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FCBC
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Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
JULY 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 July 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 July
M1	Whinny Hill	Frisbee	21/03/12	<ul style="list-style-type: none"> • Earthworks/Fill Placement • Hope Street roadworks • Bridge works at Ferrytoll • Main carriageway roadworks • Rock crushing • Ferrytoll bridge demolition
		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 • Pier S3 hydro demolition • 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 • Pier S3 hydro demolition • 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 formwork & concrete works • Pier S2 formwork & concrete works • Pier S3 hydro demolition • 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 • Pier S1 rebar, formwork & concrete works • Pier S2 formwork and concrete works • Pier S3 hydro demolition • SUDS detention basin works •
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • AVS Scaffolding, shuttering and

M13	Clufflat Brae	Frisbee	21/09/11	<ul style="list-style-type: none"> reinforcement to deck Main carriageway works
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway works
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> AVS Scaffolding, shuttering and reinforcement to deck Main carriageway works
		Automatic light scatter meter	10/11/11	
M16	Scotstoun	Frisbee	07/09/11	<ul style="list-style-type: none"> Utility works Main carriageway works 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 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 July 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 July with the exception of Linn Mill on the 19th July and Clufflat Brae on the 28th and 29th July. All monitors generally follow the same pattern throughout the month, with the exception of the exceedances noted above, in addition to Scotstoun on 5th, 6th and 18th July and Clufflat Brae on 15th and 22nd July (although below the threshold level on these dates). With the exceedance on the 19th July at Linn Mill, the weather on this day was hot and dry so it is possible that this exceedance was caused by dust from the access track on site. The access track has since been resurfaced which has



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reduced any dust emissions in this area. With regards to the exceedance at Clufflat Brae on 28th and 29th July, the light scatter meters registered 15 minute exceedances for PM₁₀. The FCBC Environmental Coordinator investigated the area and confirmed that although dry, the site conditions were not dusty and that sufficient mitigation was in place. The closest works to the monitors was surfacing works on the main line (approx. 200m away). It was considered unlikely that this work would cause the exceedances registered on the meter due to the distance and absence of any visible evidence of dust. FCBC will continue to monitor construction works closely in this area and provide mitigation when necessary.

3.1.2. On 27th, 28th and 30th July the light scatter meter at Inchgarvie registered a number of extremely high results (eg. 1604µg/m³). These results occurred in the afternoon / early evening. The FCBC Environmental Coordinator attended the site on 28th July to investigate the incident on that day. There was no visible signs of dust in the vicinity of the meter and no construction works being undertaken which were a likely source of the high levels. Furthermore, on Saturday 30th July the only construction works being undertaken in the afternoon at the time of the high results were deck works on the viaduct section of the bridge. These works would not have provided a source of PM₁₀. The results for Inchgarvie have therefore been excluded from the charts in Appendix A and B as erroneous results on these days.

3.1.3. 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 there are some notable differences in July where the light scatter meter results indicate



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some higher peaks of PM₁₀. In addition to the exceedances noted in 3.1.1 above, the following locations also indicated higher results than the TEOM regional levels:

- Scotstoun - 5th, 6th, 12th, 13th, 14th and 18th July;
- Clufflat Brae - 13th, 14th, 15th and 22nd July; and
- Inchgarvie - 13th and 14th July.

3.1.4. The weather throughout most of July was warm and dry which has caused dustier conditions on site. FCBC has provided mitigation throughout this time with dampening the haul roads and access tracks. The resurfacing of the access track through Echline to the south abutment was completed at the end of July in order to control dust emissions in this area.

3.2. Total Suspended Particles

3.2.1. The TSP results for July 2016 have been presented in a monthly chart; this can be found in Appendix B. The TSP levels at monitoring locations during July were all within the threshold. The TSP pattern at locations across the site was similar to that observed for PM₁₀ levels. As with PM₁₀ it is considered that the TSP levels across site were generally influenced by regional changes in TSP levels, with the exception of results corresponding with the higher peaks noted in 3.1.1 and 3.1.3 above.

3.2.2. The results for Inchgarvie have been excluded from the chart in Appendix B as erroneous results on these days (see 3.1.1).

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for July 2016 have been presented in a chart and can be found in Appendix C. Two collections were made in July; these occurred on the 6th and 20nd July 2016.



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- 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 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 July there was one exceedance of the action level at Scotstoun Park for the fortnight concluding 6 July. There were three exceedances of the review level, at Whinnyhill and Newton for the fortnight concluding 6th July and at Scotstoun Park for the fortnight concluding 20th July. With regards to the review level at Whinnyhill, the closest works being undertaken were approx. 90 metres away. However, due to the elevated height of the residential area it is considered unlikely that the construction works caused the exceedance. The light scatter meter at this location indicated mostly low levels of PM₁₀ and TSP during this fortnight. FCBC will continue to monitor the area as works on the carriageway progress at this location. The exceedance at Newton was caused by the Frisbee container being found away from the Frisbee during collection, leading to likely contamination of the sample. The closest FCBC work is approx. 1.75 kilometres away. With regards to the exceedance at Scotstoun Park, the light scatter meter at this location indicated a number of peaks in levels of PM₁₀ and TSP during this fortnight. The temporary Frisbee at Scotstoun Arups, which is located closer to the FCBC works, indicates a significantly lower result than for the permanent Frisbee during this period. This suggests that the higher results obtained recently at the permanent monitoring location are not entirely due to FCBC activities. As noted in previous reports, other construction work (not project related) is ongoing in the Scotstoun area. However, FCBC will continue to monitor Forth Replacement Crossing construction 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 July 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.

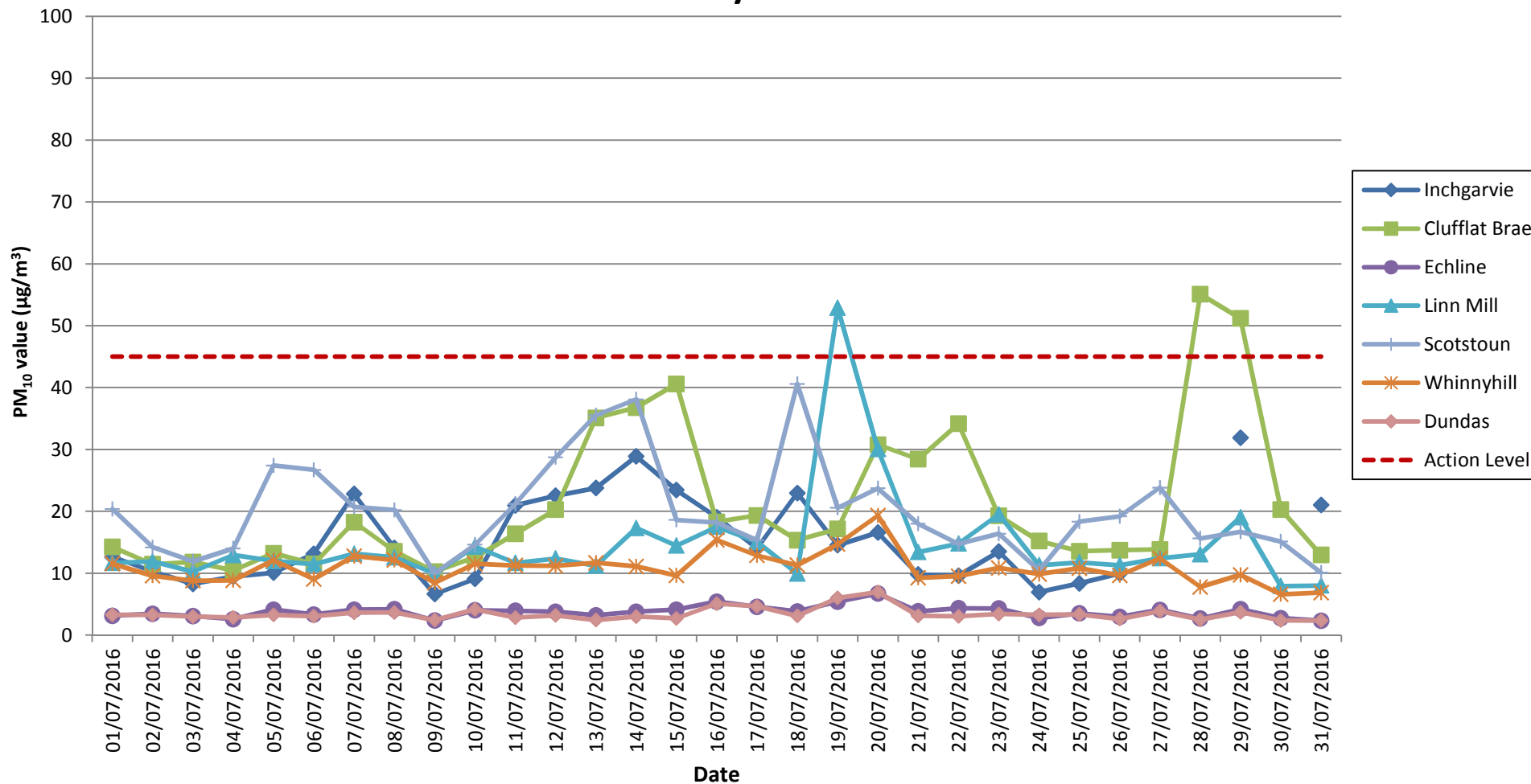
- 3.4.3.** As noted in 3.1.1, on the 27th–29th July there were 15 minute exceedances at Clufflat and Inchgarvie which were investigated by the environmental team. However no dust was visible during site inspections. Site teams were requested to continue dust suppression when necessary.



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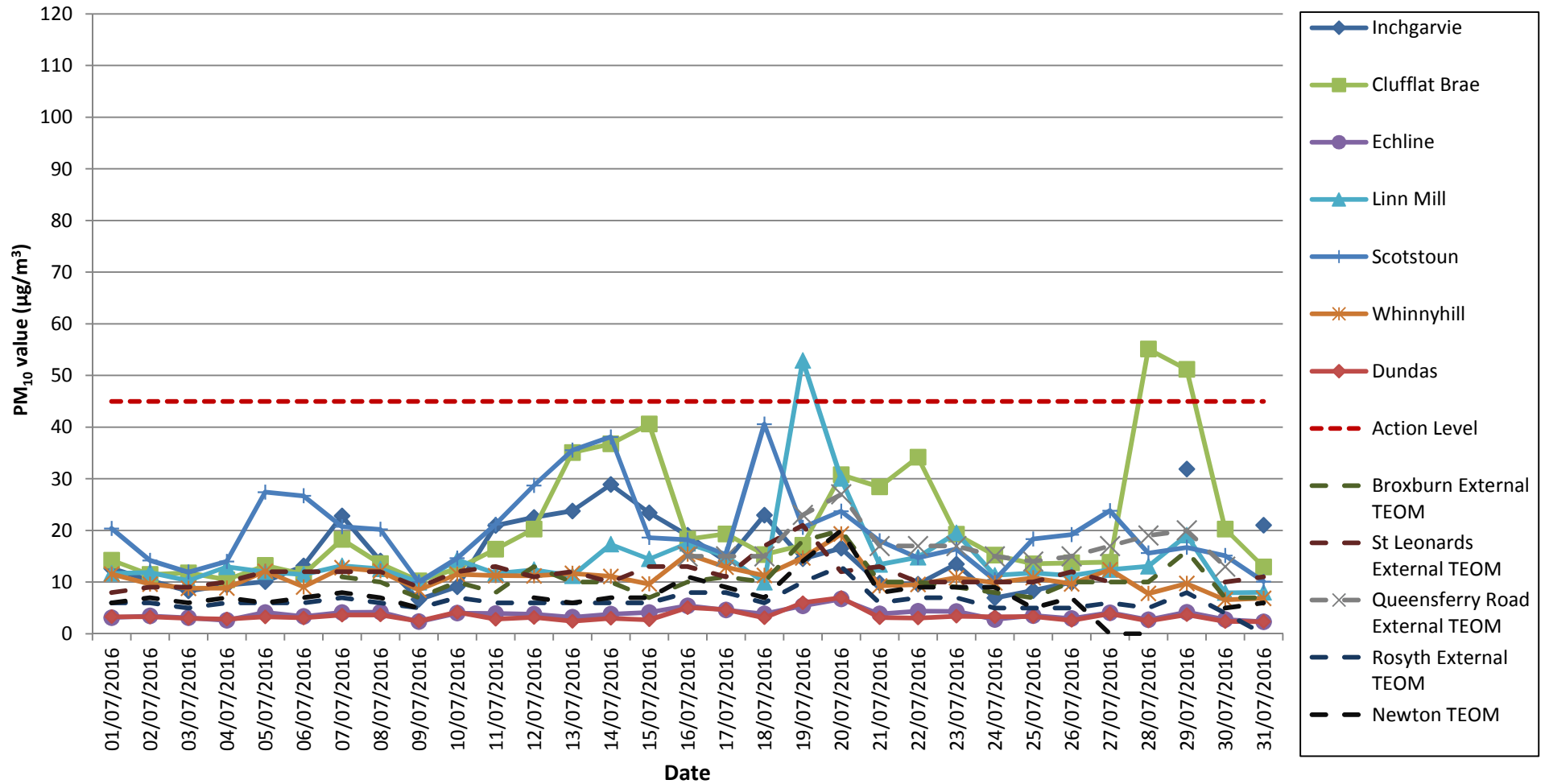
APPENDIX A: LIGHT SCATTER METER RESULTS

Air Quality Monitoring Particulate Matter (PM10) Results for all Monitoring Locations July 2016



Note: Data missing from Inchgarvie on 27th, 28th and 30th due to erroneous results (see 3.1.2 of report)

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



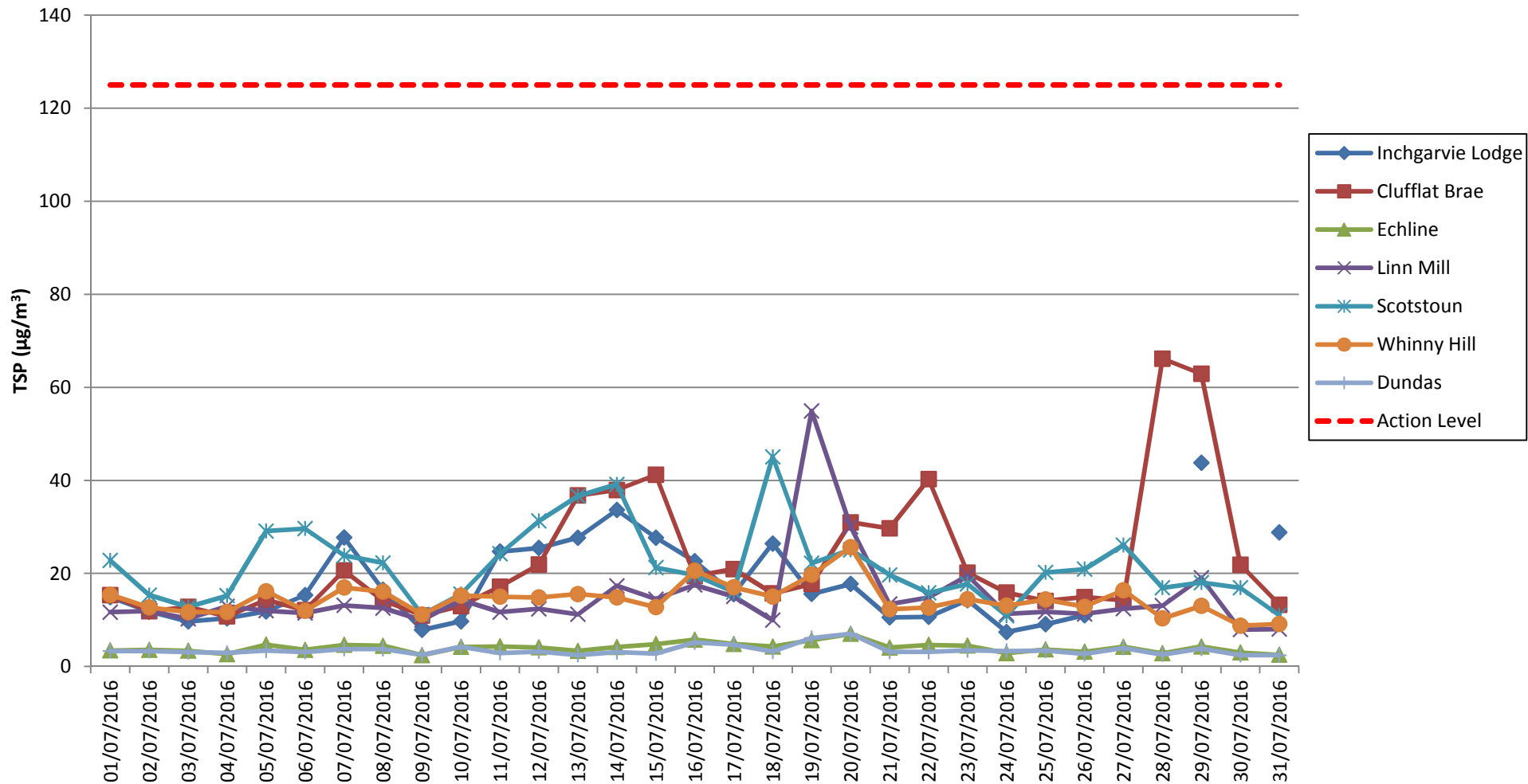
Note: Data missing from Inchgarvie on 27th, 28th and 30th due to erroneous results (see 3.1.2 of report)



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APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results July 2016



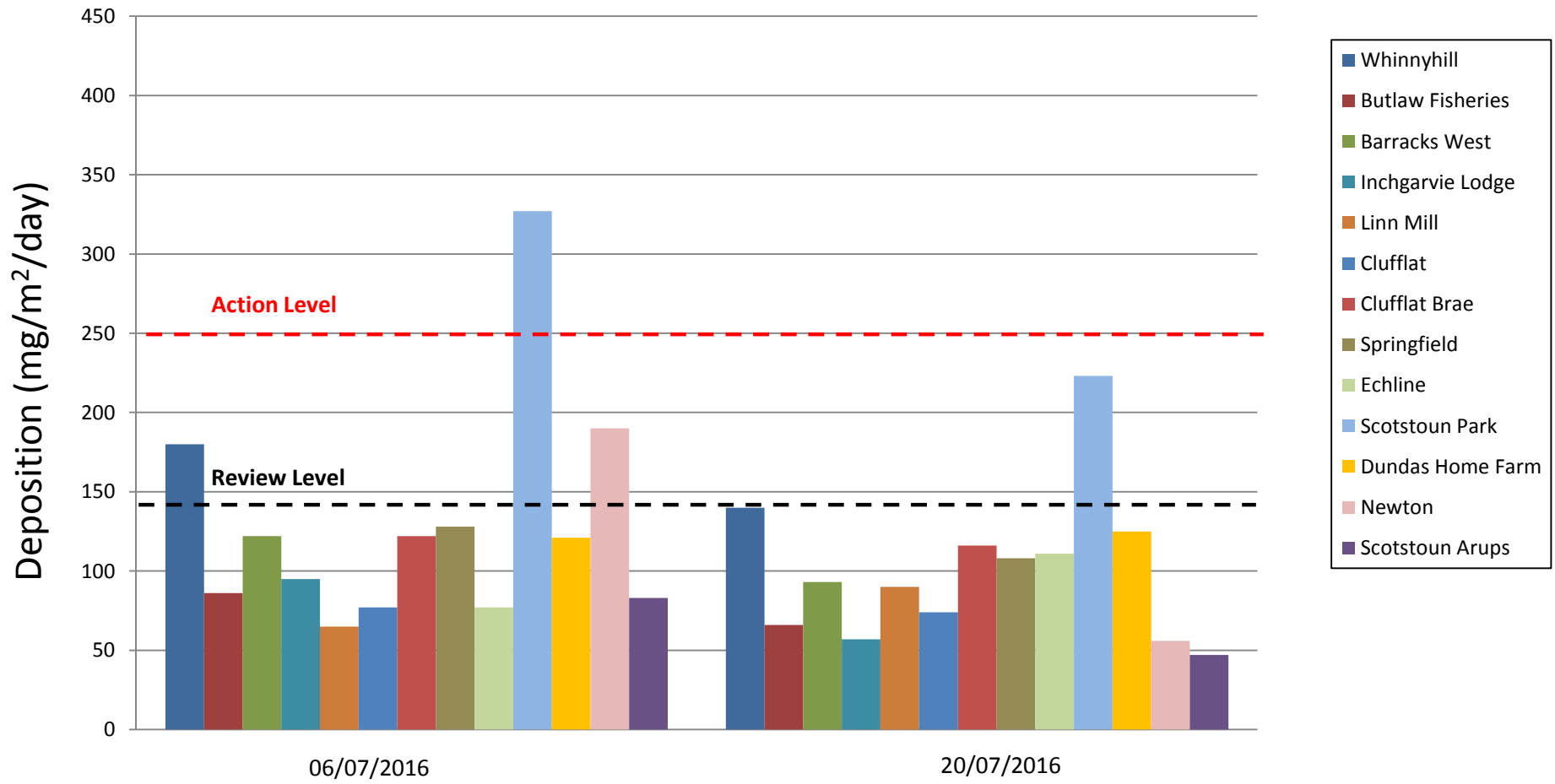
Note: Data missing from Inchgarvie on 27th, 28th and 30th due to erroneous results (see 3.1.2 of report)



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APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: July 2016





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APPENDIX D: DAILY DUST LOG

Daily Dust Log - North - June 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/07/2016	N	LIGHT	SE	DAMP	N			
02/07/2016	N							
03/07/2016	N							
04/07/2016	N	LIGHT	E	DAMP	N			
05/07/2016	N	LIGHT	S	DAMP	N			
06/07/2016	N	LIGHT	SE	DAMP	N			
07/07/2016	N	LIGHT	E	DRY	N			
08/07/2016	N	LIGHT	SE	DRY	N			
09/07/2016	N							
10/07/2016	N							
11/07/2016	N	LIGHT	SE	DAMP	N			
12/07/2016	N	LIGHT	NE	DRY	N			
13/07/2016	N	LIGHT	SW	DRY	N			
14/07/2016	N	LIGHT	SW	DRY	N			
15/07/2016	N	LIGHT	SW	DAMP	N			
16/07/2016	N							
17/07/2016	N							
18/07/2016	N	LIGHT	SW	DRY	N			
19/07/2016	N	LIGHT	SE	DRY	N			
20/07/2016	N	LIGHT	SE	WET	N			
21/07/2016	N	LIGHT	S	DRY	N			
22/07/2016	N	LIGHT	S	DAMP	N			
23/07/2016	N							
24/07/2016	N							
25/07/2016	N	LIGHT	SW	DRY	N			
26/07/2016	N	LIGHT	SW	DRY	N			
27/07/2016	N	LIGHT	S	DRY				
28/07/2016	N	LIGHT	S	DRY	N			
29/07/2016	N	LIGHT	E	DRY	N			
30/07/2016	N							
31/07/2016	N							

Daily Dust Log -South - June 2016

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/07/2016	S	LIGHT	SE	DAMP	N			
02/07/2016	S							
03/07/2016	S							
04/07/2016	S	LIGHT	S	DAMP	N			
05/07/2016	S	LIGHT	S	DAMP	N			
06/07/2016	S	LIGHT	E	DAMP	N			
07/07/2016	S	LIGHT	E	DRY	N			
08/07/2016	S	LIGHT	S	DRY	N			
09/07/2016	S							
10/07/2016	S							
11/07/2016	S	LIGHT	SE	DAMP	N			
12/07/2016	S	LIGHT	S	DRY	N			
13/07/2016	S	LIGHT	S	DRY	N			
14/07/2016	S	LIGHT	SE	DRY	N			
15/07/2016	S	LIGHT	E	DAMP	N			
16/07/2016	S							
17/07/2016	S							
18/07/2016	S	LIGHT	S	DRY	N			
19/07/2016	S	LIGHT	SW	DRY	N			
20/07/2016	S	LIGHT	S	WET	N			
21/07/2016	S	LIGHT	SE	DRY	N			
22/07/2016	S	LIGHT	SE	DAMP	N			
23/07/2016	S							
24/07/2016	S							
25/07/2016	S	LIGHT	SE	DRY	N			
26/07/2016	S	LIGHT	N	DRY	N			
27/07/2016	S	LIGHT	S	DRY				15 Minute exceedances at Inchgarvie
28/07/2016	S	LIGHT	S	DRY	N			15 Minute exceedances at Inchgarvie and Clufflat , no dust visible on site inspections.
29/07/2016	S	LIGHT	SE	DRY	N			15 Minute exceedances at Clufflat , no dust visible on site inspections.
30/07/2016	S							
31/07/2016	S							