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6 AIR QUALITY

6.1 Introduction & background

6.1.1 This chapter of the ES assesses the potential effects of the proposed development of IAMP ONE Phase Two site (the site) on air quality.

6.1.2 The proposed development at IAMP ONE Phase Two includes the removal of the existing topsoil within the site, in order to facilitate the development of the site as part of the wider IAMP area, and the construction of the new battery manufacturing facility. There are no vehicle generation increases arising from IAMP ONE Phase Two.

6.1.3 In addition, there will be emissions associated with the battery manufacturing processes taking place within the proposed development. A number of processes will result in emissions to air.

6.1.4 This ES chapter details the results of an air quality screening assessment, which considers the potential disamenity dust effects and fine particulate matter arising during the construction phase of the development. A qualitative discussion of air quality emissions arising from vehicular generation during the operational phase is also included and the assessment considers the findings from a previous air quality assessment undertaken as part of the wider IAMP ONE consent[1]. Finally, a detailed assessment, comprising air dispersion modelling, has also been undertaken to consider emissions to air from the proposed battery manufacturing processes.

6.2 Consultation and scope of the assessment

6.2.1 Informal consultation with Sunderland City Council (SCC) suggested that an air quality assessment be included within the EIA for the site, and that it should include modelling of stack emissions connected to the industrial processes. Sensitive receptors to be affected by the construction activities are outlined in Table 6.2.

6.2.2 The air quality effects of the operational phase were assessed as part of the wider IAMP ONE consent, although this did not consider any emissions to air from the proposed battery manufacturing processes. Owing to the reasons outlined in the introductory Chapters, the original outline application did not include the triangle of land forming the south-western part of the site (the location of the former West Moor Farm). For air quality (and transport), however the assessment considered the entirety of IAMP ONE as being operational. Consequently, vehicle generation and the

[1] Planning application ref. 18/00092/HE4

subsequent impacts this may have had on air quality have already been accounted for and modelled as part of the outline May 2018 Air Quality Environment Statement[1], prepared by Golder Associates. The air quality effects of the operational phase were also assessed as part of the 2020 IAMP ONE Phase Two consent. Compared to the previous two assessments, however, it is known that there will be fewer vehicle movements in relation to the operation of the current proposed development.

6.2.3 The demolition of West Moor Farm will provide land in excess of what was previously assessed in the May 2018 report[1], but this additional land will not result in a net increase in vehicle generation (rather, it is anticipated that vehicles movements will reduce for the proposed development). Consequently, all vehicle generation arising from IAMP ONE has already been assessed[1].

6.3 Methodology

Legislation, policy context & literature review

Relevant Air Quality Legislation & Guidance

6.3.1 The air quality assessment has been undertaken in accordance with the following legislation and guidance:

- The Environment Act 1995.
- Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, July 2007.
- The Air Quality Standards Regulations 2010.
- Department for Environment, Food and Rural Affairs, Local Air Quality Management Technical Guidance LAQM.TG(16), April 2021.
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework, July 2021.
- Department for Communities and Local Government, Planning Practice Guidance: Air Quality, November 2019.
- Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction v1.1, July 2016.
- Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning and Development Control: Planning for Air Quality v1.2, January 2017.
- Institute of Air Quality Management, A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites v1.1, May 2020., now

demolished

- Environment Agency, Air Emissions Risk Assessment for Your Environmental Permit, August 2016 (updated May 2021).
- Environment Agency, Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, March 2014.
- Conservation Agencies' Guidance on Evaluating Model Impacts Against Critical Loads.

6.3.2 Further details of these documents are included in Appendix 6.1.

Construction phase impacts

6.3.3 To assess the impacts associated with dust and fine particulate matter releases during the construction phase of the development, an assessment has been undertaken in accordance with guidance from the Institute of Air Quality Management (IAQM)[2]. Further details of the construction assessment methodology are provided in Appendix 6.2.

6.3.4 Three sensitive receptors have been identified within 350 m of the site, two human (high sensitivity, North Moor Farm and the former Usworth Cottages, now demolished) and one ecological receptor. The ecological receptor is the ecological and landscape mitigation area (ELMA), which borders to the land to the north of IAMP ONE. The land is not currently an ecological designation and, therefore, it would typically be assigned a low sensitivity in accordance with the IAQM Construction Guidance criteria. However, in recognition of the ELMA (and Green Belt) status of this land, a medium sensitivity is assigned to this area for the purposes of this assessment.

6.3.5 A summary of the closest sensitive receptors in relation to where construction phase activities will take place is detailed in Table 6.1.

Table 6.1: Closest Existing Sensitive Receptors to Construction Phase Activities

Receptor	Direction from the Site	Approximate distance to the closest on-site operation (m)*
North Moor Farm	North west	170
ELMA	North and west	Adjacent to site boundary
*Construction vehicles are expected to travel onto the A1290 and toward the A19(T). There are no sensitive receptors located on this route, within 50 m of the roadside at a distance of up to 500m from the construction site entrance		

[2] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction v1.1, July 2016

6.3.6 The criteria used to assess the construction impact of the proposed development, and the associated significance of effects at existing sensitive receptors, are included in Appendix 6.2.

Operational phase impacts

Road Traffic Emissions

6.3.7 A discussion of the potential impact, as a result of road traffic emissions, during the operational phase is outlined in this ES Chapter. Reference is made to the findings of the previous ES for IAMP ONE prepared by Golder Associates[1] and the 2020 ES for IAMP ONE Phase two. A review of the most recent air quality information is included in this chapter, as well as a discussion regarding vehicle-derived air quality impacts. It should be noted that, it is known that there will be fewer vehicle movements in relation to the operation of the current proposed development compared to the assumed movements assessed as part of the previous two assessments. As such, the previous two assessments constitute a worst-case scenario.

Process Emissions

6.3.8 With regard to emissions to air resulting from the proposed battery manufacturing processes, this was not considered within the previous ES. A detailed assessment has, therefore, been undertaken to consider the potential for air quality impacts as a result of emissions to air.

6.3.9 Potential emissions to atmosphere have been modelled using AERMOD (Lakes Environmental model version 9.9.5). This is a proprietary quantitative atmospheric dispersion model that is based upon the Gaussian theory of plume dispersion.

6.3.10 The dispersion modelling has been carried out in accordance with guidance from the IAQM[3] and the Environment Agency (EA) guidance on carrying out risk assessments for environmental permits[4].

6.3.11 The assessment of emissions to air from the manufacturing processes has considered the following sources:

- 4 No. cathode stacks associated with electrode manufacturing.
- 4 No. stacks associated with the electrolyte coating process area.

[3] Moorcroft and Barrowcliffe et al, Land-Use Planning and Development Control: Planning for Air Quality (v1.2), January 2017
[4] Environment Agency, Air emissions risk assessment for your environmental permit, August 2016 [Accessed at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit]

- 2 No. stacks associated with the steam generating boilers.
- 5 No. stacks associated with the Low Temperature Hot Water (LTHW) boilers.

6.3.12 Further details of the sources considered in the air quality assessment, and the modelling methodology, are provided in Appendix 6.3.

6.3.13 Details of the existing sensitive human receptors considered in the assessment of emissions to air are included in Table 6.2.

Table 6.2: Closest Existing Sensitive Human Receptors to Proposed Development

Receptor	Location		Direction from the Site	Approximate Distance to Site (m)
	X	Y		
ESR 1	433008	559056	North	290
ESR 2	433348	559511	North	610
ESR 3	433325	559682	North	780
ESR 4	433964	559014	East	570
ESR 5	434421	559599	North East	1,250
ESR 6	434628	559171	East North East	1,240
ESR 7	434701	558784	East	1,235
ESR 8	432334	557787	South West	1,120
ESR 9	431864	558150	West South West	1,305
ESR 10	431633	558997	West North West	1,450
ESR 11	431811	559418	North West	1,415
ESR 12	432337	559965	North North West	1,410

6.3.14 In addition, the EA guidance on carrying out risk assessments for environmental permits advises that the following screening distances apply to statutory designated habitat sites (referred to in the guidance as 'protected conservation areas') (see Figure 8.2):

- 10 km from a site (or 15 km for Part A(1) processes): Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites.
- 2 km from a site: Sites of Special Scientific Interest (SSSI) and local nature sites (including Ancient Woodland, Local Wildlife Sites (LWS), National Nature Reserves (NNR) and Local Nature Reserves (LNR)).

6.3.15 These screening distances are reiterated in the IAQM guidance on assessing air quality impacts on designated habitat sites[5].

6.3.16 Four statutory habitat sites have been identified within these distances (15 km has

[5] Institute of Air Quality Management, A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites v1.1, May 2020

been assumed as a worst-case approach):

- Barmston Pond LNR, approximately 1,175 m to the south south west, at the closest point
- Hylton Dene LNR, approximately 1,530 m to the east south east, at the closest point. The Hylton Dene LWS and Tilesheds LWS are also located within the boundary of this LNR.
- Durham Coast SAC, approximately 7,600 m to the east north east, at the closest point.
- Northumbria Coast Ramsar site/SPA, approximately 7,275 m to the east, at the closest point.

6.3.17 In addition to the statutory sites listed above, it has been possible to identify two further existing LWSs, and three candidate LWSs, located within a 2km radius of the site:

- Severn Houses LWS, approximately 880 m to the south west.
- High Wood LWS, approximately 1,700 m to the south.
- River Don candidate LWS, approximately 580 m to the north.
- Usworth Burn (River Don South) candidate LWS, approximately 520m to the north.
- Elliscope Farm East/Hylton Bridge candidate LWS, approximately 620 m to the north.

6.3.18 No detailed habitat information is available on the online MAGIC resource[6] for the River Don or Usworth Burn candidate LWSs so full assessment of these cannot be included.

6.3.19 Details of the existing sensitive ecological receptor points considered in the assessment of emissions to air are included in Table 6.3.

Table 6.3: Closest Existing Sensitive Ecological Receptors to Proposed Development

Designated Site	Receptor Point	Location	
		X	Y
Barmston Pond LNR	ECO 1	432898	557317
	ECO 2	432826	557377
	ECO 3	432757	557436

[6] Accessed at: https://magic.defra.gov.uk/MagicMap.aspx

Table 6.3: Closest Existing Sensitive Ecological Receptors to Proposed Development			
Designated Site	**Receptor Point**	**Location**	
		X	**Y**
	ECO 4	432502	557295
	ECO 5	432526	556917
Hylton Dene LNR (including Hylton Dene and Tilesheds LWSs)	ECO 6	434998	558111
	ECO 7	434977	558286
	ECO 8	434991	558395
	ECO 9	435179	558458
	ECO 10	435395	558651
Northumbria Coast Ramsar site/SPA	ECO 11	442469	550558
Northumbria Coast Ramsar site/SPA and Durham Coast SAC	ECO 12	442020	551558
	ECO 13	441510	553317
	ECO 14	441266	554722
Northumbria Coast Ramsar site/SPA	ECO 15	440691	559575
	ECO 16	440654	559929
Northumbria Coast Ramsar site/SPA and Durham Coast SAC	ECO 17	440766	561003
	ECO 18	440853	561335
	ECO 19	441075	561641
	ECO 20	441256	562268
	ECO 21	441306	562877
Durham Coast SAC	ECO 22	441068	563824
	ECO 23	439916	564875
	ECO 24	438341	566409
Northumbria Coast Ramsar site/SPA	ECO 25	437290	567782
	ECO 26	436692	568865
	ECO 27	435756	572415

6.3.20 The existing and candidate LWSs have not been considered as specific receptor points in the assessment but they are located within the area covered by the Uniform Cartesian Grid included in the dispersion model. High Wood LWS is not located within the grid area and therefore the highest results from the nearby Barmston Ponds LNR have been used, as a robust approach.

Assessment criteria

6.3.21 The relevant air quality objectives and limit values applicable to the assessment of air quality effects at existing sensitive human receptors are set out in Table 6.4, below.

6.3.22 The battery manufacturing processes taking place at the site will make use of two different types of solvent: N-Methyl-2-Pyrrolidone (NMP) and Ethyl Carbonate. There are no specific air quality objectives or Environmental Assessment Levels (EALs) for these solvents and, therefore, they have been considered as total Volatile Organic

Compounds (VOCs), with predicted concentrations compared against the air quality objective for Benzene (C_6H_6).

Table 6.46: Air Quality Objectives and Limit Values Relevant to the Assessment*			
Pollutant	**Objective/Limit Value**	**Averaging Period**	**Obligation**
Nitrogen Dioxide (NO_2)	200µg/m³, not to be exceeded more than 18 times a year	1-hour mean	All local authorities
	40µg/m³	Annual mean	All local authorities
Particulate Matter (PM_{10})	50µg/m³, not to be exceeded more than 35 times a year	24-hour mean	England, Wales and Northern Ireland
	40µg/m³	Annual mean	England, Wales and Northern Ireland
Particulate Matter ($PM_{2.5}$)	Limit Value of 25µg/m³	Annual mean	England, Wales and Northern Ireland
Carbon Monoxide (CO)	10mg/m³	Maximum daily running 8-hour mean	England, Wales and Northern Ireland
Benzene (C_6H_6)	5µg/m³	Annual mean	England and Wales
**In accordance with the Air Quality Standards Regulations 2010*			

6.3.23 Modelled airborne pollutant concentrations and deposition rates, at locations within relevant statutory designated habitat sites, have been assessed against critical levels and critical loads respectively.

6.3.24 The relevant critical levels used in the assessment of air quality effects, associated with airborne pollutant concentrations, at existing sensitive ecological receptor points are included within Table 6.5.

Table 6.56: Critical Levels Relevant to the Assessment			
Pollutant	**Objective/Limit Value**	**Averaging Period**	**Obligation**
Nitrogen Oxide (as NO_2)	75µg/m³	24-hour mean	All local authorities
	30µg/m³	Annual mean	All local authorities

6.3.25 Nitrogen Dioxide (NO_2) is a nitrogen containing pollutant and its deposition to ground can promote eutrophication and acidification. Both eutrophication and acidification can cause substantial alterations in soil chemistry (including nutrient status) and plant community composition. Critical loads define the maximum amount of an atmospheric pollutant that can be deposited onto soils, waters or vegetation without causing adverse harmful effects in the long term.

6.3.26 Site relevant critical loads for nutrient nitrogen and acid deposition have been obtained for the SPAs and SACs from the Air Pollution Information System (APIS) online resource[7].

6.3.27 As specific values are not provided for LNRs and LWSs, the APIS 'Search by Location' tool has been used to derive critical loads for the location of each LNR and LWS considered. The lowest value has been used for each LNR and LWS to provide a conservative assessment.

6.3.28 Further details of the critical loads used in the assessment are provided in Table 6.6.

Table 6.66: Critical Loads Relevant to the Assessment

Designated Site	Sensitive Feature	Relevant Nitrogen Critical Load (kgN/ha/yr) / Habitat	Nitrogen-Derived Acid Deposition Critical Load (kEq/ha/year)
Barmston Pond Local Nature Reserve (LNR)	Broadleaved, Mixed and Yew Woodland	10	CLminN: 0.357 CLmaxN: 2.733
Hylton Dene Local Nature Reserve (LNR)	Broadleaved, Mixed and Yew Woodland	10	CLminN: 0.357 CLmaxN: 2.73
Durham Coast Special Area of Conservation (SAC)	Vegetated sea cliffs of the Atlantic and Baltic Coasts	No comparable habitat with established critical load available	Not sensitive
Northumbria Coast Ramsar site/Special Protection Area (SPA)	Sternea paradisea/ Sterna albifrons (little tern)	8	MinCLminN: 0.223 MinCLmaxN: 0.786
High Wood Local Wildlife Site (LWS)	Broadleaved, Mixed and Yew Woodland	10	CLminN: 0.357 CLmaxN: 2.734
Severn Houses Local Wildlife Site (LWS)	Coniferous Woodland	5	CLminN: 0.357 CLmaxN: 2.733
Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	Broadleaved, Mixed and Yew Woodland	10	CLminN: 0.357 CLmaxN: 2.729

6.3.29 As there are no established critical loads for the sensitive feature within Durham Coast

[7] [Accessed at: http://www.apis.ac.uk/]

SAC, and no features sensitive to acid deposition, this designated site has not been considered further within the assessment.

6.3.30 In addition, it has not been possible to obtain any detailed information about the habitats within the two candidate LWSs.

6.3.31 The EA guidance states that emissions can be screened out, for Ramsar sites/SPAs/SACs and SSSIs, where the following criteria apply:

- The short-term Process Contribution (PC) is less than 10% of the short-term environmental standard for protected conservation areas.
- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

6.3.32 Where these requirements are not met, the Predicted Environmental Concentration (PEC) should be calculated for long-term concentrations only and should be compared against the above criteria. If the long-term PC is greater than 1%, but the PEC is less than 70% of the long-term environmental standard, the emissions are considered not significant.

6.3.33 For local nature sites (such as LNRs and LWSs), emissions can be screened out where both of the following criteria apply:

- The short-term PC is less than 100% of the short-term environmental standard.
- The long-term PC is less than 100% of the long-term environmental standard.

6.3.34 Should these criteria be exceeded, it does not necessarily follow that there will be a consequent significant ecological effect; rather it indicates the potential for such an effect to occur.

6.4 Baseline situation

Background air pollutant concentrations

6.4.1 The air quality assessment needs to take into account background concentrations upon which emissions from the proposed development are superimposed.

6.4.2 As there are currently no representative NO_2, PM_{10} or $PM_{2.5}$ monitoring locations in the vicinity of the proposed development site, background concentrations have been obtained from the 2018-based Defra default concentration maps for the appropriate

grid squares[8].

6.4.3 In addition, background CO and C_6H_6 concentrations have been obtained from the 2001-based Defra default concentration maps for the appropriate grid squares[9]. These have been adjusted to 2021 using the associated adjustment factors provided by Defra in the Background Concentration Maps User Guide[10].

6.4.4 The background pollutant concentrations used in the assessment of air quality impacts at existing sensitive human receptors are detailed in Table 6.7.

Table 6.7: Background Pollutant Concentrations used in the Air Quality Assessment

Receptor	2021 Annual Mean Concentrations (µg/m³)					
	Oxides of Nitrogen (NO_x)	Nitrogen Dioxide (NO_2)	Fine Particulate Matter (PM_{10})	Fine Particulate Matter ($PM_{2.5}$)	Carbon Monoxide (CO)	Benzene (C_6H_6)
ESR 1	15.46	11.61	11.98	6.83	0.16	0.33
ESR 2	15.46	11.61	11.98	6.83	0.16	0.33
ESR 3	15.46	11.61	11.98	6.83	0.16	0.33
ESR 4	15.46	11.61	11.98	6.83	0.16	0.33
ESR 5	21.35	15.52	12.76	7.57	0.15	0.29
ESR 6	21.35	15.52	12.76	7.57	0.15	0.29
ESR 7	35.87	23.49	12.83	7.86	0.15	0.29
ESR 8	18.90	13.85	12.66	7.09	0.16	0.30
ESR 9	18.80	13.79	10.51	6.59	0.15	0.33
ESR 10	18.80	13.79	10.51	6.59	0.15	0.33
ESR 11	15.08	11.35	11.49	6.70	0.15	0.32
ESR 12	14.30	10.82	12.43	6.87	0.15	0.32

6.4.5 Background pollutant concentrations at and in the vicinity of the proposed development are well below the relevant air quality objectives/limit values.

6.4.6 Current pollutant concentrations and deposition rates at the considered designated habitat sites have been taken from the APIS resource and are shown in Table 6.8.

Table 6.86: Current Air Pollutant Conditions at the Considered Designated Habitat Sites

Designated Site	Nitrogen Deposition (kg N/ha/yr)	Acid Deposition (Nitrogen, keq/ha/yr)	NO_x Concentration (µg/m³)
Barmston Pond Local Nature Reserve (LNR)	24.64	1.76	21.73

[8] Accessed through the Defra Local Air Quality Management webpages [http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html]
[9] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2001
[10] Available at: https://laqm.defra.gov.uk/documents/2018-based-background-maps-user-guide-v1.0.pdf

Table 6.86: Current Air Pollutant Conditions at the Considered Designated Habitat Sites			
Designated Site	**Nitrogen Deposition (kg N/ha/yr)**	**Acid Deposition (Nitrogen, keq/ha/yr)**	**NO_x Concentration (µg/m³)**
Hylton Dene Local Nature Reserve (LNR)	25.62	1.83	23.01
Durham Coast Special Area of Conservation (SAC)	8.9	0.6	10.91
Northumbria Coast Ramsar site/Special Protection Area (SPA)	8.7	0.6	7.23
High Wood Local Wildlife Site (LWS)	24.64	1.76	18.84
Severn Houses Local Wildlife Site (LWS)	24.64	1.76	21.73
Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	24.64	1.76	17.52

Sunderland city council & local pollution review

6.4.7 The proposed development is located on land to the north of the A1290, north of the existing Nissan manufacturing plant, surrounded by arable farming land and the under-development IAMP ONE site. There are no significant sources of pollution near the site, however the A19(T) is located approximately 1.4 km to the east.

6.4.8 There are no air quality monitors operated by SCC in the vicinity of the site and no air quality monitoring was undertaken as part of the IAMP ONE submission.

6.4.9 For the preparation of the Preliminary Environmental Information Report (which has been prepared to accompany the IAMP TWO Development Consent Order application), air quality monitoring has been undertaken by the Applicant. A 9-month monitoring study was completed at 9 locations in the local area (near and around the A1290 and A19), and data has been annualised. Of most relevance to this assessment are diffusion tubes 1 and 2, which are located at the A1290, at West Moor Farm and near Downhill Lane which is the closest monitoring location to the site. Annualised 2018 NO_2 concentrations were 22.10µg/m^3 and 20.80µg/m^3 respectively.

6.5 Assessment of effects

Construction phase

Step 1 – Requirement for Detailed Construction Phase Assessment

6.5.1 There are sensitive receptors located within 350 m of the future construction activities. The requirement for a detailed construction phase risk assessment is met.

6.5.2 The IAMP ONE outline submission[1] includes sensitive receptors around the entirety of the red line boundary. It is, therefore, anticipated that the permitted dust mitigation scheme will already account for risks higher than those predicted in this assessment.

6.5.3 The demolition of West Moor Farm is included and considered within the previous 2020 assessment and, as such, is not repeated here. It is also noted that the demolition of West Moor Farm is now subject to a separate detailed application that was submitted in June 2021 in order to bring forward the demolition date.

Step 2 – Impact Assessment

6.5.4 In accordance with the IAQM guidance, the main activities to be considered during the construction phase of the proposed development are earthworks, construction and trackout. There are no demolition activities associated with the proposed development.

6.5.5 Earthworks covers the processes of soil-stripping, ground-levelling, excavation and landscaping. Earthworks also encompasses any material handling activities that may be required either during the working of the surfaces or by unloading/loading activities.

6.5.6 Construction activities will focus on the construction of proposed buildings, access roads and car parking areas. This includes the foundation design and casting concrete.

6.5.7 Trackout is defined as the transport of dust and dirt by vehicles travelling from a construction site on to the public road network. This may occur through the spillage of dusty materials onto road surfaces or through the transportation of dirt by vehicles that have travelled over muddy ground on the site. This dust and dirt can then be deposited and re-suspended by other vehicles.

Step 2A

6.5.8 Step 2A of the assessment defines the potential dust emission magnitude from earthworks, construction and trackout in the absence of site-specific mitigation. Examples of the criteria for the dust emission classes are detailed in Appendix 6.2. The results of this step are detailed in Table 6.9.

Step 2B

6.5.9 Step 2B of the construction phase dust assessment defines the sensitivity of the area, taking into account the significance criteria detailed in Appendix 6.2, for earthworks,

construction and trackout. The sensitivity of the area to each activity is assessed for potential dust soiling, human health effects and ecological effects.

6.5.10 For earthworks and construction, there are currently between 1 and 10 receptors (residential) within 350 m of where these activities may take place, which is assumed to be the site boundary for the purposes of this assessment. The ELMA is estimated to be located within 20 m of an earthwork activity but up to 50 m from a construction-specific activity.

6.5.11 For trackout, there are no sensitive receptors located within 50 m of where trackout may occur for a distance of up to 500 m from the site entrance (assuming construction vehicles exit onto the A1290 and travel to the A19). Notwithstanding the IAQM Construction Guidance terminology, the sensitivity of the area is defined as medium.

Step 2C

6.5.12 Step 2C of the construction phase dust assessment defines the risk of impacts from each activity, by combining the dust emission magnitude with the sensitivity of the surrounding area.

6.5.13 The risk of dust impacts from each activity, with no mitigation in place, has been assessed in accordance with the criteria detailed in Appendix 6.2. The results of this step are detailed in Table 6.9.

Summary of Step 2

6.5.14 Table 6.9 details the results of Step 2 of the construction phase assessment for the sensitive receptors identified.

Table 6.9: Construction Phase Dust Assessment for Sensitive Receptors

	Activity			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Step 2A				
Dust Emission Magnitude	N/A	Large[a]	Large[b]	Large[c]
Step 2B				
Sensitivity of Closest Human Receptors	N/A	High	High	High
Sensitivity of Closest Ecological Receptors (ELMA)	N/A	Medium	Medium	Medium
Sensitivity of Area to Ecological Impacts	N/A	Medium	Low	Low
Sensitivity of Area to Dust Soiling Effects	N/A	Low	Low	Low

Table 6.9: Construction Phase Dust Assessment for Sensitive Receptors				
	Activity			
	Demolition	Earthworks	Construction	Trackout
Sensitivity of Area to Human Health Effects	N/A	Low[d]	Low[d]	Low[d]
Step 2C				
Dust Risk: Dust Soiling	N/A	Low Risk	Low Risk	Low Risk
Dust Risk: Human Health	N/A	Low Risk	Low Risk	Low Risk
Dust Risk: Ecological	N/A	Medium Risk	Low Risk	Low Risk

a. Total site area estimated to be more than 10,000m^2

b. Total building volume estimated to be more than100,000m^3, with potentially dusty construction materials involved

c. Number of construction phase vehicles estimated to be more than 50 movements per day (the IAMP ONE Phase One submission estimates up to 84 movements per day)

d. Background annual mean PM_{10} concentration is taken from the LAQM Defra default concentration maps, for the appropriate grid square for 2021

Operational phase

Road traffic emissions

6.5.15 The proposed development does not introduce any new vehicle flows.

6.5.16 The IAMP ONE submission[1] included an operational phase assessment of vehicle generation, using the detailed modelling software ADMS-Roads. The assessment predicted air quality pollutant (NO_2, PM_{10} and $PM_{2.5}$) concentrations at various sensitive receptor locations and for a proposed 2020 future operational year. The scope of study covered the main road network to be utilised by the development (this included the A1290, A19, A1231 and A184).

6.5.17 The air quality assessment predicted negligible air quality changes and that pollutant concentrations would be below the air quality objectives and limit values in all scenarios considered.

6.5.18 The additional extent of development land included as part of this submission is not expected to result in significant effects or even any changes to those conclusions predicted previously, in terms of air quality.

Process Emissions

Existing Sensitive Human Receptors

6.5.19 NO_x and CO concentrations, as a result of the operation of the steam-generating boilers and LTHW boilers have been modelled at a number of existing human and ecological sensitive receptors/receptor points, where applicable.

6.5.20 In addition, NMP and Ethyl Carbonate concentrations, as a result of the operation of the electrode manufacturing and electrolyte coating processes, have been modelled at a number of existing human sensitive receptors.

6.5.21 The predicted NO_x concentrations have been converted to NO_2 concentrations in line with EA recommendations.

6.5.22 The background concentrations of NO_2, detailed in Table 6.7, have been used to determine the PEC at each human receptor, for each year of meteorological data. The PC and PEC as a percentage of the relevant air quality objective have then been determined for each receptor, for each year of meteorological data.

6.5.23 The highest NO_2 concentrations/percentages, for the existing sensitive human receptors predicted to experience to highest PCs, are summarised in Table 6.10.

Table 6.10: Maximum Modelled NO_2 Concentrations for Existing Sensitive Human Receptors

Pollutant	AQO	ESR	PC	PEC	PC/AQO	PEC/AQO
NO_2 Annual Mean	40µg/m³	ESR 1 (North Moor Farm) and ESR 7 (Ferryboat Lane)	2.40µg/m³	24.22µg/m³	6.01%	60.55%
NO_2 1-hour Mean (99.8th Percentile)	200µg/m³, not to be exceeded more than 18 times a year	ESR 1 (North Moor Farm) and ESR 7 (Ferryboat Lane)	30.32µg/m³	60.37µg/m³	15.16%	30.37%

6.5.24 The background concentrations of CO, detailed in Table 6.7, have been used to determine the PEC at each human receptor, for each year of meteorological data. The PC and PEC as a percentage of the relevant air quality objective have then been determined for each receptor, for each year of meteorological data.

6.5.25 The highest CO concentrations/percentages, for the existing sensitive human receptors predicted to experience to highest PCs, are summarised in Table 6.11.

Table 6.11: Maximum Modelled CO Concentrations for Existing Sensitive Human Receptors

Pollutant	AQO	ESR	PC	PEC	PC/AQO	PEC/AQO
CO Maximum Daily Running 8-hour Mean	10mg/m³	ESR 1 (North Moor Farm)	0.05µg/m³	0.37µg/m³	0.49%	3.69%

6.5.26 The background concentrations of C_6H_6, detailed in Table 6.7, have been used to determine the PEC at each human receptor, for each year of meteorological data. The PC and PEC as a percentage of the relevant air quality objective have then been determined for each receptor, for each year of meteorological data.

6.5.27 The highest C_6H_6 concentrations/percentages, for the existing sensitive human receptors predicted to experience to highest PCs, are summarised in Table 6.12.

Table 6.12: Maximum Modelled NMP and Ethyl Carbonate (as C_6H_6) Concentrations for Existing Sensitive Human Receptors

Pollutant	AQO	ESR	PC	PEC	PC/AQO	PEC/AQO
NMP (as C_6H_6) Annual Mean	5µg/m³	ESR 1 (North Moor Farm)	0.002µg/m³	0.33µg/m³	0.04%	6.64%
Ethyl Carbonate (as C_6H_6) Annual Mean	5µg/m³	ESR 1 (North Moor Farm)	0.30µg/m³	0.63µg/m³	6.08%	12.68%

6.5.28 The results confirm that the maximum modelled PCs and PECs do not exceed the relevant air quality objectives for any of the existing sensitive human receptors considered in the assessment (i.e. ESR 1 to ESR 12).

6.5.29 In addition, the potential air quality effect at the existing sensitive human receptors has been assessed in accordance with the impact descriptors within the IAQM Air Quality and Planning guidance (as included in Table 6.1/2 in Appendix 6.1). This allows the significance of the impact to be determined.

6.5.30 Taking into account the PC (and for long term emissions, the PEC), the overall air quality impact is classed as a Negligible or Slight Adverse, in accordance with the IAQM guidance, resulting in an overall **Not Significant** effect.

6.5.31 The modelled pollutant concentrations for the considered receptors, along with the Cartesian grid point(s) experiencing the maximum modelled concentrations, are detailed in Appendix 6.4.

Existing sensitive ecological receptor points

6.5.32 In-line with the EA guidance, the short-term and long-term PCs have been compared against the relevant critical levels. The PC values, as a percentage of the relevant critical level, have been determined for each receptor point considered, for each year of meteorological data.

6.5.33 Short-term and long-term PCs have been predicted at the existing sensitive ecological receptor points. The highest NO_2 concentrations/percentages are summarised in Table 6.13.

Table 6.13: Maximum Modelled NO_2 Concentrations for Existing Sensitive Ecological Receptor Points				
Pollutant	**Critical Level**	**Habitat Site**	**PC**	**PC as % of Critical Level**
NO_2 Annual Mean	30µg/m³	Barmston Pond Local Nature Reserve (LNR)	0.21µg/m³	0.69%
		Hylton Dene Local Nature Reserve (LNR)	0.44µg/m³	1.45%
		Northumbria Coast Ramsar site/Special Protection Area (SPA)	0.06µg/m³	0.19%
		High Wood Local Wildlife Site (LWS)	0.21µg/m³	0.69%
		Severn Houses Local Wildlife Site (LWS)	0.20µg/m³	0.67%
		Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	0.59µg/m³	1.96%
NO_2 24-hour Mean[a]	75µg/m³	Barmston Pond Local Nature Reserve (LNR)	3.35µg/m³	4.46%
		Hylton Dene Local Nature Reserve (LNR)	6.98µg/m³	8.93%
		Northumbria Coast Ramsar site/Special Protection Area (SPA)	0.47µg/m³	0.63%
		High Wood Local Wildlife Site (LWS)	3.35µg/m³	4.46%
		Severn Houses Local Wildlife Site (LWS)	3.60µg/m³	4.80%
		Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	6.79µg/m³	9.06%
[a] Worst-case conversion from NO_x to NO_2 applied (100%) to provide a conservative approach				

6.5.34 The results confirm that the maximum modelled PCs do not exceed 100% of the short-term or long-term critical levels, for the protection of vegetation, for any of the modelled receptor points within the nearby LNRs or (candidate) LWSs.

6.5.35 In addition, the results confirm that the maximum modelled PCs do not exceed 10% of the short-term nor 1% of the long-term critical levels, for the protection of vegetation, for any of the modelled receptor points within the Northumbria Coast Ramsar site/SPA.

6.5.36 It is, therefore, not necessary to proceed to a comparison of PECs against the critical levels, as NO_2 emissions are considered to be Not Significant at the designated habitat sites considered (in accordance with EA guidance).

6.5.37 The maximum modelled nutrient nitrogen and acid deposition rates, due to emissions from the battery manufacturing processes, are detailed in Table 6.14.

Table 6.14: Maximum Modelled Deposition Rates for Nutrient Nitrogen and Acid at Existing Sensitive Ecological Receptor Points

Designated Habitat Site	Highest Modelled Nutrient Nitrogen Deposition Rate PC (kgN/ha/yr)	Highest Modelled Acid Deposition Rate PC (kEq/ha/yr)
Barmston Pond Local Nature Reserve (LNR)	0.059	0.004
Hylton Dene Local Nature Reserve (LNR)	0.125	0.009
Northumbria Coast Ramsar site/Special Protection Area (SPA)	0.008	0.001
High Wood Local Wildlife Site (LWS)	0.059	0.004
Severn Houses Local Wildlife Site (LWS)	0.058	0.004
Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	0.557	0.170

6.5.38 The process contribution to nutrient nitrogen deposition has been assessed as a percentage of the critical load. Nitrogen-derived acid deposition has been assessed in accordance with guidance published by APIS[11]. The guidance provided with this tool enables a calculation to be made of the contribution to acid deposition as a percentage of the relevant critical load value. This guidance advises:

"Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

Where PEC N Deposition > CLminN.

*PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100"*

6.5.39 For this assessment, the PEC was greater than CLminN in every case and consequently the above calculation was used to calculate the PC as a percentage of the critical load function.

6.5.40 The results are presented in Table 6.15.

[11] Available on the APIS website [http://www.apis.ac.uk/clf-guidancel]

Table 6.15: Assessment of Maximum Modelled Deposition Rates, for Nutrient Nitrogen and Acid, Against Critical Loads

Designated Habitat Site	Nutrient Nitrogen Deposition		Acid Deposition	
	Critical Load (kgN/ha/yr)	Highest Modelled PC as % of Critical Load	Critical Load – MinCLmaxN (kEq/ha/yr)[a]	Highest Modelled PC as % of Critical Load
Barmston Pond Local Nature Reserve (LNR)	10	0.59%	2.733	0.15%
Hylton Dene Local Nature Reserve (LNR)	10	1.25%	2.73	0.33%
Northumbria Coast Ramsar site/Special Protection Area (SPA)	8	0.10%	0.786	0.08%
High Wood Local Wildlife Site (LWS)	10	0.59%	2.733	0.15%
Severn Houses Local Wildlife Site (LWS)	5	1.16%	2.733	0.15%
Elliscope Farm East/Hylton Bridge candidate Local Wildlife Site (LWS)	10	1.70%	2.729	0.44%

[a] *Lowest critical load applied*

6.5.41 The results confirm that the maximum modelled PCs, for both nutrient nitrogen and acid deposition, do not exceed 100% of the long-term critical loads, for the protection of vegetation, for any of the modelled receptor points within the nearby LNRs or (candidate) LWSs.

6.5.42 In addition, the results confirm that the maximum modelled PCs do not exceed 10% of the short-term nor 1% of the long-term critical levels, for the protection of vegetation, for any of the modelled receptor points within the Northumbria Coast Ramsar site/SPA.

6.5.43 It is not therefore necessary to proceed to a comparison of PECs against the critical loads, as NO_2 emissions are considered to be **Not Significant** at the designated habitat sites considered (in accordance with EA guidance).

6.5.44 The maximum modelled NO_2 concentrations/deposition rates, expressed as a proportion of the relevant critical levels and critical loads respectively, for the considered existing sensitive ecological receptor points are detailed in Appendix 6.5.

6.6 Mitigation measures

Construction phase

Step 3 – Mitigation

6.6.1 During the construction phase, the implementation of effective mitigation measures will substantially reduce the potential for nuisance dust and fine particulate matter to be generated, which can be secured by planning condition.

6.6.2 Step 2C of the assessment has identified that the risk of dust soiling, human health and ecological effects is not negligible for all the activities and therefore site-specific mitigation will need to be implemented to ensure dust effects from these activities will be Not Significant.

6.6.3 Best practice dust control measures are recommended and would be set out in more detail in a Dust Management Plan (DMP), prepared as part of the Construction Environmental Management Plan (CEMP) for the site, in advance of development commencing.

6.6.4 Examples of typical dust controls, included in the Management Plan, are:

- Regular grading and maintenance of haul roads, if used within the site.
- Speed restrictions on vehicles within the site.
- Recording of all dust complaints and prompt action to address these, keeping a detailed written log of received information and complaints, and actions taken to resolve the situation.
- Provision of training to the onsite personnel on dust mitigation.
- Laden lorries to be covered before leaving the site.
- Provision of water bowsers to spray haul roads and stockpiles with water to suppress dust emissions, as necessary.
- Minimising of stockpiling heights, thereby reducing wind whipping and lofting.

Operational phase

Road traffic emissions

6.6.5 No additional mitigation above that required for IAMP ONE Phase One is deemed necessary, due to there being no prediction of significant effects. Mitigation measures required for IAMP ONE include a number of transport-related measures, including junction upgrades, traffic management improvements and a travel plan.

Process emissions

6.6.6 The results of the assessment confirm that the maximum modelled PCs and PECs do not exceed the relevant air quality objectives for any of the existing sensitive human receptors. The potential air quality effect is also considered to be Not Significant in accordance with the IAQM Air Quality and Planning guidance.

6.6.7 The results of the assessment also confirm that the maximum modelled PCs do not exceed the relevant screening criteria, for either critical levels or critical loads, for any of the modelled existing sensitive ecological receptor points considered in the assessment. The emissions from the modelled source are, therefore, not considered to be significant at any designated habitat sites considered.

6.6.8 On this basis, it is considered that there will be sufficient dispersion of all pollutants considered, meaning further mitigation will not be required. It should also be noted that the proposed development will operate under an Environmental Permit, which will be regulated by either the Local Authority or the EA (dependent on the final details of the proposed manufacturing processes).

6.7 Residual effects

6.7.1 Residual effects are those effects of the development that remain after mitigation measures have been implemented. With the implementation of the measures set out in the DMP, residual effects are expected to be Negligible (**Not Significant**) for construction and operation.

6.8 Cumulative effects

Construction phase

6.8.1 The construction and working of land within the site will be completed as part of the construction of IAMP ONE. The identified committed developments requiring due consideration for cumulative effects will not cause adverse risks during their construction period, should this coincide with that of the site (i.e. increased disamenity dust and fine particulate matter releases) due to the distances between these developments and the site. No consideration of potential cumulative effects of construction is, therefore. required for these.

6.8.2 Both IAMP ONE, this development and the future developments at IAMP TWO would all be worked in accordance with an approved CEMP, which will outline an extensive

list of mitigation ensuring that the potential for dust and fine particulate matter arising from construction activities will be minimal and will be controlled.

Operational phase

Road traffic emissions

6.8.3 In relation to the cumulative effects associated with traffic generation and air quality, the outline submission[1] considered two committed developments within the traffic data modelled: Hillthorn Farm Commercial Park and Turbine Business Park. Owing to the low pollutant concentration predictions presented in the air quality report accompanying the 2018 outline submission, it is anticipated that any additional committed developments that might be considered would not change the overall conclusions of the assessment and would remain as Negligible and **Not Significant**. There is no additional vehicle generation arising from IAMP ONE Phase Two. Rather, vehicle movements are anticipated to reduce from those approved.

Process emissions

6.8.4 A review of nearby committed and proposed developments suggests that there are no known similar emission sources proposed in the local area other than the existing Nissan battery plant which is part of the baseline. The most relevant developments for consideration of cumulative effects are the IAMP One Phase 1 development, and further light industrial, general industrial and storage distribution units proposed at Hillthorn Farm (approximately 1.21 km to the south west of the site) and consented at Follingsbury International Enterprise Park (approximately 2.49 km to the north west).

6.8.5 Although these developments do include for light industrial, general industrial and distribution uses, these do not include for a manufacturing facility on the scale of that proposed for the IAMP One Phase 2 development. The use of NMP and Ethyl Carbonate in particular is restricted to certain types of processes and therefore would be unlikely to be used in significant quantities elsewhere.

6.8.6 Given the distances involved between these sites, and the results of the air quality assessment, it is considered extremely unlikely that any significant cumulative air quality effects will arise.

6.8.7 Full details of the nearby committed and proposed developments in the local area are provided in Table 2.5 of Chapter 2 of this ES.

6.9 Limitations of study

Road traffic emissions

6.9.1 There were no known limitations to this study.

6.9.2 As there will be no changes to the upper limit of forecast traffic generation considered for IAMP ONE, the findings of the 2018 assessment are considered still valid (details pertaining to traffic flows, trip generation and distribution, etc. are set out in the IAMP ONE ES and TA).

Process emissions

6.9.3 The precise design of the proposed battery manufacturing process is yet to be finalised but there is sufficient understanding to carry out the impact assessment. The air quality assessment, therefore, considers a worst-case scenario in terms of the process emissions, both through the type and number of each source considered. This has been carried out in collaboration with the client and the technology suppliers for each stage of the process. It is, however, likely that the final design will result in changes to the precise configuration of the emission sources.

6.9.4 Input information for the air dispersion model has been provided in good faith, based on assumptions about the proposed battery manufacturing process or from scaled-up data collected from the nearby existing plant. Worst-case inputs have been chosen, wherever possible.

6.9.5 With regard to the process design, the air dispersion model includes both the steam generating boilers and LTHW boilers as point sources. It is, however, unlikely that both will be required as part of the final design and therefore this represents an overestimation of the emissions from the site.

6.9.6 It should be noted that it is possible that an alternative to the use of gas fired steam boilers may become part of the process design in the future. Should that be the case, gas fired dehumidifier plant will be required for the effective operation of the battery manufacturing process. Emissions from this type of plant are however considered trivial compared to the other combustion sources at the site (i.e. the steam generating boilers and LTHW boilers), which have been modelled as part of this assessment. The modelled scenario therefore remains a robust approach.

6.9.7 The air quality assessment also adopts a conservative approach to try to address the uncertainties involved with atmospheric dispersion modelling. This approach includes:

- Assuming that all sources will be operational at all times, which may not be the case in reality.
- Using a worst-case conversion for NO_x to NO_2 concentrations (i.e. a 50% conversion rate for short-term concentrations and a 100% conversion rate for long-term concentrations).
- Running the model separately for the most recent five years of meteorological data, with the highest results presented.

6.9.8 As a result of these conservative inputs, the model is considered more likely to provide an overestimation of the potential air quality effects, associated with the sources at the proposed battery manufacturing plant, than an underestimation.

6.10 Summary and conclusions

6.10.1 An air quality assessment has been completed which considers the potential air quality effects of both the construction and operational phases of the IAMP ONE Phase Two development proposals.

6.10.2 A construction phase risk assessment has concluded that there is a risk of potential disamenity dust and fine particulate matter releases associated with the earthworks, construction and trackout activities during construction of the development. Mitigation to control and limit dust generation during construction would be outlined in a CEMP.

6.10.3 A qualitative review of the potential air quality effects relating to road traffic emissions during the operation of the proposed development has been undertaken. A review of the baseline indicates pollutant concentrations in the local area are well below the relevant air quality objectives and limit values.

6.10.4 All traffic arising from IAMP ONE has been assessed in the previous 2018 ES that was prepared by Golder Associates and the 2020 IAMP ONE Phase Two ES prepared by Wardell Armstrong. The planning application was granted, and the Air Quality Chapter concluded a Negligible (Not Significant) effect upon air quality. There are no vehicle increases proposed as part of this development and, therefore, there will be no adverse air quality changes arising. A Negligible (Not Significant) effect is predicted. No significant cumulative impacts on air quality have been identified.

6.10.5 A detailed assessment has also been undertaken to consider the potential for air quality effects arising as a result of emissions from the battery manufacturing

processes that will take place at the site. The assessment concludes that there will be a Negligible to Slight Adverse (Not Significant) effect for nearby existing sensitive human receptors, and a Negligible (Not Significant) effect for the closest existing sensitive ecological receptor points. No significant cumulative impacts on air quality have been identified.