Department
for Environment
Food & Rural Affairs

Report on measures for 2015 exceedance of the Target Value for Benzo[a]pyrene in South Wales non-agglomeration zone (UK0041)

December 2017

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

Any enquiries regarding this publication should be sent to us at

Air Quality
Department for Environment, Food and Rural Affairs
Area 2C
Nobel House
Smith Square
London
SW1P 3JR

Email: air.quality@defra.gsi.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 4

2 Exceedance situation South Wales [B[a]P_UK0041_2015_1] related to industrial emissions 7

2.1 Description of exceedance 7

2.2 Source apportionment 11

2.3 A detailed local assessment 16

2.4 Measures 17

Reason for increases in reported coke oven emissions and next steps 18

1. Introduction

1.1 Context

Under the EU Directive 2004/107/EC[1], 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 (m^{-3}) of ambient air or lower. The Directive requires 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.

Exceedance of the TV was reported in 2013 and 2014 in the South Wales non-agglomeration zone and a report on measures was published detailing the exceedance and the measures in place[2].

This document reports the exceedance situation for 2015 reflecting the more recent assessment and updating the 2013 and 2014 reports 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 South Wales zone identified within the 2015 UK air quality assessment. Exceedances within this zone were identified on the basis of model results providing supplementary information. This exceedance was reported via e-Reporting dataflow G[3] on attainment and Air Pollution in the UK[4].

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

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF
[2] https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/bap_southwales_UK0041_reportonmeasures_2013.pdf
[3] http://cdr.eionet.europa.eu/gb/eu/aqd
[4] http://uk-air.defra.gov.uk/library/annualreport/index

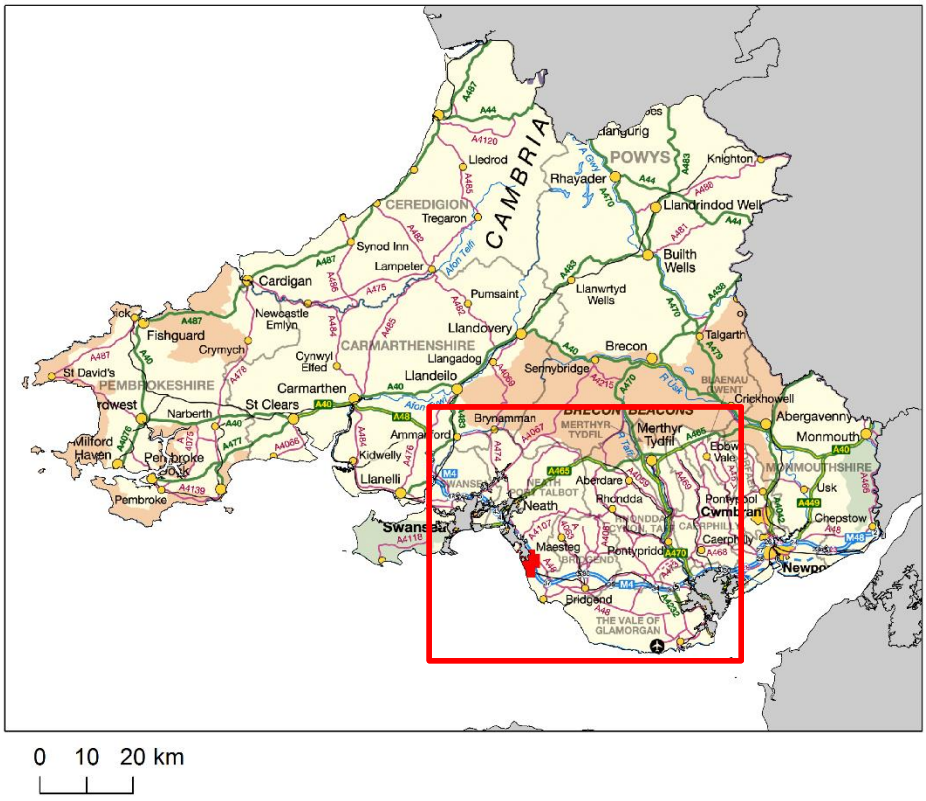
Table 1. Area exceeding B[a]P target value in 2015 and associated population for South Wales zone UK0041

Zone code	Zone Name	Area exceeding TV (km^2)	Population exceeding TV
UK0041	South Wales	21	275

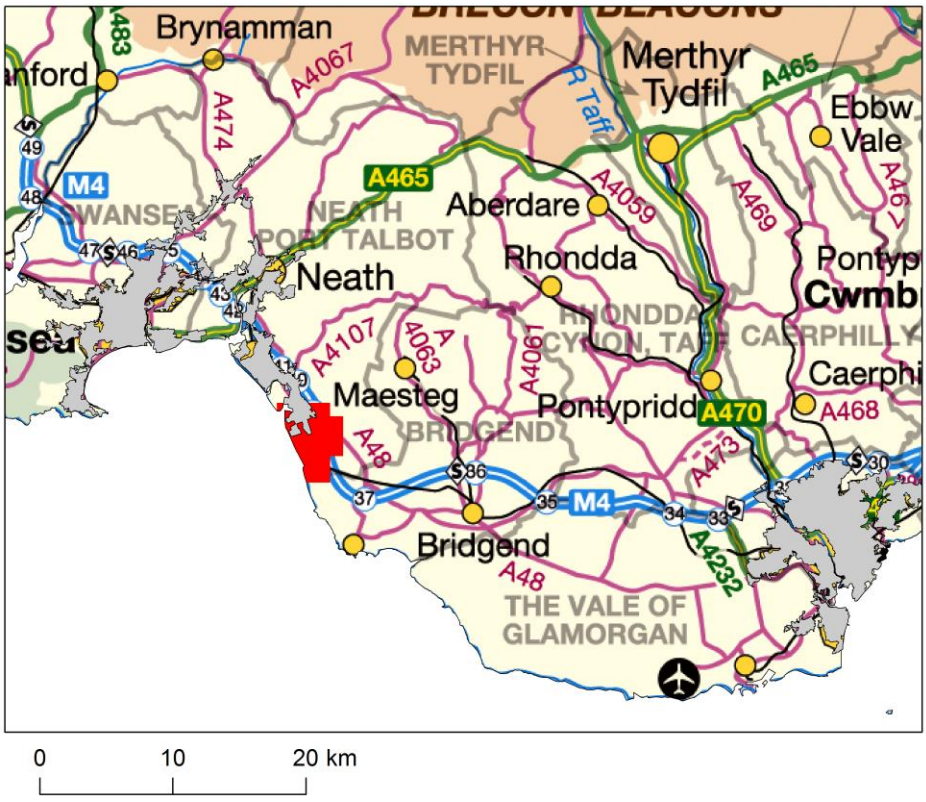
Figure 1a shows the locations of the exceedances in the context of the zone as a whole. Figure 1b shows the part of the zone including the exceedances in more detail.

Figure 1. Location of exceedance of the B[a]P target value on 2015 in South Wales zone UK0041. 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 has identified a single exceedance situation in this zone:

- South Wales [B[a]P_UK0041_2013_1] related to industrial emissions (area of exceedance 21 km^2)

Following the approach developed for the previous report on measures for 2014, a subsequent more detailed modelling assessment was carried out for 2015 using additional local data. Whereas the previous assessment concluded that there was unlikely to be an exceedance of the TV outside the boundary of the industrial site in 2014, the most recent assessment indicated it was likely that there was an exceedance of the TV at locations close to the industrial site in 2015. This change has been linked to the adoption of an improved assessment method for fugitive emissions which has led to a significant increase in reported coke ovens emission in 2015 and is discussed later in this report. This report includes a description of the exceedance situation, including 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 K[5].

2 Exceedance situation South Wales [B[a]P_UK0041_2015_1] related to industrial emissions

2.1 Description of exceedance

This exceedance situation has an area of exceedance of 21 km^2 in Margam in Neath Port Talbot. Figure 2 shows the location of the exceedance situation, as predicted by the national model in detail. Figure 3 shows the location of the exceedance situation in finer detail based on a more detailed, local modelling assessment. The exceeding grid squares are numbered in Figure 2 and in subsequent tables for easy reference. There is no resident population in 15 of the grid squares. The resident population associated with the exceedance situation identified by the national modelling was 275. A resident population of 84 was identified by the more detailed modelling. This exceedance situation is adjacent to and shares common sources with the exceedance situation Swansea Urban Area [B[a]P_UK0027_2015_1].

Figure 2 also shows the locations of the monitoring site associated with the exceedance situation (Port Talbot Margam, which is in Swansea Urban Area zone UK0027) and the locations of the key industrial sources. The area shown on this map includes grid squares assigned to both the Swansea Urban Area (UK0027) and South Wales (UK0041) zones. The grid squares assigned to the Swansea Urban Area zone and exceedance Swansea Urban Area [B[a]P_UK0027_2015_1]- are shown as hatched and the non-hatched red grid squares correspond to this exceedance situation, which is South Wales [B[a]P_UK0041_2015_1].

Table 3 lists the exceeding grid squares and the resident population. The grid squares also identified as exceeding in the more detailed local modelling are highlighted.

[5] http://cdr.eionet.europa.eu/gb/eu/aqd

It should be noted that the measurements at Port Talbot Margam were less than the TV. In modelling the spatial coverage of B[a]P concentrations, the national scale model predictions were calibrated in order to match these measurements at the monitoring site. The calibrated predictions were reported to exceed the target in the vicinity of the steelworks industrial complex in Port Talbot due to industrial emissions; hence this exceedance situation is included in this report on measures. Subsequent, more detailed, modelling also indicated that off-site concentrations of B[a]P exceeded the TV in 2015, although the spatial extent of the exceedance area identified is different. The assessment is discussed in more detail in section 2.3.

Figure 2. Exceedance situation South Wales [B[a]P_UK0041_2015_1]. Exceeding grid squares are marked red. Locations of coke works at Morfa and sinter plant at Port Talbot are also shown. Non-hatched grid squares are those assigned to South Wales zone UK0041. Hatched grid squares are assigned to Swansea Urban Area zone UK0027 and do not form part of this exceedance situation.

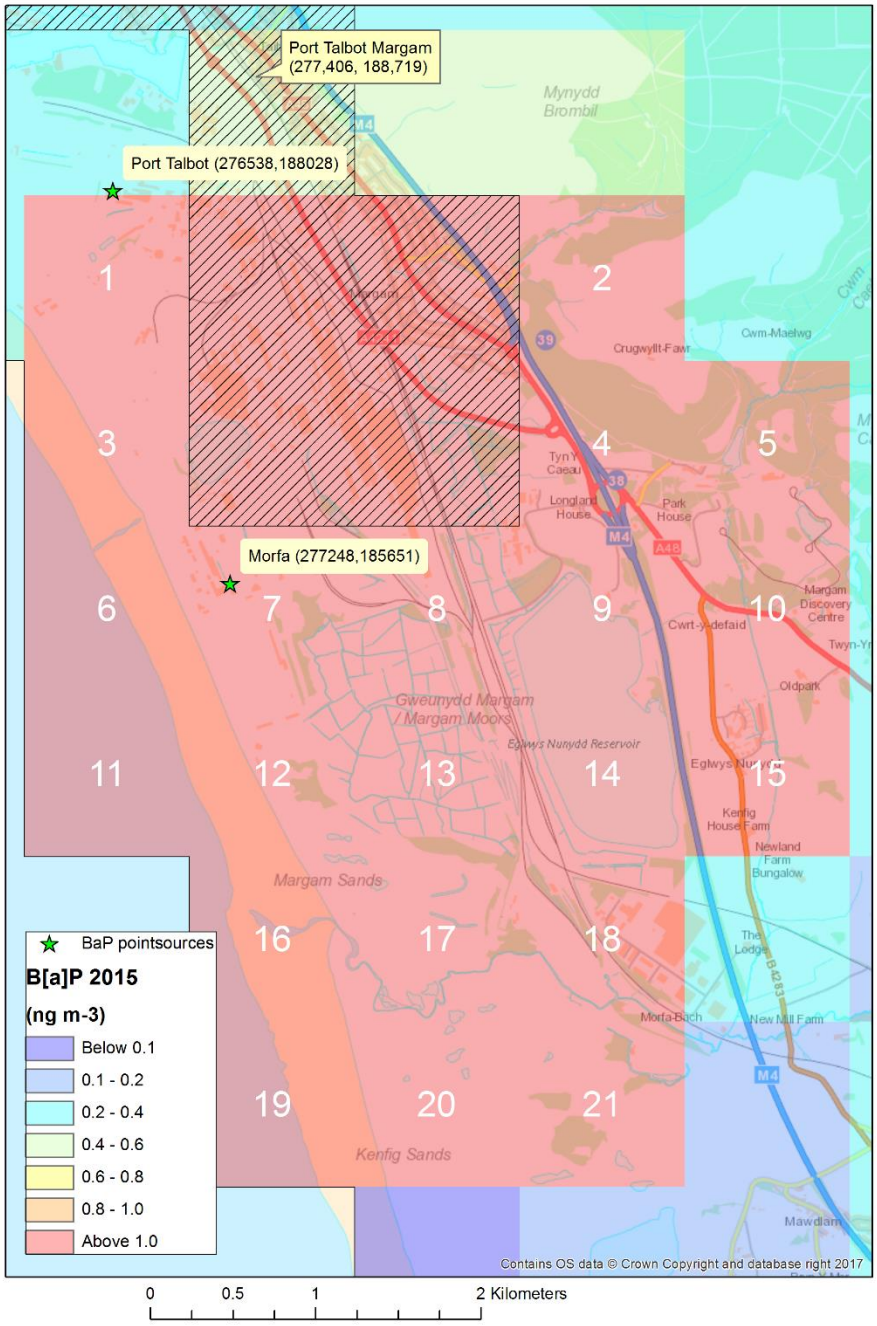


Table 2. Exceeding grid squares for exceedance situation BaP_UK0041_2015_1. * denotes grid squares also identified as exceeding in the detailed local modelling

Grid square number	Resident population	Notes
1*	0	Steelworks industrial complex
2*	11	Margam Country Park
3*	0	Steelworks industrial complex
4*	71	Margam Country Park
5	10	Margam Country Park
6*	0	Steelworks industrial complex
7*	0	Steelworks industrial complex
8*	0	Steelworks industrial complex, industrial land
9*	0	Industrial land, reservoir
10	32	Margam Country Park
11*	0	Sea
12*	0	Partly steelworks industrial complex
13*	0	Partly steelworks industrial complex
14*	0	Reservoir

15	149	St David's Park
16*	0	Partly steelworks industrial complex
17*	0	Partly steelworks industrial complex
18*	2	Industrial Estate
19*	0	Sea
20*	0	Open land
21*	0	Open land

2.2 Source apportionment

Table 3 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 4 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 Morfa are the main sources associated with this exceedance situation.

Table 3. Source apportionment for exceedance situation South Wales [B[a]P_UK0041_2015_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	Urban background increment: commercial	Urban background increment: Shipping	Urban background increment: Off road	Urban background increment: Other	**c) Local increment: Total**	Local increment: Industry including heat and power	**Total for all emission sources (a+b+c)**	Resident population
1	276500	187500	41	n/a	0.058	0.000	0.004	0.048	0.000	0.000	0.005	1.165	1.165	1.2	0
2	279500	187500	41	n/a	0.099	0.001	0.021	0.064	0.000	0.002	0.011	1.101	1.101	1.2	11
3	276500	186500	41	n/a	0.048	0.000	0.004	0.038	0.000	0.000	0.005	2.374	2.374	2.4	0
4	279500	186500	41	n/a	0.088	0.002	0.028	0.046	0.000	0.002	0.009	1.304	1.304	1.4	71
5	280500	186500	41	n/a	0.065	0.001	0.009	0.044	0.000	0.001	0.011	1.013	1.013	1.1	10
6	276500	185500	41	n/a	0.041	0.000	0.004	0.032	0.000	0.000	0.004	5.504	5.504	5.5	0
7	277500	185500	41	n/a	0.050	0.000	0.009	0.033	0.000	0.001	0.005	8.727	8.727	8.8	0

8	278500	185500	41	n/a	0.056	0.001	0.013	0.034	0.000	0.001	0.007	2.763	2.763	2.8	0
9	279500	185500	41	n/a	0.059	0.002	0.010	0.037	0.000	0.001	0.008	1.410	1.410	1.5	0
10	280500	185500	41	n/a	0.058	0.001	0.006	0.040	0.000	0.001	0.010	1.027	1.027	1.1	32
11	276500	184500	41	n/a	0.036	0.000	0.003	0.028	0.000	0.000	0.004	3.533	3.533	3.6	0
12	277500	184500	41	n/a	0.040	0.000	0.005	0.029	0.000	0.000	0.005	3.137	3.137	3.2	0
13	278500	184500	41	n/a	0.042	0.000	0.004	0.031	0.000	0.000	0.007	2.357	2.357	2.4	0
14	279500	184500	41	n/a	0.047	0.001	0.004	0.034	0.000	0.000	0.007	1.311	1.311	1.4	0
15	280500	184500	41	n/a	0.055	0.001	0.004	0.040	0.000	0.001	0.009	1.016	1.016	1.1	149
16	277500	183500	41	n/a	0.034	0.000	0.003	0.026	0.000	0.000	0.004	1.683	1.683	1.7	0
17	278500	183500	41	n/a	0.036	0.000	0.002	0.029	0.000	0.000	0.005	1.668	1.668	1.7	0
18	279500	183500	41	n/a	0.042	0.001	0.002	0.033	0.000	0.000	0.006	1.221	1.221	1.3	2
19	277500	182500	41	n/a	0.030	0.000	0.002	0.024	0.000	0.000	0.004	1.144	1.144	1.2	0
20	278500	182500	41	n/a	0.033	0.000	0.001	0.027	0.000	0.000	0.004	1.175	1.175	1.2	0

21	279500	182500	41	n/a	0.040	0.001	0.001	0.032	0.000	0.000	0.005	1.083	1.083	1.1	0

Table 4. Detailed source apportionment for industrial sources only for exceedance situation South Wales [B[a]P_UK0041_2015_1]. Annual mean B[a]P concentration (ngm^{-3})

Grid square number	OS easting (m)	OS Northing (m)	Zone	Morfa coke ovens	Port Talbot, other plant	Local increment: Industry including heat and power production
1	276500	187500	41	1.165	0.000	1.165
2	279500	187500	41	1.099	0.002	1.101
3	276500	186500	41	2.374	0.000	2.374
4	279500	186500	41	1.303	0.001	1.304
5	280500	186500	41	1.011	0.001	1.013
6	276500	185500	41	5.504	0.000	5.504
7	277500	185500	41	8.726	0.001	8.727
8	278500	185500	41	2.762	0.001	2.763
9	279500	185500	41	1.409	0.001	1.410
10	280500	185500	41	1.026	0.001	1.027
11	276500	184500	41	3.532	0.000	3.533
12	277500	184500	41	3.136	0.000	3.137

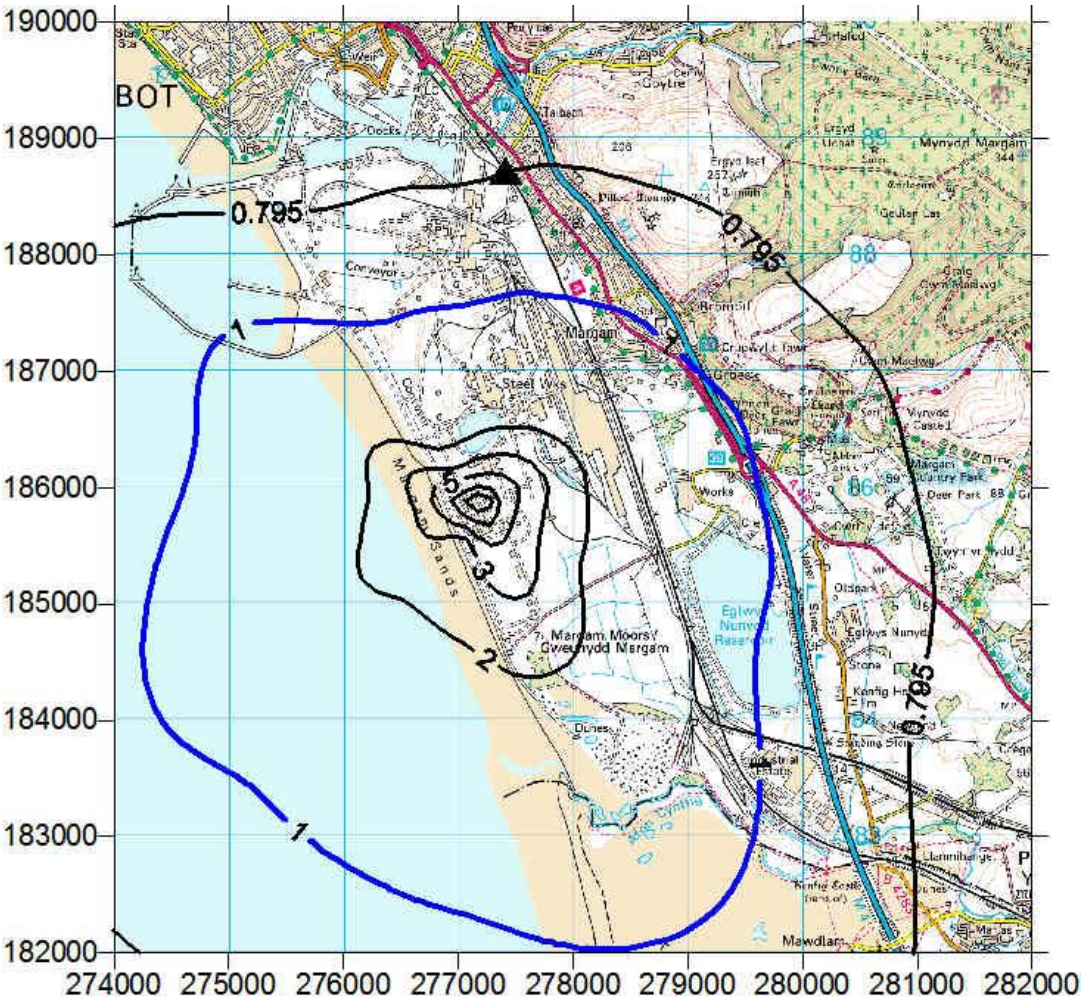
13	278500	184500	41	2.356	0.001	2.357
14	279500	184500	41	1.310	0.001	1.311
15	280500	184500	41	1.015	0.001	1.016
16	277500	183500	41	1.682	0.000	1.683
17	278500	183500	41	1.667	0.001	1.668
18	279500	183500	41	1.220	0.001	1.221
19	277500	182500	41	1.144	0.000	1.144
20	278500	182500	41	1.174	0.000	1.175
21	279500	182500	41	1.083	0.001	1.083

2.3 A detailed local assessment

In order to assess this exceedance in more detail, a dispersion modelling assessment was undertaken following a similar approach to that taken for 2015, making use of additional local data. The background concentration for this assessment was derived from local measurements rather than from a model, as was the case for the national modelling assessment. The detailed assessment indicated that off-site concentrations of B[a]P exceeded the TV in 2015, in contrast to the 2014 assessment, which did not predict an exceedance of the TV outside the boundaries of the industrial site. The increase in predicted B[a]P concentration is due to changes in the method for estimating emissions from the coke ovens. B[a]P emission from the coke ovens in 2015 was estimated to be 51 kg using the new assessment method, increasing from 25 kg reported in 2014 using the previous emission estimation method. Section 2.4 provides more detail on coke oven emission sources and measures that have been, or will be, implemented to tackle them.

Figure 3 plots the sum of the process contribution, due to emissions from the steelworks complex, and the ambient B[a]P background, derived from the measurement at the Port Talbot Margam site. The blue contour indicates the predicted environmental concentration of 1ng/m^3 and shows that it is likely that the TV would have been exceeded beyond the industrial site boundary.

Figure 3. Predicted environmental concentration of B[a]P (ng/m^3) for 2015.



2.4 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), in either the Coke Ovens or Sinter plant which are the main sources of this pollutant. BAT looks to control emissions in general and the techniques required will also affect B[a]P concentrations. The iron and steel 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). The reduction of emissions of polychlorinated dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyls (PCB) by utilising lignite injection at the sinter plant will also result in a reduction of B[a]P. Monitoring and further modelling as the techniques are employed will demonstrate the scale of the reduction. The regulator is of the view that Tata will be at BAT within the timescales required by the Industrial Emissions Directive or within the periods of any agreed derogations for the Sinter Plant and the Coke Ovens.

Reason for increases in reported coke oven emissions and next steps

In 2015 the implementation of the BREF for Iron and Steel production, resulted in the need to improve the monitoring of fugitive emissions from the coke ovens.

The method employed prior to 2015 (BCRA method) required an estimate to be carried out every three months relied on a subjective assessment of leak severity. The industrial operator agreed a new method with the regulator (NRW) which was adapted from the US EPA methodology. This methodology requires the leaks be monitored and recorded daily and does not attribute a severity to the leaks, all leaks are treated as a priority. When both methods were assessed side by side it was clear that the BCRA method gave a favourable estimation of the fugitive emission resulting in a low estimation factor per tonne of coke. The new methodology has resulted in an increase in the estimation of B[a]P released from the coke ovens in 2015, however the actual release is likely to be similar to previous years.

The change in the methodology has meant that the operator has a better understanding of the precise sources of fugitive emissions and enabled a targeted improvement programme to be established. This improvement programme is expected to start showing a decrease in the estimated emission in 2017 and 2018.

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

Table 5 shows the measures taken or to be taken at the Port Talbot industrial site.

Table 5. Table of measures taken or to be taken at Port Talbot industrial site

Measure code	Description	Classification	Implementation dates	Other information		Comment
Coke Ovens 1	Measures to meet new fugitive BAT emission limits (BATELs)	Permit systems and economic instruments: IPPC permits	Start: 2015 Expected end: 2019 Status: Implementation	Source affected:	Industry including heat and power production	Tata has adopted a modified US EPA method for fugitive release assessment. This uses a binary 'leak-no leak' assessment. This method directly compares to the BATc. Tata has committed to coke ovens life extension expenditure worth ~£3m/year over the next three years.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Emissions estimate	

				Target emissions reduction:	Not available	Compliance with the new limits has been summarised below for tops, doors and charging emissions. Where compliance has not been achieved, NRW will respond per its CCS compliance scheme and work with Tata to achieve the new limits.
Coke Ovens 2	Spigot improvements. The spigot is the joint between the oven and the gas main. Measures include fitting of new collars, 'repacking' existing spigot seals, fitting new seals and, shortening of ascension pipes.	Permit systems and economic instruments: IPPC permits	Start: 2015 Expected end: 2019 Status: Implementation	Source affected:	Industry including heat and power production	Control of fugitive emissions from coke ovens will result in lower B[a]P emissions. The 1% BAT-AEL for tops is very challenging. Current leakage rate is 8% (or 92% leak free) A programme of works is ongoing to reduce leakage, but the rate of
				Spatial scale:	Local	
				Cost:	Not available	

				Indicator:	Percentage leak rate reduced to target of 1%	spigot renewal is difficult to change due to the complexities of working on a live coke ovens. The work must be sequenced to avoid affecting oven integrity (ovens are usually in continuous operation). It remains unlikely that Tata will be able to comply with this BAT-AEL for several months. NRW is addressing non-compliance in accordance with its CCS scheme. We have also commenced monthly compliance reviews of coke ovens performance.
				Target emissions reduction:	Not available	
Coke Ovens 3	Coke Oven door improvements	Permit systems and economic	Start: 2015 Expected 2019	Source affected:	Industry including heat and power production	Control of fugitive emissions from coke ovens will result in lower

	Each coke oven has two sets of doors at either end. Hot coke is pushed from the 'ram side' doors through the 'coke side' doors into waiting rail cars. Doors and door frames require regular maintenance and periodic replacement to minimise fugitive emissions.	instruments: IPPC permits	end: Status: Implementation			B[a]P emissions. BAT-AEL for doors is 10% leakage or 90% non-leaking doors. Improvements to Battery 1 have brought its doors into compliance with the BAT-AEL. Battery 2 needs further work. Tata are close to achieving this limit but are not yet in full compliance. Because of changing shift practices, standardising door cleaning methods and an ongoing door/door frame replacement programme, the door leakage rate has dropped noticeably across both batteries. Tata may be able to fully comply with the BAT-AEL for doors by Q1 of
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Percentage leak rate reduced to target of 10%	
				Target emissions reduction:	Not available	

						2018/19. NRW is addressing non-compliance in accordance with its CCS scheme. We have also commenced monthly compliance reviews of coke ovens performance.
Coke Ovens 4	Reduction of emissions during charging Coke ovens are 'charged' with coal through charge holes in the top of each oven. The charging nozzles, holes and lids all require regular maintenance and periodic replacement to minimise fugitive emissions.	Permit systems and economic instruments: IPPC permits	Start: 2015 Expected end: Status: Implementation	Source affected:	Industry including heat and power production	Control of fugitive emissions from coke ovens will result in lower B[a]P emissions. BAT-AEL for charging emissions is 30 seconds as a monthly mean. During 2017 Tata have improved charging performance and are currently achieving close to 30 seconds. Tata complied with the BAT-AEL for charging
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Duration of release reduced to 30 seconds as a	

					monthly mean	emissions during July and August 2017. NRW is addressing non-compliance in accordance with its CCS scheme. We have also commenced monthly compliance reviews of coke ovens performance.
				Target emissions reduction:	Not available	
Sinter Plant	Improvements to Lignite Injection Lignite is used in combination with lime to trap and neutralise certain pollutants present in hot flue gases. These additives are injected directly into the hot flue gases. The integrity of the flues and the emissions abatement systems must be sound for lignite-lime injection	Permit systems and economic instruments: IPPC permits	Start: 2015 Expected end: 2018 Status: Implementation	Source affected:	Industry including heat and power production	Lignite-lime injection forms part of several projects to ensure that the sinter plant complies with the new tighter EU (IED) standards. There are no specific BATc or BAT-AELs designed to reduce B[a]P from sinter plant emissions. However, reducing overall emissions will result in lower B[a]P emissions.

	to be used safely.					Lignite-lime injection has already been approved by Tata and is still progressing. Several preparatory works must be completed over planned sinter plant stops before the system can be brought online. The revised projected ‘go live’ date is April 2018.