

Avenue Remediation Project

Air Quality and Odour Monitoring Programme

Summary of Results: June 2010

1. Overview

1.1 Summary of Monthly Air Quality Monitoring Results

Table 1 provides an overview of the air quality measurement data for June 2010 (1st June to 30th June¹) and the evaluation of significance of the measured values in the context of target levels for each pollutant. Further details concerning the measured levels of each of the pollutants are reported in subsequent sections of this summary report.

Table 1 – Summary of Air Quality Monitoring Results Compared to Air Quality Objectives and Guideline Values for Key Pollutants

Pollutant	Averaging Period	The Avenue Target Value	The Avenue Measured Values	Evaluation (Low, Med, High)
Nitrogen Dioxide (NO ₂)	Monthly Mean	40 µg m ⁻³	10.95 – 18.19	Low
Fine Particulate Matter (PM ₁₀)	Monthly Mean	40 µg m ⁻³	9.98 – 13.21	Low
Fine Particulate Matter (PM ₁₀)	24-hr Mean	50 µg m ⁻³	5.40 – 26.65	Low
Fine Particulate Matter (PM _{2.5})	Monthly Mean	25 µg m ⁻³	4.40 – 4.55	Low
Metals - Lead	Monthly Mean	0.25 µg m ⁻³	0.02 max	Low
Metals – Cadmium	Monthly Mean	0.005 µg m ⁻³	< 0.009 LOD**	Low**
Cyanide	2-week Mean	50 µg m ⁻³	0.01 max	Low
PAHs - Coal Tar Pitch Volatiles	2-week Mean	0.48 µg m ⁻³	0.04 max	Low
PAHs - Naphthalene	2-week Mean	126 µg m ⁻³	0.0005 max	Low
Phenols – Phenol	2-week Mean	48 µg m ⁻³	< 0.2	Low
Phenols – Cresols	2-week Mean	220 µg m ⁻³	< 0.2	Low
VOCs - Benzene	2-week Mean	5 µg m ⁻³	5.9 max	Medium
Dust Deposition (off-site monitoring)	Monthly Mean	200 mg m ⁻² day ⁻¹	79 – 197	Low
Dust Deposition (on-site monitoring)	Monthly Mean	200 mg m ⁻² day ⁻¹	138 - 195	Low
Dust Soiling – Sticky Pad	% EAC*	5 % EAC	7.5 max	Medium***
Odours	n/a	n/a	Low-Medium	Low

Notes:

Where the averaging period of the target value is for a 2-week mean, the measured value presented in the table is the maximum value measured during the month.

* %EAC refers to percentage area covered per day. ** Concentration below limit of detection but above target level

*** Locations where dust levels are recorded as 'medium' are within the site boundary and are primarily situated to monitor on-site levels. The nearest receptor properties are some 500m away and are unlikely to be affected by elevated levels of dust.

¹ Monitoring reporting periods are 4 or 5 weeks in duration and may not correspond directly to a calendar month.

In summary:

There were three exceedences of on-site target levels in June. These were related to dust soiling at Site 8 located within the western boundary of the site, benzene concentrations at Site D located to the south-west of the Avenue and cadmium at Site A located to the north-west of the Avenue.

The elevated dust soiling was most likely to be due to very localised emissions of dust from the car parking area immediately upwind of the monitoring location. No visual off-site nuisance was evident, recorded or reported and the nearest receptor properties are some 500 m away. There is no specific explanation as to why the concentration of benzene ($5.9 \mu\text{g m}^{-3}$) was marginally above the target level ($5.0 \mu\text{g m}^{-3}$) during the first half of June; concentrations in the second 2 week period were comfortably within the target level. Concentrations of cadmium were below limits of detection, although at Site A in the second period of monitoring, the limit of detection ($0.009 \mu\text{g m}^{-3}$) was above the Avenue target level ($0.005 \mu\text{g m}^{-3}$).

There were two air quality related complaints recorded during the month, both related to odours. The reported incidents were attributed to the exposure of historic contamination in the River Rother following several weeks of dry weather and the subsequent liberation of odour due to the heavy rain. The issues were closed out to the satisfaction of the complainants.

Concentrations of particulate matter (PM_{10}) were generally lower than measurements in May 2010, with the maximum measured 24-hour average concentration of $26.6 \mu\text{g m}^{-3}$ recorded at Site B (Avenue NE) on 9th June. Elevated concentrations on 9th June were most likely the result of regional pollution as opposed to activities associated with remediation activities at the Avenue, as elevated concentrations were measured simultaneously at all monitoring stations. The variability in concentrations of PM_{10} at on-site monitoring stations suggests that the remediation works at the Avenue are leading to slightly higher concentrations; these observations are consistent with those for deposited dust and dust soiling. The magnitudes of the measured concentrations at all sites are comfortably within the target value of $50 \mu\text{g m}^{-3}$ and the remediation works are not having a significant effect on ambient concentrations of particulate matter.

Concentrations of $\text{PM}_{2.5}$ were of a similar magnitude to those measured in previous months. Measured concentrations at Site B, within the north-east boundary of the Avenue site, indicate an additional contribution from local emission sources which are likely to include the Avenue. Site B is very close to vehicular activities, haul route construction and dry surfaces; both the emission source and the effects are very localised.

The highest measured level of deposited dust was recorded off-site at Site 5 (Avenue Farm) and as observed in previous months, the dust was most likely to have originated from a local emission source associated with activities at Avenue Farm as opposed to remediation activities at the Avenue. At the three further off-site monitoring locations the distribution of deposited dust suggested no dominant local source direction of dust. At the on-site monitoring locations, the maximum level of deposited dust was measured at Site B (Avenue NE) and the predominant source of dust was likely to be vehicular activities, haul route construction and dry surfaces in close proximity to the monitoring site.

Concentrations of nitrogen dioxide (NO_2) were between approximately 11 and $18 \mu\text{g m}^{-3}$ and were therefore typically less than 50% of the $40 \mu\text{g m}^{-3}$ annual mean air quality objective. Concentrations of cyanide, metals, VOCs and PAHs were below limits of detection or within their respective target levels.

At all locations where the sensory field odour surveys were conducted, the maximum odour annoyance impact was 'low-medium'. There were reports by odour diarists of odours that may have been linked to the Avenue, which may have been a result of contaminated material from Zone 4 that was deposited onto the high-level stocking area in Zone 3.

1.2 Work Activity

The site remediation operations are well established and some site-based works with the potential to adversely affect air quality have taken place during this reporting period. The earthworks included the following activities:

Zone 1: River Flood Plain

- Construction of the sheet pile wall / coffer continued, with works centring around the welding of struts to the inside of the structure; and
- Construction of the temporary bridge over the river and the concrete haul road up to the bridge continued.

Zone 2: Low Level Stocking Area (western boundary, adjacent to A61)

- Filling of the borrow-pit in the southern part of Zone 2 took place, with material excavated from Zone 4 (former plant area).

Zone 3: High Level Stocking Area and Waste Tip

- Temporary stockpiling took place of small volumes of contaminated material from Zone 4 that required further treatment in advance of the availability of the treatment processes;
- Red shale was excavated from the northern part of the High Level Stocking Area for use as fill in the development area in Zone 4; and
- Sludge from the concrete tanks of the Water Treatment Plant was deposited upon the waste-tip for temporary storage ahead of future processing.

Zone 4: Former Plant Area

- Construction of the Thermal Treatment Plant continued;
- Site establishment works (offices, mess facilities, etc) associated with the Thermal Desorption Plant continued;
- Excavations and concrete breakout works continued to the south of the site water treatment plant where construction of the proposed new water treatment plant is to take place;
- Further investigation of the Coke Oven basement structures was undertaken;
- Breakout of structures north of the Coke Oven basements associated with old cooling tower and pumping sumps was undertaken. Rubble from sumps was excavated and refilling activities were undertaken;
- Crushing activities were recommenced;
- Sludge was removed from the concrete tanks of the existing Water Treatment Plant ahead of establishment of the new Water Treatment Plant; and
- Construction of the new Water Treatment Plant commenced following remediation of that area.

Zone 5: Eastern Area

- Works associated with site surface drainage redirection and works involving the positioning of the holding pond (HP11) associated with the bioremediation area continued; and
- Preparation of the concrete hardstanding area for bioremediation continued.

1.3 Alterations, Downtime and Technical Difficulties

A summary of alterations to the monitoring programme, alongside downtime and technical issues during the month are summarised in Table 2.

Table 2 – Summary of Alternations, Downtime and Technical Difficulties

Location	Dates	Technical Issue
<i>Alternations to Monitoring Programme:</i>		
Site A	22 nd June	The duplicate APM950s that were previously measuring PM ₁₀ at Site A were replaced on 22 nd June by an Osiris unit to provide PM ₁₀ and PM _{2.5} measurements. The APM950s were relocated to Site D and Site 6 and converted to measure PM _{2.5} .
<i>Downtime and Technical Difficulties:</i>		
Site 5	29 th and 30 th June	There was a loss of power to Site 5 resulting in a loss of PM ₁₀ data for the last two days of June. The equipment was re-set at the start of July.
Site B	June	The nitrogen dioxide diffusion tube was not present at the site when scheduled for collection. Therefore, no monitoring results are presented for this site for June 2010.

2. Detailed Air Quality Monitoring Results

2.1 Routine Air Quality Monitoring

This section provides an overview of the measurement data for the fixed monitoring sites.

2.1.1 PM₁₀ Concentrations

Table 3 presents monthly average concentrations of PM₁₀ at the fixed monitoring sites. Concentrations of PM₁₀ within and close to the Avenue were in the range of 10.0–13.2 µg m⁻³. The highest average concentration of 13.2 µg m⁻³ at Site A (Avenue NW) and Site B (Avenue NE) was less than 50% of the 40 µg m⁻³ annual mean air quality objective. As there were only slight variations in monitored concentrations at sites bordering the Avenue, it could be concluded that the Avenue is having no discernible effect on concentrations of particulate matter.

Table 3 – Monthly Average Concentrations of PM₁₀ Particulate Matter (µg m⁻³)

Monitoring Site	PM ₁₀ Monthly Average Concentration (µg m ⁻³)
Site A: Avenue (NW)	13.2
Site B: Avenue (NE)	13.2
Site D: Avenue (SW)	12.0
Site 2: Hunloke Primary School	10.0
Site 4: Village Hall, Hasland	12.8
Site 5: Avenue Farm	12.2
Site 6: BT Offices (Pioneer House) Mill Lane	11.6

Figure 1 presents 24-hour average concentrations of PM₁₀ at the fixed continuous monitoring sites.

As with the month of May, there was less variation in the measured concentrations of PM₁₀ than in previous months. Generally, concentrations of PM₁₀ in June were also lower than those measured in May, with the maximum measured monthly average concentration in May recorded at 17.2 µg m⁻³ compared to 13.2 µg m⁻³ in June.

The maximum measured 24-hour average concentration of 26.6 µg m⁻³ was recorded at Site B (Avenue NE) on 9th June. As shown by Figure 1, at all monitoring stations, maximum concentrations of PM₁₀ were measured on 9th June and the elevated concentrations are therefore expected to be the result of regional pollution as opposed to activities associated with remediation activities at the Avenue. The wind direction at the time of the peak concentration supports this conclusion, as Site B was upwind of the Avenue as the wind direction on 9th June was from north and north-easterly sectors.

The graph shows that that measured concentrations across the month were similar at each of the sites, although there was more variability in 24-hour average concentrations in the second half of the month than there was in the first, particularly at Site A (Avenue NW) which is located near to the site offices. Localised emissions from vehicles manoeuvring around the car park adjacent to the monitoring station may be partly responsible for the observed variations in PM₁₀ concentrations.

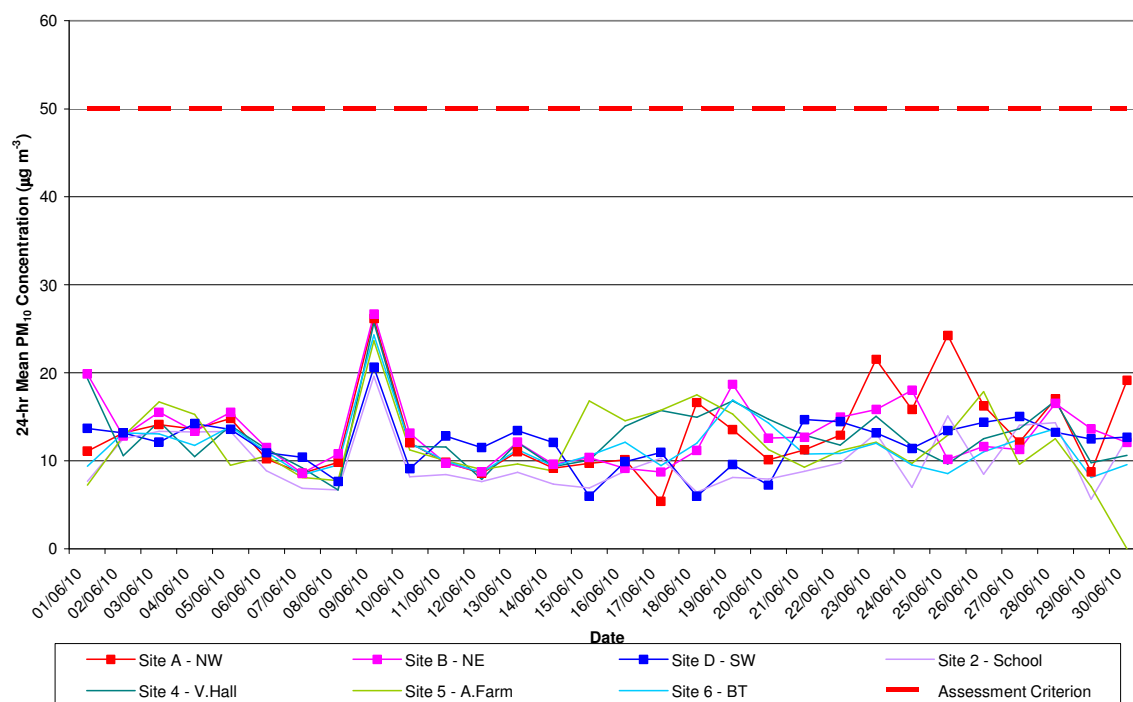
At the time of the peak in concentrations on 23rd June (0700-0800), the wind was blowing from the south-east. The timing of the peak concentrations and the direction of the wind would also suggest manoeuvring vehicles may have contributed to the measure levels of particulates. On 25th June, peaks in concentrations occurred at Site A from 0800-1100 when the wind direction was from north-westerly sectors. These peaks did not occur at Site B (Avenue NE) which was upwind of the Avenue, so on this basis the Avenue, or more specifically the car park, was the most likely source of particulate matter.

The magnitudes of the measured concentrations at all sites are comfortably within the target value of 50 µg m⁻³. Furthermore, as concentrations at each location are similar, and trends in increasing and decreasing concentrations are

generally observed simultaneously at both upwind and downwind sites, it would seem that the remediation works are not having a significant effect on ambient concentrations of particulate matter.

The zero concentrations in PM₁₀ at Site 5 from 29th June are the result of a loss of power to this monitor.

Figure 1 – 24-hour Average Concentrations of PM₁₀ Particulate Matter (µg m⁻³)



2.1.2 PM_{2.5} Concentrations

Table 4 presents monthly average concentrations of PM_{2.5} at the two long-term fixed monitoring sites (4 and B) and at Site A which was added to the monitoring network on 22nd June in line with the ongoing monitoring requirements detailed in the Avenue Air Quality Management Plan.

In the context of the 25 µg m⁻³ annual mean national air quality objective for PM_{2.5}, average concentrations of PM_{2.5} at each monitoring station were reasonably similar during the month of June, particularly at Site 4 and Site A.

At Site 4, located in Hasland beyond the north-eastern boundary of the Avenue site, the concentration was 4.6 µg m⁻³, which was 0.1 µg m⁻³ higher than the previous month. At Site A, located near to the site office at the north-west of the Avenue, the average concentration was 4.4 µg m⁻³, although the average for Site A has been reported on the basis of less than 1-month of data, so the monthly average concentrations cannot be directly compared to those from the longer-term monitoring stations.

At Site B, located at the north-east boundary of the Avenue site, the measured monthly average concentration was 7.0 µg m⁻³ and was 1.1 µg m⁻³ higher than the month of May when the measured value was 5.9 µg m⁻³. The small variations in concentrations suggest that remediation activities have not significantly affected ambient concentrations of PM_{2.5}, although the measured concentrations at Site B are higher than at the other sites, indicating an additional contribution from local emission sources which are likely to include the Avenue. The higher levels of PM_{2.5} at Site B are likely to be due to proximity of this location to vehicular activities, haul route construction and dry surfaces (within 10m of the monitor) and elevated levels of particulates are therefore likely to be very localised.

All measured concentrations are significantly less than the 25 µg m⁻³ annual mean national air quality objective.

Table 4 – Monthly Average Concentrations of PM_{2.5} Particulate Matter (µg m⁻³)

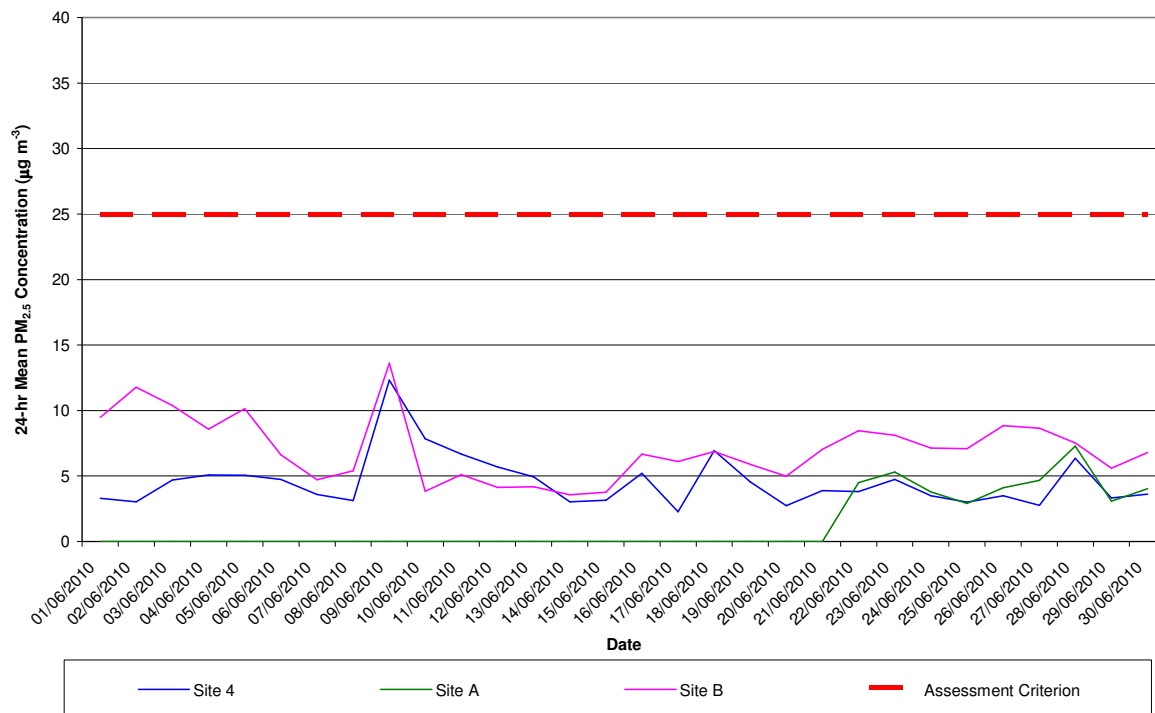
Monitoring Site	PM _{2.5} Monthly Average Concentration (µg m ⁻³)
Site 4 – Village Hall, Hasland	4.6
Site A: Avenue (NW) – data from 22 nd June.	4.4
Site B: Avenue (NE)	7.0

Figure 2 presents 24-hour average concentrations of PM_{2.5} at the fixed monitoring sites, to provide an indication of the monthly variation in measured values. Concentrations at all sites follow the same trend in terms of increasing and decreasing daily concentrations, although the measured concentrations at Site B, located at the north-east boundary of the Avenue site, are typically above those measured at Site 4, located in Hasland beyond the north-eastern boundary of the Avenue site. This suggests that background levels of PM_{2.5} dominate and that the Avenue remediation activities are not having a significant effect on ambient concentrations of PM_{2.5}, although emissions from vehicular activities and haul road construction adjacent to the monitoring station at Site B are reflected in slightly higher measured concentrations of PM_{2.5} when compared to the other monitoring stations which are more remote from such activities.

In the context of the 25 µg m⁻³ annual mean air quality objective for PM_{2.5}, there was little variability in measured concentrations across the month, and until 9th June when concentrations peaked at both Site 4 and Site B. The 24-hour average at Site 4 was 13.3 µg m⁻³ and at Site B the concentration on 9th June was 13.6 µg m⁻³. As discussed above in Section 2.1.1, the measured PM₁₀ results across all monitoring sites also peaked on 9th June and the elevated concentrations of both PM₁₀ and PM_{2.5} are therefore expected to be the result of regional pollution as opposed to remediation related activities at the Avenue. The wind direction at the time of the peak concentrations supports this conclusion, as Site B was upwind of the Avenue as the wind direction on 9th June was from north and north-easterly sectors and was therefore blowing from the direction of the monitoring station, towards the Avenue.

Concentrations across the month are significantly less than the annual mean national air quality objective of 25 µg m⁻³.

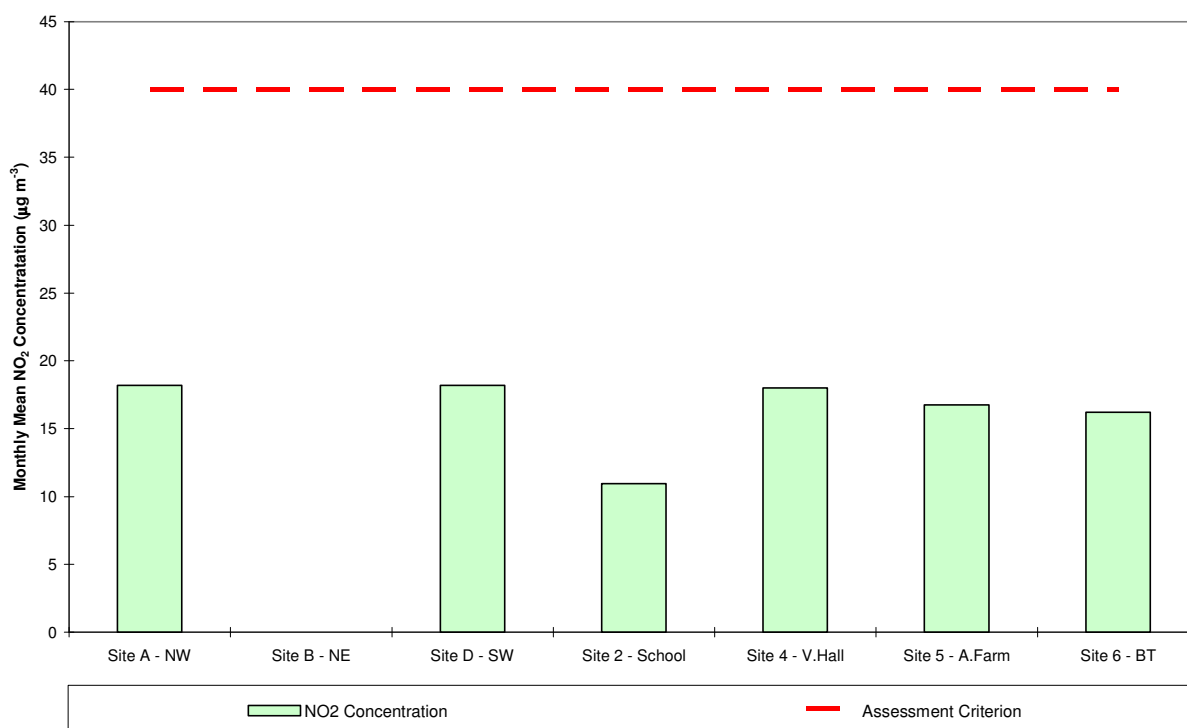
Figure 2 – 24-hour Average Concentrations of PM_{2.5} Particulate Matter (µg m⁻³)



2.1.3 Nitrogen Dioxide Concentrations

Figure 3 presents monthly average concentrations of nitrogen dioxide across each of the fixed monitoring sites. The diffusion tube at Site B was not present at the monitoring location when scheduled for collection and therefore, no results are presented for June. At all locations, measured concentrations were below the 40 $\mu\text{g m}^{-3}$ annual mean air quality objective. The maximum measured monthly average concentration was 18.19 $\mu\text{g m}^{-3}$ at Site D (Avenue SW) and Site A (Avenue NW), although all other sites, with the exception of Site 2 (Hunloke Park Primary School, Wingerworth) have monthly average concentrations approaching this value. Concentrations at Site 2 are the lowest, with a measured monthly average of 10.95 $\mu\text{g m}^{-3}$.

Figure 3 – Monthly Average Concentrations of Nitrogen Dioxide ($\mu\text{g m}^{-3}$)



2.1.4 Deposited Dust Levels

Figure 5 presents the monthly levels of deposited dust at each of the monitoring stations and the source direction. The sites with an identifier beginning with a letter (A, B and D) are located on the Avenue site, whilst numerically referenced sites (2, 4, 5 and 6) are located off-site. There were no exceedences of the Avenue target level of 200 $\text{mg/m}^2/\text{day}$, although measured levels of deposited dust at two on-site monitoring locations (Site A and Site B) and one off-site location (Site 5) approached this level.

The highest measured level of deposited dust of 197 $\text{mg/m}^2/\text{day}$ was recorded at Site 5 (Avenue Farm). At this location, approximately one-third of the deposited dust originated from the north, suggesting that the source was not the Avenue, and as observed in previous months, the dust was most likely to originate from a local emission source associated with activities at Avenue Farm. At the three further off-site monitoring locations (sites 2, 4 and 6), the distribution of deposited dust at each of the compass points is more even, suggesting no dominant local source direction of dust.

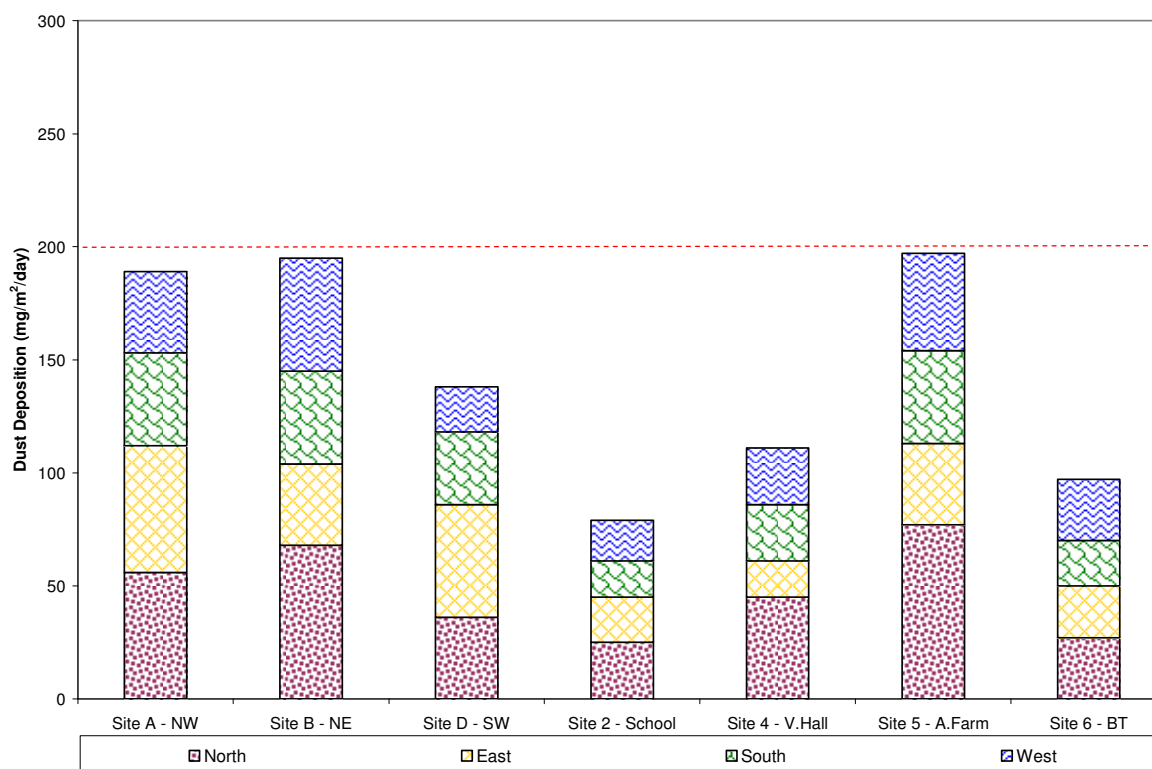
At the on-site monitoring locations, the maximum level of deposited dust of 195 $\text{mg/m}^2/\text{day}$ was measured at Site B (Avenue NE); at Site A and Site D the deposition levels were 189 $\text{mg/m}^2/\text{day}$ and 138 $\text{mg/m}^2/\text{day}$, respectively.

At Site B, one-third of the deposited dust originated from the north and this pattern of dust deposition levels would suggest the Avenue site was a contributing element to these dust levels. As identified in previous months, the higher levels of deposited dust at Site B were likely to be due to proximity of this location to vehicular activities, haul route

construction and dry surfaces (within 10 metres of the monitor). Mitigation measures employed on site include; the use of a water bowser, which is in continuous operation around the site during working hours; speed limits are observed onsite, trafficking on un-dampened roads is minimised; and daily checks for nuisance dust levels offsite are undertaken.

At Site D (Avenue SW), approximately one-third of the deposited dust originated from the north and slightly more than one third originated from the east. This pattern of dust deposition levels would suggest the Avenue site was a contributing element to the total levels of dust levels measured. The pattern of deposition levels at Site A also indicates that the majority of just originated from the north and east, also suggesting that the Avenue contributes to levels of dust deposition.

Figure 5 – Measured Dust Deposition Levels (mg/m²/day)



2.1.5 Dust Soiling Levels

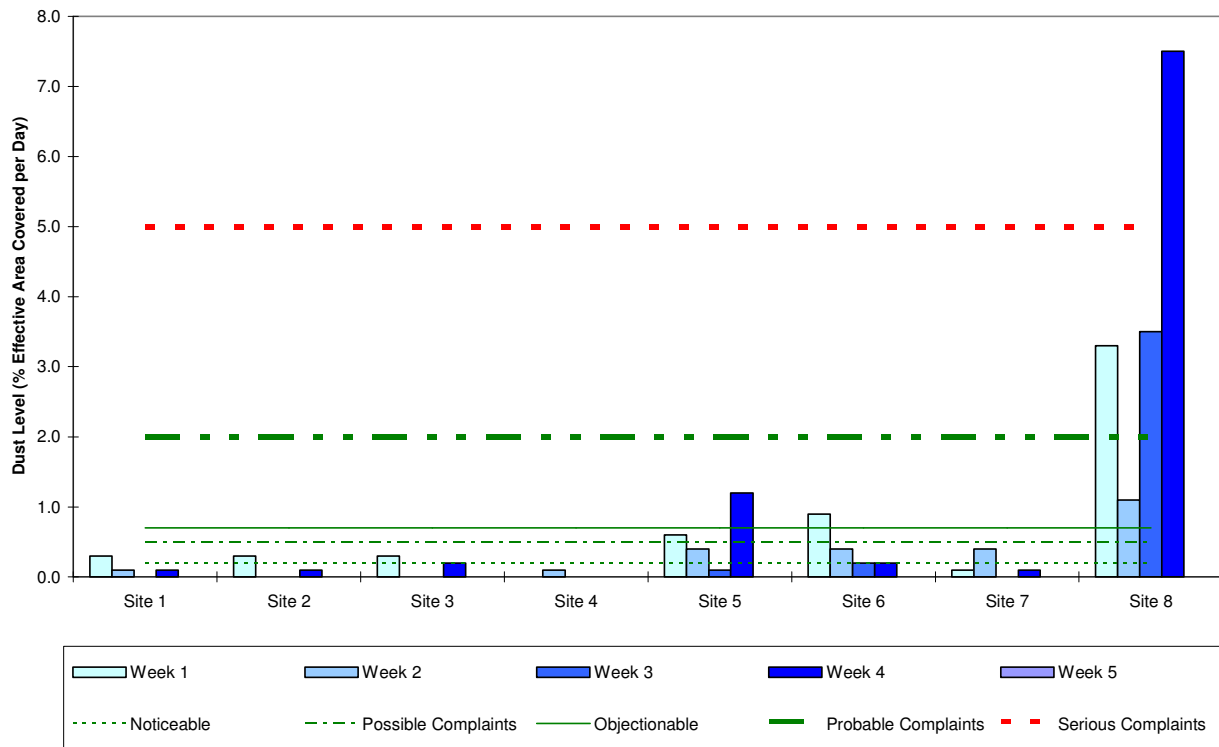
Measurements of dust soiling continue to be undertaken using sticky pads at 8 locations, over periods of approximately seven days, for comparison against target levels measured in units of effective area covered per day (% EAC).

Figure 6 shows the maximum measured weekly levels of dust from the sticky pads at each of the 8 monitoring locations. The highest level of dust of 7.5 %EAC was measured in Week 4 at Site 8 (west boundary). This value was recorded for the northern side of the sticky pad suggesting that the source of dust was from the north, and was therefore likely to originate from the Avenue site. The level of dust experienced at this location could result in complaints if this monitoring site was located at a receptor, rather than the edge of the Avenue site, within the site boundary. This sticky pad location is however immediately on the edge of the car park that lies between the main Avenue site and the monitoring location. Vehicles manoeuvring in the car park have been observed to cause surface dust to become airborne which then deposits on the sticky pad a few metres away. As the measured levels at the sticky pad do not represent the wider contribution from the remediation activities at the Avenue, and instead reflect very localised levels of dust soiling, the monitoring site has been moved approximately 20 m to the east and since 2nd July it has been located between the main Avenue site and the car park.

At all locations, with the exception of Site 8 in week 4 (as explained above), measured levels of dust were below the target level of 5% EAC and would therefore be unlikely to lead to complaints from receptors located further from the Avenue site.

The threshold values will be re-evaluated in the review of the site Air Quality Management Plan that is scheduled for July / August 2010.

Figure 6 – Maximum Weekly Measured Dust Levels using Sticky Pad Technique (%EAC/day)



2.1.6 Volatile Organic Compounds

The assessment criteria limits for benzene and toluene are $5 \mu\text{g m}^{-3}$ and 1.9 mg m^{-3} as a 2-week average, respectively.

The maximum measured concentration of benzene in period 1 was $5.9 \mu\text{g m}^{-3}$ at Site D (Avenue SW). At all other monitoring locations during period 1, the measured levels were less than the limit of detection of $1.8 \mu\text{g m}^{-3}$. There is no particular explanation for the elevated concentration measured at Site D which is not particularly close to any remediation activities and for much of the time the monitoring station is upwind of the Avenue and would therefore not be affected by the works.

In period 2 measured concentrations of benzene were less than the limit of detection of $1.8 \mu\text{g m}^{-3}$ at Site D and all other locations.

The assessment criterion for benzene was therefore marginally exceeded in period 1 at Site D, but was comfortably achieved at all other monitoring stations. The measured average concentration at Site D for the month was below $5 \mu\text{g m}^{-3}$ and for all other VOCs measured, including Ethyl Benzene and Xylenes, concentrations were below limits of detection in both monitoring periods.

The maximum measured concentrations of toluene in period 1 were less than the limit of detection of 0.0059 mg m^{-3} and in period 2 the measured concentrations were less than the limit of detection of 0.0052 mg m^{-3} . The assessment criterion for toluene has therefore been comfortably achieved at all monitoring stations.

2.1.7 Metals

The only metal with an air quality objective is lead, with a concentration of $0.25 \mu\text{g m}^{-3}$ as an annual average. The maximum measured concentration of lead was $0.02 \mu\text{g m}^{-3}$ at Site 2 (Hunloke School, Wingerworth) during the first monitoring period. During the second monitoring period the maximum measured concentration of lead was $0.01 \mu\text{g m}^{-3}$ at Sites B, D, 4, 5 and 6, with the concentration of $0.009 \mu\text{g m}^{-3}$ measured at Site A.

Chromium concentrations measured at Site 2 (Hunloke School, Wingerworth) and Site 4 (Village Hall, Hasland), although below target levels, were elevated when compared to previous months. These values were checked with the laboratory and repeat analysis confirmed the initial concentrations. Concentrations at the on-site monitoring stations were close to or below limits of detection.

Concentrations of cadmium were below limits of detection in both monitoring periods at all monitoring sites. However, at Site A (Avenue NW) in the second period of monitoring, the limit of detection ($0.009 \mu\text{g m}^{-3}$) was above the Avenue

target value ($0.005 \mu\text{g m}^{-3}$) and consequently, this has been identified as an exceedance of the target level. In practice, the actual concentration, if comparable with other monitoring sites, would be below the target level.

Concentrations of all other metals were in most cases below limits of detection; where concentrations were above limits of detection the concentrations were below target levels.

2.1.8 Cyanide

There are no air quality objectives for cyanide. The assessment criterion for the Avenue is a maximum concentration of $50 \mu\text{g m}^{-3}$ as a 2-week average. At all locations concentrations of cyanide were below the limit of detection of 0.0009 or $0.01 \mu\text{g m}^{-3}$.

2.1.9 Phenol(s)

The target levels for phenol and cresol at the Avenue are $48 \mu\text{g m}^{-3}$ and $220 \mu\text{g m}^{-3}$ as a 2-week average, respectively. The reporting of these compounds is subject to a lower detection limit of $0.2 \mu\text{g m}^{-3}$ and there were no measured concentrations above this level.

2.1.10 Poly-Aromatic Hydrocarbons

The target level of Coal Tar Pitch Volatiles at the Avenue is $0.48 \mu\text{g m}^{-3}$, whilst for naphthalene the level is $126 \mu\text{g m}^{-3}$. There were no exceedances of the target level for Coal Tar Pitch Volatiles during the month and no exceedances of the target level for naphthalene.

The highest measured concentration of total Coal Tar Pitch Volatiles was $0.04 \mu\text{g m}^{-3}$ at Site B (Avenue NE) during the first period of monitoring. The highest measured concentration of naphthalene was $0.0058 \mu\text{g m}^{-3}$ at Site D (Avenue SW) in the first period of monitoring.

Given the location of Site B, it is likely the source of Poly-Aromatic Hydrocarbons was the Avenue site. The activities taking place near this monitoring location during June included the stockpiling, prior to treatment, of small quantities of contaminated material from Zone 4 in Zone 3 close to the monitoring location.

2.2 Targeted Air Quality Monitoring

2.2.1 Asbestos

Reassurance air testing for asbestos was carried out on 2nd, 9th, 16th, 23rd and 29th June. The monitoring was undertaken downwind and at the boundary of the following works:

- Zone 4: Downwind of earthworks, stockpiling and excavation works south of the Roman Baths (underground liquid holding tanks).

All measured concentrations of fibres were $< 0.01 \text{ f ml}^{-1}$ (fibres per milli-litre) and are therefore comfortably within the control limit.

2.3 Odour Monitoring

2.3.1 Odour Diaries

Odour diaries for June show that there were 14 Odour Days when odour intensity was rated as 4 or greater when wind was blowing from the Avenue.

The odour day of the 6th June had odours that were described as “*tar/asphalt*”, with an odour intensity rated as 5. On 9th June odours were described as “*smokey*”, with the odour intensity rated as 4. With respect to the five odours days between 23rd and 27th June, odours were described as “*floral*” with an odour intensity of 4 and on the 6 odour days between 15th and 20th June, the odours were again described as “*tar/asphalt*” and at times “*floral*”.

The observation on 6th June was from a location to the north of the Avenue site and the odours with “*tar/asphalt*” characteristics may have been from the remediation activities in line with the complaints received (see section 2.3.3 below). At the time when the “*tar/asphalt*” odours were logged, the wind, which had been typically blowing from the north and north-west on this day, switched to the south-west which could have then carried odours from the Avenue towards the receptor. The “*floral*” odours observed at the same location are not connected with the Avenue.

On the day when “*smokey*” odours were recorded (9th June), the wind direction was from the north and north-east which could result in odours from the site being transported to the location where the odour was recorded. However, there were

no activities on site which could have generated the smokey odours and the location where the odour was recorded was approximately 1 km from the boundary of the Avenue site.

On the 6 odour days between 15th and 20th June when odours were described as “*tar/asphalt*” the wind direction was from northerly sectors and therefore, the location where the odours were observed was downwind of the Avenue. It was possible that the Avenue was the source of these odours and during this period, as there was general excavation of contaminated material from Zone 4 that was deposited onto the high-level stocking area in Zone 3. Further dialogue with the Odour Diarist identified inconsistencies in the reporting of odour intensity ratings which may have led to the overstating of observed odours; the diarist will contact VSD if odours of a similar magnitude are observed in the future, in order that further investigation into the reporting of these odours can be undertaken.

2.3.2 Sensory Field Odour Surveys

Sensory field odour surveys were carried out on 2nd, 9th, 15th and 23rd June at each of the fixed monitoring stations. During each survey, the maximum odour annoyance impact level at the times when the wind was blowing from the Avenue was recorded. At all locations, the maximum odour annoyance impact was ‘*low-medium*’ and, therefore, the effects of odour are not considered significant.

2.3.3 Odour Complaints

There were two odour complaints during June 2010. These were not received from Odour Diarists, but other members of the public.

Odours became apparent emanating from the River Rother, downstream, north of site, following heavy rain on the morning of Sunday 6th June. The reported incidents, at Herriot Drive (~1.5km north of the Avenue) and by McGregor’s Pond, were attributed to the exposure of historic contamination in the River Rother following several weeks of dry weather and the subsequent liberation of odours due to the heavy rain. The issues were closed out to the satisfaction of the complainants.