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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT  
OCTOBER 2014**

00	08/12/2014	First revision	SSN	LSN	LSN
<b>Rev</b>	<b>Rev. Date</b>	<b>Purpose of revision</b>	<b>Made</b>	<b>Checked</b>	<b>Reviewed</b>

Document status

**FOR REVIEW**

Made by Stuart Swainson	Checked By: Liam Soden
Initials: SSN	Initials: LSN

Document number	Rev
<b>REP -00202</b>	<b>00</b>

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## **Contents**

- 1. Introduction**
- 2. Monitoring Equipment and Locations**
- 3. Air Quality Monitoring Results**
  - 3.1. Automatic Light Scatter Meter Particulate Matter Monitoring Results**
  - 3.2. Total Suspended Particle Results**
  - 3.3. Frisbee Dust Deposition Results**
  - 3.4. Daily Dust Log and Weekly Environmental Inspections**

## **Appendices:**

- Appendix A: Particulate Matter Results**
- Appendix B: Total Suspended Particle Results**
- Appendix C: Frisbee Dust Deposition Results**
- Appendix D: Daily Dust Log Summary**

## **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 October 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 Quality Management Plan (DAQMP) 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, including the date it was installed.

**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, 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 provides a visual record of the weather conditions at the time of the inspection, including conditions that can affect readings, such as fog.

**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 register any environmental issues using a QMT (Quality Management Tool). Any issues relating to air quality can therefore be noted and closed out appropriately.



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**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 October
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> <li>• Earthworks</li> <li>• Drainage installation</li> <li>• CMC Piles</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>• Assembling and fixing rebar and formwork works at Piers S1</li> <li>• Concrete pouring at Piers S1</li> <li>• Repair and removal of formwork platforms</li> <li>• Excavation at Pier S2</li> </ul>
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> <li>• Marine works</li> <li>• Assembling and fixing rebar and formwork works at Piers S1&amp;4</li> <li>• Concrete pouring at Piers S1&amp;4</li> <li>• Repair and removal of formwork platforms</li> <li>• Excavation at Pier S2</li> </ul>
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Assembling and fixing rebar and formwork works at Piers S1</li> <li>• Concrete pouring at Piers S1</li> <li>• Repair and removal of formwork platforms</li> <li>• Excavation at Pier S2</li> <li>• Minor works Inchgarvie Lodge wall</li> </ul>
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Launch Operations</li> </ul>
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Launch Operations</li> <li>• Minor works Inchgarvie Lodge wall</li> </ul>
M13	Clufflat Brae	Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Launch Operations</li> <li>• Excavation and haulage from mainline north of A904 to Dundas area</li> </ul>





M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> <li>• Launch – Element joints and welding</li> <li>• Launch Operations</li> <li>• Paving, kerbing, surfacing, drainage and earthworks adjacent to A904</li> <li>• Painting, surfacing and concrete finishing at gyratory</li> <li>• Line marking</li> </ul>
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> <li>• Earthworks at B800</li> <li>• Utility works</li> <li>• Bearings and protection installation</li> <li>• Drainage works</li> </ul>
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> <li>• Haulage of excavated materials from Echline</li> <li>• Construction of road formation from Dundas to Queensferry gyratory</li> <li>• Gantry foundations</li> </ul>
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	<ul style="list-style-type: none"> <li>• None</li> </ul>
		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 October 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 the month. All the monitors follow the same general pattern throughout the month.

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 station located at Queensferry Road, Edinburgh. No data was available from the TEOM FDMS monitor at St Leonards, Edinburgh. 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 October was largely driven by regional changes in air quality. Though it should be noted that the Queensferry Road, Edinburgh monitor registered much higher levels during 17<sup>th</sup>- 24<sup>th</sup> September. However as mentioned above, this monitor is only used as a reference and is not related to FCBC activities or equipment.

### **3.2. Total Suspended Particles**

**3.2.1.** The TSP results for October 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during October were found to be low and all within the threshold level. All locations across the site were mostly found to follow a similar pattern, 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 October 2014 have been presented in a chart and can be found in Appendix C. This includes an additional Frisbee (Echline Corner) currently located south of the A904 in proximity to the Echline monitor. This temporary Frisbee is used to provide additional information and its results are presented alongside the 13 permanent monitors. Frisbee dust deposition results were collected fortnightly, and the results averaged over this fortnight period to give a daily dust deposition rate. Three collections were made in October, on the 1<sup>st</sup>, 15<sup>th</sup> and 29<sup>th</sup>. The next collection will take place on the 12<sup>th</sup> November 2014.

**3.3.2.** 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 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 review threshold the site works are reviewed to ensure good practice is implemented; it is essentially a warning that additional controls may be required.

- 3.3.3.** During October there were three exceedances of the site review level and no exceedances of the action level (see Table 2).

**Table 2: Exceedances of the dust deposition thresholds**

Fortnight ending	Threshold Exceeded	Monitoring Location	Considerations	Weather conditions during period
15/10/2014	Review	Inchgarvie Lodge	Brickwork cladding in immediate proximity	Mixed wind/ Generally wet
	Review	Echline Corner	Gauge located on site. No dust generating construction activities in close proximity. Dust generating activities near A904 being mitigated.	
29/10/2014	Review	Echline Corner	Gauge located on site. No dust generating construction activities in close proximity. Dust generating activities near A904 being mitigated.	Mixed wind/ Generally wet

- 3.3.4.** 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 gauge results were also considered alongside the particulate matter data for the same period.

**3.3.5.** With regards to the exceedance of the review level at Inchgarvie Lodge for the fortnight concluding 15<sup>th</sup> October, a review into works undertaken in the vicinity was carried out. Finishing work on the brickwork cladding was taking place on the newly installed wall to the rear of Inchgarvie Lodge, in immediate proximity to the gauge (within 10m). It should be noted that site works do not usually occur at this location and the wall construction is a short-term activity. This means that during this period the gauge was essentially within the construction site. A review of the works in the area, weather conditions, and the mitigation measures in place was undertaken. Considering all the factors, the proximity of the work is believed to be responsible for the exceedance. Three other gauges (Clufflat, Clufflat Brae & Barracks East) are located within 150m of the Inchgarvie Lodge gauge, all of which registered low readings during the same period. It is concluded that while construction activities on and around the wall caused the exceedance at the Inchgarvie Frisbee gauge, mitigation was in place which limited the increase in dust to the immediate area and prevented it from migrating off site. Completion of the wall construction occurred during November with the exception of some planting. Due to the continued elevated levels observed at this location additional checks will be undertaken to ensure that mitigation measures are effective.

**3.3.6.** During the periods ending 15<sup>rd</sup> and 29<sup>th</sup> October the Echline Corner Frisbee registered levels above the review level. This is an additional temporary Frisbee that was put in place after a dust incident during April. It has been positioned within the construction site and provides information regarding dust levels generated on-site. A review of the works was undertaken and it was found that although construction activities that could give rise to dust took place in the area during this period, mitigation was in place to prevent dust migrating off-site. The

Echline gauge, which is located within 200m of the Echline Corner Frisbee gauge, registered low levels during the same periods suggesting that the levels of dust at source on site were above review level but mitigation has prevented dust migrating off-site. In general, levels measured at the Echline Corner gauge have been continually higher than the other Frisbees that are located around the edges of the site, closer to residential areas. In an attempt to gather more representative data, the location of this gauge is being reviewed with a view to identifying an alternative location within the same area of works.

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

- 3.4.1.** A summary of the daily dust log for October can be found in Appendix D. During October no instances of dust relating to FCBC works 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 October, no instances of dust were noted during inspections.



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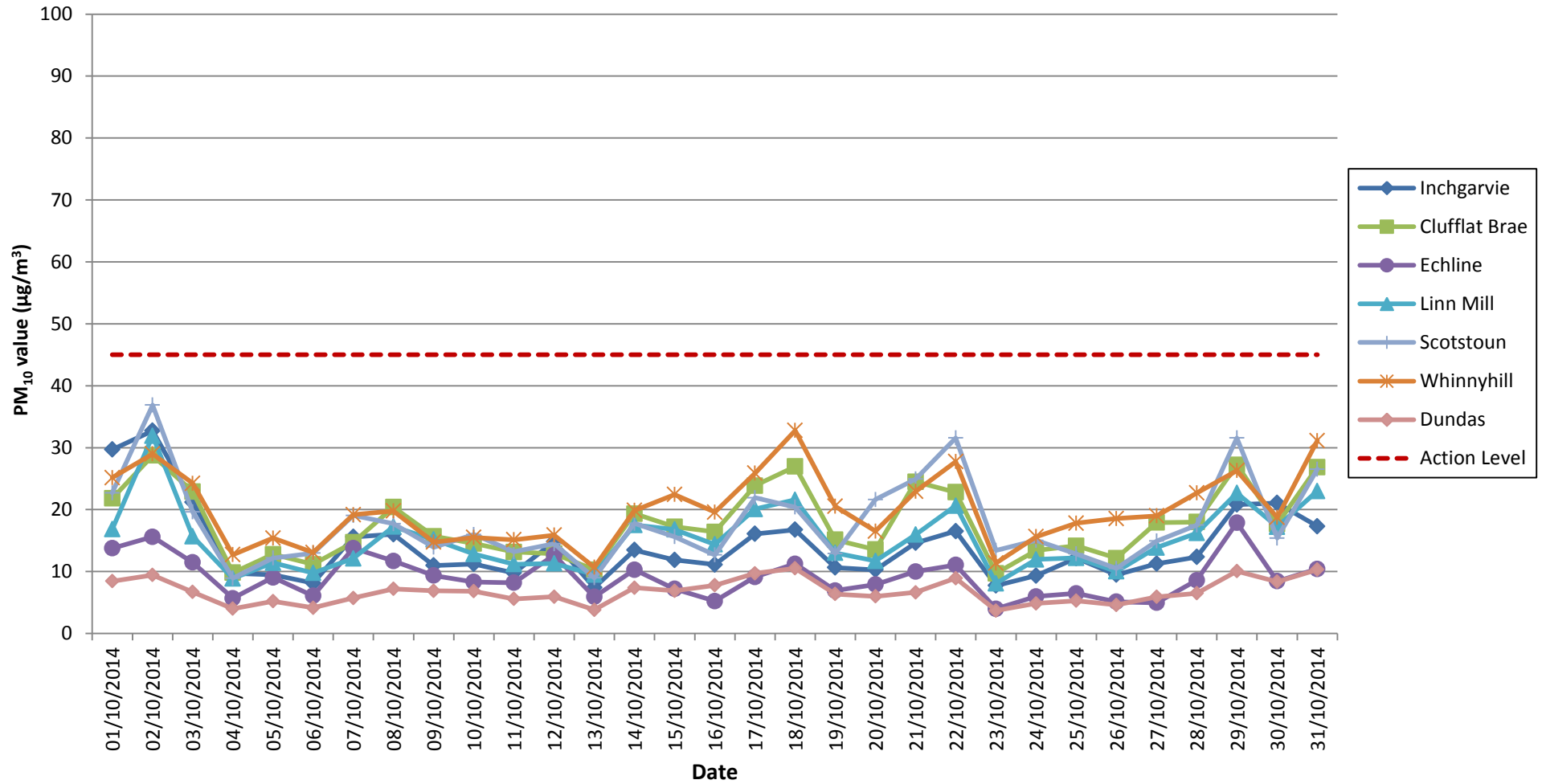
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## **APPENDIX A: LIGHT SCATTER METER RESULTS**

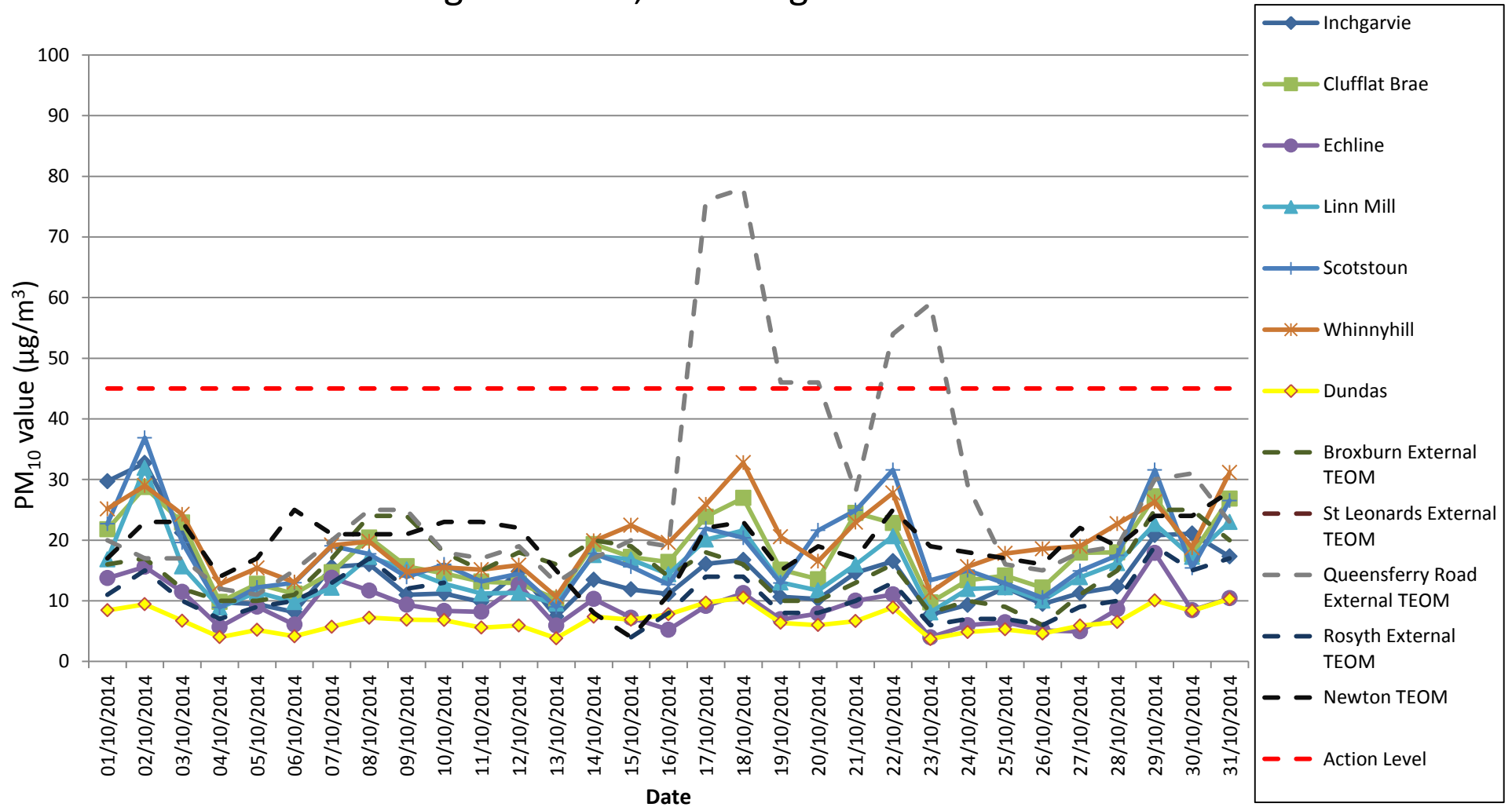
# Air Quality Monitoring

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

### October 2014



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



Note: TEOM data missing from scottish air quality for the 11-14 October for Rosyth and no data has been recorded at the St Leonards monitor since 12th September.



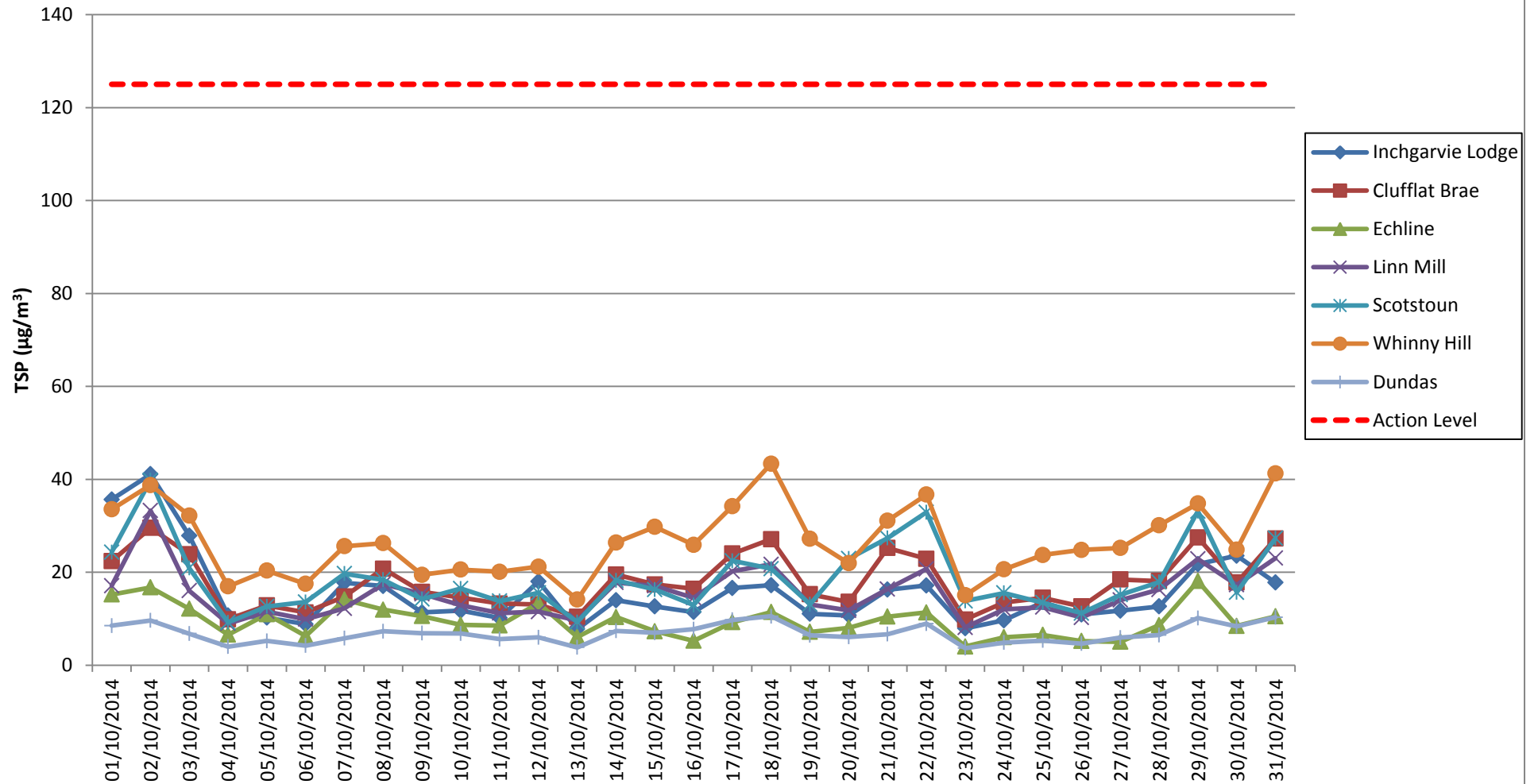


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## **APPENDIX B: TOTAL SUSPENDED PARTICLES**

# Total Suspended Particles (TSP) Results October 2014



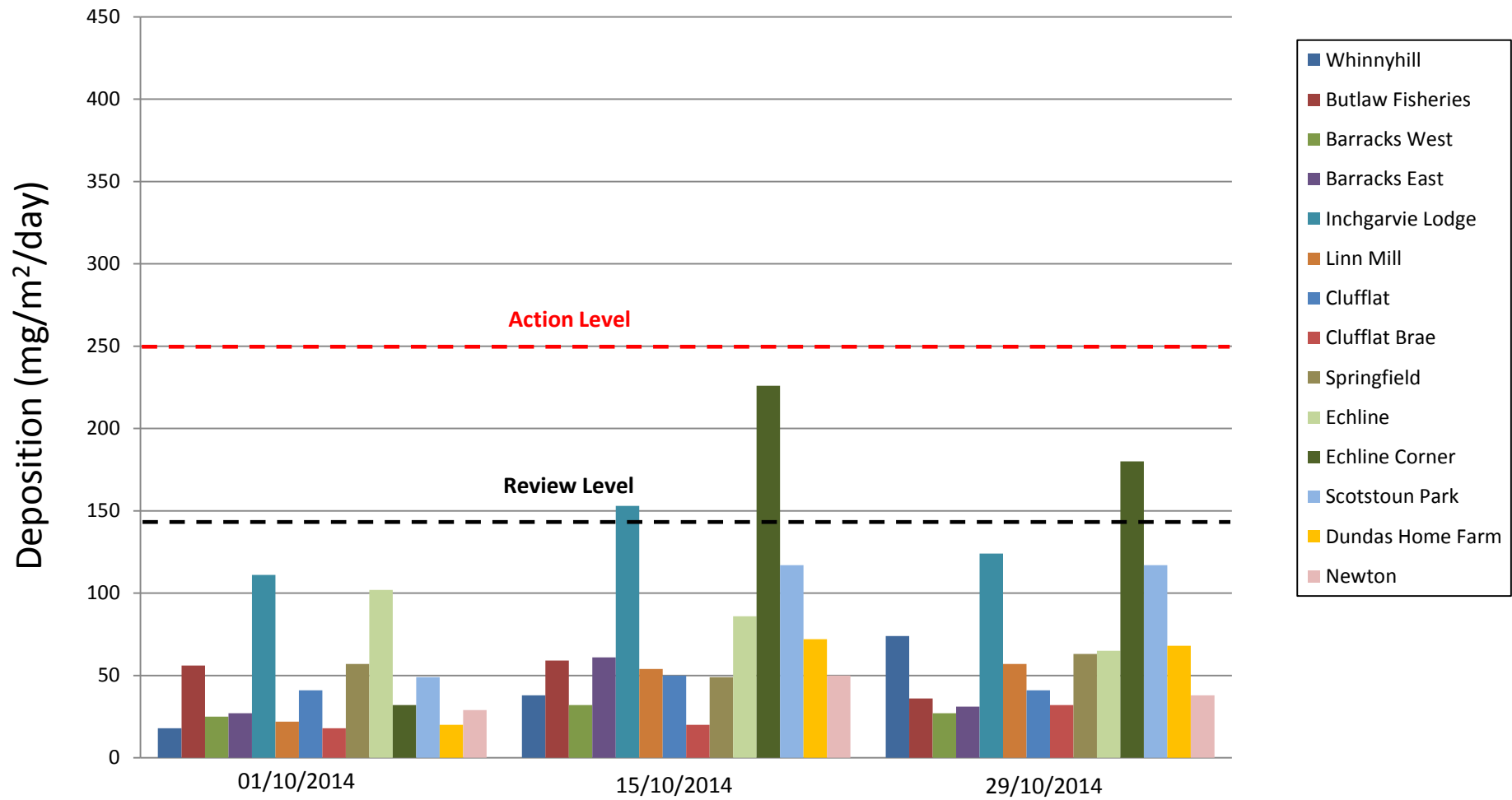


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## **APPENDIX C: FRISBEE GAUGE RESULTS**

## Frisbee Dust Deposition Results: October 2014





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

### Daily Dust Log - North - October 2014

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

### Daily Dust Log - South - October 2014

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