9.0 AIR QUALITY

Introduction

9.1 This Chapter of the ES assesses the likely significant effects of the Proposed Development in terms of air quality. In particular the likely significant effects associated with the Proposed Development include:

- Emissions generated by construction plant at the Ebberston Well Site, the pipeline route and at the Hurrell Lane Gas Processing Facility;
- Dust generation during construction works at the Ebberston Well Site, the pipeline route and at the Hurrell Lane Gas Processing Facility;
- Emissions from road traffic associated with the construction and operation of the Proposed Development; and
- Emissions from the operational Hurrell Lane Gas Processing Facility.

9.2 The Chapter describes the assessment methodology; the baseline conditions currently existing at the Assessment Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset and significant adverse effects; and the likely residual effects after these measures have been employed. This Chapter has been prepared by URS Corporation.

Planning Policy Context

9.3 This sub-section presents the national legislation, national planning policy, regional planning policy and local planning policy that is of relevance to the Proposed Development. Compliance of the Proposed Development with respect to air quality policy and legislation will be discussed in the Residual Effects and Summary Sections.

National Legislation

9.4 The principal air quality legislation within the United Kingdom is the **Air Quality Standards Regulations 2007** (Ref. 9.1), which came into force in February 2007 and brings together the Government's requirements to transpose the separate EU Daughter Directives into national legislation through a single consolidated statutory instrument.

9.5 In addition, the **Environment Act 1995** (Ref. 9.2) requires the Government to produce a national Air Quality Strategy (AQS) containing standards, objectives, and measures for

improving ambient air quality and to keep the policies identified below under review. It also requires that Local Authorities undertake a tiered appraisal of air quality within their borough to establish compliance or non-compliance with the targets established in the AQS. Where the objectives are likely to be exceeded, the Authority must designate an Air Quality Management Area (AQMA) and establish an Action Plan for the region, which outlines measures to achieve the objectives.

9.6 The **AQS for England, Scotland, Wales and Northern Ireland** (Ref. 9.3) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the Government to protect human health. These objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor, or in-vehicle exposure.

9.7 The air quality objectives applicable to Local Air Quality Management are set out in the **Air Quality Regulations 2000** (Ref. 9.4) and the **Air Quality (Amendment) Regulations 2002** (Ref. 9.5). The **Air Quality Standards Regulations 2007** (Ref. 9.1) include additional objectives for arsenic, cadmium, nickel and $PM_{2.5}$. However the AQS does not contain objectives for these pollutants and local authorities have no statutory obligation to currently review and assess concentrations of these species locally.

9.8 Current assessment criteria applicable to the protection of human health and Local Air Quality Management based on the recent AQS and the 2007 Regulations are presented in **Table 9.1**. Concentrations are expressed in mass pollutant (micrograms) per cubic metre of air ($\mu g/m^3$).

Table 9.1: Air Quality Strategy Objectives ($\mu g/m^3$)

Pollutant	Objective	Averaging period	Percentile	To be met by and maintained after
Nitrogen dioxide (NO_2)	200	1 hour	99.8^{th} (18 exceedances/year)	31 Dec 2005
	40	Annual	Mean	31 Dec 2005
Particulate matter (PM_{10})	40	Annual	Mean	31 Dec 2004
	50	24 hour	90.4^{th}	31 Dec 2004

Pollutant	Objective	Averaging period	Percentile	To be met by and maintained after
			(35 exceedances/year)	
Carbon monoxide (CO)	10,000	8-hour	100th	31 Dec 2003
Benzene	5	Annual	Mean	31 Dec 2010
1,3 butadiene	2.25	Annual	Mean	31 Dec 2003
Lead	0.25	Annual	Mean	31 Dec 2008
Poly aromatic hydrocarbons (PAH) (ng/m^3)	0.25	Annual	Mean	31 Dec 2010
Sulphur dioxide (SO_2)	266	15 minute	99.9th (35 exceedances/year)	31 Dec 2005
	350	1 hour	99.7th (24 exceedances/year)	31 Dec 2004
	125	24 hour	99.2nd (3 exceedances/year)	31 Dec 2004

9.9 In addition, a number of objectives have been developed for the protection of vegetation and ecosystems, these are shown in **Table 9.2** below.

Table 9.2: Air Quality Strategy Objectives – Protection of Vegetation and Ecosystems

Pollutant	Objective	Averaging period	Percentile	To be met by
Oxides of Nitrogen (NO_x)	30 $\mu g/m^3$	Annual	Mean	31 Dec 00
Sulphur dioxide (SO_2)	20 $\mu g/m^3$	Annual	Mean	31 Dec 00
Ozone	18 mg/m^3	5 year average of summer 1 hour values		1 Jan 2010

9.10 The above legislation relates to concentrations of pollutants in ambient air with respect to human health or vegetation. There are no legislative standards or agreed guidelines

for dust nuisance in the UK, for example due to dust deposition. Most issues of dust nuisance are covered through Statutory Nuisance legislation defined in the Environmental Protection Act, Part III, 1990, Section 79, Parts (d) and (e) which covers dust (Ref. 9.6):

> **"d) Any dust, smell or effluvia arising on industrial, trade, or business premises and being prejudicial to health or a nuisance;**
>
> **e) Any accumulation or deposit which is prejudicial to health or a nuisance."**

9.11 In the absence of legislative standards there are however a number of non-statutory guidelines that are available when measuring the effect of dust deposition. For example for dust deposition the Environment Agency has set a custom and practice limit of 200 $mg/m^2/day$ (Ref. 9.7).

National Planning Policy

9.12 Air quality is considered in a range of national policy guidance notes and statements including general pollution control statements, local air quality policy guidance, transport guidance notes and also minerals planning notes. This sub-section identifies the key national policy guidance from these different policy areas.

9.13 **Planning Policy Statement 23 'Planning and Pollution Control' (PPS23)** (Ref. 9.8) outlines a number of material planning considerations with respect to pollution control and identifies that air quality can be a material planning consideration.

9.14 **Policy Guidance Note LAQM.PG(09)** (Ref. 9.9) considers all aspects of local air quality management policy, including air quality reviews and assessments, air quality action planning, transport planning, and land use planning. It provides specific guidance on developing local air quality strategies; however the structure and format of a local air quality strategy is entirely up to the local authority.

9.15 **Planning Policy Guidance Note 13 'Transport' (PPG13)** (Ref. 9.10) states that local air quality is a key consideration in the integration of planning and transport issues, and is of particular relevance for areas where the AQS standards are not likely to be met and air quality action plans will be required, and advises that well designed traffic measures contribute to reductions in local air pollution.

9.16 **Minerals Planning Policy Statement 1 (MPS1): Planning and Minerals** (Ref. 9.11) provides the overarching policies and principles that apply to minerals in England. Environmental polices with respect to minerals extraction are described in **Minerals Planning Policy Statement 2 (MPS2): Controlling and Mitigating the Environmental Effects of Mineral Extraction in England** (Ref. 9.12). MPS2 is accompanied by two Annexes including Annex 1: Dust which provides practical guidance with respect to dust assessment and mitigation.

Regional Planning Policy

9.17 The **Regional Spatial Strategy for Yorkshire and Humber** (Ref. 9.13) provides guidance for the region's development over the next 15 to 20 years to 2026. The strategy considers many themes including the economy, housing, transport, the built and natural environment. The Environment is considered in Section 10 with fourteen policies listed, none of the policies are directly related to air quality. However, policies to improve air quality in air quality management areas (AQMAs) are included in the different sub-regional policies including the York sub-region, within which the Site is located.

Local Planning Policy

9.18 Local planning policy applicable to the Ryedale Gas Project includes policy prepared by North Yorkshire County Council (NYCC), North York Moors' National Park Authority (NYMNPA) and Ryedale District Council (RDC). This sub-section presents the findings of a review undertaken to identify any air quality polices presented in the local planning policy documents for the above bodies.

9.19 NYCC is currently preparing a joint minerals and waste development framework (MWDF) as part of their Local Development Framework (LDF). Until the MWDF is finalised some 'saved' policies from the Council's **Mineral Local Plan** (Ref. 9.14) must be considered for future development. The Environment is considered in Chapter 4 – Environmental Protection, of the plan. One of the key aims listed in Section 4.1 is:

> **"To encourage the utilisation of the most environmentally acceptable standards of mineral operation and processing."**

9.20 The above aim would include the control of dust egress for site activities. Policy 4/14 Local Environment and Amenity expands upon the above aim stating that:

> **"Proposals for mining operations and the associated depositing of mineral waste will be permitted only where there would not be an unacceptable impact on the local environment or residential amenity."**

9.21 NYMNPA published a **Core Strategy and Development Polices Document** in November 2008 (Ref. 9.15). This document includes a number of air quality references, and notes that good air quality is one of the special qualities of the National Park. As one of the special qualities of the National Park, air quality is protected in Development Policy 1 – Environmental Protection Item 1:

> **"To Conserve and enhance the special qualities of the North York Moors National Park, development will only be permitted where: It will not have an unacceptable adverse impact on surface and groundwater, soil, air quality and agricultural land."**

9.22 Similar to NYCC, RDC also has a range of 'saved' local plan policies (Ref. 9.16) including the Chapter 15 – Landscape, Wildlife and Environmental Quality policies ENV2, ENV3, ENV5, ENV7, ENV12, ENV13 and ENV18. None of these polices directly relate to air quality.

9.23 The RDC **Core Strategy** (Ref. 9.17) includes one reference to air quality in relation to transportation and accessibility (LDF Actions and Implementation – CP6) as described below:

> **"Encourage measures that will reduce congestion and remove unnecessary traffic in Malton/Norton, improve air quality at Butcher Corner, Malton and benefit traffic flows along the A170 in Pickering."**

Assessment Methodology

9.24 This Section identifies the study pollutants associated with the different potential emission sources associated with the construction and operation of the Proposed Development (construction plant emissions, construction dust emissions, construction and operational vehicle emissions and operational plant emissions at Hurrell Lane Gas Facility). The Section also identifies the sensitive receptors that could potentially be affected by the emission sources, and describes the significance criteria used to

determine the significance of effects on these receptors. The Section also describes the assessment methodology utilised for each potential emission source.

Study Pollutants

9.25 The following paragraphs identify the relevant study species from the identified potential sources of pollutants including vehicle emissions from road vehicles and off-road plant, construction dust emissions, and operational plant emissions at the Hurrell Lane Gas Processing Facility.

9.26 Vehicle exhaust emissions (e.g. from petrol and diesel combustion) comprise a complex mixture of organic and inorganic substances. Of these emissions, assessment criteria for the protection of human health exist for the following pollutants:

- Fine particulate matter (PM_{10} and $PM_{2.5}$);
- Nitrogen dioxide (NO_2);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO);
- Benzene;
- 1,3-butadiene;
- Lead; and
- Poly Aromatic Hydrocarbons (PAHs)

9.27 These pollutants are currently regulated because of their known or suspected deleterious effects upon human health, and because historically, relatively high concentrations have been recorded within and downwind of urban centres.

9.28 Within this assessment of vehicular emissions, only PM_{10} and NO_2 emissions have been considered. Lead is not included as it is no longer added to petrol fuels and emissions from vehicles are, therefore, not considered significant nationally. SO_2 emissions from vehicles are also considered to be insignificant since the introduction of low sulphur diesel and the negligible sulphur content of petrol fuels. The only AQMAs to have been designated within the UK as a result of exceedances of CO, benzene, PAH or 1,3-butadiene objectives was for benzene which was designated by Plymouth City Council, therefore, no quantitative assessment of these pollutants is considered necessary or has been provided as part of this assessment.

9.29 The key pollutants of concern with respect to construction activities are suspended dust (e.g. PM_{10}) and accumulated dust (soiling/deposition). This is due to the movement of

on-site plant equipment, movement of materials on-site and stockpiling of materials on-site. In consultation with the designers of the Proposed Development no notable odour sources have been identified for the construction phase and therefore construction odours are not considered further.

9.30 The key pollutants for the Hurrell Lane Gas Processing Facility have been determined from a review of the **Environment Agency Combustion Activities Guidance Note** (Ref. 9.18). The review indicates that for natural gas related combustion, Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), Methane (CH_4) and Carbon Dioxide (CO_2) are the main pollutants (See **Table 9.3**). However, CH_4 and CO_2 are of concern with respect to greenhouse gases and climate change rather than for local air quality. Climate change is not considered to be significant issue for the Proposed Development as limited combustion will be undertaken on-site, in contrast to the power stations that the sector guidance primarily relates.

9.31 The operational assessment for Hurrell Lane will therefore focus on NO_x and CO. Additionally, as the gas that will be processed at the Hurrell Lane Gas Processing Facility is a sour gas, meaning the gas contains significant concentrations of sulphur, Sulphur Dioxide (SO_2) and Hydrogen Sulphide (H_2S) will also be considered.

Table 9.3: Guide to Air Pollutants - Combustion

Fuel Type	Inputs	Potential air emissions
Solid	Coal	NO_x, CO, CO_2, particulate matter (including PM_{10}), fugitive dust, trace metals, polychlorinated biphenyls (PCBs) and Polycyclic Aromatic Hydrocarbons (PAHs), hydrogen halides, methane (CH_4), Non Methane Volatile Organic Compounds (NMVOCs), dioxins and nitrous oxide (N_2O).
	Biomass	NO_x, CO, CO_2, SO_x, Particulate matter (including PM_{10}), CH_4, NMVOCs and trace metals (from sewage sludge).
Liquid	Fuel Oil	NO_x, CO, CO_2, SO_x, particulate matter (including PM_{10}), PCBs and PAHs, hydrogen chloride, trace metals and dioxins.
Gaseous	Natural Gas	NO_x, CO, CO_2, CH_4
Secondary fuels	Solid, liquid or gaseous	NO_x, CO, CO_2, SO_x, particulate matter (including PM_{10}), PCBs and PAHs, hydrogen halides, trace

Fuel Type	Inputs	Potential air emissions
		metals, NMVOCs, hydrogen sulphide (H_2S), ammonia and dioxins.

9.32 The study pollutants described in the preceding paragraphs have been selected based on the potential of the species to generate adverse odours, adversely affect human health or adversely affect vegetation and sensitive ecosystems. The known health effects of some of the key identified study species are briefly discussed below:

- Particulate matter – Health based assessment criteria focus on the fine 'PM_{10}' and '$PM_{2.5}$', size fractions. PM_{10} and $PM_{2.5}$ are defined as particulate matter with an aerodynamic diameter of less than 10 microns and 2.5 microns respectively. Emissions of particulates from construction activities and combustion processes are likely to contain a range of particulate sizes, including many larger than 10 microns in diameter. However for the purposes of a worst-case assessment and to enable comparison with national air quality objectives, these have been assumed to constitute PM_{10}. Although the health effects of fine particulate matter are currently the subject of much research, the possible association between exposure to increased levels and respiratory and cardiovascular illness, and mortality has previously been acknowledged. Recent reviews by the World Health Organisation (WHO) and the Committee on the Medical Effects of Air Pollutants (COMEAP) have suggested exposure to $PM_{2.5}$ gives a stronger association with adverse health than the larger particulate fractions.
- Nitrogen dioxide ($NO_{2)}$ and oxides of nitrogen (NO_x) – Formed as a by-product of high temperature combustion by the oxidation of nitrogen in the air and the fuel. NO_x on emission primarily consists of nitric oxide (NO), which is oxidised in the atmosphere to produce NO_2, as well as small quantities of NO_2 produced directly during combustion. For combustion sources, NO_x emissions are typically in the $NO:NO_2$ ratio of 9:1. NO_2 is the component of NO_x that is principally associated with health impacts, including effects on lung function and airway responsiveness, and potential increase in reactivity to natural allergens (Ref. 9.3).
- SO_2: Formed during the combustion process due to the oxidation of sulphur present in the fuel. The sulphur content of natural gas is typically 0.001%, compared to the sulphur content of coal of typically 0.5%. SO_2 can cause constriction of the airways of the lung, particularly in people suffering from asthma and chronic lung disease.

- CO: Formed when incomplete combustion of carbon-containing fuels occurs, due to insufficient oxygen being present. CO affects the transport of oxygen around the body by the blood. At very high levels, it can lead to a significant reduction in the supply of oxygen to the heart, particularly in people suffering from heart disease.
- H_2S: present in natural gas, which when burnt oxidises to SO_2. However, in some circumstances not all H_2S present is oxidised to SO_2. The residual H_2S can cause breathing difficulties and be fatal at very high concentrations. H_2S is also odorous with a characteristic rotten eggs odour.
- Mercaptans (or thiols): are colourless odorous sulphur containing organic gases, with an odour often described as rotten cabbage. They are considered to be an irritant when inhaled.

Sensitive Receptors

9.33 A number of sensitive receptors have been identified within the vicinity of the Proposed Development and these are detailed in **Table 9.4** and shown on **Figure 9.1a and b**.

Table 9.4: Identified Sensitive Receptors

Receptor Number	Receptor Name	Reason for Selection	Emission Type	Grid Reference		Distance (m) and Direction
				X	Y	
1	The Elacres	Closest Property to the North of the Hurrell Lane Gas facility	Operational	484084	482429	750m (NW)
2	Cinder Cottage	Closest Property to the West of the Hurrell Lane Gas facility	Operational	483414	482130	1,250 (W)
3	Charity Farm	Closest Property to the South of the Hurrell Lane Gas facility	Operational	484541	480908	850 (S)
4	Wilton Carr	Closest Property to	Operational	486573	482095	1,500 (E)

Receptor Number	Receptor Name	Reason for Selection	Emission Type	Grid Reference		Distance (m) and Direction
				X	Y	
	House	the East of the Hurrell Lane Gas facility				
5	Church Farm	Closest Property to the North East of the Hurrell Lane Gas facility	Operational	486083	482782	1,250 (NE)
6	Warren House	Closest Property to Pipeline Route	Construction – Pipeline	487448	484553	90 (W)
7	Eller's Wood And Sand Dale	SSSI and SAC within 10km of the Hurrell Lane Gas facility	Operational	485408	484419	2,400 (N)
8	Nabgate	SSSI within 10km of the Hurrell Lane Gas facility	Operational	486239	484552	2,800 (N)
9	Ellerburn Bank		Operational	485155	484732	2,750 (N)
10	Troutsdale And Rosekirk Dale Fens		Operational	490035	487468	7,300 (NE)
11	Seive Dale Fen		Operational	485537	487403	5,300 (N)
12	Newtondale		Operational	482777	485940	4,400 (NW)
13	Haugh And Gundale Slacks		Operational	480267	486073	5,300 (NW)
14	East Heslerton Brow		Operational	492713	476015	9,700 (SE)
15	Wintringham Marsh		Operational	487415	473635	8,600 (SE)
16	River Derwent	SSSI and SAC within 10km of the	Operational	482579	475675	6,400 (SE)

Receptor Number	Receptor Name	Reason for Selection	Emission Type	Grid Reference		Distance (m) and Direction
				X	Y	
		Hurrell Lane Gas facility				

9.34 Receptors 1 to 5 are human health receptors (e.g. residential) and have been selected as the closest operational receptors to the Hurrell Lane Gas Processing Facility. No specific operational receptors were selected around the Ebberston Well Site or pipeline as no significant operational air quality emission sources are associated with the Ebberston Well Site or pipeline.

9.35 Receptor 6 (Warren House) is the only receptor identified for the construction phase, as this is the only sensitive receptor location within 200m of construction works for the pipeline, Hurrell Lane Gas Processing Facility or the Ebberston Well Site. Other human health receptors including: Pheaseant Hill (over 800m), Grievedale Farm (over 300m), Keepers Cottage (over 500m) and Cockmoor Hall (over 850m) were also considered, but these are all over 200m from areas of construction, and as such are anticipated to be too far from works to experience significant air quality effects.

9.36 Receptors 7 to 16 are ecological receptors which have been selected in accordance with **Environment Agency H1 Guidance** (Ref. 9.19) so that Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC) within 10km are considered for operational effects.

Significance Criteria

9.37 The assessment of potential effects and their significance has been based on the criteria outlined in the Environmental Protection UK (EPUK) "**Development Control: Planning for Air Quality**" publication (formerly National Society for Clean Air, NSCA) (Ref. 9.20).

9.38 There are three aspects of effect that must be taken into account when assessing the significance of the effect, these are:

- The magnitude of the change caused by the Proposed Development;
- The absolute predicted environmental concentration in relation to the air quality objectives; and

- The number of people exposed.

9.39 Particular significance should be given to a change that takes the concentration from below to above the national AQS objective or vice versa because of the importance ascribed to the objectives in assessing local air quality. The descriptors also allow for a very small change in concentration to be more significant when the absolute concentration is above the objective than for an absolute concentration below the objective.

9.40 **Table 9.5** presents the EPUK criteria for the determination of the "magnitude of change", based on the percentage increase in pollutant concentrations due to the Proposed Development. **Table 9.6** presents the significance of the effects, taking into account the magnitude of change over baseline conditions and the absolute concentration in relation to air quality objectives.

9.41 Environment Agency significance criteria, taken from the H1 Guidance document (Ref. 9.19) will also be discussed in relation to point source emissions. The Environment Agency H1 Guidance indicates that long term ground level concentrations arising from point sources which are less than 1% of an air quality objective or environmental assessment level (EAL)[1] can be treated as insignificant. Similarly, the guidance also indicates that short term ground level concentrations arising from point sources which are less than 10% of an air quality objective or EAL can also be treated as insignificant.

Table 9.5: Determination of Magnitude of Change

Magnitude of change	Annual Mean Concentration (NO_2 and PM_{10})	Days PM_{10} >50μg/m^3
Very Large	Increase/decrease >25%	Increase/decrease >25 days
Large	Increase/decrease 15-25%	Increase/decrease 15-25 days
Medium	Increase/decrease 10-15%	Increase/decrease 10-15 days
Small	Increase/decrease 5-10%	Increase/decrease 5-10 days
Very Small	Increase/decrease 1-5%	Increase/decrease 1-5 days
Extremely Small	Increase/decrease <1%	Increase/decrease <1day

[1] Where national AQS objectives are not specified for the study species identified, Environmental Assessment Levels (EALs), published in the Environment Agency's Environmental Permitting Regulations - H1 Environmental Risk Assessment document (Ref 9.19), have been used to assess the health effects on the general population.

Table 9.6: Significance of Effects

Absolute Concentration Relative to Objectives	Extremely Small	Very Small	Small	Medium	Large	Very Large
Above Standard without PD	Minor / Negligible*	Minor	Major	Major	Severe	Severe
Below Standard Without PD; Above with PD	Minor / Negligible*	Moderate	Major	Major	Severe	Severe
Below Standard with PD but not Well Below**	Negligible	Minor	Minor	Moderate	Moderate	Major
Well Below Standard with PD **	Negligible	Negligible	Minor	Minor	Minor	Moderate

Notes: PD = Proposed Development. * Minor where the change is > 0.5µg/m^3 or more, 'Negligible' if 0.5µg/m^3. ** 'Well Below' is taken to mean <75% below the standard. Slight deviation in terms applied for cross discipline consistency, where slight adverse is replaced by minor, substantial by major and very substantial by Severe.

9.42 The EPUK criteria have been applied to changes in concentrations for construction dust in addition to operational changes in concentration. This is considered to be a very conservative approach as many construction activities will be undertaken over very short timescales (e.g. weeks) rather than the annual durations the EPUK criteria are intended to address. In the absence of short term NO_2 significance criteria within the EPUK approach, changes in short term NO_2 concentrations from plant emissions have also be compared to the criteria presented in **Tables 9.5 and 9.6**.

Assessment of Construction Site Plant

9.43 The construction phase is anticipated to take 12 months and based on construction commencing in Autumn 2011, the development would be complete by Autumn 2012,

with commissioning to follow shortly after. Therefore 2012 has been assumed to be the first year of operation.

9.44 Emissions to air during construction activities will be associated with on-site construction vehicles and plant. However, it is anticipated that there will be relatively few vehicles/plant present on-site at any one time, and that the total number used will be relatively small compared to background road traffic levels in the area.

9.45 In the absence of any other specific information, and for the benefit of the assessment, it has been assumed that the equivalent of five 'large construction equipment' would be operating simultaneously at any one time across a 50m x 50m plot. Using the European **Environment Agency's Core Inventory of Air Emissions** (CORINAIR) 2007 Inventory (Ref. 9.21), an emission rate of 1.9 grams per second (g/s) NO_X and 1.3 g/s PM_{10} has been obtained, and subsequently modelled as an area source using ADMS 4 (Ref. 9.22). These emission rates are based on a typical fleet of five large construction plants operating simultaneously (consisting, for example, of a bulldozer, an excavator, a grader and two large dumper trucks).

9.46 The movement of soils and rubble during construction activities is anticipated to lead to the generation of some additional short-term airborne soil dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate, and depends upon meteorological and ground conditions at the time and location of earth working and the nature of the activity being carried out.

Assessment of Dust Emissions Generated During Construction Works

9.47 In 2000 the Building Research Establishment (BRE) (Ref. 9.23) undertook six months of continuous PM_{10} sampling at three locations within 200m of a demolition and construction site of 0.65 hectares. The site was a former chemical works and required demolition of existing buildings, piling along some of the site boundary, excavation of soil to a depth of 1m across the site (greater than 1m in some areas), and the subsequent erection of new structures. During working hours, in the 6-month monitoring period, PM_{10} concentrations within 1m of the study site boundary increased by up to 11µg/m^3 during demolition, 3µg/m^3 during site preparation and 5µg/m^3 during piling and earth working (including a period of piling at the site boundary). PM_{10} concentrations about 150m from the construction site were indistinguishable from background levels. The study utilised 'best practice' dust mitigation measures and the site did not receive any complaints concerning dust effects, despite the presence of residential properties within 10m of the site perimeter.

9.48 The findings of this BRE study have been applied to the Proposed Development, taking into consideration the ambient background levels of particulate matter for the area.

Assessment of Road Traffic

9.49 A review of the potential for air quality effects associated with increases in road traffic during both the construction and operational phases of the Proposed Development has been undertaken. The review has been undertaken as vehicles travelling to and from the pipeline, Hurrell Lane Gas Processing Facility and the Ebberston Well Site have the potential to affect air quality with respect to PM_{10} and NO_2.

9.50 The level of assessment for road traffic emissions has been established by comparison of anticipated construction and operational traffic flows against the Design Manual for Roads and Bridges (DMRB) local air quality road traffic criteria (Ref. 9.24). The DMRB criteria enable significant traffic changes, with the potential to affect air quality, to be identified. Where significant traffic changes are identified these are then modelled using either the DMRB air quality screening model or an advanced air quality dispersion model. The criteria for the identification of significant traffic changes outlined in the Environmental Protection UK (EPUK) document 'Development Control: Planning for Air Quality' have also been considered.

Assessment of Emissions from the Operational Plant

9.51 An assessment has been made of the potential air quality effects associated with the operation of the Proposed Development. The assessment has considered the following main emission sources at the Hurrell Lane Gas Processing Plant:

- Two boilers each with two flues, each with a power capacity of 500 Kilowatts (KW); and
- One gas regeneration heater with a maximum power capacity of 1 Megawatt (MW).

9.52 An emergency flare will also be located on-site and this would be operated in emergency situations or as part of some maintenance operations. The emergency flare is anticipated to be utilised once per year. The duration of flaring is anticipated to be 15 minutes and the flare will destroy up to 98% of odorous sulphur bearing compounds, such as H_2S in the gas flow.

9.53 The main emissions with respect to human health and vegetation anticipated during the fifteen minutes of flare operation are NO_x, SO_2 and CO. The shortest averaging periods for the air quality objectives for NO_x and CO are 1-hour and 8-hours respectively. Consequently no exceedance of these objectives would be expected at the sensitive receptors identified around the Hurrell Lane Gas Processing Facility, the closest being approximately 750m for the site. SO_2 does have an air quality objective with a fifteen minute averaging period with a concentration of 266 µg/m³, but SO_2 concentrations can be higher than this concentration in 35 fifteen minute periods on an annual basis before the objective is exceeded.

9.54 Due to the very limited anticipated frequency and duration of any gas flaring, the efficiency of the flare in destroying potentially odorous compounds and the distance of the flare from sensitive receptors (closest approximately 750m), no further assessment of the emergency flare emissions has been undertaken. The emissions associated with the emergency flare are considered insignificant for human health, vegetation and odour.

9.55 Point source emissions from combustion, such as at the Hurrell Lane Gas Processing Facility, can be assessed using a variety of methods such as Environment Agency H1 Screening (Ref. 9.19). In the H1 screening approach, simple calculation methods are used to estimate pollutant concentrations. In some instances the H1 approach is used as an initial test, or "screening tool" to identify significant emissions requiring more detailed air quality assessment via dispersion modelling.

9.56 In this instance all the main pollutants of concern identified previously (NO_x and CO) have been assessed using detailed modelling. This is considered to be a precautionary approach as comparing the power of the boilers and heater (2MW combined) proposed for the Hurrell Lane Gas Processing Facility with the Environment Agency H1 guidance Note (Ref. 9.19) indicates that the these point sources are **'small point sources'** and that:

> **"For gas and distillate oil fired boilers with an aggregated thermal input less than 20MW and small point sources such a vents and short stacks a case may be made by the operator that the scale of the release does not warrant detailed modelling on the basis of limited environmental risk. This should be done preferably in discussion with the regulator."**

9.57 A precautionary approach has been utilised for these small point source emissions due to the presence of residential receptors and designated ecological sites, as listed in **Table 9.4**. No other fugitive sources of pollutants such as vents and pump seals have been assessed in detail as these emissions are likely to be insignificant (as described in H1 guidance above) and these emissions will be controlled on the Hurrell Lane and Well Site through the application of Best Available Techniques (BAT).

9.58 Emissions from the two boilers and regeneration heater been assessed by modelled using the atmospheric dispersion model Atmospheric Dispersion Modelling System 4 (ADMS4). Dispersion modelling calculates the predicted ground level concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use and its use in such assessments is approved by the Environment Agency.

9.59 The assessment has been based on the operational design parameters for the emission points listed above; these are provided in **Table 9.7**.

Table 9.7: Dispersion Model Input Parameters

Parameter	Boilers		Regeneration Heater	
Number of Emission Points	4		1	
Emission Locations (National Grid Reference)	484994	481910	484970	481896
	484998	481910		
	484994	481907		
	484998	481907		
Emission Height (m)	3.5		15.0	
Diameter (m)	0.2		1.1	
Volumetric Flow (m^3/s)	0.1		0.2	
NO_x emission concentration (mg/Nm^3)	47		100	
CO emission concentration (mg/Nm^3)	35		75	
NO_x Emission Rate (g/s)	0.005		0.02	
CO Emission Rate (g/s)	0.003		0.02	

Note: SO_2 and H_2S not considered as the gas combusted in the boilers will have already been sweetened to remove sulphurous gases to concentrations equivalent to domestic gas supplies.

9.60 The emissions modelled for the boiler and regeneration heater include NO_x and CO. Emissions of SO_2, H_2S and mercaptans are not modelled for the boiler and regeneration heater as the sweetening plant on-site will remove these pollutants prior to heating and burning to national domestic gas standards.

9.61 The assessment of the emissions has been based on the design parameters provided by the designers of the Proposed Development.

9.62 Consistent with EA H1 Guidance (Ref. 9.19) it has been assumed that 100% of long term NO_x will be converted into NO_2 for comparison with long term objectives, such as the annual average objective and that for comparison to short term NO_2 objectives (e.g. 1-hour) that 50% of NO_x is converted into NO_2.

9.63 The dispersion of emissions from point sources is largely dependent on atmospheric stability and turbulent mixing in the atmosphere, which in turn are dependent upon wind speed and direction, ambient temperature, cloud cover and the friction created by buildings and local terrain.

9.64 The dispersion model takes into account variations in meteorological conditions, terrain effects and building effects on the predicted concentrations from the operations. Sensitivity of the predicted concentrations to variations in these model representations has been undertaken to ensure that the reported results provide a realistic assessment.

9.65 Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that is modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.

9.66 The meteorological site that was selected for the assessment was Church Fenton, located approximately 30 miles southwest of the Hurrell Lane Gas Processing Facility, at a flat airfield. The modelling for this assessment has utilised meteorological data for the period 2004-2008. No particular year was identified as having significantly different predicted pollutant concentrations. Consequently the likely significant effects section discusses the worst concentrations predicted from all years. The wind roses[2] for Church Fenton between 2004 and 2008 are provided in **Figure 9.2**.

[2] A wind rose is a diagram that shows the distribution of wind directions and speeds at a measurement location, over a specific time period.

9.67 Another variable that can have a significant effect on the dispersion of emissions from sources is the presence of buildings or structures near to the emission points. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations.

9.68 The site will contain a variety of small buildings and process equipment. The modelling has included the largest building on the site namely the compressor building and also the boiler house. The boiler house has been included to adequately characterise building effects for the four boiler flues. Parameters representing the buildings included in the model are shown in **Table 9.8** and a plan showing the buildings used in the ADMS simulations is also shown in **Figure 9.3**.

Table 9.8: Buildings Incorporated into the Modelling Assessment

Building	Grid Reference (x,y)		Height (m)	Length (m)	Width (m)	Angle [1]
Boiler House	484996	481908.5	3.1	8	7	0
Compressor House	484848	481942.5	10.2	20	15	0

Notes: [1] The angle between the building length and grid north.

9.69 The Hurrell Lane Gas Processing Facility is located in a flat arable field surrounded by similar fields. A surface roughness of 0.3m, corresponding to agricultural areas, has been selected to represent the local terrain. Site-specific terrain data has not been used in the model, as typically terrain data will only have a marked effect on predicted concentrations where hills with gradient of more than 1 in 10 are present in the vicinity of the source, which is not the case at this site.

9.70 Nitrogen deposition (N-deposition) has also been considered for the ten ecological receptors listed in **Table 9.4**. The NO_2 annual mean concentrations predicted for each receptor have been multiplied by 0.1 to provide dry deposition values in a kg/N/ha/yr, as used in the DMRB Assessment Manual (Ref. 9.24).

9.71 Wet deposition of nitrogen within the locality (10 km) of combustion emissions is considered to be insignificant, particularly as the NO_x emissions are dominated by emissions of NO, which is relatively insoluble in water; wet deposition typically occurs

over longer distances and in particular at upland locations (Ref. 9.3). It has therefore been screened out of this impact assessment.

9.72 The nitrogen deposition rates have then been compared to critical load values for the ten ecological receptors. The critical loads used in the assessment are taken from the UN Economic Commission for Europe (UNECE) (Ref. 9.25) and these are presented in **Table 9.9**.

9.73 The Air Pollution Information System (APIS) (Ref. 9.26) provides information on the existing nitrogen deposition over 5km squares for the UK. The baseline existing concentrations at the identified habitat receptors are shown in **Table 9.9** below.

Table 9.9: Nitrogen Deposition Critical Loads

Receptors	Designation Habitat	Critical Load (kg N/ha/y)	Critical Load Habitat	Background N-Deposition (kg N/ha/y)	Existing N-Deposition as % of Critical Load[1]
R7	SSSI - Broadleaved, mixed and yew woodland – upland (Unit 1)	10 - 20	Temperate and Boreal Forests	20.4	204
	SSSI - Acid grassland – upland (Unit 2)	10 - 20	Non-Mediterranean dry acid and neutral closed grassland		204
	SAC - Bogs. Marshes. Water fringed vegetation. Fens (25%)	5 - 10	Lowest of 4 designations for mire, bog and fen habitats.		408
	SAC - Heath. Scrub. Maquis and garrigue. Phygrana (5%)	5 - 15	Lowest of 3 heath and scrub designations		408
	SAC - Humid grassland. Mesophile grassland (70%)	10 - 20	Non-Mediterranean dry acid and neutral closed grassland		204
R8	SSSI - Calcareous grassland - upland	15 - 25	Sub-Atlantic semi-dry calcareous grassland	20.4	136
R9	SSSSI - Calcareous grassland - upland	15 - 25	Sub-Atlantic semi-dry calcareous grassland	20.4	136
R10	SSSI - Neutral grassland – upland (Units 1 to 4)	10 - 20	Non-Mediterranean dry acid and neutral closed grassland	18.6	186

Receptors	Designation Habitat	Critical Load (kg N/ha/y)	Critical Load Habitat	Background N-Deposition (kg N/ha/y)	Existing N-Deposition as % of Critical Load[1]
R11	SSSI - Fen, marsh and swamp - lowland	5 - 10	Lowest of 4 designations for mire, bog and fen habitats.	17.8	356
R12	SSSI - Fen, marsh and swamp – lowland (Unit 1)	5 - 10	Lowest of 4 designations for mire, bog and fen habitats.	20.9	418
	SSSI - Dwarf shrub heath – upland (Units 2, 3, 4 and 8)	5 - 15	Lowest of 3 heath and scrub designations		418
	SSSI - Earth Heritage (Units 5 and 6)	N/A	N/A		N/A
	SSSI - Broadleaved, mixed and yew woodland – upland (Unit 7, 9 to 19)	10 - 20	Temperate and Boreal Forests		209
R13	SSSI - Calcareous grassland – upland (Units 1 and 4)	15 - 25	Sub-Atlantic semi-dry calcareous grassland	20.9	139
	SSSI - Broadleaved, mixed and yew woodland – upland (Units 2, 3, 5 and 6)	10 - 20	Temperate and Boreal Forests		209
R14	SSSI - Calcareous grassland – lowland (Units 1 and 2)	15 - 25	Sub-Atlantic semi-dry calcareous grassland	22.8	152
R15	SSSI - Neutral grassland – lowland	10 - 20	Non-Mediterranean dry acid and neutral closed grassland	21.0	210
R16	SSSI - Rivers and Streams (Units 1 to 4)	5 - 10	Softwater lakes	19.6	392
	SSSI - Fen, marsh and swamp – lowland (Unit 5)	5 - 10	Lowest of 4 designations for mire, bog and fen habitats.		392
	SSSI - Standing open water and canals (Units 6, 17, 20 and 21)	5 - 10	Softwater lakes		392
	SSSI - Broadleaved, mixed and yew woodland – upland (Units 7, 10, 13, 16 and 18)	10 - 20	Temperate and Boreal Forests		196
	SSSI - Neutral grassland – lowland (Units 8 and 9, 11, 12, 14, 15 and 19)	10 - 20	Non-Mediterranean dry acid and neutral closed grassland		196

Receptors	Designation Habitat	Critical Load (kg N/ha/y)	Critical Load Habitat	Background N-Deposition (kg N/ha/y)	Existing N-Deposition as % of Critical Load[1]
	SAC - Inland water bodies (standing water, running water) (95%)	5 - 10	Softwater lakes		392
	SAC - Bogs. Marshes. Water fringed vegetation. Fens (2%)	5 - 10	Lowest of 4 designations for mire, bog and fen habitats.		392
	SAC - Humid grassland. Mesophile grassland (3%)	10 - 20	Non-Mediterranean dry acid and neutral closed grassland		196

Notes: [1] To represent the depositions as percentage the lower Nitrogen critical load has been used.

9.74 It can be seen from **Table 9.9** above that the background nitrogen deposition rates exceed all of the lower critical loads at the identified habitat receptors.

Baseline Conditions

9.75 Baseline conditions for the key combustion and road traffic pollutants are presented in this Section. Baseline PM_{10} concentrations have also been utilised in the assessment of construction emissions.

9.76 The statutory review and assessment of local air quality within the area by RDC has identified one AQMA under the Local Air Quality Management (LAQM) regime at Malton (approximately 8.5km SW of the Hurrell Lane Gas Processing Facility), as described below (Ref. 9.27):

> **"An area in the centre of Malton encompassing properties along the B1248 (Castlegate and Yorkersgate, between Sheepfoot Hill and Market Street), and the B1257 (Wheelgate and Old Maltongate, between Finkle Street and 20m east of the junction with East Mount). The area also includes pat of Church Hill."**

9.77 The **2009 Updating and Screening Assessment for RDC** (Ref. 9.28) did not identify any other areas which were likely to exceed air quality objectives.

9.78 Background NO_2 and PM_{10} concentrations have been taken directly from the National Air Quality Archive Background maps for 2009 and 2012 to provide levels for the baseline year and the estimated year of completion of the Development, respectively (Ref. 9.27), as the automatic monitoring data in RDC is gathered at a roadside location. The non-automatic data (e.g. NO_2 diffusion tubes) collected in RDC is also from either roadside or kerbside locations. The following national grid reference of 484500, 481500 is the closest location to the Hurrell Lane Gas Processing Facility site data is available (located approximately 250m south west of the Hurrell Lane Gas Processing Facility). This location is away from A-Roads and is considered to be a representative location to describe background air quality for the Hurrell Lane Gas Processing Facility and also the wider pipeline route and the Ebberston Well Site.

9.79 Concentrations of CO were obtained from the Middlesbrough AURN site (Ref. 9.29), as CO is not monitored within RDC and the Middlesbrough AURN is the closet non-roadside AURN site to the Proposed Development.

9.80 **Table 9.10** presents all the relevant background ambient air quality data for the required averaging periods. In accordance with Environment Agency guidance, in the absence of actual measured short term background concentrations, these have been assumed to be twice the annual average concentration.

Table 9.10: Predicted Mean Background Pollutant Concentrations ($\mu g/m^3$)

Pollutant	Current Estimated Background (2009)	Estimated Background (2012)	Objective	Averaging Period
CO	204	180	350	Annual mean
	408	360	10,000	Maximum 8 hr running mean
NO_2	6.1	5.3	40	Annual mean
	12.2	10.6	200	1 hour, 99.8th percentile
PM_{10}	14.6	14.2	40	Annual mean
	29.2	28.4	50	Daily mean, 90.4th percentile

9.81 For all pollutants assessed, background concentrations in 2012 are predicted to comply with the air quality standards.

Likely Significant Effects

9.82 This Section describes the likely significant effects from construction site plant, construction dust, road traffic (construction and operation) and operational sources at the Hurrell Lane Gas Processing Facility.

Construction Site Plant

9.83 The location of the two development sites and pipeline has been carefully selected to avoid sensitive receptors such as residential locations. The only location where the construction works are within 200m of a residential location is at Warren House, which is approximately 90m from the pipeline route.

9.84 Indicative modelling of construction vehicle emissions has been undertaken (using ADMS (version 4)) as an area source emission. The modelling outcomes provide an indicative guide to the potential effects from construction site plant, based on a set of assumptions and identified parameters.

9.85 The modelling results indicate that mean ground level NO_x concentrations may increase by a maximum of 18$\mu g/m^3$ at the boundary of works, reducing to 8$\mu g/m^3$ 10 m beyond the boundary, and dropping rapidly with increasing distance away from the site. Increases in concentrations due to plant equipment would only occur during daytime working hours. Assuming that 50% of short term NO_x is converted to NO_2 this equates to 9 µg/m³ NO_2 at the boundary of works to 4 µg/m³ at 10m. Adding the 4 µg/m³ increase in NO_2 concentrations to the short term NO_2 background concentration results in a short term NO_2 concentration of 16.2 µg/m³. In comparison to the short term NO_2 objective this is well below the objective of 200 µg/m³ (less than 90%) and represents an increase of just over 1% of the objective. Utilising the EPUK significance criteria, as a guide, the change in NO_2 concentration would be very small and the significance of the change can be considered to be Negligible.

Dust Emissions Generated During Construction Works

9.86 The dust emission findings from a previous BRE study have been extrapolated to the construction of the pipeline route, which is within approximately 90m of Warren House.

Based on the BRE study, the mean concentrations at the Development boundary arising from earth works and site preparation works could increase by 5µg/m^3 to 34.2 µg/m^3 during site working hours, from a short term concentration of 29.2 µg/m^3. This concentration is still within the AQS 24-hour objective of 50µg/m^3.

9.87 On the basis of these findings, it is anticipated that construction dust will cause a Negligible effect to Warren House. This is because during construction activities, PM_{10} concentrations are predicted to remain below the 24-hour AQS objective of 50µg/m^3 (with no increase in the number of days of exceedance). Although, a Negligible effect is predicted for dust effects these will be further mitigated through the preparation and implementation of a dust management plan, which will be agreed in consultation with the Council.

Assessment of Road Traffic

9.88 The DMRB guidance states that assessment of affected roads is only considered necessary where proposals would result in:

- An increase in daily traffic flows by 1,000 or more;
- Daily Heavy Goods Vehicles (HGVs) flows will change by 200 or more;
- Daily average speed will change by 10 km/hr or more; or
- Peak hour speed will change by 20 km/hr or more.

9.89 Furthermore, the Environmental Protection UK (EPUK) document 'Development Control: Planning for Air Quality' states that an air quality assessment is not normally required unless there is a change in annual average daily traffic (AADT) flows of more than 5% or 10% (depending on local circumstances) on a road with more than 10,000 AADT.

9.90 **Table 9.11** presents the number of vehicles anticipated per week of construction. The traffic increases are below the level of change requiring further assessment against both DMRB and EPUK criteria. It is therefore considered that the traffic effects of the Proposed Development during construction are insignificant in terms of local air quality, no further assessment is needed and construction traffic is deemed to be an effect of Negligible significance.

Table 9.11: Weekly Construction Traffic Movements

Site	Weekly HGV Movements	Weekly Light Goods Vehicle Movements	Weekly Totals
Ebberston Well Site	6	35	41
Pipeline	68	204	272
Hurrell Lane Gas Processing Facility	31	119	150

9.91 During the operational phase of the Proposed Development, even fewer additional traffic movements are anticipated than during the construction period, with only 5 staff vehicles visiting the Hurrell Lane Gas Processing Facility per shift, 1 light vehicle trip between the Hurrell Lane Gas Processing Facility and the Ebberston Well Site per day and also 1 HGV vehicle trip to and from the Hurrell Lane Gas Processing Facility per day. Therefore, the operational change in traffic flows is considered to be insignificant against the DMRB and EPUK criteria and is therefore deemed to have a Negligible significance.

Operational Emissions

9.92 The modelling assessment indicates that similar concentrations of pollutants are predicted for the human health receptors modelled around the Hurrell Lane Gas Processing Facility. This is because the human health receptors included in the model are located similar distances away from the Hurrell Lane Gas Processing Facility (between 750m and 1,500m). For the ecological receptors the three closest receptors had the highest predicted concentrations: Eller's Wood and Sand Dale SSSI and SAC, Nabgate SSSI and Ellerburn Bank SSSI.

9.93 A summary of the highest predicted pollutant concentrations for all receptors, based on the worst-case results from all of meteorological data used (years 2004 to 2008), is presented in **Table 9.12**. The summary table indicates the highest predicted concentration without background concentrations, known as process contribution (PC), and also with background concentrations (BC), which is known as Predicted Environmental Concentration (PEC). The summary also shows the PC as a percentage of the relevant AQS or EAL and also as a percentage change from BC.

Table 9.12: Highest Operational Pollutant Concentrations (µg/m³)

Pollutant	Measured as	AQS / EAL	PC	PC / AQS %	BC	PEC	PEC / AQS %	Increase in BC %
NO_x (as NO_2)	Annual mean	40	0.02	0.05	5.3	5.3	13	0
	Annual mean at Habitat site	30	0.01	0.03	5.3	5.3	18	0
	Hourly mean (99.8th %ile))	200	1.1	0.6	10.6	11.7	6	10
CO	Annual mean	350	0.00002	0.00001	180	180	51	0
	8-hour rolling annual average	10,000	0.002	0.00002	360	360	4	0

9.94 The highest predicted environmental concentrations are detailed below for the first year of operation. The first year of operation is anticipated to be the worst case year for air quality as in future years, air quality is predicted to improve due to reduced background pollutant concentrations resulting from anticipated improvements in pollutant emissions from a range of sources.

9.95 The highest increase in the annual mean NO_2 process contribution for the human health receptors, is a total of 0.02 $\mu g/m^3$, which is considered to be an extremely small magnitude of change, in comparison to the EPUK criteria. As the predicted environmental concentration during the operational phase of the Proposed Development is predicted to be only 13% of the annual AQS objective, this can be considered to be 'well below' the AQS objective for NO_2, and therefore the significance of the NO_2 effects from the Proposed Development are predicted to be Negligible against EPUK criteria. Against the EA H1 guidance this is considered to be an insignificant change in concentration (i.e. less than 1% for long term criteria).

9.96 The worst case increase of 1.1 $\mu g/m^3$ for short term NO_2 is also a considered to be insignificant against EA H1 guidance (i.e. less than 10% change for short term criteria) and consequentially the significance of the change is considered to be Negligible.

9.97 The results of the modelling predict a maximum increase in NO_x concentration at the worst-case ecological receptor of 0.01 µg/m³, which equates to less than 0.1% of the NO_x air quality objective for the protection of vegetation and ecosystems (30 µg/m³). The Environment Agency H1 Guidance indicates that long term ground level concentrations arising from point sources which are less than 1% of an air quality objective can be treated as insignificant. Increases in NO_x with the Proposed Development are therefore considered insignificant.

9.98 The maximum increase in nitrogen deposition is anticipated to be 0.001 kg nitrogen per hectare per year (kgN/ha/y). The maximum increases are predicted for Eller's Wood and Sand Dale SSSI and SAC, Nabgate SSSI and Ellerburn Bank SSSI, which have a background nitrogen deposition rate of 20.4 kgN/ha/y. The increase of 0.001 kgN/ha/y equates to 0.005% of the background rate of nitrogen deposition for these sites.

9.99 In relation to critical load thresholds all the designated sites considered exceed their respective lowest critical load thresholds. However, the anticipated changes in nitrogen deposition are very small for all the sites in absolute terms and also as a proportion of background nitrogen deposition. Therefore, the predicted changes in nitrogen deposition are considered to be insignificant and no change in the condition of any designated ecosystem is anticipated.

9.100 CO concentrations are considered to be Negligible for all receptors with maximum process contributions of 0.00002 µg/m³ for annual average concentrations and 0.002 µg/m³ for short term concentrations. These changes in CO are less than 1% of the annual EAL and less than 10% of the short term AQS concentrations and as such changes in CO are insignificant against EA guidance. Consequentially the significance of the change is considered to be Negligible.

Mitigation Measures

9.101 This section presents the mitigation measures appropriate to minimise the effect on air quality from either construction or operational activities.

Construction

9.102 Despite the Negligible predicted effect from construction activities, construction vehicle emissions would be mitigated through:

- The use (where appropriate) of catalytic converters; and
- The regular maintenance of vehicle engines.

9.103 In accordance with best practice, construction dust will be controlled through the application of a series of measures, including (where appropriate):

- Regular inspection and, where necessary, wet suppression of material/soil stockpiles (including wind shielding, storage away from site boundaries, and restricted height of stockpiles);
- Appropriate orientation of material stockpiles to minimise wind dispersion;
- Provision of wheel washing and wet suppression during loading of wagons/vehicles;
- Covering vehicles carrying dry spoil and other wastes;
- Shielding of dust-generating construction activities;
- Provision of suitable site hoarding;
- Restricting vehicle speeds on access roads and other unsurfaced areas of the site; and
- Inspection of unsurfaced haulage routes, and wet suppression as necessary, during prolonged dry periods.

9.104 A Principal Contractor will be appointed by the Applicant to develop and implement a Construction Environmental Management Plan, which will present a comprehensive list of mitigation measures, for agreement with the Council.

Operation

9.105 The Hurrell Lane Gas Processing Site has been designed to minimise emissions to air. Good management processes will also be implemented to minimise emissions to air. The measures that are proposed on site in comparison to indicative Best Available Techniques (BAT) as outlined in the **Environment Agency Gasification, Liquefaction and Refining Installations (EPR 1.02) Sector Guidance** for natural gas refining and flares (Ref. 9.30) are presented in **Tables 9.13** and **Table 9.14**.

Table 9.13: Air Emission Mitigation Measures – Natural Gas Refining

Item	Indicative BAT – You should, where appropriate	Proposed Implementation
1.	Minimise frequency of pig/sphere use by operating sea-lines at high	Gas and liquids are to be transferred from the well site to the gas facility

Item	Indicative BAT – You should, where appropriate	Proposed Implementation
	velocity where practicable, i.e. use "mist flow" conditions, minimise recovery of spheres by use of receivers holding several devices and use of vent receivers of high pressure gas to a low pressure part of the process for gas recovery by recompression, before opening for access to pig/spheres.	using separate lines. This, together with suitable design, fabrication and inspection, should result in minimum pigging operations.
2.	Use sectioned vent and isolation systems which minimise the volume of gas to be released or allow high pressure gas to be vented by an enclosed header system to a low pressure part of the process for recompression.	The gas facility will include isolation valves to enable the isolation of relatively small, discrete sections of plant to minimise quantities of gas requiring venting. The relevant isolated section can then be depressurised via the ground flare.
3.	For planned depressurisation (e.g. of the sea line or process plan), minimise the quantity of gas released by venting down to as low a pressure as possible through the terminal process before flaring the remaining gas.	As the gas inventory is the primary resource it is in the interest of the operator / owner to flare as little gas as possible. As discussed in item 2, the plant will include isolation valves to enable the isolation of relatively small, discrete sections of plant to minimise the quantity of gas to be released. When depressurisation of a section of plant is required, the gas will be recompressed to another section of the plant (using the off gas compressor or a temporary / mobile compressor) to recover as much gas as possible.
4.	Gas streams with significant sulphur content should not be used as fuel.	The sulphur will be removed from the gas in the upstream processes. The fuel gas system will be fed by

Item	Indicative BAT – You should, where appropriate	Proposed Implementation
		clean export gas that meets the National Grid NTS specifications (which includes sulphur content).
5.	Consider alternatives to direct releases of CO_2 particularly for large flows.	Not applicable.
6.	Dispose of mercury recovered from raw natural gas in an environmentally responsible way.	Not applicable. The gas is not expected to contain any mercury.

Table 9.14: Air Emission Mitigation Measures – Flare

Item	Indicative BAT – You should, where appropriate	Proposed Implementation
1.	Use flaring as a safety system (start up, shutdowns and emergencies).	Flaring will be used if emergency depressurisation is required.
2.	Use a flare control system with a response sufficiently fast to avoid unnecessarily leaving steam injection running in order to anticipate flaring events.	A suitable flare control system will be specified. Steam injection is not relevant to the ground flare proposed for this project.
3.	Ensure smokeless and reliable operation.	The flare will be designed to operate without smoke and will be serviced and maintained to ensure reliable operation.

Item	Indicative BAT – You should, where appropriate	Proposed Implementation
4.	Minimise flaring by a suitable combination of: ▪ Management information systems and instrumentation; ▪ Balancing the refinery fuel gas system; ▪ Installing a gas recovery system; ▪ Using high-integrity relief valves; and ▪ Applying advanced process control.	Flaring will be minimised by through the use of: ▪ Integrated control system and instrumentation to avoid emergency scenarios and minimise flaring; ▪ Flash gas will be recovered from liquid stabilisation processes and will be recompressed for processing and export; ▪ Equipment will be suitably designed and specified to avoid excessive maintenance requirements and minimise the need for (planned) depressurisation; and ▪ Equipment, relief systems and procedures will be designed and specified to minimise flaring.
5.	Reduce relief gas to flare by management/good housekeeping practices.	Relief of gas to flare will be minimised through: ▪ Design and specification of suitable equipment and systems; ▪ Appropriate operating procedures; and ▪ Good housekeeping.

9.106 The mitigation of odour releases on-site also includes the 'sweetening plant' which removes odorous gas from natural gas prior to any combustion on-site.

9.107 The comparisons of indicative BAT with the proposed air emissions mitigation measures indicates a high degree of compliance that will control emissions of pollutants to air, including odorous gases such as H_2S and Mercaptans.

Residual Effects

9.108 This Section discusses the anticipated level of effect following implementation of the aforementioned mitigation measures.

9.109 The residual effect associated with construction site plant is expected to be Negligible at Warren House (the only receptor identified within 200m of works).

9.110 Any effects associated with construction dust are predicted to be Negligible, as Warren House is approximately 90m from the areas of construction work and as best practice dust mitigation measures will be utilised.

9.111 Traffic emissions associated with either the construction or operation of the pipeline, Hurrell Lane Gas Facility and Ebberston Well Site are Negligible, as there are small numbers of vehicles associated with either the construction or operational phases.

9.112 Operational effects of the Development are considered to be Negligible, as against AQS and EALs insignificant changes in NO_x and CO concentrations are anticipated and odours will be removed from routine emissions by the on-site sweetening plant. Atypical emissions from the site from the operation of the emergency flare are also considered to be insignificant as the flare is only anticipated to be operated once a year for approximately 15 minutes.

9.113 The residual effects associated with each aspect that has been assessed is described in **Table 9.15**.

Table 9.15: Summary of Effects Following Mitigation

Phase	Nature of Effect	Temporal and Spatial Extent	Significance
Construction	Construction plant emissions	Temporary, Local	Negligible
	Increase in fugitive dust emissions during construction	Temporary, Local	Negligible
	Construction traffic Emissions	Temporary, Local	Negligible
Operation	Operational traffic emissions	Temporary, Local	Negligible
	Operational plant emissions	Permanent, Local	Negligible

Cumulative and Interactive Effects

9.114 The scoping responses from North Yorkshire County Council and the Environment Agency do not list any potential cumulative or interactive effects that need to be considered with respect to the review of air quality.

Summary

9.115 The significance of effects for construction activities is considered to be Negligible due to the distance of construction from receptors, along with the construction dust management that will be implemented. The effects associated with traffic are considered to be Negligible, due to the small number of vehicles required to construct and operate the Proposed Development. Operational emissions are also considered to be Negligible, due to the small amounts of gas that will be combusted on-site and because of the BAT that will be utilised on-site to manage emissions.

9.116 In summary as the air quality significance of effects is considered to be Negligible. The Proposed Development is considered to comply with the relevant air quality policies and plans described in the planning policy context Section of this Chapter. All construction and operational air quality effects following mitigation are considered to be Negligible and therefore it is anticipated that air quality will not be a material planning consideration with respect to the above proposals.