

# Avenue Remediation Project

## Air Quality and Odour Monitoring Programme

### Summary of Results: January 2010

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## 1. Overview

### 1.1 Summary of Monthly Air Quality Monitoring Results

Table 1 provides an overview of the air quality measurement data for January 2010 (4<sup>th</sup> January to 1<sup>st</sup> February<sup>1</sup>) 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 <sub>2</sub> )	Monthly Mean	40 µg m <sup>-3</sup>	17.60 – 32.44	Low
Fine Particulate Matter (PM <sub>10</sub> )	Monthly Mean	40 µg m <sup>-3</sup>	8.22 – 20.89	Low
Fine Particulate Matter (PM <sub>10</sub> )	24-hr Mean	50 µg m <sup>-3</sup>	1.80 – 47.10	Low
Fine Particulate Matter (PM <sub>2.5</sub> )	Monthly Mean	25 µg m <sup>-3</sup>	2.45 – 4.70	Low
Sulphur Dioxide (SO <sub>2</sub> )	2-week Mean	125 µg m <sup>-3</sup>	9.90 max	Low
Metals - Lead	Monthly Mean	0.25 µg m <sup>-3</sup>	0.03 max	Low
Cyanide	2-week Mean	50 µg m <sup>-3</sup>	0.07 max	Low
PAHs - Coal Tar Pitch Volatiles	2-week Mean	0.48 µg m <sup>-3</sup>	0.16 max	Low
PAHs - Naphthalene	2-week Mean	126 µg m <sup>-3</sup>	0.0098 max	Low
Phenols – Phenol	2-week Mean	48 µg m <sup>-3</sup>	<0.2	Low
Phenols – Cresols	2-week Mean	220 µg m <sup>-3</sup>	<0.2	Low
VOCs - Benzene	2-week Mean	5 µg m <sup>-3</sup>	<2.1	Low
Dust Deposition - Directional Gauge	Monthly Mean	200 mg m <sup>-2</sup> day <sup>-1</sup>	24 – 46	Low
Dust Soiling – Sticky Pad	% EAC*	5 % EAC	1.1 max	Low
Odours	n/a	n/a	Low-Med	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.

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

*In summary:*

*There were no air quality related complaints recorded during the month, although an ‘inquiry’ was made to Site Security on the evening of 27<sup>th</sup> January regarding odours.*

*In terms of the monitoring results, there were no exceedences of the target levels of pollutants during the month.*

*Concentrations of nitrogen dioxide and particulate matter (PM<sub>10</sub>) were higher than measurements in December 2009. On 14<sup>th</sup> January, concentrations of PM<sub>10</sub> peaked at seven of the nine continuous monitoring stations, approaching, but not exceeding, the value of the 24-hour Air Quality Objective at Site 4 (Village Hall, Hasland). As several monitoring stations measured elevated concentrations on the same day, background pollution not related to the Avenue site is the predominant cause.*

*Although the magnitude of change was generally small, concentrations of particulate matter (PM<sub>2.5</sub>), sulphur dioxide, metals, VOCs and naphthalene were lower than December, while concentrations of cyanide, coal tar pitch volatiles (PAHs) and levels of deposited dust were higher than December.*

## **1.2 Work Activity**

The site remediation operations (known as Stage 3 of the Avenue project) officially commenced on 9 September 2009. Some site-based works, with the potential to affect air quality have taken place during January 2010, although work during the first two weeks was postponed due to snowfall. The earthworks included the following activities:

- Week 1 (4–10 January)
  - Borrow-pit excavation and stockpiling in Zone 2;
  - Construction of the site of waste-tip processing washing area in Zone 3;
  - Crushing activities in Zone 5; and
  - Holding Pond 11 preparation in Zone 5.
- Week 2 (11–17 January):
  - Borrow-pit excavation and stockpiling in Zone 2;
  - Construction of the site of waste-tip processing washing area in Zone 3;
  - Crushing activities in Zone 5;
  - Holding Pond 11 preparation in Zone 5; and
  - Decommissioning of services in Zone 4.
- Week 3 (18–24 January):
  - Commencement of remediation in the Ruberoid part of the plant area;
  - Borrow-pit infilling with material from Plant Area;
  - Construction of the site of waste-tip processing washing area in Zone 3;
  - Crushing activities in Zone 5;
  - Haul Route construction (east of High-level Stocking Area);
  - Construction of the foundation of the River Rother crossing in Zone 1;
  - New water treatment plant commissioned; and
  - Decommissioning of services in Zone 4.
- Week 4 (25–31 January):
  - Commencement of remediation in the Ruberoid part of the plant area;

- Construction of the site of waste-tip processing washing area in Zone 3;
- Borrow-pit infilling with material from Plant Area;
- Crushing activities in Zone 5;
- Haul Route construction (east of High-level Stocking Area);
- New water treatment plant commissioned; and
- Decommissioning of services in Zone 4.

### 1.3 Alterations, Downtime and Technical Difficulties

A summary of alternations 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
<b><i>Alternations to Monitoring Programme:</i></b>		
None	n/a	n/a
<b><i>Downtime and Technical Difficulties:</i></b>		
Site B and C	12 <sup>th</sup> January	The power supply to sites B and C was interrupted on 12 <sup>th</sup> January. This resulted in a loss of data from the APM950 instrumentation for 48 hours.

## 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 PM<sub>10</sub> Concentrations

Table 3 presents monthly average concentrations of PM<sub>10</sub> at the fixed monitoring sites. The highest average concentration of 20.9 µg m<sup>-3</sup> at Site 7 (Nursery at Stretton), which is located ~6 km to the south of the site, is approximately 50% of the 40 µg m<sup>-3</sup> annual mean air quality objective. The second highest monthly average of 11.8 µg m<sup>-3</sup> was recorded at Site D (Avenue SW), whilst the additional stations within and close to the Avenue recorded levels in the 8.2-11.6 µg m<sup>-3</sup> range.

**Table 3 – Monthly Average Concentrations of PM<sub>10</sub> Particulate Matter (µg m<sup>-3</sup>)**

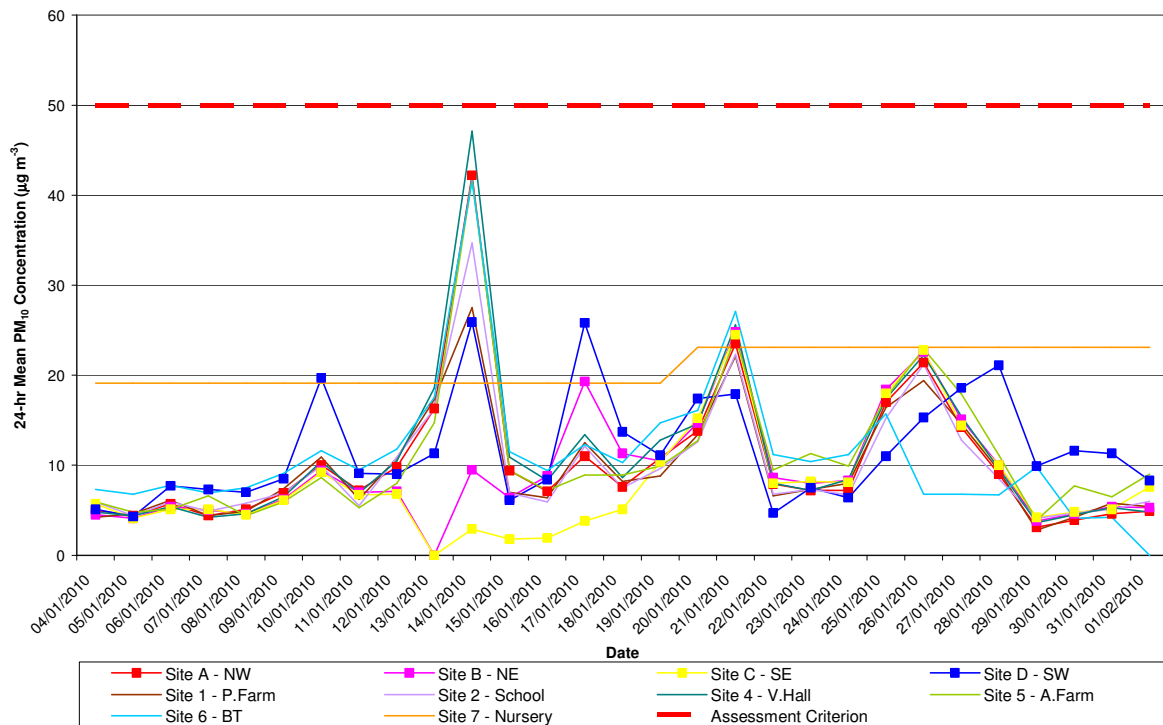
Monitoring Site	PM <sub>10</sub> Monthly Average Concentration (µg m <sup>-3</sup> )
Site A: Avenue (NW)	10.4
Site B: Avenue (NE)	9.6
Site C: Avenue (SE)	8.2
Site D: Avenue (SW)	11.8
Site 1: Press Lane Farm, Old Tupton	9.7
Site 2: Hunloke Primary School	9.9
Site 4: Village Hall, Hasland	11.2
Site 5: Avenue Farm	11.0
Site 6: BT Offices (Pioneer House) Mill Lane	11.6
Site 7: Nursery at Stretton*	20.9

Notes:

\* Concentration measured at Site 7 using Mini-Vol sampler. All other measurements using APM950 instrumentation

Figure 1 presents 24-hour average concentrations of PM<sub>10</sub> at the fixed continuous monitoring sites; measured concentrations in the January monitoring period were generally higher than those measured during December and there were more defined peaks in measured concentrations. The maximum measured concentration of 47.1 µg m<sup>-3</sup> was recorded at Site 4 (Village Hall, Hasland) on 14<sup>th</sup> January, which was also the date of the maximum measured concentration at sites A, D, 1, 2, 4, 5 and 6. For the remainder of the sites (B and C), 21<sup>st</sup> January was the date with the highest measured concentrations. These results show that elevated concentrations of particulate matter were widespread and as such, the Avenue site was not likely to be the principal source of emissions.

**Figure 1 – 24-hour Average Concentrations of PM<sub>10</sub> Particulate Matter (µg m<sup>-3</sup>)**



Notes:

\* Concentration measured at Site 7 using Mini-Vol sampler. All other measurements using APM950 instrumentation

### 2.1.2 PM<sub>2.5</sub> Concentrations

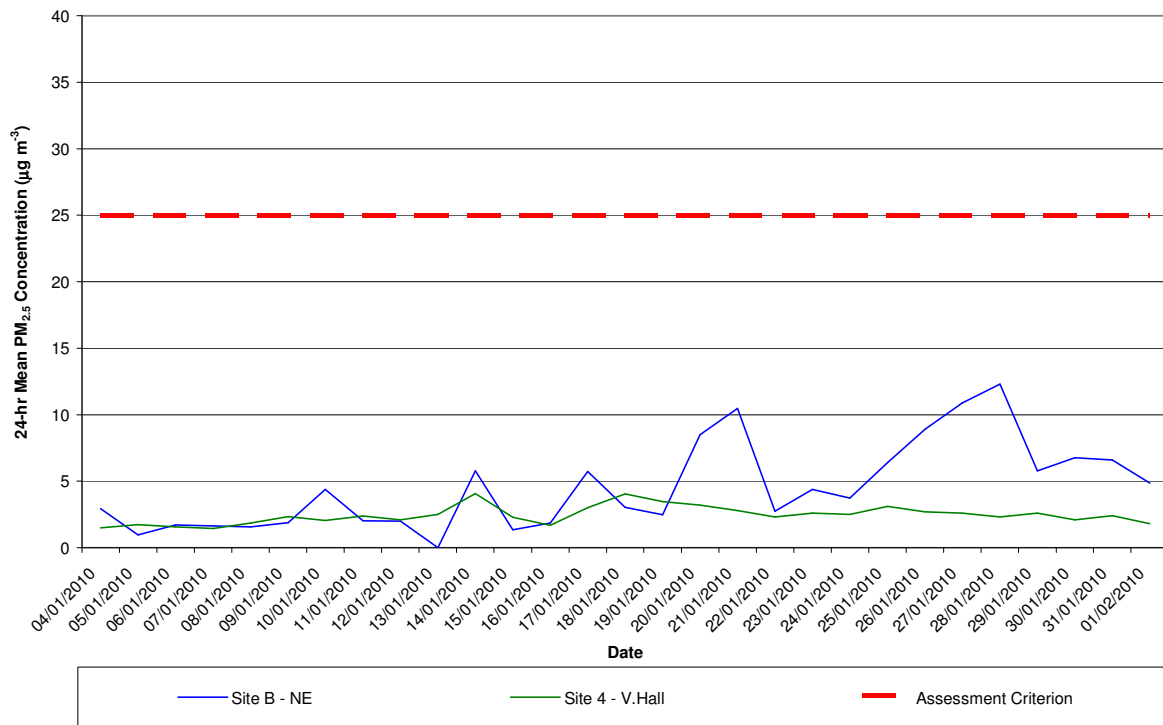
Table 4 presents monthly average concentrations of PM<sub>2.5</sub> at the two fixed monitoring sites. The highest average concentration of 4.7 µg m<sup>-3</sup> occurred at Site B (located on the north east boundary of the Avenue site) and this was 0.2 µg m<sup>-3</sup> lower than the concentration measured in December. At Site 4 (Village Hall, Hasland) located beyond the north east boundary of the Avenue site, the monthly average concentration of PM<sub>2.5</sub> reduced from 4.0 µg m<sup>-3</sup> in December to 2.4 µg m<sup>-3</sup> in January. All measured concentrations are significantly less than the 25 µg m<sup>-3</sup> annual mean national air quality objective.

**Table 4 – Monthly Average Concentrations of PM<sub>2.5</sub> Particulate Matter (µg m<sup>-3</sup>)**

Monitoring Site	PM <sub>2.5</sub> Monthly Average Concentration (µg m <sup>-3</sup> )
Site B: Avenue (NE)	4.7
Site 4 – Village Hall, Hasland	2.4

Figure 2 presents 24-hour average concentrations of PM<sub>2.5</sub> at the fixed monitoring sites, to provide an indication of the monthly variation in measured values. The figure shows more variability in concentrations measured at Site B (located on the north east boundary of the Avenue site) compared to Site 4 (Village Hall, Hasland). Measured concentrations at Site B deviate more widely from those measured at Site 4 in the second half of the month and there are two distinct periods when concentrations at Site B are more than four times those at Site 4, which suggests that the emissions causing the higher concentrations are perhaps more local to the monitoring station. In any event, the 24-hour concentrations of PM<sub>2.5</sub> at Site B and 4 do not exceed the assessment criterion during the period; the highest 24-hour average concentrations measured at Site B are less than 50% of the 25 µg m<sup>-3</sup> annual mean national air quality objective.

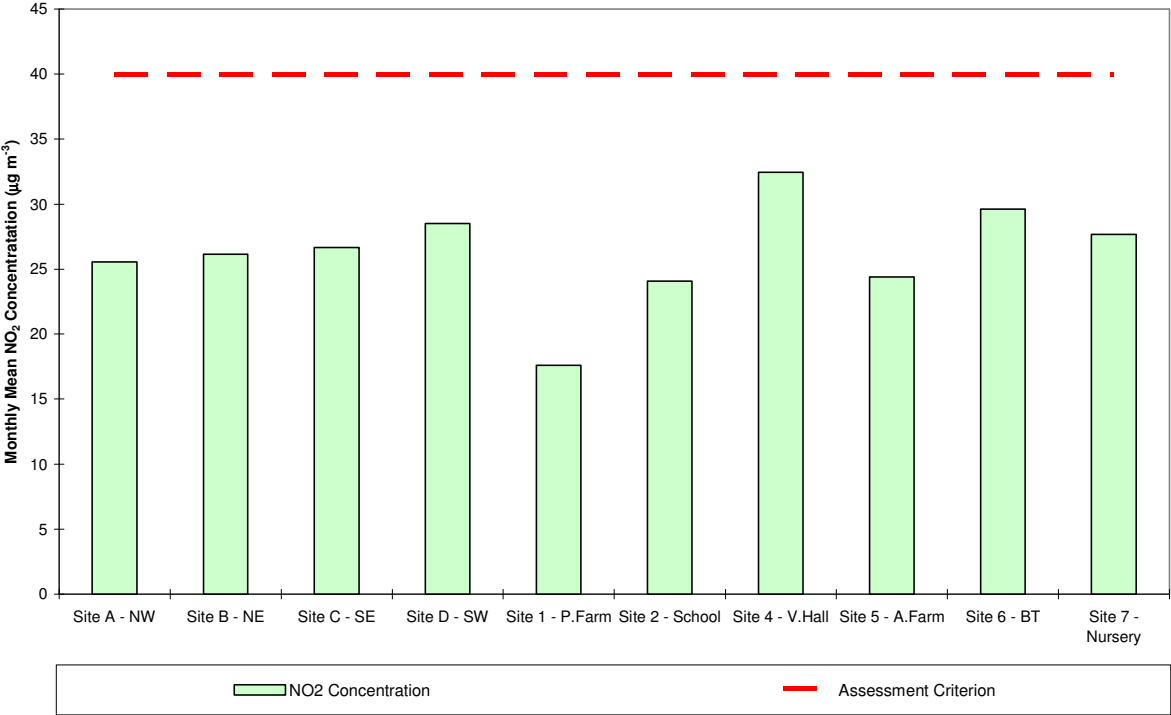
Figure 2 – 24-hour Average Concentrations of PM<sub>2.5</sub> Particulate Matter (µg m<sup>-3</sup>)



### 2.1.3 Nitrogen Dioxide Concentrations

Figure 3 presents monthly average concentrations of nitrogen dioxide across each of the fixed monitoring sites. At all locations, measured concentrations were below the 40 µg m<sup>-3</sup> annual mean air quality objective. The maximum measured concentration was 32.44 µg m<sup>-3</sup> at Site 4 (the Village Hall in Hasland), although levels of NO<sub>2</sub> at this location would be primarily affected by local emission sources unconnected to The Avenue. Concentrations of NO<sub>2</sub> in January were generally higher than those measured in December, where the maximum monthly average concentration, also at Site 4 was 27.89 µg m<sup>-3</sup>.

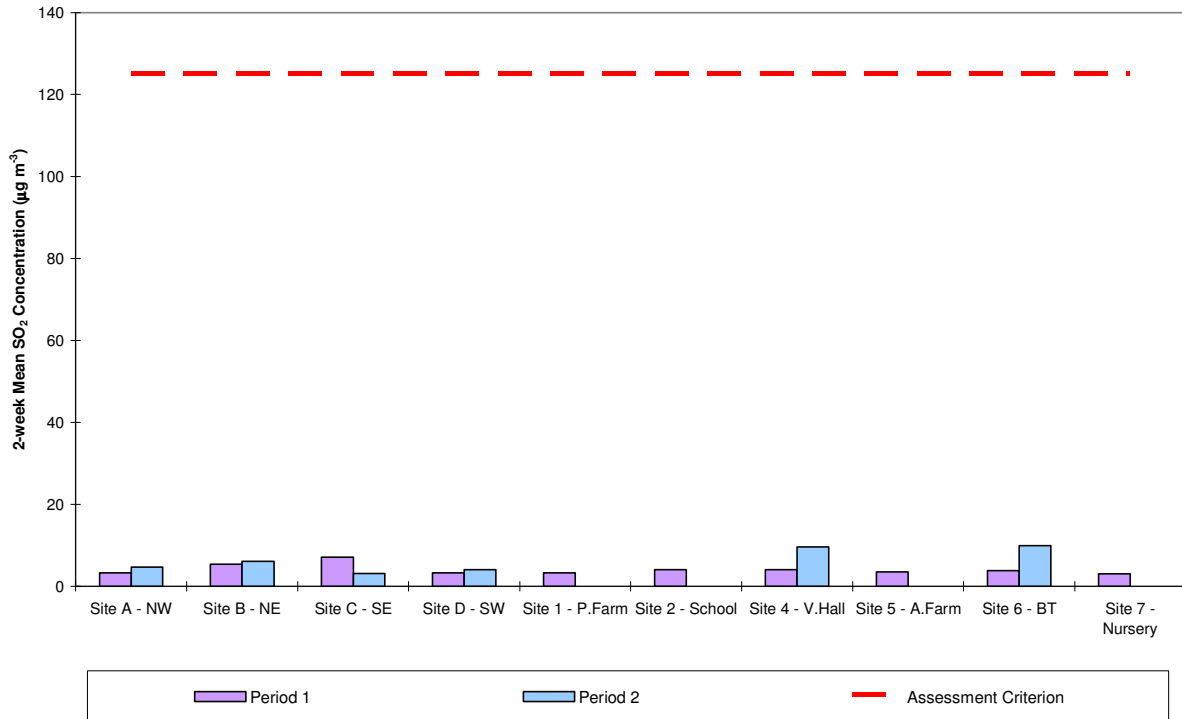
**Figure 3 – Monthly Average Concentrations of Nitrogen Dioxide ( $\mu\text{g m}^{-3}$ )**



**2.1.4 Sulphur Dioxide Concentrations**

Figure 4 presents 2-week average concentrations of sulphur dioxide across each of the fixed monitoring sites. At all locations, measured concentrations were significantly below the  $125 \mu\text{g m}^{-3}$  target level. The maximum measured concentration was  $9.9 \mu\text{g m}^{-3}$  and occurred at Site 6 (Pioneer House) during the second monitoring period.

Figure 4 – 2-week Average Concentrations of Sulphur Dioxide ( $\mu\text{g m}^{-3}$ )

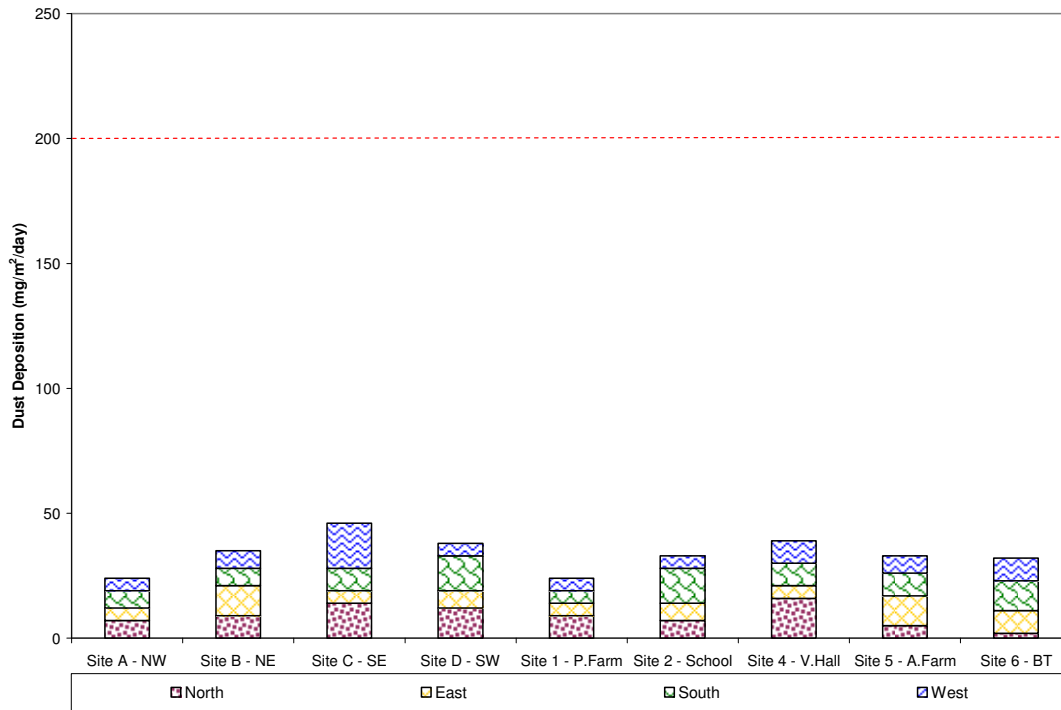


### 2.1.5 Deposited Dust Levels

Figure 5 presents the monthly levels of deposited dust at each of the monitoring stations and the source direction.

The highest measured level of deposited dust of  $46 \text{ mg/m}^2/\text{day}$  was recorded at Site C (Avenue SE) and the measured levels did not represent an exceedence of the target level. At Site C, approximately 40% of the deposited dust originated from the west and 30% was from the north. This pattern of dust deposition levels would suggest the Avenue site was a contributing element to these dust levels, although other local sources of dust from the north (e.g. farming activity) were also significant.

**Figure 5 – Measured Dust Deposition Levels (mg/m<sup>2</sup>/day)**



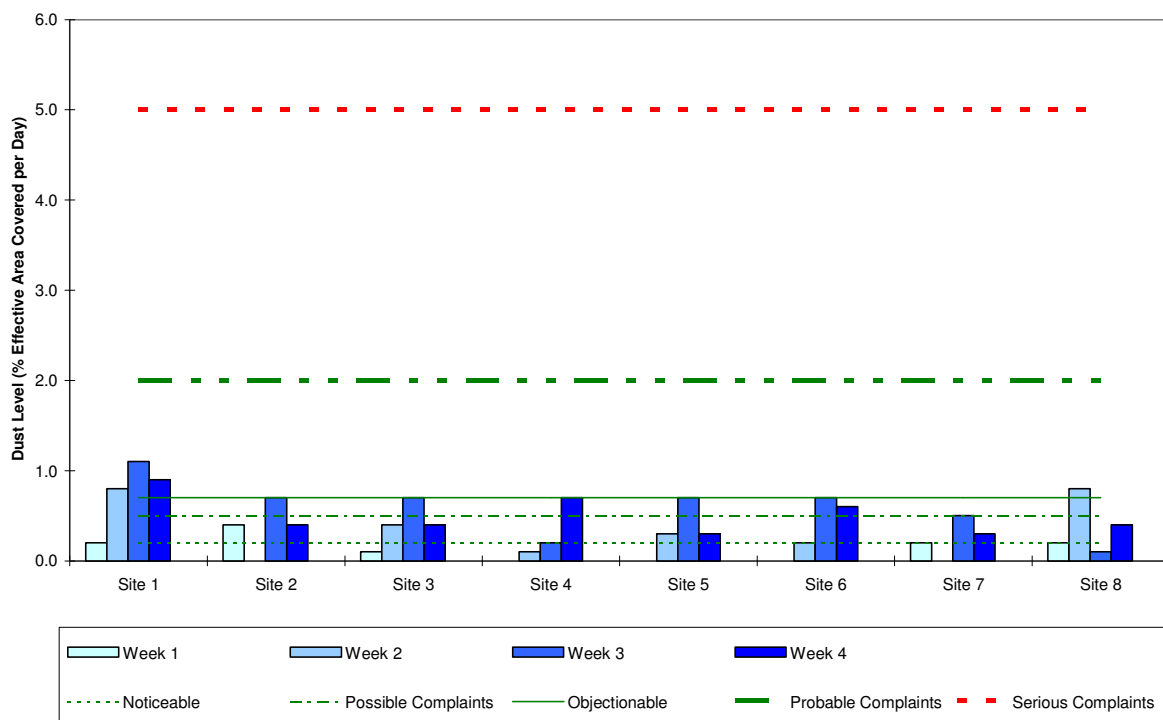
### 2.1.6 Dust Soiling Levels

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 1.1 %EAC was measured in Week 3 at Site 1 (located at the site entrance). Week 3 was also the period when the highest levels of coverage were recorded at a number of other monitoring locations. The results would suggest that the Avenue works were the primary source of dust at these locations.

At all locations, 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.

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



### 2.1.7 Volatile Organic Compounds

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

During the first and second 2-week monitoring periods all recorded levels of benzene were below the limit of detection of  $1.4 \mu\text{g m}^{-3}$  in the first monitoring period (4<sup>th</sup> January to 20<sup>th</sup> January) and  $2.1 \mu\text{g m}^{-3}$  in the second monitoring period (20<sup>th</sup> January to 1<sup>st</sup> February). The assessment criterion for benzene has therefore been achieved at all monitoring stations.

The maximum measured concentration of toluene in period 1 was  $0.042 \text{mg m}^{-3}$  and in period 2 the maximum measured concentration was  $0.037 \text{mg m}^{-3}$ . At most of the monitoring stations the levels of toluene were below limits of detection. The assessment criterion for toluene has therefore been comfortably achieved at all monitoring stations.

### 2.1.8 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  $0.03 \mu\text{g m}^{-3}$ , recorded at Site 5 (Avenue Farm) during the second monitoring period.

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

### 2.1.9 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 limits of detection.

### 2.1.10 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.

### 2.1.11 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 exceedences of these criteria during the month. The highest measured concentration of total Coal Tar Pitch Volatiles was  $0.16 \mu\text{g m}^{-3}$  and the highest measured concentration of naphthalene was  $0.0098 \mu\text{g m}^{-3}$ .

### 2.1.12 Quality Control Samples

#### Media Blanks

The analysis of media blanks indicated no issues with the contamination of media used for the collection of samples. The laboratory blank corrected VOC results due to the presence of toluene in the laboratory.

#### Duplicates

Duplicate  $\text{PM}_{10}$  measurements at Site A correlated well with original data during the month. The monthly average concentration at Site A was  $9.0 \mu\text{g m}^{-3}$  compared to  $8.4 \mu\text{g m}^{-3}$  for the duplicate monitor.

Duplicate metals results taken at Site A produced the same results during both the first and the second monitoring periods. The only variation in measurements was for zinc, where concentrations in the second period were  $0.02 \mu\text{g m}^{-3}$  and  $0.03 \mu\text{g m}^{-3}$ .

Duplicate PAH results from Site 1 showed that the magnitude of difference in the measured concentrations of each compound were not significant.

Duplicate phenol samples were taken at Site 1. No results were reported above the limit of detection (LOD) of  $0.2 \mu\text{g m}^{-3}$  during either of the two monitoring periods.

Duplicate  $\text{SO}_2$  measurements were taken at Site B. In period 1 the measured concentrations were  $5.42 \mu\text{g m}^{-3}$  and  $4.49 \mu\text{g m}^{-3}$ ; in the second period, the measured concentrations were  $6.06 \mu\text{g m}^{-3}$  and  $6.40 \mu\text{g m}^{-3}$ . It is therefore considered that the measurements are in good agreement.

For total VOC measurements, the measured concentrations from the duplicate diffusion tubes were the same for the first monitoring period. In the second monitoring period, toluene concentrations were different between the two sets of measurements, with one of the results being less than the lower limit of detection of  $<0.0066 \text{ mg m}^{-3}$ , while the second measured concentration was  $0.017 \text{ mg m}^{-3}$ . In absolute terms, and in the context of the  $1.9 \text{ mg m}^{-3}$  target level, the difference in measurements is not considered significant.

The duplicate  $\text{NO}_2$  measurements gave concentrations of  $28.3 \mu\text{g m}^{-3}$  for the first diffusion tube, and  $26.2 \mu\text{g m}^{-3}$  for the second tube. The diffusion tube measurements are therefore considered to be in good agreement.

## 2.2 Targeted Air Quality Monitoring

### 2.2.1 Asbestos

Reassurance air testing for asbestos was carried out on 21<sup>st</sup>, 27<sup>th</sup> and 29<sup>th</sup> January. The monitoring was undertaken downwind and at the boundary of the following works:

- Crushing activities in Zone 5 towards the south of the site on 21<sup>st</sup> January,
- Excavation works in the former Plant Area (Zone 4) on 21<sup>st</sup>, 27<sup>th</sup> and 29<sup>th</sup> January; and
- Placement of materials from the Plant Area into the borrow-pit in Zone 2 on 27<sup>th</sup> and 29<sup>th</sup> January.

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

## 2.3 Odour Monitoring

### 2.3.1 Odour Diaries

Odour diaries for January show that there were 2 Odour Days when odour intensity was rated greater than 4, but these occurred at times when there was no wind, and therefore the direction of the source of odour could not be fully determined. During these odour episodes (3<sup>rd</sup> January at 16:20 and 5<sup>th</sup> January at 06:20) the reported odour descriptions were “smokey” and were therefore unlikely to be connected with the Avenue site.

### 2.3.2 Sensory Field Odour Surveys

Sensory field odour surveys were carried out on 4, 12, 20, 27 January 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 one location the maximum odour annoyance impact was '*Medium*', although the odour descriptors used during the field odour surveys to characterise the odours did not suggest that odours were from the Avenue site and identified that agricultural activity (cattle) was the cause of the observed odours. At all other times and locations the maximum odour annoyance impact were '*Low-Medium*' and, therefore, the effects of odour are not considered significant.

### 2.3.3 Odour Complaints

No odour-related complaints were received during the month, although an enquiry about odour was made on 27<sup>th</sup> January. This coincided with the period between 27<sup>th</sup> and 29<sup>th</sup> January when odour levels in excess of those considered as typical were observed around the site offices and downwind of relevant works. The odours were associated with the excavation of material in Zone 4 and deposition in Zone 2 and were therefore attributable to operations at the Avenue.