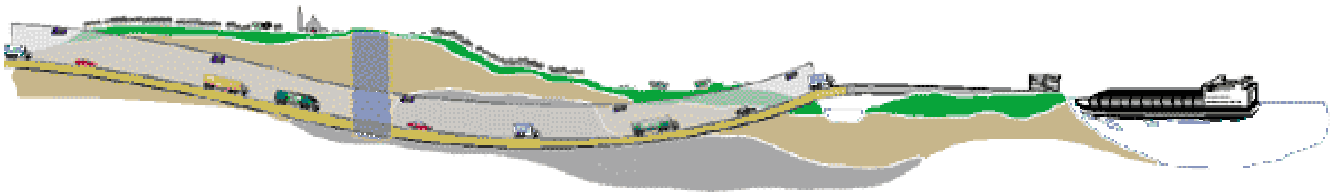


## Dublin Port Tunnel Project

### Air Quality Monitoring

### Annual Report

2005



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**DUBLIN PORT TUNNEL**  
**AIR QUALITY MONITORING**  
**ANNUAL REPORT 2005**

***Introduction***

This report presents the results of air quality monitoring at the Northern and Southern Portals of the Port Tunnel for the period January - December 2005. This monitoring is being carried out as a result of the public inquiry in relation to this project, which specified the following:

1. Continuous monitoring of particulates (PM<sub>10</sub>) at the nearest residential receptor to the Northern Portal
2. Continuous measurement of total volatile organic compounds (VOCs) in the vicinity of the Northern Portals
3. Monitoring to be carried out prior to and during construction, and also for a period of five years following completion of the Dublin Port Tunnel

Monitoring has been taking place for over 8 years. This years report does not include Ozone measurements. Monitoring was discontinued during the year as concentrations for this pollutant have remained continuously low since monitoring began and at this stage it is clear that they do not pose a threat to public health or are likely to cause a nuisance.

The site at the Southern Portals is to cease monitoring at the end of 2005. The equipment is over 8 years old and is not capable of providing the required continuous measurements. However facilities have been specially provided for the installation of new monitoring equipment in the new building at the Toll Plaza. It is the intention to fit this facility out with monitoring equipment before the port tunnel commences operations. No change has been made to the monitoring and site locations of equipment at the Northern Portals.

***Report Summary***

- Particulate levels (PM<sub>10</sub>) and volatile organic compounds measured in the vicinity of the Northern Portal in 2005 complied with the relevant statutory limits for these pollutants.
- Pollution measurements in the vicinity of the Southern Portal -Nitrogen Dioxide and PM<sub>10</sub>, indicate that the Nitrogen Dioxide levels comply with the relevant statutory limits, but PM<sub>10</sub> levels have exceeded the limit values.
- It is likely the increase in Particulate levels (PM<sub>10</sub>) in the vicinity of the Southern Portal was due to the intensive construction activity close to the monitoring site, both on and off the Port Tunnel site.

## *The Legal Framework*

Air quality is an issue locally, nationally and internationally. Internationally, the European Union (E.U.) sets regulations for managing air quality, which are transposed into Irish law by the Air Quality Standards Regulations 2002, from which the relevant limit levels are presented in Table 1. The limit values established for air pollutants are based on the protection of human health. The results presented in this report are compared with the relevant limit values.

**Table 1: Air Quality Standards Regulations 2002**

<b>Pollutant</b>	<b>Limit Value*</b>	<b>Permitted Exceedances</b>	<b>Attainment Date</b>
Nitrogen Dioxide (NO <sub>2</sub> )	40 µg/m <sup>3</sup> 200 µg/m (1-Hour)	Annual Mean 18 per year	2010
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> (24-Hour) 40 µg/m <sup>3</sup>	7 per year Annual Mean	2010
Benzene	5 µg/m <sup>3</sup>	Annual Mean	2010

\* microgram's per cubic metre/ milligrams per cubic metre

\*\* EU Framework Directive on Air Quality

## Southern Portal – East Wall

The main air pollutants of concern, both at a national and local level, were measured at East Wall Road for 2005. The results presented in this report are representative of the contribution of all road and rail traffic, residential, commercial and construction activities in the local environment. Since there are multiple activities occurring at this site (including heavy traffic on East Wall Road) it is difficult to determine PM<sub>10</sub> impacts caused by project-related activities alone. Monitoring is carried out within the confines of the construction site and therefore, comparison with EU Directives and Irish Regulations is not appropriate, as the location does not represent average background conditions or siting criteria as specified in the Directives. However, given the proximity of residential property on East Wall Road, monitoring is carried out on a 24-hour basis for the pollutants detailed in Table 1.

### Nitrogen Dioxide

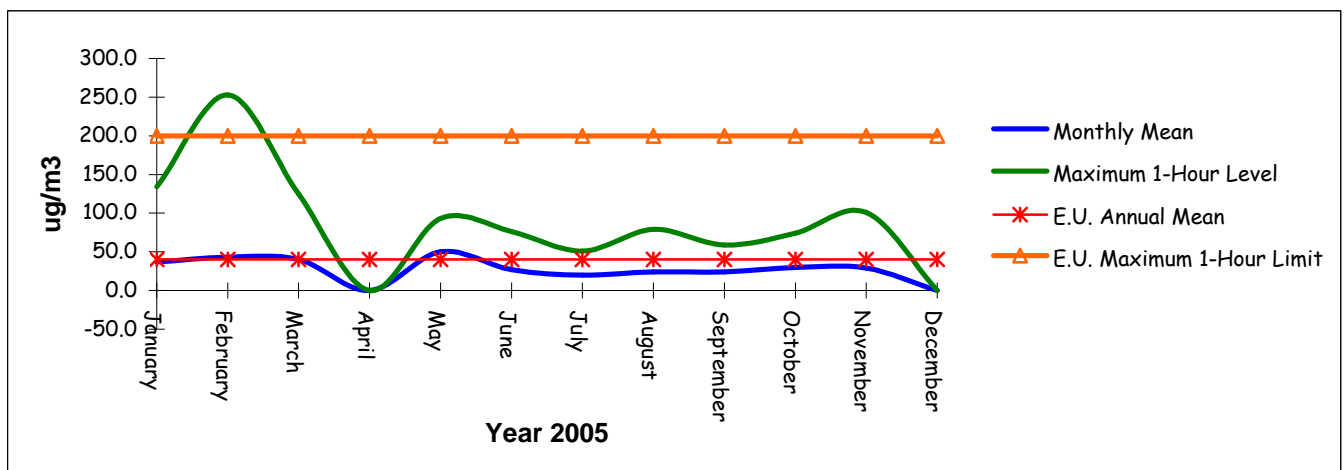
This pollutant is thought to increase the lung's vulnerability to infection. The main source of NO<sub>2</sub> is motor vehicles, although gas use for building/home heating is also a significant contributor. Statutory limits were complied with at the East Wall Road location over the monitoring period.

**Mean Monthly and Maximum Hourly NO<sub>2</sub> Levels**

Limit Values	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
200 µg/m <sup>3</sup> (1-Hour)	134	253	125	No Data	93	76	51	79	59	74	101	No Data
40 µg/m <sup>3</sup> Annual Mean	37	43	40	No Data	50	27	20	24	24	30	29	No Data

The annual mean of 30.0 µg/m<sup>3</sup> recorded at East Wall Road in 2005 was 3µg/m<sup>3</sup> higher than the 2004 value but still complied with the statutory annual mean limit value of 40 µg/m<sup>3</sup>. The hourly limit value of 200µg/m<sup>3</sup> was met, with only 2 exceedances of this value against the statutory limit of 18.

**Figure 1 : Mean and Maximum Monthly NO<sub>2</sub> Levels**



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

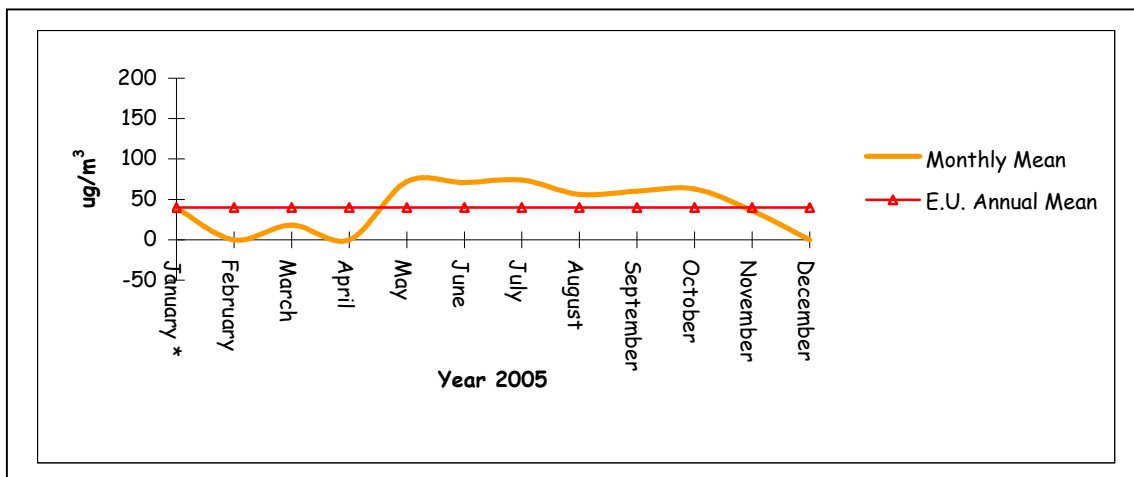
Inhalation of airborne particulate matter can increase the risk, frequency and severity of respiratory disorders. PM<sub>10</sub> in the atmosphere results from direct emissions (primary PM<sub>10</sub>) or from secondary emissions of precursors (nitrogen dioxide, sulphur dioxide and ammonia) which are transformed by chemical reaction in the atmosphere. The main source of PM<sub>10</sub> is road transport, especially diesel vehicles, although a significant proportion at the Eastwall site is from airborne dust emissions.

The Annual Mean recorded at East Wall Road was 57µg/m<sup>3</sup> compared to 35µg/m<sup>3</sup> for 2004. This is above the statutory annual mean limit of 40µg/m<sup>3</sup>. The maximum 24-hour limit of 50 µg/m<sup>3</sup>, which should not be exceeded for more than 7 days was exceeded in 2005. There were a relatively high 119 excursions over this limit. It is self evident that as the site work came closer to the monitoring site that these levels would increase. For most of the year, activity on and off the site caused the PM<sub>10</sub> levels to rise. One would not normally measure for PM<sub>10</sub> in the heart of a construction site, but for continuity reasons it was decided not to relocate it.

### Mean and Maximum Monthly PM<sub>10</sub> Levels

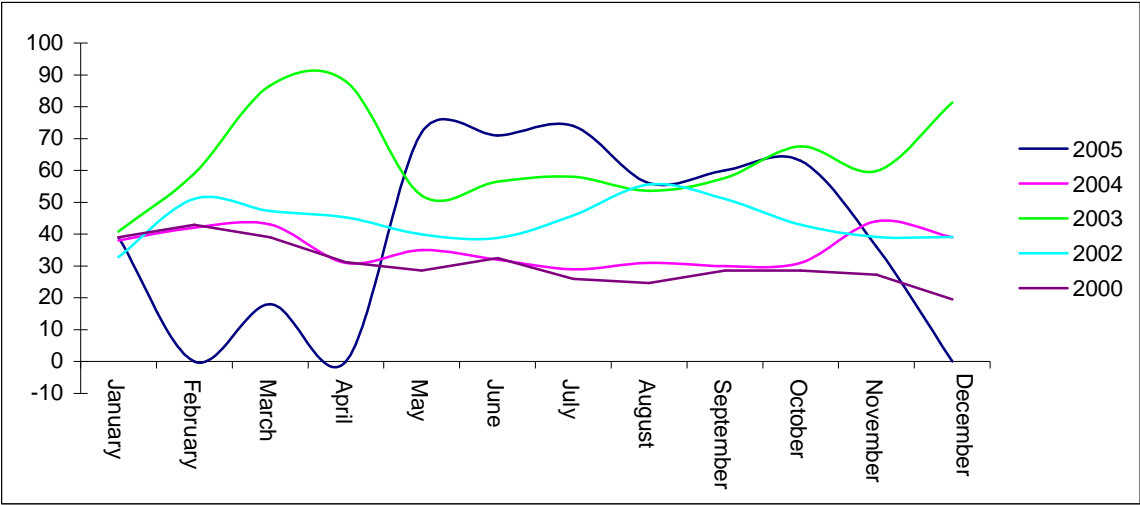
Limit Value	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Annual Mean - 40 µg/m <sup>3</sup>	39	No Data	18	No Data	72	71	74	56	60	63	36	No Data
Max. 24-hour - 50 µg/m <sup>3</sup>	151	No Data	38	No Data	144	187	171	116	133	158	77	No Data

Figure 3 : Average(Mean) Monthly PM<sub>10</sub> Levels



For comparative purposes, PM<sub>10</sub> levels for 2000, 2002, 2003 and 2004 are compared with 2005 levels in Figure 4 below. It is anticipated that the PM<sub>10</sub> levels at the East Wall Road site will decrease on full cessation of construction works.

**Figure 4 : Comparison of Average(Mean) Monthly PM<sub>10</sub> Levels at East Wall Road**



## Northern Portal – Oak Park, Santry

In accordance with the requirements of the public inquiry, particulate monitoring commenced at Oak Park, Santry in November 2001. Prior to the commencement of construction of the Northern Portal, background monitoring of a number of pollutants (sulphur dioxide, nitrogen dioxide, lead, particulates, carbon monoxide) was carried out at Ellenfield Park for a two-year period and this data represents average background conditions for the locality prior to construction activities.

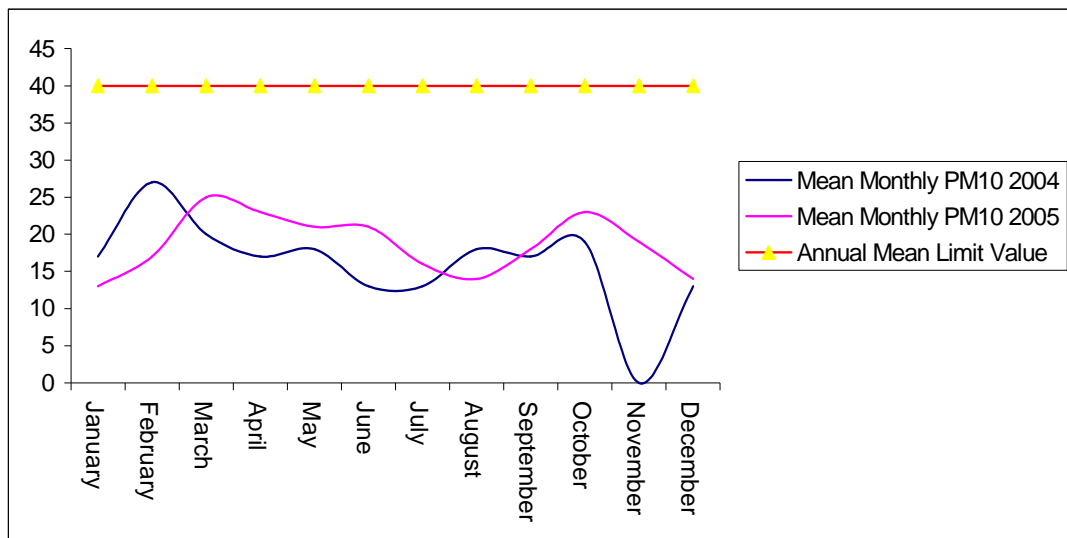
### Particulate Matter (PM<sub>10</sub>)

Particulates (PM<sub>10</sub>) and volatile organic compounds (VOCs) continued to be measured in 2005, in the vicinity of the Northern Portal. PM<sub>10</sub> levels recorded in 2005 are presented below and are compared with the annual mean limit of 40 µg/m<sup>3</sup>. The annual mean PM<sub>10</sub> level measured at Oak Park was 18µg/m<sup>3</sup>. This was the same as for 2004. There were six days during 2005 when the 24-hour limit of 50 µg/m<sup>3</sup> was exceeded, compared to 4 in 2004. The statutory limit is 7 exceedences in a calendar year. Overall, particulate levels recorded at Oak Park are not significantly different from average urban residential levels recorded in the Dublin area.

Limit Value	Average(Mean) Monthly and Maximum 24-hour PM <sub>10</sub> Levels											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Annual Mean 40 µg/m <sup>3</sup>	13	17	25	23	21	21	16	14	18	23	19	14
Max 24-Hour 50 µg/m <sup>3</sup>	28	51	73	58	41	44	27	36	46	55	46	32

**Figure 5.** compares PM<sub>10</sub> levels at Oak Park between 2004 and 2005 and indicates a relatively stable level of PM<sub>10</sub> in the vicinity of the Northern Portal. It is anticipated that local particulate levels will reduce in 2006 as dust-generating activities will be significantly curtailed in the vicinity of the monitoring location.

**Figure 5: Monthly Mean Particulates (PM<sub>10</sub>)**



## Volatile Organic Compounds (VOCs)

As previously indicated, the measurement of volatile organic compounds (VOCs) is required as a result of the public inquiry in the vicinity of the Northern Portal. While not legally required, monitoring of VOCs is also carried out at East Wall Road in order to determine average background levels in the vicinity of the Southern Portal. The results of VOCs measured at five sites in the vicinity of the northern and southern portals of the Port Tunnel and at other local residential locations are presented in this report.

Monitoring for a number of compounds is currently being carried out using diffusive samplers, which are exposed for a fixed period of time and analysed at an approved laboratory. A statutory limit exists in relation to benzene, with guide values being used as a comparison for the other VOC components measured. These guide values are based on occupational standards for comparative purposes in the absence of statutory limits, which include toluene, xylene, and butadiene. Over the 12-month monitoring period, at two sites, notable the M1 Slip Road and Santry Court, diffusive tubes were lost due to construction works being carried on in the monitoring location (M1 Slip Road) and vandalism at Santry Court. The current VOC monitoring locations include:

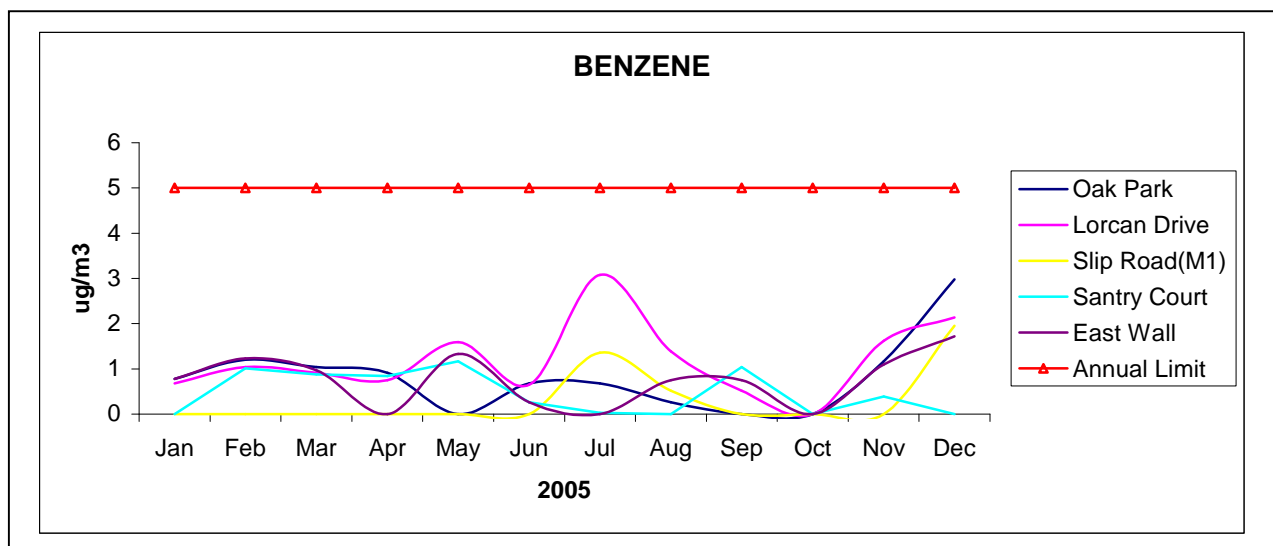
- Oak Park
- Santry Court
- Lorcan Drive
- East Wall Road
- M1 Sliproad at Santry

## Benzene

Benzene is an organic chemical which is a constituent of crude oil and is present in unleaded petrol. The main source of exposure for the general population is from vehicle exhaust emissions, where benzene is produced by chemical reactions occurring during the combustion of petrol. A further source of exposure, which contributes a significant proportion of an individual's total intake of benzene is cigarette smoking. Passive smoking may also contribute to benzene intake.

The annual average benzene levels measured at the five sites ranged from 0.26 – 3.08 $\mu\text{g}/\text{m}^3$  which are within the relevant statutory limit of 5 $\mu\text{g}/\text{m}^3$ .

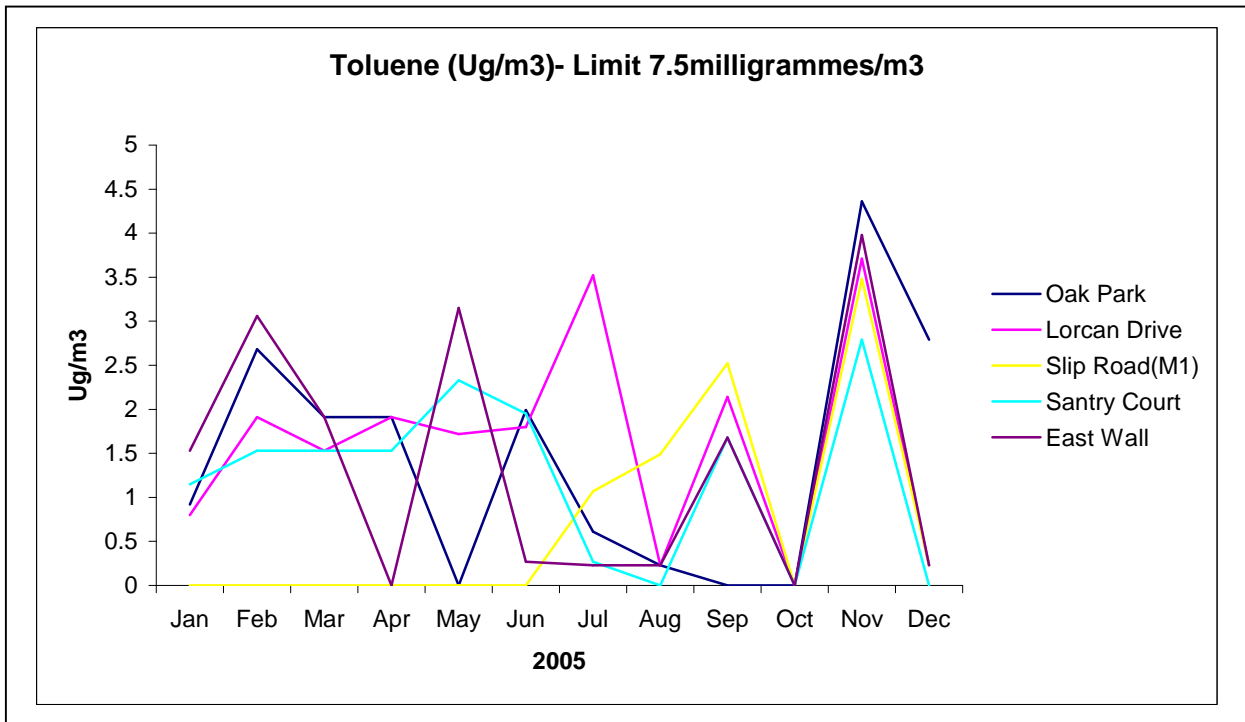
**Figure 6 : Average Benzene Levels**



## Toluene

Vehicle emissions are the principal source of emissions of toluene to the atmosphere. Other forms of environmental exposure to toluene usually occurs from exposure to paints, adhesives, cigarette smoke. Health effects of exposure through inhalation to toluene include decreased resistance to respiratory infections and cardiac problems. Toluene is not however a human carcinogen. Average background levels are compared, which range from 0.23 to 4.36 ug/m<sup>3</sup>, with a World Health Organization 24-hour average value of 7.5 milligrams per cubic metre. Figure 9 shows this comparison.

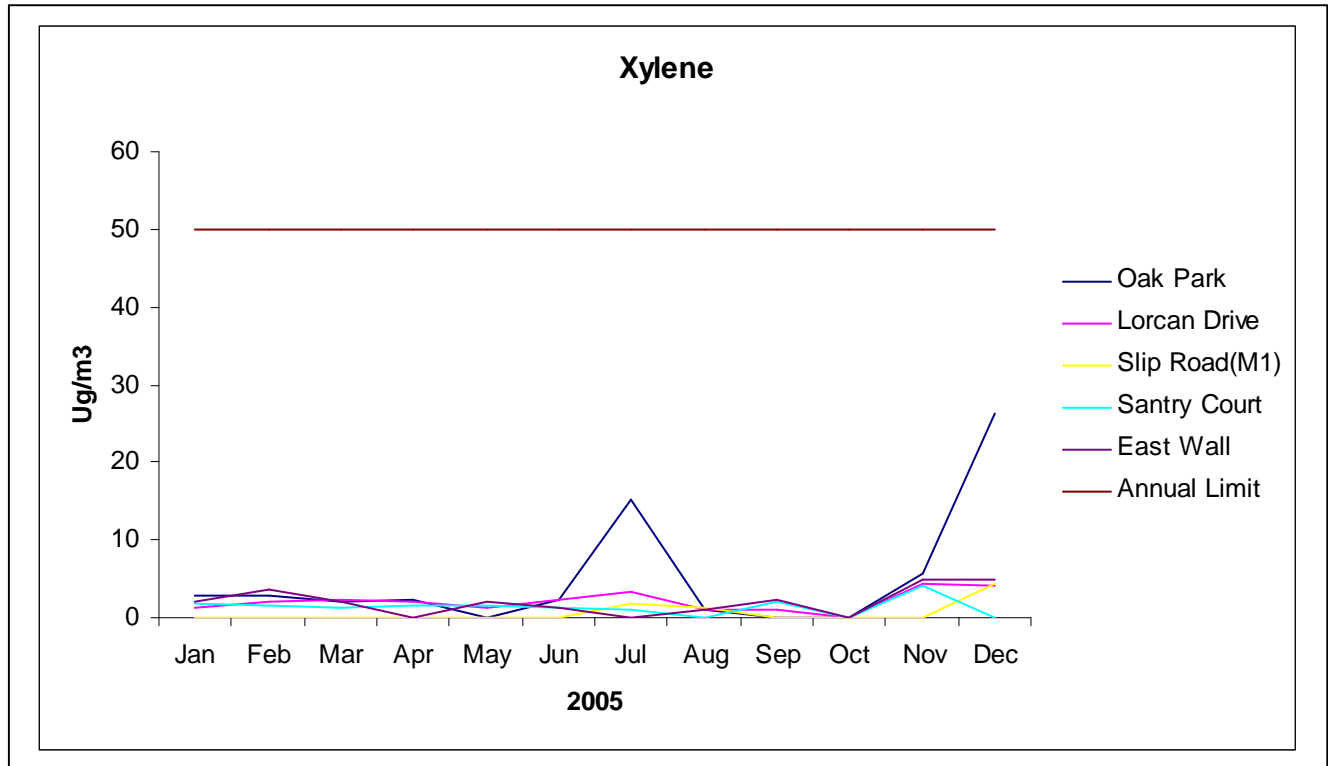
**Figure 7 : Average Toluene Levels**



## Xylenes

Environmental exposure to xylene occurs through inhalation from paints, solvents and petrol. Similar to toluene, xylene have not been associated with an increased risk of cancer in humans. Xylene are also distributed throughout the environment – they have been detected in air, rainwater, and soils. Average background levels of xylene are compared with an EU Indicative Occupational Exposure Limit Value (IOELV) adopted under Council Directive 98/24/EC. This limit value of 50µg/m<sup>3</sup> relates to indoor exposure and is used for comparative purposes only. Figure 8 indicates that xylene with levels between 0.93 – 5.55ug/m<sup>3</sup> were not significant at the five monitored locations in 2005.

**Figure 8 : Average Xylene Levels**



### **1,3 Butadiene**

Motor vehicle exhaust is a constant source of 1,3 butadiene. Although it breaks down quickly in the atmosphere, 1,3 butadiene is usually found in ambient air at low levels in urban and suburban areas. Based on UK research, Butadiene levels have been shown to have fallen rapidly with the introduction of catalytic converters on vehicles. Epidemiological studies have reported a possible association between this compound and cardiovascular disease. Other sources include manufacturing and processing facilities, cigarette smoke and fires. This pollutant has been classified as a probable human carcinogen.

Average 1,3 butadiene levels at the five monitored locations were less than 0.25ppb. These levels compare favourably with a standard of 1.0ppb (annual mean) as established by the U.K. Expert Panel on Air Quality Standards.