

Albemarle Lithium Pty Ltd
Albemarle Kemerton Plant
Air Quality Impact
Assessment - Part B

November 2017



7. Dispersion modelling results

Table 7-1 to Table 7-5 show the predicted concentrations of each air pollutant at each identified sensitive receptor. The results present the incremental pollutant concentrations, (predicted impacts due to the Plant's pollutant source alone) and the cumulative impact (incremental pollutants plus background concentrations). The background concentrations for each pollutant were presented in Table 3-1.

7.1 Particulates as PM₁₀

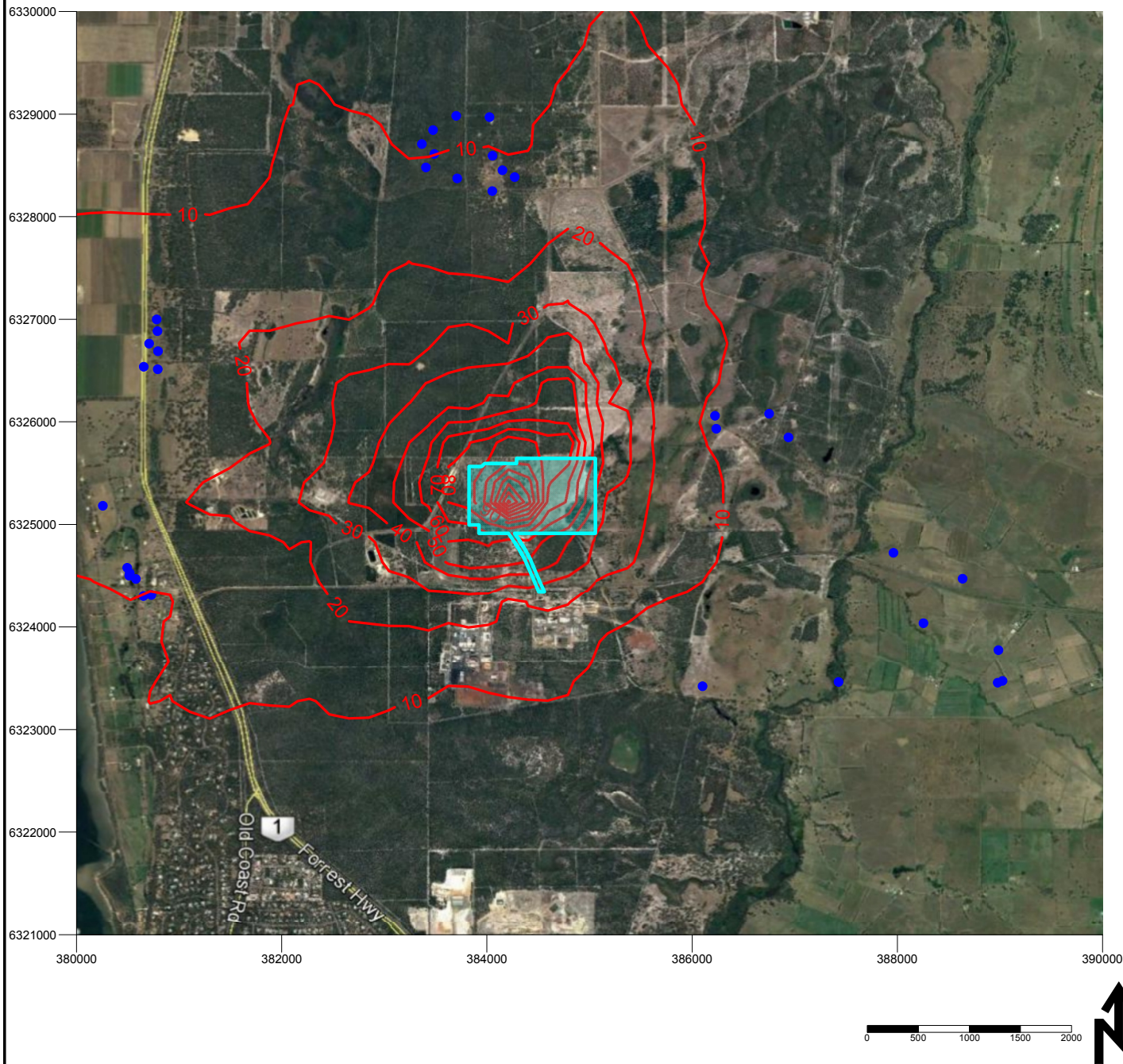
Table 7-1 shows that the predicted cumulative 24 hour maximum PM₁₀ ground level concentrations at the sensitive receptor locations, inclusive of background concentration of 21 µg/m³ (24 hour average) and 18 µg/m³ (annual average) measured at Bunbury AQMS, are significantly below the assessed criterion.

Table 7-1 Predicted PM₁₀ 24 hour and annual average concentrations (µg/m³)

Sensitive receptor	24 hour average maximum		Annual average	
	Incremental	Cumulative	Incremental	Cumulative
Criterion	50		25	
1	4	25	0.4	18
2	5	26	0.3	18
3	2	23	0.2	18
4	2	23	0.2	18
5	3	23	0.2	18
6	3	24	0.2	18
7	3	24	0.2	18
8	5	26	0.3	18
9	6	27	0.5	18
10	6	27	0.5	18
11	9	30	0.7	18
12	8	29	0.7	18
13	11	32	2.9	20
14	11	31	2.7	20
15	10	31	2.5	20
16	12	33	2.8	20
17	12	33	2.4	20
18	10	31	2.1	20
19	10	31	2.1	20
20	9	30	1.9	19
21	9	30	1.9	19
22	14	35	2.4	20
23	15	36	2.5	20
24	15	36	2.6	20
25	15	36	2.5	20
26	16	37	2.5	20
27	16	37	2.5	20
28	9	30	1.9	19
29	12	33	1.3	19
30	12	33	1.3	19
31	12	33	1.3	19
32	11	32	1.2	19
33	9	30	1.2	19

Sensitive receptor	24 hour average maximum		Annual average	
	Incremental	Cumulative	Incremental	Cumulative
<i>Criterion</i>	50		25	
34	9	30	1.1	19
35	17	38	1.8	19
36	9	29	2.2	20

Dispersion modelling results for the maximum 24 hour PM₁₀ ground level concentrations are presented as contours in Figure 7-1.



Legend

— Maximum 24 hour average PM_{10} concentration ($\mu g/m^3$)

— Proposed plant boundary

Receptor within grid domain

● Sensitive receptor

CRITERIA

NEPM: 24 hour PM_{10} criterion = $50 \mu g/m^3$

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Predicted emissions
Incremental maximum 24 hour PM_{10} ($\mu g/m^3$)

FIGURE 7.1

7.2 Particulates as PM_{2.5}

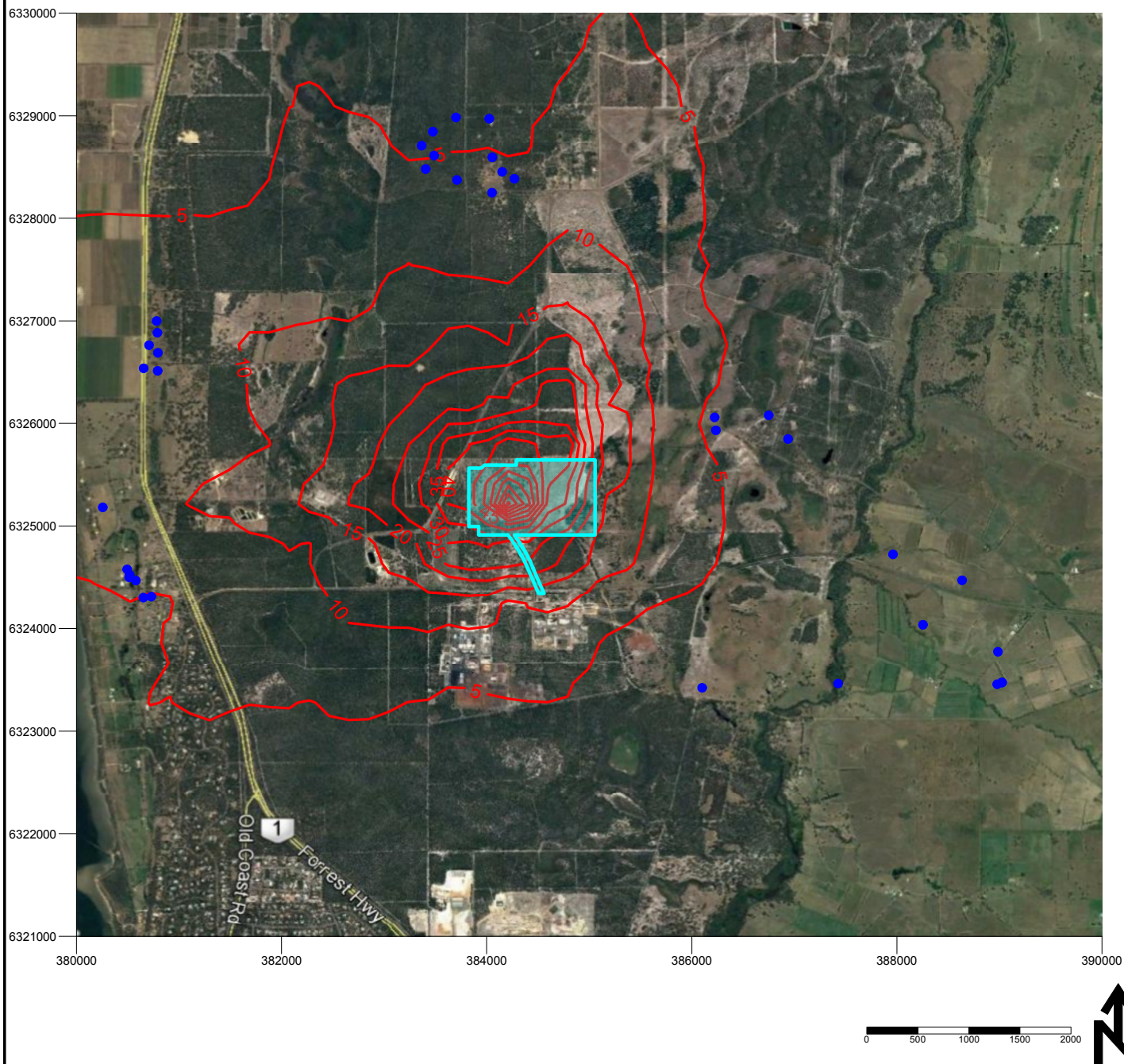
Table 7-2 predicted 24 hour maximum PM_{2.5} ground level concentrations at the sensitive receptor locations, inclusive of background of 10 µg/m³ (24 hour average) and 9 µg/m³ (annual average) measured at Bunbury AQMS.

24 hour maximum PM_{2.5} ground level concentrations are significantly below the assessed criterion, however predicted annual average PM_{2.5} exceeds the yearly criteria by up to 2 µg/m³. The exceedance can be attributed to the existing background concentration, which exceeds the criterion by 1 µg/m³.

Table 7-2 Predicted PM_{2.5} 24 hour and annual average concentrations (µg/m³)

Sensitive receptor	24 hour average maximum		Annual average	
	Incremental	Cumulative	Incremental	Incremental
Criterion	25		8	
1	2	12	0.2	9
2	2	12	0.2	9
3	1	11	0.1	9
4	1	11	0.1	9
5	1	11	0.1	9
6	2	11	0.1	9
7	2	12	0.1	9
8	2	12	0.1	9
9	3	13	0.2	9
10	3	13	0.2	9
11	4	14	0.3	9
12	4	14	0.3	9
13	6	16	1.5	10
14	5	15	1.4	10
15	5	15	1.2	10
16	6	16	1.4	10
17	6	16	1.2	10
18	5	15	1.1	10
19	5	15	1.0	10
20	5	15	1.0	10
21	5	14	1.0	10
22	7	17	1.2	10
23	7	17	1.3	10
24	8	18	1.3	10
25	7	17	1.2	10
26	8	18	1.3	10
27	8	18	1.3	10
28	5	14	1.0	10
29	6	16	0.7	9
30	6	16	0.6	9
31	6	16	0.6	9
32	6	16	0.6	9
33	5	15	0.6	9
34	5	14	0.6	9
35	9	18	0.9	9
36	4	14	1.1	10

Dispersion modelling results for 24 hour maximum PM_{2.5} ground level concentrations are presented as contours in Figure 7-2.



Legend

— Maximum 24 hour average $PM_{2.5}$ concentration ($\mu g/m^3$)

— Proposed plant boundary

Receptor within grid domain

● Sensitive receptor

CRITERIA

NEPM: 24 hour $PM_{2.5}$ criterion = $25 \mu g/m^3$

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Predicted emissions
Incremental maximum 24 hour $PM_{2.5}$ ($\mu g/m^3$)

FIGURE 7.2

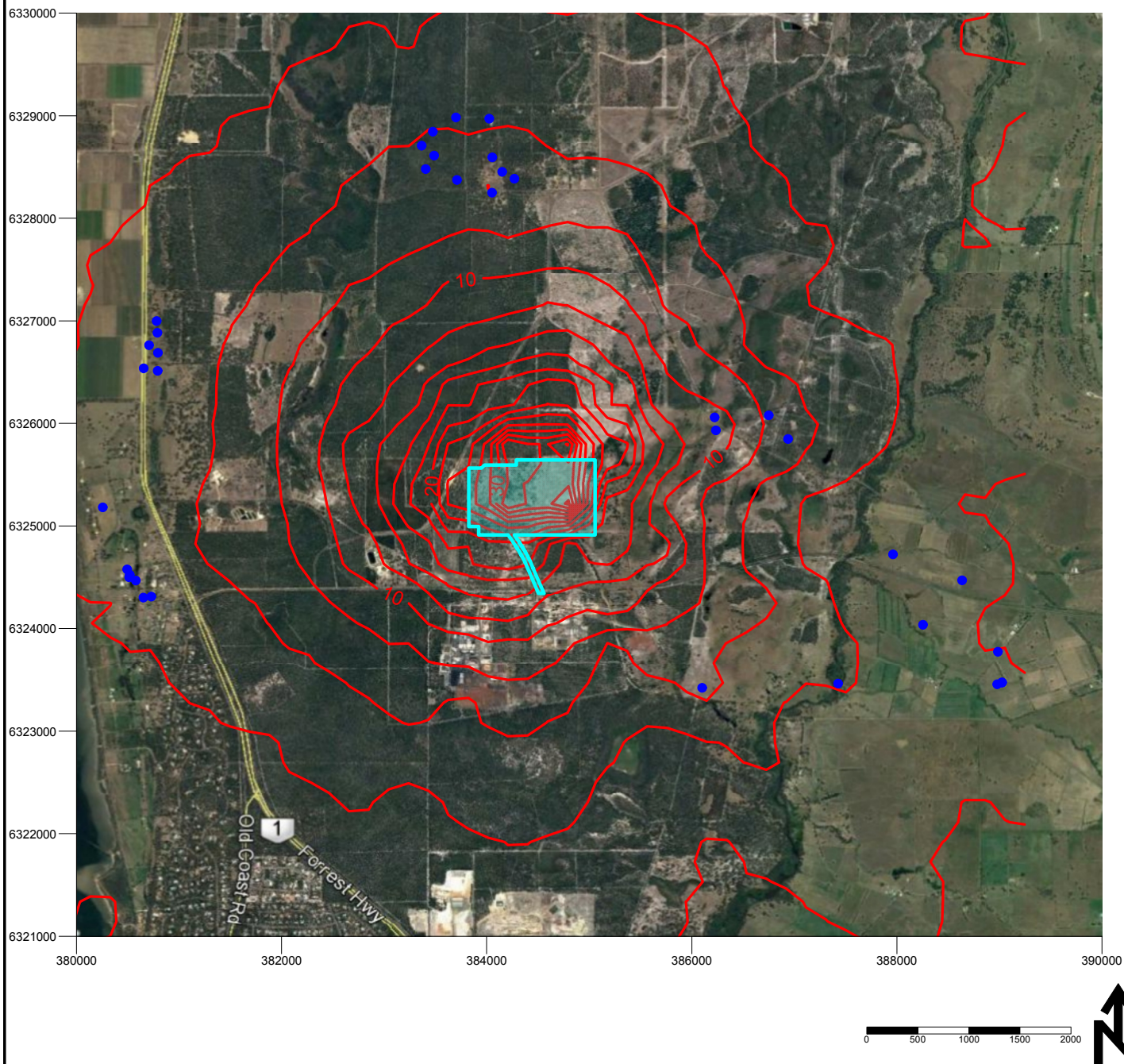
7.3 NO₂

Table 7-3 shows the predicted 1 hour maximum annual average ground level concentrations of NO₂ at the sensitive receptor locations. Assuming a conservative 30% of NO_x as NO₂ (for combustion sources), including the background NO₂ measurements of 41 µg/m³(1 hour) and 30 µg/m³ (annual) from South Lake AQMS, the predicted concentrations are significantly below the assessed criteria.

Table 7-3 Predicted NO₂ maximum 1 hour and annual average concentrations (µg/m³)

Sensitive receptor	Maximum 1 hour average		Annual average	
	Incremental	Cumulative	Incremental	Incremental
Criterion	246		62	
1	7	48	0.04	13
2	4	45	0.03	13
3	2	43	0.02	13
4	2	43	0.02	13
5	2	43	0.02	13
6	2	43	0.03	13
7	3	44	0.02	13
8	4	45	0.03	13
9	7	48	0.05	13
10	8	49	0.04	13
11	11	52	0.06	13
12	12	53	0.06	13
13	8	49	0.24	13
14	7	48	0.22	13
15	7	48	0.20	13
16	8	49	0.23	13
17	7	48	0.19	13
18	7	48	0.17	13
19	7	48	0.17	13
20	7	48	0.16	13
21	6	47	0.16	13
22	5	46	0.15	13
23	6	47	0.16	13
24	6	47	0.16	13
25	6	47	0.16	13
26	6	47	0.17	13
27	5	46	0.17	13
28	6	47	0.16	13
29	6	47	0.09	13
30	6	47	0.08	13
31	5	46	0.08	13
32	5	46	0.08	13
33	5	46	0.08	13
34	5	46	0.08	13
35	5	46	0.11	13
36	6	47	0.18	13

Dispersion modelling results for 1-hour maximum NO₂ ground level concentrations are presented as contours in Figure 7-3 .



Legend

— Maximum 1 hour average NO₂ concentration

— Proposed plant boundary

Receptor within grid domain

● Sensitive receptor

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NEPM: 1 hour NO₂ criterion = 246 ug/m³

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Predicted emissions
Incremental maximum 1 hour NO₂ (ug/m³)

FIGURE 7.3

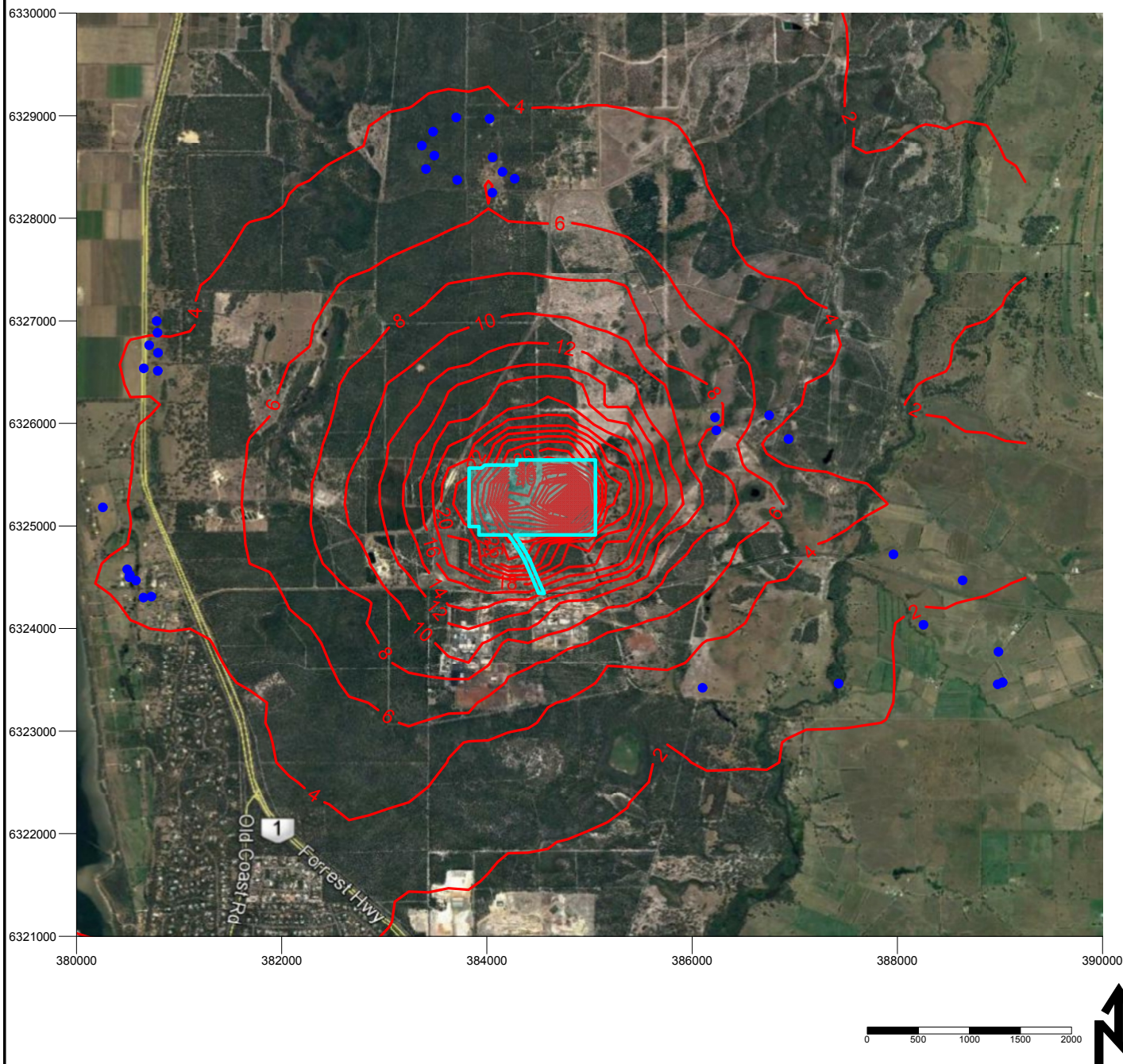
7.4 SO₂

Figure 7-4 shows that the predicted 1 hour maximum, 24 hour maximum and annual average ground level concentrations at the sensitive receptor locations, inclusive of the background measurements of 21 µg/m³(1 hour), 8 µg/m³ (24 hour) and 5 µg/m³ (annual) at South Lake AQMS, are significantly below the assessed criteria.

Table 7-4 Predicted SO₂ maximum 1 hour, 24 hour and annual average concentrations (µg/m³)

Sensitive receptor	Maximum 1 hour average		Maximum 24 hour average		Annual average	
	Incremental	Cumulative	Incremental	Cumulative	Incremental	Cumulative
Criterion	570		228		60	
1	4	25	0.24	8	0.02	5
2	3	24	0.29	8	0.01	5
3	1	22	0.14	8	0.01	5
4	1	22	0.14	8	0.01	5
5	1	22	0.18	8	0.01	5
6	2	23	0.23	8	0.01	5
7	2	23	0.27	8	0.01	5
8	3	24	0.38	8	0.01	5
9	3	24	0.34	8	0.02	5
10	5	26	0.36	8	0.02	5
11	8	29	0.54	9	0.03	5
12	9	30	0.74	9	0.03	5
13	5	26	0.77	9	0.15	5
14	6	27	0.68	9	0.14	5
15	6	27	0.66	9	0.13	5
16	7	28	0.80	9	0.15	5
17	5	26	0.78	9	0.13	5
18	6	27	0.68	9	0.11	5
19	5	26	0.66	9	0.11	5
20	5	26	0.62	9	0.10	5
21	4	25	0.61	9	0.10	5
22	5	26	1.08	9	0.15	5
23	5	26	1.14	9	0.16	5
24	4	25	1.08	9	0.16	5
25	4	25	1.03	9	0.15	5
26	4	25	1.00	9	0.15	5
27	4	25	0.96	9	0.15	5
28	4	25	0.59	9	0.10	5
29	5	26	0.74	9	0.08	5
30	5	26	0.74	9	0.08	5
31	5	26	0.73	9	0.08	5
32	5	26	0.73	9	0.08	5
33	5	26	0.63	9	0.07	5
34	5	26	0.62	9	0.07	5
35	4	25	1.05	9	0.11	5
36	4	25	0.55	9	0.11	5

Dispersion modelling results for 1 hour maximum SO₂ ground level concentrations are presented as contours in Figure 7-4.



Legend

— Maximum 1 hour average SO₂ concentration

— Proposed plant boundary

Receptor within grid domain

● Sensitive receptor

CRITERIA

NEPM: 1 hour SO₂ criterion = 570 ug/m³

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Predicted emissions
Incremental maximum 1 hour SO₂ (ug/m³)



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FIGURE 7.4

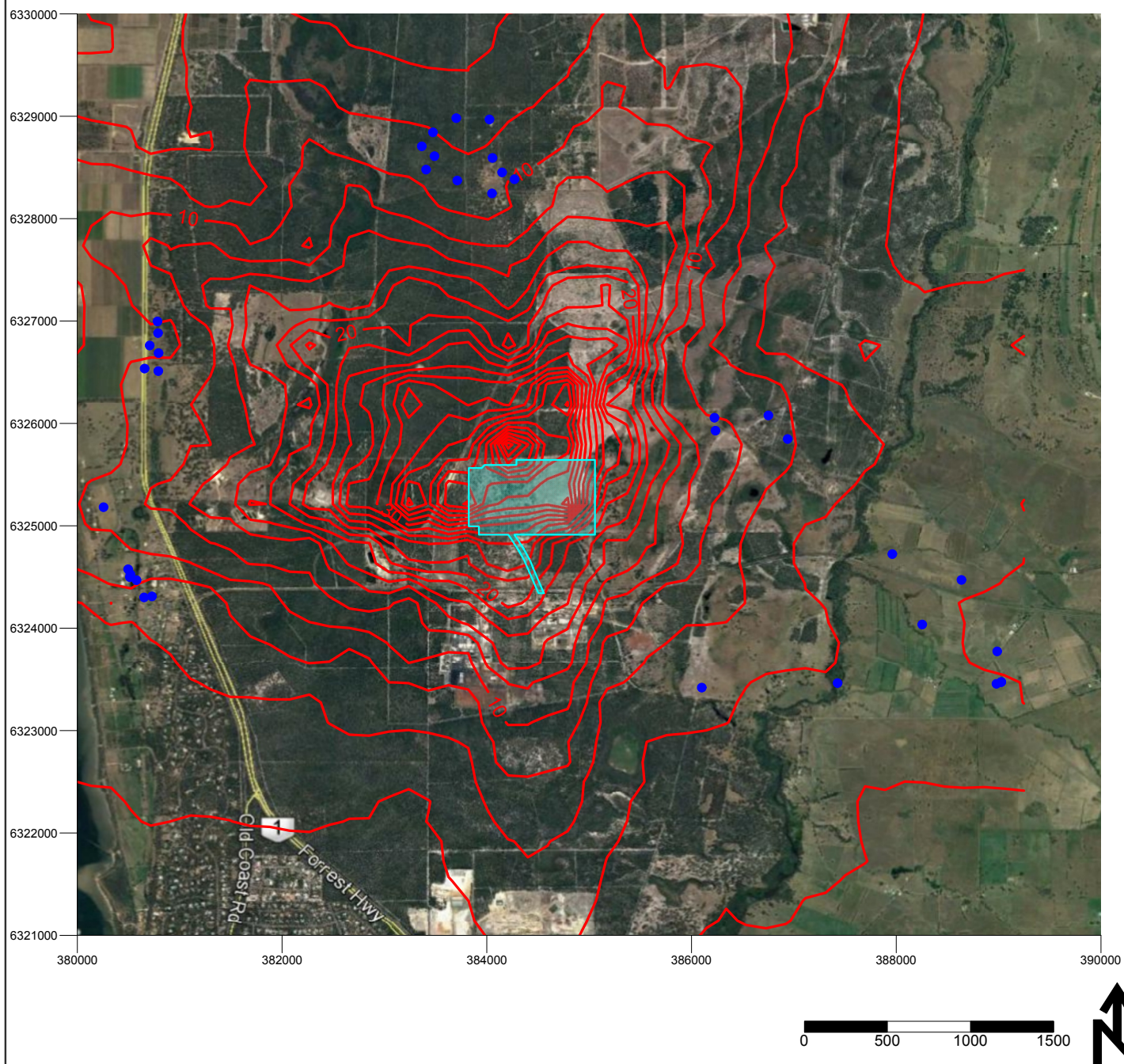
7.5 CO

Table 7-5 shows that the predicted 8 hour maximum CO ground level concentrations at the sensitive receptor locations, inclusive of a background of 575 µg/m³ measured at South Lake AQMS, are significantly below the assessed criterion.

Table 7-5 Predicted CO maximum 8 hour concentrations (µg/m³)

Sensitive receptor	8 hour average maximum	
	Incremental	Cumulative
Criteria	10,000	
1	5	580
2	4	579
3	2	577
4	2	577
5	2	577
6	2	577
7	2	577
8	3	578
9	6	581
10	6	581
11	8	583
12	9	584
13	11	586
14	9	584
15	8	583
16	8	583
17	10	585
18	10	585
19	9	584
20	9	584
21	8	583
22	11	586
23	11	586
24	10	585
25	9	584
26	9	584
27	11	586
28	7	582
29	10	585
30	9	584
31	9	584
32	8	583
33	7	582
34	7	582
35	11	586
36	7	582

Dispersion modelling results for 8 hour maximum CO ground level concentrations are presented as contours in Figure 7-5.



Legend

— Maximum 8 hour average CO concentration

— Proposed plant boundary

Receptor within grid domain

● Sensitive receptor

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NEPM: 8 hour CO criterion = 10,000 $\mu\text{g}/\text{m}^3$

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Predicted emissions
Incremental maximum 24-hour $\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$)

FIGURE 7.5

8. Discussion

The modelling results of this study indicate that predicted cumulative ground level concentrations at sensitive receptors are below the NEPM ambient air quality criteria.

An air dispersion modelling study of the KSIA (Environmental Alliances 2010) examined the NO₂ and SO₂ impacts from existing industry, approved future industry and numerous hypothetical future industries to represent future impacts. The predicted cumulative ground level concentrations were determined to meet NEPM criteria and therefore were within acceptable air quality limits.

By assuming the scenario predicted in (Environmental Alliances 2010) is representative of the current air shed at the KSIA, and the predicted air quality provided in this report, it is suggested that combined air emissions from existing land uses and this study will still be below the air quality criteria. The combined results are shown in Table 8-1.

Table 8-1

Predicted cumulative impact of the Albemarle Kemerton Plant (100,000 tpa) and a full suite of industry in the KSIA using Environmental Alliances modelling (2010)

Predicted pollutant	Criterion	Maximum 1 hour ground concentration level from Albemarle Kemerton Plant emissions µg/m ³ (Section 6.2.2)	Maximum 1 hour ground concentration level from hypothetical full KSIA scenario (Air Emissions, 2010) µg/m ³	Cumulative impact µg/m ³
NO ₂	246	12	71	83
SO ₂	572	9	169	178

9. Conclusion

This report has assessed the potential emissions of PM₁₀, PM_{2.5}, NO₂, SO₂ and CO concentrations associated with the proposed Albemarle Kemerton Plant.

Dispersion modelling with AERMOD was used to predict potential PM₁₀, PM_{2.5}, NO₂, SO₂ and CO impacts at nearby sensitive receptors.

The results presented in this air dispersion modelling study of the Plant indicate that predicted PM₁₀, PM_{2.5}, NO₂, SO₂ and CO concentrations at all receptors as a result of operation of the proposed Plant are within the assessment criteria.

Overall, the assessment shows that the Plant can operate without causing any significant air quality impact to identified sensitive receptors.

10. References

BOM (2016). *Climate statistics for Australian locations – Bunbury Automatic Weather Station*. Retrieved from <http://www.bom.gov.au/climate/data/>

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