



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
 American Bridge International
 DRAGADOS
 Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

AIR QUALITY MONITORING REPORT
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Contents

- 1. Introduction**
- 2. Monitoring Equipment and Locations**
- 3. Air Quality Monitoring Results**
 - 3.1. Automatic Light Scatter Meter Particulate Matter Monitoring Results**
 - 3.2. Total Suspended Particle Results**
 - 3.3. Frisbee Dust Deposition Results**
 - 3.4. Daily Dust Log and Weekly Environmental Inspections**

Appendices:

- Appendix A: Particulate Matter Results**
- Appendix B: Total Suspended Particle Results**
- Appendix C: Frisbee Dust Deposition Results**
- Appendix D: Daily Dust Log Summary**

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 2013.

- 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). These meters are calibrated annually. Table 1 lists the air quality monitoring equipment present at each monitoring location. The installation of the air quality monitoring equipment was not 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.

In relation to these inspections, the FCBC Environmental Department hold an environmental actions register where any environmental issues, including those relating to air quality, can 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 November
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • King Malcolm Drive embankment landscaping
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> • Marine works • Society Road works • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Marine works • Society Road works • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Access to S5 causeway
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works • Echline cut – ripping rock and crushing
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	

M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Placing segments/rebar, concreting, waterproofing and installation of tie beams at S7/S8 • Society Road works • Echline cut – ripping rock and crushing
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> • Launch – delivery and assembly of steel sections • South abutment – preparatory works for the launch of west section • Echline cut – ripping rock and crushing • Gyrotory – installation of beams • A904 tie in road works, including drainage works
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> • Utilities works • Structure works
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> • Utility works • Mainline works – fill with material from Echline cut
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	<ul style="list-style-type: none"> • 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 2013 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were below threshold levels throughout November and generally followed the same pattern across the site. Furthermore, no 15 minute trigger alerts were received by the environmental department during November.

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, 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 November was largely driven by regional changes in air quality.

3.2. Total Suspended Particles

3.2.1. The TSP results for November 2013 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during November were found to be low and all within the threshold level. All locations were mostly found to follow a similar pattern across the site, 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 November 2013 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 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 November, on 13 and 27 November.

- 3.3.3.** The site action level for the dust deposition rate has been set at 250 mg/m²/day. Exceedances of this level are treated as a potential incident and a formal review of the works in the vicinity of the site is instigated. A lower, site review level has been set at 140 mg/m²/day. Where concentrations exceed the lower action threshold the site works are reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.
- 3.3.4.** During November there were three exceedances of the site review level (see Table 4). There was one exceedance of the site action level. With the exception of the locations where exceedances occurred, Frisbee results from monitoring locations across site were generally found to be low.

Table 4: Exceedances of the dust deposition thresholds

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
13/11/13	Review	Scotstoun	Located underneath trees	Generally damp
		Barracks East	Located at viaducts storage and parking area	
27/11/13	Review	Scotstoun	Located underneath trees	Generally damp
	Action	Newton	Frisbee gauge found knocked over upon collection	

- 3.3.5.** For each of the exceedances of the review 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 gauges are located underneath vegetation this may give rise to false increase levels, particularly during autumn when vegetation begins to fall. Where available, the Frisbee results were also considered alongside the particulate matter data for the same period; particulate matter levels were low and within the threshold levels.

- 3.3.6.** With regard to the exceedances at Scotstoun, it is thought that the levels may have been influenced by the proximity of this gauge to vegetation. Whilst construction activities cannot be excluded from considerations, a review of the works at these locations and the weather conditions demonstrate that the impact of construction activities on the dust levels at these receptors is likely to have been minimal during the periods in question. Works were largely structural works which would not have given rise to dust, though some movement of fill material for utility works was undertaken during November. However, mitigation measures were on-going throughout November, with damp conditions ensuring that works did not give rise to dust. Furthermore, the PM₁₀ results for this location do not indicate elevated levels of dust during this period.
- 3.3.7.** With regard to the exceedance at Newton, this is not thought to be related to construction works. On collection of the gauge it was found to have been knocked or blown over. It is likely, therefore that this influenced the results at this location, due to contamination of the sample, and therefore no further investigations were deemed necessary.
- 3.3.8.** The exceedance of the review level at Barracks East initiated further review into dust levels at this location, with factors such as the location of the gauge, any works undertaken and the weather conditions taken into account. Whilst this gauge is located in an area where works are on-going, no dust generating activities were undertaken during this period. It should also be noted that this is not a sensitive receptor and the Barracks West meter, located within 100m, did not show any corresponding high levels. It should be recognised that the dust levels at this gauge were found to reduce below the review level for the second period of November. FCBC are continuing to review the positioning of this gauge to ensure that it is positioned so not be influenced by factors that do not reflect the dust levels in the area.

3.4. Daily Dust Log and Environmental Inspections

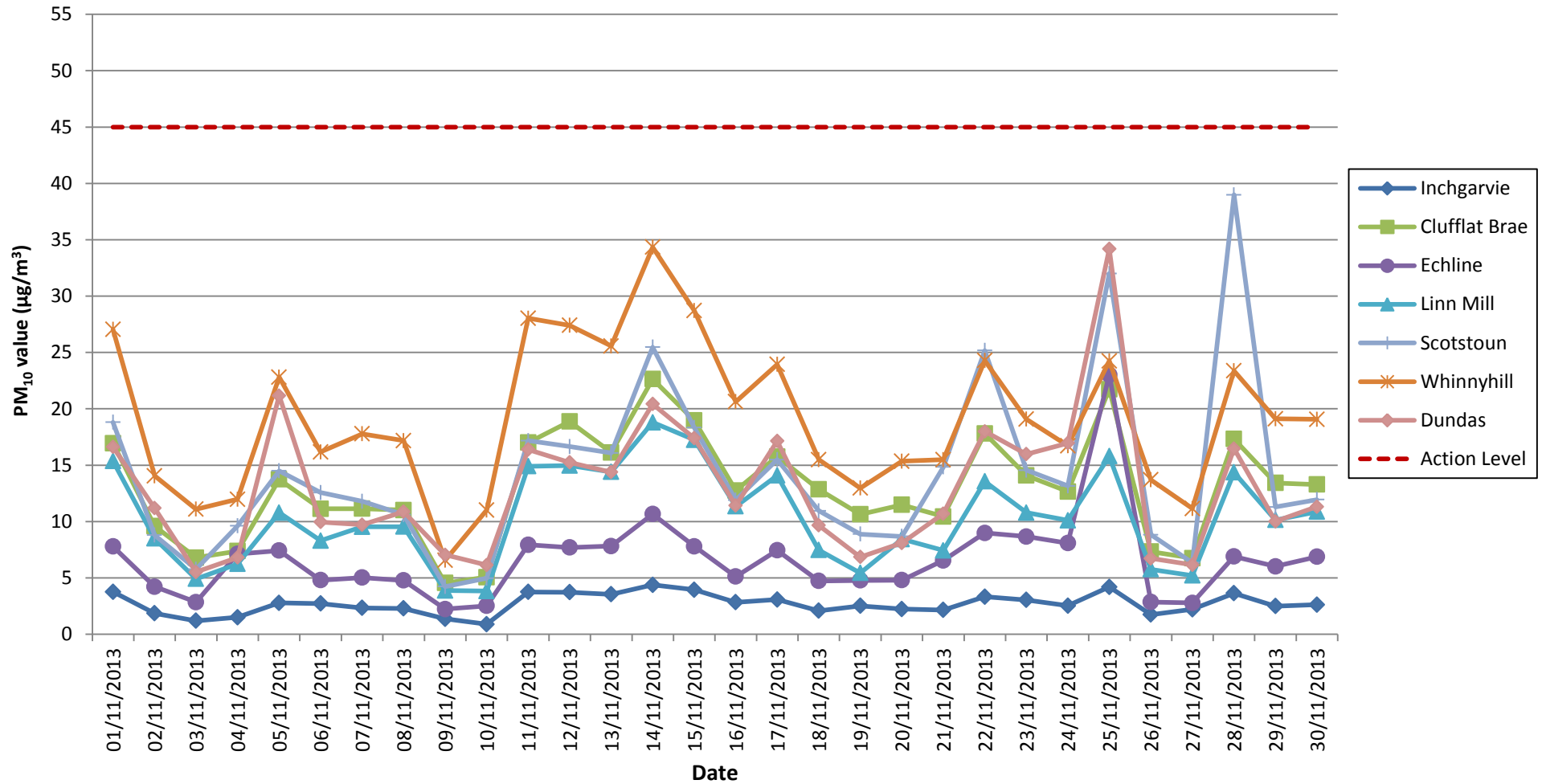
- 3.4.1.** A summary of the daily dust log for November can be found in Appendix D. During this period no instances of dust were noted on site.
- 3.4.2.** During this period full environmental inspections were also undertaken across the site and covered areas where works were being undertaken. In November, 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

November 2013

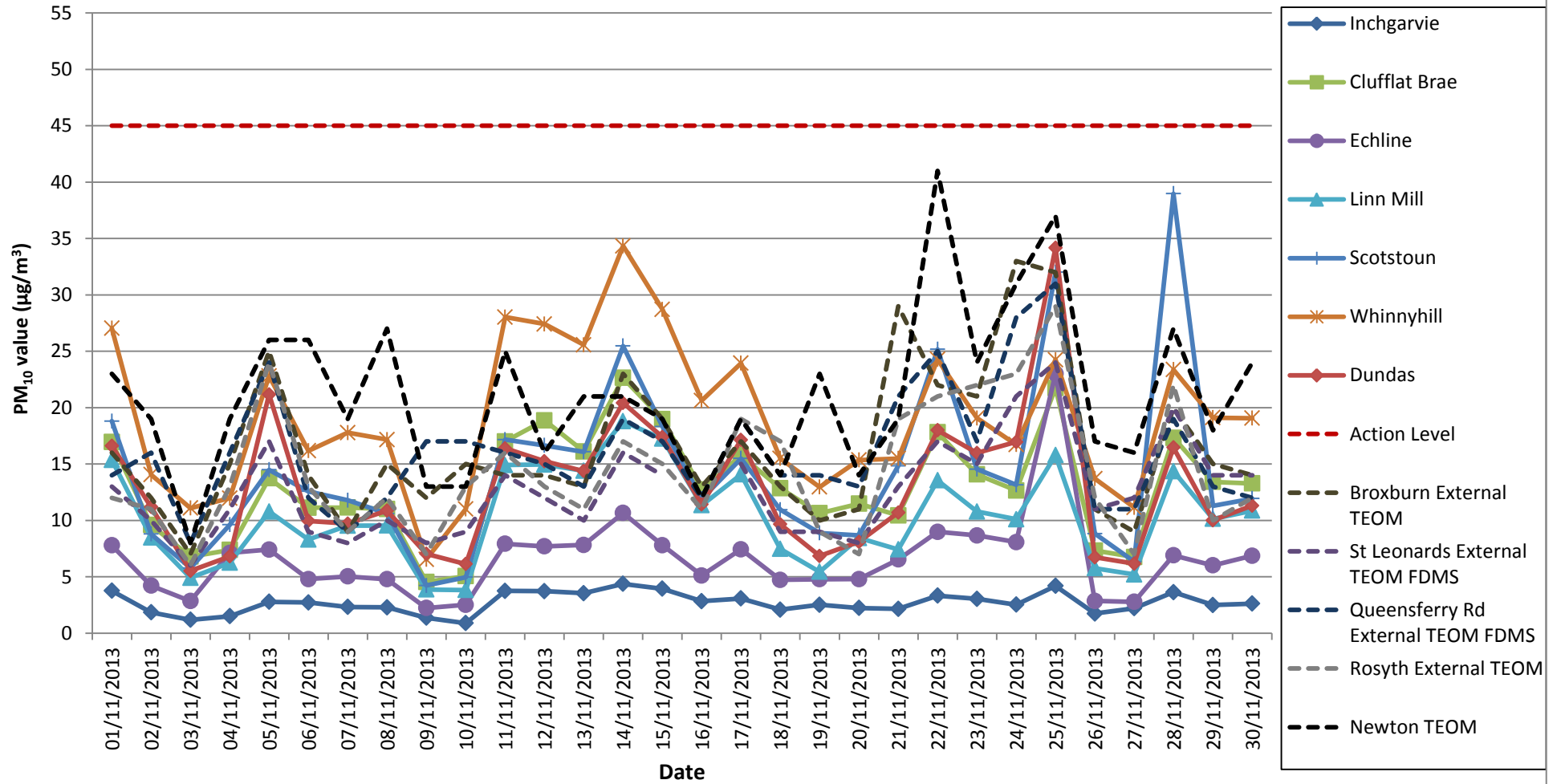


Note: Please refer to section 3 of the Air Quality Monitoring Report: November 2013.

Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

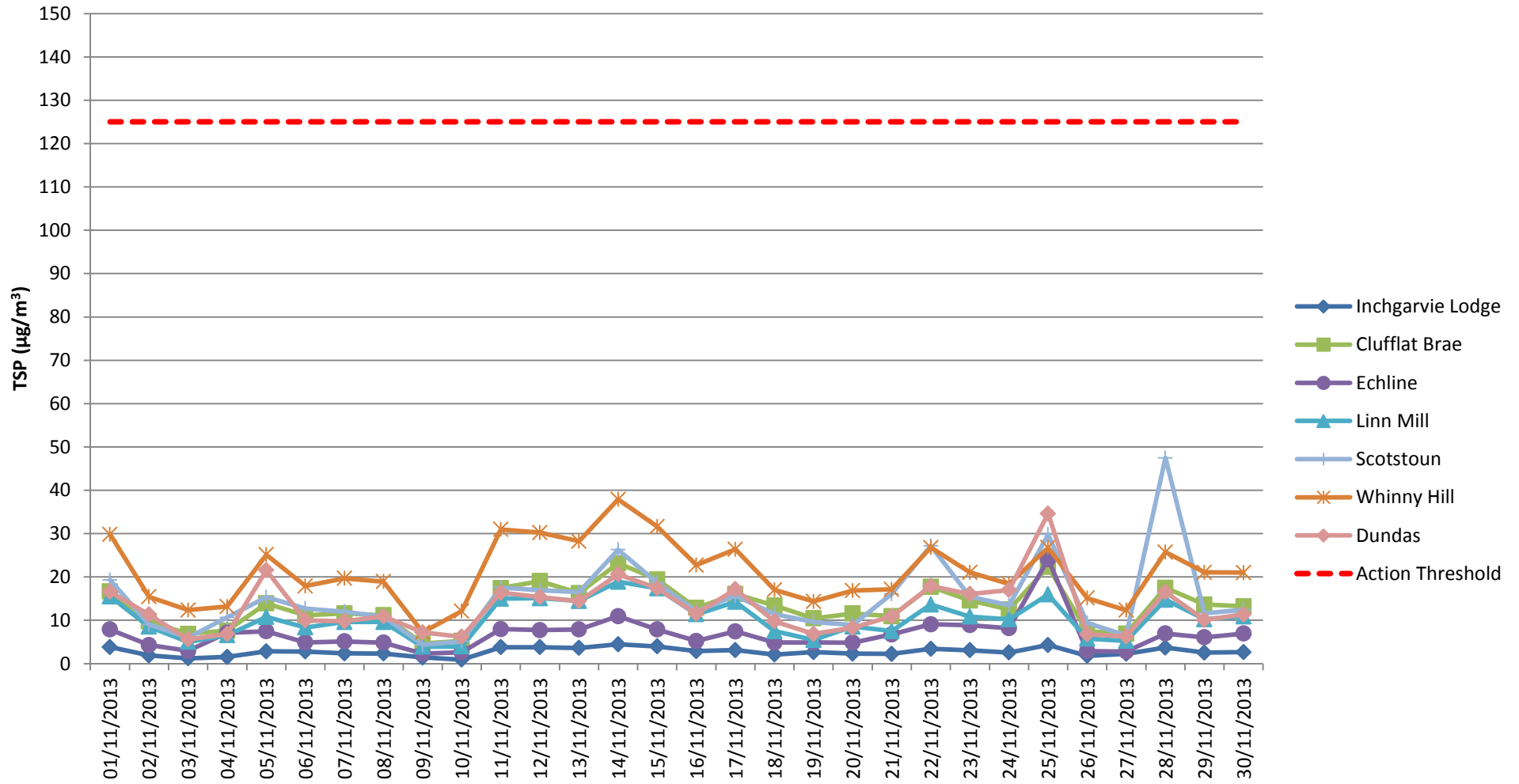
November 2013



Note: Please refer to section 3 of the Air Quality Monitoring Report: November 2013.

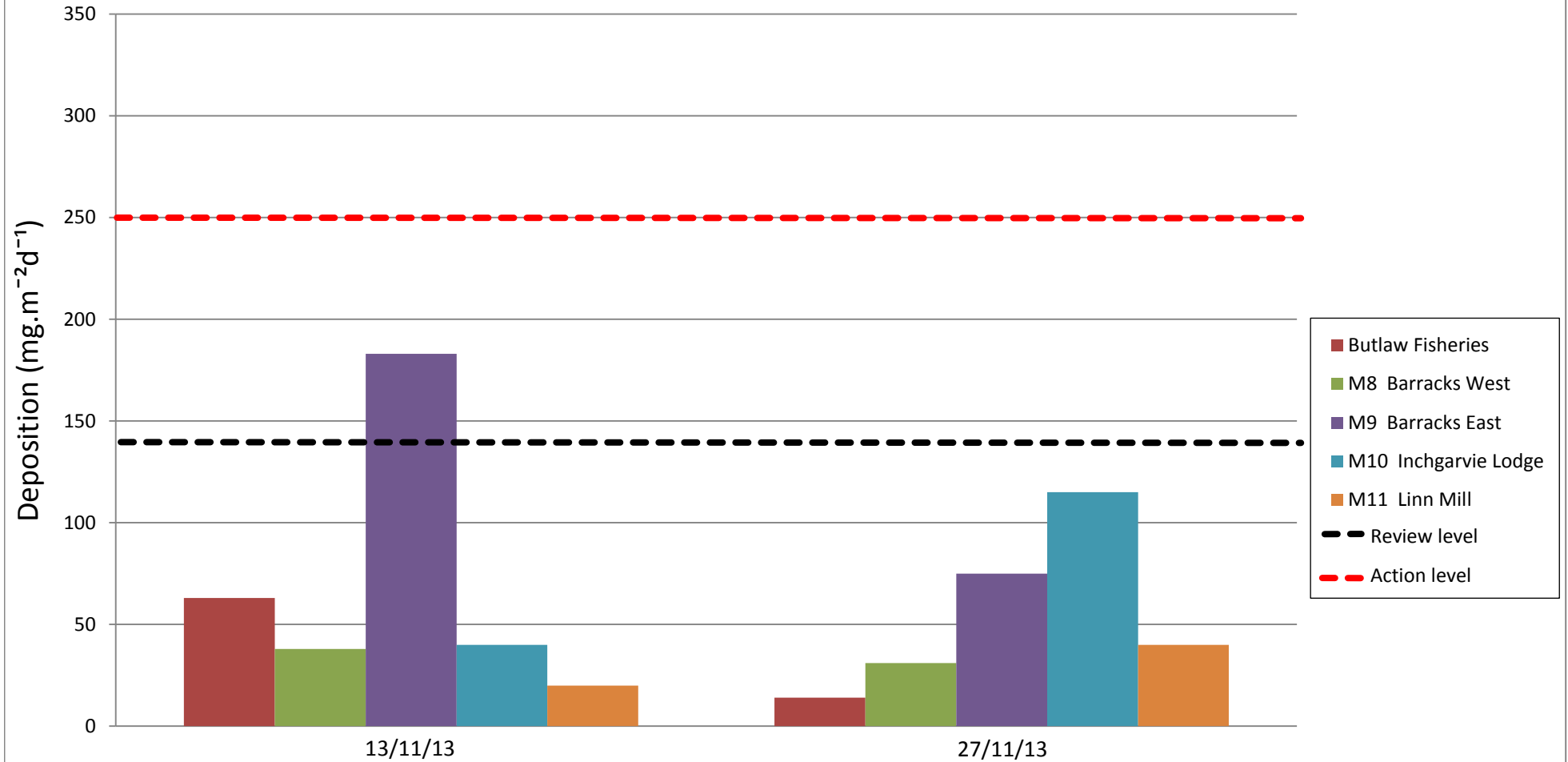
APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results November 2013



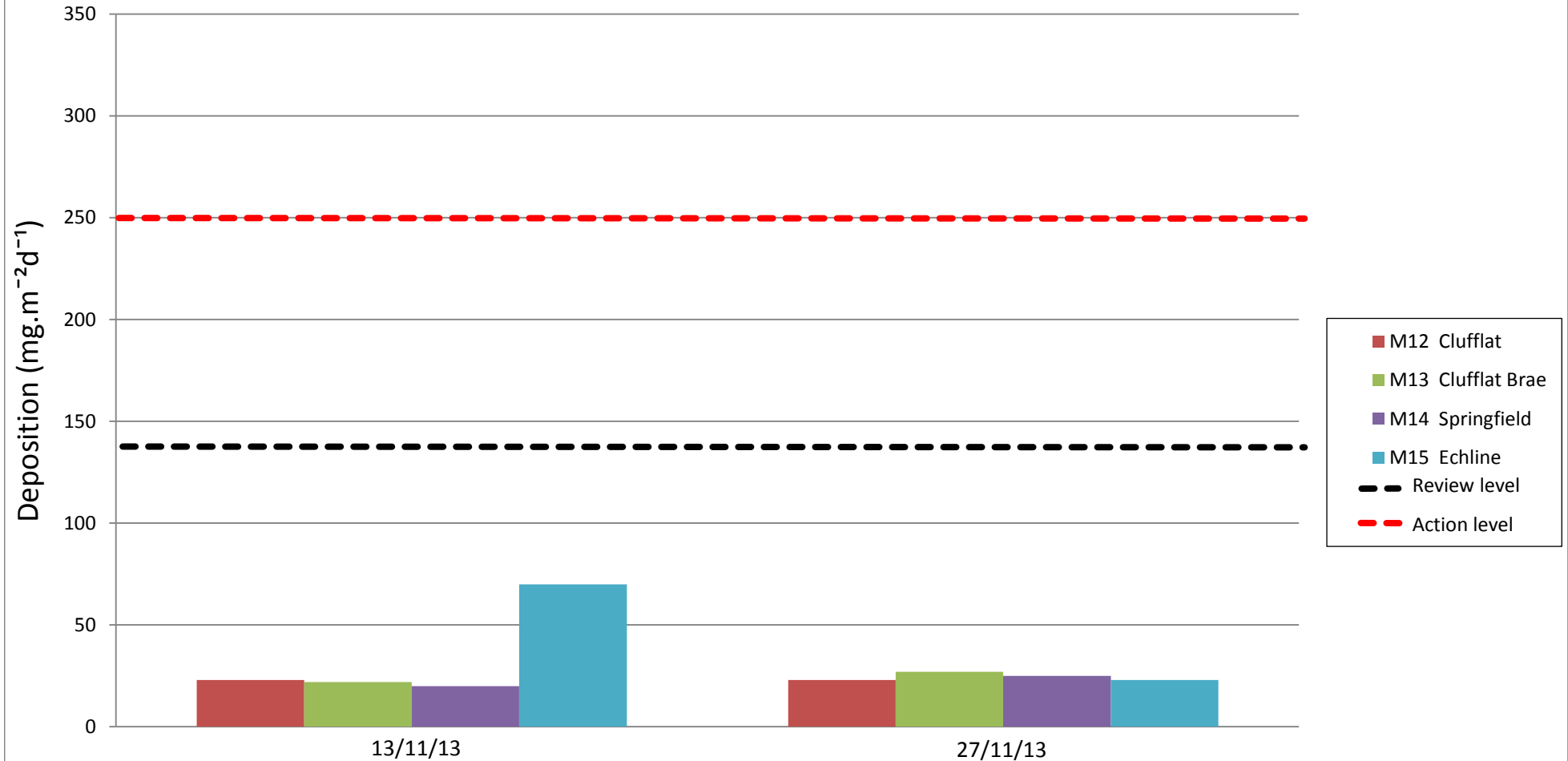
APPENDIX C: FRISBEE GAUGE RESULTS

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



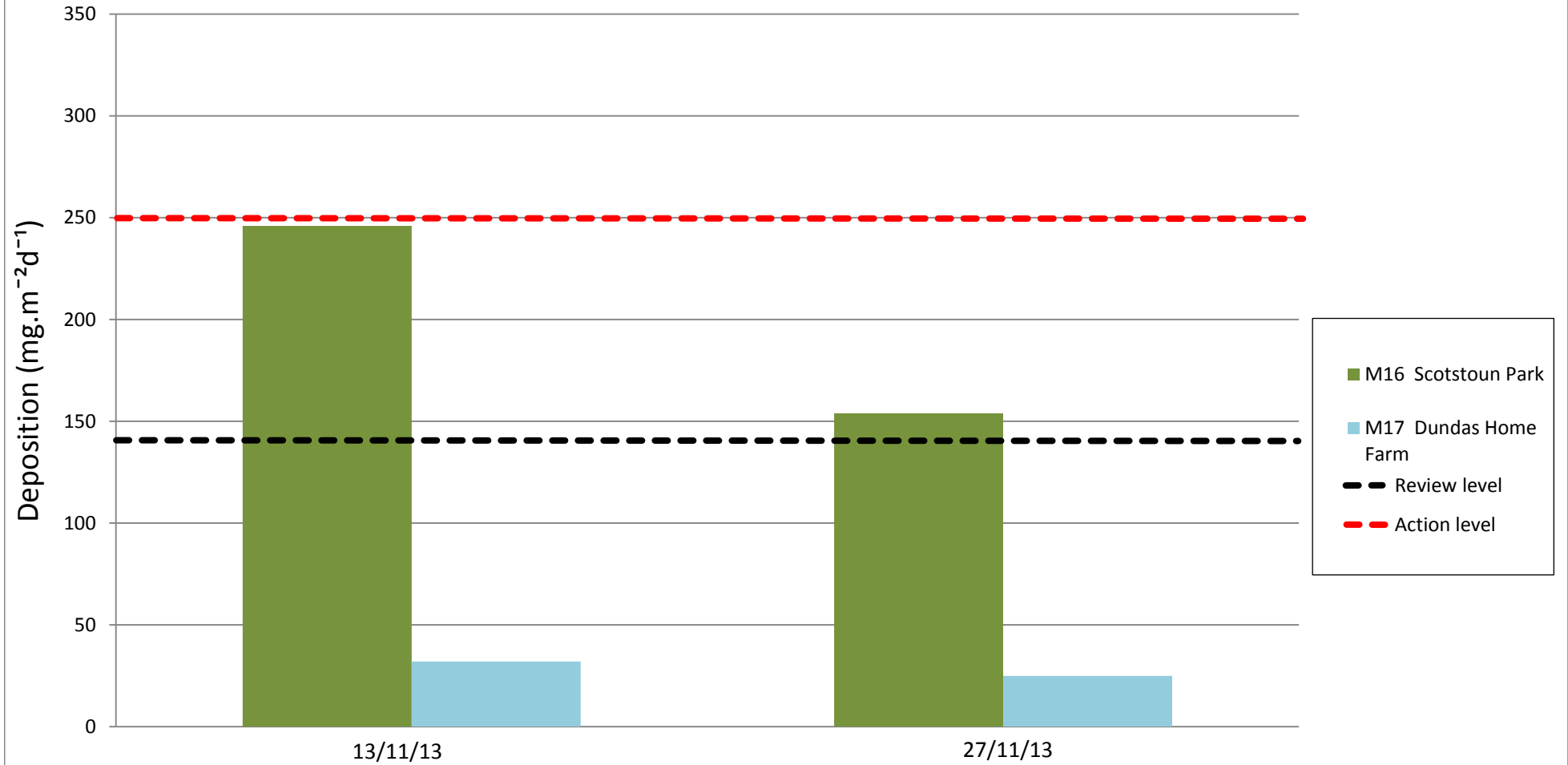
Frisbee Dust Deposition Results: Group 2

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



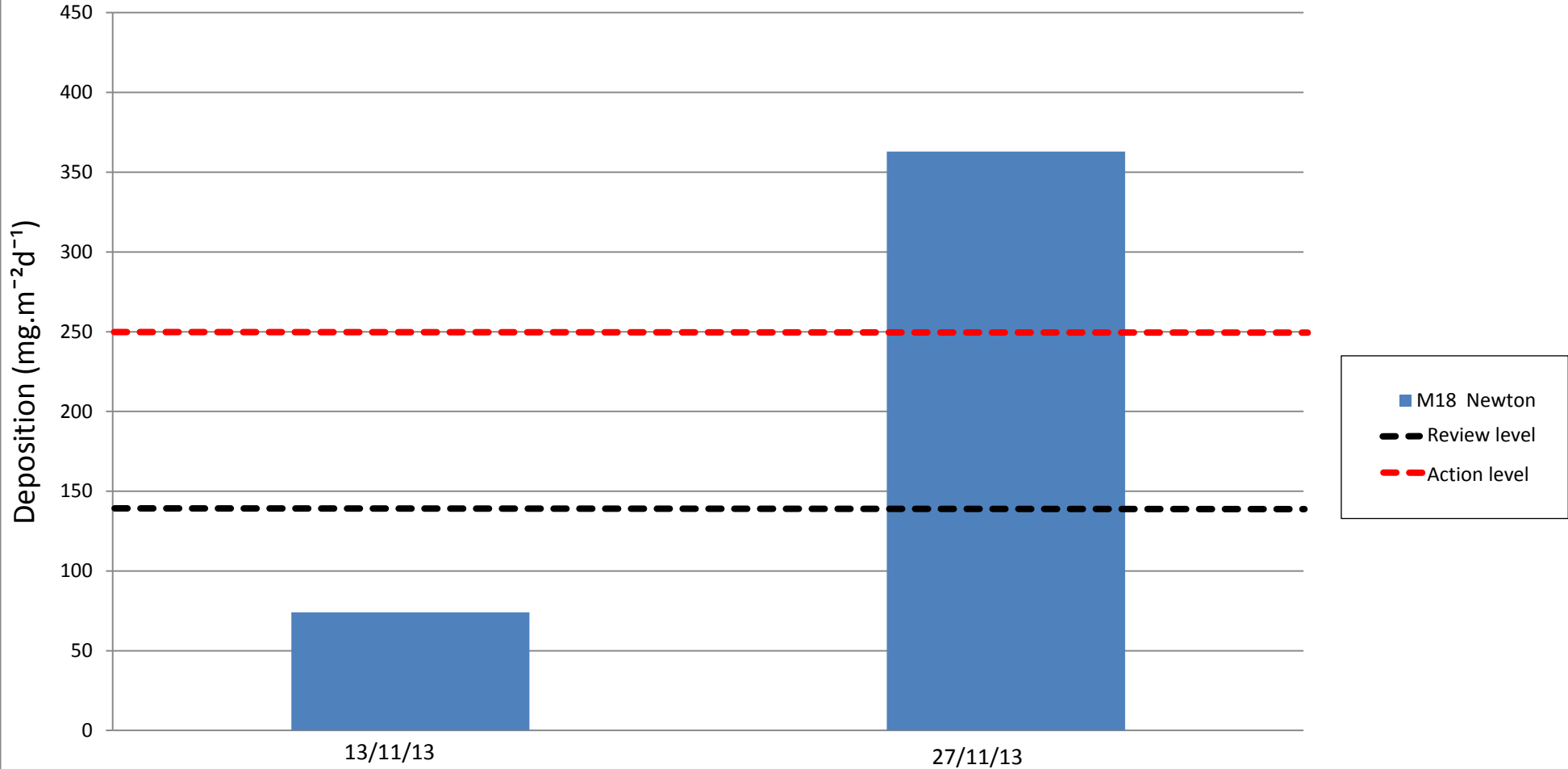
Frisbee Dust Deposition Results: Group 3

Locations: M16 Scotstoun Park and M17 Dundas Home Farm



Frisbee Dust Deposition Results: Group 4

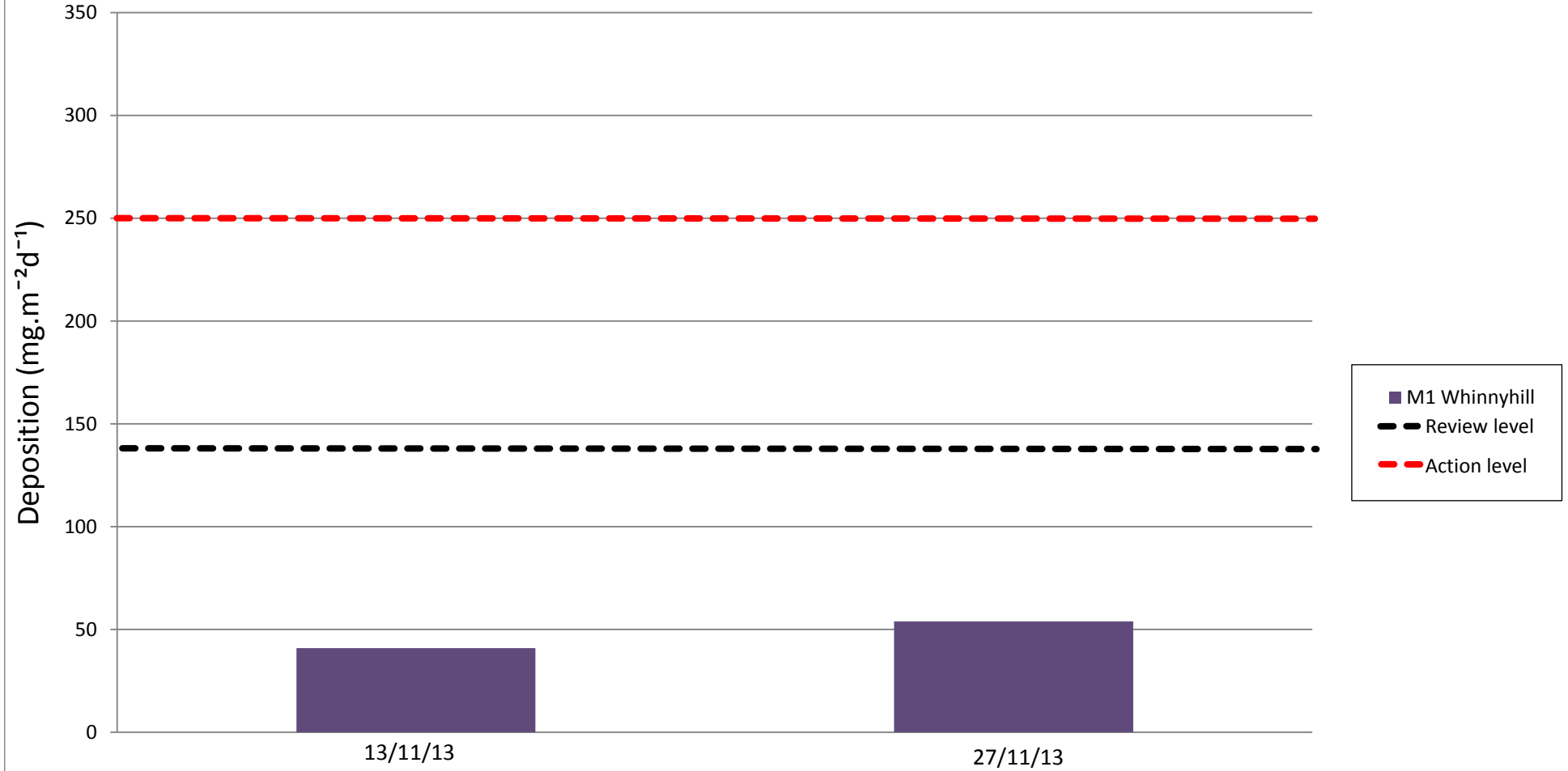
Locations: M18 Newton



Note: On 27/11/13 the gauge was found to have been blown/knocked over and therefore the results for this date are likely to be erroneous due to contamination of the sample.

Frisbee Dust Deposition Results: Group 5

Locations: M1 Whinny Hill



APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - November 2013

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/11/2013	N	MEDIUM	SW	DRY	N			
02/11/2013	N							
03/11/2013	N							
04/11/2013	N	LIGHT	WSW	DRY	N			
05/11/2013	N	LIGHT	WSW	DAMP	N			
06/11/2013	N	LIGHT	SW	DAMP	N			
07/11/2013	N	MEDIUM	SSW	WET	N			
08/11/2013	N	LIGHT	SSW	WET	N			
09/11/2013	N							
10/11/2013	N							
11/11/2013	N	LIGHT	SSW	WET	N			
12/11/2013	N	LIGHT	SW	DAMP	N			
13/11/2013	N	MEDIUM	SSW	DAMP	N			
14/11/2013	N	MEDIUM	WSW	DAMP	N			
15/11/2013	N	MEDIUM	SW	DRY	N			
16/11/2013	N							
17/11/2013	N							
18/11/2013	N	LIGHT	WSW	DAMP	N			
19/11/2013	N	MEDIUM	SSW	WET	N			
20/11/2013	N	STRONG	NW	WET	N			
21/11/2013	N	LIGHT	NNW	DAMP	N			
22/11/2013	N	LIGHT	W	FROZEN	N			
23/11/2013	N							
24/11/2013	N							
25/11/2013	N	LIGHT	W	FROZEN	N			
26/11/2013	N	MEDIUM	SW	DAMP	N			
27/11/2013	N	MEDIUM	SW	DAMP	N			
28/11/2013	N	LIGHT	W	DRY	N			
29/11/2013	N	MEDIUM	WSW	WET	N			
30/11/2013	N							

Daily Dust Log - South - November 2013

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/11/2013	S	MEDIUM	SW	DRY	N			
02/11/2013	S							
03/11/2013	S							
04/11/2013	S	LIGHT	WSW	DRY	N			
05/11/2013	S	LIGHT	WSW	DAMP	N			
06/11/2013	S	LIGHT	SW	DAMP	N			
07/11/2013	S	MEDIUM	SSW	WET	N			
08/11/2013	S	LIGHT	SSW	WET	N			
09/11/2013	S							
10/11/2013	S							
11/11/2013	S	LIGHT	SSW	WET	N			
12/11/2013	S	LIGHT	SW	DAMP	N			
13/11/2013	S	MEDIUM	SSW	DAMP	N			
14/11/2013	S	MEDIUM	WSW	DAMP	N			
15/11/2013	S	MEDIUM	SW	DRY	N			
16/11/2013	S							
17/11/2013	S							
18/11/2013	S	LIGHT	WSW	DAMP	N			
19/11/2013	S	MEDIUM	SSW	WET	N			
20/11/2013	S	STRONG	NW	WET	N			
21/11/2013	S	LIGHT	NNW	DAMP	N			
22/11/2013	S	LIGHT	W	FROZEN	N			
23/11/2013	S							
24/11/2013	S							
25/11/2013	S	LIGHT	W	FROZEN	N			
26/11/2013	S	MEDIUM	SW	DAMP	N			
27/11/2013	S	MEDIUM	SW	DAMP	N			
28/11/2013	S	LIGHT	W	DRY	N			
29/11/2013	S	MEDIUM	WSW	WET	N			
30/11/2013	S							