



Contractor



**Forth Crossing** Bridge Constructors

HOCHTIEF Solutions  
 American Bridge International  
 DRAGADOS  
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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT  
 JANUARY 2014**

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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 January 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 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 (PM<sub>10</sub>) 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 January
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> <li>• Drainage, kerbing and placing of type 1 subbase material (Granular) at Castlandhill Road</li> </ul>
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> <li>• Marine works</li> <li>• Society Road drain excavation</li> <li>• Concreting, fixing rebar and installation of tie beam at S7</li> </ul>
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> <li>• Marine works</li> <li>• Society Road drain excavation</li> <li>• Concreting, fixing rebar and installation of tie beam at S7</li> </ul>
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – install props and launch equipment</li> <li>• Concreting, fixing rebar and installation of tie beam at S7</li> <li>• Society Road drain excavation</li> </ul>
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – install props and launch equipment</li> <li>• South abutment – launch of west section</li> <li>• Concreting, fixing rebar and installation of tie beam at S7/S8</li> </ul>
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Launch – install props and launch equipment</li> <li>• Concreting, fixing rebar and installation of tie beam at S7</li> <li>• Society Road drain excavation</li> </ul>
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"> <li>• Launch – install props and launch equipment</li> </ul>
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> <li>• Launch – install props and launch equipment</li> <li>• Gyrotory – filling and structures works</li> <li>• A904 tie in road works, including drainage works, kerbing and placing of type 1 subbase to west</li> </ul>
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> <li>• Utilities works</li> <li>• Structure works</li> </ul>
		Automatic light scatter meter	14/02/12	

M17	Dundas Home Farm	Frisbee	29/08/11	• Filling works
		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 January 2014 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM<sub>10</sub> levels were below threshold levels throughout January and generally followed the same pattern across the site. It should be noted that a correction factor has been applied to the data for Whinny Hill between 01/01/14 to 27/01/14; this was done in consultation with the supplier following an error that was noted with the results obtained from this monitor. The supplier was able to remotely repair the fault with the meter on 27/01/14 and the meter is now under review to ensure that it is functioning correctly.

**3.1.2.** The PM<sub>10</sub> 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 January was largely driven by regional changes in air quality.

#### 3.2. Total Suspended Particles

**3.2.1.** The TSP results for January 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during January 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 January 2014 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 January, on the 8<sup>th</sup> and 22<sup>nd</sup>. The results for 8<sup>th</sup> January were averaged over a four week period due to the Christmas period. The next collection will take place on the 5<sup>th</sup> February 2014.

**3.3.3.** The site action level for the dust deposition rate has been set at 250 mg/m<sup>2</sup>/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/m<sup>2</sup>/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 January there were two exceedances of the site review level (see Table 4). 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
22/01/2014	Review	Inchgarvie Lodge	No relevant construction activities in the area	Low winds/ Generally wet
	Review	Echline	Some works in area	

**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 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 exceedance of the review level at Echline, whilst construction activities cannot be excluded from considerations, a review of the works at this location, the PM<sub>10</sub> data and the weather conditions during this period demonstrate that the impact of construction activities on the dust levels at these receptors is likely to have been minimal.

**3.3.7.** The exceedance of the review level at Inchgarvie also initiated a further review into works undertaken in the vicinity. However, during the period in question no construction activities that would be likely to give rise to dust took place in the area, indicating that the exceedance at this location was not related to construction works.

### **3.4. Daily Dust Log and Environmental Inspections**

**3.4.1.** A summary of the daily dust log for January can be found in Appendix D. During this period no instances of dust were noted on site.

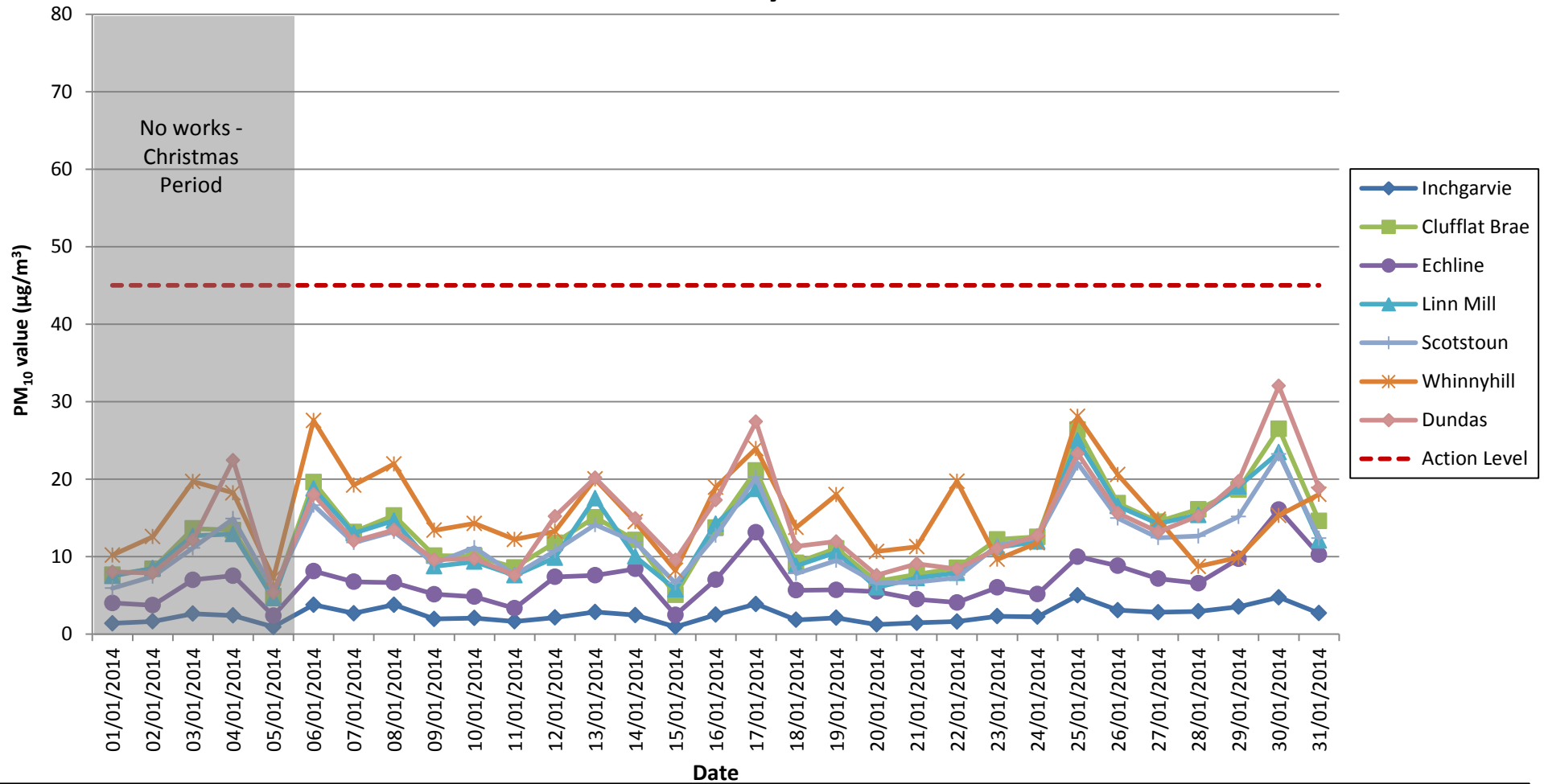
**3.4.2.** During this period full environmental inspections were also undertaken across the site and covered areas where works were being undertaken. In January, no instances of dust were noted during inspections.

## **APPENDIX A: LIGHT SCATTER METER RESULTS**

# Air Quality Monitoring

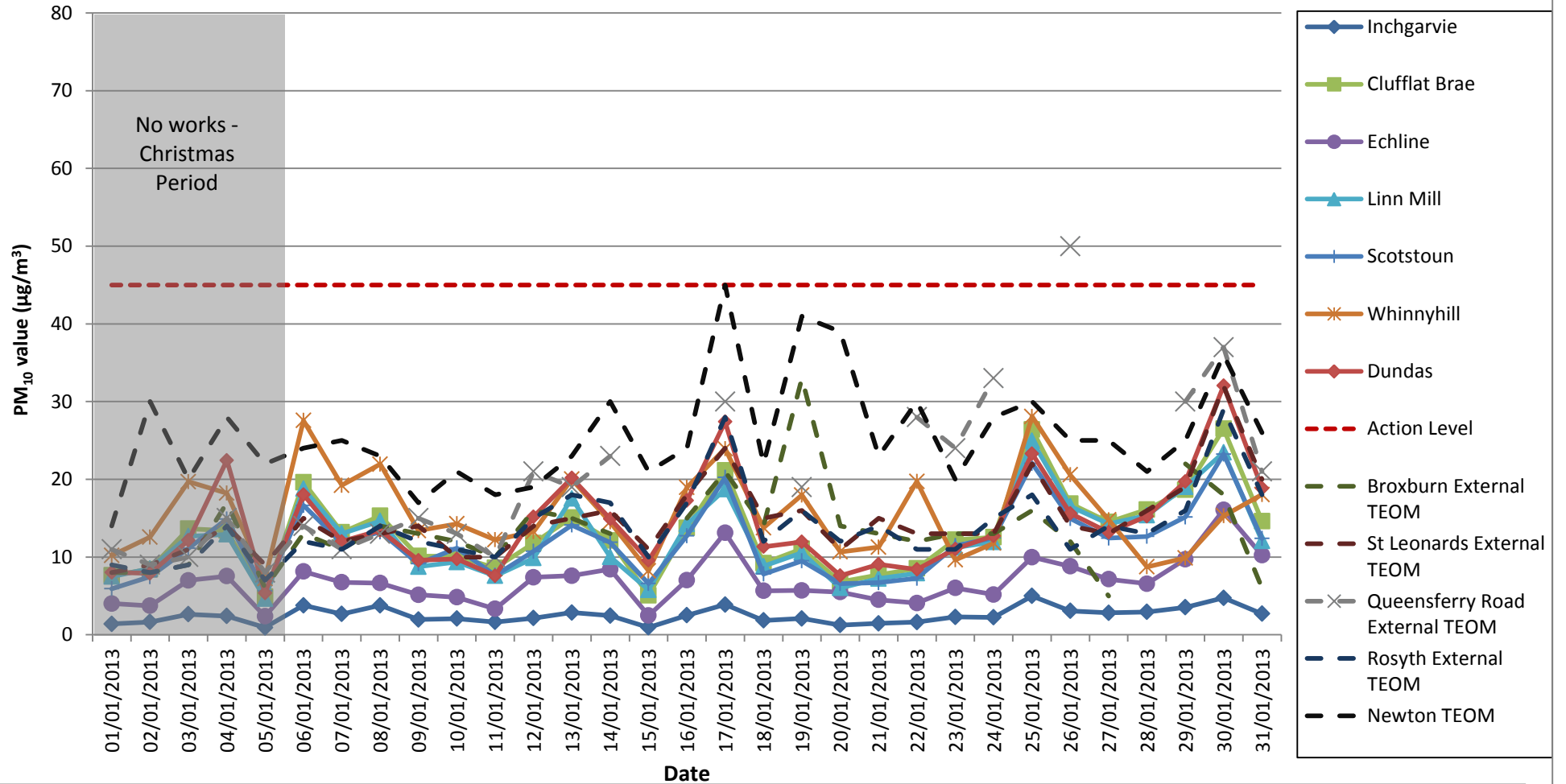
## Particulate Matter (PM10) Results for all Monitoring Locations

### January 2014



**Note:** The grey area of the chart represents the Christmas period (20/12/12 to 06/01/14), over which no works were undertaken. Due to an error with the device, a correction factor has been applied to the data for Whinny Hill between 01/01/14 to 27/01/14 following consultation with the supplier.

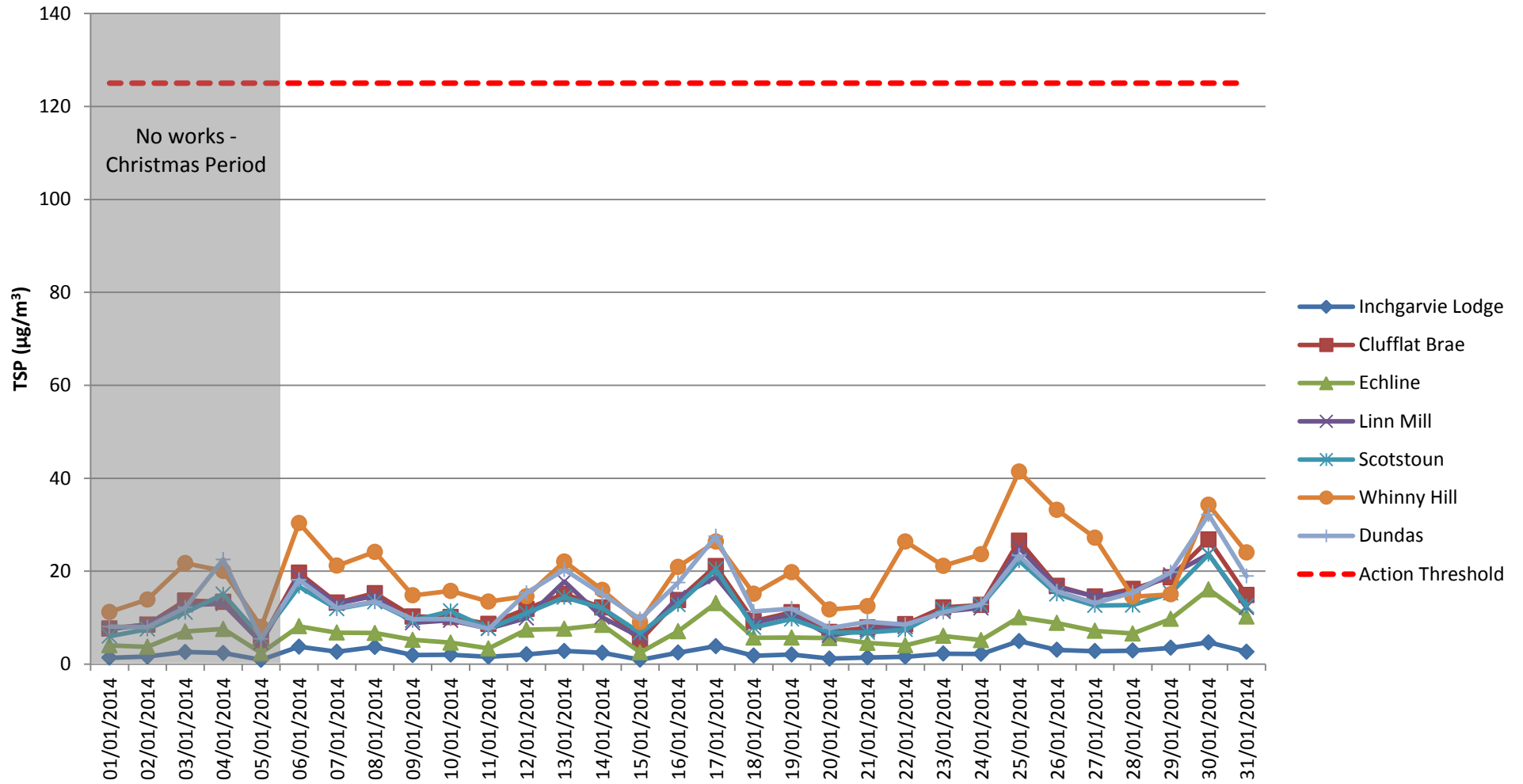
# Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, including TEOM data January 2014



**Note:** The grey area of the chart represents the Christmas period (20/12/13 to 06/01/14), over which no works were undertaken. Due to an error with the device, a correction factor has been applied to the data for Whinny Hill between 01/01/14 to 27/01/14 following consultation with the supplier.

## **APPENDIX B: TOTAL SUSPENDED PARTICLES**

## Total Suspended Particles (TSP) Results January 2014



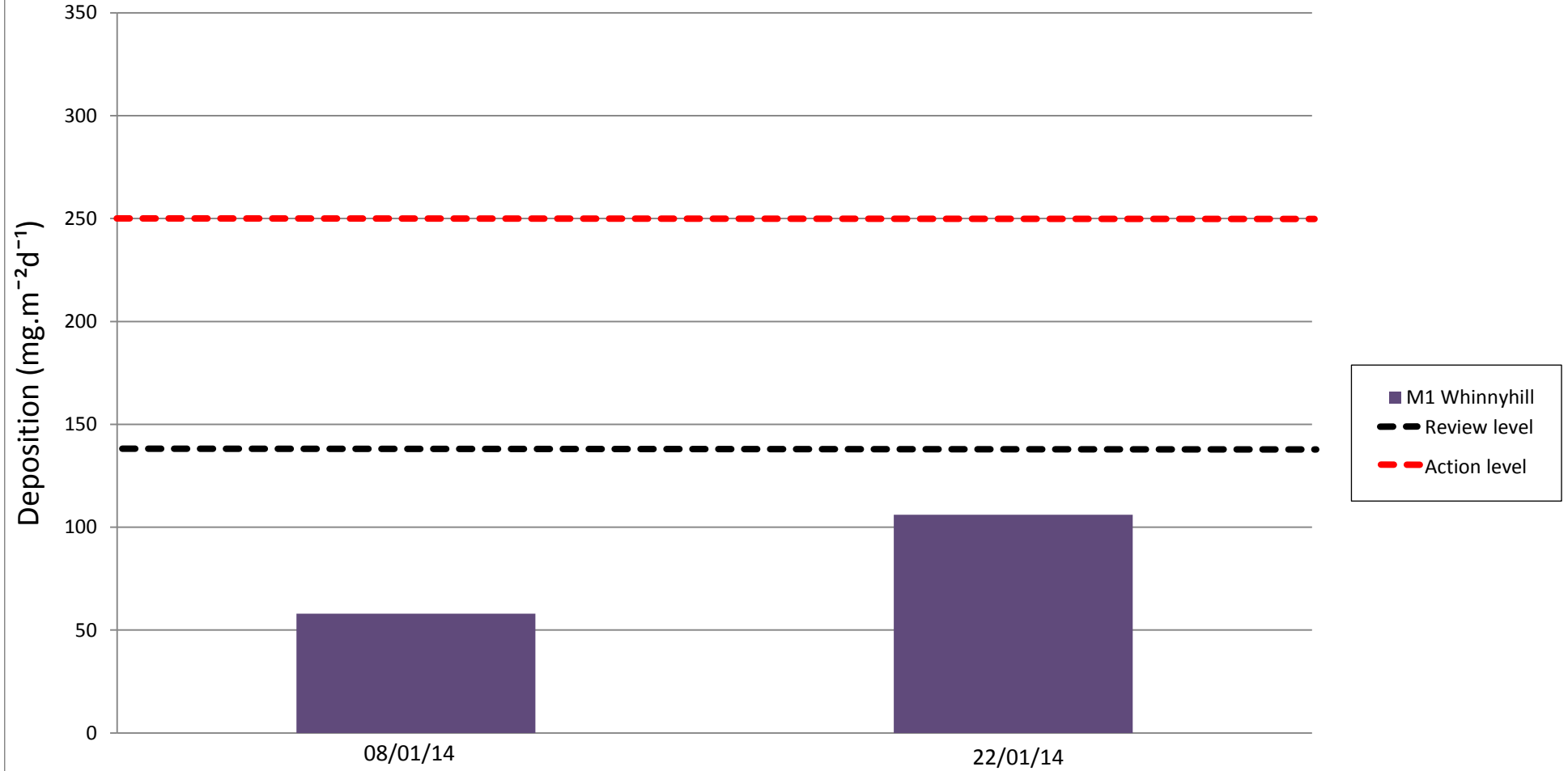
**Note:** The greyed out area of the graphs represents the Christmas period over which no works were undertaken (20/12/13 to 06/01/14). Due to an error with the device, a correction factor has been applied to the data for Whinny Hill between 01/01/14 to 27/01/14 following consultation with the supplier.



## **APPENDIX C: FRISBEE GAUGE RESULTS**

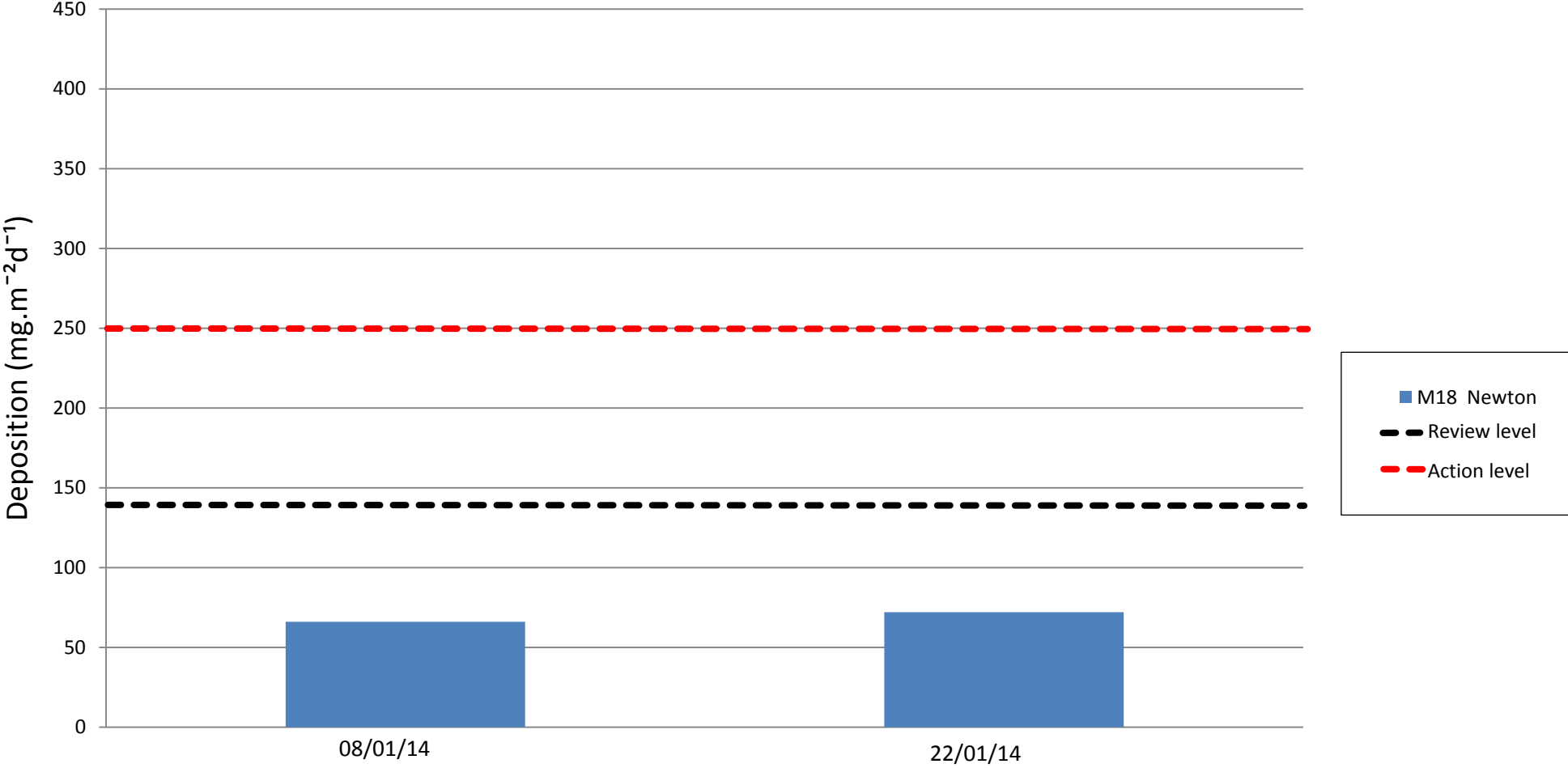
# Frisbee Dust Deposition Results: Group 5

## Locations: M1 Whinny Hill



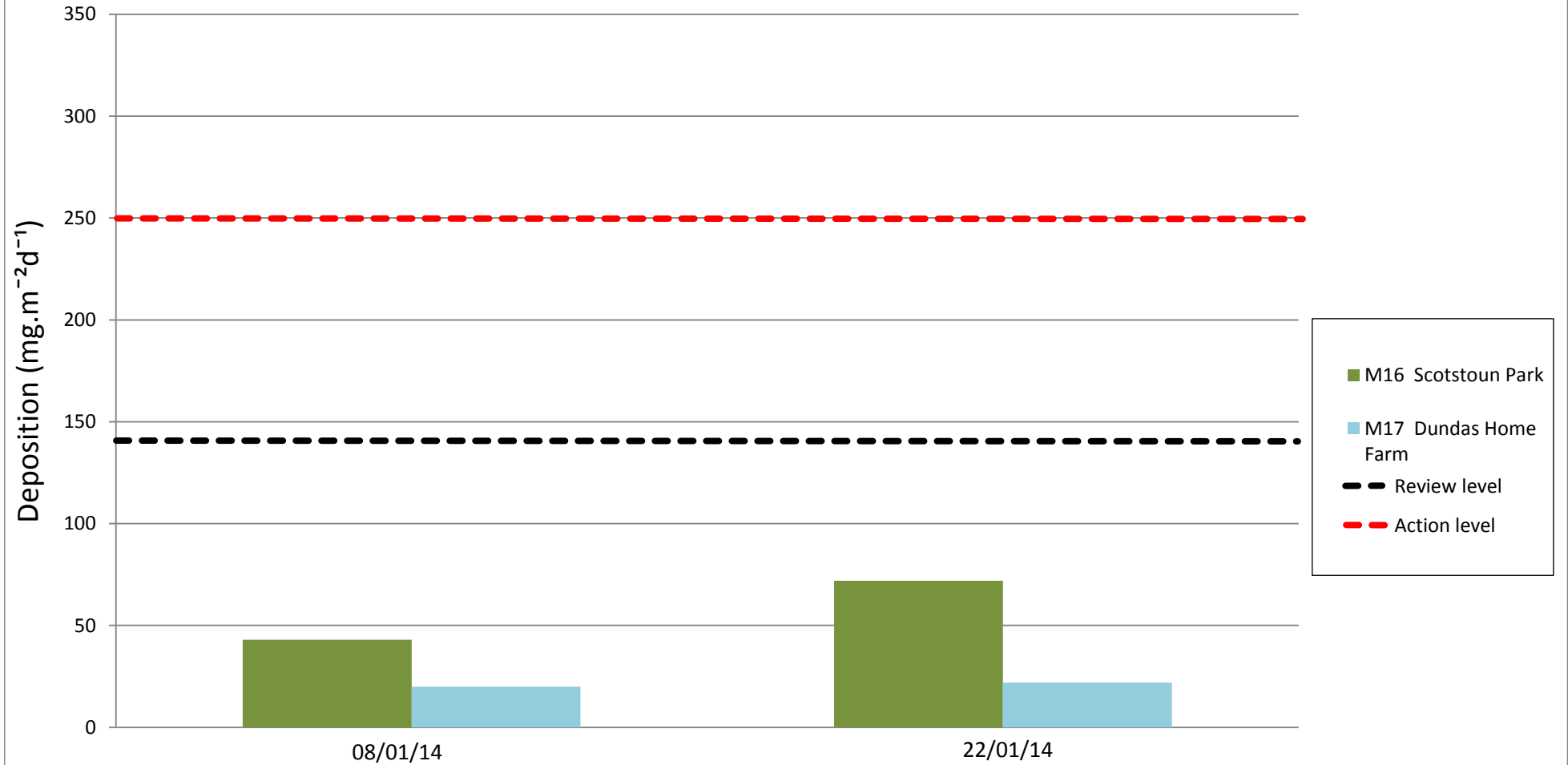
# Frisbee Dust Deposition Results: Group 4

## Locations: M18 Newton



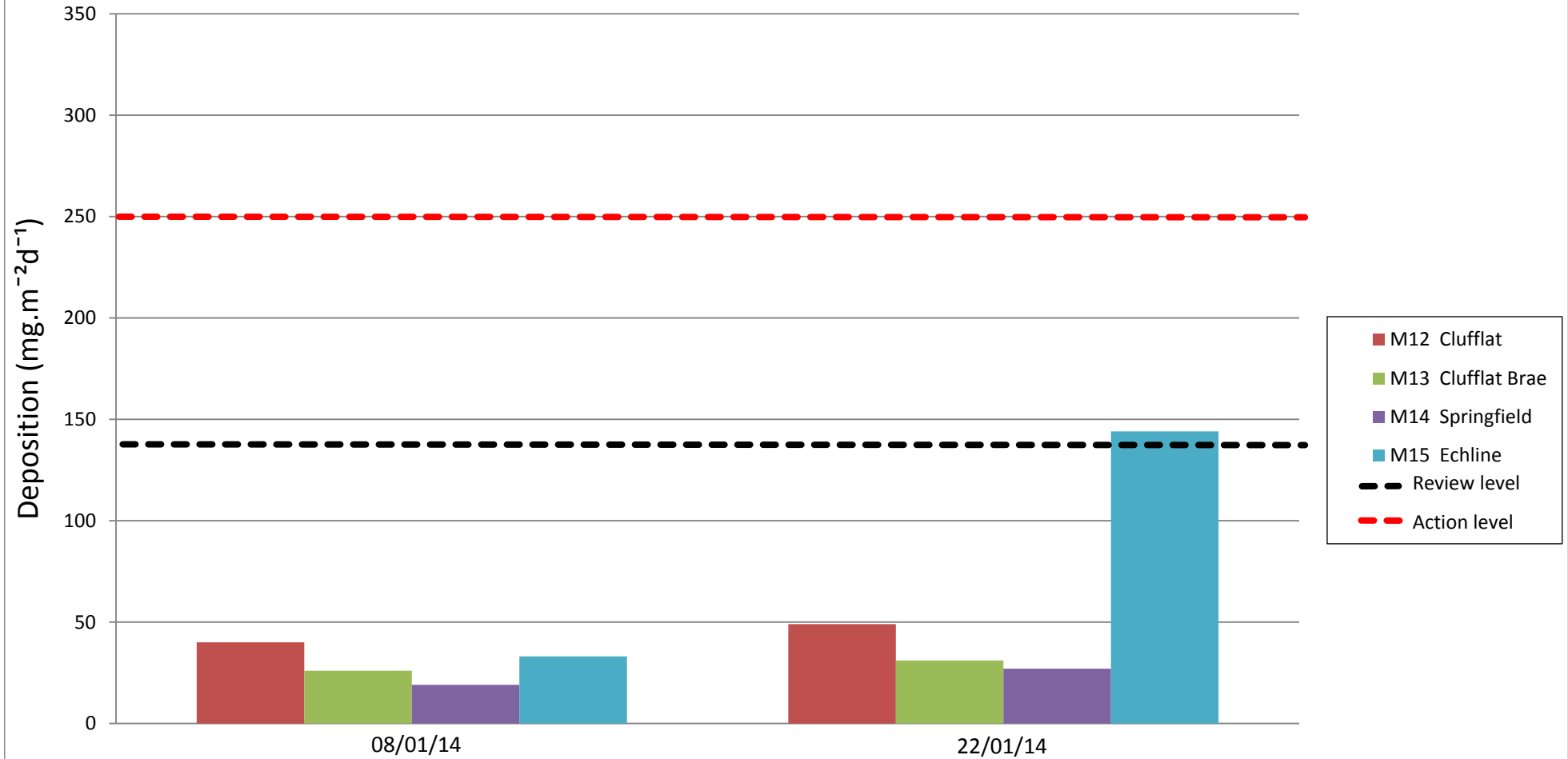
### Frisbee Dust Deposition Results: Group 3

#### Locations: M16 Scotstoun Park and M17 Dundas Home Farm

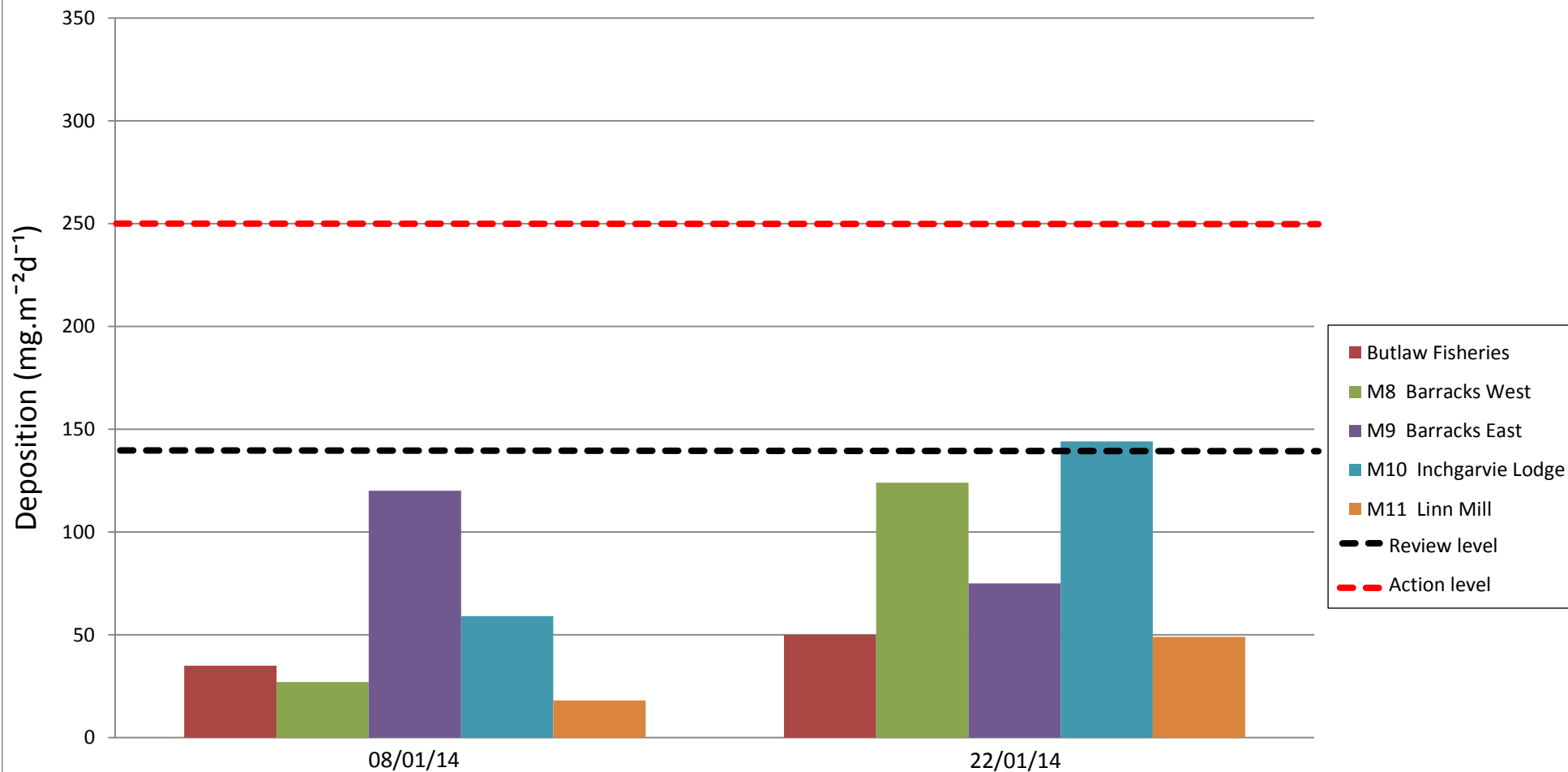


# Frisbee Dust Deposition Results: Group 2

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



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



## **APPENDIX D: DAILY DUST LOG**

### Daily Dust Log - North - January 2014

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



### Daily Dust Log - South - January 2014

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