



OFFICE OF THE  
**DIRECTOR OF TRAFFIC**  
OIFIG AN BHAINISTEOR TRÁCHTA

**DUBLIN CORPORATION**

*Dublin Port Tunnel Project*

*Ambient Air Quality  
Annual Report  
2000  
East Wall Road*

**Getting  
Dublin  
Moving**

## **General Summary.**

This is the first complete year of continuous monitoring of air quality at East Wall Road. The multi-pollutant monitoring unit was previously located at Ellen Field Park, Santry, for two years. The site at East Wall is located in an industrial zoned area. It is considered, however, that the predominant emissions arise from vehicles passing on East Wall Road. Air quality at this site is assessed for pollutants including Particulate Matter under 10 microns in size (PM<sub>10</sub>), Sulphur Dioxide (SO<sub>2</sub>), Nitrogen Dioxide (NO<sub>2</sub>), Carbon Monoxide (CO), Ozone (O<sub>3</sub>) and Lead (Pb).

This report incorporates all these pollutants with the exception of Lead, which is dealt with elsewhere. The results of the monitoring are compared with EU limits, which were adopted on the 22<sup>nd</sup> of April 1999. The initial limits are required to be met by the year 2005 except for Nitrogen Dioxide, the compliance date being 2010. Monitoring indicates that overall ambient air quality in the area is acceptable when assessed against these EU limits.

Enterprise Ireland carries out calibration and servicing of the equipment. Enviro Technology, the equipment suppliers, carries out a twice-yearly overhaul and calibration to a reference standard. There was some loss of data during the year due to a malfunction with the Sulphur Dioxide monitor and a faulty telephone line.

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

The EU Directive was comfortably met at this site. The maximum measured 24 hr average was just less than 50% of the EU limit level. As with air quality throughout Dublin, Sulphur Dioxide does not present a problem at this site.

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

Pollution levels at this site are typical of a heavily trafficked location. EU levels were complied with. However with an annual average of 33 microgrammes per cubic metre, levels were 83% of the EU limit value.

### **Particulate Matter (PM<sub>10</sub>)**

All current EU limits in relation to particulate matter are being met at this site. The number of 24 hour periods exceeding the 50 microgramme standard was just over 25% of the permitted level. The measured annual mean was 58% of the permitted level.

## General Summary. *Contd.*

### Carbon Monoxide (CO)

The EU recently adopted a standard for Carbon Monoxide levels (16/11/2000). The value is based on a rolling average. The level was comfortably met at this site over the past year with measured levels 25% of the limit level.

### Ozone (O<sub>3</sub>)

There are four threshold values for Ozone set out in the EU Directive. There were 15 excursions of one of these limits over the past year.

Air Quality Monitoring, Jan - Dec 2000 East Wall Road Hourly Values							
	PM <sub>10</sub>	SO <sub>2</sub>	Nox	NO	NO <sub>2</sub>	CO	O <sub>3</sub>
Median	18	21	28	11	31	0.3	38
98%tile	73	57	138	98	81	1.2	93
Mean	23	23	37	20	33	0.4	39
Max	220	154	410	354	132	3.0	144
Min	0	1	1	0	1	0.0	1
% Data Capture	96	86	98	98	98	96	98
Values in	UG/M <sup>3</sup>	UG/M <sup>3</sup>	PPB	PPB	UG/M <sup>3</sup>	PPM	UG/M <sup>3</sup>

**Summary of Compliance with EU Directives- East Wall Road**

<b>Air Monitoring Results Jan - Dec 2000</b>					
	<b>EU Limit Level</b>	<b>No. Of allowable exceedences per year</b>	<b>uG/M<sup>3</sup></b>	<b>Pass</b>	<b>Fail</b>
<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>	1Hr. Values - 200ug/m <sup>3</sup> Yearly Mean - 40 ug/m <sup>3</sup>	18 times/yr None	Max 1 Hr = 132 33	* *	
<b>Sulphur Dioxide (SO<sub>2</sub>)</b>	1Hr. Values - 350ug/m <sup>3</sup> 24Hr. Values - 125ug/m <sup>3</sup>	24 times/yr 3 times/yr	Max 1 Hr = 154 Max 24Hr = 60	* *	
<b>PM<sub>10</sub></b>	24Hr. Values - 50ug/m <sup>3</sup> Yearly Mean - 40 ug/m <sup>3</sup>	35 times/yr None	Max 24Hr = 61 No. >50 = 9 23	* * *	
<b>Ozone (O<sub>3</sub>)</b>	Ave. 8Hr Value - 110ug/m <sup>3</sup> 1Hr Values - 180ug/m <sup>3</sup> 1Hr value -360ug/m <sup>3</sup> -	None None Population Warning	Max 8Hr = 131 No. >110 = 15 Max 1Hr = 144 Max 1Hr = 144	* * *	* *
<b>Carbon Monoxide (CO)</b>	8 Hour Rolling Ave, 8.5ppm	None	Max 8Hr = 3.0 ppm	*	

**Air Quality Monitoring  
East Wall Road,**

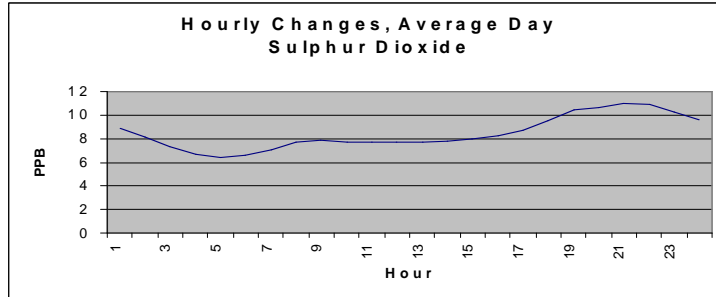
**Dublin Port Tunnel Project  
Annual Report**

**January - December  
2000**

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Dublin Corporation,  
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## Sulphur Dioxide (SO<sub>2</sub>) - Review of period Jan. - Dec. 2000

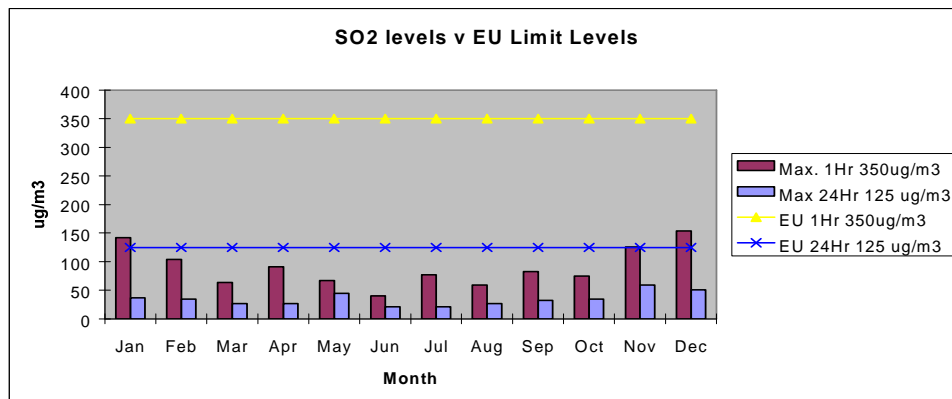
Results of monitoring at this site show that levels are low and comfortably comply with both the previous and new EU Directives, which were adopted on the 22/4/1999. The chart below indicates how SO<sub>2</sub> levels change through out a typical day. The highest levels arise in the evening suggesting that these emissions arise from space heating.



### Summary of SO<sub>2</sub> results (Hourly Figs.)

SO <sub>2</sub> 2000	Jan	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<b>PPB</b>												
<b>Median</b>	6	6	4	4	17	4	5	7	9	10	13	12
<b>98%tile</b>	28	19	19	14	25	13	11	13	15	18	28	27
<b>Mean</b>	78	7	6	5	17	4	5	7	9	11	14	13
<b>Max.</b>	53	39	24	34	25	15	29	22	31	28	47	58
<b>Min</b>	1	0	1	2	10	1	3	4	1	7	8	7

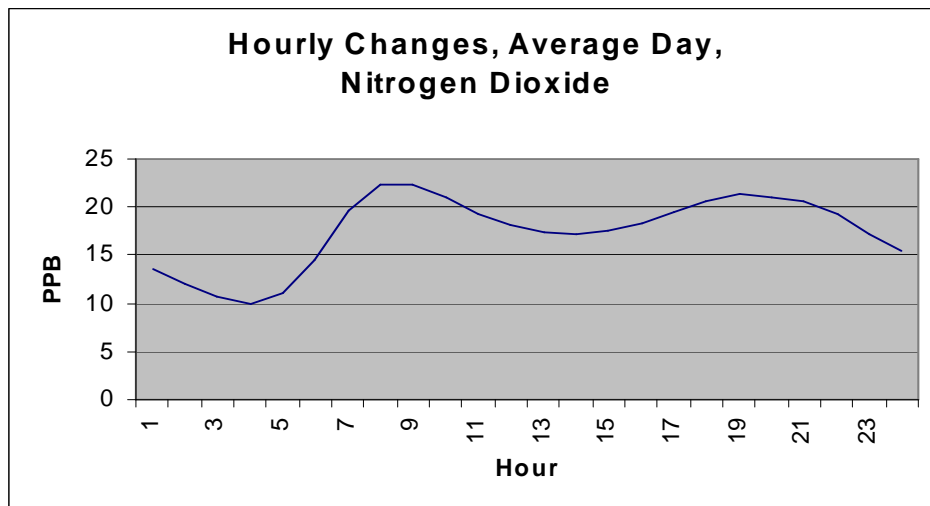
SO <sub>2</sub> Directive	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.
<b>1Hr 350ug/m<sup>3</sup></b>	142	104	64	91	67	40	77	59	83	75	126	154
<b>24Hr 125 ug/m<sup>3</sup></b>	37	35	27	27	45	21	21	27	32	35	59	51



Currently the predominant source of Nitrogen Dioxide in Dublin City is from vehicular emissions. The EU Directive specifies a limit value that requires all the hourly values recorded between the 1st of January and the 31st of December, annually, should not exceed 200 micrograms per cubic metre ( $\mu\text{g m}^{-3}$ ) on more than 18 occasions. The Directive also provides for an annual mean value of  $40\mu\text{g m}^{-3}$ .

The annual mean measured at  $33\mu\text{g m}^{-3}$ , was below the annual limit value of  $40\mu\text{g m}^{-3}$ . However, this is deemed to be an 'approach', i.e. exceeds 75% of the stated level. The maximum one-hour average was 132 microgrammes per cubic metre, comfortably below the EU limit of  $200\mu\text{g/m}^3$ . The 99.8 percentile was  $107\mu\text{g m}^{-3}$

The Chart below indicates the hourly changes of  $\text{NO}_2$  throughout an average day. This average day is based on all the hourly measurements throughout the year. The indicated trend tracks traffic flow patterns closely and shows that the majority of these emissions are due to vehicular traffic.

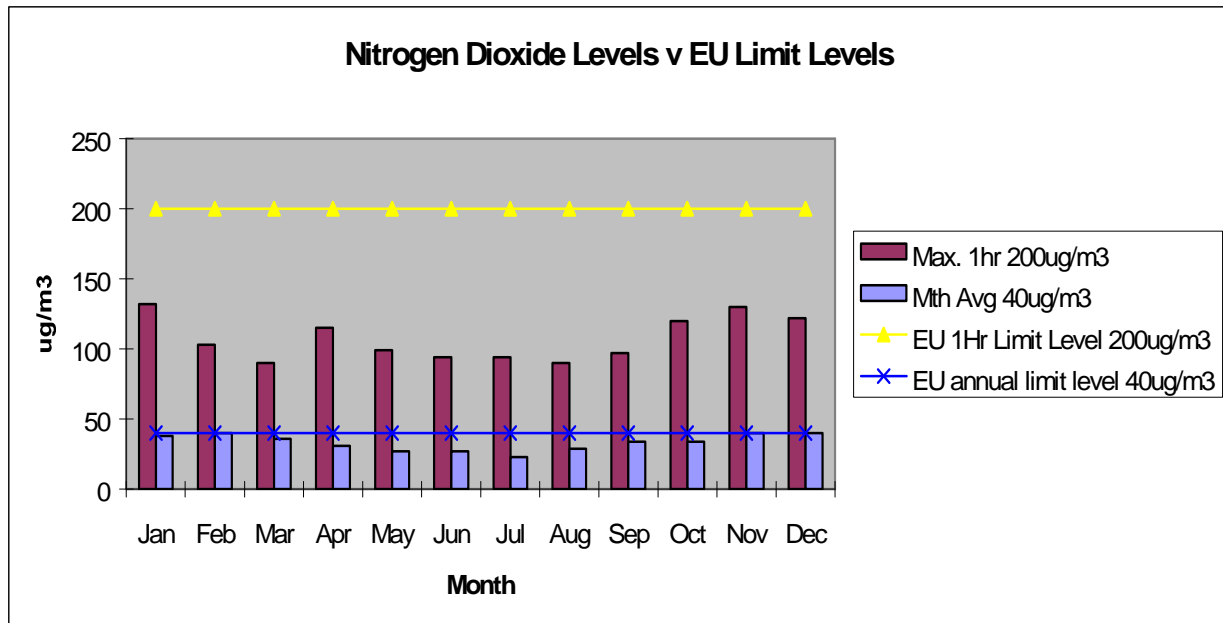


## Nitrogen Dioxide (NO<sub>2</sub>) contd.

### Summary of NO<sub>2</sub> Results (Hourly Figs.)

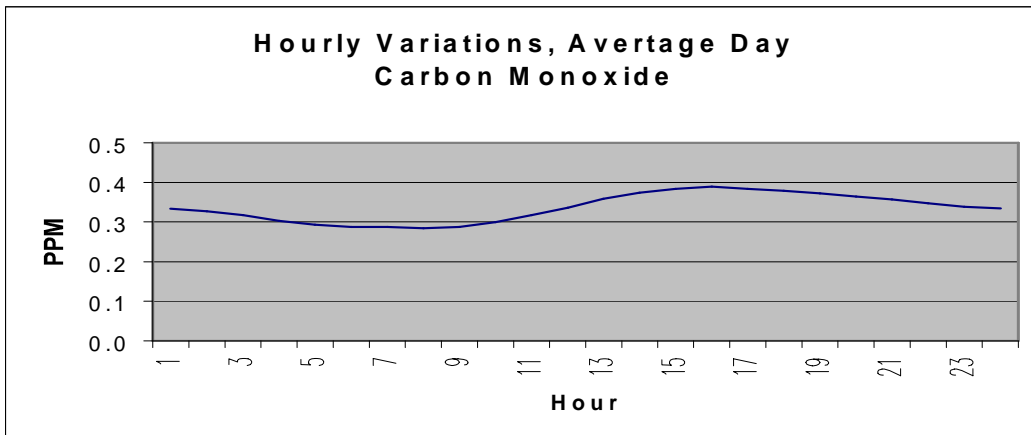
NO <sub>2</sub> 2000 PPB	Jan	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Median	19	20	18	15	13	13	12	15	17	18	20	21
98%tile	40	45	39	40	34	34	30	32	40	39	50	50
Mean	20	21	19	16	14	14	12	15	18	18	21	21
Max.	69	54	47	60	52	49	49	47	51	63	68	64
Min	1	0	1.5	1	1	1	1	1	1	2	1	1

New Directive	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
<b>1Hr 200ug/m<sup>3</sup></b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>	<b>Max. Lev.</b>
<b>Annual Avg. 40ug/m<sup>3</sup></b>	132	103	90	115	99	94	94	90	97	120	130	122
Mth. Ave.*	38*	40*	36*	31*	27*	27*	23*	29*	34*	34*	40*	40*



## Carbon Monoxide (CO) - Review of period Jan. - December 2000

A new EU directive covering the monitoring of CO came into effect on the 16/11/2000. However it has not been transposed into Irish law as yet. It requires that an 8hour rolling average should not exceed 8.5ppm. The monitored results are very low showing the highest 8hr moving means at 3ppm. CO levels are not likely to present any problems in meeting the requirements of the proposed new directive. The chart below shows hourly variations over an average day

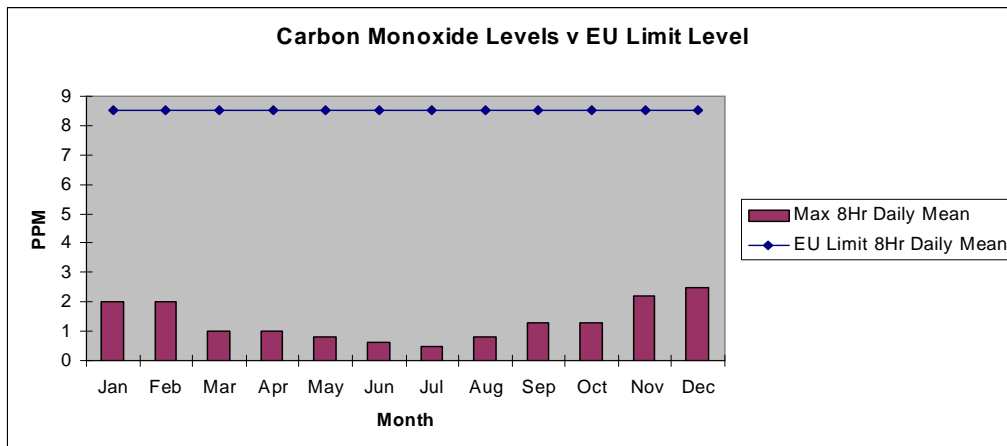


### Summary of Carbon Monoxide

Results in ppm, Rolling Averages

#### Carbon Monoxide Summary (Hourly Figs.)

CO 2000 PPM	Jan	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Median	.4	0.3	0.2	0.3	0.3	0.2	0.1	0.2	0.3	0.3	0.4	0.4
98%tile	1.2	1.1	1	1.3	0.7	0.5	0.4	0.6	.9	1	1.4	1.3
Mean	0.5	0.4	0.3	0.37	0.3	0.2	0.1	0.2	0.3	0.3	0.5	0.4
Max.	2.3	2	1	1	0.8	0.6	0.5	0.8	1.3	1.3	2.2	2.5
Min	0.1	0	0	0.1	0.1	0.0	0	0	0	0.1	0.1	0.1



## PM<sub>10</sub> - Review of period Jan. - December 2000

The limits for PM<sub>10</sub> as set out in the EU Directive are set out below

### PM<sub>10</sub> 24 hour primary standard

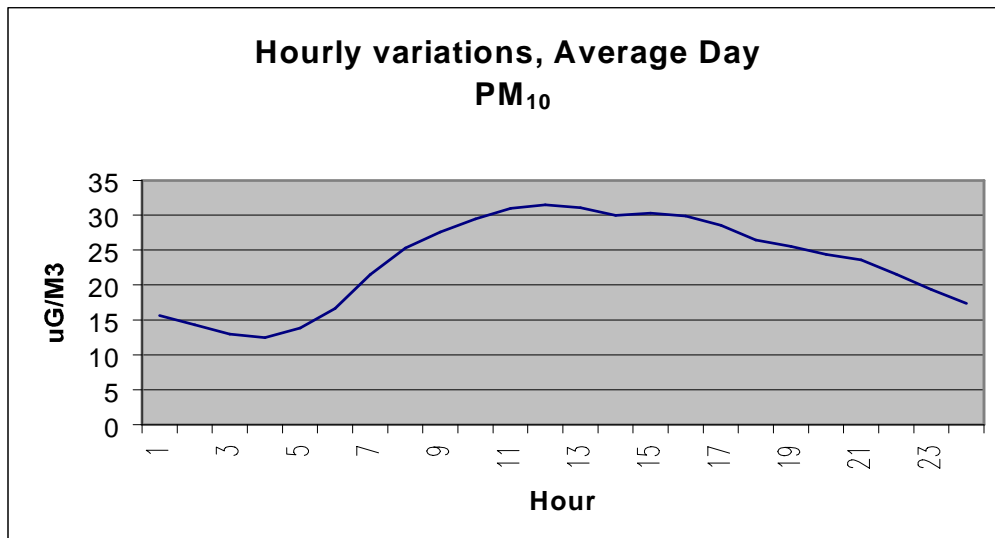
<35 exceedences of 50µg m<sup>-3</sup> by 1<sup>st</sup> January 2005  
< 7 exceedences of 50µg m<sup>-3</sup> by 1<sup>st</sup> January 2010

### An annual mean value

40 µg m<sup>-3</sup> by 1 st January 2005.  
20 µg m<sup>-3</sup> by 1 st January 2010.

### PM<sub>10</sub>

The 24hr value for PM<sub>10</sub> at 50ug/m<sup>3</sup> was not "exceeded on 35 occasions" during the year. There were 9 excursions, with the maximum 24-hour average measured at 61ug/m<sup>3</sup>. The annual average was 23ug/m<sup>3</sup>. Set out below is a chart showing the hourly variations through out the day. There is a marked difference in trends between this chart and hourly variations of the same pollutant in Ellenfield Park (former site at proposed Northern Portals to the tunnel.). The Ellenfield site showed rising levels from 8 o'clock in the morning right up to 10 o'clock at night. The chart below shows levels decreasing from 6 pm onwards. This would seem to indicate that the sources of PM<sub>10</sub> emissions at this site are predominately from traffic.

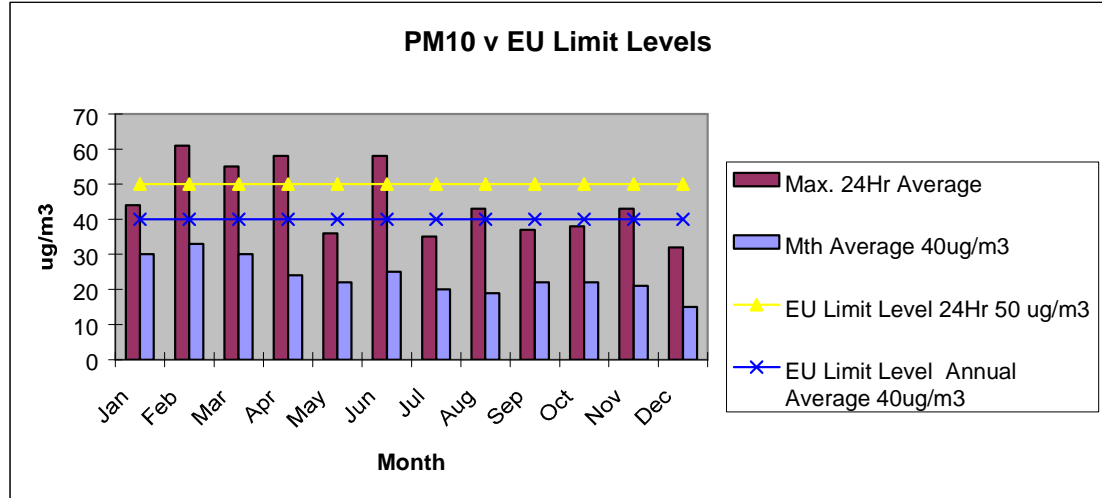


**PM<sub>10</sub> - Review of period Jan. - December 2000 *contd.***

**PM<sub>10</sub> Summary (Hourly Figs.)**

PM10 2000 µg m <sup>-3</sup>	Jan	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<b>Median</b>	24	26	25	19	19	18	16	16	18	18	15	13
<b>98%tile</b>	79	96	79	73	59	89	64	55	63	58	68	44
<b>Mean</b>	29	33	30	24	22	25	20	19	22	22	21	15
<b>Max.</b>	132	220	180	169	102	140	114	91	105	125	162	73
<b>Min</b>	0	0	0	0	0	2	2	2	2	1	1	1

E.U Directive	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	Max. Lev.	
<b>Max. 24Hr 50 µg m<sup>-3</sup></b>	44	61	55	58	36	58	35	43	37	38	43	32
<b>Annual Avg. 40µg m<sup>-3</sup></b>	30*	33*	30*	24*	22*	25*	20	19	22	22	21	15
<b>MTh. Ave.*</b>												



## Ozone (O<sub>3</sub>) - Review of period Jan. - December 2000

The EU Directive on Ozone prescribes various threshold values that must be complied with. They are as follows: -

### Health protection threshold

- 110 $\mu\text{g m}^{-3}$  for the mean value over 8 hours

### Population protection threshold

- 180 $\mu\text{g m}^{-3}$  for the mean value over one hour

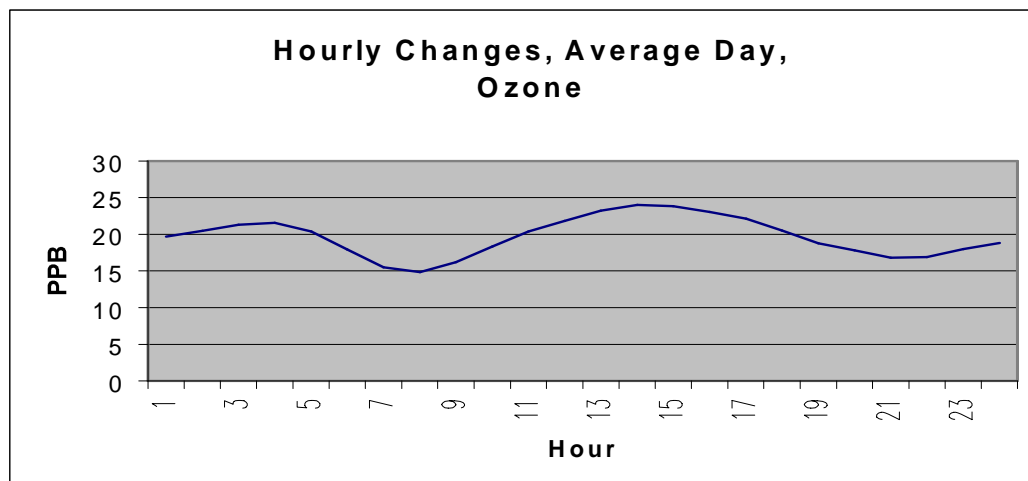
### Population warning threshold

- 360 $\mu\text{g m}^{-3}$  for the mean value over one hour

### Vegetation protection threshold

- 200 $\mu\text{g m}^{-3}$  for the mean value over one hour
- 65 $\mu\text{g m}^{-3}$  for the mean value over 24 hours

The 8hr 110 $\mu\text{g m}^{-3}$  threshold value as set out in EU Directive 92/72/EEC was exceeded on 15 occasions during the year 2000. The maximum 8-hour value recorded was 131 $\mu\text{g m}^{-3}$ . All other thresholds values were complied with. Set out below is a chart indicating the hourly variations throughout an average day. It can be noted that the indicated trends are opposite to those of the NO<sub>2</sub> chart. Whilst NO<sub>2</sub> goes from 'peak' to 'dip' to 'peak', O<sub>3</sub> goes from 'dip' to 'peak' to 'dip', indicating Nitric Oxide in the air acting as a scavenger for Oxygen molecules from Ozone to form Nitrogen Dioxide.



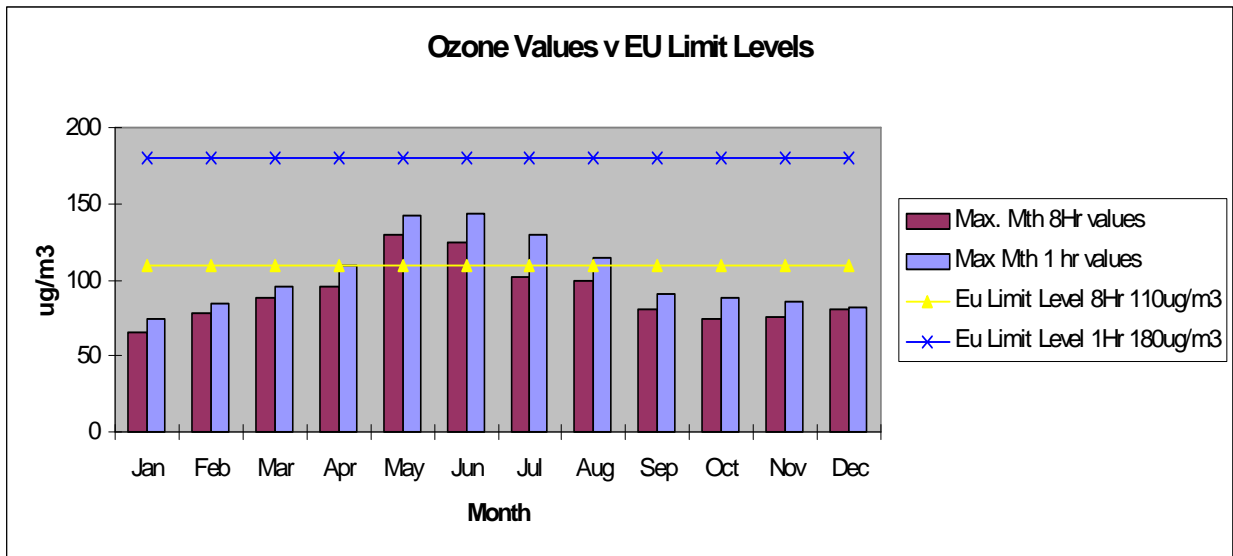
**Ozone (O<sub>3</sub>) - Review of period Jan. - December 2000 *contd.***

**Ozone Summary (Hourly Figs.)**

O3 2000 PPB	Jan	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<b>Median</b>	14	21	20	28	28	24	21	16	14	17	14	14
<b>98%tile</b>	33	39	45	49	60	55	46	42	40	34	37	40
<b>Mean</b>	15	21	20	26	29	25	21	17	14	17	15	16
<b>Max.</b>	37	42	48	55	71	72	65	57	45	44	43	42
<b>Min</b>	0	1	1	1	0	1	1	1	1	1	1	1

EU Directive	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level	Max. Level
<b>8hr 110ug/m3</b>	66	78	88	96	130	124	102	100	80	74	76	80
<b>1hr 180ug/m3</b>	74	84	96	110	142	144	131	114	90	88	86	82

The monitored results set out below in chart form are plotted against the EU limits.



## Appendix

**Mean daily figure** - Sum of all the monitored daily figures divided by the number of monitoring periods throughout a 24-hour period.

**Median** - The middle value of recorded values arranged in order from the smallest to the largest,

**98%tile** - The position of a value which lies in an array of figures arranged in order from the smallest to the largest, whose position in relation to the smallest number within the array is 98 percent of the number of values in the array.

**Rolling 8 hour Average** - selected by examining 8-hour running averages, calculated from hourly data and updated each hour. Each 8-hour so calculated will be assigned to the day on which it ends. i.e. the first calculation period for any one-day will be from 17:00 on the previous day to 01:00 on that day.

**The conversion factors** from PPB to  $\mu\text{g}/\text{m}^3$  are as follows  $\text{O}_3$  - 1ppb =  $2\mu\text{g}/\text{m}^3$ : CO - 1ppm =  $1.176\text{mg}/\text{m}^3$ :  $\text{SO}_2$  1ppb =  $2.67\mu\text{g}/\text{m}^3$ :  $\text{NO}_2$  1ppb =  $1.91\mu\text{g}/\text{m}^3$ .