



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task C.15

Tracer Test No. 3

May 2014

442-27-001

HAZEN AND SAWYER
Environmental Engineers & Scientists

In association with:



AET
Applied Environmental Technology

**Otis Environmental
Consultants, LLC**

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK C.15 PROGRESS REPORT

Tracer Test No. 3

Prepared for:

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Environmental Health
Onsite Sewage Programs
4042 Bald Cypress Way Bin #A-08
Tallahassee, FL 32399-1713

FDOH Contract CORCL

May 2014

Prepared by:

HAZEN AND SAWYER
Environmental Engineers & Scientists

In Association With:





S&GW Test Facility

Test Area 3 Tracer Test

1.0 Background

Task C of the Florida Onsite Sewage Nitrogen Reduction Strategies Study includes monitoring at field sites in Florida to evaluate nitrogen reduction in soil and groundwater, to assess groundwater impacts from various onsite wastewater systems, and to provide data for parameter estimation, verification, and validation of models developed in Task D. Controlled pilot-scale testing was conducted at the GCREC soil and groundwater (S&GW) test facility to characterize nitrogen fate and transport under a variety of typical operating conditions presented previously in Task C.16 and C.17 documents. The Task C objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the GCREC S&GW test facility site have been documented in previous reports.

2.0 Purpose

This memo documents the Test Area 3 (TA3) tracer test that was conducted at the GCREC S&GW test facility which commenced February 17, 2014. The most direct method for groundwater velocity determination was used which consisted of introducing a tracer at one point in the flow field and observing its arrival at other points. The test was conducted to assess expected travel direction, times and uniformity of flow.

3.0 Materials and Methods

The tracer test was conducted at the GCREC S&GW test facility located at the University of Florida, Gulf Coast Research and Education Center (GCREC) in southeast Hillsborough County, Florida. The specially designed pilot-scale test areas are representative of typical mounded onsite sewage treatment and disposal systems and enable controlled testing and evaluation of nitrogen reduction in soil and groundwater. Each test area consists of an above ground mound system to which effluent is dosed. Septic tank effluent (STE) is delivered to TA3 via a pressure dosed mound with a drip dispersal system at a design hydraulic loading rate of 32.6 L/m²-day (0.8 gal/ft²-day). The source of the influent wastewater is the septic tank effluent from the existing onsite wastewater system serving the GCREC. Details of the design and construction of the S&GW test facility were presented previously in Task C.6, C.7, C.8, C.10, C.11, C.12, A.15 and A.17 documents.

o:\44237-001R004\Wpdocs\Report\Final

Throughout the S&GW test facility monitoring and sampling study period, from June 2012 through December 2013, the approximate direction of the groundwater flow was determined for TA3. Figure 1 depicts the groundwater elevations measured on February 21, 2014 in piezometers surrounding the site. The groundwater elevations have been found to fluctuate due to periods of dry weather and/or heavy precipitation; however, routine monitoring of the groundwater elevations indicates that the general flow-path does not change significantly.

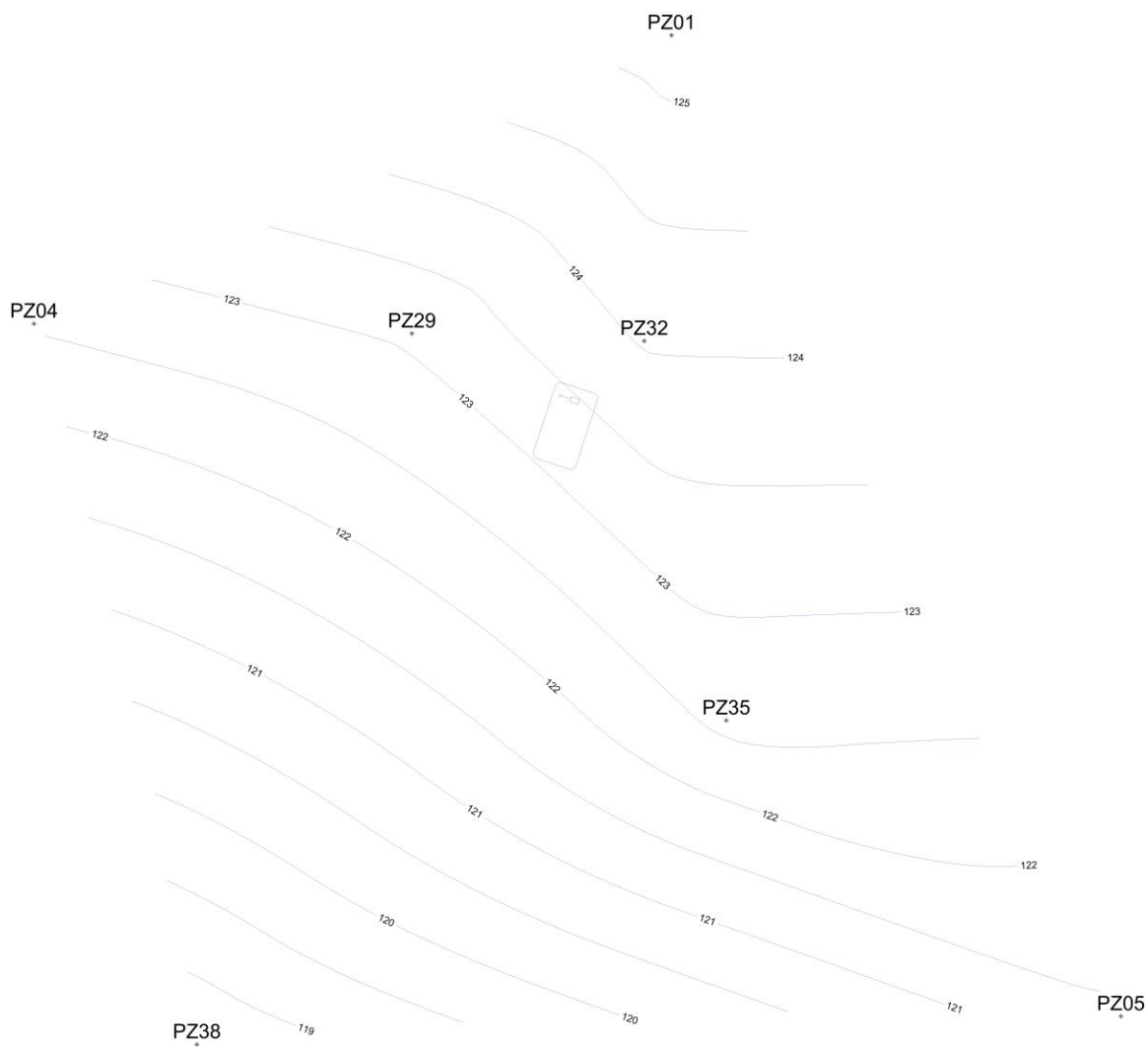


Figure 1
Groundwater Elevations on February 21, 2014

3.1 Experimental Location and Design

A 0.61 m (2 ft) by 0.61 m (2 ft) sampling grid for groundwater screening was developed downgradient of TA3. Transect lines A through T are parallel to the northern edge of the mound and increase (higher letter identification) moving southward from the mound. Transect lines 4' through 16 (numbered from east to west) are perpendicular to the northern edge of the mound. Groundwater monitoring points were installed in November 2011, March 2012, May 2012, and October 2012 with additional wells installed specifically for the tracer test in October 2013 (Figure 2). Standpipe piezometers were installed using either hand or drilling methods. Standpipe piezometers consist of either 0.02 m ($\frac{3}{4}$ in), 0.03 m (1 in), or 0.05 m (2 in) diameter Schedule 40 PVC with 0.31 m (1 ft), 0.76 m (2.5 ft), 1.52 m (5 ft), or 3.05 m (10 ft) long, 0.025 cm (0.010 in) slotted well screen and Schedule 40 riser extending to the ground surface (refer to the Task C QAPP and Task C.10/C.11/C.12 Progress Report for additional detail). Environmental Drilling Service, Inc. installed twenty-four additional TA3 wells October 28th and 29th, 2013 using a Geoprobe™ rig. The new standpipe piezometers consist of 0.025 m (1 in) diameter PVC with 1.52 m (5 ft) long 0.025 cm (0.010 in) Schedule 40 well screens and Schedule 40 riser extending to the ground surface. The target bottom of casing for all new wells was 37 m (121.5 ft) above mean sea level based on NGVD 1929. A complete list of all TA3 installed monitoring devices is included in Appendix A.

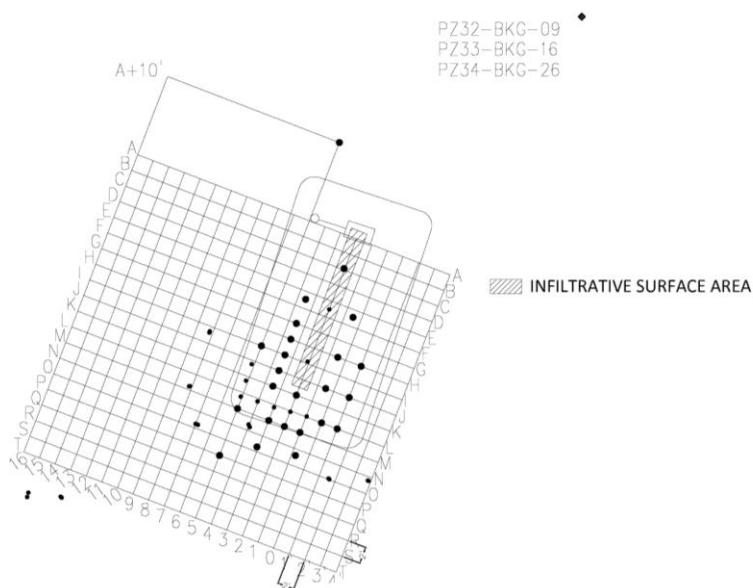


Figure 2
TA3 Grid

c:\44237-001R004\Wpdocs\Report\Final

The tracer loading rate was designed to be the same loading as during the S&GW test facility study period which used the maximum allowable loading rate for sandy soils of 32.6 L/m²-day (0.8 gal/ft²-day) resulting in a daily flow of 121 liters/day (32 gal/day) over the 0.61 m (2 ft) by 6.1 m (20 ft) infiltrative area. The tracer solution was prepared in the STE dose tank, and the dose pump that was used throughout the S&GW test facility study period was used to deliver the tracer solution to the three STE dose areas (TA1, TA3, and TA5). All three test areas were dosed tracer solution to ensure that the hydraulic loading was consistent with the study period; however only TA3 was monitored and results reported herein.

The drip emitters discharge at a rate of 2.3 liters/hr (0.6 gal/hr). The test areas continued to receive a 15 minute dose, 6 times per day. The STE dose tank was emptied of wastewater, and 1136 liters (300 gal) of tracer solution was prepared using clean water within the STE dose tank, which was enough volume to dose the test areas for approximately three days at the design loading rate.

3.2 Tracer Solution and Standards

Tracers are usually chemical or radioactive compounds that flow in a fluid phase without altering the transport properties of the phase. Bromide (Br⁻) was chosen as the most appropriate tracer as it is conservative, and thus representative of the water movement through soil (although some diffusion from mobile to immobile water may occur). A target bromide concentration of 1,000 ppm was selected to ensure detection of the tracer in downgradient locations. The tracer solution was prepared by mixing granular potassium bromide (KBr) with clean water. To prevent density profiles, the solution was mixed onsite. A submersible pump to which a PVC stirring tree was attached was placed inside the STE dose tank to ensure that the solution was mixed during the experiment.

Nine bromide detection probes were used during the test. Six submersible water quality sensor dataloggers (AquiStar TempHion smart sensors) were installed within various wells to continuously record the bromide concentration. Two additional sensor dataloggers were used over a short period during the test. In addition, a bromide ion selective electrode (Cole Palmer model EW-27502-05) connected to a pH/mV meter (Oakton Ion 6+) was used to analyze pumped samples. Six bromide standards (ranging from 10 ppm to 10,000 ppm) were prepared prior to the start of the tracer test. The standards were used to create a calibration curve to which the ISE probe and datalogging sensors could be calibrated. The bromide standards were prepared using standard dilution as shown in Table 1. The standards were sent to an independent and fully NELAC certified analytical laboratory

(Southern Analytical Laboratory) for analyses (see Table 2), the laboratory report is provided in Appendix B. After the standards were prepared, each was measured with the ISE probe daily. The resulting readings (in mV) on February 17, 2014 for the standards are shown in Table 2, and the calibration curve associated with the standards is illustrated in Figure 3 using the laboratory reported value for the standards.

The laboratory value for Br concentration was significantly less than the target concentration. Standard concentrations were prepared and checked several times and results were routinely the same, lab results indicated less bromide in solution than the target concentration of the standard. The potassium bromide used for the test was not analytical grade, and it is suspected that this was the reason that target concentrations were not met. Laboratory values for Br concentration were therefore used throughout the study for calibration of probes and sensors.

Table 1. Stock preparation method

CONCENTRATION	DILUTION	PREPARATION
10,000 ppm = A	1:1	14.8 g of KBr in 1,000 mL
2,000 ppm	1:5	100 mL of A plus 400 mL DI in 500 mL flask
1,000 ppm	1:10	50 mL of A plus 450 mL DI in 500 mL flask
500 ppm	1:20	25 mL of A plus 475 mL DI in 500 mL flask
100 ppm	1:100	5 mL of A plus 495 mL DI in 500 mL flask
50 ppm	1:200	2.5 mL of A plus 497.5 mL DI in 500 mL flask
10 ppm	1:1000	0.5 mL of A plus 499.5 mL DI in 500 mL flask

DI = deionized water

Dilution factor expressed as: volume of analyte: total volume

Table 2. The mV equivalent for the five standards.

Bromide Stock (mV)	Target Br Concentration (ppm)	SAL Laboratory Reported Br Concentration (ppm)
128.8	10	7.1
74.2	100	77
34.5	500	380
18.5	1,000	830
-2.8	2,000	1,700

o:\44237-001R004\Wpdocs\Report\Final

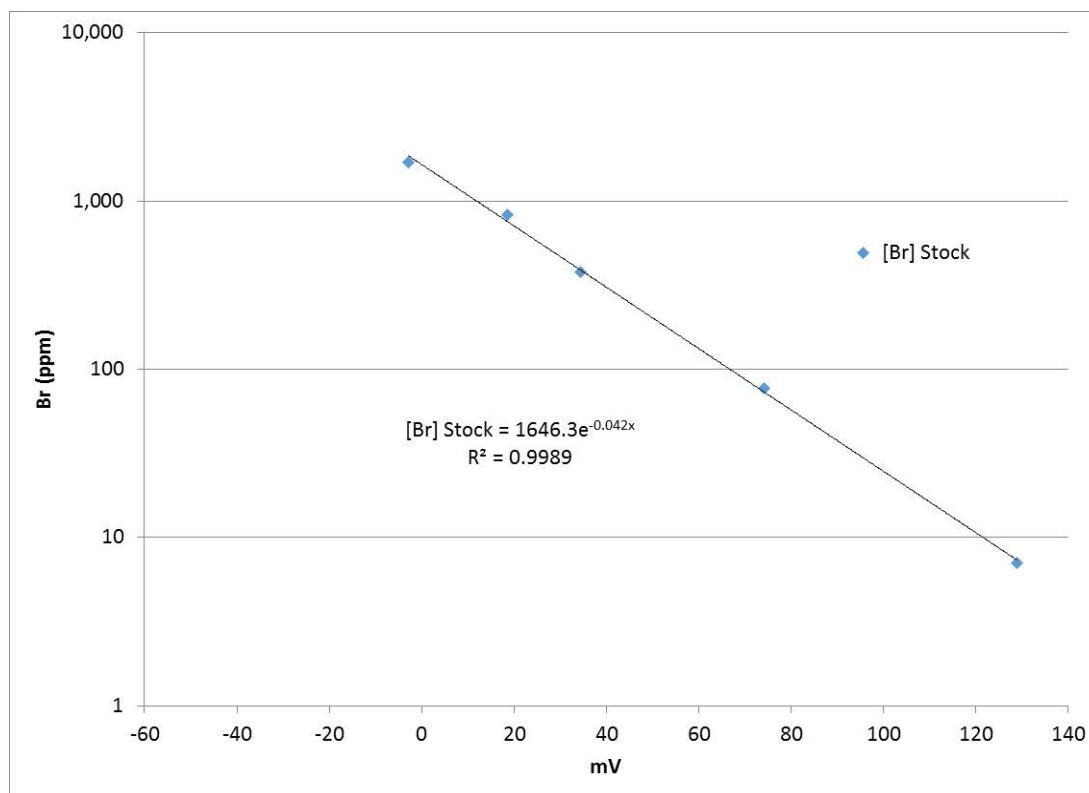


Figure 3
Bromide calibration curve – ISE probe

3.3 Pumped Sample Analysis

Two types of monitoring devices were used during the tracer test: soil water suction lysimeters and groundwater piezometers, shown in Figure 4. The suction lysimeters have a 0.05 m (1.9 in) diameter, 0.23 m (9 in) long porous ceramic cup (Soil Moisture Equipment Corp. part number 0653X07-B01M3). Soil moisture samples from the three TA3 southern suction lysimeters (center of the cup located 0.3, 0.6 and 1.07 meters (12, 24 and 42 in) below the infiltrative surface) were collected using a peristaltic pump and dedicated 0.006 m (0.25 in) diameter linear low density polyethylene tubing. A vacuum of 50 kPa (7.25 psi) was applied to the suction lysimeters for one hour prior to collecting the soil water.

Groundwater samples were also collected using 0.006 m (0.25 in) diameter dedicated linear low density polyethylene tubing and a peristaltic pump. During the groundwater sample collection, a very low flow rate was used to minimize flow into the well during sampling. At the start of the test, the groundwater elevation was approximately 2.13 m (7

ft) below natural grade. For both monitoring devices, the tubing was first purged (approximately 100 mL), and then water was collected in a 100 mL beaker. A 10 mL sample was taken from the beaker using a pipette and placed in a 50 mL beaker, and 2 mL of 5M NaNO_3 ion strength adjustment solution (ISA) was added to each sample. A bromide ISE probe connected to a pH/mV meter or ion meter was used to measure the mV of the tracer solution. In addition, the concentration of the bromide solution in the STE dose tank was measured prior to and during the tracer test to ensure proper mixing of the solution.

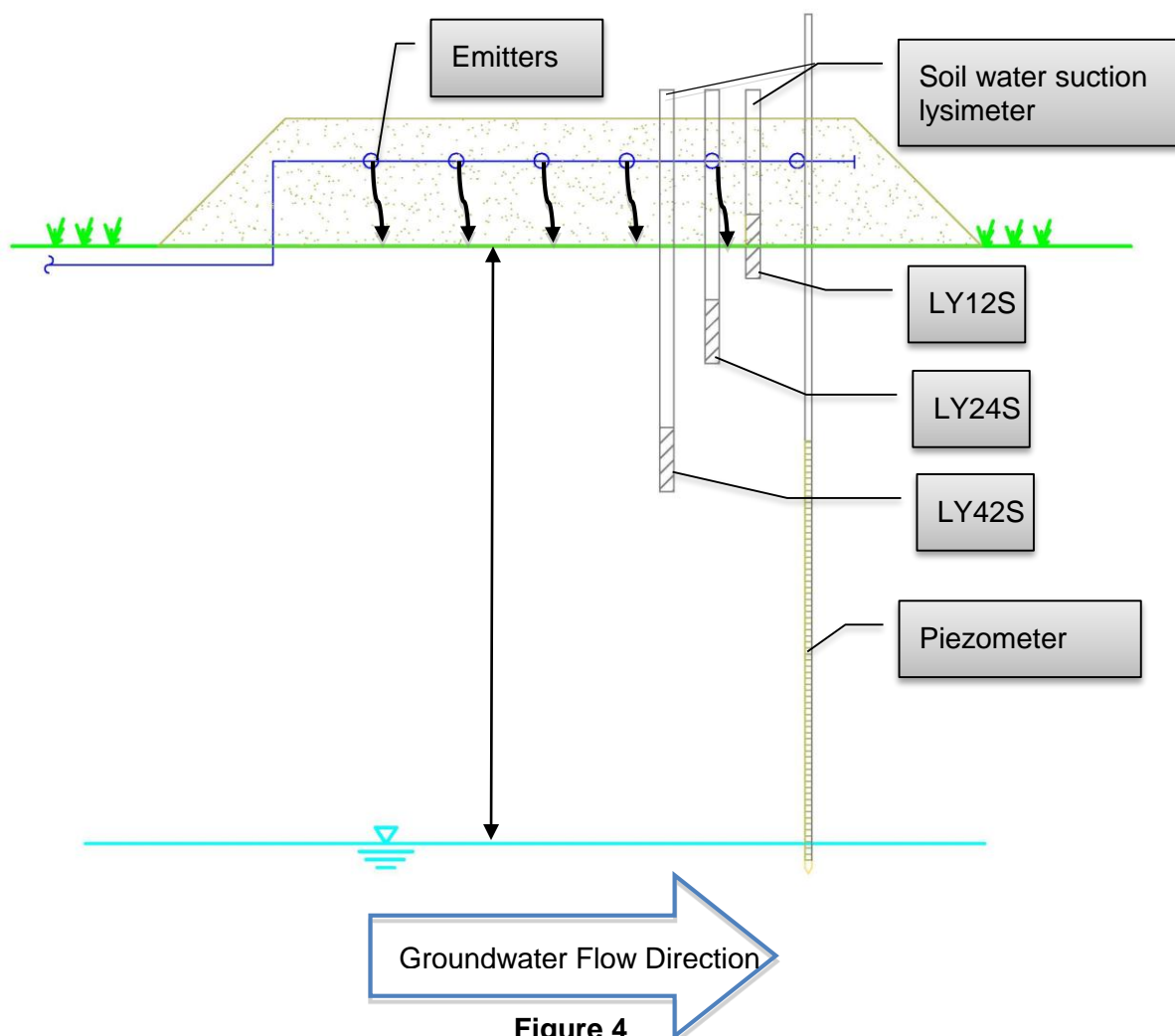


Figure 4
Test Area 3 Cross Section

o:\44237-001R004\Wpdocs\Report\Final

3.4 Submersible Sensors

The six Aquistar™ submersible water quality sensor dataloggers were initially calibrated and installed within the test area 3 wells at grid locations G3.5, I2, I3.5, I5, K3.5, and the test area 5 outlet tee. The sensors were connected to an INW supplied junction box which was connected to an INW VZCOM device. The INW VZCOM device transmitted the six sensor readings at 5-minute intervals to the INW server accessed through the website www.myinwdata.com. The sensors were set to record the bromide concentration at 15-minute intervals within the sensor's internal data logger. Following detection in the pumped samples, the sensors were moved to the well grid locations within the anticipated peak concentration flow path.

4.0 Results

4.1 Bromide Tracer Solution

The tracer test was started at the GCREC S&GW test facility on February 17, 2014. Bromide tracer solution samples collected from the STE dose tank were sent for analyses in a NELAC certified laboratory (Appendix B) to confirm the bromide concentration as summarized in Table 3. The average bromide concentration of the tracer dose solution was 763 ppm. Tank samples analyzed in the field using the bromide ISE sometimes differed considerably from the laboratory results. Although the ISE probe was calibrated daily, it was not temperature compensating, and it is believed that changes in temperature were the cause of the differences. The laboratory results are therefore the most accurate.

Table 3. Bromide solution within dose tank laboratory results

Date	Time Sample Collected	Laboratory Result Bromide Concentration (ppm)
2/17/2014	14:45	770
2/17/2014	15:05	730
2/17/2014	19:00	780
2/18/2014	7:06	750
2/18/2014	11:55	780
2/18/2014	15:05	760
2/19/2014	7:20	800
2/20/2014	12:23	750
2/20/2014	17:15	750
Average		763

c:\44237-001R004\Wpdocs\Report\Final

On February 21st, the tracer solution tank was completely empty (after 97 hours of dosing). Following the tracer dosing, the tank was filled with septic tank effluent (STE), and STE was then dosed continuously to the test area at the same loading rate as the tracer solution.

4.2 Unsaturated Zone Transport

Soil moisture samples from the three TA3 southern suction lysimeters LY12S, LY24S, and LY42S center of the cup located at 0.3, 0.6 and 1.07 meters (12, 24 and 42 in) below the infiltrative surface respectively provides an opportunity to evaluate the unsaturated zone travel time. Figure 5 depicts the breakthrough curves generated for these three locations which are summarized in Table 4.

The shallowest lysimeter (LY12S) is located at the mound sand and native soil interface which is 0.3 m (12 in) below the infiltrative surface. The maximum or peak concentration of bromide in LY12S (580 ppm Br) occurred 5.8 days (138 hours) after initial input of bromide. The lysimeter located 0.3 m (12 in) into the native soil (LY24S) peak bromide concentration (590 ppm Br) occurred 162 hours after initial input of bromide. The deepest lysimeter 0.76 m (30 in) into the native soil (LY42S) peak bromide concentration (395 ppm Br) occurred 257 hours after initial input of bromide. The average velocity (V_a) can be expressed using the equation:

$$V_a = \frac{L}{t}$$

Where L is the distance traveled and t is the time of travel. Based on the average peak bromide unsaturated zone travel time obtained during this test, the estimated unsaturated zone flow rate would be 0.081 m/day (0.265 ft/day) below the infiltrative surface.

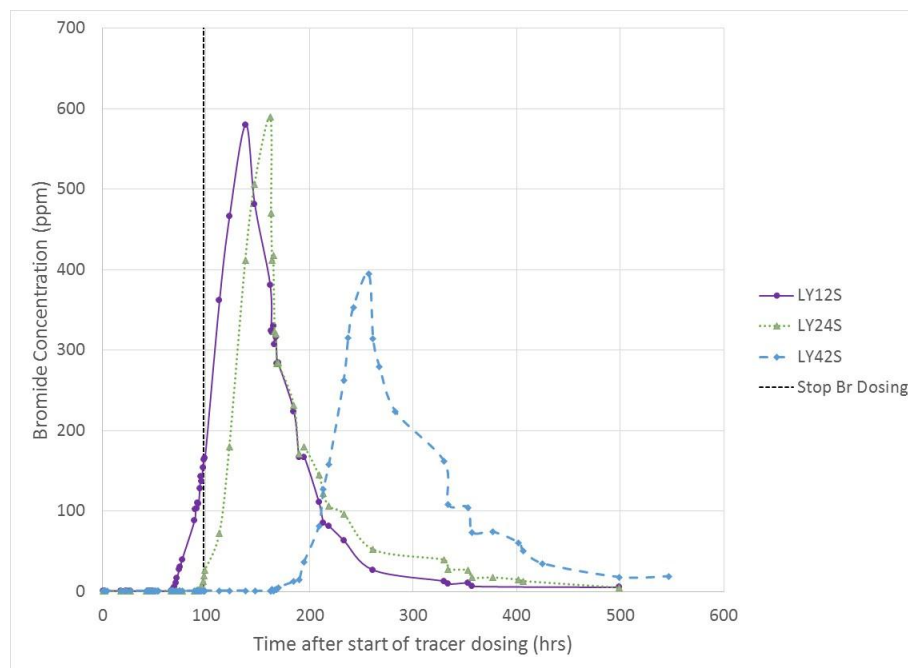


Figure 5
Test Area 3 Unsaturated Zone Breakthrough Curves

Table 4: Unsaturated Zone Travel Time

		Distance (L)	Time since start (t)		Br- conc	Velocity (Va)	Velocity (Va)
		m	hours	days	ppm	m/day	ft/day
LY12S	Br start	0.3	69.2	2.9	5.8	0.106	0.347
	Br peak		138.3	5.8	580.0	0.053	0.174
	Br end		334.0	13.9	9.3	0.022	0.072
LY24S	Br start	0.6	95.0	4.0	5.2	0.154	0.505
	Br peak		162.0	6.8	590.0	0.090	0.296
	Br end		402.1	16.8	14.6	0.036	0.119
LY42S	Br start	1.07	169.7	7.1	4.7	0.151	0.495
	Br peak		257.2	10.7	394.7	0.100	0.327
	Br end		498.9	20.8	17.9	0.051	0.168
Range	Br start					0.11-0.15	0.35-0.51
	Br peak					0.05-0.10	0.17-0.33
	Br end					0.02-0.05	0.07-0.17
Average (based on peak Br)						0.081	0.265

c:\44237-001R004\Wpdocs\Report\Final

4.3 Groundwater Transport

Pumped samples were collected starting with the closest well to the test area and continuing with those placed further away. The sampling interval was initially daily. To allow for a better visualization of the pumped data collected at the site, the mapping program **Surfer** was utilized for each sample event. **Surfer** is a grid-based mapping program that interpolates irregularly spaced XYZ data into a regularly spaced grid. Although there are several methods used in Surfer to fill in areas where data is missing, the Natural Neighbor method output gave the most informative graphs for determining the general peak bromide concentration flow direction (Appendix C, Figures C-1 through C-27). Although these graphs illustrate bromide movement, the areas without monitoring wells represent results from Surfer that are not well supported by field data. Nonetheless, the Surfer graphs in Appendix C depict the general flow path and bromide concentrations.

The graphs for time 568 hours (Figure 6) and time 1171 hours (Figure 7) are presented here to illustrate the general flow path for the peak bromide concentration (Figure 8) which follows approximately grid locations G3.5 → I5.

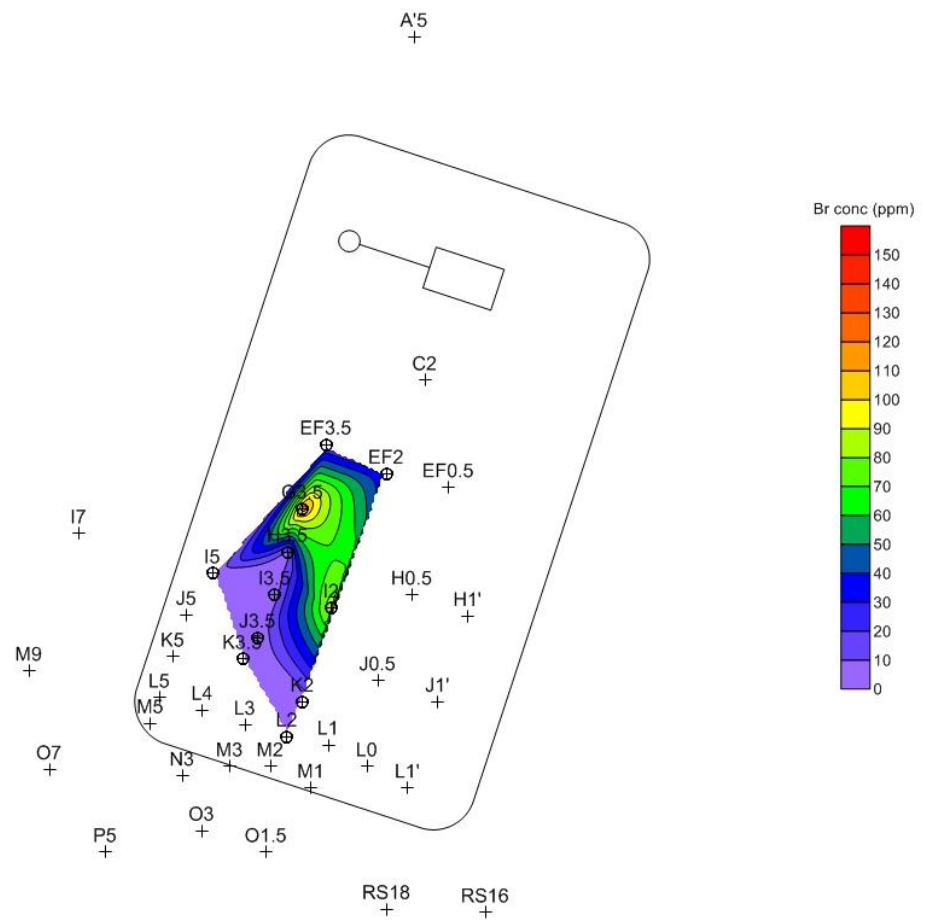


Figure 6
Time 568 hours, pumped sample
March 13th 8 am

ST16
+
ST14
+
o:\44237-001R01

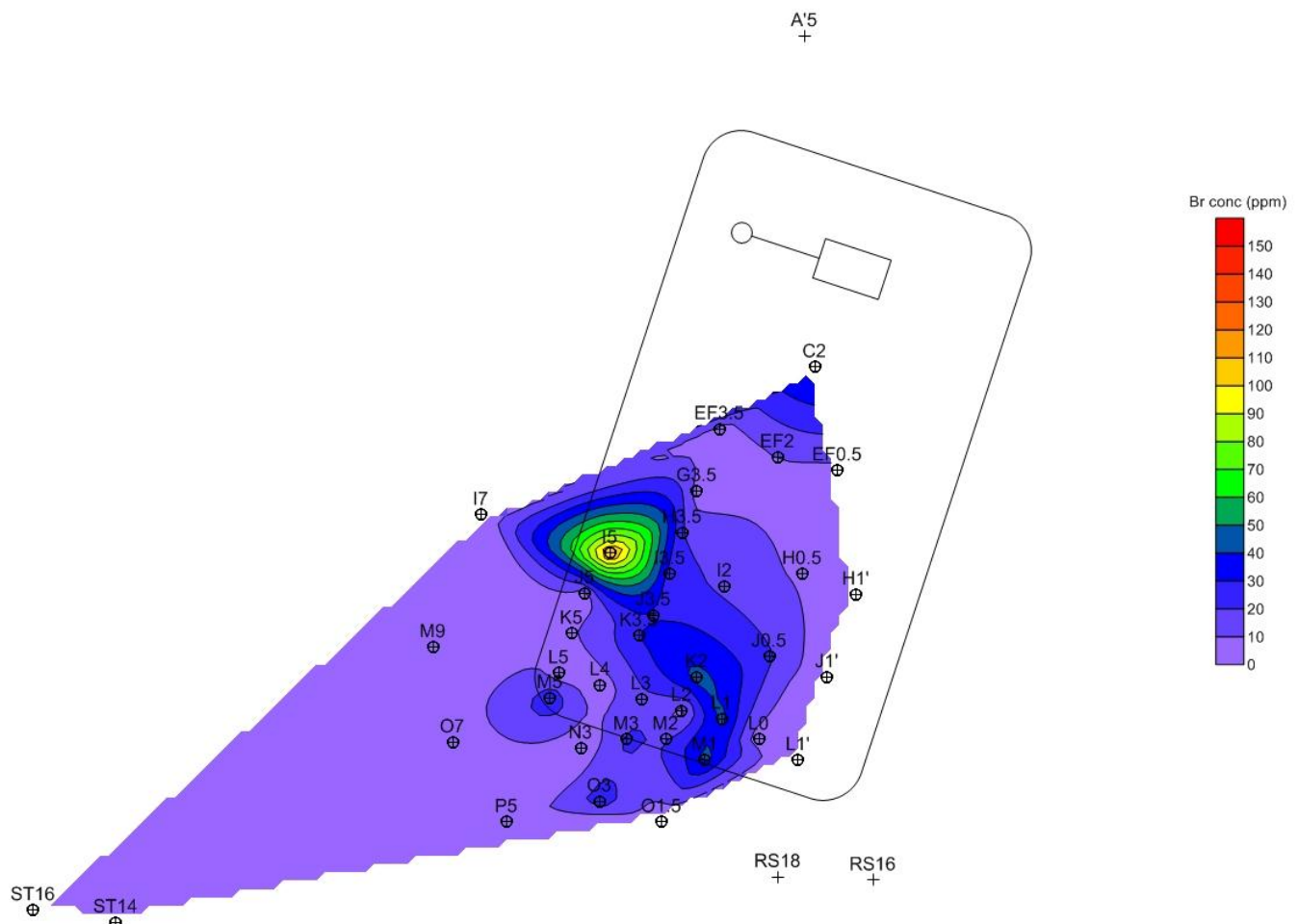


Figure 7
Time 1171 hours, pumped sample
April 7th 10 am

o:\44237-001R0

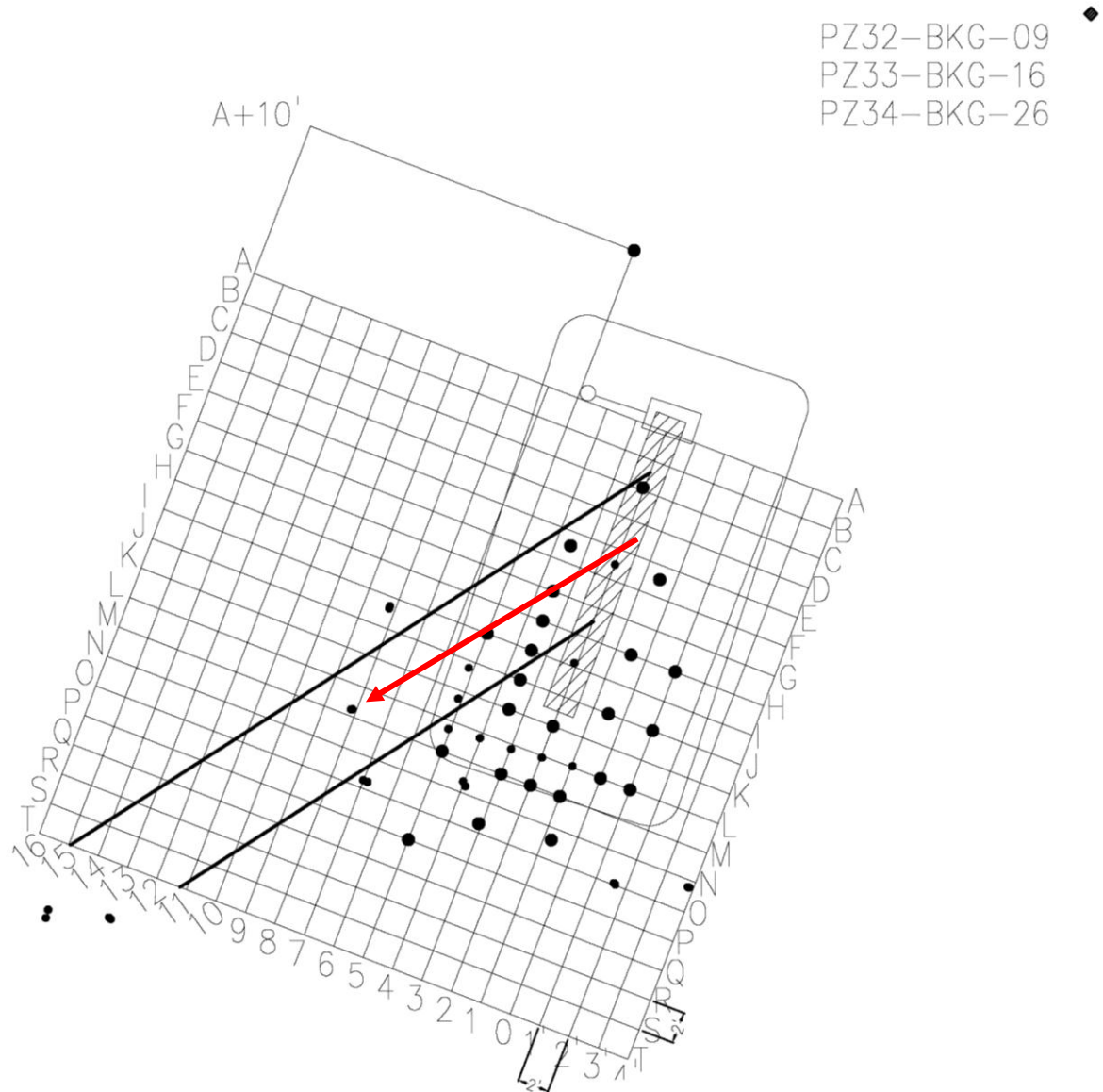


Figure 8
Approximate peak bromide concentration flow direction

o:\44237-001R004\Wpdocs\Report\Final

Breakthrough curves were generated for each of the wells where a datalogging sensor was installed. Figure 9 illustrates the curves at the two downgradient locations approximately 1.52 m (5 ft) apart (G3.5 and I5) where the peak bromide concentration was measured.

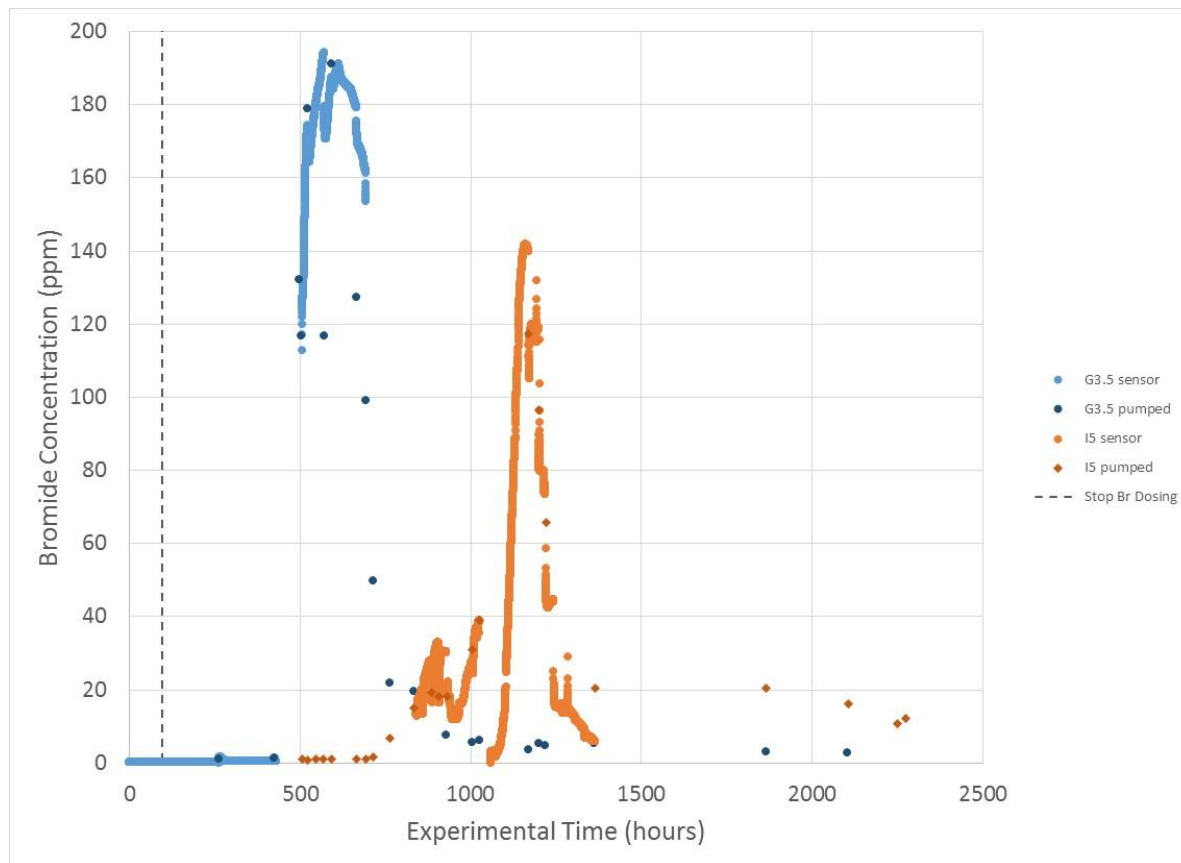


Figure 9
Test Area 3 Groundwater Breakthrough Curves

4.4 Groundwater Velocity and Hydraulic Conductivity Estimations

Various analytical methods are available for calculating the average interstitial velocity of groundwater flow. One approach in calculating the horizontal velocity is the empirical method where the distance is divided by the time of peak concentration occurrence (Table

4). During the 112-day period of bromide monitoring, the bromide plume moved horizontally away from the dosing area a distance of over 3 m (10 ft). Table 5 shows the calculated linear velocity in the area where the peak bromide concentrations were measured. The peak-to-peak tracer travel time between wellpoints G3.5 and I5 was 24.562 days. Using this travel time, the average groundwater seepage velocity immediately downgradient of the infiltrative surface was 1.5 m (4.96 ft) in 24.562 days, or approximately 0.0616 m/day (0.2019 ft/day) which is less than the velocity determined from tracer test No. 2 (median 0.0914 m/d) which was also conducted at GCREC.

Table 5. Groundwater Velocity using Empirical Method

Peak to Peak Well Ids	L, distance (m (ft))	t, Peak-to-peak tracer travel time (days)	Velocity (m/day)	Velocity (ft/day)
EF3.5→I5	2.34 (7.67)	19.806	0.1181	0.3873
G3.5→ I5	1.51 (4.96)	24.562	0.0616	0.2019
H3.5→ I5	1.10 (3.60)	18.806	0.0584	0.1914
I3.5→ I5	0.91 (3.00)	14.024	0.0652	0.2139
Median			0.0634	0.2079
Range			0.058 – 0.118	0.191 – 0.387

¹Peak flow path generally follows G3.5 → I5 direction

Huang (1991) presented an approach for one-dimensional tracer models using analytical solutions and the tracer breakthrough curve to calculate the average velocity. The following equations, developed by Huang (1991), were used to compare the peak G3.5 and I5 concentrations and travel time.

$$U_{max} = \frac{t_1 t_{max}}{t_1 - t_{max}} \ln \frac{C_1 \sqrt{t_1}}{C_{max} \sqrt{t_{max}}}$$

$$V = \sqrt{\frac{2U_{max} - t_{max}}{2U_{max} - t_1} \frac{x}{t_{max}}}$$

$$D = \frac{x^2 - V^2 t_{max}^2}{2t_{max}}$$

Where C_{\max} is the max concentration and t_{\max} is the time associated with C_{\max} , C_1 is the concentration at time t_1 , x is the distance to the tracer dose point, V is the estimated average linear velocity, and D is the dispersion coefficient of the tracer. U_{\max} is a calculated function relating tracer concentrations and travel times.

The tracer breakthrough and peak data for the G3.5 and I5 curves are summarized in Table 6. The estimated average horizontal groundwater linear velocity is 0.0639 m/day (0.2097 ft/day), which agrees well with the data in Table 5. The associated dispersion coefficient of the tracer for locations G3.5 and I5 are approximately 4.295 and 28.723 cm²/day (0.0046 and 0.0309 ft²/day), respectively.

Table 6. Breakthrough Curve Data

Well ID	t_1 Tracer break-through started (days after Bromide dosed)	C_1 Tracer break-through bromide concentration (ppm)	t_{\max} Peak concentration occurred (days after Bromide dosed)	C_{\max} Peak bromide concentration (ppm)	U_{\max}	X distance from Row 2 (m)	V Velocity (m/day)	D Dispersion coefficient (cm ² /day)
G3.5	17.72	1.29	23.74	194.30	361.0	1.545	0.0648	4.295
I5	31.77	6.92	48.30	141.90	299.9	3.088	0.0630	28.723
Average							0.0639	

The saturated hydraulic conductivity, K_{sat} , can also be estimated from the tracer results using Darcy's law as follows:

$$v = \frac{K_{sat} * gradient}{n_e}, \text{ solving for } K_{sat}$$

$$K_{sat} = \frac{v * n_e}{gradient}$$

where K_{sat} is the saturated hydraulic conductivity, and n_e is the effective porosity. Using the average groundwater velocity determined from the breakthrough curve data 0.0639 m/day (0.2096 ft/day), the average hydraulic gradient across the tracer test area (0.0157), and an estimated effective porosity of 33%; the estimated saturated hydraulic conductivity is 134.48 cm/day (4.4120 ft/day).

5.0 Summary

Based on the average peak bromide unsaturated zone travel time obtained during this tracer test, the estimated unsaturated zone flow rate is 0.081 m/day (0.265 ft/day) below the infiltrative surface of TA3. Using the peak-to-peak travel time determined in this tracer test, the groundwater seepage velocity immediately downgradient of the infiltrative surface of TA3 was 1.51 m (4.96 ft) in 24.562 days, or approximately 0.0616 m/day (0.2019 ft/day) which is less than the velocity determined from tracer test No. 2 which was also conducted at GCREC. The results of the tracer testing will be used in evaluating the fate and transport of nitrogen at the soil and groundwater test facility. In addition, the data will be used in the development of the Task D models.

References

Huang, H., 1991. On a One-Dimensional Tracer Model. Ground Water 29 (1):18-20.



Appendix A: S&GW Test Facility TA3 Sample Identification

Table A.1
S&GW Test Facility TA3 Sample Identification

ID #	Sample Identification	Test Area	Grid Location	Elev NGVD 29	Revised Elev NGVD 29	Notes
38	TA1-PZ-09-RS16	TA1	RS16	129.65	128.04	
39	TA1-PZ-16-RS16	TA1	RS16	129.72	128.00	
40	TA1-PZ-09-RS18	TA1	RS18	130.25	128.22	
41	TA1-PZ-16-RS18	TA1	RS18	130.25	128.25	
71	TA3-PAN-12-N	TA3	North			
72	TA3-OBS-N	TA3	North	131.20		
73	TA3-OBS-S	TA3	South	131.11		
74	TA3-SM-39-N	TA3	North	130.59		
75	TA3-SM-39-C	TA3	Center	130.60		
76	TA3-SM-39-S	TA3	South	130.57		
77	TA3-SM-BKG-S	TA3	South	129.32		
78	TA3-SM-BKG-E	TA3	East			
79	TA3-LY-24-C	TA3	Center	133.45		
80	TA3-LY-12-S	TA3	South	132.24		
81	TA3-LY-24-S	TA3	South	132.90		
82	TA3-LY-42-S	TA3	South	132.98		
83	TA3-T-6-C	TA3	Center	132.19		
84	TA3-T-12-C	TA3	Center	132.70		
85	TA3-T-24-C	TA3	Center	132.23		
86	TA3-T-36-C	TA3	Center	131.70		
87	TA3-T-42-C	TA3	Center	132.20		
88	TA3-T-6-S	TA3	South	132.19		
89	TA3-T-12-S	TA3	South	132.69		
90	TA3-T-24-S	TA3	South	132.22		
91	TA3-T-36-S	TA3	South	131.71		
92	TA3-T-42-S	TA3	South	132.21		

o:\44237-001\Wpdocs\Report\Draft

Table A.1
S&GW Test Facility TA3 Sample Identification

ID #	Sample Identification	Test Area	Grid Location	Elev NGVD 29	Revised Elev NGVD 29	Notes
93	TA3-PZ-11-EF2	TA3	EF2	133.82		
94	TA3-PZ-11-I2	TA3	I2	133.54		
95	TA3-PZ-10-J5	TA3	J5	133.49	128.31	
96	TA3-PZ-10-K5	TA3	K5	133.49	128.46	
97	TA3-PZ-11-L2	TA3	L2	133.51	129.16	
98	TA3-PZ-11-L3	TA3	L3	133.51	129.02	
99	TA3-PZ-11-L4	TA3	L4	133.50	128.83	
100	TA3-PZ-10-L5	TA3	L5	133.49	128.53	
101	TA3-PZ-09-N3	TA3	N3	129.88	129.19	
102	TA3-PZ-16-N3	TA3	N3	129.89	129.26	
103	TA3-PZ-09-O7	TA3	O7	130.06	128.20	
104	TA3-PZ-16-O7	TA3	O7	130.26	128.19	
105	TA3-PZ-09-I7	TA3	I7	130.06	129.48	
106	TA3-PZ-16-I7	TA3	I7	130.06	129.48	
107	TA3-PZ-09-M9	TA3	M9	130.18	129.60	
108	TA3-PZ-16-M9	TA3	M9	130.12	129.54	
109	TA3-PZ-09-ST14	TA3	ST14	129.88		
110	TA3-PZ-16-ST14	TA3	ST14	129.81		
111	TA3-PZ-09-ST16	TA3	ST16	129.54		
112	TA3-PZ-16-ST16	TA3	ST16	130.00		
167	PZ32-BKG-09	BKG		133.51		
168	PZ33-BKG-16	BKG		132.84		
169	PZ34-BKG-26	BKG		130.45		
184	PZ-44	TA3		131.82		
185	PZ-45	TA3		132.48		
198	TA3-PZ-BKG5	TA3	BKG5	131.36		New well installed Oct 2013
199	TA3-PZ-C2	TA3	C2	132.08		New well installed Oct 2013
200	TA3-PZ-EF0.5	TA3	EF0.5	131.24		New well installed Oct 2013
201	TA3-PZ-EF3.5	TA3	EF3.5	131.52		New well installed Oct 2013
202	TA3-PZ-G3.5	TA3	G3.5	131.05		New well installed Oct 2013
203	TA3-PZ-H1'	TA3	H1'	131.41		New well installed Oct 2013

o:\44237-001\Wpdocs\Report\Draft

Table A.1
S&GW Test Facility TA3 Sample Identification

ID #	Sample Identification	Test Area	Grid Location	Elev NGVD 29	Revised Elev NGVD 29	Notes
204	TA3-PZ-H0.5	TA3	H0.5	131.25		New well installed Oct 2013
205	TA3-PZ-H3.5	TA3	H3.5	131.04		New well installed Oct 2013
206	TA3-PZ-I3.5	TA3	I3.5	131.49		New well installed Oct 2013
207	TA3-PZ-I5	TA3	I5	130.90		New well installed Oct 2013
208	TA3-PZ-J1'	TA3	J1'	131.24		New well installed Oct 2013
209	TA3-PZ-J0.5	TA3	J0.5	131.34		New well installed Oct 2013
210	TA3-PZ-J3.5	TA3	J3.5	130.91		New well installed Oct 2013
211	TA3-PZ-K2	TA3	K2	131.46		New well installed Oct 2013
212	TA3-PZ-K3.5	TA3	K3.5	131.28		New well installed Oct 2013
213	TA3-PZ-L1'	TA3	L1'	131.52		New well installed Oct 2013
214	TA3-PZ-L0	TA3	L0	131.18		New well installed Oct 2013
215	TA3-PZ-M1	TA3	M1	131.54		New well installed Oct 2013
216	TA3-PZ-M2	TA3	M2	131.40		New well installed Oct 2013
217	TA3-PZ-M3	TA3	M3	131.34		New well installed Oct 2013
218	TA3-PZ-M5	TA3	M5	131.45		New well installed Oct 2013
219	TA3-PZ-O1.5	TA3	O1.5	131.16		New well installed Oct 2013
220	TA3-PZ-O3	TA3	O3	130.88		New well installed Oct 2013
221	TA3-PZ-P5	TA3	P5	129.28		New well installed Oct 2013

o:\44237-001\Wpdocs\Report\Draft



Appendix B: Laboratory Results

o:\44237-001\Wpdocs\Report\Draft

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-10-D						
Matrix		Water						
SAL Sample Number		1401927-01						
Date/Time Collected		02/19/14 08:58						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	7.1	EPA 300.0	0.20	0.022		02/24/14 15:48	1
Sample Description		BR-100-D						
Matrix		Water						
SAL Sample Number		1401927-02						
Date/Time Collected		02/19/14 08:59						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	77	EPA 300.0	2.0	0.22		02/24/14 15:58	10
Sample Description		BR-500-D						
Matrix		Water						
SAL Sample Number		1401927-03						
Date/Time Collected		02/19/14 09:00						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	380	EPA 300.0	20	2.2		02/24/14 16:07	100
Sample Description		BR-1000-D						
Matrix		Water						
SAL Sample Number		1401927-04						
Date/Time Collected		02/19/14 08:59						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	830	EPA 300.0	20	2.2		02/24/14 16:17	100

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-2000-D						
Matrix		Water						
SAL Sample Number		1401927-05						
Date/Time Collected		02/19/14 09:01						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	1,700	EPA 300.0	20	2.2		02/24/14 16:26	100
Sample Description		Tank-1000						
Matrix		Water						
SAL Sample Number		1401927-06						
Date/Time Collected		02/19/14 07:20						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	800	EPA 300.0	20	2.2		02/24/14 16:35	100
Sample Description		Tank-1000						
Matrix		Water						
SAL Sample Number		1401927-07						
Date/Time Collected		02/18/14 11:55						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	780	EPA 300.0	20	2.2		02/24/14 16:45	100
Sample Description		Tank-1000						
Matrix		Water						
SAL Sample Number		1401927-08						
Date/Time Collected		02/17/14 19:00						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	780	EPA 300.0	20	2.2		02/25/14 07:30	100

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		K3.5						
Matrix		Water						
SAL Sample Number		1401927-09						
Date/Time Collected		02/17/14 10:23						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	0.62	EPA 300.0	0.20	0.022		02/24/14 17:03	1
Sample Description		Tank						
Matrix		Water						
SAL Sample Number		1401927-10						
Date/Time Collected		02/18/14 07:06						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	750	EPA 300.0	20	2.2		02/25/14 07:40	100
Sample Description		Tank						
Matrix		Water						
SAL Sample Number		1401927-11						
Date/Time Collected		02/18/14 15:05						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	760	EPA 300.0	20	2.2		02/24/14 17:50	100
Sample Description		Tank						
Matrix		Water						
SAL Sample Number		1401927-12						
Date/Time Collected		02/17/14 14:45						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	770	EPA 300.0	20	2.2		02/24/14 18:00	100

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		Tank						
Matrix		Water						
SAL Sample Number		1401927-13						
Date/Time Collected		02/17/14 15:05						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	730	EPA 300.0	20	2.2		02/24/14 18:09	100
Sample Description		EF2						
Matrix		Water						
SAL Sample Number		1401927-14						
Date/Time Collected		02/17/14 09:32						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	0.022 U	EPA 300.0	0.20	0.022		02/24/14 18:18	1
Sample Description		C4-12-S						
Matrix		Water						
SAL Sample Number		1401927-15						
Date/Time Collected		02/18/14 12:05						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/19/14 15:30						
<u>Inorganics</u>								
Bromide	mg/L	0.022 U	EPA 300.0	0.20	0.022		02/24/14 18:28	1

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BB42401 - Ion Chromatography 300.0 Prep										
Blank (BB42401-BLK1)					Prepared & Analyzed: 02/24/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
LCS (BB42401-BS1)					Prepared & Analyzed: 02/24/14					
Bromide	7.25	0.20	0.022	mg/L	7.5		97	85-115		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
LCS Dup (BB42401-BSD1)					Prepared & Analyzed: 02/24/14					
Bromide	7.29	0.20	0.022	mg/L	7.5		97	85-115	0.6	200
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
Matrix Spike (BB42401-MS1)					Source: 1401927-10		Prepared & Analyzed: 02/24/14			
Bromide	1,420	20	2.2	mg/L	750	749	90	85-115		
Surrogate: Dichloroacetate	0.953			mg/L	1.0		95	90-115		
Matrix Spike (BB42401-MS2)					Source: 1401882-05		Prepared & Analyzed: 02/24/14			
Bromide	72.3	2.0	0.22	mg/L	75	2.04	94	85-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

February 25, 2014
Work Order: 1401927

* Qualifiers, Notes and Definitions

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

Christy Whitehurst

Telephone (813) 855-1844 FAX (813) 855-2218

Christy@southernanalyticallabs.com



Client Name		Project Name / Location		Matrix Codes:		PARAMETER / CONTAINER DESCRIPTION												Instructions / Remarks:							
SAL Use Only		Sample Description		Date	Time	Matrix	Composite	Grab	500mL P, Cool	TSS, CBOD, NOX, SO ₄	125mL P, H ₂ SO ₄	TKN, NH ₃	500mL P, NaOH, Zn	Acetate	500mL P, Cool	NOX	500mL P, Cool	NOX, SO ₄	500mL P, Cool	TSS, CBOD, NOX	Field Temperature	Field pH	Field Conductivity	Field DO	No. of Containers (Total per each location)
01	01	BR-10-D	2/19/14	8:58	WW			X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
02	02	BR-100-D	2/19/14	8:59	WW			X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
03	03	BR-500-D	2/19/14	9:00	WW			X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
04	04	BR-1000-D	2/19/14	9:01	WW			X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
05	05	BR-2000-D	2/19/14	9:01	WW			X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
06	06	Tank - 1000	2/19/14	7:20	WW																				
07	07	Tank - 1000	2/18/14	11:35	WW																				
08	08	Tank - 1000	2/17/14	19:00	WW																				
09	09	K3.5	2/17/14	10:22	WW																				
10	10	Tank	2/18/14	7:00	WW																				
11	11	Tank	2/18/14	15:05	WW																				
12	12	Tank	2/17/14	14:45	WW																				
Containers Prepared/Relinquished:		Date/Time: 12:45		Received:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:	
Relinquished:		Date/Time: 02-17-18		Received:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:	
Relinquished:		Date/Time:		Received:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:	
Relinquished:		Date/Time:		Received:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:	
Relinquished:		Date/Time:		Received:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:		Date/Time:	

Chain of Custody

2 x 500mL, unpres
2 x 250mL, unpres
1 x plastic vial, unpres

1307319

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

SAL Project No. 1401927

[illegible]Chain of Custody.xls
Rev Date 11/19/01Chain of Custody Page 1 of 1

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA5-Outlet						
Matrix		Wastewater						
SAL Sample Number		1402044-01						
Date/Time Collected		02/24/14 10:34						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	98	EPA 300.0	2.0	0.22		03/03/14 19:12	10
Sample Description		Tank-WW						
Matrix		Wastewater						
SAL Sample Number		1402044-02						
Date/Time Collected		02/23/14 08:20						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	34	EPA 300.0	2.0	0.22		03/03/14 19:23	10
Sample Description		Tank-1000						
Matrix		Wastewater						
SAL Sample Number		1402044-03						
Date/Time Collected		02/20/14 12:23						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	750	EPA 300.0	20	2.2		03/04/14 09:49	100
Sample Description		TA3-LY-12S						
Matrix		Wastewater						
SAL Sample Number		1402044-04						
Date/Time Collected		02/20/14 18:15						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	46	EPA 300.0	0.20	0.022		03/03/14 19:57	1

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		Tank WW						
Matrix		Wastewater						
SAL Sample Number		1402044-05						
Date/Time Collected		02/24/14 09:45						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	26	EPA 300.0	2.0	0.22		03/04/14 16:24	10
Sample Description		Tank-1000						
Matrix		Wastewater						
SAL Sample Number		1402044-06						
Date/Time Collected		02/20/14 17:15						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	750	EPA 300.0	20	2.2		03/04/14 16:35	100
Sample Description		TA5-Outlet						
Matrix		Wastewater						
SAL Sample Number		1402044-07						
Date/Time Collected		02/24/14 13:47						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	100	EPA 300.0	2.0	0.22		03/04/14 16:46	10
Sample Description		Tank-WW						
Matrix		Wastewater						
SAL Sample Number		1402044-08						
Date/Time Collected		02/24/14 13:45						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	26	EPA 300.0	2.0	0.22		03/04/14 16:58	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA5-LY-18-C						
Matrix		Wastewater						
SAL Sample Number		1402044-09						
Date/Time Collected		02/24/14 09:16						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	580	EPA 300.0	20	2.2		03/04/14 17:09	100
Sample Description		TA5-LY-18-C						
Matrix		Wastewater						
SAL Sample Number		1402044-10						
Date/Time Collected		02/23/14 09:10						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	410	EPA 300.0	2.0	0.22		03/04/14 17:20	10
Sample Description		TA3-LY-42S						
Matrix		Groundwater						
SAL Sample Number		1402044-11						
Date/Time Collected		02/24/14 09:12						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	0.022 U	EPA 300.0	0.20	0.022		03/04/14 17:43	1
Sample Description		TA3-LY-24-S						
Matrix		Groundwater						
SAL Sample Number		1402044-12						
Date/Time Collected		02/24/14 09:09						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	590	EPA 300.0	2.0	0.22		03/04/14 18:17	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA3-LY-24S						
Matrix		Groundwater						
SAL Sample Number		1402044-13						
Date/Time Collected		02/23/14 09:08						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	470	EPA 300.0	2.0	0.22		03/04/14 18:29	10
Sample Description		TA3-LY-12S						
Matrix		Groundwater						
SAL Sample Number		1402044-14						
Date/Time Collected		02/24/14 09:07						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	400	EPA 300.0	2.0	0.22		03/04/14 18:40	10
Sample Description		TA3-LY-12S						
Matrix		Groundwater						
SAL Sample Number		1402044-15						
Date/Time Collected		02/23/14 09:05						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	580	EPA 300.0	20	2.2		03/04/14 18:52	100
Sample Description		TA3-LY-12S						
Matrix		Groundwater						
SAL Sample Number		1402044-16						
Date/Time Collected		02/22/14 08:11						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	330	EPA 300.0	2.0	0.22		03/05/14 10:24	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA3-LY-42S						
Matrix		Groundwater						
SAL Sample Number		1402044-17						
Date/Time Collected		02/23/14 09:22						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	0.022 U	EPA 300.0	0.20	0.022		03/04/14 19:14	1
Sample Description		TA3-LY-24S						
Matrix		Groundwater						
SAL Sample Number		1402044-18						
Date/Time Collected		02/22/14 08:12						
Collected by		Josephine Edeback-Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	73	EPA 300.0	2.0	0.22		03/04/14 19:26	10
Sample Description		TA5-LY-18C						
Matrix		Groundwater						
SAL Sample Number		1402044-19						
Date/Time Collected		02/22/14 08:15						
Collected by		Josefin Hirst						
Date/Time Received		02/25/14 10:30						
<u>Inorganics</u>								
Bromide	mg/L	180	EPA 300.0	2.0	0.22		03/04/14 19:37	10

Hazen and Sawyer
 10002 Princess Palm Ave, Suite 200
 Tampa, FL 33619

March 5, 2014
 Work Order: 1402044

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC40306 - Ion Chromatography 300.0 Prep										
Blank (BC40306-BLK1)					Prepared & Analyzed: 03/03/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	1.01			mg/L	1.0		101	90-115		
LCS (BC40306-BS1)					Prepared & Analyzed: 03/03/14					
Bromide	7.05	0.20	0.022	mg/L	7.5		94	85-115		
Surrogate: Dichloroacetate	0.961			mg/L	1.0		96	90-115		
LCS Dup (BC40306-BSD1)					Prepared & Analyzed: 03/03/14					
Bromide	7.22	0.20	0.022	mg/L	7.5		96	85-115	2	200
Surrogate: Dichloroacetate	0.972			mg/L	1.0		97	90-115		
Matrix Spike (BC40306-MS1)					Source: 1401951-02		Prepared & Analyzed: 03/03/14			
Bromide	75.2	2.0	0.22	mg/L	75	ND	100	85-115		
Surrogate: Dichloroacetate	0.981			mg/L	1.0		98	90-115		
Matrix Spike (BC40306-MS2)					Source: 1402044-03		Prepared & Analyzed: 03/03/14			
Bromide	1,560	20	2.2	mg/L	750	754	107	85-115		
Surrogate: Dichloroacetate	0.967			mg/L	1.0		97	90-115		
Batch BC40410 - Ion Chromatography 300.0 Prep										
Blank (BC40410-BLK1)					Prepared & Analyzed: 03/04/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	0.976			mg/L	1.0		98	90-115		
LCS (BC40410-BS1)					Prepared & Analyzed: 03/04/14					
Bromide	7.20	0.20	0.022	mg/L	7.5		96	85-115		
Surrogate: Dichloroacetate	0.950			mg/L	1.0		95	90-115		

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC40410 - Ion Chromatography 300.0 Prep										
LCS Dup (BC40410-BSD1)					Prepared & Analyzed: 03/04/14					
Bromide	7.32	0.20	0.022	mg/L	7.5		98	85-115	2	200
Surrogate: Dichloroacetate	0.971			mg/L	1.0		97	90-115		
Matrix Spike (BC40410-MS1)					Source: 1402044-10 Prepared & Analyzed: 03/04/14					
Bromide	489	2.0	0.22	mg/L	75	415	100	85-115		
Surrogate: Dichloroacetate	0.927			mg/L	1.0		93	90-115		
Matrix Spike (BC40410-MS2)					Source: 1401942-01 Prepared & Analyzed: 03/04/14					
Bromide	77.2	2.0	0.22	mg/L	75	ND	103	85-115		
Surrogate: Dichloroacetate	0.955			mg/L	1.0		96	90-115		

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402044

*** Qualifiers, Notes and Definitions**

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

Christy Whitehurst

Telephone (813) 855-1844 FAX (813) 855-2218

Christy@southernanalyticallabs.com



Client Name <u>Hazen and Sawyer</u>		Contact / Phone: <u>813-630-4498</u>	
Project Name / Location <u>Test Area 3 Tracer Test</u>		Turn Around Time Requested ("Surcharges may apply") <input checked="" type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input type="checkbox"/> 5 Bus. Days* <input type="checkbox"/> 10 Bus. Days <input checked="" type="checkbox"/>	
Samplers: (Signature) <u>[Signature]</u>		PARAMETER / CONTAINER DESCRIPTION	
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water		No. of Containers (Total per each location)	
SAL Use Only	Sample Description	Date	Time
01	TAS-OUTLET	2/24/14	10:34
02	Tank-ww	2/23/14	8:20
03	Tank-1000	2/10/14	12:23
04	TAS-LY-125	2/20/14	14:15
05	Tank-ww	2/24/14	09:45
06	Tank-1000	2/20/14	17:15
07	TAS-OUTLET	2/24/14	13:47
08	Tank-ww	2/24/14	13:45
09	TAS-LY-18-C	2/24/14	09:16
10	TAS-LY-18-C	2/23/14	9:10
11	TAS-LY-425	2/24/14	09:12
12	TAS-LY-245	2/24/14	09:09
Containers Prepared/Relinquished:	Date/Time:	Received:	Seal intact?
<u>[Signature]</u>	2/25/14	Scott McCullough	<input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
Relinquished:	Date/Time:	Received:	Samples intact upon arrival?
<u>Scott McCullough</u>	2/25/14	<u>[Signature]</u>	<input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
Relinquished:	Date/Time:	Received:	Received on ice? Temp <u>3.1</u>
			<input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
			Proper preservatives indicated?
			<input checked="" type="checkbox"/> Y <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
			Rec'd within holding time?
			<input checked="" type="checkbox"/> Y <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
			Volatiles rec'd w/out headspace?
			<input checked="" type="checkbox"/> Y <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
			Proper containers used?
			<input checked="" type="checkbox"/> Y <input checked="" type="checkbox"/> N <input checked="" type="checkbox"/> NA
		Instructions / Remarks	
		<u>12 x 125 mL P, (w)</u>	
		<u>7 x 250 mL P, (w)</u>	

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-100-E-1						
Matrix		Water						
SAL Sample Number		1402168-01						
Date/Time Collected		02/27/14 12:50						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	63	EPA 300.0	2.0	0.22		02/28/14 06:11	10
Sample Description		BR-100-E-2						
Matrix		Water						
SAL Sample Number		1402168-02						
Date/Time Collected		02/27/14 12:50						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	82	EPA 300.0	2.0	0.22		02/28/14 06:23	10
Sample Description		BR-1000-E-1						
Matrix		Water						
SAL Sample Number		1402168-03						
Date/Time Collected		02/27/14 12:45						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	700	EPA 300.0	20	2.2		02/28/14 06:34	100
Sample Description		BR-1000-E-2						
Matrix		Water						
SAL Sample Number		1402168-04						
Date/Time Collected		02/27/14 12:45						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	820	EPA 300.0	20	2.2		02/28/14 06:46	100

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-10-E						
Matrix		Water						
SAL Sample Number		1402168-05						
Date/Time Collected		02/27/14 13:15						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	6.6	EPA 300.0	0.20	0.022		03/01/14 00:27	1
Sample Description		BR-100-E-3						
Matrix		Water						
SAL Sample Number		1402168-06						
Date/Time Collected		02/27/14 13:40						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	74	EPA 300.0	2.0	0.22		03/01/14 00:38	10
Sample Description		BR-500-E						
Matrix		Water						
SAL Sample Number		1402168-07						
Date/Time Collected		02/27/14 13:20						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	370	EPA 300.0	20	2.2		03/01/14 00:49	100
Sample Description		BR-1000-E-3						
Matrix		Water						
SAL Sample Number		1402168-08						
Date/Time Collected		02/27/14 13:35						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	800	EPA 300.0	20	2.2		03/01/14 01:01	100

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-2000						
Matrix		Water						
SAL Sample Number		1402168-09						
Date/Time Collected		02/27/14 13:25						
Collected by		Josefin Hirst						
Date/Time Received		02/27/14 14:50						
<u>Inorganics</u>								
Bromide	mg/L	1,500	EPA 300.0	20	2.2		03/01/14 01:12	100

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BB42730 - Ion Chromatography 300.0 Prep										
Blank (BB42730-BLK1)					Prepared & Analyzed: 02/28/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	0.994			mg/L	1.0		99	90-115		
LCS (BB42730-BS1)					Prepared & Analyzed: 02/28/14					
Bromide	7.47	0.20	0.022	mg/L	7.5		100	85-115		
Surrogate: Dichloroacetate	0.996			mg/L	1.0		100	90-115		
LCS Dup (BB42730-BSD1)					Prepared & Analyzed: 02/28/14					
Bromide	7.56	0.20	0.022	mg/L	7.5		101	85-115	1	200
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Matrix Spike (BB42730-MS1)					Source: 1402168-04		Prepared & Analyzed: 02/28/14			
Bromide	1,640	20	2.2	mg/L	750	816	110	85-115		
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
Batch BB42832 - Ion Chromatography 300.0 Prep										
Blank (BB42832-BLK1)					Prepared & Analyzed: 02/28/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
LCS (BB42832-BS1)					Prepared & Analyzed: 02/28/14					
Bromide	7.21	0.20	0.022	mg/L	7.5		96	85-115		
Surrogate: Dichloroacetate	0.948			mg/L	1.0		95	90-115		
LCS Dup (BB42832-BSD1)					Prepared & Analyzed: 02/28/14					
Bromide	7.29	0.20	0.022	mg/L	7.5		97	85-115	1	200
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BB42832 - Ion Chromatography 300.0 Prep										
Matrix Spike (BB42832-MS1)		Source: 1401964-03			Prepared & Analyzed: 03/01/14					
Bromide	7.23	0.20	0.022	mg/L	7.5	0.197	94	85-115		
Surrogate: Dichloroacetate	1.05			mg/L	1.0		105	90-115		

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 5, 2014
Work Order: 1402168

*** Qualifiers, Notes and Definitions**

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

Christy Whitehurst

Telephone (813) 855-1844 FAX (813) 855-2218

Christy@southernanalyticallabs.com



SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

SAL Project No. 1402168

Client Name <u>Hazen and Sawyer</u>		Contact / Phone: <u>813-630-4498</u>	
Project Name / Location <u>Test Area 3 Tracer Test Stack E</u>		Turn Around Time Requested ("Surcharges may apply") <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input type="checkbox"/> 5 Bus. Days <input type="checkbox"/> 10 Bus. Days <input type="checkbox"/>	
Samplers: (Signature) <u>[Signature]</u>		PARAMETER / CONTAINER DESCRIPTION	
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water		No. of Containers (Total)	
SAL Use Only	Sample Description	Date	Time
01	BR-100-E-1	2/27/14	12:50
02	BR-100-E-2	2/27/14	12:50
03	BR-1000-E-1	2/27/14	12:45
04	BR-1000-E-2	2/27/14	12:45
05	BR-10-E	2/27/14	13:15
06	BR-100-E-3		13:40
07	BR-500-E		13:20
08	BR-1000-E-3		13:35
09	BR-2000		13:25
Containers Prepared/Relinquished: <u>[Signature]</u>		Date/Time: <u>2/27/14</u>	Received: <u>[Signature]</u>
Relinquished: <u>[Signature]</u>		Date/Time: <u>2/27/14</u>	Received: <u>[Signature]</u>
Relinquished:		Date/Time:	Received:
Relinquished:		Date/Time:	Received:
Relinquished:		Date/Time:	Received:

Seal intact?	Seal intact upon arrival?	Received on ice? Temp	Proper preservatives indicated?	Rec'd within holding time?	Volatiles rec'd w/out heads pact	Proper containers used?
<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N	<input checked="" type="checkbox"/> Y	<input checked="" type="checkbox"/> N
Instructions / Remarks						
<div> <div>Requested turnaround ASAP</div> <div>BR popz</div> <div>100</div> <div>100</div> <div>1000</div> <div>1000</div> <div>10</div> <div>100</div> <div>500</div> <div>1000</div> <div>2000</div> </div> <div> <div>Brands Only</div> <div>ASAP</div> <div>Whenever able to get done</div> </div>						

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 17, 2014
Work Order: 1402575

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA3 I2						
Matrix		Wastewater						
SAL Sample Number		1402575-01						
Date/Time Collected		03/10/14 09:24						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	45	EPA 300.0	0.20	0.022		03/14/14 22:22	1
Sample Description		TA3 G3.5						
Matrix		Wastewater						
SAL Sample Number		1402575-02						
Date/Time Collected		03/10/14 09:09						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	150	EPA 300.0	2.0	0.22		03/14/14 22:33	10
Sample Description		TA3 EF2						
Matrix		Wastewater						
SAL Sample Number		1402575-03						
Date/Time Collected		03/10/14 09:12						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	37	EPA 300.0	0.20	0.022		03/14/14 22:45	1
Sample Description		TA3 G3.5						
Matrix		Wastewater						
SAL Sample Number		1402575-04						
Date/Time Collected		03/11/14 08:42						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	150	EPA 300.0	2.0	0.22		03/14/14 22:56	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 17, 2014
Work Order: 1402575

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		TA3 I2						
Matrix		Wastewater						
SAL Sample Number		1402575-05						
Date/Time Collected		03/11/14 08:48						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	51	EPA 300.0	0.20	0.022		03/14/14 23:08	1
Sample Description		BR-10G						
Matrix		Wastewater						
SAL Sample Number		1402575-06						
Date/Time Collected		03/10/14 12:30						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	9.1	EPA 300.0	0.20	0.022		03/14/14 23:19	1
Sample Description		BR-100F						
Matrix		Wastewater						
SAL Sample Number		1402575-07						
Date/Time Collected		03/10/14 15:00						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	92	EPA 300.0	2.0	0.22		03/14/14 23:30	10
Sample Description		BR-100G						
Matrix		Wastewater						
SAL Sample Number		1402575-08						
Date/Time Collected		03/10/14 12:45						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	92	EPA 300.0	2.0	0.22		03/14/14 23:42	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 17, 2014
Work Order: 1402575

Laboratory Report

Project Name		Wastewater						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BR-500G						
Matrix		Wastewater						
SAL Sample Number		1402575-09						
Date/Time Collected		03/10/14 12:55						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	460	EPA 300.0	2.0	0.22		03/14/14 23:53	10
Sample Description		BR-1000G						
Matrix		Wastewater						
SAL Sample Number		1402575-10						
Date/Time Collected		03/10/14 13:00						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	900	EPA 300.0	20	2.2		03/15/14 00:05	100
Sample Description		BR-1000F						
Matrix		Wastewater						
SAL Sample Number		1402575-11						
Date/Time Collected		03/10/14 15:00						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	810	EPA 300.0	20	2.2		03/15/14 00:50	100
Sample Description		BR-2000G						
Matrix		Wastewater						
SAL Sample Number		1402575-12						
Date/Time Collected		03/10/14 13:15						
Collected by		Sean Schmidt						
Date/Time Received		03/11/14 13:00						
<u>Inorganics</u>								
Bromide	mg/L	1,800	EPA 300.0	20	2.2		03/15/14 01:02	100

SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 17, 2014
Work Order: 1402575

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC41402 - Ion Chromatography 300.0 Prep										
Blank (BC41402-BLK1)					Prepared & Analyzed: 03/14/14					
Bromide	0.022 U	0.20	0.022	mg/L						
Surrogate: Dichloroacetate	1.15			mg/L	1.0		115	90-115		
LCS (BC41402-BS1)					Prepared & Analyzed: 03/14/14					
Bromide	7.42	0.20	0.022	mg/L	7.5		99	85-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
LCS Dup (BC41402-BSD1)					Prepared & Analyzed: 03/14/14					
Bromide	7.42	0.20	0.022	mg/L	7.5		99	85-115	0.05	200
Surrogate: Dichloroacetate	1.13			mg/L	1.0		113	90-115		
Matrix Spike (BC41402-MS1)					Source: 1402575-10		Prepared & Analyzed: 03/15/14			
Bromide	1,620	20	2.2	mg/L	750	899	96	85-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Matrix Spike (BC41402-MS2)					Source: 1402575-12		Prepared & Analyzed: 03/15/14			
Bromide	2,490	20	2.2	mg/L	750	1810	91	85-115		
Surrogate: Dichloroacetate	1.13			mg/L	1.0		113	90-115		

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

March 17, 2014
Work Order: 1402575

*** Qualifiers, Notes and Definitions**

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

Questions regarding this report should be directed to :

Christy Whitehurst

Telephone (813) 855-1844 FAX (813) 855-2218

Christy@southernanalyticallabs.com



Client Name <u>Hazen & Sawyer</u>		Contact / Phone:	
Project Name / Location <u>OCREC TAZ Tracer Test</u>		Turn Around Time Requested (*Surcharges may apply) <input type="checkbox"/> 24 Hour <input type="checkbox"/> 48 Hour <input type="checkbox"/> 5 Bus. Days* <input type="checkbox"/> 10 Bus. Days <input type="checkbox"/>	
Samplers: (Signature) <u>[Signature]</u>		PARAMETER / CONTAINER DESCRIPTION	
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water	Sample Description	Date	Time
SAL Use Only Sample No.	Matrix	Composite	Grab
01 TAZ IZ	GW	✓	✓
02 TAZ G3.5	GW	✓	✓
03 TAZ EF2	GW	✓	✓
04 TAZ G3.5	GW	✓	✓
05 TAZ IZ	GW	✓	✓
06 BR-10G	WW	✓	✓
07 BR-100F	WW	✓	✓
08 BR-100G	WW	✓	✓
09 BR-500G	WW	✓	✓
10 BR-1000G	WW	✓	✓
11 AB-1000F	WW	✓	✓
12 BR-2000G	WW	✓	✓
Containers Prepared/Relinquished:	Date/Time: <u>3/11/14</u>	Received:	Date/Time: <u>3/11/14</u>
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:



Appendix C: Pumped Sample Graphs

o:\44237-001\Wpdocs\Report\Draft

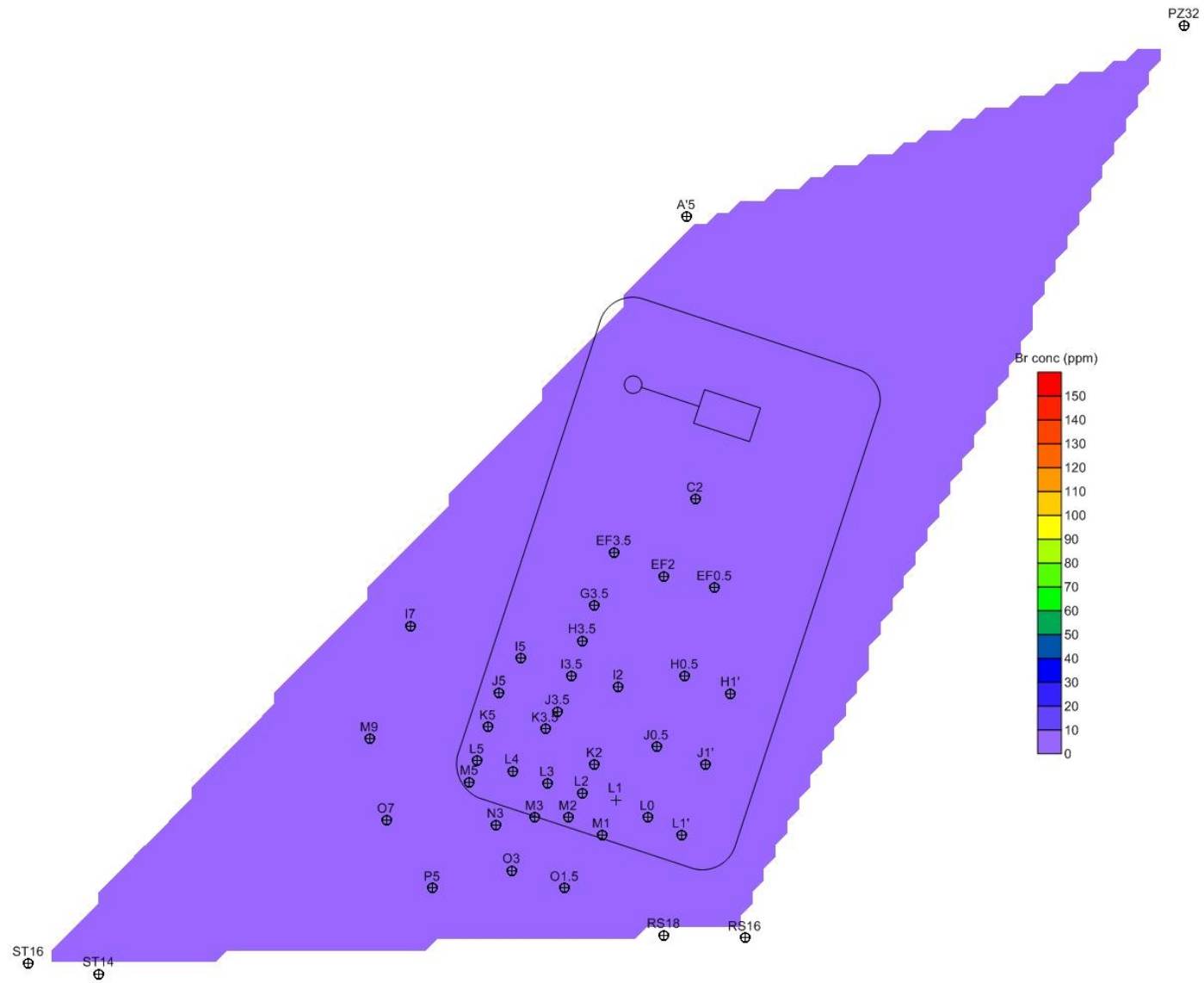


Figure C-1
February 17th 10 am
0 hours, pumped samples

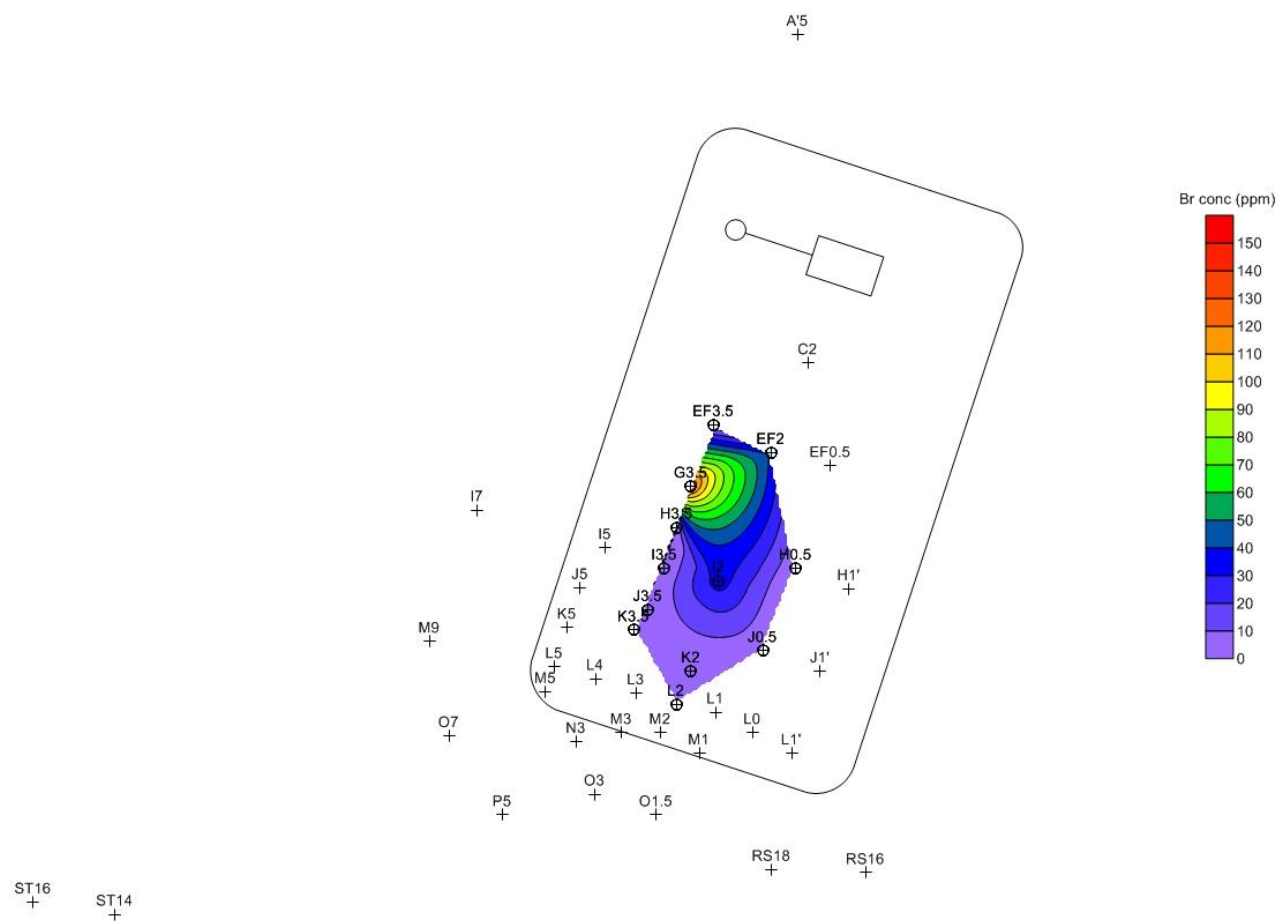
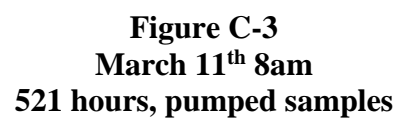


Figure C-2
March 10th 9am
498 hours, pumped samples



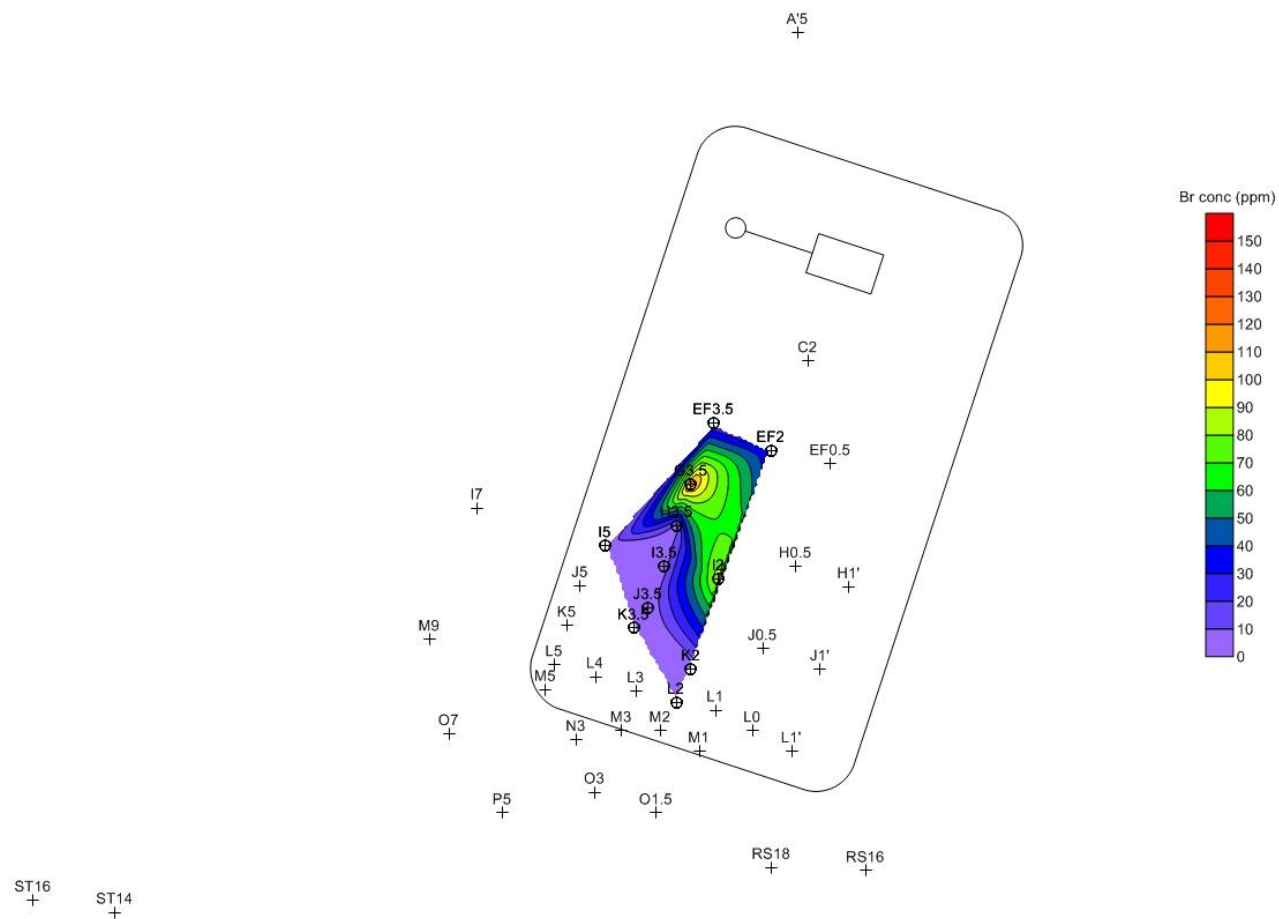


Figure C-4
March 13th 8am
569 hours, pumped samples

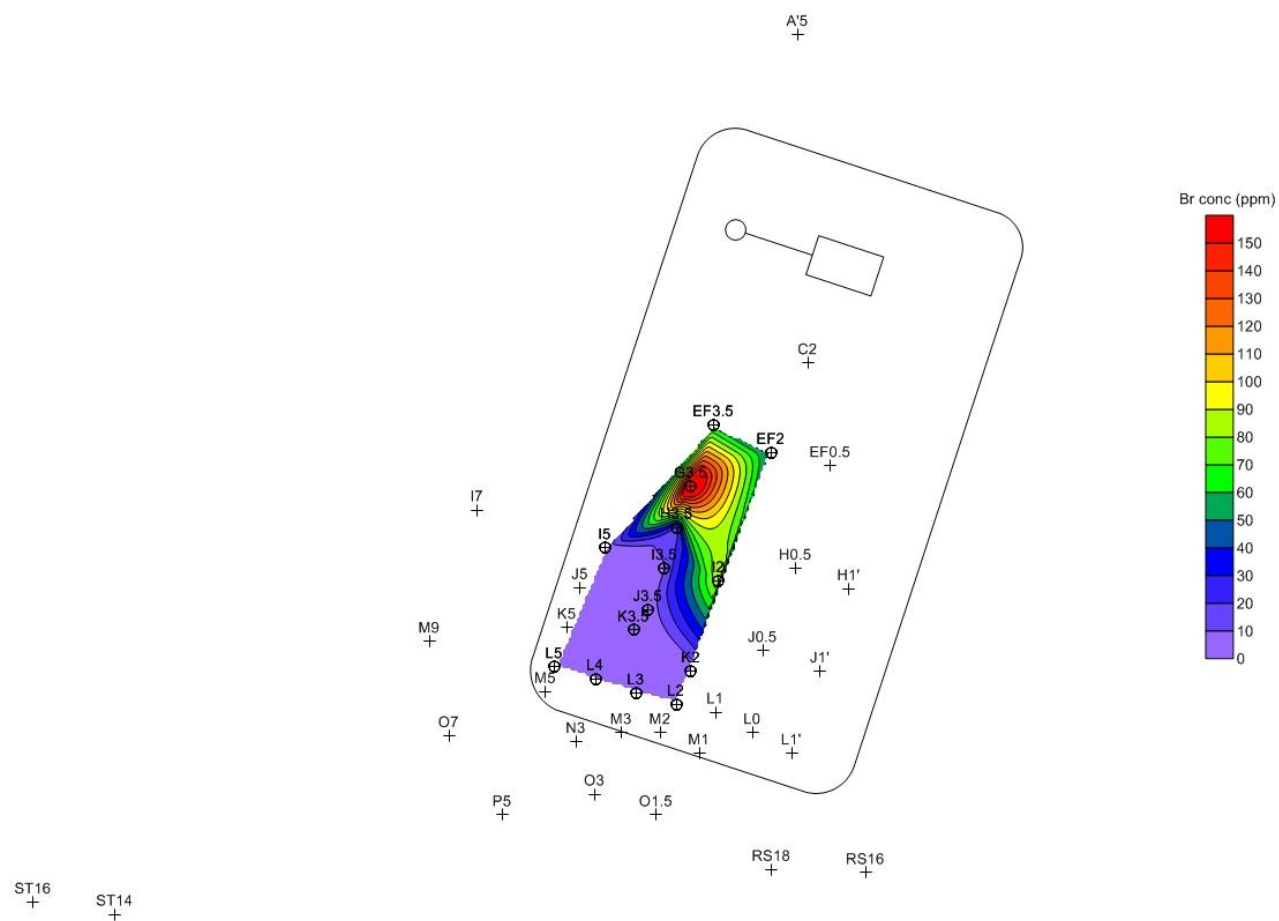


Figure C-5
March 14th 8am
593 hours, pumped samples

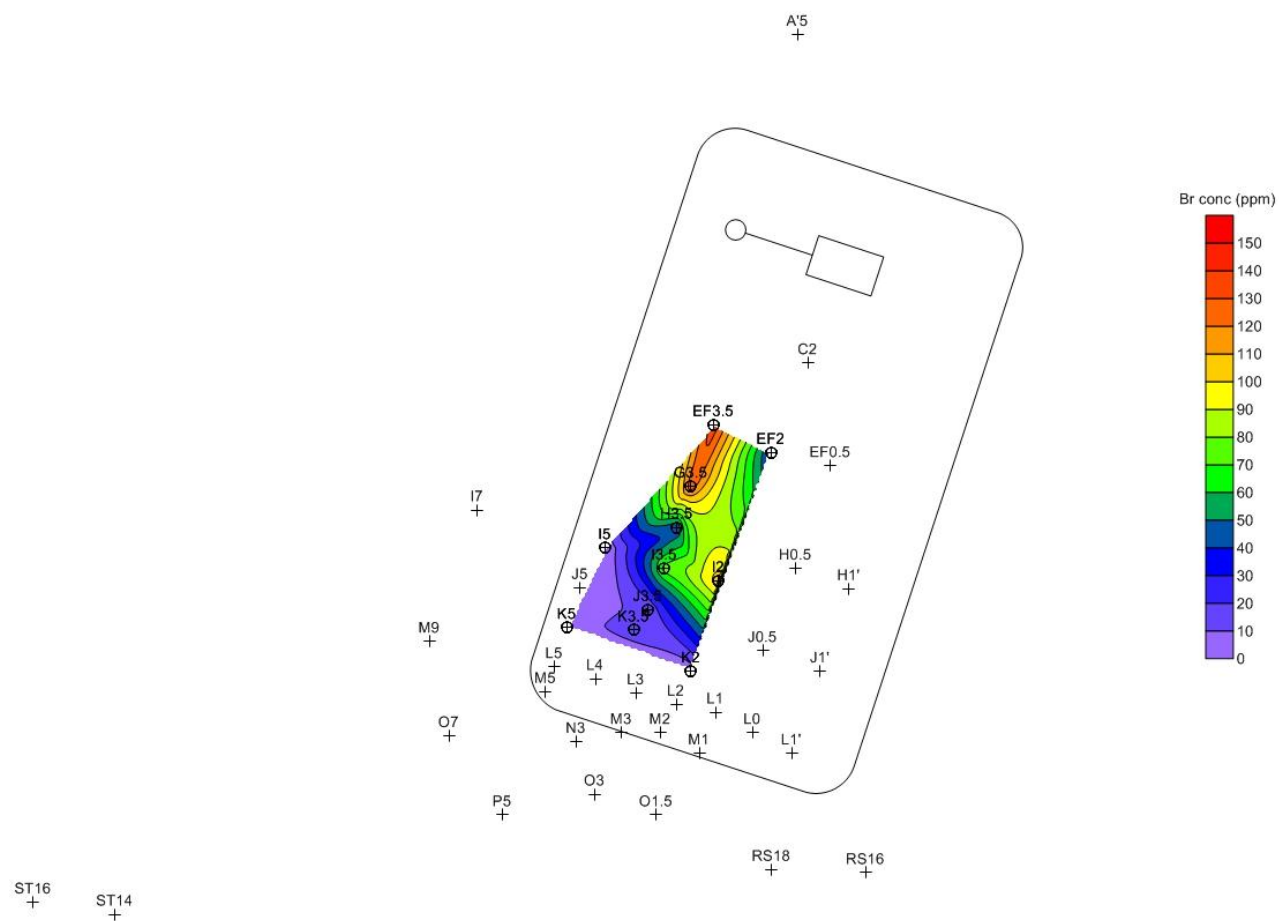


Figure C-6
March 17th 8am
665 hours, pumped samples

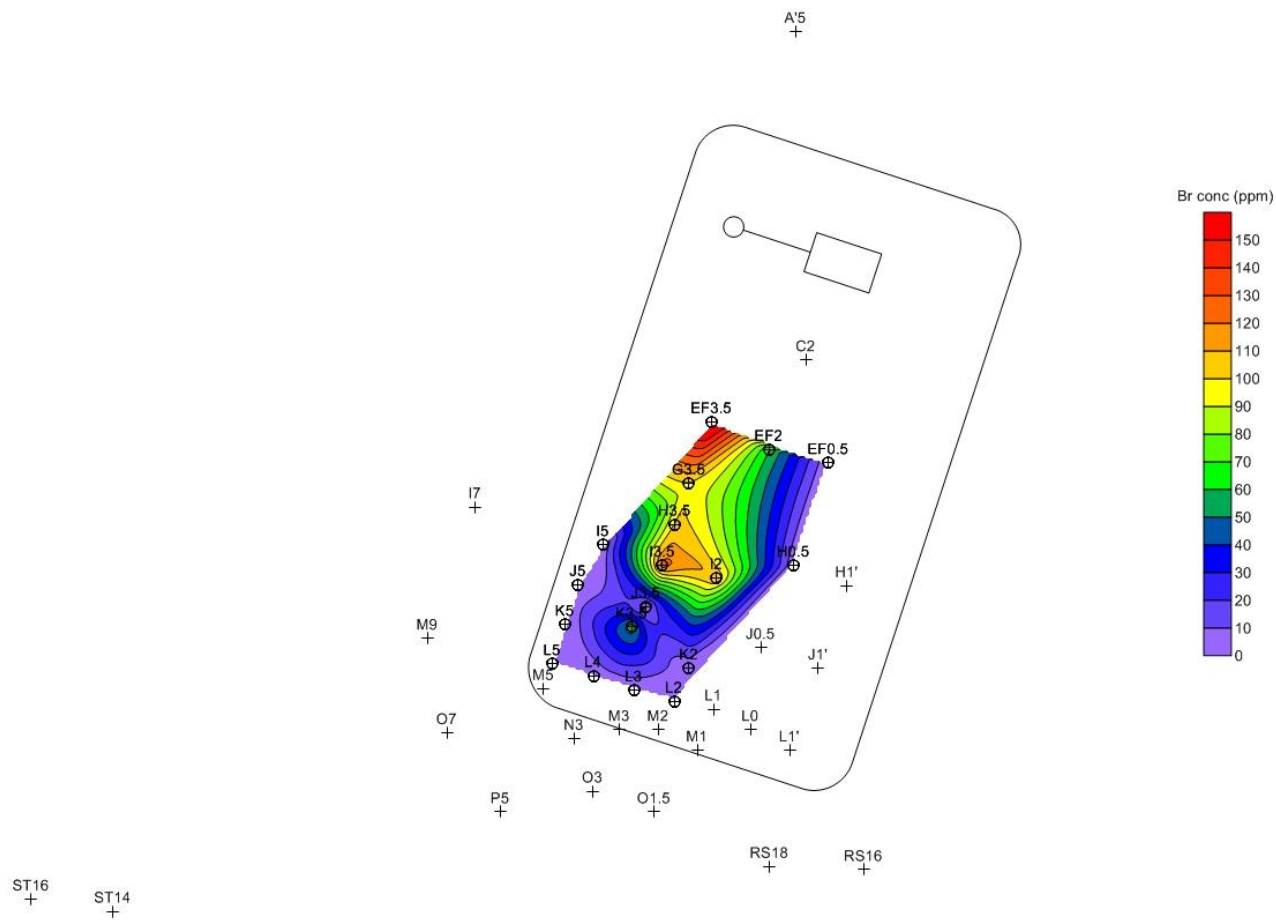


Figure C-7
March 18th 8am
689 hours, pumped samples

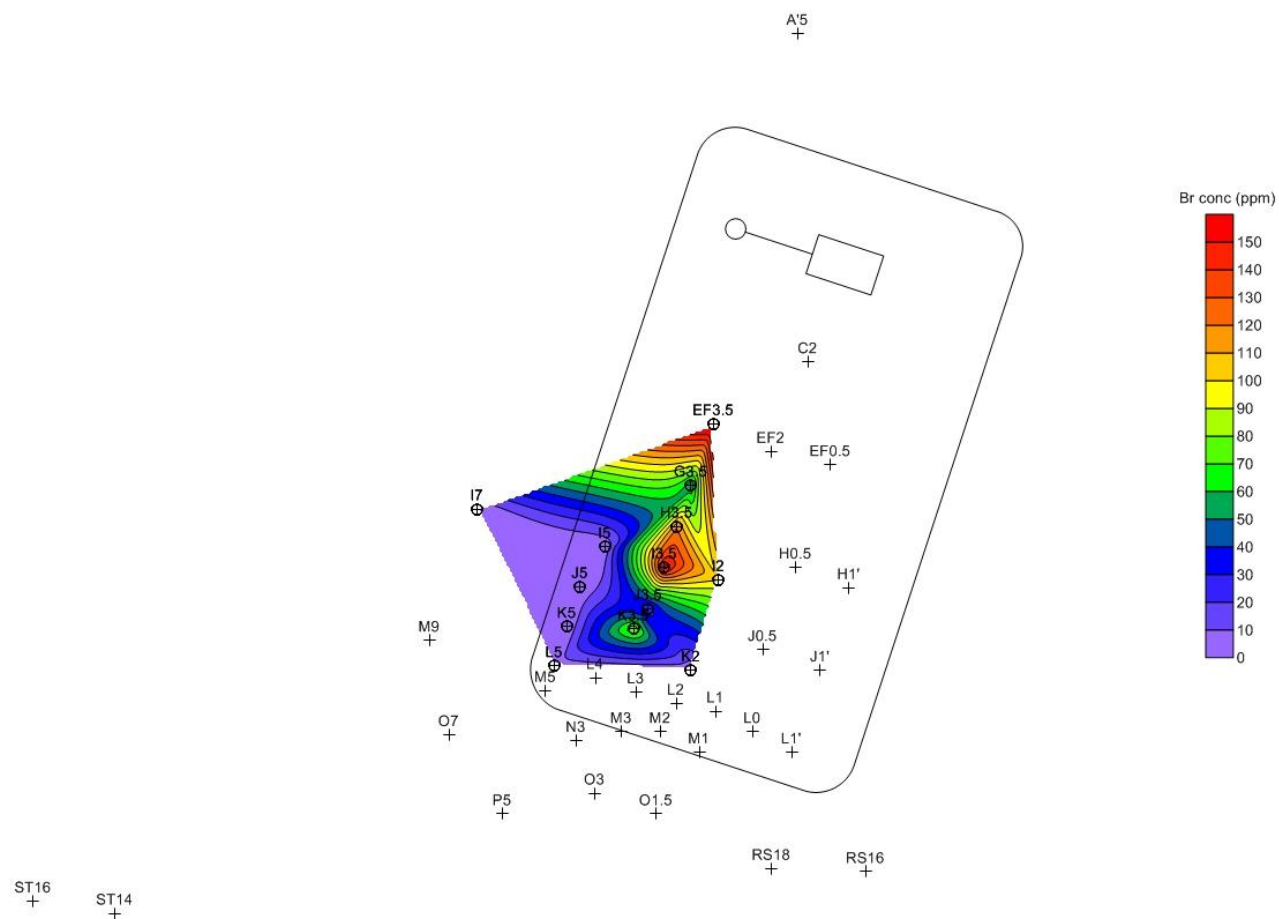


Figure C-8
March 19th 8am
713 hours, pumped samples

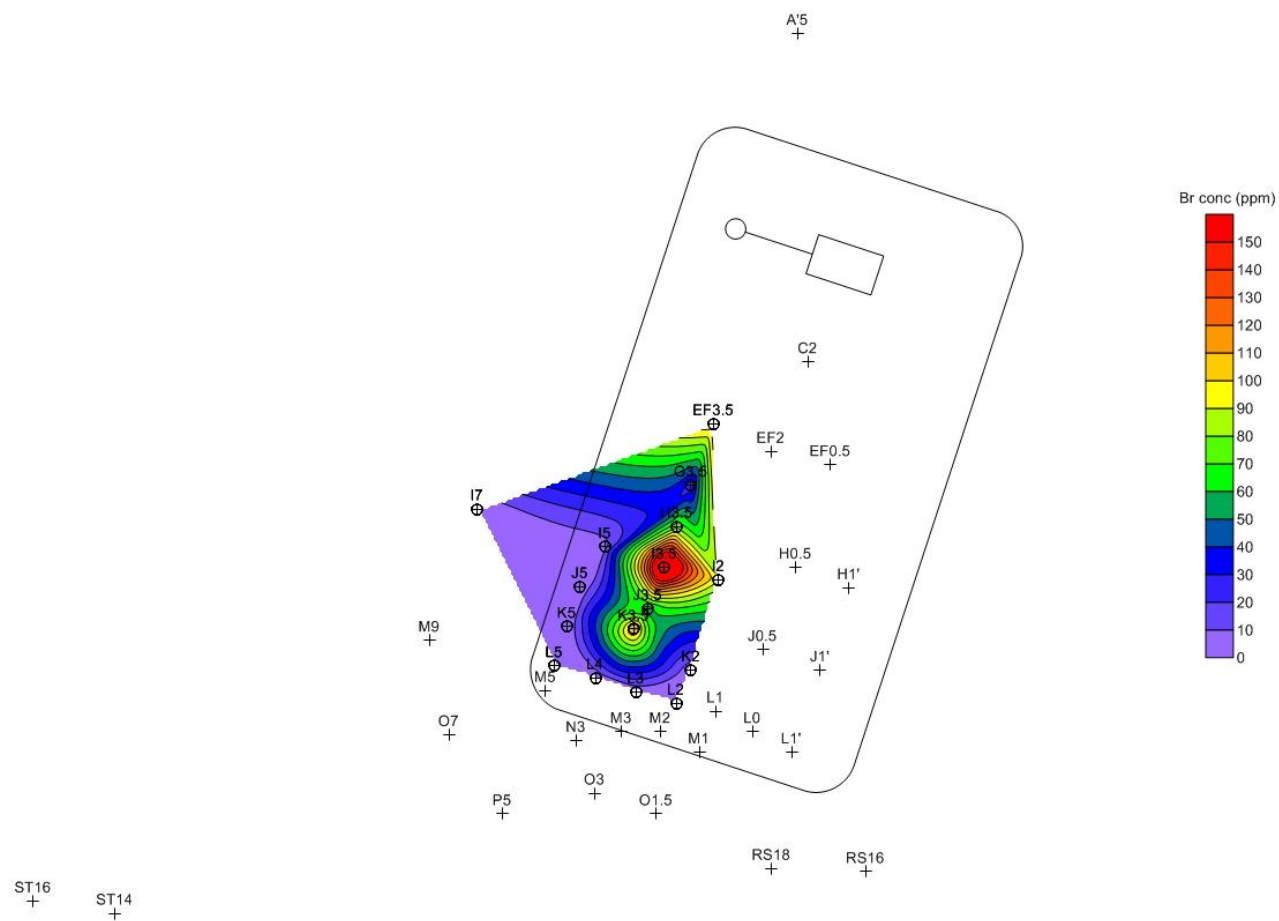


Figure C-9
March 21st 8am
761 hours, pumped samples

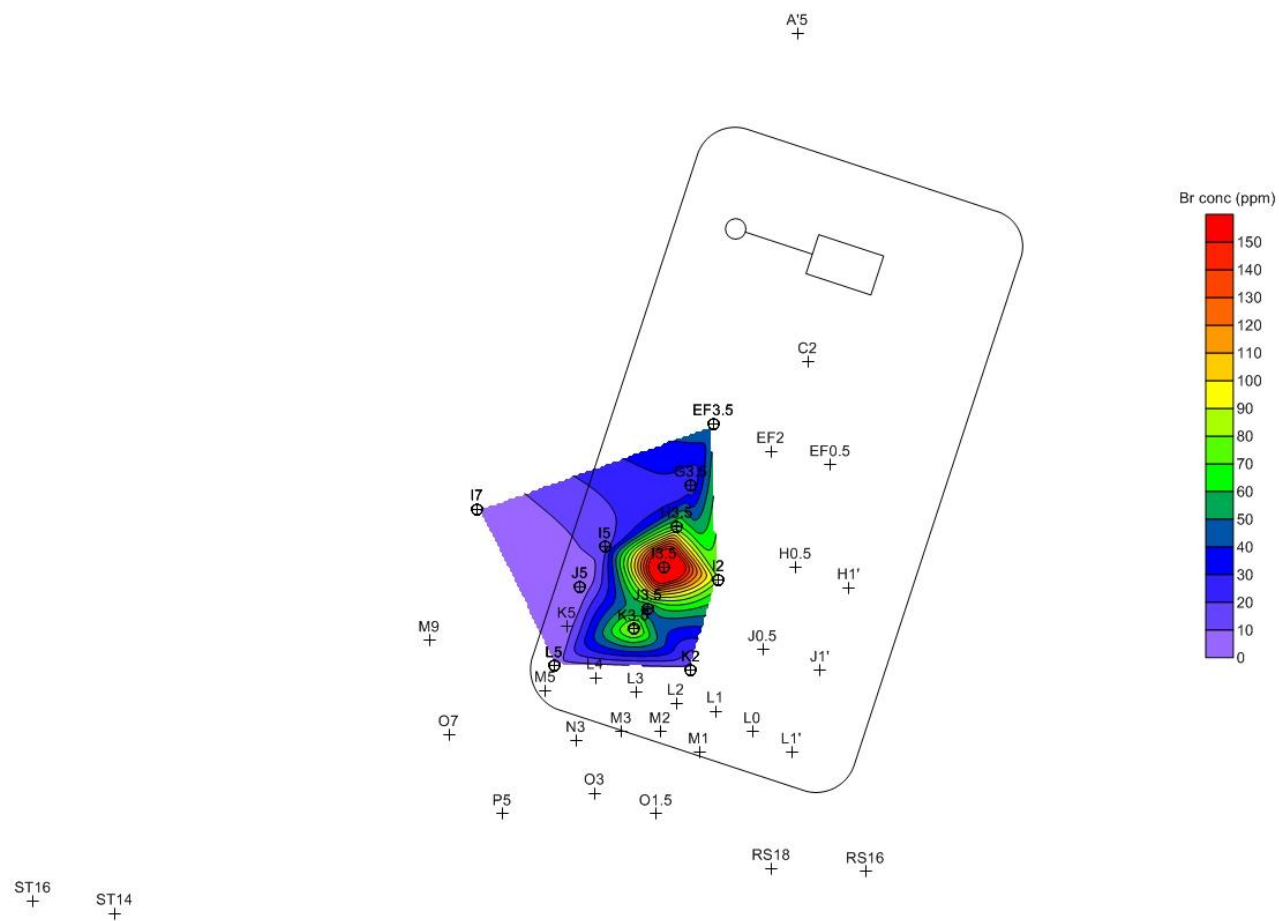


Figure C-10
March 24th 8am
833 hours, pumped samples

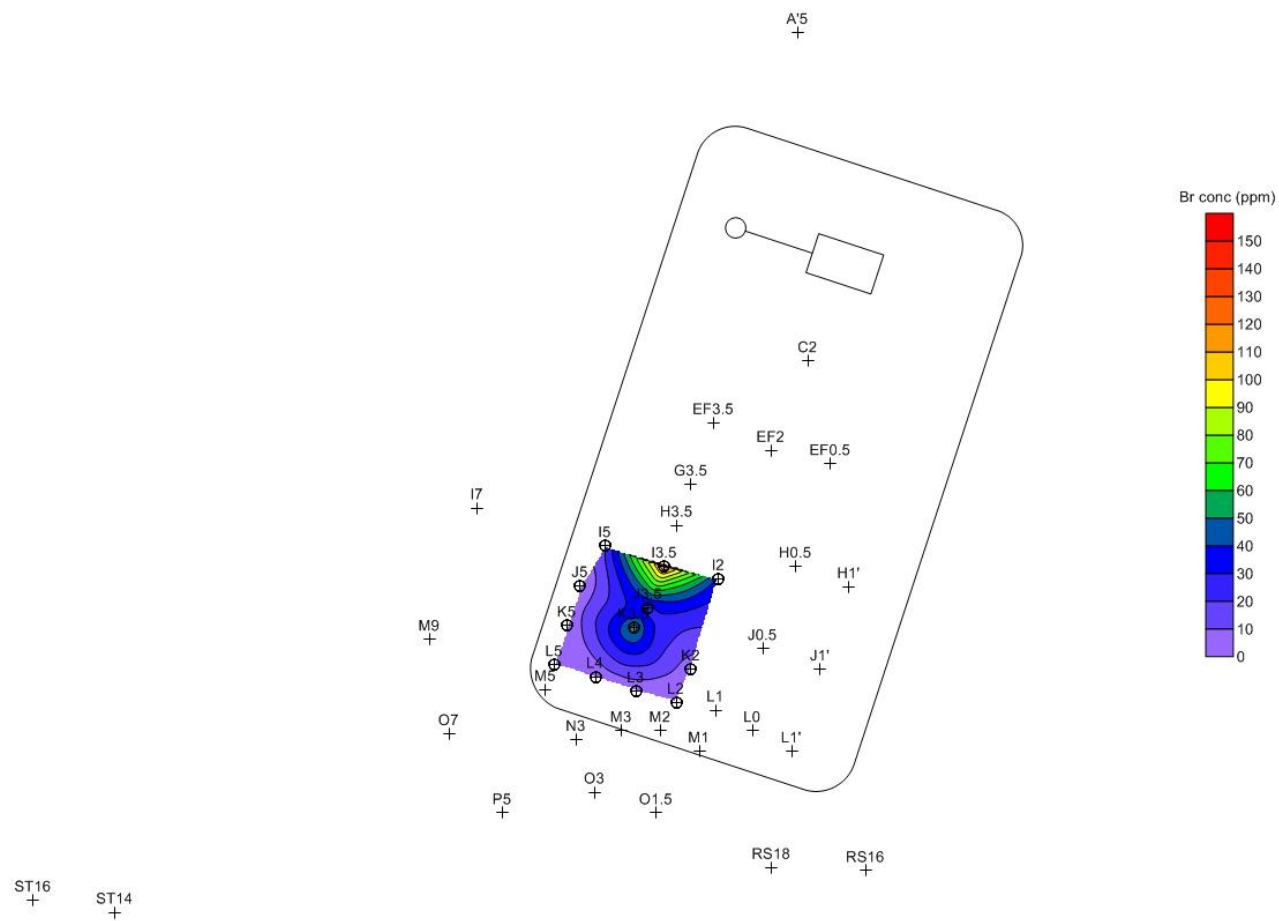
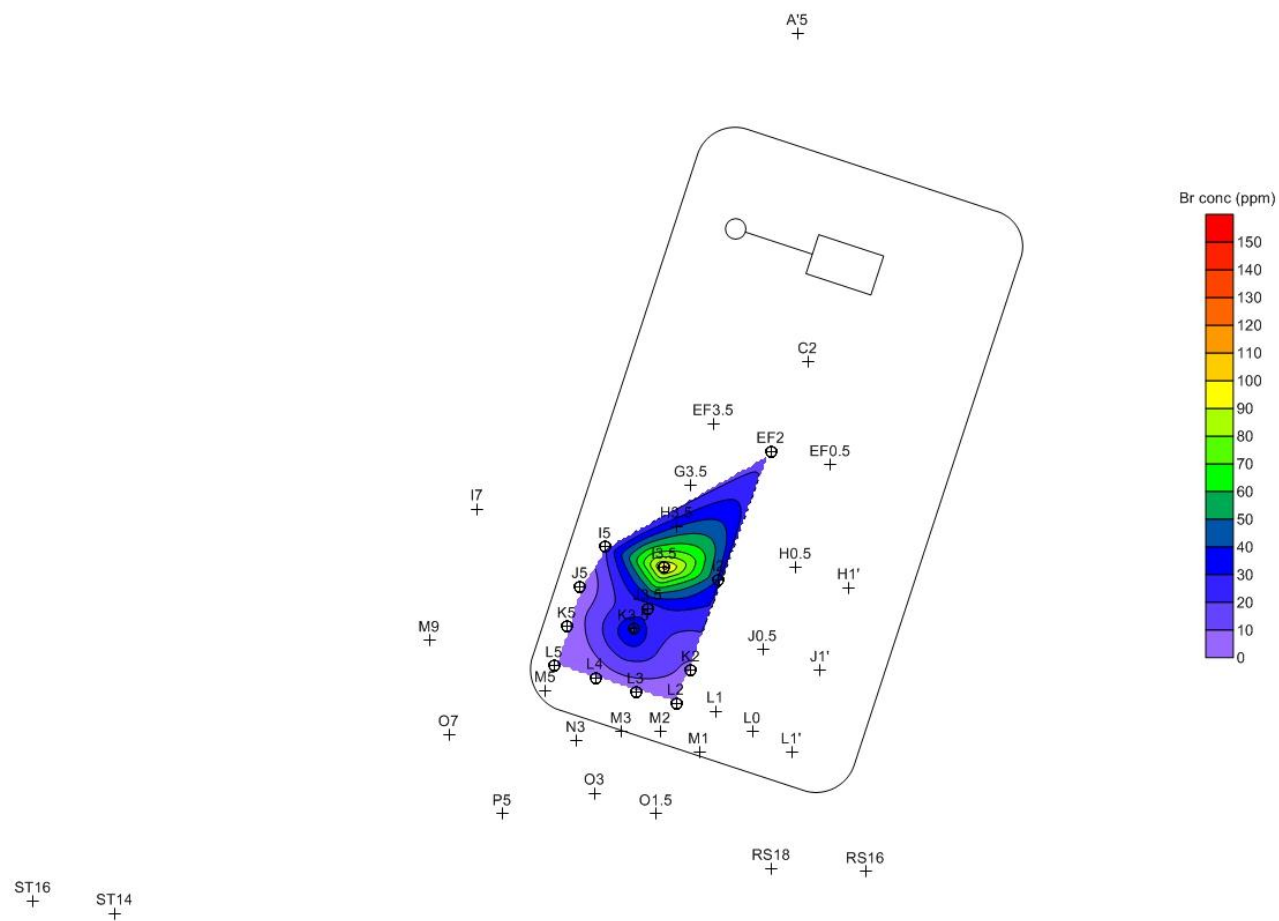


Figure C-11
March 26th 1pm
886 hours, pumped samples



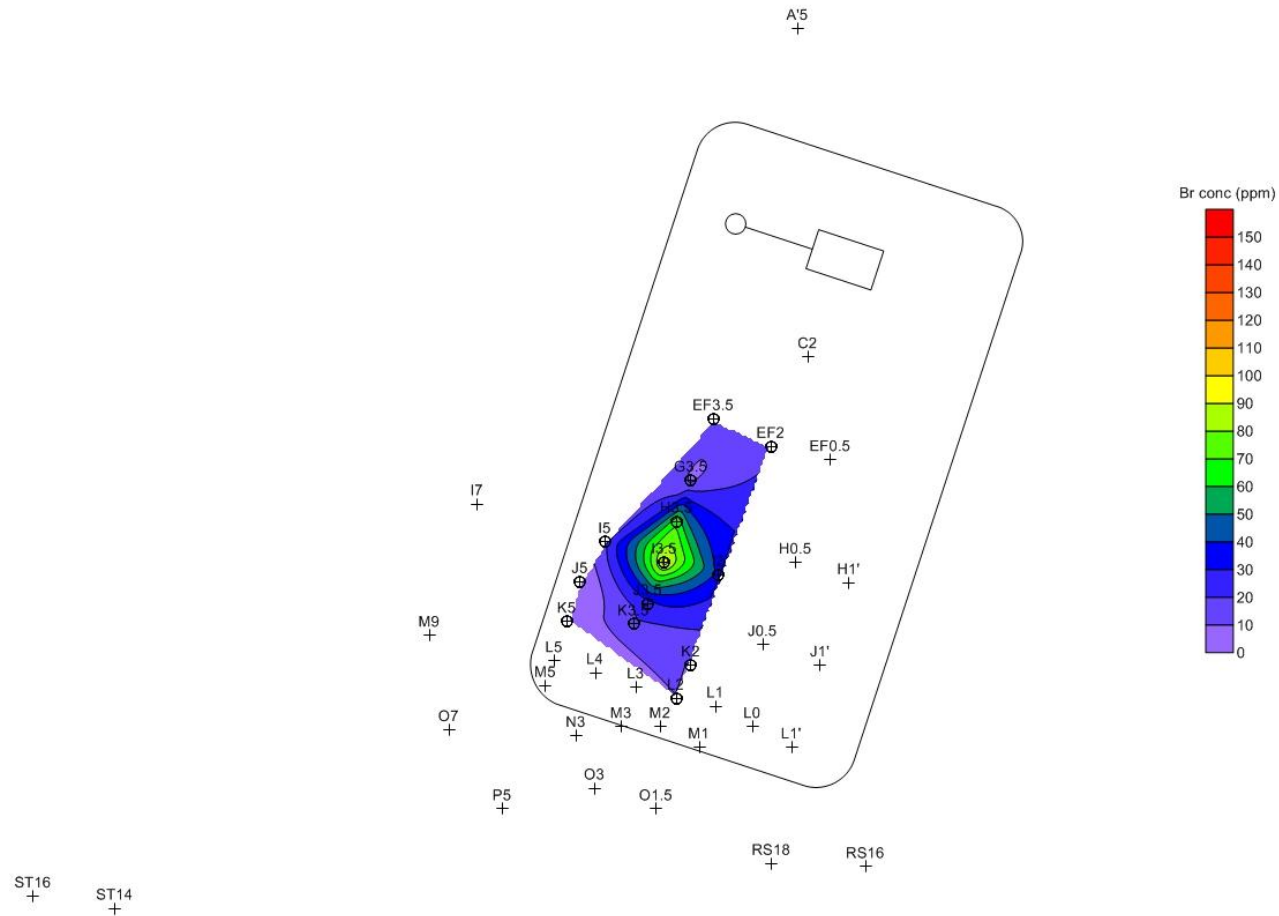


Figure C-13
March 28th 9am
930 hours, pumped samples

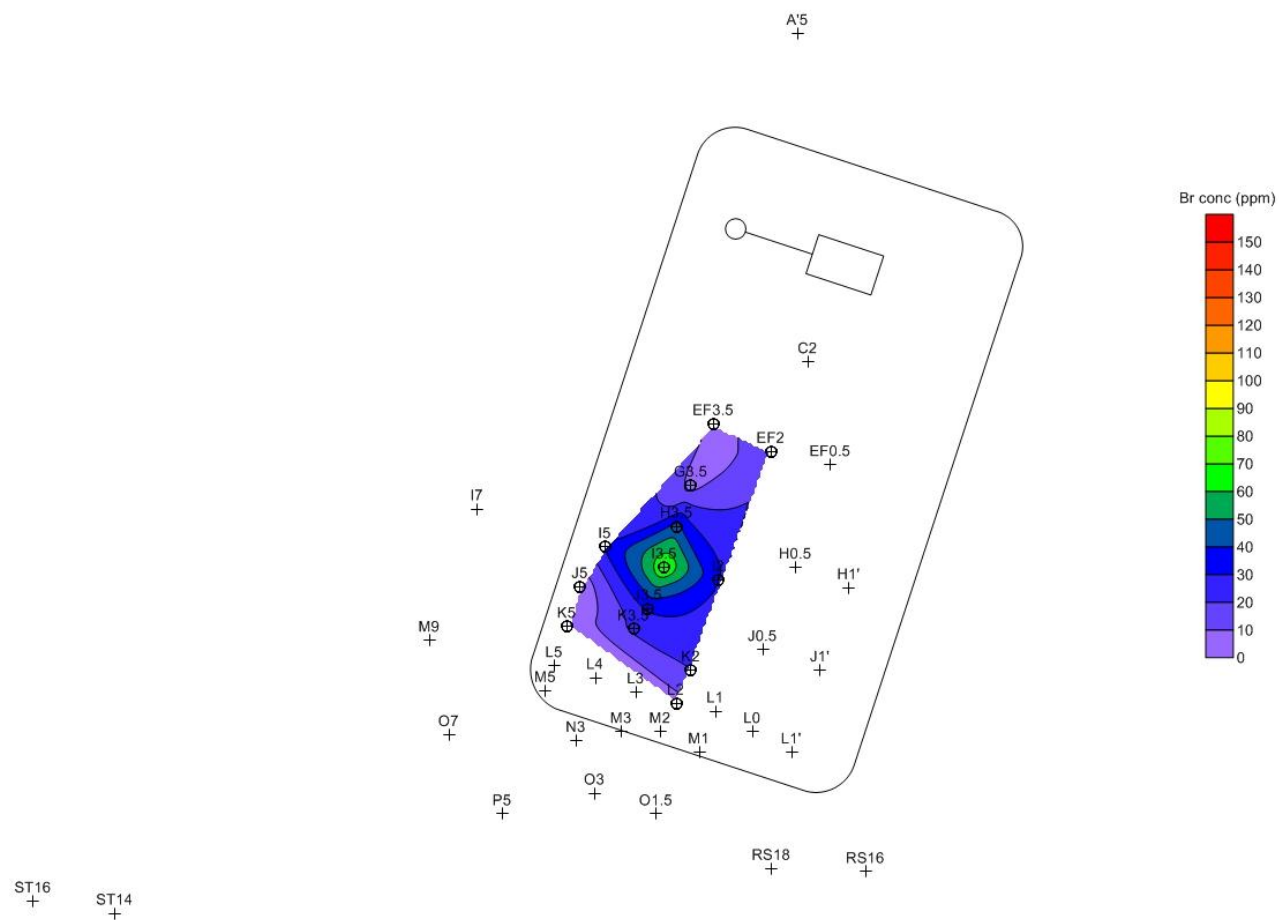


Figure C-14
March 31st 11am
1004 hours, pumped samples

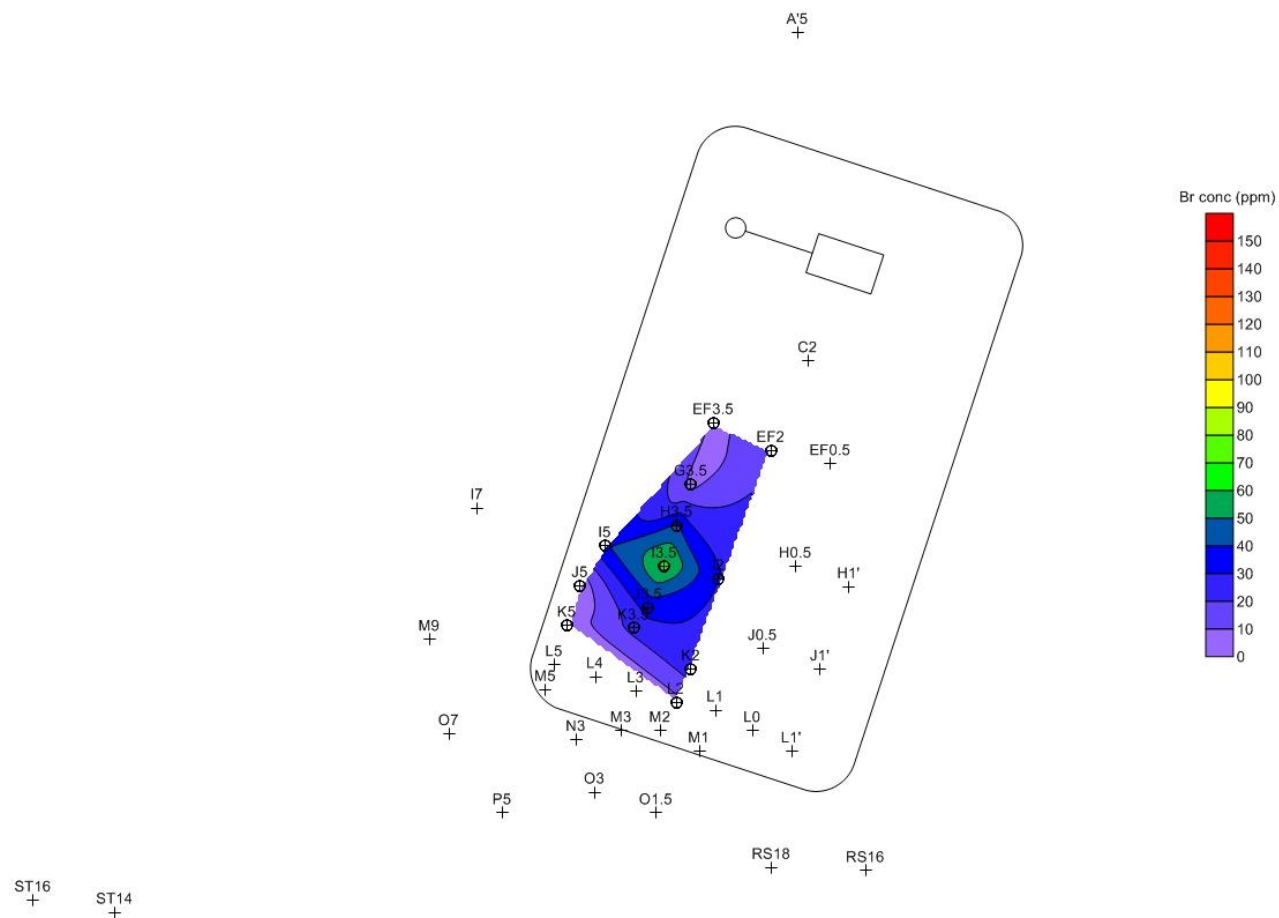
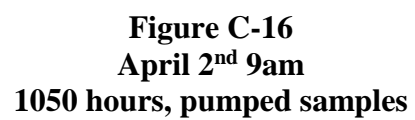


Figure C-15
April 1st 9am
1026 hours, pumped samples



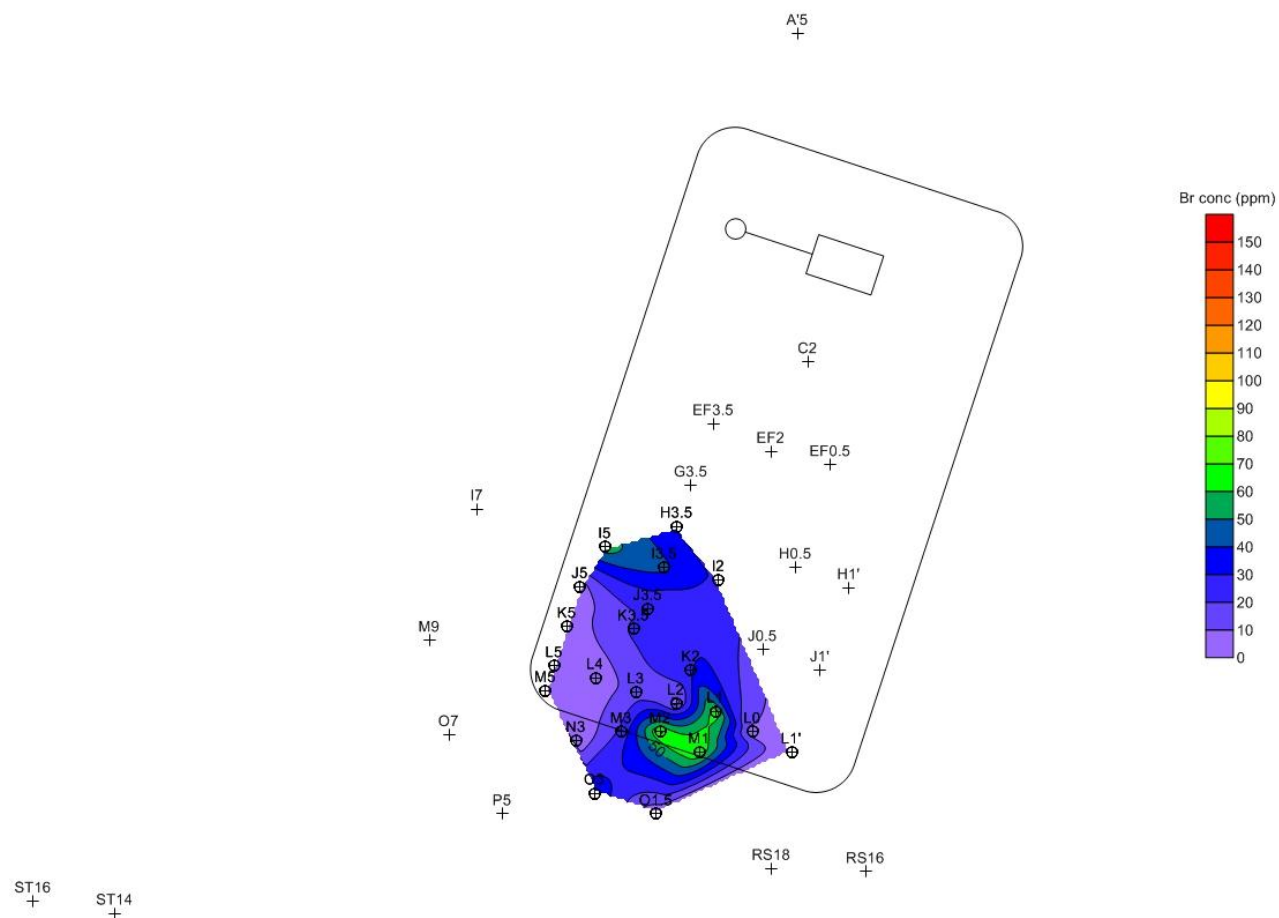


Figure C-17
April 3rd 3pm
1080 hours, pumped samples

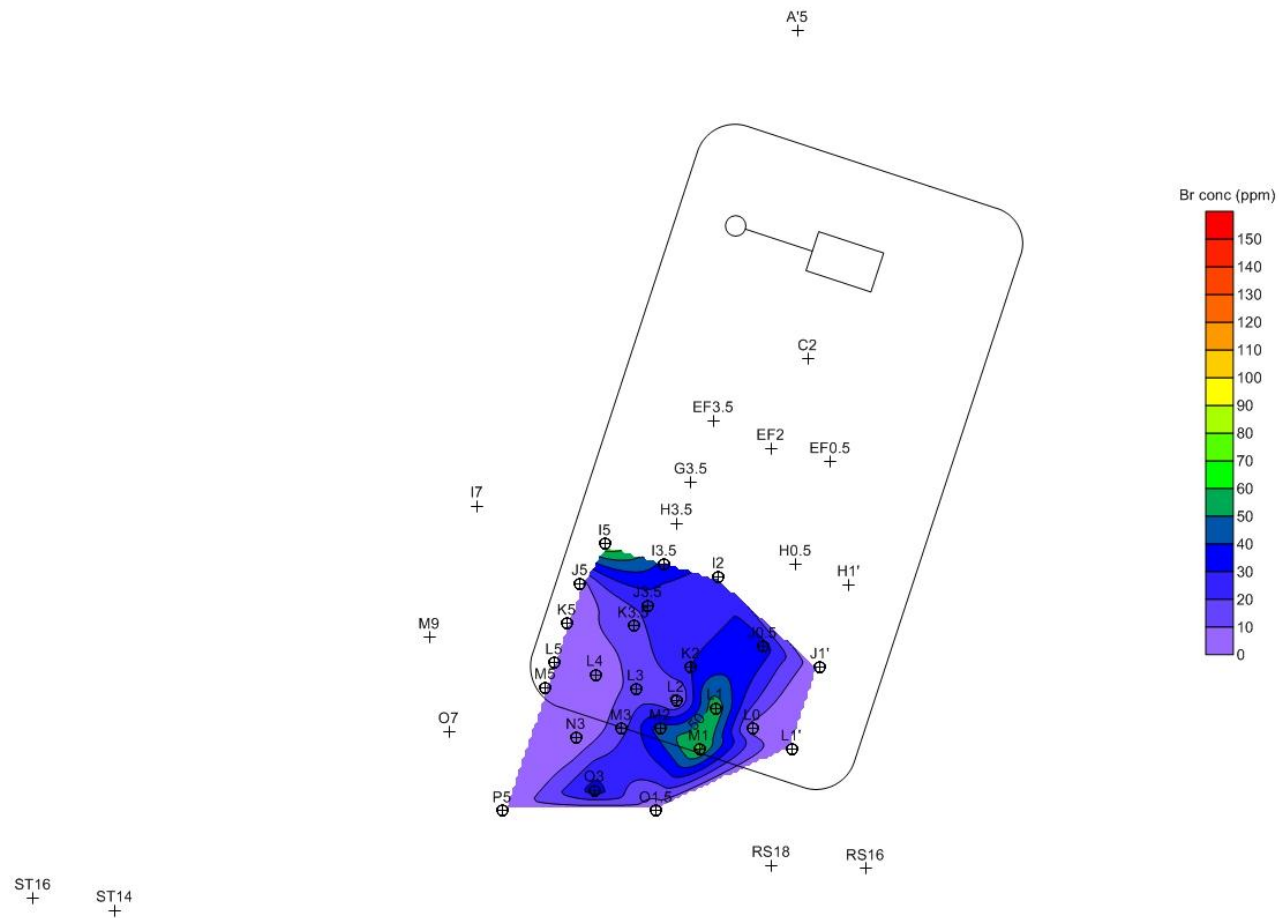


Figure C-18
April 4th 10am
1099 hours, pumped samples

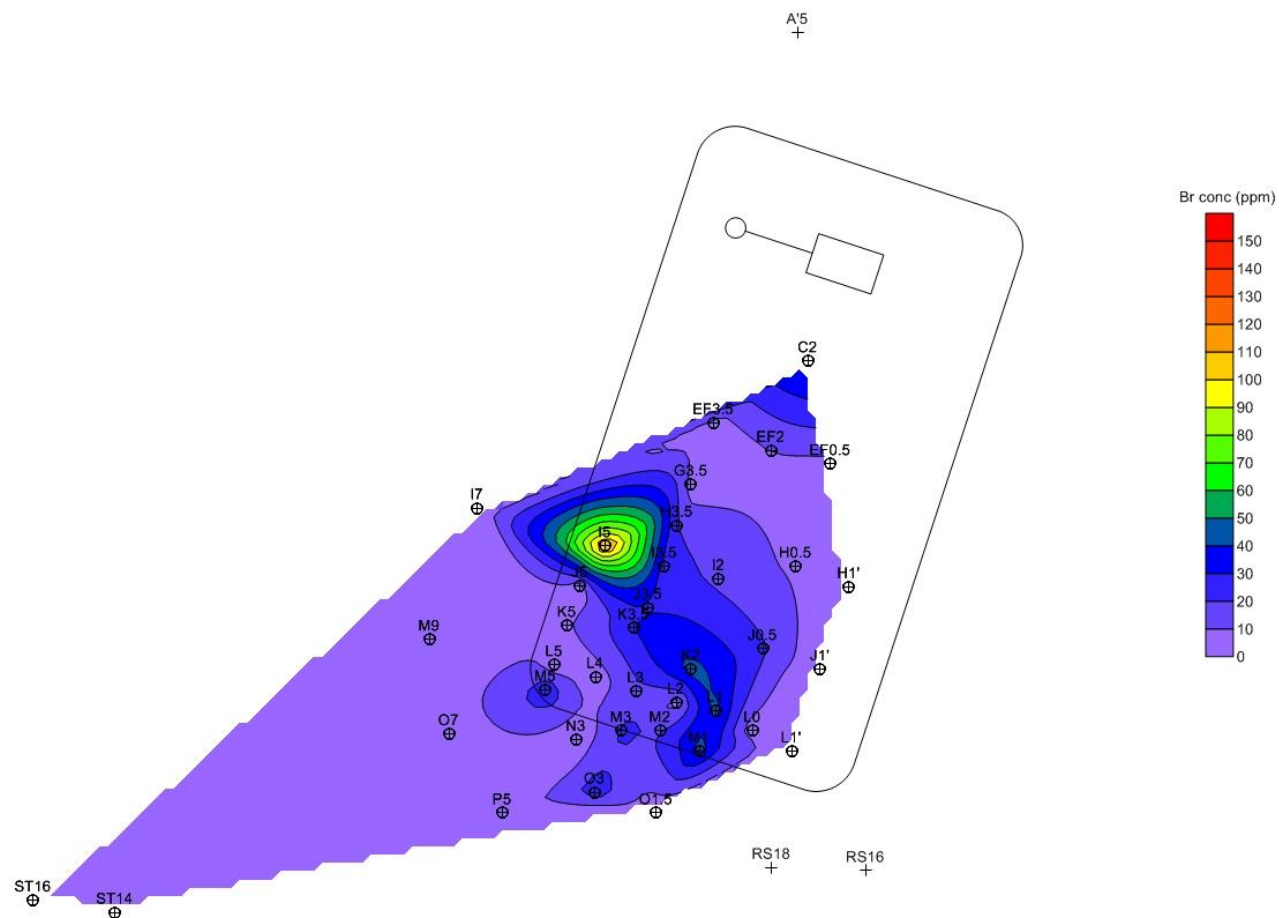
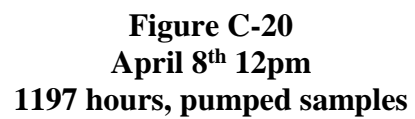


Figure C-19
April 7th 10am
1171 hours, pumped samples



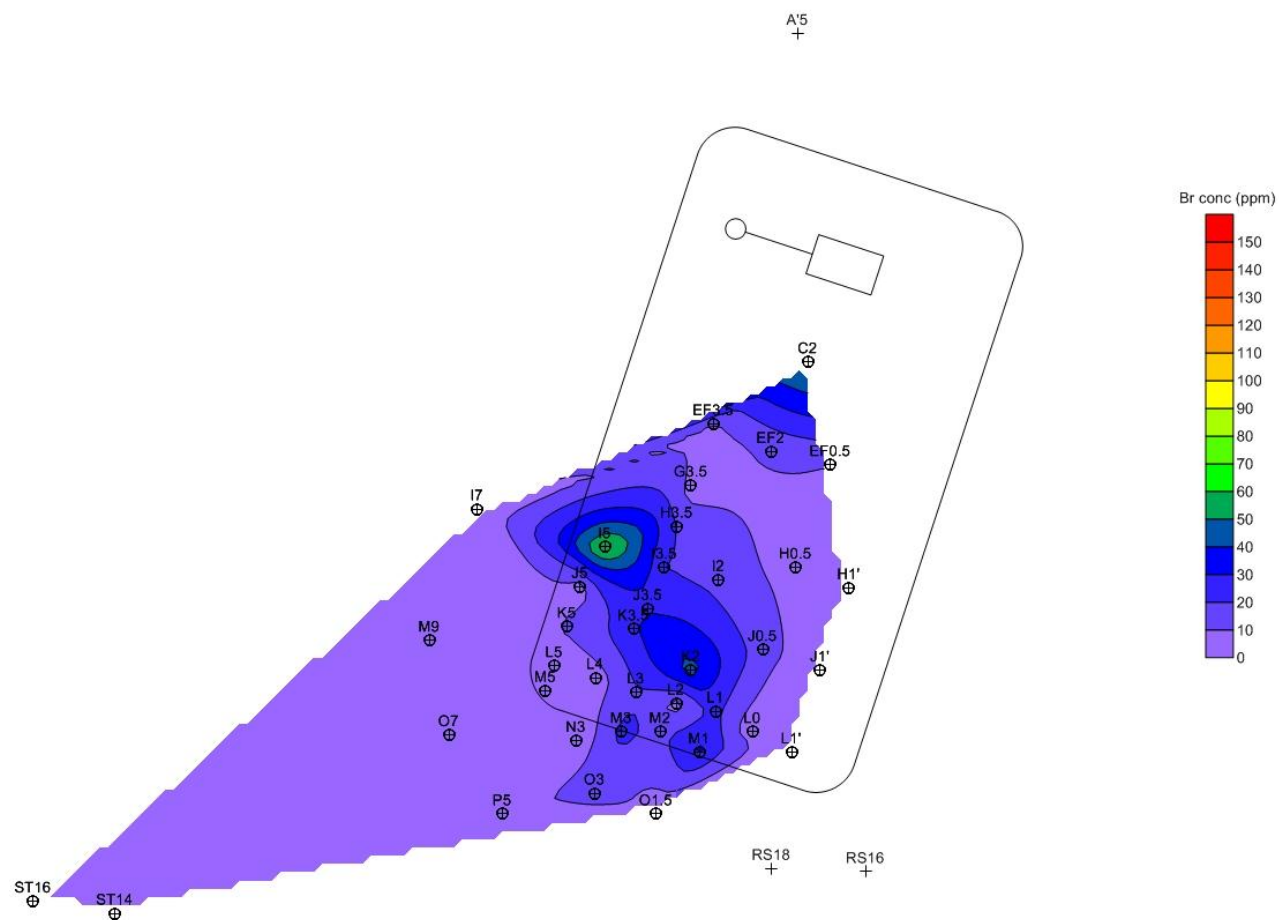


Figure C-21
April 9th 10am
1219 hours, pumped samples

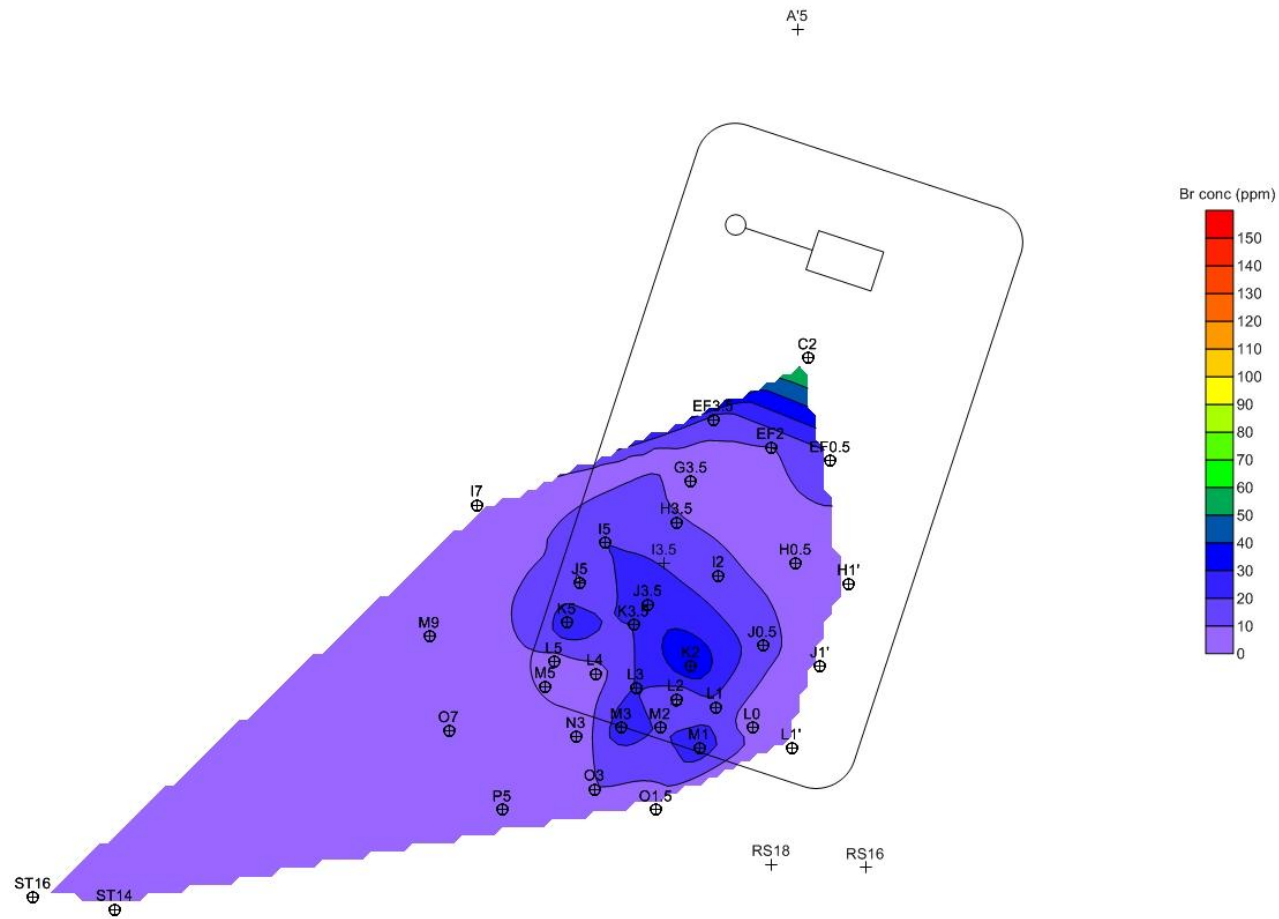


Figure C-22
April 15th 10am
1363 hours, pumped samples

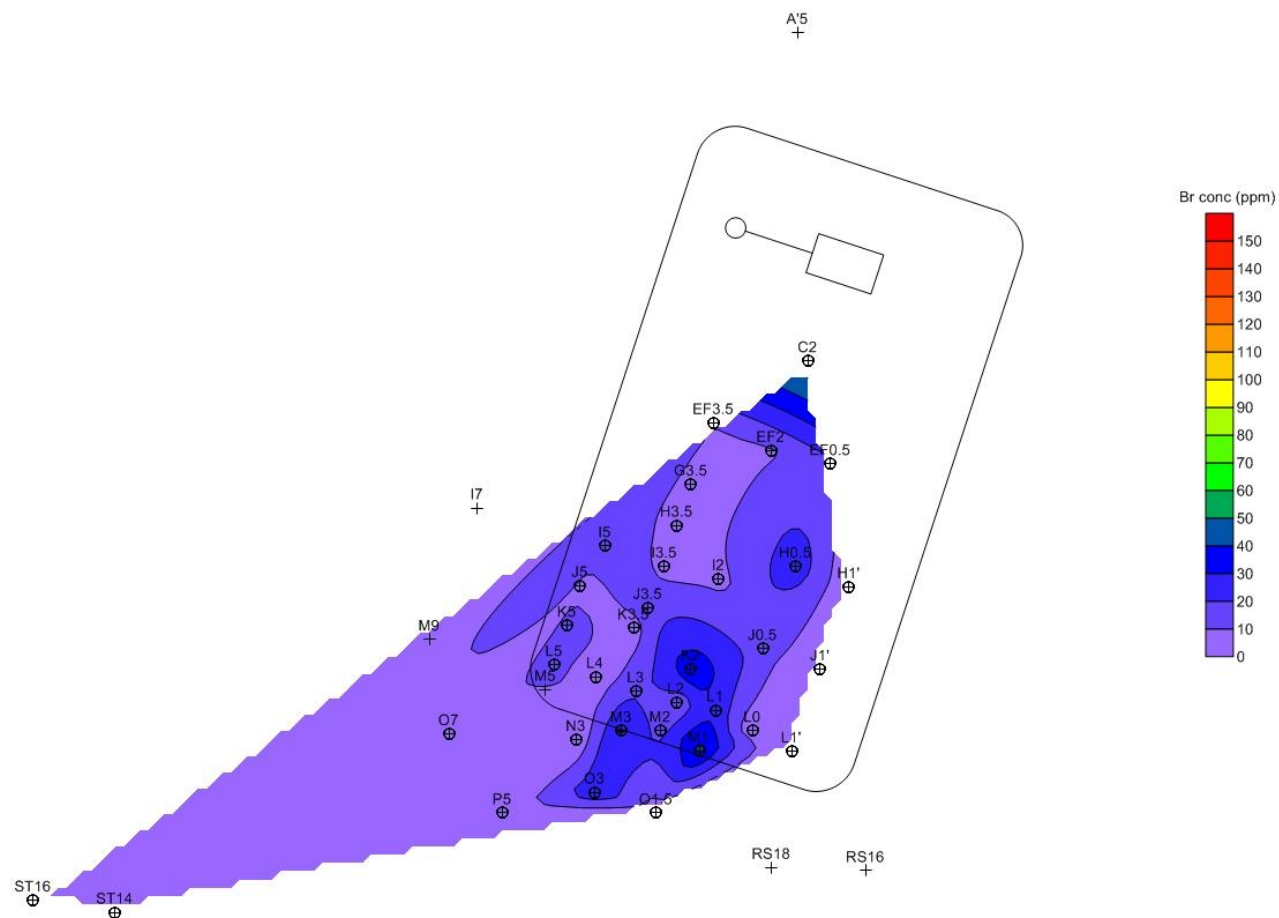


Figure C-23
May 6th 9am
1866 hours, pumped samples

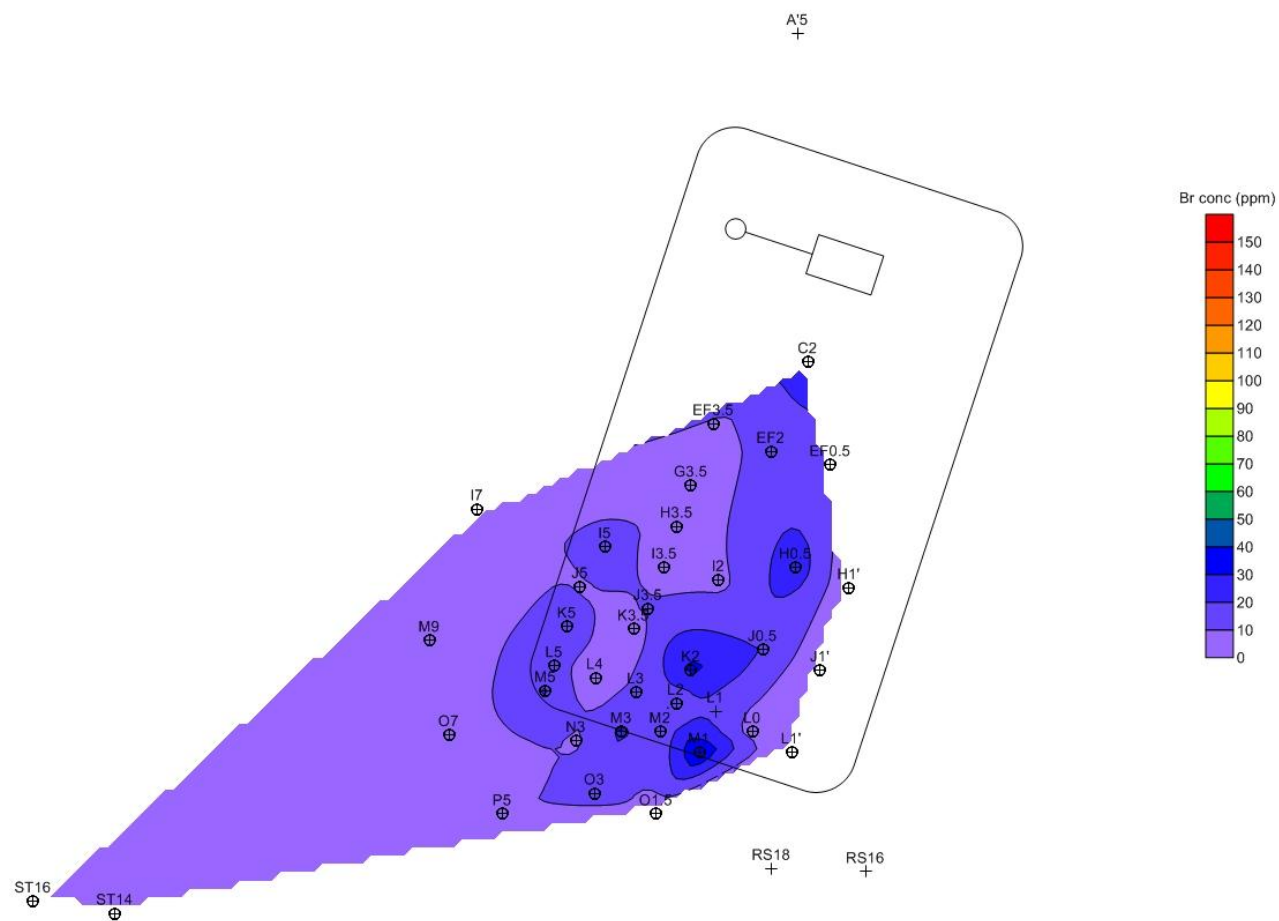


Figure C-24
May 16th 9am
2106 hours, pumped samples

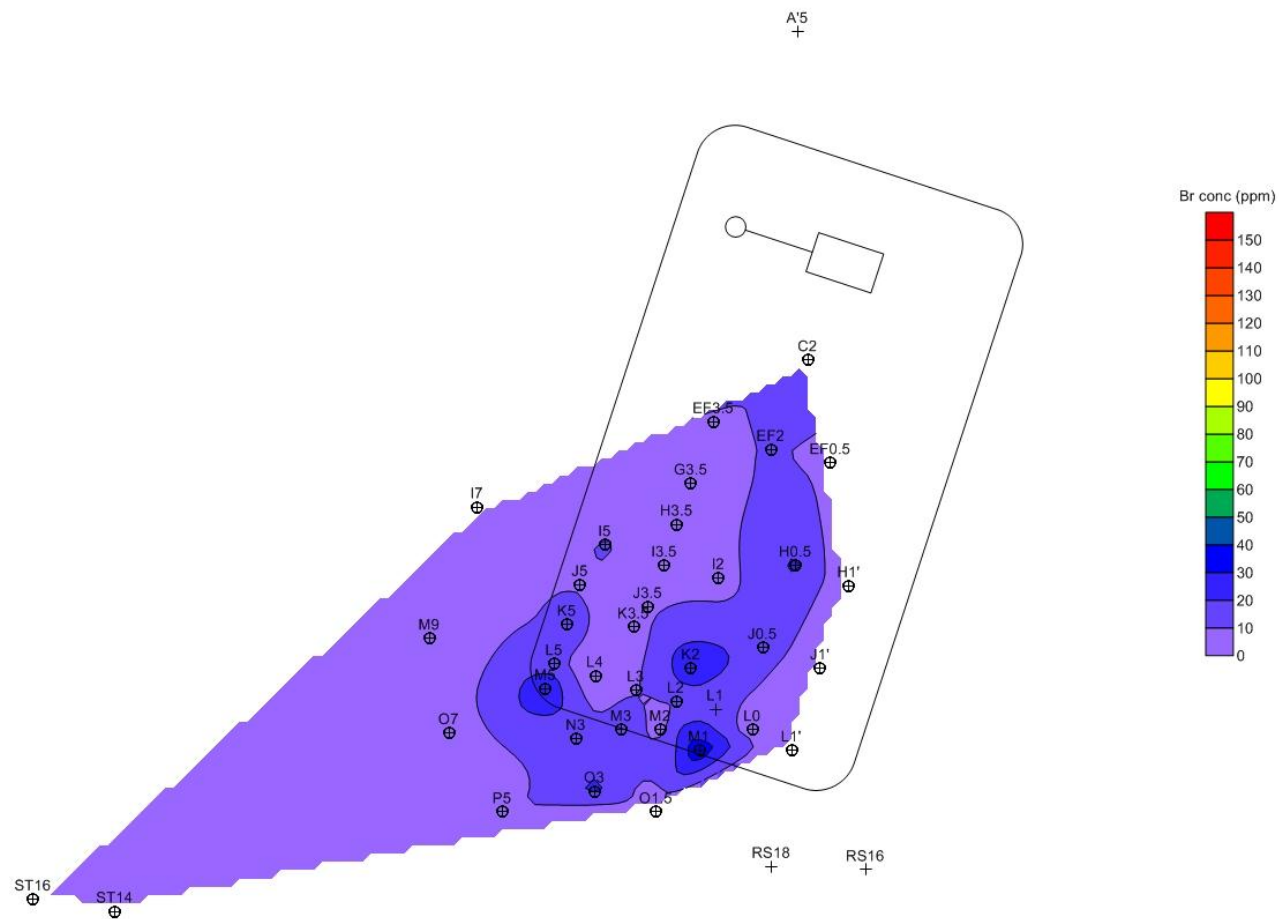


Figure C-25
May 22nd 9:30am
2250 hours, pumped samples

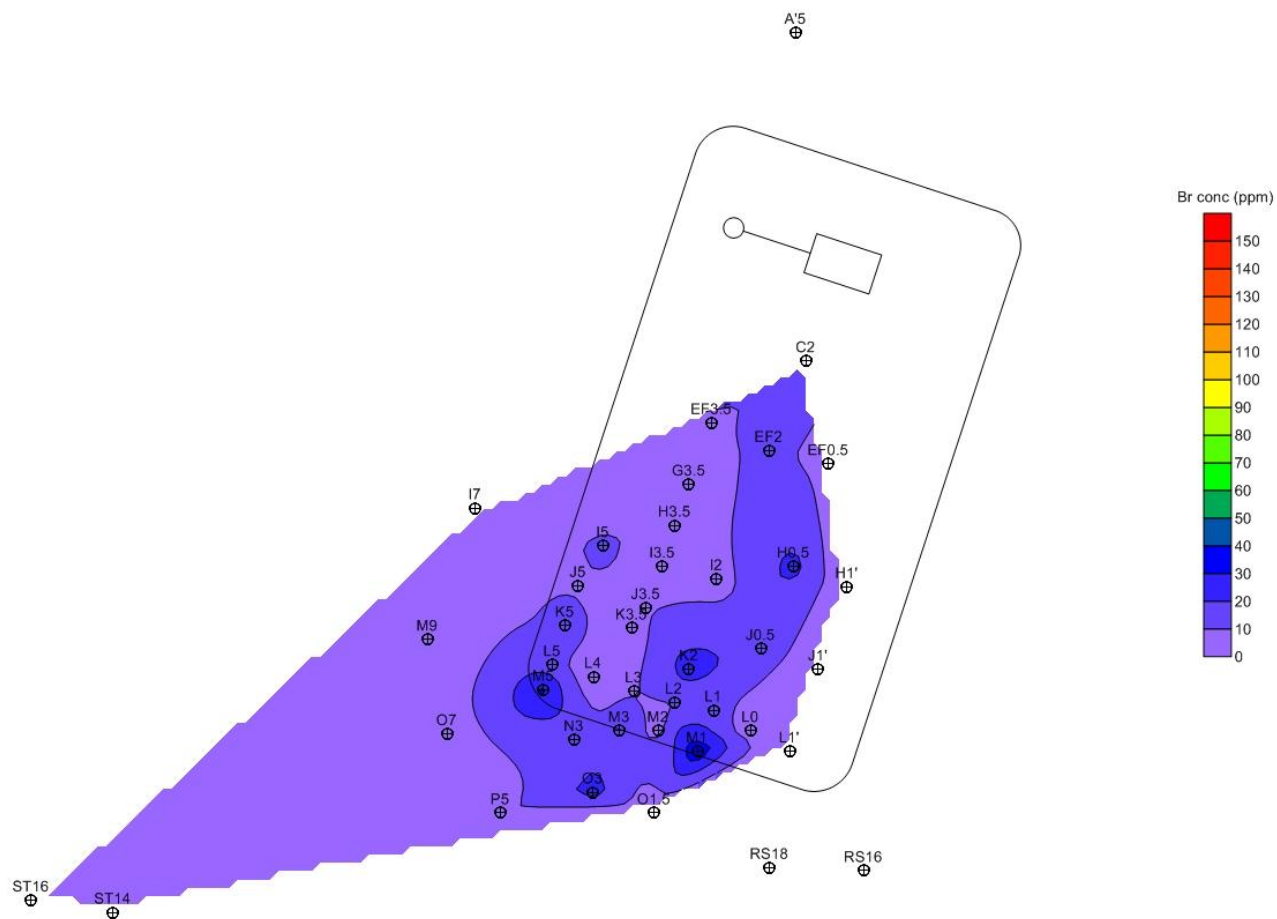


Figure C-26
May 23rd 9am
2274 hours, pumped samples

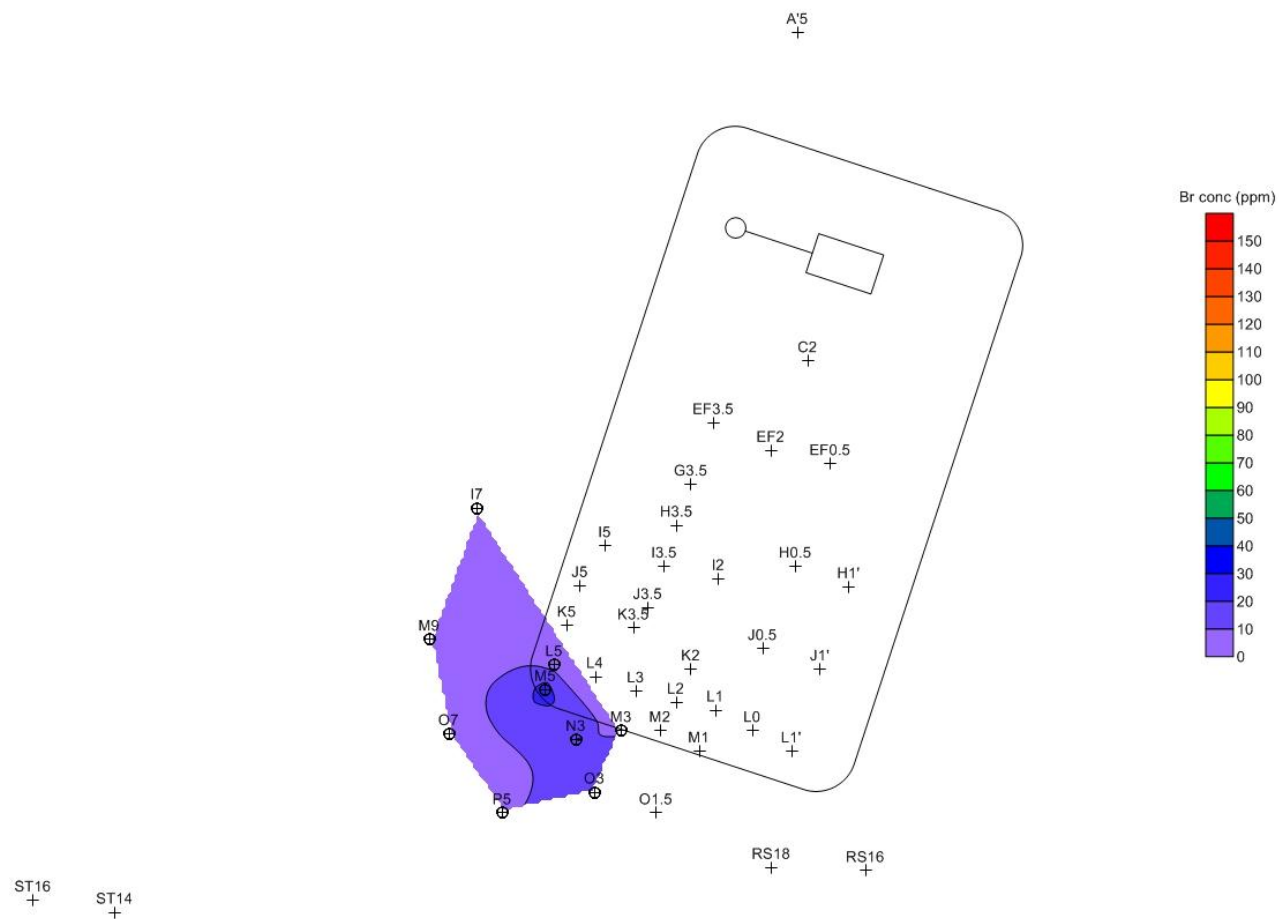


Figure C-27
June 10th 1pm
2710 hours, pumped samples