



Contractor



Forth Crossing Bridge Constructors

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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 October 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 October
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	Works at S7 & S8 Marine works S6 Access Track Drainage works
M8	Barracks West	Frisbee	31/08/11	Marine works Works at S7 & S8 S6 Access Track Drainage works
M9	Barracks East	Frisbee	31/08/11	Marine works Works at S7 & S8 S6 Access Track Drainage works
M10	Inchgarvie Lodge	Frisbee	22/08/11	Works at S7 & S8 S6 Access Track Drainage works Excavation of material from launch and south abutment SUDS pond works
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Excavation of material from launch and south abutment Drainage works SUDS pond works
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Excavation of material from launch and south abutment SUDS pond works
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 works
M15	Echline	Frisbee	16/08/11	Cut/Fill from Queensferry gyratory
		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 October 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 an exceedance of the threshold at Echline on 29 October. This exceedance is not considered to be related to construction works in this area, as unrealistically high results occurred during the night (between 02:00 and 05:00 am). The exceedance was from an unidentified local source. However, it should also be noted that there were foggy conditions in the area at the time of the exceedance, which can affect readings (see section 2.2). Another peak (although not an exceedance) was noted on the 22 October at Echline which can also be attributed to foggy conditions, with unrealistically high results noted between 03:00 and 06:00 am.

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 October was largely due to regional changes in air quality.

- 3.1.3.** Data is not included for Dundas throughout October 2012 as potential errors were again noted by the Environmental Team. Previous consultation with the supplier identified the readings from the meter as likely to be incorrect and re-calibration by the supplier did not resolve the errors; a visit by a site engineer has, therefore, been organised for mid-November. Data is also missing for Inchgarvie during October due to a loss of power, caused accidentally by a third party. FCBC are currently arranging for an electrician to visit site during November to restore the power supply.

3.2. Total Suspended Particles

- 3.2.1.** The TSP results for October 2012 have been presented in a monthly chart; this can be found in Appendix B. Largely, the TSP levels at all monitoring locations throughout October were within the threshold level and found to follow a similar pattern across the site. One exceedance of the threshold level did occur at Echline on 29 October, with an additional peak, although not exceeding the threshold level, occurring on 22 October. However, both of these results can be attributed to the errors in the readings caused by the foggy conditions on these dates as discussed in paragraph 3.1.1. All other TSP results were 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.

- 3.2.2.** Due to a device error associated with the measurement of TSP at Dundas, as noted in section 3.1.3, the results for this location have been excluded from the graph. Measurements of TSP throughout October continued to be unrealistically low. FCBC have consulted with

the supplier and have arranged a visit from an engineer in November to resolve the issue. Data is also missing for Inchgarvie due to the loss of power, as noted in paragraph 3.1.3.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for October 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. Three collection dates fell during October; 3, 17 and 31 October 2012. The next collection date is due on the 14 November. Due to unforeseen circumstances, the collection on the 31 October was delayed until the 1 November; the results for the third period are therefore averaged over a period of 15 days and, although the collection date fell during November the period concerned remains October. Data is missing for Whinny Hill on the 1 November as the sample bottle had fallen over causing the results to become contaminated and therefore invalid. Data is also missing for Linn Mill for the period ending on 17 October due to loss of the sample following collection.

- 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.
- 3.3.4.** Throughout October the dust deposition rates for all groups were within the site action level threshold. All dust deposition rates for Groups 3, 4 and 5 were also within the lower, site review level threshold. For the period ending on 3 October there were exceedances of the site review level at Barracks East (157 mg.m⁻²d⁻¹) and Inchgarvie Lodge (190 mg.m⁻²d⁻¹) within Group 1 and also Clufflat (174 mg.m⁻²d⁻¹) and Echline (163 mg.m⁻²d⁻¹) within Group 2.
- 3.3.5.** Due to the exceedances of the site review level during October, at four different locations, FCBC conducted a review into site wide dust levels and the construction works being undertaken at these locations. As construction works were being undertaken in the areas close to the monitoring locations it is possible, therefore, that the exceedance at this location was caused by dust generated from these works. However, during the fortnight period covered by the collection date on the 3 October, adverse weather conditions were noted, including heavy rainfall and strong winds (please refer to Air Quality Monitoring Report: September 2012 (REP-00062-00) for log of weather conditions at end of September). Wet weather conditions ensured that materials were sufficiently suppressed during this period. It should also be noted that the increased levels may be partially attributable to falling particles from nearby vegetation during the autumn period. Dust logs and inspections (see section 3.4) during the period ensured that dust levels were continually monitored.

3.4. Daily Dust Log and Environmental Inspections

- 3.4.1.** A summary of the daily dust log for October can be found in Appendix D. No instances of visual dust on site were noted in the southern networks area during October, with a single occurrence noted in the northern networks areas. The cause of the exceedances was noted to be drilling works at Whinny Hill. Contact was made with the site engineers and the bowser was deployed on site.
- 3.4.2.** 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. Nine inspections across the site were undertaken by the FCBC Environmental Department during October, focussing on areas in which works were being undertaken. No air quality issues were noted at the time of the inspections.



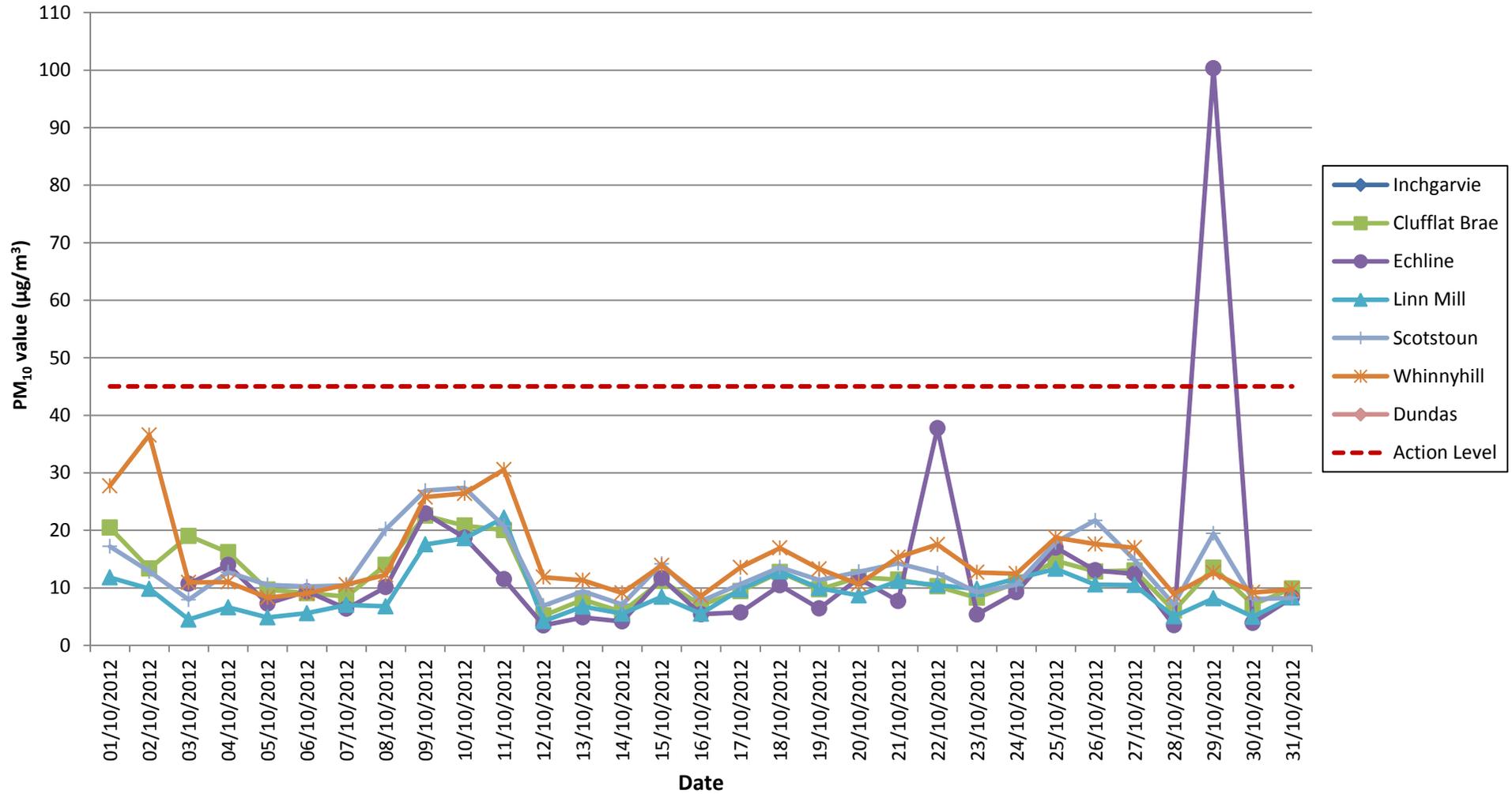
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APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

October 2012

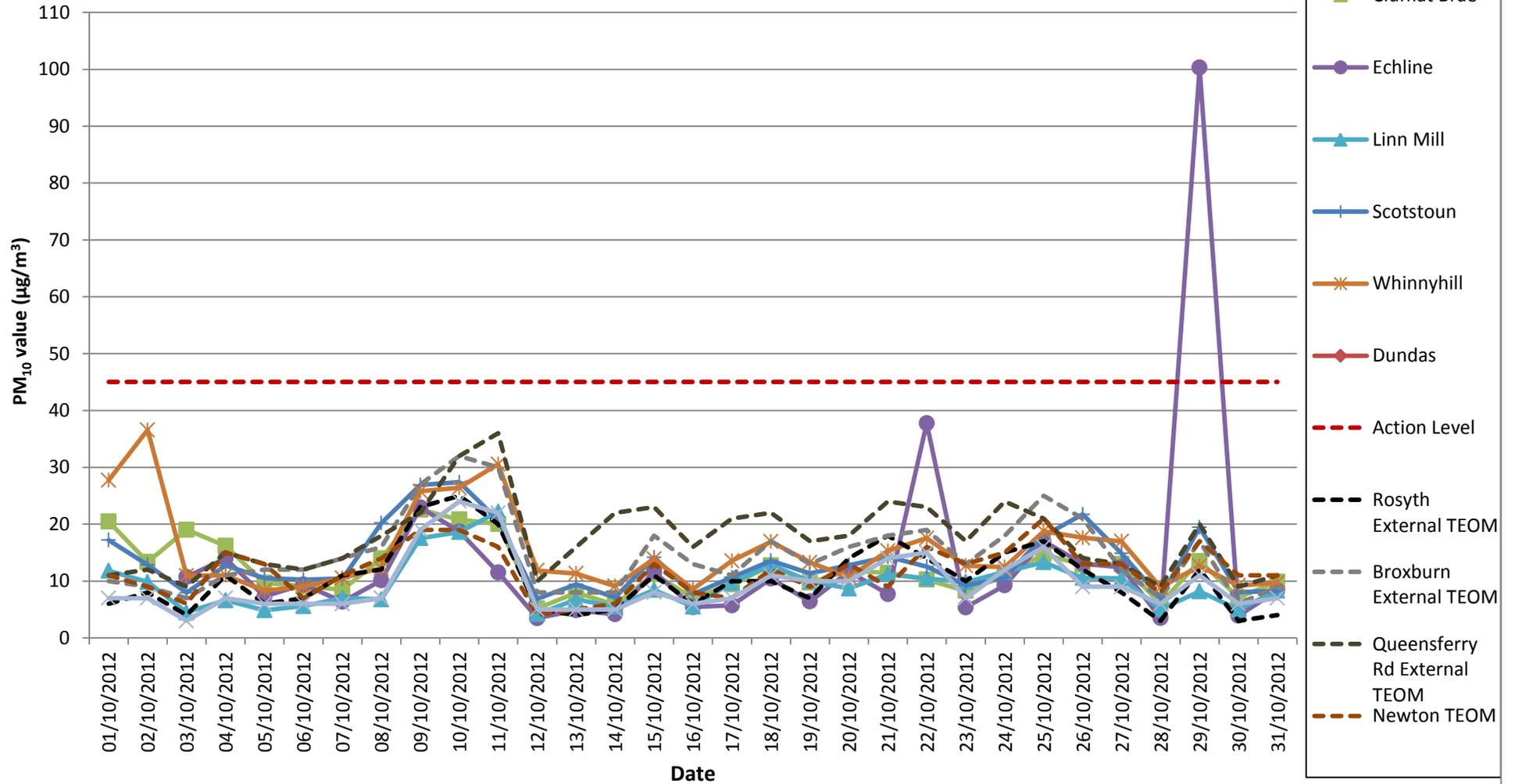


Note: Due to an error associated with the Dundas device the results for this location have been excluded. Data is missing from Inchgarvie due to an error with the connection accidentally caused by a third party.

Air Quality Monitoring -All Monitoring Locations

Particulate Matter (PM10) Results including TEOM Results

October 2012



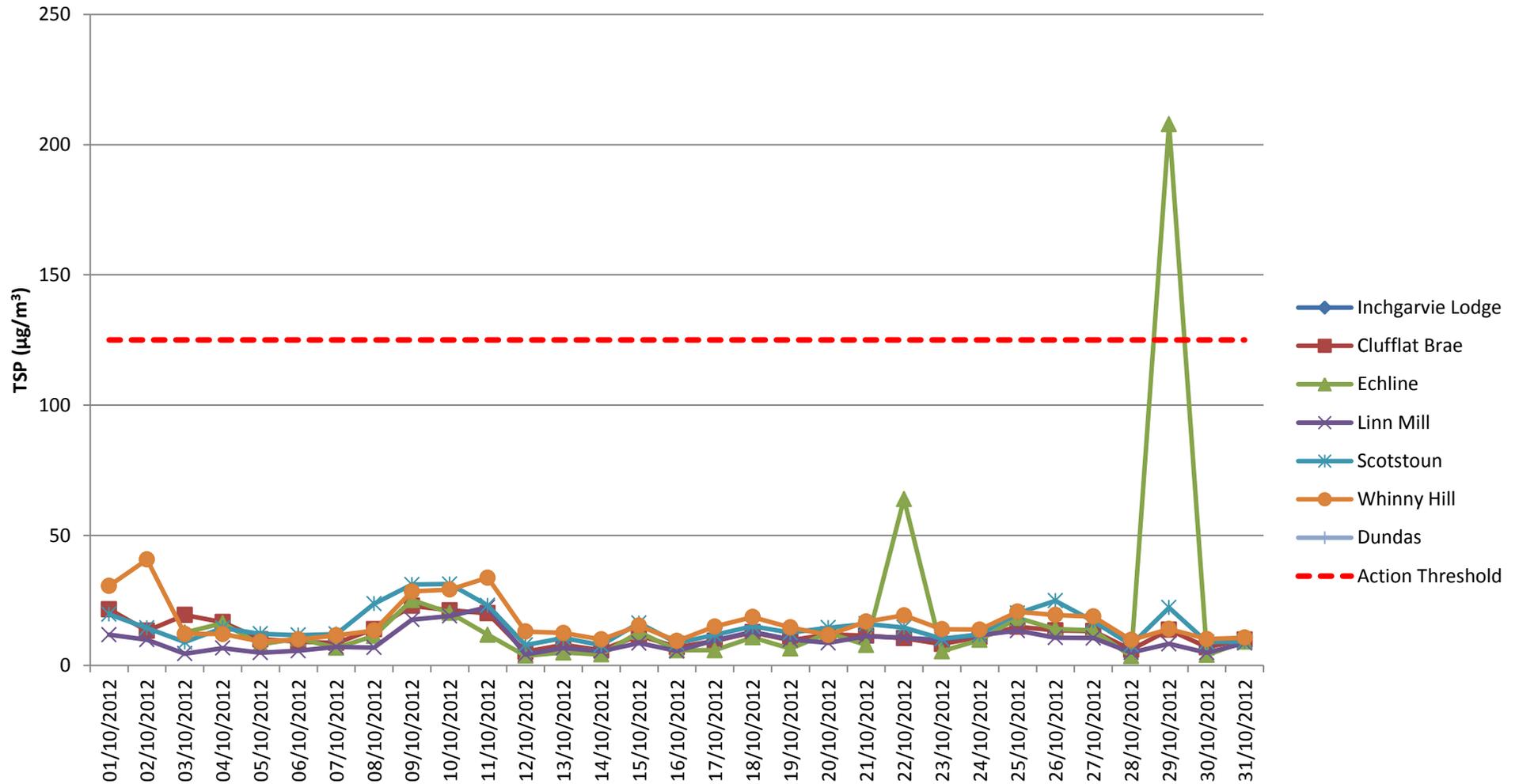
Note: Due to an error associated with the Dundas device the results for this location have been excluded. Data is missing from Inchgarvie due to an error with the connection accidentally caused by a third party.



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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results October 2012



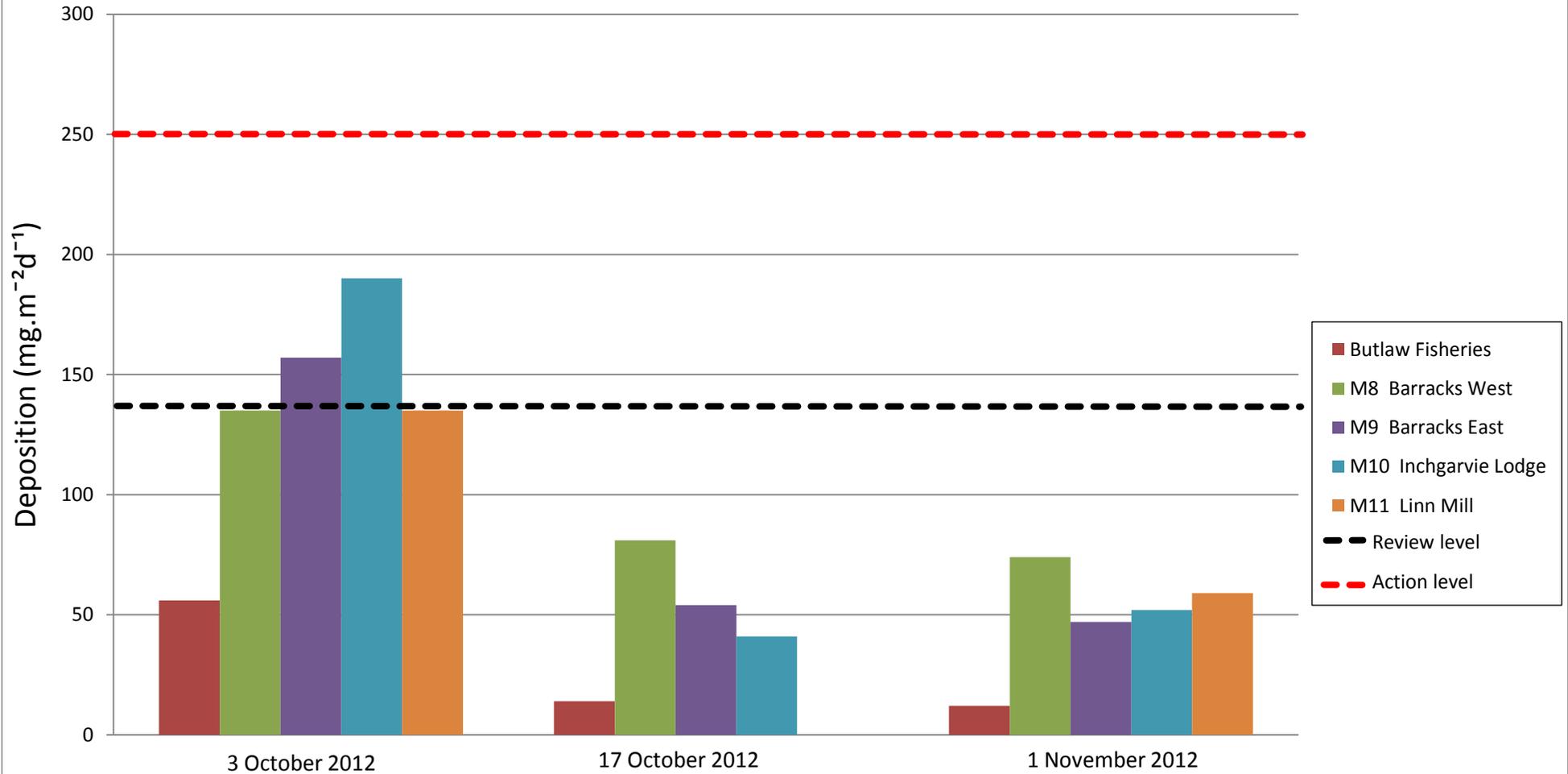
Note: Due to errors associated with the TSP results for Dundas, these results have been excluded. Data is missing from Inchgarvie due to an error with the connection accidentally caused by a third party.



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APPENDIX C: FRISBEE GAUGE RESULTS

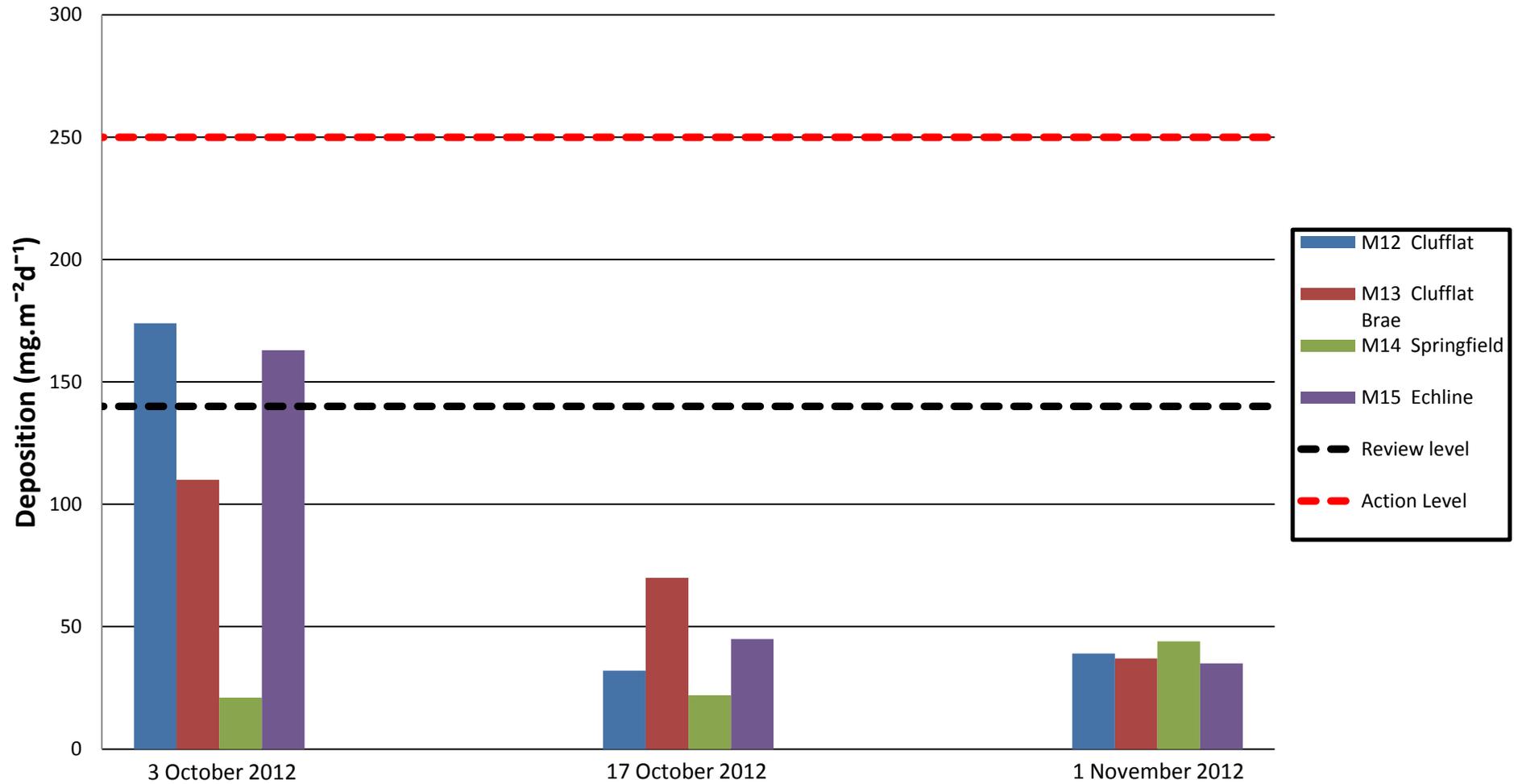
Frisbee Dust Deposition Results: Group 1
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill



Note: The results for Linn Mill on 17 October are missing due to a sampling error.

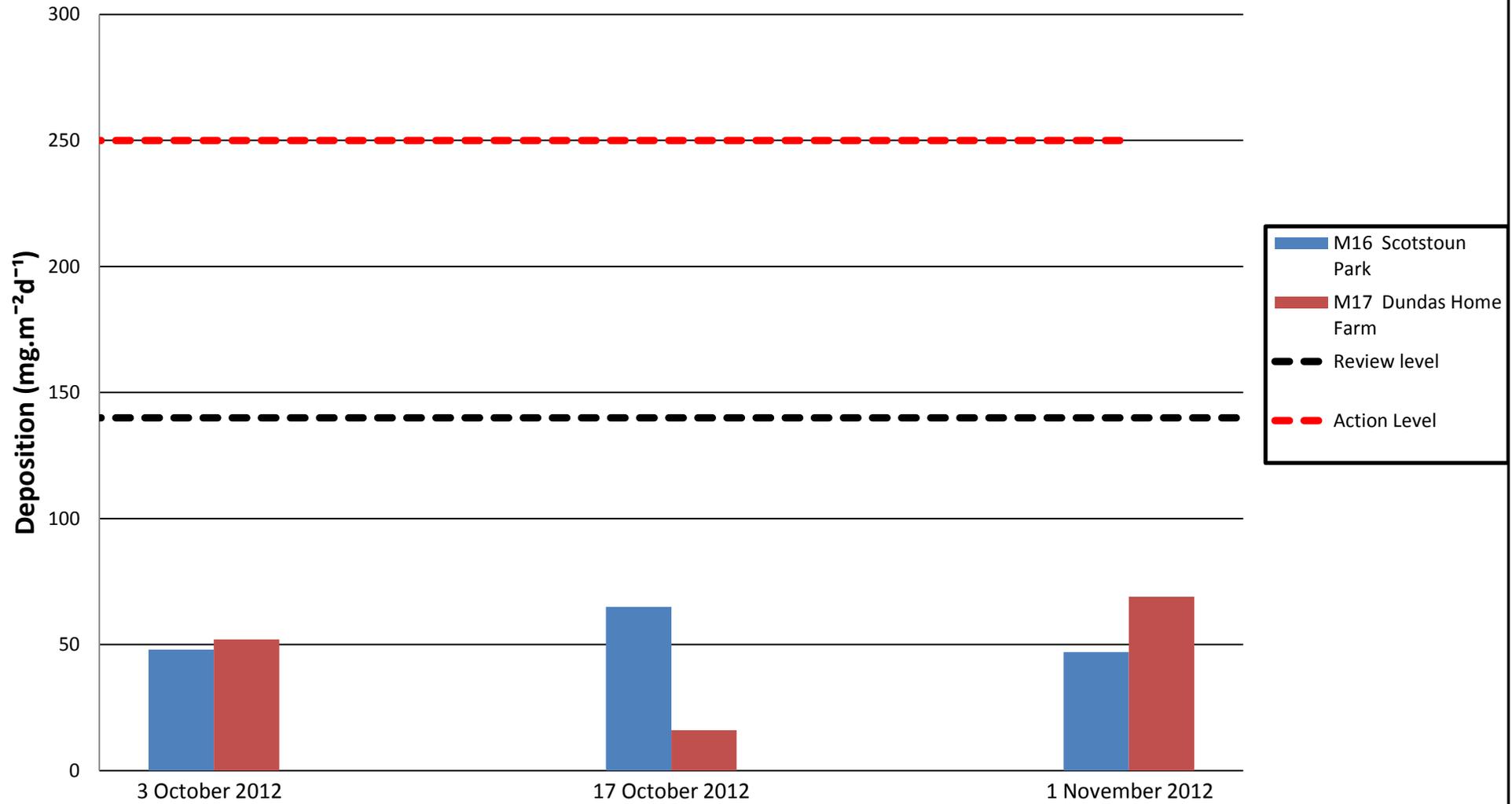
Frisbee Dust Deposition Results: Group 2

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



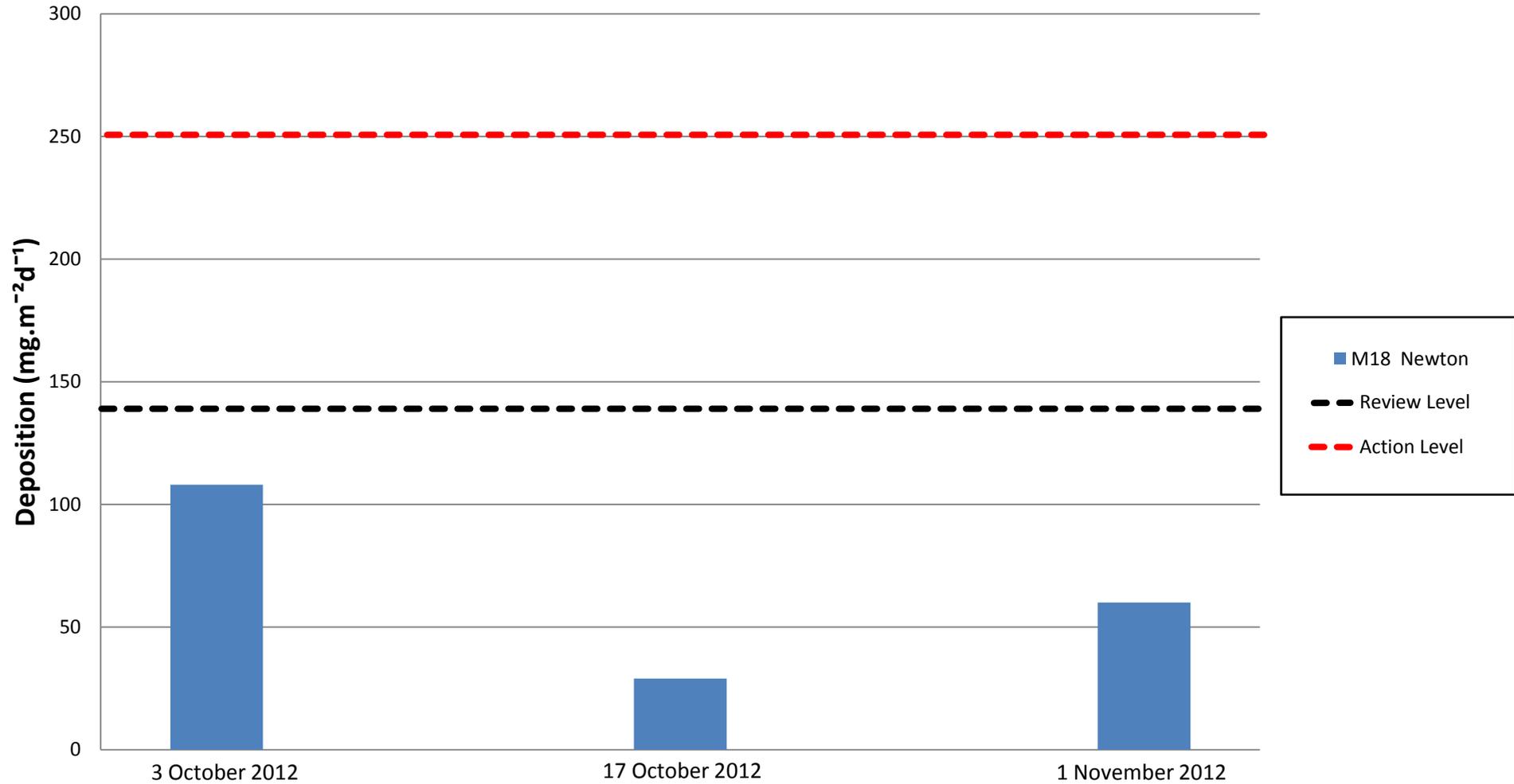
Frisbee Dust Deposition Results: Group 3

Locations: M16 Scotstoun Park and M17 Dundas Home Farm



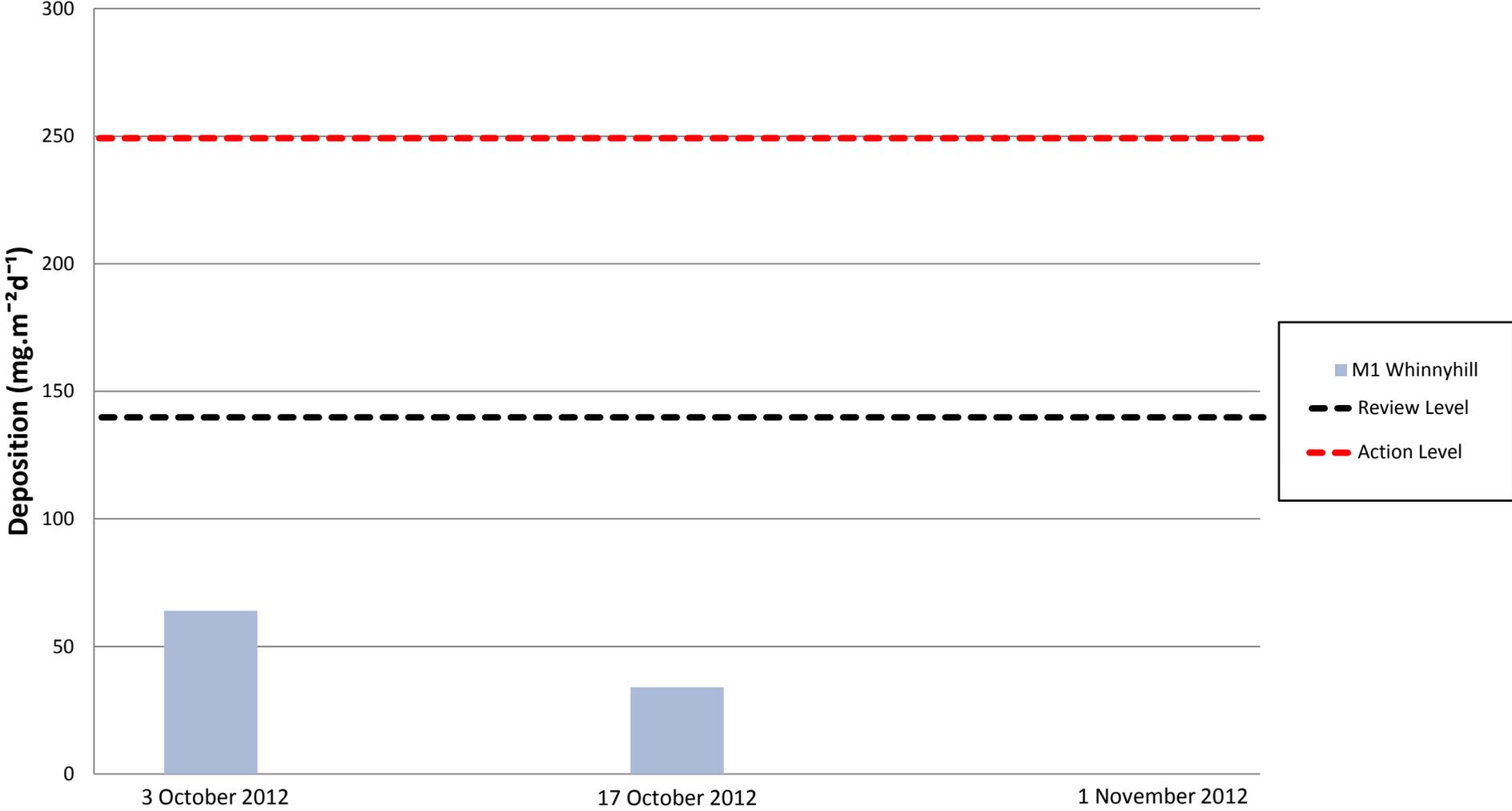
Frisbee Dust Deposition Results: Group 4

Location: M18 Newton



Frisbee Dust Deposition Results: Group 5

Location: M1 Whinny Hill



Note: The results for 1 November are missing as the Frisbee equipment had fallen over at this location.



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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - October 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)
01/10/2012	N	STRONG	SW	WET	N				
02/10/2012	N	LIGHT	SE	WET	Y	Y	Drilling holes for Blast, Castlandhill		Contact with site engineers - bowser deployed on site
03/10/2012	N	STRONG	SW	WET	N				
04/10/2012	N	LIGHT	W	DAMP	N				
05/10/2012	N	LIGHT	W	DAMP	N				
06/10/2012									
07/10/2012									
08/10/2012	N	LIGHT	W	DAMP	N				
09/10/2012	N	NONE	W	DRY	N				
10/10/2012	N	LIGHT	NW	DRY	N				
11/10/2012	N	LIGHT	E	WET	N				
12/10/2012	N	STRONG	W	WET	N				
13/10/2012									
14/10/2012									
15/10/2012	N	LIGHT	W	DAMP	N				
16/10/2012	N	LIGHT	W	WET	N				
17/10/2012	N	LIGHT	W	WET	N				
18/10/2012	N	LIGHT	E	DAMP/WET	N				
19/10/2012	N	LIGHT	W	DAMP	N				
20/10/2012									
21/10/2012									
22/10/2012	N	LIGHT	W	DAMP	N				
23/10/2012	N	LIGHT	NW	DAMP	N				
24/10/2012	N	LIGHT	E	DAMP	N				
25/10/2012	N	LIGHT	NW	DRY	N				
26/10/2012	N	STRONG	NW	DRY	N				
27/10/2012									
28/10/2012									
29/10/2012	N	LIGHT	W	DAMP	N				
30/10/2012	N	STRONG	SW	DAMP	N				
31/10/2012	N	STRONG	S	DAMP/WET	N				

Daily Dust Log - South - October 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)
01/10/2012	S	STRONG	SW	WET	N				
02/10/2012	S	LIGHT	SE	WET	N				
03/10/2012	S	STRONG	SW	WET	N				
04/10/2012	S	LIGHT	W	DAMP	N				
05/10/2012	S	LIGHT	W	DAMP	N				
06/10/2012									
07/10/2012									
08/10/2012	S	LIGHT	W	DAMP	N				
09/10/2012	S	NONE	W	DRY	N				
10/10/2012	S	LIGHT	NW	DRY	N				
11/10/2012	S	LIGHT	E	WET	N				
12/10/2012	S	STRONG	W	WET	N				
13/10/2012									
14/10/2012									
15/10/2012	S	LIGHT	W	DAMP	N				
16/10/2012	S	LIGHT	W	WET	N				
17/10/2012	S	LIGHT	W	WET	N				
18/10/2012	S	LIGHT	E	DAMP/WET	N				
19/10/2012	S	LIGHT	W	DAMP	N				
20/10/2012									
21/10/2012									
22/10/2012	S	LIGHT	W	DAMP	N				
23/10/2012	S	LIGHT	NW	DAMP	N				
24/10/2012	S	LIGHT	E	DAMP	N				
25/10/2012	S	LIGHT	NW	DRY	N				
26/10/2012	S	STRONG	NW	DRY	N				
27/10/2012									
28/10/2012									
29/10/2012	S	LIGHT	W	DAMP	N				
30/10/2012	S	STRONG	SW	DAMP	N				
31/10/2012	S	STRONG	S	DAMP/WET	N				



APPENDIX E: SUMMARY OF ENVIRONMENTAL INSPECTIONS

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

Date	Location	Dust Levels	Suppression/ Dampening down	Transportation of materials	Comments/Actions
05/10/2012	Echline Field - South Networks	Satisfactory	Satisfactory	Satisfactory	
08/10/2012	Queensferry Gyrotory - South Networks	Satisfactory	Satisfactory	Satisfactory	
08/10/2012	Southern Compound and Echline	Satisfactory	Satisfactory	Not Applicable	
09/10/2012	FT05 and Ferrytoll Embankment - North Structures and Networks	Satisfactory	Satisfactory	Satisfactory	
18/10/2012	Viaducts (S7 & S8)	Satisfactory	Satisfactory	Satisfactory	
18/10/2012	Echline Field - South Networks	Satisfactory	Satisfactory	Satisfactory	
24/10/2012	North Abutment	Satisfactory	Satisfactory	Satisfactory	
30/10/2012	Dundas - South Networks and Structures	Satisfactory	Satisfactory	Satisfactory	
30/10/2012	SB Bus link	Satisfactory	Satisfactory	Not Checked	