Contractor

Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

AIR QUALITY MONITORING REPORT

JANUARY 2013

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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 January 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 (PM_{10}) 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 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 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 January
M1	Whinny Hill	Frisbee	21/03/12	Breaking of rock Loading of rock Drilling and blast 13
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	Grit blasting at S8 Installation of rebar & concrete pour at S7 Piling and excavation works at S6 Marine works
M8	Barracks West	Frisbee	31/08/11	Grit blasting at S8 Installation of rebar & concrete pour at S7 Piling and excavation works at S6 Marine works
M9	Barracks East	Frisbee	31/08/11	Grit blasting at S8 Installation of rebar & concrete pour at S7 Piling and excavation works at S6 Marine works
M10	Inchgarvie Lodge	Frisbee	22/08/11	Grit blasting at S8 Installation of rebar & concrete pour at S7 Break out rock from launch Works at South Abutment including concrete pour
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Break out rock from launch Works at South Abutment including concrete pour
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Break out rock from launch Works at South Abutment including concrete pour
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	Break out rock from launch Generate rock at Queensferry gyratory

M15	Echline	Frisbee	16/08/11	Generate rock at Queensferry gyratory Backfill of A904 verges Hedge removal at U221
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	Drainage works
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	Utilities works Export of rock to Dundas Badger fence installation
		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 2013 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM_{10} levels were generally low and largely followed the same pattern across the site. There were no exceedances of the threshold throughout January. It should be noted that no land-based works were undertaken over the Christmas period (21/12/12 to 07/01/13), indicating that changes in the particulate matter results during this period were not likely to be associated with construction works but were rather due to non-construction related factors. Damp weather conditions over this time would also restrict any dust arising from the site.

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, 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 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 due to regional changes in air quality.

3.1.3. Due to a pump failure, the Echline meter was returned to the supplier for servicing in December. In the meantime, the Whinny Hill device was relocated to Echline as a temporary measure as, at the time of the pump failure in December, works were limited in the Whinny Hill area due to demobilisation in the lead up to the Christmas break; the meter was therefore considered better placed at Echline. As a result, data is missing at Whinny Hill between 1 and 22 January. During site operating times over this period, there were increased visual inspections by the FCBC environmental team at Whinny Hill.

3.2. Total Suspended Particles

3.2.1. The TSP results for January 2013 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at all monitoring locations throughout January were low and within the threshold level. All locations 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. Data is missing from Whinny Hill between 1 and 21 January as the Whinny Hill meter was temporarily relocated to Echline whilst the Echline meter was returned to the supplier for repair. Please refer to paragraph 3.1.3 for further information.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for January 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 data deposition results were collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Two collection dates fell during January; one on the 9 January, with another a fortnight later on the 23 January 2013. It should be noted that due to the Christmas break (21/12/12 to 07/01/13), the results for the collection date on the 9 January 2013 cover a period of four weeks.

3.3.3. The site action level for the dust deposition rate has been set at 250 $mg/m^2/day$. 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 $mg/m^2/day$. 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. During January there were no exceedances of either the site action or the site review thresholds at any locations. Results from across site were found to be low.

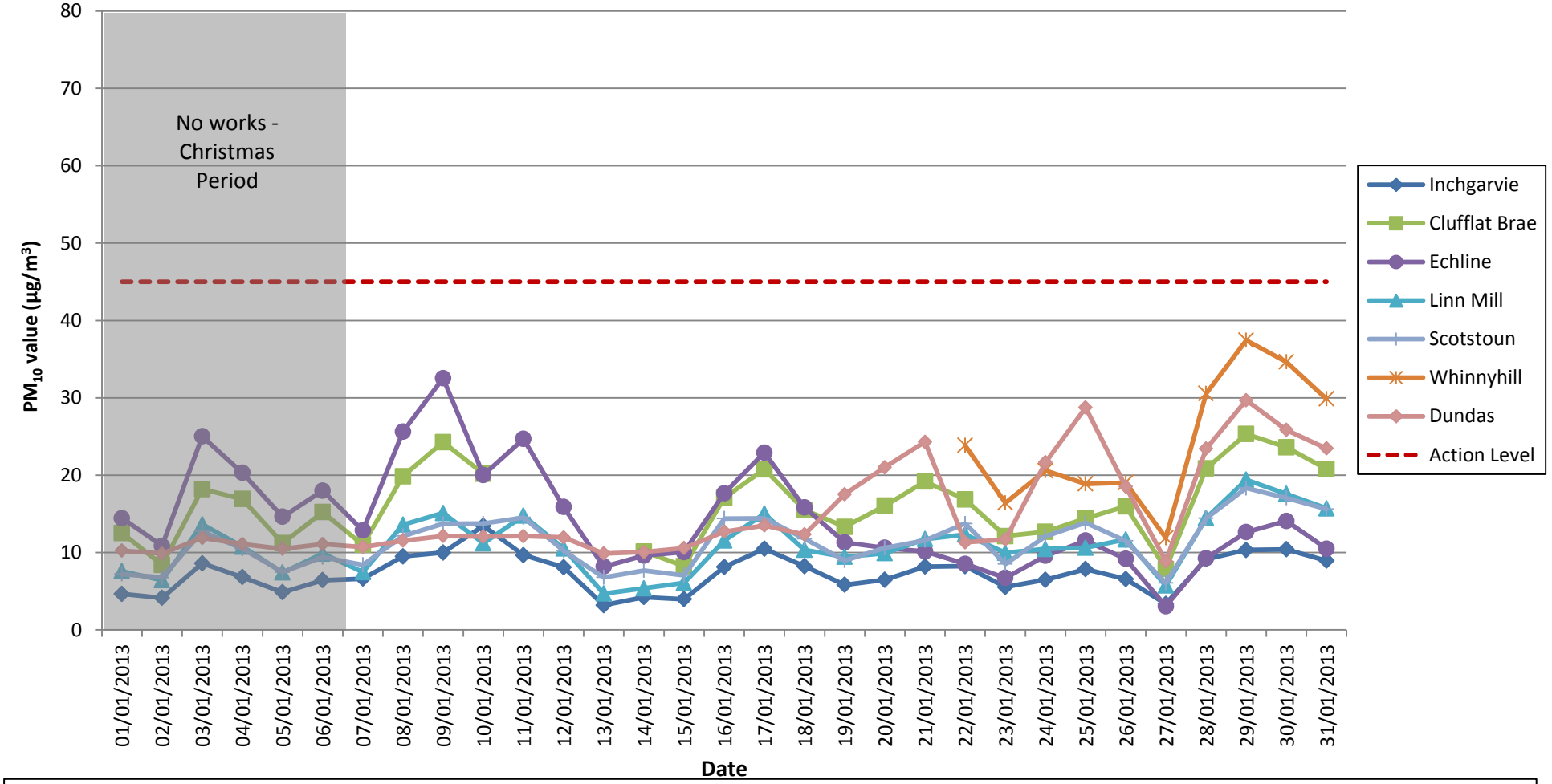
3.4. Daily Dust Log and Environmental Inspections

3.4.1. A summary of the daily dust log for January can be found in Appendix D. No instances of visual dust on site were noted in either the southern or northern networks areas during January. No daily dust inspections were undertaken over the Christmas period (21/12/12 to 07/01/13) as no land-based works were undertaken during this period.

3.4.2. During this period a number of environmental inspections were also undertaken across the site. These were undertaken weekly and covered areas of site where works were being undertaken. No inspections were undertaken over the Christmas period (21/12/12 to 07/01/13) as no land-based works were undertaken during this time. In January, no instances of air quality issues were noted during any of these inspections and therefore no actions relating to air quality were noted within the environmental actions register during this period.

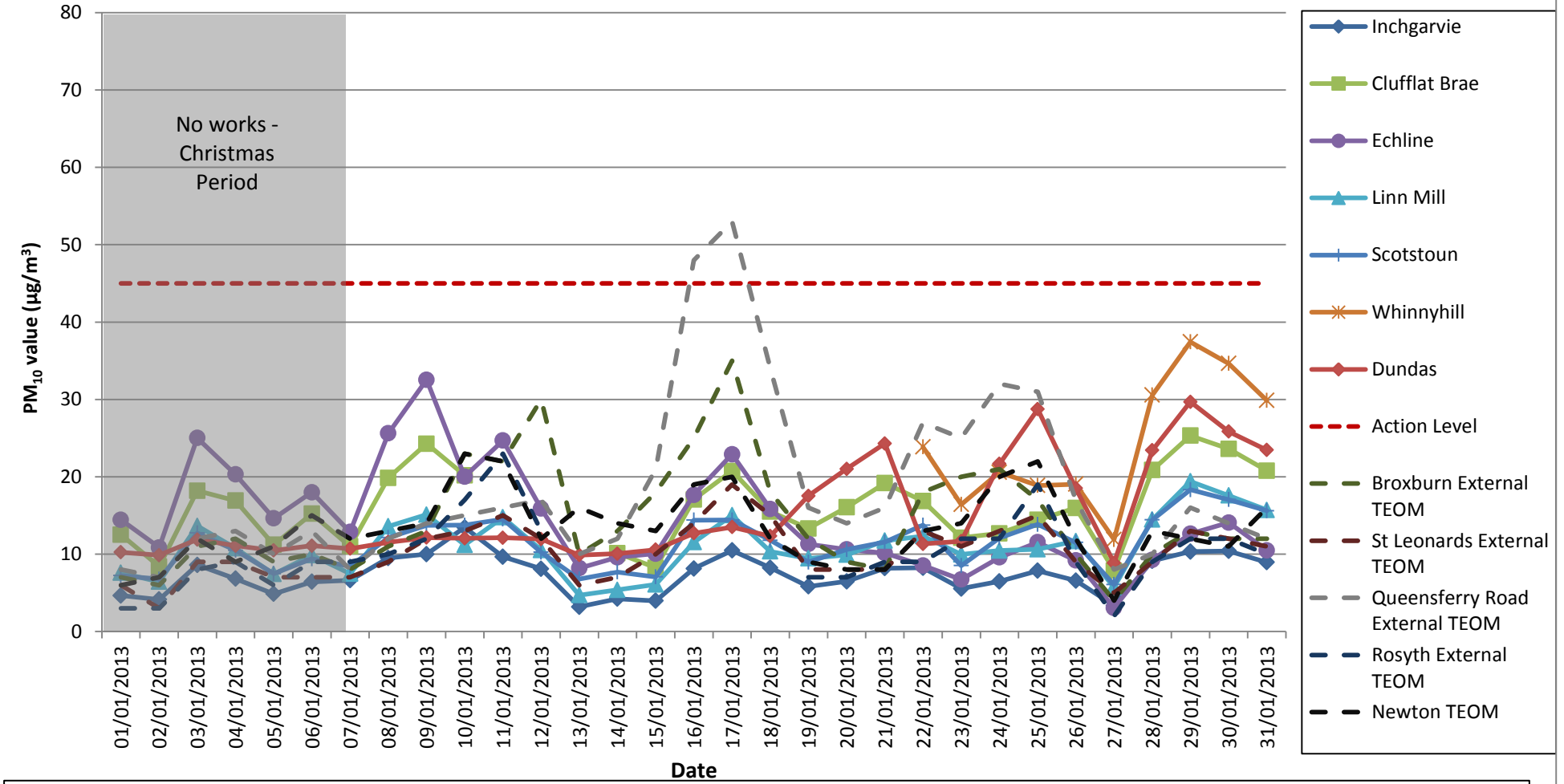
APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring
Particulate Matter (PM10) Results for all Monitoring Locations
January 2013



Note: The grey area of the chart represents the Christmas period (21/12/12 to 07/01/13), over which no works were undertaken. Data is missing for Whinny Hill between 01/01/13 and 21/01/13 as this meter was temporarily relocated to Echline whilst the Echline meter was with the supplier for servicing. Visual inspections were increased at Whinny Hill, as required during works, whilst the meter was not present. Data is mising for Clufflat between 11/01/13 and 13/01/13 due to device error.

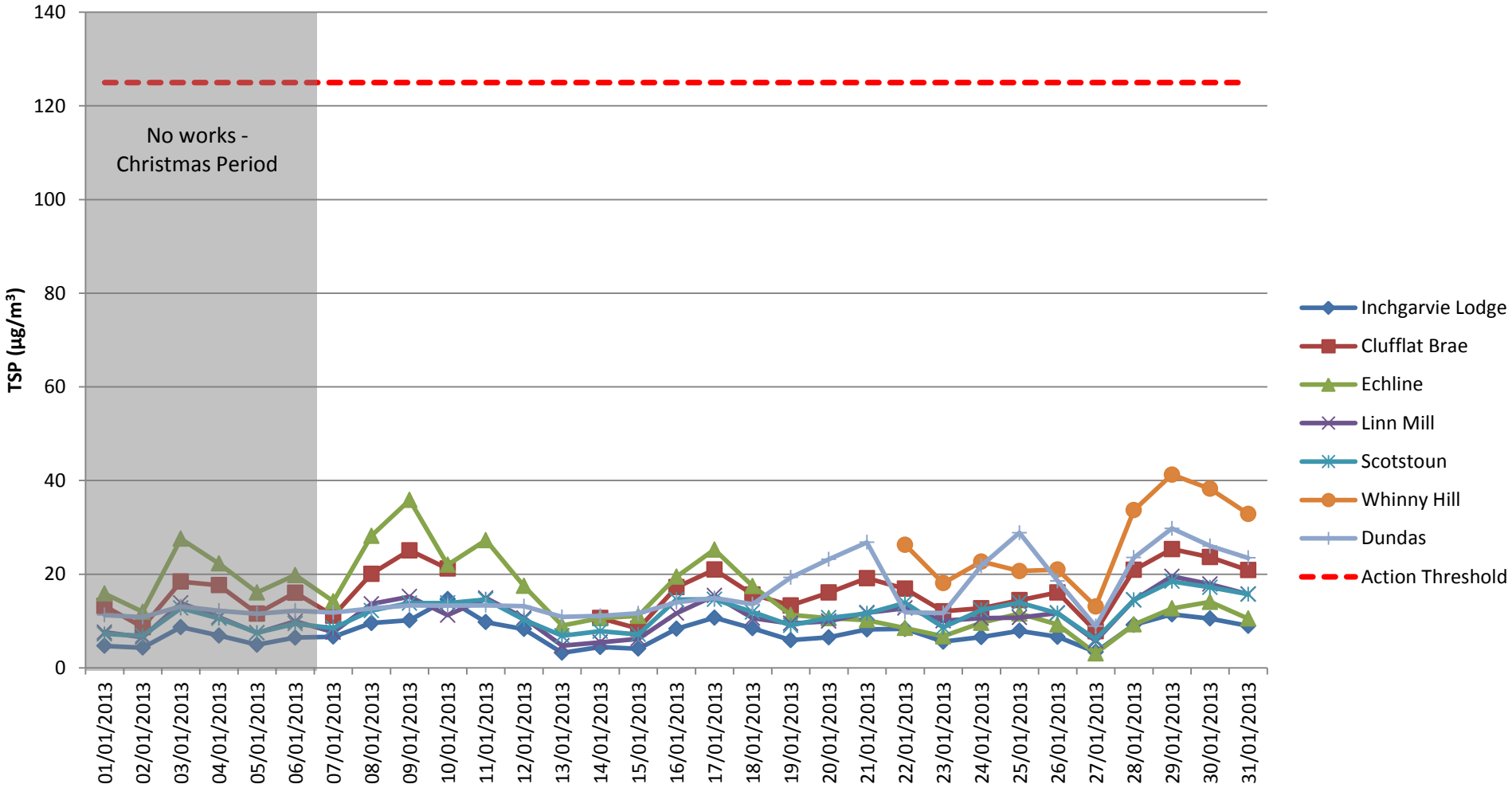
Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, inlcuding TEOM data
January 2013



Note: The grey area of the chart represents the Christmas period (21/12/12 to 07/01/13), over which no works were undertaken. Data is missing for Whinny Hill between 01/01/13 and 21/01/13 as this meter was temporarily relocated to Echline whilst the Echline meter was with the supplier for servicing. Visual inspections were increased at Whinny Hill, as required during works, whilst the meter was not present. Data is missing for Clufflat between 11/01/13 and 13/01/13 due to device error.

APPENDIX B: TOTAL SUSPENDED PARTICLES

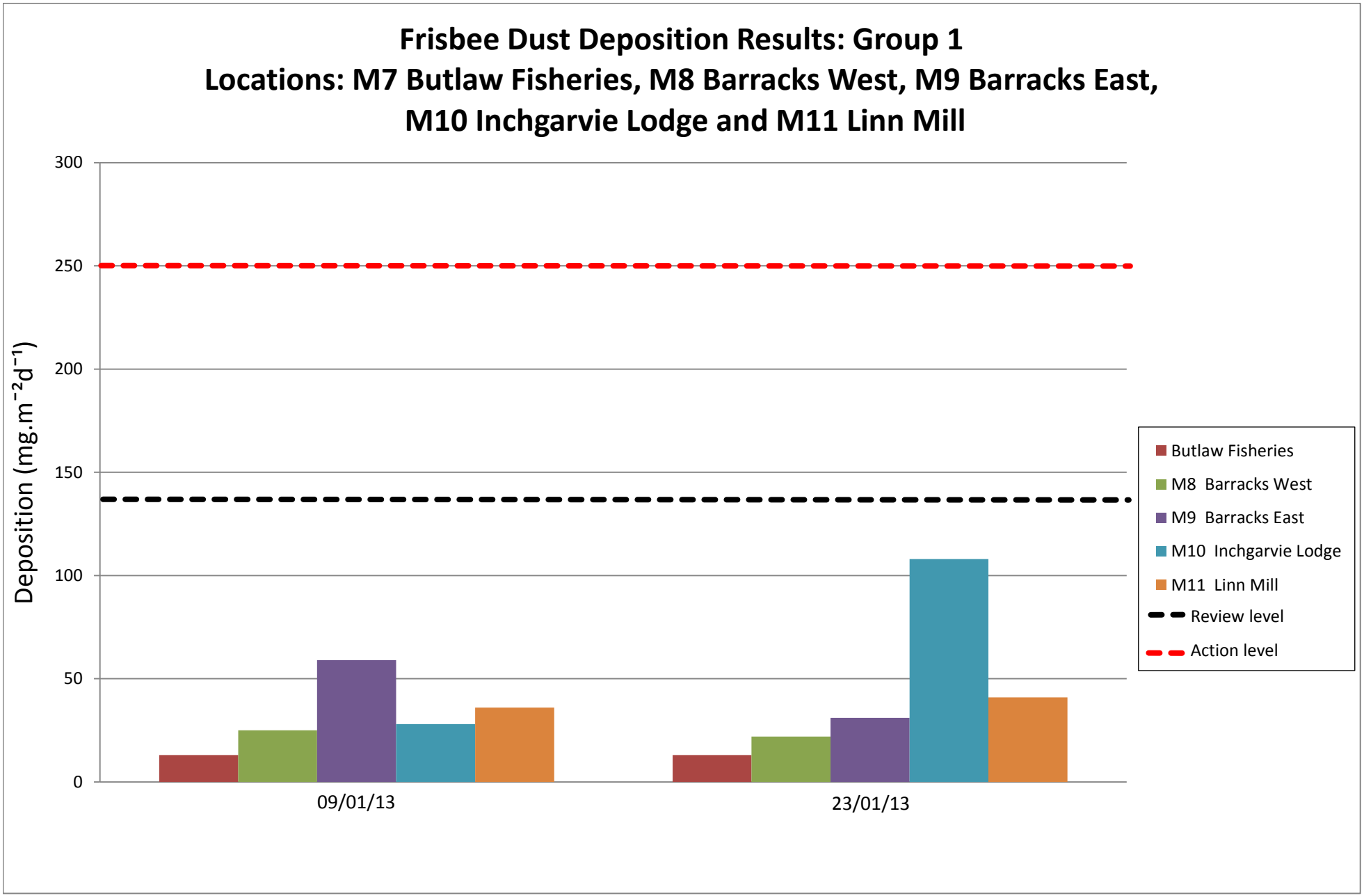
Total Suspended Particles (TSP) Results
January 2013



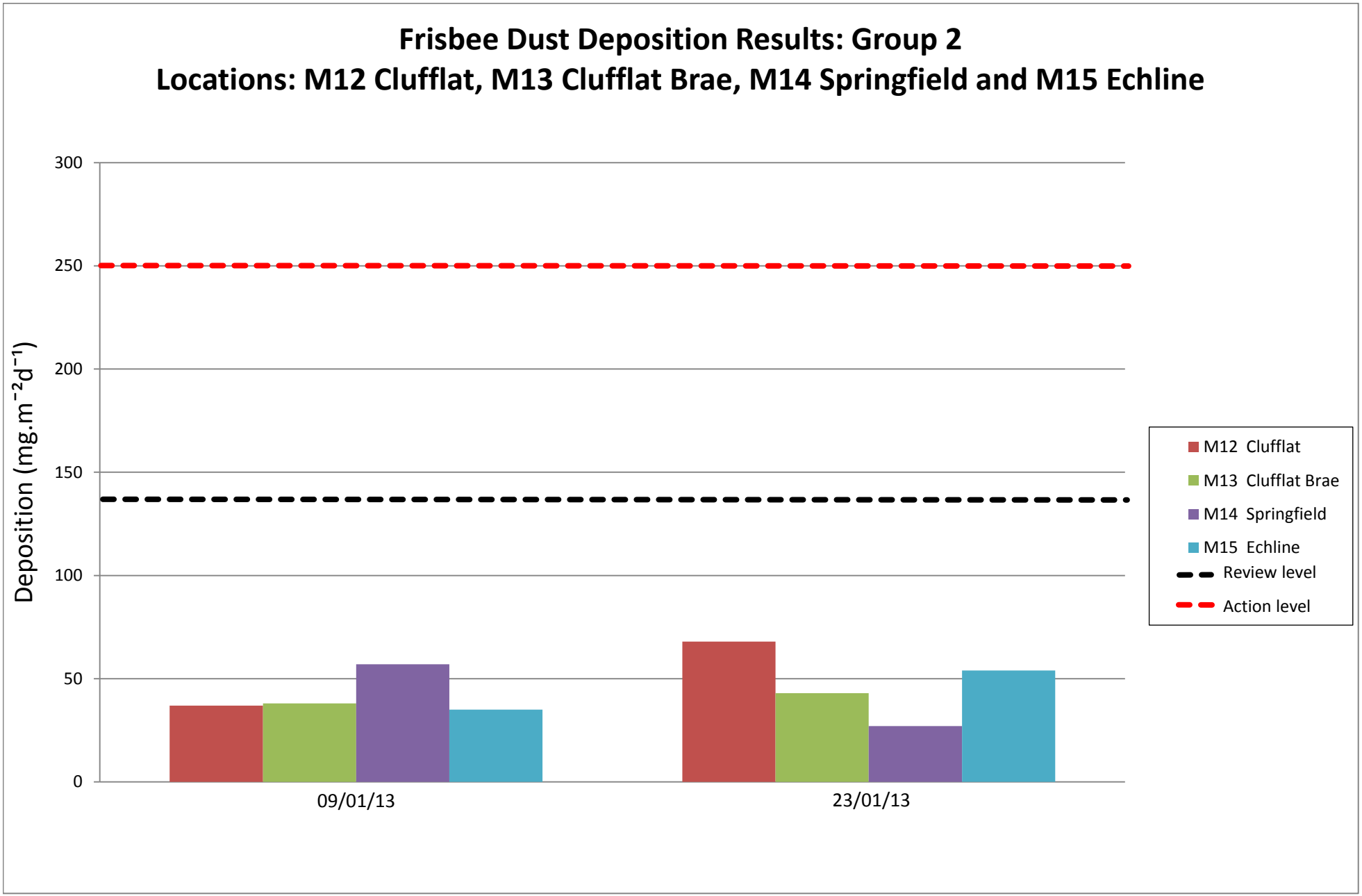
Note: The greyed out area of the graphs represents the Christmas period over which no works were undertaken (21/12/12 to 07/01/12). Whilst the Echline meter was away for servicing ,the Whinny Hill meter was stationed at Echline as a temporary measure. Visual inspections were increased at Whinny Hill during the period for which data is missing for this location.

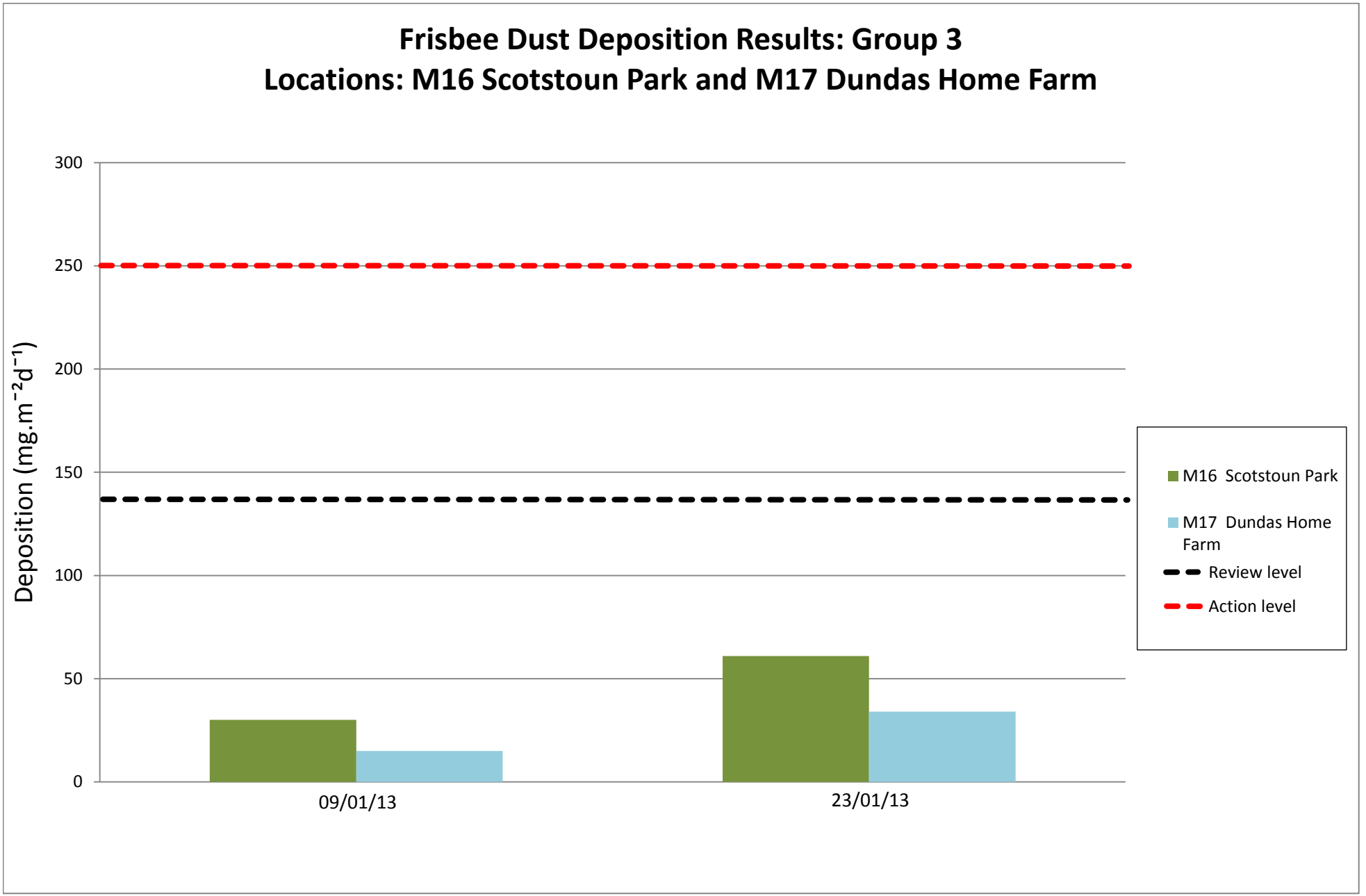
APPENDIX C: FRISBEE GAUGE RESULTS

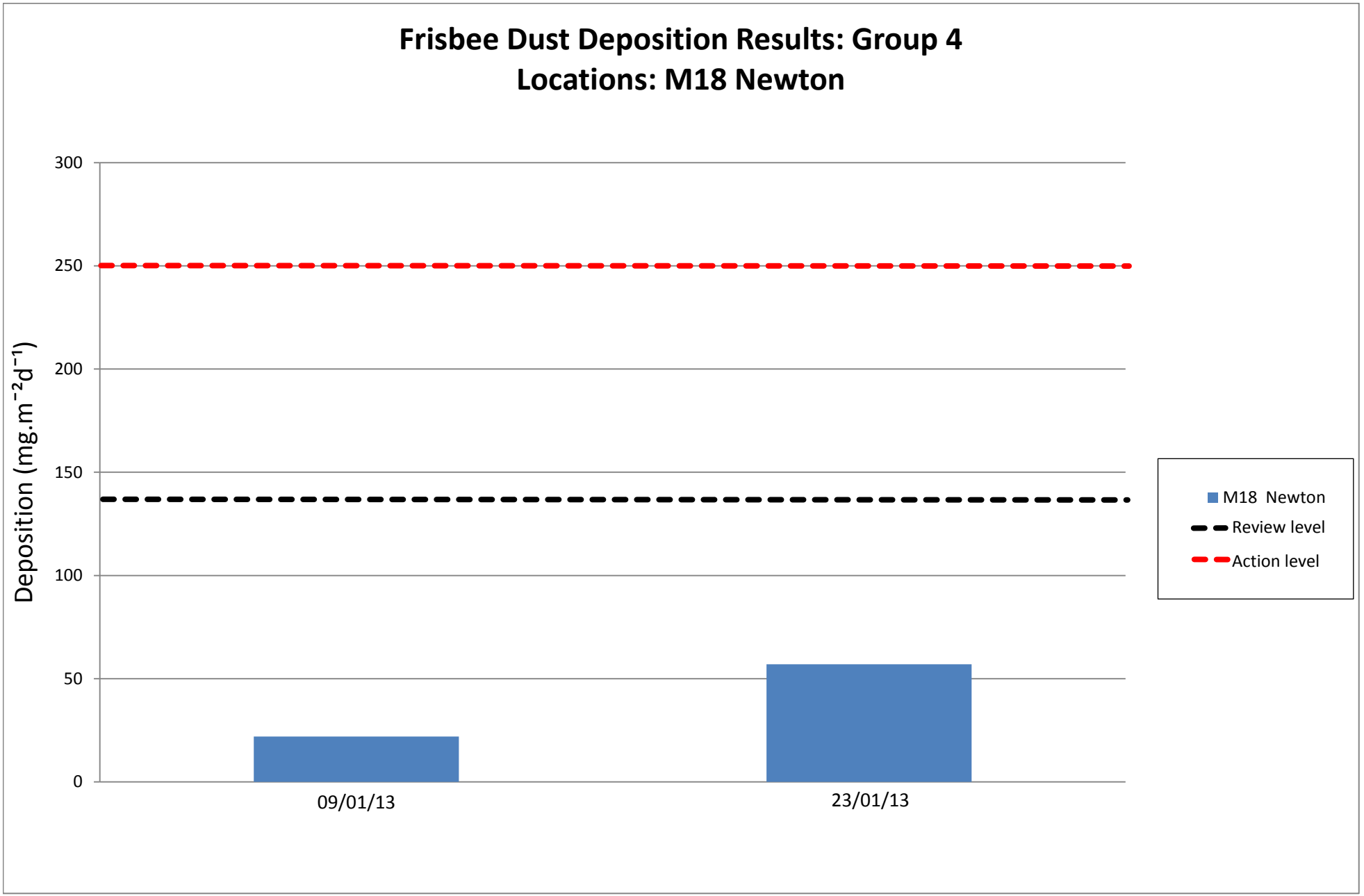
Frisbee Dust Deposition Results: Group 1
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill

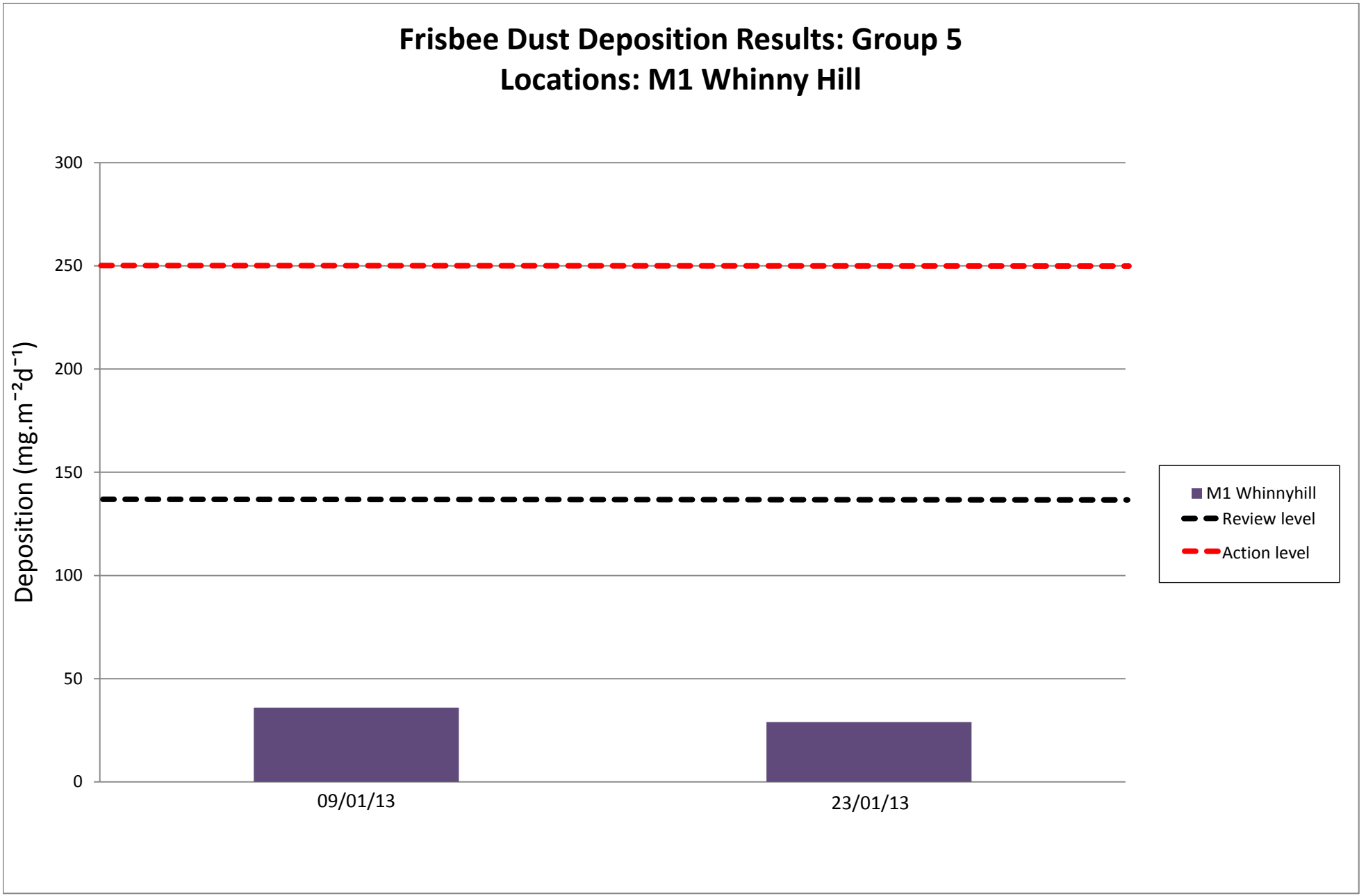


Frisbee Dust Deposition Results: Group 2
Locations: M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline




Frisbee Dust Deposition Results: Group 3
Locations: M16 Scotstoun Park and M17 Dundas Home Farm
Deposition (mg.m⁻²d⁻¹)
300
250
200
150
100
50
0
09/01/13
23/01/13
M16 Scotstoun Park
M17 Dundas Home Farm
Review level
Action level


Frisbee Dust Deposition Results: Group 4
Locations: M18 Newton
Deposition (mg.m⁻²d⁻¹)
300
250
200
150
100
50
0
09/01/13
23/01/13
M18 Newton
Review level
Action level


Frisbee Dust Deposition Results: Group 5
Locations: M1 Whinny Hill
Deposition (mg.m⁻²d⁻¹)
300
250
200
150
100
50
0
09/01/13
23/01/13
M1 Whinnyhill
Review level
Action level

APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - January 2013

No works over Christmas period (22/12/12 to 07/01/13)

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)
01/01/2013									
02/01/2013									
03/01/2013									
04/01/2013									
05/01/2013									
06/01/2013									
07/01/2013	N	LIGHT	SW	DRY	Y			Additional inspections undertaken in Whinny Hill area due to temporary relocation of Whinny Hill light scatter to Echline. No visual signs of dust. No drilling/blasting on this date.	
08/01/2013	N	LIGHT	W	DRY	Y			As above	
09/01/2013	N	LIGHT	W	DAMP	Y			As above	
10/01/2013	N	LIGHT	NE	DRY	Y			As above	
11/01/2013	N	LIGHT	NE	DAMP	Y			As above	
12/01/2013									
13/01/2013									
14/01/2013	N	LIGHT	NE	FROZEN	N			As above	
15/01/2013	N	NONE	NE	FROZEN	N			As above	
16/01/2013	N	LIGHT	NE	FROZEN	N			As above, however drilling on this date - no noteable adverse impact on air quality	
17/01/2013	N	LIGHT	NE	FROZEN	N			As above, however drilling on this date - no noteable adverse impact on air quality. Drilling completed.	
18/01/2013	N	LIGHT	NE	FROZEN	N			As above	
19/01/2013									
20/01/2013									
21/01/2013	N	LIGHT	E	DAMP	N			Light scatter reinstalled	
22/01/2013	N	LIGHT	NE	DRY	N				
23/01/2013	N	LIGHT	SE	DRY	N				
24/01/2013	N	LIGHT	SE	DRY	N				
25/01/2013	N	STRONG	W	DAMP	N				
26/01/2013									
27/01/2013									
28/01/2013	N	STRONG	SW	WET	N				
29/01/2013	N	STRONG	SW	DAMP/WET	N				

30/01/2013	N	STRONG	W	WET	N				
31/01/2013	N	LIGHT	W	DAMP/WET	N				

Daily Dust Log - South - January 2013

No works over Christmas period (22/12/12 to 07/01/13)

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)
01/01/2013									
02/01/2013									
03/01/2013									
04/01/2013									
05/01/2013									
06/01/2013									
07/01/2013	N	LIGHT	SW	DRY	N				
08/01/2013	N	LIGHT	W	DRY	N				
09/01/2013	N	LIGHT	W	DAMP	N				
10/01/2013	N	LIGHT	NE	DRY	N				
11/01/2013	N	LIGHT	NE	DAMP	N				
12/01/2013									
13/01/2013									
14/01/2013	N	LIGHT	NE	FROZEN	N				
15/01/2013	N	NONE	NE	FROZEN	N				
16/01/2013	N	LIGHT	NE	FROZEN	N				
17/01/2013	N	LIGHT	NE	FROZEN	N				
18/01/2013	N	LIGHT	NE	FROZEN	N				
19/01/2013									
20/01/2013									
21/01/2013	N	LIGHT	E	DAMP	N				
22/01/2013	N	LIGHT	NE	DRY	N				
23/01/2013	N	LIGHT	SE	DRY	N				
24/01/2013	N	LIGHT	SE	DRY	N				
25/01/2013	N	STRONG	W	DAMP	N				
26/01/2013									
27/01/2013									
28/01/2013	N	STRONG	SW	WET	N				
29/01/2013	N	STRONG	SW	DAMP/WET	N				
30/01/2013	N	STRONG	W	WET	N				
31/01/2013	N	LIGHT	W	DAMP/WET	N				