GEI Consultants

May 16, 2017
GEI Project 1701486

Ms. Elizabeth Lukowski
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7014

Consulting
Engineers and
Scientists

Re: 2017 Site Management Plan Implementation
Nyack Former MGP Site
NYSDEC Site # 3-44-046

Dear Ms. Lukowski:

GEI Consultants, Inc., P.C. (GEI), on behalf of Orange and Rockland Utilities, Inc. (O&R), is submitting this Work Plan for the implementation of tasks identified in the Site Management Plan (SMP) for the Nyack Manufactured Gas Plant (MGP) site.

Background

The current site plan is shown on Figure 1. The remediation of the Nyack MGP site has been performed, and the New York State Department of Environmental Conservation (NYSDEC) has approved the Final Engineering Report (FER), and the April 2016 Site Management Plan (SMP) prepared by GEI. The SMP identifies required post-remedial tasks, including: non-aqueous phase liquid (NAPL) gauging (and removal if identified), annual groundwater sampling, monitoring well decommissioning and new well installation, a site-wide inspection, and periodic reporting.

The current owner of the property has plans to redevelop the site. It may be necessary to modify the groundwater monitoring plan and / or to install or decommission additional wells once the developer's plans are finalized. Additional modifications to the SMP (if needed) will be discussed in a separate Work Plan which will be submitted to the NYSDEC.

RCDOH Permit Well Abandonment and Installation

Permits to install new monitoring wells and to abandon existing wells will be required by the Rockland County Department of Health (RCDOH). The permit applications will be submitted to the RCDOH, along with this Work Plan as an attachment. The completed RCDOH permit for the SMP well installation and abandonment tasks will be included as an attachment in the Periodic Report.

Health and Safety and CAMP

A Health and Safety Plan (HASP) was included in the NYSDEC-approved SMP. The HASP will be updated with an amendment to describe the identified 2017 SMP field activities, and then utilized for the field work. The Community Air Monitoring Plan (CAMP), also included in the SMP, will be used for the air monitoring task required when the invasive drilling and abandonment field activities are completed. The data recorded will be reviewed and retained in the GEI project

GEI Consultants, Inc., P.C.
1301 Trumansburg Road, Suite N, Ithaca, New York 14850
607.216.8955 fax: 607.274.7577

files. The data will be transmitted to the NYSDEC or the New York State Department of Health (NYSDOH) if requested by the agencies.

Media Monitoring Tasks

NAPL Gauging and Removal

The locations of the wells currently at the site are shown on Figure 2. The borelogs for the wells are included in Attachment A. The construction details for the wells are shown in Table 1.

In conjunction with the groundwater monitoring, NAPL gauging will be conducted for all of the existing site wells, including: MW33D, MW41, MW43, MW44, and MW45. If light-phase non-aqueous phase liquid (LNAPL) or dense phase non-aqueous phase liquid (DNAPL) is identified, it will be removed from the wells by bailing or pumping, until no measurable layer of NAPL is observed. The NAPL will be placed in a drum and properly disposed of off site at a permitted disposal facility which has been approved by O&R. The NAPL thickness and amount removed will be recorded in Table 1, which will be included in the Periodic Report.

Groundwater Sampling

Wells remaining at the site following remediation were sampled in February 2015. This event was a baseline event performed after the remedial activities were complete. The results of the sampling (detections only) for BTEX and PAHs are shown on Figure 2.

The wells that will be sampled in 2017 are shown on Figure 3. These wells include: MW33D, MW41, MW43, MW44, and MW45. The well construction details and the laboratory analyses to be performed are included in Table 2. The samples will be analyzed for BTEX and PAHs, according to the quality assurance quality control (QA/QC) specifications of the SMP. The results of the monitoring will be presented in the Periodic Report.

Well Installation and Abandonment

Mobilization and Utility Locating and Clearing

Prior to mobilization for the drilling tasks, Dig Safely New York will be contacted to initiate the utility mark-out. Known subsurface utilities include a storm water drain pipe in the south central area of the site, and natural gas distribution lines in the sidewalk adjacent to Gedney Street. These utilities will be confirmed through the Dig Safely mark-out task. Well locations will be hand cleared to 5 feet below ground surface by the drilling subcontractor.

Monitoring Well Installation

As specified in the SMP, two new wells will need to be installed at the site. The locations of the wells are shown on Figure 3. These include MW46 at the northern perimeter of the site along the Nyack Boat Club property, and MW47 which will be an up gradient well installed along Gedney Street. Well construction methods will be consistent with the methods previously used to install bedrock wells at the Upper Terrace. Continuous split spoon sampling will be performed to confirm the depth of the bedrock unit. A rock socket will be installed and an isolation casing installed and grouted. The bedrock will then be cored and reamed, and then a 2-inch PVC well installed in the bedrock borehole. The PVC well will be equipped with a 2-foot-long DNAPL sump. Following installation, each of the new wells will be developed. Borelogs for the new wells will be included in the Periodic Report.

Monitoring Well Abandonment

The SMP identified one well (MW1D) for abandonment in the Western Parcel Area parking lot. A second well (MW33D) is also proposed for abandonment. This well was not identified for abandonment in the SMP; however, the well will need to be removed because it is in the footprint of the construction activities planned by the property developer as part of the Phase 1 construction activities. . The wells will be decommissioned using methods described in the document entitled "*NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy,"* dated November 3, 2009. The NYSDEC document is included in Attachment B. The methods used for the decommissioning will be recorded on a CP43 - Abandonment Record Form. The form is included in Attachment B. The completed forms will be included in the Periodic Report.

New Well Groundwater Monitoring

Groundwater sampling will be performed following the installation and development of the new wells (MW46 and MW47). The wells will be allowed to stabilize for a minimum of two weeks following development. The wells will then be gauged to determine the presence or absence of NAPL. The absence of NAPL will be confirmed, and then the wells will be sampled and analyzed for BTEX and PAHs (Table 2).

Survey

The location and elevation of the wells and groundwater elevation reference points (top of PVC riser) will be surveyed by a NYS PLS. As required by the NYSDEC, all horizontal locations and elevation data will be uploaded into an EQuIS™ database and then submitted to the NYSDEC EIMS website along with the results of the chemical analyses. The survey data will be used during preparation of the Periodic Report figure and borelogs.

IDW Profiling and Disposal

Three types of investigation-derived waste (IDW) may be generated during the field activities. These include water from groundwater sampling and monitoring well purging and decontamination of equipment, the water and NAPL mixture generated from the NAPL removal task (if NAPL is found in any of the wells), and soil and solids generated during drilling and well abandonment. The IDW generated from the field activities will be profiled for waste disposal purposes, and then disposed of at an O&R-approved disposal facility. The disposal records will be provided to the RCDOH for closure of the RCDOH well installation and abandonment permit.

Site-Wide Inspection

As specified in the SMP, an inspection of all remedial components installed at the site is required to be conducted on an annual basis (calendar year 2017).

The inspection will document whether Engineering Controls continue to be performed as designed, whether site activities are performed in compliance with the SMP, and recommendation for changes, or needed changes to the controls established in the remedial areas. The inspection will include observations regarding: site usage, general site conditions, soil cover at the Upper Terrace and above the in-situ soil solidification (ISS) area in the Lower Terrace, rip-rap conditions along the Hudson River shoreline, and the condition of planting at the outer edge of the ISS area. A qualified environmental professional will perform the inspection and complete the required inspection forms (SMP Appendices H and K), which are included in Attachment C. The forms will be included in the Periodic Report.

Periodic Report

The Periodic Report will be prepared to summarize the field activities identified above, the media sampling, and the site-wide inspection. The report will document the following:

- **Well Installation** – Well construction logs for the new wells.
- **Well Decommissioning** – Records documenting the decommissioning procedures (NYSDEC CP-43 forms).
- **DNAPL Gauging and Removal Records** – A summary table summarizing the gauging activities and removal results.
- **Groundwater Sampling** – Tabulated results of the groundwater analyses. SMP Figure 16 will be updated to show the cumulative BTEX and PAH results for the wells remaining at the site at the conclusion of the field activities.
- **Groundwater Data Management –** Results of the laboratory analyses uploaded into a database (EQuIS). The results will be submitted to the NYSDEC EIMS website.
- **Site Figures** – The PLS survey data will be used to update the site features figure provided in the SMP and the analytical summary figures. New well locations will be shown on the revised figure.
- **IDW Management** – The management of IDW will be summarized.
- **Site-Wide Inspection** – A Photographic Record will be prepared to show site conditions at the time of the inspection. Observations made regarding site conditions and compliance with the Engineering Controls will be documented. The inspection form identified in the SMP will be completed and included.
- **Summary and Recommendations** – The inspection will document whether Engineering Controls continue to be performed as designed, whether site activities are performed in compliance with the SMP, and recommendation for changes, or needed changes to the controls established in the remedial areas.

It is anticipated that the Periodic Report will be submitted in hard-copy format and electronic format to the NYSDEC by September 2017.

RCDOH Permit for Well Abandonment and Installation Closure

The permit for the well installation and well abandonment tasks will be requested to be closed at the end of the field activities. A summary of the permit request and the well installation, well abandonment, and IDW disposal information will be prepared and submitted to the RCDOH.

Schedule

Following approval of this Work Plan by the NYSDEC, the field activities will be scheduled. As required by the NYSDEC, notification will be provided to the Department within 10 working days of the field work. It is anticipated that the field activities will be performed in the spring or early summer of 2017. O&R will notify the NYSDEC when the project schedule can be determined.

If you have any questions, please do not hesitate to contact me at (607) 216-8958. Please direct the Department's official response to Maribeth McCormick of O&R.

Sincerely,

GEI CONSULTANTS, INC., P.C.

James H. Edwards

James Edwards, P.G.
Senior Geologist / Project Manager

JHE:mlr

Attachments: Table 1 – Monitoring Wells and DNAPL Gauging and Removal Summary
Table 2 – Previous and Proposed Monitoring Well Construction Summary, and Laboratory Analyses
Fig. 1 – Site Plan and Remedial Areas
Fig. 2 – Site Well Locations and 2015 Baseline Post-Remediation Groundwater Quality
Fig. 3 – Well Abandonment, Well Installation and Groundwater Sampling Locations
Attachment A – Borelogs
Attachment B – NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy
Attachment C – Site Inspection Forms

c: Maribeth McCormick – Orange and Rockland Utilities, Inc.
Doug MacNeal – NYSDEC
Dan Kopcow, P.E. – GEI

Tables

Table 1
Monitoring Wells and DNAPL Gauging and Removal Summary
Nyack MGP Site

Well Construction Summary										
Designation	**Installation Date**	**Ground Surface Elevation (Feet NAVD88)**	**Top of PVC Riser Elevation (Feet NAVD88)**	**Northing (NAD83)**	**Easting (NAD83)**	**Latitude**	**Longitude**	**Screened Interval (Elevation NAVD88)**	**DNAPL Thickness (ft) (Date TBD)**	**DNAPL Removed Date (gallons)**
Existing Monitoring Wells										
MW33D	8/31/2004	25.33	25.16	822865.99	653222.97	41.090936	-73.91552	-0.16 to 15.16	TBD	TBD
MW41	5/19/2008	34.07	33.79	823022.67	653236.45	41.091366	-73.91547	-0.71 to 14.29	TBD	TBD
MW43	5/22/2008	6.16	5.78	823061.51	653448.31	41.091469	-73.9147	-19.22 to -14.22	TBD	TBD
MW44	5/20/2008	33.84	33.55	823072.61	653244.4	41.091503	-73.91544	1.55 to 16.55	TBD	TBD
MW45	5/23/2008	14.15	13.84	822983.34	653307.75	41.091257	-73.91521	-13.66 to 1.34	TBD	TBD
Proposed Monitoring Wells										
MW46	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
MW47	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

TBD - To be determined

NA = Not Applicable

Horizontal Coordinates are New York State Plane, Central Zone, NAD83 North American Datum 1983 (NAD83), and latitude and longitude.

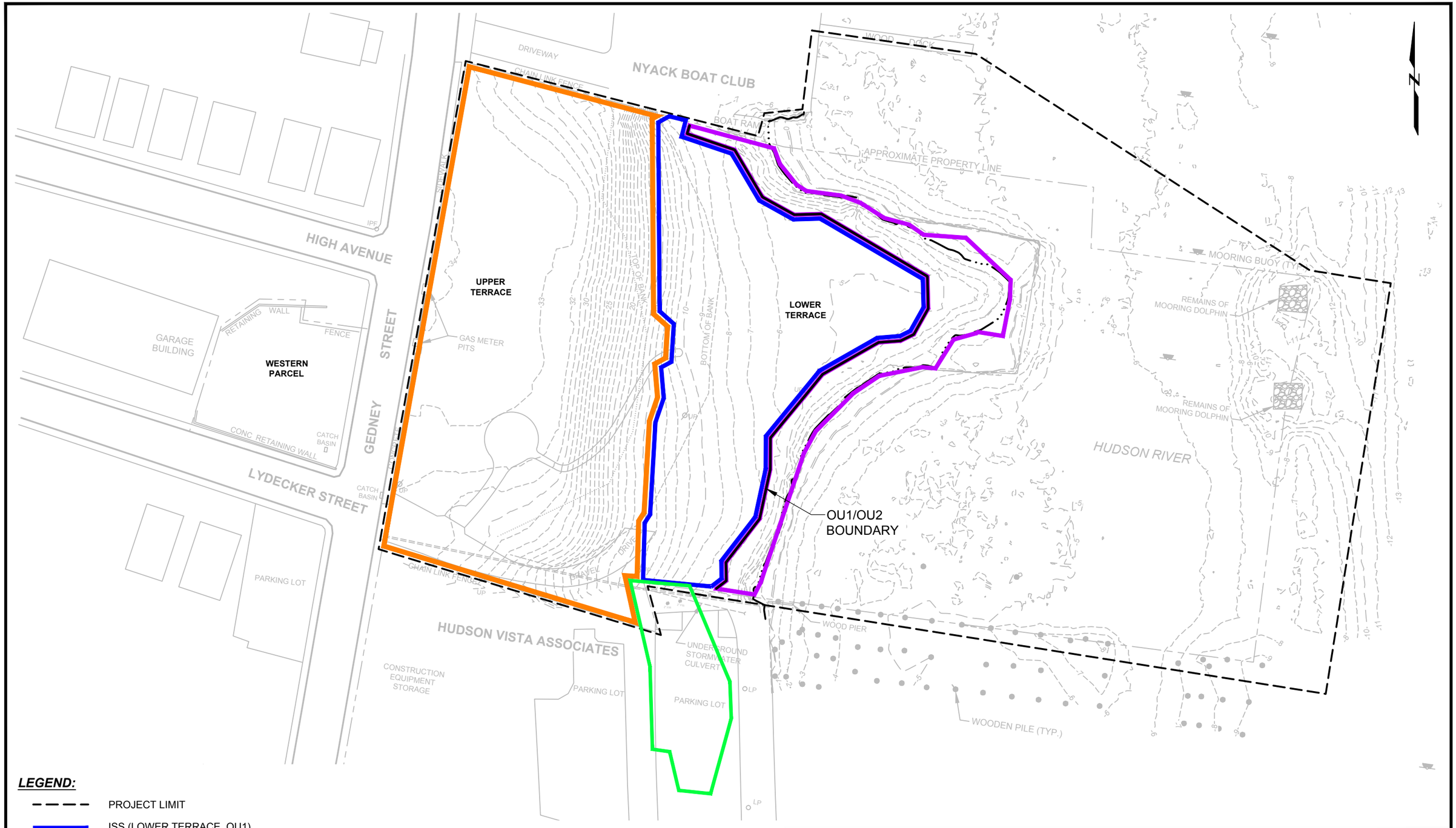
Vertical Coordinates are North American Datum 1988 (NAVD88).

Table 2
Previous and Proposed Monitoring Well Construction Summary, and Laboratory Analyses
Nyack MGP Site

Well Construction Summary												Laboratory Analyses		
Designation	**Rationale / Zone Monitored**	**Installation Date**	**Ground Surface Elevation (Feet NAVD88)**	**Top of PVC Riser Elevation (Feet NAVD88)**	**Northing (NAD83)**	**Easting (NAD83)**	**Latitude**	**Longitude**	**Screened Interval (Elevation NAVD88)**	**Depth to Water (Feet)**	**Water Elevation (Feet NAVD88)**	**Sample Depth**	**BTEX**	**PAHs**
Existing Monitoring Wells														
MW33D	water table along south side of site, cross-gradient to flow	8/31/2004	25.33	25.16	822865.99	653222.97	41.090936	-73.915522	-0.16 to 15.16	TBD	TBD	Center of saturated screened interval	X	X
MW41	bedrock water table in Upper Terrace	5/19/2008	34.07	33.79	823022.67	653236.45	41.091366	-73.915469	-0.71 to 14.29	TBD	TBD	Center of saturated screened interval	X	X
MW43	downgradient groundwater conditions in soil between ISS and bedrock	5/22/2008	6.16	5.78	823061.51	653448.31	41.091469	-73.914699	-19.22 to -14.22	TBD	TBD	Center of saturated screened interval	X	X
MW44	bedrock water table in Upper Terrace	5/20/2008	33.84	33.55	823072.61	653244.4	41.091503	-73.915439	1.55 to 16.55	TBD	TBD	Center of saturated screened interval	X	X
MW45	water table in bedrock at upper to Lower Terrace transition	5/23/2008	14.15	13.84	822983.34	653307.75	41.091257	-73.915211	-13.66 to 1.34	TBD	TBD	Center of saturated screened interval	X	X
Proposed Monitoring Wells														
MW46	water table along north side of site, cross-gradient to flow	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Center of saturated screened interval	X	X
MW47	up-gradient sampling and water level	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Center of saturated screened interval	X	X
Existing Monitoring Wells to be Abandoned														
MW-1D	up-gradient western parcel - not needed for monitoring	NA	NA	NA	822981.43	653009.59	41.091257	-73.916293	NA	NA	NA	NA	NA	NA
Surface Water Gauging Point														
SG-1	water level monitoring point	TBD	NA	NA	TBD	TBD	TBD	TBD	NA	TBD	TBD	NA	NA	NA

TBD - To be determined
NA = Not Applicable
Horizontal Coordinates are New York State Plane, Central Zone, NAD83 North American Datum 1983 (NAD83), and latitude and longitude.
Vertical Coordinates are North American Datum 1988 (NAVD88).

Figures



LEGEND:

- PROJECT LIMIT
- ISS (LOWER TERRACE, OU1)
- ISS (LOWER TERRACE, OU2)
- HUDSON VISTA ISS
- UPPER TERRACE

0 60' 120'

SCALE: 1" = 60'

2017 Nyack Site Management Plan Tasks
Nyack Former MGP
Nyack, New York

Orange and Rockland Utilities, Inc.
Spring Valley, New York

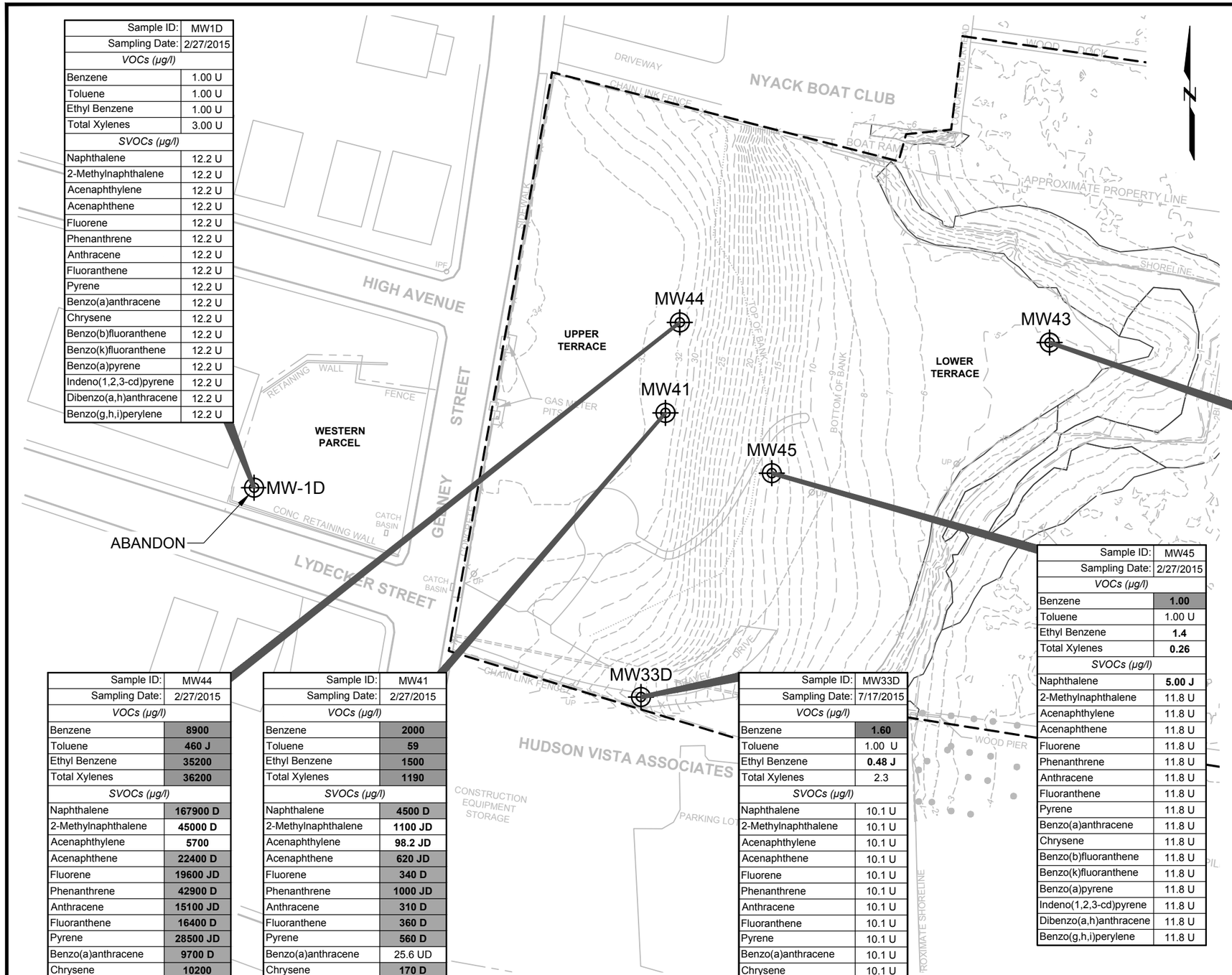
GEI Consultants

Project 1701486

SITE PLAN AND REMEDIAL AREAS

May 2017 Fig. 1

\\gtb1v-fs01\ I:\Project\ORANGE & ROCKLAND\Nyack\CAD\Figures\SMP\1701486_SMP_FIGS.dwg - 5/8/2017



LEGEND:

– – –	PROJECT LIMIT
⊕	EXISTING MONITORING WELL
U	THE RESULT WAS NOT DETECTED ABOVE THE REPORTING LIMIT
J	THE RESULT IS AN ESTIMATED VALUE
D	THE REPORTED VALUE IS FROM A SECONDARY ANALYSIS WITH A DILUTION FACTOR
NE	NOT ESTABLISHED
BOLD	BOLD FONT INDICATES DETECTED COMPOUND
	HIGHLIGHTED CELLS INDICATE THE COMPOUND IN EXCEEDANCE OF THE NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES FOR GA GROUNDWATER
µg/L	MICROGRAMS PER LITER OR PARTS PER BILLION (PPB)

Sample ID:	MW1D
Sampling Date:	2/27/2015
VOCs (µg/l)	
Benzene	1.00 U
Toluene	1.00 U
Ethyl Benzene	1.00 U
Total Xylenes	3.00 U
SVOCs (µg/l)	
Naphthalene	12.2 U
2-Methylnaphthalene	12.2 U
Acenaphthylene	12.2 U
Acenaphthene	12.2 U
Fluorene	12.2 U
Phenanthrene	12.2 U
Anthracene	12.2 U
Fluoranthene	12.2 U
Pyrene	12.2 U
Benzo(a)anthracene	12.2 U
Chrysene	12.2 U
Benzo(b)fluoranthene	12.2 U
Benzo(k)fluoranthene	12.2 U
Benzo(a)pyrene	12.2 U
Indeno(1,2,3-cd)pyrene	12.2 U
Dibenzo(a,h)anthracene	12.2 U
Benzo(g,h,i)perylene	12.2 U

Sample ID:	MW44
Sampling Date:	2/27/2015
VOCs (µg/l)	
Benzene	**8900**
Toluene	**460 J**
Ethyl Benzene	**35200**
Total Xylenes	**36200**
SVOCs (µg/l)	
Naphthalene	**167900 D**
2-Methylnaphthalene	**45000 D**
Acenaphthylene	**5700**
Acenaphthene	**22400 D**
Fluorene	**19600 JD**
Phenanthrene	**42900 D**
Anthracene	**15100 JD**
Fluoranthene	**16400 D**
Pyrene	**28500 JD**
Benzo(a)anthracene	**9700 D**
Chrysene	**10200**
Benzo(b)fluoranthene	**9300**
Benzo(k)fluoranthene	**1700**
Benzo(a)pyrene	**10200**
Indeno(1,2,3-cd)pyrene	**2900**
Dibenzo(a,h)anthracene	**1000 J**
Benzo(g,h,i)perylene	**4500**

Sample ID:	MW41
Sampling Date:	2/27/2015
VOCs (µg/l)	
Benzene	**2000**
Toluene	**59**
Ethyl Benzene	**1500**
Total Xylenes	**1190**
SVOCs (µg/l)	
Naphthalene	**4500 D**
2-Methylnaphthalene	**1100 JD**
Acenaphthylene	**98.2 JD**
Acenaphthene	**620 JD**
Fluorene	**340 D**
Phenanthrene	**1000 JD**
Anthracene	**310 D**
Fluoranthene	**360 D**
Pyrene	**560 D**
Benzo(a)anthracene	25.6 UD
Chrysene	**170 D**
Benzo(b)fluoranthene	25.6 UD
Benzo(k)fluoranthene	**120**
Benzo(a)pyrene	25.6 UD
Indeno(1,2,3-cd)pyrene	**160**
Dibenzo(a,h)anthracene	**46.4**
Benzo(g,h,i)perylene	**180**

Sample ID:	MW33D
Sampling Date:	7/17/2015
VOCs (µg/l)	
Benzene	**1.60**
Toluene	1.00 U
Ethyl Benzene	**0.48 J**
Total Xylenes	2.3
SVOCs (µg/l)	
Naphthalene	10.1 U
2-Methylnaphthalene	10.1 U
Acenaphthylene	10.1 U
Acenaphthene	10.1 U
Fluorene	10.1 U
Phenanthrene	10.1 U
Anthracene	10.1 U
Fluoranthene	10.1 U
Pyrene	10.1 U
Benzo(a)anthracene	10.1 U
Chrysene	10.1 U
Benzo(b)fluoranthene	10.1 U
Benzo(k)fluoranthene	10.1 U
Benzo(a)pyrene	10.1 U
Indeno(1,2,3-cd)pyrene	10.1 U
Dibenzo(a,h)anthracene	10.1 U
Benzo(g,h,i)perylene	10.1 U

Sample ID:	MW45
Sampling Date:	2/27/2015
VOCs (µg/l)	
Benzene	**1.00**
Toluene	1.00 U
Ethyl Benzene	**1.4**
Total Xylenes	**0.26**
SVOCs (µg/l)	
Naphthalene	**5.00 J**
2-Methylnaphthalene	11.8 U
Acenaphthylene	11.8 U
Acenaphthene	11.8 U
Fluorene	11.8 U
Phenanthrene	11.8 U
Anthracene	11.8 U
Fluoranthene	11.8 U
Pyrene	11.8 U
Benzo(a)anthracene	11.8 U
Chrysene	11.8 U
Benzo(b)fluoranthene	11.8 U
Benzo(k)fluoranthene	11.8 U
Benzo(a)pyrene	11.8 U
Indeno(1,2,3-cd)pyrene	11.8 U
Dibenzo(a,h)anthracene	11.8 U
Benzo(g,h,i)perylene	11.8 U

Sample ID:	MW43
Sampling Date:	2/27/2015
VOCs (µg/l)	
Benzene	**7.6**
Toluene	**0.520 J**
Ethyl Benzene	**2.1**
Total Xylenes	**1.47**
SVOCs (µg/l)	
Naphthalene	11.6 U
2-Methylnaphthalene	11.6 U
Acenaphthylene	11.6 U
Acenaphthene	**3.30 J**
Fluorene	11.6 U
Phenanthrene	11.6 U
Anthracene	11.6 U
Fluoranthene	11.6 U
Pyrene	11.6 U
Benzo(a)anthracene	11.6 U
Chrysene	11.6 U
Benzo(b)fluoranthene	11.6 U
Benzo(k)fluoranthene	11.6 U
Benzo(a)pyrene	11.6 U
Indeno(1,2,3-cd)pyrene	11.6 U
Dibenzo(a,h)anthracene	11.6 U
Benzo(g,h,i)perylene	11.6 U

Groundwater Analyte	NYSDEC AWQS
VOCs (µg/l)	
Benzene	1
Toluene	5
Ethyl Benzene	5
Total Xylenes	5
SVOCs (µg/l)	
Naphthalene	10
2-Methylnaphthalene	NE
Acenaphthylene	NE
Acenaphthene	20
Fluorene	50
Phenanthrene	50
Anthracene	50
Fluoranthene	50
Pyrene	50
Benzo(a)anthracene	0
Chrysene	0
Benzo(b)fluoranthene	0
Benzo(k)fluoranthene	0
Benzo(a)pyrene	NE
Indeno(1,2,3-cd)pyrene	0
Dibenzo(a,h)anthracene	NE
Benzo(g,h,i)perylene	NE

2017 Nyack Site Management Plan Tasks
Nyack Former MGP
Nyack, New York

Orange and Rockland Utilities, Inc.
Spring Valley, New York

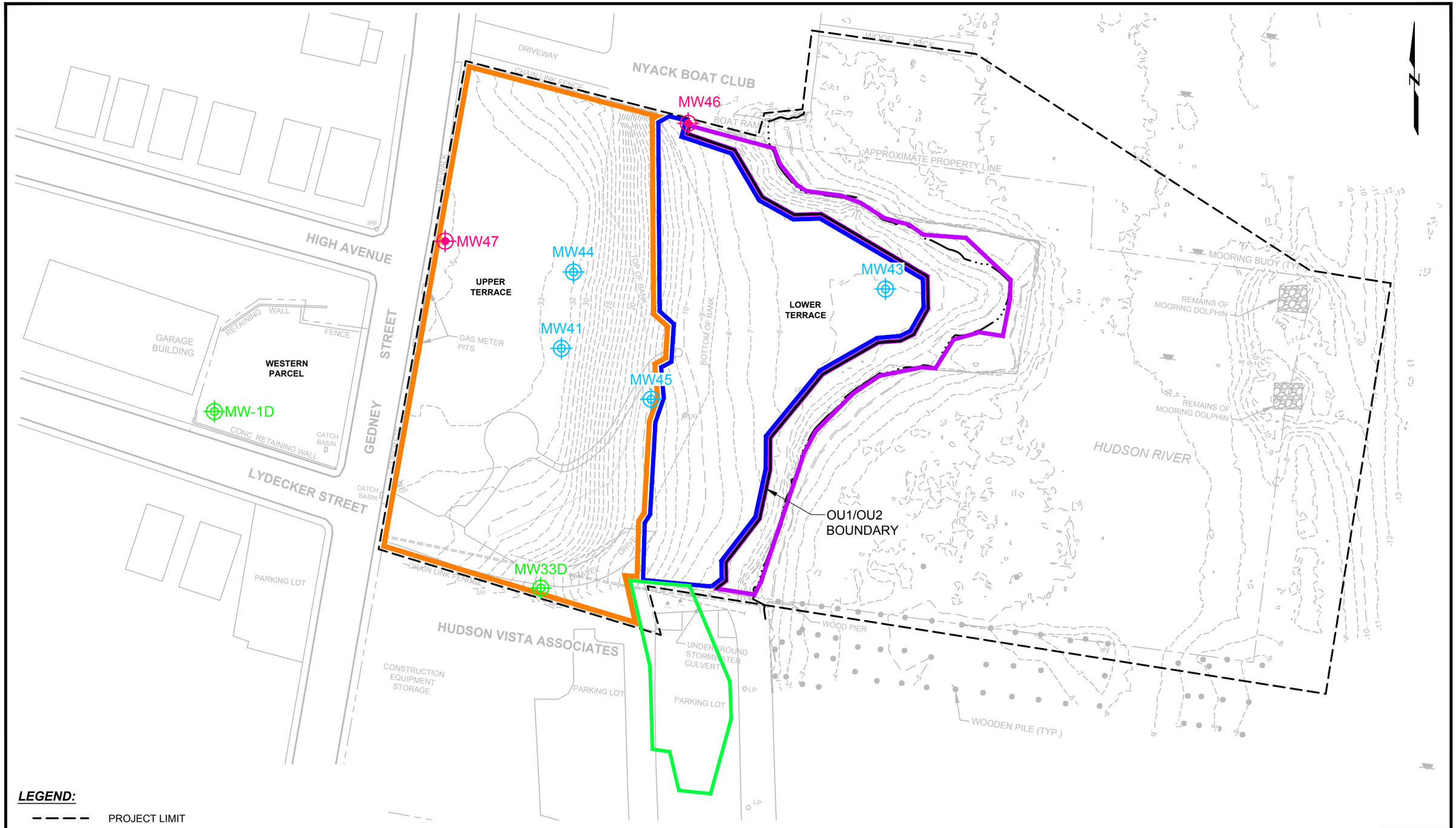
GEI Consultants

Project 1701486

SITE WELL LOCATIONS AND 2015 BASELINE POST-REMEDIATION GROUNDWATER QUALITY

May 2017 Fig. 2

\\gtb1v-fs01\ I:\Project\ORANGE & ROCKLAND\Nyack\CAD\Figures\SMP\1701486_SMP_FIGS.dwg - 5/8/2017



LEGEND:

- PROJECT LIMIT
- NEW WELLS FOR INSTALLATION
- SITE WELLS FOR GROUNDWATER SAMPLING
- WELLS FOR ABANDONMENT

0 60' 120'

SCALE: 1" = 60'

2017 Nyack Site Management Plan Tasks
Nyack Former MGP
Nyack, New York

Orange and Rockland Utilities, Inc.
Spring Valley, New York

GEI Consultants

Project 1701486

WELL ABANDONMENT, WELL INSTALLATION AND GROUNDWATER SAMPLING LOCATIONS

May 2017 Fig. 3

\\gtb1v-fs01\ I:\Project\ORANGE & ROCKLAND\Nyack\CAD\Figures\SMP\1701486_SMP_FIGS.dwg - 5/8/2017

Attachment A

Borelogs

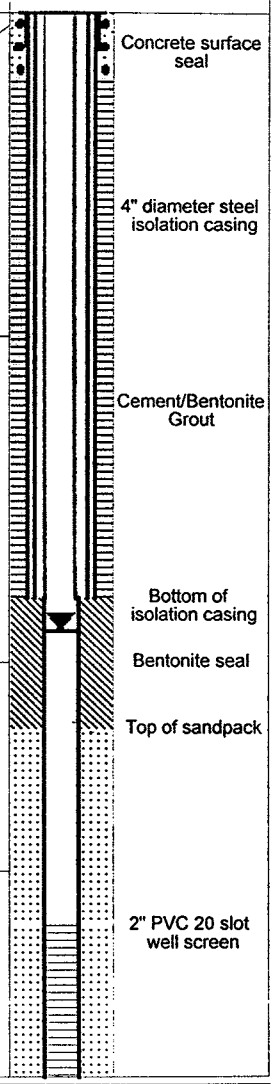
ThermoRetec Corporation
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342
(607) 277-5716 Phone
(607) 277-9057 Fax
www.thermoretec.com

WELL INSTALLATION LOG

ID: MW1D

Project Number: ORAN2-04301	**Drilling Co.:** Maxim Technologies Inc.	**Surface Elevation: (MSL)** 37.70
Client: Orange and Rockland Utilities	**Driller:** Walt Ketter	**Water Level During Drilling:** 9.52
Site Location: Nyack MGP	**Casing ID:** 4" Schedule 40 Steel	**Stickup:** Flush Mount Installation
Start Date: 10/23/99	**Method:** 6 1/4" ID HSA/HQ Rock Core	**MP Elevation: (MSL)** 37.27
Completion Date: 10/24/99	**Logged By:** James Edwards	**Total Depth:** 39
Location: Western Parcel		

Depth (ft)	Sample Depth	Blow Counts\6"	Percent Recovery	PID (ppm)	Run Number	Rock Quality Designation	Lithology (symbol)	Description
1	0-2	3 9 15 50\0.1	30	4.1	NA	NA		**Asphalt Pavement** **Fill** Gravel; asphalt fragments; brick and mortar fragments.
2								
3	2-4	8 9 9 9	45	15.5	NA	NA		Concrete slab - 1.8-2.8' bgs.
4								
5	4-6	13 76 60\0.1	NA	28.5	NA	NA		Fill: sand mixed with sandstone fragments; hydrocarbon-like odor.
6								**Sandstone Bedrock** Reddish; average hardness; fine grained; broken; thickly bedded;fractures are 0 to 60 degrees; slightly weathered.
7	6-8	NA	NA	NA	NA	NA		
8								
	8-9	NA	NA	NA	NA	NA		
9								
10								**Mudstone** Reddish; nodules of grey silt in random pattern; broken; soft; open fractures; 0 to 40 degrees; moist.
11	9-14	NA	50	NA	1	7		
12								Open 90 degree fracture w/ reddish silt.
13								
14								**Sandstone** Reddish; average hardness; very fine grained; broken; thickly bedded; nodules of grey silt in random pattern; fractures 0 to 20 degrees; slightly weathered.
15								
16								



Remarks: Laboratory Soil Sample
MW1D(4.0-6.0)
MGP Indicators
4" steel Schedule 40 isolation casing
set at 9.0' bgs

ThermoRetec Corporation
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342
(607) 277-5716 Phone
(607) 277-9057 Fax
www.thermoretec.com

WELL INSTALLATION LOG

ID: MW1D

Project Number: ORAN2-04301	**Drilling Co.:** Maxim Technologies Inc.	**Surface Elevation: (MSL)** 37.70
Client: Orange and Rockland Utilities	**Driller:** Walt Ketter	**Water Level During Drilling:** 9.52
Site Location: Nyack MGP	**Casing ID:** 4" Schedule 40 Steel	**Stickup:** Flush Mount Installation
Start Date: 10/23/99	**Method:** 6 1/4" ID HSA/HQ Rock Core	**MP Elevation: (MSL)** 37.70
Completion Date: 10/24/99	**Logged By:** James Edwards	**Total Depth:** 39
Location: Western Parcel		

Depth (ft)	Sample Depth	Blow Counts\6"	Percent Recovery	PID (ppm)	Run Number	Rock Quality Designation	Lithology (symbol)	Description	Well Construction
17								**Sandstone** Reddish; average hardness; very fine grained; broken; thickly bedded; nodules of grey silt in random pattern; fractures 0 to 20 degrees; slightly weathered.	
18	14-19	NA	78	NA	2	50			
19								Mudstone layer - 0.5' thick; very broken.	
20									
21									
22	19-24	NA	100	NA	3	84			
23								0.4' sandstone layer - very broken; soft.	
24									Well built inside 4" open bedrock borehole
25								Sandstone; grey and reddish in mottled pattern;	
26								slightly broken; fractures 0 to 80 degrees; trace reddish silt in open fracture.	
27	24-29	NA	99	NA	4	92		Sandstone becomes grey; coarse.	
28									
29									
30									
31			100						
32								Becomes massive.	

Remarks:

ThermoRetec Corporation
1001 W. Seneca St., Suite 204
Ithaca, NY 14850-3342
(607) 277-5716 Phone
(607) 277-9057 Fax
www.thermoretec.com

WELL INSTALLATION LOG

ID: MW1D

Project Number: ORAN2-04301
Client: Orange and Rockland Utilities
Site Location: Nyack MGP
Start Date: 10/23/99
Completion Date: 10/24/99
Location: Western Parcel

Drilling Co.: Maxim Technologies Inc.
Driller: Walt Ketter
Casing ID: 4" Schedule 40 Steel
Method: 6 1/4" ID HSA/HQ Rock Core
Logged By: James Edwards

Surface Elevation: (MSL) 37.70
Water Level During Drilling: 9.52
Stickup: Flush Mount Installation
MP Elevation: (MSL) 37.70
Total Depth: 39

Depth (ft)	Sample Depth	Blow Counts\6"	Percent Recovery	PID (ppm)	Run Number	Rock Quality Designation	Lithology (symbol)	Description	Well Construction
33	29-34	NA	100	NA	5	100			
34									
35									
36	34-39	NA	94	NA	6	80			
37								Becomes slightly broken.	
38									
39								Bottom of Borehole	Bottom of sandpack
40									
41									
42									
43									
44									
45									
46									
47									
48									

Remarks:

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW41

Project Name: Nyack OU2 MGP Investigation
Project Number: 05090-022
Date Started/Completed: May 19, 2008
Boring Location: Upper Terrace
Drilling Company: Northstar Drilling Ltd.

Drilling Method: Drive and wash
Sampling Method: HQ core barrel
PVC/Ground Elevation (ft/msl): 25.16 / 34.07
Total Depth: 35.0 ft bgs
Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	PID (ppm)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Remarks	Well Construction
0										
-2										
-4	NA	NA								
-6										
-8										
-10						Over-burden		No soil samples were collected at this location. Four (4) inch casing was driven to bedrock and washed out using a rollerbit.	Flush mounted curb box	
-12						Over-burden			Cement - bentonite grout from 1-17 ft bgs	
-14	NA	NA								
-16										
-18									Bentonite seal from 17-18 ft bgs	
-20						Sand-stone		Bedrock was encountered at 20.0 ft bgs.		
-22	2.2	11.3						White and reddish-brown SANDSTONE, fine to medium grained, thin to medium bedding, intensely to moderately fractured.	Sand pack from 18-34.5 ft bgs	
-24	1.8	30.0						White and reddish-brown SANDSTONE, fine to medium grained, thin to medium bedding, intensely to moderately fractured. Little hydrocarbon-like sheen and little black staining in fractures at 23.5 and 24.5 ft bgs.		

Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No analytical samples were collected at this location

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW41

Project Name: Nyack OU2 MGP Investigation

Project Number: 05090-022

Date Started/Completed: May 19, 2008

Boring Location: Upper Terrace

Drilling Company: Northstar Drilling Ltd.

Drilling Method: Drive and wash

Sampling Method: HQ core barrel

PVC/Ground Elevation (ft/msl): 25.16 / 34.07

Total Depth: 35.0 ft bgs

Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	PID (ppm)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Remarks	Well Construction
-26										
-28	4.1	71.1						White and reddish-brown SANDSTONE, fine to medium grained, thin to medium bedding, intensely to moderately fractured. Hydrocarbon-like black staining in fractures at 26.7 and 27.6 ft bgs. Slight hydrocarbon-like sheen in fractures from 26.0-30.0 ft bgs.	2", 0.020 slotted PVC screen from 19.5-34.5 ft bgs	
-30										
-32	4.7	68.0						White and reddish-brown SANDSTONE, fine to medium grained, thin to thick bedding, intensely to slightly fractured. Slight hydrocarbon-like sheen in fractures from 26.0-30.0 ft bgs.	Well sump with bentonite seal from 34.5-35 ft bgs.	
-34								Boring terminated at 35.0 ft bgs.		

Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No analytical samples were collected at this location

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW43

Project Name: Nyack OU2 MGP Investigation
Project Number: 05090-022
Date Started/Completed: May 22, 2008
Boring Location: ISS Area
Drilling Company: Northstar Drilling Ltd.

Drilling Method: Direct Push
Sampling Method: Macro-core
PVC/Ground Elevation (ft/msl): 5.78 / 6.16
Total Depth: 25.0 ft bgs
Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	PID (ppm)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Remarks	Well Construction
0						ISS		No soil samples were collected at this location. Augered through the In-situ solidified (ISS) material.	Flush mounted curb box	
-2										
-4	NA	NA							Cement bentonite grout from 0-18 ft bgs	
-6										
-8										
-10										
-12								The thickness of the ISS material ranged from 0-20 ft bgs.		
-14	NA	NA								
-16										
-18									Bentonite seal from 18-19 ft bgs	
-20						SM		Brown fine to medium SAND, little silt; wet.	Sand pack from 19-25 ft bgs	
-22	2.6	1.1							2", 0.020 slotted PVC screen from 20-25 ft bgs	
-24		1.3						Boring terminated at 25.0 ft bgs.		
	NA	NA								

Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No samples were collected.

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW44

Project Name: Nyack OU2 MGP Investigation
Project Number: 05090-022
Date Started/Completed: May 20, 2008
Boring Location: Upper Terrace
Drilling Company: Northstar Drilling Ltd.

Drilling Method: Drive and wash
Sampling Method: HQ core barrel
PVC/Ground Elevation (ft/msl): 33.55 / 33.84
Total Depth: 32.5 ft bgs
Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	RQD (%)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Remarks	Well Construction
0						Over-burden		No soil samples were collected at this location. Four (4) inch casing was driven to bedrock and washed out using a rollerbit.	Flush mounted curb box	
-2										
-4	NA	NA							Cement bentonite grout from 1-15 ft bgs	
-6										
-8						Over-burden				
-10										
-12	NA	NA								
-14										
-16									Bentonite seal from 15-16 ft bgs	
-18	1.5	0.0				Sand-stone		Bedrock was encountered at 17.5 ft bgs. White and reddish-brown SANDSTONE, fine to medium grained, medium bedding, intensely fractured; hydrocarbon-like sheen and black staining in a fracture at 18 ft bgs.	Sand pack from 16-32 ft bgs	
-20	4.8	0.0						White and reddish-brown SANDSTONE, fine to medium grained, medium bedding, intensely fractured; slight hydrocarbon-like sheen in fractures from 19-24 ft bgs, black hydrocarbon-like staining in fractures at 19.5, 19.9, 20.1, and 21.5 ft bgs.	2", 0.020 slotted PVC screen from 17-32 ft bgs	
-22										
-24								White and reddish-brown SANDSTONE, fine to medium grained, medium bedding, intensely to moderately fractured; hydrocarbon-like sheen in fractures from 24.0-26.0 ft bgs,		

Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No analytical samples were collected at this location

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW44

Project Name: Nyack OU2 MGP Investigation

Project Number: 05090-022

Date Started/Completed: May 20, 2008

Boring Location: Upper Terrace

Drilling Company: Northstar Drilling Ltd.

Drilling Method: Drive and wash

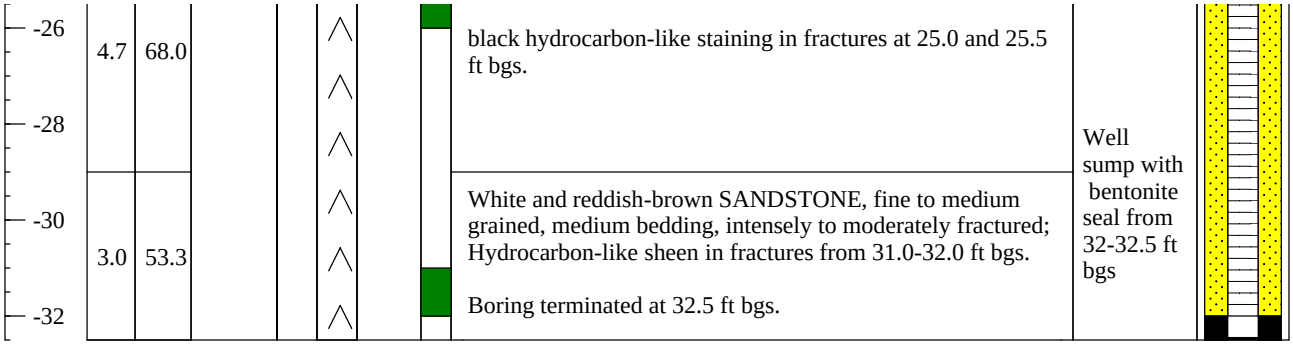
Sampling Method: HQ core barrel

PVC/Ground Elevation (ft/msl): 33.55 / 33.84

Total Depth: 32.5 ft bgs

Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	RQD (%)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Remarks	Well Construction
-26	4.7	68.0						black hydrocarbon-like staining in fractures at 25.0 and 25.5 ft bgs.	Well sump with bentonite seal from 32-32.5 ft bgs	
-28										
-30	3.0	53.3						White and reddish-brown SANDSTONE, fine to medium grained, medium bedding, intensely to moderately fractured; Hydrocarbon-like sheen in fractures from 31.0-32.0 ft bgs.		
-32								Boring terminated at 32.5 ft bgs.		



Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No analytical samples were collected at this location

ENSR | AECOM

1001 West Seneca Street, Suite 204
Ithaca, New York, 14850

Well ID: MW45

Project Name: Nyack OU2 MGP Investigation
Project Number: 05090-022
Date Started/Completed: May 23, 2008
Boring Location: Bottom of the slope
Drilling Company: Northstar Drilling Ltd.

Drilling Method: Drive and wash
Sampling Method: HQ core barrel
PVC/Ground Elevation (ft/msl): 13.84 / 14.15
Total Depth: 28.5 ft bgs
Logged By: Jesse Lloyd

Depth (Feet)	Recovery (Feet)	PID (ppm)	Sample ID	Sample Interval	Lithology	USCS	Visual Impacts	Geologic Description	Well Remarks	Well Construction
0						Over-burden		No soil samples were collected at this location. Four (4) inch casing was driven to bedrock and washed out using a rollerbit.	Flush mounted curb box	
-2										
-4	NA	NA							Cement bentonite grout from 1-10 ft bgs	
-6										
-8										
-10	NA	NA							Bentonite seal from 10-11 ft bgs	
-12								Bedrock encountered at 13.5 ft bgs.		
-14						Bed-rock		Reddish-brown SANDSTONE, fine to medium grained, thin to medium bedding, intensely to moderately fractured.	Sand pack from 11-27.5 ft bgs	
-16	4.8	75.0								
-18									2", 0.020 slotted PVC screen from 12.5-27.5 ft bgs	
-20	1.8	59.0						Reddish-brown SANDSTONE, fine to medium grained, medium bedding, moderately fractured.		
-22	4.1	83.7						Reddish-brown SILTSTONE, fine to medium grained, thin to thick bedding, moderately to slightly fractured.		
-24										
-26	3.5	19.0						Reddish-brown SILTSTONE, thin to medium bedding, intensely to moderately to fractured.	Well sump with bentonite seal from 27.5-28.5 ft bgs	
-28								Sheen in fracture at 27.0 ft bgs. Boring terminated at 28.5 ft bgs.		

Coal Tar or Coal Tar NAPL Saturated Soil

Hydrocarbon Staining, Hydrocarbon Sheen or NAPL Blebs

Comments: No analytical samples were collected at this location

Attachment B

NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy

CP-43:Groundwater Monitoring Well Decommissioning Policy

New York State Department of Environmental Conservation

DEC POLICY

Issuing Authority: Commissioner Alexander B. Grannis

Date Issued: November 3, 2009	**Latest Date Revised:**

I. Summary:

Groundwater monitoring wells provide essential access to the subsurface for scientific and engineering investigations (including monitoring wells installed for leak detection purposes). To a degree, every monitoring well is an environmental liability because of the potential to act as a conduit for pollution to reach the groundwater. To limit the environmental risk, a groundwater monitoring well must be properly decommissioned when its effective life has been reached. This document provides procedures to satisfactorily decommission groundwater monitoring wells in New York State. This policy also pertains to other temporary wells such as observation wells, test wells, de-watering wells and other small diameter, non-potable water wells. It does not pertain to water supply wells.

II. Policy:

Environmental monitoring wells should be decommissioned when:

1. they are no longer needed and re-use by another program is not an option; or
2. the well's integrity is suspect or compromised.

The method for decommissioning will be determined based upon well construction and environmental parameters. The method selected must be designed to protect groundwater and implemented according to current best engineering practices while following all applicable federal, state and local regulations. *Groundwater Monitoring Well Decommissioning Procedures* shall be maintained as an addendum to this policy.

This policy is applicable to all New York State Department of Environmental Conservation (DEC) programs that install, utilize and maintain monitoring wells for the study of groundwater, except monitoring wells for landfills regulated under 6 NYCRR Part 360 decommissioned in accordance with those regulations [*see* 6 NYCRR 360-2.11(a)(8)(vi)] and wells installed under the Oil, Gas and Solution Mining Law, Environmental Conservation Law Article 23. There is no specific time frame to dictate when to decommission a well; timing is dependent upon the use and condition of the well

and shall be determined on an individual basis. Best professional judgment must be exercised when using the decommissioning procedures. Outside of DEC use, this policy is mandatory when incorporated into the specifications of a state contract, an Order on Consent or a permit. In all other situations, it shall serve as guidance.

III. Purpose and Background:

This document establishes a monitoring well decommissioning policy and provides technical guidance. Synonyms for well decommissioning include “plugging,” “capping” and “abandoning. For consistency, only the term “decommissioning” is used within this document.

Unprotected, neglected and improperly abandoned monitoring wells are a serious environmental liability. They can function as a pollution conduit for surface contaminants to reach the subsurface and pollute our groundwater. They also can cause unwanted mixing of groundwater, which degrades the overall water quality within an aquifer. Improperly constructed, poorly maintained or damaged monitoring wells can yield anomalous poor data that can compromise the findings of an environmental investigation or remediation project. Unneeded or compromised monitoring wells should be properly decommissioned in order to prevent harm to our groundwater.

Since 1980, the DEC has installed, directed or overseen the installation of thousands of monitoring wells throughout New York for various state and federal programs, such as Superfund, solid waste, Resource Conservation and Recovery Act (RCRA), spill response, petroleum bulk storage and chemical bulk storage. This guidance addresses the environmental liability associated with this aging network of wells.

Within its boring zone, a successfully decommissioned well prevents the following:

1. Migration of existing or future contaminants into an aquifer or between aquifers;
2. Migration of existing or future contaminants within the vadose zone;
3. Potential for vertical or horizontal migration of fluids in the well or adjacent to the well; and
4. Any change in the aquifer yield and hydrostatic head, unless due to natural conditions.

Monitoring well construction in New York varies considerably with factors such as age of the well, local geology and either the presence or absence of contamination. The predominant type of monitoring well in New York is the shallow, watertable monitoring well constructed of polyvinyl chloride plastic (PVC). The best method for decommissioning should be selected to suit the conditions and circumstances. Each decommissioning situation is to be evaluated separately using this guidance before a method is chosen and implemented.

IV. Responsibility:

The Division of Environmental Remediation (DER) is responsible for updating this policy and the *Groundwater Monitoring Well Decommissioning Procedures* (addendum) in consultation with the Division of Solid and Hazardous Materials (DSHM) and the Division of Water (DOW). Compliance with the guidance does not relieve any party of the obligation to properly decommission a monitoring well. Oversight responsibility will be carried out by the DEC Regional Engineer.

V. Procedure:

Groundwater Monitoring Well Decommissioning Procedures, the addendum to this policy, provides guidance on proper decommissioning of monitoring wells in New York State.

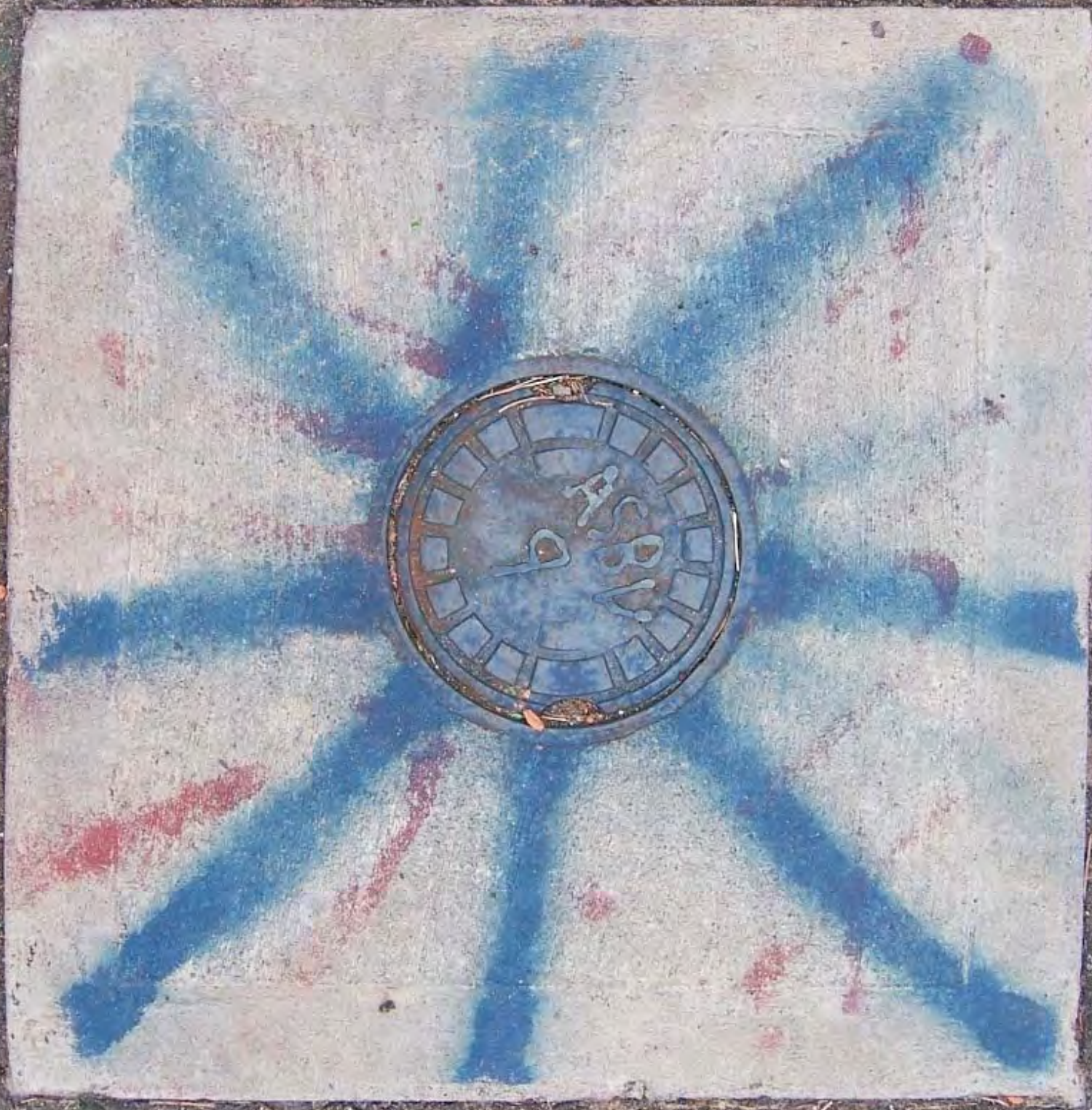
VI. Related References:

- Groundwater Monitoring Well Decommissioning Procedures, October 1986. Prepared by Malcolm Pirnie, Inc. for the New York State Department of Environmental Conservation, Division of Environmental Remediation.
- Standard Guide for the Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities, ASTM D 5299-99. American Society for Testing and Materials (ASTM). Philadelphia. 2005.
- 6 NYCRR Part 360 Solid Waste Management Facilities, New York State Department of Environmental Conservation, Division of Solid and Hazardous Materials.
- Specifications for Abandoning Wells and Boreholes in Unconsolidated Materials, New York State Department of Environmental Conservation, Region 1 - Water Unit, undated.
- Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells, EPA 600/4-89/034, United States Environmental Protection Agency (EPA).

[Page Intentionally Left Blank]

Final - August 2009

GROUNDWATER MONITORING WELL DECOMMISSIONING PROCEDURES



New York State Department of Environmental Conservation
Division of Environmental Remediation

[Page Intentionally Left Blank]

TABLE OF CONTENTS

FIGURES

APPENDICES

INTRODUCTION

This document, *Groundwater Monitoring Well Decommissioning Procedures*, is the addendum to CP-43, Groundwater Monitoring Well Decommissioning Policy, which provides acceptable procedures to be used as guidance when decommissioning monitoring wells in New York State. Please note that this document does not address some site-specific special situations that may be encountered in the field. Compliance with the procedures set forth in this document does not relieve any party of the obligation to properly decommission a monitoring well.

Unprotected, neglected and improperly abandoned monitoring wells are a serious environmental liability. They can function as a pollution conduit for surface contaminants to reach the subsurface and pollute our groundwater. They also can cause unwanted mixing of groundwater, which degrades the overall water quality within an aquifer. Improperly constructed, poorly maintained or damaged monitoring wells can yield anomalous poor data that can compromise the findings of an environmental investigation or remediation project. Unneeded or compromised monitoring wells should be properly decommissioned in order to prevent harm to our groundwater.

Previous versions of this guidance have been issued since 1995. Originally developed as a specification for well decommissioning at Love Canal, the procedures were rewritten to make them applicable across the state. From an engineering standpoint, the guidance has changed very little. Most situations do not require a complex procedure.

If you have any questions, please contact Will Welling at (518) 402-9814.

Sincerely,

Gerald J. Rider, Jr., P.E.
Chief, Remedial Section D
Remedial Bureau E
Division of Environmental Remediation

1.0 PREPARATION

If an unneeded monitoring well remains in good usable condition, an alternative to decommissioning might be the reuse by another agency program. DEC encourages reuse in situations where a well will continue to be used and cared for responsibly.

When reuse is not an option, the first step in the well decommissioning process is to review all pertinent well construction information. One must know the well depth and construction details. GPS coordinates and permanent labeling (if available) will be useful in confirming the well to be decommissioned. An inspection must be performed prior to decommissioning in order to verify the construction and condition of each well. Specific details and subsurface conditions form the basis for decisions throughout the decommissioning process.

Well Details

1. Is the well a single stem riser (all one diameter)?
2. Is the well a simple overburden well (no penetration into bedrock)?
3. Does the well riser consist of telescoping diameters of pipe which decrease with depth?
4. Is the well seal compromised (leaking, inadequate or damaged)?
5. If the well is PVC, is it 25 feet or shallower and not grouted into rock?
6. Can the riser be pulled and is removal of the well desired?
7. Is the well a bedrock well?
8. If the monitoring well is a bedrock well, does it have an open hole?
9. Is there a well assembly (riser and screen) installed within the bedrock hole?

Subsurface Conditions

10. Is the soil contaminated?
11. Does the well penetrate a confining layer?
12. If the well penetrates a confining layer, might overdrilling or casing pulling cause contamination to travel up or down through a break in the confining layer?
13. Does the screened interval cross multiple water-bearing zones?

For additional collection and verification of information, the "Monitoring Well Field Inspection Log" (Figure 1) can be used during a field inspection. After the well has been located and the information gathered, one is ready to select the decommissioning procedure in accordance with Section 2.

Special conditions, such as access problems, well extensions through capped and covered non-Part 360 landfills and seasonal weather patterns affecting construction, should be assessed in the planning stage. Decommissioning work requiring the use of heavy vehicular equipment on landfill caps should be scheduled during dry weather (if possible) so as to minimize damage to the cover. If work must be performed during the spring, winter or inclement weather, special measures to reduce ruts should be employed to maintain the integrity of a completed landfill cover system. As an example, placement of plywood under vehicular equipment can eliminate deep ruts that would require repair.

2.0 DECOMMISSIONING METHODS

The primary rationale for well decommissioning is to remove any potential groundwater pathway. A secondary rationale, often important to the property owner or owner of the well, is to physically remove the well. Removed well materials may be recycled and will not interfere with future construction excavation. The previous versions of these decommissioning procedures have stressed that physical removal of the well by pulling is preferable to leaving casing in the ground. Due to the added effort, expense and risk involved with pulling, the decision of whether to pull or not should be a separate consideration aside from selecting the sealing procedure.

One should select a decommissioning procedure that takes into account the geologic and hydrogeologic conditions at the well site; the presence or absence of contamination in the groundwater; and original well construction details. The selection process for well decommissioning procedures is provided by the flow chart, Figure 2. Answers to the questions

in the preceding section are the input for this flow chart. The four primary well decommissioning methods are:

1. Grouting in-place;
2. Perforating the casing followed by grouting in-place;
3. Grouting in-place followed by casing pulling;
4. Over-drilling and grouting with or without a temporary casing.

In a complex situation, one or more decommissioning procedures may be used for different intervals of the same well.

The remainder of Section 2 discusses the well decommissioning methods and the selection process. Refer to Figure 2 for a flow chart diagram of the complete procedure selection process. The DEC Project Manager has the discretion to deviate from the flow chart, (Figure 2), based on site conditions and professional judgment.

2.1 Grouting In-Place

Grouting in-place is the simplest and most frequently used well decommissioning method and grouting itself is the essential component of all the decommissioning methods. The grout seals the borehole and any portion of the monitoring well that may be left in the ground. Because dirt and foreign objects can fall into an open well, whenever possible a well should be sealed first with grout before attempting subsequent decommissioning steps.

For the purpose of these decommissioning procedures, the well seal is defined as the bentonite seal above the sand pack. Aside from obvious channeling by in-flowing surface water around the well, an indication of the well seal integrity may be obtained through review of the boring logs and/or a comparison of groundwater elevations if the well is part of a cluster. Any problems noted on the boring logs pertaining to the well seal, such as bridging of bentonite pellets or running sands, or disparities between field notes (if available) and the well log would indicate the potential for a poor (compromised) well seal.

If the well seal is not compromised and there is no confining layer present, a single-stem, 2-inch PVC, monitoring well can be satisfactorily decommissioned by grouting it in-place. If the seal is compromised, casing perforation may be called for as discussed in Section 2.2.

As discussed in Section 2.4 and its sub-sections, this method is specified for the bedrock portion of a well, and is used for decommissioning small diameter cased wells. Grouting in-place involves filling the casing with grout to a level of five feet below the land surface, cutting the well casing at the five-foot depth, and removing the top portion of the casing and associated well materials from the ground. The casing must be grouted according to the procedures in Section 6. In addition, the upper five feet of the borehole is filled to land surface and restored according to the procedures described in Section 7.

For open-hole bedrock wells, the procedure involves filling the opening with grout to the top of rock according to the procedures in Section 5. A thicker grout may be required to fill any bedrock voids. If excessive grout is being lost down-hole, consider grouting in stages to reduce the pressure caused by the height of the grout column.

The standard mix with the maximum amount of allowable water will be required to penetrate the well screen and sand pack when a well assembly has been installed within a bedrock hole. For an assembly such as this, the grout should be mixed thinly enough to penetrate the slots and sand pack. The grout mixes are discussed in Sections 6.1 and 6.2.

2.2 Casing Perforating/Grouting In-Place

Casing perforation followed by grouting in-place is the preferred method to use if there is poor documentation of the grouting of the well annulus, or the annulus was allowed to be back-filled with cuttings. The grout will squeeze through the perforations to seal any porous zones along the outside of the casing. The procedure involves puncturing, cutting or splitting the well casing and screen followed by grouting the well. A variety of commercial equipment is available for perforating casings and screens in wells with four-inch or larger inside diameters. Due to the diversity of applications, experienced contractors must recommend a specific technique based on site-specific conditions. A minimum of four rows of perforations several inches long around the circumference of the pipe and a minimum of five perforations per linear foot of casing or screen is recommended (American Society for Testing and Materials, Standard D 5299-99, 1999). After the perforating is complete, the borehole must be grouted according to the procedures in Section 6 and the upper five feet of borehole restored according to the procedures in Section 7.

2.3 Casing Pulling

Casing pulling should be used in cases where the materials of the well assembly are to be recycled, or the well assembly must be removed to clear the site for future excavation or re-development. Casing pulling is an acceptable method to use when no contamination is present; contamination is present but the well does not penetrate a confining layer; and when both contamination and a confining layer are present but the contamination cannot cross the confining layer. Additionally, the well construction materials and well depth must be such that pulling will not break the riser. When contamination is likely to cross the confining layer during pulling, a temporary casing can be used. See Section 2.4.

Casing pulling involves removing the well casing by lifting. Grout is to be added during pulling; the grout will fill the space once occupied by the material being withdrawn. An acceptable procedure to remove casing involves puncturing the bottom of the well or using a casing cutter to cut away the screen, grouting, using jacks to free casing from the hole, and lifting the casing out by using a drill rig, backhoe, crane, or other suitable equipment. Additional grout must be added to the casing as it is withdrawn. Grout mixing and placement procedures are provided in Section 6. In wells or well points in which the bottom cannot be punctured, the casing or screened interval will be perforated or cut away prior to being filled with grout. This procedure should be followed for wells installed in collapsible formations or for highly contaminated wells.

At sites in which well casings have been grouted into the top of bedrock, the casing pulling procedure should not be attempted unless the casing can be first cut or freed from the rock.

2.4 Over-Drilling

Over-drilling is the technique used to physically remove an entire monitoring well, its sand pack and the old grout column and fill. In situations where PVC screens and risers are expected to sever and removal of all well materials is required, over-drilling will be required. Over-drilling is called for when a riser can't be pulled and it penetrates a confining layer. Compared to the other procedures, over-drilling is the least common method of well decommissioning.

A "temporary casing" may be necessary when extraordinary conditions are present, such as a high concentration of mobile contaminants in the overburden, depth to water is shallow, there is poor construction documentation or shoddy construction practices. The approach involves installing a large diameter steel casing around the outside of the well followed by drilling / pulling /grouting within this casing. The casing is withdrawn at the end of pulling, grouting and (perhaps) drilling. If the confining layer is less than 5 feet thick, the casing should be installed to the top of the confining layer. Otherwise, it is installed to a depth of 2 feet below the top of the confining layer. After the outer casing has been set, the well can be removed and grouted through pulling if possible or removed and grouted by drilling inside the casing.

Over-drilling is used where casing pulling is determined to be unfeasible, or where installation of a temporary casing is necessary to prevent cross-contamination, such as when a confining layer is present and contamination in the deeper aquifer could migrate to the upper aquifer as the well is pulled. The over-drilling method should:

- Follow the original well bore;
- Create a borehole of the same or greater diameter than the original boring; and
- Remove all of the well construction materials.

In over-drilling the difficulty lies in keeping the augers centered on the old well as the bit is lowered; it will tend to wander off. As a precaution, the well column should be filled with grout before over-drilling. Then without allowing the grout to dry, the driller proceeds with over-drilling the well. Grouting first guarantees that if the drill wanders off the old well and the effort is less than 100% successful, the remaining well portion will at least have been grouted. There are many methods for over-drilling. Please note that the following methods are not suitable for all types of casing, and the advice of an experienced driller should be sought.

- Conventional augering (i.e., a hollow stem auger fitted with a pilot bit). The pilot bit will grind the well construction materials, which will be brought to the well surface by the auger.
- A conventional cable tool rig to advance "temporary" casing having a larger diameter than the original boring. The cable tool kit is advanced within the casing to grind the well construction materials and soils, which are periodically removed with large diameter bailer. This method is not applicable to bedrock wells.

- An over-reaming tool with a pilot bit nearly the same size as the inside diameter of the casing and a reaming bit slightly larger than the original borehole diameter. This method can be used for wells with steel casings.

- A hollow-stem auger with outward facing carbide cutting teeth having a diameter two to four inches larger than the casing.

Prior to over-drilling, the bottom of the well should be perforated or cut away, and the casing filled with grout as with casing removal by pulling.

In all cases above, over-drilling should advance beyond the original bore depth by a distance of half a foot to ensure complete removal of the construction materials. Oversight attention should be focused on the drill cuttings, looking for fragments of well materials. Absence of these indicators is a sign that the drill has wandered off the well. If wandering is suspected, having previously filled the well with grout, the remaining portion which cannot be over-drilled can be considered grouted in-place. When the over-drilling is complete, grout should be tremied within the annular space between the augers and well casings. The grout level in the borehole should be maintained as the drilling equipment and well materials are sequentially removed. As with all the other methods, the upper five feet of borehole should be restored according to the procedures in Section 7.

3.0 SELECTION PROCESS AND IMPLEMENTATION

The decommissioning procedure selection flow chart, Figure 2, is to be used to select decommissioning methods. The selection process first identifies the basic monitoring well type. There are only two types of monitoring wells described in this guidance, overburden wells and bedrock wells. Bedrock wells typically have an overburden portion which in the selection process is to be treated as an overburden well. Techniques are specified for wells based upon their type and the other physical conditions present. Decommissioning techniques called for by the selection process have their practical limits; construction details dictate when a well stem can be pulled without breaking and when it cannot be pulled. The DEC project manager has the discretion to deviate from the flow chart, (Figure 2), based on site conditions, budgetary concerns and professional judgment. The remainder of this section will discuss types of monitoring wells in various settings along with recommended decommissioning techniques.

3.1 Bedrock Wells

Referring to Figure 2 and Section 2.1, if the well extends into bedrock, the rock hole portion of the well is to be grouted in-place to the top of the rock. The grout mix, however, may vary according to the conditions. A thicker grout may be required to fill voids and a thinner grout may be necessary to penetrate well screen and sand pack. Refer to the grout mixture specifications given in Section 6.1 and 6.2.

Prior to grouting, the depth of the well will be measured to determine if any silt or debris has plugged the well. If plugging has occurred, all reasonable attempts to clear it should be made before grouting. The borehole will then be tremie grouted according to Section 6.4 from the bottom of the well to the top of bedrock to ensure a continuous grout column.

After the rock hole is grouted, the overburden portion of the well is decommissioned using appropriate techniques described below. If the bedrock extends to the ground surface, grouting can extend to the ground surface or to slightly below so that the site can be restored as appropriate in accordance with Section 7.

3.2 Uncontaminated Overburden Wells

For overburden wells and the overburden portion of bedrock wells, the first factor in determining the decommissioning method is whether the overburden portion of the well exhibits contamination, as determined through historical groundwater and/or soil sampling results. If the overburden is uncontaminated, the next criteria considers whether the well penetrates a confining layer. In the case that the overburden portion of the well does not penetrate a confining layer, the casing can either be tremie-grouted and pulled or tremie grouted and left in place. As a general rule, PVC wells greater than 25-feet deep should not be pulled unless site-specific conditions or other factors indicate that the well can be pulled without breaking. If the well cannot be pulled, the well should be grouted in-place as accordance with Sections 2.1 and 2.2.

If a non-telescoped overburden well penetrates a confining layer, the casing should be removed by pulling (if possible) in accordance with Section 2.3. If the casing cannot be removed by pulling, the well should be grouted in-place or where complete removal is required, removed by over-drilling. Over-drilling will be based upon the site-specific conditions and requirements. If pulling is attempted and fails (i.e., a portion of the riser breaks) the remaining portion of the well should be removed by using the conventional augering procedure identified in Section 2.4. Note that if the riser is broken during pulling, it is highly unlikely that the driller will be able to target it to over-drill it. This is the reason why all wells should be grouted first. In all cases, after the well construction materials have been removed to the extent possible, the borehole will be grouted in accordance with Section 6 and the upper five feet will be restored in accordance with Section 7.

3.3 Contaminated Overburden Monitoring Wells/Piezometers

Contamination in the overburden plays a role in the selection process. Any contamination present in the overburden must not be allowed to spread as a result of the decommissioning construction. For wells and piezometers suspected or known to be contaminated with light non-aqueous phase liquid (LNAPL) and/or dense non-aqueous phase liquid (DNAPL), often referred to as “product,” the decision to decommission the well should be reviewed. Such gross contamination is a special condition and requires design of the decommissioning procedure. If decommissioning is determined to be the proper course of action, measurement of the non-aqueous phase liquid volume will be determined and this liquid will be removed.

If an overburden well (or the overburden portion of a bedrock well) is contaminated with LNAPL, DNAPL and /or dissolved fractions as indicated by historical sampling results, one must evaluate the potential for contamination to cross an overburden confining layer (if one exists) during decommissioning. A rock or soil horizon of very low permeability is known as a confining layer. Contamination in the overburden lying above a confining layer is a significant condition to recognize. To prevent mobile contaminants from crossing a confining layer during pulling or over-drilling, a temporary casing should be installed to isolate the work zone. One should follow the procedure selection flow chart. Some contaminated conditions call for over-

drilling or a specially designed procedure.

A well in contaminated overburden may be grouted in-place as long as the grout fully seals the well and boring zone. If a well in contaminated overburden was constructed allowing formation collapse as annular backfill or if the well has a compromised well seal, one must either physically remove the well or thoroughly perforate the riser and grout it in-place.

If physical removal of the well is required and the overburden contaminants are likely to be dragged upward or downward during decommissioning, a temporary casing should be used to seal off the construction work zone. Casing pulling and overdrilling can be safely accomplished within the temporary casing. Section 2.4 discusses the temporary casing technique.

3.4 Telescoped Riser

If the riser is telescoped in one or more outer casings, the decommissioning approach depends upon the integrity of the well seal. If there is no evidence that the well seal integrity is compromised, the riser should be grouted in-place in accordance with Sections 2.1 or 2.2 and the upper 5 feet of the well surface should be restored in accordance with Section 7. If indications are that the well seal is not competent, it will be necessary to design and implement a special procedure to perforate and grout or remove the well construction materials. The presence and configuration of the outer casing(s) will be specific in the individual wells and will be a key factor in the decommissioning approach. The special procedure must mitigate the potential for cross-contamination during removal of the well construction materials.

4.0 LOCATING AND SETTING-UP ON THE WELL

Prior to mobilizing to decommission a monitoring well, one should notify the property owner and/or other interested parties including the governing regulatory agency. It is advisable that when at the well location, one should review the proposed well decommissioning procedure. Verify well locations and identification by their identifying markers and GPS coordinates. Lastly, verify the depth of each well with respect to depth recorded on the well construction log.

5.0 REMOVING THE PROTECTIVE CASING

Most monitoring wells installed in non-traffic locations are finished with an elevated, protective casing (guard pipe) and a concrete rain pad. Wells at gasoline stations, usually being in high-traffic areas, are typically finished with a flush-mount, curb box and protective 8" dia steel inspection plate rather than a stick-up riser. The curb box is usually easily removed from around the flush-mount well before pulling or over-drilling. In the case of stick-up wells, the riser pipe may be bonded to the guard pipe and rain pad. When the protective casing and concrete pad of a stick-up monitoring well are "yanked out," a PVC riser will typically break off at the bottom of the guard pipe several feet below grade. Once this happens, it may become impossible to center a drill rig upon the well. The riser may become splintered and structurally unstable for pulling. Unless grouted first, the well may fill with dirt. Before pulling a casing or over-drilling a well, a method must be devised for removing these protective surface pieces without jeopardizing the remaining decommissioning effort.

Generally, unless the protective casing is loose and can be safely lifted off by hand, *one*

should fill the monitoring well with grout before removing the outer protective casing. This will ensure that the well is properly sealed regardless of any problems later when removing the protective casing. Remove the protective casing or road box vault initially only if the stick-up or vault will interfere with subsequent down-hole work which must be done before grouting. This down-hole work may include puncturing, perforating or cutting the screen or riser. But as a general procedure don't remove the protective casing or road box until after initial grouting is complete.

The procedure for removing the protective casing of a well depends upon the decommissioning method specified for the monitoring well. The variety of protective casings available preclude developing a specific removal procedure but often one can simply break up the concrete seal surrounding the casing and jack or hoist the protective casing out of the ground. A check should be made during pulling to ensure that the inner well casing is not being hoisted with the protective casing. If this occurs, the well casing should be cut off after the base of the protective casing is lifted above the land surface. At well locations where the riser has been extended, the burial of a previous concrete pad may require the excavation of soil to the top of the concrete pad to remove the well.

Steel well casing should be removed approximately five feet below the land surface so as to be below the frost line and out of the way of any subsequent shallow digging. The upper five feet of casing and the protective casing can be removed in one operation if a casing cutter is used.

Waste handling and disposal must be consistent with the methods used for the other well materials unless an alternate disposal method can be employed (i.e., steam cleaning followed by disposal as non-hazardous waste).

6.0 SELECTING, MIXING, AND PLACING GROUT

This section gives recipes for the “standard grout mixture” and the thicker “special grout mixture.” Mixing and placing grout is also discussed in this section. The goal of well decommissioning is to eliminate the capability of water to travel up or down within the volume of the former well and its boring. Success depends upon the correct grout mixture and placement where it is needed. There are two types of grout mixes that may be used to seal monitoring wells: a standard mix and a special mix. Both mixes use Type 1 Portland cement and four percent bentonite by weight. However, the special mix uses a smaller volume of water and is used in situations where excessive loss of the standard grout mix is possible (e.g., highly-fractured bedrock or coarse gravels).

6.1 Standard Grout Mixture

For most boreholes, the following standard mixture will be used:

- One 94-pound bag Type I Portland cement;
- 3.9 pounds powdered bentonite; and
- 7.8 gallons potable water.

Slightly more water may be used in order to penetrate a sand pack when a well screen transects multiple flow zones. This mixture results in a grout with a bentonite content of four percent by weight and will be used in all cases except in boreholes where excessive use of grout is anticipated. In these cases a special thicker mixture will be used.

6.2 Special Mixture

In cases where excessive use of grout is anticipated, such as high permeability formations and highly fractured or cavernous bedrock formations, the following special mixture will be used:

- one 94-pound bag type I Portland cement;
- 3.9 pounds powdered bentonite;
- 1 pound calcium chloride; and
- 6.0-7.8 gallons potable water (depending on desired thickness).

The special mixture results in a grout with a bentonite content of four percent by dry weight. It is thicker than the standard mixture because it contains less water. This grout is expected to set faster than the Standard Grout Mixture due to the added calcium chloride. The least amount of water that can be added for the mixture to be readily pumpable is 6 gallons per 94-pound bag of cement.

6.3 Grout Mixing Procedure

To begin the grout-mixing procedure, calculate the volume of grout required to fill the borehole. If possible, the mixing basin should be large enough to hold all of the grout necessary for the borehole.

Mix grout until a smooth, homogeneous mixture is achieved. Grout can be mixed manually or with a mechanized mixer. Colloidal mixers should not be used as they tend to excessively decrease the thickness of the grout for the above recipes.

6.4 Grout Placement

This guidance requires that grout be placed in the well from the bottom to the top by means of a "tremie." A tremie is a pipe, a hose or a tube extending from the grout supply to the bottom of the well. The tremie delivers the grout all the way down through the water column without its being diluted and mixed with the water that may be present in the well. The tremie pipe or tube is withdrawn as (or after) the well is filled with grout.

Using the tremie, grout is placed in the borehole filling from the bottom to the top. Two-inch and larger wells should use tremie tubing of not less than 1-inch diameter. Smaller diameter wells will call for a smaller tremie pipe. Grout will then be pumped in until the grout appears at the land surface (when grouting open holes in bedrock, the grout level only needs to reach above the bedrock surface). Any groundwater displaced during grout placement, if known to be contaminated, will be contained for proper disposal.

At this time the rate of settling should be observed. If grouting the well in place, the well

casing remains in the hole. But if the decommissioning method has involved down-hole tools such as hollow-stem augers or temporary casing for overdrilling, these will be removed from the hole. As each section is removed, grout will be added to keep the level between 0 and 5 feet below grade. If the grout level drops below the land surface to an excessive degree, an alternate grouting method must be used. One possibility is to grout in stages; i.e., the first batch of grout is allowed to partially cure before a second batch of grout is added.

As previously described in Section 5.0, the outer protective casing "stick-up" should be removed only after a well has been properly filled with grout. This will ensure that the well is properly sealed regardless of any breakage which may occur when removing the stick-up. It is important to reiterate that when either casing pulling or over-drilling are required, due to the uncertainty of successfully pulling a well or over-boring a well, we insist that the driller tremie grout the well first. Then without allowing the grout to dry, the driller proceeds with pulling the casing or over-drilling the well.

Upon completion of grouting, ensure that the final grout level is approximately five feet below land surface. A ferrous metal marker will be embedded in the top of the grout to indicate the location of the former monitoring well. Lastly, a fabric "utility" marking should be placed one foot above the grout so an excavator can see it clearly.

7.0 BACKFILLING AND SITE RESTORATION

The uppermost five feet of the borehole at the land surface should be filled with material physically similar to the natural soils. The surface of the borehole should be restored to the condition of the area surrounding the borehole. For example, concrete or asphalt will be patched with concrete or asphalt of the same type and thickness, grassed areas will be seeded, and topsoil will be used in other areas. All solid waste materials generated during the decommissioning process must be disposed of properly.

8.0 DOCUMENTATION

A form which may be used in the field to record the decommissioning construction is included as Figure 3. Additional documentation may be required by a DEC project manager and samples are included in Appendix A. Programs within the DEC that maintain geographic data on monitoring wells strive to keep that data up to date. Owners of these data sets must be notified when a well is decommissioned. Historical groundwater quality data is linked to monitoring well locations so when a well is decommissioned, existing GIS data must be updated to reflect that fact but the coordinate location in the GIS database should not be eliminated. A metal detector may not be able to detect a deeply buried marker so if this locator is important for future utility runs or foundations, a map should be submitted to the property owner and the town engineer showing the decommissioned well locations. Global Positioning System (GPS) coordinates should be indicated on this map. Lastly, whatever documentation is produced should be provided to the property owner, the DEC, and all other parties involved.

9.0 FIELD OVERSIGHT

Over-drilling requires careful observation to detect whether the drill has wandered off the well. Grout preparation and tremie work should be carefully observed. The successful implementation of a decommissioning work plan depends upon proper direction, observation and oversight. Methods to be employed must be clearly worked through and all parties must understand what they have to do before going into the field. Flexibility is allowed where necessary but the work effort must be thorough and effective to protect our groundwater.

10.0 RELATED REFERENCES

- *Groundwater Monitoring Well Decommissioning Procedures*, October 1986. Prepared by Malcolm Pirnie, Inc., for the New York State Department of Environmental Conservation, Division of Environmental Remediation.

- American Society for Testing and Materials, A.S.T.M. D 5299-99, Standard Guide for the Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities. A.S.T.M.. Philadelphia. 2005.

- New York State Department of Environmental Conservation, Division of Solid and Hazardous Materials, 6 NYCRR Part 360, Solid Waste Management Facilities.

- New York State Department of Environmental Conservation, Region I - Water Unit, Specifications for Abandoning Wells and Boreholes in Unconsolidated Materials, undated.

- United States Environmental Protection Agency, The Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells, EPA 600/4-89/034.

FIGURES

APPENDICES

[Page Intentionally Left Blank]

FIGURE 1

MONITORING WELL FIELD INSPECTION LOG

FIGURE 1

SITE NAME:

SITE ID.: _____
INSPECTOR: _____
DATE/TIME: _____
WEll ID.: _____

MONITORING WELL FIELD INSPECTION LOG
NYSDEC WELL DECOMMISSIONING PROGRAM

	YES	NO
WELL VISIBLE? (If not, provide directions below)		
WELL I.D. VISIBLE?		
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back).....		

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: .....

	YES	NO
SURFACE SEAL PRESENT?		
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)		

HEADSPACE READING (ppm) AND INSTRUMENT USED..... _____
TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable) _____
PROTECTIVE CASING MATERIAL TYPE: ..... _____
MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): ..... _____

	YES	NO
LOCK PRESENT?		
LOCK FUNCTIONAL?		
DID YOU REPLACE THE LOCK?		
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		
WELL MEASURING POINT VISIBLE?		

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): ..... _____
MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): ..... _____
MEASURE WELL DIAMETER (Inches): ..... _____
WELL CASING MATERIAL: ..... _____
PHYSICAL CONDITION OF VISIBLE WELL CASING: ..... _____
ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE ..... _____
PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES..... _____

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

REMARKS:

FIGURE 2

DECOMMISSIONING PROCEDURE SELECTION

NYSDEC Monitoring Well Decommissioning Procedure Selection

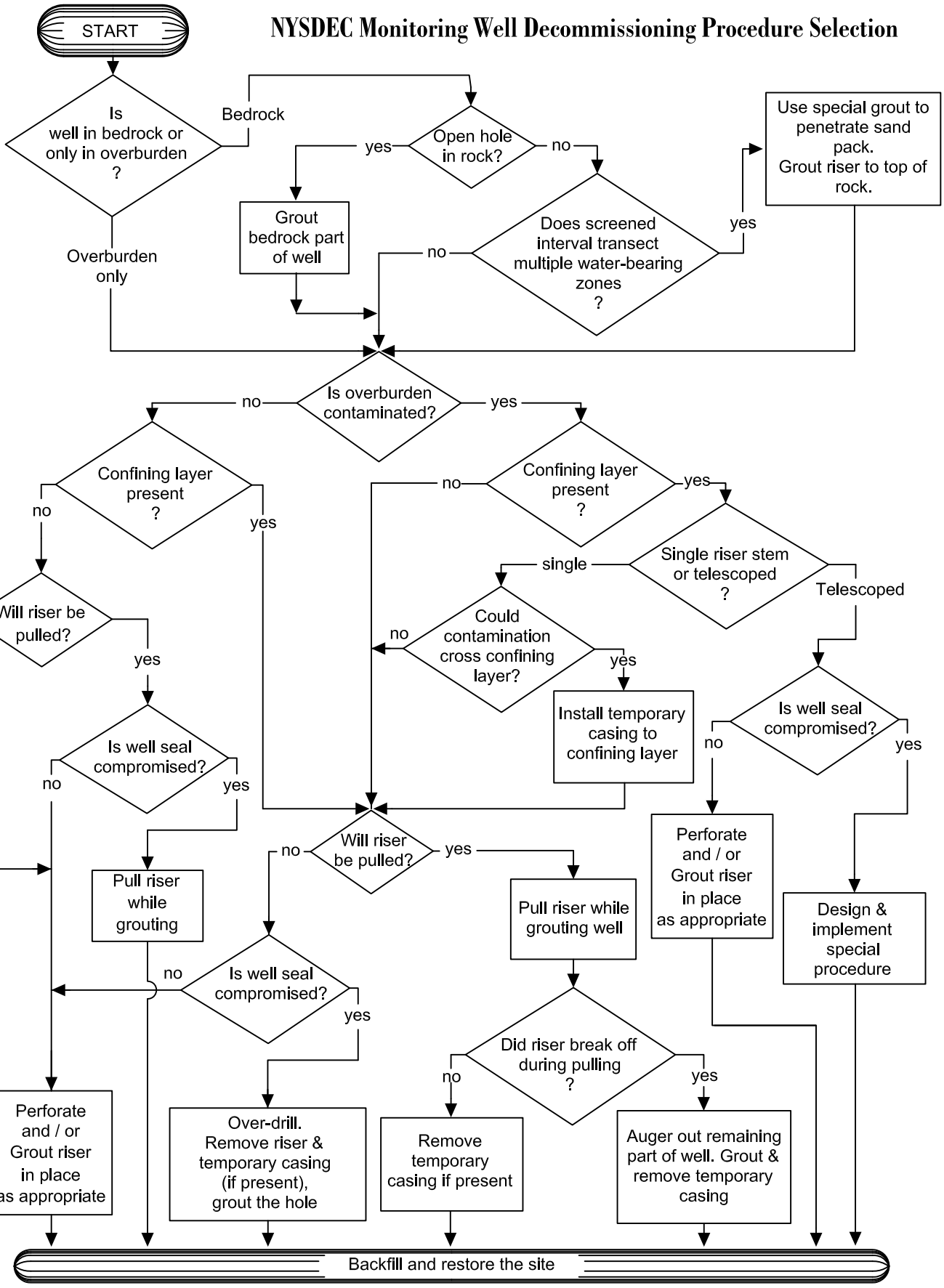


FIGURE 2

FIGURE 3

WELL DECOMMISSIONING RECORD

FIGURE 3

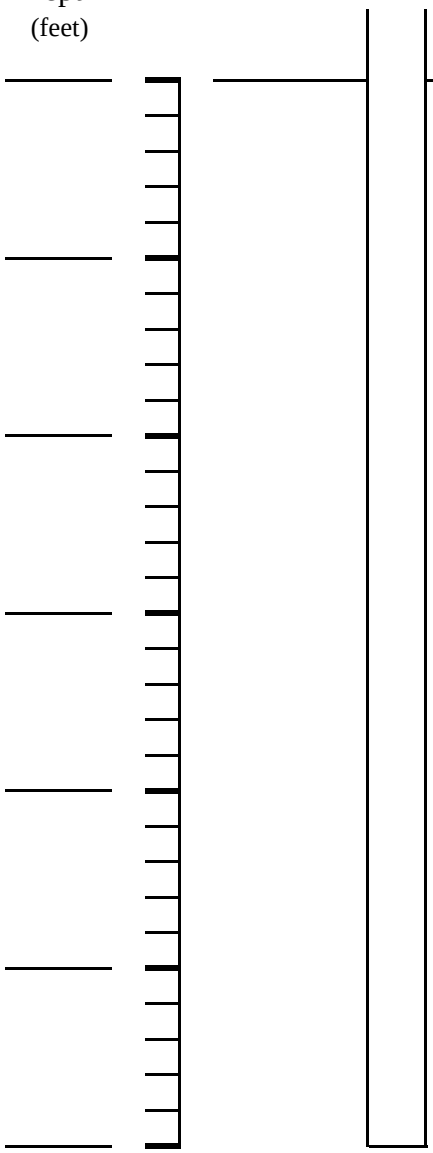
WELL DECOMMISSIONING RECORD

Site Name:	Well I.D.:
Site Location:	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

APPENDIX A - REPORTS

APPENDIX A1 - INSPECTOR'S DAILY REPORT

APPENDIX A2 - PROBLEM IDENTIFICATION REPORT

APPENDIX A3 - CORRECTIVE MEASURES REPORT

[Page Intentionally Left Blank]

Appendix A1

Inspector's Daily Report

CONTRACTOR:
ADDRESS:

TELEPHONE:
LOCATION _____ FROM _____ TO _____
WEATHER _____ TEMP _____ A.M. _____ P.M. _____ DATE _____

CONTRACTOR'S WORK FORCE AND EQUIPMENT											
DESCRIPTION	*H*	*#*	*DESCRIPTION*	*H*	*#*	*DESCRIPTION*	*H*	*#*	*DESCRIPTION*	*H*	*#*
Field Engineer						Equipment			Front Loader Ton		
Superintendent			Ironworker			Generators			Bulldozer		
						Welding Equip.					
Laborer Foreman			Carpenter								
Laborer									Backhoe		
Operating Engineer			Concrete Finisher								
Carpenter						Paving Equip. & Roller					
						Air compressor					

SEE REVERSE SIDE FOR SKETCH YES ☐ NO ☐ _____

WORK PERFORMED: _____

PAY ITEMS

CONTRACT		STA		DESCRIPTION	QUANTITY	REMARKS
Number	ITEM	FROM	TO			

TEST PERFORMED: _____
PICTURES TAKEN: _____

VISITORS: _____

QA PERSONNEL
SIGNATURE _____

REPORT NUMBER _____
SHEET _____ Of _____

[Page Intentionally Left Blank]

PROBLEM IDENTIFICATION REPORT

Date _____

Day | Su | M | T | W | Th | F | Sa |

Project _____ Job Number _____

Contractor _____

Subject _____

Sky/Precip.	Clear	Partly Cloudy	Cloudy	Rainy	Snow
TEMP.	<32F	32-40F	40-70F	70-80F	80-90F
WIND	No	Light	Strong		
HUMIDITY	Dry	Mod.	Humid		

PROBLEM DESCRIPTION Reference Daily Report Number 1: _____

PROBLEM LOCATION - REFERENCE TEST RESULTS AND LOCATION (Note: Use sketches on back of form as appropriate):

PROBABLE CAUSES: _____

SUGGESTED CORRECTIVE MEASURES: _____

APPROVALS:

QA ENGINEER: _____

PROJECT MANAGER: _____

Distribution:
1. Project Manager
2. Field Office
3. File
4. Owner

QA Personnel
Signature: _____

MEETINGS HELD AND RESULTS

REMARKS

REFERENCES TO OTHER FORMS

SKETCHES

SAMPLE LOG

SAMPLE NUMBER

APPROXIMATE LOCATION OF STOCKPILE

NUMBER OF STOCKPILE

DATE OF COLLECTION

CLIMATIC CONDITIONS

FIELD OBSERVATION

SHEETS OF

CORRECTIVE MEASURES REPORT

Date _____

Project _____ Job Number _____

Day | Su | M | T | W | Th | F | Sa |

Contractor _____

Subject _____

Sky/Precip.	Clear	Partly Cloudy	Cloudy	Rainy	Snow
TEMP.	<32F	32-40F	40-70F	70-80F	80-90F
WIND	No	Light	Strong		
HUMIDITY	Dry	Mod.	Humid		

CORRECTIVE MEASURES TAKEN (Reference Problem Identification Report No.): _____

RETESTING LOCATION: _____

SUGGESTED METHOD OF MINIMIZING RE-OCCURRENCE: _____

SUGGESTED CORRECTIVE MEASURES: _____

APPROVALS:

QA ENGINEER: _____

PROJECT MANAGER: _____

Distribution:

1. Project Manager
2. Field Office
3. File
4. Owner

QA Personnel
Signature: _____

Attachment C

Site Inspection Forms

SITE INSPECTION FORM

Nyack Former Manufactured Gas Plant Site

SITE INSPECTION DATE: _____ **TIME OF ARRIVAL**: _____

DEPARTURE: _____

WEATHER: _____

_____

Orange and Rockland Representative(s): _____

INSPECTION TYPE: **Annual Inspection or Emergency Inspection**

(if emergency indicate event that required an inspection): _____

Are the Institutional Controls in place, performing properly, and remain effective?

Site Signage in Place? Yes / No

Does the Site comply with NYSDEC-approved Site Management Plan? Yes / No

Has ownership of the property changed since the last inspection? Yes / No

(Verify with Real Estate and Survey Departments)

Are there any changes to intended site use (restricted Residential, Commercial Yes / No

Or Industrial which would affect the SMP or institutional controls?

Is site used for agricultural purpose or vegetable gardens? Yes / No

Is groundwater used as source of potable or process water onsite Yes / No

If yes to the above – does water go through the necessary water quality treatment? Yes/No

SITE INSPECTION FORM
Nyack Former Manufactured Gas Plant Site

Is solidified material visible? Yes / No

Is there any evidence of the damage to solidified soil from frost and wave Yes / No
Erosion?

Are the Engineering Controls in place, performing properly, and remain effective?

Surface Cover Intact (i.e. no evidence of erosion, excavations)? Yes / No

GENERAL SITE OBSERVATIONS:

Have there been any changes to the property since the last inspection?
(i.e. new equipment, residential buildings or facilities, changes in site topography, erosion, etc.)

NOTE:

Inspections should be made a minimum once a year and within 5 days of an emergency, such as a natural disaster or an unforeseen failure or damage to the building occurs. Inspections will be conducted by Orange and Rockland (or their agent) and results reported to NYSDEC.

COMPLETED BY:	**REVIEWED BY:**
SIGNATURE:	**SIGNATURE**