10.0 AIR QUALITY AND CLIMATIC FACTORS

10.1 ASSESSMENT METHODOLOGY

10.1.1 General

Section 39 (2) (b) (ii) of the Transport (Railway Infrastructure) Act 2001, requires that proposed developments are examined in terms of their likely significant impacts on air and climatic factors.

The proposed Luas Line A1 will have a positive impact on air quality and climate by increasing the use of public transport and thereby reducing road traffic emissions in the region. However, there is the potential for negative impacts on local air quality at specific locations as a result of:

a. The proposed Cheeverstown stop Park and Ride facility;

b. Increased traffic at road traffic junctions along the route of the proposed tramway.

Air dispersion modelling assessments of both scenarios above have been carried out as part of the air quality assessment.

Air Emission Sources

Road traffic would be expected to be the dominant source of emissions (with the possible exception of PM_{10}) in the region of the proposed Cheeverstown stop Park and Ride facility and at road traffic junctions along the route of the proposed tramway. Thus road traffic emissions are the focus of the current assessment. Detailed traffic flow information was obtained from the traffic consultant for the project and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur.

Air Dispersion Modelling

The air dispersion modelling assessments focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and benzene in the region of the proposed Luas Line A1, both currently (by assessment of EPA monitoring data) and when the tramway is opened (through modelling). Thereafter, the impact of the proposed Luas Line A1 on air quality at the neighbouring sensitive receptors was determined relative to the existing baseline when the proposed Luas Line A1 is opened (2010). The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (DEFRA 2003a) [Version 1.02 (released November 2003)] and following guidance issued by the UK DEFRA (DEFRA 2000, 2003a, 2003b). The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (e.g. AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptor using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. The worst-case ambient concentration is then compared to the relevant ambient air quality standard to assess the compliance of the proposed Luas Line A1 with these ambient air quality standards. The DMRB has recently undergone an extensive validation exercise (DEFRA 2001) as part of the UK's Review and Assessment Process to designate areas as Air Quality Management Areas (AQMAs). The validation exercise confirmed that the model is a useful screening tool for the Second Stage Review and Assessment, for which a conservative approach is applicable.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (DEFRA 2003a, 2003b). Firstly, background concentrations (DEFRA 2003a) have been included in the modelling study, for both "do minimum" and "do something" scenarios. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern (DEFRA 2003c, DETR 1998). Appropriate background levels were selected based on the available monitoring data provided by the EPA and Local Authorities (EPA 2006a, 2006b, EC 2003) (see Appendices).

Once appropriate background concentrations were established, the existing situation, including background levels, was assessed in the absence of the proposed Luas Line for the opening year (Year 2010). The cumulative effect of the baseline situation and the additional impact of the proposed Luas Line A1 have also been assessed for the opening year. This assessment allows the significance of the proposed Luas Line A1, with respect to both relative and absolute impact, to be determined both temporally and spatially.

The impact of the proposed Luas Line A1 on road traffic emissions should also be assessed in terms of the relative additional contribution of the tramway system, (i.e. resulting from changes in road traffic conditions at junctions along the route of the proposed tramway), expressed as a percentage of the limit value. Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the National Roads Authority document "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (Consultation Draft)" (NRA 2006) details a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the tramway system. The NRA significance criteria have been adopted for the proposed tramway system and are detailed in Tables A3 – A4 (see Appendix 10A). The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the limit values. However the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

10.2 RECEIVING ENVIRONMENT

10.2.1 Ambient Air Quality & Climate Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health- or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 10.1 and Appendix 10A of the EIS).

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002 (FCCC 1997, 1999). For the purposes of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six GHGs under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012 (EPA 2004, ERM 1998).

10.2.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is the "Air Quality Monitoring Report 2005" (EPA 2006a). The EPA website gives details on the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA 2006b). A recent monitoring programme carried out in 2001 (RESOLUTION, part of the EU LIFE program) provides extensive information on NO_2 and benzene levels throughout Dublin (EC 2003).

Based on the available long-term data from the EPA and Dublin City Council, existing baseline levels of NO_2, PM_{10}, $PM_{2.5}$, CO and benzene are below ambient air quality limit values in the vicinity of the proposed Luas Line A1 (see Appendix 10A). In summary, existing baseline levels of NO_2, PM_{10}, CO and benzene based on extensive long-term data from the EPA are below ambient air quality limit values in the vicinity of the proposed Luas Line A1.

10.3 CONSTRUCTION IMPACTS

10.3.1 Impacts

Air Quality

There is the potential for a number of emissions to atmosphere during the construction of the proposed Luas Line A1. In particular, the construction activities may generate quantities of dust. Construction vehicles, generators etc., will also give rise to some exhaust emissions. These impacts will be localised and short-term in nature.

Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the proposed Luas Line A1. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions.

10.3.2 Mitigation

Air Quality

An Environmental Management Plan (EMP) plan will be formulated for the construction phase of the project. This will include dust mitigation measures as construction activities are likely to generate some dust emissions. The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source, typically be within two hundred metres of the construction area.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. These measures should be concentrated in areas where the proposed alignment runs close to residential properties (e.g. at Belgard Green, Fettercairn, Kilmartin, Brookview, Ard Mór and Carrigmore).

Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any unsurfaced site road, this shall be 20 km per hour, and on hard surfaced roads as site management dictates.

To ensure that mud and other wastes are not tracked onto public roads, vehicles exiting the site onto Cookstown Way, N82 Citywest Road, Fortunestown Lane or other local roads should first make use of a wheel wash facility. Public roads outside the site entrance should be regularly inspected for cleanliness, and cleaned as necessary.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

Furthermore, during movement of the soil off-site, trucks should be stringently enclosed or covered at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented to rectify the problem.

A liaison officer should be appointed to provide a point of contact with local residents and to deal with any concerns raised regarding dust emissions. Furthermore, the dust minimisation plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

Climate

Due to the nature and size of the proposed tramway, construction phase impacts on climate will be negligible.

10.4 OPERATIONAL IMPACTS

10.4.1 Impacts

Air Quality

In general, the proposed Luas Line A1 is expected to have a positive impact on air quality by increasing the use of public transport and thereby reducing road traffic emissions in the region. However, there is the potential for negative impacts on local air quality at specific locations as a result of:

a. The proposed Cheeverstown stop Park and Ride facility;

b. Increased traffic levels at road traffic junctions along the route of the proposed tramway.

The impacts of the above two scenarios have been investigated as part of the air quality impact assessment. An assessment of the vehicle emissions resulting from each scenario has been carried out using the UK DMRB screening air dispersion model (DEFRA 2003a). Full details of the dispersion modelling results are detailed in Appendix 10A. A summary of the assessment results is detailed below.

a. Cheeverstown Stop Park and Ride Facility

An assessment of the vehicle emissions resulting from increased in traffic levels in the region of the Cheeverstown stop Park and Ride facility has been carried out using the UK DMRB screening air dispersion model (see Table 10.2) (DEFRA 2003a).

In relation to NO_2, carbon monoxide (CO), benzene and PM_{10}, detailed modelling study predictions have shown that concentrations present in the region of the proposed Park and Ride facility during the opening year (2010) will be below significance criteria even under rush-hour traffic conditions (10 km/hr). Furthermore, relative to no Park and Ride facility, the impact of the Park and Ride facility will contribute at most 1% of these limit values to the baseline concentration and thus the impact will be negligible. On a cumulative basis, worst-case concentrations will reach at most approximately 19% (for benzene) to 58% (for NO_2) of the limit values in the opening year (2010).

There are currently no statutory limits for $PM_{2.5}$. However, an annual target value for this pollutant is expected to come into force in 2010. In terms of impact on $PM_{2.5}$ concentrations, the Park and Ride facility will account for less than 1% of the proposed target value. Furthermore, predicted levels of $PM_{2.5}$ with proposed Luas Line A1 in place will peak at 40% of the proposed value in 2010. Thus, the impact of the Park and Ride facility for $PM_{2.5}$ is negligible.

In summary, although some increases in the maximum pollutant concentrations may occur at the nearest sensitive receptors as a result of the Park and Ride facility, no significant increase in pollutant levels will occur. Thus, the proposed Park and Ride facility will result in a negligible impact on air quality. The predicted pollutant levels with the proposed Luas A1 in place are shown graphically in Figure 10.1.

b. Increased Traffic Levels At Road Traffic Junctions

The UK DMRB screening air dispersion model (DEFRA 2003a) has also been used to assess the air quality impact of changes in traffic levels at the worst-case road crossover junction along the route of the proposed tramway (see Table 10.3). Traffic levels at junctions along the route of the proposed tramway are predicted to experience increase or decreases in traffic levels depending on the junction location. The Fortunestown Lane / N82 Citywest junction was selected as the worst-case junction as it is predicted to experience an increase in traffic levels and also due to the close proximity of residential locations to the junction.

In relation to NO_2, carbon monoxide (CO), benzene and PM_{10}, detailed modelling study predictions have shown that concentrations at the Fortunestown Lane / N82 Citywest junction in the opening year (2010) will be below significance criteria, even under rush-hour traffic conditions (10 km/hr). Furthermore, relative to no junction modification, the impact of the junction modification will contribute at most 4% of these limit values to the baseline concentration and thus will be negligible in terms of NO_2, CO, benzene and PM_{10}. On a cumulative basis, worst-case concentrations will reach at most approximately 19 - 63% of the limit values in 2010.

There are currently no statutory limits for $PM_{2.5}$. However, an target value for this pollutant is expected to come into force in 2010. In terms of impact on $PM_{2.5}$ concentrations, the junction modification will account for only 3% of the proposed target value. Furthermore, predicted levels of $PM_{2.5}$ with proposed Luas Line A1 in place will peak at 44% of the proposed target value in 2010. Thus, the impact of the junction modification for PM2.5 is negligible.

In summary, although some increases in the maximum pollutant concentrations may occur at the nearest sensitive receptors as a result of the junction modification, no significant increase in pollutant levels will occur. Thus, the proposed junction modification will result in a negligible impact on NO_2, CO, benzene, PM_{10} and $PM_{2.5}$. The predicted pollutant levels with the proposed Luas A1 in place are shown graphically in Figure 10.2.

Climate

The proposed tramway is expected to have a positive impact on climate by increasing the use of public transport and thereby reducing vehicle related CO2 and N2O emissions. Indeed, one of the policies of the National Climate Change Strategy (DoELG 2000) is to encourage a modal shift from car use to public transport. More recently, a report published by Sustainable Energy Ireland has stated that encouraging modal shift is a key policy measure for the reduction of greenhouse gases from transport in Ireland (SEI 2004).

10.4.2 Mitigation

Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. Recent EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants for passenger cars (Directive 98/69/EC) and on reductions in both sulphur and benzene content of fuels (Directive 98/70/EC).

No further mitigation measures are required during the operational phase of the proposed tramway.

Climate

No mitigation measures are required

Table 10.1 Air Quality Standards Regulations 2002 (based on EU Council Directive 1999/30/EC)

POLLUTANT	REGULATION	LIMIT TYPE	MARGIN OF TOLERANCE	VALUE
Nitrogen Dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	40% until 2003 reducing linearly to 0% by 2010	200 µg/m³ NO_2
		Annual limit for protection of human health	40% until 2003 reducing linearly to 0% by 2010	40 µg/m³ NO2
		Annual limit for protection of vegetation	None	30 µg/m³ NO + NO_2
Lead	1999/30/EC	Annual limit for protection of human health	60% until 2003 reducing linearly to 0% by 2005	0.5 µg/m³
Sulphur Dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	90 µg/m3 until 2003, reducing linearly to 0 µg/m3 by 2005	350 µg/m³
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m³
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m³

continued >>>

Table 10.1 continued

POLLUTANT	REGULATION	LIMIT TYPE	MARGIN OF TOLERANCE	VALUE
Particulate Matter (as PM_{10}) **Stage 1**	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	30% until 2003 reducing linearly to 0% by 2005	50 µg/m³ PM_{10}
		Annual limit for protection of human health	12% until 2003 reducing linearly to 0% by 2005	40 µg/m³ PM_{10}
Particulate Matter (as PM_{10}) **Stage 2**[Note 1]	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 7 times/year	Not to be exceeded more than 28 times until 2006, 21 times until 2007, 14 times until 2008, 7 times until 2009 and zero times by 2010.	50 µg/m³ PM_{10}
		Annual limit for protection of human health	50% from 2005 reducing linearly to 0% by 2010	20 µg/m³ PM_{10}
$PM_{2.5}$	COM (2005) 447	Annual target value designed to limit unduly high risks to the population	None. Limit value applicable in 2010	25 µg/m³ $PM_{2.5}$
Benzene	2000/69/EC	Annual limit for protection of human health	100% until 2006 reducing linearly to 0% by 2010	5 µg/m³
Benzene	2000/69/EC	Annual limit for protection of human health	100% until 2006 reducing linearly to 0% by 2010	5 µg/m³

Note 1 *EU 1999/30/EC states "Indicative limit values to be reviewed in the light of further information on health and environmental effects, technical feasibility and experience in the application of Stage 1 limit values in the Member States". Proposed EU Directive COM (2005) 447 will "replace the indicative limit values for PM_{10} for the year 2010 by a legally binding "target value" for the annual average concentrations of $PM_{2.5}$ of 25 µg/m³ to be attained by 2010"*

Table 10.2 Air Quality Assessment, Proposed Luas Line A1. Summary of predicted Air Quality at a Worst Case Location in the Region of the proposed Cheeverstown Stop & Park Ride Facility

Scenarios	Traffic Speed (km/hr)	Carbon Monoxide (mg/m^3)	Benzene ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)		Particulates ($\mu g/m^3$)		
		Maximum 8-hour	Annual Average	99.8th%ile of 1-hr	Annual Average	Annual Average PM_{10}	PM_{10}: No Days >50 $\mu g/m^3$	Annual Average $PM_{2.5}$
2010 Do Nothing	10	3.0	0.93	119	23.8	19.0	2	10.7
	40	2.4	0.84	115	23.0	18.3	2	10.0
2010 Do Something	10	3.1	0.94	120	23.9	19.1	2	10.8
	40	2.5	0.84	116	23.1	18.4	2	10.1
Standards		10 Note 1	5 Note 1	200 Note 2,3	40 Note 2	40 Note 2	35 Note 2,4	25 Note 5

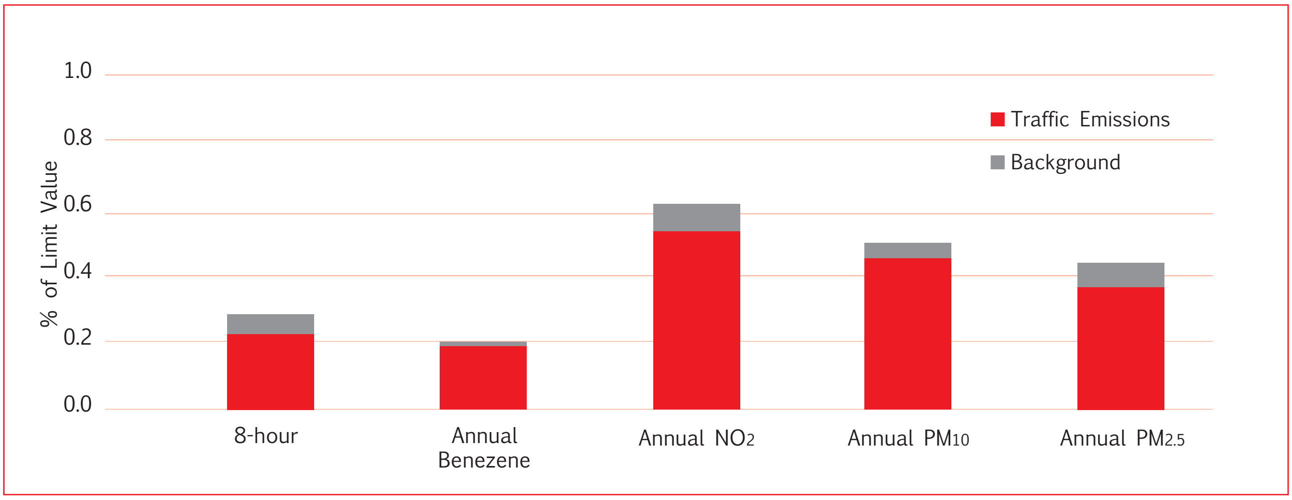
Note 1 EU Council Directive 2000/69/EC (S.I. 271 of 2002)
Note 3 1-hr limit of 200 $\mu g/m^3$ not to be exceeded > 18 times/year (99.8th %ile)
Note 5 Proposed EU Directive COM(2005) 447
Note 2 EU Council Directive 1999/30/EC (S.I. 271 of 2002)
Note 4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded >35 times/year (90.1th %ile)

Table 10.3 Air Quality Assessment, Proposed Luas Line A1. Summary of Worst Case Predicted Air Quality in the Region of the Fortunestown Lane / N82 Citywest Junction.

Scenarios	Traffic Speed (km/hr)	Carbon Monoxide (mg/m^3)	Benzene ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)		Particulates ($\mu g/m^3$)		
		Maximum 8-hour	Annual Average	99.8th%ile of 1-hr	Annual Average	Annual Average PM_{10}	PM_{10}: No Days >50 $\mu g/m^3$	Annual Average $PM_{2.5}$
2010 Do Nothing	10	3.1	0.93	133	26.5	20.0	3	11.7
	40	2.3	0.80	121	24.2	18.4	2	10.1
2010 Do Something	10	3.1	0.94	133	26.7	20.0	3	11.7
	40	2.7	0.88	127	25.3	19.2	3	10.9
Standards		10 Note 1	5 Note 1	200 Note 2,3	40 Note 2	40 Note 2	35 Note 2,4	25 Note 5

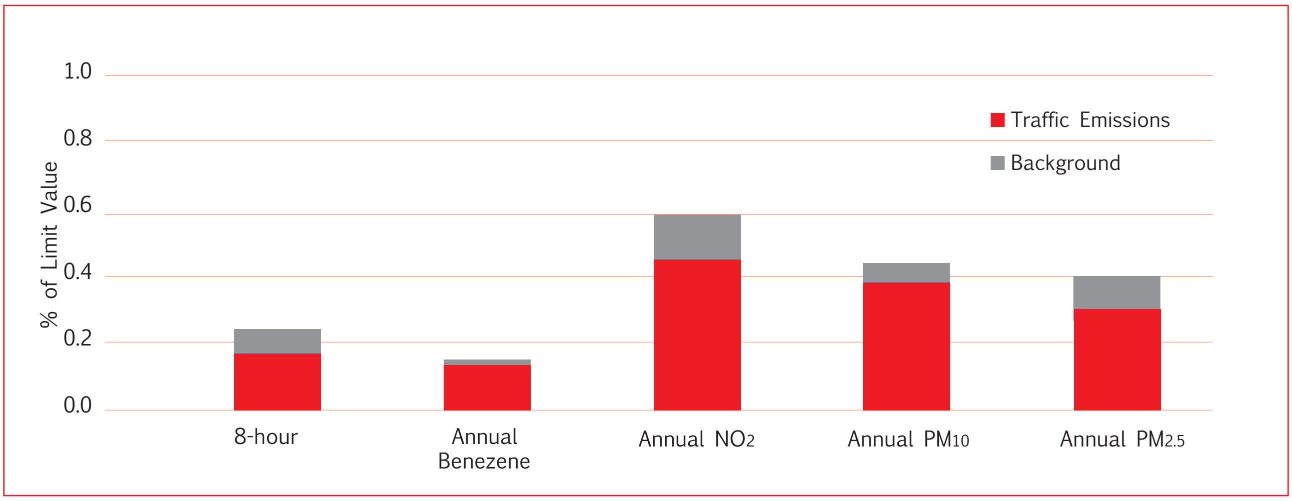
Note 1 EU Council Directive 2000/69/EC (S.I. 271 of 2002)
Note 3 1-hr limit of 200 $\mu g/m^3$ not to be exceeded > 18 times/year (99.8th %ile)
Note 5 Proposed EU Directive COM(2005) 447
Note 2 EU Council Directive 1999/30/EC (S.I. 271 of 2002)
Note 4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded >35 times/year (90.1th %ile)

Figure 10.1 Predicted Pollutant Levels at Cheeverstown Stop Park & Ride Facility



Modelling Scenario: 2010 Do Something

Figure 10.2 Predicted Pollutant Levels at Fortunestown Lane / N82 Citywest Lunction



Modelling Scenario: 2010 Do Something