the Act, a corporation is considered to be the entity that has operational control. Controlling corporations that exceed the following thresholds are required to report under the Act:

- For facilities, consumption of more than 100 Tera joules (TJ) of energy annually or emits over 25,000 tonnes CO_2-e annually
- For corporations, consumption of more than 200TJ of energy annually or emits 50,000 tonnes CO_2-e annually.

Direct Action Plan and Emissions Reduction Fund

The *Clean Energy Act 2011* and the Carbon Pricing Mechanism were repealed with effect from 1 July 2014. The Australian Government replaced it with the Direct Action Plan, a policy consisting of programs including the Emissions Reduction Fund (the Fund) directed at reducing carbon emissions.

The Fund came in to effect on 13 December 2014. To date, the Australian Government has provided $2,550M to establish the Fund and support businesses pursuing emissions reduction activities. The Fund involves a ‘reverse auction’ mechanism, where businesses can sell their carbon abatement, with the government purchasing the lowest cost per tonne of abatement. This aims to encourage businesses to invest in the most cost-efficient

emissions reduction methods. As part of this fund, construction or operating companies could potentially be eligible to generate Emission Reduction Fund credits. The Fund is monitored by the Clean Energy Regulator.

Victorian Climate Change Act 2017

The *Climate Change Act 2017* (Vic) sets the legislative foundation to manage climate change risks, and drive Victoria's transition to net zero emissions by 2050. The Act embeds the 2050 net zero emissions target and provides for the setting of 5-yearly interim greenhouse gas emissions reduction targets, climate change strategies, and adaptation action plans to ensure the 2050 target is achieved and vulnerabilities to climate change impacts are reduced while potential opportunities are realised. Adaptation action plans will cover systems including the built environment and transport.

The *Climate Change Act 2017* requires decision-makers to take climate change into account when making specified decisions under the *Catchment and Land Protection Act 1994* (Vic), *Coastal Management Act 1995* (Vic), *Environment Protection Act 1970* (Vic), *Flora and Fauna Guarantee Act 1988* (Vic), *Public Health and Wellbeing Act 2008* (Vic) and *Water Act 1989* (Vic).

More specifically, the Environment Protection Agency (EPA) must regulate the potential impacts of climate change and GHG emissions in relation to the Victoria's long-term and interim emissions reduction targets as part of the works or other development approvals process.

The *Climate Change Act 2017* requires the Minister to undertake additional periodic reporting and publishing of 5-yearly climate science reports, 'end of interim target period' reports, as well as annual GHG emissions reports, to provide transparency, accountability, and meet community engagement principles.

Environment Protection Act 1970

Under the *Environment Protection Act 1970* (Vic) (EPA Act), GHGs are defined as a waste. The Act authorises the EPA Victoria to issue works or other development approvals and licenses to regulate the State Environment Protection Policies (SEPP).

APA Group policy

The APA Group identify the following key areas of focus to support the business sustainability approach; customers, investors, the environment, communities and employees.

Under the environmental focus category, and of direct relevance to this assessment, APA Group make the following statements[1]:

- maintaining compliance with environmental laws in all jurisdictions we conduct our business including our emissions reporting obligations
- including environmental risk management in all investment and procurement decision-making
- contributing to policy and responding to climate change initiatives to promote the use of gas as essential to a cleaner energy mix
- reducing carbon emissions as a responsible risk mitigation response to climate change, including evaluating complementary clean energy projects

The APA Group, under the NGER Act, are required to report on their annual Scope 1 and 2 GHG emissions, having a total annual emission of greater than 50,000 tonnes CO_2-e.

[1] "APA Group Sustainability – Environment", The APA Group website, Accessed 19/07/2018

2. Methodology

Overview

This section outlines the operational scenarios assessed, the scope of operational emissions sources, the emissions calculations methodology and the associated emissions factors used to estimate the volume of GHG emissions associated with the operation of the pipeline.

The GHG inventory has been assessed and prepared in accordance with:

- *National Greenhouse and Energy Reporting Scheme (NGERS) (Measurement) Determination 2008*, for the evaluation of Scope 1, 2 and 3 emissions
- *National Greenhouse Account Factors, July 2018*, for the derivation of Scope 1, 2 and 3 emissions factors
- *Greenhouse Gas Protocol* by the World Business Council for Sustainable Development (WBCSD) and the World Resource Institute (WRI), for the evaluation of Scope 3 related emissions.

Scope

Scenarios Assessed

Under all scenarios assessed, it is assumed the AGL Floating Storage Regasification Unit (FSRU) is continuously operating year-round at an average of 500 million standard cubic feet per day (mmscfd) high pressure gas send-out.

While the preferred project delivery approach is yet to be resolved, three scenarios have been assessed:

Scenario 1

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 6 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational

Scenario 2

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 4 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational

Scenario 3

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- All 40 cargos will be composed of lean LNG
- Nitrogen will not be required
- Odorant plant operational.

All inputs and assumptions have been provided by APA via email on 01 August 2018, and further clarified via email on 06 August 2018. These are set-out in Table 2 below.

Table 2: Summary of scenarios assessed

Input	Scenario 1	Scenario 2	Scenario 3
Gas supply and operation			
Gas supply from FSRU (days/annum)	365		
Gas supply flow rate from FSRU to pipeline (mmscfd)	500		
Lean LNG cargos (per annum)	34	36	40
Rich LNG cargos (per annum)	6	4	0
Total LNG cargos (per annum)	40	40	40
Crib Point receiving facility			
Metering & odorant plant operation (days/annum)	365		
Metering & odorant plant demand (kW_e)	31		
Nitrogen supply	3rd party supply via road from Dandenong		NA
Nitrogen Supply to site (# of 23t trucks per annum)	786	524	N/A
Nitrogen storage facility operation (days/annum)	Refill: 180 Enrichment: 54 Total: 234	Refill: 120 Enrichment: 36 Total: 156	NA
Nitrogen storage facility demands (kW_e)	60	60	N/A
Crib Point Pakenham pipeline			
Pipeline operation (days/annum)	365		
Pipeline length (approximate km)	56		
Pakenham delivery facility			
Metering plant operation (days/annum)	365		
Metering plant demand (kW_e)	114		
Water bath heater operation (days/annum)	365		
Water bath heater demand (winter/summer) (MW/day)	Lean: 8.0 / 2.5 Rich: 11.3 / 3.5		Lean: 8.0 / 2.5 Rich: n/a

Emissions sources

The identified GHG emissions sources from the project's operations include:

Indirect emissions from electricity

- Grid electricity used at the Crib Point receiving facility
- Grid electricity used at the Crib Point nitrogen facility
- Grid electricity used at the Pakenham delivery facility
- Grid electricity used in the operation of a remote telemetry unit (RTU) for pipeline monitoring.

Stationary energy emissions

- Natural Gas used onsite for the Pakenham water bath heaters supplied from the pipeline.

Fugitive emissions

- Operational gas leaks through the Crib Point receiving facility
- Operational gas leaks through the Pakenham delivery facility
- Natural gas transmission leaks through the Crib Point Pakenham pipeline at the flange at the end facilities and at the MLV's connections
- Natural gas vented for emergency and ad-hoc maintenance purposes at the Crib Point receiving facility
- Natural gas vented for maintenance and emergency purposes at the Pakenham delivery facility.

Transport fuel emissions

- Emissions from vehicle usage of staff for maintenance, surveying and operational requirements of the Crib Point Pakenham pipeline
- Emissions from nitrogen delivery vehicles
- Emissions from odorant delivery vehicles.

For the purpose of this assessment, Scope 3 emissions have been quantified to gain an understanding of the wider impacts of the proposed Crib Point Pakenham pipeline project, however, these emissions are not required to be included as part of the EEA referral.

Table 3 outlines the scope of emissions associated with the project assessment. Some emissions have been deemed immaterial in accordance with the NGERS 5% threshold rule (indicated with a cross) and excluded from the assessment. The green boxes highlight the scope of emissions required for submission under the EEA referral, whereas the orange boxes indicate Scope 3 emissions that were quantified but are not required for assessment.

Table 3: Summary of activities and sources of emissions considered in the assessment

Activity	GHG Emissions Source	Included	Scope 1	Scope 2	Scope 3
Indirect emissions from electricity					
Crib Point receiving facility	Grid Electricity	✓	-	✓	✓
Crib Point nitrogen facility	Grid Electricity	✓	-	✓	✓
Pakenham delivery facility	Grid Electricity	✓	-	✓	✓
Remote telemetry unit pipeline monitor	Grid Electricity	×	×	-	×
Stationary energy emissions					

Activity	GHG Emissions Source	Included	Scope 1	Scope 2	Scope 3
Pakenham water bath heaters	Natural Gas	✓	✓	-	✓
Fugitive emissions					
Crib Point receiving facility	Natural Gas	✓	✓	-	-
Crib Point vent stack	Natural Gas	×	×	-	-
Pakenham delivery facility	Natural Gas	✓	✓	-	-
Pakenham vent stack	Natural Gas	×	×	-	-
Pipeline transmission	Natural Gas	✓	✓	-	-
Transport fuel emissions					
APA survey vehicles	Diesel	✓	✓	-	✓
Nitrogen delivery vehicles*	Diesel	✓	✓	-	✓
General staff movements	Diesel	✓	✓	-	✓
Odorant delivery vehicles	Diesel	✓	-	-	✓

*It is noted that the nitrogen delivery vehicles are typically owned by a contractor which would categorise related emissions as only Scope 3, however, there is the potential for the delivery vehicles to be owned by APA, therefore have been included in the Scope 1 boundary

Emissions factors and calculation methodology

Indirect emissions from electricity

On-grid electricity generation emissions are included as Scope 2 emissions for APA and related to the consumption of electricity sourced from the Victorian electricity grid. Emissions factors for the consumption of grid electricity have been determined in accordance with the NGERS (Measurement) Determination 2008 and drawn from the NGAF July 2018.

Table 4: Emissions factors; indirect emissions from electricity

Activity	Scope 2 (kg CO_2-e/kWh)	Reference
Consumption of purchased electricity, Victoria	1.07	National Greenhouse Account Factors July 2018, Section 2.3.2, Table 5

Stationary energy emissions

Stationary energy emissions relate to the consumption of Natural Gas from the Crib Point Pakenham pipeline to power the water bath heaters at Pakenham. Emissions factors relating to the Natural Gas consumption at Pakenham (Table 5) have been determined in accordance with the NGERS (Measurement) Determination 2008 and drawn from the NGAF July 2018.

The calculation methodology used in relation to the combustion of natural gas and the consumption of grid supplied electricity are in accordance with the NGERS guidance for Method 1.

Table 5: Emissions factors; stationary energy emissions

Activity	Scope 1 ($kgCO_2$-e/GJ)	Reference
Natural gas distributed in a pipeline	51.53	National Greenhouse Account Factors July 2018, Section 2.1.2, Table 2

Fugitive emissions

Fugitive emissions related to the transmission of natural gas in the Crib Point Pakenham pipeline have been determined in accordance with the NGERS (Measurement) Determination 2008, Section 3.76 using Method 1.

Fugitive emissions related to the metering facilities at Crib Point and Pakenham have been determined in accordance with the NGERS (Measurement) Determination 2008, Section 3.77 using Method 2. This method requires adoption of the American Petroleum Institute's (API) Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry 2009, with reference to Sections 5 and 6.1.2. This method allows fugitive emissions factors to be incorporated for individual equipment components that make-up the Crib Point and Pakenham facilities. Table 6 shows the relevant emissions factors used in the assessment.

Table 6: Emission factors; fugitive emissions

Activity	Scope 1	Reference
Natural gas transmission in a pipeline (tCO_2-e/km of pipe)	10.42	NGERS (Measurement) Determination 2008, Section 3.76; Method 1
Meter/Regulation stations (tCO_2-e/station)	28.69	NGERS (Measurement) Determination 2008, Section 3.77; Method 2 - API Compendium, Section 6.1.2, Table 6.6

Further research has been conducted to benchmark the NGERS Method 1 and Method 2 emissions factors against the Intergovernmental Panel on Climate Change (IPCC) methodology. The IPCC factors are detailed in Table 7 and provide context for the methodologies adopted in the calculation of fugitive emissions for this assessment.

Table 7: Fugitive emissions factors using various accepted methodology

Activity	NGERS Method 1[2]	NGERS Method 2[3]	IPCC 1996 Guidelines[4] (Low)	IPCC 1996 Guidelines (Med)
Natural gas transmission in a pipeline (tCO_2-e/km of pipe)	10.42	0.1655	7.510	75.10
Metering and regulation equipment fugitive emissions (tCO_2-e/station	n/a	28.689	16.88	84.41

Transport fuel emissions

Emissions factors relating to transport fuel (Table 8) have been determined in accordance with the NGERS (Measurement) Determination 2008 and drawn from the NGAF July 2018. Transport emissions relate to the APA survey vehicles inspecting the pipeline, nitrogen and odorant delivery vehicles and general staff movements from Dandenong to Crib Point.

[2] NGERS (Measurement) Determination 2008, Section 3.77
[3] API Compendium, Section 6.1.2, Table 6.6
[4] Revised 1996 Guidelines for Nation GHG Inventories – Table 2.18 Classification of gas losses as either low, medium or high at selected Natural Gas Facilities

Table 8: Emission factor for diesel oil as a transport fuel

Activity	Emissions Factor (kg CO_2-e/GJ)	Reference
Diesel Oil	70.51	National Greenhouse Account Factors July 2018, Section 2.2, Table 4; Post-2004 Vehicles

3. Assumptions and limitations

Crib Point receiving facility

The receiving facility at Crib Point is proposed to house a metering and odorant facility fed directly from the offshore FSRU, a vent stack and a nitrogen storage facility.

Metering and odorant facility

The energy demand of the metering and odorant facility has been estimated based on input provided by APA based on the expected operational demands of the facility as summarised in Table 9.

Table 9: Annual estimated energy consumption at Crib Point metering and odorant facility

Use	Annual Energy Consumption (kWh/annum)	Source	Status
Metering & Odorant Facility	271,560	Grid Electricity	Included

Odorant will be supplied to the Crib Point receiving facility every two months on a heavy ridged vehicle from a 3rd party supplier in Dandenong, as per the assumptions in Table 10.

Table 10: Odorant delivery vehicle movements

Use	Vehicle/Fuel Type	Trip Distance (km)	Frequency (delivery per annum)	Fuel Economy (L/100km)[5]	Source	Status
Delivery of odorant	Heavy Rigid	92.2	6	46.3	Diesel Oil	Included

Nitrogen storage facility

The energy demand of the proposed nitrogen storage facility at Crib Point is based on the expected operational demands provided by APA via email on 1 August 2018 with further clarifications provided on 6 August 2018.

The proposed nitrogen facility will consume approximately 60kW at peak operation. Table 11 and Table 12 set out the assumed energy use and transport activities used to estimate GHG emissions related to the Nitrogen facility.

Table 11: Annual estimated electricity consumption of the nitrogen facility

Nitrogen Storage Facility	Annual Energy Consumption (kWh/annum)	Source	Status
Scenario 1	336,960	Grid Electricity	Included
Scenario 2	224,640	Grid Electricity	Included
Scenario 3	Not operational	-	-

[5] Reference vehicle MAN TGS 26.480 6x4 BLS LX Efficient Line

Table 12: Nitrogen delivery vehicle movements

Delivery of nitrogen	Vehicle/Fuel Type	Trip Distance (km)	Frequency (delivery per annum)	Fuel Economy (L/100km)[6]	Source	Status
Scenario 1	Heavy Rigid	85.6	786	46.3	Diesel Oil	Included
Scenario 3	Heavy Rigid	85.6	524	46.3	Diesel Oil	Included
Scenario 3	Not required	-	-	-	-	-

Venting stack

The venting stack located at the Crib Point facility is connected to the jetty piping, station piping and meter run piping. The jetty and station piping venting is only used in emergency situations and the frequency of occurrence is expected to be greater than every 10 years. The meter run piping is only expected to be vented in the situation of a meter replacement. This is also expected to be infrequent.

The venting stack fugitive emissions have therefore been excluded from the annual operational emissions calculations within this assessment due to their immateriality.

Crib Point Pakenham pipeline

The approximately 56 km 600DN steel pipeline used to transfer the rich natural gas from the Crib Point facility to the Pakenham facility is subject to fugitive emissions through operational leakage in valves and piping connections.

Pakenham delivery facility

Metering facility

The energy demand of the metering facility at Pakenham has been estimated based on the APA engineering team calculation of peak energy demand, outlined in Table 13.

Table 13: Annual estimate energy of the Pakenham metering facility

Use	Peak Energy Demand (kW)	Operational Days (days/annum)	Annual Energy Consumption (kWh/annum)	Source	Status
Metering Facility	114	365	998,640	Grid Electricity	Included

Water bath heater

The Pakenham facility includes a water bath heater which is used to heat the natural gas to prevent condensation forming in the pressurisation process. The Natural Gas demand for the water bath heater has been based on the expected seasonal operation of the heater, provided by APA via email on the 6 August 2018, outlined in Table 14

Table 14: Annual estimated energy consumption of the heated water bath

Water bath heater	Annual Energy Consumption (GJ/annum)	Source	Status
Scenario 1	7,540	Natural Gas	Included

[6] Reference vehicle MAN TGS 26.480 6x4 BLS LX Efficient Line

Water bath heater	Annual Energy Consumption (GJ/annum)	Source	Status
Scenario 2	7,326	Natural Gas	Included
Scenario 3	6,899	Natural Gas	Included

Venting stack

The venting stack located at the Pakenham facility is connected to the filter, meter run, heater and FCV run piping. The meter and FCV pipe venting is only expected to occur in the event of a meter replacement which is infrequent and not part of normal operations. The venting stack fugitive emissions for the meter and FCV piping have therefore been excluded from the annual operational emissions calculations within this assessment.

The filter and heater pipe venting occur for regular maintenance at 4 yearly intervals, or if required due to filter blockages. Table 15 outlines the estimated vented gas per annum at the Pakenham facility. This calculation indicates the immateriality of the emissions and has therefore been excluded from the assessment.

Table 15: Average annual gas venting for maintenance at the Pakenham facility

Use	Pipe run volume (m^3)	Frequency of venting	Average annual volume of gas vented (kg/annum)	Source	Status
Pakenham vent stack	1.4 (filter) 2.9 (heater)	Every 4 years	0.765	Natural Gas	Excluded

Operations and maintenance

Pipeline surveys

Surveys of the pipeline will be undertaken by APA staff monthly, once the plant is in operation. Assumptions for associated vehicle emissions are outlined in Table 16. The survey distance is based on a return trip along the entire length of the pipeline.

Table 16: Survey vehicle assumptions

Use	Vehicle / Fuel Type	Survey Distance (km)	Frequency	Fuel Economy (L/km)[7]	Source
Pipeline Survey	Light / Diesel	2 x 55.6 (return trip)	monthly	9.2	Diesel Oil

Staff Operations

Staff will attend the Crib Point facility weekly in an APA owned dual cab vehicle from the Dandenong office. Assumptions for associated vehicle emissions are outlined in Table 17.

Table 17: Staff operational vehicle assumptions

Use	Vehicle / Fuel Type	Survey Distance (km)	Frequency	Fuel Economy (L/km)	Source
Staff Operations	Light / Diesel	2 x 42.6 (return trip)	Weekly	9.2	Diesel Oil

[7] Toyota Hilux SR5 2018 Model

4. Assessment

Scenario 1

Scenario 1 assumes 40 cargos of LNG per annum will be processed by AGL's FSRU, with up to 6 out of the 40 cargos composed of rich LNG. Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility. The quantified GHG emissions for scenario 1 are outlined in Table 18.

Table 18: Scenario 1 greenhouse gas emissions summary

Source	GHG Emissions Source	Scope 1 (tCO_2-e)	Scope 2 (tCO_2-e)	Scope 3 (tCO_2-e)
Indirect emissions from electricity				
Crib Point Nitrogen Facility	Grid Electricity	-	361	34
Crib Point Receiving Facility	Grid Electricity	-	291	27
Pakenham Delivery Facility	Grid Electricity	-	1,069	100
Stationary energy emissions				
Pakenham Water Bath Heaters	Natural Gas	389	-	29
Fugitive emissions				
Crib Point Metering & Odorant Plant	Natural Gas	29	-	-
Pakenham Metering Plant	Natural Gas	29	-	-
Pipeline Transmission	Natural Gas	580	-	-
Transport fuel emissions				
APA Survey Vehicles	Diesel	<1	-	<1
Nitrogen Delivery Vehicles	Diesel	85	-	6
General Staff Movements	Diesel	1	-	<1
Odorant Delivery Vehicle	Diesel	-	-	<1
Total				
Sub-totals		**1,112**	**1,720**	**197**
Total Scope 1+2		**2,831**		**-**
Total Scope 1+2+3		**3,029**		

Scenario 2

Scenario 2 assumes 40 cargos of LNG per annum will be processed by AGL's FSRU, with up to 4 out of the 40 cargos composed of rich LNG. Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility. The quantified GHG emissions for scenario 2 are outlined in Table 19.

Table 19: Scenario 2 greenhouse gas emissions summary

Source	GHG Emissions Source	Scope 1 (tCO_2-e)	Scope 2 (tCO_2-e)	Scope 3 (tCO_2-e)
Indirect emissions from electricity				
Crib Point Nitrogen Facility	Grid Electricity	-	240	23
Crib Point Receiving Facility	Grid Electricity	-	291	27
Pakenham Delivery Facility	Grid Electricity	-	1,069	100
Stationary energy emissions				
Pakenham Water Bath Heaters	Natural Gas	378	-	29
Fugitive emissions				
Crib Point Metering & Odorant Plant	Natural Gas	29	-	-
Pakenham Metering Plant	Natural Gas	29	-	-
Pipeline Transmission	Natural Gas	580	-	-
Transport fuel emissions				
APA Survey Vehicles	Diesel	<1	-	<1
Nitrogen Delivery Vehicles	Diesel	57	-	4
General Staff Movements	Diesel	1	-	<1
Odorant Delivery Vehicle	Diesel	-	-	<1
Total				
Sub-totals		**1,072**	**1,599**	**183**
Total Scope 1+2		**2,672**		**-**
Total Scope 1+2+3		**2,855**		

Scenario 3

Scenario 3 assumes 40 cargos of LNG per annum will be processed by AGL's FSRU, with all of the 40 cargos composed of lean LNG. Under scenario 3 there is no demand for nitrogen supply. The quantified GHG emissions for scenario 3 are outlined in Table 20.

Table 20: Scenario 3 greenhouse gas emissions summary

Source	GHG Emissions Source	Scope 1 (tCO_2-e)	Scope 2 (tCO_2-e)	Scope 3 (tCO_2-e)
Indirect Emissions from electricity				
Crib Point Nitrogen Facility	Grid Electricity	-	-	-
Crib Point Receiving Facility	Grid Electricity	-	291	27
Pakenham Delivery Facility	Grid Electricity	-	1,069	100
Stationary Energy emissions				
Pakenham Water Bath Heaters	Natural Gas	356	-	27
Fugitive emissions				
Crib Point Metering & Odorant Plant	Natural Gas	29	-	-
Pakenham Metering Plant	Natural Gas	29	-	-
Pipeline Transmission	Natural Gas	580	-	-
Transport fuel emissions				
APA Survey Vehicles	Diesel	<1	-	<1
Nitrogen Delivery Vehicles	Diesel	-	-	-
General Staff Movements	Diesel	1	-	<1
Odorant Delivery Vehicle	Diesel	-	-	<1
Total				
Sub-totals		**994**	**1,359**	**155**
Total Scope 1+2		**2,353**		**-**
Total Scope 1+2+3		**2,508**		

5. Conclusions

Table 21 summarises the estimate of operational GHG emissions related to each scenario assessed within this study. Scenario 1 is estimated to lead to the highest quantity of scope 1 and scope 2 GHG emissions (2,831 tonnes of CO_2-e pa). Scenario 1 is also the most likely operational scenario. Scenario 2 and 3 result in less overall emissions, due to the reduced demand of nitrogen required for rich LNG deliveries. Under the assumptions used in this assessment, the project is significantly under the 200,000 tonnes of CO_2-e limit.

For this study, Scope 3 emissions have also been assessed to understanding the project's wider impacts. Whilst there is an increase in total emissions if scope 3 emissions are include, the increase is not significant enough to reach the limit of 200,000 tonnes of CO_2-e as stipulated in the EEA.

Table 21: Summary of greenhouse gas emissions under each scenario

Source	GHG Emissions Source	Scenario 1 (tCO_2-e)	Scenario 2 (tCO_2-e)	Scenario 3 (tCO_2-e)
Indirect emissions from electricity				
Scope 2	Grid Electricity	1,720	1,599	1,359
Scope 3	Grid Electricity	161	150	127
Stationary energy emissions				
Scope 1	Natural Gas	389	378	356
Scope 3	Natural Gas	29	29	27
Fugitive emissions				
Scope 1	Natural Gas	637	637	637
Transport fuel emissions				
Scope 1	Diesel Oil	86	58	2
Scope 3	Diesel Oil	7	5	1
Total				
Scope 1		1,112	1,072	994
Scope 2		1,720	1,599	1,359
Scope 3		197	183	155
Total Scope 1+2		**2,831**	**2,672**	**2,353**
Total Scope 1+2+3		**3,029**	**2,855**	**2,508**

The assessment required a significant amount of assumptions on the operation of the proposed project to be made. It has drawn on data from the design stage of the project, as supplied by the APA engineering team to quantify estimated project emissions. Through the design and engineering for the final equipment and operational requirements, the actual emissions of the project will become known and are likely to change from this estimate.

The assessment shows the likely emissions are well below the EES referral limit and unless there is significant change to the design or operation of the project, the emissions are unlikely to exceed the 200,000 tonnes of CO_2-e per annum limit in isolation.

6. References

APA provided documents (various)

API, 2009: *API Compendium of GHG Emissions Methodologies for the Oil and Natural Gas Industry*, API, August 2009

NGERS, 2016: *National Greenhouse and Energy Reporting Scheme Measurement, Technical Guidelines for the estimation of emissions by facilities in Australia* NGERS Technical Guidelines, Australian Government, Department of the Environment and Energy, August 2016

NGERS, 2018: *National Greenhouse Accounts Factors, Australian National Greenhouse Accounts*, Australian Government, Department of the Environment and Energy, July 2018

ISO *14064-1:2006 Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*

JACOBS, 2018: *AGL Gas Import Jetty Project: Greenhouse Gas Emissions Assessment (including Climate Change)*, August 2018

Appendix A Calculations

Activity		Total Stationary Energy						Crib Point Nitrogen Facility			Crib Point Receiving Facility			Pakenham Delivery Facility			Pakenham Water Bath Heaters		
Emissions Source		Fuel Gas			Grid Electricity			Grid Electricity			Grid Electricity			Grid Electricity			Fuel Gas		
Scenario	Description	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
		tCO2-e			tCO2-e			tCO2-e			tCO2-e			tCO2-e			tCO2-e		
Scenario 1	**40 Cargos; 6 Rich; Trucks**	**389**	**-**	**29**	**-**	**1,720**	**161**	-	361	34	-	291	27	-	1,069	100	388.54	-	29.41
Scenario 2	**40 Cargos; 4 Rich; Trucks**	**378**	**-**	**29**	**-**	**1,599**	**149**	-	240	22	-	291	27	-	1,069	100	377.52	-	28.57
Scenario 3	**40 Cargos; 0 Rich; No Nitrogen**	**355**	**-**	**27**	**-**	**1,359**	**127**	-	-	-	-	291	27	-	1,069	100	355.48	-	26.90

Activity Data																						
LNG Supply			Crib Point Nitrogen Facility					Crib Point Receiving Facility			Pakenham Delivery Facility			Pakenham Water Bath Heaters WINTER				Pakenham Water Bath Heaters SUMMER				TOTAL	
Total LNG Cargos	Lean LNG Cargos	Rich LNG Cargos	Tank Refill Period	Enrichment Period	Peak Energy Demand	Operational Hours	Energy Demand	Peak Demand	Operational Hours	Electricity Consumption	Peak Demand	Operational Hours	Electricity Consumption	Lean Gas Demand	Lean Gas Operation	Rich Gas Demand	Rich Gas Operation	Lean Gas Demand	Lean Gas Operation	Rich Gas Demand	Rich Gas Operation	Total Fuel Gas Consumption	Fuel Gas Consumption
#	#	#	days/Rich LNG	days/Rich LNG	kW	hrs/annum	kWh/annum	kW	hrs/annum	kWh/annum	kW	hrs/annum	kWh/annum	MW	days/annum	MW	days/annum	MW	days/annum	MW	days/annum	MWh/annum	GJ/annum
40	34	6	30	9	60	5,616	336,960	31	8,760	271,560	114	8,760	998,640	8.0	128.5	11.3	54	2.5	182.5	3.5	-	2,094	7,540
40	36	4	30	9	60	3,744	224,640	31	8,760	271,560	114	8,760	998,640	8.0	146.5	11.3	36	2.5	182.5	3.5	-	2,035	7,326
40	40	-	30	9	60	-	-	31	8,760	271,560	114	8,760	998,640	8.0	182.5	11.3	-	2.5	182.5	3.5	-	1,916	6,899

Emissions Factors					
Natural Gas			Electricity		
Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
tCO2-e/GJ			tCO2-e/kWh		
0.05153	0	0.0039	0	0.00107	0.0001
0.05153	0	0.0039	0	0.00107	0.0001
0.05153	0	0.0039	0	0.00107	0.0001

Activity		Total Fugitive Emissions			
Emissions Source		Fugitive (Scope 1)			
Scenario	Description	NGERS Method 2	NGERS Method 1	IPCC Factors (Low)	IPCC Factors (Med)
		tCO2-e			
Scenario 1	**40 Cargos; 6 Rich; Trucks**	**66.58**	**579.35**	**451.30**	**4,344.12**
Scenario 2	**40 Cargos; 4 Rich; Trucks**	**66.58**	**579.35**	**451.30**	**4,344.12**
Scenario 3	**40 Cargos; 0 Rich; No Nitrogen**	**66.58**	**579.35**	**451.30**	**4,344.12**

Crib Point Metering & Odorant Plant				Pakenham Metering Plant				Pipeline Tranmission			
Fugitive				Fugitive				Fugitive			
Method 2	Method 1	IPCC Factors (Low)	IPCC Factors (Med)	Method 2	Method 1	IPCC Factors (Low)	IPCC Factors (Med)	Method 2	Method 1	IPCC Factors (Low)	IPCC Factors (Med)
tCO2-e				tCO2-e				tCO2-e			
28.69		16.88	84.41	28.69		16.88	84.41	9.20	579.35	417.53	4,175.30
28.69		16.88	84.41	28.69		16.88	84.41	9.20	579.35	417.53	4,175.30
28.69		16.88	84.41	28.69		16.88	84.41	9.20	579.35	417.53	4,175.30

Activity Data					
Crib Point Receiving Facility		Pakenham Delivery Facility		Crib Point Pakenham Pipeline	
Number of Plants	Operational Hours	Number of Plants	Operational Hours	Pipeline Length	Operational Hours
#	hrs	#	hrs		hrs
1.0	8,760	1.0	8,760	55.60	8,760
1.0	8,760	1.0	8,760	55.60	8,760
1.0	8,760	1.0	8,760	55.60	8,760

Emissions Factors						
Metering Plant (Method 2 - API)	Pipeline Transmission (Method 2 - API)	Pipeline Transmission (Method 1 - NGA)	Metering Plant (IPCC - Low)	Pipeline Transmission (IPCC - Low)	Metering Plant (IPCC - Med)	Pipeline Transmission (IPCC - Med)
Scope 1	Scope 1	Scope 1	Scope 1	Scope 1	Scope 1	Scope 1
tCO2-e/station/hr	tCO2-e/km/hr	tCO2-e/km	tCO2-e/station	tCO2-e/km	tCO2-e/station	tCO2-e/km
0.003275	0.000018893	10.42	16.88	7.51	84.41	75.10
0.003275	0.000018893	10.42	16.88	7.51	84.41	75.10
0.003275	0.000018893	10.42	16.88	7.51	84.41	75.10

Activity		Total Transport Emissions			APA Survey Vehicles			Nitorgen Delivery Vehilces			General Staff Movements			Odorant Delivery Vehicle		
Emissions Source		Diesel			Diesel			Diesel			Diesel			Diesel		
Scenario	Description	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
		tCO2-e			tCO2-e			tCO2-e			tCO2-e			tCO2-e		
Scenario 1	**40 Cargos; 6 Rich; Trucks**	**86.32**	**-**	**7.19**	0.33	-	0.03	85	-	6	1.20	-	0.09	-	-	0.70
Scenario 2	**40 Cargos; 4 Rich; Trucks**	**58.06**	**-**	**5.06**	0.33	-	0.03	57	-	4	1.20	-	0.09	-	-	0.70
Scenario 3	**40 Cargos; 0 Rich; No Nitrogen**	**1.54**	**-**	**0.81**	0.33	-	0.03	-	-	-	1.20	-	0.09	-	-	0.70

Activity Data															
APA Survey Vehicles							Nitrogen Delivery Vehicles								
Survey return distance	Frequency	Total Distance	Fuel Economy	Fuel Consumption	Fuel Energy	Total Fuel Energy	Survey return distance	Trucks per rich LNG	Number of Rich LNG	Frequency	Total Distance	Fuel Economy	Fuel Consumption	Fuel Energy	Total Fuel Energy
km/trip	trips/year	km/year	L/100km	L	GJ/kL	GJ	km/trip	#	#	trips/year	km/year	L/100km	L	GJ/kL	GJ
111.2	12	1,334	9.2	122.76	39	4.74	85.60	131	6	786	67,282	46.3	31,151	38.60	1,202
111.2	12	1,334	9.2	122.76	39	4.74	85.60	131	4	524	44,854	46.3	20,768	38.60	802
111.2	12	1,334	9.2	122.76	39	4.74	85.60	131	-	-	-	46.3	-	38.60	-

General Staff Movements							Odorant Delivery Vehicle						
Survey return distance	Frequency	Total Distance	Fuel Economy	Fuel Consumption	Fuel Energy	Total Fuel Energy	Survey return distance	Frequency	Total Distance	Fuel Economy	Fuel Consumption	Fuel Energy	Total Fuel Energy
km/trip	trips/year	km/year	L/100km	L	GJ/kL	GJ	km/trip	trips/year	km/year	L/100km	L	GJ/kL	GJ
92.4	52	4,805	9	442.04	39	17.06	92.2	6	553	46	256.13	39	9.89
92.4	52	4,805	9	442.04	39	17.06	92.2	6	553	46	256.13	39	9.89
92.4	52	4,805	9	442.04	39	17.06	92.2	6	553	46	256.13	39	9.89

Emissions Factors		
Diesel		
Scope 1	Scope 2	Scope 3
tCO2-e/GJ		
0.07051	0	0.0053
0.07051	0	0.0053
0.07051	0	0.0053