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THE AUSTRAL BRICK CO PTY LTD

PLANT 2 SSD 9601 MOD 1

780 WALLGROVE ROAD, HORSLEY PARK, NSW

REVISED AIR QUALITY IMPACT ASSESSMENT

130 MILLION STANDARD BRICK EQUIVALENT (SBE) PER ANNUM

DOCUMENT CONTROL

Report Number	Date Issued	Version	Prepared	Checked	Released
JAN21013M.1	15 February 2021	V1 – Revised report to reflect increased production of 130 million SBE	A Aitharaju	A Aitharaju, B Bhensdadia	A Aitharaju
JAN21013M.3	12 April 2021	V2 – Report reflecting changes to the kiln stack parameters	A Aitharaju	A Aitharaju	A Aitharaju
JAN21013M.3	19 October 2021	V3 – Minor amendments	N Page	N Page	N Page

PREPARED FOR
Mr. Andrew Cowan
Director
WillowTree Planning
Suite 7, Level 7, 100 Walker Street
North Sydney, NSW 2060
Tel: 02 9929 6974
Mob: 0413 555 638
E-mail: acowan@willowtreeplanning.com.au

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1. BACKGROUND

The New South Wales (NSW) – Department of Planning Industry and Environment (DPI&E) granted development consent on 18 May 2020 for the State Significant Development (SSD) 9601 – Horsley Park Brickworks Plant 2 Upgrade lodged by The Austral Brick Co Pty Ltd (Austral Bricks).

SSD 9601 proposed upgrade works to the Plant 2 site including demolition of existing kilns and replacement with one (1) new kiln and the extension of the existing production building on 780 Wallgrove Road, Horsley Park (Lot 7 D91059698) in the Fairfield Local Government Area (LGA).

A key objective of SSD 9601 was to implement best practice measures and to increase efficiencies associated with the operations. The upgrade was also being planned to improve fuel consumption and the environmental performance, specifically air pollutant emissions discharged to the atmosphere from the brick kiln. SSD 9601 at that time did not propose any changes to the production capacity for the Plant 2 site which had an annual production rate of 80 million bricks per annum.

An Air Quality Impact Assessment (AQIA) report prepared by Airlabs Environmental Pty Ltd (Airlabs) accompanied the Environmental Impact Statement (EIS) for SSD 9601. The AQIA (Report No. NOV19210., issued 19 December 2019) (hereafter 'the SSD 9601 AQIA') quantified improvements / upgrades proposed by Austral Bricks for the Plant 2 site at the current annual production rate of 80 million bricks per annum.

From an air quality perspective, notable improvements comprised of the following:

- *New Kiln*: The two (2) existing kilns for Plant 2 will be replaced by a new kiln, which would improve fuel consumption and the emissions profile.
- *Scrubber to minimise acid gas emissions:* The upgraded Plant 2 kiln would comprise a dry limestone fluorine cascade scrubber, which is aimed at Hydrogen Fluoride (HF) concentrations. EPA in their previous correspondences have expressed concerns about the effectiveness of the scrubber. In response to the EPAs comments, Austral Bricks have agreed to lower the maximum HF discharge concentration at the upgraded Plant 2 kiln stack to 20 mg/m^3 from the originally assessed 45 mg/m^3, which translates to a 55% improvement in HF emissions discharged to the atmosphere. The revised HF concentration is also in-line with best practice measures implemented by Austral Bricks as most of the Austral Bricks' plants that have end-of-pipe HF abatement technologies have a maximum discharge concentration of 20 mg/m^3.
- *Increase in stack height:* The proposed upgrade also includes increasing the stack height of the existing Plant 2 kiln from 16m to 35m. Increasing the stack height would facilitate better dispersion of pollutants and minimise building wake effects that can potentially disrupt / impact the plume dispersion.

The SSD 9601 AQIA quantified impacts resulting from the aforementioned improvements proposed by Austral Bricks through a Level 2 impact assessment conducted as per the NSW Environment Protection Authority (EPA) published – *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods), January 2017. The assessment was based on an unchanged annual production rate of 80 million bricks per annum. The assessment also quantified Scope 1 and Scope 2 Greenhouse Gas Emissions (GHG) resulting from gas and electricity usage, as a GHG assessment was required as per the Secretary Environmental Assessment Requirements (SEAR) issued for SSD 9601.

Subsequent to submission of the SSD 9601 AQIA, no further comments were issued by DPI&E and the NSW – Environment Protection Authority (EPA) regarding air quality matters and development consent for SSD 9601 was granted in May 2020.

In January 2021, Austral Bricks and Willowtree Planning – who are managing the SSD 9601, informed Airlabs that a Modification Application for SSD 9601 (hereafter 'SSD 9601 Mod 1') is being lodged by Austral Bricks. Key features of SSD 9601 Mod 1 comprise:

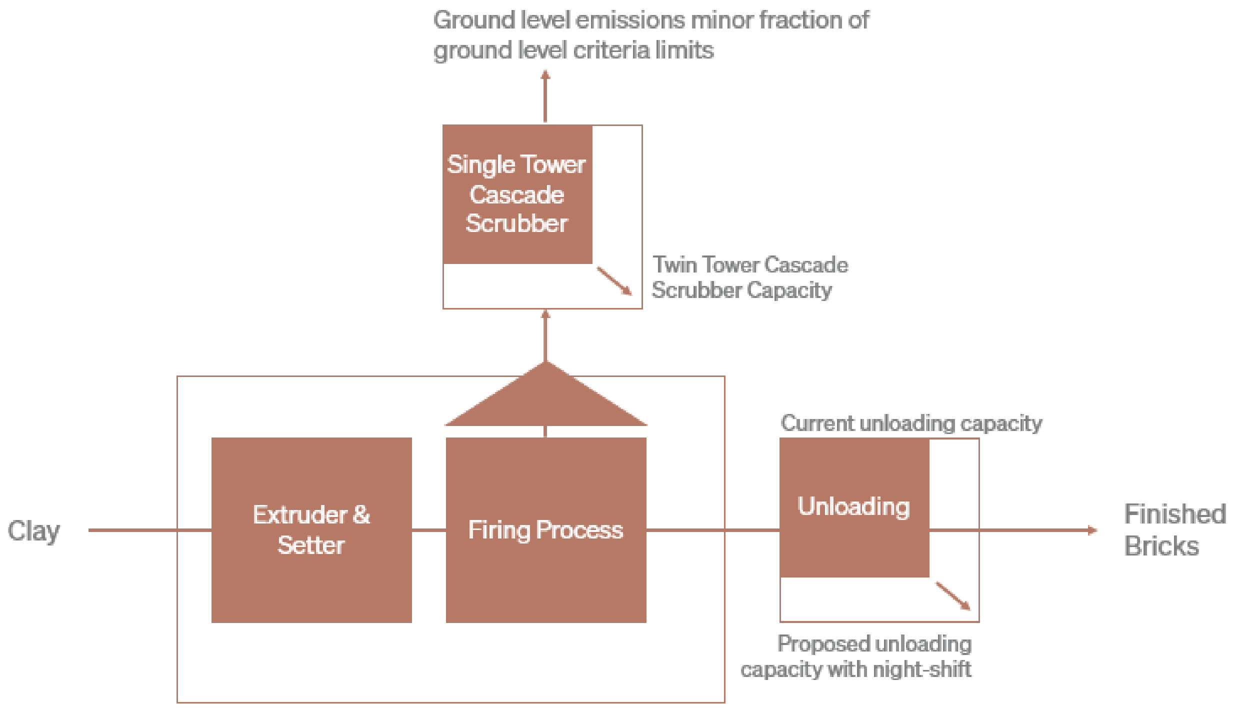
- Increasing the annual production rate at Plant 2 from 80 million bricks per annum to 130 million standard brick equivalent (SBE) per annum.

- Upgrading the cascade scrubber to a twin cascade scrubber so that the pollutant discharge concentrations reported in the SSD 9601 AQIA are still achieved at the increased annual production rate of 130 million SBE per annum.
- Expanding the Hardstand and installing a new gatehouse – required for storage corresponding to the increased capacity and for any downturn periods.

The modification proposed by Austral Bricks represents improvements in the optimal use of the equipment and operational footprint approved under SSD 9601 to enable best practice lean manufacturing at the Plant 2 site.

An illustrative representation of the SSD 9601 is shown below in **Figure 1**.

Figure 1: Illustrative Representation of SSD 9601 Modification Development Application



Source: Austral Bricks

Austral Bricks advised Airlabs that the pollutant discharge concentrations reported in SSD 9601 AQIA (refer to Table 18 – SSD 9601 AQIA, page 53 of 116) would remain unchanged for the SSD 9601 Mod 1 application, with the exception of sulfuric acid mist (H_2SO_4) / sulfur trioxide (SO_3), where-by the revised discharge concentration is expected to be no greater than 10 mg/m^3, which is substantially lower than the 50 mg/^{3}, which was proposed in the SSD 9601 AQIA. It is also noted that the revised discharge concentration of 10 mg/m^3 is ten (10) times lower than the corresponding Group 6 concentration limit of 100 mg/m^3.

Exhaust gas volumetric flow rate (m^3/sec) from the Plant 2 kiln stack corresponding the proposed increased annual production rate of 130 million SBE per annum was provided to Airlabs for determination of pollutant emission rates.

Airlabs were also informed by Austral Bricks that there would be no change in the Plant 2 kiln stack height and location from what was originally presented in SSD 9601 AQIA. Critical point source parameters such as temperature of the exhaust gas at the stack exit and the exit velocity corresponding to SSD 9601 Mod 1 was provided to Airlabs.

Raw material quantities required for the proposed increased annual production rate of 130 million SBE per annum was provided to Airlabs by Austral Bricks, which were used in estimating fugitive dust emission rates for the TSP, PM_{10} and $PM_{2.5}$ size fractions.

Other than the aforementioned, no considerable changes are being proposed for the Plant 2 site from what was presented in SSD 9601 AQIA.

This memo (JAN21013M.3) issued by Airlabs summarises the impacts predicted from the revised modelling conducted for SSD 9601 Mod 1 application.

As the SSD 9601 Mod 1 application primarily focusses on increasing the annual production rate from 80 million bricks per annum to 130 million SBE per annum and as no major changes are being proposed for the Plant 2 site (such as the kiln stack location and the overall manufacturing process) or to the adjacent Plant 1 facility, the assessment methodology adopted by Airlabs in SSD 9601 AQIA has been retained in determining impacts from this modification application – SSD 9601 Mod 1.

The assessment methodology – including selection of the dispersion model; characterisation of the study area; selection of the sensitive receptors; development of the TAPM / CALMET meteorological model; determination of background concentrations; methodology adopted for predicting cumulative ground level concentrations have been reproduced from SSD 9601 AQIA to determine impacts resulting from the modification application. As-such, for the convenience of the readers, all of the relevant information that has been exactly reproduced from SSD 9601 AQIA are not presented in this memo and only the changes resulting from the increase in annual production rate from 80 million bricks per annum to 130 million SBE per annum are reported in this memo (JAN21013M.3).

As-such, it is advised that this memo (JAN21013M.3) be read in conjunction with the SSD 9601 AQIA report.

Relevant information concerning air quality matters that have changed from the SSD 9601 AQIA as a consequence of the SSD 9601 Mod 1 application are summarised in the following section.

2. NOTABLE CHANGES CORRESPONDING TO THE PROPOSED MODIFICATION

Dispersion model parameters (including kiln stack emissions and fugitive particulate emissions) reflecting the proposed modification that have been updated from the SSD 9601 AQIA are presented in **Table 1** through to **Table 3**. Natural gas and electricity usage estimates reflecting the increased annual production rate for which Scope 1 and Scope 2 GHG emissions have been estimated are presented in **Table 4**.

For the sake of comparison, the corresponding Table number in the SSD 9601 AQIA is also presented alongside the headings for **Table 1** through to **Table 4** in italics.

SSD 9601 AQIA was based on the mid cycle maximum throughput at 25.4 Nm^3/sec of the “Batch Shift” operating model (day and afternoon shifts only), which was a conservative maximum throughput estimate from the mid cycle, and throughput would have been lower during slower times of the production cycle (e.g. start and end of cycle and night time), resulting in an 80 million bricks per annum. production. Therefore, based on the above, the pollutant emission rates estimated in SSD 9601 AQIA are conservative.

The SSD 9601 Mod 1 application refers to an expanded annual production of 130 million SBE per annum, from a continuous throughput of 36.2 Nm^3/sec. The extruder, setter, firing process have capacity for the higher throughput of 130 million SBE per annum (36.2 Nm^3/sec), and an expanded scrubber capacity is proposed to match the increased daily production load. A “Continuous Shift” Operating Model also allows for constant efficient production throughout the cycle (day, afternoon and night shift) at the higher throughput of 36.2 Nm^3/sec, avoiding lower during slower times of the production cycle (e.g. start and end of cycle and night time). This continuous shift operating model at the expanded capacity production results in the proposed 130 million SBE per annum.

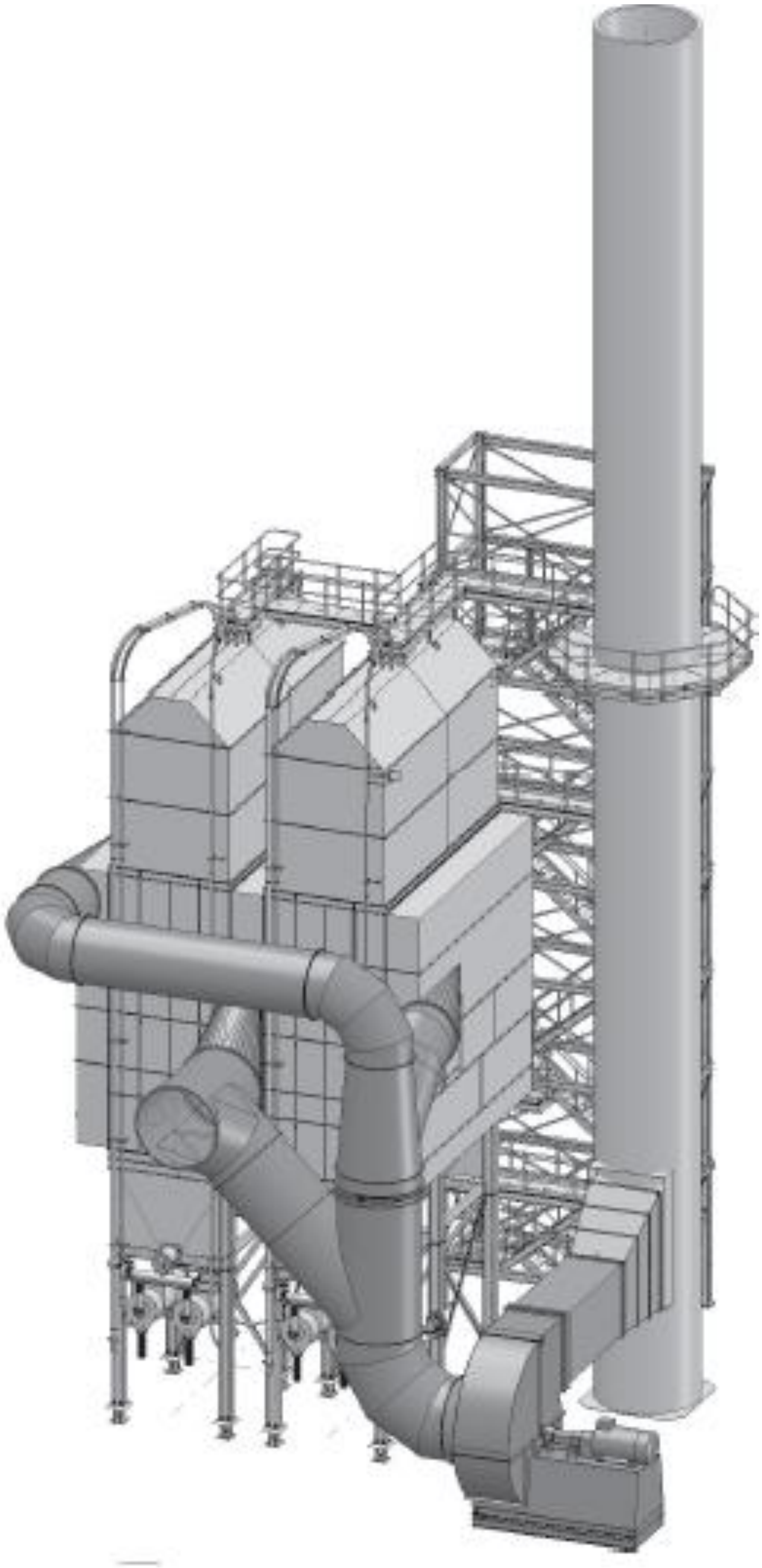
The continuous shift at also allows constant operation at the most efficient rate, offering a 10% energy efficiency opportunity. This would further improve the already very energy efficient kiln, greatly outperforming internal energy efficiency benchmarks. This is a crucial carbon reduction opportunity for brick production in Australia.

As mentioned in **Section 1**, one of the key changes relating to this modification corresponds to upgrading the cascade scrubber to a twin cascade scrubber so that the hydrogen fluoride (HF) discharge concentrations reported in the SSD 9601 AQIA are still achieved at the increased annual production rate of 130 million SBE per annum.

Essentially, a twin cascade scrubber consists of two (2) scrubber columns (refer **Figure 2**) to provide the required ratio of limestone surface area to gas flowrate. Cascade limestone dry gas scrubbers achieve best practice by reducing fluoride discharge concentrations to below 20 mg/m^3.

Published literature suggests that the Ceramic Industry typically experience raw gas HF concentrations within the range of 60-250 mg/m^3 and other HF producing industries such as aluminium can experience elevated raw concentrations in the range of 200-400 mg/m^3. Cascade limestone dry gas scrubbers achieve best practice by reducing concentrations to less than 20 mg/m^3, with ordinary calcium carbonate ($CaCO_3$).

Figure 2: Concept Drawing of the Proposed Twin Cascade Fluorine Scrubber



Source: Austral Bricks

Table 1: Pollutant Discharge Concentrations and Stack Emission Rates Corresponding to the Increased Production Rate of 130 Million Bricks Per Annum (*supersedes Table 18, SSD 9601 AQIA, Page 53 of 116*)

Pollutant	Design Concentration (as provided to Airlabs)	Units	Corresponding Group 6 Standard of Concentration – POEO Clean Air Regulation 2010, Schedule 4	Compliance with Clean Air Regulation Standard of Concentration	Estimated Mass Emission Rate (g/sec) [(b)] from Plant 2 Kiln Stack for SSD 9601 Mod 1
TSP	34	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	50 mg/m^3	Yes	1.23
PM_{10}	28	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	n.d.	n.d.	1.01
$PM_{2.5}$	17 [(a)]	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	n.d.	n.d.	0.61
HF	20	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	50 mg/m^3	Yes	0.72
SO_2	150	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	400 mg/m^3 [(c)]	Yes	5.42
NOx as NO_2	100	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	350 mg/m^3	Yes	3.62
Sulfuric acid mist	10	mg/Nm^3 corrected to 273K, dry and 101.325 kPa	100 mg/m^3	Yes	0.36

(a) Design concentrations for $PM_{2.5}$ were not provided. As-such, $PM_{2.5}$ concentrations have been estimated assuming that they are approximately 50% of the design TSP concentrations.
(b) Mass emission rate calculated based on provided design concentration and volumetric flow rate of 36.2 Nm^3/sec (expressed at reference condition of 273K, dry, 101.325 kPa) for the proposed production rate of 130 million bricks pa.
n.d. – no data
(c) – SO_2 concentrations compared against the licence limit specified in EPL 546

Figure 3: Site Plan – Alterations and Additions of Plant 2 (Figure 1 of 2)

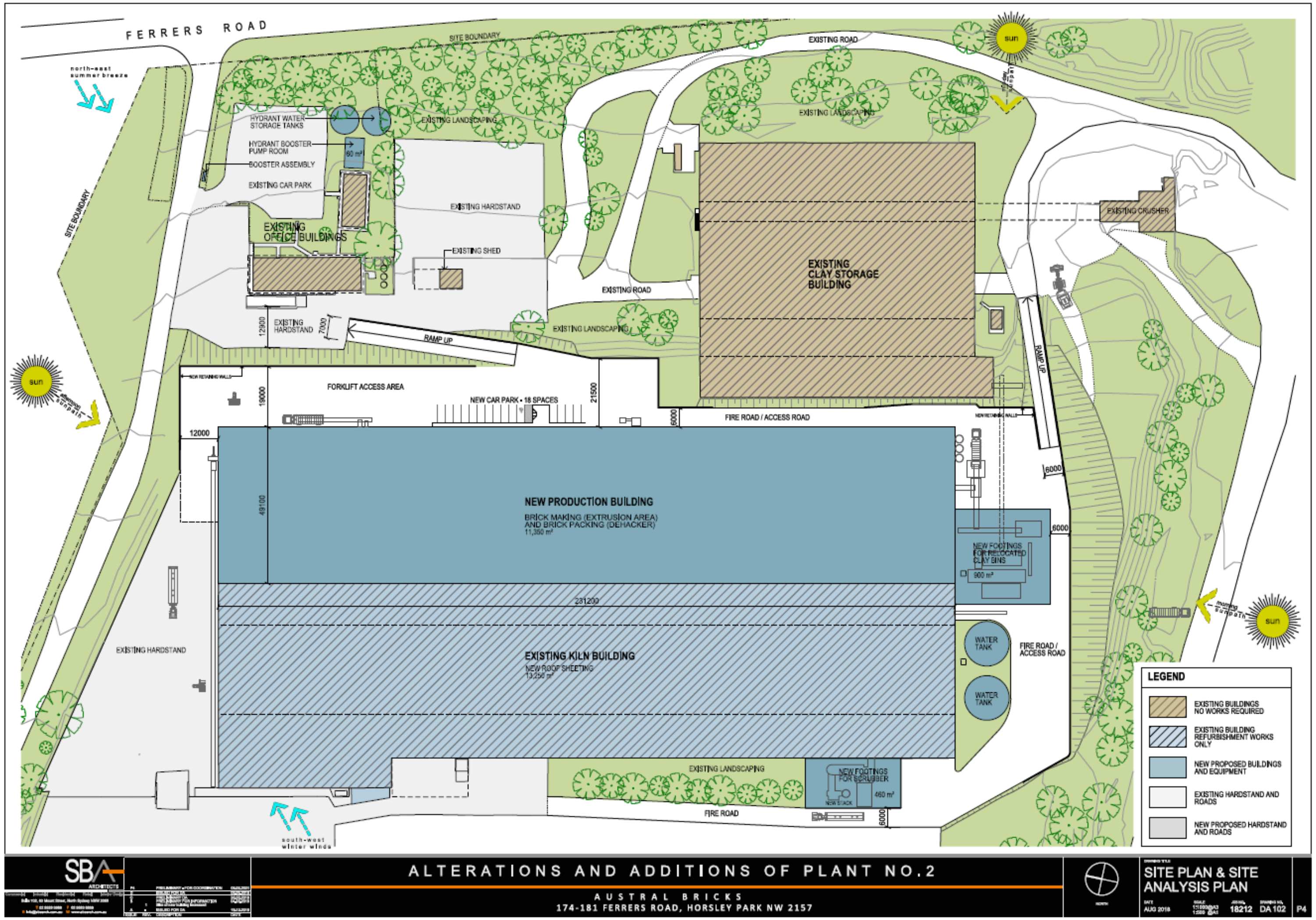


Figure 4: Site Plan – Alterations and Additions of Plant 2 (Figure 2 of 2)

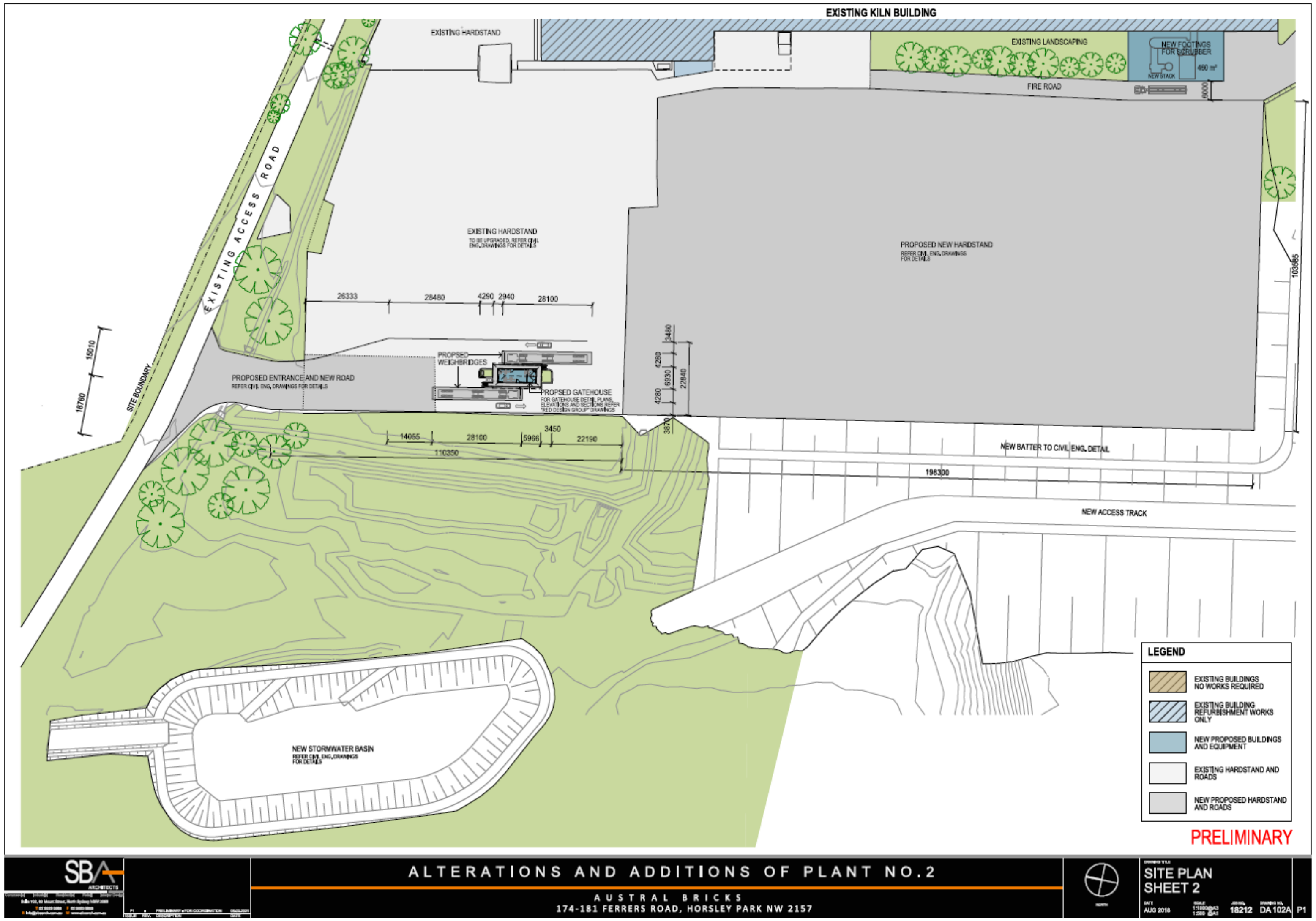


Figure 5: Comparison of Batch Shift and Continuous Shift Operating Models

"Batch Shift" Operating Model - Day and afternoon shifts only

<table>
<tr><th>Production Cycle</th><th>Start of Cycle</th><th>Mid Cycle</th><th>Mid Cycle</th><th>Mid Cycle</th><th>End of Cycle</th></tr>
<tr><td>Efficiency</td><td>Less than efficient production</td><td>Less than efficient production</td><td>Efficient production</td><td>Efficient production</td><td>Less than efficient production</td></tr>
<tr><td>Setting</td><td>Waiting for cars to be unloaded to be able to start setting</td><td colspan="4">Setting at optimal capacity</td></tr>
<tr><td>Firing</td><td colspan="2">Waiting for cars to be loaded to start firing</td><td colspan="3">Firing at optimal capacity</td></tr>
<tr><td>Unloading</td><td>Unloading - at capacity</td><td colspan="3">Unloading at optimal capacity</td><td>Waiting for cars to unload</td></tr>
</table>

"Continuous Shift" Operating Model - day, afternoon and night shifts

<table>
<tr><th>Production Cycle</th><th>Continuous Cycle</th><th>Continuous Cycle</th><th>Continuous Cycle</th><th>Continuous Cycle</th><th>Continuous Cycle</th></tr>
<tr><td>Efficiency</td><td colspan="5">Efficient production</td></tr>
<tr><td>Setting</td><td colspan="5">Setting at optimal capacity</td></tr>
<tr><td>Firing</td><td colspan="5">Firing at optimal capacity</td></tr>
<tr><td>Unloading</td><td colspan="5">Unloading at optimal capacity</td></tr>
</table>

Table 2: Plant 2 Kiln Stack Parameters for SSD 9601 Mod 1 (supersedes *Table 19, SSD 9601 AQIA, Page 54 of 116*)

Parameter	Value	Units
Location – Easting (X)	302801	m
Location – Northing (Y)	6255028	m
Height above ground level	35	m
Stack diameter at exit	2.5	m
Design exit velocity	15	m/sec
Stack temperature at exit	453	Kelvin
Operational hours	Continuous (24 hours, 365 days)	

Table 3: Estimated Annual Fugitive Dust Emission Rates from the Plant 2 Site Corresponding to the Increased Production Rate of 130 Million Bricks Per Annum (supersedes *Table 20, SSD 9601 AQIA, Page 55 of 116)*

Activity	Quantity	Units	Modelled Annual Emission Rates (kg/year)		
			TSP	PM_{10}	$PM_{2.5}$
Front end loader on raw material stockpiles	455,000 [(a)]	tpa	39.2	18.5	2.8
Haul truck unloading raw materials	455,000 [(a)]	tpa	39.2	18.5	2.8
Loading raw materials into the crusher unit	455,000 [(a)]	tpa	39.2	18.5	2.8
Crushing operations	455,000 [(a)]	tpa	273.0	122.9	22.8
Conveying to the mill building	455,000 [(a)]	tpa	11.8	5.6	0.8
Mill building operations (incl. grinding)	455,000 [(a)]	tpa	75.1	25.3	12.6
Conveying to the new brick kiln	455,000 [(a)]	tpa	11.8	5.6	0.8
Wind erosion – inactive and active stockpiles	21.1 [(b)]	ha	5,280.7	2,640.3	396.0
Heavy vehicle haulage on gravel surfaces	455,000 [(a)]	tpa	3,512.4	751.4	75.1
Total			**9,282**	**3,607**	**517**

(a) As per information provided by Austral Bricks, 115 million standard brick equivalents (SBE) roughly translates to 400,000 tpa of material. Based on this information, the estimated material quantity required to produce 130 million bricks per annum would be approximately 455,000 tonnes per annum (tpa).

(b) No change expected in the extent of active and inactive stockpiles for the increased production rate. Footprint referenced from SSD 9601 AQIA.

Detailed calculations of the estimated fugitive dust emissions from Plant 2 operations are presented in **Appendix A.**

Table 4: Projected Estimates of Natural Gas and Electricity Consumption Corresponding to the Increased Capacity of 130 Million SBE Per Annum (supersedes *Table 28, SSD 9601 AQIA, Page 77 of 116)*

Parameter	Value	Units
Natural Gas	683,728.19	GJ/annum
Electricity usage	18,646.06	MWh/annum

3. UPDATED RESULTS CORRESPONDING TO THE PROPOSED MODIFICATION

The updated modelling results – incremental and cumulative concentrations corresponding to the SSD 9601 Mod 1 application are presented in this section.

3.1 Assessment of Incremental Impacts due to increasing Annual Production to 130 Million Bricks per Annum

Predicted ground level concentrations of all modelled pollutants from the proposed modification are discussed below. Incremental concentrations discussed in this section are a consequence of the following sources:

- Point source emissions from the Plant 2 kiln exhaust stack reflecting an increased production rate of 130 million bricks per annum.
- Fugitive dust emissions generated from the operational activities at the Plant 2 site corresponding to the increased production rate of 130 million bricks per annum.

Model predicted hydrogen fluoride (HF) ground-level incremental concentrations are a result of the revised maximum discharge concentration of 20 mg/m^3, increasing the stack height to 35m from the existing 16m and increasing the exhaust gas volumetric flow rate corresponding to the increase in the annual production rate to 130 million bricks per annum. As HF is the key pollutant amongst the assessed, model predicted maximum incremental ground level concentrations at the identified sensitive receptors have been exclusively presented in **Table 5**.

Maximum model predicted incremental ground level concentrations for all the other pollutants are summarised in **Table 6**.

Modelling shows that the incremental HF concentrations predicted at all sensitive receptors comply with the relevant impact assessment criteria for all averaging periods, for the proposed modification application. It is noted that the impact assessment criteria are relevant for cumulative concentrations, however, for the sake of comparison and to demonstrate the contribution of the Plant 2 emissions in isolation, the incremental concentrations have been compared against the assessment criteria.

Additionally, based on comments issued by the EPA for SSD 9601, agricultural receptors which are assumed to be susceptible to fluoride emissions have been identified and incremental impacts have been predicted at these receptors. HF ground-level concentrations at agricultural receptors have been compared against the specialised land-use assessment criteria, which is more stringent than the general land-use assessment criteria.

From the results presented in **Table 5**, it is noted that incremental HF concentrations predicted at the agricultural receptors are also well below the specialised land-use assessment criteria, which is more stringent than the general land-use criteria. Maximum model predicted HF incremental concentration at all agricultural sensitive receptors for all averaging periods is less than 35% of the corresponding assessment criteria for the proposed modification. For the non-agricultural / general land use sensitive receptors, the maximum incremental concentrations across all the averaging periods is less than 25% of the assessment criteria for the proposed modification.

Overall, from the revised model predictions for the proposed SSD 9601 Mod 1 application, it is observed that the incremental HF concentrations are well below their respective assessment criteria, at all the identified receptors, including those that are considered to be sensitive to fluoride impacts.

Modelling shows that incremental concentrations predicted at the identified sensitive receptors for all the other pollutants are well below their respective assessment criteria, which demonstrates the low-level impacts expected from the Plant 2 site operating at an increased production rate of 130 million bricks per annum.

Incremental particulate modelling results presented in **Table 6** are a result of the point and fugitive dust sources inventoried from the Plant 2 site.

With respect to SO_3 (sulfuric acid mist and sulfur trioxide expressed as SO_3) concentrations, the Approved Methods specifies that ground level concentrations are to be reported as the 99.9th percentile 1-hour average incremental concentration predicted at or beyond the Plant 2 site boundary, and subsequently, this value has been extracted, which is around 16% of the corresponding impact assessment criteria.

Concentration isopleths, illustrating spatial variation in the predicted incremental HF concentrations are illustrated in **Appendix B**.

Table 5: Revised Model Predicted Incremental HF Impacts at Identified Sensitive Receptors – Specialised Land-Use and General Land-Use – Plant 2 SSD 9601 Mod 1 Application

Model Predicted Maximum (100th Percentile) HF Incremental Concentrations (µg/m³) at Agricultural / Fluoride Sensitive Receptors				
Averaging Period	90-days	30-days	7-days	24-hours
Impact Assessment Criteria (µg/m³) – Specialised Land-Use	0.25	0.4	0.8	1.5
R1	0.08	0.10	0.18	0.41
R2	0.04	0.06	0.13	0.28
R3	0.03	0.04	0.09	0.18
R4	0.05	0.06	0.11	0.25
R5	0.06	0.08	0.11	0.35
R6	0.06	0.08	0.12	0.45
R7	0.05	0.06	0.10	0.30
R8	0.04	0.05	0.10	0.23
Max of R1-R8	*0.08*	*0.10*	*0.18*	*0.45*
Max of R1-R8 – Percentage of Impact Assessment Criteria	*31%*	*26%*	*22%*	*30%*
Model Predicted Maximum (100th Percentile) HF Incremental Concentrations (µg/m³) at Non-Agricultural / General Land-Use Sensitive Receptors				
Averaging Period	90-days	30-days	7-days	24-hours
Impact Assessment Criteria (µg/m³) – General Land-Use	0.5	0.84	1.7	2.9
R9	0.08	0.10	0.14	0.50
R10	0.09	0.11	0.17	0.61
R11	0.10	0.13	0.19	0.44
R12	0.06	0.08	0.10	0.31
R13	0.06	0.09	0.17	0.34
R14	0.06	0.08	0.14	0.37
R15	0.07	0.09	0.14	0.35
R16	0.06	0.09	0.13	0.31
R17	0.07	0.10	0.16	0.32
R18	0.07	0.08	0.12	0.37
R19	0.05	0.06	0.08	0.26
R20	0.06	0.06	0.11	0.36
Max of R9-R20	*0.10*	*0.13*	*0.19*	*0.61*
Max of R9-R20 – Percentage of Impact Assessment Criteria	20%	16%	11%	21%

Table 6: Summary of Revised Model Predicted Incremental Impacts – All Pollutants Excluding HF – Plant 2 SSD 9601 Mod 1 Application

Model Predicted Maximum (100th Percentile) Incremental Concentrations (µg/m³) at Identified Sensitive Receptors													
Pollutant	TSP	PM_{10}		$PM_{2.5}$		SO_2				NO_2 (a)		SO_3	Deposited Dust
Averaging Period	Annual	24-hours	Annual	24-hours	Annual	10-minutes	1-hour	24-hours	Annual	1-hour	Annual	1-hour	Annual
Impact Assessment Criteria (µg/m³)	90	50	25	25	8	712	570	228	60	246	62	18	2 (Max increase)
R1	0.52	1.69	0.38	0.49	0.09	47.71	25.38	3.08	0.32	16.92	0.22	0.77	0.07
R2	0.23	1.18	0.21	0.33	0.06	42.33	22.52	2.07	0.20	15.01	0.13	0.66	0.03
R3	0.13	0.82	0.15	0.23	0.04	41.19	21.91	1.33	0.15	14.60	0.10	0.57	0.02
R4	0.74	2.20	0.49	0.40	0.10	34.72	18.47	1.90	0.26	12.31	0.17	0.74	0.08
R5	0.86	3.16	0.68	0.65	0.15	51.02	27.14	2.62	0.34	18.09	0.22	0.85	0.08
R6	0.72	2.77	0.60	0.65	0.14	41.53	22.09	3.38	0.35	14.73	0.23	0.82	0.07
R7	0.71	2.74	0.57	0.57	0.13	50.60	26.92	2.22	0.29	17.94	0.19	0.70	0.07
R8	0.34	1.51	0.30	0.34	0.07	36.59	19.47	1.70	0.23	12.98	0.15	0.59	0.03
R9	1.08	2.89	0.83	0.76	0.18	65.92	35.06	3.75	0.38	23.37	0.26	1.53	0.16
R10	1.74	4.35	1.24	1.09	0.25	100.35	53.38	4.61	0.46	35.58	0.30	1.51	0.26
R11	1.38	5.22	1.23	1.06	0.25	104.10	55.37	3.33	0.44	36.92	0.29	2.25	0.16
R12	0.16	1.25	0.22	0.35	0.07	53.63	28.53	2.29	0.25	19.02	0.16	1.05	0.02
R13	0.22	1.35	0.21	0.40	0.06	29.06	15.46	2.55	0.25	10.30	0.17	0.70	0.03

Model Predicted Maximum (100th Percentile) Incremental Concentrations (µg/m³) at Identified Sensitive Receptors

Pollutant	TSP	PM_{10}		$PM_{2.5}$		SO_2				NO_2 (a)		SO_3	Deposited Dust
Averaging Period	Annual	24-hours	Annual	24-hours	Annual	10-minutes	1-hour	24-hours	Annual	1-hour	Annual	1-hour	Annual
Impact Assessment Criteria (µg/m³)	90	50	25	25	8	712	570	228	60	246	62	18	2 (Max increase)
R14	0.20	1.14	0.19	0.39	0.06	27.01	14.37	2.74	0.26	9.58	0.17	0.68	0.03
R15	0.52	1.69	0.38	0.49	0.09	47.71	25.38	3.08	0.32	16.92	0.22	0.77	0.03
R16	0.23	1.18	0.21	0.33	0.06	42.33	22.52	2.07	0.20	15.01	0.13	0.66	0.02
R17	0.13	0.82	0.15	0.23	0.04	41.19	21.91	1.33	0.15	14.60	0.10	0.57	0.02
R18	0.74	2.20	0.49	0.40	0.10	34.72	18.47	1.90	0.26	12.31	0.17	0.74	0.01
R19	0.86	3.16	0.68	0.65	0.15	51.02	27.14	2.62	0.34	18.09	0.22	0.85	0.01
R20	0.72	2.77	0.60	0.65	0.14	41.53	22.09	3.38	0.35	14.73	0.23	0.82	0.01
Max of R1-R20	*1.74*	*5.22*	*1.24*	*1.09*	*0.25*	*104.10*	*55.37*	*4.61*	*0.46*	*36.92*	*0.30*	*2.92 (b)*	*0.26*
Max of R1-R20 – Percentage of Impact Assessment Criteria	*1.9%*	*10.4%*	*5.0%*	*4.4%*	*3.2%*	*14.6%*	*9.7%*	*2.0%*	*0.8%*	*15.0%*	*0.5%*	*16%*	*13.2%*

(a) To predict ground level NO_2 concentrations, it has been conservatively assumed that all the NOx released is converted to NO_2 (100% NOx to NO_2 conversion). This approach is listed in Section 8.1.1 of the Approved Methods
(b) The value presented is the maximum (reported as 99.9th percentile) 1-hour average sulfuric acid concentration predicted at or beyond the Plant 2 site boundary as per the Approved Methods

3.2 Assessment of Cumulative Impacts

Cumulative model predictions for HF are presented in **Table 7** and all the other remaining pollutants are presented in **Table 8**. The presented cumulative concentrations are a sum total of the following sources:

- Incremental impacts from Plant 2 predicted as a consequence of the proposed improvements and increasing the production rate to 130 million bricks per annum.
- Impacts from the existing Plant 1 operations – point and fugitive (refer SSD 9601 AQIA for additional details)
- Impacts from the existing Horsley Park WMF – fugitive (refer SSD 9601 AQIA for additional details)
- Impacts from the existing Plant 3 operations – point sources (Point 6 – Swindell and Point 7 – Ceric) (refer SSD 9601 AQIA for additional details); and
- Background concentrations from the ambient air quality monitoring station at Prospect (refer SSD 9601 AQIA for additional details).

With respect to cumulative HF concentrations, no exceedances of the impact assessment criteria are reported at any of the identified sensitive receptors – including agricultural receptors for the modification application.

From the model predictions at the agricultural receptors, the 90-day averaging period HF is considered the most critical pollutant, whereby, the maximum cumulative concentration predicted across all the agricultural receptors, is approximately 66% of the assessment criteria, followed by the 30-day averaging period HF, where the maximum across all the sensitive receptors is 45% of the assessment criteria. It is to be noted that these ground-level cumulative HF concentrations have been compared against the specialised land-use assessment criteria, which is a lot more stringent than the general land-use criteria. Moreover, as noted in Section 8.2 of the SSD 9601 AQIA, it is unknown as to the type of produce that is grown at these receptors, and therefore, it has been assumed that all of these receptors are sensitive to fluoride impacts. Therefore, the cumulative HF model predictions are slightly on the conservative side mainly due to the unknown nature of the agricultural produce and the application of the stringent assessment criteria across all of the agricultural receptors.

For the non-agricultural receptors, the 90-day average maximum HF cumulative concentration predicted across all the receptors is approximately 35% of the assessment criteria, and the maximum 30-day and 24-hour averaging period concentrations is approximately 25-26% of the respective assessment criteria.

These results in conjunction with the low incremental impacts expected from the Plant 2 kiln stack infer that the potential for adverse HF impacts from the modelled sources in the receiving environment is low, even at the increased production rate of 130 million bricks per annum. Moreover, the modelling results are reflective of the improvements proposed by Austral Bricks, which includes the upgrades at Plant 2 (limiting the maximum HF concentration to 20 mg/m^3), upgrades at Plant 1 (limiting the maximum HF concentration to 20 mg/m^3) and upgrades at Plant 3 Ceric kiln stack (limiting the maximum HF concentration to 45 mg/m^3) (refer to SSD 9601 AQIA for additional details).

The following observations can be made from the cumulative concentrations presented for the other pollutants in **Table 8**.

- Cumulative concentrations of all the modelled pollutants are in compliance with the relevant assessment criteria at all the receptors.
- With respect to gases, the 1-hour average NO_2 cumulative concentration has the highest impact when compared to the assessment criteria. The maximum 1-hour average cumulative NO_2 ground level concentration is approximately 69.6% of the assessment criteria, whereas the

maximum annual average concentration predicted at receptor R1 is approximately 33% of the assessment criteria.

- Cumulative SO_2 concentrations for all averaging periods are well below their respective assessment criteria and therefore do not warrant a detailed discussion.
- SO_3 (sulfuric acid mist and sulfur trioxide expressed as SO_3) concentrations are to be reported as incremental and therefore, have been excluded from the cumulative impact assessment.
- Cumulative model predictions of particulate matter (TSP, PM_{10} and $PM_{2.5}$) concentrations for all averaging periods are in compliance with the impact assessment criteria at all the identified sensitive receptors.
- It is noted that the maximum 24-hour average cumulative PM_{10} concentration is predicted at receptor R11, which is approximately 86% of the assessment criteria, whereas the highest annual average of all the sensitive receptors predicted at receptor R10, is approximately 81% of the assessment criteria.
- With respect to $PM_{2.5}$ impacts, it is evident from the model predictions that the highest cumulative 24-hour average $PM_{2.5}$ concentrations of all the modelled receptors is 24.97 $\mu g/m^3$ (at receptor R1) and is approaching the assessment criteria of 25 $\mu g/m^3$. A similar observation has been made with the annual average $PM_{2.5}$ cumulative concentrations, whereby the highest annual average of all the receptors is 99.3% (at receptor R1) of the assessment criteria.
- It is noted that a Level 2 contemporaneous assessment was undertaken to predict the 24-hour average PM_{10} and $PM_{2.5}$ cumulative concentrations, where the daily varying model predicted concentrations at each receptor were paired with the corresponding daily varying background concentrations, which included contribution from the following – Plant 1 (point and fugitive), Horsley Park WMF (fugitive), Plant 3 kiln stacks (point) and the ambient concentrations measured at the Prospect monitoring station.
- As the 24-hour and annual average cumulative $PM_{2.5}$ concentrations are approaching their respective assessment criteria at receptor R1, a source contribution exercise was conducted to understand the effect of Plant 2 emissions on the overall cumulative concentrations.
- For the source contribution exercise, 24-hour average $PM_{2.5}$ concentrations from each of the modelled facilities (Plant 2, Plant 1, Horsley Park WMF, Plant 3) were extracted on the day when the maximum 24-hour cumulative concentration was predicted at the worst impacted receptor, which is R1. Contributions from each facility were extracted from the model output on that day. The corresponding ambient concentration on that day was also noted. Through this exercise, contribution from the Plant 2 facility was determined and is illustrated in **Figure 6**.
- With regards to the cumulative annual average $PM_{2.5}$ concentrations, predicted concentrations from each of the modelled facilities at receptor R1 was noted along with the annual average ambient background concentrations and compared against the corresponding cumulative concentration at receptor R1 to ascertain the contribution of Plant 2.
- The findings of the source contribution exercise for receptor R1 are illustrated in **Figure 6** (for the $PM_{2.5}$ 24-hour average) and **Figure 7** ($PM_{2.5}$ annual average). From the pie-charts, it is noted that the major contributor is the ambient background concentrations measured at the Prospect monitoring station (represented by the light blue coloured pie), followed by contribution from localised sources – which include point and fugitive emissions from Plant 1, fugitive emissions from the Horsley Park WMF and point source emissions from the two (2) kiln stacks at Plant 3 – Point 6 (Swindell) and Point 7 (Ceric). Contribution from Plant 2 operations corresponding to the modification application (point and fugitive) at the worst impacted receptor R1 is very low.

Table 7: Predicted Cumulative HF Impacts at Identified Sensitive Receptors – Specialised Land-Use and General Land-Use

Model Predicted Maximum (100th Percentile) HF Cumulative Concentrations (µg/m³) at Agricultural / Fluoride Sensitive Receptors				
Averaging Period	90-days	30-days	7-days	24-hours
Impact Assessment Criteria (µg/m³) – Specialised Land-Use	0.25	0.4	0.8	1.5
R1	0.16	0.18	0.26	0.53
R2	0.10	0.12	0.18	0.41
R3	0.08	0.10	0.12	0.34
R4	0.11	0.13	0.18	0.49
R5	0.10	0.13	0.20	0.50
R6	0.10	0.12	0.20	0.53
R7	0.10	0.12	0.17	0.41
R8	0.09	0.11	0.14	0.36
Max of R1-R8	*0.16*	*0.18*	*0.26*	*0.53*
Max of R1-R8 – Percentage of Impact Assessment Criteria	*66%*	*45%*	*32%*	*35%*
Model Predicted Maximum (100th Percentile) HF Cumulative Concentrations (µg/m³) at Non-Agricultural / General Land-Use Sensitive Receptors				
Averaging Period	90-days	30-days	7-days	24-hours
Impact Assessment Criteria (µg/m³) – General Land-Use	0.5	0.84	1.7	2.9
R9	0.12	0.14	0.20	0.63
R10	0.15	0.18	0.25	0.67
R11	0.17	0.21	0.34	0.73
R12	0.11	0.13	0.19	0.45
R13	0.12	0.15	0.26	0.46
R14	0.13	0.16	0.24	0.44
R15	0.14	0.17	0.24	0.50
R16	0.14	0.17	0.25	0.52
R17	0.17	0.22	0.35	0.60
R18	0.15	0.17	0.29	0.54
R19	0.11	0.12	0.17	0.44
R20	0.10	0.11	0.22	0.42
Max of R9-R20	*0.17*	*0.22*	*0.35*	*0.73*
Max of R9-R20 – Percentage of Impact Assessment Criteria	*35%*	*26%*	*21%*	*25%*

Model predicted cumulative concentration isopleths for Hydrogen fluoride (HF), PM_{10}, $PM_{2.5}$ and NO_2 are presented in **Appendix B.**

Table 8: Summary of Model Predicted Cumulative Concentrations – All Pollutants

Model Predicted Maximum (100th Percentile) Cumulative Concentrations (µg/m³) at Identified Sensitive Receptors												
Pollutant	TSP	PM_{10}		$PM_{2.5}$		SO_2				NO_2 (a)		Deposited Dust
Averaging Period	Annual	24-hours	Annual	24-hours	Annual	10-minutes	1-hour	24-hours	Annual	1-hour	Annual	Annual
Impact Assessment Criteria (µg/m³)	90	50	25	25	8	712	570	228	60	246	62	4 (Max total)
R1	49.14	42.65	20.32	24.97	7.94	232.53	123.69	19.02	3.38	140.79	20.65	2.16
R2	47.90	40.88	19.40	24.44	7.74	175.09	93.14	15.75	2.73	139.58	20.40	2.04
R3	47.65	40.55	19.19	24.32	7.69	171.77	91.37	15.03	2.54	138.81	20.33	2.02
R4	48.55	41.89	19.75	24.68	7.81	227.58	121.05	16.71	2.93	140.71	20.48	2.14
R5	48.45	41.96	19.79	24.66	7.81	216.74	115.29	16.82	2.82	141.45	20.47	2.11
R6	48.25	41.67	19.67	24.59	7.79	215.26	114.50	16.82	2.78	139.88	20.46	2.09
R7	48.28	41.69	19.67	24.58	7.79	200.68	106.74	15.60	2.78	140.99	20.44	2.09
R8	47.87	41.02	19.37	24.43	7.73	195.76	104.13	15.99	2.70	136.44	20.39	2.04
R9	48.62	41.83	19.93	24.73	7.83	223.63	118.95	17.02	2.76	151.95	20.46	2.17
R10	49.29	42.54	20.35	24.90	7.91	244.27	129.93	17.57	2.88	162.32	20.53	2.28
R11	48.86	42.98	20.24	24.94	7.89	291.30	154.95	18.56	2.79	171.31	20.50	2.17
R12	47.58	40.57	19.17	24.34	7.68	206.93	110.07	15.35	2.45	147.97	20.32	2.02
R13	48.16	41.43	19.60	24.56	7.78	166.58	88.61	15.48	2.76	136.55	20.44	2.07
R14	48.20	41.50	19.63	24.58	7.79	169.65	90.24	15.73	2.78	136.55	20.45	2.07

Model Predicted Maximum (100th Percentile) Cumulative Concentrations (µg/m³) at Identified Sensitive Receptors												
Pollutant	TSP	PM_{10}		$PM_{2.5}$		SO_2				NO_2 (a)		Deposited Dust
Averaging Period	Annual	24-hours	Annual	24-hours	Annual	10-minutes	1-hour	24-hours	Annual	1-hour	Annual	Annual
Impact Assessment Criteria (µg/m³)	90	50	25	25	8	712	570	228	60	246	62	4 (Max total)
R15	48.50	42.01	19.86	24.73	7.84	174.88	93.02	17.02	2.90	133.30	20.49	2.10
R16	48.29	41.63	19.70	24.63	7.81	170.83	90.87	17.05	2.86	134.12	20.48	2.08
R17	48.87	42.53	20.18	24.86	7.91	180.88	96.21	19.07	3.09	135.19	20.56	2.14
R18	48.97	42.37	20.10	24.76	7.88	184.45	98.11	20.02	3.06	136.84	20.52	2.16
R19	47.80	40.87	19.28	24.38	7.71	171.00	90.96	17.69	2.72	133.78	20.39	2.04
R20	47.89	40.78	19.37	24.41	7.73	170.68	90.79	17.22	2.72	137.11	20.40	2.05
Max of R1-R20	*49.29*	*42.98*	*20.35*	*24.97*	*7.94*	*291.30*	*154.95*	*20.02*	*3.38*	*171.31*	*20.65*	*2.28*
Max of R1-R20 – Percentage of Impact Assessment Criteria	*54.8%*	*86.0%*	*81.4%*	*99.9%*	*99.3%*	*40.9%*	*27.2%*	*8.8%*	*5.6%*	*69.6%*	*33.3%*	*56.9%*

(a) To predict ground level NO_2 concentrations, it has been conservatively assumed that all the NOx released is converted to NO_2 (100% NOx to NO_2 conversion). This approach is listed in Section 8.1.1 of the Approved Methods

Figure 6: Source Contribution Pie-Chart – Cumulative 24-hour Average Maximum $PM_{2.5}$ Concentration at Worst Impacted Receptor-R1

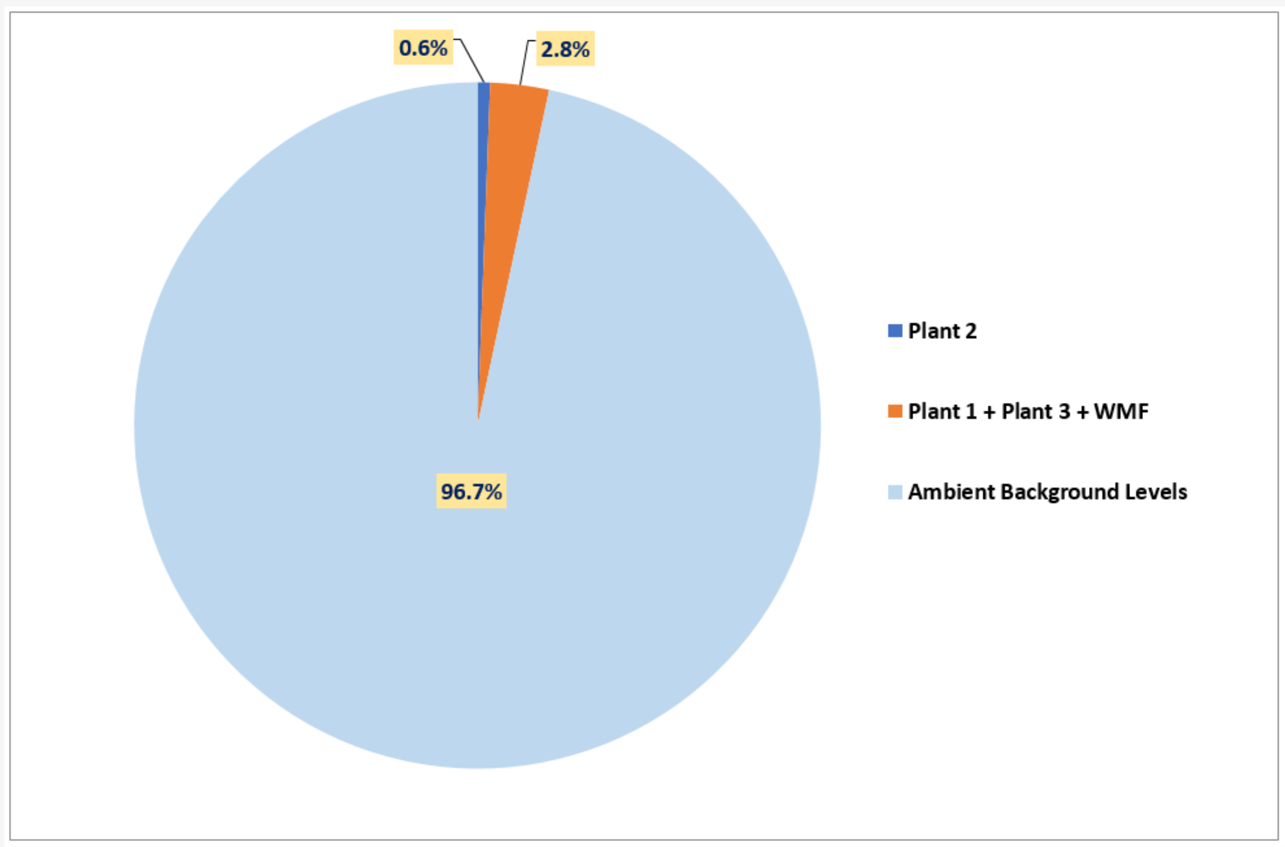
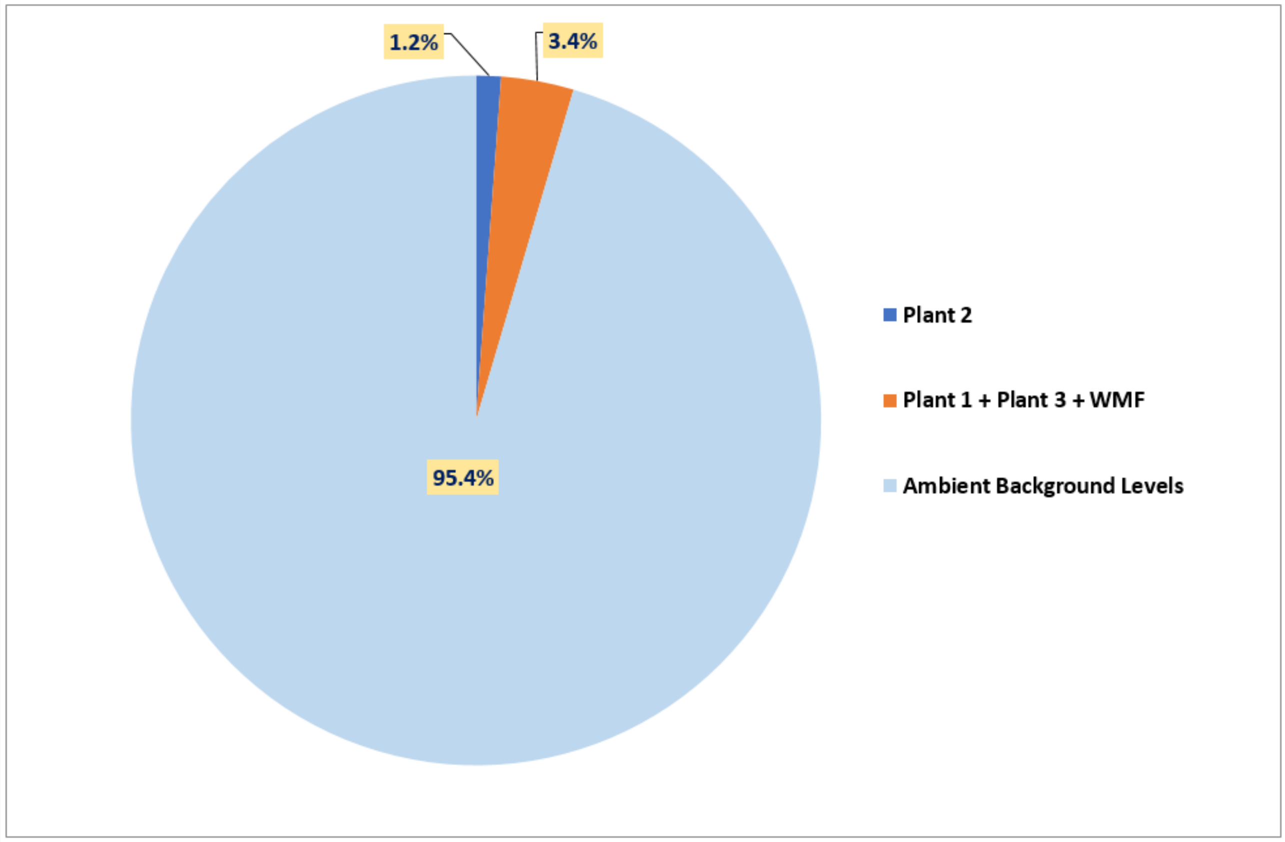


Figure 7: Source Contribution Pie-Chart – Cumulative Annual Average $PM_{2.5}$ Concentration at Worst Impacted Receptor-R1



3.3 GHG Emission Estimates

Scope 1 and 2 GHG emissions corresponding to the proposed modification have been quantified for:

- On-site combustion of diesel fuel and natural gas – Scope 1 emissions
- On-site consumption of electricity – Scope 2 emissions.

Natural gas is the principal fuel used at the site, which would be mains sourced natural gas. Quantities of natural gas and electricity projected to be used for the increased production rate of 130 million bricks per annum at the Plant 2 site are summarised in **Table 9**.

Table 9: Projected Estimates of Natural Gas and Electricity Consumption Corresponding to the Increased Capacity of 130 Million SBE Per Annum

Parameter	Value	Units
Natural Gas	683,728.19	GJ/annum
Electricity usage	18,646.06	MWh/annum

Estimated annual Scope 1 and 2 GHG emissions, expressed in tonnes of CO_2-e (t CO_2-e/annum) for the Plant 2 site with an increased production capacity of 130 million SBE per annum are presented in **Table 10.**

Table 10: Annual Scope 1 and 2 GHG Emissions from the Upgraded Plant 2 Site – 130 Million SBE Per Annum

Scope	Annual Emissions (t CO_2-e/annum)	Source of Emissions
Scope 1 GHG emissions	35,143.6	Natural gas consumption and other emissions (incl. calcination, scrum oil, die oil, waste oil, diesel oil)
Scope 2 GHG emissions	15,662.7	Electricity consumption
Total Scope 1 and 2 GHG emissions	50,806.3	All sources

The total estimated annual operational GHG emissions from the Plant 2 site operating at the increased production rate of 130 million bricks per annum are expected to be approximately 50,806.3 tonnes of carbon dioxide equivalent (CO2-e).

In order to further understand the impacts on a larger scale, the total emissions have been compared against state (NSW) and national (Australia) GHG emissions.

Reference has been drawn to the *State and Territory Greenhouse Gas Inventories 2016 – Australia's National Greenhouse Accounts* compiled by the Department of the Environment and Energy, February 2018 (DOEE, 2018)

According to the estimates presented in the 2016 State and Territory inventory, the annual GHG emissions for NSW and Australia in 2016 were 131.6 Mt CO_2-e and 524 Mt CO_2-e. The Plant 2 facility annual emissions contribute to approximately 0.04% and 0.01% of the state and national GHG emissions respectively for the 2016 year.

The contribution of GHG emissions from the Plant 2 site to the state and national emissions is relatively minimal as observed from comparing the estimated emissions with the state and national inventories. This low footprint is a result of Austral Bricks' energy management policy which aims to continually improve energy efficiency and invest in plant upgrades to achieve step change efficiency improvements. Details on how the kiln upgrade will reduce gas quantities used and consequently lower GHG emissions is discussed in the following section.

3.4 Proposed Improvements and their Impacts on Gas Consumption and GHG Emissions

Relevant changes are being incorporated into the proposed modification to SSD 9601 to enable best practice lean manufacturing, which include:

- Removal of process bottlenecks by processing fired cars during the night shift with limited additional outdoor activities.
- Enabling equipment approved in SSD 9601 to be used at design capacity rather than operating at restricted levels due to employee labour hours.

Incorporating the above measures will improve the energy efficiency by more than 10% per unit produced with respect to gas consumption when compared to the current production and gas consumption rates. A detailed explanation regarding the expected energy efficiency improvement is presented below.

The current modification refers to an expanded production of 130 million bricks per annum, from a continuous energy use of 683,728 GJ per annum of gas. The extruder, setter, firing process have capacity for the higher throughput of 130 million bricks per annum (683,728 GJ), and an expanded scrubber capacity is proposed to match the increased daily production load. A "Continuous Shift" Operating Model also allows for constant efficient production throughout the cycle (day, afternoon and night shift) at the higher energy use of 683,728 GJ, avoiding lower during slower times of the production cycle (e.g. start and end of cycle and night time). This continuous shift operating model at the expanded capacity production results in 130 million SBE per annum.

The continuous shift at also allows constant operation at the most efficient rate, offering a 10% energy efficiency opportunity. This would further improve the already very energy efficient kiln, greatly outperforming internal energy efficiency benchmarks. This is a crucial carbon reduction opportunity for brick production in Australia. A clear comparison of the two operating model has been provided in **Figure 5**.

As per information provided to Airlabs, approximately 475,637 GJ per annum of energy in the form of natural gas is expended to produce 80,000,000 SBE per annum, which approximately translates to 458.4 kcal of energy expended per kg of product manufactured. On the other hand, with the measures proposed by Austral Bricks to enable lean manufacturing, it is expected that approximately 683,728 GJ of energy in the form of natural gas would be expended to produce 130 million bricks per annum, which equates to approximately 405.52 kcal of energy consumed per kg of product manufactured, thereby representing a 12% improvement in gas consumption when compared to the current production of 80 million SBE per annum. Similarly, the measures proposed provides a 15% improvement in electricity consumption when compared to current practices.

Therefore, based on the above estimates, it is clearly observed that the measures proposed by Austral Bricks for the Plant 2 modification application will improve the energy efficiency by at least 10% or more when compared to current production levels.

4. CONCLUSION

The air quality impact assessment conducted by Airlabs for the Plant 2 Upgrade (SSD 9601) was updated to assess potential impacts arising from the proposed modification (SSD 9601 Mod 1) which increases the annual production rate at Plant 2 from 80 million bricks per annum to 130 million bricks per annum.

Austral Bricks informed Airlabs that there would be no change in the discharge concentration of pollutants released from the Plant 2 kiln stack from what was presented in the SSD 9601 AQIA. However, the increase in the exhaust gas volumetric flow rate due to the increased production was provided which was used to estimate the pollutant emission rates from the Plant 2 kiln stack. Critical stack parameters that have been revised for the SSD 9601 Mod 1 application including stack diameter and exit velocity were provided to Airlabs.

Modelling demonstrates that all the assessed pollutants comply with the relevant assessment criteria at all the identified sensitive receptors for the increased production rate of 130 million SBE per annum.

Fugitive dust emission rates were also updated from what was originally presented in SSD 9601 AQIA to reflect the proposed increase in the annual production rate to 130 million bricks per annum.

Similarly, natural gas and electricity consumption estimates for the increased production rate were provided to estimate Scope 1 and Scope 2 GHG emissions.

Other than updating the emission rates as a consequence of the increased production rate, the remaining components of the impact assessment – such as the meteorological model, list of sensitive receptors (including agricultural receptors for assessment of fluoride impacts), sources inventoried for determining background concentrations, the methodology adopted in determining cumulative concentrations were all directly reproduced from the SSD 9601 AQIA. Additionally, there is no necessity for conducting a plume rise assessment as the critical stack parameters (stack height, location, exit velocity) (refer **Table 2**) have not changed significantly from the previous assessment (i.e. SSD 9601 AQIA).

Revised modelling with respect to the proposed increase in production rate shows that all the assessed pollutants are below / comply with the relevant assessment criteria at all the identified sensitive receptors, including receptors which are sensitive to fluoride impacts. Furthermore, modelling shows that the contribution from the Plant 2 operations to the overall predicted air quality levels is low, even at increased production rate of 130 million bricks per annum.

Scope 1 and 2 GHG emissions generated from the Plant 2 operations are low when compared to the state and national greenhouse gas inventories, with the operations contributing to approximately 0.04% and 0.01% of the state and national GHG emissions respectively. The upgraded Plant 2 kiln results in a highly efficient plant – providing energy efficiency opportunities of at least 10% or more which would substantially lower the gas used per brick and also the electricity consumed, therefore subsequently lower the corresponding GHG emissions released.

Overall, from the findings of the revised dispersion modelling, it can be concluded that increasing the production rate at the Plant 2 site from the current 80 million bricks per annum to 130 million bricks is not expected to adversely impact the ambient air quality levels in the surrounding environment as all the modelled pollutants are well below their respective ambient air quality levels.

As-such, from an air quality context, this memo (JAN21013M.3) supports the proposed modification application.

APPENDIX A

Fugitive Dust Emissions Inventory Background – Plant 2 Upgrade

Fugitive Dust Emissions –Plant 2 Operations

Fugitive dust emissions (TSP, PM_{10} and $PM_{2.5}$) for the upgraded Plant 2 site with the proposed increased production rate of 130 million bricks per annum have been estimated based on site-specific operational activities provided by Austral Bricks and utilising emission factors from emission estimation technique (EET) manuals listed below:

- National Pollutant Inventory (NPI), *Emission Estimation Technique Manual for Mining*, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012 (NPI, 2012).
- AP-42 Emission Factors, *Chapter 11.9 Western Surface Coal Mining*, United States Environmental Protection Agency (US-EPA 1998)
- AP-42 Emission Factors, *Chapter 11.19.2 Crushed Stone Processing and Pulverised Mineral Processing*, United States Environmental Protection Agency (US-EPA 2004).
- AP-42 Emission Factors, *Chapter 13.2.4 Aggregate Handling and Storage Piles*, United States Environmental Protection Agency (US-EPA 2006); and
- AP-42 Emission Factors, *Chapter 13.2.2 Unpaved Roads*, United States Environmental Protection Agency (US-EPA 2011).

Particulate emission rates from the adjoining Plant 1 facility and from the Horsley Park WMF facility along with the background concentrations from the ambient air quality monitoring stations have been presented in the SSD 9601 AQIA.

Dust generating activities along with corresponding emission factor and key variables used to estimate annual TSP, PM_{10} and $PM_{2.5}$ emissions for the Plant 2 SSD 9601 Mod 1 application are summarised in **Table A.1**.

Dust control efficiencies adopted in developing the emissions inventory are summarised in **Table A.2**.

Table A.1: Emission Factors and Key Variables for Estimating Dust (TSP, PM_{10} and $PM_{2.5}$) Emissions – Upgraded Plant 2 Operations

Activity	Emission Factor	Key Variables and Assumptions	Source of Emission Factor
Front end loader on raw material stockpiles	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$	k_{TSP} = 0.74 k_{PM10} = 0.35 $k_{PM2.5}$ = 0.053 U – mean wind speed, CALMET 2017 mean wind speed – 2.2 m/sec M – moisture content – 13% for the raw material to be processed as provided by Austral Bricks	AP-42, Chapter 13.2.4 – Aggregate Handling and Storage Piles
Haul truck unloading raw materials	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$	k_{TSP} = 0.74 k_{PM10} = 0.35 $k_{PM2.5}$ = 0.053 U – mean wind speed, CALMET 2017 mean wind speed – 2.2 m/sec M – moisture content – 13% for the raw material to be processed as provided by Austral Bricks	AP-42, Chapter 13.2.4 – Aggregate Handling and Storage Piles
Loading raw materials into the crusher unit	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$	k_{TSP} = 0.74 k_{PM10} = 0.35 $k_{PM2.5}$ = 0.053 U – mean wind speed, CALMET 2017 mean wind speed – 2.2 m/sec M – moisture content – 13% for the raw material to be processed as provided by Austral Bricks	AP-42, Chapter 13.2.4 – Aggregate Handling and Storage Piles
Crushing operations	$E_{TSP} = 0.0006\ kg/t$ $E_{PM10} = 0.00027\ kg/t$ $E_{PM2.5} = 0.00005\ kg/t$	Controlled crushing – water sprays and enclosed operations	AP-42, Chapter 11.19.2 – Crushed Stone Processing and Pulverised Mineral Processing
Conveying to mill building	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$	k_{TSP} = 0.74 k_{PM10} = 0.35 $k_{PM2.5}$ = 0.053 U – mean wind speed, CALMET 2017 mean wind speed – 2.2 m/sec M – moisture content – 13% for the raw material to be processed as provided by Austral Bricks	AP-42, Chapter 13.2.4 – Aggregate Handling and Storage Piles
Mill building operations (incl. grinding)	$E_{TSP} = 0.0011\ kg/t$ $E_{PM10} = 0.00037\ kg/t$ $E_{PM2.5} = 0.00005\ kg/t$	No specific emission factors available for activities inside the mill building. Therefore, used the controlled screening emission factor. It is to be noted that minimal dust emissions would be generated from operations inside the mill building, as the raw material would be mixed with water and additivities which would considerably limit the potential for fugitive dust emissions and all of the operations would be inside the building – enclosed operations. EET manual does not provide emission factors for $PM_{2.5}$ size fraction. Therefore, assumed that $PM_{2.5}$ would be 50% of TSP	NPI – EETM for Mining and Processing of Non-Metallic Minerals Version 2.1

Activity	Emission Factor	Key Variables and Assumptions	Source of Emission Factor
Conveying to brick kiln	$E = k(0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}$	k_{TSP} = 0.74 k_{PM10} = 0.35 $k_{PM2.5}$ = 0.053 U – mean wind speed, CALMET 2017 mean wind speed – 2.2 m/sec M – moisture content – 13% for the raw material to be processed as provided by Austral Bricks	AP-42, Chapter 13.2.4 – Aggregate Handling and Storage Piles
Wind erosion – exposed areas and stockpiles	E_{TSP} = 850 kg/ha/yr E_{PM10} = 425 kg/ha/yr $E_{PM2.5}$ = 63.75 kg/ha/yr	No emission factors provided for PM_{10} and $PM_{2.5}$ size fractions. To determine PM_{10} and $PM_{2.5}$ emission factors, reference was made to the PM_{10}/TSP and $PM_{2.5}$/TSP ratios specified within the AP-42, *Chapter 13.2.5 – Industrial Wind Erosion.*	AP-42, Chapter 11.9 – Western Surface Coal Mining
Heavy vehicle haulage on gravel finish surface	$E = k\ (s/12)^a (W/3)^b$	k_{TSP} = 4.9 a_{TSP} = 0.7 b_{TSP} = 0.45 k_{PM10} = 1.5 a_{PM10} = 0.9 b_{PM10} = 0.45 $k_{PM2.5}$ = 0.15 $a_{PM2.5}$ = 0.9 $b_{PM2.5}$ = 0.45 s – surface material silt content (%), assumed to be 2.0% as the road surface would have a low silt gravel / aggregate finish. W – Average vehicle weight assumed to be 45 tonnes Haul truck payload capacity – 40 tonnes / trip-load Return trip length – Plant 1 ~ 2.1km/trip Return trip length – Plant 2 – Path 1 ~ 1.6 km/trip Return trip length – Plant 2 – Path 2 ~ 1.0 km/trip	AP-42, Chapter 13.2.2 – Unpaved Roads

Table A.2: Fugitive Dust Control Measures and Quantifiable Emission Reduction Factors

Fugitive Dust Control Measure	Emission Reduction Efficiency	Source
Enclosed conveyors	70%	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Water sprays on stockpiles	50%	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Wind breaks from taller stockpiles and vegetation to reduce wind erosion emissions	30%	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Water sprays on crusher	50%	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Enclosed crushing operation	70%	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Presence of hard "crust" on existing non-active clay stockpiles at the Plant 2 site which considerably minimises the potential for wind erosion emissions	95%	Katestone Environmental (2011), NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, Prepared for NSW Office of Environment and Heritage, KE1006953, June 2011
Application of Level 1 watering (<2L/m^2/hour) on unsealed surfaces	50% [(a)]	National Pollutant Inventory (NPI), Emission Estimation Technique Manual for Mining, Version 3.1, Australian Government – Department of Sustainability, Environment, Water, Population & Communities, January 2012
Imposing speed restrictions (max. of 40km/hr on major haul routes)	44% [(a)]	Teralba Quarry Extensions, Air Quality Assessment, Report Prepared by SLR Consulting Pty. Ltd. for Metromix Pty. Ltd., January 2012
Application of low silt aggregate (gravel finish) on unsealed haulage routes	30% [(a)]	Katestone Environmental (2011), NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining, Prepared for NSW Office of Environment and Heritage, KE1006953, June 2011

(a) For haulage emissions, combined control efficiency applied. The combined control efficiency is multiplicative. For example, if Level 1 watering is used in conjunction with application of low silt aggregate, the resultant emissions will be (1-0.5) x (1-0.3) = 0.35 of the uncontrolled emissions (i.e. 65% combined control efficiency)

TSP, PM_{10} and $PM_{2.5}$ emission calculations for Plant 2 are illustrated in **Figure A.1** through to **FigureA.3.**

Figure A.1: Annual Fugitive TSP Emission Estimates – Upgraded Plant 2 Operations – Increased Production Rate of 130 Million Bricks Per Annum

Activity	TSP Emissions (kg/year)	Intensity	Units	TSP Emission Factor	Units	Variable 1	Units	Variable 2	Units							Control Efficiency	Units	Operational Hours
FEL on raw material stockpiles	39.2	455,000	tonnes per annum	0.00009	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Truck unloading raw materials	39.2	455,000	tonnes per annum	0.00009	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Loading into crusher	39.2	455,000	tonnes per annum	0.00009	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Crushing operations	273.0	455,000	tonnes per annum	0.0006	kg/t													6AM - 6PM, 7 days of the week
Conveying to mill building	11.8	455,000	tonnes per annum	0.00009	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Mill building operations	75.1	455,000	tonnes per annum	0.00110	kg/t											85	% Control	6AM - 6PM, 7 days of the week
Conveying to the new brick kiln	11.8	455,000	tonnes per annum	0.00009	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Wind erosion - inactive stockpile 1	29.8	0.7	hectares	850	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 2	64.4	1.5	hectares	850	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 3	107.1	2.5	hectares	850.00	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 4	166.1	3.9	hectares	850.00	kg/ha/yr											95	% Control	Continuous
Wind erosion - active stockpile 1	505.8	1.2	hectares	850.00	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 2	489.8	1.6	hectares	850.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 3	301.4	1.0	hectares	850.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 4	1645.6	3.9	hectares	850	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 5	1165.9	2.7	hectares	850.00	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 6	135.9	0.5	hectares	850.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 7	668.7	1.6	hectares	850.00	kg/ha/yr											50	% Control	Continuous
Heavy vehicle haulage on gravel surfaces - (Path 1 only)	2165.6	227,500	tonnes per annum	0.0486	kg/t	40	tonnes/each trip-load	1.62	km/trip	1.199	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Heavy vehicle haulage on gravel surfaces - (Path 2 only)	1346.9	227,500	tonnes per annum	0.0302	kg/t	40	tonnes/each trip-load	1.01	km/trip	1.199	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Total TSP Emissions (kg/year)	**9282**																	

Figure A.2: Annual Fugitive PM_{10} Emission Estimates – Upgraded Plant 2 Operations – Increased Production Rate of 130 Million Bricks Per Annum

Activity	PM10 Emissions (kg/year)	Intensity	Units	PM10 Emission Factor	Units	Variable 1	Units	Variable 2	Units							Control Efficiency	Units	Operational Hours
FEL on raw material stockpiles	18.5	455,000	tonnes per annum	0.00004	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Truck unloading raw materials	18.5	455,000	tonnes per annum	0.00004	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Loading into crusher	18.5	455,000	tonnes per annum	0.00004	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Crushing operations	122.9	455,000	tonnes per annum	0.00027	kg/t													6AM - 6PM, 7 days of the week
Conveying to mill building	5.6	455,000	tonnes per annum	0.00004	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Mill building operations	25.3	455,000	tonnes per annum	0.00037	kg/t											85	% Control	6AM - 6PM, 7 days of the week
Conveying to the new brick kiln	5.6	455,000	tonnes per annum	0.00004	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Wind erosion - inactive stockpile 1	14.9	0.7	hectares	425	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 2	32.2	1.5	hectares	425	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 3	53.6	2.5	hectares	425.00	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 4	83.1	3.9	hectares	425.00	kg/ha/yr											95	% Control	Continuous
Wind erosion - active stockpile 1	252.9	1.2	hectares	425.00	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 2	244.9	1.6	hectares	425.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 3	150.7	1.0	hectares	425.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 4	822.8	3.9	hectares	425	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 5	583.0	2.7	hectares	425.00	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 6	68.0	0.5	hectares	425.00	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 7	334.3	1.6	hectares	425.00	kg/ha/yr											50	% Control	Continuous
Heavy vehicle haulage on gravel surfaces - (Path 1 only)	463.3	227,500	tonnes per annum	0.0104	kg/t	40	tonnes/each trip-load	1.62	km/trip	0.257	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Heavy vehicle haulage on gravel surfaces - (Path 2 only)	288.1	227,500	tonnes per annum	0.0065	kg/t	40	tonnes/each trip-load	1.01	km/trip	0.257	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Total PM10 Emissions (kg/year)	**3607**																	

Figure A.3: Annual Fugitive $PM_{2.5}$ Emission Estimates – Upgraded Plant 2 Operations – Increased Production Rate of 130 Million Bricks Per Annum

Activity	PM2.5 Emissions (kg/year)	Intensity	Units	PM2.5 Emission Factor	Units	Variable 1	Units	Variable 2	Units							Control Efficiency	Units	Operational Hours
FEL on raw material stockpiles	2.8	455,000	tonnes per annum	0.00001	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Truck unloading raw materials	2.8	455,000	tonnes per annum	0.00001	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Loading into crusher	2.8	455,000	tonnes per annum	0.00001	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4									6AM - 6PM, 7 days of the week
Crushing operations	22.8	455,000	tonnes per annum	0.00005	kg/t													6AM - 6PM, 7 days of the week
Conveying to mill building	0.8	455,000	tonnes per annum	0.00001	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Mill building operations	12.6	455,000	tonnes per annum	0.00019	kg/t											85	% Control	6AM - 6PM, 7 days of the week
Conveying to the new brick kiln	0.8	455,000	tonnes per annum	0.00001	kg/t	1.00	average (wind speed /2.2)^1.3 in (m/sec)	13.74	(moisture content /2)^1.4							70	% Control	6AM - 6PM, 7 days of the week
Wind erosion - inactive stockpile 1	2.2	0.7	hectares	63.75	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 2	4.8	1.5	hectares	63.75	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 3	8.0	2.5	hectares	63.75	kg/ha/yr											95	% Control	Continuous
Wind erosion - inactive stockpile 4	12.5	3.9	hectares	63.75	kg/ha/yr											95	% Control	Continuous
Wind erosion - active stockpile 1	37.9	1.2	hectares	63.75	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 2	36.7	1.6	hectares	63.75	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 3	22.6	1.0	hectares	63.75	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 4	123.4	3.9	hectares	63.75	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 5	87.4	2.7	hectares	63.75	kg/ha/yr											50	% Control	Continuous
Wind erosion - active stockpile 6	10.2	0.5	hectares	63.75	kg/ha/yr											65	% Control	Continuous
Wind erosion - active stockpile 7	50.1	1.6	hectares	63.75	kg/ha/yr											50	% Control	Continuous
Heavy vehicle haulage on gravel surfaces - (Path 1 only)	46.3	227,500	tonnes per annum	0.0010	kg/t	40	tonnes/each trip-load	1.62	km/trip	0.026	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Heavy vehicle haulage on gravel surfaces - (Path 2 only)	28.8	227,500	tonnes per annum	0.0006	kg/t	40	tonnes/each trip-load	1.01	km/trip	0.026	kg/vkt	2	% silt content	54	Avg GVM (tonnes)	80.4	% Control	6AM - 6PM, 7 days of the week
Total PM2.5 Emissions (kg/year)	**517**																	

APPENDIX B

Incremental and Cumulative Concentration Isopleths

Figure B.1: Incremental (Plant 2 only) 90-days average maximum HF concentrations ($\mu g/m^3$) (General land-use assessment criteria: 0.5 $\mu g/m^3$ – red contour, Specialised land-use assessment criteria: 0.25 $\mu g/m^3$ – blue contour)

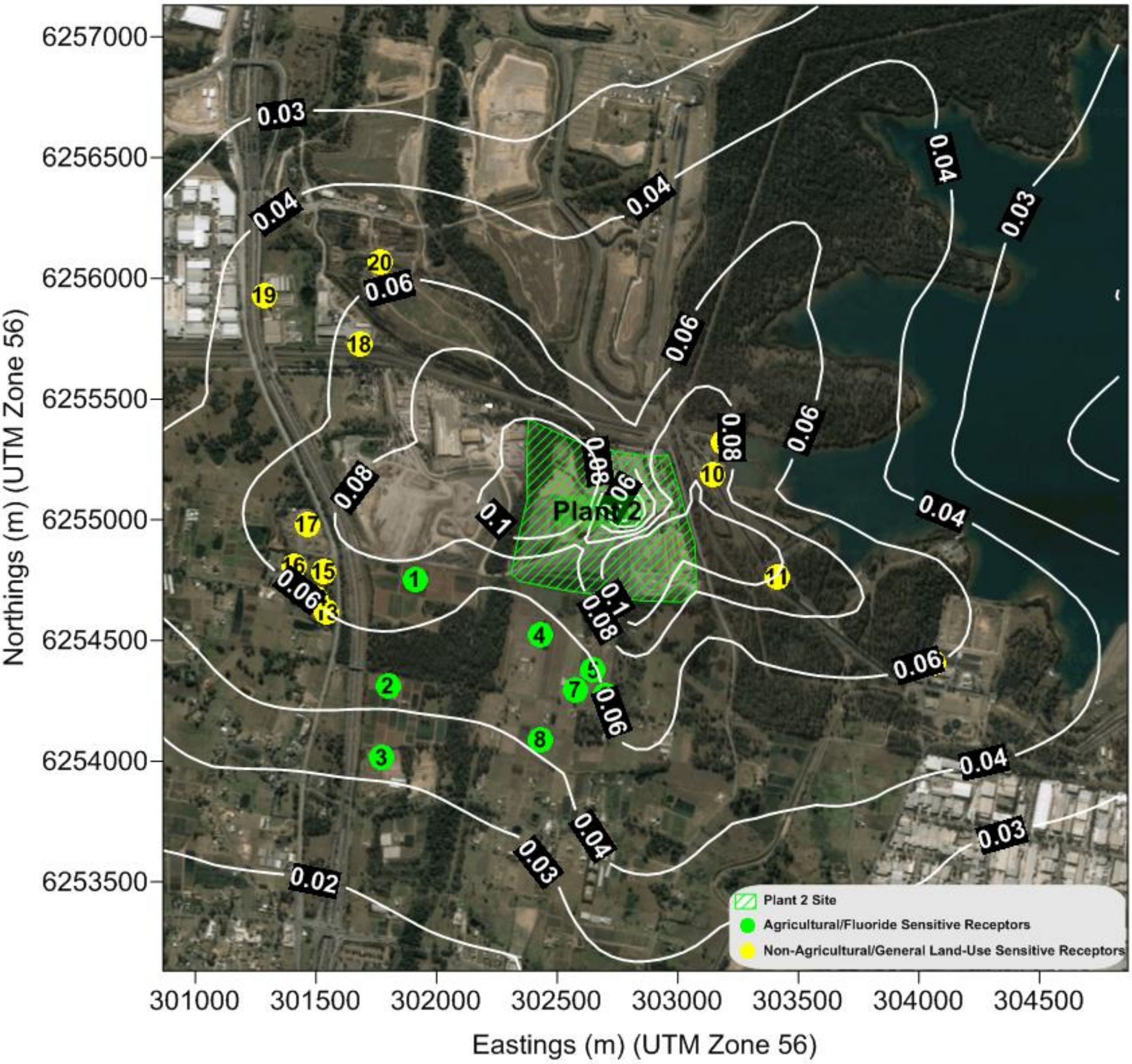


Figure B.2: Incremental (Plant 2 only) 30-days average maximum HF concentrations (μg/m³) (General land-use assessment criteria: 0.84 μg/m³ – red contour, Specialised land-use assessment criteria: 0.4 μg/m³ – blue contour)

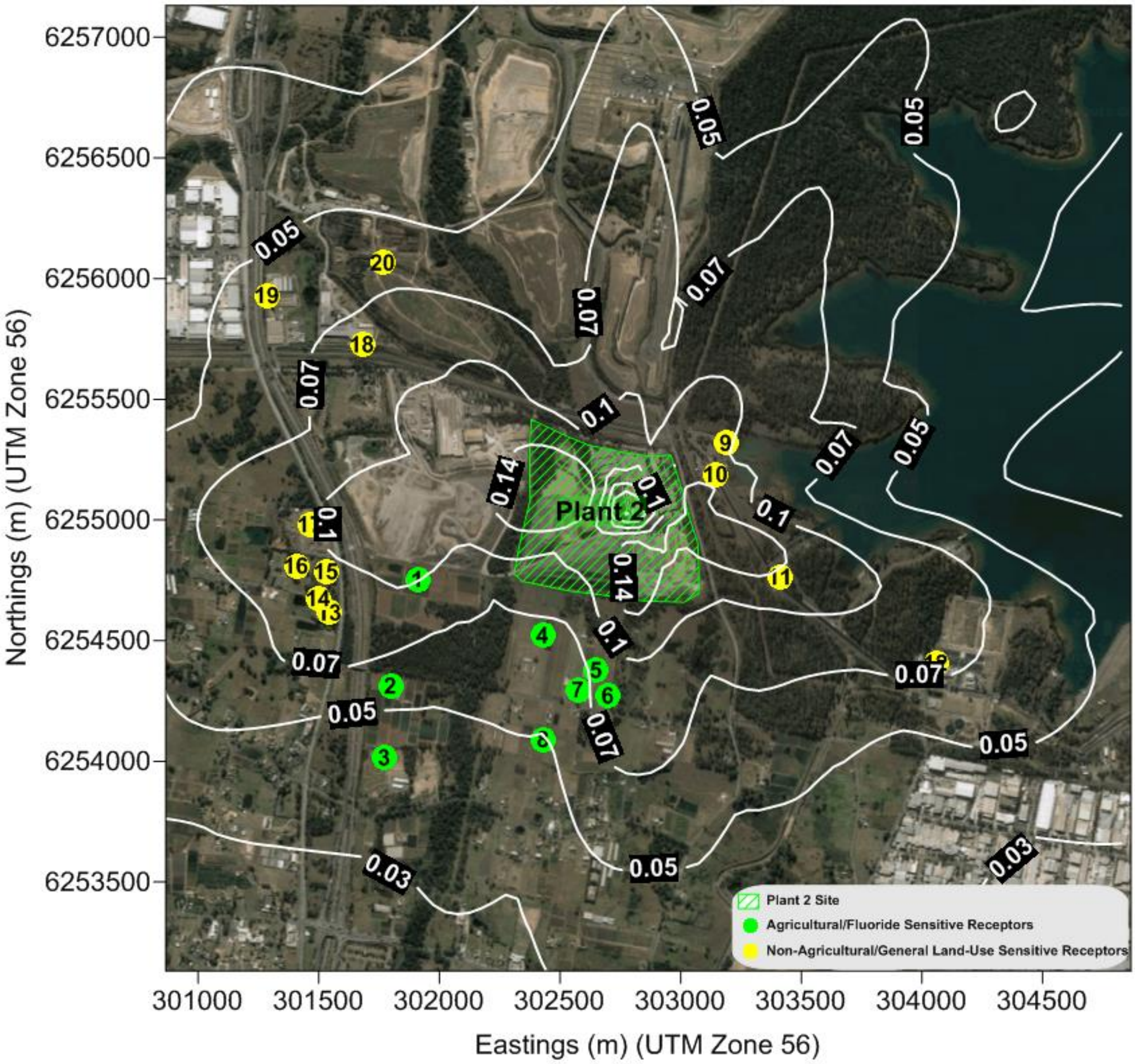


Figure B.3: Incremental (Plant 2 only) 7-days average maximum HF concentrations ($\mu g/m^3$) (General land-use assessment criteria: 1.7 $\mu g/m^3$ – red contour, Specialised land-use assessment criteria: 0.8 $\mu g/m^3$ – blue contour)

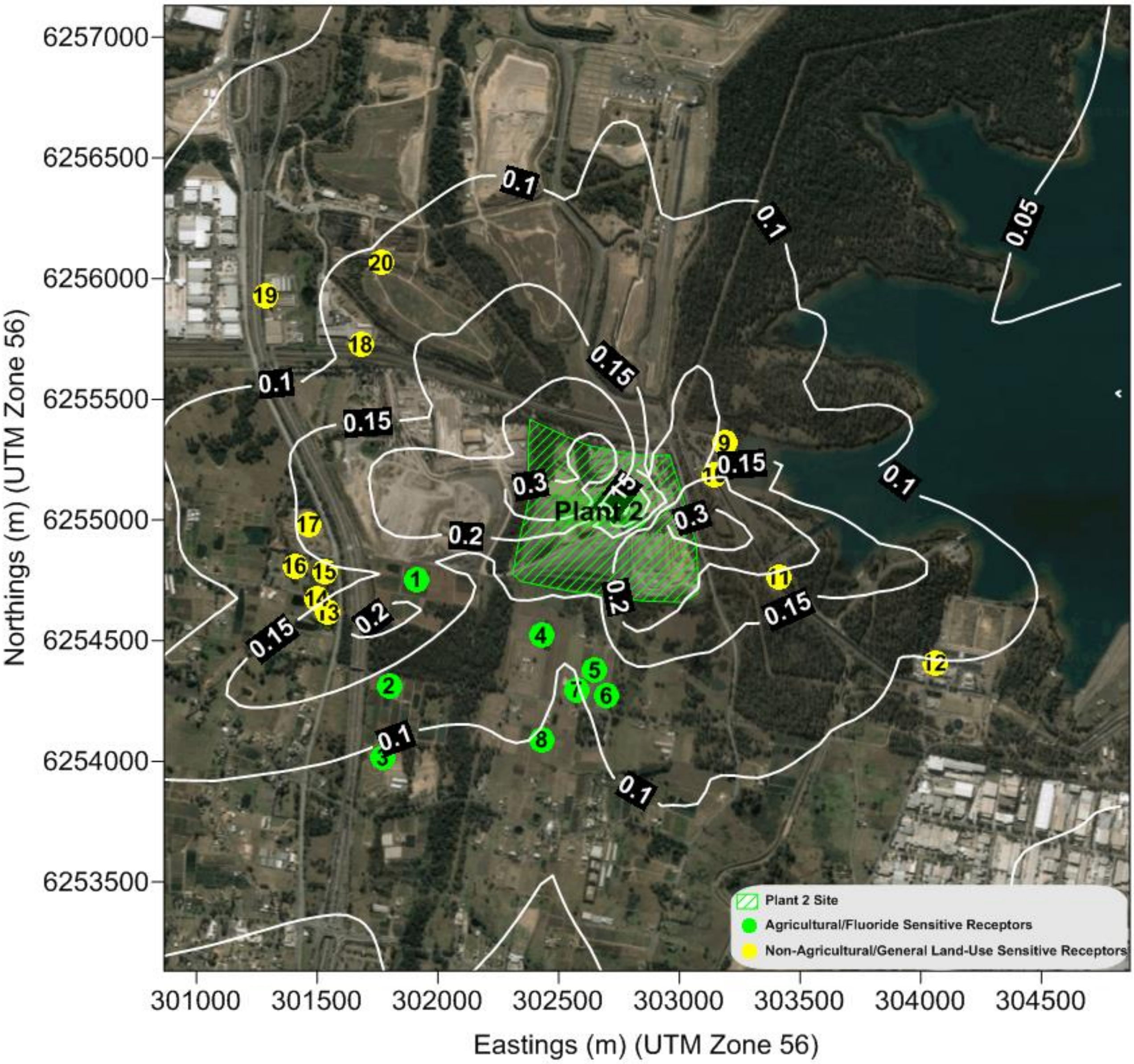


Figure B.4: Incremental (Plant 2 only) 24-hours average maximum HF concentrations ($\mu g/m^3$) (General land-use assessment criteria: 2.9 $\mu g/m^3$ – red contour, Specialised land-use assessment criteria: 1.5 $\mu g/m^3$ – blue contour)

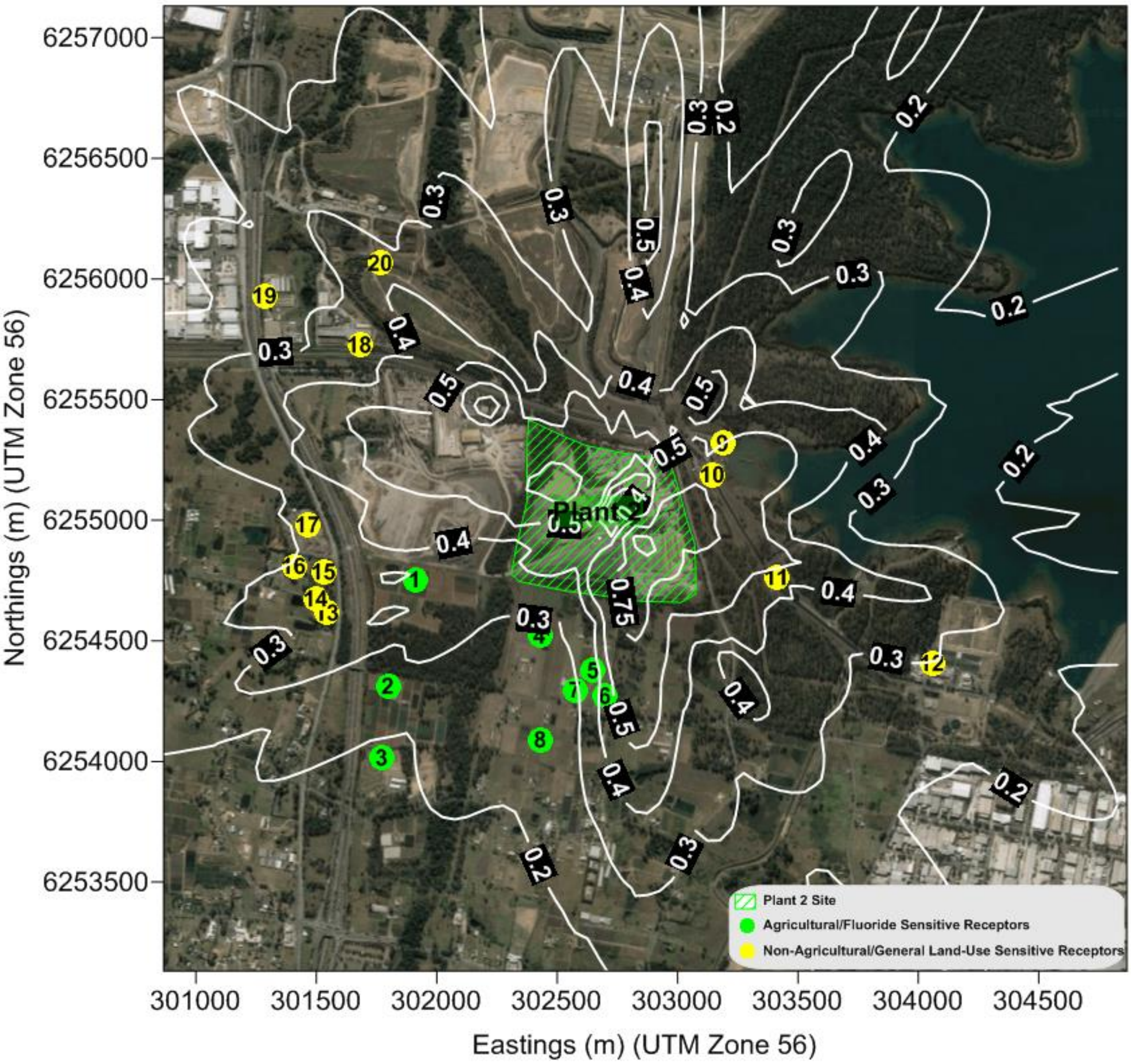


Figure B.5: Cumulative 90-days average maximum HF concentrations (μg/m³) (General land-use assessment criteria: 0.5 μg/m³ – red contour, Specialised land-use assessment criteria: 0.25 μg/m³ - blue contour)

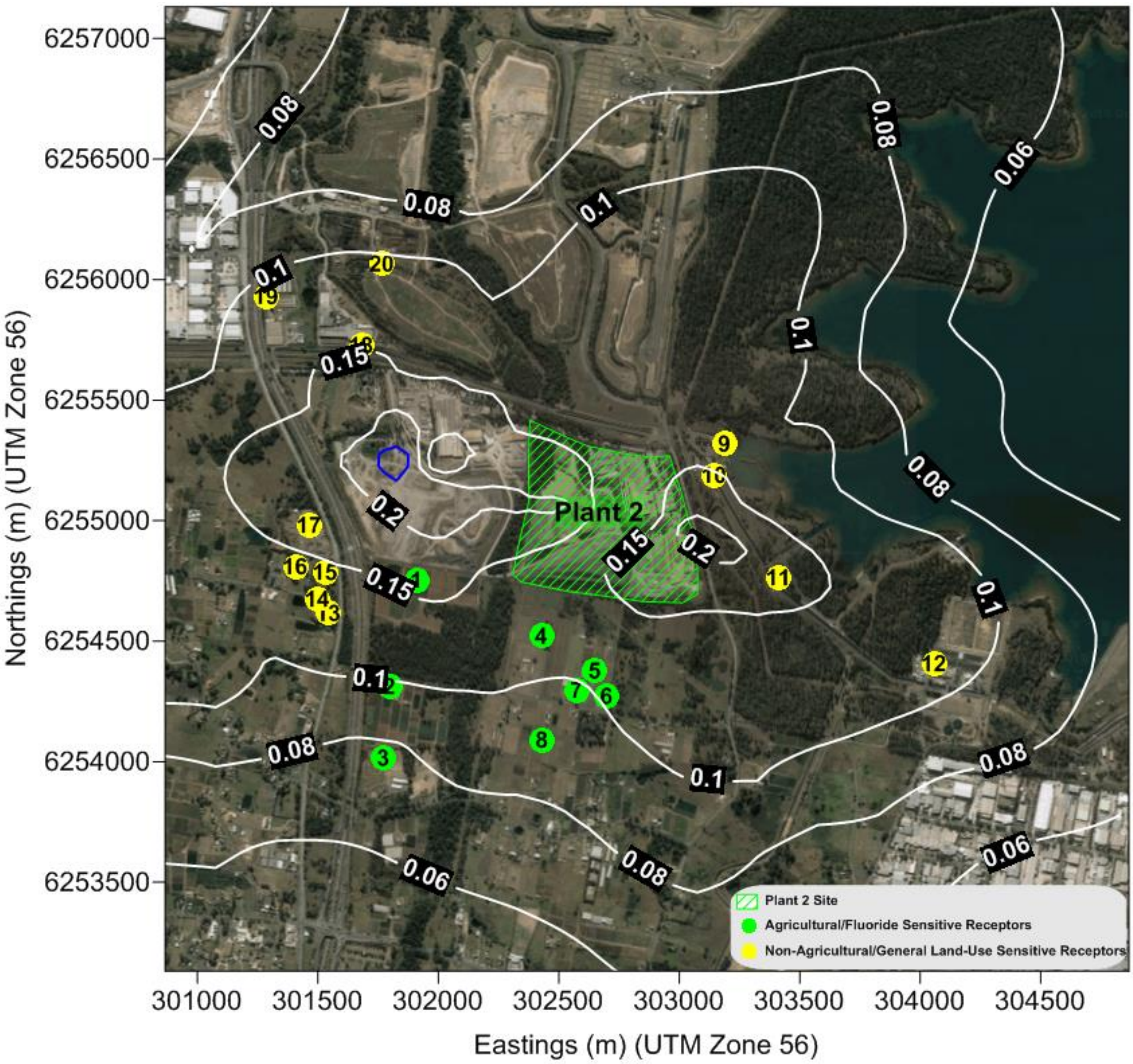


Figure B.6: Cumulative 30-days average maximum HF concentrations (μg/m³) (General land-use assessment criteria: 0.84 μg/m³ – red contour, Specialised land-use assessment criteria: 0.4 μg/m³ - blue contour)

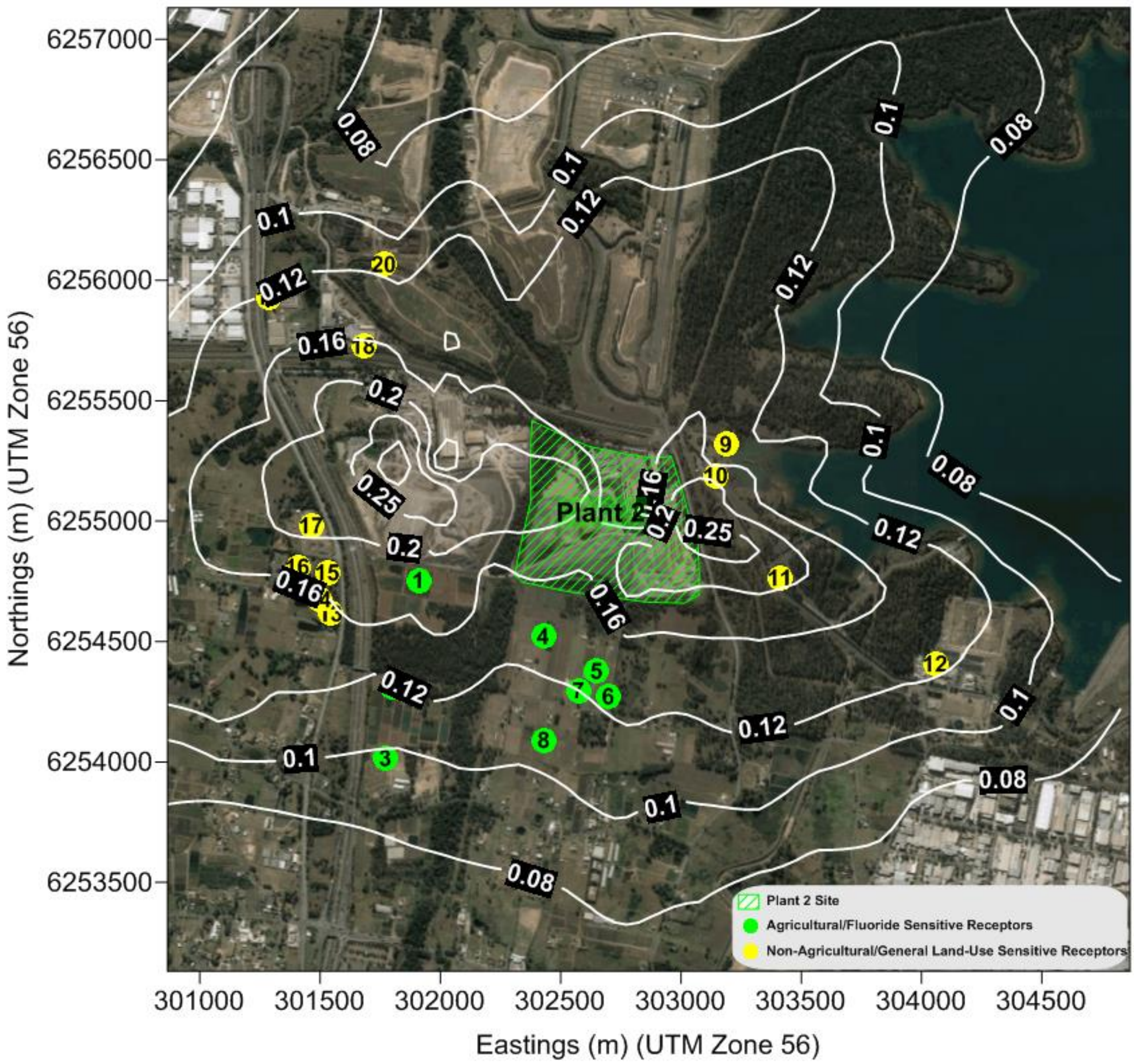


Figure B.7: Cumulative 7-days average maximum HF concentrations ($\mu g/m^3$) (General land-use assessment criteria: 1.7 $\mu g/m^3$ – red contour, Specialised land-use assessment criteria: 0.8 $\mu g/m^3$ - blue contour)

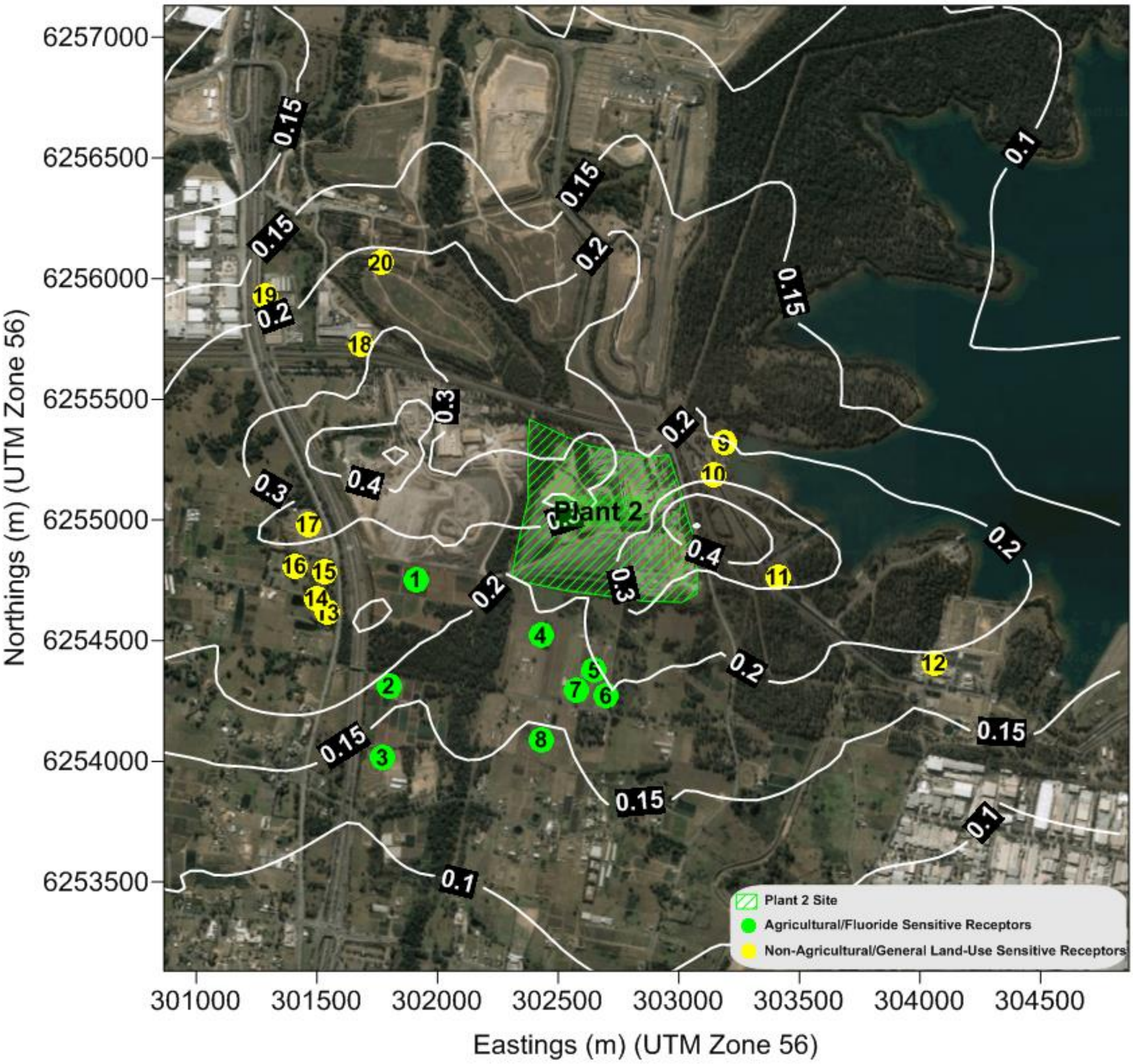


Figure B.8: Cumulative 24-hours average maximum HF concentrations (µg/m³) (General land-use assessment criteria: 2.9 µg/m³ – red contour, Specialised land-use assessment criteria: 1.5 µg/m³ - blue contour)

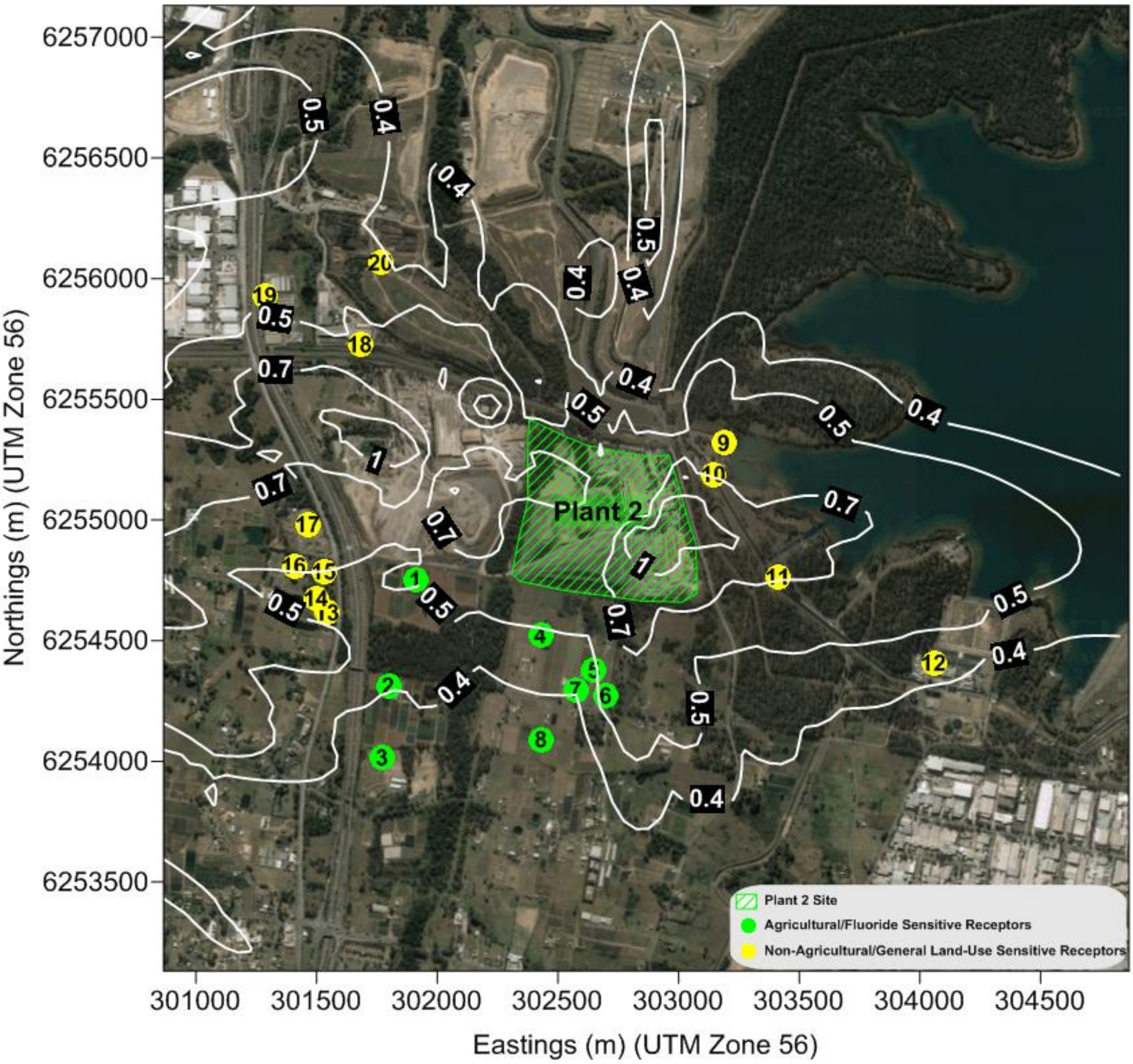


Figure B.9: Cumulative 24-hours average maximum PM_{10} concentrations (µg/m³) (Assessment criteria: 50 µg/m³) (Assessment criteria contour shown in red)

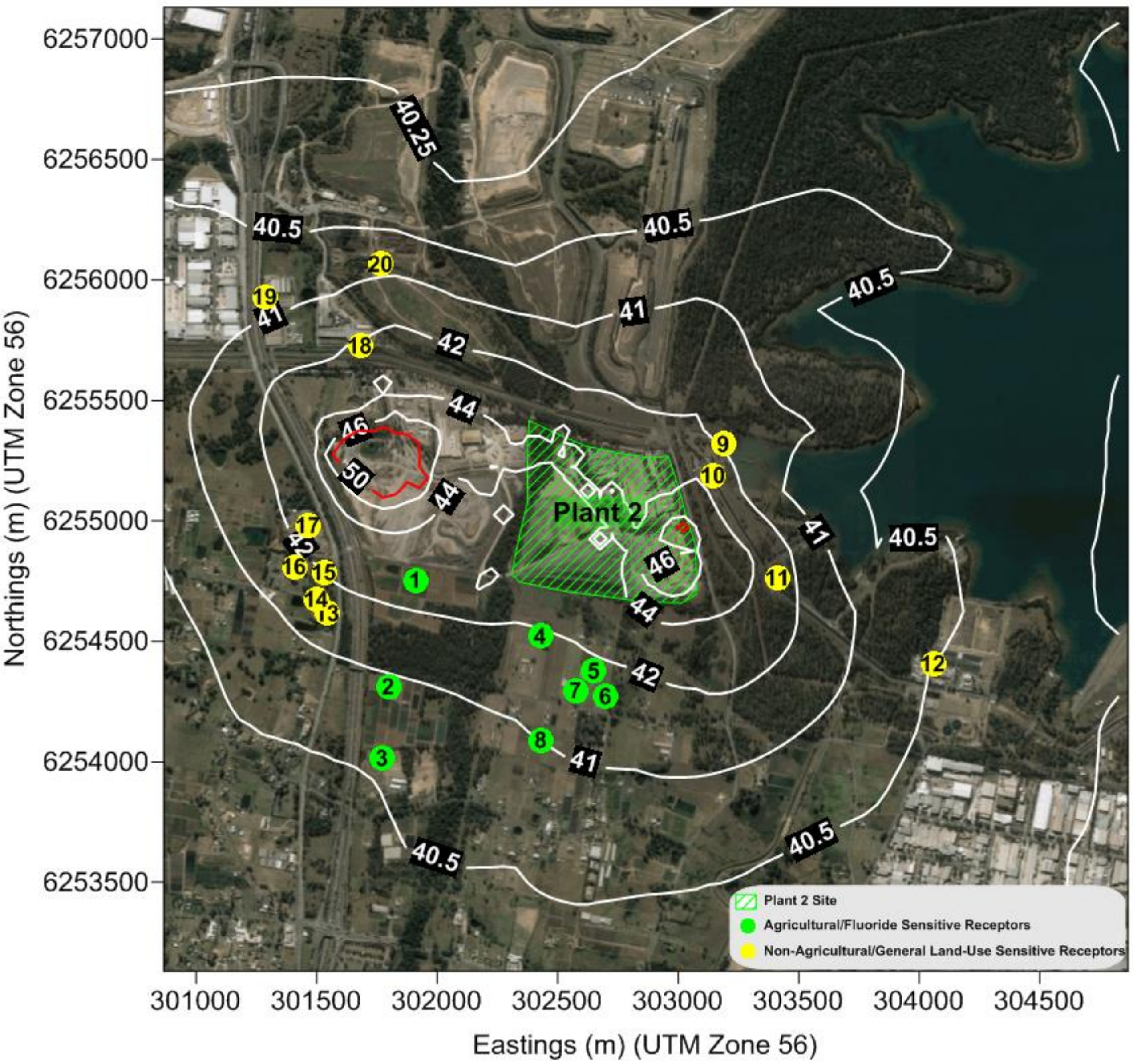


Figure B.10: Cumulative annual average PM_{10} concentrations (µg/m³) (Assessment criteria: 25 µg/m³) (Assessment criteria contour shown in red)

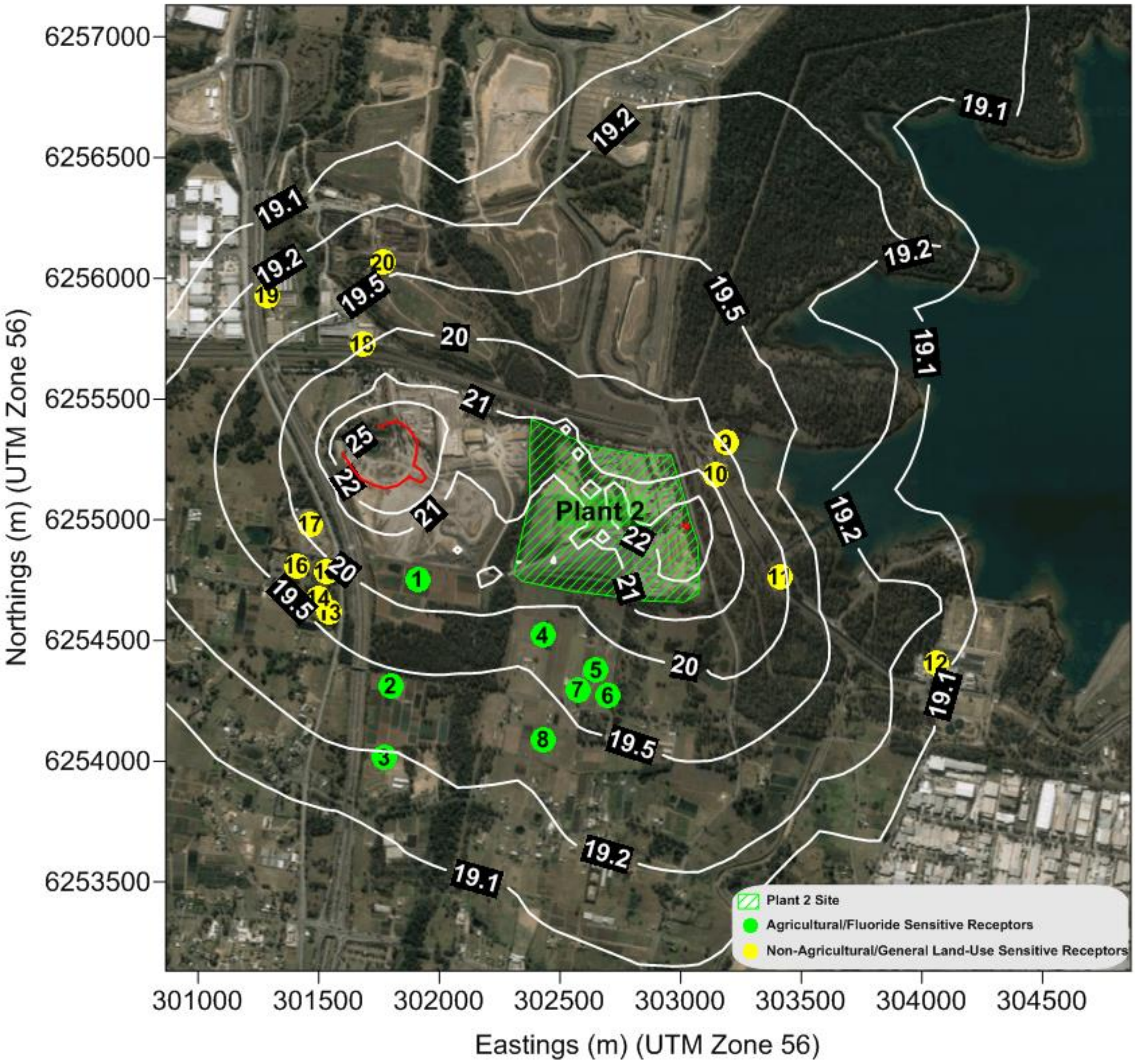


Figure B.11: Cumulative 24-hours average maximum $PM_{2.5}$ concentrations (μg/m³) (Assessment criteria: 25 μg/m³) (Assessment criteria contour shown in red)

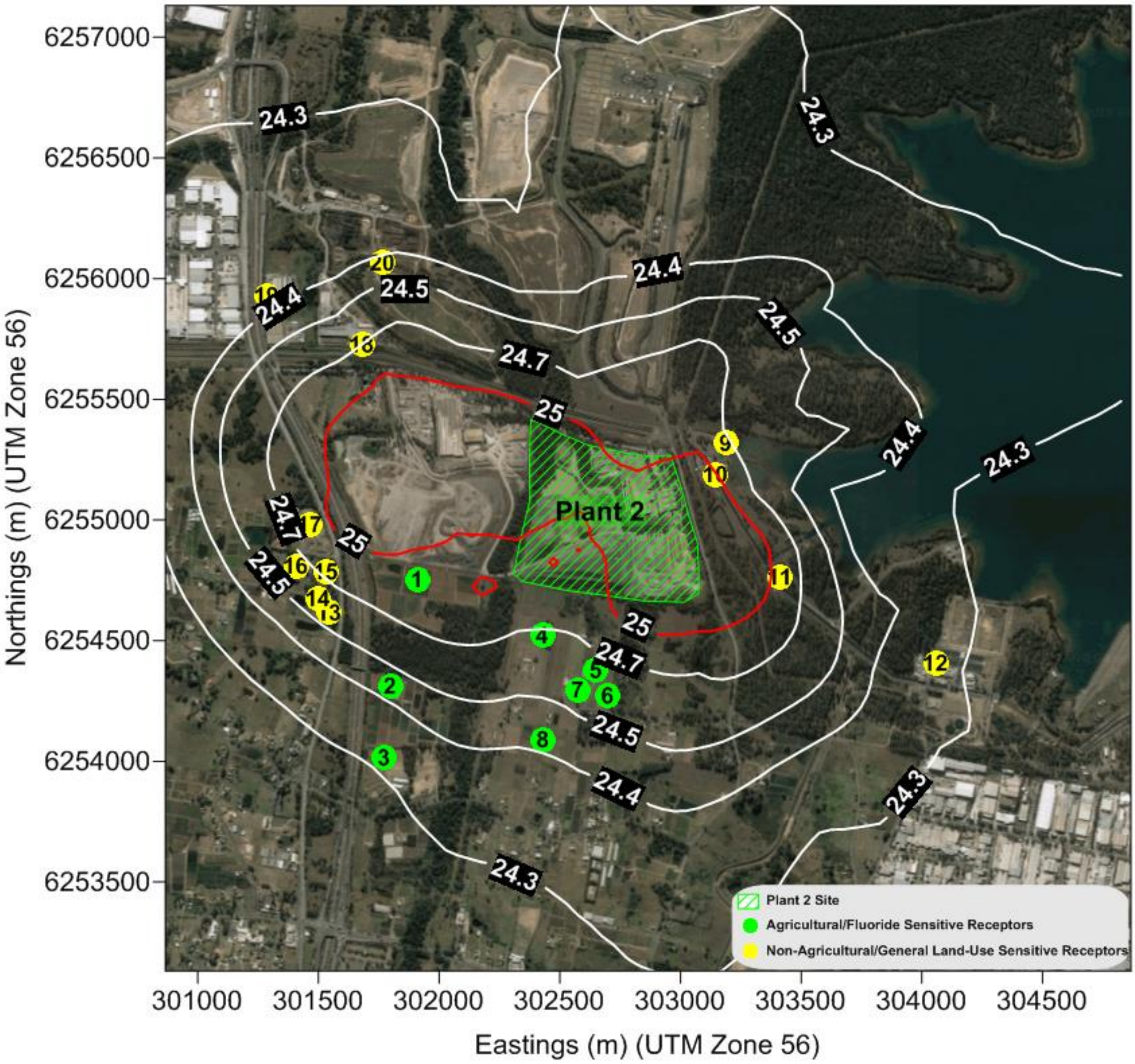


Figure B.12: Cumulative annual average $PM_{2.5}$ concentrations ($\mu g/m^3$) (Assessment criteria: 8 $\mu g/m^3$) (Assessment criteria contour shown in red)

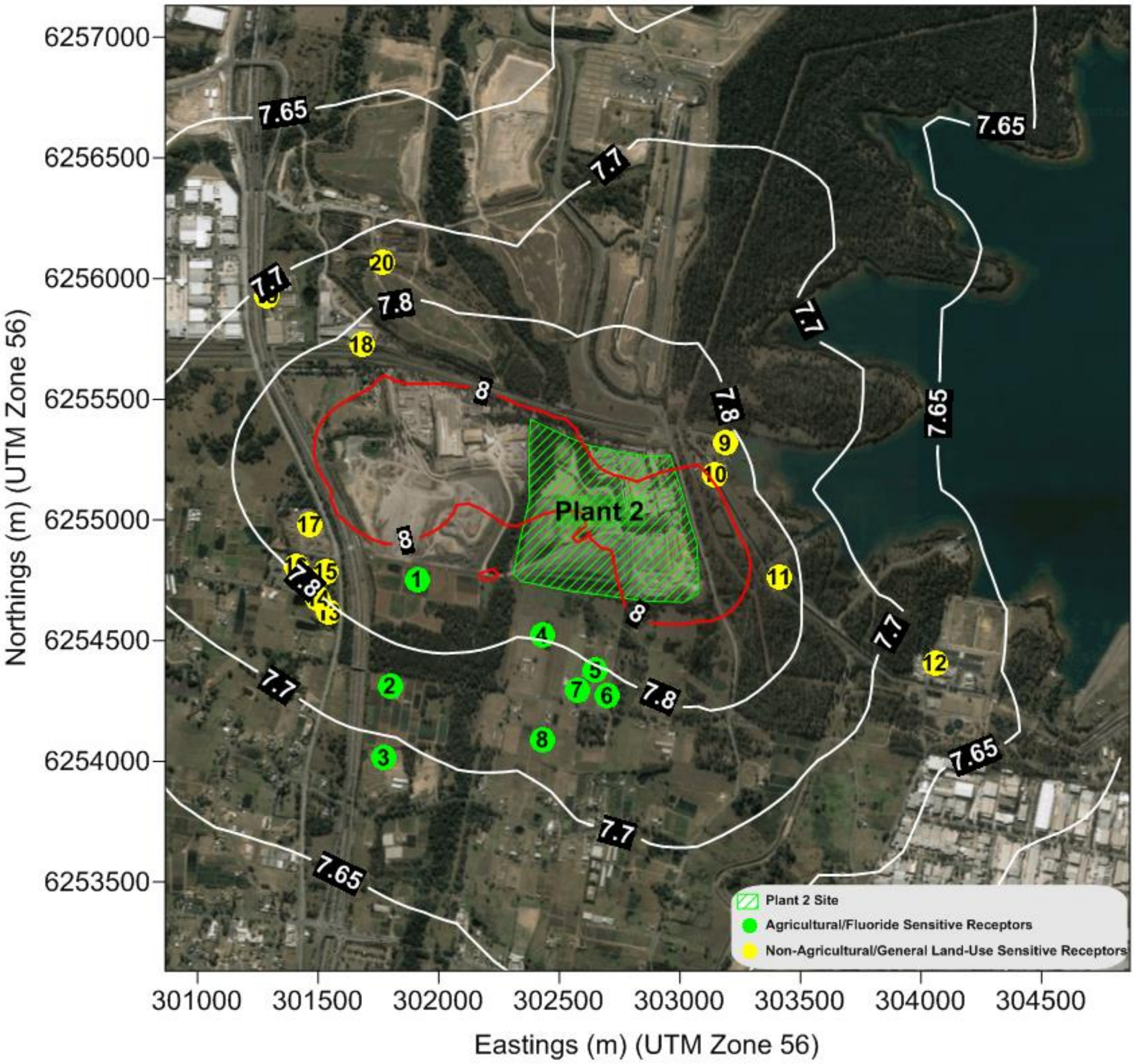


Figure B.13: Cumulative 1-hour average maximum NO_2 concentrations ($\mu g/m^3$) (Assessment criteria: 246 $\mu g/m^3$ contour shown in red)

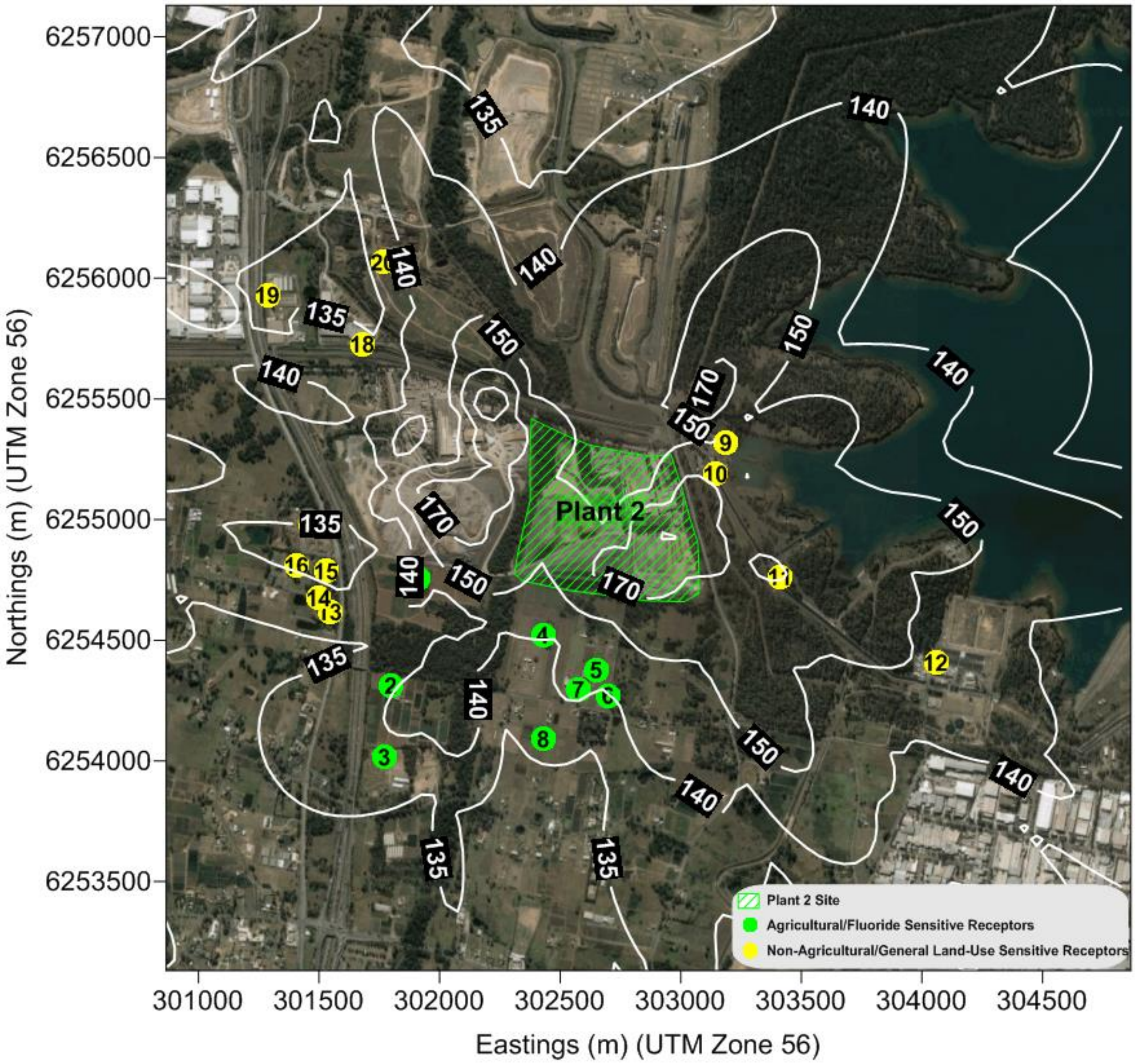


Figure B.14: Cumulative annual average maximum NO_2 concentrations ($\mu g/m^3$) (Assessment criteria: 62 $\mu g/m^3$)