



Contractor



**Forth Crossing** Bridge Constructors

HOCHTIEF Solutions  
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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT**  
**FEBRUARY 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 network. This report details the air quality monitoring that is currently being undertaken across the site and presents the monitoring results for February 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. Twelve 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 (Figure 2). Table 1 lists the air quality monitoring equipment present at each monitoring location.
- 2.2.** The installation of the air quality monitoring equipment has not been simultaneous across the site, thus installation dates are given in Table 1. During February, three automatic light scatter meters were set up; Scotstoun, Dundas Home Farm and Whinny Hill each now have these monitors installed. The Frisbee gauge at Whinny Hill has yet to be installed.
- 2.3.** Furthermore, weather conditions (temperature and relative humidity) are also continually measured by the light scatter meters at Inchgarvie Lodge and Clufflat Brae. A weather station, located at the noise meter at Echline which is adjacent to the light scatter at this monitoring location, also continually records 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, 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:
- Visual or olfactory 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 February   |
|------|---------------------|-------------------------------|-----------------------|---|
| M1   | Whinny Hill         | Frisbee                       | Awaiting installation | Site Clearance<br>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 only   |
| M9   | Barracks East       | Frisbee                       | 31/08/11              | Marine works only   |
| M10  | Inchgarvie Lodge    | Frisbee                       | 22/08/11              | Trial Grouting<br>Access Track<br>Utilities soil stripping<br>and excavation            |
|      |                     | Automatic light scatter meter | 17/10/11              |   |
| M11  | Linn Mill           | Frisbee                       | 22/08/11              | Trial Grouting<br>Access Track<br>Utilities soil stripping<br>and excavation            |
|      |                     | Automatic light scatter meter | 06/12/11              |   |
| M12  | Clufflat            | Frisbee                       | 29/08/11              | Trial Grouting<br>Access Track<br>Utilities soil stripping<br>and excavation            |
| M13  | Clufflat Brae       | Frisbee                       | 21/09/11              |   |
|      |                     | Automatic light scatter meter | 24/10/11              |   |
| M14  | Springfield         | Frisbee                       | 15/08/11              | Trial Grouting<br>Access Track<br>Utilities soil stripping<br>and excavation            |
| M15  | Echline             | Frisbee                       | 16/08/11              | Access Track<br>Utilities soil stripping<br>and excavation<br>LMA fencing               |
|      |                     | Automatic light scatter meter | 10/11/11              |   |
| M16  | Scotstoun           | Frisbee                       | 07/09/11              | Utility access tracks,<br>containment pond and<br>bund<br>LMA fencing<br>Site Clearance |
|      |                     | Automatic light scatter meter | 14/02/12              |   |
| M17  | Dundas Home Farm    | Frisbee                       | 29/08/11              | Utility access tracks,<br>containment pond and<br>bund<br>LMA fencing<br>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 February 2012 have been presented in a monthly chart. This can be found in Appendix A. Results show that, for the majority of the period, the PM<sub>10</sub> concentrations were below the threshold for each location. From the 13 February 2012 onwards all locations were within the threshold value of 50µg/m<sup>3</sup>. Additionally, the results were compared to the daily mean results from the TEOM air quality monitoring stations located in Rosyth, Broxburn and Queensferry Road, Edinburgh (Appendix A). 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 February was due to regional changes in air quality, rather than due to construction works.

**3.1.2.** Readings at Echline and Dundas both appeared to be 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 localised 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.

**3.1.3.** Some exceedances of the PM<sub>10</sub> threshold did occur within the period. These exceedances generally occurred as single daily peaks rather than continued periods. Table 2 lists the dates and locations of all February exceedances of the PM<sub>10</sub> threshold. Echline experienced the greatest number of exceedances (9 exceedances in total). However, 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. There were no instances where mitigating measures were necessary.

**Table 2: February exceedances of the PM<sub>10</sub> Threshold**

| Date     | Location         |
|----------|------------------|
| 01/02/12 | Inchgarvie Lodge |
|          | Clufflat brae    |
|          | Linn Mill        |
|          | Echline          |
| 02/02/12 | Clufflat Brae    |
|          | Echline          |
| 04/02/12 | Clufflat Brae    |
|          | Echline          |
| 07/02/12 | Inchgarvie Lodge |
|          | Clufflat Brae    |
|          | Echline          |
| 08/02/12 | Inchgarvie Lodge |
|          | Clufflat Brae    |
|          | Echline          |
| 09/02/12 | Clufflat Brae    |
|          | Echline          |
| 10/02/12 | Clufflat Brae    |
|          | Echline          |
| 11/02/12 | Echline          |
| 12/02/12 | Echline          |

**3.1.4.** In general, weather conditions experienced during February have not been such that construction works are likely to have been responsible for PM<sub>10</sub> exceedances during the first 13 days of February (see Appendix C). Frozen and wet ground surfaces were noted on the days on which there were exceedances of the PM<sub>10</sub> threshold; such conditions do not give rise to high PM<sub>10</sub> values as particulates are largely kept in situ.

**3.1.5.** An important consideration is that light scattering is often very high at relative humidities exceeding 80%; small particles grow to sizes that scatter light more efficiently as they acquire liquid water. As a result, ambient temperature nephelometers (the type of light scatter meter in use) overestimate mass concentrations at high humidities when particles have a large soluble component. During winter the humidity is generally over 80%; humidity of over 90% has also been recorded in the area during this period (see Appendix C). High humidity was recorded on five days on which there were exceedances; 7, 8 and 10 – 12 February.

## **3.2. Frisbee Dust Deposition Results**

**3.2.1.** The Frisbee dust deposition results for February 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 February; 8 February 2012 and 22 February 2012. The next collection date is due on the 7 March 2012, thus the dust data covering the final week of February will be presented in a subsequent report covering March 2012.

**3.2.3.** The action level for the dust deposition rate has been set at 250 mg/m<sup>2</sup>/day. Results show that the action level was not exceeded at any location during February. Dust deposition rates were below 50 mg/m<sup>2</sup>/day throughout February at Newton (Group 4). For Groups 2, 3 and 4, low deposition rates were also found. The maximum dust deposition rate during February was at Clufflat (110 mg/m<sup>2</sup>/day) for the fortnight ending on 22/02/12. 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.

### **3.3. Environmental Inspections**

**3.3.1.** During this period environmental inspections have been undertaken at Castlandhill (two at this location), Dophington Woodland and Echline Woodland to reflect areas where works were being undertaken. A dust and odour check was not applicable at Echline Woodland, Dolphington Woodland or at Castlandhill on the initial visit as no significant earthworks were being undertaken. Whilst there was potential for dust at Castlandhill on 28 February 2012, due to on-going earthworks, soil was suitably compacted due to damp weather conditions.

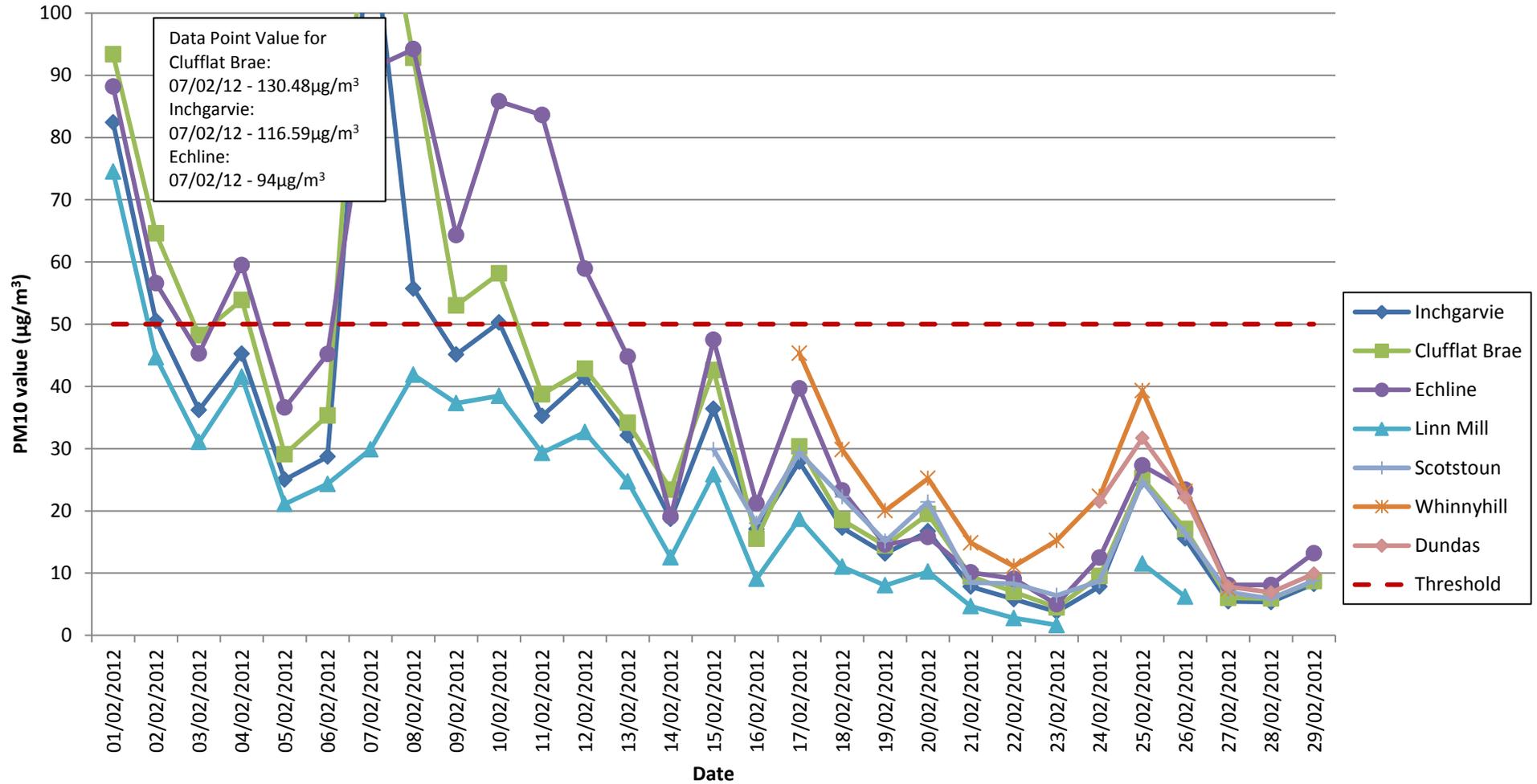


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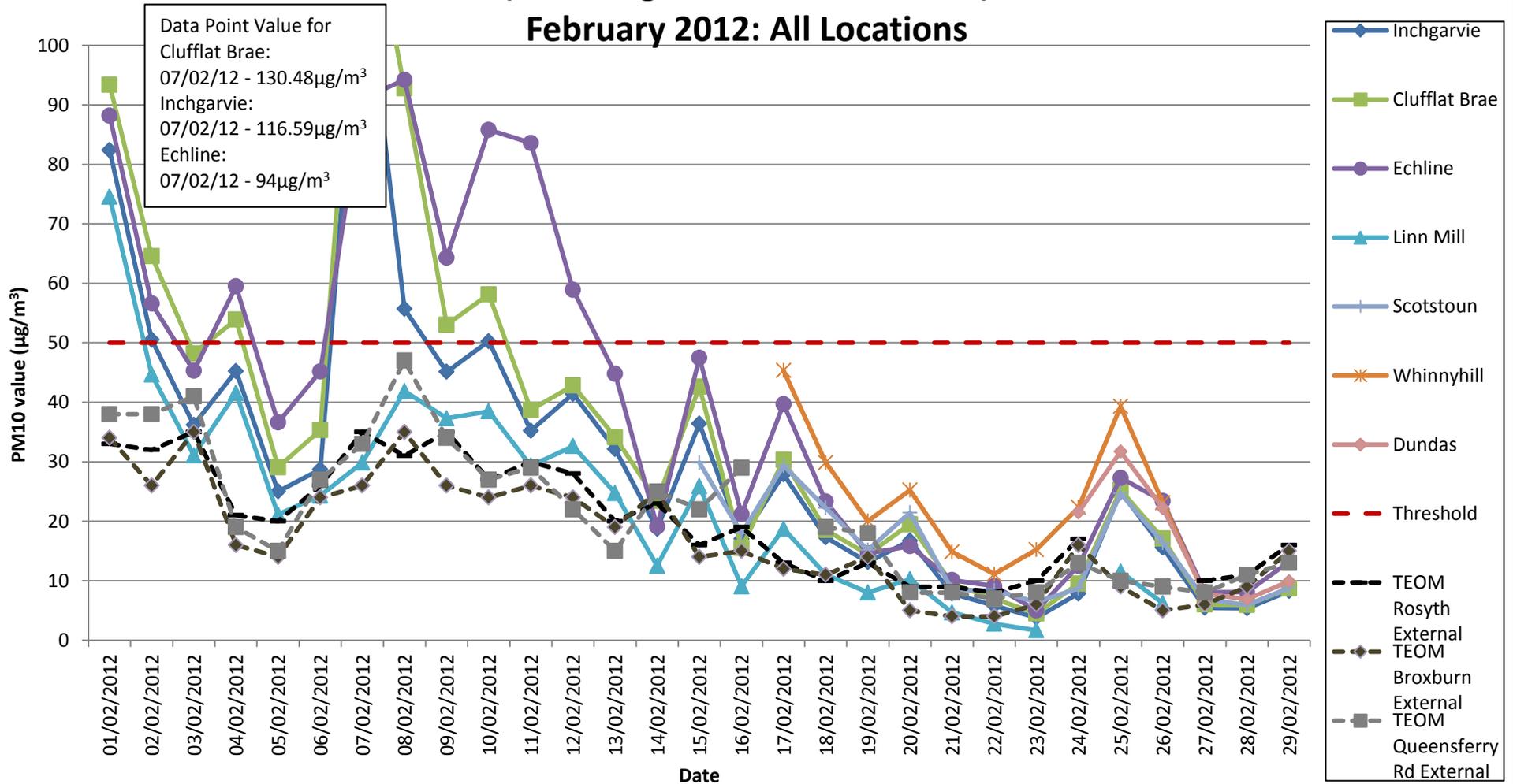
## **APPENDIX A**

## PM10 Results February 2012: All Locations



**Note:** Monitoring began at the following locations during February; Scotstoun (14/02/12), Whinnyhill (16/02/12) and Dundas (23/02/12). Data is missing for Linn Mill: 24/02/12, 27/02/12, 28/02/12 and 29/02/12 and for Whinnyhill: 28/02/12 to 29/02/12 due to device error. The results for Echline and Dundas have been multiplied by 10.

## PM10 Results (Including External TEOM Data) February 2012: All Locations



**Note:** Monitoring began at the following locations during February; Scotstoun (14/02/12), Whinnyhill (16/02/12) and Dundas (23/02/12). Data is missing for Linn Mill: 24/02/12, 27/02/12, 28/02/12 and 29/02/12 and for Whinnyhill: 28/02/12 to 29/02/12 due to device error. The results for Echline and Dundas have been multiplied by 10 following consultation with the supplier.

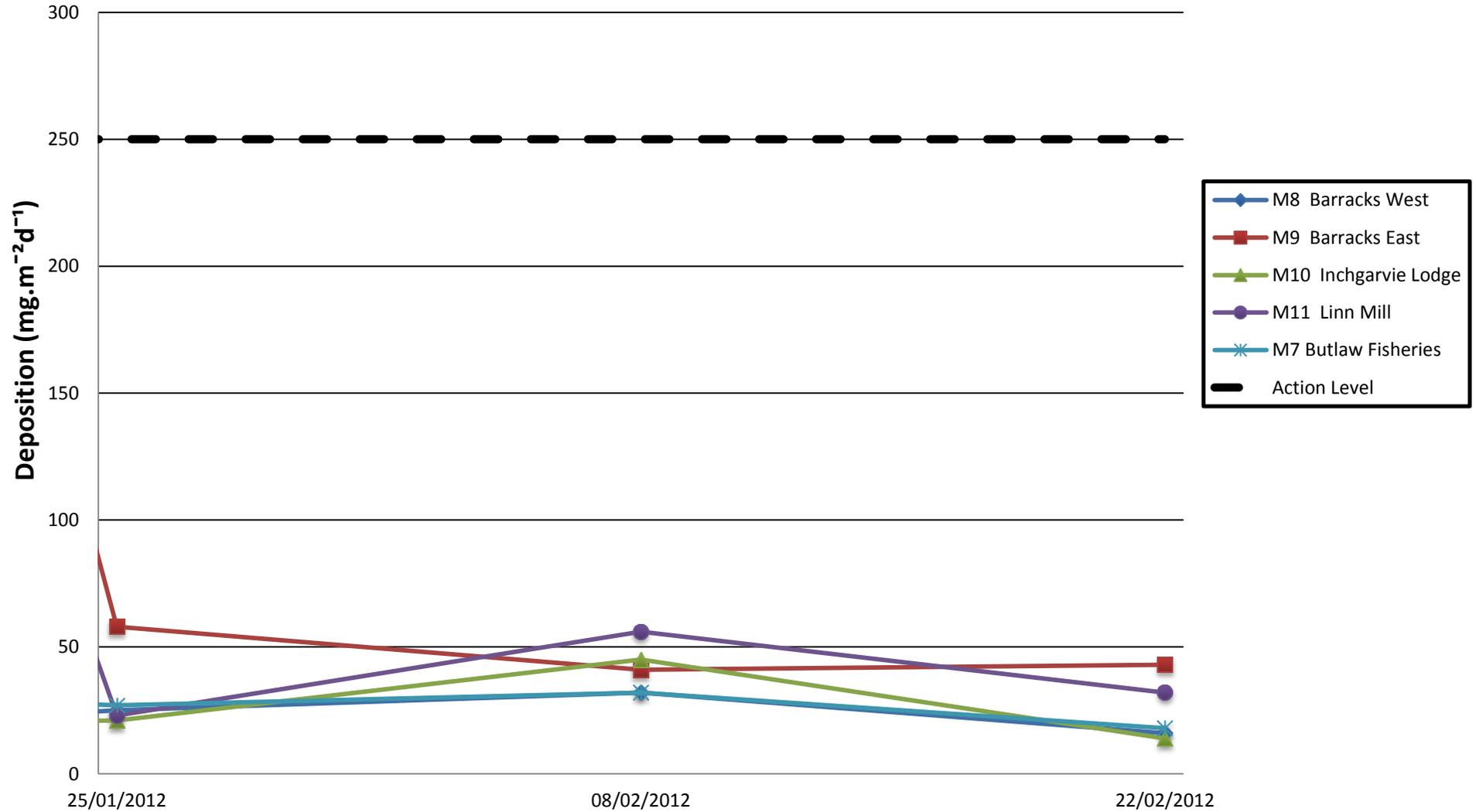


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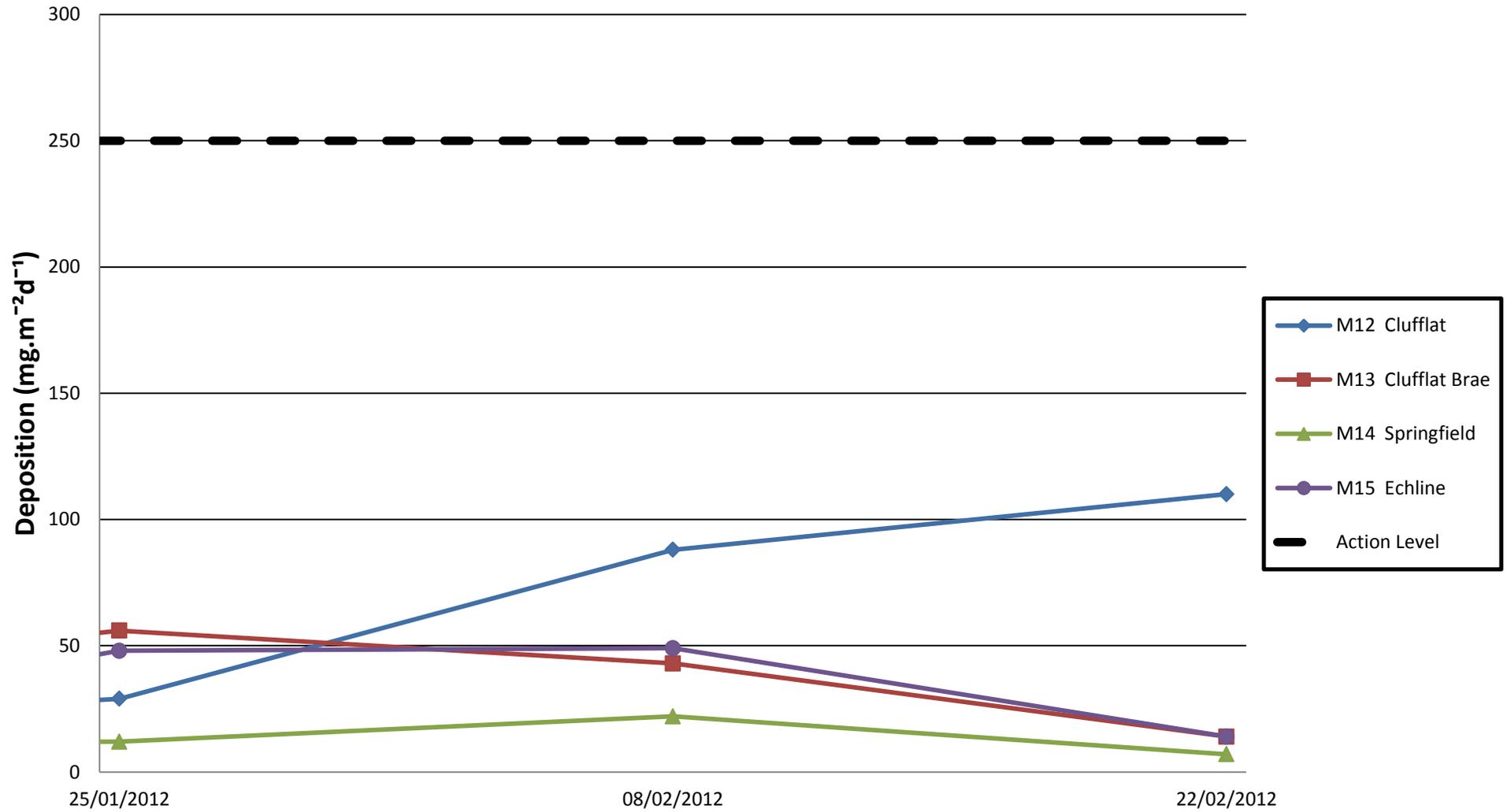
## **APPENDIX B**

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



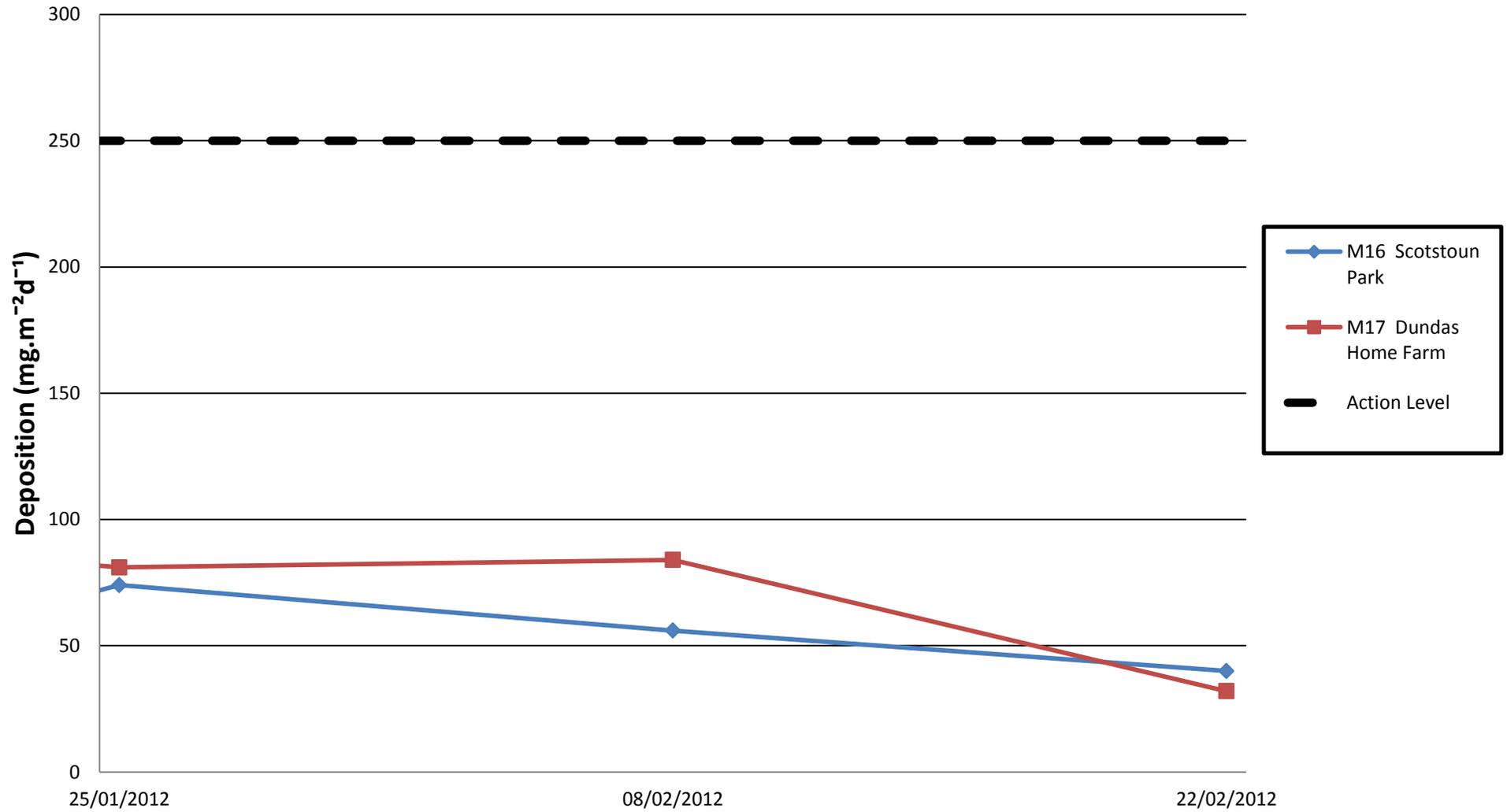
# Frisbee Dust Deposition Results: February 2012

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



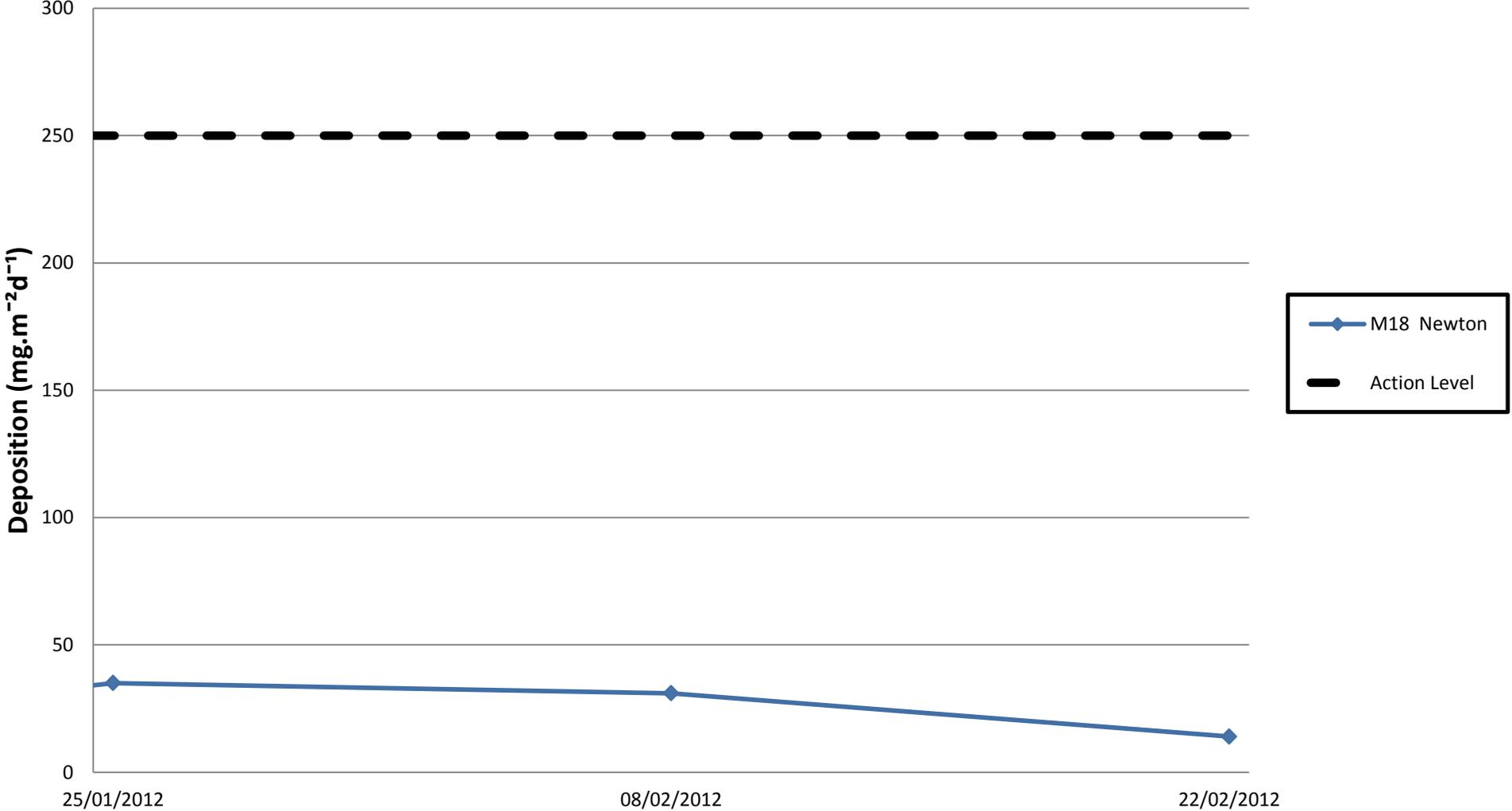
# Frisbee Dust Deposition Results: February 2012

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



# Frisbee Dust Deposition Results: February 2012

## Location: M18 Newton





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### **APPENDIX C**

### Daily Dust Log - North - February 2012

| Date       | Check By | Exceedance? | Dust from Construction (Y/N) | Additional Measures required (Y/N) | Comments                             | Action (where applicable) |
|------------|----------|-------------|------------------------------|------------------------------------|--------------------------------------|---------------------------|
| 01/02/2012 | ESE      |             | N                            | N                                  |                                      |                           |
| 02/02/2012 | LSN      |             | N                            | N                                  |                                      |                           |
| 03/02/2012 | NAM      |             | N                            | N                                  | frozen ground                        |                           |
|            |          |             |                              |                                    | high humidity on Sunday              |                           |
| 06/02/2012 | ESE      |             | N                            | N                                  | high humidity and damp ground        |                           |
| 07/02/2012 | LSN      |             | N                            | N                                  | high humidity                        |                           |
| 08/02/2012 | ESE      |             | N                            | N                                  | high humidity and damp ground        |                           |
| 09/02/2012 | ESE      |             | N                            | N                                  | damp ground                          |                           |
| 10/02/2012 | LSN      |             | N                            | N                                  | damp ground and high humidity        |                           |
|            |          |             |                              |                                    | high humidity over weekend           |                           |
| 13/02/2012 | ESE      |             | N                            | N                                  | windy and high humidity              |                           |
| 14/02/2012 | LSN      |             | N                            | N                                  | windy                                |                           |
| 15/02/2012 | NAM      |             | N                            | N                                  | windy                                |                           |
| 16/02/2012 | LSN      |             | N                            | N                                  | windy                                |                           |
| 17/02/2012 | ESE      |             | N                            | N                                  | windy, high humidity and wet ground  |                           |
|            |          |             |                              |                                    | high humidity on Saturday 18         |                           |
| 20/02/2012 | LSN      |             | N                            | N                                  | high humidity and damp ground        |                           |
| 21/02/2012 | LSN      |             | N                            | N                                  | windy, damp ground and high humidity |                           |
| 22/02/2012 | ESE      |             | N                            | N                                  | windy, high humidity and wet ground  |                           |
| 23/02/2012 | ESE      |             | N                            | N                                  | windy, damp ground and high humidity |                           |
| 24/02/2012 | SSD      |             | N                            | N                                  | windy and high humidity              |                           |
|            |          |             |                              |                                    | high humidity on Sunday              |                           |
| 27/02/2012 | SSD      |             | N                            | N                                  | windy, damp ground and high humidity |                           |
| 28/02/2012 | ESE      |             | N                            | N                                  | windy, damp ground and high humidity |                           |
| 29/02/2012 | ESE      |             | N                            | N                                  | windy, damp ground and high humidity |                           |

### Daily Dust Log - South - February 2012

| Date       | Check By | Exceedance?                                    | Dust from Construction (Y/N) | Additional Measures required (Y/N) | Comments                             | Action (where applicable) |
|------------|----------|--|------------------------------|------------------------------------|--------------------------------------|---------------------------|
| 01/02/2012 | ESE      | Inchgarvie<br>Clufflat<br>Linn Mill<br>Echline | N                            | N                                  |                                      |                           |
| 02/02/2012 | LSN      | Clufflat<br>Echline                            | N                            | N                                  |                                      |                           |
| 03/02/2012 | NAM      |  | N                            | N                                  | frozen ground                        |                           |
|            |          |  |                              |                                    | high humidity on Sunday              |                           |
| 06/02/2012 | ESE      |  | N                            | N                                  | high humidity and damp ground        |                           |
| 07/02/2012 | LSN      | Inchgarvie<br>Clufflat<br>Echline              | N                            | N                                  | high humidity                        |                           |
| 08/02/2012 | ESE      | Inchgarvie<br>Clufflat<br>Echline              | N                            | N                                  | high humidity and damp ground        |                           |
| 09/02/2012 | ESE      | Clufflat<br>Echline                            | N                            | N                                  | damp ground                          |                           |
| 10/02/2012 | LSN      | Clufflat<br>Echline                            | N                            | N                                  | damp ground and high humidity        |                           |
|            |          |  |                              |                                    | high humidity over weekend           |                           |
| 13/02/2012 | ESE      |  | N                            | N                                  | windy and high humidity              |                           |
| 14/02/2012 | LSN      |  | N                            | N                                  | windy                                |                           |
| 15/02/2012 | NAM      |  | N                            | N                                  | windy                                |                           |
| 16/02/2012 | LSN      |  | N                            | N                                  | windy                                |                           |
| 17/02/2012 | ESE      |  | N                            | N                                  | windy, high humidity and wet ground  |                           |
|            |          |  |                              |                                    | high humidity on Saturday 18         |                           |
| 20/02/2012 | LSN      |  | N                            | N                                  | high humidity and damp ground        |                           |
| 21/02/2012 | LSN      |  | N                            | N                                  | windy, damp ground and high humidity |                           |
| 22/02/2012 | ESE      |  | N                            | N                                  | windy, high humidity and wet ground  |                           |
| 23/02/2012 | ESE      |  | N                            | N                                  | windy, damp ground and high humidity |                           |
| 24/02/2012 | SSD      |  | N                            | N                                  | windy and high humidity              |                           |
|            |          |  |                              |                                    | high humidity on Sunday              |                           |
| 27/02/2012 | SSD      |  | N                            | N                                  | windy, damp ground and high humidity |                           |
| 28/02/2012 | ESE      |  | N                            | N                                  | windy, damp ground and high humidity |                           |
| 29/02/2012 | ESE      |  | N                            | N                                  | windy, damp ground and high humidity |                           |