Department
for Environment
Food & Rural Affairs

Report on measures for 2023 exceedance of the Target Value for Benzo[a]pyrene in South Wales non-agglomeration zone (UK0041)

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Contents

1. Introduction

1.1 Context

Under the Air Quality Standards Regulations 2010[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 regulation requires the UK to 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 – 2022 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 2023 reflecting the more recent assessment and updating the 2013 – 2022 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 2023 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 for the compliance assessment in 2023 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] The Air Quality Standards Regulations 2010 (legislation.gov.uk)
[2] https://uk-air.defra.gov.uk/library/bap-nickel-measures
[3] https://uk-air.defra.gov.uk/data/compliance-xml-files
[4] http://uk-air.defra.gov.uk/library/annualreport/index

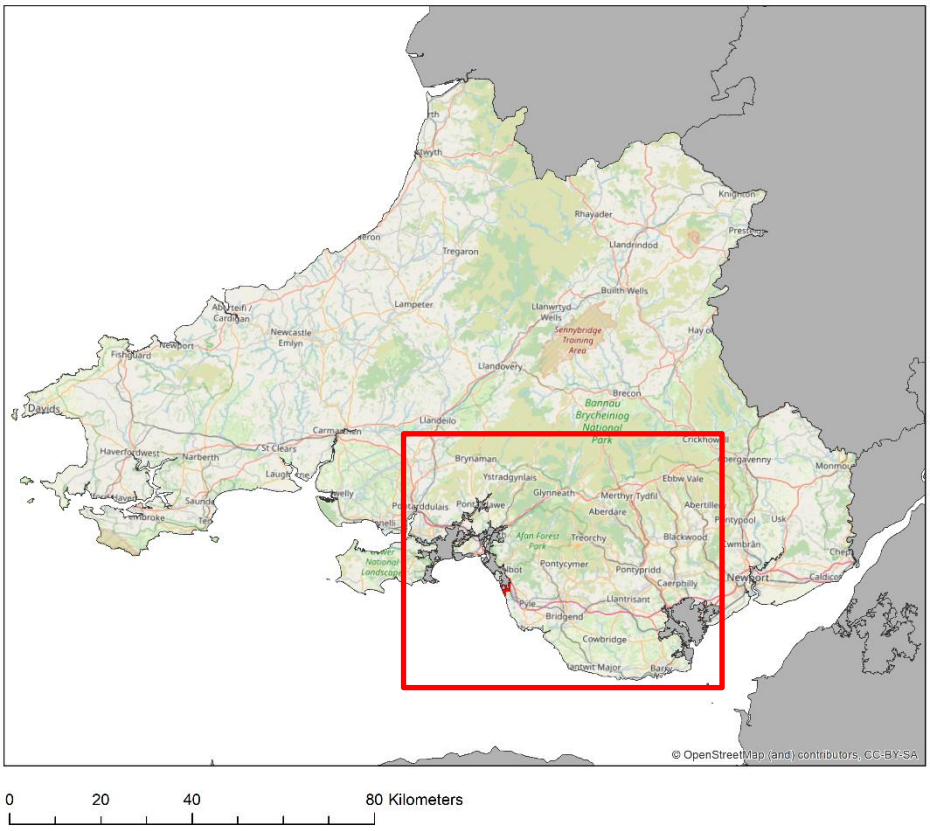
Table 1. Area exceeding B[a]P target value in 2023 and associated population for South Wales zone UK0041

Zone code	Zone Name	Area exceeding TV (km^2)	Population exceeding TV
UK0041	South Wales	5	0

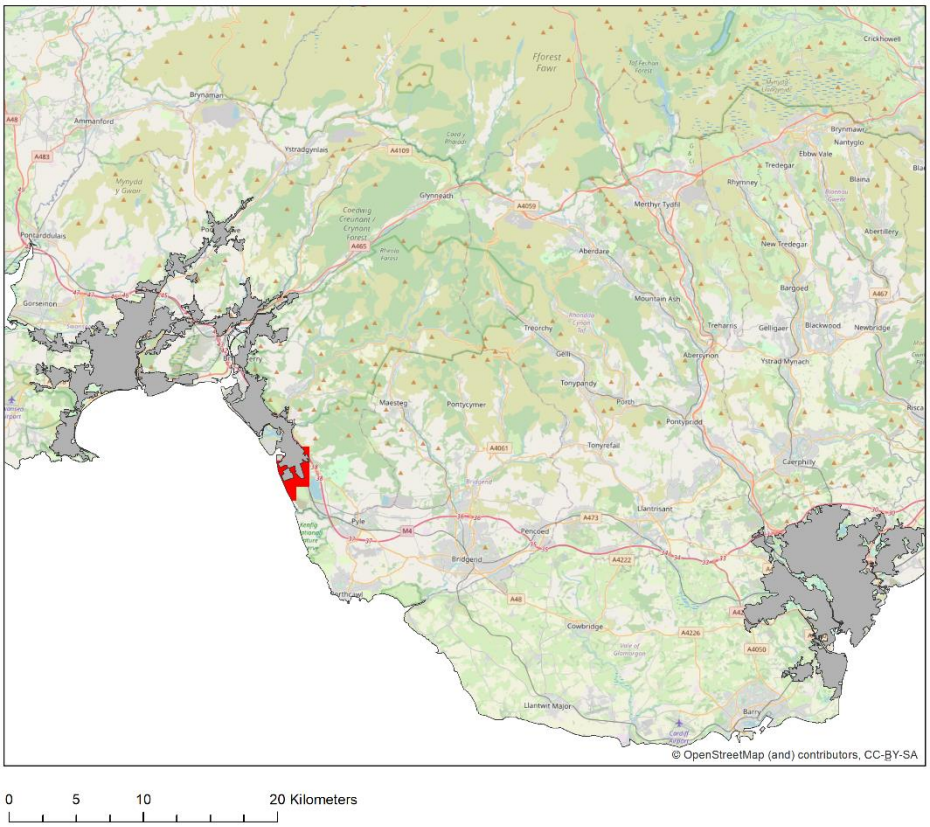
Figure 1a shows the locations of the exceedances in the context of the zone as a whole. Figure 1b shows the part of the zone including the exceedances in more detail.

Figure 1. Location of exceedance of the B[a]P target value during 2023 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_2023_1] related to industrial emissions (area of exceedance 5 km^2)

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.

2 Exceedance situation South Wales [B[a]P_UK0041_2023_1] related to industrial emissions

2.1 Description of exceedance

This exceedance situation has an area of exceedance of 5 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. The exceeding grid squares are numbered in Figure 2 and in subsequent tables for easy reference. There is no resident population in any of the 5 grid squares. This exceedance situation is adjacent to and shares common sources with the exceedance situation Swansea Urban Area [B[a]P UK0027_2023_1].

Figure 2 also shows the locations of the monitoring sites associated with the exceedance situation (Port Talbot Margam and Margam Youth Centre, which are both 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 situation Swansea Urban Area [B[a]P_UK0027_2023_1] are shown as hatched grid squares and the non-hatched red grid squares correspond to this exceedance situation, which is South Wales [B[a]P_UK0041_2023_1].

Table 2 lists the measured concentrations of B[a]P in this zone since 2008. The measured concentrations in this zone were below the TV in all years. The Newport monitoring station is about 55 km from the modelled exceedance situation.

Table 2. Measured annual mean B[a]P concentrations in South Wales zone UK0041 from 2008 to 2024 (ng m^{-3}). (Percentage data capture is shown in brackets).

Station (EoI code)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Newport (GB0962A)	0.34 (99)	0.22 (89)	0.25 (84)	0.14 (94)	0.23 (96)	0.21 (97)	0.21 (100)	0.19 (99)	0.25 (100)	0.19 (61)	0.16 (74)	0.18 (96)	0.15 (91)	0.19 (98)	0.23 (98)	0.19 (96)	0.11 (98)

Table 3 lists the exceeding grid squares and the resident population.

The measurements at the newly established Margam Youth Centre site exceeded the TV in 2023, while measurements at the Port Talbot Margam site were less than the TV. In modelling the spatial coverage of B[a]P concentrations, the national scale model predictions were calibrated using data from these two measurement sites. The calibrated predictions exceeded the target in the vicinity of the steelworks industrial complex in Port Talbot due to industrial emissions including at the location of the Margam Youth Centre site. Fine scale modelling at a 100 m grid resolution was undertaken for the Port Talbot area. 1 km grid squares have been classified as exceeding the TV if at least nine 100 m grid squares exceed the TV or at least one 100 m grid square exceeds and there is residential population in the exceeding 100 m grid squares. A concentration value was defined for each 1 km grid square from the fine scale modelling as the mean of the 100 m grid squares exceeding the TV within that 1 km grid square.

Figure 2. Exceedance situation South Wales [B[a]P_UK0041_2023_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.

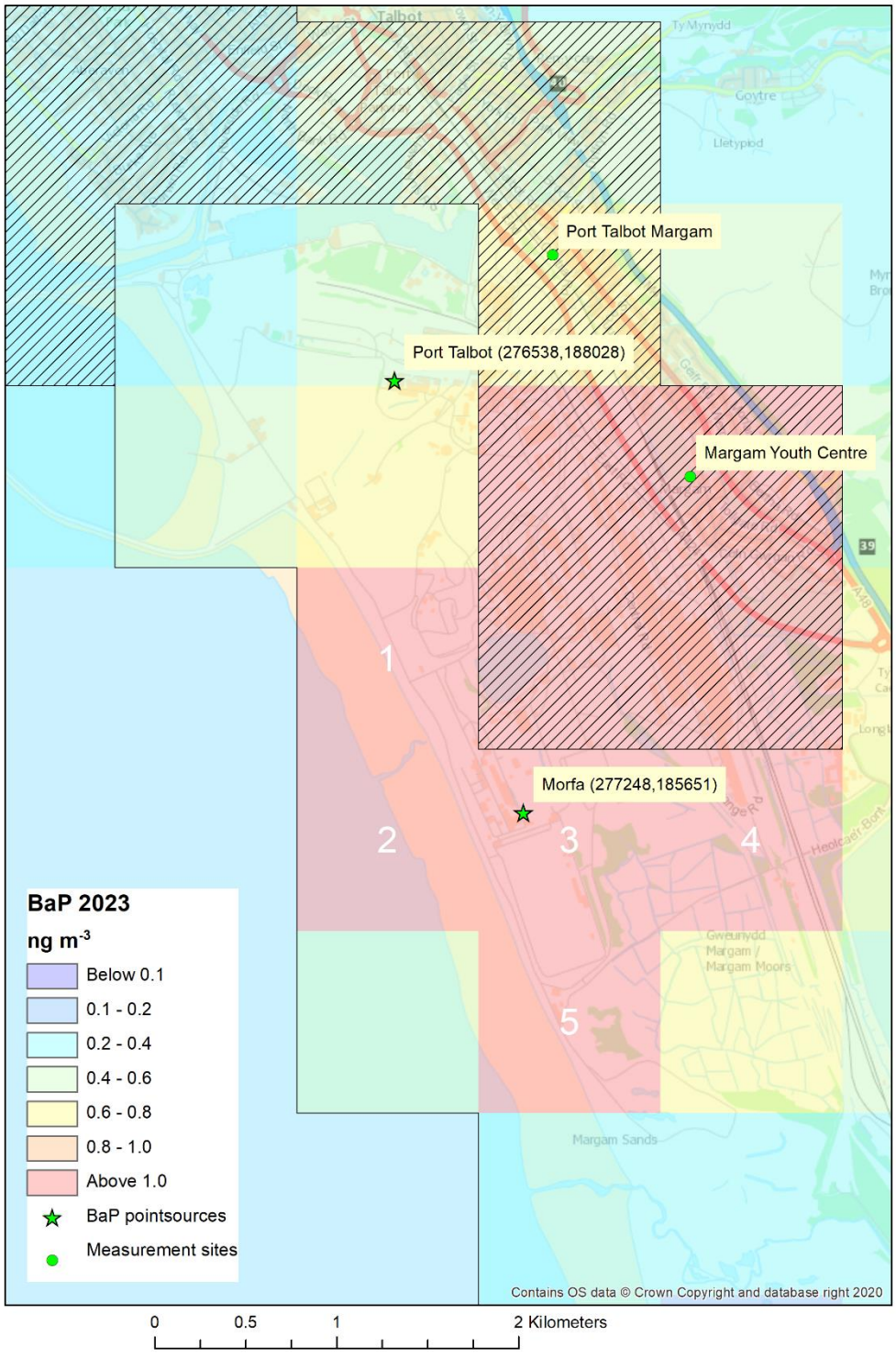


Table 3. Exceeding grid squares for exceedance situation BaP_UK0041_2023_1.

Grid square number	Resident population	Notes
1	0	Steelworks industrial complex and beach
2	0	Steelworks industrial complex and beach
3	0	Steelworks industrial complex
4	0	Steelworks industrial complex and industrial land
5	0	Partly steelworks industrial complex and beach

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 Morfa are the main sources associated with this exceedance situation.

Table 4. Source apportionment for exceedance situation South Wales [B[a]P_UK0041_2023_1]. Annual mean B[a]P concentration (ng m^{-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 production	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	276500	186500	41	n/a	0.048	0.001	0.008	0.025	0.000	0.000	0.014	2.308	2.308	2.4	0
2	276500	185500	41	n/a	0.038	0.001	0.004	0.021	0.000	0.000	0.012	3.685	3.685	3.7	0
3	277500	185500	41	n/a	0.040	0.001	0.004	0.021	0.000	0.001	0.014	7.989	7.989	8.0	0
4	278500	185500	41	n/a	0.042	0.001	0.003	0.022	0.000	0.001	0.015	1.452	1.452	1.5	0
5	277500	184500	41	n/a	0.035	0.001	0.002	0.020	0.000	0.000	0.012	1.186	1.186	1.2	0

Table 5. Detailed source apportionment for industrial sources only for exceedance situation South Wales [B[a]P_UK0041_2023_1]. Annual mean B[a]P concentration (ng m^{-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	186500	41	2.304	0.004	2.308
2	276500	185500	41	3.680	0.005	3.685
3	277500	185500	41	7.980	0.008	7.989
4	278500	185500	41	1.444	0.008	1.452
5	277500	184500	41	1.182	0.004	1.186

2.4 Measures

The main overview report contains more information on how industrial sites are regulated. The Industrial Emissions Directive (IED), as transposed into UK law, sets out control emissions within specific industrial sectors like iron & steel. There are no specific Best Available Techniques (BAT) conclusions within the IED Iron and Steel (IS) BAT Reference Document (BREF), specifically setting out any BAT Associated Emissions Limits or direct techniques or measures to prevent or minimise B[a]P emissions. However, there are some narrative and specific BAT Conclusions to indirectly prevent or minimise B[a]P emissions by reducing fugitive or point source particulate emissions. Following the 2016 sector permit review to adopt the IS BAT Conclusions, permit conditions relevant to Polycyclic Aromatic Hydrocarbons (PAH) emissions, transposed these with a focus on the Coke Ovens and the Sinter Plant that are the main sources and mass release of B[a]P pollutant. The IS BREF contains stringent requirements for iron and steel works to significantly reduce their fugitive emissions (especially particulate matter), indirectly including PAH and subsequently B[a]P emissions.

Reason for previous increases in reported coke oven emissions

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, which 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 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 was expected to show a decrease in results in 2017 and 2018. Monitoring has shown a decrease in 2017 but a slight increase in 2018 caused by a high result in May, with subsequent months showing a return to a lowering trend that continues into 2019 and 2020.

Closure of coke ovens and sinter plant

The main contributors of B[a]P emissions from Port Talbot Steelworks has historically been Morfa Coke Ovens and the Sinter Plant. Both assets were subjected to significant investment in recent years to minimise B[a]P emissions. These activities have now ceased at Port Talbot Steelworks, along with the remaining activities associated with the heavy end.

The closure of the heavy end of Port Talbot Steelworks in 2024 followed a phased approach, marking the end of traditional steelmaking in South Wales. The process began with the shutdown of the Morfa Coke Ovens on the 20th of March 2024. This was followed by the decommissioning of Blast Furnace No 5 at the end of June 2024. The final operational blast furnace, Blast Furnace No 4, ceased production on the 30th of September 2024 bringing an end to primary steelmaking at the site. The Sinter Plant closure was part of the 'heavy end' operations that were shut down along with the blast furnaces in September. These closures are part of Tata Steel's restructuring plan for a change to steelmaking at Port Talbot.

The future of Port Talbot Steelworks is centred around a transition to greener steelmaking technology. Tata Steel plans to invest £1.25 billion, including a £500

million UK Government grant, to transform the site into a green steelmaking process. The key components of this future include:

- Electric Arc Furnace (EAF): A new 3.2 million tonne capacity state-of-the-art electric arc furnace will be built to replace the traditional blast furnaces. This EAF is expected to be the largest globally and will primarily use scrap metal to produce new steel.
- Carbon Emission Reduction: The transformation project aims to reduce the UK's overall CO_2 emissions by around 1.5%.
- Timeline: The new electric arc furnace is projected to be operational by the end of 2027.
- Interim Production: For at least the next five years, steel production will rely on imported slabs from the Netherlands or India, which will be processed and finished in Port Talbot.

This transition marks a significant shift from traditional steelmaking to a more sustainable and environmentally friendly approach, aiming to secure the long-term future of steelmaking in Port Talbot.

Given that B[a]P is primarily associated with industrial processes involving incomplete combustion of organic materials, such as those in coke ovens, blast furnaces and sinter plants, the shutdown of these facilities will likely result in a substantial decrease in B[a]P emissions in South Wales.

Since the closure of Morfa Coke Ovens, a significant reduction in ambient B[a]P concentration from the internal Tata Steel UK monitoring network and from the National PAH Network has been observed.

Since B[a]P emissions are generally associated with particulate matter and traditional steelmaking processes, it's reasonable to estimate that the reduction in B[a]P emissions would be in line with the overall emission reductions at Port Talbot, likely ranging from 85% to 90% based on current emissions. This significant decrease is primarily due to the shutdown of blast furnaces and coke ovens, which are major sources of B[a]P emissions.

Measured annual mean concentrations of B[a]P at the Port Talbot Margam and Margam Youth Centre sites in 2024 were lower than in 2023 by approximately 80% to 90%. There were no reported exceedances for B[a]P in the compliance assessment for 2024, which was submitted in September 2025.

The Report on Measures for Swansea [UK0027, section 2.4] summarises the historic measures taken at the Port Talbot industrial site, which are no longer applicable since the closure of the Morfa Coke Ovens and sinter plant