Contractor

Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

AIR QUALITY MONITORING REPORT AUGUST 2014

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Contents

1. INTRODUCTION

1.1. Air quality monitoring is being undertaken by FCBC during the construction of the Forth Replacement Crossing and the associated road network. This report details the air quality monitoring that is currently being undertaken across the site and presents the monitoring results for August 2014.

1.2. Air quality monitoring during this period has been undertaken in accordance with the Code of Construction Practice (CoCP) and the Dust and Air Quality Management Plan (DAQMP) contained within the Environmental Management Plan (EMP).

2. MONITORING EQUIPMENT AND LOCATIONS

2.1. Air quality is being monitored on site using both automatic light scatter dust meters and Frisbee gauge dust deposition monitoring. Thirteen Frisbee gauges are set up at sensitive locations across the site to measure dust deposition rates (Figure 1). Seven automatic light scatter meters have also been installed at various sensitive locations to measure real time particulate matter (PM_{10}) concentrations and the Total Suspended Particle (TSP) concentrations (Figure 2). These meters are calibrated annually. Table 1 lists the air quality monitoring equipment present at each monitoring location, including the date it was installed.

2.2. Light scatter type monitoring equipment have been selected as a site monitoring tool to create a live network which assesses the levels of fugitive particulate matter, principally airborne dust. These monitors require less space, maintenance and power than other real time monitors such as a Tapered Element Oscillating Microbalance (TEOM) which is used and designed to measure particulate levels to exceedingly high standards, including measuring long-term compliance to statutory limits. Light scatter meters are more practicable to deploy. However, the meters do generally record levels higher than those measured by the TEOM. The meters can also be affected by atmospheric moisture content which further increases reported levels. Accordingly, any elevations of statutory limits should be treated as precautionary exceedances. The monitors are reliable for on-site monitoring and the establishment of action thresholds to ensure unforeseen activities generating significant dust are identified and suitably controlled. Light scatter meters are becoming the construction and waste industries norm for particulate dust monitoring.

2.3. In association with air quality monitoring across the site, temperature and relative humidity are also continually measured by the light scatter meters at Inchgarvie Lodge and Clufflat Brae. Weather stations, located at the sound level meters at Echline and Linn Mill which are adjacent to the light scatter meters at these monitoring locations, also continually record weather data, including temperature, relative humidity, wind speed and wind direction.

2.4. In addition to the fixed monitoring equipment used at sensitive locations across the site, a daily dust log for both the North and South sites has been kept by the FCBC Environmental Department. This daily dust inspection is used to identify any dust occurring as a result of construction works and any actions required. This log also provides a visual record of the weather conditions at the time of the inspection, including conditions that can affect readings, such as fog.

2.5. Frequent environmental site inspections are also undertaken by members of the FCBC Environmental Department. These inspections include a dust check to assess the following:

- dust levels on site;
- suppression/dampening down; and
- transportation of materials.

In relation to these inspections, the FCBC Environmental Department register any environmental issues using a QMT (Quality Management Tool). Any issues relating to air quality can therefore be noted and closed out appropriately.

Figure 1: Example of an Installed Frisbee Gauge Meter

Figure 2: Example of an installed Automatic Light Scatter Dust Meter

Table 1: Air Quality Monitoring Locations

Ref:	Monitoring Location	Monitoring Equipment	Installation Date	Construction Activities in August
M1	Whinny Hill	Frisbee	21/03/12	• Earthworks
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	• Marine works • Assembling and fixing rebar and formwork works at Pier S4 • Concrete pouring at Pier S4 • Repair and removal of formwork platforms • Excavation at S 2&3
M8	Barracks West	Frisbee	31/08/11	• Marine works • Assembling and fixing rebar and formwork works at Pier S4 • Concrete pouring at Pier S4 • Repair and removal of formwork platforms • Excavation at S2&3
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	• Launch – Element joints and welding • Assembling and fixing rebar and formwork works at Pier S4 • Concrete pouring at Pier S4 • Repair and removal of formwork platforms • Excavation at S2&3 • Brickwork cladding to Inchgarvie Lodge wall
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	• Launch – Element joints and welding • Launch Operations
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	• Launch – Element joints and welding • Launch Operations • Brickwork cladding to Inchgarvie Lodge wall
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	• Launch – Element joints and welding • Launch Operations • Excavation and haulage from

				mainline north of A904 to Dundas area
M15	Echline	Frisbee	16/08/11	• Launch – Element joints and welding • Launch Operations • Paving, kerbing, drainage and earthworks adjacent to A904 • Painting, surfacing and concrete finishing at gyratory • Construction of slip roads south of Queensferry gyratory
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	• Filling embankments and sheet piling at B800 • Concrete pours and rebar work • Utility works
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	• Haulage of excavated materials from Echline • Construction of road formation from Dundas to Queensferry gyratory
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	• None
		TEOM	23/05/12	

3. AIR QUALITY MONITORING RESULTS

3.1. Automatic Light Scatter Dust Meter Monitoring Results

3.1.1. Light scatter results for August 2014 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM_{10} levels were below threshold levels throughout the month for all monitors. The monitors follow the same general pattern throughout the month of August with the exception of the Scotstoun monitor which varied between 13th to 22nd August, although results were still well below the action level.

3.1.2. The PM_{10} results have also been compared to the daily mean results obtained from the TEOM air quality monitoring stations located in Newton, Rosyth, and Broxburn, and from the TEOM FDMS stations located at Queensferry Road,

Edinburgh and St Leonards, Edinburgh (an urban background site). The TEOM at Newton was installed by West Lothian Council, facilitated by FCBC, during May 2012. The comparison between the light scatter and TEOM results demonstrates that both sets of results generally follow the same pattern at similar levels, indicating that the pattern observed throughout August was largely driven by regional changes in air quality.

3.2. Total Suspended Particles

3.2.1. The TSP results for August 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during August were found to be low and all within the threshold level. All locations across the site were mostly found to follow a similar pattern, demonstrating that, in general, the levels were influenced by regional changes in TSP levels, rather than construction works.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for August 2014 have been presented in a chart and can be found in Appendix C. This includes an additional Frisbee (Echline Corner) currently located south of the A904 in proximity to the Echline monitor. This temporary Frisbee is used to provide additional information and its results are presented alongside the 13 permanent monitors. Frisbee dust deposition results were collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Two collections were made in August, on the 6th and 20th. The next collection will take place on the 3rd September 2014.

3.3.2. The site action level for the dust deposition rate has been set at 250 mg/m^2/day. Exceedances of this level are treated as a potential incident and a review of the works in the vicinity of the site is instigated. A lower site review level has been set at 140 mg/m^2/day. Where concentrations exceed the lower review threshold the site works are reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.

3.3.3. During August there were 4 exceedances of the site review level and one exceedance of action level (see Table 2).

Table 2: Exceedances of the dust deposition thresholds

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
06/08/2014	Action	Springfield	No dust generating construction activities in close proximity. Dust generating activities near A904 being mitigated.	Low winds/ Generally dry
	Review	Barracks East	No dust generating construction activities in the area	
		Inchgarvie Lodge	No dust generating construction activities in the area	
		Scotstoun	No dust generating construction activities in close proximity.	
20/08/2014	Review	Scotsoun	No dust generating construction activities in close proximity.	Low winds/ Generally dry

3.3.4. For each of the exceedances of the review or action level, a review of the works in each of the areas, weather conditions, and the mitigation measures in place was undertaken. Other considerations were also made, such as where the gauge is located. Where available, the Frisbee results were also considered alongside the particulate matter data for the same period; particulate matter levels were low and comfortably within the threshold levels at all locations throughout the period of time covered by the dust deposition monitoring.

3.3.5. Frisbee dust deposition levels were higher than usual at all monitors across site for the duration of the fortnight ending 6th August. This suggests that a regional change/event is contributing a greater level than usual across all monitors during this period.

3.3.6. With regards to the exceedance of the action level at Springfield for the fortnight concluding 6th August, a review into works undertaken in the vicinity was carried out. However, during the period in question no construction activities that would be likely to give rise to dust took place in close proximity to the area. The excavations being undertaken to the north of the A904 are located 500m to the south-west. Three light scatter meters are situated within 500m of the Springfield Frisbee (Clufflat, Echline and Inchgarvie Lodge), all of which showed low levels for all indicators (TSP and PM_{10}) during this period. These factors would indicate that the exceedance at this location was not related to FCBC works. Although the Inchgarvie Lodge Frisbee gauge registered an exceedance of the review level for this period, dust deposition levels were raised across the whole site and were not considered to be caused by construction activities (Section 3.3.5.). Similar construction activities were ongoing throughout the entire month and low levels of dust deposition were measured for the latter two weeks, further suggesting that the exceedance was not related to FCBC construction factors.

3.3.7. During the fortnight ending the 6th August the Frisbees located at Barracks East, Inchgarvie and Scotstoun all registered levels slightly above the review level. As outlined in Section 3.3.5, Frisbee dust deposition levels were higher than usual across all 14 site monitors for the duration of this fortnight suggesting that a regional change/event was contributing to all levels. A review was conducted into works undertaken in the vicinity of these locations. It was concluded that the high results at these locations cannot be explained by FCBC construction activities undertaken during this period and are likely due to regional high levels of dust (Section 3.3.5).

3.3.8. With regard to the exceedance of the review level at Scotstoun for the fortnight concluding 20th March 2014, a further review into works undertaken in the

vicinity took place. However, during the period in question no construction activities that would be likely to give rise to dust took place in proximity to the meter. The Scotstoun light scatter meter registered levels well below the action level for both TSP and PM_{10} during this period. These factors would indicate that the exceedance at this location was not related to FCBC works. However, considering the elevated levels in consecutive periods FCBC will conduct increased inspections in the vicinity to ensure adequate dust suppression measures are in place if required.

3.4. Daily Dust Log and Environmental Inspections

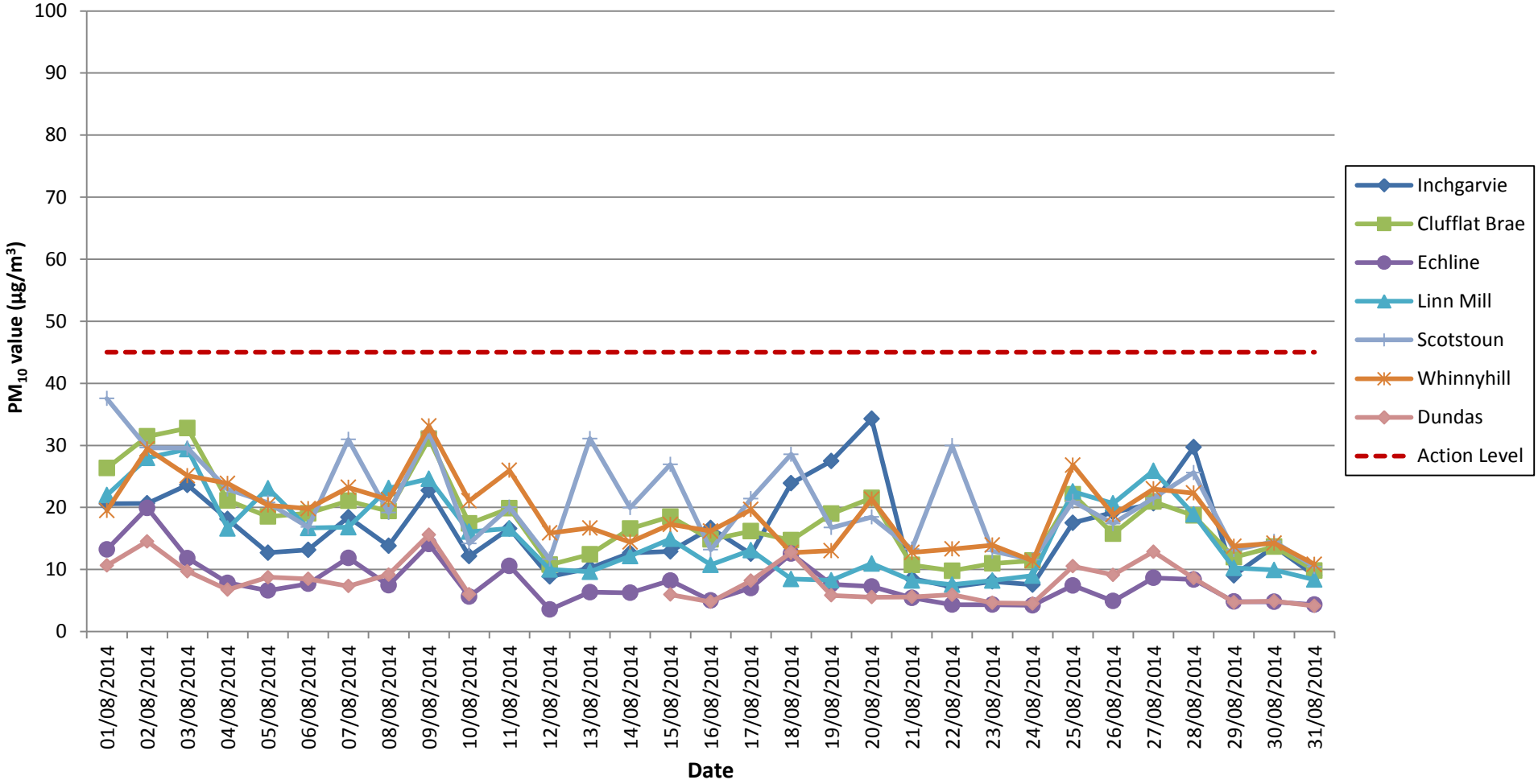
3.4.1. A summary of the daily dust log for August can be found in Appendix D. During August one incident of dust arising from the construction site was noted on the 18th August. Dust was observed arising from a pecker, breaking rock immediately adjacent to the East A904 (Figure 3). The site agent was called to ensure the appropriate mitigation was put in place in relation to the site activity. The situation, including nearby monitors were checked to ensure that dust was not migrating off-site. Dust was also observed off-site from agricultural activities (harvesting) adjacent to the A904. All monitors in proximity to both these activities (Echline, Linn Mill, Inchgarvie Lodge and Clufflat) did not show elevated results on this date.

Figure 3: Location of pecker observed 18th August

3.4.2. During this period full environmental inspections were also undertaken across the site and covered areas where works were being undertaken. In August, no instances of dust were noted during inspections.

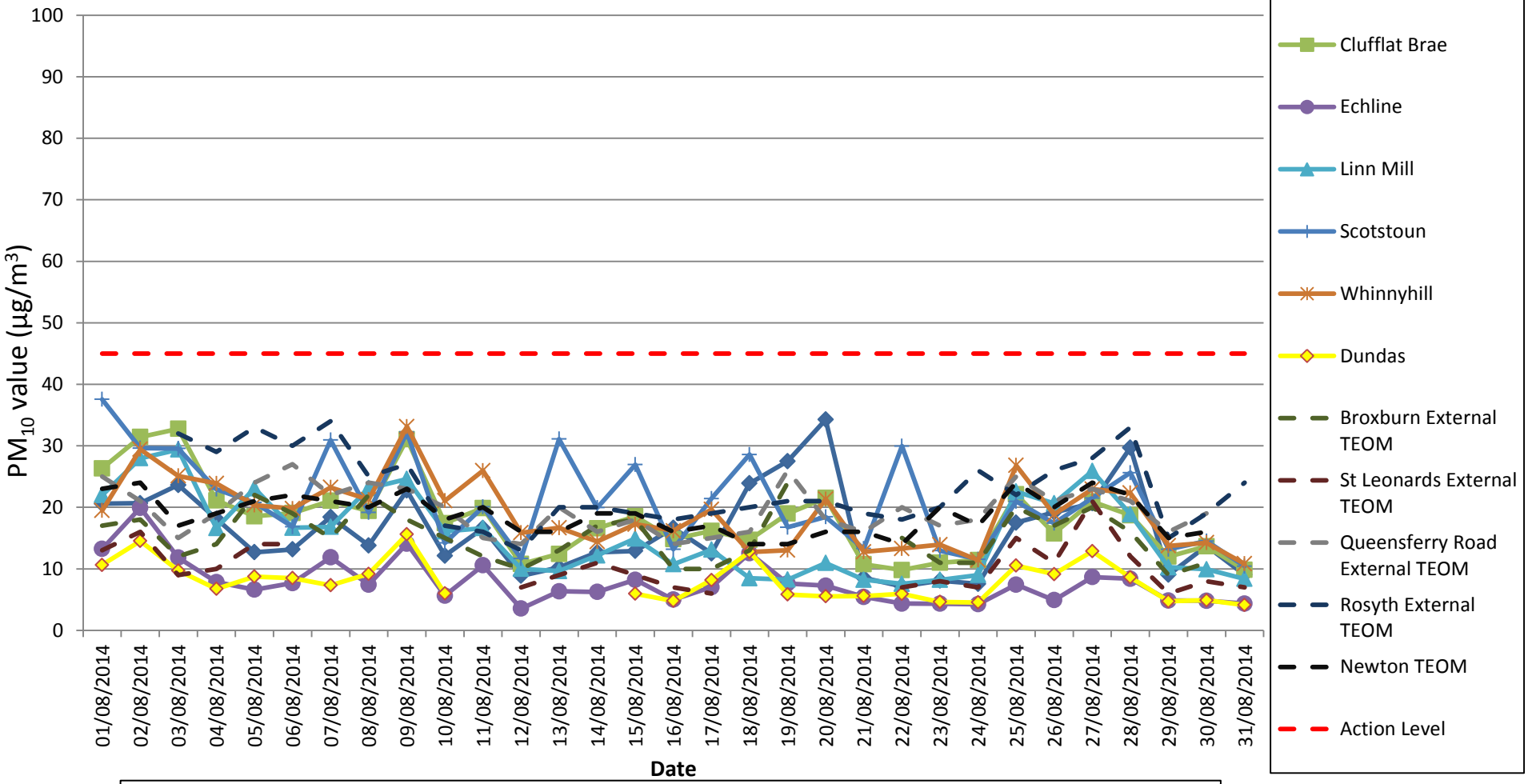
APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring
Particulate Matter (PM10) Results for all Monitoring Locations
August 2014



Note: No data at Dundas 11/08-14/08 due to to power supply issues.

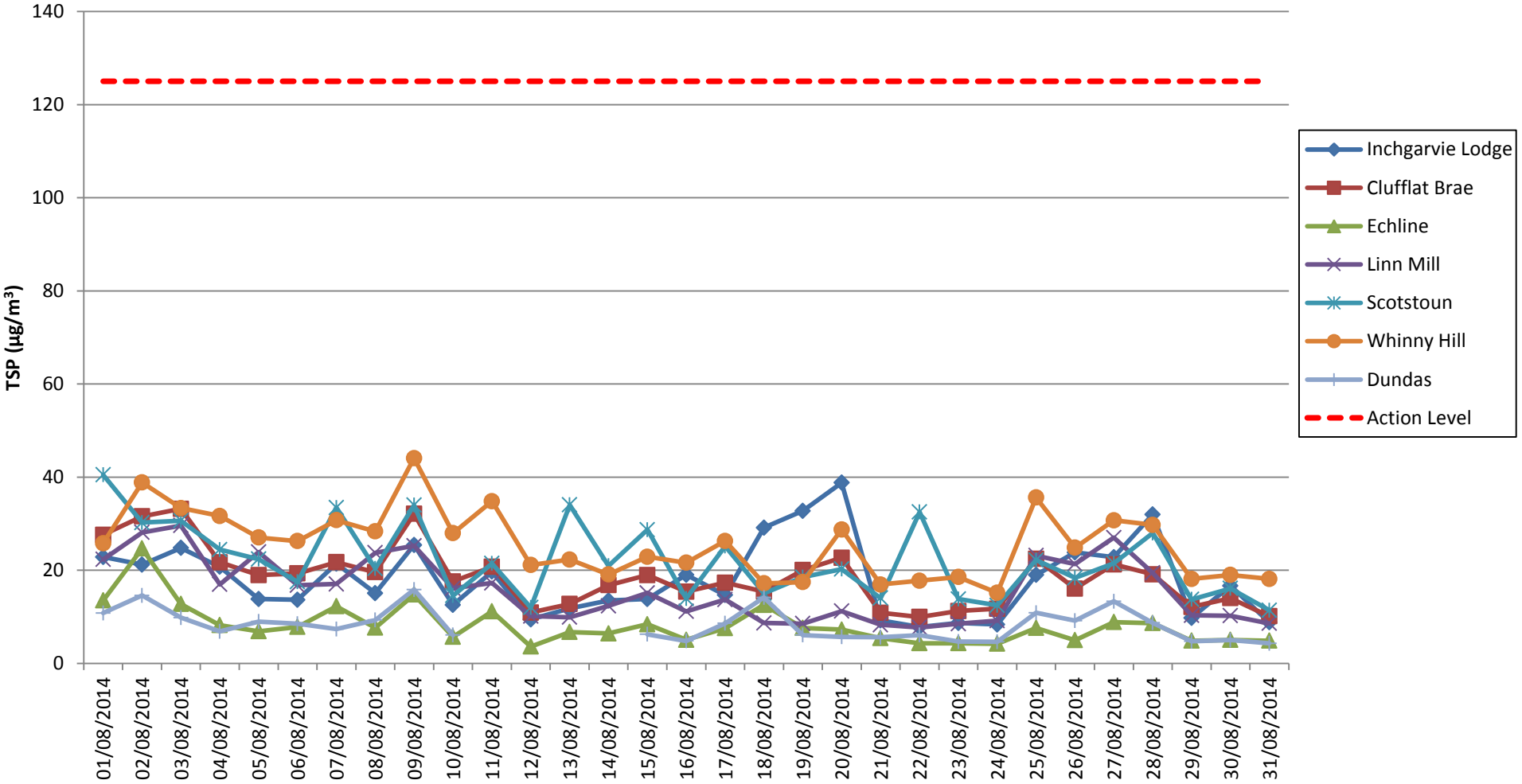
Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, inlcuding TEOM data August 2014



Note: No data at Dundas 11/08-14/08 due to to power supply issues. TEOM data missing from scottish air quality for 7-11 August for Broxburn and the 20-21 August for St. Leonard.

APPENDIX B: TOTAL SUSPENDED PARTICLES

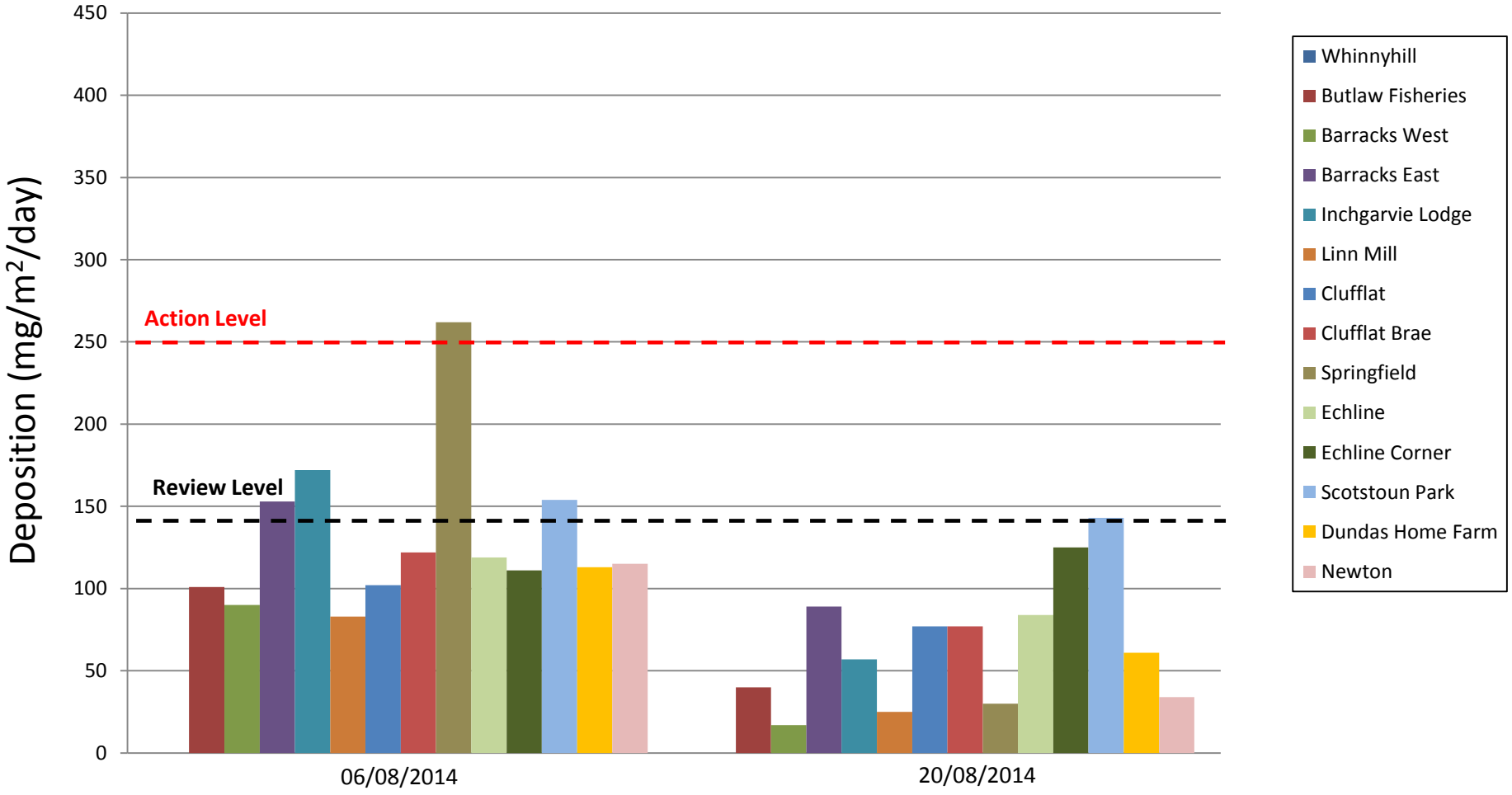
Total Suspended Particles (TSP) Results
August 2014



Note: No data at Dundas 11/08-14/08 due to a power supply issues.

APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: August 2014



APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - August 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/08/2014	N	LIGHT	SSE	DRY	N			
02/08/2014	N	LIGHT	NNE		N			
03/08/2014	N	LIGHT	E		N			
04/08/2014	N	MEDIUM	SW	DRY	N			
05/08/2014	N	LIGHT	NE	DRY	N			
06/08/2014	N	LIGHT	NE	WET	N			
07/08/2014	N	LIGHT	SW	DAMP	N			
08/08/2014	N	LIGHT	NE	DRY	N			
09/08/2014	N	LIGHT	WSW		N			
10/08/2014	N	LIGHT	NE		N			
11/08/2014	N	MEDIUM	WSW	WET	N			
12/08/2014	N	MEDIUM	WSW	DAMP	N			
13/08/2014	N	LIGHT	WSW	DRY	N			
14/08/2014	N	LIGHT	SE	DRY	N			
15/08/2014	N	LIGHT	SW	DAMP	N			
16/08/2014	N	MEDIUM	WSW		N			
17/08/2014	N	MEDIUM	WSW		N			
18/08/2014	N	LIGHT	W	DRY	N			
19/08/2014	N	LIGHT	W	DRY	N			
20/08/2014	N	LIGHT	WSW	DRY	N			
21/08/2014	N	LIGHT	SW	DRY	N			
22/08/2014	N	LIGHT	W	DRY	N			
23/08/2014	N	LIGHT	WSW		N			
24/08/2014	N	LIGHT	S		N			
25/08/2014	N	LIGHT	NNE	DRY	N			
26/08/2014	N	LIGHT	NNE	DRY	N			
27/08/2014	N	LIGHT	E	DRY	N			
28/08/2014	N	LIGHT	SE	DRY	N			
29/08/2014	N	MEDIUM	SW	DRY	N			
30/08/2014	N	MEDIUM	W		N			
31/08/2014	N	LIGHT	WSW		N			

Daily Dust Log - North - August 2014

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/08/2014	S	LIGHT	SSE	DRY	N			
02/08/2014	S	LIGHT	NNE		N			
03/08/2014	S	LIGHT	E		N			
04/08/2014	S	MEDIUM	SW	DRY	N			
05/08/2014	S	LIGHT	NE	DRY	N			
06/08/2014	S	LIGHT	NE	WET	N			
07/08/2014	S	LIGHT	SW	DAMP	N			
08/08/2014	S	LIGHT	NE	DRY	N			
09/08/2014	S	LIGHT	WSW		N			
10/08/2014	S	LIGHT	NE		N			
11/08/2014	S	MEDIUM	WSW	WET	N			
12/08/2014	S	MEDIUM	WSW	DAMP	N			
13/08/2014	S	LIGHT	WSW	DRY	N			
14/08/2014	S	LIGHT	SE	DRY	N			
15/08/2014	S	LIGHT	SW	DAMP	N			
16/08/2014	S	MEDIUM	WSW		N			
17/08/2014	S	MEDIUM	WSW		N			
18/08/2014	S	LIGHT	W	DRY	Y	Y	Pecker North of A904	Visible Dust from a pecker, breaking rock, immediately adjacent to the East A904 (Figure 3)and a combine was also observed creating dust south of the Eastern end of the A904 (See section 3.4)
19/08/2014	S	LIGHT	W	DRY	N			
20/08/2014	S	LIGHT	WSW	DRY	N			
21/08/2014	S	LIGHT	SW	DRY	N			
22/08/2014	S	LIGHT	W	DRY	N			
23/08/2014	S	LIGHT	WSW		N			
24/08/2014	S	LIGHT	S		N			
25/08/2014	S	LIGHT	NNE	DRY	N			
26/08/2014	S	LIGHT	NNE	DRY	N			
27/08/2014	S	LIGHT	E	DRY	N			
28/08/2014	S	LIGHT	SE	DRY	N			
29/08/2014	S	MEDIUM	SW	DRY	N			
30/08/2014	S	MEDIUM	W		N			
31/08/2014	S	LIGHT	WSW		N			