CONTENTS

SUMMARY

8.1 The Air Quality and Climate assessment has been carried out in line with all relevant guidelines. The proposed extension to the McHale facility has been designed to ensure that there are no significant adverse effects on air quality and where possible provide improvements in air quality in the vicinity of the facility. It is proposed to move from a solvent based paint system to a water based paint system which will reduce the volumes of solvents being released to air. The assessment was done on a worst case scenario and assumed that both systems operate simultaneously as this will possibly occur for a period during the switch between the two systems. No significant adverse effects were demonstrated through the air modelling study, which establishes that no air quality standards or guidelines are forecast to be exceeded. The assessment concludes that the controls built into the proposed facility development mean that emissions to air will have no significant adverse effects on air quality or the health of local people. A Construction Management Plan (CMP) will incorporate best practice measures in order to minimise dust at the construction phase. During the operational phase emissions to air from the plant will be regulated in accordance with specific conditions set out in licence issued by the Environmental Protection Agency (EPA). McHales will be required to regularly monitor emissions to air, in accordance with the provisions of the EPA licence and these results will be made available to the public.

INTRODUCTION

8.2 This assessment has been undertaken by Odour Monitoring Ireland. The chapter describes the potential impacts to ambient air quality from the proposed extension to the McHales manufacturing facility located in Ballinarobe, Co. Mayo. Particular attention is given to the potential exposure of receptors to airborne pollutants resulting from the development and operation of the existing and proposed plant operations. Sensitive receptors in the vicinity of the subject site have been included within the assessment.

8.3 The facility is located is in the townland of Creagh Demense at National Grid Reference (NGR) 118085E, 2656088N. It is on the N84, approximately 1.5 kilometres (km) northwest of Ballinrobe. The existing site layout is shown on Drawing No 101. The site covers an area of approximately 13.5ha, with one large building (10,000m^2) housing offices, fabrication areas, assembly lines, paint spray area and stores. There are a number of smaller buildings that are used for R&D and paint storage, and an extensive paved open storage yard and car parking areas.

8.4 The proposed site layout is shown on Drawing No STE 102 of the EIS and planning application. The existing buildings and structures will be retained. The extension will be constructed on an area adjoining the southern side of the existing building and the development area will encompasses ha. The overall development will include:

- Construction of Extension to the south of the existing Building;
- Provision of an access road around the extension for vehicle manoeuvring;
- Provision of paved yard south of the extension for external storage of parts and finished units
- An extension to the surface water drainage system, including percolation area, firewater retention facility and ancillary works.
- Fit out of the extension area to include the bunded E-Coating Plant and new assembly lines.

8.5 The scope of the study consists of the following components:

- assessment of effects on climate;
- review of background ambient air quality in the vicinity of the application area using available reference data generated by the EPA;
- appraisal of site specific baseline air quality monitoring data in the vicinity of the proposed plant;

- identification of the significant substances likely to be released from the proposed plant during construction and when operational;
- review of maximum emission levels and other relevant information needed to inform the dispersion modelling study for identified compounds;
- detailed air dispersion modelling of significant substances expected to be released during the operational phase;
- identification of predicted ground level concentrations (GLC's) of released substances at the site boundary and at identified sensitive receptors in the local environment;
- a full cumulative assessment of significant releases from the proposed plant taking into account the releases from all other significant sources such as traffic;
- evaluation of the significance of these predicted concentrations, including consideration of whether these GLC's are likely to exceed the ambient air quality standards and guidelines;
- assessment of other potential air quality impacts such as construction dust and emissions from construction and operational phase traffic associated with the proposed plant.

CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

8.6 A detailed description of the proposal including the layout, sections and elevations, are presented in Chapter 5 of the EIS. In summary, the proposed facility will comprise the following:

8.7 The proposed site layout is shown on Drawing No STE 102 of the EIS and planning application. The existing buildings and structures will be retained. The extension will be constructed on an area adjoining the southern side of the existing building and the development area will encompasses ha. The overall development will include:

- Construction of Extension to the south of the existing Building;

- Provision of an access road around the extension for vehicle manoeuvring;

- Provision of paved yard south of the extension for external storage of parts and finished units

- An extension to the surface water drainage system, including percolation area, firewater retention facility and ancillary works.

- Fit out of the extension area to include the bunded E-Coating Plant and new assembly lines.

- The manufacturing process including all associated processes including pre-treatment, e-coating application, rinse and treatment, curing, powder coating and electrostatic spray painting is discussed elsewhere in the EIS.

STUDY METHODOLOGY

Plant Design Review

8.8 A full review of the design of the proposed extension and e-coating plant was undertaken in order to establish emission levels of classical air pollutants such as Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Particulate matter, Total organic carbon and specific pollutants represented by Total organic carbon. The proposed e-coating plant is assumed to be not a recognised source of odour.

Assessment Criteria

8.9 The European Union (EU) has introduced several measures to address the issue of air quality management. In 1996, Environmental Ministers agreed a Framework Directive on ambient air quality assessment and management (Council Directive 96/62/EC). As part of the measures to improve air quality, the European Commission has adopted proposals for daughter legislation under Directive 96/62/EC.

8.10 The first of these directives to be enacted, 1999/30/EC, set limit values in April 2001 that replaced previous limit values that were set by Directives 80/779/EEC, 82/884/EEC and 85/203/EEC. This was again updated through the implementation of the *Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive* 2008/50/EC. New limit values for sulphur dioxide, PM_{10}, $PM_{2.5}$ and nitrogen dioxide set by the CAFÉ Directive are detailed in **Table 8.1**.

8.11 The *National Air Quality Standards Regulations 2002* (S.I. No. 271 of 2002) transpose those parts of the "Framework" Directive 96/62/EC on ambient air quality assessment and management not transposed by the EPA Act 1992 (*Ambient Air Quality Assessment and Management*) Regulations 1999 (S.I. No. 33 of 1999). The 2002 Regulations also transpose, in full, the 1st two "Daughter" Directives 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, and 2000/69/EC relating to limit values for benzene and carbon monoxide in ambient air.

8.12 Council Directive 2008/50/EC on *Ambient Air Quality and Cleaner Air for Europe* will revise and combine several existing Ambient Air Quality Standards including Council Directives 96/62/EC, 1999/30/EC and 00/69/EC. With regard to existing ambient air quality standards, it will not modify the standards but will strengthen existing provisions to ensure that non-compliances are removed. It does however set a new ambient standard for $PM_{2.5}$. With regard to $PM_{2.5}$, the proposed approach is to establish a limit value of 25 $\mu g/m^3$, as an annual average (to be attained by 2015), coupled with a non-binding target to reduce human exposure generally to $PM_{2.5}$ between 2010 and 2020. This exposure reduction target is currently proposed at 20% of the average exposure indicator (AEI). The AEI is based on measurements taken in urban background locations averaged over a three year period.

8.13 In 2011, SI 271 of 2002, *Air Quality Standards Regulations 2002* was replaced with SI 180 of 2011, *Air Quality Standards Regulations 2011* which transposes 2008/50/EC into Irish law.

8.14 In terms of modelling, the EPA's *Air Dispersion Modelling from Industrial Installations Guidance Note* (AG4) was taken into account. This document was used to assess whether the proposed plant is likely to give rise to air quality impact at identified sensitive receptors at or beyond the facility boundary.

8.15 The limit values for each species / compound is reported in **Tables 8.1 and 8.2**.

Table 8-1 EU and Irish Ambient Air Quality Standards

	Directive / Regulation	Limit Type	Value
Nitrogen Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 18 times/year-1 hour average	200 µg/m^3 NO_2
		Annual limit for protection of human health-Annual	40 µg/m^3 NO_2
		Annual limit for protection of vegetation-Annual	30 µg/m^3 NO + NO_2
Sulphur Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 24 times/year-1 hour average	350 µg/m^3
		Daily limit for protection of human health – not to be exceeded more than 3 times/year-24hr average	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems-Annual	20 µg/m^3
Particulate Matter as PM_{10}	2008/50/EC and SI 180 of 2011	24-hour limit for protection of human health – not to be exceeded more than 35 times/year-24 hour average	50 µg/m^3 PM_{10}
		Annual limit for protection of human health-Annual	40 µg/m^3 PM_{10}
Particulate matter as $PM_{2.5}$	2008/50/EC and SI 180 of 2011	Annual limit for protection of human health-Annual	25µg/m^3 $PM_{2.5}$
Carbon Monoxide	2008/50/EC SI180 of 2011	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3

Table 8-2 EA and EPA Ambient Air Quality Standards

Pollutant	Guidance	Limit Type	Value
Total Organic Carbon	EA, UK H1 Part 2 EA, UK H1 Part 2 EH40 notes and fractional exposure based on contents of products utilised	1 hour average 100%ile Annual average This is based on the worst case compound present in surface treatment products and it is assumed that all of this is emitted from the stack in order to provide a worst case analysis of impact at receptors (assumed that all of TOC is worst case compound which is not the case in reality) This was n-hexane for the Annual average limit and Butan-1-ol for the 1 hr max limit.	<7,500 µg/m^3 <720 µg/m^3

8.16 The above standards have been set by environmental and health professionals across Europe following extensive worldwide research and are designed to protect the most sensitive of receptors, including elderly humans with existing respiratory ailments and areas valued for their flora and fauna.

8.17 The fractional exposure limit is based on details provided in the Environmental Agency guidance H1 and is based on the following calculation: Annual average = 1/100th of 8 hr OEL and 1 hr max is based on 1/10th of 15 min OEL.

CONSULTATION

8.18 Preplanning consultation was undertaken with both statutory and non statutory consultees. Full details of the consultation process and feedback received are presented in Chapter 1 of the EIS.

DIFFICULTIES ENCOUNTERED

8.19 No difficulties were encountered in carrying out the assessment.

RECEIVING ENVIRONMENT - AIR

Sensitive Receptors

8.20 There are 43 residential properties located next to the plant, details are presented in **Tables 8-3**. The location of each is presented in **Figure 8-1**.

Table 8-3 Residential sensitive receptors in the vicinity of the subject site.

Receptor Identity	X Coordinate (m)	Y Coordinate (m)
R1	118151	265823
R2	118217	265798
R3	118201	265759
R4	118217	265736
R5	118234	265693
R6	118296	265583
R7	118307	265567
R8	118320	265552
R9	118332	265531
R10	118346	265513
R11	118367	265477
R12	118383	265456
R13	118398	265437
R14	118255	265437
R15	118283	265420
R16	118292	265397
R17	118305	265386
R18	118320	265364
R19	118332	265350
R20	118245	265408
R21	118256	265391
R22	118266	265382
R23	118275	265373
R24	118284	265361
R25	118291	265350
R26	118299	265336

Receptor Identity	X Coordinate (m)	Y Coordinate (m)
R27	118212	265325
R28	118196	265288
R29	118205	265279
R30	118223	265320
R31	118237	265315
R32	118219	265281
R33	118234	265271
R34	118247	265308
R35	118258	265233
R36	118271	265259
R37	118314	265286
R38	118343	265311
R39	118329	265617
R40	118358	265560
R41	118366	265573
R42	118371	265580
R43	118379	265588

Baseline Air Quality Assessment

8.21 The EU Air Framework Directive deals with each EU Member State in terms of 'Zones' and 'Agglomerations' for air quality. For Ireland, four zones, A, B, C and D have been defined and are included in the *Air Quality Standards (AQS) Regulations* (SI No 180 of 2011).

- Zone A – Dublin conurbation
- Zone B – Cork conurbation
- Zone C – 21 towns in Ireland with population > 15,000
- Zone D – remaining area of Ireland

8.22 Ballinrobe and its environs are classified for the purposes of this assessment as falling within Zone D. While there is some availability of recent and historic data for air quality in major cities and towns, there is limited data available from the national air quality monitoring database for air quality specific to Ballinrobe. As such, available data from the EPA Monitoring Sites located across a number of Zone C and D areas has been referenced for Carbon Monoxide, Nitrogen

Oxides, Sulphur Dioxide and PM_{10} and $PM_{2.5}$ levels (see **Table 8-4**) and is considered representative of background air quality in the study area.

Carbon Monoxide (CO)

8.23 Carbon monoxide is produced as a result of the incomplete burning of carbon-containing fuels including coal, wood, charcoal, natural gas, and fuel oil. It can be emitted by combustion sources such as un-vented kerosene and gas heaters, furnaces, woodstoves, gas stoves, fireplaces and water heaters, automobile exhausts, etc.

8.24 A number of the EPA air quality monitoring locations include analysis of carbon monoxide over a 1 year period. Results from this monitoring are presented in **Table 8-4**.

8.25 As can be observed in **Table 8-4**, the baseline annual average 8 hr concentration of Carbon monoxide expected in this region is between the range 100 to 400 µg/m^3 which is well within the limit value of 10 mg/m^3 presented in **Table 8-1**.

Nitrogen Dioxides (NO_2)

8.26 Nitrogen is a constituent of both the natural atmosphere and of the biosphere. When industrial metabolism releases nitrogen to the environment it is considered a "pollutant" because of its chemical form: NO, NO_2, and N_2O. In the transportation sector, NOx emissions result from internal combustion engines. In power plants and industrial sources, NOx is produced in boilers. The overwhelming fraction of nitrogen oxide emissions arises from the high temperature combustion of fossil fuels; emissions from metal-processing plants and open-air burning of biomass.

8.27 Nitrogen dioxide is classed as both a primary pollutant and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). Potentially, the main source of primary NO_2 for the proposed development will be from vehicle exhausts.

8.28 At the onsite baseline monitoring locations (**Figure 8-2**) the air quality data was analysed for Nitrogen dioxide over a 1 month period, while at the EPA monitoring locations, monitoring was undertaken for a 1 year period. The results are presented in **Table 8-4**.

8.29 As can be observed in **Table 8-4**, the baseline annual average concentration of Nitrogen dioxide expected in this region is between the range 14 to 34 µg/m^3 which is above the limit value of 30 µg/m^3 for protection of vegetation and well within the limit value of 40 µg/m^3 for protection of human health, as presented in **Table 8-1**. However, when the values recorded in all Zone A locations are averaged, then a baseline value of 25 µg/m^3 is calculated.

8.30 The baseline value recorded on the site ranged from 16.55 to 26.37 µg/m^3 with an average of 20.62 µg/m^3 which is within the limit values for both the protection of vegetation and human health.

Sulphur Dioxide (SO_2)

8.31 Sulphur dioxide is a colourless gas, about 2.5 times as heavy as air, with a suffocating faint sweet odour. It occurs in volcanic gases and thus traces of sulphur dioxide are present in the atmosphere. Other sources of SO_2 include smelters and utilities, electricity generation, iron and steel mills, petroleum refineries, pulp and paper mills, metallurgical processes, chemical processes and the combustion of iron pyrites, which is often present in coal. Small sources include residential, commercial and industrial space heating.

8.32 At the onsite baseline monitoring stations (**Figure 8-2**) and EPA monitoring locations, the air quality data was analysed for Sulphur dioxide over a 1 month and 1 year period, respectively. The results are presented in **Table 8-4**.

8.33 The baseline value recorded on the site ranged from 1.24 to 2.95 µg/m^3 with an average of 1.95 µg/m^3 which is within the limit values for both the protection of vegetation and human health.

8.34 As can be observed in **Table 8-4**, the baseline annual average concentration of Sulphur dioxide expected in this region is between the range 1.24 to 5 µg/m^3

which is well within the limit value of 20 µg/m^3 for protection of ecosystems and well within the limit value of 125 µg/m^3 for protection of human health, as presented in **Table 8-1**.

Particulate Matter (as PM_{10} and $PM_{2.5}$)

8.35 PM_{10} and $PM_{2.5}$ refer to particulate matter with an aerodynamic diameter of 10 and 2.5 µm, respectively. Generally, such particulate matter remains in the air due to low deposition rates. Particulate matter is of concern in Europe and as a result air quality limits have been established for both parameters.

8.36 At the onsite baseline monitoring stations (**Figure 8-2**) and EPA monitoring locations, the air quality data was analysed for particulate matter (PM_{10} and $PM_{2.5}$) over a 2 day and 1 year period, respectively. The results are presented in **Table 8-4**.

8.37 The average baseline value recorded on the site for PM_{10} was 22 µg/m^3, while for $PM_{2.5}$ the average was 12 µg/m^3 which is within the limit values for both the protection of human health.

8.38 As can be observed in **Table 8-4**, the baseline annual average concentrations of Particulate matter as PM_{10} and $PM_{2.5}$ expected in this region is between the range 14 to 22 and 11 to 12 µg/m^3 respectively, which is well within the limit values for protection of human health of 40 and 25 µg/m^3 respectively, as presented in **Table 8-1**.

Benzene

8.39 The sources associated with individual volatile organic compounds (VOCs) tend to be dependent on the nature of industries in a region. Methane is a naturally occurring VOC derived from plants and animals; it is also generated as a by-product of certain industries. Benzene and other aromatic/alkanes are most often derived from petrol driven vehicle exhausts. Heavier semi-volatile organic compounds are frequently derived from diesel-powered engines.

8.40 At the onsite baseline monitoring stations (**Figure 8-2**) and EPA monitoring locations, the air quality data was analysed for Benzene over a 1 month and 1 year period, respectively. The results are presented in **Table 8-4**.

8.41 The average baseline value recorded on the site for Benzene was 0.59 $\mu g/m^3$, which is within the limit values for both the protection of human health.

8.42 As can be observed in **Table 8-4**, the baseline annual average concentration of Benzene expected in this region is between the range 0.29 and 1.60 $\mu g/m^3$ which is well within the limit value of 5 $\mu g/m^3$ for protection of human health, as presented in **Table 8-1**.

Table 8-4 EPA Baseline air quality monitoring data for Zones C and D sites throughout Ireland

Compound	Kilkenny 2012(µg/m³)[1]	Mullingar 2012(µg/m³)[1]	Balbriggan 2012 (µg/m³)[1]	Shannon town 2012 (µg/m³)[1]	Glashaboy 2012 (µg/m³)[1]	Castlebar 2012 (µg/m³)[1]	Kilkitt 2012 (µg/m³)[1]
	Zone C	Zone C	Zone C	Zone D	Zone D	Zone D	Zone D
Carbon monoxide 8 hr (Annual mean)	-	300	600	200	-	-	-
Oxides of nitrogen (Annual mean)	4	7	9	10	9	8	4
Sulphur dioxide (Annual mean)	-	3	3	2	-	-	3
Particulate matter as PM10 (Annual mean)	-	16	17	11	-	12	9
Particulate matter as PM2.5 (Annual mean)	ENNIS 12	-	-		LONGFORD 9	CLARMORRIS 6	-
Benzene (µg/m3) (Annual mean)	-	0.4	0.4	0.4	-	-	-

Notes: [1] see EPA Air Quality in Ireland 2012 Report – Key indicators in Air Quality, www.epa.ie

Climate

8.43 The assessment methodology of the existing climatic environment involved a desk-based review of literature including the National Climate Change Strategy 2007-2012 (Department of Environment Heritage and Local Government, 2007).

8.44 The surrounding landuse is shown on Figure 4.1 of the EIS. The N84 forms the northern boundary, and there are three commercial units and one domestic residence on the northern side of the road opposite the subject site. The commercial units are approximately 100m from the northern side of the existing McHale building and include a furniture manufacturer, cold storage warehouse and open storage yards. A house, which is opposite the McHale site entrance and approximately 100m from the northwest corner of the existing building, is the closest residence to the facility. Further east (approximately 130m) of this house are a cluster of seven houses also adjacent to the N84. There is further ribbon development along the N84 towards Ballinrobe, comprising residential and commercial outlets.

8.45 The lands to the west and south are currently used of agricultural purposes. The Ballinrobe Racecourse is located further west, approximately 300m from the site. There is a housing estate to the east of the site on the southern side of the N84 towards Ballinrobe. The estate has approximately sixty houses, the closest of which is approximately 130m from the proposed extension area. Further east is ribbon development including a petrol station and one off private houses. The lands to the south are used as pasture for farm animals. The Robe River is approximately 1km to the south of the site.

8.46 The prevailing wind direction at the application area is from the southeast to southwest as presented in the wind rose for Knock Airport in **Plate 8-1**. Northerly and easterly winds tend to be very infrequent. Wind characteristics vary between a moderate breeze to gales. Monthly average wind speeds range at around 3.5 m/s with highest wind speeds occurring during winter and spring months (January, February and March). Lowest wind speeds were recorded in the June to August period.

8.47 Poor dispersion can occur under certain weather characteristics known as inversions that form in very light or calm wind and stable atmospheric conditions. The wind roses presented in **Plate 8-1** identifies that such wind conditions are very infrequent (0.46% of hours in the years 2005 to 2009).

8.48 Wind characteristics vary between a moderate breeze to gales. Monthly average wind speeds range between 8.6 and 12.50 knots with highest wind speeds occurring during winter and spring months (January, February and March). Lowest wind speeds were recorded in the June to August period.

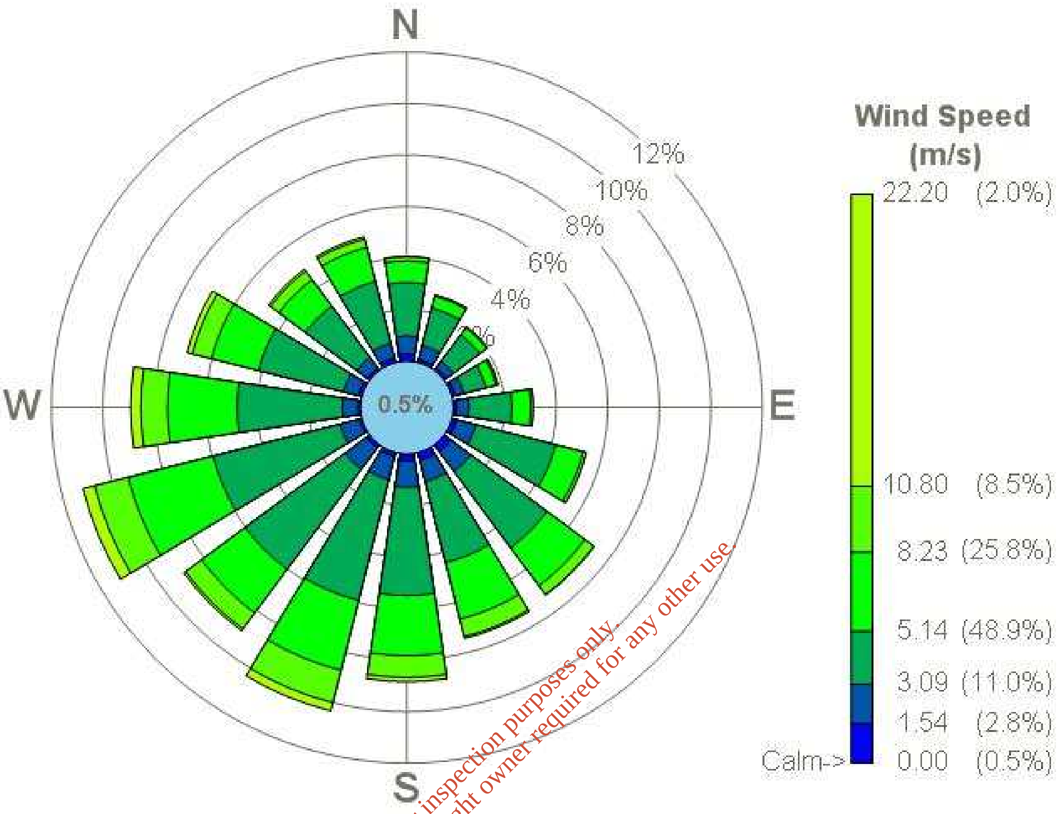
8.49 The nearest meteorological station to the application area with long term averages is the Met Éireann Station at Knock Airport which lies approximately 30km northeast of the subject site. The weather in the area is influenced by the Irish Sea, resulting in mild, moist weather dominated by cool temperate oceanic air masses. The prevailing wind direction in Ireland is from a quadrant centred on the southwest. These are relatively warm winds and frequently bring rain. Easterly winds are weaker and less frequent and tend to bring cooler weather from the northeast in spring and warmer weather from the southeast in summer. The 30-year averages from the station located at Birr are presented in **Table 8-5**. Knock station does not have 30 yr averages as of yet. Birr is located 110 km as the crow flies to the south east of Ballinrobe.

Table 8-5 30-year Average Meteorological Data from Birr Airport (1979-2008)

Parameter	30 yr Average (1979 to 2008)
Mean temperature (^{0}C)	13.50
Mean relative humidity at 0900UTC (%)	85.4
Mean daily sunshine hours (Hrs)	3.20
Mean Annual total rainfall (mm)	845.70
Mean wind speed (Knots)	6.7

Source: www.met.ie

Plate 8.-1 Knock Airport Windrose 2005 to 2009 inclusive



Source: www.met.ie

Effects of Climate Change in Ireland

8.50 The potential effects of climate change on a global scale have been investigated by the Intergovernmental Panel on Climate Change (IPCC). The resulting impacts in Ireland are outlined in the National Climate Change Strategy 2007-2012 and include the following:

- Significant increases in winter rainfall, in the order of 10% in the southeast, with a corresponding increase in the water levels in rivers, lakes and soils. Flooding will be more frequent than experienced at present.
- Lower summer rainfall, in the order of 10% in the southern half of the country. Less recharge of reservoirs in the summer leading to more regular and prolonged water shortages than at present.

- An overall annual decrease in rainfall in the east of the country and a resultant decrease in baseline river flows.
- Increased agricultural production, with new crops becoming more viable and potentially reduced agricultural costs. Grass growth could enjoy beneficial effects with an increase of 20% possible with higher temperatures and changes in rainfall patterns.

8.51 A paper entitled *Establishing Reference Climate Change Scenarios for Ireland* (Sweeney & Fealy, 2003) identified future climate change scenarios for Ireland. This paper predicts that the average annual temperature in Ireland will increase by 1.5°C by the 2050's with an average increase in summer temperature of 2°C. These temperature increases are predicted to be accompanied by alterations in precipitation levels. The authors estimate an 11% increase in precipitation levels during the winter periods, whilst a more significant increase in precipitation levels during the summer periods were predicted i.e. 25% by the 2070's.

8.52 It is important to note that considerable uncertainty is encountered when attempting to predict future climate scenarios. This uncertainty arises due to the difficulties associated with determining future demographic changes, economic development, technological advancement and future emissions of greenhouse gases to the atmosphere. Further difficulty is associated with the complexity of the climatic system and uncertainty surrounding these processes.

8.53 It is recognised that Ireland cannot, on its own, prevent or ameliorate the impacts of climate change. However, the National Climate Change Strategy 2007-2012 states that Ireland must meet its responsibilities with regard to reducing CO2 emissions in partnership with the EU and the global community.

IMPACT ASSESSMENT

'Do Nothing'

8.54 The survey undertaken of baseline EPA data as part of this assessment suggests that air quality in the vicinity of the application area is expected to be good with typical levels of pollutants for a rural area. All pollutant levels are within the relevant Irish and EU limits (for similar sized population centres). In the event that the development does not proceed it is likely that the application area would be developed in the future for some industrial use.

Construction Phase Impact – Air Quality

8.55 The following sections describe the potential impacts to air quality resulting from the construction phase of the proposed plant. The impacts have been assessed on a local scale to determine impacts on human health and surrounding receptors. The aspects considered include:

- construction dust and its potential to impact on sensitive receptors and to cause an environmental nuisance,
- construction traffic emissions and their potential for impacts on sensitive receptors.

8.56 The impacts are assessed in the following sections with respect to the relevant assessment criteria where appropriate.

Construction Dust

8.57 Construction activities such as excavation, earth moving and backfilling can generate dust, particularly in dry weather conditions. The extent of dust generation is dependent on the nature of the material (soils, peat, sands, gravels, silts etc.) and the location of the construction activity. In addition, the potential for dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction (see Meteorological Data section). Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes.

8.58 **Table 8-6** presents the distances within which dust could be expected to result in a nuisance from construction sites for impacts such as soiling (dust nuisance), PM_{10} deposition and vegetation effects. This data has been taken from the National Roads Authority (NRA) *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* and is considered a worst case assessment. These distances present the potential for dust impact with standard mitigation in place.

8.59 Detail of proposed mitigation measures to be implemented as part of the construction phase of the project are presented under the Construction Phase Mitigation section of this report.

Table 8-5 Assessment criteria for the impact of dust from construction, with standard mitigation in place

Source		Potential distance for significant effects (distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation effects**
Major	Large construction sites with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites with minor use of haul roads	25m	10m	10m

Source: National Roads Authority, 2006.

8.60 The construction phase of this proposal is deemed for the purposes of this assessment to be of a minor to moderate scale. Using this screening assessment tool, at a minor to moderate construction site there is a risk that dust may cause an impact at sensitive receptors within 25m of the source of the dust generated. The nearest residential sensitive receptors to the centre of the subject site is located at a distance of over 100m, therefore, the impact from construction activities can be considered to be imperceptible.

8.61 All sensitive habitats are located at a distance greater than 25m from the emission source as a result the impact on habitats will be imperceptible.

8.62 A Construction Management Plan (CMP) incorporating dust mitigation measures will further reduce any impacts significantly and this will be implemented as part of the proposed development.

Construction Traffic Emissions

8.63 Emissions associated with construction traffic can impact on local air quality. In particular, the proposed routes used for deliveries and any sensitive receptors that line these routes may experience impacts to local air quality.

8.64 The potential impact of construction traffic associated with this proposal was estimated as a worst case Annual Average Daily Traffic (AADT) scenario of 1000 (which is higher than the expected peak AADT so as to assume worst case potential impact). The detailed results of the modelling exercise are presented in **Table 8-6**.

Table 8-6 Predicted contribution of air pollutants to baseline air quality as a result of construction traffic.

Link location	Carbon monoxide Annual mean (µg/m³)	Benzene Annual mean (µg/m³)	Oxides of nitrogen Annual mean (µg/m³)	Particulate matter 10um	
				Annual mean (µg/m³)	Days > 50 (µg/m³)
Worst case receptor 5m from road centreline on any roadway yr 2013	<0.01	<0.01	0.51	0.10	0
Worst case receptor 5m from road centreline on any roadway yr 2018	0.010	0.010	0.62	0.12	0
Worst case receptor 5m from road centreline on any roadway yr 2028	0.010	0.010	0.77	0.14	0

Operational Phase Impacts – Air Quality

8.65 Air quality impacts may arise from process based emissions and traffic movements associated with the operational phase of the proposed plant. Traffic based air quality emissions will result from traffic making deliveries and collections to and from the proposed plant and employee traffic movements.

Traffic

8.66 The detailed information provided in the traffic and transport assessment (see **Chapter 7** of the EIS) has been used to identify whether any significant impact on sensitive receptors will occur. The traffic information has been inputted into the Design Manual for Roads and Bridges (DMRB), Volume 11 (ver. 1.03c) model. This model was prepared by the United Kingdom Department of Transport, the Scottish Office of Industrial Development, the Welsh Office and the Department of Environment for Northern Ireland as a screening tool to assess worst-case air quality impact associated with traffic movements.

8.67 The screening model uses a worst-case scenario in calculating emissions. The emission factors used for each pollutant are intentionally set to biased and to overestimate the actual emission rate. In addition, wind speeds are assumed to be 2 ms^{-1} (approximately 3.90 knots compared to a mean wind speed of between 5 and 7 knots at the nearest Met station. Emission rates predicted as a result of traffic are added to the cumulative emissions generated by the proposed plant's scheduled emission points and baseline data. This is considered a worst case assessment of likely impact. It can therefore be assumed with confidence that traffic related air pollution will not arise if the model does not identify any issues.

8.68 Traffic figures have been assessed using Annual Average Daily Traffic (AADT) figures. The Heavy Goods Vehicle (HGV) percentage was taken from the traffic assessment. As the average speed of vehicles has a significant effect on the generation of pollutants, calculations are carried out at a worst case traffic speed scenarios. The speed used is 20 km hr^{-1}, to represent gridlock conditions so as to assess the worst case scenario. In addition, it was assumed within the model that the sensitive receptor was located within 5m of the road centreline, again to represent worst case conditions.

Traffic: Output Data from Traffic Air Quality Model

8.69 **Table 8-7** presents the results of the worst case conservative traffic air quality modelling data, performed in order to ascertain the likely increase in air quality impact as a result of additional traffic generated during the operational phase of the proposed extension. Construction based traffic is included in this so as to remain conservative.

8.70 As can be observed, there is no significant increase in the air quality impact of named pollutants as a result of increased baseline traffic numbers in 2013, 2018, and 2028 with only a slight increase occurring in pollutant concentration predicted 5m from the road centreline.

8.71 In terms of the ‘do nothing’ versus ‘do something’ for 2013, 2018, and 2028, there is a slight increase in pollutant concentration in the order of 1% which is considered to be imperceptible. When this increase is added to baseline data presented in **Table 8-12** for each named pollutant, emissions will remain well within the air quality limits presented in **Table 8-1** for the protection of human health.

Table 8-7 Predicted contribution of air pollutants as a result of traffic from development in 2013, 2018 and 2028.

Years	Entrance to McHales facility (Traffic count as per Traffic Assessment Chapter)	
	Entrance to McHales facility	
Operation and Construction phase air quality emissions as a result of traffic **2013**	Carbon monoxide Annual mean (µg/m^3)	0.010
	Benzene Annual mean (µg/m^3)	0.010
	Oxides of nitrogen Annual mean (µg/m^3)	0.86
	Particulate matter 10um - Annual mean (µg/m^3)	0.19
	Particulate matter 10um - Days > 50 (µg/m^3)	0
Operation and Construction phase air quality emissions as a result of traffic **2018**	Carbon monoxide Annual mean (µg/m^3)	0.010
	Benzene Annual mean (µg/m^3)	0.010
	Oxides of nitrogen Annual mean (µg/m^3)	0.91
	Particulate matter 10um - Annual mean (µg/m^3)	0.17
	Particulate matter 10um - Days > 50 (µg/m^3)	0
Operation and Construction phase air quality emissions as a result of traffic **2028**	Carbon monoxide Annual mean (µg/m^3)	0.010
	Benzene Annual mean (µg/m^3)	0.010
	Oxides of nitrogen Annual mean (µg/m^3)	0.88
	Particulate matter 10um - Annual mean (µg/m^3)	0.17
	Particulate matter 10um - Days > 50 (µg/m^3)	0

Scheduled Emission Point Schedule Emissions

8.72 The relative location of the scheduled emission points within the subject site is presented in **Figure 8-3**.

- The source characteristics of each stack is illustrated in **Table 8-8**;

8.73 Classical air pollutants from the existing and proposed scheduled emission points were examined utilising process guaranteed air quality emission rate data supplied by the plant's process design engineers. The proposed location of point source emission points within the subject site are presented in **Figure 8-3**.

8.74 Cumulative air quality impacts were accounted for through utilisation of a combination of EPA plus predicted air quality impacts as a result of the operation of scheduled emission points located within the existing and proposed plant and increased emissions as a result of increased traffic numbers arising from the proposed facility (see Baseline Air Quality Assessment).

8.75 The predicted impacts as a result of operation of scheduled emission points at the proposed plant for air quality was examined utilising air quality emission rate data as presented in **Tables 8-9**, in accordance with procedures and methods contained in the following publications:

- *Air Dispersion Modelling from Industrial Installations Guidance Note* (AG4), EPA 2010.

8.76 This data was inputted into a dispersion model in order to predict the impacts of named pollutant emissions from scheduled emissions points located within the existing and proposed plant's boundary. AERMOD Prime (12060) and 5 years of hourly sequential meteorological data (Knock Airport 2005 to 2009) representative of the study area were utilised within the dispersion model with the worst case year Knock 2009 was used for data presentation.

Dispersion Model AERMOD Prime

8.77 The AERMOD model was developed through a formal collaboration between the American Meteorological Society (AMS) and U.S. Environmental Protection Agency (U.S. EPA). AERMOD is a Gaussian plume model and replaced the ISC3 model in demonstrating compliance with the National Ambient Air Quality Standards (Porter et al., 2003). AERMIC (USEPA and AMS working group) is emphasising development of a platform that includes air turbulence structure, scaling, and concepts; treatment of both surface and elevated sources; and simple and complex terrain. The modelling platform system has three main components: AERMOD, which is the air dispersion model; AERMET, a meteorological data pre-processor; and AERMAP, a terrain data pre-processor (Cora and Hung, 2003).

Model Assumptions

8.78 The approach adopted in this assessment is considered a worst-case investigation in respect of emissions to the atmosphere from the proposed scheduled emission points to be located within the operational plant. These predictions are therefore most likely to overestimate the GLC's that may actually occur for each modelled scenario. The assumptions are summarised and include:

- all emissions were assumed to occur at maximum potential emission concentration and mass emission rates for each scenario and were assumed to occur for 100% of an operating year, simultaneously (when the existing and proposed plant is in operation);
- Five years of hourly sequential meteorological data from Knock Airport 2005 t 2009 inclusive was used in the modelling screen which will provide statistical significant results in terms of the short and long term assessment. The worst case year 2009 was used for data analysis, this is in keeping with guidance presented in AG4. In addition, AERMOD incorporates a meteorological pre-processor AERMET PRO. The AERMET PRO meteorological pre-processor requires the input of surface characteristics, including surface roughness (z0), Bowen Ratio and Albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. The values of Albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc.) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10km from the meteorological station for Bowen Ratio and Albedo and to a distance of 1km for surface roughness in line with USEPA recommendations.

- AERMOD Prime (12060) dispersion modelling was utilised throughout the assessment in order to provide the most conservative dispersion estimates;
- All building wake affects were assessed within the dispersion model;
- Topographical data was inputted into the model in order to take account of any rolling terrain in the vicinity of the site (which is the case in this instance);
- Baseline data from EPA sources was used in conjunction with the predicted process emissions. In addition traffic contribution values were calculated using the DMRB model.

Meteorological Data

8.79 Five years of hourly sequential meteorological data was chosen for the modelling exercise (i.e. Knock Airport 2005 to 2009 inclusive). A schematic wind rose and tabular cumulative wind speed and directions of all five years are presented in **Plate 8.1**. All five years of meteorological data was screened to provide statistically significant output results from the dispersion model. The worst case year 2009 was used for data presentation. This is in keeping with national and international recommendations on quality assurance in operating dispersion models and will provide a worst case assessment of predicted ground level concentrations based on the input emission rate data. Surface roughness, Albedo and Bowen ratio were assessed and characterised around Dublin Airport Met Station for AERMET Pro processing.

Terrain Data

8.80 Topography effects were accounted for within the dispersion modelling assessment as terrain was considered complex in the vicinity of the site. 10m spaced XYZ column format topographical data as gathered from Ordnance Survey Ireland was pre-processed using AERMAP (12060) for the dispersion modelling area in order to allow for the characteristics of terrain to be accounted for in the model. A total fine and course grid area of 0.56 km sq and 9 km sq were examined within the dispersion modelling assessment giving a total receptor grid number of 1,545 receptor points in the assessment area.

Building Wake Effects

8.81 Building wake effects are accounted for in modelling scenarios through the use of the Prime algorithm (i.e. all building features located within the existing and proposed plant) as this can have a significant effect on the compound plume dispersion at short distances from the source and can significantly increase GLC's in close proximity to the proposed plant. All adjacent building structures, stack heights and orientations were inputted into the dispersion model in order to allow for wake effects to be taken in to account in the calculations. The latest Building Profile Input Programme (BPIP) version (04274) was utilised in the analysis.

Input Source Characteristics for Dispersion Model

8.82 Input source characteristics for the dispersion model are specified within **Table 8-8**. Each of the scheduled emission points are detailed within this Table to include, emission point location, height, stack tip diameter, efflux velocity, exhaust actual airflow volume, etc. This data was utilised in conjunction with the emission rate data for classical air pollutants in order to predict the worst case GLC over the specified receptor grid area detailed in the section entitled Terrain Data.

Emission Ref	Description	X coordinate (m)	Y coordinate (m)	Temperature (K)	Stack tip diameter (m)	Volume flow (Nm3/sec)	Stack tip area (m2)	Efflux velocity (m/s)	Emissions
A1-1	cleaner stage 1 pretreatment lip extract	118067	265570	328	0.8	5.8	0.503	13.862	water vapour
A1-2	cleaner stage 2 pretreatment lip extract	118070	265569	328	0.8	5.8	0.503	13.862	water vapour
A1-3	cleaner stage 3 pretreatment lip extract	118073	265568	328	0.8	5.8	0.503	13.862	water vapour
A1-4	Zn phosphate stage 7 pretreatment lip extract	118082	265564	328	0.8	5.8	0.503	13.862	water vapour
A2-1	Gas fired Boiler - burner flue	118067.5	265579.8	478	0.24	0.67	0.045	25.928	products of combustion
A3-1	Electrocoat oven Cooler exhaust	118062	265555	313	0.9	7.0	0.636	12.614	none
A4-1	Electrocoat oven - heat up zone gas fired burner flue	118076	265547	593	0.24	0.17	0.045	8.162	products of combustion
A4-2	Electrocoat oven - exhaust	118082	265545	453	0.4	1.34	0.126	17.692	none
A4-3	Electrocoat oven -hold zone gas fired burner flue	118087	265542	593	0.24	0.1	0.045	4.801	products of combustion
A5-1	Powder oven Cooler exhaust	118057	265544	313	0.9	7.0	0.636	12.614	none
A6-1	Powder oven - exhaust	118086	265534	448	0.4	1.34	0.126	17.497	none
A7-1	Paint Spraybooth - air exhaust	118105	265526	294	1.5	19.5	1.767375	11.882	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C
A8-1	Paint Spraybooth - air exhaust	118074	265611	293	0.8	5	0.503	10.675	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C
A8-2	Paint Spraybooth - air exhaust	118073	265609	293	0.8	5	0.503	10.675	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C
A9-1	Paint Spraybooth - air exhaust	118082	265609	293	0.8	5	0.503	10.675	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C
A9-2	Paint Spraybooth - air exhaust	118081	265607	293	0.8	5	0.503	10.675	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C

Table 8-3 Scheduled emission points source characteristics.

Input Air Quality Data for the Dispersion Model

8.83 The overall air quality emission data for Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Total particulates (as PM_{10} and $PM_{2.5}$), and TOC from the identified processes is presented in **Table 8-9 and 8-10**. The relative location of each emission point is presented in **Figure 8-8.** This data was inputted into the dispersion model AERMOD Prime 12060 along with meteorological data, terrain and building and source characteristics as described under the Scheduled Emission Points to allow for the examination of predicted classical air pollutant levels for maximum predicted regime at each of the identified sensitive receptors presented in **Table 8-3**.

8.84 For modelling classical air pollutants and in order to obtain the predicted environmental concentration (PEC), baseline data was added to the predicted process emission at ground level. In relation to the predicted annual averages, the ambient background concentration was added directly to the predicted process concentration. However, in relation to the predicted short-term peak 1 hr concentrations, twice the background concentration level was added to the predicted environmental concentration (PEC) (UK Environment Agency).

8.85 As EPA baseline data and traffic air quality data was calculated, the contribution of pollutants from other sources in close proximity to the application area have been taken into account within this data set. In order to remain conservative the following elements were considered:

- All emission points were assumed to exhaust at the same time;
- emissions as a result of traffic were accounted in the final predictions at each sensitive receptor;
- the worst case baseline figure gathered during the survey of the application area and from a review of EPA air quality data was utilised in calculations to remain conservative.

8.86 In modelling air dispersion of NOx from combustion sources, the source term should be expressed as NO_2, (e.g., NOx mass (expressed as NO_2)). A portion of the exhaust air comprises NO while the remainder comprises NO_2. NO will be converted in the atmosphere to NO_2 but this will depend on a number of factors to include Ozone and VOC concentrations. In order to take account of this conversion the following screening was performed.

8.87 The worst case screening scenario treatment applied to results was:

- 35% for short-term predicted concentration value and
- 70% for long-term predicted concentration value

These were considered to assess compliance with the relevant air quality objective.

This is in accordance with recommendations from the Environmental Agency UK for the dispersion modelling of NO_2 emissions from combustion processes, www.environmentagency.gov.uk

Table 8-9 Classical air pollutant concentration data used for calculation of air quality mass emission rate for use in the dispersion model AERMOD Prime (12060) for each scheduled emission point.

Flue gas concentrations of compounds to be emitted from processes on site								
Emission point ID	**Description**	**Volume flow rate (Nm^3/s)**	**Type of emission**	**Carbon monoxide (mg/Nm^3)**	**Oxides of nitrogen (mg/Nm^3)**	**Sulphur dioxide (mg/Nm^3)**	**Total particulates (mg/Nm^3)**	**Total Organic Carbon (mg/Nm^3)**
A2-1	Gas fired Boiler - burner flue	0.67	products of combustion	50	200	50	10	-
A4-1	Electrocoat oven - heat up zone gas fired burner flue	0.17	products of combustion	50	200	50	10	-
A4-3	Electrocoat oven -hold zone gas fired burner flue	0.1	products of combustion	50	200	50	10	-
A7-1	Paint Spraybooth - air exhaust	19.50	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C	-	-	-	10	50
A8-1	Paint Spraybooth - air exhaust	5	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C	-	-	-	10	50
A8-2	Paint Spraybooth - air exhaust	5	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C	-	-	-	10	50
A9-1	Paint Spraybooth - air exhaust	5	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C	-	-	-	10	50
A9-2	Paint Spraybooth - air exhaust	5	< 10 mg/Nm3 of particulates < 50 mg/Nm3 of VOC as C	-	-	-	10	50

Table 8-10 Classical air pollutant mass emission rate for use in the dispersion model AERMOD Prime (12060) for each scheduled emissio

Mass emissions of compounds to be emitted from processes on site						
Emission point ID	**Description**	**Carbon monoxide (g/s)**	**Oxides of nitrogen (g/s)**	**Sulphur dioxide (g/s)**	**Total particulates (g/s)**	**Total Organic Carbon (g/s)**
A2-1	Gas fired Boiler - burner flue	0.0335	0.134	0.0335	0.0067	-
A4-1	Electrocoat oven - heat up zone gas fired burner flue	0.0085	0.034	0.0085	0.0017	-
A4-3	Electrocoat oven -hold zone gas fired burner flue	0.005	0.020	0.005	0.001	-
A7-1	Paint Spraybooth - air exhaust	-	-	-	0.195	0.975
A8-1	Paint Spraybooth - air exhaust	-	-	-	0.05	0.25
A8-2	Paint Spraybooth - air exhaust	-	-	-	0.05	0.25
A9-1	Paint Spraybooth - air exhaust	-	-	-	0.05	0.25
A9-2	Paint Spraybooth - air exhaust	-	-	-	0.05	0.25

8.88 There will a total of 8 scheduled emission points with emissions. These will be made up of combustion and non-combustion sources. Emissions from combustion sources will be from gas fired equipment. Emissions of solvents, TOC and Total particulates will occur from Paint booths. All emission points have been assessed as part of the assessment.

8.89 In terms of TOC, the proposed impact criterion is based on a analysis of the potential constituents contained in the materials used on site. **Table 8-11** presents the analysis of the materials MSDS and the proposed assessment criterion for each compound. It is proposed to decommission locations A9-1 and A9-2 (electrostatic solvent based paint spray booth) once the E-coat plant is operational. This will however not occur immediately and therefore it is assumed that both systems are fully operational

Table 8-11. Individual compound analysis of individual raw materials containing TOC and used on site.

Compound identity	CAS Number	OEL 8 hr value (mg/Nm^3)	OEL 15 min value (mg/Nm^3)	1/100 of 8 hr value to represent an Annual average dispersion estimate (μg/m^3)	1/10 of 15 min value used to represent the short term 1 hr max dispersion estimate (μg/m^3)
Acetone	67-64-1	1210	-	12,100	-
Butan-1-ol	71-36-3	-	75	-	7,500
Ethyl methyl ketone	78-93-3	600	900	6,000	90,000
n-butyl acetate	123-86-4	710	950	7,100	95,000
dichloromethane	75-09-2	174	550	1,740	55,000
Ethanol	64-17-5	1900	-	19,000	
ethyl acetate	141-78-6	785	1571	7,850	157,100
Heptane	142-82-5	2085	-	20,850	-
n hexane	110-54-3	72	-	720	-
iso propyl acetate	108-21-4	455	910	4,550	91,000
methyl acetate	79-20-9	610	760	6,100	76,000
propan-2-ol	67-63-0	536	1073	5,360	107,300
toluene	108-88-3	192	384	1,920	38,400
4-methylpentan-2-ol	108-10-1	83	208	830	20,800
Methanol	67-56-1	260	-	2,600	-
Naphtha, light aromatics	64742-95-6	-	-	-	-
Butyl acetate	123-86-4	710	950	7,100	95,000
2-methoxy-1-methylethylacetate	108-65-6	275	550	2,750	55,000
Xylene	1330-20-7	221	442	2,210	44,200
2-methoxy-1-methylethyl acetate	108-65-6	275	550	2,750	55,000
Ethylbenzene	100-41-4	442	884	4,420	88,400
Highest risk compound					
n hexane	-	-		**720**	**-**
Butan-1-ol	-	-		**-**	**7,500**

8.90 The worst case individual compound was n-hexane for the long term assessment criterion and this was 720 µg/m^3 and Buntan-1-ol for the short term 1 hr max assessment criterion and this was 7,500 µg/m^3. Assuming that all of the compound emitted through the emission points was either of these compounds will provide a worst case assessment of the likely impact of the emission points on the surrounding area. This would never happen and these compounds only make up a fractional amount of the overall compound mix so therefore this is considered worst case.

Output Air Quality Data from the Dispersion Model

8.91 **Table 8-12** presents the maximum predicted classical air pollutant values in the vicinity of the proposed plant when all processes are operating. As can be observed in **Table 8-12**, the maximum predicted ground level concentration (GLC) of Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Particulate matter as PM_{10} and $PM_{2.5}$, Total non methane Volatile organic compounds and Ammonia with baseline values and predicted traffic related emissions is well within the air quality limit values presented in **Table 8.1**.

8.92 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum 8 hr Carbon monoxide GLC is less than or equal to 6.14% of the impact criterion (see **Table 8-12**).

8.93 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum 99.79%ile 1 hr Oxides of nitrogen GLC is less than or equal to 22.05% of the impact criterion (see **Table 8-12)**.

8.94 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum Annual average Oxides of nitrogen GLC is less than or equal to 37.75% of the impact criterion (see **Table 8-12**).

8.95 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum 99.73%ile 1 hr Sulphur dioxide GLC is less than or equal to 6.35% of the impact criterion (see **Table 8-12**).

8.96 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum 99.18%ile 24 hr Sulphur dioxide GLC is less than or equal to 7.70% of the impact criterion (see **Table 8-12**).

8.97 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum Annual average Sulphur dioxide GLC is less than or equal to 20.05% of the impact criterion (see **Table 8-12**).

8.98 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum 90.40%ile 24 hr Total particulates as PM_{10} GLC is less than or equal to 75.60% of the impact criterion (see **Table 8-12**).

8.99 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum Annual average Total particulates as PM_{10} GLC is less than or equal to 72.25% of the impact criterion (see **Table 8-12**).

8.100 The predicted maximum ground level concentration including baseline and traffic related emissions for the maximum Annual average Total particulates as $PM_{2.5}$ GLC is less than or equal to 91.60% of the impact criterion (see **Table 8-12**).

8.101 The predicted maximum ground level concentration including baseline and traffic related emissions for the 1 hr maximum short term hourly average TOC GLC is less than or equal to 9.87% of the impact criterion (see **Table 8-12**).

8.102 The predicted maximum ground level concentration including baseline and traffic related emissions for the Annual average long term TOC GLC is less than or equal to 7.56% of the impact criterion (see **Table 8-12**).

Table 8-11 Comparison between predicted process worst case GLC's, baseline and traffic relat

Receptor identity	X coordinate (m)	Y coordinate (m)	Scen 1 (µg/m^3)	Scen 2 (µg/m^3)	Scen 3 (µg/m
R1	118151	265823	2.47	7.10	0.70
R2	118217	265798	2.63	6.87	0.66
R3	118201	265759	3.24	7.52	0.79
R4	118217	265736	3.37	7.48	0.77
R5	118234	265693	3.33	7.12	0.80
R6	118296	265583	2.79	6.64	0.61
R7	118307	265567	2.63	6.12	0.53
R8	118320	265552	2.45	5.33	0.46
R9	118332	265531	2.50	5.39	0.39
R10	118346	265513	2.49	4.96	0.35
R11	118367	265477	3.42	5.49	0.30
R12	118383	265456	3.41	5.60	0.28
R13	118398	265437	3.10	5.36	0.26
R14	118255	265437	2.61	6.29	0.39
R15	118283	265420	2.20	5.50	0.33
R16	118292	265397	1.77	4.91	0.27
R17	118305	265386	1.65	4.59	0.25
R18	118320	265364	1.49	4.40	0.21
R19	118332	265350	1.38	4.21	0.19
R20	118245	265408	2.02	5.60	0.31
R21	118256	265391	1.83	5.25	0.27
R22	118266	265382	1.72	4.84	0.25
R23	118275	265373	1.54	4.68	0.23
R24	118284	265361	1.45	4.52	0.21
R25	118291	265350	1.37	4.19	0.20
R26	118299	265336	1.27	3.87	0.18
R27	118212	265325	1.49	3.88	0.18
R28	118196	265288	1.23	3.77	0.17
R29	118205	265279	1.17	3.56	0.16
R30	118223	265320	1.41	3.63	0.18
R31	118237	265315	1.31	3.78	0.17
R32	118219	265281	1.23	3.71	0.15
R33	118234	265271	1.17	3.25	0.14
R34	118247	265308	1.23	3.70	0.16
R35	118258	265233	0.96	3.02	0.12
R36	118271	265259	1.05	3.04	0.13
R37	118314	265286	1.18	3.52	0.14
R38	118343	265311	1.10	3.58	0.16
R39	118329	265617	2.62	5.78	0.57
R40	118358	265560	2.06	5.36	0.41
R41	118366	265573	2.26	5.40	0.42
R42	118371	265580	2.30	5.47	0.42
R43	118379	265588	2.31	5.64	0.42
Air quality Limit value (µg/m^3)	-	-	10,000	200	40
Max predicted value at or beyond the facility boundary (µg/m^3)	-	-	13.20	23.1	4.1

8.103 Ground level concentrations of classical air pollutants were predicted at each of the named sensitive receptors contained in **Table 8-3**. As can be observed, the cumulative predicted GLC of each pollutant is well within their respective ground level concentration limit (range of less than 1.78 to 58.17% of impact criterion as per **Table 8-12** when the proposed plant is at 100% operation capacity. **Table 8-12** also provides an analysis of the worst case predicted ground level concentrations of compounds at or beyond the facility boundary. As can be observed the predicted worst case ground level concentrations are from 6.35 to 91.60% of the impact criterion and the impacts will therefore be imperceptible.

MITIGATION MEASURES

8.104 In order to sufficiently ameliorate any potential negative impacts on air quality, a schedule of measures has been formulated for both the construction and operational phases of the proposed plant.

Incorporated Mitigation

8.105 In view of the potential for adverse environmental effects, the design and operation of the proposed plant is intended to ensure that emission limit values as established within the assessment will not be exceeded. These will be established as part of the EPA licence for combustion and non-combustion sources.

8.106 Limit values have being reported in **Table 8-9** of this chapter.

Construction Phase Mitigation

8.107 A full traffic management plan and dust management plan will be incorporated into the Construction Management Plan (CMP) in order to minimise such emissions as a result of the construction phase of the development. This will be generated specifically for the proposed development when detailed design is completed.

8.108 In order to ensure that no dust nuisance occurs at sensitive receptors, a series of measures will be implemented through the CEMP:

- On 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 as a result of the development.
- Any un-surfaced roads shall be restricted to essential site traffic only.
- Furthermore, any on site road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during extended dry and/or windy conditions.
- Vehicles using site roads shall have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road and on hard surfaced roads speed shall be restricted to 20 km per hour.
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- 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.
- At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the subject site boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.
- In relation to the completion of the proposed development, the hard standing surface, and all roads will be tarmacadamed/concreted where applicable.
- In terms of good practice construction vehicles and equipment will receive regular maintenance. Technical inspection will be performed of vehicles

to ensure they will perform most efficiently. A Traffic Management Plan will be implemented to minimise congestion.

Climate

8.109 Emissions of Oxides of nitrogen, Sulphur dioxide, Carbon monoxide and Carbon dioxide will be mitigated by using efficient construction vehicles, appropriate scheduling of construction activities to minimise duration, the shutting off of equipment during periods of inactivity if they do occur, and a transport management plan as part of the CMP as described above. Gas fired boilers will be utilised within the process. No additional mitigation measures are considered necessary.

Operational Phase Mitigation

8.110 Scheduled emission points operated within the facility are expected to be regulated through the EPA Licencing process and emission limit values presented are typical of emission levels stated in such Licences.

8.111 This assessment demonstrates that emission levels as a result of the operation of the proposed plant will not result in any air quality impact in line with Irish and European assessment criteria limits. The air quality emissions from each of the scheduled emission points will exhaust through a 14.90 m stacks, respectively.

Climate

8.112 The effects of the proposed plant on climate are expected to be negligible. No additional mitigation is considered necessary.

RESIDUAL IMPACT

8.113 Imperceptible residual impacts are anticipated as a result of the proposed extension development McHales, Ballinarobe, Co. Mayo.

Construction Phase

8.114 The effect of construction of the proposed plant on air quality will not be significant following the implementation of the proposed mitigation measures. No residual impacts are anticipated.

Operational Phase

8.115 Scheduled emission points operated within the proposed plant will be regulated through the EPA Licensing process. This assessment demonstrates that the level of emissions will not result in any air quality impact in line with Irish and European assessment criteria limits. No residual impacts are anticipated.

"WORST CASE" SCENARIO

8.116 A worst case of assessment was utilised throughout the air quality impact study in order to assess any risk associated with the proposed operation of the plant. Emission concentration values will be regulated through the EPA Licence process.