



April 5, 2007

Margaret Ash  
Environmental Protection Specialist  
Colorado Oil and Gas Conservation Commission  
1120 Lincoln Street, Suite 801  
Denver, CO 80203

Subject: Status Report, North Fork Ranch Groundwater Monitoring, Raton Basin, Colorado

Dear Ms. Ash:

On behalf of Pioneer Natural Resources USA Inc., please find attached a status update of groundwater monitoring activities in the North Fork Ranch area of the Raton Basin. Information on water well and monitoring well installation and sampling was submitted to you previously in reports dated October 18th and December 4th, 2006. The attached report summarizes these actions and describes more recent monitoring activities and future plans.

Please contact me if you have any comments or questions regarding this report.

Sincerely,  
Norwest Applied Hydrology

Martin S. Johnson, P.G.  
Senior Hydrogeologist

Attachments

cc. Gerald Jacob, Pioneer Natural Resources USA

**STATUS REPORT**  
**North Fork Ranch Groundwater Monitoring**  
**March 30, 2007**

**Summary:**

Three monitoring wells were installed in the North Fork Ranch subdivision in November and December, 2006, as proposed in the "North Fork Ranch Groundwater Monitoring Work Plan" dated September 23, 2006. The wells were installed near and downgradient of three, planned, coalbed methane production wells between the CBM well sites and the nearest domestic water wells (Figure 1). Two of the monitoring wells, located near the Sanchinator and Keystone CBM wells, were completed in water-bearing units currently utilized by downgradient water users. The third well, located near the Niagara CBM well, was completed at a depth coinciding with the nearest domestic well, but did not contain water.

After completion and development the Sanchinator and Keystone monitoring wells were sampled and the samples submitted for laboratory analysis. Results of the analyses are shown on attached Table 1. The water from both wells met primary drinking water standards for all analytes except fluoride (Sanchinator). Both monitoring wells exceeded secondary standards for iron, and manganese, and the Sanchinator for pH. The Niagara monitoring well did not contain sufficient water to be sampled.

After the monitoring wells were sampled and before any CBM well drilling took place nearby, the Sanchinator and Keystone monitoring wells were equipped with transducers that measure water pressure, temperature, and electrical conductivity. The transducers were initialized to record data every 5 minutes. A pressure transducer was also hung near the bottom of the Niagara well to record any pressure changes that might occur if water came into the well. The transducers were operational during CBM drilling activities at the Niagara and Keystone pads in December, 2006.

Shortly after the transducers were installed, the first of a series of large snowfall events occurred making the wells inaccessible for approximately two months. When the wells were finally accessible in late February, 2007, the transducers were found to be functional, although the internal memories of the dataloggers had been filled and no more data were being recorded. Data from the transducers through February 25<sup>th</sup> were downloaded and the transducers reset in the wells.

Data from the transducers are currently being compiled. Preliminary evaluation of the data indicates the water level in the Sanchinator monitoring well declined after the transducer was installed until it reached a static level of approximately 516 feet below ground surface. This reduction in water level is common for new monitoring wells as they reach equilibrium following installation. The water level in the Keystone MW fluctuated only slightly during the period of record, likely in response to barometric pressure changes. The temperature and conductivity did not change appreciably in either well. The water level, temperature, and conductivity of the water in the Keystone MW

changed very little during the drilling of the Keystone CBM well, as shown by the graph in Figure 2.

### **Domestic water well replacement:**

Pioneer replaced the Dolores and Ross water wells in September and October, 2006, respectively. The replacement wells were drilled in locations where the shallow, alluvial groundwater that served as a source for the existing wells would not be encountered. Although the replacement well locations were determined by dowsers chosen by the Doloreses and Ms. Ross, neither well encountered sufficient groundwater to serve as a suitable water supply. With the well owners' approval Pioneer installed cisterns and water treatment systems on the two original water wells so they could continue to be used for potable water supply.

On October 24 and 25, 2006, NAH collected water samples from the two domestic wells at the same time that a consultant hired by the well owners (Glibota Environmental) sampled the wells. The purpose of the joint sampling was to resolve any questions regarding sampling methodology and assure that sampling data obtained by both parties were comparable. As attached Table 2 shows, analytical results for samples collected by both parties were very similar. Federal and state drinking water standards were met for all analytes in the untreated water samples except for slightly elevated manganese in the Dolores well. The well also had coliform bacteria, indicating the need for treatment.

The replacement water well drilled for the Doloreses was subsequently re-permitted with the Colorado State Engineers Office as a monitoring well. The well will be included in the groundwater monitoring program for the North Fork Ranch area and will be sampled periodically and equipped with a pressure transducer to monitor for water level changes during CBM well drilling in the area.

### **Plans:**

The transducers were reset in the Keystone and Sanchinator monitoring wells to resume recording data at 5-minute intervals. The transducers will be checked and data downloaded monthly or more frequently when there is nearby CBM drilling activity. Water samples will be collected for laboratory analysis from the two monitoring wells containing water on the schedule proposed in the work plan. The Niagara well will be checked to see if it contains water and, if so, will be sampled and equipped for continuous data recording.

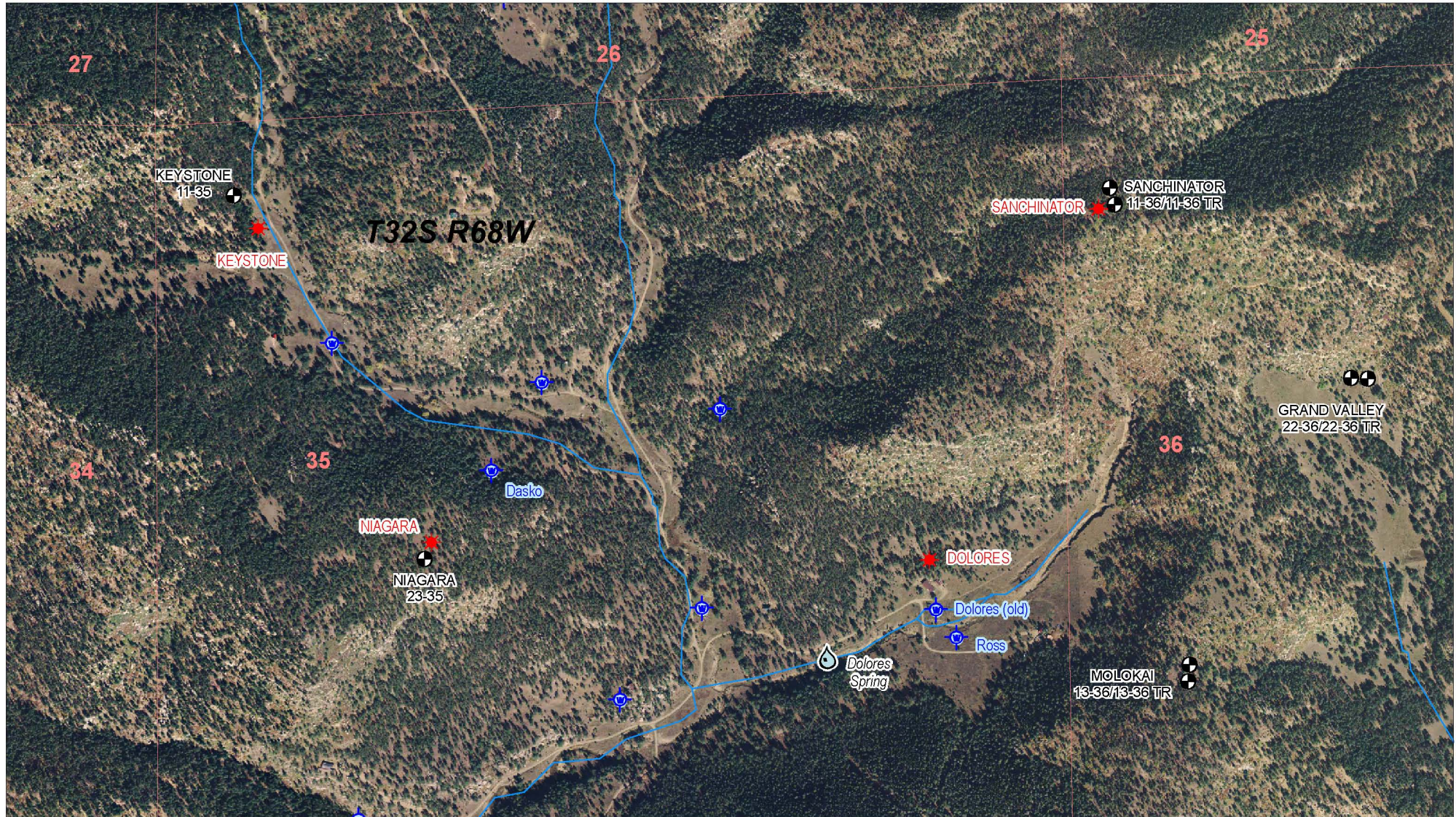










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# Figure 1

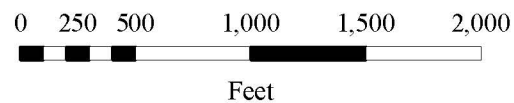
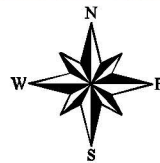
## Site Location Map



### Legend

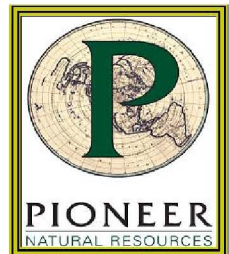
-  Monitoring Well
-  Water Well
-  Spring
-  CBM Well
-  Stream
-  Section Line

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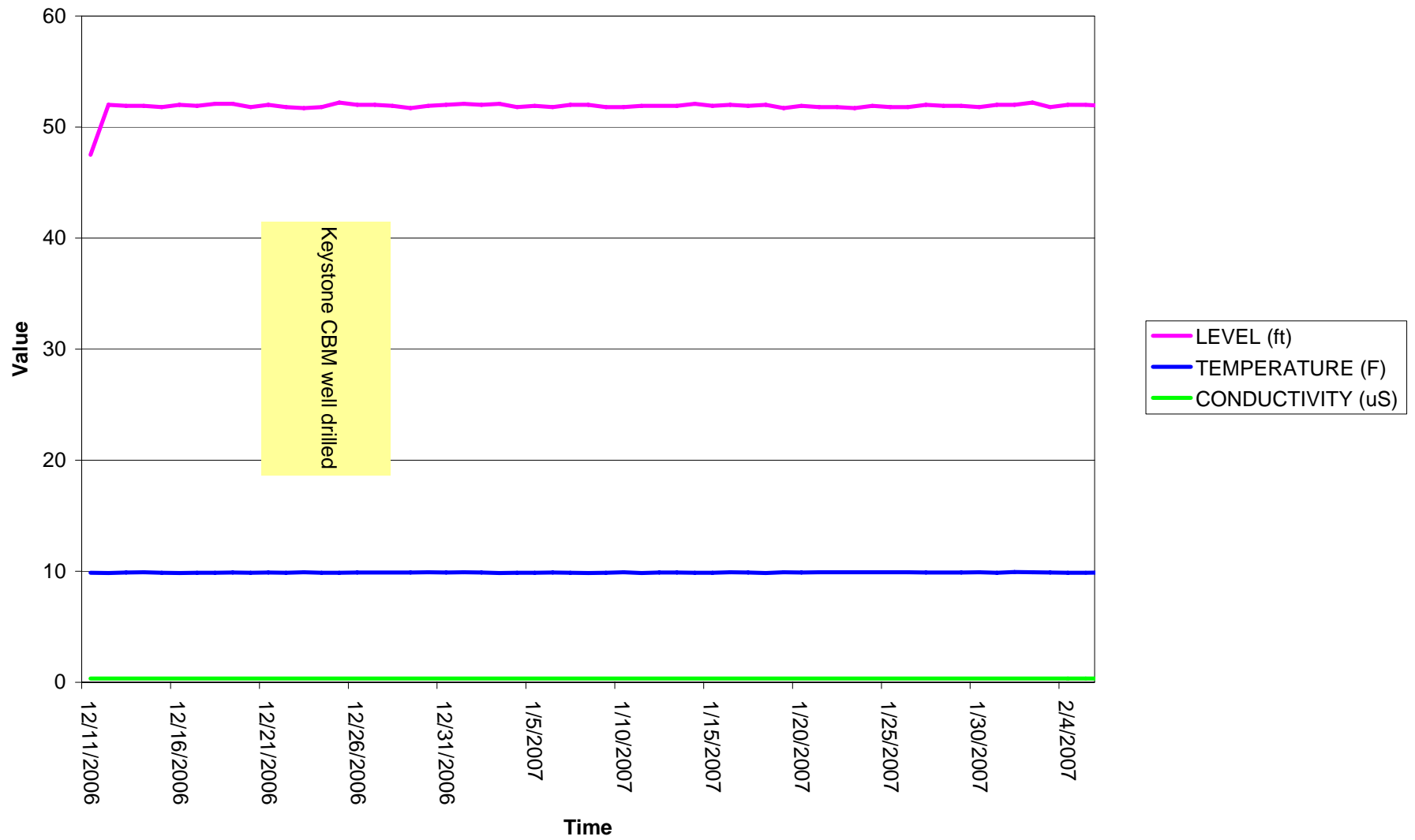
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Datum: NAD 1927  
Zone: 13N  
Units: Feet

Created: MD  
Date 3/27/2007





**FIGURE 2**  
**Keystone MW**



**TABLE 1**  
**North Fork Ranch Monitoring Well Data**

Constituent	Method	Reporting Limit	Units	MCL or TT Primary	Secondary Standard	Sanchinator 11/18/2006	Keystone 11/20/2006
Alkalinity	310.1	5.0	mg/L			170	134
Arsenic - T.Rec	200.8	0.0025	mg/L	0.0100		0.0081	0.0025
Barium - T.Rec	200.8	0.0050	mg/L	2.0000		0.170	0.210
Benzene	8021B / 524.2	0.0005	mg/L	0.0050		ND	0.00093
Bicarbonate Alkalinity	310.1	5.0	mg/L			170	134
Boron - T.Rec	200.8	0.100	mg/L			ND	ND
Boron - Total	6010B	0.050	mg/L			ND	ND
Bromide	300.0	0.20	mg/L			ND	ND
Cadmium - Total	200.7	0.0050	mg/L	0.0050		ND	ND
Calcium - Total	200.7	0.20	mg/L			3.1	36.5
Calcium - Total	6010B	0.200	mg/L			3.1	32.3
Carbonate Alkalinity	310.1	5.0	mg/L			32.1	ND
Chloride	300.0	1.0	mg/l		250.000	8.0	3.9
Chromium - Total	200.7	0.010	mg/L	0.1000		0.012	ND
Copper - Diss.	200.7	0.010	mg/L		1.0000	ND	ND
Copper - T.Rec	200.8	0.0050	mg/L		1.0000	0.0082	ND
Ethane	RSK-175	0.0050	mg/L			ND	0.017
Ethene	RSK-175	0.0050	mg/L			ND	ND
Ethylbenzene	8021B / 524.2	0.0005	mg/L	0.7000		ND	ND
Fluoride	300.0	0.20	mg/L	4.00	2.00	8.30	0.66
Hydroxide Alkalinity	310.1	5.0	mg/L			ND	ND
Iron - T.Rec	200.7	0.10	mg/L		0.300	12.70	2.20
Iron - Total	6010B	0.1000	mg/L		0.300	12.50	2.10
Lead - T.Rec	200.8	0.0015	mg/L	0.0150		0.0036	ND
Magnesium - T.Rec	200.8	0.20	mg/L			1.30	4.90
Magnesium - Total	6010B	0.20	mg/L			1.30	4.40
Manganese - Diss.	200.7	0.010	mg/L			0.120	0.260
Manganese - T. Rec	200.7	0.0100	mg/L		0.050	0.180	0.270
Methane	RSK-175	0.0050	mg/L			1.40	0.460
Nitrate	300.0	0.10	mg/L	10.000		ND	ND
Oil & Grease	1664A HEM	5.0	mg/L			ND	ND
pH	150.1	0.10	-		6.5-8.5	9.2	7.8
Potassium - T.Rec	200.8	0.250	mg/L			1.90	2.50
Potassium - Total	6010B	3.00	mg/L			ND	ND
Resistivity	120.1	0.00020	ohm-m			26.0	21.3
Selenium - T.Rec	200.8	0.0025	mg/L	0.0500		ND	ND
Silver - Total	200.7	0.010	mg/l		0.100	ND	ND
Sodium - Total	200.7	5.0	mg/L			95.6	57.1
Sodium - Total	6010B	5.0	mg/L			89.7	49.6
Specific Gravity	D1429	0.00010	-			1.00	1.00
Sulfate	300.0	5.0	mg/l		250.0	ND	85.8
Sulfide	376.2	0.050	mg/L			ND	ND
TDS	160.1	10.0	mg/L		500.0	245	308
TEPH - DRO	8015B	0.250	mg/L			ND	ND
Toluene	8021B / 524.2	0.0005	mg/L	1.0000		ND	ND
TSS	160.2	4.0	mg/L			141	32
Xylenes	8021B / 524.2	0.0005	mg/L	10.0000		ND	ND
Zinc - Total	200.7	0.020	mg/L		5.000	0.023	ND

ND = Not Detected

MCL or TT = Maximum Contaminant Level or Treatment Target for municipal water supplies (not necessarily water wells)

Secondary Standard = "non enforceable guidelines regulating contaminants that may cause cosmetic effects or aesthetic effects in drinking water"

RL = Reporting Limit. The reporting limit may be adjusted high concentrations of the target constituent necessitate sample dilution.

TABLE 2  
Ross and Dolores Water Well Sample Results

Constituent	Method	Requested RL	MCL or TT Primary	Secondary Standard	Ross 10/25/06	Ross 10/25/2006	Dolores 10/24/2006	Dolores 10/24/2006
Acetone	524.2	0.0100			0.019	ND	ND	ND
Alkalinity	310.1	1.0			170	164	190.0	178
Aluminum - T. Rec	200.8	0.050		0.2000	ND	-	ND	-
Antimony - T. Rec	200.8	0.0025	0.0060		ND	-	ND	-
Arsenic - Diss.	200.7	0.0150	0.0100		-	ND	-	ND
Arsenic - T.Rec	200.8	0.0025	0.0100		ND	-	ND	-
Barium - Diss.	200.7	0.010	2.0000		-	0.068	-	0.054
Barium - T.Rec	200.8	0.0050	2.0000		0.073	0.069	0.056	0.056
Benzene	8021B / 524.2	0.0005	0.0050		ND	ND	ND	ND
Beryllium - T. Rec	200.8	0.0005	0.0040		ND	-	ND	-
Bicarbonate Alkalinity	310.1	1.0			170	164	180.0	178
Boron - T.Rec	200.8	0.100			ND	ND	ND	ND
Boron - Total	6010B	0.050			-	ND	-	ND
Bromide	300.0	0.20			-	ND	-	ND
Cadmium - Diss.	200.7	0.0050	0.0050		-	ND	-	ND
Cadmium - T. Rec	200.8	0.0005	0.0050		ND	-	ND	-
Calcium - Diss.	200.7	0.200			-	25.3	-	43.4
Calcium - T.Rec	200.8	0.250			28.0	28.0	47.0	46.0
Calcium - Total	6010B	0.200			-	25.8	-	44.4
Carbonate Alkalinity	310.1	5.0			ND	ND	ND	ND
Chloride	300.0	1.0		250.0000	6.2	5.9	ND	6.7
Chloride	325.2	2.5		250.0000	-	6.0	-	6.6
Chloroform	524.2	0.0005			ND	ND	0.0049	0.0038
Chromium - Diss.	200.7	0.010	0.1000		-	ND	-	ND
Chromium - T. Rec	200.8	0.005	0.1000		ND	-	ND	-
Cobalt - T. Rec	200.8	0.0005			ND	-	ND	-
Coliform, Fecal	9222D	1.0	0.0000		ND	-	ND	-
Coliform, Total	9223	1.0	0.0000		5.2	-	2400.0	-
Color	2120B	5.0		15.0000	ND	-	ND	-
Copper - Pot. Diss.	200.7	0.010	1.3000	1.0000	-	ND	-	ND
Copper - T.Rec	200.8	0.0050	1.3000	1.0000	ND	ND	ND	ND
Copper - T.Rec	6010B	0.010	1.3000	1.0000	-	ND	-	ND
Escherichia coli	9223	1.0	0.0000		ND	-	ND	-
Ethane	RSK-175	0.0500			-	ND	-	ND
Ethene	RSK-175	0.0500			-	ND	-	ND
Ethylbenzene	8021B / 524.2	0.0005	0.7000		ND	ND	ND	ND
Fluoride	300.0	0.20	4.00	2.00	0.97	0.97	ND	0.47
Hydroxide Alkalinity	310.1	5.0			-	ND	-	ND
Iron - Diss.	200.7	0.050		0.3000	-	ND	-	ND
Iron - T.Rec	200.8	0.100		0.3000	ND	ND	ND	ND
Iron - T.Rec	6010B	0.050		0.3000	-	0.058	-	ND
Iron - Total	6010B	0.050		0.3000	-	ND	-	ND
Lead - Diss.	200.7	0.0090	0.0150		-	ND	-	ND
Lead - T.Rec	200.8	0.0015	0.0150		ND	ND	ND	ND
Magnesium - Diss.	200.7	0.10			-	5.60	-	8.10
Magnesium - T.Rec	200.8	0.250			6.30	5.80	8.80	8.30
Magnesium - Total	6010B	0.10			-	5.40	-	9.30
Manganese - Diss.	200.7	0.010		0.0500	-	ND	-	0.150
Manganese - Pot. Diss.	200.7	0.010		0.0500	-	ND	-	0.160
Manganese - T.Rec	200.8	0.0050		0.0500	ND	ND	0.160	0.160
Mercury - T. Rec	200.8	0.0005	0.0020		ND	-	ND	-
Methane	RSK-175	0.0050			0.200	0.250	2.400	0.63
Molybdenum - T. Rec	200.8	0.0050			0.013	-	ND	-
MTBE	524.4	0.0020			ND	ND	ND	ND
Nickel - T. Rec	200.8	0.0010			ND	-	ND	-
Nitrate	300.0	0.10	10.0000		-	0.26	-	ND
Odor	2150B	1.0		3.0000	ND	-	ND	-
Oil & Grease	1664A HEM	5.0			-	ND	-	ND
pH	150.1	0.10		6.5-8.5	7.7	7.9	7.32	7.7
Potassium - Diss.	200.7	3.0			-	ND	-	ND
Potassium - T.Rec	200.8	0.250			0.88	0.87	1.300	1.300
Potassium - Total	6010B	3.0			-	ND	-	ND
Resistivity	120.1	0.0002			-	21.5	-	16.2
Selenium - Diss.	200.7	0.0150	0.0500		-	ND	-	ND
Selenium - T.Rec	200.8	0.0025	0.0500		ND	ND	0.0025	ND
Silver - Diss.	200.7	0.010		0.1000	-	ND	-	ND
Silver - T. Rec	200.8	0.0010		0.1000	ND	-	ND	-
Sodium - Diss.	200.7	5.0			-	75.3	-	85.2
Sodium - T.Rec	200.8	0.250			75.0	77.0	87.000	85.000
Sodium - Total	6010B	5.0			-	75.7	-	94.6
Specific Gravity	D1429	0.0001			-	1.00	-	1.00
Sulfate	300.0	25.0		250.0000	56.0	66.7	120.0	133
Sulfide	376.2	0.10			ND	ND	ND	ND
TDS	160.1	5.0		500.0000	300	278	400.0	380
Thallium - T. Rec	200.8	0.0010	0.0020		ND	-	ND	-
Toluene	8021B / 524.2	0.0010	1.0000		ND	ND	0.00071	0.0011
TPH - DRO	8015B	0.25			-	ND	-	ND
TSS	160.2	4.0			-	ND	-	ND
Xylenes	8021B / 524.2	0.0005	10.0000		ND	ND	ND	ND
Zinc - Pot. Diss.	200.7	0.020		5.0000	-	ND	-	0.030
Zinc - T.Rec	200.8	0.020		5.0000	ND	-	0.020	-
Zinc - T.Rec	6010B	0.020		5.0000	-	ND	-	ND
					Collected by Glibota Environmental	Collected by NAH	Collected by Glibota Environmental	Collected by NAH

ND = Not Detected

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