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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
MARCH 2016**

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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 2016.

- 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).



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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 currently 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 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.



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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, Linn Mill and Whinnyhill (these are adjacent to the light scatter meters at these monitoring locations), 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 to determine if any actions are 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.



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 March
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Earthworks/Fill Placement • Hope Street roadworks • Bridge works at Ferrytoll • Bridge Demolition at Ferrytoll • Main carriageway roadworks • Rock crushing
		Automatic light scatter meter	16/02/12	
M7	Butlaw Fisheries	Frisbee	05/10/11	<ul style="list-style-type: none"> • Pier S1 rebar, formwork & concrete works • Pier S2 rebar, formwork & concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Pier S1 rebar, formwork & concrete works • Pier S2 rebar, formwork & concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck • Main carriageway earthworks • Pier S1 rebar, formwork & concrete works • Pier S2 formwork and concrete works • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck • Main carriageway earthworks • South Tower rebar, formwork, concreting works, deck segment lifts, deck table installation works
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and reinforcement to deck
M13	Clufflat	Frisbee	21/09/11	



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	Brae	Automatic light scatter meter	24/10/11	<ul style="list-style-type: none"> Main carriageway earthworks
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway earthworks
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway earthworks
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> Footpath works Utility works Main carriageway works B800 Rebar and Concrete works. Top soil spread next to B800 North-bound bus link
		Automatic light scatter meter	14/02/12	
M17	Dundas Home Farm	Frisbee	29/08/11	<ul style="list-style-type: none"> Utility works B800 Rebar and Concrete works Main carriageway works North-bound bus link
		Automatic light scatter meter	23/02/12	
M18	Newton	Frisbee	22/08/11	<ul style="list-style-type: none"> 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 March 2016 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were below threshold levels throughout March. All monitors generally follow the same pattern throughout the month. However, the PM₁₀ results for Scotstoun show larger increases on the 7th, 9th, 21st and 29th March. On the 7th March, the Scotstoun light scatter meter registered 15 minute exceedances for PM₁₀. The FCBC Environmental Coordinator investigated the area and confirmed that conditions were not dusty and that sufficient mitigation was in place (see Appendix D).



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3.1.2. The PM₁₀ 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 and St Leonards, Edinburgh (an urban background site). The TEOM at Newton was installed by West Lothian Council, facilitated by FCBC, during January 2012. The comparison between the light scatter and TEOM results demonstrates that both sets of results generally follow the same pattern, although the TEOM results indicate some higher peaks of PM₁₀ throughout March. The higher levels of PM₁₀ observed at Scotstoun (3.1.1 above) are largely consistent with one or more TEOM results for the same period, with the exception of 21st March. The pattern observed throughout March was largely driven by regional changes in air quality.

3.2. Total Suspended Particles

3.2.1. The TSP results for March 2016 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during March were found to be low and all within the threshold. All locations across the site were found to follow a similar pattern (similar to that observed for PM₁₀ levels). As with PM₁₀ it is considered that the TSP levels across site were influenced by regional changes in TSP levels.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for March 2016 have been presented in a chart and can be found in Appendix C. Three collections were made in March; these occurred on the 2nd, 16th and 30th March 2016.

3.3.2. The site action level for the dust deposition rate has been set at 250 mg/m²/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



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site review level has been set at 140 mg/m²/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 March there was one exceedances of the review level at Scotstoun for the fortnight concluding 2nd March. Although there were FCBC earthworks ongoing (top soil being spread) at the embankment next to the B800 between Friday 19th and Friday 26th February there was no dust observed on site. In addition, the light scatter meters at Scotstoun indicated very low levels of PM₁₀ and TSP during this fortnight. These exceedances may have been caused from another construction site (not part of the FRC project) located closer to the Scotstoun frisbee, on the other side of the B800 (approx. 80m from the frisbee). This other construction work started in December with earthworks being undertaken. In order to further investigate exceedances at this location, FCBC placed an additional temporary Frisbee at Scotstoun on 2nd March (noted as Scotstoun Arups in Appendix C). This temporary frisbee is located closer to the FCBC works than the permanent frisbee. The results from the temporary frisbee for the fortnights ending 16th and 30th March indicate a significantly lower result than for the Scotstoun permanent frisbee. This suggests that the higher results obtained recently at the permanent monitoring location are not entirely due to FCBC activities. However, FCBC will continue to monitor this area closely as works progress and provide mitigation as necessary.



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3.4. Daily Dust Log and Environmental Inspections

- 3.4.1.** A summary of the daily dust log for March can be found in Appendix D.

- 3.4.2.** During this period full environmental inspections were also undertaken across the site and covered areas where works were being carried out. In addition to the inspection noted in 3.1.1, dust from a rock crusher was observed at the Ferrytoll Gyrotory area on 18th March. This was reported to the site team and appropriate mitigation put in place.



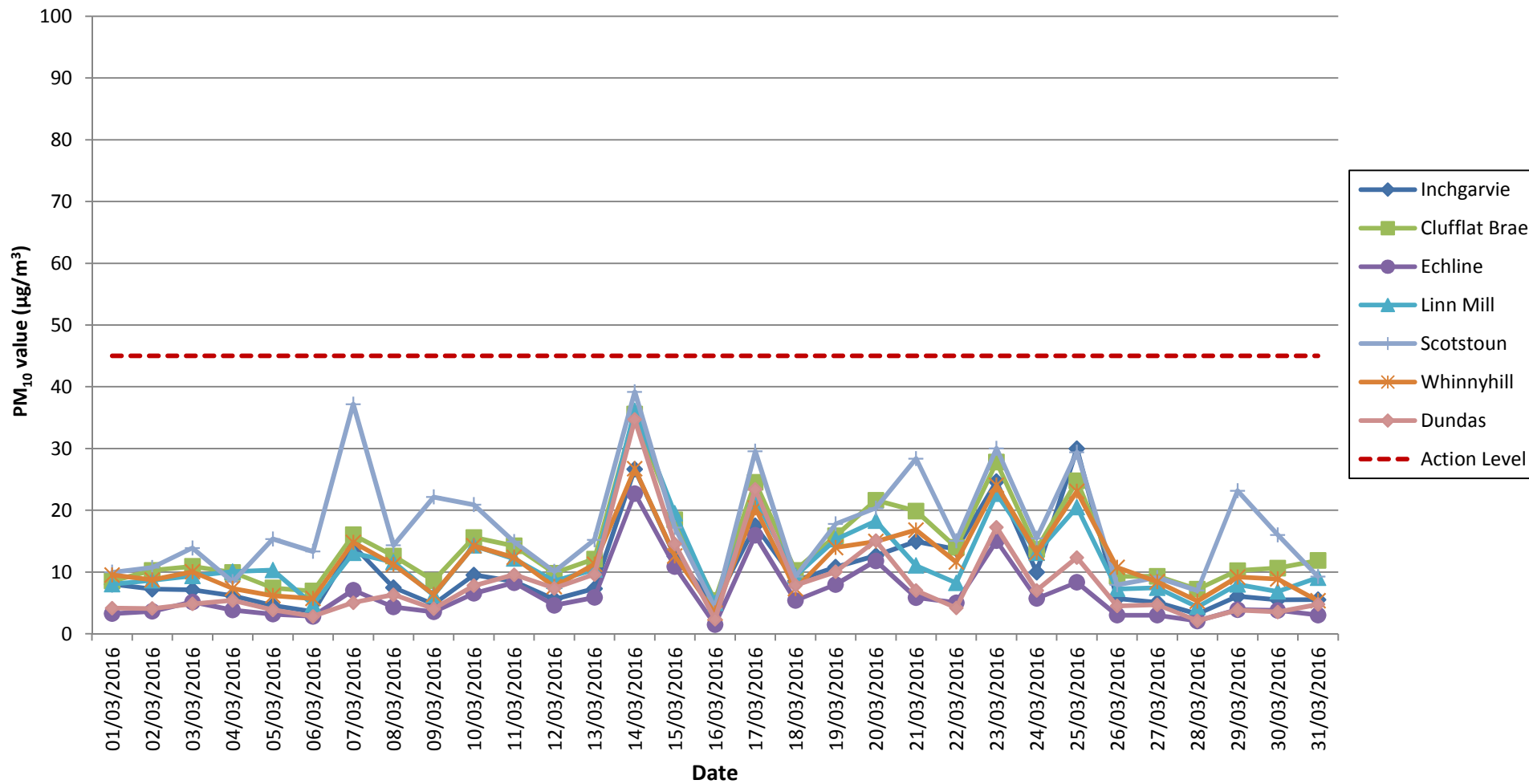
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APPENDIX A: LIGHT SCATTER METER RESULTS

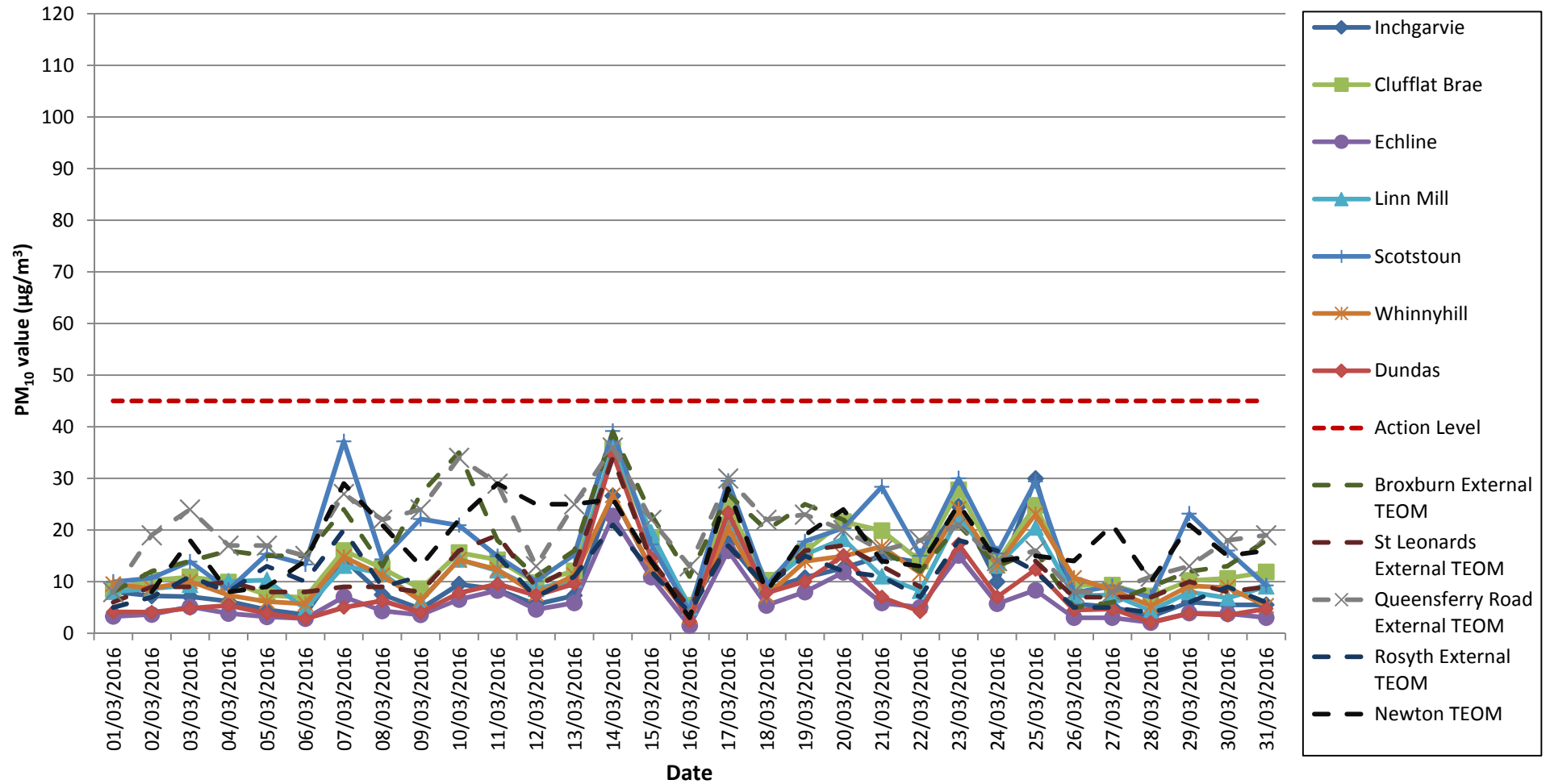
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

March 2016



Air Quality Monitoring: Particulate Matter (PM10) Results for all Monitoring Locations, including TEOM data March 2015

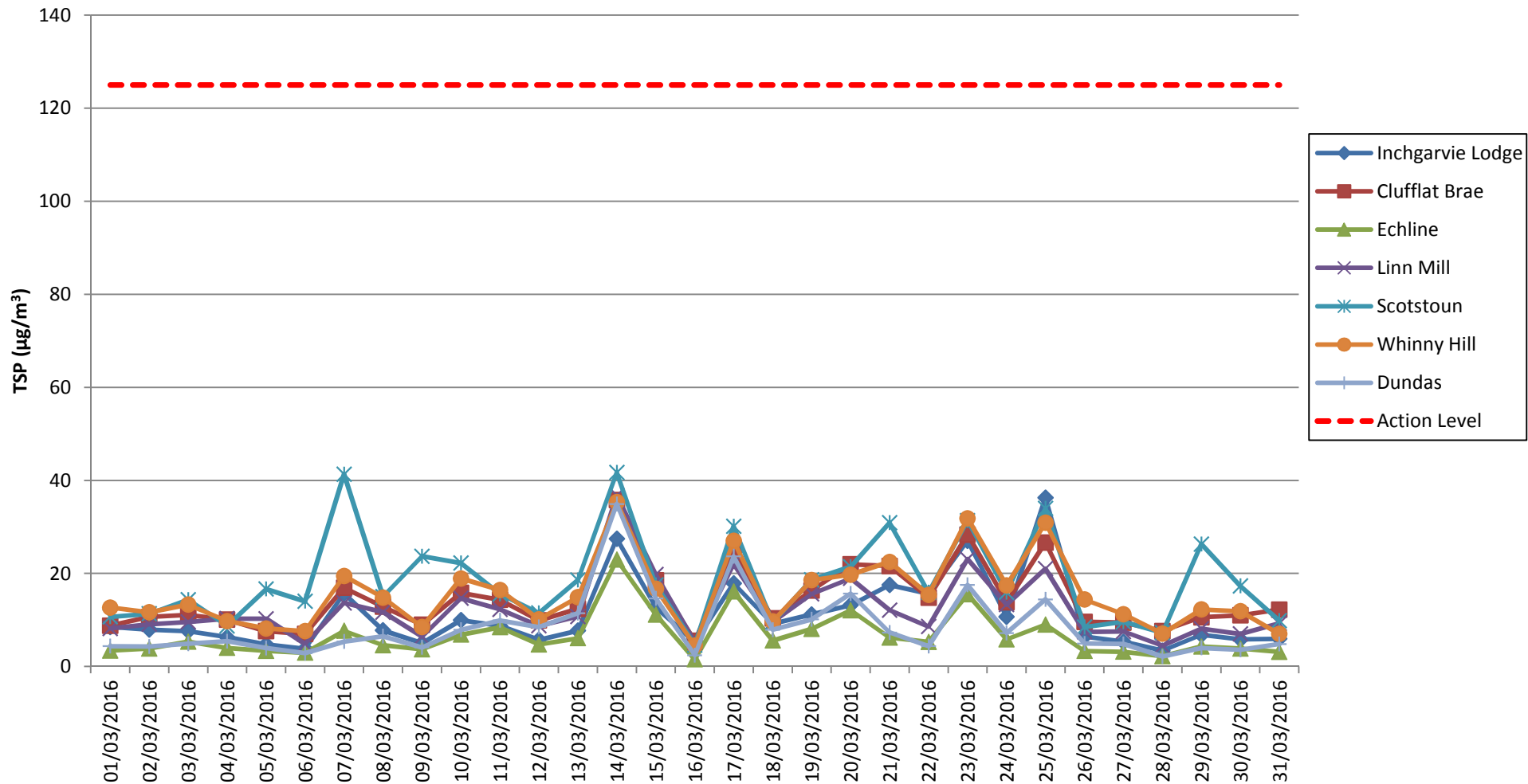




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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results March 2016

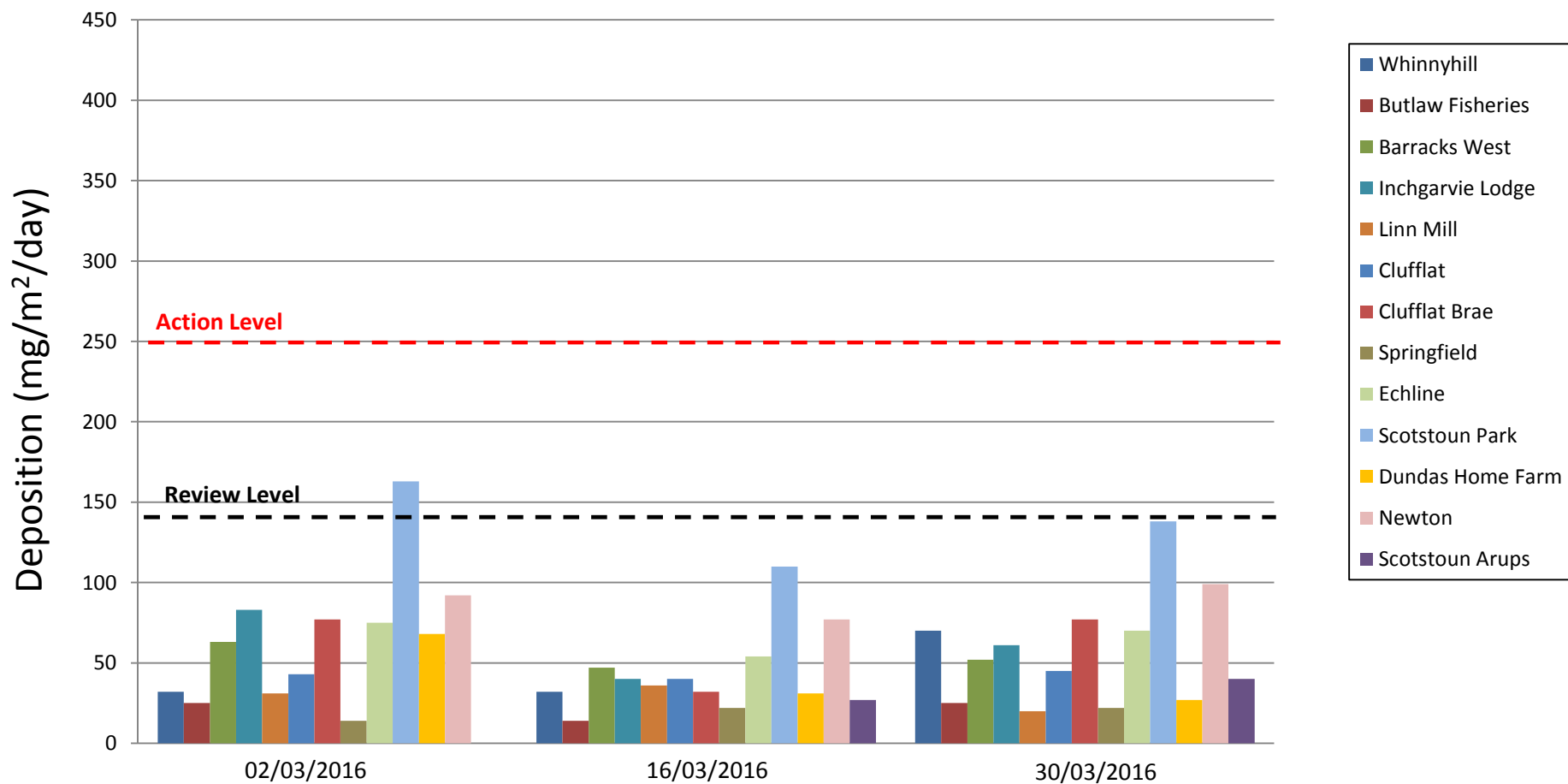




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APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: March 2016





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - March 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/03/2016	N	LIGHT	SW	Damp	N			
02/03/2016	N	LIGHT	S	Damp	N			
03/03/2016	N	LIGHT	S	Dry	N			
04/03/2016	N	LIGHT	SE	Dry	N			
05/03/2016	N							
06/03/2016	N							
07/03/2016	N	LIGHT	S	DRY	N			
08/03/2016	N	LIGHT	SW	WET	N			
09/03/2016	N	LIGHT	SW	DAMP	N			
10/03/2016	N	LIGHT	S	DRY	N			
11/03/2016	N	LIGHT	S	WET	N			
12/03/2016	N							
13/03/2016	N							
14/03/2016	N	LIGHT	E	DRY	N			
15/03/2016	N	LIGHT	E	DAMP	N			
16/03/2016	N	LIGHT	E	DRY	N			
17/03/2016	N	LIGHT	S	DAMP	N			
18/03/2016	N	LIGHT	SE	DAMP	Y	Y		Dust from rock crusher at works near FT03/04 . Contacted site teams to put appropriate mitigation in place
19/03/2016	N							
20/03/2016	N							
21/03/2016	N	LIGHT	SW	DRY	N			
22/03/2016	N	LIGHT	SW	DRY	N			
23/03/2016	N	LIGHT	SW	DRY	N			
24/03/2016	N	LIGHT	SW	WET	N			
25/03/2016	N	LIGHT	W	DRY	N			
26/03/2016	N							
27/03/2016	N							
28/03/2016	N	LIGHT	SW	DRY	N			
29/03/2016	N	LIGHT	SW	DAMP	N			
30/03/2016	N	LIGHT	S	DRY	N			
31/03/2016	N	LIGHT	SE	DRY	N			

Daily Dust Log - South - March 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/03/2016	S	MEDIUM	NW	DAMP	N			
02/03/2016	S	LIGHT	SW	DAMP	N			
03/03/2016	S	LIGHT	W	DRY	N			
04/03/2016	S	LIGHT	SE	DRY	N			
05/03/2016	S							
06/03/2016	S							
07/03/2016	S	LIGHT	S	DRY	N			PM10 - 15 minute exceedances throughout day at Scotstoun. Environmental coordinator attended site. No dust observed and dust suppression was ongoing (bowser).
08/03/2016	S	LIGHT	W	WET	N			
09/03/2016	S	LIGHT	S	DAMP	N			
10/03/2016	S	LIGHT	SW	DRY	N			
11/03/2016	S	LIGHT	W	WET	N			
12/03/2016	S							
13/03/2016	S							
14/03/2016	S	LIGHT	SE	DRY	N			
15/03/2016	S	LIGHT	S	DAMP	N			
16/03/2016	S	LIGHT	SE	DRY	N			
17/03/2016	S	LIGHT	S	DAMP	N			
18/03/2016	S	LIGHT	SE	DAMP	N			
19/03/2016	S							
20/03/2016	S							
21/03/2016	S	LIGHT	NW	DRY	N			
22/03/2016	S	LIGHT	W	DRY	N			
23/03/2016	S	LIGHT	NW	DRY	N			
24/03/2016	S	LIGHT	NW	WET	N			
25/03/2016	S	MEDIUM	W	DRY	N			
26/03/2016	S							
27/03/2016	S							
28/03/2016	S	LIGHT	SW	DRY	N			
29/03/2016	S	LIGHT	W	DAMP	N			
30/03/2016	S	LIGHT	SW	DRY	N			
31/03/2016	S	LIGHT	S	DRY	N			