

# APPENDIX G

## DUST SURVEY

May 23, 2008

0601660103-LTR-R0003-00

Ms. Tracey Braun, M.Sc.  
Director, Environmental Assessment and Licensing  
Manitoba Conservation  
Suite 160, 123 Main Street  
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Dear Ms. Tracey Braun

**Subject    Dust Survey Program, Old Tailings Management Area  
             Cabot Specialty Fluids - Bernic Lake Cesium Products Facility  
             Manitoba Environment Act License No. 973**

Cabot Corporation (Cabot) operates their Cesium Products Facility (CPF) at Bernic Lake (Figure 1) under *Environment Act* License No. 973. As a condition of continuing approvals for the stockpiling of CPF residue in the Old TMA, Manitoba Conservation, in their letter of operating approval dated June 30, 2004, requested that a dust survey be conducted to determine if the residue stockpile is a source of dust when covered with the feldspar waste rock cap. Dust surveys could not be conducted in 2004, 2005, or 2006 because the feldspar cap was not completed until the onset of winter and fresh residue placement was initiated in each following spring so that the residue was never in a fully capped condition, at a time of year when dust could potentially be generated, so that useful data could be collected to fully address the question.

Given that this situation was expected to continue for the next several years, Cabot decided to conduct a dust survey in autumn 2007, even though the residue pile had not been completely capped with feldspar waste, in order to screen for potential issues of concern. Wardrop Engineering Inc. (Wardrop) was retained to conduct the dust survey and the results are presented in this report.

## **BACKGROUND**

Cabot's Cesium Products Facility (CPF) at Bernic Lake was developed as a substantially closed system, with the tailings slurry from the CPF process discharged to one of two double-lined containment cells (CPF Containment Cells 1 and 2; Figure 1). The tailings solids settle out in the containment cell, and the decant is returned to the CPF for reuse in the process. The containment cells are used alternately. When one cell is full, the discharge is transferred to the second cell while the residue in the first cell is dewatered, removed, and dry-stacked in the Old TMA.

The residue placement has raised the elevation of the residue pile above the crest of the surrounding dikes. This situation may be a concern in conventional tailings

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management areas, potentially exposing the tailings to erosion by wind. However, due to its high gypsum content (approximately 50%) and content of mechanically encapsulated water (about 25%), the CPF residue is not inherently prone to wind disturbance. As an additional precaution against wind erosion, the stockpiled residue is covered with granular feldspar cap. The feldspar cap further supports the expectation that wind erosion of the residue is not expected to occur.

Wardrop conducted the required dust survey monitoring program in the fall of 2007; after the 2007 residue placement from emptying Cell No. 2, and while approximately 50% of the stockpiled residue in the TMA was capped with feldspar.

## **METHODS**

The dust survey monitoring program consisted of gathering meteorological data, collecting airborne material samples (PM<sub>2.5</sub>) at upwind and downwind locations for analytical laboratory testing, and in-office data analysis. At the time of the dust survey, the feldspar cap covered approximately 50% of the stockpiled residue; hence, approximately 50% of the residue pile was exposed to wind conditions.

A HOBO weather station was installed on an elevated area of the site to record meteorological parameters for the duration of the program (Figure 1). The weather station recorded a full set of measurements every 15 seconds over the period from October 19, 2007 to November 21, 2007 and stored them in a data logger that was regularly downloaded by on-site TANCO personnel. Meteorological parameters included:

- λ Air Temperature (°C)
- λ Relative Humidity (%)
- λ Rainfall (mm)
- λ Wind Speed (m/s) – representing the average speed for each 15 second logging interval.
- λ Gust Speed (m/s) – representing the highest 3 second wind gust recorded during each 15 second logging interval.
- λ Wind Direction (azimuth) – vector components of wind direction were accumulated every 3 seconds for the duration of each 15 second logging interval; an average direction was calculated from the sum of the vector components (wind direction is based on where wind was coming from).

During periods predicted to represent dry and gusty conditions based on the weather forecast and weather conditions on site, 24-hour integrated dust samples were collected at three locations to represent both upwind and downwind residue conditions (Table 1). Sample locations DS-1, DS-2, and DS-3 were each equipped with a PM<sub>2.5</sub> MiniVol™ air sampler (Figure 1). Each air sampler was mounted approximately 1.5 m above grade on a tripod, and collected samples over four selected 24-hour periods, herein referred to as “events”. These events were initiated on the basis of prevailing weather conditions, in an attempt to sample during the highest wind speeds and during a period when at least one sampler was upwind and one sampler downwind of the

residue pile. However, the upwind/downwind pairing was not always maintained throughout the event because of changes in wind direction.

The samplers drew in ambient air at a rate of 5L / min through a sample inlet and 2.5 µm mesh-size pre-filter and a 47 mm x 0.8 µm mixed cellulose ester filter where particulate was deposited. Filter analyses were conducted by ALS Laboratory (ALS) in Winnipeg, Manitoba for total particulates, metals (including cesium and rubidium), and sulphur. A blank filter was submitted with each set of filter samples for QA/QC purposes.

## RESULTS AND DISCUSSION

Continuous meteorological data for the period from October 19, 2007 to November 21, 2007 are plotted in Figures 2 through 6. Mean meteorological conditions for the period are in Table 2. These data were used to determine which of the 24-hour dust sampling events best represented average or worst-case climate conditions to promote potential wind erosion (i.e., wind direction was measured to differentiate upwind and downwind samples relative to the residue pile). Wind direction varied in the sampling events, and the directional data for each event are displayed on Figure 1 as wind rose diagrams. The objective was to compare PM<sub>2.5</sub> in a downwind sample with PM<sub>2.5</sub> in an upwind sample to determine if there was any net increase in dust concentration in passing over the residue pile. The four events were evaluated with respect to the ability to make this comparison.

Event 1 occurred over a 24-hour period with above average wind speed, but also a significant amount of rainfall (Figure 3, Table 2). Event 2 occurred over a 24-hour period with below average wind speed and a minor amount of rainfall (Figure 4, Table 2). Event 3 occurred over a 24-hour period with above average wind speed and slightly above average rainfall (Figure 5, Table 2). Event 4 occurred over a 24-hour period with above average wind speed and no rainfall (Figure 6, Table 2). Unfortunately, wind direction changes during Event 4 did not yield a clear downwind sampler location (Figure 1). Therefore, Event 3 is the only event that occurred during optimum conditions to promote wind erosion with dust samplers at both upwind and downwind locations.

Analytical results for PM<sub>2.5</sub> and metals from all sample filters are summarized in Table 3. The PM<sub>2.5</sub> concentrations in air were <0.01 mg/m<sup>3</sup> for all trials run for 24 hours. However, in the one sample run for only 4 hours, the resultant concentration was 0.02 mg/m<sup>3</sup> because the same below detection particulate concentration was divided by a smaller volume of air sampled. Therefore, PM<sub>2.5</sub> production from the Old TMA was consistently below analytical detection (Table 4). There was no evidence of a contribution of dust from the residue stockpile, even though the stockpile was only partially covered with the feldspar waste rock cap during the study.

The same finding extends to the individual chemical parameters measured on the sample filters for upwind and downwind samples on Event 3 (Table 3). In the downwind sample, Ba, Ca, Mg and Na occurred at concentrations at or near (i.e., <twice) the respective analytical detection limits with trace levels of Na, Ba, and Cs in the upwind samples and Ca, Mg, Na, Sr, and V occurring in the blank. Concentrations in the downwind sample were never higher than in the upwind sample indicating no incremental contribution from the residue pile.

The blank filters variously contained trace levels of Ba, Ca, Mg, Na, Sr, Sn, and V over the four events, which indicates that the trace levels of these parameters on the sample filters typically can be attributed to handling contamination rather than to airborne sources.

## CONCLUSIONS

In general, the four air sampling trials, and particularly sampling Event 3, indicated that the partially covered residue stockpile is not a source of dust as indicated by PM<sub>2.5</sub>. Therefore, it is expected that the fully capped residue stockpile does not represent a significant source of airborne dust. This finding is consistent with the properties of the residue. No further investigation of the dusting potential of the residue stockpile should be necessary.

Should you have any questions, please contact myself or Mr. Doug Ramsey at (204) 956-0980, or Ms. Susan Appleyard of Cabot at (204) 884-2400, ext. 206.

Sincerely

Reviewed by

WARDROP ENGINEERING INC.

WARDROP ENGINEERING INC.

Patrick Solylo, B.Sc.(Hon.), P.Geo  
Geoenvironmental Scientist

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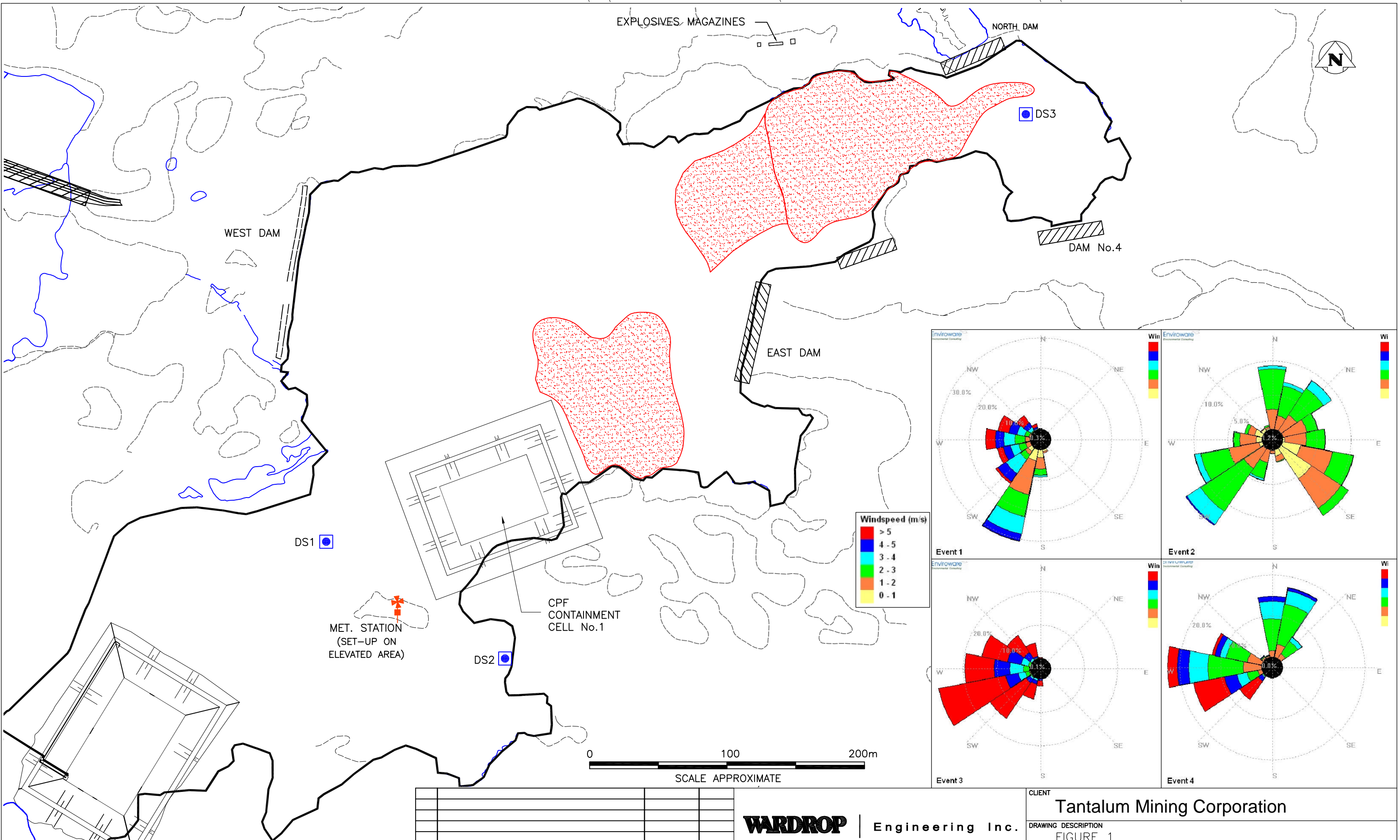
PS/II

Copy: Ms. Susan Appleyard Cabot Corp.

Attachments

## REFERENCES

Wardrop. 2007. Cabot Speciality Fluids, Bernic Lake Cesium Products Facility – CPF Residue Placement Groundwater Monitoring Data, 2006. Report prepared by Wardrop Engineering, Winnipeg, MB, for Cabot Specialty Fluids, Lac du Bonnet, MB.



**LEGEND**

- DUST FILTER COLLECTION STATION
- METEOROLOGICAL STATION
- RESIDUE PLACEMENT AT TIME OF DUST SURVEY

NO.	DESCRIPTION	DATE	BY
<b>REVISIONS/ISSUE</b>			

**WARDROP** | Engineering Inc.

CLIENT  
**Tantalum Mining Corporation**

DRAWING DESCRIPTION  
FIGURE 1  
TANCO MINE – BERNIC LAKE, MANITOBA  
GENERAL SITE PLAN WITH WIND DIRECTION DIAGRAMS

DESIGNED BY: PRS	DRAWN BY: ET	DRAWING NO. 0601660103-SKT-R0007	REV. A1
CHECKED BY:	DATE: 08.04.10		

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Figure 2. Range of temperature, relative humidity (RH), wind and gust speed from October 19, 2007 to November 21, 2007.

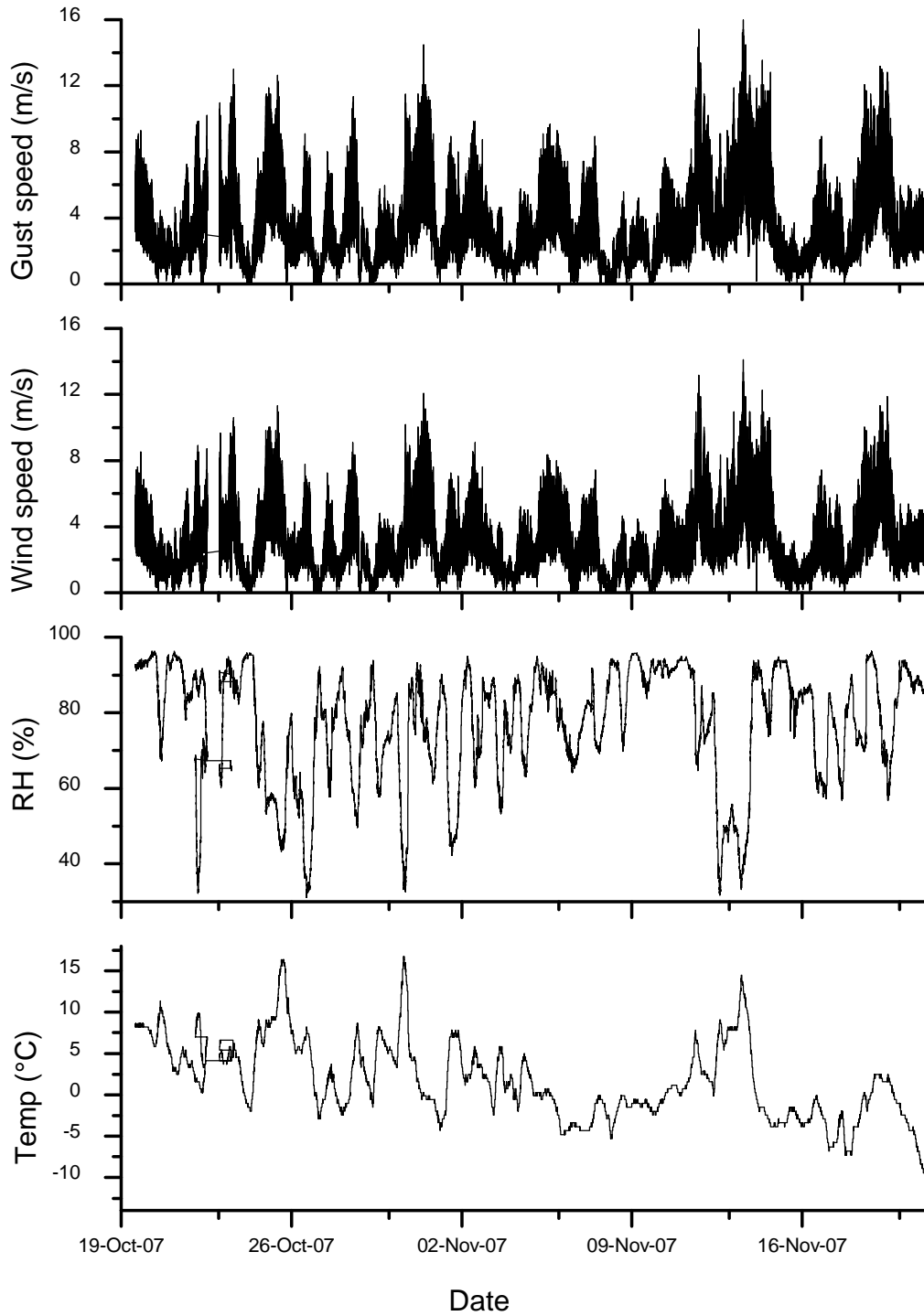


Figure 3. Temperature, relative humidity and wind speed during sampling Event 1.

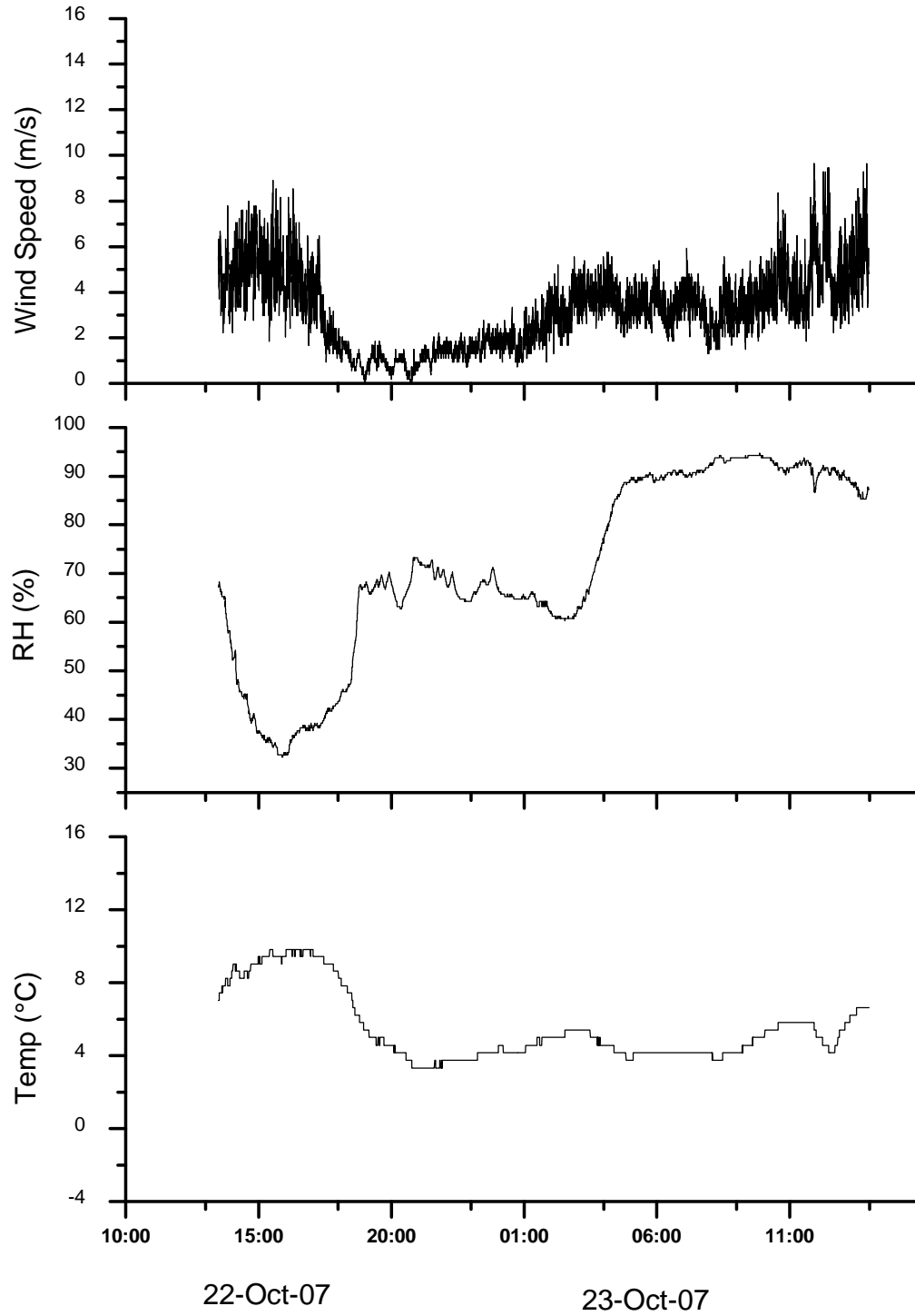




Figure 4. Temperature, relative humidity and wind speed during sampling Event 2.

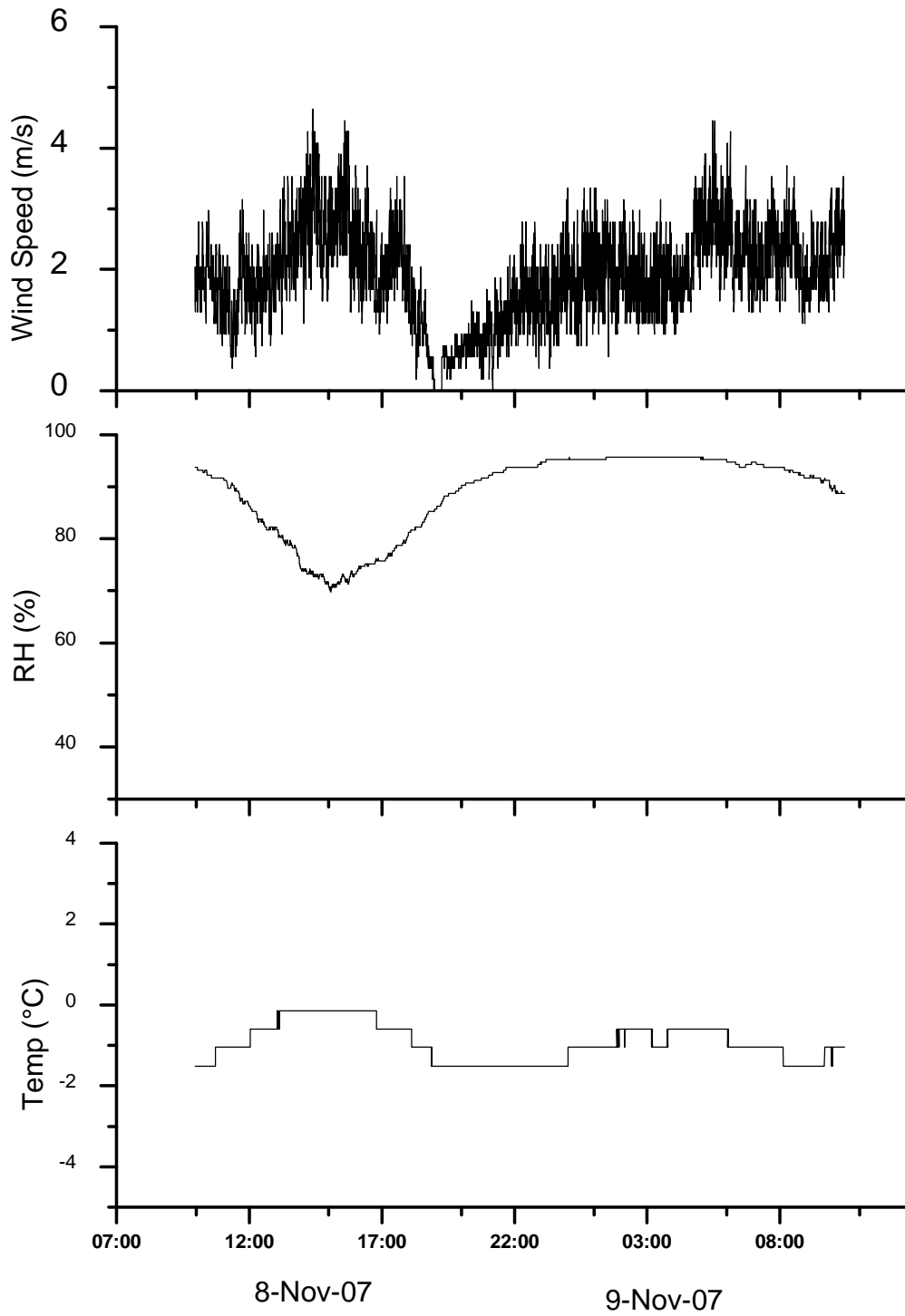


Figure 5. Temperature, relative humidity and wind speed during sampling Event 3.

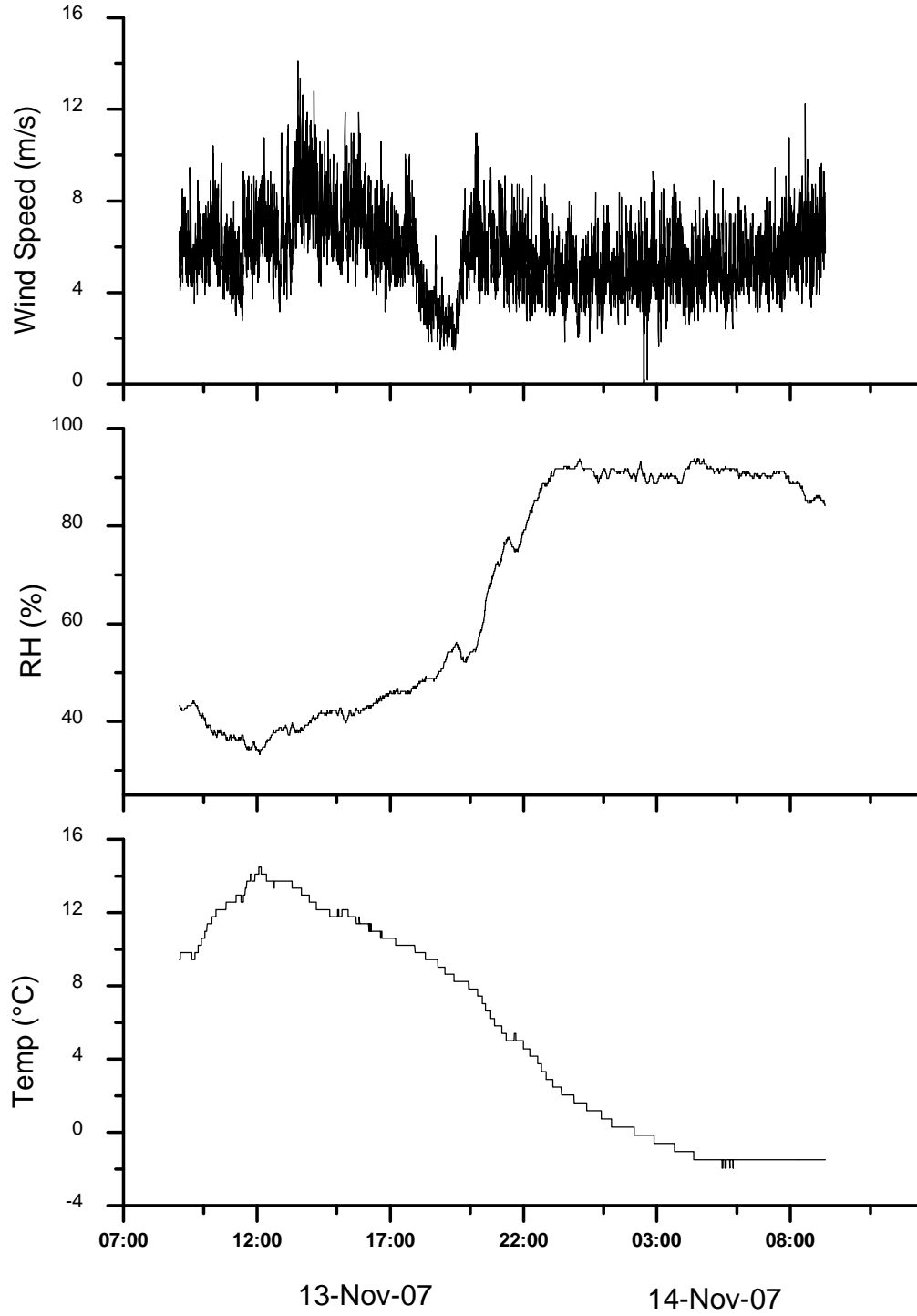
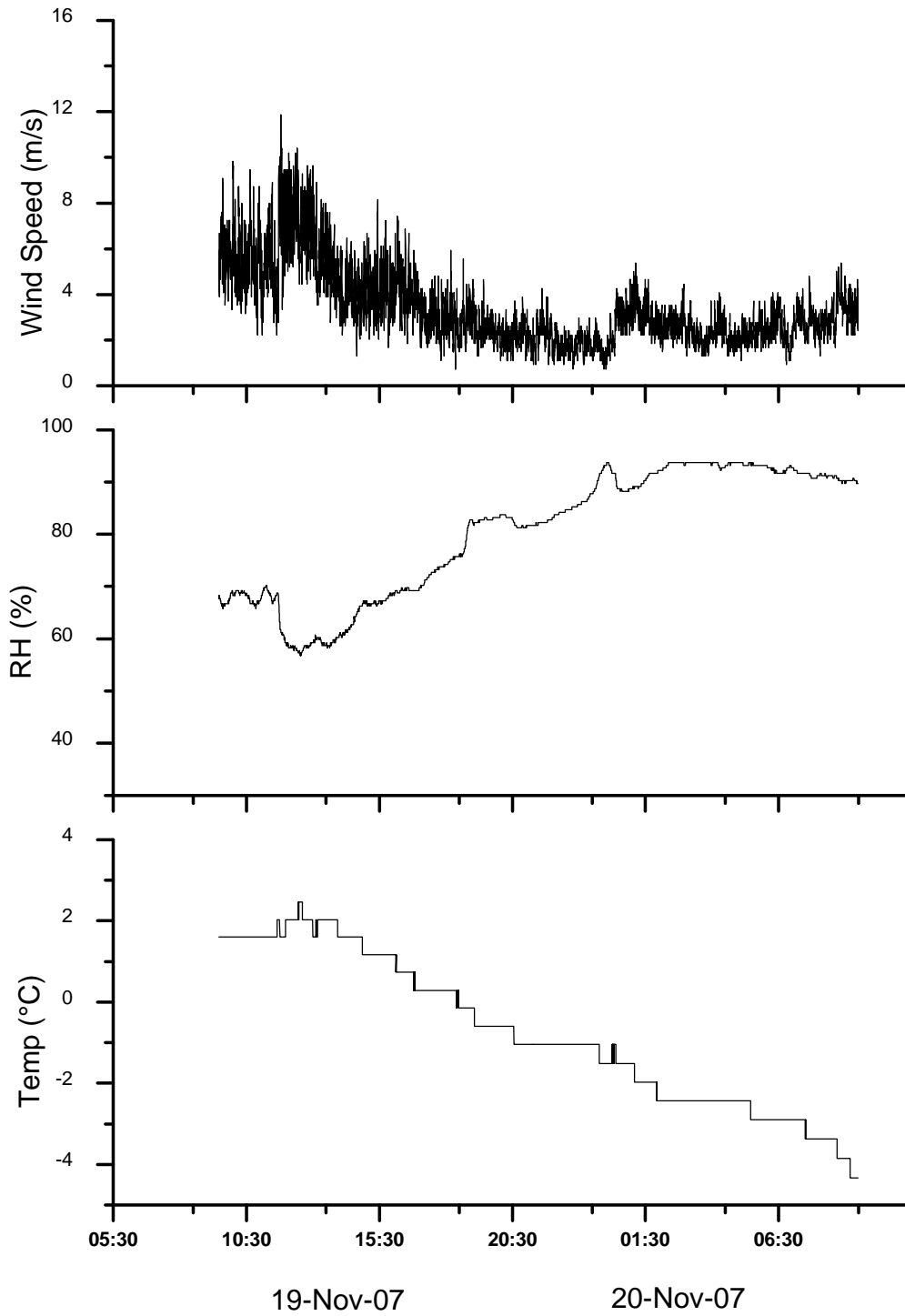


Figure 6. Temperature, relative humidity and wind speed during sampling Event 4.



**Table 1: Details of sampling events.**

Dust Sampler	Event	Filter #	Time Start	Time Stop	Counter Start (hours)	Counter Stop (hours)	Elapsed Time (Hours)
DS # 1	1	TB6607	22/10/2007 13:58	23/10/2007 13:58	not recorded	433.6	24 (est)
DS # 2	1	TB6614	22/10/2007 13:29	23/10/2007 13:29	not recorded	118.5	24 (est)
DS # 3	1	TB6666	22/10/2007 13:41	23/10/2007 13:41	not recorded	4146.5	unknown
Blank	1	TB6610					
DS # 1	2	TB6608	08/11/2007 9:57	09/11/2007 9:57	433.6	457.6	24.0
DS # 2	2	TB6612	08/11/2007 10:04	09/11/2007 10:04	118.5	122.5	4.0
DS # 3	2	TB6613	08/11/2007 10:26	09/11/2007 10:26	4169.8	4193.8	24.0
Blank	2	TB6672					
DS #1	3	TB6674	13/11/2007 9:05	14/11/2007 9:06	457.6	481.7	24.1
DS #2	3	TB6670	13/11/2007 9:13	14/11/2007 9:13	122.5	146.5	24.0
DS #3	3	TB6667	13/11/2007 9:17	14/11/2007 9:18	4193.8	4217.9	24.1
Blank	3	TB6671					
DS #1	4	TB6669	19/11/2007 9:28	20/11/2007 9:19	481.7	505.5	23.8
DS #2	4	TB6668	19/11/2007 9:35	20/11/2007 9:25	146.5	170.4	23.9
DS #3	4	TB6673	19/11/2007 9:39	20/11/2007 9:29	4217.9	4241.7	23.8
Blank	4	TB6611					

*Sampling Event 1 comments:*

- *Sampler at DS#3 shut off on its own at an unknown time during the 24 hr period.*
- *After sampling set 1, we ran a 24 hr non-filtered test run on the sampler at DS3 and it worked without a shut off problem.*

*Sampling Event 2 comments:*

- *Sampler at DS#2 shut off on its own after about 4 hrs into the 24 hr period.*
- *Determined that sampler shut off problems are caused by the battery packs.*
- *From then on, all sample runs were started with freshly charged batteries and the problem was eliminated.*

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**Table 2: Daily and Event average meteorological conditions and total rainfall/day (or rainfall/event).**

Date/Event	Average Daily				Total Rainfall (mm)
	Temp (°C)	RH (%)	Wind Speed (m/s)	Gust Speed (m/s)	
19-Oct-07	8.33	92.85	4.15	4.86	2.0
20-Oct-07	7.73	88.45	2.17	2.50	0.0
21-Oct-07	3.89	89.71	2.02	2.33	0.0
22-Oct-07	4.13	72.29	3.31	3.79	0.0
23-Oct-07	4.53	84.92	3.52	4.10	12.6
24-Oct-07	3.51	80.93	2.27	2.70	0.0
25-Oct-07	11.27	57.10	4.34	5.08	0.0
26-Oct-07	5.49	52.30	2.42	2.80	0.0
27-Oct-07	0.07	78.28	1.83	2.12	0.0
28-Oct-07	2.32	70.59	3.09	3.61	0.0
29-Oct-07	4.21	74.37	1.60	1.86	0.0
30-Oct-07	7.97	67.41	2.86	3.34	0.2
31-Oct-07	0.40	75.99	4.87	5.73	1.0
01-Nov-07	2.82	65.38	2.38	2.84	0.0
02-Nov-07	3.11	80.73	3.59	4.14	0.6
03-Nov-07	1.77	75.10	1.86	2.11	0.0
04-Nov-07	1.72	78.68	1.91	2.19	0.0
05-Nov-07	-0.30	87.30	4.02	4.68	0.2
06-Nov-07	-4.04	72.42	2.59	2.97	0.0
07-Nov-07	-2.39	78.75	2.25	2.65	0.0
08-Nov-07	-1.95	87.74	1.29	1.48	0.2
09-Nov-07	-1.27	91.65	1.62	1.85	0.0
10-Nov-07	0.07	92.19	2.69	3.24	3.2
11-Nov-07	3.05	84.78	4.04	4.75	0.4
12-Nov-07	4.61	59.58	3.54	4.10	0.0
13-Nov-07	9.00	51.64	5.43	6.34	0.8
14-Nov-07	-2.22	87.08	4.70	5.52	0.0
15-Nov-07	-2.74	87.77	1.32	1.50	0.0
16-Nov-07	-2.35	73.14	2.24	2.61	0.0
17-Nov-07	-5.42	74.67	2.07	2.42	0.2
18-Nov-07	-1.80	82.66	3.93	4.71	0.4
19-Nov-07	1.16	75.40	4.68	5.43	0.0
20-Nov-07	-4.77	89.54	2.84	3.19	0.0
21-Nov-07	-11.55	85.48	2.28	2.55	0.0
<b>DAILY AVERAGE</b>	<b>1.57</b>	<b>77.45</b>	<b>2.92</b>	<b>3.40</b>	<b>0.6</b>
Event 1	5.50	71.27	3.16	3.67	8.8
Event 2	-0.95	88.84	1.88	2.15	0.2
Event 3	5.59	66.87	5.70	6.66	0.8
Event 4	-0.74	80.41	3.38	3.89	0.0

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Table 3: Dust filter sampling analytical results.

Sampling Event Sampling Location / Filter ID Upwind or Downwind Parameters	EVENT 1												
	DS #1 / TB6607			DS #2 / TB6614			DS #3 / TB6666			Blank / TB6610			
	Detection Limit (µg)	Upwind		Upwind		Both		Total mass on filter (µg)	Uncertainty (µg) <sup>†</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>***</sup>	Total mass on filter (µg)	Uncertainty (µg) <sup>†</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>***</sup>
		Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> ) <sup>***</sup>	Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> ) <sup>***</sup>	Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> ) <sup>***</sup>						
Total Particulates PM <sub>2.5</sub>	100	<100	--	<0.01	110	79	0.02	100	--	--	<100	--	<0.01
<b>Other Parameters</b>													
Silver (Ag)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	--	<0.5	--	<0.00007
Aluminum (Al)	20	<20	--	<0.003	<20	--	<0.003	<20	--	--	<20	--	<0.003
Arsenic (As)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Barium (Ba)	0.05	<0.05	--	<0.000007	0.08	0.040	0.00001	<0.05	--	--	<0.05	--	<0.000007
Beryllium (Be)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Calcium (Ca)	20	<20	--	<0.003	<20	--	<0.003	30	6.7	--	<20	--	<0.003
Cadmium (Cd)	0.01	<0.01	--	<0.000001	<0.01	--	<0.000001	<0.01	--	--	<0.01	--	<0.000001
Cobalt (Co)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Chromium (Cr)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	--	<0.5	--	<0.00007
Cesium (Cs)	0.05	0.11	Ins. Data	0.000015	0.08	Ins. Data	0.00001	<0.05	--	--	<0.05	--	<0.000007
Copper (Cu)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	--	<0.5	--	<0.00007
Iron (Fe)	50	<50	--	<0.007	<50	--	<0.007	<50	--	--	<50	--	<0.007
Mercury (Hg)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Potassium (K)	20	<20	--	<0.003	<20	--	<0.003	<20	--	--	<20	--	<0.003
Magnesium (Mg)	5	<5	--	<0.0007	<5	--	<0.0007	6	3.6	--	<5	--	<0.0007
Manganese (Mn)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	--	<0.2	--	<0.00003
Molybdenum (Mo)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	--	<0.2	--	<0.00003
Sodium (Na)	20	<20	--	<0.003	20	16	0.003	20	16	--	20	16	0.003
Nickel (Ni)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	--	<0.1	--	<0.00001
Lead (Pb)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	--	<0.2	--	<0.00003
Rubidium (Rb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Sulfur (S)	50	<50	--	<0.007	<50	--	<0.007	<50	--	--	<50	--	<0.007
Antimony (Sb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	--	<0.05	--	<0.000007
Selenium (Se)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	--	<0.1	--	<0.00001
Tin (Sn)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	--	<0.5	--	<0.00007
Strontium (Sr)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	--	<0.2	--	<0.00003
Vanadium (V)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	--	<0.1	--	<0.00001
Tungsten (W)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	--	<0.5	--	<0.00007
Zinc (Zn)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	--	<5	--	<0.0007
Zirconium (Zr)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	--	<5	--	<0.0007

<sup>†</sup> Uncertainty of measurement = parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measured

<sup>\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 7200 L / 24 hours

<sup>\*\*\*</sup> Concentration in air could not be calculated as start count was not recorded and sampler shut off at an unknown time during sampling period

<sup>\*\*\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 1200 L / 4 hours

Table 3 (cont'd): Dust filter sampling analytical results.

Sampling Event Sampling Location / Filter ID Upwind or Downwind Parameters	EVENT 2												
	DS #1 / TB6608			DS #2 / TB6612			DS #3 / TB6613			Blank / TB6672			
	Detection Limit (µg)	Both		Both		Both		Both		Total mass on filter (µg)	Uncertainty (µg)	Concentration in air (mg/m <sup>3</sup> )**	
		Total mass on filter (µg)	Uncertainty (µg) <sup>†</sup>	Concentration in air (mg/m <sup>3</sup> )**	Total mass on filter (µg)	Uncertainty (µg) <sup>†</sup>	Concentration in air (mg/m <sup>3</sup> )****	Total mass on filter (µg)	Uncertainty (µg) <sup>†</sup>				Concentration in air (mg/m <sup>3</sup> )**
Total Particulates PM <sub>2.5</sub>	100	<100	--	<0.01	<100	--	<0.01	<100	--	<0.01	<100	--	<0.01
<b>Other Parameters</b>													
Silver (Ag)	0.5	<0.5	--	<0.00007	<0.5	--	<0.0004	<0.5	--	<0.00007	<0.5	--	<0.00007
Aluminum (Al)	20	<20	--	<0.003	<20	--	<0.02	<20	--	<0.003	<20	--	<0.003
Arsenic (As)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Barium (Ba)	0.05	0.05	0.040	0.000007	0.07	0.040	0.00006	0.07	0.040	0.00001	<0.05	--	<0.000007
Beryllium (Be)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Calcium (Ca)	20	40.0	9.0	0.006	30.0	6.7	0.025	30.0	6.7	0.004	30	7	0.004
Cadmium (Cd)	0.01	<0.01	--	<0.000001	<0.01	--	<0.000008	<0.01	--	<0.000001	<0.01	--	<0.000001
Cobalt (Co)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Chromium (Cr)	0.5	<0.5	--	<0.00007	<0.5	--	<0.0004	<0.5	--	<0.00007	<0.5	--	<0.00007
Cesium (Cs)	0.05	0.09	Ins. Data	0.00001	<0.05	--	<0.00004	0.06	Ins. Data	0.000008	<0.05	--	<0.000007
Copper (Cu)	0.5	<0.5	--	<0.00007	<0.5	--	<0.0004	<0.5	--	<0.00007	<0.5	--	<0.00007
Iron (Fe)	50	<50	--	<0.007	<50	--	<0.04	<50	--	<0.007	<50	--	<0.007
Mercury (Hg)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Potassium (K)	20	<20	--	<0.003	<20	--	<0.02	<20	--	<0.003	<20	--	<0.003
Magnesium (Mg)	5	8	3.6	0.001	7	3.6	0.006	7	3.6	0.001	7	3.6	0.001
Manganese (Mn)	0.2	<0.2	--	<0.00003	<0.2	--	<0.0002	<0.2	--	<0.00003	<0.2	--	<0.00003
Molybdenum (Mo)	0.2	<0.2	--	<0.00003	<0.2	--	<0.0002	<0.2	--	<0.00003	<0.2	--	<0.00003
Sodium (Na)	20	30	16	0.004	30	16	0.025	30	16	0.004	30	16	0.004
Nickel (Ni)	0.1	0.1	0.10	0.00001	<0.1	--	<0.00008	<0.1	--	<0.00001	<0.1	--	<0.00001
Lead (Pb)	0.2	<0.2	--	<0.00003	<0.2	--	<0.0002	<0.2	--	<0.00003	<0.2	--	<0.00003
Rubidium (Rb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Sulfur (S)	50	<50	--	<0.007	<50	--	<0.04	<50	--	<0.007	<50	--	<0.007
Antimony (Sb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.00004	<0.05	--	<0.000007	<0.05	--	<0.000007
Selenium (Se)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00008	<0.1	--	<0.00001	<0.1	--	<0.00001
Tin (Sn)	0.5	<0.5	--	<0.00007	<0.5	--	<0.0004	<0.5	--	<0.00007	<0.5	--	<0.00007
Strontium (Sr)	0.2	<0.2	--	<0.00003	<0.2	--	<0.0002	<0.2	--	<0.00003	<0.2	--	<0.00003
Vanadium (V)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00008	<0.1	--	<0.00001	<0.1	--	<0.00001
Tungsten (W )	0.5	<0.5	--	<0.00007	<0.5	--	<0.0004	<0.5	--	<0.00007	<0.5	--	<0.00007
Zinc (Zn)	5	<5	--	<0.0007	<5	--	<0.004	<5	--	<0.0007	<5	--	<0.0007
Zirconium (Zr)	5	<5	--	<0.0007	<5	--	<0.004	<5	--	<0.0007	<5	--	<0.0007

<sup>†</sup> Uncertainty of measurement = parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measured

<sup>\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 7200 L / 24 hours

<sup>\*\*\*</sup> Concentration in air could not be calculated as start count was not recorded and sampler shut off at an unknown time during sampling period

<sup>\*\*\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 1200 L / 4 hours

Table 3 (cont'd): Dust filter sampling analytical results.

Sampling Event Sampling Location / Filter ID Upwind or Downwind Parameters	EVENT 3																
	DS #1 / TB6674			DS #2 / TB6670			DS #3 / TB6667			DS #3 - DS #1		DS #3 - DS #2		Blank / TB6671			
	Detection Limit (µg)	Upwind		Upwind		Downwind		Difference between total metals on filter of downwind & upwind samples (µg)	Total mass on filter (µg)	Uncertainty (µg)	Concentration in air (mg/m <sup>3</sup> )**	Total mass on filter (µg)	Uncertainty (µg)	Concentration in air (mg/m <sup>3</sup> )**	Total mass on filter (µg)	Uncertainty (µg)	Concentration in air (mg/m <sup>3</sup> )**
		Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> )**	Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> )**	Total mass on filter (µg)	Concentration in air (mg/m <sup>3</sup> )**										
Total Particulates PM <sub>2.5</sub>	100	<100	--	<0.01	<100	--	<0.01	<100	--	<0.01	nil	nil	<100	--	<0.01		
<b>Other Parameters</b>																	
Silver (Ag)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	nil	nil	<0.5	--	<0.00007		
Aluminum (Al)	20	<20	--	<0.003	<20	--	<0.003	<20	--	<0.003	nil	nil	<20	--	<0.003		
Arsenic (As)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Barium (Ba)	0.05	<0.05	--	<0.000007	0.10	0.014	0.000014	0.09	0.040	0.00001	nil	-0.01	<0.05	--	<0.000007		
Beryllium (Be)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Calcium (Ca)	20	<20	--	<0.003	<20	--	<0.003	20	10	0.003	nil	nil	40	9	0.006		
Cadmium (Cd)	0.01	<0.01	--	<0.000001	<0.01	--	<0.000001	<0.01	--	<0.000001	nil	nil	<0.01	--	<0.000001		
Cobalt (Co)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Chromium (Cr)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	nil	nil	<0.5	--	<0.00007		
Cesium (Cs)	0.05	<0.05	--	<0.000007	0.10	Ins. Data	0.000014	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Copper (Cu)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	nil	nil	<0.5	--	<0.00007		
Iron (Fe)	50	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007	nil	nil	<50	--	<0.007		
Mercury (Hg)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Potassium (K)	20	<20	--	<0.003	<20	--	<0.003	<20	--	<0.003	nil	nil	<20	--	<0.003		
Magnesium (Mg)	5	<5	--	<0.0007	<5	--	<0.0007	5	3.6	0.0007	nil	nil	8	3.6	0.001		
Manganese (Mn)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	nil	nil	<0.2	--	<0.00003		
Molybdenum (Mo)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	nil	nil	<0.2	--	<0.00003		
Sodium (Na)	20	30	16	0.004	20	16	0.003	20	16	0.003	-10	nil	20	16	0.003		
Nickel (Ni)	0.1	<0.1	--	<0.00007	<0.1	--	<0.00001	<0.1	--	<0.00001	nil	nil	<0.1	--	<0.00001		
Lead (Pb)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	nil	nil	<0.2	--	<0.00003		
Rubidium (Rb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Sulfur (S)	50	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007	nil	nil	<50	--	<0.007		
Antimony (Sb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	nil	nil	<0.05	--	<0.000007		
Selenium (Se)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001	nil	nil	<0.1	--	<0.00001		
Tin (Sn)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	nil	nil	0.5	--	<0.00007		
Strontium (Sr)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	nil	nil	0.2	0.15	0.00003		
Vanadium (V)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001	nil	nil	0.2	0.03	0.00003		
Tungsten (W )	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	nil	nil	<0.5	--	<0.00007		
Zinc (Zn)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007	nil	nil	<5	--	<0.0007		
Zirconium (Zr)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007	nil	nil	<5	--	<0.0007		

\* Uncertainty of measurement = parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measured

\*\* Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 7200 L / 24 hours

\*\*\* Concentration in air could not be calculated as start count was not recorded and sampler shut off at an unknown time during sampling period

\*\*\*\* Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 1200 L / 4 hours



Table 3 (cont'd): Dust filter sampling analytical results.

Sampling Event		EVENT 4											
Sampling Location / Filter ID		DS #1 / TB6669			DS #2 / TB6668			DS #3 / TB6673			Blank / TB6611		
Upwind or Downwind		Upwind			Both			Both					
Parameters	Detection Limit (µg)	Total mass on filter (µg)	Uncertainty (µg) <sup>*</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>**</sup>	Total mass on filter (µg)	Uncertainty (µg) <sup>*</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>**</sup>	Total mass on filter (µg)	Uncertainty (µg) <sup>*</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>**</sup>	Total mass on filter (µg)	Uncertainty (µg) <sup>*</sup>	Concentration in air (mg/m <sup>3</sup> ) <sup>**</sup>
Total Particulates PM <sub>2.5</sub>	100	<100	--	<0.01	<100	--	<0.01	<100	--	<0.01	<100	--	<0.01
<b>Other Parameters</b>													
Silver (Ag)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007
Aluminum (Al)	20	<20	--	<0.003	<20	--	<0.003	<20	--	<0.003	<20	--	<0.003
Arsenic (As)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Barium (Ba)	0.05	0.08	0.040	0.00001	0.08	0.040	0.00001	0.08	0.040	0.00001	0.06	0.040	0.000008
Beryllium (Be)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Calcium (Ca)	20	40	9.0	0.006	40	9.0	0.006	50	11	0.007	30	6.7	0.004
Cadmium (Cd)	0.01	<0.01	--	<0.000001	<0.01	--	<0.000001	<0.01	--	<0.000001	<0.01	--	<0.000001
Cobalt (Co)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Chromium (Cr)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007
Cesium (Cs)	0.05	<0.05	--	<0.000007	0.15	Ins. Data	0.000021	<0.05	--	<0.000007	<0.05	--	<0.000007
Copper (Cu)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007
Iron (Fe)	50	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007
Mercury (Hg)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Potassium (K)	20	<20	--	<0.003	<20	--	<0.003	20	20	0.003	<20	--	<0.003
Magnesium (Mg)	5	8	3.6	0.001	8	3.6	0.001	11	2.2	0.0015	8	3.6	0.001
Manganese (Mn)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003
Molybdenum (Mo)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003
Sodium (Na)	20	40	16	0.006	30	16	0.004	50	16	0.007	30	16	0.004
Nickel (Ni)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001
Lead (Pb)	0.2	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003	<0.2	--	<0.00003
Rubidium (Rb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Sulfur (S)	50	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007	<50	--	<0.007
Antimony (Sb)	0.05	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007	<0.05	--	<0.000007
Selenium (Se)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001
Tin (Sn)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007
Strontium (Sr)	0.2	<0.2	--	<0.00003	0.2	0.15	0.00003	0.2	0.15	0.00003	0.2	0.15	0.00003
Vanadium (V)	0.1	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001	<0.1	--	<0.00001
Tungsten (W)	0.5	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007	<0.5	--	<0.00007
Zinc (Zn)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007
Zirconium (Zr)	5	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007	<5	--	<0.0007

<sup>\*</sup> Uncertainty of measurement = parameter associated with the result of a measurement that characterizes the dispersion of the values that could reasonably be attributed to the measured

<sup>\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 7200 L / 24 hours

<sup>\*\*\*</sup> Concentration in air could not be calculated as start count was not recorded and sampler shut off at an unknown time during sampling period

<sup>\*\*\*\*</sup> Calculated as: (total metals on filter)/(air volume over 24 hour period), where air volume is 5 L/min or 1200 L / 4 hours

**Table 4: Average total particulates.**

<b>Sample ID</b>	<b>Total Particulate (PM<sub>2.5</sub>) concentration in air (mg/m<sup>3</sup>)</b>
TB6607	<0.01
TB6614	0.02 <sup>a</sup>
TB6666	no air volume
TB6608	<0.01
TB6613	<0.01
TB6674	<0.01
TB6670	<0.01
TB6667	<0.01
TB6669	<0.01
TB6668	<0.01
TB6673	<0.01
TB6612	<0.01
<b>AVERAGE</b>	<b>&lt;0.01</b>

a. Sampling period of 4 hrs, All others were 24 hrs

**WARDROP**