8. Energy Use and GHG Emissions

8.1 General Information

This section has been compiled with reference to the Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency in Industry 2002 (PEM), National Greenhouse Gas Account Factors 2018 - 2019 and the State Environment Protection Policy (Air Quality Management) 2001 (SEPP – AQM). This assessment reviews the expected energy and non-energy related greenhouse gas emissions together with an assessment of best practice with respect to GHG emissions from the Project in accordance with the requirements of the EPA Guideline for Works Approval Application Publication 1658. It also reviews the potential impacts to and adaptive actions available to the WtE business as a consequence of climate change.

The WtE Project will be a classified as Scheduled Premise under the Scheduled Premises and Exemptions Regulations 2007 and as such will be subject to the Climate Change Act 2017. This Act includes long term carbon reduction targets and this WtE Project will assist Victoria meet its targets by reducing emissions from landfill and substituting energy generation from non-renewable resources.

Under the Environmental Effects Act 1978 the Minister may require the preparation of an Environmental Effects Statement (EES) where there is a likelihood of significant adverse effects to the environment and where potential greenhouse gas emissions exceed 200,000 tonnes of CO_2e/annum. The GHG assessment following indicates that this limit will not be exceeded and a requirement to complete an EES on GHG criteria should not be required.

8.2 Detailed Information - Energy Use and Greenhouse Gas Emissions

8.2.1 Scope and Boundary of Assessment

The scope of this assessment includes the construction and operation of the proposed REA WtE facility in Laverton North and considers all material sources of emissions. The assessment contrasts the proposed operation with a business as usual scenario where the waste is sent to landfill in western Melbourne, and where the electricity generated would be generated at typical Victorian emissions intensity.

8.2.2 Sources of Emissions

GHGs generated by this project will include:

- Carbon Dioxide (CO_2)
- Methane (CH_4) and
- Nitrous Oxide (N_2O)

The assessment has included Scope 1 (Direct Emissions), Scope 2 (Indirect Emissions) and Scope 3 (Other Indirect Emissions) emissions across the construction and operation of the facility over a nominal 25-year operational life.

8.2.3 Emissions Factors

Unless stated otherwise, all emission factors are taken from National Greenhouse Gas Accounts Factors July 2018 (NGA 2018) (Tables 8-1 – 8-6).

Emission Factor (kg CO_2e/GJ)									
		Scope 1				Source	Scope 3	**TOTAL**	Source
Source	Energy Content (GJ/tonne - solids) (GJ/kL - liquids)	CO2	CH4	N2O	Total CO2e (Scope 1)		CO2e	**CO2e**	
Combustion of Non-Biomass municipal materials	10.5	87.1	0.7	1.1	88.9	Table 1		**88.9**	No scope 3 estimate available
Combustion of Biomass municipal materials	12.2	0	0.7	1.1	1.8	Table 1		**1.8**	No scope 3 estimate available
Combustion of Diesel - stationary uses	38.6	69.9	0.1	0.2	70.2	Table 3	3.6	**73.8**	Table 40
Combustion of Dry Wood	16.2	0	0.1	1.2	1.3	Table 1		**1.3**	No scope 3 estimate available
Diesel Fuel - Heavy Vehicles (Euro IV or higher)	38.6	69.9	0.06	0.5	70.46	Table 4	3.6	**74.06**	Table 40
Diesel Fuel - Post-2004 Vehicles	38.6	69.9	0.01	0.6	70.51	Table 4	3.6	**74.11**	Table 40

Table 8-1: Emission Factors for fuel combustion on site

Emission Factor (kg CO_2e/kWh)			
	Scope 2	Scope 3	**TOTAL**
Electricity Consumption (in Victoria)	1.07	0.1	**1.16**

Table 8-2: Emission factor for electricity consumption (*sourced from Table 41*)

Emission Factor (t CO_2e / tonne of waste to Melbourne municipal landfill)		
	Scope 1	**TOTAL**
Emissions from residual waste sent to landfill		**0.778**

Table 8-3: Emission factor for waste sent to landfill in Municipal Melbourne - *Sourced from MRA Calculation; letter dated 21 August 2018 Appendix 14*

Emission Factor (W/m2)	
Site Office Power Use	21.3

Table 8-4: Emission factor for Site Office power consumption. *Sourced from Commercial Building Disclosure Program Review 2015*

Emission Factor (kg CO_2e / kg)	
Fine Aggregate	0.007584317
Coarse Aggregate	0.014458965
Cement	0.99393196
Steel	1.5469619

Table 8-5: Emission Factors for embedded emissions in construction materials ***- Sourced from IS Materials Calculator 23/11/18***

Truck Fuel Consumption		
Articulated Trucks	55.6	L/100km
Rigid Trucks	27.2	L/100km

Table 8-6: Truck Fuel Consumption - ***sourced from ABS Survey of Motor Vehicle Use June 2016***

8.2.4 Construction

During the construction phase the predominant source of emissions will be embedded emissions from the extraction and manufacturing of the construction materials. While final detailed design is yet to be completed, initial estimates of materials required for the project show that around 15,786 tonnes of high strength concrete and 2,286 tonnes of steel will be required. As can be seen in Table 8-7 below these two aspects will account for 88% of construction phase emissions.

Project Area	Emissions Source	Emissions (tonnes CO_2e)	Scope
Fuel Consumption	Construction plant and equipment	407.64	1
Electricity Use	Site Office	46.65	2 & 3
Materials	Steel & Concrete Production	6,524.78	3
Materials	Transport to site	406.43	3
Total		**7,385.5**	

Table 8-7: GHG emissions generated during construction phase

Other significant sources of emissions will include the transport of materials from their point of manufacture to the site, fuel consumed by construction vehicles throughout the construction phase and electricity required to operate the site office which will result in a total of 7,385.5 tonnes of CO_2e being released to atmosphere throughout the construction phase. Amortising the generation of CO_2e over the nominal 25 years operational life of the facility, results in the emission of 295.42 tonnes of CO_2e per year of operation.

8.2.5 Operation

The proposed facility will consume a nominal 600tonnes per day of residual MSW. This will constitute the vast majority of the fuel consumed by the facility over the course of a year as once started, the plant has been designed to supply all of its own electricity requirements and operate continuously for 12 months before requiring an annual shut down for maintenance and repair.

8.2.6 Start up

While the plant has been designed to only require a single start-up per year, for the purposes of the GHG inventory it has been conservatively assumed that two start-ups will be required per processing line. At start up the plant will require approximately: 60 tonnes of wood to heat the gasification chambers, 10,000L of diesel fuel to heat the secondary combustion chambers and approximately 25MWh of electricity to get up to full operation.

Once it reaches steady-state operation the plant will be self-sufficient and will require only the 600tonnes/day of MSW feedstock to continue operating. Table 8-8 shows the GHG emissions estimated for the two annual start-ups.

Source	Quantity required	Emission Factor (kg CO_2e/kWh or kg CO_2e/GJ)	GHG emissions (tCO_2e)
Electricity from Grid	33,600kWh	1.16	38.98
Diesel	21,176L	70.2	57.38
Wood	120 tonnes	1.3	2.53
Total			**98.88**

Table 8-8: Energy required and GHG emissions released as a result of start-up of the proposed facility

8.2.7 Operation – Facility Emissions

Once operational the plant will consume 600t/day of residual MSW, which at a split of approximately 65% biomass derived and 35% non-biomass derived (Appendix 7) will yield approximately 2,338GJ of energy per year. This energy will be used to create steam which will be used to spin a turbine to generate an estimated 137,600MWh of electricity. Of this the site will consume approximately 16,800MWh of electricity throughout the year to operate the plant, office and associated equipment, with the remaining 120,800MWh fed into the grid as renewable electricity.

Using the conversion factors from the July 2018 National Greenhouse Accounts Factors the operation of the proposed facility will generate approximately 59,198 tonnes of CO_2 equivalent per year of operations (Table 8-9).

Source	Annual Consumption	Energy (GJ	Emissions Factor (kg CO_2e/GJ)	GHG emissions (tCO_2e)
MSW - Biomass component	140,000t	1,708,000.00	1.8	3,074.40
MSW - Non biomass component	60,000t	630,000.00	88.9	56,007.00
Totals for Start-up	As per table above	2,938.69	As per table above	117.04
Annual total		**2,340,938.69**		**59,198.44**

Table 8-9: Summary of energy consumption and GHG emissions from operation

As biomass derived materials are considered to have a neutral CO_2 content the majority of GHG emission are expected to come from the gasification of non-biomass derived waste materials which will include items such as plastic films and other plastics not sorted for recycling, textiles, shoes and other non-biogenic materials. A detailed breakdown of the GHG inventory calculations can be found at appendix 14.

8.2.8 Operation - Waste Transport

Two aspects of waste transport have been included in the GHG inventory of this project: Transport of MSW to the plant and transport of PIW generated by the plant to a suitable landfill.

For delivery of MSW to the plant it has been assumed that; wastes for the plant will be sourced predominantly from the inner city and inner western Melbourne. These will be diverted from Wyndham City Council Landfill and that delivery will be in enclosed waste collection vehicles (Table 8-10).

Reduced waste transport emissions	
600	Tonnes / day
8	tonnes / garbage truck
75	Number of trips per day
41.8	Km / trip saved by going to REA rather than Wyndham Landfill
3,135	Km saved / day
1,045,000	Km Saved / year
248.24	kL of diesel saved / year
773.07	**Tonnes CO_2e saved per year**

Table 8-10: Impact on waste transport emissions from operation of the facility

For PIW disposal it has been calculated that at full production capacity of 600t/day the plant will generate 14.1t/day of boiler ash/Baghouse dust and that this will be required to be stabilised before it is transported to Lyndhurst landfill as Category B waste.

Emissions from Disposal of PIW	
PIW Ash generated /year (tonnes)	5640
Trips to Lyndhurst PIW landfill / year @30t / load	188
Km travelled to Lyndhurst	11674.8
Diesel consumed (kL)	6.4911888
Fossil Energy Consumed (GJ)	250.56
Emission Factor (kg CO_2e/GJ)	70.46
Annual GHG Emissions (Tonnes CO_2e)	**17.65**

Table 8-11: GHG emissions resulting from the transport of PIW to suitable disposal location

As can be seen in tables 8-10 and 8-11 it is anticipated that operation of the facility will have a net positive impact on GHG emissions, resulting in approximately 755.41t.CO_2e of emissions being avoided per year of operation.

8.2.9 Non-Energy Related GHG emissions

Direct non-energy related GHG emissions from the plant will be minimal as the waste storage hopper will be under negative pressure, with air from this area being used to supply feed air into the gasifier and secondary oxidation chamber, meaning that any fugitive methane or other waste gases generated will be combusted prior to discharge to atmosphere.

8.2.10 Total GHG emissions generated by construction and operation of the facility

Taking all sources of GHG emissions set out above, it is anticipated that the construction and operation of the proposed facility will result in the generation and emission of 59,493t.CO_2e per year (Table 8-12).

Scope 1, 2 and 3 Emissions from REA Facility		
Emission Source	Annual emissions	Unit
Processing of Residual MSW	59,081.40	tonnes CO_2e
Emissions from facility start up	59.91	tonnes CO_2e
Electricity required from NEM	57.13	tonnes CO_2e
Transport of PIW for disposal	17.65	tonnes CO_2e
Amortised Construction emissions	295.42	tonnes CO_2e
Total Annual GHG Emissions	**59,493.36**	**tonnes CO_2e**

Table 8-12: Total Annual GHG emissions (scope 1, 2 & 3)

8.2.11 Impact of proposal on total GHG emissions

On a larger scale, the plant will result in a net reduction of CO_2 emissions. As the operation of the plant will reduce the creation and emissions of fugitive methane to atmosphere from waste that would otherwise be sent to landfill, will reduce waste transport distances, and will generate over 120MWh of electricity for the grid at less than half the current Victorian emissions intensity (Table 8-13).

The REA proposal will generate a net 120,800MWh of electricity per year that will be dispatched to the grid. At current Scope 2 and 3 emissions intensity for electricity generation in Victoria of 1.16t.CO_2e/MWh, this will result in the avoidance of releasing 140,128 tonnes of CO_2e per year of the project's operation.

Electricity Generation and Dispatch to Grid	
137,600.00	total MWh generated
16,800.00	MWh consumed internally
120,800.00	MWh to grid / year
140,128.00	**tCO2e / year to generate this amount of power at normal emissions intensity in Victoria**

Table 8-13: GHG emissions avoided through operation of the REA facility

Work completed by MRA Consulting Group to assess emissions from Victorian landfills (Appendix 14) has shown that currently each tonne of residual MSW sent to landfill in metropolitan Melbourne releases approximately 0.778tonnes of CO2e to the atmosphere (Table 8-14).

Emissions generated from landfill in Municipal Melbourne (t CO2e)	
600	tonnes / day
200,000	tonnes / year
0.778	Emission Factor (t CO2e / tonne)
155,600.00	**t CO2e released if waste went to landfill**

Table 8-14: GHG emissions avoided through diversion of waste from landfill

Using the figures above, the proposed facility will reduce this to 0.296 tonnes CO_2e per tonne of MSW treated through the plant. This will result in a net reduction in emissions of 143,252 tonnes of CO_2e per year of the project's operation (Table 8-15).

Scope 1, 2 and 3 Emissions avoided by operation of REA Facility		
Emission Source	Annual Emissions	Unit
Electricity sourced from NEM	140,128	tonnes CO2e
GHG emissions from Landfill	155,600.00	tonnes CO2e
Transport Emissions	773.06	tonnes CO2e
Total Annual GHG Emissions Avoided	**296,501**	**tonnes CO2e**

Table 8-15: Gross annual GHG emissions avoided by the operation of the ERA proposal over BAU

Summing all GHG emissions avoided gives gross total of 296,501 tonnes of CO_2e that will be saved by the project per year when compared to the business as usual (BAU) scenario of transporting waste to landfill and sourcing electricity from the grid.

Subtracting emissions generated by the proposal from the emissions avoided by the proposal, the net impact of the project is an annual saving of just over 237,000 tonnes of CO_2e per year of operation of the plant. Which at a nominal 25-year lifespan, results in a net project benefit of over 5,925,000 tonnes of CO_2e emissions avoided.

Total Impact of REA Facility on GHG emissions from disposal of 600t/day of residual MSW (t CO2e / year)	
GHG Emissions Generated	59,493.36
GHG Emissions Avoided	296,501.06
Net annual emission reduction over BAU	**237,007.70**

Table 8-16: Net Annual Emissions Reduction over Business as Usual

8.2.12 Best Practise Energy and GHG Management

REA are committed to assessing and utilising the most energy efficient equipment that is available and economically viable for this project.

Section 7.4.2 compares the proposed WtE to best practise in the European Union and indicates that it is consistent with Best Available Technology.

Section 7.7 discusses the choice of gasifier technology over other thermal treatment pathways and indicates that the key consideration for the choice of gasification over incineration was the requirement for relatively small scale MSW processing facilities that could be scaled to accept MSW from a small number of Council areas. The basis of this key consideration was limiting the distance

MSW would be transported to save on energy and GHG generation and to ensure that the burden and impacts of waste management are shared fairly across the community.

The EPA require an assessment of thermal efficiency based on the calculation of the R1 Efficiency Indicator as defined in European Union's Waste Framework Directive 2008/98/EC (WID). For a plant to be considered a genuine energy recovery facility, R1 will be expected to be equal to or above 0.65.

The R1 factor has been calculated for this project based on the characteristics of the MSW assessed by HRL. The details of this calculation are presented in Appendix 6. The calculation estimates an R1 factor of 0.746 which is above the requirement for the plant to be considered a genuine energy recovery facility but slightly lower than might be expected.

The R1 factor is slightly lower than what it could be as a direct result of the decision by REA to install air cooled chiller condensers instead of water cooling towers. Water cooling towers consume substantially less power than the air cooled system but use large quantities of water through evaporation and blowdown. Adopting air cooled systems effectively reduces mains water consumption by +60%. While this results in higher energy consumption and a lower R1 factor it minimises external resource use substituting for increased energy use which is produced internally.

8.3 Climate Change – Impacts and Adaption

While the above analysis of GHG emissions details a reduction in emissions compared to a business-as-usual approach and that this will contribute to the Victorian Governments objective of long term carbon reduction target of net zero emissions by 2050[81], climate change is a reality and the Climate Change Act 2017 requires that "Decision makers must have regard to climate change". Section 17 of the Act requires that "*A person making a decision or taking an action referred to in subsection (1) must have regard to—*

(a) the potential impacts of climate change relevant to the decision or action; and

(b) the potential contribution to the State's greenhouse gas emissions of the decision or action"

Section 8.2 described the contribution to the State's greenhouse gas emissions. This section of the WAA addresses the potential impacts of climate change on the project and the adaptive measures required.

8.3.1 Climate Change Projections

Climate projections for this section of the report have been obtained from the publications of the Department of Environment Land Water and Planning (DELWP). Documents specific to Greater Melbourne are provided on the Climate Ready web site which provide climate data projections[82] as well as advice on what aspects of a business should be assessed "*and what climate change responses might work for your situation"*[83].

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[81] Victorian State Government *Climate Change Act 2017*
https://www.climatechange.vic.gov.au/legislation/climate-change-act-2017

[82] Climate-Ready Victoria – Greater Melbourne Climate Projections Data Sheet, November 2015
https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0021/60753/Greater-Melbourne-Data-sheet.pdf

[83] Climate-Ready Victoria – Greater Melbourne Climate Change, November 2015
https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0019/60742/Greater-Melbourne.pdf

These publications detail various aspects of climate change on an annual and seasonal basis. They include projections for 2030 and 2070. Table 8-17 summarises the projected changes.

Climate Parameter	Projection through till 2070
Average Temperature	Average temperatures will rise around 0.85ºC by 2030 and 2ºC by 2070. Extreme temperatures are likely to increase at a similar rate to average temperature. There will be a substantial increase in the temperature reached on hot days. There will be more hot days (greater than 35°C), and warm spells will last longer.
Average Rainfall	Rainfall will fall by around 1.3% by 2030 and nearly 4% by 2070. The frequency and intensity of extreme rainfall events are projected to rise. Time spent in drought is projected to increase over the course of the century.
Evaporation	Evaporation will increase by around 3.5% by 2030 and 8.6% by 2070.
Wind speed	Wind speeds will remain fairly stable with some projections showing a slight increase
Relative Humidity	Relative humidity will reduce by around 0.9% by 2030 and 1.9% by 2070
Solar Radiation	Solar Radiation will increase by around 1.8% by 2030 and 3.3% by 2070
Soil Moisture	Soil moisture will reduce by around 2.7% by 2030 and 4.6% by 2070

Table 8-17: Projected Changes in Climate Parameters by 2070

The climate projections predict a generally drying climate with higher temperatures and lower rainfall with more intense climate events – hot spells will be more common and last longer, rainfall when it occurs will be more intense, and periods of drought will be more common. The climate of Melbourne will more closely resemble the present climate of Adelaide by the end of this century.

These projected changes in weather conditions are likely to result in:

- Increase frequency of extreme rainfall events resulting in flooding;
- More frequent drought resulting in more high fire risk days with more extreme risk days likely;
- Sea levels will continue to rise and could increase by as much as 0.89 meters under the high emissions projection.

8.3.2 Aspects of the WtE Facility Potentially Impacted by the Projected Changes in Climate.

The detailing of the predicted changes in climate could potentially impact on a range of aspects in the operation of the WtE facility. These generally relate to:

- Logistics- the ability to receive residual MSW at the site;
- Logistics - the ability to dispatch waste products generated in the process;
- Operation of the WtE facility - the impact on the characteristics of the residual MSW;
- Operation of the WtE facility – the ability of the facility to operate within its design parameters;
- Operation of the WtE facility – the ability of the facility to maintain energy output and distribution of electricity, steam or heating;
- Control of emissions – the impact on emissions and the ability of the facility to meet its emission limits in the changing environment.

8.3.3 Climate Change Risk Assessment for the WtE Project

Identification of the projected changes in climate parameters combined with detailing those aspects of the operation of the facility that have the potential to be impacted by these changes has allowed the development of a climate change risk assessment for the proposed project. There are a wide range of potential risks but most of these are insignificant and the following analysis evaluates those risks which the project team have assessed as of sufficient significance to require further analysis.

Table 8-18 presents the identified risks and then details how the proposed WtE facility will accommodate the projected change and evaluates the risk to the project after consideration of the design and operational adaptions included within the facility. This table shows that the risks to the WtE facility from climate change are considered to be low.

Climate Variation	Aspect Impacted	Potential Risk	Risk Treatment	Risk Rating
More intensive rainfall events and flooding of site	Operations of the facility	Potential for flooding of site in general, potential for flooding of waste receival and waste pit	Site is located above 1:100 year flood levels. Storm impact assessment completed as part of the Planning Permit on 15th November 2018. Waste receival areas are raised above existing land surface minimising any flood potential. Waste pit is partially excavated into rock base but is sealed to prevent ingress of groundwater.	LOW
More intensive rainfall events and flooding of roadways	Ability to receive and consign waste	Potential flooding of road networks limiting supply of waste to facility, restricting dispatch of waste generated by facility	In general multiple road pathways to facility will allow alternative transport routes if some routes are closed due to flooding. Flooding of Alex Fraser Drive of Dohertys Road may restrict waste movements. Waste pit has 4 days storage capacity to provide a buffer. Unlikely at this location that road infrastructure into facility would be blocked for more than 24 hours.	LOW
More intensive rainfall events and flooding	Operations of facility – dispatch of electricity	Potential flooding of electrical dispatch infrastructure such as substations, transformers, switch yards.	Electricity distribution infrastructure on site all located above 1:100 year flood level. Drainage managed to ensure flood during intense rainfall does not occur. Possible impacts to regional or State infrastructure could limit transmission capacity	LOW
Drying climate (higher temperatures, evaporation, relative humidity etc. and lower rainfall)	Lower moisture content of residual waste	Likelihood that the residual waste will contain lower moisture levels which will result in a higher “as received” calorific value which may be outside the design envelope for the gasifier	The operating envelope of the WtE facility has taken into account reductions in moisture content of the waste and can accept a broad range of “as received” calorific values ranging from 6.6MJ/kg – 13.2MJ/kg. The slight drying of the waste will remain within the design calorific values but may allow for slightly higher energy production	LOW

Drying climate (higher temperatures, evaporation, relative humidity etc. and lower rainfall)	Operations of facility – water supply	Potential for increasing pressure on municipal water supplies which could limit supply to the WtE facility	The WtE facility requires around 100ML/annum for operations. Considerable effort has been made to minimise mains water usage with all waste water generated on site recycled into the process and air cooling installed in preference to water cooled cooling towers. Water supply is drawn from the Melbourne water infrastructure which includes substantial storage and a large desalination plant and it is therefore unlikely that the minor water demand from the WtE facility would result in water restrictions being applied.	LOW
Higher temperatures and increased incidence of heat wave conditions with more days and longer periods above 35°C	Operation of the facility – efficiency of facility operation	Higher ambient air temperatures may affect air cooling efficiencies for steam condensate, turbine efficiencies may be slightly lower – both of which could translate to slightly lower electricity generation. Potential for electrical transmission infrastructure to be negatively affected (substations, transformers)	While air cooled condensers are more vulnerable to increased ambient temperatures they have been designed to operate reliably and continuously at the maximum recorded temperature at Laverton North of 47.5°C. Temperature projections indicate that Melbourne could expect up to 17 days greater than 35°C (compared to 8 days currently) by 2070. While reduced generation capacity is likely to result from prolonged very hot weather this will only impact minimally on project finances and not on operational capacity.	LOW
Higher temperatures and increased incidence of heat wave conditions with more days and longer periods above 35°C	Operation of the facility – waste storage prior to treatment	May result in more odours being generated from the organic components of the waste.	The WtE facility waste receival and storage areas are designed to be under negative pressure with air drawn from these areas for the gasifier and secondary combustion chamber where the odour forming substances are destroyed. While odour generation may increase with higher temperatures it is unlikely that this odour will escape from the facility.	LOW

Higher temperatures and increased incidence of heat wave conditions with more days and longer periods above 35°C	Operation of the facility – fire risk to facility	WtE facility located in relatively unoccupied industrial zone. Potential for grass fires to develop and impact on facility operations either through direct combustion or through smoke. Risk reduces as more industry develops in the industrial zone	The WtE site is not subject to a bush fire overlay a fire management plan will be developed for the facility. While the focus of this plan is the operational requirements of the facility it will include consideration and provide management options to minimise the risk of fire entering the perimeter of the occupied land.	LOW
Higher temperatures and increased incidence of heat wave conditions with more days and longer periods above 35°C	Operation of the facility – fire risk supply of residual waste	Potential for increased risk of local grass or structural fires which could limit access of waste delivery to the facility. Increasing fire risk may impact on road infrastructure and reduce access to the site for waste delivery vehicles.	Increased fire risk for Metropolitan Melbourne has the potential to disrupt traffic and close some access routes for delivery/disposal vehicles through smoke or direct fire activity. Many alternative routes are available so it is unlikely that increased fire risk will result in major disruptions to deliveries to the WtE facility	LOW
Higher temperatures and increased incidence of heat wave conditions with more days and longer periods above 35°C	Operation of the facility – fire risk to electricity infrastructure	Potentially increased risk to electricity distribution infrastructure which may impact on generation capacity	WtE site electrical infrastructure will be located within hardstand areas where the potential for fire impacts from outside the premises will be minimal. Offsite infrastructure could be impacted by major fires which could temporarily limit transmission capacity.	LOW
Lower wind speeds	Operation of the facility – control of emissions	Lower wind speeds may impact on the dispersal of stack emissions	Climate projections predict only minor changes in wind conditions and these changes are already accounted for in the emissions modelling which predict conditions for maximum air quality impacts.	LOW

Reduced soil moisture	Operation of the facility – risk of destabilising infrastructure	General drying of the soil could impact on the stability of foundations, hard stand areas etc. Drying soils have the potential to shrink and in the worst case could destabilise foundations and hard stand areas. This may result in increased maintenance costs and in the worst case temporary facility closure until stability issues are rectified.	Site drilling has been undertaken to assess the foundation substrate and the foundation and hardstand design will include consideration of the potential for shrinkage and foundation stability. Over much of the site, basaltic bed rock is close to the surface and foundation will be based on this material rather than the overlying clays minimising any major impacts of drying conditions.	LOW
Sea level rise	Ability to receive waste	Potential for some disruption to supply of residual waste from those councils with coastal communities particularly when combined with high tides and storm surges.	Areas affected within the supply zone for the proposed WtE facility are very small and it is likely that impacts of sea level rise will be associated with other climate events like storms which will be of short duration. Unlikely to have a significant effect on supply of residual waste to the WtE facility	LOW

Table 8-18: Identified risks from Climate Change and Proposed Mechanisms to minimise Impacts of Climate Change