

**Attachment I.1**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Assessment of Atmospheric Emissions**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## Attachment No. I.1 Emissions to Atmosphere

As part of the application to the EPA for an IPPC licence, Cadbury Ireland commissioned Envirocon Ltd. to undertake an air dispersion modelling exercise on emissions to atmosphere arising from the boiler operations on site.

The objective of the modelling was to predict the impact of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) on the local air quality. The predicted results were compared with the current and future National Air Quality Standards (NAQS) specified in SI No 271 of 2002.

The full text of the Envirocon Ltd ADM Report is contained in Appendix I.1.

The ADMS3 (Atmospheric Dispersion Modelling System Version 3.3, August 2005) air quality dispersion model was used to predict ground level concentrations within about 2km of the boundary of the facility. This model has been developed by CERC (Cambridge Environmental Research Consultants). It is a third generation prediction model that has been approved by the Environmental Protection Agency for modelling studies supporting IPPCL applications.

The model input parameters included building wake effects and three years climatological data from Cork Airport.

### I.1.1 Impact Assessment Sulphur Dioxide (SO<sub>2</sub>)

#### Hourly SO<sub>2</sub>

The predicted 99.7 percentile of hourly SO<sub>2</sub> concentrations due to emissions from both boilers, burning fuel oil at maximum output shows the overall impact near the site boundary and a maximum ground level concentration of 290 µg/m<sup>3</sup> is predicted near the NE boundary of the effluent plant and over the banks of the River Blackwater.

This maximum ground level concentration is 83% of the hourly NAQS limit value. The pattern of ground level contours indicates high levels near the plant due to building wake effects downwind of the main building structures within the Cadbury site.

The hourly 99.7 percentile concentrations at the nearest houses to the East and West of the site boundary are about 100 µg/m<sup>3</sup> or less than 29% of the NAQS limit value.

#### Daily SO<sub>2</sub>

The predicted 99.2 percentile of daily SO<sub>2</sub> concentrations resulted in maximum levels at a similar location near to the NE boundary of the effluent plant to that indicated for the maximum 99.7 percentile of hourly SO<sub>2</sub> levels. Daily concentrations are predicted to be 120-125 µg/m<sup>3</sup> at this location.

Predicted levels at the nearest houses to the site boundary are about 25-50 µg/m<sup>3</sup>, which is 40% of the daily NAQS.

### I.1.2 Impact Assessment Nitrogen Dioxide (NO<sub>2</sub>)

#### Hourly NO<sub>2</sub>

The maximum predicted 99.8 percentile of hourly NO<sub>2</sub> concentrations is about 90 µg/m<sup>3</sup> or 45% of the future hourly NAQS of 200 µg/m<sup>3</sup> near the NE site boundary. The predicted hourly concentrations decrease to below 60 µg/m<sup>3</sup> beyond about 250m from the site boundary. The corresponding maximum 98 percentile concentrations are less than 65 µg/m<sup>3</sup> beyond the site boundary, which is less than 33% of the current hourly NAQS.

## **Annual NO<sub>2</sub>**

The annual average NO<sub>2</sub> concentrations are predicted to be less than 6 µg/m<sup>3</sup> with maximum values occurring to the north of the site. To the south of the plant, the predicted annual average NO<sub>2</sub> concentrations are less than 2 µg/m<sup>3</sup>. These predicted long-term ground level concentrations are very low and less than 15% of the future annual NAQS of 40 µg/m<sup>3</sup>.

### **11.3 Conclusions**

TBC

There are no other emissions to atmosphere of environmental significance arising from the activity.

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**Appendix I.1.1**  
Envirocon ADM Report

ENVIROCON  
ENVIROCON  
ENVIROCON  
ENVIROCON  
ENVIROCON

**AIR QUALITY IMPACT OF  
BOILER EMISSIONS  
FROM DAIRY PRODUCT FACILITY**

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**CADBURY IRELAND LTD  
RATHMORE CO. KERRY**

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ENVIROCON  
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**AIR POLLUTION  
AND  
ENVIRONMENTAL CONSULTANCY**

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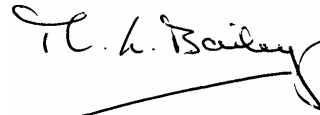
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Date: 8 DECEMBER 2006

Report By: Michael L. Bailey



## 1.0 INTRODUCTION

Cadbury Ireland Ltd is applying to the Environmental Protection Agency for an IPPC Licence for the manufacture of chocolate crumb at their industrial facility near Rathmore, Co. Kerry. The process heat and steam requirements for the crumb process is provided on site by 2 oil-fired boilers burning heavy fuel oil and the exhaust emissions from these boilers are discharged to atmosphere via separate flues from a single 34m exhaust stack.

As part of the licensing of the manufacturing plant, a detailed air quality modelling study was undertaken in relation to predicting the impact of sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) on the local air quality. The predicted results were compared with the current and future National Air Quality Standards (NAQS) specified in SI No 271 of 2002.

## 2.0 EMISSION SOURCES

### 2.1 Location

The Cadbury plant is located about 1km to the east of the village of Rathmore and is situated near the River Blackwater. This river flows eastwards along a valley about 10km wide, with the ground near the plant site about 130-135m O.D. The grade across the site is generally flat, apart from a 3-4m rise between the site of the boiler house up to the R582 road that borders the southern boundary. There are a small number of houses within 0.5km of the southern plant boundary. To the north of the main production building area of the plant, the Kilarney-Mallow railway line separates the effluent treatment plant located on the bank of the River Blackwater, from the rest of the Cadbury site. The land to the north and east of the site is mainly arable farming with no housing within 0.5km of the boundary.

### 2.2 Emission Sources

**Table 1**  
**Emission characteristics of the boiler stack**

Boiler Exhaust Flues	Ht (m)	Diameter (m)	Exhaust Volume (Nm <sup>3</sup> /h) <sup>(b)</sup>	Exit T. (°C)	Exit Vel (m/s)	SO <sub>2</sub> (g/s)	NO <sub>x</sub> (g/s)
Boiler No 2	34.0	0.95	12,580	220	9	4.3	2.4
Boiler No 3	34.0	0.95	18,000	215	12	6.0	3.0
Combined (A1-1)	34.0	1.33 <sup>(a)</sup>	30,580	217	11	10.3	5.4

Note: (a) Equivalent stack diameter based on diameters of the 2 flues. (b) Exhaust flows as discharged Nm<sup>3</sup>/h and uncorrected for O<sub>2</sub>% reference conditions.

Emission data for the exhaust flues of the boilers was obtained from a manual emissions monitoring programme undertaken in August 2006 (Wright Environmental Services) to measure exhaust flows and emission concentrations in the flue gas from each of the

boilers. Both boiler flues are contained within a single 34m high stack (A1-1), which is located at the NE end of the boiler house.

The exhaust gas volume flows and exit velocities from the two boilers, given in Table 1 are based on high firing with heavy fuel oil for each of the burners in the boilers. In the case of Boiler 2, the exhaust volume flow and corresponding exit velocity of 9 m/s was based on both the burners firing at 90% (Wright Environmental Services Boiler Tests Nos 7 and 9). The SO<sub>2</sub> and NO<sub>x</sub> emissions were calculated from the maximum rate obtained in g/s from the boiler tests. For Boiler No 3, the volume flow and exit velocity given in Table 1 is based on the combination of the two emission measurements obtained when only one of the two burners was firing at maximum load (Wright Environmental Services Boiler Tests 12 and 13). The stack emission data used in the air quality impact assessment was derived from the combined flows from the Boiler No 2 and 3 exhaust flues, with an equivalent stack diameter of 1.33m. The emission rates are based on the summation of those obtained for Boiler No 2 and 3.

It is estimated that for oil-fired boilers, over 95% of the total nitrogen oxides (NO<sub>x</sub>) in the exhaust gas is emitted as nitric oxide (NO) with the remainder (< 5%) emitted as nitrogen dioxide (NO<sub>2</sub>). The mass concentration of NO<sub>x</sub> in the exhaust gases from boilers is more complex compared to SO<sub>2</sub> emissions. It is related not only to the amount of combustion air available and chemistry of the fuel being burnt but also to the temperature within the flame area in the boiler chamber. NO<sub>x</sub> may be formed thermally or from the chemical-bound nitrogen or 'fuel' nitrogen. Thermal NO<sub>x</sub> results from the thermal disassociation and subsequent reaction of nitrogen and oxygen molecules in the combustion air and the quantity formed depends on the combustion temperature.

### **3.0 MODEL REQUIREMENTS**

#### **3.1 Introduction**

The ADMS3 (Atmospheric Dispersion Modelling System Version 3.3, August 2005) air quality dispersion model was used to predict ground level concentrations within about 2km of the boundary of the facility. This model has been developed by CERC (Cambridge Environmental Research Consultants). It is a third generation prediction model that has been approved by the Environmental Protection Agency for modelling studies supporting IPPCL applications.

The ADMS3 model takes account of the substantially improved understanding of the plume dispersion within the atmospheric boundary layer by the use of more complex parameterisation, than used in previous generation models. It uses boundary layer theory based on the Monin-Obukhov length and boundary layer height instead of the categories of atmospheric stability used in the older U.S. EPA dispersion models including ISC3.

#### **3.2 Model Input Requirements**

##### **3.2.1 Emission source characteristics**

Information relating to the stack height, stack diameter, exit velocity and temperature SO<sub>2</sub> and NO<sub>x</sub> emission rates were calculated for the boiler plant (Ref Table 1).

### 3.2.2 Building wake effects

The effect of buildings on the dispersion of emission plumes from nearby stacks can have a significant effect on predicted downwind ground level concentrations, under certain weather conditions. The presence of a building creates turbulence around the structure that can result in the emission plume being caught in this area of turbulence. This zone consists of a recirculating flow region or cavity near the building with a diminishing turbulent wake further downwind. The plume is entrained in the cavity region, bringing it down to ground level, which results in a significant increase in predicted ground level concentrations.

Buildings that are more than 30% of the stack heights being examined should be included in the ADMS3 model. A Preliminary evaluation of the buildings layout within the Cadbury plant was undertaken based on plans and elevations of the various building structures. The structures included in this exercise included the chocolate crumb factory, boiler house (height 9.8m) and sugar storage silo (16.8m) and other smaller storage silos. The crumb factory building is the longest and highest building in the plant and has a maximum height of 13.5m above ground level and dimensions of 62m ( W-E) and 37m ( N-S). Given its bulk, this was the principal building structure likely to affect the dispersion of the emission plume from the boiler stack.

### 3.2.3 Climatological data

Sequential hourly climatological data from the meteorological station at Cork Airport was used in predicting the ground level concentrations near the facility. The three-year period, 1999-2001 was used so that year to year variations in wind speed and direction were taken into account in the modelling, instead of relying on ground level concentration results for just one year. Input parameters for wind speed, direction, cloud cover and air temperature provided values to enable the degree of atmospheric turbulence, or stability within the lower air layers to be calculated. Atmospheric instability occurs due to heating of the ground by solar radiation and this is related to the amount of cloud cover, coupled with the solar inclination which is a function of the time of year. These parameters are computed by the ADMS3 dispersion model.

Long-term wind observations over the period 1962-91 indicate that the prevailing wind direction for the Cork Region is from the SW direction with a secondary maximum for N-NW winds (Fig 1). The lowest frequency is for winds from a direction of 30-90 degrees, i.e. from the NE-E direction. Winds from this direction have an annual incidence of about 8%. The wind speed is over 5 m/s for about 47% of the time with winds exceeding 9 m/s for about 17% of the year. The highest wind speeds are recorded for winds from a westerly direction, which will be most prevalent during the winter months. The incidence of low wind conditions in the region is low, with less than 8% of hourly observations recording wind speeds below 2m/s.

The climatological data for Cork Airport, which is about 60km to the SE of Rathmore, is considered reasonably representative of conditions experienced in the area. This meteorological station is at an altitude of 154m O.D., which is also at a similar altitude to the site, which is about 130m O.D. The overall pattern of wind speed and direction

will also be similar to that experienced in the area near Rathmore as the general W-E alignment of Blackwater valley will tend to result in a prevailing SW-Westerly wind field in the area.

### **3.2.4 Surface Roughness**

The vertical wind profile above the ground is an important parameter in determining the structure of the atmospheric boundary layer near the ground. The Monin-Obukhov length provides a measure of the relative importance of buoyancy generated by heating of the ground and mechanical mixing generated by the frictional effect of the earth's surface. This frictional effect is related both to the surface roughness length and wind speed. The former parameter is supplied as input to the ADMS3 dispersion model and it can vary from 0.001m over open sea to 1.5m in urban areas. It is used in calculating the boundary layer structure, which determines the rate of dispersion of an emission plume both in the horizontal and vertical plane as the plume travels downwind from the stack. A surface roughness length value of 0.3m, which approximates to agricultural areas, was used in the ADMS3 to represent conditions in the Rathmore area.

### **3.2.5 Receptor Grid**

A receptor grid was used with a regular spacing of 900 (30x30) points. The grid covered an area around the site with a grid reference of 116500E, 91500N at the SW corner extending to 119000N, 94500E at the NE corner of the grid. Preliminary modelling to assess the extent of the area of the likely maximum hourly and daily ground level impact from the boiler plant emissions indicated that the highest levels occurred within 0.75 km of the facility. A secondary receptor grid of 1600 receptor points was used for this area, extending from 117800E, 92600N to 118500E, 93150N. This larger scale receptor grid provides an improved resolution to determining compliance with NAQS close to the Cadbury site boundary.

### **3.2.6 Terrain**

The surrounding terrain is relatively flat and with a low slope gradient and so a flat terrain was assumed for the modelling runs. There is height difference N-S across of the site of less than 4m and so this will not affect the dispersion of emissions from the boiler stack. The terrain module in the ADMS3 is generally for assessing the impact of dispersion of the emission plume along slopes of 1:10 or more and so the local terrain near the Cadburys site did not require this additional refinement in the model.

## **3.3 NO<sub>x</sub> and NO<sub>2</sub> Modelling**

As the emission plume from the boiler stack disperses downwind the nitric oxide (NO) component emitted is partially converted to NO<sub>2</sub>. The rate at which this conversion takes place varies with the degree of solar insolation present and atmospheric stability conditions and so changes throughout the day and the year. The conversion rate of NO to NO<sub>2</sub> is generally limited by the level of ozone present. This normally is at a maximum during the summer, with strong sunshine forming convective cells near the ground resulting in unstable conditions.

For modelling the impact of NO<sub>x</sub> emissions from the boiler exhaust stack at the Cadbury plant a constant conversion ratio for NO<sub>2</sub>/NO<sub>x</sub> of 0.6 was used. This ratio was applied to the calculated NO<sub>x</sub> value, irrespective of distance downwind, in calculating the corresponding equivalent NO<sub>2</sub> concentration at each of the receptor locations. This is a conservative approach to modelling the impact of NO<sub>x</sub> emissions, as the actual levels of NO<sub>2</sub> at a specific receptor downwind of the emission stack are likely to be substantially lower, especially close to the source. The rate of conversion of NO within the plume to NO<sub>2</sub> is dependent on the degree of solar radiation and travel time of the pollutant between the emission source and receptor location. As a result, the likely observed maximum NO<sub>2</sub> ground level concentrations at locations close to the boundary will be significantly below those calculated using a conversion ratio of 0.6 and so the modelled results provide a 'worst-case' air quality impact.

## 4.0 RESULTS OF MODELLING STUDY

### 4.1 Introduction

The results of the modelling studies are shown as ground level concentration contour plots, based on the maximum emission load for the boiler exhaust stack described in Section 3.2.1 above. The predicted values are based on the maximum percentile statistic obtained at each of the receptor points within the modelled area over the three separate climatological data-sets used in the study. Two base maps were used on which concentration contours were superimposed; one covering the whole 2.5 x 3 km receptor grid area and a more detailed map showing the site boundary and nearest houses.

**Table 3**  
**National Air Quality Standards (SI No 271 of 2002)**

Pollutant	Criteria	(µg/m <sup>3</sup> )	Compliance Date
SO <sub>2</sub>	Hourly – 99.7% (not to be exceeded more than 24 times per year)	350	1 Jan 2005
	Daily – 99.2% (not to be exceeded more than 3 times per year)	125	1 Jan 2005
NO <sub>2</sub>	Hourly – 99.8% (not to be exceeded more than 18 times per year)	200	1 Jan 2010
	Annual average	40	1 Jan 2010

Predicted ground level SO<sub>2</sub> concentrations were compared with the hourly and daily National Air Quality Standards (NAQS) values specified in the Air Quality Standards Regulations 2002 (SI: No 271 of 2002) (Table 3). These Standards are based on the limit values specified in the EU Council Directive 99/30/EC, which was adopted under the 1996 Framework Directive on Air Quality Assessment and Management (96/62/EC).

In the case of NO<sub>2</sub> concentrations, the current NAQS is an hourly limit value of 200 µg/m<sup>3</sup> expressed as a 98 percentile or 175<sup>th</sup> highest concentration over the year. This air quality limit value is to be replaced from January 1 2010 by a more stringent hourly NAQS of 200 µg/m<sup>3</sup> as a 99.8 percentile, which equates to the 19<sup>th</sup> highest hourly concentration over the year and a corresponding annual average of 40 µg/m<sup>3</sup>. These future NO<sub>2</sub> limit values are specified in the Air Quality Standards Regulations 2002 and are also based on the values contained in the E U Directive 99/30/EC.

## **4.2 Predicted Impact**

### **4.2.1. Sulphur Dioxide (SO<sub>2</sub>)**

#### **4.2.1.1 Hourly SO<sub>2</sub>**

The predicted 99.7 percentile of hourly SO<sub>2</sub> concentrations due to emissions from both boilers, burning fuel oil at maximum output is shown in Figure 2. This shows the overall impact within the 2km of the Cadbury site. The highest predicted ground level concentrations occur near the site boundary, with the 99.7 percentile SO<sub>2</sub> concentrations predicted to be below 50 µg/m<sup>3</sup> beyond about 0.5km downwind of the boundary. Figure 3 shows the concentration contour pattern close to the site and the maximum ground level concentration of 290 µg/m<sup>3</sup> is predicted near the NE boundary of the effluent plant and over the banks of the River Blackwater. This maximum ground level concentration is 83% of the hourly NAQS limit value. The pattern of ground level contours indicates high levels near the plant due to building wake effects downwind of the main building structures within the Cadbury site. The hourly 99.7 percentile concentrations at the nearest houses to the East and West of the site boundary are about 100 µg/m<sup>3</sup> or less than 29% of the NAQS limit value.

#### **4.2.1.2 Daily SO<sub>2</sub>**

The predicted 99.2 percentile of daily SO<sub>2</sub> concentrations are shown in Figures 4 and 5. The concentration pattern shown is similar to that given for the hourly levels with a rapid decrease beyond about 300m from the site boundary. Beyond a distance of approximately 500m from the site the predicted 99.2 percentile of SO<sub>2</sub> concentrations are less than 25 µg/m<sup>3</sup>. The highest ground level concentrations are predicted to occur at near to the NE boundary of the effluent plant with a level of 120-125 µg/m<sup>3</sup> at this location. Predicted levels at the nearest houses to the site boundary are about 25-50 µg/m<sup>3</sup>, which is 40% of the daily NAQS.

### **4.2.2 Nitrogen Dioxide (NO<sub>2</sub>)**

#### **4.2.2.1 Hourly NO<sub>2</sub>**

The predicted 99.8 percentile of hourly NO<sub>2</sub> concentrations in the surrounding area are shown in Fig 6, with maximum levels below about 20 µg/m<sup>3</sup> beyond 500m downwind of the boundary. The maximum predicted 99.8 percentile of hourly NO<sub>2</sub> concentrations is 90 µg/m<sup>3</sup> or 45% of the future hourly NAQS of 200 µg/m<sup>3</sup> near the NE site boundary,

as shown in Figure 7. The predicted hourly concentrations decrease to below 60 µg/m<sup>3</sup> beyond about 250m from the site boundary. The corresponding maximum 98 percentile concentrations near the site boundary are shown in Figure 8 and the levels are less than 65 µg/m<sup>3</sup>, which is less than 33% of the current hourly NAQS.

#### 4.2.2.2 Annual NO<sub>2</sub>

The annual average NO<sub>2</sub> concentrations are predicted to be less than 6 µg/m<sup>3</sup> with maximum values occurring to the north of the site, as shown in Figures 9 and 10. To the south of the plant, the predicted annual average NO<sub>2</sub> concentrations are less than 2 µg/m<sup>3</sup>. These predicted long-term ground level concentrations are very low and less than 15% of the future annual NAQS of 40 µg/m<sup>3</sup>.

### 5.0 CONCLUSION AND DISCUSSION

A detailed air quality dispersion modelling study using the ADMS3 model was undertaken to evaluate the impact of SO<sub>2</sub> and NO<sub>x</sub> emissions from the Cadbury plant on the surrounding air quality. Emissions of SO<sub>2</sub> and NO<sub>x</sub> from the single 34m high boiler exhaust stack was used as input to the dispersion model and these were derived from exhaust flows and emission concentrations based on high-firing on both boilers. These emissions were used to calculate hourly, daily and annual concentration statistics for SO<sub>2</sub> and NO<sub>2</sub> within a local receptor grid.

The approach used to evaluate the air quality impact from the boiler stack emissions was based on a worst-case emission scenario. The exhaust volume flows and emission rates were derived for the simultaneous high-load firing of both boilers. However, only one boiler would tend to operate at maximum load and so the emissions of SO<sub>2</sub> and NO<sub>x</sub> from the boiler exhaust stack will be substantially lower than the values used in the model. In addition, a reduction in boiler demand, arising from variation in process energy requirements throughout the day, for a boiler will reduce the emission rate and this will also result in a lower impact on ground level concentrations than predicted from the modelling study.

**Table 4**  
**Summary of Maximum SO<sub>2</sub> and NO<sub>2</sub> Predicted Concentrations beyond the Site Boundary and Compliance with NAQS**

Pollutant	Criteria	Max Predicted GLC	NAQS (µg/m <sup>3</sup> )	% of NAQS
SO <sub>2</sub>	Hourly – 99.7%	290	350	83
	Daily – 99.2%	120	125	96
NO <sub>2</sub>	Hourly – 99.8%	97	200	49
	Hourly – 98%	60	200	30
	Annual average	6	40	15

*Note: SO<sub>2</sub> NAQS Air Quality Standards Regulations 2002 (SI: 271 of 2002). Hourly 99.8% NO<sub>2</sub> and annual average NAQS limit values compliance date 1 January 2010. Current NO<sub>2</sub> hourly 98% NAQS (SI: 244 - Air Pollution Act, 1987 (Air Quality Standards) Regulations 1987)*

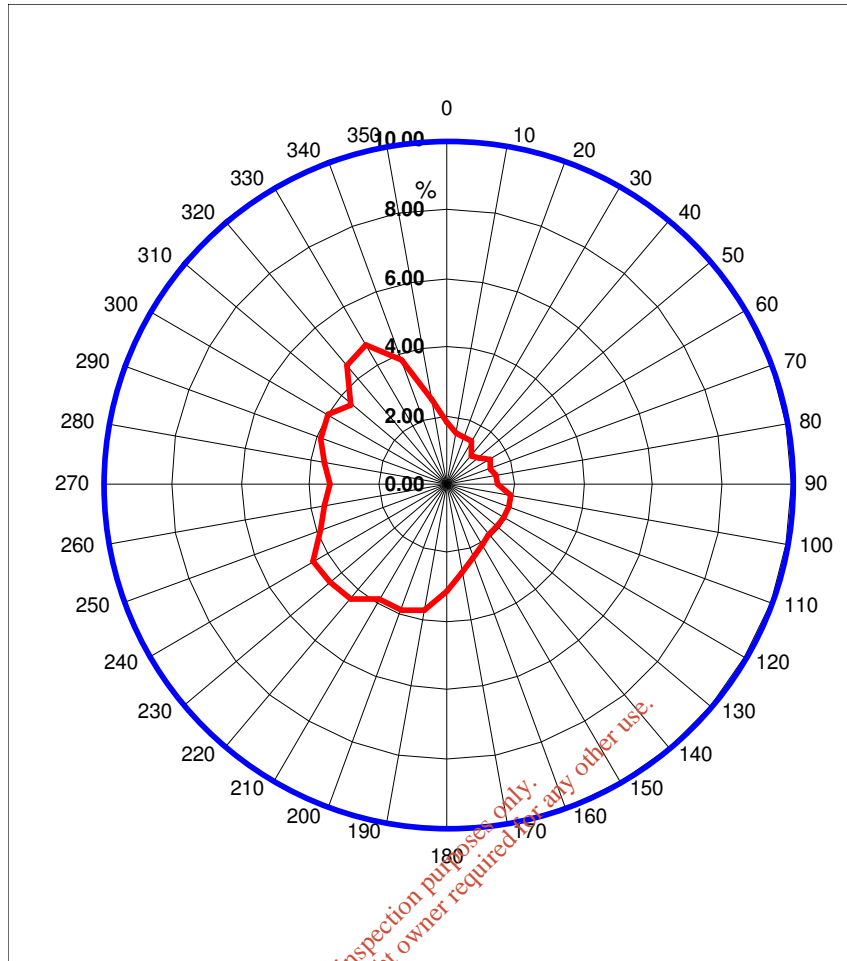
The maximum results of the air quality dispersion model show that maximum hourly and daily SO<sub>2</sub> beyond the Cadbury site boundary occur just to the NE of the site. Table 4 gives the maximum predicted ground level concentrations in relation to the hourly and daily NAQS. Both the corresponding hourly and daily predicted levels are less than the NAQS. These predicted concentrations are based on the maximum continuous emissions from the boiler stack, with both boilers operating near to full load. In reality, this operational scenario is not likely to occur under normal conditions and so observed ambient levels will be significantly lower.

In terms of maximum NO<sub>2</sub> concentrations, these are also predicted to be below 50% of both the current and future NAQS value of 200 µg/m<sup>3</sup>, beyond the site boundary. The hourly concentrations are less than 40% of the current and future NAQS. Corresponding annual average NO<sub>2</sub> concentrations are also very low and 15% of the future NAQS.

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**FIGS 1-10**  
**WIND ROSE AND**  
**AIR QUALITY DISPERSION**  
**MODELLING RESULTS**

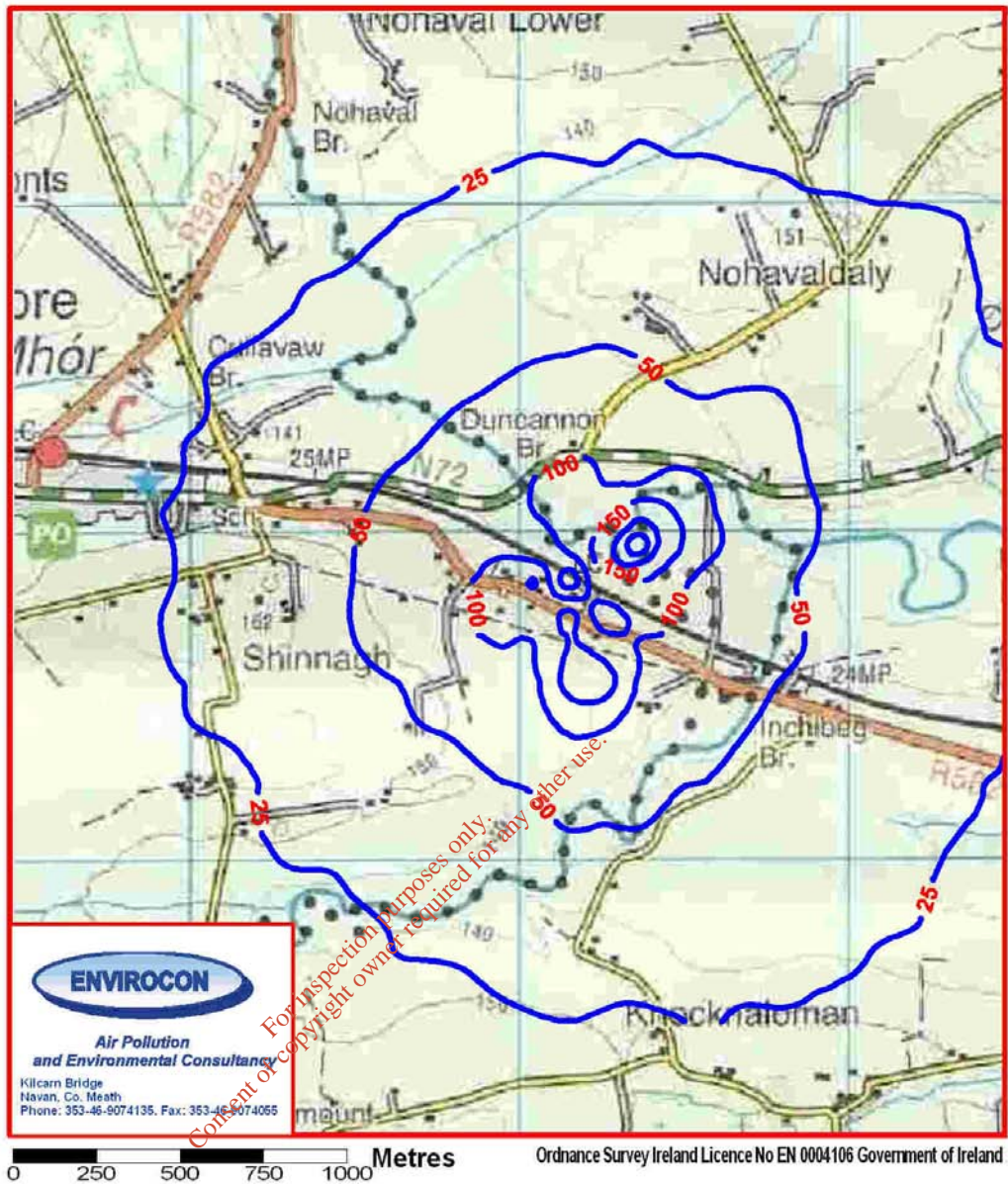
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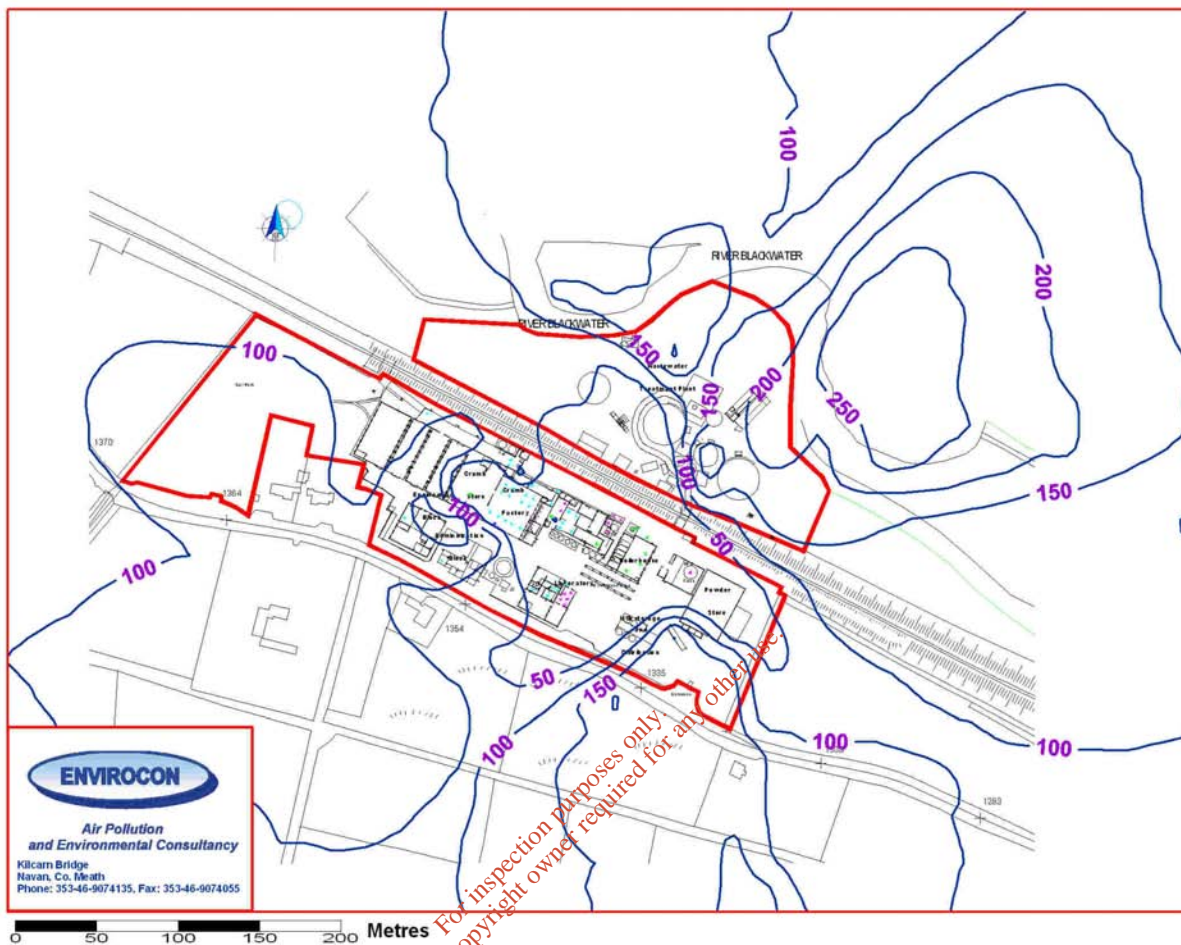
**HOURLY WIND DIRECTION FREQUENCY - ALL WIND SPEEDS**

Direction	Percentage Occurrence of Wind Speeds (m/s)						All
	<2	2-3	3-5	6-8	9-11	>11	
350-10	0.6	1.2	1.9	1.6	0.4	0.0	5.7
20-40	0.6	1.1	1.3	1.0	0.2	0.0	4.0
50-70	0.3	0.8	1.4	1.1	0.3	0.0	3.9
80-100	0.3	0.6	1.3	1.6	0.5	0.5	4.8
110-130	0.5	0.9	1.5	1.7	0.7	0.3	5.6
140-160	0.6	0.9	1.3	1.9	0.8	0.7	6.2
170-190	0.7	1.4	2.2	2.9	1.3	0.8	9.3
200-220	0.6	1.4	2.7	3.9	1.8	1.7	12.1
230-250	0.6	1.7	3.4	4.4	1.7	0.9	12.8
260-280	0.7	2.1	3.3	3.1	0.9	0.5	10.6
290-310	0.8	2.3	3.5	3.3	1.1	0.4	11.4
320-340	0.7	2.3	4.8	3.9	1.0	0.3	13.0
Calms	0.5						0.5
<b>Total</b>	<b>7.3</b>	<b>16.8</b>	<b>28.5</b>	<b>30.3</b>	<b>10.8</b>	<b>6.3</b>	<b>100.0</b>

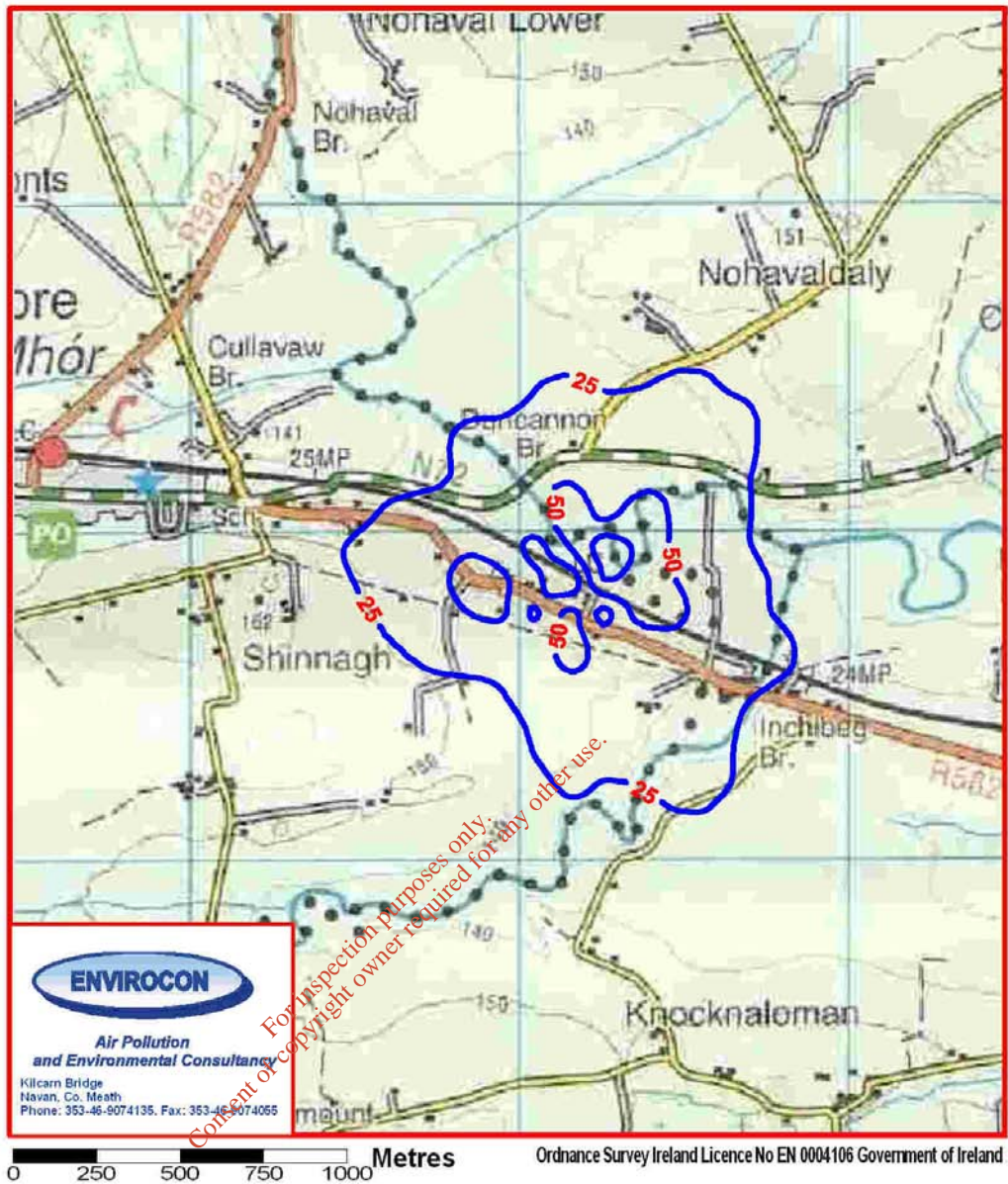
**FIG 1: FREQUENCY OF WIND DIRECTION AND WIND SPEED FOR HOURLY OBSERVATIONS AT CORK AIRPORT, CO. CORK (1962-91)**



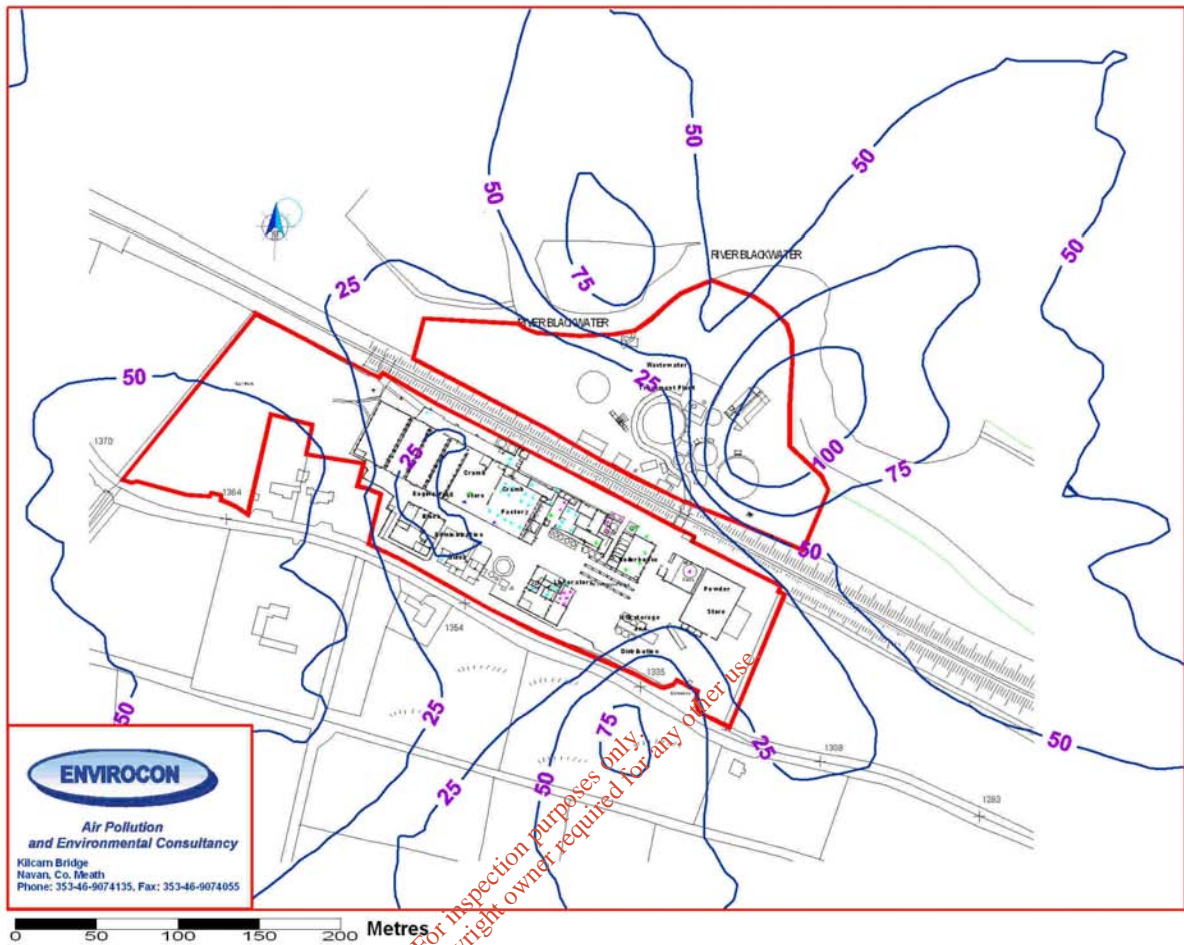
**FIGURE 2: PREDICTED 99.7 PERCENTILE OF HOURLY SO<sub>2</sub> CONCENTRATIONS DUE TO EMISSIONS FROM BOILER EXHAUST STACK OPERATING AT MAXIMUM LOAD. (µg/m<sup>3</sup>)**



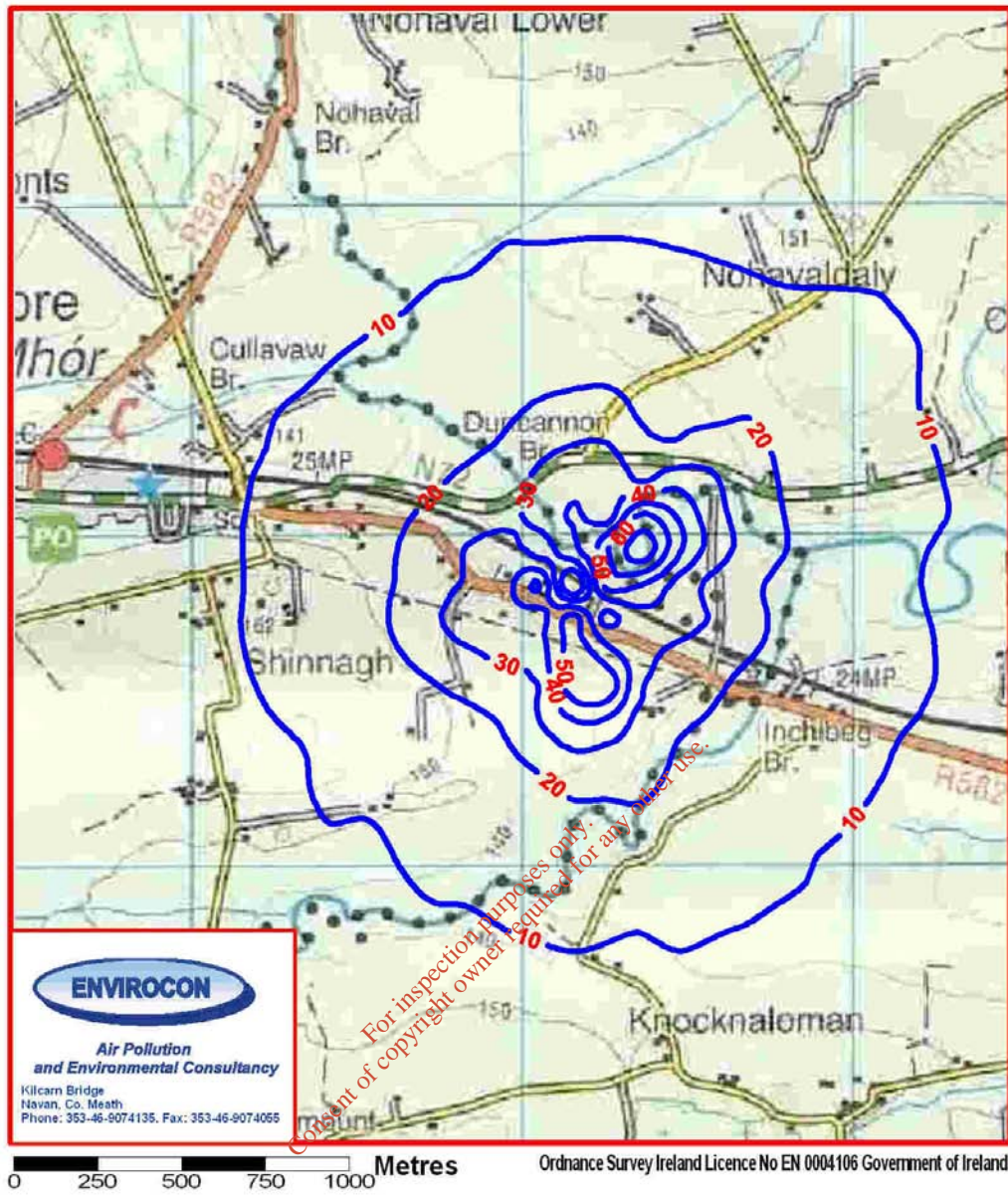
**FIGURE 3: SITE BOUNDARY DETAIL WITH PREDICTED 99.7 PERCENTILE OF HOURLY SO<sub>2</sub> CONCENTRATIONS DUE TO BOILER EXHAUST STACK EMISSIONS, OPERATING AT MAXIMUM LOAD. (µg/m<sup>3</sup>)**



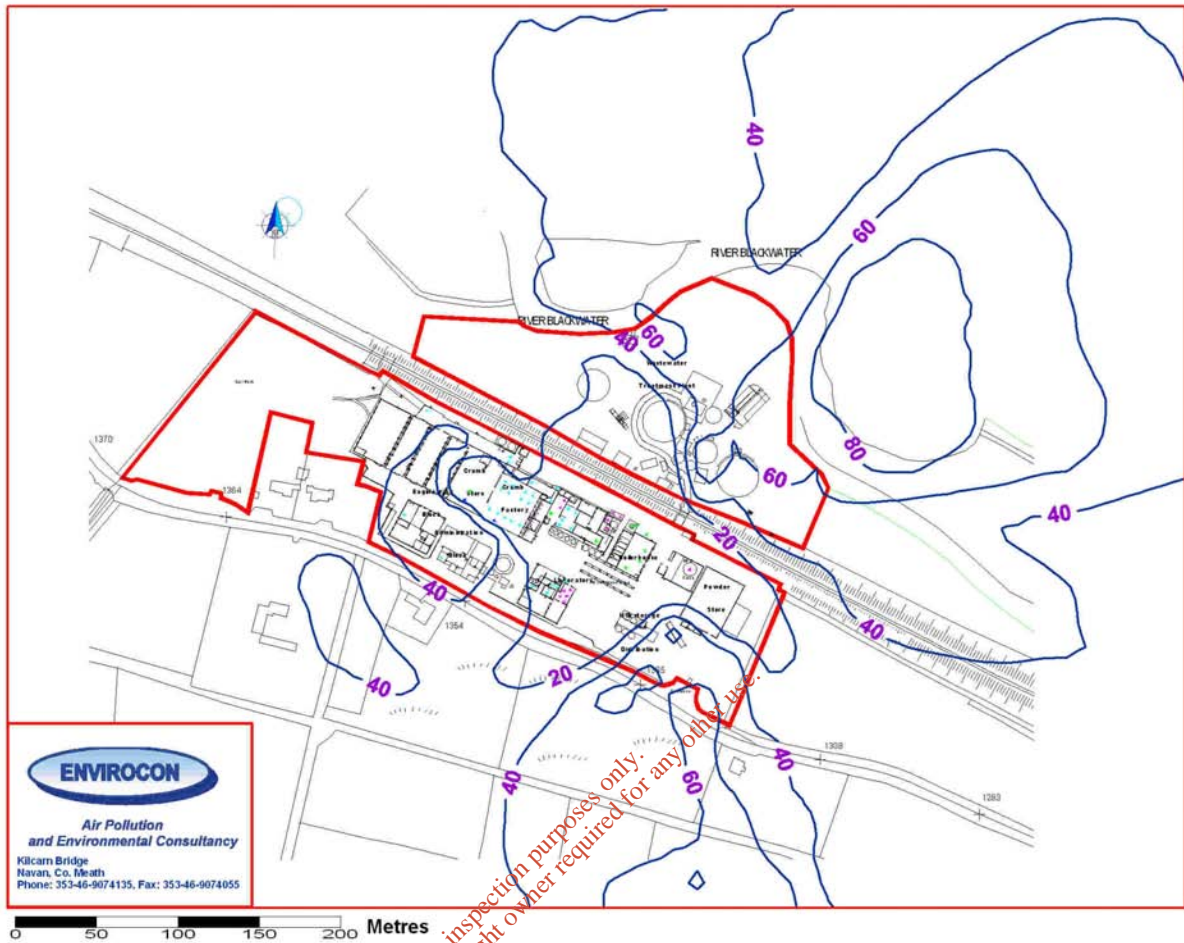
**FIGURE 4: PREDICTED 99.2 PERCENTILE OF DAILY SO<sub>2</sub> CONCENTRATIONS DUE TO EMISSIONS FROM BOILER EXHAUST STACK OPERATING AT MAXIMUM LOAD. ( $\mu\text{g}/\text{m}^3$ )**



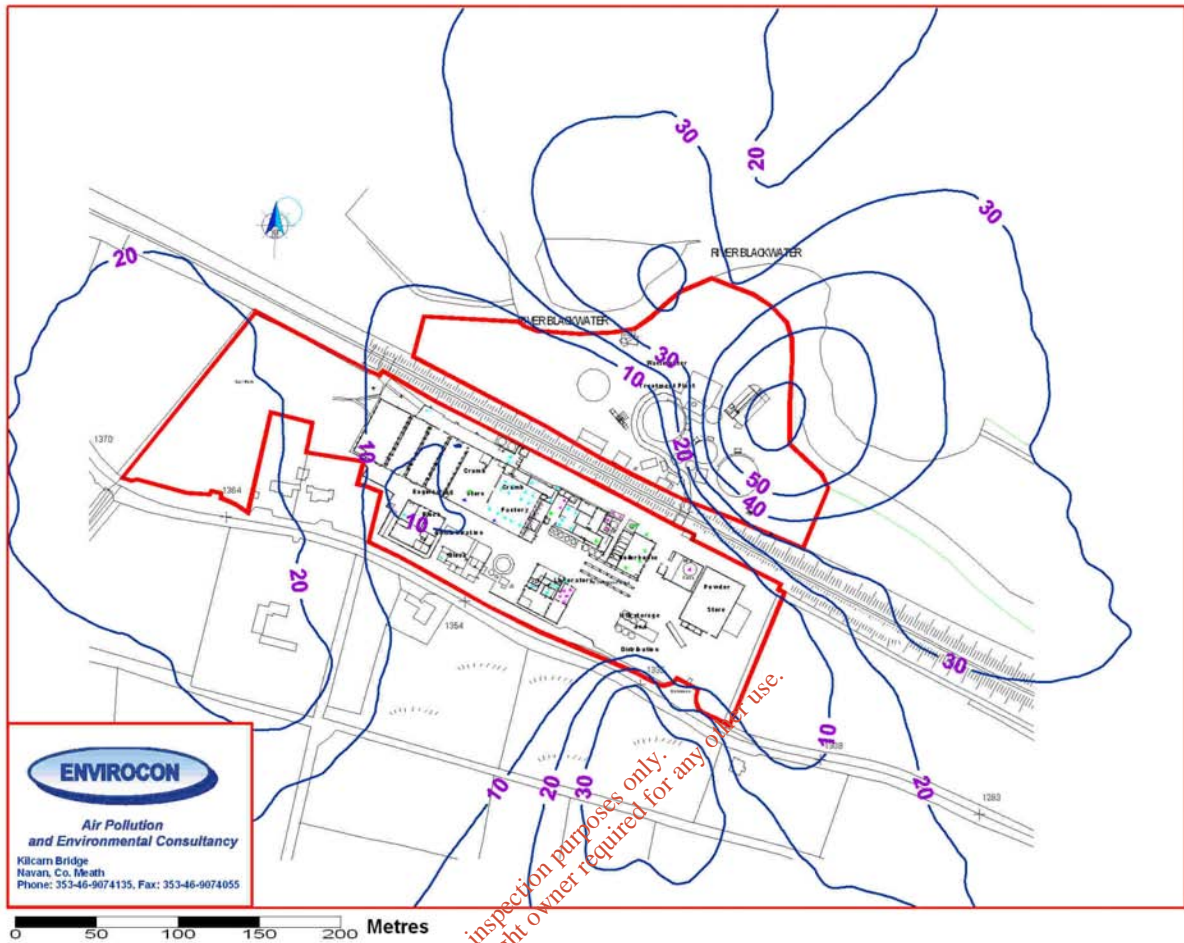
**FIGURE 5: SITE BOUNDARY DETAIL WITH PREDICTED 99.2 PERCENTILE OF DAILY SO<sub>2</sub> CONCENTRATIONS DUE TO BOILER EXHAUST STACK EMISSIONS, OPERATING AT MAXIMUM LOAD. ( $\mu\text{g}/\text{m}^3$ )**



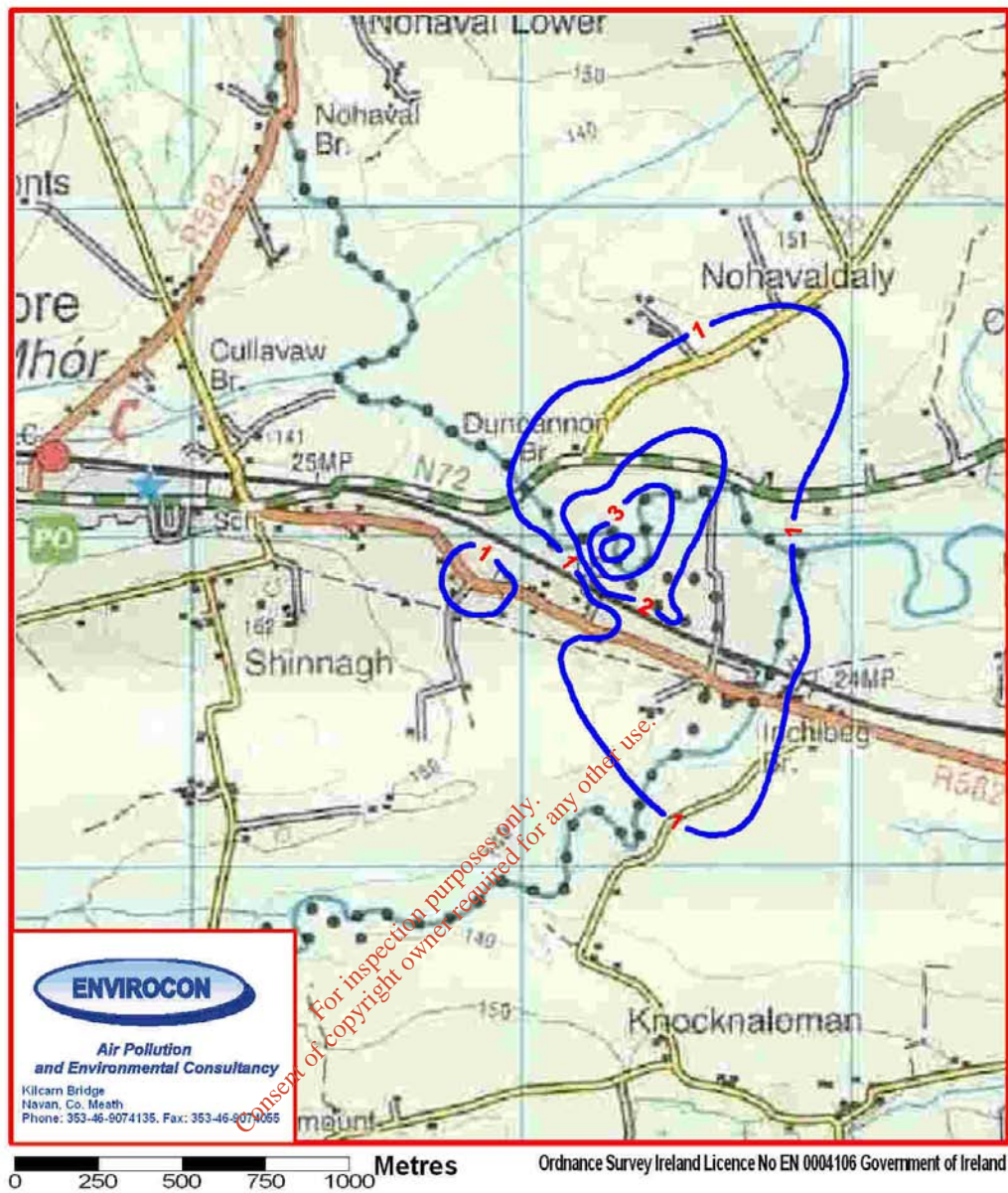
**FIGURE 6: PREDICTED 99.8 PERCENTILE OF HOURLY NO<sub>2</sub> CONCENTRATIONS DUE TO EMISSIONS FROM BOILER EXHAUST STACK OPERATING AT MAXIMUM LOAD. (µg/m<sup>3</sup>)**



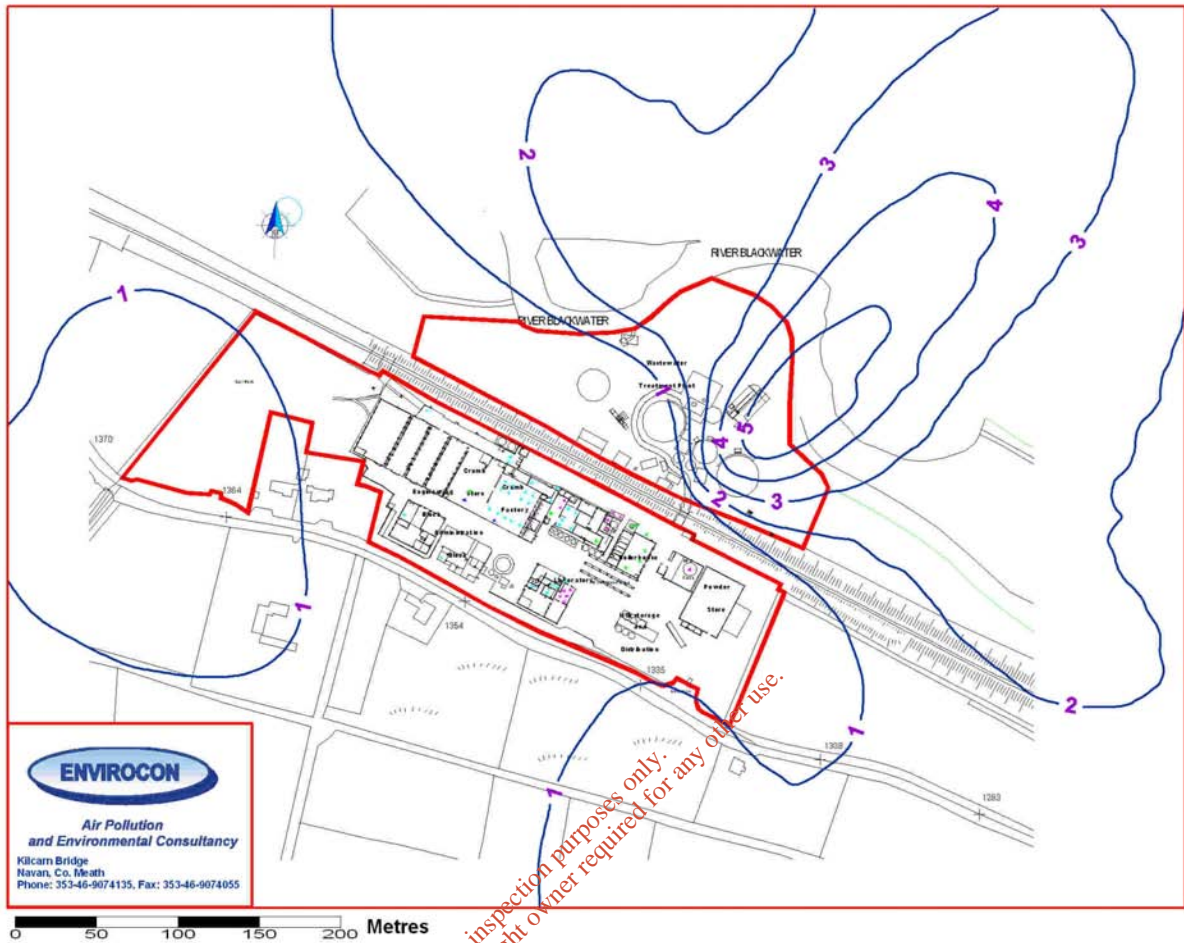
**FIGURE 7: SITE BOUNDARY DETAIL WITH PREDICTED 99.8 PERCENTILE OF HOURLY NO<sub>2</sub> CONCENTRATIONS DUE TO BOILER EXHAUST STACK EMISSIONS, OPERATING AT MAXIMUM LOAD. ( $\mu\text{g}/\text{m}^3$ )**



**FIGURE 8: SITE BOUNDARY DETAIL WITH PREDICTED 98 PERCENTILE OF HOURLY NO<sub>2</sub> CONCENTRATIONS DUE TO BOILER EXHAUST STACK EMISSIONS, OPERATING AT MAXIMUM LOAD. (µg/m<sup>3</sup>)**



**FIGURE 9: PREDICTED ANNUAL AVERAGE NO<sub>2</sub> CONCENTRATIONS DUE TO EMISSIONS FROM BOILER EXHAUST STACK OPERATING AT MAXIMUM LOAD. ( $\mu\text{g}/\text{m}^3$ )**



**FIGURE 10: SITE BOUNDARY DETAIL WITH PREDICTED ANNUAL AVERAGE NO<sub>2</sub> CONCENTRATIONS DUE TO BOILER EXHAUST STACK EMISSIONS, OPERATING AT MAXIMUM LOAD. (µg/m<sup>3</sup>)**

**Attachment I.2**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Assessment of impacts of surface water discharges on the**  
**receiving waters**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## Attachment No. I.2 Assessment of Impacts on Surface Waters

### I.2.1 Receiving Waters

Discharges of treated wastewater from the Cadbury (Ireland) Rathmore facility are made via SW-1 to the River Blackwater at a point located adjacent the WWTP. The discharge point is shown in Appendix I.2.1.

The River Blackwater is located within the Blackwater (Munster) hydrometric area. The surface catchment drained by the River Blackwater and all streams entering tidal water between East Point and Knockaverry, Youghal, Co. Cork. It is classified as salmonid water under the 1st schedule of the European Communities (Quality Salmonid Waters) Regulations, 1988 (S.I. 293 of 1988).

The River Blackwater is also a designated candidate Special Area of Conservation (site code 2170), which contains protected species listed within Annexes I and II of the E.U. Habitats Directive.

The River Blackwater is located within the Munster River Blackwater hydrometric area whose surface catchment includes and all streams entering tidal water between East Point and Knockaverry, Youghal, Co. Cork.

Further details relating the designated sites of International and National importance within the vicinity of the facility can be seen in Attachment L.

### Biological Monitoring

Benthic macro invertebrates provide an indication of the long-term effects of environmental quality by integrating water, sediment, and habitat qualities. Macro invertebrate species have sensitive life stages which react to stress; and combine effects of both short-term and long-term environmental perturbations.

The Environmental Protection Agency (EPA) monitors the biological water quality of the River Blackwater by applying a Q Value scoring system. The system utilises the relative sensitivities of macro invertebrates to water pollution in order to determine the condition of the water quality.

The water quality is classified in accordance with a biotic index. The index ranges from Q1 which indicates bad water quality through to Q5 which indicates good water quality. In general the higher the biotic score the better the water quality.

The classification of the EPA water quality Q Values can be seen in Table 2.1, and the biological river water quality classification scheme in Table 2.2. Information relating to the general characteristics of the biological water classes can be seen in Appendix I.2.1.

**Table 2.1 Relationship between Biotic Indices or Quality (Q) Values Water Quality**

'Q' Value	Community Diversity	Water Quality	Condition *
Q5	High	Good	Satisfactory
Q4	Reduced	Fair	Satisfactory
Q3	Much Reduced	Doubtful	Unsatisfactory
Q2	Low	Poor	Unsatisfactory
Q1	Very Low	Bad	Unsatisfactory

\* 'Condition' refers to the likelihood of interference with beneficial or potential beneficial uses.

**Table 2.2 Biological River Water Quality Classification Scheme**

Biotic Index	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A
Q3-4	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

EPA monitoring locations are situated along the River Blackwater at a number of locations and routine monitoring is undertaken by the Environmental Protection.

Table 2.3 shows a summary of the quality rating assigned to monitoring locations along the River Blackwater near the facility between the years 2001-2003. A map illustrating the locations of the monitoring points relative to the location of Cadbury (Ireland) Rathmore can be seen in Appendix I.2.2.

**Table 2.3 Biological Water Quality Q-value Rating for Waters Located near the Facility**

Station No.	River Code	Location	Relative to Facility	1994	1997	2000	2003	Status
200	18 B 02	Nohaval Bridge	Upstream	4	4-5	4	4	Class A Unpolluted
300	18 B 02	Duncannon Bridge	Upstream	-	-	-	-	Unavailable
400	18 B02	Awnaskirtaum River Confluence	Downstream	4	3-4	4	3-4	Class B Slightly Polluted
600	18 B02	Shamrock Br	Downstream	4	4-5	4-5	4-5	Class A Unpolluted

Where a value of 4,4-5,5=unpolluted,3-4=slightly polluted,2-3,3=Moderately Polluted,1-2,2= Polluted

As indicated in Table 2.3 the upstream monitoring station (no: 200), from the Cadbury Ireland Rathmore discharge location indicates that the River Blackwater has a high biotic community; which is indicative of good water quality which is in "satisfactory" condition.

There is no biological information available for the nearest upstream monitoring (station no. 300) location. The latest set of results at monitoring location no: 200 in 2006 is a Q rating of 4 which is in keeping with previous Q values. (Reference: unpublished data, EPA, pers.com, Jacinta Reynolds from John Lucy)

The biological results for one of the monitoring stations (no: 400) located downstream of the facility indicates that the water quality is slightly polluted, in which the biotic community has been reduced. This has been classified as a "Class B" river indicating the water is "slightly polluted". The latest set of results at this monitoring location (no: 400) in 2006 is a Q value of 3/4. This is in keeping with the previous results. (Reference: unpublished data, EPA, pers. com., Jacinta Reynolds from John Lucy).

Further downstream water quality conditions demonstrate an improvement in water quality and have been classified as a "Class A" which indicates that the water is "unpolluted".

The results from the biological water quality values indicate that there has been a slight deterioration in the water quality from the nearest upstream EPA monitoring station, which is located approximately 1.8km from the Cadbury Ireland facility, to the nearest downstream EPA monitoring station.

Between the two monitoring location (i.e. upstream location 200 and downstream location 400) both Cadbury's Ireland and the Rathmore Urban Waste water treatment facility discharge treated effluent into the River Blackwater.

Overall the biological results of the river water quality show that the River Blackwater is in good condition which in accordance with EPA monitoring standard is classified as being "satisfactory". There is a small deterioration downstream between the Rathmore urban waste water treatment plant and the Cadburys Ireland plant as noted at station No. 400 (river code: 18 B02), however the monitoring station located further downstream of this station shows an improvement in the water quality.

Land surrounding the Cadbury Ireland Rathmore facility is predominantly rural in character and is dominated by agricultural activities. The distance of the upstream monitoring stations from the Cadburys Ireland Rathmore facility increases the potential for additional contributory sources to the decrease in water quality observed further downstream. For example the reduction observed between monitoring stations No. 200 and 400 may be attributed to surface water runoff from agriculture and Rathmore waste water treatment plant activities upstream of the Cadbury (Ireland) Rathmore discharge location.

### Chemical Monitoring

Physio chemical sampling provides a "snap shot" as to the chemical conditions present in the water body at the time of sampling. Chemical monitoring provides a short term assessment of water quality, in contrast to the long-term effects noted in biological assessments. However continuous chemical monitoring can help establish potential sources of pollution.

Chemical monitoring is undertaken for selected EPA monitoring stations along the River Blackwater. The nearest stations located upstream and downstream of the Cadbury Ireland Rathmore facility were noted.

These include station No.300 (river code: 18/B/02), located near Duncannon approximately 0.5 kilometres upstream of the facility, and station No. 400 (river code: 18/F/03), located upstream of the Blackwater confluence approximately 0.6 km downstream of the Cadbury Ireland Rathmore Facility. The locations of each of these monitoring locations relative to the facility can be seen in Appendix I.2.1. The chemical results for the monitoring stations are displayed below.

**Station no. 300**  
**River Code:18/B/02**  
**Location: Duncannon Bridge**  
**Chemical Data (2001-2003)**

Parameter	Units	Median Value	No of Samples	MAC
B.O.D	mg/l O <sup>2</sup>	1.1	35	5*
Colour	Hazen	113	12	20**
Conductivity	µS/cm <sup>-1</sup>	-	-	1000**
Dissolved Oxygen	mg/l O <sup>2</sup>	11.2	-	>9*
Ortho-Phosphate	mg/l P	0.02	35	0.03***
pH	pH	7.2	33	6-9*
Temperature	°C	10.5	35	21.5*
Total Ammonia	mg/l N	0.05	35	1*
Un-ionised Ammonia	mg/l NH <sup>3</sup>	<0.001	33	0.1*

\* S.I. 293 of 1998-European Communities (Quality of Salmonid Waters) Regulations 1998

\*\* S.I. 249 of 1989- European Communities (Quality of Surface Water intended for the Abstraction of Drinking Water) Regulation,1989.

\*\*\* S.I. 258 of 1998-Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorous) Regulations,1998.

As is evident from the chemical results upstream and downstream of the facility all the monitoring parameters are generally compliant with the Salmonid Water Quality regulations.

The facility was granted an effluent discharge licence by Kerry County Council in 1993, and as a result water quality monitoring results has been undertaken on a regular basis. The discharge of treated waste water from the facility is made to the River Blackwater via SW-1. The discharge location can be seen in Appendix I.2.1. The current limits associated with the discharge licence can be seen in Table 2.4.

**Table 2.4 Current Limits on Cadbury Kerry Co. Council Discharge Licence**

Parameter	Units	Limit Values
B.O.D	kg	30
Suspended Solids	mg/l	100
Non – ionised Ammonia	mg/l	0.1
Temperature	°C	25
Volume	m <sup>3</sup> /d	900
pH	pH Units	6.0 – 9.0

Kerry County Council maintains water quality monitoring records for stations located upstream, downstream and at the discharge location (SW-1) to the River Blackwater since 2001.

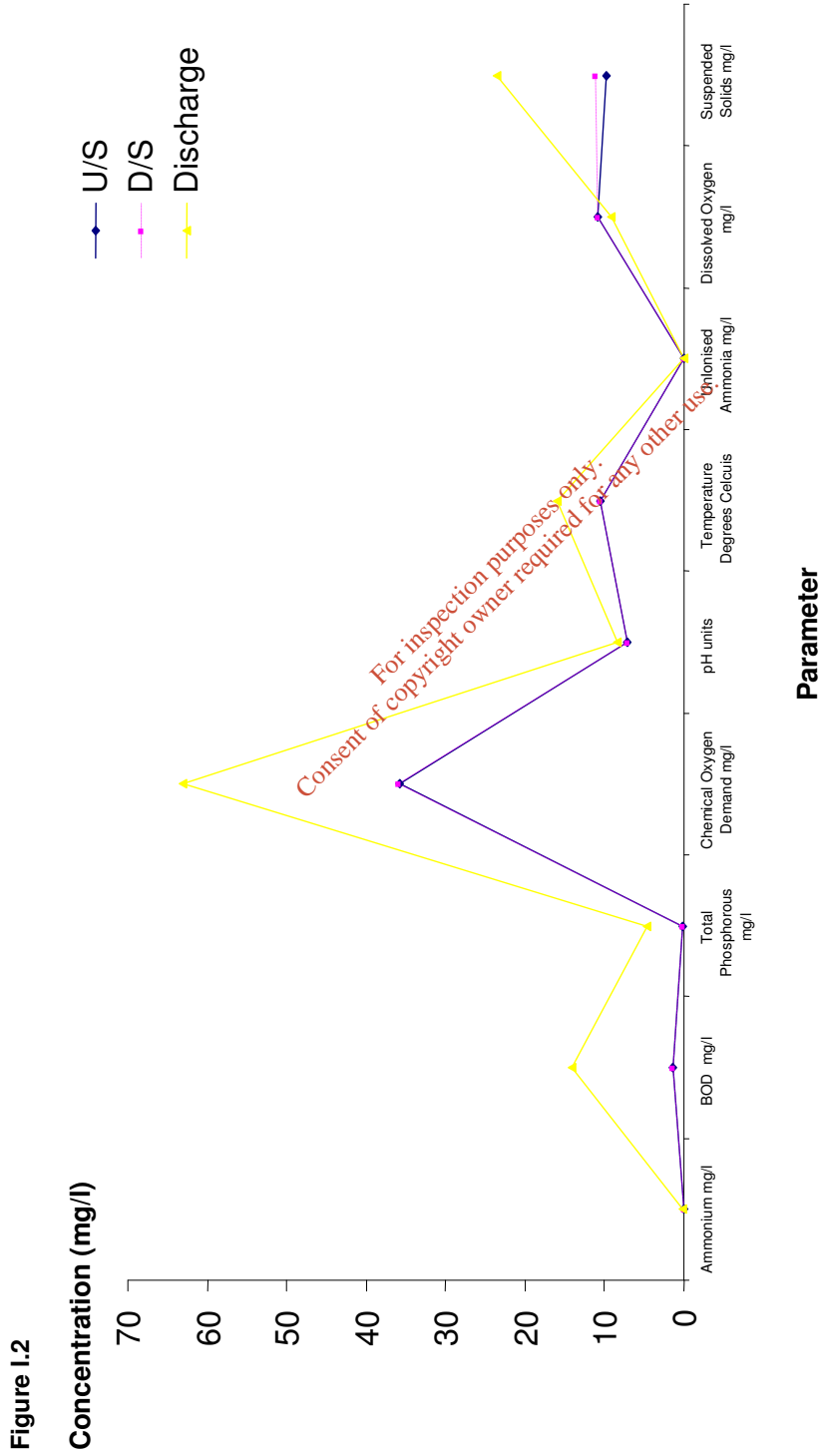
Results of long term monitoring by the Kerry County Council are summarised on Table I.2.1. This information relates specifically to the Cadbury Ireland Rathmore facility therefore in contrast the EPA monitoring results would be less likely influenced by additional sources of contamination.

Results of water chemistry analysis which are illustrated in Table I.2.1 above have shown that over the past number of years the impact of Cadbury (Ireland) Rathmore discharges to the River Blackwater have been negligible, as is indicated when both upstream and downstream water quality results are compared. These results are illustrated in Figure I.2.

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**Table I.2.1 Chemical Water Quality Monitoring Results from Kerry County Council (2001 – 2006)**

Parameter	Ammonium Mg/l	BOD mg/l	Conductivity @ 20 oC Mg/l	Chemical Oxygen Demand Mg/l	pH units	Temperature Degrees Celsius	Dissolved Oxygen Mg/l	Suspended Solids Mg/l	Un-ionised Ammonia Mg/l	Total Phosphorous Mg/l
<b>Cadbury Discharge</b>										
Minimum	0.02	2.1	419	19	7.7	4.5	7.8	3.0	0.002	0.49
Average	0.13	14.1	640	63	8.4	15.9	9.1	23.5	0.002	4.63
Maximum	0.90	53.4	996	144	9.0	22.5	10.6	82.0	0.002	8.06
St Dev	0.24	13.7	120	32	0.3	4.2	0.9	18.7	0.000	1.73
Median	0.04	7.8	622	59	8.4	15.9	9.3	18.5	0.002	4.39
<b>Downstream of Discharge</b>										
Minimum	0.02	1.0	77	10	6.8	2.5	9.9	1.5	0.002	0.07
Average	0.06	1.5	110	36	7.2	10.6	10.9	11.17	0.002	0.13
Maximum	0.26	3.0	158	80	7.9	17.5	12.8	82.0	0.002	0.31
St Dev	0.06	0.6	19	19	0.3	3.5	0.81	16.3	0.000	0.07
Median	0.04	1.3	110	31	7.1	10.8	10.8	7.0	0.002	0.11
<b>Upstream of Discharge</b>										
Minimum	0.02	1	77	10	6.7	2.5	9.8	1.0	0.002	0.03
Average	0.07	1.5	108	36	7.1	10.5	10.8	9.8	0.002	0.11
Maximum	0.3	2.9	140	71	7.7	17.0	12.8	33.0	0.002	0.21
St Dev	0.06	0.6	17	18	0.3	3.5	0.9	9.7	0.000	0.05
Median	0.04	1.2	109	32	7.1	10.9	10.7	5.3	0.002	0.09



As is evident from Figure I.2 there is little variation between the average results for the water quality monitoring parameters located upstream and downstream of the Cadbury Ireland Rathmore Facility.

Negligible increases were observed for pH, BOD, Conductivity, COD, temperature, dissolved oxygen, suspended solids, and total phosphorous downstream of the discharge location. It is noted that concentrations of ammonium are reduced in the downstream results than those recorded upstream.

### **Assimilative Capacity of River Blackwater**

Assimilative calculations were taken for the following parameters, Biological Oxygen Demand (BOD), Total Phosphorus, Suspended Solids, Chemical Oxygen Demand (COD) Orthophosphate, ammonia and Nitrate.

Two different flow rates were used in assessing the assimilative capacity of the effluent. The 95%-ile flow rate was taken using the EPA's daily flow averages between 1982 and 2006 -  $0.33\text{m}^3/\text{s}$ . The second flow rate was the mean flow taking EPA's daily average flows from 1982 and 2006, calculated as  $2.07\text{m}^3/\text{s}$ .

Assimilative capacities were produced using Kerry Co Council (KCC) upstream data as the mean parameter value in the receiving waters. This data was thought to be the most appropriate because it is the closest to the effluent discharge point and monitored frequently.

The current limits associated with Discharge Licence to the River Blackwater are shown in table 2.4. Where ELV's are not given the values used were taken from the urban waste water treatment Directive 91/271/EEC, i.e. phosphorus limit taken as  $2\text{mg}/\text{l}$  and COD limit taken as  $125\text{mg}/\text{l}$ .

Table I.2.2 below shows the results of the assimilative capacities using the results above. The results using the ELV's show that none of these parameters exceed the current salmonid water quality guidelines.

### **Total Phosphorus and Ortho-Phosphate**

Using the total phosphorus ELV of  $2\text{mg}/\text{l}$  in the assimilative capacity calculations gives a new background concentration of  $0.1681\text{mg}/\text{l}$  in a 95%-ile flow situation. The actual average phosphorus concentration (taken from KCC effluent monitoring) is  $4.633\text{mg}/\text{l}$ . Putting this into the assimilative capacity calculation gives a new background concentration of  $0.251\text{mg}/\text{l}$  of total phosphorus. This is above the salmonid water quality limits by  $0.051\text{mg}/\text{l}$ . This exceedence occurs only when there is a maximum flow rate of  $900\text{m}^3/\text{d}$  and a continuous output concentration of  $4.633\text{mg}/\text{l}$  of total phosphorus in the effluent. When using the average flow rate from the effluent data instead of the  $900\text{m}^3/\text{d}$  this value drops below the salmonid water quality limits.

Orthophosphate assimilative capacity calculations were undertaken using an ELV of  $2\text{mg}/\text{l}$  and the median flow rate of  $2.07\text{m}^3/\text{s}$ . The results of this calculation show that at  $2\text{mg}/\text{l}$  ELV the new resultant background concentration is  $0.03\text{mg}/\text{l}$ . This is the limit of Orthophosphate for the River Blackwater. The upstream concentration value was taken from the EPA's Duncannon monitoring point results from 2001-2003 median values. This value is  $0.02\text{mg}/\text{l}$ . More recent values obtained from David Sheehan (Cork County Council) show that there have been 59 orthophosphate readings from the Duncannon upstream monitoring station from the 30/Jan/02 to the 13/Dec/06. Out of these 59 readings 14 were greater than  $0.03\text{mg}/\text{l}$ . This works out to be 23.7% of all upstream Orthophosphate readings were not in compliance with salmonid water limits before they reached the Cadbury's WWT discharge point. The average value from these 52 readings give a concentration of  $0.026\text{mg}/\text{l}$  for upstream concentrations of Orthophosphate. This could suggest that some upstream activities are affecting the water quality at the Duncannon monitoring station, thereby increasing the concentration in the upstream data in our assimilative capacity calculations

All other actual average concentration parameters are below the ELV defined by KCC and the Waste water treatment directive at the 95%-ile flow.

Using the mean flow of 2.07m<sup>3</sup>/s all ELV averages and actual averages (except Orthophosphate) of measured parameters and ELV limits are below the salmonid water quality limit.

**Table I.2.2 Assimilative capacity calculations from Cadbury's Ireland Rathmore**

Parameter	Flow rate	Flow m <sup>3</sup> /s	U/S value mg/l*	%age of AC	Increase due to discharge	New Background level based proposed ELV	Background based on measured data**	Salmonid limits	Proposed ELV Mg/l
BOD	95%-ile	0.33	1.455	23.3	0.789	2.2441	1.7067	>5	25
	MEAN	2.07	1.455	3.5	0.1258	1.5808	1.526		
Total Phosphorus	95%-ile	0.33	0.105	66.5	0.0631	0.1681	0.2512	0.2	2
	MEAN	2.07	0.105	1.4	0.0101	0.1151	0.1283		
Suspended solids	95%-ile	0.33	9.79	12.5	3.156	12.946	10.53	<25	35
	MEAN	2.07	9.79	2	0.503	10.29	9.91		
Chemical Oxygen demand	95%-ile	0.33	35.8	4.4	3.9457	39.7457	37.78	unknown	125
	MEAN	2.07	35.8	0.7	0.629	36.43	36.118		
Unionized Ammonia	95%-ile	0.33	0.002	17.5	0.0172	0.0192	0.0023	<0.02	0.1
	MEAN	2.07	0.002	0.5	0.0005	0.0025	0.002		
Ortho-phosphate	Mean	2.07	0.02	100.6	0.010	0.03	0.0623	0.03	2
Nitrates	95%-ile	0.33	3.4	0.8	0.3157	10.31	10.25	50	10
	Mean	2.07	3.4	0.1	0.05	10.05	10.04		

\*\*Using the Actual averages taken from KCC effluent data

\* Taken from KCC upstream monitoring point and EPA's monitoring point

Results of water chemistry analysis would indicate that over the past number of years that the impact of Cadbury (Ireland) Rathmore discharges are negligible to the River Blackwater when upstream and downstream physio-chemical results are compared.

As part of the Integrated Pollution Prevention Control licence application Cadbury Ireland Rathmore propose to retain the current water quality conditions as stated in above the table I.2.2.

**Appendix I.2.1**  
**General Characteristics of Biological Quality Classes**

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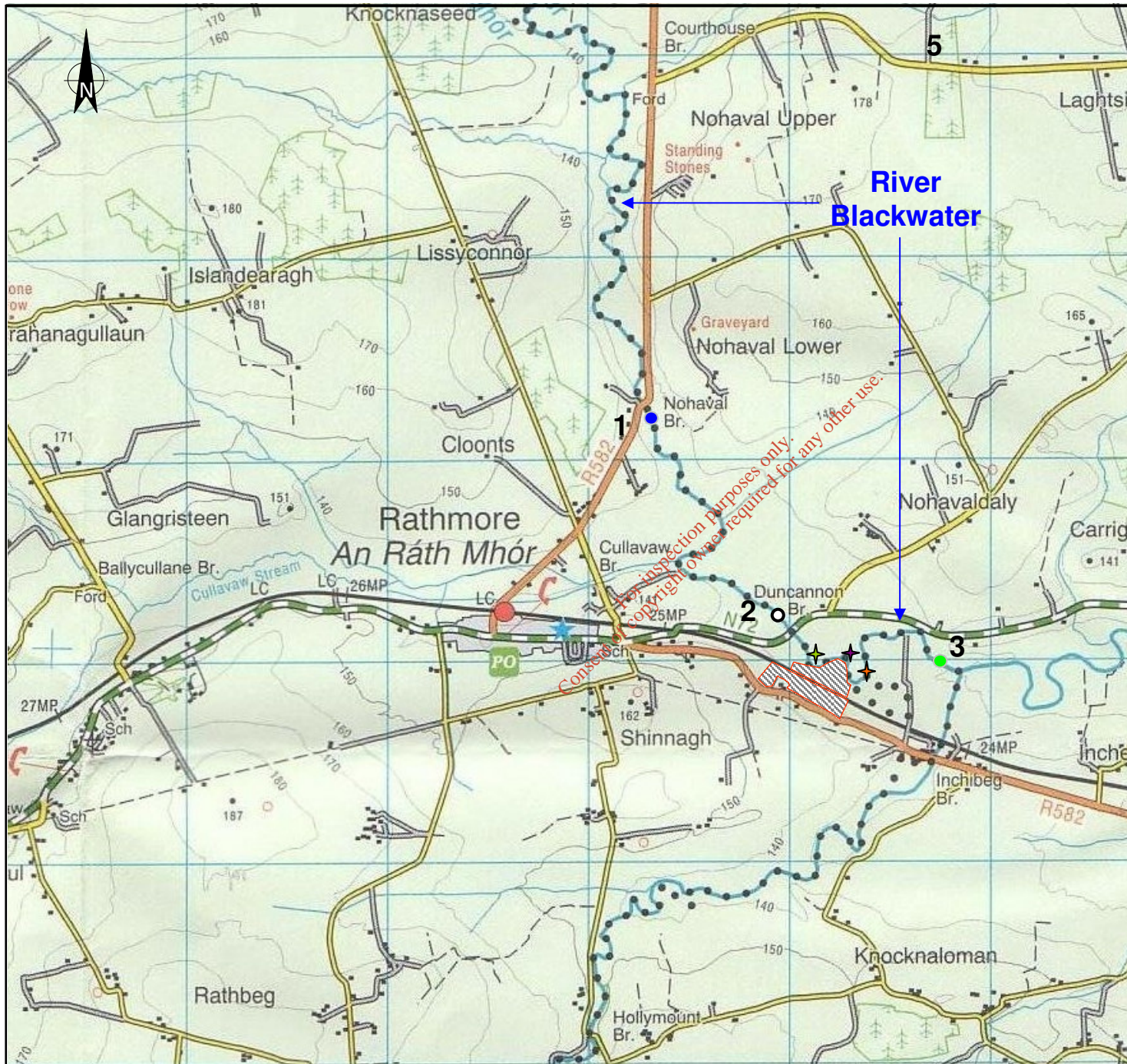
EPA General Characteristics of the various Biological Quality Classes

Quality Classes	Class A		Class B	Class C		Class D	
	Q5	Q4	Q3-4	Q3	Q2	Q1	
<b>Pollution Status</b>	Pristine, Unpolluted	Unpolluted	Slight Pollution	Moderate Pollution	Heavy Pollution	Gross Pollution	
<b>Organic Waste Load</b>	None	None	Light	Considerable	Heavy	Excessive	
<b>Maximum B.O.D.</b>	Low (< 3mg/l)	Low (< 3mg/l)	Occasionally elevated	High at times	Usually High	Usually very high	
<b>Dissolved Oxygen</b>	Close to 100% at all times	80%-120%	Fluctuates from <80% to >120%	Very unstable, Potential fish-kills	Low, sometimes zero	Very low, often zero	
<b>Annual median PO<sub>4</sub></b>	0.015 mg/l	0.03 mg/l	0.045 mg/l	0.07 mg/l	> 0.1 mg/l	> 0.1 mg/l	
<b>Siltation</b>	None	May be light	May be light	May be considerable	Usually heavy	Usually very heavy and anaerobic	
<b>'Sewage Fungus'</b>	Never	Never	Never	May be some	Usually abundant	May be abundant	
<b>Filamentous Algae</b>	Limited Development	Considerable growth, diverse communities	Luxuriant growths, typically Cladophora	Excessive growths, typically Cladophora	Usually abundant	None	
<b>Macrophytes</b>	Diverse communities, limited growths	Diverse Communities, Considerable Growths	Reduced diversity, luxuriant growths	Limited diversity, excessive growths	Tolerant species only, may be abundant	Most tolerant forms, minimal diversity	
<b>Water Quality</b>	Highest quality	Fair Quality	Variable quality	Doubtful quality	Poor quality	Bad quality	
<b>Abstraction Potential</b>	Suitable for all	Suitable for all	Potential problems	Advanced treatment	Low grade abstractions	Extremely limited	
<b>Fishery Potential</b>	Game fisheries	Good game fisheries	Game fish at risk	Coarse fisheries	Fish usually absent	Fish absent	
<b>Amentiy Value</b>	Very high	High	Considerable	Reduced	Low	Zero	

**Appendix I.2.2**  
**EPA Monitoring Locations 2001-2003**

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### River Stations Q Value

- Status Unknown
- Dry- no Result
- Unpolluted (4,4-5, or 5)
- Slightly Polluted (3.-4)
- Moderately Polluted (2-3 or 3)
- Seriously Polluted 1,1-2, or 2)
- ▨ Cadbury Ireland Rathmore Facility

- 1 Station No:200  
River Code18B02  
Nohaval Bridge
- 2 Station No:300  
River Code18B02  
Duncannon Bridge
- 3 Station No:400  
River Code18B02  
Upstream Awnaskirtaun

- ★ Kerry County Council  
Upstream Monitoring Location
- ★ Kerry County Council  
Downstream Monitoring Location
- ★ Kerry County Council  
Discharge Monitoring Location

Issue no.	Date	Drawn	Checked	Approved	Note Ref	Date Scanned


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Client **Cadbury Ireland Ltd.**

Title **River Water Quality Map**

Scale: NTS Project No. 1061

Drawing No. Drawing No.11 01

**Attachment I.3**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Assessment of Impact on Receiving Sewer**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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### **I.3 Assessment of Impacts on Receiving Sewer**

This section is not applicable as there are no emissions to sewer.

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**Attachment I.4**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Assessment of Impact of Ground Emissions**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## I.4 Assessment of Impact on Ground Emissions

This section details summary information on the management of organic wastes through landspreading.

Contractors involved in organic waste landspreading are trained and audited. In addition, contractors maintain extensive procedures and records relating to control of organic waste landspreading.

McGill Environmental Systems (Ire.) Ltd. compost sludges at their facility Molaisin Compost Ltd., Cappoquinn, Co. Waterford. The facility operates under Waterford County Council waste permit WP05/2004.

There is no requirement under this permit for Nutrient Management Plans to be conducted. However, McGill conduct in-house testing and recording at their facility.

All fields used for landspreading of compost are soil sampled prior to application. Within two years of application of the compost are sampled again.

Details of McGills Environmental Systems (Ire.) Ltd. landspreading policy can be seen in Appendix E.4.1. of Attachment E. The land spreading operations are undertaken in accordance with Standard Operating Procedure (SOP) which has the consequential benefit of improving soil conditions for crop growth for renewable energy sources i.e. Oilseed Rape, and Biopower Ltd. Further details pertaining to the SOP of the facility can be seen in Appendix F.4.1 of Attachment F.4. There is no requirement under this permit for Nutrient Management Plans to be produced; the company undertake their own in-house testing and recording.

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**Attachment I.5**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Ground and/or Groundwater Contamination**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## **I.5 Ground and Groundwater Contamination**

This section is not applicable as there are no emissions to Ground.

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**Attachment I.6**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Assessment of the Environment Impact of On-Site Waste Disposal**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## **I.6 Waste Disposal**

Attachment I.6 is not applicable as there is no on site waste disposal.

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**Attachment I.7**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**  
**Noise Impact**

**Cadbury Ireland Limited**  
**Rathmore Installation**  
**IPPC Licence Application**

**Project Ref: OES1061\_01**

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## I.7 Noise Impacts

As part of the application for an Integrated Pollution Prevention Control Licence, a noise survey of the plant was undertaken in August 2006 (Appendix I.7.1.). The objective of the survey is to assess the noise impact associated with the operation of the facility at the boundary and at noise sensitive locations to ensure that it is operating in accordance with Environmental Protection Agency (EPA) requirements. The survey was undertaken during normal operating conditions, and the character of each noise source was stated as broadband, tonal or impulsive as assessed at the measurement distance. A copy of the noise survey can be seen in Appendix I.7.1.

The measurements were conducted to obtain representative values for noise levels for both daytime and night time periods as follows:

- Daytime 13:00 hrs to 17:30 hrs on 24/07/2006;
- Night-time 01:00 hrs to 04:00 hrs on 25/07/2006

The noise survey was undertaken at five boundary locations (BL1 to BL5) and the four noise sensitive locations (NSL1 to NSL4). A description of each location is given in Table I.7.1. The locations of the five boundary monitoring positions relative to the facility can be seen Appendix I.7.2. , and similarly the four noise sensitive locations Appendix I.7.3.

**Table I.7.1. Description of Noise Monitoring Stations**

Position	Description
BL 1	Located to the north-east corner of the plant, which is used as a set down area.
BL 2	Located to the north side of the boiler house and cooling towers adjacent to the railway line.
BL 3	Located to the east side of the two bulk storage silo.
BL 4	Located to the south east side between the two residential dwellings, and the south east of the Cadbury plant.
BL 5	Located to the east of the administration block.
NSL1	Located at a residential dwelling to the south east of the plant on the opposite side of the road from the plant.
NSL2	Located between the two residential dwellings to the south of the plant.
NSL3	Located at a residential dwelling on the south east of the along the R582 on the opposite side of the side of the road to the plant.
NSL4	Located to the north of the plant along the N72.

The principal noise sources at the facility comprise external fixed equipment such as cooling towers and fans. In addition, the noise survey noted significant contribution to overall noise levels from extraneous noise sources such as road traffic, aircraft, birds or intermittent local activities.

There are no statutory limits for noise emissions, or for ambient noise levels in Ireland. Therefore the activities of the facility were assessed against the usual range of values allowed for industrial activities indicated below.

Period	Limit
Daytime (08:00hrs to 22:00hrs):	55 dBA (+ 2 dBA)
Night Time (22:00hrs to 08:00hrs):	45 dBA (+ 2 dBA)

In addition, there shall be no tonal or impulsive characteristics to the noise at receptor locations. A summary of the noise results for the various monitoring locations, and their associated contributory sources can be seen in Table I.7.2.

Table I.7.2. Summary of Noise Monitoring Results

Location	Results					Main Noise Sources (Day Time)	Main Noise Sources (Night Time)
	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>Amin</sub>	L <sub>A10</sub>	L <sub>A90</sub>		
<b>BL1</b>						<b>Dominant Source:</b> Plant noise and site and road vehicle noise on the R582. <b>Secondary contributions:</b> A number of onsite vehicular movements were noted during the survey.	<b>Dominant Source:</b> Plant noise and site and road vehicle noise on the R582. <b>Secondary contributions:</b> A number of onsite vehicular movements were noted during the survey.
Daytime	55.7	68.6	50.7	57.5	53.0		
<b>BL2</b>						<b>Dominant Source:</b> Boiler house and cooling tower <b>Secondary contributions:</b> Storage Silo	<b>Dominant Source:</b> Boiler house and cooling tower <b>Secondary contributions:</b> Storage Silo
Daytime	77.7	79.2	76.3	78.2	77.3		
<b>BL3</b>						<b>Dominant Source:</b> Two storage silos	<b>Dominant Source:</b> Two storage silos
Daytime	70.1	73.7	65.2	73.7	69.0		
<b>BL4</b>						<b>Dominant Source:</b> Plant and road noise from the R582 <b>Secondary contributions:</b> Storage Silo	<b>Dominant Source:</b> Plant and road noise from the R582 <b>Secondary contributions:</b> Storage Silo
Daytime	52.8	73.5	43.3	52.7	46.8		
<b>BL5</b>						<b>Dominant Source:</b> Traffic noise generated from the R582 <b>Secondary contributions:</b> Plant	<b>Dominant Source:</b> Traffic noise generated from the R582 <b>Secondary contributions:</b> Plant
Daytime	64.4	83.5	50.3	67.1	51.8		
<b>NLS 1</b>						<b>Dominant source:</b> Traffic (Heavy Goods Vehicles) <b>Secondary contributions:</b> Plant, and boiler house	<b>Dominant source:</b> Traffic <b>Secondary contributions:</b> Boiler house
Daytime	67.4	89.3	37.2	68.0	42.5		

Location	Results						Main Noise Sources (Day Time)	Main Noise Sources (Night Time)
	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>Amin</sub>	L <sub>A10</sub>	L <sub>A50</sub>	L <sub>A90</sub>		
Night time	50.7	68.6	50.7	42.5	37.1			
<b>NLS 2</b>						L <sub>A90</sub>		
Daytime	<b>68.3</b>	90.4	39.9	70.6	44.8		<b>Dominant source:</b> Traffic dominant noise <b>Secondary contributions:</b> Plant noise from the loading area	
Night time	<b>57.9</b>	81.2	35.8	54.2	38.0			
<b>NLS 3</b>						L <sub>A90</sub>		
Daytime	<b>64.9</b>	80.6	38.8	69.5	43.5		<b>Dominant source:</b> Traffic associate with the R582 <b>Secondary contributions:</b> Plant noise	
Night time	<b>56.6</b>	79.8	34.7	48.0	38.0			
<b>NLS 4</b>						L <sub>A90</sub>		
Daytime	<b>64.7</b>	84.8	42.8	65.4	47.9		<b>Dominant source:</b> Traffic associated with the R582 <b>Secondary contributions:</b> Plant noise, traffic associated with the N72.	
Night time	<b>58.7</b>	81.6	36.2	56.8	40.0			

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The results of the noise survey indicate that there are no significant impacts on noise sensitive locations outside the boundary area. While the plant is audible at times at these locations, particularly at night in low wind conditions, noise levels are unlikely to give rise to any disturbance.

The noise survey concluded that the facility would be in compliance with the EPA criteria of 55dB LAeq, 15min for daytime periods (08:00hrs to 22:00hrs), and 45dB LAeq, 15min for nighttimes (22:00hrs to 08:00hrs) periods.

In addition a copy of the most recent annual noise report (2005) can be seen in Appendix E.5.1

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**Appendix I.7.1**  
**Environmental Noise Assessment**

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# Cadbury Ireland Limited.

Rathmore  
Co. Kerry

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## Environmental Noise Assessment for submission to the Environmental Protection Agency as part of Integrated Pollution Prevention & Control License Application (P000796-01)

August 2006

Rev.	Issue Date	Revision Description	Prepared by	Checked by	Approved by	Client Approval
0001A	03.08.06	DRAFT	TM	EMC, JS	POL	FH
0001. 1	03.08.06	Final	TM	EMC, JS	POL	FH

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# Cadbury Ireland Limited.

Rathmore  
Co. Kerry

## Environmental Noise Assessment for submission to the Environmental Protection Agency as part of Integrated Pollution Prevention & Control License Application (P000796-01)

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### Attachments

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<b>Attachment B</b>	<b>Noise Graphs</b>
<b>Attachment C</b>	<b>Monitoring Location Maps</b>

## 1.0 Introduction

This Environmental Noise Survey has been prepared by OES Consulting as part of an Integrated Pollution Prevention Control (IPPC) application for the Cadbury Ireland Rathmore Instillation. The objective of the survey is to assess the noise impact associated with the operation of the facility to ensure that it is operating in accordance with Environmental Protection Agency (EPA) requirements. The noise survey identifies noise emission locations, and establishes potential sensitive locations with particular reference to boundary locations within the vicinity of the site. The survey also determines whether the facility is operating in compliance with the following IPPC noise criteria:

- Activities on-site shall not give rise to noise levels off site, at noise-sensitive locations, (at specified noise sensitive locations) which exceed the following sound pressure limits ( $L_{Aeq, 15min}$ ):
  - Daytime: 55dB(A)
  - Night-time: 45dB(A)
- There shall be no clearly audible tonal or impulsive components at any noise-sensitive locations.
- A noise survey of site operations shall be carried out on an annual basis.

The above noise limits relate to the following criteria:

Daytime (08:00hrs to 22:00hrs): 55dB  $L_{Aeq, 15min}$

Night-time (22:00hrs to 08:00hrs): 45dB  $L_{Aeq, 15min}$

## 2.0 Survey Details and Measured Noise levels

An environmental noise survey was conducted in order to quantify the existing noise environment at the Cadbury Ireland Rathmore facility. The survey was conducted generally in accordance with ISO 1996: 1982: *Acoustics – Description and Measurement of Environmental Noise*. Specific details are set out below.

### 2.1 Choice of Measurement Locations

The five boundary locations (BL1 to BL5) and the four noise sensitive locations (NSL1 to NSL4) are shown on Figure 1.1 and 1.2 appended in Attachment C. These locations are outlined below.

- Position BL 1** Is at the north-east corner of the plant which is used as a set down area.
- Position BL 2** Is on the north side of the boiler house and cooling towers adjacent to the railway line.
- Position BL 3** Is on the east side of the two bulk storage silo.
- Position BL 4** Is on the south east of the side between the two residential dwellings and the south east of the Cadbury plant.
- Position BL 5** This location is to the east of the administration block.
- Position NSL1** The location is a residential dwelling to the south east of the plant on the opposite side of the road from the plant.
- Position NSL2** This location is between the two residential dwellings to the south of the plant.
- Position NSL3** The location is a residential dwelling on the south east of the along the R582 on the opposite side of the side of the road to the plant.
- Position NSL4** This location is to the north of the plant along the N72.

### 2.2 Survey Periods

Measurements were conducted over the course of two survey periods as follows:

- Daytime 13:00 hrs to 17:30 hrs on 24/07/2006
- Night-time 01:00 hrs to 04:00 hrs on 25/07/2006

During all of the survey periods noted above, it is understood that the facility was in normal operation.

The weather during the daytime survey was mild (nominally 18 to 20°C) and calm (less than 1ms<sup>-1</sup>). During the night-time it remained calm and the temperature dropped to around 12°C, conditions remained dry throughout both periods.

### 2.3 Personnel and Instrumentation

Trevor Montgomery (OES Consulting) conducted the noise level measurements during both survey periods.

The measurements were performed using a Brüel & Kjær Type 2260 Modular Precision Sound Analyzer. Before and after the survey the measurement apparatus was checked and calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

## 2.4 Procedure

Manned measurements were conducted at four external locations which represent the closest noise sensitive locations to the Cadbury site (Locations NSL1 to NSL4). Manned measurements conducted internal to the site at five locations represent the Boundary Noise Locations on the Cadbury site (Locations BL1 to BL5). Measurements were conducted on a cyclical basis with sample periods of 15 minutes for both the daytime and night-time surveys. The survey results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted the primary noise sources contributing to noise build-up during the noise survey.

## 2.5 Measurement Parameters

The boundary survey results are presented in terms of the following five parameters:

**L<sub>Aeq</sub>** is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

**L<sub>Amax</sub>** is the instantaneous maximum sound level measured during the sample period.

**L<sub>Amin</sub>** is the instantaneous minimum sound level measured during the sample period.

**L<sub>A10</sub>** is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

**L<sub>A90</sub>** is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing.

All sound levels in this report are expressed in terms of decibels (dB) relative to  $2 \times 10^{-5}$  Pa.

The specific noise level is the component of the ambient noise that can be attributed to the specific source, which is the Cadbury Ireland Rathmore. Extraneous noise from sources other than the Cadbury site were noted throughout the survey i.e. traffic noise. It was also noted that noise emissions from the Cadbury site were relatively constant. The Environmental Protection Agency document entitled, Environmental Noise Survey Guidance Document (2003) states the following:

*"For some noise surveys, the L<sub>A90</sub> index may be used to give a good indication of the actual noise output from the site, where the noise emissions on site are relatively steady".*

As a result for this assessment, a  $L_{A90}$  parameter has been adopted as being representative of noise emissions from the Cadbury Ireland site.

### **3.0 Receiving Environment**

#### **3.1 General Description**

Cadbury Ireland Rathmore has manufactured chocolate crumb since 1948. The facility is located in Rathmore Co. Kerry. It is located adjacent to the River Blackwater, approximately 2 Km from the village of Rathmore and 20 Km east of Killarney. The total area of the site is 5.4 hectares, of which 1 hectare is under roof. Approximately 34% of the total area is comprised of hard standing areas.

The facility is serviced by the R582, which connects Rathmore to Millstreet, and the N72 (National Primary Route), located to the north of the plant.

A railway line runs through a portion of the facility and was initially used to transport the product, this operation ceased in the early 1980s as a result of its unreliability and expense.

The site is bordered to the east and west by agricultural farmland, to the north by the River Blackwater, and to the south by the R582. The topography of the area consists of gently undulating farmland which has a gradual decrease in elevation towards the Blackwater River.

The plant employs a total of 115 people and is operated 24 hours a day, 50 weeks per year.

The working shifts are allocated on a cyclical basis, comprising of three shifts as follows:

- 8am-4pm
- 4pm-12pm
- 12pm-8am

The working population density within 2 Km radius of the site boundary is less than 50 and the residential population is approximately 200. There is a security office located at the entrance to the plant and site security is provided on a continuous basis.

### **4.0 Survey Results and Discussion**

The results for all Noise Sensitive Location (NSL') and Boundary Locations (BL's) are outlined in Tables 1(a), 1(b) and 2 respectively appended in Attachment A.

#### **4.1 Boundary Noise Monitoring**

The monitoring locations throughout the facility can be seen in Figure 1.2 appended in Attachment C. All graph results are appended in Attachment B.

##### **4.1.1 Position BL 1**

This monitoring location is situated to the east of the facility near the packaging store. Site noise at this location is primarily associated with the plant noise, site and road vehicle noise on the R582. The noise level during the survey ranged from 52.2 and 84.4

dB  $L_{Aeq}$  and is shown in Graph 1. A number of onsite vehicular movements were noted during the survey.

#### **4.1.2 Position BL 2**

This site is located between the boiler house stack and the fencing on the north side of the plant. The boiler house and cooling tower are the main noise sources with the storage silo secondary. The noise level was constant as shown in Graph 2 and the noise level was 77.7 dB  $L_{Aeq}$ .

#### **4.1.3 Position BL 3**

This monitoring location is located to the north of the crumb stores in the northern section of the plant directly south of the railway line divide. The noise at this location is dominated by the noise generated from the two storage silos. The noise level was steady with very little fluctuations at 70.1 dB  $L_{Aeq}$  and is shown in Graph 3.

#### **4.1.4 Position BL 4**

This noise monitoring location is located to the western section of the plant near the car park and the engineering building. The noise at this location was primarily plant and road noise from the R582, but the silo system was audible during lulls in the noise. The noise level varies from 46.7 to 73.5 dB  $L_{Aeq}$  and is shown in Graph 4.

#### **4.1.5 Position BL 5**

This noise monitoring location is situated to the south of the facility near the administration buildings and to the north of the R582. At this location, the noise generated from the traffic travelling along the R582 is the primary source with the plant a secondary noise source. Graph 5 shows that the noise levels varied at this location from 50.3 to 83.4 dB  $L_{Aeq}$ .

### **4.2 Noise Sensitive Location Monitoring**

#### **4.2.1 Position NLS 1**

During the daytime survey, the dominant noise source at NSL 1 was generated by traffic on the R582, which carries a large proportion of HGVs (Heavy Goods Vehicles). Traffic entering and leaving the Cadbury site also contributed to the noise climate. Plant noise was audible during the daytime survey and noise levels were 67.4 dB  $L_{Aeq}$ , and 42.5 dB  $L_{A90}$  and are shown in Graph 6.

During the night-time survey, there were reduced traffic flows on the local roads although this source was still dominant. Noise levels at NSL1 were 50.7 dB  $L_{Aeq}$ , and 37.1 dB  $L_{A90}$  and are shown in Graph 7.

Noise sources from onsite equipment at the plant and boiler house was audible during the survey.

NSL 1 is a proposed noise sensitive location as part of IPPC Licence application. At this location, the  $L_{A90}$  parameter is a good representation of the specific noise from the Cadbury site (i.e. there is intermittent extraneous traffic noise). The measured  $L_{A90}$

values are within the IPPC Licence daytime and night-time criteria of 55dB and 45dB  $L_{Aeq, 15min}$  respectively.

No tonal or impulsive noise characteristics were noted.

#### 4.2.2 Position NLS 2

During the daytime survey, the dominant source of noise at NSL 2 was traffic on the R582 that carries a significant number of vehicles including a large proportion of HGVs. Traffic entering and leaving the Cadbury site also contributed to the noise climate. Some Plant noise was audible during the daytime survey and noise levels were 68.4 dB  $L_{Aeq}$ , and 44.8 dB  $L_{A90}$  and are shown in Graph 8.

During the night-time survey, there were reduced traffic flows on the R582 although this source was still dominant. Noise levels at NSL 2 were 57.9 dB  $L_{Aeq}$ , and 38.0 dB  $L_{A90}$  and plant noise from the loading area was just audible during short lulls in traffic and is shown in Graph 9.

NSL 2 is a proposed noise sensitive location as part of IPPC Licence application. At this location, the  $L_{A90}$  parameter is a good representation of the specific noise from the Cadbury site (i.e. there is intermittent extraneous traffic noise). The measured  $L_{A90}$  values are within the IPPC Licence daytime and night-time criteria of 55dB and 45dB  $L_{Aeq, 15mins}$  respectively.

No tonal or impulsive noise characteristics were noted.

#### 4.2.3 Position NLS 3

During the daytime survey, the dominant source of noise at Location 3 was traffic on the R582. Plant noise was just audible during the daytime survey during lulls in traffic. Noise levels were in the order of 64.9 dB  $L_{Aeq}$ , and 43.5 dB  $L_{A90}$  and are shown in Graph 10.

During the night-time survey, there were reduced traffic flows on the R582 although this source was still dominant. Plant noise from the Cadbury site was audible during lulls in traffic. Noise levels were of the range of 60 to 68dB  $L_{Aeq}$  and in the range of 56.6 dB  $L_{Aeq}$ , and 38.0 dB  $L_{A90}$  and are shown in Graph 11.

NSL 3 is a proposed noise sensitive location as part of the IPPC Licence application. NSL 3 is at the entrance to a residential property along the R582. During the daytime, the  $L_{A90}$  parameter is a good representation of the specific noise from the Cadbury site at this location (i.e. there is intermittent extraneous traffic noise).

The estimated daytime specific noise level attributable to the Cadbury site is 43.5 dB  $L_{A90, 15mins}$  at NSL3. During the night-time, the  $L_{A90}$  parameter is a good representation of the specific noise from the Cadbury site at this location (i.e. there is intermittent extraneous traffic noise). The estimated night-time specific noise level of 38.0 dB  $L_{A90, 15min}$  is attributable to Cadbury Ireland. The estimated values are within the IPPC Licence daytime and night-time criteria of 55dB and 45dB  $L_{Aeq, 15mins}$  respectively.

No tonal or impulsive noise characteristics were noted.

#### 4.2.4 Position NLS 4

During the daytime survey, the dominant source of noise at NSL 4 was traffic on the N72, Mallow to Killarney road. Plant noise from the Cadbury site was audible during lulls in the traffic on the N72. Noise levels were in the order of 64.7 dB  $L_{Aeq}$ , and 47.9 dB  $L_{A90}$  and are shown in Graph 12.

During the night-time survey, there were reduced traffic flows on the R582 although this source was still dominant. Plant noise from the Cadbury site was audible during lulls in traffic on the N72. Noise levels were in the range of 58.7 dB  $L_{Aeq}$ , and 40.0 dB  $L_{A90}$  and are shown in Graph 13.

NSL 3 is a proposed noise sensitive location as part of the IPPC Licence application. NSL 4 is considered a noise sensitive location as it gives a good indication of noise level emanating from the plant to the north of the facility. During the daytime, the  $L_{A90}$  parameter is a good representation of the specific noise from the Cadbury site at this location (i.e. there is intermittent extraneous traffic noise). The measured  $L_{A90}$  value of 47.9 dB is within the IPPC Licence daytime criteria of 55dB LAeq, 15 mins.

During the night-time, the  $L_{A90}$  parameter is a good representation of the specific noise from the WMI site at this location (i.e. there is intermittent extraneous traffic noise). The measured  $L_{A90}$  value of 40.0 dB is within the IPPC Licence night-time criteria of 45 dB  $L_{Aeq}$ , 15 mins.

No tonal or impulsive noise characteristics were noted.

## 5.0 Conclusion

### 5.1 Sources and Emissions

Apart from maintenance shutdowns and other holidays, the plant operates continuously, 24 hours a day, seven days a week. Delivery of raw materials and export of finished product offsite is by road. Road traffic to and from the site is considered a noise source in terms of the overall traffic flow and pattern in the area.

The character of each noise source has been stated as broadband, tonal or impulsive as assessed at the measurement distance. It should be noted that an assessment of tonality or impulsivity at source does not necessarily mean that this character is audible at the boundary of the plant or at nearby residences.

The measurement locations are shown on Figures 1.1 and 1.2 appended in Attachment C. The results for each location are shown in Tables 1(a), 1(b) and 2 "Noise Sources Summary Sheet" appended in Attachment A. The results include A-weighted and un-weighted octave band levels sound pressure levels for Boundary Locations, with comments as appropriate. The measurements were generally short  $L_{Aeq}$  measurements. Some measurements of  $L_{max}$  levels are noted in the Table. Note that the "Fast" Time Weighting was used for  $L_{max}$  measurements.

Weather conditions can have both positive and negative effects on sound propagation. A positive wind vector or a temperature inversion can give an increase in noise level at a distance from a source. A negative wind vector can reduce the received noise levels. These effects tend to become more significant at relatively long distances from the noise source. When wind speeds rise above ten knots (five metres per second), locally generated wind noise (through trees, etc.) can have a significant masking effect, often rendering a low level noise source inaudible.

Noise measurements were confined to periods when weather conditions on and around the Cadbury site were judged to have little significant effect on noise propagation. A check on wind speed and direction was undertaken at the times throughout the measurements.

Where plant noise is steady and audible, but there are extraneous noise sources such as road traffic, aircraft, birds or intermittent local activities,  $L_{A90}$  usually gives a good approximation of the relatively constant plant noise level. Where the Cadbury site, etc is stated as clearly audible or the dominant background source, plant noise may be taken as approximately equal to  $L_{A90}$ .

## 5.2 Noise Impact

The proposed development falls in the category "Food and Drink" in the First Schedule of the EPA Act, 1992. As such the requirements of BAT apply to noise emissions from the operation of the development.

The range 35 to 45 dB (A), is suggested by the EPA (Guidance Notes for Noise in relation to Scheduled Activities), as the range of target levels appropriate to avoid disturbance at night outside houses. An important aspect of acceptability is the absence of significant tones or impulses.

The results of the noise survey indicate that there is no significant impacts on noise sensitive locations outside the boundary. The plant is audible at times at these locations, particularly at night in low wind conditions. However, the plant noise levels are unlikely to give rise to any disturbance.

The noise survey data has been analysed and it may be concluded that this facility would be in compliance with the criteria as set out in 1.0 above and is in compliance with these requirements.

## References

British Standard BS 7385 (1993): Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.

British Standard BS 5228 (1992): Noise control on construction and open sites Part 4 Code of practice for noise and vibration control during piling.

BS5228: Noise control on construction and open sites.

1509613: Acoustics - Attenuation of sound outdoors, Part 2: General method of calculation, 1996.

ISO 1996: Acoustics - Description and measurement of environmental noise: 1982.

EPA 1995 Guidance Note for Noise in Relation to Scheduled Activities, 1995

EPA 2003 Environmental Noise Survey, Guidance Documents

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**Attachment A  
Tables**

**Table 1(a) Boundary Levels**

Location reference	Sampling Interval	Duration (minutes)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>Amin</sub>	L <sub>A10</sub>	L <sub>A90</sub>	Wind	Comments
<b>BL 1</b>	<b>DAY</b> 1535 – 1550	15	<b>55.7</b>	68.6	50.7	57.5	53.0	Light breeze	Site and R582 traffic noise
<b>BL 2</b>	1605 – 1620	15	<b>77.7</b>	79.2	76.3	78.2	77.3	Light breeze	Boiler house and cooling towers
<b>BL 3</b>	1630 – 1645	15	<b>70.1</b>	73.7	65.2	73.7	69.0	Light breeze	Storage silo's noise
<b>BL 4</b>	1655 – 1710	15	<b>52.8</b>	73.5	43.3	52.7	46.8	Light breeze	Plant, road noise and silo's
<b>BL 5</b>	1715 – 1730	15	<b>64.4</b>	83.5	50.3	67.1	51.8	Light breeze	Road noise

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**Table: 1 (b) Noise Sensitive Locations**

Location reference	Sampling Interval	Duration (minutes)	L <sub>Aeq</sub>	L <sub>Amax</sub> <sub>x</sub>	L <sub>Amin</sub>	L <sub>A10</sub>	L <sub>A90</sub>	Wind	Comments
NSL1 NSL2 NSL3 NSL4	<b>DAY</b> 1300 – 1315 1325 – 1340 1350 – 1405 1420 - 1435	15	67.4	89.3	37.2	68.0	42.5	Light breeze	Road noise
			68.3	90.4	39.9	70.6	44.8	Light breeze	Road traffic and plant.
			64.9	80.6	38.8	69.5	43.5	Light breeze	Road traffic and plant.
			64.7	84.8	42.8	65.4	47.9	Light breeze	Road noise & plant
NSL1 NSL2 NSL3 NSL4	<b>NIGHT</b> 0200 – 0215 0230 – 0245 0305 – 0320 0335 – 0350	15	50.7	68.6	50.7	42.5	37.1	Calm	Road noise & plant
			57.9	81.2	35.8	54.2	38.0	Calm	Road traffic and plant.
			56.6	79.8	34.7	48.6	38.0	Calm	Road traffic and plant.
			58.7	81.6	36.2	56.8	40.0	Calm	Road noise & plant

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**Table 2: NOISE EMISSIONS - Noise sources summary sheet**

Source	Emission point Ref. No	Equipment Ref. No	Sound Pressure <sup>1</sup> dB(A) at reference distance	Octave bands (Hz)										Impulsive or tonal qualities	Periods of Emission
				Sound Pressure <sup>1</sup> Levels dB(unweighted) per band											
				31.5	63	125	250	500	1K	2K	4K	8K			
Boundary location 1	BL 1	N/A		61.2	57.0	51.1	46.1	48.1	47.8	41.5	34.7	24.8	None	24 hr	
Boundary location 2	BL 2	N/A		69.0	72.6	75.8	73.6	69.7	67.9	62.2	56.1	51.2	None	24 hr	
Boundary location 3	BL 3	N/A		73.1	65.6	63.6	57.8	72.1	59.2	49.4	42.9	35.7	None	24 hr	
Boundary location 4	BL 4	N/A		66.5	63.1	58.8	49.8	49.3	40.1	34.2	27.9	23.6	None	24 hr	
Boundary location 5	BL 5	N/A		64.3	60.9	58.5	57.6	55.8	56.7	51.8	44.6	33.8	None	24 hr	

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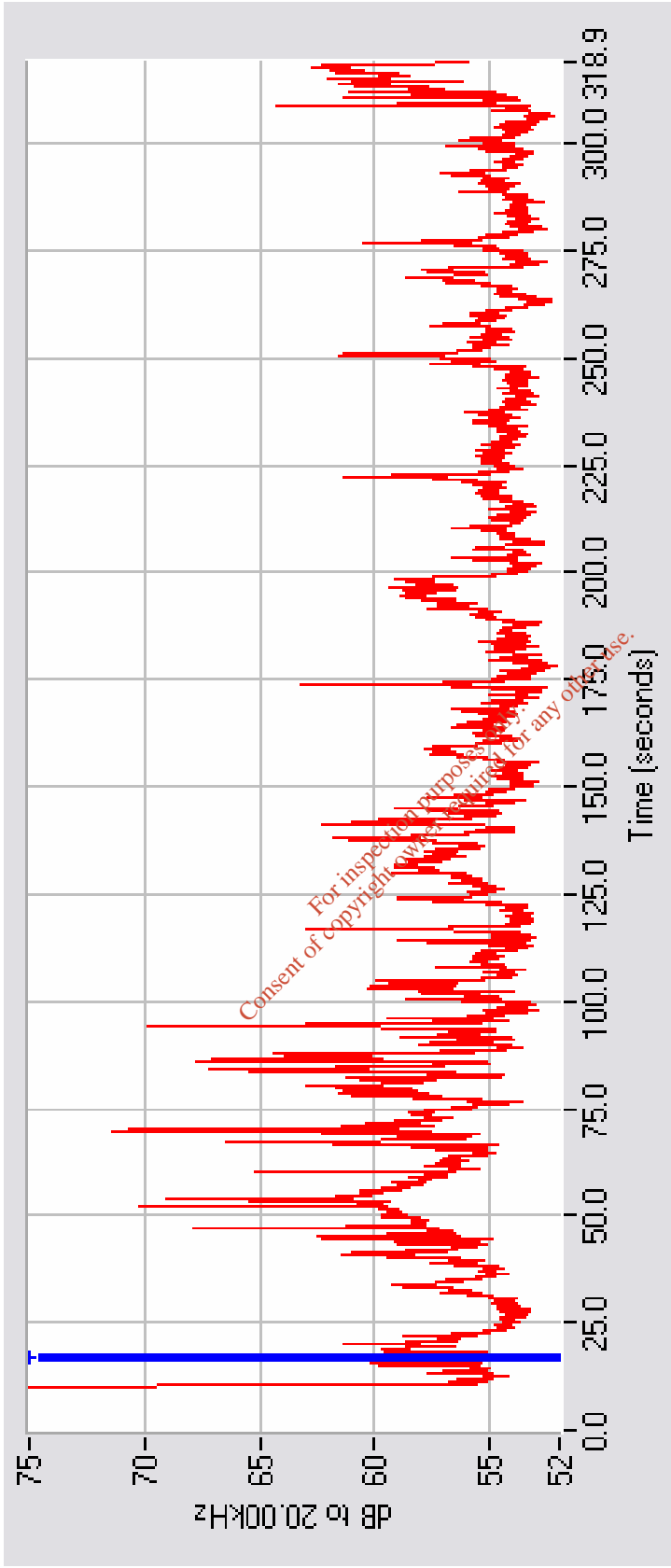
1. For items of plant sound power levels may be used.

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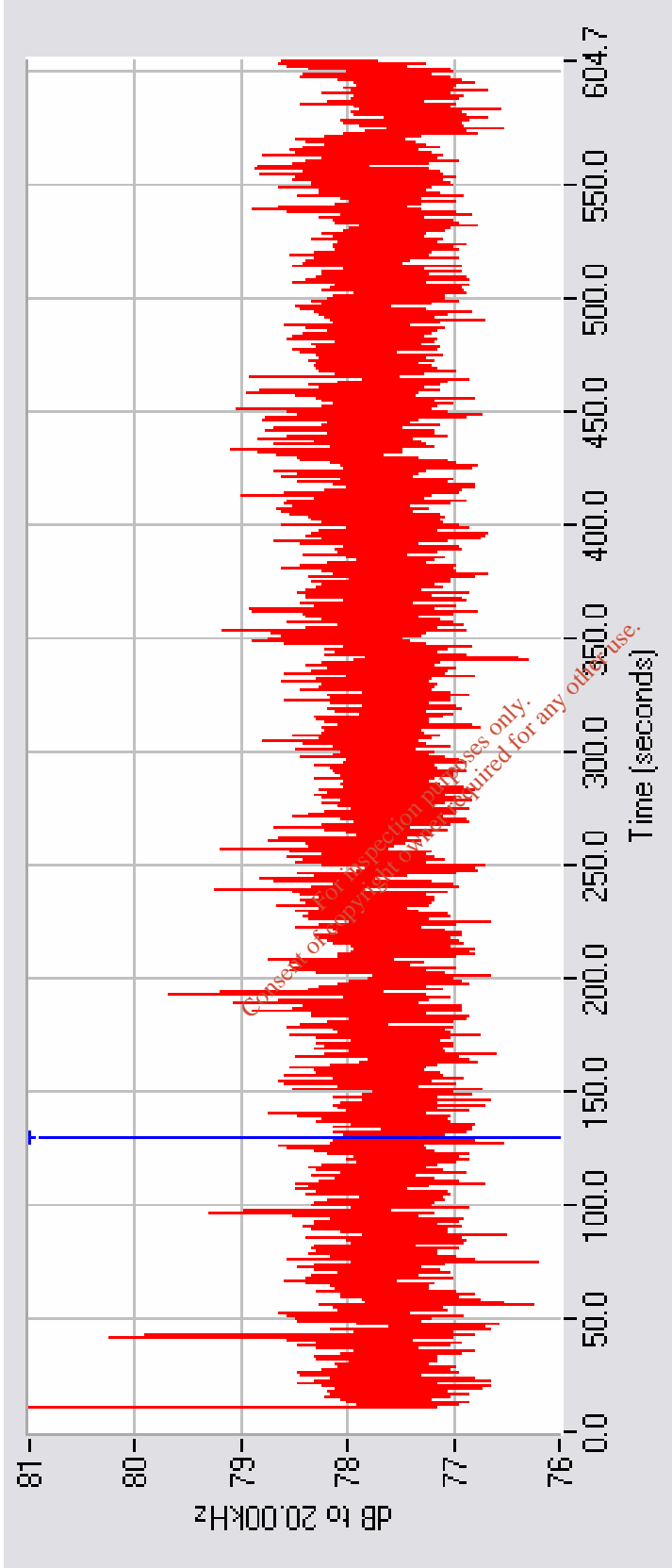
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**Attactment B  
Graphs**

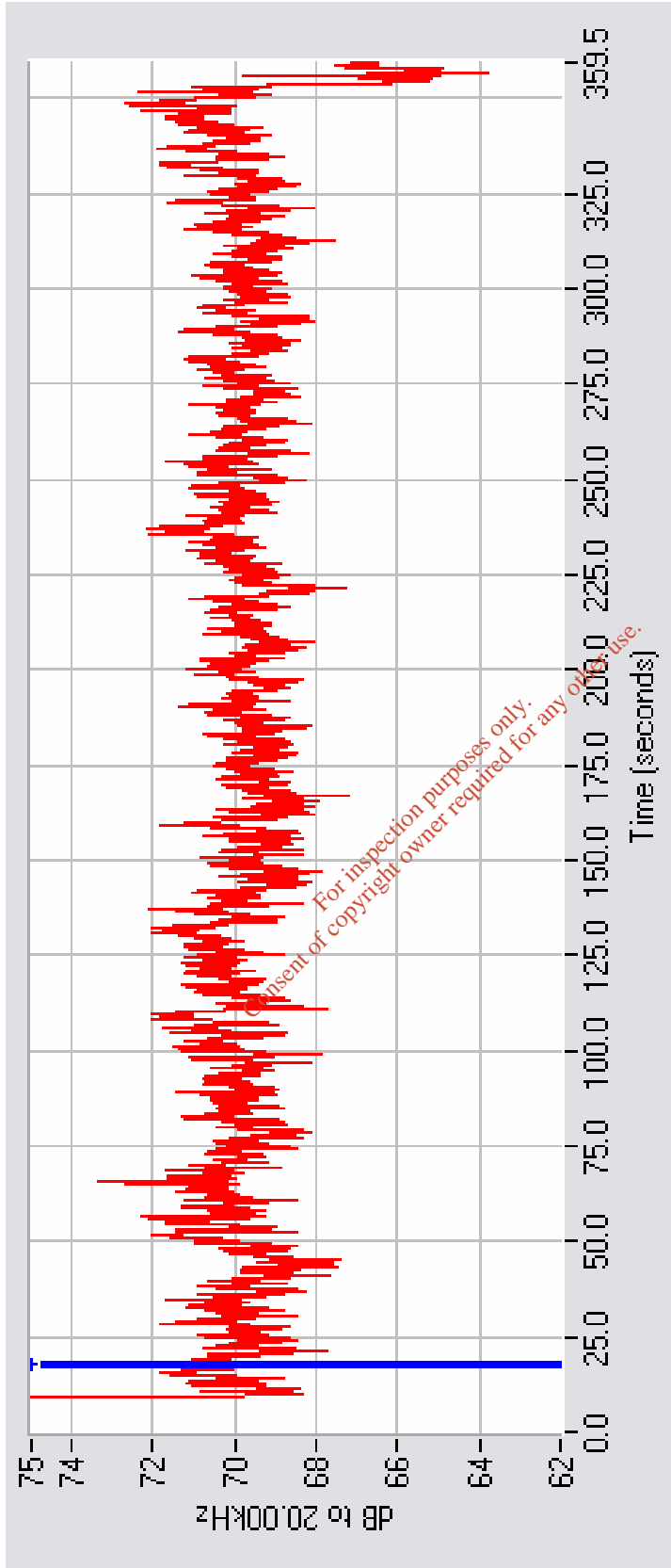
Graph 1: Showing noise level at Boundary Location 1



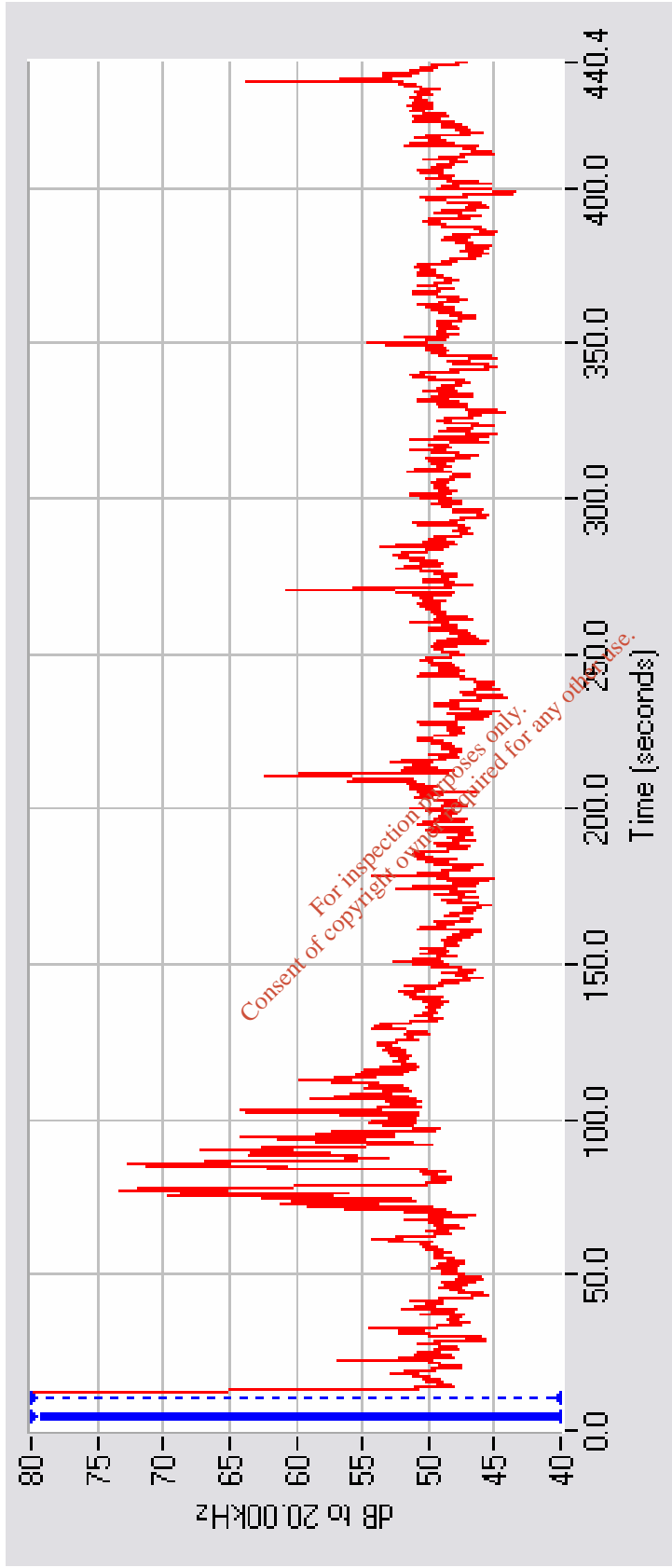
Graph 2: Showing noise level at Boundary Location 2



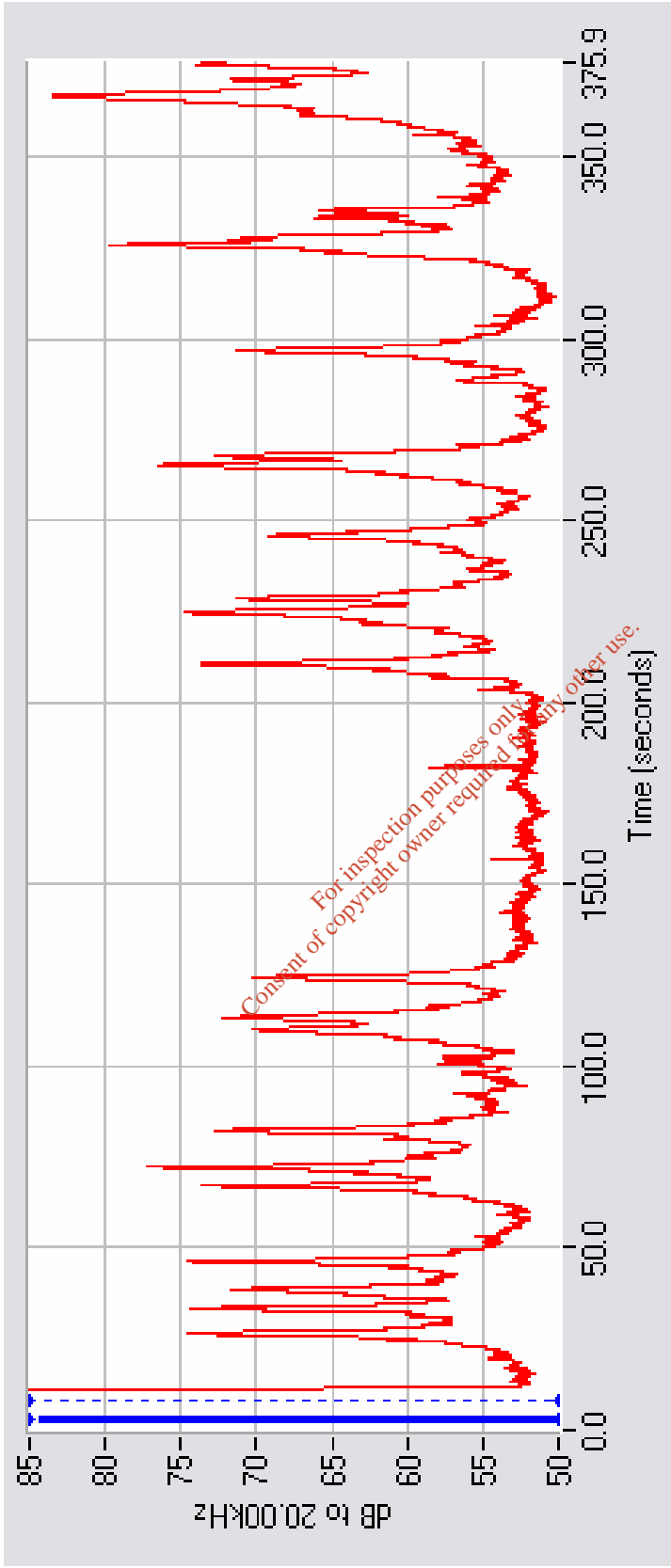
Graph 3: Showing noise level at Boundary Location 3



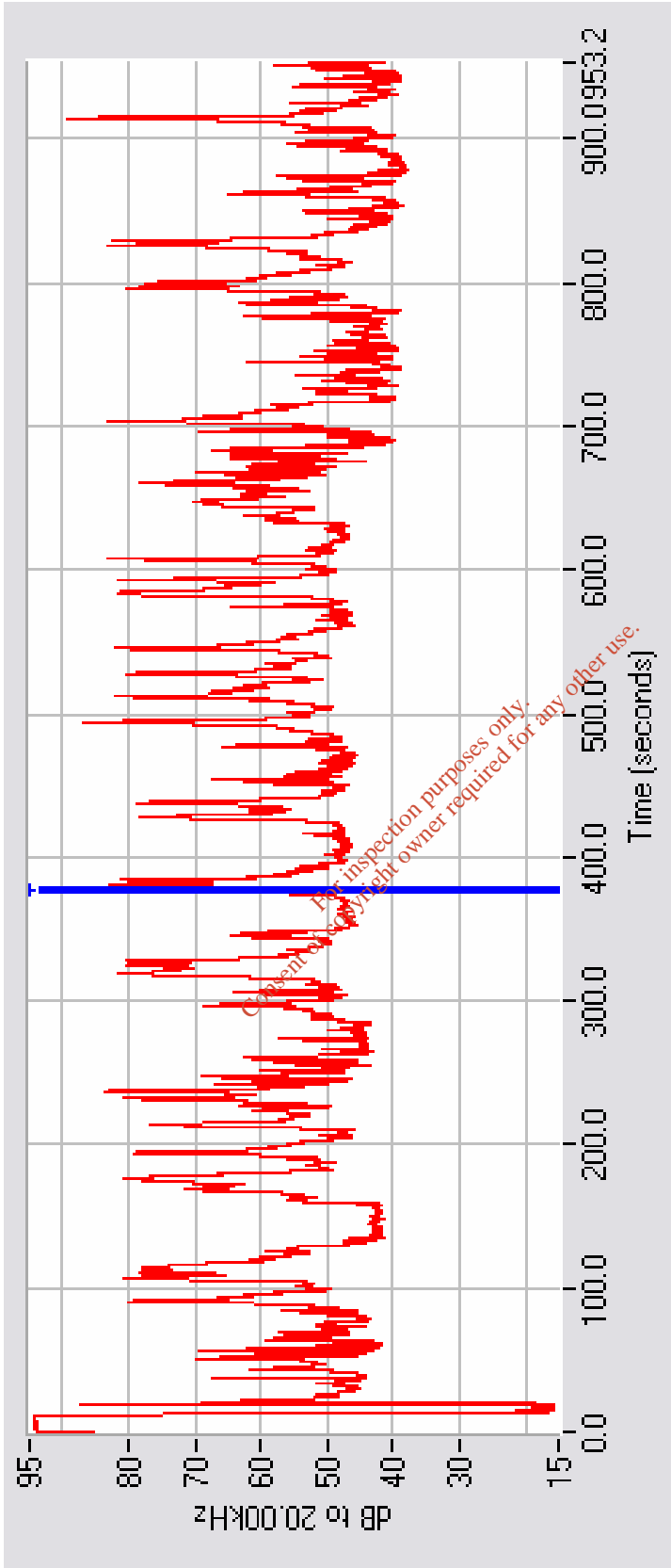
Graph 4: Showing noise level at Boundary Location 4



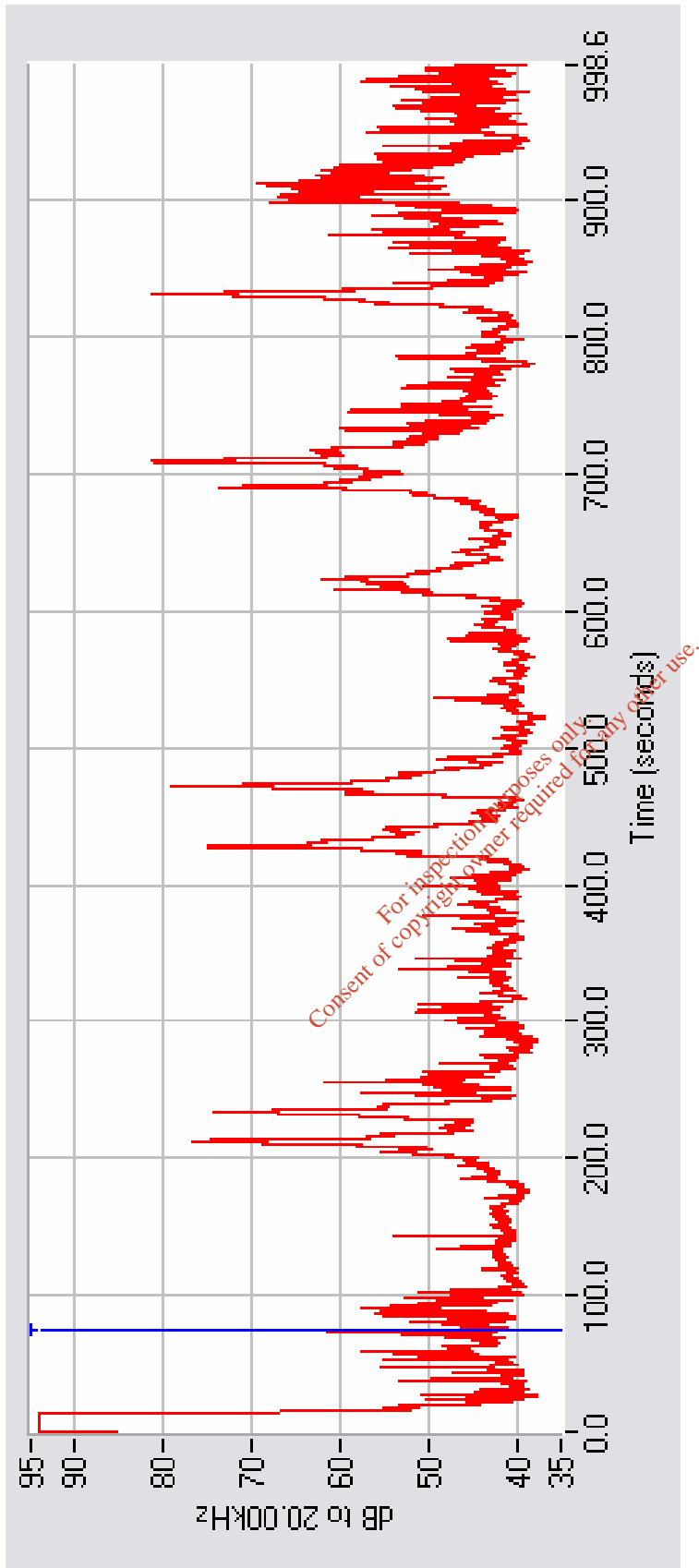
Graph 5: Showing noise level at Boundary Location 5



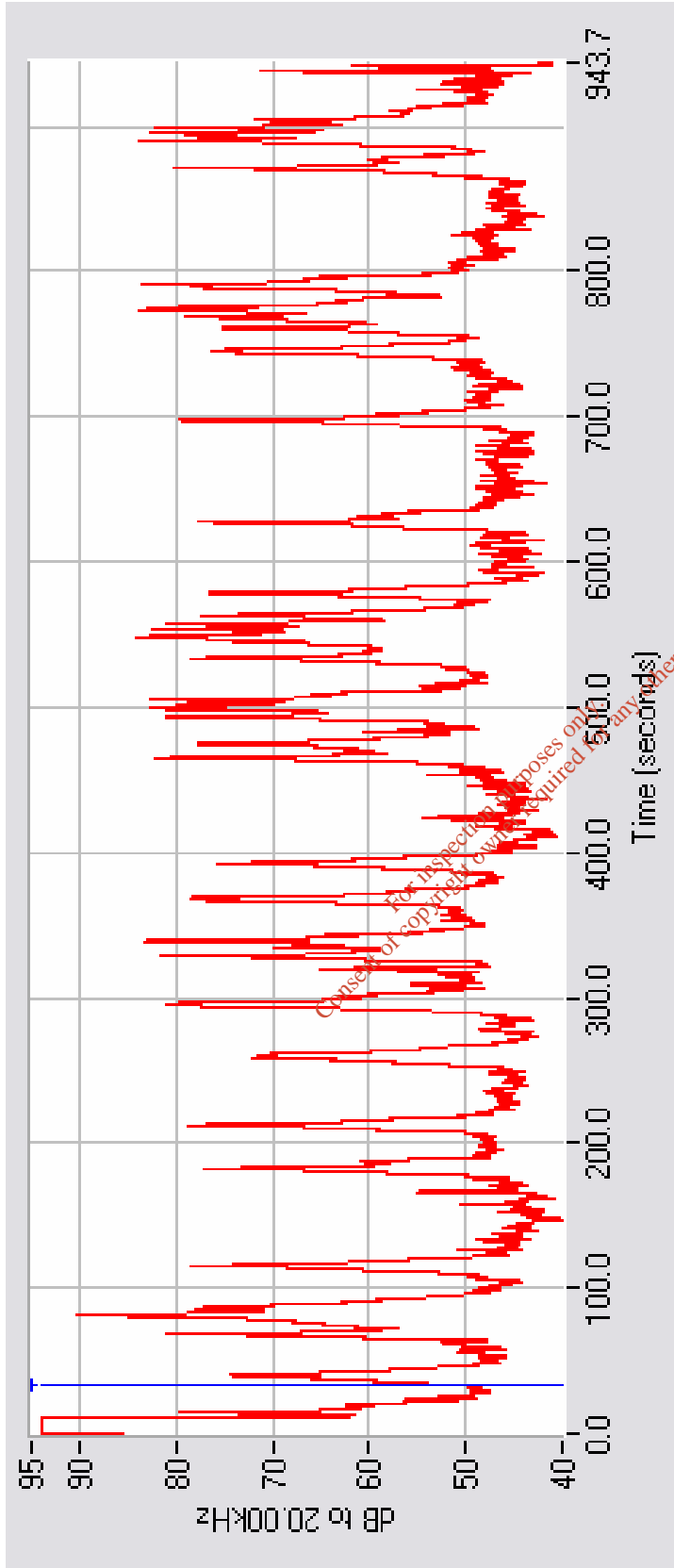
Graph 6: Showing noise level at NSL 1 – Day Survey



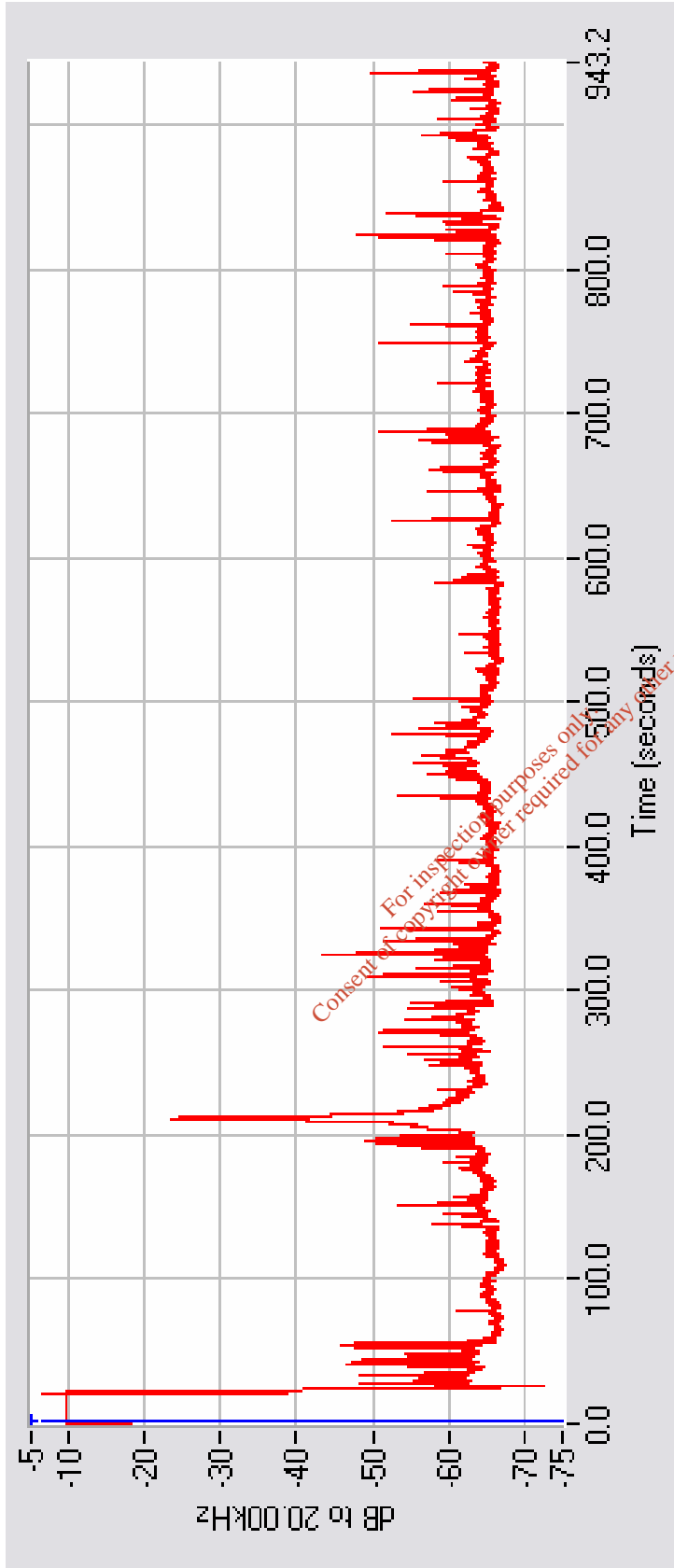
Graph 7: Showing noise level at NSL 1 - Night Survey



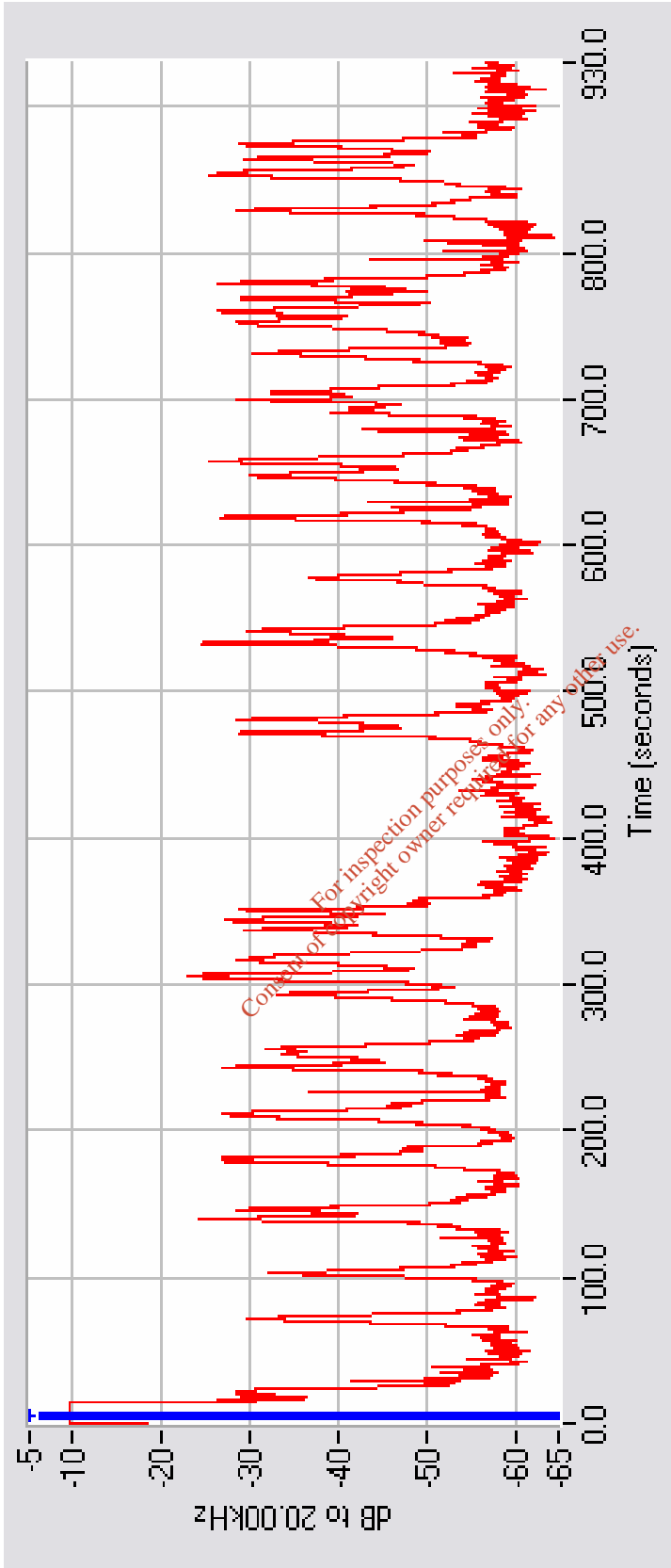
Graph 8: Showing noise level at NSL 2 – Night Survey



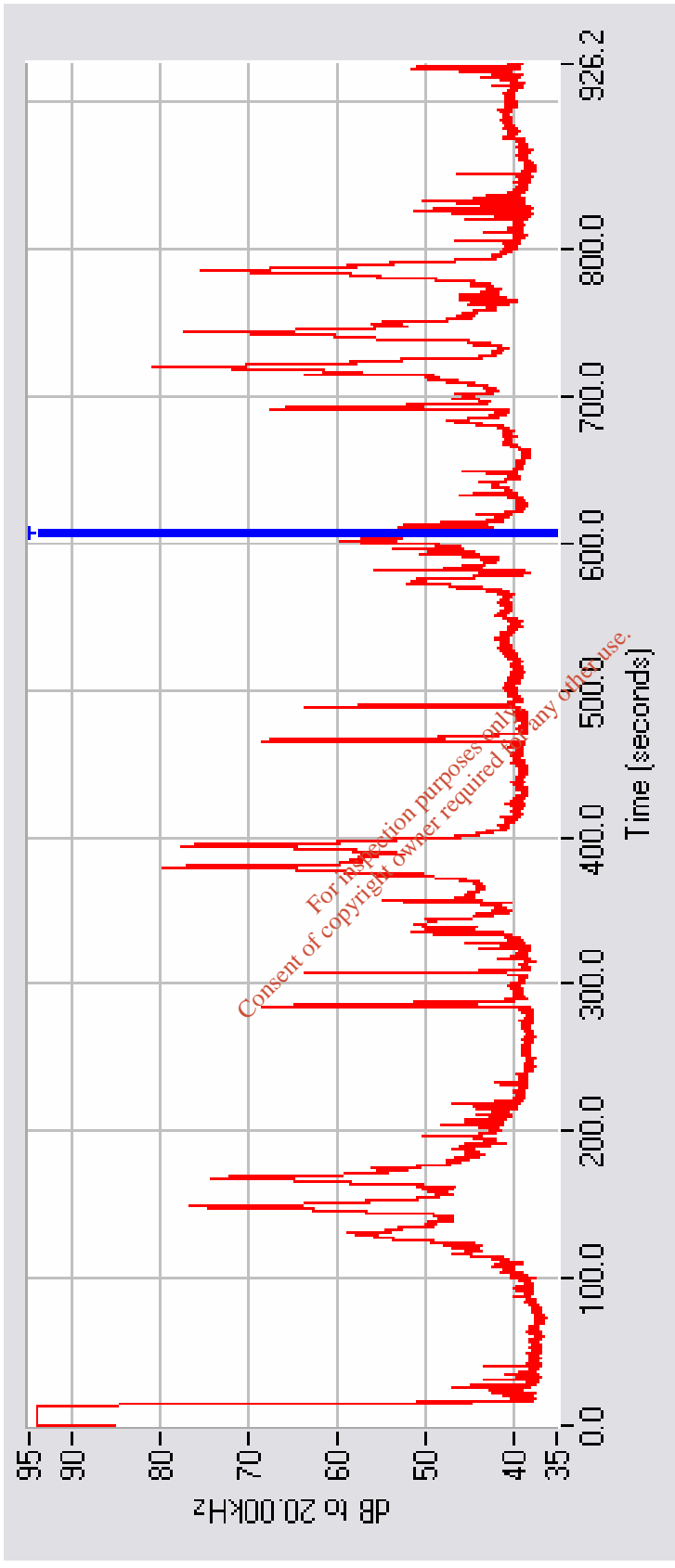
Graph 9: Showing noise level at NSL 2 – Night Survey



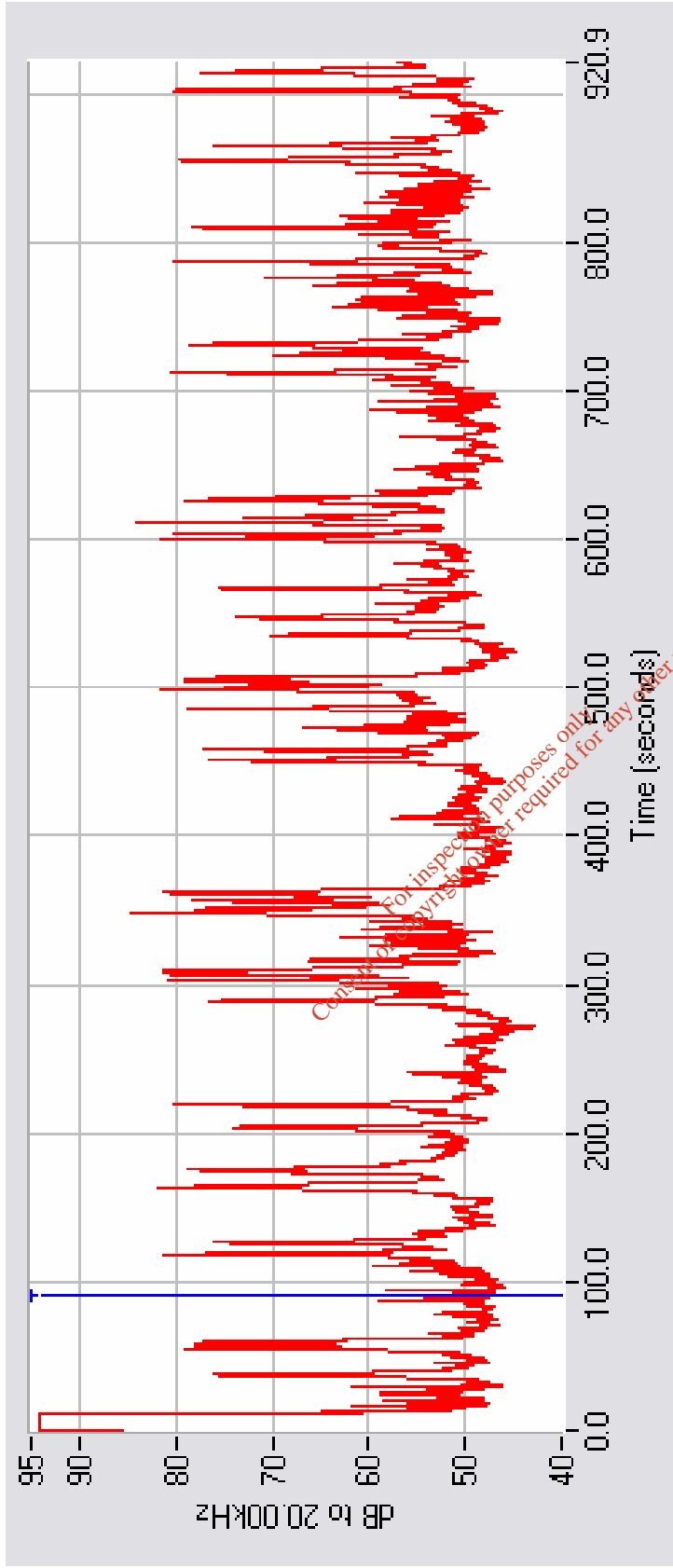
Graph 10: Showing noise level at NSL 3 – Day Survey



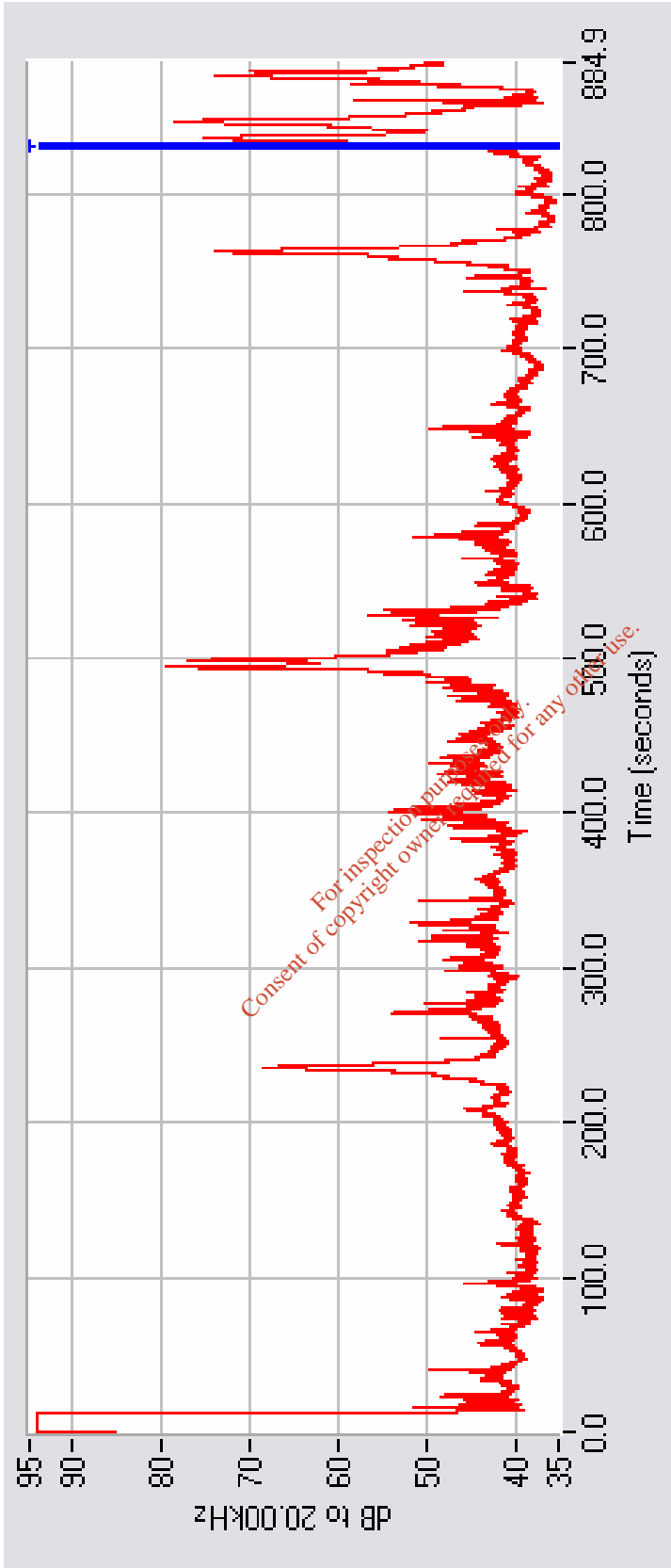
Graph 11: Showing noise level at NSL 3 – Night Survey



Graph 12: Showing noise level at NSL 4 – Day Survey



Graph 13: Showing noise level at NSL 4 - Night Survey



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**Attachment C**  
**Monitoring Location Maps**

**Figure 1.1 – Boundary Noise Monitoring Locations**

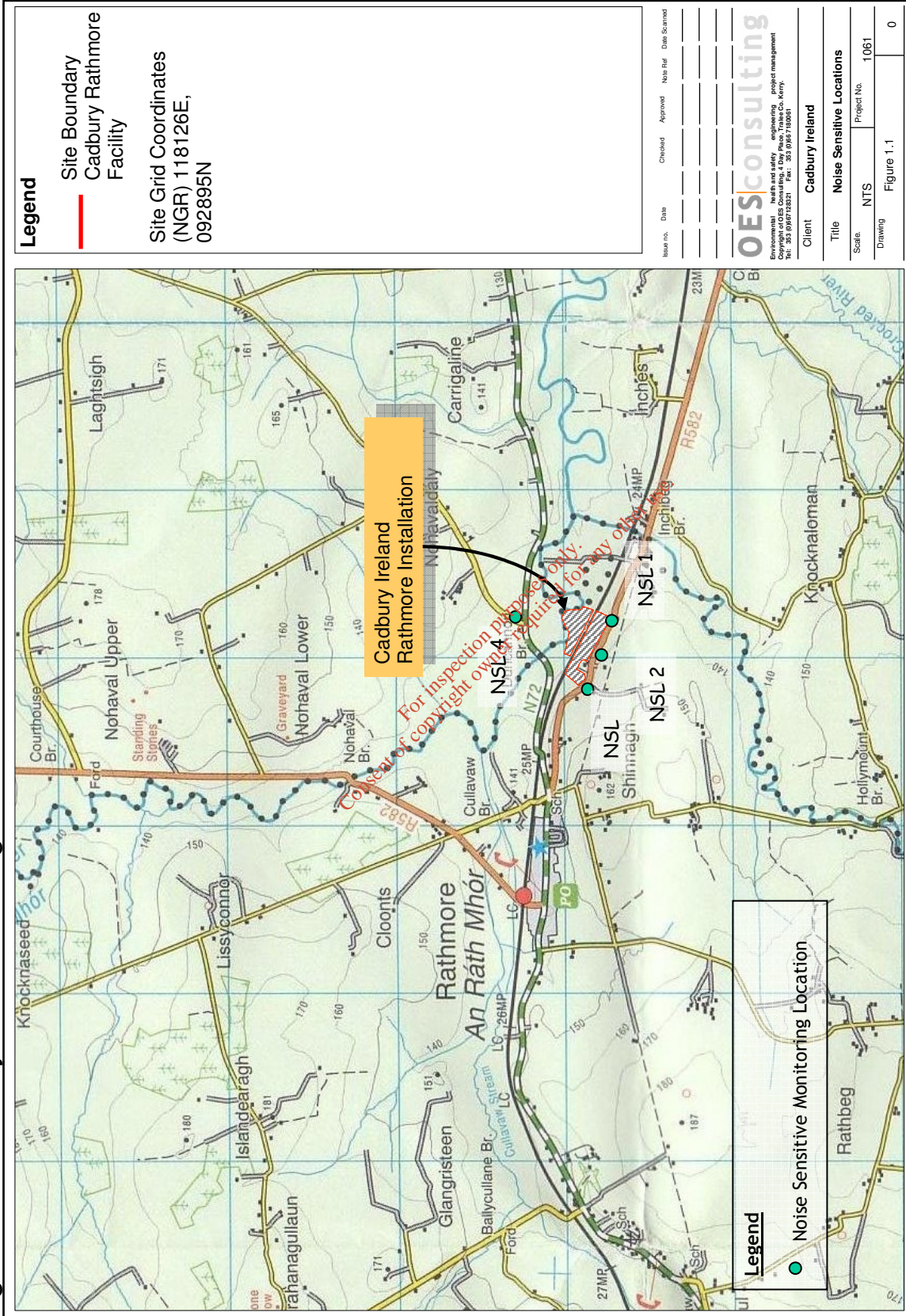
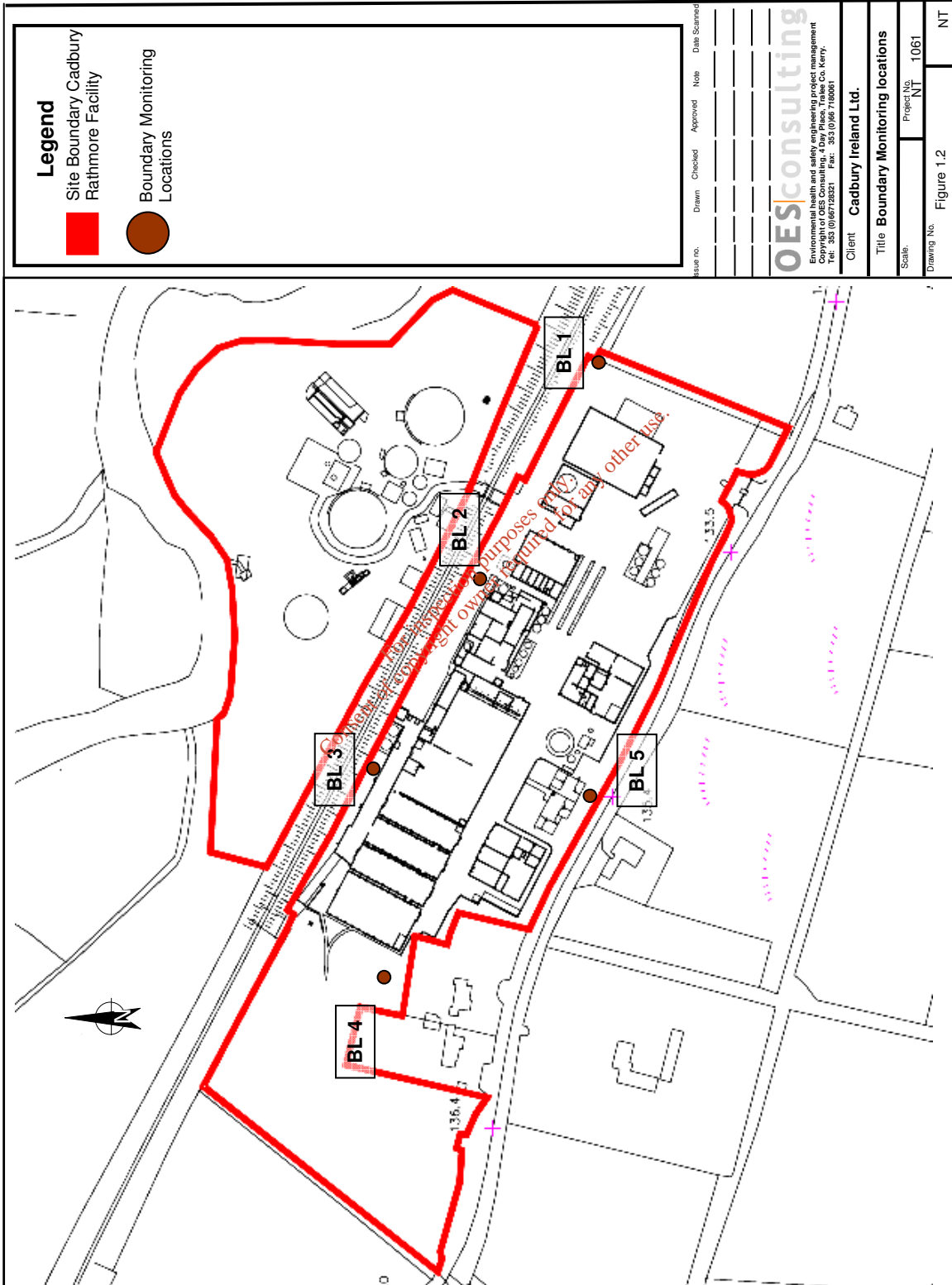


Figure 1.2 – Boundary Noise Monitoring Locations

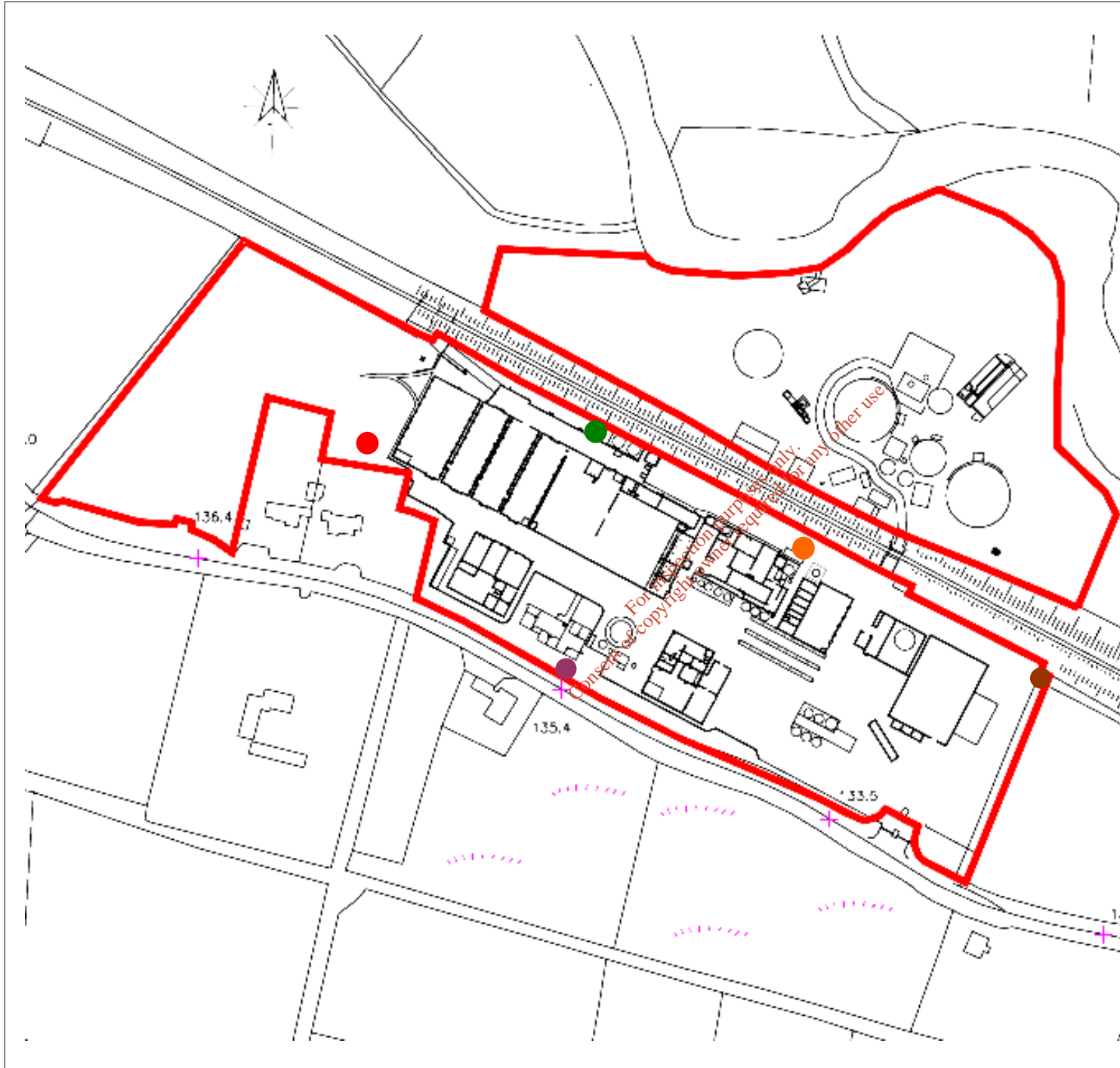


<p><b>Legend</b></p> <p>■ Site Boundary Cadbury Rathmore Facility</p> <p>● Boundary Monitoring Locations</p>		<p>Issue no. _____</p> <p>Drawn _____</p> <p>Checked _____</p> <p>Approved _____</p> <p>Note _____</p> <p>Date Scanned _____</p>
<p><b>OES consulting</b></p> <p>Environmental health and safety engineering project management</p> <p>Copyright of OES Consulting, 4 Day Place, Tralee Co. Kerry.</p> <p>tel: 353 (0)23 88221 fax: 353 (0)23 78881</p> <p>Client <b>Cadbury Ireland Ltd.</b></p>		<p><b>Title Boundary Monitoring locations</b></p> <p>Scale: _____</p> <p>Project No. <b>NT 1061</b></p> <p>Drawing No. <b>Figure 1.2</b></p> <p><b>NT</b></p>

**Appendix I.7.2**  
**Location of Boundary Monitoring Positions**

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### Legend

- Site Boundary Cadbury Rathmore Facility
- BL1
- BL2
- BL3
- BL4
- BL5

Issue no.	Date	By	Checked	Approved	Note Ref	Date Scanned

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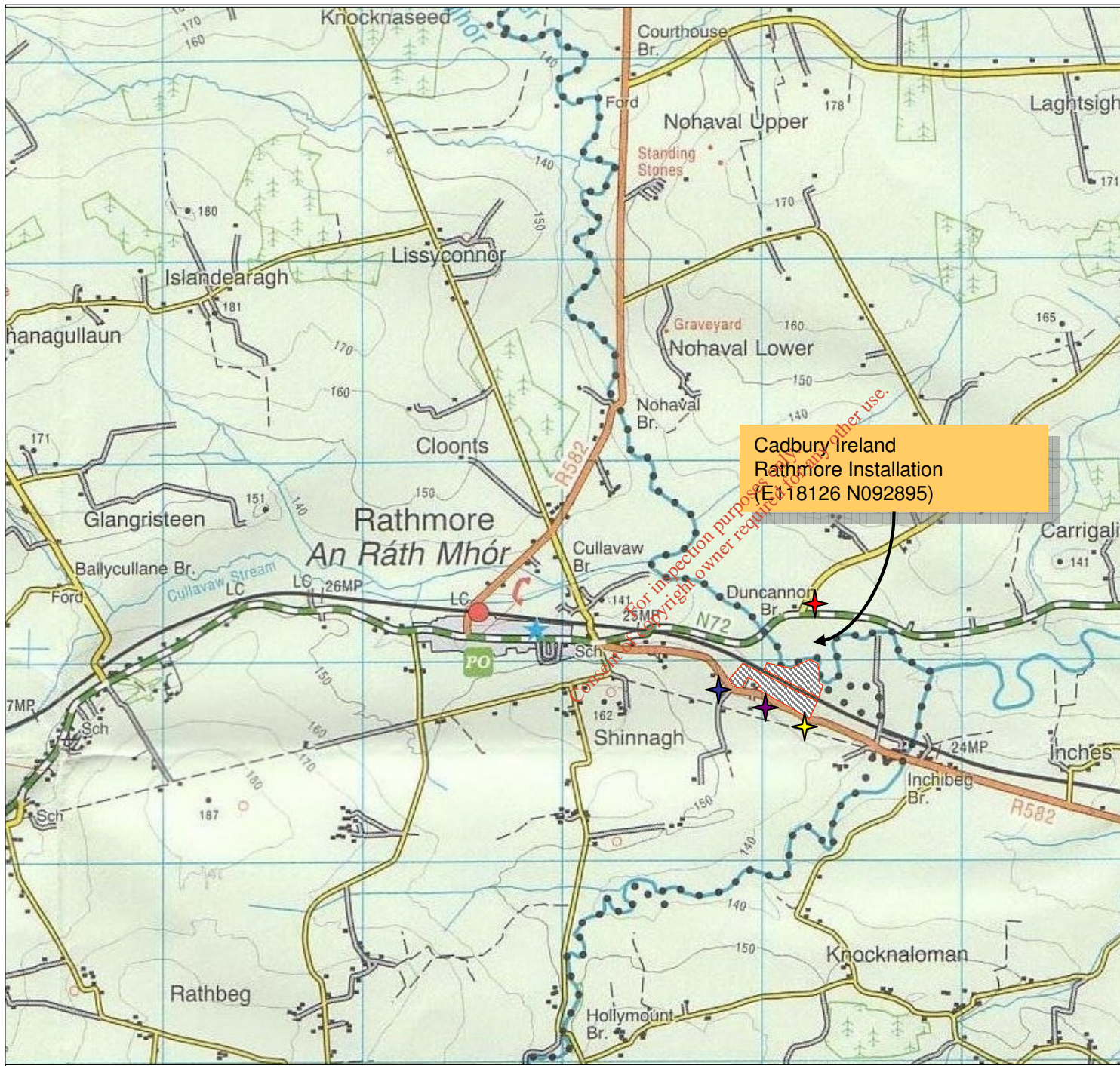
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Client		<b>Cadbury Ireland Ltd.</b>	
Title		Boundary Monitoring locations	
Scale	NTS	Project No.	1061
Figure No.	Drawing No. 8		Rev. A

**Appendix I.7.3**  
**Location of Noise Sensitive Positions**






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Cadbury Ireland  
Rathmore Installation  
(E 18126 N 092895)

### Legend

-  Site Boundary Cadbury Rathmore Facility
-  NSL 1
-  NSL 2
-  NSL 3
-  NSL 4

Issue no.	Date	By	Checked	Approved	Note Ref	Date Scanned

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Client	<b>Cadbury Ireland Ltd.</b>		
Title	Noise Sensitive Locations		
Scale	NTS	Project No.	1061
Figure No.		Rev.	A

**Attachment I.8**

**EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY  
Environmental Considerations and BAT**

**Cadbury Ireland Limited  
Rathmore Installation  
IPPC Licence Application**

**Project Ref: OES1061\_01**

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## I.8 Environmental Considerations

Cadbury (Ireland) Rathmore have in the past undertaken various energy conservation projects, and plant upgrades in order to maximise the conversion of raw material to saleable product at the factory.

In the process of achieving this, improvements at the plant have been made in the areas of the use of cleaner technologies, load minimisation, containment of emissions, recycle and reuse.

### ***Expenditure on Environmental Protection***

As a result of the commitment of Cadbury Ireland Limited, Rathmore Installation, to environmental protection at the site, significant expenditure has been incurred in the upgrade of existing environmental controls in addition to energy conservation measures and structural remediation work. An approximation of the environmental expenditure incurred over the past five years can be seen in Table I.8.1.

**Table I.8.1 Expenditure on Environmental Protection (2000 to 2005)**

<b>Item</b>	<b>Approximate Cost (€)</b>
<b>Capital Expenditure</b>	
○ Site repair and upgrade Projects	320,000
○ Energy Conservation Projects	220,000
○ Drains Remediation Project	210,000
<b>Total Environmental Capital Expenditure</b>	<b>€750,000</b>
<b>Operational Expenditure</b>	
○ Total operational spend – Effluent Plant	400,000
○ Non-Hazardous Waste Recycling and Disposal	75,000
○ Hazardous Waste Disposal	10,000
○ IPPC Application Costs	80,000
<b>Total Environmental Operational Expenditure</b>	<b>€565,000</b>
<b>Total Environmental Protection Expenditure</b>	<b>€1,315,000</b>

In addition to the costs outlined above, there will be environmental expenditure associated with the provision of reports as part of the IPPC Licence process.

### **I.8.1 Cleaner Technologies**

Cadbury (Ireland) Rathmore continually monitor and aim to reduce loadings to the waste water treatment plant.

A considerable amount of capital has been invested in energy conservation projects with the aim of reducing consumption, and enhancing recovery and usage in line with production. Energy consumptions targets are set on an annual basis with the aim of reducing requirements based on data from previous years.

### **I.8.2 Load Minimisation**

The oil and chemical storage tanks are fully bunded to contain any accidental spillage's, which may occur.

Sludge from the wastewater treatment plant is dewatered using a belt press prior to composting and subsequent landspreading to reduce the volume of material requiring transport. Cadbury (Ireland) Rathmore are currently in the process of reviewing sludge handling and treatment options.

Where practicable, washing techniques are utilised which minimise the volume of water used and consequently reducing the volume of discharge sent to the waste water treatment plant.

Pallets are re circulated or reused.

### **I.8.3 Containment of Emissions**

A large proportion of the noise generating plant material and equipment is located within the building with the added benefit of minimising noise emissions.

The fuel and chemical storage tanks are fully bunded.

Cadbury (Ireland) Rathmore are currently in the process of completing a drains remediation project which aims to implement a new industrial wastewater sewer system to convey waste and by-products of the manufacturing processes carried out at the plant. This industrial wastewater system should be constructed from stainless steel to offer sufficient durability against corrosive agents in the wastewater. As part of the programme a new domestic wastewater sewer system will be installed to convey human waste to a new package treatment plant.

A large proportion of noise generating plant and equipment is located within the building to minimise noise emissions.

### **I.8.4 Recycle and Reuse**

Solid waste management at the installation receives significant attention in terms of ensuring that all wastes are appropriately labelled, collected, segregated, stored and dispatched.

The company maintains a register of all waste contractors and ensures that contractors, and waste/recycling facilities have appropriate permits (waste permit/or waste collection permit) and where relevant, licenced.

Regular inspections and audits of organic waste landspreading contractors are undertaken to evaluate performance in agreement with spreading criteria.

Waste oil is collected and stored prior to be taken away by a specialist contractor for recycling.

Fluorescent light bulbs are collected by Irish Lamp Recycling Limited for proper disposal.

Clean waste such as cardboard and paper are collected for offsite recycling.

Further details of contractors used for recycling and reuse of materials can be seen in Attachment H.

Cadbury (Ireland) Rathmore is a member of REPAK Scheme for recovery of packaging and packaging waste. Appendix I.8.1 contains a copy of the REPAK certificate.

### **I.8.5 Specific Technologies for Treating Emissions**

Generally throughout the plant, the building enclosure reduces noise and air emissions through containment and provision of acoustic screening of intermit equipment.

Externally equipment has been sited away from potential noise sensitive receptors where practicable. A recent noise monitoring survey has indicated that the facility is in compliance with the EPA guidance criteria. Further information relating to this can be found in Attachment I.7.

### **I.8.6 Environmental Risk Control & Management**

Cadbury (Ireland) Rathmore operate an externally certified environmental management system in accordance with the ISO14001 EMS Standard. The system is periodically audited by an external auditor on an ongoing basis and is subject to a full re certification every three years.

The basis of the EMS at Cadbury (Ireland) Rathmore is for the provision of a series of documented and formal operational control procedures, which deal with all aspects of the installation where a potential for environmental impact occurs.

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**Appendix I.8.1**  
Copy of REPAK Certificate

COPY

Mem No. 3



MEMBERS WORKING FOR THE ENVIRONMENT

## Certificate of Compliance

### 2006

It is hereby certified on behalf of Repak Limited, an approved body for the purposes of Waste Management (Packaging) Regulations, 2004 that

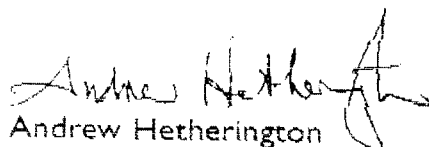
### **Cadbury Schweppes Ireland Ltd**

is participating in a satisfactory manner in the scheme operated by Repak Limited for the recovery of packaging and packaging waste and is accordingly exempt from the requirements of articles 9, 10, 11, 12, 13, 14 and 22 of those Regulations.

This certificate is valid from the date of grant below until the 31st day of December of the same year unless earlier revoked in accordance with the membership rules of the scheme.

*Granted on behalf of Repak Limited*

this 1<sup>st</sup> day of *January* 2006

  
Andrew Hetherington

Chief Executive

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