Melbourne Energy and Resource Centre: Air Quality Assessment

Prepared for:

Cleanaway Operations Pty Ltd

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Final

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Glossary

Term	Definition
µg/m³	micrograms per cubic metre
µm	microns
°C	degrees Celsius
km	kilometre
km/h	kilometre per hour
kPa	kilopascals
m	metre
m/s	metres per second
m²	square metres
m³	cubic metres
m³/s	cubic metres per second
mg/m³	milligram per cubic metre
MJ/lg	megajoules per kilogram
MW	megawatt
% O_2	percent oxygen content
ppm	Parts per million
ppb	parts per billion
tpa	tonnes per annum
Tph	tonnes per hour

Nomenclature	Definition
As	Arsenic
BaP	Benzo(a)pyrene
Cd	Cadmium
CO	Carbon monoxide
Cr	Chromium
Cu	Copper
HCl	Hydrogen chloride
HF	Hydrogen fluoride
Hg	Mercury
LOI	loss on ignition
Mn	Manganese
NH_3	Ammonia
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O_3	Ozone
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PCBs	Polychlorinated biphenyls
PCDD/F	Polychlorinated dioxins and furans
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
Sb	Antimony
SO_2	Sulfur dioxide
TVOC	total volatile organic carbon
TSP	total suspended particulate
VOC	volatile organic compounds

Abbreviations	Definition
AAQ NEPM	National Environment Protection (Ambient Air Quality) Measure
ABS	Australian Bureau of Statistics

Term	Definition
APAC	Air pollution assessment criteria
APCr	Air pollution control residues
AWS	Automatic weather station
BAT	Best Available Techniques (refer BREF)
BoM	Bureau of Meteorology
BREF	Best Available Techniques Reference documents (developed under the European Integrated Pollution Prevention and Control Bureau Directive and the Industrial Emissions Directive)
BREF WI	BREF for Waste Incineration Facilities
CDMP	Construction Dust Management Plan
CEMS	Continuous Emissions Monitoring System
C&I	Commercial and industrial
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EP Act	*Environment Protection Act 2017*
EPR	Environmental Performance Requirements
ERS	Environment Reference Standard
FGT	Flue Gas Treatment stack
FGTR	Flue Gas Treatment Residuals
GED	General Environmental Duty
IAQM	Institute of Air Quality Management
IBA	Incinerator bottom ash
IED	EU Industrial Emissions Directive
IRSD	Index of relative socio-economic disadvantage
LP1	Load point 1
LP2	Load point 2
MERC	Melbourne Energy and Resource Recovery Centre
MSW	Municipal solid waste
NEPC	National Environment Protection Council
NPI	National Pollutant Inventory
NTP	Normal Temperature and Pressure, 0 degrees Celsius & 101.325 kPa
SEIFA	Socio-economic indexes for areas
SEPP AQM	*State Environment Protection Policy (Air Quality Management)*
SWRRIP	Statewide Waste and Resource Recovery Infrastructure Plan
WtE	Waste-to-energy

EXECUTIVE SUMMARY

Cleanaway Operations Pty Ltd (Cleanaway), an Australian waste management, recycling, and industrial services company, is developing a waste-to-energy (WtE) facility in Victoria known as the Melbourne Energy and Resource Centre (the Proposal). The Proposal is located at 510 Summerhill Road, Wollert.

The Proposal will be designed to thermally treat 380,000 tonnes per annum (tpa) of residual Municipal Solid Waste (MSW) and residual Commercial and Industrial (C&I) waste streams that would otherwise be sent to landfill.

Katestone Environmental Pty Ltd (Katestone) has been commissioned by Cleanaway to conduct air quality, odour and plume visibility assessments in order to support approvals with the Environmental Protection Authority (EPA) Victoria.

The air quality assessment has been conducted to satisfy a Level 2 Assessment as defined in EPA Victoria's Guideline for assessing and minimising air pollution in Victoria (Publication 1961).

The air quality assessment has investigated the potential for the Proposal to affect air quality during construction and operations.

The potential impacts of dust emissions during construction of the Proposal have been assessed using a risk-based methodology. This is appropriate due to the temporary nature of the proposed construction activities, and well-established mitigation measures that can be applied to minimise potential dust emissions.

The potential impacts of emissions during operation of the Proposal have been assessed using a dispersion modelling approach. Five consecutive years of meteorological data from the BoM's monitoring station at Melbourne Airport has been used in the dispersion modelling. Emissions of key pollutants have been assessed for three scenarios:

- Load point 1 (LP1) daily average emission concentration limits
  - Nominal waste throughput.
  - BREF, 2019 - daily average (upper) concentration limits
  - Both lines assumed to be at the daily average (upper) concentration limits.
- LP1 – short-term emission concentration limits
  - Nominal waste throughput.
  - EU IED (2010) - short-term (30-minute average) emission limits to reflect variability in a line due to non-routine operations. Only one line will be operating at short-term emission limits whilst the other line will be operating at the daily average (upper) concentration limit.
  - These emissions would be short in duration (30-minute) due to the management and mitigation measures (as detailed in Section 11) to be employed by the Proposal.
- LP2 – daily average operations.
  - Maximum waste throughput.
  - BREF, 2019 – daily average (upper) concentration limits.

The regulatory-approved dispersion model, AERMOD, has been used to predict ground-level concentrations of air pollutants. Background levels of air pollutants have been accounted for by explicitly modelling adjacent industry and adding ambient backgrounds from the EPA Victoria's ambient air monitoring station at Alphington. Predicted concentrations have been compared with the relevant APAC both health-based and environmental.

Odour from the Proposal has also been assessed using a combination of risk assessment approaches.

For the Proposal's construction phase the air quality risk assessment identified the following:

- Without mitigation, the preliminary risk of dust soiling associated with the construction of the Proposal is low to medium
- Without mitigation, the preliminary risk to human health associated with the construction of the Proposal is low
- Without mitigation, the preliminary risk to ecological receptors associated with construction of the Proposal is low to medium
- A Construction Dust Management Plan (CDMP) will be implemented that includes mitigation measures for controlling dust. By implementing the CDMP, the risk of dust emissions from the Proposal's construction phase is low.

For the Proposal's operation phase the air quality assessment has identified the following:

- In terms of plume visibility:
    - The maximum height above ground at which the plume would be visible ranges from 69 m to 138 m above ground
    - The horizontal extent that the plume would be visible ranges from 1 metre to 123.5 m downwind, with an average horizontal extent of 28.8 m
    - In terms of the visible plume extending beyond the site boundary, site plans provided by Arup indicate that distance from the stack to the closest site boundary is 214 m. The modelling shows that the visible plume is contained within the Proposal area.
- With the Proposal operating at the daily average (upper) emission concentration limits as specified in the BREF:
    - Predicted ground-level concentrations of all air pollutants due to the Proposal in isolation comply with the relevant APAC and demonstrate that at the proposed emission concentration limits, the MERC WtE facility will make an insignificant contribution to local air quality and has minimal impact on the local airshed
    - Predicted cumulative ground-level concentrations of nitrogen dioxide (NO_2) comply with the relevant APAC across all sensitive receptors
    - Predicted cumulative ground-level concentrations of sulfur dioxide (SO_2) comply with the relevant APAC across all sensitive receptors
    - Predicted cumulative ground-level concentrations of carbon monoxide (CO) comply with the relevant APAC across all sensitive receptors
    - Existing 24-hour average ground-level concentrations of PM_{10} and $PM_{2.5}$ are higher than the relevant APAC. A contemporaneous assessment of the Proposal and the existing background concentrations of PM_{10} and $PM_{2.5}$ shows that there are no additional days when concentrations of PM_{10} or $PM_{2.5}$ are predicted to be higher than the 24-hour average air quality criterion as a result of the Proposal
    - Predicted cumulative ground-level concentrations of hydrogen chloride (HCl) comply with the relevant APAC across all sensitive receptors

- Predicted cumulative ground-level concentrations of hydrogen fluoride (HF) comply with the relevant health-based APAC across all sensitive receptors. The predicted 24-hour average concentrations of HF exceed the environmental APAC when considered cumulatively. This is due to the background concentration predicted to exceed the environmental APAC for HF due to the adjacent industry. The exceedance area is limited to within the boundary of the adjacent industry. Less than 0.01% of the maximum predicted 24-hour average concentration of HF is due to the Proposal.
    - Predicted ground-level concentrations of ammonia (NH_3) due the Proposal comply with the relevant APACs across all sensitive receptors
    - Predicted ground-level concentrations of total volatile organic compounds (TVOCs) due to the Proposal comply with the relevant APACS across all sensitive receptors
    - Predicted ground-level concentrations of polycyclic aromatic hydrocarbons (PAH) as benzo(a)pyrene due to the Proposal comply with the relevant APAC across all sensitive receptors
    - Predicted cumulative ground-level concentrations of dioxins and furans (PCDD/F) comply with the relevant APAC across all sensitive receptors
    - Predicted cumulative ground-level concentrations of metals comply with the relevant APAC across all sensitive receptors.
- With the Proposal operating at the LP1 short-term emission concentration limits as specified in the EU IED (2010):
    - Predicted ground-level concentrations of all air pollutants due to the Proposal in isolation comply with the relevant APAC
    - Predicted cumulative ground-level concentrations of all air pollutants comply with the relevant APAC across all sensitive receptors.
- Different calorific values of waste fuel do not significantly affect the emissions due to the Proposal (LP1 vs LP2) with predicted ground-level concentrations predicted to vary at most by 0.4% relative to APAC based on different calorific values of the waste fuel and despite a 20% increase in waste throughput associated with LP2.

In summary, the daily average AQ modelling results demonstrate that with the proposed emission limit settings, based on the upper end of the BAT-AEL range associated with implementation of BAT for emission control and flue gas treatment, the Proposal (in isolation) is predicted to have an insignificant impact on air quality, as measured against the relevant health-based and environmental based APACs. In conjunction with the proposed mitigation and risk management procedures the Proposal is expected to meet the requirements of the GED.

The air quality assessment has found that the risk of adverse odour impacts due to the Proposal is low.

The outcomes of the air quality assessment have provided the basis for the application of the following Proposed Safeguards and Environmental Management Measures for the Proposal.

- AQ01: Design of facility avoids release of dust, and controls and monitors emissions to air
- AQ02: Construction dust management plan
- AQ03: Construction environment management plan - air quality and GHG measures
- AQ04: Design of site layout avoids unnecessary excavation
- AQ05: Operating License - air quality conditions

- AQ06: Operational Environmental Management Plan - air quality and GHG measures
- AQ07: Proof of performance trials
- AQ08: Commissioning plan – air quality measures.

1. INTRODUCTION

Cleanaway Operations Pty Ltd (Cleanaway), an Australian waste management, recycling, and industrial services company, is developing a waste-to-energy (WtE) facility in Victoria known as the Melbourne Energy and Resource Centre (the Proposal). The Proposal is located at 510 Summerhill Road, Wollert.

The MERC has been designed to thermally treat a design capacity of 380,000 tonnes per annum (tpa) of waste feedstock, consisting of residual Municipal Solid Waste (MSW) and residual commercial waste, which is waste that would otherwise be sent to landfill. Waste feedstock processed by the MERC will be subject to a Waste Acceptance Protocol to determine eligibility and suitability for processing both prior to arrival and upon arrival on-site.The Proposal will also incorporate maturation and processing of bottom ash to recover recyclable metals, with the intent to utilise the remaining ash as an aggregate in construction.

Katestone Environmental Pty Ltd (Katestone) has been commissioned by Cleanaway to conduct air quality, odour and plume visibility assessments in order to support the preparation of a Development Licence Application (DLA) under the *Environment Protection Act (2017)*.

This air quality and odour assessment comprises the following sections:

- General description of the Proposal (Section 2)
- Identification of applicable policies and legislation (Section 3)
- Description of the existing environment including local terrain and land-use, sensitive receptors, meteorology, and ambient air quality (Section 4)
- Outline of the methodology adopted for this assessment (Section 5)
- Assessment of construction (Section 6)
- Assessment of operations (Section 7)
- Assessment of odour (Section 8)
- Assessment of plume visibility (Section 9)
- Details of mitigation and risk management strategies and technology to be implemented at the Proposal (Section 11)
- Conclusions and recommendations (Section 12)
- Details of modelling inputs, tabulated results, and risk assessment methodologies (Appendices).

2. THE PROPOSAL

2.1 Overview

The MERC has been designed to thermally treat a design capacity of 380,000 tonnes per annum (tpa) of waste feedstock, consisting of residual Municipal Solid Waste (MSW) and residual commercial waste, which is waste that would otherwise be sent to landfill. Waste feedstock processed by the MERC will be subject to a Waste Acceptance Protocol to determine eligibility and suitability for processing both prior to arrival and upon arrival on-site. The Proposal will also incorporate maturation and processing of bottom ash to recover recyclable metals, with the intent to utilise the remaining ash as an aggregate in construction.

Residual waste is waste that is left over from recycling and resource recovery operations and waste from source separated collections. Source separation involves separating waste into common material streams or categories for separate collection. Waste processed at the site will be subject to a Waste Acceptance Protocol to ensure only appropriate waste is used as feedstock.

The WtE process would generate approximately 46.3MW gross of electricity, 4.7MW of which would be used to power the facility itself and the associated on-site by-product and residue handling processes, with 41.6MW (328,700 MWh/year) exported to the grid as base load electricity. In addition to supplying electricity to the grid, there is also potential to supply energy in the form of heat and/or process steam to local industrial users.

Some residual materials are produced because of the WtE process, including Incinerator Bottom Ash (IBA), boiler ash and flue gas treatment residue. The boiler ash and flue gas treatment residue are typically combined and together are referred to as Air Pollution Control residue (APCr). Overall, the WtE process typically leads to about 90% reduction in the volume, or 80% reduction in mass (tonnes), of waste that would otherwise go to landfill. If IBA is reused as an alternative construction product to virgin materials, this percentage increases further to approximately 95% reduction in volume and mass of waste that would otherwise go to landfill. The final volume of waste diverted from landfill is dependent on the classification and market for the residues and by-products generated by the WtE facility.

The Proposal includes the construction and operation of an IBA maturation and processing facility on site. The purpose of this facility is to store the IBA to mature (stabilise) it, before mechanically processing IBA from the WtE facility into an aggregate for reuse. As part of this process, both ferrous and non-ferrous metals will be recovered from the IBA for recycling and sale to market.

The Proposal also includes a stabilisation facility for APCr, a necessary treatment step to immobilise leachable components of the APCr prior to removal from site by vehicle and disposal at an appropriately licenced landfill.

The Proposal will use best available techniques and technologies in the engineering design, operation, maintenance and monitoring activities associated with the MERC.

Moving grate technology has been chosen as the means to thermally treat incoming waste to recover energy and other resources. Current international best-practice techniques, including automated combustion controls and advanced flue gas treatment technology will be applied so that air emissions meet stringent emission standards. The moving grate combustion system is a common form of thermal WtE technology in which the waste is fed through the combustion chamber on a travelling grate. This enables efficient and complete combustion of the waste, with primary combustion air introduced from below the grate and secondary combustion air introduced directly into the combustion zone above the grate. Moving grate technology has been used globally for over 100 years, and in that time the technology has been subject to continual improvement responding to regulatory, industry and public demands. There are approximately 500 similar operational examples across Europe alone, the majority of which use the moving grate-type technology being proposed for the MERC.

The Proposal involves the building of all onsite infrastructure required to support the WtE facility, including site utilities, internal roads, weighbridges, parking and hardstand areas, stormwater infrastructure, fencing and landscaping. The Proposal will also include a visitor and education centre to help educate and inform the community on the circular economy, recycling, resource recovery, the benefits of landfill diversion and the WtE process. The intent behind this education is to drive a shift in community thinking and actions around waste management.

The Victorian Waste to Energy Framework (2021) recognises the role of WtE to divert waste from landfills, helping Victoria transition to a circular economy. Recycling Victoria recognises a role for WtE investment and supports WtE facilities where they meet best-practice environment protection requirements. This includes reducing waste to landfill, supporting waste avoidance, reusing and recycling, and demonstrating social license with affected communities. The Victorian Environment Protection Authority (EPA) Energy from Waste Guideline (Publication 1559.1, 31 July 2017) also notes that efficient recovery of energy from the thermal processing of waste is considered a resource recovery as opposed to a waste disposal option.

EPA VIC publication 1559.1 stipulates that '*Proponents of EfW proposals…will be expected to demonstrate that the siting, design, construction and operation of EfW facilities will incorporate best practice measures for the protection of the land, water and air environments as well as for energy efficiency and greenhouse gas emissions management. Facilities should be able to provide evidence of how they minimise and manage emissions (including pollutants, odour, dust, litter, noise and residual waste) in accordance with relevant statutory requirements.*'

The Proposal has been designed to meet the European Industrial Emissions Directive (IED) (2010) and the associated Best Available Techniques Reference (BREF) Document for Waste Incineration published December 2019, which sets the European Union environmental standards for waste incineration. The Proposal has also been designed with reference to the technical criteria set out in the EPA VIC Energy from Waste Guideline (Publication 1559.1).

The purpose of this specialist assessment is to assess the proposed design to demonstrate compliance with the various authority requirements (Section 3), specifically including meeting the General Environmental Duty (GED), and to provide information to inform the application and community.

2.2 Proposal layout

The Proposal is located approximately 25 km north of Melbourne CBD in the suburb of Wollert and falls under the Whittlesea Local Government Area. The Proposal area design is depicted in Figure 1.

The Proposal area will incorporate the following key elements:

- Two-line WtE facility, with each line comprising: a combustor, boiler, flue gas treatment system, Induced Draft (ID) fan, Continuous Emissions Monitoring System (CEMS) and a dedicated flue. The processing capacity of each line will be approximately 190,000 tpa. The two lines will supply steam to a single steam turbine while flue gas will be discharged through a single stack containing two internal flues. Moving grate combustion will be employed as the preferred thermal treatment technology.
- Incinerator Bottom Ash (IBA) treatment area incorporating: a fully enclosed sorting facility, stockpiles for sorted and matured IBA, conveyor for delivery of IBA from WtE facility to the IBA treatment area, open-air IBA maturation piles (1-2 months) with dust control using spraying, and water capture system around the IBA treatment area.
- Air Pollution Control residues (APCr) stabilisation facility where treated APCr (a slurry of APCr, cement and water) is allowed to cure into solid blocks prior to transport offsite for landfill disposal.
- Spatial provision for a future Carbon Capture (CC) area (not part of the Proposal).
- Site infrastructure including roads, weighbridges, inspection bays, dangerous goods tanks, firewater and process water tanks, electrical substation, truck movement areas, offices, and parking spaces.

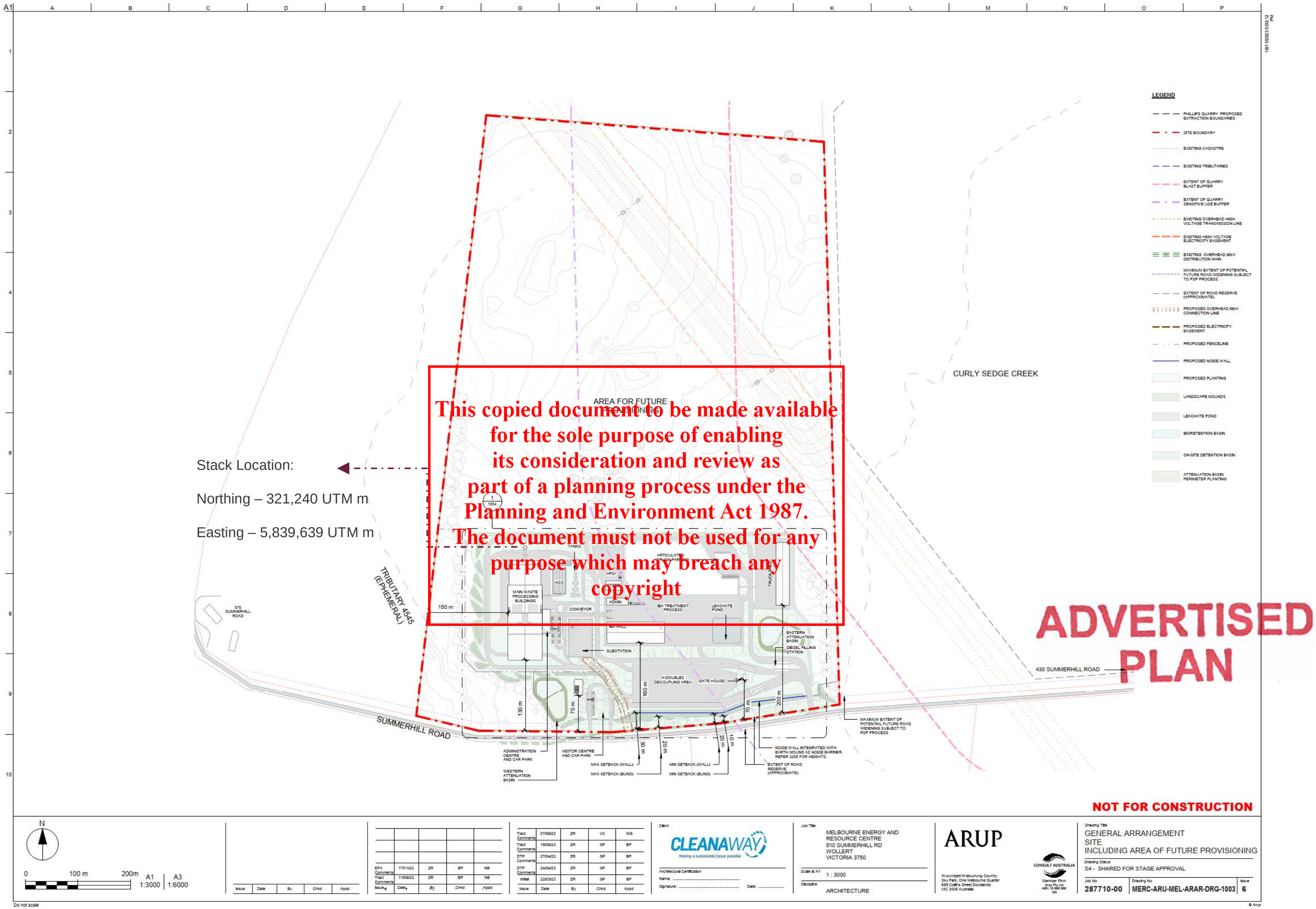


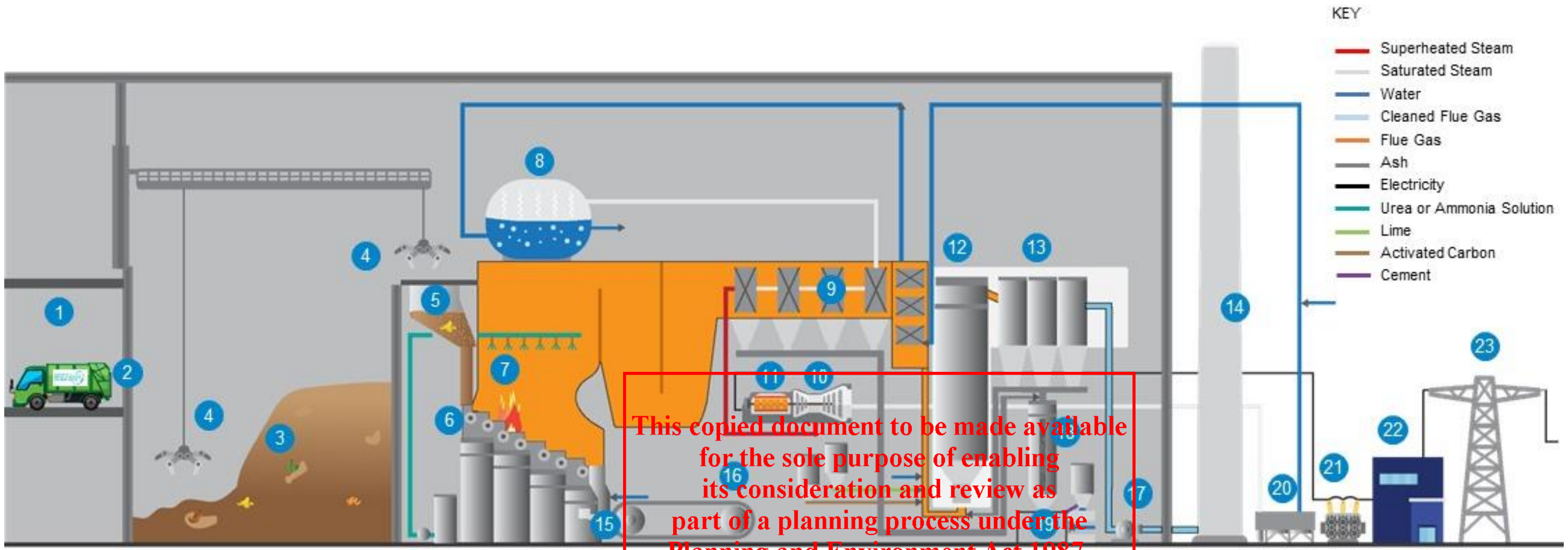
Figure 1 Site Layout

2.3 Construction

Construction is anticipated to take approximately 36 months (inclusive of commissioning and proof of performance testing prior to operations) to complete and will have the potential to generate dust emissions from demolition, land clearing, the handling of material, windblown dust of exposed areas, vehicle movements and exhaust emissions from diesel generators. Potential impacts from construction emissions are addressed through a construction dust risk assessment detailed in Section 6.

2.4 Operations

Figure 2 provides an overview of the operational features to be present at the Proposal. Further details on elements of the facility with relevance to air quality are described in the following sections.



LEGEND

1 Waste receiving hall
2 Tipping bay
3 Waste bunker
4 Waste crane
5 Feed hopper (chute)
6 Moving grate
7 Boiler with SNCR (de-NOx)
8 Steam drum
9 Heat exchangers
10 Steam turbine
11 Generator
12 Semi dry reactor
13 Bag filter
14 Stack
15 Incinerator bottom ash (IBA) quenching
16 IBA conveyor to treatment area for maturation and on-site metals recovery
17 ID Fan
18 Air Pollution Control residues (APCr) and boiler fly ash silo
19 Treated APCr to stabilization area for curing prior to removal off-site for disposal
20 Air cooled condenser
21 Transformer
22 Substation
23 Local electricity grid or 'behind the meter' connection points

Figure 2 **Key features of the Proposal**

2.4.1 Waste Volumes and Waste Acceptance

The Proposal will receive approximately 380,000 tpa of a combination of mainly residual MSW and residual C&I waste. The design will aim to accommodate an initial split of approximately 40% MSW and 60% C&I waste aiming for an eventual regular split of approximately 60% MSW and 40% C&I waste. The WtE facility is designed to maintain availability of 8,000 hrs/yr per operational line with a nominal throughput for each line of 23.8 tph.

Only wastes which are consistent with the Victorian waste to energy framework (2021) definition of permitted waste will be accepted as waste feedstock. Waste feedstock supplies by Cleanaway Pty Ltd and third-party suppliers will be managed in accordance with the MERC Waste Acceptance Protocol (WAP) which defines both acceptable and unacceptable waste types, along with waste arrival and inspection protocols and provisions to divert or remove unacceptable waste or waste loads. The waste acceptance process essentially involves inspection of the waste at various stages (Figure 3) for size and suitability aiming to maintain the calorific value of waste and to remove unacceptable materials that may result in unacceptable contaminant levels or may cause damage to plant and equipment. Periodic sampling of waste will also be undertaken to determine certain key parameters of the waste profile including ash, moisture, chlorine, sulphur and metallic aluminum. Oversized acceptable waste can be fed to an onsite shredder before being fed to the boiler.

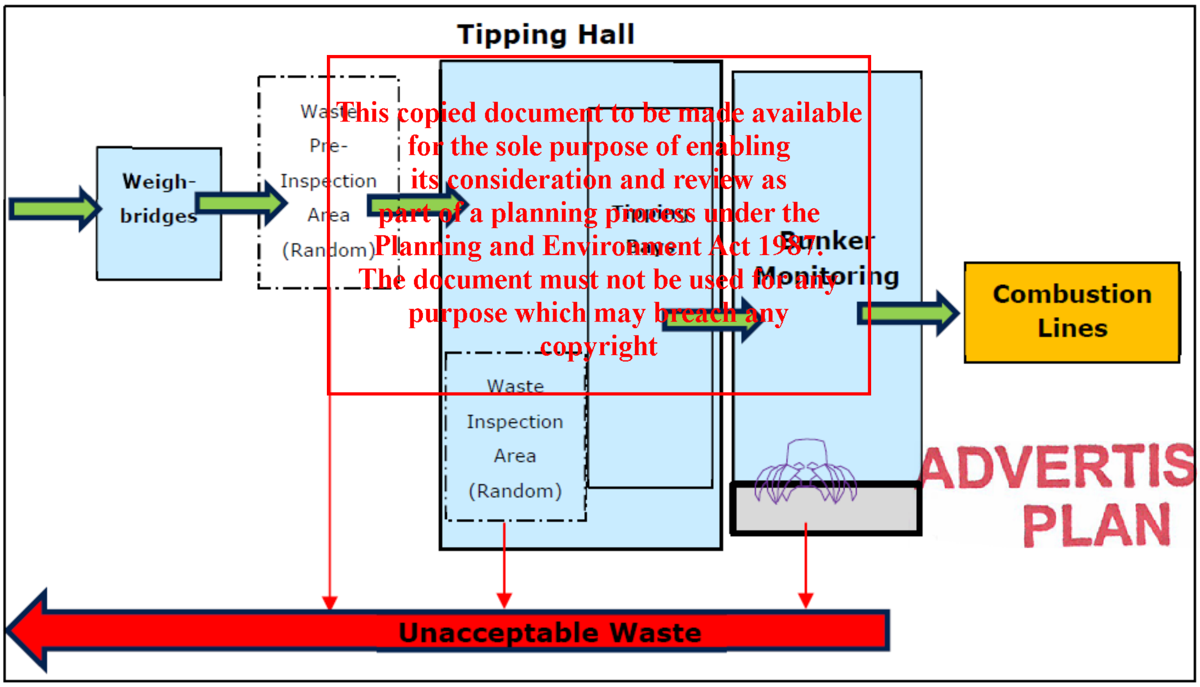


Figure 3 Stages of feedstock unacceptable waste filtering

2.4.2 Waste Arrival

Waste deliveries will enter the MERC site via a security gate house and proceed to the weighbridge where the vehicle will be weighed and delivery details recorded. Waste delivery vehicles may be selected at random to proceed to a designated pre-inspection area to allow the MERC operations staff to verify the waste and where feasible, visually inspect the load to confirm its suitability as acceptable waste.

2.4.3 Tipping Hall and Waste Bunker

Waste will be delivered to the Proposal via a tipping hall, expected to operate 12 hours per day, 6 days/week.

The tipping hall will be designed to cope with the facility 'peak hour', which is the hour in the day where the largest number of vehicles is expected to require processing. The preliminary estimate of peak waste delivery vehicle movements is 150 vehicles per day (weekday total truck and car). The tipping hall will be enclosed and will include quick shutting roller doors for odour control. Negative pressure will be maintained in the hall and waste bunker areas by preferentially drawing potentially odorous air from within the tipping hall and waste bunker area into the boiler furnace as combustion air. Adjustable louvres in the façade of the Tipping Hall will allow air inflow (for the furnace combustion air system), even if the entry and exit roller doors are closed.

The tipping hall shall include a waste inspection area where random waste loads arriving in compactor size vehicles can be temporarily unloaded for inspection and shall include a waste rejection point to allow removal of unsuitable waste from the bunker.

Tipping hall bays shall include a protection mechanism to mitigate the risk of vehicles overreaching into the bunker.

The waste bunker shall be designed to store approximately seven days of waste at full capacity. The waste bunker is monitored by CCTV in the plant control room.

During delivery hours, the waste crane operators will monitor the operation of the grab cranes, to mix and distribute the waste, and move oversize acceptable waste into the shredder for resizing. The grab cranes will also be used to remove unacceptable waste from the waste bunker. The mixing operation of the grab crane is important for the stable operation of the combustion system and flue gas treatment system, by working to ensure that individual waste loads are mixed together prior to being fed to each grate combustion system.

2.4.4 Combustion system and Process Firing

The boiler system will be of a typical moving grate design suitable for combustion of MSW and C&I wastes. The boiler will generate superheated steam suitable for driving the steam turbine. The boiler will be designed to reach a temperature of at least 850 degrees Celsius for a residence time of at least two seconds to comply with the requirements of EU, as adopted by Australian, legislation. The system will include online boiler tube cleaning.

The boiler system will include an allowance for auxiliary fossil fuel burners (e.g., auxiliary diesel fuel burners) for start-up, shutdown and to ensure that the 850 degree Celsius for two seconds residence time criteria is maintained at all times that waste is being combusted.

The capacity diagram (Figure 4) identifies the maximum and minimum design ranges for determining both mechanical and thermal capacity requirements of the process equipment and components. The design point for the firing diagram is:

- Throughput of 380,000 tpa of waste
- Lower Heating Value (LHV) of 11.2 MJ/kg (based on a C&I and MSW waste mixer).

The Proposal is designed to operate across a range of calorific values with a reasonably selected design point. This is done to accommodate normal variabilities in waste make-up and associated changes in LHV. Although Cleanaway is seeking a plant that combusts 380,000 tpa, in reality the plant and waste streams will have to be actively managed during operation to get as close to the design point as possible on an annual basis noting that significant fluctuations in combusted waste volumes are possible.

Figure 4 shows a number of ranges for various operating capacities of the Proposal as follows:

- Diagonal pale green lines: indicate the range of LHVs for the waste fuel from 7.8 MJ/kg (load points (LPs) 8 and 9) to 14.6 MJ/kg (LP4, 5, and 6). This allows for a variation in fuel LHV of ± 30% of the design point (11.2 MJ/kg of waste)
- Vertical dashed lines: indicate the waste throughput mechanical load ranging from 16.6 t/hr to 28.5 t/hr. This represents a range between 70% - 120% of the design point of 23.8 t/hr
- Horizontal dashed lines: indicate the thermal input ranging from 51.7 MW to 81.3 MW. This represents a range between 70% - 110% of the design point of 73.9 MW
- Load Points: These indicate valid operational points. The Proposal can continuously operate at all LPs for periods over an hour, except for the region bounded by LP2, 3, 4 and 5, The area constituted by the points (LP2), (LP3), (LP4) and (LP5) represents the thermal overload region, which is designed to manage inevitable fluctuations from the preferred continuous operational line (LP2) – (LP5). Continuous operation at thermal overload is not possible in this area, consequently, operating set points are not allowed in the thermal overload region.

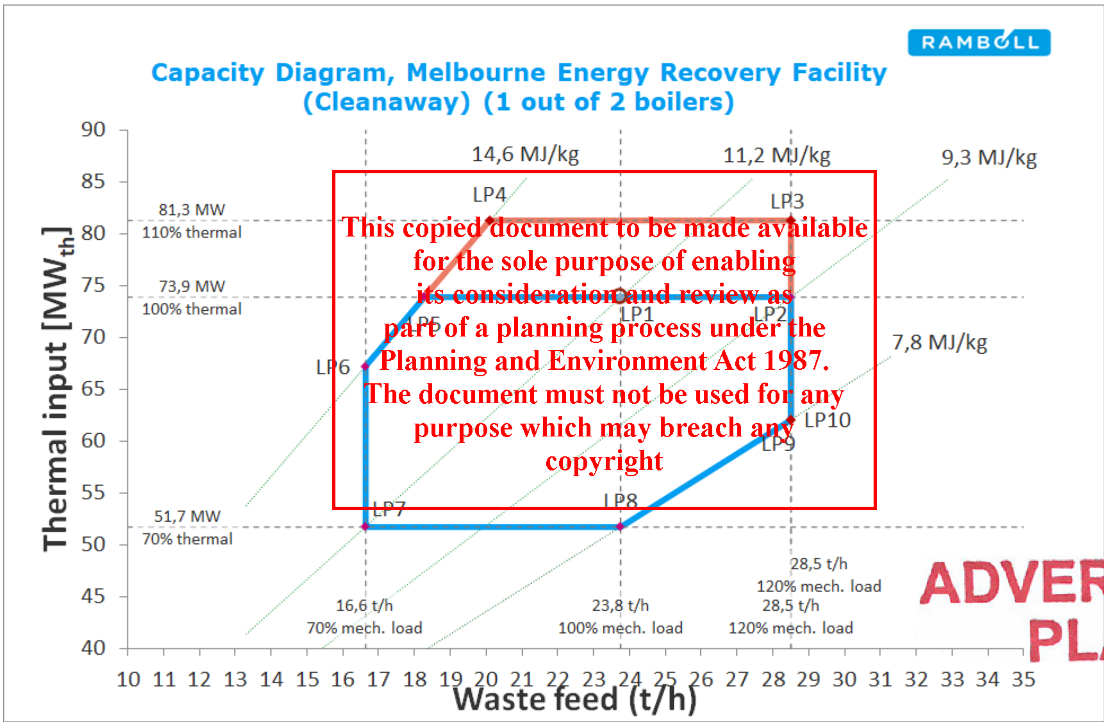


Figure 4 **Firing capacity diagram (one line) as provided by Ramboll**

2.4.5 Emission Controls and Flue Gas Treatment (FGT)

The concentrations of some pollutants in the flue gas leaving the combustion system, such as nitrogen oxide, nitrogen dioxide (together referred to as NOx), carbon monoxide (CO), volatile organic compounds (VOCs), and dioxins and furans, are directly linked to the performance of the combustion system as well as the composition of the waste. Primary emission control involves:

- Mixing of the waste in the waste bunker prior to feeding each combustion system

- An automatic combustion control system which adjusts the feeder speed, movement of the grate (residence time and thickness of waste on the grate), primary and secondary combustion air flows, in order to maintain a desired steam generation set point from the boiler
- Careful control of combustion air injection such that excess air levels are controlled, helps to control the primary formation of NOx, though there is a trade-off with CO formation if combustion air levels are too low
- Maintaining stable combustion conditions and ensuring the flue gas temperature remains above 850 degrees Celsius for at least two seconds residence time helps to ensure the destruction of VOCs, dioxins and furans, and other similar organic compounds commonly found in solid fuel combustion systems.

The MERC Proposal also includes a secondary NOx abatement system within the boiler known as Selective Non-Catalytic Reduction (SNCR). SNCR involves injecting ammonia or urea solution into the flue gas within a temperature range of ~900 – 1050 degrees Celsius. In this temperature range, the ammonia or urea will reduce a majority of the NOx that may be present in the flue gas to nitrogen and water.

After the SNCR system, hot flue gas passes through the boiler where it is cooled by both raising steam and then superheating steam. At the exit of the boiler economiser section, the cooled flue gas will be treated using an air emissions control system that consists of semi-dry flue gas treatment, and a bag house filter.

Lime injection will be used to control emissions concentrations of acid gas pollutants via chemisorption (in particular HCl, HF, and SO_2) while activated carbon injection is used to control volatile heavy metals (such as mercury, lead and cadmium) and any residual organic compounds through adsorption, when coupled with a baghouse filter. Expected quantities of lime, urea, and activated carbon are detailed in Table 1.

The flue gas treatment (FGT) and air emissions control system will be designed to ensure stack emissions at least meet the upper end of the range of associated emission levels (Section 7.1) of the best available techniques (BAT-AELs) as detailed in the latest Best Available Techniques Reference Document (BREF) for Waste Incineration (WI) (BREF WI) (Newahl F, et.al., 2019) and European IED, consistent with international best practice.

Table 1 FGT consumables (figures understood to be +/- 20%)

Consumable	Consumption (kg/h)	Annual consumption assuming 380,000 tpa waste (tpa)
Quicklime (~90% purity)	646	5,170
40% Urea (or NH_3-H_2O)	260	2,080
Activated carbon	25	200

2.4.6 Bottom ash and Residue management

The Proposal will generate two primary residue streams: IBA and APCr.

IBA will be collected from below the grate using a wet ash conveyor system. IBA will be transported via a long conveyor to the IBA Treatment area where it will undergo maturation and sorting including the removal of ferrous and non-ferrous metals. Sorting and metals recovery will occur indoors, after a period of maturation.

After maturation and metals recovery, the IBA aggregate (IBAA) is typically considered (after suitable testing and confirmation during commissioning) to be non-hazardous. There is currently no recycling pathway for IBAA in Victoria; however, given that a number of existing WtE developments have already received approval to commence construction in Victoria, this is expected to be in place to allow recovered IBAA to be used as an aggregate in construction (such as road bases). This is common practice for recycled IBAA in Europe and the UK. In the case that Victoria does not approve a recycling pathway, IBA will be sent to an inert landfill.

APCr consists of two separate ash streams:

- Boiler ash (recovered in the hoppers below the horizontal pass/convective section of the boiler)
- Air pollution control residues (essentially a purge stream of baghouse filter cake, consisting of flue gas treatment residue and residual fly ash).

Boiler ash from the convective section of the boiler may be considered hazardous. To be conservative and align with precedents set for other waste-to-energy facilities in development in Australia, boiler ash will be mixed with APCr. APCr is hazardous and must be treated as such. APCr must be immobilised to avoid the leaching of heavy metals and other hazardous compounds into the surrounding area. This will be achieved through blending with cement and water, which cures to form a solid concrete, immobilising the hazardous elements. Once fully cured, APCr will be transported to and disposed of in an appropriately classed landfill.

3. POLICY FRAMEWORK AND ASSESSMENT REQUIREMENTS

3.1 Overview

Victoria revised its environmental legislation from 1 July 2021 commencing with the new *Environment Protection Act 2017* (EP Act). Supporting legislation, policy and guidance for the EP Act relevant to this assessment are described below:

- *Environment Protection Regulations 2021*
- Guideline for assessing and minimizing air pollution in Victoria 2022, Publication 1961, February 2022
- Guide to the Environment Reference Standard, Publication 1992, June 2021.

Further to the above, this assessment has been prepared with consideration to:

- EPA Victoria's Guidelines for Input Meteorological data for AERMOD, Publication 1550, October 2013
- EPA Victoria's Guidance Notes for Using AERMOD, Publication 1551, October 2013
- National Environment Protection (Ambient Air Quality) Measure 2021 (AAQ NEPM)
- Victorian Waste to Energy Framework, November 2021
- Guideline: Energy from Waste, Environment Protection Authority Victoria, Publication 1559.1, July 2017
- EPA Victoria's Guidance for Assessing Odour, Publication 1883, June 2022.

The Proposal has been designed to satisfy best available techniques and emission characteristics common to WtE facilities across Europe as identified in the following:

- European Commission, Best Available Techniques (BAT) Reference Document for Waste Incineration (BREF WI) (2019) and the associated Best Available Techniques Conclusions (BATC) for waste incineration (2019). Due to the various types and combinations of BAT for controlling emissions, the BREF WI specifies a range of associated emission levels (BAT-AELs).
- Directive 2010/75/EU of the European Parliament and the Council on industrial emissions (the Industrial Emissions Directive (IED)) Annex VI.

3.2 Environment Protection Act 2017

The EP Act provides the EPA powers and tools to prevent and minimise the risks of harm to human health and the environment from pollution and waste. It does not provide criteria to be used in an air quality assessment. Such criteria are contained in the *Guideline for assessing and minimising air pollution in Victoria* (EPA Victoria, 2022) (Publication 1961). The EP Act makes it a criminal offence to unlawfully pollute the air environment. The cornerstone of the EP Act is the general environmental duty (GED). This requires anyone engaging in any activity that may cause harm to human health and the environment from pollution or waste to eliminate such risks, or if it is not reasonably practical to do so, to reduce those risks as far as reasonably practicable. Furthermore, the person or company undertaking activities with risks to cause harm must implement and maintain systems for identification, assessment and control of risks of harm and to aid evaluation of their controls.

These measures assist to inform the state of knowledge, where the state of knowledge is defined as the body of accepted knowledge that is:

- known about the harm or risks of harm to human health and the environment; and
- the controls for elimination or reducing those risks.

The state of knowledge changes over time. This is because ways of working develop, and new hazards and risks emerge.

3.3 Environment Protection Regulations 2021

The new Regulations support the EP Act by providing clarity and further detail for duty holders on how to fulfil their obligations. They aim to further the purpose of, and give effect to, the EP Act. Chapter 5 Part 5.2 – Air provides some details on obligations for reporting to the National Pollutant Inventory (NPI). Schedule 1 details activity categories that require development and/or operational licences under the EP Act. The Proposal will primarily be classified as prescribed activity type A08 (waste-to-energy) defined as activity "recovering energy from waste at a rated capacity of at least 3 MW of thermal capacity or at least one MW of electrical power". The Proposal will also involve the undertaking of a range of other prescribed activities. The Proposal will, therefore, be subject to a development and operating licence to be issued by the EPA Victoria.

3.4 Environment Reference Standard

The Environment Reference Standard (ERS) replaced the previous *State Environment Protection Policy (Air Quality Management)* (SEPP AQM) on 1 July 2021. The ERS covers common air pollutants in Victoria providing reference standards for ambient air, not compliance standards, primarily for the use of decision-makers when presiding over decisions. Decision makers can include Environment Protection Authority Victoria (EPA) officers, officers from other government authorities and departments, environmental auditors, and representatives from local government and planning authorities. Objectives for these common air pollutants are generally adopted from the AAQ NEPM. The ERS is also used to inform management practices to ensure that the GED requirements are met, and for implementation in specific conditions or criteria in industry licensing. The ERS objectives are reproduced in Table 2 below.

Table 2 ERS indicators and objectives

Column 1 Indicators	Column 2 Objectives	Column 3 Averaging Periods
Carbon monoxide (maximum concentration)	9.0 ppm / 11,250 $\mu g/m^{3(1)}$	8 hours
Nitrogen dioxide (maximum concentration)	0.08 ppm / 164 $\mu g/m^{3(1)}$	1 hour
	0.015 ppm / 31 $\mu g/m^{3(1)}$	1 year
Sulfur dioxide (maximum concentration)	0.075 ppm / 214 $\mu g/m^{3(1)}$	1 hour
	0.02 ppm / 57 $\mu g/m^{3(1)}$	1 day
Lead (maximum concentration)	0.50 $\mu g/m^3$	1 year
Particles as PM_{10} (maximum concentration)	50 $\mu g/m^3$	1 day
	20 $\mu g/m^3$	1 year
Particles as $PM_{2.5}$ (maximum concentration)	25 $\mu g/m^3$	1 day
	8 $\mu g/m^3$	1 year

Column 1 Indicators	Column 2 Objectives	Column 3 Averaging Periods
Visibility reducing particles (minimum visual distance)	20 km	1 hour
Odour	An air environment that is free from offensive odours from commercial, industrial, trade and domestic activities	N/A
Table note: (1) Converted from ppm to µg/m^3 at 0ºC		

3.5 Guideline for assessing and minimising air pollution in Victoria

Publication 1961 (EPA Victoria, 2022) is part of Victoria's new environmental laws and relates to the EP Act 2017. Publication 1961 "provides a framework to assess and control risks associated with air pollution. It is a technical guideline for air pollution practitioners and specialists with a role managing pollution discharges to air." The objectives of Publication 1961 include:

- A clear framework for air pollution assessment and management that protects the environmental values of air (as defined in the ERS) to ensure risks of harm to human health and the environment are minimised so far as reasonably practicable.
- Guidance on methods for assessing risk of harm from air pollution to human health and the environment. This includes a broad risk-based assessment framework, site-specific risk assessment methods, and risk-based air pollution assessment criteria (APAC).
- A conceptual framework for identifying and selecting risk management techniques and technologies to ensure that risks are minimised so far as reasonably practicable.
- Clarity on EPA's expectations for the minimum reporting standards related to the assessment and management of air pollution in Victoria.

Air pollution assessment criteria (APAC) for the assessment and management of air emissions are detailed in the guidance document and supersede those in the older SEPP AQM.

APAC are risk-based concentrations that aid in identifying the likelihood of an activity posing an unacceptable risk to humans or the environment. Exceedance of these criteria indicate a need for further risk management controls and investigation into causes for the exceedance. There are two broad categories of APAC, namely health-based, which are concerned with protection of public health and environmental APAC, which aim to protect ecosystems and agricultural land uses.

For modelling assessments, the EPA recommends the following for applying APAC to predicted concentrations:

- Concentrations are reported for:
    - The most impacted location at or beyond the boundary of the site.
    - Any sensitive land uses that have been specifically identified.

- Results are presented as:
  - The incremental ground level concentration at the location due to the emissions from the subject site. When elevated receptors are present, concentrations need to also be provided for the relevant elevations.
  - Background concentrations of the pollutant.
  - Total concentrations (cumulative – background plus incremental).
- The percentiles of the data are reported as follows:
  - The 99.9th percentile for averaging times of an hour or less.
  - The 100th percentile (maximum) for all averaging times greater than an hour.
- APAC with averaging times less than 24 hours apply at any location at or beyond the boundary of the facility. APAC with averaging times of 24 hours or greater apply at discrete sensitive locations.

Relevant health-based and environmental APAC for the Proposal are provided in Table 3 and Table 4.

Publication 1961 defines three levels of assessment in order of increasing complexity. The details associated with each level of assessment are presented below. This report will constitute a Level 2 assessment.

- Level 1 assessments – screening level assessments that are qualitative or semiquantitative in nature. They are used to quickly describe risks from activities that either have:
  - Intrinsically low risks, or
  - Risks that are so common and well understood they can be effectively controlled without the need for extensive assessment work.
- Level 2 assessments – most common type of risk assessment for industry. They usually involve the use of dispersion modelling or monitoring. Predicted or measured pollutant concentrations can be benchmarked against a set of pre-defined APAC to understand the resulting risks.
- Level 3 assessments – detailed risk assessments only used in exceptional circumstances when a simple comparison of a pollutant's concentration to an APAC cannot adequately describe the risk.

Table 3 Health-based APAC

Pollutant	Pollutant Type	Cumulative/Incremental(1)	Averaging time	APAC ($\mu g/m^3$)	Basis
PM_{10}	Criteria pollutant	Cumulative	24 hours	50	ERS
			1 year	20	
$PM_{2.5}$	Criteria pollutant	Cumulative	24 hours	25	ERS
			1 year	8	
Cd	Carcinogen, highly toxic (chronic)	Cumulative	1 hour	18	TCEQ(final)
			24 hours	0.03	ATSDR
			1 year	0.005	WHO
Sb	-	Cumulative	24 hours	1	ATSDR
			1 year	0.3	ATSDR
As	Carcinogen	Cumulative	1 hour	9.9	TCEQ(final)
		Cumulative	1 year	0.015	OEHHA
		Incremental	1 year	0.007	WHO
Pb	Toxic to reproduction, bioaccumulative	Cumulative	1 year	0.5	ERS
Cr (hexavalent)	Carcinogen	Cumulative	1 hour	1.3	TCEQ(final)
		Cumulative	1 year	0.005	ATSDR
Cu	-	Cumulative	1 hour	100	OEHHA
Mn	-	Cumulative	1 hour	9.1	TCEQ(final)
		Cumulative	1 year	0.15	WHO
Ni	Highly toxic (chronic)	Cumulative	1 hour	0.2	OEHHA
		Cumulative	1 year	0.09	ATSDR
HCl	-	Cumulative	1 hour	2100	OEHHA
		Cumulative	1 year	20	US EPA
HF (as fluorides)	-	Cumulative	1 hour	60	TCEQ(final)
		Cumulative	24 hours	31	ATSDR
SO_2	Criteria pollutant	Cumulative	1 hour	214	ERS
		Cumulative	24 hours	57	ERS
Nox (as NO_2)	Criteria pollutant	Cumulative	1 hour	164	ERS
		Cumulative	1 year	30	ERS
CO	Criteria pollutant	Cumulative	8 hours	11,250	ERS
NH_3	-	Cumulative	1 hour	3,200	OEHHA
		Cumulative	24 hours	1184	ATSDR
		Cumulative	1 year	70	ATSDR

Pollutant	Pollutant Type	Cumulative/Incremental[1]	Averaging time	APAC ($\mu g/m^3$)	Basis
Hg	Highly toxic (chronic), bioaccumulative	Cumulative	1 year	1	WHO
Formaldehyde	Carcinogen	Cumulative	30-minute	100	WHO
		Cumulative	24 hours	49	ATSDR
		Cumulative	1 year	9.8	ATSDR
Benzene	Carcinogen, mutagen, highly toxic (chronic)	Cumulative	1 hour	580	TCEQ
		Cumulative	24 hours	29	ATSDR
		Incremental	1 year	1.7	WHO
PAH as BaP	Carcinogen, mutagen, toxic to reproduction, bioaccumulative	Cumulative	1 year	0.002	USEPA
		Cumulative	1 year	0.15	ATSDR
		Incremental	1 year	0.0001	WHO
Dioxins and furans (as TCDD equivalents)	Carcinogen, bioaccumulative	Cumulative	1 year	0.00004	OEHHA

Table Notes:
[1] Cumulative APAC apply to total concentration (cumulative including background) and incremental APAC apply to the incremental concentration (excluding background)

Table 4 **Environmental APAC**

Pollutant	Endpoint	Averaging time	APAC ($\mu g/m^3$)	Basis
NH_3	Natural or urban vegetation	1 year	8	NZ AAQG
Cd	Food chain effects from accumulation in agricultural soil	1 year	0.005	WHO
HF	Urban vegetation	24 hours	2.9	ANZEC 1990
		7 days	1.7	
		30 days	9.84	
		90 days	0.5	
	Commercially valuable plants that are highly sensitive to fluoride	24 hours	1.5	
		7 days	0.8	
		30 days	0.4	
		90 days	0.25	
	Natural vegetation	90 days	0.1	
NO_2	Terrestrial vegetation	1 year	30	WHO
SO_2	Agricultural crops	1 year	30	WHO
	Natural vegetation	1 year	20	

3.6 National Environment Protection Measure for Ambient Air Quality

The National Environment Protection Council (NEPC) defines national ambient air quality standards and goals in consultation, and with agreement from all Australian State and territory governments. These were first published in 1998 in the *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM) and previously varied in 2015. The AAQ NEPM contains, amongst other parameters, standards for particulates and combustion products. Compliance with the AAQ NEPM standards is determined by ambient air quality monitoring undertaken at locations prescribed by the AAQ NEPM and that are representative of large urban populations. The goal of the AAQ NEPM is to monitor and improve ambient air quality. Whilst the AAQ NEPM is relevant to ambient air quality levels rather than the assessment of emissions from individual facilities, a number of Australian States including Victoria have adopted the AAQ NEPM standards as APAC.

The NEPC approved a variation to the AAQ NEPM standards for ozone, nitrogen dioxide, and sulfur dioxide in April 2021. These revisions tightened the ambient air quality standards for nitrogen dioxide and sulfur dioxide to make them some of the strictest standards in the world and to reflect most recent emerging health evidence.

The standards in the AAQ NEPM are not intended to be applied as environmental standards by regulators without consideration of regulatory impacts in their jurisdictions. The Explanatory Statement clarifies the intent of the AAQ NEPM as a standard for reporting representative ambient air quality within an airshed, and not as a regulatory standard.

4. EXISTING ENVIRONMENT

4.1 Local terrain and land-use

The Proposal is located approximately 25 km north of Melbourne CBD in the suburb of Wollert and falls under the Whittlesea Local Government Area. Surrounding land uses are depicted in Figure 5. The Proposal site is predominantly designated as farming zone (FZ) with a small area of rural conservation (RCZ1) (<2% by area). The planning zones immediately surrounding the Proposal include Rural Conservation, Farming, and Special Use Zones (RCZ1, FZ, SUZ4). Beyond this the area encompasses a mixture of zones including Urban Growth Zones of various schedules (UGZ), Commercial Zones (C2Z), and Comprehensive Development Zones of various schedules (CDZ). Existing or proposed land uses and projects of note include the following:

- Grazing land - The Proposal is surrounded immediately in all direction by open grazing land with sparse rural residences.
- Quarries - The Austral Bricks clay quarry is located approximately 500 m south of the site. The Barro Group Mountain View Concrete Quarry is located approximately 1 km north of the Proposal. Hanson cement quarry and landfill is located approximately 5 km east of the Proposal.
- Compression Station – owned by APA Gasnet 1 km west of Proposal.
- Hume Freeway – located 2.8 km west and 2.9 km south of Proposal.
- Reserve - Craigieburn Grassland Nature Conservation Reserve located 3.2 km south of the Proposal.
- Existing industrial area – located in a strip on both sides along the Hume Highway 3.5 km south of the Proposal.
- High density residential areas including Craigieburn (2.8 km west) , Wollert (4.3 km southeast), and Kalkallo (3.1 km northwest) of the Proposal.
- Proposed developments – There are four detailed Precinct Structure Plans (PSP) (Figure 9) surrounding the Proposal:
  - The Shenstone Park PSP – located 800 m north of the Proposal planned for residential (1.3 km from the Proposal) and industrial use. Woody Hill quarry is located in this PSP approximately 810 m north of the Proposal. A recycled water treatment plant has been proposed just south of the Shenstone Park PSP approximately 550 m north of the Proposal.
  - English Street PSP – located 1.6 km northwest of the Proposal, this will consist of predominantly residential area with a commercial precinct including a community facility 2.3 km northwest of the Proposal and a conservation area running parallel along Merri Creek.
  - Wollert PSP – located 1.4 km east of the Proposal, includes plans for residential area with five possible schools (the closest 2.5 km southeast of the Proposal), conservation reserves, sports reserves and an emergency services precinct approximately 3.1 km southeast of the Proposal. Wollert Landfill and Quarry is located 5.1 km east of site and another future quarry is planned 5.9 km southeast of the Proposal.
  - Craigieburn North Employment PSP – located approximately 1.3 km west of the Proposal, consists of commercial properties to the north of the land, industrial properties to the south and a small conservation area running parallel to Merri Creek (1.4 km northwest).
  - The Proposal is also located within the Northern Quarries PSP area, which is expected to commence in five to ten years. Bordering the Proposal, 1 km to the east, is land approved for use as a basalt quarry (Phillips Quarry).

Terrain within the study area used in this air quality assessment (approximately 10 km x 10km, based on a 5 km site buffer and meeting the modelling requirements of EPA Victoria) is depicted in Figure 6. The landscape gradually rises from the southeast moving towards the northwest with some small hills to the north and northwest, notably at Mt Ridley, located approximately 3.5 km west of the Proposal. There are several small waterways that drain south into the tributaries Findon and Edgars Creeks, and the Curly Sedge Creek. The terrain could be described as gently undulating. There are no major local features likely to significantly influence wind patterns or dispersion from the Proposal. .

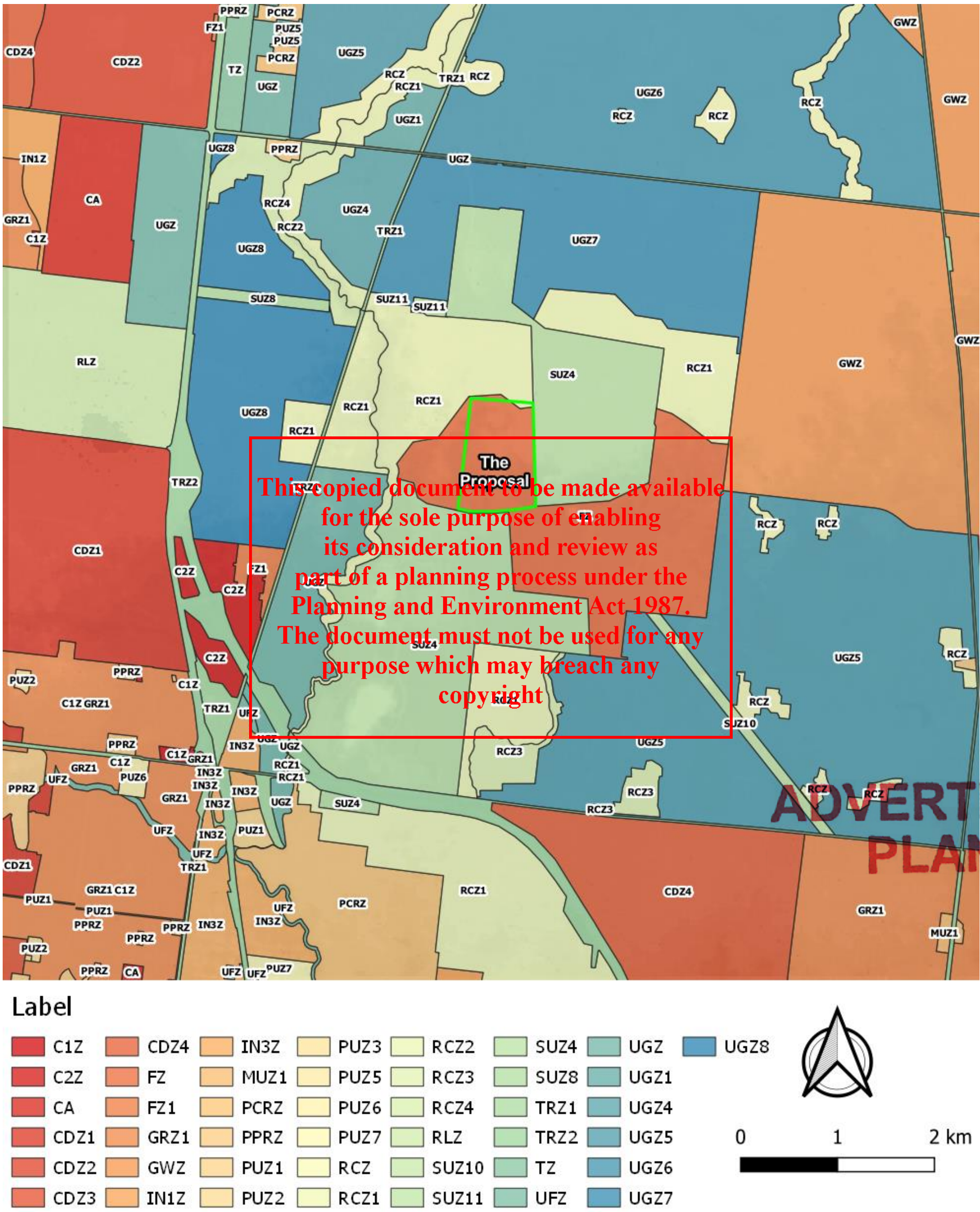


Figure 5 **Planning zones within the study area**

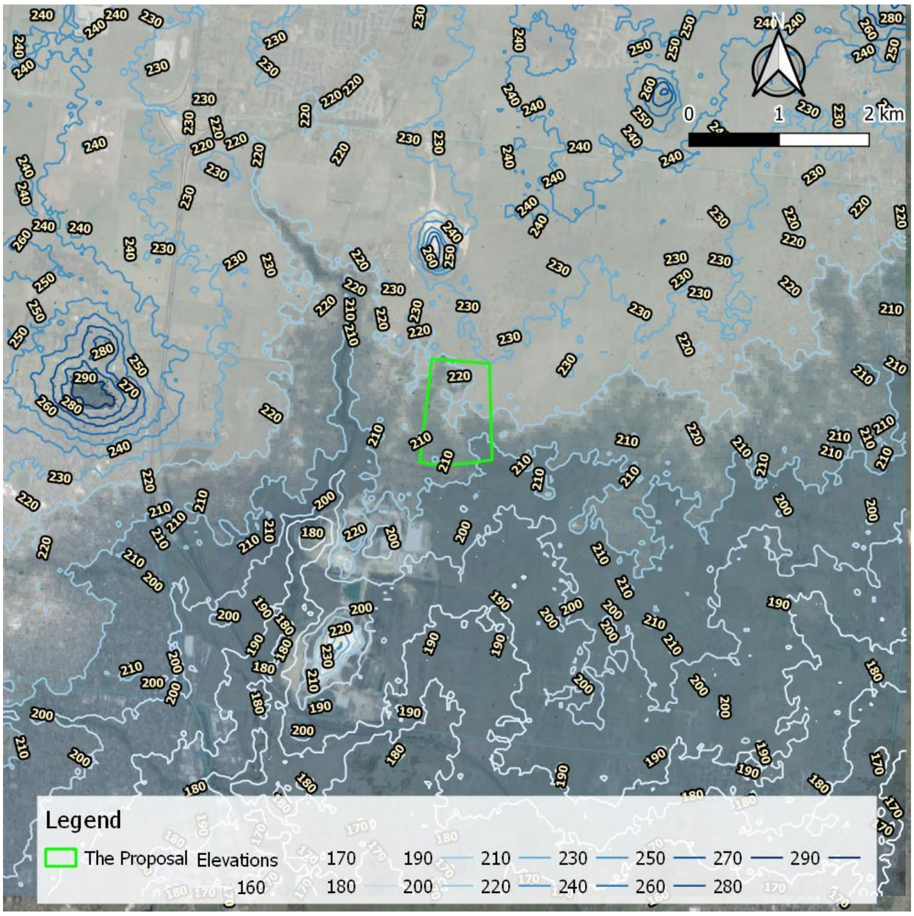


Figure 6 Elevation across the study area

4.2 Population density and vulnerability

The Publication 1961 (EPA Victoria, 2022) recommends that all air pollution reports consider the simple indicators of population density and vulnerability of the receiving environment in order to provide context for the risks that are being assessed. These factors are to be considered holistically when evaluating whether the risks of a development are being minimised so far as reasonably practicable.

Population density data for areas surrounding the Proposal have been derived from the Australian Bureau of Statistics (ABS, 2021) by Mesh Block (MB) and are presented in Figure 7. In 2021, there were 368,286 Mesh Blocks covering the whole of Australia without gaps or overlaps. Most areas immediately surrounding the Proposal include populations between 0 – 100 persons. The highest population areas of up to 400 people are located approximately 2.5 km north and 4.5 km southeast of the Proposal.

Figure 8 displays socio-economic indexes for areas (SEIFA) as derived from the ABS (2016). The values represent an index of relative socio-economic disadvantage (IRSD) for the statistical area level 1 (SA1). SA1s have a population of between 200 to 800 people. An IRSD quintile of one represents the most disadvantaged population, which is particularly vulnerable to air pollution. The nearest and most disadvantaged area to the Proposal is approximately 800 m west of the site and has been demarcated with an IRSD quintile of three. There are no areas with an IRSD less than two, the nearest such area being approximately 3.2 km southwest of the Proposal.

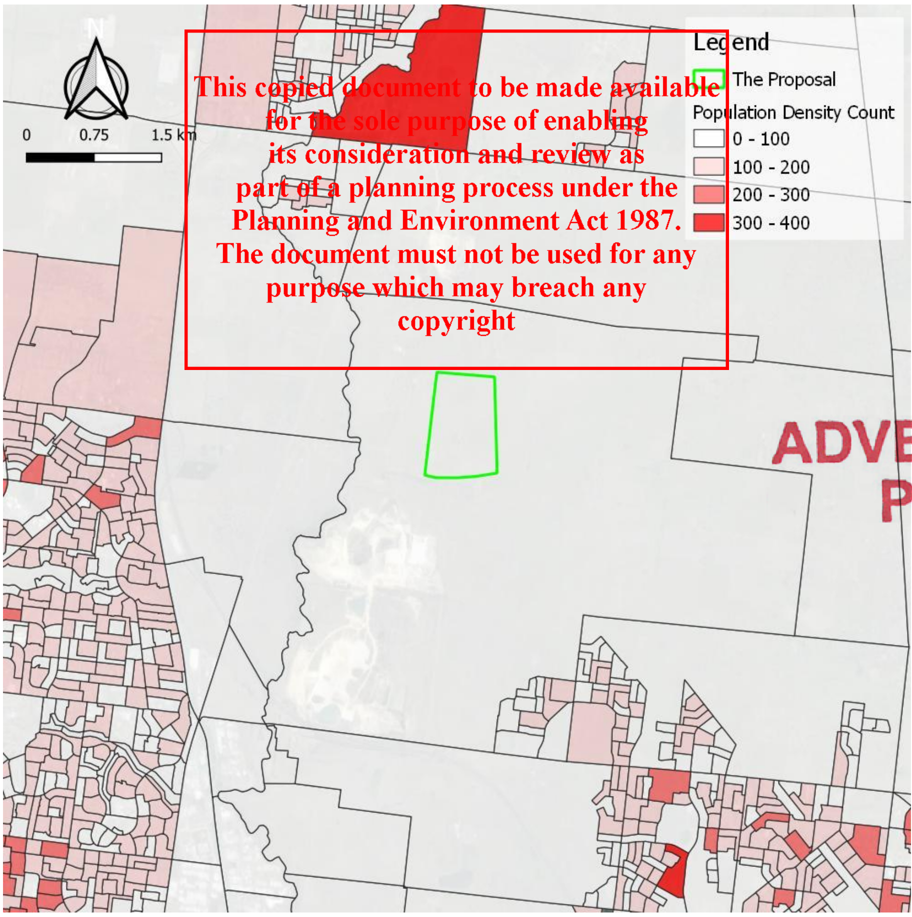


Figure 7 **Mesh Block (MB) Population Densities in the receiving environment (ABS, 2021)**

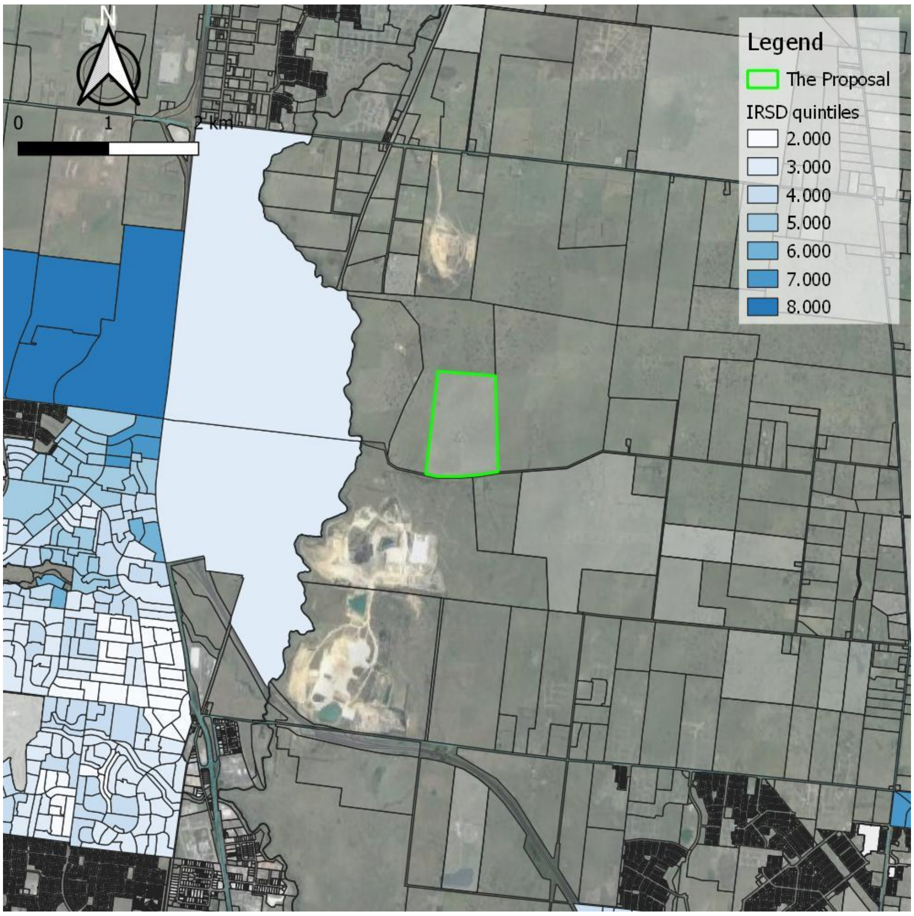


Figure 8 **Population vulnerabilities as represented by IRSD quintiles (ABS, 2016)**

4.3 Sensitive receptors and locations

Publication 1961 (EPA Victoria, 2022) recommends consideration of the following factors in identifying and presenting sensitive land uses:

- Discussion and presentation of surrounding land uses including present and future planned uses (Section 4.1).
- Characterise the sensitive land uses using population density and vulnerability data as provided by the Australian Bureau of Statistics (ABS) (Section 4.2).

Sensitive land uses are defined as anywhere it is plausible for people to be exposed over extended durations. Examples may include, residential premises, educational and childcare facilities, nursing homes, retirement villages, and hospitals. Areas of ecological significance should also be identified.

For the purposes of assessing impacts at sensitive locations in this report, a combination of discrete sensitive receptors (Table 5) and gridded receptors (contour maps) across the study area have been included. Discrete receptors and sensitive residential zones (blue shaded areas) are presented in Figure 9. “Other receptors” denotes, schools, recreational reserves and areas, as well as a library. Sensitivity of the surrounding land uses and population vulnerabilities as identified in Section 4.1 and Section 4.2, respectively, have been considered in selection of sensitive receptors and zones (including future development zones identified by various PSPs in Section 4.1, particularly to the north and east). Aerial imagery has also been utilised to assist with identifying potential receptors.

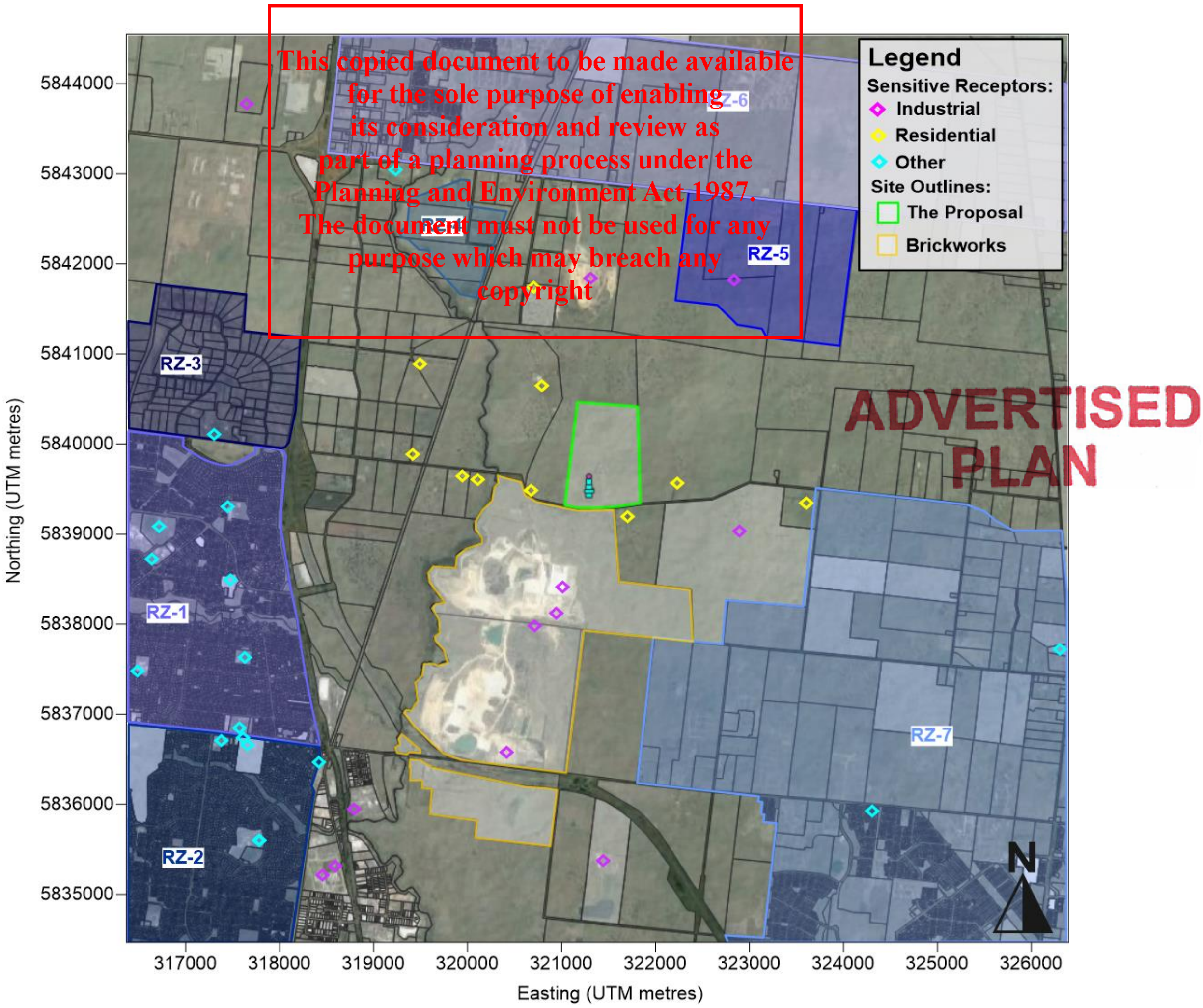


Figure 9 Discrete receptors and receptor zones in the study area

Table 5 Discrete receptor coordinates (UTM metres)

X	Y	Name	Category
317,648	5,843,777	Dulux Paints Merrifield	Industry
321,311	5,841,842	Mountain View Quarries - Donnybrook	Industry
322,897	5,839,035	Wollert Compressor Station	Industry
321,008	5,838,417	AB Wollert Plant	Industry
320,943	5,838,120	AB Summerhill Plant	Industry
320,712	5,837,984	AB NUBRIK P/L	Industry
320,412	5,836,574	Craigieburn Plant	Industry
318,793	5,835,943	Craigieburn Sewage Treatment Plant	Industry
321,446	5,835,378	Aurora Sewage Treatment Plant	Industry
318,588	5,835,316	Note Printing Australia Limited	Industry
318,458	5,835,211	CCL Secure	Industry
319,239	5,843,042	John Laffen Memorial Reserve	Other sensitive
322,832	5,841,819	Station	Other sensitive
317,299	5,840,105	Hume Anglican Grammar	Other sensitive
317,450	5,839,304	Mother Teresa School	Other sensitive
316,719	5,839,089	Highgate Recreation Reserve	Other sensitive
316,637	5,838,726	Mount Ridley P-12 College	Other sensitive
317,478	5,838,489	Craigieburn Primary School	Other sensitive
317,628	5,837,633	Victor Foster Reserve	Other sensitive
326,305	5,837,725	Tuttle Recreation Reserve	Other sensitive
316,488	5,837,480	Willmott Park Primary School	Other sensitive
317,573	5,836,852	D.S. Aitken Reserve	Other sensitive
317,384	5,836,707	Our Lady's School	Other sensitive
317,659	5,836,663	Craigieburn Leisure Centre	Other sensitive
318,417	5,836,464	Unique Female Fitness	Other sensitive
324,307	5,835,929	Lower Plenty Club Grounds	Other sensitive
317,780	5,835,604	Craigieburn Secondary College	Other sensitive
317,783	5,835,595	Craigieburn South Primary School	Other sensitive
317,611	5,836,743	Library	Other sensitive
320,679	5,839,490	Residence	Residential
320,791	5,840,647	Residence	Residential
321,698	5,839,194	Residence	Residential
322,229	5,839,563	Residence	Residential
320,109	5,839,603	Residence	Residential
319,944	5,839,647	Residence	Residential
319,490	5,840,888	Residence	Residential
319,420	5,839,883	Residence	Residential
320,708	5,841,738	Residence	Residential
323,600	5,839,349	Residence	Residential
321,339	5,839,372	Visitor Centre	The Proposal

4.4 Meteorology

This section presents an analysis of meteorological data derived from the BoM AWS located at the Melbourne airport. AERMET was used to develop surface and profile data files using upper air data from the Melbourne Airport and terrain and landuse information for the area surround the Proposal. The data files have been prepared to be suitable for use with the dispersion model AERMOD. Meteorological parameters for the Melbourne airport have been considered to be representative of the Proposal site due to similarities in terrain and landcover surrounding each site.

4.4.1 Climate

Long term meteorological data has been derived from the nearest Bureau of Meteorology (BoM) automatic weather station (AWS) monitoring station to the Proposal, located at Melbourne Airport, approximately 16 km to the southwest. The monitoring station has been in operation since 1970. Table 6 presents a summary of monthly climate statistics from the Melbourne Airport AWS averaged over the period between 1970 - 2022. Mean monthly rainfall is reasonably consistent, with a slight increase from August – November before dropping again with an annual average rainfall of 44.85 mm. Mean monthly temperatures range from a mean minimum temperature of 5.4°C to a mean maximum temperature of 26.6°C, being hottest in January and coolest in July. Relative humidity is higher in the afternoons (3 pm) compared to the morning (9 am).

Table 6 Summary of climate statistics (BoM Melbourne Airport Monitoring Station #086282)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years of Data	Years
Temperature															
Mean maximum temperature (°C)	26.6	26.6	24.2	20.4	16.7	13.7	13.2	14.5	16.8	19.5	22.1	24.7	19.9	52	1970-2022
Mean minimum temperature (°C)	13.9	14.1	12.8	10.2	8.3	6.2	5.4	5.9	7.1	8.5	10.4	12.1	9.6	52	1970-2022
Rainfall															
Mean rainfall (mm)	42.7	40.1	38	44.6	40.1	40.3	35	44.5	46.5	54.2	61.9	50.3	537.5	51	1970-2022
Decile 5 (median) rainfall (mm)	40	25.6	33.1	38.4	39.3	35.4	34.2	41.2	41	47.1	52.9	43.1	554.6	52	1970-2022
Mean number of days of rain ≥ 1 mm	8.3	6.9	9	10.2	12.5	13.4	14	15.6	14	13.3	11.5	9.5	138.2	52	1970-2022
9 am conditions															
Mean 9am temperature (°C)	18.1	18	16.6	14.2	11.3	8.7	8	9.1	11.3	13.6	15	16.8	13.4	40	1970-2022
Mean 9am relative humidity (%)	65	69	70	72	79	83	81	77	72	66	67	64	72	40	1970-2022
Mean 9am wind speed (km/h)	18.5	17	16.9	16.7	17.2	18.3	20.2	21.6	22.1	21.8	19	18.7	19	40	1970-2022
3 pm conditions															
Mean 3pm temperature (°C)	24.3	24.8	22.5	19	15.6	12.6	12	13.2	15.2	17.6	20.2	22.4	18.3	40	1970-2022
Mean 3pm relative humidity (%)	44	44	47	52	60	67	65	59	56	52	49	45	53	40	1970-2022
Mean 3pm wind speed (km/h)	22.3	21.2	20.6	19.9	19.7	20.8	22.7	23.9	24.4	23.5	22.4	22.7	22	40	1970-2022

4.4.2 Wind speed and wind direction

Wind speed and wind direction are important meteorological parameters that will influence the dispersion of air pollutants. Figure 10 illustrates the wind speed distribution of from the BoM's Melbourne Airport site. The average wind speed over the 5-years was 5.35 m/s, with highest annual average wind speeds recorded in 2019 at 5.49 m/s. The predominant wind directions at Melbourne Airport are from the north, with some additional strong winds from the south and southwestern quadrant.

Figure 11 illustrates that on average over the five years of data, variations in wind direction are to be expected between seasons. Winter exhibits dominant northerly winds, while in autumn and spring the dominant winds are from the north but there is an increase in winds from the southwest. Winds from the south are most prevalent for summer months.

Figure 12 shows the predicted average diurnal variation in wind speed and wind direction. The strongest winds occur between midday to 6 pm, with an average wind speed reaching 6.3 m/s. Wind directions are predominantly from the north between midnight to midday, shifting to southerly from midday to 6pm before northerly winds dominate in the evening.

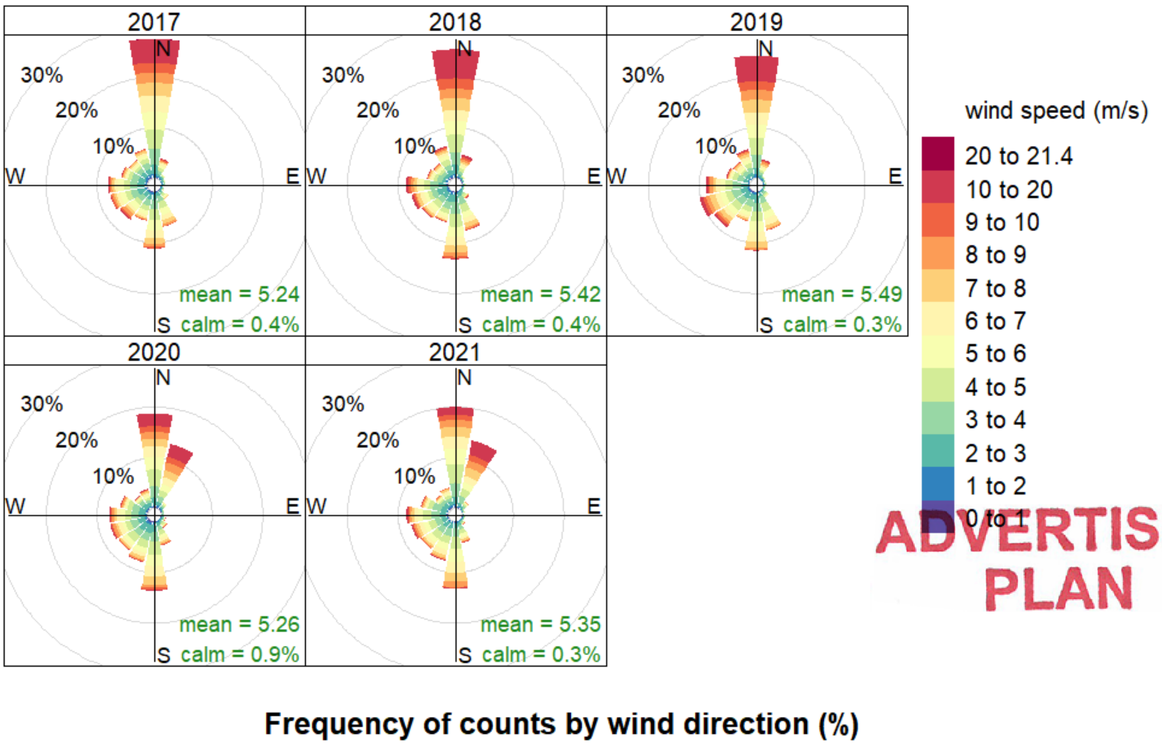


Figure 10 Annual distribution of winds for the Melbourne Airport BoM AWS (2017-2021)

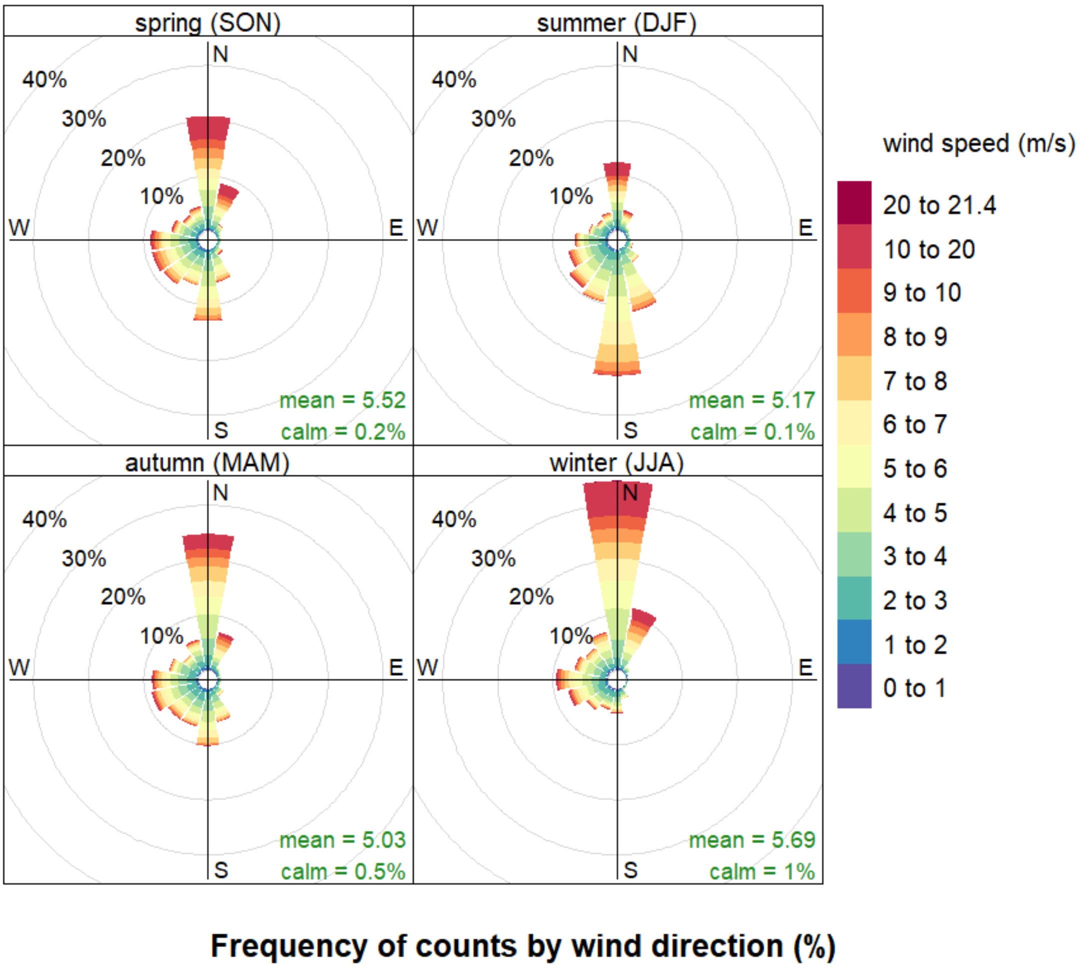


Figure 11 Seasonal distribution of winds for the Melbourne Airport BoM AWS (2017-2021)

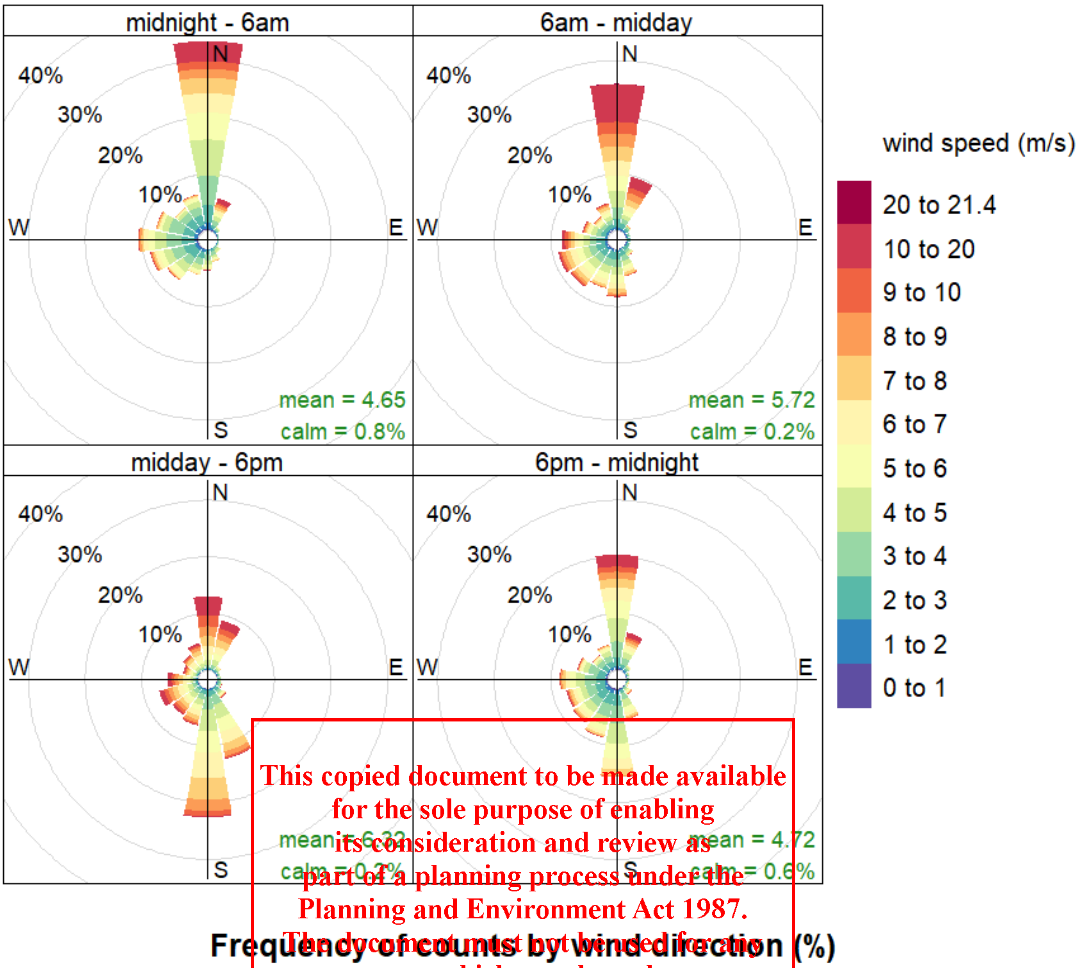


Figure 12 Diurnal distribution of winds at for the Melbourne Airport BoM AWS (2017-2021)

4.4.3 Mixing height

The mixing height refers to the height above ground within which air pollutants released at or near ground can mix with ambient air. During stable atmospheric conditions, the mixing height is often low and dispersion is limited to within this layer. During the day, solar radiation heats the air at the ground level and causes the mixing height to rise. The air above the mixing height during the day is generally cooler. The growth of the mixing height is dependent on how well the air can mix with the cooler upper level air and, therefore, depends on meteorological factors such as the intensity of solar radiation and wind speed. During strong wind speeds, the air will be well mixed, resulting in a more elevated mixing height.

AERMET was utilised to determine mixing heights representative of the Proposal site. Predicted mixing heights are presented as a diurnal box plot in Figure 13. The data shows that the mixing height develops around 7am and reaches a peak around 3pm before descending during the evening.

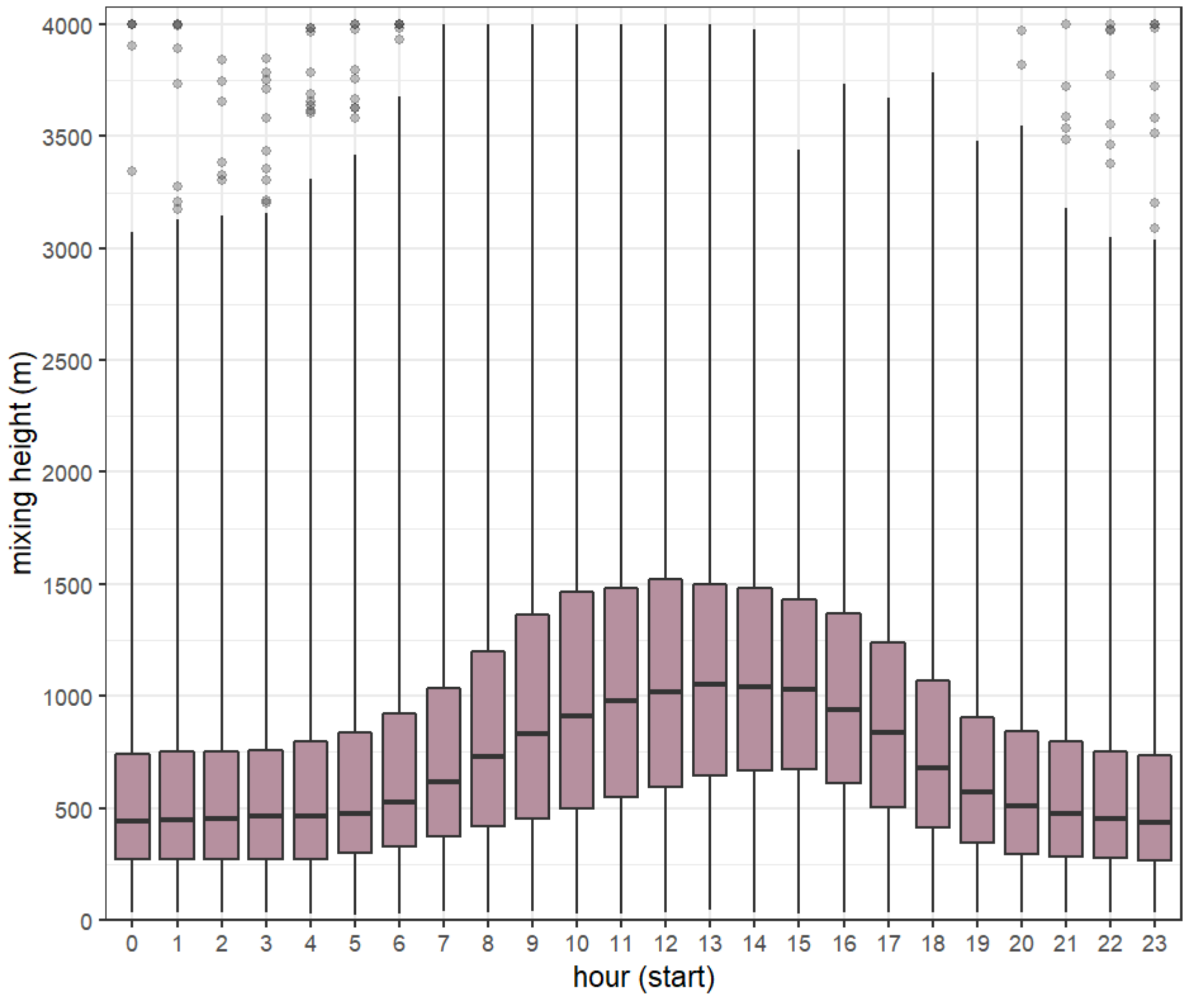


Figure 13 **Diurnal profile of modelled mixing height representative of the Proposal area (AERMET) (2017-2021) (boxes showing 25th, 50th, and 75th percentiles)**

4.5 Existing air quality

4.5.1 Existing sources of emissions

Existing industrial activities in the study area have been identified through a review of the National Pollutant Inventory (NPI) for the 2020-2021 reporting year. The facilities within 5km of the site of the Proposal that report emissions of key pollutants associated with the Proposal are summarised in Table 7. Industrial activities include clay brick manufacturing, gas transmission and hard rock quarrying.

NPI emissions have been utilised to determine a suitable approach to including background concentrations for cumulative assessment of the Proposal as discussed in Section 5.2.6.

Table 7 Total emissions to air for facilities within 5km of the Proposal as reported to the NPI for the 2020-2021 reporting year

Facility	Austral Bricks Wollert Plant	Wollert Compressor Station	Mountain View Quarries - Donnybrook
Main Activity	Clay brick manufacturing	Gas transmission	Hard rock quarry and crushing plant
Distance and Direction	1.3 km SSW	1.7 km ESE	2.2 km SSW
CO (kg/year)	304,000	11,988	9,372
NOx (kg/year)	95,000	46,870	24,882
PM_{10} (kg/year)	299,000	330	3,346
$PM_{2.5}$ (kg/year)	7,300	330	1,845
SO_2 (kg/year)	100,021	82	15

4.5.2 Existing ambient air quality

A review of available data from the nearest Victoria EPA operated air quality monitoring station at Alphington has been conducted to characterise existing air quality relevant to this assessment. Figure 14 depicts the location of the Alphington monitoring station approximately 23 km south of the Proposal. The most recent five years (2017 – 2021) of monitoring data has been analysed and summarised in Table 8.

Alphington is expected to provide a conservative indication of ambient air quality given its location in a more highly urbanised area with higher traffic volumes compared to the Proposal area.

Analysis of the Alphington data from 2017 to 2021 shows the following:

- APAC for NO_2, SO_2, and CO were not exceeded for any times over the period 2017 to 2021
- 24-hour APAC for PM_{10} were exceeded a total of 15 times from 2017 to 2021, with no exceedances occurring in the years 2017 or 2021
- 24-hour APAC for $PM_{2.5}$ were exceeded a total of 28 times from 2017 to 2021, with most exceedances (12) occurring in 2017
- Annual APAC for PM_{10} and $PM_{2.5}$ were not exceeded except for $PM_{2.5}$ in 2017.

Overall, the air quality in the study area is expected to be good. However, as the monitoring data shows, exceedances of the 24-hour average PM_{10} and $PM_{2.5}$ APAC may occur. The exceedances of PM_{10} and $PM_{2.5}$ have been reported to be a result of windblown dust, bushfires, hazard reduction burns and urban sources such as domestic wood heating (EPA, 2018, 2019, 2020, 2021).

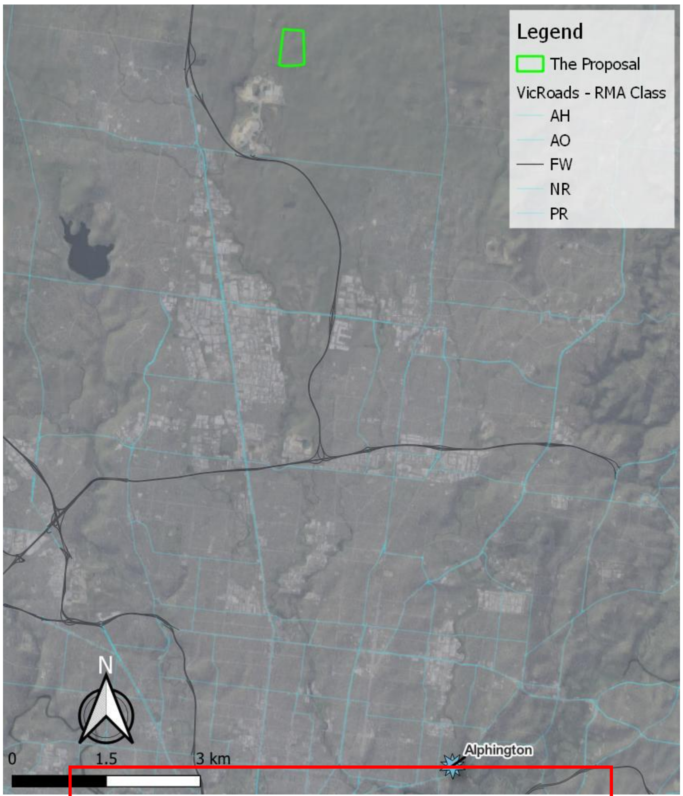


Figure 14 Location of the Alphington monitoring site

Table 8 Ambient concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$ and CO measured at Alphington (µg/m³)

Pollutant	Averaging period	Concentration (µg/m³)					APAC/ERS
		2017	2018	2019	2020	2021	
NO_2	1-hour	117	103	86	107	85	164
	Annual	20.0	19.6	18.6	16.8	16.0	30
SO_2	1-hour	31	37	29	14	47	214
	24-hour	7.3	10.7	6.0	7.1	10.5	57
CO	8-hour	1,965	2,197	1,661	2,814	1,992	11,250
PM_{10}	24-hour	35.6	74.0	69.8	225.9	42.2	50
	Annual	15.4	18.3	18.3	18.2	17.0	25
$PM_{2.5}$	24-hour	35.9	42.0	30.7	35.7	34.3	25
	Annual	8.9	7.9	7.6	7.9	6.8	8

Table 9 Exceedances of criteria as measured at Alphington

Pollutant	Averaging period	Criteria	Exceedances				
Health Based APAC			2017	2018	2019	2020	2021
PM_{10}	24 hours	50	0	3	5	7	0
$PM_{2.5}$	24 hours	25	8	8	2	7	3

5. AIR QUALITY ASSESSMENT METHODOLOGY

5.1 Construction

EPA Victoria's Publication 1961 states that fugitive emissions are difficult to assess accurately. For certain fugitive emission sources, a full quantitative assessment is prone to such large uncertainties that it is often more effective to invest resources into risk controls rather than into assessment works. This is particularly true of dust emissions from diffuse sources such as construction activities.

The Institute of Air Quality Management (IAQM) has published a risk assessment methodology titled Guidance on the assessment of dust from demolition and construction (IAQM Methodology) (Holman et al, 2014). Whilst it was drafted with the intention of application in the United Kingdom, the IAQM Methodology is applicable and widely used in Australia.

The potential impacts of dust emissions during construction of the Proposal have been addressed using the IAQM Methodology. This is appropriate due to the temporary nature of the proposed construction activities, and well-established mitigation measures that can be applied to minimise potential dust emissions.

There will be no transport of waste to/from the facility or processing of waste at the facility during construction. Odour may arise if the topsoil and subsoil removed during construction is contaminated. However, odour from contaminated soil is generally temporary in nature and dissipates after a few days. The site does not contain any contaminated soil and as such the risk of odour during construction is low. Therefore, odour during construction is not assessed. Notwithstanding this, contingencies for removal and treatment of material (if significant odorous material is excavated) will be incorporated into the construction management plan separate to this assessment.

Details of the risk assessment are provided in Section 6. The complete dust risk methodology is described in Appendices D1 and D2.

5.2 Operations

The potential impacts associated with the operation of the Proposal have been assessed using dispersion modelling, which is consistent with a level 2 assessment approach as outlined in EPA Victoria's Publication 1961. Details of the assessment method are provided in the following sections.

5.2.1 Meteorology

Surface and profile data files suitable for use in AERMOD were generated based on five years of meteorological modelling (2017 to 2021) using AERMET.. Upper air data for the BoM Melbourne Airport site and landuse and terrain information for the area surrounding the Proposal were incorporated into AERMET. Preparation of data files and modelling procedures were performed in accordance with the EPA Victoria's Guidance for Construction of input meteorological data files for the EPA Victoria's regulatory air pollution model (AERMOD) (Publication 1550).

Details of model configuration are provided in Appendix A, Section A1.

5.2.2 Dispersion modelling

The dispersion model AERMOD (version 22112), was used to predict ground-level concentrations of key pollutants due to the Proposal, across the model domain and at key sensitive receptors. AERMOD was configured in accordance with EPA Victoria's *Guidance Notes for Using AERMOD* (Publication 1551). Details of the model configuration are discussed in Appendix A, Section A2.

5.2.3 Scenarios

The following three operational scenarios have been considered:

- Load point 1 (LP1) daily average operations
  - Nominal waste throughput
  - BREF WI, 2019 - daily average (upper) concentration limits
  - Both lines assumed to be at the daily average (upper) concentration limits.
- LP1 – short-term operations
  - Nominal waste throughput
  - EU IED (2010) - short-term (30-minute average) emission limits to reflect variability in a line due to non-routine operations. Only one line will be operating at short-term emission limits whilst the other line will be operating at the daily average (upper) concentration limit.
  - These emissions would be short in duration (30-minute) due to the management and mitigation measures (as detailed in Section 11) to be employed by the Proposal.
- LP2 – daily average operations.
  - Maximum waste throughput
  - BREF WI, 2019 - daily average (upper) concentration limits
  - Included as a comparison only to LP1. Information regarding emissions and modelling results is presented in Appendix B.

Some additional sources other than the flue gas stack may contribute to site emissions, such as fugitive releases of odour from tipping hall access doors, or from trucks entering and leaving the site. Potential odour emissions from the site have been considered as part of the Odour Risk Assessment (Section 8). Emissions truck movements and exhausts are not expected to have any meaningful impact on overall emissions, with releases from the flue gas stack likely to dominate. Therefore, these non-stack sources have not been considered further.

5.2.4 Emission rates

Emission rates of air pollutants are conservatively based on the upper end of the range of BAT-AEL emission concentrations defined in the BREF WI, 2019. The approach ensures that emission concentrations will be within the BAT-AEL range expected for WtE facilities that have implemented BAT. Stack characteristics for the Proposal have been provided by Ramboll. Detailed emissions information is provided in Section 7.

Regarding emissions of total volatile organic compounds (TVOC) BAT-AEL emissions are for undifferentiated VOCs, while the Victorian APACs are for individual VOCs, making direct comparison inappropriate considering TVOCs incorporate a mixture of a wide range of different compounds. . Therefore, this assessment has assumed that the TVOC emissions are entirely comprised of formaldehyde or benzene as these compounds have the most stringent APAC values. Therefore, it can be demonstrated that if compliance with the relevant APACs for these compounds is achievable, then all other VOCs would also be compliant with the relevant APACs. Similarly for polycyclic aromatic hydrocarbons (PAHs), associated emissions have been assumed to be 100% benzo(a)pyrene equivalent (B(a)P), which is a common marker pollutant used in assessments of PAHs.

5.2.5 NOx to NO2 conversion

The modelling results presented in this report have assumed a constant conversion ratio of nitrogen dioxide to oxides of nitrogen (NO_2) of 30% with the addition of an ambient background concentration for NO_2 to provide additional conservatism. The actual degree of conversion of oxides of nitrogen in the plume to nitrogen dioxide will depend on atmospheric conditions at the time that the emissions occur.

The percentage of nitrogen dioxide within the plume exiting the stack usually ranges from 5% to 10%. After release from the stack, nitric oxide gradually oxidises to form nitrogen dioxide. The rate and extent to which this occurs depends on the presence of other atmospheric pollutants such as ozone and volatile organic compounds, and on the presence of sunlight.

To support the conversion rate of 30% a brief review of available literature was undertaken. This identified that for power stations in central Queensland , under worst-case conditions, that a conversion rate of 25% to 40% can occur within the first 10 kilometres of plume travel and suggest a rate of 30% at distances less than ten kilometres. During days with elevated background levels of hydrocarbons (generally originating from bushfires), the conversion is usually below 50% in the first 30 kilometres of travel (Bofinger et al, 1986). An air quality report prepared by Jacobs (2020) indicated that, based on monitoring data for NO_2 and NO_x in Latrobe Valley, high NO_2/NO_x ratios were never detected when NO_x was high, the ratio instead trending downwards to 15-20% for the highest NO_x concentrations. Therefore, it is expected that the 30% conversion rate will be appropriate for Wollert, and even potentially conservative, particularly with inclusion of an ambient background for NO_2.

5.2.6 Cumulative impacts

A cumulative assessment has been conducted incorporating the adjacent Austral Bricks owned Brickworks and ambient background concentrations from EPA Victoria's monitoring station at Alphington (Table 8). Brickworks has been explicitly modelled as the review of NPI data (Section 4.5.1) identified it as a key source of emissions in the area. Austral Bricks supplied the stack and building dimension data, and licenced emission limits required to undertake the cumulative dispersion modelling assessment. Details are provided in Section A3. It was decided not to include modelling of the Mountain View Quarries or Wollert Compressor Stations sites as the NPI emissions identified these as relatively minor sources compared to Brickworks and it is expected that the ambient background will adequately address contributions from these two sites.

Table 10 summarises sources included in the cumulative assessment.

Table 10 Sources of data for cumulative assessment

Pollutant	The Proposal	Brickworks[1]	Ambient monitoring data[2]
NO_2	✓	✓	✓[2,3]
CO	✓	✓	✓[4]
SO_2	✓	✓	✓[5,6]
PM_{10}	✓	✓	✓[2]
$PM_{2.5}$	✓	✓	✓[2]
HCl	✓	✓	×
HF	✓	✓	×
NH_3	✓	×	×
TVOC (100% formaldehyde)	✓	×	×
TVOC (100% benzene)	✓	×	×
PAH as BaP	✓	×	×
Dioxins and furans	✓	✓	×
Dioxins and furans + dioxin like PCBs	✓	✓	×
Cd	✓	✓	×
Tl	✓	×	×
As	✓	✓	×
Co	✓	✓	×
Cr(III)	✓	✓	×
Cr(VI)	✓	✓	×
Cu	✓	✓	×
Hg	✓	✓	×
Mn	✓	✓	×
Ni	✓	✓	×
Pb	✓	×	×
Sb	✓	×	×
V	✓	×	×

Table note:

(1) Details of source characteristics and emission rates included in the modelling are provided in Appendix A3

(2) Contemporaneous background used

(3) Yearly annual average as presented in Table 8

(4) Maximum 8-hour average used as presented in Table 8

(5) Maximum 1-hour average used as presented in Table 8

(6) Maximum 24-hour average used as presented in Table 8

5.2.7 Presentation of results

Predicted ground-level concentrations of air pollutants have been presented as maximum 100th percentiles for all averaging periods for all assessment scenarios (LP1 daily average and short-term emissions, and LP2 daily average operations). This additional conservatism beyond the requirements of the EPA Victoria Publication 1961 has been adopted to account for uncertainties in dispersion modelling.

Results have been determined within identified sensitive receptor zones, and at residential receptors and sensitive (on-residential) receptors as summarised in Section 4.3. Maximum offsite concentrations have also been presented for the Proposal in:

- Isolation – representing maximum concentrations predicted outside of the Proposal area
- Cumulative (including Brickworks) – representing maximum concentrations predicted outside the Proposal area and Brickworks boundary.

Ground-level concentrations associated with the Proposal operating at LP1 short-term emission concentrations have been presented for short-term averaging periods only. This is because this scenario represents conditions that are expected to be relatively short in duration.

Results for LP1 scenarios are presented in Section 7.2 and Section 14. Results for LP2 and a comparison against LP1 results are presented in Appendix B.

5.2.8 Ecological receptors

Publication 1961 (EPA Victoria, 2022) specifies a need to consider ecologically significant areas when assessing impacts from a proposal and provides environmental based APAC (Table 4) for this purpose. To assess ecological impacts from the Proposal maximum predicted ground-level concentrations at all locations outside the Proposal area have been determined and compared against the ecological APAC. These results are presented in Section 7.2.

5.3 Odour

EPA Victoria defines odour pollution as being any smell which is offensive to the human nose (EPA Victoria, 2012). Odour is a key environmental issue set out in the *EP Act* and is also included in the ERS.

EPA Victoria's Guidance for assessing odour (Publication 1883, 2022) provides information on how to assess the risk posed by odour emission sources and to understand the receiving environment where effects might occur. Publication 1883 focuses on the assessment of odour under the provisions of the *EP Act*, including the GED, which requires all Victorians to take precautionary and reasonable actions to avoid hazards causing harm. Under the *EP Act*, offensive odour constitutes a harm. Publication 1883 includes three levels of assessment; this assessment has been conducted to a Level 2 standard.

Level 2 assessments are described in Publication 1883 as:

- Consisting of two tools, the cumulative effects test and the source-pathway receiving environment tool.
  - The cumulative effects test takes into consideration the effects of multiple odour sources where there is a different dispersed industry, different clustered industries, and clusters of similar industries.
  - The source-pathway-receiving environment tool gives guidance on determining the level of hazard posed by the odour source, the effectiveness of the exposure pathway and the sensitivity of the receiving environment. It enables the calculation of a risk score. Depending on this score and the quality of the evidence used, further steps in the risk assessment can be identified.

As cumulative effects are not considered to be relevant due to an absence of other odour sources in the surrounding area, the source-pathway-receiving environment tool has been adopted. The outcome from the odour assessment is detailed in Section 8.

6. CONSTRUCTION DUST RISK ASSESSMENT

The IAQM sets out initial screening criteria for determining the need to conduct a construction dust risk assessment. A construction dust risk assessment is required if there is a 'human receptor' within:

- 350 m of the boundary of the site; or
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

It was determined that the requirements of this screening step were met. Therefore, construction of the Proposal has been assessed in the following sections.

The complete dust risk methodology is described in Appendices D1 and D2 including matrices defining levels sensitivity, risk and magnitude.

6.1 Potential magnitude of dust

Table 11 presents the potential dust emission magnitude for construction activities, which has been based on site-specific information provided by Cleanaway. Magnitudes of emissions have been determined following guidance outlined in Table D1.

Table 11 Potential dust magnitude

Construction Element		Site-specific description	Overall Magnitude of Emissions
Demolition	Building volume	<20,000 m^3	Small
	Material type	timber, cladding	
	Height of demolition	<10 m	
Earthworks	Site area	>10,000 m^2	Large
	Number of heavy earth moving vehicles	>10	
	Formation of bunds (height)	4-8 m	
	Soil type	Gravel/silt/clay	
	Total material moved	>100,000 m^3	
Construction	Building volume	>100,000 m^3	Small
	Onsite concrete batching	No	
	Sandblasting	No	
Trackout (1)	Number of heavy vehicles (HDV) in any one day	10 - 50 HDV	Medium
	Unpaved road length	>100 m	
	Surface material type	Moderately dusty, gravelly/silt/clay/crushed rock	

Table note:

(1) Trackout is defined in the IAQM guidance as being the transport of dust and dirt from the construction/demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when heavy duty vehicles (HDVs) leave the construction/demolition site with dusty materials, which may then spill onto the road, and/or when HDVs transfer dust and dirt onto the road having travelled over muddy ground on site

6.2 Sensitivity of the area to dust

The sensitivity of the receptors to dust effects depends on the number of receptors in the area and their proximity to the construction site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

Table 12 and Figure 15 present the number of receptors falling within different buffer distances from the boundary of the Proposal. The number of receptors for each distance are cumulative with the preceding distance. There is one residential, and no industrial or other sensitive receptors within 350 m of the Proposal. Therefore, the sensitivity of receptors to the effects of dust is judged to be 'low'.

Table 12 Proximity of receptors to the boundary of the Proposal

Receptors	Distance from Proposal area (m)			
	<20	<50	<100	<350
Number of sensitive places(1)	0	0	0	1
Number of industrial facilities	0	0	0	0
Ecological receptors	1			

Table note:
(1) There are some sites of ecological significance within the site boundary including habitats for Golden Sun Moths and Growling Grass Frogs.

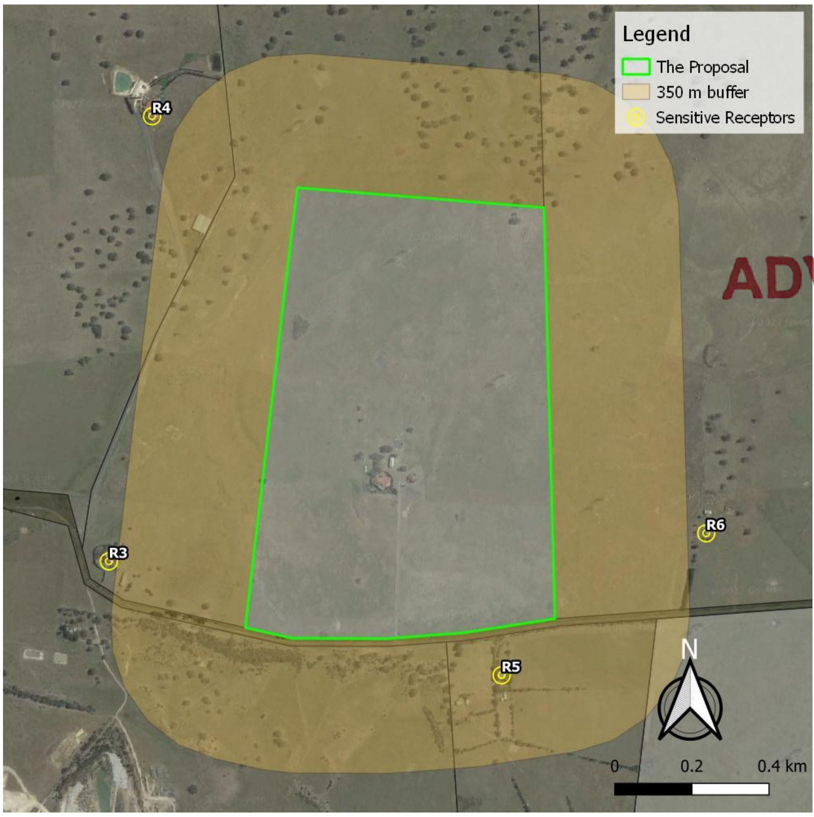


Figure 15 350 m boundary buffer from the Proposal area

The IAQM guidance requires consideration of the background annual average PM_{10} concentration. Table 8 indicates that the highest annual average PM_{10} concentration was 18.3 µg/m^3.

There are some sites of ecological concern within the Proposal area including habitats for Golden Sun Moths and Growling Grass Frogs. Mitigation measures will need to account for potential ecological effects.

Table 13 summarises the sensitivity of the area surrounding the Proposal before mitigation has been implemented. Sensitivities have been informed by Table D2 to Table D5.

Table 13 Summary of the sensitivity of the area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Trackout	Construction
Dust soiling	Low	Medium	Low	Low
Human health	Low	Low	Low	Low
Ecological	Low	Medium	Low	Low

The determined dust emission magnitudes (Table 11) are combined with the sensitivity of the area summarised in Table 13 to determine the risk of impacts with no mitigation applied. Table 14 presents the preliminary assessment of the risk due to construction activities associated with the Proposal. These risk categories have been used to determine the appropriate level of mitigation. Levels of risk have been informed by Table D6 to Table D9.

The IAQM guidance does not provide a method for assessing the significance of effects before mitigation and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

Table 14 Summary of dust risk

Potential Impact	Risk			
	Demolition	Earthworks	Trackout	Construction
Dust soiling	Low	Medium	Low	Low
Human health	Low	Low	Low	Negligible
Ecological	Low	Medium	Low	Low

6.3 Mitigation measures

Under the GED, persons who engage in activities that involve air emissions are required to eliminate risks of harm to human health and the environment from those emissions so far as reasonably practicable. Where it is not reasonably practicable to eliminate such risks, the Proponent is required to reduce them so far as reasonably practicable.

Based on the outcome of the risk assessment, the following mitigation measures (Table 15) are recommended to be implemented. These mitigation measures have been determined from the IAQM Methodology. These measures also address requirements of the EPA Victoria's Guideline for Assessing Nuisance dust (1943), EPA Victoria's Civil construction, building and demolition guide (Publication 1834) and the EPA Victoria's Construction – Guide to preventing harm to people and the environment (Publication 1820).

Table 15 Construction: potential mitigation measures

Activity	Mitigation measures
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues along the periphery of the Proposal area. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions.
Site management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available upon request from a regulating authority.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Monitoring	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to regulatory authority when asked.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available upon request from a regulating authority.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out (such as major excavation works) and during prolonged dry or windy conditions
Site layout	Plan site layout so that machinery and dust causing activities are located away from sensitive receptors, as far as reasonably practicable.
	Erect solid screens or barriers around dusty activities or the entire Proposal area that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on-site. If they are being re-used on-site cover as described below.
	Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery	Ensure all vehicles switch off engines when stationary. There should be no idling vehicles.
	Minimise the use of diesel or petrol powered generators if possible and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 25km/h on surfaced and 15km/h on unsurfaced haul roads and work areas.
Waste management	Bonfires and burning of waste materials should not be permitted.
Demolition	Soft strip inside the building before demolition.
	Utilise water suppression during demolition, preferably with hand-held hoses directing water to areas of visible dust generation.
	Bag and remove or damp down biological debris before demolition.
Earthworks	Covering or watering exposed stockpiles when not in use

Activity	Mitigation measures
	Revegetating disturbed areas as soon as is feasible
Trackout	Covering truck cargo when entering or leaving the site
	Hosing down truck tyres before exiting the site
	Avoiding dry sweeping of large areas, instead using hoses, sprays, or water trucks.
Construction	Ensuring all fine powder materials such as cement are delivered in closed tankers and stored in silos
	Ensure sand and other aggregates are stored in bunded areas
	Avoid scabbling (roughening of concrete surfaces) if possible
	Minimise drop heights from loading shovels and other loading or handling equipment, use enclosed chutes and cover skips
	Use dust suppression techniques when grinding, cutting, or sawing (water sprays, filter extractions)
	Ensure adequate supply of water for mitigation use.

6.4 Residual risk

The IAQM guidance is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in Section 6.3 are based on the IAQM guidance (Appendix D2). With these measures in place and effectively implemented the residual effects are judged to be 'not significant'.

The IAQM guidance does, however, recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however, the scale of this would not normally be considered sufficient to change the conclusion that overall the effects will be 'not significant'.

7. OPERATIONS

7.1 Emissions to air

7.1.1 LP1 daily average and short-term emission concentrations

Emissions from the Proposal are expected to be from the WtE facility flue gas stack. Emissions from other sources on site including vehicle exhaust emissions, emergency diesel generator (~2 MW electrical, for emergency and temporary use only), delivery of waste fuels, and removal of waste ash are considered to be either insignificant or sufficiently controlled to be considered insignificant.

Stack characteristics for normal operations at the Proposal are presented in Table 16 for LP1. Stack characteristics have been provided for a single flue and two flues. The emissions from the two flues will be exhausted from a single stack. It has been assumed that the Proposal operates continuously, 24 hours per day for every hour of the year for modelling purposes. In reality, the Proposal is expected to operate for approximately 8000 hours/year.

Table 16 The Proposal: Stack characteristics for LP1

Parameter	Value	Units	Information Source
Stack characteristics for a single line			
Stack height	60	m (agl)	Ramboll
Exhaust diameter	1.85	m	
Exhaust temperature	131	°C	
Exhaust velocity	20	m/s	
Moisture content	16.7	Volume %	
Oxygen content	6.3	Volume %, wet	
Flow rate (wet, actual)	190,136	m^3/hour	
Flow rate (dry, NTP, 11%O_2 with 10% additional flow rate)	158,705	Nm^3/hour @ 11% O_2, dry	
Stack characteristics for two lines (single stack)			
Exhaust diameter (effective)	2.6	m	Calculated
Exit velocity	20	m/s	
Flow rate (dry, NTP, 11%O_2 with 10% additional flow rate)	317,409	Nm^3/hour @ 11% O_2, dry	

While the actual flow rate of flue gas (wet basis) is used for sizing each individual flue, to meet the exhaust velocity criteria, the flow rate at reference conditions (i.e. dry, NTP of 0 degrees Celsius & 101.325 kPa and 11% O_2) is used to determine the design emission rates for individual pollutants, based on the BREF WI/IED emission concentrations selected for the Proposal (Table 17). Using the flow rate of flue gas at reference conditions removes the uncertainty associated with the technology providers choice of excess air ratio, which will not be confirmed until the Proposal selects a moving grate technology provider.

Emission rates for LP1 are based on daily average and short-term concentrations, as presented in Table 18. Emission rates of individual metals have been calculated using metal speciation of clean gas and fly ash as provided by Ramboll (Table 19).

Table 17 The Proposal: Emission concentration (daily average and short term)

Pollutant	Emission concentration (mg/Nm^3 @ 11% O_2 dry)		Information Source
	Daily average (3, 5)	Short Term (½hr) (4, 6)	
Dust	5	30	EU IED & BREF WI
TVOC	10	20	
HCl	6	60	
HF	1	4	
Sox	30	200	
NOx	120	400	
CO	50	100	
NH_3	10	NA	
Cd+Tl(2)	0.02	ND	
Other metals(2)	0.3	ND	
Hg(2)	0.02	ND	
Dioxins and furans(1)	0.04 (ng I-TEQ/Nm^3 @ 11% O_2 dry)	ND	
Dioxins and furans + dioxin like PCBs(1)	0.06 (ng I-TEQ/Nm^3 @ 11% O_2 dry)	0.1	
PAHs (BaP)7)	0.2 µg/Nm^3 @ 11% O_2 dry	ND	

ND not defined

Table note:

(1) Either the daily average BAT-AEL emission concentration for dioxins and furans or the daily average BAT-AEL emission concentration for dioxins and furans + dioxin-like PCBs applies (BREF WI (2019)).

(2) Average emission limit values (mg/Nm^3) for the heavy metals over a sampling period of a minimum of 30 minutes and a maximum of 8 hours.

(3) Daily average (upper) BAT-AEL emission concentration limits for each pollutant as presented in the BREF WI (2019).

(4) Short term average emission concentration limits for each pollutant (where applicable) are the half-hourly averages from the IED Annex VI Part 3.

(5) IED 2010/75/EU Annex VI Part 6 *Monitoring of Emissions* clause 1.3 At the daily emission limit value level, the values of the 95 % confidence intervals of a single measured result shall not exceed the following percentages of the emission limit values:

Emission	Units
CO	10%
SO_2 / NOx	20%
Particulate / TOC	30%
HCl/HF	40%

(6) IED 2010/75/EU Annex VI Part 8 *Assessment of compliance with emission limit values* clause 1.2 The half-hourly average values and the 10-minute averages shall be determined within the effective operating time (excluding the start-up and shut-down periods if no waste is being incinerated) from the measured values after having subtracted the value of the confidence interval specified in point 1.3 of Part 6. The daily average values shall be determined from those validated average values.

(7) BREF WI (2019) Figure 8.121 Emission levels for periodically monitored benzo(a)pyrene (BaP) emissions to air from reference lines incinerating predominantly MSW, for modern facilities with similar flue gas treatment controls to the Proposal (i.e. activated carbon injection and bag filter), the maximum periodically monitored emission level for BaP is reported to be 0.1 micrograms/Nm^3 (at reference conditions), with most averaging between 0 – 0.05 micrograms/Nm^3 (at reference conditions). For potential PAH emissions expressed as B(a)P, Ramboll has conservatively assumed 2 x the maximum concentration for potential contributions from others in the PAH family i.e. 0.2 micrograms/Nm^3 (at reference conditions).

Table 18 The Proposal: Emission rates (daily average and short term)

Emission rates (per two flues)	Daily average (g/s)	Short Term[6] (g/s)	Information source
Dust[1]	0.44	1.54	Calculated from emission concentration (Table 17) and flow rates (Table 16), inclusive of a 10% flow margin
HCl	0.529	2.91	
HF	0.088	0.220	
SOx	2.65	10.14	
NOx	10.58	22.92	
CO	4.41	6.61	
NH_3	0.88	NA	
Dioxins and furans	0.0000000035	NA	
Dioxins and furans + dioxin like PCBs	0.0000000053	0.0000000071	
PAHs (BaP equivalent)	0.000000018	NA	
TVOC (100% formaldehyde)	0.88[2]	1.32[2]	
TVOC (100% benzene)	0.88[3]	1.32[3]	
Cd	0.001[4]	0.001[5]	
Tl	0.0007[4]	0.0007[5]	
As	0.0008[4]	0.0006[5]	
Co	0.0007[4]	0.0004[5]	
Cr(III), Cr(VI)	0.0027[4]	0.0022[5]	
Cu	0.0023[4]	0.0028[5]	
Mn	0.004[4]	0.0037[5]	
Hg	0.0018	NA	
Ni	0.0032[4]	0.0018[5]	
Pb	0.0106[4]	0.0199[5]	
Sb	0.0019[4]	0.0016[5]	
V	0.0003[4]	0.0003[5]	

Table note:

[1] It has been conservatively assumed that 100% of the dust emission rate is both PM_{10} and $PM_{2.5}$

[2] Assumption that 100% of the TVOC is formaldehyde. This is highly conservative given the BREF WI (2019) Figures 8.24 for daily and annual average emission levels of continuous monitored TVOC for most newer facilities are between 0-1 mg/Nm^3 (at reference conditions).

[3] Assumption that 100% of the TVOC is benzene. This is highly conservative since few constituents are likely to form or release benzene.

[4] Individual emission rates of metals for daily averages are based on speciation of heavy metals in clean gas as provided by Ramboll (Table 19)

[5] Individual emission rates of metals for short term are based on speciation of heavy metals in fly ash as provided by Ramboll (Table 19)

[6] Only one line will operate at short term limits, the other line will operate at daily average limits.

Table 19 Speciation of heavy metals in clean gas and fly ash

Metal	Clean gas		Fly ash	
	Cd and Tl	Other metals	Cd and Tl	Other metals
As	-	3%	-	0.013%
Cd	59%	-	59%	-
Co	-	2%	-	0.005%
Cr	-	10%	-	0.065%
Cu	-	9%	-	0.12%
Mn	-	15%	-	0.13%
Ni	-	12%	-	0.014%
Pb	-	40%	-	1.1%
Sb	-	7%	-	0.053%
Tl	41%	-	41%	-
V	-	1%	-	0.005%

7.2 Dispersion modelling results

The following sections described the ground-level concentrations from emissions due to operations. It is important to note that concentrations in Table 20 to Table 23 are not always directly comparable, with the maximum impact sites being different when only considering the Proposal to those when considering the Proposal inclusive of Brickworks and an ambient background.

7.2.1 LP1 daily average (upper) emission concentration limit

Table 20 and Table 21 present the predicted ground-level concentrations of all air pollutants due to the Proposal in isolation and cumulatively (with Brickworks and ambient backgrounds). Results are presented for the maximum off-site, at a residential receptor, at an industrial receptor and at a sensitive (non-residential) receptor.

Contour plates illustrating the predicted ground-level concentrations across the model domain for key pollutants:

- NO_2 (Plate 1 to Plate 4)
- SO_2 (Plate 5 to Plate 10)
- PM_{10} and $PM_{2.5}$ (Plate 11 to Plate 14)
- HF (Plate 15 to Plate 18).

Publication 1961 requires that APACs with averaging times greater than or equal to 24-hours be applied to discrete sensitive receptors, while those with averaging times less than 24-hours need to be considered for any location beyond the site boundary. Therefore, percentage contributions reported in the following section are based on the maximum off-site for 1-hour average concentrations and the maximum at a sensitive receptor for averaging periods of 24-hours or longer. Furthermore, all pollutants relating to the Proposal are to be considered cumulatively, as per Publication 1961, with the exception of annual average arsenic, benzene and PAH as BAP. The following results summary shows ground-level impacts as percentage contributions to the respective APACs for each pollutant with consideration given to requirements of Publication 1961:

- Maximum 1-hour and annual average ground-level concentrations of NO_2 are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of NO_2 are at most 10.5% in isolation** and 71.5% with a cumulative background of the respective health-based APAC. **Predicted concentrations of NO_2 are at most 2.7% in isolation** and 68.0% of the environmental APAC with a cumulative background.

- Maximum 8-hour average ground-level concentrations of CO are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of CO are at most 0.1% in isolation** and 12.5% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour, 24-hour and annual average ground-level concentrations of SO_2 are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of SO_2 are at most 6.7% in isolation** and 92.0% with a cumulative background of the respective health-based APACs, and 6.0% in isolation and 46.5% of the environmental APAC with a cumulative background.
- Maximum 1-hour and annual average ground-level concentrations of HCl are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of HCl are at most 0.7% in isolation** and 20.0% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour and 24-hour average ground-level concentrations of HF are predicted to comply with the relevant APACs at all off-site sensitive locations within the study area, due to the Proposal in isolation

and cumulatively. **Predicted concentrations of HF are at most 0.8% in isolation** and 16.3% of the respective health-based APAC with a cumulative background. **Maximum predicted ground-level concentrations of HF comply with the environmental APAC in isolation, constituting 7.2% of the criteria**, however, exceed the environmental APAC when considered cumulatively, constituting 135% of the criteria. This is due to the background concentration predicted to exceed the environmental APAC for HF due to the adjacent industry. Less than 0.01% of the maximum predicted 24-hour average concentration of HF is due to the Proposal on the day concentrations are predicted to be above the environmental APAC.

- Maximum 1-hour, 24-hour and annual average ground-level concentrations of NH_3 are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation. **Predicted concentrations of NH_3 are at most 0.3% of the respective health-based APAC**, and 2.9% of the environmental APAC. No information was available to determine a background for NH_3 for a cumulative assessment.

- Annual average ground-level concentrations of PCDD/F in isolation and with a cumulative background at all off-site sensitive locations within the study area comply with the relevant APAC. **Predicted concentrations of PCDD/F are at most 0.001% in isolation** and 0.004% with a cumulative background of the respective health-based APACs.

- Maximum 30-minute, 24-hour and annual average ground-level concentrations of formaldehyde are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation. **Predicted concentrations of formaldehyde are at most 5.5% of the respective health-based APAC**,

- Maximum 1-hour, 24-hour and annual average ground-level concentrations of benzene are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation. **Predicted concentrations of benzene are at most 13.5% of the respective health-based APAC**,

- Annual average ground-level concentrations of PAHs (as BaP) in isolation at all off-site sensitive locations within the study area comply with the relevant APAC. **Predicted concentrations of PAHs (as BaP) are at most 4.6% in isolation** of the incremental health-based APAC.

- Maximum 24-hour and annual average ground-level concentrations of PM_{10} are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation. **Predicted concentrations of PM_{10} in isolation are at most 1.2% of the respective health-based APAC**. Maximum predicted ground-level concentrations of PM_{10} with a cumulative background exceed the health-based APAC, constituting at most 452% of the criteria. This is due to the ambient background concentration already exceeding the APAC for PM_{10} (Section 4.5.2). **Analysis of the 24-hour concentrations over the five years shows that there are no additional days of exceedance proposed due to the inclusion of the Proposal.**

- Maximum 24-hour and annual ground-level concentrations of $PM_{2.5}$ in isolation at all off-site sensitive locations within the study area comply with the relevant APAC. **Predicted concentrations of $PM_{2.5}$ in isolation are at most 2.3% of the respective health-based APAC**. Maximum predicted ground-level concentrations of $PM_{2.5}$ with a cumulative background exceed the health-based APAC, constituting at most 169% of the criteria. This is due to the ambient background concentration already exceeding the APAC for $PM_{2.5}$ (Section 4.5.2). **Analysis of the 24-hour concentrations over the five years shows that there are no additional days of exceedance proposed due to the inclusion of the Proposal.**

- Maximum predicted ground-level concentrations of any metal in isolation and with a cumulative background at all off-site locations within the study area comply with the relevant APAC. **The metal contributing most significantly to ground level concentrations was Ni, constituting 10.0% of the APAC. Cd is the only metal with an environmental based APAC, for which predicted ground level concentrations were at most 5.4% in isolation** and 1.6% of the APAC with a cumulative background.

The difference between the isolation and cumulative impacts here are a result of Brickworks not being included as an industrial receptor for the purposes of the cumulative assessment.

In summary, the daily average AQ modelling results demonstrate that with the proposed emission limit settings, based on the upper end of the BAT-AEL range associated with implementation of BAT for emission control and flue gas treatment, the Proposal (in isolation) is predicted to have an insignificant impact on air quality, as measured against the relevant health-based and environmental based APACs.

Table 20 LP1 daily average – predicted ground-level concentrations of NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, HCl, HF, NH_3, PCDD/F

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
NO_2(4)	1-hour	164	2017	17.3	9.9	7.7	2.1	117.3	117.1	117.3	117.1
			2018	14.1	10.4	7.1	2.4	107.2	102.7	104.0	102.7
			2019	14.0	9.6	7.0	2.0	92.5	86.6	86.3	86.3
			2020	13.5	9.9	7.6	3.9	106.8	106.8	106.8	106.8
			2021	12.4	10.2	7.7	1.9	86.9	85.0	85.0	86.9
NO_2 (4)	Annual	30 / 30(3)	2017	1.4	0.2	0.4	0.02	21.9	20.4	20.2	20.1
			2018	1.3	0.2	0.5	0.02	21.5	20.0	19.8	19.7
			2019	1.2	0.2	0.4	0.02	20.4	19.0	18.7	18.6
			2020	1.3	0.1	0.8	0.02	18.7	17.1	17.1	16.8
			2021	1.3	0.1	0.8	0.01	18.0	16.4	16.3	16.1
CO	8-hour	11,250	2017	11.4	7.9	5.9	1.2	1,402	1,369	1,350	1,346
			2018	11.5	5.3	6.0	1.3	1,156	1,130	1,102	1,116
			2019	11.9	6.3	6.6	0.8	896	882	856	845
			2020	11.5	5.7	7.1	1.2	1,298	1,271	1,249	1,248
			2021	11.7	5.0	7.2	1.0	1,075	1,056	1,027	1,020
SO_2	1-hour	214	2017	14.4	8.2	6.4	1.7	155.6	126.3	58.3	64.3
			2018	11.8	8.6	5.9	2.0	166.9	132.4	72.6	163.4
			2019	11.7	8.0	5.9	1.7	150.0	123.3	81.8	51.0

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
			2020	11.2	8.3	6.3	3.2	196.8	123.9	48.7	177.6
SO_2	1-hour	214	2021	10.3	8.5	6.4	1.6	151.0	128.2	73.7	89.2
SO_2	24-hour	57	2017	6.1	2.2	2.7	0.3	60.1	27.6	15.5	8.9
			2018	6.3	1.7	2.8	0.3	58.8	36.0	16.1	17.8
			2019	6.4	1.6	2.8	0.2	63.6	44.1	14.9	8.3
			2020	6.0	2.2	3.5	0.3	60.2	29.2	21.0	12.8
			2021	6.0	2.3	3.3	0.3	53.6	35.4	21.1	10.2
SO_2	Annual	20(3)	2017	1.2	0.16	0.37	0.02	7.6	5.0	2.3	1.5
			2018	1.1	0.17	0.40	0.02	8.5	5.5	2.5	1.5
			2019	1.0	0.17	0.36	0.02	8.5	5.3	2.2	1.4
			2020	1.1	0.12	0.68	0.01	8.7	4.7	3.3	1.3
			2021	1.1	0.10	0.67	0.01	9.3	5.4	4.1	2.1
PM_{10}	24-hour	50	2017	1.0	0.36	0.45	0.051	36.6	35.6	35.7	35.6
			2018	1.1	0.28	0.46	0.047	76.0	74.6	74.3	74.0
			2019	1.1	0.27	0.47	0.029	71.1	70.7	70.0	69.9
			2020	1.0	0.36	0.58	0.055	225.9	225.9	225.9	225.9
			2021	1.0	0.39	0.55	0.053	42.8	42.2	42.8	42.3
PM_{10}	Annual	20	2017	0.20	0.03	0.06	0.003	16.4	15.6	15.4	15.3
			2018	0.18	0.03	0.07	0.003	19.3	18.6	18.3	18.2
			2019	0.17	0.03	0.06	0.003	19.5	18.7	18.4	18.3

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
PM_{10}	Annual	20	2020	0.18	0.02	0.11	0.003	19.5	18.6	18.4	18.2
			2021	0.18	0.02	0.11	0.002	18.3	17.4	17.3	17.1
$PM_{2.5}$	24-hour	25	2017	1.0	0.36	0.45	0.051	36.3	36.1	36.0	36.0
			2018	1.1	0.28	0.46	0.047	42.4	42.2	42.2	42.1
			2019	1.1	0.27	0.47	0.029	30.8	30.8	30.7	30.7
			2020	1.0	0.36	0.58	0.055	36.1	35.7	35.7	35.7
			2021	1.0	0.39	0.55	0.053	34.6	34.4	34.5	34.4
$PM_{2.5}$	Annual	8	2017	0.20	0.03	0.06	0.003	9.2	8.9	8.9	8.8
			2018	0.18	0.03	0.07	0.003	8.2	7.9	7.9	7.8
			2019	0.17	0.03	0.06	0.003	8.0	7.7	7.6	7.6
			2020	0.18	0.02	0.11	0.003	8.3	7.9	7.9	7.9
			2021	0.18	0.02	0.11	0.002	7.1	6.8	6.7	6.7
NH_3(5)	1-hour	3,200	2017	4.8	2.7	2.1	0.57	-	-	-	-
			2018	3.9	2.9	2.0	0.68	-	-	-	-
			2019	3.9	2.7	2.0	0.56	-	-	-	-
			2020	3.7	2.8	2.1	1.1	-	-	-	-
			2021	3.4	2.8	2.1	0.54	-	-	-	-
NH_3(5)	24-hour	1,184	2017	2.0	0.72	0.91	0.10	-	-	-	-
			2018	2.1	0.55	0.93	0.09	-	-	-	-
			2019	2.1	0.53	0.93	0.06	-	-	-	-

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
NH_3(5)	24-hour	1,184	2020	2.0	0.72	1.16	0.11	-	-	-	-
			2021	2.0	0.78	1.10	0.11	-	-	-	-
NH_3(5)	Annual	70 / 8(3)	2017	0.4	0.05	0.12	0.006	-	-	-	-
			2018	0.4	0.06	0.13	0.006	-	-	-	-
			2019	0.3	0.06	0.12	0.005	-	-	-	-
			2020	0.4	0.04	0.23	0.005	-	-	-	-
			2021	0.4	0.03	0.22	0.004	-	-	-	-
HF	1-hour	60	2017	0.48	0.27	0.21	0.06	7.5	6.0	2.5	2.9
			2018	0.39	0.29	0.20	0.07	8.1	6.4	3.2	7.9
			2019	0.39	0.27	0.20	0.06	7.3	5.9	3.7	2.2
			2020	0.37	0.28	0.21	0.11	9.8	6.1	2.2	8.8
			2021	0.34	0.28	0.21	0.05	7.4	6.2	3.4	4.2
HF	24-hour	31 / 2.9(3)	2017	0.20	0.07	0.09	0.010	2.8	1.2	0.53	0.19
			2018	0.21	0.06	0.09	0.009	2.7	1.6	0.54	0.64
			2019	0.21	0.05	0.09	0.006	3.0	2.0	0.52	0.18
			2020	0.20	0.07	0.1	0.01	2.8	1.2	0.78	0.37
			2021	0.20	0.08	0.1	0.01	2.4	1.5	0.74	0.19
HCl	1-hour	2,100	2017	2.9	1.6	1.3	0.3	136	109	44	52
			2018	2.4	1.7	1.2	0.4	147	115	58	143
			2019	2.3	1.6	1.2	0.3	131	106	66	39

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
HCl	1-hour	2,100	2020	2.2	1.7	1.3	0.6	177	109	38	159
			2021	2.1	1.7	1.3	0.3	133	112	60	76
HCl	Annual	20	2017	0.23	0.03	0.07	0.004	5.7	3.5	1.0	0.3
			2018	0.22	0.03	0.08	0.004	6.8	4.0	1.2	0.3
			2019	0.21	0.03	0.07	0.003	6.8	3.9	1.0	0.3
			2020	0.21	0.02	0.14	0.003	6.9	3.3	2.1	0.3
			2021	0.21	0.02	0.13	0.002	6.7	3.3	2.1	0.3
Formaldehyde	30-minute	100	2017	5.51	3.15	2.47	0.66	-	-	-	-
			2018	4.51	3.31	2.27	0.78	-	-	-	-
			2019	4.46	3.06	2.25	0.64	-	-	-	-
			2020	4.30	3.17	2.43	1.24	-	-	-	-
			2021	3.95	3.25	2.45	0.61	-	-	-	-
Formaldehyde	24-hour	49	2017	2.03	0.72	0.91	0.10	-	-	-	-
			2018	2.12	0.55	0.93	0.09	-	-	-	-
			2019	2.14	0.53	0.93	0.06	-	-	-	-
			2020	2.00	0.72	1.16	0.11	-	-	-	-
			2021	1.99	0.78	1.10	0.11	-	-	-	-
Formaldehyde	Annual	9.8	2017	0.39	0.05	0.12	0.006	-	-	-	-
			2018	0.37	0.06	0.13	0.006	-	-	-	-
			2019	0.35	0.06	0.12	0.005	-	-	-	-

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
			2020	0.35	0.04	0.23	0.005	-	-	-	-
			2021	0.35	0.03	0.22	0.004	-	-	-	-
Benzene	1-hour	580	2017	4.80	2.75	2.15	0.57	-	-	-	-
			2018	3.92	2.88	1.97	0.68	-	-	-	-
			2019	3.88	2.67	1.96	0.56	-	-	-	-
			2020	3.75	2.76	2.11	1.08	-	-	-	-
			2021	3.44	2.83	2.13	0.54	-	-	-	-
Benzene	24-hour	29	2017	2.03	0.72	0.91	0.10	-	-	-	-
			2018	2.12	0.55	0.93	0.09	-	-	-	-
			2019	2.14	0.53	0.93	0.06	-	-	-	-
			2020	2.00	0.72	1.16	0.11	-	-	-	-
			2021	1.99	0.78	1.10	0.107	-	-	-	-
Benzene	Annual	9.6/1.7(6)	2017	0.39	0.05	0.12	0.006	-	-	-	-
			2018	0.37	0.06	0.13	0.006	-	-	-	-
			2019	0.35	0.06	0.12	0.005	-	-	-	-
			2020	0.35	0.04	0.23	0.005	-	-	-	-
			2021	0.35	0.03	0.22	0.004	-	-	-	-
PAH as BAP	Annual	0.002 / 0.0001(6) / 0.15	2017	7.83E-06	1.07E-06	2.44E-06	1.24E-07	-	-	-	-
			2018	7.34E-06	1.15E-06	2.66E-06	1.18E-07	-	-	-	-
			2019	6.93E-06	1.12E-06	2.39E-06	1.01E-07	-	-	-	-

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site [1]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[2]	Maximum at residential receptor	Maximum at industrial receptor[2]	Maximum at other sensitive receptor
			2020	7.04E-06	7.91E-07	4.50E-06	9.98E-08	-	-	-	-
			2021	7.06E-06	6.80E-07	4.50E-06	8.22E-08	-	-	-	-
PCDD/F	Annual	0.00004	2017	2.3E-09	3.2E-10	7.3E-10	3.7E-11	1.3E-09	3.2E-10	1.6E-10	3.8E-11
			2018	2.2E-09	3.5E-10	8.0E-10	3.5E-11	1.4E-09	3.5E-10	1.9E-10	3.6E-11
			2019	2.1E-09	3.4E-10	7.2E-10	3.0E-11	1.3E-09	3.4E-10	1.6E-10	3.1E-11
			2020	2.1E-09	2.4E-10	1.4E-09	3.0E-11	1.5E-09	2.4E-10	2.0E-10	3.1E-11
			2021	2.1E-09	2.0E-10	1.3E-09	2.5E-11	1.5E-09	2.2E-10	2.1E-10	2.5E-11

Table note:

Greyed cells indicate concentrations above APACS. In all instances, exceedances are due to the existing environment. No additional exceedances occur due to the contribution from the Proposal

[1] Maximum off-site is the maximum outside of the Proposal area

[2] Maximum off-site and maximum at an industry is the maximum outside of the Proposal area and Brickworks site

[3] Environmental APAC

[4] NOx to NO_2 conversion assumes 30% conversion

[5] No background information available for cumulative assessment

[6] Incremental APAC

Table 21 LP1 daily average – predicted ground-level concentrations of metals

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
As	1-hour	9.9	2017	0.004	0.003	0.002	0.0005	0.004	0.003	0.001	0.0007
			2018	0.004	0.003	0.002	0.0006	0.004	0.003	0.001	0.0015
			2019	0.004	0.002	0.002	0.0005	0.004	0.002	0.002	0.0005
			2020	0.003	0.003	0.002	0.0010	0.003	0.003	0.001	0.0017
			2021	0.003	0.003	0.002	0.0005	0.003	0.003	0.001	0.0008
As	Annual	0.007	2017	0.0004	0.00005	0.0001	0.00001	0.0002	0.0001	0.00003	0.00001
			2018	0.0003	0.00005	0.0001	0.00001	0.0003	0.0001	0.00004	0.00001
			2019	0.0003	0.00005	0.0001	0.00001	0.0002	0.0001	0.00003	0.00001
			2020	0.0003	0.00004	0.0002	0.00001	0.0003	0.0001	0.00005	0.00001
			2021	0.0003	0.00003	0.0002	0.00001	0.0003	0.0001	0.00005	0.00001
Cd	1-hour	18	2017	0.006	0.003	0.003	0.0007	0.006	0.003	0.002	0.0007
			2018	0.005	0.003	0.002	0.0008	0.005	0.003	0.002	0.0008
			2019	0.005	0.003	0.002	0.0007	0.005	0.003	0.002	0.0007
			2020	0.004	0.003	0.002	0.0013	0.004	0.003	0.002	0.0015
			2021	0.004	0.003	0.003	0.0006	0.004	0.003	0.001	0.0006
Cd	24-hour	0.03	2017	0.002	0.0009	0.00107	0.00012	0.002	0.0009	0.0003	0.0001
			2018	0.002	0.0007	0.0011	0.00011	0.002	0.0007	0.0003	0.0001
			2019	0.003	0.0006	0.0011	0.00007	0.002	0.0006	0.0002	0.00008
			2020	0.002	0.0009	0.00136	0.00013	0.002	0.0009	0.0004	0.0002

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
Cd	24-hour	0.03	2021	0.002	0.0009	0.00129	0.00013	0.002	0.0009	0.0003	0.0001
Cd	Annual	0.005/ 0.005 (3)	2017	0.0005	0.00006	0.00014	0.00001	0.0003	0.00007	0.00004	0.00001
			2018	0.0004	0.00007	0.00016	0.00001	0.0003	0.00008	0.00004	0.00001
			2019	0.0004	0.00007	0.00014	0.00001	0.0003	0.00007	0.00003	0.00001
			2020	0.0004	0.00005	0.00027	0.00001	0.0003	0.00006	0.00005	0.00001
			2021	0.0004	0.00004	0.00027	0.00001	0.0003	0.00006	0.00005	0.00001
Cr(III)	30-day	0.1	2017	0.003	0.0004	0.0008	0.00005	0.002	0.0004	0.0002	0.00006
			2018	0.003	0.0003	0.0008	0.00004	0.002	0.0003	0.0002	0.00005
			2019	0.002	0.0004	0.0007	0.00003	0.001	0.0004	0.0002	0.00004
			2020	0.002	0.0004	0.001	0.00004	0.001	0.0004	0.0002	0.00005
			2021	0.002	0.0002	0.001	0.00003	0.001	0.0003	0.0003	0.00003
Cr(VI)	1-hour	1.3	2017	0.014	0.008	0.006	0.002	0.01	0.008	0.004	0.002
			2018	0.012	0.009	0.006	0.002	0.01	0.009	0.004	0.002
			2019	0.012	0.008	0.006	0.002	0.01	0.008	0.005	0.002
			2020	0.011	0.008	0.006	0.003	0.01	0.008	0.005	0.003
			2021	0.010	0.009	0.006	0.002	0.01	0.009	0.004	0.002
Cr(VI)	Annual	0.005	2017	0.001	0.0002	0.0004	0.00002	0.0007	0.0002	0.0001	0.00002
			2018	0.001	0.0002	0.0004	0.00002	0.0007	0.0002	0.0001	0.00002
			2019	0.001	0.0002	0.0004	0.00002	0.0007	0.0002	0.0001	0.00002
			2020	0.001	0.0001	0.0007	0.00002	0.0008	0.0001	0.0001	0.00002

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(2)]	Maximum at residential receptor	Maximum at industrial receptor[(2)]	Maximum at other sensitive receptor
Cr(VI)	Annual	0.005	2021	0.001	0.0001	0.0007	0.00001	0.0007	0.0001	0.0001	0.00001
Cu	1-hour	100	2017	0.013	0.007	0.006	0.002	0.013	0.007	0.004	0.002
			2018	0.010	0.008	0.005	0.002	0.010	0.008	0.004	0.002
			2019	0.010	0.007	0.005	0.001	0.010	0.007	0.004	0.001
			2020	0.010	0.007	0.006	0.003	0.010	0.007	0.004	0.003
			2021	0.009	0.007	0.006	0.001	0.009	0.007	0.003	0.001
Hg	Annual	1.0	2017	0.0008	0.0001	0.0002	0.00001	0.0004	0.0001	0.00006	0.00001
			2018	0.0007	0.0001	0.0003	0.00001	0.0005	0.0001	0.00006	0.00001
			2019	0.0007	0.0001	0.0002	0.00001	0.0004	0.0001	0.00005	0.00001
			2020	0.0007	0.0001	0.0005	0.00001	0.0005	0.0001	0.00007	0.00001
			2021	0.0007	0.0001	0.0005	0.00001	0.0005	0.0001	0.00007	0.00001
Mn	1-hour	9.1	2017	0.02	0.012	0.010	0.003	0.02	0.012	0.008	0.005
			2018	0.02	0.013	0.009	0.003	0.02	0.013	0.010	0.014
			2019	0.02	0.012	0.009	0.003	0.02	0.012	0.011	0.004
			2020	0.02	0.012	0.010	0.005	0.02	0.012	0.008	0.016
			2021	0.02	0.013	0.010	0.002	0.02	0.013	0.010	0.008
Mn	Annual	0.15	2017	0.002	0.0002	0.0006	0.00003	0.001	0.0005	0.0002	0.00005
			2018	0.002	0.0003	0.0006	0.00003	0.001	0.0005	0.0002	0.00006
			2019	0.002	0.0003	0.0005	0.00002	0.001	0.0006	0.00019	0.00005
			2020	0.002	0.0002	0.0010	0.00002	0.002	0.0005	0.00035	0.00005

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site[1]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[2]	Maximum at residential receptor	Maximum at industrial receptor[2]	Maximum at other sensitive receptor
Mn	Annual	0.15	2021	0.002	0.0002	0.0010	0.00002	0.002	0.0005	0.00035	0.00004
Ni	1-hour	0.2	2017	0.02	0.010	0.008	0.002	0.02	0.010	0.005	0.002
			2018	0.01	0.010	0.007	0.002	0.01	0.010	0.005	0.004
			2019	0.01	0.010	0.007	0.002	0.01	0.010	0.005	0.002
			2020	0.01	0.010	0.008	0.004	0.01	0.010	0.005	0.005
			2021	0.01	0.010	0.008	0.002	0.01	0.010	0.005	0.002
Ni	Annual	0.09	2017	0.001	0.0002	0.0004	0.00002	0.0009	0.0002	0.0001	0.00003
			2018	0.001	0.0002	0.0005	0.00002	0.0009	0.0002	0.0001	0.00003
			2019	0.001	0.0002	0.0004	0.00002	0.0009	0.0003	0.0001	0.00003
			2020	0.001	0.0001	0.0008	0.00002	0.0010	0.0002	0.0002	0.00002
			2021	0.001	0.0001	0.0008	0.00001	0.0010	0.0002	0.0002	0.00002
Pb	Annual	0.5	2017	0.005	0.0006	0.001	0.00007	0.003	0.0008	0.0004	0.00010
			2018	0.004	0.0007	0.002	0.00007	0.003	0.0008	0.0004	0.00010
			2019	0.004	0.0007	0.001	0.00006	0.003	0.0008	0.0004	0.00009
			2020	0.004	0.0005	0.003	0.00006	0.003	0.0007	0.0006	0.00008
			2021	0.004	0.0004	0.003	0.00005	0.003	0.0007	0.0006	0.00006
Sb[4]	24-hour	1.0	2017	0.004	0.002	0.002	0.0002	-	-	-	-
			2018	0.004	0.001	0.002	0.0002	-	-	-	-
			2019	0.005	0.001	0.002	0.0001	-	-	-	-
			2020	0.004	0.002	0.002	0.0002	-	-	-	-

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
Sb(4)	24-hour	1.0	2021	0.004	0.002	0.002	0.0002	-	-	-	-
Sb(4)	Annual	0.3	2017	0.0008	0.0001	0.0003	0.00001	-	-	-	-
			2018	0.0008	0.0001	0.0003	0.00001	-	-	-	-
			2019	0.0007	0.0001	0.0003	0.00001	-	-	-	-
			2020	0.0007	0.00008	0.0005	0.00001	-	-	-	-
			2021	0.0007	0.00007	0.0005	0.00001	-	-	-	-

Table note:

(1) Maximum off-site is the maximum outside of the Proposal area

(2) Maximum off-site and maximum at an industry is the maximum outside of the Proposal area and Brickworks site

(3) Environmental APAC

(4) No background information available for cumulative assessment

7.2.2 LP1 short-term emission concentration limit

Table 22 and Table 23 present the predicted ground-level concentrations of all pollutants due to the Proposal in isolation and cumulatively (with Brickworks and ambient backgrounds). Results are presented for the maximum off-site, at a residential receptor, at an industrial receptor and at a sensitive (non-residential) receptor.

Contour plates (Plate 19 to Plate 22) illustrate the predicted ground-level concentrations across the model domain for key pollutants NO_2 and SO_2.

Publication 1961 requires that APACs with averaging times greater than or equal to 24-hours be applied to discrete sensitive receptors, while those with averaging times less than 24-hours need to be considered for any location beyond the site boundary. The following results summary shows ground-level impacts as percentage contributions to the respective APACs for each pollutant with consideration given to requirements of Publication 1961:

- Maximum 1-hour average ground-level concentrations of NO_2 are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of NO_2 are at most 22.8% in isolation** and 71.8% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour average ground-level concentrations of SO_2 are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation and cumulatively. **Predicted concentrations of SO_2 are at most 25.8% in isolation** and 92% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour ground-level concentrations of HCl in isolation and with a cumulative background at all off-site sensitive locations within the study area comply with the relevant APAC. **Predicted concentrations of HCl are at most 0.8% in isolation** and 8.4% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour average ground-level concentrations of HF in isolation and with a cumulative background at all off-site sensitive locations within the study area comply with the relevant APAC. **Predicted concentrations of HF are at most 2.0% in isolation** and 16.3% of the respective health-based APAC with a cumulative background.
- Maximum 1-hour average ground-level concentrations of formaldehyde are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in isolation. **Predicted concentrations of formaldehyde are at most 8.3% in isolation.**
- Maximum 1-hour average ground-level concentrations of benzne are predicted to comply with the relevant APAC at all off-site sensitive locations within the study area, due to the Proposal in. **Predicted concentrations of benzene are at most 1.3% in isolation.**
- Maximum 1-hour average ground-level concentrations of any metal in isolation and with a cumulative background at all off-site locations within the study area comply with the relevant APAC. **The metal contributing most significantly to ground level concentrations was Ni, constituting 5.0% of the APAC.**

Table 22 LP1 short-term – predicted ground-level concentrations of NO_2, SO_2, NH_3, HF, HCl

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
NO_2(3)	1-hour	164	2017	37.4	21.4	16.7	4.47	117.7	117.1	117.7	117.1
			2018	30.6	22.5	15.4	5.28	105.7	102.7	105.2	102.7
			2019	30.3	20.8	15.3	4.38	94.5	87.0	86.3	86.5
			2020	29.2	21.5	16.5	8.42	106.8	106.8	106.8	106.8
			2021	26.8	22.1	16.6	4.17	91.1	85.0	85.0	89.1
SO_2	1-hour	214	2017	55.2	31.6	24.7	6.60	155.6	126.3	64.3	64.3
			2018	45.1	33.1	22.7	7.79	166.9	132.4	77.6	163.4
			2019	44.7	30.6	22.5	6.45	150.0	123.3	90.6	51.0
			2020	43.1	31.7	24.3	12.4	196.8	123.9	56.3	177.6
			2021	39.6	32.5	24.5	6.15	151.0	128.2	80.6	89.2
HF	1-hour	60	2017	1.2	0.68	0.54	0.14	7.5	6.0	2.6	2.9
			2018	1.0	0.72	0.49	0.17	8.1	6.4	3.3	7.9
			2019	1.0	0.66	0.49	0.14	7.3	5.9	3.9	2.2
			2020	0.9	0.69	0.53	0.27	9.8	6.1	2.3	8.8
			2021	0.9	0.71	0.53	0.13	7.4	6.2	3.5	4.2
HCl	1-hour	2,100	2017	15.8	9.1	7.1	1.9	136	109	46	52
			2018	12.9	9.5	6.5	2.2	147	115	60	143
			2019	12.8	8.8	6.5	1.9	131	106	68	39

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site [(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(2)]	Maximum at residential receptor	Maximum at industrial receptor[(2)]	Maximum at other sensitive receptor
HCl	1-hour	2,100	2020	12.4	9.1	7.0	3.6	177	109	40	159
			2021	11.4	9.3	7.0	1.8	133	112	62	76
Formaldehyde	30-minute	100	2017	8.3	4.7	3.7	1.0	-	-	-	-
			2018	6.8	5.0	3.4	1.2	-	-	-	-
			2019	6.7	4.6	3.4	1.0	-	-	-	-
			2020	6.5	4.8	3.6	1.9	-	-	-	-
			2021	5.9	4.9	3.7	0.92	-	-	-	-
Benzene	1-hour	580	2017	7.2	4.1	3.2	0.86	-	-	-	-
			2018	5.9	4.3	3.0	1.0	-	-	-	-
			2019	5.8	4.0	2.9	0.84	-	-	-	-
			2020	5.6	4.1	3.2	1.6	-	-	-	-
			2021	5.2	4.2	3.2	0.80	-	-	-	-

Table note:

(1) Maximum off-site is the maximum outside of the Proposal area

(2) Maximum off-site and maximum at an industry is the maximum outside of the Proposal area and Brickworks site

(3) NOx to NO_2 conversion assumes 30% conversion

Table 23 LP1 short-term – predicted ground-level concentrations of metals

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
As	1-hour	9.9	2017	0.003	0.002	0.001	0.0004	0.003	0.002	0.001	0.001
			2018	0.003	0.002	0.001	0.0005	0.003	0.002	0.001	0.001
			2019	0.003	0.002	0.001	0.0004	0.003	0.002	0.001	0.0004
			2020	0.002	0.002	0.001	0.0007	0.002	0.002	0.001	0.002
			2021	0.002	0.002	0.001	0.0004	0.002	0.002	0.001	0.0008
Cd	1-hour	18	2017	0.006	0.003	0.003	0.0007	0.006	0.003	0.002	0.0007
			2018	0.005	0.003	0.002	0.0008	0.005	0.003	0.002	0.0008
			2019	0.005	0.003	0.002	0.0007	0.005	0.003	0.002	0.0007
			2020	0.004	0.003	0.002	0.0013	0.004	0.003	0.002	0.0015
			2021	0.004	0.003	0.003	0.0006	0.004	0.003	0.001	0.0006
Cr(VI)	1-hour	1.3	2017	0.012	0.007	0.005	0.001	0.012	0.007	0.004	0.0015
			2018	0.010	0.007	0.005	0.002	0.010	0.007	0.004	0.002
			2019	0.010	0.007	0.005	0.001	0.010	0.007	0.004	0.001
			2020	0.009	0.007	0.005	0.003	0.009	0.007	0.004	0.003
			2021	0.009	0.007	0.005	0.001	0.009	0.007	0.003	0.001
Cu	1-hour	100	2017	0.01	0.009	0.007	0.002	0.01	0.009	0.004	0.002
			2018	0.01	0.009	0.006	0.002	0.01	0.009	0.005	0.002
			2019	0.01	0.008	0.006	0.002	0.01	0.008	0.005	0.002

Pollutant	Averaging period	APAC	Year	Isolation (µg/m³)				Cumulative (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(2)	Maximum at residential receptor	Maximum at industrial receptor(2)	Maximum at other sensitive receptor
			2020	0.01	0.009	0.007	0.003	0.01	0.009	0.005	0.003
			2021	0.01	0.009	0.007	0.002	0.01	0.009	0.004	0.002
Mn	1-hour	9.1	2017	0.02	0.012	0.009	0.002	0.02	0.012	0.007	0.005
			2018	0.02	0.012	0.008	0.003	0.02	0.012	0.010	0.014
			2019	0.02	0.011	0.008	0.002	0.02	0.011	0.011	0.004
			2020	0.02	0.012	0.009	0.005	0.02	0.012	0.008	0.016
			2021	0.01	0.012	0.009	0.002	0.02	0.012	0.009	0.008
Ni	1-hour	0.2	2017	0.010	0.006	0.004	0.001	0.010	0.006	0.003	0.001
			2018	0.008	0.006	0.004	0.001	0.008	0.006	0.003	0.004
			2019	0.008	0.005	0.004	0.001	0.008	0.005	0.004	0.001
			2020	0.008	0.006	0.004	0.002	0.008	0.006	0.003	0.004
			2021	0.007	0.006	0.004	0.001	0.007	0.006	0.003	0.002

Table note:

(1) Maximum off-site is the maximum outside of the Proposal area

(2) Maximum off-site and maximum at an industry is the maximum outside of the Proposal area and Brickworks site

8. ODOUR RISK ASSESSMENT

Odour is not considered to be an air pollutant with major associated impacts relating to emissions from the operation of the Proposal. However, small fugitive odour emissions from the waste tipping hall could possibly occur during random and temporary inspection of waste prior to entry into the waste bunker, escaping from open tipping hall entry and exit fast acting roller doors or during plant failure when negative pressure can no longer be maintained in the hall.

While the proposal can accept some potentially odorous and wet wastes such as Food Organics and Garden Organics (FOGO) processing facility residuals, the majority of waste loads will be mixed wastes with wet and odorous wastes only making up a portion of mixed waste deliveries. In addition, waste loads which are predominantly wet and potentially odorous waste will not be dumped/tipped for inspection outside of the waste bunker. The Waste Acceptance Protocol for the Proposal also classifies certain waste types such as clinical waste and reportable priority wastes such as oil sludges as unacceptable waste and these wastes will not be accepted for processing by the Proposal.

Key controls for the Proposal in relation to odour include:

- All waste deliveries arriving to the MERC will be fully enclosed vehicles or loads
- Waste deliveries must be in accordance with the site Waste Acceptance Protocol
- Good housekeeping within the tipping hall area
- Some waste deliveries may be subject to random visual inspection prior to entering the tipping hall, if safe to do so. However, in such cases, the waste will remain inside the delivery vehicle. Tipping of waste outside of the tipping hall will be prohibited.
- Primary odour controls, including building design to segregate the tipping hall and waste bunker areas from other plant areas, the use of fast acting roller doors at entry and exit of tipping hall and maintaining a negative pressure in the tipping hall by extracting combustion air from within the waste bunker area, and pre-mixing of waste within the waste bunker (to avoid potential anaerobic conditions) are highly effective in managing odour during normal operation. Redundancy is also provided as there will be at least two air intakes for the combustion air drawn from the bunker and tipping hall i.e. one for each boiler line.
- Secondary controls include operable louvres, which in combination with the fast acting entry and exit roller doors, will fully enclose the tipping hall and waste bunker areas. These controls are backed up by a standby odour control unit with an activated carbon filter, for use during full plant outages on an 'as required' basis i.e. when work is being undertaken in the tipping hall and/or bunker areas. Where appropriate, prior to periods of planned maintenance, the waste stored within the waste bunker may be 'run-down' to reduce the quantities of waste in storage in the bunker. However, waste will be required to be on-hand prior to re-starting.

The Level 2 odour risk assessment for the Proposal, performed in accordance with EPA Victoria's guidance Publication 1883 (2022) as discussed in Section 0, is presented in Table 24. The Level 2 risk potential score ranges from 1 to 12 as defined below:

- 1 to 7 – low risk: risk of odour is low, safe to report
- 8 or 9 – medium risk: borderline cases – there may be one element that can influence the score and tip it into a low or high score. In these cases, this should be explored further
- 10 to 11 – high risk: A level 3 assessment is recommended to fully understand the risk

- 12 – very high risk: A level 3 assessment is not likely to demonstrate risk is acceptable but may provide further illustration on the nature of the risks and/or inform on odour mitigation measures.

This risk assessment resulted in an overall risk potential score of 6, and therefore, the risk of odour impacts from activities at the Proposal can be considered low taking into consideration the odour management measures and the separation of the activities from sensitive receptors.

Table 24 Level 2 odour assessment risk potential score matrix

Odour Source	*Odour Source Hazard Potential*		Odour Exposure Pathway Effectiveness		Receiving Environment Sensitivity		Odour Control Effectiveness Weighting	
	Category	Odour Source Score (OSS)	Category	Odour Pathway Score (OPS)	Existing Uses	Score	Category	Weighting
Tipping Haul	Activity Type	(1) - Low odour potential: Waste to energy plant	Distance	(2) - Medium Distance: Receiving environment is tens to hundreds of metres from the source. Separation distance has not been met or only just met at the threshold distances.	Business areas, single dwelling or isolated rural dwellings, recreational outdoor areas	(2) - Medium	Odour Control Effectiveness	(-1) - High: Tangible mitigation measures in place leading to little or no residual odour; releases, even due to plant failure. Fully enclosed operations.
	Size of Odour Hazard	(2) - Medium size: Materials usage thousands of tonnes/m3 per year.	Meteorology	(3) - Unfavourable: High frequency of winds from source to receiving environment	-	-	-	-
	Offensive Potential	(2) - Unwelcome Unpleasant odour range: although not likely to be perceived as toxic or unsafe, these odours are usually unwelcomed for most people.	Terrain and Built Form	(2) - Neutral: Moderate vegetation, source is on same altitude as receiving environment. Intervening land use zone contains other non-odorous industry or smaller businesses.	-	-	-	-
	-	-	Hours of Operation	(3) - High frequency: Emissions continually occurring 24/7 or for long periods at a time.	-	-	-	-
Attribute Score	**-**	**2**	**-**	**3**		**2**		**-1**
Overall Risk Rating	**6**							

Sensitive

9. PLUME VISIBILITY

A plume visibility study has been conducted using ADMS-5 to determine:

- The percentage of time the plume from the flue gas treatment stack is expected to be visible
- The height above ground at which the plume from the flue gas treatment stack may be visible
- The distance from the stack that the plume from the flue gas treatment stack may be visible.

The results of the plume visibility modelling for the Proposal operating at LP1 indicate the following:

- For the entire five-year period (42,806 hours modelled), the plume has the potential to be visible for 869 hours of which only 154 (0.4% of entire period) would be during daylight hours.
- The maximum height above ground at which the plume would be visible ranges from 69 m to 138 m above ground
- The horizontal extent that the plume would be visible ranges from 1 metre to 123.5 m downwind, with an average horizontal extent of 28.8 m
- In terms of the visible plume extending beyond the site boundary, site plans provided by Ramboll indicate that distance from the stack to the closest site boundary is 214 m (Figure 1). The modelling shows that the visible plume is contained within the Proposal area.

10. PLUME RISE

The Proposal is located within Melbourne Airport's Protected Airspace. The Proposal is therefore subject to regulations under the Airports Act 1996 and the Airports (Protection of Airspace) Regulations 1996. Specifically, structures or exhaust plumes located at the site higher than the Procedures of Air Navigation Services – Aircraft Operations (PANS-OPS) of 457.2 metres AHD require approval. The site is just outside the Obstacle Limitation Surfaces (OLS) outer horizontal surface limit of 262.5 metres AHD.

The plume from the flue gas treatment stack has a vertical velocity greater than 4.3 m/s upon release. Therefore the Civil Aviation Safety Authority's (CASA) Form 1247 - Application for Operational Assessment of a Proposed Plume Rise, has been submitted to CASA for its review.

11. MITIGATION AND RISK MANAGEMENT

The Proposal will be fully automated incorporating the latest online emissions monitoring technology, continuous monitoring of operational performance and automatic shut off mechanisms where preprogramed limits are triggered for key parameters. The operating system will incorporate a number of layers of contingency to detect system changes and respond to potential incidents. Regular monitoring, alarms and standard operating procedures will be in place to ensure that emissions are monitored continuously and responded to appropriately should the risk of related emissions exceedances or actual exceedance be detected.

All mitigation and risk management measures to be employed at the Proposal are addressed in the following sections. These aim to achieve the requirements of the GED, namely to:

- reduce risks as far as reasonably practicable; and to
- implement and maintain systems for identification, assessment and control of risks of harm and to aid evaluation of their controls.

11.1 Plant design and pollution controls

The Proposal has been designed in line the European IED and the associated BREF WI document which sets the EU environmental standards for waste incineration as published on 3 December 2019. The EU Commission Implementing Decision (2019/2010) on 12 November 2019 states the BAT conclusions as the main element of the BREF and prescribes them to be adopted by Member States. Due to the various types and combinations of BAT for controlling emissions, the BREF WI specifies a range of associated emission levels (BAT-AELs). The approach ensures that emission concentrations will be within the BAT-AEL range expected for WtE facilities that have implemented BAT.

Primary pollution controls will include:

- Enclosed waste receival and removal areas (Section 11.2).
- Sophisticated combustion control system (Section 11.3) for each grate-boiler line.
- A state-of-the-art flue gas cleaning system (Section 11.3) for each grate-boiler line.
- Inclusion of a CEMS (Section 11.5) for each grate-boiler line.

11.2 Waste receival and removal

All waste deliveries arriving at the MERC will be fully enclosed vehicles or loads and waste accepted for processing must be in accordance with the site Waste Acceptance Protocol. The enclosed tipping hall will be designed with automated fast-acting roller doors and will be maintained at negative pressure to minimise potential dust/odour generation. Good housekeeping in the tipping hall will prevent accumulation of potentially odorous materials outside of the waste bunker, while the grab cranes will constantly pre-mix the waste in the waste bunker, to avoid potential anaerobic conditions. Negative pressure is maintained through constant drawing of air from the tipping hall into the boiler system for combustion while adjustable louvres within the tipping hall can ensure constant ingress of fresh combustion air even when access doors are shut. Furthermore, the waste bunker where incoming waste is tipped and stored will be largely separated from the tipping hall by an internal wall. Tipping hall louvres and entry and exit roller doors will typically be closed when the plant is not operating. A dedicated stand-by odour control unit is proposed to manage odour in the tipping hall and waste bunker areas in the event of a full plant outage.

11.3 Combustion system

Pre-mixed feedstock will be fed into the furnace from the waste bunker and combusted on a grate system incorporating combustion air injection. The automatic combustion control system will be designed to achieve combustion, burnout and emissions outcomes, by controlling fuel feeding, grate movement and combustion air supply. Auxiliary fuel burners (2 per boiler) will be provided for start-up (boiler heating prior to introducing waste), shutdown flue gas temperature control and to ensure flue gas temperatures remain above 850 degrees Celsius for 2 seconds whenever waste is being combusted.

The moving grate system is designed to additionally agitate and mix waste to facilitate complete combustion, while air flow is fed and distributed from beneath the grate, and secondary air is fed to the furnace as needed to ensure complete burnout of the combustion gases. Primary air flow will be fed from air intakes above the waste bunker while secondary combustion air will be drawn from the warm boiler building headspace. This helps to maintain the negative pressure in the waste bunker and tipping hall, while the warm secondary air from the boiler headspace enhances boiler energy efficiency. The automatic combustion control system monitors flue gas temperature and controls the waste feed rate and primary and secondary combustion air injection rates to maintain a stable steam generation rate from the boiler. Maintaining the flue gas temperature above 850 degrees Celsius for at least 2 seconds helps to destroy any residual volatile organic compounds and limit the formation of dioxins and furans.

The boiler operates such that complete combustion and sufficient cooling occurs before combustion gases and particles enter the convection stage of the system to avoid corrosion and blockages of internal piping. The convection stage involves flue gas cooling and super heating. The final stage is the boiler economiser where flue gas is further cooled by preheating the boiler feedwater. The rapid cooling of flue gas in the boiler economiser section helps to prevent the formation of dioxins and furans through de-novo synthesis mechanisms.

11.4 Emission Control and Flue Gas treatment System

The Proposal will be equipped with a Selective Non-Catalytic Reduction (SNCR) system in the combustion chamber and a semi dry flue gas treatment system at the exit of the boiler economiser. The combustion control system, the SNCR, the flue gas treatment system and the Continuous Emission Monitoring System (CEMS) work in concert to minimise emissions of dust, NOx, acidic gases, heavy metals and dioxins and furans.

11.4.1 Selective non-catalytic reduction (SNCR)

The Proposal will use a SNCR system as a secondary abatement technique to mitigate NOx emissions. Ammonia or urea solution is injected into the first pass of the boiler where the flue gas temperature is in the range of 900 – 1050 degrees Celsius (for urea solution). This allows for the NOx to react with the ammonia/urea, converting NOx into free nitrogen and water. Using a SNCR system where flue gas temperature is used to select the optimum injection level and the CEMS measured NOx and residual ammonia concentrations at the stack are used to set the optimum injection rate will ensure that the Proposal can achieve emissions of NOx at the upper end of the BAT-AEL range.

11.4.2 Reactor

Flue gas exiting the boiler economizer is quench cooled with water sprays to optimize the temperature at the inlet to the scrubbing reactor and enhance the reactivity of the lime reagent. Hydrated lime is injected into the flue gas stream along with recirculating residue in the reactor in which acidic flue gases (i.e., HCl, SO_2 and HF) are absorbed and separated from the flue gas (in the downstream baghouse filter) as the corresponding calcium salts together with fly ash from the combustion chamber. Activated carbon is also injected into the reactor to adsorb and capture heavy metals and dioxins and furans.

11.4.3 Baghouse filter

The baghouse filter removes the mixture of activated carbon, excess hydrated lime and fly ash, as well as the acid gas neutralization reaction products from the flue gas at the reactor outlet by forming a filter cake. The filter cake is intermittently dislodged from the filter bags, typically by pulsing the bags with compressed air. The majority of the filter cake, which contains unreacted hydrated lime and excess activated carbon, is recycled to the reactor to enhance the pollutant removal efficiency and minimize reagent consumption. A small purge of the residuals, termed Air Pollution Control residue (APCr) is safely and securely stored in silos prior to treatment with cement and water, to create a concrete slurry. This slurry is allowed to cure for approximately seven days before collection and transportation off-site for disposal at a licensed facility.

11.5 Continuous emissions monitoring system

Each grate line will be equipped with a CEMS upon commissioning and, thereafter, in operation to allow for continuous monitoring of the flue gas to ensure the Proposal is compliant with the licence limits. This also assists in providing real time feedback to the control systems to make automatic adjustments to the injection rates for the flue gas cleaning system process.

Continuous monitoring will be installed for all pollutants that must be continuously monitored including NO_x, CO, particulates, TOC, HCl, HF, NH_3, and SO_2.

For pollutants with levels below limits of detection or where continuous monitoring is not feasible, routine sampling and testing will be established to ensure that the facility complies with environmental obligations. Auxiliary parameters such as flow rate, temperature, pressure, moisture content, oxygen and CO_2 will also be measured as part of the CEMS.

Proposed Safeguards and Environmental Management Measures relevant to air quality for the Proposal are presented in Table 25.

Table 25 Proposed Safeguards and Environmental Management Measures

ID	Proposed Safeguards and Environmental Management Measures
AQ01	Design of facility avoids release of dust, and controls and monitors emissions to air
AQ02	Construction dust management plan
AQ03	Construction environment management plan - air quality and GHG measures
AQ04	Design of site layout avoids unnecessary excavation
AQ05	Operating License - air quality conditions
AQ06	Operational Environmental Management Plan - air quality and GHG measures
AQ07	Proof of performance trials
AQ08	Commissioning plan – air quality measures

12. CONCLUSIONS

The air quality assessment has investigated the potential for the Proposal to affect air quality during construction and operations.

The potential impacts of dust emissions during construction of the Proposal have been assessed using a risk-based methodology. This is appropriate due to the temporary nature of the proposed construction activities, and well-established mitigation measures that can be applied to minimise potential dust emissions.

The potential impacts of emissions during operation of the Proposal have been assessed using a dispersion modelling approach. Five consecutive years of meteorological data from the BoM's monitoring station at Melbourne Airport has been used in the dispersion modelling. Emissions of key pollutants have been assessed for three scenarios:

- Load point 1 (LP1) daily average emission concentration limits
  - Nominal waste throughput.
  - BREF, 2019 - daily average (upper) concentration limits
  - Both lines assumed to be at the daily average (upper) concentration limits.
- LP1 – short-term emission concentration limits
  - Nominal waste throughput.
  - EU IED (2010) - short-term (30-minute average) emission limits to reflect variability in a line due to non-routine operations. Only one line will be operating at short-term emission limits whilst the other line will be operating at the daily average (upper) concentration limit.
  - These emissions would be short in duration (30-minute) due to the management and mitigation measures (see Section 11) to be employed by the Proposal.
- LP2 – daily average operations.
  - Maximum waste throughput.
  - BREF, 2019 – daily average (upper) concentration limits.

The regulatory-approved dispersion model, AERMOD, has been used to predict ground-level concentrations of air pollutants. Background levels of air pollutants have been accounted for by explicitly modelling adjacent industry and adding ambient backgrounds from the EPA Victoria's ambient air monitoring station at Alphington. Predicted concentrations have been compared with the relevant APAC both health-based and environmental.

Odour from the Proposal has also been assessed using a combination of risk assessment approaches.

For the Proposal's construction phase the air quality risk assessment identified the following:

- Without mitigation, the preliminary risk of dust soiling associated with the construction of the Proposal is low to medium
- Without mitigation, the preliminary risk to human health associated with the construction of the Proposal is low
- Without mitigation, the preliminary risk to ecological receptors associated with construction of the Proposal is low to medium
- A Construction Dust Management Plan (CDMP) will be implemented that includes mitigation measures for controlling dust. By implementing the CDMP, the risk of dust emissions from the Proposal's construction phase is low.

For the Proposal's operation phase the air quality assessment has identified the following:

- In terms of plume visibility:
  - The maximum height above ground at which the plume would be visible ranges from 69 m to 138 m above ground
  - The horizontal extent that the plume would be visible ranges from 1 metre to 123.5 m downwind, with an average horizontal extent of 28.8 m
  - In terms of the visible plume extending beyond the site boundary, site plans provided by Arup indicate that distance from the stack to the closest site boundary is 214 m. The modelling shows that the visible plume is contained within the Proposal area.
- With the Proposal operating at the LP1 daily average (upper) emission concentration limits as specified in the BREF:
  - Predicted ground-level concentrations of all air pollutants due to the Proposal in isolation comply with the relevant APAC and demonstrate that at the proposed emission concentration limits, the MERC WtE facility will make an insignificant contribution to local air quality and has minimal impact on the local airshed
  - Predicted cumulative ground-level concentrations of nitrogen dioxide (NO_2) comply with the relevant APAC across all sensitive receptors
  - Predicted cumulative ground-level concentrations of sulfur dioxide (SO_2) comply with the relevant APAC across all sensitive receptors
  - Predicted cumulative ground-level concentrations of carbon monoxide (CO) comply with the relevant APAC across all sensitive receptors
  - Existing 24-hour average ground-level concentrations of PM_{10} and $PM_{2.5}$ are higher than the relevant APAC. A contemporaneous assessment of the Proposal and the existing background concentrations of PM_{10} and $PM_{2.5}$ shows that there are no additional days when concentrations of PM_{10} or $PM_{2.5}$ are predicted to be higher than the 24-hour average air quality criterion as a result of the Proposal
  - Predicted cumulative ground-level concentrations of hydrogen chloride (HCl) comply with the relevant APAC across all sensitive receptors
  - Predicted cumulative ground-level concentrations of hydrogen fluoride (HF) comply with the relevant health-based APAC across all sensitive receptors. The predicted 24-hour average concentrations of HF exceed the environmental APAC when considered cumulatively. This is due to the background concentration predicted to exceed the environmental APAC for HF due to the adjacent industry. The exceedance area is limited to within the boundary of the adjacent industry. Less than 0.01% of the maximum predicted 24-hour average concentration of HF is due to the Proposal .
  - Predicted ground-level concentrations of ammonia (NH_3) due the Proposal comply with the relevant APACs across all sensitive receptors
  - Predicted ground-level concentrations of total volatile organic compounds (TVOCs) due to the Proposal comply with the relevant APACS across all sensitive receptors
  - Predicted ground-level concentrations of polycyclic aromatic hydrocarbons (PAH) as benzo(a)pyrene due to the Proposal comply with the relevant APAC across all sensitive receptors
  - Predicted cumulative ground-level concentrations of dioxins and furans (PCDD/F) comply with the relevant APAC across all sensitive receptors

- Predicted cumulative ground-level concentrations of metals comply with the relevant APAC across all sensitive receptors.

- With the Proposal operating at the LP1 short-term emission concentration limits as specified in the EU IED (2010):
  - Predicted ground-level concentrations of all air pollutants due to the Proposal in isolation comply with the relevant APAC
  - Predicted cumulative ground-level concentrations of all air pollutants comply with the relevant APAC across all sensitive receptors.
- Different calorific values of waste fuel do not significantly affect the emissions due to the Proposal (LP1 vs LP2) with predicted ground-level concentrations predicted to vary at most by 0.4% relative to APAC based on different calorific values of the waste fuel and despite a 20% increase in waste throughput associated with LP2.

In summary, the daily average AQ modelling results demonstrate that with the proposed emission limit settings, based on the upper end of the BAT-AEL range associated with implementation of BAT for emission control and flue gas treatment, the Proposal (in isolation) is predicted to have an insignificant impact on air quality, as measured against the relevant health-based and environmental based APACs. In conjunction with the proposed mitigation and risk management procedures the Proposal is expected to meet the requirements of the GED.

The air quality assessment has found that the risk of adverse odour impacts due to the Proposal is low. The outcomes of the air quality assessment have provided the basis for the application of the following EPRs for the Proposal.

- AQ01: Design of facility avoids release of dust, and controls and monitors emissions to air
- AQ02: Construction dust management plan
- AQ03: Construction environment management plan - air quality and GHG measures
- AQ04: Design of site layout avoids unnecessary excavation
- AQ05: Operating License - air quality conditions
- AQ06: Operational Environmental Management Plan - air quality and GHG measures
- AQ07: Proof of performance trials
- AQ08: Commissioning plan – air quality measures.

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14. CONTOUR PLATES

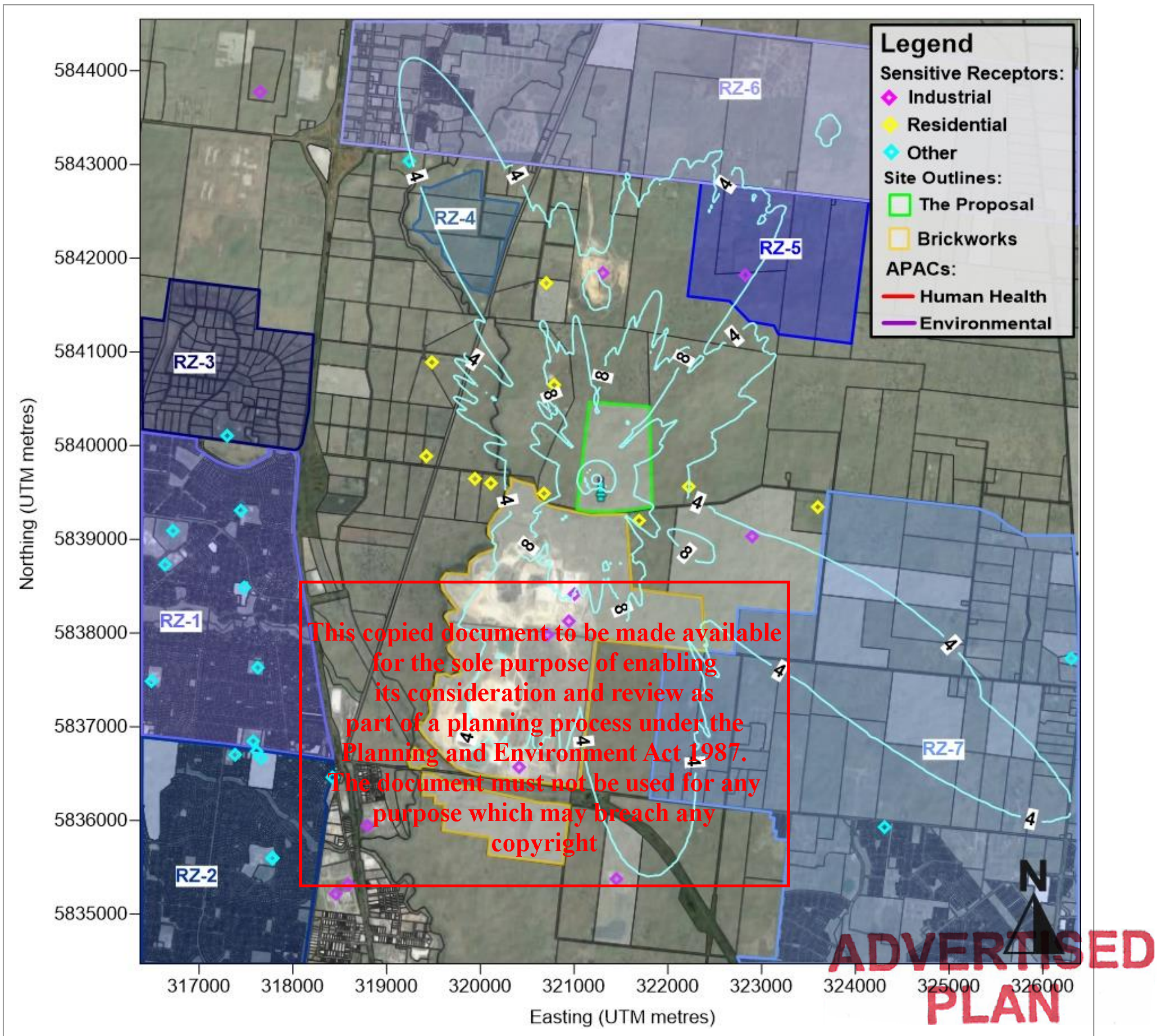
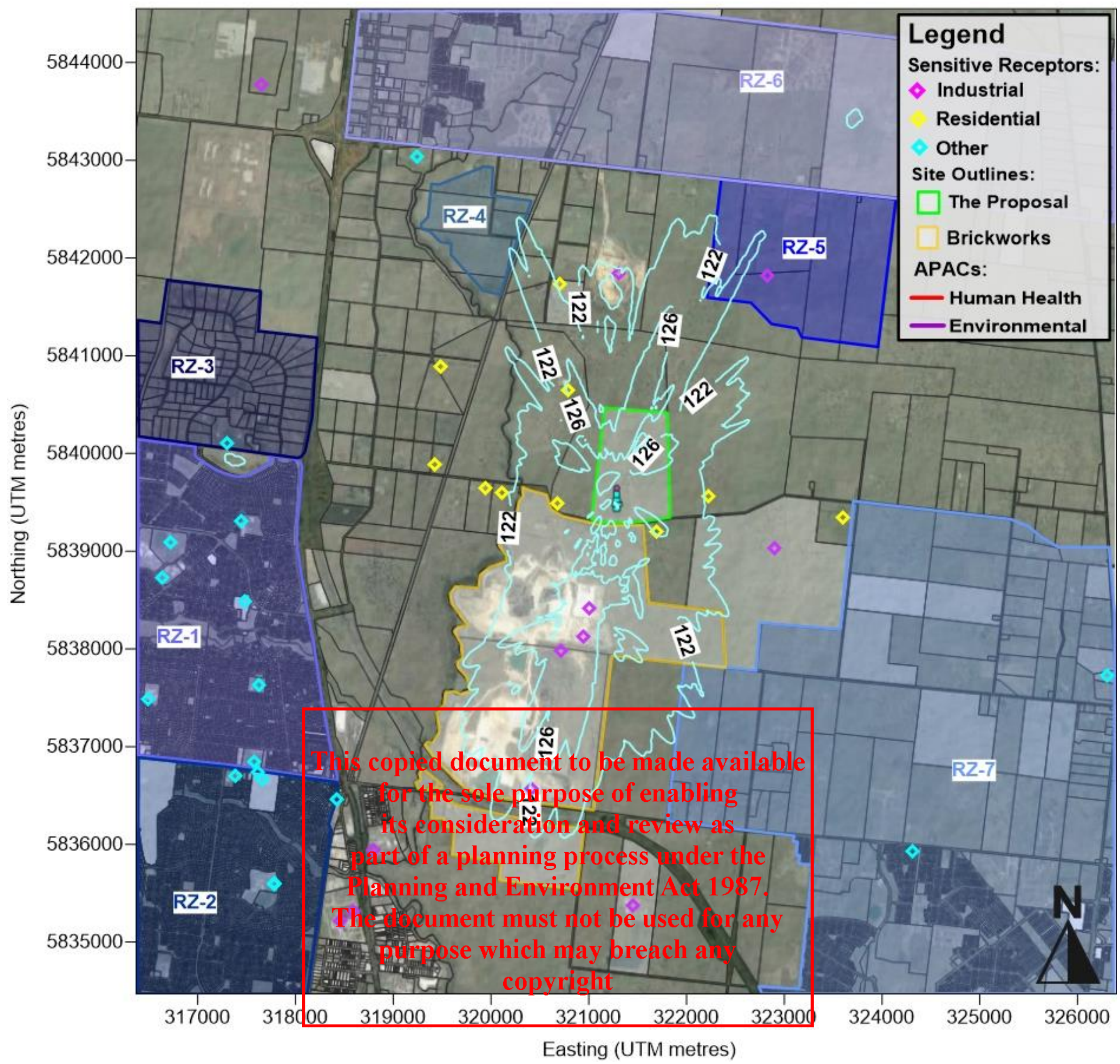


Plate 1 **LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for NO_2 due to the Proposal in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	1-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	164 µg/m³ (health-based)	Jemima Goodhew	November 2022



* Maximum ambient background added instead of contemporaneous assessment

Plate 2	**LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for NO_2 due to the Proposal and background concentrations**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	1-hour	AERMOD	µg/m^3
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	164 µg/m^3 (health-based)	Jemima Goodhew	November 2022

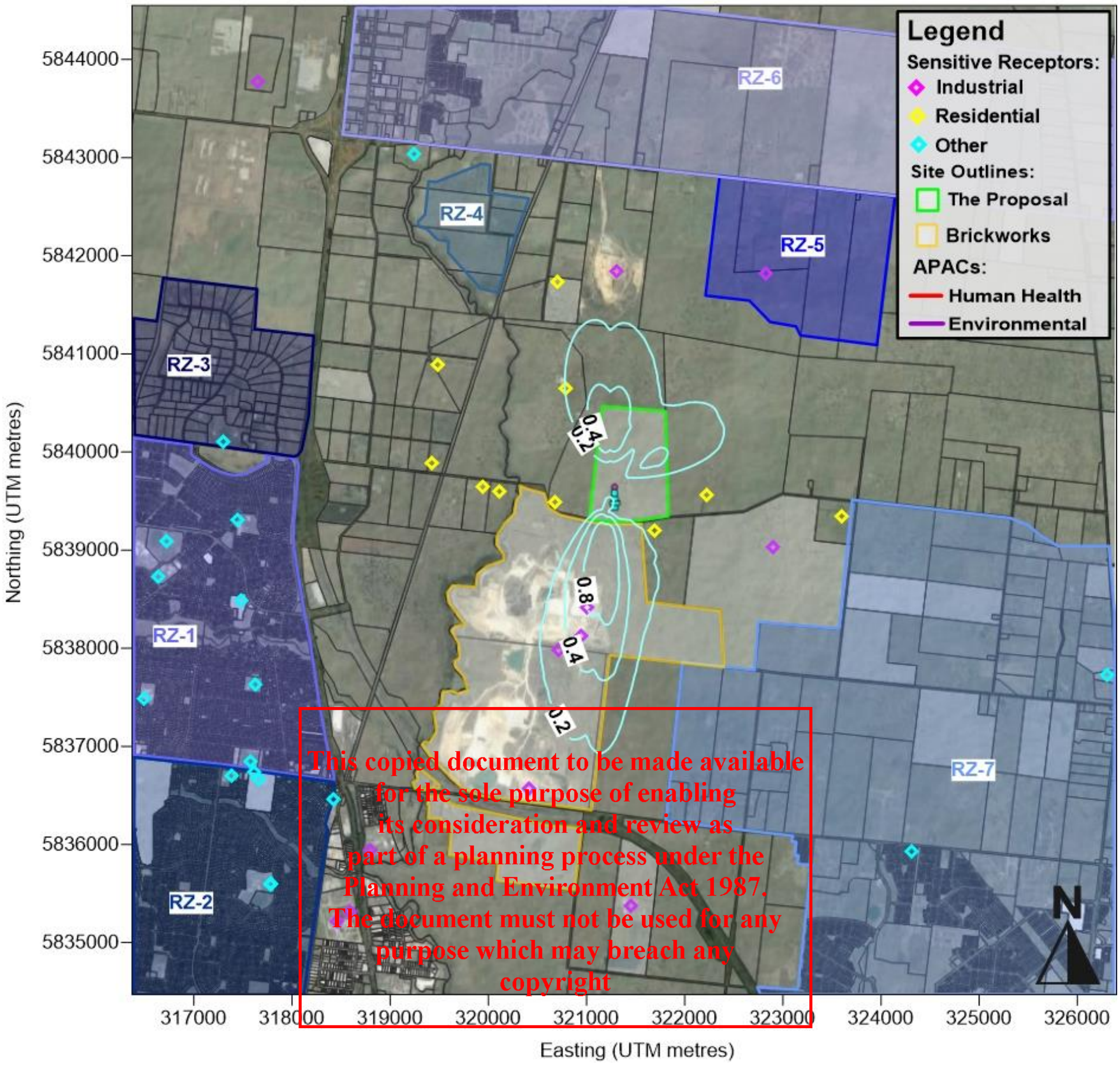
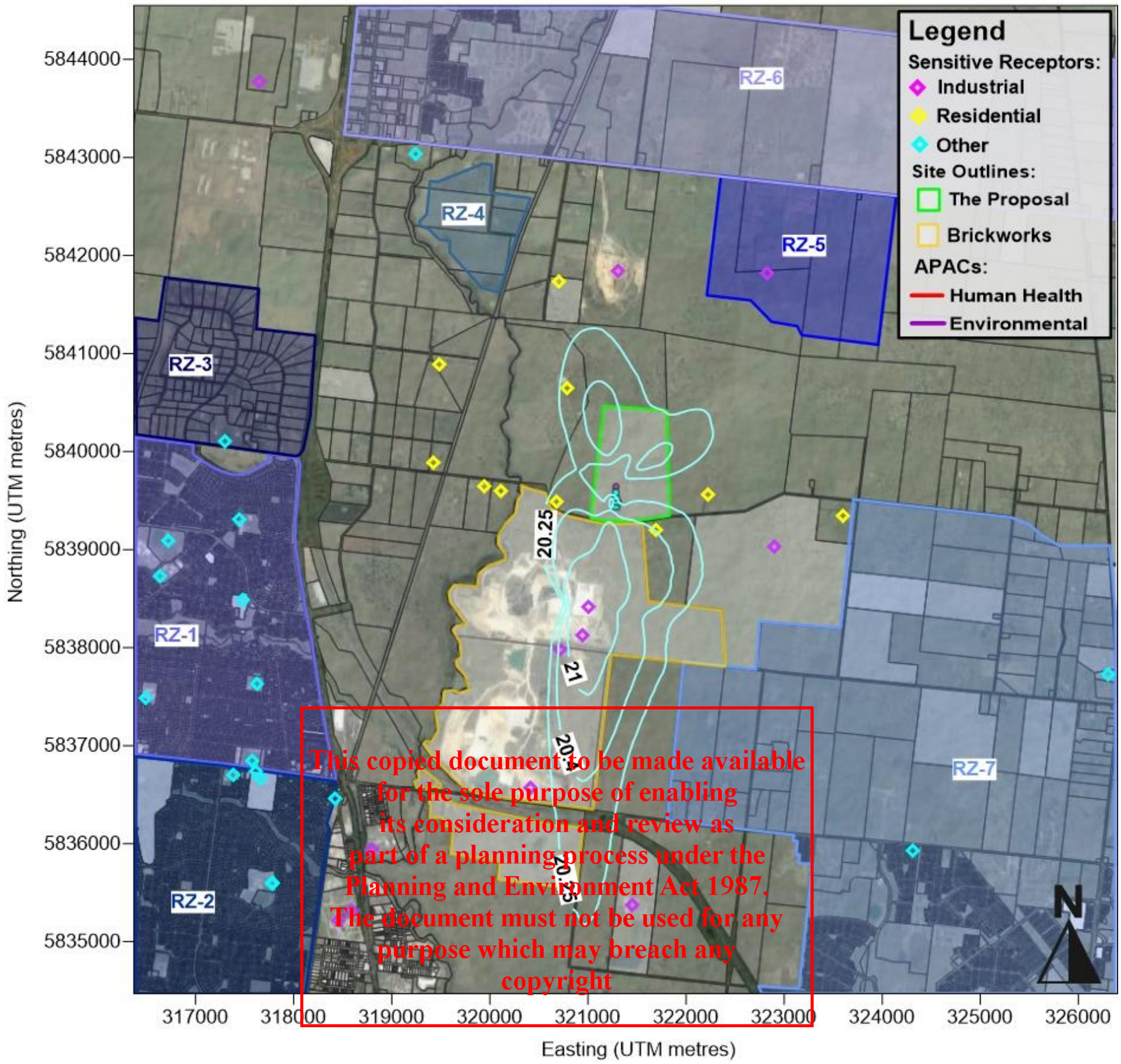


Plate 3 LP1 daily average concentration limits: predicted annual average ground-level concentration for NO_2 due to the Proposal in isolation

Location:	Averaging period:	Data source:	Units:
Wollert	Annual	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	30 µg/m³ (health-based and environmental)	Jemima Goodhew	November 2022



* Maximum ambient background added instead of contemporaneous assessment

Plate 4 **LP1 daily average concentration limits: predicted annual average ground-level concentration for NO_2 due to the Proposal and background concentrations**

Location: Wollert	**Averaging period:** Annual	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 30 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

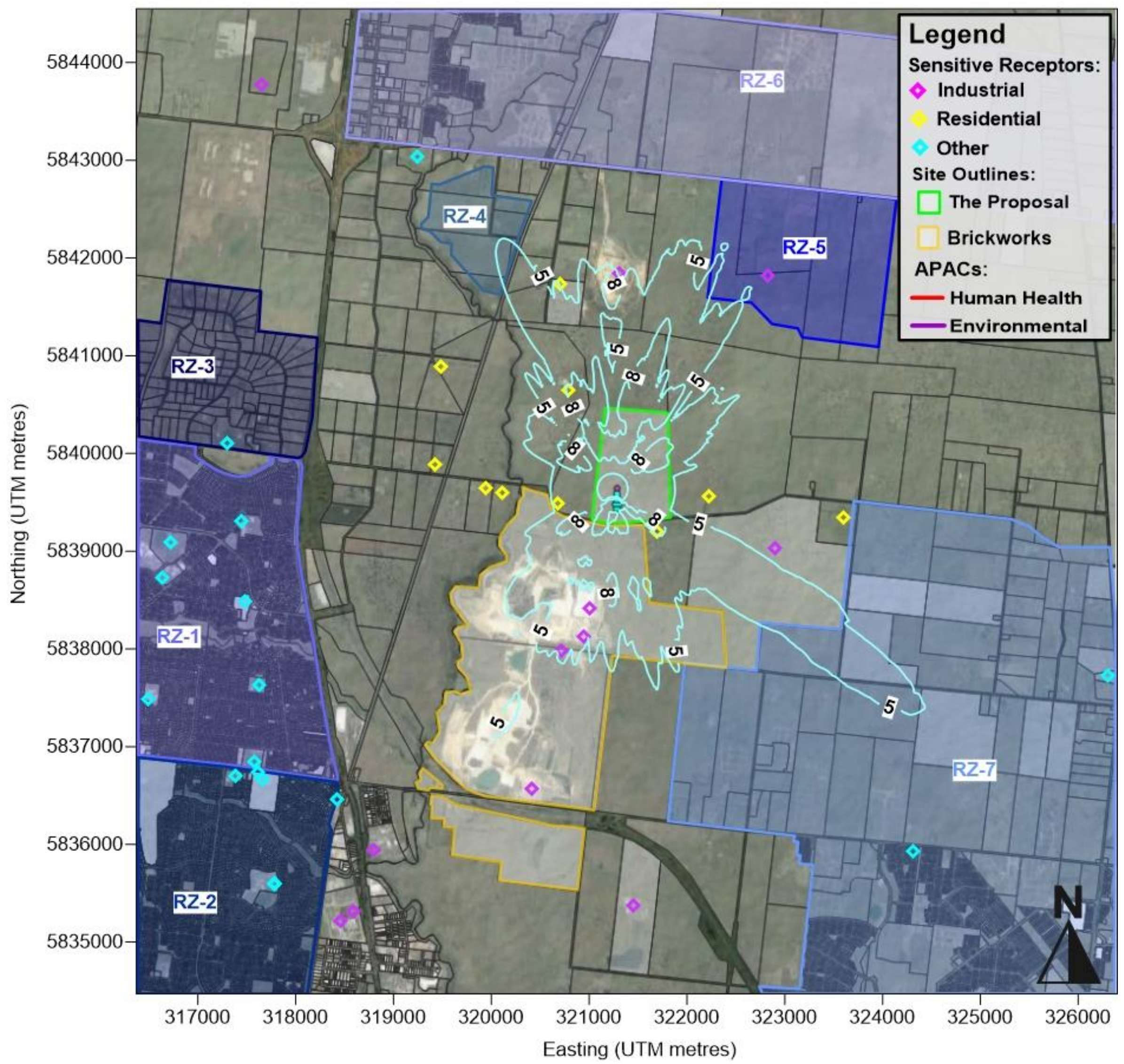


Plate 5	LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for SO_2 due to the Proposal in isolation

Location:	Averaging period:	Data source:	Units:
Wollert	1-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	214 µg/m³ (health-based)	Jemima Goodhew	November 2022

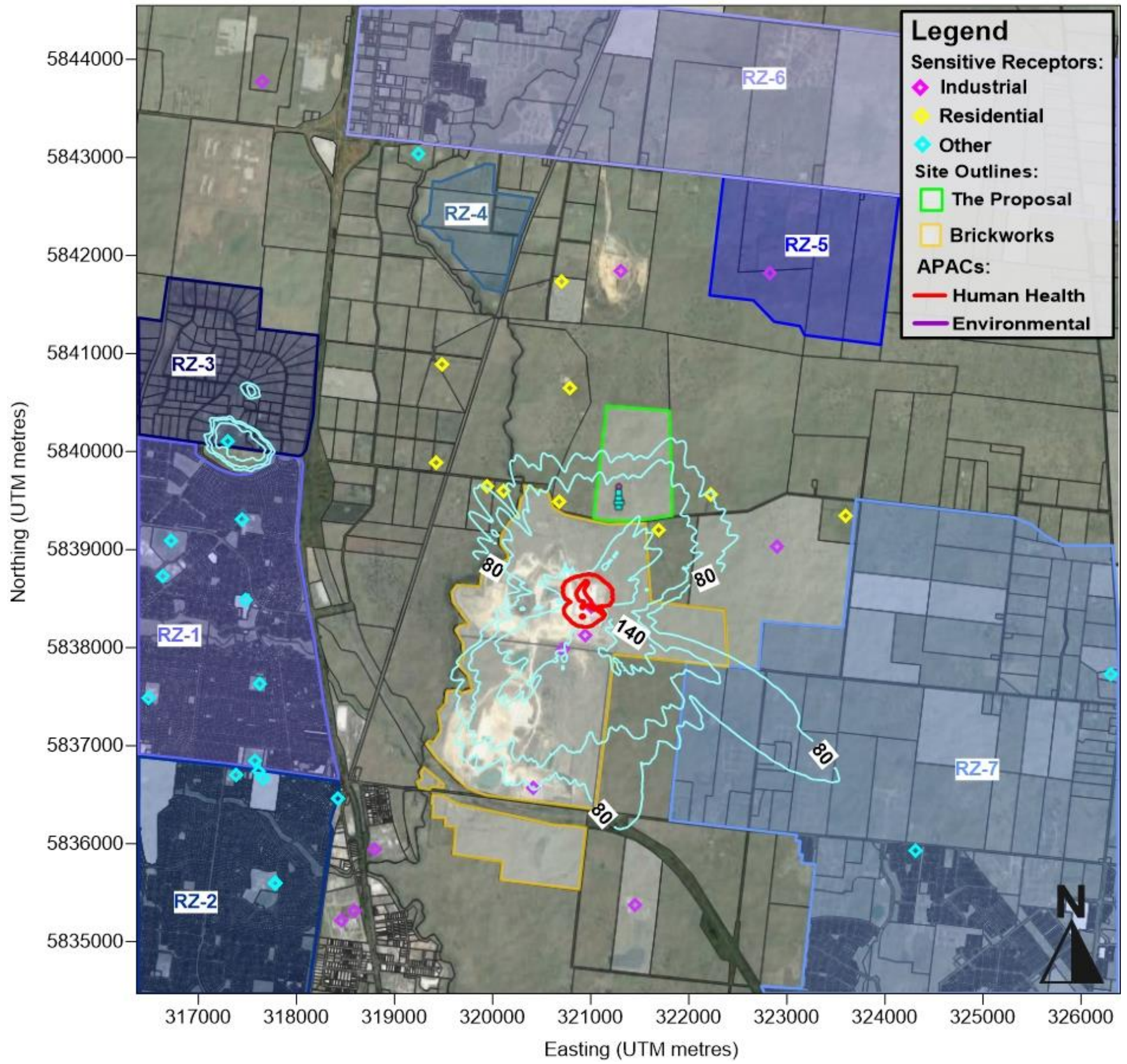


Plate 6	LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for SO_2 due to the Proposal and background concentrations		
Location: Wollert	**Averaging period:** 1-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 214 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

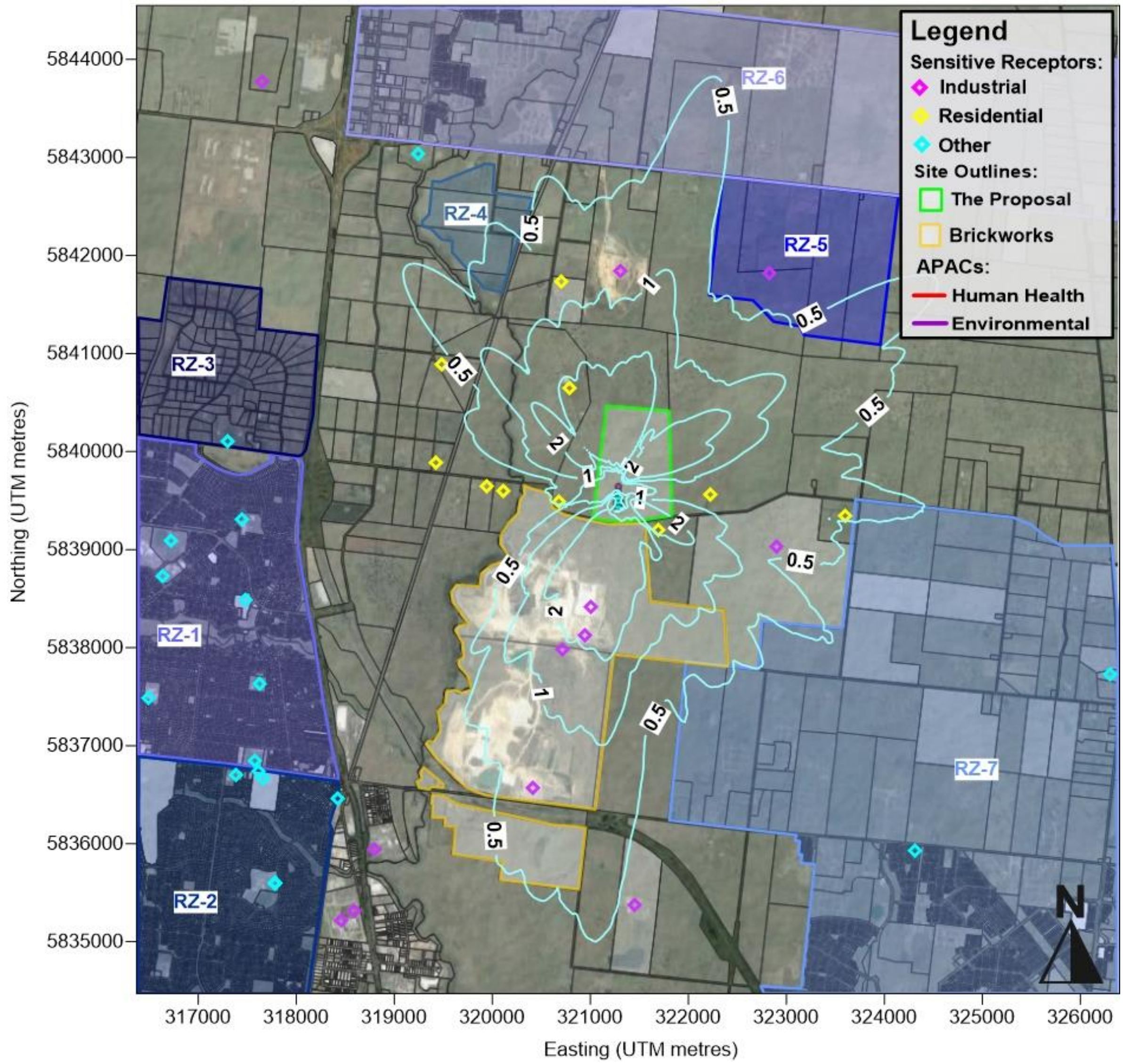


Plate 7	**LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for SO_2 due to the Proposal in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	24-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	57 µg/m³ (health-based)	Jemima Goodhew	November 2022

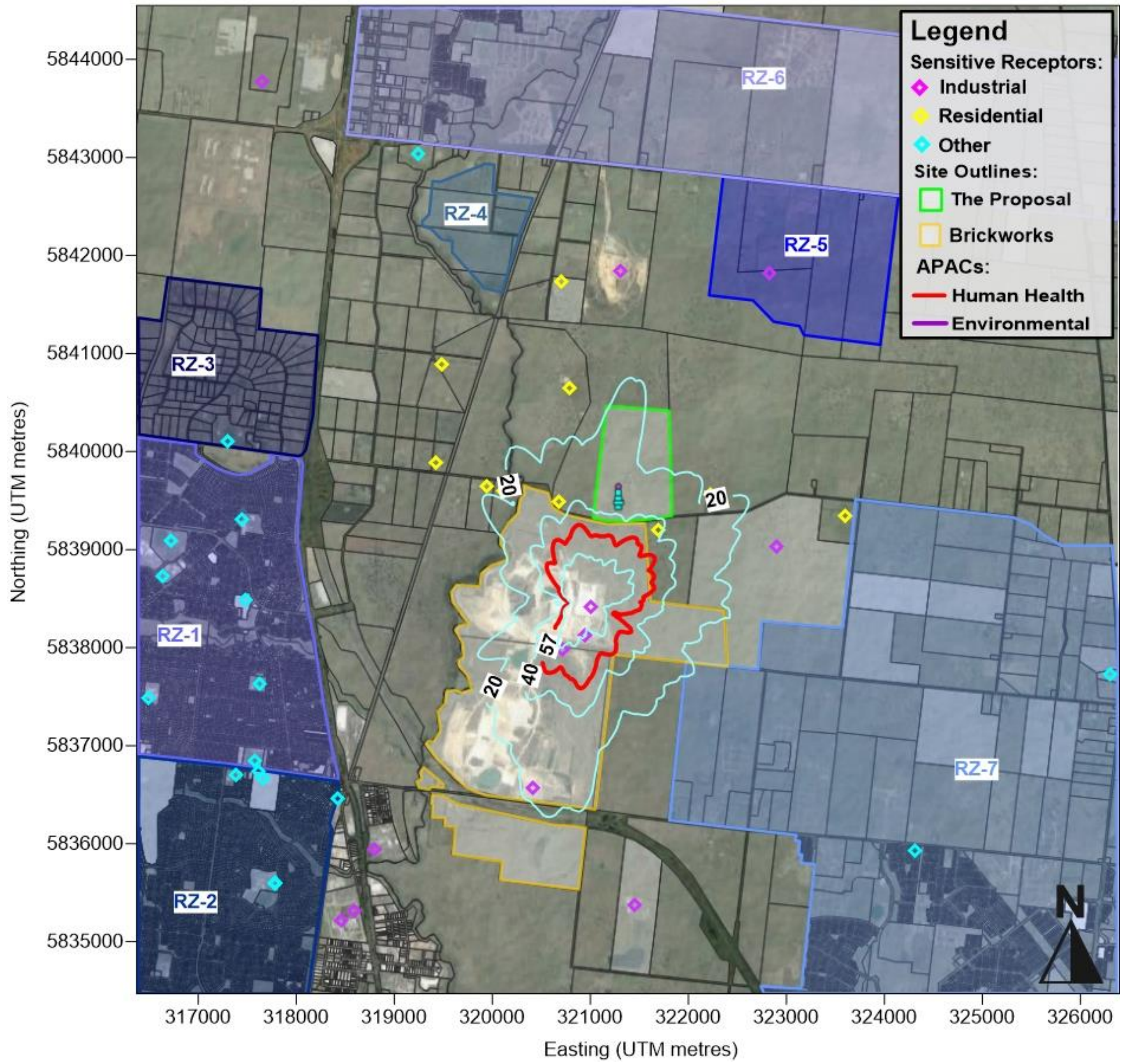


Plate 8	**LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for SO_2 due to the Proposal and background concentrations**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	24-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	57 µg/m³ (health-based)	Jemima Goodhew	November 2022

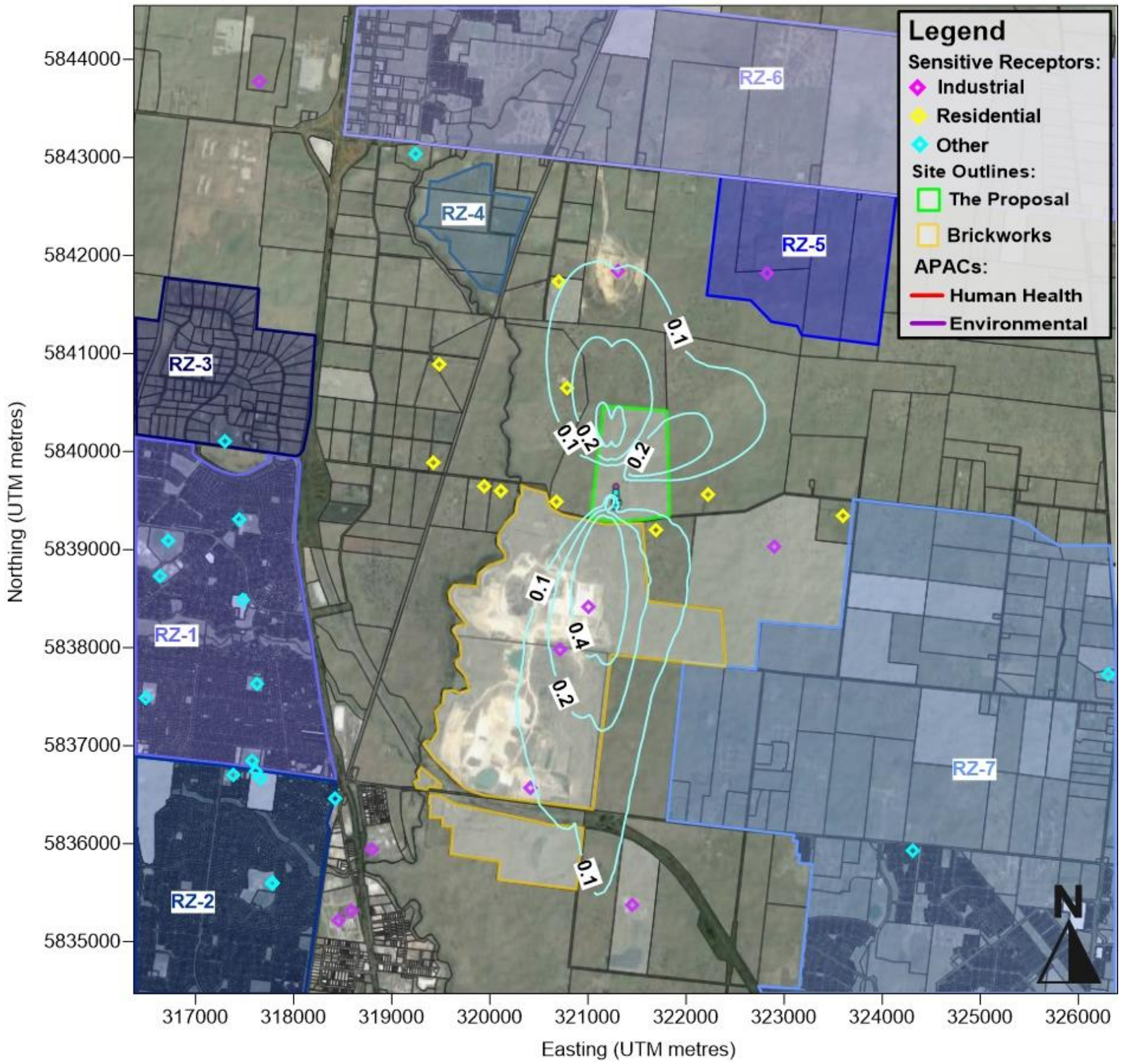


Plate 9	**LP1 daily average concentration limits: predicted annual average ground-level concentration for SO_2 due to the Proposal in isolation**		
Location: Wollert	**Averaging period:** Annual	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 20 µg/m³ (environmental)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

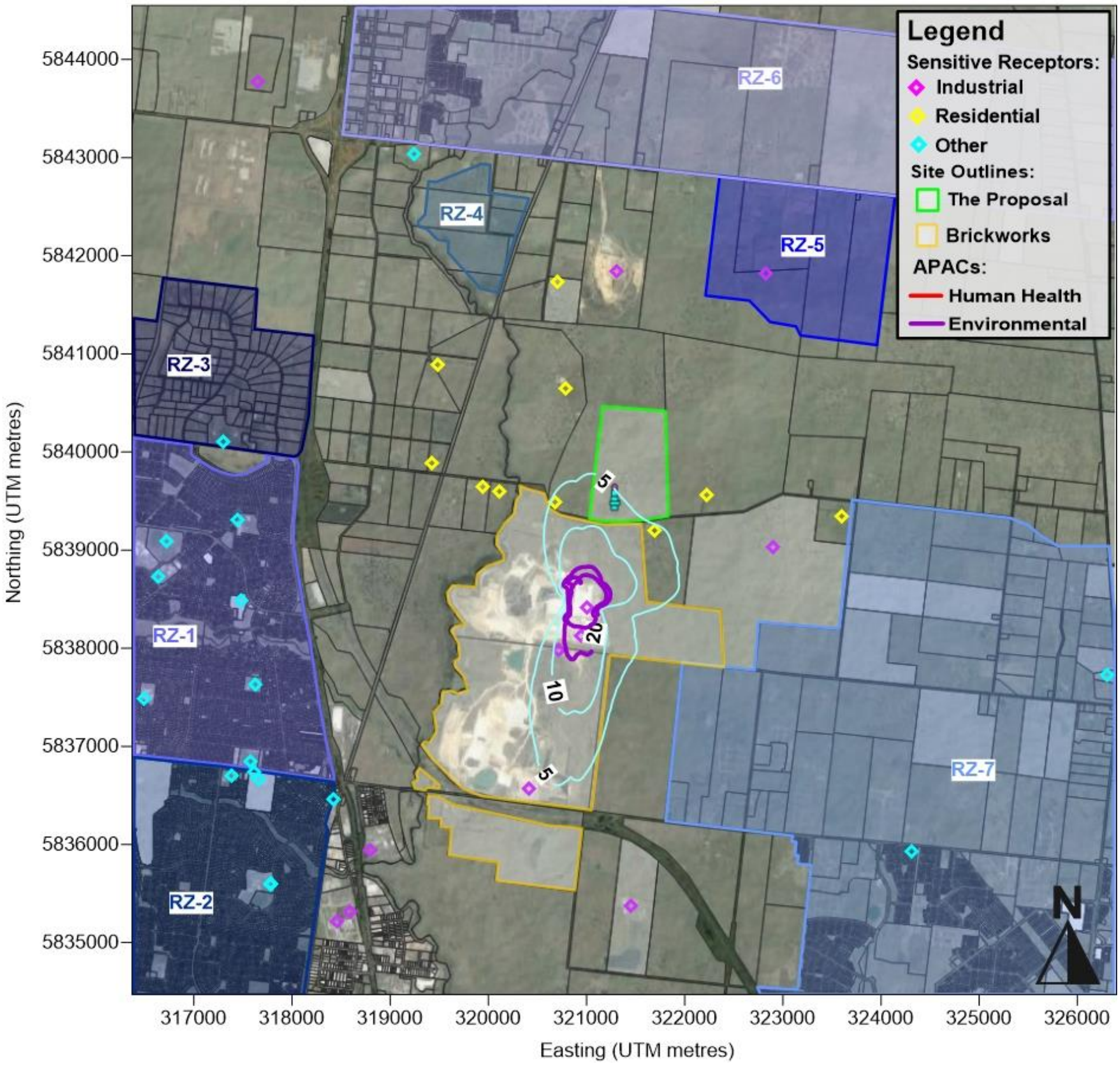


Plate 10	**LP1 daily average concentration limits: predicted annual average ground-level concentration for SO_2 due to the Proposal and background concentrations**		
Location: Wollert	**Averaging period:** Annual	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 20 µg/m³ (environmental)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

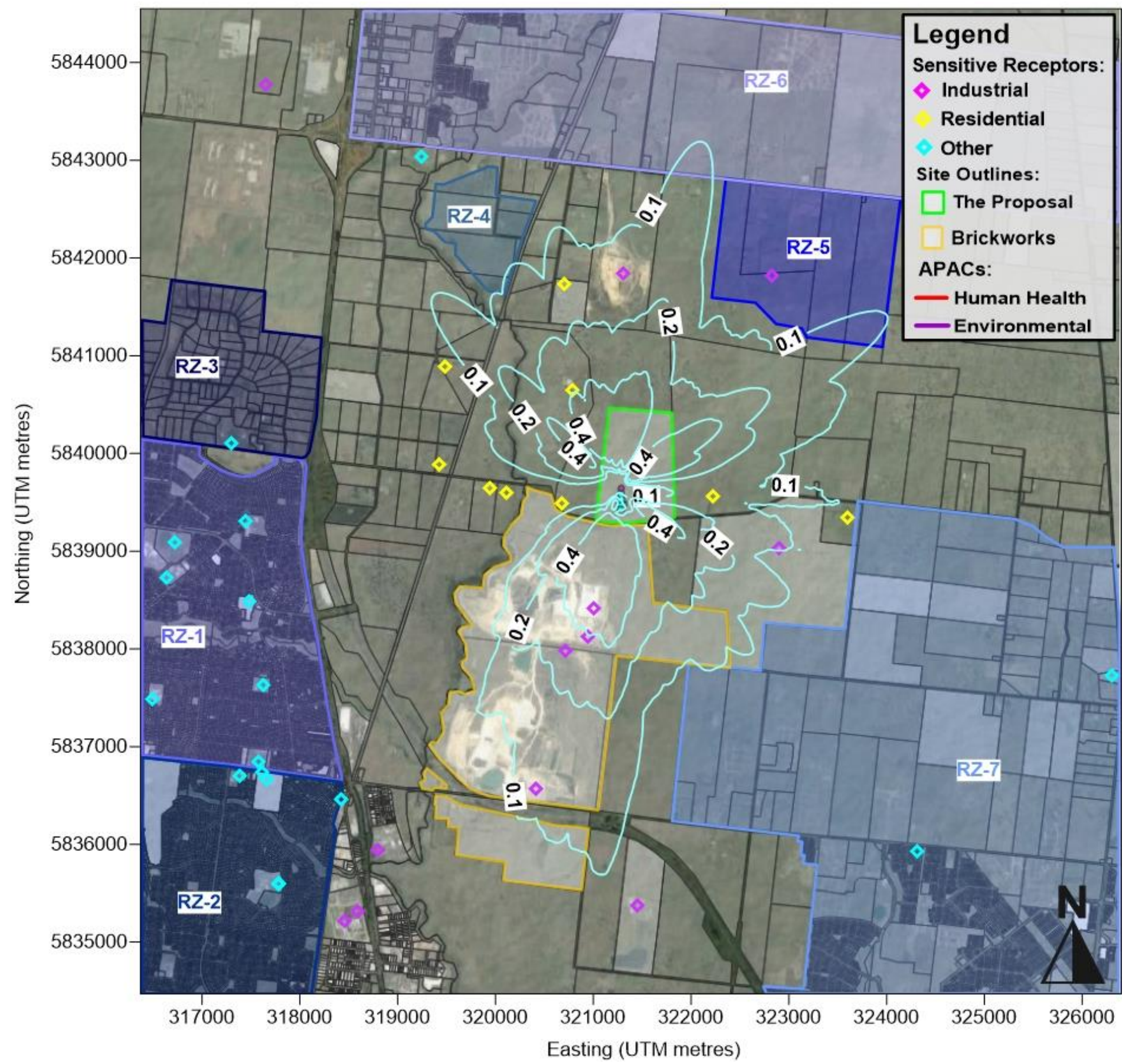


Plate 11	**LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for PM_{10} due to the Proposal in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	24-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	50 µg/m³ (health-based)	Jemima Goodhew	November 2022

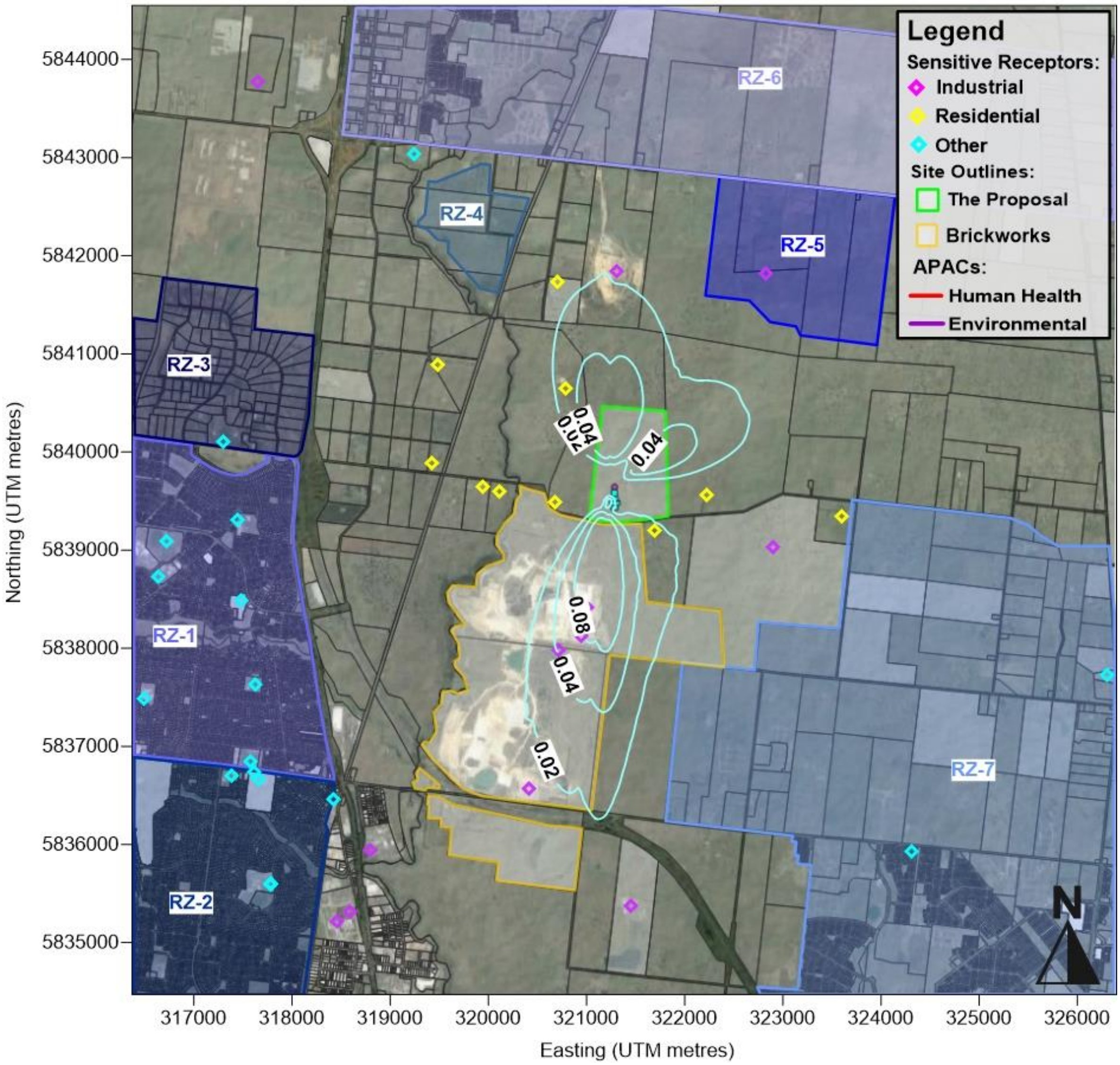


Plate 12	**LP1 daily average concentration limits: predicted annual average ground-level concentration for PM_{10} due to the Proposal in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	Annual	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	20 µg/m³ (health-based)	Jemima Goodhew	November 2022

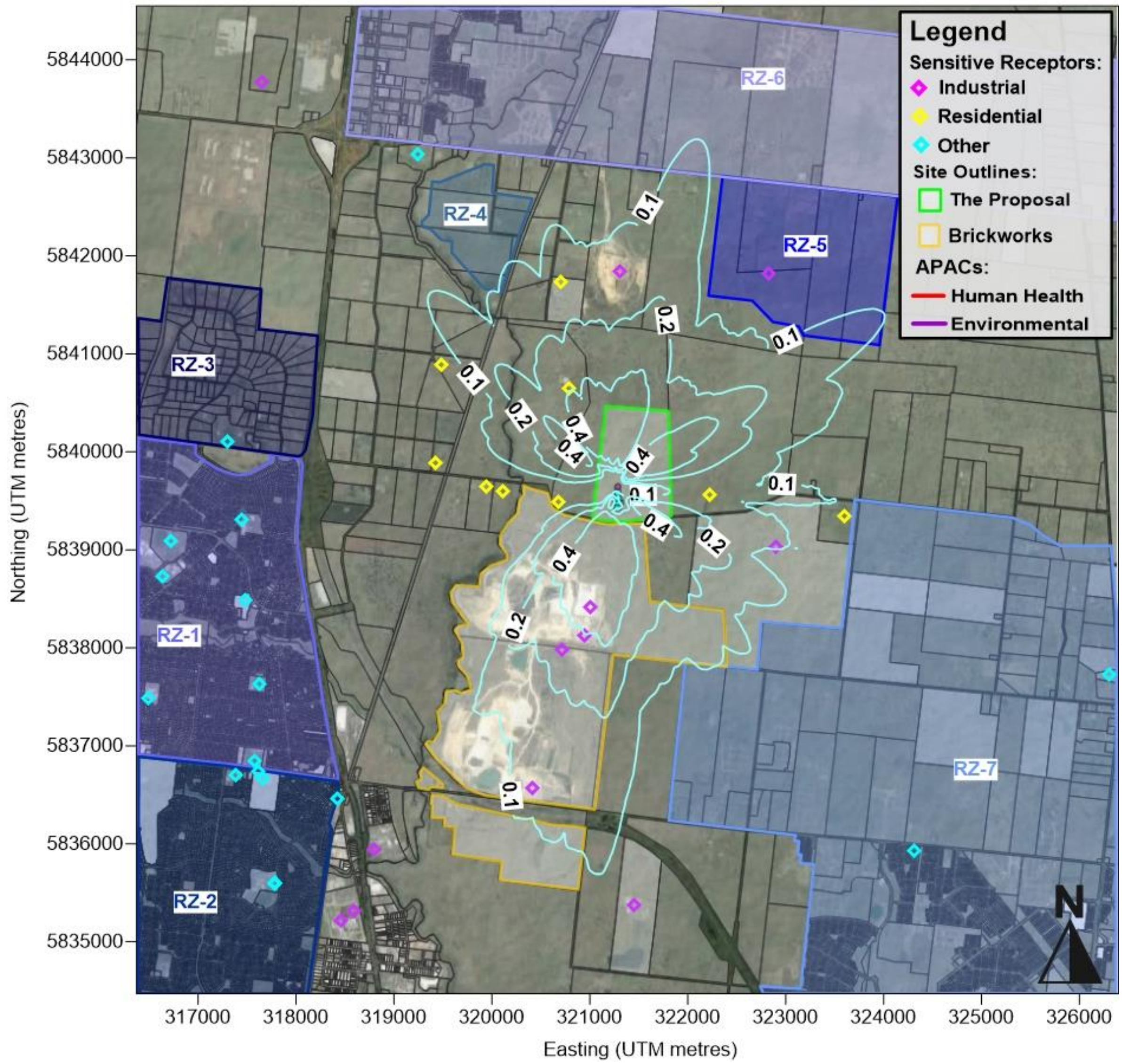


Plate 13	**LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for $PM_{2.5}$ due to the Proposal in isolation**		
Location: Wollert	**Averaging period:** 24-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 25 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

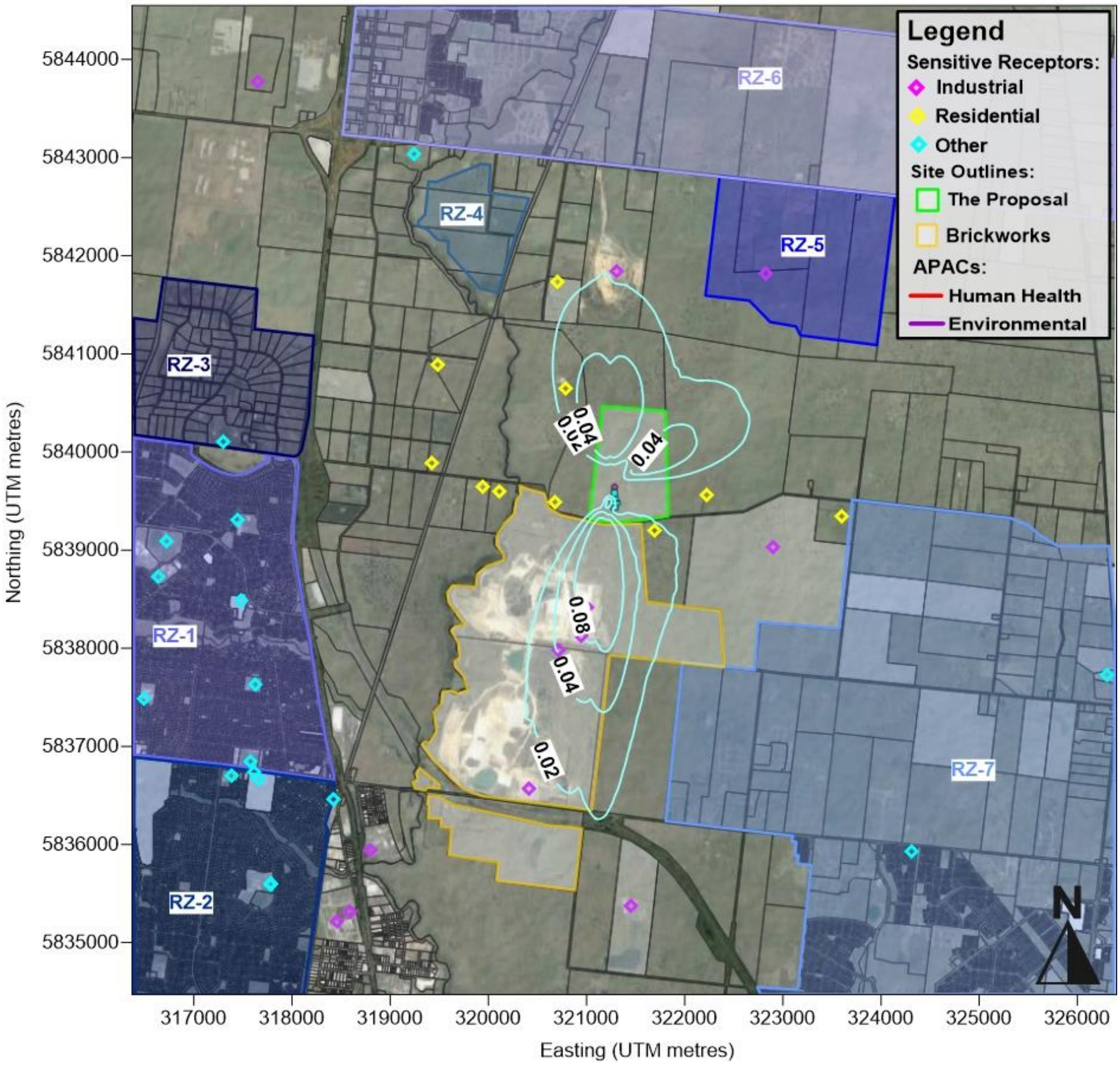


Plate 14	LP1 daily average concentration limits: predicted annual average ground-level concentration for $PM_{2.5}$ due to the Proposal in isolation		
Location: Wollert	**Averaging period:** Annual	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 8 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

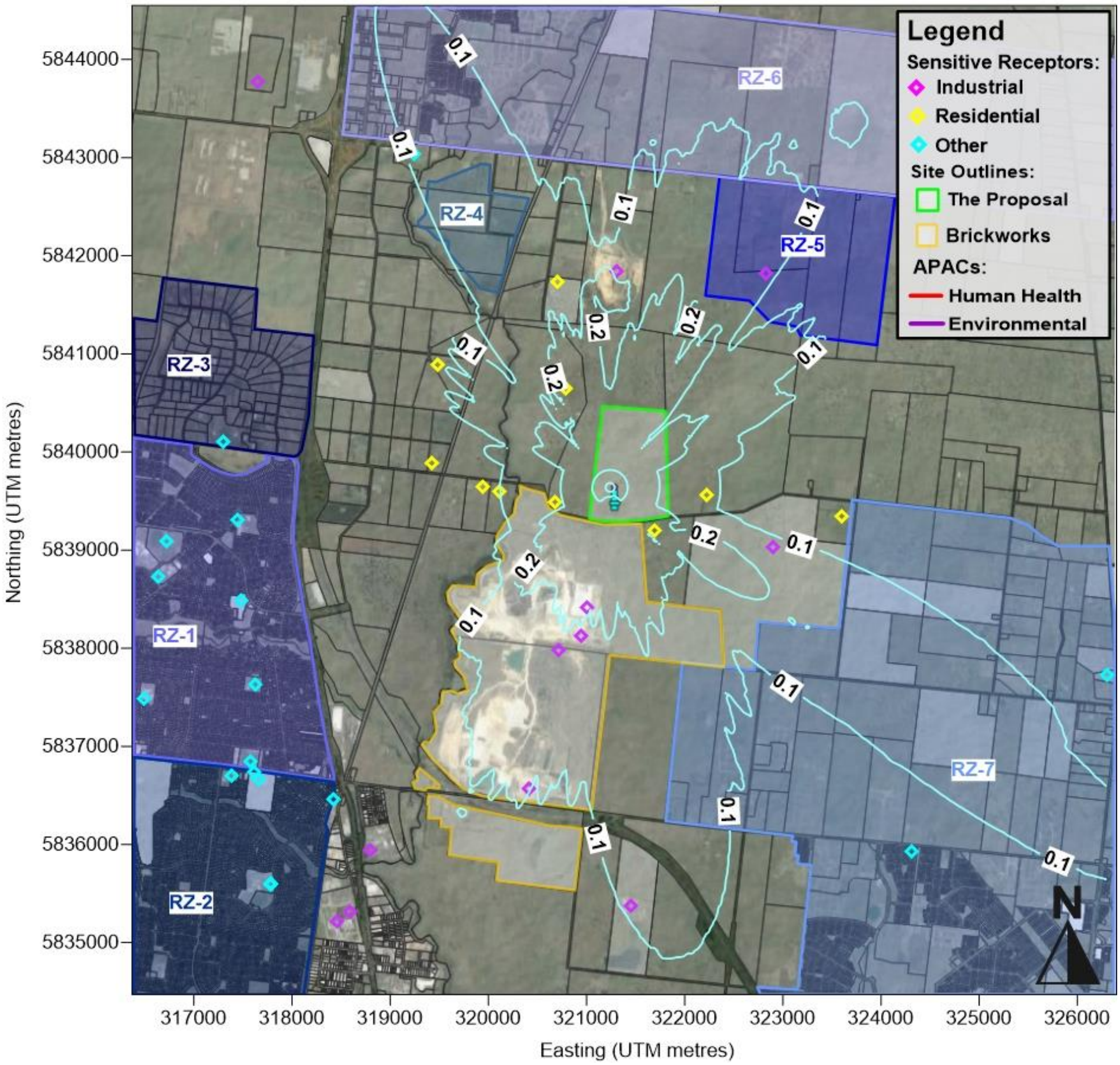


Plate 15 **LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for HF due to the Proposal in isolation**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	1-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	60 µg/m³ (health-based)	Jemima Goodhew	November 2022

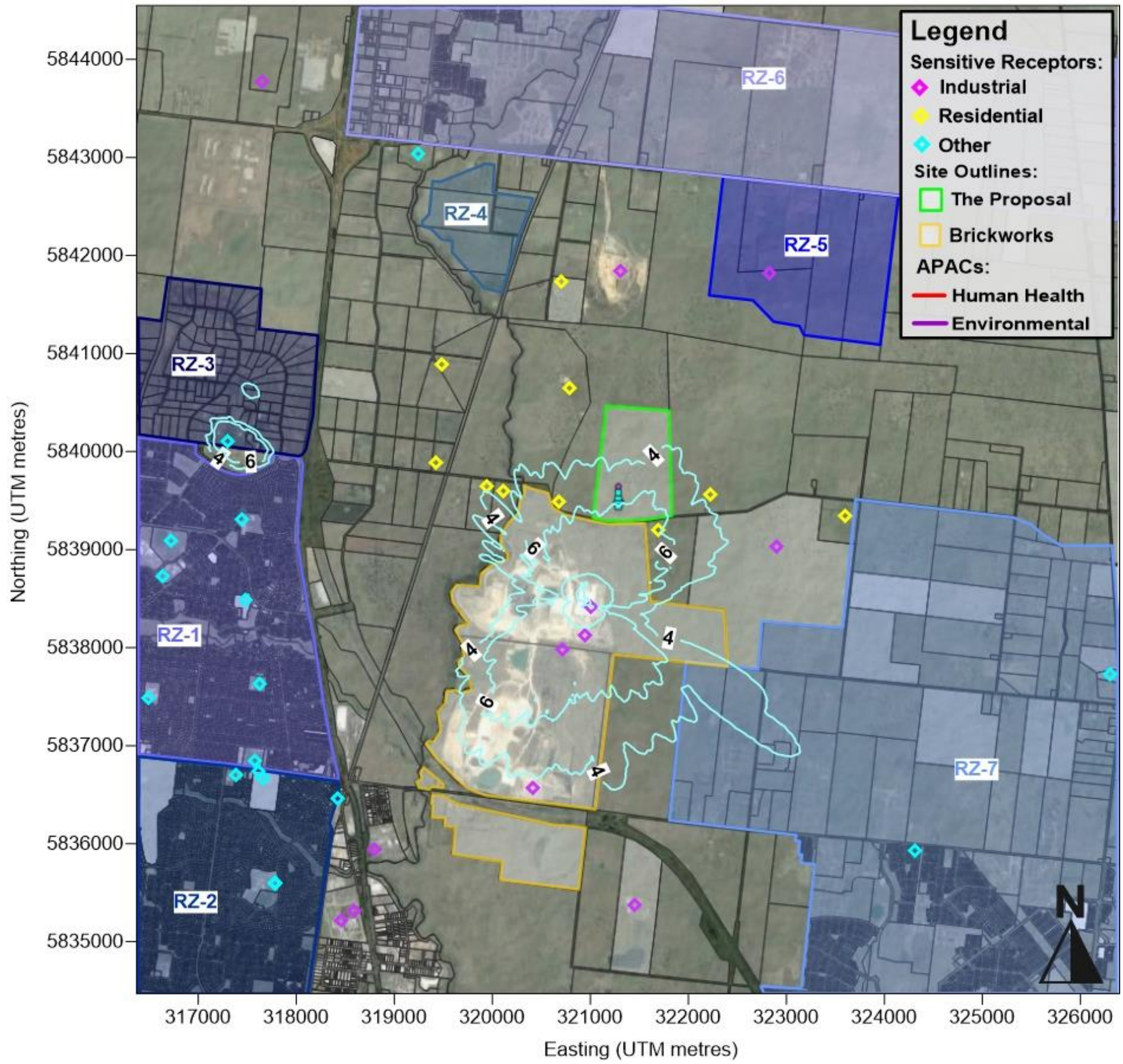


Plate 16	LP1 daily average concentration limits: maximum predicted 1-hour ground-level concentration for HF due to the Proposal and background concentrations

Location: Wollert	**Averaging period:** 1-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 60 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

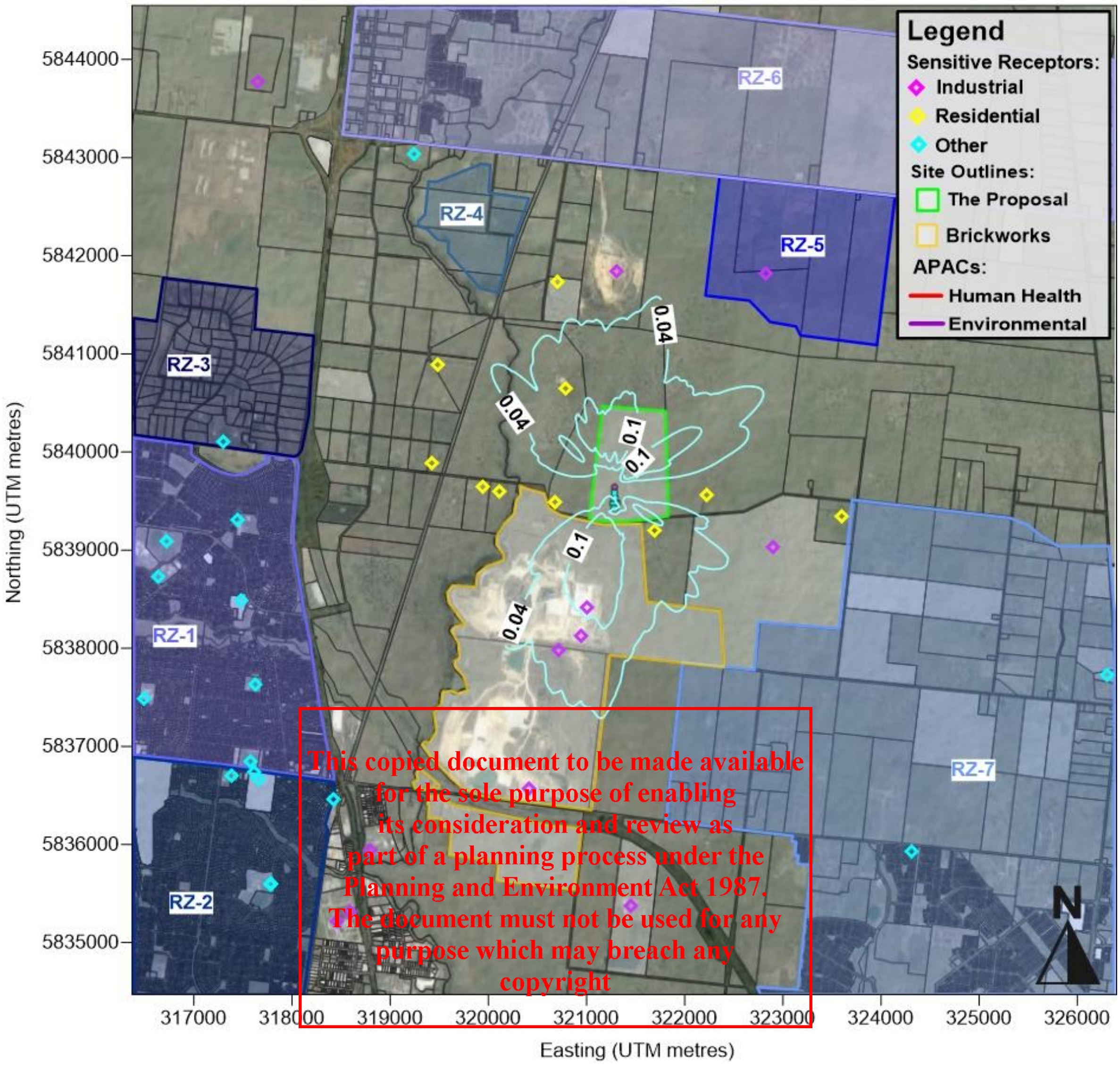


Plate 17	LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for HF due to the Proposal in isolation		
Location: Wollert	**Averaging period:** 24-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 31 µg/m³ (health-based) 2.9 µg/m³ (environmental)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

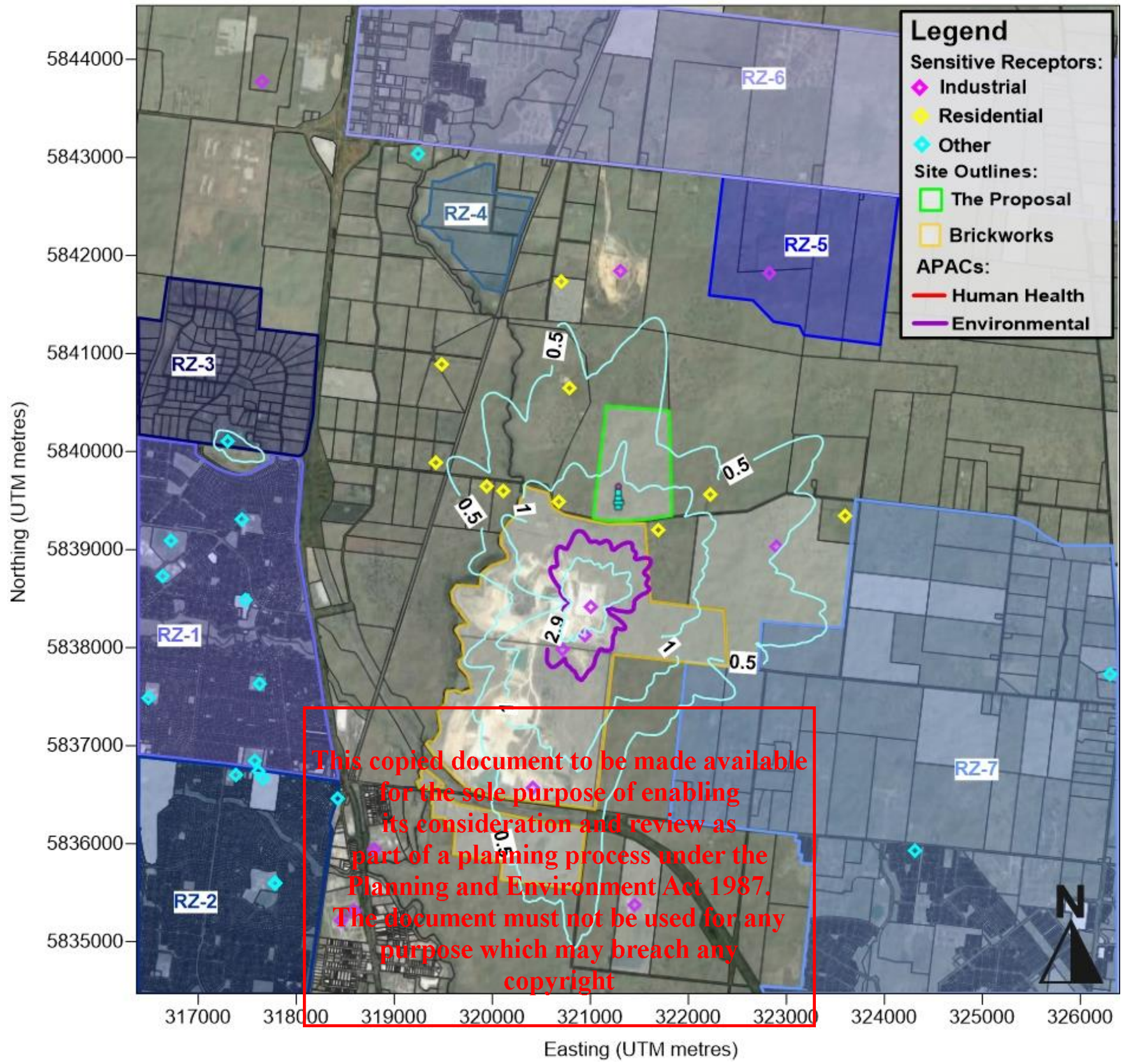


Plate 18	LP1 daily average concentration limits: maximum predicted 24-hour ground-level concentration for HF due to the Proposal and background concentrations		
Location: Wollert	**Averaging period:** 24-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 31 µg/m³ (health-based) 2.9 µg/m³ (environmental)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

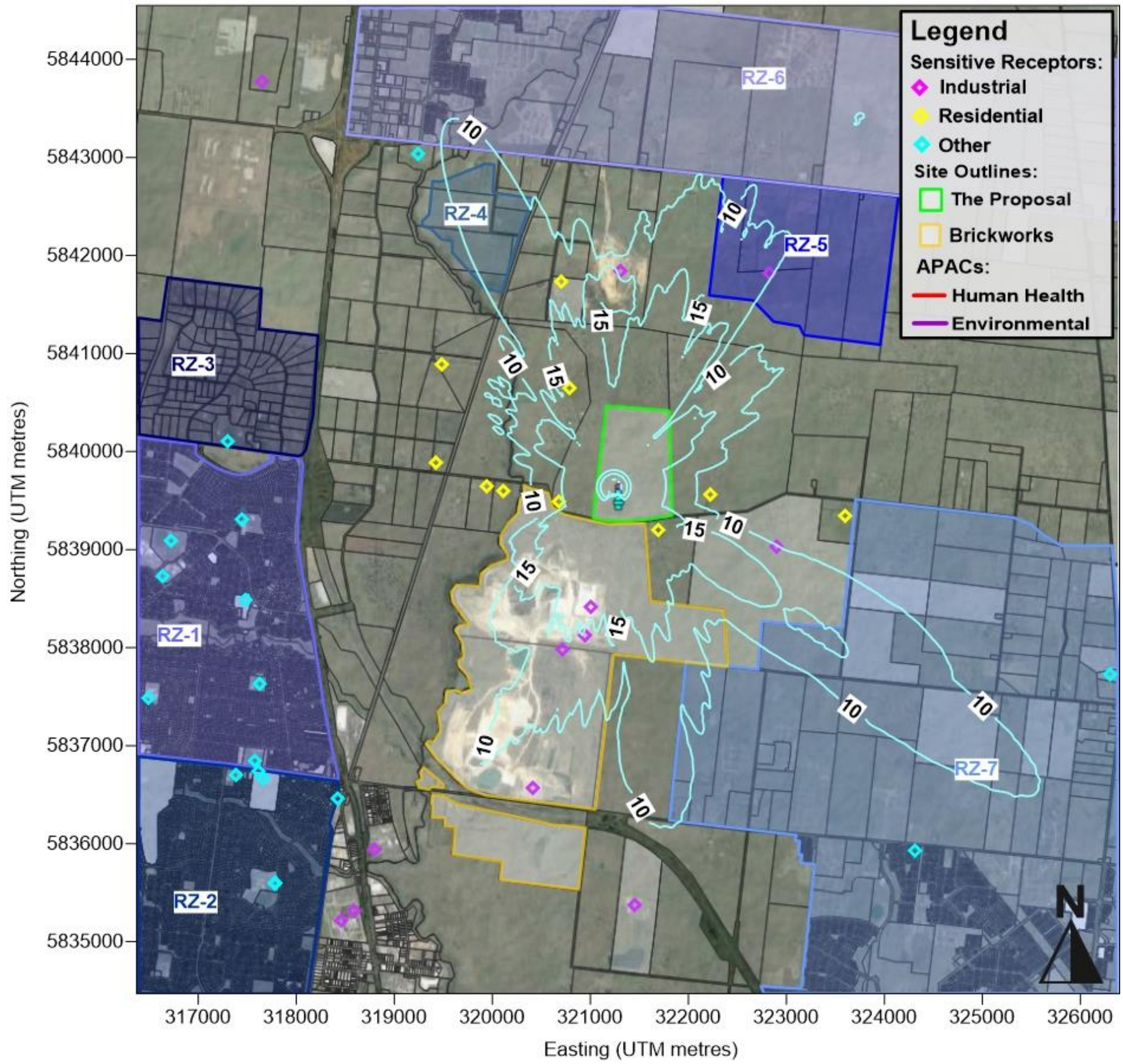
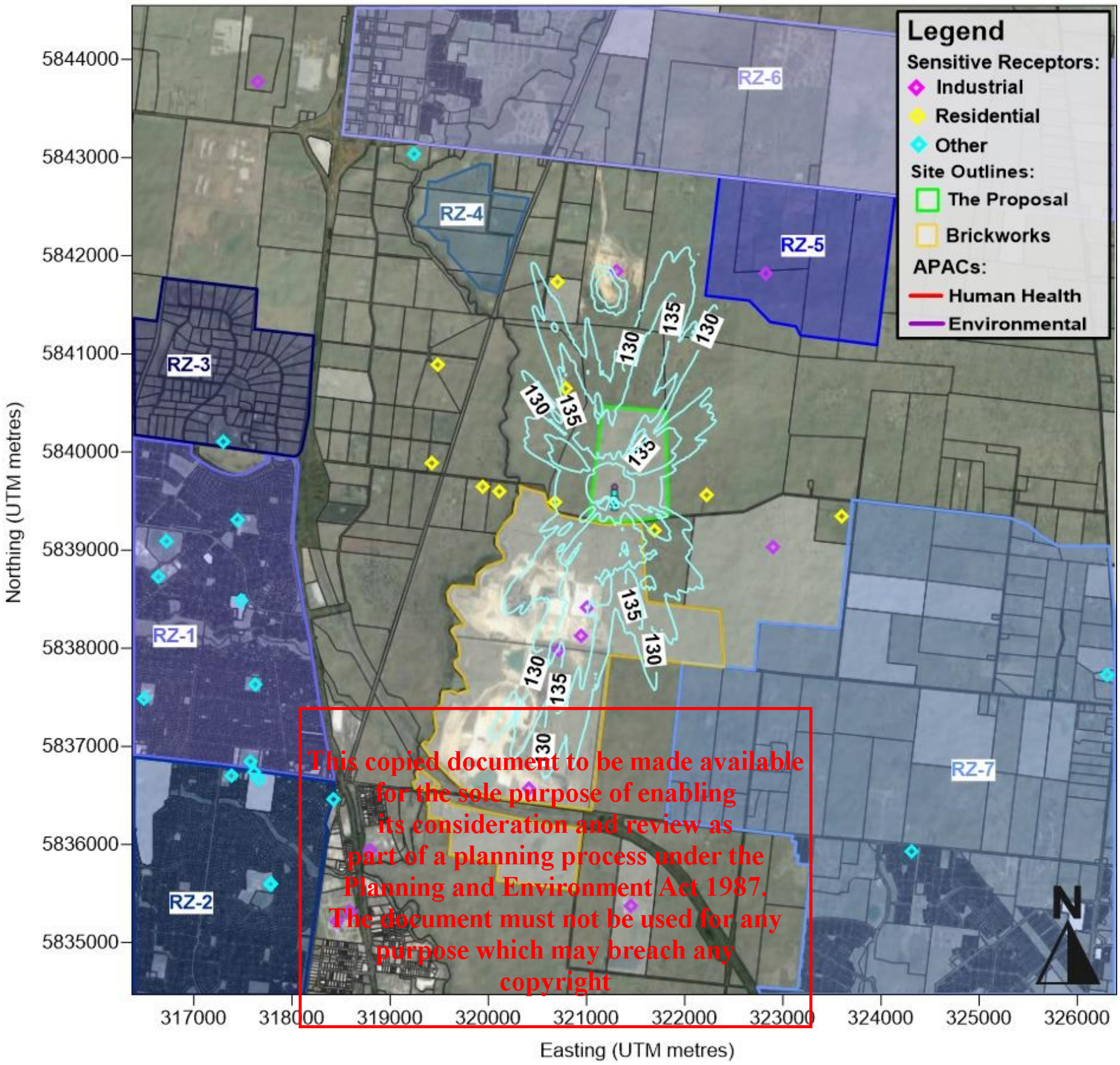


Plate 19 LP1 short-term concentration limits: maximum predicted 1-hour ground-level concentration for NO_2 due to the Proposal in isolation

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	1-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	164 µg/m³ (health-based)	Jemima Goodhew	November 2022



* Maximum ambient background added instead of contemporaneous assessment

Plate 20 **LP1 short-term average concentration limits: maximum predicted 1-hour ground-level concentration for NO_2 due to the Proposal and background concentrations**

Location:	**Averaging period:**	**Data source:**	**Units:**
Wollert	1-hour	AERMOD	µg/m³
Type:	**APAC:**	**Prepared by:**	**Date:**
Maximum across 2017 to 2021	164 µg/m³ (health-based)	Jemima Goodhew	November 2022

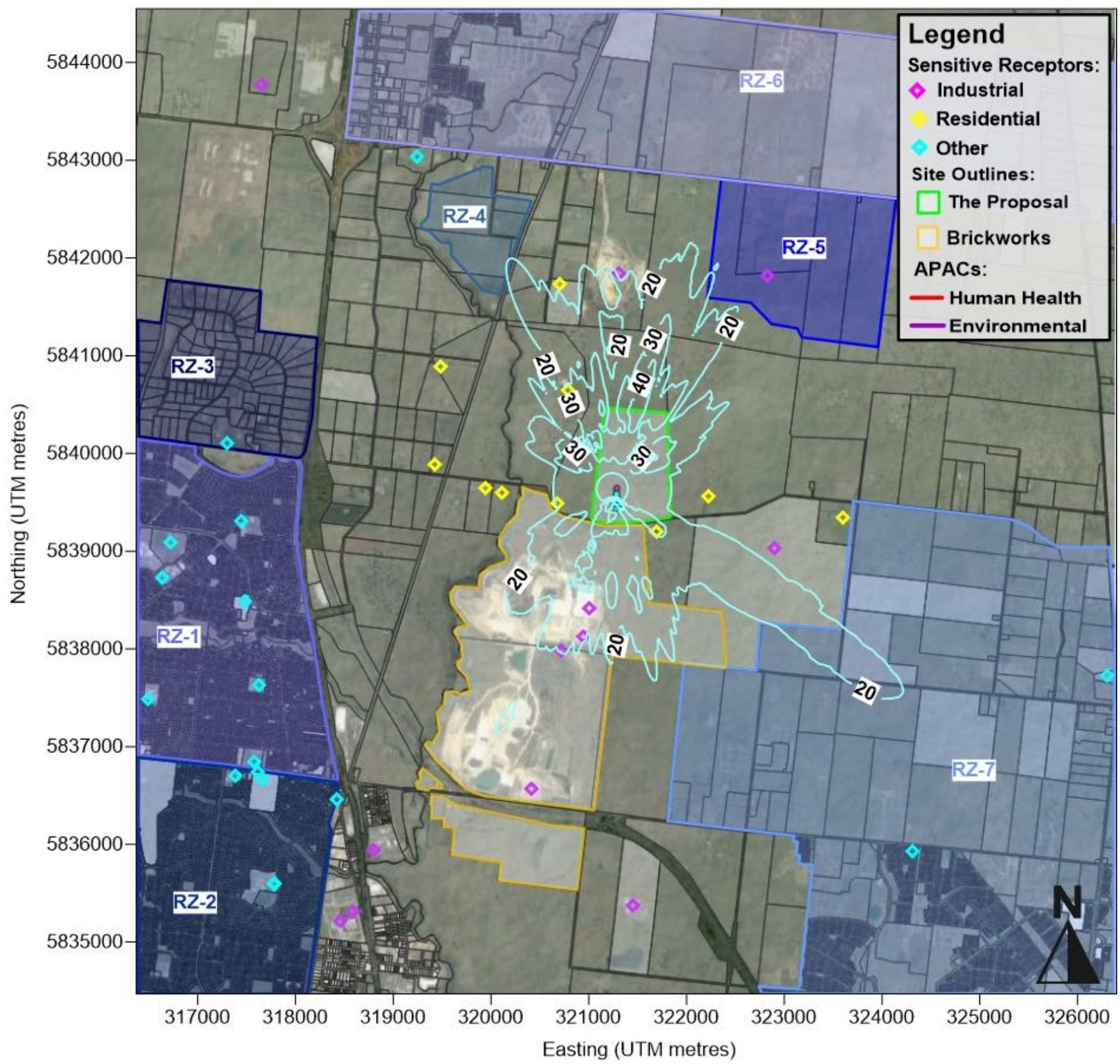


Plate 21	LP1 short-term concentration limits: maximum predicted 1-hour ground-level concentration for SO_2 due to the Proposal in isolation		
Location: Wollert	**Averaging period:** 1-hour	**Data source:** AERMOD	**Units:** µg/m³
Type: Maximum across 2017 to 2021	**APAC:** 214 µg/m³ (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

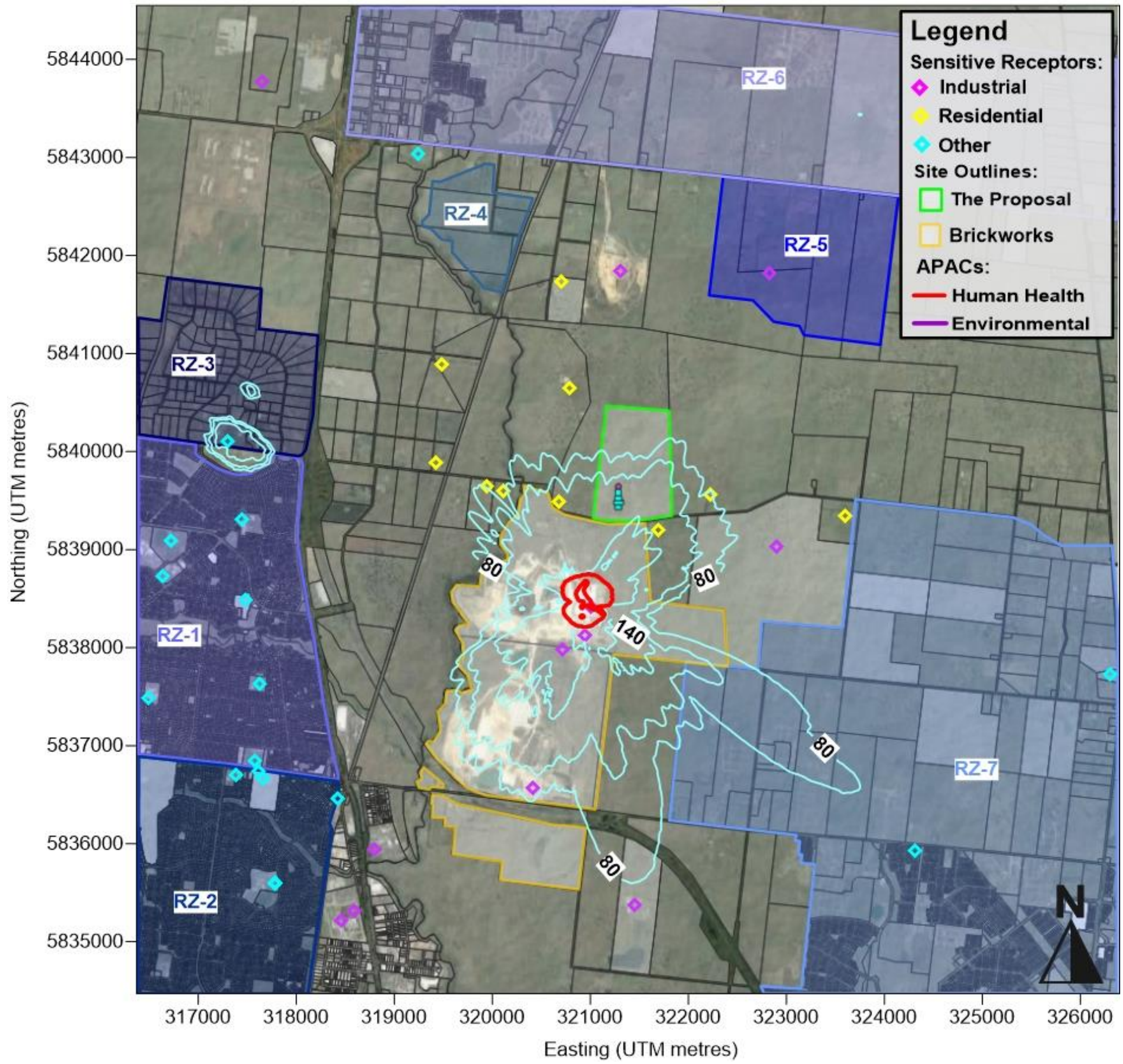


Plate 22	**LP1 short-term average concentration limits: maximum predicted 1-hour ground-level concentration for SO_2 due to the Proposal and background concentrations**		
Location: Wollert	**Averaging period:** 1-hour	**Data source:** AERMOD	**Units:** µg/m^3
Type: Maximum across 2017 to 2021	**APAC:** 214 µg/m^3 (health-based)	**Prepared by:** Jemima Goodhew	**Date:** November 2022

APPENDIX A METEOROLOGICAL AND DISPERSION MODELLING METHODOLOGY

A1 AERMET METEOROLOGICAL PROCESSING

Surface and profile data files suitable for use in AERMOD were generated based on five years of meteorological modelling (2017 to 2021) using AERMET.. Upper air data for the BoM Melbourne Airport site and landuse and terrain information for the area surrounding the Proposal were incorporated into AERMET. Preparation of data files and modelling procedures were performed in accordance with the EPA Victoria's Guidance for Construction of input meteorological data files for the EPA Victoria's regulatory air pollution model (AERMOD) (Publication 1550).

AERMET (v22112) is a meteorological data pre-processor for the AERMOD air pollution dispersion model. AERMET processes commercially available or custom on-site met data and creates two files: a surface data file and a profile data file.

Table A1 presents surface roughness values and Table A2 presents the Albedo and Bowen Ratios used in developing the meteorological file based on season.

Table A1 Surface roughness, Z_0, based on season and wind direction

Sector	Wind direction	Summer	Autumn	Winter	Spring
A	359 - 108	0.07	0.07	0.07	0.07
B	108 - 167	0.085	0.085	0.085	0.085
C	167 - 207	0.150	0.150	0.150	0.150
D	207 - 319	0.07	0.07	0.07	0.07
E	319 - 359	0.104	0.104	0.099	0.102

Table A2 Seasonal Albedo and Bowen ratio

Parameter	Summer	Autumn	Winter	Spring
Albedo Arithmetic Weighted Average	0.175	0.175	0.191	0.175
Bowen Ratio Geometric Mean	0.863	1.069	1.069	0.581

A2 AERMOD DISPERSION MODELLING

The AERMOD dispersion model, v22112 (the latest version at the time the assessment commenced), a steady-stage Gaussian model, was configured in accordance with EPA Victoria's Guidance Notes for Using Aermod (Publication 1551, February 2015) as follows for the Proposal:

- Modelling period of five years (2017 – 2021), with each year run separately
- Model domain of 400 x 400 grid points at 25m resolution (Figure A1)
- Source characteristics for the Proposal included in the modelling are presented in Section 6

- Source characteristics for existing Brickworks included in the modelling are presented in Section A3
- Terrain data included
- Discrete receptors included
- Building wakes included for buildings as part of the Proposal (Figure A2)
- PM_{10} and $PM_{2.5}$ modelled as gases.

Figure A1 Model domain

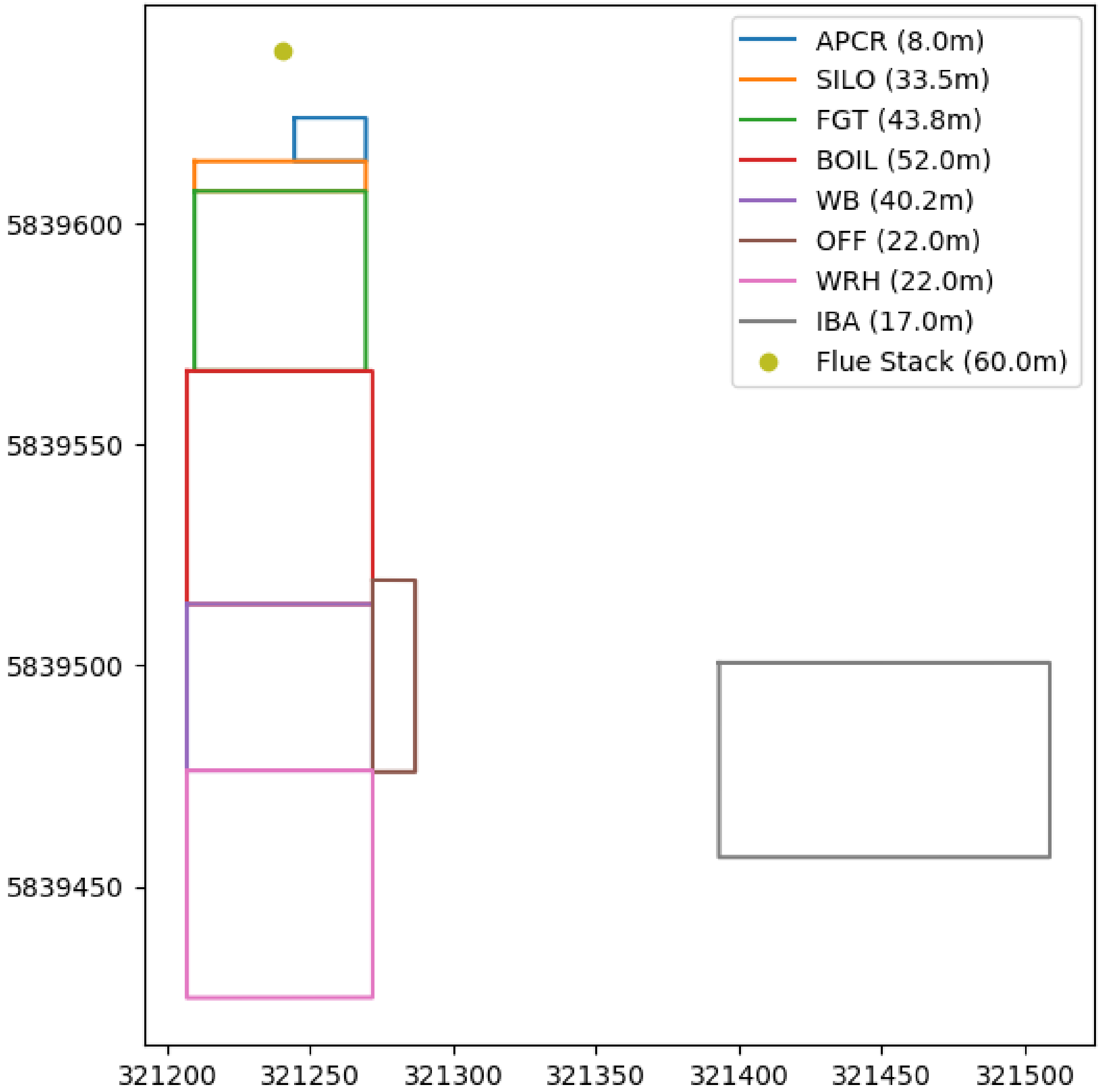


Figure A2 **Proposal buildings included in model (UTM metres northing and easting)**

A3 BRICKWORKS

Austral Bricks supplied the stack and building dimension data, and licenced emission limits required to undertake the cumulative dispersion modelling assessment. Stack characteristics are provided in Table A3 and emission rates are provided in Table A4. Figure A3 is a diagram of the building included for building wakes.

Table A3 Brickworks: stack characteristics

Parameter	Value	Units	Information Source
Number of kilns	2	#	Brickworks
Parameter per kiln			
Stack height	47	m	
Exhaust diameter	1.56	m	
Exhaust temperature	150	°C	
Exhaust velocity	20	m/s	

Table A4 Brickworks: emission rates

Parameter	Value	Units	Information Source
Parameter per kiln			
CO	500	g/min/kiln	Licence 11517
HCl	650	g/min/kiln	Licence 11517
NOx	150	g/min/kiln	Licence 11517
SO_2	700	g/min/kiln	Brickworks
HF	72	g/min (bubble)	Licence 11517
PM_{10}	74	g/min/kiln	Licence 11517
$PM_{2.5}$	0.27	g/s/kiln	Average FY2019-2021 based on NPI data
As	0.00011	g/s/kiln	
Cd	0.00006	g/s/kiln	
Cr(III)	0.00014	g/s/kiln	
Cr(VI)	0.00006	g/s/kiln	
Cu	0.00001	g/s/kiln	
Hg	0.00003	g/s/kiln	
Mn	0.0011	g/s/kiln	
Ni	0.00027	g/s/kiln	
TVOC	0.0428	g/s/kiln	
Dioxins and furans	0.00000000001	g/s/kiln	

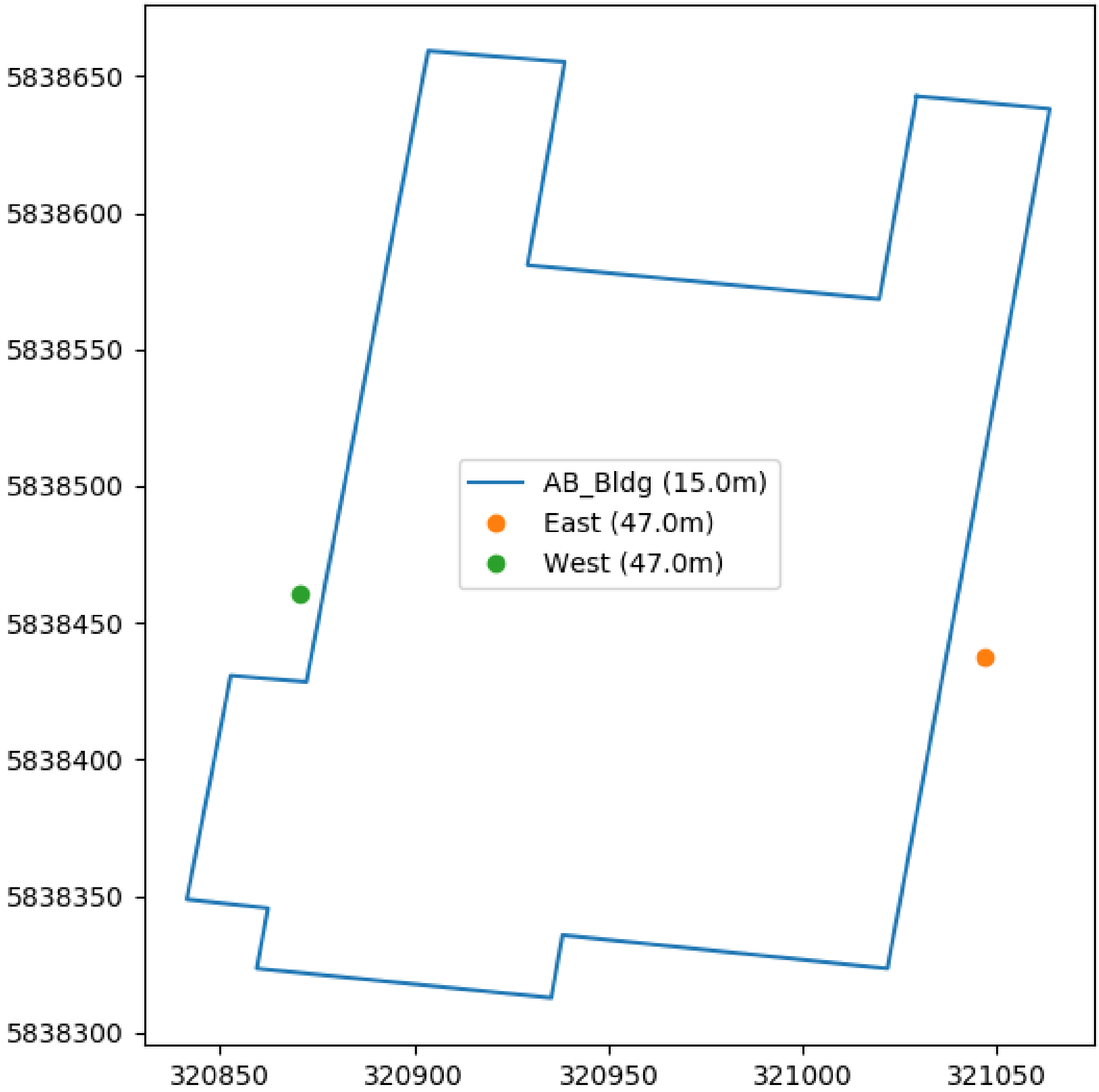


Figure A3 Brickworks building included in model (UTM metres northing and easting)

A4 PLUME VISIBILITY

The meteorological input file for the ADMS-5 model was obtained by converting the corresponding AERMOD surface meteorological file using the ADMS-5 AERMOD surface file conversion utility.

The ADMS-5 model setup is summarised in Table A5. All other parameters were set to default values.

Table A5 ADMS-5 model configuration

Parameter	Units	LP1
Moisture content	kg/kg	0.1067
Molecular mass of emissions	g/mol	28.106
Roughness length (dispersion site)	metres	0.02
Roughness length (meteorological site)	metres	0.1
Latitude (°)	degrees	-37.66

APPENDIX B – COMPARISON OF LP1 AND LP2

As discussed in Section 2.4.4 the Proposal can operate at various operating capacities based on the calorific values for the waste fuel. A comparison of exhaust characteristics and predicted ground-level concentrations for when the Proposal is operating at LP1 and LP2 is presented in the following sections.

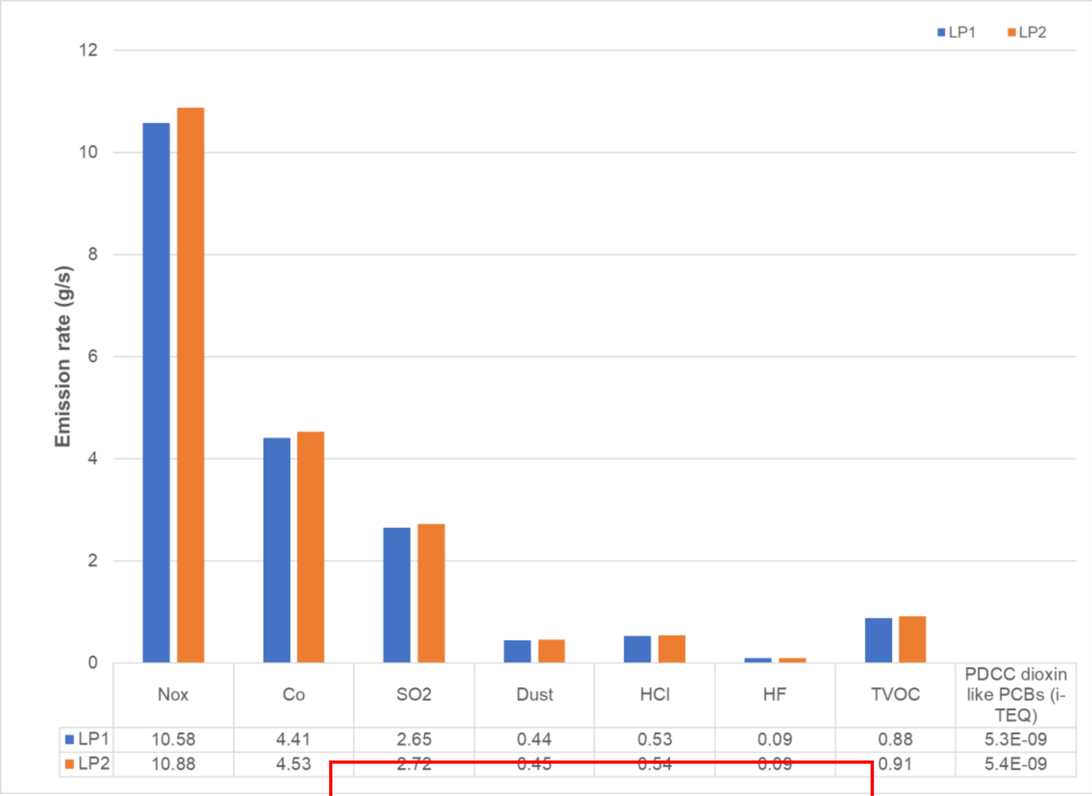
B1 STACK CHARACTERISTICS

A comparison of exhaust characteristics for the Proposal operating at LP1 and LP2 are presented in Table B1. The difference in emission rates when operating at daily average limits is illustrated in Figure B1 and Figure B2.

Table B1 The Proposal: Stack characteristics for LP1 vs LP2

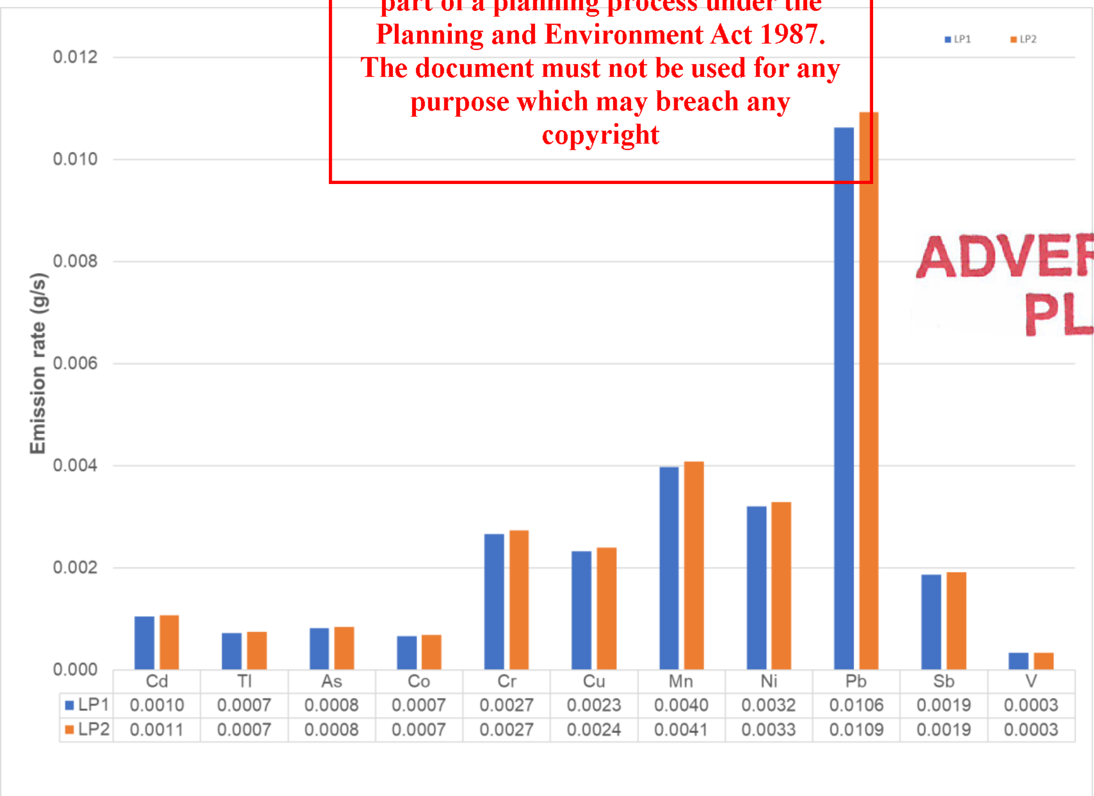
Parameter	LP1	LP2	Units
Stack characteristics for a single line			
Stack height	60	60	m (agl)
Exhaust diameter	1.85	1.85	m
Exhaust temperature	131	131	°C
Moisture content	16.7	19.1	Volume %
Oxygen content	6.3	6.1	Volume %, wet
Flow rate (wet, actual)	190,136	201,804	m^3/hour
Flow rate (dry, NTP, 11%O_2 with 10% additional flow rate)	158,705	163,167	Nm^3/hour @ 11% O_2, dry
Stack characteristics for two lines (single stack)[(2)]			
Exhaust diameter (effective)	2.6	2.6	m
Exit velocity	20	23.3	m/s
Flow rate (dry, NTP, 11%O_2 with 10% additional flow rate)	317,409	326,335	Nm^3/hour @ 11% O_2, dry

Table note:
(1) Provided by Ramboll
(2) Calculated



	Nox	Co	SO2	Dust	HCl	HF	TVOC	PDCC dioxin like PCBs (i-TEQ)
LP1	10.58	4.41	2.65	0.44	0.53	0.09	0.88	5.3E-09
LP2	10.88	4.53	2.72	0.45	0.54	0.09	0.91	5.4E-09

Figure B1 Comparison of emission rates for LP1 and LP2 (NOx, CO, SO2, Dust, HCl, HF, TVOC, PDDC/F)



	Cd	Tl	As	Co	Cr	Cu	Mn	Ni	Pb	Sb	V
LP1	0.0010	0.0007	0.0008	0.0007	0.0027	0.0023	0.0040	0.0032	0.0106	0.0019	0.0003
LP2	0.0011	0.0007	0.0008	0.0007	0.0027	0.0024	0.0041	0.0033	0.0109	0.0019	0.0003

Figure B2 Comparison of emission rates for LP1 and LP2 (metals)

B2 PREDICTED GROUND-LEVEL CONCENTRATIONS

A comparison of predicted ground-level concentrations due to the Proposal operating at LP1 and LP2 has been conducted. Table B2 and Table B3 present the predicted ground-level concentrations due to the proposal in isolation for both LP1 and LP2.

The results indicate that there is very little variation (less than 0.4% relative to APAC) in predicted ground-level concentrations based on different calorific values of the waste fuel and despite a 20% increase in waste throughput associated with LP2.

Table B2 Comparison of LP1 vs LP2 for daily average – predicted ground-level concentrations of NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, HCl, HF, NH_3, PCDD/F

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
NO_2(3)	1-hour	164	2017	17.3	9.9	7.7	2.1	16.8	9.7	7.4	2.1
			2018	14.1	10.4	7.1	2.4	13.9	10.2	6.9	2.5
			2019	14.0	9.6	7.0	2.0	13.7	9.3	6.7	1.9
			2020	13.5	9.9	7.6	3.9	13.3	10.0	7.3	3.9
			2021	12.4	10.2	7.7	1.9	12.1	9.7	7.4	1.9
NO_2(3)	Annual	30 / 30(2)	2017	1.4	0.2	0.4	0.02	1.4	0.2	0.4	0.02
			2018	1.3	0.2	0.5	0.02	1.3	0.2	0.5	0.02
			2019	1.2	0.2	0.4	0.02	1.2	0.2	0.4	0.02
			2020	1.3	0.1	0.8	0.02	1.2	0.1	0.8	0.02
			2021	1.3	0.1	0.8	0.01	1.2	0.1	0.8	0.01
CO	8-hour	11,250	2017	11.4	7.9	5.9	1.2	11.3	7.9	5.8	1.3
			2018	11.5	5.3	6.0	1.3	11.3	5.3	5.9	1.3
			2019	11.9	6.3	6.6	0.8	11.9	6.4	6.5	0.9
			2020	11.5	5.7	7.1	1.2	11.6	5.6	7.1	1.2
			2021	11.7	5.0	7.2	1.0	11.7	5.0	7.2	1.1
SO_2	1-hour	214	2017	14.4	8.2	6.4	1.7	14.0	8.1	6.2	1.8
			2018	11.8	8.6	5.9	2.0	11.5	8.5	5.7	2.1
			2019	11.7	8.0	5.9	1.7	11.4	7.7	5.6	1.6

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site [(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2020	11.2	8.3	6.3	3.2	11.1	8.3	6.1	3.3
SO_2	1-hour	214	2021	10.3	8.5	6.4	1.6	10.1	8.1	6.2	1.5
SO_2	24-hour	57	2017	6.1	2.2	2.7	0.3	6.1	2.1	2.7	0.31
			2018	6.3	1.7	2.8	0.3	6.3	1.7	2.7	0.29
			2019	6.4	1.6	2.8	0.2	6.4	1.6	2.8	0.18
			2020	6.0	2.2	3.5	0.3	6.0	2.1	3.5	0.33
			2021	6.0	2.3	3.3	0.3	5.9	2.3	3.3	0.32
SO_2	Annual	20[(2)]	2017	1.2	0.16	0.37	0.02	1.2	0.16	0.37	0.02
			2018	1.1	0.17	0.40	0.02	1.1	0.17	0.40	0.02
			2019	1.0	0.17	0.36	0.02	1.0	0.17	0.36	0.02
			2020	1.1	0.12	0.68	0.01	1.0	0.12	0.67	0.02
			2021	1.1	0.10	0.67	0.01	1.0	0.10	0.67	0.01
PM_{10}	24-hour	50	2017	1.0	0.36	0.45	0.05	1.0	0.35	0.46	0.05
			2018	1.1	0.28	0.46	0.05	1.1	0.28	0.46	0.05
			2019	1.1	0.27	0.47	0.03	1.1	0.26	0.46	0.03
			2020	1.0	0.36	0.58	0.05	1.0	0.35	0.58	0.06
			2021	1.0	0.39	0.55	0.05	1.0	0.38	0.55	0.05
PM_{10}	Annual	20	2017	0.20	0.03	0.06	0.003	0.2	0.03	0.06	0.003
			2018	0.18	0.03	0.07	0.003	0.2	0.03	0.07	0.003
			2019	0.17	0.03	0.06	0.003	0.2	0.03	0.06	0.003

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site [(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2020	0.18	0.02	0.11	0.003	0.2	0.02	0.11	0.003
PM_{10}	Annual	25	2021	0.18	0.02	0.11	0.002	0.2	0.02	0.11	0.002
$PM_{2.5}$	24-hour	25	2017	1.0	0.36	0.45	0.051	1.0	0.35	0.46	0.05
			2018	1.1	0.28	0.46	0.047	1.1	0.28	0.46	0.05
			2019	1.1	0.27	0.47	0.029	1.1	0.26	0.46	0.03
			2020	1.0	0.36	0.58	0.055	1.0	0.35	0.58	0.06
			2021	1.0	0.39	0.55	0.053	1.0	0.38	0.55	0.05
$PM_{2.5}$	Annual	8	2017	0.20	0.03	0.06	0.003	0.2	0.03	0.06	0.003
			2018	0.18	0.03	0.07	0.003	0.2	0.03	0.07	0.003
			2019	0.17	0.03	0.06	0.003	0.2	0.03	0.06	0.003
			2020	0.18	0.02	0.11	0.003	0.2	0.02	0.11	0.003
			2021	0.18	0.02	0.11	0.002	0.2	0.02	0.11	0.002
NH_3	1-hour	3,200	2017	4.8	2.7	2.1	0.57	4.7	2.7	2.1	0.6
			2018	3.9	2.9	2.0	0.68	3.8	2.8	1.9	0.7
			2019	3.9	2.7	2.0	0.56	3.8	2.6	1.9	0.5
			2020	3.7	2.8	2.1	1.1	3.7	2.8	2.0	1.1
			2021	3.4	2.8	2.1	0.54	3.4	2.7	2.1	0.5
NH_3	24-hour	1,184	2017	2.0	0.72	0.91	0.10	2.0	0.71	0.91	0.10
			2018	2.1	0.55	0.93	0.09	2.1	0.55	0.91	0.10
			2019	2.1	0.53	0.93	0.06	2.1	0.53	0.93	0.06

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site [1]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[1]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
NH_3	24-hour	1,184	2020	2.0	0.72	1.16	0.11	2.0	0.71	1.15	0.11
			2021	2.0	0.78	1.10	0.11	2.0	0.77	1.10	0.11
NH_3	Annual	70 / 8[2]	2017	0.4	0.05	0.12	0.006	0.4	0.05	0.12	0.006
			2018	0.4	0.06	0.13	0.006	0.4	0.06	0.13	0.006
			2019	0.3	0.06	0.12	0.005	0.3	0.06	0.12	0.005
			2020	0.4	0.04	0.23	0.005	0.3	0.04	0.22	0.005
			2021	0.4	0.03	0.22	0.004	0.3	0.03	0.22	0.004
HF	1-hour	60	2017	0.48	0.27	0.21	0.06	0.47	0.27	0.21	0.06
			2018	0.39	0.29	0.20	0.07	0.38	0.28	0.19	0.07
			2019	0.39	0.27	0.20	0.06	0.38	0.26	0.19	0.05
			2020	0.37	0.28	0.21	0.11	0.37	0.28	0.20	0.11
			2021	0.34	0.28	0.21	0.05	0.34	0.27	0.21	0.05
HF	24-hour	31 / 2.9[2]	2017	0.20	0.07	0.09	0.010	0.20	0.07	0.09	0.010
			2018	0.21	0.06	0.09	0.009	0.21	0.06	0.09	0.010
			2019	0.21	0.05	0.09	0.006	0.21	0.05	0.09	0.006
			2020	0.20	0.07	0.1	0.01	0.20	0.07	0.1	0.01
			2021	0.20	0.08	0.1	0.01	0.20	0.08	0.1	0.01
HCl	1-hour	2,100	2017	2.9	1.6	1.3	0.3	2.8	1.6	1.2	0.4
			2018	2.4	1.7	1.2	0.4	2.3	1.7	1.1	0.4
			2019	2.3	1.6	1.2	0.3	2.3	1.5	1.1	0.3

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site (1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
HCl	1-hour	2,100	2020	2.2	1.7	1.3	0.6	2.2	1.7	1.2	0.7
			2021	2.1	1.7	1.3	0.3	2.0	1.6	1.2	0.3
HCl	Annual	20	2017	0.23	0.03	0.07	0.004	0.23	0.03	0.07	0.004
			2018	0.22	0.03	0.08	0.004	0.22	0.03	0.08	0.004
			2019	0.21	0.03	0.07	0.003	0.20	0.03	0.07	0.003
			2020	0.21	0.02	0.14	0.003	0.21	0.02	0.13	0.003
			2021	0.21	0.02	0.13	0.002	0.21	0.02	0.13	0.002
Formaldehyde	30-minute	100	2017	5.51	3.15	2.47	0.66	5.34	3.11	2.38	0.67
			2018	4.51	3.31	2.27	0.78	4.42	3.27	2.19	0.79
			2019	4.46	3.06	2.25	0.64	4.38	2.96	2.14	0.61
			2020	4.30	3.17	2.43	1.24	4.24	3.18	2.33	1.25
			2021	3.95	3.25	2.45	0.61	3.87	3.08	2.36	0.59
Formaldehyde	24-hour	49	2017	2.03	0.72	0.91	0.10	2.02	0.71	0.91	0.10
			2018	2.12	0.55	0.93	0.09	2.11	0.55	0.91	0.10
			2019	2.14	0.53	0.93	0.06	2.13	0.53	0.93	0.06
			2020	2.00	0.72	1.16	0.11	1.99	0.71	1.15	0.11
			2021	1.99	0.78	1.10	0.11	1.98	0.77	1.10	0.11
Formaldehyde	Annual	9.8	2017	0.39	0.05	0.12	0.006	0.38	0.05	0.12	0.01
			2018	0.37	0.06	0.13	0.006	0.36	0.06	0.13	0.01
Formaldehyde	Annual	9.8	2019	0.35	0.06	0.12	0.005	0.34	0.06	0.12	0.01

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site [(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2020	0.35	0.04	0.23	0.005	0.35	0.04	0.22	0.01
			2021	0.35	0.03	0.22	0.004	0.35	0.03	0.22	0.00
Benzene	1-hour	580	2017	4.80	2.75	2.15	0.57	4.65	2.71	2.07	0.58
			2018	3.92	2.88	1.97	0.68	3.85	2.84	1.90	0.69
			2019	3.88	2.67	1.96	0.56	3.81	2.58	1.86	0.53
			2020	3.75	2.76	2.11	1.08	3.69	2.77	2.03	1.09
			2021	3.44	2.83	2.13	0.54	3.37	2.68	2.06	0.51
Benzene	24-hour	29	2017	2.03	0.72	0.91	0.10	2.02	0.71	0.91	0.10
			2018	2.12	0.55	0.93	0.09	2.11	0.55	0.91	0.10
			2019	2.14	0.53	0.93	0.06	2.13	0.53	0.93	0.06
			2020	2.00	0.72	1.16	0.11	1.99	0.71	1.15	0.11
			2021	1.99	0.78	1.10	0.107	1.98	0.77	1.10	0.11
Benzene	Annual	9.6/1.7	2017	0.39	0.05	0.12	0.006	0.38	0.05	0.12	0.01
			2018	0.37	0.06	0.13	0.006	0.36	0.06	0.13	0.01
			2019	0.35	0.06	0.12	0.005	0.34	0.06	0.12	0.01
			2020	0.35	0.04	0.23	0.005	0.35	0.04	0.22	0.01
			2021	0.35	0.03	0.22	0.004	0.35	0.03	0.22	0.00
PAH as BAP	Annual	0.002 / 0.0001[(6)] / 0.15	2017	7.83E-06	1.07E-06	2.44E-06	1.24E-07	7.7E-06	1.1E-06	2.43E-06	1.24E-07
			2018	7.34E-06	1.15E-06	2.66E-06	1.18E-07	7.2E-06	1.1E-06	2.65E-06	1.19E-07
			2019	6.93E-06	1.12E-06	2.39E-06	1.01E-07	6.8E-06	1.1E-06	2.38E-06	1.01E-07

Pollutant	Averaging period	APAC	Year	LP 1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site [(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2020	7.04E-06	7.91E-07	4.50E-06	9.98E-08	6.9E-06	7.8E-07	4.47E-06	1.00E-07
			2021	7.06E-06	6.80E-07	4.50E-06	8.22E-08	6.9E-06	6.6E-07	4.46E-06	8.22E-08
PCDD/F	Annual	0.00004	2017	2.3E-09	3.2E-10	7.3E-10	3.7E-11	2.3E-09	3.2E-10	7.3E-10	3.7E-11
			2018	2.2E-09	3.5E-10	8.0E-10	3.5E-11	2.2E-09	3.4E-10	8.0E-10	3.6E-11
			2019	2.1E-09	3.4E-10	7.2E-10	3.0E-11	2.0E-09	3.3E-10	7.2E-10	3.0E-11
			2020	2.1E-09	2.4E-10	1.4E-09	3.0E-11	2.1E-09	2.3E-10	1.3E-09	3.0E-11
			2021	2.1E-09	2.0E-10	1.3E-09	2.5E-11	2.1E-09	2.0E-10	1.3E-09	2.5E-11

Table note:

(1) Maximum off-site is the maximum outside of the Proposal area

(2) Environmental APAC

(3) NOx to NO_2 conversion assumes 30% conversion

Table B3 Comparison of LP1 vs LP2 for daily average – predicted ground-level concentrations of metals

Pollutant	Averaging period	APAC	Year	LP1 isolation (µg/m^3)				LP2 isolation (µg/m^3)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
As	1-hour	9.9	2017	0.004	0.003	0.002	0.0005	0.004	0.003	0.002	0.0005
			2018	0.004	0.003	0.002	0.0006	0.004	0.003	0.002	0.0006
			2019	0.004	0.002	0.002	0.0005	0.004	0.002	0.002	0.0005
			2020	0.003	0.003	0.002	0.0010	0.003	0.003	0.002	0.0010
			2021	0.003	0.003	0.002	0.0005	0.003	0.002	0.002	0.0005
As	Annual	0.007	2017	0.0004	0.00005	0.0001	0.00001	0.0004	0.00005	0.0001	0.00001
			2018	0.0003	0.00005	0.0001	0.00001	0.0003	0.00005	0.0001	0.00001
			2019	0.0003	0.00005	0.0001	0.00001	0.0003	0.00005	0.0001	0.00001
			2020	0.0003	0.00004	0.0002	0.00001	0.0003	0.00004	0.0002	0.00001
			2021	0.0003	0.00003	0.0002	0.00001	0.0003	0.00003	0.0002	0.00001
Cd	1-hour	18	2017	0.006	0.003	0.003	0.0007	0.005	0.003	0.002	0.0007
			2018	0.005	0.003	0.002	0.0008	0.005	0.003	0.002	0.0008
			2019	0.005	0.003	0.002	0.0007	0.004	0.003	0.002	0.0006
			2020	0.004	0.003	0.002	0.0013	0.004	0.003	0.002	0.0013
			2021	0.004	0.003	0.003	0.0006	0.004	0.003	0.002	0.0006
Cd	24-hour	0.03	2017	0.002	0.0009	0.00107	0.00012	0.002	0.001	0.001	0.0001

Pollutant	Averaging period	APAC	Year	LP1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2018	0.002	0.0007	0.0011	0.00011	0.002	0.001	0.001	0.0001
			2019	0.003	0.0006	0.0011	0.00007	0.003	0.001	0.001	0.00007
			2020	0.002	0.0009	0.00136	0.00013	0.002	0.001	0.001	0.00013
Cd	24-hour	0.03	2021	0.002	0.0009	0.00129	0.00013	0.002	0.001	0.001	0.00013
Cd	Annual	0.005 / 0.005 [(2)]	2017	0.0005	0.00006	0.00014	0.00001	0.0005	0.00006	0.0001	0.00001
			2018	0.0004	0.00007	0.00016	0.00001	0.0004	0.00007	0.0002	0.00001
			2019	0.0004	0.00007	0.00014	0.00001	0.0004	0.00007	0.0001	0.00001
			2020	0.0004	0.00005	0.00027	0.00001	0.0004	0.00005	0.0003	0.00001
			2021	0.0004	0.00004	0.00027	0.00001	0.0004	0.00004	0.0003	0.00001
Cr(III)	30-day	0.1	2017	0.003	0.0004	0.0008	0.00005	0.003	0.0004	0.0008	0.00005
			2018	0.003	0.0003	0.0008	0.00004	0.003	0.0003	0.0008	0.00004
			2019	0.002	0.0004	0.0007	0.00003	0.002	0.0004	0.0007	0.00003
			2020	0.002	0.0004	0.001	0.00004	0.002	0.0004	0.0012	0.00004
			2021	0.002	0.0002	0.001	0.00003	0.002	0.0002	0.0015	0.00003
Cr(VI)	1-hour	1.3	2017	0.014	0.008	0.006	0.002	0.014	0.008	0.006	0.002
			2018	0.012	0.009	0.006	0.002	0.012	0.009	0.006	0.002
			2019	0.012	0.008	0.006	0.002	0.011	0.008	0.006	0.002
			2020	0.011	0.008	0.006	0.003	0.011	0.008	0.006	0.003
			2021	0.010	0.009	0.006	0.002	0.010	0.008	0.006	0.002
Cr(VI)	Annual	0.005	2017	0.001	0.0002	0.0004	0.00002	0.001	0.0002	0.0004	0.00002

Pollutant	Averaging period	APAC	Year	LP1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2018	0.001	0.0002	0.0004	0.00002	0.001	0.0002	0.0004	0.00002
			2019	0.001	0.0002	0.0004	0.00002	0.001	0.0002	0.0004	0.00002
			2020	0.001	0.0001	0.0007	0.00002	0.001	0.0001	0.0007	0.00002
Cr(VI)	Annual	0.005	2021	0.001	0.0001	0.0007	0.00001	0.001	0.0001	0.0007	0.00001
Cu	1-hour	100	2017	0.013	0.007	0.006	0.002	0.012	0.007	0.005	0.002
			2018	0.010	0.008	0.005	0.002	0.010	0.008	0.005	0.002
			2019	0.010	0.007	0.005	0.001	0.010	0.007	0.005	0.001
			2020	0.010	0.007	0.006	0.003	0.010	0.007	0.005	0.003
			2021	0.009	0.007	0.006	0.001	0.009	0.007	0.005	0.001
Hg	Annual	1.0	2017	0.0008	0.0001	0.0002	0.00001	0.0008	0.0001	0.0002	0.00001
			2018	0.0007	0.0001	0.0003	0.00001	0.0007	0.0001	0.0003	0.00001
			2019	0.0007	0.0001	0.0002	0.00001	0.0007	0.0001	0.0002	0.00001
			2020	0.0007	0.0001	0.0005	0.00001	0.0007	0.0001	0.0005	0.00001
			2021	0.0007	0.0001	0.0005	0.00001	0.0007	0.0001	0.0005	0.00001
Mn	1-hour	9.1	2017	0.02	0.012	0.010	0.003	0.02	0.01	0.009	0.00264
			2018	0.02	0.013	0.009	0.003	0.02	0.01	0.009	0.00309
			2019	0.02	0.012	0.009	0.003	0.02	0.01	0.008	0.00241
			2020	0.02	0.012	0.010	0.005	0.02	0.01	0.009	0.00492
			2021	0.02	0.013	0.010	0.002	0.02	0.01	0.009	0.00232
Mn	Annual	0.15	2017	0.002	0.0002	0.0006	0.00003	0.002	0.0002	0.0006	0.00003

Pollutant	Averaging period	APAC	Year	LP1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site(1)	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2018	0.002	0.0003	0.0006	0.00003	0.002	0.0003	0.0006	0.00003
			2019	0.002	0.0003	0.0005	0.00002	0.002	0.0003	0.0005	0.00002
			2020	0.002	0.0002	0.0010	0.00002	0.002	0.0002	0.0010	0.00002
Mn	Annual	0.15	2021	0.002	0.0002	0.0010	0.00002	0.002	0.0001	0.0002	0.00001
Ni	1-hour	0.2	2017	0.02	0.010	0.008	0.002	0.02	0.010	0.008	0.002
			2018	0.01	0.010	0.007	0.002	0.01	0.010	0.007	0.002
			2019	0.01	0.010	0.007	0.002	0.01	0.009	0.007	0.002
			2020	0.01	0.010	0.008	0.004	0.01	0.010	0.007	0.004
			2021	0.01	0.010	0.008	0.002	0.01	0.010	0.007	0.002
Ni	Annual	0.09	2017	0.001	0.0002	0.0004	0.00002	0.001	0.0002	0.0004	0.00002
			2018	0.001	0.0002	0.0005	0.00002	0.001	0.0002	0.0005	0.00002
			2019	0.001	0.0002	0.0004	0.00002	0.001	0.0002	0.0004	0.00002
			2020	0.001	0.0001	0.0008	0.00002	0.001	0.0001	0.0008	0.00002
			2021	0.001	0.0001	0.0008	0.00001	0.001	0.0001	0.0008	0.00001
Pb	Annual	0.5	2017	0.005	0.0006	0.001	0.00007	0.005	0.0006	0.001	0.00007
			2018	0.004	0.0007	0.002	0.00007	0.004	0.0007	0.002	0.00007
			2019	0.004	0.0007	0.001	0.00006	0.004	0.0007	0.001	0.00006
			2020	0.004	0.0005	0.003	0.00006	0.004	0.0005	0.003	0.00006
			2021	0.004	0.0004	0.003	0.00005	0.004	0.0004	0.003	0.00005
Sb	24-hour	1.0	2017	0.004	0.002	0.002	0.0002	0.004	0.001	0.002	0.0002

Pollutant	Averaging period	APAC	Year	LP1 isolation (µg/m³)				LP2 isolation (µg/m³)			
				Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor	Maximum off-site[(1)]	Maximum at residential receptor	Maximum at industrial receptor	Maximum at other sensitive receptor
			2018	0.004	0.001	0.002	0.0002	0.004	0.001	0.002	0.0002
			2019	0.005	0.001	0.002	0.0001	0.004	0.001	0.002	0.0001
			2020	0.004	0.002	0.002	0.0002	0.004	0.001	0.002	0.0002
Sb	24-hour	1.0	2021	0.004	0.002	0.002	0.0002	0.004	0.002	0.002	0.0002
Sb	Annual	0.3	2017	0.0008	0.0001	0.0003	0.00001	0.0008	0.0001	0.0003	0.00001
			2018	0.0008	0.0001	0.0003	0.00001	0.0008	0.0001	0.0003	0.00001
			2019	0.0007	0.0001	0.0003	0.00001	0.0007	0.0001	0.0003	0.00001
			2020	0.0007	0.00008	0.0005	0.00001	0.0007	0.00008	0.0005	0.00001
			2021	0.0007	0.00007	0.0005	0.00001	0.0007	0.00007	0.0005	0.00001

Table note:

(1) Maximum off-site is the maximum outside of the Proposal area

(2) Environmental APAC

APPENDIX C – SAMPLE AERMOD INPUT FILE


```
CO STARTING
   TITLEONE CLE_21124
   MODELOPT CONC ELEV
   AVERTIME 1 24 PERIOD
   POLLUTID NOX
   FLAGPOLE 0
   RUNORNOT RUN
   ERRORFIL ErrorList.txt
CO FINISHED

SO STARTING
   ELEVUNIT METERS
   CONCUNIT 1.0E6 GRAMS/SEC MICROGRAM/M**3

   LOCATION Stack   POINT  321240   5839639    213.1
   LOCATION AB_East POINT  321047.1 5838437.3  204.4
   LOCATION AB_West POINT  320870.5 5838460.3  205.3
   SRCPARAM Stack    10.580    60.0   404.15    20    2.6
   SRCPARAM AB_East   2.5    47.0   423.15    20    1.56
   SRCPARAM AB_West   2.5    47.0   423.15    20    1.56

SO BUILDHGT Stack   52.00   52.00   52.00   52.00   43.80   43.80
SO BUILDHGT Stack   43.80    0.00    0.00    0.00   43.80   43.80
SO BUILDHGT Stack   43.80   52.00   52.00   52.00   52.00   52.00
SO BUILDHGT Stack   52.00   52.00   52.00   52.00   43.80   43.80
SO BUILDHGT Stack   43.80    0.00    0.00    0.00   43.80   43.80
SO BUILDHGT Stack   43.80   52.00   52.00   52.00   52.00   52.00
SO BUILDWID Stack   73.19   79.12   82.75   83.50   70.00   65.50
SO BUILDWID Stack   58.50    0.00    0.00    0.00   58.50   65.00
```

SO BUILDWID Stack 70.00 83.75 82.75 79.00 73.12 65.00

SO BUILDWID Stack 73.12 79.00 82.75 83.50 69.50 65.50

SO BUILDWID Stack 58.50 0.00 0.00 0.00 59.00 65.00

SO BUILDWID Stack 69.50 83.75 82.75 79.00 73.12 65.00

SO BUILDLEN Stack 63.00 72.00 78.00 82.00 72.00 72.25

SO BUILDLEN Stack 70.25 0.00 0.00 0.00 70.25 72.25

SO BUILDLEN Stack 72.00 82.00 78.00 72.00 63.00 52.50

SO BUILDLEN Stack 63.50 71.50 78.00 82.00 72.00 72.25

SO BUILDLEN Stack 70.00 0.00 0.00 0.00 70.25 72.25

SO BUILDLEN Stack 72.00 82.00 78.00 71.50 63.50 53.00

SO XBADJ Stack -129.00 -129.00 -125.00 -117.00 -70.00 -62.50

SO XBADJ Stack -53.50 0.00 0.00 0.00 -17.88 -10.50

SO XBADJ Stack -2.75 34.50 46.50 56.50 65.50 72.50

SO XBADJ Stack 66.00 57.50 47.00 35.50 -2.50 -9.50

SO XBADJ Stack -16.75 0.00 0.00 0.00 -52.50 -62.00

SO XBADJ Stack -69.00 -116.00 -124.50 -128.00 -129.00 -125.00

SO YBADJ Stack -16.47 -33.06 -48.62 -63.00 -39.50 -45.25

SO YBADJ Stack -48.75 0.00 0.00 0.00 -49.25 -45.50

SO YBADJ Stack -40.00 -64.12 -49.88 -34.25 -17.81 -0.69

SO YBADJ Stack 16.44 33.12 48.88 63.00 39.75 44.75

SO YBADJ Stack 48.75 0.00 0.00 0.00 49.00 45.00

SO YBADJ Stack 40.25 63.88 49.88 34.50 17.81 0.69

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_East 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDWID AB_East 185.12 226.00 270.25 306.50 333.50 350.00

SO BUILDWID AB_East 356.00 351.50 346.50 345.00 365.50 374.50

SO BUILDWID AB_East 372.00 358.50 337.25 308.00 269.25 222.31

SO BUILDWID AB_East 185.12 226.00 270.50 306.50 333.00 350.00

SO BUILDWID AB_East 356.00 351.50 346.50 345.50 365.50 375.00

SO BUILDWID AB_East 372.50 358.75 337.25 308.00 269.25 222.31

SO BUILDLEN AB_East 345.00 365.50 374.50 372.00 358.75 337.25

SO BUILDLEN AB_East 308.00 269.12 222.31 185.12 226.00 270.25

SO BUILDLEN AB_East 306.50 333.00 350.00 356.00 351.00 346.50

SO BUILDLEN AB_East 345.50 365.50 374.50 372.00 358.50 337.25

SO BUILDLEN AB_East 307.75 269.12 222.31 185.12 226.12 270.25

SO BUILDLEN AB_East 306.50 333.50 350.00 356.00 351.00 346.50

SO XBADJ AB_East -144.50 -171.00 -192.50 -208.00 -217.25 -222.50

SO XBADJ AB_East -223.75 -218.00 -205.72 -190.19 -210.75 -235.25

SO XBADJ AB_East -252.50 -262.00 -263.50 -257.50 -243.50 -222.00

SO XBADJ AB_East -200.50 -194.00 -182.00 -164.00 -141.75 -114.75

SO XBADJ AB_East -84.25 -51.12 -16.59 5.00 -15.38 -35.25

SO XBADJ AB_East -54.00 -71.50 -86.00 -98.50 -107.50 -124.50

SO YBADJ AB_East 97.50 97.75 99.88 99.25 95.25 88.50

SO YBADJ AB_East 79.50 67.75 48.75 28.00 11.25 -5.25

SO YBADJ AB_East -21.50 -37.75 -53.88 -69.75 -83.38 -94.53

SO YBADJ AB_East -97.62 -97.62 -100.00 -99.25 -95.50 -89.00

SO YBADJ AB_East -79.50 -67.75 -48.75 -27.75 -11.25 5.00

SO YBADJ AB_East 21.75 37.38 53.88 69.75 83.50 94.53

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDHGT AB_West 15.00 15.00 15.00 15.00 15.00 15.00

SO BUILDWID AB_West 185.12 226.00 270.25 306.50 333.50 350.00

SO BUILDWID AB_West 356.00 351.50 346.50 345.00 365.50 374.50

SO BUILDWID AB_West 372.00 358.50 337.25 308.00 269.25 222.31

SO BUILDWID AB_West 185.12 226.00 270.50 306.50 333.00 350.00

SO BUILDWID AB_West 356.00 351.50 346.50 345.50 365.50 375.00

SO BUILDWID AB_West 372.50 358.75 337.25 308.00 269.25 222.31

```
SO BUILDLEN AB_West  345.00  365.50  374.50  372.00  358.75  337.25
SO BUILDLEN AB_West  308.00  269.12  222.31  185.12  226.00  270.25
SO BUILDLEN AB_West  306.50  333.00  350.00  356.00  351.00  346.50
SO BUILDLEN AB_West  345.50  365.50  374.50  372.00  358.50  337.25
SO BUILDLEN AB_West  307.75  269.12  222.31  185.12  226.12  270.25
SO BUILDLEN AB_West  306.50  333.50  350.00  356.00  351.00  346.50
SO XBADJ    AB_West -136.50 -132.50 -124.50 -112.00  -96.75  -81.00
SO XBADJ    AB_West  -65.50  -48.00  -29.12  -12.25  -36.88  -70.75
SO XBADJ    AB_West -102.50 -131.00 -155.50 -175.50 -190.00 -199.00
SO XBADJ    AB_West -208.50 -233.00 -250.50 -260.00 -262.25 -256.00
SO XBADJ    AB_West -242.25 -221.12 -193.19 -172.94 -189.25 -199.75
SO XBADJ    AB_West -204.25 -202.50 -194.50 -180.50 -161.00 -147.50
SO YBADJ    AB_West  -80.38  -76.12  -64.38  -50.75  -35.75  -19.50
SO YBADJ    AB_West   -2.50   14.25   25.75   36.00   50.25   63.25
SO YBADJ    AB_West   74.00   82.75   87.62   88.50   86.50   82.06
SO YBADJ    AB_West   80.31   76.12   64.50   50.75   35.50   19.00
SO YBADJ    AB_West    2.50  -14.25  -25.75  -35.75  -49.75  -63.00
SO YBADJ    AB_West  -74.25  -83.12  -87.62  -88.50  -86.50  -82.06
   SRCGROUP ALL
   SRCGROUP WOL Stack
   SRCGROUP BRICKS AB_East AB_West

SO FINISHED

RE STARTING

** DR1 - DR14
RE DISCCART 321385.0 5839693.0 219.2 219.0
RE DISCCART 321466.0 5839700.0 218.0 219.0
RE DISCCART 320679.0 5839490.0 216.9 217.0
RE DISCCART 320791.0 5840647.0 231.9 231.5
RE DISCCART 321698.0 5839194.0 210.4 211.0
```

RE DISCCART 322229.0 5839563.0 215.4 215.5

RE DISCCART 320109.0 5839603.0 212.1 212.0

RE DISCCART 319944.0 5839647.0 212.8 213.0

RE DISCCART 319490.0 5840888.0 222.0 222.0

RE DISCCART 319420.0 5839883.0 221.0 221.5

RE DISCCART 320708.0 5841738.0 222.0 222.0

RE DISCCART 323600.0 5839349.0 215.0 216.0

** Provided sensitive recepts

RE DISCCART 317648.2 5843777.4 234.4 234.5

RE DISCCART 319238.9 5843042.3 221.9 222.0

RE DISCCART 321311.4 5841841.7 242.0 268.0

RE DISCCART 322831.9 5841819.3 237.8 238.0

RE DISCCART 317298.9 5840105.2 296.1 297.0

RE DISCCART 317449.9 5839304.3 235.7 237.0

RE DISCCART 316719.3 5839088.7 226.8 227.0

RE DISCCART 322896.8 5839035.1 208.0 208.0

RE DISCCART 316637.4 5838726.2 222.7 223.0

RE DISCCART 317477.5 5838489.2 211.2 211.0

RE DISCCART 321007.6 5838417.4 203.5 203.0

RE DISCCART 320943.1 5838119.6 199.7 200.0

RE DISCCART 320711.8 5837983.8 204.0 204.0

RE DISCCART 317627.9 5837632.6 209.4 210.0

RE DISCCART 326305.1 5837724.6 193.5 194.0

RE DISCCART 316487.7 5837480.4 218.1 218.0

RE DISCCART 317573.2 5836851.6 206.3 208.0

RE DISCCART 317384.3 5836707.4 206.0 206.0

RE DISCCART 317659.3 5836662.8 205.0 205.0

RE DISCCART 320412.3 5836573.7 191.8 192.0

RE DISCCART 318416.7 5836464.0 193.0 193.0

RE DISCCART 318793.2 5835943.2 186.5 188.0

RE DISCCART 324307.2 5835928.7 187.1 187.0

RE DISCCART 317780.4 5835604.4 193.7 194.0

RE DISCCART 317783.1 5835595.0 193.4 193.0

RE DISCCART 321446.2 5835378.4 179.3 180.0

RE DISCCART 318588.0 5835315.7 184.5 184.5

RE DISCCART 318458.4 5835211.1 184.0 184.0

** Cleanaway additional rec

RE DISCCART 317611.4 5836743.0 204.5 204.5

** Max Offsite Grid Points

RE DISCCART 321490.0 5840440.0 220.5 220.5

RE DISCCART 321215.0 5838865.0 208.0 208.0

RE DISCCART 321490.0 5840440.0 220.5 220.5

RE DISCCART 321215.0 5839265.0 211.9 212.0

RE DISCCART 321015.0 5840140.0 217.2 217.0

RE DISCCART 321215.0 5838865.0 208.0 208.0

RE DISCCART 321015.0 5840140.0 217.2 217.0

RE DISCCART 321215.0 5839265.0 211.9 212.0

RE DISCCART 321090.0 5840190.0 216.0 216.0

RE DISCCART 321215.0 5838865.0 208.0 208.0

RE DISCCART 321090.0 5840190.0 216.0 216.0

RE DISCCART 321215.0 5839265.0 211.9 212.0

RE DISCCART 321140.0 5840440.0 219.2 219.0

RE DISCCART 321140.0 5838990.0 209.8 210.0

RE DISCCART 321140.0 5840440.0 219.2 219.0

RE DISCCART 321165.0 5839265.0 211.9 212.0

RE DISCCART 321490.0 5840440.0 220.5 220.5

RE DISCCART 321140.0 5838990.0 209.8 210.0

RE DISCCART 321490.0 5840440.0 220.5 220.5

RE DISCCART 321165.0 5839265.0 211.9 212.0

RE FINISHED

ME STARTING

```
   SURFFILE CLE_21124_SFC_2017.txt
   PROFFILE CLE_21124_PFL_2017.txt
   SURFDATA 99999 2017
   UAIRDATA 99999 2017
   SITEDATA 99999 2017
   PROFBASE 213 METERS
ME FINISHED

OU STARTING
   RECTABLE 1  1 9
   RECTABLE 24 1
   POSTFILE 1     ALL PLOT GLC_1hr_TS.PLT
   POSTFILE 24    ALL PLOT GLC_24hr_TS.PLT
   PLOTFILE 1     ALL 9    GLC_9th_1hr.PLT
   PLOTFILE 1     ALL 1    GLC_max_1hr.PLT
   PLOTFILE 24    ALL 1    GLC_max_24hr.PLT
   PLOTFILE PERIOD ALL     GLC_ANN.PLT
   POSTFILE 1     BRICKS PLOT BRICKS_1hr_TS.PLT
   POSTFILE 24    BRICKS PLOT BRICKS_24hr_TS.PLT
   PLOTFILE 1     BRICKS 9    BRICKS_9th_1hr.PLT
   PLOTFILE 1     BRICKS 1    BRICKS_max_1hr.PLT
   PLOTFILE 24    BRICKS 1    BRICKS_max_24hr.PLT
   PLOTFILE PERIOD BRICKS     BRICKS_ANN.PLT
   POSTFILE 1     WOL PLOT WOL_1hr_TS.PLT
   POSTFILE 24    WOL PLOT WOL_24hr_TS.PLT
   PLOTFILE 1     WOL 9    WOL_9th_1hr.PLT
   PLOTFILE 1     WOL 1    WOL_max_1hr.PLT
   PLOTFILE 24    WOL 1    WOL_max_24hr.PLT
   PLOTFILE PERIOD WOL     WOL_ANN.PLT
OU FINISHED
```

APPENDIX D DUST RISK ASSESSMENT METHODOLOGY

The methodology detailed in the IAQM involves the following steps:

STEP 1 is to screen the requirement for a more detailed assessment (with no further assessment required if there are no receptors within a certain distance of the works).

STEP 2 is to assess the risk of dust impacts. This is done separately for each of the four activities (demolition; earthworks; construction; and trackout) and takes account of:

- The scale and nature of the works, which determines the potential dust emission magnitude (STEP 2A)
- The sensitivity of the area (STEP 2B).

These factors are combined in STEP 2C to give the risk of dust impacts.

Risks are described in terms of there being a low, medium or high risk of dust impacts for each of the four separate potential activities. Where there are low, medium or high risks of an impact, then site-specific mitigation will be required, proportionate to the level of risk.

Based on the threshold criteria and professional judgement one or more of the groups of activities may be assigned a 'negligible' risk. Such cases could arise, for example, because the emissions magnitude is small and there are no receptors near to the activity.

STEP 3 is to determine the site-specific mitigation for each of the four potential activities in STEP 2. This will be based on the risk of dust impacts identified in STEP 2. Where a regulatory authority has issued guidance on measures to be adopted at demolition / construction sites, these should also be considered.

STEP 4 is to examine the residual effects and to determine whether these are significant.

STEP 5 is to prepare the dust assessment report.

Each of the steps is described in more detail in the following sections.

D1 STEP 1: SCREEN THE NEED FOR A DETAILED ASSESSMENT

An assessment will normally be required where there is:

- A 'human receptor' within:
  - 350 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).
- An 'ecological receptor' within:
  - 50 m of the boundary of the site; or
  - 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

D2 STEP 2: ASSESS THE RISK OF DUST IMPACTS

D2.1 Step 2A – Define the potential dust emission magnitude

The dust emission magnitude is based on the scale of the anticipated works as defined in Table D1

Table D1 Magnitude of emissions by activity relevant to the Proposal

Magnitude of emissions	Description
Demolition	
Large	Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level
Medium	Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level
Small	Total building volume <20,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months
Earthworks	
Large	Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes
Medium	Total site area 2,500 m^2 – 10,000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area <2,500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months
Construction	
Large	Total building volume >100,000 m^3, on site concrete batching, sandblasting
Medium	Total building volume 25,000 m^3 – 100,000 m^3, potentially dusty construction material (e.g. concrete), on site concrete batching
Small	Total building volume <25,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
Trackout	
Large	>50 HDV (>3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	10-50 HDV (>3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m
Small	<10 HDV (>3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.
Tables notes: HDV = Heavy Duty Vehicle	

D2.2 Step 2B – Define the sensitivity of the area

The sensitivity of the area considers a number of factors:

- The specific sensitivities of receptors in the area
- The proximity and number of those receptors

- In the case of PM_{10}, the local background concentration
- Site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

The sensitivity of areas to the effects of dust due to soiling, human health and ecological receptors are each considered. Table D2 provides a description of the range of sensitivities associated with each of these impact categories.

Table D2 Receptor sensitivity to dust effects

Receptor sensitivity	Description
Dust Soiling Effects on People and Property	
High	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.
Low	• The enjoyment of amenity would not reasonably be expected; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.
Human health effects of PM_{10}	
High	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).
Medium	• Locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day).
Low	• Locations where human exposure is transient.
Ecological effects	
High	• Locations with an international or national designation and the designated features may be affected by dust soiling; or • Locations where there is a community of a particularly dust sensitive species.
Medium	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • Locations with a national designation where the features may be affected by dust deposition.
Low	• Locations with a local designation where the features may be affected by dust deposition.

Table D3, Table D4, and Table D5 show how the sensitivity of the area is determined for dust soiling, human health and ecosystem impacts, respectively. These tables take account of a number of factors which may influence the sensitivity of the area. When using these tables, it should be noted that distances are measured from the dust source, and so a different area (and therefore, different number of receptors) may be affected by trackout than by on-site works. The highest level of sensitivity from each table should be recorded.

The annual mean PM_{10} concentrations recommended for use in the UK in the IAQM guidance have been replaced with concentrations reflective of the different Victoria EPA APAC (in Table 3).

Table D3 Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table D4 Sensitivity of the area to human health impacts

Receptor Sensitivity	Annual Mean PM_{10} concentration ($\mu g/m^3$)	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>20	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	18-20	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	16-20	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<16	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>20	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	18-20	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	19 – 22	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<16	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

Table D5 Sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

D2.3 Step 2C – Define the Risk of Impacts

The dust emission magnitude determined at STEP 2A (Section D2.1) is combined with the sensitivity of the area determined at STEP 2B (Section D2.2) to determine the risk of impacts with no mitigation applied. The matrices in Table D6 to Table D9 provide a method of assigning the level of risk for each activity. This is used to determine the level of mitigation that must be applied. Mitigation is discussed in STEP 3 (Section D2.4). For those cases where the risk category is 'negligible', no mitigation measures beyond those required by legislation is required.

Table D6 Risk of dust impacts - demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table D7 Risk of dust impacts – earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table D8 Risk of dust impacts – construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table D9 Risk of dust impacts – trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

D2.4 Step 3: Site-specific mitigation

The IAQM recommends that the dust risk categories for each of the four activities determined in STEP 2C be used to define the appropriate, site-specific, mitigation measures to be adopted.

For almost all construction activity, the IAQM guideline notes that the aim should be to prevent significant effects on receptors through the use of effective mitigation and experience shows that this is normally possible.

The IAQM guidelines include appropriate mitigation measures that could be adopted for construction activities that are determined to have low, medium and high preliminary risk of adverse air quality impacts.