



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project

FORTH REPLACEMENT CROSSING

Document title

AIR QUALITY MONITORING REPORT
MARCH 2012

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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 March 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 (Figure 2). Table 1 lists the air quality monitoring equipment present at each monitoring location.
- 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. The monitors require less space, maintenance and power than other real time monitors such as 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 and are the construction and waste industry standard for measuring airborne particulate matter and defining action thresholds to ensure controls are suitably applied. 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.** The installation of the air quality monitoring equipment has not been simultaneous across the site, thus installation dates are given in Table 1. During March the Frisbee gauge at Whinny Hill was installed, with monitoring results due from the beginning of April.

2.4. In association with air quality monitoring across 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. The weather station at Linn Mill was installed during February 2012.

2.5. 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. An updated pro forma was implemented at the beginning of March 2012 (Appendix C). 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.

2.6. Frequent environmental site inspections are also undertaken by members of the FCBC Environmental Department. These inspections include a dust and odour check to assess the following:

- signs of dust or odour leaving site;
- any burning occurring on site;
- adequate suppression and monitoring to prevent the spread of dust; and
- materials damped down or covered in vehicles leaving/entering the site.



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 March
M1	Whinny Hill	Frisbee	21/03/12	Site Clearance Excavation
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	Marine works only
M8	Barracks West	Frisbee	31/08/11	Marine works Site Clearance Access Track
M9	Barracks East	Frisbee	31/08/11	Marine works Site Clearance Access Track
M10	Inchgarvie Lodge	Frisbee	22/08/11	Utility works Trial holes
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	Utility works Trial holes
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	Utility works Trial holes
M13	Clufflat Brae	Frisbee	21/09/11	
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	Construction of Southern Compound, including access track
M15	Echline	Frisbee	16/08/11	Construction of Southern Compound, including access track
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	Utility access tracks, containment pond and bund LMA fencing Site Clearance
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	Utility access tracks, containment pond and bund LMA fencing Site Clearance
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	None

3. AIR QUALITY MONITORING RESULTS

3.1. Automatic Light Scatter Dust Meter Monitoring Results

- 3.1.1.** Light scatter results for March 2012 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ concentrations were variable throughout March 2012. The results were compared to the daily mean results from the TEOM air quality monitoring stations located in Rosyth, Broxburn and Queensferry Road, Edinburgh. This demonstrated that the results obtained using the light scatter meters follow the same pattern as those collected from the TEOMs; this indicates that the pattern observed throughout March was due to regional changes in air quality, rather than due to construction works.
- 3.1.2.** During March, essential device maintenance was undertaken on the light scatter meters. Due to device errors, the light scatter meters located at Echline and Linn Mill required maintenance works offsite. Therefore, data is missing throughout March for Linn Mill and from the 10 March for Echline. These monitors are both due to be reinstalled during April.
- 3.1.3.** Readings at Echline and Dundas were low in comparison to the other meters on site. As meters across the site would be expected to read similarly, with the exception of during a location specific air pollution incident, these low readings were investigated in consultation with the supplier. The supplier confirmed that the meters were reading low by a factor of approximately 10, thus the results have been updated to reflect this.
- 3.1.4.** Exceedances of the PM₁₀ action level did occur within the period. These exceedances generally occurred as single daily peaks rather than continued periods and were found to coincide with peaks of the

daily mean results obtained from the TEOM monitoring stations at various regional locations. Table 2 lists the dates and locations of all March exceedances of the PM_{10} threshold, recorded by the light scatter monitors on site. The period at the end of March was affected by the warm, hazy conditions across the region, causing the increased number of exceedances noted in Table 2.

- 3.1.5.** No exceedances during the period were found to be attributable to construction. Real time triggers were received to inform of any exceedances, initiating investigations into the causes during working periods. Investigations of the exceedances did not detect any occurrences where construction works were deemed to be responsible for the exceedances and there were no direct instances where mitigating measures were necessary.

Table 2: February exceedances of the PM₁₀ Threshold

Date	Location(s)
01/03/12	Dundas and Echline
02/03/12	Dundas and Echline
03/03/12	Whinny Hill, Dundas and Echline
08/03/12	Whinny Hill, Dundas and Echline
13/03/12	Whinny Hill and Echline
15/03/12	Clufflat Brae, Inchgarvie, Scotstoun, Dundas and Echline
20/03/12	Whinny Hill
23/03/12	Dundas, Whinny Hill, Scotstoun and Clufflat Brae
24/03/12	Dundas, Whinny Hill, Scotstoun, Clufflat Brae and Inchgarvie
25/03/12	Inchgarvie, Clufflat Brae, Scotstoun and Whinny Hill
26/03/12	Inchgarvie, Scotstoun, Whinny Hill and Dundas
27/03/12	Scotstoun, Whinny Hill, Dundas and Clufflat Brae
28/03/12	Clufflat Brae, Inchgarvie, Scotstoun, Whinny Hill and Dundas
29/03/12	Clufflat Brae, Inchgarvie, Scotstoun, Whinny Hill and Dundas
30/03/12	Whinny Hill and Dundas

3.2. Frisbee Dust Deposition Results

3.2.1. The Frisbee dust deposition results for March 2012 have been presented in charts and can be found in Appendix B. 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

3.2.2. Frisbee dust data deposition results have been collected fortnightly, and the results averaged over this period to give a daily dust deposition rate. Two collection dates fell during March; 7 March 2012 and 21 March 2012. The next collection date is due on the 4 April 2012, thus the dust data covering the final week of March will be presented in a subsequent report covering April 2012.

3.2.3. The action level for the dust deposition rate has been set at 250 mg/m²/day. Results show that the action level was not exceeded at any location during February. Dust deposition rates were low and were found to be below 50 mg/m²/day throughout March for all locations in Groups 1, 3 and 4. The maximum dust deposition rate during March was at Echline (57 mg/m²/day) for the fortnight ending on 21/03/12; however, this result is also low. The results obtained from Frisbee dust deposition monitoring show that there have been no instances of dust from construction works causing a nuisance to nearby residential and other sensitive areas. The low dust deposition results obtained also demonstrate that the peaks in the PM₁₀ results (Section 3.1) were unlikely to have been due to construction.

3.3. Daily Dust Log and Environmental Inspections

3.3.1. The daily dust log highlighted 3 days on which dust was being generated due to construction works. On each occasion the dust was being generated due to the movement of vehicles on site access tracks which had become dry in the southern area. On each occasion appropriate action was taken to ensure that the track was dampened as a mitigating measure. Although exceedances at the light scatter meters were recorded on these dates, the dust generated by the movement of vehicles is not believed to have caused the exceedances; these incidents of dust were localised whereas the exceedances recorded by

the light scatter meters were found across the site and also coincided with high measurements of PM10 from the TEOM monitoring stations located in the surrounding area.

- 3.3.2.** 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 D. Thirteen inspections across the site were undertaken by the FCBC Environmental Department during March, focussing on areas in which works were being undertaken. One instance of dust generation was noted at Echline Field on 15 March; this was also reflected in the daily dust check. Due to dry conditions, a note was made at two locations that there was potential for dust generation, although at the time of the environmental check there was no dust seen to be leaving site. Action was taken to ensure that appropriate mitigation measures were put in place, including dampening down of the site access tracks.

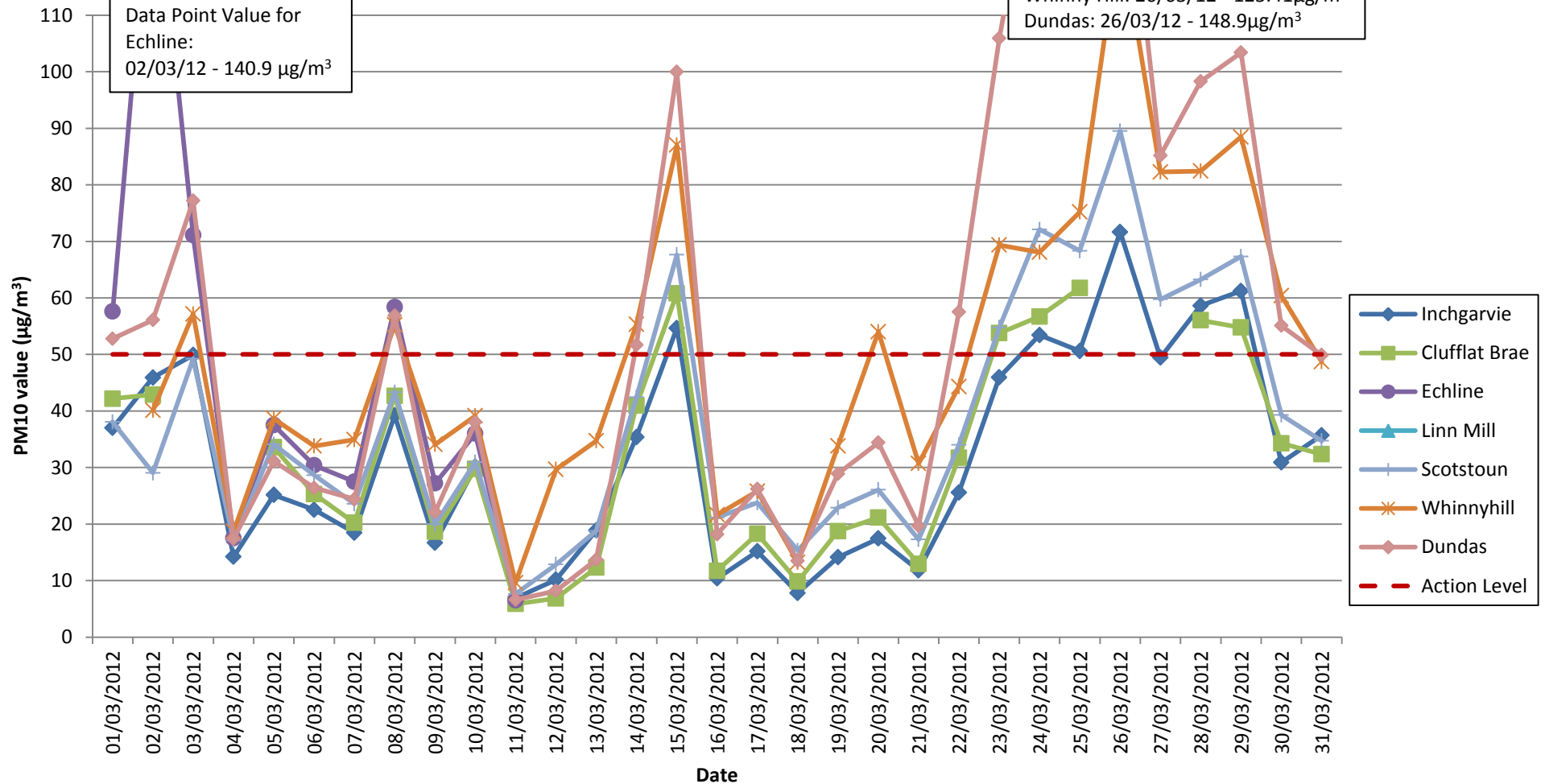


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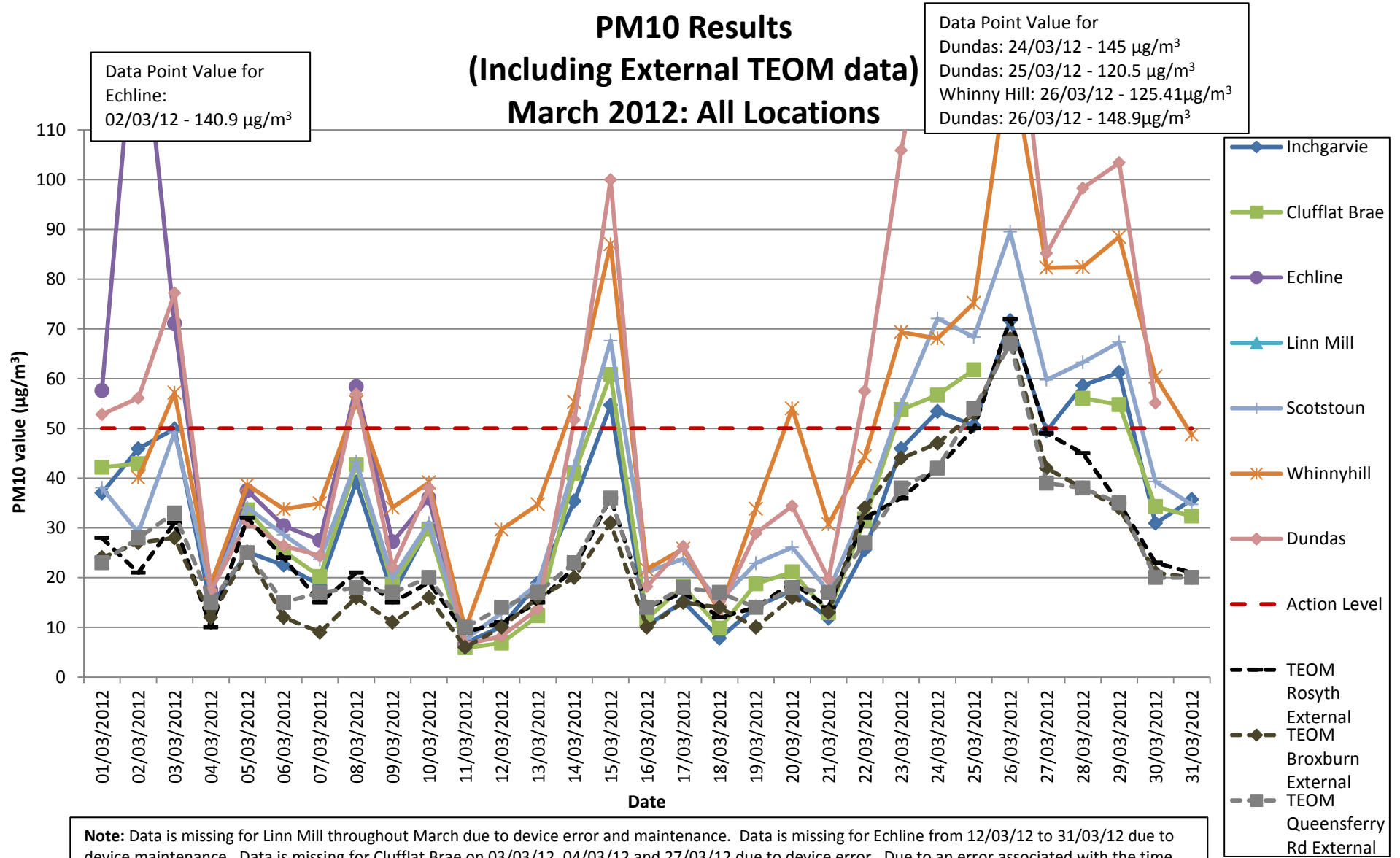
APPENDIX A: LIGHT SCATTER METER RESULTS

PM10 Results March 2012: All Locations



Note: Data is missing for Linn Mill throughout March due to device error and maintenance. Data is missing for Echline from 12/03/12 to 31/03/12 due to device maintenance. Data is missing for Clufflat Brae on 03/03/12, 04/03/12 and 27/03/12 due to device error. The results for Echline and Dundas have been multiplied by 10 following consultation with the supplier.

PM10 Results (Including External TEOM data) March 2012: All Locations



Note: Data is missing for Linn Mill throughout March due to device error and maintenance. Data is missing for Echline from 12/03/12 to 31/03/12 due to device maintenance. Data is missing for Clufflat Brae on 03/03/12, 04/03/12 and 27/03/12 due to device error. Due to an error associated with the time change on 25/03/12, no data is available for this date. The results for Echline and Dundas have been multiplied by 10 following consultation with the supplier.

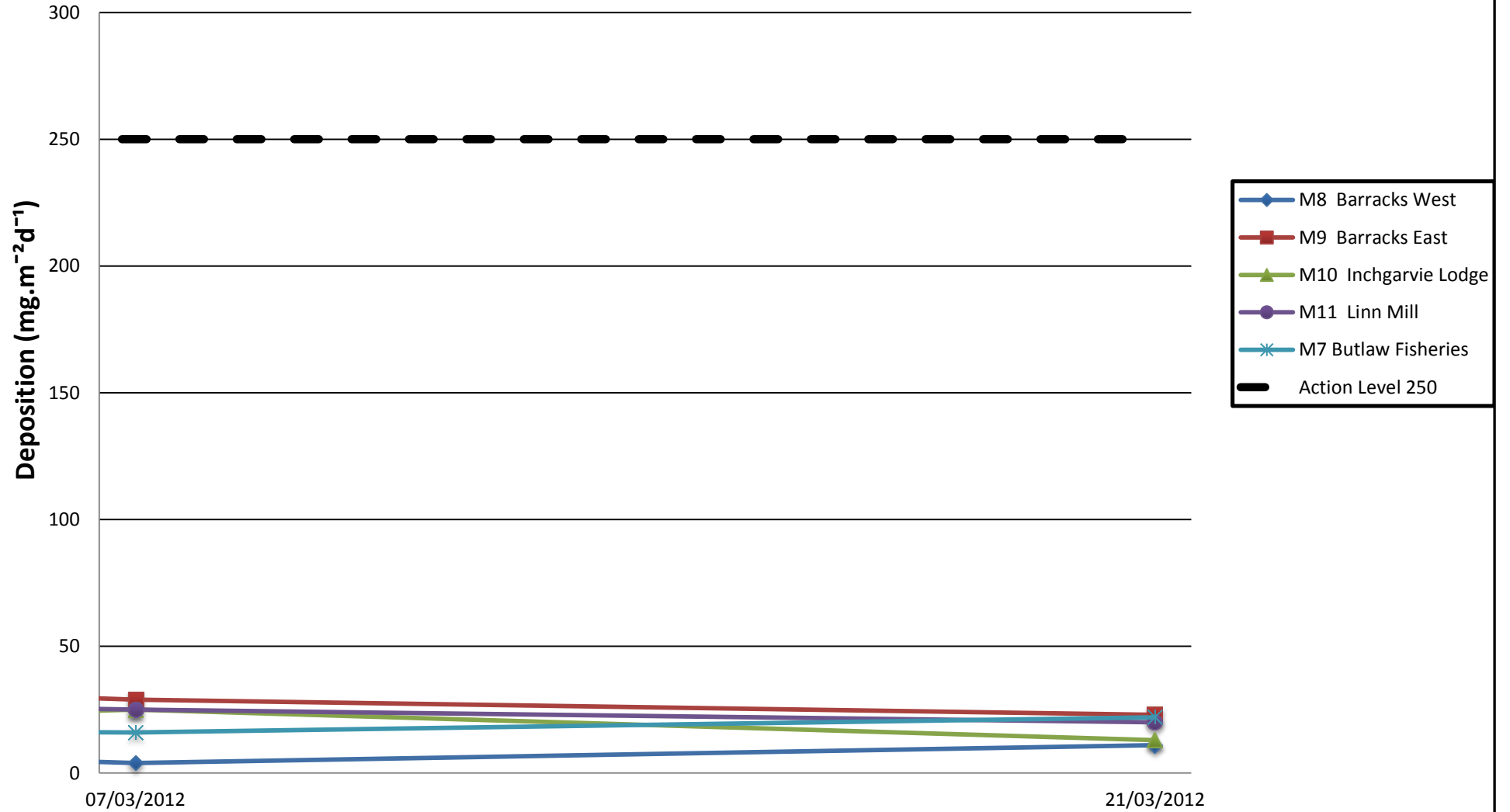


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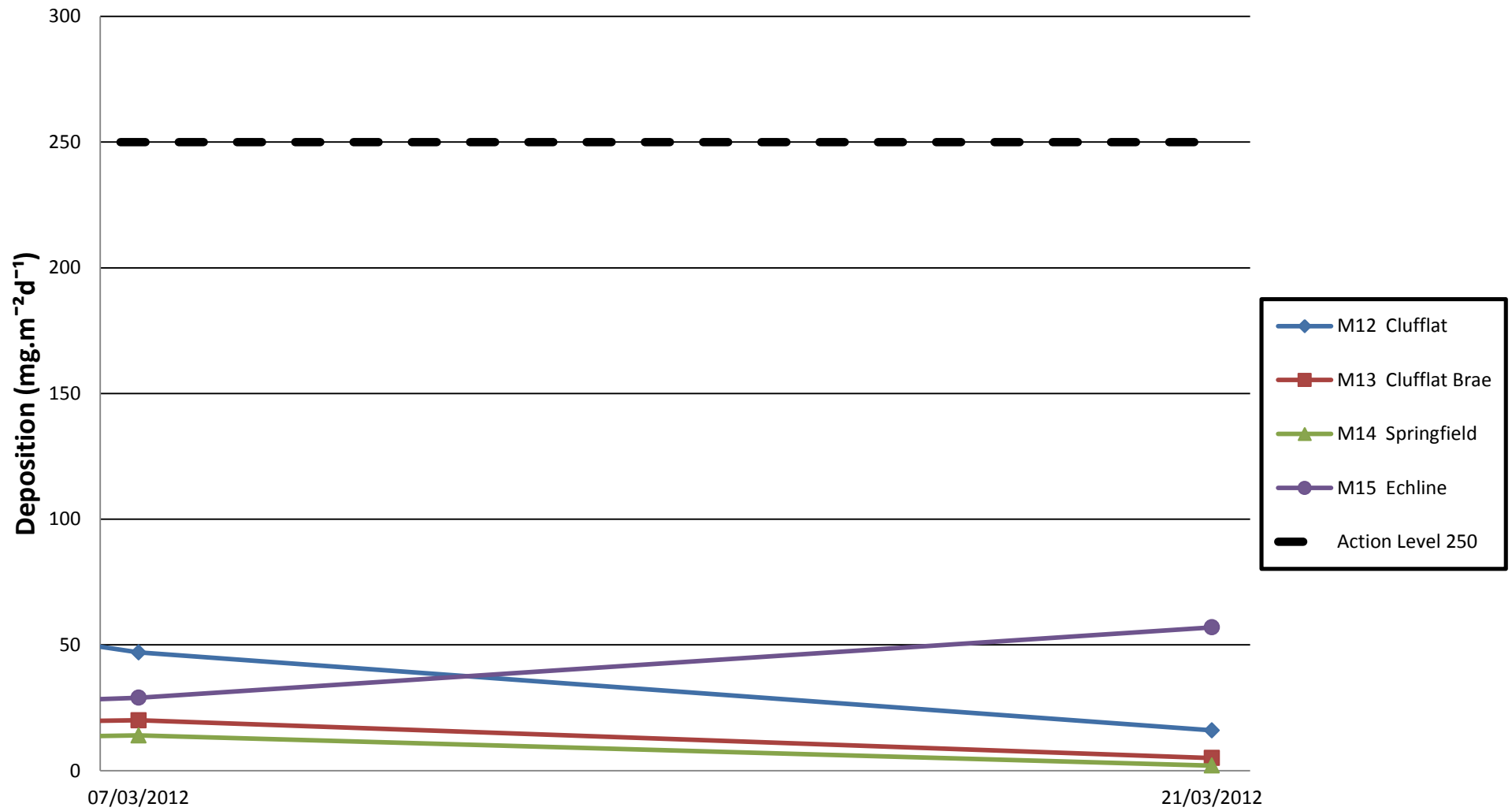
APPENDIX B: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: March 2012
Locations: M7 Butlaw Fisheries, M8 Barracks West, M9 Barracks East, M10 Inchgarvie Lodge and M11 Linn Mill



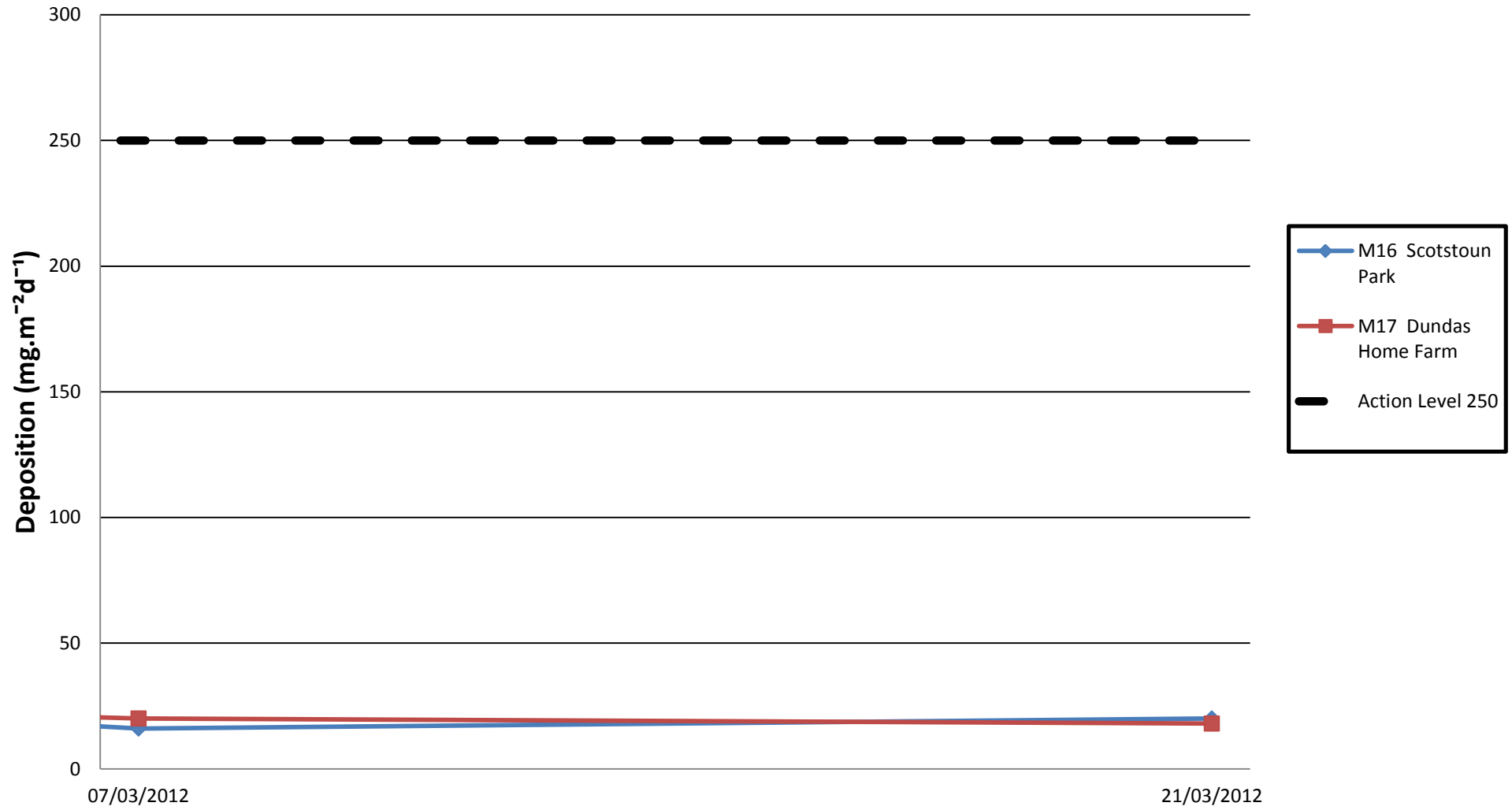
Frisbee Dust Deposition Results: March 2012

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



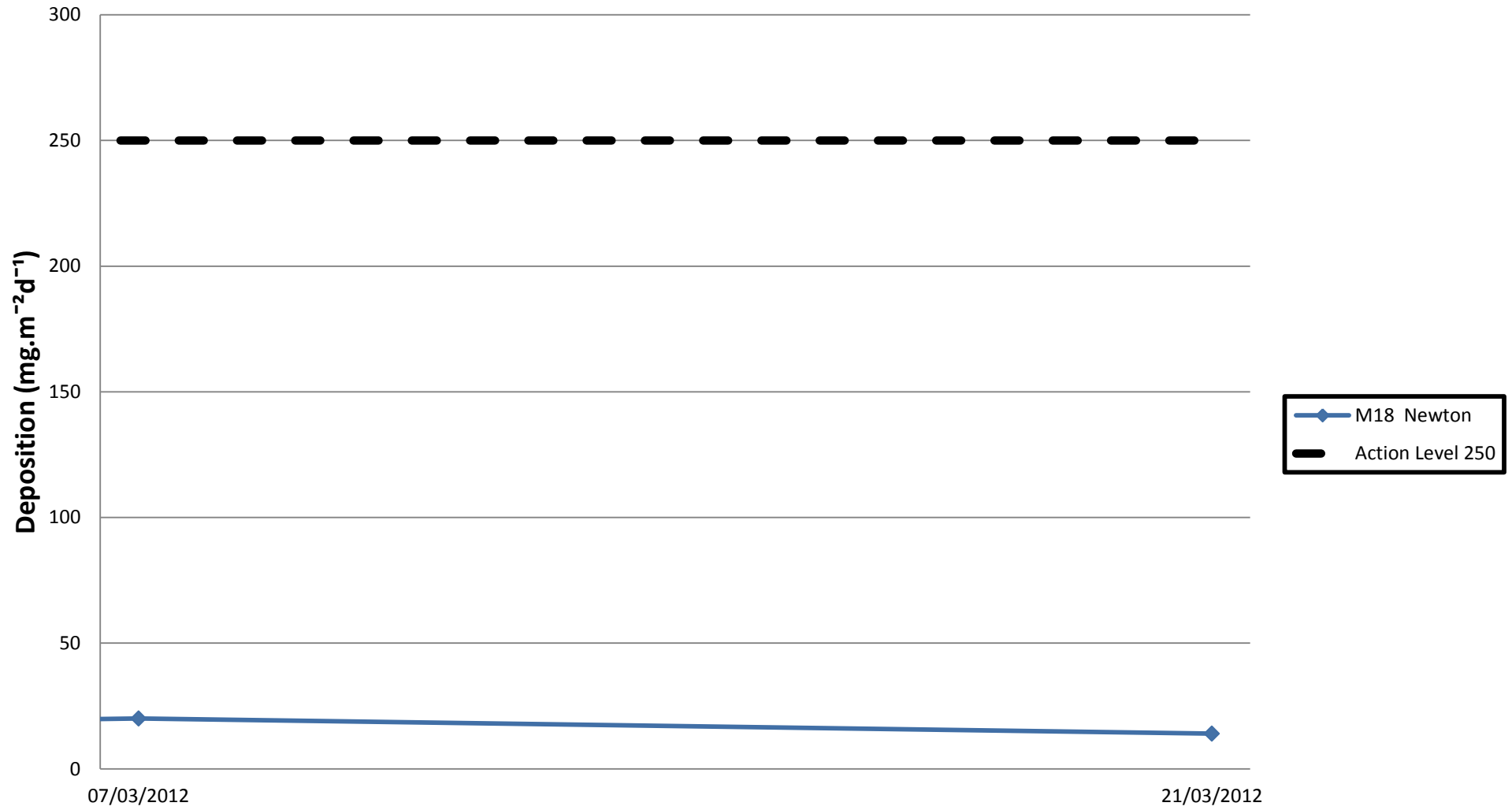
Frisbee Dust Deposition Results: March 2012

Locations: M16 Scotstoun Park and M17 Dundas Home Farm



Frisbee Dust Deposition Results: March 2012

Location: M18 Newton





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APPENDIX C: DAILY DUST LOG



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DAILY DUST INSPECTION

LOCATION:									
NORTH				SOUTH					
COMPLETED BY:									
TIME				DATE					
INITIALS				SIGNATURE					
WEATHER CONDITIONS (circle as appropriate)									
WIND:		NONE			LIGHT WIND			STRONG WIND	
WIND DIRECTION:		N	NE	E	SE	S	SW	W	NW
GROUND SURFACE:		DRY		DAMP		WET (PUDDLES)		FROZEN	
DUST VISIBLE		YES			NO				
DUE TO CONSTRUCTION		YES			NO				
IF DUST IS VISIBLE, WHICH ACTIVITIES ARE CAUSING THE DUST? DETAIL BELOW.									
OTHER COMMENTS									



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APPENDIX D: SUMMARY OF ENVIRONMENTAL INSPECTIONS

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

Date	Location	Dust and Odour				Comments/Actions
		Signs of dust or odour leaving site	Burning on site	Adequate suppression/monitoring	Materials damped down/covered when entering/leaving site	
07/03/2012	Lower Echline and Linn Mill	No	No	Yes	Yes	
07/03/2012	Echline Strip and Dundas	No	No	Yes	Yes	
09/03/2012	Inchgarvie and Linn Mill	No	No	Yes	Yes	
09/03/2012	Dundas Estate	No	No	Yes	N/A	
14/03/2012	Dolphinton Woodland	No	No	N/A	N/A	
14/03/2012	Linn Mill	No	No	N/A	N/A	
15/03/2012	Echline	Yes	No	No	Yes	Some dust generated from vehicles on track. Reported to site engineer. Appropriate mitigation measures employed.
15/03/2012	St Margarets Marsh	No	No	Yes	Yes	Materials entering site covered. Potential for dust generation from vehicle movement on track. Reported to site engineer. Appropriate mitigation measures employed.
15/03/2012	Whinny Hill and Castlandhill	No	No	Yes	Yes	Potential for dust generation from vehicle movement on track at Castlandhill. Reported to site engineer. Appropriate mitigation measures employed.
22/03/2012	Echline	No	No	Yes	Yes	
22/03/2012	Inchgarvie and Linn Mill	No	No	Yes	N/A	No plant in section.
27/03/2012	Inchgarvie, Clufflat and Linn Mill	No	No	Yes	N/A	Attended monitoring at Inchgarvie and Clufflat. No plant in section.
27/03/2012	Whinny Hill	No	No	N/A	N/A	