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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT  
NOVEMBER 2014**

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**Distribution**

Name	Email Address	Copy Sent (Y/N)
Michael Martin	<a href="mailto:Michael.martin@fbcjv.co.uk">Michael.martin@fbcjv.co.uk</a>	

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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 November 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 November
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> <li>• Drainage &amp; Kerbing 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>• 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</li> <li>• Concrete pouring at Piers S1</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>• Excavation at Pier S2</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> </ul>
M13	Clufflat Brae	Frisbee	21/09/11	
		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> </ul>

		Automatic light scatter meter	10/11/11	<ul style="list-style-type: none"> <li>• Paving, kerbing, surfacing, drainage and earthworks adjacent to A904</li> <li>• Painting, surfacing and concrete finishing at gyratory</li> </ul>
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 November 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 with the exception of two days. The Scotstoun monitor registered levels above the Action Level on the 5<sup>th</sup> and the Clufflat and Whinny Hill monitors registered above the Action Level on the 29<sup>th</sup>. All the monitors follow the same general pattern throughout the month.

**3.1.2.** Raised levels were seen at all monitors on the 5<sup>th</sup> November, with the Scotstoun monitor registering levels over the Action Level. For the exceedances of the Action Level, a review of the works in each of the areas, weather conditions, and the mitigation measures in place was undertaken. During the 5<sup>th</sup> November levels across all monitors saw a significant increase in levels after 6:00pm. Land based construction activities finished by 7:00pm so it is concluded that the increases observed across all the monitors are caused by regional conditions, with

the possibility of bonfires and fireworks (Bonfire Night) contributing to high levels at some locations.

**3.1.3.** Raised levels were also observed across all monitors on site on Saturday 29<sup>th</sup> November, including levels above the Action Level at Whinnyhill and Clufflat. As with all exceedances of the Action Level, a review of the works in each of the areas, weather conditions, and the mitigation measures in place was undertaken. Due to it being a Saturday, very little work was being undertaken across site with no works that would create dust. The only activities in the exceedance related areas were welding in the launch sections and some kerbing and drainage work on the North Networks area. This combined with the fact that a similar increase was seen across all the monitors suggests the increase was caused by a regional event rather than construction related activities.

**3.1.4.** 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 November was largely driven by regional changes in air quality.

## **3.2. Total Suspended Particles**

**3.2.1.** The TSP results for November 2014 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during November 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 November 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. Two collections were made in November, on the 12<sup>th</sup> and 26<sup>th</sup>. The next collection will take place on the 10<sup>th</sup> December 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 November there was one exceedance of the site review level and no exceedances of the action level (see Table 2).

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

<b>Fortnight ending</b>	<b>Threshold Exceeded</b>	<b>Monitoring Location</b>	<b>Considerations</b>	<b>Weather conditions during period</b>
12/11/2014	Review	Whinnyhill	No dust generating construction activities in the area	Mixed, windy and generally wet

- 3.3.4.** For 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.** During the two week period ending the 12<sup>th</sup> November the Whinnyhill gauge registered above the Review Level. However, a review of works was undertaken and it was found that no construction activities that would be likely to give rise to dust took place in the area during this period. PM<sub>10</sub> and TSP data were very low for the period at the same location with the exception of the 5<sup>th</sup> November (see Section 3.1.2). After a thorough review it was concluded that the results cannot be explained by FCBC construction activities undertaken during this period.

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

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



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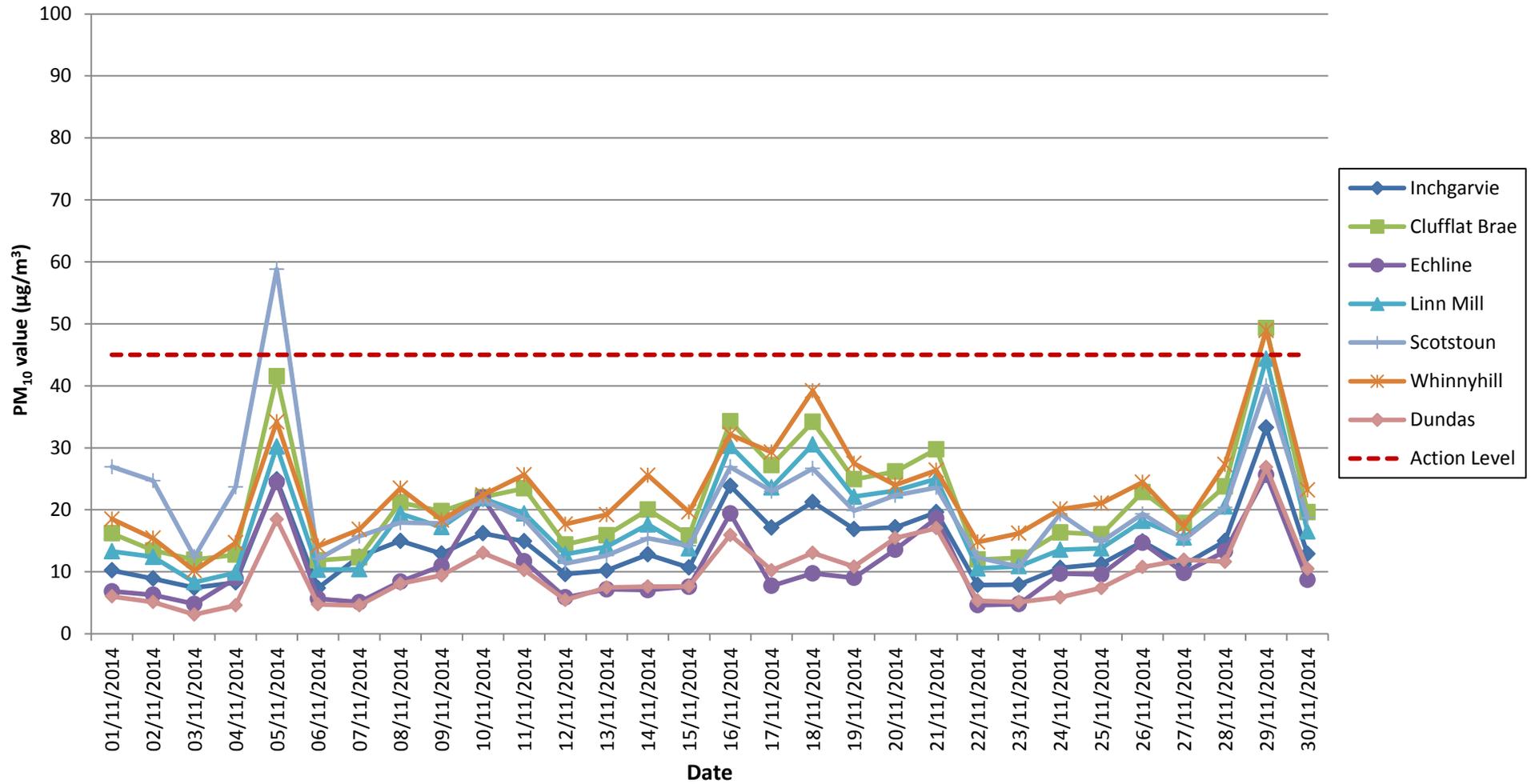
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## **APPENDIX A: LIGHT SCATTER METER RESULTS**

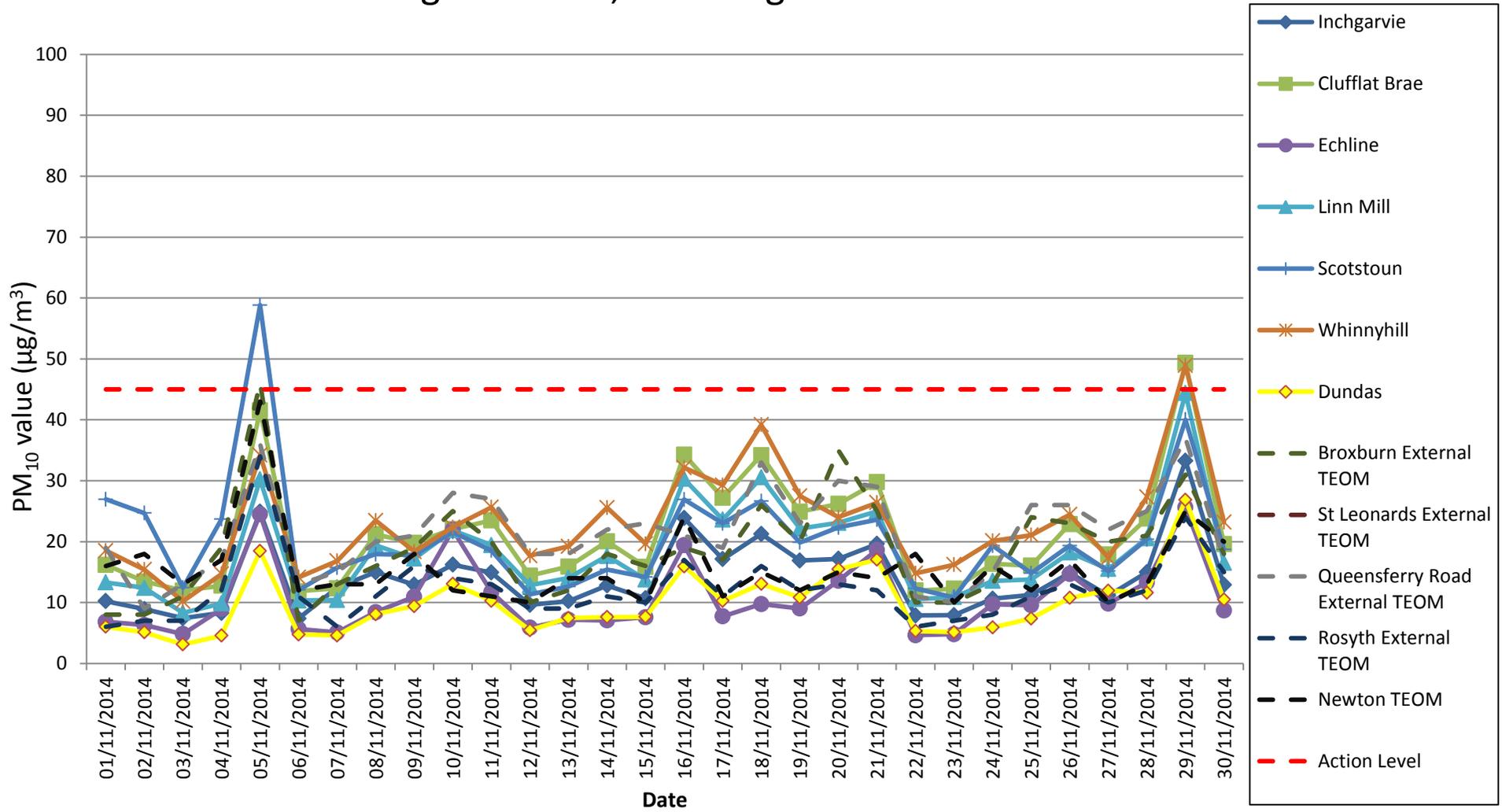
# Air Quality Monitoring

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

### November 2014



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



Note: TEOM data missing from scottish air quality for the St Leonards monitor since 12th September.

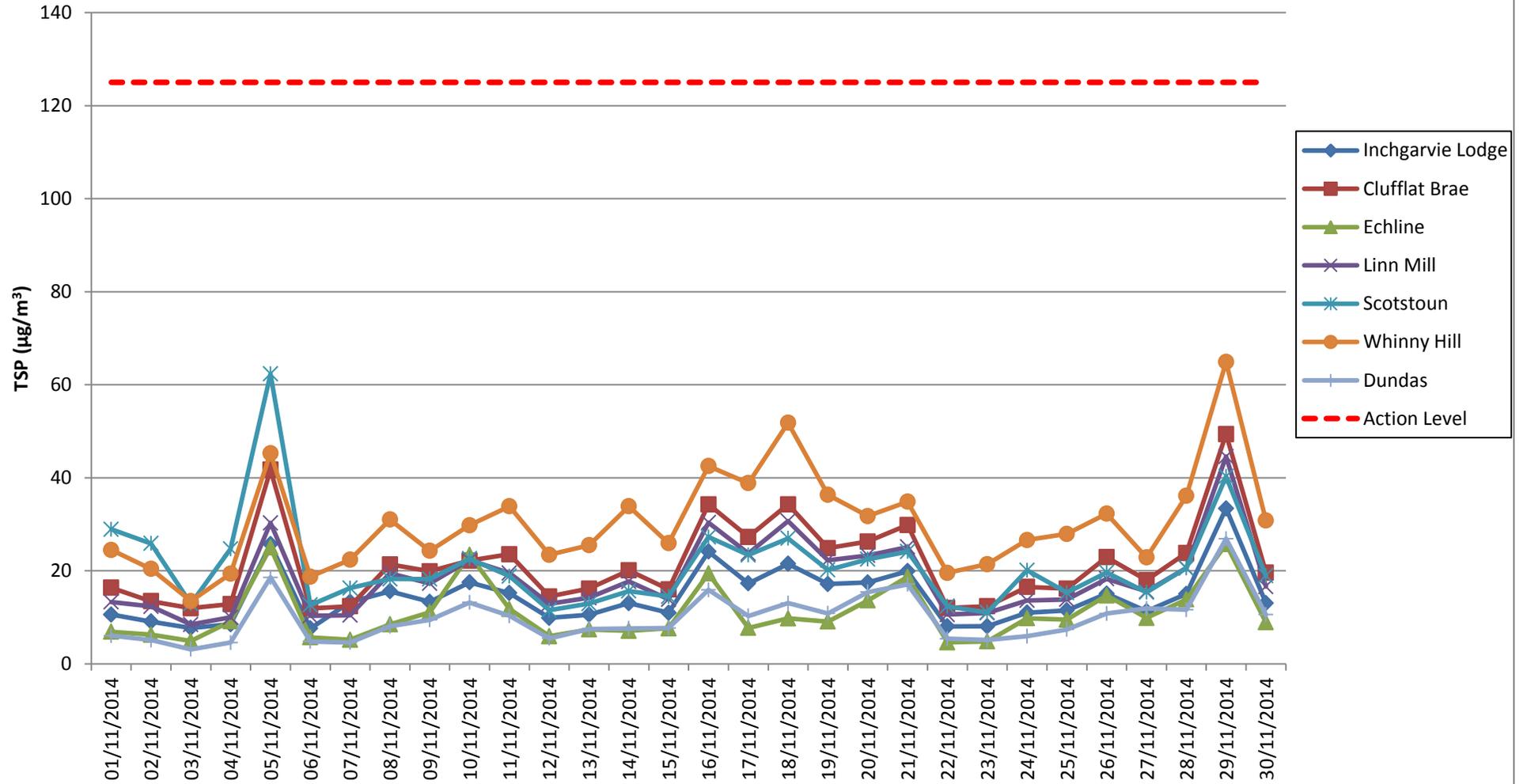


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## **APPENDIX B: TOTAL SUSPENDED PARTICLES**

# Total Suspended Particles (TSP) Results November 2014



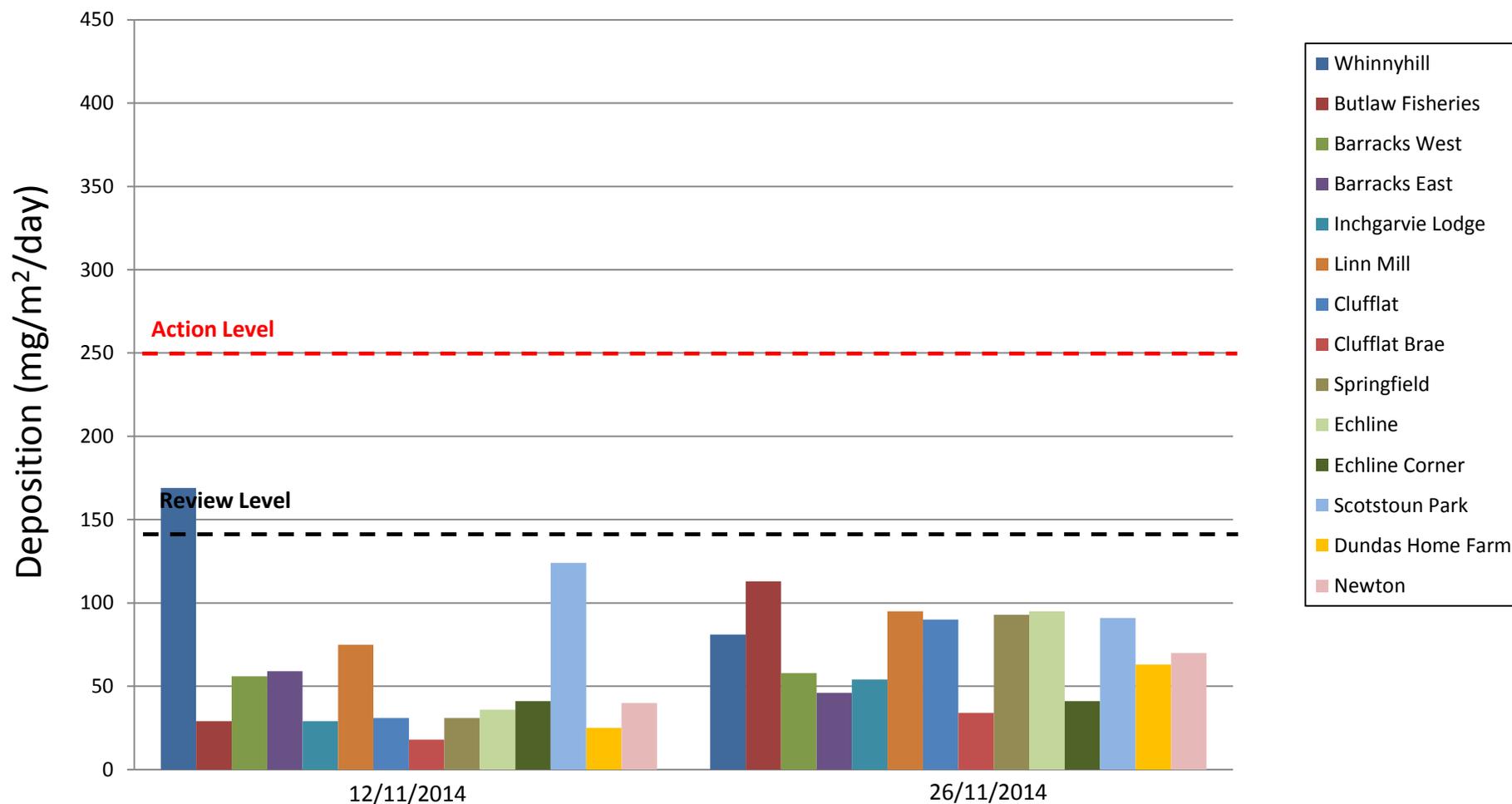


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## **APPENDIX C: FRISBEE GAUGE RESULTS**

## Frisbee Dust Deposition Results: November 2014



Note: Echline Corner gauge not collected on 12/11/2014. Collection on 26/11/2014 was analysed to cover the four week period ending 26/11/2014.



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

### Daily Dust Log - North - November 2014

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

### Daily Dust Log - South - November 2014

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