Attachment I.1

- SCREENING DISPERSION MODEL

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Screening Air Dispersion Report

For

G Bruss GmbH Dichtungstechnik Ltd

Document Number 1461-08 v2.00

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Where it is a requirement that this report be issued to a regulatory or other authority, then the client should sign the appropriate place in the above table and, unless specifically agreed in writing to the contrary, forward copies to the appropriate authority (e.g. EPA).

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1 Executive Summary

G Bruss GmbH Dichtungstechnik Ltd has five air emission points at their facility in Finisklin Road, Sligo. A2-1 to A2-4 are emission points from the Curing Oven Process Stacks. A2-5 is the sole stack from the Gleitmo Coating process. Rubber Fume (particulates) and VOC and Dibutyl Tin emissions from the facility were the main focus of this study.

- For rubber fume particulates the result from an air dispersion screening model gives maximum concentrations at the nearest environmental receptor, that are lower than the Air Quality Standards (based on Directive 2008/50/EC).

- For the VOCs, when treated as benzene as per EPA guidance, the maximum concentrations at the nearest environmental receptor are significantly breached. However, the constituents of the VOCs, when compared with accepted occupational exposure limits are significantly below those limits.

- Dibutyl Tin is also below the Air Quality Standards.

It is concluded that the emissions from the stacks do not adversely impact the local air quality or pose a health risk. Therefore an advanced dispersion model is not required at this time.

1.1 Tables of Summary

1.1.1 Results from Merged Oven Stacks (A2-1 to A2-4)

Table 1 Summary of Results. All plant, Rubber Fume (Particulates) mg/m^3

	AQS
Max Predicted Ground Level Concentration (30m)	0.03
Nearest Sensitive Receptor (approx. 300m)	0.0086
Limit	**0.05** Note 1

1.1.2 Results from Gleitmo Stack (A2-5)

1.1.2.1 Speciated VOC: Propan-2-ol

Table 2 Summary of Results. All plant, Propan-2-ol mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.12	0.12
Nearest Sensitive Receptor (approx. 300m)	0.02	0.02
Limit	**0.005** Note 2	**24.0** Note 3

1.1.2.2 Speciated VOC: hydrocarbons circa C8 to C10

Table 3 Summary of Results. All plant, hydrocarbons circa C8 to C10 mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.084	0.084
Nearest Sensitive Receptor (approx. 300m)	0.02	0.014
Limit	**0.005** Note 2	**2.9** Note 5

1.1.3 Dibyutyl-Tin

Table 4 Summary of Results. All plant, Dibutyltin note 2 mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.0003	0.0003
Nearest Sensitive Receptor (approx. 300m)	0.0005	0.00005
Limit	**0.005** Note 2	**0.1** Note4

Note 1: Air quality standard mg/m3 (Directive 2008/50/EC)
Note 2: EPA AG4 Appendix K: "When modelling unidentified / semi-quantified mixtures of volatile organic compounds (VOCs), a worst-case approach may be to assume that all emissions are in the form of benzene"
Note 3: 1/40th OSHA Regulation 29CFR1910.1000
Note 4: 1/40th US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Note 5: 1/40th NL SCOEL/SUM/87

2 Introduction

G. Bruss Ltd commissioned Environmental Efficiency Consulting Engineers to conduct a Screening Air Dispersion Report. The purpose of the report was to assess the impact of air emissions from five point source locations at the G. Bruss Ltd facility on Finisklin Road, Sligo, Co. Sligo.

G. Bruss Ltd made an application to the Environmental Protection Agency (EPA) for the addition of the coating process at the Gleitmo coating process stack (A2-5) to their site permit. Volatile Organic Compound (VOC) and Dibutyl Tin emissions from the Gleitmo Coating process stack (**A2-5)** as well as Rubber Fume (particulate) emissions from the Curing Oven Process Stacks **(A2-1 to A2-4)** were assessed.

2.1 Description of the Project

G.Bruss GmBH., Finisklin Road, Sligo, is a subsidiary of G.Bruss GmbH & Co. KG., Hamburg, Germany. The company was established in Sligo in 1981 and commenced manufacturing radial symmetric seals, precision rubber formparts and gaskets for the export market in March 1982. The Gleitmo process involves the application of a solvent based coating using a spray gun and a wash drum. The 95,800 sq. ft. site area (67,200 sq. ft. of buildings) employs 300 people.

There are no parks or amenity areas in the vicinity of the building. There is an SAC a SPA and a proposed NHA approximately 300m to the NE of the premises.

- Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (Site Code: 000627)
- Cummeen Strand SPA (Site code: 004035)
- Cumeen Strand/Drumcliff Bay (Sligo Bay) Proposed NHA (Site Code 000627)

3 Methodology

Screen View is a US EPA air dispersion-screening modelling programme for single stationary sources. The Irish EPA Air Guidance Note 4 (AG4) states that a screening model is a simple tool for the conservative assessment. Where the results of the screening model predict exceedances of air quality standards, then more advanced models are used.

Terrain modelling was not taken into account as the area surrounding the plant is flat.

The programme is used to estimate the maximum 1 hr average ground level concentration that can potentially be emitted from the stack. These emissions are termed the Process Contribution.

The screening model was run using emission values that were obtained from onsite sampling of the emissions from 5 stacks during normal production.

Input data used in this report was from Environmental Efficiency Stack Monitoring Reports *1461-05 v1.00* and *1461-06 v1.00*. This details the sampling that had taken place out on the 10/07/2014. Results will compared with the Ambient Air Quality Standards as set out in Appendix K of AG4.

The screening model was run for parameters:

Process	Parameter	Emission point
Merged Curing Oven Process	Rubber Fume (particulates)	A2-1 to A2-4
Gleitmo Coating Process	Total VOC's (incl. target VOC propan-2-ol)	A2-5
	Dibutyl Tin	

3.1 Merged Curing Oven Stack Representation (A2-1 to A2-4)

Stacks that emit the same pollutant with similar exit parameters and which are within about 100m of each other may be analysed by treating all of the emissions as coming from a single representative stack. The Curing Oven Process Stacks (A2-1 to A2-4) were all tested for the same pollutant (Particulates). To determine the appropriate parameters to use for the "representative" stack, calculate the parameter M for each stack:

M = (Hs V Ts) / Q

Where:

- M = merged stack parameter which accounts for the relative influence of stack height, plume rise , and emission rate on concentrations
- Hs = stack height [m]
- V = (pi/4) Ds^2 v = stack gas volumetric flow rate (m^3/s)
- Ds = inside stack diameter [m]
- v = stack gas exit velocity [m/s]
- Ts = stack gas exit temperature [K]
- Q = pollutant emission rate [g/s]

The stack that has the lowest value of M is used as a "representative" stack.

Stack	ESP	Diameter	m/s	Stack h	m3/hr	Conc	g/s	Temp oC	V	M
A2-1	8	0.29	6.5	9.5	2969	4.1	0.003381	45	0.42912	71385.5
A2-4	3	0.34	11.5	9.5	2157	5.4	0.003236	49	1.043579	197555.9
A2-2	4	0.48	4.7	9.5	4435	3.6	0.004435	46	0.850061	110210.8
A2-3	2	0.34	9.8	9.5	1284	10.4	0.003709	61	0.889311	182809.0

A2-1 will therefore be the "representative" stack for Rubber Fume (particulates).

The "representative" stack will have the following parameters:

- emission rate [g/s] -> Q= Q1 + Q2 + ... + Qn (sum of the emissions from all stacks) 0.014761
- stack height [m] -> hs1 (stack height of the "representative" source) 9.5
- stack gas volumetric flow rate [m3/s] -> V1 (stack gas volumetric flow rate from "representative" source) 2,969 m3/hr (0.8247 m3/s)
- stack gas exit temperature [K] -> Ts1 (stack gas exit temperature from "representative" source) 45°C (318.15°K)

3.2 Gleitmo Coating Process Stack (A2-5)

Gleitmo Coating Process Stack emissions were screened separately. Total VOC's (incl. target VOC Propan-2-ol) emissions were screening along with Dibutyl Tin.

In the event that total VOC's breach the EPA's recommended limit value, speciated results will be modelled separately in to their constituents:

- propan-2-ol
- unresolved aliphatic/cyclic hydrocarbons circa C8 to C10

3.3 Building Downwash

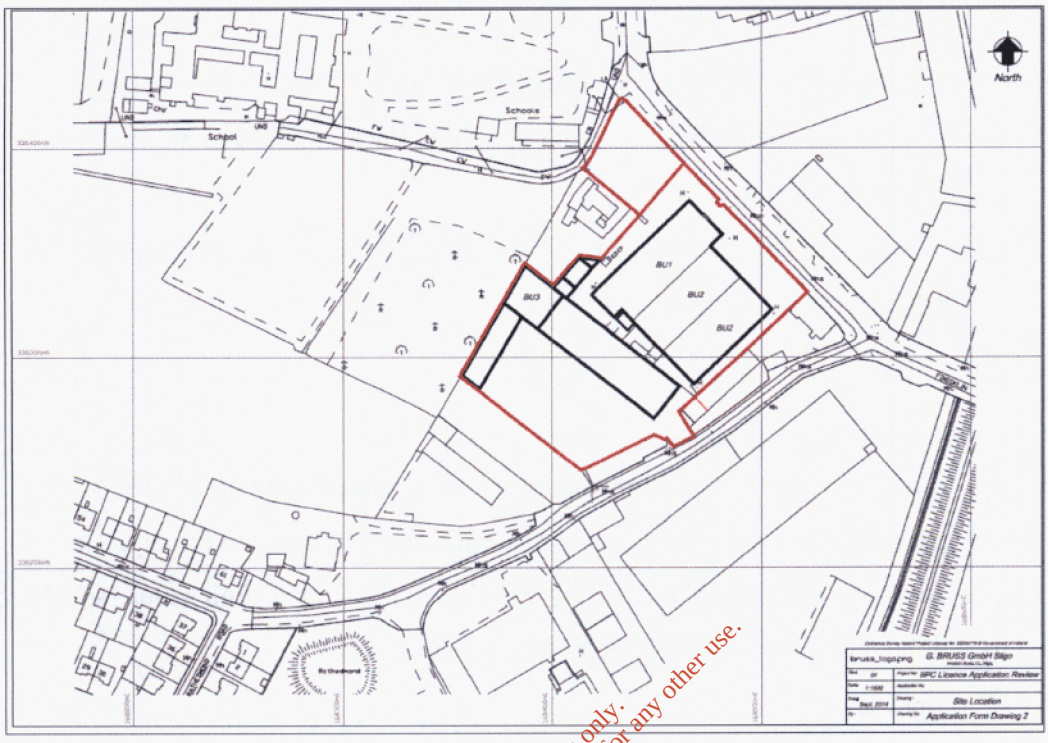
The US EPA Document "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised" gives a simple rule to evaluate whether building downwash has to be taken into account in the screening model:

"$h_s \geq h_b + 1.5\ L_b$

Where h_s is the stack height, h_b is the building height and L_b is lesser of either building height or maximum projected building width. In other words, if the stack height is equal to or higher than $h_b + 1.5\ L_b$, downwash is unlikely to be a problem."

The dimensions of the building(s) are as follows:

Height (m)	Length (m)	Width (m)	$h_b + 1.5\ L_b$	Stack height (m)	Downwash
8.85	64.5	56.52	93.63	9.5	Yes



Site Plan

4 Results from Merged Oven Stacks (A2-1 to A2-4)

4.1 Rubber Fume Particulates

Input data

SOURCE TYPE	POINT
EMISSION RATE (G/S)	0.014761
STACK HEIGHT (M)	9.50
STACK INSIDE DIAM (M)	0.29
STACK EXIT VELOCITY (M/S)	12.53
STACK GAS EXIT TEMP (K)	318.15
AMBIENT AIR TEMP (K)	293
RECEPTOR HEIGHT (M)	0
URBAN/RURAL OPTION	Urban
BUILDING HEIGHT (M)	8.85
METEOROLOGICAL DATA	Full

Summary of Results

Dist (m)	Conc. (µg/m^3)	Plume Ht (m)	Downwash
10	0	0	Not Applicable
20	0	0	Not Applicable
30	**34.47**	**9.62**	**Yes**
40	33.81	9.76	Yes
50	32.53	9.90	Yes
75	27.63	10.36	Yes
100	22.03	10.95	Yes
150	13.49	11.17	Yes
300	8.60	13.18	Yes
600	5.77	14.78	Yes
900	4.71	18.00	Yes
1,200	3.92	18.00	Yes
1,500	3.23	18.00	Yes

Distance to max concentration: 30 m
Max concentration: 34.47 µg/m^3 (0.03 mg/m^3)
Concentration at nearest receptor: 8.60 µg/m^3 (0.0086 mg/m^3)
Limit value: 5.00 µg/m^3 (0.005 mg/m^3)

Comment: Results below AQS limit value.

= Nearest environmental receptor

5 Results from Gleitmo Stack (A2-5)

5.1 Total VOC (incl. target VOC Propan-2-ol)

Input data

SOURCE TYPE	POINT
EMISSION RATE (G/S)	0.0393
STACK HEIGHT (M)	9.50
STACK INSIDE DIAM (M)	0.3
STACK EXIT VELOCITY (M/S)	12.53
STACK GAS EXIT TEMP (K)	293.15
AMBIENT AIR TEMP (K)	293
RECEPTOR HEIGHT (M)	0
URBAN/RURAL OPTION	Urban
BUILDING HEIGHT (M)	8.85
METEOROLOGICAL DATA	Full

Summary of Results

Dist (m)	Conc. (µg/m^3)	Plume Ht (m)	Downwash
10	0	0	Not Applicable
20	0	0	Not Applicable
30	**410.5**	**9.51**	**Yes**
40	365.5	9.51	Yes
50	327.5	9.51	Yes
75	251.6	9.51	Yes
100	196.2	9.51	Yes
150	134.1	9.51	Yes
300	68.42	9.51	Yes
600	32.94	9.51	Yes
900	20.58	9.51	Yes
1,200	14.44	9.51	Yes
1,500	10.86	9.51	Yes

Distance to max concentration: 30 m
Max concentration: 410.5 µg/m^3 (0.411 mg/m^3)
Concentration at nearest receptor: 68.42 µg/m^3 (0.068 mg/m^3)
Limit value: 5.00 µg/m^3 (0.005 mg/m^3)

Comment: Result above AQS limit value. Speciated results to be analysed and compared with relevant standards / guideline values.

= Nearest environmental receptor

5.1.1 Speciated VOC: Propan-2-ol

Input data

SOURCE TYPE	POINT
EMISSION RATE (G/S)	0.0083
STACK HEIGHT (M)	9.50
STACK INSIDE DIAM (M)	0.3
STACK EXIT VELOCITY (M/S)	12.53
STACK GAS EXIT TEMP (K)	293.15
AMBIENT AIR TEMP (K)	293
RECEPTOR HEIGHT (M)	0
URBAN/RURAL OPTION	Urban
BUILDING HEIGHT (M)	8.85
METEOROLOGICAL DATA	Full

Summary of Results

Dist (m)	Conc. (µg/m^3)	Plume Ht (m)	Downwash
10	0	0	Not Applicable
20	0	0	Not Applicable
30	**114.9**	**9.51**	**Yes**
40	102.3	9.51	Yes
50	91.69	9.51	Yes
75	70.45	9.51	Yes
100	54.91	9.51	Yes
150	37.55	9.51	Yes
300	19.15	9.51	Yes
600	9.22	9.51	Yes
900	5.76	9.51	Yes
1,200	4.04	9.51	Yes
1,500	3.04	9.51	Yes

Distance to max concentration: 30 m
Max concentration: 114.9 µg/m^3 (0.12 mg/m^3)
Concentration at nearest receptor: 19.15 µg/m^3 (0.02 mg/m^3)

Comment: See discussion

= Nearest environmental receptor

5.1.2 Speciated VOC: hydrocarbons circa C8 to C10

Input data

SOURCE TYPE	POINT
EMISSION RATE (G/S)	0.014761
STACK HEIGHT (M)	9.50
STACK INSIDE DIAM (M)	0.29
STACK EXIT VELOCITY (M/S)	12.53
STACK GAS EXIT TEMP (K)	318.15
AMBIENT AIR TEMP (K)	293
RECEPTOR HEIGHT (M)	0
URBAN/RURAL OPTION	Urban
BUILDING HEIGHT (M)	8.85
METEOROLOGICAL DATA	Full

Summary of Results

Dist (m)	Conc. (µg/m^3)	Plume Ht (m)	Downwash
10	0	0	Not Applicable
20	0	0	Not Applicable
30	**83.56**	**9.51**	**Yes**
40	74.37	9.51	Yes
50	66.67	9.51	Yes
75	51.23	9.51	Yes
100	39.93	9.51	Yes
150	27.31	9.51	Yes
300	13.93	9.51	Yes
600	6.71	9.51	Yes
900	4.19	9.51	Yes
1,200	2.94	9.51	Yes
1,500	2.21	9.51	Yes

Distance to max concentration: 30 m
Max concentration: 83.56 µg/m^3 (0.084 mg/m^3)
Concentration at nearest receptor: 13.93 µg/m^3 (0.014 mg/m^3)

Comment: See discussion

= Nearest environmental receptor

5.2 Dibyutyl-tin

Input data

SOURCE TYPE	POINT
EMISSION RATE (G/S)	0.014761
STACK HEIGHT (M)	9.50
STACK INSIDE DIAM (M)	0.29
STACK EXIT VELOCITY (M/S)	12.53
STACK GAS EXIT TEMP (K)	318.15
AMBIENT AIR TEMP (K)	293
RECEPTOR HEIGHT (M)	0
URBAN/RURAL OPTION	Urban
BUILDING HEIGHT (M)	8.85
METEOROLOGICAL DATA	Full

Summary of Results

Dist (m)	Conc. (µg/m^3)	Plume Ht (m)	Downwash
10	0	0	Not Applicable
20	0	0	Not Applicable
30	**0.31**	**9.51**	**Yes**
40	0.28	9.51	Yes
50	0.25	9.51	Yes
75	0.19	9.51	Yes
100	0.15	9.51	Yes
150	0.10	9.51	Yes
300	0.05	9.51	Yes
600	0.03	9.51	Yes
900	0.02	9.51	Yes
1,200	0.01	9.51	Yes
1,500	0.008	9.51	Yes

Distance to max concentration: 30 m
Max concentration: 0.31 µg/m^3 (0.0003 mg/m^3)
Concentration at nearest receptor: 0.05 µg/m^3 (0.00005 mg/m^3)
Limit value: 5.00 µg/m^3 (0.005 mg/m^3)

Comment: Result below AQS limit value.

= Nearest environmental receptor

6 Evaluation of Results

6.1 Results from Merged Oven Stacks (A2-1 to A2-4)

Table 5 Summary of Results. All plant, Rubber Fume (Particulates) mg/m^3

	AQS
Max Predicted Ground Level Concentration (30m)	0.03
Nearest Sensitive Receptor (approx. 300m)	0.0086
Limit	**0.05** Note 1

6.2 Results from Gleitmo Stack (A2-5)

6.2.1 Total VOC (incl. Propan-2-ol)

Table 6 Summary of Results. All plant, Total VOC (incl. Propan-2-ol) mg/m^3

	AQS
Max Predicted Ground Level Concentration (30m)	0.41
Nearest Sensitive Receptor (approx. 300m)	0.068
Limit	**0.005** Note 2

6.2.1.1 Speciated VOC: Propan-2-ol

Table 7 Summary of Results. All plant, Total VOC (incl. Propan-2-ol) mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.12	0.12
Nearest Sensitive Receptor (approx. 300m)	0.02	0.02
Limit	**0.005** Note 2	**24.0** Note 3

6.2.1.2 Speciated VOC: hydrocarbons circa C8 to C10

Table 8 Summary of Results. All plant, Total VOC (incl. Propan-2-ol) mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.084	0.084
Nearest Sensitive Receptor (approx. 300m)	0.02	0.014
Limit	**0.005** Note 2	**2.9** Note 5

6.2.2 Dibyutyl-tin

Table 9 Summary of Results. All plant, Dibutyltin note 2 mg/m^3

	AQS	OEL/40th
Max Predicted Ground Level Concentration (30m)	0.0003	0.0003
Nearest Sensitive Receptor (approx. 300m)	0.0005	0.00005
Limit	**0.005** Note 2	**0.1** Note4

Note 1: Air quality standard mg/m3 (Directive 2008/50/EC)
Note 2: EPA AG4 Appendix K: "When modelling unidentified / semi-quantified mixtures of volatile organic compounds (VOCs), a worst-case approach may be to assume that all emissions are in the form of benzene"
Note 3: 1/40th OSHA Regulation 29CFR1910.1000
Note 4: 1/40th US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Note 5: 1/40th NL SCOEL/SUM/87

7 Conclusions and Recommendations

7.1 Results from Merged Oven Stacks (A2-1 to A2-4)

The maximum ground level concentration (GLC) of rubber fume particulates was at 30m and is therefore inside the company's facility boundary. The nearest environmental receptor is The Garavogue River which is a permanent channel that flows in to Sligo Bay, it is approx. 300m from the emission point with a GLC of 0.0086 mg/m3 thus below the limit of 0.05 mg/m3.

7.2 Results from Gleitmo Stack (A2-5)

7.2.1 Total VOC's (incl. Propan-2-ol)

Benzene was used as a worst-case-approach limit as set out in the EPA AG4 guidance document. In that document it states that:

"When modelling unidentified / semi-quantified mixtures of volatile organic compounds (VOCs), a worst-case approach may be to assume that all emissions are in the form of benzene. Where this indicates an exceedance of the EU ambient air quality standard, a more detailed assessment will be required in order to determine the main constituents of the mixture and thereafter to assess whether compliance is being achieved with the relevant standards or guideline values for these constituents."

Total VOC's which include the target VOC Propan-2-ol was shown to be above the AQS worst-case-approach limit value for semi-quantified mixtures at the Max Predicted Ground Level Concentration and the Nearest Sensitive Receptor.

After analysing total VOC's (incl. Propan-2-ol) further, it was found that when **Propan-2-ol** was discounted for the remaining VOC's consisted of unresolved **aliphatic/cyclic hydrocarbons circa C8 to C10**. The two VOC's were then separately screened.

7.2.1.1 Propan-2-ol

For propan-2-ol the maximum GLC was again at 30m and therefore inside the company's facility boundary. The nearest environmental receptor is The Garavogue river. A reading of 0.02 mg/m3 shows us that it is still above the "worst-case-approach" limit of 0.005 mg/m3.

Relatively few jurisdictions have established an ambient air quality guideline for propan-2-ol. All existing air quality guideline values appear to be adequately protective of human health. In addition, given the available data on the environmental fate, transport, and effects of propan-2-ol, this compound is not expected to affect the physical properties of the atmosphere, contribute to global warming, deplete stratospheric ozone, or alter precipitation patterns. Propan-2-ol has a relatively low reactivity in photochemical smog situations, and a low potential for ground level ozone formation.

When the result is then compared with the $1/40^{th}$ of the US OSHA Regulation 29CFR1910.1000 (24 mg/m3), propan-2-ol is therefore within the acceptable range.

7.2.1.2 Aliphatic/cyclic hydrocarbons circa C8 to C10

For aliphatic/cyclic hydrocarbons circa C8 to C10, the GLC was 0.084 mg/m3 and the concentration at the nearest environmental receptor was 0.02 mg/m3. When compared to the AQS benzene limit of 0.005 mg/m3 it shows that it is above the limit. After further analysis of relevant occupational exposure limits (2.9 mg/m3) it was found that the concentrations were within the acceptable range.

7.2.2 Dibutyl Tin

Dibutyl Tin was below the AQS for benzene limit and therefore further limit standards were not investigated.

Recommendations

The result from the air dispersion screening model gives maximum concentrations at the nearest environmental receptor are within the relevant statutory standards given in

Section 5. Therefore at the company's current rate of production there are no recommendations to be made. Furthermore, there shall be no requirement for a full Air Dispersion Model at this time.

Map illustrating the plant with the nearest environmental recptor