



Contractor



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Project **FORTH REPLACEMENT CROSSING**

Document title

**AIR QUALITY MONITORING REPORT
OCTOBER 2015**

00	10/11/2015	First revision	SWR	MRN	MRN
Rev	Rev. Date	Purpose of revision	Made	Checked	Reviewed

Document status

FOR REVIEW

Made by Steven Westwater	Checked By: Michael Richardson
Initials: SWR	Initials: MRN

Document number	Rev
REP-00255	00

This document is intellectual property of FCBC Construction JV. Copying, distribution, usage, and information on contents of this are forbidden unless explicitly authorized.



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

Distribution

Name	Email Address	Copy Sent (Y/N)
Michael Martin	Michael.martin@fbcjv.co.uk	

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 2015.

- 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 (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.

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 (these are adjacent to the light scatter meters at these monitoring locations), have previously recorded weather data including; temperature, relative humidity, wind speed and wind direction. However, in recent months the weather data collection has been problematic with missing data and erroneous results. FCBC has therefore used the weather station located at the Marine Yard at Rosyth to provide this data. Unfortunately, this weather station is now experiencing technical problems and will be replaced. As an interim measure during October, wind speed and direction for the Forth area has been sourced from available data on the internet.

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.



Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction



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"> • Earthworks/Fill Placement • Works at railway bridge at Ferrytoll • Reinforced earth wall at Castlandhill Road • Roadworks
		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 foundation work • Central Tower rebar, formwork, concreting works, deck table installation works • South Tower rebar, formwork, concreting works, deck table installation works • South Tower Deck Segment Lifts
M8	Barracks West	Frisbee	31/08/11	<ul style="list-style-type: none"> • Pier S1 rebar, formwork & concrete works • Pier S2 foundation work • Central Tower rebar, formwork, concreting works, deck table installation works • South Tower rebar, formwork, concreting works, deck table installation works • South Tower Deck Segment Lifts
M9	Barracks East	Frisbee	31/08/11	
M10	Inchgarvie Lodge	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch – snagging and bearing installation • Main carriageway earthworks • Pier S1 rebar, formwork & concrete works • Pier S2 formwork and concrete works • South Tower rebar, formwork, concreting works, deck table installation works. • South Tower Deck Segment Lifts
		Automatic light scatter meter	17/10/11	
M11	Linn Mill	Frisbee	22/08/11	<ul style="list-style-type: none"> • Launch – snagging and bearing installation • Main carriageway earthworks • South Tower Deck Segment Lifts
		Automatic light scatter meter	06/12/11	
M12	Clufflat	Frisbee	29/08/11	<ul style="list-style-type: none"> • Launch – snagging and bearing

M13	Clufflat Brae	Frisbee	21/09/11	<ul style="list-style-type: none"> installation Main carriageway earthworks
		Automatic light scatter meter	24/10/11	
M14	Springfield	Frisbee	15/08/11	<ul style="list-style-type: none"> Launch – snagging and bearing installation Main carriageway earthworks
M15	Echline	Frisbee	16/08/11	<ul style="list-style-type: none"> Launch – snagging and bearing installation 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 B800 Bridge demolition
		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 B800 Bridge demolition
		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 October 2015 have been presented in a monthly chart; this can be found in Appendix A. Results show that the PM₁₀ levels were mostly below threshold levels throughout the month with the exception of four exceedances. One exceedance occurred on the 5th October at Linn Mill. Two exceedances occurred at Scotstoun and Clufflat on the 22nd October. Another exceedance occurred on the 25th October at Scotstoun. With regards to the exceedance on the 5th at Linn Mill, as this corresponds to wet ground conditions and all monitors showed an increase on this day it is concluded that the exceedance was caused by regional changes in air quality rather than being driven

by construction related activities. The exceedances on the 22nd at Clufflat and Scotstoun correspond with dry weather. However, as all monitors show an increase on this day it is concluded that these exceedances also were caused by air quality in the region rather than construction work. The exceedance at Scotstoun on the 25th October corresponds to dry weather conditions and is likely to have been caused by the B800 bridge demolition work that took place on this day (see 3.1.3).

- 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 October 2012. The comparison between the light scatter and TEOM results demonstrates that both sets of results generally follow the same pattern, indicating that the pattern observed throughout October was largely driven by regional changes in air quality, with the exception of the exceedance for Scotstoun on the 25th October as noted in 3.1.1.
- 3.1.3.** During October, site operations continued around the B800 north of the bridge over the A90. These works currently extend up to the fence line where the Scotstoun PM₁₀ monitor is located. These works include landscaping, surfacing and earthworks in the vicinity of the monitor. The demolition of the B800 bridge was also a major activity with the first section being demolished over the weekend of 24th/25th October. This means that the monitor is essentially on-site and that operations are now closer to some receptors. However, with the exception of the exceedances noted in 3.1.1, the Scotstoun PM₁₀ results throughout the month of October are under the threshold. It is noted that on the 8th and 12th October, the PM₁₀ levels were elevated compared to the other monitors. FCBC will continue to monitor this area closely over the next

few months as works in this area progress, and provide mitigation as necessary.

3.2. Total Suspended Particles

3.2.1. The TSP results for October 2015 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 generally low and all within the threshold. All locations across the site were mostly found to follow a similar pattern (similar to that observed for PM₁₀ levels). As with PM₁₀ it is considered that, in general, the TSP levels across site were influenced by regional changes in TSP levels, with the exception of the increases corresponding to the higher PM₁₀ levels noted at Scotstoun on the 8th, 12th and 25th October.

3.3. Frisbee Dust Deposition Results

3.3.1. The Frisbee dust deposition results for October 2015 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 to cover the results for October; these occurred on the 7th and 21st October 2015.

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 October there was one exceedance of the review level at Dundas for the fortnight concluding 7th October. The Dundas light scatter meter registered levels well below the action levels for both TSP and PM₁₀ during the period. The main carriageway works being undertaken during this period potentially gave rise to dust although dusty conditions were not observed during site visits or reported. The ground conditions for the period were mostly dry. Therefore, it is possible that construction activities contributed to the dust deposition result. FCBC will continue to monitor this area and provide mitigation as necessary.

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. There is no information for wind speed and direction in the month of October due to a continuing problem which is currently being dealt with (see section 2.3). Interim data from the internet has been used. 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 carried out.



Forth Crossing Bridge Constructors

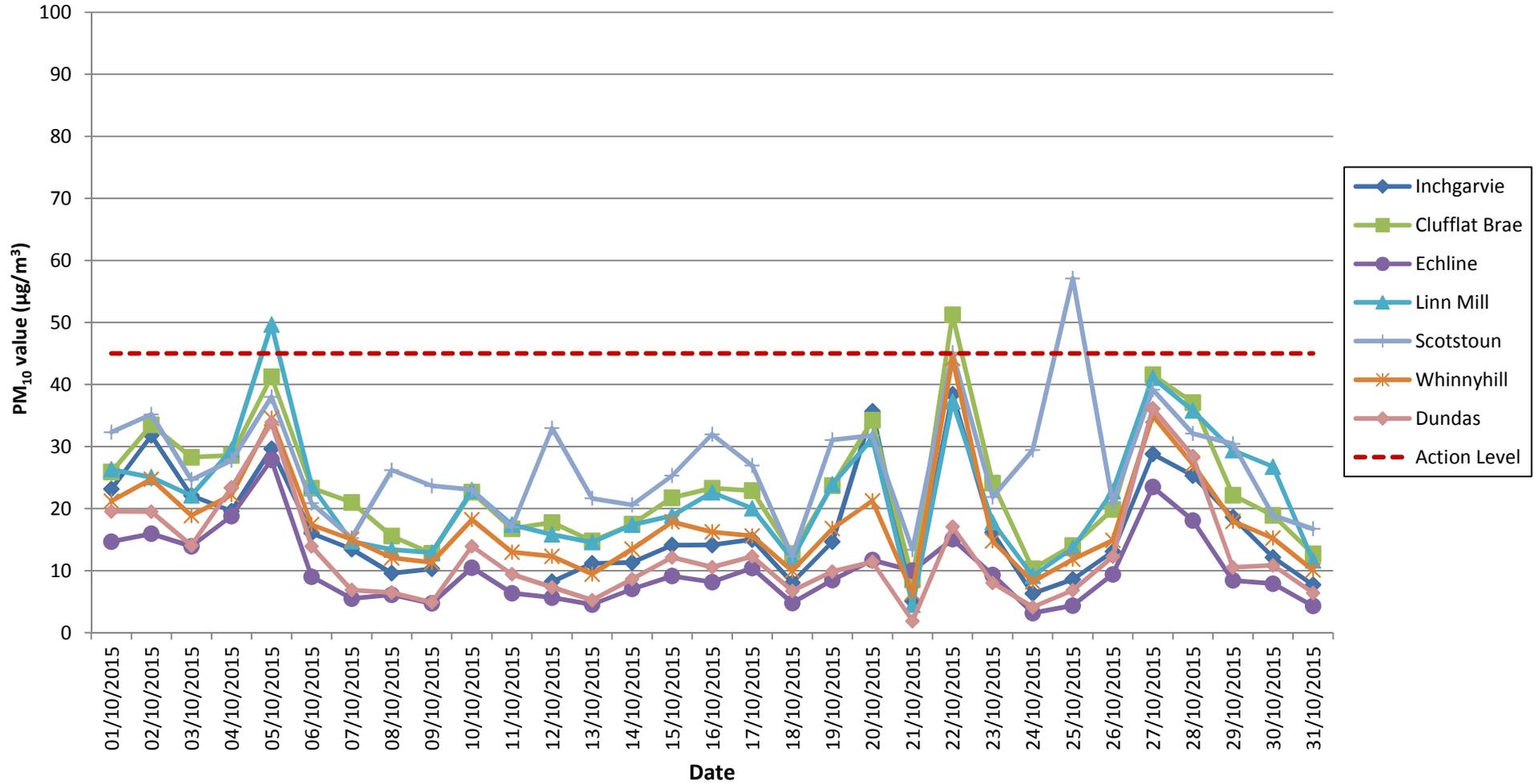
HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

APPENDIX A: LIGHT SCATTER METER RESULTS

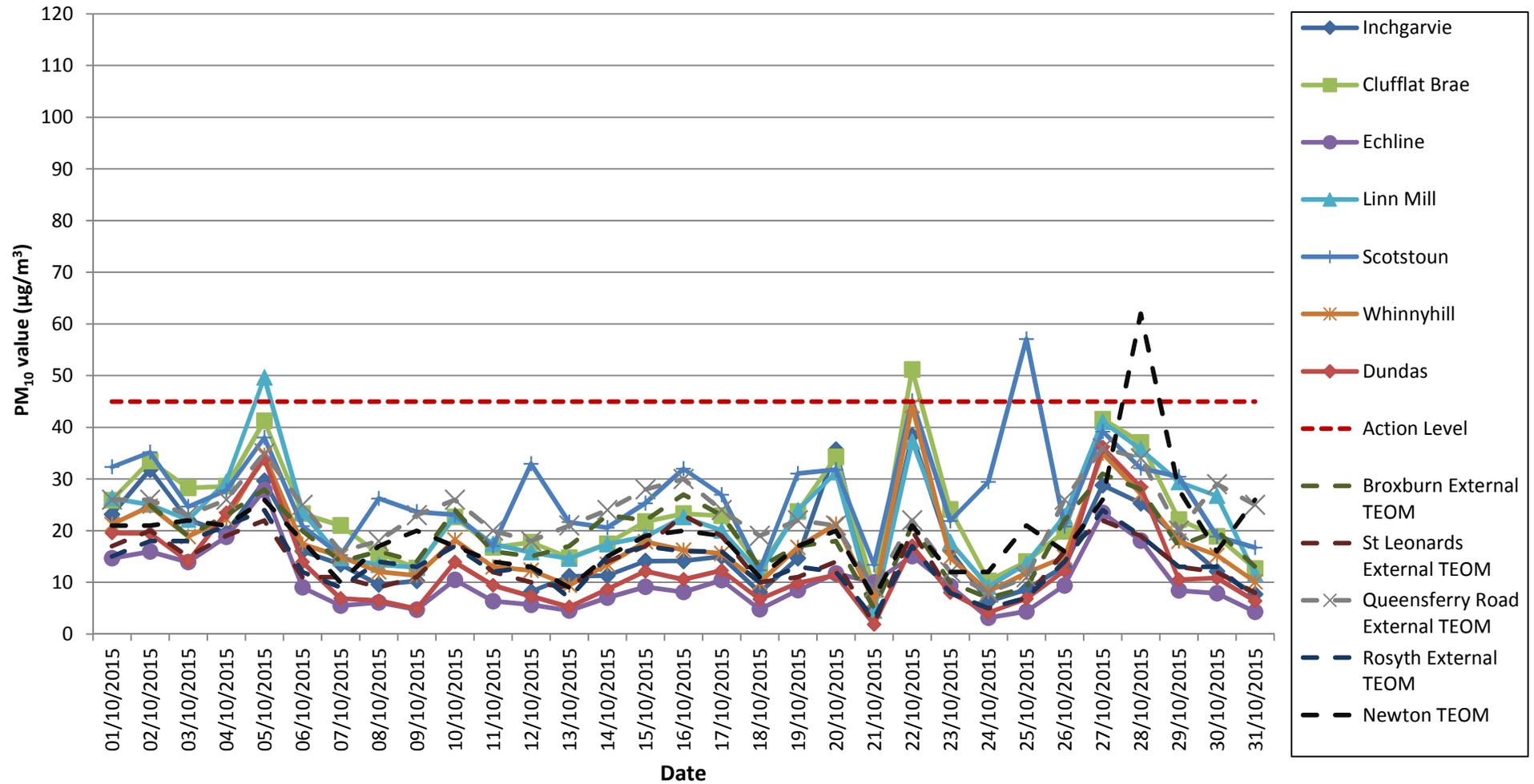
Air Quality Monitoring

Particulate Matter (PM10) Results for all Monitoring Locations

October 2015



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



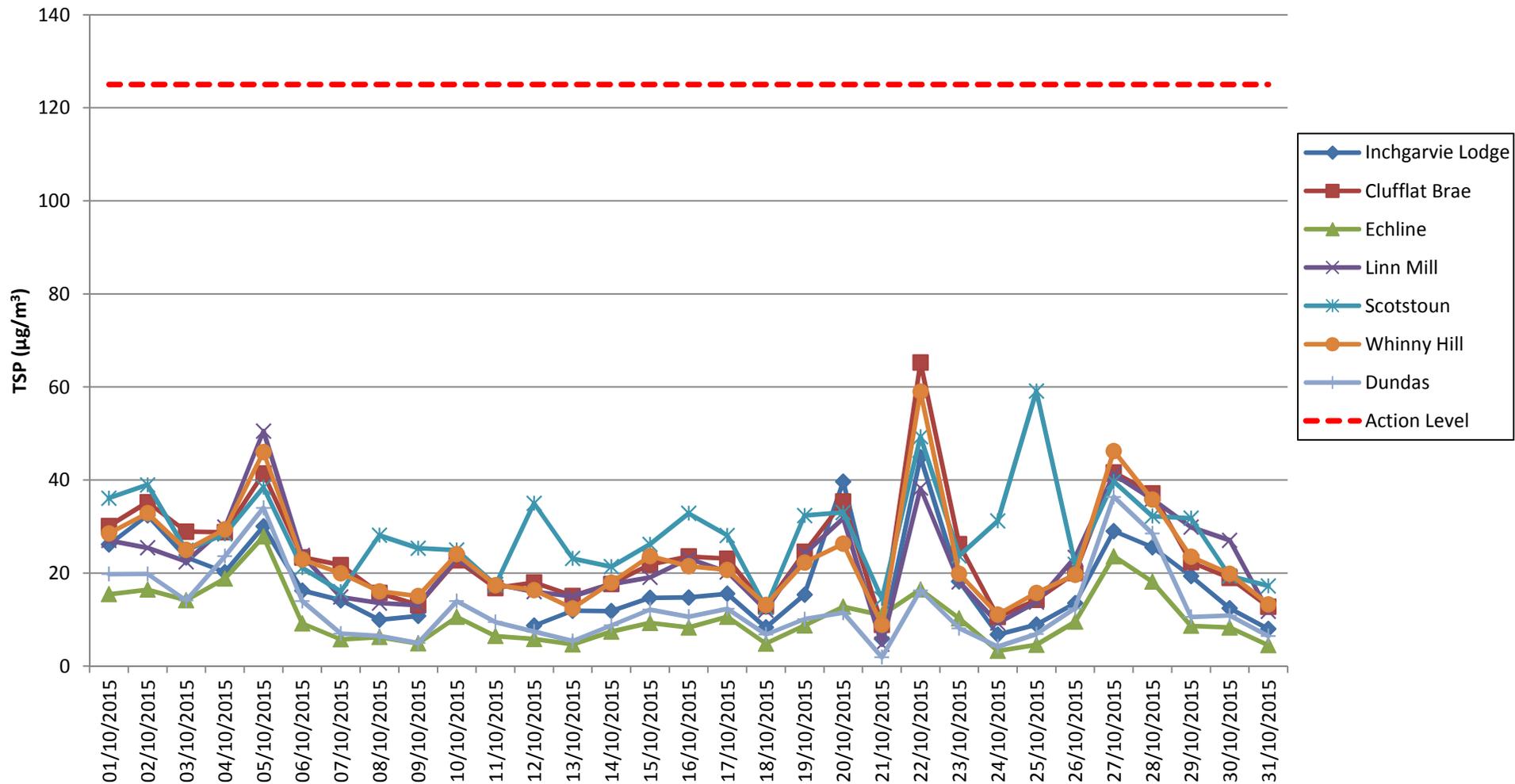


Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

APPENDIX B: TOTAL SUSPENDED PARTICLES

Total Suspended Particles (TSP) Results October 2015



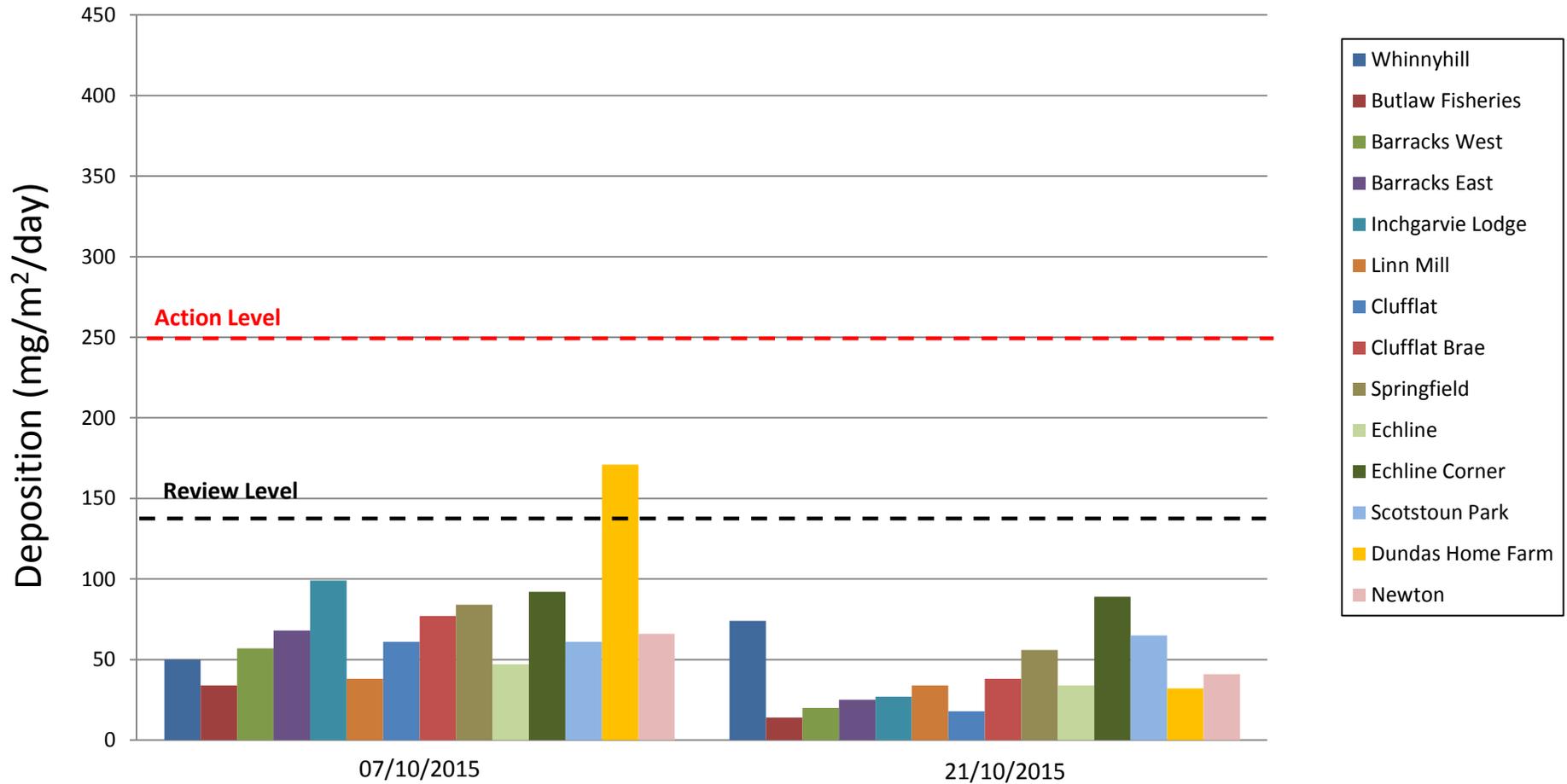


Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

APPENDIX C: FRISBEE GAUGE RESULTS

Frisbee Dust Deposition Results: October 2015





Forth Crossing Bridge Constructors

HOCHTIEF Solutions
American Bridge International
DRAGADOS
Morrison Construction

APPENDIX D: DAILY DUST LOG

Daily Dust Log - North -October 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/10/2015	N	LIGHT	S	DRY	N			FOG
02/10/2015	N	LIGHT	S	DRY	N			FOG.
03/10/2015	N	LIGHT	S	DRY				
04/10/2015	N	MEDIUM	NE	DRY				
05/10/2015	N	LIGHT	NE	WET	N			
06/10/2015	N	LIGHT	SE	WET	N			
07/10/2015	N	LIGHT	SW	WET	N			
08/10/2015	N	MEDIUM	S	DRY	N			
09/10/2015	N	LIGHT	S	WET	N			
10/10/2015	N	LIGHT	SE	DRY				
11/10/2015	N	LIGHT	S	DRY				
12/10/2015	N	LIGHT	S	WET	N			
13/10/2015	N	LIGHT	SE	DRY	N			
14/10/2015	N	LIGHT	S	DRY	N			
15/10/2015	N	LIGHT	SE	DRY	N			
16/10/2015	N	LIGHT	SE	DRY	N			
17/10/2015	N	LIGHT	SE	DRY				
18/10/2015	N	MEDIUM	S	DRY				
19/10/2015	N	LIGHT	S	DRY	N			
20/10/2015	N	LIGHT	SE	WET	N			
21/10/2015	N	MEDIUM	SE	DRY	N			
22/10/2015	N	MEDIUM	SE	DRY	N			
23/10/2015	N	MEDIUM	SE	DRY	N			
24/10/2015	N	MEDIUM	NE	DAMP				
25/10/2015	N	LIGHT	SE	DRY				
26/10/2015	N	LIGHT	NE	DRY	N			
27/10/2015	N	LIGHT	SE	DRY	N			
28/10/2015	N	LIGHT	SW	DAMP	N			
29/10/2015	N	LIGHT	SW	DAMP	N			
30/10/2015	N	LIGHT	NW	WET	N			
31/10/2015	N	MEDIUM	SW	DAMP				

Daily Dust Log - South -October 2015

DATE	LOCATION	WIND	WIND DIRECTION	GROUND SURFACE	VISIBLE DUST	DUST DUE TO WORKS (if applicable)	CAUSES OF DUST (if applicable)	COMMENTS AND ACTIONS
01/10/2015	S	LIGHT	S	DRY	N			FOG
02/10/2015	S	LIGHT	S	DRY	N			FOG. Clufflat and inchgarvie showed higher readings. Visisted site and there was no dust visable
03/10/2015	S	LIGHT	S	DRY				
04/10/2015	S	MEDIUM	NE	DRY				
05/10/2015	S	LIGHT	NE	WET	N			
06/10/2015	S	LIGHT	SE	WET	N			
07/10/2015	S	LIGHT	SW	WET	N			
08/10/2015	S	MEDIUM	S	DRY	N			
09/10/2015	S	LIGHT	S	WET	N			
10/10/2015	S	LIGHT	SE	DRY				
11/10/2015	S	LIGHT	S	DRY				
12/10/2015	S	LIGHT	S	WET	N			
13/10/2015	S	LIGHT	SE	DRY	N			
14/10/2015	S	LIGHT	S	DRY	N			
15/10/2015	S	LIGHT	SE	DRY	N			
16/10/2015	S	LIGHT	SE	DRY	N			
17/10/2015	S	LIGHT	SE	DRY				
18/10/2015	S	MEDIUM	S	DRY				
19/10/2015	S	LIGHT	S	DRY	N			
20/10/2015	S	LIGHT	SE	WET	N			
21/10/2015	S	MEDIUM	SE	DRY	N			
22/10/2015	S	MEDIUM	SE	DRY	N			
23/10/2015	S	MEDIUM	SE	DRY	N			
24/10/2015	S	MEDIUM	NE	DAMP				
25/10/2015	S	LIGHT	SE	DRY				
26/10/2015	S	LIGHT	NE	DRY	N			
27/10/2015	S	LIGHT	SE	DRY	N			
28/10/2015	S	LIGHT	SW	DAMP	N			
29/10/2015	S	LIGHT	SW	DAMP	N			
30/10/2015	S	LIGHT	NW	WET	N			
31/10/2015	S	MEDIUM	SW	DAMP				