EMRC Hazelmere Air Dispersion Modelling

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Prepared by:

Name: Miles Sowden
Title: Senior Atmospheric Scientist
Phone: +61 (08) 9225 0704
Email: msowden@environcorp.com
Signature: Date: 17/02/2014

Reviewed by:

Name: Brian Bell
Title: Principal, ENVIRON Australia
Phone: +61 (08) 9225 0702
Email: bbell@environcorp.com
Signature: Date: 17/02/2014

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1 Introduction

1.1 Background

EMRC Hazelmere are looking to construct a Waste to Energy processing facility at a site near Perth airport, Western Australia. Strategen requested that ENVIRON Australia Pty Ltd (ENVIRON) undertake an air dispersion modelling of the atmospheric emissions from two point sources associated with operations at the processing facility. This modelling considers the ground level concentrations arising from the emissions of sulphur dioxide (SO_2), oxides of nitrogen (NO_x), metals, volatile organic compounds (VOCs) and particulates. This report outlines the approach used in the air dispersion modelling and the results of the modelling. Strategen will review the predicted ground level concentrations and complete an assessment of their potential impacts.

2 Modelling Methodology

ENVIRON has completed the air dispersion modelling using the AERMOD air dispersion model. The AERMOD modelling only considers the emissions from the proposed EMRC Hazelmere Plant in isolation and does not take into account background pollutant levels as detailed emission inventories are not available for the other industries.

The American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) has been listed by the USEPA as a "recommended modelling system, and was specially designed to support its regulatory modelling programs. AERMOD is a current-generation air dispersion model that incorporates concepts such as planetary boundary layer (pbl) theory and advanced methods for handling complex terrain. AERMOD also incorporates the Plume Rise Model Enhancements (PRIME) building downwash algorithms, which provide a more realistic handling of downwash effects than previous approaches.

AERMOD is regularly used for assessing the potential air quality impacts of industrial facilities.

2.1 Meteorological Data

AERMOD requires both surface and upper air data to calculate the dispersion of emissions. Net radiation and mixing height data from The Air Pollution Model (TAPM), a prognostic meteorological model, was used to augment surface data from Perth airport from 2008 to 2012. Five years of meteorological data was used in the modelling assessment.

2.2 Model Parameterisation

The AERMOD modelling has been completed in the regulatory default mode. The proposed location and dimensions of buildings and other structures were used as input to the model to account for building wake effects. Site specific terrain elevation data, obtained from high resolution global coverage Digital Elevation Model (DEM) data (SRTM-90) in 3 arc seconds (approximately 90 m) resolution, were incorporated into AERMOD using the AERMAP terrain processor. A sample AERMOD input file is provided as Appendix A. It should be noted that a fixed emission rate of 1 g/s for each modelled source was used as input for the model. The model output was post-processed using the emissions information presented in Section 3.

2.3 Model Domains

A single model domain was used in AERMOD. This consisted of 51x51 grid cells of 100m resolution with a Bottom Left Coordinate of 403500 (mE) and 6466200 (mN). Three nearby houses were selected as nearby receptors as shown in Figure 1.

Figure 1: Sensitive Receptors

2.4 Source Parameters

Three scenarios were assessed: Normal operations, Reduced (half power) and Bypass under emergency conditions. The emission source parameters used as input to the modelling were based on information supplied by Strategen, and are presented in **Table 1**.

Table 1: Source Properties

Description	Height	Diameter	Flow rate	Temp	Velocity
Main stack	m AGL	m	Nm3/h	deg C	m/s
All engines on-line, SACTO[1] idle, kiln burner exhaust to stack	18.3	1.6	32,123	400	10.9
Half engines on-line, SACTO on-line, kiln burner exhaust to stack	18.3	1.6	33,020	400	11.2
Total plant outage, engines shutdown, kiln burners shut down, dirty syngas to SACTO	18.3	1.6	53,420	612	23.9
8x Gas Engines					
All engines on-line, SACTO idle, kiln burner exhaust to stack	2.8	0.85	13680	300	14.1
Half engines on-line, SACTO on-line, kiln burner exhaust to stack	2.8	0.85	6840	300	14.1

2.5 Sensitive Receptors

AERMOD was used to predict the GLC of pollutants across the entire modeled domain, as well as at the three sensitive receptor locations (houses) near the proposed site as shown in Figure 1.

2.6 Proposed EMRC Hazelmere Plant Emissions

The emission rates for point sources (i.e. stack and engine vents) used as inputs for the modelling were derived from information supplied by Strategen, and are summarised in **Table 2**.

[1] Staged Air Cyclonic Thermal Oxidiser (SACTO)

Table 2: Emission rates (g/s)

	Main stack - maximum values			Gas engines - maximum values		
Emissions	Normal operation	Reduced rate operation	Emergency bypass	Normal operation	Reduced rate operation	Emergency bypass
NOx	6.93E-02	1.74E-01	9.05E-01	1.93E+00	9.63E-01	0
SO_2	2.90E-02	7.43E-02	1.51E-01	9.47E-02	4.73E-02	0
CO	7.60E-02	1.95E-01	4.15E-01	2.97E+00	1.49E+00	0
total VOC	8.19E-03	2.08E-02	4.00E-02	6.19E-02	3.09E-02	0
HCl	1.51E-04	3.86E-04	2.10E-02	4.92E-04	2.46E-04	0
HF	5.08E-05	1.30E-04	3.94E-04	1.66E-04	8.31E-05	0
Hg	8.05E-08	2.07E-07	5.61E-06	2.63E-07	1.32E-07	0
Cd	4.20E-08	1.08E-07	2.20E-04	1.37E-07	6.87E-08	0
Tl	9.05E-08	2.32E-07	1.89E-04	2.96E-07	1.48E-07	0
Sb	5.37E-09	1.38E-08	3.74E-06	1.75E-08	8.77E-09	0
As	4.89E-06	1.25E-05	3.41E-03	1.60E-05	7.99E-06	0
Cr	1.16E-07	2.97E-07	6.06E-04	3.79E-07	1.89E-07	0
Co	7.16E-11	1.84E-10	3.74E-07	2.34E-10	1.17E-10	0
Cu	1.45E-07	3.71E-07	7.57E-04	4.73E-07	2.37E-07	0
Pb	7.24E-08	1.86E-07	3.79E-04	2.37E-07	1.18E-07	0
Mn	1.43E-13	3.67E-13	7.48E-10	4.68E-13	2.34E-13	0
Ni	9.05E-08	2.32E-07	1.89E-04	2.96E-07	1.48E-07	0
V	3.58E-10	9.18E-10	3.74E-07	1.17E-09	5.85E-10	0
Particulate	9.40E-03	3.61E-03	3.32E-01	7.22E-03	3.61E-03	0
Dioxins	6.74E-12	1.74E-11	2.88E-11	2.20E-11	1.10E-11	0

3 Modelling Results

The ground level concentration (GLC) results of the AERMOD modelling are summarized for the three scenarios in **Table 3** to **Table 14** and GLC isopleths are given in **Figure 2** to **Figure** 237.

Table 3: Normal Operations - Maximum Hourly Ground Level Concentration

	R1	R2	R3
As	4.34E-04	5.51E-04	4.74E-04
Cd	3.49E-06	4.43E-06	3.81E-06
Co	6.35E-09	8.06E-09	6.93E-09
CO	7.58E+01	1.00E+02	8.52E+01
Cr	1.03E-05	1.31E-05	1.12E-05
Cu	1.28E-05	1.63E-05	1.40E-05
Dioxins	5.97E-10	7.58E-10	6.52E-10
HCl	1.33E-02	1.69E-02	1.46E-02
HF	4.50E-03	5.72E-03	4.92E-03
Hg	7.09E-06	9.01E-06	7.75E-06
Mn	1.27E-11	1.61E-11	1.39E-11
Ni	8.03E-06	1.02E-05	8.77E-06
NO_X	4.93E+01	6.50E+01	5.53E+01
Pb	6.42E-06	8.15E-06	7.01E-06
Particulates	2.77E-01	2.85E-01	2.44E-01
Sb	4.75E-07	6.03E-07	5.18E-07
SO_2	2.57E+00	3.26E+00	2.80E+00
Ti	8.03E-06	1.02E-05	8.77E-06
V	3.17E-08	4.03E-08	3.47E-08
VOC	1.62E+00	2.10E+00	1.80E+00

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 4: Reduced Operations - Maximum Hourly Ground Level Concentration

	R1	R2	R3
As	3.35E-04	3.31E-04	2.86E-04
Cd	2.71E-06	2.67E-06	2.31E-06
Co	4.92E-09	4.85E-09	4.19E-09
CO	3.88E+01	5.05E+01	4.32E+01
Cr	7.94E-06	7.83E-06	6.76E-06
Cu	9.94E-06	9.81E-06	8.47E-06
Dioxin	4.64E-10	4.57E-10	3.95E-10
HCl	1.03E-02	1.02E-02	8.80E-03
HF	3.49E-03	3.44E-03	2.97E-03
Hg	5.49E-06	5.41E-06	4.67E-06
Mn	9.83E-12	9.69E-12	8.37E-12
Ni	6.21E-06	6.13E-06	5.29E-06
NO_X	2.54E+01	3.29E+01	2.81E+01
Pb	4.97E-06	4.90E-06	4.24E-06
PM	1.24E-01	1.35E-01	1.15E-01
Sb	3.69E-07	3.63E-07	3.14E-07
SO_2	1.99E+00	1.96E+00	1.69E+00
Ti	6.21E-06	6.13E-06	5.29E-06
V	2.46E-08	2.42E-08	2.09E-08
VOC	9.27E-01	1.09E+00	9.54E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 5: Bypass Operations - Maximum Hourly Ground Level Concentration

	R1	R2	R3
As	4.57E-02	4.24E-02	3.63E-02
Cd	2.87E-03	2.67E-03	2.28E-03
Co	5.01E-06	4.65E-06	3.98E-06
CO	5.56E+00	5.16E+00	4.41E+00
Cr	8.12E-03	7.53E-03	6.45E-03
Cu	1.01E-02	9.41E-03	8.05E-03
Dioxin	3.86E-10	3.58E-10	3.06E-10
HCl	2.81E-03	2.61E-03	2.23E-03
HF	5.28E-03	4.90E-03	4.19E-03
Hg	7.55E-05	7.00E-05	5.99E-05
Mn	1.00E-08	9.30E-09	7.96E-09
Ni	2.54E-03	2.35E-03	2.01E-03
NO_X	1.21E+01	1.13E+01	9.63E+00
Pb	5.07E-03	4.70E-03	4.03E-03
Particulates	4.46E+00	4.13E+00	3.54E+00
Sb	5.01E-05	4.65E-05	3.98E-05
SO_2	2.03E+00	1.88E+00	1.61E+00
Ti	2.53E-03	2.35E-03	2.01E-03
V	5.01E-06	4.65E-06	3.98E-06
VOC	5.36E-01	4.97E-01	4.26E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 6: Normal Operations - Maximum 8-Hour Ground Level Concentration

	R1	R2	R3
As	3.07E-04	3.77E-04	3.06E-04
Cd	2.46E-06	3.02E-06	2.45E-06
Co	4.49E-09	5.51E-09	4.47E-09
CO	5.04E+01	6.44E+01	5.58E+01
Cr	7.27E-06	8.92E-06	7.24E-06
Cu	9.07E-06	1.11E-05	9.04E-06
Dioxin	4.22E-10	5.18E-10	4.20E-10
HCl	9.43E-03	1.16E-02	9.40E-03
HF	3.18E-03	3.91E-03	3.17E-03
Hg	5.01E-06	6.16E-06	5.00E-06
Mn	8.97E-12	1.10E-11	8.94E-12
Ni	5.67E-06	6.97E-06	5.65E-06
NO_X	3.28E+01	4.19E+01	3.62E+01
Pb	4.54E-06	5.57E-06	4.52E-06
Particulates	1.95E-01	2.18E-01	1.85E-01
Sb	3.36E-07	4.12E-07	3.34E-07
SO_2	1.82E+00	2.23E+00	1.81E+00
Ti	5.67E-06	6.97E-06	5.65E-06
V	2.24E-08	2.75E-08	2.24E-08
VOC	1.10E+00	1.39E+00	1.17E+00

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 7: Reduced Operations - Maximum 8-Hour Ground Level Concentration

	R1	R2	R3
As	2.33E-04	2.55E-04	2.18E-04
Cd	1.88E-06	2.06E-06	1.76E-06
Co	3.42E-09	3.74E-09	3.20E-09
CO	2.64E+01	3.33E+01	2.81E+01
Cr	5.52E-06	6.04E-06	5.17E-06
Cu	6.91E-06	7.56E-06	6.47E-06
Dioxin	3.22E-10	3.52E-10	3.02E-10
HCl	7.18E-03	7.85E-03	6.72E-03
HF	2.42E-03	2.65E-03	2.27E-03
Hg	3.81E-06	4.17E-06	3.57E-06
Mn	6.83E-12	7.47E-12	6.39E-12
Ni	4.32E-06	4.72E-06	4.04E-06
NO_X	1.75E+01	2.19E+01	1.83E+01
Pb	3.45E-06	3.78E-06	3.24E-06
Particulates	8.91E-02	1.02E-01	8.52E-02
Sb	2.56E-07	2.80E-07	2.40E-07
SO_2	1.38E+00	1.51E+00	1.29E+00
Ti	4.32E-06	4.72E-06	4.04E-06
V	1.71E-08	1.87E-08	1.60E-08
VOC	6.82E-01	8.03E-01	6.63E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 8: Bypass Operations - Maximum 8-Hour Ground Level Concentration

	R1	R2	R3
As	2.70E-02	3.06E-02	2.61E-02
Cd	1.70E-03	1.93E-03	1.64E-03
Co	2.96E-06	3.36E-06	2.86E-06
CO	3.29E+00	3.73E+00	3.17E+00
Cr	4.80E-03	5.45E-03	4.64E-03
Cu	6.00E-03	6.80E-03	5.79E-03
Dioxin	2.28E-10	2.59E-10	2.20E-10
HCl	1.66E-03	1.89E-03	1.61E-03
HF	3.12E-03	3.54E-03	3.01E-03
Hg	4.46E-05	5.06E-05	4.31E-05
Mn	5.92E-09	6.72E-09	5.72E-09
Ni	1.50E-03	1.70E-03	1.45E-03
NO_X	7.17E+00	8.14E+00	6.93E+00
Pb	3.00E-03	3.40E-03	2.89E-03
Particulates	2.63E+00	2.99E+00	2.54E+00
Sb	2.96E-05	3.36E-05	2.86E-05
SO_2	1.20E+00	1.36E+00	1.16E+00
Ti	1.50E-03	1.70E-03	1.45E-03
V	2.96E-06	3.36E-06	2.86E-06
VOC	3.17E-01	3.60E-01	3.06E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 9: Normal Operations - Maximum Daily Ground Level Concentration

	R1	R2	R3
As	1.61E-04	2.02E-04	1.67E-04
Cd	1.29E-06	1.63E-06	1.34E-06
Co	2.35E-09	2.96E-09	2.45E-09
CO	2.53E+01	3.40E+01	2.78E+01
Cr	3.81E-06	4.79E-06	3.96E-06
Cu	4.76E-06	5.98E-06	4.95E-06
Dioxin	2.21E-10	2.78E-10	2.30E-10
HCl	4.95E-03	6.22E-03	5.15E-03
HF	1.67E-03	2.10E-03	1.74E-03
Hg	2.63E-06	3.31E-06	2.73E-06
Mn	4.70E-12	5.92E-12	4.89E-12
Ni	2.98E-06	3.74E-06	3.09E-06
NO_X	1.65E+01	2.22E+01	1.81E+01
Pb	2.38E-06	3.00E-06	2.48E-06
Particulates	1.12E-01	1.28E-01	1.04E-01
Sb	1.76E-07	2.21E-07	1.83E-07
SO_2	9.52E-01	1.20E+00	9.90E-01
Ti	2.98E-06	3.74E-06	3.09E-06
V	1.18E-08	1.48E-08	1.22E-08
VOC	5.64E-01	7.37E-01	6.05E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 10: Reduced Operations - Maximum Daily Ground Level Concentration

	R1	R2	R3
As	1.35E-04	1.54E-04	1.25E-04
Cd	1.09E-06	1.24E-06	1.01E-06
Co	1.99E-09	2.25E-09	1.84E-09
CO	1.35E+01	1.77E+01	1.45E+01
Cr	3.21E-06	3.64E-06	2.97E-06
Cu	4.01E-06	4.56E-06	3.72E-06
Dioxin	1.87E-10	2.13E-10	1.73E-10
HCl	4.17E-03	4.73E-03	3.86E-03
HF	1.41E-03	1.60E-03	1.30E-03
Hg	2.22E-06	2.51E-06	2.05E-06
Mn	3.97E-12	4.50E-12	3.67E-12
Ni	2.51E-06	2.85E-06	2.32E-06
NO_X	9.03E+00	1.17E+01	9.60E+00
Pb	2.01E-06	2.28E-06	1.86E-06
Particulates	5.00E-02	5.78E-02	4.76E-02
Sb	1.49E-07	1.69E-07	1.38E-07
SO_2	8.03E-01	9.11E-01	7.43E-01
Ti	2.51E-06	2.85E-06	2.32E-06
V	9.92E-09	1.13E-08	9.19E-09
VOC	3.73E-01	4.42E-01	3.68E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 11: Bypass Operations - Maximum Daily Ground Level Concentration

	R1	R2	R3
As	1.86E-02	1.97E-02	1.72E-02
Cd	1.17E-03	1.24E-03	1.08E-03
Co	2.04E-06	2.16E-06	1.89E-06
CO	2.27E+00	2.39E+00	2.10E+00
Cr	3.31E-03	3.49E-03	3.06E-03
Cu	4.14E-03	4.37E-03	3.83E-03
Dioxin	1.57E-10	1.66E-10	1.46E-10
HCl	1.15E-03	1.21E-03	1.06E-03
HF	2.15E-03	2.27E-03	1.99E-03
Hg	3.08E-05	3.25E-05	2.85E-05
Mn	4.09E-09	4.31E-09	3.78E-09
Ni	1.03E-03	1.09E-03	9.57E-04
NO_X	4.95E+00	5.22E+00	4.58E+00
Pb	2.07E-03	2.18E-03	1.91E-03
Particulates	1.82E+00	1.92E+00	1.68E+00
Sb	2.04E-05	2.16E-05	1.89E-05
SO_2	8.28E-01	8.73E-01	7.66E-01
Ti	1.03E-03	1.09E-03	9.56E-04
V	2.04E-06	2.16E-06	1.89E-06
VOC	2.19E-01	2.31E-01	2.02E-01

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 12: Normal Operations – Annual Average Ground Level Concentration

	R1	R2	R3
As	1.88E-05	2.18E-05	1.77E-05
Cd	1.51E-07	1.76E-07	1.42E-07
Co	2.70E-10	3.20E-10	2.60E-10
CO	3.07E+00	3.66E+00	2.94E+00
Cr	4.40E-07	5.20E-07	4.20E-07
Cu	5.50E-07	6.50E-07	5.20E-07
Dioxin	2.58E-11	3.00E-11	2.43E-11
HCl	5.77E-04	6.72E-04	5.43E-04
HF	1.95E-04	2.27E-04	1.83E-04
Hg	3.06E-07	3.57E-07	2.89E-07
Mn	5.50E-13	6.40E-13	5.20E-13
Ni	3.47E-07	4.04E-07	3.27E-07
NO_X	2.00E+00	2.38E+00	1.91E+00
Pb	2.77E-07	3.23E-07	2.61E-07
Particulates	1.20E-02	1.33E-02	1.09E-02
Sb	2.05E-08	2.39E-08	1.93E-08
SO_2	1.11E-01	1.29E-01	1.05E-01
Ti	3.50E-07	4.00E-07	3.30E-07
V	1.37E-09	1.60E-09	1.29E-09
VOC	6.72E-02	7.94E-02	6.39E-02

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 13: Reduced Operations – Annual Average Ground Level Concentration

	R1	R2	R3
As	1.44E-05	1.57E-05	1.29E-05
Cd	1.16E-07	1.27E-07	1.05E-07
Co	2.10E-10	2.30E-10	1.90E-10
CO	1.61E+00	1.91E+00	1.53E+00
Cr	3.40E-07	3.70E-07	3.10E-07
Cu	4.30E-07	4.60E-07	3.80E-07
Dioxin	1.99E-11	2.17E-11	1.79E-11
HCl	4.43E-04	4.83E-04	3.99E-04
HF	1.49E-04	1.63E-04	1.35E-04
Hg	2.35E-07	2.57E-07	2.12E-07
Mn	4.20E-13	4.60E-13	3.80E-13
Ni	2.66E-07	2.91E-07	2.40E-07
NO_X	1.07E+00	1.26E+00	1.01E+00
Pb	2.13E-07	2.32E-07	1.92E-07
Particulates	5.48E-03	6.11E-03	5.01E-03
Sb	1.58E-08	1.72E-08	1.42E-08
SO_2	8.52E-02	9.29E-02	7.67E-02
Ti	2.70E-07	2.90E-07	2.40E-07
V	1.05E-09	1.15E-09	9.50E-10
VOC	4.19E-02	4.76E-02	3.88E-02

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

Table 14: Bypass Operations – Annual Average Ground Level Concentration

	R1	R2	R3
As	1.69E-03	1.62E-03	1.40E-03
Cd	1.07E-04	1.02E-04	8.80E-05
Co	1.86E-07	1.77E-07	1.53E-07
CO	2.06E-01	1.97E-01	1.70E-01
Cr	3.01E-04	2.87E-04	2.49E-04
Cu	3.76E-04	3.59E-04	3.11E-04
Dioxin	1.43E-11	1.37E-11	1.18E-11
HCl	1.04E-04	9.96E-05	8.62E-05
HF	1.96E-04	1.87E-04	1.62E-04
Hg	2.80E-06	2.67E-06	2.31E-06
Mn	3.72E-10	3.55E-10	3.07E-10
Ni	9.41E-05	8.98E-05	7.76E-05
NO_X	4.50E-01	4.29E-01	3.71E-01
Pb	1.88E-04	1.79E-04	1.55E-04
Particulates	1.65E-01	1.58E-01	1.36E-01
Sb	1.86E-06	1.77E-06	1.53E-06
SO_2	7.52E-02	7.18E-02	6.21E-02
Ti	9.39E-05	8.96E-05	7.75E-05
V	1.86E-07	1.77E-07	1.53E-07
VOC	1.99E-02	1.90E-02	1.64E-02

Units:

ug/m3: CO, NO_x, PM, SO_2, VOC
ng/m3: As, Cd, Cr, Cu, HCl, HF, Pb, Ti
pg/m3: Co, Hg, Ni, Sb, V
fg/m3: Dioxins, Mn

4 Summary and Conclusions

Air dispersion modelling has been completed to predict the potential ground level concentrations associated with emissions from the proposed EMRC Hazelmere Plant. The AERMOD modelling has been completed in the regulatory default mode for a tracer gas of unit emission. The AERMOD modelling accounts for the emissions from the proposed EMRC Hazelmere Plant in isolation, and does not take into account background pollutant levels from existing industry in the region. This study has only reported on the modelling results in isolation and has not compared the predicted results to applicable guidelines and standards.

As with any air dispersion modelling, there are areas of uncertainty in this assessment. To ensure that the potential air quality impacts associated with the proposed EMRC Hazelmere Plant are not under-estimated, conservative assumptions have been used to characterise emissions and the ground level impacts where possible.

5 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to Strategen dated 24th October 2013 and in accordance with our understanding and interpretation of current regulatory standards.

The results presented in this report represent ENVIRON's professional judgment based on information made available during the course of this assignment and are true and correct to the best of ENVIRON's knowledge as at the date of the assessment.

ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to ENVIRON was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

Appendix A

Sample AERMOD Input File

```
**
**************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 8.2.0
** Lakes Environmental Software Inc.
** Date: 12/11/2013
** File: Aermod.ADI
**
**************************************
**
**
**************************************
** AERMOD Control Pathway
**************************************
**
**
CO STARTING
   TITLEONE Normal Operations
   TITLETWO  EMRC Hazelmere WTE: Scenario1: Normal Operations CO
   MODELOPT DFAULT CONC NOWARN
   AVERTIME 1 8 24 ANNUAL
   POLLUTID CO
   RUNORNOT RUN
   ERRORFIL Aermod.err
CO FINISHED
**
**************************************
** AERMOD Source Pathway
**************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION MAIN         POINT      406006.000  6468722.929       15.350
** DESCRSRC Main
   LOCATION GTE          POINT      406002.000  6468737.000       14.910
** DESCRSRC GTE
** Source Parameters **
   SRCPARAM MAIN            0.0760    18.300   673.000  10.90000     1.600
   SRCPARAM GTE             2.9735     7.000   573.000  14.10000     0.850

** Building Downwash **
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT MAIN             2.80     2.80     2.80     2.80     2.80     2.80

   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80
   BUILDHGT GTE              2.80     2.80     2.80     2.80     2.80     2.80

   BUILDWID MAIN            12.16    12.25    12.04    12.25    12.09    11.57
   BUILDWID MAIN            10.69     9.49     8.00     6.27     4.34     5.10
   BUILDWID MAIN             4.75     6.64     8.33     9.76    10.90    11.71
   BUILDWID MAIN            12.16    12.25    12.04    12.25    12.09    11.57
   BUILDWID MAIN            10.69     9.49     8.00     6.27     4.34     5.10
   BUILDWID MAIN             4.75     6.64     8.33     9.76    10.90    11.71

   BUILDWID GTE             18.70    19.10    19.04    15.62    17.51    18.86
   BUILDWID GTE             19.65    19.84    19.42    18.41    16.85    15.23
   BUILDWID GTE             17.21    18.67    19.56    19.86    19.55    18.65
   BUILDWID GTE             17.18    15.19    13.25    15.62    17.51    18.86
   BUILDWID GTE             19.65    19.84    19.42    18.41    16.85    15.23
   BUILDWID GTE             17.21    18.67    11.81    14.24    16.24    17.74

   BUILDLEN MAIN             6.27     4.34     2.71     4.75     6.64     8.33
   BUILDLEN MAIN             9.76    10.90    11.71    12.16    12.25    19.04
   BUILDLEN MAIN            12.25    12.09    11.57    10.69     9.49     8.00
   BUILDLEN MAIN             6.27     4.34     2.71     4.75     6.64     8.33
   BUILDLEN MAIN             9.76    10.90    11.71    12.16    12.25    19.04
   BUILDLEN MAIN            12.25    12.09    11.57    10.69     9.49     8.00

   BUILDLEN GTE             11.00     8.01     5.10    17.21    18.67    19.56
   BUILDLEN GTE             19.86    19.55    18.65    17.18    15.19    13.25
   BUILDLEN GTE             15.62    17.51    18.86    19.65    19.84    19.42
   BUILDLEN GTE             18.41    16.85    15.23    17.21    18.67    19.56
   BUILDLEN GTE             19.86    19.55    18.65    17.18    15.19    13.25
   BUILDLEN GTE             15.62    17.51    18.88    17.66    15.90    13.66

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   XBADJ    MAIN            -4.55    -4.33    -3.97    -3.49    -2.91    -9.28
   XBADJ    MAIN            -1.97    -1.61    -1.19    -0.74    -0.26     0.22
   XBADJ    MAIN             0.70     1.15     1.35    -0.36    -2.05    -3.69
   XBADJ    MAIN            -5.21    -6.58    -7.74    -8.67    -9.34    -9.76
   XBADJ    MAIN           -10.28   -10.49   -10.38    -9.95    -9.23    -8.22
```

```
   XBADJ    GTE            -20.12   -17.35   -14.26    -8.47    -9.27    -9.79
   XBADJ    GTE            -10.02    -9.94    -9.56    -8.89    -7.95    -7.02
   XBADJ    GTE             -8.23    -9.19    -9.88   -10.26   -10.33   -10.09
   XBADJ    GTE             -9.54    -8.70    -7.83    -8.75    -9.40    -9.77
   XBADJ    GTE             -9.84    -9.61    -9.09    -8.29    -7.25    -6.23
   XBADJ    GTE             -7.38    -8.31   -24.56   -24.54   -23.78   -22.29

   YBADJ    MAIN            -2.59    -3.21    -3.74    -4.15    -4.44    -4.59
   YBADJ    MAIN            -4.61    -4.48    -4.22    -3.83    -3.32    -1.52
   YBADJ    MAIN            -2.02    -1.27    -0.48     0.33     1.12     1.89
   YBADJ    MAIN             2.59     3.21     3.74     4.15     4.44     4.59
   YBADJ    MAIN             4.61     4.48     4.22     3.83     3.32     1.52
   YBADJ    MAIN             2.02     1.27     0.48    -0.33    -1.12    -1.89

   YBADJ    GTE             -5.70    -8.36   -10.74     0.42     0.44     0.45
   YBADJ    GTE              0.44     0.42     0.38     0.33     0.28     0.21
   YBADJ    GTE              0.14     0.06    -0.01    -0.09    -0.17    -0.24
   YBADJ    GTE             -0.30    -0.35    -0.39    -0.42    -0.44    -0.45
   YBADJ    GTE             -0.44    -0.42    -0.38    -0.33    -0.28    -0.21
   YBADJ    GTE             -0.14    -0.06     5.79     2.96     0.05    -2.87

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RE FINISHED
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** AERMOD Meteorology Pathway
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   PROFFILE ..\..\Perth.PFL
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   UAIRDATA 1 2007
   SITEDATA 1 2007
   PROFBASE 10.0 METERS
ME FINISHED
**
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** AERMOD Output Pathway
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   RECTABLE 1 1ST
   RECTABLE 8 1ST
   RECTABLE 24 1ST
** Auto-Generated Plotfiles
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   PLOTFILE 8 ALL 1ST 08H1GALL.PLT 32
   PLOTFILE 24 ALL 1ST 24H1GALL.PLT 33
   PLOTFILE ANNUAL ALL AN00GALL.PLT 34
   SUMMFILE Aermod.sum
OU FINISHED
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** Project Parameters
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** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
** ZONE     -50
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Appendix B

Figures

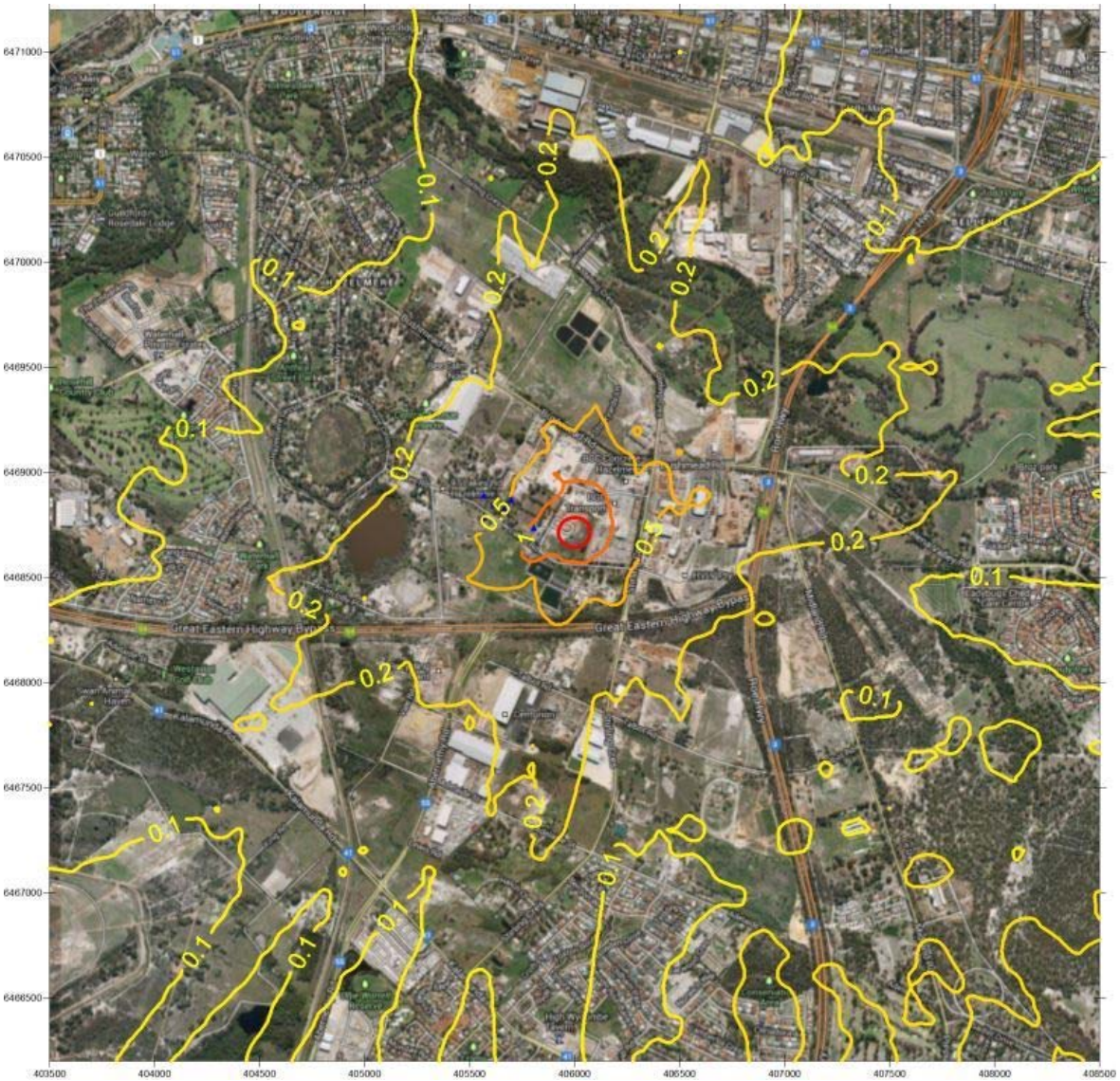

Figure 2: Normal Operations - GLC As (ng/m³) Maximum Hourly

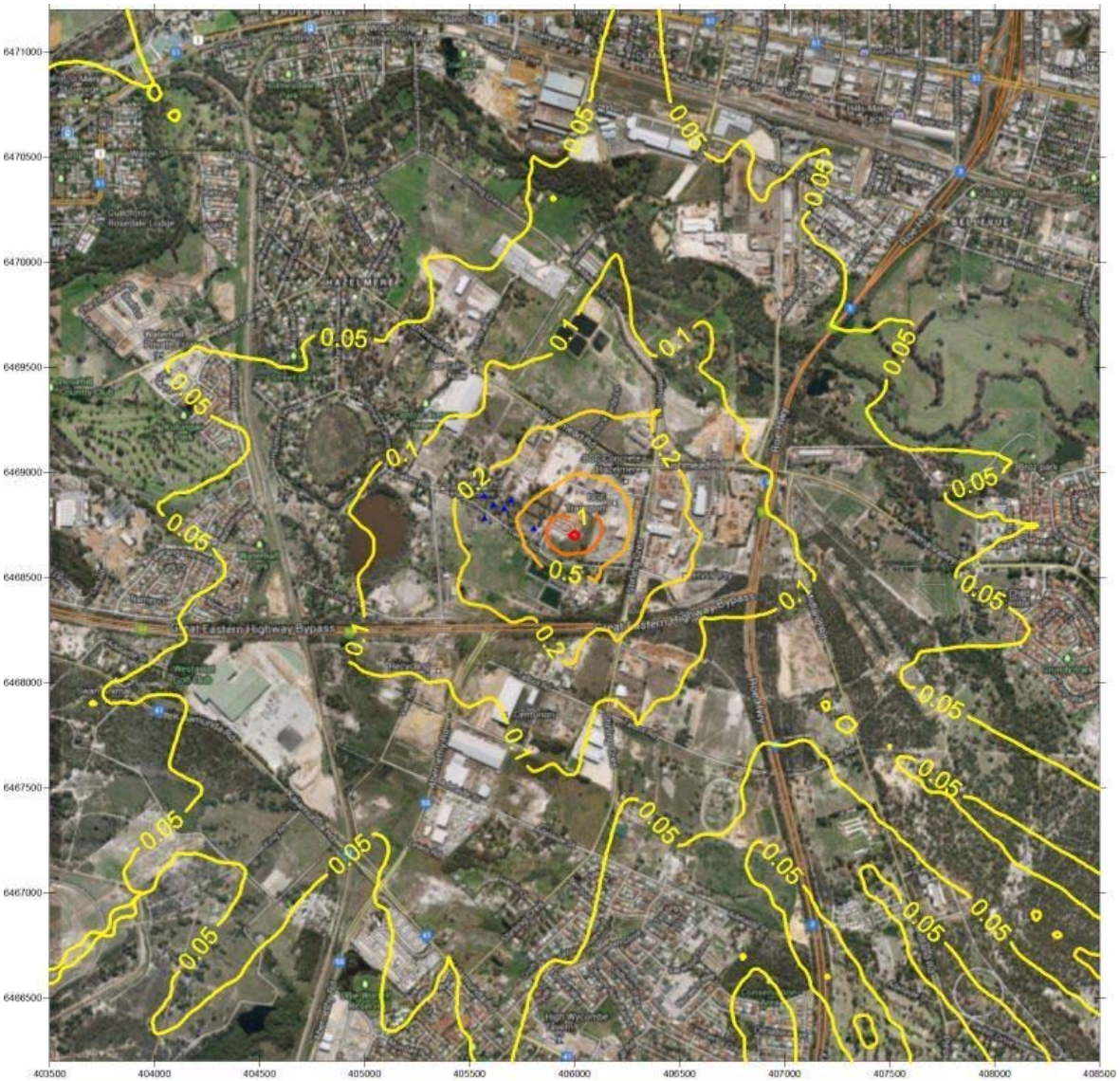

Figure 3: Normal Operations - GLC As (ng/m³) Maximum 8-Hourly

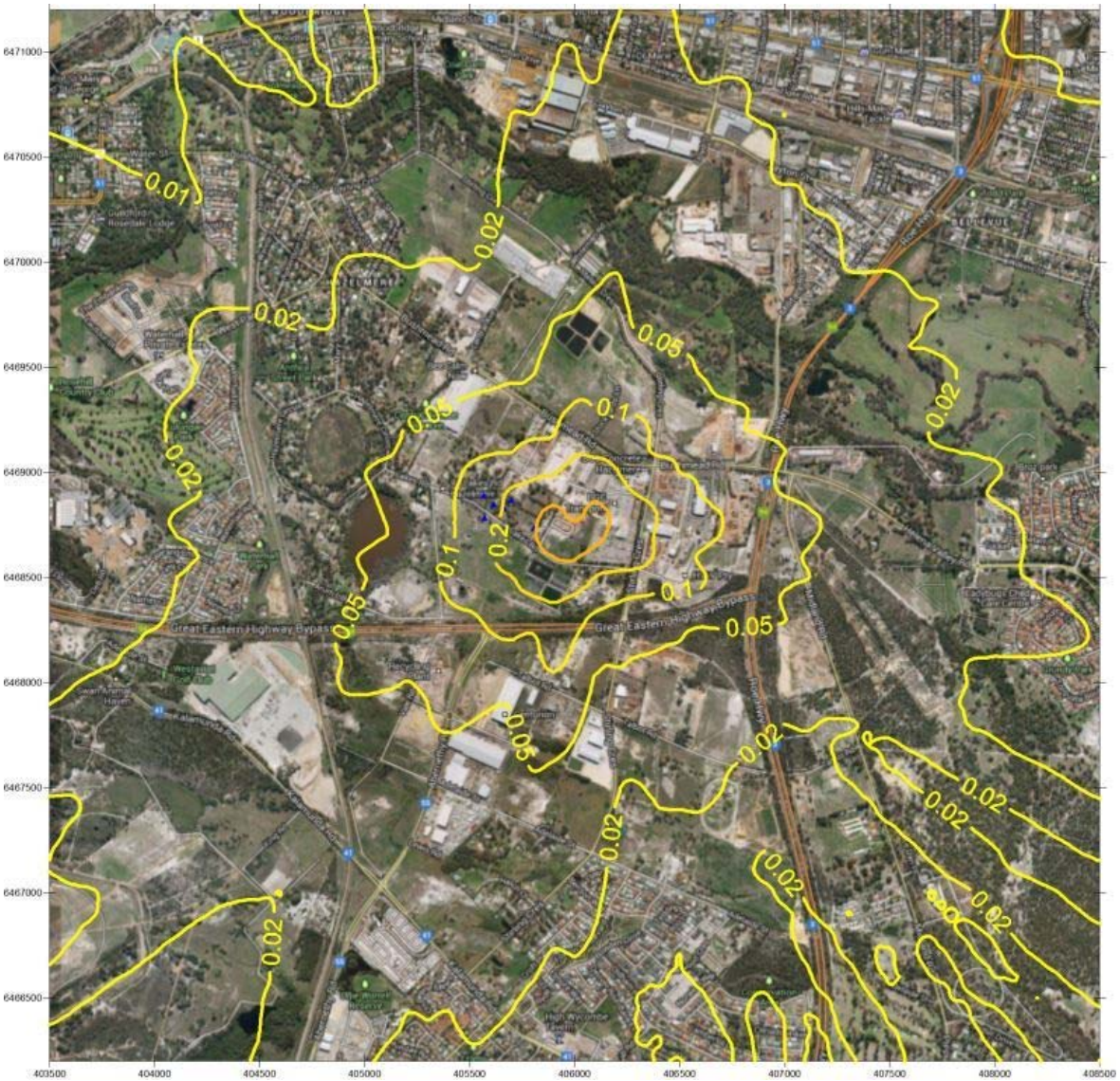

Figure 4: Normal Operations - GLC As (ng/m³) Maximum Daily

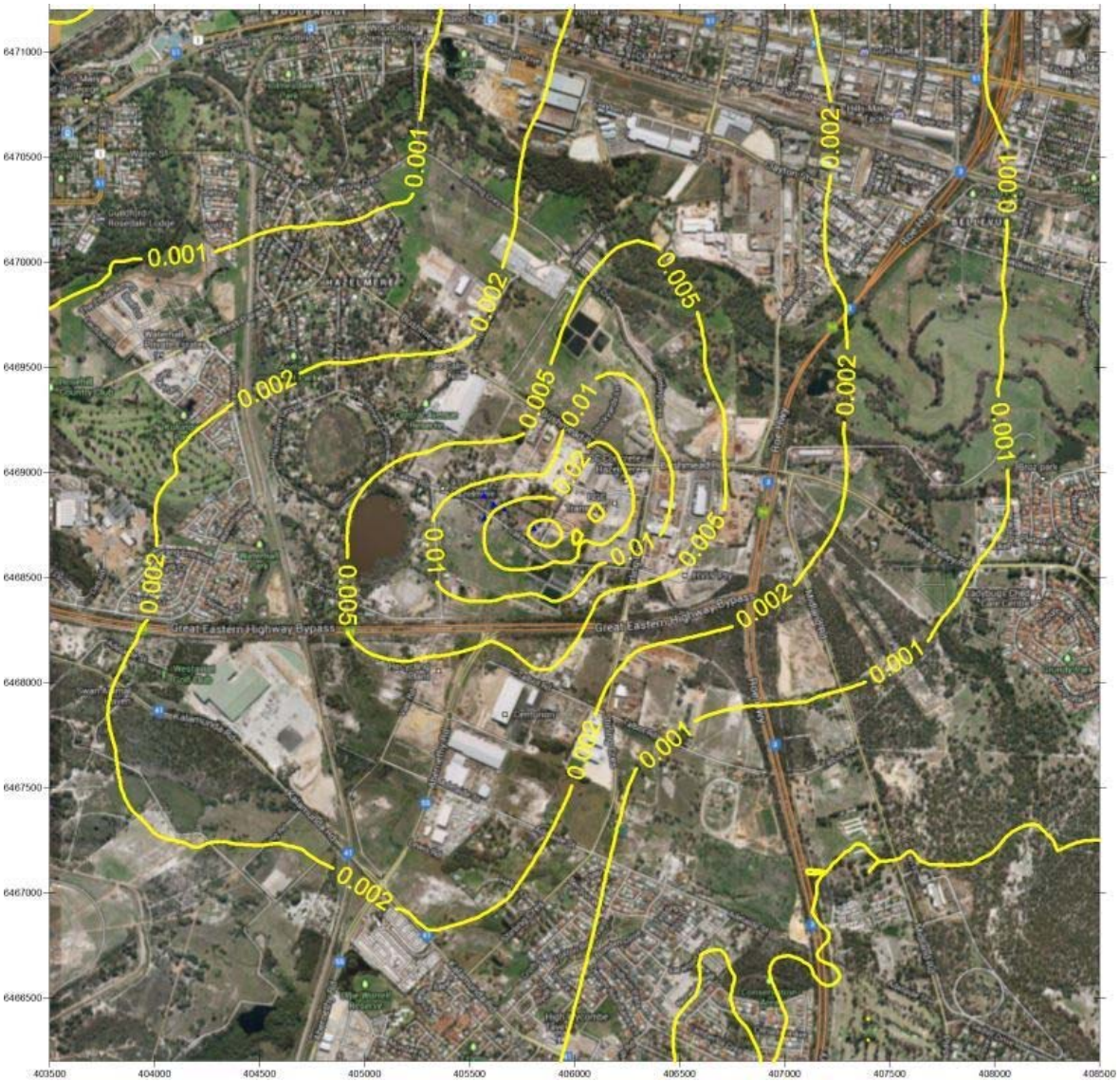

Figure 5: Normal Operations - GLC As (ng/m³) Annual average

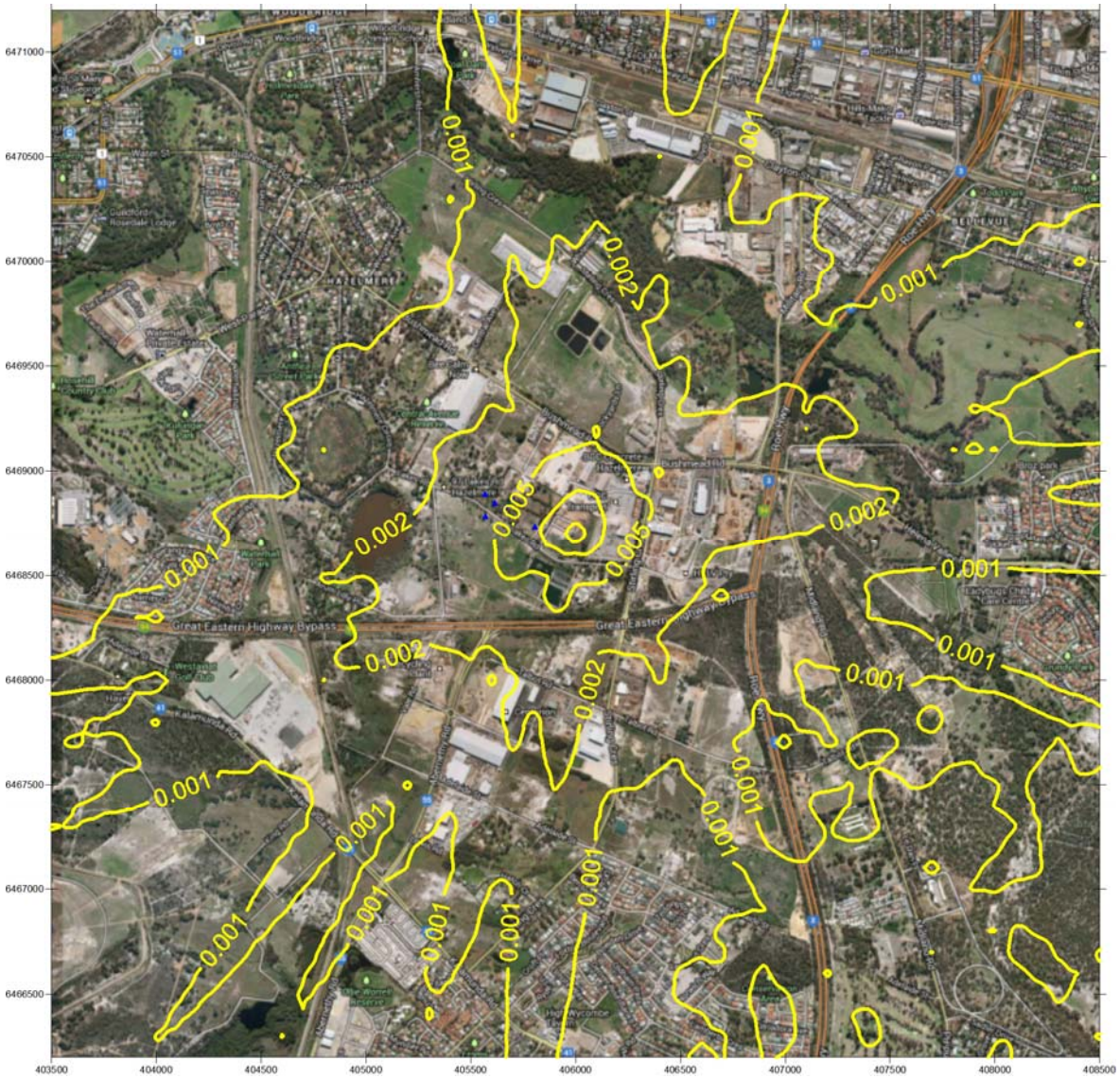

Figure 6: Normal Operations - GLC Cd (ng/m³) Maximum Hourly

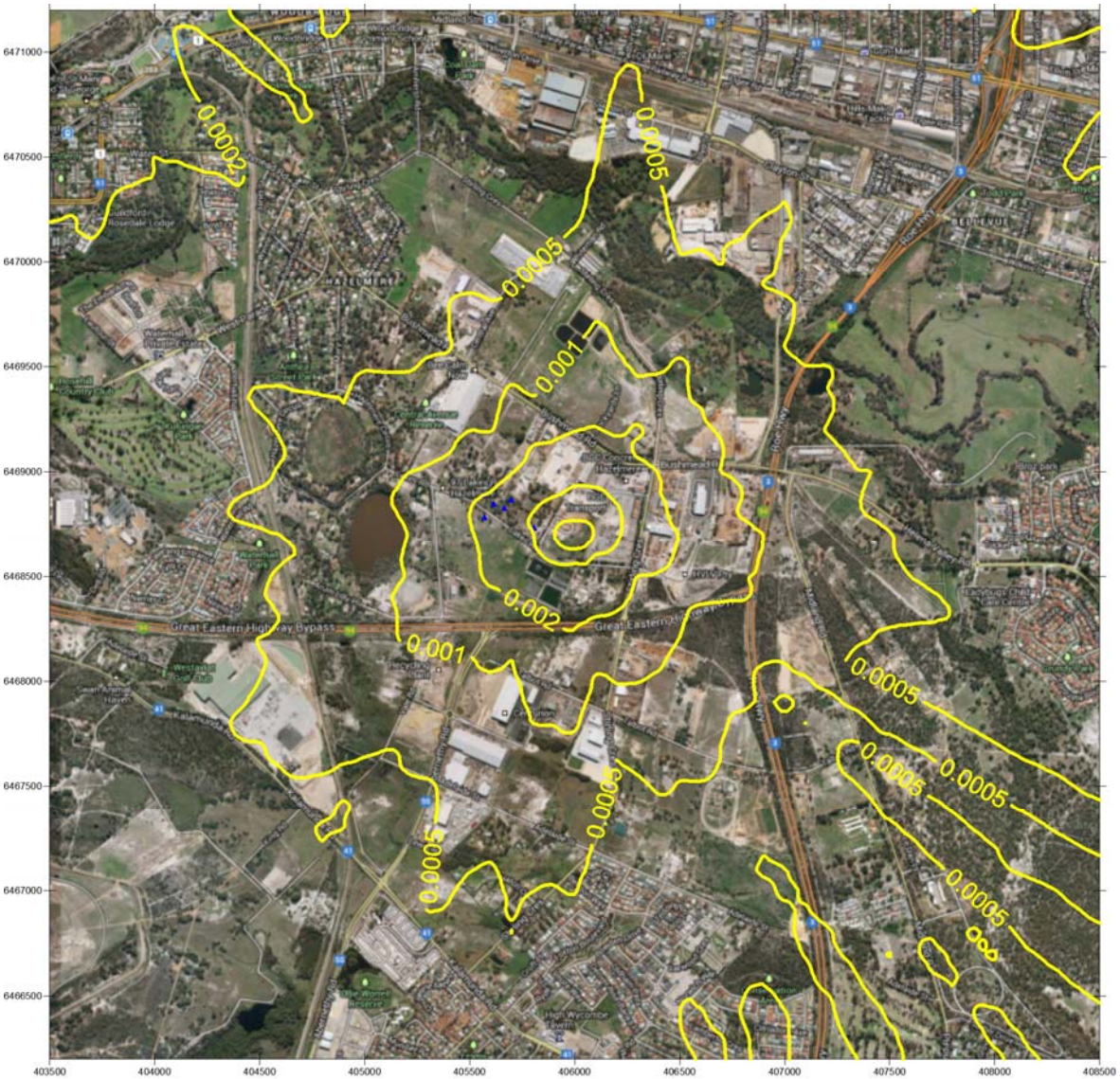

Figure 7: Normal Operations - GLC Cd (ng/m³) Maximum 8-Hourly

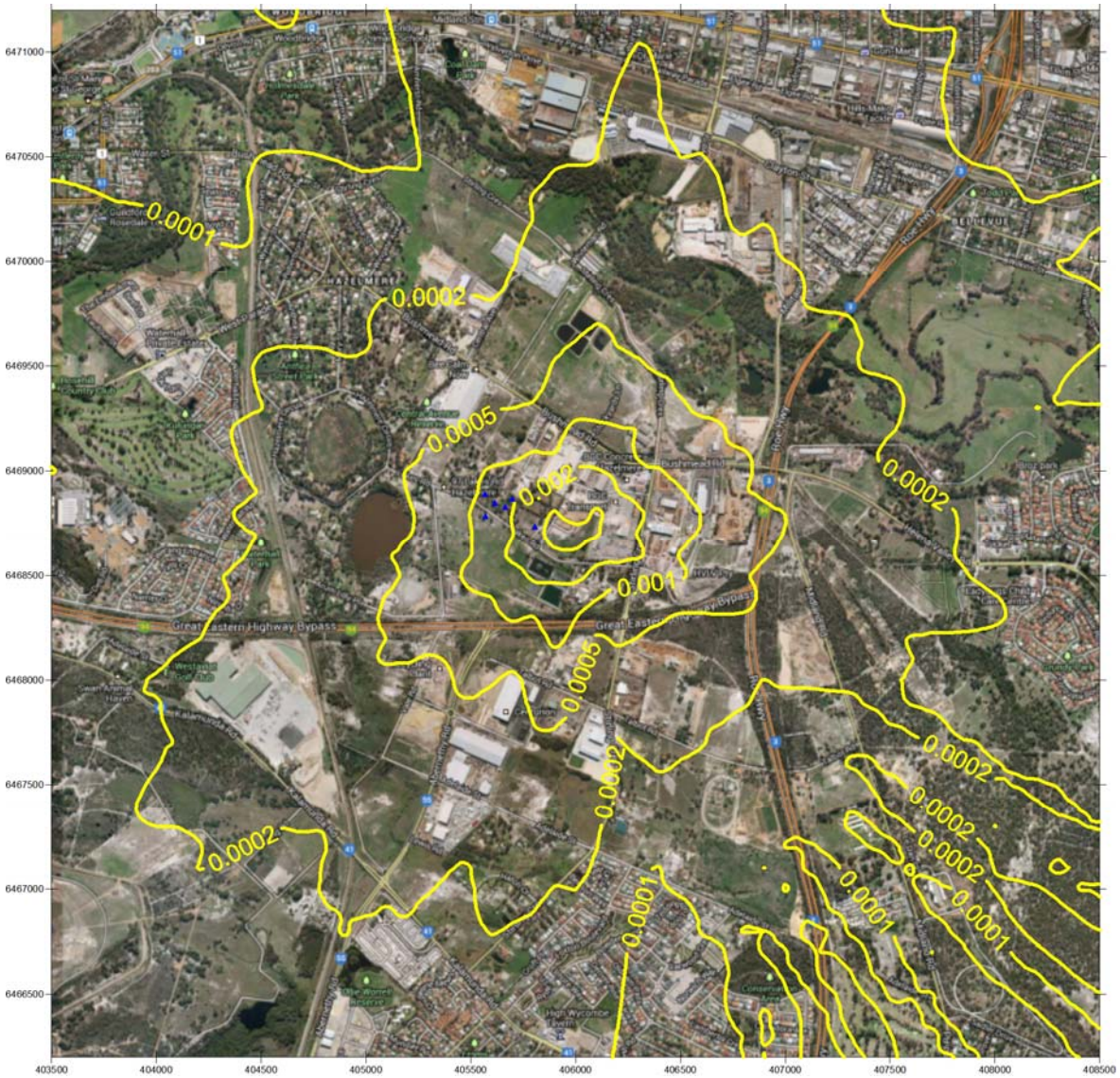

Figure 8: Normal Operations - GLC Cd (ng/m³) Maximum Daily

Figure 9: Normal Operations - GLC Cd (ng/m³) Annual average

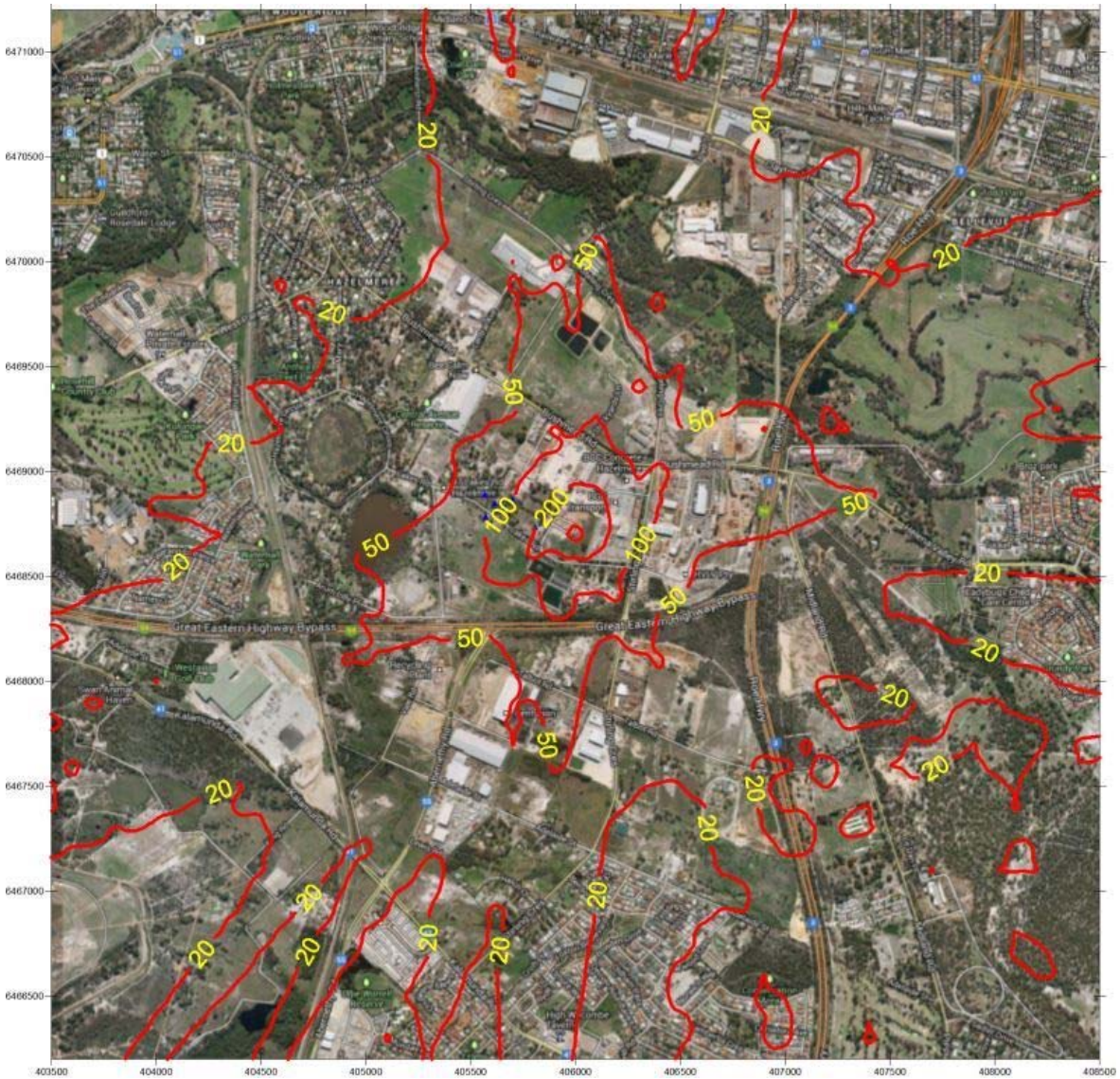

Figure 10: Normal Operations - GLC CO (µg/m³) Maximum Hourly

Figure 11: Normal Operations - GLC CO (µg/m³) Maximum 8-Hourly

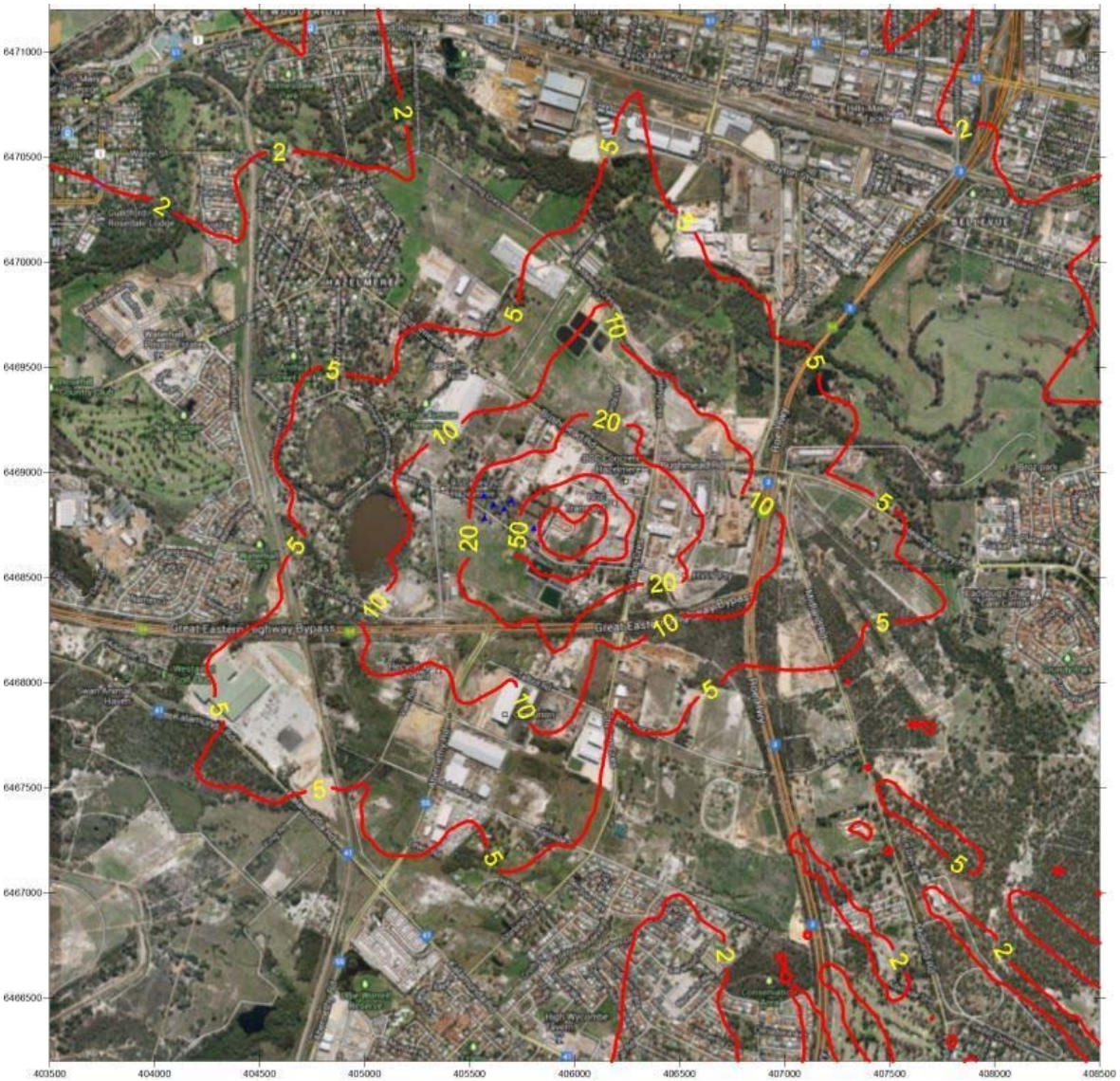

Figure 12: Normal Operations - GLC CO (µg/m³) Maximum Daily

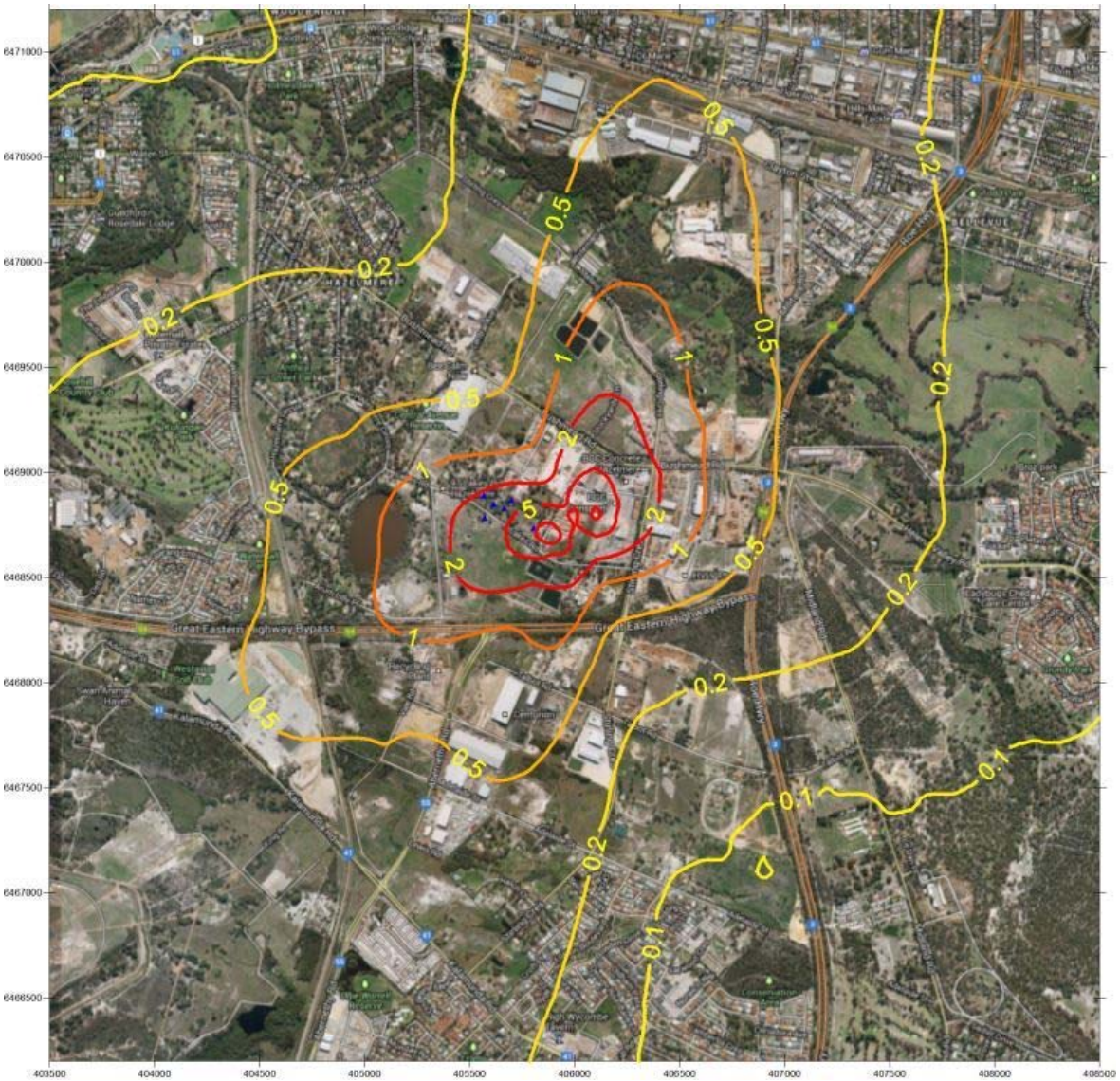

Figure 13: Normal Operations - GLC CO (µg/m³) Annual average

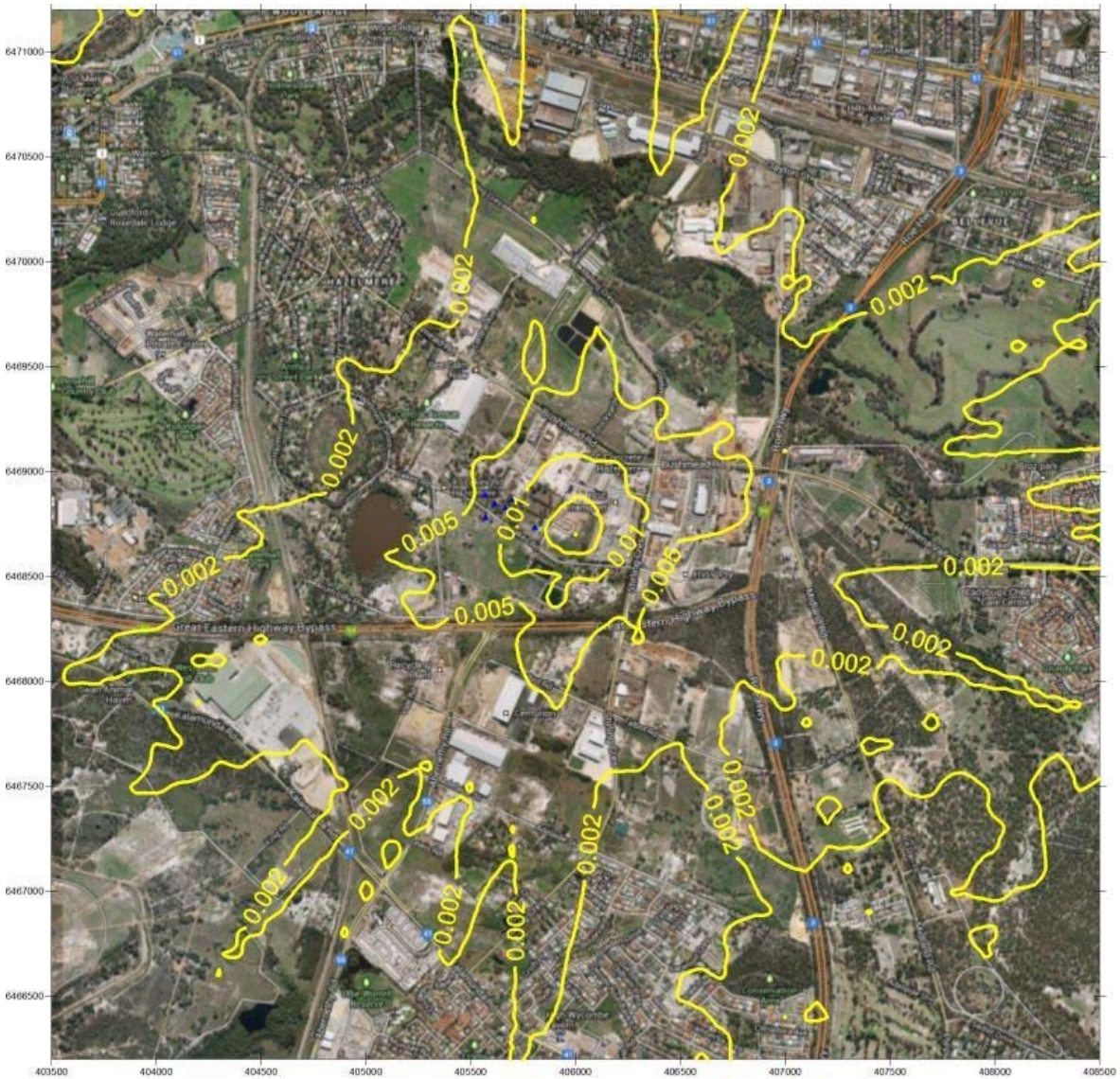

Figure 14: Normal Operations - GLC Co (ρg/m³) Maximum Hourly

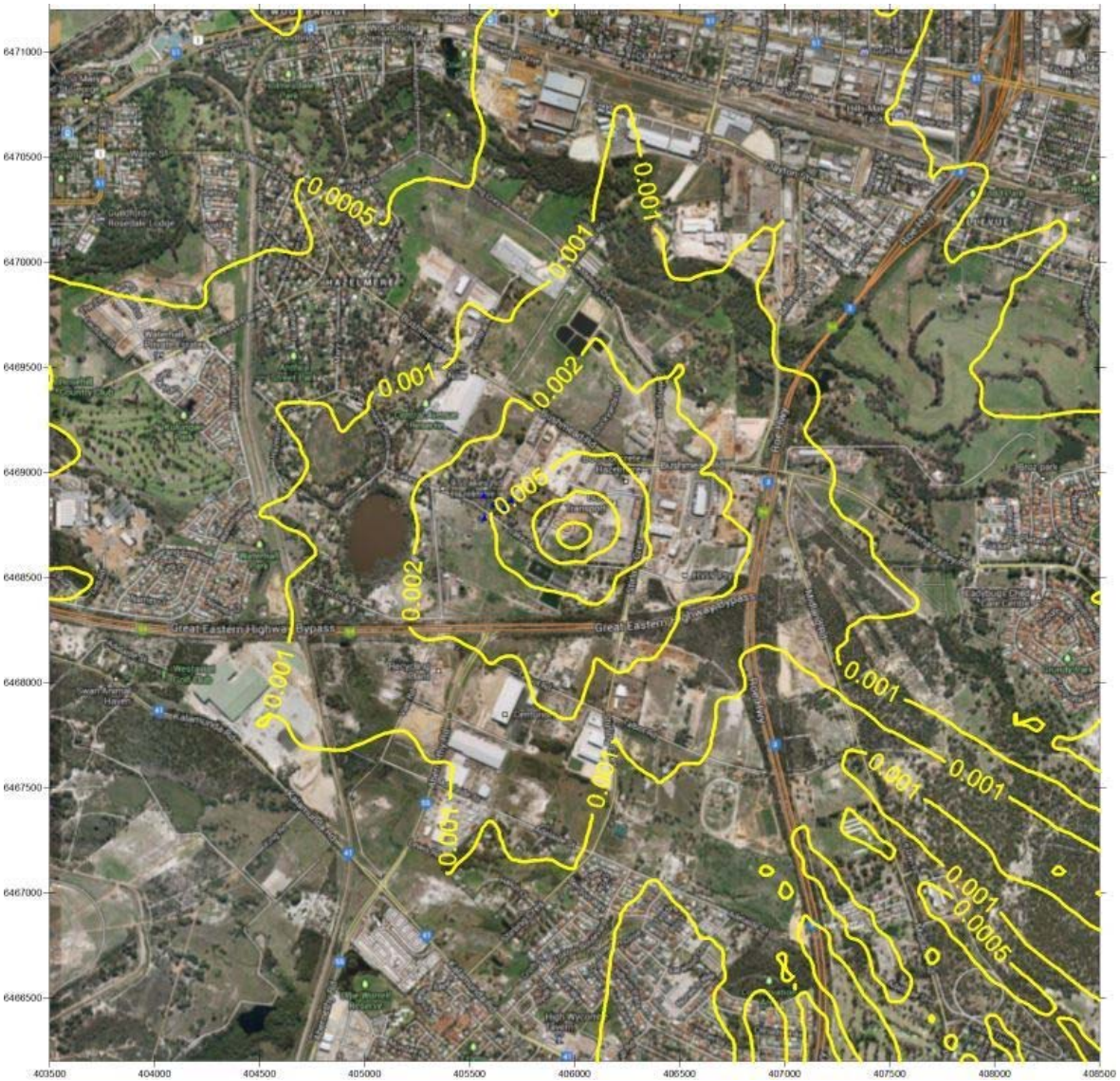

Figure 15: Normal Operations - GLC Co (ρg/m³) Maximum 8-Hourly

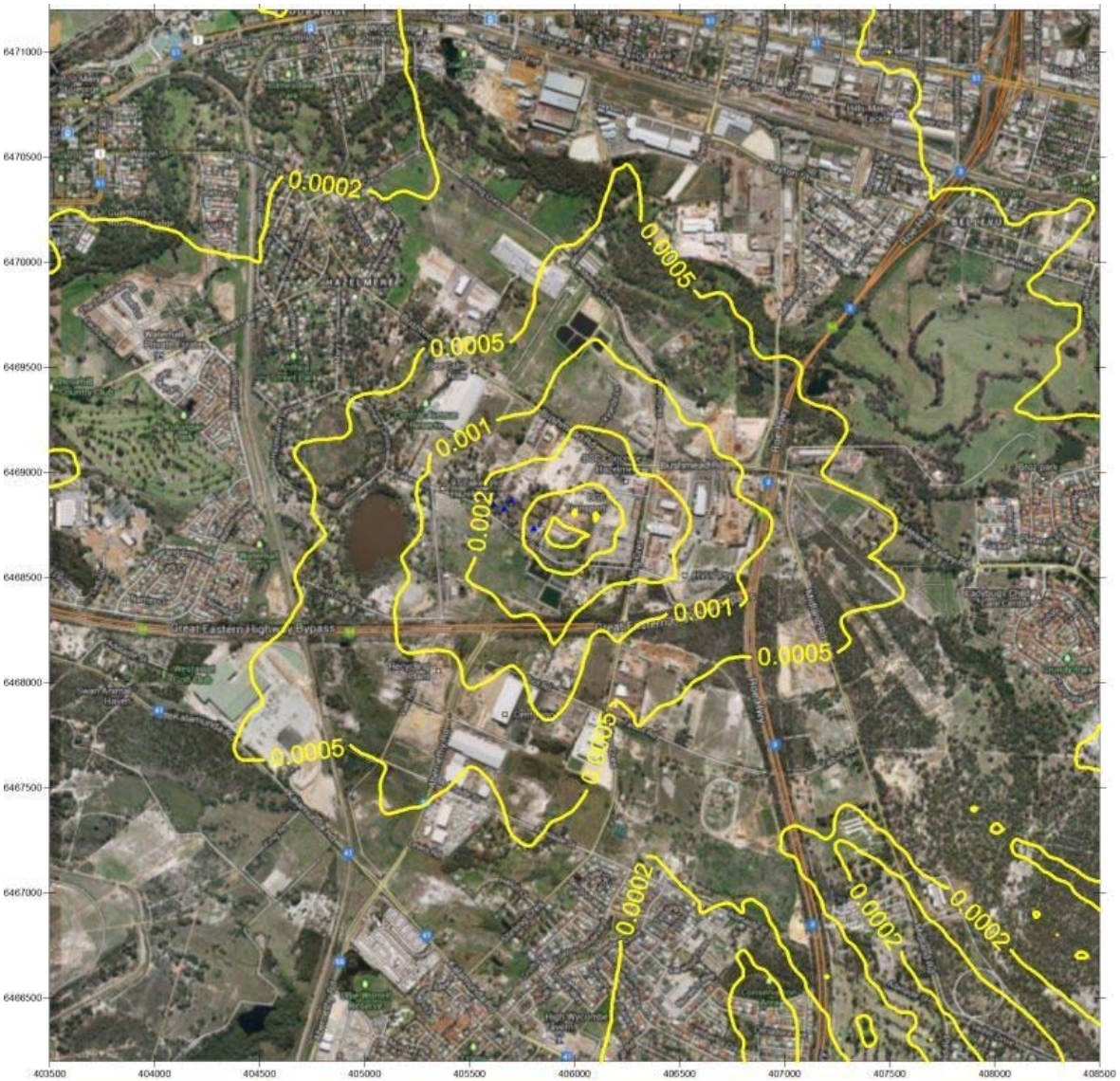

Figure 16: Normal Operations - GLC Co (ρg/m³) Maximum Daily

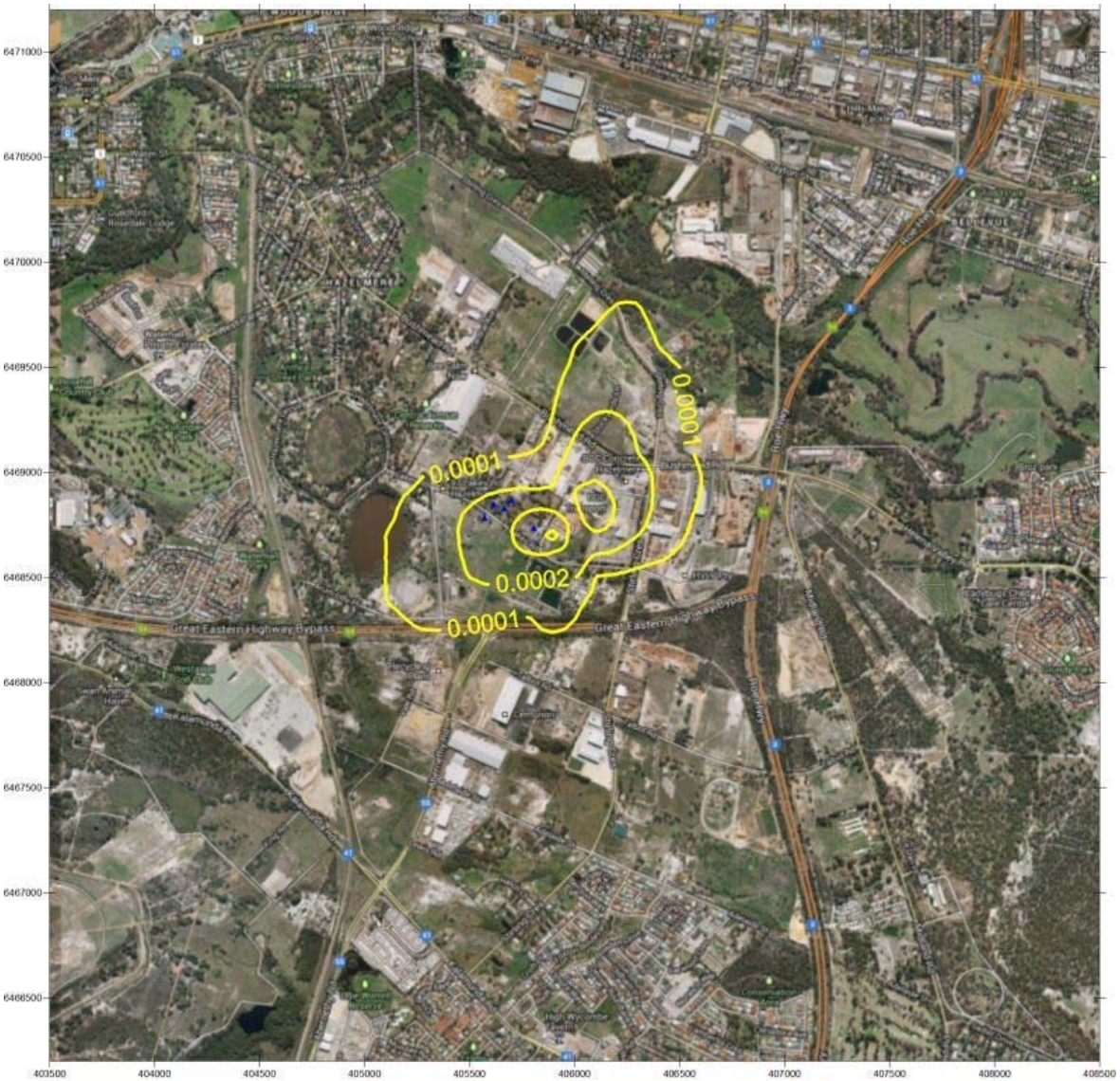

Figure 17: Normal Operations - GLC Co (ρg/m³) Annual average

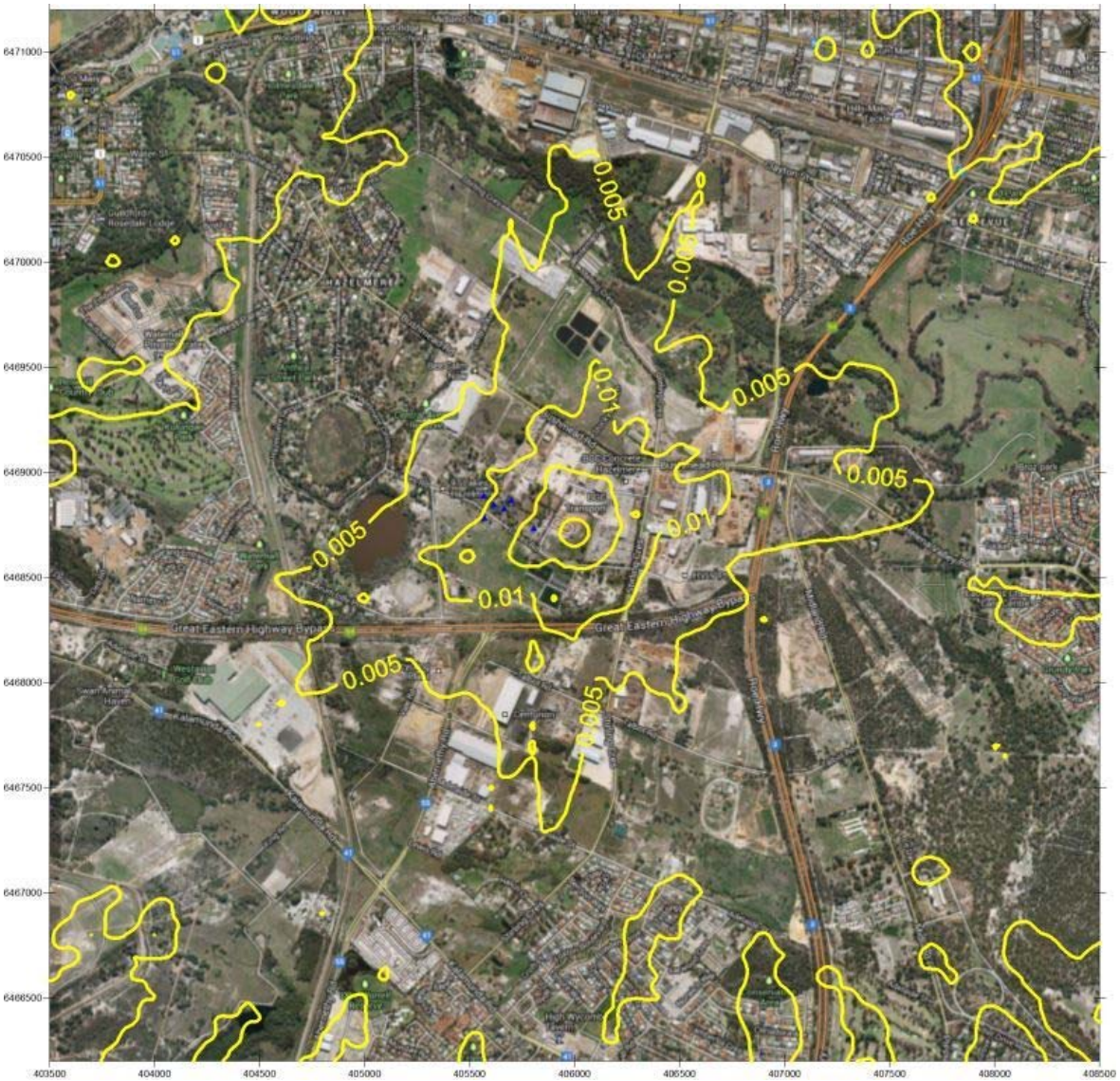

Figure 18: Normal Operations - GLC Cr (ng/m³) Maximum Hourly

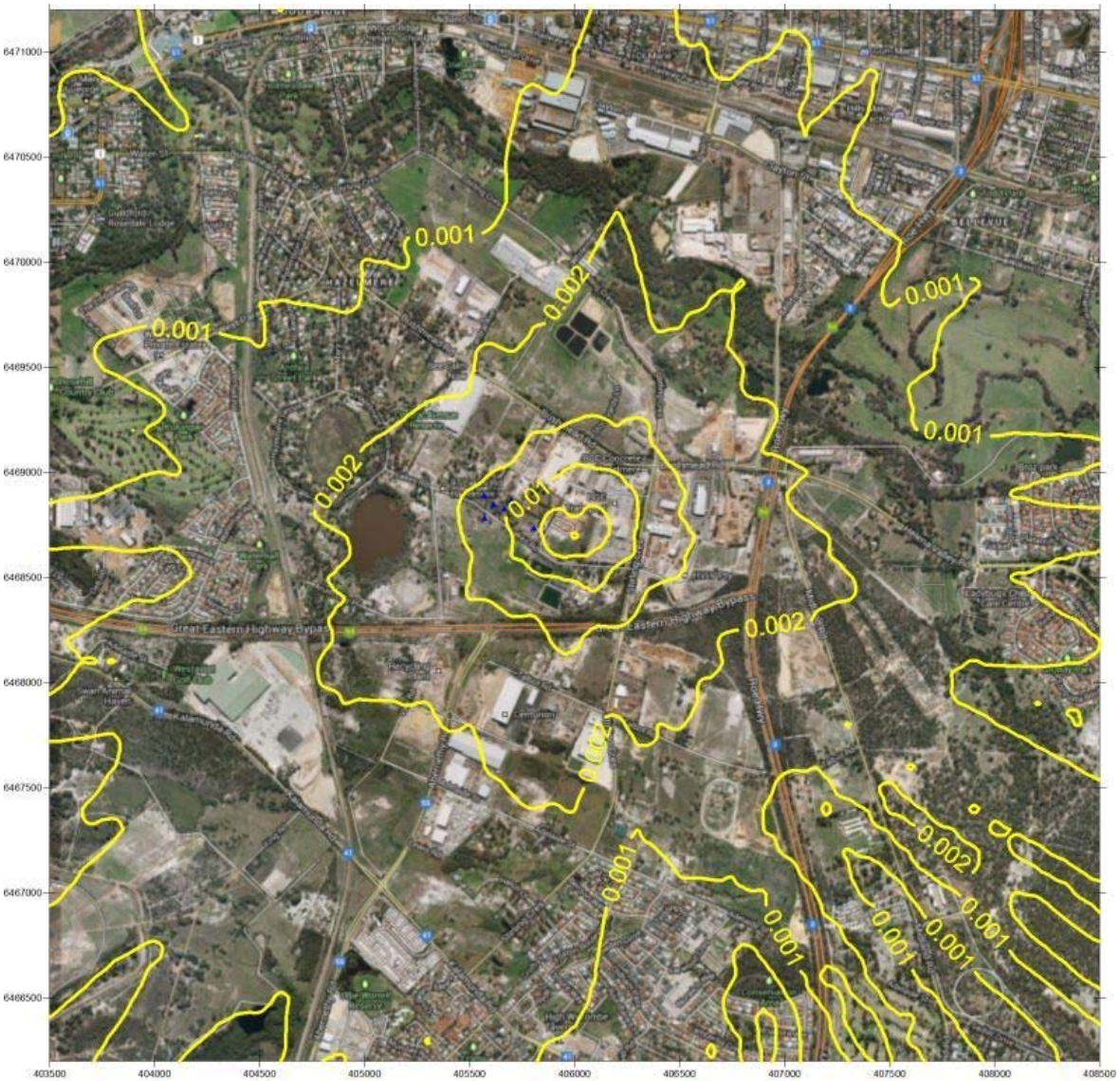

Figure 19: Normal Operations - GLC Cr (ng/m³) Maximum 8-Hourly

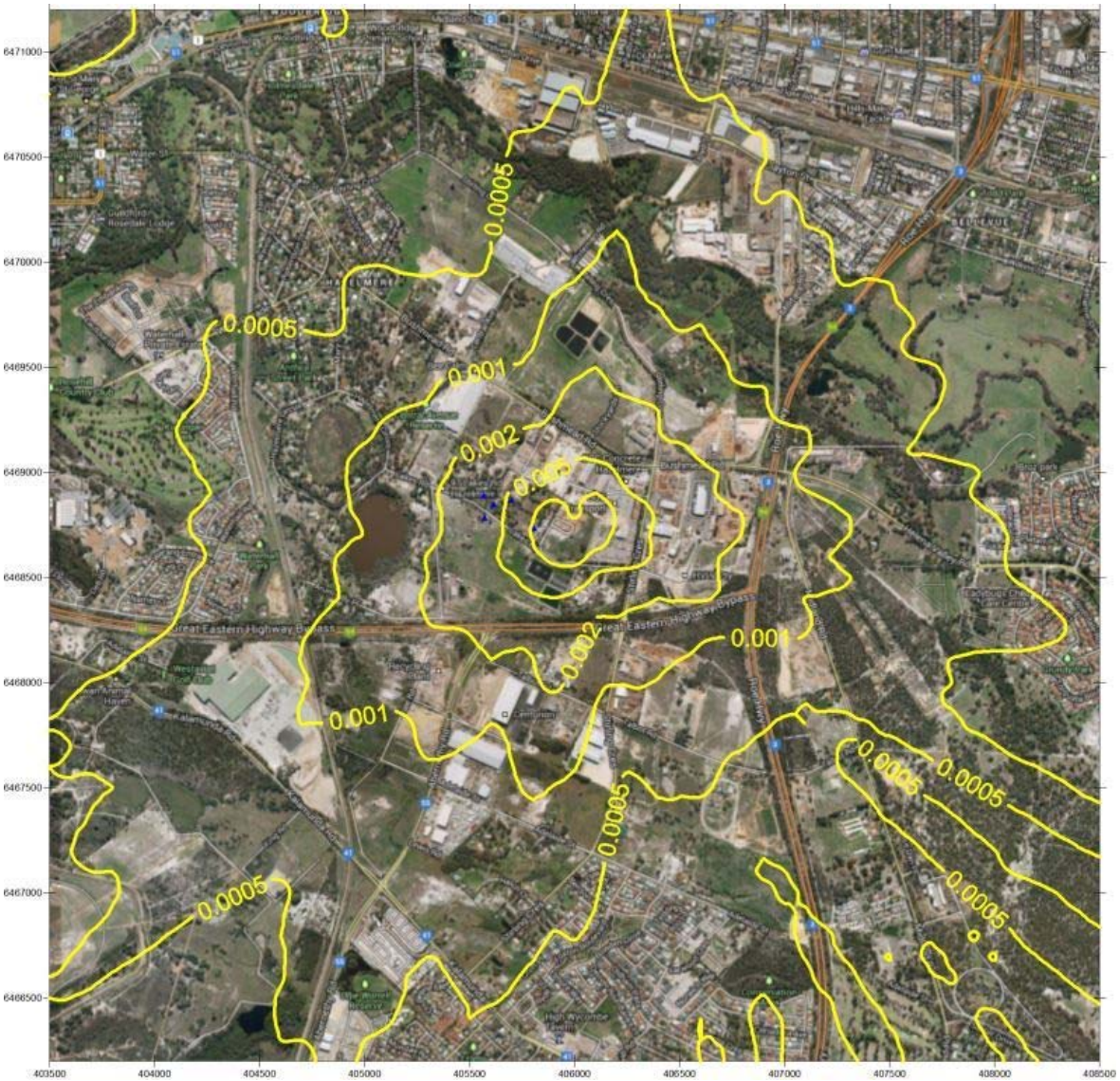

Figure 20: Normal Operations - GLC Cr (ng/m³) Maximum Daily

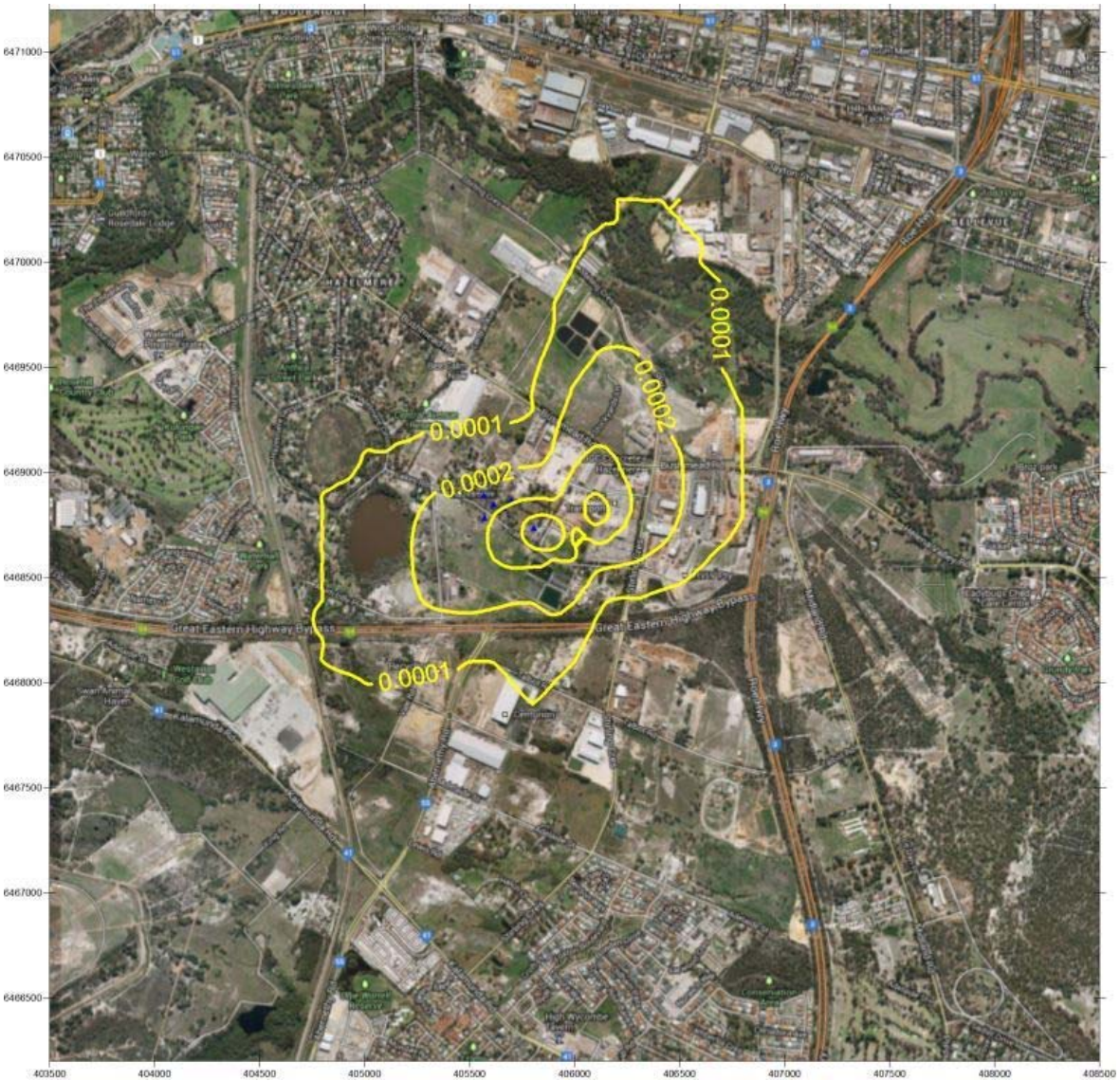

Figure 21: Normal Operations - GLC Cr (ng/m³) Annual average

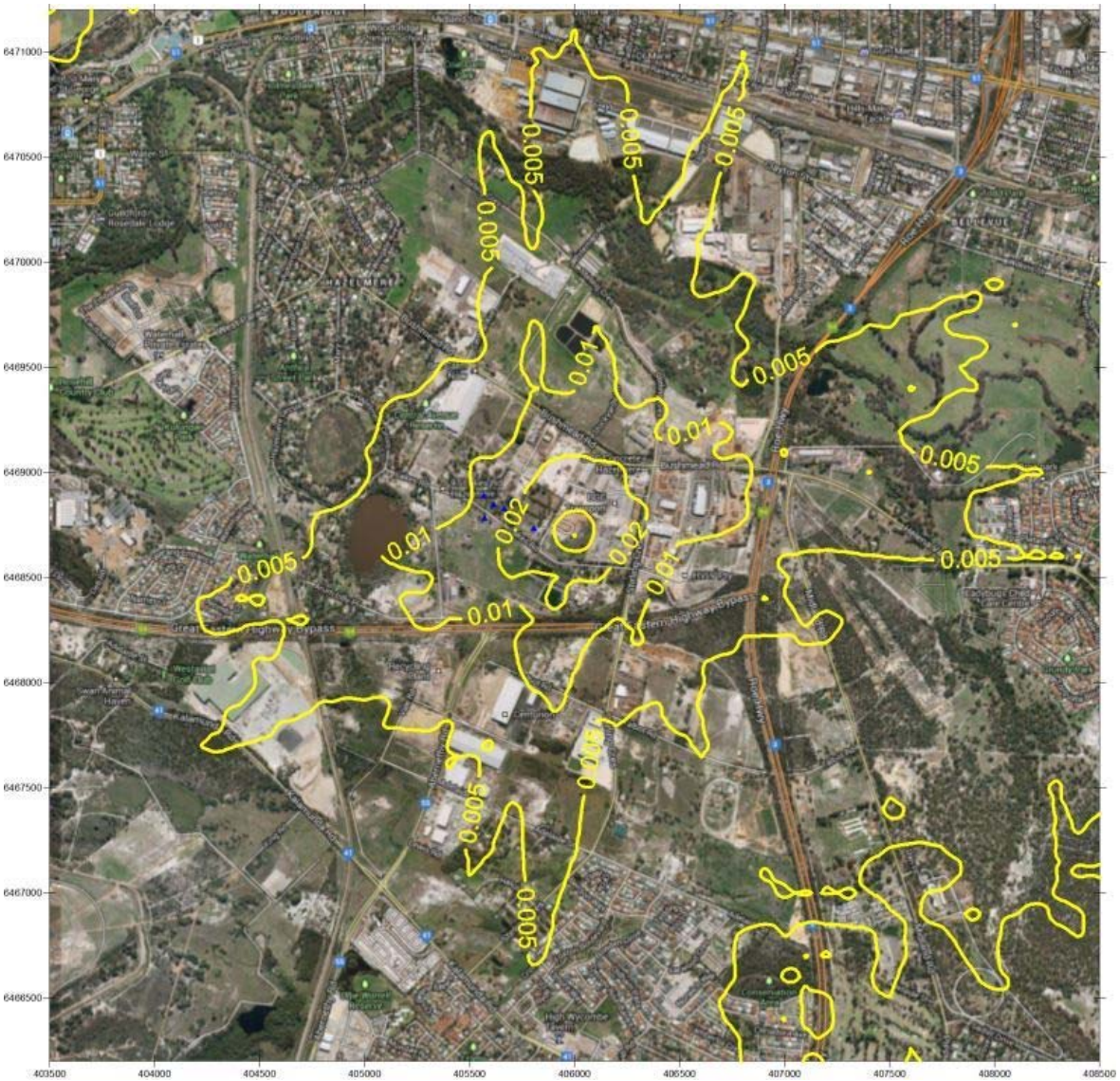

Figure 22: Normal Operations - GLC Cu (ng/m³) Maximum Hourly

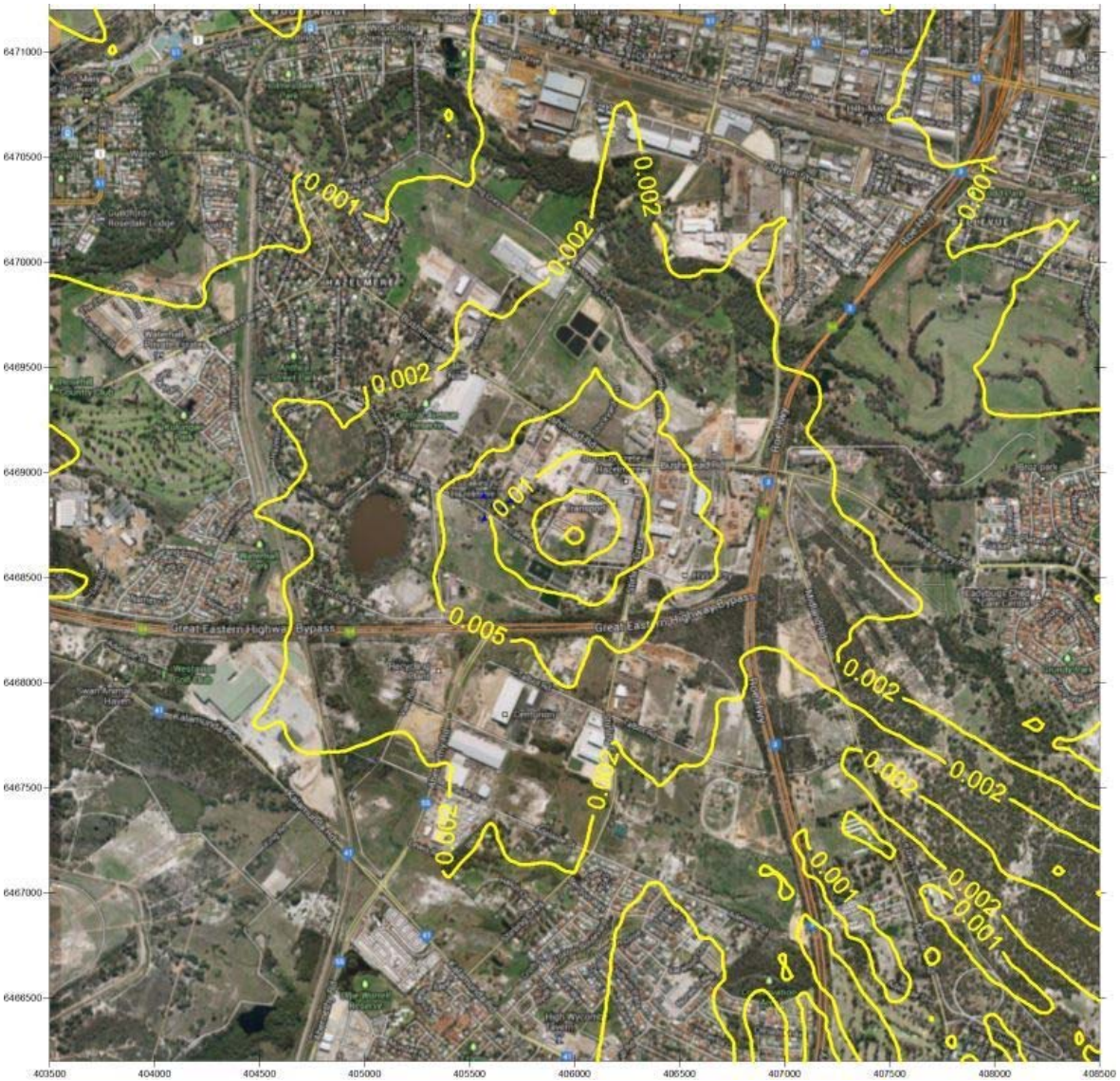

Figure 23: Normal Operations - GLC Cu (ng/m³) Maximum 8-Hourly

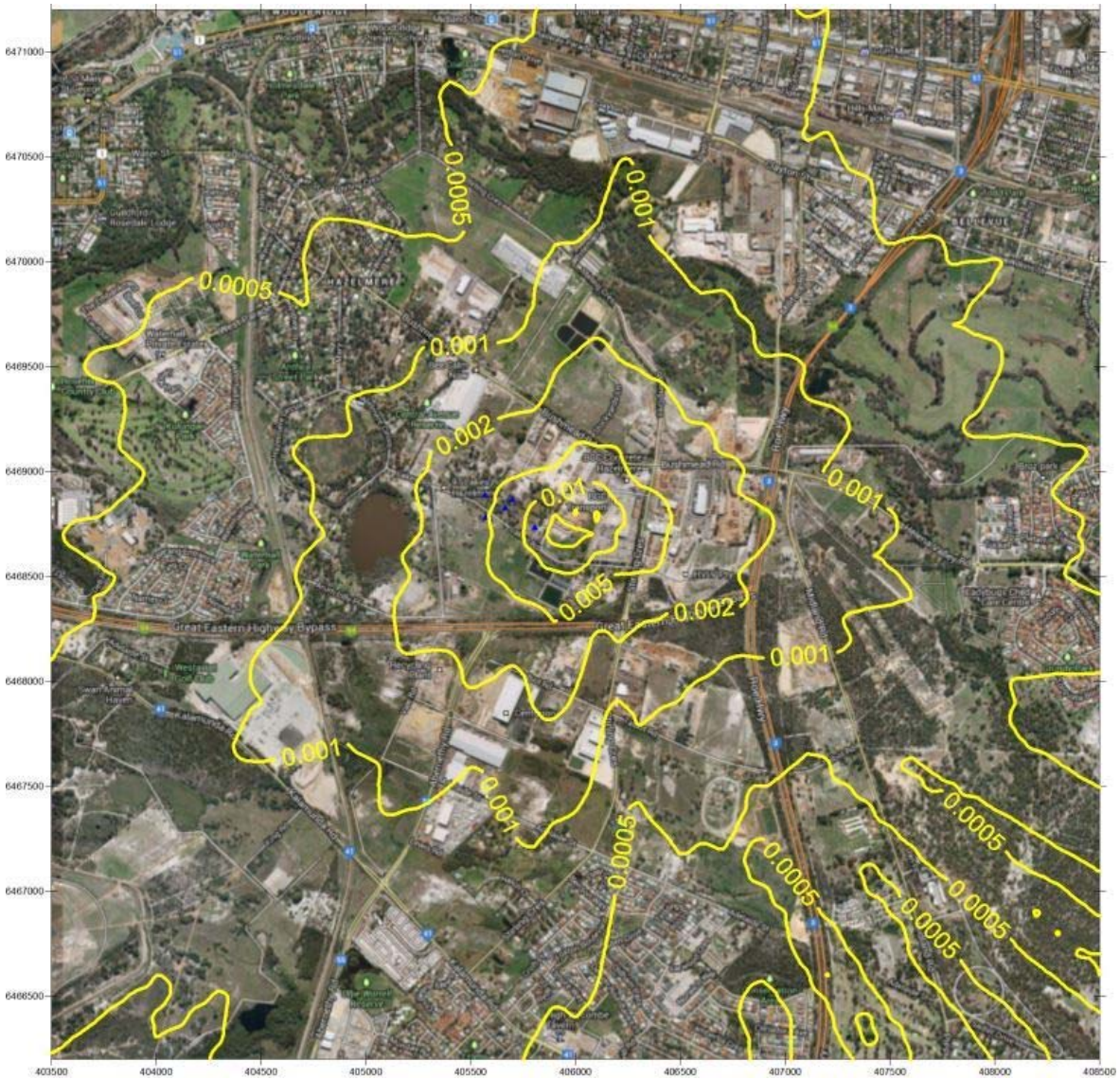

Figure 24: Normal Operations - GLC Cu (ng/m³) Maximum Daily

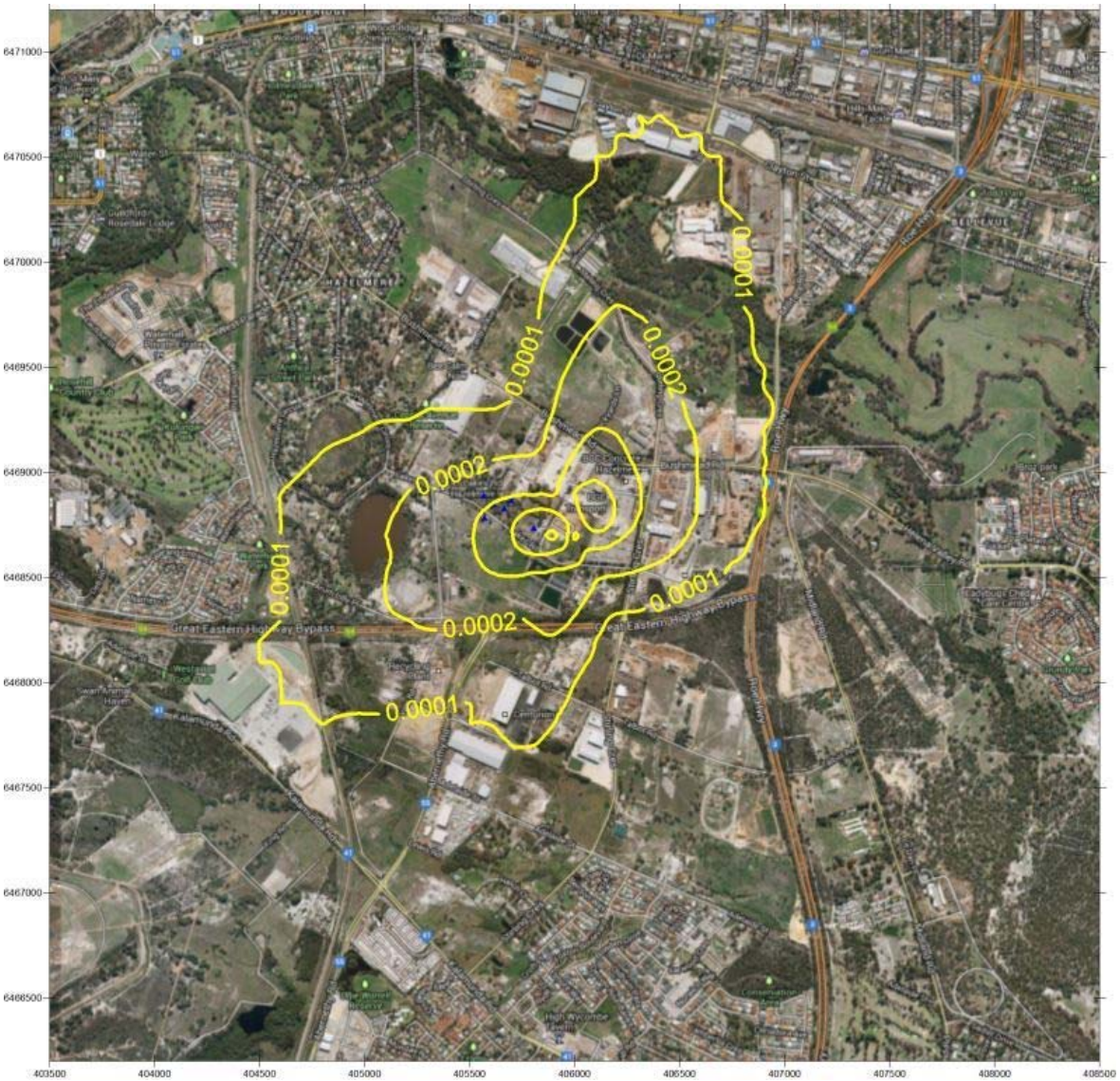

Figure 25: Normal Operations - GLC Cu (ng/m³) Annual average

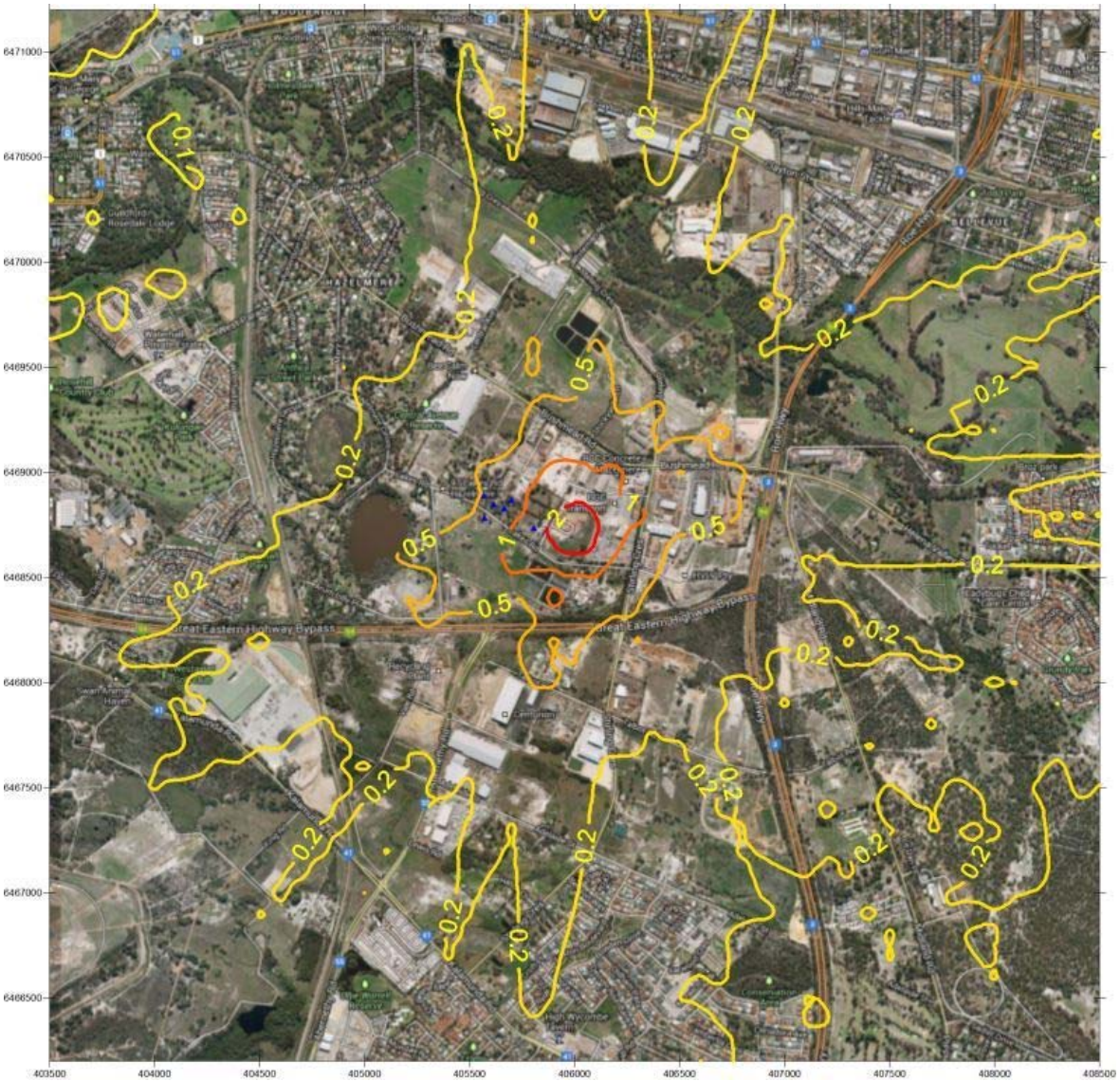

Figure 26: Normal Operations - GLC Dioxin (fg/m³) Maximum Hourly

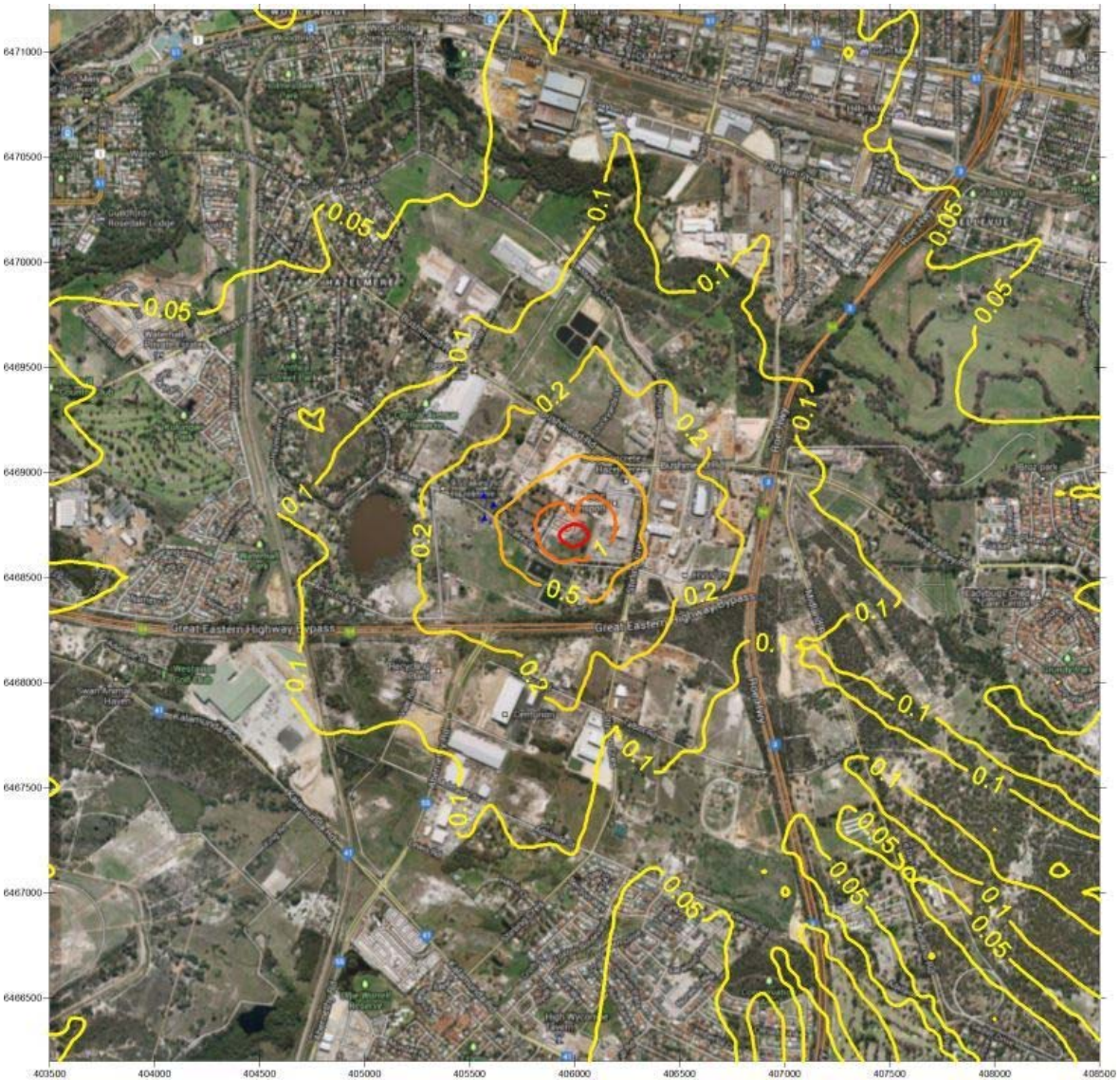

Figure 27: Normal Operations - GLC Dioxin (fg/m³) Maximum 8-Hourly

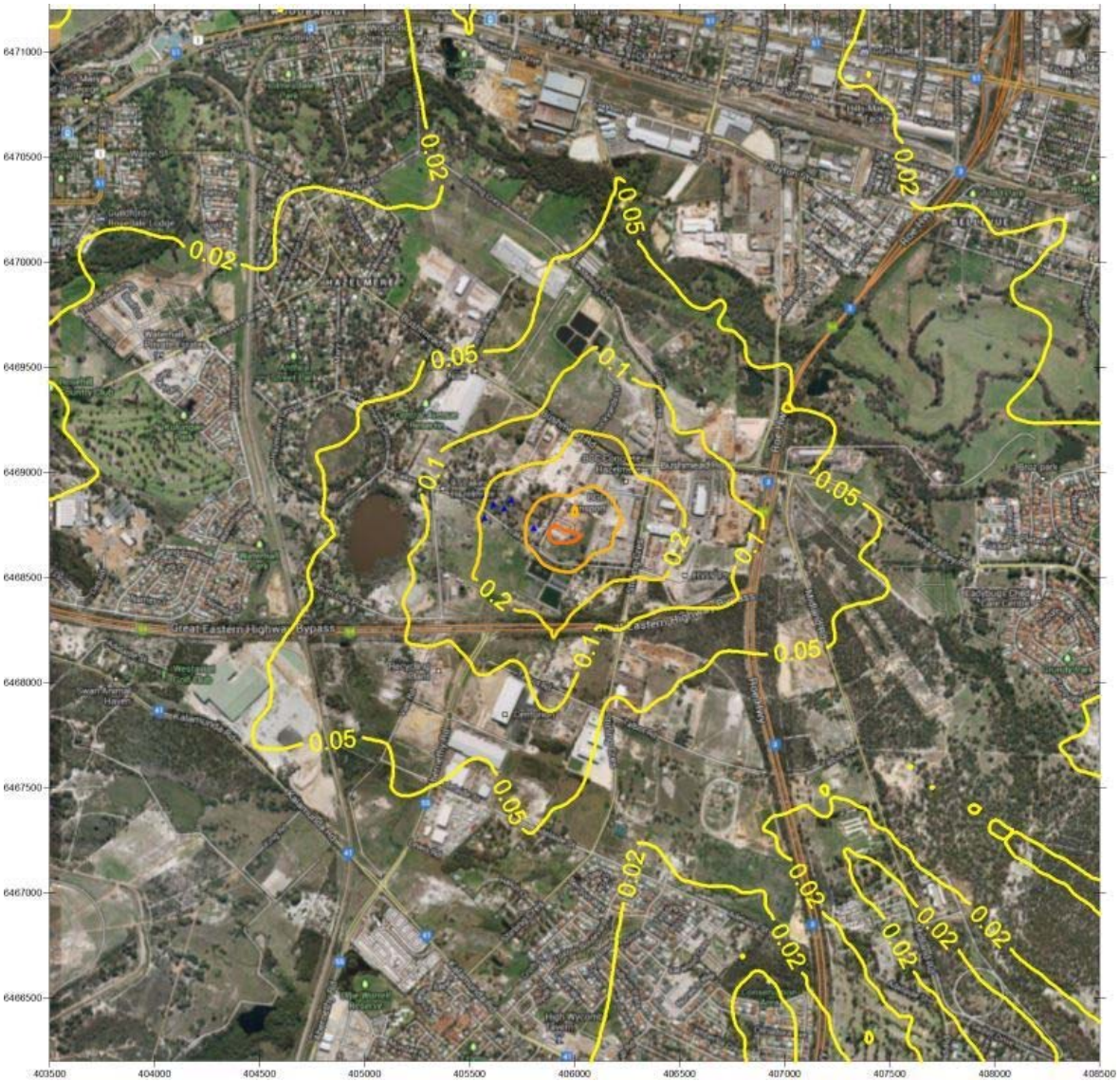

Figure 28: Normal Operations - GLC Dioxin (fg/m³) Maximum Daily

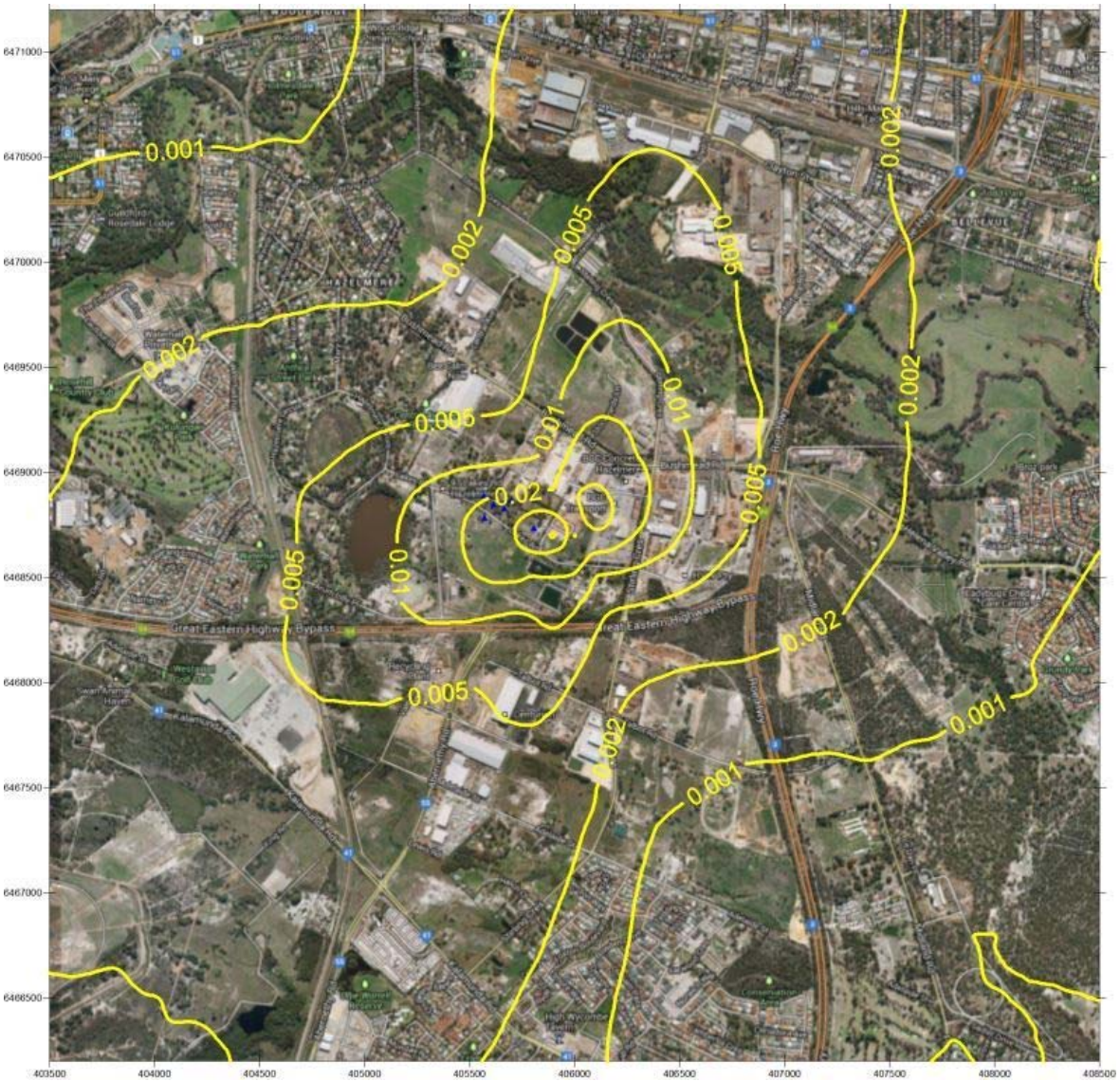

Figure 29: Normal Operations - GLC Dioxin (fg/m³) Annual average

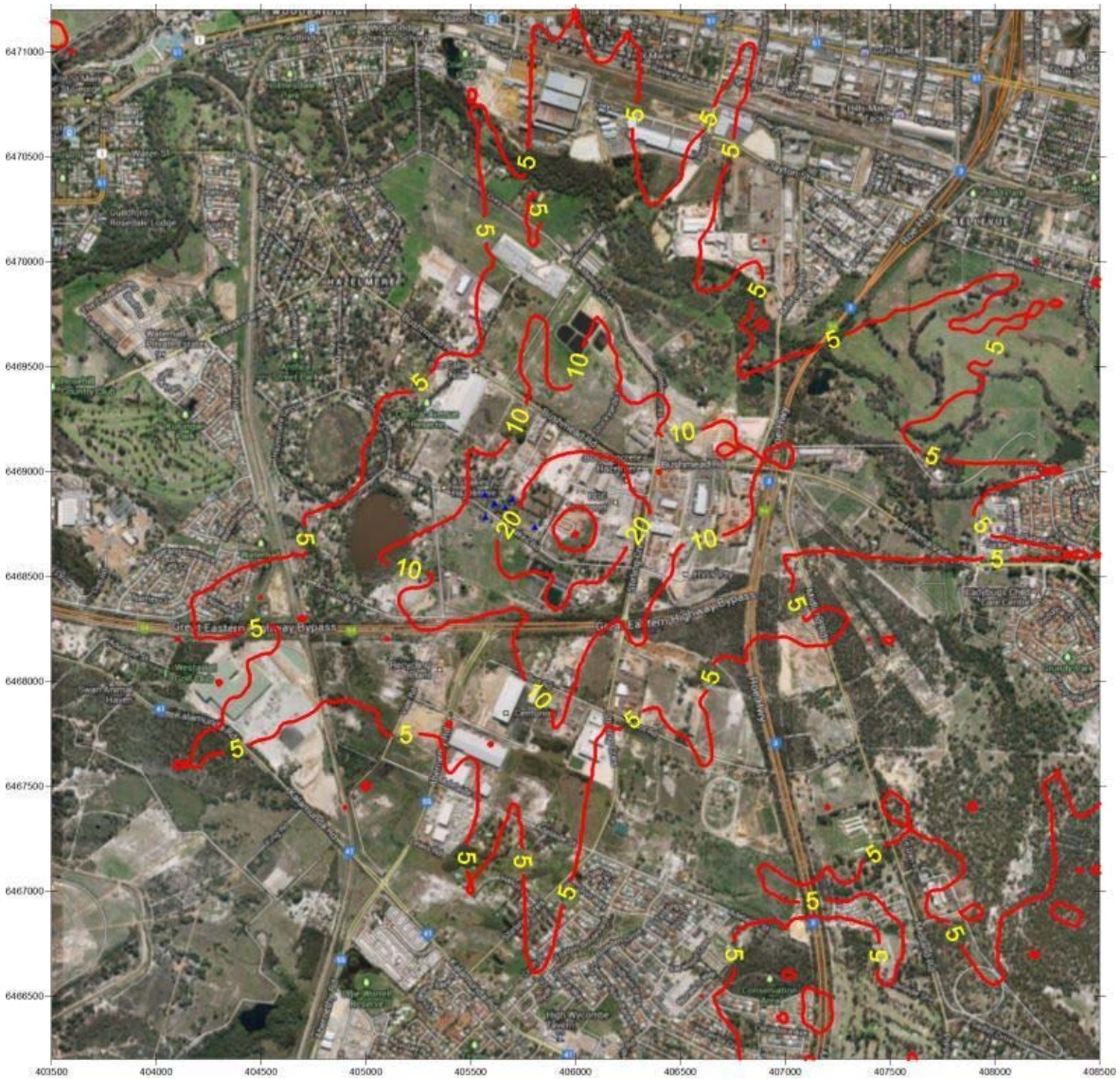

Figure 30: Normal Operations - GLC HCl (ng/m³) Maximum Hourly

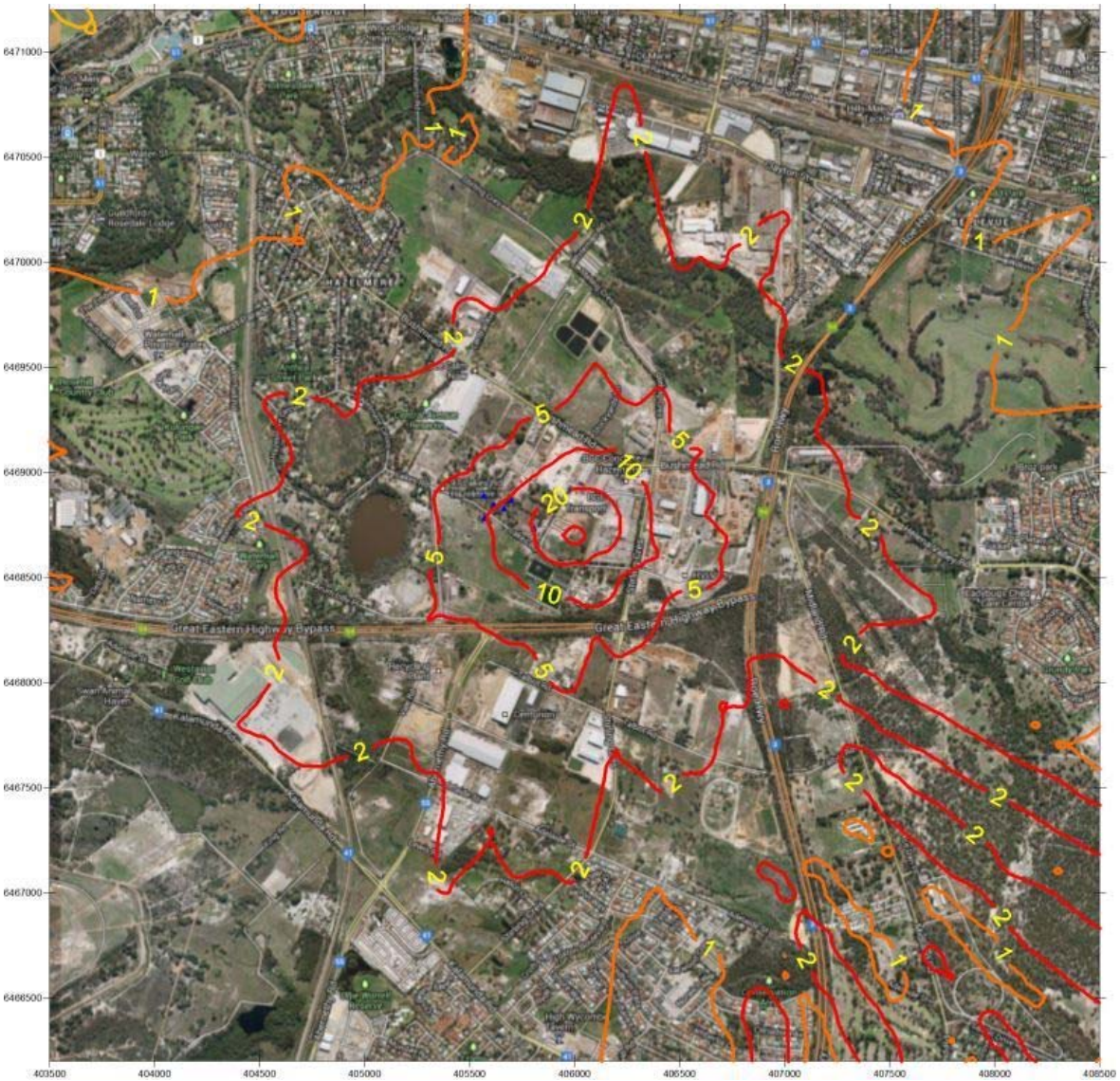

Figure 31: Normal Operations - GLC HCl (ng/m³) Maximum 8-Hourly

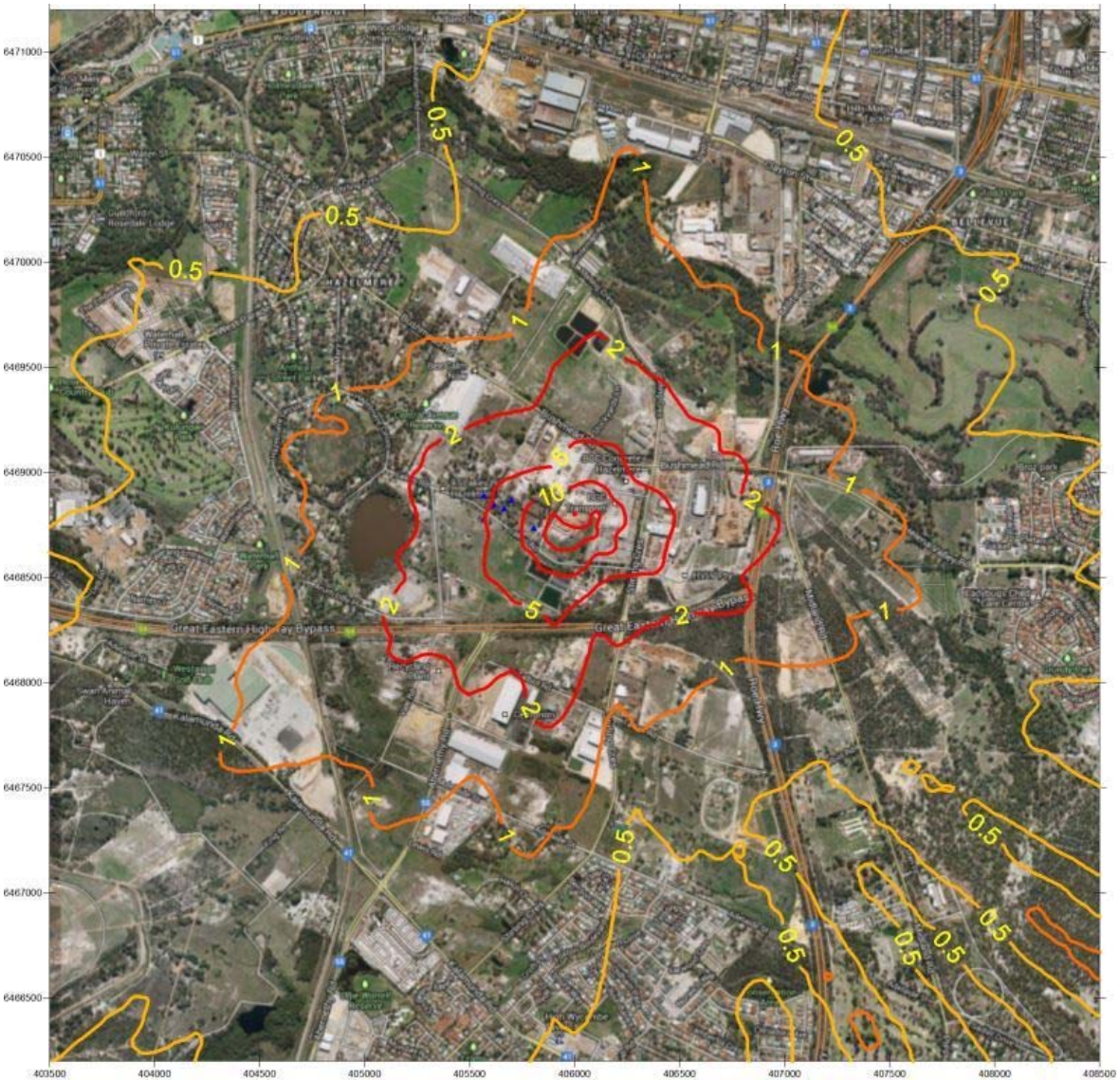

Figure 32: Normal Operations - GLC HCl (ng/m³) Maximum Daily

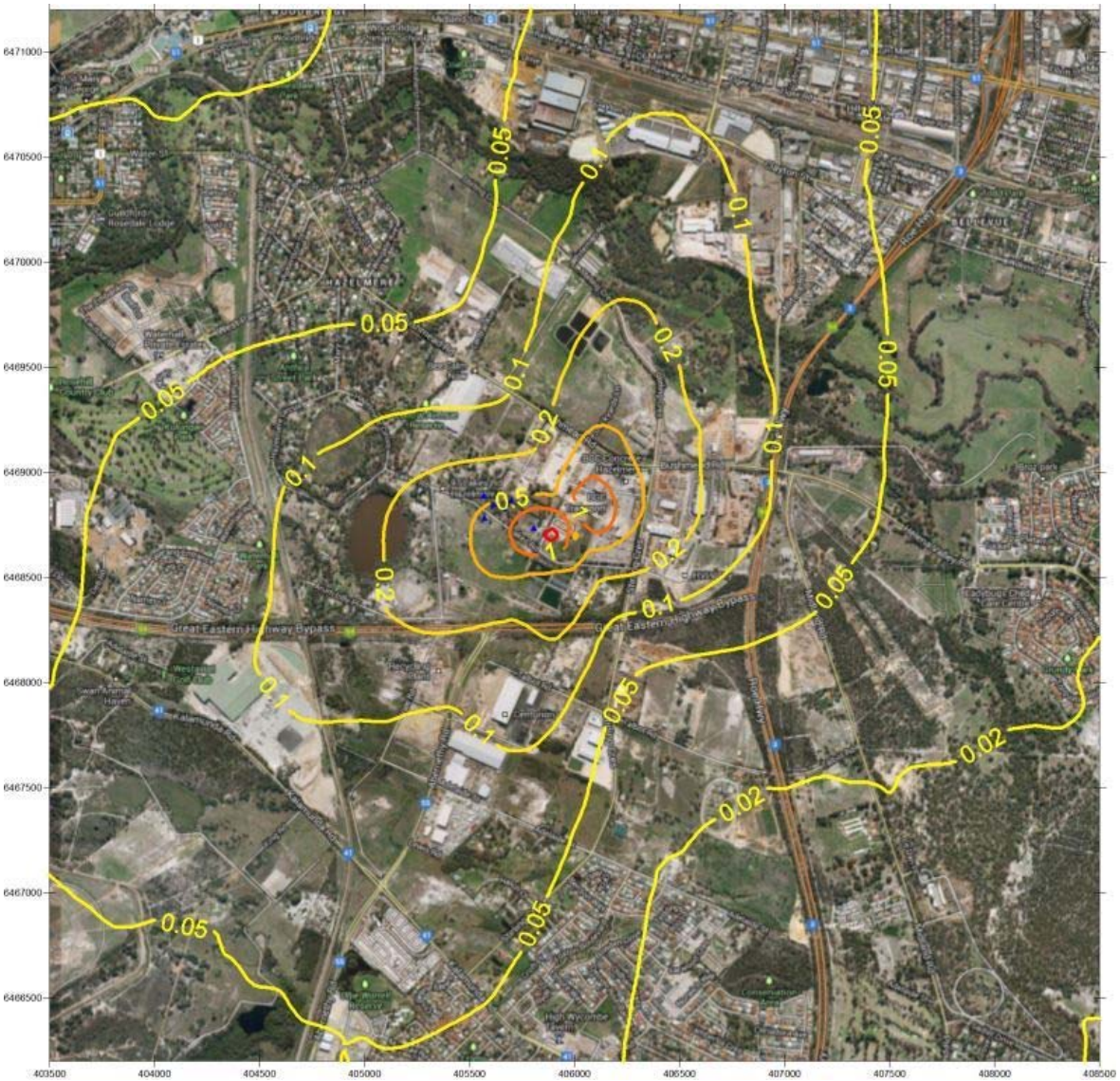

Figure 33: Normal Operations - GLC HCl (ng/m³) Annual average

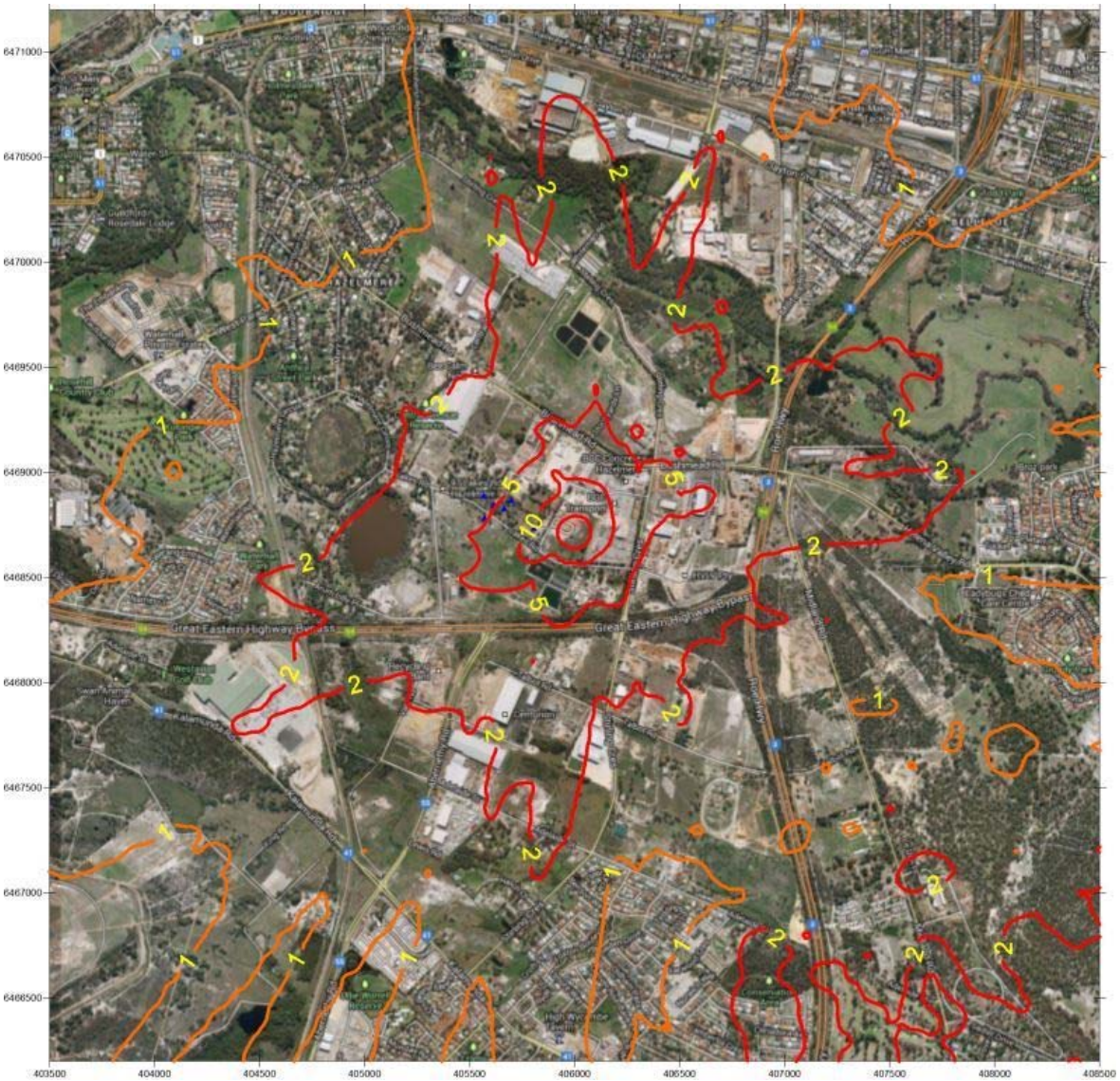

Figure 34: Normal Operations - GLC HF (ng/m³) Maximum Hourly

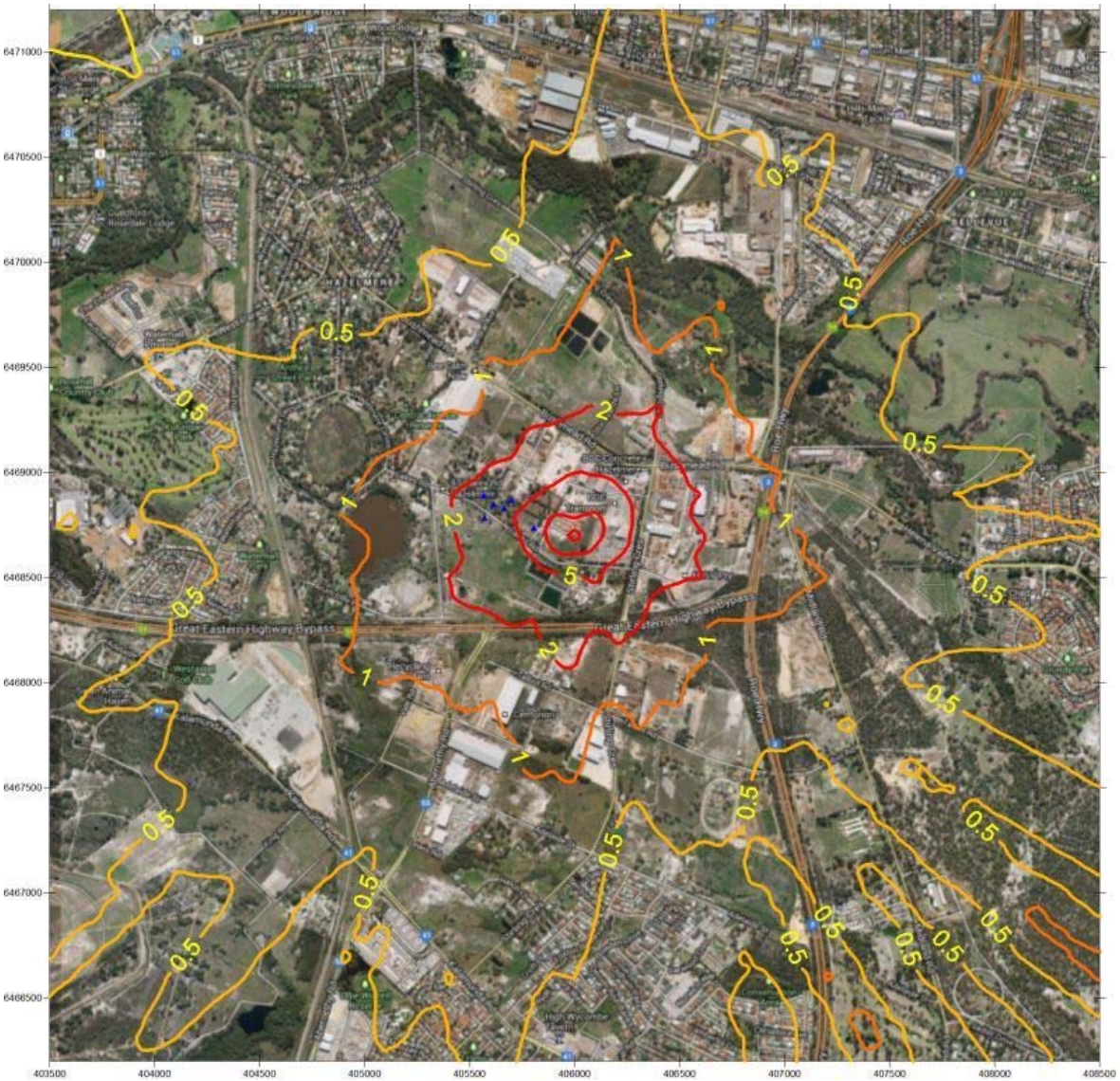

Figure 35: Normal Operations - GLC HF (ng/m³) Maximum 8-Hourly

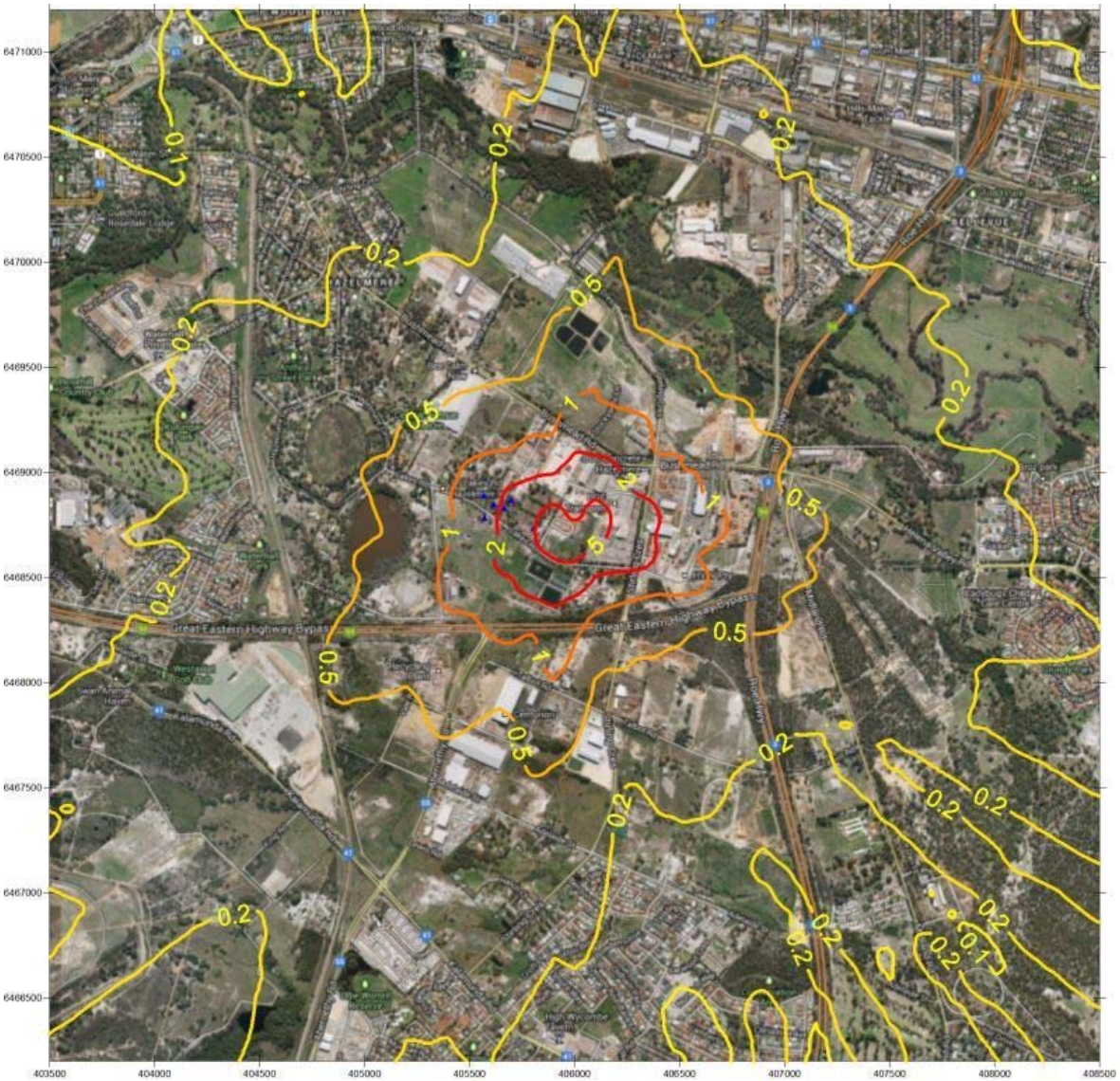

Figure 36: Normal Operations - GLC HF (ng/m³) Maximum Daily

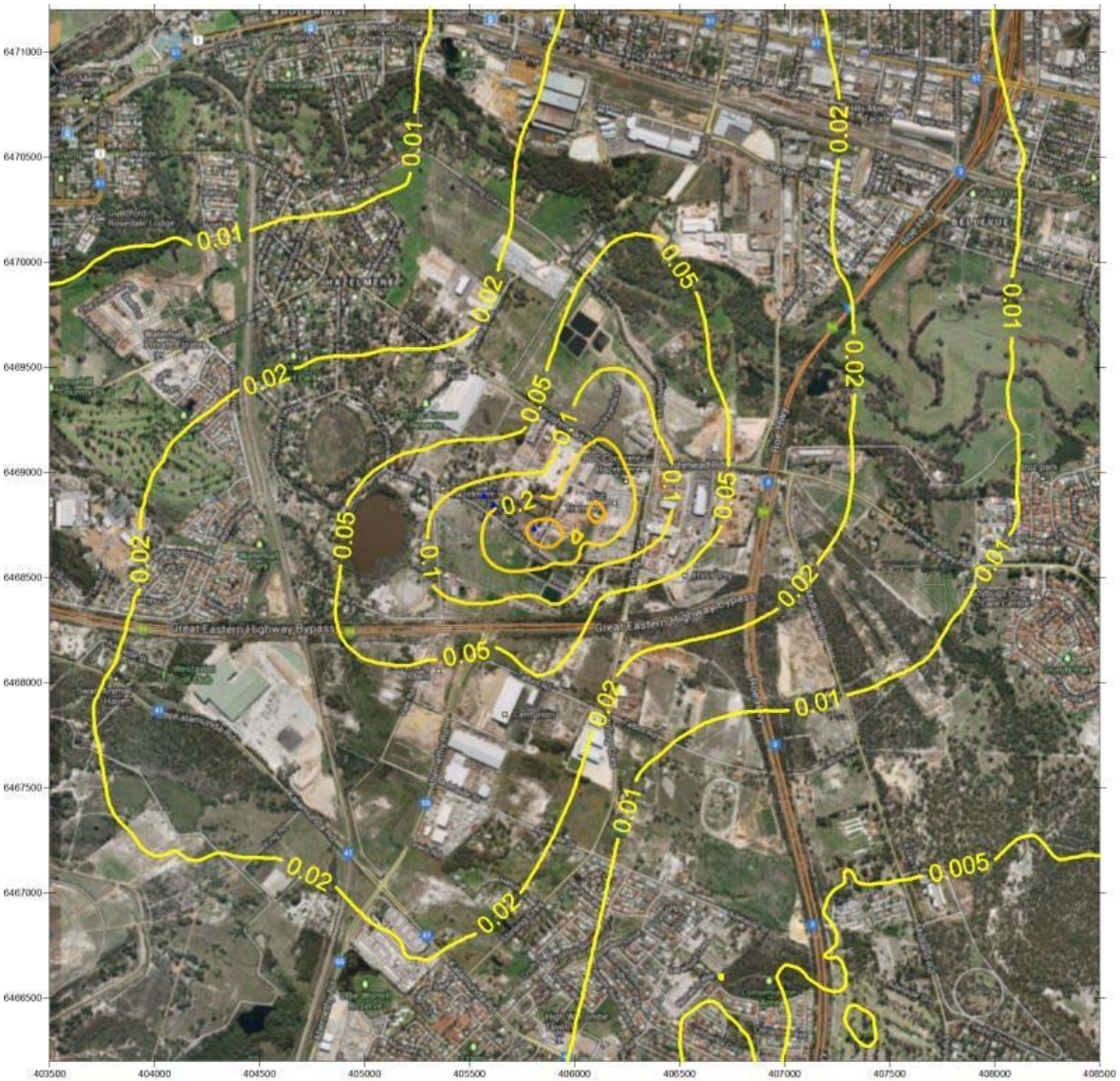

Figure 37: Normal Operations - GLC HF (ng/m³) Annual average

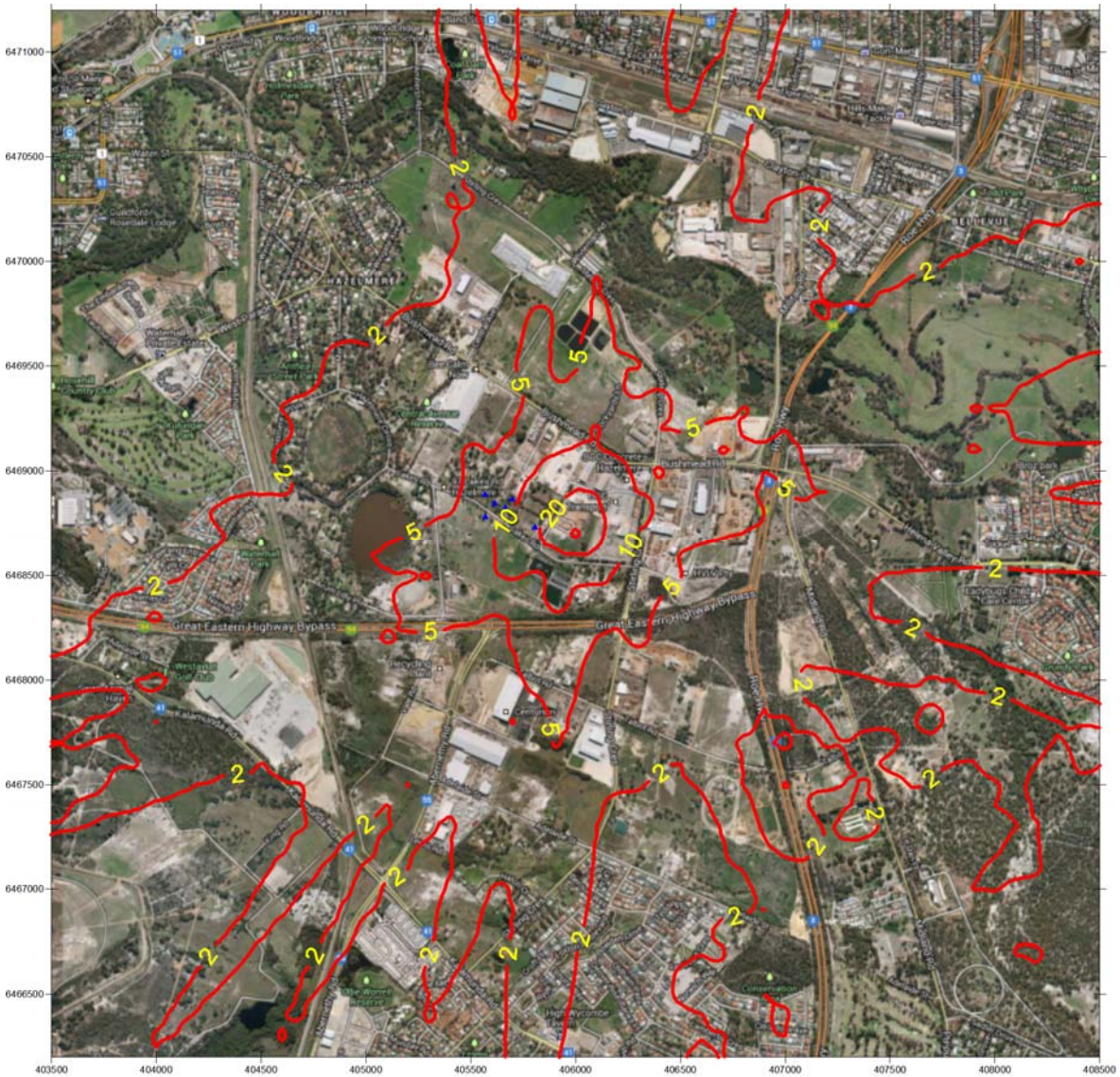

Figure 38: Normal Operations - GLC Hg (ρg/m³) Maximum Hourly

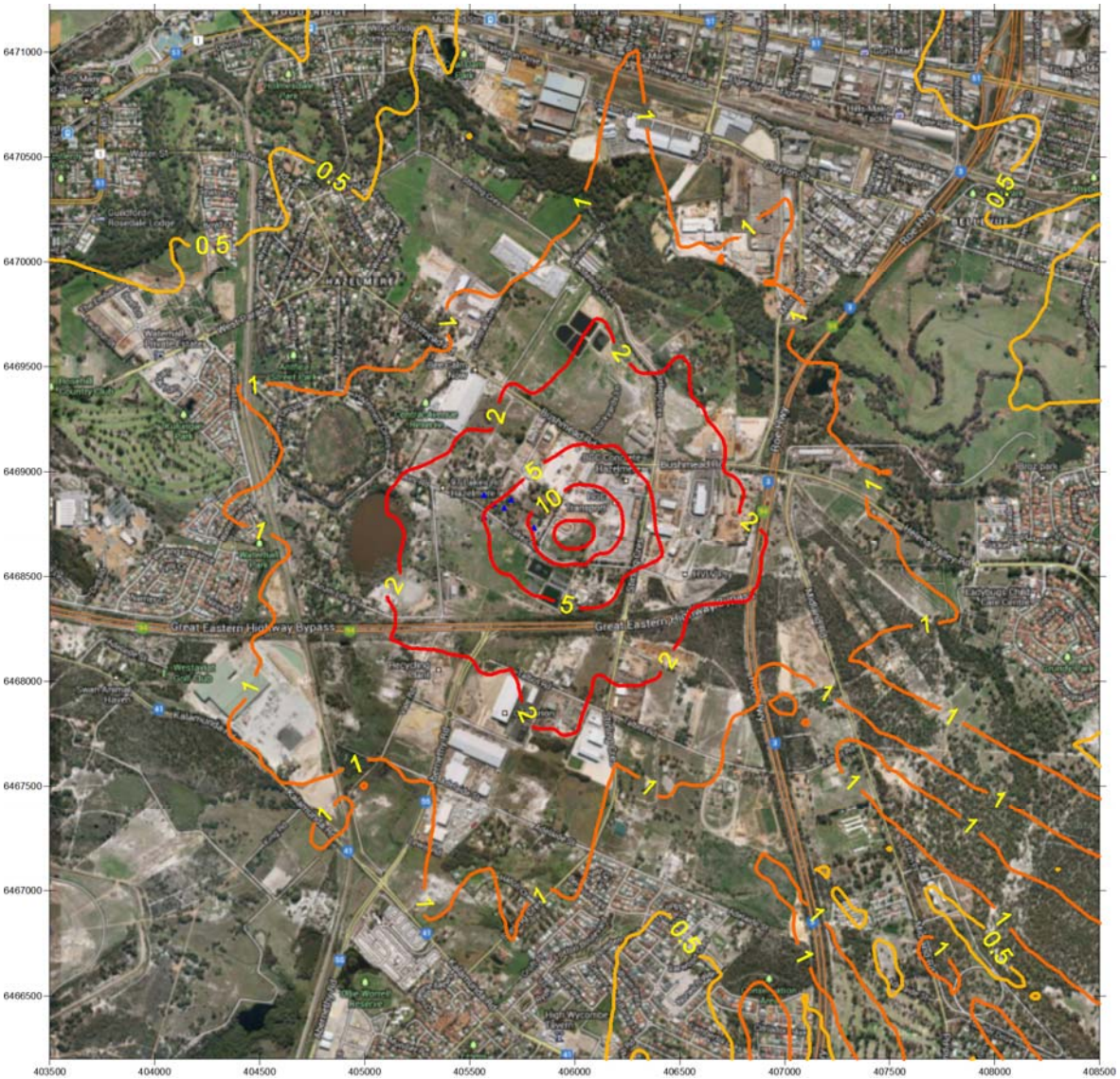

Figure 39: Normal Operations - GLC Hg (ρg/m³) Maximum 8-Hourly

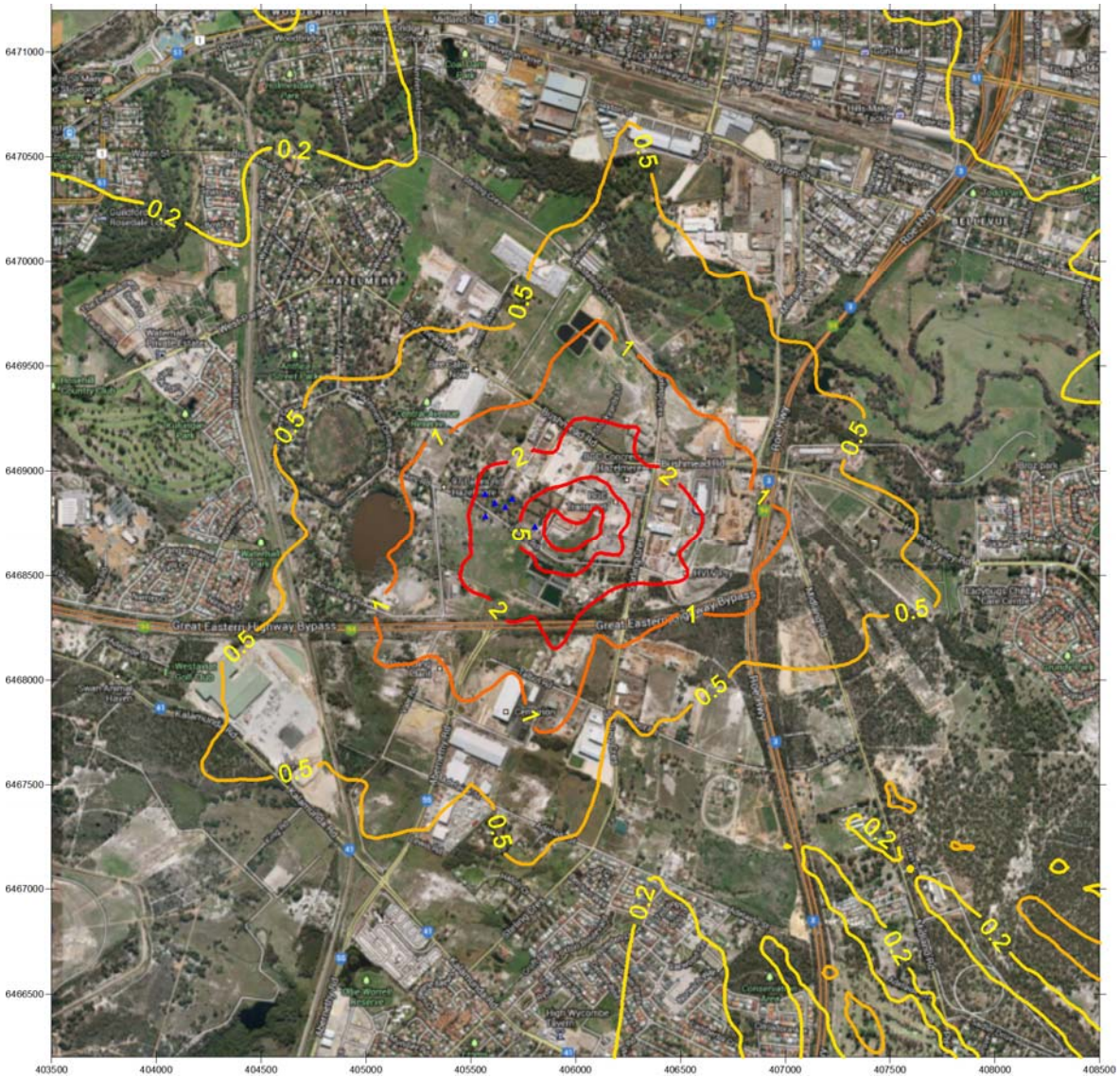

Figure 40: Normal Operations - GLC Hg (ρg/m³) Maximum Daily

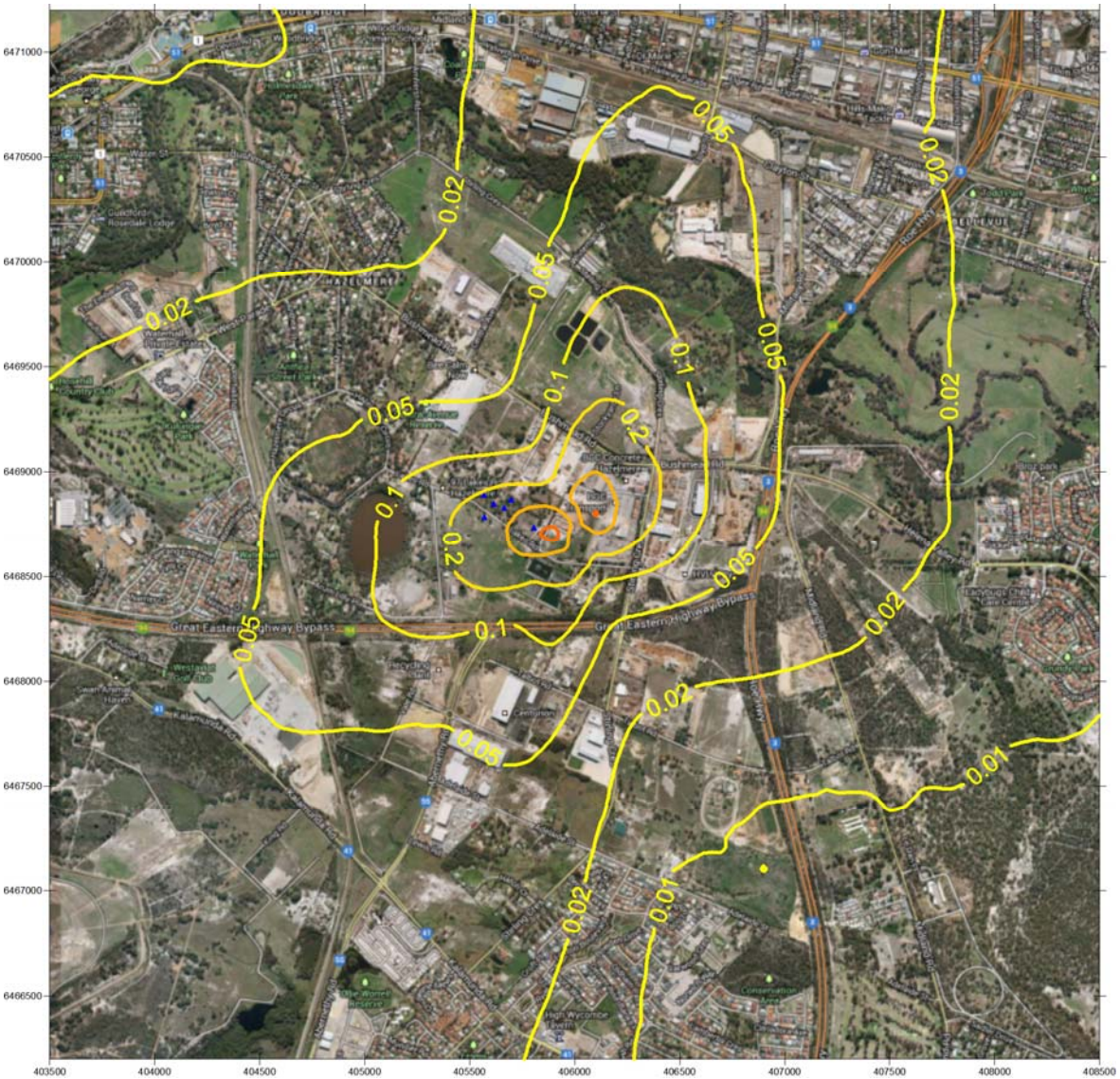

Figure 41: Normal Operations - GLC Hg (ρg/m³) Annual average

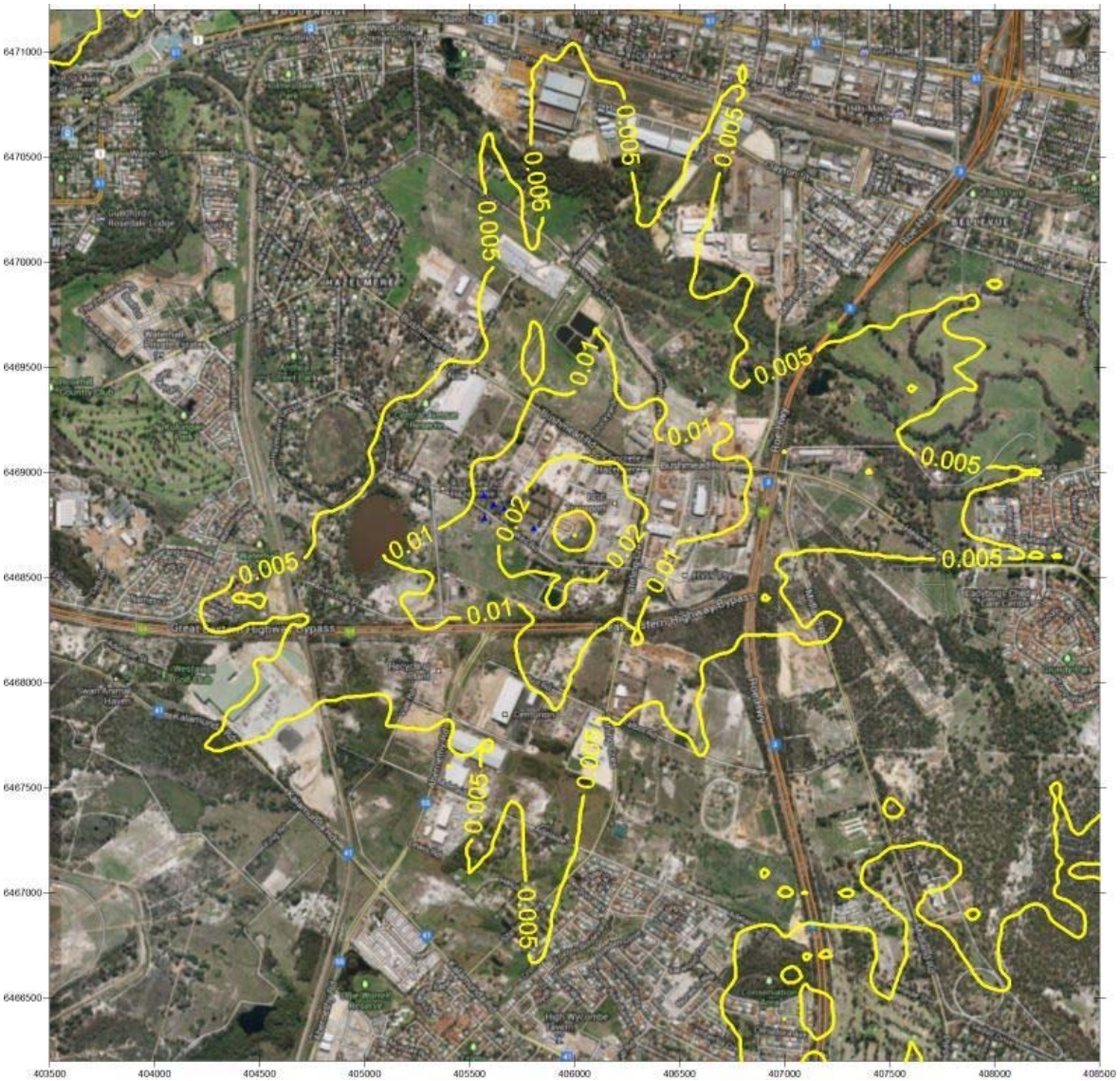

Figure 42: Normal Operations - GLC Mn (fg/m³) Maximum Hourly

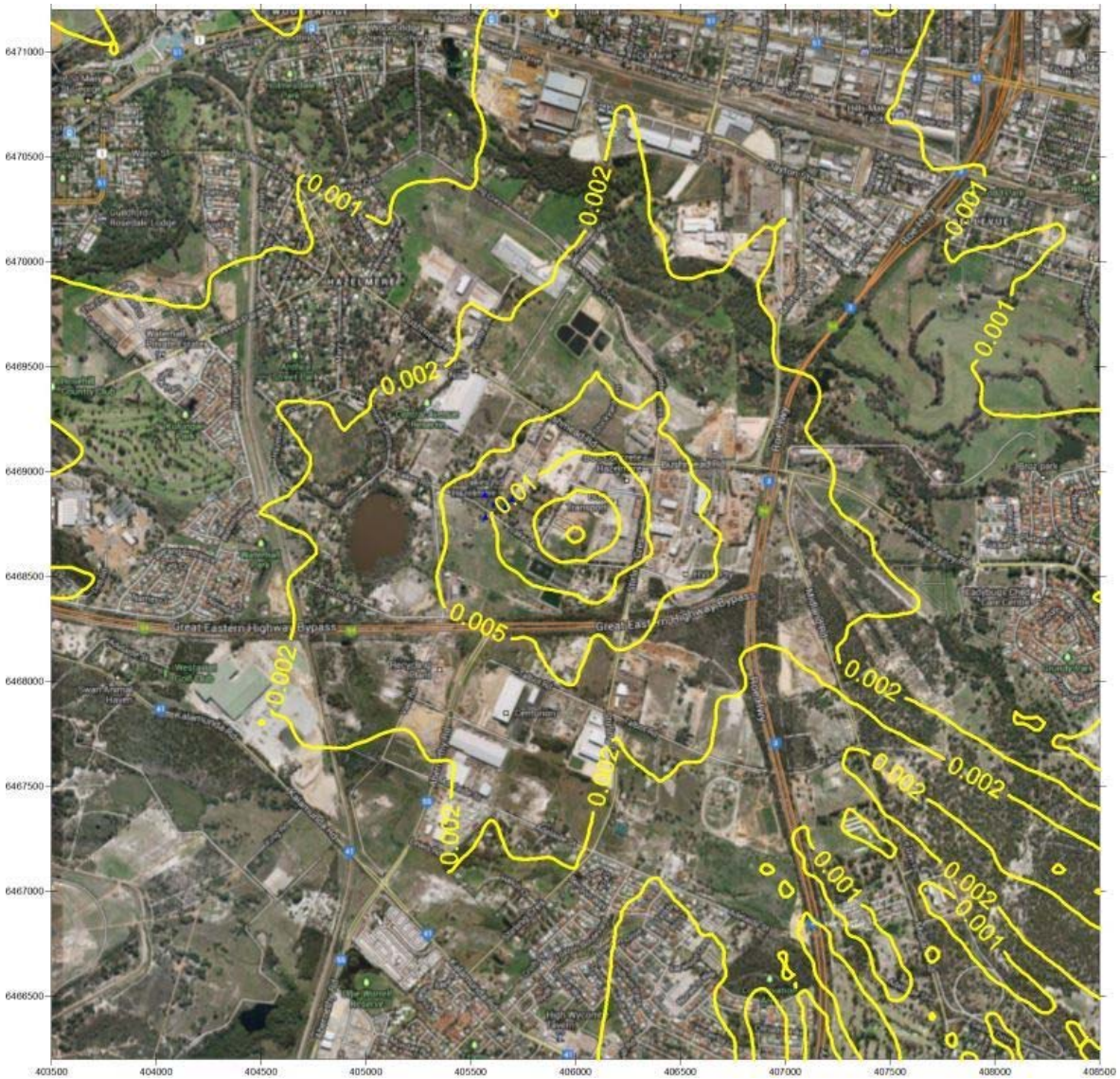

Figure 43: Normal Operations - GLC Mn (fg/m³) Maximum 8-Hourly

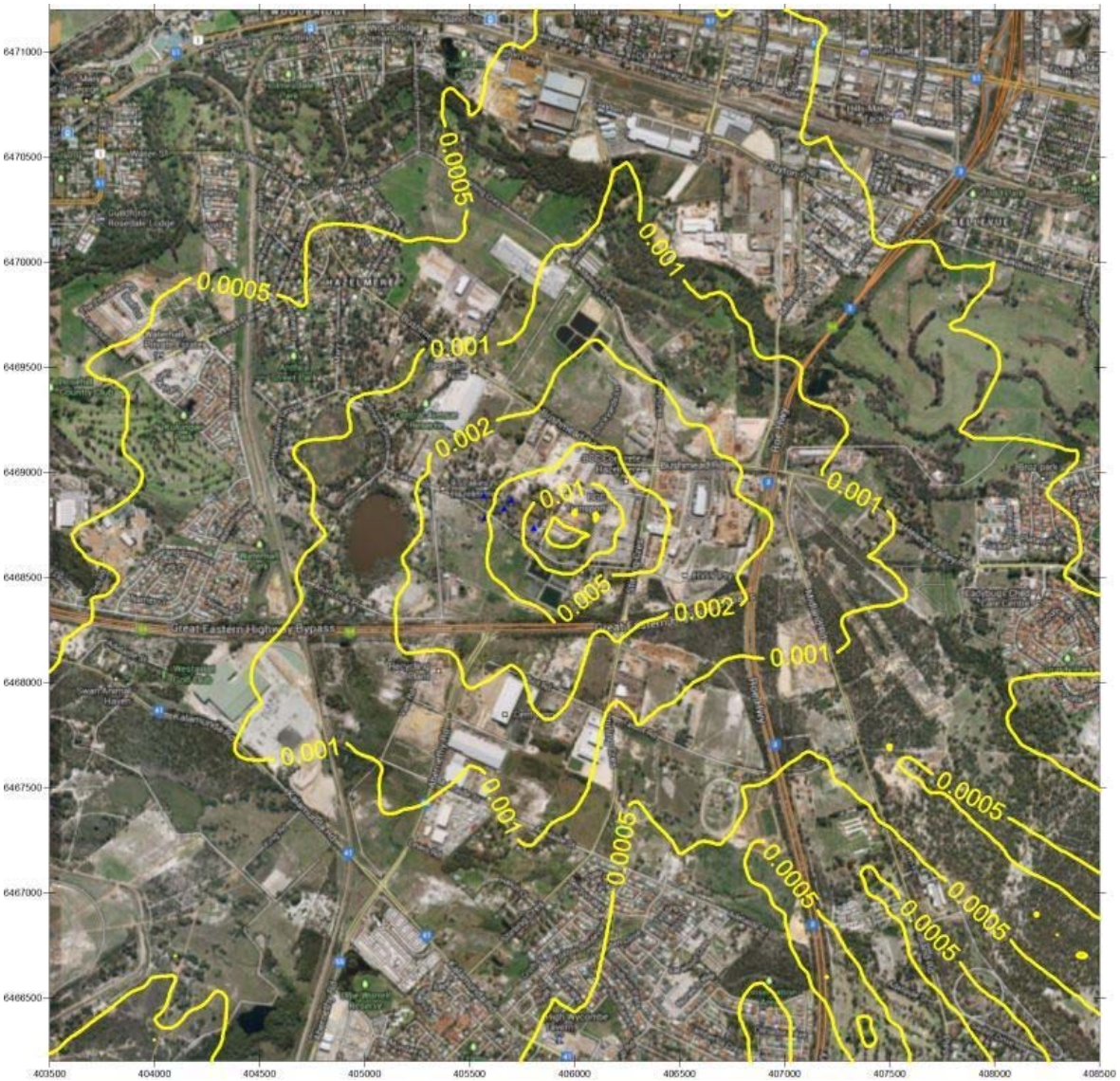

Figure 44: Normal Operations - GLC Mn (fg/m³) Maximum Daily

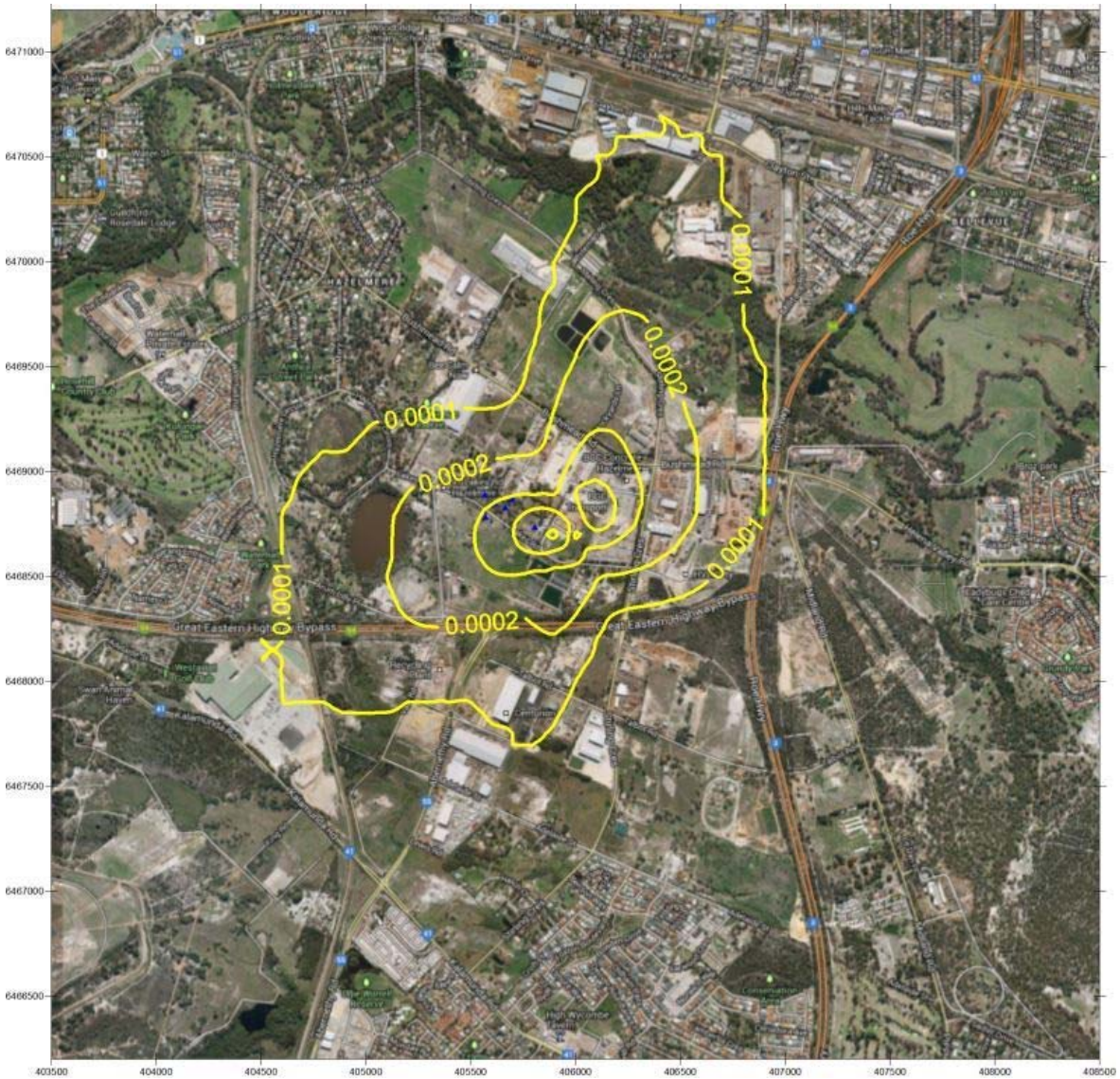

Figure 45: Normal Operations - GLC Mn (fg/m³) Annual average

Figure 46: Normal Operations - GLC Ni (ρg/m³) Maximum Hourly

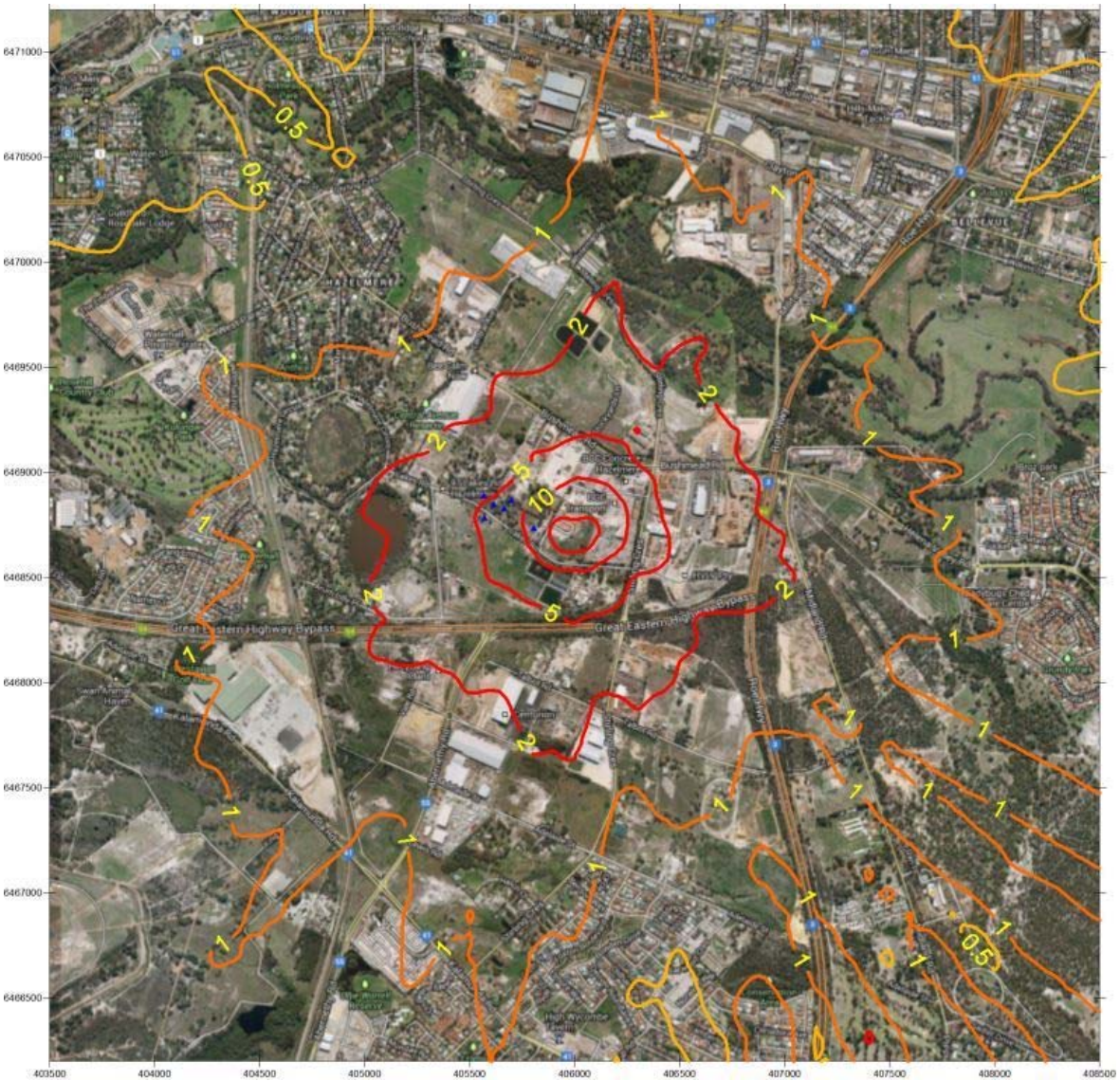

Figure 47: Normal Operations - GLC Ni (ρg/m³) Maximum 8-Hourly

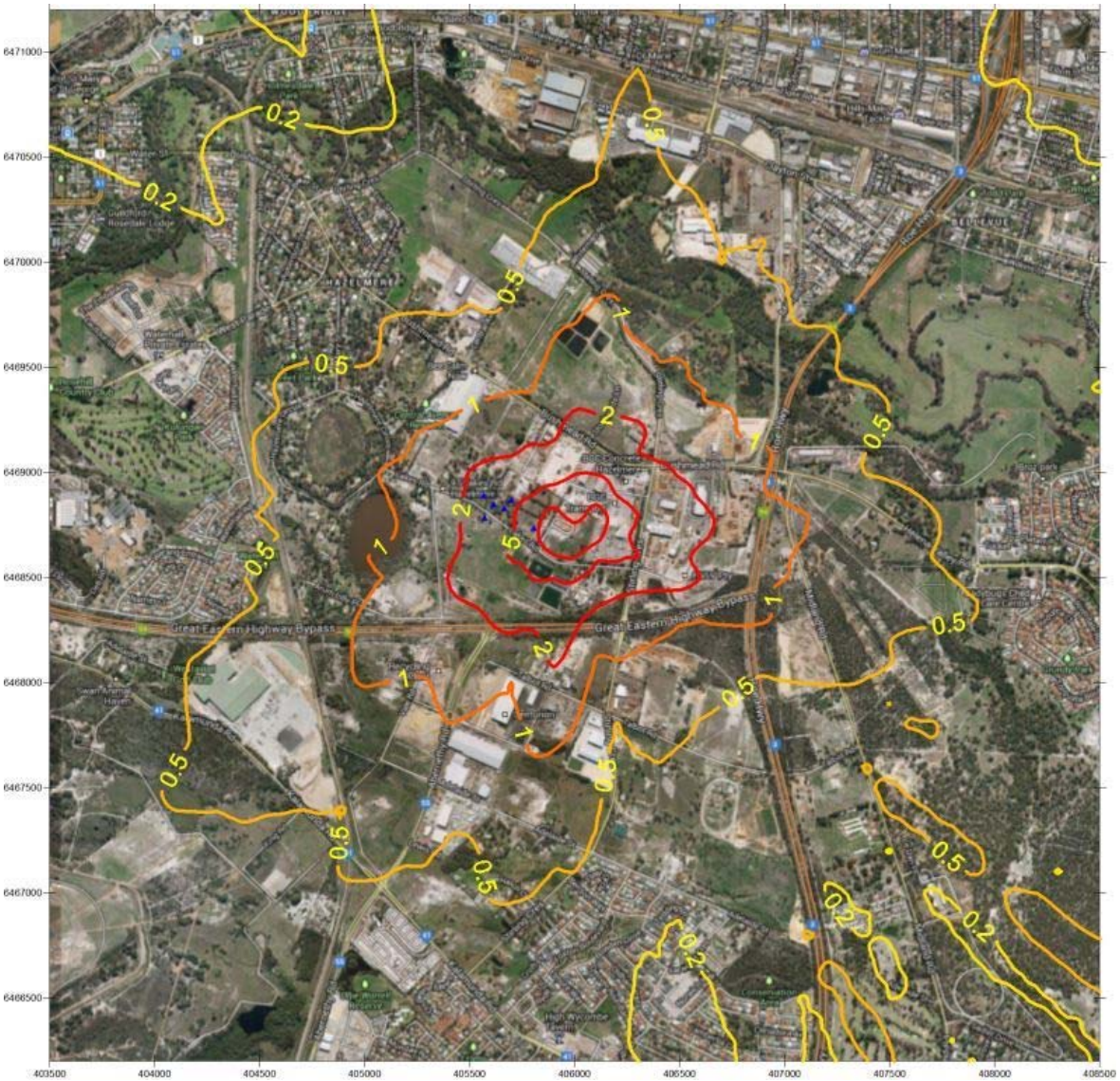

Figure 48: Normal Operations - GLC Ni (ρg/m³) Maximum Daily

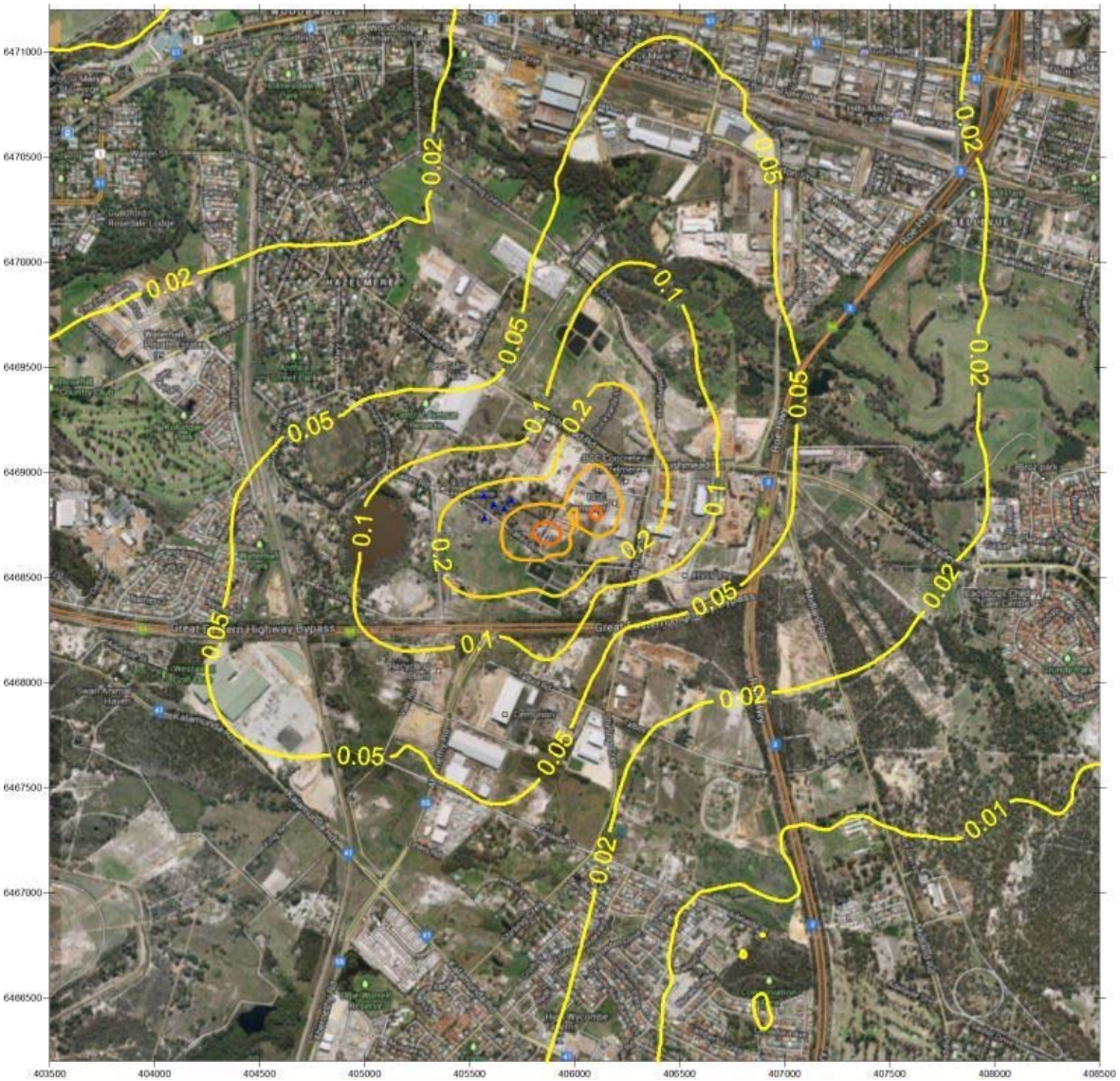

Figure 49: Normal Operations - GLC Ni (ρg/m³) Annual average

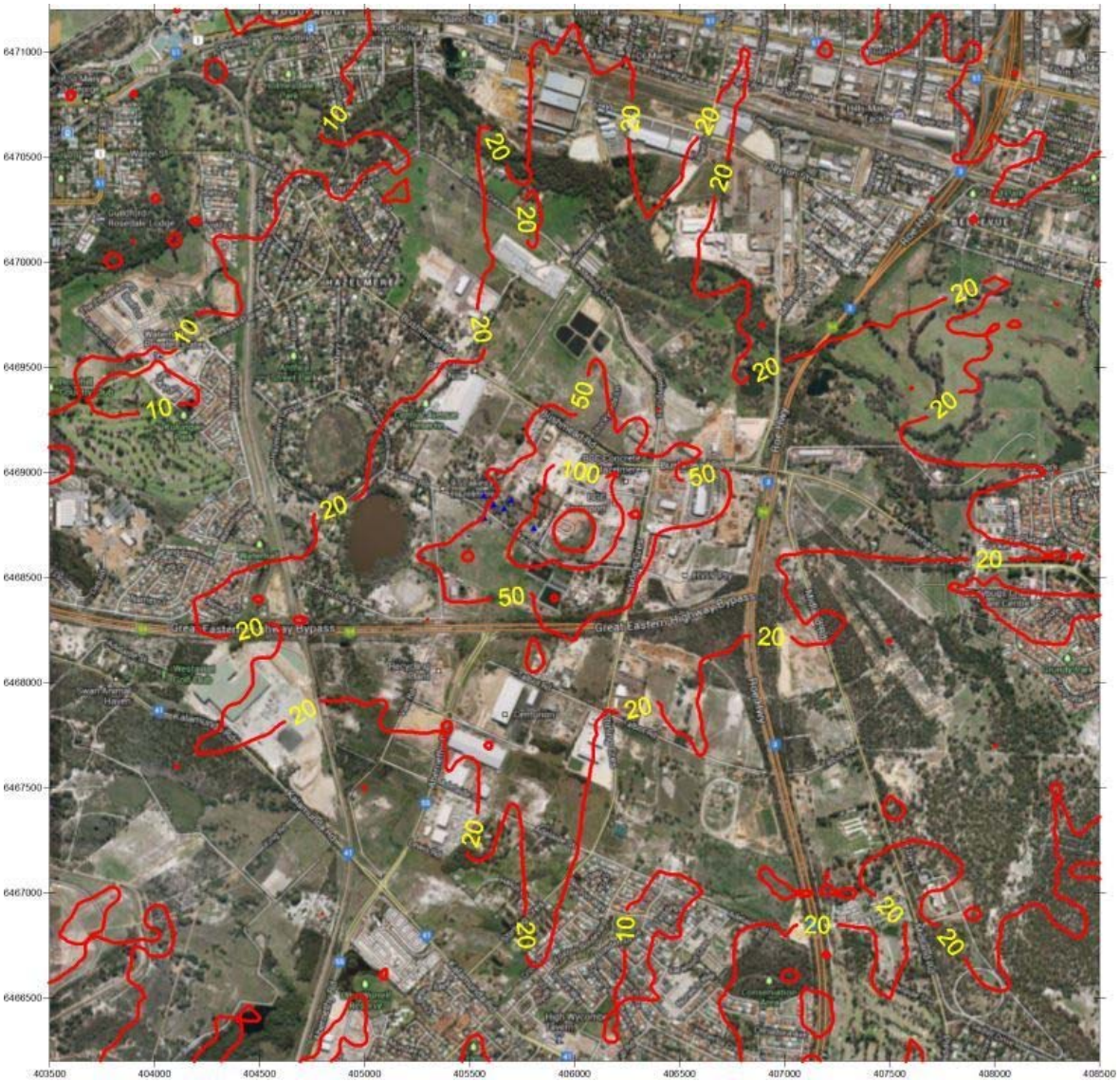

Figure 50: Normal Operations - GLC NOx (µg/m³) Maximum Hourly

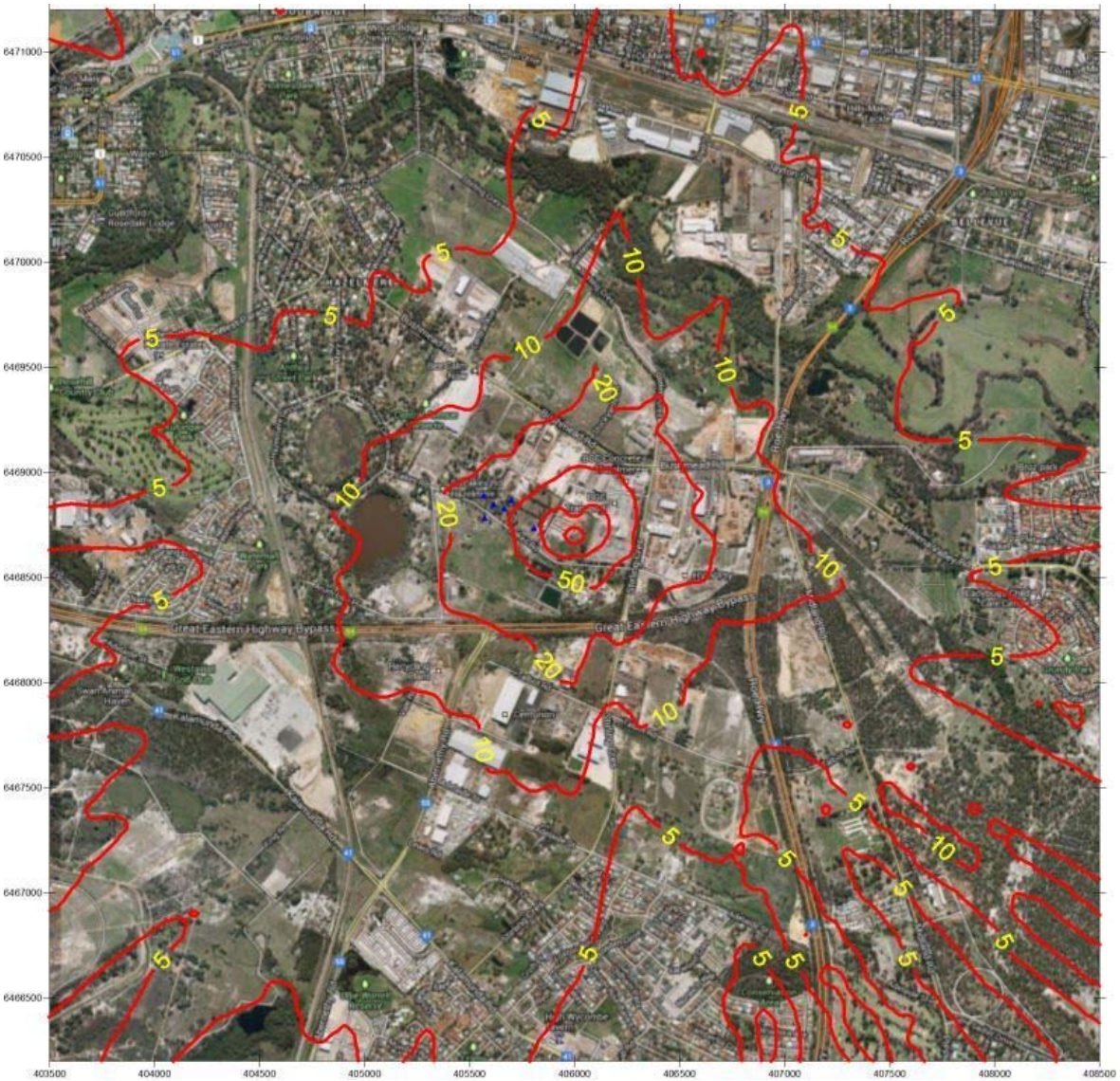

Figure 51: Normal Operations - GLC NOx (µg/m³) Maximum 8-Hourly

Figure 52: Normal Operations - GLC NOx (µg/m³) Maximum Daily

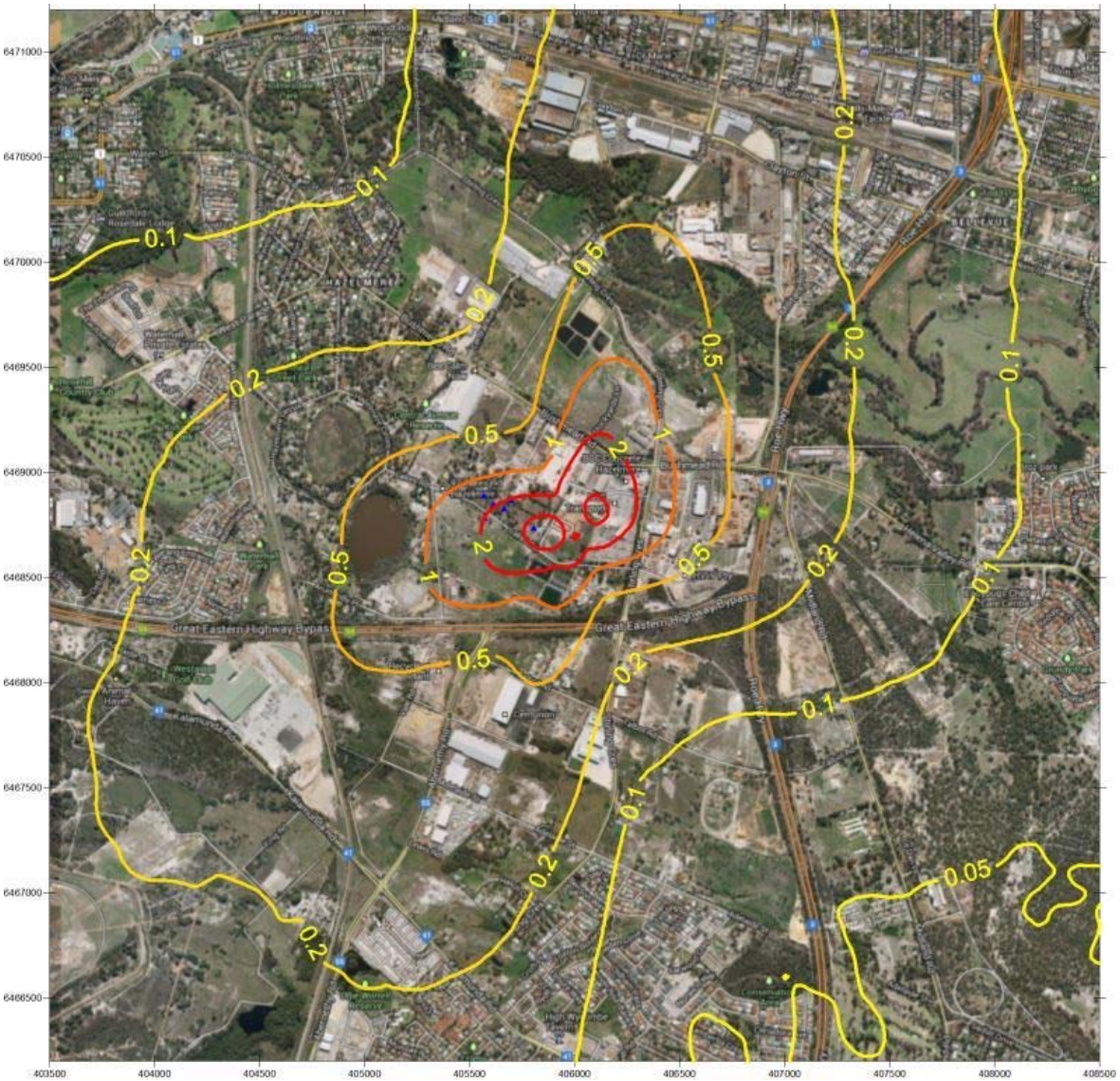

Figure 53: Normal Operations - GLC NOx (µg/m³) Annual average

Figure 54: Normal Operations - GLC Pb (ng/m³) Maximum Hourly

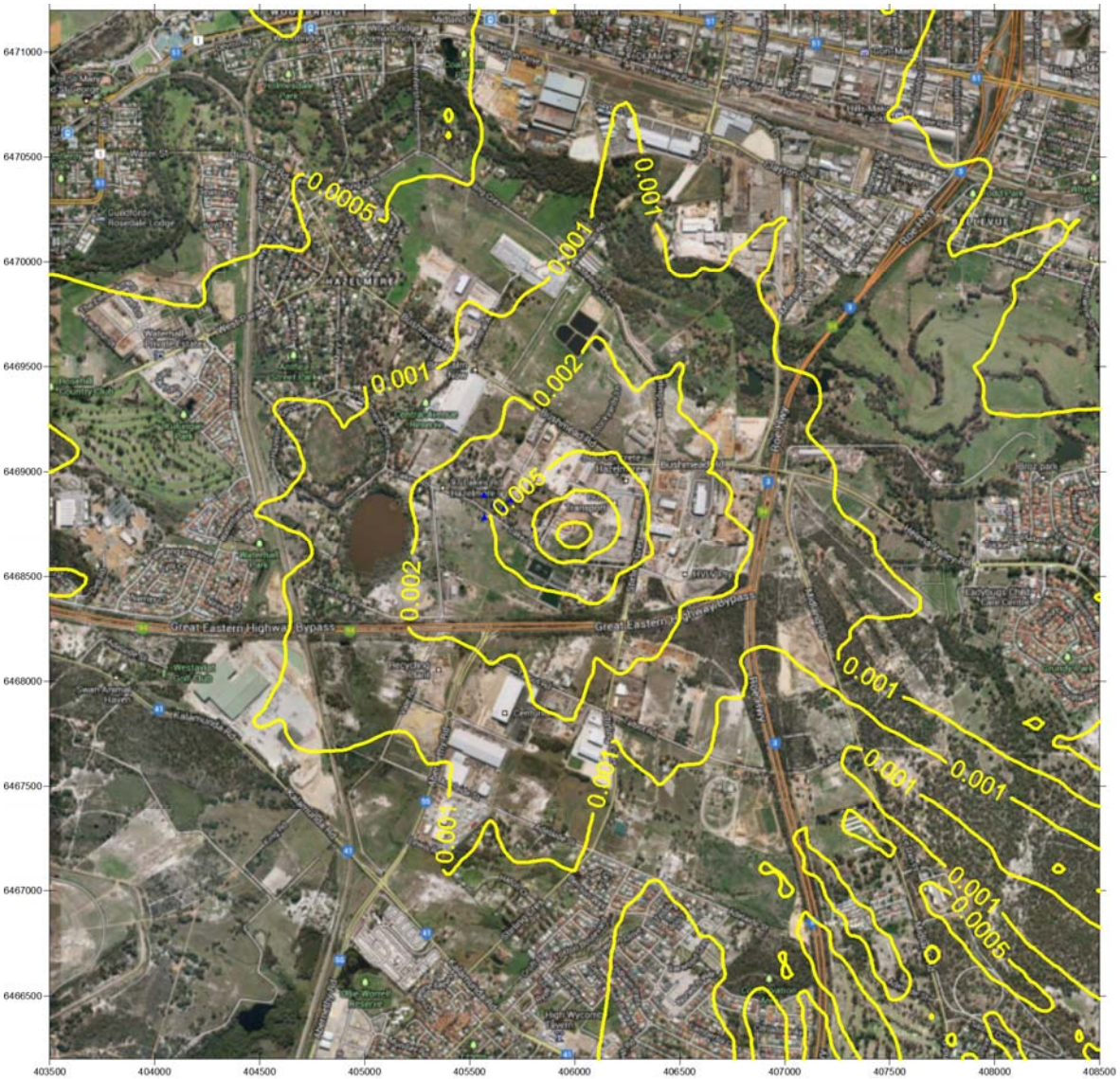

Figure 55: Normal Operations - GLC Pb (ng/m³) Maximum 8-Hourly

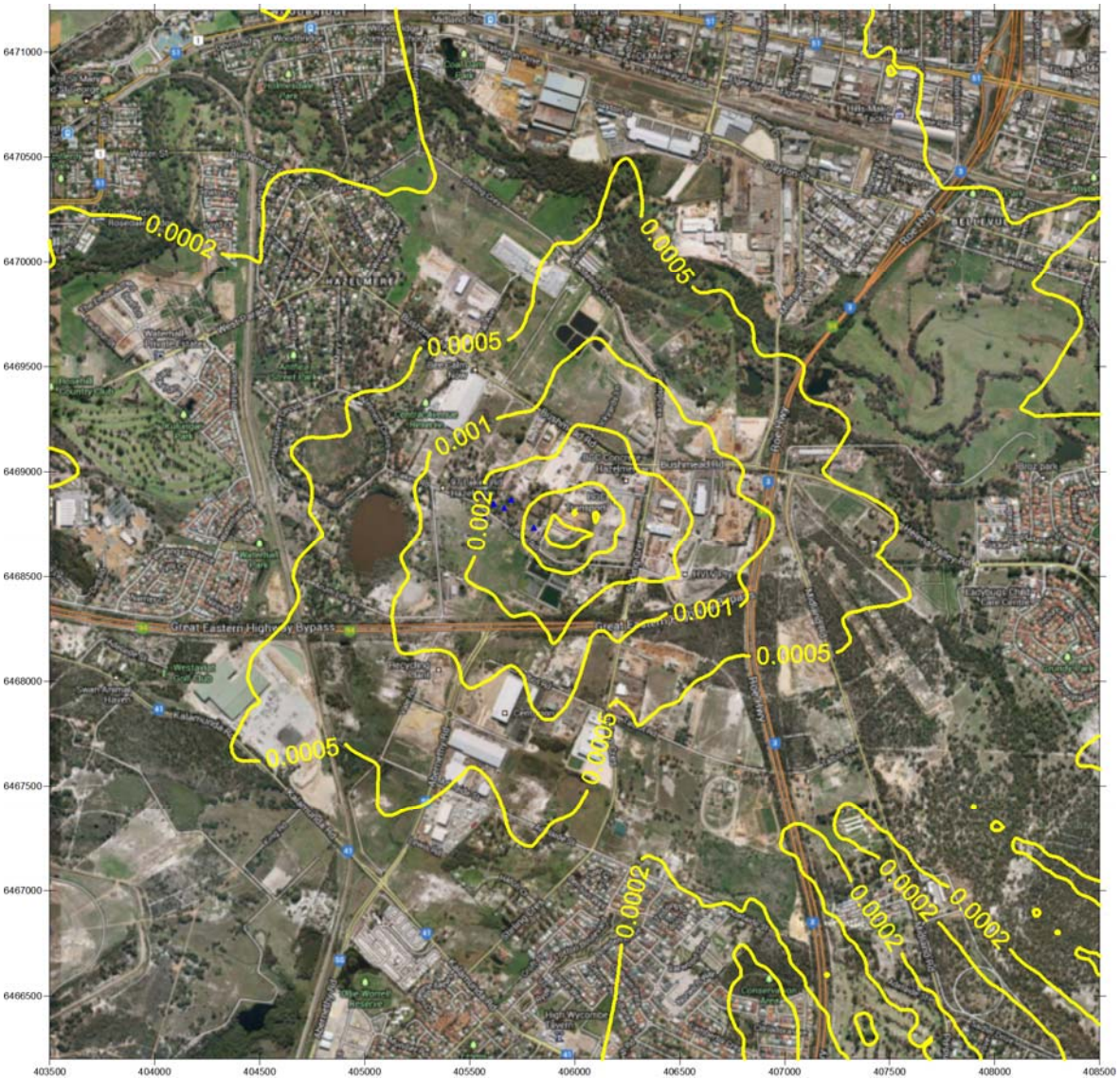

Figure 56: Normal Operations - GLC Pb (ng/m³) Maximum Daily

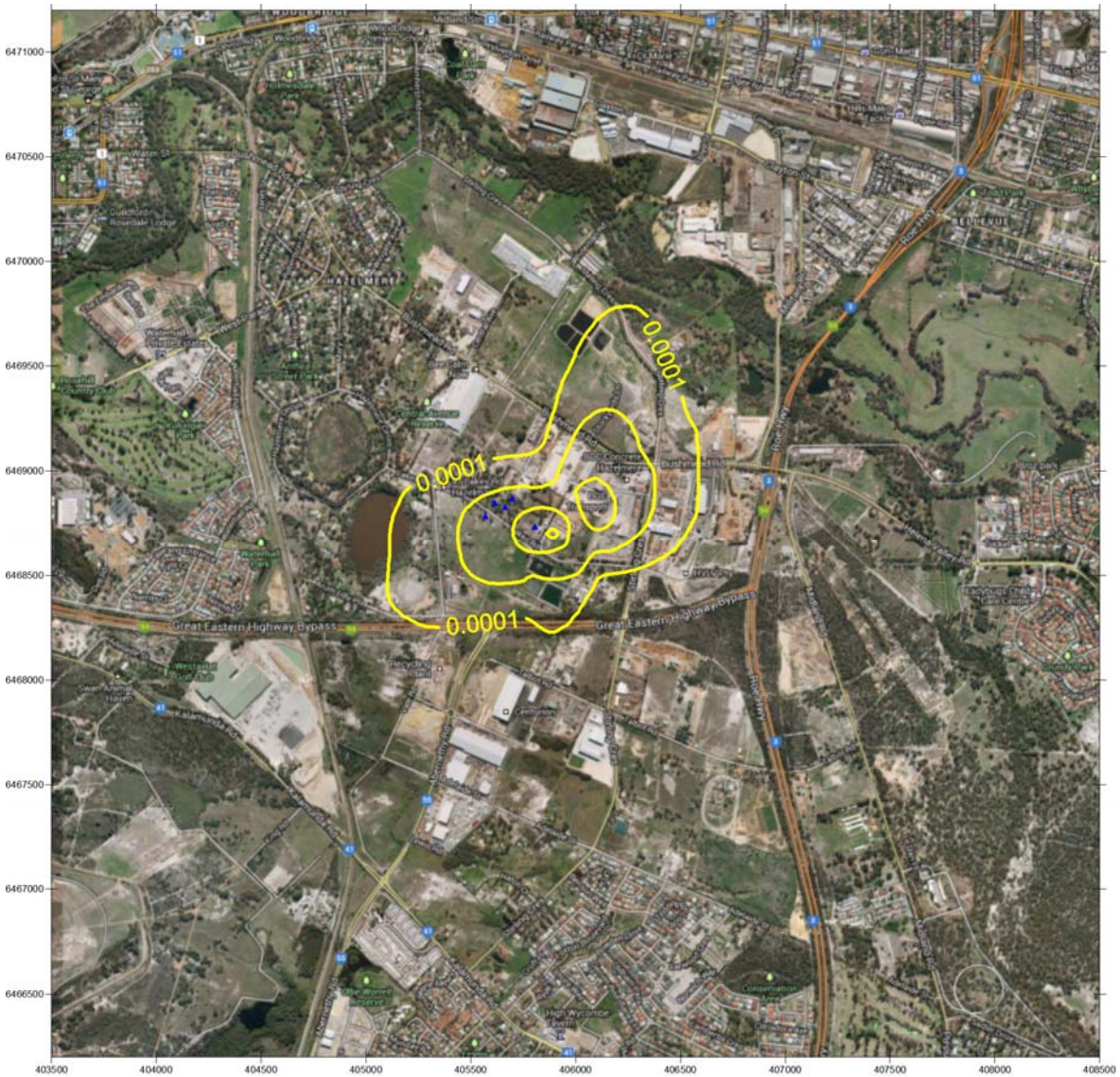

Figure 57: Normal Operations - GLC Pb (ng/m³) Annual average

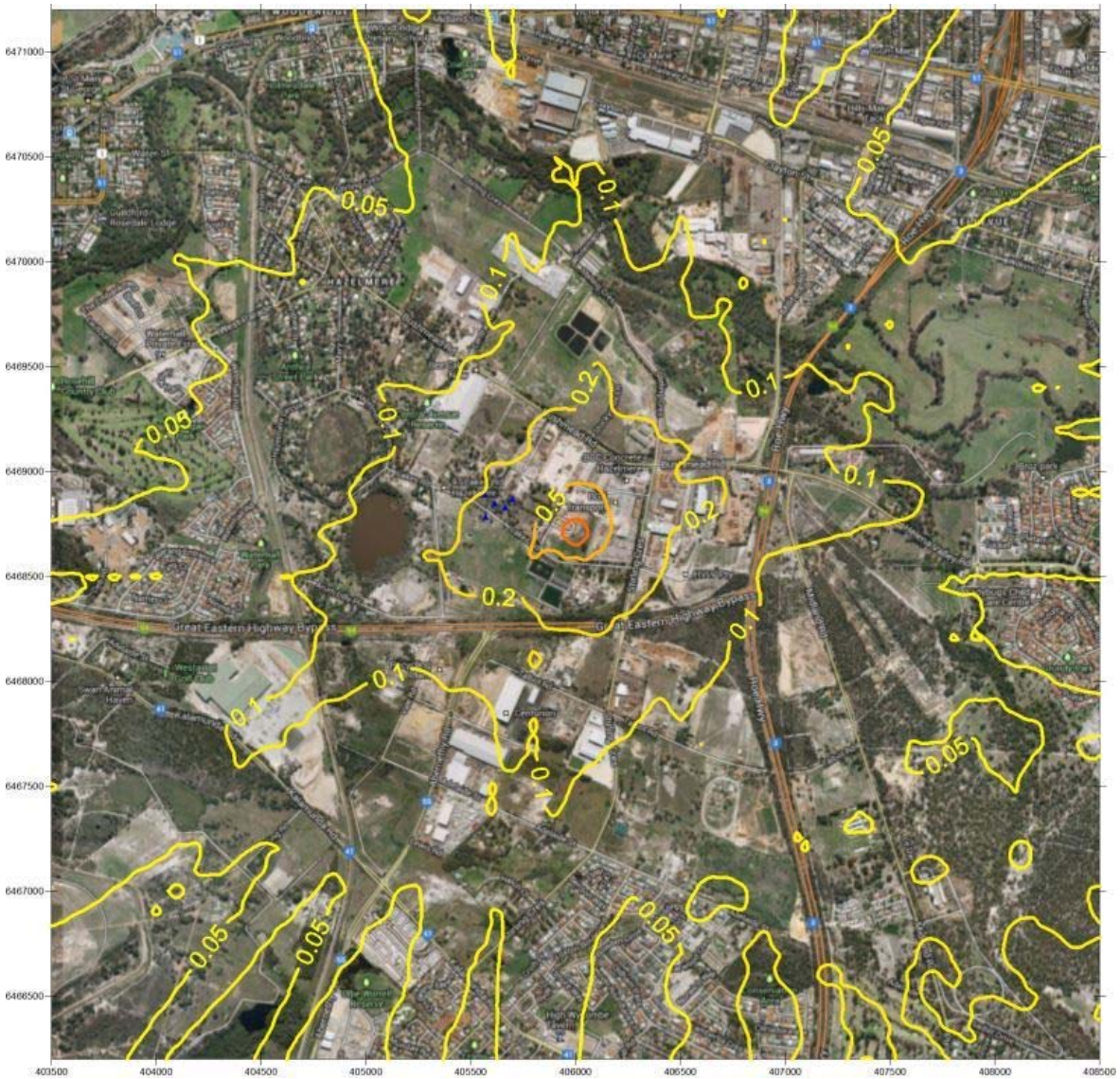

Figure 58: Normal Operations - GLC Particulates (µg/m³) Maximum Hourly

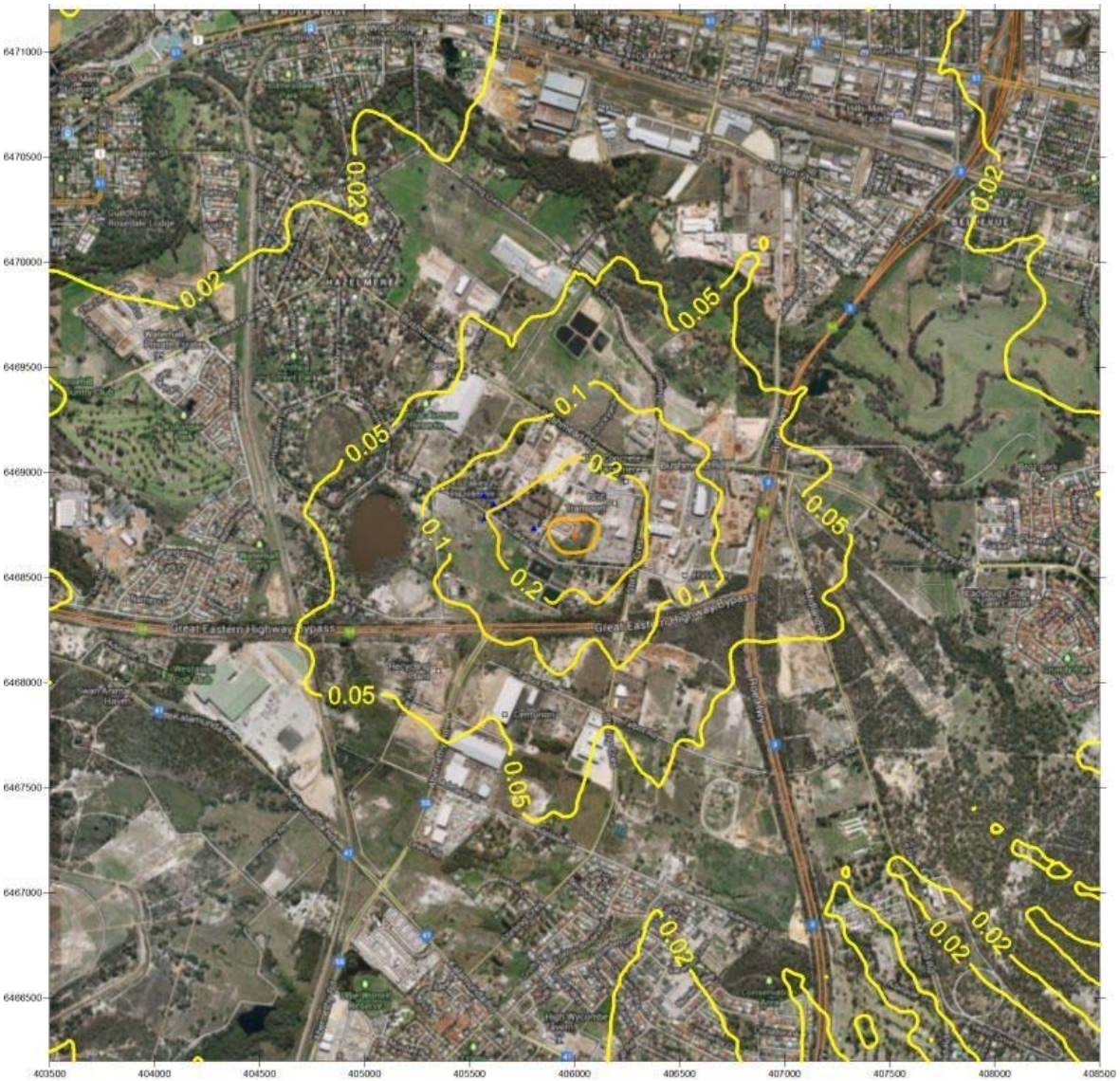

Figure 59: Normal Operations - GLC Particulates (µg/m³) Maximum 8-Hourly

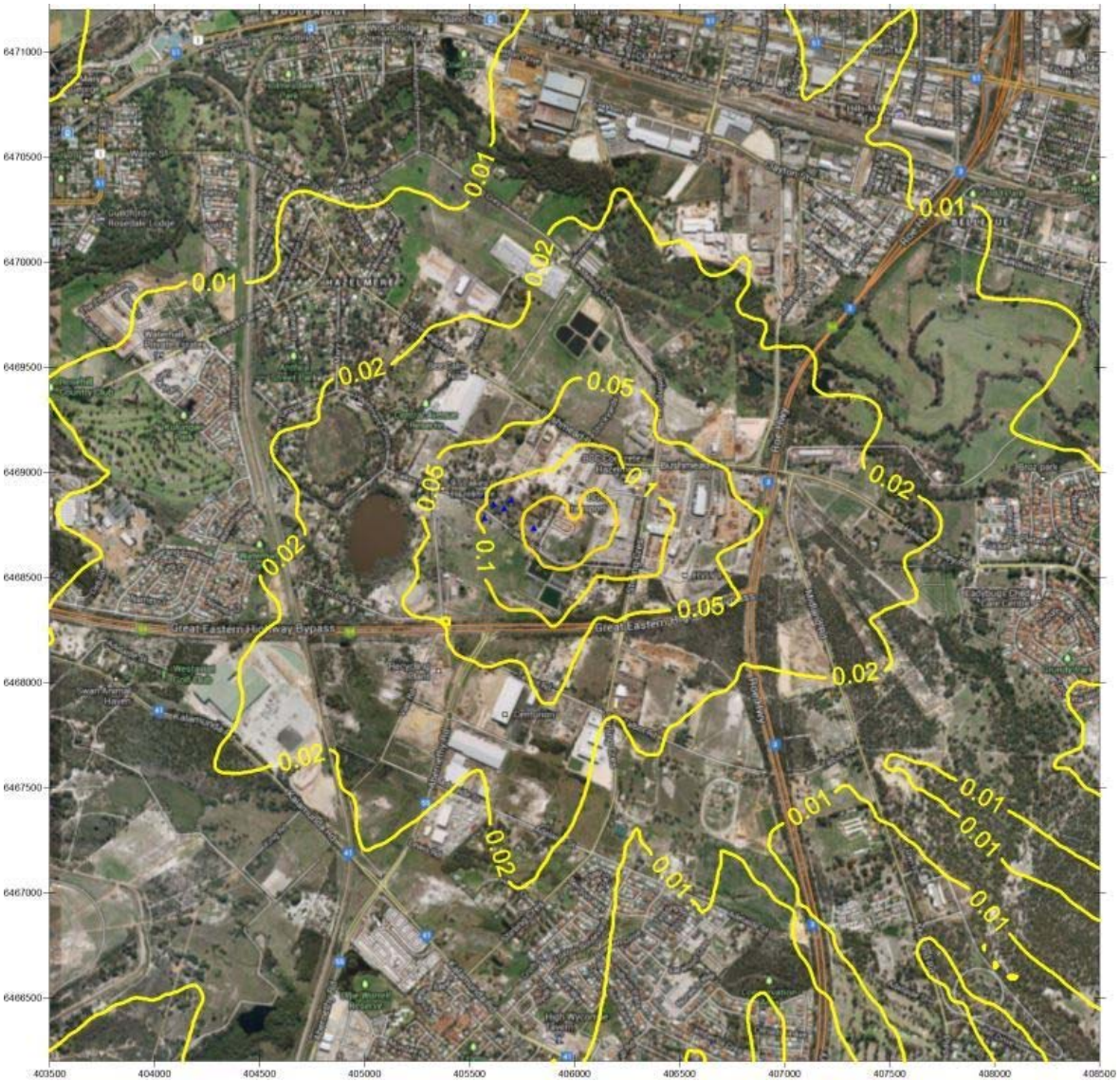

Figure 60: Normal Operations - GLC Particulates (µg/m³) Maximum Daily

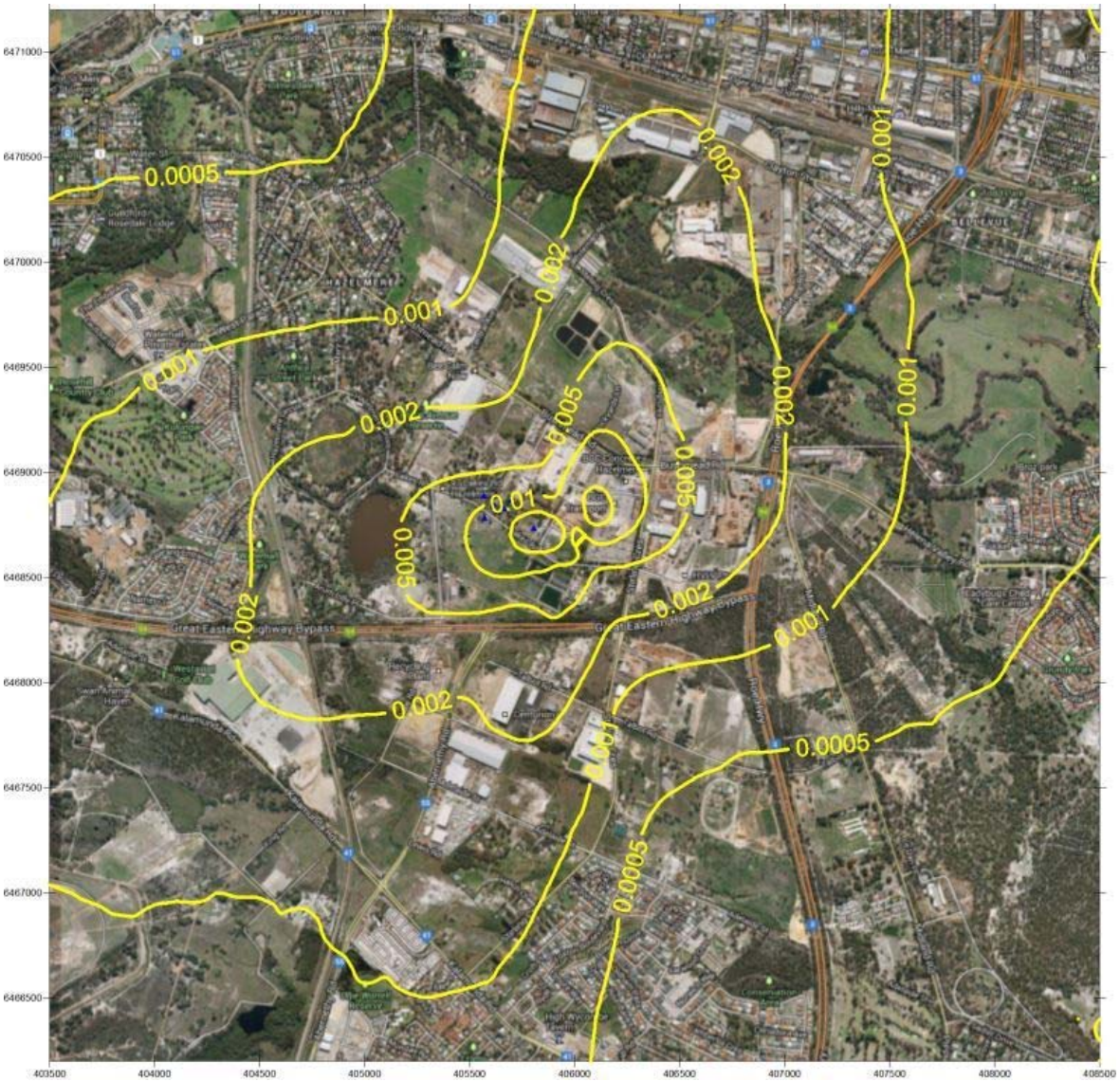

Figure 61: Normal Operations - GLC Particulates (µg/m³) Annual average

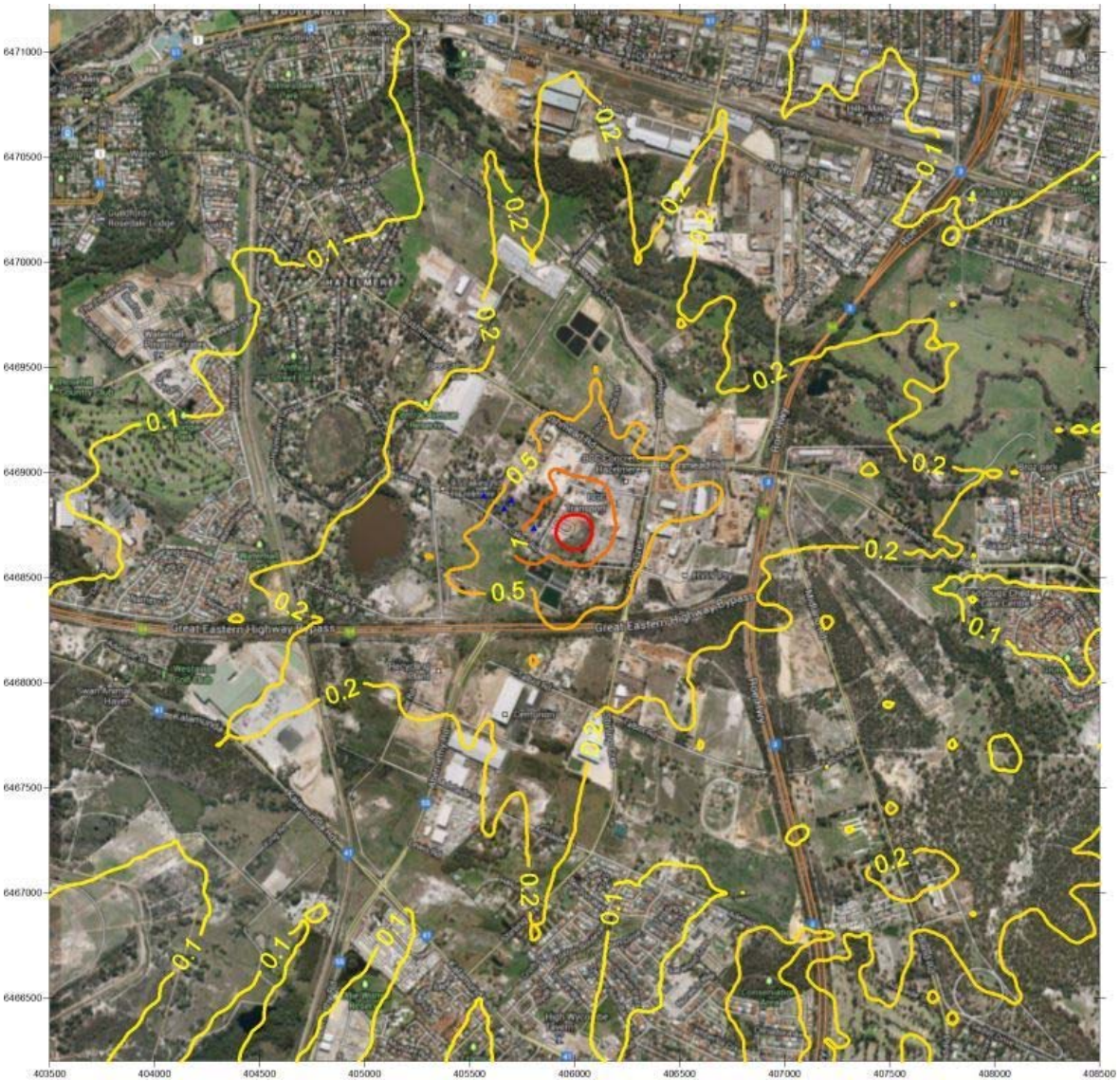

Figure 62: Normal Operations - GLC Sb (ρg/m³) Maximum Hourly

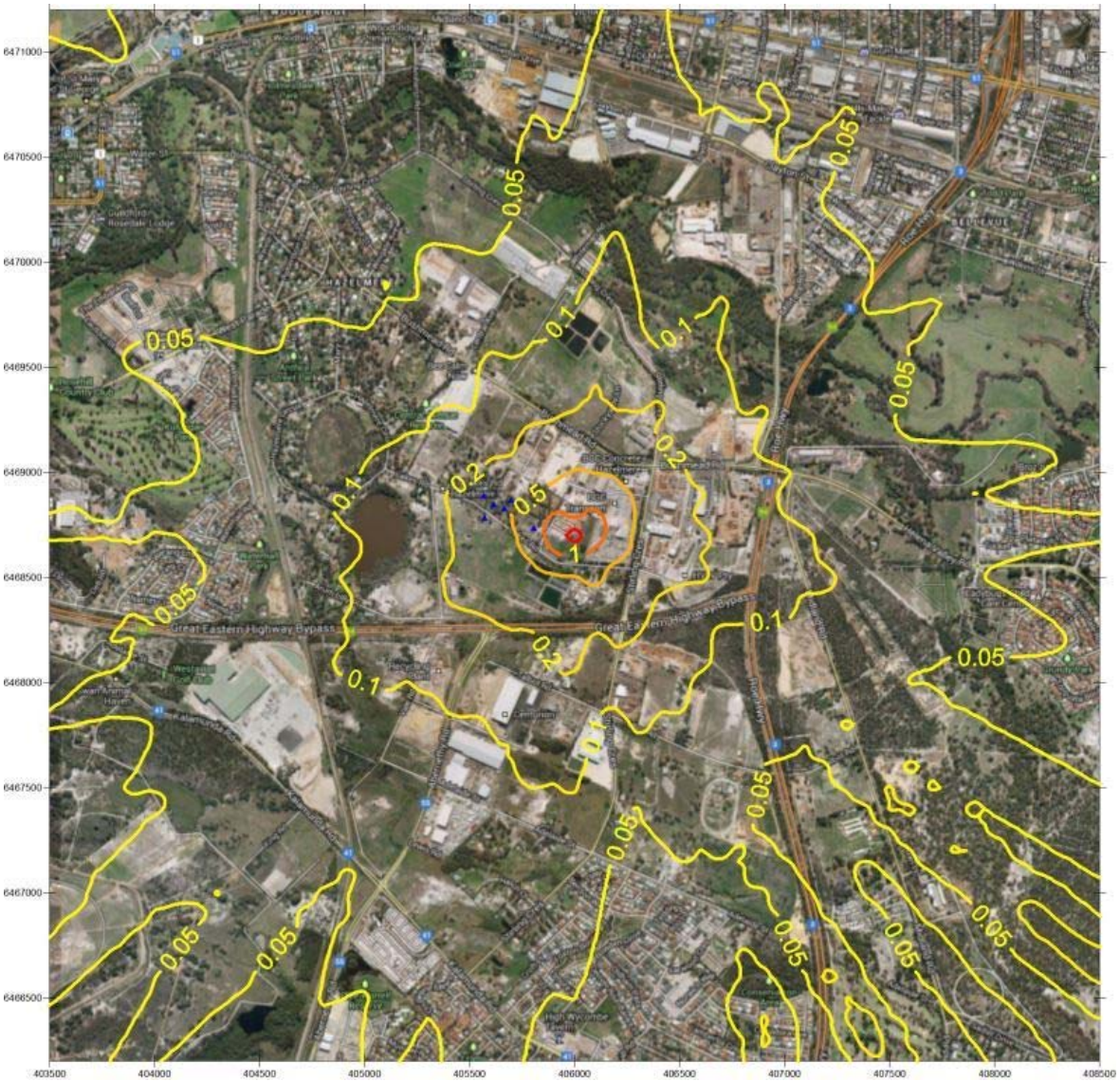

Figure 63: Normal Operations - GLC Sb (ρg/m³) Maximum 8-Hourly

Figure 64: Normal Operations - GLC Sb (ρg/m³) Maximum Daily

Figure 65: Normal Operations - GLC Sb (ρg/m³) Annual average

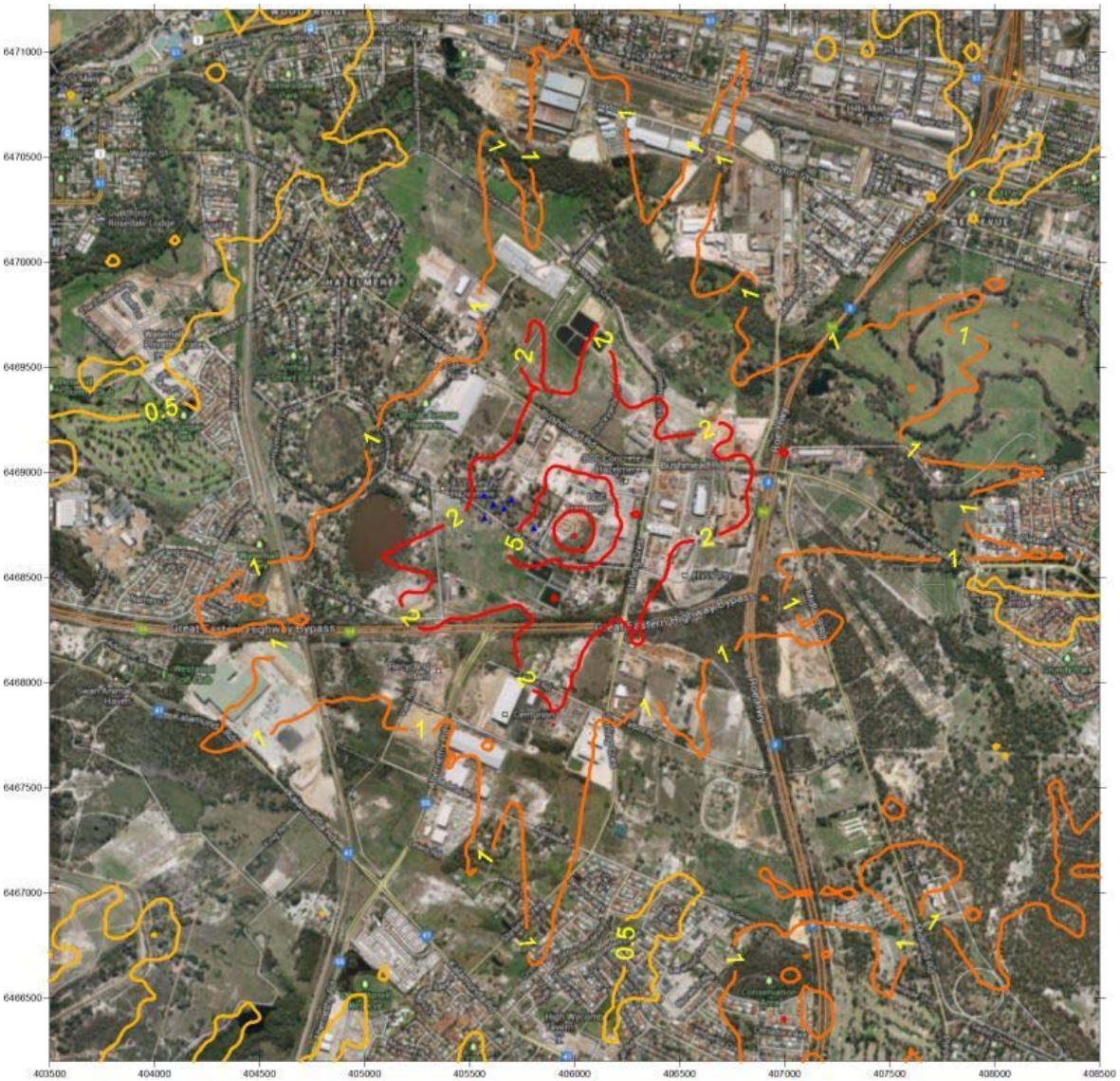

Figure 66: Normal Operations - GLC SO_2 (µg/m³) Maximum Hourly

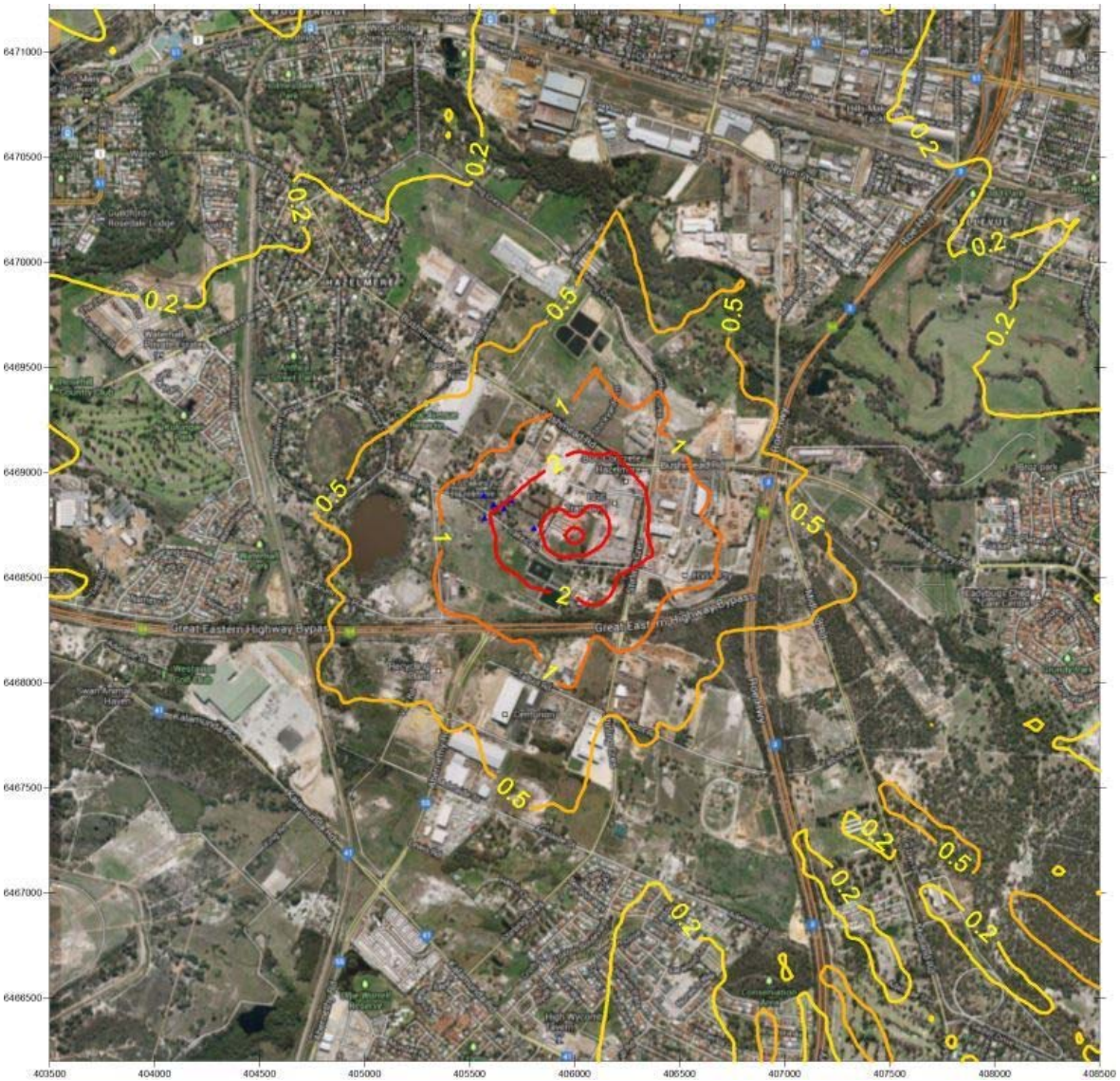

Figure 67: Normal Operations - GLC SO_2 (µg/m³) Maximum 8-Hourly

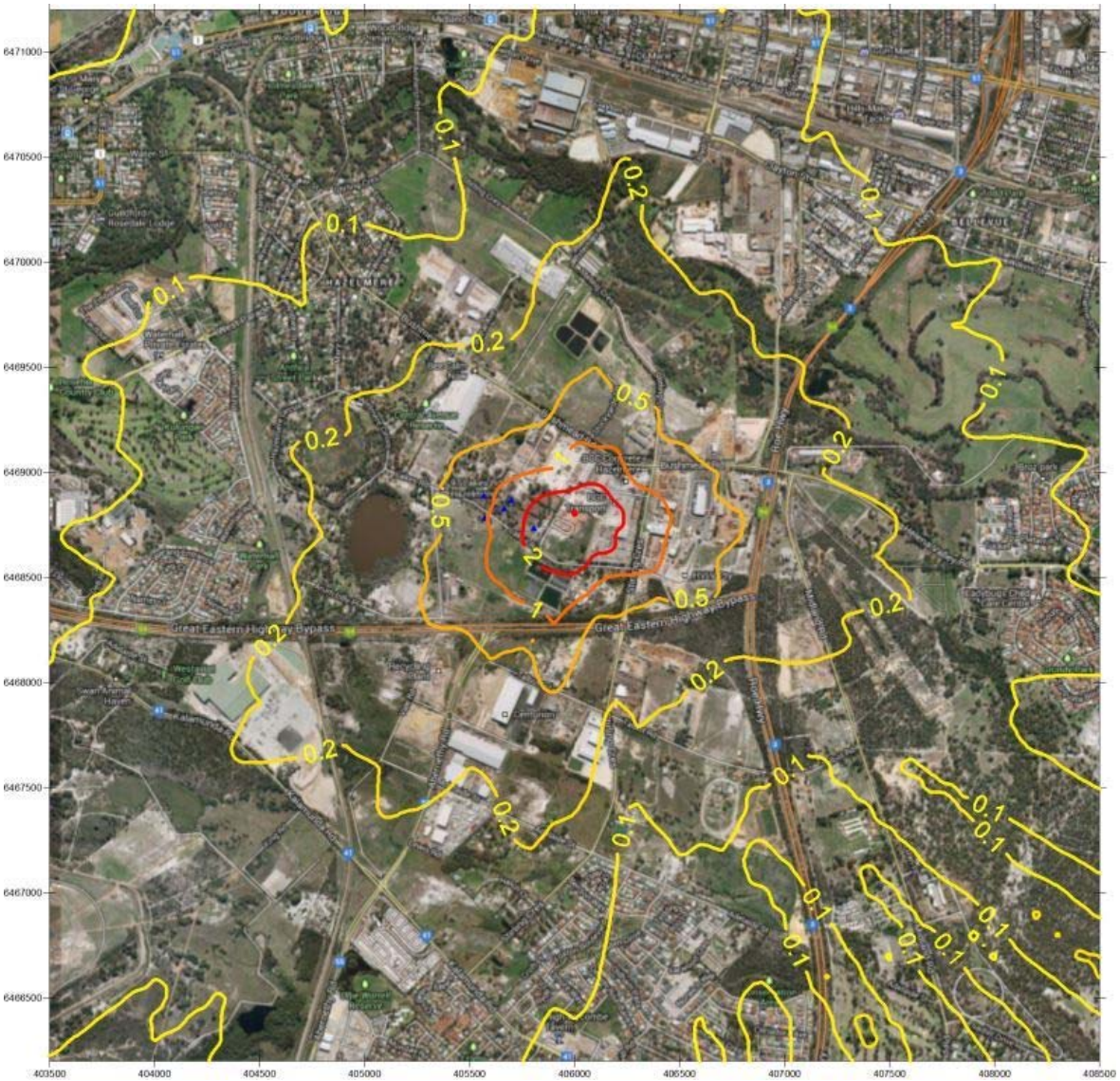

Figure 68: Normal Operations - GLC SO_2 (µg/m³) Maximum Daily

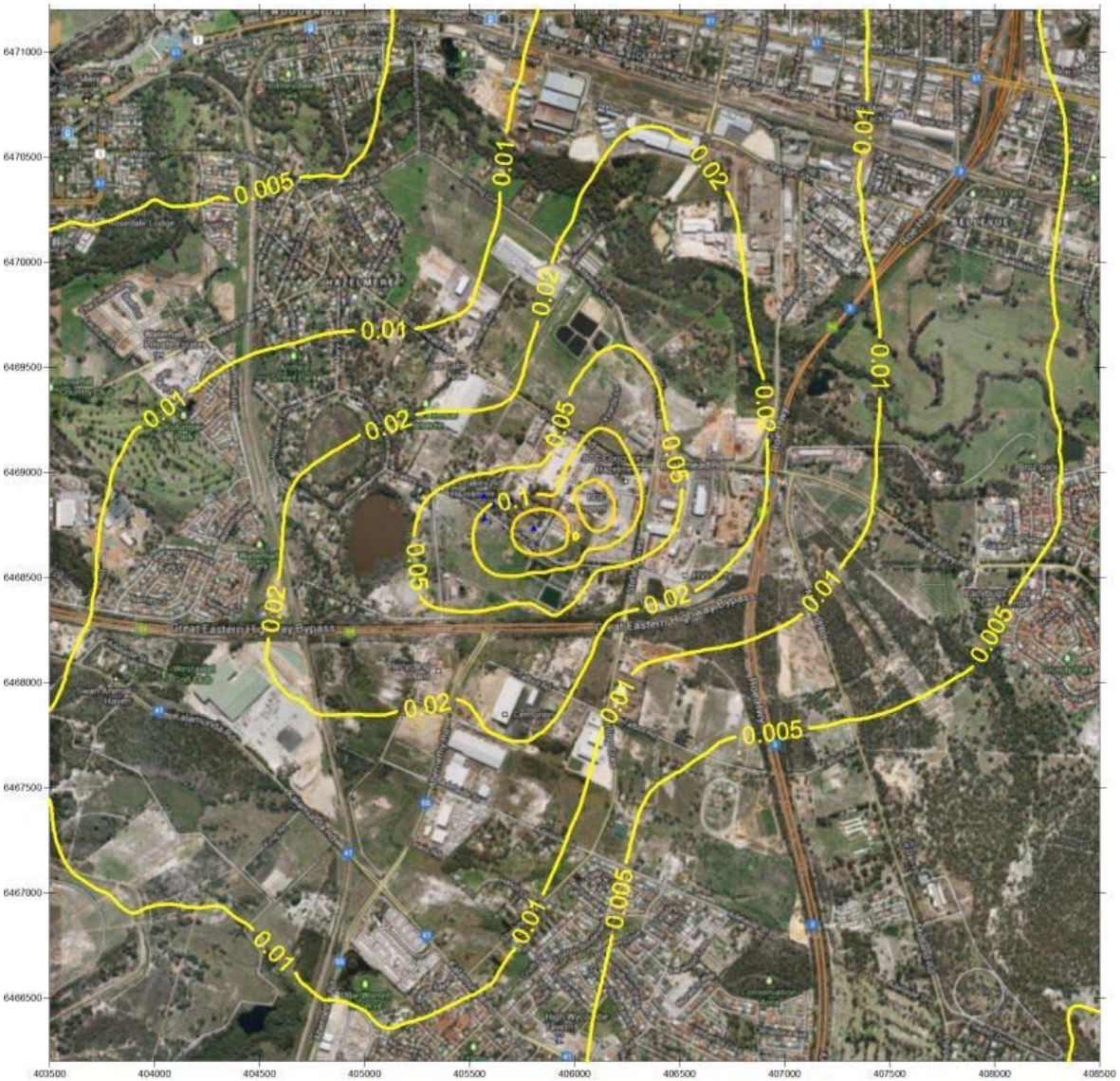

Figure 69: Normal Operations - GLC SO_2 (µg/m³) Annual average

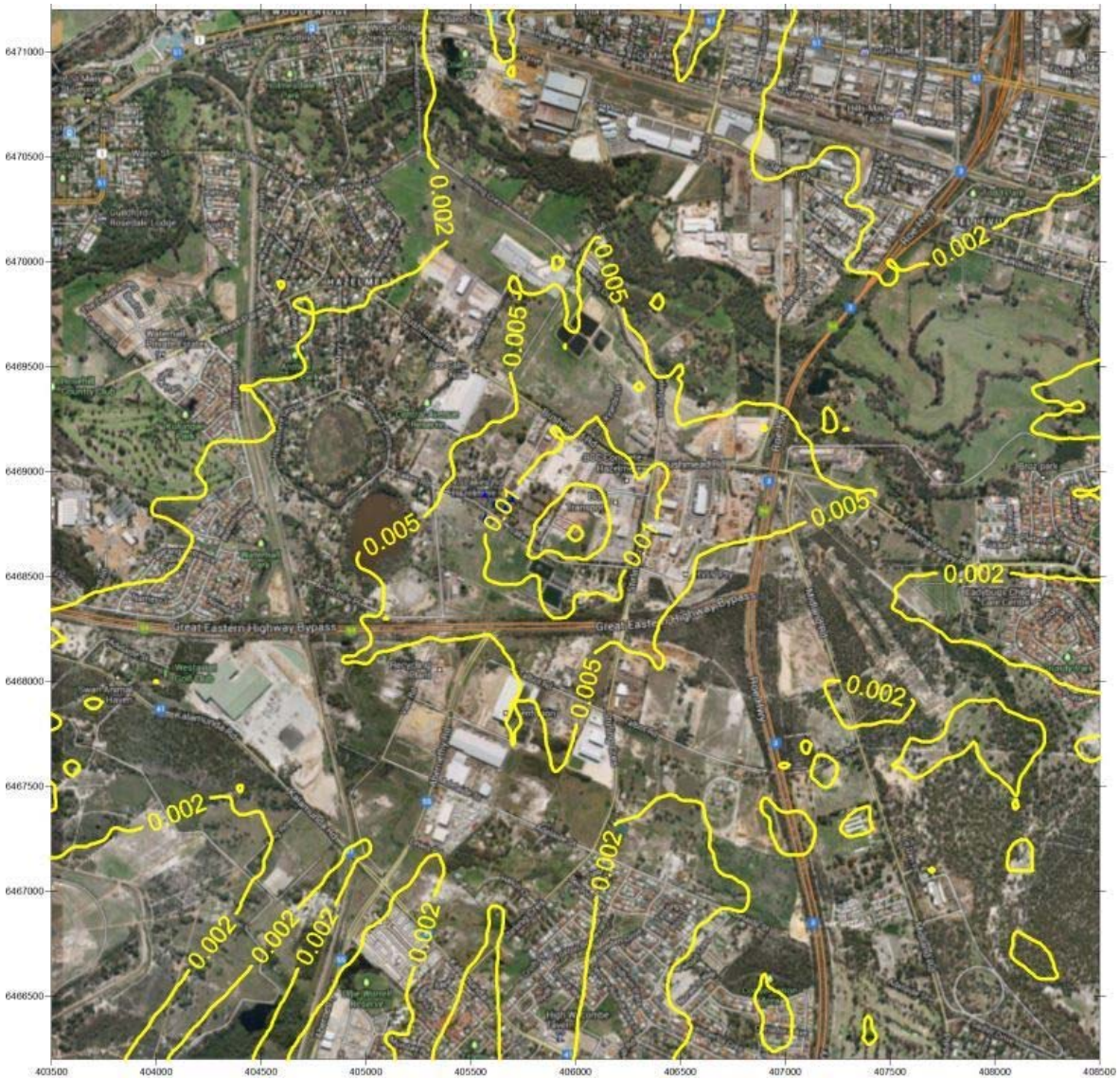

Figure 70: Normal Operations - GLC Ti (ng/m³) Maximum Hourly

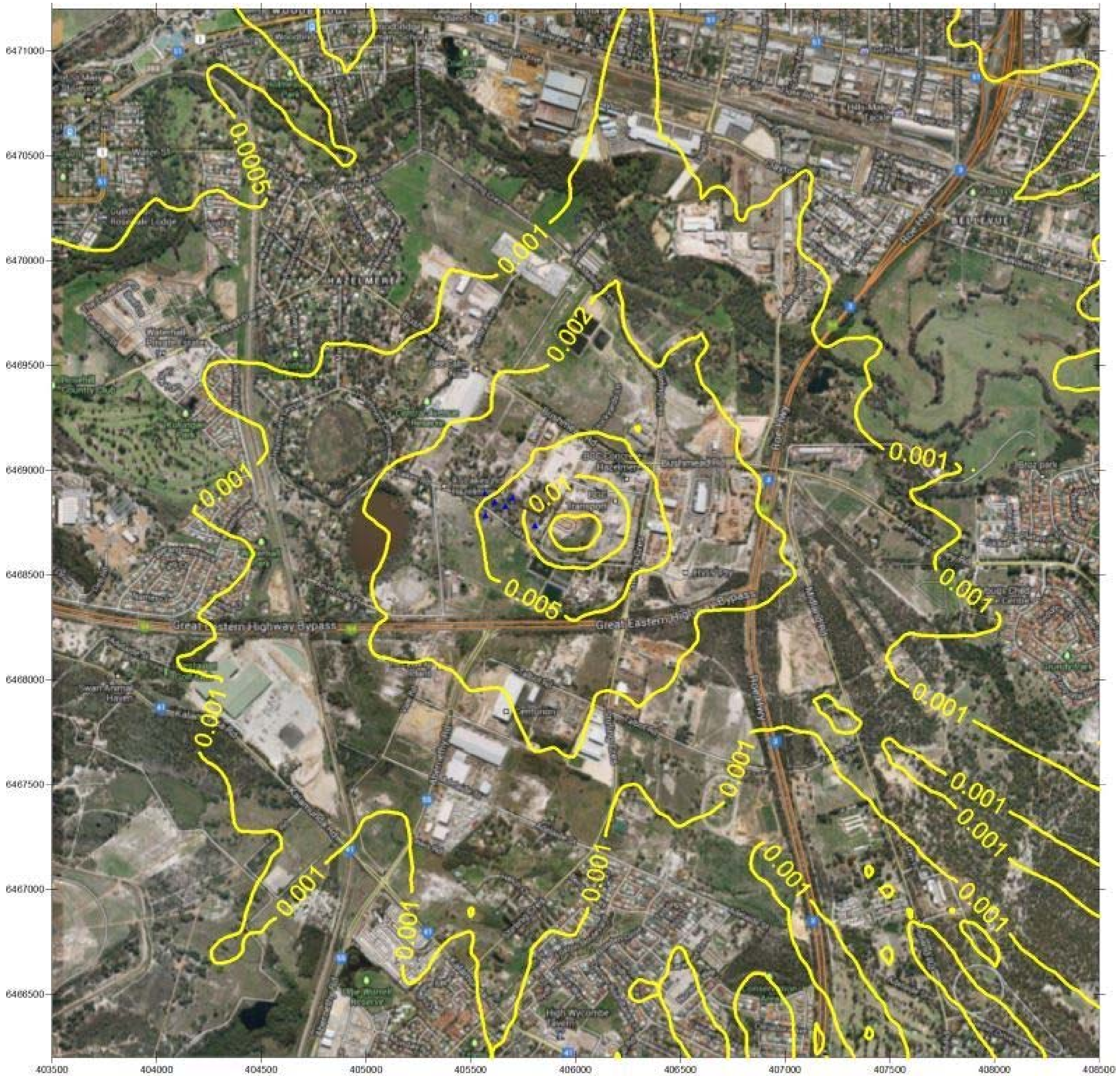

Figure 71: Normal Operations - GLC Ti (ng/m³) Maximum 8-Hourly

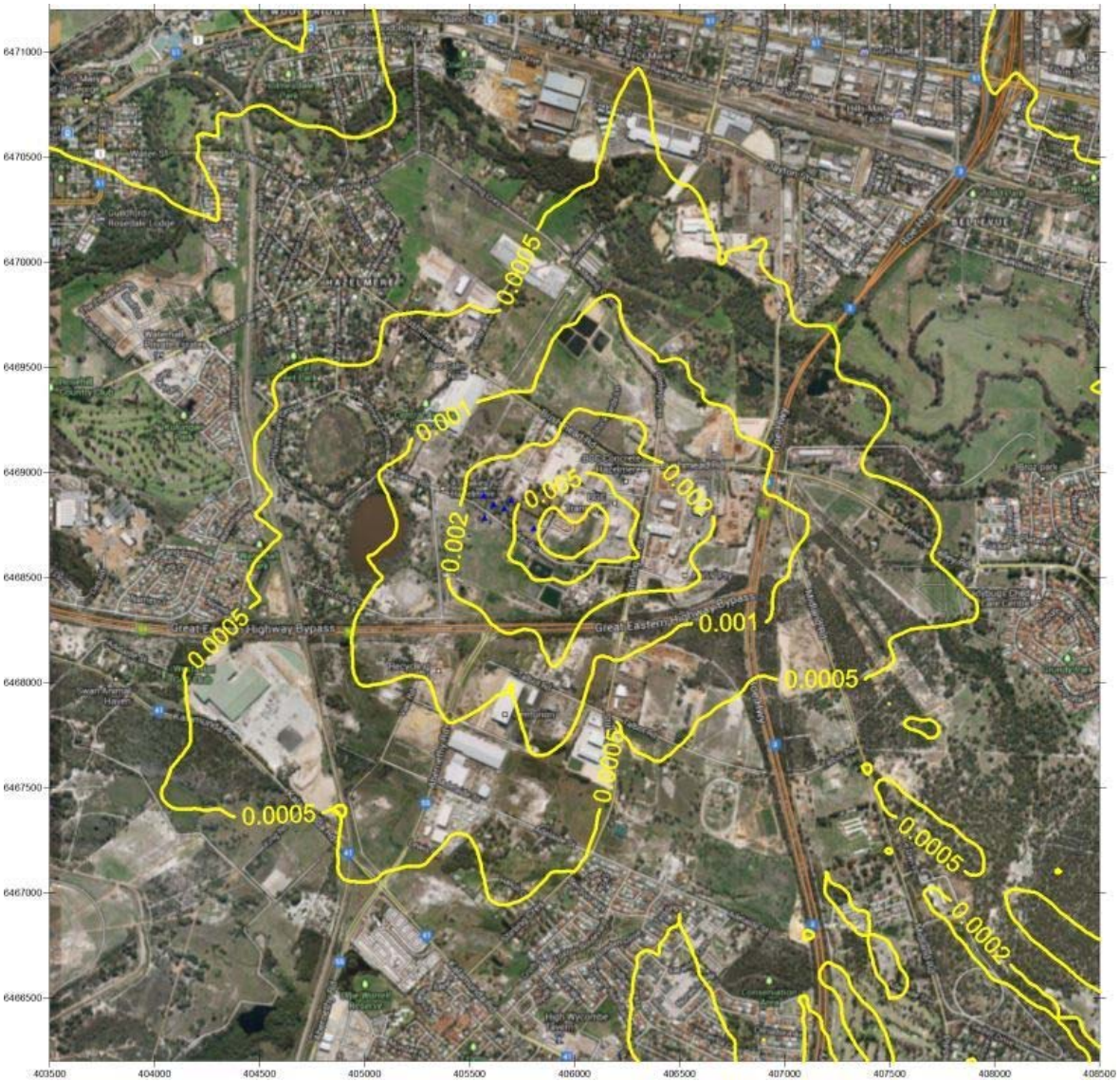

Figure 72: Normal Operations - GLC Ti (ng/m³) Maximum Daily

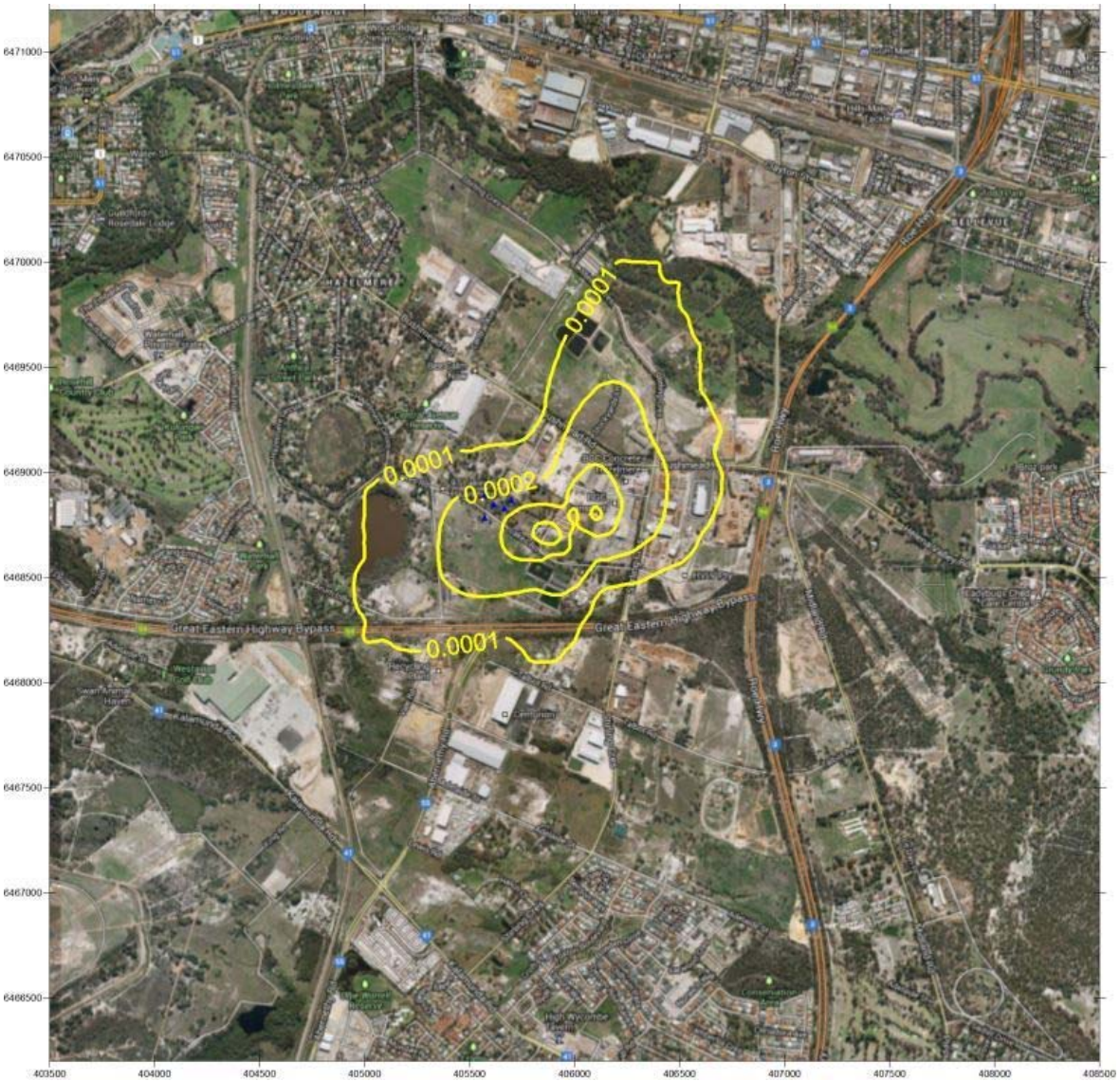

Figure 73: Normal Operations - GLC Ti (ng/m³) Annual average

Figure 74: Normal Operations - GLC VOC (µg/m³) Maximum Hourly

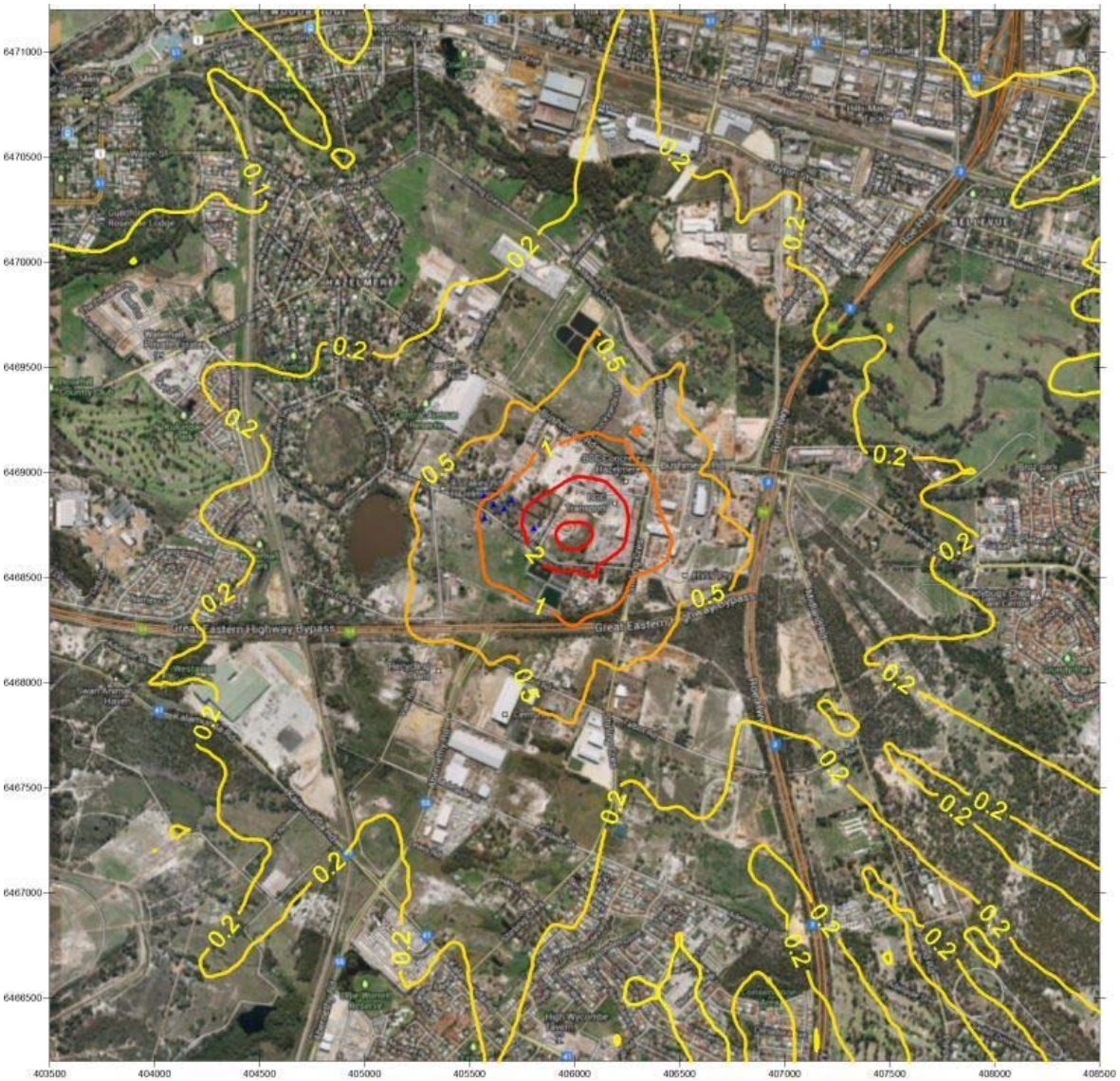

Figure 75: Normal Operations - GLC VOC (µg/m³) Maximum 8-Hourly

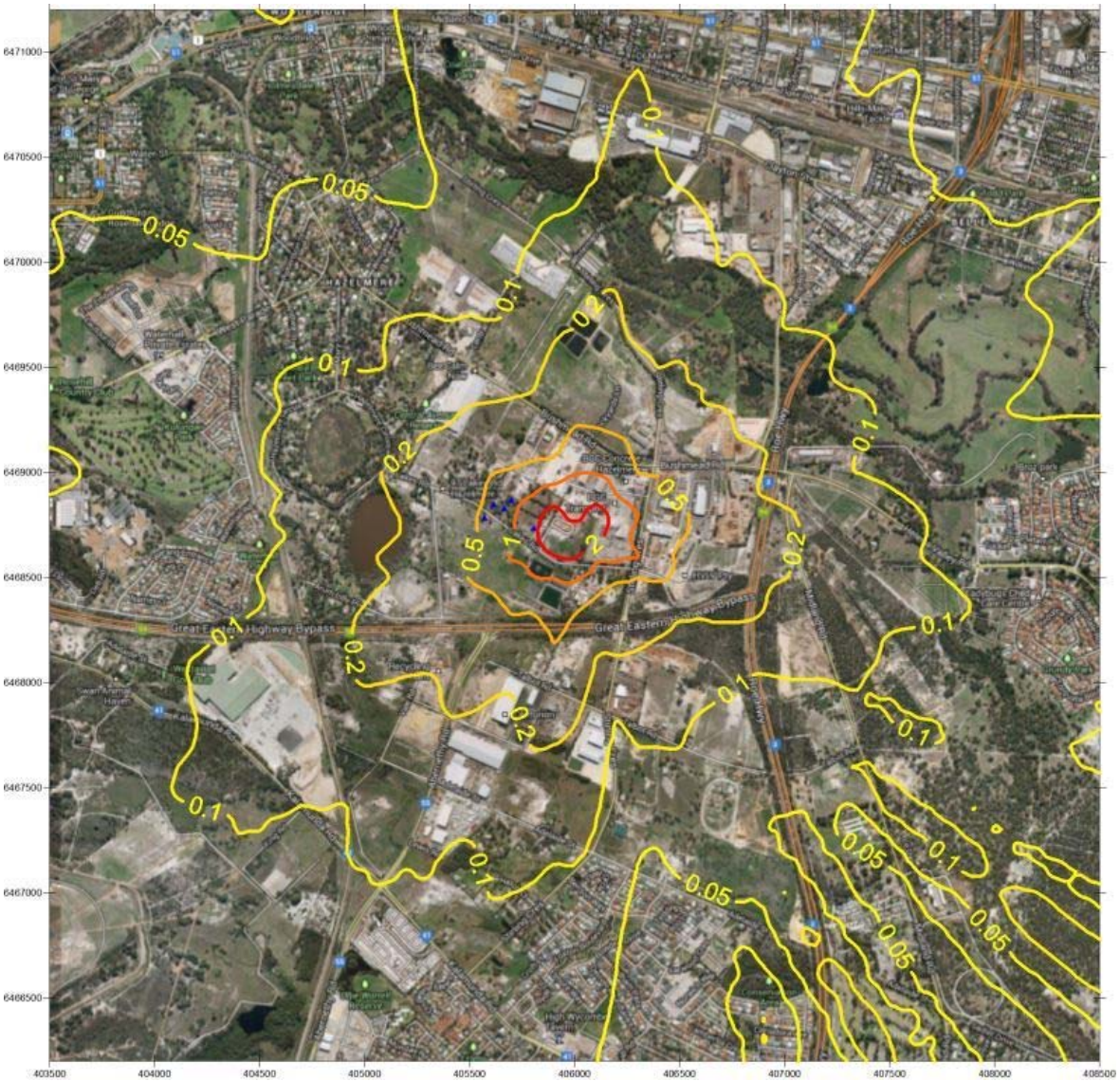

Figure 76: Normal Operations - GLC VOC (µg/m³) Maximum Daily

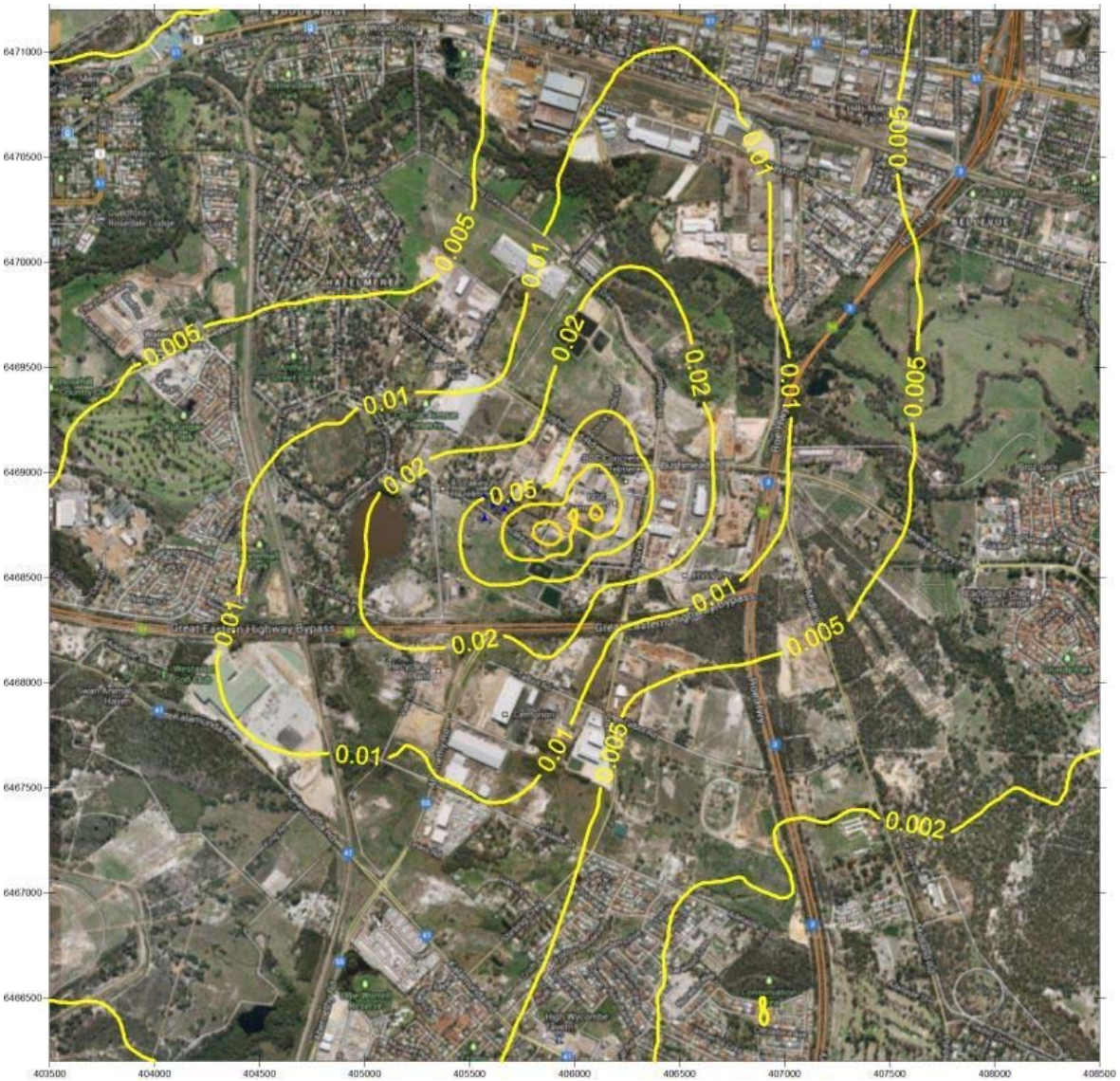

Figure 77: Normal Operations - GLC VOC (µg/m³) Annual average

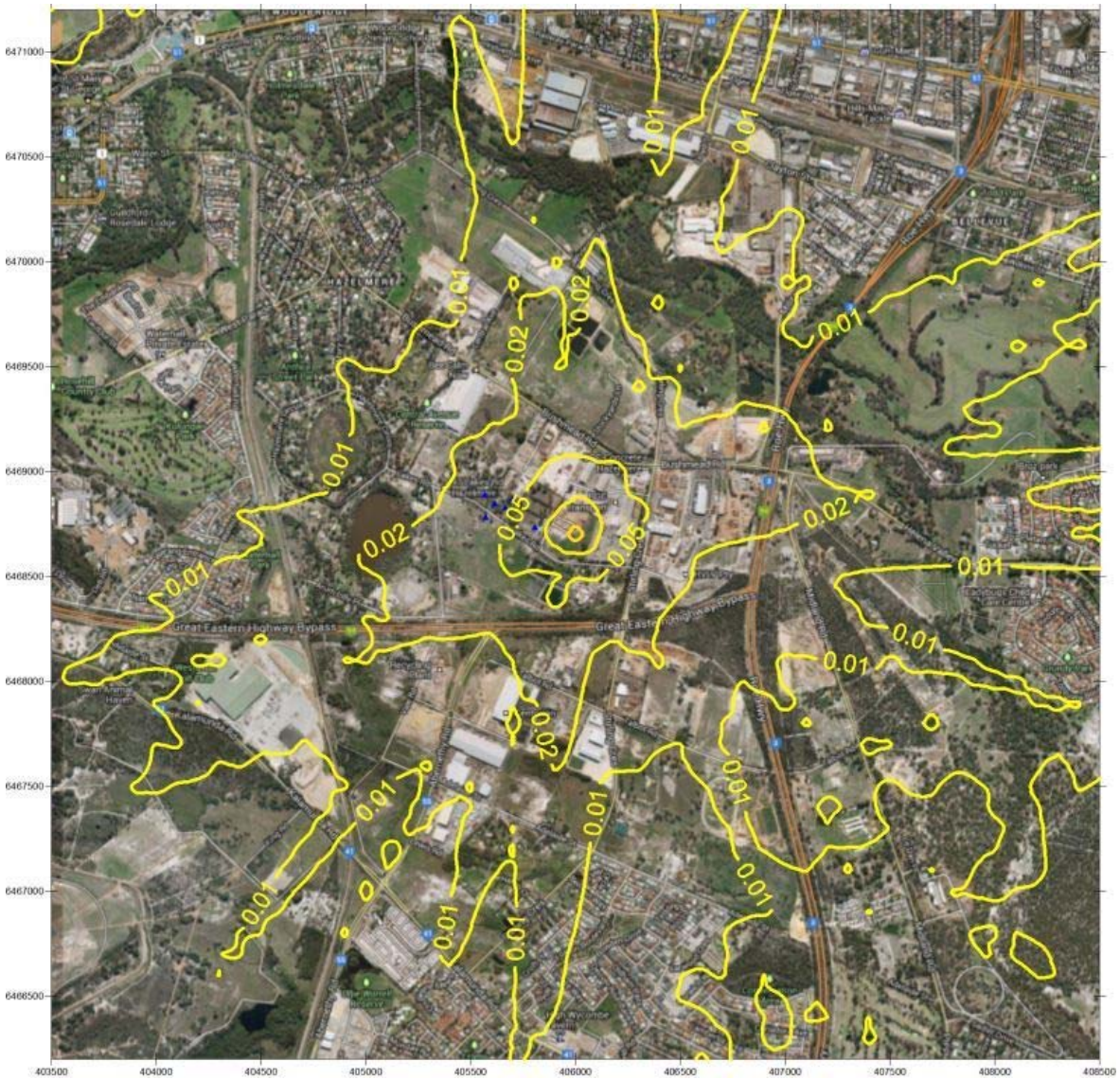

Figure 78: Normal Operations - GLC V (ρg/m³) Maximum Hourly

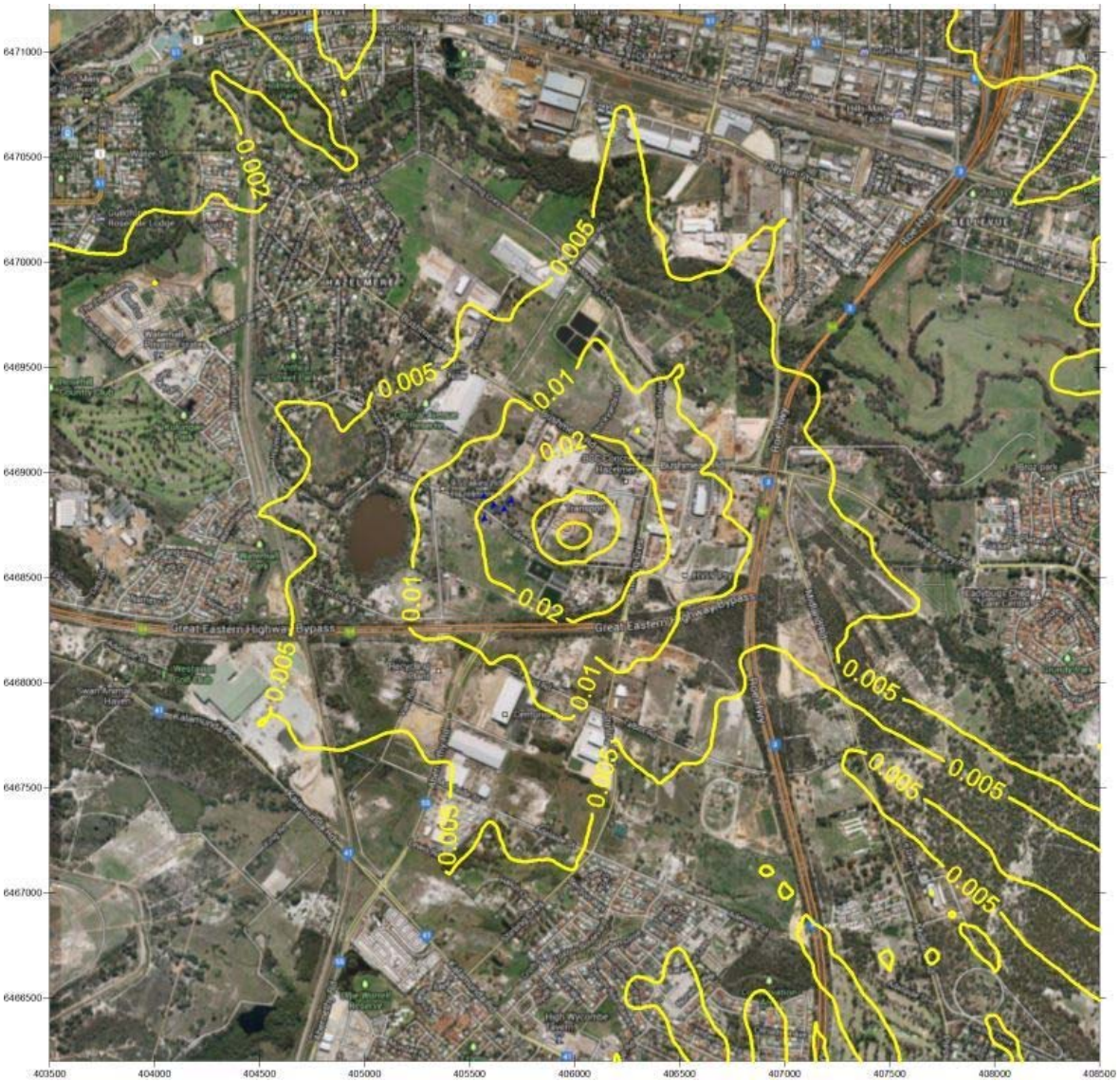

Figure 79: Normal Operations - GLC V (ρg/m³) Maximum 8-Hourly

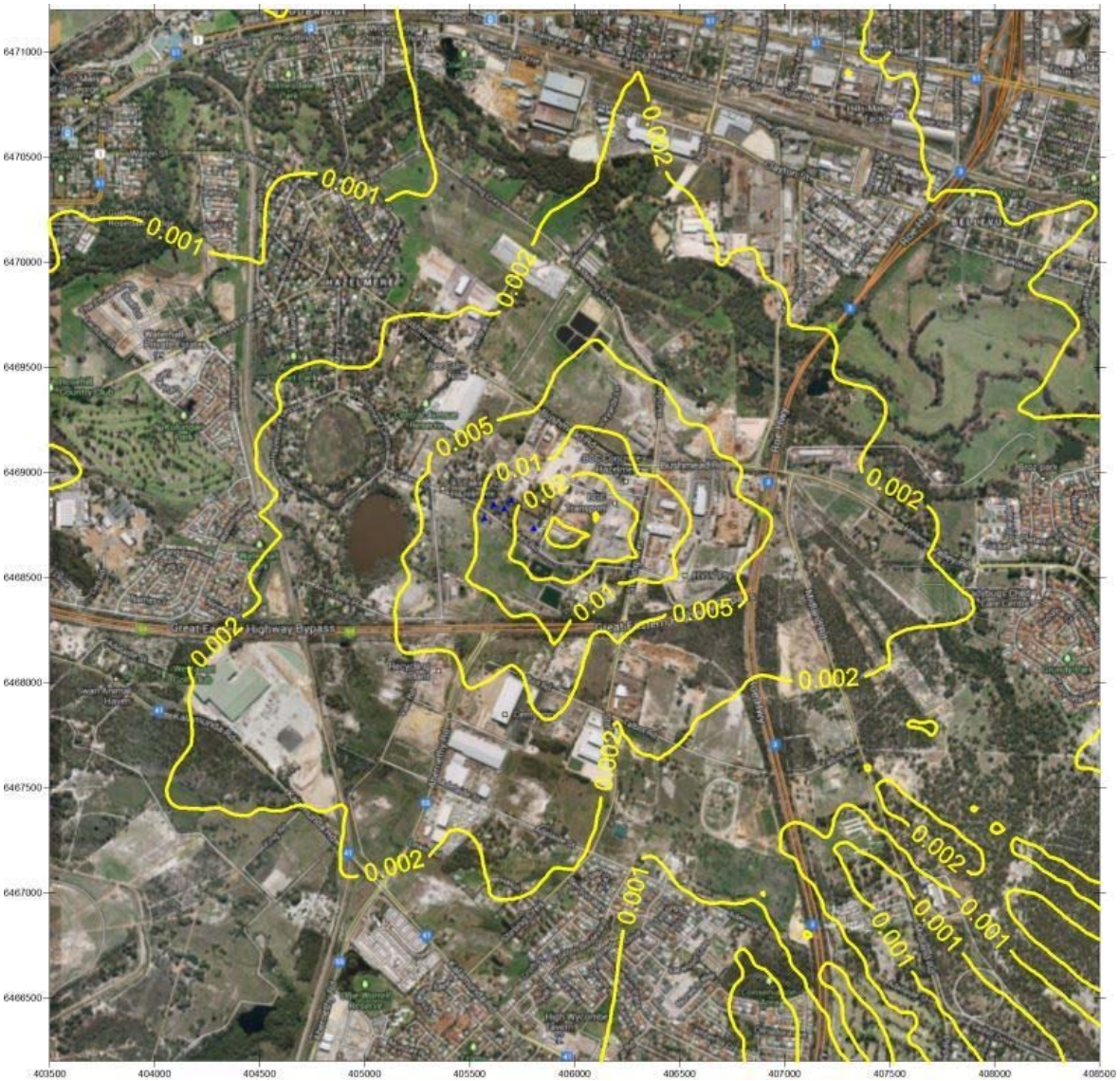

Figure 80: Normal Operations - GLC V (ρg/m³) Maximum Daily

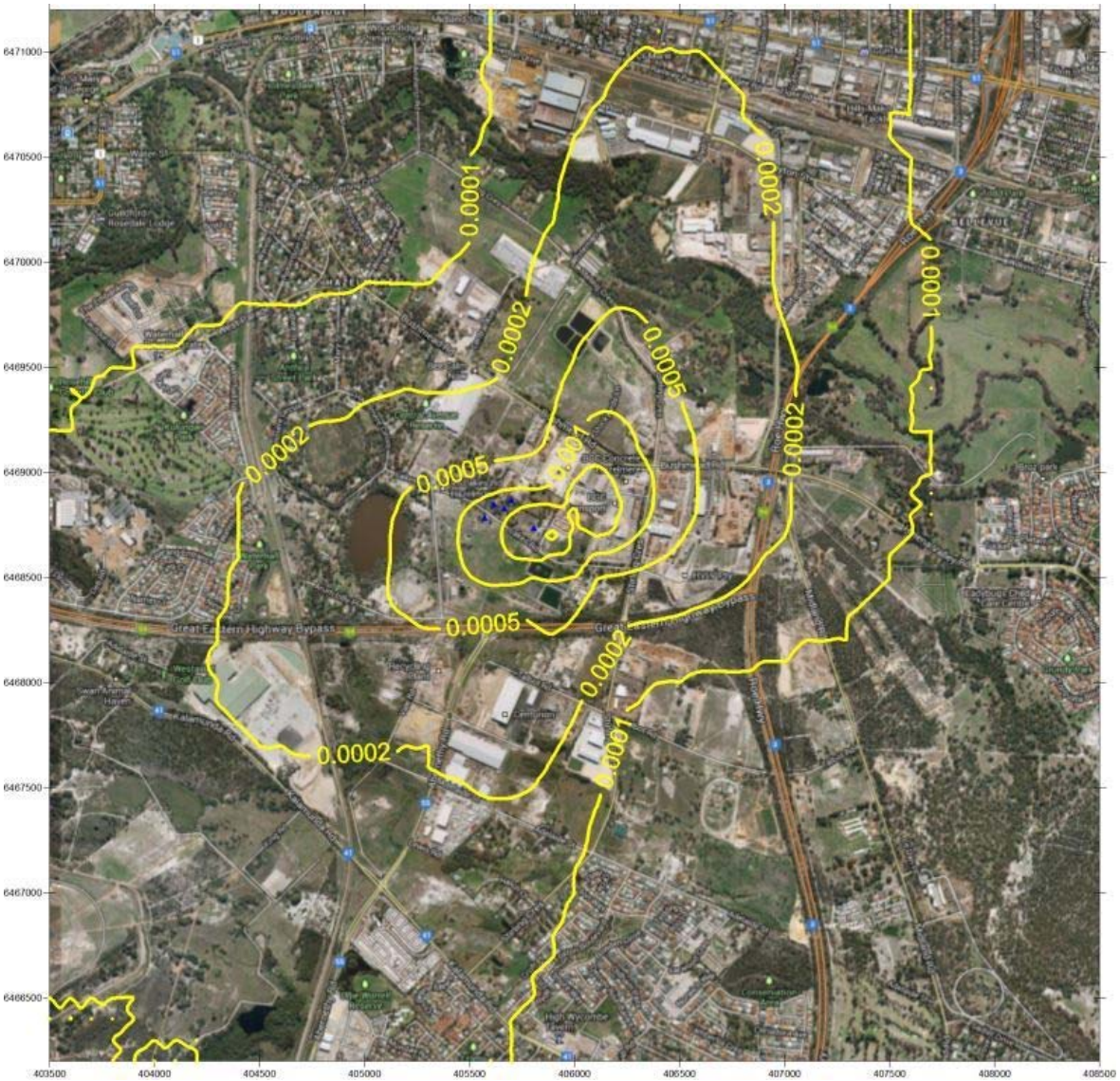

Figure 81: Normal Operations - GLC V (ρg/m³) Annual average

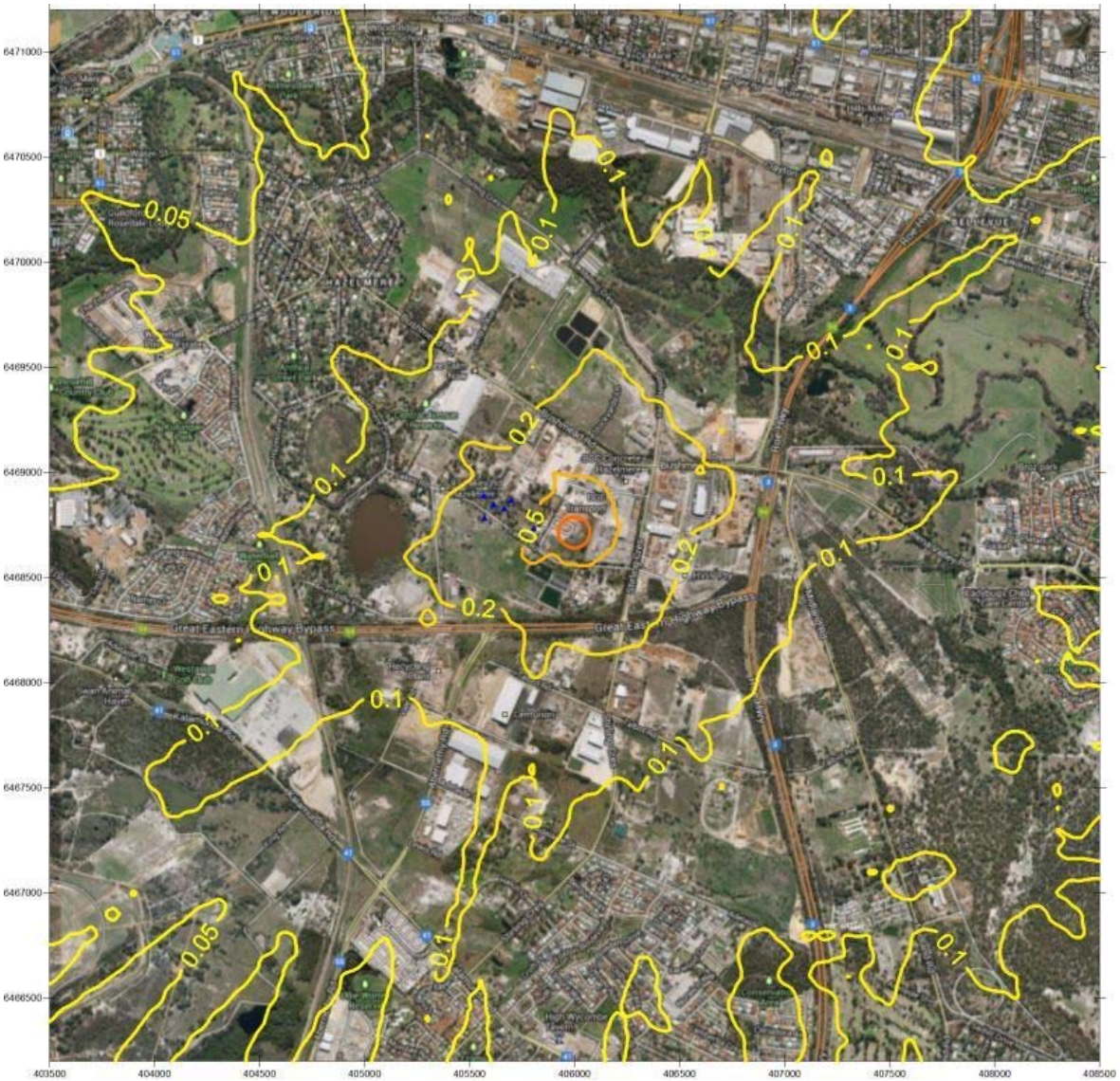

Figure 82: Reduced Operations - GLC As (ng/m³) Maximum Hourly

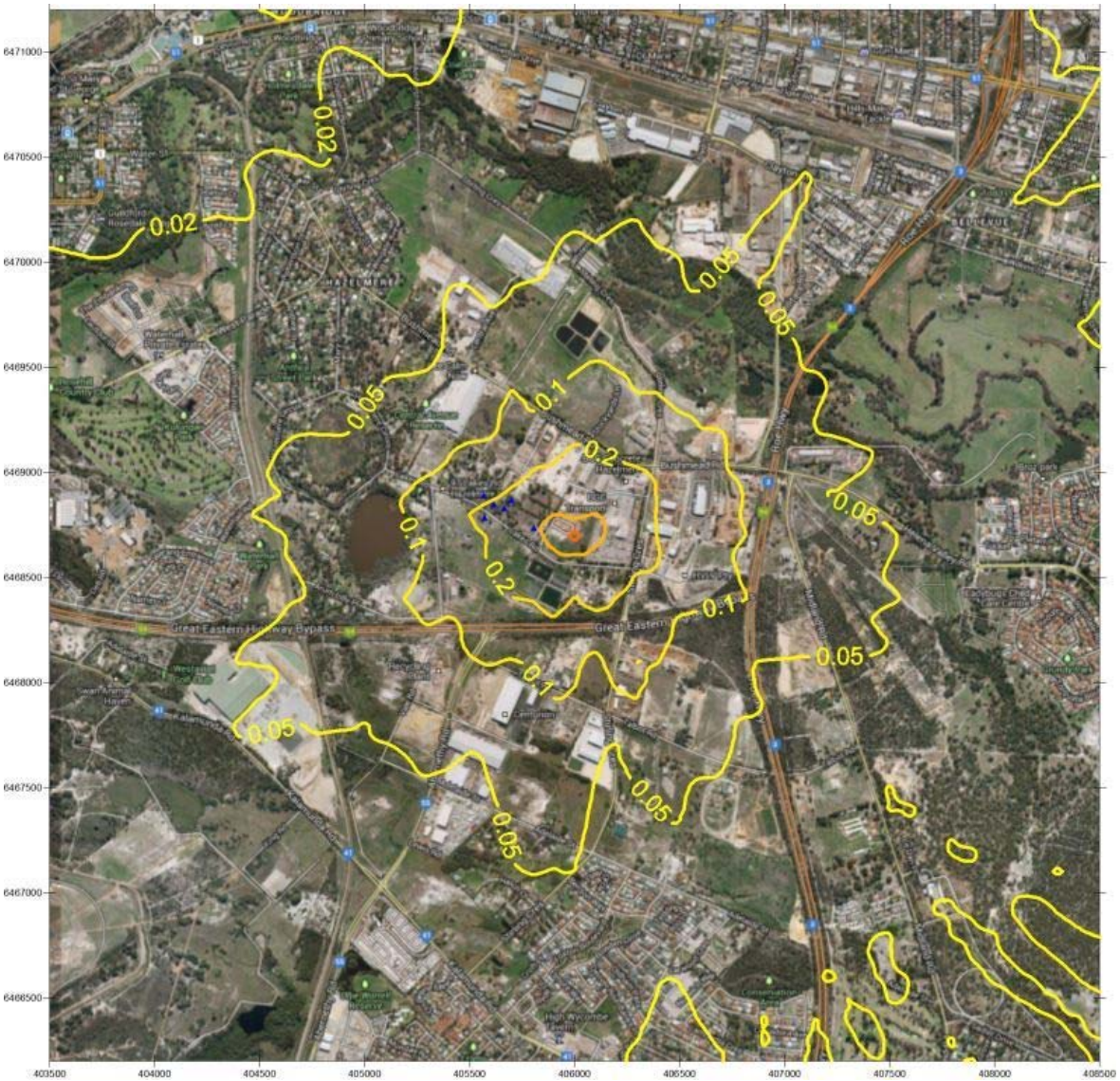

Figure 83: Reduced Operations - GLC As (ng/m³) Maximum 8-Hourly

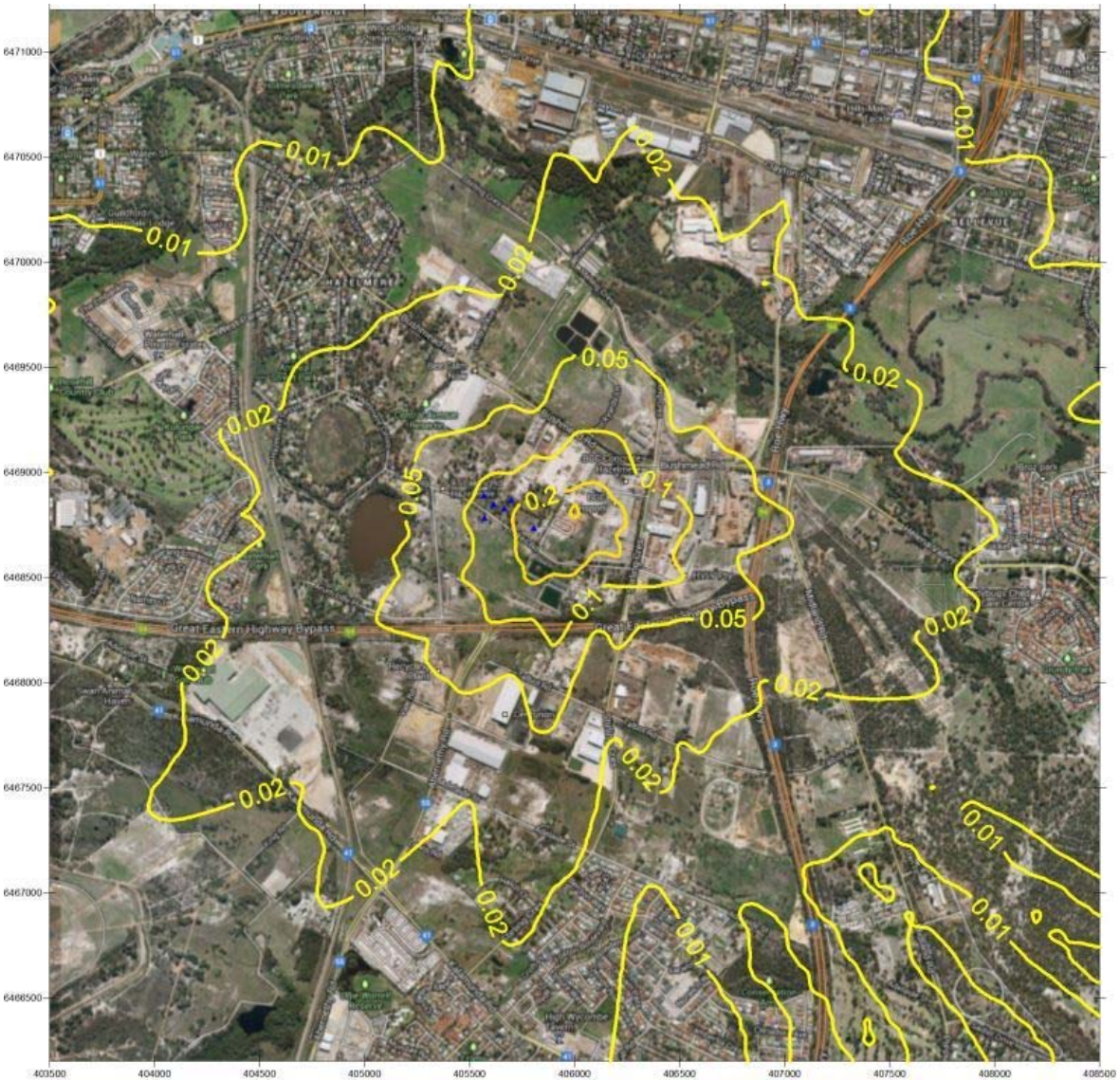

Figure 84: Reduced Operations - GLC As (ng/m³) Maximum Daily

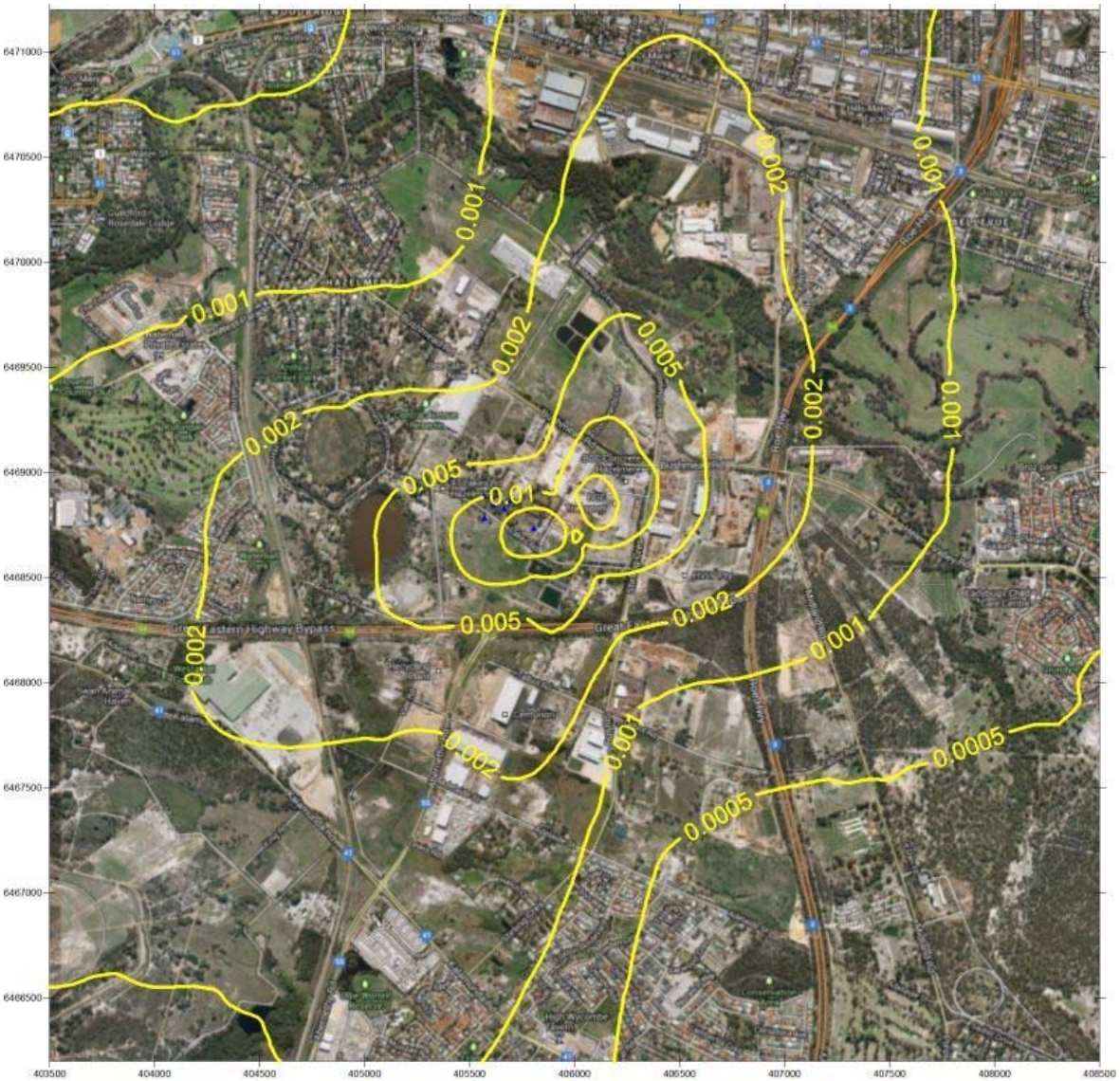

Figure 85: Reduced Operations - GLC As (ng/m³) Annual average

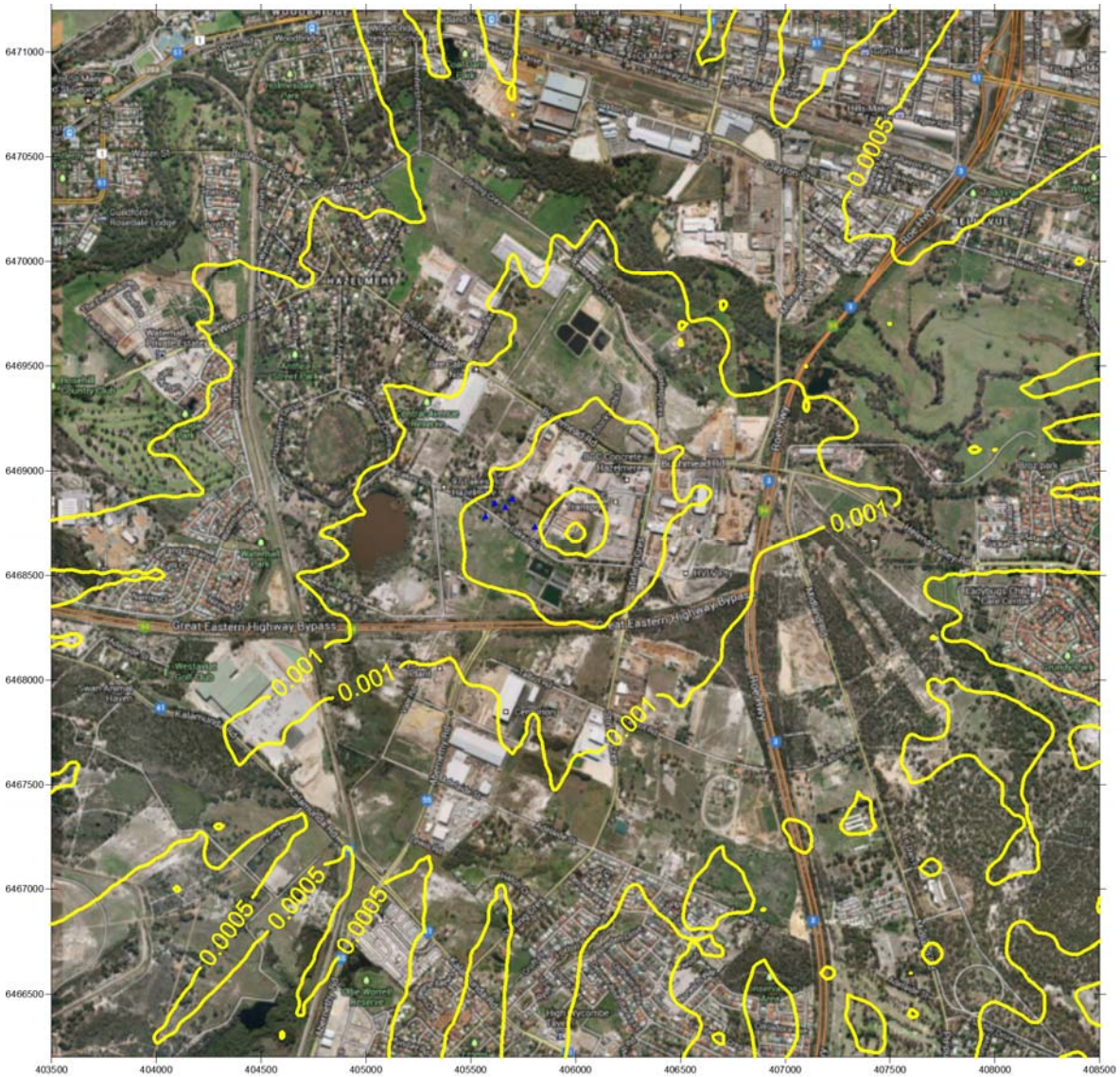

Figure 86: Reduced Operations - GLC Cd (ng/m³) Maximum Hourly

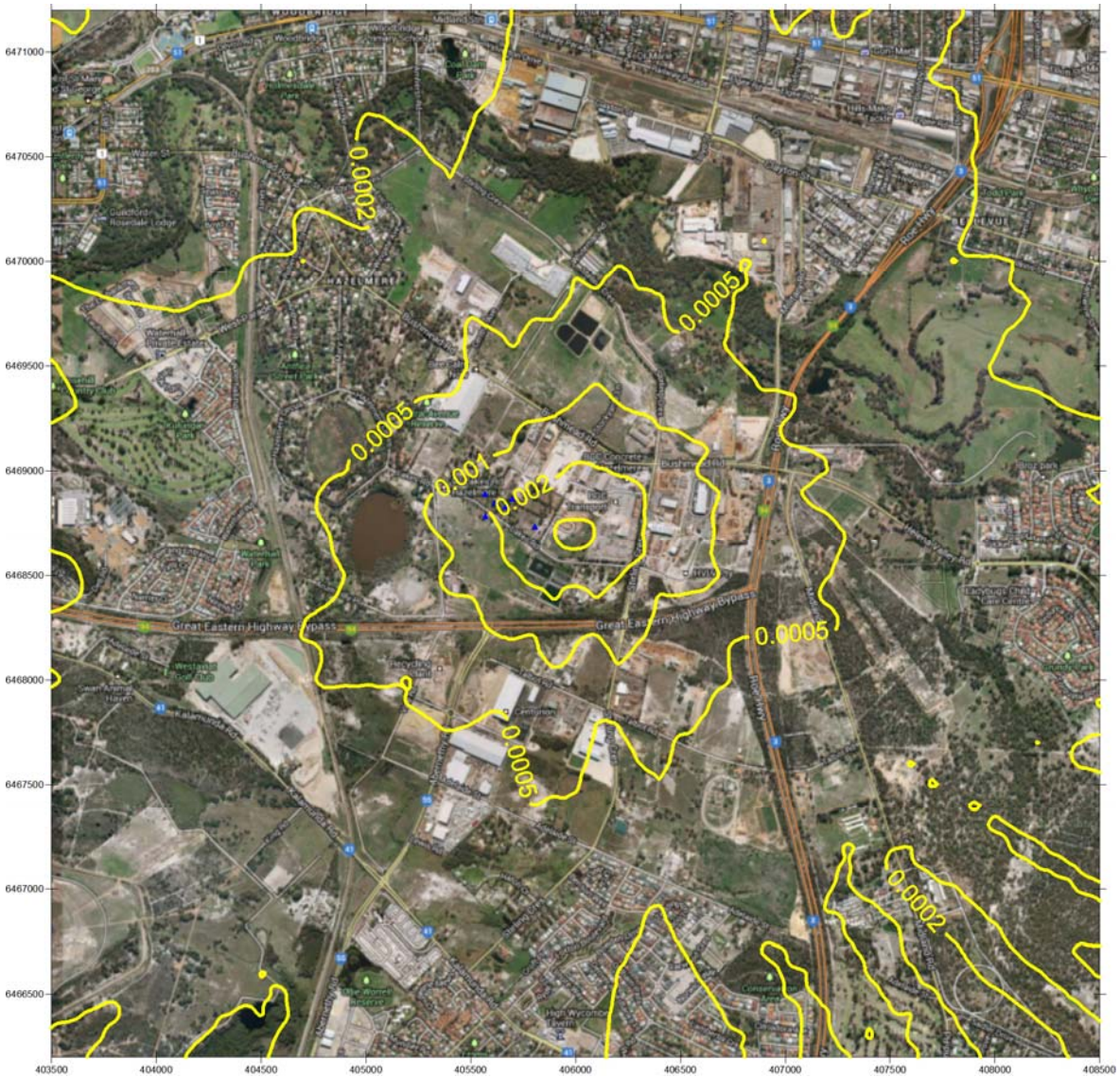

Figure 87: Reduced Operations - GLC Cd (ng/m³) Maximum 8-Hourly

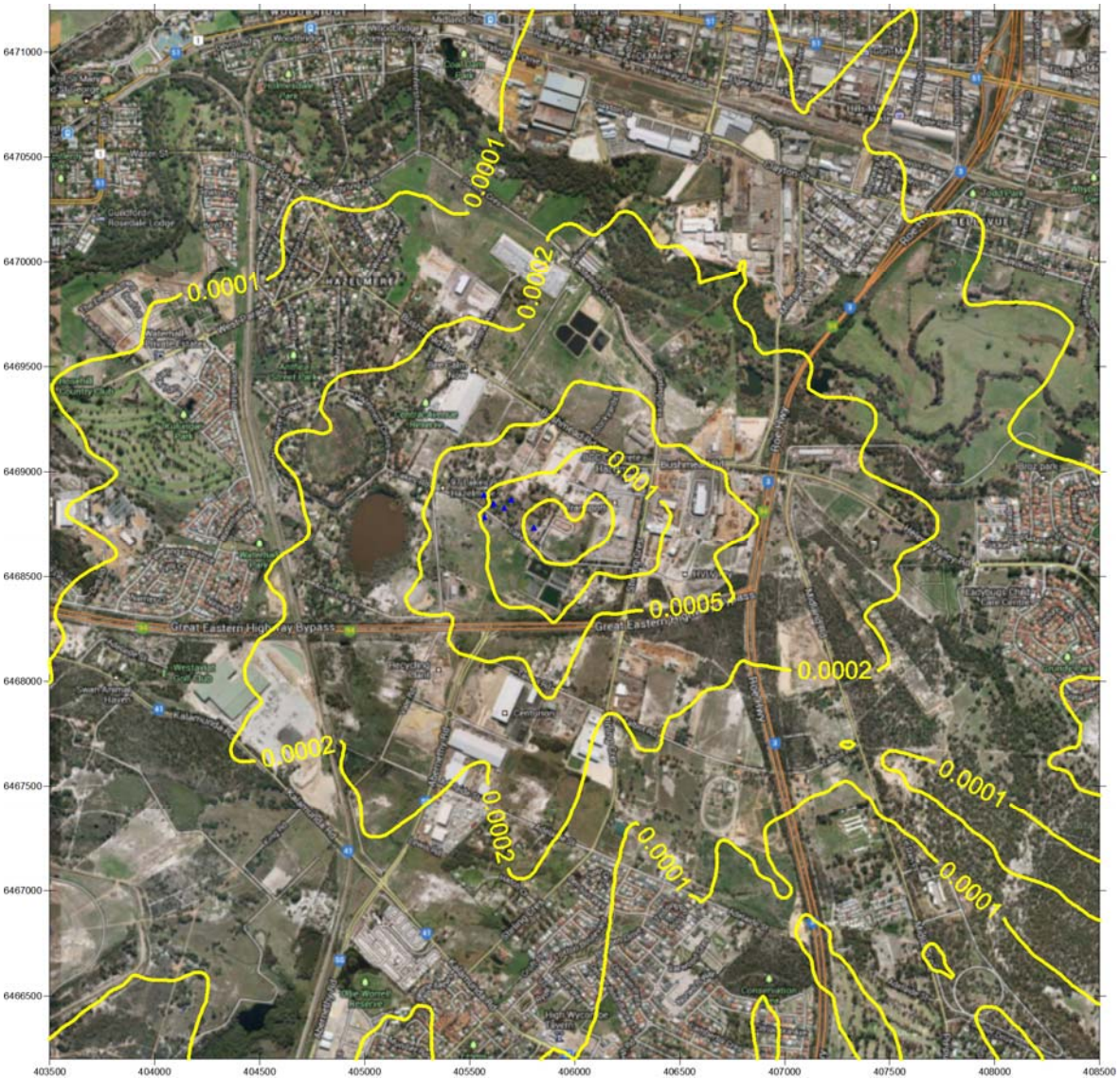

Figure 88: Reduced Operations - GLC Cd (ng/m³) Maximum Daily

Figure 89: Reduced Operations - GLC Cd (ng/m³) Annual average

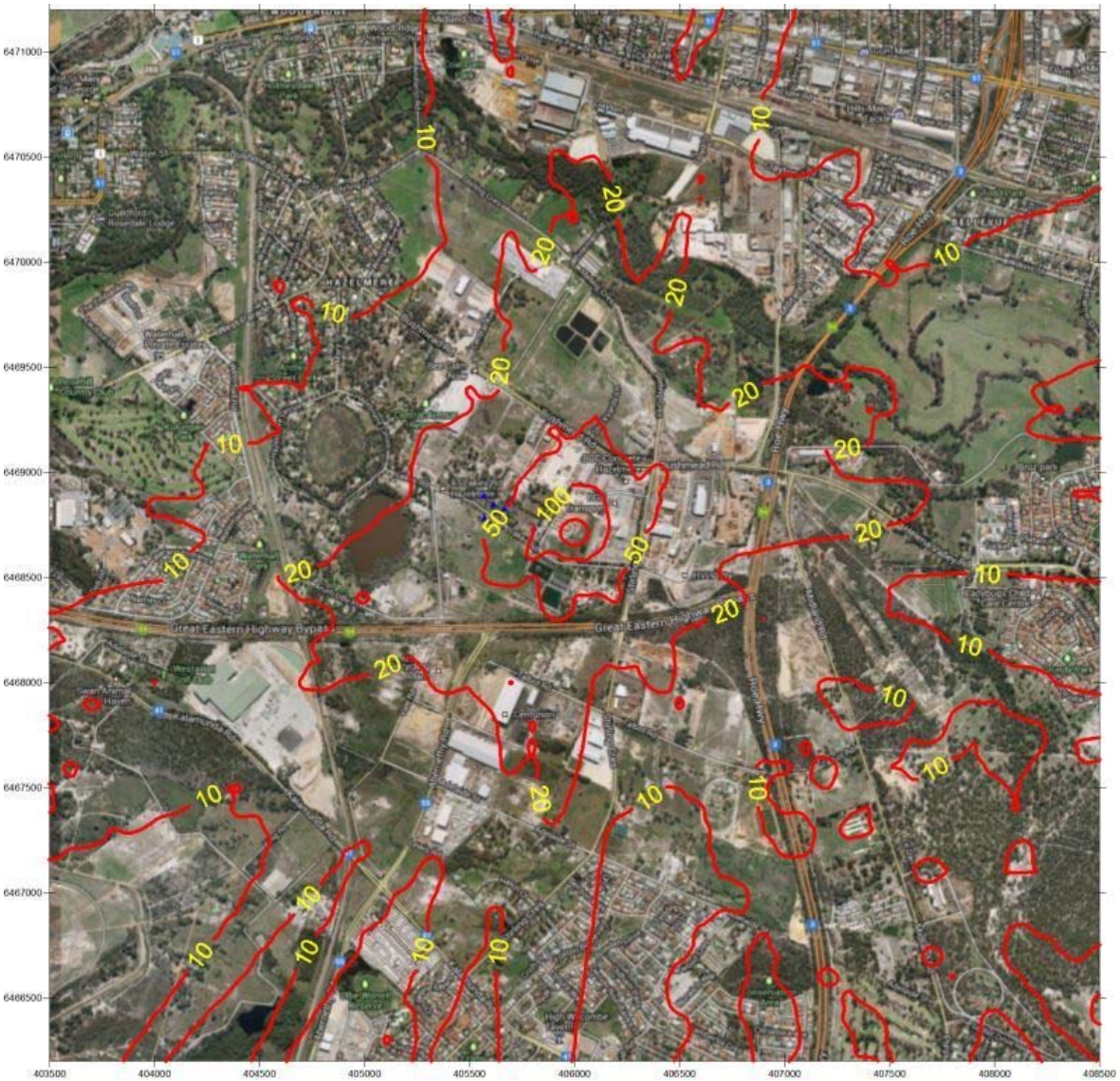

Figure 90: Reduced Operations - GLC CO (µg/m³) Maximum Hourly

Figure 91: Reduced Operations - GLC CO (µg/m³) Maximum 8-Hourly

Figure 92: Reduced Operations - GLC CO (µg/m³) Maximum Daily

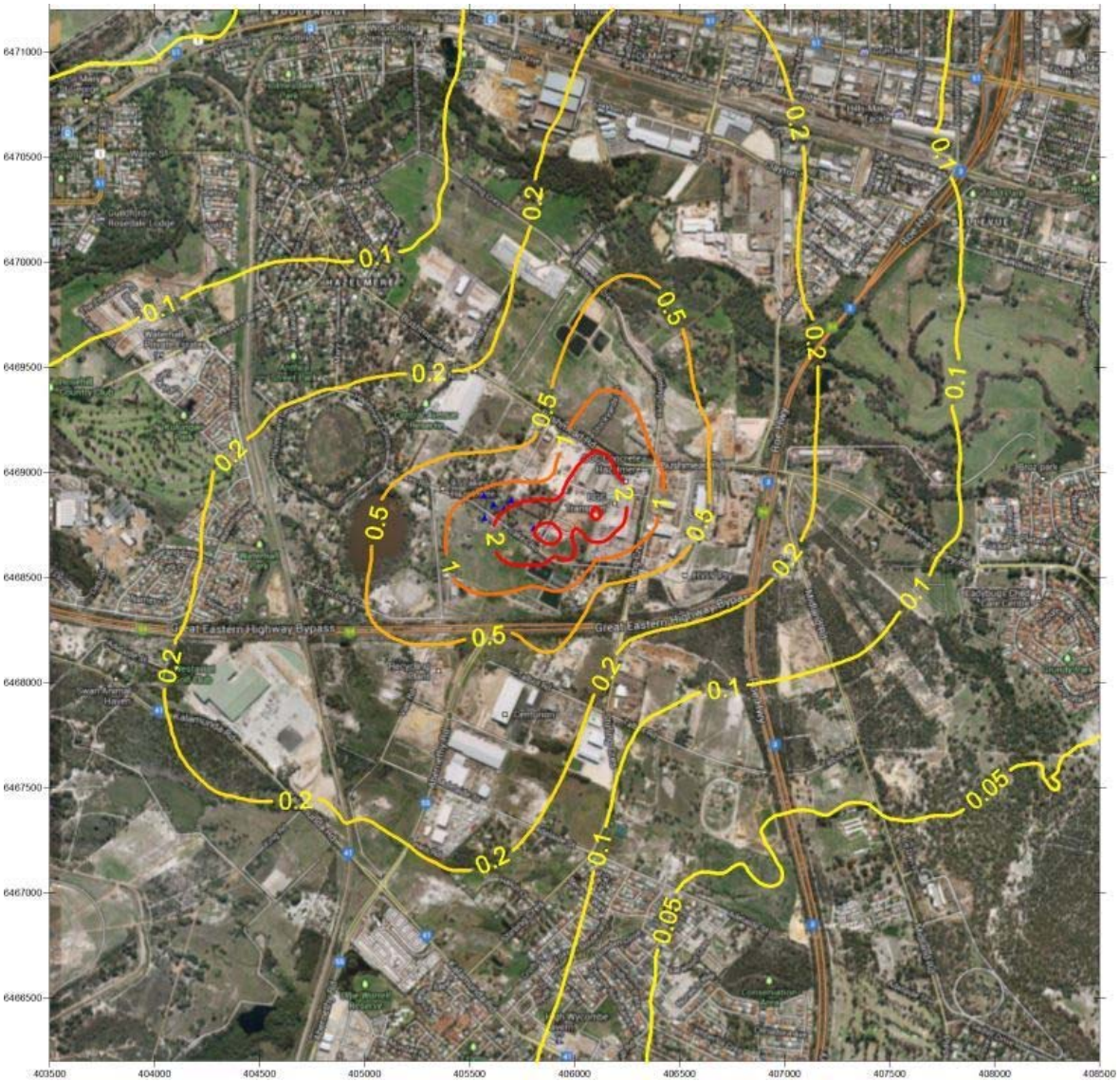

Figure 93: Reduced Operations - GLC CO (µg/m³) Annual average

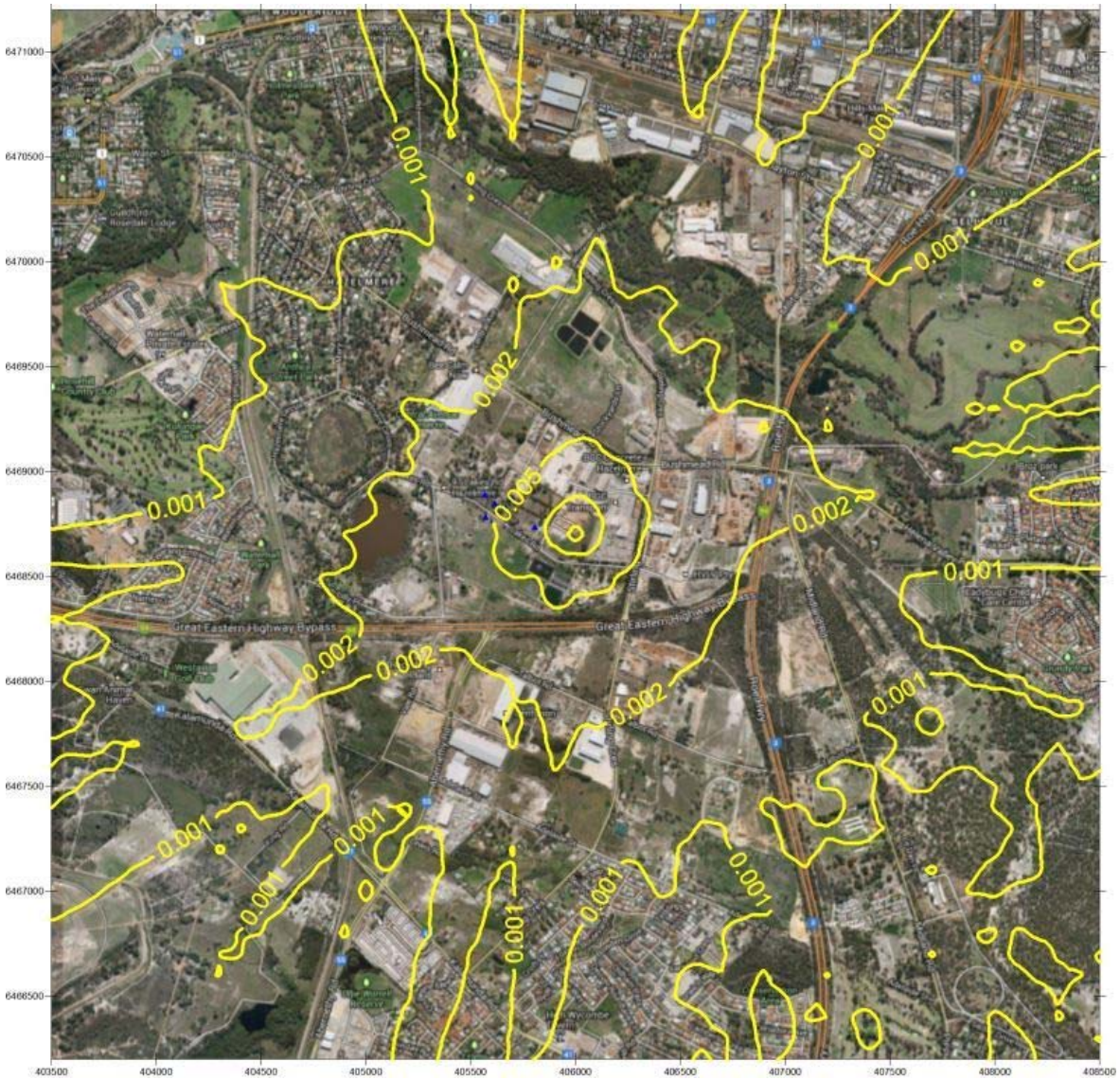

Figure 94: Reduced Operations - GLC Co (ρg/m³) Maximum Hourly

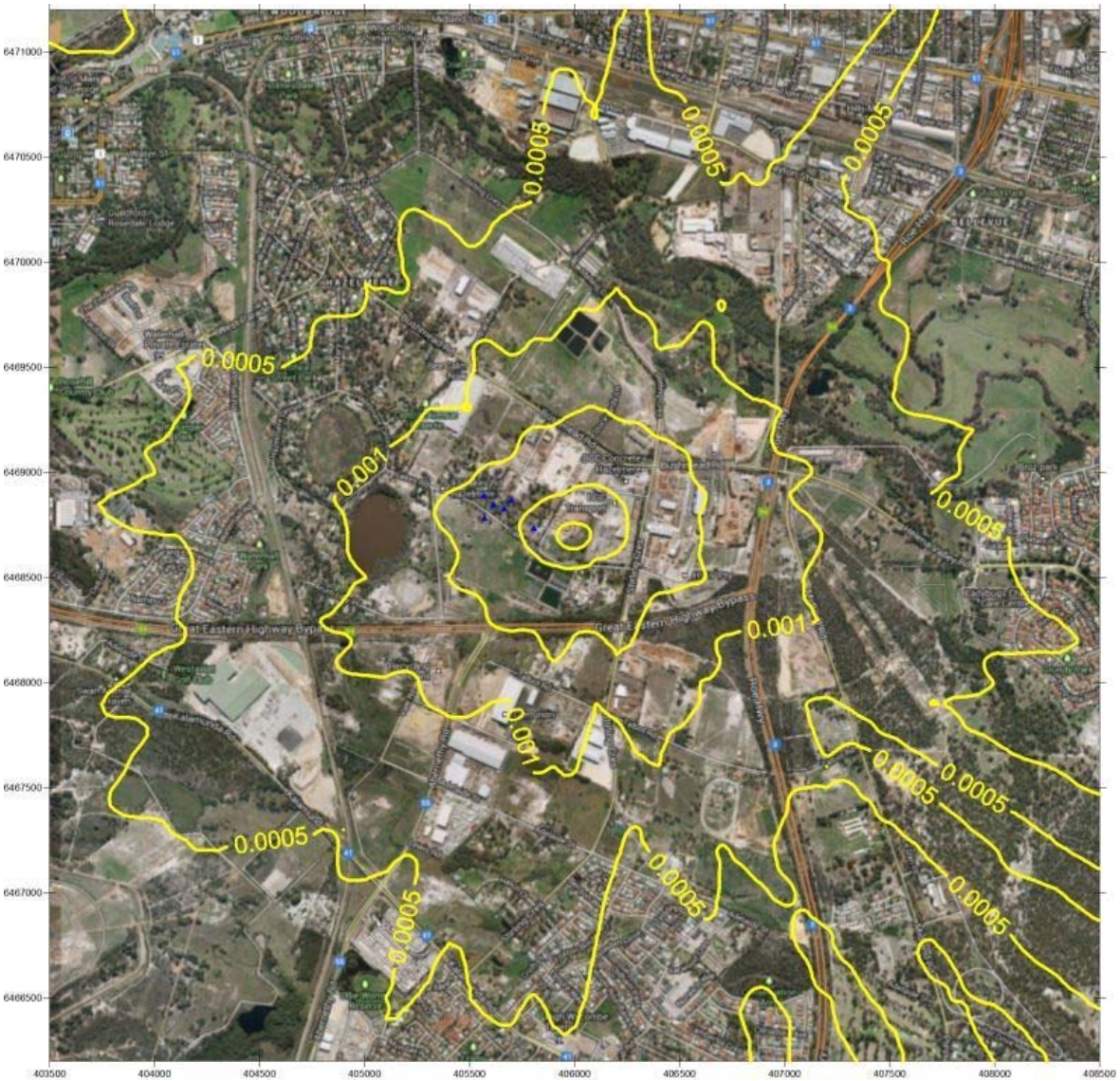

Figure 95: Reduced Operations - GLC Co (ρg/m³) Maximum 8-Hourly

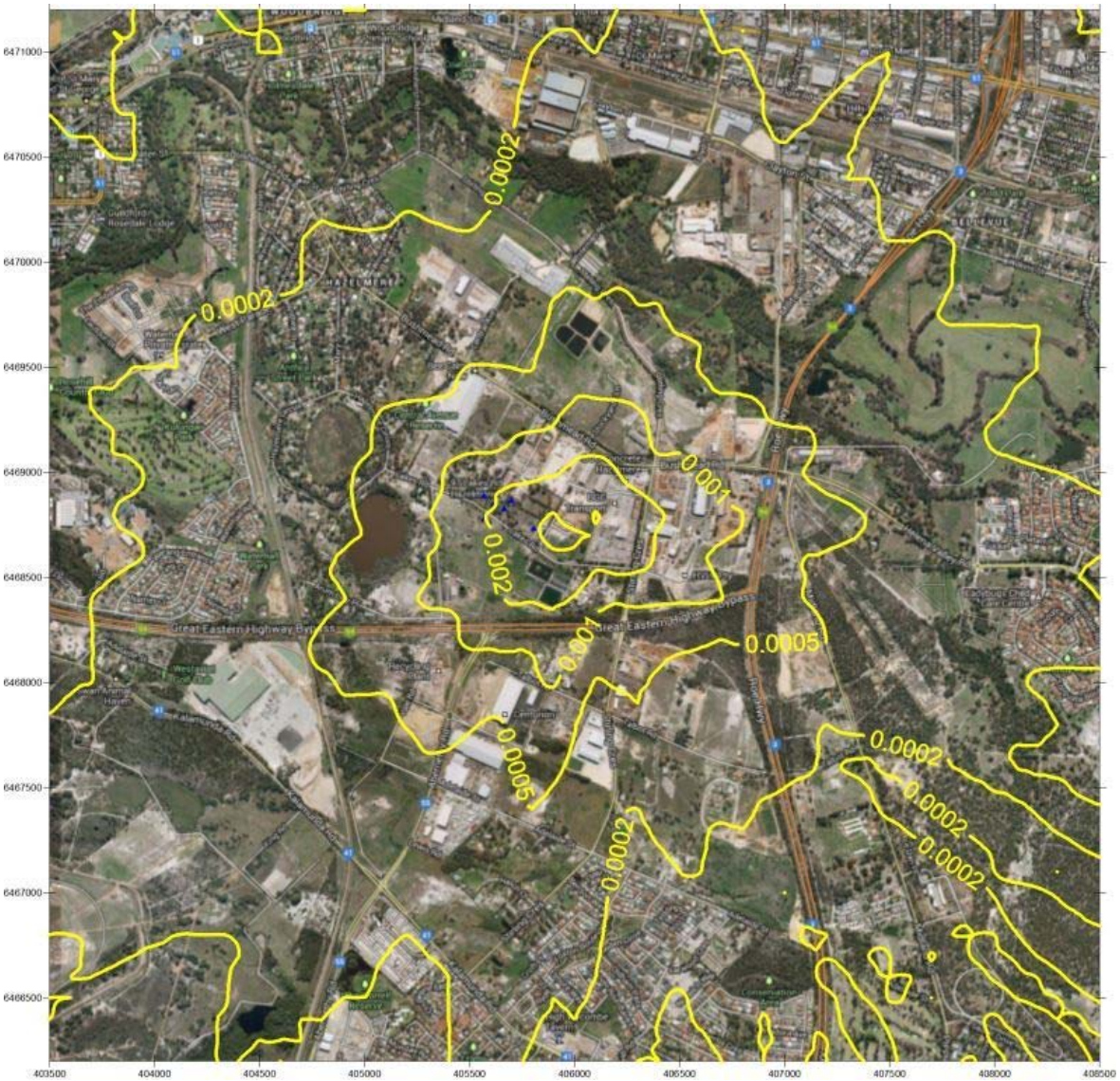

Figure 96: Reduced Operations - GLC Co (ρg/m³) Maximum Daily

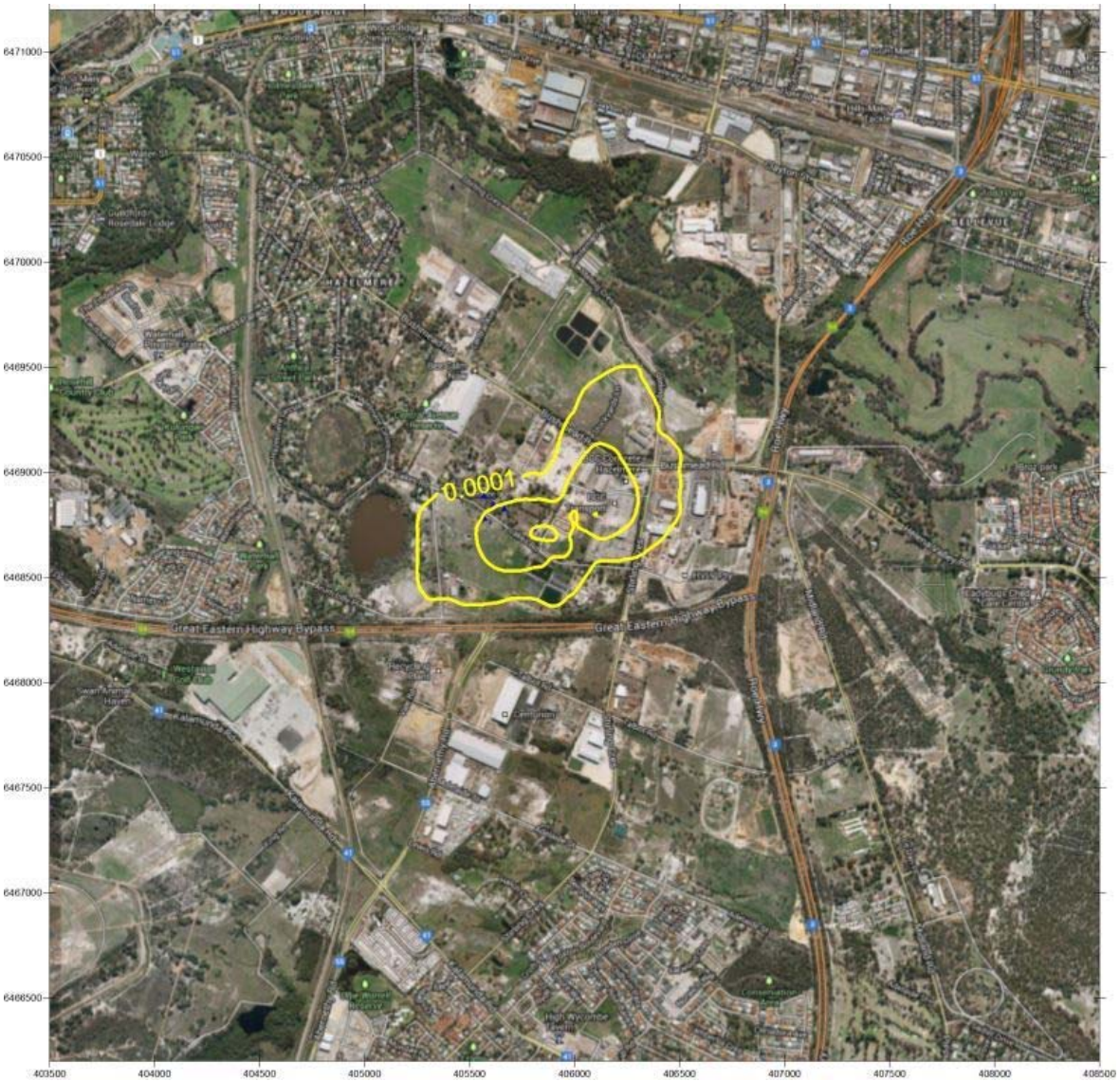

Figure 97: Reduced Operations - GLC Co (ρg/m³) Annual average

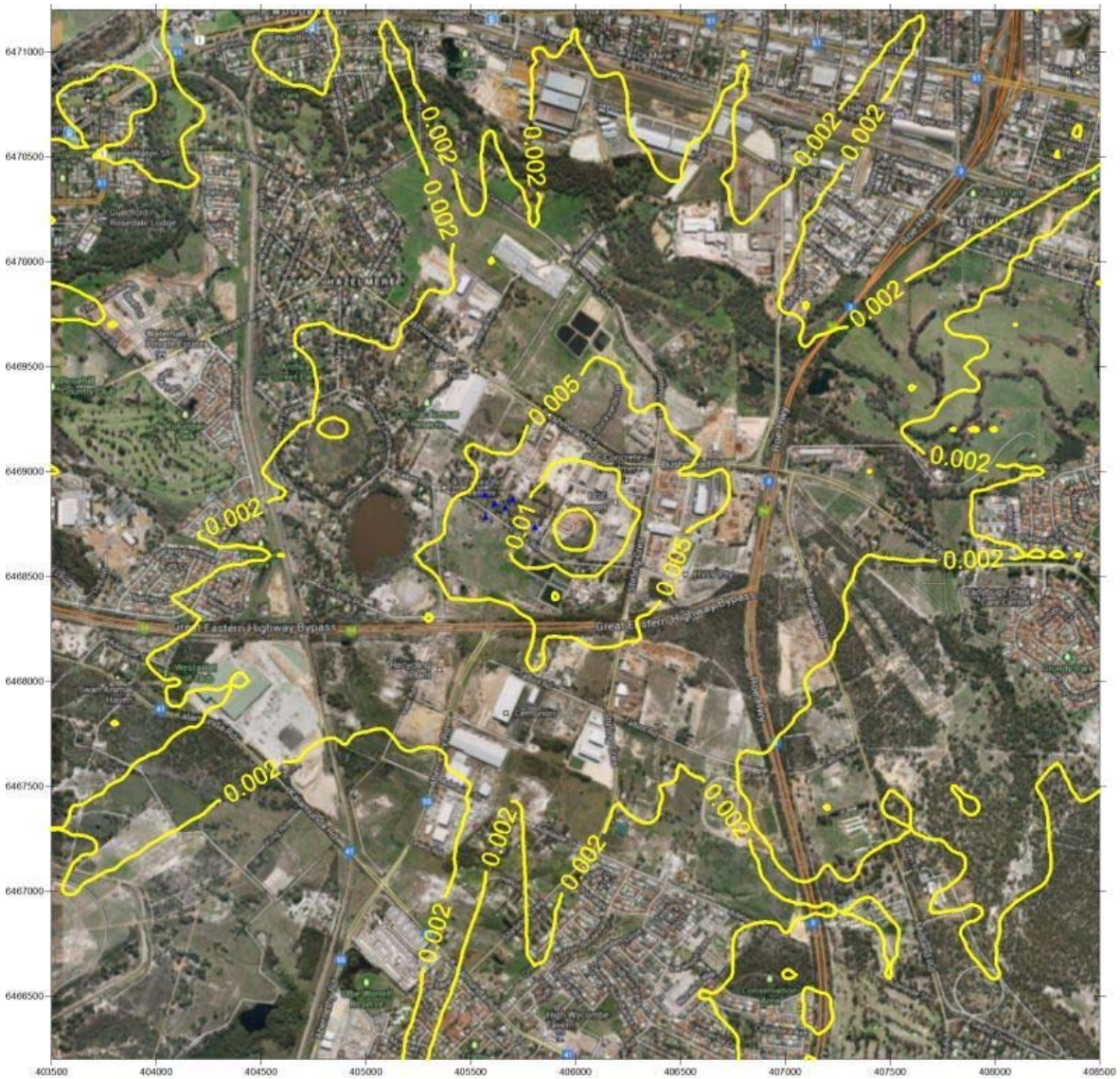

Figure 98: Reduced Operations - GLC Cr (ng/m³) Maximum Hourly

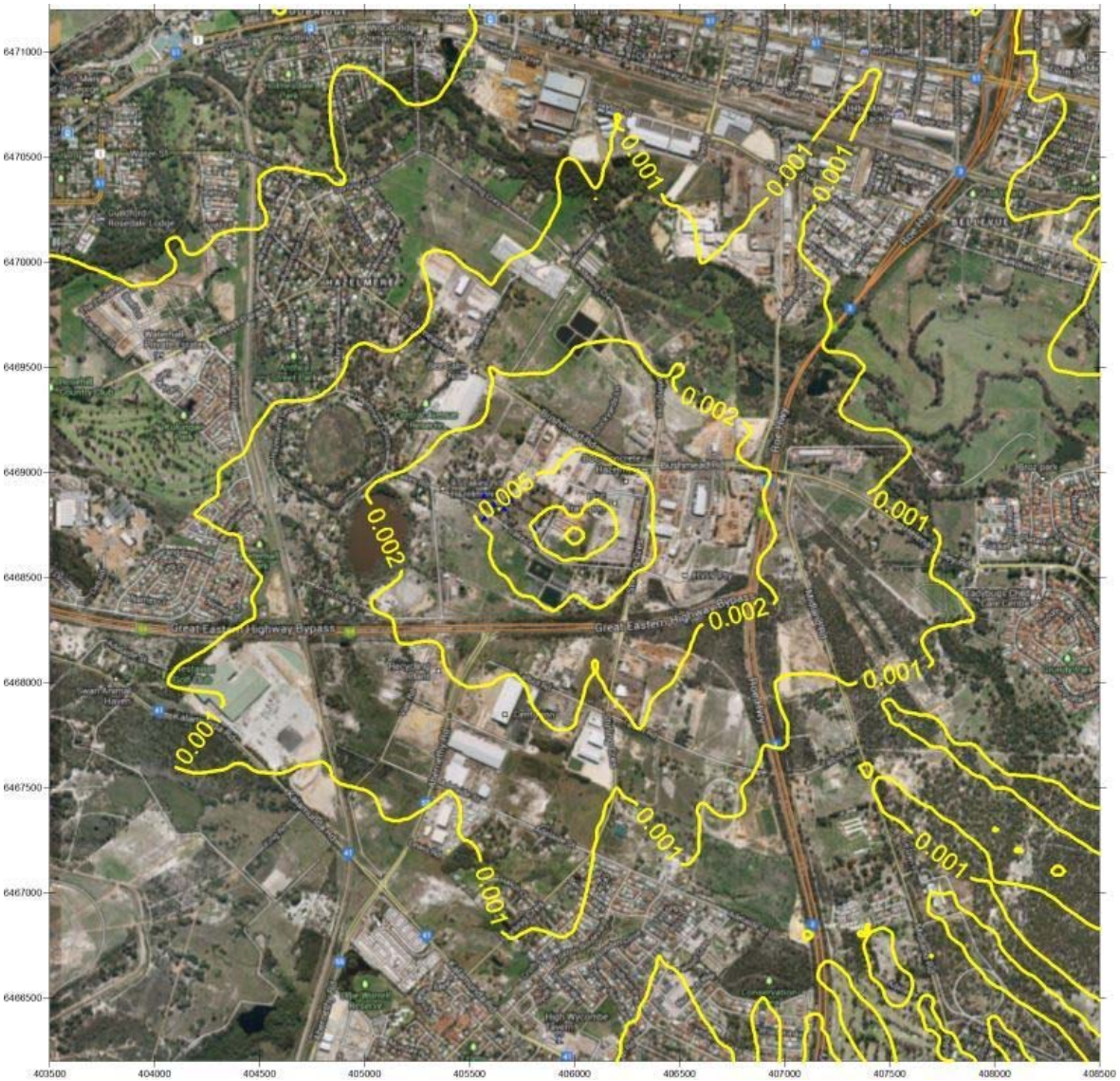

Figure 99: Reduced Operations - GLC Cr (ng/m³) Maximum 8-Hourly

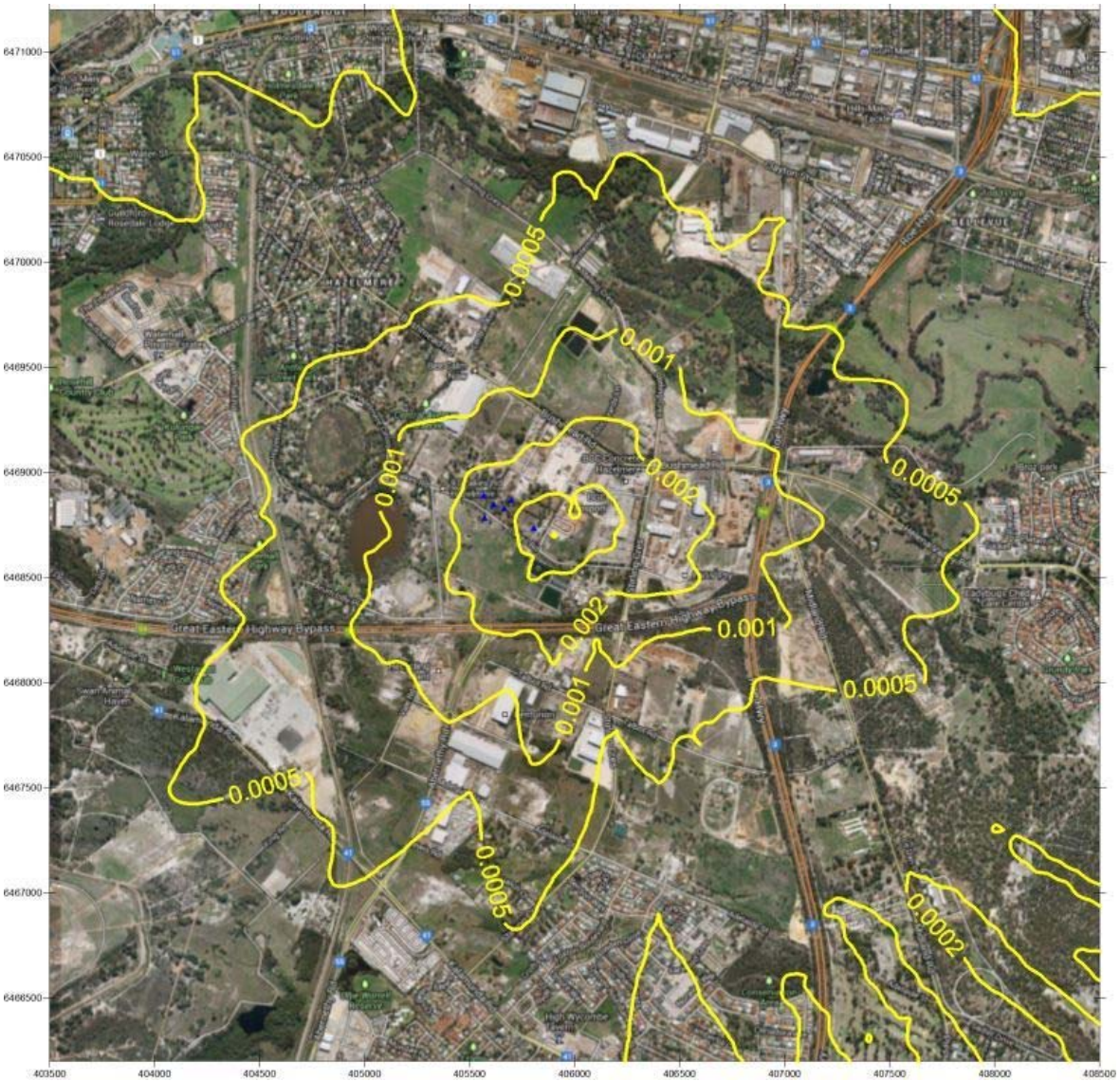

Figure 100: Reduced Operations - GLC Cr (ng/m³) Maximum Daily

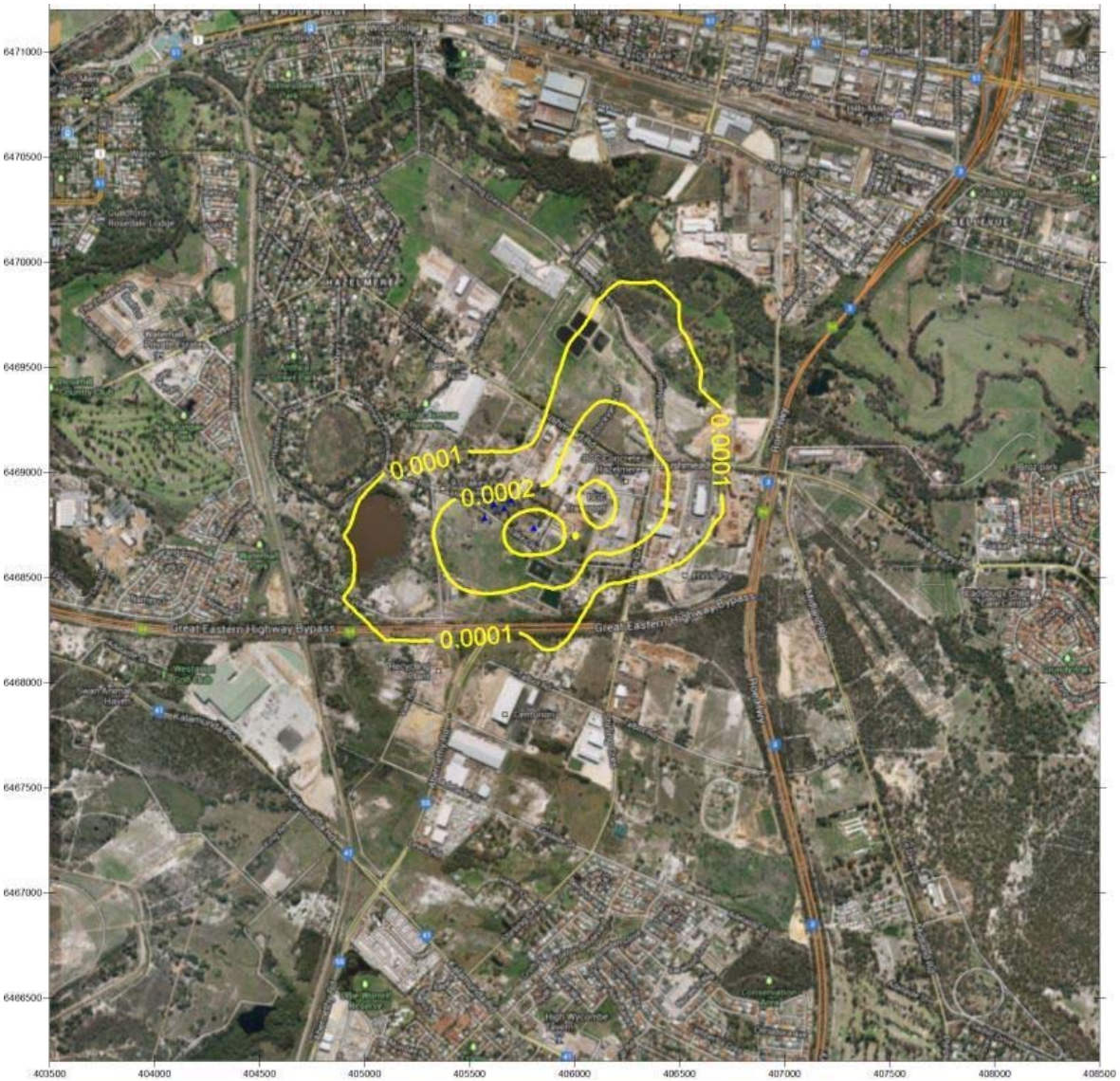

Figure 101: Reduced Operations - GLC Cr (ng/m³) Annual average

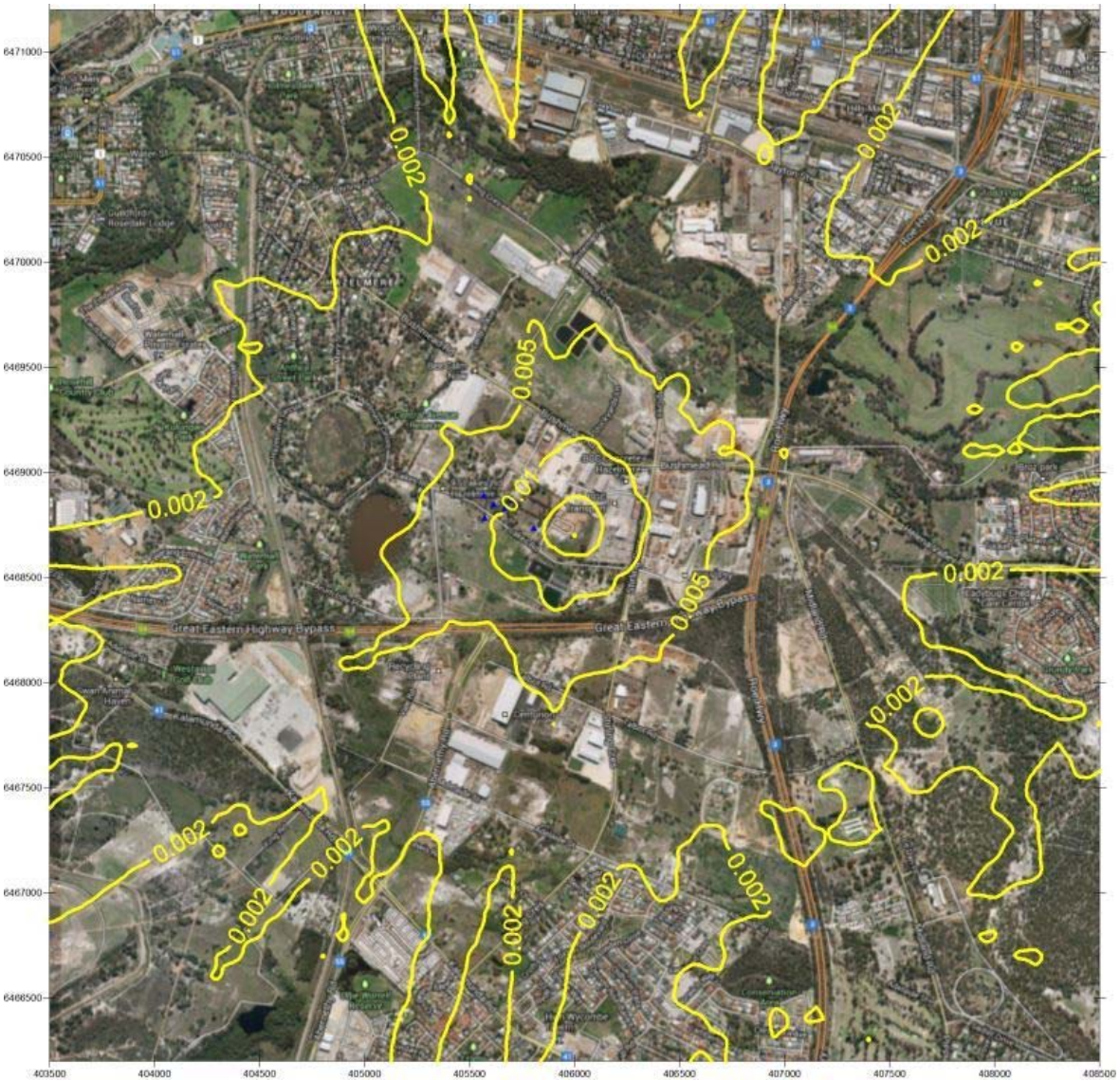

Figure 102: Reduced Operations - GLC Cu (ng/m³) Maximum Hourly

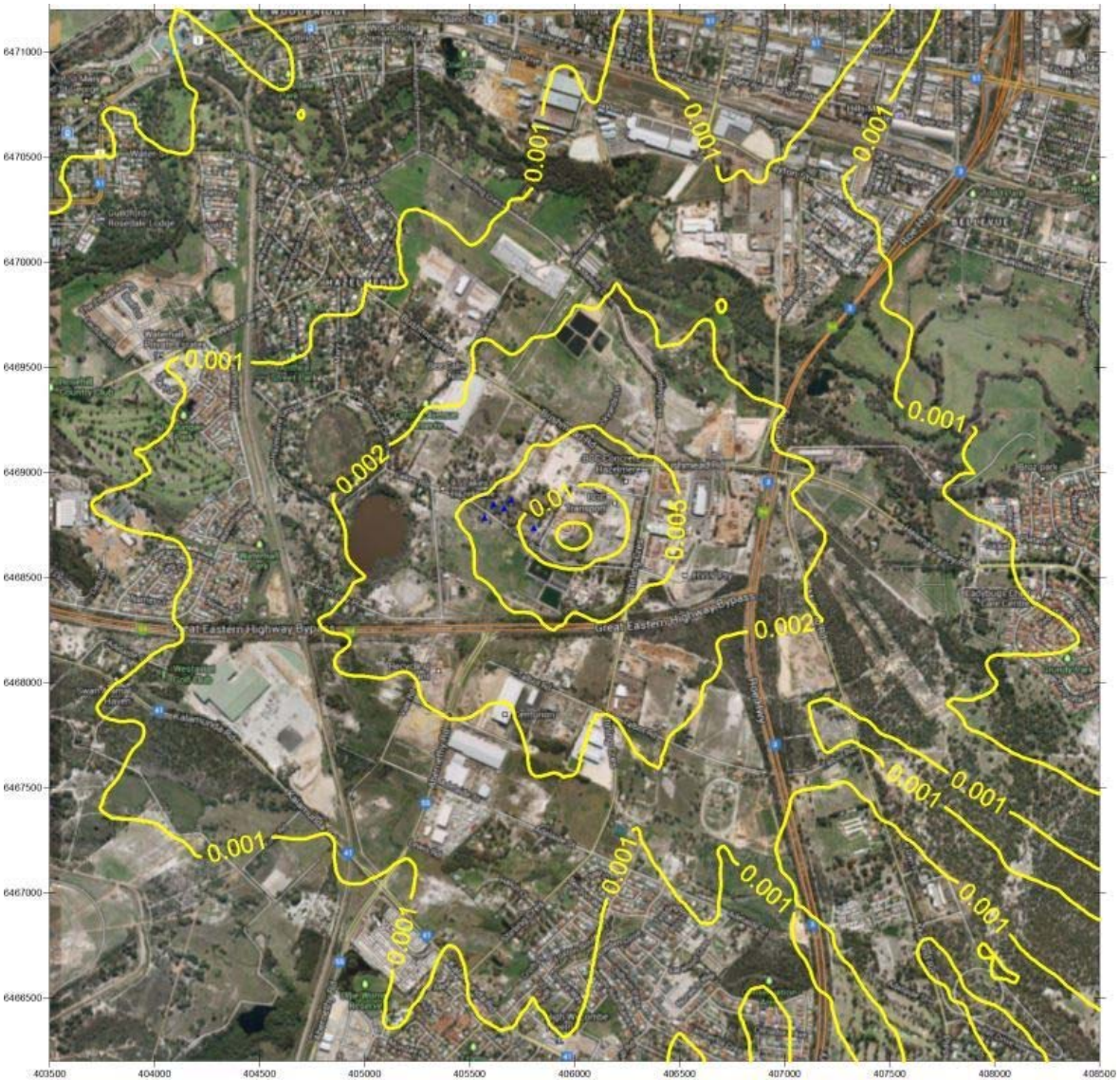

Figure 103: Reduced Operations - GLC Cu (ng/m³) Maximum 8-Hourly

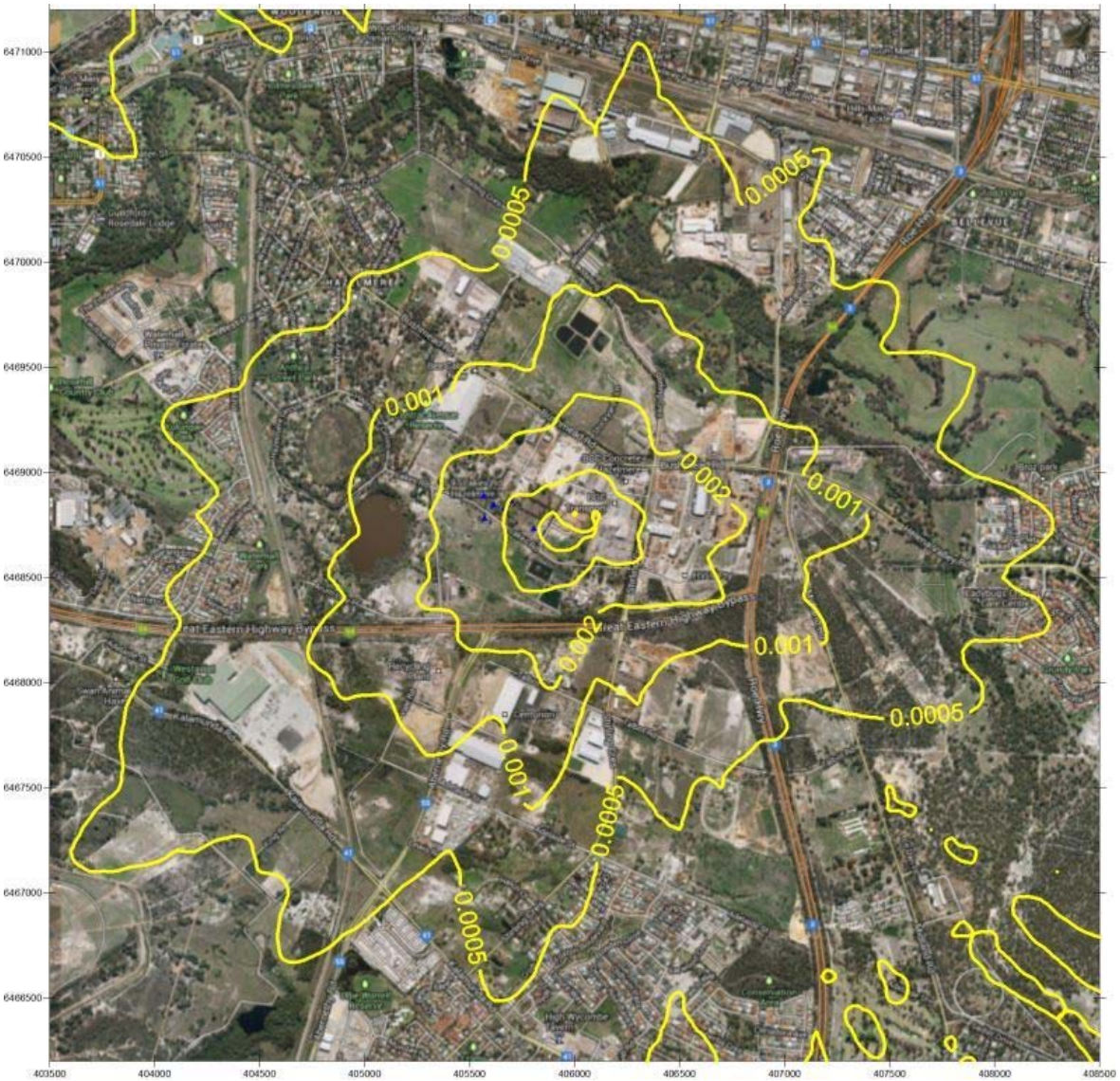

Figure 104: Reduced Operations - GLC Cu (ng/m³) Maximum Daily

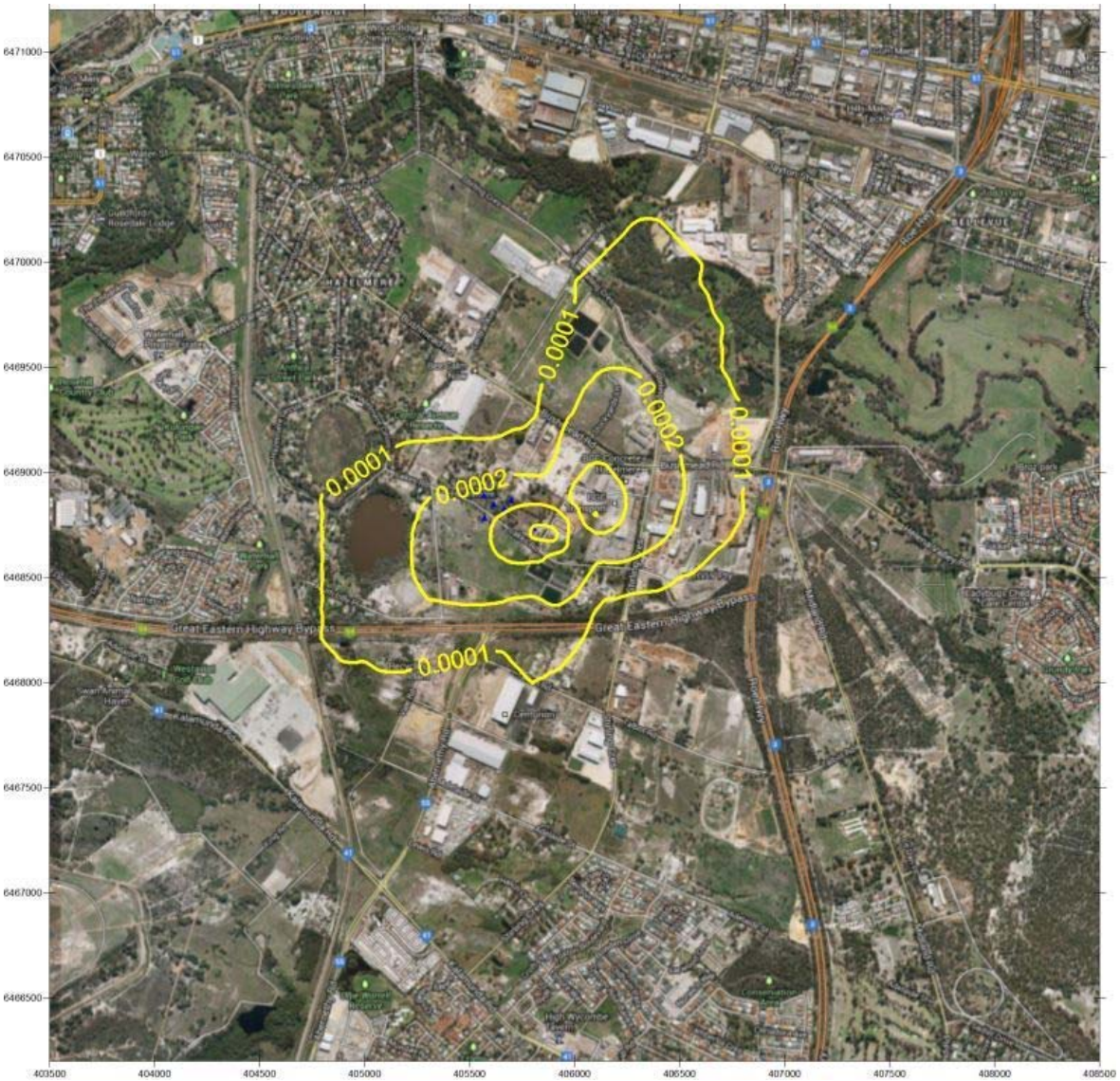

Figure 105: Reduced Operations - GLC Cu (ng/m³) Annual average

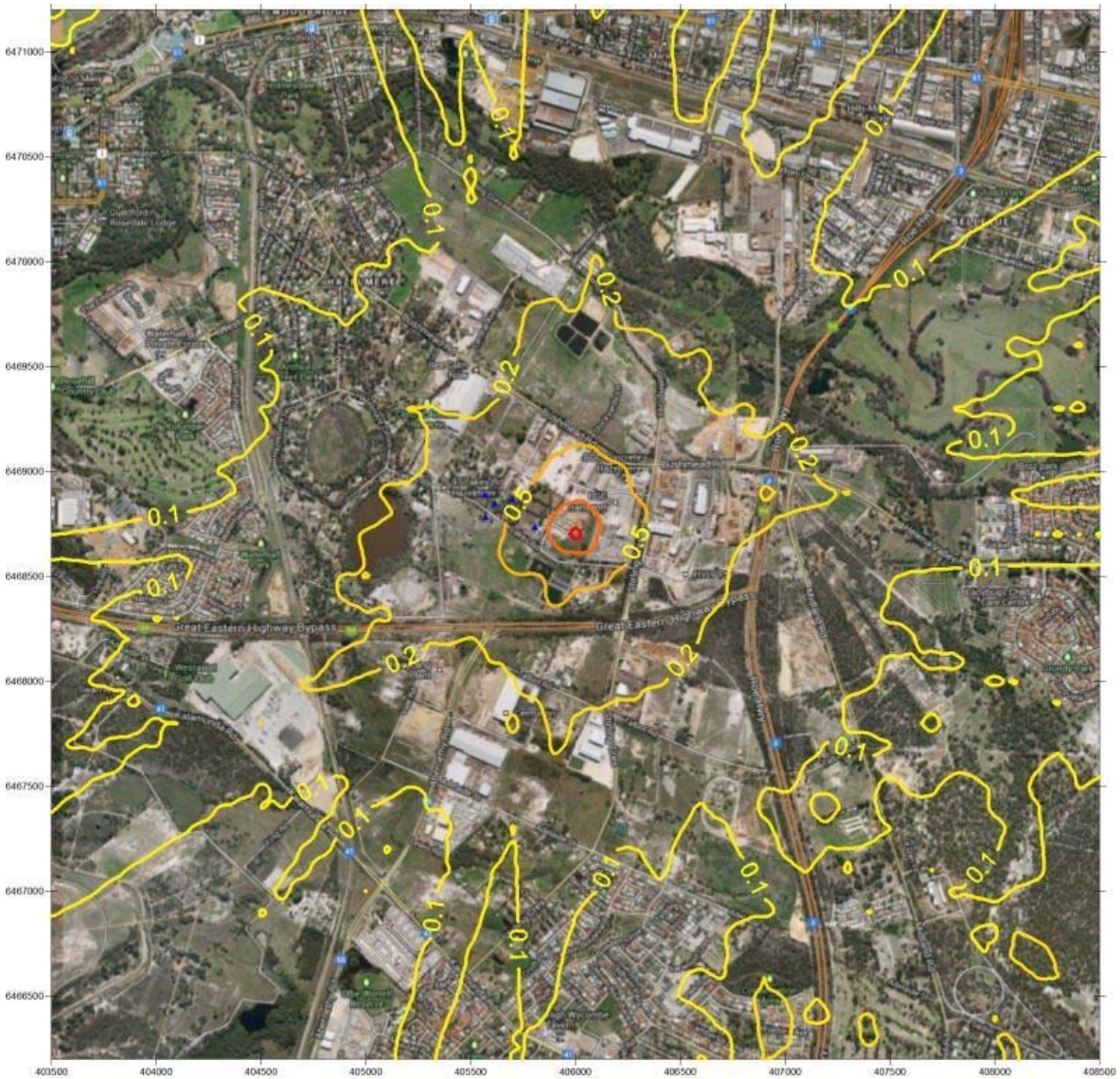

Figure 106: Reduced Operations - GLC Dioxin (fg/m³) Maximum Hourly

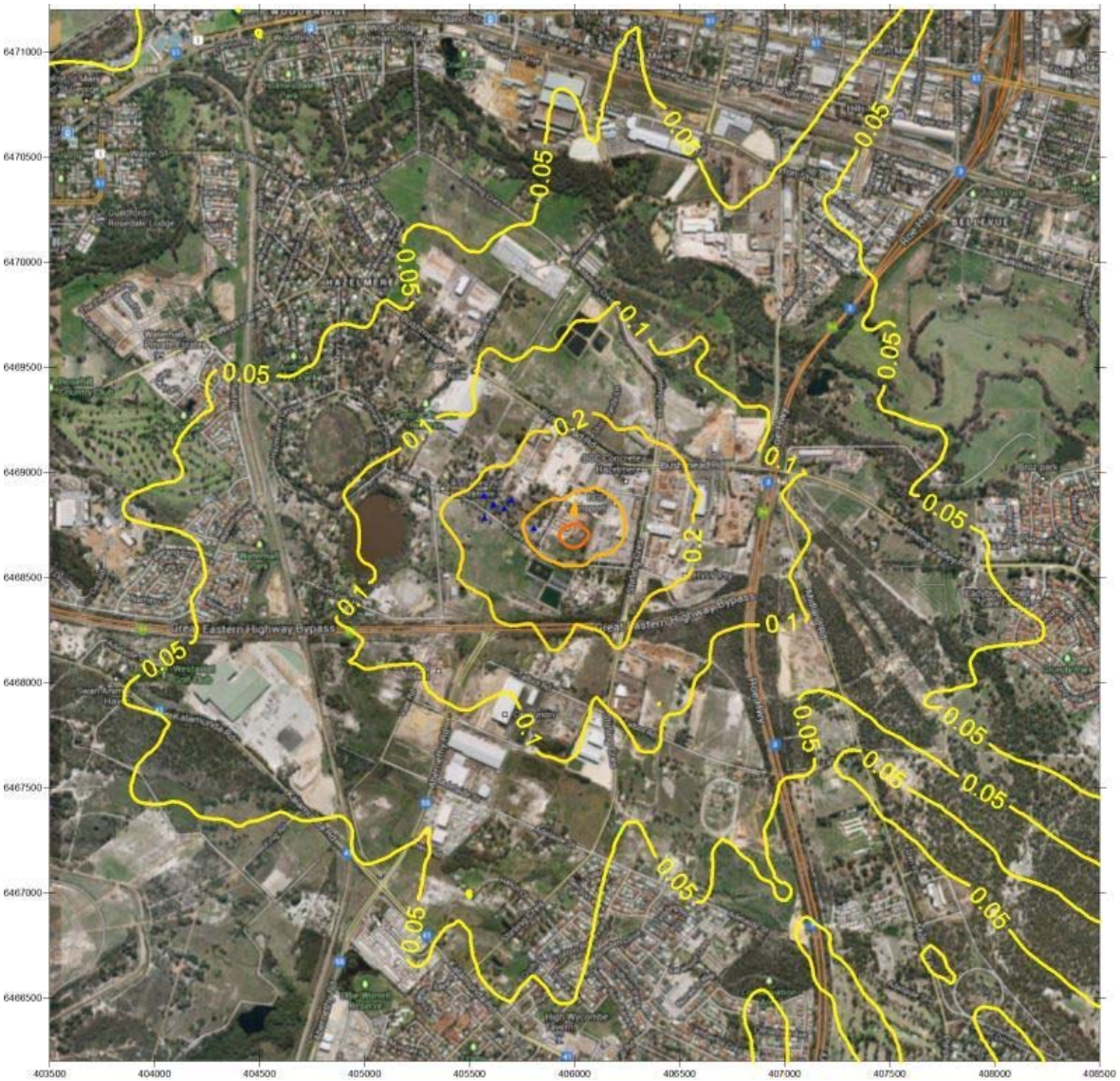

Figure 107: Reduced Operations - GLC Dioxin (fg/m³) Maximum 8-Hourly

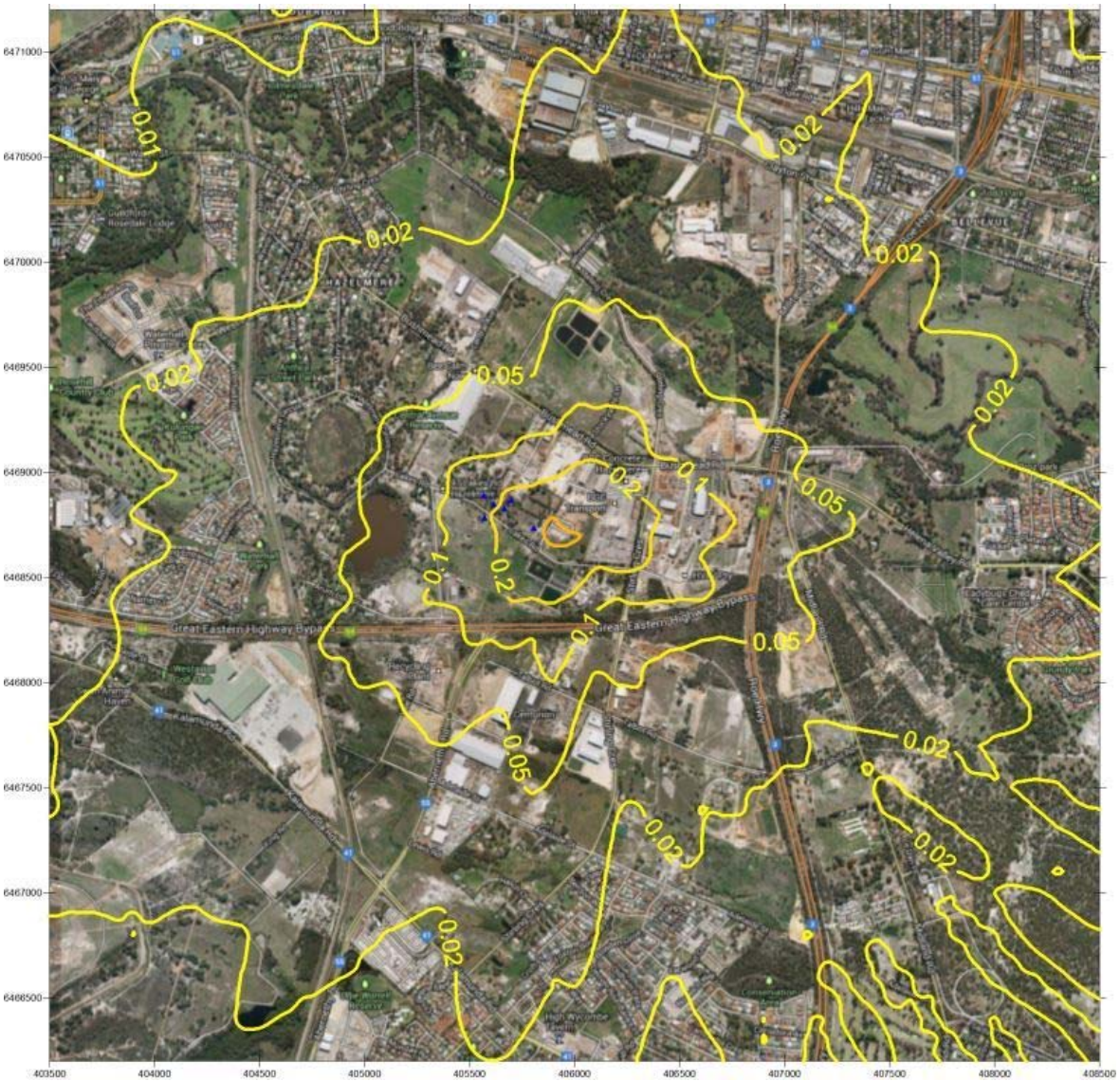

Figure 108: Reduced Operations - GLC Dioxin (fg/m³) Maximum Daily

Figure 109: Reduced Operations - GLC Dioxin (fg/m³) Annual average

Figure 110: Reduced Operations - GLC HCl (ng/m³) Maximum Hourly

Figure 111: Reduced Operations - GLC HCl (ng/m³) Maximum 8-Hourly

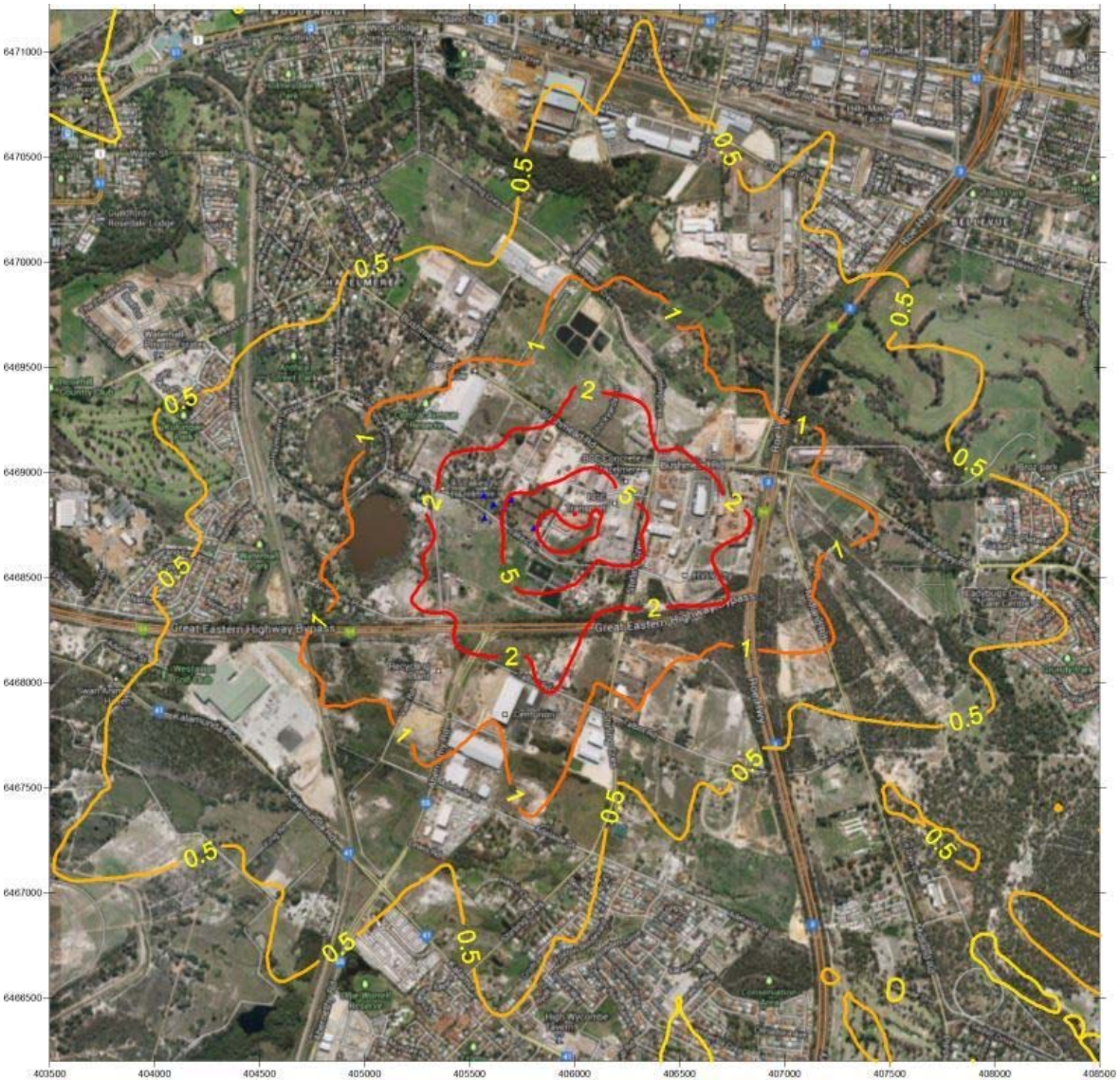

Figure 112: Reduced Operations - GLC HCl (ng/m³) Maximum Daily

Figure 113: Reduced Operations - GLC HCl (ng/m³) Annual average

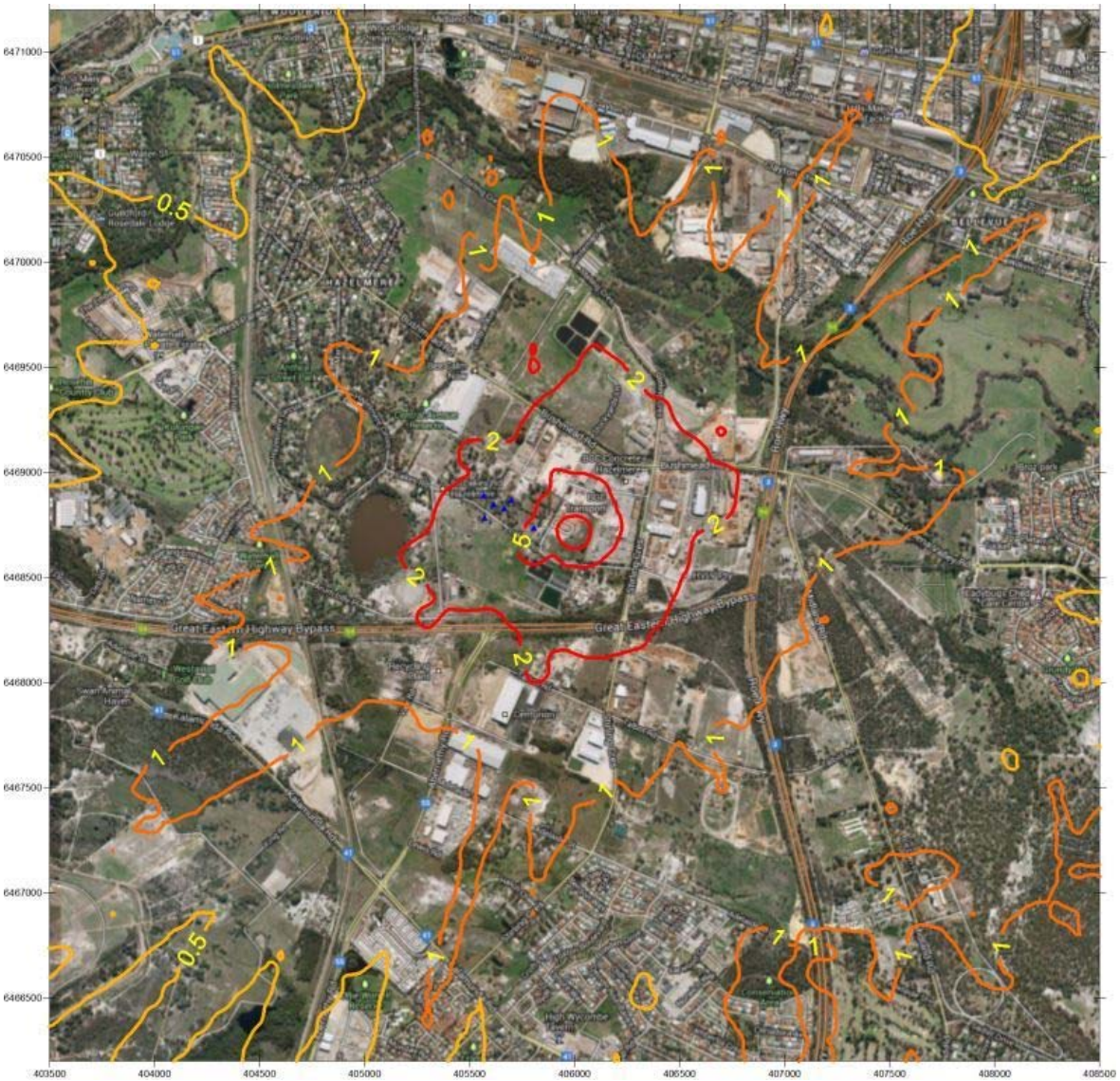

Figure 114: Reduced Operations - GLC HF (ng/m³) Maximum Hourly

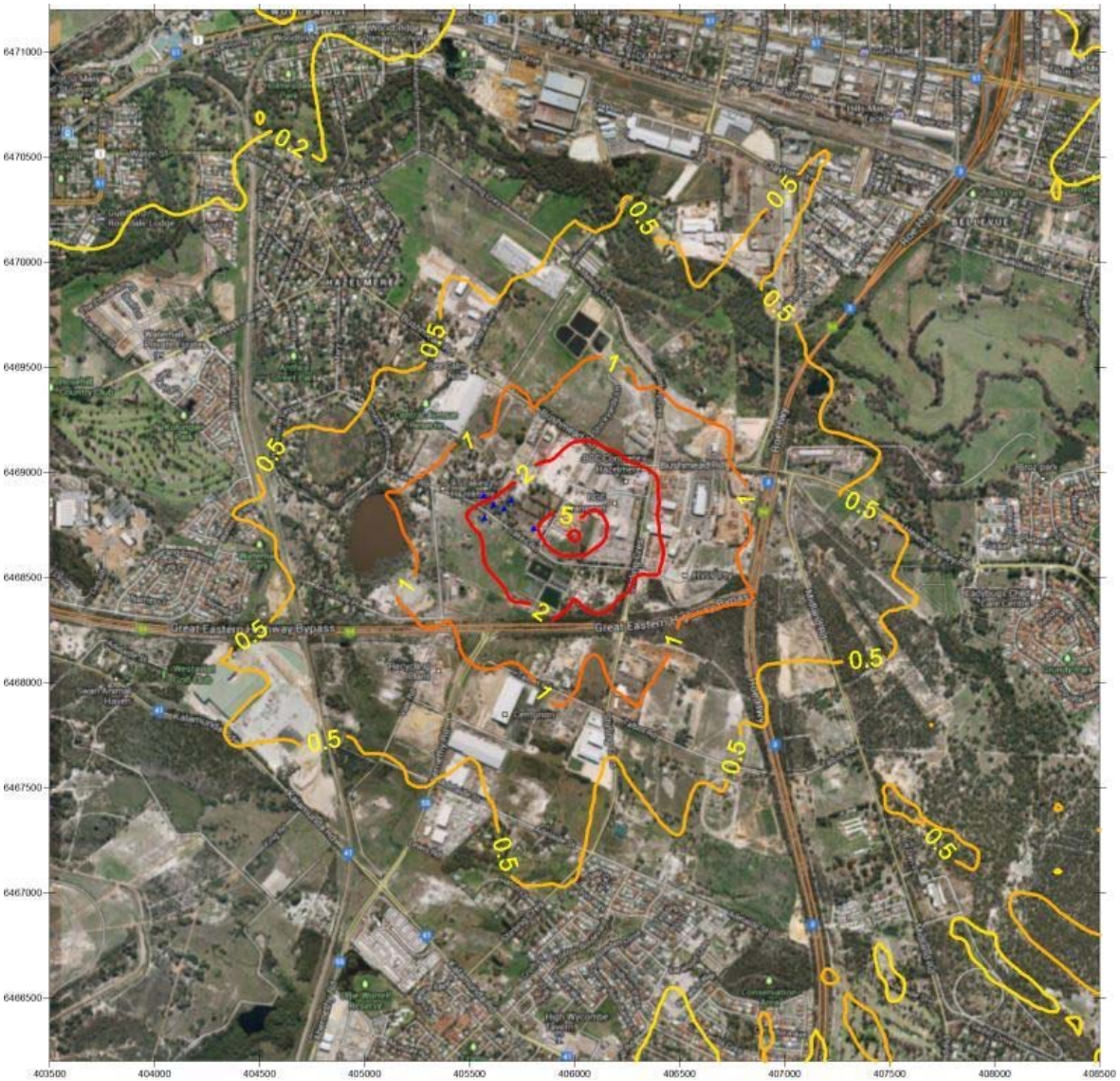

Figure 115: Reduced Operations - GLC HF (ng/m³) Maximum 8-Hourly

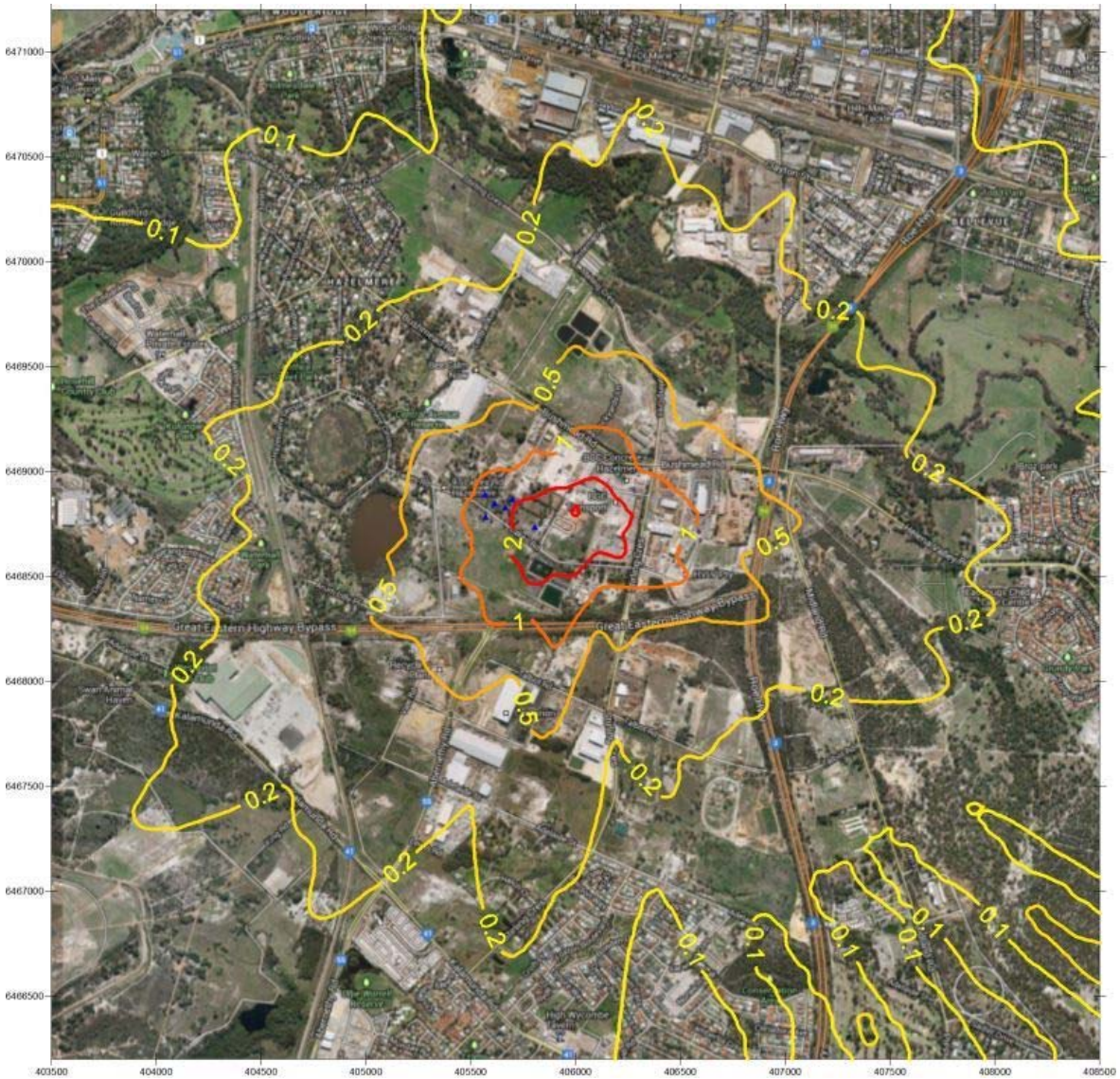

Figure 116: Reduced Operations - GLC HF (ng/m³) Maximum Daily

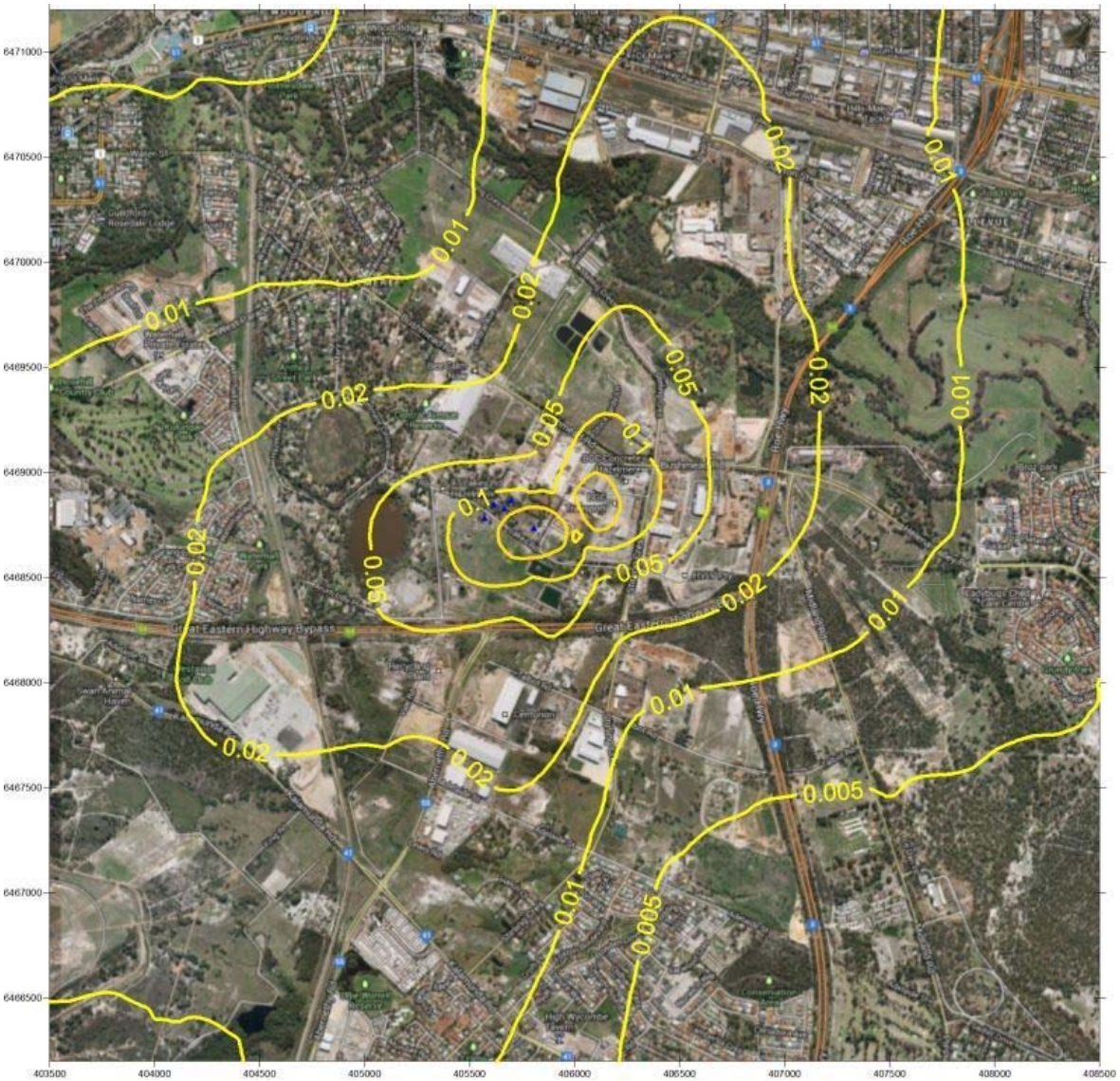

Figure 117: Reduced Operations - GLC HF (ng/m³) Annual average

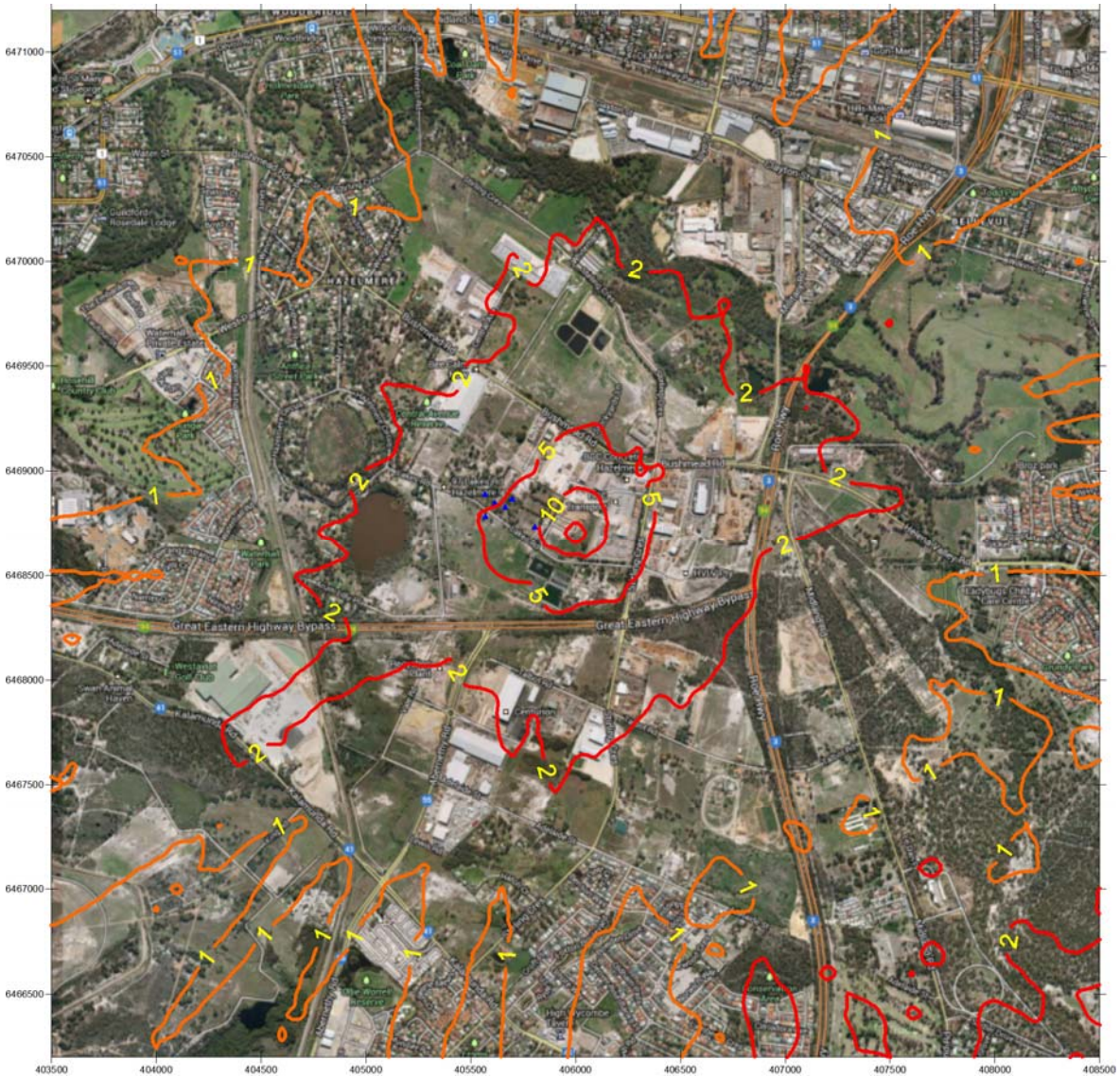

Figure 118: Reduced Operations - GLC Hg (ρg/m³) Maximum Hourly

Figure 119: Reduced Operations - GLC Hg (ρg/m³) Maximum 8-Hourly

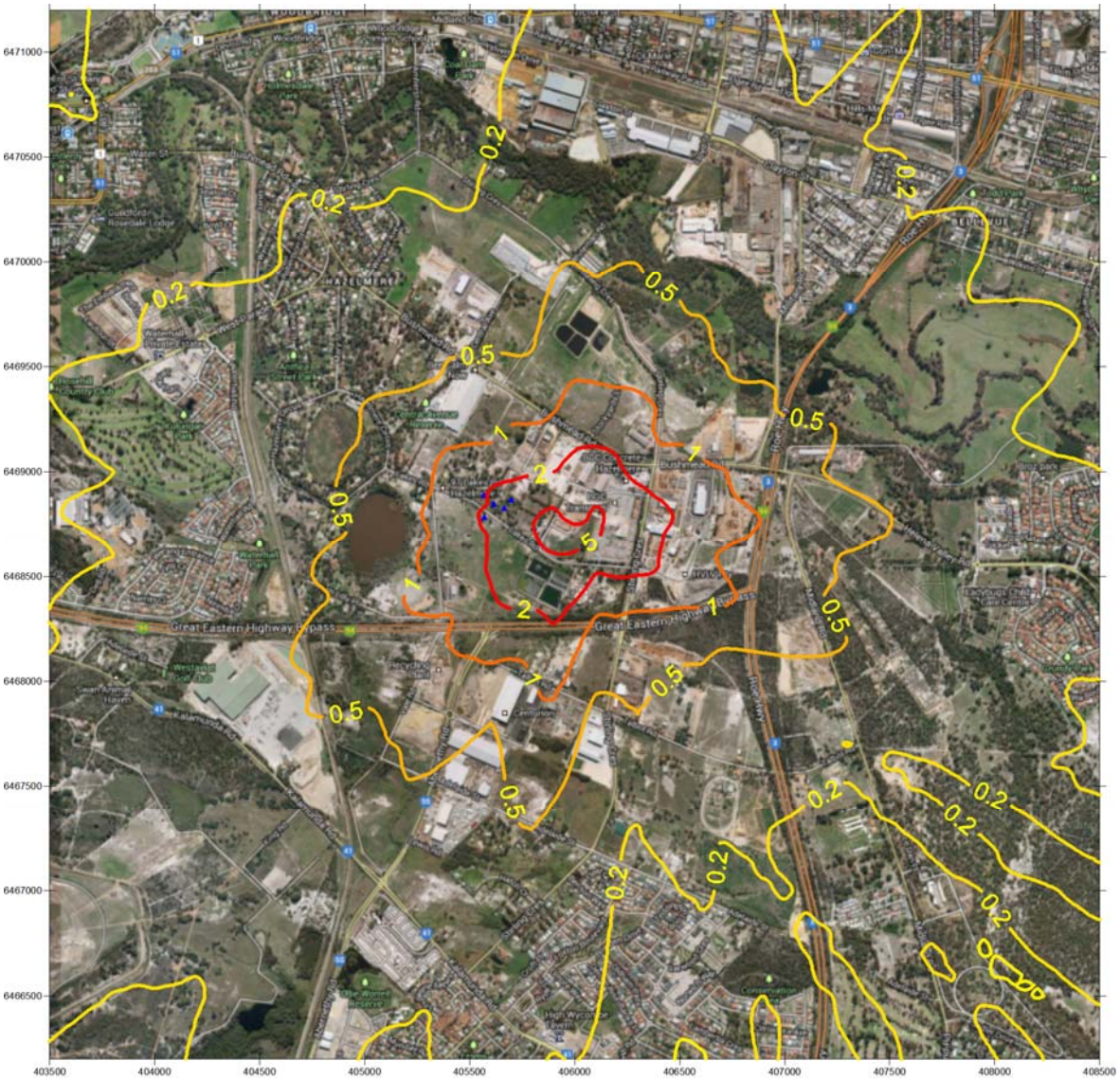

Figure 120: Reduced Operations - GLC Hg (ρg/m³) Maximum Daily

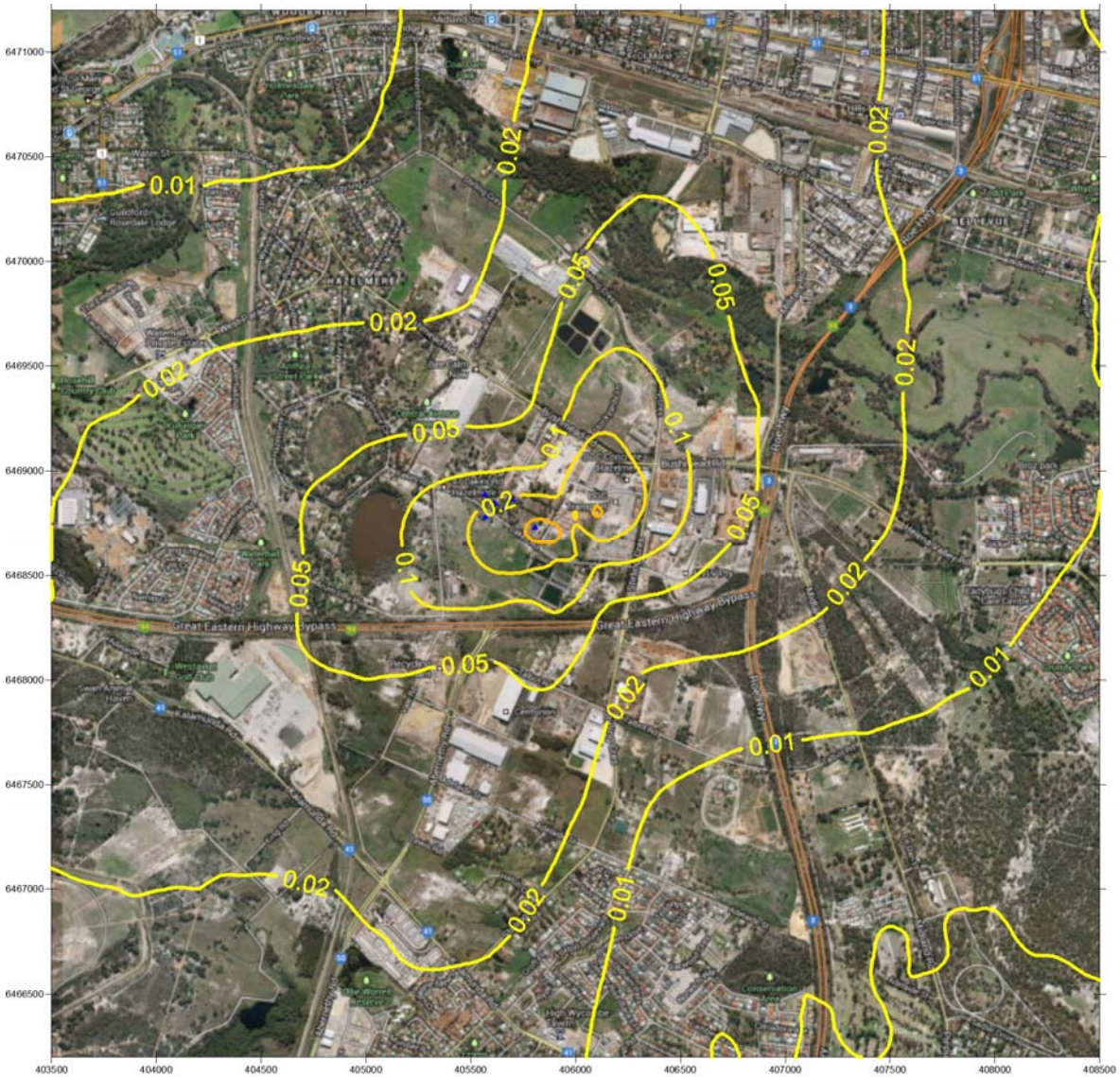

Figure 121: Reduced Operations - GLC Hg (ρg/m³) Annual average

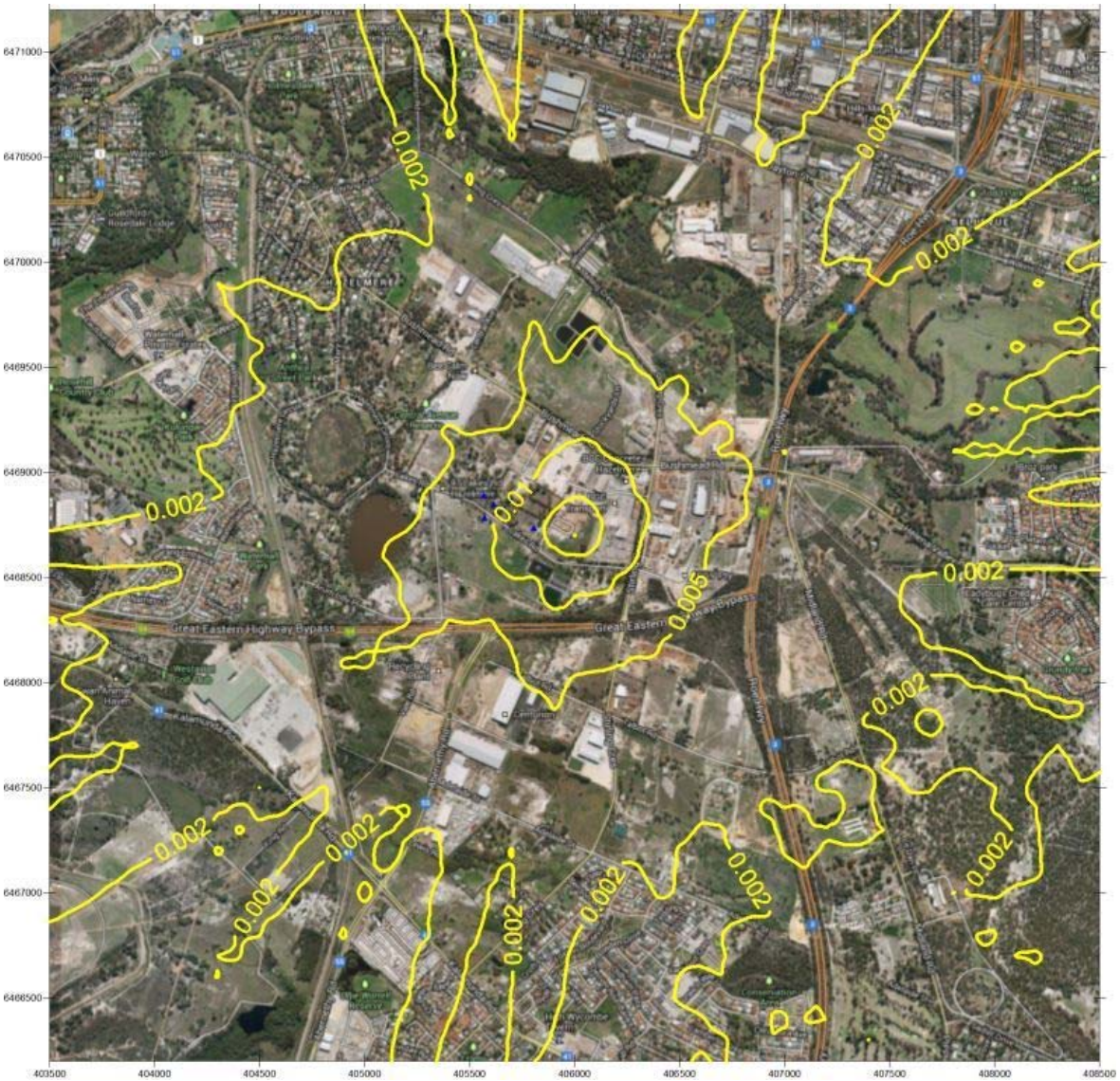

Figure 122: Reduced Operations - GLC Mn (fg/m³) Maximum Hourly

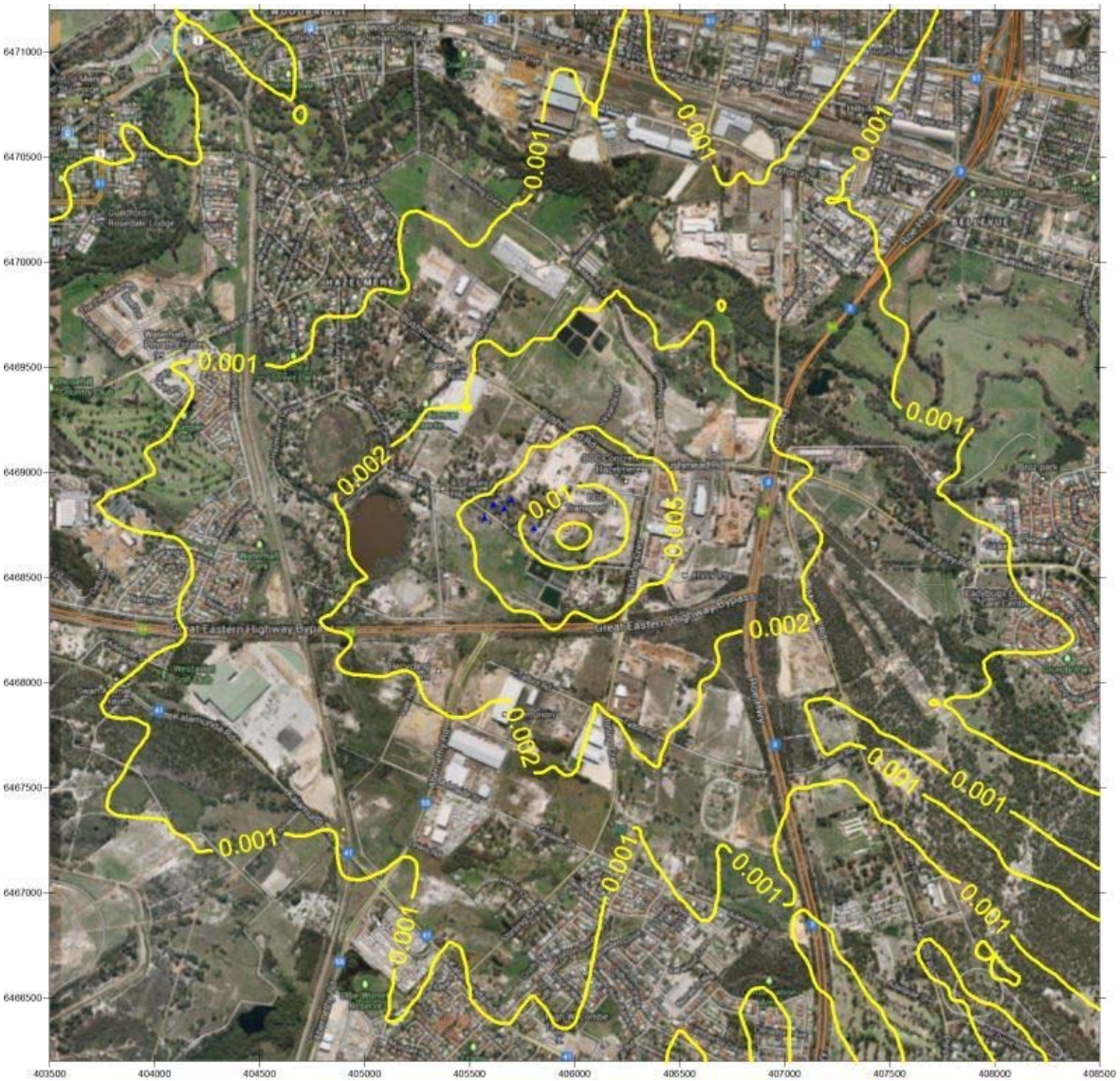

Figure 123: Reduced Operations - GLC Mn (fg/m³) Maximum 8-Hourly

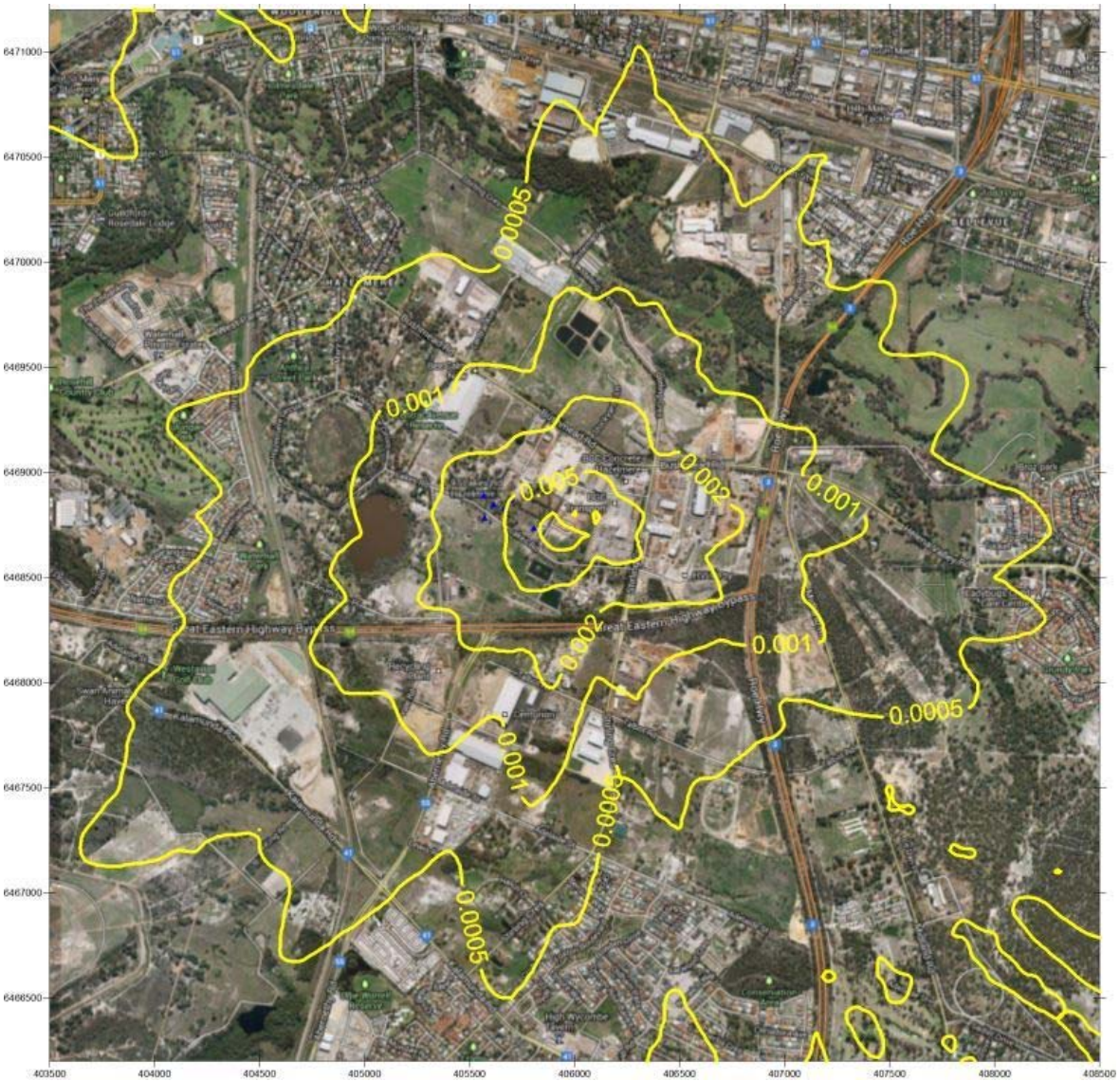

Figure 124: Reduced Operations - GLC Mn (fg/m³) Maximum Daily

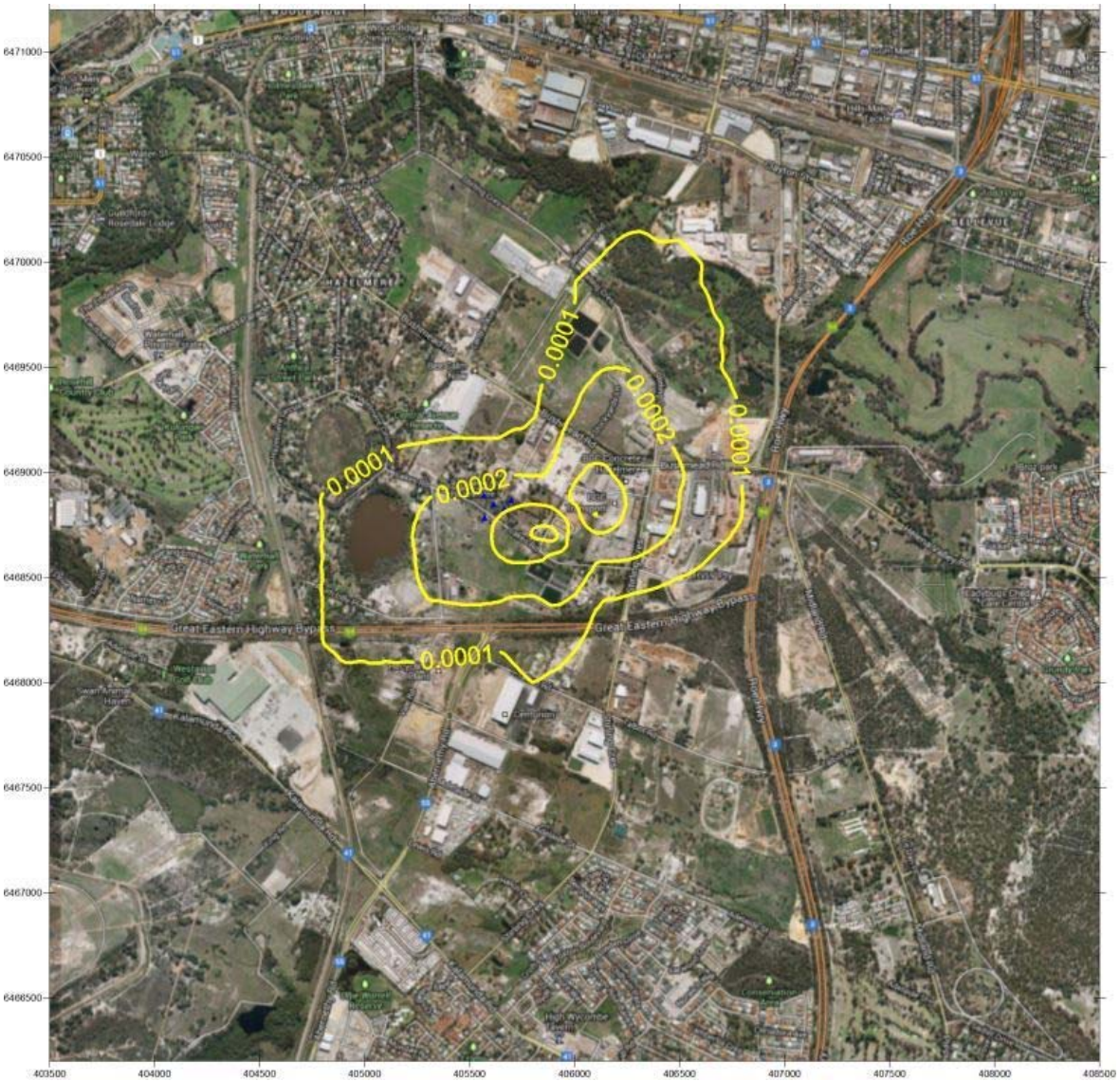

Figure 125: Reduced Operations - GLC Mn (fg/m³) Annual average

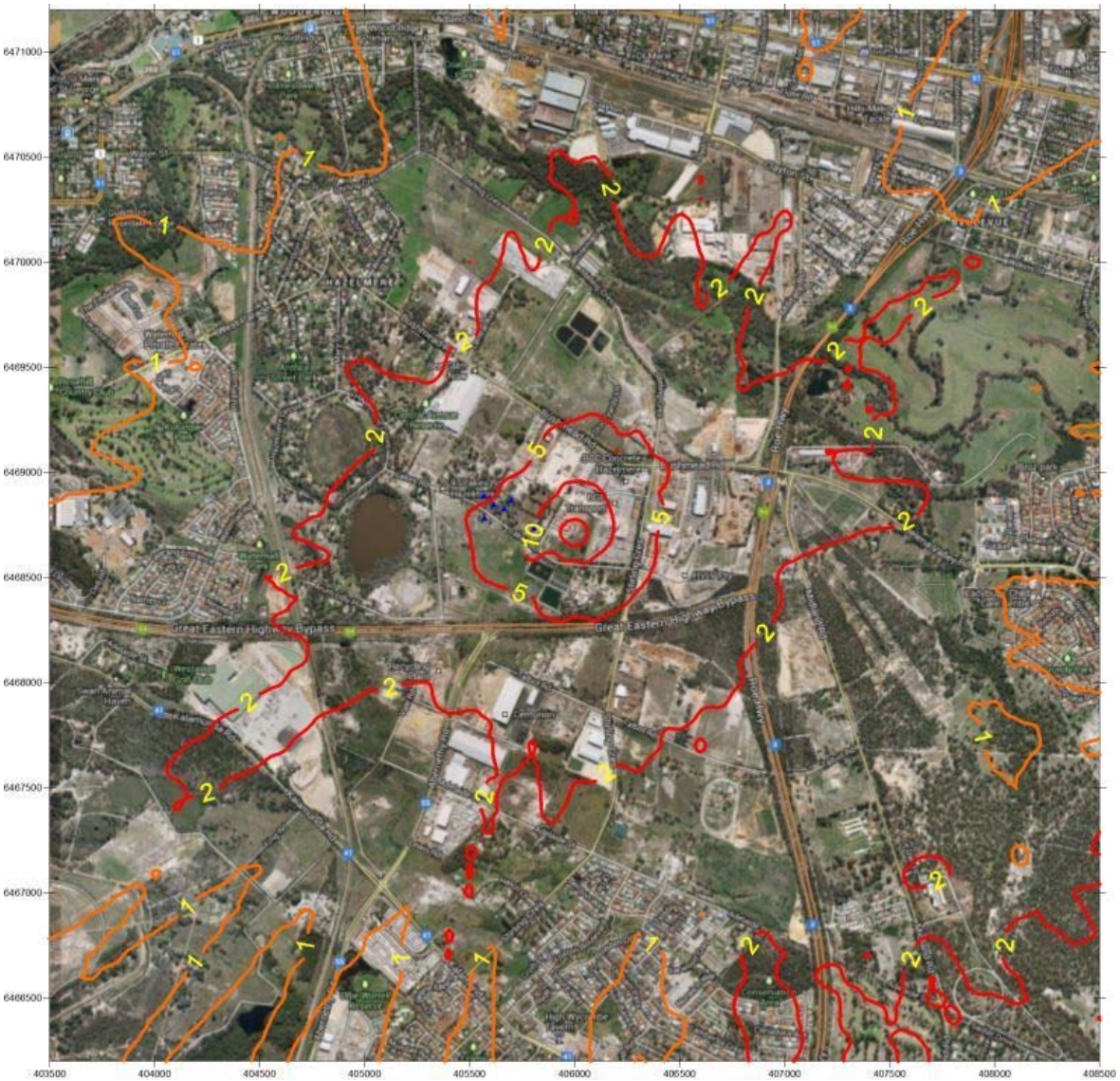

Figure 126: Reduced Operations - GLC Ni (ρg/m³) Maximum Hourly

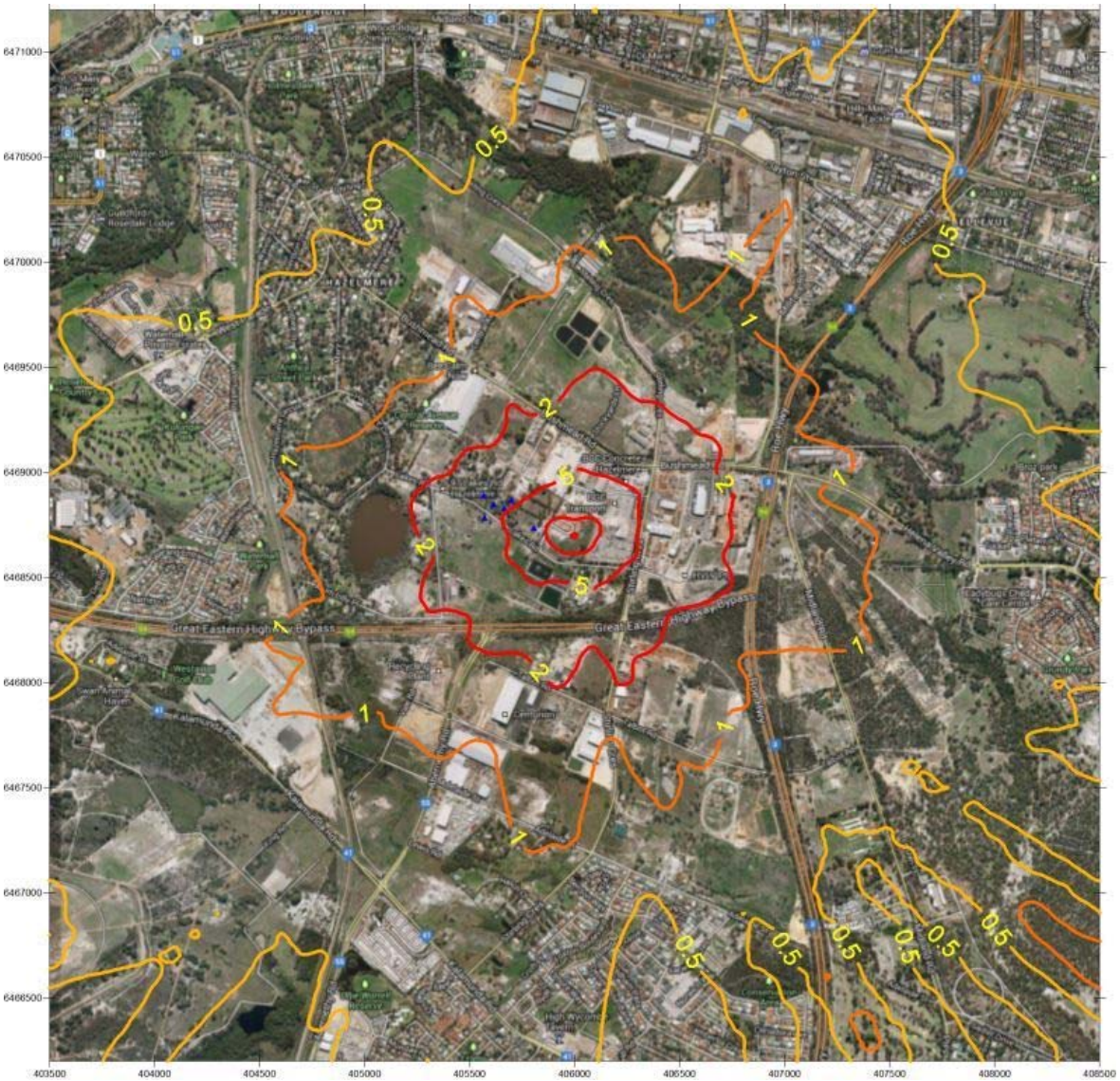

Figure 127: Reduced Operations - GLC Ni (ρg/m³) Maximum 8-Hourly

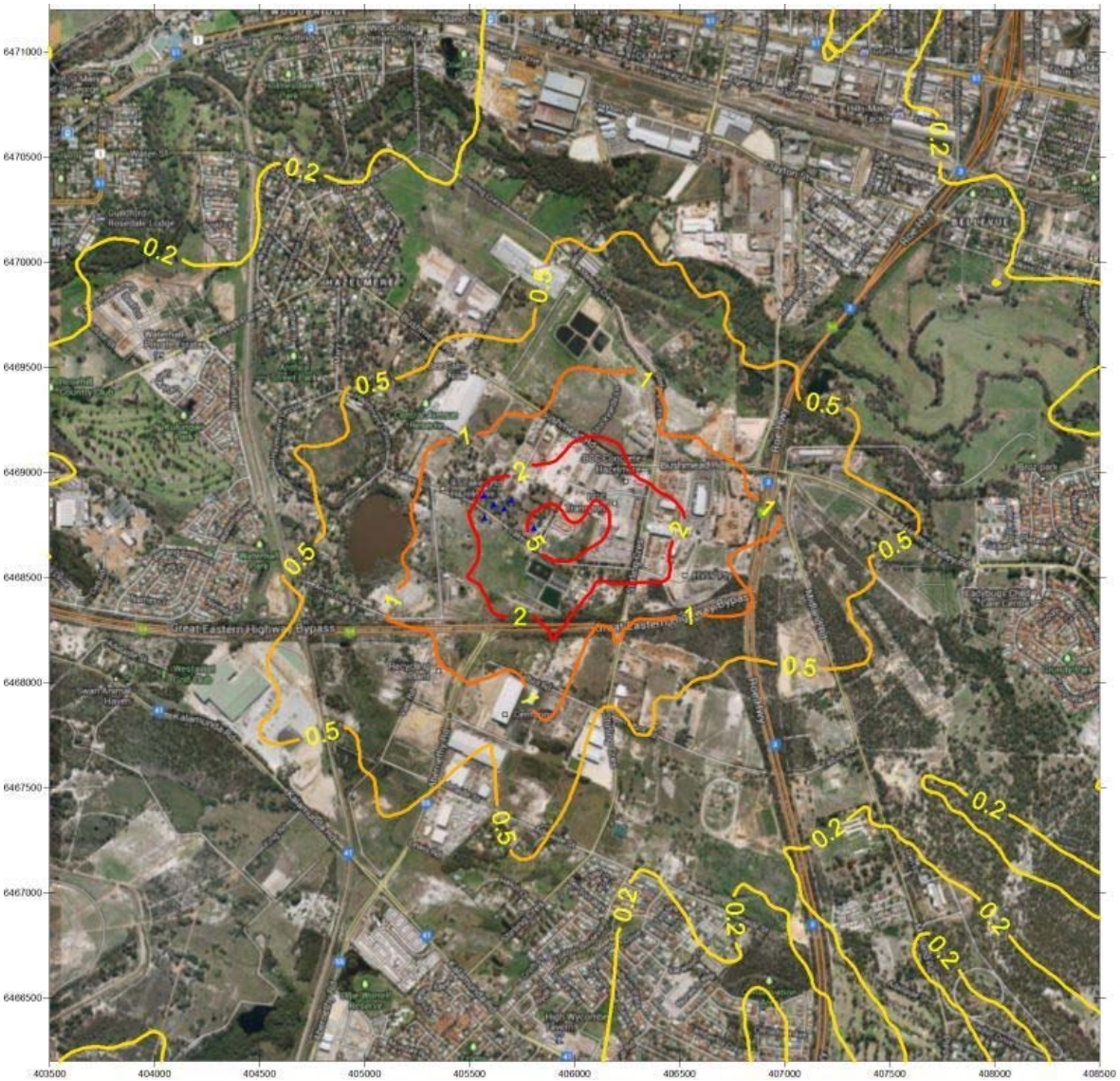

Figure 128: Reduced Operations - GLC Ni (ρg/m³) Maximum Daily

Figure 129: Reduced Operations - GLC Ni (ρg/m³) Annual average

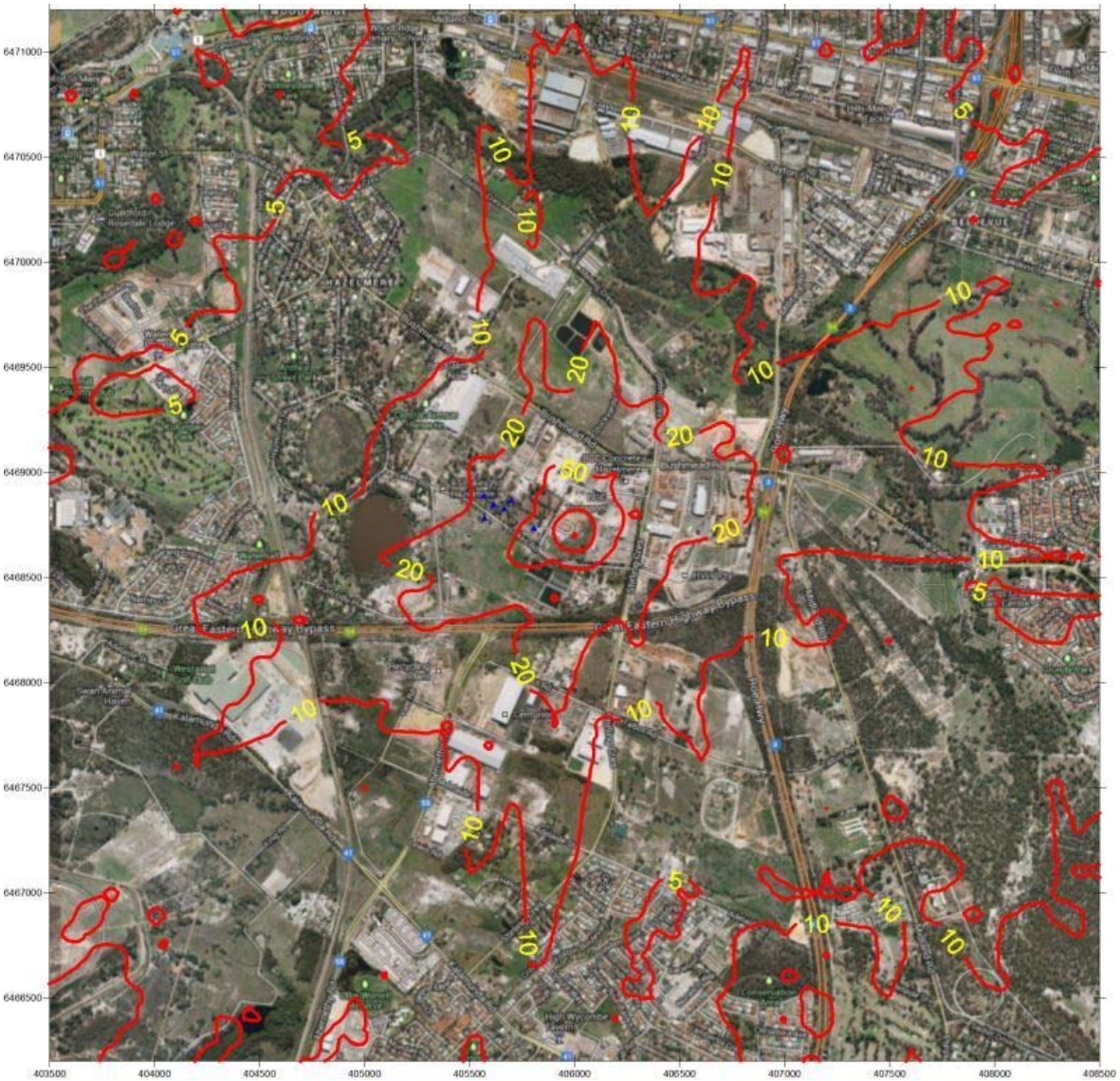

Figure 130: Reduced Operations - GLC NOx (µg/m³) Maximum Hourly

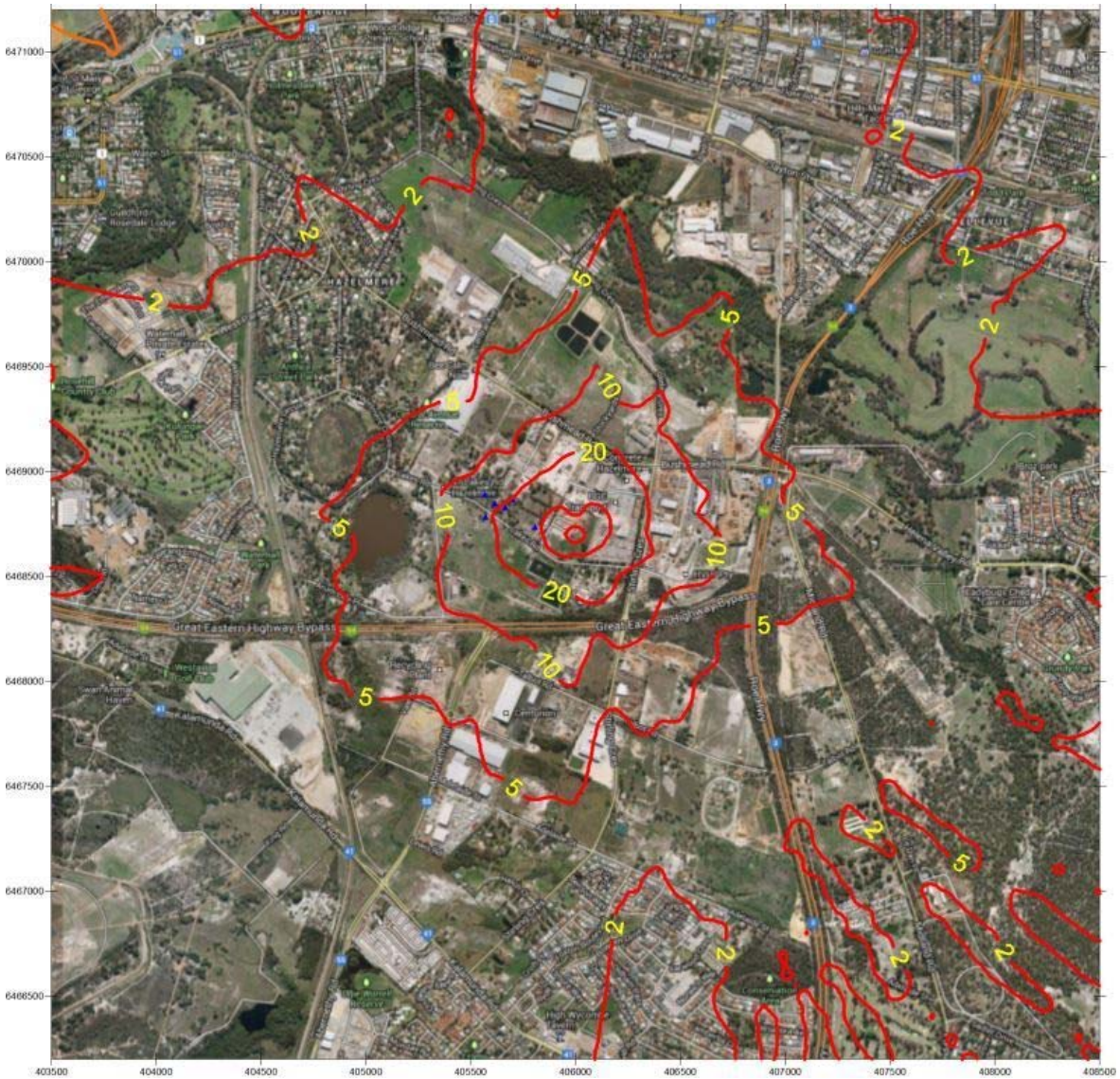

Figure 131: Reduced Operations - GLC NOx (µg/m³) Maximum 8-Hourly

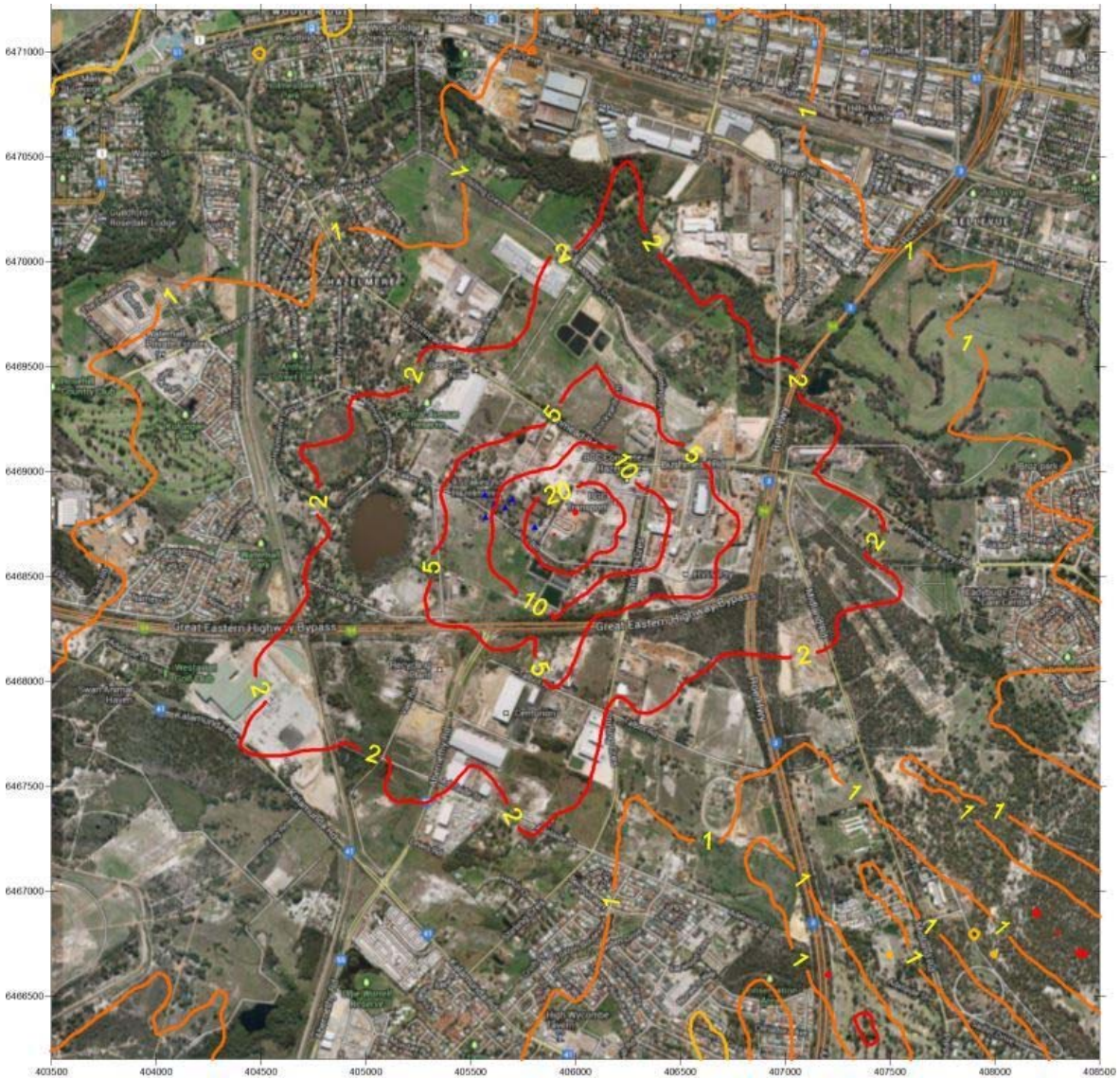

Figure 132: Reduced Operations - GLC NOx (µg/m³) Maximum Daily

Figure 133: Reduced Operations - GLC NOx (µg/m³) Annual average

Figure 134: Reduced Operations - GLC Pb (ng/m³) Maximum Hourly

Figure 135: Reduced Operations - GLC Pb (ng/m³) Maximum 8-Hourly

Figure 136: Reduced Operations - GLC Pb (ng/m³) Maximum Daily

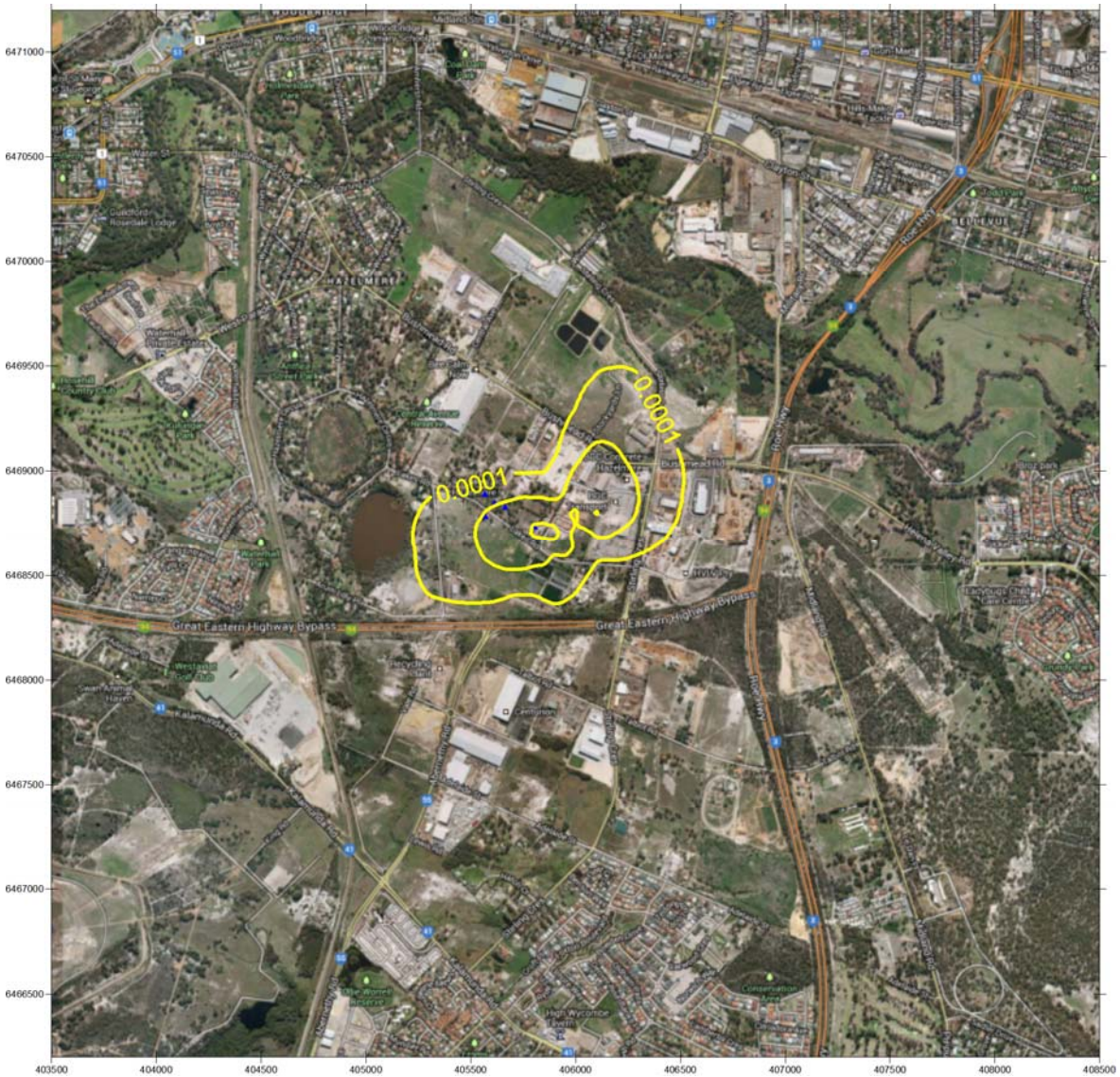

Figure 137: Reduced Operations - GLC Pb (ng/m³) Annual average

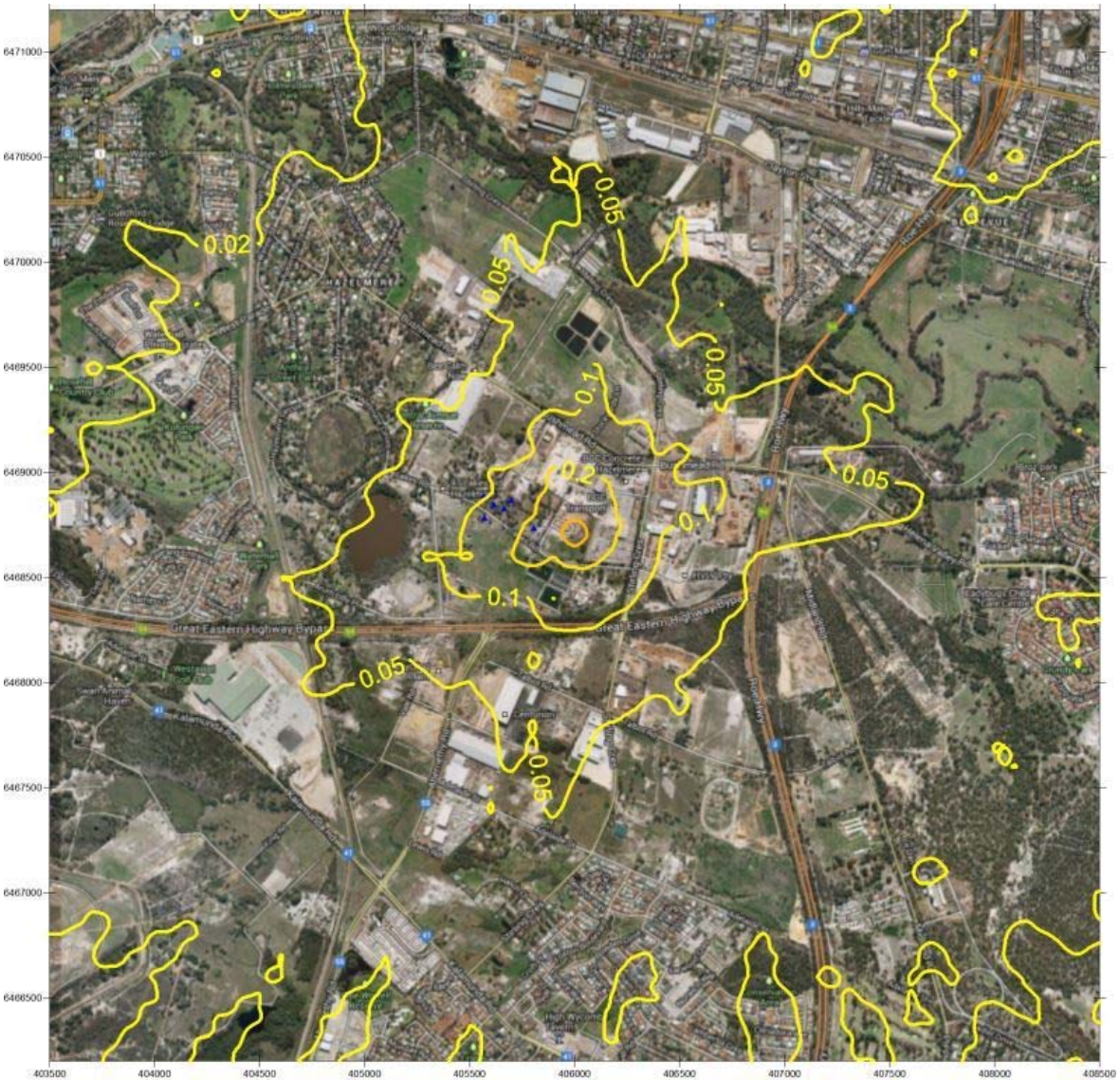

Figure 138: Reduced Operations - GLC Particulates (µg/m³) Maximum Hourly

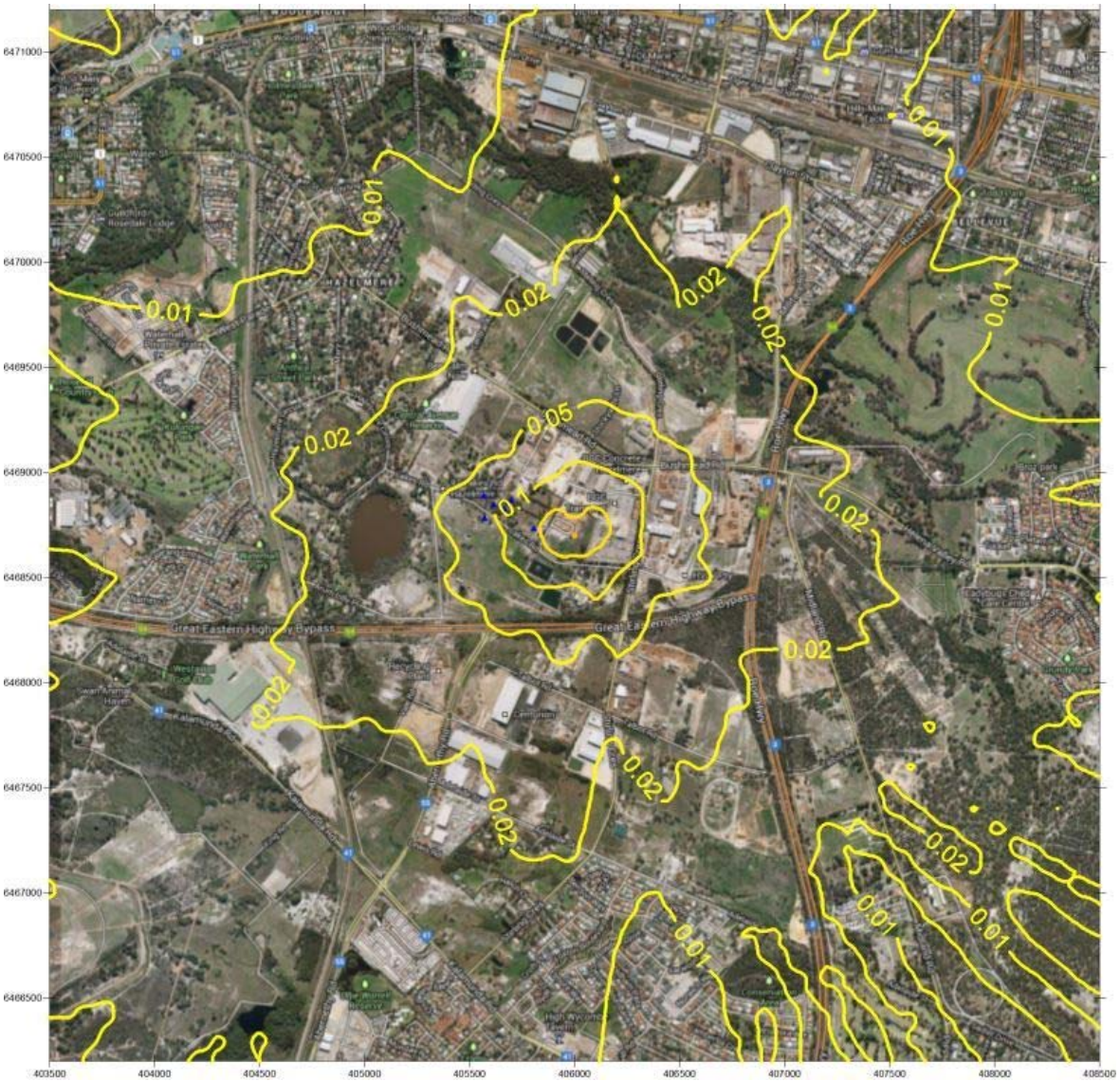

Figure 139: Reduced Operations - GLC Particulates (µg/m³) Maximum 8-Hourly

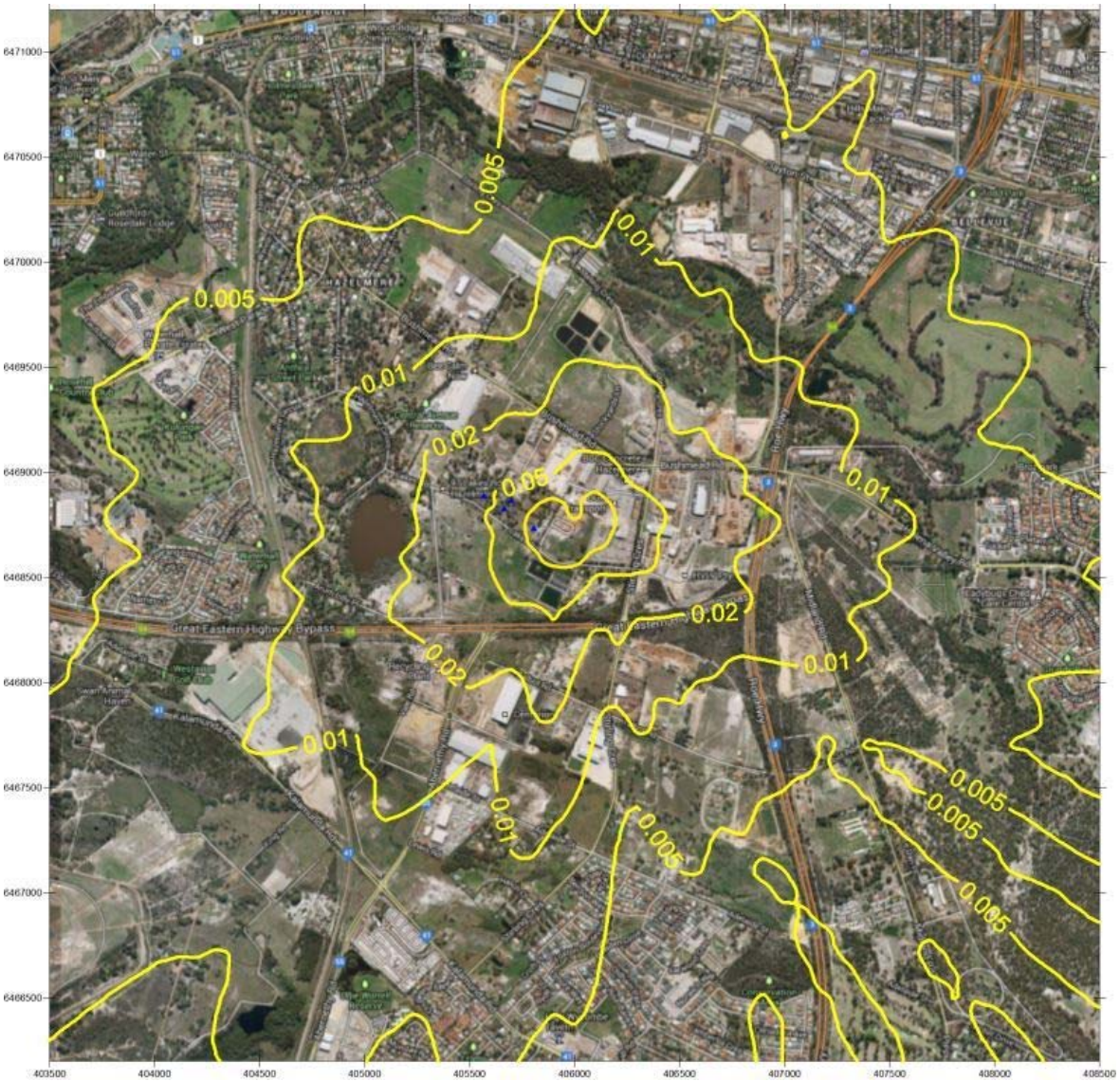

Figure 140: Reduced Operations - GLC Particulates (µg/m³) Maximum Daily

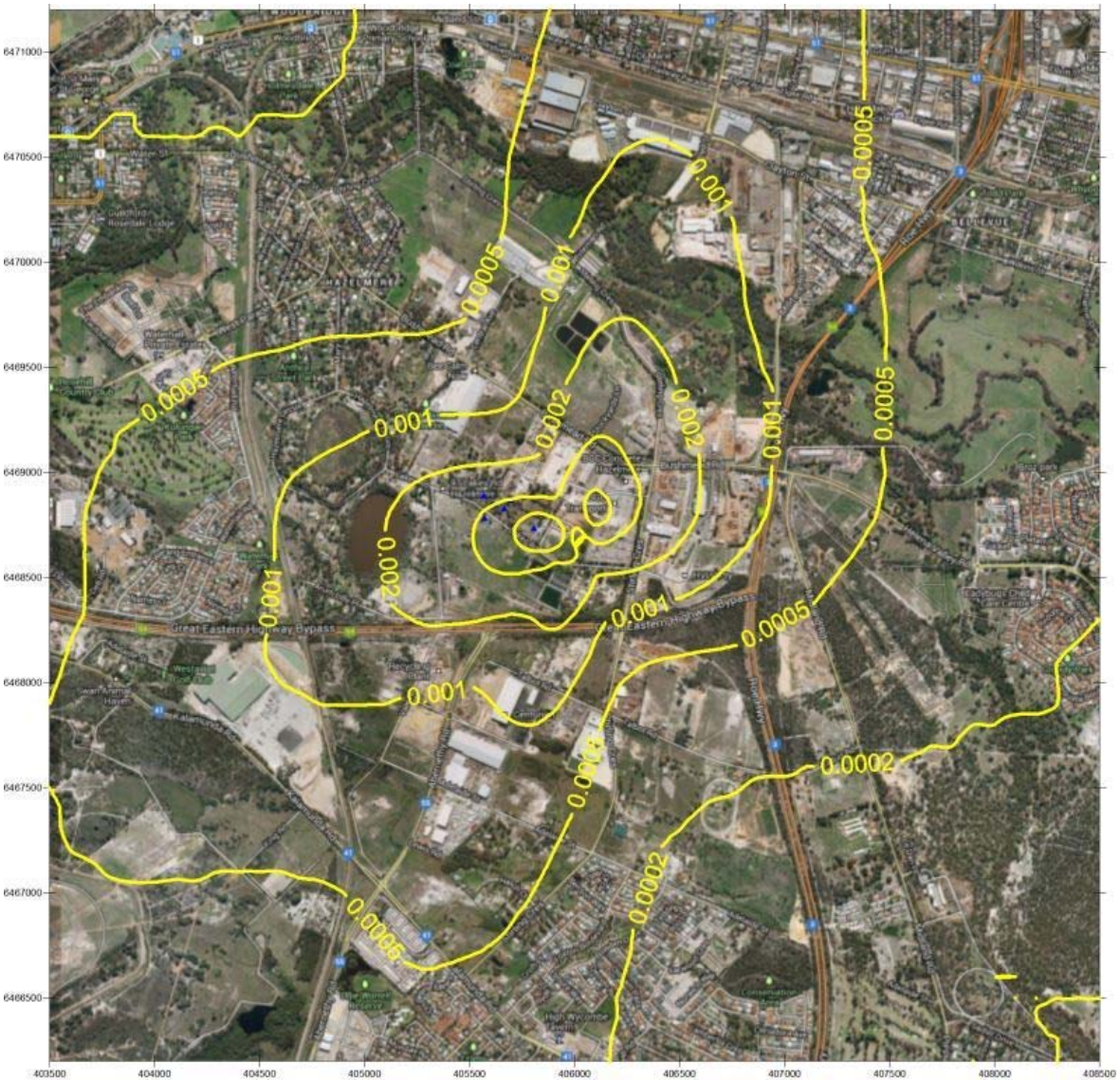

Figure 141: Reduced Operations - GLC Particulates (µg/m³) Annual average

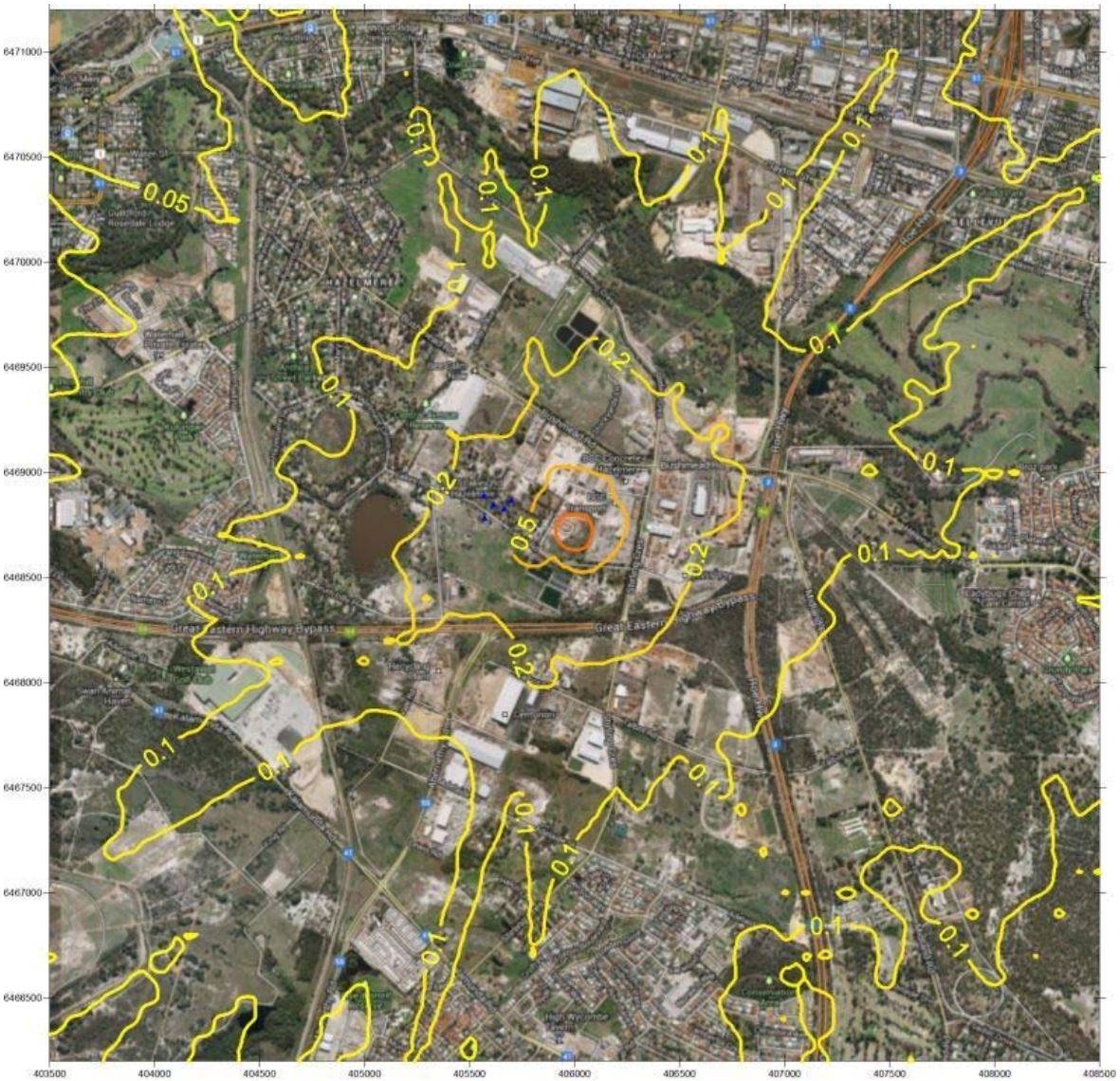

Figure 142: Reduced Operations - GLC Sb (ρg/m³) Maximum Hourly

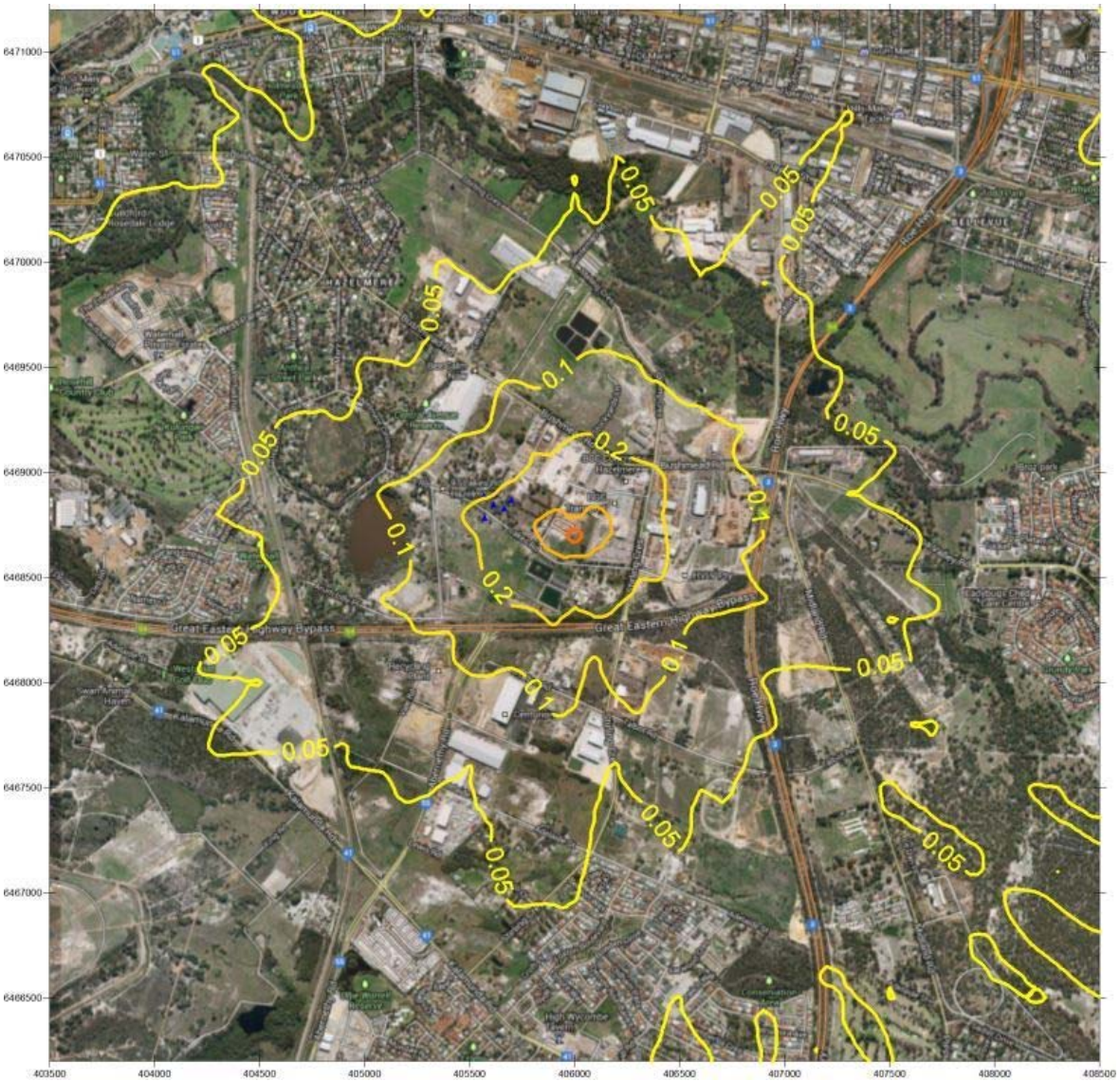

Figure 143: Reduced Operations - GLC Sb (ρg/m³) Maximum 8-Hourly

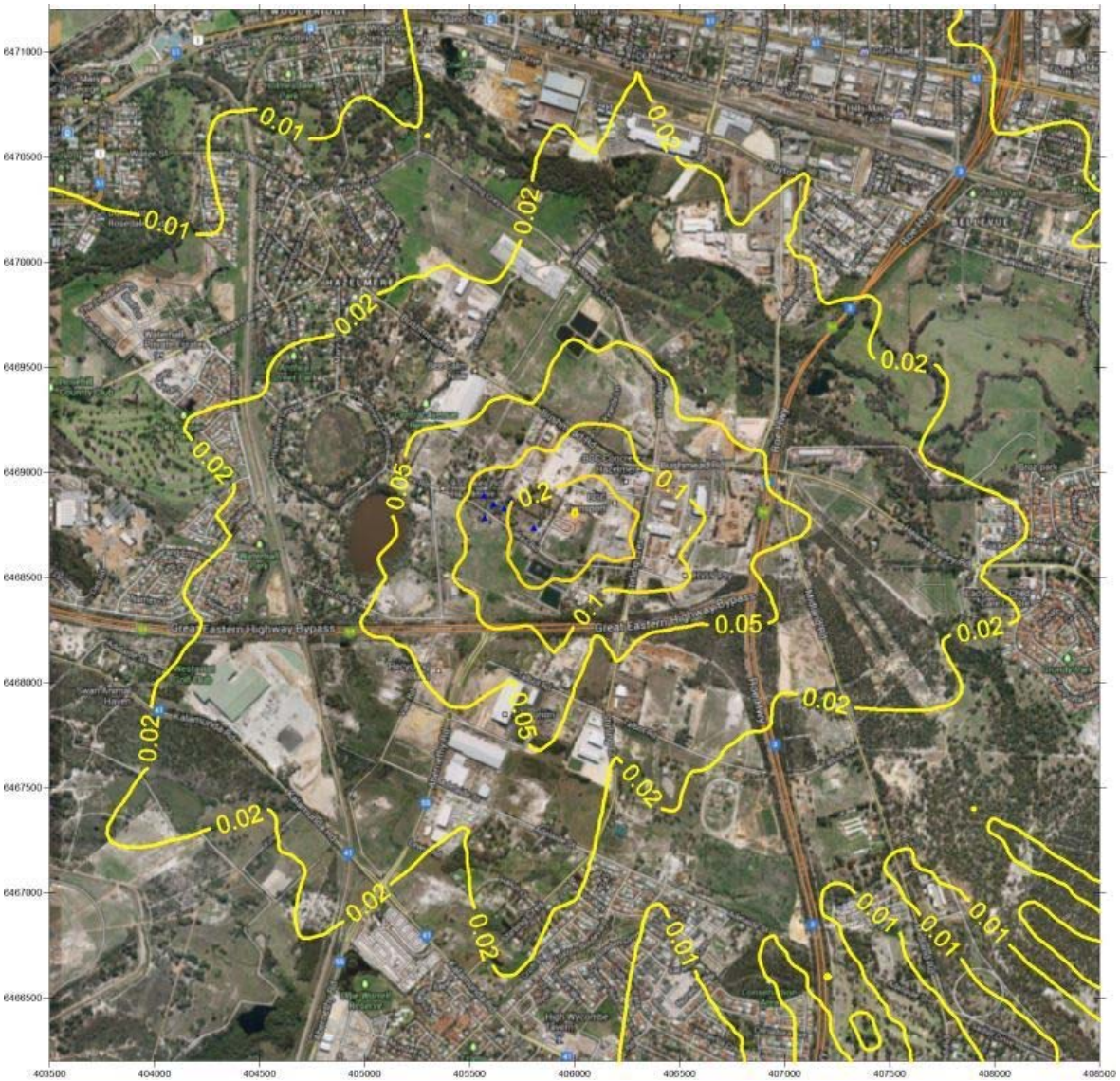

Figure 144: Reduced Operations - GLC Sb (ρg/m³) Maximum Daily

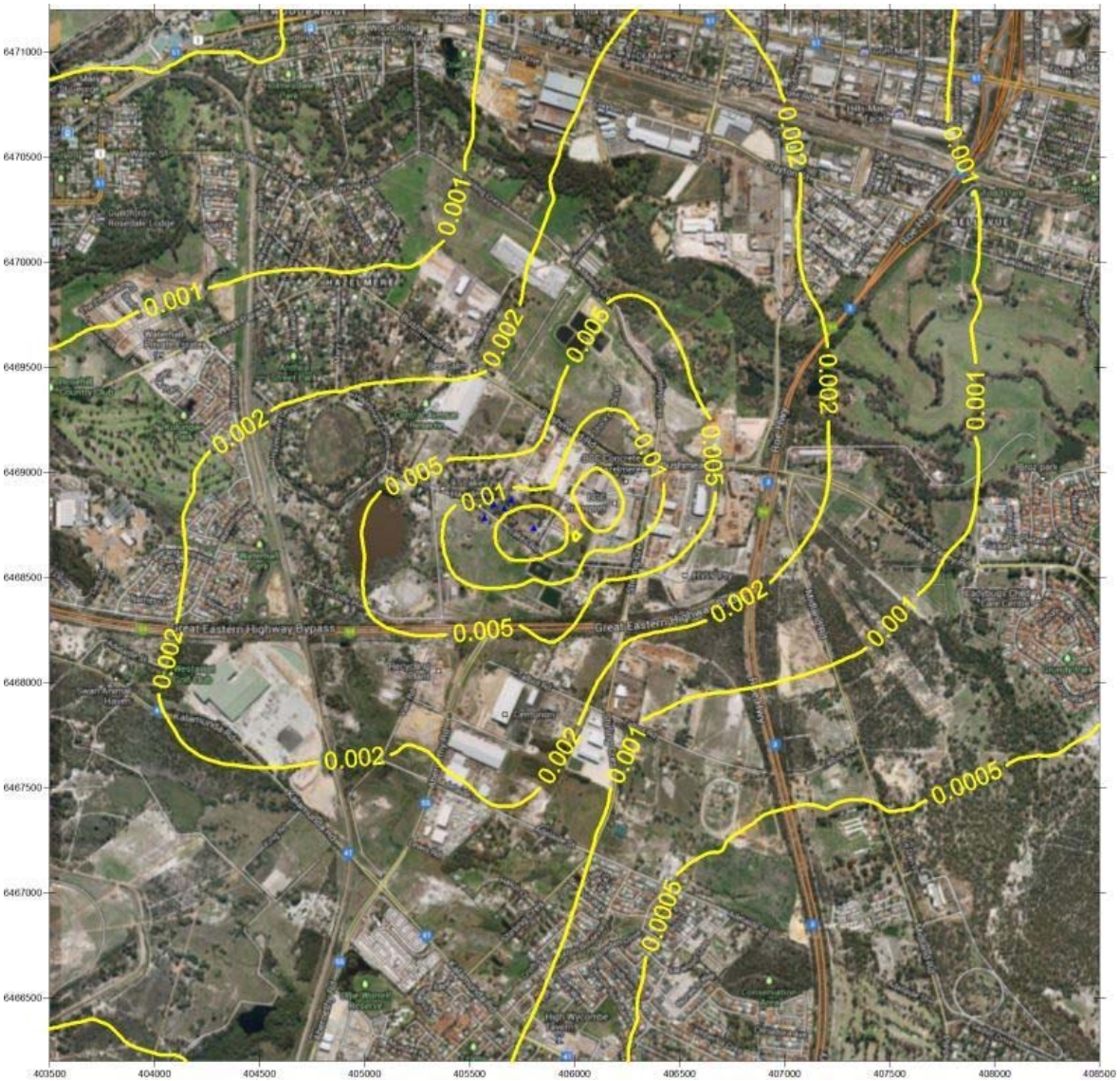

Figure 145: Reduced Operations - GLC Sb (ρg/m³) Annual average

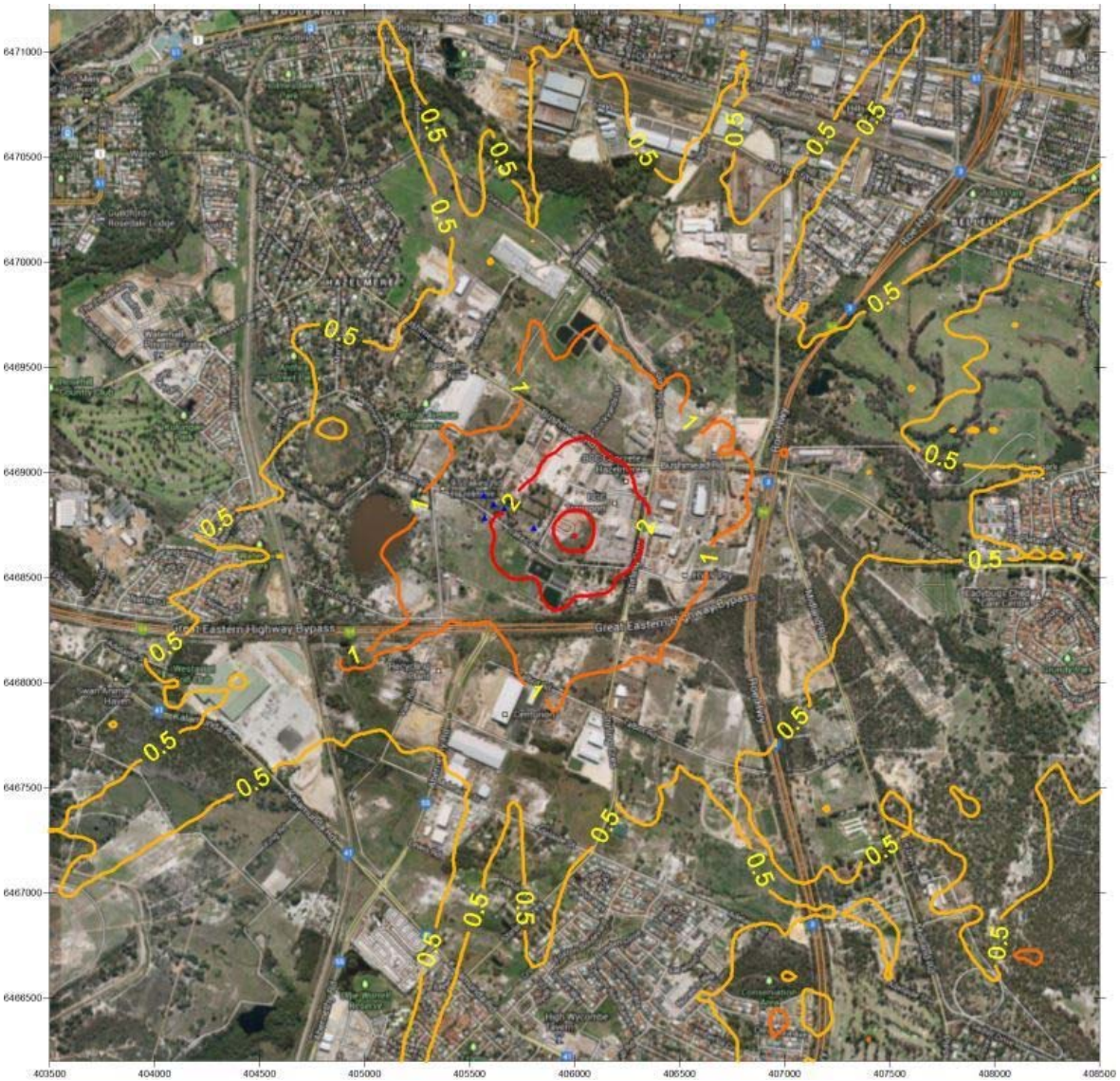

Figure 146: Reduced Operations - GLC SO_2 (µg/m³) Maximum Hourly

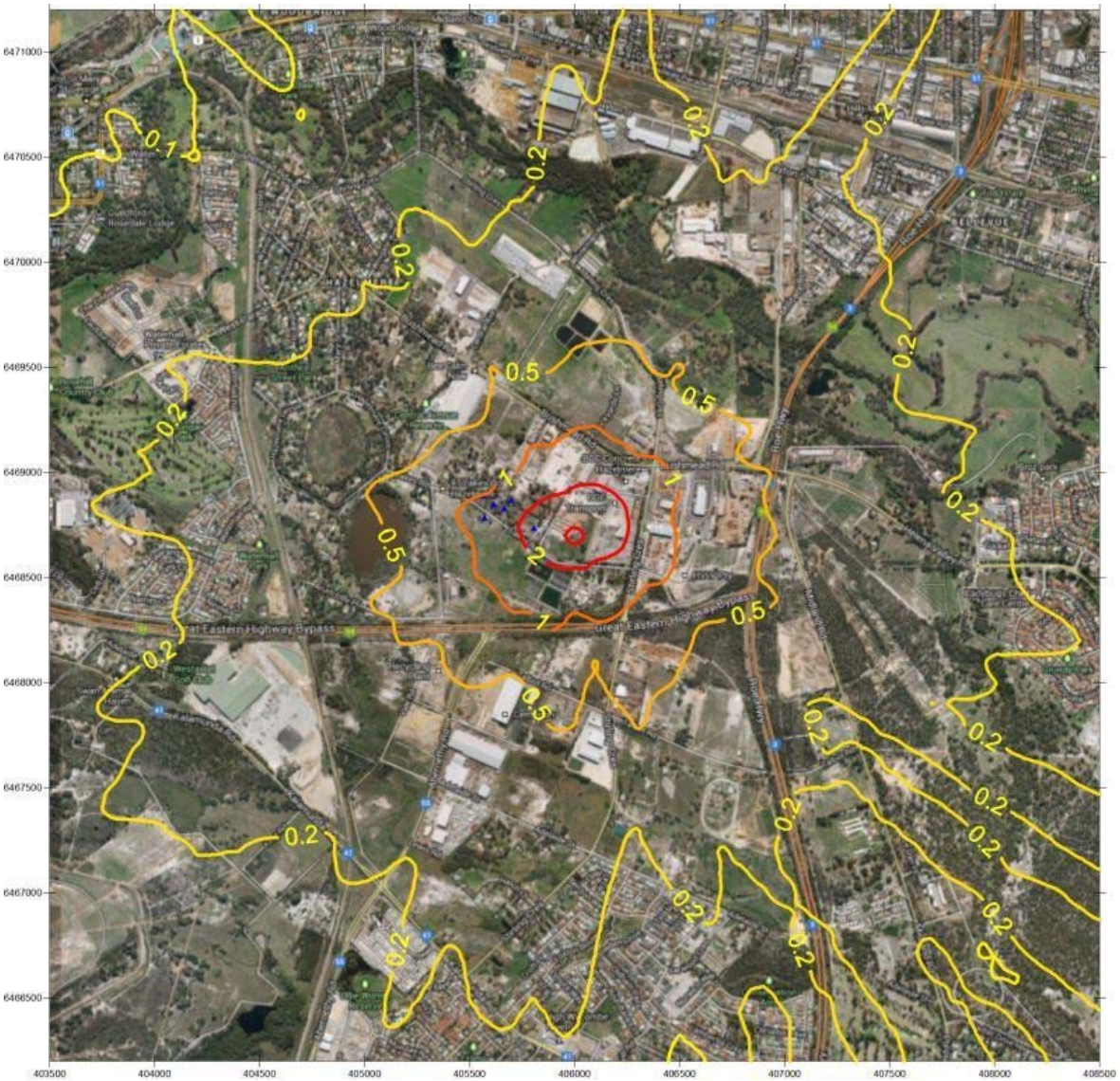

Figure 147: Reduced Operations - GLC SO_2 (µg/m³) Maximum 8-Hourly

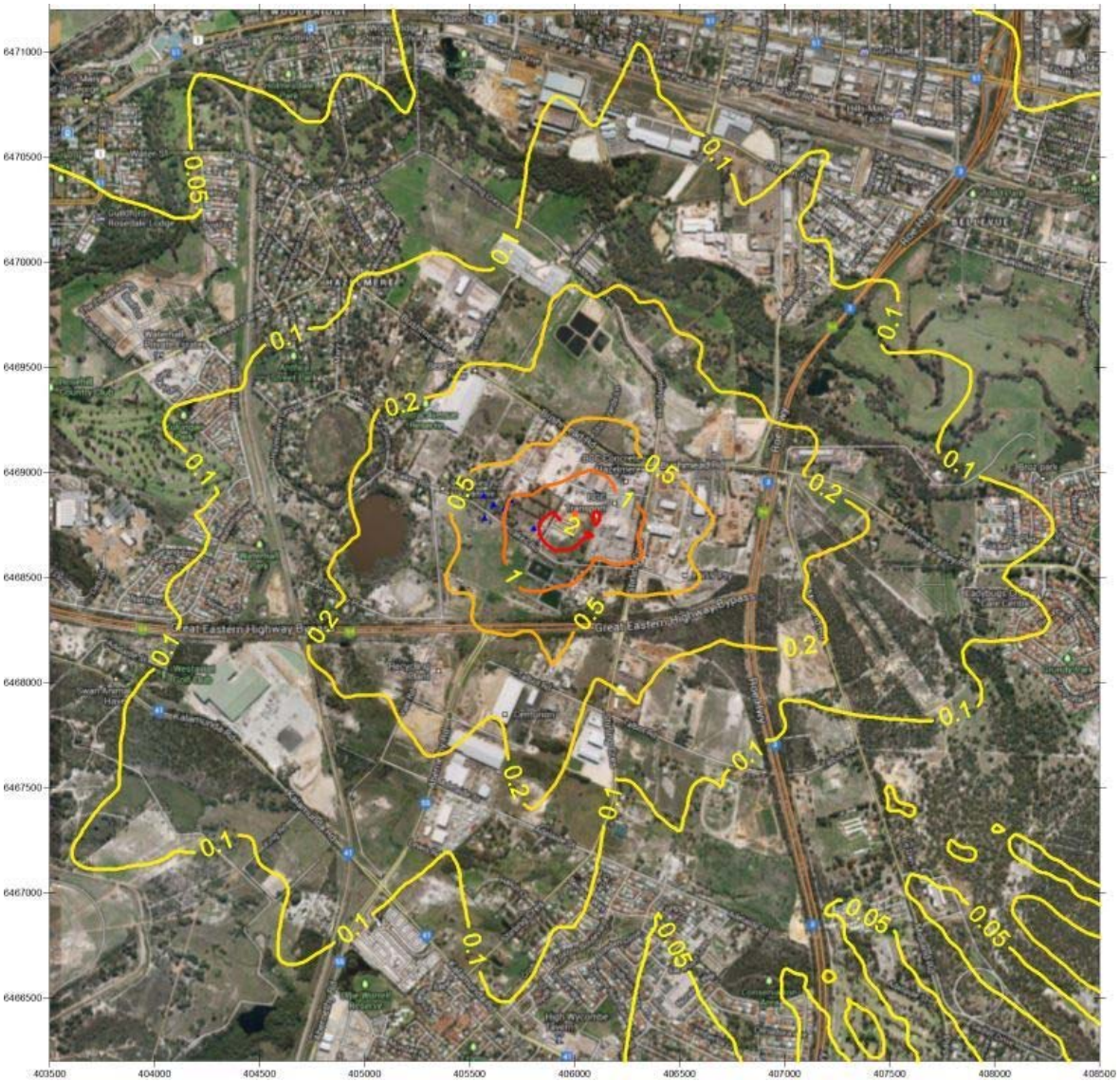

Figure 148: Reduced Operations - GLC SO_2 (µg/m³) Maximum Daily

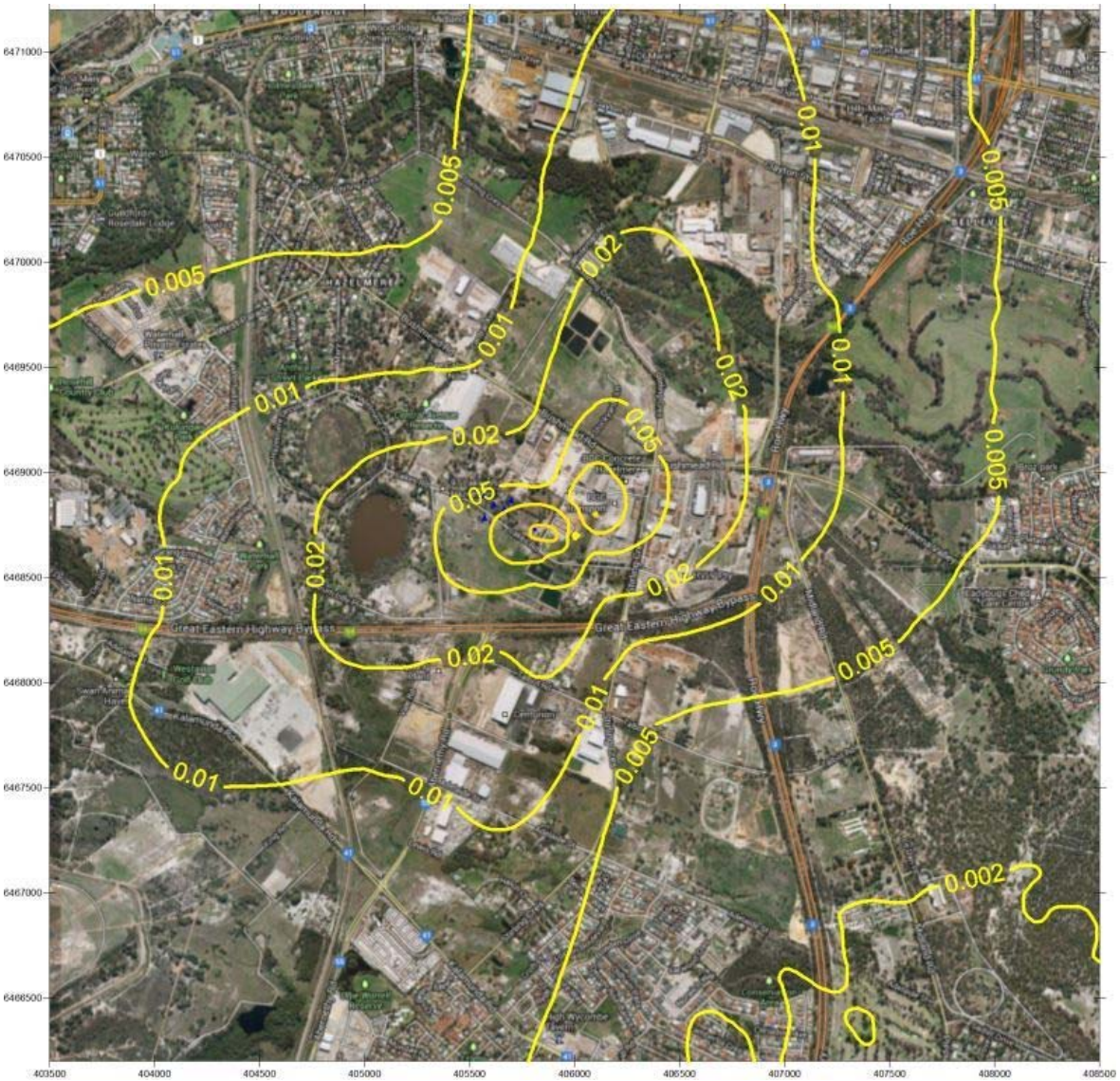

Figure 149: Reduced Operations - GLC SO_2 (µg/m³) Annual average

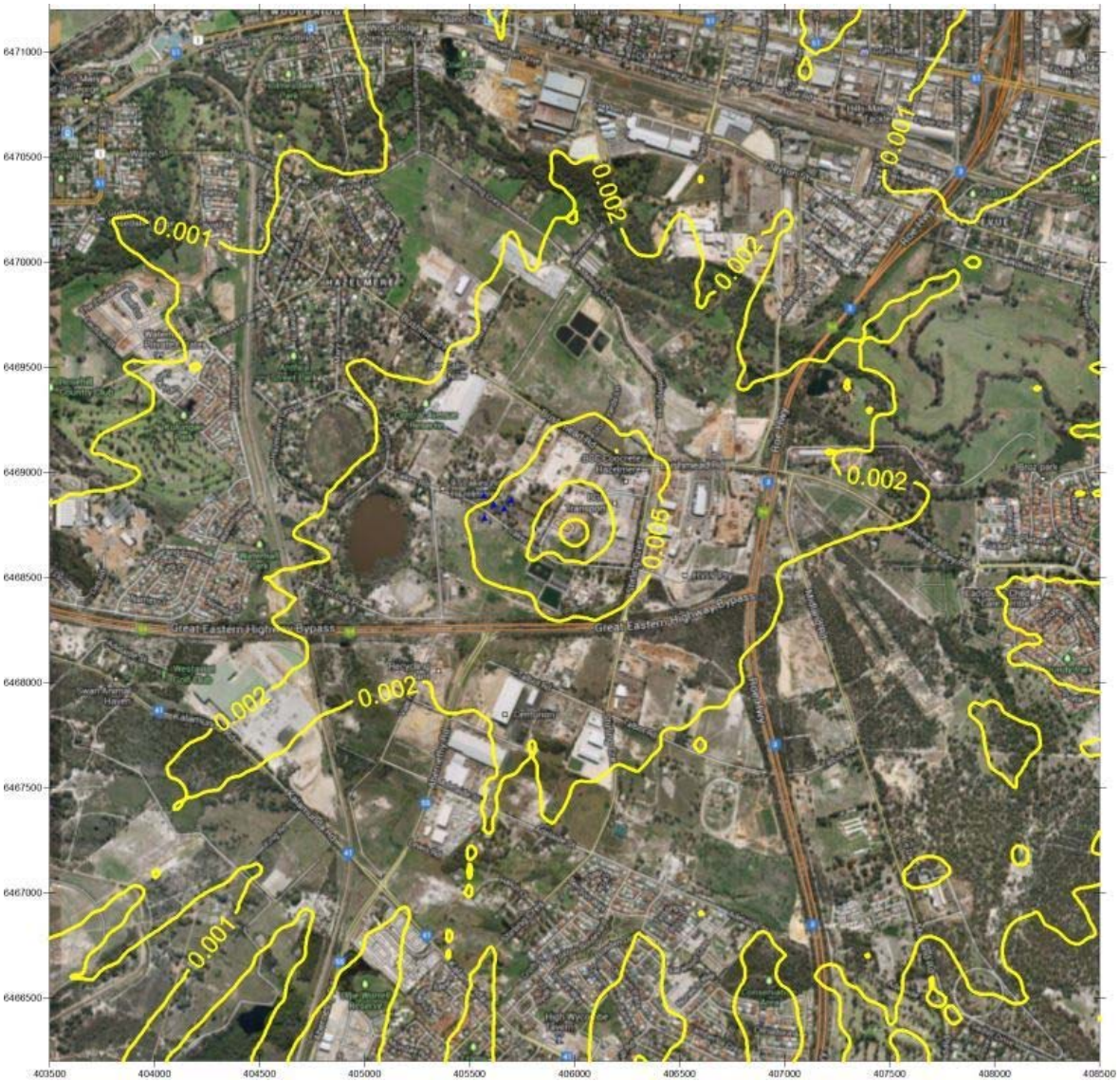

Figure 150: Reduced Operations - GLC Ti (ng/m³) Maximum Hourly

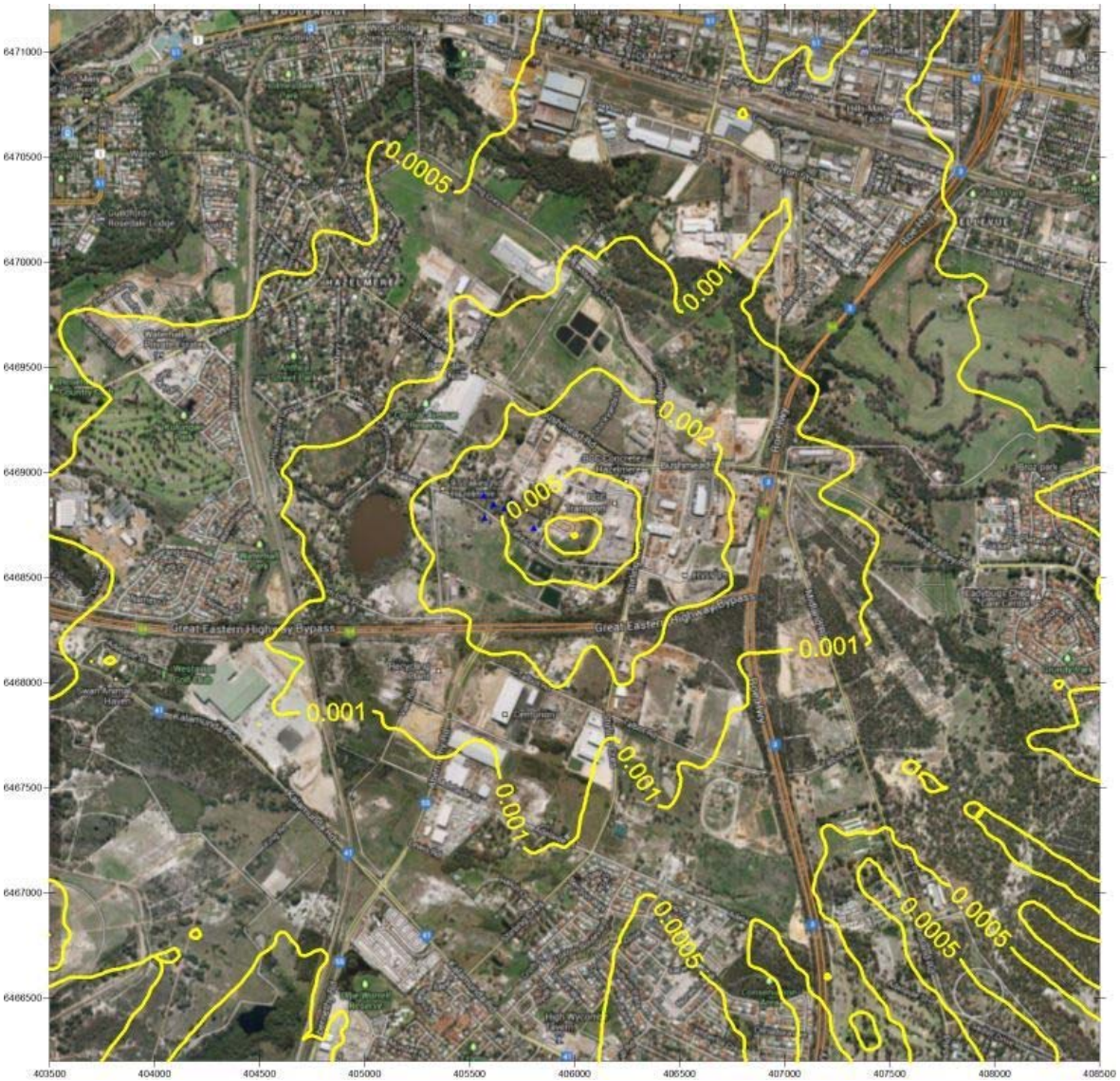

Figure 151: Reduced Operations - GLC Ti (ng/m³) Maximum 8-Hourly

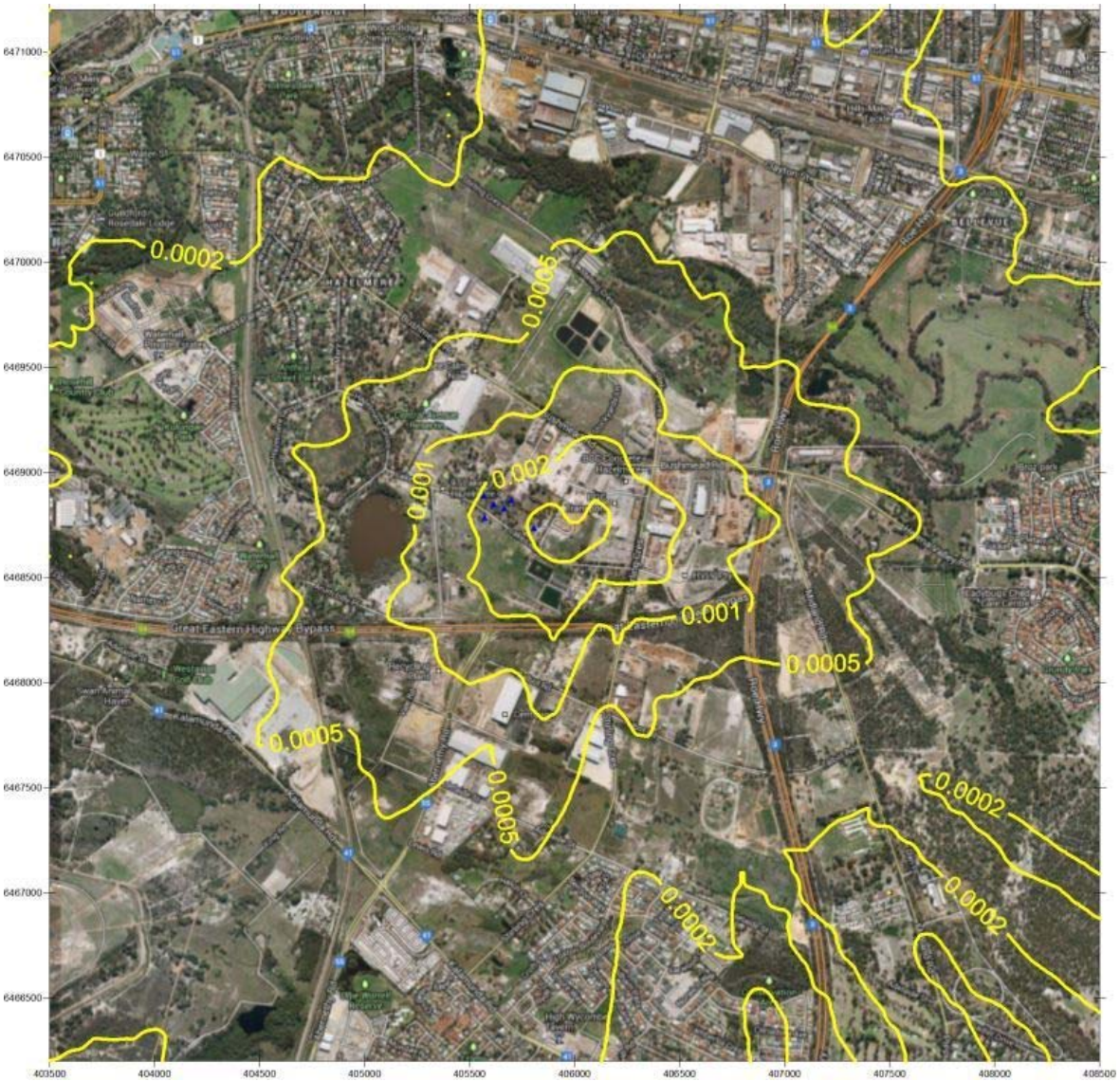

Figure 152: Reduced Operations - GLC Ti (ng/m³) Maximum Daily

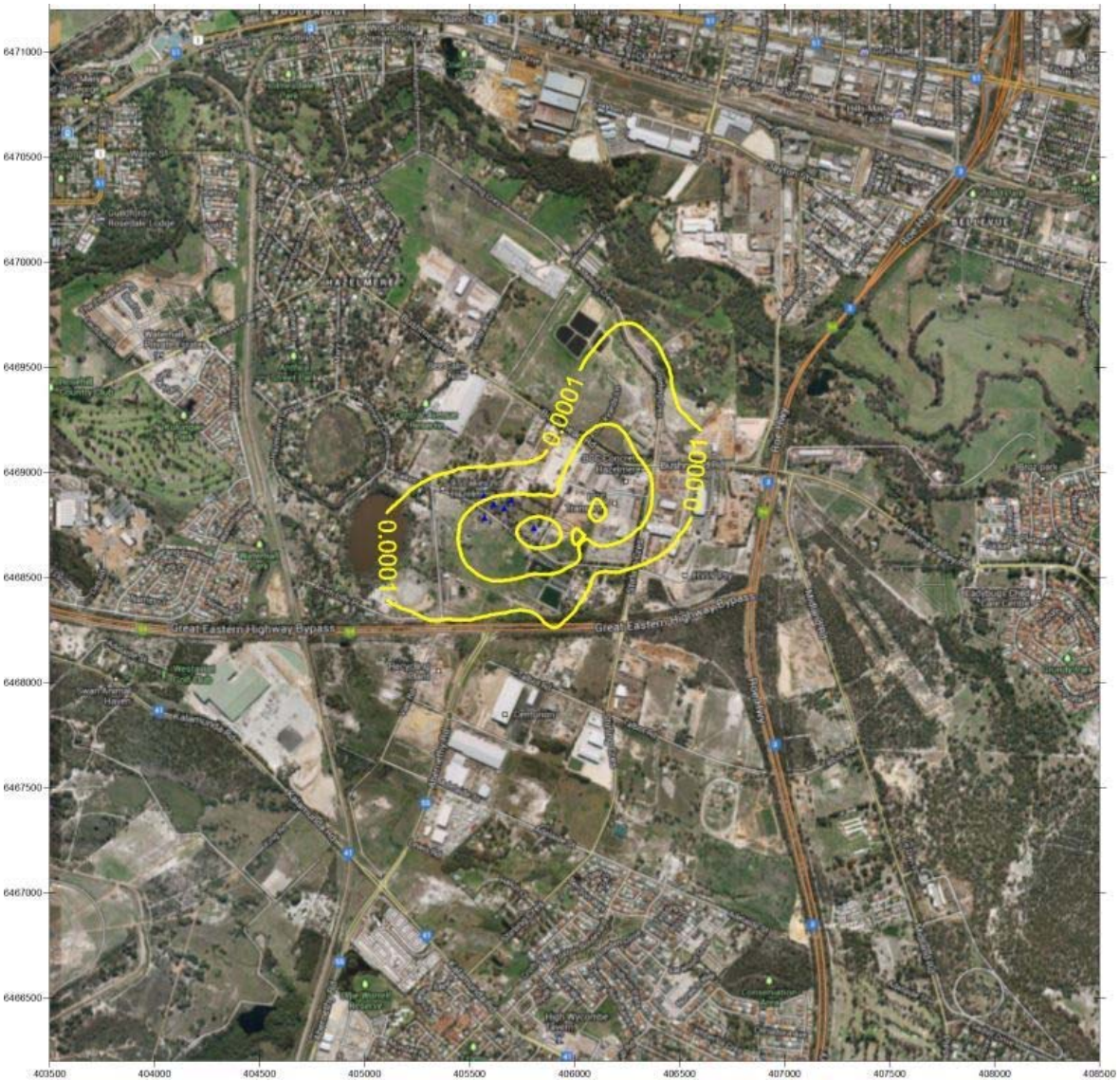

Figure 153: Reduced Operations - GLC Ti (ng/m³) Annual average

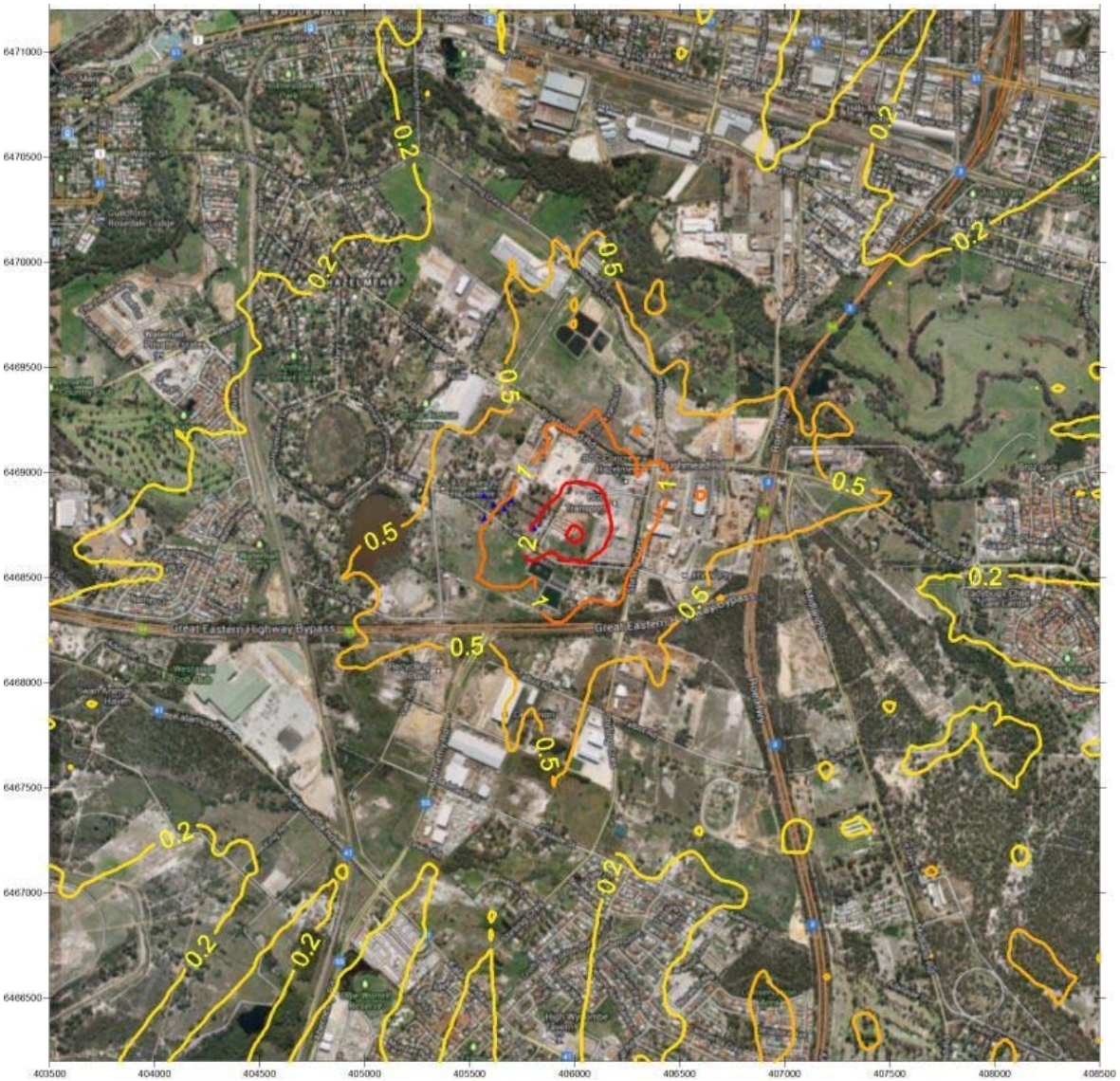

Figure 154: Reduced Operations - GLC VOC (µg/m³) Maximum Hourly

Figure 155: Reduced Operations - GLC VOC (µg/m³) Maximum 8-Hourly

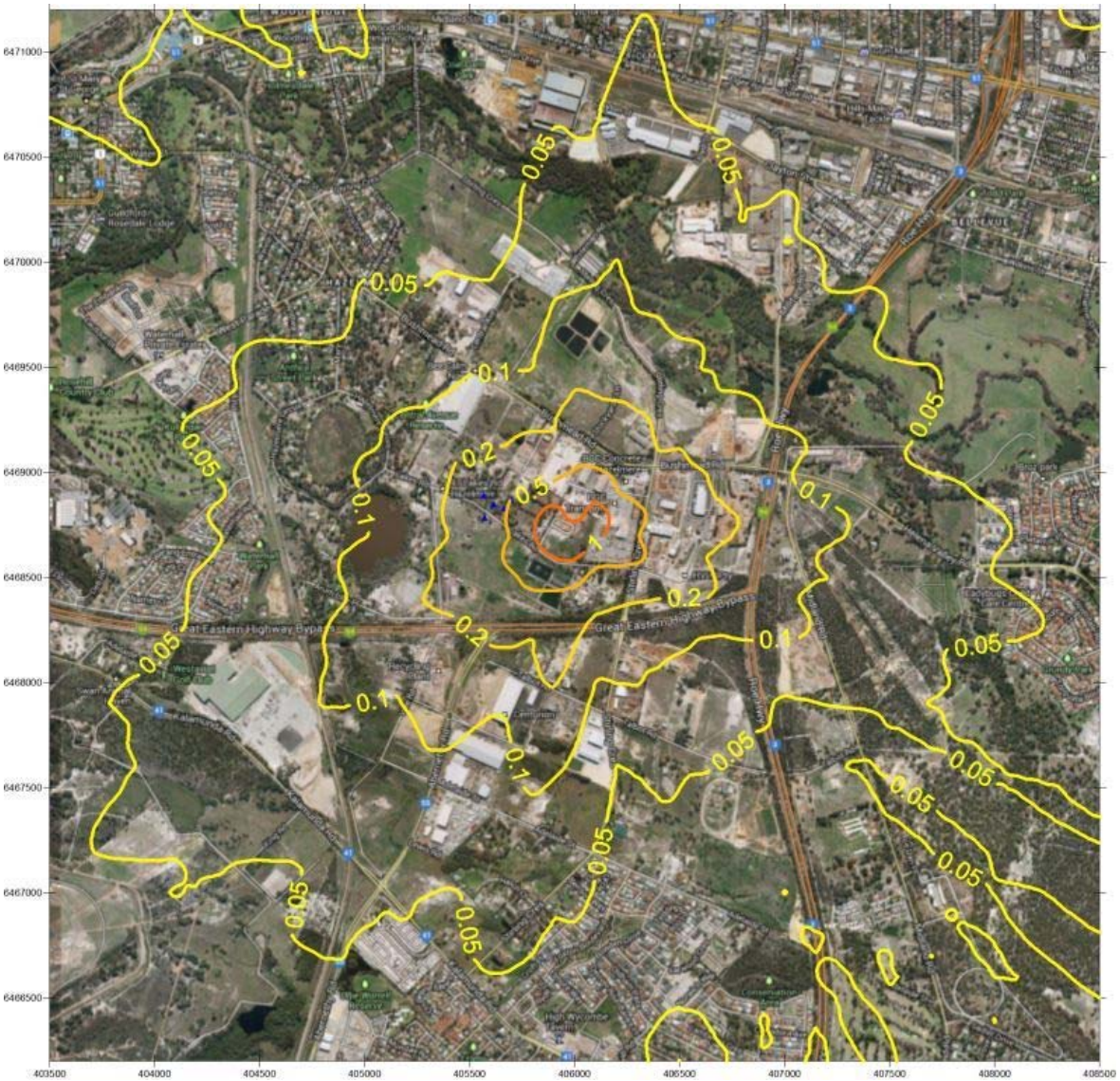

Figure 156: Reduced Operations - GLC VOC (µg/m³) Maximum Daily

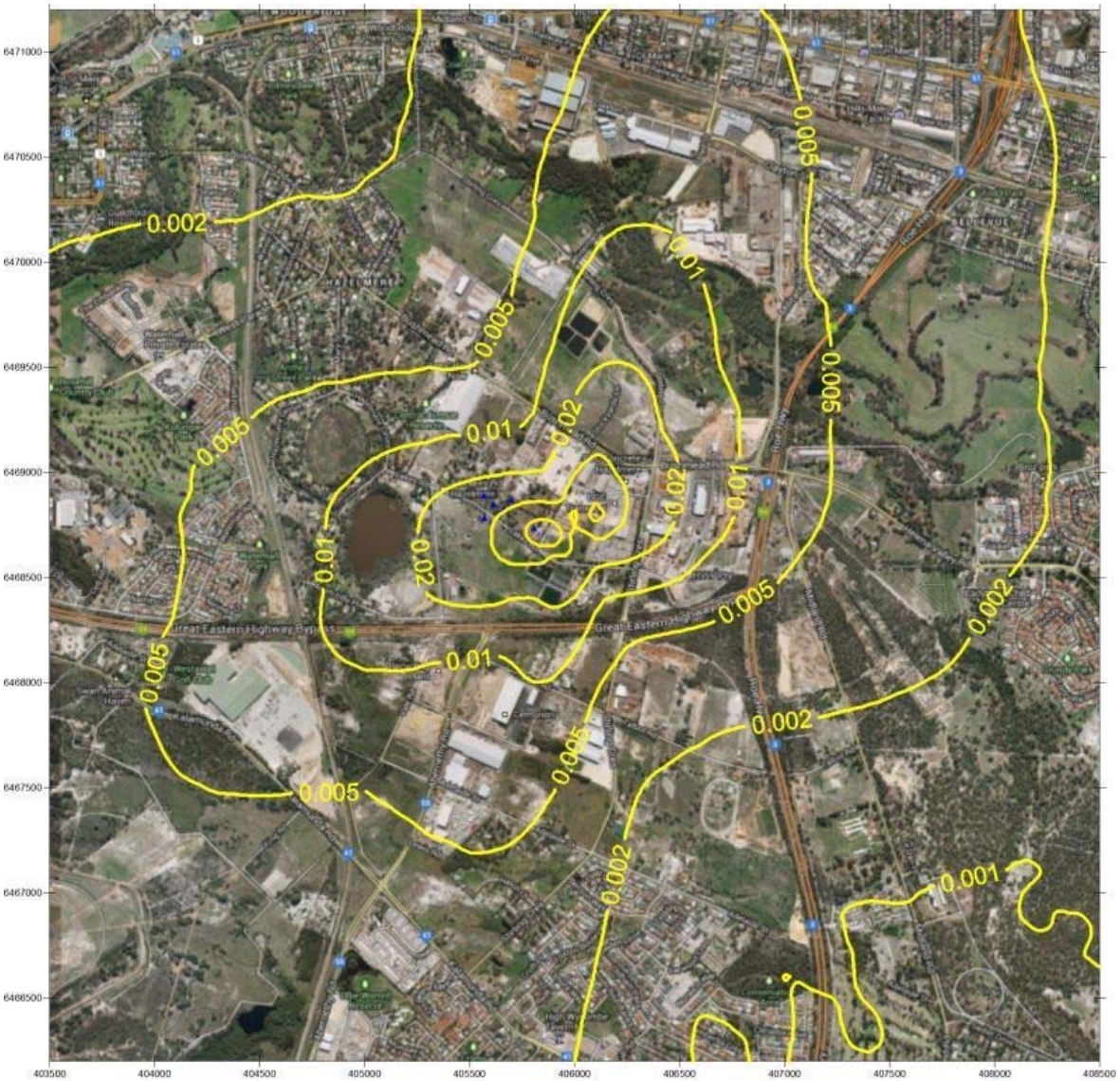

Figure 157: Reduced Operations - GLC VOC (µg/m³) Annual average

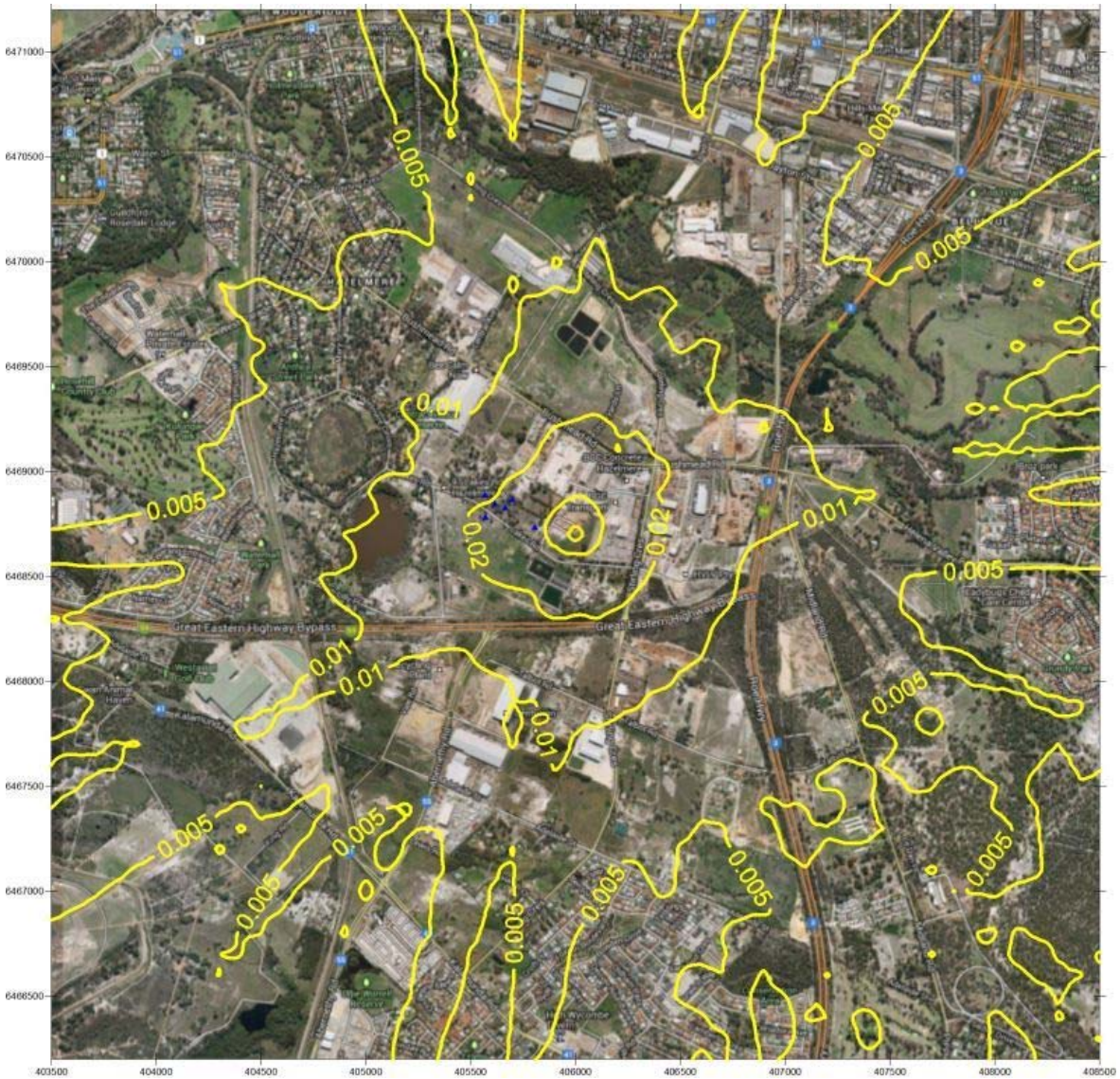

Figure 158: Reduced Operations - GLC V (ρg/m³) Maximum Hourly

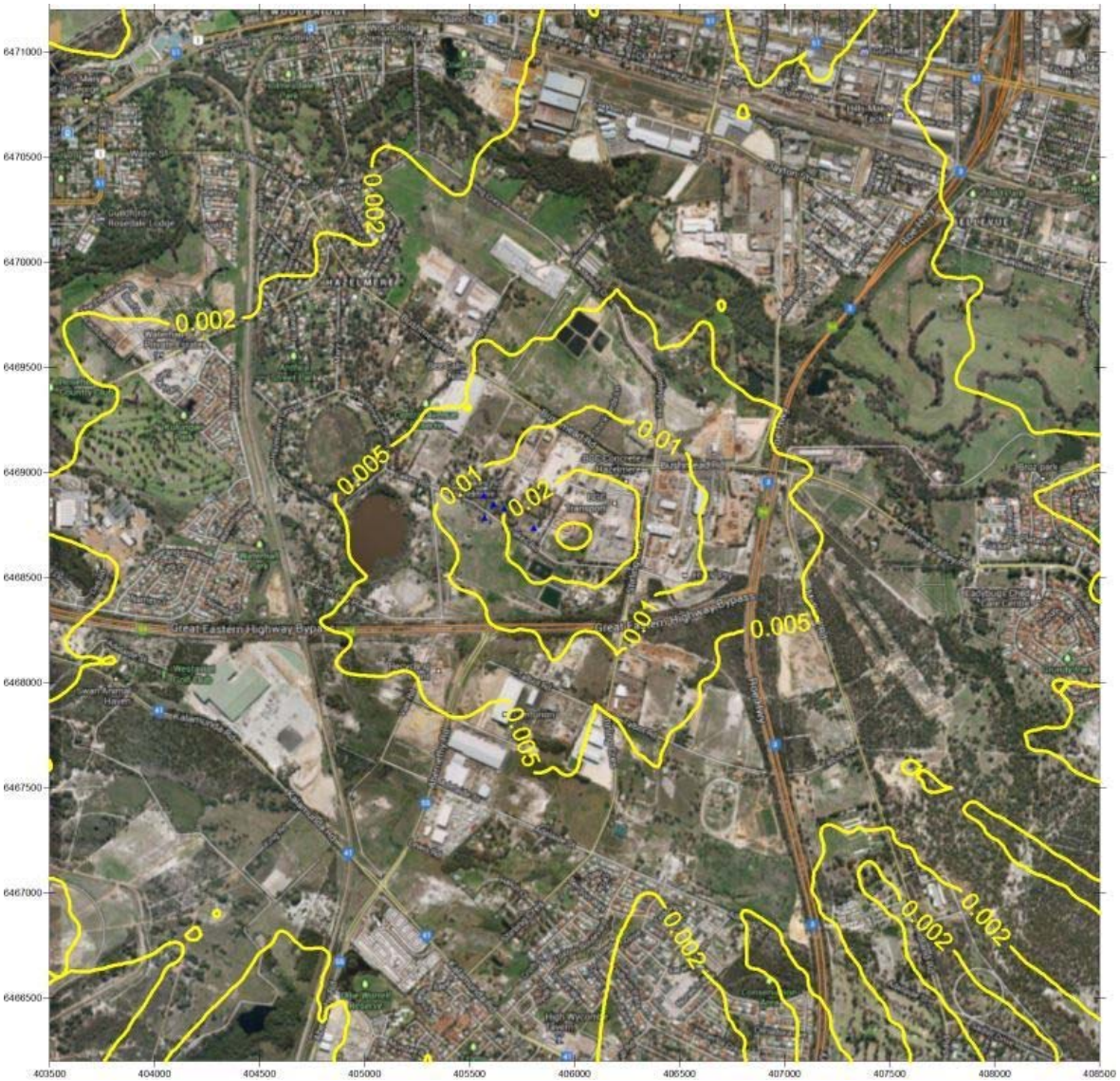

Figure 159: Reduced Operations - GLC V (ρg/m³) Maximum 8-Hourly

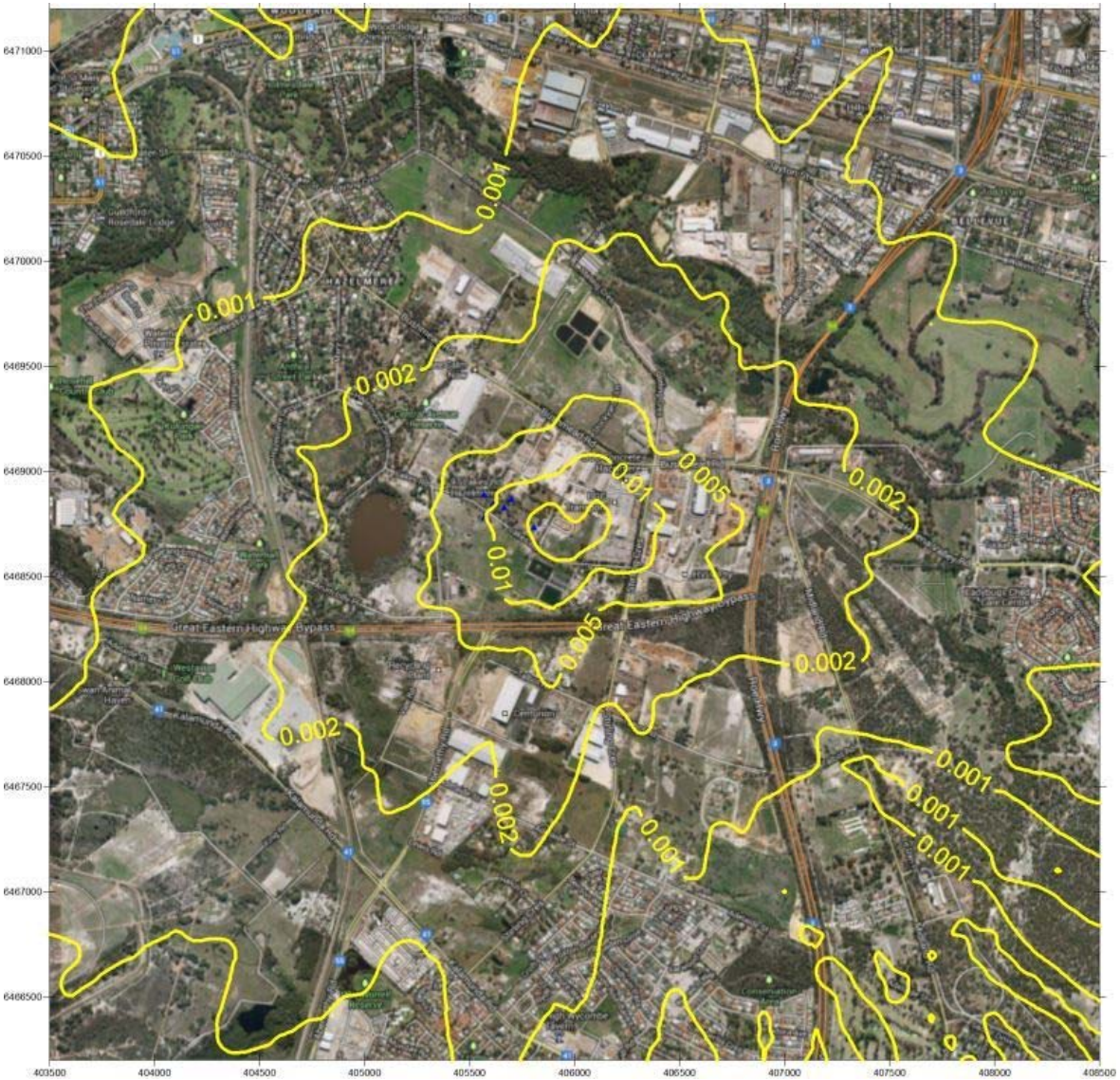

Figure 160: Reduced Operations - GLC V (ρg/m³) Maximum Daily

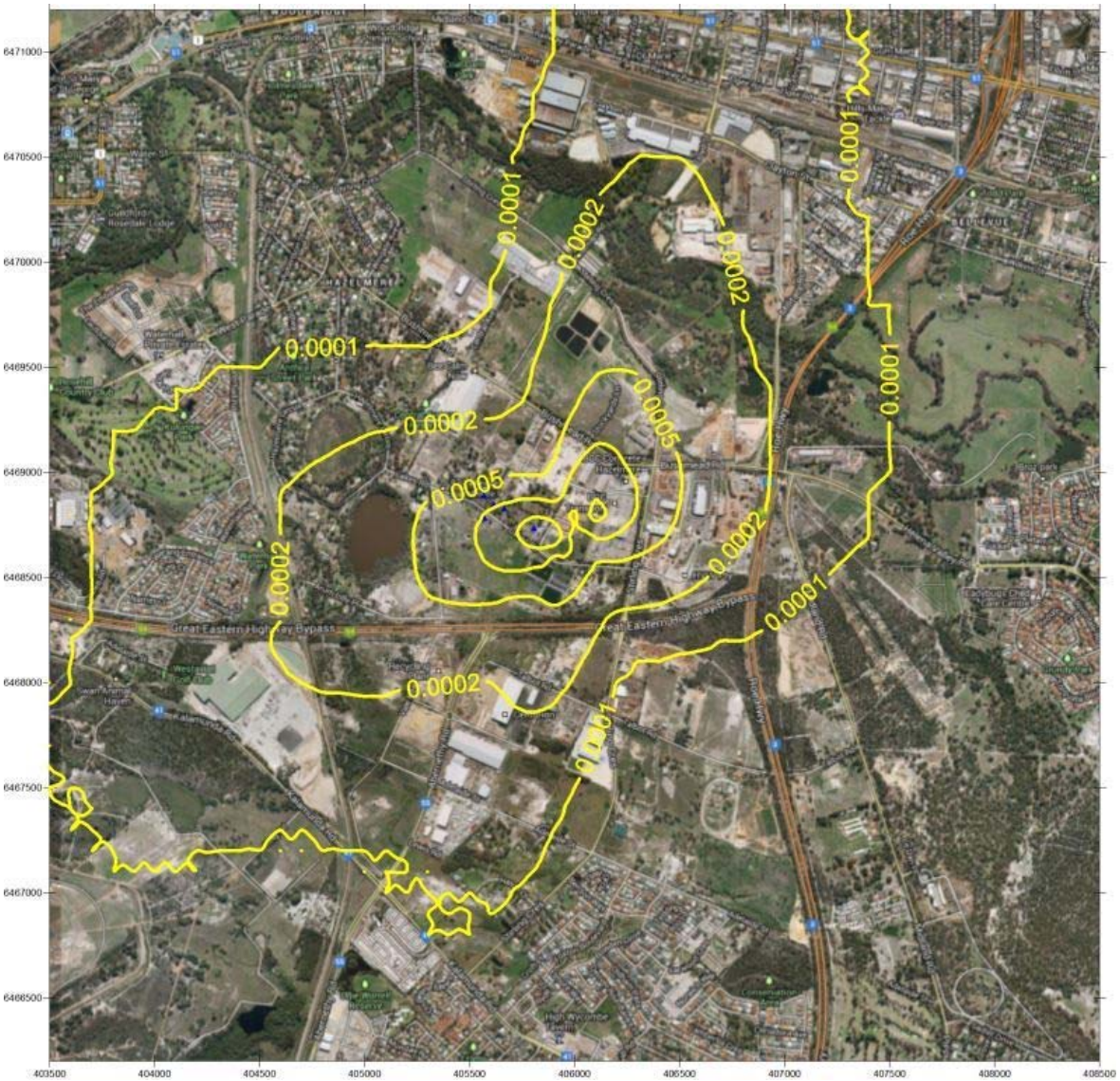

Figure 161: Reduced Operations - GLC V (ρg/m³) Annual average

Figure 162: Bypass Operations - GLC Cd (ng/m³) Maximum Hourly

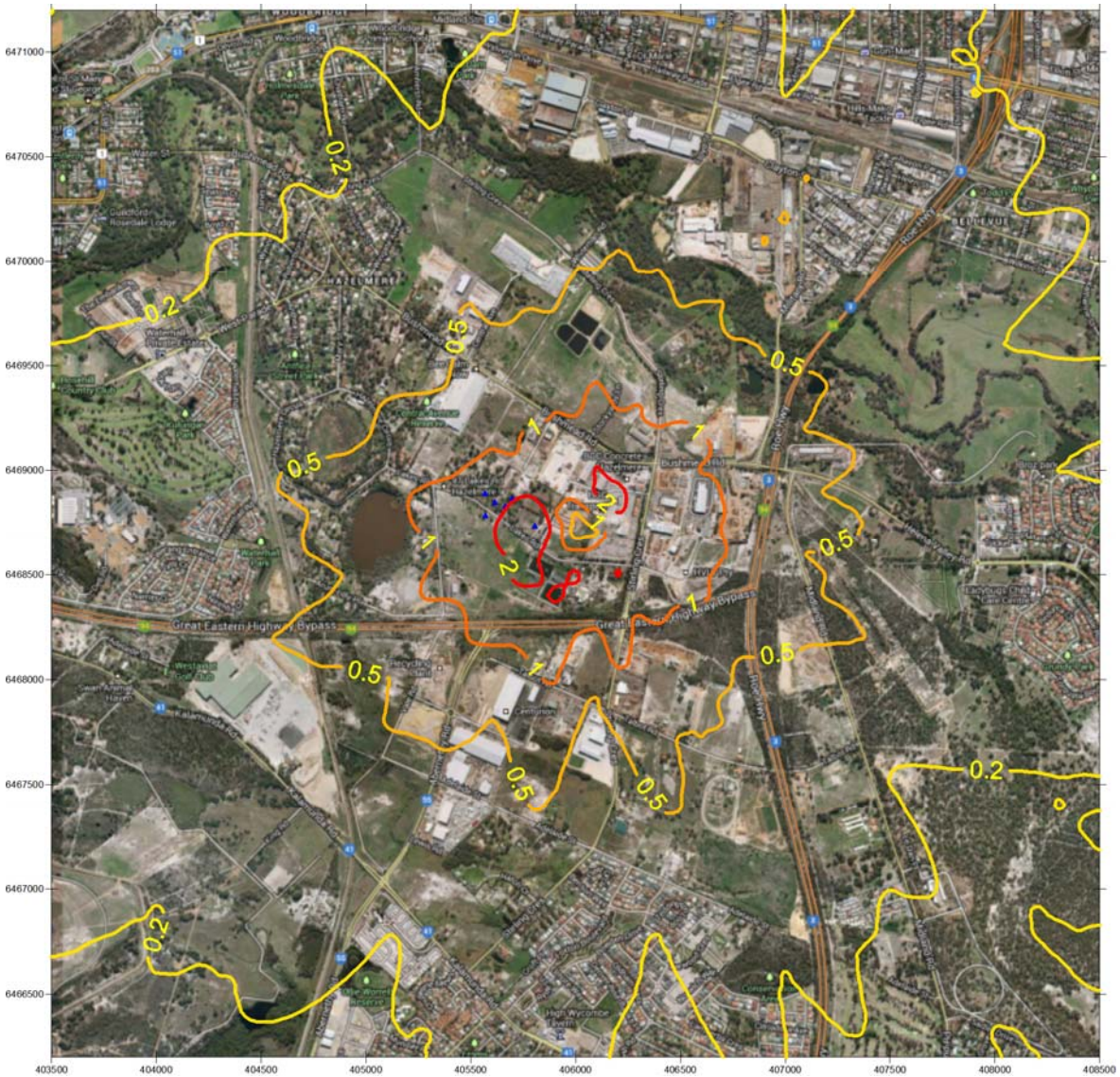

Figure 163: Bypass Operations - GLC Cd (ng/m³) Maximum 8-Hourly

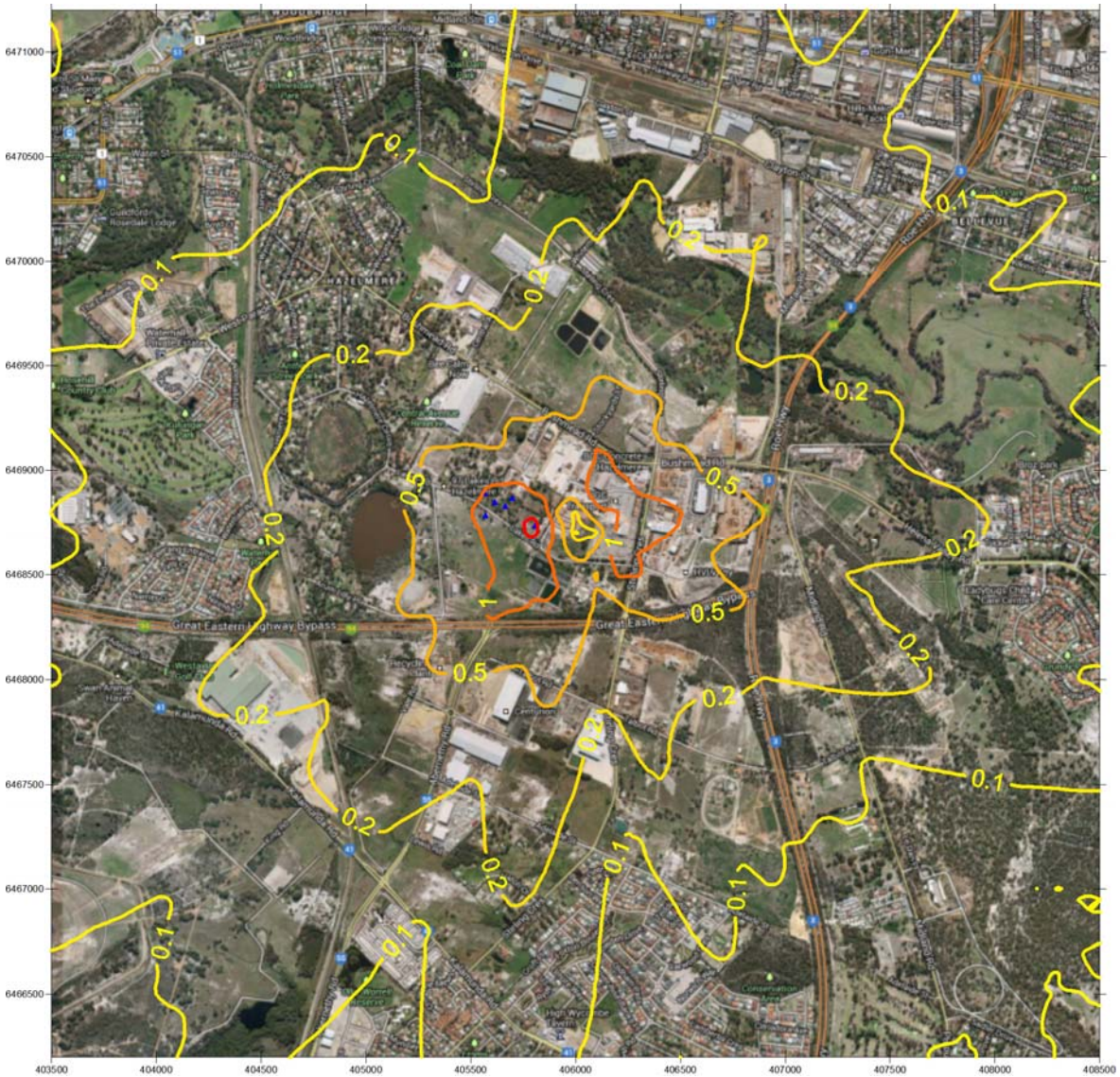

Figure 164: Bypass Operations - GLC Cd (ng/m³) Maximum Daily

Figure 165: Bypass Operations - GLC Cd (ng/m³) Annual average

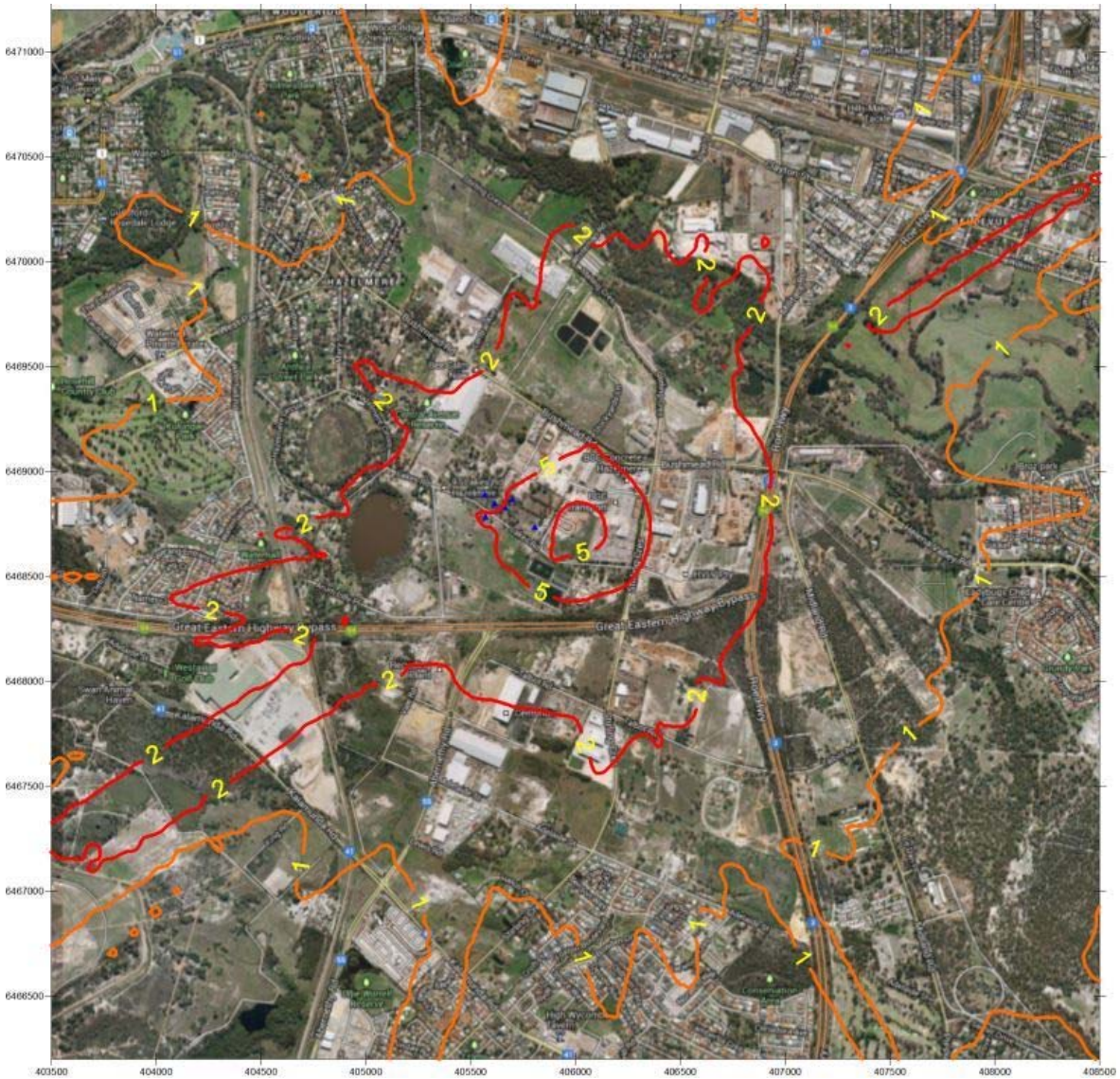

Figure 166: Bypass Operations - GLC CO (µg/m³) Maximum Hourly

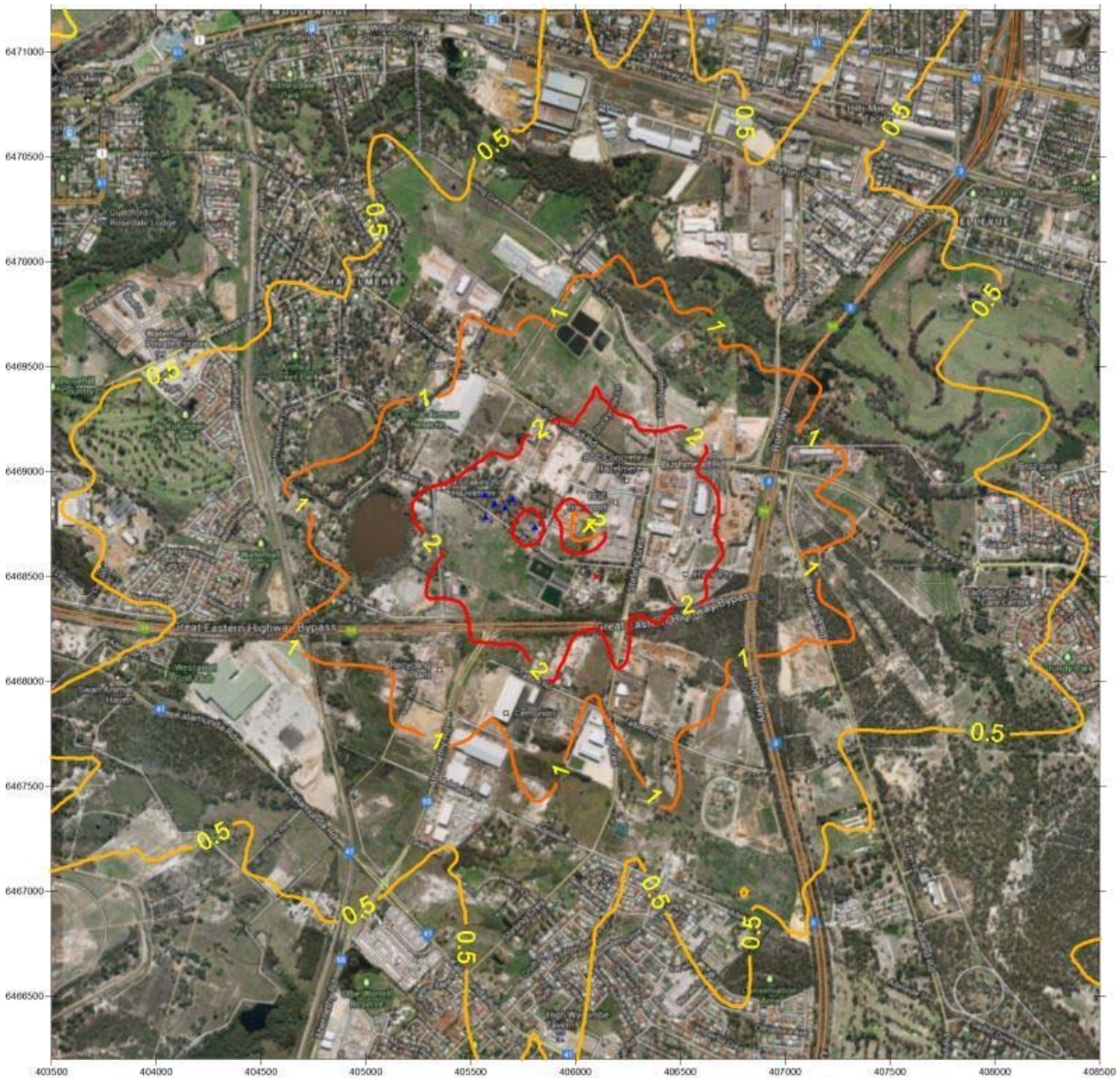

Figure 167: Bypass Operations - GLC CO (µg/m³) Maximum 8-Hourly

Figure 168: Bypass Operations - GLC CO (µg/m³) Maximum Daily

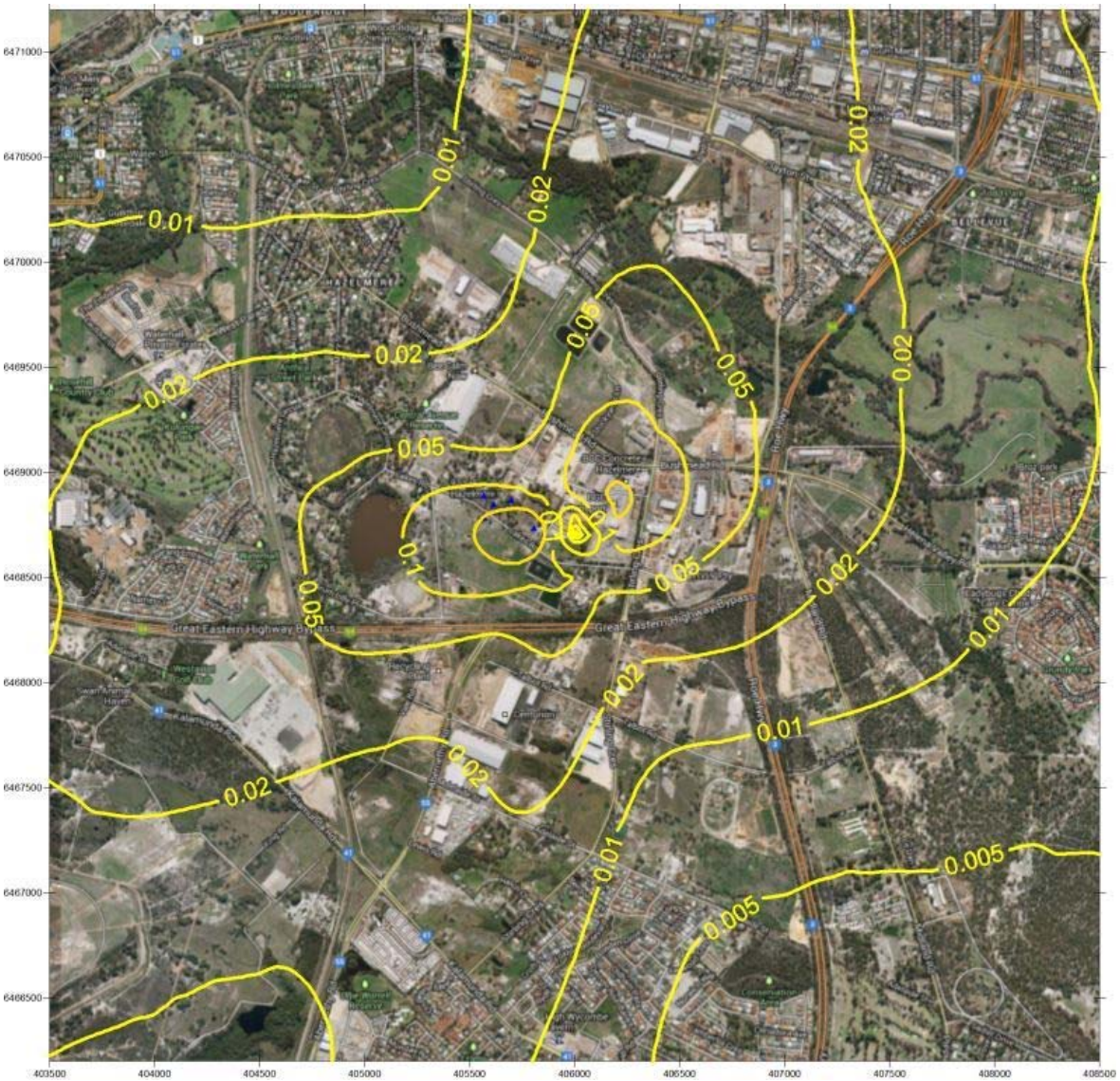

Figure 169: Bypass Operations - GLC CO (µg/m³) Annual average

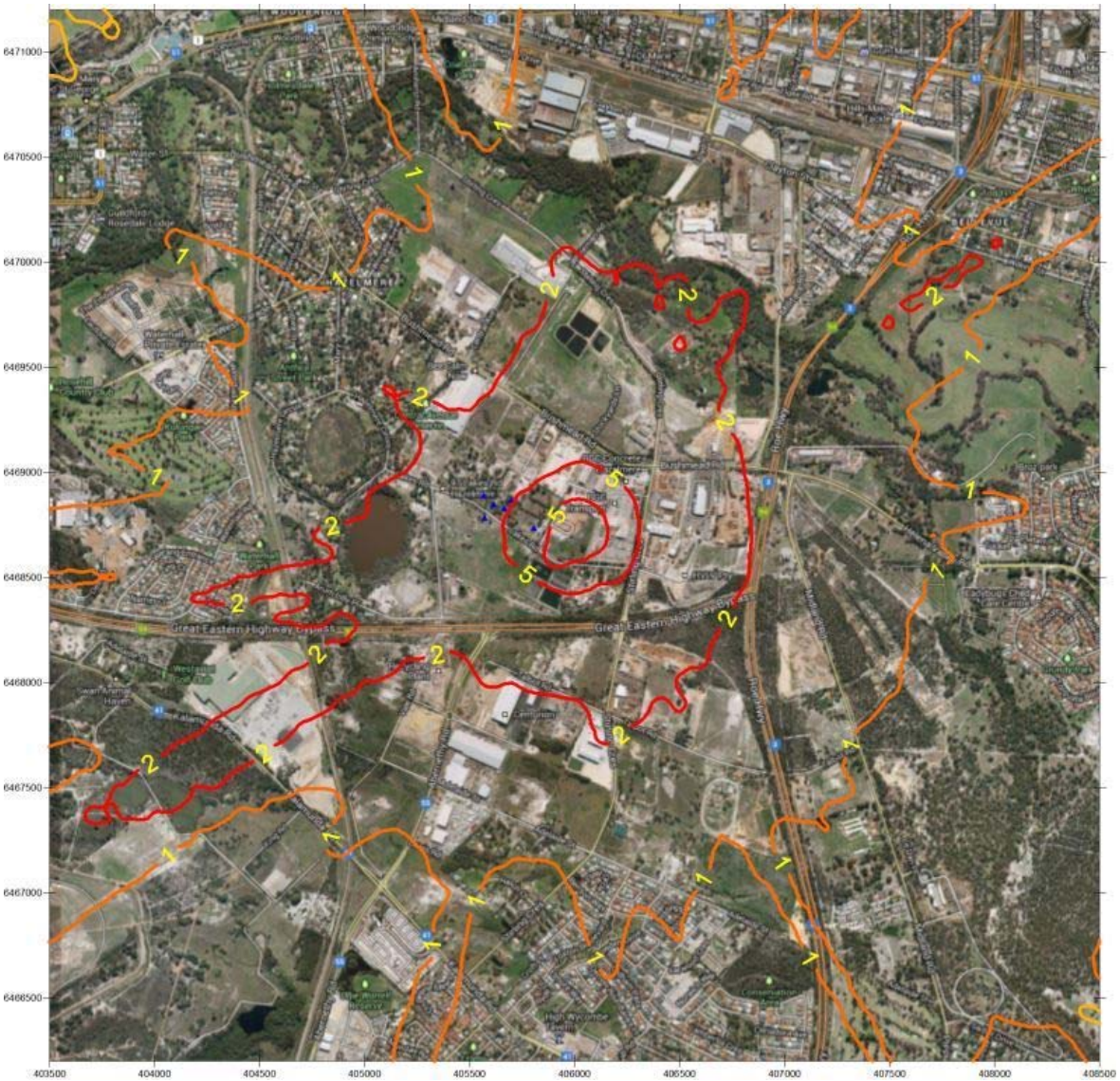

Figure 170: Bypass Operations - GLC Co (ρg/m³) Maximum Hourly

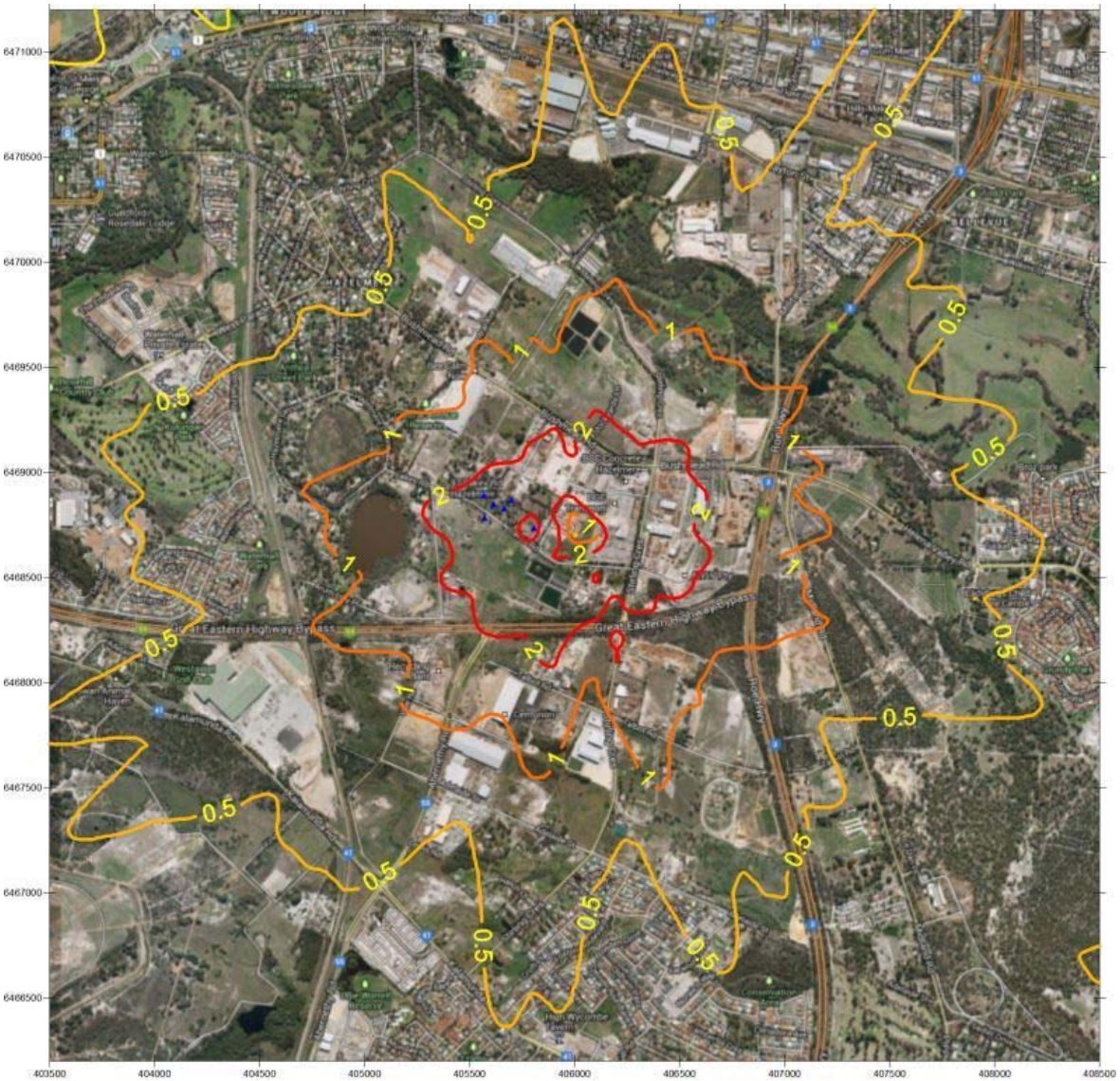

Figure 171: Bypass Operations - GLC Co (ρg/m³) Maximum 8-Hourly

Figure 172: Bypass Operations - GLC Co (ρg/m³) Maximum Daily

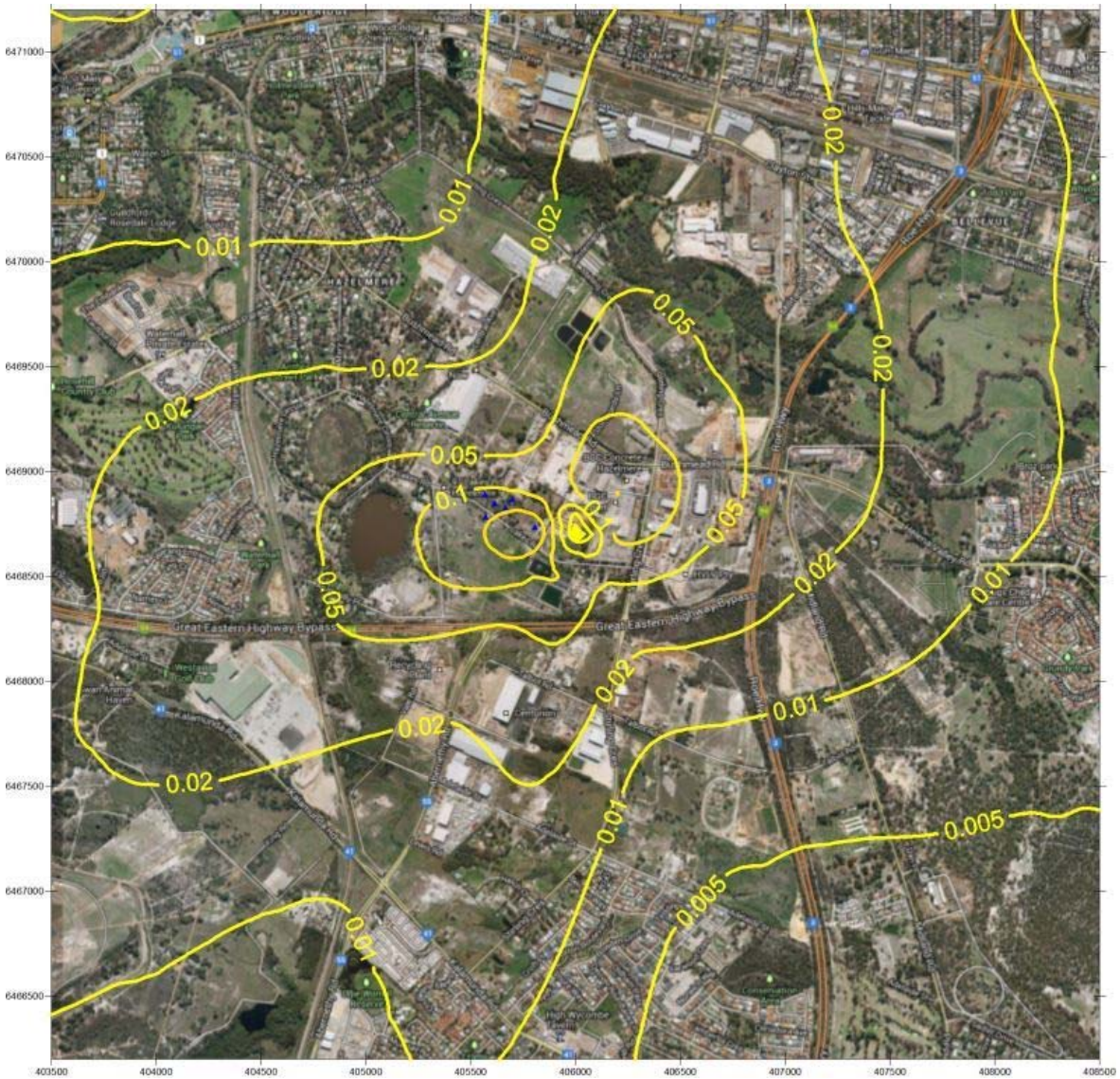

Figure 173: Bypass Operations - GLC Co (ρg/m³) Annual average

Figure 174: Bypass Operations - GLC Cr (ng/m³) Maximum Hourly

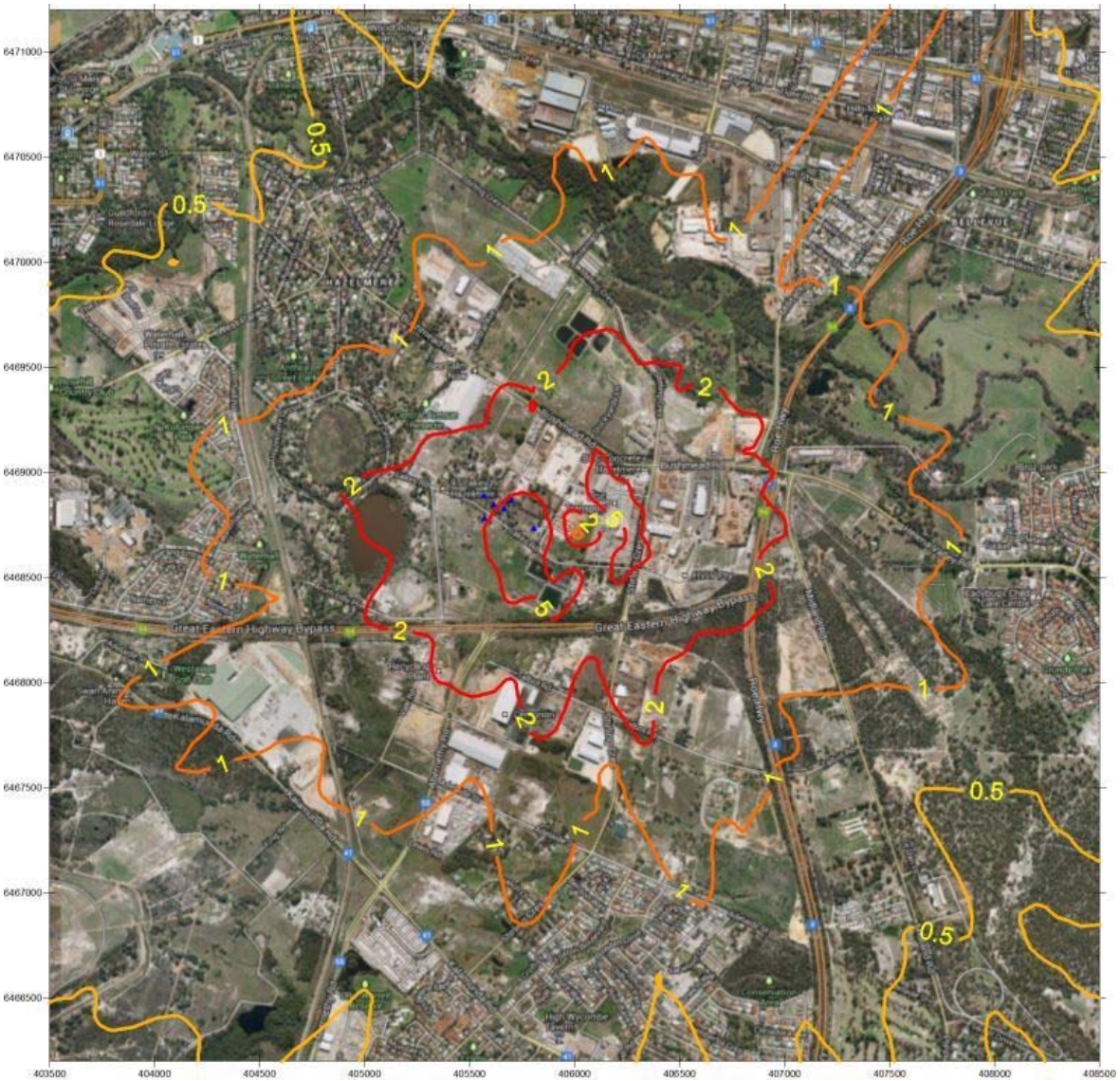

Figure 175: Bypass Operations - GLC Cr (ng/m³) Maximum 8-Hourly

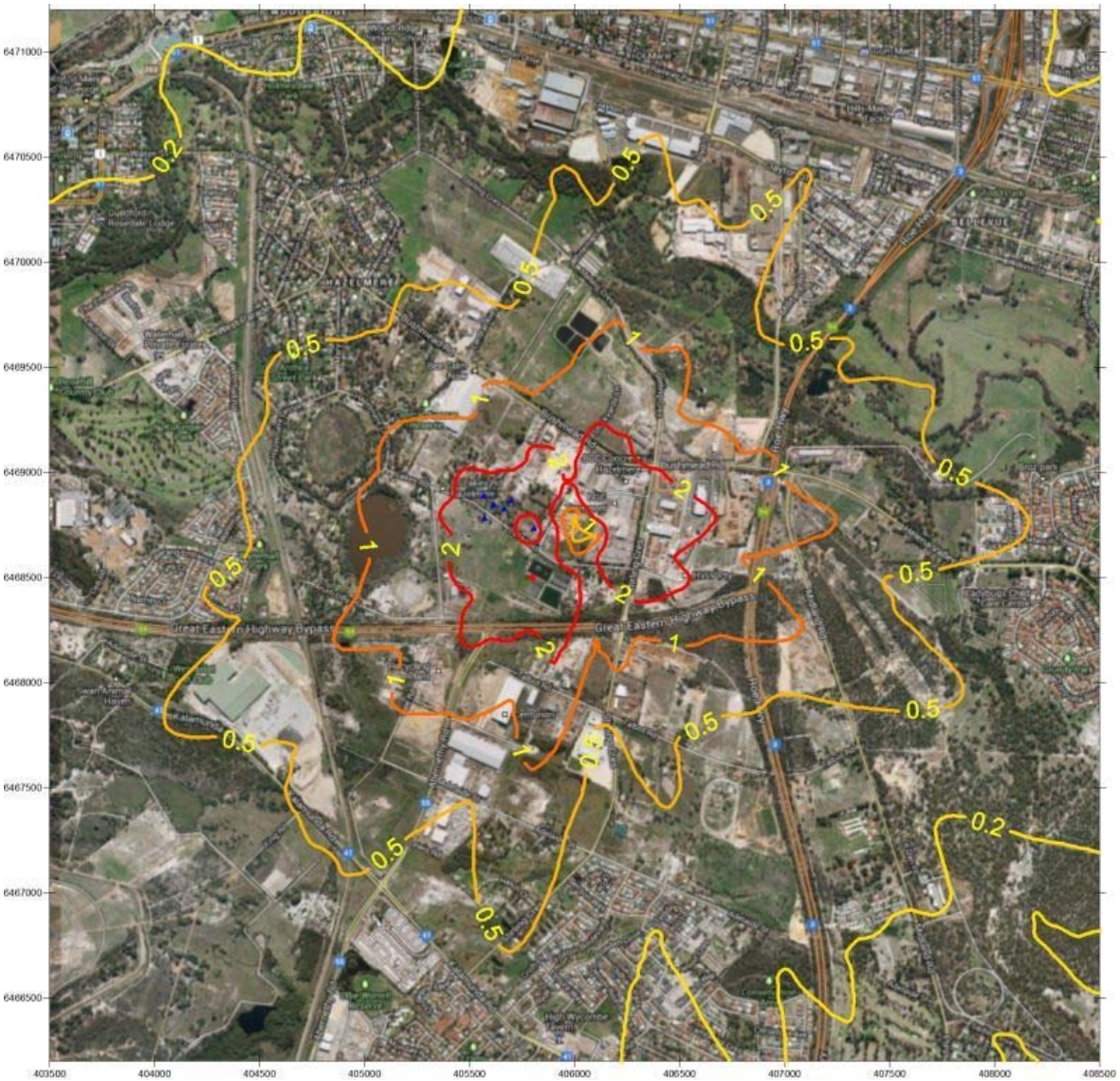

Figure 176: Bypass Operations - GLC Cr (ng/m³) Maximum Daily

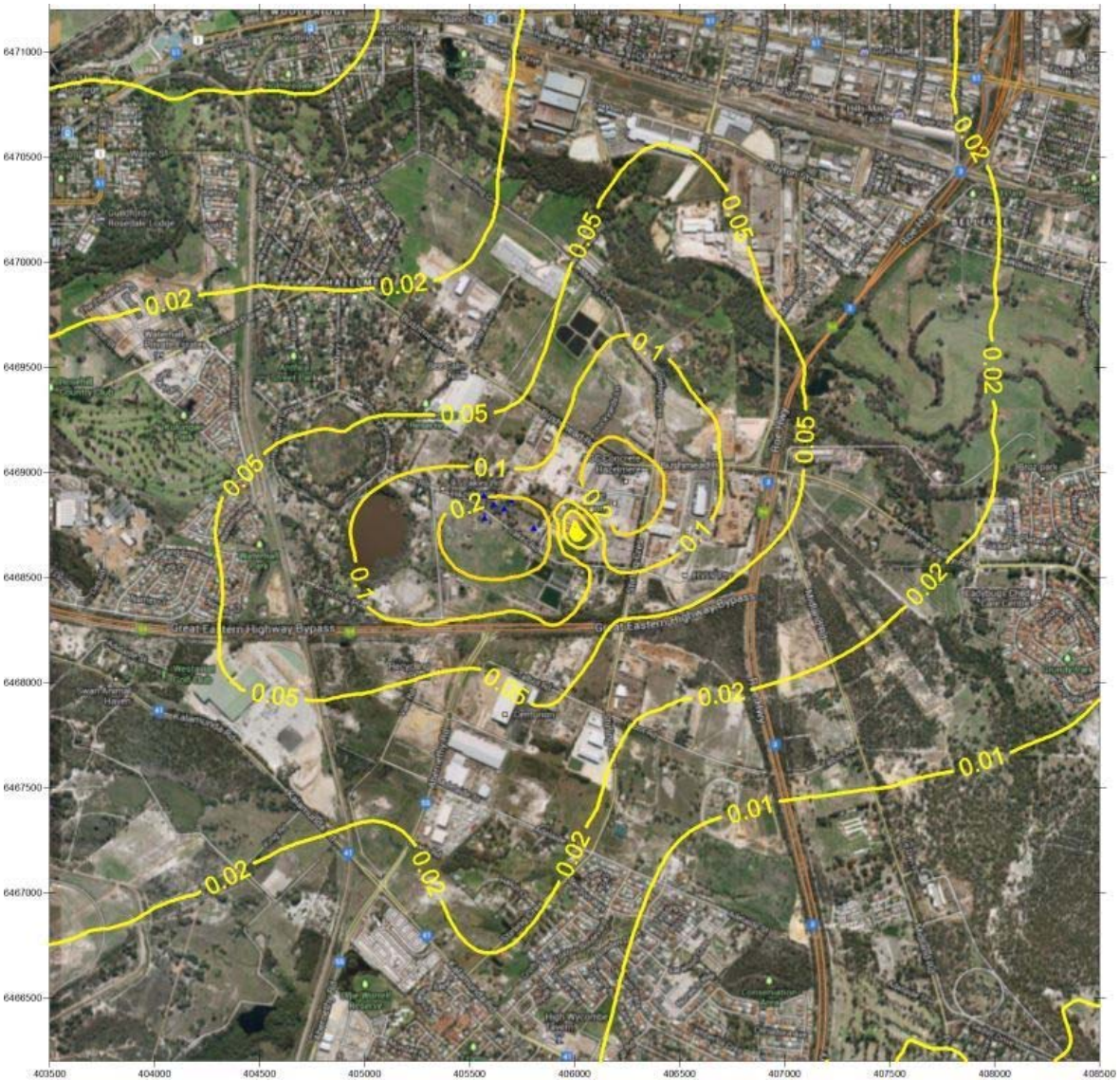

Figure 177: Bypass Operations - GLC Cr (ng/m³) Annual average

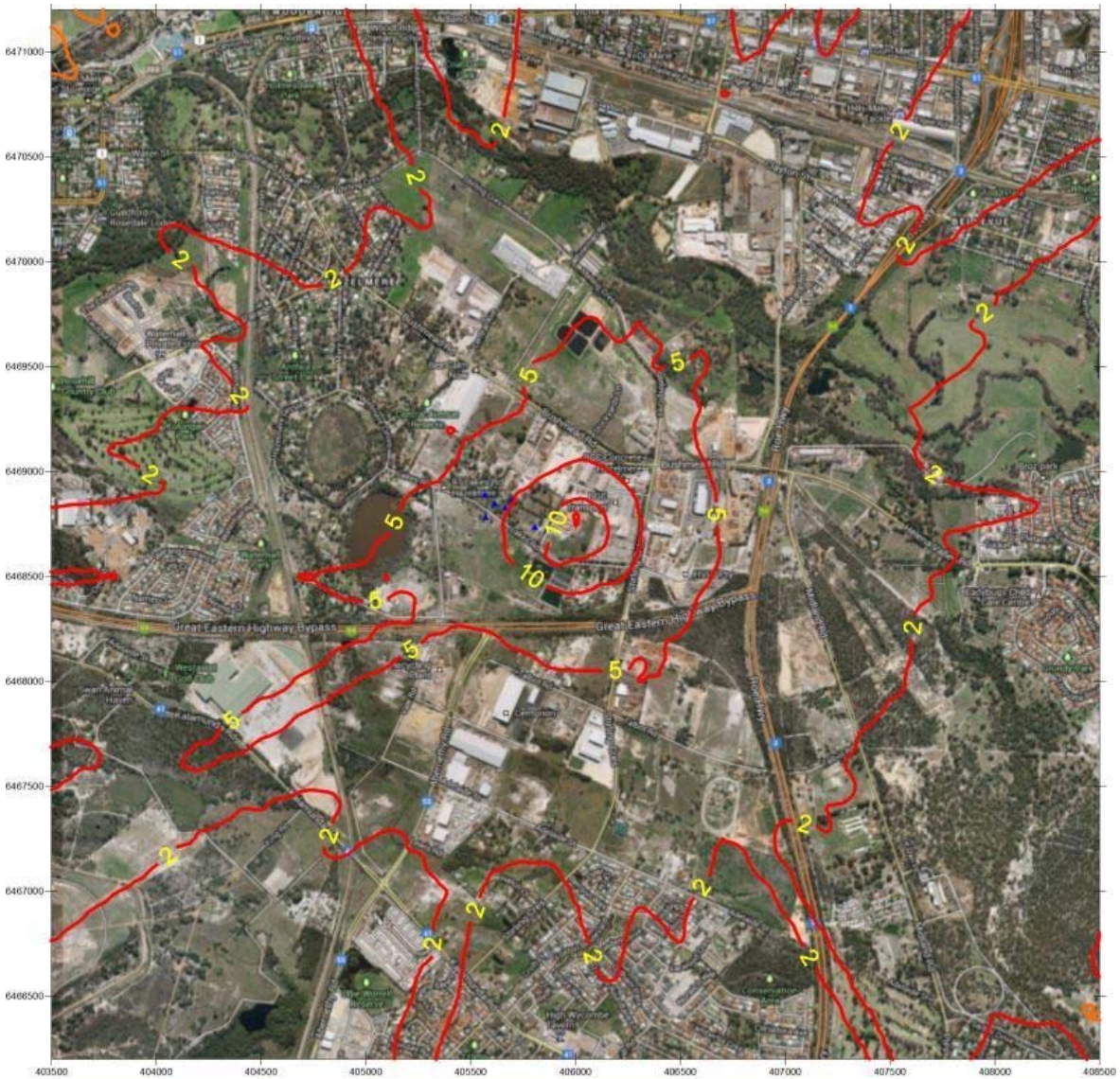

Figure 178: Bypass Operations - GLC Cu (ng/m³) Maximum Hourly

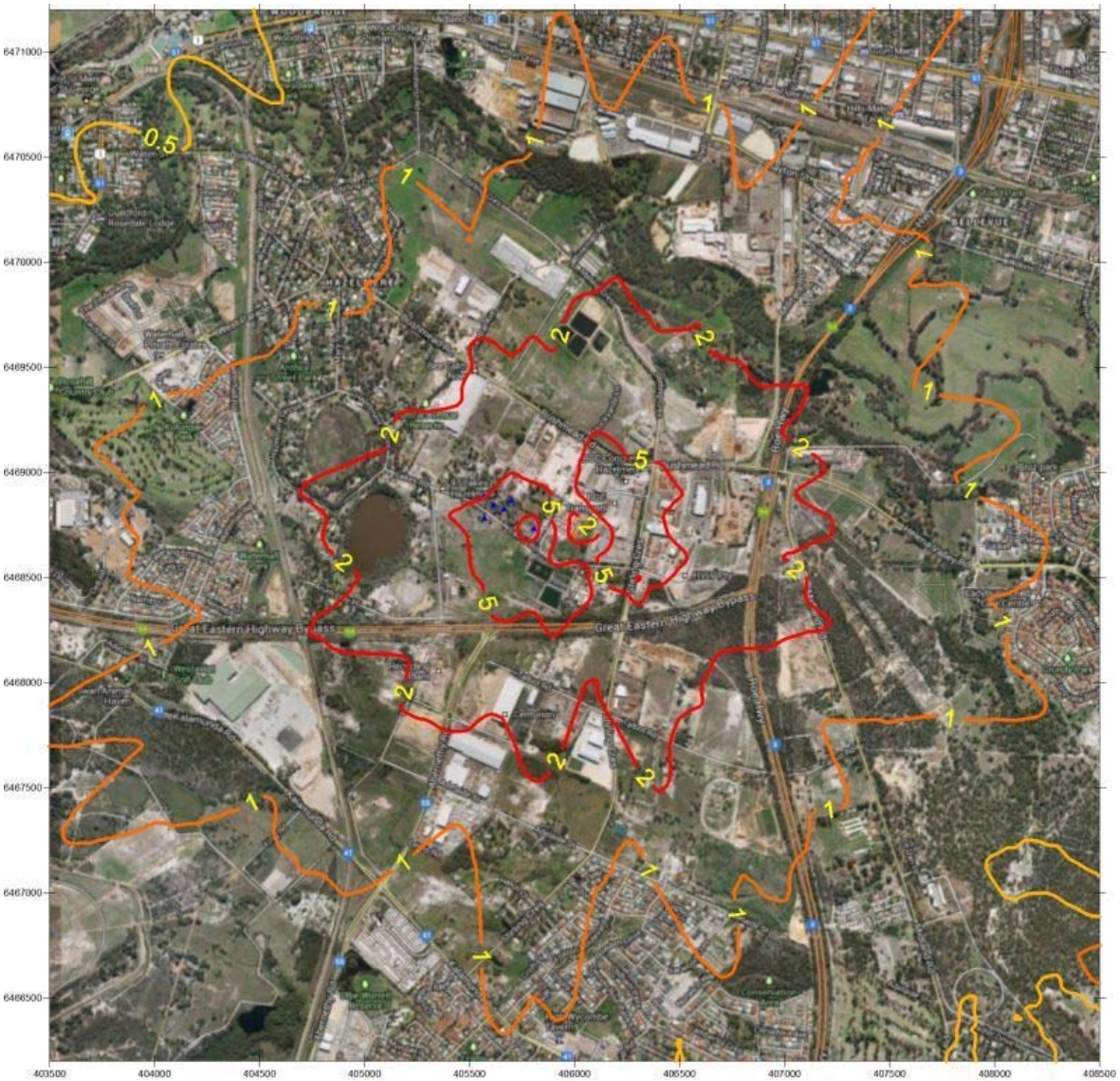

Figure 179: Bypass Operations - GLC Cu (ng/m³) Maximum 8-Hourly

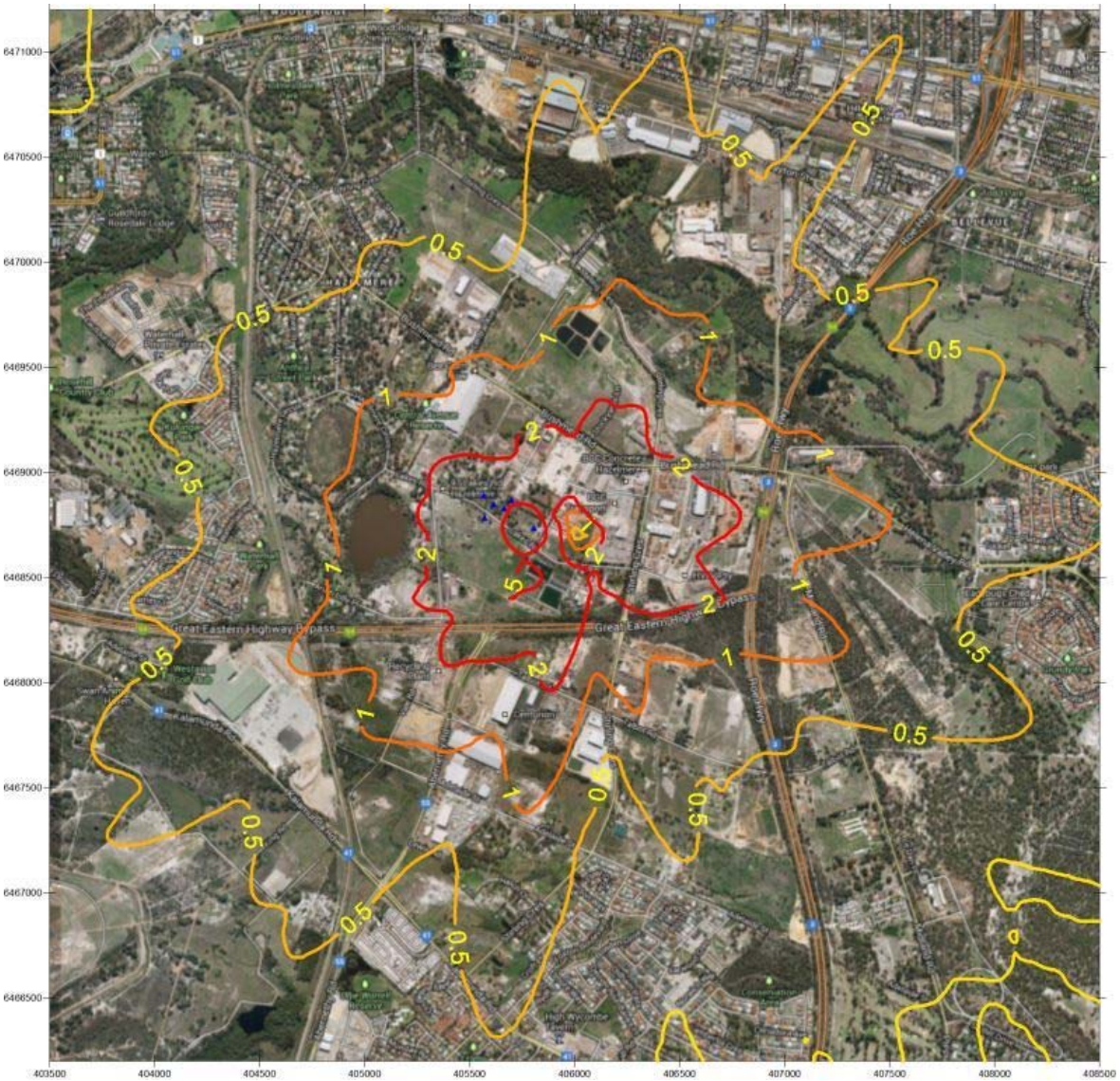

Figure 180: Bypass Operations - GLC Cu (ng/m³) Maximum Daily

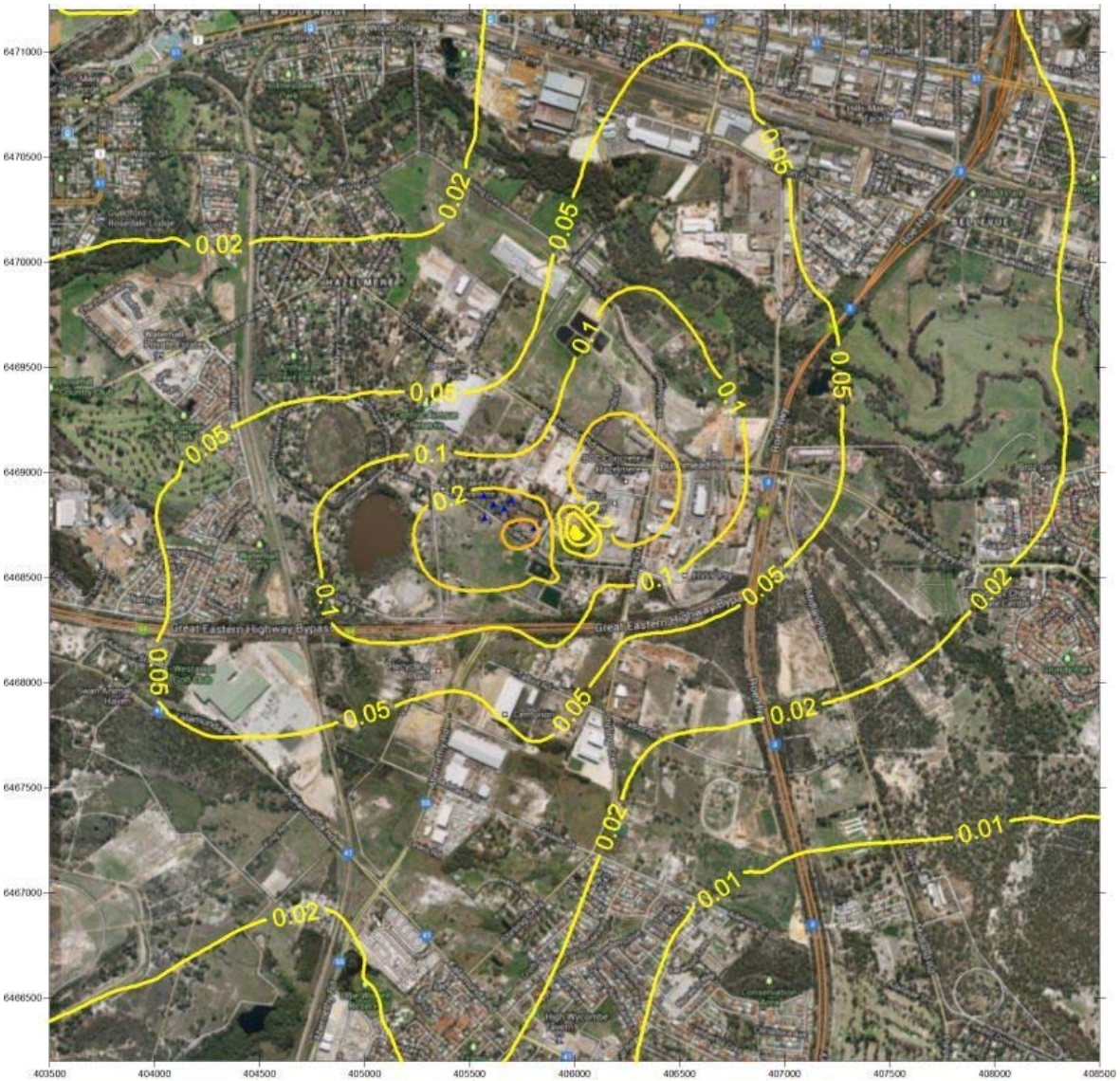

Figure 181: Bypass Operations - GLC Cu (ng/m³) Annual average

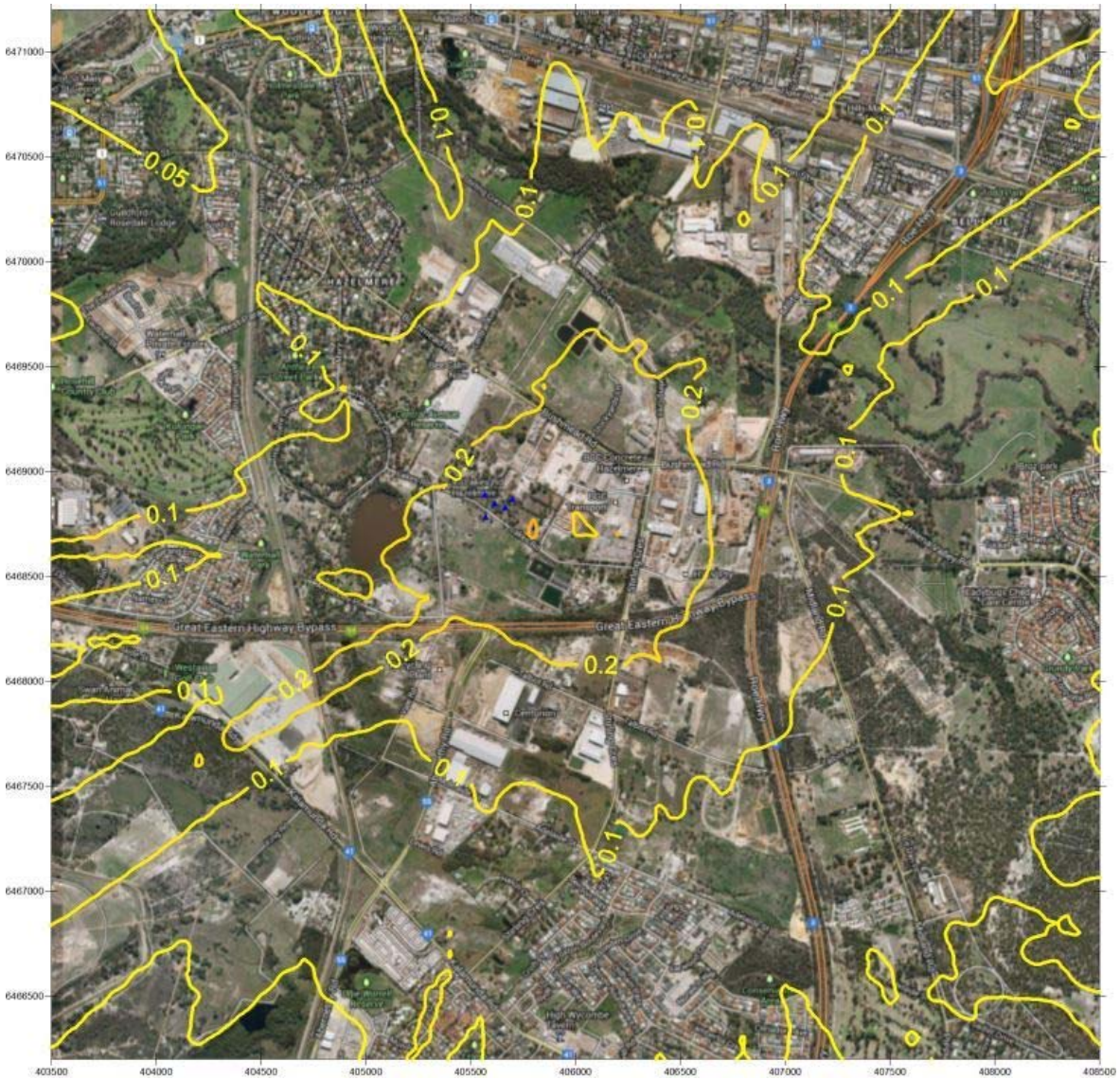

Figure 182: Bypass Operations - GLC Dioxin (fg/m³) Maximum Hourly

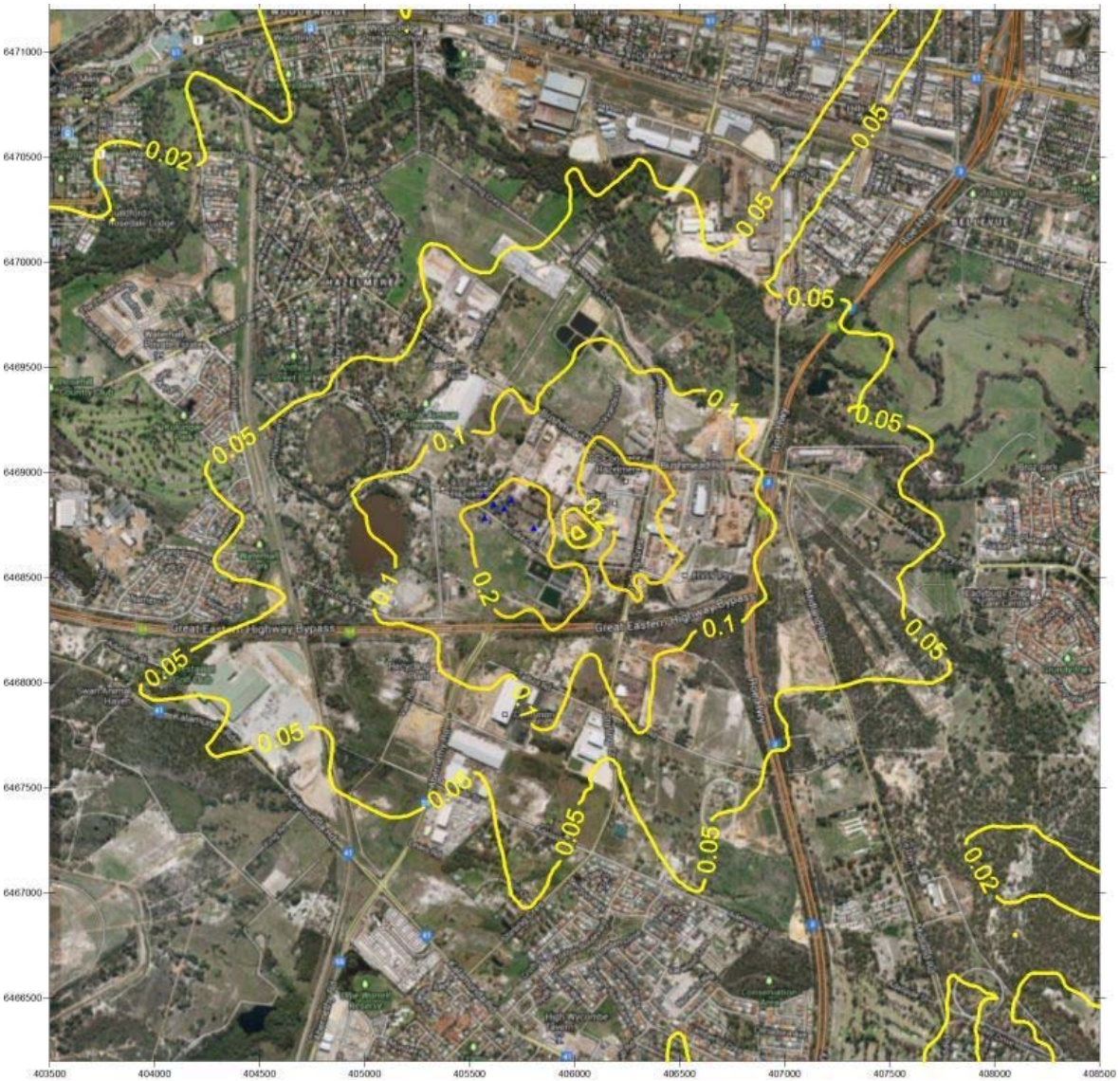

Figure 183: Bypass Operations - GLC Dioxin (fg/m³) Maximum 8-Hourly

Figure 184: Bypass Operations - GLC Dioxin (fg/m³) Maximum Daily

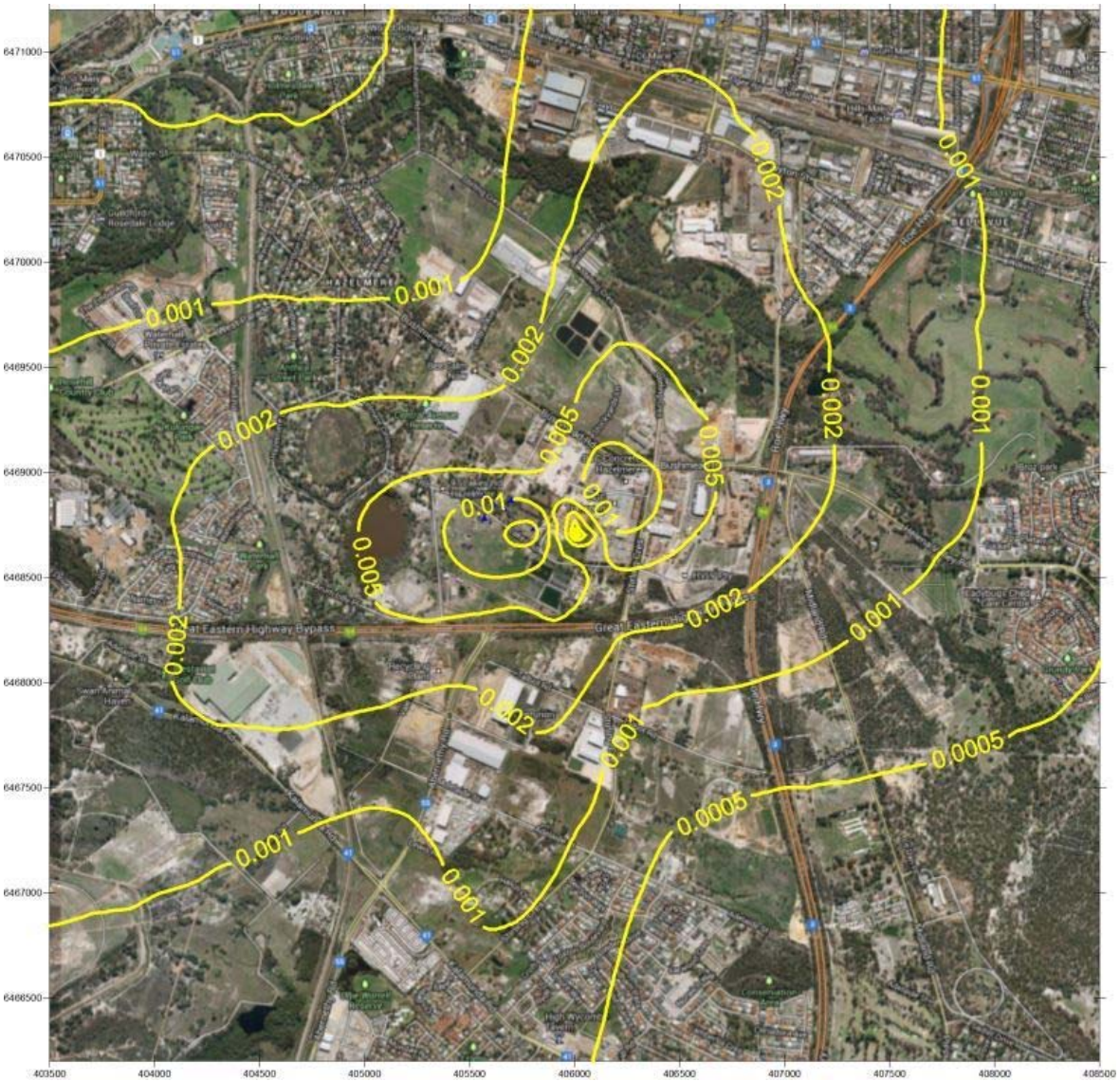

Figure 185: Bypass Operations - GLC Dioxin (fg/m³) Annual average

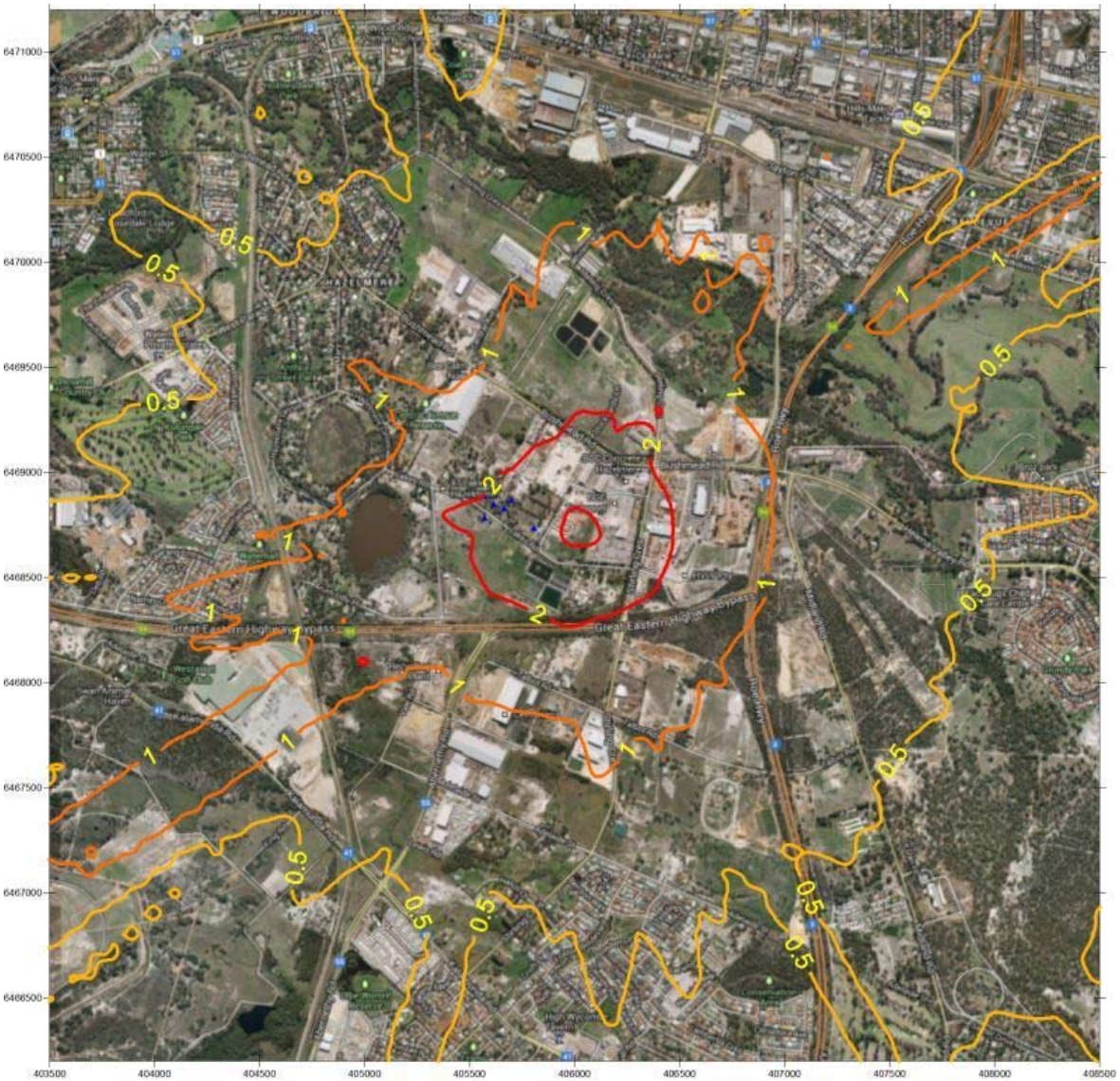

Figure 186: Bypass Operations - GLC HCl (ng/m³) Maximum Hourly

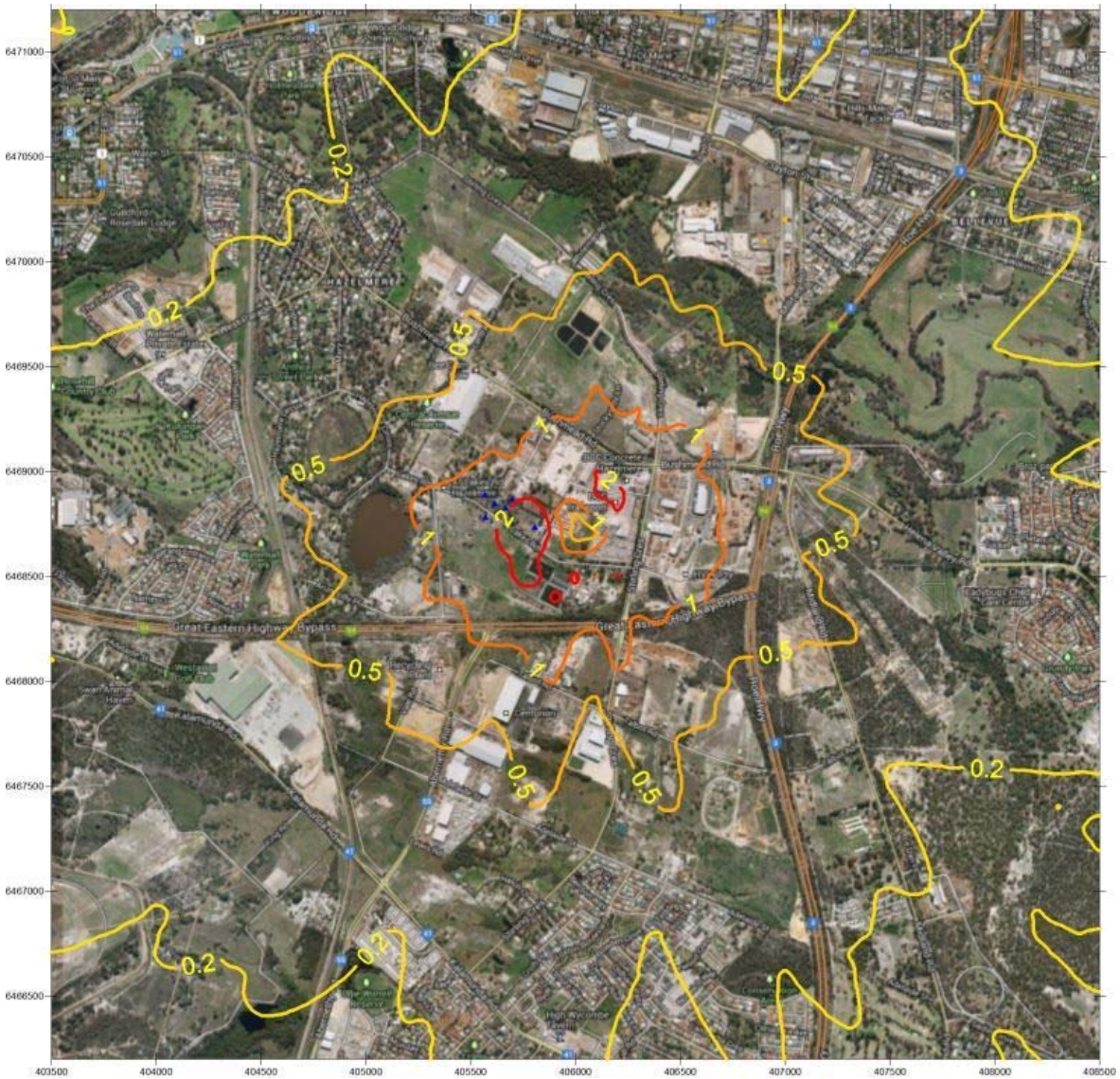

Figure 187: Bypass Operations - GLC HCl (ng/m³) Maximum 8-Hourly

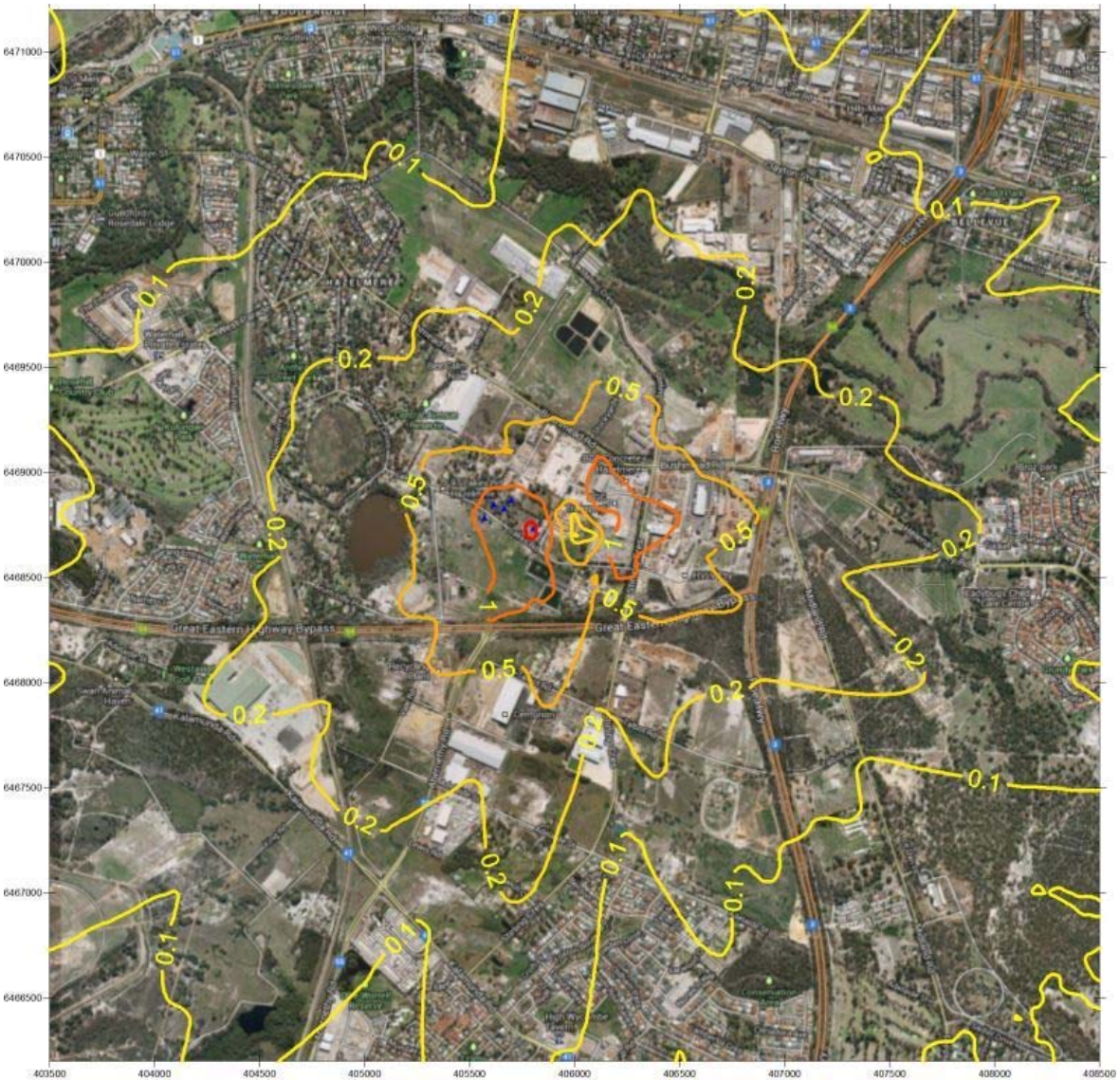

Figure 188: Bypass Operations - GLC HCl (ng/m³) Maximum Daily

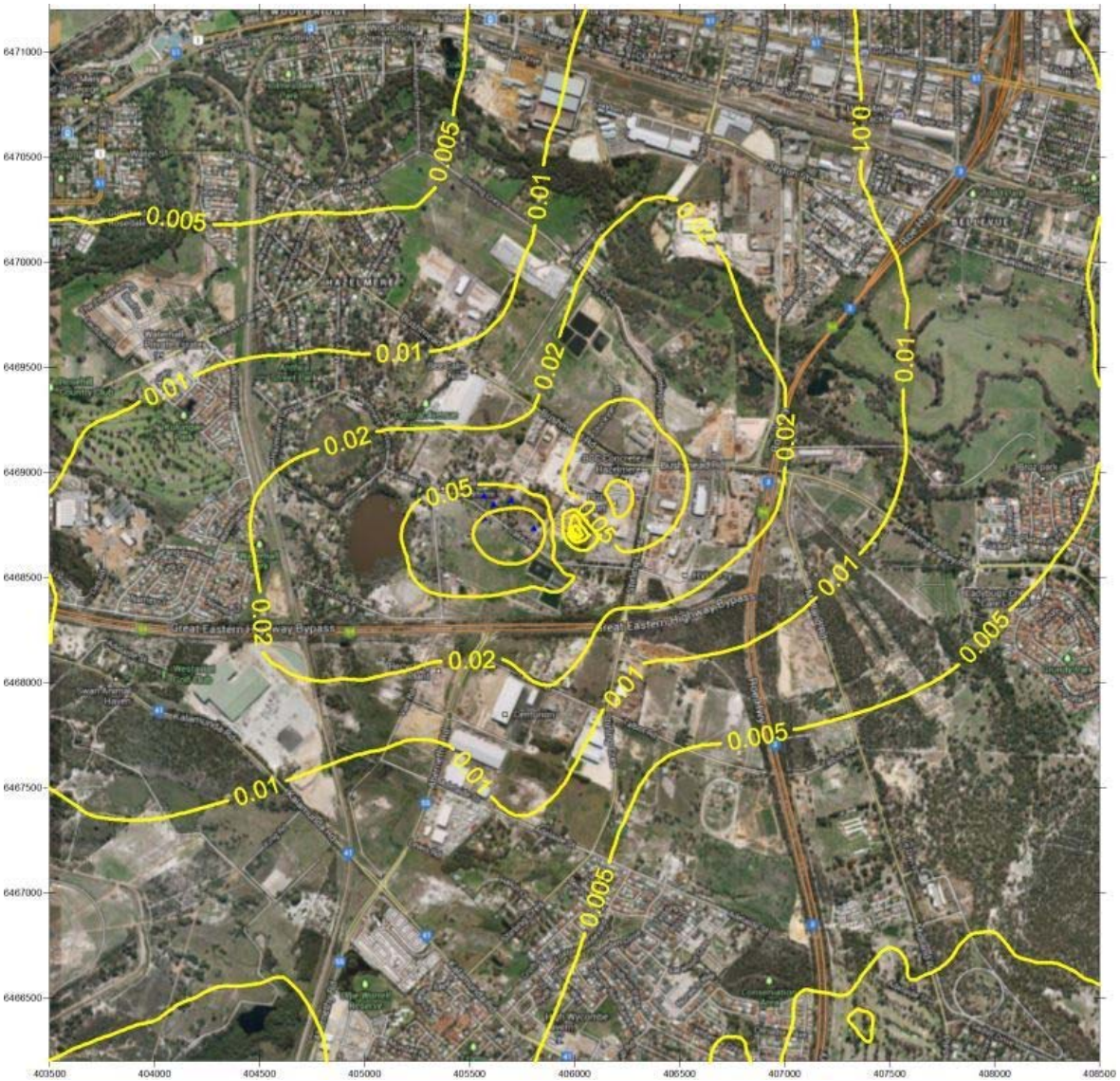

Figure 189: Bypass Operations - GLC HCl (ng/m³) Annual average

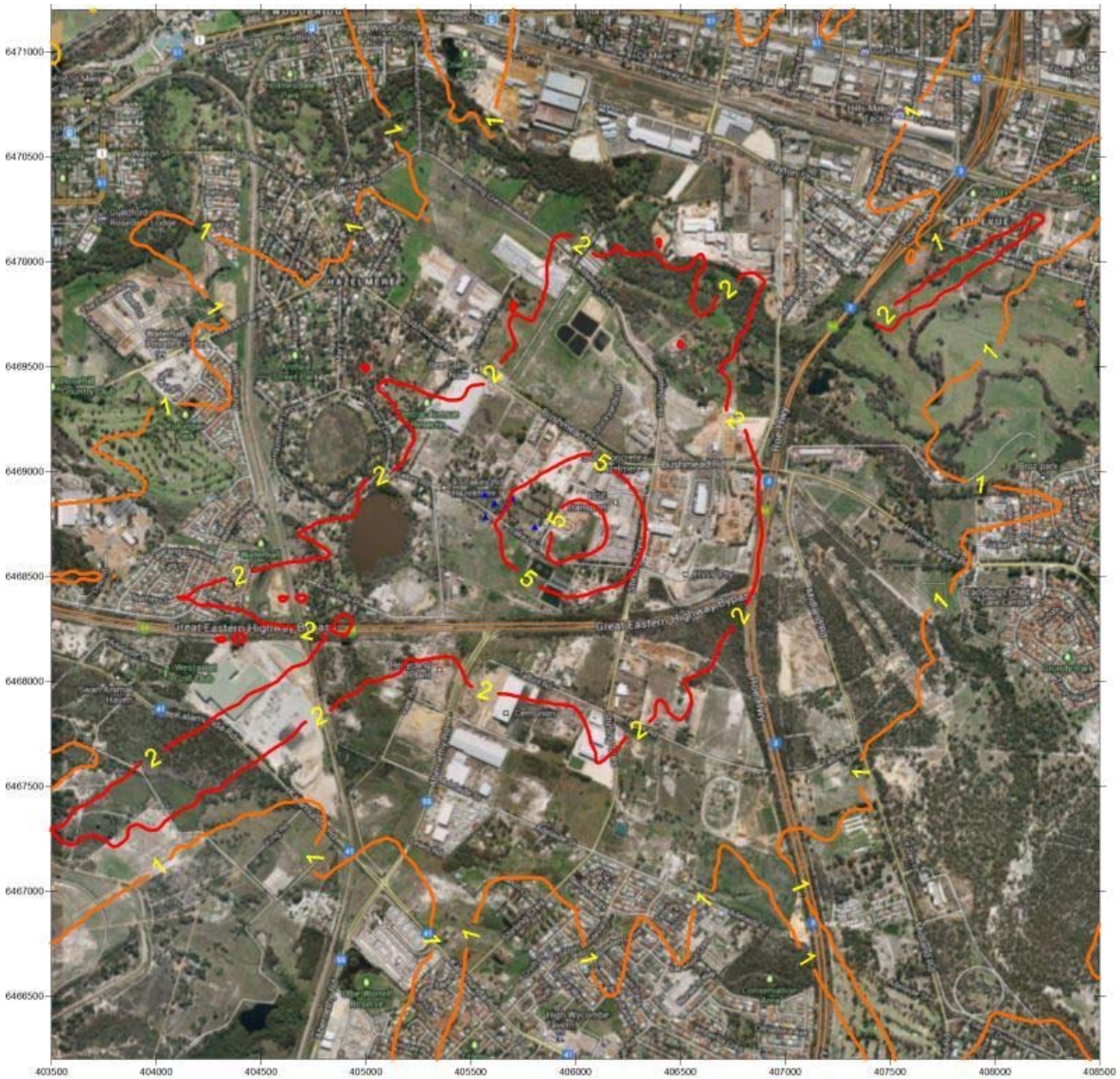

Figure 190: Bypass Operations - GLC HF (ng/m³) Maximum Hourly

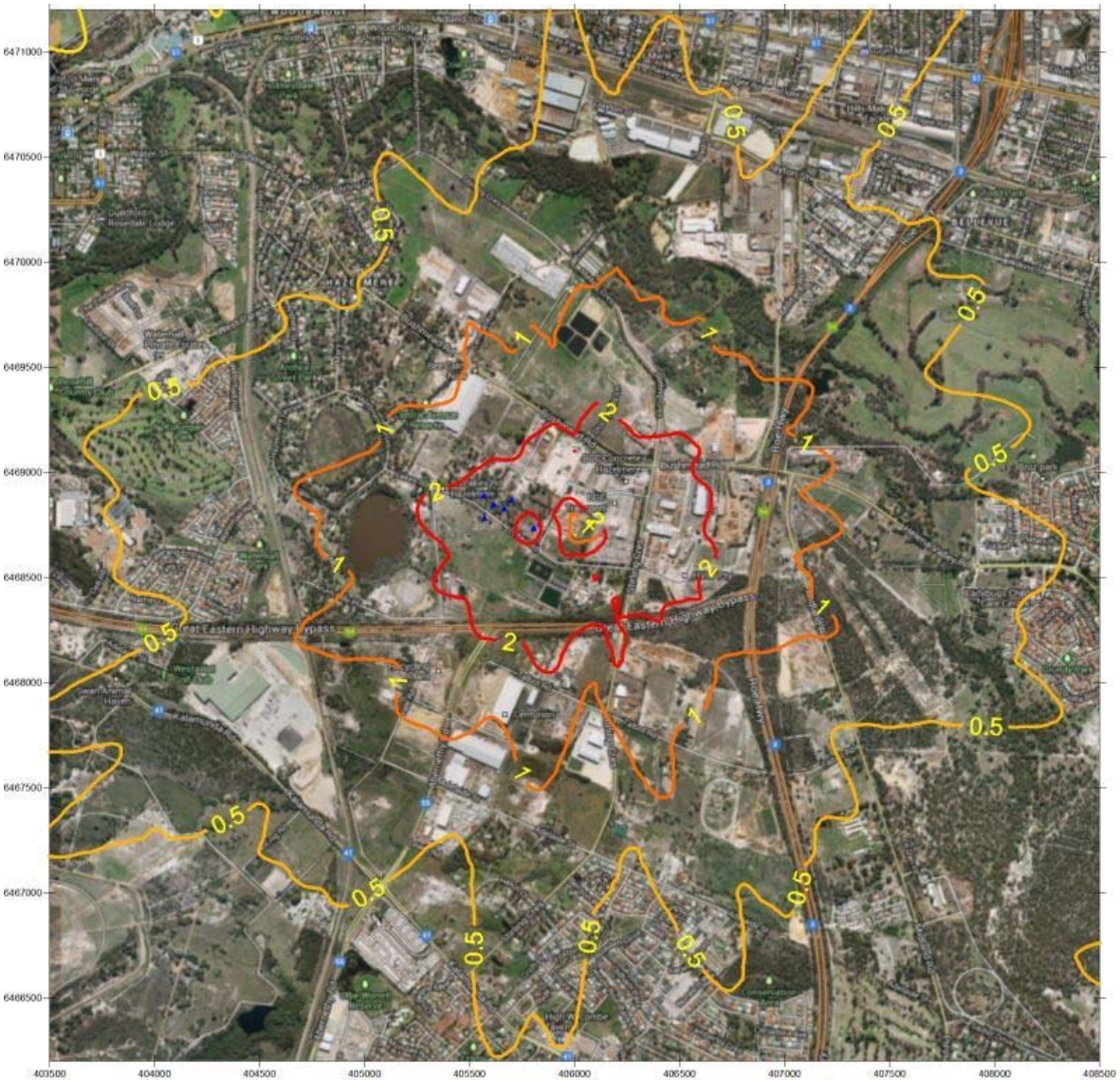

Figure 191: Bypass Operations - GLC HF (ng/m³) Maximum 8-Hourly

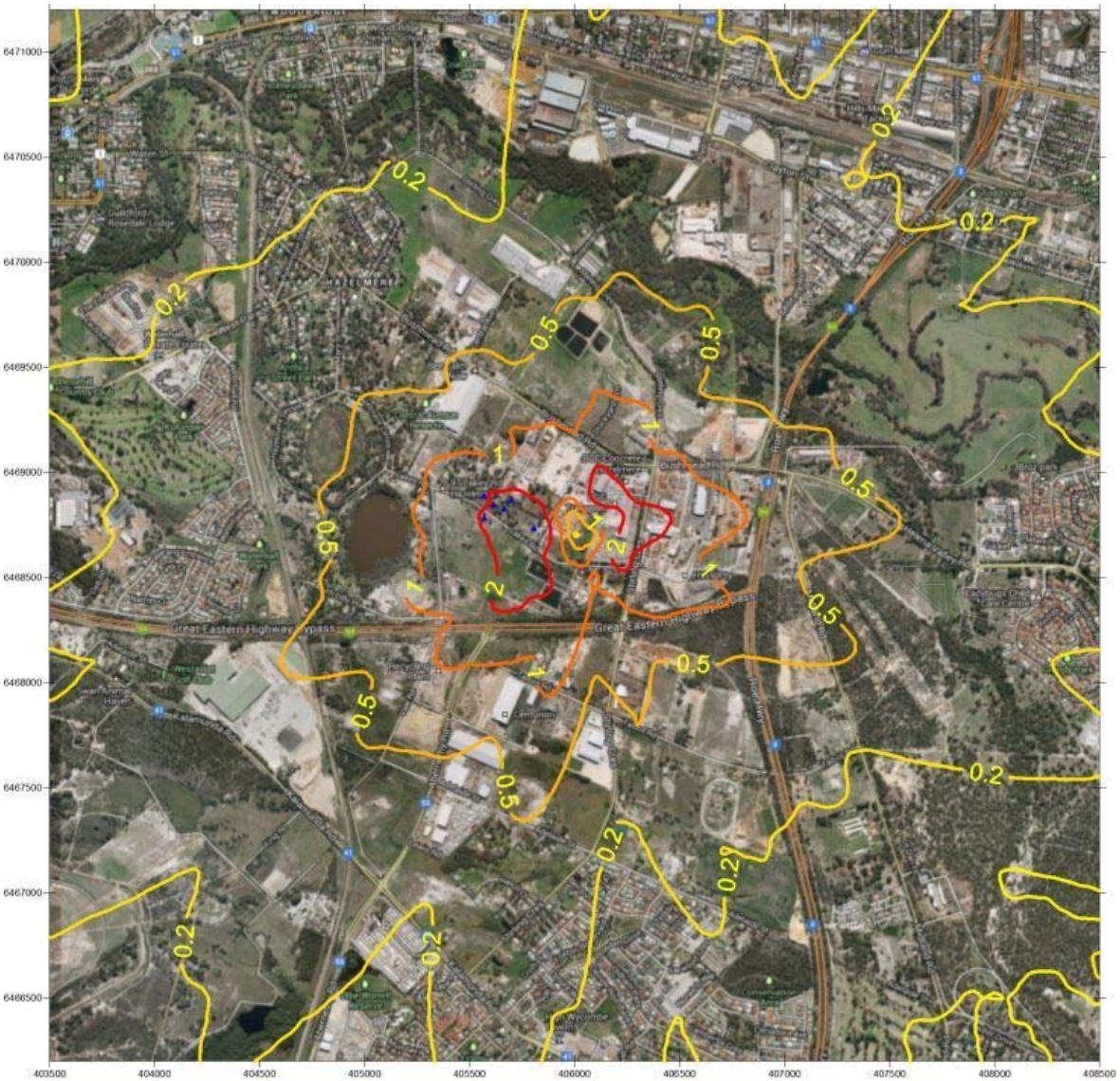

Figure 192: Bypass Operations - GLC HF (ng/m³) Maximum Daily

Figure 193: Bypass Operations - GLC HF (ng/m³) Annual average

Figure 194: Bypass Operations - GLC Hg (ρg/m³) Maximum Hourly

Figure 195: Bypass Operations - GLC Hg (ρg/m³) Maximum 8-Hourly

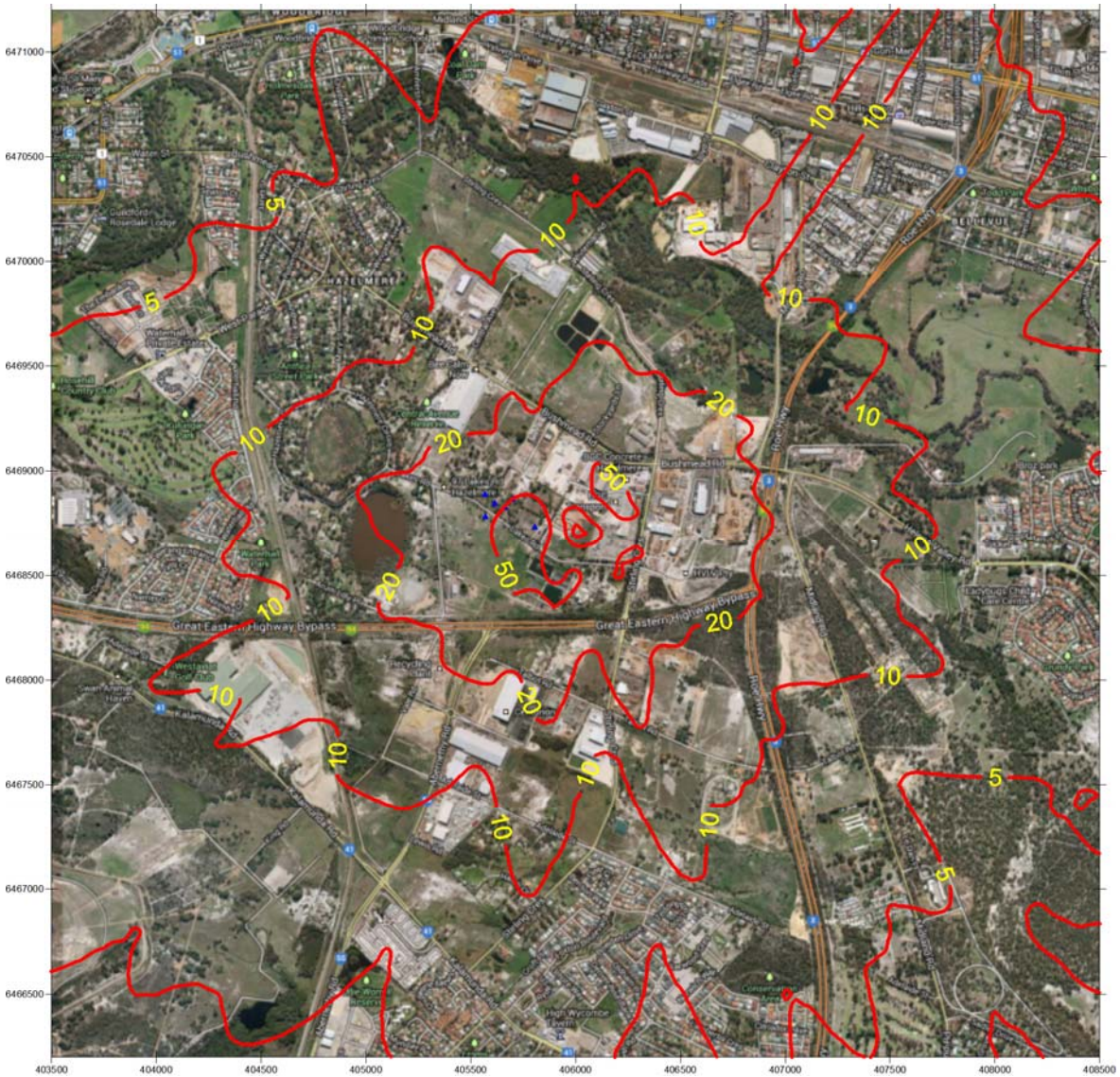

Figure 196: Bypass Operations - GLC Hg (ρg/m³) Maximum Daily

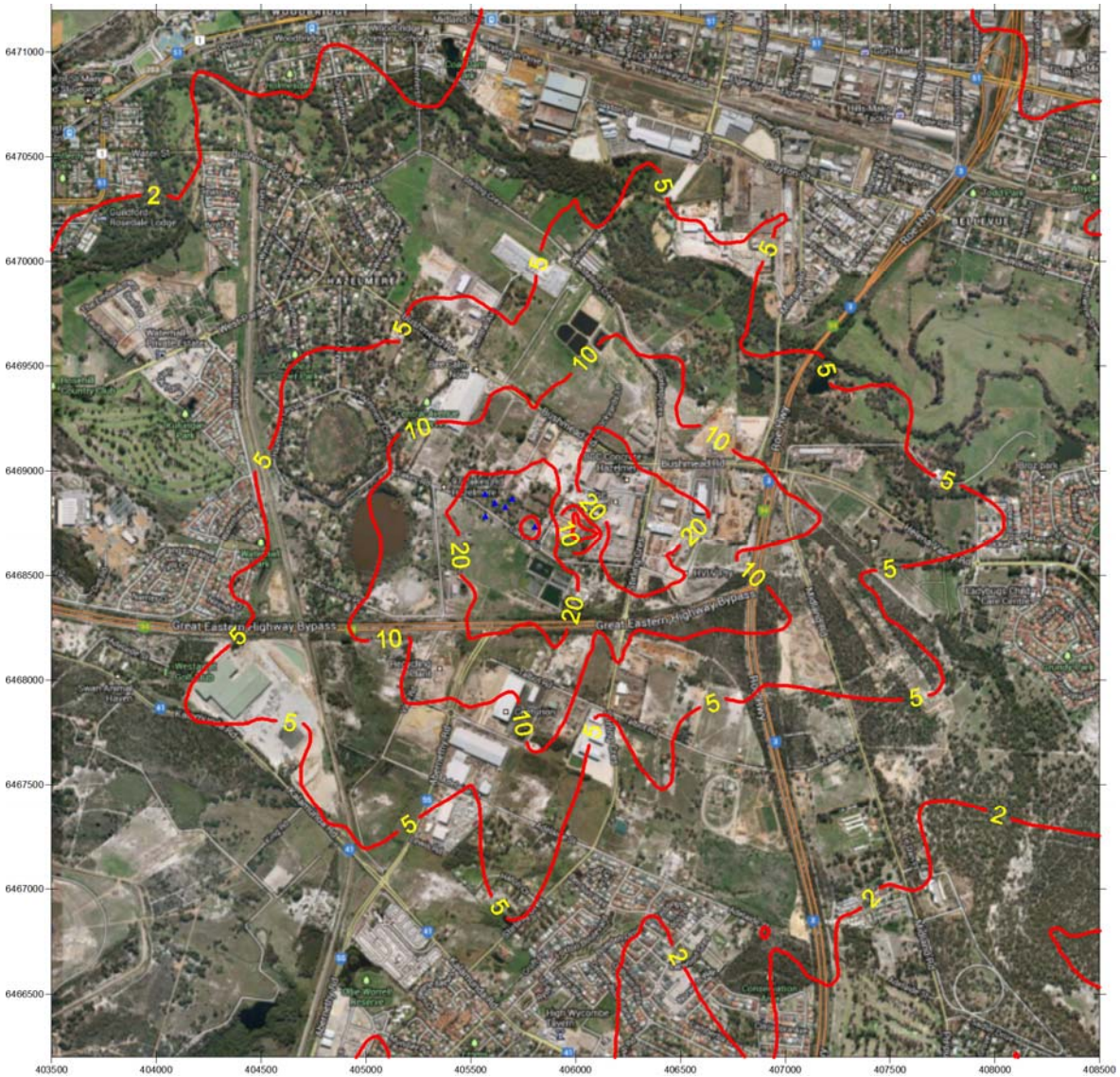

Figure 197: Bypass Operations - GLC Hg (ρg/m³) Annual average

Figure 198: Bypass Operations - GLC Mn (fg/m³) Maximum Hourly

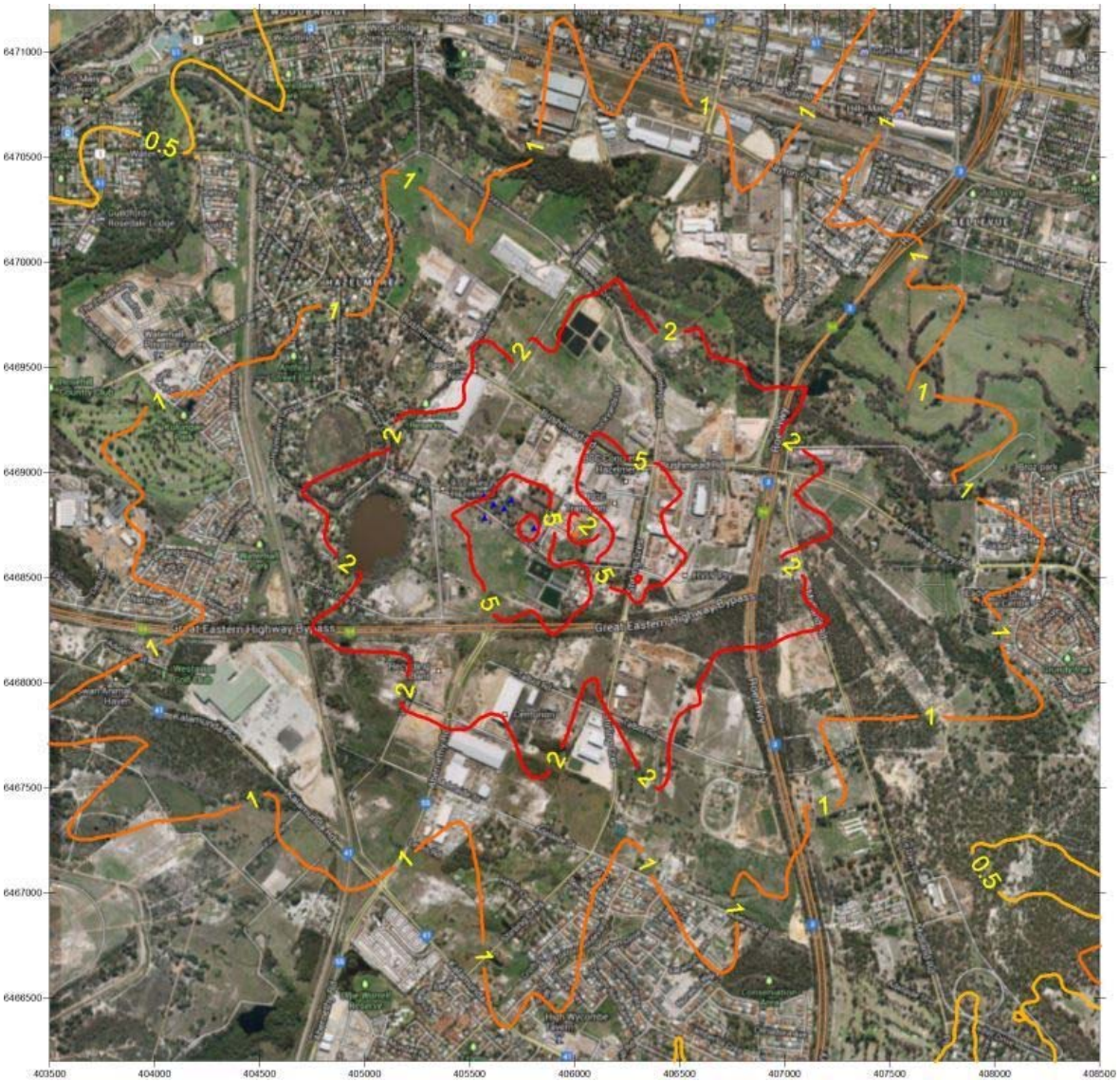

Figure 199: Bypass Operations - GLC Mn (fg/m³) Maximum 8-Hourly

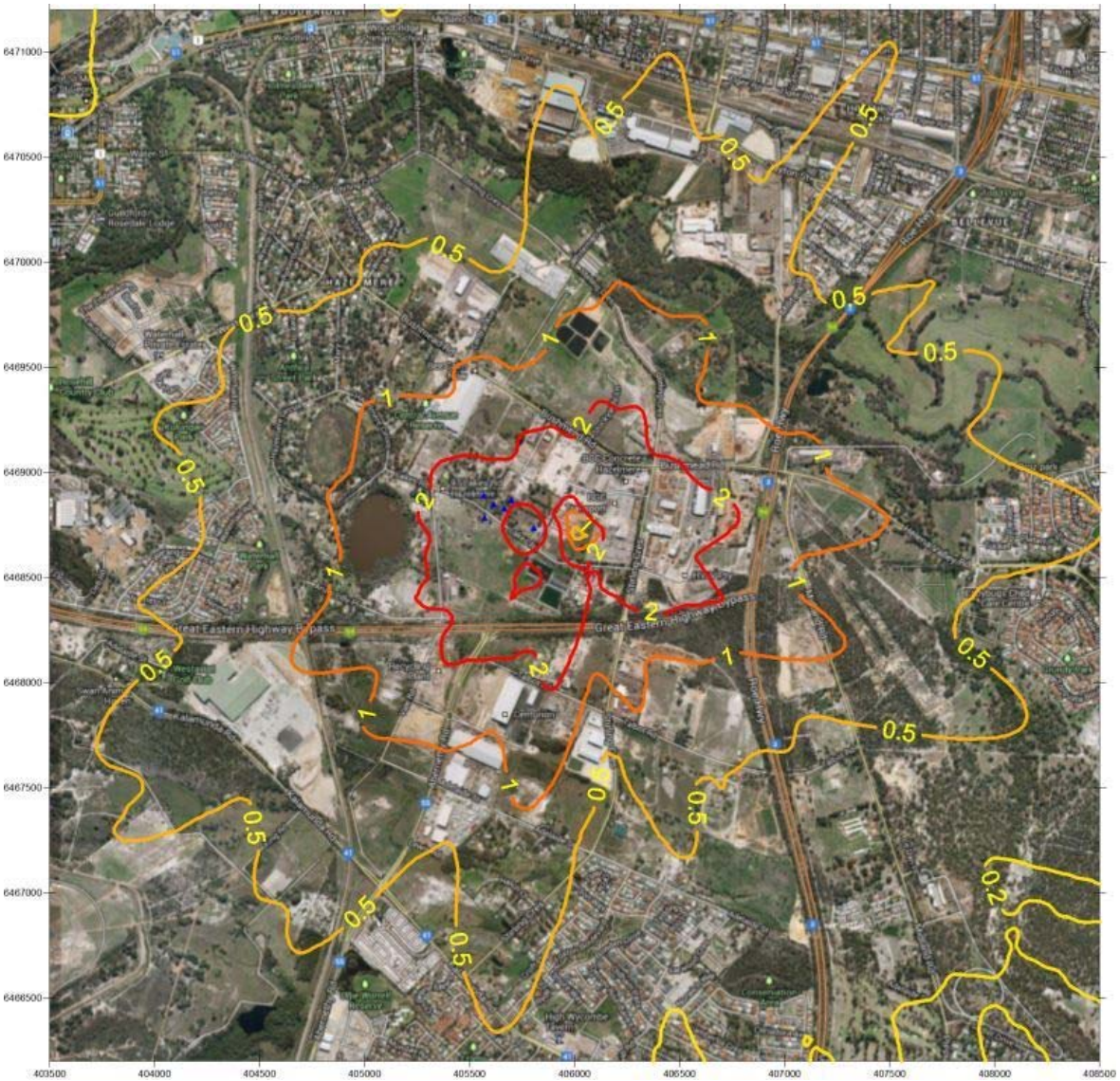

Figure 200: Bypass Operations - GLC Mn (fg/m³) Maximum Daily

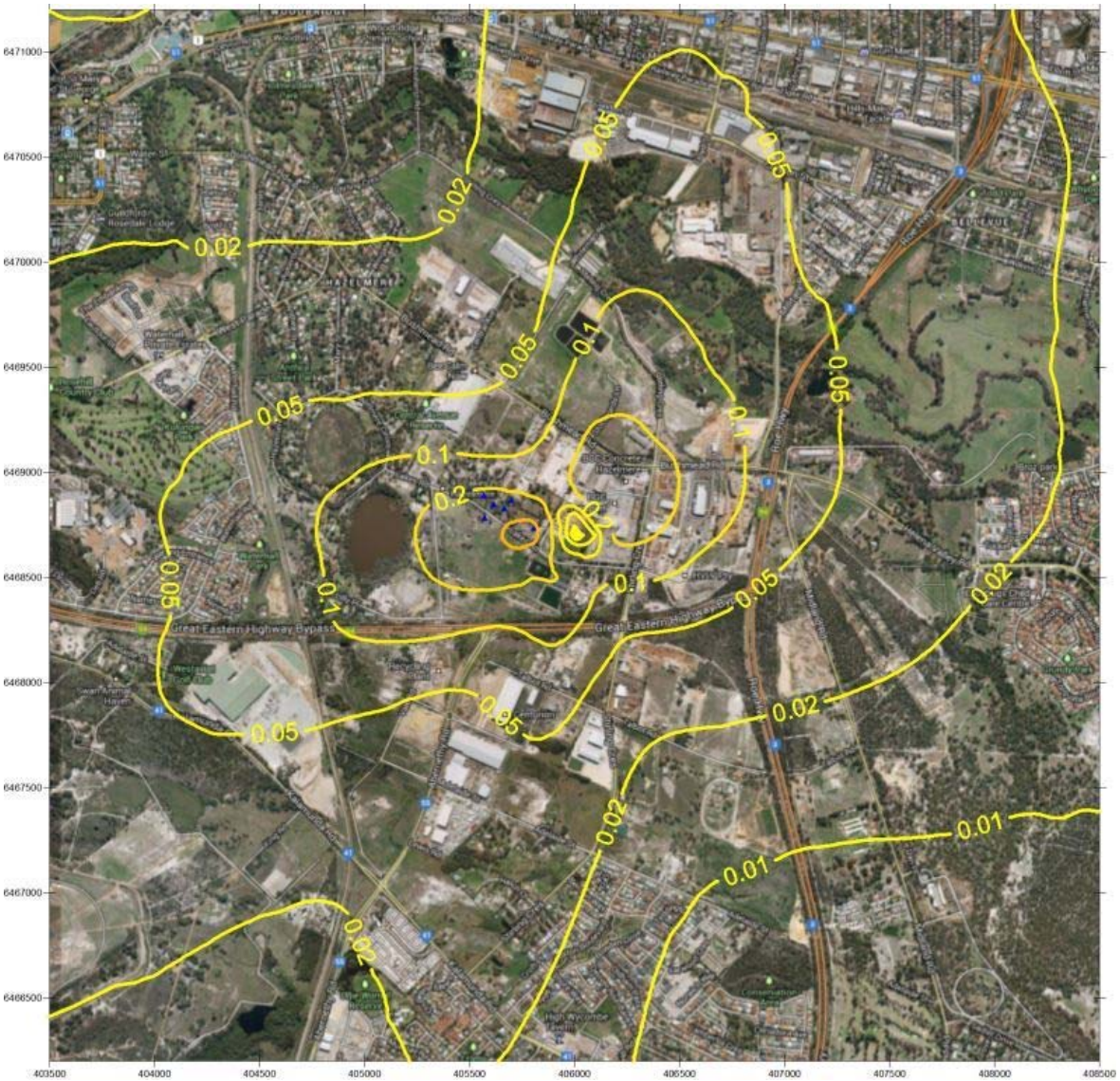

Figure 201: Bypass Operations - GLC Mn (fg/m³) Annual average

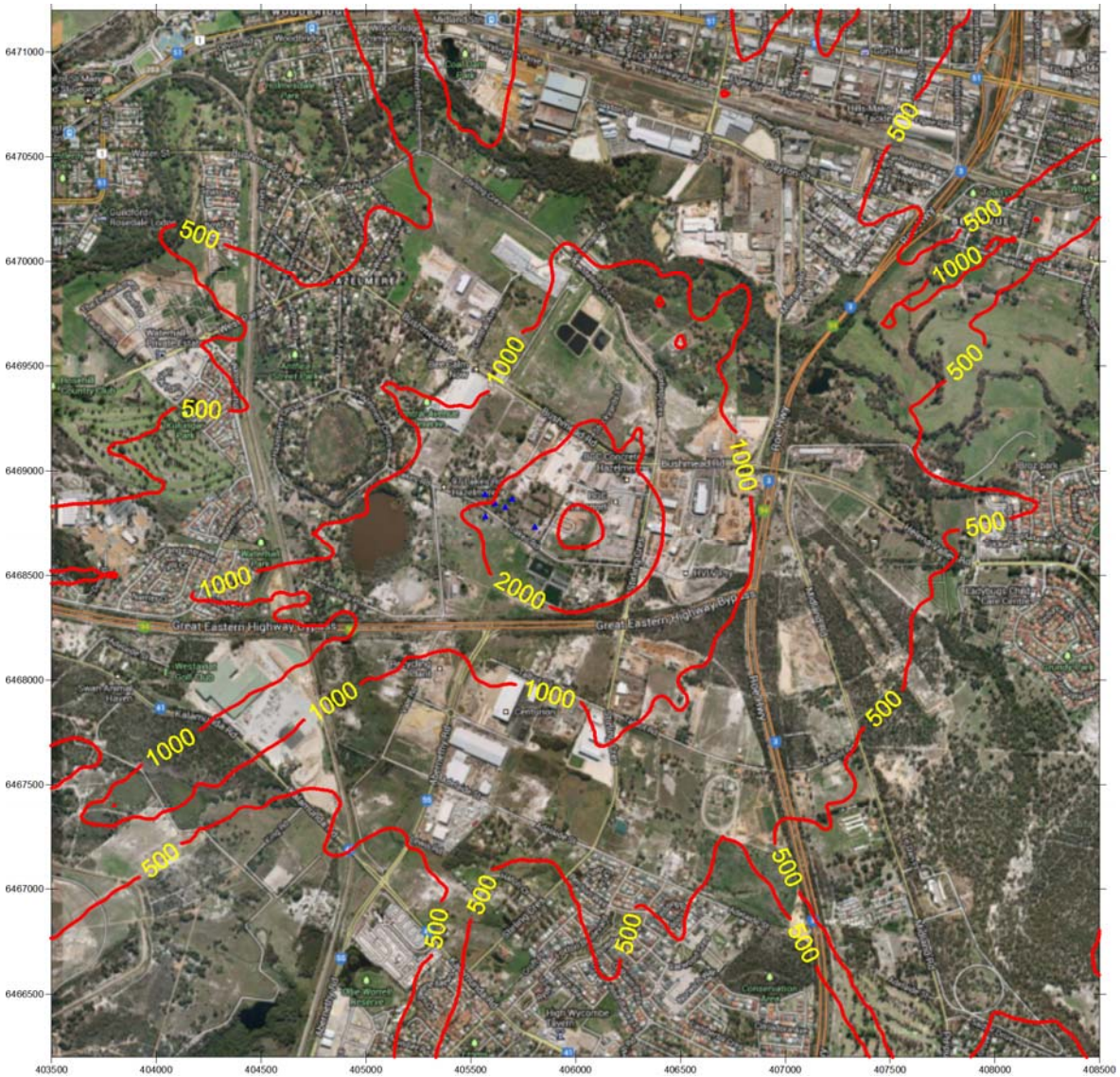

Figure 202: Bypass Operations - GLC Ni (ρg/m³) Maximum Hourly

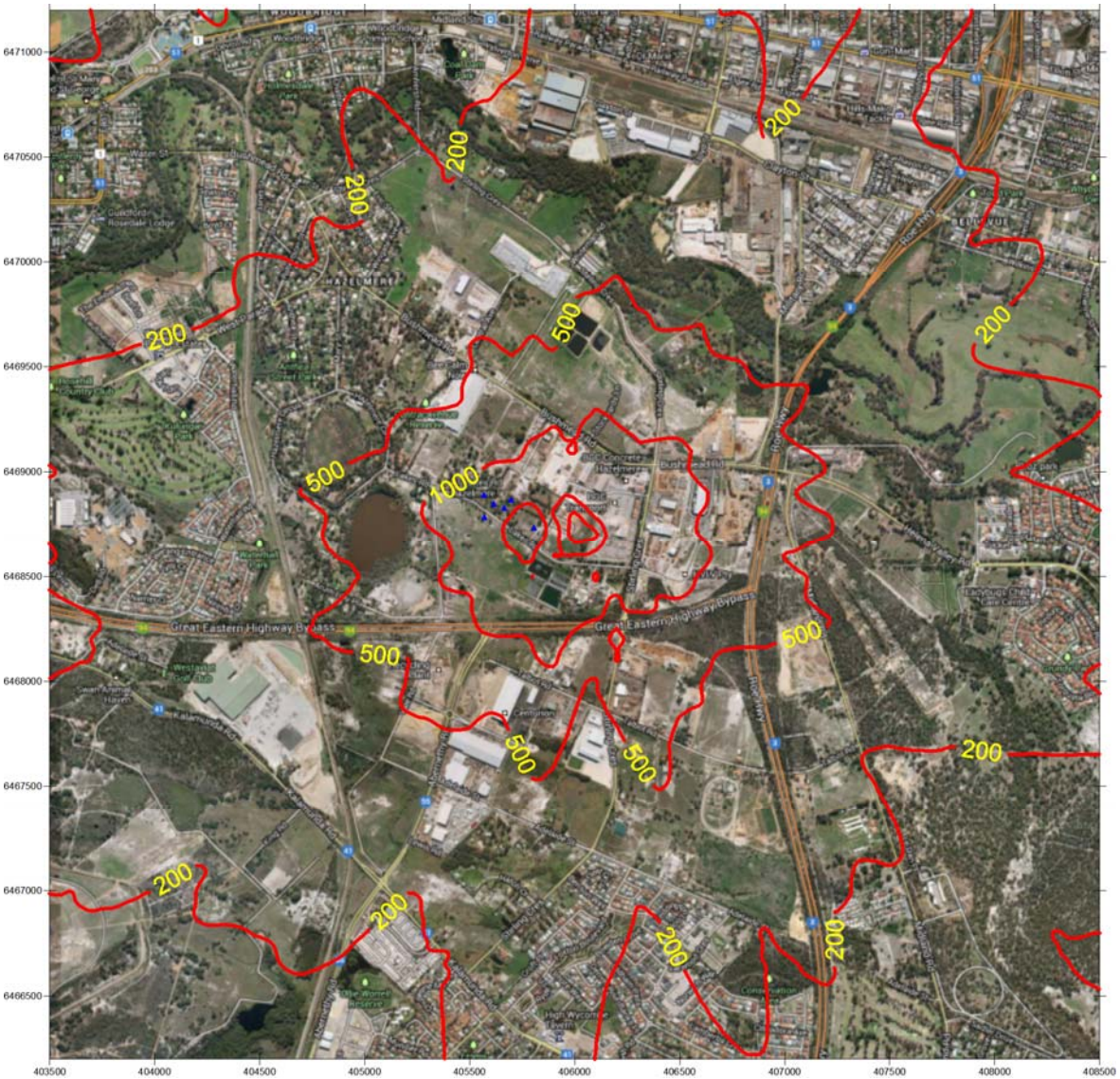

Figure 203: Bypass Operations - GLC Ni (ρg/m³) Maximum 8-Hourly

Figure 204: Bypass Operations - GLC Ni (ρg/m³) Maximum Daily

Figure 205: Bypass Operations - GLC Ni (ρg/m³) Annual average

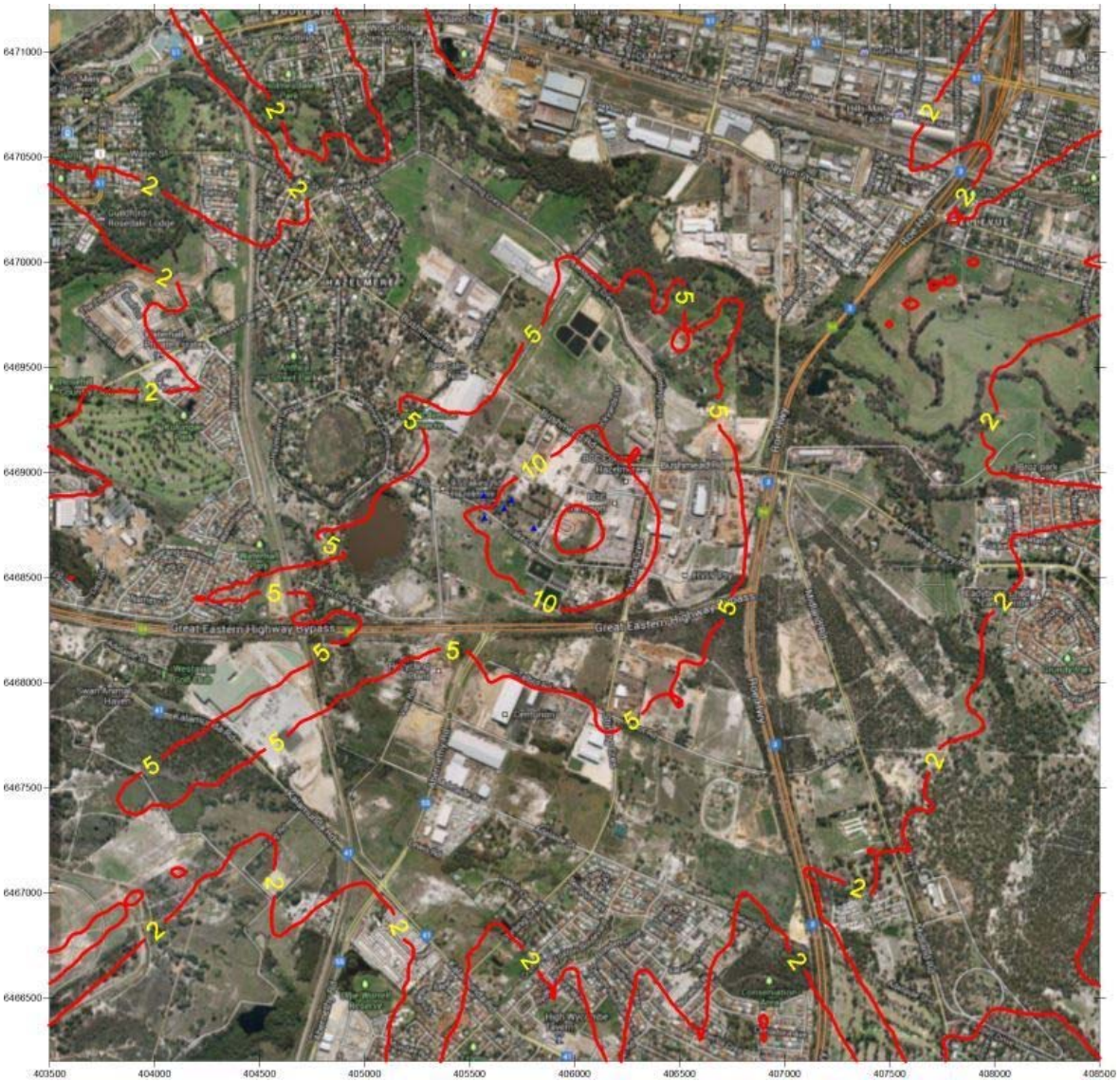

Figure 206: Bypass Operations - GLC NOx (µg/m³) Maximum Hourly

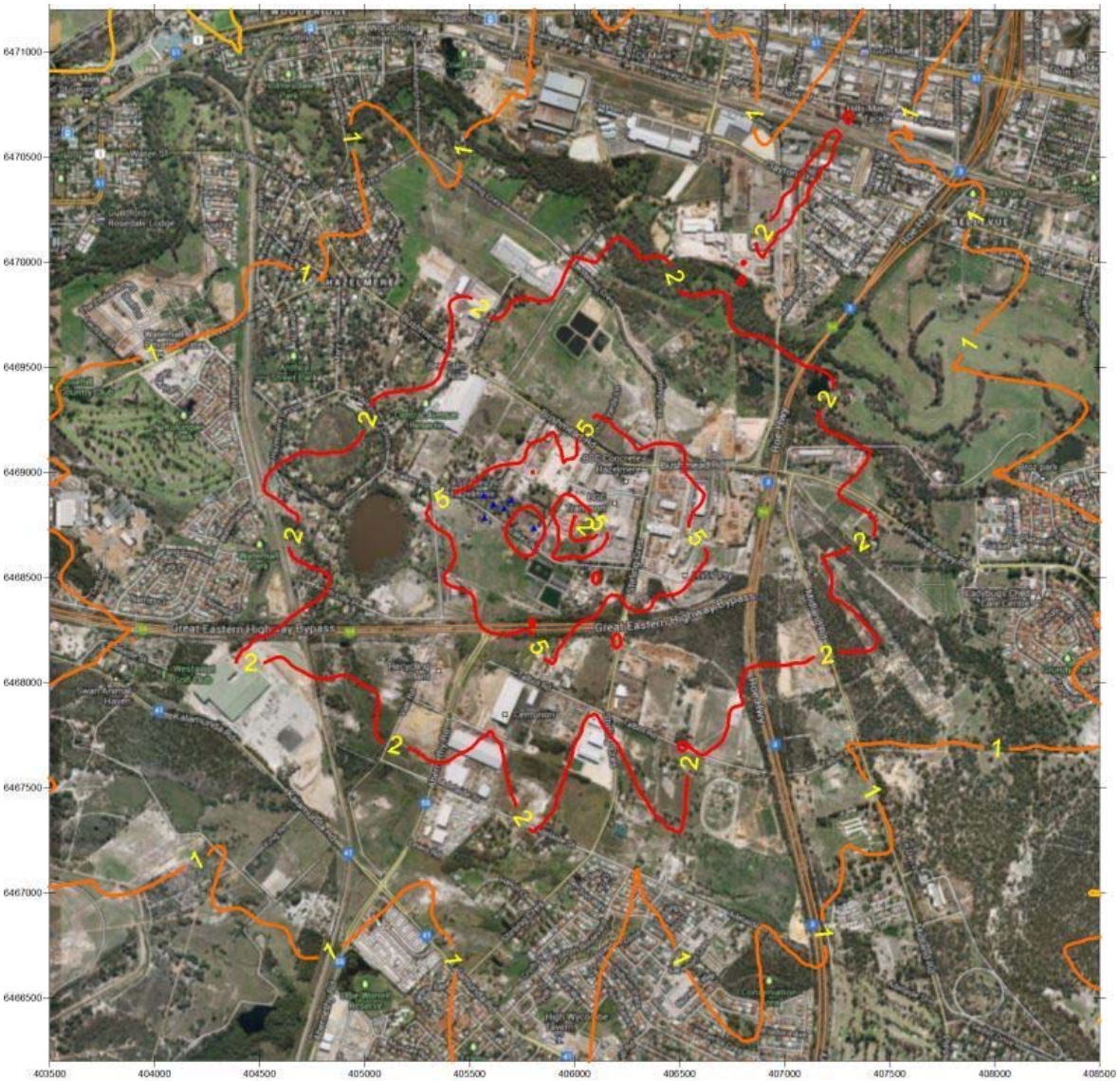

Figure 207: Bypass Operations - GLC NOx (µg/m³) Maximum 8-Hourly

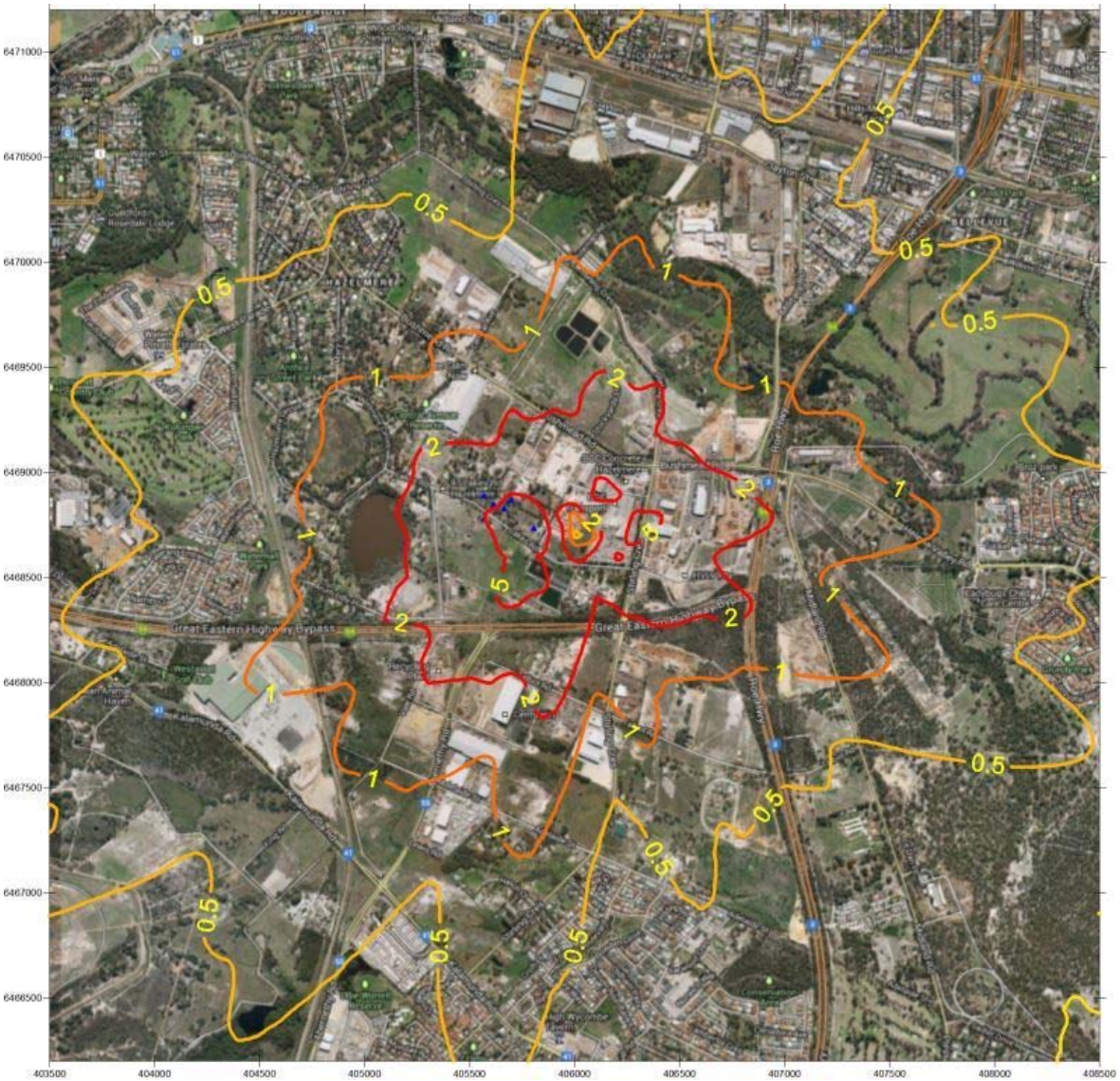

Figure 208: Bypass Operations - GLC NOx (µg/m³) Maximum Daily

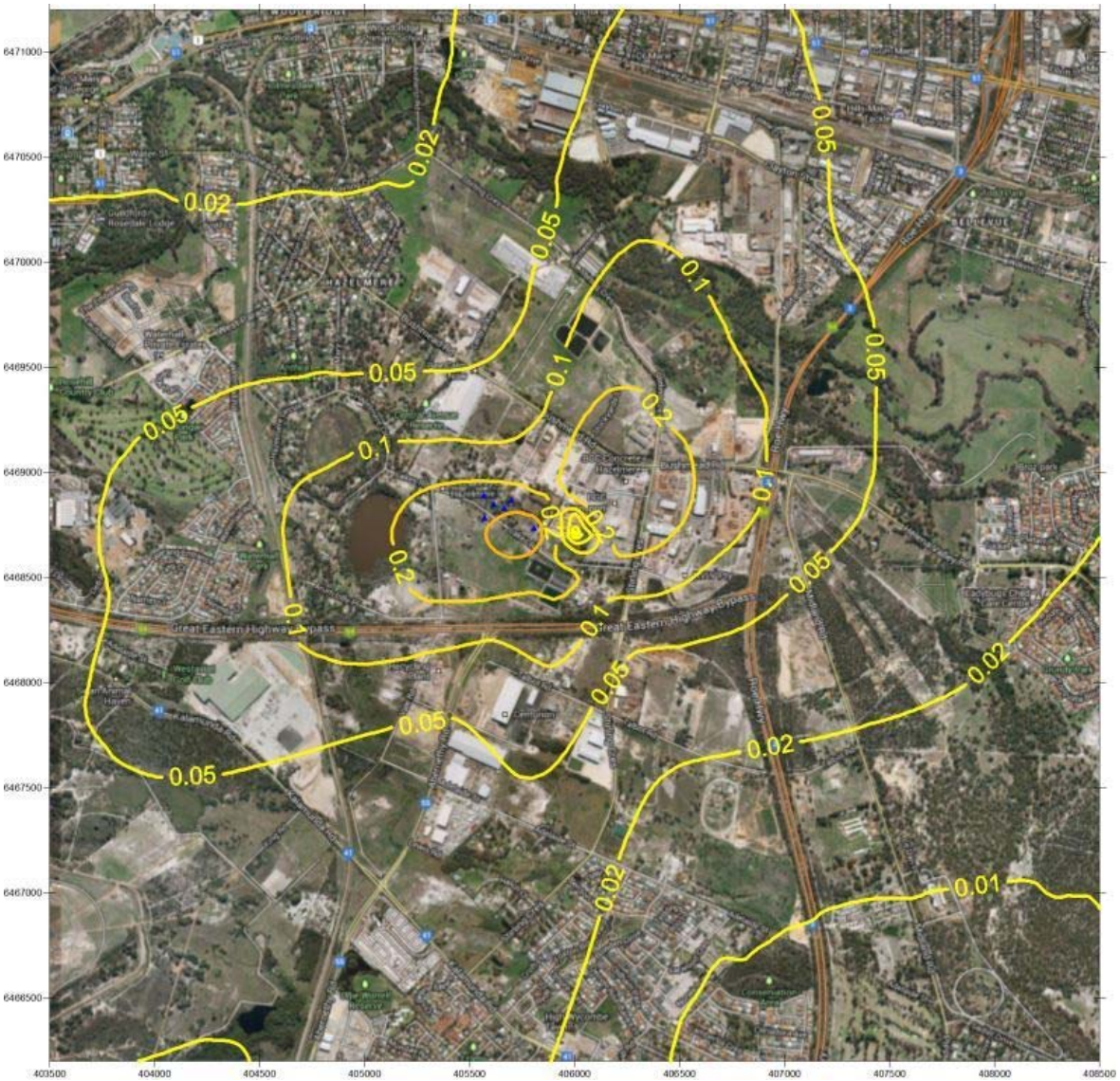

Figure 209: Bypass Operations - GLC NOx (µg/m³) Annual average

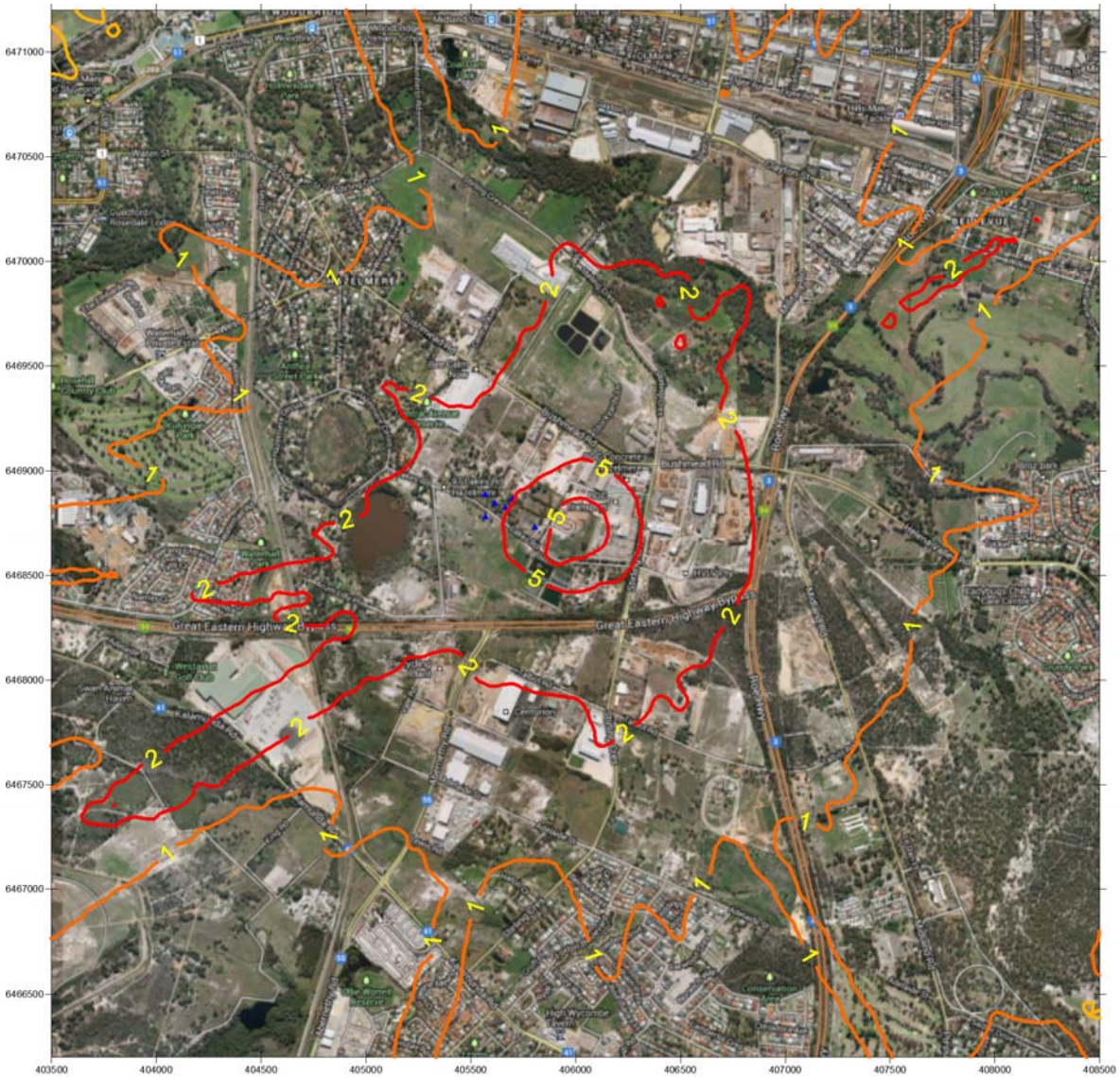

Figure 210: Bypass Operations - GLC Pb (ng/m³) Maximum Hourly

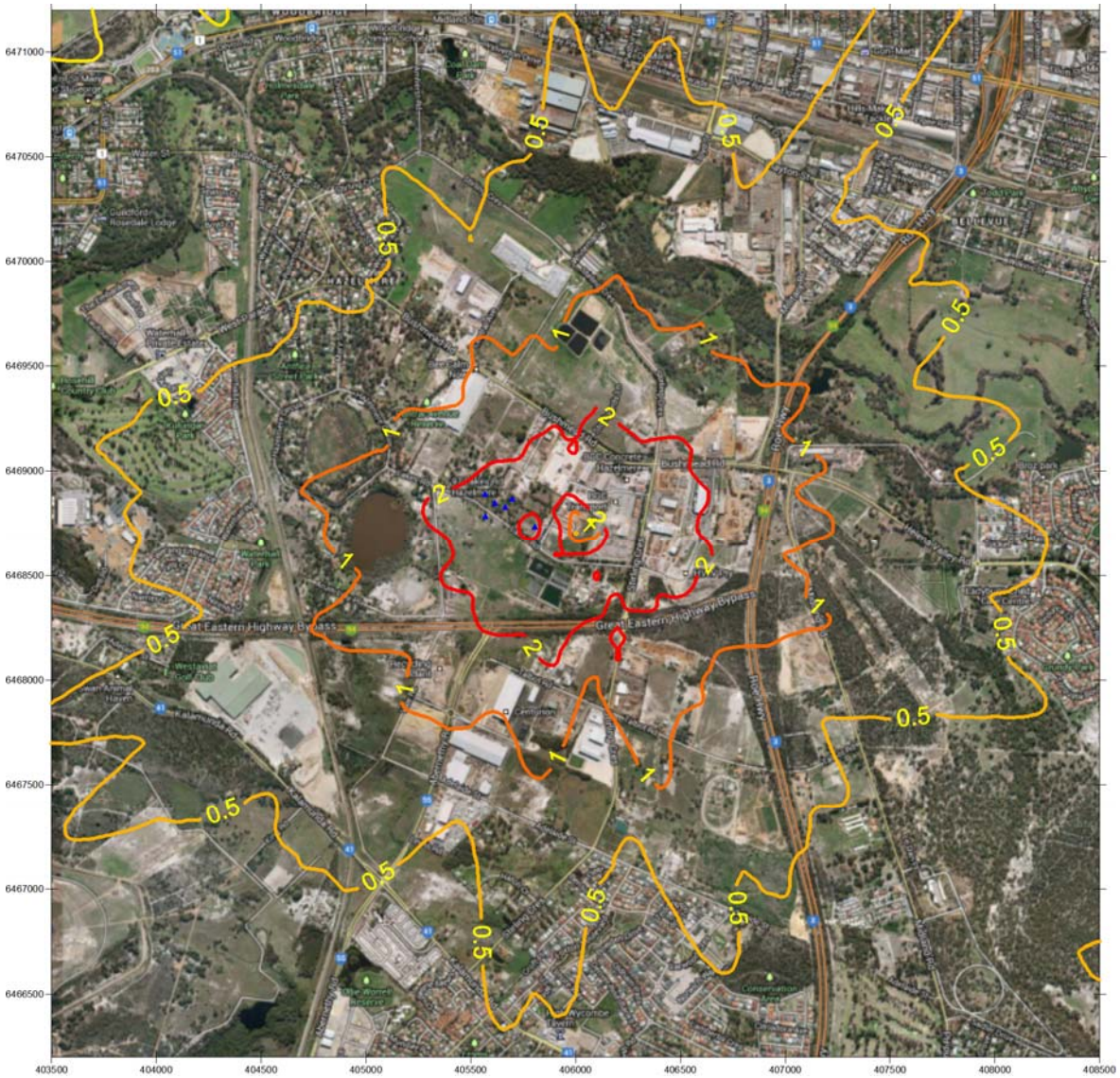

Figure 211: Bypass Operations - GLC Pb (ng/m³) Maximum 8-Hourly

Figure 212: Bypass Operations - GLC Pb (ng/m³) Maximum Daily

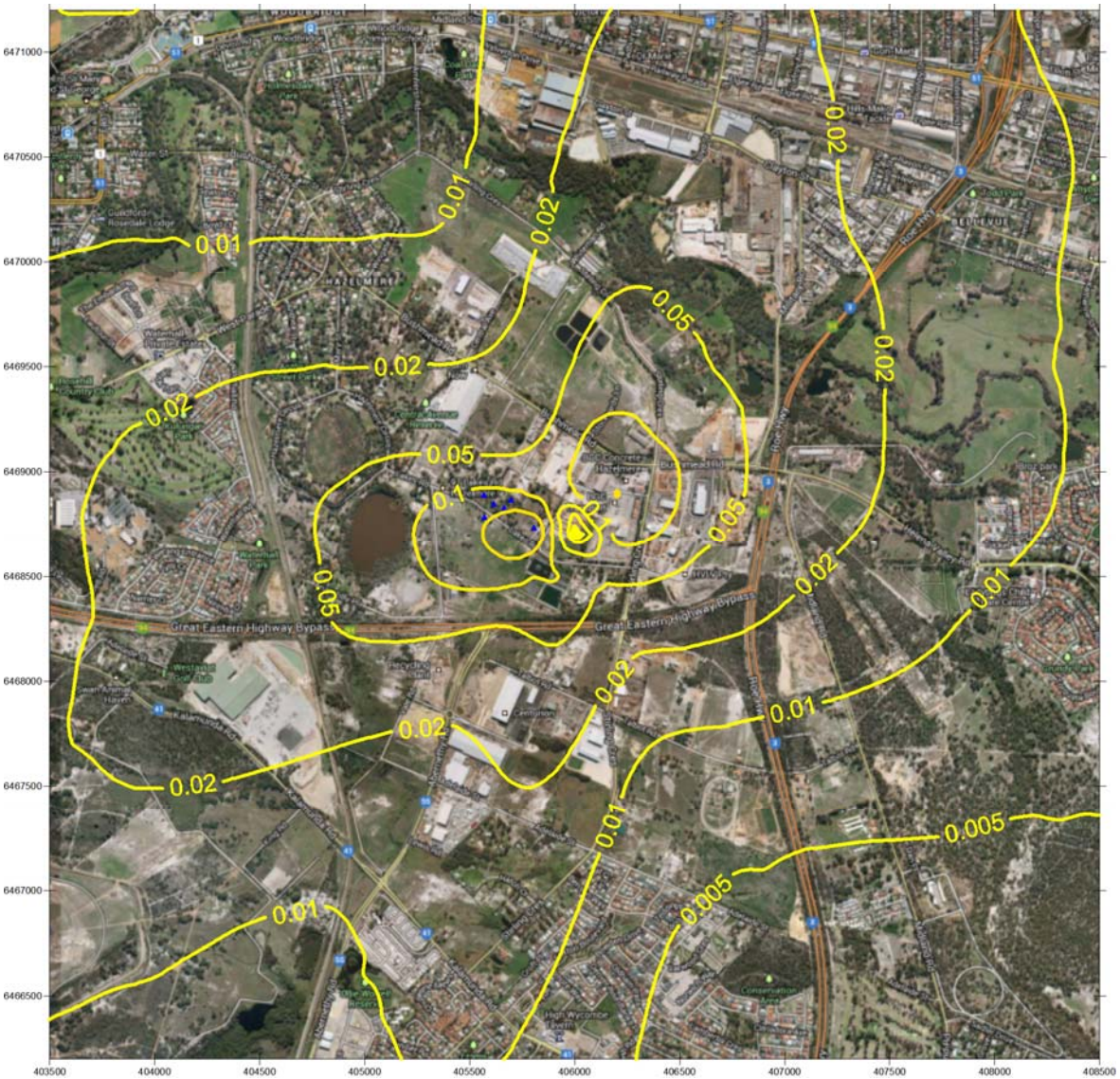

Figure 213: Bypass Operations - GLC Pb (ng/m³) Annual average

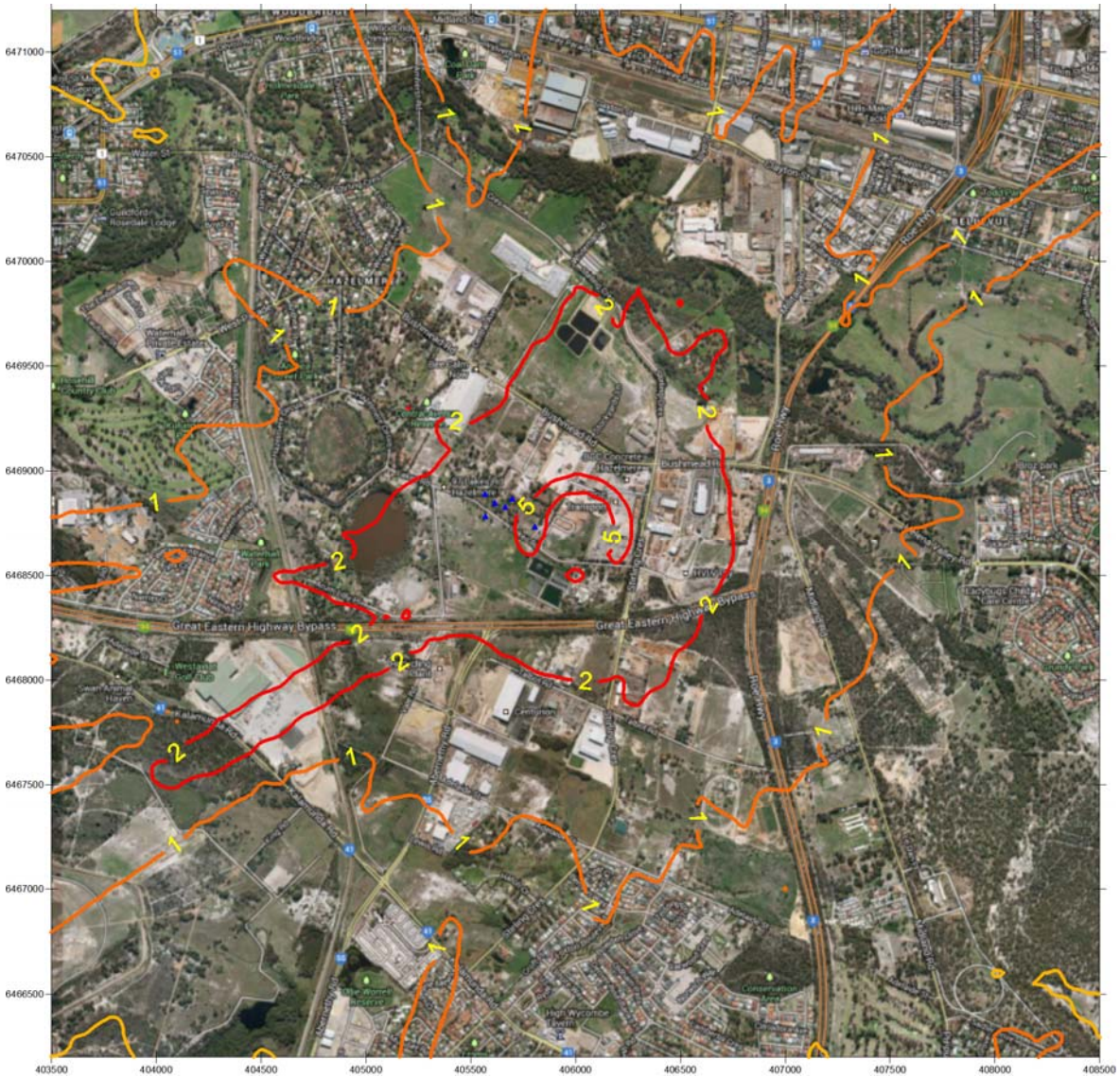

Figure 214: Bypass Operations - GLC Particulates (µg/m³) Maximum Hourly

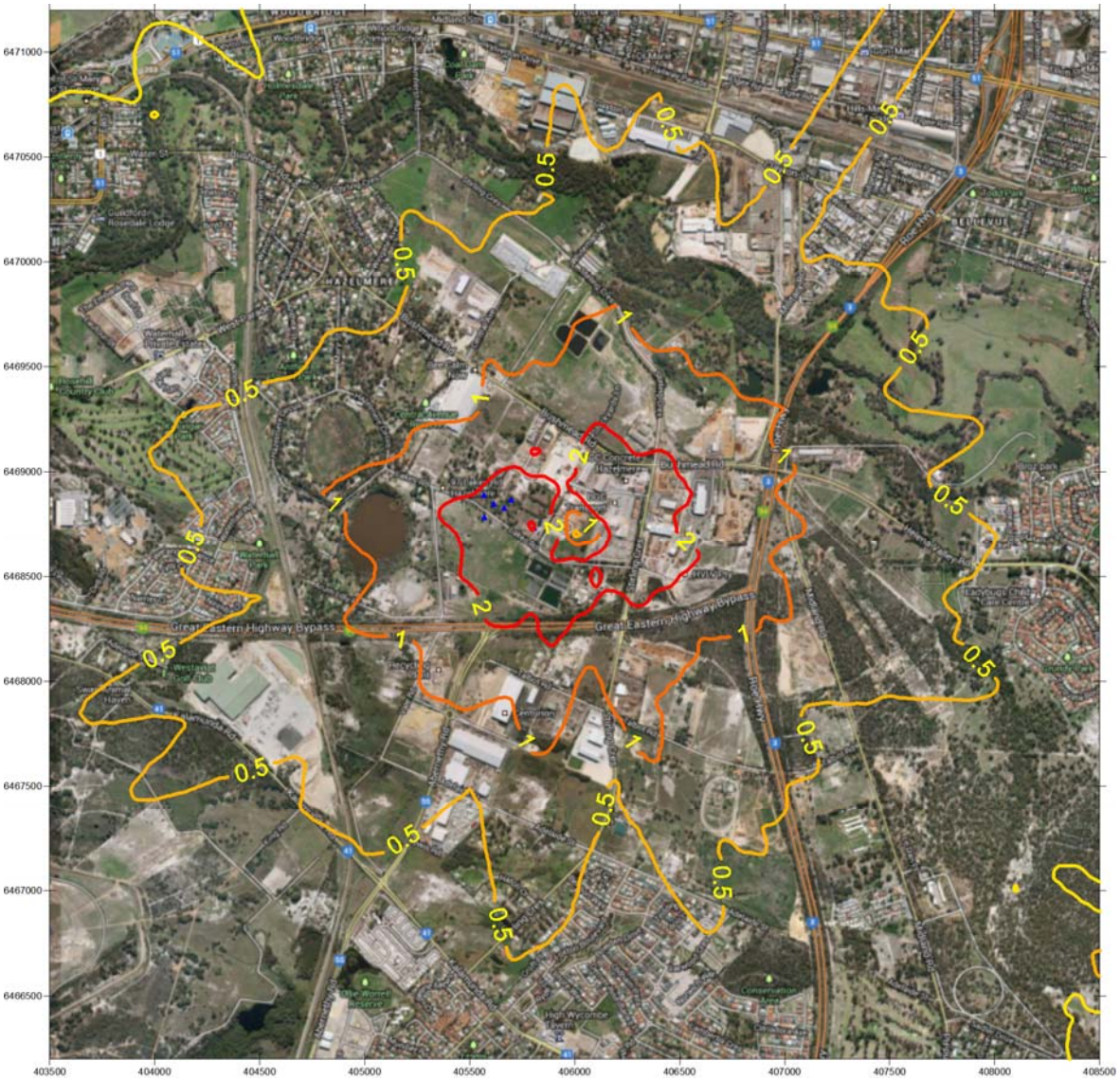

Figure 215: Bypass Operations - GLC Particulates (µg/m³) Maximum 8-Hourly

Figure 216: Bypass Operations - GLC Particulates (µg/m³) Maximum Daily

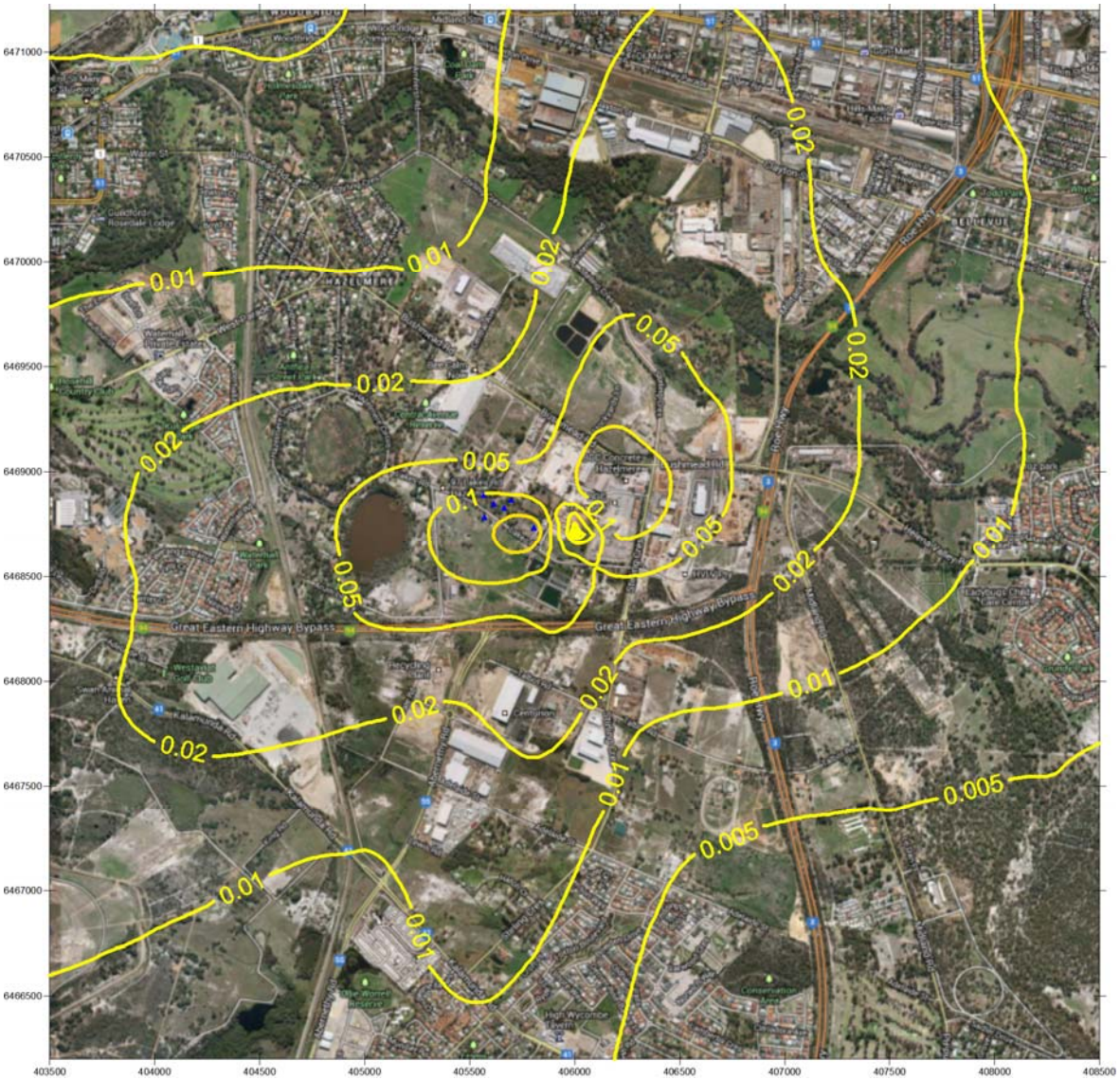

Figure 217: Bypass Operations - GLC Particulates (µg/m³) Annual average

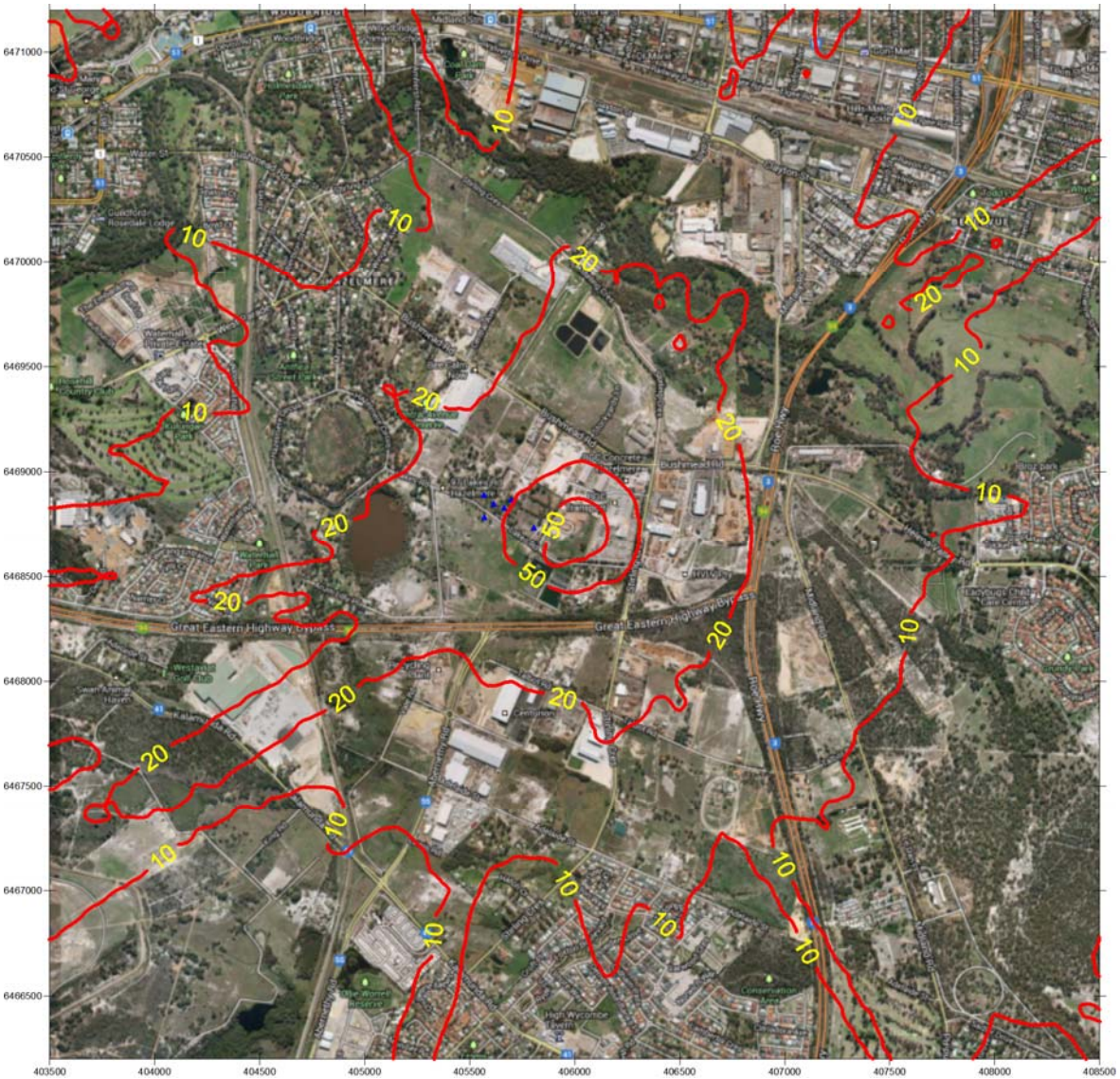

Figure 218: Bypass Operations - GLC Sb (ρg/m³) Maximum Hourly

Figure 219: Bypass Operations - GLC Sb (ρg/m³) Maximum 8-Hourly

Figure 220: Bypass Operations - GLC Sb (ρg/m³) Maximum Daily

Figure 221: Bypass Operations - GLC Sb (ρg/m³) Annual average

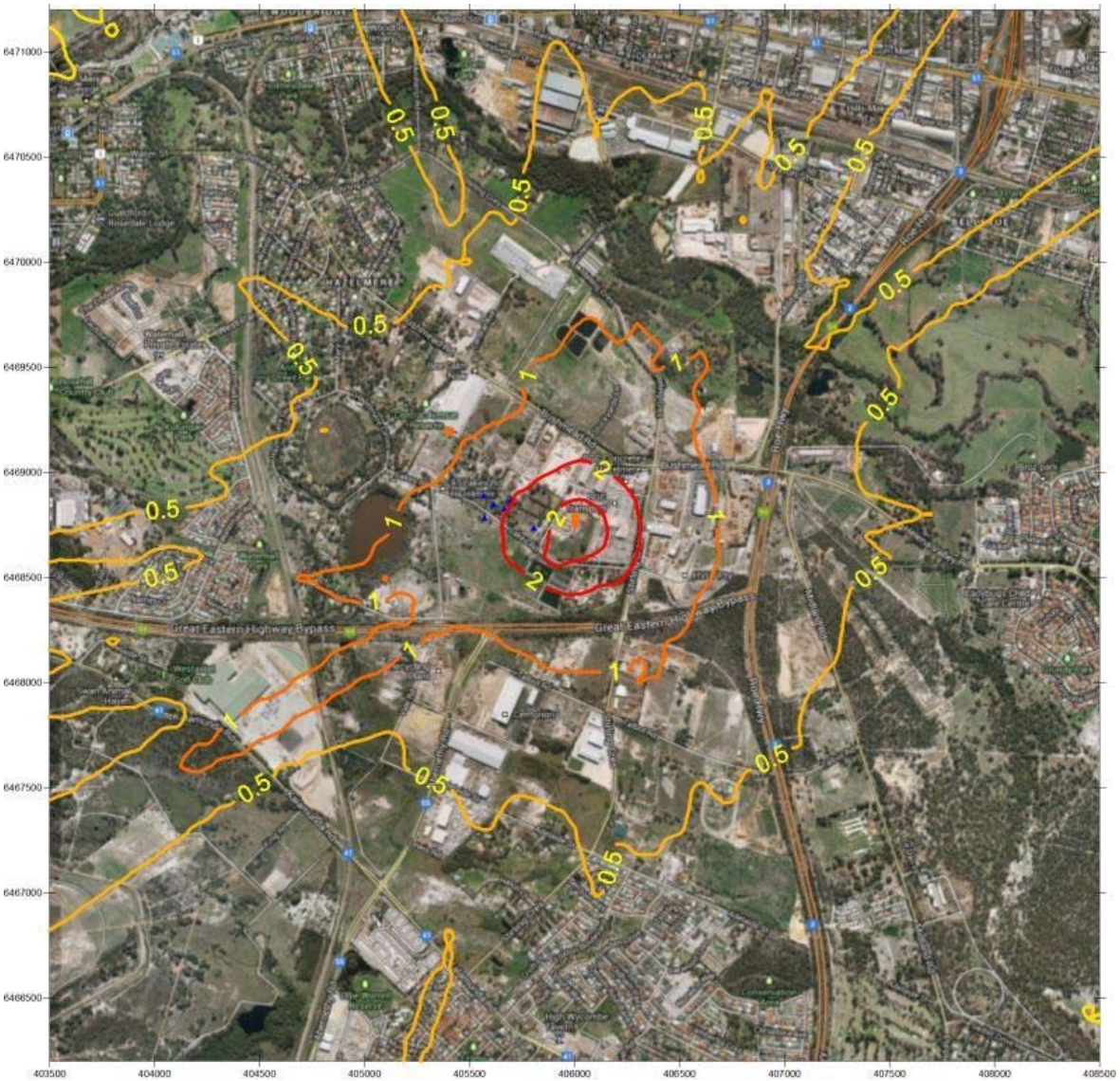

Figure 222: Bypass Operations - GLC SO_2 (µg/m³) Maximum Hourly

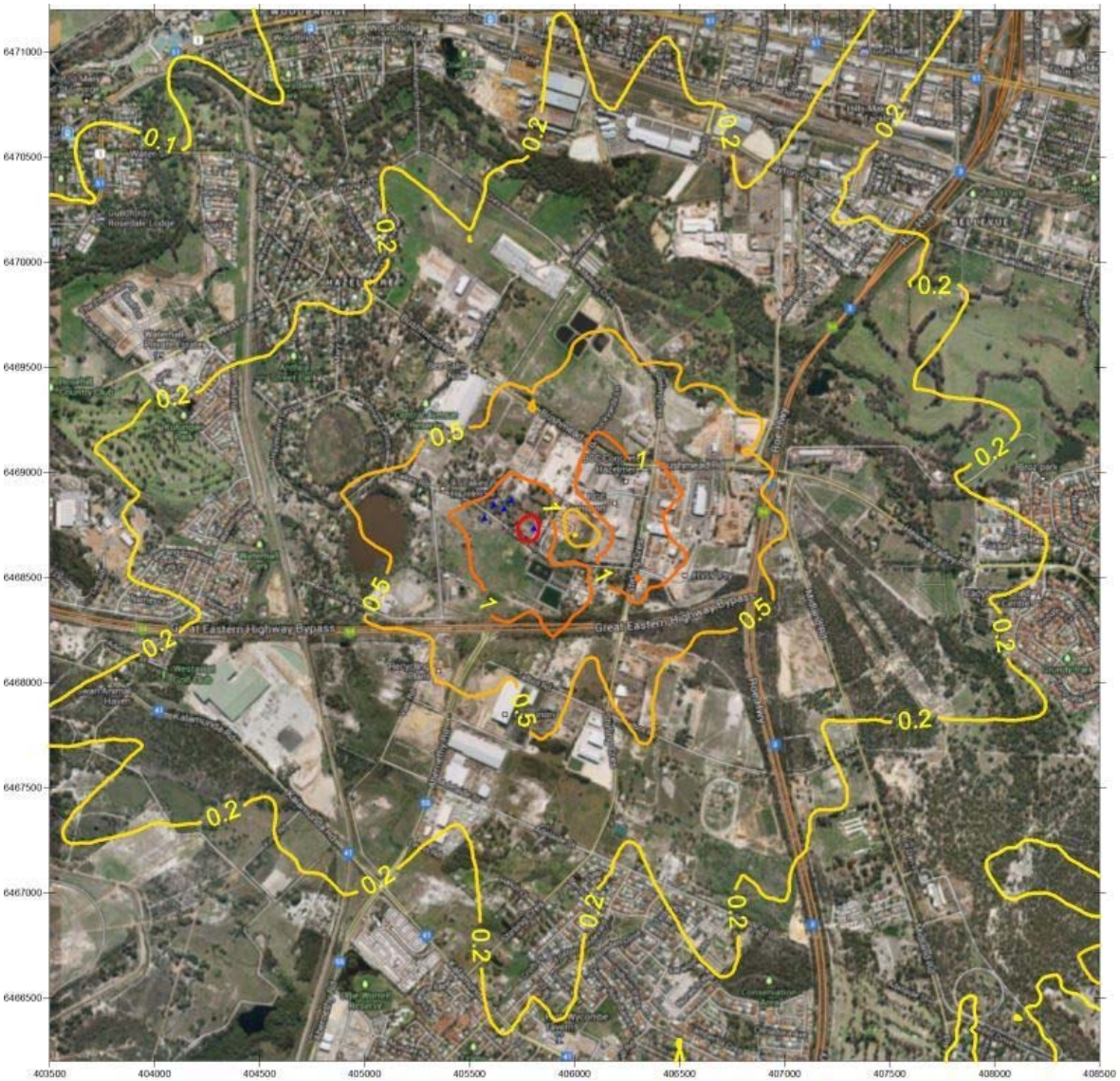

Figure 223: Bypass Operations - GLC SO_2 (µg/m³) Maximum 8-Hourly

Figure 224: Bypass Operations - GLC SO_2 (µg/m³) Maximum Daily

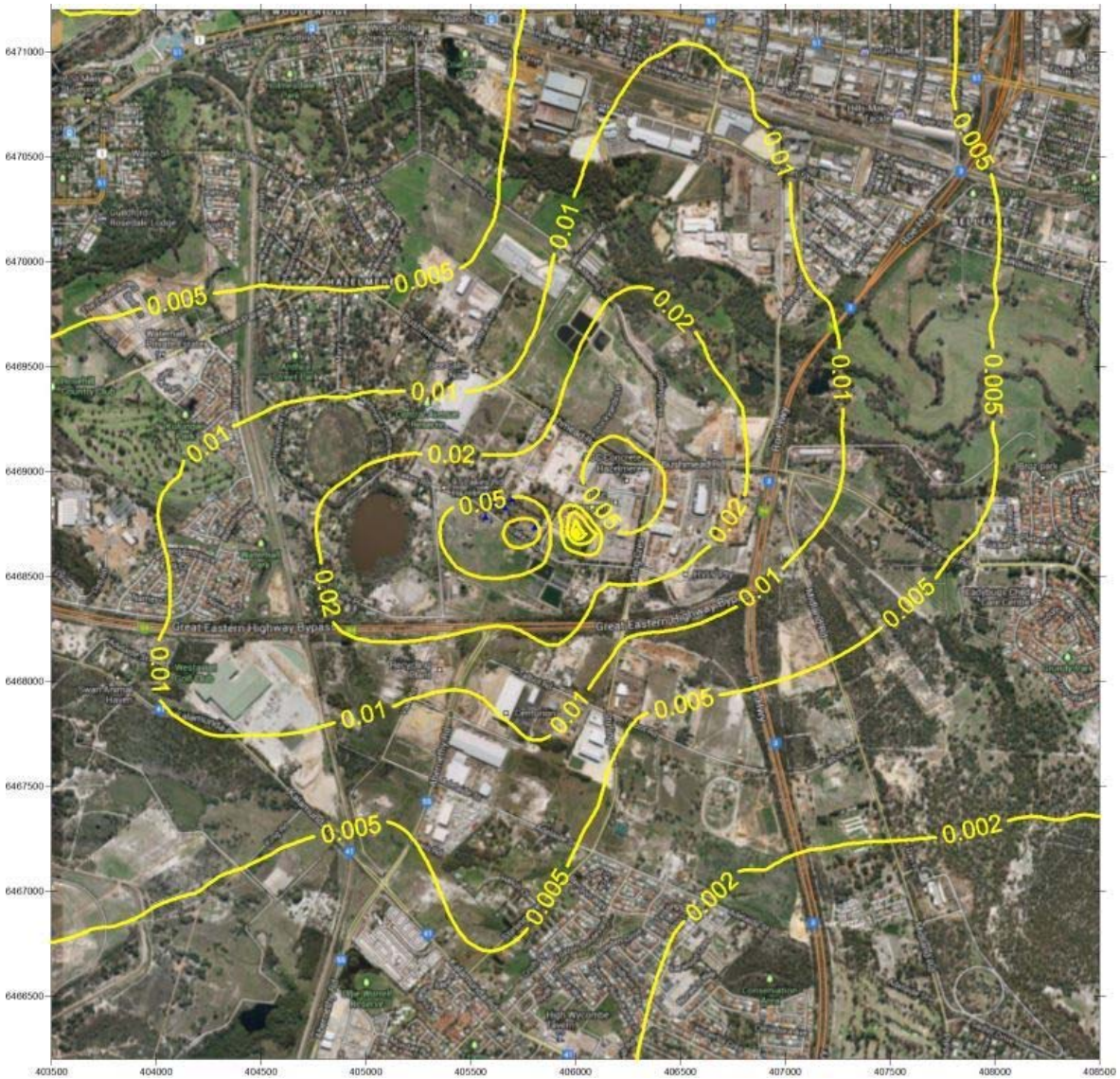

Figure 225: Bypass Operations - GLC SO_2 (µg/m³) Annual average

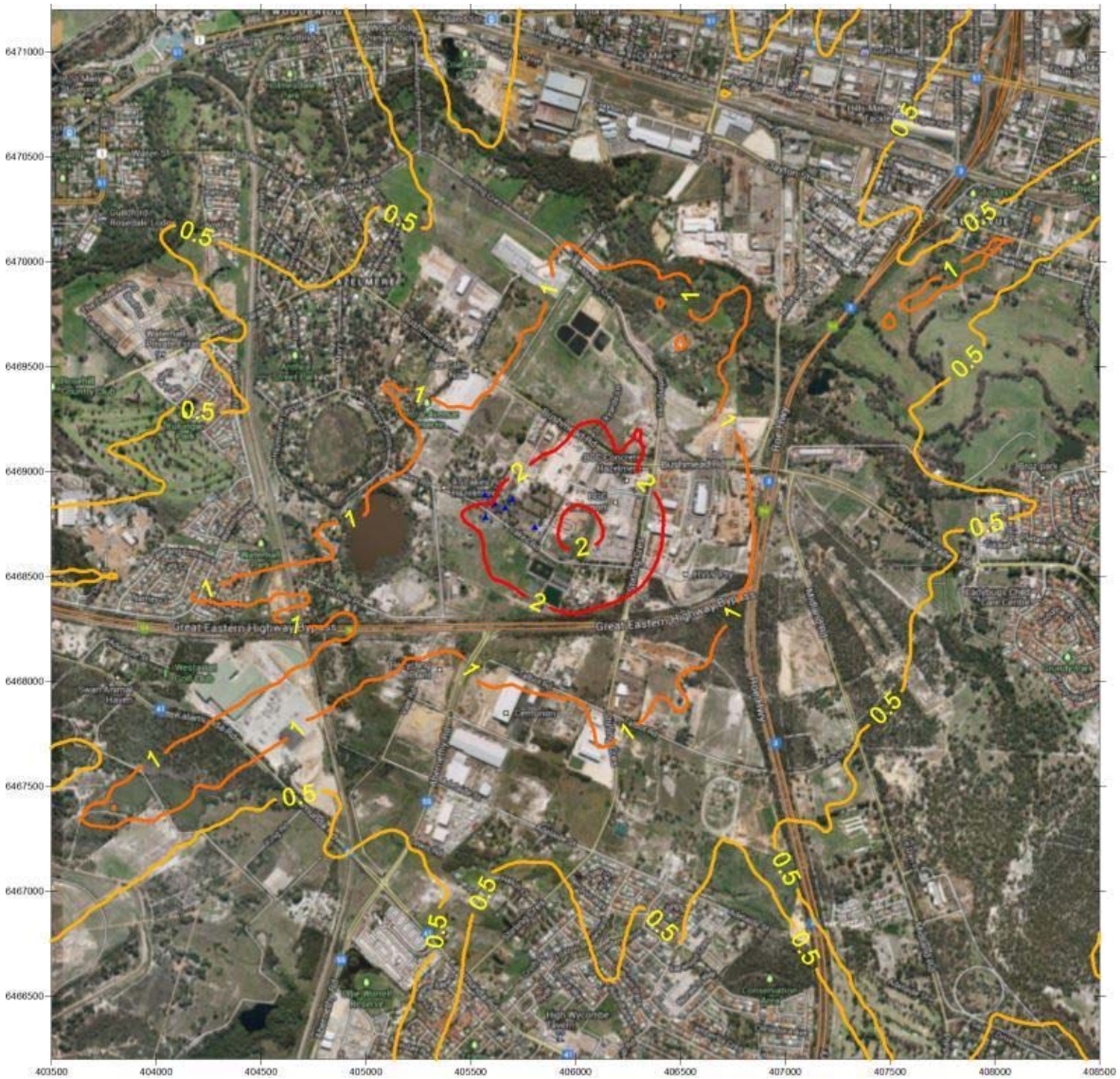

Figure 226: Bypass Operations - GLC Ti (ng/m³) Maximum Hourly

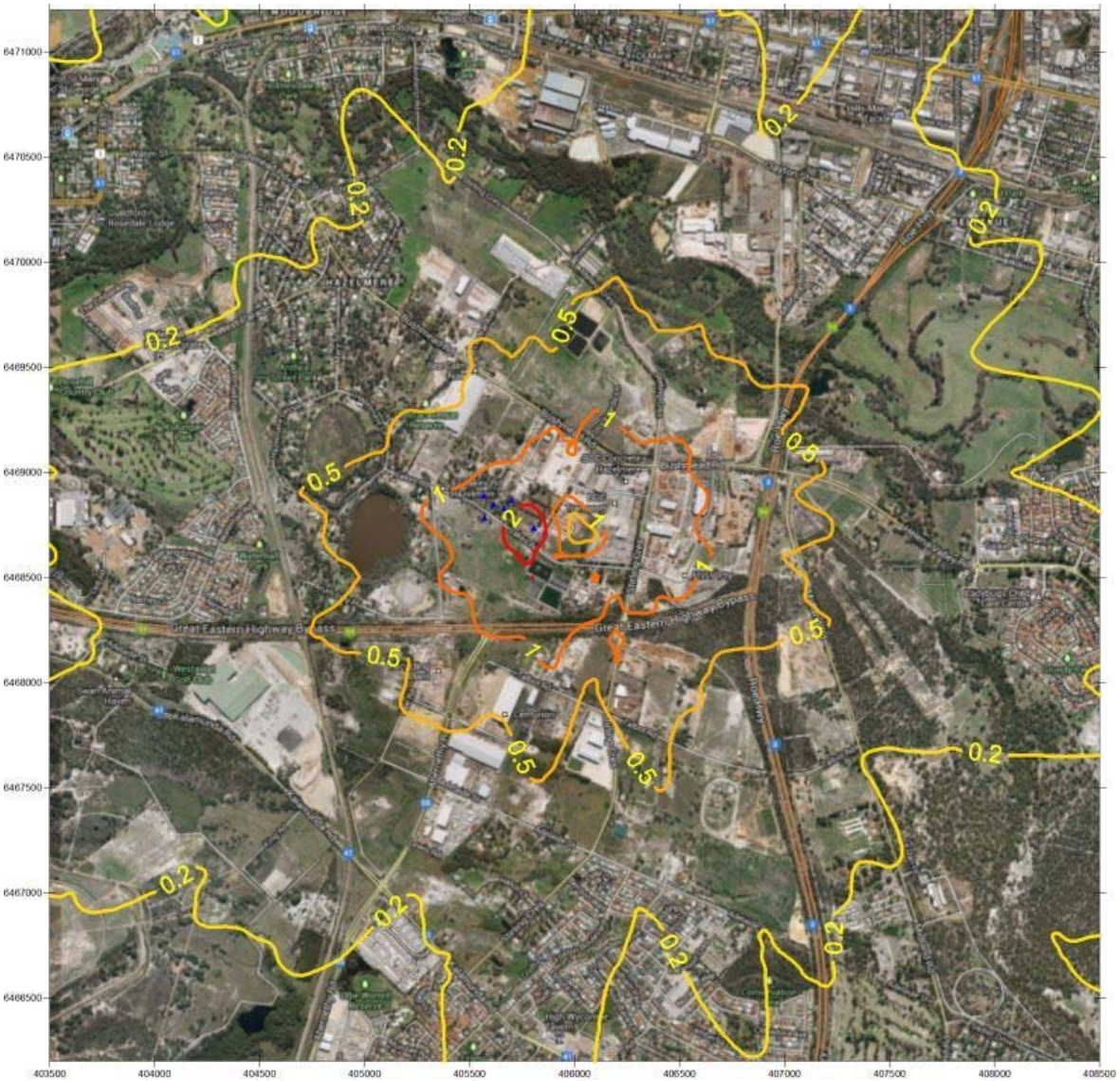

Figure 227: Bypass Operations - GLC Ti (ng/m³) Maximum 8-Hourly

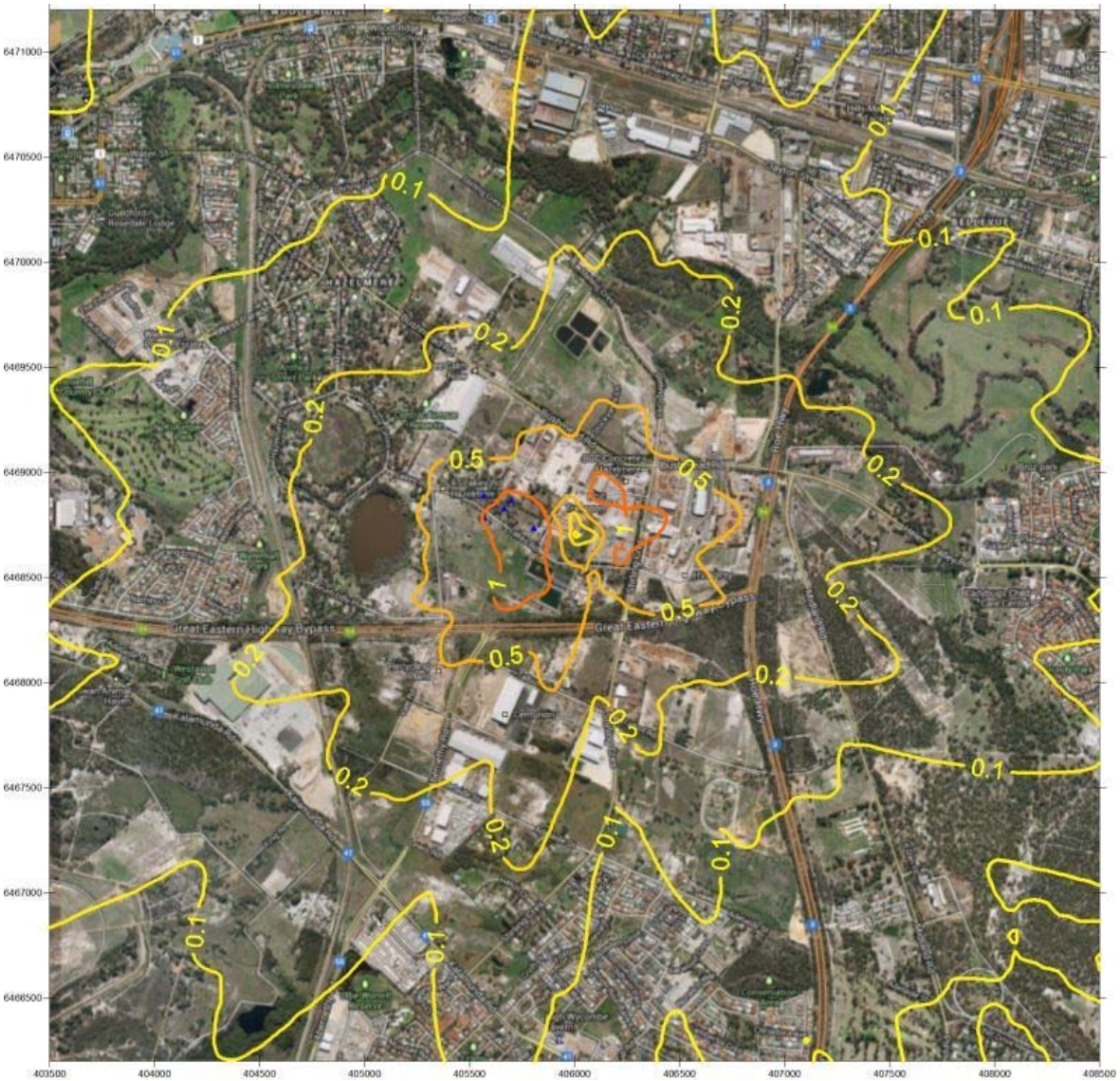

Figure 228: Bypass Operations - GLC Ti (ng/m³) Maximum Daily

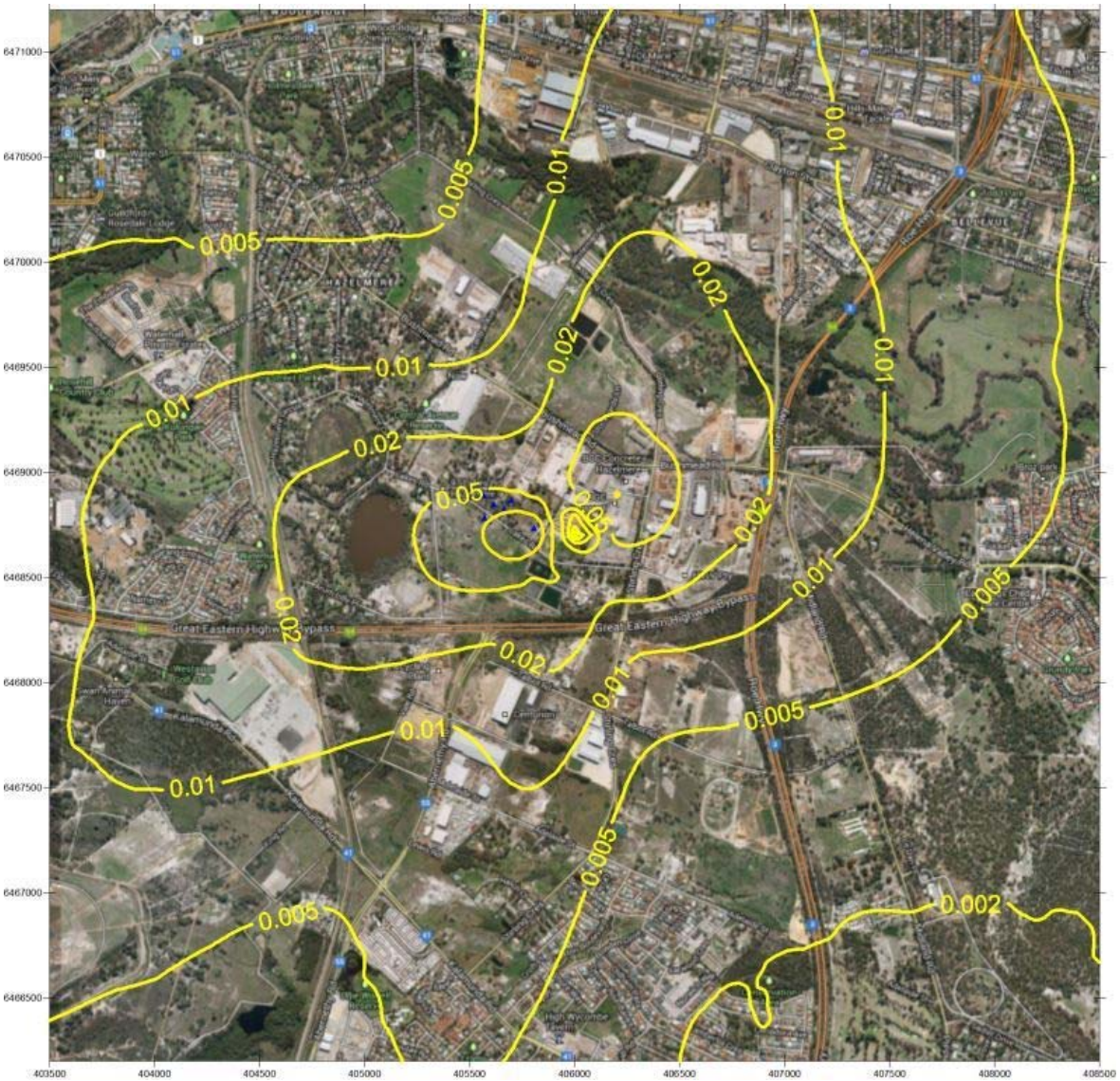

Figure 229: Bypass Operations - GLC Ti (ng/m³) Annual average

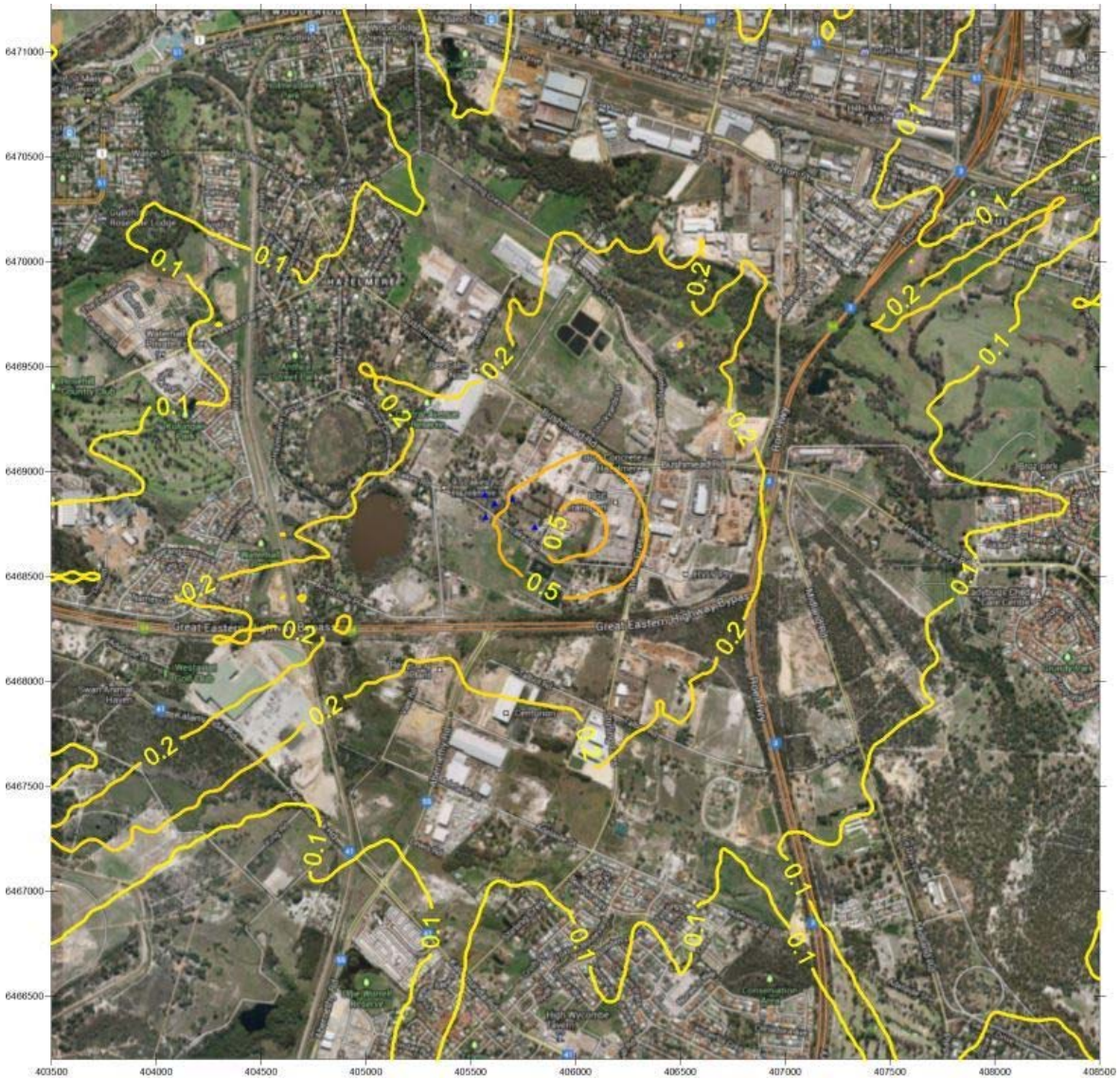

Figure 230: Bypass Operations - GLC VOC (µg/m³) Maximum Hourly

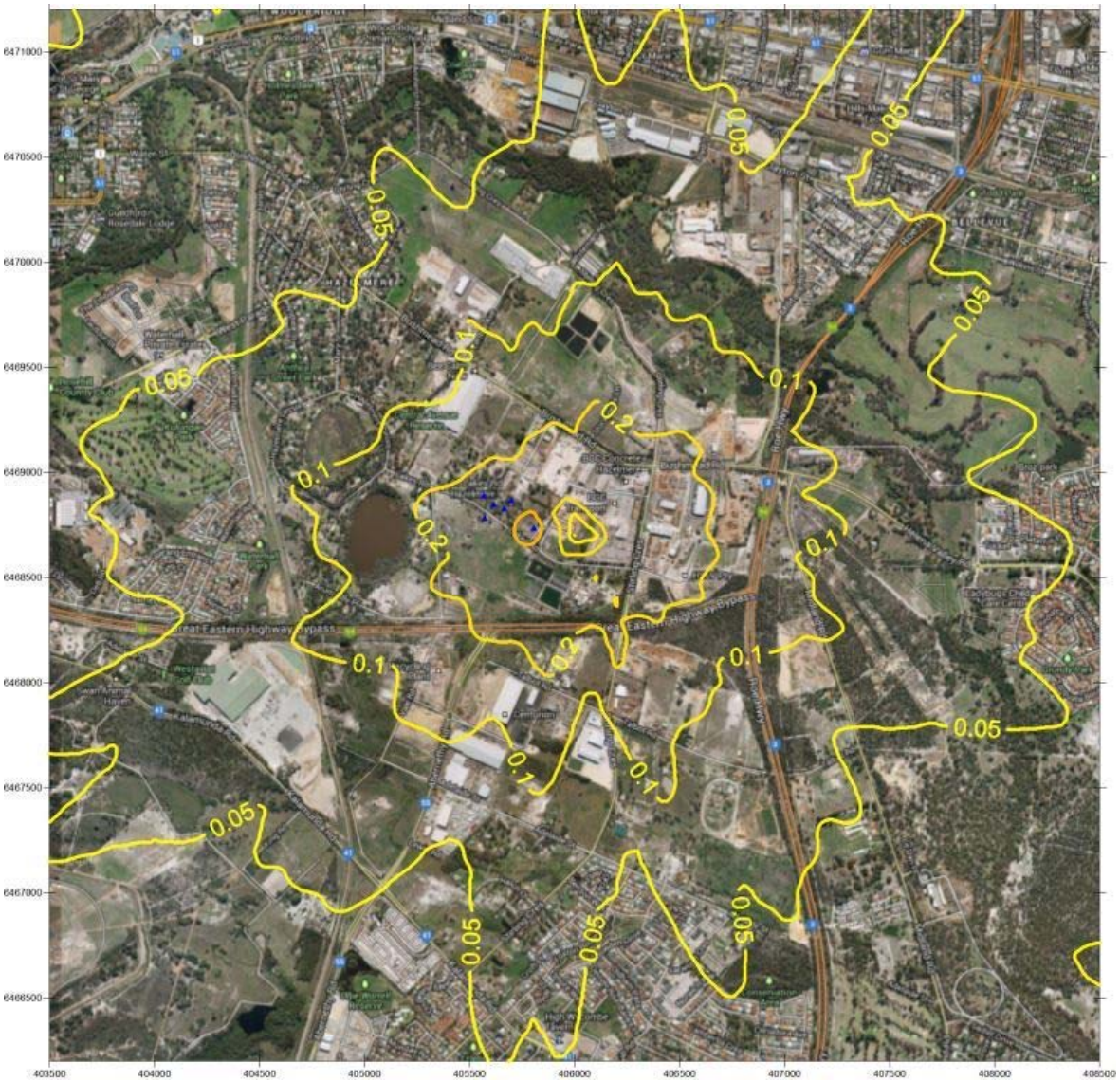

Figure 231: Bypass Operations - GLC VOC (µg/m³) Maximum 8-Hourly

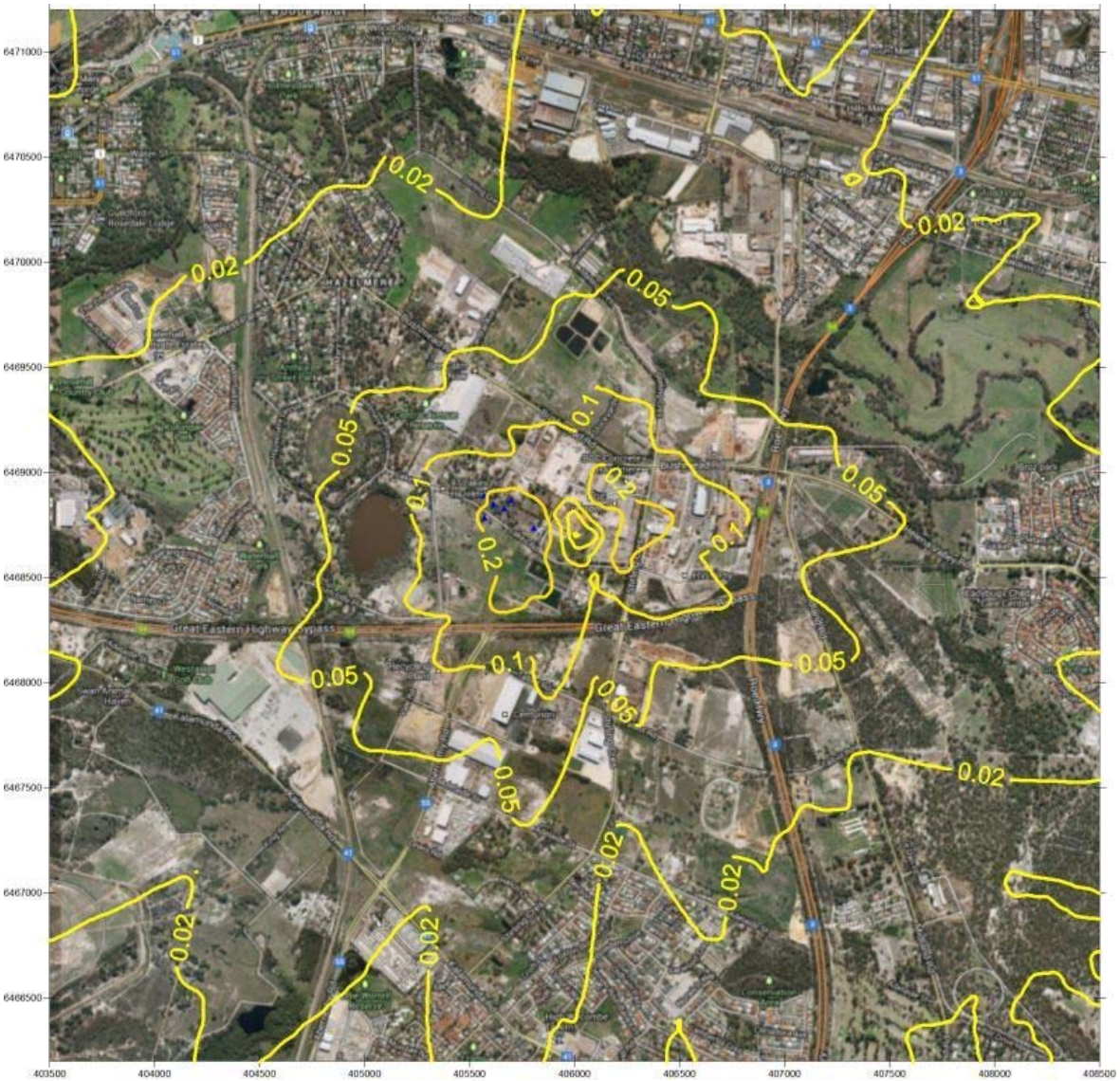

Figure 232: Bypass Operations - GLC VOC (µg/m³) Maximum Daily

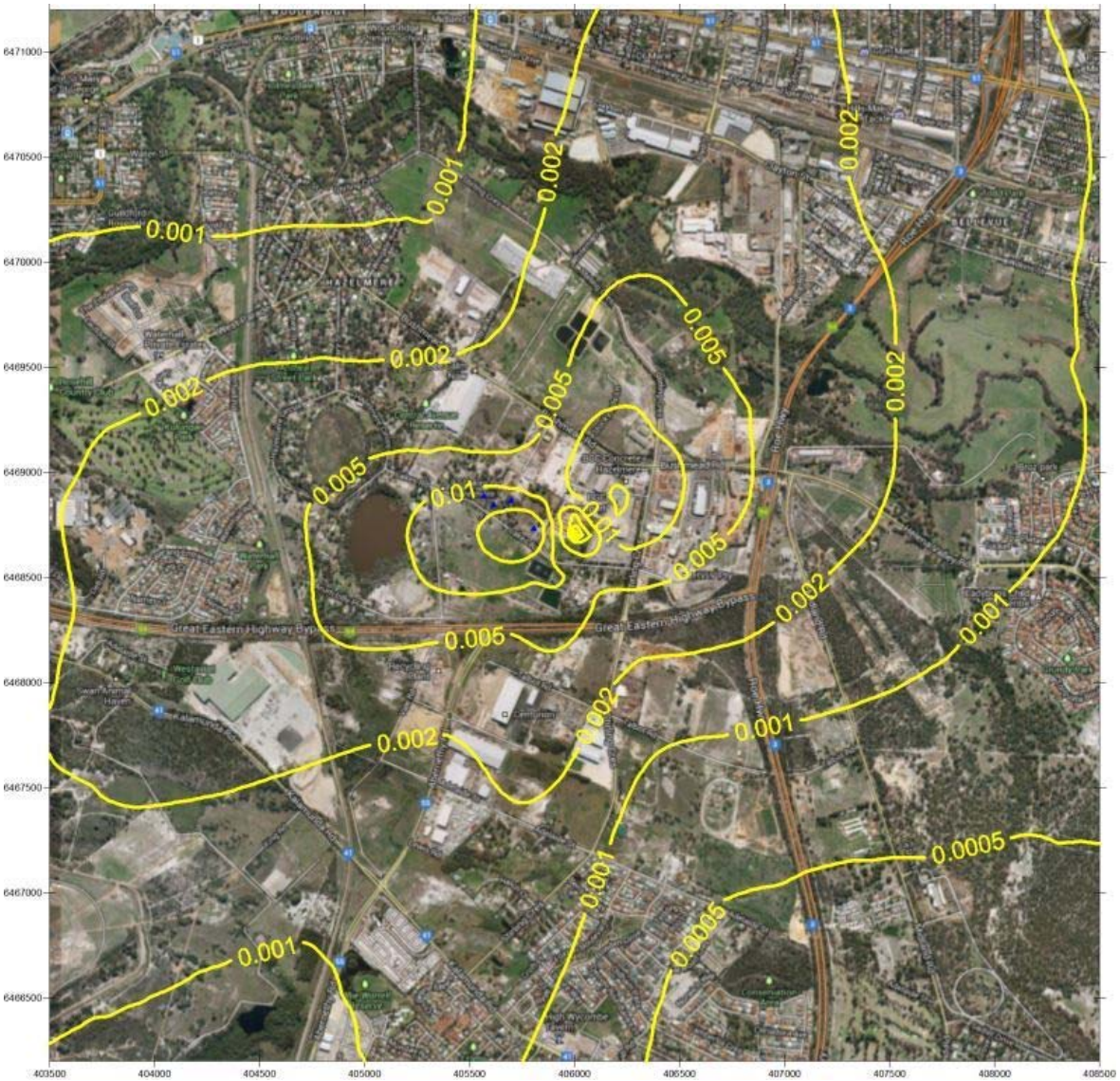

Figure 233: Bypass Operations - GLC VOC (µg/m³) Annual average

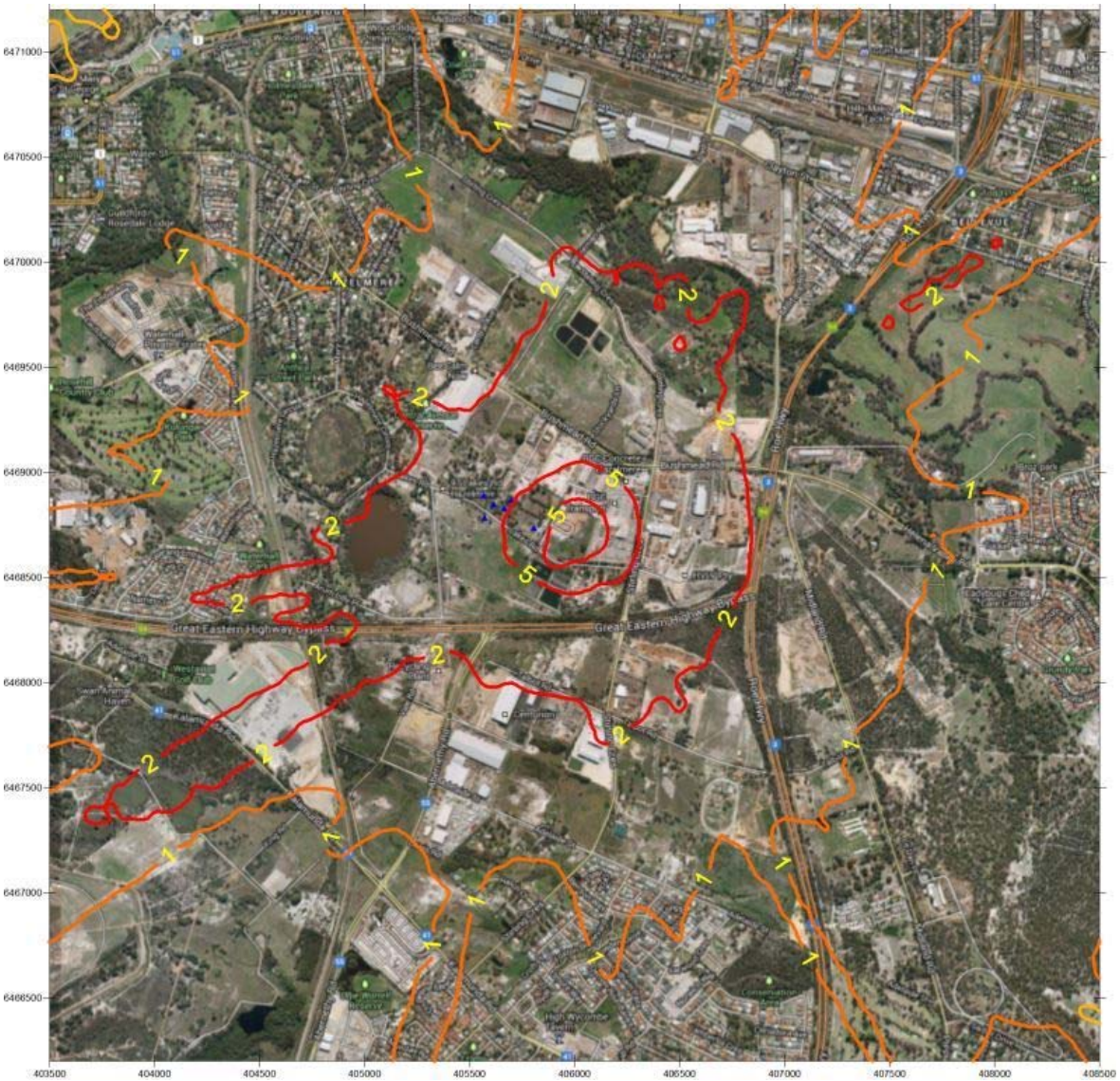

Figure 234: Bypass Operations - GLC V (ρg/m³) Maximum Hourly

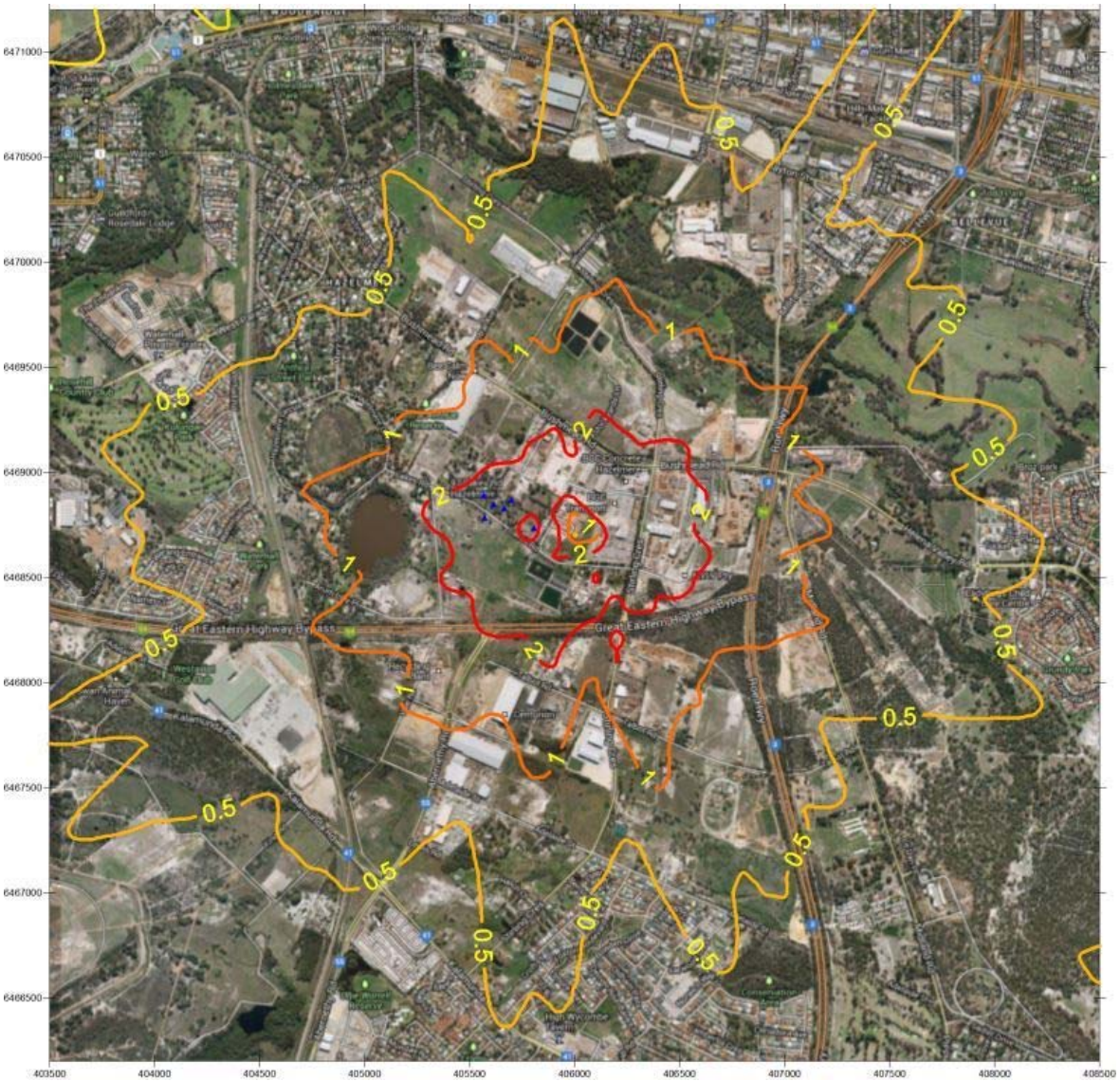

Figure 235: Bypass Operations - GLC V (ρg/m³) Maximum 8-Hourly

Figure 236: Bypass Operations - GLC V (ρg/m³) Maximum Daily

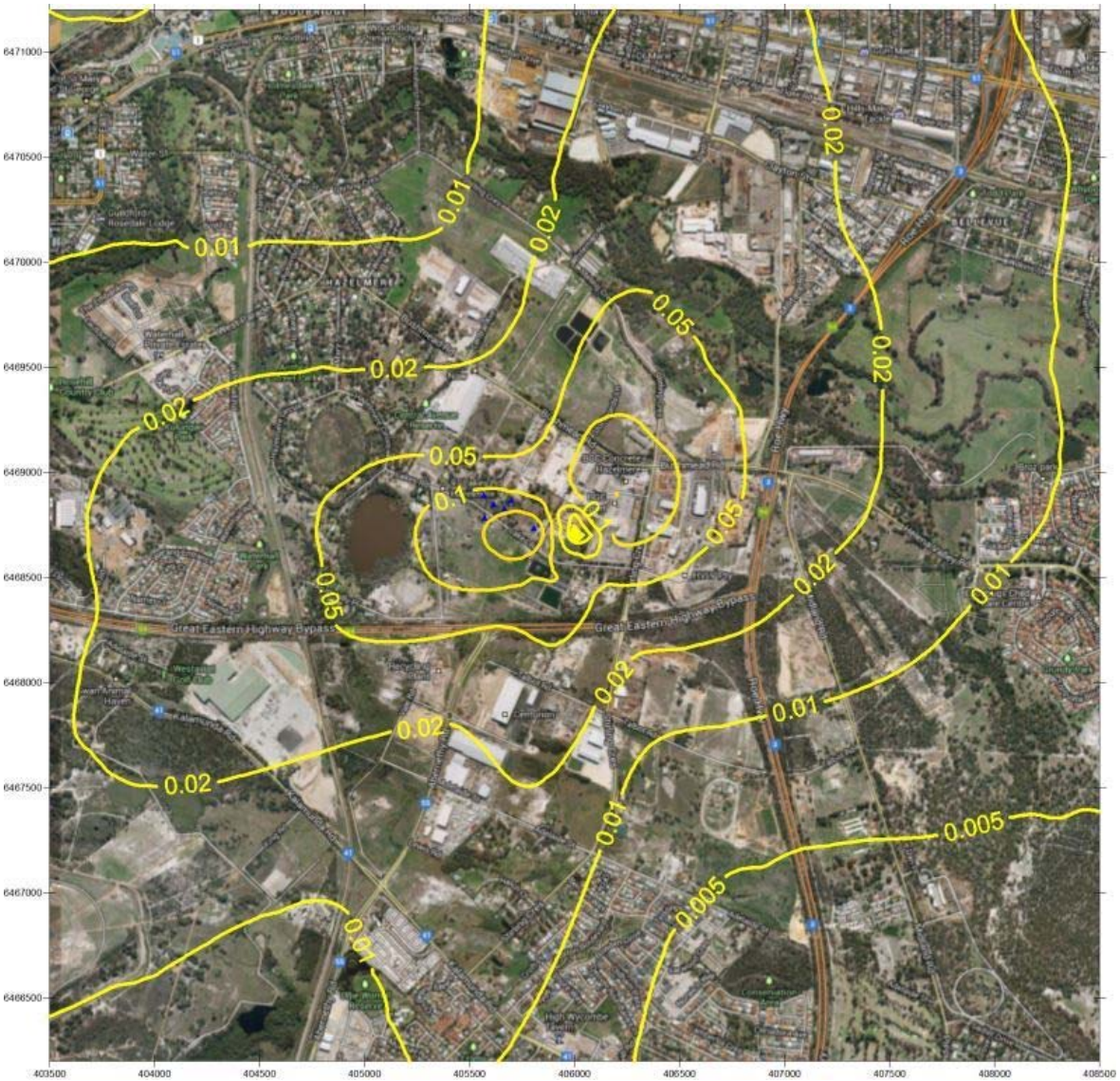

Figure 237: Bypass Operations - GLC V (ρg/m³) Annual average