

FORD ENERGY RECOVERY FACILITY AND  
WASTE SORTING AND TRANSFER FACILITY,  
FORD CIRCULAR TECHNOLOGY PARK



ENVIRONMENTAL STATEMENT  
TECHNICAL APPENDIX C:  
AIR QUALITY, ODOUR AND DUST

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## Ford Energy Recovery Facility and Waste Sorting and Transfer Facility



**Viridor Energy Limited**  
**Grundon Waste Management Limited**  
**Ford Energy from Waste Limited**

Appendix C1 Baseline Analysis

## Document approval

	Name	Signature	Position	Date
Prepared by:	Rhys Weir		Environmental Scientist	02/03/2021
Checked by:	Rosalind Flavell		Senior Environmental Consultant	02/03/2021

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# 1 Introduction

This Appendix contains a review of the baseline air quality and defines the appropriate baseline concentrations to be used in the Environmental Impact Assessment (EIA).

## 2 Air quality review and assessment

Under Section 82 of the Environment Act (1995) (Part IV), local authorities are required to undertake an ongoing exercise to review air quality within their area of jurisdiction. Where a local authority identifies an area of concern with regard to air quality, they have a duty to declare an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP) to reduce pollutant concentrations. No AQMAs have been declared within 10 km of the Proposed Development. The closest AQMA is the Chichester (St Pancras) AQMA, located approximately 13 km to the north-west of the Proposed Development. At this distance it is unlikely that emissions would have a significant impact. Therefore, the impact of emissions from the Proposed Development on AQMAs has not been considered in this assessment.

### 3 National modelling – mapped background data

In order to assist local authorities with their responsibilities under Local Air Quality Management, the Department for Environment Food and Rural Affairs (DEFRA) provides modelled background concentrations of pollutants across the UK on a 1 km by 1 km grid. This model is based on known pollution sources and background measurements and is used by local authorities in lieu of suitable monitoring data. Mapped background concentrations have been downloaded for the grid square containing the Proposed Development and those covering the modelling domain (as detailed in Appendix C2 [Emissions Modelling], the modelling domain is a 8.5 x 8.5 km grid of output points centred on the Proposed Development). In addition, mapped atmospheric concentrations of ammonia are available from DEFRA via the National Environment Research Council (NERC) Centre for Ecology and Hydrology (CEH) throughout the UK on a 5 km by 5 km grid.

The mapped background data is calibrated against monitoring data. For instance, the 2018 mapped background concentrations are based on 2018 meteorological data and are calibrated against monitoring undertaken in 2018. As a conservative approach where mapped background data is used the concentration for the year against which the data was validated has been used. This eliminates any potential uncertainties over anticipated trends in future background concentrations.

Pollutant concentrations will vary over the modelling domain area. Therefore, the maximum mapped background concentration within the modelling domain has been calculated as presented in Table 1, together with the concentration at the Proposed Development site.

Table 1: Mapped Background Data

Pollutant	Annual mean concentration ( $\mu\text{g}/\text{m}^3$ )		Dataset
	At Proposed Development	Max within modelling domain	
Nitrogen dioxide	9.95	12.84	DEFRA 2018 Dataset
Oxides of nitrogen	13.13	17.30	DEFRA 2018 Dataset
Sulphur dioxide	2.52	6.89	DEFRA 2001 Dataset
Particulate matter (as $\text{PM}_{10}$ )	14.43	15.38	DEFRA 2018 Dataset
Particulate matter (as $\text{PM}_{2.5}$ )	9.19	10.82	DEFRA 2018 Dataset
Carbon monoxide	229	265	DEFRA 2001 Dataset
Benzene	0.26	0.36	DEFRA 2001 Dataset
1,3-butadiene	0.11	0.15	DEFRA 2001 Dataset
Ammonia	1.03	1.93	DEFRA (CEH) 2014

## 4 AURN and LAQM monitoring data

The UK Automatic Urban and Rural Network (AURN) is a country-wide network of air quality monitoring stations operated on behalf of the DEFRA. This includes automatic monitoring of oxides of nitrogen, nitrogen dioxide, sulphur dioxide, ozone, carbon monoxide and fine particulate matter.

There are no AURN monitoring stations within 10 km of the Proposed Development. The closest AURN monitoring station to the Proposed Development is Worthing A27 Roadside, an urban traffic site located approximately 15 km to the east of the Proposed Development. Concentrations at roadside/traffic sites are predominately determined by emissions from nearby traffic and are only representative of air quality for the immediate area of the analyser. Therefore, concentrations at this roadside continuous monitoring site would not be representative of concentrations in the vicinity of the Proposed Development, and therefore this data has not been considered further in this analysis.

No continuous analysers operated by local authorities have been identified within 10 km of the Proposed Development.

Arun District Council undertakes non-automatic (diffusion tube) monitoring at various sites across the district, 14 of which lie within 5 km of the Proposed Development.

A summary of monitoring data from these sites is provided in the tables below:

Table 2: Summary of Nitrogen Dioxide Monitoring Results

Site Name	Type *	2018 Mapped Bg ( $\mu\text{g}/\text{m}^3$ )	2014	2015	2016	2017	2018
<b>Diffusion Tube Monitoring</b>							
Litt01	Roadside	11.7	18.0	22.4	22.6	24.5	23.0
Litt02	Roadside	11.3	20.0	25.8	24.4	25.3	23.0
Litt03	Urban Background	11.7	10.3	12.9	12.9	-	-
Litt04	Roadside	8.6	17.0	16.1	22.9	27.1	25.0
Arun05	Roadside	9.5	14.0	17.1	16.2	18.0	16.0
Arun06	Roadside	10.1	25.0	31.4	27.6	28.6	26.0
Arun07	Urban Background	9.5	11.9	12.7	13.7	-	-
Ford08	Roadside	8.9	16.0	17.1	16.6	18.5	18.0
Bog10	Roadside	9.6	25.0	29.9	25.8	25.5	25.0
Arun14	Roadside	10.0	23.0	28.2	27.4	29.0	29.0
Arun16	Roadside	10.1	15.0	18.1	17.0	17.6	19.0
Arun17	Roadside	9.8	-	-	-	-	35.0
Yap19	Roadside	9.2	-	-	-	16.9	17.0
Barn20	Roadside	9.9	-	-	-	20.7	20.0



As shown, all monitored nitrogen dioxide concentrations are well below the annual mean Air Quality Assessment Level (AQAL) of  $40 \mu\text{g}/\text{m}^3$ . At the urban background monitoring locations the monitored concentrations are broadly similar to the mapped background concentrations. The maximum mapped background concentration within the modelling domain ( $13.08 \mu\text{g}/\text{m}^3$ , as shown in Table 1) is slightly higher than the maximum concentration monitored at any of the urban background monitoring sites. The monitoring undertaken by Arun District Council has been fairly consistent over the last 4 years with no trend observable in the data.

## 5 Site specific monitoring

A programme of monitoring of ambient air quality was undertaken in the vicinity of the Proposed Development by TRL, for a period of six months between December 2017 and June 2018.

The monitoring programme comprised diffusion tube monitoring of nitrogen dioxide at eight separate locations in each wind direction surrounding the Proposed Development. The monitoring locations are shown in Figure 1 of Annex A. The diffusion tube nitrogen dioxide results have been annualised and bias-adjusted in accordance with the guidance in LAQMTG(16)<sup>1</sup> and the adjusted results are provided in Table 3.

Table 3: Nitrogen Dioxide Monitoring Results

Location	Type	NGR (m)		2018 mapped Bg ( $\mu\text{g}/\text{m}^3$ )	Annual mean concentration ( $\mu\text{g}/\text{m}^3$ )
		X	Y		
Site 1 – Unnamed Road	R	499692	102996	9.1	13.59
Site 2 – Nelson Row	R	500121	103101	8.7	18.90
Site 3 – Rodney Crescent	R	499951	103551	9.9	12.34
Site 4 – Ford Lane 1	R	499726	103686	9.9	20.71
Site 5 – Ford Lane 2	R	499086	103880	9.9	14.98
Site 6 – Markeeta Cottage	R	499028	102929	9.1	14.94
Site 7 – Rollaston Park	R	498997	102756	8.6	16.38
Site 8 – Horsemere Green	R	499551	102247	9.1	12.73

As shown, measured nitrogen dioxide concentrations are slightly higher than the mapped background concentrations for the grid square containing each of the monitoring sites. However, all these locations are classified as ‘roadside’ sites and as such will include a greater contribution from road sources than the mapped background dataset. As a conservative measure, the maximum monitored concentration of nitrogen dioxide from the site-specific monitoring ( $20.71 \mu\text{g}/\text{m}^3$ ) has been used as the baseline concentration for the purpose of this assessment.

<sup>1</sup> DEFRA (2018), “Local Air Quality Management – Technical Guidance (TG16)”

## 6 Other national monitoring

### 6.1 Hydrogen chloride

Hydrogen chloride is measured on behalf of DEFRA as part of the UK Eutrophying and Acidifying Atmospheric Pollutants (UKEAP) project. This consolidates the previous Acid Deposition Monitoring Network (ADMN), and National Ammonia Monitoring Network (NAMN). There are no monitoring locations within 10 km of the Proposed Development. A summary of data from all UK monitoring sites is presented in Table 4. The UK ceased monitoring of hydrogen chloride at the end of 2015.

Table 4: National Monitoring – Hydrogen Chloride

Site Type	Quantity	AQAL	Annual mean concentration ( $\mu\text{g}/\text{m}^3$ )			
			2012	2013	2014	2015
All	Min	-	0.11	0.15	0.10	0.12
	Max		0.49	0.50	0.54	0.71
	Average		0.27	0.31	0.26	0.24

The UKEAP monitoring was fairly consistent prior to the monitoring ceasing in 2015 with no trend observable in the data. In lieu of any local monitoring, the UK maximum from the national monitoring network has been used for the purpose of this assessment as a conservative estimate ( $0.71 \mu\text{g}/\text{m}^3$  – 2015).

### 6.2 Hydrogen fluoride

Baseline concentrations of hydrogen fluoride are not measured locally or nationally, since these are not generally of concern in terms of local air quality. However, the EPAQS report 'Guidelines for halogens and hydrogen halides in ambient air for protecting human health against acute irritancy effects' (May 2008) contains some estimates of baseline levels, reporting that measured concentrations have been in the range of  $0.036 \mu\text{g}/\text{m}^3$  to  $2.35 \mu\text{g}/\text{m}^3$ .

In lieu of any local monitoring, the maximum measured baseline hydrogen fluoride concentration has been used for the purpose of this assessment as a conservative estimate.

### 6.3 Ammonia

Ammonia is also measured as part of the UKEAP project. There are no UKEAP monitoring locations within 10 km of the Proposed Development. The closest site to the Proposed Development is Lillington Heath, located approximately 54 km to the east of the Proposed Development. In lieu of any local UKEAP monitoring, the maximum mapped background over the modelling domain has been used for the purpose of this assessment, as set out in Table 1.

### 6.4 Volatile Organic Compounds

As part of the Automatic and Non-Automatic Hydrocarbon Network, benzene concentrations are measured at sites co-located with the AURN across the UK. In 2007, due to low monitored

concentrations of 1,3-butadiene at non-automatic sites, DEFRA took the decision to cease non-automatic monitoring of 1,3-butadiene.

There are no benzene monitoring locations within 10 km of the Proposed Development. In lieu of any local monitoring of benzene or 1,3-butadiene, the maximum mapped background concentrations within the modelling domain as presented in Table 1 have been used as the baseline concentrations for this assessment.

## 6.5 Metals

Metals are measured as part of the Rural Metals and UK Urban/Industrial Networks (previously the Lead, Multi-Element and Industrial Metals Networks). There are no metals monitoring locations within 10 km of the Proposed Development. The closest site to the Proposed Development is Chilbolton Observatory, located approximately 80 km to the north-west of the Proposed Development.

The Proposed Development site is in a predominantly rural area, however, as a conservative measure it is considered that the urban background monitoring sites are likely to be most like the conditions close to the Proposed Development. A summary of annual data averaged across all UK urban background monitoring sites is presented in Table 5.

Table 5: Metals Monitoring - Average of all Urban Background Sites

Substance	Annual mean concentration (ng/m <sup>3</sup> )						Max (as % of AQAL)
	AQAL	2015	2016	2017	2018	2019	
Arsenic	3	0.75	0.72	0.77	0.74	0.78	25.95%
Cadmium	5	0.18	0.23	0.21	0.22	0.21	4.51%
Chromium	5,000	6.14	6.41	6.50	8.26	5.63	0.17%
Copper	10,000	9.80	12.15	10.10	11.09	10.43	0.12%
Mercury	250	2.50	2.50	2.70	2.80	-	1.12%
Manganese	150	8.16	8.67	9.24	10.19	8.31	6.79%
Nickel	20	5.39	5.80	4.36	5.53	4.96	29.01%
Lead	250	9.59	8.83	8.71	11.06	8.00	4.42%
Vanadium	5,000	0.88	0.90	0.91	1.14	1.04	0.02%
Antimony*	5,000	-	-	-	-	-	-
Cobalt	-	0.21	0.25	0.24	0.29	0.23	-

\*Notes: Antimony is not monitored at urban background sites. The average across all UK monitoring sites has been used (0.38 ng/m<sup>3</sup>) .

## 6.6 Dioxins, furans and polychlorinated biphenyl (PCBs)

Dioxins, furans and PBCs are monitored on a quarterly basis at a number of urban and rural stations in the UK as part of the Toxic Organic Micro Pollutants (TOMPs) network. There are no monitoring locations within 10 km of the Proposed Development. The closest site to the Proposed Development is London Noble House, located approximately 81 km to the north of the Proposed Development.

A summary of dioxin and furan and PCB concentrations from all monitoring sites across the UK is presented in Table 6 and Table 7. Note that annual statistics are only available up to 2016.

Table 6: TOMPS – Dioxin and Furans Monitoring

Site	Annual mean concentration (fg TEQ/m <sup>3</sup> )				
	2012	2013	2014	2015	2016
Auchencorth Moss	0.13	0.86	0.01	0.01	0.13
Hazelrigg	8.75	2.02	2.61	5.27	4.59
High Muffles	4.32	0.6	1.07	0.54	2.73
London Nobel House	15.42	3.47	2.89	4.34	21.27
Manchester Law Courts	32.99	10.19	16.52	5.94	12.23
Weybourne	9.30	2.34	1.61	1.42	16.32

Table 7: TOMPS – PCB Monitoring

Site	Annual mean concentration (pg/m <sup>3</sup> )				
	2014	2015	2016	2017	2018
Auchencorth Moss	23.23	24.27	25.32	19.09	12.31
Hazelrigg	25.84	41.68	52.58	33.15	22.22
High Muffles	26.11	33.43	37.76	31.63	8.86
London Nobel House	107.49	121.39	110.46	121.87	46.63
Manchester Law Courts	128.93	97.99	92.60	97.27	40.10
Weybourne	17.00	20.95	38.61	32.26	11.23

As shown, the concentrations vary significantly between sites and years. As no site is located in close proximity to the Proposed Development, the maximum monitored concentration has been used as the baseline concentration within this assessment (33.00 fg/TEQ/m<sup>3</sup> for dioxins and furans and 128.93 pg/m<sup>3</sup> for PCBs).

## 6.7 Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are monitored at a number of stations in the UK as part of the PAH network. There are no monitoring locations within 10 km of the Proposed Development. For the purpose of this assessment, benzo(a)pyrene is considered as this is the only PAH for which an AQAL has been set. The Proposed Development site is in a predominantly rural area, however as a conservative measure it is considered that the urban background monitoring sites are likely to be most like the conditions close to the Proposed Development. A summary of annual data averaged across all UK urban background monitoring sites is presented in Table 8.

Table 8: Summary of Benzo(a)pyrene Monitoring Results

Site Type	Quantity	AQAL	Annual mean concentration (ng/m <sup>3</sup> )				
			2015	2016	2017	2018	2019
Urban Background	Average	0.25	0.29	0.36	0.24	0.23	0.29
Rural Background	Average	0.25	0.10	0.11	0.10	0.12	0.16

As shown, the average concentration from an urban background site exceeded the AQAL for benzo(a)pyrene in 2015, 2016 and 2019. However, the Fourth Daughter Directive outlines target assessment thresholds for benzo(a)pyrene of 1.0 ng/m<sup>3</sup> total content in the PM<sub>10</sub> fraction averaged over a calendar year, with an upper assessment threshold of 0.6 ng/m<sup>3</sup> and a lower assessment threshold of 0.4 ng/m<sup>3</sup>. In all years the average is less than the Fourth Daughter Directive assessment threshold.

As a conservative measure, the maximum of the average monitored concentrations from an urban background site (0.36 ng/m<sup>3</sup> – 2016) has been used as the baseline concentration for this assessment. It is noted that this exceeds the AQAL.

## 7 Summary

The preceding sections have provided a review of the baseline local and national monitoring data and national modelled background concentrations. It is generally considered that at background sites concentrations of oxides of nitrogen, nitrogen dioxide and particulate matter (i.e. pollutants associated with transportation and combustion processes) have been decreasing. The only local monitoring available is for nitrogen dioxide. The monitored concentrations are fairly low and as such the decreases in background concentrations observed in the UK are not specifically demonstrated in the local area. Therefore, as a conservative assumption it has been assumed that there will be no decrease in future background concentrations.

The Predicted Environmental Concentration (PEC) will be calculated by adding the contribution from the Proposed Development to the baseline concentration presented in Table 9.

The assessment methodology for annual mean impacts is based on the contribution from the Proposed Development in relation to a future baseline. Where the annual mean contribution from the Proposed Development is less than 0.5% of the long term AQAL, the magnitude of change is described as 'negligible' irrespective of the total concentration. If the magnitude of change cannot be described as 'negligible' irrespective of the total concentration the choice of baseline concentrations will be considered further.

*Table 9: Summary of Baseline Concentrations*

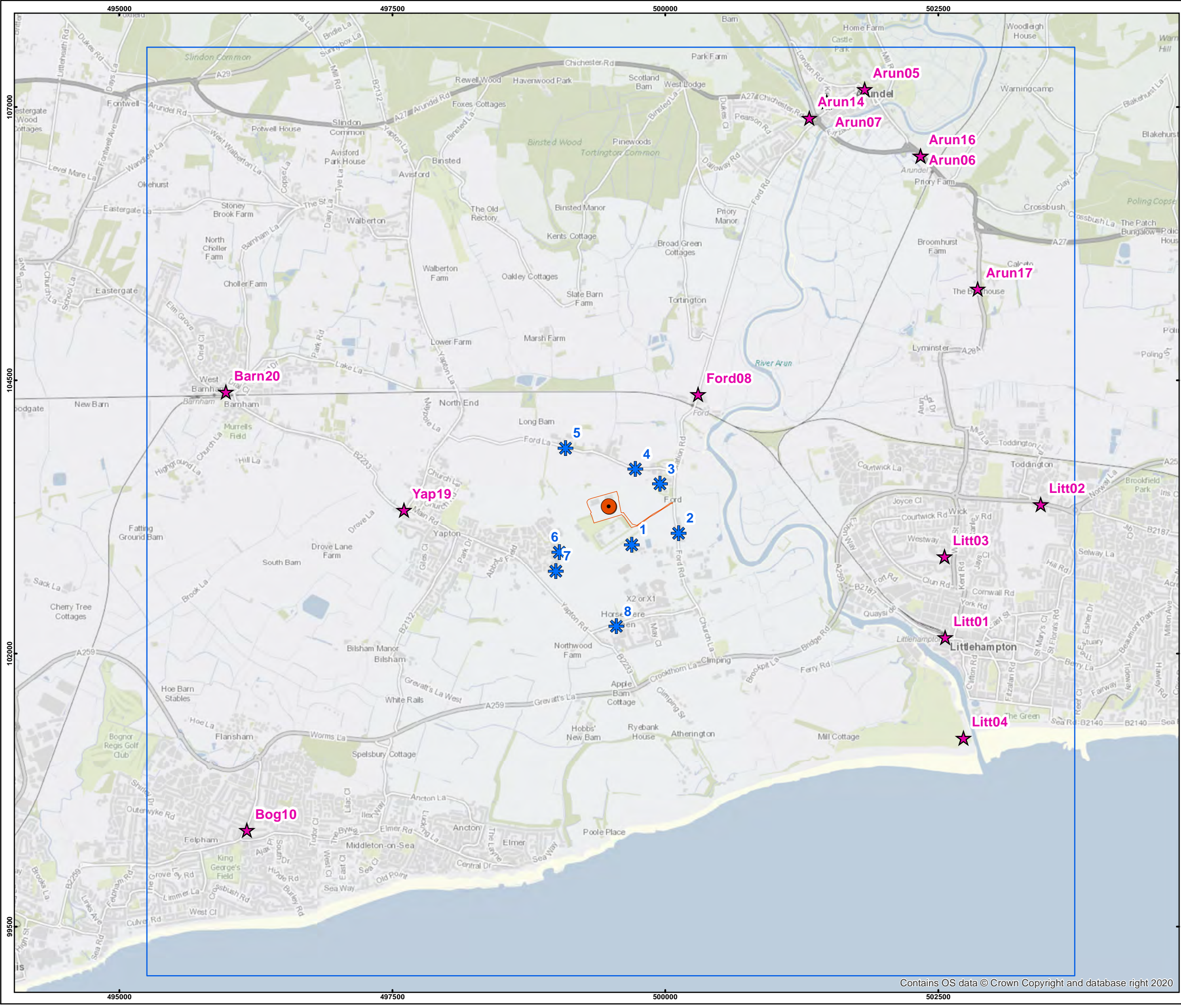
Pollutant	Annual mean concentration	Units	Justification
Nitrogen dioxide	20.71	µg/m <sup>3</sup>	Maximum monitored concentration from site specific monitoring.
Oxides of nitrogen	17.30	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2018 dataset.
Sulphur dioxide	6.89	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset.
Particulate matter (as PM <sub>10</sub> )	15.38	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2018 dataset.
Particulate matter (as PM <sub>2.5</sub> )	10.82	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2018 dataset.
Carbon monoxide	265	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset.
Benzene	0.36	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset
1,3-butadiene	0.15	µg/m <sup>3</sup>	Maximum mapped background concentration from across the modelling domain – DEFRA 2001 dataset






Pollutant	Annual mean concentration	Units	Justification
Ammonia	1.93	$\mu\text{g}/\text{m}^3$	Maximum monitored concentration from DEFRA (CEH) 2014 dataset.
Hydrogen chloride	0.71	$\mu\text{g}/\text{m}^3$	Maximum monitored concentration across the UK 2012 to 2015
Hydrogen fluoride	2.35	$\mu\text{g}/\text{m}^3$	Maximum measured concentration from EPAQS report
Mercury	2.80	$\text{ng}/\text{m}^3$	Maximum annual concentration averaged across all urban background sites across the UK 2015 to 2019
Cadmium	0.23	$\text{ng}/\text{m}^3$	
Arsenic	0.78	$\text{ng}/\text{m}^3$	
Antimony	0.38	$\text{ng}/\text{m}^3$	Average across all UK monitoring sites 2015 to 2019
Chromium	8.26	$\text{ng}/\text{m}^3$	Maximum annual concentration averaged across all urban background sites across the UK 2015 to 2019
Cobalt	0.29	$\text{ng}/\text{m}^3$	
Copper	12.15	$\text{ng}/\text{m}^3$	
Lead	11.06	$\text{ng}/\text{m}^3$	
Manganese	10.19	$\text{ng}/\text{m}^3$	
Nickel	5.80	$\text{ng}/\text{m}^3$	
Vanadium	1.14	$\text{ng}/\text{m}^3$	
Dioxins and Furans	33.00	$\text{fg}/\text{m}^3$	
Dioxin-like PCBs	128.93	$\text{pg}/\text{m}^3$	
PaHs	0.36	$\text{ng}/\text{m}^3$	Maximum annual concentration averaged across all urban background sites across the UK 2015 to 2019



# Annex

# A Figures

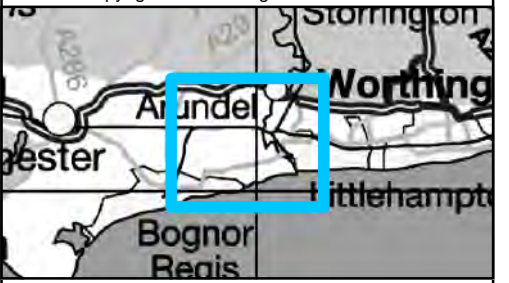


- Legend**
-  Stack locations
  -  Modelling Domain
  -  Site boundary
  -  TRL Diffusion Tube locations
  -  Arun District Council Diffusion Tube Locations

Client:	Viridor, Grundon and Ford EFW
Site:	Ford
Project:	Ford Circular Technology Park
Title:	

Figure 1 - Monitoring Locations

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**FICHTNER**  
 Consulting Engineers Limited

Kingsgate, Wellington Road North,  
 Stockport, Cheshire, SK4 1LW  
 Tel: 0161 476 0032  
 Fax: 0161 474 0618

ENGINEERING  CONSULTING

**FICHTNER**

Consulting Engineers Limited

Kingsgate (Floor 3), Wellington Road North,  
Stockport, Cheshire, SK4 1LW,  
United Kingdom

t: +44 (0)161 476 0032

f: +44 (0)161 474 0618

[www.fichtner.co.uk](http://www.fichtner.co.uk)