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

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 February 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 14
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	Backfilling at S7 & S8 Excavation and rock breaking works at S6 Drilling for de-stressing wells at S6 Marine works
M8	Barracks West	Frisbee	31/08/11	Backfilling at S7 & S8 Excavation and rock breaking works at S6 Drilling for de-stressing wells at S6 Marine works
M9	Barracks East	Frisbee	31/08/11	Backfilling at S7 & S8 Excavation and rock breaking works at S6 Drilling for de-stressing wells at S6 Marine works
M10	Inchgarvie Lodge	Frisbee	22/08/11	Backfilling at S7 & S8 Excavation at launch Temporary drainage works at launch Works at South Abutment, including placing of structural backfill and erection of reinforcement
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Excavation at launch Temporary drainage works at launch Works at South Abutment, including placing of structural backfill and erection of reinforcement
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Excavation at launch Temporary drainage works at launch Works at South Abutment, including placing of structural
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	

				backfill and erection of reinforcement
M14	Springfield	Frisbee	15/08/11	Excavation at launch Temporary drainage works at launch Generate rock at Queensferry gyratory
M15	Echline	Frisbee	16/08/11	Excavation at launch Temporary drainage works at launch Generate rock at Queensferry gyratory Soil strip at A904
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	Drainage works Spread of material from launch at North-bound bus link
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	Utilities works Soil strip Topsoil bund
		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 February 2013 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM_{10} levels were largely below threshold levels and followed the same pattern across the site. During February there were eight exceedances of the threshold; these occurred at Whinny Hill on 11 and 18 February and at Dundas on 11, 12, 18, 19, 27 and 28 February. However, construction works are not considered to have been the cause of these exceedances. Rather, the exceedances coincide with days on which the weather conditions were such that the light scatter meter readings were affected, as set out in paragraph 2.2; snow, haze and foggy conditions were noted on the dates on which exceedances occurred. Furthermore,

when automatic alerts were received on these dates within site working hours, inspections were undertaken which confirmed no visible signs of dust arising from the site and wet or frozen ground conditions ensured prevention of dust generation from any construction activities.

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 February was largely due to regional changes in air quality. On the dates on which exceedances occurred at the light scatter meters at Dundas and Whinny Hill, increased levels were also noted at all the TEOM monitors, demonstrating further that the light scatter exceedances were caused by regional conditions.

3.2. Total Suspended Particles

3.2.1. The TSP results for February 2013 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at all monitoring locations throughout February 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.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for February 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 February; one on the 6 February, with another a fortnight later on the 20 February 2013.

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 February there was a single exceedance of the site action threshold at Barracks (east). This exceedance was investigated by the FCBC Environmental Team and it was attributed to a stockpile of material that was stored immediately adjacent to the Frisbee gauge. In consideration of the results for the other nearby monitoring locations, this exceedance was found to be a very localised incident; notably, the results for Barracks (west), which is located within 100 meters of Barracks (east), were very found to be significantly below both the review and action thresholds. Additionally, investigations found that it is likely that the exceedance occurred at the point at which the stockpile was created; no exceedance occurred for the second fortnight during

February, during which, movement of materials also occurred as the stockpile was moved during this time. The stockpiling of this material was, therefore, following the procedures set out within the FCBC Dust and Air Quality Management Plan, as the stockpile existed for only a short time and was stored away from sensitive receptors; no residential properties are in close proximity to the Barracks (east) monitoring location.

3.3.5. Frisbee results from all monitoring locations across site were found to be low.

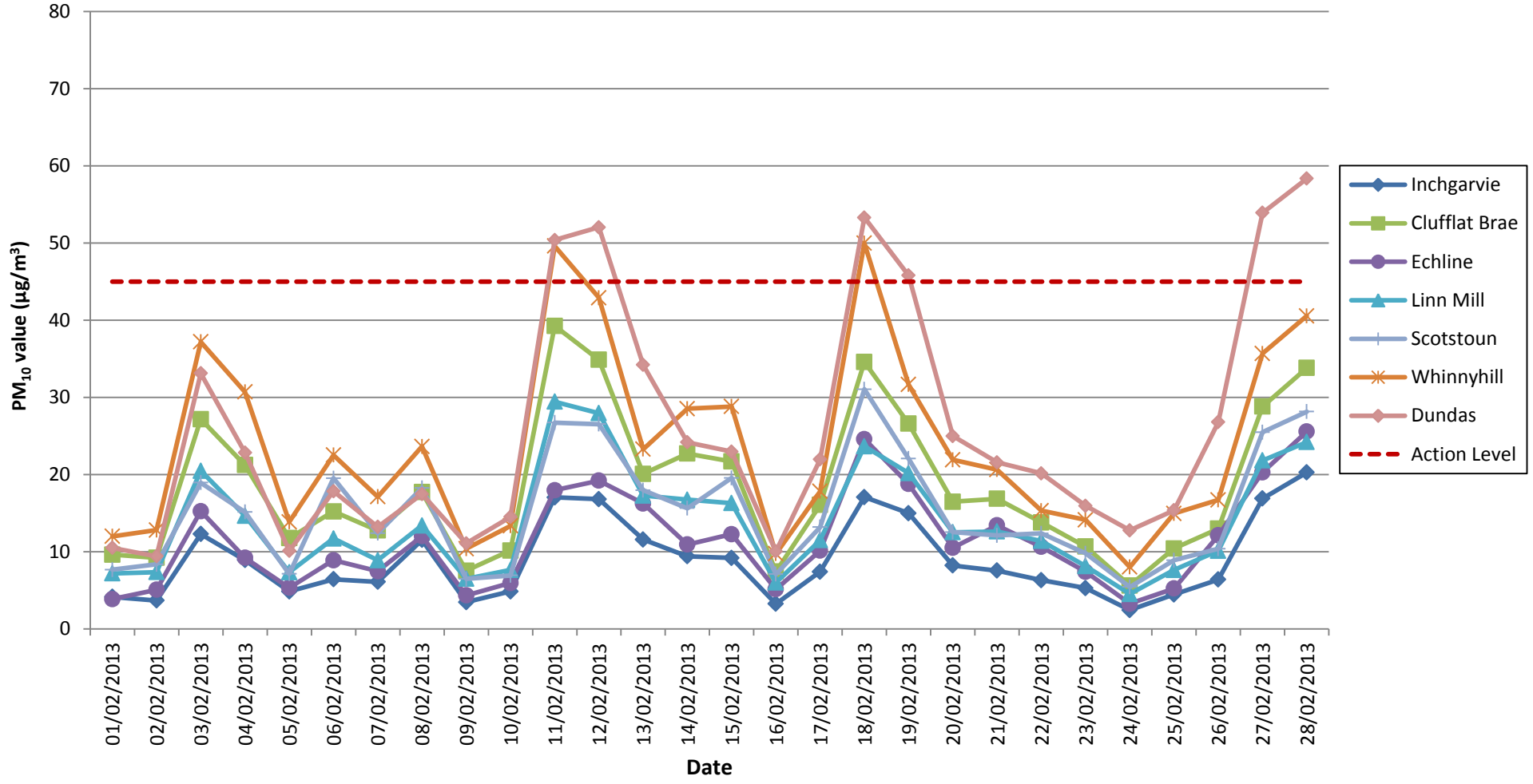
3.4. Daily Dust Log and Environmental Inspections

3.4.1. A summary of the daily dust log for February can be found in Appendix D. No instances of visual dust on site were noted in either the southern or northern networks areas during February.

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. In February, 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.

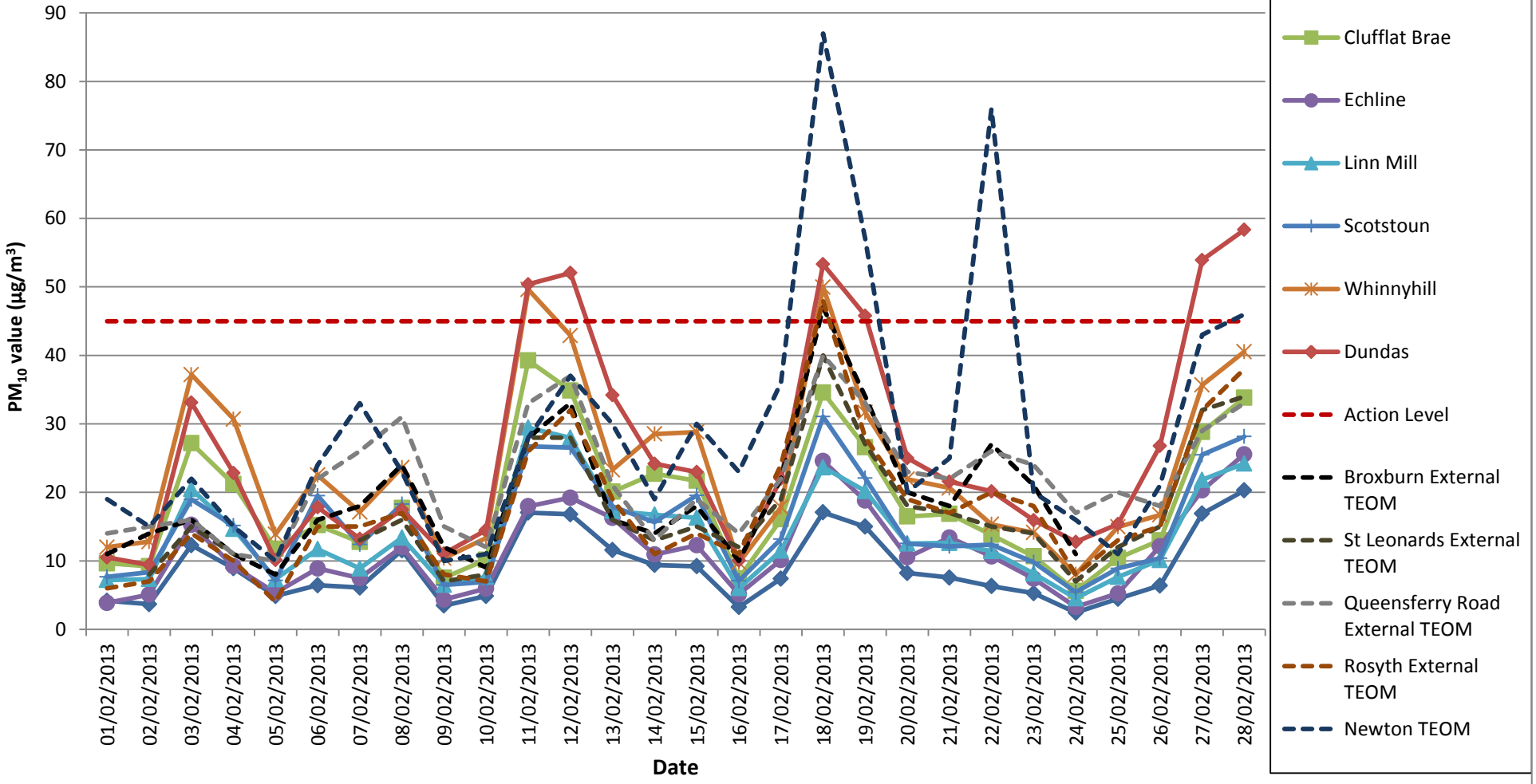
APPENDIX A: LIGHT SCATTER METER RESULTS

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



Note: The exceedances of the threshold are not considered to be related to construction works. Please refer to section 3.1 of the Air Quality Monitoring Report: February 2013

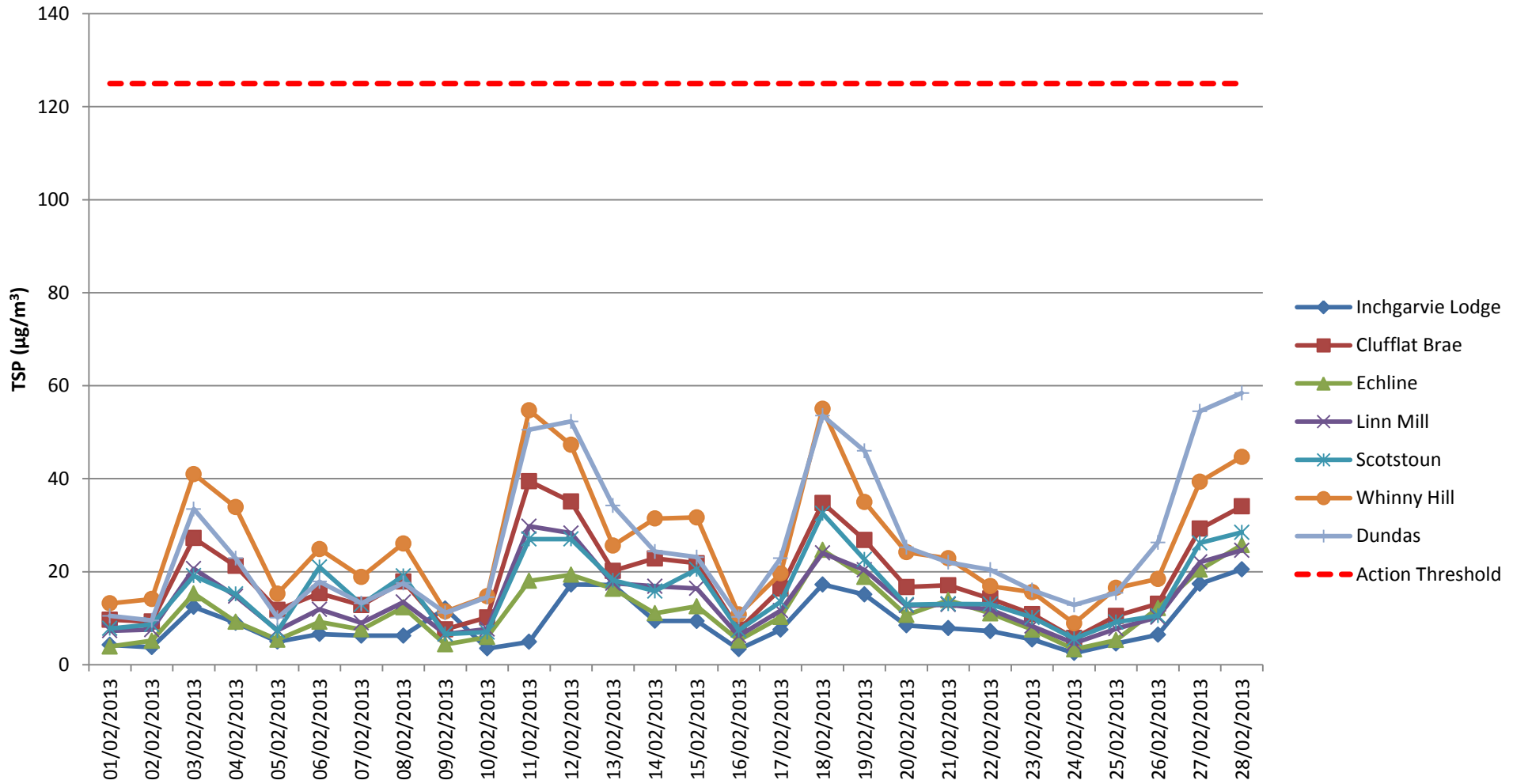
Air Quality Monitoring
Particulate Matter (PM10) Results for all Monitoring Locations (with TEOM)
February 2013



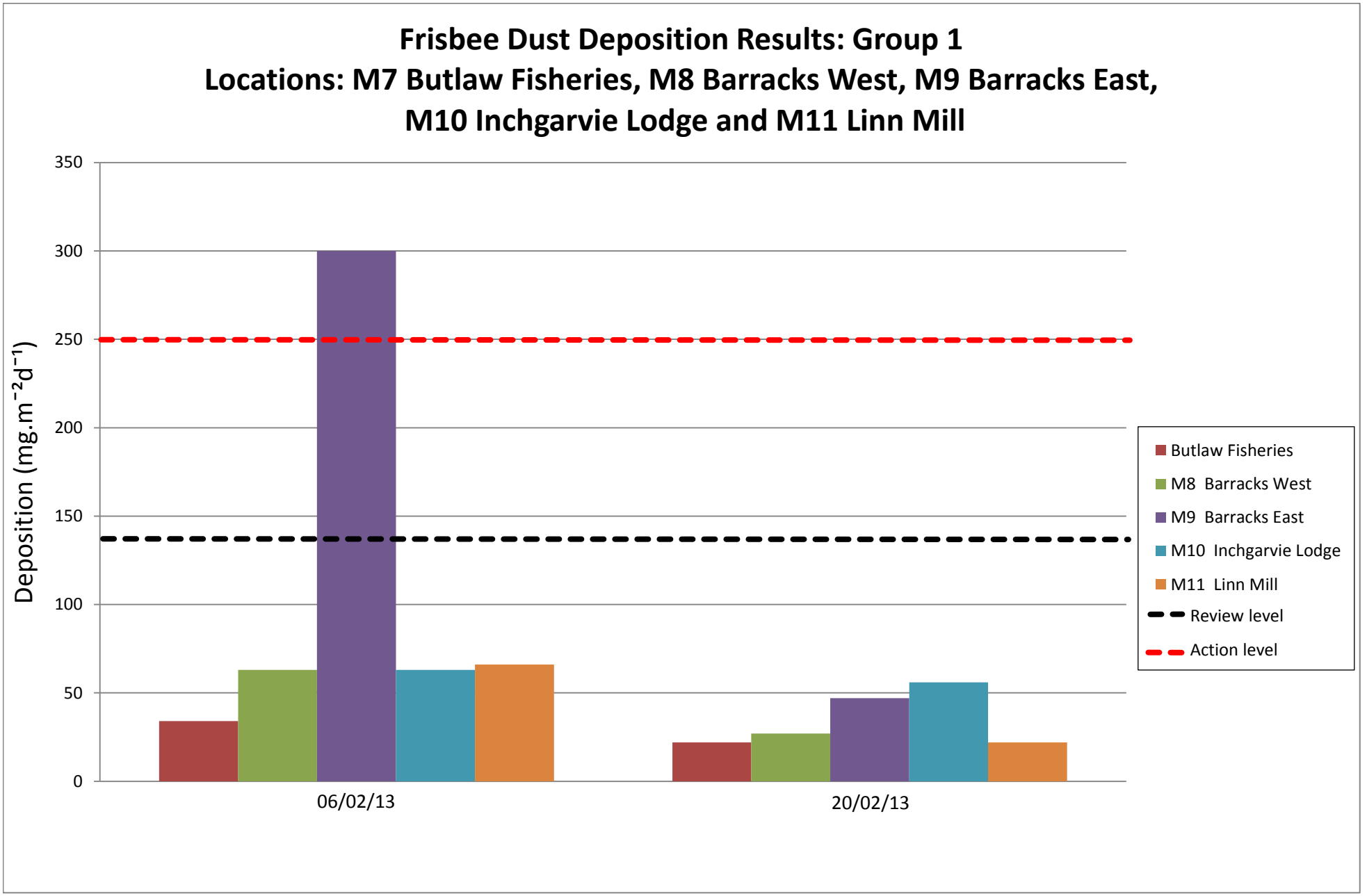
Note: The exceedances of the threshold are not considered to be related to construction works. Please refer to section 3.1 of the Air Quality Monitoring Report: February 2013

APPENDIX B: TOTAL SUSPENDED PARTICLES

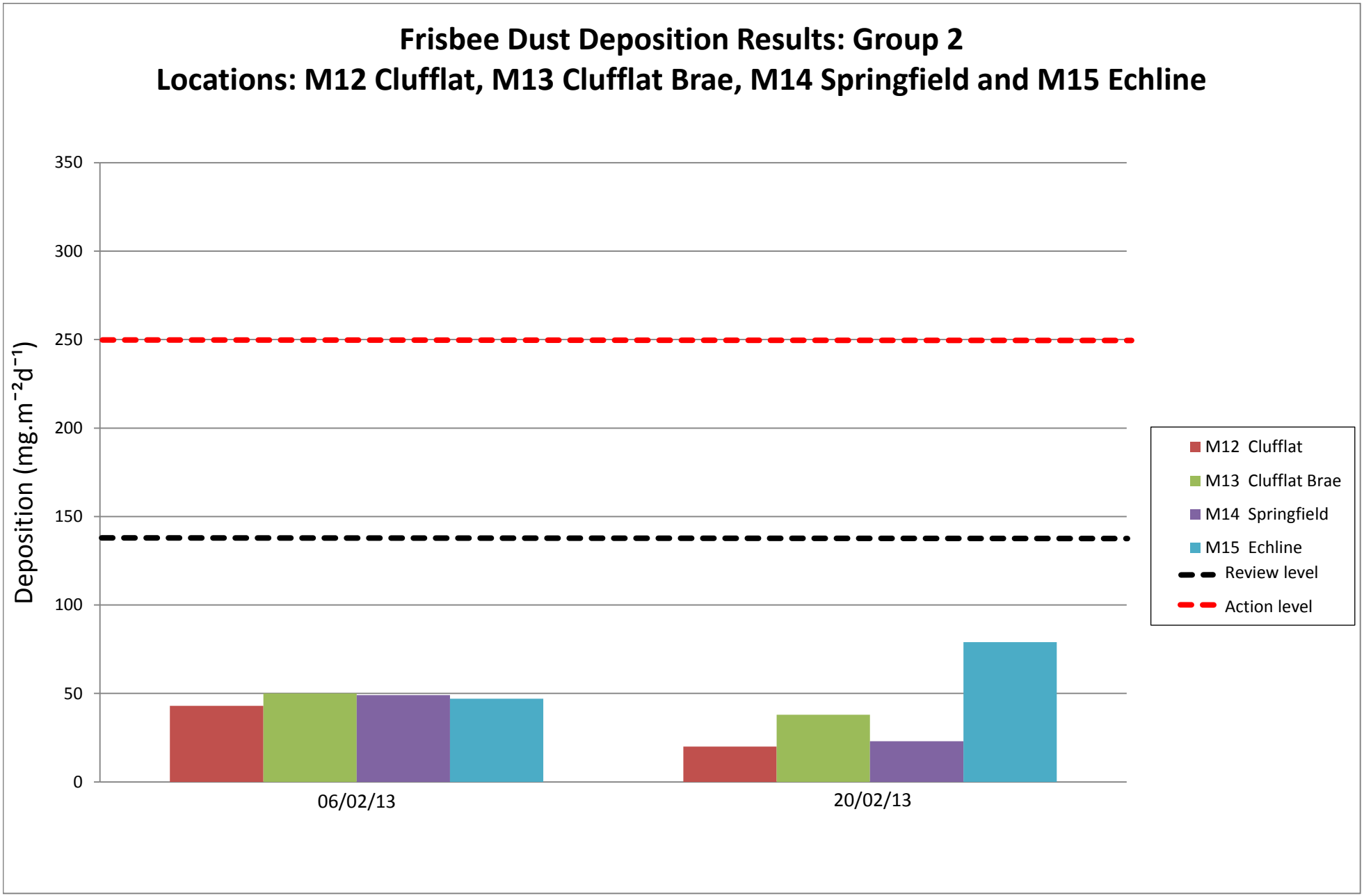
Total Suspended Particles (TSP) Results
February 2013



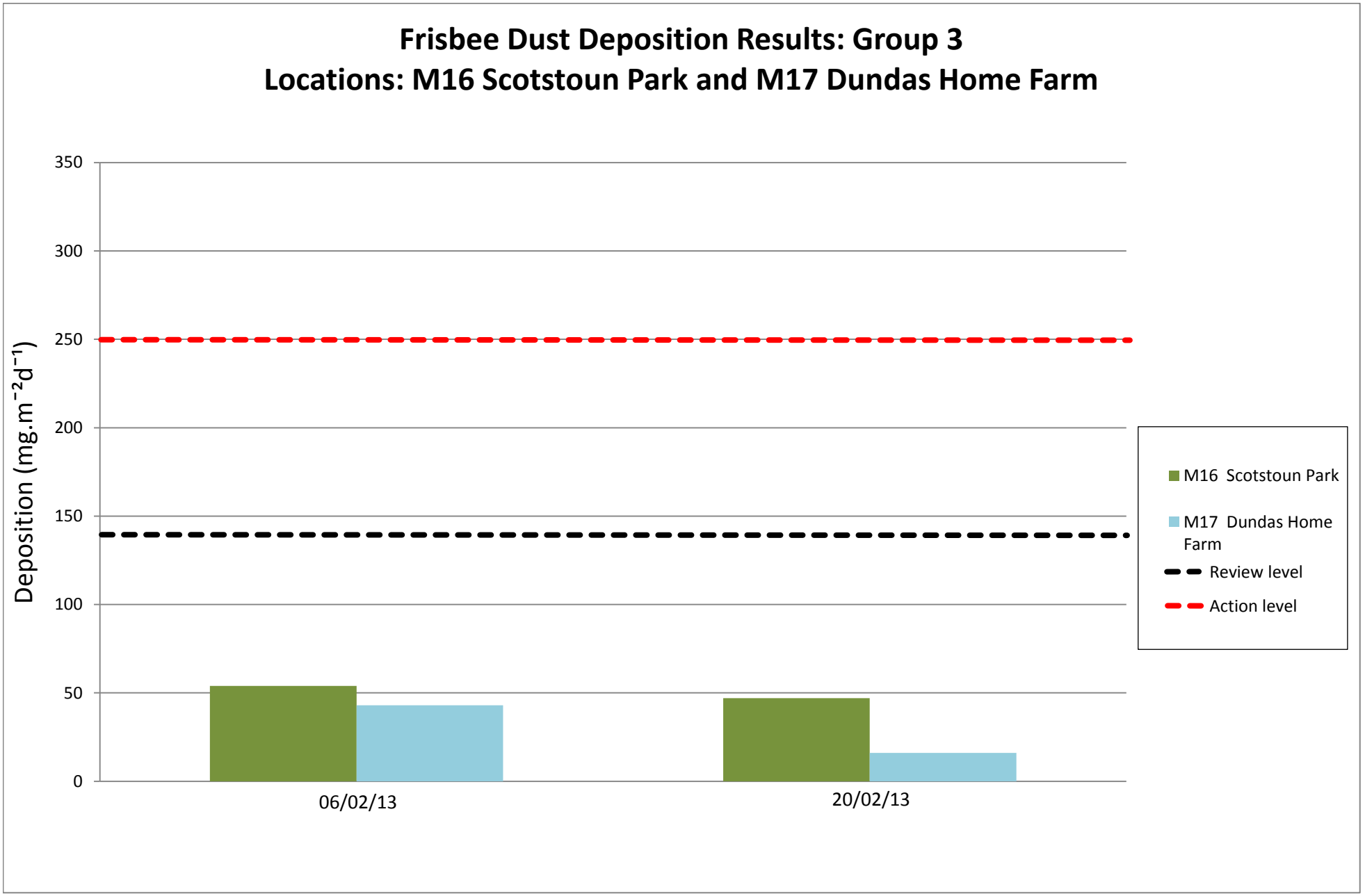
APPENDIX C: FRISBEE GAUGE RESULTS

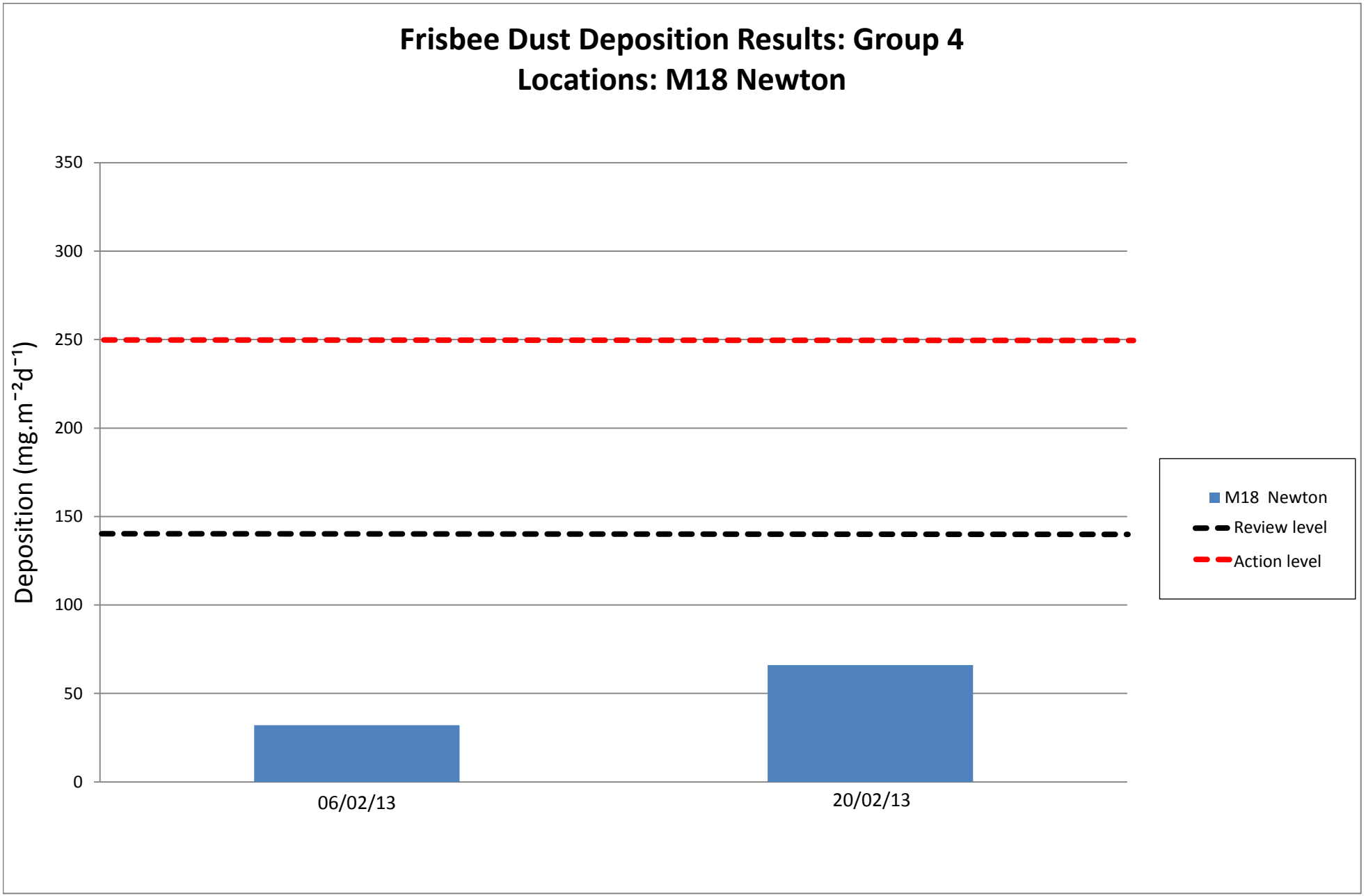

Frisbee Dust Deposition Results: Group 1
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East,
M10 Inchgarvie Lodge and M11 Linn Mill
Deposition (mg.m⁻²d⁻¹)
350
300
250
200
150
100
50
0
06/02/13
20/02/13
Butlaw Fisheries
M8 Barracks West
M9 Barracks East
M10 Inchgarvie Lodge
M11 Linn Mill
Review level
Action level

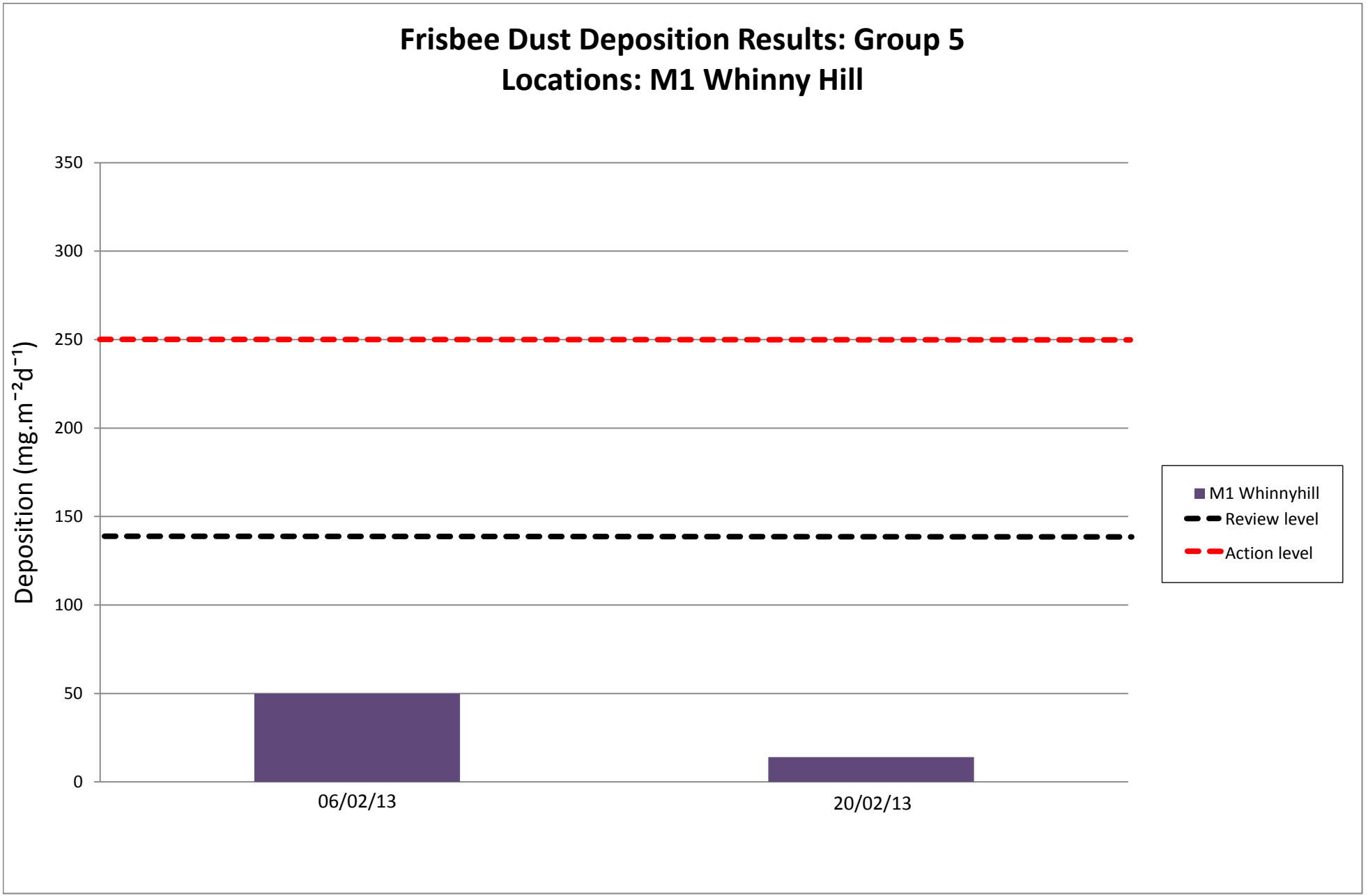
Frisbee Dust Deposition Results: Group 2
Locations: M12 Clufflat, M13 Clufflat Brae, M14 Springfield and M15 Echline



Frisbee Dust Deposition Results: Group 3
Locations: M16 Scotstoun Park and M17 Dundas Home Farm




Frisbee Dust Deposition Results: Group 4
Locations: M18 Newton
Deposition (mg.m⁻²d⁻¹)
350
300
250
200
150
100
50
0
06/02/13
20/02/13
M18 Newton
Review level
Action level


Frisbee Dust Deposition Results: Group 5
Locations: M1 Whinny Hill
Deposition (mg.m⁻²d⁻¹)
350
300
250
200
150
100
50
0
06/02/13
20/02/13
M1 Whinnyhill
Review level
Action level

APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - February 2013

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)
01/02/2013	N	LIGHT	W	FROZEN	N				
02/02/2013									
03/02/2013									
04/02/2013	N	STRONG	W	DAMP	N				
05/02/2013	N	STRONG	WNW	DAMP	N				
06/02/2013	N	LIGHT	W	DAMP	N				
07/02/2013	N	LIGHT	W	DAMP	N				
08/02/2013	N	LIGHT	E	DAMP	N				
09/02/2013									
10/02/2013									
11/02/2013	N	STRONG	E	DAMP	N				
12/02/2013	N	LIGHT	ENE	FROZEN	N				
13/02/2013	N	LIGHT	SW	DAMP	N			Snowy conditions	
14/02/2013	N	LIGHT	W	DAMP	N				
15/02/2013	N	LIGHT	W	DRY	N				
16/02/2013									
17/02/2013									
18/02/2013	N	LIGHT	WNW	FROZEN	N			Hazy conditions. Frozen ground surface.	
19/02/2013	N	LIGHT	E	DAMP	N			Hazy conditions.	
20/02/2013	N	LIGHT	E	DAMP	N				
21/02/2013	N	LIGHT	ESE	DRY	N				
22/02/2013	N	LIGHT	WNW	DAMP	N				
23/02/2013									
24/02/2013									
25/02/2013	N	LIGHT	E	FROZEN	N				
26/02/2013	N	LIGHT	W	FROZEN	N				
27/02/2013	N	LIGHT	WNW	FROZEN	N			Foggy conditions	
28/02/2013	N	LIGHT	WNW	FROZEN	N			Foggy conditions	

Daily Dust Log - South - February 2013

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)
01/02/2013	S	LIGHT	W	FROZEN	N				
02/02/2013									
03/02/2013									
04/02/2013	S	STRONG	W	DAMP	N				
05/02/2013	S	STRONG	WNW	DAMP	N				
06/02/2013	S	LIGHT	W	DAMP	N				
07/02/2013	S	LIGHT	W	DAMP	N				
08/02/2013	S	LIGHT	E	DAMP	N				
09/02/2013									
10/02/2013									
11/02/2013	S	STRONG	E	DAMP	N				
12/02/2013	S	LIGHT	ENE	FROZEN	N				
13/02/2013	S	LIGHT	SW	DAMP	N			Snowy conditions	
14/02/2013	S	LIGHT	W	DAMP	N				
15/02/2013	S	LIGHT	W	DRY	N				
16/02/2013									
17/02/2013									
18/02/2013	S	LIGHT	WNW	FROZEN	N			Hazy conditions. Frozen ground surface.	
19/02/2013	S	LIGHT	E	DAMP	N			Hazy conditions.	
20/02/2013	S	LIGHT	E	DAMP	N				
21/02/2013	S	LIGHT	ESE	DRY	N				
22/02/2013	S	LIGHT	WNW	DAMP	N				
23/02/2013									
24/02/2013									
25/02/2013	S	LIGHT	E	FROZEN	N				
26/02/2013	S	LIGHT	W	FROZEN	N				
27/02/2013	S	LIGHT	WNW	FROZEN	N			Foggy conditions	
28/02/2013	S	LIGHT	WNW	FROZEN	N			Foggy conditions	