Notification Addendum to Excavation Work Plan and Air Sparge/Soil Vapor Extraction System Decommisioning Work Plan

229 Homer Street Site
Site No. C905044
Olean, New York

August 8, 2023

Prepared for:

Homer Street Properties, LLC
130 South Union Street, Suite 300
Olean, New York 14760

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218

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Appendices

1. Introduction

This document presents the proposed scope of work and implementation procedures for intrusive activities in accordance with the New York State Department of Environmental Conservation (NYSDEC or Department) December 2018 Site Management Plan (SMP) for the 229 Homer Street Brownfield Cleanup Program (BCP) Site No. C905044 (Ref. 1) in Olean, Cattaraugus County, New York (see Figure 1).

This Notification Addendum to Excavation Work Plan (EWP) is being submitted in accordance with the Department-approved SMP and includes details regarding decommissioning of the air sparge/soil vapor extraction (AS/SVE) system. Appendix A includes the EWP prepared by Benchmark Civil/Environmental Engineering & Geology PLLC in association with TurnKey Environmental Restoration LLC (Benchmark-TurnKey) and submitted as Appendix B to the 2018 SMP (Ref. 2). The 60-Day Advance Notification of Site Change of Use form was submitted concurrently to NYSDEC with this Work Plan.

1.1 Background

Benson Construction and Development, LLC entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC in October 2015 to investigate and remediate the approximate 3.34-acre property comprised of one tax parcel identified as 229 Homer Street (SBL#94.032-1-2.5) in the City of Olean, Cattaraugus County, New York and referred to as the 229 Homer Street Site (see Figure 1). The BCA was amended in October 2017 to add Homer Street Properties, LLC as an additional Applicant (Volunteer) to the existing BCA. In December 2018, the BCA was amended to transfer property ownership of the Site from Benson Construction and Development, LLC to Homer Street Properties, LLC.

As part of the remedial activities at the Site, an AS/SVE system was installed and operated through January 13, 2022, when it was turned off for the winter.

On May 2, 2022, Benchmark-TurnKey submitted a letter request to NYSDEC on behalf of Homer Street Properties, LLC with verification soil/fill sampling data for consideration of termination of the SVE system operation since volatile organic compound (VOC) removal had leveled off as evidenced by the data submitted in the 2020/2021 Periodic Review Report (PRR). The Department replied on May 5, 2022, stating that system shutdown was approved but the AS/SVE system must remain on-site and intact. To assess if rebounding occurs, NYSDEC and NYSDOH requested that the following activities be completed at least one year after discontinuing operation of the AS/SVE system.

- Collection of an additional round of photoionization detector (PID) readings at each of the SVE wells.
- Collection of VOC samples (TO-15) from SVE-7 and SVE-8 to evaluate potential rebound effects in proximity to the on-site building.

Benchmark-TurnKey recorded PID readings three times in 2022 (i.e., May 12, August 4, and November 10) and on February 22, 2023. Benchmark-TurnKey collected an air sample from wells SVE-7 and SVE-on February 21, 2023. The results of the additional monitoring requested by the NYSDEC were consistent with previous operational results and confirmed no rebounding in the vicinity of the building. Benchmark, on behalf of Homer Street Properties, requested full decommissioning and removal of the AS/SVE system on May 1, 2023, which was subsequently approved by the Department on June 15, 2023.

1.2 Purpose

The purpose of this Work Plan is to notify the Department of planned intrusive activities related to the decommissioning of the AS/SVE system that may result in exposure to remaining contamination on-site and how the decommissioning activities will be performed. This Work Plan has been prepared in accordance with the May 2010 NYSDEC DER-10 (Ref. 3), December 2018 SMP, and NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy (Ref. 4, Appendix B). Intrusive activities will comply with the EWP included with the SMP and Occupational Safety and Health Standards contained at 29CFR 1910.120.

1.3 Project Schedule

The following is a tentative project schedule:

- **August 2023:** Disconnect electrical components of the AS/SVE system. Disassemble piping and remove AS/SVE system trailer and contents from the Site. Collect waste characterization samples of biofilter media for proper off-site disposal.
- **August/September 2023:** Decommission AS/SVE wells. Place imported gravel to restore cover system.
- **November 2023:** Update SMP.
- **May 2024:** Include well decommissioning logs, disposal documentation, and summary of work in the PRR Report due May 28, 2024.

2. Introduction

2.1 General

The BCP property, located at 229 Homer Street (Tax ID No. 94.032-1-2.5), is situated in a commercial and industrial zoned area of the City of Olean, Cattaraugus County, New York and consists of one parcel measuring approximately 3.34 acres. The Site is currently improved with a 7,500-square foot, one-story building in the central portion of the Site. This Work Plan includes decommissioning of the AS/SVE system on-site (see Figures 2 and 3).

2.2 Site History

The 229 Homer Street Redevelopment Site and surrounding area were originally developed in approximately 1890 for the oil industry and used for refinery purposes and as a

petroleum storage tank farm. The site was historically occupied by a large tank, used for oil storage by Socony Vacuum and/or Felmont Oil, and two tank berm areas. The Site was identified as part of the Exxon/Mobil Legacy Site (EMLS) Works #3 area. EMLS operated as an oil refiner in the area under several different names from approximately 1880 to 1950s.

2.3 Summary of Remedial Actions

Previous environmental investigations identified the presence of petroleum odors, elevated PID measurements, abandoned piping, and LNAPL, as well as elevated VOC TICs indicating significant petroleum impacts. Remedial activities commenced in 2015 and were completed in 2018. The Site was remediated in accordance with the February 2018 RAWP (Ref. 5). A total of 5,814.47 tons of grossly contaminated soil (GCS) was excavated and disposed off-site at a permitted solid waste facility. A total of 8,233 tons of screened gravel and 191 tons of surge stone meeting the requirements of 6NYCRR Part 375-6.7(d) was imported for use as backfill for the excavations. A cover system was required to allow for commercial use of the Site, preventing human exposure to remaining contamination. The cover system consists of a minimum of 12 inches of clean gravel, an existing building pad, and concrete pads. The Environmental Easement for the Site was executed by the Department on August 7, 2017, and filed with the Cattaraugus County Clerk on October 19, 2017, to restrict land use to commercial/industrial operations and prevent future exposure to any contamination remaining on-site.

2.3.1 Remaining Contamination

The Site was remediated to remove abandoned subsurface piping and contents, and certain heavily contaminated GCS-impacted soils. The completed Track 4 commercial cleanup is consistent with the intended commercial/industrial use of the Site. Residual contamination remaining at the Site above unrestricted soil cleanup objectives (USCOs) is present beneath the cover system (i.e., minimum 1 fbgs) to the groundwater interface. Based on the planned decommissioning of the AS/SVE system, decommissioning activities may encounter remaining residual contamination beneath the cover system. The approved SMP will be followed during these intrusive decommissioning activities.

3. Planned Activities

The on-site AS/SVE system trailers will be removed and the 53 AS wells and 14 SVE wells will be decommissioned. Appendix C includes AS/SVE well construction logs that are representative of typical well construction; construction logs for each well are not included. Well decommissioning will be conducted in accordance with NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy and TurnKey Environmental Restoration LLC's (TurnKey's) Field Operating Procedure (FOP) 002.0, Abandonment of Monitoring Wells Procedure (Ref 6, Appendix D). Roux Environmental Engineering and Geology D.P.C. (Roux) will perform the work and provide construction oversight and monitoring.

3.1 Site Preparation

3.1.1 Utility Clearance

Dig Safely New York (Call 811) will be contacted at least 3 days prior to the work to mark locations of on-site utilities.

3.2 Decommissioning Activities

In accordance with CP-43 and FOP 002.0, 53 AS wells and 14 SVE wells will be decommissioned. At each well, the concrete road box will be removed, the well casing will be cut to one foot below grade, and the wells will be tremie grouted in-place. At each well location, the horizontal piping to the trailer will be cut and removed but remaining horizontal piping will be left in place below the cover system. At the trailers, the AS/SVE headers will be cut approximately one foot below grade. Following the removal of road boxes and where the AS/SVE header was cut, Roux will fill the voids with NYSDEC-approved clean imported fill and seed the areas to restore the vegetated cover system. Roux will disassemble the AS/SVE systems and remove them from the Site.

3.3 Waste Characterization

The biofilter media (wood chips/compost filter) will be analyzed for target compound list (TCL) VOCs. A waste profile application will be completed and submitted to an approved landfill facility for proper off-site removal and disposal.

3.4 Backfill Materials

3.4.1 On-Site Reuse

"Reuse on-site" means reuse on-site of material that originates at the Site and does not leave the Site during excavation. The criteria under which soil/fill originating on-site may be reused on-site are presented below.

Excavated, On-Site Soil/Fill: Any soil that does not exhibit visual, olfactory, or other obvious signs of contamination may be reused on-site below the cover system.

The project should not generate soil; however, should minor soil be generated, it will be placed in the void below the demarcation layer and 1 foot of cover soil.

3.4.2 Imported Backfill

All materials proposed for import onto the Site will be approved by a qualified environmental professional and will follow the provisions of the SMP prior to receipt at the Site. Appendix E includes an approval letter from May 2, 2023, for the importation of 3-inch crushed stone from Portville-Obi Stone, LLC to the Site. Roux plans to use the same material for imported backfill as part of this work plan.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site, unless tested in accordance with DER-10 and approved by the NYSDEC.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet 'exempt' fill requirements under 6NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be secured with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

3.5 Site Restoration

The cover system will be restored by Roux to pre-construction conditions once the AS/SVE system is removed. Figure 4 provides current cover system details.

4. Work Plan Support Documents

A copy of this Work Plan will be located on-site during intrusive activities.

4.1 Health and Safety Protocols

The Health and Safety Plan (HASP), Appendix H of the SMP, will be followed by Roux personnel and includes the following site-specific information:

- Hazard assessment and risk analysis.
- Training requirements.
- Definition of exclusion, decontamination, and other work zones.
- Monitoring procedures for site operations.
- Safety procedures.
- Personal protective clothing and equipment requirements for various field operations.
- Disposal and decontamination procedures.
- Emergency response and contingency planning.

4.2 Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) was prepared as part of the approved SMP for the Site. The CAMP describes the required particulate and vapor monitoring to protect the neighboring community and environment during intrusive activities (see Appendix H-2 of the HASP). Roux will perform the required monitoring during intrusive activities.

5. Reporting

During and upon completion of the decommissioning activities, Roux will prepare the following reports.

5.1 Decommissioning Monitoring and Reporting

Standard daily reporting procedures will include preparation of a daily report and, when appropriate, problem identification and corrective measures reports. Information that may be included on the daily report includes:

- Processes and locations of decommissioning tasks completed, including well decommissioning logs.
- Equipment and personnel working in the area, including subcontractors.
- A description of waste materials removed from the Site.
- A description of off-site materials imported to the Site.

A description of the work, off-site disposal receipts, and well decommissioning logs will be included as part of the PRR due May 28, 2024. The NYSDEC will be promptly notified of problems requiring modifications to this Work Plan prior to proceeding or completing the construction item. Photo documentation of the intrusive activities will be prepared by Roux throughout the duration of the project as necessary to convey typical work activities and whenever changed conditions or special circumstances arise.

5.2 SMP Update

A summary of decommissioning details will be incorporated into the SMP upon completion. The SMP update will include:

- A summary of the AS/SVE decommissioning and cover system restoration.
- Documentation showing at least one foot of clean soil cover in non-hardscaped areas.

6. References

TurnKey Environmental Restoration, LLC. *Site Management Plan, 229 Homer Street Redevelopment Site (C905044), City of Olean, Cattaraugus County, New York.* August 2015.

TurnKey Environmental Restoration, LLC in association with Benchmark Environmental Engineering & Science, PLLC. *SMP Appendix B: Excavation Work Plan, 229 Homer Street Redevelopment Site (C905044), City of Olean, Cattaraugus County, New York.* December 2018.

New York State Department of Environmental Conservation. *DER-10; Technical Guidance for Site Investigation and Remediation.* May 2010.

New York State Department of Environmental Conservation. *CP-43: Groundwater Monitoring Well Decommissioning Policy*. November 3, 2009.

TurnKey Environmental Restoration, LLC in association with Benchmark Environmental Engineering & Science, PLLC. *Remedial Action Work Plan (RAWP), 229 Homer Street Redevelopment Site (C905044), City of Olean, Cattaraugus County, New York.* Approved by the NYSDEC in March 2018.

TurnKey Environmental Restoration, LLC*. Field Operating Procedures (FOP) 002.0; Abandonment of Monitoring Wells Procedure*.

Respectfully submitted,

ROUX ENVIRONMENTAL ENGINEERING AND GEOLOGY, D.P.C.

Jessica Dombrowski
Project Scientist

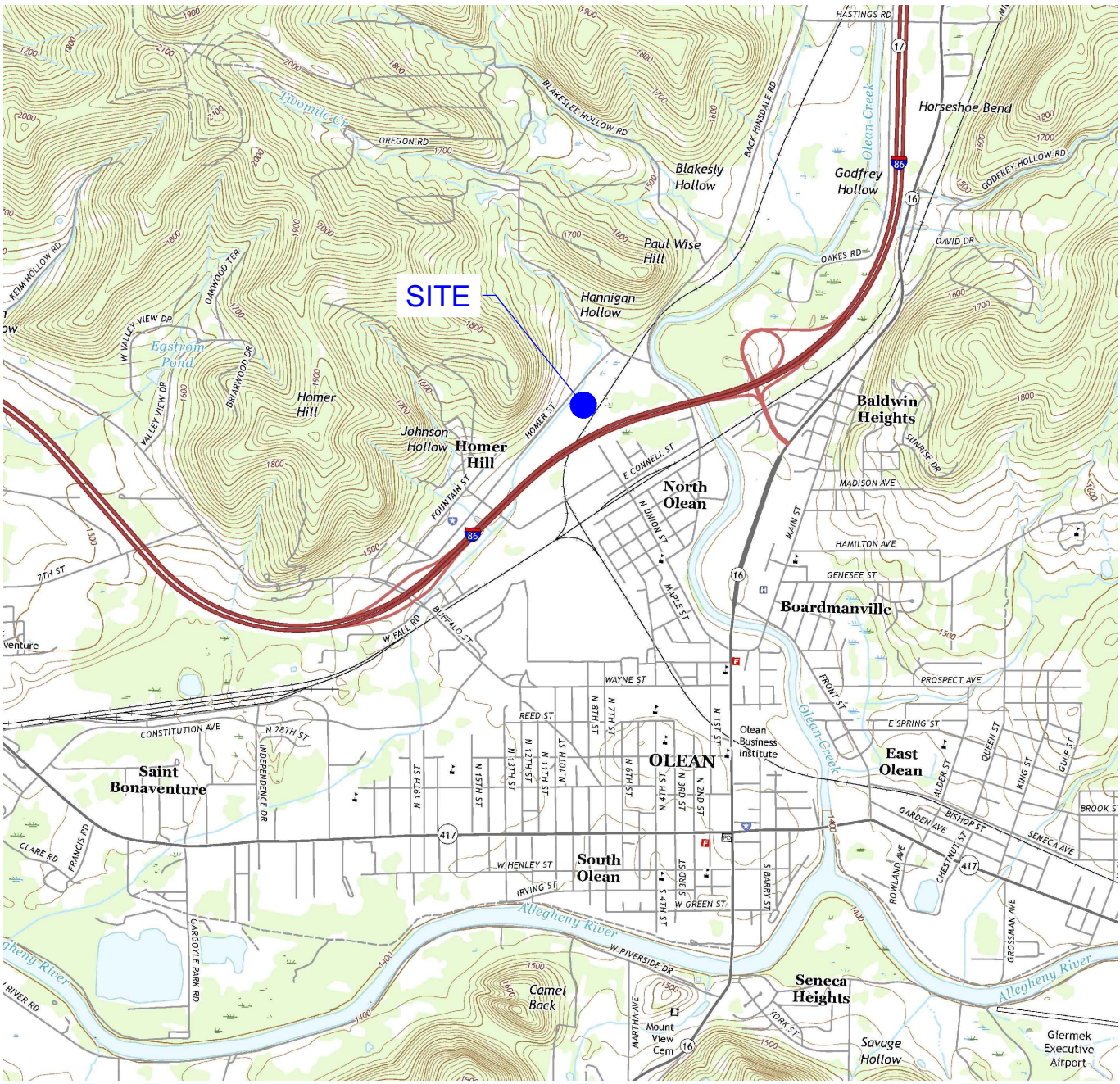
Lori E. Riker, P.E.
Principal Engineer

FIGURES

1. Site Location and Vicinity Map
2. Current AS/SVE System Layout
3. AS/SVE System Schematic and Well Details
4. Site Cover System

F:\CAD\TurnKey\Benson\229 Homer Street\16-SMP\Figure 1; Site Location and Vicinity Map.dwg, DWG To PDF.pc3

FIGURE 1



QUADRANGLE LOCATION

NOTES:
1. BASE MAP OLEAN, NEW YORK USGS QUADRANGLE, 2016.
2. APPROX. SCALE 1"=3,000 FEET.

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
IN ASSOCIATION WITH
TURNKEY ENVIRONMENTAL RESTORATION, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

PROJECT NO.: 0311-018-001

DATE: AUGUST 2018

DRAFTED BY: RFL

SITE LOCATION AND VICINITY MAP

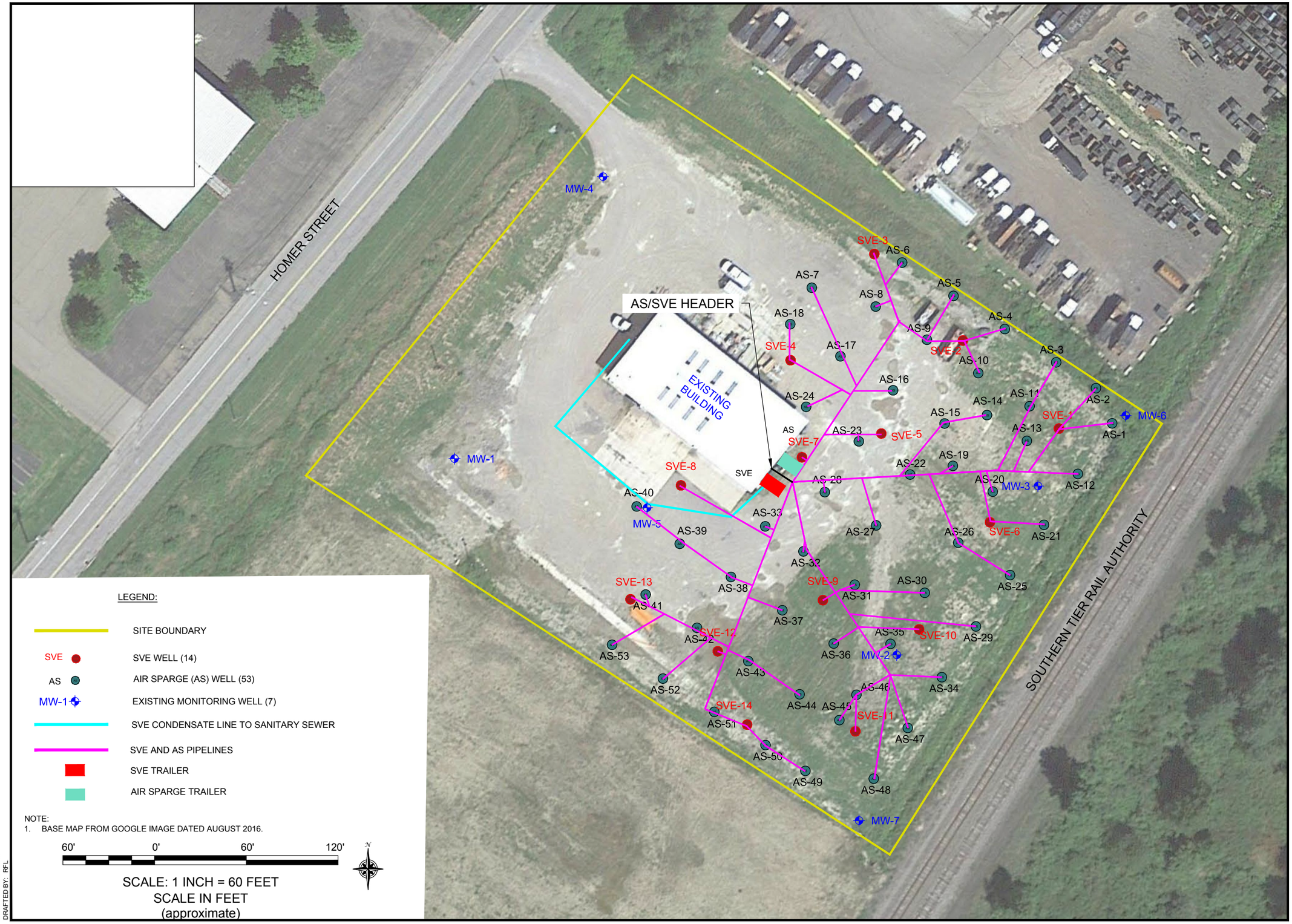
ADDENDUM TO EWP & DECOMMISSIONING WORK PLAN

229 HOMER STREET SITE
BCP SITE NO. C905044
OLEAN, NEW YORK

PREPARED FOR

HOMER STREET PROPERTIES, LLC

F:\CAD\TurnKey\Benson\229 Homer Street\16-SMP\Figure 7; SVE and AS Insitu Remediation Record.dwg, DWG to PDF.pc3



LEGEND:

- SITE BOUNDARY
- SVE — SVE WELL (14)
- AS — AIR SPARGE (AS) WELL (53)
- MW-1 — EXISTING MONITORING WELL (7)
- SVE CONDENSATE LINE TO SANITARY SEWER
- SVE AND AS PIPELINES
- SVE TRAILER
- AIR SPARGE TRAILER

NOTE:
1. BASE MAP FROM GOOGLE IMAGE DATED AUGUST 2016.

60' 0' 60' 120'

SCALE: 1 INCH = 60 FEET
SCALE IN FEET
(approximate)

DATE: AUGUST 2018
DRAFTED BY: RFL

AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM LAYOUT

ADDENDUM TO EWP & DECOMMISSIONING WORK PLAN

229 HOMER STREET SITE
BCP SITE NO. C905044
OLEAN, NEW YORK

PREPARED FOR
HOMER STREET PROPERTIES, LLC

JOB NO.: 0311-018-001

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
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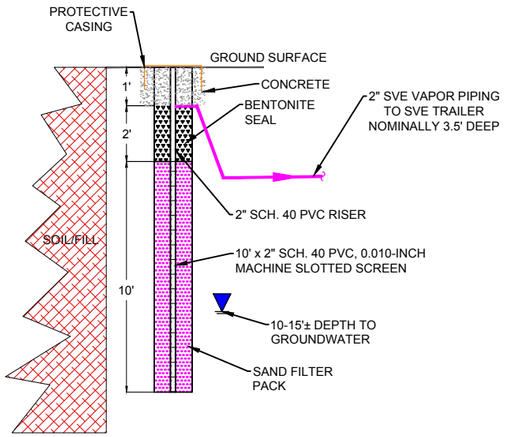
TURNKEY ENVIRONMENTAL RESTORATION LLC
2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

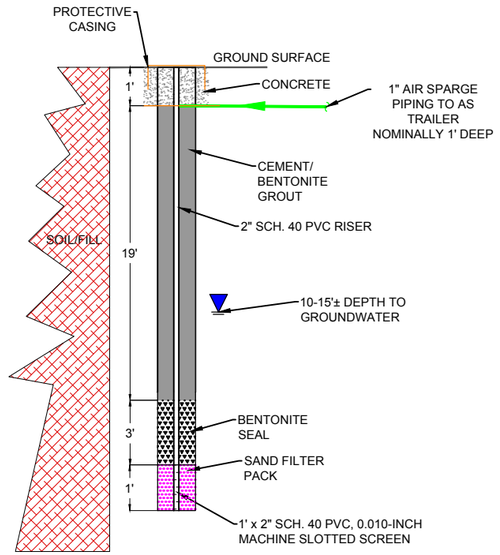
FIGURE 2

F:\CAD\TurnKey\Benson\229 Homer Street\16-SMP\Figure 8, SVE and AS Details.dwg, DWG To PDF.pc3

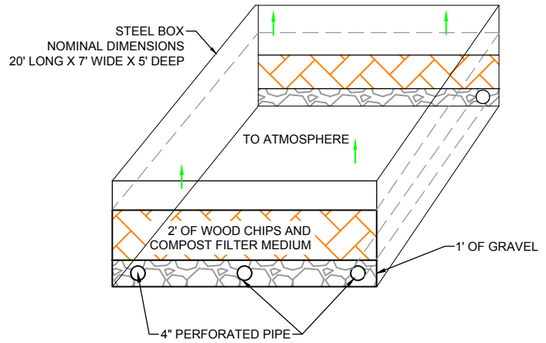
TYPICAL SVE WELL
DEPTH 13 FEET
NTS



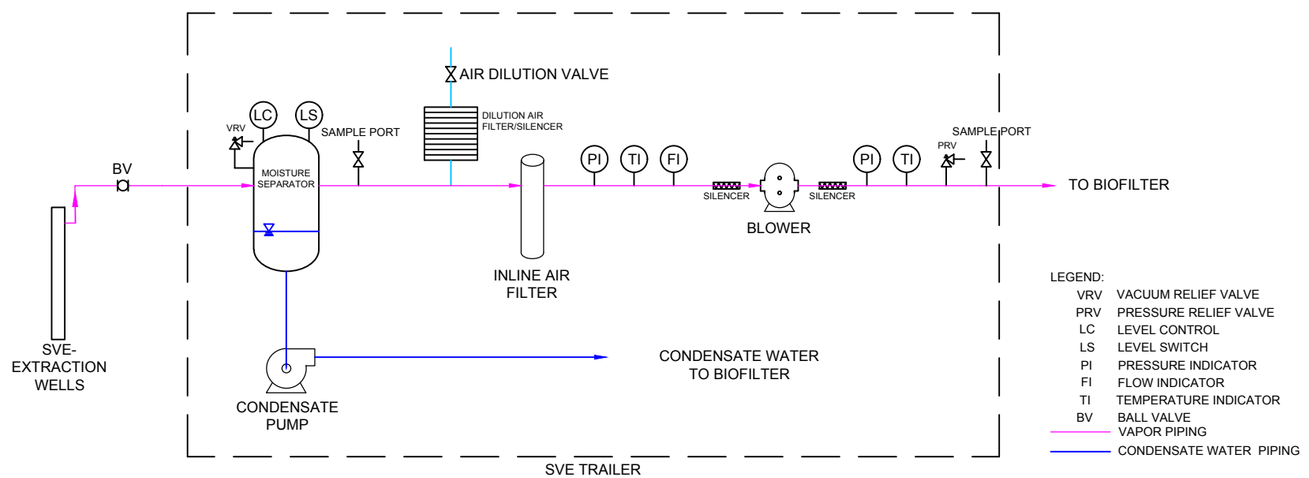
TYPICAL AIR SPARGE WELL
DEPTH 24 FEET
NTS



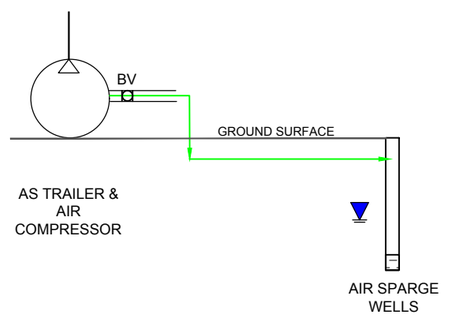
BIOFILTER DETAIL
NTS



SVE SYSTEM



AIR SPARGE SYSTEM



DATE: AUGUST 2018
DRAFTED BY: RFL

AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM SCHEMATIC AND WELL DETAILS

ADDENDUM TO EWP & DECOMMISSIONING WORK PLAN

229 HOMER STREET SITE
BCP SITE NO. C905044
OLEAN, NEW YORK

PREPARED FOR
HOMER STREET PROPERTIES, LLC

JOB NO.: 0311-018-001

IN ASSOCIATION WITH

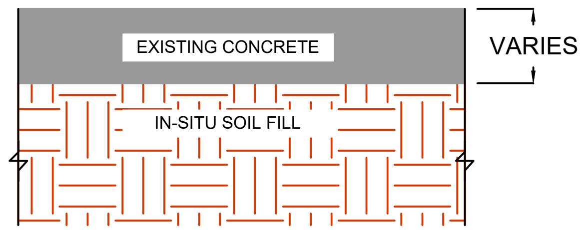
BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC
2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

FIGURE 3

F:\CAD\TurnKey\Benson\229 Homer Street\00-PRR\Figure 4; Site Cover System.dwg, 3/14/2023 2:23:53 PM

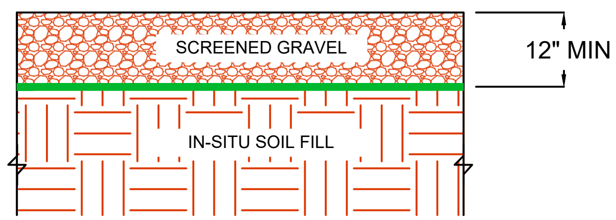
EXISTING CONCRETE COVER SYSTEM DETAIL

NTS



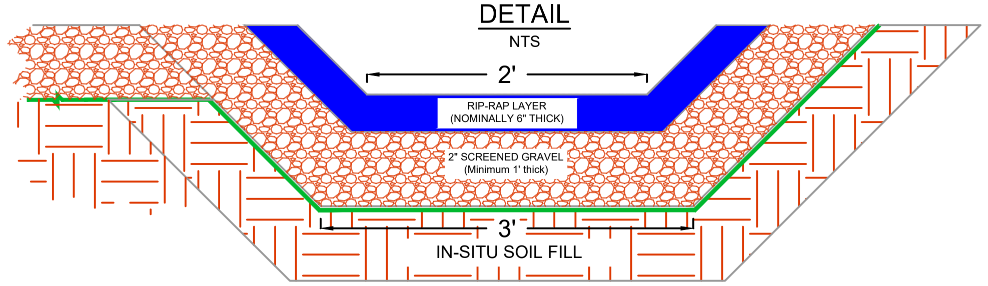
2" SCREENED GRAVEL COVER SYSTEM DETAIL

NTS



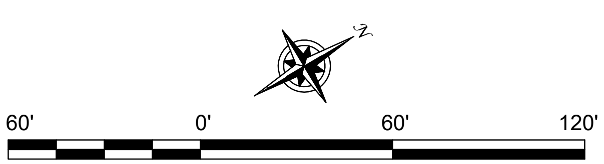
SWALE COVER SYSTEM DETAIL

NTS



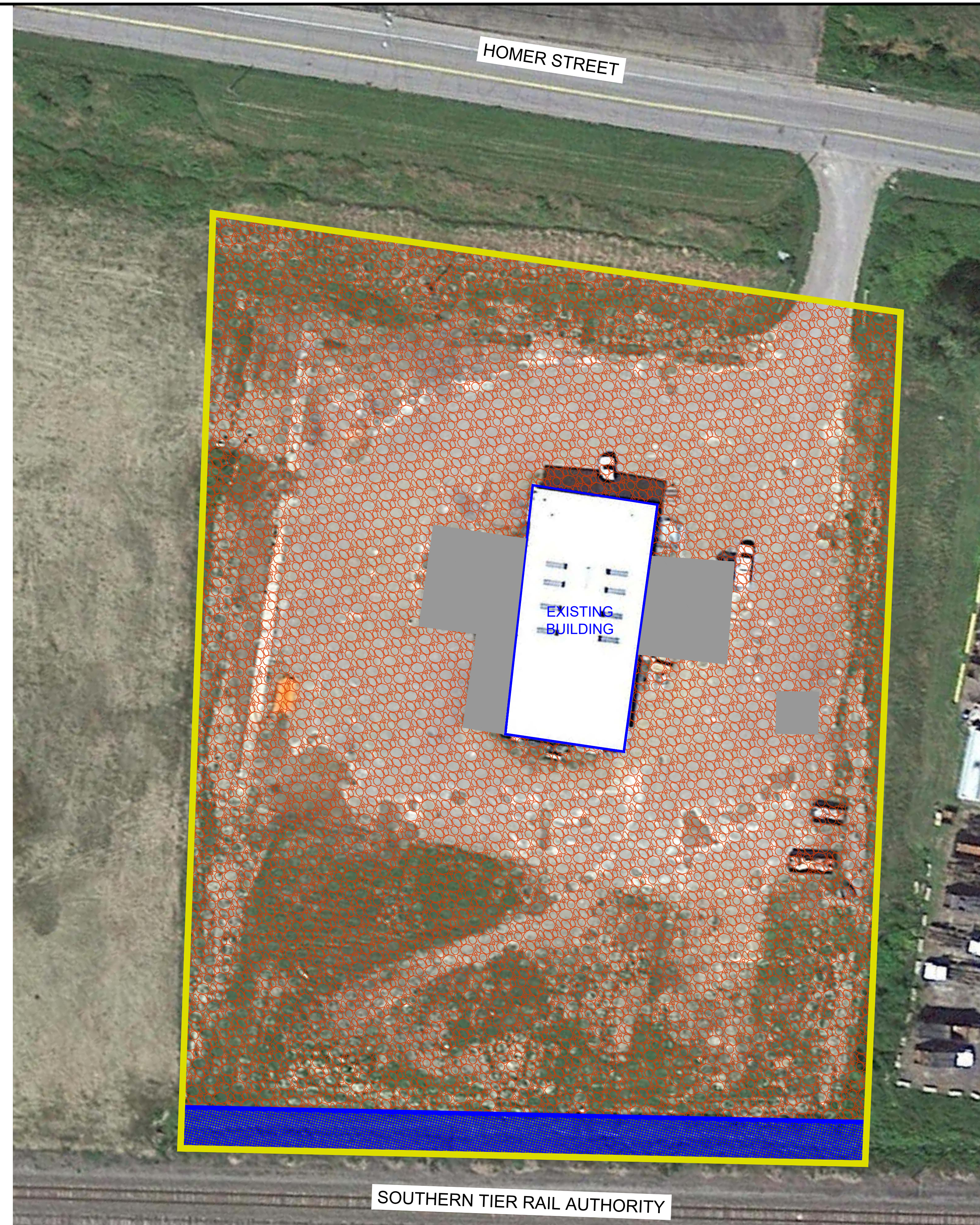
LEGEND:

- BCP AND PROPERTY BOUNDARY
- SWALE COVER SYSTEM
- CONCRETE COVER SYSTEM
- GRAVEL COVER SYSTEM
- DEMARCATION LAYER



SCALE: 1 INCH = 60 FEET
SCALE IN FEET
(approximate)

DATE: MARCH 2023
DRAFTED BY: RFL



BENCHMARK IN ASSOCIATION WITH TURNKEY ENVIRONMENTAL RESTORATION, LLC

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(716) 856-0599

JOB NO.: 0311-018-001

SITE COVER SYSTEM AND DETAILS

PERIODIC REVIEW REPORT
229 HOMER STREET SITE
BCP SITE NO. C905044
OLEAN, NEW YORK
PREPARED FOR
HOMER STREET PROPERTIES, LLC

FIGURE 4

APPENDICES

A. SMP Appendix B – Excavation Work Plan

B. NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy

C. AS/SVE Well Construction Logs

D. Field Operating Procedure (FOP) 002.0, Abandonment of Monitoring Wells Procedure

E. NYSDEC Import Request Approval Letter (May 2, 2023)

APPENDIX A

SMP Appendix B – Excavation Work Plan

BROWNFIELD CLEANUP PROGRAM
SITE MANAGEMENT PLAN

APPENDIX B
EXCAVATION WORK PLAN

229 HOMER STREET SITE
NYSDEC SITE NUMBER: C905044
CITY OF OLEAN, NEW YORK

December 2018 0311-018-001

Prepared for:

HOMER STREET PROPERTIES, LLC
221 Homer Street
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Prepared By:

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In Association With:

TurnKey Environmental Restoration, LLC
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SITE MANAGEMENT PLAN
APPENDIX B: EXCAVATION PLAN
229 HOMER STREET SITE

Table of Contents

B-1: NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. Table B1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table B1: Notifications*

NYSDEC Regional HW Engineer Chad Staniszewski, P.E.	716-851-7220 chad.staniszewski@dec.ny.gov
NYSDEC Project Manager Anthony Lopes	716-851-7220 Anthony.lopes@dec.ny.gov
NYSDEC Site Control Kelly Lewandowski, P.E.	518-402-9543 kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix H of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

B-2: SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Section B-7 of this Appendix.

B-3: SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

B-4: MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

The qualified environmental professional will be responsible for ensuring that all outbound trucks are free of loose debris before leaving the site until the activities performed under this section are complete. Any loose debris removed or wash waters (if any) will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

B-5: MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

B-6: MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

B-7: MATERIALS REUSE ON-SITE

"Reuse on-site" means reuse on-site of material that originates at the site and which does not leave the site during the excavation.

The criteria under which soil/fill originating on-site may be used on-site are presented below.

- Excavated, On-Site Soil/Fill: Any soil that does not exhibit visual, olfactory, or other obvious signs of contamination may be reused on-site below the site cover..

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any above-grade building demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site, unless approved by NYSDEC.

B-8: FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream, or river) will be performed under a SPDES permit.

B-9: COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Decision Document. The existing cover system is comprised of a minimum of 12 inches of clean soil, existing building floor slab and concrete pads. The demarcation layer, consisting of orange plastic mesh material, will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

B-10: BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of five business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site, unless tested in accordance with DER-10 and approved by the NYSDEC.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

B-11: STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor or silt socks shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing/silt socks damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt socks, silt fencing or hay bales will be installed strategically (e.g., downgradient) from the construction area.

B-12: EXCAVATION CONTINGENCY PLAN

If underground tanks, subgrade piping or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

If additional piping is encountered during future excavation work, pipe and contents will be removed and disposed of in a manner consistent with the previous subsurface piping remedial activities on-site; exposed subsurface piping will be traced, excavated, and disposed of. Any solid, semi-solid and liquid pipe contents, if present, will be containerized, characterized and disposed of off-site. If piping extends off-site, it will be cut and capped at the property boundary and the type, condition and contents of the piping, as well as condition of the surrounding soils, will be documented.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

APPENDIX 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).

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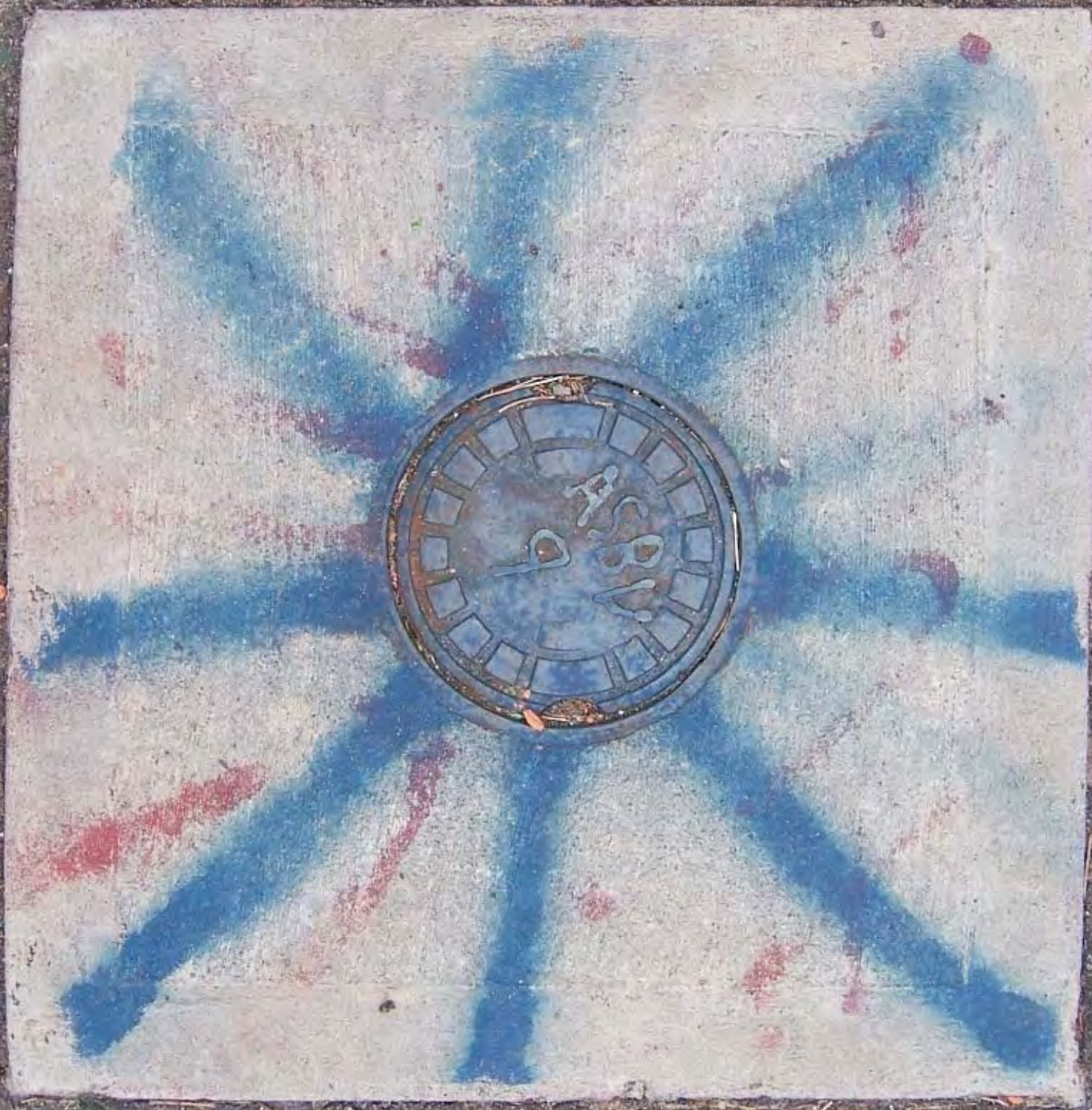
Final - August 2009

GROUNDWATER MONITORING WELL DECOMMISSIONING PROCEDURES



New York State Department of Environmental Conservation
Division of Environmental Remediation

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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

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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

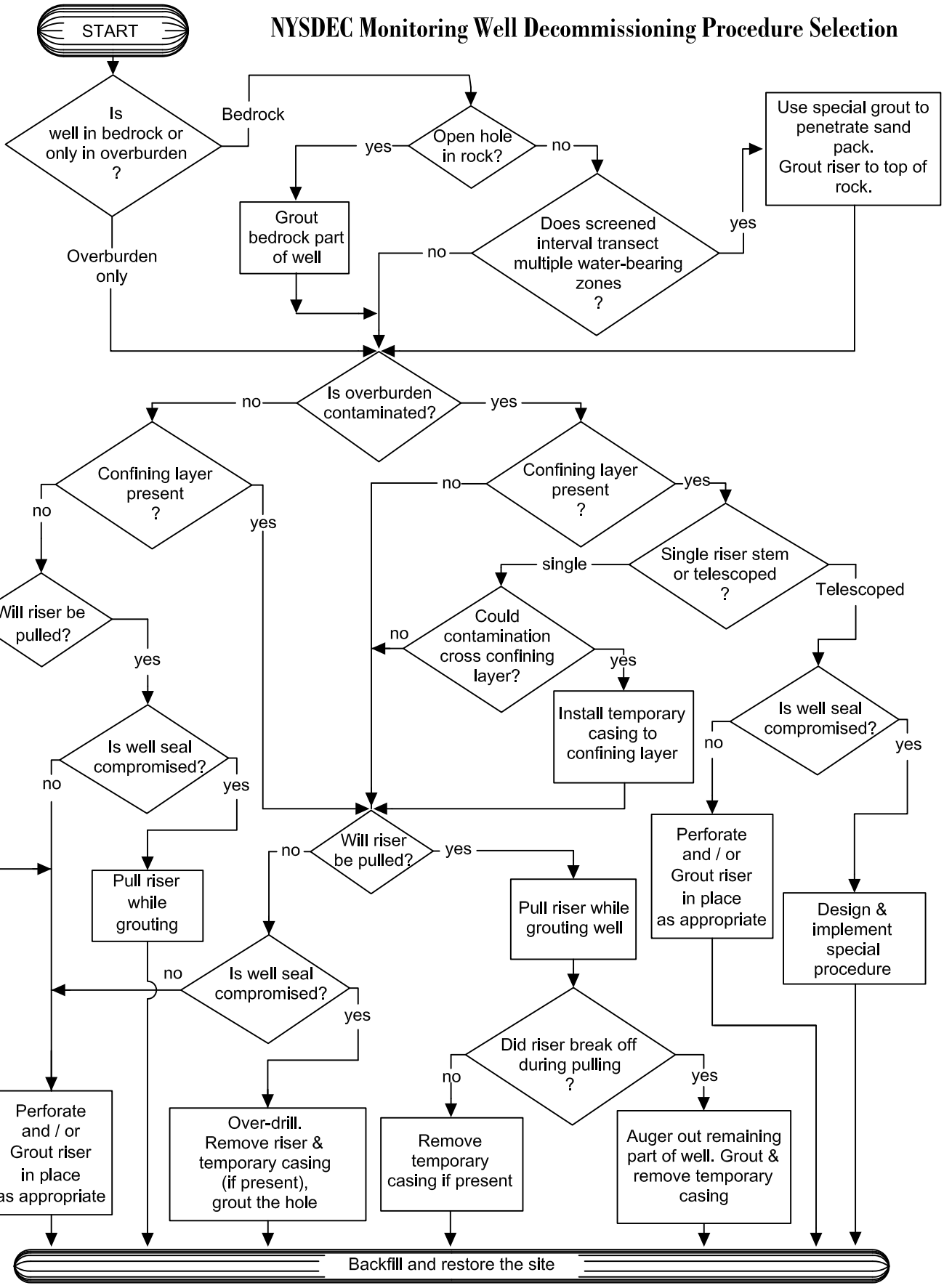


FIGURE 2

FIGURE 3

WELL DECOMMISSIONING RECORD

FIGURE 3

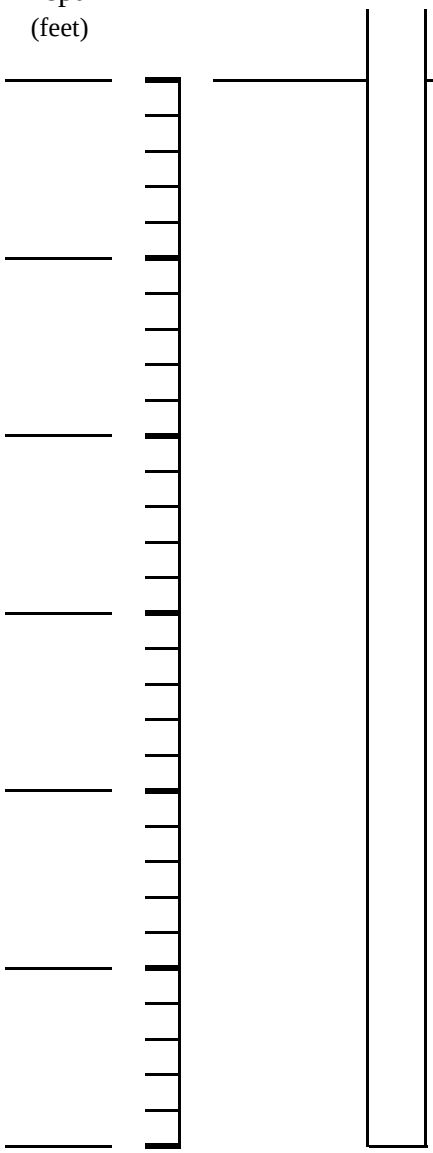
WELL DECOMMISSIONING RECORD

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

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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 _____

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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: _____

APPENDIX C

AS/SVE Well Construction Logs

Project No: T0225-015-001

Borehole Number: AS-1

Project: 229 Homer Street Site

A.K.A.:

Client: Benson Construction and Development, LLC

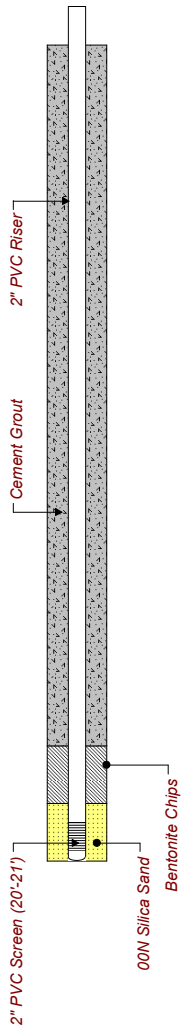
Logged By: BMG

Site Location: Olean, New York

Checked By: RFL

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE			SAMPLE						
Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol	PID VOCs ppm (0 – 12.5 – 25)	Lab Sample	Well Completion Details or Remarks
-1.0		Ground Surface							
	0.0								
4.0									
9.0									
14.0									
19.0									
	21.0	End of Borehole							
24.0									
29.0									



Drilled By: Earth Dimensions
Drill Rig Type:
Drill Method: HSA
Comments:
Drill Date(s): 10/4/2017

Hole Size: 7" (3-3/4" HSA)
Stick-up: 2'+/-
Datum:

Sheet: 1 of 1

Project No: T0225-015-001

Borehole Number: AS-2

Project: 229 Homer Street Site

A.K.A.:

Client: Benson Construction and Development, LLC

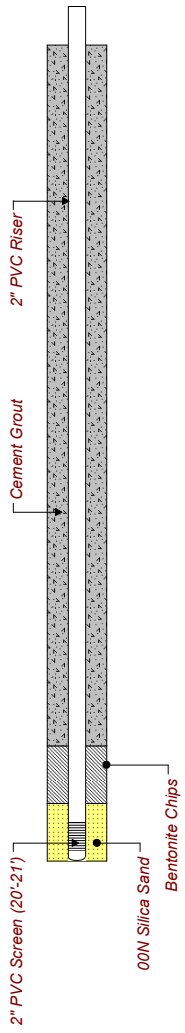
Logged By: BMG

Site Location: Olean, New York

Checked By: RFL

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE			SAMPLE						
Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol	PID VOCs ppm (0 – 12.5 – 25)	Lab Sample	Well Completion Details or Remarks
-1.0									
		Ground Surface							
	0.0								
4.0									
9.0									
14.0									
19.0									
	21.0	End of Borehole							
24.0									
29.0									



Drilled By: Earth Dimensions
Drill Rig Type:
Drill Method: HSA
Comments:
Drill Date(s): 10/4/2017

Hole Size: 7" (3-3/4" HSA)
Stick-up: 2'+/-
Datum:

Sheet: 1 of 1

Project No: T0225-015-001

Borehole Number: AS-3

Project: 229 Homer Street Site

A.K.A.:

Client: Benson Construction and Development, LLC

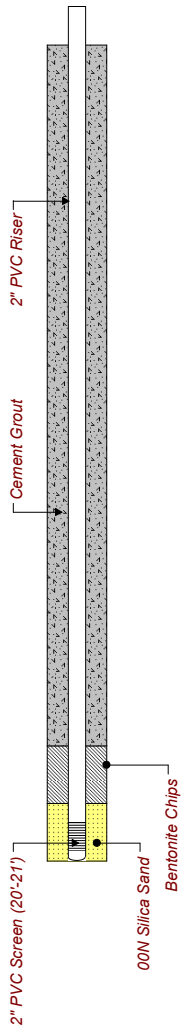
Logged By: BMG

Site Location: Olean, New York

Checked By: RFL

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE			SAMPLE						
Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol	PID VOCs ppm (0 – 12.5 – 25)	Lab Sample	Well Completion Details or Remarks
-1.0		Ground Surface							
	0.0								
4.0									
9.0									
14.0									
19.0									
	21.0	End of Borehole							
24.0									
29.0									



Drilled By: Earth Dimensions
Drill Rig Type:
Drill Method: HSA
Comments:
Drill Date(s): 10/4/2017

Hole Size: 7" (3-3/4" HSA)
Stick-up: 2'+/-
Datum:

Sheet: 1 of 1

Project No: T0225-015-001

Borehole Number: SVE

Project: 229 Homer Street Site

A.K.A.:

Client: Benson Construction and Development, LLC

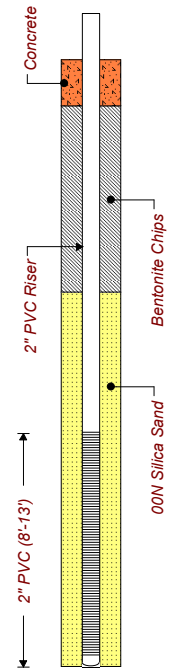
Logged By: BMG

Site Location: Olean, New York

Checked By: RFL

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE			SAMPLE						
Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol	PID VOCs ppm (0 – 12.5 – 25)	Lab Sample	Well Completion Details or Remarks
-1.0	0.0	Ground Surface							
	0.0	auger to 13'							
4.0									
9.0									
	-13.0	End of Borehole							
	13.0								
14.0									
19.0									
24.0									



Drilled By: Earth Dimensions
Drill Rig Type: HSA
Drill Method: HOLLOW STEM AUGER 3-3/4" ID
Comments:
Drill Date(s): 10/3/2017

Hole Size: 7"
Stick-up: 2'+/-
Datum:

Sheet: 1 of 1

APPENDIX D

Field Operating Procedure (FOP) 002.0, Abandonment of Monitoring Wells Procedure

TurnKey Environmental Restoration, LLC

FIELD OPERATING PROCEDURES

Abandonment of Monitoring Wells Procedure

FOP 002.0

ABANDONMENT OF MONITORING WELLS PROCEDURE

PURPOSE

This guideline presents a method for the abandonment and decommissioning of wells that are no longer reliable as competent monitors of formation groundwater. Well abandonment and decommissioning is required in order to remove a potential pathway for the vertical migration of impacted groundwater and/or surface water.

PROCEDURE

1. Examine the existing well to be abandoned/decommissioned and review well construction detail information (if applicable) to determine well depth,, screened interval, diameter, material of composition and other construction details. Establish appropriate equipment requirements for removal of the well.

2. Determine the most suitable seal materials as discussed in the next section.

3. Attempt to remove the well using a drilling rig, by using the following procedures:
    - Attaching the winch line to the well to see if it can be removed by pulling;
    - Using the rig's hydraulics to advance casing incrementally;
    - If a cable tool rig is available, bump back the casing using the cathead and drive block.

3. Upon removal of the well, ream the borehole by advancing the augers approximately one foot beyond the total depth of the well. Rotate the augers at a speed sufficient to remove the construction materials (i.e., filter pack, bentonite seal, etc.) from the borehole annulus (if possible). Backfill the resulting borehole with cement/bentonite grout, by tremie method, to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

4. If the well cannot be removed from the borehole over-drill the borehole and well to approximately two (2) feet below the well depth. Upon reaching the desired depth, remove the well from within the augers and go back to Step 3.

5. If the borehole cannot be reamed out using conventional drilling techniques (i.e., over-drilled), remove or puncture the base plate of the well screen using the drill rig and associated equipment by pounding with the drill rods. Upon filling the well with grout by tremie method, slowly pull the well from the ground surface to allow the grout to evacuate through the bottom of the well to fill the void space created by removal of the well casing. Continue adding grout mix to the well casing, as necessary, to fill the void space to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

   If the driller is unsuccessful at removing or puncturing the base plate of the well due, in part, to well construction materials (i.e., stainless steel or black iron), go to Step 6.

6. Insert a tremie pipe down the well to the bottom and pump a cement/bentonite grout mixture to a depth one to two feet above the top of the screen.

7. Perform a hydraulic pressure test on the portion of the well casing above the grouted screen section. Allow the grout to set up for a period not less than 72 hours before pressure testing of the grouted interval. Place a pneumatic packer a maximum of 4.5 feet above the top of the slotted screen section of the well. The infiltration pressure applied to the packer shall not exceed the pressure rating of the well casing material. If the interval between the top of the grout and the bottom of the packer is not saturated, potable water will be used to fill the interval. A gauge pressure of 5 psig at the well head shall be applied to the interval for a period of 5 minutes to allow for temperature stabilization. After 5 minutes, the pressure will be maintained at 5 psig for 30 minutes. The grout seal shall be considered acceptable if the total loss of water to the seal does not exceed 0.5 gallons over a 30-minute period.

8. If the grout seal is determined to be unacceptable, tremie grout an additional 5 feet of well riser above the failing interval and retest as specified above (see Step 7).

9. If the grout seal is determined to be acceptable, tremie grout the remainder of the well until grout displaces all formation water and a grout return is visible in the well at the surface. Cut off well casing at a depth of five feet or greater below ground surface and backfill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary).

10. Record all well construction details and abandonment procedures on the **Well Abandonment/Decommissioning Log** (sample attached).

CEMENT/BENTONITE GROUT MIXTURE

The cement/bentonite grout mixture identified below is generally considered the most suitable seal material for monitoring well advancement and abandonment. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (% Weight)

1.5 to 3.0% - Bentonite (Quick Gel)
40 to 60% - Cement (Portland Type I)
40 to 60% - Potable Water

MISCELLANEOUS

All removed well materials (PVC, stainless steel, steel pipe) should be decontaminated (if necessary) as per the project specific **Drilling and Excavation Equipment Decontamination FOP** and removed from the site. The project manager will determine the destination of final disposal for all well materials. All drill cuttings (depending on site protocol) should be placed in DOT-approved 55-gallon drums, labeled and sampled in

accordance with TurnKey's field operating procedure **Management of Investigation-Derived Waste** in order to determine proper removal and disposal procedures. The drilling subcontractor will provide any potable water utilized during this field activity from a known and reliable source (see Notes section).

ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

REFERENCES

New York State Department of Environmental Conservation, July 1988, *Drilling and Monitoring Well Installation Guidance Manual.*

Driscoll, F.G., 1987, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota, p. 1089.

TurnKey FOPs:

018 Drilling/Excavation Equipment Decontamination Protocols
032 Management of Investigation-Derived Waste

NOTES

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.

ELL ABAN ONMENT
ECOMMISSIONIN LO

PRO ECT INFORMATION	ELL INFORMATION
Project Name:	WELL I.D.:
Client:	Stick-up (fags):
Project Job Number:	Total Depth (fbgs):
Date:	Screen Interval (fbgs):
Weather:	Well Material:
	Diameter (inches):
BM/TK Personnel:	
Drilling Company:	Drilling Company Pers l:
Drill Rig Type:	

ECOMMISSIONIN PROCE ES

Time	Description of Field Activit

PREPARED BY: DATE:

APPENDIX E

NYSDEC Import Request Approval Letter (May 2, 2023)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation
700 Delaware Avenue, Buffalo, NY 14209
P: (716) 851-7220| F: (716) 851-7226
www.dec.ny.gov

May 2, 2023

Lori Riker
Benchmark & TurnKey
2558 Hamburg Turnpike
Suite 300
Buffalo, NY 14218

Re: Site Management (SM) –
Import Request
229 Homer Street, Olean
Cattaraugus County, Site No.: **C905044**

Dear Lori Riker:

The Department has reviewed your request dated May 2, 2023 to import approximately 5,000 cubic yards of 3-inch crushed stone from Portville-Obi Stone, LLC. Based on the information provided, the request is hereby approved.

The proposed fill material meets the requirements for material other than soil (i.e., gravel, rock, stone, recycled concrete or recycled brick) as specified in section 5.4(e)5 of DER-10. Therefore, this material may be placed below the demarcation barrier or above the demarcation layer as part of final site cover.

Testing in accordance with DER-10 and approval by the Department is required for any additional material imported from this source.

If you have any questions, please contact me at 716-851-7220 or email: megan.kuczka@dec.ny.gov.

Sincerely,

Megan Kuczka
Environmental Program Specialist – 1

ec: R. Donald Benson – Homer Street Properties, LLC
Michael Lesakowski – Benchmark & TurnKey