

# Technical Memorandum

## 2017 Mobile TAGA Survey in the Vicinity of St. Marys Cement



*photos taken by TAGA staff*



Ontario Ministry of the Environment and Climate Change

Report Prepared by:

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Report Completion  
Date: January 2018



## **Survey Background**

At the request of the Ministry of the Environment and Climate Change's (MOECC or Ministry) London District Office, the Environmental Monitoring and Reporting Branch (EMRB) completed a mobile air monitoring in the vicinity of St. Marys Cement in St. Marys, Ontario in 2017. The survey was requested in response to dust and odour complaints received from local residents. EMRB staffs were deployed to investigate ambient concentrations of volatile organic compounds (VOCs) and particulate matter smaller than 10 micrometres (PM<sub>10</sub>) upwind and downwind of St. Marys Cement on November 28 and during stack testing on November 29, and 30, 2017.

St. Marys Cement is located at 585 Water Street South, St. Marys, Ontario. It operates one cement kiln which employs a system of cyclones to preheat incoming feed with hot exhaust gases. The flue gases are exhausted through a stack on the roof of the cyclone building. Cement is manufactured by combining materials such as calcium oxide, iron oxide, alumina and silica at high temperature (over 1500°C) to produce cement clinker which is then cooled and subsequently ground with gypsum to produce cement.

This survey utilized a real-time mobile measurement platform which provides great flexibility in sampling location. This significantly increases the ability to measure maximum ambient emissions from facilities and enables more thorough investigations of short term events. St. Marys Cement is subject to *Ontario Regulation 419/05 – Local Air Quality* (O. Reg. 419/05) Schedule 3 standards and many of the applicable standards or guidelines are based on annual or 24-hour averaging periods. These standards are based on effects that occur after long-term exposure and therefore direct comparison of shorter term measurements, such as those that are typically captured by EMRB's mobile air monitoring vehicle, are not appropriate. Potential health impacts of short term exposure to elevated air concentrations would require further assessment and are not covered in this report.

## **Survey Methodology**

Real-time monitoring of VOCs in ambient air was performed utilizing the mobile trace atmospheric gas analyzer (TAGA) unit: a van outfitted with an AB Sciex mass spectrometer equipped with a Low Pressure Chemical Ionization (LPCI) source. The TAGA unit performed chemical fingerprinting to identify different VOCs in ambient air. Plume tracking was conducted while TAGA was in motion to acquire VOCs data in real time and identify locations with the highest concentrations of VOCs downwind of the facility. Concurrently with TAGA measurements, PM<sub>10</sub> measurements were recorded using a TSI Dusttrak DRX Aerosol Monitor on-board the TAGA van.

Site selection for half-hour concentration measurements was based on plume tracking results, meteorological conditions and odour observations by TAGA staff. One half-hour concentration of VOCs measured by the TAGA is the average of 360 five-second readings. Concentrations of target VOCs and PM<sub>10</sub> were determined both upwind and downwind of St Marys Cement while the mobile units were stationary.

On November 28 the wind was from the southwest. The upwind site was located on Water Street South, to the west of the facility, and two downwind locations were established, the first at Church Street and Quarry Road (Site A), the second at the southern end of Tracy Street (Site B). On November 29 the wind was from the northwest. Tracy Street (Site B) was used as the upwind site and two downwind sites were established, the first located on Enterprise Drive (Site C), the second on Elginfield Road/Highway 7 (Site D). On November 30, wind was from the southwest. Upwind measurements were performed on Elginfield Road/Highway 7 (Site D) and downwind measurements were performed at two locations, the first at the south end of Tracy Street (Site B) and the second at the parking lot of the Pyramid Recreation Centre (Site E). The monitoring locations are shown in Figure 1.

### **Survey Results**

Three days of TAGA air monitoring of St. Marys Cement were conducted on November 28, 29, and 30, 2017. No odours were noted by the TAGA staff upwind of the facility however odours were noted occasionally downwind of the facility. TAGA staff observed visible dust downwind of the facility on November 28 and mild odours downwind of the facility on November 28 and 29. The odour and visible dust observations loosely corresponded with elevated measurements of VOCs and PM<sub>10</sub> respectively.

Concentrations of toluene, xylenes and trimethyl benzene were very similar upwind and downwind of the facility. In three samples, concentrations of benzene were up to three times higher downwind compared to upwind. In two samples, levels of styrene were almost ten times higher downwind compared to upwind. In five samples, concentrations of PM<sub>10</sub> were approximately two times higher downwind compared to upwind. Concentrations (in units of µg/m<sup>3</sup>) upwind and downwind of the facility on each day are provided in Table 1 and Table 2.

Although ambient real-time VOC measurements are not routinely conducted in Ontario, the federal government collects 24-hour average samples from select locations in the province. The two types of measurements (half-hour versus 24-hour) are not directly comparable since they have different averaging periods, however the benzene and styrene levels measured during this survey are consistent with what is seen in other nearby communities (e.g. London, Hamilton and Windsor). The highest half hour concentration of PM<sub>10</sub> was 71 µg/m<sup>3</sup> with an average concentration of 37 µg/m<sup>3</sup> over the

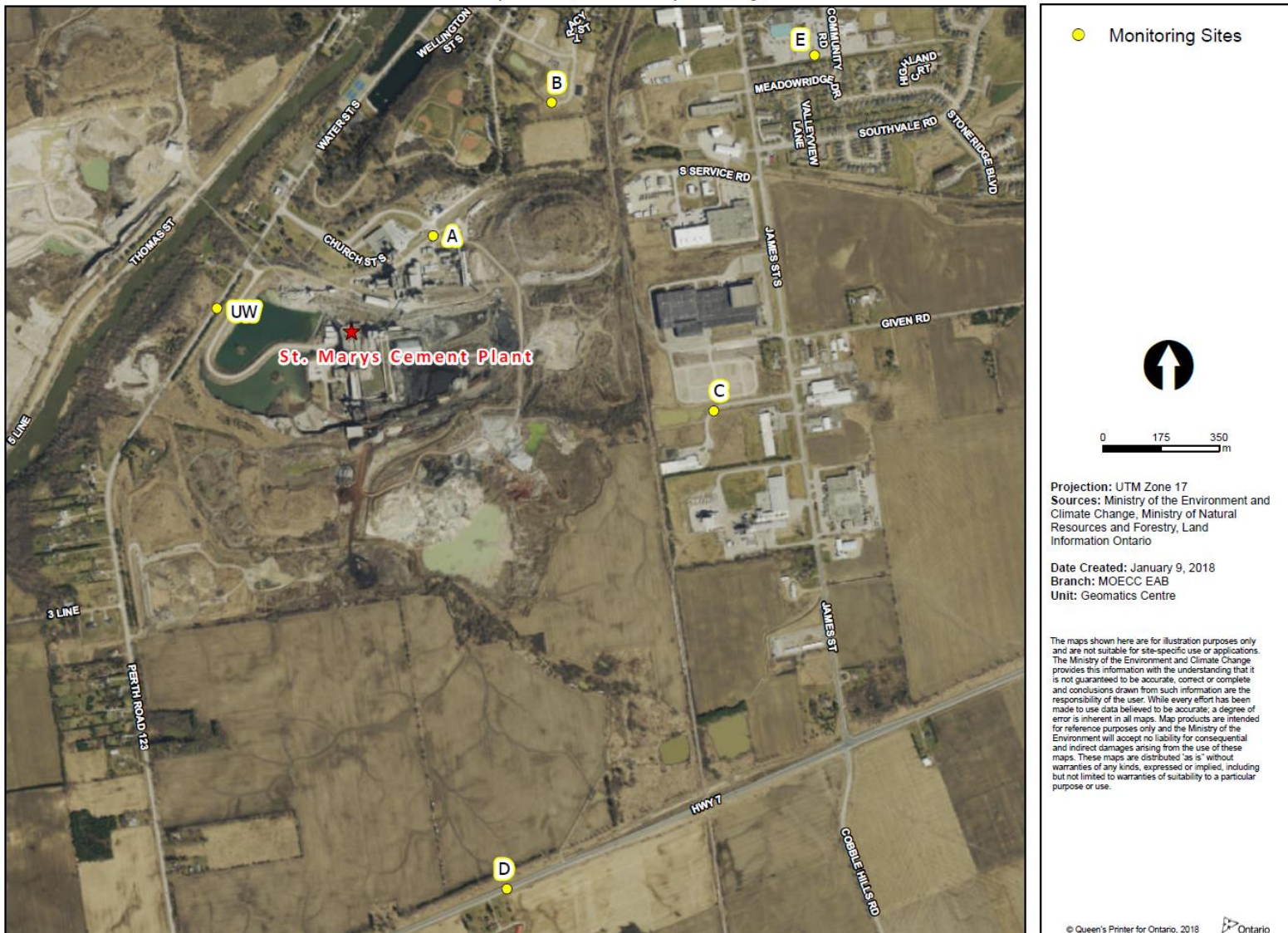
survey period. These levels, while elevated above background, are typical of downwind areas in proximity to industrial activities and/or transportation related sources.

Plume tracking results for benzene and PM<sub>10</sub> obtained on November 28 from 14:03 to 14:33 are shown in Figure 2 and Figure 3. Winds were from the southwest (SW) during these measurements. It is evident that the concentration of benzene was elevated downwind of the facility but not upwind.

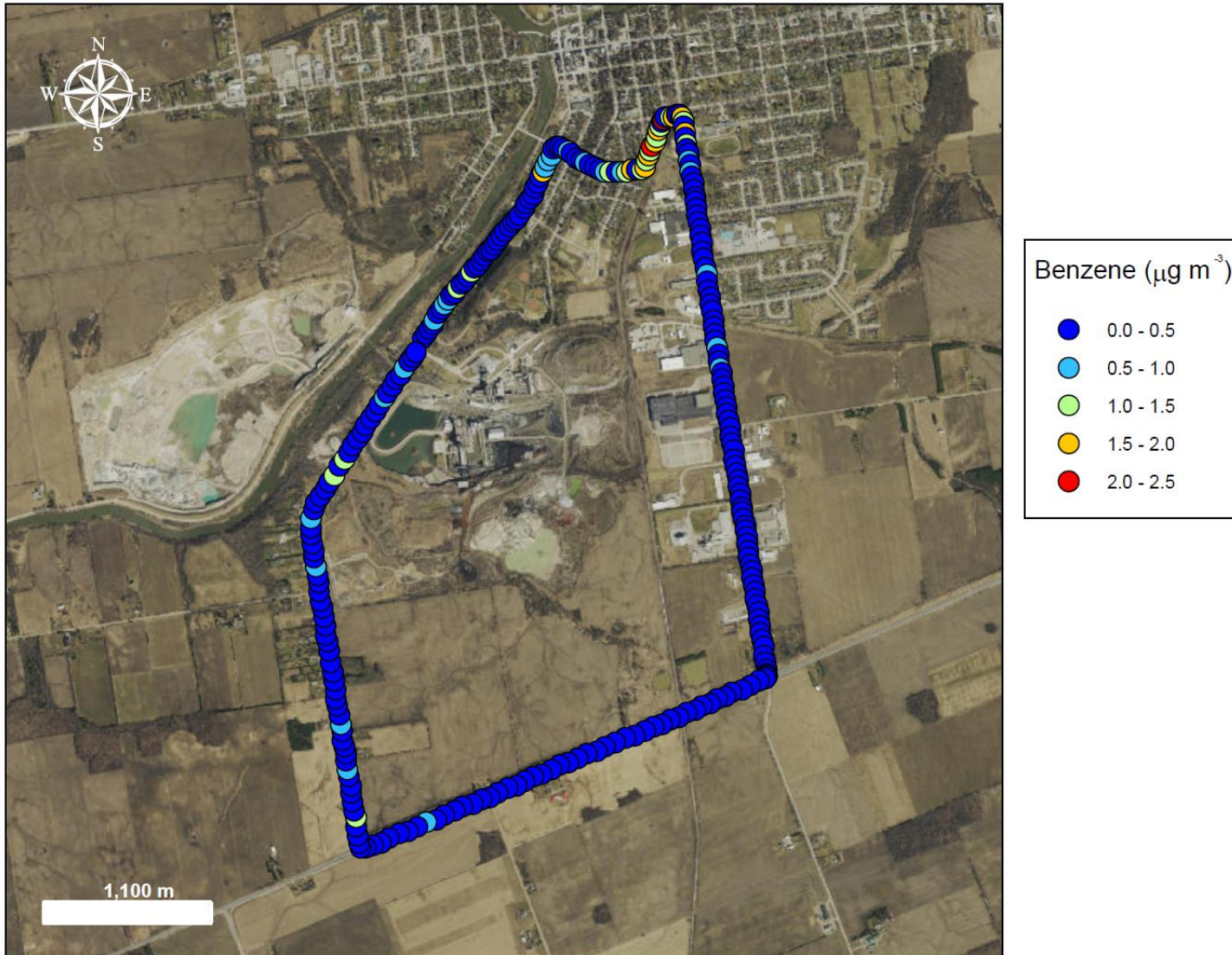
### **Summary**

The Ministry conducted real time air monitoring in the vicinity of St. Marys Cement in November, 2017. St. Marys Cement is likely a contributing source to benzene, styrene and PM<sub>10</sub> concentrations measured during the survey. Odours detected by the TAGA staff may be attributed to the synergistic odours of chemicals emitted from St. Marys Cement and other sources including the compounds detected by the TAGA.

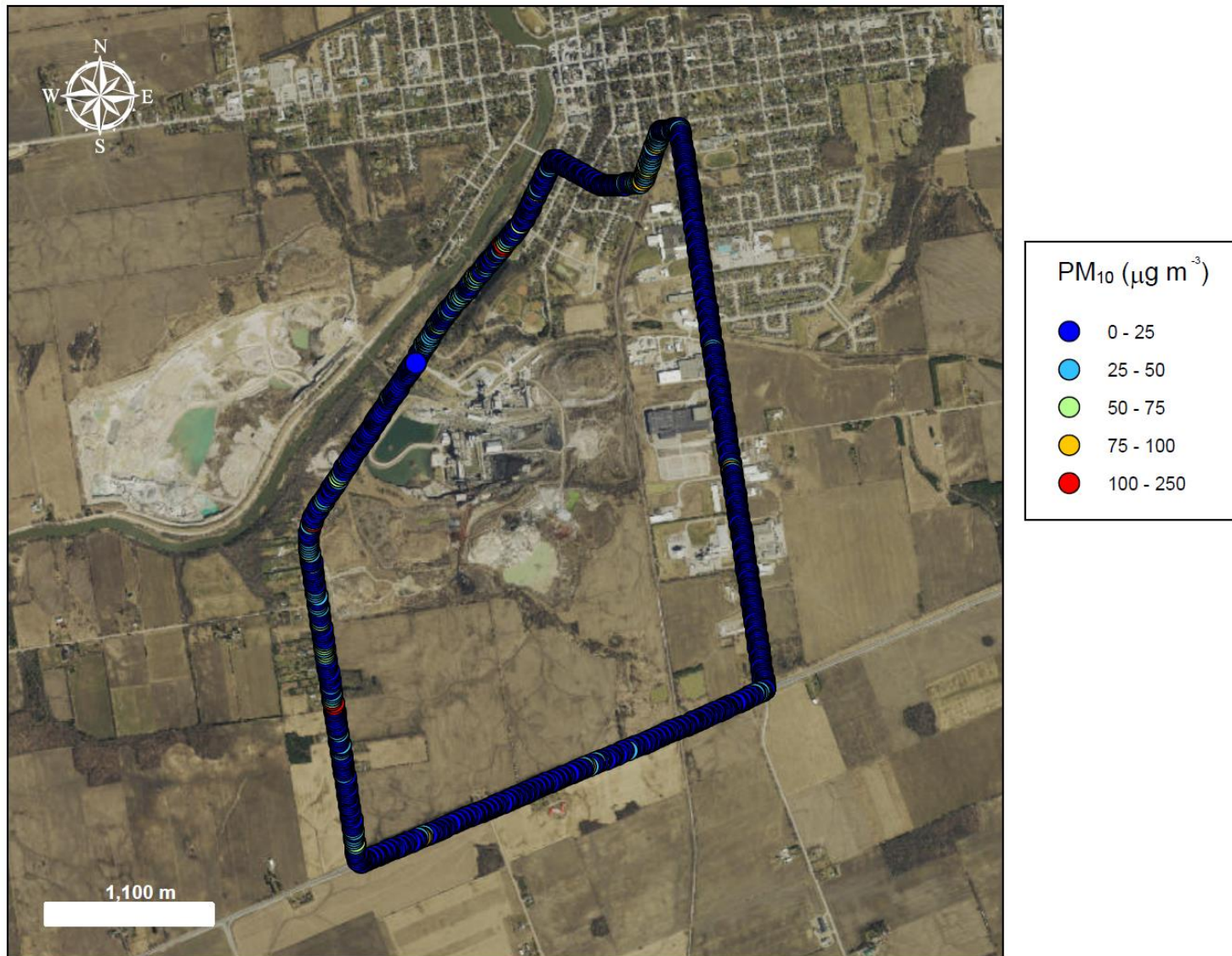
**Figure 1: Monitoring sites in the vicinity of St. Marys Cement Plant, St. Marys, Ontario.  
Mobile TAGA (EMRB, MOECC) survey, November 2017.**



**Figure 2:** Plume tracking of benzene in the vicinity of St. Marys Cement, St. Marys, Ontario. Mobile TAGA (EMRB, MOECC) air monitoring survey, November 28, 2017. Wind was from the southwest during these measurements (14:03-14:33).



**Figure 3:** Plume tracking of PM<sub>10</sub> in the vicinity of St. Marys Cement, St. Marys, Ontario. Mobile TAGA (EMRB, MOECC) air monitoring survey, November 28, 2017. Wind was from the southwest during these measurements (14:03-14:33).



**Table 1**  
**TAGA van LPCI – 10-minute average concentrations (UPWIND)**  
 Ten-min average concentrations of VOCs measured Upwind of St. Marys Cement (St. Marys).  
 MOECC (EMRB) mobile TAGA air monitoring survey, November 2017

Date	Sample	Sampling Time	Monitoring Sites	Met	VOC					
				WD (from)	Benzene	Toluene	Styrene	Xylene	Trimethylbenzene	Particulate Matter (PM <sub>10</sub> )
28-Nov-17	UW1	10:30	A	SW	0.6	<b>0.8</b>	<b>&lt;0.7</b>	<b>1.2</b>	<b>1.1</b>	<b>34</b>
29-Nov-17	UW2	10:23	C	NW	<b>1.3</b>	0.3	<0.7	1.1	<0.3	11
30-Nov-17	UW3	10:40	B	SW	<0.3	<0.6	<0.7	0.7	<0.3	26

Red highlighted numbers indicate maximum survey values.



**Table 2**  
**TAGA van LPCI – Half-hour average concentrations (DOWNWIND)**  
 Half-hour average concentrations of VOCs measured Downwind of St. Marys Cement (St. Marys).  
 MOECC (EMRB) mobile TAGA air monitoring survey, November 2017

Date	Sample	Sampling Time	Monitoring Sites	Met	VOC					
				WD (from)	Benzene	Toluene	Styrene	Xylene	Trimethylbenzene	Particulate Matter (PM <sub>10</sub> )
28-Nov-17	S01	11:03	A	SW	2.0	1.0	4.8	0.9	0.5	71
	S02	11:33	A	SW	1.1	0.9	4.7	1.3	0.7	61
	S03	12:03	A	SW	1.0	0.7	3.8	0.9	0.4	56
	S04	12:33	A	SW	1.2	1.0	5.5	1.4	0.6	61
	S05	13:03	A	SW	1.5	1.0	6.8	1.3	0.8	46
	S06	13:33	A	SW	1.4	0.9	6.0	1.2	0.7	60
	S07	14:44	B	SW	0.5	<0.6	1.8	1.2	0.6	47
29-Nov-17	S08	10:59	C	NW	4.4	<0.6	<0.7	0.6	<0.3	4.0
	S09	11:59	D	NW	1.3	<0.6	<0.7	0.7	0.5	18
	S10	12:30	D	NW	<0.3	<0.6	<0.7	0.7	<0.3	19
	S11	13:01	D	NW	<0.3	<0.6	<0.7	0.6	<0.3	19
	S12	13:31	D	NW	<0.3	<0.6	<0.7	<0.6	0.3	17
	S13	14:01	D	NW	<0.3	<0.6	<0.7	0.8	<0.3	21
	S14	14:31	D	NW	<0.3	<0.6	<0.7	<0.6	0.3	19
30-Nov-17	S15	11:30	B	SW	0.3	<0.6	<0.7	0.6	0.3	32
	S16	12:00	B	SW	0.4	<0.6	<0.7	0.8	0.3	49
	S17	12:30	B	SW	0.3	<0.6	<0.7	0.8	0.4	35
	S18	13:00	B	SW	<0.3	<0.6	<0.7	1.0	0.5	24
	S19	13:30	B	SW	<0.3	<0.6	<0.7	0.9	0.5	30
	S20	14:06	E	SW	0.3	<0.6	<0.7	0.7	0.7	44
	S21	14:36	E	SW	<0.3	0.9	<0.7	0.9	0.6	40

Red highlighted numbers indicate maximum survey values.