CHAPTER 5.0 AIR QUALITY, ODOUR AND HUMAN HEALTH

FIGURES (Volume 2 bound separately)

APPENDICES (Volume 3 bound separately)

5.0 AIR QUALITY

5.1 Introduction

5.1.1 This Chapter of the EIAR Main Report considers the potential impacts of the LSEP with the Proposal, on local air quality and odour. The main focus of the Chapter is the emissions from the stack of the LSEP facility. However, the emissions from traffic associated with the import and export of materials and potential fugitive emissions of dust and odour during operational phase have also been assessed. The emissions of dust from construction have been scoped out. This is because the Proposal does not make any chances to the design, layout or location of the LSEP, as consented.

5.1.2 Furthermore, works to clear and construct the LSEP site are already underway. The Chapter also includes a comparison of predicted results for the LSEP with those of the existing s.36 consent (as varied).

5.1.3 This Chapter is supported by the following technical appendices:

- Appendix 5-1 Air Quality Baseline Analysis – which provides a detailed analysis of the existing air quality in the area;
- Appendix 5-2 Process Emissions Modelling – which provides all the technical details of the dispersion modelling of process emissions from the stack undertaken;
- Appendix 5-3 Vehicle Emissions Modelling – which provides all the technical details of the vehicle emissions to air assessment and in-combination impacts with the process emissions from the stack;
- Appendix 5-4 Human Health Risk Assessment – which assesses the risk of emissions to human health; and
- Appendix 5-5 Ecological Interpretation of Air Quality Assessment – which assesses the ecological impacts from the emissions.

Competence

5.1.4 This Chapter of the EIAR Main Report and supporting technical appendices have been prepared by Hannah Lederer (BSc AMIEnvSc) and reviewed by Rosalind Flavell (CEnv CSci MIAQM MIEnvSc PIEMA) at Fichtner Consulting Engineers. Hannah is an associate member of the Institute of Environmental Sciences (IES) and has previous experience undertaking air quality assessments for planning applications for energy from waste (EfW) facilities. Rosalind is a chartered member of the Institute of Air Quality Management (IAQM) and IES and a practitioner member of the Institute for Environmental Management and Assessment (IEMA). Rosalind has over fifteen years of experience of project management and undertaking air quality assessments for planning and permitting purposes for a wide range and scale of developments including EfW facilities across the UK.

5.2 Methodology

Legislation and Guidance

5.2.1 European air quality legislation is consolidated under the Ambient Air Quality Directive (Directive 2008/50/EC), which came into force on 11 June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides Ambient Air Directive (AAD) Limit Values for sulphur dioxide, nitrogen dioxide, benzene, carbon monoxide, lead and particulate matter with a diameter of less than 10µm (PM_{10}) and a new AAD Target Value and Limit Value for fine particulates (those with a diameter of less than 2.5µm ($PM_{2.5}$). The fourth daughter Directive - 2004/107/EC - was not included within the consolidation. It sets health-based Target Values for polycyclic aromatic hydrocarbons (PAHs), cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable. Directives 2008/50/EC and 2004/107/EC are transposed into UK Law into the Air Quality Standards Regulations (2010) and subsequent amendments.

5.2.2 The UK Government and the devolved administrations are required under the Environment Act (1995) to produce a national air quality strategy. This was last reviewed and published in 2007. The Air Quality Strategy (AQS) sets out the UK's air quality objectives and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. This includes additional targets and limits for 15-minute sulphur dioxide and 1,3-butadiene and more stringent requirements for benzene and PAHs, known as AQS Objectives. Environmental Assessment Levels (EALs) for other pollutants are presented on the gov.uk website as part of the Environment Agency's (EA) Environmental Management Guidance (Air emissions risk assessment for your environmental permit), which was last updated on 1st March 2016 and is referred to here as the Air

Emissions Guidance. AAD Target and Limit Values, AQS Objectives, and EALs are set at levels well below those at which significant adverse health effects have been observed in the general population and in particularly sensitive groups. For the remainder of this chapter these are collectively referred to as AQALs.

5.2.1 The UK Government published the Clean Air Strategy (CAS) in January 2019. This sets out the methods by which air pollution from all sectors will be reduced. The CAS has not introduced any new air quality limits. However, the CAS sets out the actions required across all parks of the government to meet legally binding targets to reduce five key pollutants (fine particulate matter ($PM_{2.5}$s), ammonia, oxides of nitrogen, sulphur dioxide and non-methane volatile organic compounds (NMVOCs)) by 2020 and 2030 and secure health public heath benefits. The CAS also makes a commitment to bring forward primary legislation on clean air as outlined in the Environment Bill.

5.2.2 The Environment Bill introduces a duty on the government to set a legally binding target for $PM_{2.5}$s. To date this has not yet been set. The Department for the Environment Food and Rural Affairs (DEFRA) fact sheet sets out that:

"The government is committed to evidence-based policy making, and will consider the WHO's annual mean guideline level for $PM_{2.5}$ when setting the target, alongside independent expert advice, evidence and analysis on a diversity of factors – from the health benefits of reducing $PM_{2.5}$, to the practical feasibility and economic viability of taking different actions.

It would be irresponsible to set a target without giving consideration to its achievability and the measures required to deliver on that target.

The target level and achievement date will be developed during the target setting process and will follow in secondary legislation."

5.2.3 As such, the World Health Organisation (WHO) annual mean PM guidelines values are included within this assessment to ensure that this assessment has allowed for future changes in legislation which can be foreseen at this point

5.2.4 Local Air Quality Management Technical Guidance (2016) referred to as LAQM.TG(16), outlines that the AQALs apply in the following locations:

- Annual mean - all locations where members of the public might be regularly exposed - i.e. building facades of residential properties, schools, hospitals, care homes etc.
- 24-hour mean and 8-hour mean - all locations where the annual mean objective would apply together with hotels and gardens of residential properties.
- 1-hour mean - all locations where the annual mean, 24-hour and 8-hour mean apply together with kerbside sites and any areas where members of the public might be reasonably expected to spend one hour or more.
- 15-minute mean - all locations where members of the public might reasonably be exposed for a period of 15 minutes or more.

5.2.5 The AQALs relevant to this project are summarised in Appendix 5-2 and in Tables 5.1 and 5.2.

Table 5.1: Air Quality Assessment Levels

Pollutant	AQAL (μg/m3)	Averaging Period	Frequency of Exceedance	Source
Nitrogen dioxide	200	1 hour	18 times per year (99.79th percentile)	AAD Limit Value
	40	Annual	-	AAD Limit Value
Sulphur dioxide	266	15 minutes	35 times per year (99.9th percentile)	AQS Objective
	350	1 hour	24 times per year (99.73rd percentile)	AAD Limit Value
	125	24 hours	3 times per year (99.18th percentile)	AAD Limit Value
Particulate matter (PM_{10})	50	24 hours	35 times per year (90.41st percentile)	AAD Limit Value
	50	24 hours	-	WHO Guideline
	40	Annual	-	AAD Limit Value
	20	Annual	-	WHO Guideline
Particulate matter ($PM_{2.5}$)	20	Annual	-	AAD Limit Value
	25	24 hours		WHO Guideline
	10	Annual		WHO Guideline
Carbon monoxide	10,000	8 hours, running	-	AAD Limit Value
	30,000	1 hour		Air Emissions Guidance

Pollutant	AQAL (µg/m3)	Averaging Period	Frequency of Exceedance	Source
Hydrogen chloride	750	1 hour	-	Air Emissions Guidance
Hydrogen fluoride	160	1 hour	-	Air Emissions Guidance
	16	Annual	-	Air Emissions Guidance
Ammonia	2,500	1 hour	-	Air Emissions Guidance
	180	Annual	-	Air Emissions Guidance
Benzene	195	1-hour	-	Air Emissions Guidance
	5	Annual	-	AQS Objective
1,3-butadiene	2.25	Annual, running	-	AQS Objective
PCBs	6	1-hour	-	Air Emissions Guidance
	0.2	Annual	-	Air Emissions Guidance
PAHs – benzo(a)pyrene	0.00025	Annual	-	AQS Objective

Table 5.2: Air Quality Assessment Levels for Metals

Pollutant	AAD Target – Long Term (µg/m3)	Long Term Air Emissions Guidance (µg/m3)	Short Term Air Emissions Guidance (µg/m3)
Cadmium	0.005	0.005	-
Thallium	-	-	-
Mercury	-	0.25	7.5
Antimony	-	5	150
Arsenic	0.006	0.006	-
Cadmium	0.005	0.005	-
Chromium (II & III)	-	5	150
Chromium (VI)	-	0.0002	-
Cobalt	-	-	-
Copper	-	10	200
Lead	-	0.25	-
Manganese	-	0.15	1500
Nickel	0.020	0.020	-
Vanadium	-	5	1

5.2.6 Critical Levels for the protection of sensitive ecosystems and habitats are also outlined within the Air Quality Standards Regulations for oxides of nitrogen and sulphur dioxide. Limits for ammonia and hydrogen fluoride are contained in the Air Emissions Guidance. The Critical Levels relevant to this project are presented in the following table.

Table 5.3: Critical Levels for the Protection of Ecosystems

Pollutant	**Critical Level (μg/m3)**	**Averaging period**	**Source**
Nitrogen oxides (as nitrogen dioxide)	75/200	Daily mean	Air Emissions Guidance/WHO
	30	Annual mean	AAD
Sulphur dioxide	10	Annual mean for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystems integrity	Air Emissions Guidance
	20	Annual mean for all higher plants	AAD
Hydrogen fluoride	<5	Daily mean	Air Emissions Guidance
	<0.5	Weekly mean	Air Emissions Guidance
Ammonia	1	Annual mean for sensitive lichen communities and bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystems integrity	Air Emissions Guidance
	3	Annual mean for all higher plants	Air Emissions Guidance

5.2.7 In addition to the Critical Levels, the Air Pollution Information System (APIS) provides habitat specific Critical Loads for nitrogen and acid deposition. Full details of the habitat specific Critical Loads can be found in Appendix 5-2.

Industrial Pollution Regulation

5.2.8 Atmospheric emissions from industrial processes are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2016). The LSEP will be regulated by the EA and will need an Environmental Permit (EP) to operate. The EP will include conditions to prevent fugitive emissions of dust and odour beyond the boundary of the installation. The EP will also include limits on emissions to air. The currently consented development has an EP (EPR/QP3136CV/A001) and variation (EPR/WP3934AK) and will require a further variation to incorporate the increase in throughput.

5.2.9 The Industrial Emissions Directive (IED) (Directive 2010/75/EU), was adopted on 7th January 2013, and is the key European Directive which covers almost all regulation of industrial processes in the European Union (EU). Within the IED, the requirements of the relevant sector BREF (Best Available Techniques Reference documents) become binding as BAT (Best Available Techniques) guidance. The Waste Incineration BREF was published by the European Integrated Pollution Prevention and Control (IPPC) Bureau in December 2019. The BREF has introduced BAT-AELs (BAT Associated Emission Levels) which are more stringent than those currently set out in the IED for some pollutants. At the pre-application meeting for the EP application, it was agreed that the emission limits to use are those for an existing plant, rather than a new plant as set out in the Waste Incineration BREF. These limits are provided in Appendix 5-2.

Local Air Quality Management

5.2.10 Under Section 82 of the Environment Act (1995) (Part IV), local authorities are required to periodically review and assess air quality within their area of jurisdiction, under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future ambient pollutant concentrations against AQALs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, then the local authority is required to declare an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to produce an Air Quality Action Plan (AQAP), the objective of which is to reduce pollutant levels in pursuit of the relevant AQALs. A review of the local area shows that the closest AQMA is the Chester Road AQMA which at its closest point is located approximately 6.5 km from the LSEP Site and is therefore at too great of a distance to be impacted by the LSEP. Appendix 5-1 includes further detail.

Assessment Methodology

Vehicle Emissions

5.2.11 The IAQM document ‘Land-Use Planning & Development Control: Planning for Air Quality’ (2017) states that an air quality assessment is required where a development would cause a "*significant change*" in light duty vehicles (LDVs) or heavy goods vehicles (HGV). The indicative criteria to process to an assessment are:

- A change in LDV flows of:
  - more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA; or
  - more than 500 AADT elsewhere.
- A change in HGV flows of:
  - more than 25 AADT within or adjacent to an AQMA; or
  - more than 100 AADT elsewhere.

5.2.12 As stated in Chapter 4 of the EIAR Main Report, the vehicles associated with the operation of the LSEP are expected to result in 514 one-way movements (257 inward journeys and 257 outward journey) on an AADT basis. 434 of these (217 inward journeys and 217 outward journeys) would be HGVs. This is an increase from the number of vehicles within the existing s.36 consent (as varied) of 170 HGV journeys per day and exceeds the IAQM criteria above. In addition, the routing of vehicles north east along the A556 has the potential for vehicle emissions to combine with emissions from the stack. Therefore, it has been considered appropriate to undertake a detailed assessment of the transport emissions in order to calculate the in combination impact with the process emissions from the main stack of the LSEP facility.

5.2.13 The Design Manual for Roads and Bridges (DMRB) considers any receptor within 200m of a road source to be potentially affected by that operation. Therefore, the vehicle emissions assessment has included impact on any ecological sites within 200m of the roads used by vehicles accessing the LSEP.

Operational Phase Process Emissions

5.2.14 This assessment has been undertaken using the Advanced Dispersion Modelling System (ADMS) 5.2 dispersion model, and the five most recent years for which weather data is available. Full details of the dispersion modelling methodology and inputs can be found in Appendix 5-2. The model has been used to predict the ground level concentration of pollutants on a long and short-term basis across a grid of points. It has also been used to predict the concentration at nominated points to represent sensitive receptors. The assessment is based on the total impact of the LSEP scheme (i.e. the consented scheme with the Proposal) and takes into account changes to the baseline, assessment methodology, legislation and modelling since the May 2011 ES was carried out. When 'the LSEP' or 'LSEP scheme' is mentioned, this refers to the scheme as now proposed.

5.2.15 For operational phase process emissions from the LSEP stack, a comparison model has also been created to understand the difference in outcomes that the proposed increase in tonnage will have. The comparison model has used the emissions data and buildings from the May 2011 ES, which was when the last Air Quality Assessment was undertaken. A new model has been created, rather than directly comparing the results presented in the May 2011 ES, because using the latest version of ADMS and the most recent meteorological data (2016-2020) from Manchester gives a more accurate comparison.

5.2.16 For some pollutants which accumulate in the environment such as dioxins and dioxin-like PCBs, inhalation is only one of the potential exposure routes and the assessment levels is expressed as a sum of the exposure from inhalation and ingestion. Therefore, other exposure routes have been considered. A detailed Human Health Risk Assessment has been carried out using the Industrial Risk Assessment Program - Human Health (IRAP-h View - Version 5.0). The programme, created by Lakes Environmental, is based on the United States Environment Protection Agency (USEPA) Human Health Risk Assessment Protocol. This Protocol is a development of the approach defined by Her Majesty's Inspectorate for Pollution (HMIP) in 1996, taking account of further research since that date. Full details of the modelling methodology and inputs can be found in Appendix 5-4.

Plume Visibility

5.2.17 There is the potential for the plume of the stack of the LSEP to be visible under certain circumstances. ADMS 5.2 includes a plume visibility module, which models the dispersion and cooling of water vapour and predicts whether the plume will be visible, based on the liquid water content of the plume. This module has been used to quantify the number of visible plumes likely to occur during the operation of the LSEP. These results have been drawn upon in the EIAR Main Report Chapter 7 (Landscape and Visual).

Fugitive Dust and Odour

5.2.18 There is the potential for fugitive emissions of dust and odour to be released from the LSEP during the operational phase, especially during the delivery, unloading and storing of materials. The impact of fugitive odour emissions has been assessed on a qualitative basis in accordance with the methodology outlined within the IAQM guidance document 'Guidance on the Assessment of Odour for Planning' (the IAQM (2018) guidance). This guidance sets out a methodology for assessing the effects of odour on amenity.

5.2.19 There is no specific guidance for assessing the impact of dust from operational sites. Therefore, the impact has been assessed on a source-pathway-receptor approach.

Assessment of Significance / Assessment Criteria

Process and Vehicle Emissions

5.2.20 For the LSEP to operate it will need to satisfy industrial permitting requirements set out and monitored by the EA. However, EA guidance has not been developed for conducting an assessment to accompany a planning application (or indeed, a s.36 variation in the case of this application). Consequently, the IAQM guidance document “Land-Use Planning & Development Control: Planning for Air Quality” (2017) has been developed for professionals operating within the planning system. It provides planning officers and developers with a means of reaching sound decisions, having regard to the air quality implications of development proposals. The IAQM (2017) guidance states that it may be adapted using professional judgement. Therefore, where appropriate, EA guidance has been incorporated which is considered appropriate given that the LSEP will need to satisfy the industrial permitting requirements set out by the EA.

5.2.21 The IAQM (2017) guidance includes the following matrix which should be used to describe the impact based on the change in concentration relative to the AQAL and the overall predicted concentration from the scheme - i.e. the future baseline plus the process contribution.

Table 5.4: Magnitude of Change Descriptors

Long term average concentration at receptor in assessment year	% change in concentration relative to the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

5.2.22 It is intended that the change in concentration relative to the AQAL (the process contribution) is rounded to the nearest whole number. Therefore, any impact which is greater than 0.5% but less than 1.5% would be classified as a 1% change in concentration. An impact of less than 0.5% is described as negligible, irrespective of the total concentration.

5.2.23 The above matrix is only designed to be used with annual mean concentrations. The approach for assessing the impact of short-term emissions has been carried out in line with the IAQM (2017) guidance. This does not take into account the background concentrations as it is noted that background concentrations are less important in determining the severity of impact for short term concentrations.

5.2.24 Consequently, for short term concentrations (i.e. those averaged over a period of an hour or less), the following descriptors of change are used to describe the impact:

- < 10% - negligible;
- 10 - 20% - slight;
- 20 - 50% - moderate; and
- > 50% - substantial.

5.2.25 Following quantification of the magnitude of change the assessor should determine the significance of effect using professional judgement and should take into account such factors as:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

5.2.26 The IAQM (2017) states that, in relation to the significance of short-term impacts, *“In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other prominent local sources.”*

5.2.27 Therefore, if a short-term impact cannot be screened out as negligible or insignificant, consideration will be given to the risk of exceeding the short-term AQAL when determining the significance of effect.

5.2.28 The IAQM (2017) guidance does not provide any descriptors for averaging periods of between 1 hour and a year. Therefore, for these periods the Air Emissions Guidance criteria have been used, which state that:
"process contributions can be considered insignificant if:

- *the long term process contribution is <1% of the long term environmental standard; and*
- *the short term process contribution is <10% of the short term environmental standard."*

5.2.29 Where an impact cannot be screened out as ‘insignificant’ based on the outputs of the initial screening and modelling, the significance of the effect has been determined based on professional scientific judgement of the likelihood of emissions causing an exceedance of an AQAL. This is a standard approach which allows the risk and likelihood of exceedance to be investigated and assessed in detail, following the first stage assessment.

5.2.30 In addition, the EA guidance document 'Guidance on assessing group 3 metals stack emissions from incinerators - V.4 June 2016' for assessing the impact of emissions of metals relative to their respective AQALs, states that where the process contribution (PC) for any metal exceeds 1% of the long term or 10% of the short term environmental standard (in this case the AQAL), this is considered to have potential for significant pollution. Where the PC exceeds these criteria, the Predicted Environmental Contribution (PEC) should be compared to the environmental standard. The PEC can be screened out where the PEC is less than the environmental standard. Where the impact is within these parameters, it can be concluded that there is no risk of exceeding the AQAL and, as such, the magnitude of change and significance of effect is considered negligible. In addition, consideration will be made of the impact in line with the IAQM (2017) guidance.

5.2.31 For those substances which have the potential to accumulate in the environment, Tolerable Daily Intakes (TDI) (the amount of contaminant which can be ingested daily over a lifetime without appreciable health risk) and Index Doses (ID) (a level of exposure which is associated with a negligible risk to human health), are defined. Where the impact of process emissions is within these levels, emissions are expected to make a negligible impact on human health.

5.2.32 In May 2020 the IAQM released the guidance document ‘A guide to the assessment of air quality impacts on designated nature conservation sites’ (the IAQM (2020) guidance). This guidance draws on the EA Air Emissions Guidance, which states that to screen out impacts as ‘insignificant’ at European and UK statutory designated sites:

- the long-term process contribution must be less than 1% of the long-term environmental standard (i.e. the Critical Level or Load); and
- the short-term process contribution must be less than 10% of the short-term environmental standard.

5.2.33 If the above criteria are met, no further assessment is required. If the long-term process contribution exceeds 1% of the long-term environmental standard, the PEC must be calculated and compared to the standard. If the resulting PEC is less than 70% of the long-term environmental standard, the Air Emissions Guidance states that the emissions are ‘insignificant’ and further assessment is not required. In accordance with the guidance, calculation of the PEC for short-term standards is not required.

5.2.34 The Air Emissions Guidance states further that to screen out impacts as 'insignificant' at local nature sites:

- the long-term process contribution must be less than 100% of the long-term environmental standard; and
- the short-term process contribution must be less than 100% of the short-term environmental standard.

5.2.35 In accordance with the Air Emissions Guidance, calculation of the PEC for local nature sites is not required. However, with regard to locally designated sites, the IAQM (2020) guidance states: *"For local wildlife sites and ancient woodlands, the Environment Agency uses less stringent criteria in its permitting decisions. Environment Agency policy for its permitting process is that if either the short-term or long-term PC is less than 100% of the critical level or load, they do not require further assessment to support a permit application. In ecological impact assessments of projects and plans, it is, however, normal practice to treat such sites in the same manner as SSSIs and European Sites, although the determination of the significance of an effect may be different. It is difficult to understand how the Environment Agency's approach can provide adequate protection."*

5.2.36 As such, it is considered appropriate to apply the screening criteria for SSSIs and European Sites to locally designated sites to screen out the requirement for further consideration of the significance of effect for planning. Where an impact cannot be screened out as 'insignificant' further analysis has been undertaken by the project ecologist and this analysis is provided in Appendix 5-5.

Fugitive Dust and Odour

5.2.37 The IAQM (2018) guidance has been developed to assist in the assessment of the effects of odour on amenity. The IAQM note that before an adverse effect can occur there must be odour exposure. For odour exposure to occur all three links in the source-pathway-receptor chain must be present. The magnitude of effect experienced is determined by the scale of the exposure (considering the Frequency, Intensity, Duration and Odour unpleasantness, FIDO) and the sensitivity of the receptor (L, denoting the location), which is often taken to be a surrogate for the sensitivity and incorporates the social and physical factors that can be expected for a given community.

5.2.38 The likely magnitude of effect is a combination of the risk of exposure and the sensitivity of the receptors. The risk of exposure is determined based on the source odour potential and the pathway effectiveness.

5.2.39 When determining the risk of exposure, the first stage is to categorise the source odour potential using the following risk ranking:

Table 5.5: Source Odour Potential Criteria

Source Potential	Description
Large	• Larger Permitted processes of odorous nature or large Sewage Treatment Works (STWs). • Highly odorous compounds with very low detection thresholds with unpleasant to very unpleasant odours. • Open air operation with no containment.
Medium	• Smaller Permitted processes or small STWs. • Moderately odorous compounds with neutral to unpleasant odours. • Some mitigation measures in place, but significant residual odour remains.
Small	• Smaller Permitted processes or small STWs. • Processes classed as “Less offensive. • Effective, tangible mitigation measures in place (e.g. Best Available Techniques (BAT), Best Practicable Means (BPM) leading to little or no residual odour.

5.2.40 The next stage is to determine the pathway effectiveness as a transport mechanism for odour. This includes consideration of the distance, whether the receptors are down wind of the odour source, the effectiveness of the release, the topography and terrain between the source and receptor. Using the following risk ranking the pathway effectiveness can be categorised as ineffective, moderately effective or highly effective.

Table 5.6: Pathway Effectiveness Criteria

Pathway Effectiveness	Description
Highly effective	• Receptor is adjacent to the source/site. • Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind).
Moderately effective	• Receptor is local to the source.

Pathway Effectiveness	Description
Ineffective	• Receptor is remote from the source. • Direction – low frequency (%) of winds from source to receptor (or, qualitatively, receptors upwind of source with respect to prevailing wind).

5.2.41 The risk of odour at receptor locations is then determined using the following matrix considering the pathway effectiveness and source odour potential.

Table 5.7: Risk of Odour Exposure Criteria

Pathway Effectiveness	Source Odour Potential		
	Small	Medium	Large
Highly effective	Low Risk	Medium Risk	High Risk
Moderately effective	Negligible Risk	Low Risk	Medium Risk
Ineffective	Negligible Risk	Negligible Risk	Negligible Risk

5.2.42 The sensitivity of receptors to odours is determined using the following principles.

Table 5.8: Sensitivity of Receptor

Sensitivity of receptor	Description
High	Surrounding land where: • users can reasonably expect enjoyment of a high level amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level as amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low	Surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

5.2.43 The next step is to estimate the effect of that odour impact on the exposed receptor, taking into account its sensitivity, as shown by the following matrix.

Table 5.9: Odour Impact Criteria

Risk of Odour Exposure	Receptor Sensitivity		
	Low	Medium	High
High risk	Slight Adverse	Moderate Adverse	Substantial Adverse
Medium risk	Negligible	Slight Adverse	Moderate Adverse
Low risk	Negligible	Negligible	Slight Adverse
Negligible	Negligible	Negligible	Negligible

5.2.44 Where the overall effect is greater than “slight adverse” the effect is likely to be considered significant.

5.2.45 A similar approach has been applied for operational phase dust emissions where the source potential has been modified to account for the likelihood of dust emissions.

Limitations

5.2.46 Limitations of the assessment have been taken into account wherever possible. For instance:

- The assessment has been undertaken using standard methods outlined in guidance produced by the EA and the IAQM. Standard assessment criteria, developed by nationally recognised institutions, minimise any uncertainty on the applicability of the approach used.
- Baseline data has been collected from local and national monitoring networks. Where site specific monitoring is not available, worst-case assumptions have been made and if impacts cannot be screened out as negligible irrespective of the baseline concentration, then the choice of baseline concentrations has been considered in greater detail.
- The impact of process emissions from the LSEP has been determined, based on operation at the Emission Limit Values (ELVs). In practice the LSEP will operate below the ELVs and will be offline for periods of maintenance. Therefore, impacts would be even lower.

- The assessment has used five years of meteorological data to ensure inter-annual variability is taken into account and considered the predicted concentrations at the point of maximum impact and receptor locations.
- A range of sensitivities of model inputs have been analysed in line with best practice. Where assumptions have been made, these are conservative yet realistic.

5.3 Baseline

Atmospheric Pollution

5.3.1 A detailed review of baseline atmospheric pollution levels has been undertaken as provided in Appendix 5-1. This has included a review of local and national monitoring networks, and nationally modelling background data.

5.3.2 This analysis has shown that the monitoring of pollutants is limited. In lieu of any local monitoring of other pollutants reference has been made to the DEFRA mapped background dataset and national monitoring networks. This has shown that background concentrations (away from the local road network) are below the AQAL. For other pollutants, not included in the DEFRA mapped background dataset, to determine the baseline concentrations for this assessment reference has been made to national monitoring data and estimates of the local conditions made based on the maximum monitored concentrations for sites in a similar setting to the LSEP site. When considering emissions of nitrogen dioxide and particulate matter road modelling has been undertaken which quantifies the baseline, and future baseline taking into account committed developments as identified in the transport assessment.

Dust and Odour

5.3.3 The LSEP site is located within the existing Lostock Works site. The wider Lostock Works site comprises an area of circa 68 hectares. It is occupied by a number of independent businesses and includes a significant area of waste treatment lagoons. A number of other companies producing chemical and chemical related products are also clustered within the Lostock Works site.

5.3.4 The LSEP site comprises an area of circa 10.3 hectares centred on land at the former Lostock Power Station site. In line with the previous permissions, enabling works are currently being carried out on the LSEP Site which includes demolition of the former power station. Most of this is now complete and construction works for the LSEP have begun.

5.3.5 The baseline dust and odour in the local area is potentially impacted by the other facilities within the Lostock Works site. However, each facility is required to control dust and odour beyond its installation boundary as a requirement of their respective EPs. Therefore, these should not be a source of significant dust or odour in the area. No other potentially significant sources of dust such as mineral extraction sites, or odour, such as wastewater treatment plants or other waste sites, have been identified in the local area. The closest wastewater treatment works is approximately 4km from the LSEP site. Therefore, the baseline dust and odour levels are not expected to be significant.

Sensitive Receptors

Process Emissions - Human Sensitive Receptors

5.3.6 The general approach to the assessment is to evaluate the highest predicted process contribution to ground level concentrations. In addition, the predicted process contribution has been evaluated at a number of sensitive receptor locations. These locations are displayed in Figure 5.3 and listed in the following table.

Table 5.10: Process Emissions Sensitive Receptors

ID	Receptor Name	Location		Distance from Stack (m)
		X (m)	Y (m)	
R1	Works Lane	368206	374535	604
R2	Manchester Road 1	368368	374615	675
R3	Griffiths Road	368622	374676	793
R4	Arthur Street	369111	374754	1,133
R5	Station Road	369195	374655	1,128
R6	Lostock Hollow	369059	374205	783
R7	Birches Lane	369119	374030	803

ID	Receptor Name	Location		Distance from Stack (m)
		X (m)	Y (m)	
R8	Birches Lane 2	369361	373864	1,043
R9	Village Close	369318	373603	1,053
R10	Cookes Lane	369064	373300	982
R11	Britannia Drive	368534	373024	942
R12	Cottage Close	368298	373564	379
R13	St. Johns Close	368125	373535	452
R14	Middlewich Road	367833	373465	682
R15	Birkenhead Street	367471	373707	882
R16	Bowden Drive	367267	373906	1,055
R17	Manchester Road 2	367609	374375	833
R18	Manchester Road 3	368026	374529	657
R19	Rudheath Senior Academy	367967	373347	692
R20	Rudheath Primary Academy	368034	372783	1,194
R21	Lostock Gralam CoE primary school	369205	374818	1,245
R22	Wincham Community Primary School	368630	376327	2,405
R23	Victoria Road Primary	366687	373822	1,638
R24	Witton Church Walk CofE Primary	366340	373743	1,991
R25	Leftwich community Primary school and Couty High School Leftwich	366499	371744	2,855
R26	Victoria Infirmary	365510	373992	2,811
R27	Lostock Lodge Care Home	369801	375133	1,900
R28	Avandale Lodge Car Home	369110	374998	1,318
R29	Daneside Court Care Home	366121	373674	2,216

5.3.7 Reference should also be made to additional roads receptors (provided in Table 2 and Figure 1 of Appendix 5-3) which have been located on the façade of residential properties on the roads used by LSEP vehicles. These roads receptors and the above human receptors are not an exhaustive list of receptors. As such reference has also been made to the distribution of emissions where areas of public exposure may not be captured by the specific receptors listed above.

Process Emissions - Ecological Sensitive Receptors

5.3.8 The Air Emissions Guidance states that the following sites of ecological importance should be considered:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), or Ramsar sites within 10 km of the site (or 15 km for a larger emitters)
- Sites of Special Scientific Interest (SSSIs) within 2 km of the site; and
- National Nature Reserves (NNR), Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs) and ancient woodlands within 2 km of the site.

5.3.9 In accordance with the Scoping Opinion (see Document 7 of the Variation Application), any potential local wildlife sites (pLWS) within 2km have also been considered as ecological receptors. The locations of these sensitive ecological receptors are listed in the following table and displayed in Figure 5.4 and Figure 5.4a. A review of the citation and APIS website for each site has been undertaken to determine if lichens are an important part of the ecosystem's integrity, for the purposes of determining the relevant Critical Level for the habitat.

Table 5.11: Process Emissions – Ecologically Sensitive Receptors

ID	Site	Distance from the stack at the closest point (km)	Lichens identified as present?
European designated sites within 10 km			
E1	Midland Meres and Mosses – Phase 1 Ramsar (also the Mere Mere SSSI and Tatton Meres SSSI)	8.48	Yes
E2	Midland Meres and Mosses – Phase 1 Ramsar (also the Mere Mere SSSI and Tatton Meres SSSI) 2	8.94	Yes
E3	Midland Meres and Mosses – Phase 2 Ramsar (also Oak Mere SAC and West Midlands Mosses SAC)	9.54	Yes
E4	Midland Meres and Mosses – Phase 2 Ramsar (also Oak Mere SAC and West Midlands Mosses SAC) 2	12.58	Yes
E5	Midland Meres and Mosses – Phase 2 Ramsar (also Oak Mere SAC and West Midlands Mosses SAC) 3	12.06	Yes
E6	Rostherne Mere Ramsar	11.34	No
UK designated sites within 2 km			
E7	Witton Lime Beds SSSI	2.01	Yes

ID	Site	Distance from the stack at the closest point (km)	Lichens identified as present?
E*	Plumley Lime Beds SSSI	2.37	Yes
Local sites within 2 km			
E9	Ashton's and Neumann's Flashes	1.46	Yes*
E10	Gadbrok Valley	1.85	Yes*
E11	Griffiths Park	0.29	Yes*
E12	Long Wood	1.77	Yes*
E13	Marston Flashes	1.82	Yes*
E14	Wade Brook	0.46	Yes*
E15	Wincham Brook Valley and Mill Wood	0.76	Yes*
E16	Winnington Wood	2.11	Yes*
E17	River Dane	1.49	Yes*
E18	Marshall's Gorse	1.72	Yes*
E19	Rudheath Lime Beds	0.15	Yes*
E20	Lostock House Orchard	1.98	Yes*
*No information on lichen/bryophytes presence available but their presence have been presumed as a conservative measure			

5.3.10 Reference should be made to Appendix 5-2 for full details of the discrete receptor points used to assess the impact on these ecological sites, the habitats present at each site and the habitat-specific Critical Loads.

Dust and Odour Sensitive Receptors

5.3.11 The following table outlines the dust and odour sensitive receptors identified for the purpose of this assessment, including their relative sensitivities to dust and odour effects. These are displayed on Figure 5.1. The distances to site boundary are measured to the main section of the LSEP site boundary, rather including the triangular area to the north. This is considered the most appropriate approach as there are currently no plans to develop the northern triangle or undertake any activities on the land within it. The triangle was originally included in the 2010 / 2011 LSEP application with the intention to use it for ash storage, however, as the project has progressed, alternative arrangements have been made for ash storage elsewhere within the site boundary. Accordingly, there will be no dust generating activities on the triangular area of land and so can be discounted.

Table 5.12: Dust and Odour Sensitive Receptors

ID	Receptor name	Sensitivity	Location		Distance from Site boundary* (m)	Distance from tipping hall (m)
			X (m)	Y (m)		
OR1	Builders Merchants	Medium	368453	374579	412	475
OR2	Griffiths Road	Medium	368605	374485	354	422
OR3	Sports and Social Club	Medium	368283	374503	331	388
OR4	Manchester Road Residential	High	368304	374592	421	475
OR5	Cottage Close	High	368297	373562	209	535
OR6	St Johns Close	High	368074	373574	226	581
OR7	Canal footpath 1	Low	368465	374396	231	300
OR8	Canal footpath 2	Low	368442	374100	0	72
OR9	Canal footpath 3	Low	368359	373891	0	718
OR10	Griffiths Park Footpath 1	Low	368140	373741	47	402
OR11	Griffiths Park Footpath 2	Low	367819	373906	90	529
OR12	Birkenhead Street	High	367468	373703	494	948
OR13	Manchester Road 1	Low	367566	374347	455	790
OR14	Manchester Road 2	Low	367862	374453	415	570
Note: *measured to the southern main section of site boundary.						

5.3.12 The above is not an exhaustive list of sensitive receptors in the local area but those chosen to represent the closest likely areas of exposure in each wind direction. The identification of receptors has been limited to an area of 500 m from the LSEP Site boundary.

5.3.13 In addition to the receptors listed above there are also two ecological receptors within 50m of the LSEP site boundary; Griffiths Park, a local wildlife site, and Rudheath Lime Beds, a potential local wildlife site. In line with the IAQM ‘Guidance on the assessment of dust from demolition and construction’ (2014), these ecological sites have been considered with reference to dust impacts from operational phase activities on site.

5.4 Assessment of Effects

Incorporated Mitigation

5.4.1 The LSEP will require a variation to the current EP in order to operate with the proposed increased throughput. The EP will include a list of conditions including limits on emissions to air known as ELVs. For the purpose of this assessment, it has been assumed that the LSEP complies with the requirements of the EP.

5.4.2 All deliveries of waste will be in enclosed vehicles as such the potential for fugitive releases of dust and odour from vehicles will be minimal. Once at the LSEP all operations will be conducted within enclosed buildings, and vehicles would deposit waste into an enclosed tipping hall. The tipping hall will be held under negative pressure, with the air being used in the combustion process. This prevents the release of odours and dust from the building when the doors are opened for short periods for deliveries. Residual waste will be stored within a waste bunker, albeit this would be within the enclosed waste tipping hall and waste would not be stored for prolonged periods helping to minimise the conditions which can lead to the generation of malodours. There will be no waste stored outside the buildings. Any odours from the waste stored within the bunker will be drawn into the combustion process by the induced draft fan, where the odorous compounds will be destroyed as a result of the high temperatures within the furnace. Therefore, there will be no release of odour from the stack emissions.

5.4.3 In the event of a planned shut-down / closure, the incoming waste would be managed such that residual waste in the waste bunker would be processed prior to shut-down and the amount of residual waste remaining in the waste bunker would be minimal. In addition, the LSEP is designed with two lines which will allow waste to be processed in either line reducing the potential for residual waste not to be able to be processed and air can be extracted for use in either combustion line. It should be noted that as part of the EP needed for the LSEP to operate with the increased throughput, all emissions, including fugitive dust and odour, would be controlled to ensure there is no impact beyond the installation boundary.

Operational Phase

5.4.4 Potential air quality impacts during the operational phase have been identified as:

- Generation of emissions from the combustion of waste emitted to atmosphere via the main stack and operational phase road vehicles; and
- Generation of dust and odour from operational phase activities on the LSEP site.

Operational Phase Process Emissions

5.4.5 Full details of the modelling methodology for the emissions from the main stack of the LSEP can be found in Appendix 5-2, and road traffic emissions can be found in Appendix 5-3. This includes input parameters, assumptions, sensitivity analysis, and results.

5.4.6 It should be noted that the first stage of the assessment is considered highly conservative as it assumes that:

- The LSEP operates at the ELVs for the entire year;
- The worst-case weather conditions over five years occur;
- The worst-case conversion of NOx to NO_2 has been applied;
- The entire dust emissions are assumed to consist of either PM_{10} or $PM_{2.5}$;
- The entire Volatile Organic Compound (VOC) emissions are assumed to consist of either benzene or 1,3-buitadiene; and
- Cadmium is released at the combined ELV for cadmium and thallium.

5.4.7 When considering the impact of road vehicle emissions at the first stage of the assessment it assumes:

- Background concentrations do not reduce in line with projections;
- The fleet mix[1] does not change from the 2018 fleet mix – i.e. no uptake of cleaner vehicles;
- The vehicles associated with the operation of the LSEP have the same mix as the UK fleet for 2018;
- The total impact of vehicles associated with the operation of the LSEP with the increased throughput (i.e. not just the impact of the Proposal), has been considered, in line with IAQM guidance.

[1] *The 'fleet mix' in this context describes all vehicles on the road, and accounts for a range of vehicle emission standards of LDVs and HGVs.*

5.4.8 The following tables (5.13 and 5.14) provide a summary of process emissions at the point of maximum impact, when LSEP is operating at the daily and short-term ELVs. The point of maximum impact is the location where the modelling predicts the highest air quality impacts to be. The table includes the modelled results of the LESP operating with the Proposal and that without (i.e. as currently consented).

Table 5.13: Summary of Dispersion Modelling Results – Point of Maximum Impact – Daily ELVs

Pollutant	Quantity	Units	AQAL	Background	Impact of LSEP with the Proposal				Impact of LSEP as currently consented	
					PC	PC as % of AQAL	PEC	PEC as % of AQAL	PC	PC as a % of AQAL
Nitrogen dioxide	Annual mean	µg/m³	40	17.05	0.53	1.31%	17.58	43.94%	0.61	1.52%
	99.79th%ile of hourly means	µg/m³	200	34.10	7.89	3.95%	41.99	21.00%	10.61	5.30%
Sulphur dioxide	99.18th%ile of daily means	µg/m³	125	29.40	1.93	1.54%	31.33	25.06%	2.59	2.07%
	99.73rd%ile of hourly means	µg/m³	350	29.40	4.88	1.40%	34.28	9.80%	7.46	2.13%
	99.9th%ile of 15 min. means	µg/m³	266	29.40	5.83	2.19%	35.23	13.24%	8.75	3.29%
PM_{10}	Annual mean	µg/m³	40	12.98	0.02	0.05%	13.00	32.50%	0.04	0.11%
	90.41th%ile of daily means	µg/m³	50	25.96	0.08	0.17%	26.04	52.09%	0.18	0.36%
$PM_{2.5}$	Annual mean	µg/m³	25	8.79	0.02	0.10%	8.81	44.05%	0.04	0.22%
Carbon monoxide	8 hour running mean	µg/m³	10,000	690.00	8.61	0.09%	698.61	6.99%	9.19	0.09%
	Hourly mean	µg/m³	30,000	690.00	10.36	0.03%	700.36	2.33%	10.86	0.04%
Hydrogen chloride	Hourly mean	µg/m³	750	1.42	0.03	0.00%	1.45	0.19%	2.17	0.29%
	Annual mean	µg/m³	16	2.35	<0.01	0.03%	2.35	14.71%	0.00	0.03%

Pollutant	Quantity	Units	AQAL	Background	Impact of LSEP with the Proposal				Impact of LSEP as currently consented	
					PC	PC as % of AQAL	PEC	PEC as % of AQAL	PC	PC as a % of AQAL
Hydrogen fluoride	Hourly mean	µg/m³	160	4.70	0.21	0.13%	4.91	3.07%	0.22	0.14%
Ammonia	Annual mean	µg/m³	180	4.23	0.04	0.02%	4.27	2.37%	0.04	0.02%
	Hourly mean	µg/m³	2,500	8.46	2.07	0.08%	10.53	0.42%	2.17	0.09%
VOCs (as benzene))	Annual mean	µg/m³	5	0.56	0.04	0.84%	0.60	12.04%	0.04	0.87%
	Hourly mean	µg/m³	195	1.12	2.07	1.06%	3.19	1.64%	2.17	1.11%
VOCs (as 1,3-butadiene)	Annual mean	µg/m³	2.25	0.25	0.04	1.86%	0.29	12.97%	0.04	1.93%
Mercury	Annual mean	ng/m³	250	0.57	0.08	0.03%	2.88	1.15%	0.22	0.09%
	Hourly mean	ng/m³	7500	1.14	4.15	0.06%	9.75	0.13%	10.86	0.14%
Cadmium	Annual mean	ng/m³	5	-	0.08	1.67%	0.65	13.07%	0.22	4.34%
	Hourly mean	ng/m³	-		4.15	-	5.29	-	10.86	-
PAHs	Annual mean	pg/m³	250	0.98	0.84	0.33%	1.82	0.73%	0.87	0.35%
Dioxins	Annual mean	fg/m³	-	32.99	0.33	-	33.32	-	0.43	-
PCBs	Annual mean	ng/m³	200	128.93	0.02	0.01%	128.95	64.48%	0.02	0.01%

Pollutant	Quantity	Units	AQAL	Background	Impact of LSEP with the Proposal				Impact of LSEP as currently consented	
					PC	PC as % of AQAL	PEC	PEC as % of AQAL	PC	PC as a % of AQAL
	Hourly mean	ng/m³	6000	257.86	1.04	0.02%	258.90	4.31%	1.09	0.02%

Table 5.14: Summary of Dispersion Modelling Results – Point of Maximum Impact – Short-term ELVs

Pollutant	Quantity	Units	AQAL	Background	Impact of LSEP with the Proposal				Impact of LSEP as currently consented	
					PC	PC as % of AQAL	PEC	PEC as % of AQAL	PC	PC as % of AQAL
Nitrogen dioxide	99.79th%ile of hourly means	µg/m³	200	34.10	17.54	8.77%	51.64	25.82%	21.22	10.61%
Sulphur dioxide	99.73rd%ile of hourly means	µg/m³	350	29.40	24.42	6.98%	53.82	15.38%	29.83	8.52%
	99.9th%ile of 15 min. means	µg/m³	266	29.40	29.15	10.96%	58.55	22.01%	35.00	13.16%
Carbon monoxide	8 hour running mean	µg/m³	10,000	690.00	17.22	0.17%	707.22	7.07%	18.38	0.18%
	Hourly mean	µg/m³	30,000	690.00	20.73	0.07%	710.73	2.37%	21.72	0.07%
Hydrogen chloride	Hourly mean	µg/m³	750	1.42	12.44	1.66%	13.86	1.85%	13.03	1.74%
Hydrogen fluoride	Hourly mean	µg/m³	160	4.70	0.83	0.52%	5.53	3.46%	0.87	0.54%
VOCs (as benzene)	Hourly mean	µg/m³	195	1.12	4.15	2.13%	5.27	2.70%	4.34	2.23%
Mercury	Hourly mean	ng/m³	7500	5.60	4.15	0.06%	9.75	0.13%	-	-

5.4.9 The comparison between the LSEP with the Proposal, and that for the LSEP as currently consented (based on the inputs from the May 2011 ES), show that the impacts for the LSEP with the Proposal are predicted to be lower, despite the increase in tonnage. This is because of other changes which have taken place between the model for LSEP with the Proposal and the model for LSEP without the Proposal.

5.4.10 The model inputs for the LSEP with the Proposal have been provided by the technology provider based on an understanding of how the plant would operate. They show that the stack volumetric flow rate is lower than that used within the May 2011 ES. It is assumed that the inputs used in the May 2011 ES were based on conservative assumptions, in lieu of accurate data from the technology provider. A lower volumetric flow rate means that less pollutant is emitted per second from the stack, causing lower impacts. There have also been some reductions to the ELVs, for example the ELV for particulate matter has reduced by half from that assessed in the May 2011 ES, also causing lower impacts. In addition, the exit velocity value provided by the technology provider is higher than that assumed in the May 2011 ES, resulting in better buoyancy and better dispersion, and consequently reduced impacts. Therefore, despite the increase in annual throughput of waste, the air quality impacts of the LSEP with the Proposal are lower than the currently consented scheme.

5.4.11 From this point on, the total impact of the LSEP scheme (i.e. with the Proposal) has been discussed to demonstrate that the operation of the LSEP with the proposed increase in waste tonnage throughput will not have a significant impact on air quality. This takes into account changes to the baseline, assessment methodology, legislation and modelling since the May 2011 ES was carried out. As previously stated earlier in the Chapter, where ‘the LSEP’ or ‘LSEP scheme’ is mentioned, this refers to the LSEP scheme with the Proposal.

5.4.12 As shown, at the point of maximum impact the contribution from the LSEP when assumed operation at the daily ELVs is less than 10% of the short term AQAL and less than 0.5% of the annual mean AQAL and can be screened out as negligible irrespective of the total concentration in accordance with the stated assessment methodology, with the exception for the following:

- Annual mean nitrogen dioxide impacts;
- Annual mean VOC impacts; and

- Annual mean cadmium impacts.

5.4.13 At the point of maximum impact all of the PCs are less than 10% of the short-term AQAL when operating at the half-hourly ELVs and can be screened out as 'negligible' irrespective of the total concentration in accordance with the IAQM 2017 guidance, with the exception of 15-minute sulphur dioxide impacts.

5.4.14 For the listed pollutants above, further analysis has been undertaken to define the magnitude of change. This includes assessment of the spatial impact of pollutants, taking into account the extent of relevant exposure, and the impact at the identified receptors. For annual mean impacts, assessment has taken into consideration the likely future background concentrations. For those pollutants released from road vehicles and the process (namely nitrogen dioxide and particulate matter) further consideration has been made to the in combination impact of process and road vehicles emissions.

Annual mean nitrogen dioxide impacts

5.4.15 Oxides of nitrogen would be released from both the process and road traffic and are converted to nitrogen dioxide during complex atmospheric chemistry involving the ozone and sunlight. When considering the impact of emissions from the LSEP, consideration is needed of the contribution from the process and road traffic and the conversion from oxides of nitrogen to nitrogen dioxide.

5.4.16 As shown in Table 5.13, the annual mean nitrogen dioxide contribution from process emissions at the point of maximum impact is 1.13% of the AQAL. Figure 7 of Appendix 5-2 shows the spatial distribution of annual mean nitrogen dioxide impacts from the process as a percentage of the annual mean AQAL. As shown, the point of maximum impact occurs in fields to the north of Manchester Road approximately 220m from any road and 440m from a road used by LSEP vehicles (i.e. not in an area of residential properties). As such there would be limited contribution from road traffic associated with LSEP and baseline concentrations in the area where the point of maximum impact occurs are likely to be similar to the mapped background concentration (i.e 17.05 µg/m^3). Applying this baseline concentration, the PEC at the point of maximum impact would be 43.94% of the AQAL. Therefore, using IAQM guidance the magnitude of change is described as negligible as the process contribution is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL.

5.4.17 Reference has been made to the contour plot of process emissions as shown in Figure 7 of Appendix 5-2. As shown, there are some identified receptors (and other properties not specifically identified) at which the impact of process emissions is above 0.5% of the AQAL, and therefore the impact of process emissions cannot be screened out as negligible irrespective of the baseline concentrations. Therefore, additional consideration has been made of the baseline concentration and contribution from road vehicles from the LSEP where these receptors are close to the road.

5.4.18 The area where the impact of process emissions is greater than 0.5% of the AQAL to the south-west of the LSEP site includes a number of residential properties. No vehicles associated with the LSEP will travel along the section of the B5082 to the north of this area. As such, in this area the total impact of process emissions represents the total impact of the LSEP. In this area, away from the road, the baseline concentration is likely to be similar to the mapped background. For the impact to be considered ‘slight adverse’ in this area the baseline concentration would need to be over 29.00µg/m^3, about 70% greater than the mapped background value of 17.05µg/m^3. It is not expected for the baseline values to be this much increased in this area even close to the road, so the magnitude of change would be described as negligible.

5.4.19 The second area where the impact of process emissions is greater than 0.5% of the AQAL covers a much larger area to the north-east of the LSEP site which includes a number of residential properties and trunk roads which vehicles associated with the LSEP will travel along. The DMRB considers receptors within 200m of a road to be potentially impacted by emissions from road traffic and concentrations drop of quickly with distance from the road. As such, for those areas more than 200m from a road the baseline concentration is likely to be similar to the mapped background and the impact of the LSEP dominated by the contribution from process emissions. Applying the mapped background concentration away from roads the magnitude of change would be described as negligible as the impact from the LSEP (process and road) would be 1% of the AQAL and the PEC would be well below 75% of the AQAL. Closer to the roads, consideration of the in combination impact between process and road vehicle emissions is needed. As such, detailed modelling of road vehicle exhaust emissions has been undertaken. The detailed results can be found in Appendix 5-3.

5.4.20 Receptors have been chosen as a selection of residential properties including those closest to the roads. As shown, the greatest impacts are predicted to occur along Broken Cross King Street (the A530). This is as expected as this is the route vehicles from the LSEP take to reach the A556 before dispersing on the wider road network. At all receptors the total magnitude of change of process and road vehicles emissions can be described as negligible with the exception of at RR28 and RR30 where the magnitude of change is described as ‘slight adverse’. At RR28 and RR30 the magnitude of change is described as ‘slight adverse’ as the contribution from the LSEP is predicted to be approximately 5% and the total PEC approximately 80% of the AQAL. This is based on the worst-case scenario that the vehicles fleet does not change from that in 2018 (i.e. no change over with cleaner vehicles). If it assumed that the vehicle fleet changes in line with projections, the magnitude of change associated with the total contribution from process and road vehicles would be described as ‘negligible’.

Annual mean VOCs impacts

5.4.21 The LSEP EP (to be varied) will include a limit on total organic compounds (TOCs) these consist of a range of volatile organic compounds (VOCs) of which AQALs have been set for benzene and 1,3-butadiene. VOCs are not included in the vehicle emission factors from DEFRA and as such are not considered to be a significant source. Therefore, the impact of VOCs from the LSEP is based on the impact of process emissions only.

5.4.22 If it is assumed that the entire TOC emissions consist only of benzene, the process contribution from the LSEP at point of maximum impact is 0.84% of the AQAL. The detailed receptor results (Table 34 in Appendix 5-2) shows that the maximum impact at a receptor is 0.72% of the AQAL. When the baseline concentration of 0.56µg/m^3 is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as ‘negligible’. Figure 8a of Appendix 5-2 shows the spatial distribution of emissions. As shown, there is an extended area to the north east within which the impact is greater than 0.5% of the AQAL, which contains residential receptors. However, as above, consideration of the PC and PEC concludes the magnitude of change to be negligible. Furthermore, this is extremely conservative as it assumes that the TOC emissions consist of only benzene.

5.4.23 If it is assumed that the entire TOC emissions consist of only 1,3-butadiene, the process contribution from the LSEP at the point of maximum impact is 1.86% of the AQAL. The detailed receptor results (Table 35 in Appendix 5-2) shows that the maximum impact at a receptor is 1.60% of the AQAL. When the baseline concentration of 0.25µg/m³ is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as ‘negligible’, as the maximum impact is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL. Figure 8b of Appendix 5-2 shows the spatial distribution of emissions. As shown, there is an extended area to the north east within which the impact is greater than 0.5% of the AQAL, and two smaller areas to the east and north which exceed 1.5% of the AQAL. However, as above, consideration of the PC and PEC concludes the magnitude of change to be ‘negligible’. Furthermore, this is extremely conservative as it assumes that the TOC emissions consist of only 1,3-butadiene.

Annual mean cadmium impacts

5.4.24 The LSEP EP will include a combined limit for cadmium and thallium for which an AQAL has been set for cadmium. Cadmium is not included in the vehicle emission factors from DEFRA and as such are not considered to be a significant source. Therefore, the impact of cadmium from the LSEP is based on the impact of process emissions only.

5.4.25 If it is assumed that the entire cadmium and thallium emissions consist only of cadmium the annual mean cadmium process contribution at the point of maximum impact is 1.67% of the AQAL. The detailed receptor results (Table 36 of Appendix 5-2) shows that the maximum impact at a receptor is 1.44% of the AQAL. When the baseline concentration of 0.57 ng/m³ is included, the PEC at the point of maximum impact and at all receptor locations is well below 75% of the AQAL. Therefore, the magnitude of change is described as ‘negligible’, as the maximum impact is less than 5.5% of the AQAL and the PEC is less than 75% of the AQAL. This is extremely conservative as it assumes that the entire cadmium and thallium emissions consist of only cadmium. As detailed in Appendix 5-2 monitoring from facilities processing a similar fuel to LSEP has indicated that average recorded concentration of cadmium and thallium is 8% of the limit. Figure 9 of Appendix 5-2 shows the spatial distribution of emissions for the following scenarios:

- Screening - assumes emissions of cadmium at 100% of the ELV for cadmium and thallium
- Worst-case - assumes emissions of cadmium at 50% of the ELV for cadmium and thallium
- Typical - assumes emissions of cadmium at 8% of the ELV for cadmium and thallium.

5.4.26 As shown, when it is assumed that the emissions of cadmium from the LSEP would be similar to a typical facility, the maximum impact is less than 0.5% of the AQAL and considered negligible irrespective of background conditions. Assuming the worst-case scenario that the entire cadmium and thallium emissions consist of only cadmium there is an extended area to the north east where impacts are higher than 0.5% of the AQAL, in which there are some receptors. However, as stated above, when the baseline conditions are considered, the magnitude of change is ‘negligible’ at all areas.

Annual mean particulate matter impacts

5.4.27 The LSEP EP (to be varied) will include a limit on total dust and have a monitoring system to detect all sizes of particles. In order to achieve the emission limit, bag filters will be used. Bag filters are highly effective at removing all sizes of particles and work via two methods:

- Absolute filtration - particles larger than the holes in the filter obviously cannot pass;
- Adsorption - a layer of particles called "filter cake" builds up on the surface of the filter material which consists of reagents (lime and activated carbon) and reaction products. This layer is essential to the proper functioning of the flue gas treatment system. Within this layer, the final acid gas neutralisation and the absorption of heavy metals and complex organic compounds takes place.

5.4.28 It is the second principle which accounts for the capture of the smaller particles which are adsorbed onto the surface of the particles in the filter cake. The smaller the particle, the greater the probability that it will be adsorbed onto another particle.

Studies have shown that the effectiveness of bag filters installed on a similar plant to the LSEP:

- The abatement of total particulates was between 99.987% and 99.997%;
- The abatement of $PM_{2.5}$ was between 99.971 and 99.991% and;
- The abatement of PM_1s was between 99.864% and 99.991%.

5.4.29 This shows that bag filters are very effective at removing particulate matter including $PM_{2.5}$s and PM_1s.

As detailed in Appendix 5-2, the WHO has set guideline values for particulate matter which are more stringent than those in the AQS. For completeness, the results of particulate matter at the point of maximum impact, as compared to the WHO guidelines have been displayed within Table 21 of Appendix 5-2. Results show that even with these lower AQALs, the impact of process emissions from the LSEP are still well within the 0.5% and 10% screening criteria and are considered negligible irrespective of baseline conditions.

5.4.30 Although the contribution of particulate matter from process emissions at the point of maximum impact is well below 0.5% of the AQAL and WHO guideline value and can be screened out as negligible irrespective of baseline levels, road vehicles are also a source of particulate emissions and as such there is the potential for in-combination impacts. However, as with nitrogen dioxide impacts the at the point of maximum impact there will be limited contribution from road vehicles as it is distanced from any major road.

5.4.31 The results of this assessment for annual mean particulate matter are presented in Table 9 (PM_{10}) and Table 10 ($PM_{2.5}$) of Appendix 5-3. As shown, even when including emissions from vehicles associated with the operation of the LSEP, the impact remains below 0.5% of the AQAL set in the AQS and the magnitude of change is described as negligible irrespective of baseline concentrations for all but six sensitive receptor locations. At these locations, when the baseline is considered, the PEC is well below 75% and the magnitude of change is still considered as negligible at all receptors.

5.4.32 At the maximum impacted receptor (RR28) the annual mean PM_{10} impact from process emissions and road vehicles is predicted to be 0.28µg/m^3 and the total concentration is predicted to be 14.71µg/m^3. When considering the WHO guideline values the magnitude of change would be described as negligible as the process contribution is 1% and the PEC is below 75% of the guideline value.

5.4.33 At the maximum impacted receptor (RR28) the annual mean $PM_{2.5}$ impact from process emissions and road vehicles is predicted to be 0.17µg/m^3 and the total concentration is predicted to be 9.36µg/m^3. When considering the WHO guideline values the magnitude of change would be described as slight as the process contribution is 1% and the PEC is between 76 and 94% of the guideline value. This would only occur for receptors which are close to the A530. However, this assumes that there is no change in the vehicle fleet composition from 2018 levels, background concentrations do not reduce in line with projections, and the entire dust emissions from the main stack consist of only $PM_{2.5}$s. This is highly conservative and it is likely that impacts would be lower.

Short Term Impacts

5.4.34 The impact of 99.9th%ile of 15-minute means of sulphur dioxide, if it assumed that the plant operates at the half-hourly ELV, is predicted to be 10.96% the AQAL at the point of maximum impact. This is based on the assumption that both lines are operating at the half hourly ELVs at the same time, during the worst case weather conditions. This scenario is extremely unlikely. If just one line is operating at the half hourly ELVs, and the other at the daily ELV, the results at the point of maximum impact are reduced to 3.06% of the AQAL, which is below 10% of the AQAL and can be described as 'negligible'.

Heavy metals impacts

5.4.35 The EA's metals screening guidance has been followed as detailed in Appendix 5-2. This has shown that if it is assumed that the LSEP will perform no worse than a currently permitted facility, the predicted process contribution is below 1% of the annual mean AQAL and 10% of the 1-hour AQAL for all metals, with the exception of annual mean arsenic and nickel impacts. However, the PECs for arsenic and nickel are well below 100% of the AQAL and so the impacts can be screened out from further assessment. Applying the IAQM (2017) criteria the magnitude of change would be described as negligible as the process contribution would be less than 5% and the PEC less than 75% of the AQAL for all pollutants.

Dioxins and dioxin-like PCBs

5.4.36 A human health risk assessment has been undertaken (see Appendix 5-4). This considers the impact of dioxins and dioxins-like PCBs which have the potential to accumulate in the food chain. This has shown that the impact of the LSEP on human health due to the accumulation of dioxins and dioxins-like PCBs in the environment is negligible.

Summary of Emissions Impacts on Human Health

5.4.37 The assessment of process emissions has drawn the following conclusions:

- The magnitude of change in process emissions for most pollutants can be described as negligible irrespective of baseline concentration at the point of maximum impact. However, further analysis has been needed for annual mean impacts of nitrogen dioxide, VOCs and cadmium, and short-term sulphur dioxide impacts. Additional consideration is also needed of nitrogen and particulate matter as road vehicles are also a source of these pollutants.
- When considering annual mean nitrogen dioxide impacts consideration has been made to the in-combination impact of process and road traffic emissions. When the baseline concentrations are taken into account the magnitude of change of annual mean concentrations is negligible at all areas of relevant exposure for the stack emissions. When considering the in-combination impact of process and road traffic emissions, there are two roads receptors which have a ‘slight adverse’ magnitude of change for nitrogen dioxide. These are located close to the A530 which is the main route for vehicles access the A556 before dispersing on the wider road network.
- When considering annual mean TOCs and cadmium impacts, consideration has focussed on the process emissions as road vehicles are not considered to be a significant source of these emissions. When baseline concentrations of these pollutants are taken into account, the magnitude of change of annual mean concentrations is described as negligible at all areas of relevant exposure.
- Further analysis of the short-term sulphur dioxide impacts concludes that there is little risk that impacts would be greater than 10% of the AQAL and therefore the magnitude of change is negligible.

- When considering annual mean particulate matter impacts, consideration has been made to the in-combination impact of process and road traffic emissions. This has shown that there the magnitude of change is described as 'negligible' at all receptors. Consideration has also been made of the WHO guideline values for PM_{10} and $PM_{2.5}$ noting that these have not been set in UK legislation. This has shown that at the maximum impacted receptor the magnitude of change would be described as negligible for PM10 but slight adverse for PM2.5. However, this would only occur for a few receptors close to the A530.
- The magnitude of change for all metals emissions can be described as negligible.
- Dioxins and dioxins-like-PCBs which can accumulate in the environment would have a negligible impact on human health.

5.4.38 Using professional judgement, based on the conservatism in the process emissions modelling assumptions, the overall process emissions associated with the operation of the LSEP are predicted to have a 'negligible' and 'not significant' effect on human health. Noting that the impact of the LSEP with the increased throughput has a lower impact than predicted using the same model inputs as set out in the May 2011 ES.

Impact of Process and Vehicle Emissions on Ecology

5.4.39 Full detailed results tables are provided in Appendix 5-2 showing the impact of process emissions at the identified ecological sites.

5.4.40 At all European designated sites, the PC is less than 1% of the Critical Level and can be screened out as 'insignificant' for all pollutants considered.

5.4.41 For the UK designated sites, the PC is less than 1% of the Critical Level and can be screened out as 'insignificant' for all pollutants considered, with the exception of annual mean oxides of nitrogen and annual mean ammonia at Plumley Lime Beds. Further analysis has shown that when the baseline concentrations are considered, the PEC for annual mean oxides of nitrogen is well below 70% and is the impact can be considered negligible. For annual mean ammonia impacts, due to high background levels of 4.24ug/m^3, this is not the case. For both impact of oxides of nitrogen dioxide and ammonia, the predicted impact for the LSEP with the Proposal is less than those predicted using the model inputs in the May 2011 ES. The significance of these results is investigated further within Appendix 5-5.

5.4.42 For locally designated sites, the screening criteria is exceeded for multiple pollutants at multiple sites. Further assessment has shown that when using the higher Critical Level of 200µg/m³ for daily mean nitrogen dioxide, the impact can be screened out at all sites. Further assessment has shown that that when the baseline concentrations are considered, the PECs for oxides of nitrogen and sulphur dioxide impacts are all below 70% and are described as negligible.

5.4.43 For annual mean ammonia impacts, due to high background levels, this is not the case, and even when considering interannual variability and plant availability, ammonia impacts are above 1% of the lower Critical Level (for lichens and bryophytes habitats) at multiple local sites. As the presence of lichens has been conservatively assumed at these sites, the results have also been presented using the higher Critical Load of 3, for non lichen habitats. These results have been compared to the predicted impacts using the model input set out in the May 2011 ES. This shows that the predicted impacts of the LSEP with the Proposal are less than those using the model inputs set out in the May 2011 ES. The spatial distribution of impacts to ecological sites are shown in Figures 10 to 14 of Appendix 5-2 and the significance of these results is investigated further within Appendix 5-5.

5.4.44 For deposition impacts, at all European designated sites, the PC is less than 1% of the Critical Load and can be screened out as 'insignificant'.

5.4.45 For UK designated sites, the PC is less than 1% of the Critical Load and can be screened out as 'insignificant', excluding for nitrogen deposition and acid deposition for Broadleaved woodlands at Plumley Lime Beds SSSI.

5.4.46 For the local sites, there are multiple sites at which the screening criteria is exceeded, for both nitrogen and acid deposition.

5.4.47 As for other pollutants, the results are lower for the LSEP with the Proposal than they are using the model inputs used for the May 2011 ES. The spatial distribution of deposition impacts are displayed in Figures 15 to 18 of Appendix 5-2 and the significance of these results on ecological receptors is addressed further within Appendix 5-5.

5.4.48 The impact of vehicle emissions on ecological sites has been assessed for those sites within 200m of the routes used by vehicles associated with the operation of the LSEP in line with the DMRB. This includes;

- Wade Brook LWS;
- Long Wood LWS;
- Rudheath Lime Beds pLWS; and
- Winnington Wood LWS and ancient woodland.

5.4.49 The detailed results for each ecological site are provided in Appendix 5-3. Results assess the contribution of stack impacts and vehicle impacts at the ecological site and assess the drop of in impact with distance from the road. These results are drawn upon and their significance assessed within Appendix 5-5.

Plume Visibility

5.4.50 The plume visibility modelling can be used to predict the number of visible plumes grounding. This has shown that a visible plume is not predicted to ground under any meteorological condition. This is due to the relatively high temperature of the release ensuring the plume remains buoyant and disperses effectively in the atmosphere.

Operational Phase Dust and Odour Emissions

5.4.51 The IAQM (2018) guidance sets out a methodology for estimation of the effect of odour on a receptor, taking into account the risk of odour exposure (which is a function of the source odour potential and pathway effectiveness) and receptor sensitivity.

5.4.52 The potential for dust and odour during operation of the LSEP is primarily from the delivery of waste into the bunker and the mixing of waste within the bunker. There are also potential dust emissions from other aspects of the process including incinerator bottom ash collection, chemical and reagent delivery and offloading, and HGVs delivering waste to the LSEP.

5.4.53 The closest area of transient exposure to the LSEP site boundary is along the footpath adjacent to the Trent and Mersey Canal. This is also the closest area of transient exposure to the tipping hall where any potential odour would originate. Two receptors at the canal bridges and one at the closest point to the tipping hall have been included in the odour and dust assessment. However, they are areas of transient exposure where members of the public would not be expected to be present for more than an hour. The closest residential or workplace receptor to the site boundary is at Cottage Close (OR5), at 209m, and the closest residential or workplace receptor to the tipping hall is the Sport and Social Club (OR3) at 388m.

5.4.54 The waste within the storage bunker of the LSEP is likely to include putrescible wastes which would be considered to have an unpleasant odour. In accordance with the IAQM (2018) guidance this could warrant a descriptor of 'medium' or 'large' odour source potential. However, it has been deemed that the odour source potential is 'small' as:

- The waste would be contained within a building kept at negative pressure (i.e. where air is constantly being drawn in). It is considered that the surface area criteria in the IAQM (2018) guidance is relevant for open air sources such as landfill and sewerage works rather than enclosed processes such as at the LSEP.
- Not all the waste will be putrescible and unpleasant. The waste will be a complex mixture of wastes from domestic municipal solid waste (MSW), and Commercial and Industrial Wastes (C&I). It is reasonable to assume that the more odorous materials found within these wastes will be of a similar in make-up to household organic waste and would be considered to be unpleasant, but this will not make up the entire composition of waste and would be mixed with less / non odorous wastes.
- Effective tangible mitigation measures would be in place which represent BAT for the sector, as detailed in the incorporated mitigation section. These are a mixture of management techniques, design measures, and technology solutions. These measures will ensure that odour levels are controlled and ensure little residual odour from the abatement system or from fugitive sources.

5.4.55 The risk of odour from the proposed processes at distances greater than 500m from the source is minimal as odour would dissipate with distance from the source. If odours were to be released from the LSEP these would originate from the tipping hall. Under calm conditions odour would remain close to this area whereas during turbulent conditions odour would be moved away from the area and dissipate.

5.4.56 The wind roses from Manchester for 2016 to 2020 (Figure 6 of Appendix 5-2) have been reviewed. There is a distinct peak in frequency of winds from the south, west and southwest, with a minor secondary peak in winds from the north-east. Winds from other directions occur with a relatively uniform low frequency. When considering wind direction, receptors located downwind of the peak in wind direction frequency (to the north, east and north-east) have the most effective odour pathway. Receptors not located downwind of the peak wind direction have an ineffective pathway.

5.4.57 All identified receptors are over 300m from the tipping hall, as shown on Figure 5.1, excluding OR8, which is 72m to the north east of the LSEP.

5.4.58 The effectiveness of the pathway from the source to each receptor has been considered using the criteria in Table 5.6.

- OR1 to OR4 and OR7 are located over 300m from the source of odour (the Tipping Hall). They are down-wind of the peak in wind directions, but are at a far enough distance that odour would have dissipated by this point. There will also be some screening provided by the buildings within the wider Lostock site. Therefore, the pathway effectiveness to OR1 to OR4 and OR7 is considered to be 'ineffective'.
- OR8 is located adjacent to the site boundary and is 70m from the potential source of odour (the tipping hall), in the direction of frequent wind. Although mitigation measures should control odour, because of its closer proximity, the pathway effectiveness to OR13 is 'highly effective'.
- OR5, OR6, OR9 and OR10 are over 200m from the source of odour (the tipping hall) and winds do not frequently blow in this direction. There will also be some screening provided by the LSEP building. Therefore, the pathway effectiveness to OR5, OR6, OR9 and OR10 is considered to be 'ineffective'.
- OR11 to OR12 are located over 500m from the source of odour (the tipping hall). They are down-wind of the secondary peak in wind directions, but the receptors are at a far enough distance that odour would have dissipated by this point. Therefore, the pathway effectiveness to OR11 to OR12 is considered to be 'ineffective'
- OR13 and OR14 are located over 500m from the source of odour (the tipping hall) and winds do not frequently blow in this direction. Therefore, the pathway effectiveness to OR13 and OR14 is considered to be 'ineffective'

5.4.59 Using the criteria in Table 5.8 and Table 5.9, the likely magnitude of odour effects at the receptors considered has been determined as detailed in the following table based on a 'small' odour source potential.

Table 5.15: Likely Magnitude of Odour Effects at Receptors

Receptor		Pathway effectiveness	Risk of odour exposure	Likely magnitude of effect
OR1	Builders Merchants	Ineffective	Negligible Risk	Negligible
OR2	Griffiths Road	Ineffective	Negligible Risk	Negligible
OR3	Sports and social club	Ineffective	Negligible Risk	Negligible
OR4	Manchester Road Residential	Ineffective	Negligible Risk	Negligible
OR5	Cottage Close	Ineffective	Negligible Risk	Negligible
OR6	St Johns Close	Ineffective	Negligible Risk	Negligible
OR7	Canal footpath 1	Ineffective	Negligible Risk	Negligible
OR8	Canal footpath 2	Highly effective	Low Risk	Negligible
OR9	Canal footpath 3	Ineffective	Negligible Risk	Negligible
OR10	Griffiths Park Footpath 1	Ineffective	Negligible Risk	Negligible
OR11	Griffiths Park Footpath 2	Ineffective	Negligible Risk	Negligible
OR12	Birkenhead Street	Ineffective	Negligible Risk	Negligible
OR13	Manchester Road 1	Ineffective	Negligible Risk	Negligible
OR14	Manchester Road 2	Ineffective	Negligible Risk	Negligible

5.4.60 The likely magnitude of odour effect under the worst case scenario is 'negligible' at all receptors.

5.4.61 The IAQM (2018) odour guidance states that 'where the overall effect is greater than 'slight adverse', the effect is likely to be considered significant. Therefore, as the effect at any receptor location is not greater than 'slight adverse', the odour effect of the operation of the LSEP is not significant.

5.4.62 In order to assess the impact of fugitive dust from the operational phase of the LSEP the principals of the approach used to determine odour impacts have been applied.

5.4.63 A review of the LSEP process has shown that, during the operational phase, the most significant sources of fugitive dust would arise from the delivery and unloading of waste to the LSEP site. Noting that the EP would ensure any fugitive dust would be controlled to ensure there is no impact beyond the LSEP boundary, the likelihood of significant dust arisings during the operational phase is minimal. Therefore, the dust source potential is considered to be ‘small’. Using the same approach as the odour, accounting for the effectiveness of the pathway for dispersion and location in proximity to the site, the magnitude of dust effect under the worst case scenario is ‘negligible’ at all receptors. This includes the local wildlife sites which although are located within 50m of the LSEP site, are over 320m to the south-west and over 180m to the west of the tipping hall, for Griffiths Park and Rudheath Line Beds respectively. The mitigation measures in bedded in the design of the LSEP are such that any dust arisings would be minimal.

5.4.64 The operational phase fugitive emissions of dust and odour associated with the operation of the LSEP are predicted to have a ‘negligible’ and ‘not significant’ effect**.**

5.5 Cumulative Effects

5.5.1 The LSEP site situated within the wider Lostock Works site, in which there are a various existing emission to air from the Tata, Renescience and Imerys sites. However, these facilities have all been in operation since before 2018, and so their emissions are included within the background concentrations and no further cumulative assessment is considered necessary. The other developments covered in the May 2011 ES have since been discontinued. No other cumulative schemes have been identified as requiring assessment.

5.5.2 As stated in Appendix 5-3, the traffic data provided for the opening year of the LSEP (2023) had been calculated using the Northwich Traffic Model, which includes over 80no. allocated and committed development sites, the road vehicles from which was distributed across the whole modelled network. This means that it is not possible to isolate the volume of vehicles associated with specific committed developments close to the LSEP, however they have been considered within the model and cumulative impacts of vehicles are incorporated into the results of the ‘Do Something’ scenario.

5.6 Mitigation

Operational Phase Mitigation Measures

5.6.1 In relation to operational impacts, no additional mitigation is required beyond that imbedded into the design and required by legislation, noting that the LSEP will be regulated by the EA and required to comply with the conditions set out in the EP.

5.7 Comparison to LSEP as Currently Consented

5.7.1 This assessment has considered the impact on air quality of the LSEP, based on a 90MW EfW facility using a conventional, twin-line moving grate combustion technology, with an annual waste throughput of 728,000tpa (taking into account the additional 128,000tpa on top of the consented 600,000tpa).

5.7.2 The Air Quality Assessment which supported the May 2011 ES for the original LSEP application was undertaken by RPS in January 2010. The assessment supporting the Variation Application (and the model used to support it) has various differences to the May 2011 ES. These are as follows:

- The model has been run with emission rates based on the increased tonnage of waste to 728,000 tpa (rather than 600,000tpa);
- The emission rates are based on the emission limits determined set out in the Waste Incineration BREF for an existing plant, some of which are more stringent than the WID limits which were used in the May 2011 ES;
- The Air Emissions Guidance, published in 2016, introduced some further short term limits for carbon monoxide and hydrogen fluoride which have been assessed within this assessment;
- The model has been run with a newer version of the model (ADMS 5.2);
- The model has been run with more recent meteorological data (years 2016-2020);
- The baseline has been updated to represent the most recently available data;
- LSEP buildings used within the model have been based on the latest design of the facility, represented in the amendments to the scheme approved under a re-discharge of conditions application on 18th June 2020 (reference 20/00673/DIS);
- The number of vehicles in the traffic modelling has been updated to accommodate the Proposal and the natural traffic growth to 2023; and

- There have been some changes to the human and ecological receptors used, to include a number of local wildlife sites and potential wildlife sites.

5.7.3 The comparison between the LSEP with the Proposal, and that for the LSEP as currently consented (based on the inputs from the May 2011 ES), shows that the impacts for the LSEP with the Proposal are predicted to be lower, despite the increase in tonnage. This is because of other changes which have taken place between the model for LSEP with the Proposal and the model for LSEP without the Proposal. The model inputs for the LSEP with the Proposal have been provided by the technology provider based on an understanding of how the plant would operate. They show that the stack volumetric flow rate is lower than that used within the May 2011 ES. It is assumed that the inputs used in the May 2011 ES were based on conservative assumptions, in lieu of accurate data from the technology provider. A lower volumetric flow rate means that less pollutant is emitted per second from the stack, causing lower impacts. There have also been some reductions to the ELVs, for example the ELV for particulate matter has reduced by half from that assessed in the May 2011 ES, also causing lower impacts. In addition, the exit velocity value provided by the technology provider is higher than that assumed in the May 2011 ES, resulting in better buoyancy and better dispersion, and consequently reduced impacts. Therefore, despite the increase in annual throughput of waste, the air quality impacts of the LSEP with the Proposal are lower than the currently consented scheme.

5.7.4 The overall conclusions regarding air quality and human health presented in this Chapter do not differ from those in the May 2011 ES, in that the LSEP will not have a significant effect on air quality to human health or ecology.

5.8 Residual Effects and Conclusions

5.8.1 This Chapter of the EIAR Main Report has assessed the potential impacts of the LSEP scheme with the Proposal on local air quality and odour. This has excluded any impact of the construction phase as a) the Proposal does not include any physical changes to the LSEP scheme, and b) enabling works have been completed on the LSEP site and construction of the facility is currently underway. Accordingly, this assessment has focussed on the impacts of the operational phase of the LSEP. Impacts have been calculated for the total waste throughput of the scheme as now proposed (i.e. 728,000tpa) rather than just the proposed additional waste throughput (i.e. 128,000tpa).

5.8.2 The impact from the operational phase for both vehicle movements and the LSEP facility process emissions has been determined using detailed dispersion modelling and the results have been compared to the AQALs set for the protection of human health. This has also included consideration of the more stringent WHO guidelines for particulate matter which are likely to be brought into legislation in the UK. As such, an allowance has been made in the assessment for future changes in legislation (those which can be foreseen at this point). In addition, a Human Health Risk Assessment has been carried out to determine the impact of pollutants which the AQAL is set as the total intake from ingestion and inhalation. These assessments have concluded that the significance of the impact of process emissions and road vehicles from the LSEP scheme (as now proposed with 728,000 tpa waste throughput) would be negligible and not significant on human health.

5.8.3 The impact from operational phase road and process emissions has also been determined at ecological receptors and the results compared to the Critical Levels and Critical Loads for the protection of ecology. This has assessed the significance of effects in the context of predicted changes of LSEP with the Proposal compared to LSEP as consented, and concludes that there are no significant changes to the previously assessed (LSEP as consented) conditions as a consequence of the Proposal. No likely significant effects are predicted for European or Ramsar Sites, and no significant harm is predicted for SSSIs or locally designated sites. Appendix 5-5 provides full details.

5.8.4 The impacts of dust and odour from the operational phase activities have been determined qualitatively in line with guidance from the IAQM. This has shown that the measures imbedded in the consented design of the LSEP are such to adequately control fugitive releases of dust and odour and the residual impact will be negligible and not significant.