Mr. Walter F. Wintsch
Engineering Geologist 2
NYSDEC Region 4
1130 North Westcott Road
Schenectady, New York 12306-2014

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Subject:
Erie Boulevard Hydropower, L.P.
Former Fire Training Area
School Street Hydroelectric Station
Town of Colonie, New York
PFOA/PFOS Groundwater Sampling Plan

ENVIRONMENT

Date:
November 14, 2016

Contact:
John C. Brussel, P.E.

Phone:
315.671.9441

Email:
John.Brussel@arcadis.com

Our ref:
B0036643.0001 #10

Dear Mr. Wintsch:

On behalf of National Grid and Erie Boulevard Hydropower, L.P., this letter presents a work plan for sampling groundwater in the former fire training area at the School Street Hydroelectric Station in Cohoes, New York for perfluoro-octanoic acid (PFOA) and perfluorooctyl sulfonate (PFOS). The proposed groundwater sampling will be performed in response to the New York State Department of Environmental Conservation's (NYSDEC's) request in August 11, 2016 e-mail correspondence to National Grid and Arcadis of New York, Inc. (Arcadis). The NYSDEC indicated that it is reviewing sites across New York State where PFOA/PFOS may have been used, and this is considered one of those sites due to the former fire training operations. The NYSDEC provided guidance for PFOA/PFOS sampling in September 12, 2016 e-mail correspondence to National Grid and Arcadis. The sampling procedures presented in this work plan fully incorporate the NYSDEC's guidance and include additional provisions from other sources.

Relevant background information is presented below, followed by details of the proposed groundwater sampling and reporting and the anticipated schedule for implementing the work.

I. BACKGROUND

The School Street hydroelectric station is located in the Towns of Colonie and Cohoes, Albany County, New York (Figure 1). The generating station is located along the south bank of the Mohawk River, which flows southeasterly through the City of Cohoes. An upland portion of the hydroelectric station property in the

Town of Colonie was formerly used by Niagara Mohawk (now known as National Grid) for fire training activities. This former fire training area ("the site") is a listed New York State inactive hazardous waste site and has previously undergone extensive investigation and remediation. The site location relative to the generating station is shown on Figure 2. The former site layout and locations of the five groundwater monitoring wells installed as part of previous site investigations are shown on Figure 3.

Fire training activities were conducted at the site during the summer and fall from approximately 1968 to 1980. The fire training activities consisted of igniting oil (including transformer oil) that was piped to or poured over training props in an approximately 115-foot long by 35-foot wide area that sloped toward the river. Fires were extinguished at the site using a combination of dry chemical fire extinguishers and water pumped from the river. There are no records of the types of dry chemical extinguishers used for the fire training activities or whether the extinguishers (or any foams, if used) contained PFOA or PFOS. Certain aqueous film-forming foams (AFFF) are known to have contained PFOS and have been used in extinguishing fires at military bases, airports, oil refineries, and firefighting training facilities throughout the United States. However, it is questionable whether AFFF would have been used at the site given the small scale of the fire training operations and the comparatively high purchase price for AFFF at the time.

Various environmental site investigations were performed at the site between 1998 and 2001. These investigations identified polychlorinated biphenyls (PCBs) in soil and nearshore sediment at concentrations exceeding applicable cleanup levels. Several rounds of groundwater samples were collected at the site between 1999 and 2005. PCBs were not detected in any groundwater samples from monitoring wells MW-1 and MW-2D. PCBs were identified at low levels in five of the seven samples collected from monitoring well MW-3 and one of the four samples collected from monitoring well MW-4. These latter two wells were downgradient from the area where the highest PCB concentrations were identified in site soil. PCBs detected in the groundwater samples from MW-3 and MW-4 appeared to primarily be associated with suspended particulates in the samples. Monitoring well MW-2S was used historically for gauging only (not sampling). The potential presence of PFOA or PFOS in soil and groundwater at the site was not evaluated by the previous environmental site investigations.

An interim remedial measure (IRM) was implemented in 2002 to remove PCB-impacted soil from within and around the former fire training area and PCB-impacted sediment from a small area immediately adjacent to the river bank. The IRM was conducted to limit potential direct-contact exposure and constituent migration from soil to groundwater and surface water. The IRM removal activities also addressed other constituents (e.g., semi-volatile organic compounds) that were co-located with PCBs. Approximately 3,950 cubic yards (CY) of soil and sediment were removed and transported for offsite disposal. A final remedial measure was implemented in 2008 to address nearshore sediment containing PCBs. Approximately 100 CY of PCB-containing sediment were removed from a 200-foot long area, extending from the shoreline to 15 feet beyond the shoreline, and transported for offsite disposal. These removal activities would have also addressed PFOA/PFOS (if present) in the soil and sediment.

Surface water sampling was performed in connection with the previous site investigation and remediation activities. Surface water samples were collected near the downstream end of the approximately 0.9-mile long canal referred to as the "power canal", which diverts water from the Mohawk River (via a gatehouse opposite the former fire training area) to the generating station. The sampling was performed because the

City of Cohoes public drinking water supply intakes are in the power canal approximately 4,500 feet downstream from the canal's entrance. Samples of the influent water to the Cohoes Water Treatment Plant (from the "raw water reservoir") and treated water from the plant (from a "clear well") were also collected. The water samples from the power canal, raw water reservoir, and clear well were collected quarterly from March 2002 to April 2003 (before, during, and after the IRM soil/sediment removal) and analyzed for PCBs. The laboratory analytical results indicated that PCBs were not detected in any of the samples.

The City of Cohoes tested the treated public water supply for PFOA and PFOS quarterly in 2013 and once more in March 2016. The laboratory analytical results indicated the following:

- *2013 Water Samples:* PFOA and PFOS were not detected in any of the four 2013 water samples above the 20 parts per trillion (ppt) detection limit.

- *2016 Water Sample:* PFOS was not detected in this sample above the 0.67 ppt laboratory detection limit in this sample. PFOA was identified in the sample at an estimated concentration of 2.3 ppt, which was well-below the health advisory value that the United States Environmental Protection Agency (EPA) had lowered to 70 ppt in May 2016.

Based on the PFOA/PFOS results and test results for other water quality parameters, the latest City of Cohoes Annual Water Quality Report indicates that the City's water supply is safe for use.

II. PROPOSED PFOA/PFOS GROUNDWATER SAMPLING ACTIVITIES

Although extensive investigation and remediation has already been performed at the site, the potential presence of PFOA and PFOS in groundwater has not been evaluated. Unlike PCBs, which tend to adsorb to soil particles and are not typically found in groundwater, PFOA and PFOS are highly soluble in groundwater.

The remainder of this section describes work to be performed in preparation for the PFOA/PFOS groundwater sampling and presents procedures to be used for the proposed sampling and analysis, including quality assurance/quality control (QA/QC) procedures.

A. Monitoring Well Integrity Assessments and Redevelopment

As summarized in October 6, 2016 e-mail correspondence from Arcadis to the NYSDEC, Erie Boulevard Hydropower conducted a site reconnaissance on September 8, 2016 to field-locate the groundwater monitoring wells in the former fire training area. Erie Boulevard Hydropower found three of the five monitoring wells (MW-1, MW-2D, and MW-3), but was unable to locate the remaining two (MW-2S and MW-4). Based on photographs provided by Erie Boulevard Hydropower (see Attachment A), monitoring wells MW-1 and MW-3 appear to be intact. The steel riser and cover for MW-2D appear to have been sheared off.

Arcadis is scheduled to be onsite on November 15, 2016 to perform monitoring well integrity assessments and redevelop monitoring wells, as needed, in preparation for sampling. A metal detector will be used to

locate the two monitoring wells that Erie Boulevard Hydropower was unable to find. The monitoring well integrity assessments will evaluate the viability of the existing wells for sampling. At each well, Arcadis will observe the surface completion and casing condition and then measure the depth-to-water and total well depth. The thickness of sediment (if any) in the wells will be determined by probing and comparing the measured depth-to-bottom to the well installation depth as recorded on the monitoring well construction logs (Attachment B). The findings will be documented on the monitoring well integrity assessment form provided in Attachment C, and used to select monitoring wells for sampling (refer to the next subsection for the selection rationale).

Each monitoring well selected for sampling will be redeveloped prior to sampling. If a large amount of accumulated sediment (>2 feet) is not present in the monitoring well, then the redevelopment will consist of surging the well screen with a bailer (a surge-block may also be used) for at least five minutes (without removing water from the well), followed by purging the well of five well volumes or to dryness, whichever comes first. If a large amount of sediment is present, then the well development duration will be double that required for wells without large amounts of sediment.

B. PFOA/PFOS Groundwater Sampling and Analysis

At least two weeks following monitoring well redevelopment, groundwater sampling for PFOA and PFOS will be performed. Sampling for these perfluoroalkyl substances (PFAS) presents unique challenges that require modifications to typical field sampling protocols. These challenges stem from the fact that PFAS are found in many commonly used materials considered desirable for other analyte sampling protocols (e.g., Teflon™ tape, and Teflon™-lined pump bladders, and Teflon™-lined sample caps) and in water-resistant field clothing/gear (e.g., GORE-TEX®). While most of these materials will not present a large source of PFAS contamination, these should be avoided wherever possible. The proposed modified field sampling protocols are presented in Attachment D.

Arcadis will collect groundwater samples from at least two monitoring wells for laboratory analysis for PFOA and PFOS. Arcadis currently anticipates collecting groundwater samples from monitoring wells MW-1 and MW-3. These two wells appear to be undamaged based on the September 8, 2016 site reconnaissance and are ideal for PFOA/PFOS sampling, as follows:

- MW-1 is an upgradient well to evaluate potential background conditions
- MW-3 is the downgradient well that historically contained the highest PCB groundwater concentrations

Up to one additional monitoring well will be selected for sampling based on the results of the monitoring well integrity assessments. Either monitoring well MW-2D or MW-4 would provide an additional downgradient data point. However, the condition of monitoring well MW-2D is questionable because the steel riser section was previously sheared off, leaving the well exposed. Monitoring well MW-4 will be added to the sampling list, if located and determined to be suitable for sampling. Monitoring well MW-2S (if found) will only be used for gauging, consistent with its historical use.

Groundwater purging and sampling will be performed using the low-flow techniques described in Attachment D. Based on review of previous sampling records, purging/sampling will be performed at a rate of approximately 100 milliliters per minute using a peristaltic pump and high-density polyethylene (HDPE) tubing (separate tubing for each well). Historical data suggests that monitoring well MW-4, if found in-tact and selected for sampling, may go dry before parameters stabilize. If so, MW-4 would be sampled when the water level has recovered sufficiently to support the required sample volume. Field parameters measured during purging and immediately prior to sampling will be recorded on the groundwater sampling log included in Attachment E.

QA/QC samples, including a field duplicate, equipment (rinse) blank, trip blank, matrix spike, and matrix spike duplicate sample, will be collected in support of the PFOA/PFOS groundwater sampling. The groundwater samples will be submitted to TestAmerica of San Francisco, California for laboratory analysis for PFOA and PFOS using Modified EPA Method 537. TestAmerica's reporting limit for both constituents is 2.0 ppt, which is well-below the EPA's existing 70 ppt health advisory value for PFOA/ PFOS.

C. Wastewater Management

Wastewater generated by monitoring well redevelopment and groundwater purging prior to sampling will be containerized in 55-gallon steel drums for offsite transportation and disposal by National Grid/Erie Boulevard Hydropower. A composite wastewater sample will be collected to profile the wastewater for offsite treatment/disposal.

III. GROUNDWATER SAMPLING REPORT

Arcadis will prepare a letter report to the NYSDEC that summarizes the work performed and findings of the PFOA/PFOS groundwater sampling activities and presents conclusions and recommendations. The letter report will be supported by the following:

- Data tables presenting the validated analytical results compared to the EPA's PFOA/PFOS health advisory value
- A figure showing the monitoring well locations and PFOA/PFOS analytical results
- Monitoring well inspection forms and groundwater sampling logs as an attachment
- The data validation report and laboratory analytical data report on compact disc

IV. SCHEDULE

As indicated above, Arcadis plans to conduct the monitoring well integrity assessments and monitoring well redevelopment on November 15, 2016. The low-flow purging and groundwater sampling will be performed under a separate mobilization, within approximately two to three weeks following NYSDEC approval of this work plan. The schedule for fieldwork is subject to change based on weather conditions. As indicated in the groundwater sampling procedure (Attachment D), waterproof rain gear is not

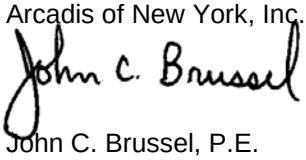
permitted. Therefore, field sampling may be postponed if: (1) heavy rainfall is predicted; or (2) a consistent rain falls at the site and persists at a rate saturating the ground (forming puddles). Sampling may proceed under a gazebo tent installed over the top of the monitoring well to provide shelter from the rain, provided proper precautions are taken to avoid cross-contamination.

Laboratory analysis of the groundwater samples will be performed on standard turnaround time, with results anticipated approximately 15 business days following sample receipt. Arcadis will validate the PFOA/PFOS laboratory analytical results within approximately four weeks after receiving the Level 4 laboratory analytical data report(s) from TestAmerica. The groundwater sampling report will be submitted to the NYSDEC within approximately three to four weeks following the data validation.

We will make any needed adjustments to this sampling plan based on NYSDEC's review. Please do not hesitate to call Mr. James F. Morgan of National Grid at 315.428.3101 or me at 315.671.9441 if you have any questions or require additional information regarding any aspect of the proposed groundwater sampling.

Sincerely,

Arcadis of New York, Inc.



John C. Brussel, P.E.
Principal Engineer

Copies:
James F. Morgan, National Grid (via e-mail)
Ian Borlang, Brookfield Renewable (via e-mail)
Matthew Johnson, Brookfield Renewable (via e-mail)

Enclosures:

Figures

1 Site Location Map
2 Site Plan
3 Monitoring Well Locations

Attachments

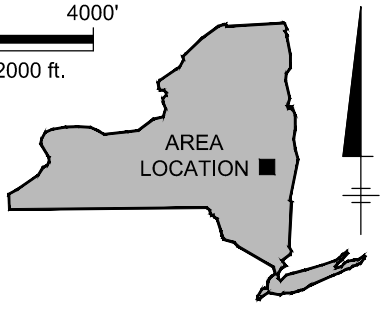
A Photograph Log
B Monitoring Well Construction Logs
C Monitoring Well Integrity Assessment Form
D PFOA/PFOS Groundwater Sampling Procedure
E Groundwater Sampling Log

FIGURES

REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., TROY NORTH, NY, 2013.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



ERIE BOULEVARD HYDROPOWER, L.P.
FORMER NATIONAL GRID
SCHOOL ST. HYDROELECTRIC STATION - TOWN OF COLONIE, NY

PFOA/PFOS GROUNDWATER SAMPLING WORK PLAN

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: SYRACUSE NY DIV/GROUP: ENVCAD DB: E. KRAHMER PIC: PM: TM: TR: C. HEALY LYR: ON=*;OFF=*REF*
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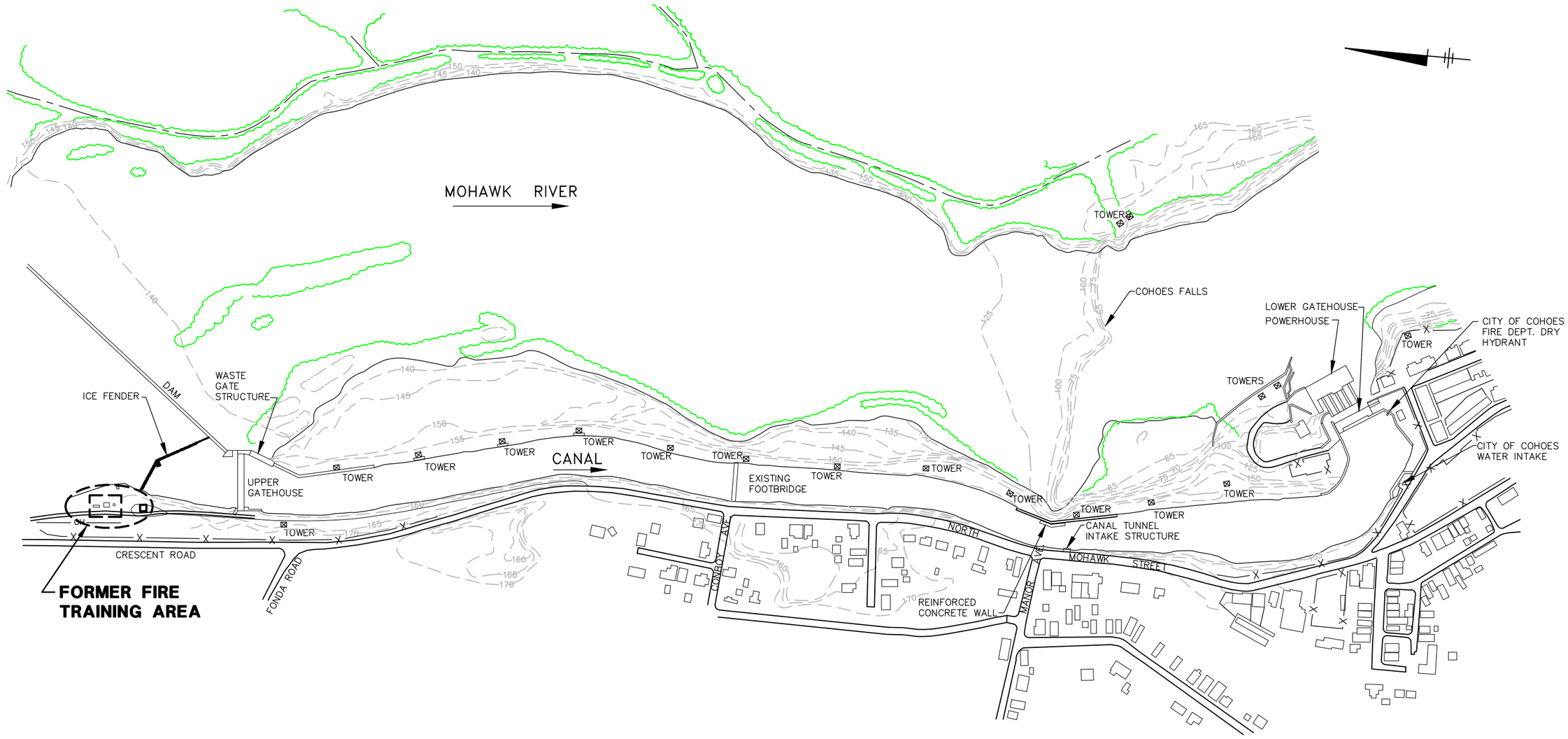

NOTES:

1. BASE MAP DEVELOPED FROM NIAGARA MOHAWK POWER CORPORATION, ACQUIRED BY AND NOW REFERRED TO AS NATIONAL GRID, AS-BUILT DRAWING ENTITLED "SCHOOL STREET HYDRO DEVELOPMENT: CANAL WALL REPLACEMENT GENERAL PLAN, LOCATION MAP, GENERAL NOTES AND DWG. INDEX," FILE INDEX NO. 2.0-S12-H4, DRAWING NO. D-30664-E, ORIGINAL ISSUE DATE 6/30/94, AS-BUILT 9/95, AT A SCALE OF 1"=200'.

2. BASE MAP ALSO DEVELOPED FROM SITE SURVEY COMPLETED BY NATIONAL GRID (AS PRESENTED ON THE NATIONAL GRID DRAWING ENTITLED "SCHOOL STREET DEVELOPMENT SAMPLING LOCATIONS, INDEX NO. 2.0-S12-M5, DRAWING NO. B-33591-E, DATED APRIL 1999, LATEST REVISION MARCH 2001, AT A SCALE OF 1"=60'). LOCATION OF ICE FENDER IS FROM SURVEY ACTIVITIES COMPLETED ARCADIS OF NEW YORK, INC., FORMERLY KNOWN AS BLASLAND, BOUCK & LEE, INC., DURING NOVEMBER 1999.

3. PFOA/PFOS = PERFLUOROOCTANOIC ACID AND PERFLUOROOCTYL SULFONATE.

0 400' 800'

GRAPHIC SCALE

ERIE BOULEVARD HYDROPOWER, L.P.
FORMER NATIONAL GRID
SCHOOL ST. HYDROELECTRIC STATION - TOWN OF COLONIE, NY
PFOA/PFOS GROUNDWATER SAMPLING WORK PLAN

SITE PLAN

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

CITY: Syracuse DIV/GROUP: Env-141 DB: L.Posenauer A.Schilling LD: AM: PD: TM: TR: LYR:ON=*;OFF=*REF*
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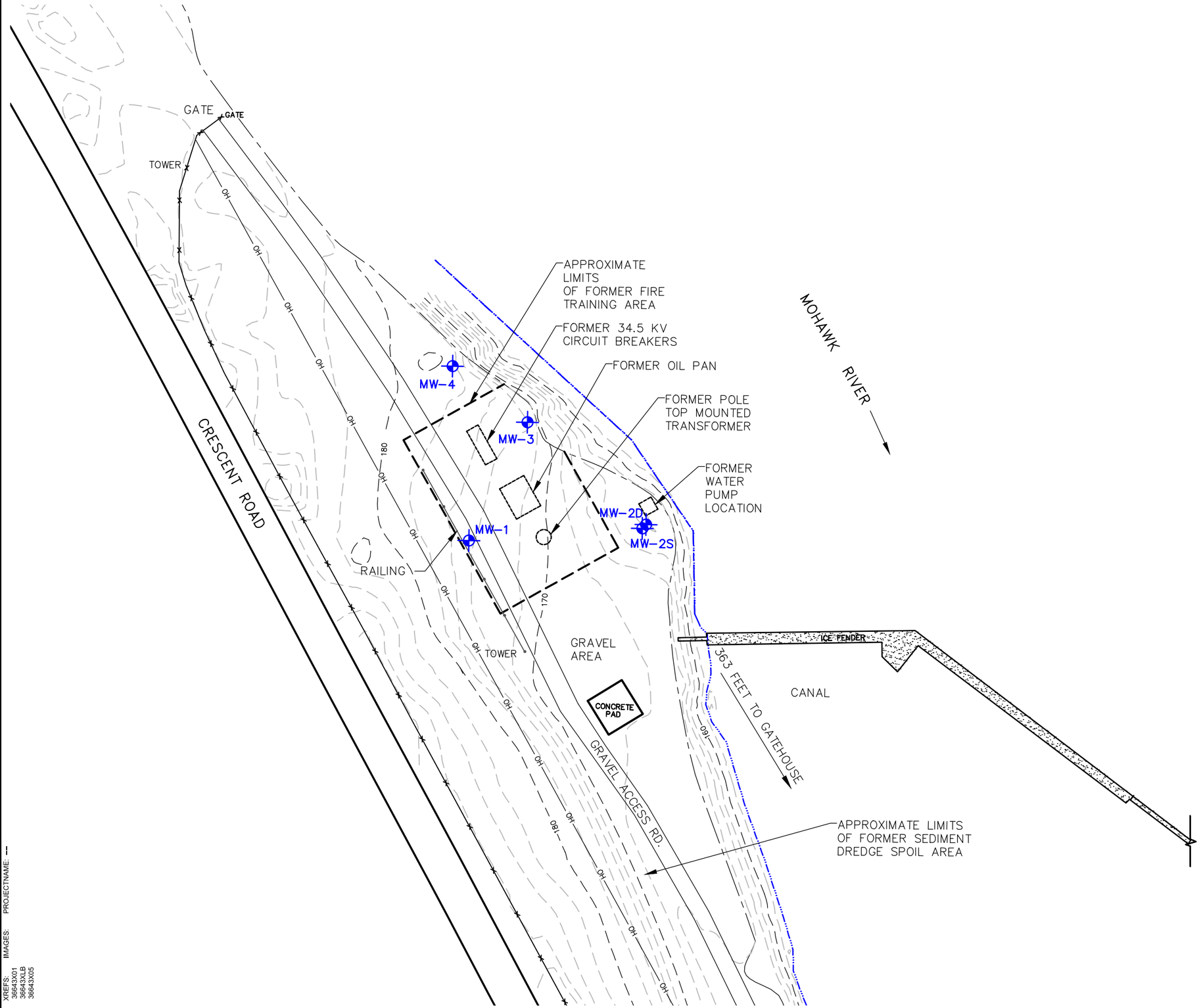

LEGEND:

- MW-1 — MONITORING WELL LOCATION
- SHORELINE
- TOP OF BANK
- X — FENCE
- OH — OVERHEAD HIGH VOLTAGE ELECTRIC LINE
- —170— GROUND SURFACE CONTOUR LINE (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)

NOTES:

1. BASE MAP DEVELOPED FROM SITE SURVEY COMPLETED BY NIAGARA MOHAWK POWER CORPORATION, ACQUIRED BY AND NOW REFERRED TO AS NATIONAL GRID (AS PRESENTED ON THE NATIONAL GRID DRAWING ENTITLED "SCHOOL STREET DEVELOPMENT SAMPLING LOCATIONS, INDEX NO. 2.0-S12-M5, DRAWING NO. B-33591-E, DATED APRIL 1999, LATEST REVISION MARCH 2001, AT A SCALE OF 1"=60'). LOCATION OF ICE FENDER, TOP OF BANK, AND HIGH VOLTAGE LINE ARE FROM SURVEY ACTIVITIES COMPLETED BY ARCADIS OF NEW YORK, INC., FORMERLY KNOWN AS BLASLAND, BOUCK & LEE, INC. DURING NOVEMBER 1999.
2. GROUND SURFACE CONTOUR LINES INDICATE TOPOGRAPHY OF SITE PRIOR TO IMPLEMENTATION OF INTERIM REMEDIAL MEASURES (WHICH WAS COMPLETED DURING 2002).
3. MONITORING WELL LOCATIONS MW-1 THROUGH MW-3 WERE SURVEYED BY NATIONAL GRID.
4. MONITORING WELL MW-4 WAS SURVEYED BY ARCADIS.
5. MONITORING WELL LOCATION MW-2S IS AN OVERBURDEN MONITORING WELL WHILE MONITORING WELL MW-2D IS A BEDROCK WELL.
6. PFOA/PFOS = PERFLUOROOCTANOIC ACID AND PERFLUOROOCTYL SULFONATE.

0 60' 120'

GRAPHIC SCALE

ERIE BOULEVARD HYDROPOWER, L.P.
FORMER NATIONAL GRID
SCHOOL ST. HYDROELECTRIC STATION - TOWN OF COLONIE, NY
PFOA/PFOS GROUNDWATER SAMPLING WORK PLAN

MONITORING WELL LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3

CITY: Syracuse DIV/GROUP: Env-141 DB: L.Posenauer A.Schilling, W. Jones LD: AM: PD: TM: TR: LYR:ON=*;OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACT\B0036643\0001\000041\DWG\36643B03.dwg LAYOUT: 3 SAVED: 11/7/2016 11:24 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/7/2016 11:26 AM BY: KRAHMER, ERIC
XREFS: IMAGES: PROJECTNAME: ---
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36643X05

ATTACHMENT A

Photograph Log

ATTACHMENT A - PHOTOGRAPH LOG

Erie Boulevard Hydopower, L.P.
Former Fire Training Area
School Street Hydroelectric Station
Town of Colonie, New York

Photograph: MW-1

Description:
Photograph of Existing Well Condition

Location:
Former Fire Training Area

Photograph taken by:
Erie Boulevard Hydropower, L.P.

Date: 9/8/2016

Photograph: MW-2D

Description:
Photograph of Existing Well Condition

Location:
Former Fire Training Area

Photograph taken by:
Erie Boulevard Hydropower, L.P.

Date: 9/8/2016

ATTACHMENT A - PHOTOGRAPH LOG

Erie Boulevard Hydopower, L.P.
Former Fire Training Area
School Street Hydroelectric Station
Town of Colonie, New York

Photograph: MW-2D

Description:
Photograph of Existing Well Condition

Location:
Former Fire Training Area

Photograph taken by:
Erie Boulevard Hydropower, L.P.

Date: 9/8/2016

Photograph: MW-3

Description:
Photograph of Existing Well Condition

Location:
Former Fire Training Area

Photograph taken by:
Erie Boulevard Hydropower, L.P.

Date: 9/8/2016

ATTACHMENT B

Monitoring Well Construction Logs

Date Start/Finish: 3-30-99 / 3-30-99
Drilling Company: Parratt Wolff
Driller's Name: Ron Bush
Drilling Method: Hollow Stem Auger
Bit Size: 4 in.
Auger Size: 4.25 in.
Rig Type: CME 85
Spoon Size: 2 in.

Northing: 1440990.7634
Easting: 704530.1848
Well Casing: 174.78 feet
Corehole Depth: 18.0 ft.
Borehole Depth: 18.0 ft.
Ground Surface: 174.98 feet

Geologist: Jennifer Sandorf

Well No: MW-1

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 174.98 ft.										**GROUND SURFACE**
		(0-2')		16 31 62/0.3 50/0.2	93	1.5	20			Gray weathered SHALE and fine SAND.
		(2-4')		NA	NA	0.4	NA			Gray SHALE fragments, dry. Bedrock refusal at 2.1' bgs.
		(4-5')		NA	NA	NA	NA			Augered from 4' to 5' bgs.
5	170	(5-6')		NA	RQD 40%	100%	NA			Gray SHALE, medium hard, slightly weathered. Broken zone from 5.0' to 5.7' bgs.
		(6-11')		Min/ft 10.75 9.0 8.0 10.67 7.75	RQD 53%	90%	NA			Shale becomes more fractured with depth. Fractures at 45 degrees at 6.7', 7-7.3', 7.8', 8.5-9.7', six 3-4" sections from 9.7-11.0' bgs.
10	165									
		(11-16')		Min/ft 7.83 8.17 6.83 7.33	RQD 66%	100%	NA			Fractures at 45 degrees at 11.6', 12.5', 13.0', 14.2', and 15.3' bgs.
15	160									

Well Construction:
- 8-in diameter steel flush mount cover
- Cement pad 0.0 to 1.0' bgs.
- 4-in diameter steel surface casing installed from grade to 5.0' below grade.
- Cement grout 0.4' to 4.3' bgs
- 2-in diameter Sch. 40 PVC well casing 0.4' to 7.3' bgs
- Bentonite seal 4.3' to 6.3' bgs
- Granusil™ silica sand pack 6.3' to 18.0' bgs
- 2-in diameter Sch. 40 PVC 0.010" slot screen 7.3' to 17.2' bgs

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Remarks:
Split-spoon sampled to 4' below grade, augered to 5' below grade, then rock cored to 18' below grade. bgs - Below Ground Surface.

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		2.22 ▼

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

Well No: MW-1

Total Depth = 18.0 ft.

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
		(11-16')		Min/ft 8.5	RQD 66%	100%	NA			Gray SHALE, medium hard, highly fractured. No sections of core >4" in length.	2-in diameter Sch. 40 PVC sump 17.2' to 17.5' bgs
		(16-18')		Min/ft 8.0 8.0	RQD 0%	100%	NA			End of corehole at 18.0' below grade.	
20	155										
25	150										
30	145										
35	140										

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Remarks:

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		2.22 ▼

Date Start/Finish: 4-1-99 / 4-1-99
Drilling Company: Parratt Wolff
Driller's Name: Ron Bush
Drilling Method: Hollow Stem Auger
Bit Size: 4 in.
Auger Size: 4.25 in.
Rig Type: CME 85
Spoon Size: 2 in.

Northing: 1440959.9119
Easting: 704632.6534
Well Casing: 164.86 feet
Corehole Depth: 21.0 ft.
Borehole Depth: 21.0 ft.
Ground Surface: 163.00 feet

Geologist: Jennifer Sandorf

Well No: MW-2D

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 163.00 ft.										GROUND SURFACE	6-in diameter steel Protective cover
0	160	(0-2')		2 8 8 8	16	1.4	10			Medium brown coarse SAND, shell fragments and rootlets, little coarse Gravel, moist.	Cement pad 0.0 to 1.0' bgs.
		(2-4')		6 6 6 5	12	1.3	17			Medium brown coarse SAND and SILT, some orange staining, moist.	4-in diameter steel surface casing installed from grade to 10.0' below grade.
5		(4-6')		4 4 7 7	11	2.0	20			Light brown-orange SILT, moist.	Cement grout 0.0' to 5.5' bgs
		(6-8')		4 4 10 12	14	1.6	15			Light brown-orange SILT, some fine Sand, moist to damp.	2-in diameter stainless steel well casing 2.5' ags to 9.8' bgs
	155	(8-10')		9 15 34 50/0.2	49	0.8	17			Gray weathered SHALE, little light brown-orange Silt and fine Sand, damp to wet. Bedrock refusal at 9.0' bgs.	Bentonite seal 5.5' to 8.0' bgs
10		(10-11')		Min/ft 20'	RQD 0%	20%	NA			Gray weathered SHALE, moderately hard.	
	150	(11-16')		Min/ft 13 14 17 7	RQD 38%	100%	NA			Many mechanical breaks with several 2-3" pieces 11' to 12.4', rock is highly fractured from 12.4' to 13.3', but only two are broken open. Fractures at 45 degrees at 12.9', 13.4' (some silt in fracture). Broken zone from 13.7' to 14'. Fractures at 14.5', 14.9' and 15.5'. Broken zones from 14' to 14.5' and 15.5' to 16'.	Granusil™ silica sand pack 8.0' to 21.0' bgs
15											2-in diameter Sch. 40 PVC 0.010" slot screen 9.8' to 19.7' bgs

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Remarks:

Split-spoon sampled to 10' below grade, then rock cored to 21' below grade. bgs - Below Ground Surface. ags - Above Ground Surface. Water level at ground surface - artesian conditions.

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		0.0

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

Well No: MW-2D

Total Depth = 21.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
	(11-16')		Min/ft 11	RQD 38%	100%	NA			Gray weathered SHALE, medium hard.	
145	(16-21')		Min/ft 17.5 NA NA NA NA	RQD 42%	86%	NA			Gray SHALE, moderately hard, less weathered and fractured than higher in core. Fractures at 17.6', 18', 18.6', 19.2', 19.4', 19.7', 19.9', 20.2'.	2-in diameter Sch. 40 PVC 0.010" slot screen 9.8' to 19.7' bgs; 2-in diameter Sch. 40 PVC sump 19.7' to 20.0' bgs
20									End of corehole at 21.0' below grade.	
140										
25										
135										
30										
130										
35										

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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		0.0 ▼

Project: 364.94.002
Script: nbblwell
Date: 05/06/99

Date Start/Finish: 3-31-99 / 3-31-99
Drilling Company: Parratt Wolff
Driller's Name: Ron Bush
Drilling Method: Hollow Stem Auger
Bit Size: 4 in.
Auger Size: 4.25 in.
Rig Type: CME 85
Spoon Size: 2 in.

Northing: 1440958.3111
Easting: 704629.7839
Well Casing: 162.38 feet

Borehole Depth: 10.0 ft.
Ground Surface: 162.61 feet

Geologist: Jennifer Sandorf

Well No: MW-2S

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation 162.61 ft.									**GROUND SURFACE**	
0 / 160	(0-10')		NA	NA	NA	NA			Medium brown coarse SAND, shell fragments and rootlets, little coarse Gravel, moist.	8-in diameter steel flush mount cover; Cement pad 0.0' to 1.0' bgs; Cement grout 1.0' to 2.0' bgs; Bentonite seal 2.0' to 3.0' bgs; 2-in diameter Sch. 40 PVC well casing 0.9' to 5.0' bgs; Granusil™ silica sand pack 3.9' to 10.0' bgs; 2-in diameter Sch. 40 PVC 0.010" slot screen 5.0' to 10.0' bgs; Bottom of well at 10.0' bgs
5									Medium brown coarse SAND, and SILT, some orange staining, moist.	
									Light brown-orange SILT, moist.	
									Light brown-orange SILT, some fine Sand, moist to damp.	
155									Gray weathered SHALE, little light brown-orange Silt and fine Sand, damp to wet.	
10									End of borehole at 10.0' below grade.	
150										
15										

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Remarks:
Augered to 10' bgs. Soil descriptions from MW-2D. bgs - Below Ground Surface.

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		4.81 ▼

Date Start/Finish: 3-31-99 / 3-31-99
Drilling Company: Parratt Wolff
Driller's Name: Ron Bush
Drilling Method: Hollow Stem Auger
Bit Size: 4 in.
Auger Size: 4.25 in.
Rig Type: CME 85
Spoon Size: 2 in.

Northing: 1441043.9700
Easting: 704589.8200
Well Casing: 172.49 feet
Corehole Depth: 18.0 ft.
Borehole Depth: 18.0 ft.
Ground Surface: 172.93 feet

Geologist: Jennifer Sandorf

Well No: MW-3

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description
gs elevation 172.93 ft.										**GROUND SURFACE**
0	170	(0-2')		3 12 48 43	60	1.6	1.1			3" of topsoil with rootlets, then gray weathered SHALE, dry.
5		(2-5')		NA	NA	NA	NA			
	165	(5-8')		Min/ft 10 8.67 7.33	RQD 27%	100%	NA			Gray SHALE, medium hard, highly weathered, breaks easily along fracture surfaces. Broken zone 5.0' to 6.1', fracture at 45 degrees at 6.4', broken zone from 6.9' to 8.0' bgs.
10		(8-13')		Min/ft 3.5 5.5 7.5 4.5 6.75	RQD 48%	100%	NA			Rock is less fractured than above. Broken zone 8.0' to 8.2', fractures at 45 degrees at 8.6', 9.5', 10.0', 10.4', 10.8', 11.5', broken zone 11.7' to 12.5', fracture at 12.5', and large piece (2-3") broken zone 12.5' to 13' bgs.
	160	(13-18')		Min/ft 8.33 7.0	RQD 72%	100%	NA			Fewer fractures in core. Broken zone 13' to 13.7', fractures at 14', 14.4', 16', 16.8', 17.2', and 17.7' bgs.
15										

Well Construction

- 8-in diameter steel flush mount cover
- Concrete pad 0.0 to 1.0' bgs.
- 4-in diameter steel surface casing installed from grade to 5.0' below grade.
- Concrete grout 1.0' to 5.0' bgs
- 2-in diameter Sch. 40 PVC well casing 1.0' to 7.3' bgs
- Bentonite seal 5.0' to 6.5' bgs
- Granusil™ silica sand pack 6.5' to 18.0' bgs
- 2-in diameter Sch. 40 PVC 0.010" slot screen 7.3' to 17.2' bgs

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Remarks:
Split-spoon sampled to 2' below grade, augered to 5' below grade, then rock cored to 18' below grade. bgs - Below Ground Surface.

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		6.10 ▼

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

Well No: MW-3

Total Depth = 18.0 ft.

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
155	(13-18')		Min/ft 7.0 7.0 5.0	RQD 72%	100%	NA			Slightly weathered gray SHALE.	2-in diameter Sch. 40 PVC sump 17.2' to 17.5' bgs
									End of corehole at 18.0' below grade.	
20										
150										
25										
145										
30										
140										
35										

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Remarks:

Saturated Zones

Date / Time	Elevation	Depth
4/1/99		6.10 ▼

Date Start/Finish: 10-23-00 / 10-24-00
Drilling Company: Parratt Wolff
Driller's Name: Rick Navatka
Drilling Method: Hollow Stem Auger
Bit Size: 4 in.
Auger Size: 4.25
Rig Type: IR A-300
Sampling Method: Split Spoon
Hammer Weight: 140 lbs.

Northing:
Easting:
Well Casing: feet
Corehole Depth: 18.5 feet
Borehole Depth: 18.5 feet
Ground Surface: feet

Geologist: Jennifer Sandorf

Well No: MW-4

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

DEPTH	ELEVATION	Sample Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
gs elevation ft.											
0										**GROUND SURFACE**	8-in diameter steel flush mount cover
		(0-2')		2 2 1 1	3	0.2				Dark brown coarse SAND and fine to coarse GRAVEL, dry, no odor, poor recovery.	Cement pad 0.0 to 1.0' bgs.
		(2-4')		2 3 5 15	8	0.9				Dark brown to gray fine to coarse GRAVEL, some fine to coarse Sand, little Silt and Clay, trace roots, dry, no odor.	6-in diameter steel surface casing installed from grade to 6.0' below grade.
5	-5	(4-6')		8 50/ 4"	NA	0.4				Gray fine to coarse angular GRAVEL Shale fragments, some brown medium to coarse Sand, dry. Bedrock refusal at 5.0' bgs. Augered from 5' to 6' bgs.	Cement grout 1.0' to 5.5' bgs 2-in diameter Sch. 40 PVC well casing 0.7' to 8.4' bgs
		(6-9')		Min/ft 6.5 5.0 6.25	RQD 0%	43%				Gray SHALE, moderately hard, slightly weathered. Possible water-bearing zone at 6.4-6.8' bgs along rust-colored surface. Recovery is mostly broken pieces with two 2-3" pieces at 9"; primarily horizontal fractures.	Bentonite seal 5.5' to 7.5' bgs
10	-10	(9-13.5')		Min/ft 7.0 9.0 9.5 10.75 12.25	RQD 11%	60%				Gray SHALE, moderately hard. Broken zone with 1-2" pieces from 9-10.8'; one 4" piece to 11.2'; two 3" pieces to 11.7' bgs. Fractures are horizontal in upper section and ~45 degrees from 10.8' to bottom. There are a couple of unbroken fractures in the 4" piece. No rust-colored fracture surfaces.	#0 Morie sand pack 7.5' to 18.5' bgs
		(13.5-18.5')		Min/ft 7.5 11.25	RQD 38%	100%				Gray SHALE, moderately hard. Subtle light gray/dark gray banding 13.5-14.3' in 1.5 inch bands.	2-in diameter Sch. 40 PVC 0.010" slot screen 8.4' to 18.4' bgs
15	-15										

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Remarks:
Split-spoon sampled to 5' below grade, augered to 6' below grade, then rock cored to 18.5' below grade. bgs - Below Ground Surface.

Water Levels

Date / Time	Elevation	Depth
11/8/00		13.31 ▼

Project: 364.58.002
File: MW-4.LOG
Script: 99nbbl
Date: 11/16/00

Client:
Niagara Mohawk Power Corporation

Location:
School Street Hydroelectric Facility
Cohoes, New York

Well No: MW-4

Total Depth = 18.5 ft.

DEPTH	ELEVATION	Sample Number	Sample/Int/Type	Blows/6 In.	N	Recovery (ft.)	PID Headspace	Geotechnical Test	Geologic Column	Stratigraphic Description	Well Construction
0											
		(13.5-18.5')		Min/ft 11.25 12.25 15.25 28.0	RQD 38%	100%				Gray SHALE, moderately hard. Fractures at ~45 degrees at 13.9', 14.1', 14.3', 14.7', 15.1', 15.3', 15.7', 15.9' and 16.1'; broken zone from 16.1-16.3', fractures at 16.8' and 17'; broken zones from 17-17.2', 17.6-17.9' and 18.2-18.5'. Possible mechanical fracture at 15.7' bgs.	#0 Morie sand pack 7.5' to 18.5' bgs 2-in diameter Sch. 40 PVC 0.010" slot screen 8.4' to 18.4' bgs
										End of corehole at 18.5' below grade.	2-in diameter Sch. 40 PVC sump 18.4' to 18.5' bgs
20	-20										
25	-25										
30	-30										
35	-35										

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Remarks:

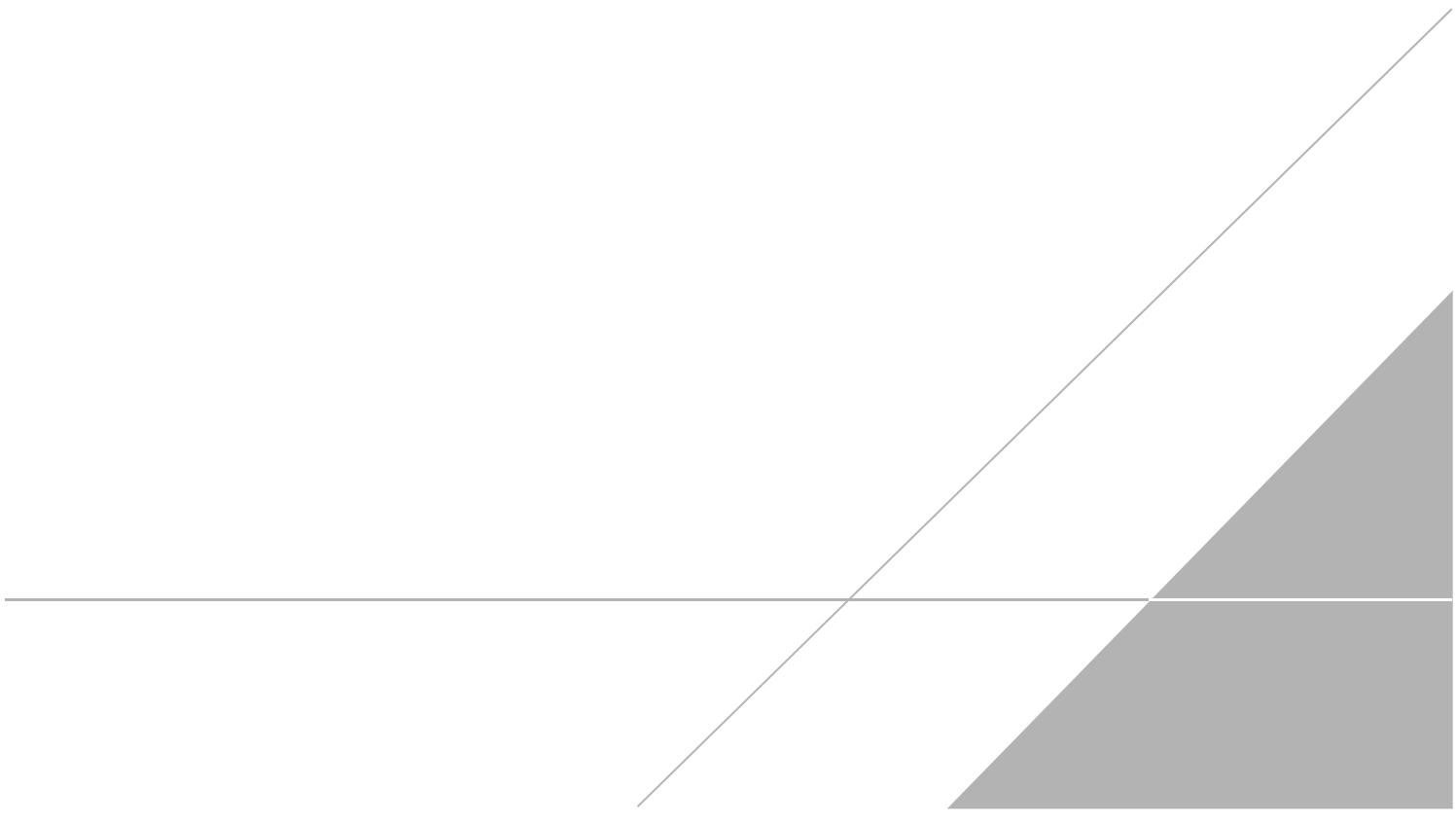
Water Levels

Date / Time	Elevation	Depth
11/8/00		13.31 ▼

Project: 364.58.002
File: MW-4.LOG
Script: 99nbbl
Date: 11/16/00

ATTACHMENT C

Monitoring Well Integrity Assessment Form



WELL INTEGRITY ASSESSMENT FORM

Site Name:_____
Well I.D.:_____
Date:_____

(For each item, circle the appropriate response or fill in the blank)

Well I.D. Clearly Marked: YES NO
Well Completion: FLUSH MOUNT ABOVE-GRADE STANDPIPE
Lockable Cover: YES NO DAMAGED *(Describe below)*
Lock Present: YES NO ADDED Key Brand/Number:_____
Measuring Point Marked: YES NO ADDED
Well Riser Diameter (inches): _____
Well Riser Type: PVC Stainless Steel Other *(Describe)* _____

Surface Condition

Cement Intact: YES NO *(Describe below)*
Curb Box/Well Cover Present: YES NO DAMAGED *(Describe below)*
All Bolts Present: YES NO *(Describe below)* NOT APPLICABLE
Ground Surface Slopes
Away from Well YES NO *(Describe below)*

Well Condition

Well Cap: PVC Slip Cap Pressure-fit Cap None
Well Vent: Slot Cut in Riser Vent Hole in Cap None Not Applicable *(Flush Mount Well)*
Reported Well Riser Stickup (feet): _____ *(use negative number if below grade)*
Measured Well Riser Stickup (feet): _____ *(use negative number if below grade)*

Depth to Water (feet from Top of Well Riser): _____ *-or-* DRY

Reported Total Depth of Well (feet below grade): _____
Measured Total Depth of Well (feet below grade): _____
Well Obstructed: YES NO If yes, list depth in feet from Top of Well Riser: _____
Well Bottom: SOFT *(contains sediment)* FIRM *(no sediment)*

Recommendations

Repair Concrete/Surface Completion: YES NO If yes, list date performed:_____
Re-Survey Well: YES NO If yes, list date performed:_____
Remove Sediment and Re-Measure Depth: YES NO If yes, list date performed:_____
Replace Well Cap: YES NO If yes, list date performed:_____
Replace Bolts: YES NO If yes, list date performed:_____
Replace Lock: YES NO If yes, list date performed:_____
Other/Miscellaneous Observations:

_____

_____

Inspector(s):_____

ATTACHMENT D

PFOA/PFOS Groundwater Sampling Procedure

ATTACHMENT D
PFOA/PFOS Groundwater Sampling Procedure

Erie Boulevard Hydropower, L.P.
Former Fire Training Area
School Street Hydroelectric Station
Town of Colonie, New York

This attachment presents a standard operating procedure for sampling groundwater within the former fire training area at the Erie Boulevard Hydropower, L.P. (former Niagara Mohawk Power Corporation) School Street Hydroelectric Station in Cohoes, New York (the site) for per-fluorinated alkyl substances (PFAS) (perfluorooctanoic acid [PFOA] and perfluorooctyl sulfonate [PFOS]). This document identifies precautions that are unique to PFOA/PFOS sampling and provides details of the proposed sampling methods, quality assurance/quality control measures, decontamination procedures, and laboratory analytical method to be used for the sampling program. Most of the PFOA/PFOS field sampling procedures and work methodology outlined in this document were adapted from those of Dillon Consulting Limited. Procedures herein were also adapted from other sources, including SLR Consulting, Environmental Sciences Group (Royal Military College), SNC-Lavalin, AXYS Analytical Service Ltd., MAXXAM Analytic Inc, and Arcadis.

1. GENERAL INFORMATION

Given the extremely low detection limits associated with PFOA/PFOS analysis and the many potential sources of trace levels of PFAS, field personnel are advised to err on the side of caution by strictly following these protocols and frequently replacing nitrile gloves and rinsing field equipment to help mitigate the potential for false detections of PFOA/PFOS. Many commonly used sampling materials (e.g., Teflon™ tape, and Teflon™-lined pump bladders, and Teflon™-lined sample caps for VOC sampling) and water-resistant field clothing/gear should be avoided. Specific items related to field sampling are discussed below.

1.1. Cautions

Food Considerations:

- Some food packaging may be treated with PFAS-containing chemicals to prevent permeation of oil and water in the food outside of the packaging. To avoid potential food packaging-related PFAS contact:
  - Do not bring any food outside of the field vehicles onsite, and eat snacks and meals offsite.
  - Wash hands after eating.
  - Remove field garments (e.g., reflective safety vests) or outer layers prior to eating. Do not put them back on until done eating and hands are washed.

Field Gear:

- Many types of clothing are treated with PFAS for stain and water resistance, such as outdoor performance wear under brand names like Gore-Tex™. To avoid potential clothing-related PFAS contact:
    - Do not wear any outdoor performance wear that is water is stain resistant, or appears to be. Error on the side of caution.
    - Wear pre-laundered (multiple washings, i.e. 6+) clothing that is not stain resistant or waterproof.
    - Natural fabrics such as cotton are preferred. Synthetic fabrics may also be acceptable if there is no indication on the label that the fabric is treated with PFAS or is water and stain resistant.
    - **Most importantly, avoid contacting your clothing with sampling equipment, containers, and samples.**
- Waterproof field books are not to be used. Field reports should be on loose paper on Masonite, plastic, or aluminum clip boards. Pens and pencils may be used. To avoid potential PFAS contact associated with field books:
    - Keep field book and writing implements away from samples and sampling materials.
    - One person should conduct sampling while another person records field notes.
    - Do not write on sampling containers unless they are closed.
- Some safety footwear has been treated to provide some degree of waterproofing/increased durability and may represent a source of trace PFAS. For the health and safety of field personnel, the protection for footwear must be maintained. To avoid potential PFAS contamination with footwear:
    - Field personnel should not touch their safety footwear in the immediate vicinity of the sampling port (i.e. 10 meters).
    - Gloves used for sampling should not contact safety footwear.
- Disposable nitrile gloves must be worn at all times. Further, a new pair of nitrile gloves shall be donned prior to the following activities:
    - Sampling at a different location.
    - Decontaminating re-usable sampling equipment.
    - Handling sample bottles or “PFAS free” water containers.
    - Handling sample tubing and other attachments to the sample ports.
    - Handling any QA/QC samples, including trip blanks and equipment blanks.
    - Handling any non-dedicated sampling equipment that contacts contaminated surfaces, or when judged necessary by field personnel.

Personnel Hygiene:

- Field personnel should not shower the morning before sampling.

- Personal care products applied after showering, such as lotions, makeup, and perfumes, should not be used unless medically necessary.
- Sunscreen and insect repellent should only be used if necessary for health and safety. If they must be applied, they should be applied away from the sampling port (i.e. 10 meters) and hands should be washed after application.

Visitors:

- Visitors to the site are asked to remain at least 10 meters from sampling areas.

Rain Events:

- Field sampling should not take place when rainfall is consistent and persistent at a rate that it saturates the ground (i.e. formation of puddles) because rain gear is not permitted while sampling. Intermittent showers or fog are acceptable conditions to proceed. If/when showers occur; field gear should be removed from the monitoring well location until rain subsides.
- If project timelines are tight, teams should consider the use of the gazebo tent, which can be erected overtop of the monitoring well and provide shelter from the rain. It should be noted that the canopy material is likely a treated surface and should be treated as such; therefore, gloves should be worn when moving the tent, changed immediately afterwards, and further contact with the tent should be avoided until all sampling activities have been finished and the team is ready to move on to the next monitoring well.

1.2. Equipment List

The following materials shall be available, as required, during groundwater sampling:

- Site plan showing sampling locations and this Attachment.
- Appropriate health and safety equipment, as specified in the site Health and Safety Plan.
- Dedicated plastic sheeting or other clean surface to prevent sample contact with the ground.
- Horiba U52 Water Quality Meter (or equivalent multiparameter water quality meter) and flow-through cell.
- Turbidity meter.
- High density polyethylene (HDPE) or low density polyethylene (LDPE) tubing. Teflon tubing is not acceptable.
- Peristaltic pump.
- Pre-labelled water sample containers – 500 mL HDPE bottles fitted with HDPE liner screw cap only; some types of PFAS samples may require preservative, which will be indicated by the laboratory conducting the analysis.
- Ziploc© bags for use as ice containers.
- Appropriate blanks (field and equipment blanks supplied by the laboratory).

- Appropriate transport containers (coolers) with ice and appropriate labeling; no blue ice.
- Packing and shipping materials.
- Groundwater sampling logs.
- Chain-of-custody forms.
- Sealable pail and 55-gallon drum(s).

2. MONITORING WELL DEVELOPMENT

During development of the well, sufficient energy should be created to agitate the water column and create flow reversals in the well screen, filter pack, and formation. Fine-grained materials should be loosened and drawn into the well. These materials should then be pumped or bailed out of the borehole adjacent formation and well.

If a large amount of accumulated sediment (>2 feet) is not present in the wells, then the redevelopment will consist of surging the well screen with a bailer (a surge-block may also be used) for at least five minutes (without removing water from the well), followed by purging the well of five well volumes or to dryness, whichever comes first. If a large amount of sediment is present, then the well development duration should be double that required for wells without large amounts of sediment, and sediment should be removed to clear at least 80% of the screen interval.

3. GROUNDWATER SAMPLE COLLECTION

Groundwater samples should be collected in pre-labelled, laboratory-supplied "PFAS free" HDPE sample vials fitted with an unlined (no Teflon), polypropylene screw cap. Container labels should be completed after the caps have been placed back on each bottle. Packaging tape should not be used to secure and seal the bottle cap or sample label. Glass containers should not be used due to potential loss of analyte through adsorption.

To mitigate cross-contamination, groundwater samples should be collected in a pre-determined order from least impacted to greater impacted (e.g., from upgradient wells to most downgradient wells to in-between wells) based on previous analytical data or knowledge about past activities at the site. If conditions allow, plastic sheeting should be placed adjacent to the sample port for use as a clean work area. Otherwise, sampling equipment should be prevented from contacting the ground or other surface that could compromise sample integrity.

No materials should be re-used between wells. Upon completion of use, all disposable materials (e.g., HDPE and/or silicone tubing) should be removed and placed in heavy duty garbage bags for disposal.

3.1. Groundwater Purging

During purging, low flow purge and sampling techniques as per the United States Environmental Protection Agency "Low Stress (low flow) purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells" and the American Society for Testing and Materials "Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations" should be followed.

To begin purging, the end of the HDPE tubing should be lowered to the approximate midpoint of the screened section of the monitoring wells. The HDPE tubing length should be measured and pre-cut to approximate lengths (i.e. previously measured arm span of field technician) to avoid contact with any materials other than the monitoring well and peristaltic pump. The tubing should be kept at least 0.6 meters from the bottom of the well to prevent intake of particulates. Flow rates should be approximately 100 milliliters per minute or as low as can be reasonably achieved.

Purge water will be directed through a flow-through cell attached to a multiparameter water quality meter (such as the Horiba U52 or equivalent) for field parameter measurements of pH, conductivity, temperature, and dissolved oxygen. Turbidity should be measured from a standalone turbidity meter (such as the HACH® 2100Q Turbidimeter or equivalent). The instruments should be calibrated in the field prior to use, and the instruments and flow-through cell should be decontaminated at each monitoring well location prior to purging.

Field parameters should be recorded in five minute intervals. Wells should be sampled after field parameter measurements indicate stabilization and turbidity is less than 50 nephelometric turbidity units, which indicates collection of the representative formation water. Stabilization will be achieved when three consecutive readings are within the following values:

- pH ± 0.1
- Conductivity ± 3%
- Oxidation/Reduction Potential (ORP) ± 10 mV
- Dissolved Oxygen ± 10%

If wells go dry before parameters stabilize, the well should be sampled when the water level has recovered sufficiently to support the required sample (without additional parameter stabilization). This should be documented in the field notes/sampling logs.

Final field parameter measurements should be recorded at each well before sampling. Purge water should be collected and disposed of appropriately.

3.2. Groundwater Sampling

Sample collection should take place upon stabilization of field parameters. Groundwater samples should be taken at the water table. Prior to collection of samples, field personnel must wash their hands and don a new set of nitrile gloves. Gloved hands must not be used to subsequently handle papers, pens, clothes, etc., prior to the collection of PFOA/PFOS samples. The sample's bottle caps must remain on the bottle until immediately before sample collection, and the bottle must be immediately sealed after sample collection. The bottle cap must remain in the other hand of the sampler, until replaced on the bottle. PFOA/PFOS sample bottles should not be rinsed during sampling.

The procedures for collecting groundwater samples are outlined below:

- Disconnect the silicone tubing from the flow-through cell to enable collection of the groundwater samples prior to passing through the cell.

- Collect the groundwater sample (up to the brim leaving no head space) from the dedicated sampling ports into the pre-labelled 500 mL HDPE bottles and tightly screw on the HDPE cap (snug, but not too tight). Do not filter samples.
- Place samples in a sealed Ziploc© bag. Labelling information and time of sampling should be recorded in the field records (e.g., groundwater sampling log, chain-of-custody form). Sampling materials should be treated as single use and disposed following completion of sampling at each monitoring well, when possible.
- Keep samples as dry as possible. Ensure that sample bottles are securely closed. Packaging tape should not be used to secure and seal the bottle cap or sample label.
- Group samples in Ziploc© plastic bags according to the sampling event.
- Note the time on the sample label. Samples should be placed in coolers and kept at a cool temperature until transportation to the lab.

NOTE: A small portion of the sample (approximately 10 mL to 25 mL) should be collected and shaken. If foaming is noted within the sample, this should be documented when samples are submitted for analysis; the 'shaker test' vial can then be disposed of. This shaker test provides information about how each of the samples should be handled analytically.

4. SAMPLE SHIPPING

Samples should be maintained between 0–4 ºC during shipping in appropriate transport containers (coolers) with ice (Ziploc© bags for use as ice containers) and appropriate labeling. Do not use blue ice. To prepare for shipping, complete the procedures for the chain-of-custody, handling, packing, and shipping. Chain-of-custody forms should be filled out and checked against the labels on the sample containers progressively after each sample is collected. Place all disposable sampling materials (such as plastic sheeting, and health and safety equipment) in appropriate containers. Samples should be shipped via courier service for overnight delivery. Tracking numbers for all shipments should be provided once they have been sent out to ensure their timely delivery. Do not ship samples via Fed Ex for Saturday delivery.

5. QUALITY ASSURANCE/QUALITY CONTROL SAMPLING

When collecting QA/QC samples, the same guidelines as regular samples apply:

1. The sample should be collected in a laboratory-supplied container.
2. Bottle caps shall remain in the hand of the sampler until replaced on the bottle.
3. Labels shall be completed after the caps have been placed back on each bottle.
4. Samples shall be sealed in suitable packaging and stored on ice in a cooler for shipment to the lab.

5.1. Field Duplicates

- One blind field duplicate will be collected for every 20 samples. Each duplicate sample will be collected immediately after the initial sample of which it is a duplicate, into a separate laboratory-provided container. Each duplicate sample will be designated by the prefix “DUP-”.

5.2. Equipment (Rinse) Blanks

- Equipment blanks will be collected daily using the laboratory-supplied ‘PFAS free’ water.
- For peristaltic pump tubing, laboratory-supplied “PFAS free” water should be poured into a clean HDPE sample bottle and then pumped through new HDPE tubing using the peristaltic pump (with new silicone tubing) into a sample container for laboratory analysis. Each rinse blank sample will be designated by the prefix “RB-”.

5.3. Trip Blank

- One laboratory-supplied reagent trip blank will be submitted during the sampling event. The trip blank will accompany the sample set shipped to the site. Once onsite, field personnel will transfer the reagent trip blank to an empty sample container without preservative and label this bottle as a field reagent trip blank or its acronym “FRB”. The FRB will be shipped back to the laboratory along with collected samples from the initial sample set.

5.4. Spiked Samples

- One matrix spike and one matrix spike duplicate sample (MS/MSD) will be collected for every 20 samples. Triple sample volumes will be collected from a field-selected sampling location to perform the MS/MSD and corresponding sample analysis.

5.5. Laboratory Analytical QA/QC

- Internal laboratory QA/QC should consist of one laboratory blank, one matrix spike per batch of samples, and additional QA/QC samples that the laboratory might want to include. Isotope dilution should be used for quantification with isotope-labeled surrogate standards, as available.
- As part of the internal QA/QC, relative percent difference should be calculated between samples and corresponding field or laboratory duplicates. The laboratory quality assurance portion of the laboratory certificates should be reviewed to verify that all calculations/recoveries were within acceptable limits as established by the laboratory method.

6. EQUIPMENT DECONTAMINATION

The flow-through cell and any non-dedicated equipment (i.e. interface probe) used for groundwater sampling that come into contact with well water should be decontaminated before use and between uses, as follows:

1. Rinse sampling equipment with a Citranox® cleaning solution.
2. Rinse with laboratory-provided, "PFAS-free" water.

3. Rinse with methanol.
4. Rinse with laboratory-provided, "PFAS-free" water.

A new pair of nitrile gloves should be donned during equipment decontamination. All rinsate should be collected in a sealed pail for disposal.

7. LABORATORY ANALYSIS

Groundwater samples will be analyzed for PFOA/PFOS by TestAmerica using modified United States Environmental Protection Agency (EPA) Method 537. TestAmerica's reporting limit for both constituents is 2.0 parts parts per trillion (ppt), which is well-below the USEPA's existing 70 ppt health advisory value for PFOA/PFOS. Additionally, TestAmerica is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program- (ELAP-) certified laboratory accredited in potable water testing for PFOA/PFOS using USEPA Method 537.

ATTACHMENT E

Groundwater Sampling Log

Site

Former Fire Training Area
School Street Hydroelectric Station

Event

GROUNDWATER SAMPLING LOG

Sampling Personnel: **Well ID:**

Client / Job Number: B0036643.0001.00004 **Date:**

Weather: **Time In:** **Time Out:**

Well Information

Depth to Water:	(feet)	(from MP)
Total Depth:	(feet)	(from MP)
Length of Water Column:	(feet)	
Volume of Water in Well:	(gal)	
Three Well Volumes:	(gal)	

Well Type:		Flushmount	Stick-Up
Well Material:		Stainless Steel	PVC
Well Locked:		Yes	No
Measuring Point Marked:		Yes	No
Well Diameter:	1”	2”	Other:

Purging Information

Purging Method:	Bailer	Peristaltic	Waterra	Other:
Tubing/Bailer Material:	Steel	Polyethylene	Teflon	Other:
Sampling Method:	Bailer	Peristaltic	Waterra	Other:

Duration of Pumping:	(min)		
Average Pumping Rate:	(ml/min)	Water-Quality Meter Type:	
Total Volume Removed:	(gal)	Did well go dry:	Yes No

Conversion Factors

gal / ft. of water	1” ID	2” ID	4” ID	6” ID
	0.041	0.163	0.653	1.469

1 gal = 3.785 L =3785 ml = 0.1337 cubic feet

Unit Stability

pH	DO	Cond.	ORP
± 0.1	±10%	± 3.0%	± 10 mV

Parameter:	1	2	3	4	5	6	7	8	9
Volume Purged (gal)									
Rate (mL/min)									
Depth to Water (ft.)									
pH									
Temp. (C)									
Conductivity (mS/cm)									
Dissolved Oxygen (mg/L)									
ORP (mV)									
Turbidity (NTU)									
Notes:									

Sampling Information

Analyses	#	Laboratory

Sample ID:	Sample Time:	
MS/MSD:	Yes	No
Duplicate:	Yes	No
Duplicate ID	Dup. Time:	
Chain of Custody Signed By:		

Problems / Observations