AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement – Volume 3 – Appendix 23.4 Air Quality Generator Emissions Modelling

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

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APPENDIX 23.4 AIR QUALITY GENERATOR EMISSIONS MODELLING

1.1. SCOPE OF THE ASSESSMENT

1.1.1. INTRODUCTION

1.1.1.1. This appendix details the methodology for the assessment of point emission sources involved with the construction and the permanent operation of the AQUIND Interconnector development.

1.1.2. STUDY AREA

1.1.2.1. The study areas for this assessment are defined as being a 1.5 km radius buffer from the point emissions source locations.

Horizontal Directional Drilling

1.1.2.2. Details were provided by the High Voltage Direct Current ('HVDC') engineering team on the predicted locations associated with Horizontal Directional Drilling ('HDD') operations. The HDD operation is predicted to involve the following:

- A diesel Power Pack to provide power to the drilling rig;
- A diesel-powered pump to remove mud, liquid and other detritus from the drill head;
- A diesel generator to run the mud recycling plant for processing material removed from the drill head; and
- A diesel generator to provide power for the site office and welfare facilities.

The predicted locations cross the following sections:

- Section 2;
- Section 3;
- Section 3;
- Section 6;
- Section 7;
- Section 8;
- Section 9; and

- Section 10.

Fibre Optic Cable Facility

1.1.2.3. Backup generators are to be provided at the Optical Regeneration Station ('ORS') facility at the landfall site to provide filtering and signal boost to fibre-optic cables that accompany the HVDC cables in the event of a power outage. The ORS facility is located in the Fort Cumberland Road car park in Section 10 as shown in Figure 23.5 of the ES Volume 2 (APP-327).

1.1.2.4. The power rating of the generators is not yet determined, with estimates ranging between 50 kVA and 200 kVA.

Converter Station

1.1.2.5. Backup power generation is to be provided to support operations at the converter station in the event of a mains power outage. Two diesel generators are specified, located in front of the main converter station buildings within the converter station compound. Whilst the exact specification of the generators is not yet finalised, two 1000 kVA (800kW) generators are expected to be required by the engineering teams, and modelling has been undertaken on this basis.

1.2. ASSESSMENT METHODOLOGY

1.2.1.1. This section describes the methodology used for the derivation of emission factors and calculation of pollutant concentrations resulting from the operation of diesel power generators. For both the operation and construction stages, the following pollutants were modelled in the assessment:

- Nitrogen oxides (NO_X);
- Nitrogen dioxide (NO_2);
- Carbon monoxide (CO);
- Particulate matter (PM_{10}); and
- Total hydrocarbons (THC).

1.2.1.2. Sulphur Dioxide (SO_2) is not assessed because ultra-low sulphur diesel will be used. Exhaust gas concentrations of general particulate matter were provided. Therefore, $PM_{2.5}$ is assumed to equal PM_{10} for comparison with the target value. This represents a conservative approach because as the exhaust gas concentration of the finer particle fraction $PM_{2.5}$ will be lower than PM_{10}. THC were modelled as benzene which represents a conservative approach because no objective or limit value exists for THC. Therefore, benzene was selected for modelling as a limit value is prescribed for this particular hydrocarbon pollutant as shown in Chapter 23 (Air Quality) of the ES Volume 1 (APP-138). It should be noted however that the toxicity of benzene in air is of a different nature to THC, particularly as benzene is a documented carcinogen (Chilcott, 2007). Therefore, the equivalent level of carcinogenesis should not be inferred from the results presented here.

1.2.2. CONSTRUCTION STAGE

Local Power Generation for HDD Operations

1.2.2.1. Following consultation with the Environmental Health Officers ('EHO') for Havant Borough Council ('HBC') and Portsmouth City Council ('PCC'), all power generating locations were scoped in to the assessment. The locations are shown in Figure 23.17.

1.2.2.2. Modelling was undertaken using information provided by the WSP Engineering and HVDC Cabling Teams, and specialist advice regarding HDD works.

Embedded Mitigation

1.2.2.3. Operation of the generators is subject to the embedded mitigation measures for air quality detailed in the CEMP regarding operation, efficiency and maintenance. Any generators are subject to the minimum EU Emissions Stage requirements from the local Environmental Health Department.

Generator Characteristics

1.2.2.4. The information in Table 1 was provided for the HDD drilling operations, corrected for percentage of oxygen in the exhaust (%O_2) and temperature. No corrections were required for differences in water content as dry exhaust gas figures were provided, or for pressure.

Table 1 - Emissions data for the HDD drilling generator model

	Pump	Recycling*	Welfare**	PowerPack	Small Drill††
Exhaust Mass Flow (m^3/min)	31.8	30.3	13.0	37.3	18.6
Exit Velocity (m/s)	2.51	5.76	2.99	4.95	8.52
Exhaust Temperature (°C)	546.7	486.6	540.0	485.7	395.0
Exhaust Diameter (m)†	0.152	0.152	0.152	0.152	0.100
NO_X (mg/Nm^3)	1440.8	870.7	466.7	1552.4	466.7
CO (mg/Nm^3)	1171.4	347.0	5834.3	513.2	5834.3
Hydrocarbons (mg/Nm^3)	32.3	52.3	221.7	20.2	221.7
Particulate Matter (mg/Nm^3)	92.1	83.0	29.2	72.0	29.2

***** Emissions for the recycling plant were not supplied, so were derived from the data sheet for the PowerPack.***

***** Emissions for the Welfare generator were not supplied, so were derived from a standard 50 kVA generator.***

† The reference exhaust diameter for the PowerPack was used for all emissions sources as no other information was supplied, except for the Small Drill where a smaller exhaust was assumed due to the mobile nature of the plant.

†† Details for the Small Drill were derived from a combination of information supplied by drilling specialists, example diesel engine emissions from a specialist manufacturer and the EU Stage IV R emissions standards.

1.2.2.5. Following consultation with the HVDC Cabling Team and a drilling specialist, indicative locations for site compounds and the arrangement of required equipment was established. Whilst the arrangements of equipment within the site compounds may be flexible, it was found that small variations in the position of the equipment used were unlikely to vary the overall results of the assessment. These indicative arrangements are shown in Figure 23.17.

1.2.2.6. The operating hours of all of the generators was considered to be between the hours of 0700 and 1900, Monday to Sunday during the predicted periods of operation except for locations where 24-hour operation was specified. The operational hours were accounted for in the modelling through the use of a variable emissions profile.

1.2.2.7. HDD equipment is located at:

- Eastney Landfall (Fort Cumberland Road Car Park) (24-hour operation);
- Adjacent to Eastney Lake Allotments;
- Milton Common;
- Eastern Road Sports Ground for Langstone Harbour (24-hour operation);
- East of Farlington Junction on the South Coast Rail Line; and
- Kings Pond, Denmead.

1.2.2.8. Due to the short-term, temporary nature of the operation of the diesel generators, the 1-hourly (99.08th percentile) and 24-hourly (90.41th percentile) were reported.

Operation Stage Modelled Year

1.2.2.9. The operational modelled year was determined based on the meteorological data sensitivity testing. Model runs were undertaken for each of five years of meteorological data between 2014 and 2018. The worst-case year from the ADMS outputs was found to be 2014, so all of the results from this year are presented.

Receptors

1.2.2.10. Receptors were selected within a 1.5 km radius of each of the supplied predicted generator locations. Receptors were identified using the Ordnance Survey AddressBase Plus dataset and modelled at a height above ground of 1.5 m, as shown in Plate 1.

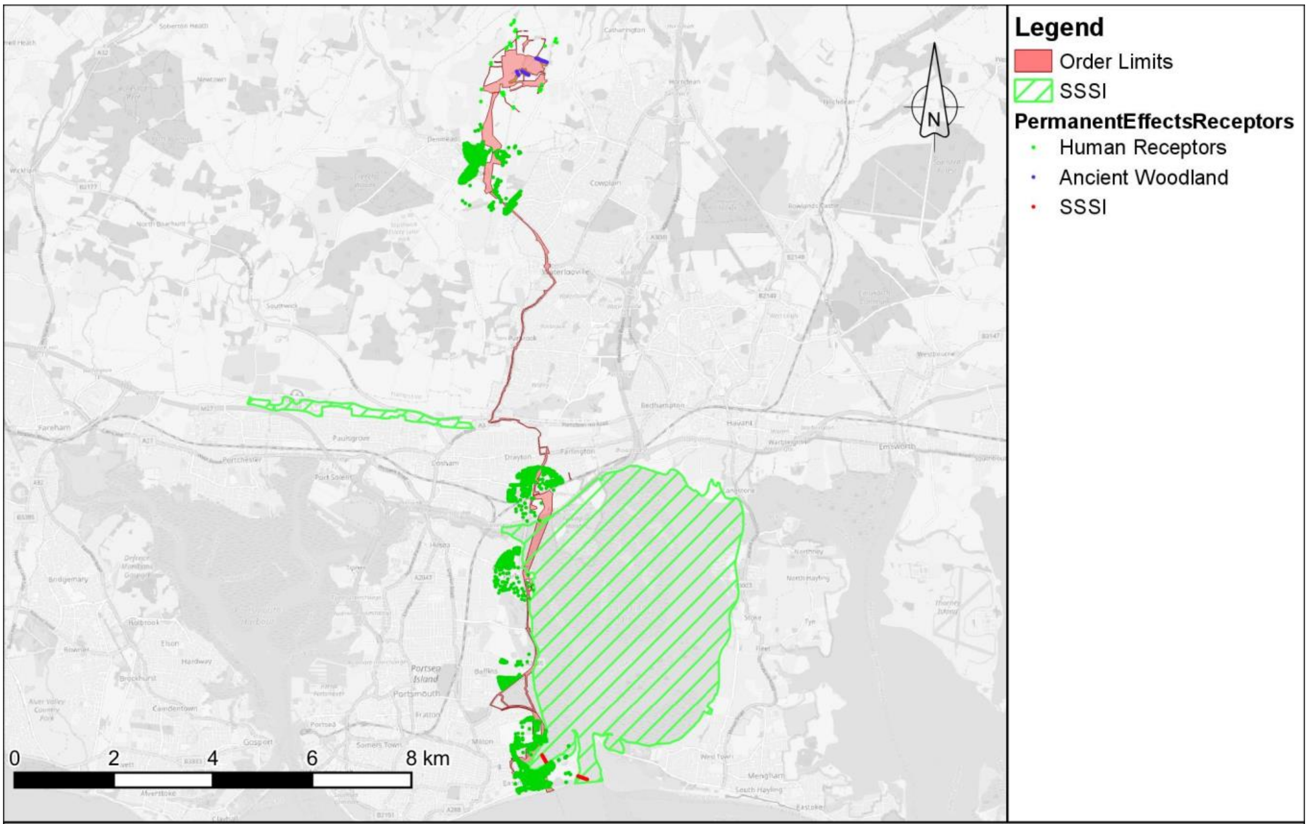


Plate 1 - Indicative Receptors for Construction Local Power Generation Effects

1.2.3. OPERATIONAL STAGE

Back-Up Power Generation

Embedded Mitigation

1.2.3.1. Detailed information regarding the installation of the backup power generators at the ORS building was unavailable due to the stage of the design. Therefore, the emission limits from the EU Stage VI Q emissions standards were used, as shown in Table 2. As a new generator installation after the construction year of 2022, the generator will be required to meet this standard as a minimum, barring the introduction of further, more stringent emissions standards during the intervening period.

ORS Back-Up Power Generation

1.2.3.2. Specifications for the backup generators ranged from two 50 kVA generators up to two 200 kVA generators. Modelling was undertaken for two 200 kVA generators as a conservative approach.

1.2.3.3. The conditions for the EU Stage VI Q emissions standards i.e. the operating temperature, pressure and $\%O_2$ were applied to the equipment being modelled.

Table 2 - EU Stage IV Emissions Standards

Cat.	Net Power	Date (on sale)	CO	HC	NO_X	PM
	kW		g/kW			
Q	130 ≤ P ≤ 560	January 2014	3.5	0.19	0.4	0.025

1.2.3.4. The following additional data was used based on sample generator data sheets provided:

- Exhaust diameter – 0.15 m (assumed based on HDD generators);
- Exhaust mass flow – 35.8 m^3/min; and
- Exhaust temperature – 561 °C.

1.2.3.5. The operation of this facility is dependent on the occurrence of power outages that might affect its ability to boost or process the fibre-optic signal in the cables.

Converter Station Back-Up Power Generation

1.2.3.6. Detailed information regarding the installation of the backup power generators at the converter station was unavailable due to the stage of the design at the time of writing. The specification is for two 800kW/1000kVA generators. A sample specification for this size of generator was used for the modelling exercise, with the following parameters:

- Exhaust diameter – 0.2 m
- Exhaust mass flow – 165 m^3/min
- Exhaust temperature – 509.3 °C
- NO_X emissions – 2967.7 mg/Nm^3
- CO emissions – 316.8 mg/Nm^3
- THC emissions – 7.5 mg/Nm^3
- PM emissions – 17.0 mg/Nm^3

1.2.3.7. Emissions were assumed to have been provided at STP (standard temperature and pressure) at a 0% content of O_2. The unit was assumed to operate with 11 %O_2 in the exhaust gases.

1.2.3.8. Whilst the size of the generating capacity specified would normally require a permit under the Medium Combustion Plant Directive, these units are considered exempt on the basis that they should not exceed a running time of 500 hours per year on a 3-year rolling average.

1.2.3.9. Additional modelling at the ancient woodland sites adjacent to the Order Limits at the converter station was undertaken for NO_X concentrations, nutrient N deposition and N acid deposition. Three transects were placed across the ancient woodland sites, one covering Stoneacre Copse, one covering Crabdens Copse, and one covering both areas associated with Crabdens Row. Modelling points were placed at 10 m intervals.

Operating hours

1.2.3.10. The model has been constructed to obtain the peak short-term pollutant concentrations in line with the expected short-term operation of the units at the ORS and the converter station. In order to obtain the worst-case outputs for comparison with the short-term limit and objective values, the units are modelled as running continuously for 8,760 hours per year (8,784 in a leap year), and the peak short-term outputs for the ten highest 1-hour means (99.79th percentile) were reported.

1.2.3.11. Specialist advice was sought on the possibility of power outages and the likely longest repair time to restore mains electricity. The number of expected power outages in any 12-month period is expected on no more than six occasions and for a maximum period of 24-hours.

1.2.3.12. Mandatory testing of the generating units will also take place for a duration of 1-hour on one occasion per year.

1.2.3.13. The long-term outputs from this modelling are also compared to the long-term limit and objective values in order to undertake calculations on the nearby designated ecological sites. This is considered an overly conservative approach due to the anticipated short-term operation of the units in their capacity to provide backup power in the case of a mains outage.

Operational Stage Modelled Year

1.2.3.14. In order that a robust assessment could be undertaken, five years of meteorological data between 2014 and 2018 were used for the assessment of permanent effects from the ORS backup generators. This ensures that predictions are based upon the worst dispersion conditions experienced between 2014 and 2018 which is a conservative approach. The measuring station at Thorney Island Airport was used, with missing cloud cover filled in from the station at Southampton International Airport. Modelling was undertaken for each of the five years for which meteorological data had been obtained and the worst-case concentrations reported.

Receptors

1.2.3.15. Receptors were selected within a 1.5 km radius of each of the supplied predicted generator locations. Receptors were identified using the Ordnance Survey AddressBase Plus dataset and modelled at a height above ground of 1.5 m, as shown in Plate 2. Two 200 m transects with points at 10 m intervals were also modelled within the Langston Harbour SSSI, also shown in Plate 2 and Figure 23.5. Transects with 10 m intervals were plotted in the ancient woodlands adjacent to the Order Limits at the Converter Station as shown in Plate 3.

Plate 2 – ORS Permanent Effects Receptors

1.2.3.16. Further transects were modelled for the ancient woodland sites adjacent to the Order Limits at the converter station, in addition to human receptors surrounding this area as shown in Plate 4.

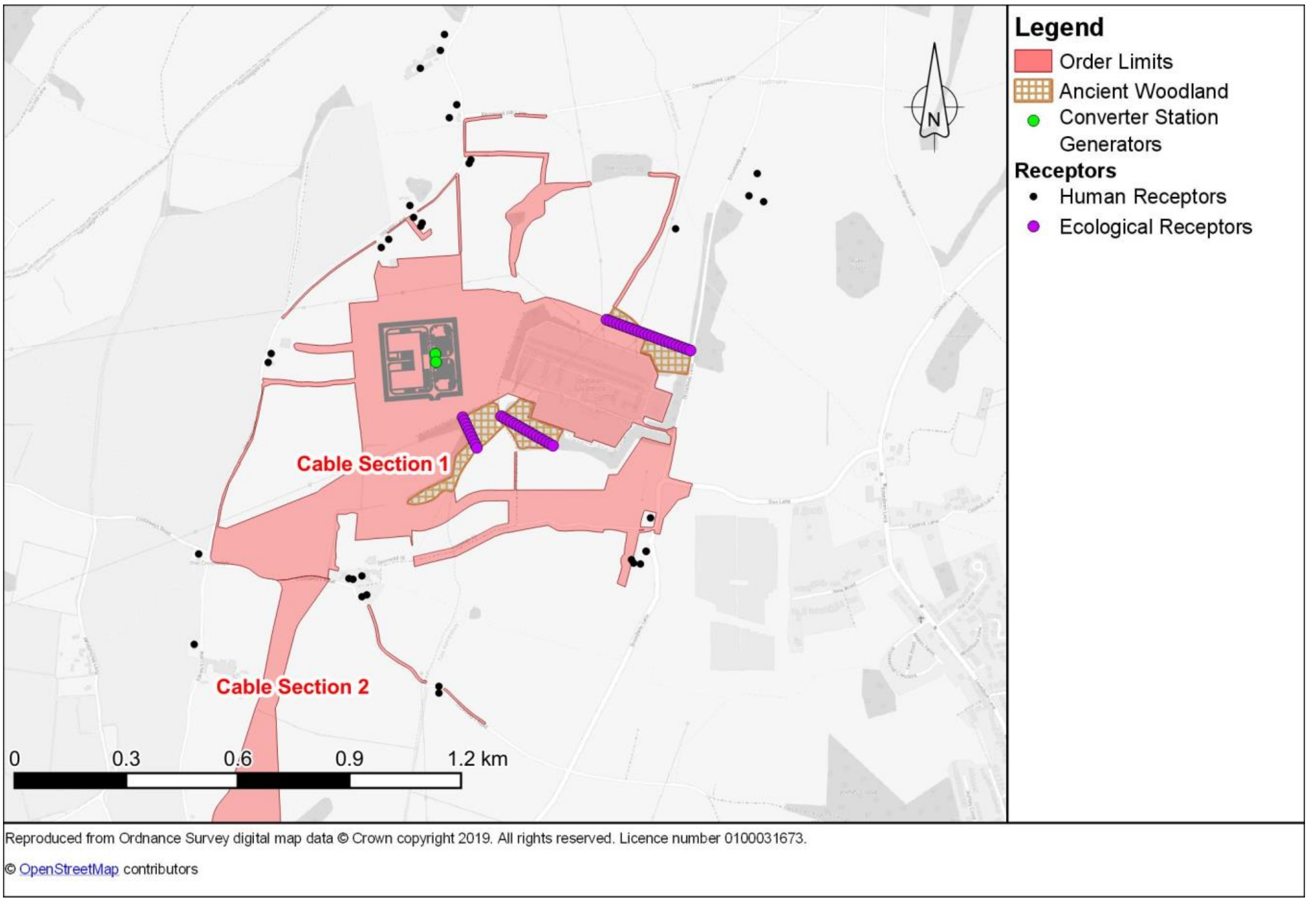


Plate 3 - Converter Station Permanent Effects Receptors

Buildings

1.2.3.17. Buildings were not included for the modelling of temporary construction effects resulting from the operation of diesel power.

1.2.3.18. For the modelling of the permanent effects from the operation of the ORS backup generators, a number of buildings were modelled according to the prevailing wind direction and presence of local sensitive receptors. These are shown in Plate 3 and Plate 4. Buildings were not modelled for the Converter Station due to the location and stack height of the generators and positions of the nearest buildings.

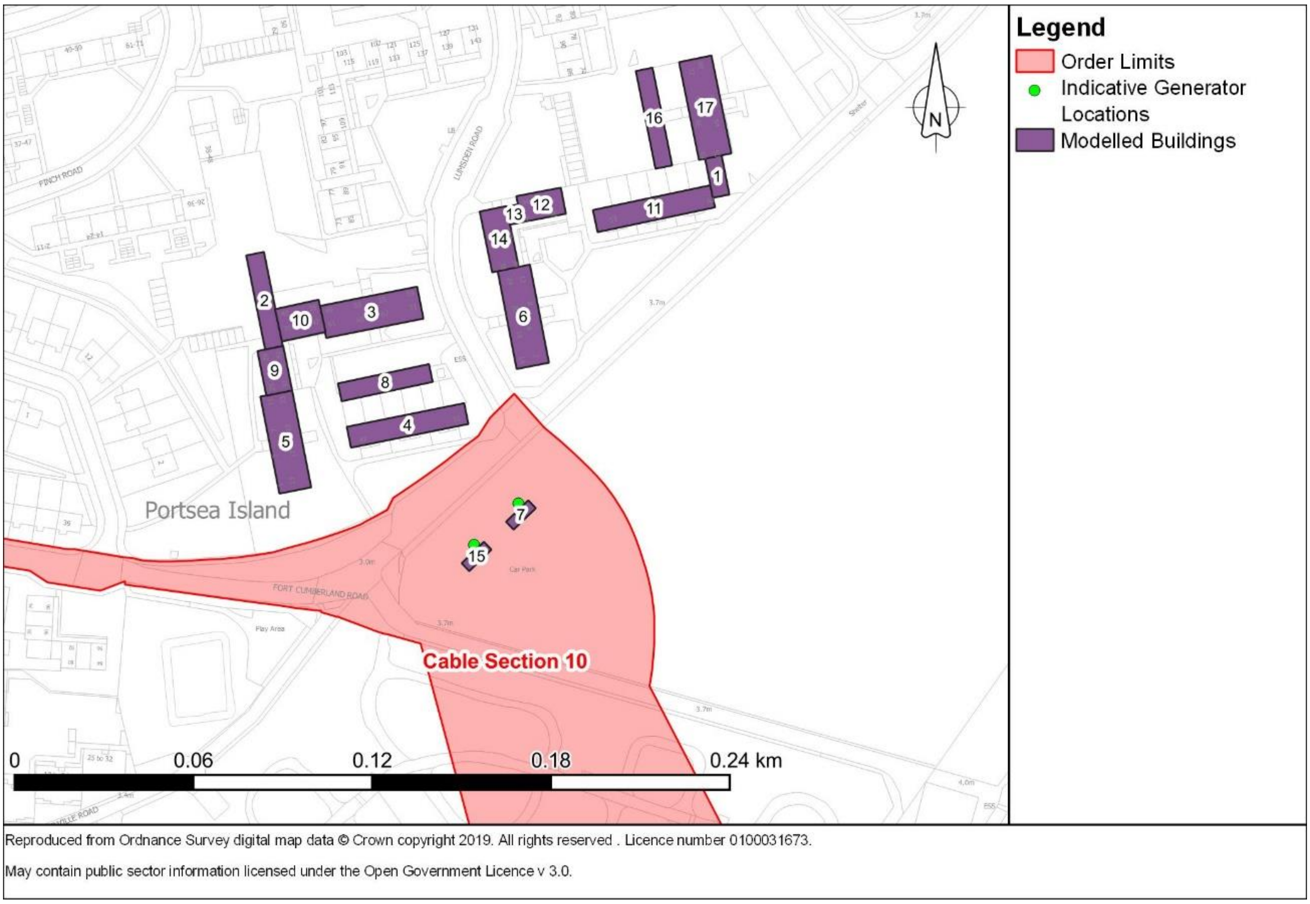


Plate 4 - Locations of Modelled Buildings

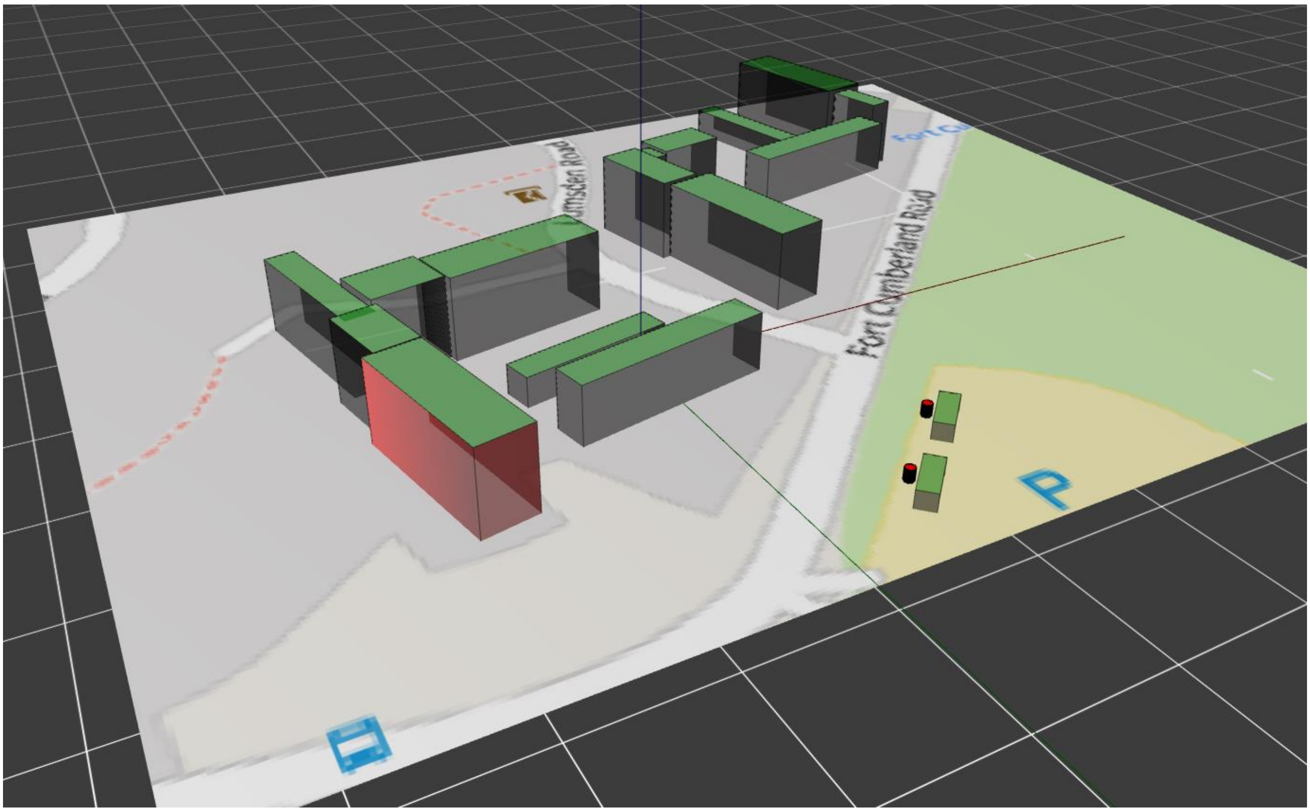


Plate 5 - 3D Representation of Modelled Buildings

Results Processing

1.2.3.19. For the construction and operation stages, modelled concentration predictions for NO_X were post processed according to the Environment Agency guidance note on the conversion ratios for NO_X and NO_2 (Air Quality Modelling and Assessment Unit, 2006). Predicted concentrations for NO_X were converted on the basis that the impacts are all short-term in nature, and so NO_2 was expressed as 35 % of the predicted NO_X concentration.

Ecological Effects

1.2.3.20. The effects on ancient woodlands adjacent to the Converter Station and Langston Harbour SSSI have been modelled along transects within the woodlands and perpendicular to the SSSI boundary within the areas affected by prevailing winds. The affected ecological sites are shown in Figure 23.5.

Table 3 - Permanent Effects Ecological Receptors

Designated Site	Habitat	Critical Load for Eutrophication (kgN/ha/yr)	Critical Load Function for Acid Deposition (keq/ha/yr)
Langstone Harbour SSSI Unit 11 – Eastney Lake (1019415)	Littoral Sediment	20 - 30	Habitats not sensitive to acidification
	Fen, marsh and swamp	15 - 30	
Langstone Harbour SSSI Unit 3 – Langstone Harbour West (1007445)	Littoral Sediment	20 - 30	Habitats not sensitive to acidification
	Fen, marsh and swamp	15 - 30	
Crabdens Row	Broadleaved, mixed and yew woodland	10 - 20	MaxCLminN: 0.285 MaxCLMaxN: 1.293 MaxCLMaxS: 1.008 MinCLminN: 0.142 MinCLMaxN: 1.1 MinCLMaxS: 0.958*
Crabdens Row			
Crabdens Copse			
Stoneacre Copse			
**** General critical load function for Acid deposition for Unmanaged broadleafed/coniferous woodland***			

1.2.3.21. Results processing was undertaken following the AQTAG06 guidance (Environment Agency AQMAU, 2006).

1.2.3.22. Deposition flux was determined using the formula:

Dry deposition Rate = Ground Level Concentration x Deposition Velocity

(µg/m²/s) (µg/m³) (m/s)

1.2.3.23. A deposition velocity of 0.0015 m/s was selected for NO_2 deposition at Langstone Harbour, and 0.03 m/s for the ancient woodlands based on the recommended deposition velocities from AQTAG06. Whilst the habitat of Langston Harbour SSSI is not grassland, the flat characteristics of the bay are more reflective of grassland than the alternative forest habitat in AQTAG06.

1.2.3.24. Dry deposition flux of N from NO_2 is converted from the units of µg/m²/s to kgN/ha/yr for N deposition using the conversion factor 95.9, and to keq/ha/yr for acidification using the conversion factor 6.84.

1.2.3.25. Changes in composition were reported in comparison to the background contribution to deposition which was obtained from the Air Pollution Information system (APIS) website (Centre for Ecology and Hydrology, 2019), and reported according to the IAQM ecological site assessment guidance (Holman, et al., 2019).

1.2.4. DECOMMISSIONING

1.2.4.1. Works for decommissioning are expected to be equivalent to those involved in construction. The methodology for assessing the air quality effects of decommissioning is the same as that described for the construction stage with updated data based on the numbers of receptors present should these change significantly over the lifetime of the infrastructure.

1.3. PREDICTED IMPACTS

1.3.1. CONSTRUCTION STAGE LOCAL POWER GENERATION

Embedded Mitigation

1.3.1.1. Mitigation is embedded in the Proposed Development design through the use of generators which conform to a minimum of EU Stage III emissions standards for non-road diesel engines.

Description of Works

1.3.1.2. Diesel will be the source of fuel burned in generators to provide power for the HDD, ORS and converter station installation activities described in Chapter 23 (Air Quality). It has been confirmed by the proposed HDD contractor that the shift pattern for construction activities will be 12 hours (0700-1900) working 7 days per week with all HDD combustion sources operating accordingly, and 24 hours (0000-2359) working 7 days per week for HDD locations at Eastney Landfall and Langstone Harbour.

1.3.1.3. Exhaust gas pollutant concentrations were available from example manufacturer specifications for the specified power generation equipment. These pollutants are nitrogen oxides, carbon mono$_X$ide, particulate matter and total hydrocarbons.

1.3.1.4. Pollutant concentrations have been predicted at the discrete receptors within 1.5 km of the expected locations of the diesel generators using the OS AddressBase Plus dataset. The relevant national air quality limits and objective values are prescribed in the national AQS as described in Chapter 23 (Air Quality).

Impacts

Meteorological Sensitivity

1.3.1.5. To test the sensitivity of the predicted concentrations in the construction stage to variable dispersion conditions, five years of meteorological data were tested to identify which year provides the most conservative dispersion conditions. The results of the meteorological sensitivity testing are presented for five years of hourly sequential data (2014 – 2018) for the main pollutant of concern which is NO_X/NO_2.

1.3.1.6. The top 10 annual mean and 99.79^{th} percentile of hourly NO_X concentrations, based on the discrete receptor results, are presented for each modelled year under the worst-case scenario emissions parameters in Table 4.

Table 4 – Meteorological sensitivity modelling results based on ground level receptor grid results under 'Worst-Case' scenario emissions parameters

Ranked Value	NO_X concentration (µg/m³)											
	2014		2015		2016		2017		2018		Worst Case	
	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*
1	13.2	**296.4**	**14.6**	258.6	13.3	252.2	12.4	263.1	10.4	255.8	2015	2014
2	13.1	**275.6**	**14.6**	258.6	13.3	252.2	12.4	245.1	10.4	249.9	2015	2014
3	**13.1**	**267.4**	8.1	250.9	7.2	249.9	8.6	245.1	10.3	241.9	2014	2014
4	**12.8**	**262.6**	8.0	248.6	7.2	244.7	8.6	241.0	10.0	240.8	2014	2014
5	**12.8**	**259.7**	7.8	244.0	6.6	239.3	7.4	239.9	9.9	240.8	2014	2014
6	**11.9**	**250.5**	7.6	234.2	6.6	239.0	7.4	236.8	9.3	239.4	2014	2014
7	**11.8**	**250.1**	7.4	234.2	6.5	232.7	6.6	229.3	8.8	227.2	2014	2014
8	**10.8**	**246.9**	7.0	233.6	6.4	223.5	6.6	227.2	8.6	225.8	2014	2014
9	**10.6**	**241.2**	7.0	224.5	6.3	222.6	6.3	222.5	7.7	223.7	2014	2014
10	**10.5**	**241.2**	6.9	224.5	6.1	222.6	6.2	222.5	7.7	217.4	2014	2014

* 99.79th percentile of hourly means. Bold value indicates year with highest concentration

1.3.1.7. A review of the results in Table 23.59 for the top 10 ranked discrete receptors in each year shows that most of the highest annual mean and of the 99.79th percentile hourly mean NO_X concentrations occur in 2014, with only the top two results from both categories occurring in different years. Further statistical tests were undertaken on all receptor results for the number of receptors for each year where the maximum concentration was produced, the average concentrations across all receptors, and a receptor weighted average concentration. The results for these tests for the short-term receptor predictions are shown in Table 5. The table shows the number of receptors for each year for which the maximum concentrations of NO_X was recorded, the average concentration across all modelled receptors, and a weighted average concentration according to the number of receptors.

Table 5 - Statistical Outputs from the Short-term Results Analysis

Test	2014	2015	2016	2017	2018	Worst-case
Receptor Count max	1378	60	149	239	2336	2018
Average concentration (µg/m³)	23.7	18.5	18.7	18.9	23.8	2018
Receptor Weighted Average Concentration	32,653.9	1,111.2	2,788.7	4,525.8	55,689.7	2018

1.3.1.8. Table 5 shows that the worst-case performing year in all tests on the short-term receptor predictions is 2018.

1.3.1.9. The results for the tests on the long-term receptor predictions are shown in Table 6.

Table 6 - Statistical Outputs from the Long-term Results Analysis

Test	2014	2015	2016	2017	2018	Worst-case
Receptor Count max	3,006	28	55	59	1,014	2014
Average concentration (µg/m³)	0.5	0.4	0.3	0.4	0.4	2014

Test	2014	2015	2016	2017	2018	Worst-case
Receptor Weighted Average Concentration	1,570.2	9.8	18.5	21.4	431.2	2014

1.3.1.10. Table 6 shows that 2014 is the worst-case performing year in all tests on the long-term receptor predictions.

1.3.1.11. Whilst there is a variation in the worst-case performing year across the categories examined, 2014 appears most frequently as the worst-case year.

1.3.1.12. As such, hourly sequential data for 2014 from the Thorney Island meteorological station were used within all subsequent model scenario runs.

Impact Assessment

1.3.1.13. The results of the dispersion modelling are presented in tabular format for the likely Construction Stage scenario. Impacts are considered on human receptors as identified by the discrete receptor locations included in the model.

1.3.1.14. A summary of the predicted annual and short-term NO_2, CO, THC, PM_{10} and $PM_{2.5}$ results at the modelled discrete receptors are presented in Table 5, Table 8 and Table 9 show the maximum predicted concentration for each pollutant and averaging period and an interpretation of the magnitude of impact following the IAQM Planning guidance (Moorcroft, et al., 2017).

Table 7 - Do-Something Scenario results for modelled receptors (annual average)

Statistic	NO_2	THC	PM_{10}	$PM_{2.5}$**
Maximum Annual Mean PC ($\mu g/m^3$)	5.0	0.7	13.2	11.8
Maximum Annual Mean PEC (PC + Background) ($\mu g/m^3$)	21.2	1.1	27.4	22.0
AQAL ($\mu g/m^3$)	40	5*	40	25***
Change relative to AQAL (%)	13%	14%	33%	47%
IAQM impact magnitude	**Moderate**	**Moderate**	**Moderate**	**Moderate**

* Annual average AQLA for benzene

** The exhaust gas concentrations provided by generator manufacturers did not differentiate between PM_{10} and $PM_{2.5}$. PM results are therefore assessed against the PM_{10} and $PM_{2.5}$ objectives.

*** Target value

1.3.1.15. Table 7 shows that the annual average objectives for NO_2, THC, PM_{10} and $PM_{2.5}$ will not be exceeded during construction at any of the sensitive receptors. The largest predicted increase relative to the AQAL is 47 % for $PM_{2.5}$ and the largest receptor concentration inclusive of background will be 22 µg/m^3 for $PM_{2.5}$. This is a **moderate** impact in accordance with the IAQM criteria as the predicted concentration is 88 % of the annual mean objective.

1.3.1.16. Table 7 shows that the principle source component of the PEC for all pollutants is made up of the background contribution.

Table 8 – Do-Something Scenario results for modelled receptors (24-hour PM_{10} and max 8-hour CO)

Statistic (PC and PEC as µg/m^3)	CO	PM_{10}
Max. Percentile PC (*90.4th daily PM_{10} and max daily 8-hour running mean CO*)	0.67	18.8
Exceedance days	-	2.6
AQAL	10	50
IAQM impact magnitude	Negligible	Negligible

1.3.1.17. Table 8 shows that the highest 8-hour running mean CO concentration is 0.67 mg/m^3 which is less than 7% of the AQLA. The 90.4th percentile daily mean PM_{10} concentration is predicted to be 18.8 µg/m^3 which is **negligible** in comparison to the AQAL. There may be up to 3 occasions predicted where the 24-hour limit may be exceeded for PM_{10}, which is less than the 50 permitted occasions where the 24-hour limit may be exceeded.

Table 9 – Do-Something Scenario results for top 10 modelled receptors (1-hour NO_2)

Statistic (µg/m^3)	1	2	3	4	5	6	7	8	9	10
x	467810	467853	467804	467844	467834	467815	467825	467799	467836	467836
y	99175	99072	99173	99075	99077	99083	99080	99172	99194	99194
2 x Background	24	24	24	24	24	24	24	24	24	24
Max. Percentile PC (*99.79th hourly* NO_2)	103.7	96.4	93.6	91.9	90.9	87.7	87.5	86.4	84.4	84.4
PEC	127.7	120.4	117.6	115.9	114.9	111.7	111.5	110.4	108.4	108.4
Short-term AQAL (µg/m^3)	200	200	200	200	200	200	200	200	200	200
Change relative to AQAL (%)	63.9	60.2	58.8	58	57.5	55.9	55.8	55.2	54.2	54.2
IAQM magnitude	**Large**									

1.3.1.18. Table 7 shows that the highest 1-hour NO_2 concentration is 127.7 µg/m^3 which is 64 % of the AQAL. The top ten 1-hour NO_2 concentrations range from 55-64 % of the AQAL and are assessed as **large** impacts following the IAQM impact criteria as they are all in excess of 51 % of the AQAL.

Significance

1.3.1.19. The IAQM impact assessment process provides impact descriptor guidance to inform the significance judgement which varies depending on the pollutant and averaging period assessed. Negligible impacts are predicted for THC, PM_{10} and $PM_{2.5}$ and moderate impacts for both annual average and 1-hour NO_2 in accordance with the IAQM criteria. However, the predicted maximum annual average NO_2 concentration is under half of the objective and exceedances of the 1-hour objective are unlikely even assuming conservative operating hours and the temporary nature of the works as described in Chapter 23 (Air Quality).

1.3.1.20. Therefore, the effect of changes in local air quality as a result of Construction Stage local power generation is assessed as a **moderate adverse impact** and a **not significant** effect.

1.3.2. OPERATIONAL STAGE LOCAL POWER GENERATION

Embedded Mitigation

1.3.2.1. Due to detailed emissions information not being available, the emissions from the EU Stage VI Q emissions standards were used, as shown in Table 2. As a new generator installation after the construction year of 2026, the generator will be required to meet this standard at a minimum, barring the introduction of further, more stringent emissions standards during the intervening period.

Description of Works

1.3.2.2. Diesel will be the source of fuel burned in generators to provide back-up power the ORS and Converter Station in the event of a mains power outage, as described in Chapter 23 (Air Quality).

1.3.2.3. The pollutants considered in the quantitative assessment of local air quality are those for which exhaust gas concentrations were available from example manufacturer specifications. These are the same as those for the Construction Stage local power generation assessment.

1.3.2.4. Pollutant concentrations have been predicted at the discrete receptors described in within 1.5 km of the predicted generator locations using the OS AddressBase Plus dataset. The relevant national air quality limits and objective values are prescribed in the national AQS as described in Chapter 23 (Air Quality).

Impacts

Meteorological Sensitivity

1.3.2.5. To test the sensitivity of the predicted concentrations in the Operational Stage to variable dispersion conditions, five years of meteorological data were tested to identify which year provides the most conservative dispersion conditions. The results of the meteorological sensitivity testing are presented for five years of hourly sequential data (2014 – 2018) for the main pollutant of concern which is NO_X/NO_2.

1.3.2.6. The top 10 annual mean and 99.79th percentile of hourly NO_X concentrations, based on the discrete receptor results, are presented in Table 10 for each modelled year under the worst-case scenario emissions parameters.

Table 10 – Meteorological sensitivity modelling results based on ground level receptor grid results under 'Worst-Case' scenario emissions parameters

Ranked Value	NO_X concentration (µg/m^3)											
	2014		2015		2016		2017		2018		Worst Case	
	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*	Annual	Hourly*
1	**0.4**	529.1	0.3	551.9	0.4	544.4	0.4	507.0	0.4	**601.4**	2014	2018
2	0.4	502.0	0.3	515.8	0.4	504.8	**0.4**	479.9	0.3	**563.8**	2017	2018
3	0.4	496.1	0.3	506.3	0.4	469.8	**0.4**	463.8	0.3	**529.6**	2017	2018
4	0.3	492.3	0.3	**501.2**	0.3	462.0	**0.4**	448.2	0.3	499.2	2017	2015
5	0.3	488.8	0.3	**493.7**	0.3	452.9	**0.3**	430.6	0.3	480.4	2017	2015
6	0.3	480.4	0.3	**485.2**	0.3	452.6	**0.3**	428.0	0.3	472.7	2017	2015
7	0.3	470.9	0.3	**483.5**	0.3	443.2	**0.3**	415.9	0.3	471.6	2017	2015
8	0.3	468.9	0.3	**476.1**	0.3	437.7	**0.3**	410.1	0.3	464.1	2017	2015
9	0.3	460.7	0.3	**466.0**	0.3	433.1	**0.3**	403.7	0.3	454.8	2017	2015
10	0.3	449.8	0.2	**455.2**	0.3	422.4	**0.3**	391.7	0.3	446.4	2017	2015

* 99.79th percentile of hourly means. Bold value indicates year with highest concentration

1.3.2.7. A review of the results for the top 10 ranked discrete receptors in each year shows that all but one of the highest annual means occur in 2017 and all but three of the 99.79th percentile hourly mean NO_X concentrations occur in 2015.

1.3.2.8. Further statistical tests were undertaken on the data regarding the total number of occurrences where each year performed worst at each of the 1,151 modelled receptors, the average concentration for each year, and a weighted average based on the number of worst-case performances. The outputs from the short-term results analysis are shown in Table 11. The table shows the number of receptors for each year for which the maximum concentrations of NO_X was recorded, the average concentration across all modelled receptors, and a weighted average concentration according to the number of receptors.

Table 11 - Statistical Outputs from the Short-term NO_X Results Analysis

Test	2014	2015	2016	2017	2018	Worst Case
Receptor Count max	268	62	276	80	**464**	2018
Average concentration (µg/m³)	22.9	22.1	22.3	22.2	**23.0**	2018
Receptor Weighted Average Concentration	6127.0	1371.2	6148.6	1774.1	**10678.9**	2018

1.3.2.9. The outputs in Table 11 show that despite 2014 providing the highest overall predictions for NO_X concentrations, the year 2018 produces the highest concentrations at the most receptors.

1.3.2.10. The outputs from the long-term (annual) results analysis are shown in Table 12.

Table 12 - Statistical Outputs from the Long-term NO_X Results Analysis

Test	2014	2015	2016	2017	2018	Worst Case
Receptor Count max	**582**	144	101	86	237	2014
Average concentration (µg/m³)	**0.0**	0.0	0.0	0.0	0.0	2014

Test	2014	2015	2016	2017	2018	Worst Case
Receptor Weighted Average Concentration	**8.9**	2.0	1.5	1.4	3.6	2014

1.3.2.11. The outputs in Table 10 show that while 2017 provides the highest long-term predictions, 2018 produces the highest short-term predictions. Table 11 shows that 2018 produces the highest short-term predictions at the greatest number of individual receptors. Table 12 shows that 2014 produces the highest long-term predictions at the greatest number of individual receptors.

1.3.2.12. As such, hourly sequential data for 2014 from the Thorney Island meteorological station were used within all subsequent model scenario runs.

Impact Assessment

1.3.2.13. The results of the dispersion modelling are presented in tabular format for the likely Construction Stage scenario. Impacts are considered on human receptors as identified by the discrete receptor locations included in the model.

1.3.2.14. A summary of the predicted annual and short-term NO_2, CO, THC, PM_{10} and $PM_{2.5}$ results at the modelled discrete receptors are presented in Table 5, Table 6 and Table 7 show the maximum predicted concentration for each pollutant and averaging period and an interpretation of the magnitude of impact following the IAQM Planning guidance (Moorcroft, et al., 2017).

Table 13 – Do-Something Scenario results for modelled receptors (annual average)

Statistic	NO_2	THC	PM_{10}	$PM_{2.5}$**
Maximum Annual Mean PC (µg/m^3)	0.3	0.0	0.0	0.0
Maximum Annual Mean PEC (*PC + Background*) (µg/m^3)	12.0	0.4	13.5	10
AQAL (µg/m^3)	40	5*	40	25***
Change relative to AQAL (%)	0.7%	0.4%	0.0%	0.0%
IAQM impact magnitude	**Negligible**	**Negligible**	**Negligible**	**Negligible**

* Annual average AQLA for benzene

** The exhaust gas concentrations provided by generator manufacturers did not differentiate between PM10 and PM2.5. PM results are therefore assumed to be PM10 and converted to PM2.5 using factors in the Defra Damage Cost Guidance for assessment against the objective values.

*** Target value

1.3.2.15. Table 13 shows that the annual average objectives for NO_2, THC, PM_{10} and $PM_{2.5}$ will not be exceeded during construction at any of the sensitive receptors. The largest predicted increase relative to the AQAL is 0.4 % for THC and 0.7 % for NO_2. This is a **Negligible** impact for THC in accordance with the IAQM criteria, and no exceedances are likely.

1.3.2.16. The information in Table 13 shows that the principle component of the PEC is made up of the background contribution, except where benzene has conservatively been used as a proxy for THC in the model.

Table 14 – Do-Something Scenario results for modelled receptors (24-hour PM_{10} and max 8-hour CO)

Statistic (PC and PEC as µg/m^3)	CO	PM_{10}
Max. Percentile PEC (90.4th daily PM_{10} and max daily 8-hour running mean CO)	0.67	14.1
Exceedance days	-	0.7
AQAL	10	50
IAQM impact magnitude	Negligible	Negligible

1.3.2.17. Table 14 shows that the highest 8-hour running mean CO concentration is 0.67 µg/m^3 which is 7 % of the AQLA. The 90.4th percentile daily mean PM_{10} concentration is predicted to be 14.1 µg/m^3 which is **negligible** in comparison to the AQAL. Less than one occasion where the 24-hour limit of 50 µg/m^3 may be exceeded is predicted to occur, which is substantially less than the 50 occasions where the 24-hour limit is permitted to be exceeded.

Table 15 – Do-Something Scenario results for top 10 modelled receptors (1-hour NO_2)

Statistic (µg/m³)	1	2	3	4	5	6	7	8	9	10
X	467252	467256	467261	467364	467373	467382	467261	467390	467399	467408
Y	113415	113406	113397	113413	113408	113403	113397	113398	113394	113389
2 x Background	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Max. Percentile PC (*99.79th hourly NO_2*)	**210.5**	197.3	185.4	174.7	168.1	165.5	165.0	162.4	159.2	156.2
PEC	**232.3**	**219.1**	**207.2**	196.5	189.9	187.3	186.8	184.2	181	178
AQAL (µg/m³)	200	200	200	200	200	200	200	200	200	200
PC relative to AQAL (%)	105%	99%	93%	87%	84%	83%	83%	81%	80%	78%
IAQM impact magnitude	**Large**									

1.3.2.18. Table 15 shows that the highest 1-hour NO_2 concentration is 55.4 µg/m³ which is 27.7 % of the AQAL. The top ten 1-hour NO_2 concentrations range from 26% to 27.5% of the AQAL. These are **large** impacts in accordance with the IAQM criteria as all PCs are above 51% of the AQAL. However, these concentrations do not occur at human receptors.

Significance

1.3.2.19. The operational stage has been conservatively modelled with the generators operational for 8,760 hours per year. In reality, there will be a single annual 1-hour test, and six expected occasions where the generators may run for up to 24 hours to provide backup during a mains power outage. On this basis, the annual concentrations predicted are significantly higher than they will be under actual operational conditions. As such the impacts are predicted to be **negligible**. The prediction for THC should be taken as conservative as Benzene was used as a proxy for THC for the purposes of dispersion modelled, where THC is a variety of compounds which different dispersal characteristics.

1.3.2.20. The peak 1-hour NO_2 results show that the predicted concentrations exceed the 200 µg/m³ objective value, however these concentrations are predicted at the nearest ecological receptor boundary, and not at human receptors. These changes are considered to **Large** according to the IAQM criteria.

1.3.2.21. Considering the negligible long-term impacts, and the low likelihood of operation of the backup generators, the overall impact is predicted to be **negligible adverse**, **not significant**.

Ecological Site Assessment

Ground Level NO_X

1.3.2.22. Table 16 shows the results of ground level NO_X predictions made at transect receptors in the Langstone Harbour SSSI - Eastney Lake Unit. The transect receptors are identified in Figure 23.5.

Table 16 – Transect annual average NO_X prediction results for Langstone Harbour SSSI - Eastney Lake

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
1019415_0	0.003	16.56	16.56	0.01%	55.21%
1019415_10	0.002	16.56	16.56	0.01%	55.21%
1019415_20	0.002	16.56	16.56	0.01%	55.21%
1019415_30	0.002	16.56	16.56	0.01%	55.21%
1019415_40	0.002	16.56	16.56	0.01%	55.21%
1019415_50	0.002	16.56	16.56	0.01%	55.20%
1019415_60	0.002	16.56	16.56	0.01%	55.20%

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
1019415_70	0.002	16.56	16.56	0.01%	55.20%
1019415_80	0.002	16.56	16.56	0.01%	55.20%
1019415_90	0.002	16.56	16.56	0.01%	55.20%
1019415_100	0.002	16.56	16.56	0.01%	55.20%
1019415_110	0.002	16.56	16.56	0.01%	55.20%
1019415_120	0.002	16.56	16.56	0.01%	55.20%
1019415_130	0.002	16.56	16.56	0.01%	55.20%
1019415_140	0.002	16.56	16.56	0.01%	55.20%
1019415_150	0.002	16.56	16.56	0.01%	55.20%
1019415_160	0.002	16.56	16.56	0.01%	55.20%
1019415_170	0.002	16.56	16.56	0.01%	55.20%
1019415_180	0.002	16.56	16.56	0.01%	55.20%
1019415_190	0.002	16.56	16.56	0.01%	55.20%
1019415_200	0.002	16.56	16.56	0.01%	55.20%

1.3.2.23. Table 16 shows that all transect receptor predictions of ground level NO_X concentrations for the Eastney Lake unit are less than the 30 µg/m^3 objective set for the protection of vegetation and ecosystems.

1.3.2.24. Table 17 shows the results of ground level NO_X predictions made at transect receptors in the Langstone Harbour SSSI - Eastney Lake Unit. The transect receptors are identified in Figure 23.5.

Table 17 - Transect annual average NO_X prediction results for Langstone Harbour SSSI - Langstone Harbour West

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
1007445_0	0.002	14.82	14.82	0.01%	49.39%
1007445_10	0.002	14.82	14.82	0.01%	49.39%

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
1007445_20	0.002	14.82	14.82	0.01%	49.39%
1007445_30	0.002	14.82	14.82	0.01%	49.39%
1007445_40	0.002	14.82	14.82	0.01%	49.39%
1007445_50	0.002	14.82	14.82	0.01%	49.39%
1007445_60	0.002	14.82	14.82	0.01%	49.39%
1007445_70	0.002	14.82	14.82	0.01%	49.39%
1007445_80	0.002	14.82	14.82	0.01%	49.39%
1007445_90	0.002	14.82	14.82	0.01%	49.39%
1007445_100	0.002	14.82	14.82	0.01%	49.39%
1007445_110	0.002	14.82	14.82	0.01%	49.39%
1007445_120	0.002	14.82	14.82	0.01%	49.39%
1007445_130	0.002	14.82	14.82	0.01%	49.39%
1007445_140	0.002	14.82	14.82	0.01%	49.39%
1007445_150	0.002	14.82	14.82	0.01%	49.39%
1007445_160	0.002	14.82	14.82	0.01%	49.39%
1007445_170	0.002	14.82	14.82	0.01%	49.39%
1007445_180	0.002	14.82	14.82	0.01%	49.39%
1007445_190	0.002	14.82	14.82	0.01%	49.39%
1007445_200	0.002	14.82	14.82	0.01%	49.39%

1.3.2.25. Table 17 shows that all transect receptor predictions of ground level NO_X concentrations for the Langstone Harbour West unit are less than the 30 µg/m^3 objective set for the protection of vegetation and ecosystems.

1.3.2.26. Table 18 shows the results of ground level NO_X predictions made at transect receptors in the Stoneacre Copse ancient woodland.

Table 18 - Transect annual average NO_X prediction results for Stonacre Copse Ancient Woodland

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
47398_0	0.006	10.92	10.92	1.24%	37.63%
47398_10	0.006	10.92	10.92	1.13%	37.53%
47398_20	0.005	10.92	10.92	1.04%	37.44%
47398_30	0.005	10.92	10.92	0.96%	37.36%
47398_40	0.004	10.92	10.92	0.89%	37.29%
47398_50	0.004	10.92	10.92	0.83%	37.23%
47398_60	0.004	10.92	10.92	0.78%	37.17%
47398_70	0.004	10.92	10.92	0.73%	37.12%
47398_80	0.003	10.92	10.92	0.69%	37.08%
47398_90	0.003	10.92	10.92	0.65%	37.04%

1.3.2.27. Table 18 shows that all transect receptor predictions of ground level NO_X concentrations for the Stoneacre Copse ancient woodland are less than the 30 µg/m^3 objective set for the protection of vegetation and ecosystems.

1.3.2.28. Table 19 shows the results of ground level NO_X predictions made at transect receptors in the Crabdens Copse ancient woodland.

Table 19 - Transect annual average NO_X prediction results for Crabdens Copse Ancient Woodland

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
27509_0	0.399	10.92	11.32	1.33%	37.73%
27509_10	0.380	10.92	11.30	1.27%	37.66%
27509_20	0.362	10.92	11.28	1.21%	37.60%

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
27509_30	0.346	10.92	11.26	1.15%	37.55%
27509_40	0.330	10.92	11.25	1.10%	37.50%
27509_50	0.316	10.92	11.24	1.05%	37.45%
27509_60	0.303	10.92	11.22	1.01%	37.41%
27509_70	0.291	10.92	11.21	0.97%	37.37%
27509_80	0.279	10.92	11.20	0.93%	37.33%
27509_90	0.269	10.92	11.19	0.90%	37.29%
27509_100	0.258	10.92	11.18	0.86%	37.26%
27509_110	0.249	10.92	11.17	0.83%	37.23%
27509_120	0.240	10.92	11.16	0.80%	37.20%
27509_130	0.232	10.92	11.15	0.77%	37.17%
27509_140	0.224	10.92	11.14	0.75%	37.14%
27509_150	0.216	10.92	11.13	0.72%	37.12%
27509_160	0.209	10.92	11.13	0.70%	37.09%

1.3.2.29. Table 19 shows that all transect receptor predictions of ground level NO_X concentrations for the Crabdens Copse ancient woodland are less than the 30 µg/m^3 objective set for the protection of vegetation and ecosystems.

1.3.2.30. Table 20 shows the results of ground level NO_X predictions made at transect receptors in the Stoneacre Copse ancient woodland.

Table 20 - Transect annual average NO_X prediction results for Crabdens Row Ancient Woodland

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
27510_0	0.205	10.92	11.12	0.68%	37.08%
27510_10	0.200	10.92	11.12	0.67%	37.06%
27510_20	0.195	10.92	11.11	0.65%	37.04%

ID	NO_X (annual PC)	NO_X (Defra background)	NO_X (PEC)	% change	PEC as % of AQAL
27510_30	0.190	10.92	11.11	0.63%	37.03%
27510_40	0.185	10.92	11.10	0.62%	37.01%
27510_50	0.181	10.92	11.10	0.60%	37.00%
27510_60	0.177	10.92	11.10	0.59%	36.99%
27510_70	0.173	10.92	11.09	0.58%	36.97%
27510_80	0.169	10.92	11.09	0.56%	36.96%
27510_90	0.166	10.92	11.08	0.55%	36.95%
27510_100	0.162	10.92	11.08	0.54%	36.94%
27510_110	0.159	10.92	11.08	0.53%	36.93%
27510_120	0.156	10.92	11.07	0.52%	36.91%
27510_130	0.152	10.92	11.07	0.51%	36.90%
27510_140	0.149	10.92	11.07	0.50%	36.89%
27510_150	0.147	10.92	11.07	0.49%	36.88%
27510_160	0.144	10.92	11.06	0.48%	36.88%
27510_170	0.141	10.92	11.06	0.47%	36.87%
27510_180	0.138	10.92	11.06	0.46%	36.86%
27510_190	0.136	10.92	11.05	0.45%	36.85%
27510_200	0.133	10.92	11.05	0.44%	36.84%
27510_210	0.131	10.92	11.05	0.44%	36.83%
27510_220	0.129	10.92	11.05	0.43%	36.83%
27510_230	0.127	10.92	11.05	0.42%	36.82%
27510_240	0.124	10.92	11.04	0.41%	36.81%

1.3.2.31. Table 20 shows that all transect receptor predictions of ground level NO_X concentrations for the Crabdens Row ancient woodland are less than the 30 µg/m^3 objective set for the protection of vegetation and ecosystems.

1.3.2.32. Although the annual mean objective is not exceeded at any of the transect receptors, emissions from the ORS back-up generators are predicted to cause an increase in NO_X concentration of more than 1% of the annual mean objective. Further modelling has been carried out for N deposition and N acid deposition in accordance with the Environment Agency's risk assessment guidance (Environment Agency, 2019). It should be noted however that the modelled scenario of constant operation of the backup generators throughout the year upon which this decision is based is highly conservative and will not occur in practise.

Nutrient Nitrogen Deposition

1.3.2.33. Plate 6 and Plate 7 show the predictions for nutrient N deposition along the two transects within the Langstone Harbour SSSI, at Eastney Lake and Langstone Harbour West.

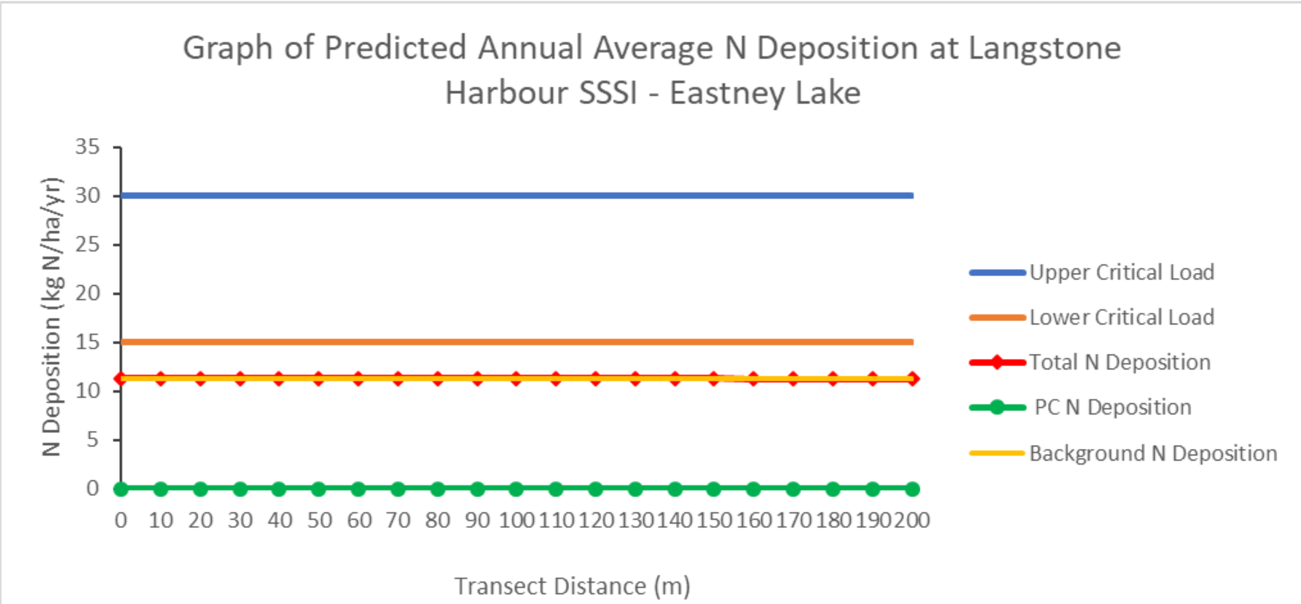


Plate 6 - Graph of Predicted Annual Average N Deposition at Langstone Harbour SSSI - Eastney Lake

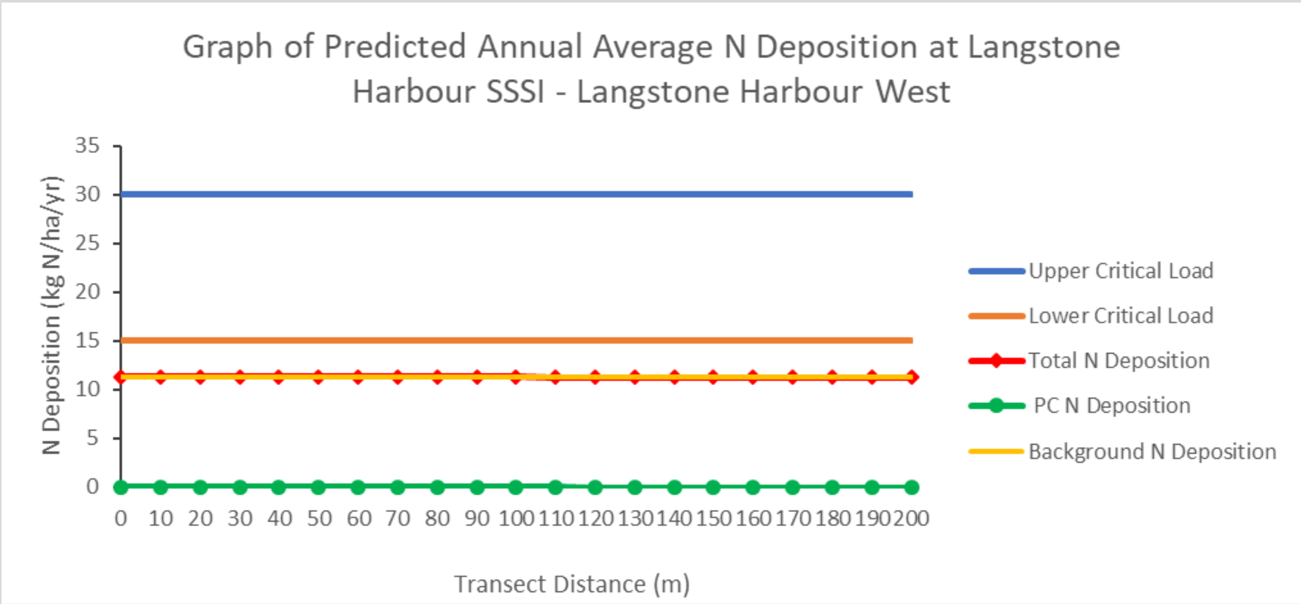


Plate 7 - Graph of Predicted Annual Average N Deposition at Langstone Harbour SSSI - Langstone Harbour West

1.3.2.34. Plate 6 and Plate 7 both show that predicted levels of nutrient N deposition are below the lower critical load value. The plates also show the minimal contribution of the PC to the overall level of N deposition. The majority of deposition in this area is assumed to be from general background, with a contribution from road traffic and marine shipping activity in the area.

Plate 8, Plate 9 and

Plate 10 show the predictions for nutrient N deposition along the modelled transects within the ancient woodlands adjacent to the converter station.

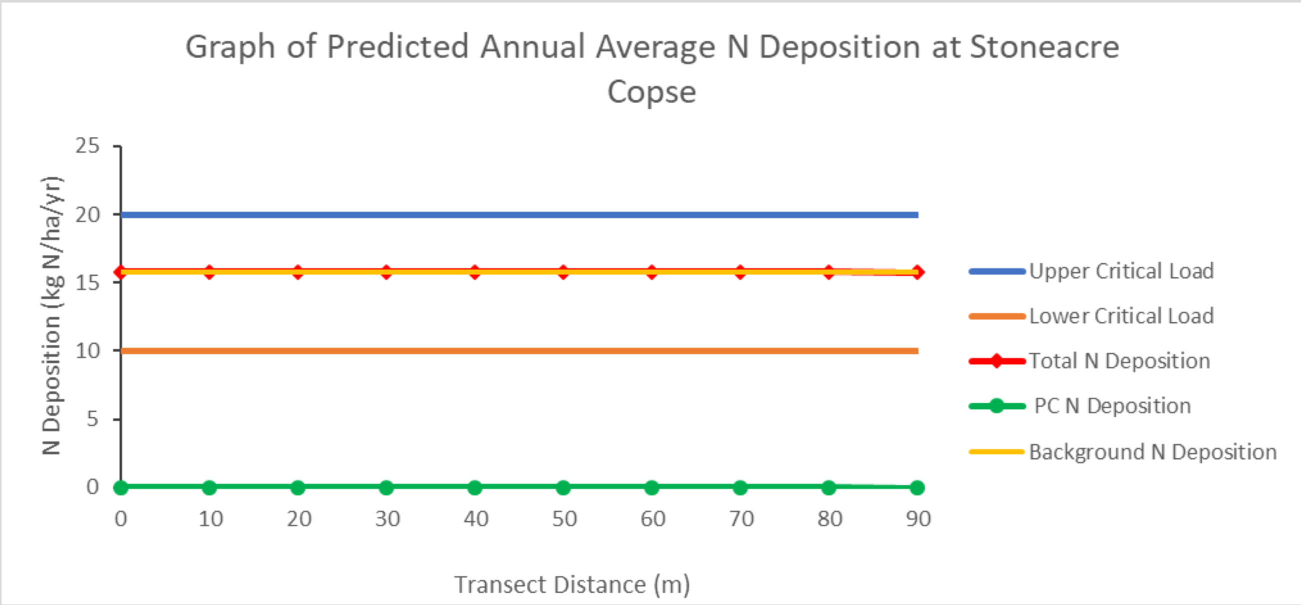


Plate 8 - Graph of Predicted Annual Average N Deposition at Stoneacre Copse

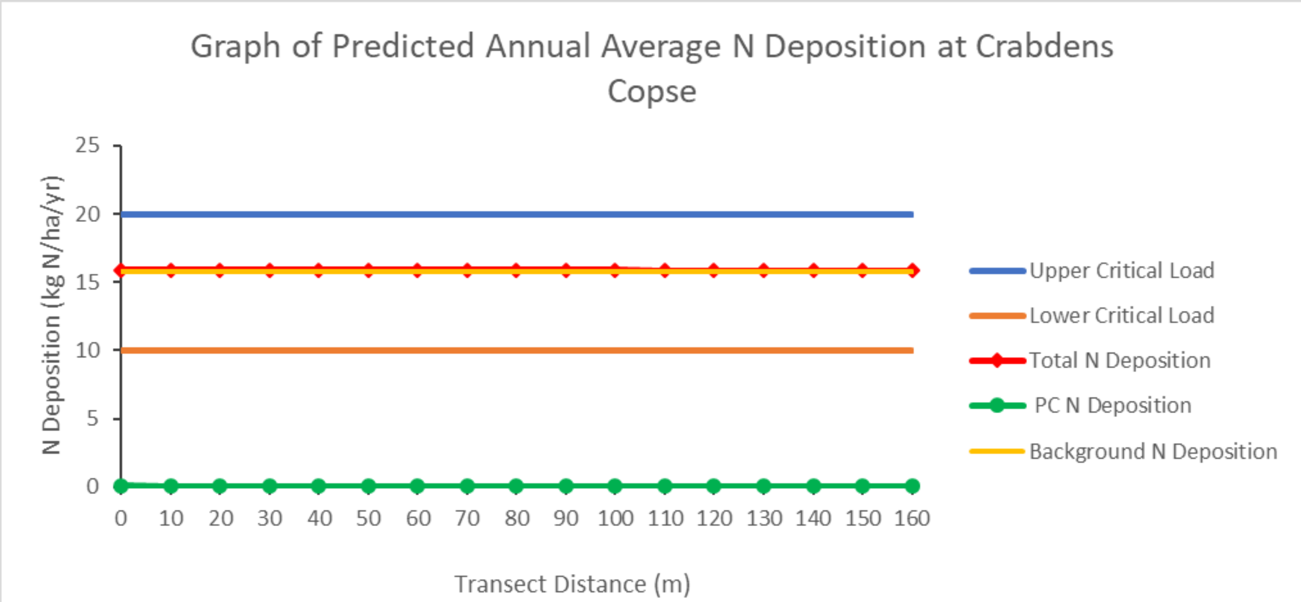


Plate 9 - Graph of Predicted Annual Average N Deposition at Crabdens Copse

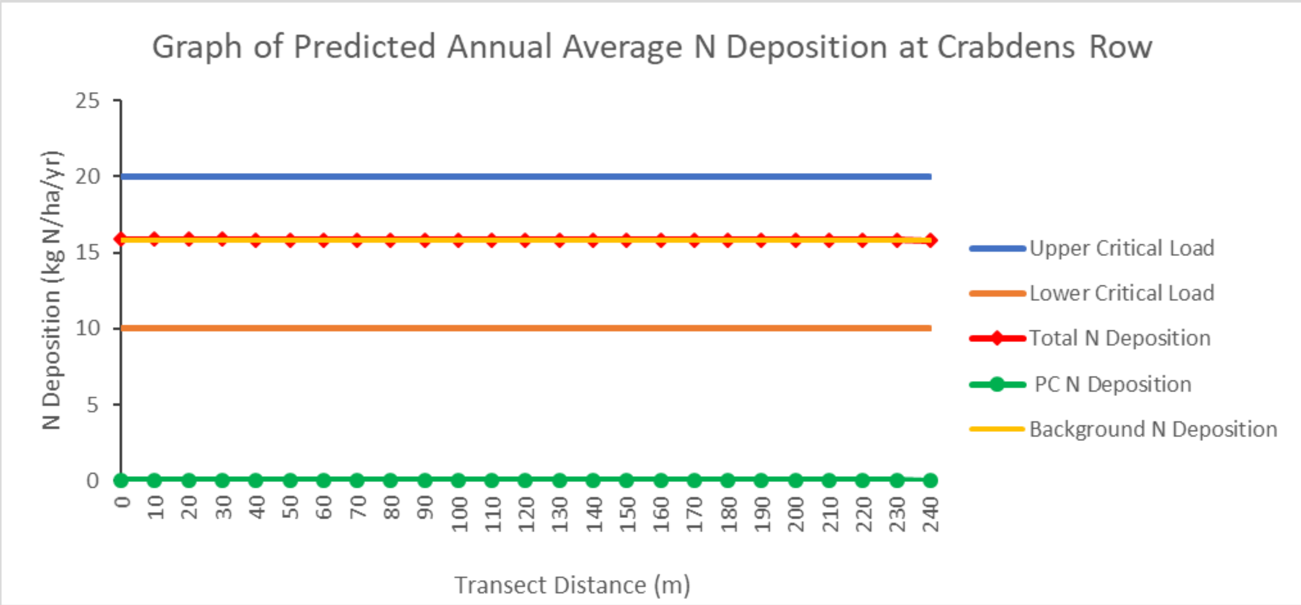


Plate 10 - Graph of Predicted Annual Average N Deposition at Crabdens Row

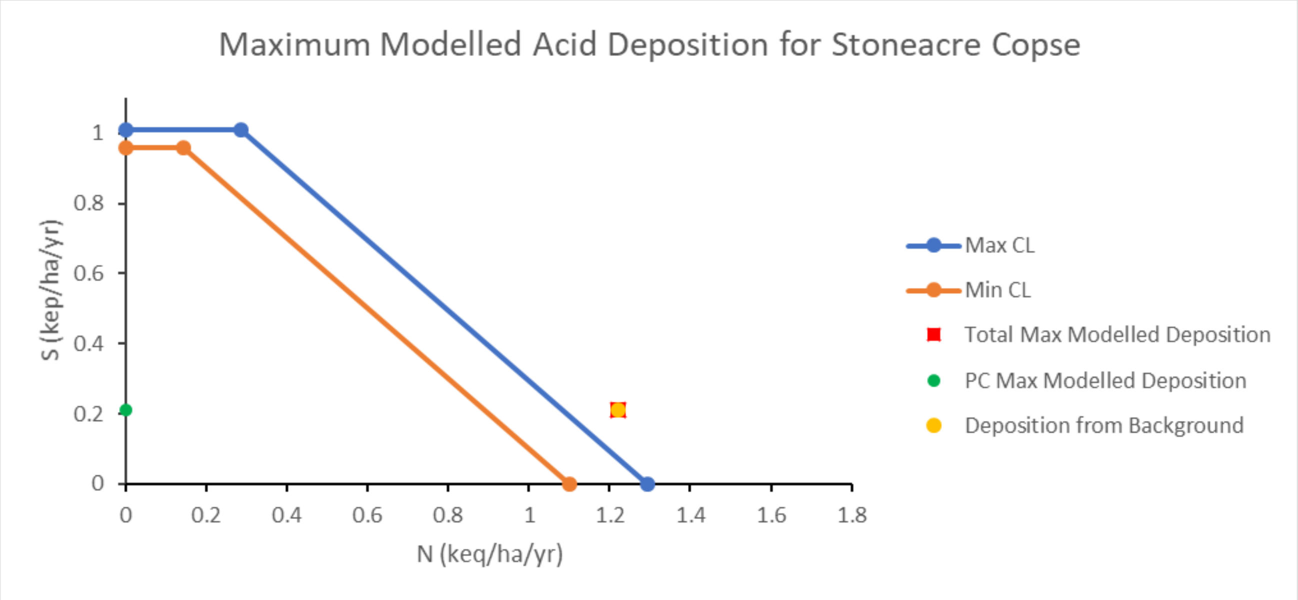
Plate 8, Plate 9 and

1.3.2.35. Plate 10 show that nutrient N deposition within the ancient woodland sites adjacent to the converter station are at the upper limits of the range for the critical load. The plates also show the minimal contribution of the PC to the overall level of deposition such that N deposition from the PEC is little affected. The dominant source of deposition is assumed to be from agricultural activities on the surrounding land.

1.3.2.36. The action of N deposition is a long-term process with any potential effects unlikely to be evident for a number of years. The presented results should be interpreted in the context of the constant long-term deposition required for any impacts to occur and the short-term, sporadic operation of the backup generators.

Acid Deposition

Further calculations for N acid deposition have been undertaken for the ancient woodlands due to their sensitivity. The results of these calculations are shown in



1.3.2.37. Plate 11, Plate 12 and Plate 13

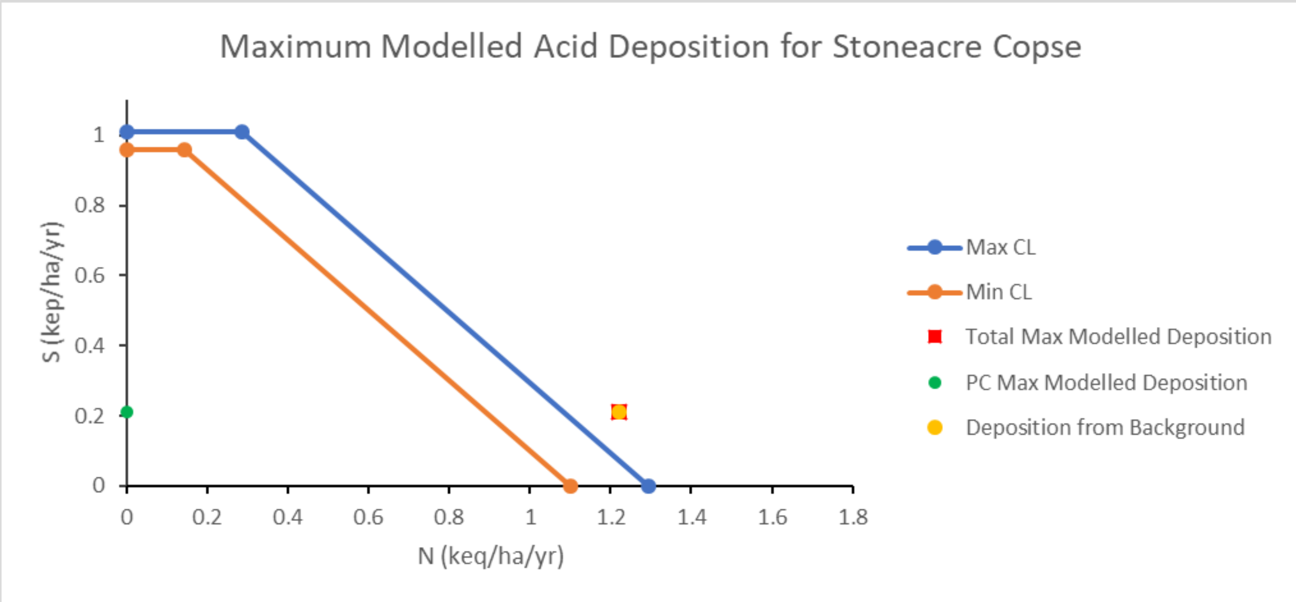


Plate 11 - Modelled N Acid Deposition for Stoneacre Copse

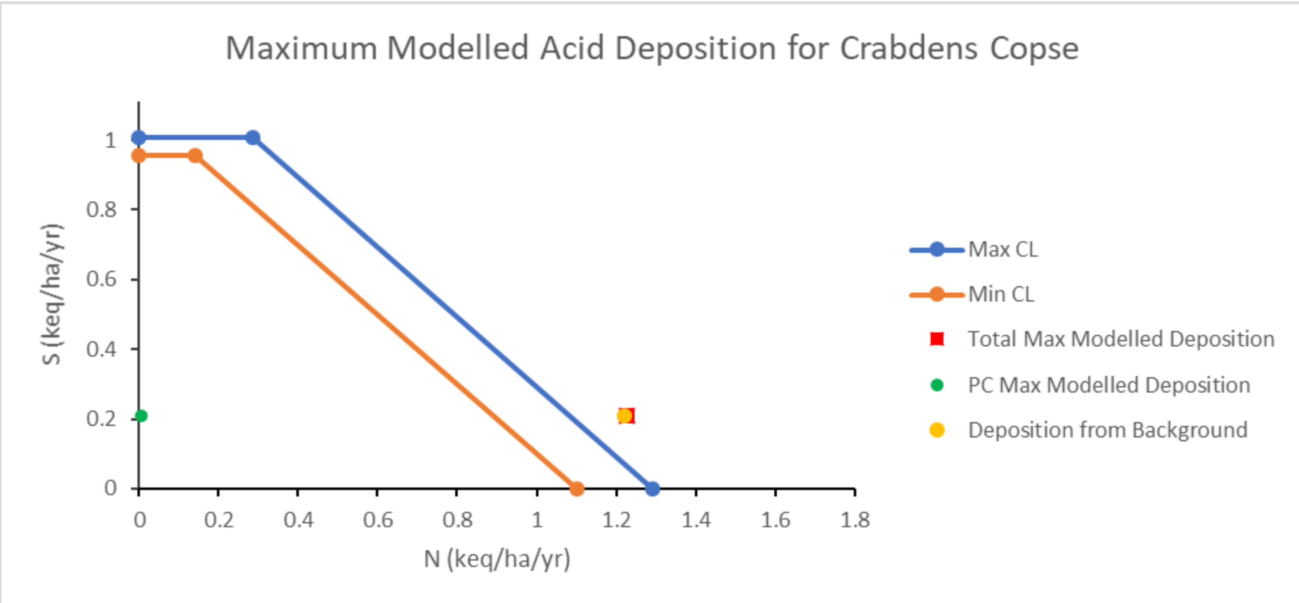


Plate 12 - Modelled N Acid Deposition for Crabdens Copse

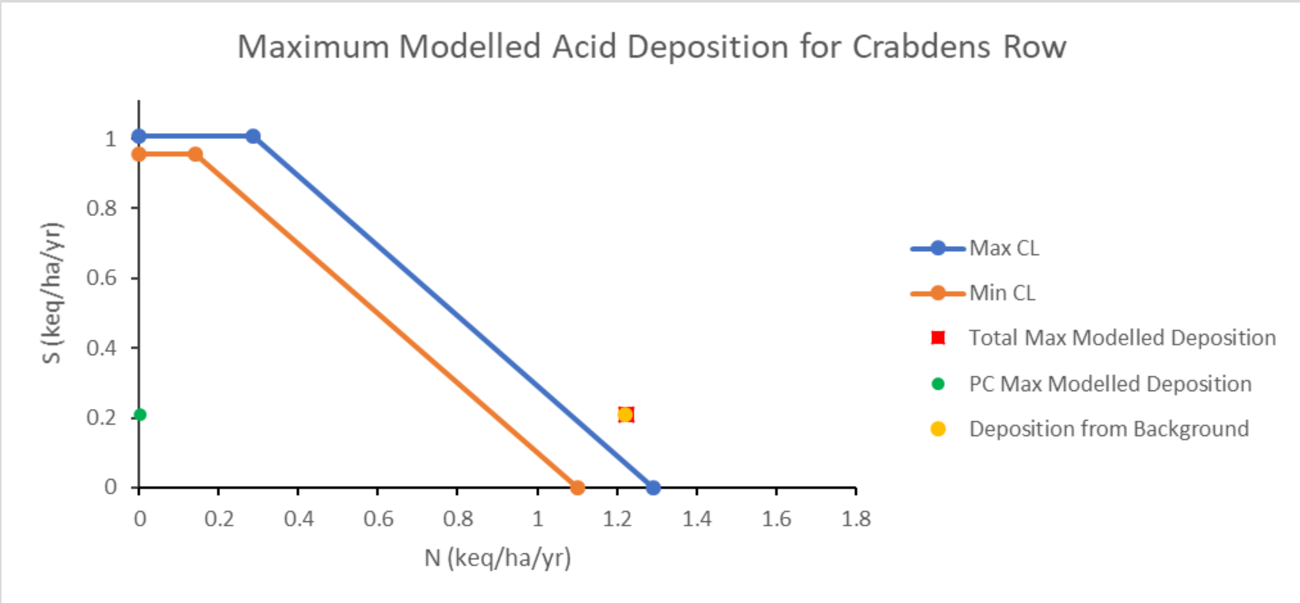
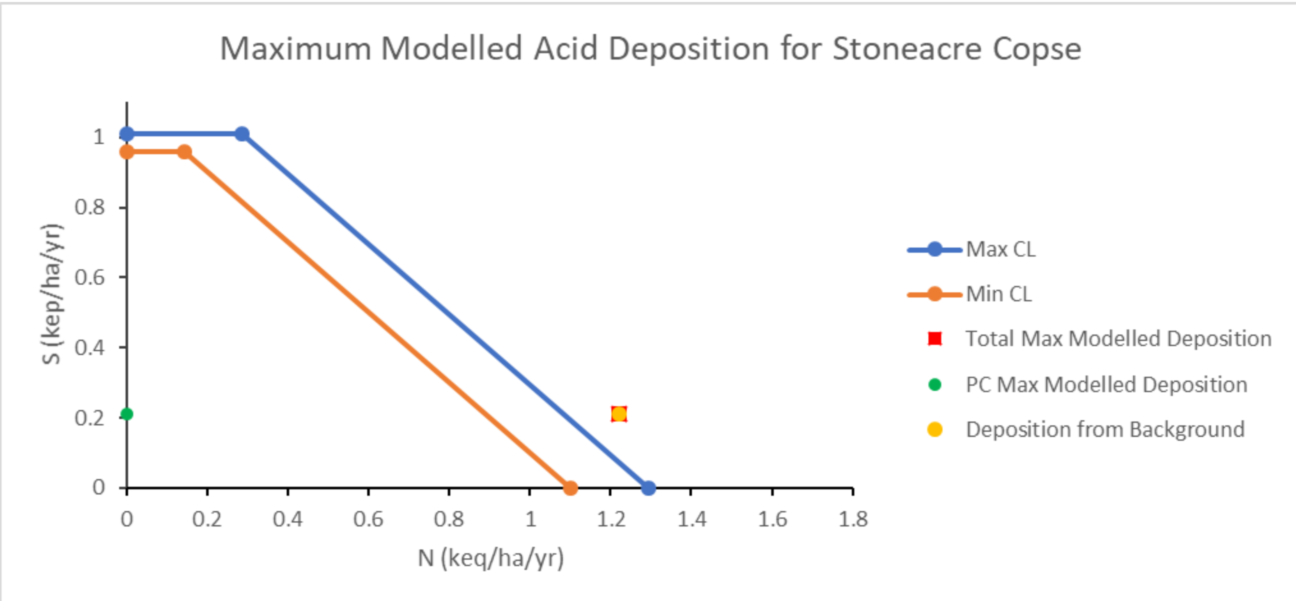
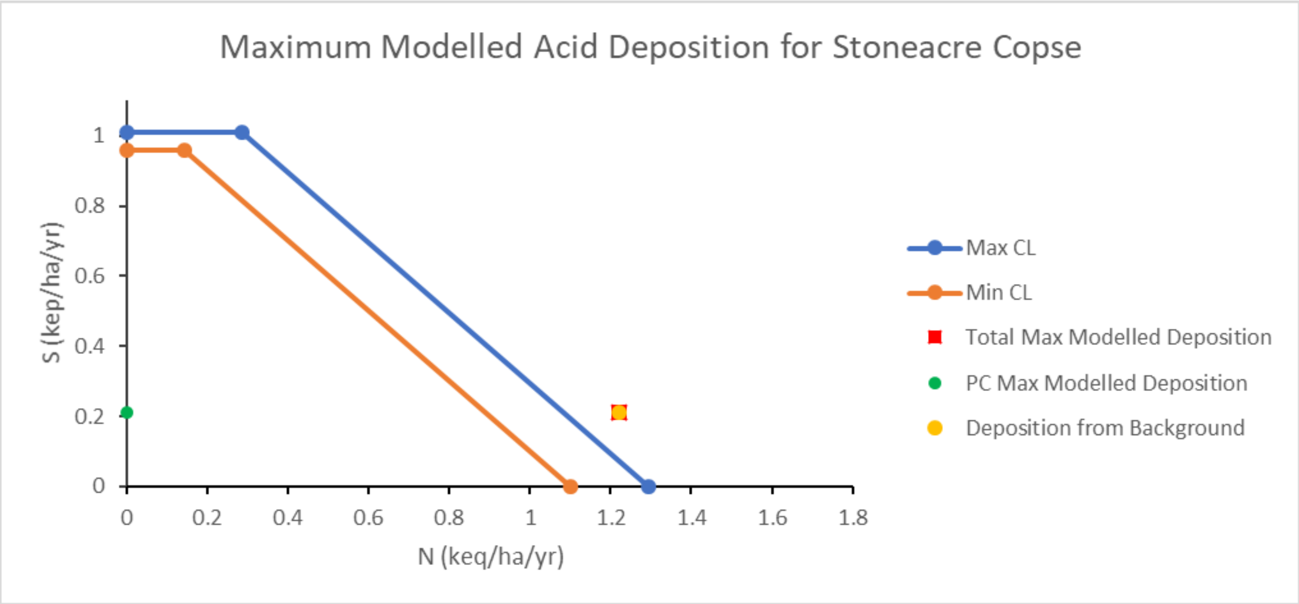


Plate 13 - Modelled N Acid Deposition for Crabdens Row



1.3.2.38. Plate 11, Plate 12 and Plate 13 show that background N acid deposition in all of the ancient woodland sites adjacent to the converter station is in excess of the critical loads for this habitat. The modelled deposition resulting from the operation of the backup diesel generator at this location increases acid deposition further in excess of the critical loads.



1.3.2.39. Plate 11, Plate 12 and Plate 13 show that whilst acid deposition is in excess of the critical load for the ancient woodlands, the PC makes a small contribution to this. The bulk of acid deposition is assumed to be from agricultural sources in the surrounding countryside.

1.3.2.40. The action of acid deposition is a long-term process with any potential effects unlikely to be evident for a number of years. The presented results should be interpreted in the context of the constant long-term deposition required for any impacts to occur and the short-term, sporadic operation of the backup generators.

Significance

1.3.2.41. Following the IAQM impact assessment criteria and taking into account the limitation of sporadic running time associated with the backup generators, negligible impacts are predicted for NO_2, PM_{10} and $PM_{2.5}$ and moderate for THC. Using the conservative assumption for modelling of 24-hour running for 365 days of the year as described in Chapter 23 Air Quality Section 23.4.7, all the predicted maximum annual average concentrations are under half of the objective and exceedances of any of the objectives are highly unlikely. The generators have an annual test for 1 hour per year and are not expected to be active for more than six separate 24-hour occasions, therefore actual emissions will many times lower.

1.3.2.42. Therefore, the effect of changes in local air quality as a result of Operational stage backup power generation is assessed as **negligible adverse** and **not significant**.

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