



Department
for Environment
Food & Rural Affairs

Report on measures for 2017 exceedance of the Target Value for Benzo[a]pyrene in Yorkshire and Humberside non-agglomeration zone (UK0034)

December 2019



© Crown copyright 2019

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence v.3. To view this licence visit www.nationalarchives.gov.uk/doc/open-government-licence/version/3/ or email PSI@nationalarchives.gov.uk

This publication is available at www.gov.uk/government/publications

Any enquiries regarding this publication should be sent to us at

Air Quality and Industrial Emissions
Department for Environment, Food and Rural Affairs
Ground Floor, Seacole Building
2 Marsham Street
London, SW1P 4DF

Email: air.quality@defra.gov.uk

With technical input from Ricardo Energy & Environment

www.gov.uk/defra

Contents

1. Introduction	4
1.1 Context.....	4
1.2 Status of zone	5
2 Exceedance situation Yorkshire and Humberside [B[a]P_UK0034_2017_1] related to industrial emissions	8
2.1 Description of exceedance	8
2.2 Source apportionment.....	12
2.3 Measures	14

1. Introduction

1.1 Context

Under the EU Directive 2004/107/EC¹, the target value (TV) for Benzo[a]pyrene (B[a]P) is an annual mean concentration of 1 nanogram (one billionth of a gram (10^{-9})) per cubic metre (ng.m^{-3}) of ambient air or lower. The Directive requires that Member States report on measures in place to address the exceedance of the TV and that all reasonable measures that do not entail disproportionate cost should be taken to ensure this target is not exceeded.

Emissions of B[a]P fell significantly from 1990 to 2001, after which the reported emissions have either reached a plateau or fallen steadily depending on the location, reflecting the effect of environmental regulation and Best Available Techniques (BAT) for pollution control. In 2017 for the UK, data shows that there is a continuing, downward trend in emissions of B[a]P, which is reflected by ambient-air measurements both nationally and locally (see Table 2 of this report). However, in the Yorkshire and Humberside region, there were two exceedances at the five measurement locations.

After reviewing the monitoring data, followed by targeted monitoring and modelling to apportion the sources of the exceedances, the Environment Agency identified the exact processes that were significantly contributing to the target exceedances. The Environment Agency then directed the operator to determine the causes of the exceedances, and put in place a compliance programme to better control the process and to minimise the likelihood of further exceedances.

The process causing the exceedances were two coke ovens at a steel works. During 2015, the performance of both coke oven plants were assessed as poor at the installation. Following regulatory pressure to improve; inspections, assessing emissions against emission limits and a permit review to meet BRef requirements, the outcome was be a closure of one of the two plants. This led to effectively implementing the sector BAT Reference Document by the Industrial Emissions Directive (EU Directive 2010/75/EU), and then focused investment and engineering works in the remaining ACO coke-oven plant and Sinter plant.

Since 2016, the operator of the coke ovens has continued working through a significant capital and revenue project to improve their operational performance of

¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF>

their plant, with improved infrastructure to prevent and minimise emissions, specifically PAH and B[a]P emissions reductions associated with particulate emissions.

A sinter-plant stack at the installations is the other significant source of PAH and B[a]P emissions. This particular plant is subject to other specific Best Available Techniques (BAT) conclusions from the BRef under the Industrial Emissions Directive (EU Directive 2010/75/EU). Improved abatement projects being implemented to reduce particulate and dioxin/furan emissions have potential to minimise B[a]P emissions. The revised permit has six-monthly PAH monitoring expressed as B[a]P emissions to assess potential improvements.

Additionally, the revised IED EPR permit for the operator requires an annual review and report on measures to prevent and minimise PAH emissions and development of an Air Quality Management plan.

Exceedance of the TV were reported in 2013, 2014, 2015 and 2016 in the Yorkshire and Humberside non-agglomeration zone and a report on measures was published detailing the exceedance and the measures in place².

This document reports the progress in reducing emissions, together with any exceedances for 2017, reflecting the more recent assessment and updating the 2013, 2014, 2015 and 2016 report on measures.

1.2 Status of zone

This is the report on measures required for exceedances of the TV for B[a]P within the Yorkshire & Humberside zone identified within the 2017 UK air quality assessment. Exceedances within this zone were identified on the basis of model results providing supplementary information for the assessment in addition to the results from fixed monitoring stations. This exceedance was reported via e-Reporting dataflow G³ on attainment and Air Pollution in the UK⁴.

Table 1 summarises the spatial extent and associated resident population for the exceedances identified in this zone, as reported via e-Reporting.

² <https://uk-air.defra.gov.uk/library/bap-nickel-measures>

³ <http://cdr.eionet.europa.eu/gb/eu/aqd>

⁴ <http://uk-air.defra.gov.uk/library/annualreport/index>

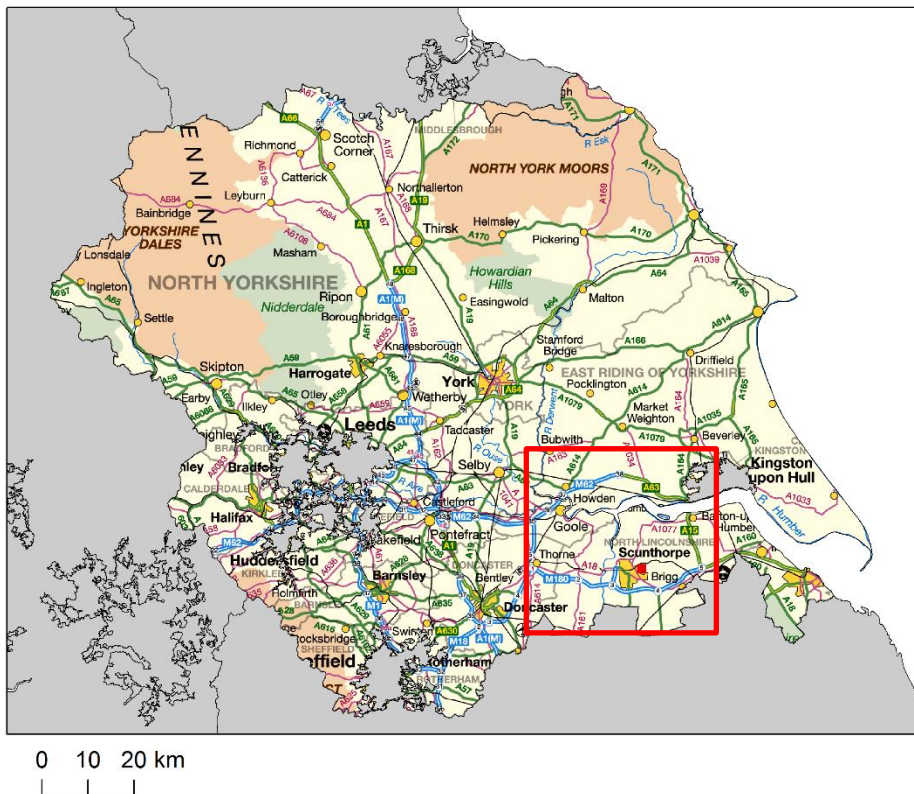
Table 1. Area exceeding B[a]P target value in 2017 and associated population for zone UK0034

Zone code	Zone Name	Area exceeding TV (km ²)	Population exceeding TV
UK0034	Yorkshire & Humberside	4	7

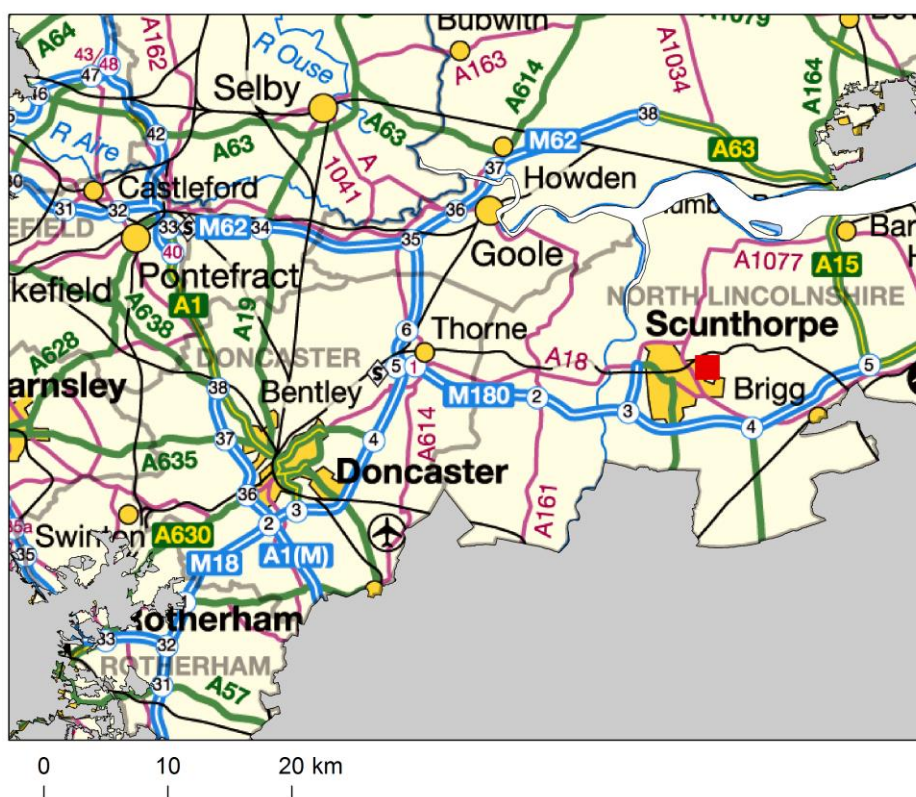
Figure 1a shows the locations of the exceedances in the context of the zone as a whole. Figure 1b shows the part of the zone including the exceedances in more detail.

Figure 1. Location of exceedance of the B[a]P target value during 2017 in zone UK0034 Yorkshire & Humberside. Areas of the zone in exceeding grid squares are marked red.

a) The whole zone



b) The exceedance locations at higher spatial resolution



An initial source apportionment was carried out and this analysis identified one exceedance situation within this zone

- Yorkshire and Humberside [B[a]P_UK0034_2017_1] related to industrial emissions (area of exceedance 4 km²)

This following section details the exceedance situation in the zone including a description of the exceedance situation, maps, information on source apportionment and a list of measures already taken or to be taken. Information on measures is reported within e-Reporting dataflow K⁵.

⁵ <http://cdr.eionet.europa.eu/gb/eu/aqd>

2 Exceedance situation Yorkshire and Humberside [B[a]P_UK0034_2017_1] related to industrial emissions

2.1 Description of exceedance

This exceedance situation is an area of exceedance 4 km² to the north east of Scunthorpe in Lincolnshire. Figure 2 shows the location of the exceedance situation in detail. The exceeding grid squares are numbered in Figure 2 and in subsequent tables for easy reference. The resident population associated with this exceedance situation is 7. Most of the grid squares have no resident population and are largely or wholly within the steelworks industrial complex area.

Table 2 lists the measured concentrations of B[a]P in this zone since 2008. The fixed monitoring station at Scunthorpe Low Santon is within the exceedance situation. The TV was not exceeded at this monitoring station or at the Scunthorpe Town monitoring station in 2017. The measured concentration at Scunthorpe Low Santon was just below the TV in 2017. The modelled concentration at this location is above the TV.

Table 2. Measured annual mean B[a]P concentrations in Yorkshire and Humberside zone UK0034 from 2008 to 2018 (ngm⁻³). (Percentage data capture is shown in brackets).

Station (Eol code)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
High Muffles (GB0014R)	0.14 (95)	0.09 (62)	0.07 (94)	0.06 (87)	0.07 (91)	0.07 (87)	0.07 (98)	0.07 (98)	0.05 (100)	0.04 (100)	0.04 (99)
Royston (GB0940A)	2.6 (95)	1.0 (95)	1.1 (84)	0.84 (96)	0.89 (99)	0.85 (100)	0.92 (100)	0.41 (100)	0.52 (100)	0.34 (99)	0.38 (99)
Scunthorpe Low Santon (GB1004A)	6.0 (95)	2.4 (99)	1.8 (94)	3.0 (91)	2.9 (100)	3.4 (100)	3.6 (92)	3.5 (99)	1.1 (99)	0.83 (100)	0.78 (100)
Scunthorpe Town (GB0841A)	3.2 (99)	1.8 (99)	1.3 (80)	1.3 (86)	1.4 (98)	3.9 (98)	3.5 (90)	1.3 (92)	1.1 (100)	0.80 (99)	1.7 (100)
South Hiendley (GB0942A)	1.3 (97)	0.89 (94)	0.63 (91)	0.68 (83)	0.54 (100)	0.35 (91)	0.44 (99)	0.26 (95)	0.31 (100)	0.19 (100)	0.23 (100)

Figure 2 also shows the locations of the monitoring sites associated with the exceedance situation and the locations of the key industrial sources. Dispersion modelling up to and including 2016 applied site level coordinates derived from the National Atmospheric Emissions Inventory (NAEI) for the sinter plant stack, which is about 850 m distant from the stack. The specific location of the sinter plant stack has been used for the 2017 assessment. The contribution from the sinter plant to ambient concentrations is much smaller than from the coke ovens and thus the uncertainty introduced will have been small. The specific location of the sinter plant is shown in Figure 2.

The Scunthorpe Steel works operator has also invested in and operated their own PaH B[a]P monitoring with the same equipment, to the same standards as the AURN monitoring network and accredited laboratory analysis at an iron & steel Research and Development centre at Rotherham. With Dawes Lane Coke Oven closing, Scunthorpe Town AURN closer to compliance, the reviewed locations (originally 3) have been reduced to one near to High Santon where typical costs are ~£80k p.a. In contrast to the Defra AURN network, measuring a daily sample monthly composite as a mean value, these measure 3-day sample composite and report mean values. Employed as more dynamic emission trending and an investigational tool for the Operator. With wind sector analysis and assessment, plant emission source apportionment and operations have been assessed.

Dawes Lane coke ovens closed in March 2016. The exceeding grid squares within this exceedance situation are numbered and the numbers correspond to those in subsequent tables. Table 3 lists the exceeding grid squares and the resident population.

Figure 2. Exceedance situation Yorkshire and Humberside [B[a]P_UK0034_2017_1]. Exceeding grid squares are marked red. Locations of coke works at Appleby and sinter plant at Scunthorpe are also shown as well as the two monitoring sites at Scunthorpe Town and Scunthorpe Low Santon.

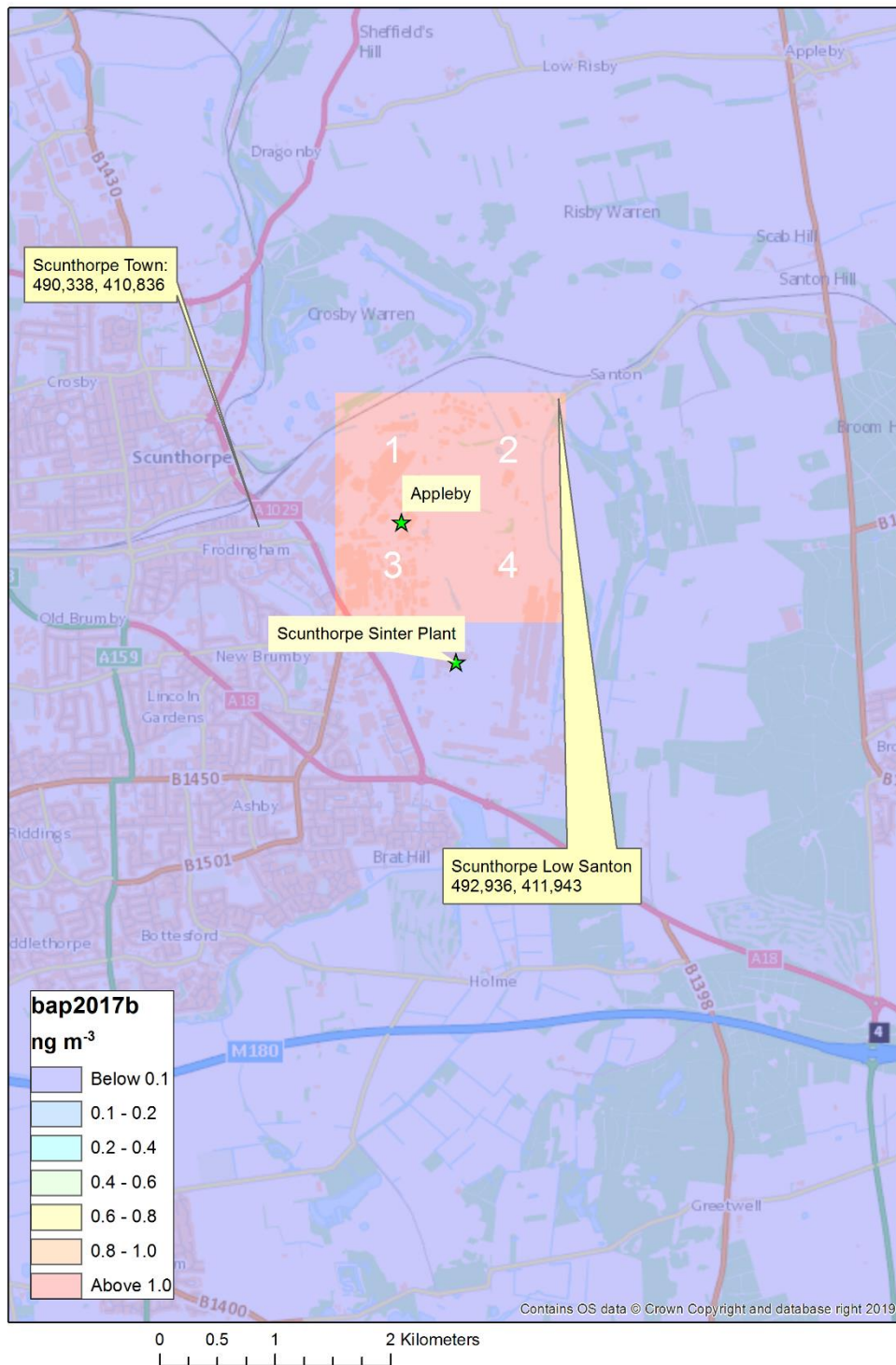


Table 3. Exceeding grid squares for exceedance situation BaP_UK0034_2017_1.

Grid square number	Resident population	Notes
1	0	Steelworks industrial complex
2	7	Mostly steelworks industrial complex, 3 houses in Low Santon
3	0	Mostly steelworks industrial complex
4	0	Steelworks industrial complex

2.2 Source apportionment

Table 4 provides a breakdown of the main emission sources (source apportionment) that have contributed to the grid squares in this exceedance situation, highlighting the significant contribution from industrial sources. The penultimate column is the total from all emission sources. The values in this column have been rounded to 1 decimal place for consistency with the values used in the compliance assessment. The values in the other columns have not been rounded. The other shaded columns are the subtotals for the regional, urban background and local contributions. Table 5 gives a more detailed source apportionment indicating how the separate industrial processes contribute to the total industrial figure. This shows that the coke ovens at Appleby is the main source associated with this exceedance situation (note Dawes Lane coke ovens closed in March 2016). As the modelling is getting closer to the monitoring values, there is scope to further investigate refining the source terms for input into the modelling. The Appleby Coke Ovens has a mixture of fugitive emissions, point source emissions, use of emission factors and more random process safety pressure relief emissions (point sources) that form the total annual B[a]P emissions.

Table 4. Source apportionment for exceedance situation Yorkshire and Humberside [B[a]P_UK0034_2017_1]. Annual mean B[a]P concentration (ngm⁻³)

Grid square number	OS easting (m)	OS Northing (m)	Zone	a) Regional background: Total	b) Urban background increment: Total	Urban background increment: Traffic	Urban background increment: Industry including heat and power	Urban background increment: commercial and residential	Urban background increment: Shipping	Urban background increment: Off road mobile machinery	Urban background increment: Other	c) Local increment: Total	Local increment: Industry including heat and power production	Total for all emission sources (a+b+c)	Resident population
1	491500	411500	34	n/a	0.051	0.000	0.022	0.021	0.000	0.001	0.007	4.801	4.801	4.852	0
2	491500	410500	34	n/a	0.039	0.000	0.017	0.016	0.000	0.001	0.006	1.840	1.840	1.879	7
3	492500	410500	34	n/a	0.061	0.001	0.027	0.026	0.000	0.001	0.007	4.332	4.332	4.393	0
4	492500	411500	34	n/a	0.042	0.000	0.018	0.017	0.000	0.001	0.006	1.582	1.582	1.624	0

Table 5. Detailed source apportionment for industrial sources only, for exceedance situation Yorkshire and Humberside [B[a]P_UK0034_2017_1]. Annual mean B[a]P concentration (ngm⁻³)

Grid square number	OS easting (m)	OS Northing (m)	Zone	Appleby coke ovens	Scunthorpe, other plant	Local increment: Industry including heat and power production
1	491500	411500	34	4.798	0.004	4.801
2	491500	410500	34	1.834	0.006	1.840
3	492500	410500	34	4.329	0.003	4.332
4	492500	411500	34	1.576	0.006	1.582

A revised modelling methodology incorporating a finer spatial scale for dispersion modelling of all coke ovens in the UK and revision to the emissions rate for the coke ovens at Scunthorpe have been adopted for the 2016 and 2017 compliance assessment for B[a]P.

2.3 Measures

The main overview report contains more information on how industrial sites are regulated. There are no specific Best Available Techniques (BAT) conclusions designed to reduce B[a]P under the Industrial Emissions Directive (EU Directive 2010/75/EU). However, there are some narrative and specific BAT Conclusions to minimise particulate emissions, indirectly reducing B[a]P emissions. Permit conditions transposed these into the EPR permit in February 2016 and focused on the Coke Ovens and Sinter plant which are the main sources of this pollutant. BAT Reference Document (BREF)⁶ contains stringent requirements for iron and steel works to significantly reduce their fugitive emissions, including Polycyclic Aromatic Hydrocarbons (PAH) (B[a]P is a pollutant from this chemical group).

⁶ http://eippcb.jrc.ec.europa.eu/reference/BREF/IS_Adopted_03_2012.pdf

During 2015, diffuse emissions at the coke ovens at Appleby and Dawes Lane continued to be the main sources associated with the exceedance in this zone, whereas whilst the Sinter Plant has a significant mass emission, it is a point emission from a 107m high stack and highly dispersed. For March 2016, the Environment Agency completed a review of the IPPC permit HP3736AW, the Operator is currently British Steel Ltd (formerly Longs Steel UK Ltd). The EPR permit review considered the Operator's proposed techniques and comparison against other relevant techniques by the European Commission establishing Best Available Techniques (BAT) conclusions for Iron and Steel Production as detailed in the document reference 2012/135/EU (BRef) published on 8 March 2012. To note following an operational strategic review, the owners of the steelworks announced in October 2015 their intention to close down Dawes Lane Coke Oven (DLCO). DLCO subsequently closed on the first compliance day for IED (8th of March 2016).

During 2015, the performance of both coke oven plants were poor at the then Longs Steel UK Ltd installation. Following regulatory pressure to improve, the operational strategic review concluded that alongside the closure of DLCO Plant there would be a focused investment in the Appleby Coke Ovens (ACO). Since 2016, the steelworks has continued working through a significant capital and revenue project. The Recovery project of ACO to improve operational performance on both the coke oven Batteries and the by-products plant with improved infrastructure to prevent and minimise emissions, specifically PAH and B[a]P emissions reductions associated with particulate emissions. A rebuild of Battery 3 was completed, operated on hot idle (no coke making) from December 2015 to August 2016. For 2017, further works have been on the refurbishment of Batteries 1, 2 and 3 and the associated By-products plant. As such, the reported measures in previous reports on "Measures for Dawes Lane Coke Ovens" can now be discounted.

During 2017, Appleby Coke Ovens (4 batteries) have continued with a programme of remedial work of oven and door repairs and tie bar replacements. Partial rebuilds of individual ovens on Battery 2 have been completed and plans to improve Battery 1 with end flue rebuilds and further remedial work during 2018 are on track. N° 7 primary cooler on the by-products was replaced enabling better cooling operations and plant operational stability. Plans are in place for a new ammonia liquor tank for 2018. Improvements in the by-products plant and work on a new Coke Oven Gas fuel holder will be enablers to reduce process gas back-pressure on the batteries to prevent and minimise doors and tops leakage, and reduced risk of process safety pressure relief systems activating.

The Sinter plant stack is the other significant PAH and B[a]P emissions source. It is a point source release and emissions are highly dispersed via its 107m high stack.

This plant is subject to other specific Best Available Techniques (BAT) conclusions from the BRef under the Industrial Emissions Directive (EU Directive 2010/75/EU). Improved abatement projects being implemented to reduce particulate and dioxin/furan emissions have potential to minimise B[a]P emissions. The revised permit has 6 monthly PAH monitoring expressed as B[a]P emissions to assess potential improvements.

The Environment Agency set out a permit condition in the 8 Feb 2016 issued EPR IED permit HP3736AW to review and report on measures to prevent and minimise PAH emissions and the PAH AQ Management plan, a reviewed final version is due late 2019. A transitional report on measures has been received by the Environment Agency. As such the measures set out in the Table 6 to prevent and minimise PAH have been updated.

Table 6 sets out the measures that are being taken or are to be taken (planned) primarily during the ACO Battery Recovery project with the closure of the DLCO plant.

Table 6. Table of measures taken or to be taken at Scunthorpe industrial site

Measure code	Description	Classification	Implementation dates	Other information		Comment
1	Polycyclic Aromatic Hydrocarbon (PAH) Improvement Plan; The operator shall submit a written plan, to the Environment Agency (the regulator) for approval, of the measures to be taken to minimise PAH emissions (IARC Group 1, 2a & 2b), particularly the marker PAH; Benzo [a] Pyrene (B[a]P) and Volatile Organic Compounds as fugitive releases from existing Appleby and Dawes Lane coke oven battery plants	Permit systems and economic instruments: EPR permits	Start: 2012 Expected end: 2024 Status: Implementation	Source affected:	Industry including heat and power production	An improvement condition on the Scunthorpe site permit BL3838IW V007 9 May 2012. The measures described in column 1 of this table (Measure codes); Appleby Coke Ovens 1 -20 and Dawes Lane 1 are from the PAH improvement Plan. This PAH Improvement Plan forms part of a wider Coke Oven Battery Recovery Project.
				Spatial scale:	Local	
				Cost:	Unknown, Operator information	
				Indicator:	Reduction in ambient B[a]P concentration	
				Target emissions reduction:	Not available	

2	PAH measurement and analysis; The operator undertakes B[a]P monitoring to AURN monitoring location standards with time resolution as low as 1 day. PAH measurements at two locations, using pollution rose analysis to identify key sources. Emission factors to be calculated.	Permit systems and economic instruments: EPR permits	Start:	2012	Source affected:	Industry including heat and power production	COMPLETED 2012 improvement. 2017 Update - Moved to measuring ambient PAH as B[a]P at one location, with time resolution now at 3 days (averaging period). Measurements and analysis indicate that the coke ovens at Appleby (and previously Dawes Lane) are the key sources for this exceedance situation. Emission factors calculated for each plant by reverse modelling methodology (Measure No. 4).
			Expected end:	None			
			Status:	Implementation			
			Spatial scale:	Local			
			Cost:	Unknown, Operator information			
Indicator:	Not available						
Target emissions reduction:	Not available						

						2016 Update – DLCO closed in March 16. Coke production has reduced which will also affect emission levels.	
3	Emission measurements; Direct emissions measurements using flameproof blanket fixed over oven doors to create a chimney. Bespoke monitoring to establish improved emission factors.	Permit systems and economic instruments: EPR permits	Start:	2007	Source affected:	Industry including heat and power production	COMPLETED: Analysis indicates that B[a]P emission dominated by door leakage (>98% of total). Emission rates consistent with estimates at other similar plants across Europe
			Expected end:	2008			
			Status:	Complete			
			Spatial scale:	Local			
			Cost:	Unknown, Operator information			
Indicator:	Not available						
Target emissions reduction:	Not available						
4			Start:	2014			

	Reverse Dispersion Modelling; To provide an independent estimate of emission rates, based on ambient measurements	Permit systems and economic instruments: EPR permits	Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	COMPLETED: Results reasonably consistent with emissions estimates from direct measurements. Indicates that coke ovens are the main source.
				Spatial scale:	Local	
				Cost:	Unknown, Operator information	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Appleby Coke Ovens 01	Replacement of Door seals; Regular door maintenance is necessary to ensure the maintenance of good	Permit systems and economic instruments: EPR permits	Start: 2012 Expected end: Ongoing Status: Implementation	Source affected:	Industry including heat and power production	ON-GOING: In 2017 doors were repaired and frame changes done on 33 ovens. In total, 57 frames were

	seals and a programme to overhaul doors on a daily basis is ongoing.						
					Spatial scale:	Local	changed; 26 pusher side and 31 on the coke side.
					Cost:	Operator information	Ascension pipes between the ovens and collecting main were replaced on 24 ovens.
					Indicator:	Not available	Door jettors are being repaired continuously on an ongoing basis.
					Target emissions reduction:	Not available	2018 plan – Planned to change a full jetting unit during late 2018/early 2019 on either battery 1 or 2.
Appleby Coke Ovens 02	Door extractor adjustments; New door extractor as a trial to increase flexibility in door adjustments. Once the	Permit systems and economic instruments: EPR permits	Start: 2013 Expected end: 2018 Status: Implementation		Source affected:	Industry including heat and power production	ON-GOING: No 3 pusher overhauled and now working within required parameters.

	optimum position for each door has been ascertained then sealing each individual door will become easier and more consistent						<table border="1"> <tr> <td>Spatial scale:</td> <td>Local</td> <td rowspan="4">2018 plan New visual pressure gauge being installed on door extractors on all machines to allow operators to ensure doors extractors are sealing properly and at optimal pressure.</td> </tr> <tr> <td>Cost:</td> <td>Operator information</td> </tr> <tr> <td>Indicator:</td> <td>Not available</td> </tr> <tr> <td>Target emissions reduction:</td> <td>Not available</td> </tr> </table>	Spatial scale:	Local	2018 plan New visual pressure gauge being installed on door extractors on all machines to allow operators to ensure doors extractors are sealing properly and at optimal pressure.	Cost:	Operator information	Indicator:	Not available	Target emissions reduction:	Not available			
Spatial scale:	Local	2018 plan New visual pressure gauge being installed on door extractors on all machines to allow operators to ensure doors extractors are sealing properly and at optimal pressure.																	
Cost:	Operator information																		
Indicator:	Not available																		
Target emissions reduction:	Not available																		
Appleby Coke Ovens 03	Machine alignments; The development of a cross-battery interlock system, using lasers to accurately line up pusher and coke machines, is under consideration.	Permit systems and economic instruments: EPR permits	<table border="1"> <tr> <td>Start:</td> <td>2015</td> </tr> <tr> <td>Expected end:</td> <td>2018</td> </tr> <tr> <td>Status:</td> <td>Implementation</td> </tr> </table>	Start:	2015	Expected end:	2018	Status:	Implementation	<table border="1"> <tr> <td>Source affected:</td> <td>Industry including heat and power production</td> <td rowspan="4">ON-GOING: The project to install cross-battery interlock system is ongoing. Technical difficulties due to movement of the batteries have resulted in the project being delayed. Update – Issues due to battery movement have prevented implementation to</td> </tr> <tr> <td>Spatial scale:</td> <td>Local</td> </tr> <tr> <td>Cost:</td> <td>Operator information</td> </tr> <tr> <td>Indicator:</td> <td>Not available</td> </tr> </table>	Source affected:	Industry including heat and power production	ON-GOING: The project to install cross-battery interlock system is ongoing. Technical difficulties due to movement of the batteries have resulted in the project being delayed. Update – Issues due to battery movement have prevented implementation to	Spatial scale:	Local	Cost:	Operator information	Indicator:	Not available
Start:	2015																		
Expected end:	2018																		
Status:	Implementation																		
Source affected:	Industry including heat and power production	ON-GOING: The project to install cross-battery interlock system is ongoing. Technical difficulties due to movement of the batteries have resulted in the project being delayed. Update – Issues due to battery movement have prevented implementation to																	
Spatial scale:	Local																		
Cost:	Operator information																		
Indicator:	Not available																		

					Target emissions reduction:	Not available	date, but it is anticipated that this can be fitted to each battery after each goes through a hot idle period.
Appleby Coke Ovens 04	Access to carry out door maintenance; There are issues with working at height on the battery bench level to manually plug leaks. Very constrained in meeting Health and Safety requirements as the design is a shallow concrete foundation bench.	Permit systems and economic instruments: EPR permits	Start:	2012	Source affected:	Industry including heat and power production	COMPLETED 4 new EZ bonding lines in place. These will allow for quicker access. An alternative option and design developed to implement on the Pusher side; a lanyard and running rail system. Trial successful full engineering design developed.
			Expected end:	2018			
			Status:	Implementation			
			Spatial scale:	Local			
			Cost:	Not available			
Indicator:	Not available						
Target emissions reduction:	Not available	2017 Update – EZ line installed of B4. New Heras fencing installed in floors on					

						all batteries to enable safe access. This issue has now been resolved and will not be progressed further.	
Appleby Coke Ovens 05	New Doors and Frames; Where damage to doors and frames is such that repairs cannot be effected in-situ then a programme of replacement is required. Develop a schedule for door and frame replacement as required at Appleby, subject to the outcome of the capital expenditure plan.	Permit systems and economic instruments: EPR permits	Start:	2015	Source affected:	Industry including heat and power production	ON-GOING: Included in the PAH / coke oven recovery capital expenditure plan. Subject to capital plan.
			Expected end:	Ongoing			
			Status:	Implementation			
			Spatial scale:	Local			
			Cost:	Unknown, Operator information			
Indicator:	Not available						
Target emissions reduction:	Not available						
						2017/2018 Recovery plan is ongoing and will continue through 2018.	

Appleby Coke Ovens 06	New inspection hatch door seals; Inspection hatches are provided in the oven top to allow temperature and visual checks to be made. The hatch seals can become degraded owing to repeated movement and require replacement. A programme of replacements is ongoing, 132 seals are to be replaced.	Permit systems and economic instruments: EPR permits	Start:	2013	Source affected:	Industry including heat and power production	132 hatches fitted, all COMPLETED .
			Expected end:	2015			
			Status:	Complete			
			Spatial scale:	Local			
			Cost:	Operator information			
Indicator:	Not available						
Target emissions reduction:	Not available						
Appleby Coke Ovens 07	Replacement spigot jointing compound; A seal is provided around the ascension pipe spigot to allow emission-free collection of coke oven gas from each oven.	Permit systems and economic instruments: EPR permits	Start:	2013	Source affected:	Industry including heat and power production	COMPLETED: The replacement spigot compound is now being used. Although it is not as reliable as the previously used compound (in terms of deterioration), it is
			Expected end:	2014			
			Status:	Complete	Spatial scale:	Local	

					Cost:	Operator information	better quality and it is the best available on the market. No further options.
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Appleby Coke Ovens 08	Pullman valve replacements; A programme of valve replacements, to combat a design issue, is ongoing.	Permit systems and economic instruments: EPR permits	Start: 2009 Expected end: Ongoing Status: Implementation	Source affected:	Industry including heat and power production	ON-GOING: 2017 Update: Routine maintenance of the Pullman valves is ongoing. This will continue as "Business as Usual". There is no longer a significant issue related to these valves.	
				Spatial scale:	Local		
				Cost:	Operation information		
				Indicator:	Not available		

					Target emissions reduction:	Not available	
Appleby Coke Ovens 09	Tie rod replacements; Periodical surveys are carried out to inspect tie rod integrity and a programme of replacement has commenced and is expected to continue until 2015	Permit systems and economic instruments: EPR permits	Start:	2013	Source affected:	Industry including heat and power production	ON-GOING: 2017 Update: 47 tie rods have been replaced throughout the year as required, during routine maintenance. 2018 Plan: Battery 1 tie rods will be replaced as required during the programmed hot idle period in late 2018/early 2019.
			Expected end:	Ongoing			
			Status:	Implementation			
			Spatial scale:	Local			
			Cost:	Operator Information			
Indicator:	Not available						
					Target emissions reduction:	Not available	
Appleby Coke	Repairs to battery refractories; A programme of silica welding and end flue	Permit systems and economic	Start:	2013	Source affected:	Industry including heat and	ON-GOING: 2017 Update: Refractory has been
			Expected end:	2024			

Ovens 10	repairs to seal oven wall cracks has begun and is expected to continue throughout the remaining operational lifetime of the coke oven plant	instruments: EPR permits	Status: Implementation		power production	replaced throughout the year as required, during routine maintenance. 4 end flues have been replaced on the pusher side, and 17 on the coke side. 2018 Plan: Battery 1 end flues and silica welds will be replaced during the programmed hot idle period in late 2018/early 2019. Other BaU maintenance ongoing on the other batteries.
				Spatial scale:	Local	
				Cost:	Operator information .	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Appleby Coke Ovens 11	Replacement of battery refractories; Where repairs to battery refractories are ineffectual or not	Permit systems and economic instruments: EPR permits	Start: 2013 Expected end: 2024 Status: Implementation	Source affected:	Industry including heat and power production	ON-GOING: A significant Battery Recovery Programme was initiated during 2014 and subject to a

	practically possible, and where the continued operation of the oven will cause excessive emissions, the oven in question is taken out of operation minimising pollution.				Spatial scale: Local	capital plan proposal put forward. Mainly end wall and flue repairs. This continued through 2017, including hot idling of battery 3, and will continue into 2018, when battery 1 will be hot idled.
					Cost: Subject to Capital plan proposal	
					Indicator: Not available	
					Target emissions reduction: Not available	
Appleby Coke Ovens 12	Pressure stabilisation system; A linkage pipe has been placed on either side of the gas booster station, providing a pressure feedback loop.	Permit systems and economic instruments: EPR permits	Start: 2012 Expected end: 2013 Status: Complete	Source affected:	Industry including heat and power production	COMPLETED.
				Spatial scale: Local		
				Cost: Operator information		

					Indicator:	Not available	
					Target emissions reduction:	Not available	
Appleby Coke Ovens 13	New Gas Holder to improve pressure control. Beneficial effects in reducing pressure fluctuations and hence emissions from the batteries caused by high positive pressure.	Permit systems and economic instruments: EPR permits	Start: 2015 Expected end: 2017 Status: Planning	Source affected:	Industry including heat and power production	ON-GOING: The new gas holder construction has been continuing through 2017. It is planned to continue throughout 2018 and commission by 2019.	
				Spatial scale:	Local		
				Cost:	Operator Information		
				Indicator:	Not available		
				Target emissions reduction:	Not available		
			Start: 2013				COMPLETED.

Appleby Coke Ovens 14	Underfiring Changeover Timings; Reversal of the heating cycle in the coke ovens at Appleby and Dawes Lane now timed not to coincide	Permit systems and economic instruments: EPR permits	Expected end: Status:	2013 Complete	Source affected:	Industry including heat and power production		
				Spatial scale:	Local			
				Cost:	Not available			
				Indicator:	Not available			
				Target emissions reduction:	Not available			
Appleby Coke Ovens 15	New benzole plant; The benzole plant will be replaced. This will minimise pressure increase at the batteries, and secondly, prevent	Permit systems and economic instruments: EPR permits	Start: Expected end: Status:	2014 2017 Implementation	Source affected:	Industry including heat and power production	ON-GOING: 2017: New benzole plant has been commissioned.	

	naphthalene in burner flues and leading to cold spots on oven walls, and eventual refractory damage caused by inconsistent heating.	
Appleby Coke Ovens 16	Coke machine 'inching' facility; The facility to 'inch' the position of the machines will allow better alignment and less damage to the battery metalwork and fabric	Permit systems and economic instruments: EPR permits

Start: 2015
Expected end: 2016
Status: Complete

Spatial scale:	Local	2018 plan: Continue work to bring new benzole plant up to stable operation.
Cost:	Operator information	
Indicator:	Not available	
Target emissions reduction:	Not available	
Source affected:	Industry including heat and power production	COMPLETED. New operator panels fitted to all three pushing machines. Systems fitted to four of the six machines. Trial unsuccessful on pusher machines, implemented on all 3 guide machines in
Spatial scale:	Local	
Cost:	Operator information	

				Indicator:	Not available	use.
				Target emissions reduction:	Not available	
Appleby Coke Ovens 17	Automated leveller control; An automated leveller control system is currently being considered as part of a management of change exercise.	Permit systems and economic instruments: EPR permits	Start: 2015 Expected end: 2018 Status: Planning	Source affected:	Industry including heat and power production	2017 Plan - See action Appleby Coke Ovens 03. This work will follow interlock system installation, which will be progressed over the coming years.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
			Start: 2013			

Appleby Coke Ovens 18	New venting lids; A new 'venting lid' has been developed to allow burn off of carbon deposits. The build-up of carbon deposits on the roof of the oven can also cause pressure issues within the oven by blocking the free passage of coke oven gas leading to door / tops leakage.	Permit systems and economic instruments: EPR permits	Expected end: Status:	2013 Complete	Source affected:	Industry including heat and power production	
					Spatial scale:	Local	
					Cost:	Operator information	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Appleby Coke Ovens 19	Primary cooler replacement; When primary coolers are not effective, the pressure of the by-products plant is increased and this is	Permit systems and economic instruments: EPR permits	Start: Expected end: Status:	2013 2019 Implementation	Source affected:	Industry including heat and power production	ON-GOING: 2017 Update – No 7 primary cooler replaced and commissioned.

	translated to the batteries and door / tops leakage.	
Appleby Coke Ovens 20	Heating system checks; The original analysis of waste gas emissions from individual oven flues was completed. This was to provide information on the operation of each individual oven in terms of heating uniformity and emissions. No benefit from the trial and	Permit systems and economic instruments: EPR permits

					Spatial scale: Local	2018 Plan: It is planned to upgrade either No 2 or No 3 primary cooler during this period.
					Cost: Operator information	
					Indicator: Not available	
					Target emissions reduction: Not available	
Start: 2013	Expected end: Ongoing	Status: Implementation	Source affected: Industry including heat and power production	Spatial scale: Local	Cost: Not available	COMPLETED: External consultants have completed a heating survey since the initial trials. Additional resources put in place to carry out the recommendations of this survey. Reviewed 6 monthly. Extra

	engaged an external company.				Indicator:	Not available	resource allocated as part of new recovery plan.
					Target emissions reduction:	Not available	2017 Update – Extra resource within day team including engineering. Heating is part of daily management and meeting reviews held. This is now business as usual, rather than an improvement.
Dawes Lane Coke Ovens 01	Closure of Dawes Lane Coke Ovens	Permit systems and economic instruments: other	Start: 2016 Expected end: 2016 Status: Complete		Source affected:	Industry including heat and power production	Dawes Lane Coke Ovens closed 8 March 2016
					Spatial scale:	Local	
					Cost:		
					Indicator:		

				Target emissions reduction:		
--	--	--	--	-----------------------------	--	--