TATA STEEL

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Tata Steel Strip Products UK
Port Talbot Steelworks
Technical
Environmental Improvement

Annual On-site Ambient PM_{10} Monitoring Report for 2014 Data

			Signed	Dated
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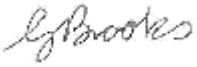
Checked:	Georgina Brooks	Environmental Engineer		30/01/15
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Introduction

This report is written to meet commitments made in Tata Steel Strip Products UK's (TSSP UK's) October 2010 response to Improvement Condition 9.8 within Permit BL7108IM/V009. The Improvement Condition states:

"The Operator shall develop a reporting framework for assessing and reporting annually and quarterly the data produced from the on site ambient air quality monitoring network. A copy of the assessment and reporting framework shall be submitted to the Environment Agency at the Reporting Address".

This report will cover the period from January 1st 2014 to December 31st 2014 and will:

- outline monitor deployment and data capture over the course of the monitoring period;
- describe the trends in monitored data with reference to any changes that occurred over the course of the monitoring period;
- present and interpret rose diagrams for data recorded over the course of the monitoring period; and
- discuss variation in trends between data presented in this annual report and the 2014 quarterly reports.

In addition to meeting the above requirements, Section 5 of this report will compare the 2014 data with data for 2011, 2012 and 2013. This will include analysis of the influence of:

- wind direction;
- national events; and
- industrial operations.

Conclusions taken from the above are presented in Section 6.

Over the course of the monitoring period there were provisionally[1] 16 breaches of the daily mean PM_{10} air quality objective in Port Talbot. A total of 16 breaches have been investigated and corresponding reports submitted to Natural Resources Wales (NRW). Tata Steel will consider all of this information when prioritising Air Quality Capital Investment schemes for the 2015/16 financial year and when auditing the effectiveness of the area's Air Quality Management Plans. A summary of the AURN breach days investigated during 2014 is shown in Table A. It shows that three breach days were attributed to trans-boundary pollution and the other 13 were attributed to localised elevations in PM_{10} concentrations. This information will be considered when undertaking the analysis outlined above.

1 The Margam AURN PM_{10} data for 2014 has not yet been fully ratified

Table A – Summary of breach days from 1st January to 31st December 2014

Count	Breach Date	PM10 Daily Mean at Port Talbot	Trans-boundary Influence (based on Narberth)	PT Normal Background	Trans-boundary influence removed	Local Influence Above Norm	PMcoarse Fraction (%)	Wind direction Towards Port Talbot town? **	National Event?
1	02/01/2014	52.9	2.8	26.5	50.1	23.6	72	Yes	No
2	03/01/2014	93.5	5.3	26.5	88.2	61.7	73	Yes	No
3	06/01/2014	93.6	16.3	26.5	77.3	50.8	65	Yes	No
4	07/01/2014	83.4	3.0	26.5	80.4	53.9	70	Yes	No
5	15/01/2014	53.8	0.0	26.5	53.8	27.3	73	Yes	No
6	01/02/2014	51.5	0.7*	26.5	50.8	26.5	70	Yes	No
7	08/02/2014	56.1	5.1*	26.5	51.0	26.7	52	Yes	No
8	22/02/2014	66.5	3.2*	26.5	63.3	39.0	65	Yes	No
9	25/02/2014	61.9	1.9*	26.5	61.0	36.7	64	Yes	No
10	12/03/2014	52.7	26.6	26.5	26.1	1.8	17	No	Yes
11	13/03/2014	74.3	30.7	26.5	43.6	19.3	16	No	Yes
12	14/03/2014	50.9	27.1	26.5	23.8	0	14	No	Yes
13	20/03/2014	56.5	4.8	26.5	51.8	27.5	53	Yes	No
14	19/10/2014	58.4	4.5	26.5	53.9	29.6	84	Yes	No
15	26/10/2014	69.8	0	26.5	69.8	45.5	86	Yes	No
16	01/11/2014	61.0	1.3	26.5	59.7	35.4	75	Yes	No

* Fonmon data used as Narberth data was unavailable.
** Based on the daily mean wind direction recorded at the Margam Firestation monitor (AURN), Port Talbot

1 Monitor Deployment and Data Capture

Since the October 2010 response to Improvement Condition 9.8, the locations of monitors in the monitoring network have changed. Figures 1 and 2 in Appendix A illustrate the monitor locations planned in March 2014 and actual locations of monitors between January 1st and December 31st 2014.

For monitors operating during 2014; their data capture rate and the reasoning for failure to capture data (if applicable) are summarised in Table B below. The locations of the monitors are illustrated in Figure 1 in Appendix A.

Table B - Summary of TOPAS monitors in operation between January 1st and December 31st 2014

Monitor	% $\underline{PM_{10}}$ Data Capture over monitoring period*	Reason for failure to capture $\underline{PM_{10}}$ data if data capture is less than 90%	% Wind Data Capture over monitoring period	Reason for failure to capture wind data if data capture is less than 90%	Date of last calibration	Start date of operation
CS&I Admin	99.6	N/A	99.6	N/A	10/11/2014	15/12/2014
Centre	96.1	N/A	96.1 (wind direction only)	N/A	15/08/2014	05/09/2014
Fines Bed	92.7	N/A	92.7	N/A	25/07/2013	07/11/2013
Harbour	80.3	Unable to download data from 22/01/14 to 30/03/14 due to date and time fault. Also, no PI data due to failure of output module.	80.3 (wind direction only)	Unable to download data from 22/01/14 to 30/01/14 due to date and time fault. Also, no PI data due to failure of output module. Zero data capture for wind speed due to connection issues **	10/12/2013	31/03/2014
Chief Engineers	97.2	N/A	97.2	N/A	11/07/2014	21/07/2014
West End	78.8	Delays with installing replacement after 18/10/14 due to access issues	78.8	Delays with installing replacement after 18/10/14 due to access issues	21/10/2013	05/06/2013
Harsco	76.4	Monitor removed for servicing on 25/06/15. Not re-installed until 16/09/14 due to delays at Turnkey Instruments Ltd	0	No wind vane connected	Calibration record owned by Harsco	16/09/2014
Penrhyn	30.1	Monitor failed on	30.1	Monitor failed on	10/03/2014	12/09/2014

Monitor	% $\underline{PM_{10}}$ Data Capture over monitoring period*	Reason for failure to capture $\underline{PM_{10}}$ data if data capture is less than 90%	% Wind Data Capture over monitoring period	Reason for failure to capture wind data if data capture is less than 90%	Date of last calibration	Start date of operation
		09/11/13. Not replaced until 12/09/14 due to road construction		09/11/13. Not replaced until 12/09/14 due to road construction		
Harbour Jetty	83.2	New location. Installed on 18/07/14. No data from 18/10/14 to 24/10/14 due to power outage	85.4	New location. Installed on 18/07/14. No data from 18/10/14 to 24/10/14 due to power outage	08/11/2013	18/07/2014
Average	81.6					

* Data downloaded from the monitor when possible. However, PI system data is used when access to the monitor is not possible or if the monitor is removed for servicing before a download can be completed.
**Several attempts have been made to connect the wind speed on the Centre and Harbour monitors. New wind vanes will be installed during quarter 1 2015.

For 2014, the TOPAS monitors achieved an average data capture of around 82%. The data capture is higher than that achieved during 2012 (75%) and 2013 (70%). The Penrhyn monitor recorded the lowest data capture of all of the on-site monitors. The monitor failed on the 9th November 2013 and the subsequent major construction of a new road in the vicinity of the monitor followed by electrical faults at the new revised location led to the monitor being offline until 12th September 2014.

There is an ongoing issue with turnaround time of monitors that are sent away for service and calibration with Turnkey Instruments Ltd. This issue caused the delay with re-installation of the Harsco monitor and has delayed the replacement of Tata Steel owned monitors due for calibration. A new contract is being developed and is expected to become valid in Q1 2015, which should improve turnaround times of the Tata Steel owned monitors.

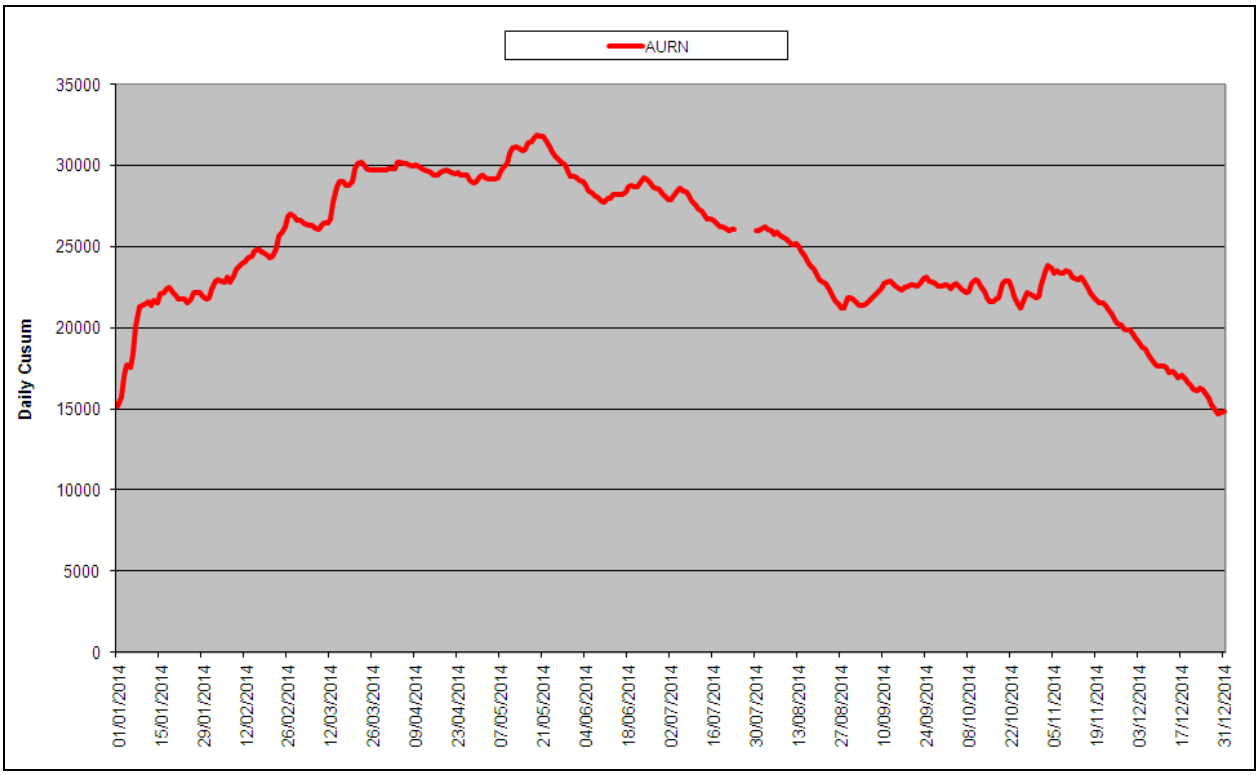
The monitor co-located with the Margam AURN site has not operated since it failed in September 2012. A review of the monitor network carried out in March 2014 (see Figure 2, Appendix A) concluded that this monitor would not be re-installed at this location. The review of the monitor network also concluded that the TOPAS monitor replacing a failed TEOM unit at the Beach would be deployed at a new location on the harbour jetty rather than at the original Beach location. This monitor was installed on the 18th July 2014.

The 200 degrees monitor is the final monitor in the monitoring network plan to be deployed. However, the 200 degrees monitor location has been removed from the plan due to the construction of a new power plant and preliminary groundwork has already started in the area. Therefore, the on-site monitoring network is now complete and any future plans will be issued via the quarterly on-site monitoring reports.

2 Monitored Data Trends

Cusum plots are used to illustrate the trends in PM_{10} concentrations recorded at the AURN and site monitors over the course of the monitoring period. These trends can then be analysed against changes that occurred at the Steelworks to determine if the changes impacted ambient PM_{10} concentrations. PM_{10} concentration data for the AURN monitor is presented as a daily cusum plot in Figure A below.

Figure A – Daily Cusum for the AURN monitor from 1st January to 31st December 2014

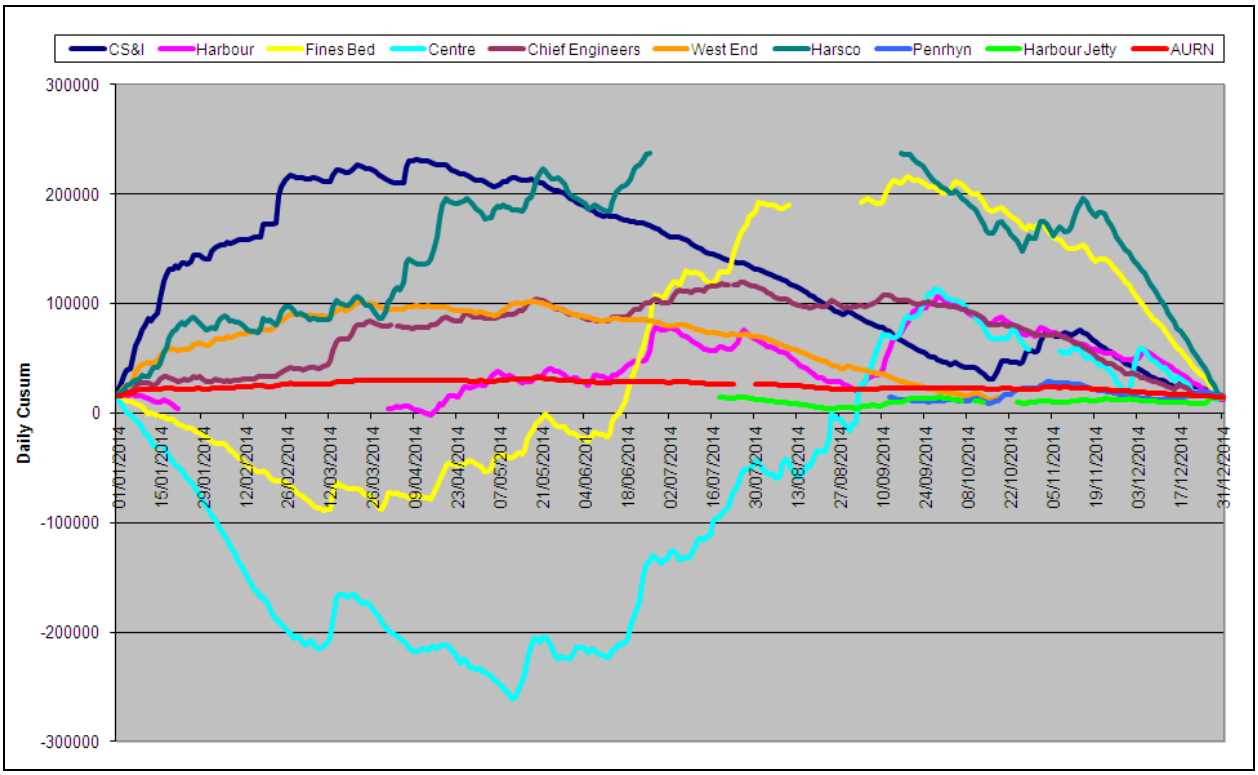


The Margam AURN cusum trend illustrated in Figure A shows a general increase in concentrations from the start of the year until mid May. The trend is particularly steep during the first half of January, which coincides with five breach days recorded during this period. The trend predominantly decreases until the end of August and then stabilises until the beginning of November. No breach days were recorded between the months of April and September. In summary, the increases in the trend mainly occur around the same time as when breaches of the PM_{10} daily mean objective were recorded at the AURN. All of the breach days recorded at the AURN monitor during 2014 were investigated and reports have been issued.

The 2014 trend is fairly similar to previous years analysed since 2008. Most of the trends increase during the spring, stabilise during the summer and decrease at the beginning of autumn until the end of the year. The main difference is the steep increase in the 2014 trend during January, which occurs earlier in the year compared with the previous years.

Monitored PM_{10} concentration data for the CS&I, Harbour, Fines Bed, Centre, Chief Engineers, West End, Harsco, Penrhyn and Harbour Jetty TOPAS monitors are presented as daily cusum plots in Figure B. The AURN cusum trend is also included in Figure B.

Figure B – Daily Cusum trends for the CS&I, Harbour, Fines Bed, Centre, Chief Engineers, West End, Harsco, Penrhyn and Harbour Jetty TOPAS monitors from 1st January to 31st December 2014



CS&I, West End and Harsco Monitors

The plots for the CS&I and West End monitors in Figure B are both fairly similar to the AURN plot. The Harsco monitor trend differs to the AURN trend, particularly during the summer months. All trends increase from the start of the year until the end of February. This increase ties in with seven localised breach days recorded at the AURN. The CS&I trend increases particularly steeply from the beginning of the year until mid January. The CS&I and West End trends are fairly stable from the beginning of March until the middle of May. A series of small peaks and troughs is observed in the Harsco plot throughout March until a sharp increase occurs between the 29th March and 20th April. This is soon followed by further increases in the Harsco trend from the 14th to 22nd May and 12th to 25th June. No breach days were recorded at the AURN monitor during these periods.

The CS&I and West End plots decrease throughout the summer until mid October. The West End cusum trend ends on the 18th October and the CS&I trend increases from the 14th October until the 1st November. This increase corresponds with three breach days recorded at the AURN. The CS&I trend stabilises over the first couple of weeks of November before decreasing for the remainder of the year. The Harsco monitor was not in operation between 25th July and 16th September. Upon re-installation of the monitor, the trend predominantly decreases for the remainder of the quarter, apart from 26th October to 16th November when there are a couple of small increases. One of these increases coincides with two breach days recorded at the AURN on 26th October and 1st November.

In summary, the increases seen in the CS&I and West End trends predominantly occurred at the same time as when breach days were recorded at the AURN monitor. This is expected due

to the fact that these two monitors are located in close proximity to the AURN and were likely impacted by the same sources.

The Harsco cusum trend increased during periods when no breach days were recorded at the AURN monitor. The Ironmaking area (Blast Furnaces, Raw Materials Handling (RMH) and Granulated Coal Injection (GCI) Plant) is located in close proximity to the Harsco monitor. Most of the Ironmaking (Environmental Incident Forms) EIFs that coincide with the increases during April, May and June were issued for Blast Furnace casthouse emissions. In all instances, immediate actions were taken to reduce the emissions. The Harsco monitor is also located in very close proximity to the Sinter Plant. The majority of the Sinter Plant related EIFs were issued when the Harsco trend was decreasing. Consequently, the incidents did not significantly impact PM_{10} concentrations recorded at the Harsco monitor. There were no other significant changes to processes within close proximity to the CS&I, West End and Harsco monitors that can explain the increases in trends.

Centre, Fines Bed and Harbour Monitors

The daily cusum trends for the Centre, Fines Bed and Harbour monitors in Figure B differ from the AURN trend in Figure A. The Centre and Fines Bed plots decrease steeply from the start of the year until the beginning of March. The Harbour trend also decreases from the start of the year until the 21st January when the trend ceased and did not start again until the beginning of April. There is a small increase in the Centre and Fines Bed trends from the 12th to 16th March. This increase corresponds to three national event breach days recorded at the AURN during this period.

The Fines Bed and Harbour plots generally increase between mid April and mid June. The Centre plot is relatively stable between mid March and mid June, apart from a small increase from the 12th to 18th May. A steep increase is observed in the Centre and Fines Bed plots from the 11th to 26th June, which is also seen in the Harbour plot, though to a lesser extent. The Centre and Fines Bed plots then stabilise for a few days before increasing steeply until the end of July. A final increase is observed for the Centre monitor between mid August and the end of September. The Harbour trend is relatively stable in July and decreases during August before increasing throughout September. The trends for all three monitors decrease from the beginning of October until the end of the year, apart from a slight increase in the Centre trend from the 28th November to 4th December. No breach days were recorded at the AURN during the periods of increasing trends between mid April to mid September, which suggests that these monitors were affected by different sources to those impacting the AURN monitor.

The Ironmaking area of the site is located in close proximity to the Centre monitor. Most of the Ironmaking EIFs that coincide with the increases in the Centre plot from mid June to the end of September, were issued for Blast Furnace casthouse emissions. In all instances, immediate actions were taken to reduce the emissions. There were no other significant changes to processes within close proximity to the Centre monitor that can explain the increases in trends during the year. The Centre monitor is also located in close proximity to the Sinter Plant. There were a number of Sinter Plant related EIFs issued during August and September when the Centre trend was increasing. In all instances, actions were taken to reduce the emissions as soon as possible. There were no other significant changes to processes within close proximity to the Centre monitor that could explain the increases in the trend during the year.

The Harbour and Burdening Stockyard areas of the site are located in close proximity to the Fines Bed and Harbour monitors. A number of EIFs were issued from the stockyard and harbour areas between the 2nd and 4th May for emissions generated from the harbour unloaders and dust lift-off from stockyards roads. In all instances, immediate actions were taken such as deploying water bowsers on roads and using water sprays in the unloader area. The increases

in the Fines Bed and Harbour trends were relatively small during this time when compared with other periods during the year. Consequently, the incidents did not significantly impact PM_{10} concentrations recorded at these monitors. There were no other significant changes to processes within these areas that can explain the increases in the trends.

Chief Engineers Monitor

The Chief Engineers trend was fairly different to the trend for the AURN monitor in Figure A. The plot was stable from the start of the year until mid March. There was a steep increase in the trend from the 12th to 16th March and 18th to 22nd March that coincided with the three national event breach days and one localised breach day recorded at the AURN. The trend levels out before another increase is seen in the trend between the 6th and 19th May. A final increase in the trend is observed from mid June until the end of July before the plot gradually decreases until the end of the year. No breach days were recorded at the AURN during May, June or July.

The Steel and Slab area is located in close proximity to the Chief Engineers monitor. Most of the EIFs issued by the Steel & Slab area during May, June and July were for slopping events. During August and September a 100% hot metal charging trial was taking place. An investigation into the relationship between the Chief Engineers trend and the number of slopping EIFs concluded that a higher number of EIFs were issued from slopping events during December when the Chief Engineers trend was decreasing than during months when the trend was increasing. There were no other significant changes to processes within close proximity to the Chief Engineers monitor that could explain the increases or decreases in the trend during the year.

Penrhyn and Harbour Jetty Monitors

The Harbour Jetty monitor was deployed on the 18th July and the Penrhyn monitor was not operational until the 12th September. Both trends were fairly stable throughout their respective periods of operation with no significant spikes in the trend.

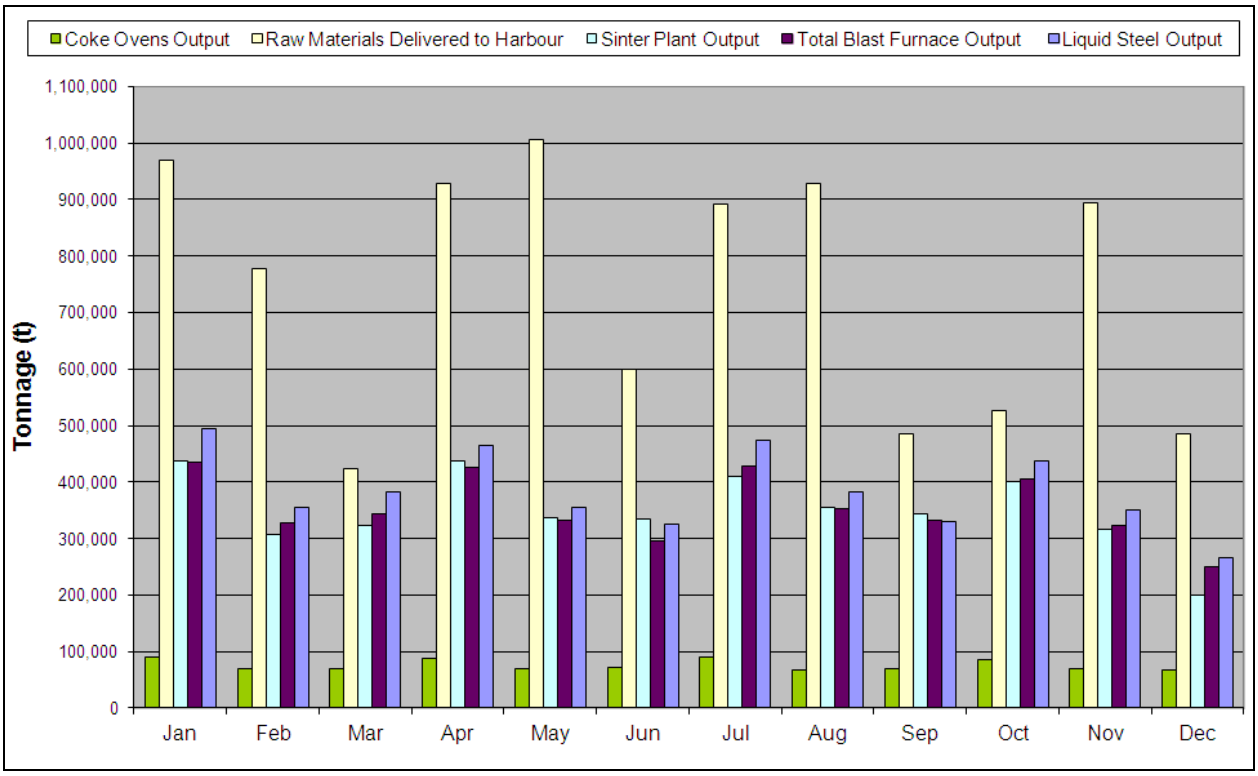
Table C summarises the mode of operation of key production processes at Tata Steel during the 16 breach days recorded during 2014. Of the 13 localised breach days, there was reduced activity (highlighted in green) for at least one of the listed processes on seven of the days. On four out of the 13 localised breach days, there were no ships discharging raw materials at the harbour. The GCI Plant operations were reduced on two of the localised breach days and the BOS Plant was running on single vessel operations on one of the localised breach days. However, the Blast Furnaces and the Sinter Plant were operating throughout most of the day or all of the day on all of the localised breach days. Despite this, the reduced activity at the other operations demonstrates that reducing site output will not guarantee a reduction in air quality breaches recorded at the AURN monitor.

Table C – Site Operations Activity Log for each Breach Day during 2014

Breach Date	National Event?	Site Operations Activity Log				
		Ship Unloading	Sinter Plant	GCI Plant	Blast Furnace(s)	BOS Vessel(s)
02/01/14	No	07:00 to 24:00	All day	All day	Both all day	Both all day
03/01/14	No	00:00 to 22:30	All day	All day	Both all day	Both all day
06/01/14	No	10:30 to 24:00	Most of the day	Most of the day	Both all day	Both most of the day
07/01/14	No	00:00 to 17:30	Most of the day	08:00 to 12:00 & 16:00 to 24:00 only	Both all day	Both all day
15/01/14	No	No Ship	Most of the day	Most of the day	Both all day	Both all day
01/02/14	No	All day	All day	Most of the day	Both all day	Both all day
08/02/14	No	All day	Most of the day	00:00 to 04:00 & 20:00 to 24:00 only	Both all day	Both all day
22/02/14	No	12:00 to 24:00	Most of the day	Most of the day	Both all day	Single vessel all day
25/02/14	No	No Ship	Most of the day	All day	Both all day	Both most of the day
12/03/14	Yes	No Ship	00:00 to 06:00 only	Most of the day	Both all day	Both all day
13/03/14	Yes	05:00 to 24:00	Most of the day	Most of the day	Both all day	Both most of the day
14/03/14	Yes	All day	All day	All day	Both all day	Both all day
20/03/14	No	No Ship	All day	Most of the day	Both all day	Both all day
19/10/14	No	All day	All day	Most of the day	Both all day	Both all day
26/10/14	No	No Ship	All day	All day	Both all day	Both most of the day
01/11/14	No	All day	All day	Most of the day	Both all day	Both most of the day

Figure C illustrates monthly raw material inputs and production tonnages for key site processes. There was a fairly consistent tonnage of coke produced at the Coke Ovens for each month over the year. The tonnage of raw materials delivered to the harbour was highest during May. However, this trend is not reflected in the daily cusum trend for the majority of the on-site monitors or for the AURN monitor. The Sinter Plant, Blast Furnace and liquid steel outputs (BOS Plant output) during each month of 2014 were closely aligned and were highest during January, April, July and October. The daily cusum trends for the AURN and some of the onsite monitors increased during January. Also, trends for the majority of on-site monitors increased during April. However, the AURN and the majority of the on-site cusum trends did not increase during July and October. This indicates that changes in production rates will not necessarily result in a corresponding change in PM_{10} concentrations recorded at the AURN and at the on-site monitors.

Figure C – Monthly Raw Material Inputs / Production for 2014



2 Monitored Data Rose Diagrams

Rose diagrams for data from all of the Tata owned monitors are presented as Figures 3 and 4 in Appendix A. The rose diagrams illustrate the predominant wind directions that impact each monitor with PM_{10}. If wind data is not available from a monitor (see Table B in Section 1), then data has been substituted from the wind vane located at the Margam AURN monitor. Potential sources of PM_{10} that may impact the site monitors are summarised in the table below. Sources that impact the site monitors may not be the same as those that impact the monitors located in the town.

Table D - Summary of potential sources impacting the TOPAS monitors between January 1st and December 31st, 2014

Monitor	Predominant Wind directions impacting the monitor	Potential sources in close proximity to the monitor	Potential sources further away from the monitor
CS&I Admin	SE to SSW (130° to 210°)	Blast furnaces, Ironmaking Raw Materials Handling (RMH), Granulated Coal Injection (GCI) Plant, Lafarge Tarmac's Slag Granulation Plant, Slag Handling Plant and Slag Pools	Hot and Cold Mills, Slab Yards, Harsco's Metal Recovery (MR) Plant and Briquetting Plant, Steel and Slab, Coke Ovens and the coast
Centre	N, NE, SE, W and NW (350° to 10°, 60° to 70°, 160°, 260°, 300° to 320°)	Blast Furnaces, Ironmaking RMH, GCI Plant, Sinter Plant Road, Sinter Plant, Lafarge Tarmac Slag Granulation Plant and Slag Pools	Civil and Marine's Slag Plant, Steel and Slab, Harbour, off-site sources in the direction of the Docks, Harbour Way (PDR) and M4 motorway and the coast
Fines Bed	NE, S, SW and W (30° to 50°, 170° to 260°, 220° and 260° to 270°)	Lafarge Tarmac's Slag Handling Plant, Primary Ore Stockyard, Fines Bed, Reverts (fine materials blending) Stockyard, Phoenix Wharf Road and off-site sources in the direction of the docks	Off-site sources in the direction of the Docks and the coast
Harbour	N, NE, S, E and NE (0°, 30° to 60°, 170° to 180°, 280°, 310° and 330°)	Reverts Stockyard, Fines Bed, 802 Road and 802 Conveyor	Civil and Marine's Slag Plant and off –site sources in the direction of the docks
Chief Engineers	NEE, S, SSW, SW, NW and N (70°, 170°, 200°, 230° to 240° and 340° to 0°)	VLN Road, Steel and Slab, Harsco's Briquetting Plant and MR Plant	Power Plant, Coke Ovens, off-site sources in the direction of Harbour Way and M4 motorway and the coast
West End	S and SSW (170° to 180° and 200° to 220°)	Margam Central Road, Blast Furnaces, Ironmaking RMH, GCI Plant and Lafarge Tarmac's Slag Granulation Plant and Slag Pools	Lafarge Tarmac's Slag Handling Plant, Steel and Slab, Harsco's MR Plant, Coke Ovens and the coast
Harsco Compound	E, SE, SW and W (80°, 110° to 160°, 240 to 250° and 270°)	Civil and Marine Slag Plant, Sinter plant, Blast Furnaces, Ironmaking RMH, GCI Plant and Lafarge Tarmac's Slag Granulation Plant and Slag Pools	Primary Ore Stockyard, Steel and Slab, Harsco's Briquetting plant, Hot and Cold Mills, Darlow Lloyd's HAA site, Coke Ovens, off-site sources and the coast

Monitor	Predominant Wind directions impacting the monitor	Potential sources in close proximity to the monitor	Potential sources further away from the monitor
Penrhyn	NE and SE (10° to 50° and 110°)	Site roads (including new West End link road) and off-site sources in the direction of Harbour Way	Off-site sources in the direction of the M4 motorway
Harbour Jetty	W and NW (280°, 320° and 340°)	Harbour and off-site sources in the direction of Mariner's Point residential area	Off-site sources in the direction of the coast and sea

In summary, the CS&I Admin, Centre, West End and Harsco monitors were all predominantly impacted from the direction of the Ironmaking area of the site, which includes the Blast Furnaces, Raw Materials Handling (RMH), Granulated Coal Injection (GCI) Plant and Lafarge Tarmac's Slag Granulation Plant and Slag Pools. These operations are all located in close proximity to these monitors. The Ironmaking area is marked by an 'A' in Figures 3 and 4, Appendix A.

Tata will use the above information to further its understanding of potential sources that may have an impact off-site and to develop targeted improvement programmes.

4 Variation Between Data Presented in the Quarterly & Annual Reports

4.1 Monitored Data Trends

Quarter 1 (Q1) Report

The majority of the cusum trends in Q1 are fairly similar to the annual cusum trends. The steepest increases in the Q1 cusum trends were seen during January and March to coincide with several breach days recorded at the AURN. In the annual cusum, the trends for the CS&I and West End monitors peak at the end of Q1, which corresponds with the steep increases seen the Q1 report trends. The Fines Bed and Centre monitors predominantly decrease during Q1 in the annual report apart from an increase that coincides with three national event breach days recorded during March. These increases are much smaller in the annual cusum trends, which indicate that the Fines Bed and Centre monitors are impacted by different sources to the AURN monitor.

Quarter 2 (Q2) Report

The CS&I, Chief Engineers and West End cusum trends in the Q2 report were fairly stable. In the annual cusum, the CS&I trend predominantly decreases during Q2, though the Centre and West End monitor remain fairly stable. The Centre, Fines Bed and Harsco trends in the Q2 report are very variable i.e. there is no long-term, consistent increase or decrease in the trends during the quarter. However, the trends for the aforementioned monitors mainly increase during Q2 in the annual report, which indicates that concentrations are higher at these three monitors during Q2 than during some other periods of the year.

Quarter 3 (Q3) Report

In the Q3 monitoring report, most of the daily cusum trends were fairly stable, apart from the Centre, Fines Bed and Harbour trends. However, this is not the case in the annual cusum as most of the trends are very variable. Significant increases in the Centre, Fines Bed and Harbour trends occur in the Q1 cusum, which are also seen in the annual cusum. The CS&I and West End plots decrease throughout the quarter in the annual cusum but not in the Q3 cusum. These differences are due to the concentrations recorded at the on-site monitors during Q3 being generally lower than during other quarters of the year.

Quarter 4 (Q4) Report

Most of the trends in the Q4 cusum differed to the trends in the annual cusum graph whereby most of the trends either decreased during Q4 in the annual cusum but some significant increases were seen in the Q4 cusum trends. In particular, the Q4 cusum shows a significant increase in the Harsco trend throughout November, which is not reflected to such an extent in the annual cusum. An increase was also seen in the Fines Bed monitor trend in the Q4 cusum, which is not observed in the annual cusum. This is because the increases in concentrations observed at the monitors during Q4 were less significant when compared with other periods during the year.

No other variation between the quarterly data trends and the annual data trend were identified.

4.2 Monitored Data Wind Roses

In all 4 of the quarterly reports, the monitors were impacted with PM_{10} from various wind directions that are from many areas of the steelworks. Therefore the CS&I Admin, Centre, West End and Harsco monitors were not predominantly impacted from the Ironmaking area as stated in the annual report. This difference indicates that over the year as a whole, the CS&I Admin, Centre, West End and Harsco monitors were all impacted with the highest PM_{10} concentrations from the direction of the Ironmaking area, which is located in close proximity to these monitors.

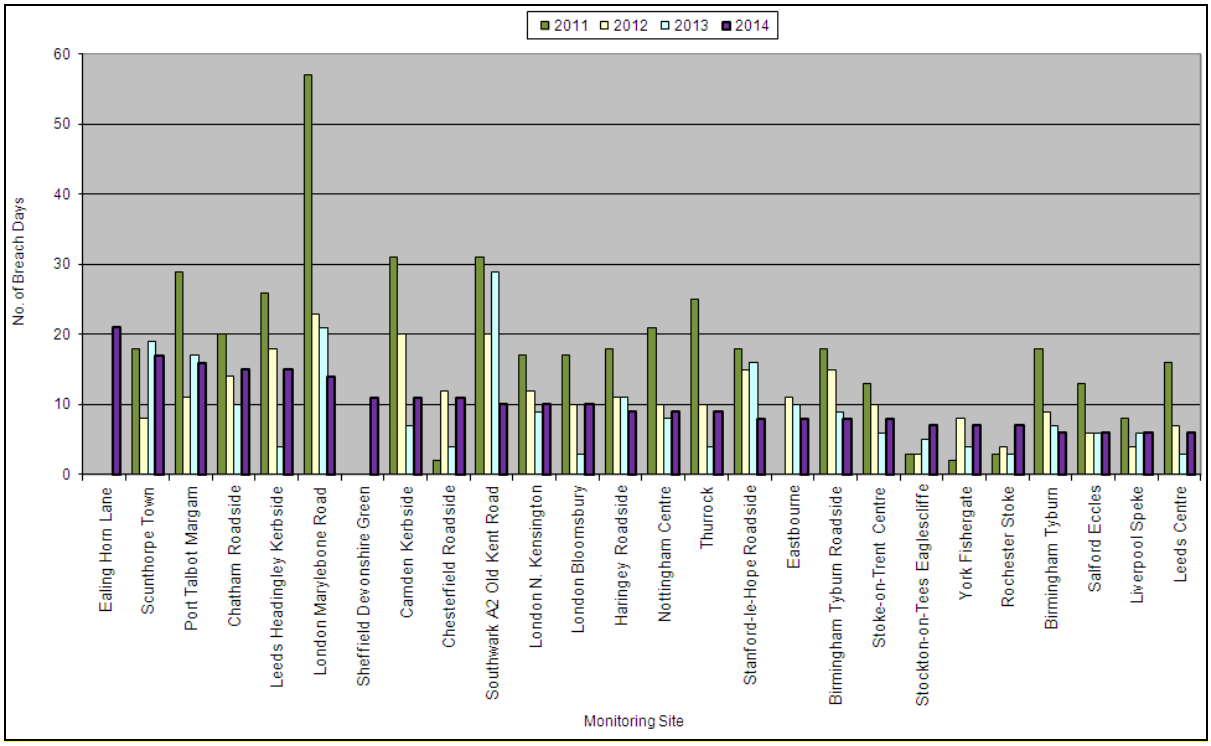
The Q1 CS&I and West End monitor windroses were very similar to those illustrated in Appendix A of the annual report. This is because these monitors recorded the highest PM_{10} concentrations during Q1 when compared with the other three quarters. In the Q3 report, the Centre and Chief Engineers windroses are very similar to those shown in the annual report. This is also because these monitors recorded the highest PM_{10} concentrations during Q3 compared with the other three quarters.

No other variation between the quarterly wind roses and the annual wind roses were identified. Tata will use the above information presented above to further the understanding of potential sources that may have an impact on off-site receptors and to develop a targeted improvement programme.

5 Comparison with 2011, 2012 and 2013 PM_{10} Data

A comparison between the numbers of breach days recorded during 2011, 2012 and 2013 at AURN monitors located in the UK presented in Figure D below.

Figure D – Number of breach days recorded at UK AURN monitors* in 2011, 2012, 2013 and 2014.



* UK AURN monitors that recorded more than 5 breach days in 2014.

The majority of the monitors illustrated in Figure D recorded similar numbers of breach days in 2012, 2013 and 2014. However, the Scunthorpe Town and Margam Port Talbot monitors both recorded a significantly lower number of breach days during 2012 compared with 2011, 2013 and 2014. The numbers of breach days were higher at most of the monitors in Figure D during 2011 compared with the other years.

The changes in the numbers of breach days from one year to the next may have been attributable to changes in wind direction, national events or industrial activity. The influence of these variables is discussed in sub-sections 5.1, 5.2 and 5.3.

A comparison between average PM_{10} concentrations recorded at monitors located in the Port Talbot Air Quality Management Area (AQMA) and rural South Wales from 2011 to 2014, 2012 to 2014 and 2013 to 2014 is presented in Figure E.

Figure E – Percentage Change in Annual Average PM_{10} Concentrations from 2011 to 2014, 2012 to 2014 and 2013 to 2014* for Monitors within Port Talbot and Rural South Wales

* 1st January to 31st December for 2011, 2012, 2013 and 2014.

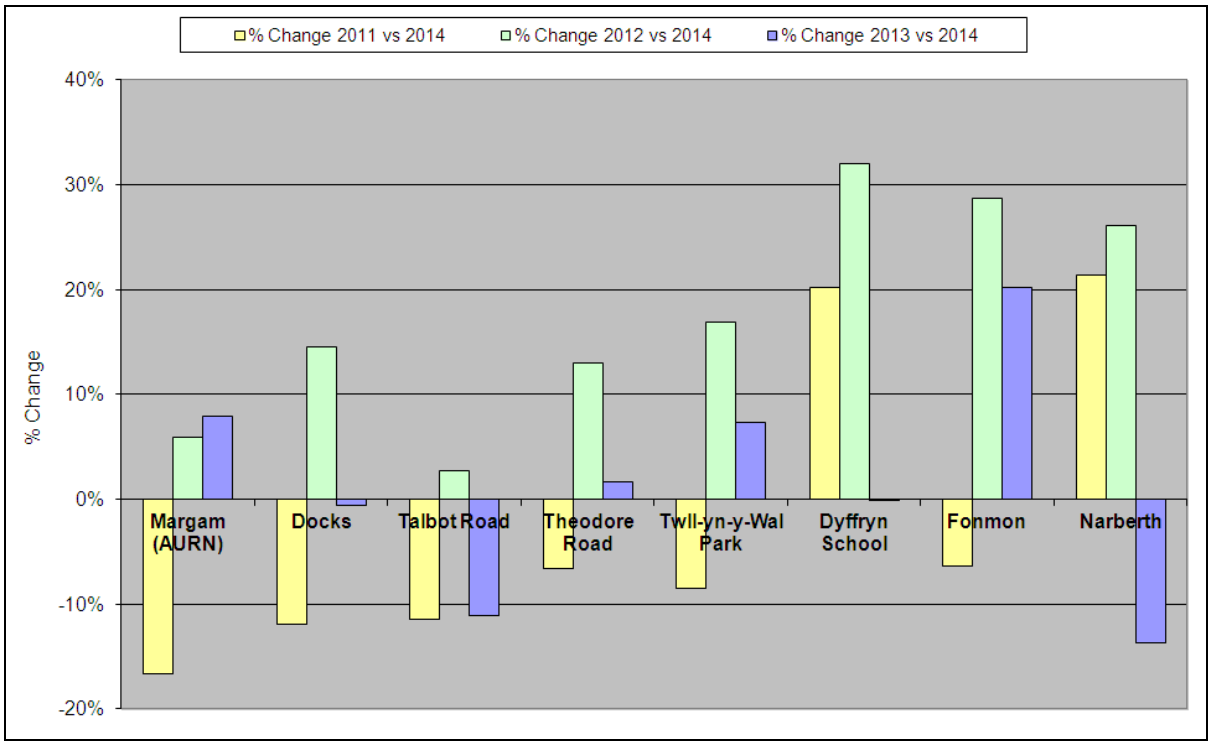


Figure E demonstrates that the Margam (AURN), Theodore Road and Twll-yn-y-Wal Park all recorded an increase in PM_{10} concentrations between 2013 and 2014. The largest increase between 2013 and 2014 is observed at the rural Fonmon monitor, which is located in the Vale of Glamorgan. However, this monitor ceased operation on the 26th May 2014 and therefore the 2014 yearly average for this monitor is not representative. The rural monitor located in Narberth (Pembrokeshire) recorded a large decrease in 2014 when compared with 2013. This suggests that the increases in PM_{10} concentrations recorded at the Margam (AURN), Theodore Road and Twll-yn-y-Wal Park monitors between 2013 and 2014 may have been attributable to local PM_{10} sources.

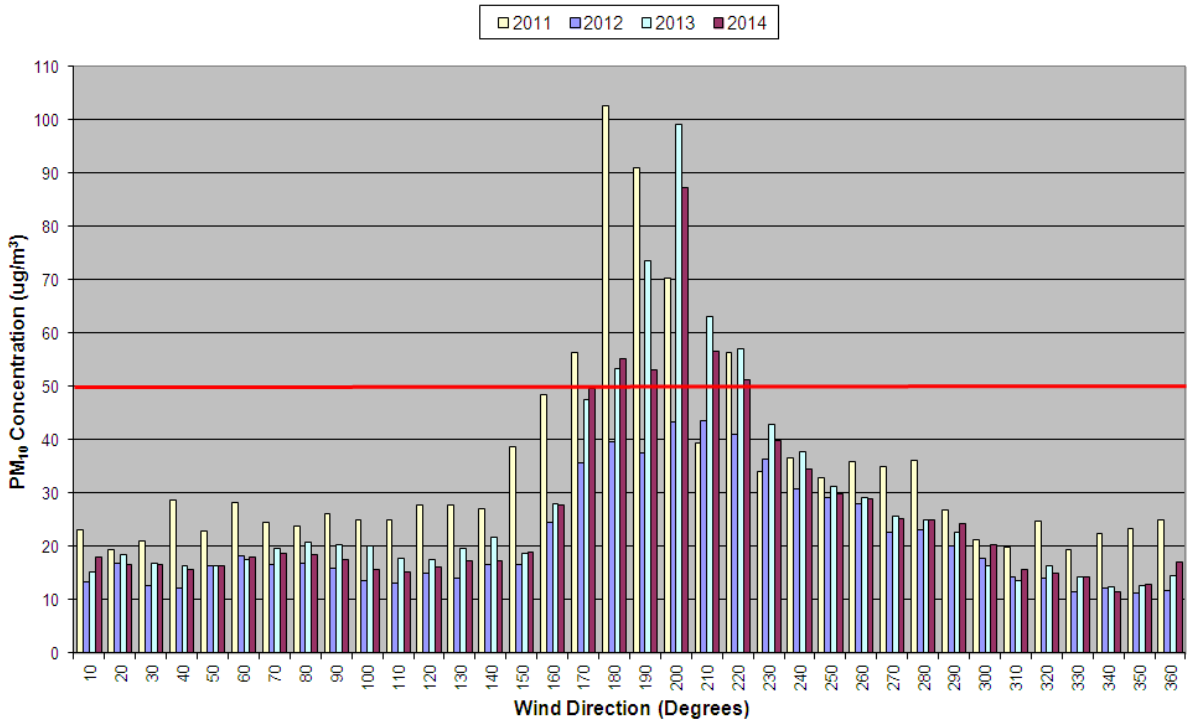
When 2012 data was compared with 2014 data, the annual averages increased at all of the monitors in 2014. However, when 2011 data was compared with 2014 data, the annual averages decreased at all of the monitors in 2014, apart from the Dyffryn School and Narberth monitors. However it should be noted that a low data capture of 48% during 2011 was recorded at the Narberth monitor. The largest decrease between 2011 and 2014 was recorded at the Margam AURN monitor.

The general changes in daily averages from one year to the next may have been attributable to changes in wind direction, national events or industrial activity. The influence of these variables is discussed in the following sub-sections.

5.1 Influence of wind direction

The average PM_{10} concentration for each wind direction recorded at the Margam AURN during 2011, 2012, 2013 and 2014 is illustrated in Figure F below.

Figure F – Average PM_{10} concentrations recorded at the AURN for each wind direction in 2011, 2012, 2013 and 2014 (all available wind data for each year).



The general distribution of average PM_{10} concentrations over the wind directions is similar for all data sets. However, higher PM_{10} concentrations were observed for most wind directions during 2011 than during the other years displayed in Figure F. The main exceptions are for the 200° and 210° wind directions where the PM_{10} concentrations recorded in 2013 and 2014 were significantly higher than in 2011 and 2012. The 200° and 210° wind directions recorded at the AURN are from the direction of Steelwork's site and coast. Potential sources in the 200° and 210° directions include the Blast Furnaces, Ironmaking Raw Materials Handling, Lafarge Tarmac's Slag Handling Plant, Granulation Plant and Slag Pools, Harsco's Metal Recovery (MR) Plant, various site roads and the coast.

5.2 Influence of National Events

National events are when poor air quality is recorded across the country. This is often attributable to trans-boundary pollution or natural sources such as Saharan sand. The calculation used to determine whether a breach day is attributable to a national event or localised sources were described in the 2011 on-site PM_{10} monitoring report. The same calculation was also used for the 2014 breach days in Table A of this report. The results from these calculations are displayed in Table E.

Table E – Summary of breach days recorded at the AURN from 1st January to 31st December 2011, 2012, 2013 and 2014

Year	Number of breach days attributable to localised sources	Number of breach days attributable to a national event	Total number of breach days
2011	18	11	29
2012	8	4	12
2013	18	1	19
2014	13	3	16

The table shows that 11 breach days in 2011, 4 breach days in 2012, 1 breach day in 2013 and 3 breach days in 2014 were attributable to national events. This demonstrates that the number of national events can vary considerably from one year to the next. The variation is largely due to weather conditions. For example if the weather is stable with low wind speeds and high pressure, it can give rise to poor dispersion of pollutants. These conditions can cause a build up of trans-boundary pollution, which can lead to national event breach days.

Additionally, the numbers of total breach days recorded at UK AURN monitors were generally higher in 2011 compared with 2012, 2013 and 2014 (see Figure D). This could also be due to the higher number of national events, which occurred during 2011.

5.3 Influence of Industrial Operations

A summary of the activity levels of Tata Steel's main operations for the periods between January 1st and December 31st 2011, 2012, 2013 and 2014 is provided in Table F. This summary includes Tata Steel operations only and does not include other key activities owned and operated by contractors on the Steelworks site.

Table F – Comparison of operational activity for 1st January to 31st December 2011, 2012, 2013 and 2014

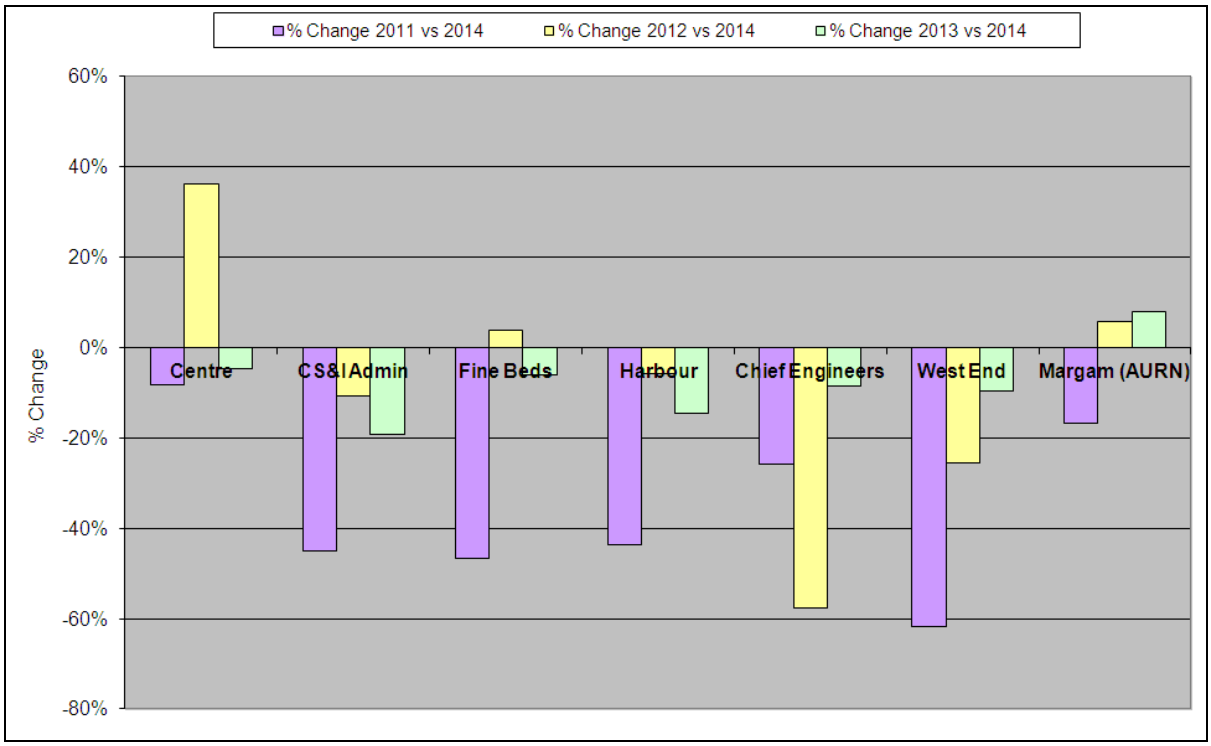
Activity	% time in operation			
	2011	**2012**	**2013**	**2014**
Sinter Plant	87.2	85.7	90.8	91.9
BF4	90.0	43.4	84.2	95.8
BF5	96.0	89.5	95.0	95.3
BOS Vessel 1	74.4	51.7	82.8	86.6
BOS Vessel 2	76.5	51.9	77.2	83.7
BOS Vessel 1 & 2 offline together	2.3	6.2	3.5	1.3

Table F indicates that there has been a significant increase in Blast Furnace No. 4 and BOS Vessel operations between 2013 and 2014. The table also shows that there was a small increase in Sinter Plant production rate during 2014 compared with 2013. Generally, production rates in 2014 were higher than the previous three years. Additionally, there was a decrease in the percentage of the year that both BOS vessels were off-line at the same time in 2014 compared with 2013. Therefore at least one vessel was operating for 98.7% of the year, which is the highest percentage of all of the years displayed in Table F. The increases in operational activity during 2014 compared with 2013 are primarily due to the re-build of Blast Furnace No.4, which was commissioned in February 2013. The number of localised PM_{10} breach days from 2013 to 2014 decreased from 18 in 2013 to 13 in 2014. This indicates that increases in production rates may not necessarily result in a corresponding increase in the number of breach days at the AURN.

Figure G presents the percentage change at site monitors for 2014 when compared with 2011, 2012 and 2013.

Figure G – Change in average PM_{10} concentrations recorded at the Steelwork's Site Monitors from 2011* to 2014, 2012 to 2014 and 2013 to 2014 (all available data for each year)

* 1st January to 31st December for 2011, 2012, 2013 and 2014.



All six of the Steelwork's monitors in Figure G recorded a decrease in average PM_{10} concentrations during 2014, when compared with the 2013 data set. Figure F showed that production rates generally increased during 2014 compared with 2013. This suggests that increases in rates of Steelwork's operations do not necessarily affect PM_{10} concentrations recorded at the on-site monitors. This conclusion contradicts the trends for the off-site Port Talbot monitors (see Figure E) where an increase in concentrations was recorded for 3 of the 6 monitors in 2014, when compared with 2013.

All of the monitors apart from the Centre and Fines Bed monitors recorded a decrease in average PM_{10} concentrations during 2014, when compared with the 2012 data set. Production rates in 2012 were lower than the other three years in Figure F due to the re-build of Blast Furnace No.4. This indicates that changes in rates of Steelwork's operations do not necessarily result in corresponding changes in PM_{10} concentrations recorded at the on-site monitors.

All six of the on-site monitors also recorded a decrease in average PM_{10} concentrations in 2014, when compared with 2011 despite an increase in rates of Steelwork's operations between 2011 and 2014. This also suggests that increases in rates of Steelwork's operations do not necessarily affect PM_{10} concentrations recorded at the on-site monitors. A similar trend is shown in Figure E for the off-site Port Talbot monitors, whereby a decrease in average PM_{10} concentrations was recorded for 5 of the 6 monitors in 2014 when compared to the 2011 dataset.

6 Conclusions

- During 2014 there were 16 breach days recorded at the AURN monitor, 13 of which were localised and three of which were national events i.e. attributable to trans-boundary pollution.

- The breaches recorded during the monitoring period have been investigated. Reports, which document the outcomes of the investigations, have been submitted to Natural Resources Wales under a separate cover. Tata will consider all of this information when prioritising Air Quality Capital Investment schemes for the 2015/16 financial year and when auditing the effectiveness of the areas Air Quality Management plans.

- The TOPAS monitors achieved an average data capture of around 82% during 2014. The data capture for the TOPAS monitors was higher than that achieved during 2013.

- The 200 degrees monitor location has been removed from the March 2014 monitoring network plan due to the construction of a new power plant. Therefore, the on-site monitoring network is now complete and any future plans will be issued via the quarterly on-site monitoring reports

- The CS&I and West End cusum trends predominantly increase to coincide with breach days recorded at the AURN monitor.

- For the 13 localised breach days, there was reduced activity for at least one the listed processes on seven of the days. This demonstrates that reducing site output will not guarantee a reduction in air quality breaches recorded at the AURN monitor.

- The Sinter Plant, Blast Furnace and liquid steel outputs (BOS Plant output) during each month of 2014 were closely aligned and were highest during January, April, July and October. Comparisons with daily cusum trends for the AURN and the onsite monitors concluded that changes in production rates will not necessarily result in a corresponding change in PM_{10} concentrations recorded at the AURN and at the on-site monitors.

- The windroses in Figures 3 and 4 in Appendix A show that the CS&I Admin, Centre, West End and Harco site monitors were predominantly impacted by PM_{10} from the direction of the Ironmaking (Blast Furnaces, Raw Materials Handling and GCI Plant) area of the site.

- Higher PM_{10} concentrations were observed for most wind directions during 2011 than during 2012, 2013 and 2014. The main exceptions are for the 200° and 210° wind directions where the PM_{10} concentrations recorded in 2013 and 2014 were significantly higher than in 2011 and 2012. The 200° and 210° wind directions recorded at the AURN are from the direction of Steelwork's site and coast.

- The number of national events can vary considerably from one year to the next, largely due to the weather conditions.

- There has been a significant increase in production rates during 2014 compared with 2013 mainly due to the completion of the re-build of blast Furnace No.4, which was commissioned in February 2013. The number of localised PM_{10} breach days from 2013 to 2014 decreased from 18 in 2013 to 13 in 2014. This indicates that increases in production

rates may not necessarily result in a corresponding increase in the number of breach days at the AURN.

- All six of the Steelwork's monitors recorded a decrease in average PM_{10} concentrations during 2014, when compared with the 2013 data set. However, production rates generally increased during 2014 compared with 2013, which suggests that increases in rates of Steelwork's operations do not necessarily affect PM_{10} concentrations recorded at the on-site monitors.

Appendix A

Figure 1 Locations of Tata Steel Monitors* Operating during 2014
*with the exception monitor no.7 which is owned by Harsco

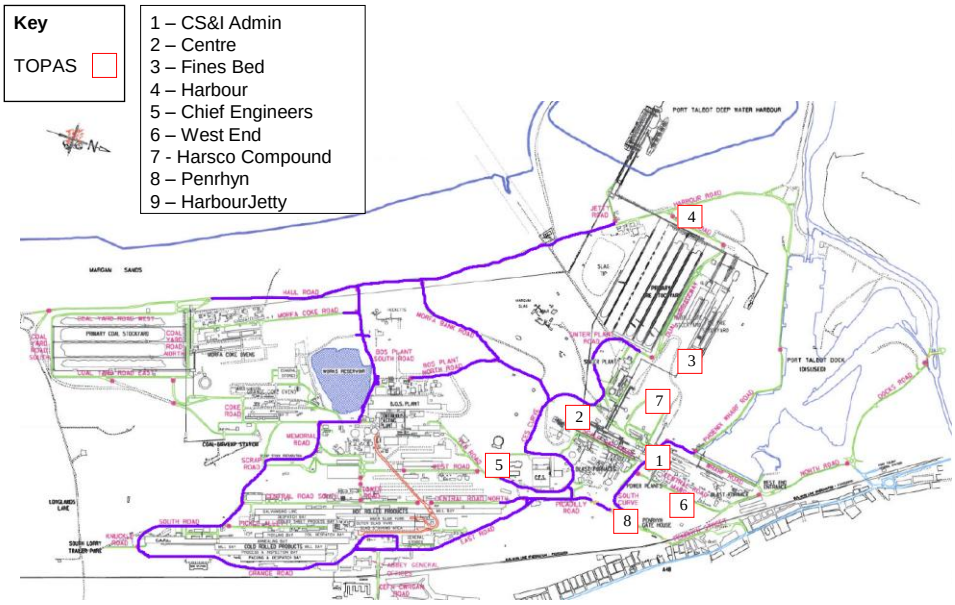
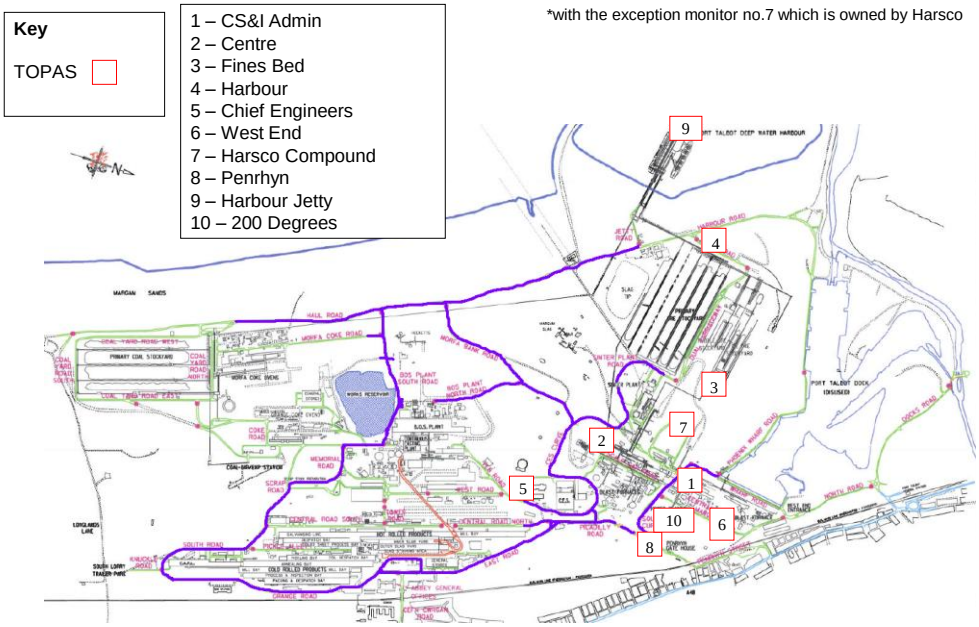


Figure 2 Future On Site Monitoring Network (Tata Steel Monitors*) as Planned in March 2014
*with the exception monitor no.7 which is owned by Harsco



Key
1 – Centre
2 – Fines Bed
3 – Harbour
4 – Penrhyn

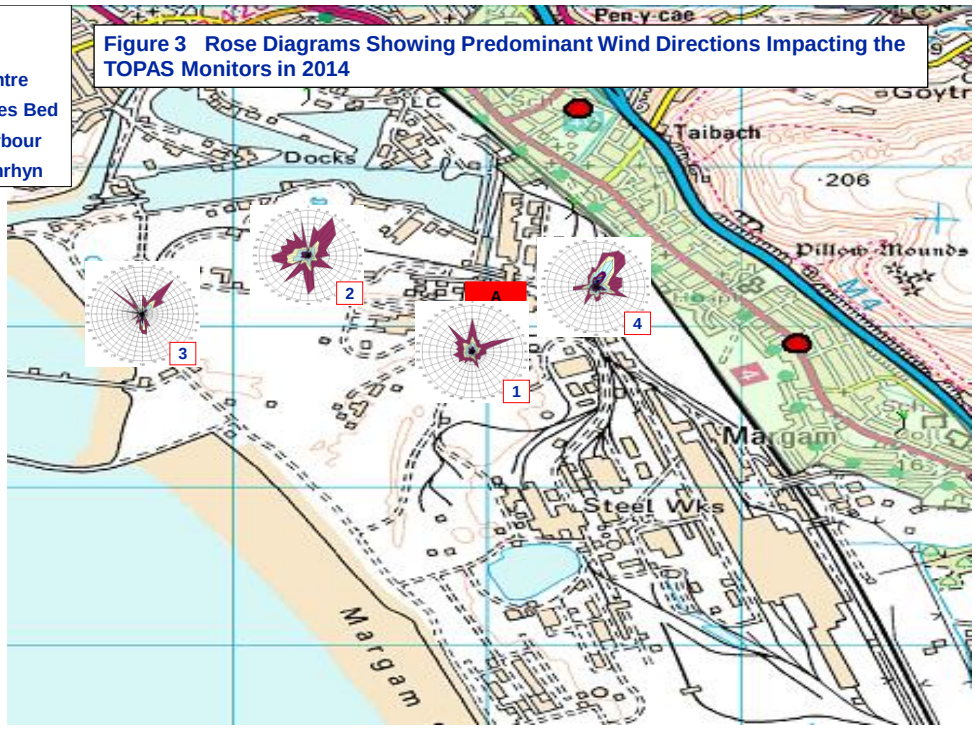


Figure 3 Rose Diagrams Showing Predominant Wind Directions Impacting the TOPAS Monitors in 2014

Key
5 – CS&I Admin
6 – Chief Engineers
7 – West End
8 – Harsco Compound
9 – Harbour Jetty

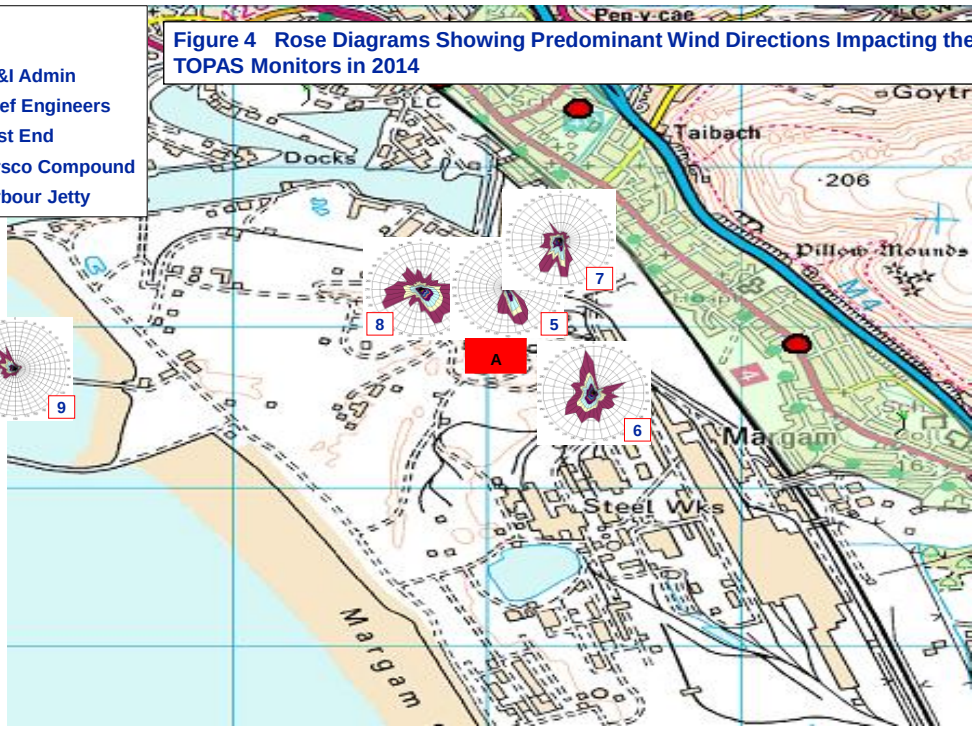


Figure 4 Rose Diagrams Showing Predominant Wind Directions Impacting the TOPAS Monitors in 2014