Department
for Environment
Food & Rural Affairs

Report on measures for 2016 exceedance of the Target Value for Nickel in Swansea Urban Area agglomeration zone (UK0027)

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1. Introduction

1.1 Context

Under the EU Directive 2004/107/EC[1], the target value (TV) for nickel (Ni) is an annual mean concentration of 20 nanograms (a nanogram is one billionth of a gram (10^{-9})) per cubic metre (m^{-3}) of ambient air or lower. The Directive requires that Member States shall 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, 2014 and 2015 in the Swansea Urban Area and a report on measures was published detailing the exceedance and the measures in place[2].

This document reports the exceedance situation for 2016 reflecting the more recent assessment and updating the 2013, 2014 and 2015 report on measures.

1.2 Status of zone

This is the report on measures required for exceedances of the TV for Ni within the Swansea Urban Area agglomeration zone identified within the 2016 UK air quality assessment. Exceedances within this zone were identified on the basis of measurement data, with model results on a 1 km x 1 km grid resolution providing supplementary information. Fine scale modelling on a 20 m x 20 m grid resolution located around an identified industrial source provided a more detailed local assessment. 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.

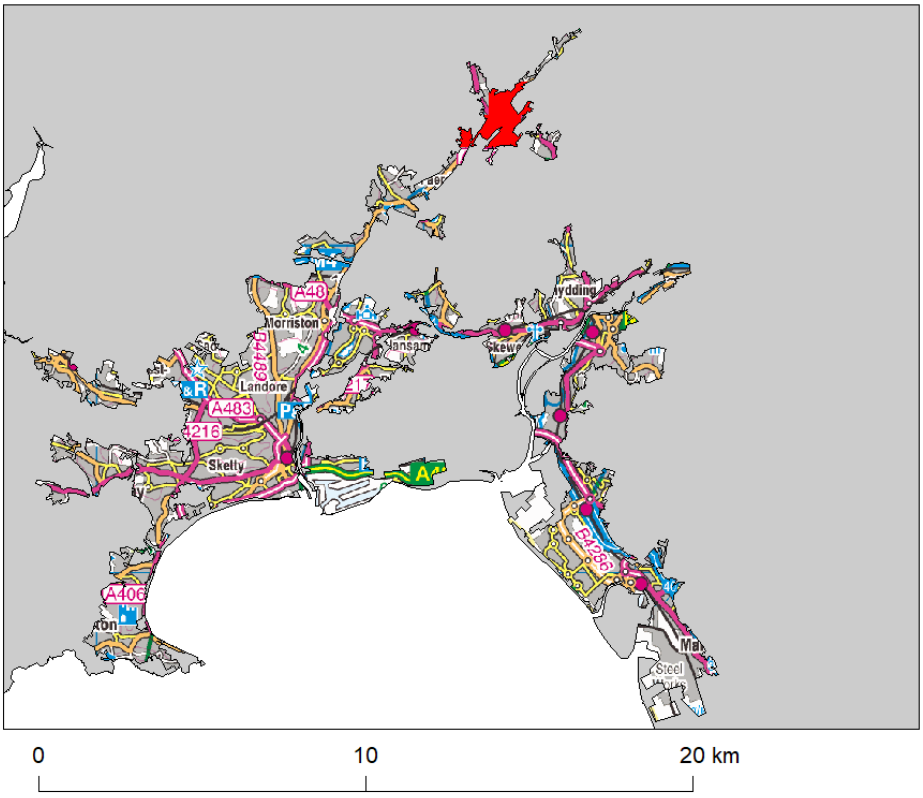
[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF
[2] https://uk-air.defra.gov.uk/library/bap-nickel-measures
[3] http://cdr.eionet.europa.eu/gb/eu/aqd
[4] https://uk-air.defra.gov.uk/library/annualreport/index

Table 1. Area exceeding Ni target value in 2016 and associated resident population for exceeding areas within Swansea Urban Area zone UK0027.

Zone code	Zone Name	Area exceeding TV (km^2)	Population exceeding TV
UK0027	Swansea Urban Area	1	2,102

Figure 1 shows the locations of the exceedances in the context of the zone.

Figure 1. Location of exceedance of the Ni target value during 2016 in Swansea Urban Area agglomeration zone UK0027. Areas of the zone in exceeding grid squares are marked red.



An initial source apportionment was carried out and this analysis identified one exceedance situation within this zone related to industrial emissions:

> Swansea Urban area [Ni_UK0027_2016_1] related to industrial emissions (area of exceedance: 1 km^2)

This report describes the exceedance situation in the zone. The sections below provide 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]. This exceedance situation is adjacent to and shares common sources with the exceedance situation South Wales [Ni_UK0041_2016_1] for which further information can be found in the report on measures for South Wales UK0041.

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

2 Exceedance situation Swansea Urban Area [Ni_UK0027_2016_1] related to industrial emissions

2.1 Description of exceedance

This exceedance situation is an area of exceedance of 1 km^2 and is located in the Swansea valley in the north of the Swansea Urban Area agglomeration zone. The resident population associated with this exceedance situation is 2,102. This exceedance situation is adjacent to and shares common sources with the exceedance situation for South Wales [Ni_UK0041_2016_1].

Table 2 lists measured annual mean concentrations of Ni from monitoring sites in Swansea Urban Area agglomeration zone from 2004 to 2017, and Figure 2 indicates the location of measurement sites. There was one measured exceedance at Pontardawe Tawe Terrace (GB1016A) in 2016 for which this report relates. Figure 3 shows the location of the exceedance situation in detail. This map also shows the locations of the monitoring sites in the vicinity of the exceedance situation and the locations of local industrial sources. The map in Figure 3 shows that Pontardawe Tawe Terrace is located within the exceedance situation for Swansea [Ni_UK0027_2016_1]. The measured concentrations of Ni at other national monitoring sites within the Swansea Urban Area agglomeration zone were all below the TV in 2016. The TV concentration was also exceeded at the Pontardawe Leisure Centre Local Authority monitoring site.

Figure 3 shows the high resolution zone boundary used to assign the locations of monitoring sites in grey and the zone boundaries for the 1 km grid used to assign exceedance situations and associated populations as black hatching. The local topography and locations of settlements results in the Swansea Urban Area Agglomeration zone extending up the Swansea Valley but only the larger urban areas are assigned to the agglomeration zone within the 1 km gridded data.

Figure 2. Location of monitoring sites in Swansea Urban Area

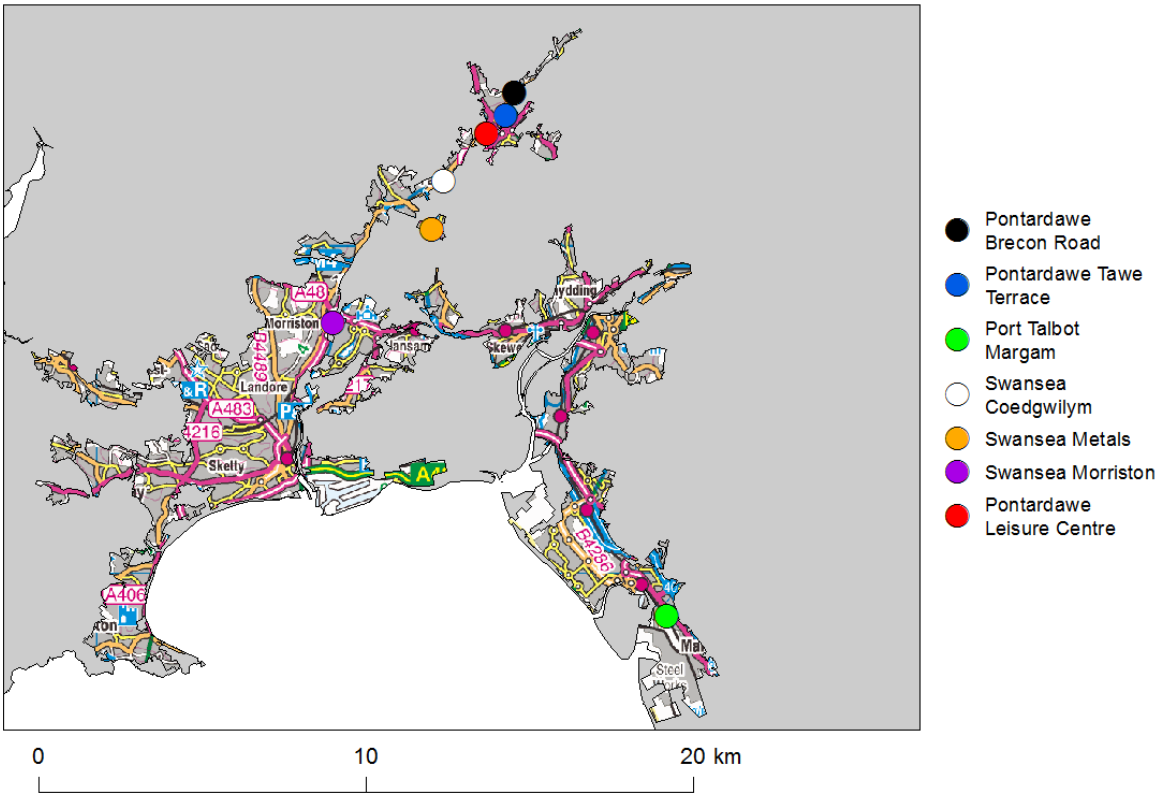
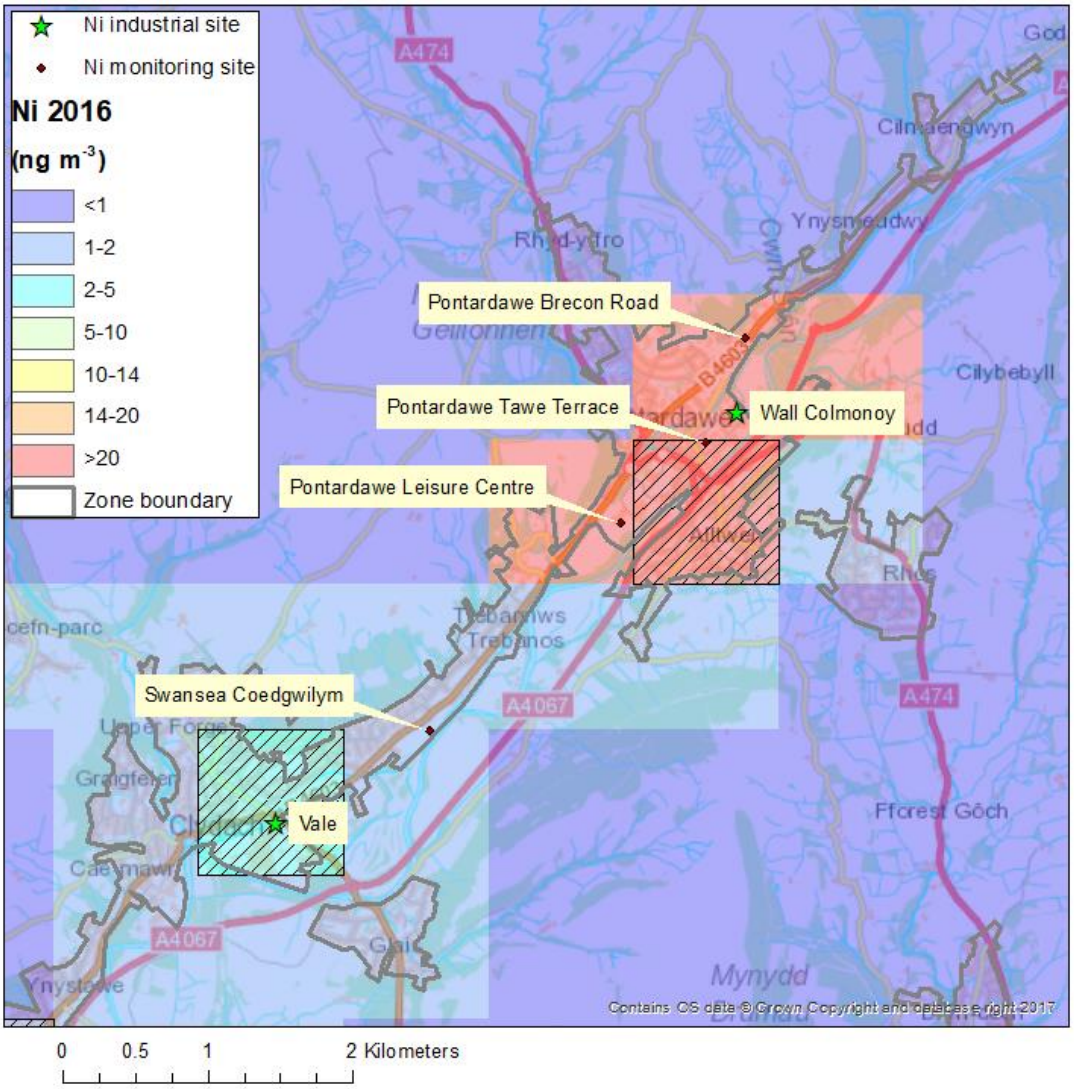


Table 2. Measured annual mean Ni concentrations in Swansea Urban Area agglomeration zone UK0027 from 2004 to 2017 (ngm^{-3}). (Percentage data capture is shown in brackets).

Station (EoI code)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Pontardawe Brecon Road (GB1015A)								6.5 (37)	6.6 (94)	5.7 (98)	8.1 (96)	9.2 (97)	4.8 (100)	4.5 (94)
Pontardawe Tawe Terrace (GB1016A)								28 (93)	30 (98)	37 (98)	43 (100)	28 (100)	47 (97)	19 (95)
Port Talbot Margam (GB0906A)					2.0 (98)	1.4 (92)	1.5 (100)	1.7 (97)	1.4 (99)	1.5 (100)	1.7 (100)	4.1 (100)	2.4 (98)	1.4 (100)
Swansea Metals (GB0876A)	34 (96)	20 (97)	26 (97)	28 (64)										
Swansea Coedgwilym (GB0981A)					20 (100)	16 (96)	10 (98)	11 (92)	8.5 (84)	7.8 (100)	12 (100)	13 (100)	10 (100)	8.5 (98)
Swansea Morriston (GB0979A)					7.6 (87)	9.3 (98)	15 (98)	8.2 (95)	5.6 (98)	6.5 (100)	9.4 (100)	7.4 (94)	5.9 (93)	5.8 (86)
Pontardawe Leisure Centre*	76	47	74	70	43	29	8.5	15	14	12	22	15	22	10.3

* Pontardawe Leisure Centre is a Local Authority monitoring site. It is included here as the site was operated continuously between 2004 and 2017. Data capture statistics were not available for this site.

Figure 3. Exceedance situation Swansea [Ni_UK0027_2016_1]. Exceeding grid squares are marked red. Locations of local industrial sites Wall Colmonoy works at Pontardawe and Vale Europe Ltd Clydach refinery and the locations of local monitoring stations are also shown. Non-hatched grid squares are assigned to the South Wales zone UK0041 and do not form part of this exceedance situation.



2.2 Source apportionment

Modelling has been used to determine the annual mean Ni source apportionment for the exceedance situation. National modelling on a 1 km x 1 km grid resolution apportions the Ni concentration to background sources. Additional fine scale modelling has also

been carried out to characterise local industrial emissions for the Wall Colmonoy site located within the exceedance situation, this is described in Appendix 1.

Table 3 provides a breakdown of the main emission sources (source apportionment) that have contributed to the grid square in this exceedance situation. It is clear that industrial sources are the main source associated with this exceedance situation. The penultimate column in the table is the total from all emissions sources. The values in this column have been rounded to integers for consistency with the values 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 for the industry sector and shows that the main source associated with this exceedance situation is Wall Colmonoy stack emissions. The emissions from Wall Colmonoy are regulated by the Neath Port Talbot County Borough Council and measures undertaken (see section 2.3) describe how these stack emissions have changed since 2008. Appendix 1 presents modelling undertaken to understand the impact of this emissions source.

In previous years, the Welsh Government have commissioned supplementary monitoring studies to improve the confidence in the source apportionment and identification of the predominant Ni sources. The sampling frequency at the Pontardawe Tawe Terrace measurement site was increased from weekly to daily sampling between August 2015 and February 2016. A subsequent study by King's College London measured the concentration of Nickel and other metals at hourly time resolution during November and December 2015. Both assessments looked at the relationship between local meteorological data, the levels of Ni compared with other metals and industrial activity to help identify Ni sources. Both studies indicated that Wall Colmonoy was a significant source of Ni at the Tawe Terrace monitoring station, although acknowledged that other sources were present. Details of both studies were provided in Appendix A1.2 of the 2015 Report on Measures for Swansea Urban Area.[6]

[6]https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_reportonmeasures_2015.pdf

Table 3. Source apportionment for exceedance situation Ni_UK0027_2016_1. Annual mean Ni concentration (ngm^{-3})

OS easting (m)	OS Northing (m)	Zone	Regional background: Total	Regional background: From within Member State	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	Local increment: Total	Local increment: Industry including heat and power production	Total for all emission sources	Resident population
272500	203500	27	1.26	1.26	1.09	0.01	0.32	0.71	0.01	0.03	0.00	44.64	44.64	47	2102

Table 4. Detailed source apportionment for industrial sources only for exceedance situation Ni_UK0027_2016_1. Annual mean Ni concentration (ngm^{-3})

OS easting (m)	OS Northing (m)	Zone	Wall Colmonoy stack emissions	Fugitive emissions	Local increment: Industry including	Total for all emission sources
272500	203500	27	44.64	0.00	44.64	47

2.3 Measures

Improving air quality is a high priority for the Welsh Government, including the attainment of EU target values. The Welsh Government brings together the regulators and local industrial operators with emissions of Ni to air in pursuit of this aim. Regular meetings have enabled:

- the Welsh Government to communicate to the industrial regulators and operators the extent of the issue and the seriousness with which it is taken;
- the regulators to demonstrate that the operators are applying all cost-effective measures, and in particular are applying best available techniques as required by Council Directive 2010/75/EU (IED);
- the operators to cooperate and share best practice in managing their operations; and
- the development of the latest evidence in understanding the predominant sources.

Table 5 presents measures that have been taken and are to be taken at the Wall Colmonoy and Vale industrial sites and the remainder of this section describes action taken at the industrial sites during 2016. Given the level of uncertainty and the cause and spatial extent of this local exceedance, the Welsh Government have undertaken further modelling studies to help identify the predominant sources (more information is provided at the end of this report).

Vale

A comparison between the reported annual Ni emissions from Vale works in Table 6 and annual Ni concentrations recorded at local monitoring sites in Table 2 shows a positive correlation between the timing of reductions of reported emissions at Vale site and the trend in measured annual mean Ni concentrations at the long running Pontardawe Leisure Centre site – although an increase was seen at this site in 2014. The timing of the large drop in measured concentrations at this site between 2007 and 2010 coincides with the large reduction in reported stack emissions from the Vale works. More recently, trends in the measured annual mean Ni concentrations at the Pontardawe Leisure Centre site have correlated less well with the reported annual Ni emissions from Vale. Table 6 shows that emissions from Vale have been relatively stable since 2011. Emissions were elevated in 2015 compared to recent previous years, but decreased in 2016 back to levels similar to other years since 2011.

The regulator for the Vale site, Natural Resources Wales, has assessed that the measures that have already been taken by Vale constitute BAT for the industrial site and that there is no evidence to suggest the emissions from that source are a

significant contributor to the high results seen at some monitoring stations throughout 2016. Natural Resources Wales will work with Vale to ensure continual improvements are made to the operations and to minimise emissions. However, no additional measures are proposed at this time. The measures reported in Table 5 are unchanged from those reported in the Report on Measures for 2015 exceedance of the Target Value for Nickel in Swansea Urban Area agglomeration zone[7].

Wall Colmonoy

The regulator for the Wall Colmonoy site, Neath Port Talbot County Borough Council, has assessed that the measures that have been taken at the Wall Colmonoy site also constitute BAT.

Table 7 shows that reported annual emissions for the Wall Colmonoy site increased from 24.23 kg yr^{-1} in 2015 to 95.37 kg yr^{-1} in 2016. Estimates of annual stack emissions are based on an annual stack test result, which is a snapshot of emissions and is dependent on the relative Ni content of the specific products that are being made or processed and the operation of the emission abatement equipment at the time of the emissions test.

The measured annual mean concentrations of Ni at Pontardawe Tawe Terrace site (the monitoring site nearest to the Wall Colmonoy site) increased significantly between 2015 and 2016. A comparison between reported annual Ni emissions from Wall Colmonoy site in Table 7 and Ni concentrations at local monitoring sites shows that there is a little or no correlation between the reported emissions from the Wall Colmonoy site and measured annual mean Ni concentrations at Pontardawe Tawe Terrace. This may be due to uncertainties in the stack emissions estimation method, amongst other factors. In 2016, emissions from Wall Colmonoy were higher than in recent previous years.

Significant work was undertaken by the regulator and site operator to understand and rectify the increase in emissions during 2016. Ambient monitoring data and internal nickel monitoring results were used to try to identify possible areas for improvement. An action tracker was used to identify, prioritise and track possible improvements with further effort being put into maintenance activities. Stack test results showed raised nickel levels from one item of plant (a wet extractor system), which was subject to maintenance, including: the pump was changed, metal particulate was cleaned out of the ducting that lead to the unit, the inspection frequency increased on this equipment and a new inspection window was installed. Improvements to this unit are likely to have made the biggest impact on ambient

[7]https://uk-air.defra.gov.uk/assets/documents/reports/bap-nickel-measures/ni_swansea_UK0027_reportonmeasures_2015.pdf

emissions. Additional maintenance and improvement activities that were carried out include:

- Maintenance carried out on wet extractor for foundry (aqualine)
- Pollution measurements were carried inside the building in order to better understand fugitive emissions
- Lip extraction was installed on induction furnaces
- Vibratory feeders were enclosed
- Improvements were made to waste handling arrangements
- Additional stack tests were carried out to gauge improvements to specific abatement plant e.g. Fettling, Cut-off saw
- Tower 4 emissions were connected to different abatement plant for enhanced performance
- Replaced HEPA filters on abatement plant that emits to inside of building
- The permit was reviewed and varied

Detailed local modelling of Ni emissions from the Wall Colmonoy site showed that the reported annual Ni emissions of 95.37 kg $year^{-1}$ were not representative of emissions throughout 2016. It was identified that reported Ni emissions were based on stack tests undertaken while there was a failure in abatement equipment at the site and that this abatement failure is likely to have lasted for a few months during 2016. For the remainder of the year the Ni emissions rate would be expected to be lower than the reported emissions rate. Appendix 1 provides more details.

In 2017 the measured annual mean concentration of Ni at Pontardawe Tawe Terrace site was 19 ng m^{-3} i.e. below the Ni TV of 20 ng m^{-3}. This demonstrates that the action taken at the Wall Colmonoy site had a significant impact on Ni concentrations in the area and shows that when the abatement systems are operating correctly compliance with the Ni TV can be achieved.

Table 5. Table of measures taken or to be taken at Wall Colmonoy and Vale industrial sites.

Measure code	Measure Description	Classification	Implementation dates	Other information		Comment
Wall Colmonoy_1	Water wash cyclone (Aqualine) filtration for casting foundry	Permit systems and economic instruments: Other measure	Start: 2010 Expected end: 2010 Status: Complete	Source affected:	Industry including heat and power production	Regulator (Neath Port Talbot County Borough Council) have assessed that this system meets BAT. This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Nickel concentration in emissions test: October 2014 results of 0.01 mgm^{-3} against limit specific in environmental permit of 15 mgm^{-3}	
				Target emissions reduction:	Not available	
Wall	New local	Permit systems	Start: 2014	Source affected:	Industry including	This measure is complete.

Colmonoy_2	exhaust ventilation system and filter unit installed in the powders section	and economic instruments: Other measure	Expected end: 2014 Status: Complete		heat and power production	
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_3	Deep clean of powders section	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions	Not available	

				reduction:		
Wall Colmonoy_4	Install new centralised vacuum system in powders section	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_5	New Local Exhaust Ventilation (LEV) and filter in fettling section	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	

				Target emissions reduction:	Not available	
Wall Colmonoy_6	Deep clean of atomising section	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_7	Flap curtains installed between the powder room and driers to minimise escape of dust	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	

	from powder room			Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_8	Nutating inlets (containment at transfer points) fitted on lockers (screens) 7 & 8	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_9	New enclosure and Local Exhaust	Permit systems and economic instruments:	Start: 2014 Expected 2014	Source affected:	Industry including heat and power production	This measure is complete.

	Ventilation (LEV) filter on blenders dispense into sieve	Other measure	end: Status: Complete			
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_10	Lip extraction fitted to furnaces feeding atomising (powder manufacture) Tower 4	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	

Wall Colmonoy_11	Dalamatic filter system upgraded with bags to same specification as Vale A1 site	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Nickel concentration in emissions test. November 2014 results of 0.01 mgm^{-3} against limit specific in environmental permit of 15 mgm^{-3}	
				Target emissions reduction:	Not available	
Wall Colmonoy_12	Russell sieve enclosed with curtains	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	

				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_13	Cut off saw bag filters installed	Permit systems and economic instruments: Other measure	Start: 2012 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_14	Cyclone followed by bag filter (Dalamatic)	Permit systems and economic instruments:	Start: 2014 Expected 2014	Source affected:	Industry including heat and power production	This measure is complete.

	arrestment used in powder manufacturing (atomising)	Other measure	end: Status: Complete			
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_15	High-efficiency particulate arrestance (HEPA) filters used on drier units where air is emitted to internal atmosphere	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	

Wall Colmonoy_16	Workplace nickel monitoring to take place to identify hot spots.	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2018 Status: Implementation	Source affected:	Industry including heat and power production	Results from this monitoring will be used to identify and prioritise future improvements A new tranche of monitoring started in Sep 2017
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_17	Ambient (external) monitoring is to take place to help identify any hot spots	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2018 Status: Implementation	Source affected:	Industry including heat and power production	Hourly monitoring study by King's College London in November/December 2015 is now complete. Monitoring by Wall Colmonoy and at Pontardawe Tawe Terrace is on-going.
				Spatial scale:	Local	
				Cost:	Not available	

				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_18	Modify hoods in castings 450kg furnaces. Only extract from two working furnaces instead of all four	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2016 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_19	Install water flow alarms on Aqualine filter system	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2015	Source affected:	Industry including heat and power production	This measure is complete.

			Status: Complete	Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_20	Roll out of differential pressure gauges on all Local Exhaust Ventilation (LEVs) including those < 50m3/min	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall	Air drier pans	Permit systems	Start: 2015	Source affected:	Industry including	This measure is complete.

Colmonoy_21	LEV to be improved	and economic instruments: Other measure	Expected end: 2016 Status: Complete		heat and power production	
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_22	Door closures for existing maintenance area	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	Complete
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions	Not available	

				reduction:		
Wall Colmonoy_23	Improve powder decanting arrangements on Tower 4. Better extraction & LEV	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_24	TD100 discharge under positive pressure. Can put strain on neoprene at transfer points	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2016 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	

				Target emissions reduction:	Not available	
Wall Colmonoy_25	Enclose vibratory feeders	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2016 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete. This is also additionally addressed through a process design change in the feed.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_26	DSB mill LEV solution to be established before installation. Although this is already within	Permit systems and economic instruments: Other measure	Start: 2015 Expected end: 2015 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	

	an enclosed room			Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Wall Colmonoy_27	Waste from bag filters are collected in enclosed drums, which are sealed prior to disposal by licenced carrier. Dust collected by the Aqualine system is saturated with water and is placed in Intermediate Bulk Containers before disposal by registered waste carrier.	Permit systems and economic instruments: Other measure	Start: 2014 Expected end: 2014 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	Not available	
				Indicator:	Not available	
				Target emissions reduction:	Not available	

Vale_1	Installation of stack filtration plant (bag house) to replace electrostatic precipitators	Permit systems and economic instruments: IPPC permits	Start: 2007 Expected end: 2007 Status: Complete	Source affected:	Industry including heat and power production	This was the most significant measure for this source.
				Spatial scale:	Local	This measure is complete.
				Cost:	£1.8M	
				Indicator:	Monthly average particulate concentration from main stack reduced from ~10 mgm^{-3} to less than 1 mgm^{-3}	
				Target emissions reduction:	3: Annual stack emission reduced from 2855 kg in 2007 to less than 100 kg by 2009, value in 2013 was 42 kg	
Vale_2	Undertook soil remediation on abandoned parcel of contaminated land to render contained nickel inert	Permit systems and economic instruments: IPPC permits	Start: 2011 Expected end: 2011 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	£90K	
				Indicator:	Not available	

				Target emissions reduction:	Not available	
Vale_3	Consolidated 3 emission points from Powder Plant Storage Hoppers into 1 emission point and installed HEPA filer at outlet	Permit systems and economic instruments: IPPC permits	Start: 2012 Expected end: 2012 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	£100K	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Vale_4	Replaced cladding and added belt enclosure on feed conveyors	Permit systems and economic instruments: IPPC permits	Start: 2013 Expected end: 2013 Status: Complete	Source affected:	Industry including heat and power production	This measure is complete.
				Spatial scale:	Local	
				Cost:	£600K	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Vale_5	Replaced all 1700 filter bags on the Stack	Permit systems and economic instruments:	Start: 2014 Expected 2014	Source affected:	Industry including heat and power production	This measure is complete.

	Filtration Plant as part of planned preventative maintenance	IPPC permits	end: Status: Complete			
				Spatial scale:	Local	
				Cost:	£160K	
				Indicator:	Not available	
				Target emissions reduction:	Not available	
Vale_6	Replacement of gas fired band dryer in effluent treatment plant with a vacuum dryer. Resulting in the removal of three emissions points and efficient drying.	Permit systems and economic instruments: IPPC permits	Start : 2015 Expected: 2017 Status: Complete	Source affected	Industry including heat and power production	This measure is complete.
				Spatial scale	Local	
				Cost:	£4 million	
				Indicator	Reduction in emission points	
				Target emissions reduction:	Not available	

Table 6. Reported annual Ni emissions to air from Vale works (kg year^{-1}).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Stack	1934	763	1382	3154	2855	193	56	96	25	31	42	11	108	36
Other	54	280	31	12	116	93	45	16	11	29	37	12	38	19

Table 7. Reported annual stack emissions of Ni from Wall Colmonoy site (kg year^{-1}).

	2008	2009	2010[a]	2011	2012	2013	2014	2015	2016
Stack	157.57	157.57	89.93	37.25	74.48	15.82	3.73	24.23	95.37

[a] Abatement measures implemented mid-2010. Reported emissions assume 6 months emissions at 2009 levels and six months at post abatement emissions level of 22.29 kg year^{-1}.

Appendix

A1 Assessment of industrial source

A1.1 Local scale modelling of the industrial point source

Detailed dispersion modelling has been undertaken using ADMS 5.2 for the area in South Wales where exceedances of the annual mean TV of 20 ngm^{-3} have been measured. This fine scale modelling has been used to assess the likely magnitude and spatial scale of the exceedance.

Modelling was carried out at a spatial resolution of 20 m x 20 m over an area of 2.5 km x 2.5 km centred on the industrial point source. Information on the Ni emissions from the principal Ni point source were provided by the site operator. Annual Ni emissions were reported to be 95.37 kg $year^{-1}$ by the site operator, however discussion with the regulator and site operator identified that these annual emissions were not representative of emissions throughout 2016. Reported Ni emissions were based on stack tests undertaken during October 2016 and, at this time, a failure in abatement equipment at the site was identified. The abatement failure was fixed early November 2016, but the start of the abatement failure is not known with certainty. Thus, Ni emissions rates for 2016 were taken to be equivalent to 95.37 kg $year^{-1}$ for a period from mid-July to early November, consistent with a period where high concentrations of Ni were measured at the Pontardawe Tawe Terrace monitoring station. For the remainder of the year, Ni emissions rates were taken to be equivalent to 24.2 kg $year^{-1}$, the reported emissions rate for 2015. Emissions were released from thirteen emission points distributed across the site. Building effects were included in the model, and a 6 km x 6 km area was extracted from the OS Terrain 50 dataset to allow the effect of the topographical features of the valley to be included in the model. The height of the terrain was specified at the centre of each 50 m x 50 m grid square.

The results of this point source modelling were assessed at the location of three nearby national monitoring stations at Pontardawe Tawe Terrace, Pontardawe Brecon Road and Swansea Coedgwilym and one Local Authority monitoring station at Pontardawe Leisure Centre. Figure A1 shows the correspondence between measured concentrations and modelled concentrations. The modelled concentration presented is the sum of the point source component from the local model and the background component from the national model. The background model includes the contribution of emissions from the Vale industrial site during 2016.

The modelled concentration of Ni at Pontardawe Tawe Terrace that results from this local modelling was 41 ngm^{-3} in 2016. The national model provides a background Ni concentration of 2.4 ngm^{-3}, which is added to the results of the point source model. The sum of the point source and background contributions is 43 ngm^{-3} and is in good agreement with the annual mean Ni concentration of 47 ngm^{-3} measured at the monitoring station. Figure A1 shows that the modelled concentrations at Pontardawe Leisure Centre and Swansea Coedgwilym monitoring stations are also in good agreement with the measured annual mean Ni concentrations at these sites. The model also correctly predicts the concentration at Pontardawe Brecon Road national monitoring station.

Figure A2 shows the modelled annual mean Ni concentrations resulting from the local industrial point source in Pontardawe (including background contributions). The Ni concentrations in Pontardawe were strongly influenced by the terrain in the area, as can be seen in Figure A2. The Swansea Valley runs south-west to north-east through the village of Pontardawe, where the point source is located. Figure A2 shows that the distribution of the Ni concentrations in the vicinity of Pontardawe corresponded with the local topography. This is believed to be due to channelling of the local wind flow by the Swansea Valley.

The conclusions from this dispersion modelling study are that there was an exceedance of the Ni TV in the Swansea urban area zone in 2016, and it is likely there was also an exceedance in the adjacent South Wales zone. This exceedance was likely to have extended over a spatial area of relevance to the directive (at least 250 m x 250 m for industrial locations).

Figure A1. Comparison between measured and modelled Ni concentrations. Modelled concentrations are the sum of contributions from the local point source model and the national background model.

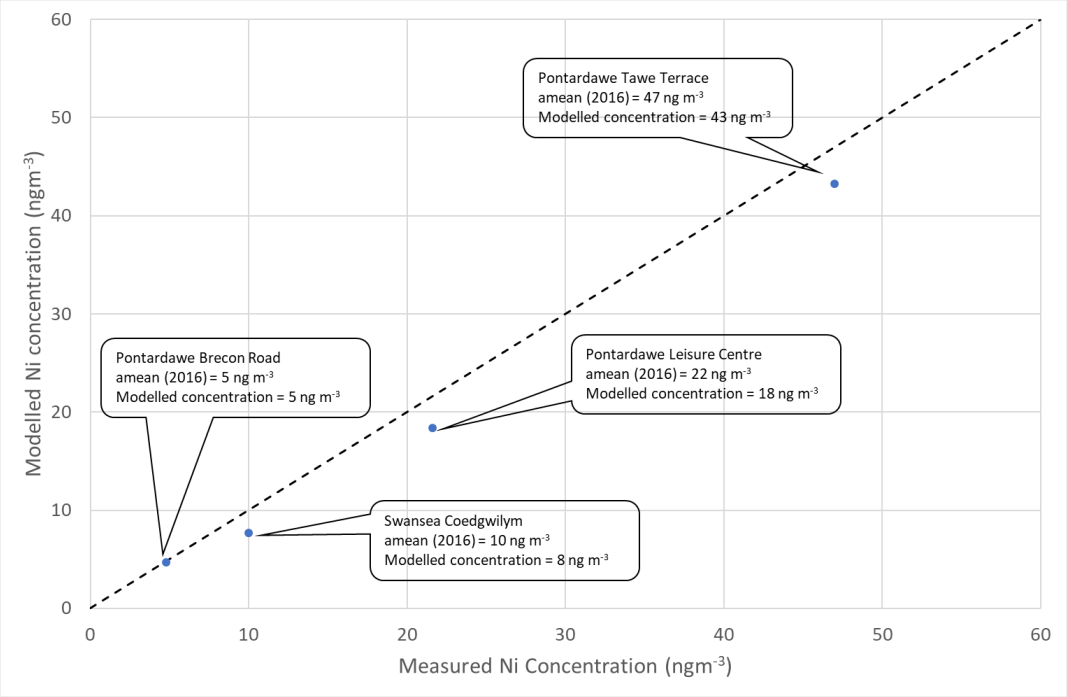


Figure A2: Modelled annual mean Ni concentration resulting from the local industrial point source in Pontardawe in 2016.