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ENVIRONMENT

Mr. Randy Whitcher
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 625 Broadway, 11th Floor
Albany, New York 12233-7014

Subject:
NAPL Recovery Well Construction Study Work Plan
Orange and Rockland Utilities, Inc.
Port Jervis Former MGP Site
City of Port Jervis, Orange County, New York
Site No. 3-36-049

Date:
February 8, 2013

Contact:
Margaret Carrillo-Sheridan
Phone:
315.671.9371

Email:
m.carrillo-sheridan@arcadis-us.com

Our ref:
B0043021

Dear Mr. Whitcher:

This letter summarizes the planned scope of the non-aqueous phase liquids (NAPL) recovery well construction study activities to be performed at the Port Jervis former manufactured gas plant (MGP) site by ARCADIS (on behalf of Orange and Rockland Utilities, Inc. [O&R]). The NAPL recovery well construction study will be implemented consistent with the *Pre-Design Investigation (PDI) Letter Report* (ARCADIS, June 29, 2012) as approved by NYSDEC on July 11, 2012 and will involve the installation of four pilot NAPL recovery wells as part of the off-site NAPL recovery program for the Port Jervis MGP site. During the course of the Remedial and Pre-Design Investigation activities performed at the site, there has been limited success in capturing NAPL via collection wells, despite visual indications of NAPL in the soil borings. O&R proposes to evaluate two different drilling and two different well construction methods to attempt to optimize NAPL recovery. The four wells will be installed to evaluate the effectiveness of:

- Recovery well design;
- Installation method; and
- Collecting site-related light NAPL (LNAPL) and dense NAPL (DNAPL).

This letter provides a description of the proposed NAPL recovery well construction, installation, and monitoring activities.

NAPL Recovery Well Installation

The NAPL recovery well installation activities will be conducted in accordance with the applicable standard operating procedures (SOPs) for field activities, soil investigation,

and groundwater/NAPL assessment included in the NYSDEC-approved *Remedial Design Work Plan* (ARCADIS, January 2010).

In general, the recovery well installation activities will consist of the following:

- Completing a total of 4 soil borings to a depth of approximately 50 feet below ground surface (bgs), 2 soil borings in the area of MW-8R (proposed as RW-1 and RW-2), and 2 soil borings in the area of MW-26 (proposed as RW-3 and RW-4) as shown on Figure 1. Both of these locations are in areas suspected to be heavily impacted with NAPL. Two separate methods of soil boring installation will be used to evaluate whether or not the drilling method affects the recovery rate of NAPL.

- Soil borings for RW-1 and RW-3 will be completed using a combination of hollow-stem auger (HSA) and fluid rotary drilling methods. HSA drilling methods will be used until refusal is encountered or the target depth of 50 feet is reached. If refusal is encountered prior to reaching the target depth of the boring, the drilling method will be switched over to fluid rotary. An attempt will be made to advance the borehole using only water as the fluid. However, if the water is not able to keep the borehole open or evacuating auger cuttings, then Revert® (or a similar additive) will be added to the water. Revert® is a natural polymer-based powder that, when added to water, makes a biodegradable (self-destroying) drilling fluid. The purpose of the fluid is to more easily convey soil cuttings from the bottom of the borehole to the ground surface. The fluid also stabilizes the borehole and prevents the borehole from collapsing.

- Soil borings for RW-2 and RW-4 will be completed using the spun casing drilling method.

- HSA borings for RW-1 and RW-3 will be completed using a minimum inside diameter auger of 8 ¼ inches. The auger and spun casing sizes will be selected to maximize the annular space surrounding the recovery well.

- During HSA and Spun Casing soil boring activities, soil samples will be collected at 5-foot intervals from the ground surface to the top of the water table. Continuous soil samples (i.e., every 2 feet) will be collected for visual observation from the water table to the final boring depth (i.e., 5 feet into the sand layer, assumed to be 50 feet below ground surface). Soil samples will be visually reviewed to:

    - Evaluate subsurface conditions

    - Characterize subsurface geology

    - Confirm the presence or absence of oil like material (OLM), and tar like material (TLM) at each boring location.

Because the goal of this program is to assess NAPL recovery, the borings need to be installed in areas with observed or suspect (based on odors/Photoionization Detector readings) OLM or TLM. If OLM or TLM is not observed in the soil boring, ARCADIS will review the results with O&R and NYSDEC to determine appropriate next steps.

- Following soil boring installation, NAPL recovery wells will be installed in the borings with observed OLM or TLM. Two separate NAPL recovery well designs are proposed. For both designs, the open pore space surrounding the recovery well screen will be maximized in an attempt to create enough driving force for NAPL to enter the well. To accomplish this objective, NAPL recovery wells will be constructed as follows:

  - Well Design 1: NAPL recovery wells RW-1 and RW-4 will be constructed of schedule 40, 2-inch diameter PVC equipped with a 0.020-inch slot screen and a 5-foot long sump. The well will be installed so that the top of the sump is approximately 1 foot below the top of the targeted "confining" sand unit. A rubber shale trap will be affixed to the well immediately below the screen. The annulus surrounding the sump will be filled with either neat cement or bentonite. Rounded river gravel (with diameter of 3 – 4 inches) will be used as the "sand pack" surrounding the screen to create large pore spacing adjacent to the well screen. A detail of Well Design 1 is included as Figure 2.

  - Well Design 2: NAPL recovery wells RW-2 and RW-3 will use a dual well casing design. Upon completion of the boring a 6-inch diameter PVC well will be installed. The well will be equipped with a 5-foot sump grouted (neat cement) or bentonited in place. Similar to Well Design 1, the well will be installed so that the top of the sump is approximately 1 foot below the top of the targeted "confining" sand unit. The well will be constructed with 0.050 to 0.100-inch slot screens targeting only NAPL bearing zones. The identification of potential NAPL bearing zones will be determined using historic site data as well as visual indications of OLM/TLM in the soil samples and PID readings. Native soils surrounding the 6-inch well casing would be allowed to collapse as the drilling tools are withdrawn from the borehole. Prior to removing the drill string a 2-inch diameter PVC well will be placed inside the 6-inch outer casing. The 2-inch well will be constructed with a 0.020-inch slot well screen spanning the entire saturated length of the boring. Two-inch diameter PVC riser pipe will complete the well to the ground surface. The bottom of the 2-inch well will be equipped with a threaded cap and will contain no sump. The 2-inch well will be held in-place inside the 6-inch casing using well centralizers. An open annulus will exist between the 6-inch well and the 2-inch well. A detail of Well Design 2 is included as Figure 3.

- Following installation, all wells will be developed by pumping. The wells will be pumped using a 2-inch diameter submersible pump, or a Hydro-Vac® truck. Note,

if NAPL enters the well after installation and before development, ARCADIS will discuss with O&R and NYSDEC considerations for not developing the wells further.

Because the well designs include larger screen slot size, without sand packs for filtration, the potential exists that sediments will enter the wells. During development, sediments will be removed (if needed) via the pumping methods described above, or via air lifting. However, additional sediments may enter the NAPL recovery wells requiring future redevelopment. This will be assessed during the post-installation monitoring of the recovery wells.

Each recovery well will be equipped with a pressure fit cap and completed at grade with a flush-mounted cover set in concrete.

Recovery Well Monitoring

Weekly gauging of the newly installed recovery wells will be conducted over a 3-month period to evaluate LNAPL and DNAPL presence/absence. If recoverable NAPL accumulation is observed during this process, the NAPL will be manual removed by bailing and the volume removed will be documented in a field notebook. The recovered NAPL will be placed in Department of Transportation- (DOT-) approved steel 55-gallon drums and stored at the O&R Service Center Site for off-site disposal.

Summary Letter Report

Upon completion of the well construction study, a NAPL Recovery Well Construction Study Summary Report will be prepared, summarizing the activities and associated results. The letter report will include a recovery well design specification, along with a tabulated summary of the quantities of NAPL recovered (if any) and a figure showing the locations of wells containing NAPL. The letter report will also provide conclusions regarding the performance of the recovery wells and recommendation for recovery well installation and completion for full-scale implementation.

Community Air Monitoring

Community air monitoring will be performed on a daily basis during the drilling activities to provide real-time measurements of total VOCs and particulate matter less than 10 microns in diameter (PM_{10}) at the downwind perimeter of the work area. The community air monitoring procedures and action levels for total VOCs and PM_{10} were specified in the NYSDEC-approved *Community Air Monitoring Plan* (CAMP), which was included as Appendix E of the January 2010 *Remedial Design Work Plan*. Community air monitoring stations (one upwind and one downwind location) will be established at the start of each work day based on the predominant wind direction and general location of work activities at that site. Each monitoring station will include a PID and dust meter with data logging capabilities.

Schedule

O&R would like to initiate the activities described herein during the week of February 18, 2013. Well installation activities are expected to last approximately 3.5 weeks.

Please contact Maribeth McCormick at 845.783.5534 with any questions or comments regarding the information provided herein. O&R will not initiate any of these proposed activities until NYSDEC approval is received.

Sincerely,

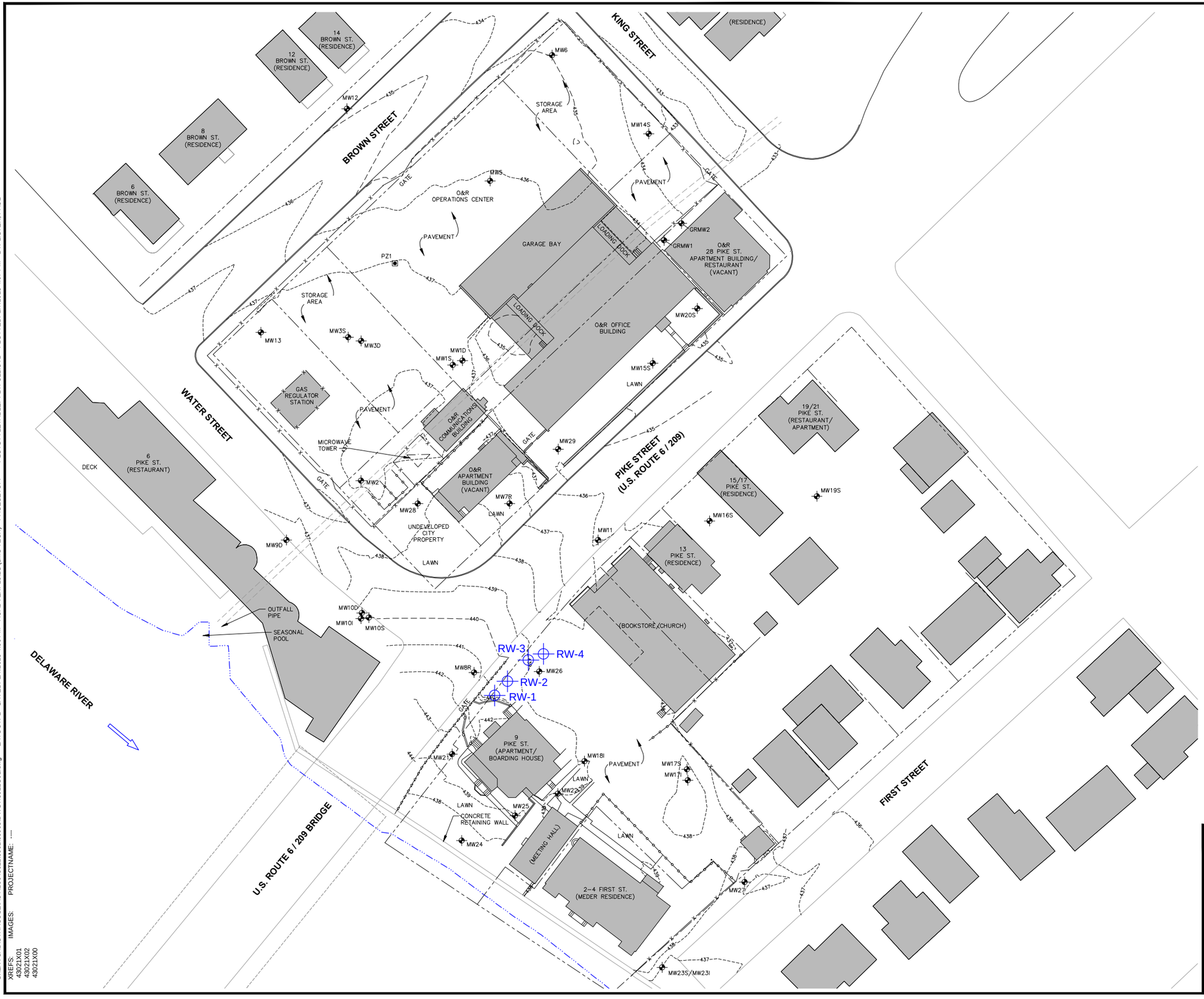
ARCADIS of New York, Inc.

Margaret Carrillo-Sheridan, P.E.
Vice-President

Enclosures:
Figure 1, Proposed NAPL Recovery Well Locations
Figure 2, Well Design 1 – River Gravel Pack
Figure 2, Well Design 2 – Dual Well Casing

Copies:
James Candiloro, NYSDEC*
Scott Deyette, NYSDEC*
Kristin Kulow, NYSDOH*
Maribeth McCormick, O&R
Dave Work, P.E., O&R
Megan Miller, P.E., ARCADIS
Dave Cornell, P.G., ARCADIS

**electronic copy only*



LEGEND:

- PROPERTY LINE
- EDGE OF WATER (APPROXIMATE)
- 436 GROUND SURFACE CONTOUR (1–FOOT INTERVAL)
- EXISTING STRUCTURE/BUILDING
- EXISTING CHAIN–LINK FENCE
- EXISTING WOOD FENCE
- EXISTING WIRE FENCE
- EXISTING GUARDRAIL
- 60–INCH–DIAMETER STORM SEWER LINE (APPROXIMATE)
- MW14S MONITORING WELL LOCATION
- PZ1 PIEZOMETER LOCATION
- RW-4 PROPOSED NAPL RECOVERY WELL

NOTES:

1. BASE MAP MODIFIED FROM DRAWINGS PORT_JERVIS_08.DWG AND FIG2-1_GW3-08.DWG PROVIDED BY AECOM AND BASED ON ELECTRONIC COPY OF SURVEY DRAWING NO. 100204, TITLED "SURVEY OF PROPERTY", DATED 03–25–10, PROVIDED BY BORBAS SURVEYING AND MAPPING, LLC.
2. HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 83); NEW YORK STATE PLANE EAST COORDINATE SYSTEM, IN U.S. SURVEY FEET. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. ALL WELL LOCATIONS AND SITE FEATURES ARE APPROXIMATE.

0 30' 60'
GRAPHIC SCALE

PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC.
PORT JERVIS, NEW YORK

NAPL RECOVERY WELL CONSTRUCTION STUDY

PROPOSED NAPL RECOVERY WELL LOCATIONS

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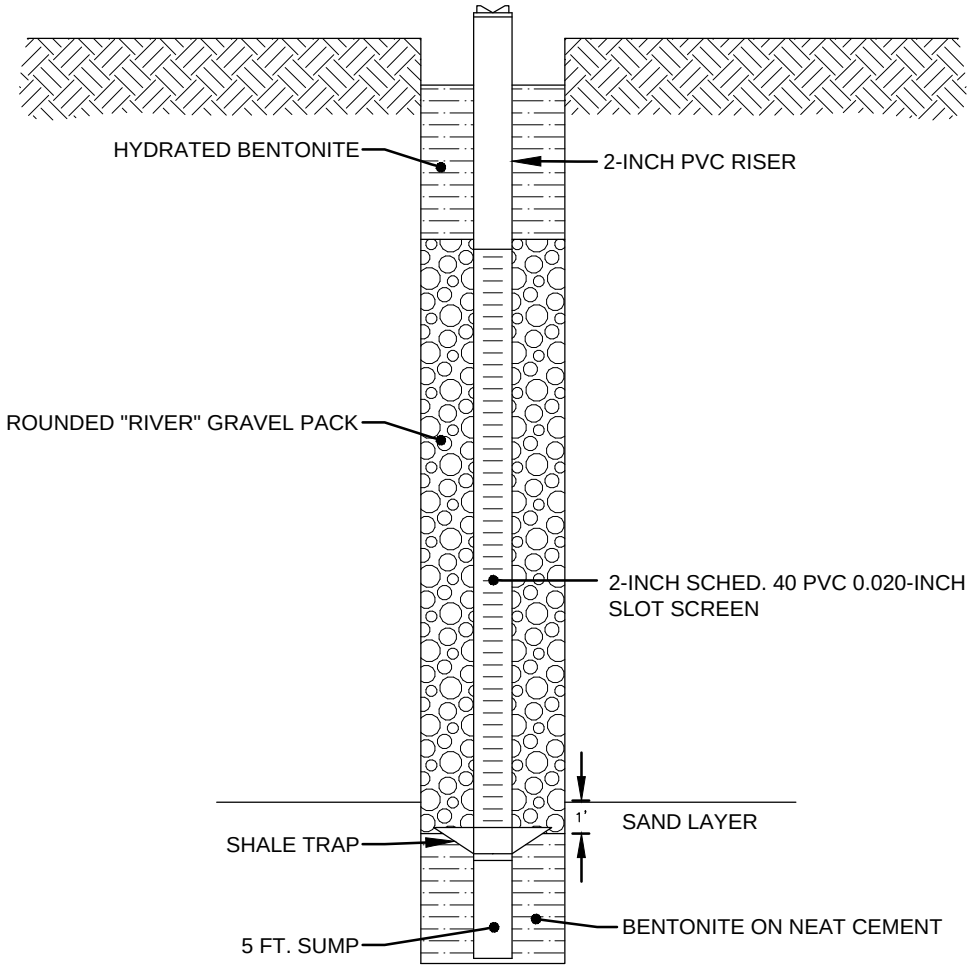
FIGURE 1

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: G. STOWELL, K. DAVIS, P. LISTER PM: J. BRIEN TM: M. BENOIT TR: M. MILLER LYR: ON=*;OFF=*REF*;|X01 HISTORICAL*
G:\ENVCAD\SYRACUSE\ACTIVE\00430210\0001\00008\DWG\430210G01.dwg LAYOUT: 1 SAVED: 2/7/2013 4:06 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/7/2013 4:07 PM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ----
430210X01
430210X02
430210X00



NOTE: WELL NOT SHOWN WITH SURFACE COMPLETION.

NOT TO SCALE

PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC.
PORT JERVIS, NEW YORK
NAPL RECOVERY WELL CONSTRUCTION STUDY

WELL DESIGN 1 - RIVER GRAVEL PACK

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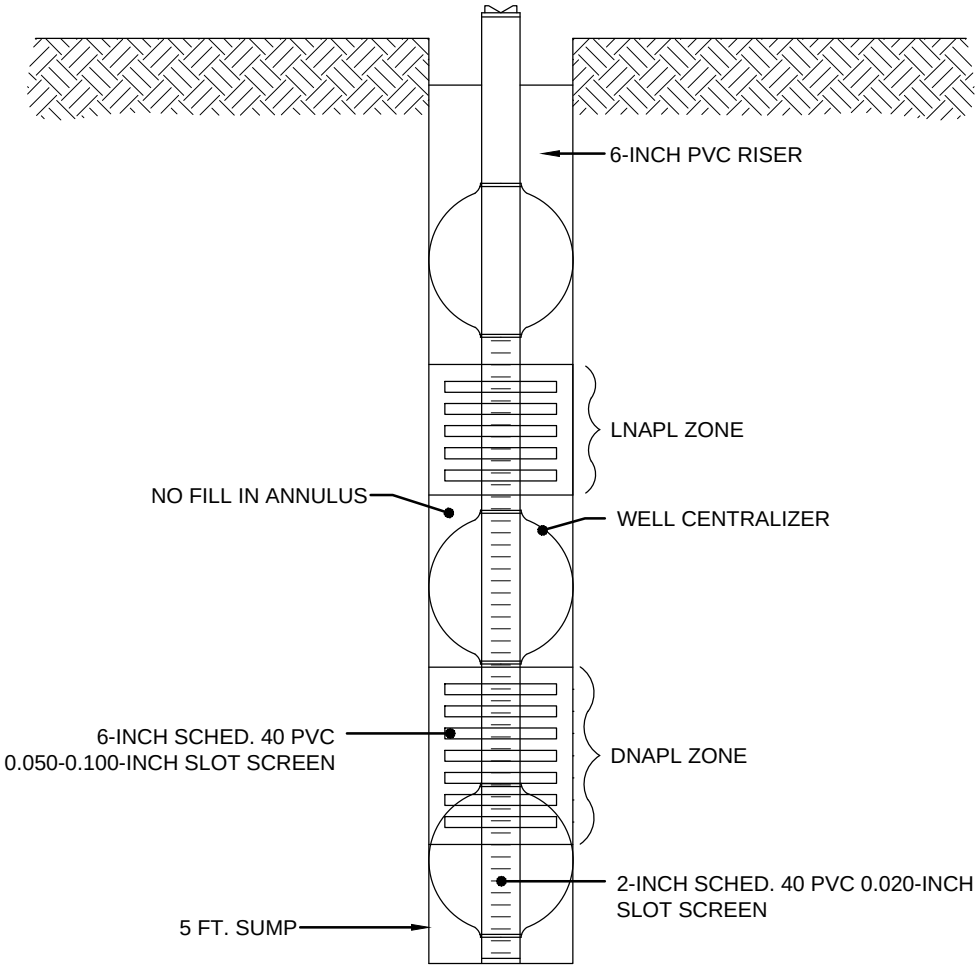
FIGURE
2



NOTE: WELL NOT SHOWN WITH SURFACE COMPLETION.

NOT TO SCALE

PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC.
PORT JERVIS, NEW YORK
NAPL RECOVERY WELL CONSTRUCTION STUDY

WELL DESIGN 2 - DUAL WELL CASING

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FIGURE
3