



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
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 DRAGADOS
 Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

AIR QUALITY MONITORING REPORT
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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 November 2012.

- 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 Pollution Management Plan (DAPMP) 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 (PM₁₀) concentrations and the Total Suspended Particle (TSP) concentrations (Figure 2). Table 1 lists the air quality monitoring equipment present at each monitoring location. The installation of the air quality monitoring equipment has not been simultaneous across the site, thus installation dates are also given in Table 1.

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, weather conditions (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 records the weather conditions at the time of the inspection.

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.



Figure 1: Example of an Installed Frisbee Gauge Meters



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 November
M1	Whinny Hill	Frisbee	21/03/12	Drilling for blasting Blasting Breaking and excavation of rock Haulage of rock
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	Waterproofing and backfilling of S7 & S8 Earthbund at S6 Marine works S6 Access Track Drainage works
M8	Barracks West	Frisbee	31/08/11	Marine works Waterproofing and backfilling of S7 & S8 Earthbund at S6S6 Access Track Drainage works
M9	Barracks East	Frisbee	31/08/11	Marine works Waterproofing and backfilling of S7 & S8 Earthbund at S6S6 Access Track Drainage works
M10	Inchgarvie Lodge	Frisbee	22/08/11	Waterproofing and backfilling of S7 & S8 S6 Access Track Drainage tie in works Excavation of material from launch and south abutment
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Excavation of material from launch and south abutment
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Excavation of material from launch and south abutment SUDS pond drainage connection
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	Excavation of material from launch SUDS pond drainage connection

M15	Echline	Frisbee	16/08/11	Cut/Fill from Queensferry gyratory Works on A904
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	Import of materials Utility works Soil stripping
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	Utilities works Earthworks
		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 November 2012 have been presented in a monthly chart; this can be found in Appendix A. Generally, results show that the PM₁₀ levels were low and largely followed the same pattern across the site. There was a single exceedance of the threshold in November. This occurred at Echline on 15 November. On this date, high levels were recorded only between 04:00 to 06:00 am and 07:00 to 09:00 am. It is believed, therefore, that this is an isolated event that is unlikely to be related to construction works due to the time of day at which the high levels were recorded. It is possible that the results were affected by foggy conditions, with local weather reports showing foggy conditions on this date and humidity levels above 90% recorded between midnight and 12pm at nearby weather stations see paragraph 2.2).. Additionally, the slightly elevated results (although not exceedances) noted at some of the devices, notably Whinny Hill and Scotstoun, on 20 November are associated with the servicing procedure of the devices.

3.1.2. The PM₁₀ results have also been compared to the daily mean results obtained from the TEOM air quality monitoring stations located in Newton, Rosyth, Broxburn, 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. 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 November was largely due to regional changes in air quality.

3.1.3. A correction factor has been applied to the data included for Dundas between 1 and 20 November. Results for this location were noted by the Environmental Team to be lower than would be expected and previous consultation with the supplier also identified the raw data readings from the meter as too low. As re-calibration by the supplier did not resolve the errors a correction factor has been applied to the results. A visit by a site engineer was undertaken on the 20 November to service and re-calibrate the device which resolved the issue associated with the device reading too low. Data is also missing for Inchgarvie during November due to a loss of power, accidentally caused by a third party. An electrician visited the site on 30 November to restore the power supply; this device is now fully functioning.

3.2. Total Suspended Particles

3.2.1. The TSP results for November 2012 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at all monitoring locations throughout November were within the threshold level and largely found to follow a similar pattern across the site, demonstrating that in general the levels are influenced by regional changes in TSP levels, rather than construction works. Although within the threshold, a peak was recorded at Echline on 15 November. This

is discussed in paragraph 3.1.1 and it is not believed that this was caused by construction works. Also, as noted with regard to the particulate matter results, the slight peaks in the results from some of the devices on 20 November are associated with the servicing of the devices and not likely to be related to construction works.

3.2.2. Due to a device error associated with the measurement of TSP at Dundas the results for this location have been excluded from the graph between 1 and 20 November; prior to servicing, the measurements of TSP were unrealistically low. The site visit from an engineer on 20 November resolved this issue with the device. Data is also missing for Inchgarvie due to the loss of power, as noted in paragraph 3.1.3; power was restored to this device on 30 November.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for November 2012 have been presented in charts and can be found in Appendix C. To present results, all the monitoring locations have been grouped, based on locality, into the following:

- **Group 1:** M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill;
- **Group 2:** M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline;
- **Group 3:** M16 Scotstoun Park and M17 Dundas Home Farm;
- **Group 4:** M18 Newton; and
- **Group 5:** M1 Whinny Hill.

3.3.2. Frisbee dust data deposition results are collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Two collection dates fell during November; 14 and 28 November 2012. The next collection date is due on the 12 December. During

November, there were no exceedances of either the site review level or the site action level across the site.

- 3.3.3.** The site action level for the dust deposition rate has been set at 250 mg/m²/day. Exceedances of this will be treated as a potential incident and a formal review of the works in the vicinity of the site will be instigated. A lower, site review level has been set at 140 mg/m²/day. Where concentrations exceed the lower action threshold the site works will be reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.

3.4. Daily Dust Log and Environmental Inspections

- 3.4.1.** A summary of the daily dust log for November can be found in Appendix D. A single instance of visual dust on site was noted in the southern networks area during November, with a single occurrence also noted in the northern networks areas.
- 3.4.2.** The cause of the observed dust levels in the south on 21 November was found to be due to pecking works in the southern launch area. Although this was a one-off occurrence, it should be noted that the bowser was available on site to dampen down in situations where an issue with dust levels persists. An attachment is available for the bower to allow it to spray over excavation areas.
- 3.4.3.** The dust noted in the north on 20 November was due to drilling works at Whinny Hill. It was found that there was an error with the vacuum on the rig. Works were therefore ceased until the vacuum was serviced the following day.
- 3.4.4.** During this period a number of environmental inspections were also undertaken across the site. A summary of the Dust and Air Quality section of these environmental checks has been included in Appendix

E. Due to updates made to the environmental inspection regime an increased number of inspections across the site were undertaken by the FCBC Environmental Department during November. A total of 34 inspections were undertaken. Air quality issues were noted at the time of the inspection on only one occasion. This coincided with the dust incident noted in the daily dust log in the southern launch area on 21 November (see paragraph 3.4.2).



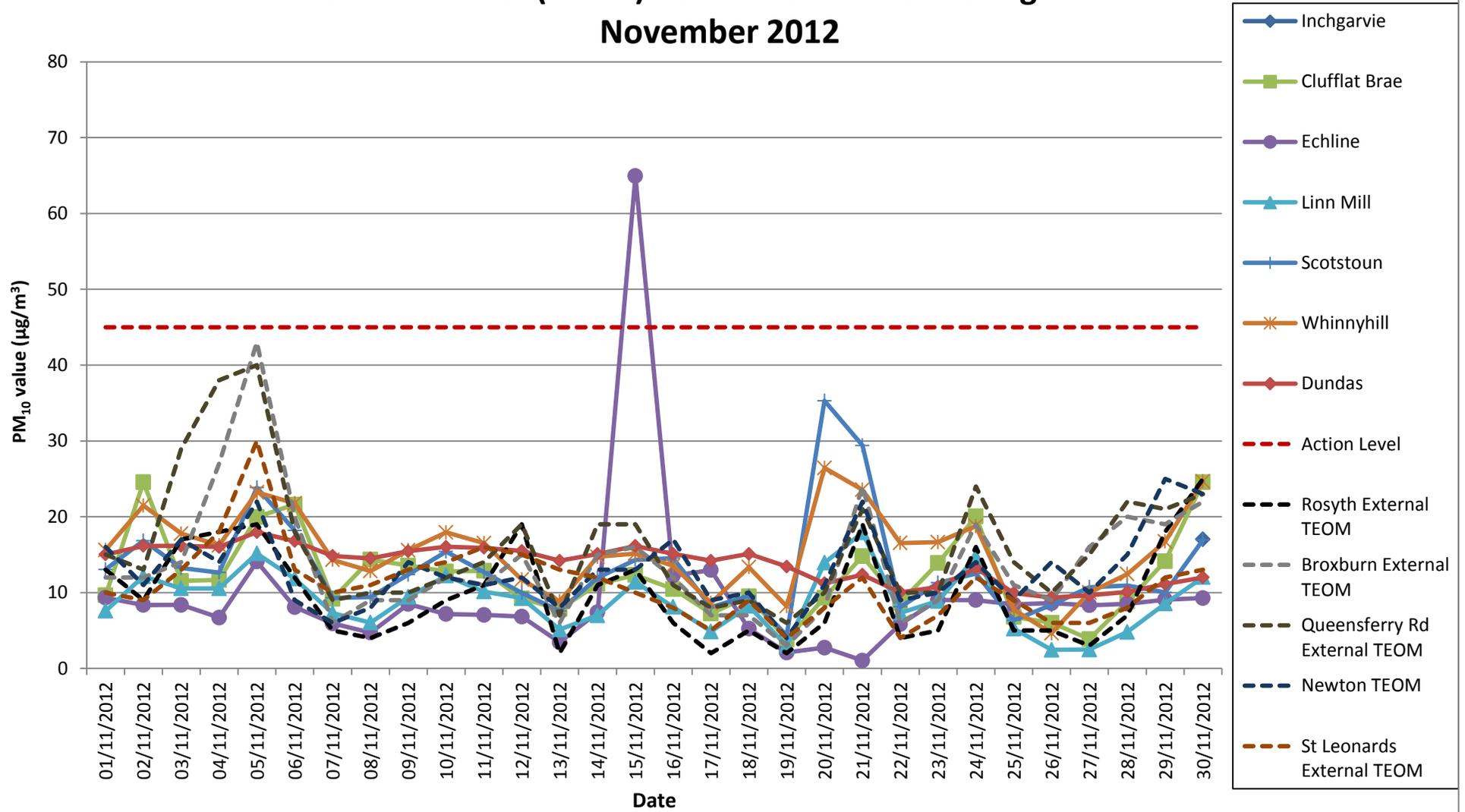
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APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring

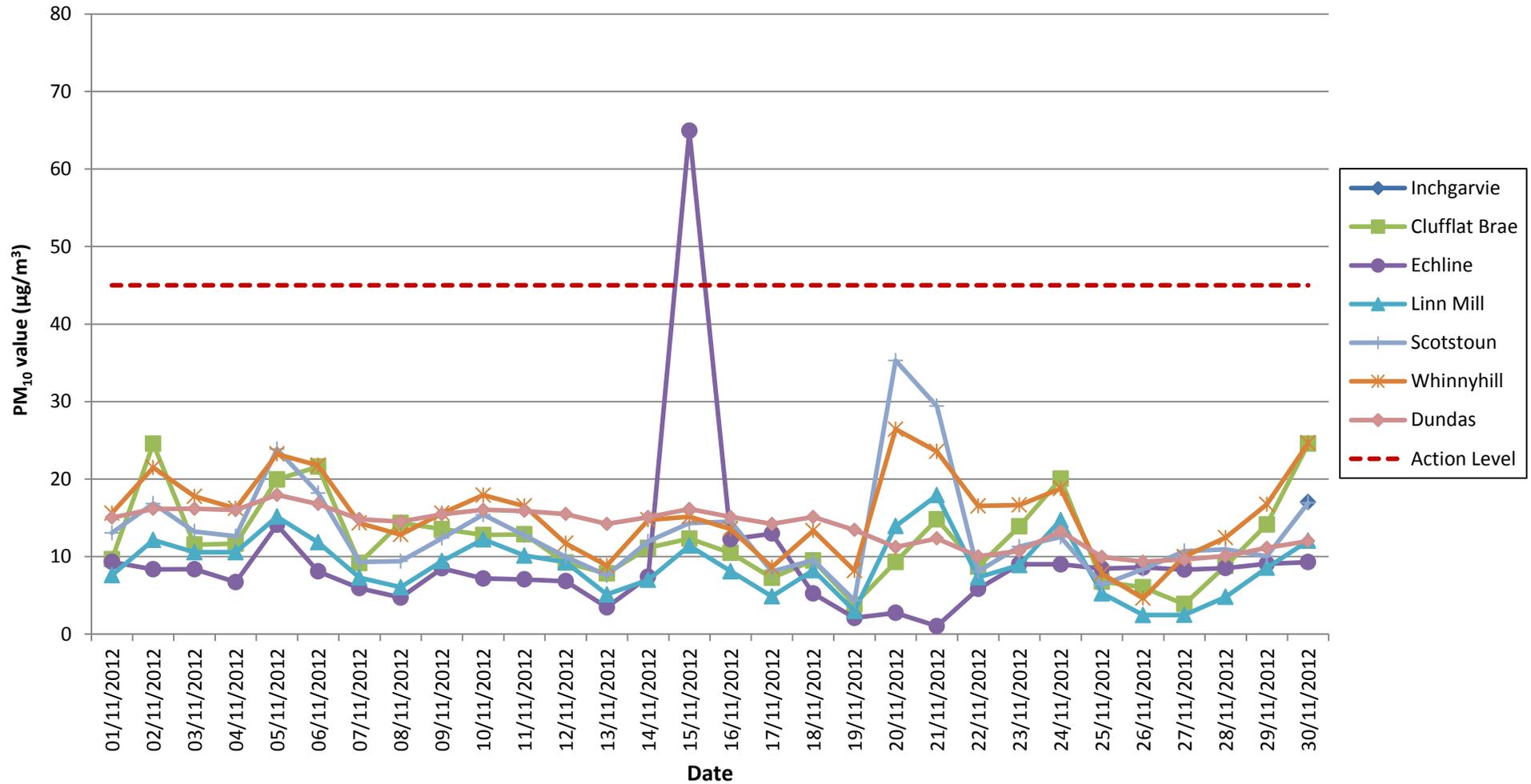
Particulate Matter (PM10) Results for all Monitoring Locations

November 2012



Note: Between 1/11/12 and 20/11/12 a correction factor has been applied to the results obtained from the meter at Dundas following consultation with the supplier. Data is missing from Inchgarvie due to an error with the connection accidentally caused by a third party; power supply was restored on 30/11/12.

Air Quality Monitoring Particulate Matter (PM10) Results for all Monitoring Locations November 2012



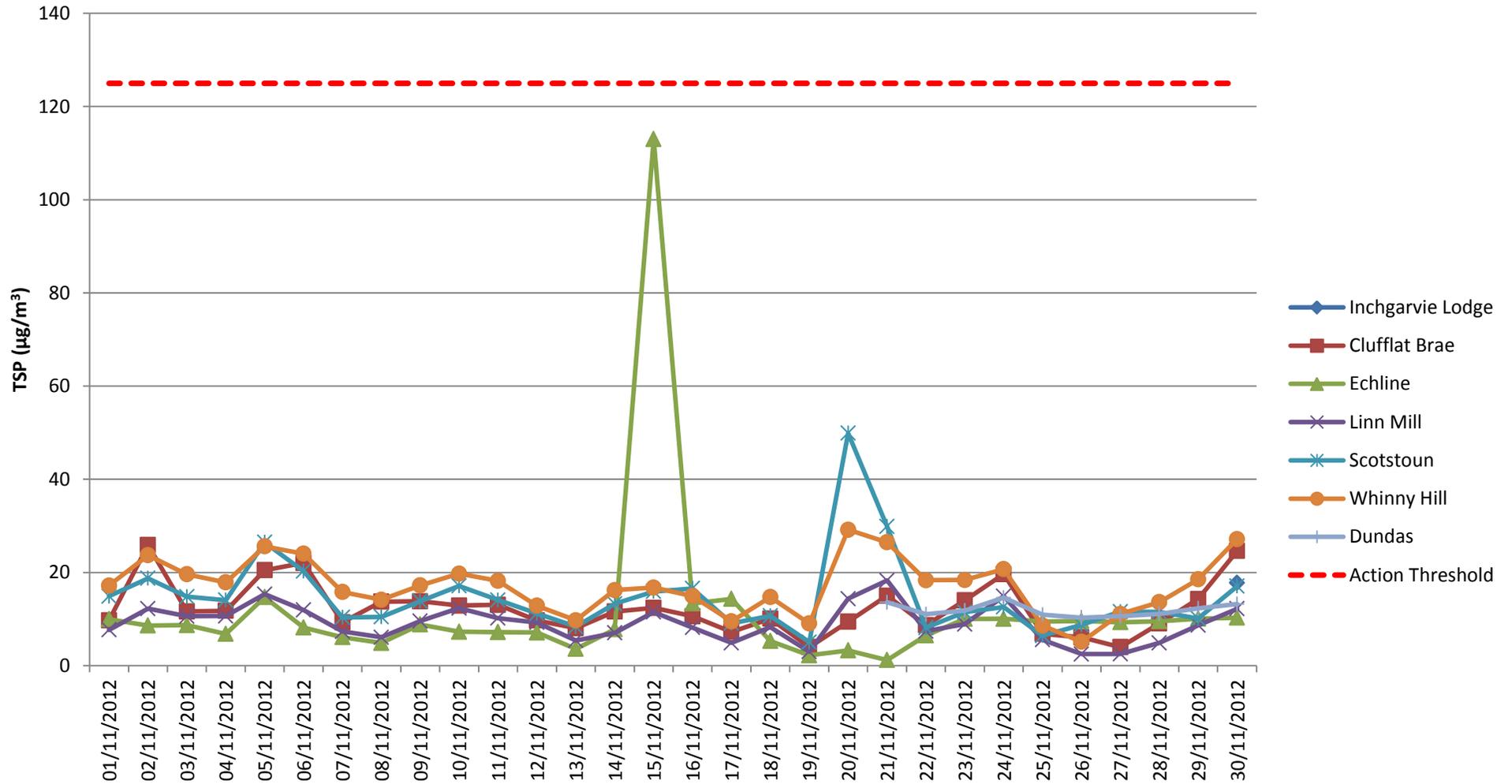
Note: Between 1/11/12 and 20/11/12 a correction factor has been applied to the results obtained from the meter at Dundas following consultation with the supplier. Data is missing from Inchgarvie due to an error with the connection accidentally caused by a third party; power was restored to this device on 30/11/12.



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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results November 2012



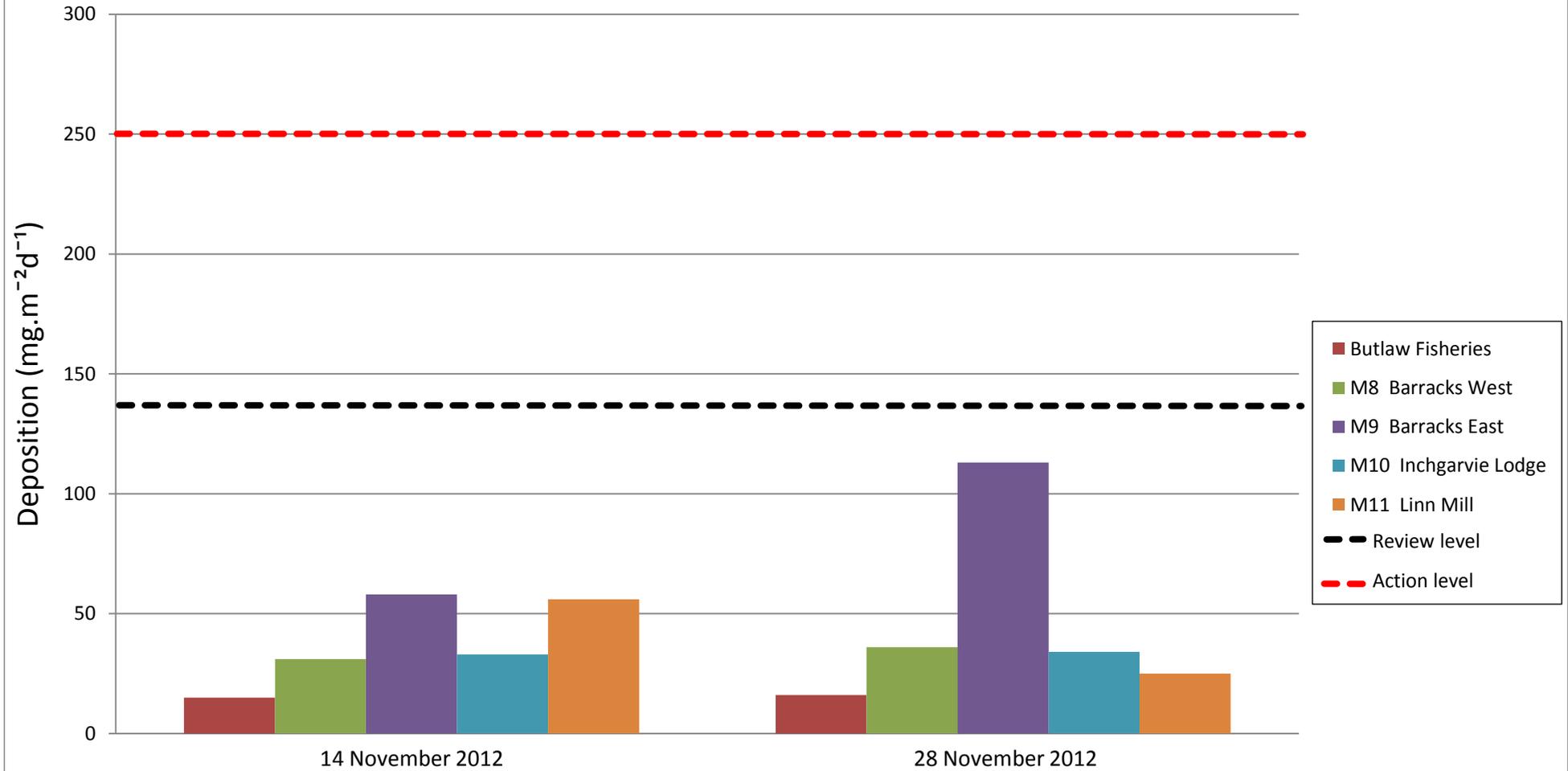
Note: The meter at Dundas was serviced on 20/11/12 - prior to this there are errors associated with the results and are therefore not included in the graph. Data is missing from Inchgarvie due to an error with the connection accidentally caused by at third party; power was reconnected on 30/11/12.



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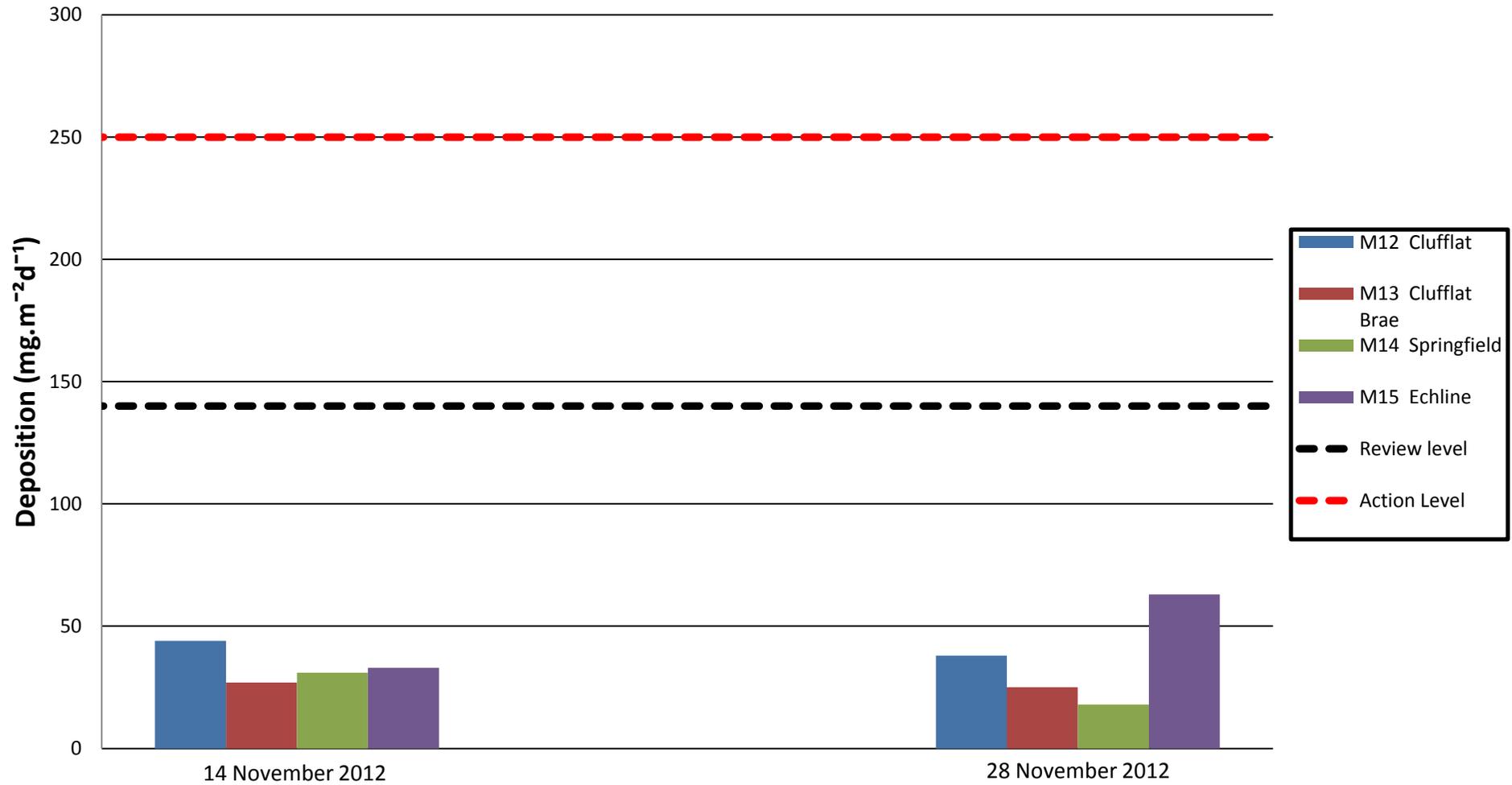
APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: Group 1
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill



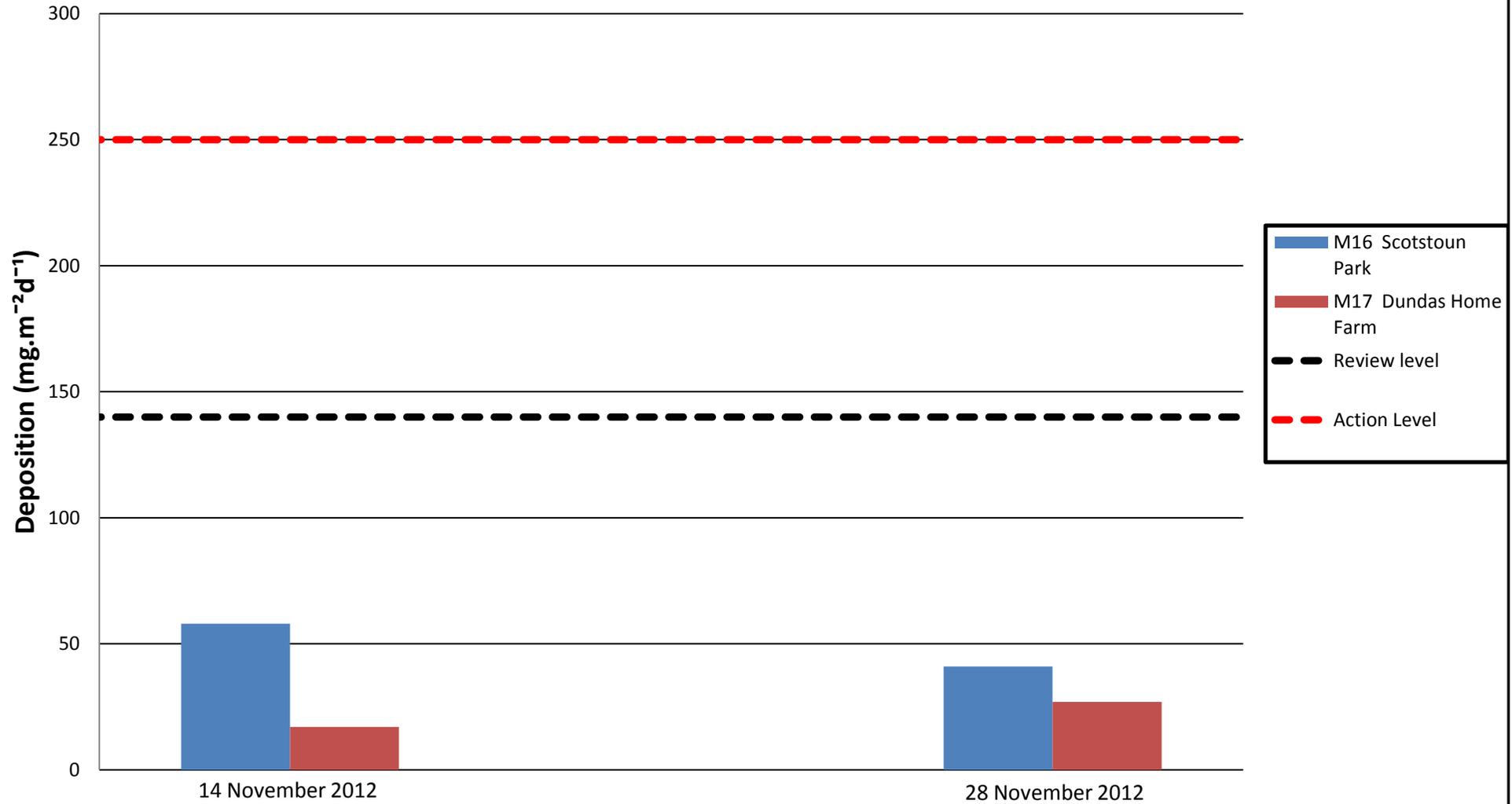
Frisbee Dust Deposition Results: Group 2

Locations: M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline



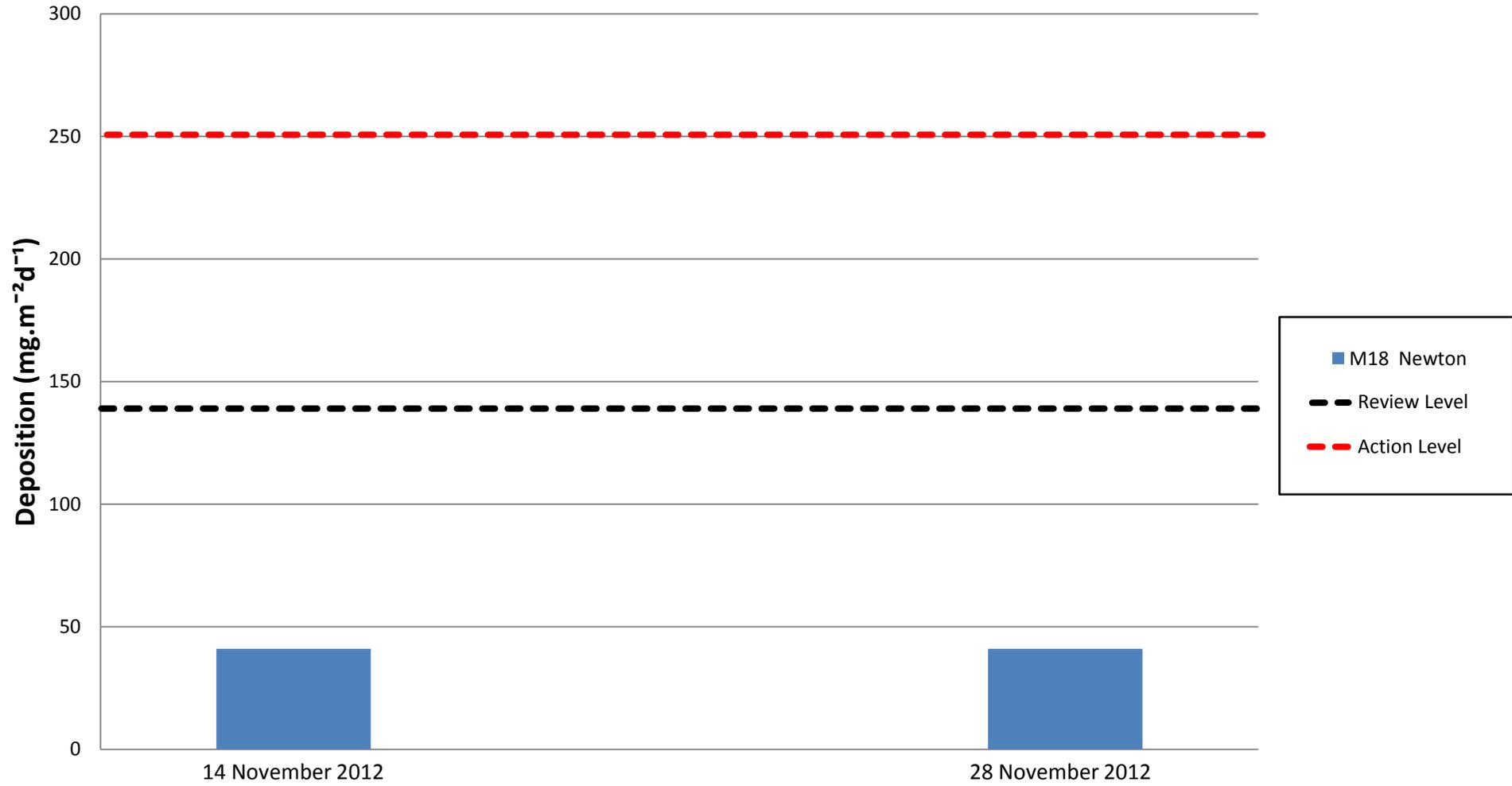
Frisbee Dust Deposition Results: Group 3

Locations: M16 Scotstoun Park and M17 Dundas Home Farm



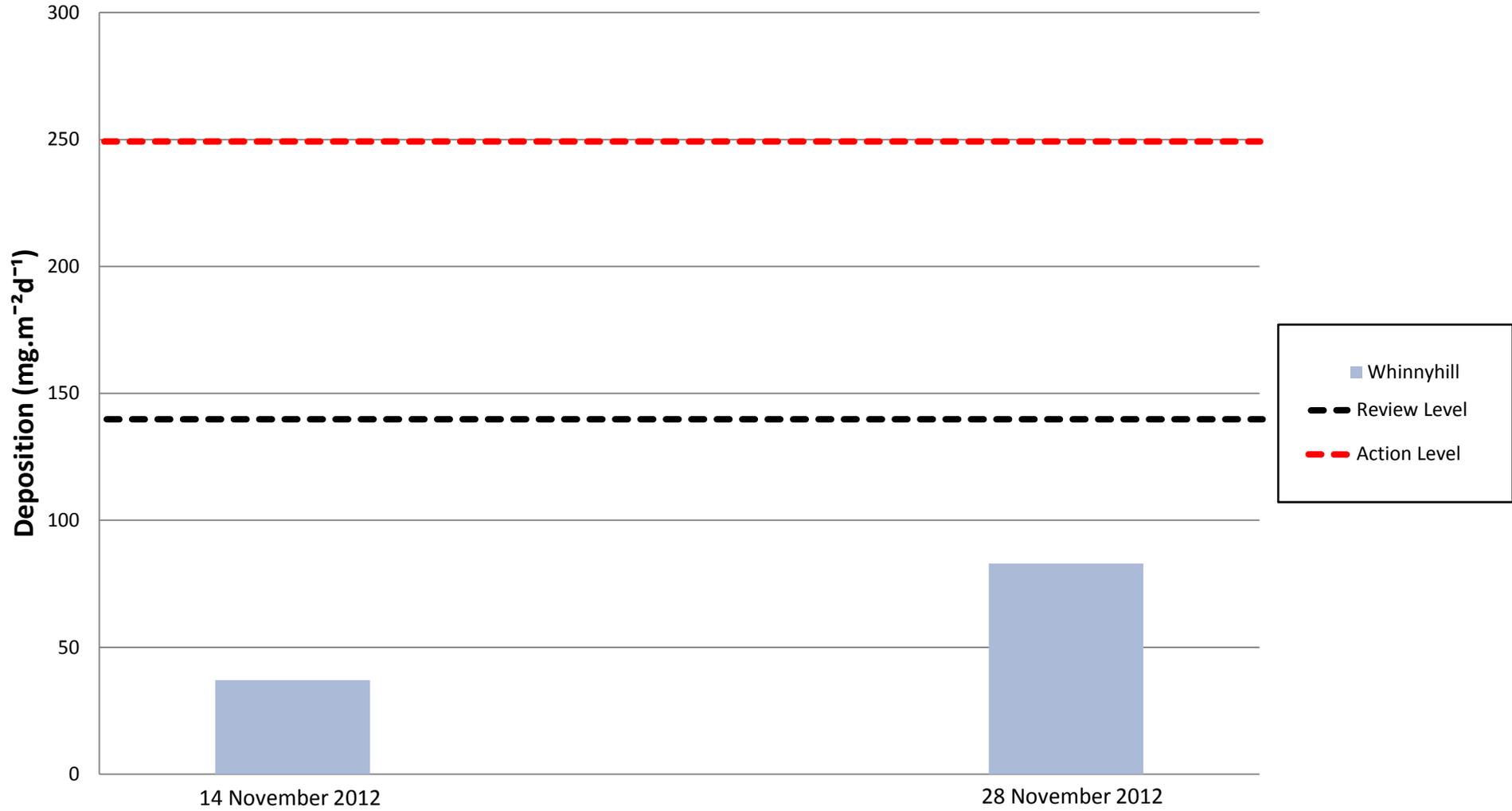
Frisbee Dust Deposition Results: Group 4

Location: M18 Newton



Frisbee Dust Deposition Results: Group 5

Location: M1 Whinny Hill





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - November 2012

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	OTHER COMMENTS	Actions (if applicable)
01/11/2012	N	LIGHT	W	DAMP	N				
02/11/2012	N	LIGHT	SW	DAMP	N				
03/11/2012									
04/11/2012									
05/11/2012	N	LIGHT	W	DAMP/WET	N				
06/11/2012	N	LIGHT	SW	WET	N				
07/11/2012	N	LIGHT	S	DAMP/WET	N				
08/11/2012	N	STRONG	SW	DAMP	N				
09/11/2012	N	STRONG	S	DAMP/WET	N				
10/11/2012									
11/11/2012									
12/11/2012	N	LIGHT	W	DAMP/WET	N				
13/11/2012	N	LIGHT	W	DAMP/WET	N				
14/11/2012	N	LIGHT	S	DAMP/WET	N				
15/11/2012	N	LIGHT	SW	DAMP	N				
16/11/2012	N	STRONG	SW	DAMP	N				
17/11/2012									
18/11/2012									
19/11/2012	N	STRONG	SE	DAMP	N				
20/11/2012	N	STRONG	SE	DAMP	Y	Y	Drilling rig	Vacuum on rig broken	Vacuum fixed on rig before any further drilling took place
21/11/2012	N	STRONG	SE	DAMP	N				
22/11/2012	N	STRONG	S	DAMP	N				
23/11/2012	N	LIGHT	NW	WET	N				
24/11/2012									
25/11/2012									
26/11/2012	N	LIGHT	W	DAMP	N				
27/11/2012	N	LIGHT	NW	DAMP	N				
28/11/2012	N	LIGHT	NW	DRY	N				
29/11/2012	N	LIGHT	W	DAMP/WET	N				
30/11/2012	N	LIGHT	W	DAMP	N				

Daily Dust Log - South - November 2012

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	OTHER COMMENTS	Actions (if applicable)
01/11/2012	S	LIGHT	W	DAMP	N				
02/11/2012	S	LIGHT	SW	DAMP	N				
03/11/2012									
04/11/2012									
05/11/2012	S	LIGHT	W	DAMP/WET	N				
06/11/2012	S	LIGHT	SW	WET	N				
07/11/2012	S	LIGHT	S	DAMP/WET	N				
08/11/2012	S	STRONG	SW	DAMP	N				
09/11/2012	S	STRONG	S	DAMP/WET	N				
10/11/2012									
11/11/2012									
12/11/2012	S	LIGHT	W	DAMP/WET	N				
13/11/2012	S	LIGHT	W	DAMP/WET	N				
14/11/2012	S	LIGHT	S	DAMP/WET	N				
15/11/2012	S	LIGHT	SW	DAMP	N				
16/11/2012	S	STRONG	SW	DAMP	N				
17/11/2012									
18/11/2012									
19/11/2012	S	STRONG	SE	DAMP	N				
20/11/2012	S	STRONG	SE	DAMP	N				
21/11/2012	S	STRONG	SE	DAMP	Y	Y	Pecking at southern launch		One off incident. Bowser available on site as required
22/11/2012	S	STRONG	S	DAMP	N				
23/11/2012	S	LIGHT	NW	WET	N				
24/11/2012									
25/11/2012									
26/11/2012	S	LIGHT	W	DAMP	N				
27/11/2012	S	LIGHT	NW	DAMP	N				
28/11/2012	S	LIGHT	NW	DRY	N				
29/11/2012	S	LIGHT	W	DAMP/WET	N				
30/11/2012	S	LIGHT	W	DAMP	N				



APPENDIX E: SUMMARY OF ENVIRONMENTAL INSPECTIONS

Summary of Dust and Air Quality Section of Environmental Inspections Undertaken in November 2012

Date	Location	Dust Levels	Suppression/ Dampening down	Transportation of materials	Comments/Actions
06/11/2012	Echline	Satisfactory	Satisfactory	Satisfactory	
06/11/2012	S6, S7 and S8	Satisfactory	Satisfactory	Satisfactory	
06/11/2012	Queensferry Gyrotory	Satisfactory	Satisfactory	Satisfactory	
06/11/2012	North - B981, FT05 and FT09	Satisfactory	Satisfactory	Satisfactory	
06/11/2012	North Abutment	Satisfactory	Satisfactory	Not Applicable	
06/11/2012	Ferrytoll Embankment	Satisfactory	Satisfactory	Satisfactory	
07/11/2012	Dundas Area	Satisfactory	Satisfactory	Satisfactory	
07/11/2012	SB Bus Link	Satisfactory	Satisfactory	Not Applicable	
07/11/2012	NB Bus Link	Satisfactory	Satisfactory	Not Applicable	
12/11/2012	S6, S7 and S8	Satisfactory	Satisfactory	Not Applicable	
13/11/2012	Dundas Area	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	NB Bus Link	Satisfactory	Not Applicable	Not Applicable	
13/11/2012	Queensferry Gyrotory	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	Echline	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	Whinny Hill and Castlandhill	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	North - B981, FT05 and FT09	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	Ferrytoll Embankment	Satisfactory	Satisfactory	Satisfactory	
13/11/2012	Marine Yard	Satisfactory	Not Applicable	Not Applicable	
13/11/2012	North Abutment	Satisfactory	Satisfactory	Not Applicable	
20/11/2012	North Abutment	Satisfactory	Satisfactory	Satisfactory	
20/11/2012	Ferrytoll Embankment	Satisfactory	Satisfactory	Satisfactory	
20/11/2012	North - B981, FT05 and FT09	Satisfactory	Satisfactory	Satisfactory	
20/11/2012	SB Bus Link	Satisfactory	Satisfactory	Satisfactory	
21/11/2012	Queensferry Gyrotory	Satisfactory	Satisfactory	Satisfactory	
21/11/2012	S6, S7 and S8	Satisfactory	Satisfactory	Satisfactory	

21/11/2012	Echline	Not Satisfactory	Not Satisfactory	Satisfactory	Dust coming from rock cutting at southern launch. One off incident at time of inspection. However, boswer available on site as required and able to spray over rock cutting area
27/11/2012	North Abutment	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	Whinny Hill and Castlandhill	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	North - B981, FT05 and FT09	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	Ferrytoll Embankment	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	Queensferry Gyratory	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	S6, S7 and S8	Satisfactory	Satisfactory	Satisfactory	
27/11/2012	Echline	Satisfactory	Satisfactory	Satisfactory	
30/11/2012	Marine Yard	Not Applicable	Not Applicable	Not Applicable	