



# MEMORANDUM

TO: Byron O'Connor, Project Manager; Eric Domingue, Project Manager  
DATE: November 19<sup>th</sup>, 2013  
FROM: Tracey Parkin; Environmental Coordinator  
SUBJECT: Rose Creek Additional Monitoring 1

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## Background

During periods of Cross Valley Pond (CVP) discharge, samples are collected from the compliance point X5 and from Rose Creek at sampling location X14 on a daily basis. For each sample, the field parameters of Temperature, pH and Conductivity (EC) are recorded. The samples are also analysed for total and dissolved Zinc at the Faro Mine Complex (FMC) Laboratory to ensure that X5 is not exceeding the effluent water quality standard limit of 0.500 mg/L as outlined in Appendix C of the Care and Maintenance contract. An unofficial Zinc limit of 0.150 mg/L has been applied to X14 to prevent loading.

During 2013, X5 experienced Turbidity fluctuations resulting in sporadic discharge events. On October 22<sup>nd</sup>, 2013, the X5 siphon was opened and since the Turbidity results were compliant discharge took place. Daily analysis, however, revealed that Zinc levels at X14 were above the internal trigger level of 0.100 mg/L and the X5 discharge values resulting in the X5 siphon being turned off. On October 23<sup>rd</sup>, 2013, the X5 siphon was again turned on and allowed to discharge. Daily analysis once again returned high Zinc levels at X14 which were again above the internal trigger and X5 discharge values. The siphon was turned off and an investigation into potential sources of increased zinc began.

Details of the investigation and subsequent results have been summarized in a memorandum, "Elevated Zinc Levels in Rose Creek" (Parkin, T. 2013), and submitted to the Yukon Government (YG) on November 4<sup>th</sup>, 2013. On November 5<sup>th</sup>, 2013, YG requested increased monitoring to occur in Rose Creek until a further plan has been developed

## Monitoring Program

Increased monitoring in Rose Creek was to include the following:

- Twice a week sampling to occur on Monday and Thursday at monitoring locations R8, R9, R10, NF1 - Oct, NF2, X2, X3A, X10 and X14;
- Maxxam Analytics analysis for the full surface water suite outlined in Appendix C of the Care and Maintenance contract with a one (1) day reporting turnaround time;
- In-house sampling to occur Monday – Thursday and Saturday at monitoring locations R8, R9, R10, NF1 - Oct, NF2, X2, X3A, X10 and X14 with Zinc and Turbidity analysis to be performed at FMC Laboratory; and
- The field parameters Temperature, pH and Conductivity (EC) will also be recorded for each sample collected.

On November 8<sup>th</sup>, 2013, an amendment was made to the scope of work and sample collection for Maxxam Analytics was removed.



# MEMORANDUM

## **Methodology**

All samples were collected in accordance with “Standard Methods for the Examination of Water and Waste Water.”

The field parameters, Temperature, pH and Conductivity, were measured with a Hanna combo meter.

## **Results**

All sampling locations are illustrated in Appendix A.

A summary of all field parameters are located in Appendix B.

A summary of all field parameters are illustrated in Appendix C.

Analytical results available to date are located in Appendix D.

# **Appendix A**

## **Map**



## Map Sheet 1: Additional Monitoring Locations



## **Appendix B**

### **Tables**



**Table 1: Rose Creek Historical Averages**

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<b>Site</b>	<b>pH</b>	<b>EC (<math>\mu</math>S/cm)</b>	<b>Total Zinc (mg/L)</b>	<b>Dissolved Zinc (mg/L)</b>	<b>Turbidity (NTU)</b>
R8	7.91	181	0.006	0.006	0.91
R9	7.94	201	0.006	0.006	0.91
R10	7.90	202	0.011	0.011	0.91
NF1	7.70	179	0.040	0.035	
NF2	7.85	200	0.021	0.020	1.00
X2	7.84	221	0.039	0.037	1.12
X3A	7.85	238	0.045	0.059	2.12
X10	7.98	238	0.040	0.036	1.29
X14	7.92	505	0.053	0.041	2.75



**Table 2: R8 - Field Parameters**

**Table 2: R8 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	11:14 AM	<0.0	7.73	178	0.002	-0.002	0.81	
06-Nov-13	9:36 AM	0.1	7.21	178	0.000	-0.002		
07-Nov-13	12:56 PM	<0.0	7.47	188	<RDL	<RDL	0.76	
09-Nov-13	9:24 AM	<0.0	7.72	7	<RDL	<RDL		EC was rechecked. Value verified.
11-Nov-13	10:50 AM	1.4	7.83	197	0.000	<RDL		
12-Nov-13								No sample collected due to equipment issues
13-Nov-13	9:37 AM	< 0.0	7.82	206	<RDL	<RDL		
14-Nov-13	12:39 PM	<0.0	7.80	225	0.004	0.002		
16-Nov-13	8:36 AM	<0.0	7.67	186	0.001	0.000		



**Table 3: R9 – Field Parameters**

**Table 3: R9 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	1:30 PM	0.3	7.62	213			0.86	No in-house sample collected as site was added to scope of work after sample collection was completed.
06-Nov-13	9:15 AM	<0.0	7.28	202	0.000	-0.002		
07-Nov-13	12:33 PM	<0.0	7.48	206	<RDL	<RDL	0.93	
09-Nov-13	9:26 AM	<0.0	7.42	224	<RDL	<RDL		
11-Nov-13	11:06 AM	0.4	7.94	225	<RDL	<RDL		
12-Nov-13	12:48 PM	3.5	7.66	262	<RDL	<RDL		
13-Nov-13	9:25 AM	< 0.0	7.31	222	0.000	0.003		
14-Nov-13	12:38 PM	3.1	7.47	250	<RDL	<RDL		
16-Nov-13	8:50 AM	<0.0	7.63	213	<RDL	<RDL		



**Table 4: R10 – Field Parameters**

**Table 4: R10 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:56 AM	<0.0	7.51	207	0.006	0.005	0.91	
06-Nov-13	9:05 AM	<0.0	7.19	201	0.011	0.005		
07-Nov-13	12:22 PM	<0.0	7.54	219	0.007	0.004	0.93	
09-Nov-13	9:17 AM	<0.0	6.74	271	0.003	0.002		
11-Nov-13	11:17 AM	0.3	7.88	226	0.010	0.002		
12-Nov-13	12:55 PM	2.3	7.74	230	0.005	0.003		
13-Nov-13	9:20 AM	< 0.0	7.26	220	0.007	0.005		
14-Nov-13	12:46 PM	1.5	7.71	236	0.008	0.006		
16-Nov-13	9:01 AM	<0.0	7.41	220	0.009	0.008		



**Table 5: NF1 - Oct – Field Parameters**

**Table 5: NF1 - Oct – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:45 AM	0.0	5.26	1080	2.485	2.804	16.57	Sample taken from location established in October. Strong sulphur like smell at sampling location, sediment in sample and once capped the bottle began to expand. Dissolved Zn greater than total Zn; Reanalysis verified the result
06-Nov-13	8:54 AM	1.3	5.30	1064	2.437	2.463		
07-Nov-13	2:58 PM	<0.0	6.83	0	2.525	2.312	22.10	Strong sulphur like smell at sampling location, sediment in sample and once capped the bottle began to expand. High range meter used for EC therefore value would not register.
09-Nov-13	9:37 AM	0.1	5.51	1092	2.081	2.269		Sample taken from location established in October. Dissolved Zn greater than total Zn; Reanalysis verified the result
11-Nov-13	11:38 AM	0.3	7.86	239	0.003	0.002		Sampled from near the middle of the pond. Once broken through ice at Oct-established site was all mud
12-Nov-13	1:10 PM	1.6	5.53	1046	2.309	2.257		Lots of suspended material in sample.
13-Nov-13	9:10 AM	< 0.0	5.54	1017	2.153	2.137		Lots of suspended material in sample. Sample produced gas when shaken in bottle
14-Nov-13	12:54 PM	<0.0	5.37	1138	2.449	2.175		
16-Nov-13	9:20 AM	<0.0	5.59	1047	2.211	2.313		Dissolved Zn greater than total Zn; Reanalysis verified the result.



**Table 6: NF2 – Field Parameters**

**Table 6: NF2 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:15 AM	0.7	7.04	276	0.904	0.824	1.94	
06-Nov-13	9:28 AM	<0.0	7.46	228	0.676	0.631		
07-Nov-13	10:08 AM	<0.0	7.42	245	0.769	0.665	2.53	
09-Nov-13	10:04 AM	<0.0	7.02	294	0.563	0.502		
11-Nov-13	12:04 PM	0.3	7.54	263	0.555	0.555		
12-Nov-13	1:30 PM	0.9	7.14	243	0.631	0.580		
13-Nov-13	10:05 AM	< 0.0	7.56	227	0.215	0.193		Collected a new sample at 3:30pm to verify the result. Dissolved Zn - 0.212 mg/L
14-Nov-13	10:48 AM	2.3	7.36	238	0.270	0.236		Sampled collected mid-stream; an additional sample was collected along the bank of the stream (after chipping away the ice) NF2 @ bank [Zn] Total = 0.912; [Zn] Dissolved = 0.828.
16-Nov-13	9:16 AM	0.2	7.72	230	0.137	0.125		EC measured in FMC Lab.



**Table 7: X2 – Field Parameters**

**Table 7: X2 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	9:58 AM	<0.0	7.33	250	0.359	0.329	1.68	
06-Nov-13	9:13 AM	<0.0	7.51	233	0.311	0.283		
07-Nov-13	12:53 PM	0.2	7.74	242	0.358	0.303	1.33	
09-Nov-13	8:46 AM	0.3	7.61	261	0.304	0.321		
11-Nov-13	9:37 AM	0.3	7.71	265	0.336	0.300		
12-Nov-13	10:45 AM	1.1	7.53	242	0.307	0.280		
13-Nov-13	9:44 AM	0.2	7.66	213	0.315	0.002		
14-Nov-13	10:23 AM	1.2	7.52	247	0.337	0.267		
16-Nov-13	9:03 AM	0.2	8.14	270	0.352	0.313		EC measured in FMC Lab.



**Table 8: X3A – Field Parameters**

**Table 8: X3A – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	11:16 AM	0.8	7.00	306	0.505	0.444	13.77	
06-Nov-13	9:00 AM	<0.0	7.47	335	0.513	0.439		
07-Nov-13	12:39 PM	0.2	7.90	262	0.291	0.203	9.55	
09-Nov-13	8:36 AM	0.2	7.85	278	0.186	0.176		
11-Nov-13	9:50 AM	1.5	7.95	321	0.197	0.172		
12-Nov-13	10:35 AM	1.6	7.58	264	0.177	0.157		
13-Nov-13	9:32 AM	0.3	7.77	252	0.179	0.160		
14-Nov-13	10:13 AM	1.8	7.88	294	0.375	0.301		
16-Nov-13	8:53 AM	0.3	8.07	261	0.202	0.186		



**Table 9: X10 – Field Parameters**

**Table 9: X10 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	10:51 AM	0.1	7.30	261	0.215	0.184	2.77	
06-Nov-13	8:48 AM	<0.0	8.25	249	0.190	0.172		
07-Nov-13	12:23 PM	0.1	8.11	271	0.192	0.157	1.97	
09-Nov-13	8:24 AM	0.1	7.85	273	0.209	0.178		
11-Nov-13	9:17 AM	0.3	7.94	291	0.195	0.179		
12-Nov-13	10:15 AM	0.8	7.71	259	0.194	0.173		
13-Nov-13	9:19 AM	0.3	7.85	255	0.185	0.164		
14-Nov-13	10:02 AM	1.5	7.58	288	0.200	0.167		
16-Nov-13	8:40 AM	0.6	8.05	266	0.199	0.178		



**Table 10: X14 – Field Parameters**

**Table 10: X14 – Field Parameters**

Date	Time	Temperature (°C)	pH	EC (µS/cm)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Turbidity (NTU)	Comments
05-Nov-13	9:38 AM	0.2	7.47	829	0.186	0.153	8.44	
06-Nov-13	8:38 AM	<0.0	7.74	744	0.163	0.137		
07-Nov-13	11:43 AM	0.1	7.77	845	0.162	0.136	7.09	
09-Nov-13	8:13 AM	0.2	7.50	1010	0.172	0.135		
11-Nov-13	9:05 AM	0.2	7.74	920	0.168	0.137		
12-Nov-13	10:00 AM	1.3	7.61	827	0.168	0.126		
13-Nov-13	9:06 AM	1.1	7.57	861	0.164	0.135		
14-Nov-13	8:54 AM	3.3	7.53	906	0.176	0.139		
16-Nov-13	8:29 AM	3.1	7.94	437	0.179	0.165		

# **Appendix C**

## **Figures**



Figure 1: pH

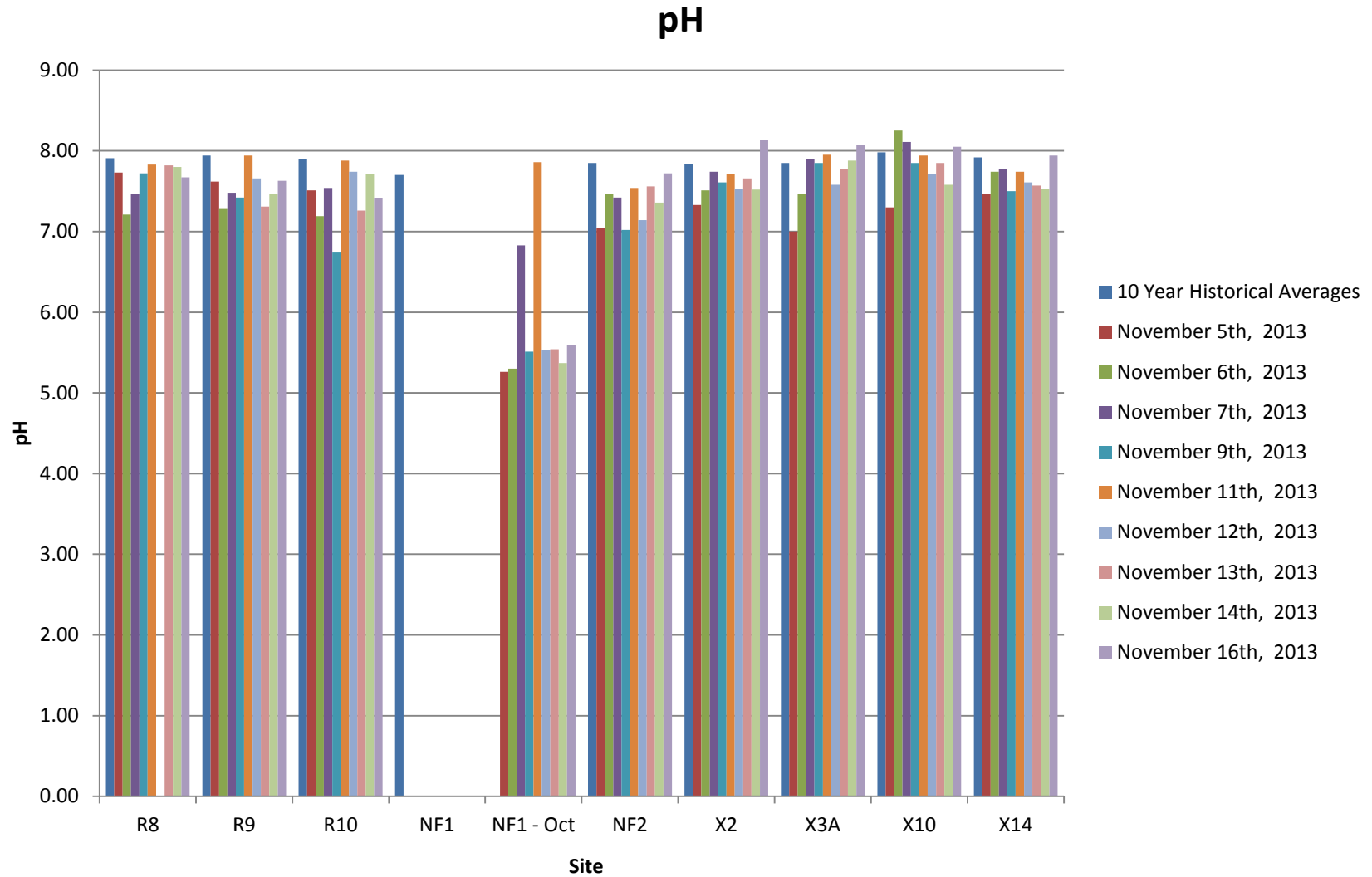




Figure 2: EC

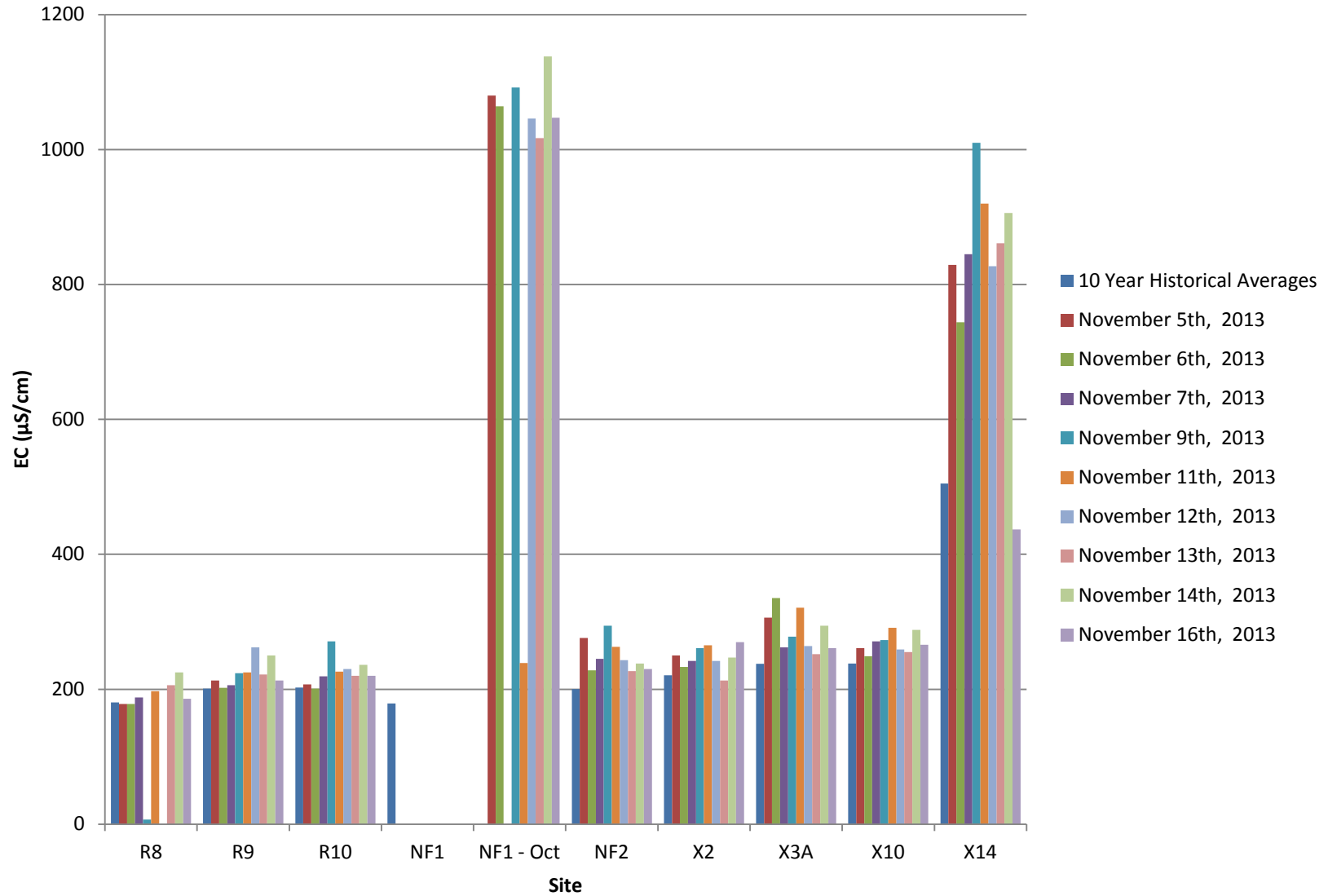
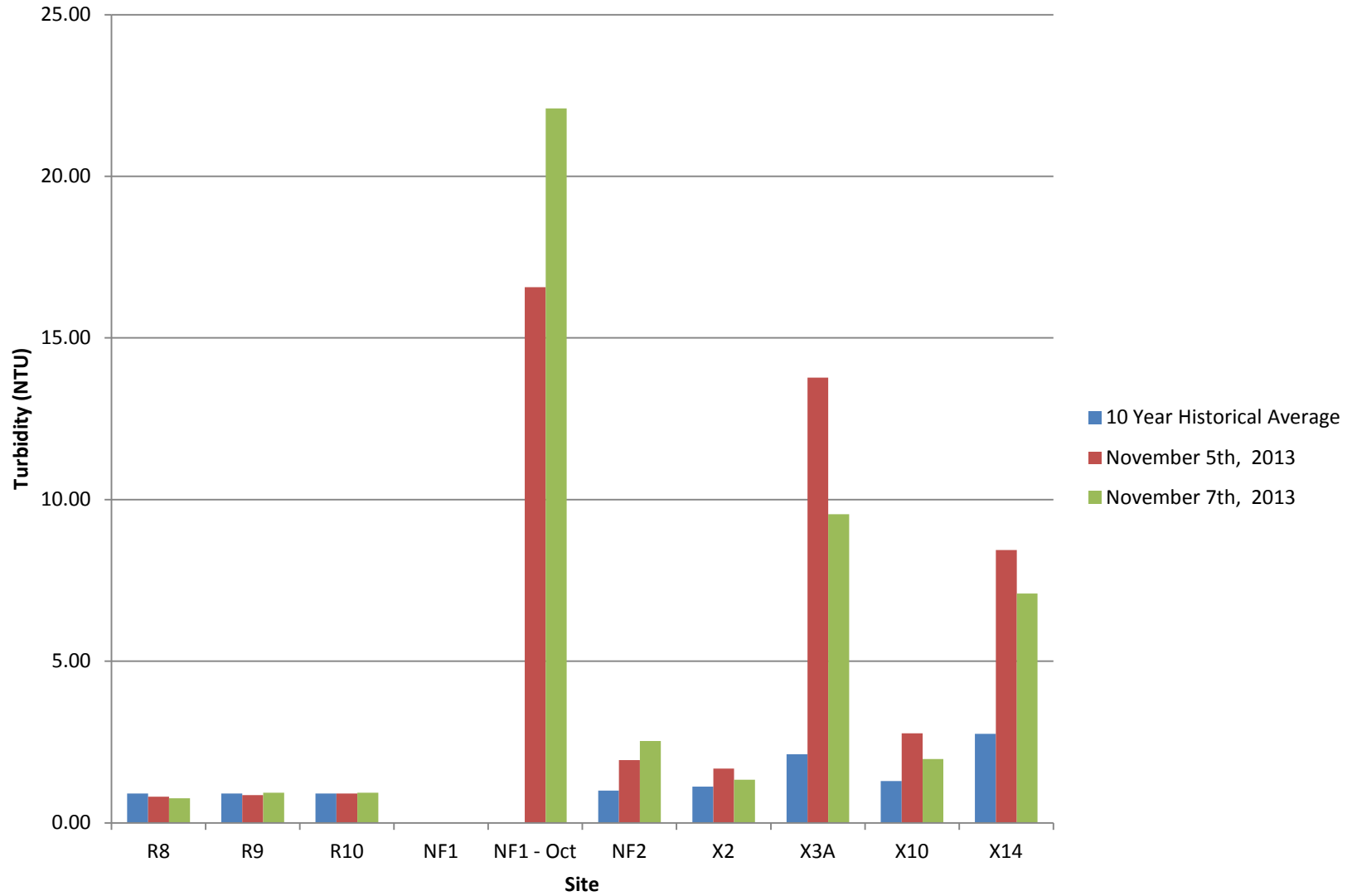








Figure 5: Turbidity



## **Appendix D**

### **Analytical Results**



### Rose Creek Additional Monitoring 1 - Maxxam Analytics Results General Chemistry

Station	Date	Sample Type	ALK mg/L	ALKPP mg/L	CaCO3 mg/L	CaCO3-d mg/L	Chloride mg/L	CO3 mg/L	COND µmho/cm	COND µS/cm	DOC mg/L	HCO3 mg/L as CaCO3	Ion Balance	NH3 mg/L	NO2 mg/L	NO2/3 mg/L	NO3 mg/L	OH mg/L	pH	pHF	SO4-d mg/L	TDS mg/L	TEMP-F °C	TOC mg/L	TSS mg/L
NF1 - Oct	11/5/2013	Surface	347.00	<0.5	517	474	1.10	<0.5	1070.0	1080.0	3.9	423.0	0.97	0.23	<0.5	<2.0	<2.0	<0.5	6.10	5.26	229.0	788.00	0.00	9.72	755
NF1 - Oct	11/7/2013	Surface	113.00	<0.5	166	168	0.67	<0.5	316.0	0.0	2.3	138.0	1.10	0.03	<0.5	<2.0	<2.0	<0.5	7.61	6.83	44.5	204.00	0.00	3.34	188
NF2	11/5/2013	Surface	97.70	<0.5	124	127	<0.5	<0.5	243.0	276.0	1.9	119.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.69	7.04	28.6	150.00	0.70	2.19	5
NF2	11/7/2013	Surface	95.70	<0.5	122	124	0.58	<0.5	251.0	245.0	1.6	117.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.96	7.42	28.5	166.00	0.00	1.67	4
R10	11/5/2013	Surface	94.10	<0.5	110	115	<0.5	<0.5	213.0	207.0	2.1	115.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.87	7.51	15.2	150.00	0.00	2.15	2
R10	11/7/2013	Surface	92.60	<0.5	113	116	<0.5	<0.5	218.0	219.0	2.5	113.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.01	7.54	15.4	140.00	0.00	1.92	<1.0
R8	11/5/2013	Surface	88.20	<0.5	98	102	<0.5	<0.5	185.0	178.0	2.0	108.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.70	7.73	8.4	84.00	0.00	2.25	<1.0
R8	11/7/2013	Surface	84.60	<0.5	93	95	<0.5	<0.5	183.0	188.0	1.6	103.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	8.02	7.47	7.8	120.00	0.00	2.12	<1.0
R9	11/5/2013	Surface	92.90	<0.5	115	112	<0.5	<0.5	211.0	213.0	2.0	113.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.85	7.62	14.3	94.00	0.30	2.14	<1.0
R9	11/7/2013	Surface	93.50	<0.5	112	109	<0.5	<0.5	218.0	206.0	3.1	114.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	8.06	7.48	14.9	146.00	0.00	2.76	<1.0
X10	11/5/2013	Surface	113.00	<0.5	147	148	0.61	<0.5	272.0	261.0	1.8	138.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.97	7.30	28.3	184.00	0.10	2.11	<1.0
X10	11/7/2013	Surface	108.00	<0.5	138	142	0.61	<0.5	261.0	271.0	2.4	131.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.11	8.11	27.7	174.00	0.10	1.73	<1.0
X14	11/5/2013	Surface	145.00	<0.5	447	458	0.84	<0.5	818.0	829.0	1.7	177.0	1.10	0.14	<0.5	<2.0	<2.0	<0.5	7.88	7.47	289.0	586.00	0.20	2.16	4
X14	11/7/2013	Surface	144.00	<0.5	433	421	0.80	<0.5	818.0	845.0	1.6	176.0	1.10	0.13	<0.5	<2.0	<2.0	<0.5	8.10	7.77	255.0	610.00	0.10	2.20	3
X2	11/5/2013	Surface	97.80	<0.5	127	127	<0.5	<0.5	237.0	250.0	2.0	119.0	1.10	0.01	<0.5	<2.0	<2.0	<0.5	7.81	7.33	24.2	146.00	0.00	2.19	1
X2	11/7/2013	Surface	96.00	<0.5	124	123	<0.5	<0.5	241.0	242.0	2.3	117.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.04	7.74	22.6	156.00	0.20	2.18	<1.0
X3A	11/5/2013	Surface	102.00	<0.5	133	139	0.67	<0.5	262.0	306.0	1.7	125.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	7.76	7.00	28.1	146.00	0.80	2.21	5
X3A	11/7/2013	Surface	103.00	<0.5	133	138	0.74	<0.5	263.0	262.0	2.0	126.0	1.10	0.02	<0.5	<2.0	<2.0	<0.5	8.09	7.90	27.9	174.00	0.20	2.05	2



**Rose Creek Additional Monitoring 1 - Maxxam Analytics Results**  
**Dissolved Metals**

Station	Date	Sample Type	Ag-d µg/L	Al-d µg/L	As-d µg/L	Ba-d µg/L	B-d µg/L	Be-d µg/L	Bi-d µg/L	Ca-d mg/L	Cd-d µg/L	Co-d µg/L	Cr-d µg/L	Cu-d µg/L	Fe-d µg/L	K-d mg/L	Li-d mg/L	Mg-d mg/L	Mn-d µg/L	Mo-d µg/L	Na-d mg/L	Ni-d µg/L	Pb-d µg/L	Sb-d µg/L	S-d mg/L	Se-d µg/L	Si-d µg/L	Sn-d µg/L	Sr-d µg/L	Ti-d µg/L	Tl-d µg/L	U-d µg/L	V-d µg/L	Zn-d µg/L	Zr-d µg/L
NF1 - Oct	11/5/2013	Surface	<0.005	81.90	0.86	135.00	<50.0	0.07	<0.005	123.00	1.84	105.00	0.31	0.28	27700.00	3.46	0.04	40.50	6780.00	0.12	11.90	45.30	0.58	0.03	83.90	<0.04	13600.00	<0.2	693.00	<0.5	0.08	1.04	<0.2	2200.00	0.17
NF1 - Oct	11/7/2013	Surface	<0.005	10.90	0.74	76.10	<50.0	<0.01	<0.005	47.60	0.15	2.70	<0.1	0.40	1350.00	1.20	0.01	11.90	428.00	0.54	3.48	6.93	1.00	0.09	17.80	0.38	7220.00	<0.2	200.00	<0.5	0.01	1.95	<0.2	338.00	<0.1
NF2	11/5/2013	Surface	<0.005	9.50	0.60	60.20	<50.0	<0.01	<0.005	35.50	0.43	4.15	<0.1	0.42	274.00	0.85	0.01	9.36	252.00	0.62	2.72	6.71	1.07	0.07	9.50	0.37	6240.00	<0.2	149.00	<0.5	0.00	1.63	<0.2	918.00	<0.1
NF2	11/7/2013	Surface	<0.005	7.37	0.49	62.40	<50.0	<0.01	<0.005	34.00	0.35	3.43	<0.1	0.44	221.00	0.86	0.01	9.42	221.00	0.60	2.73	5.64	1.01	0.08	10.80	0.36	6270.00	<0.2	142.00	<0.5	0.00	1.58	<0.2	718.00	<0.1
R10	11/5/2013	Surface	<0.005	5.07	0.49	56.70	<50.0	<0.01	<0.005	35.30	0.01	0.05	<0.1	0.42	94.00	0.79	0.00	6.62	26.10	0.59	2.41	0.51	0.07	0.07	5.90	0.35	6410.00	<0.2	134.00	<0.5	<0.002	1.60	<0.2	8.02	<0.1
R10	11/7/2013	Surface	<0.005	5.52	0.49	57.90	<50.0	<0.01	<0.005	33.80	0.01	0.07	0.14	0.49	95.10	0.81	0.00	7.60	25.80	0.66	2.55	0.53	0.17	0.05	6.80	0.40	6460.00	<0.2	137.00	<0.5	<0.002	1.56	<0.2	9.63	<0.1
R8	11/5/2013	Surface	<0.005	5.49	0.58	52.60	<50.0	<0.01	<0.005	31.30	0.02	0.06	<0.1	0.42	121.00	0.63	0.00	5.79	25.50	0.63	2.45	0.36	0.06	0.07	<3.0	0.31	6550.00	<0.2	122.00	<0.5	<0.002	1.41	<0.2	10.00	<0.1
R8	11/7/2013	Surface	<0.005	5.02	0.59	55.80	<50.0	<0.01	<0.005	28.30	0.01	0.04	0.17	0.51	118.00	0.73	0.00	5.84	20.50	0.65	2.48	0.43	0.07	0.07	3.10	0.28	6430.00	<0.2	121.00	<0.5	<0.002	1.27	<0.2	5.15	<0.1
R9	11/5/2013	Surface	<0.005	4.46	0.52	53.80	<50.0	<0.01	<0.005	33.70	0.01	0.03	<0.1	0.41	92.70	0.80	0.00	6.71	23.50	0.64	2.47	0.39	0.07	0.06	4.80	0.33	6240.00	<0.2	134.00	<0.5	<0.002	1.60	<0.2	2.63	<0.1
R9	11/7/2013	Surface	<0.005	4.45	0.48	58.20	<50.0	<0.01	<0.005	31.80	0.02	0.07	<0.1	0.43	99.70	0.83	0.00	7.30	26.00	0.58	2.58	0.39	0.08	0.06	6.80	0.33	6140.00	<0.2	136.00	<0.5	<0.002	1.59	<0.2	20.70	<0.1
X10	11/5/2013	Surface	<0.005	2.78	0.29	61.40	<50.0	<0.01	<0.005	43.80	0.08	0.82	<0.1	0.38	257.00	0.94	0.00	9.46	130.00	0.55	2.53	1.84	0.37	0.07	9.10	0.36	5840.00	<0.2	173.00	<0.5	<0.002	2.00	<0.2	199.00	<0.1
X10	11/7/2013	Surface	<0.005	3.14	0.27	66.10	<50.0	<0.01	<0.005	41.20	0.07	0.70	<0.1	0.42	322.00	1.03	0.00	9.61	117.00	0.58	2.63	1.77	0.32	0.06	10.00	0.37	6270.00	<0.2	176.00	<0.5	<0.002	1.83	<0.2	177.00	<0.1
X14	11/5/2013	Surface	<0.005	1.74	0.21	56.90	<50.0	<0.01	<0.005	136.00	0.09	13.20	<0.1	0.33	366.00	1.93	0.01	28.60	7590.00	0.57	7.46	10.50	0.10	0.06	101.00	0.34	6310.00	<0.2	388.00	<0.5	0.01	2.74	<0.2	160.00	<0.1
X14	11/7/2013	Surface	<0.005	1.82	0.19	56.90	<50.0	<0.01	<0.005	119.00	0.08	13.90	<0.1	0.35	316.00	2.15	0.01	30.10	7660.00	0.56	7.72	10.60	0.08	0.06	114.00	0.30	5820.00	<0.2	409.00	<0.5	0.01	2.58	<0.2	144.00	<0.1
X2	11/5/2013	Surface	<0.005	5.86	0.55	56.60	<50.0	<0.01	<0.005	37.00	0.17	1.73	<0.1	0.44	194.00	0.86	0.01	8.44	175.00	0.64	2.64	3.15	1.01	0.08	9.50	0.32	6410.00	<0.2	142.00	<0.5	<0.002	1.75	<0.2	365.00	<0.1
X2	11/7/2013	Surface	<0.005	5.37	0.45	60.70	<50.0	<0.01	<0.005	34.90	0.16	1.66	<0.1	0.42	149.00	0.88	0.00	8.74	152.00	0.61	2.68	2.93	0.68	0.08	8.80	0.33	6430.00	<0.2	146.00	<0.5	0.00	1.59	<0.2	331.00	<0.1
X3A	11/5/2013	Surface	<0.005	2.55	0.27	57.70	<50.0	<0.01	<0.005	40.60	0.09	1.02	<0.1	0.40	2140.00	1.02	0.00	9.08	181.00	0.49	2.63	2.10	0.47	0.06	12.50	0.34	5710.00	<0.2	172.00	<0.5	0.00	1.91	<0.2	420.00	<0.1
X3A	11/7/2013	Surface	<0.005	2.62	0.25	61.50	<50.0	<0.01	<0.005	40.20	0.09	0.88	<0.1	0.41	1280.00	1.01	0.00	9.23	141.00	0.50	2.66	1.78	0.18	0.06	10.50	0.28	6080.00	<0.2	169.00	<0.5	0.00	1.80	<0.2	258.00	<0.1



**Rose Creek Additional Monitoring 1 - Maxxam Analytics Results**  
**Total Metals**

Station	Date	Sample Type	Ag µg/L	Al µg/L	As µg/L	B µg/L	Ba µg/L	Be µg/L	Bi µg/L	Ca mg/L	Cd µg/L	Co µg/L	Cr µg/L	Cu µg/L	Fe µg/L	K mg/L	Li mg/L	Mg mg/L	Mn µg/L	Mo µg/L	Na mg/L	Ni µg/L	Pb µg/L	S mg/L	Sb µg/L	Se µg/L	Si µg/L	Sn µg/L	Sr µg/L	Ti µg/L	Tl µg/L	U µg/L	V µg/L	Zn µg/L	Zr µg/L
NF1 - Oct	11/5/2013	Surface	0	3450	7	<50.0	213.000	0.51	0.05	137.00	3.79	125.0000	2.8100	16.6000	35200.00	4.05	0.05	42.80	7470.000	0.155	12.40	74.8000	76.7	93.80	0.0790	0.1160	14700.00	<0.2	716.00	46.7000	0.2030	4.1300	8.5100	2730.0	0.75
NF1 - Oct	11/7/2013	Surface	0	1040.00	4	<50.0	128.000	0.18	0.06	46.10	0.59	3.7500	2.0400	8.3600	3790.00	1.38	0.01	12.40	466.000	0.469	3.40	11.0000	59.9000	16.30	0.1270	0.3880	8040.00	<0.2	194.00	21.8000	0.0340	2.5700	4.1300	458.000	0.33
NF2	11/5/2013	Surface	<0.005	43	1	<50.0	62.300	<0.01	<0.005	35.10	0.45	4.0900	0.1300	0.7810	506.00	0.85	0.01	8.81	262.000	0.604	2.59	6.6200	6.8	10.20	0.0770	0.3540	6300.00	<0.2	146.00	1.4600	0.0080	1.6100	<0.2	907.000	<0.1
NF2	11/7/2013	Surface	0	68.60	1	<50.0	63.200	<0.01	0.01	33.20	0.41	3.7300	0.2100	0.9750	536.00	0.90	0.01	9.46	234.000	0.592	2.79	5.9400	9.5400	9.90	0.0820	0.3380	6200.00	<0.2	141.00	3.7500	0.0070	1.6700	0.2700	757.000	<0.1
R10	11/5/2013	Surface	<0.005	14.10	1	<50.0	52.700	<0.01	<0.005	33.00	0.02	0.0610	0.1200	0.4360	151.00	0.81	0.00	6.65	25.800	0.588	2.43	0.4390	0.1760	5.80	0.0650	0.3210	6010.00	<0.2	133.00	0.7400	<0.002	1.5700	<0.2	8.210	<0.1
R10	11/7/2013	Surface	<0.005	12.90	1	<50.0	58.500	<0.01	<0.005	32.90	0.02	0.0630	0.1300	2.3400	181.00	0.84	0.00	7.49	25.700	0.578	2.62	0.4700	0.2390	6.20	0.0660	0.3190	6170.00	0.29	138.00	<0.5	<0.002	1.5700	<0.2	9.130	0.11
R8	11/5/2013	Surface	<0.005	13.30	1	<50.0	51.600	<0.01	<0.005	30.40	0.01	0.0370	<0.1	0.4320	162.00	0.69	0.00	5.42	24.200	0.596	2.24	0.3300	0.1000	3.40	0.0650	0.3700	6310.00	<0.2	116.00	<0.5	<0.002	1.3800	<0.2	0.620	<0.1
R8	11/7/2013	Surface	<0.005	9.03	1	<50.0	53.500	<0.01	<0.005	27.50	0.01	0.0390	<0.1	0.5190	158.00	0.69	0.00	5.92	20.600	0.596	2.43	0.4020	0.2200	3.20	0.0630	0.3140	6220.00	<0.2	115.00	0.6800	<0.002	1.3600	<0.2	2.170	<0.1
R9	11/5/2013	Surface	<0.005	14.50	1	<50.0	54.600	<0.01	<0.005	34.90	0.01	0.0440	<0.1	0.4750	147.00	0.83	0.00	6.68	24.700	0.587	2.44	0.3940	0.1560	5.50	0.0660	0.3300	6410.00	<0.2	134.00	<0.5	<0.002	1.5200	<0.2	8.550	<0.1
R9	11/7/2013	Surface	<0.005	9.41	1	<50.0	58.900	<0.01	<0.005	32.60	0.01	0.0400	<0.1	0.4490	138.00	0.79	0.00	7.42	23.900	0.642	2.62	0.3730	0.1970	5.30	0.0510	0.3000	6210.00	<0.2	136.00	<0.5	<0.002	1.5600	<0.2	1.570	<0.1
X10	11/5/2013	Surface	<0.005	7.92	0	<50.0	60.300	<0.01	<0.005	43.00	0.08	0.8330	<0.1	0.4950	551.00	0.98	0.00	9.54	131.000	0.520	2.47	1.8700	1.1200	9.70	0.0760	0.3700	5870.00	<0.2	173.00	<0.5	<0.002	1.9700	<0.2	206.000	<0.1
X10	11/7/2013	Surface	<0.005	15.50	0	<50.0	63.400	<0.01	<0.005	39.00	0.08	0.7060	<0.1	0.4660	483.00	1.03	0.00	9.81	119.000	0.535	2.65	1.8100	0.5970	8.70	0.0600	0.3680	5670.00	<0.2	168.00	<0.5	<0.002	1.7700	<0.2	186.000	<0.1
X14	11/5/2013	Surface	<0.005	10.20	0	<50.0	57.100	<0.01	<0.005	132.00	0.11	13.9000	<0.1	0.3890	1220.00	2.05	0.01	28.80	7530.000	0.593	7.61	10.7000	0.9160	107.00	0.0700	0.3270	6220.00	<0.2	400.00	<0.5	0.0090	2.7200	<0.2	178.000	<0.1
X14	11/7/2013	Surface	<0.005	14.40	0	<50.0	57.900	<0.01	<0.005	124.00	0.10	13.9000	<0.1	0.4750	1210.00	2.14	0.01	29.90	7290.000	0.680	7.93	11.1000	0.7240	115.00	0.0600	0.3250	6130.00	<0.2	403.00	0.5500	0.0090	2.6400	<0.2	160.000	<0.1
X2	11/5/2013	Surface	<0.005	18.20	1	<50.0	60.900	<0.01	<0.005	36.90	0.18	1.7800	0.1300	0.6520	315.00	0.88	0.01	8.52	179.000	0.642	2.75	3.2700	3.4600	9.20	0.0810	0.3370	6510.00	<0.2	145.00	<0.5	0.0050	1.5800	<0.2	372.000	<0.1
X2	11/7/2013	Surface	<0.005	21.30	1	<50.0	62.500	<0.01	<0.005	34.90	0.18	1.6900	<0.1	0.5770	269.00	0.91	0.01	9.03	154.000	0.570	2.83	3.0700	2.5900	9.10	0.0730	0.3420	6350.00	<0.2	142.00	1.2100	0.0040	1.6800	<0.2	338.000	<0.1
X3A	11/5/2013	Surface	<0.005	14.00	0	<50.0	62.000	<0.01	<0.005	39.40	0.12	1.0100	0.1100	0.5640	3210.00	1.01	0.00	8.48	174.000	0.479	2.48	2.0700	1.8500	11.20	0.0680	0.3350	5830.00	<0.2	177.00	<0.5	0.0040	1.7800	<0.2	441.000	<0.1
X3A	11/7/2013	Surface	<0.005	15.40	0	<50.0	64.000	<0.01	<0.005	37.70	0.11	0.9040	0.1200	0.5050	2020.00	1.04	0.00	9.35	142.000	0.487	2.64	1.8900	1.1700	11.80	0.0560	0.2810	5680.00	<0.2	173.00	0.5600	0.0030	1.8800	<0.2	280.000	<0.1