BT Red Hook, LLC

DNAPL Recovery System Design Report

Red Hook 4 Site No. C224214
44 and 62 Ferris Street/219 Sullivan Street
Borough of Brooklyn, Kings County, New York

July 2025

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Certification

I, Terry W. Young, PE, certify that I am currently a New York State registered professional engineer and that the *Red Hook 4 Site DNAPL Recovery System Design Report* was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the *DER Technical Guidance for Site Investigation and Remediation* (DER-10) and *Green Remediation* (DER-31).

Date 7/18/2025

Terry Young, P.E.
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Acronyms and Abbreviations

Arcadis	Arcadis of New York, Inc.
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	below ground surface
BT Red Hook	BT Red Hook, LLC
CAMP	Community Air Monitoring Plan
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CPP	Citizen Participation Plan
DNAPL	dense non-aqueous phase liquid
FER	Final Engineering Report
ft	feet
gal/event	gallons per event
HASP	Health and Safety Plan
HHEA	Human Health Exposure Assessment
HMI	human-machine interface
IBC	International Building Codes
IC	institutional control
IRM	interim remedial measure
LNAPL	light non-aqueous phase liquid
NAPL	non-aqueous phase liquid
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OM&M	operation, maintenance and monitoring
OSHA	Occupational Safety and Health Administration
P&ID	piping and instrumentation diagram
PID	photoionization detector
psi	pounds per square inch
PVC	polyvinyl chloride
QED	QED Environmental Systems

RAO	remedial action objective
RAWP	Remedial Action Work Plan
RH3	Red Hook 3 Brownfield Site (New York State Department of Environmental Conservation Brownfield Site No. C224213)
RH4	Red Hook 4 Brownfield Site (New York State Department of Environmental Conservation Brownfield Site No. C224214)
RI	remedial investigation
RW1R	recovery well A-RH4-RW1R
RW2	recovery well A-RH4-RW2
RW3	recovery well A-RH4-RW3
RW4	recovery well A-RH4-RW4
RW5	recovery well A-RH4-RW5
RW6	recovery well A-RH4-RW6
SCGs	standards, criteria and guidance
SMP	Site Management Plan
SRI	supplemental remedial investigation
SRI Report	Supplemental Remedial Investigation Report – Red Hook 4 Revised
SVOC	semi-volatile organic compound
TCLP	toxicity characteristic leaching procedure
TOGS	Technical and Operational Guidance Series
VOC	volatile organic compound

1 Introduction

This Dense Non-Aqueous Phase Liquid (DNAPL) Recovery System Design Report (Design Report) has been prepared by Arcadis of New York, Inc. (Arcadis) on behalf of BT Red Hook, LLC (BT Red Hook) for the Red Hook 4 Brownfield Site (New York State Department of Environmental Conservation [NYSDEC] Brownfield Site No. C224214), hereafter referred to as RH4. BT Red Hook is a Volunteer under the RH4 Brownfield Cleanup Agreement (BCA; Index No. C224214-06-15) and, as such, responsibility for contamination at RH4 arises solely as a result of property ownership subsequent to the disposal or discharge of contaminants. RH4 is located at 44 and 62 Ferris Street/219 Sullivan Street in Brooklyn, New York (**Figures 1** and **2**, the latter including block and lot boundaries).

This report has been prepared in accordance with the BCA and applicable provisions of the NYSDEC Division of Environmental Remediation's DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2010) to further the DNAPL recovery system remedial design following NYSDEC's approval of the Remedial Action Work Plan (RAWP; Arcadis 2025) and issuance of the Decision Document (NYSDEC 2025). Consistent with RAWP, the Decision Document identifies installation and operation of a DNAPL recovery system as an element of the selected remedy for RH4. The Decision Document also identifies that RH4 does not pose a significant threat to public health or the environment.

The selected RH4 remedy is a Brownfield Cleanup Program (BCP) Track 4 remedy, as defined in Title 6 of the New York Codes, Rules and Regulations (NYCRR) Part 375-3.8(e)(4): Restricted Commercial Use (which allows for industrial use), with site-specific soil cleanup objectives. Removal of non-aqueous phase liquid (NAPL) source materials is the site-specific soil cleanup objective. The significant components of the RH4 remedy are summarized below.

- NYSDEC-approved excavation interim remedial measure (IRM) conducted between August 26, 2019, and February 10, 2020, to remove light non-aqueous phase liquid (LNAPL) as detailed in the NYSDEC-approved Construction Completion Report (Arcadis 2022a).
- Existing site cover (engineering control) that will be maintained to allow for commercial use of the Site.
- Groundwater remedy if groundwater contamination becomes mobile and may migrate off-site, active groundwater remediation will be evaluated and implemented if required. Contaminated groundwater is not currently migrating off-site (NYSDEC 2025).
- Institutional Control in the form of an environmental easement.
- Site Management Plan (SMP) that will identify use restrictions and engineering controls, as well as protocols and requirements to manage contamination remaining at RH4 and comply with NYSDEC's DER-31 Green Remediation.
- Petroleum tar recovery consisting of enhancing the ongoing manual DNAPL recovery to capture DNAPL beneath the southeastern portion of RH4 by installing, operating and maintaining a DNAPL recovery system (engineering control). Operation, optimization and maintenance of the system will be addressed in the SMP.

1.1 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for RH4 presented in **Table 1-1** below were identified in the NYSDEC's Decision Document. The RAOs were established through the remedy selection process stated in Title 6 NYCRR Part 375, including consideration of the results presented in the NYSDEC-approved Supplemental Remedial

Investigation (SRI) Report (Arcadis 2019a) and Human Health Exposure Assessment (HHEA; Arcadis 2018). The RAOs are protective of human health and the environment. The RAOs specific to DNAPL recovery are the soil and groundwater environmental protection RAOs; noting that groundwater at or in the vicinity of RH4 is not used as a potable resource at RH4 under current conditions and is not anticipated to be used under future conditions (Arcadis 2018). The area is served by a public water supply that is not affected by the groundwater impacts at RH4 (NYSDEC 2025). As identified in the NYSDEC's Decision Document (NYSDEC 2025), operation of the DNAPL recovery system will continue until remedial objectives have been achieved, or until NYSDEC determines that continued operation is technically impracticable or not feasible.

Table 1.1 – RAOs

Soil RAOs
Public Health Protection • Prevent ingestion/direct contact with contaminated soil; and • Prevent inhalation exposure to contaminants volatilizing from soil. Environmental Protection • Prevent migration of contaminants that would result in groundwater or surface water contamination.
Groundwater RAOs
Public Health Protection • Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards; and • Prevent contact with, or inhalation of, volatiles from contaminated groundwater. Environmental Protection • Restore the groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable; and • Remove the source of groundwater or surface water contamination.
Soil Vapor RAO
• Mitigate impacts to public health resulting from the potential for soil vapor intrusion into future buildings at RH4.

1.2 Site Description and Background

RH4 is an approximately 2.29-acre, rectangular parcel located at 44 and 62 Ferris Street/219 Sullivan Street in Brooklyn, New York within a mixed industrial, commercial, and residential area in an urban setting (**Figure 1**). It is zoned as M2-1, which allows manufacturing and certain commercial uses. RH4 consists of two adjoining tax parcels (**Figure 2**) bounded to the northeast by Sullivan Street (500-foot frontage), to the southeast by Ferris Street (200-foot frontage), and to the southwest by Wolcott Street (500-foot frontage), with the Red Hook 3 Brownfield Site (RH3; NYSDEC Brownfield Site No. C224213) beyond. A masonry building owned by the Port Authority of New York and New Jersey adjoins RH4 to the northwest.

Ground elevation across RH4 ranges from approximately 5 feet above mean sea level, at the extreme eastern corner near the intersection of Ferris and Sullivan Streets, to 9 feet above mean sea level along Wolcott Street on the southwest side of RH4. Prior to remediation, RH4 had most recently been used as a large commercial parking lot for trucks, trailers, and cars; however, it is no longer being used for that purpose. At the time of preparing this Design Report, there are no permanent buildings located on RH4 and the site is vacant. RH4 is surrounded by an 8-foot-high fence with locked gates along Wolcott Street and Sullivan Street.

RH4 has a long history of commercial and industrial development dating to the late 1800s. Historical documentation indicates that the property now occupied by RH4 was below the mean water line in the late 1700s/early 1800s and was subsequently filled. Prior uses included oil refining, lumber and grain storage, dry-dock and boat repair, and manufacture and storage of lubricating oils. Historical uses of adjoining and surrounding properties included fertilizer and chemical manufacturing, tar and resin storage, shipyard/repair, foundry use, and heavy industrial manufacturing.

The subsurface strata consist of historical fill that extends from ground surface to depths ranging up to 15 feet below ground surface (bgs). Below the fill is a unit of sand, silt and gravel underlain by a dense silt and clay. A loose sand containing trace amounts of silt and gravel was encountered below the dense silt and clay to at least 80 feet bgs. The loose sand typically becomes finer grained with depth transitioning to a fine sand containing little to some silt but at times still containing coarse sand seams. Bedrock was not encountered during the remedial investigation activities but is estimated to be approximately 110 to 150 feet bgs. The water table beneath RH4 occurs at approximately 3 to 8 feet bgs, in a tidally influenced environment.

DNAPL is present at RH4 at depths ranging from approximately 50 to 73.5 feet bgs beneath the southeastern portion of RH4. The DNAPL is petroleum tar based on the high abundance of naphthalene and presence of biomarkers commonly found in petroleum compounds and is likely associated with historical releases of unused petroleum products from the prior petroleum refining and storage activities on site (Arcadis 2022b). The DNAPL bearing zone is approximately 0.5 to 4.5 feet thick and resides within a geologic “bowl” (loose sand underlain by a lower permeability layer). An abrupt demarcation was consistently observed between unimpacted soils above and below the DNAPL bearing zone during the remedial investigation activities.

Site lithology, combined with the extensive subsurface data collected over a period of more than 19 years and the absence of DNAPL in soil borings on the northern half of RH4, suggests minimal potential DNAPL mobility. Collectively, these findings, together with laboratory data (Arcadis 2019a) showing a relatively small density contrast between DNAPL and groundwater, support the overall conclusion that the potential for downward DNAPL migration is limited. A summary of historical investigations and remedial actions is provided within the RAWP (Arcadis 2025).

Manual DNAPL gauging and recovery from the recovery wells began on a monthly basis in October 2020 and is ongoing. There are six, 6-inch diameter recovery wells on RH4: A-RH4-RW1R (RW1R) and A-RH4-RW2 (RW2) were installed in 2020. Four additional recovery wells (A-RH4-RW3 [RW3] through A-RH4-RW6 [RW6]) were installed in 2022. The locations of the DNAPL recovery wells are shown on **Figure 3**. Details regarding DNAPL recovery, including a summary of the DNAPL recharge studies, are provided within the RAWP. Manual DNAPL recovery will continue on a monthly basis until recovery system installation.

The DNAPL water mixture recovered manually from the recovery wells is containerized/managed on site prior to being transported off site. Since March 2021, the DNAPL water mixture generated at RH4 has been recycled as a commercial chemical product for energy by Lorco Petroleum Services at their Class D recycling facility permitted by the New Jersey Department of Environmental Protection and located in Elizabeth, New Jersey. Recycling of the DNAPL was discussed in the C7 notification submitted by Arcadis to the NYSDEC Bureau of Technical Support, Division of Materials Management, on August 3, 2022, and the follow-up letter from Arcadis dated September 12, 2022. The NYSDEC Bureau of Technical Support, Division of Materials Management, acknowledged that the DNAPL is legitimately recycled in a November 30, 2022 email.

2 Basis of Design

This section describes the scope, extent, and design parameters for the DNAPL recovery system.

2.1 Technology Overview

Factors considered for selecting a DNAPL recovery system as an element of the remedy for the site include:

- Appropriate for the site-specific conditions;
- Protective of public health and the environment;
- Compliant with the NYSDEC-selected Track 4 remedy, the site-specific soil cleanup objective to remove NAPL source materials, and the RAOs (**Table 1.1**);
- Enhanced DNAPL recovery compared to the ongoing manual recovery conducted on a monthly basis; and
- Technology implementation is consistent with green and sustainable remediation practices; lower carbon footprint compared to other remedial alternatives (e.g., in-situ soil stabilization) or continued but more frequent site visits for manual DNAPL recovery.

For the RH4 remedy, the proposed DNAPL recovery system will utilize the four existing 6-inch diameter DNAPL recovery wells that produce recoverable DNAPL: RW1R, RW3, RW4 and RW5 (locations shown on **Figure 3**). The other two recovery wells (RW2 and RW6) are not included in the DNAPL recovery system due to absence of measurable and recoverable DNAPL in the wells, as detailed in Arcadis' letter to NYSDEC dated February 21, 2025 and agreed by NYSDEC in a March 5, 2025 email to Arcadis. Those two recovery wells will not be decommissioned at this time as NYSDEC (March 5, 2025 email) views it as premature while DNAPL recovery at RH4 is ongoing. RW2 was installed in October 2020 and no recoverable DNAPL has been produced after July 2023; and RW6 was installed in May 2022 and has not produced recoverable DNAPL since it was installed.

Each of the recovery wells (RW1R, RW3, RW4 and RW5) to be utilized in the DNAPL recovery system will be equipped with a 4-inch diameter QED Environmental Systems (QED) bottom loading pneumatic pump. An air compressor, capable of 10 cubic feet per minute (cfm) at 100 pounds per square inch (psi), will be housed in an equipment shed and supply air to the four pneumatic pumps on individually plumbed 3/4-inch diameter lines. DNAPL will be pumped from the pneumatic pumps to be collected in a 1,000-gallon double walled above ground containment tank, which will be constructed and anchored on a concrete pad and will have built-in secondary containment with interstitial monitoring to contain potential leaks. The system will be operated by programmable logic-based controls and telemetry will be utilized to alert personnel to alarm conditions and for remote monitoring of system data.

The DNAPL recovery system will include solenoid valves and set timers which will provide compressed air to the pneumatic pumps for a specific period of time to control the amount of liquid pumped from each well per day based on the volume per cycle of the pumps. With the bottom loading pneumatic pumps and the set timers, the goal is to pump the DNAPL from the well at a rate to recover DNAPL without pumping groundwater based on the recharge rates currently observed and adjusted based on rates which will be tested in the future. The future testing will be part of the operation and optimization of the system to be detailed in the SMP. The goal of the system is to pump DNAPL at the highest rate possible while minimizing pumping of groundwater in order to reduce the frequency of maintenance and storage tank liquid removal activities and maintain a DNAPL quality that is suitable for recycling for energy. As identified in Section 1.2, the DNAPL water mixture generated at RH4 has

been recycled since March 2021 as a commercial chemical product for energy by Lorco Petroleum Services at their Class D recycling facility permitted by the New Jersey Department of Environmental Protection and located in Elizabeth, New Jersey.

2.2 DNAPL Bearing Zone

DNAPL is present at RH4 at depths ranging from approximately 50 to 73.5 feet bgs beneath the southeastern portion of RH4 (approximately 0.33 acre). The DNAPL bearing zone is approximately 0.5 to 4.5 feet thick and resides within a geologic "bowl" (loose sand underlain by a lower permeability layer). DNAPL saturation was found just above the lower permeability layer, tending to "ride" along the contour of that layer, to the geologic "bowl", wherein the highest producing recovery wells (RW1R and RW4) are located. Recoverable DNAPL is present at the following four recovery wells: RW1R, RW3, RW4 and RW5 (**Figure 3**). Construction details for these wells are summarized in **Table 1**. RW2 and RW6, which have not produced recoverable DNAPL for more than 18 months and are not included in DNAPL recovery system as agreed to by NYSDEC in a March 5, 2025 email.

2.3 DNAPL Chemical Composition and Characteristics

The DNAPL was previously evaluated to determine chemical composition and characteristics to aid in predicting the effectiveness of the DNAPL recovery technology and appropriate handling and containment procedures. It also aided in approval by NYSDEC for the recovered DNAPL to be recycled as opposed to being managed and treated/disposed as hazardous waste. As detailed in prior documents, including Arcadis' C7 Notification to NYSDEC (Arcadis 2022b), the DNAPL water mixture was sampled and analyzed for waste characterization purposes in June/July 2017. Laboratory analytical reports showed that the DNAPL water mixture was hazardous due to the characteristic of benzene (D018). DNAPL from the recovery wells was also analyzed in January 2021 and showed that the DNAPL was also hazardous due to the characteristic of ignitability (D001).

Additionally, lab analysis was performed on DNAPL samples for fluid properties using ASTM D445, D181, and D971 run at 55, 70, and 85 degrees Fahrenheit (°F). The fluid properties data were typical for a petroleum tar with specific gravity, density, and viscosity greater than that of water. For example, specific gravity and density analyses indicated that the DNAPL is slightly denser than water (1.029 grams per cubic centimeter at 70 °F). The viscosity of the DNAPL sample decreased with an increase in temperature with the original viscosity of around 29 centistokes at 55 °F decreased by more than half (13 centistokes) at 85 °F.

Lab analytical data for the DNAPL samples is shown in **Appendix A**.

2.4 DNAPL Recovery System Design Basis

The rationale for the system design and remedial approach is provided below, including DNAPL recovery rates, recovery well construction details, and DNAPL transfer and containment considerations.

2.4.1 DNAPL Recovery Rates

DNAPL in the recovery wells has been gauged and manually recovered on a generally monthly basis since installed: RW1 since October 2020; and RW3, RW4 and RW5 since May 2022. The following table provides a summary of these monitoring and recovery events including average DNAPL recovery rates. As noted in Section 2.1, the other

two recovery wells on RH4 (RW2 and RW6) are not included in the DNAPL recovery system due to absence of measurable and recoverable DNAPL. This was agreed upon by NYSDEC in a March 5, 2025 email to Arcadis.

Table 2.4.1 – DNAPL Recovery Rates (through April 2025)

Recovery Well	Manual Recovery Start Date	Average DNAPL Recovery Rate (gal/event)	Total Recovered DNAPL (gal)
RW1R	12/10/2020	28	1,683.9
RW3	5/11/2022	3.8	160.0
RW4	5/11/2022	34.7	1389.5
RW5	5/25/2022	4.9	207.3

DNAPL recovery rates will be utilized when determining the set points for the timed solenoid valves for each pump which will control the volume of DNAPL recovery during each operating cycle.

2.4.2 Recovery Well Construction Details

The DNAPL recovery system will utilize four existing wells (RW1R, RW3, RW4 and RW5) whose construction consists of 6-inch diameter Schedule 40 polyvinyl chloride (PVC) pipe, each with 10-foot length of 0.010-inch slotted Schedule 40 PVC screen followed by 5-foot-deep sump (RW1R) or 10-foot-deep sump (RW3 through RW5). The screen intervals vary based on location specific conditions (i.e., lithology, presence of DNAPL). Well construction details are supplied in **Table 1** and well construction logs are supplied in **Appendix B**. The locations of the recovery wells are depicted on **Figure 3**.

2.4.3 DNAPL Transfer and Containment

The RH4 DNAPL exhibits the hazardous characteristics of benzene (D018) and ignitability (D001). The conveyance and storage of recovered DNAPL will be engineered to prevent spills and exposure of the DNAPL to heat (e.g., sparks from static electricity). As further detailed in Section 2.6 (System Construction) and the Design Drawings provided in **Appendix C**, the conveyance piping will be installed with an anti-static guard to prevent static electricity build up from the flow of DNAPL. To prevent spills, the conveyance piping and storage tank will be constructed with double walled material. DNAPL conveyance lines will be constructed with a 1.0% slope leading from the DNAPL recovery wells to a containment sump that will be installed within the concrete pad with the equipment shed located over the sump. If there is a release from the primary DNAPL conveyance line into the secondary containment piping, the DNAPL will gravity drain to the containment sump. This is also true for DNAPL that may leak from the DNAPL manifold piping within the shed. A liquid detection sensor will be installed in the containment sump that will initiate an alarm condition, shutting down the recovery system and notifying assigned personnel. The equipment shed will have a Class I, Division 1 electrical classification which indicates a hazardous location in which flammable gases and vapors may be present and explosion proof, flameproof, and intrinsically safe equipment and electrical connections are utilized.

Additionally, the double walled containment tank will be equipped with interstitial monitoring between the tank's double walls that will shut down the system and provide notification to assigned personnel in the event of DNAPL

release from the primary tank. All equipment that will come into contact with the DNAPL will be constructed of material that is chemically compatible with DNAPL, so the structural integrity of the equipment is not compromised.

2.5 Pre-Construction Activities

Pre-construction activities are summarized below, including updating the existing Health and Safety Plan (HASP), permitting, and location and mark-out of utilities and potential obstructions within the construction area.

2.5.1 Site-Specific Health and Safety Plan

On-site personnel are required to abide by the health and safety protocols established for RH4 as set forth in the site-specific HASP prepared in accordance with the most recently adopted and applicable general industry (29 Code of Federal Regulations [CFR] 1910) and construction (29 CFR 1926) standards of the federal Occupational Safety and Health Administration, as well as other federal, state, or local applicable statutes or regulations. The existing site-specific HASP will be updated prior to commencing the field work and will address the specific activities associated with the construction, startup, and operation of the DNAPL recovery system. The HASP will summarize the health and safety protocols to be followed by personnel during field activities.

2.5.2 Permitting

Required permits for system construction and operation will be obtained prior to system installation, startup, and/or operation. System installation will require securing necessary permits and approvals, including (but not necessarily limited to) those required by the New York City Department of Buildings for construction, electrical, and plumbing. A separate metered electrical service was installed in 2023 by the Consolidated Edison Company of New York, Inc. at RH4 for operation of the DNAPL recovery system. Additionally, the remediation project will need to be filed through the Fire Department of the City of New York, Technology Management Unit. Additional plans/approvals will be prepared/obtained as necessary to install and/or operate the DNAPL recovery system (e.g., New York City Department of Environmental Protection's Construction Noise Mitigation Plan). Installation activities will be performed under the oversight of a New York Professional Engineer or a person under their supervision or responsible charge.

The proposed DNAPL above grade containment tank has a 1,000-gallon capacity. Based on this capacity, the tank will not be required to be registered in the New York Petroleum Bulk Storage (PBS) program, and it will not require a Spill Prevention, Control and Countermeasure Plan. Installation of the tank will be included in the New York City Department of Buildings permits, and it is understood that notification to the local fire authorities may be needed prior to installation. The tank will be vented to the atmosphere. NYSDEC PBS regulations were reviewed and based on the size of the tank, no emissions permitting or monitoring are required. The tank will be painted with light colored paint to reflect sun and reduce overall evaporation from the tank.

As permitting and construction planning proceeds, additional inquiries regarding tank permitting, inspection, and notifications will be conducted (if needed) to ensure that required actions are taken for the installation of the above ground containment tank and associated components.

2.5.3 Underground Utility Locating

Prior to ground disturbance, New York 811 will be contacted to mark underground utilities in the area where intrusive activities will occur and historical documents and utility maps will be reviewed to assess the potential for buried pipelines, utilities, and other potential inferences in and proximate to the DNAPL recovery system construction area. In addition, a private utility locator will clear the area for subsurface activities using electromagnetic and/or ground-penetrating radar techniques to identify and mark out the approximate location of subsurface utilities near/adjacent to the location of the proposed DNAPL recovery system construction area. The trenching locations may be adjusted if the utility locator information is different than the existing and available subsurface utility information.

2.6 System Construction

This section presents a task-by-task summary of the construction activities to be completed to install the DNAPL recovery system. The overall layout and details of the proposed DNAPL recovery system are shown on the Design Drawings provided in **Appendix C**.

As identified in Section 2.5.1, the system construction field work will be conducted in accordance with Arcadis's current RH4 HASP. During ground-intrusive work, community air monitoring will be implemented in substantial conformance with the NYSDEC-approved 2019 site-specific Community Air Monitoring Plan (CAMP; Arcadis 2019b) used during implementation of the excavation IRM. Additional details regarding community air monitoring are provided in Section 3.6.

2.6.1 DNAPL and Compressed Air Conveyance Lines

DNAPL and compressed air conveyance lines from the pneumatic pumps to their respective manifolds within the equipment shed are to be installed with one continuous length of hose with no connections. Each of the four recovery wells will have a well seal installed at the well and secondary containment piping to prevent infiltration of potential surface water. The DNAPL recovery hose will be installed within a secondary containment pipe at least 30 inches below grade to prevent possible freezing. The compressed air hose will also proceed below grade within a carrier pipe to protect the hose from deterioration. Cross sections of the trench and piping details are provided in **Appendix C, P-003**. Details of the proposed well head connections are provided in **Appendix C, P-002**.

Shallow trenches will be dug to facilitate the below grade installation of the DNAPL recovery and compressed air lines below the frost line. To the extent practicable, the trenches and piping will be placed to limit disturbance to existing site features and infrastructure. The anticipated location of the trenches are shown on **Appendix C, G-005**. The locations of the trenches are subject to change in the field based on actual conditions observed and utility location information.

The trenches will be excavated using conventional excavation equipment (e.g., mini excavator or equivalent) and/or soft dig methods starting at a depth of approximately 2.5 feet at each recovery well and sloping to a depth of approximately 3.5 feet at the containment sump. The trench width will vary based on the number of individual DNAPL recovery and air supply lines within that trench. Excavated soil from the piping trenches will be stockpiled and managed within the construction area, prior to being backfilled (to extent appropriate) into the trenches. Excess soil will be transported off-site for disposal in accordance with applicable rules and regulations. Additional details regarding waste management are provided in Section 2.8. The existing site-wide cover will be restored/maintained; cap stone and crushed concrete/brick are currently on the ground surface at RH4.

The DNAPL conveyance lines will be constructed using 1-inch diameter rubber transfer hose with a static guard. The conveyance lines will be encased in a 4-inch diameter Schedule 40 PVC pipe as secondary containment which will be placed directly in the trenches. The conveyance lines and associated secondary containment piping will be sloped 1.0% from each of the four recovery wells to the containment sump. The compressed air supply lines will be constructed using 3/4-inch diameter 150 psi pressure rated compressed air hose. A minimum of three inches will be maintained between each DNAPL recovery line and air supply line placed in the trench.

Prior to installing the DNAPL recovery and air supply lines within the trench, a minimum 3-inch-thick layer of sand bedding will be placed along the bottom of the trench. The recovery and air supply lines will be installed and tested to verify the integrity of the hosing and connections. Upon acceptance of the testing result, the trench will be backfilled. Sand will be placed around the piping network and to a minimum elevation of 3-inches above the top of the piping network. Non-woven geotextile fabric will then be placed over the sand and between 17 inches to 38 inches of gravel or soil base will be placed in the trench in twelve-inch loose-lifts and compacted depending on the trench depth relative to the sloping of the piping. Metal tracing tape will be placed in the trench no less than six inches below final grade.

As noted above, excavated soil from the piping will be backfilled into the trenches and the existing site cover will be restored/maintained. Imported materials will meet the applicable requirements specified in DER-10 and will require NYSDEC approval prior to being used as backfill. Excavation trenches will be backfilled as soon as possible to facilitate area stability, reduce the potential for groundwater ponding/accumulation, and increase overall site safety. Trench cross section details including depth of installation of DNAPL recovery and air supply lines as well as various backfill details are shown on **Appendix C, P-003**.

NYSDEC's Request to Import/Reuse Fill or Soil form will be completed and submitted to the NYSDEC (as necessary) for imported material needed to backfill the excavations. Imported backfill materials will meet 6 NYCRR Part 375 restricted commercial use set forth in 6 NYCRR Part 375-6.7(d). Imported fill will also be sampled for emerging contaminants in accordance with NYSDEC's Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs. (April 2023). Samples of imported fill material will be collected and submitted for analysis to a New York accredited environmental laboratory at the frequency specified in DER-10.

2.6.2 System Equipment Installation

The DNAPL recovery system equipment will be positioned as close as possible to the remediation area to minimize the amount of trenching and conveyance piping from the system to the recovery well locations. The proposed equipment and layout are generally shown on **Appendix C, G-005**. The layout of equipment will be configured to allow adequate room for the safe operation of the system components in accordance with the International Building Codes (IBC), New York City Building Code, and Occupational Safety and Health Administration (OSHA) requirements. The equipment will also be situated to allow for easy access and safe operation, maintenance, and monitoring (OM&M) activities. The proposed layout of the equipment within the equipment shed is presented in **Appendix C, P-004**.

2.6.2.1 Equipment Shed

The DNAPL recovery system equipment will be housed in a prefabricated shed. The equipment shed will be placed on the same concrete pad as the above ground storage tank and will be placed above the containment sump. Details of the concrete pad and associated shed anchoring are presented on **Appendix C, S-003 and S-004**. The

shed will be used to house the air compressor, DNAPL conveyance and compressed air supply line manifolds, the control panel, electrical panels for power distribution, and thermostatically controlled heater and ventilation fan. The shed will have a Class I, Division 1 electrical classification.

2.6.2.2 Air Compressor, Compressed Air Manifold, and Timer Solenoid Valves

The air compressor will be capable of providing at least 10 cfm of compressed air at 100 psi and will have an integral air dryer. The main compressed air supply line will be constructed of 3/4-inch diameter steel pipe and include a ball valve, pressure indicator and switch, a pressure regulating valve, and a 3-way solenoid valve prior to the compressed air manifold. Each compressed air hose leg on the manifold will be constructed of 3/4-inch diameter steel pipe and will consist of a ball valve, timer-controlled solenoid valve, pressure indicator, and cycle-counter. The main solenoid valve will be a three-way valve to allow for instant closure and relief of pressure to the pumps to cease operation in the event of an alarm condition. The individual pump leg solenoid valves will be installed with an associated timer to allow for programmable operation of the pumps. The individual pumps will be programmed to operate for a set period of time based on field observations to allow for DNAPL recharge and reduce potential for groundwater recovery. The compressed air manifold located within the equipment shed will include one empty lateral for potential future system expansion.

2.6.2.3 DNAPL Manifold, Spill Containment Sump, Containment Tank, and Concrete Pad

DNAPL will be conveyed from the pneumatic pumps to the DNAPL pipe manifold in 1-inch diameter, rubber transfer hose with static guard and within a secondary containment sleeve. DNAPL piping will be plumbed with four individual lines coming from each of the four pumps with a valve and flowmeter and will be combined at a manifold line prior to connection to the containment tank. The manifold line construction will be 1.5-inch diameter steel piping and will consist of a valve and totalizer prior to the containment tank connection. The piping from the equipment shed to the storage tank will be heat traced and insulated for freeze protection. The DNAPL manifold located within the equipment shed will include one empty lateral for potential future system expansion.

The proposed piping containment sump will be integrated into the concrete pad with a minimum of 10-gallon capacity (approximately 5 times the volume of the longest DNAPL recovery hose) that will include a liquid detection sensor to indicate if a leak is present. The containment sump will be installed below the ground surface and beneath the equipment shed for freeze protection and to allow a spill(s) within the shed to also accumulate within the sump. The sloped DNAPL conveyance line secondary containment will terminate at the spill containment sump so that leaking DNAPL (if any) will flow from the secondary containment line and remain contained within the sump triggering an alarm and deactivating the system. The primary transfer line will continue through the sump up into the shed to the manifold. The containment sump construction details are shown in **Appendix C, S-003 and S-004**.

The proposed above ground containment tank will be a 1,000-gallon capacity double wall containment tank that will include a built-in secondary containment with interstitial monitoring to contain and indicate if a leak from the tank is present. The tank will be equipped with a non-contact radar pressure transducer integrated into the control system to provide a real-time liquid level in the tank and allow for notifications at specified levels to aid in coordinating contractors to empty the tank and will be equipped with a level switch to shut off the recovery system should the level in the tank reach the set high/high level to avoid overfills. Piping from the equipment shed to the tank will be heat traced and insulated for freeze protection.

The above ground containment tank will be installed and anchored on a steel reinforced concrete pad. The concrete pad will allow for placement of the tank as well as a stable working platform around the tank to perform maintenance activities. The concrete pad was designed to conform to New York City Building Code and the IBC. Details of the concrete pad design are included in **Appendix C, S-003**.

2.6.2.4 Pneumatic Submersible DNAPL Recovery Pumps

The proposed DNAPL recovery pumps will be QED AP4+ (or equivalent) 4-inch-diameter bottom loading pneumatic submersible pumps. The recovery pumps will be designed to handle DNAPL liquids and will have pressure range of 5 to 120 psi and flow ranges from 0 to 14 gallons per minute. The pumps will be set within the sumps of the four recovery wells (RW1R, RW3, RH4, and RW5). Compressed air lines, DNAPL recovery lines, exhaust lines and a support cable will be attached to each pump. A well seal with the necessary compression seals for each line will be installed at the top of each well to avoid infiltration of surface water.

2.6.2.5 System Electric Feed and Controls

An existing power drop will be used to power the DNAPL recovery system. An above grade service will be installed from the current drop location at the existing shed along Ferris Street to the DNAPL recovery equipment shed, as depicted in **Appendix C, G-004**.

The DNAPL recovery system will be fully automated and designed to operate continuously with periodic onsite operator oversight. The system will be equipped with fail-safe devices to deactivate the operation in the event of an alarm condition. The system control panel will act as a fail-safe device to monitor and control system inputs and outputs. The system controls will be connected to an email server, which will notify designated personnel when there is a system alarm. The control panel will be a Programmable Logic Controller with a human-machine interface (HMI) (to control system operations) and a cellular modem will be used for remote telemetry and monitoring. The control panel will be capable of monitoring and recording data and controlling system functions.

System operational data will be displayed on the HMI. The system's HMI will be capable of being monitored remotely using a web browser, smart phone application, or equivalent. The HMI will be capable of sending email and text (short message service) notifications to alert personnel of system alarms and status alerts. All instrumentation will be rated for the maximum possible temperature and pressure of the system.

The following parameters will be monitored (inputs):

- Individual recovery well flow rates and total flow volume;
- DNAPL containment tank flow rates and total flow volume;
- DNAPL containment tank liquid level and volume;
- Air supply manifold line and individual air supply recovery well line pressures; and
- Status of leak detection devices.

The system parameters that will be controlled include (outputs):

- Individual recovery well solenoid valve timers.

2.7 System Startup

Following completion of the DNAPL recovery system installation, system startup will be initiated. Startup tests will be conducted to verify proper installation of system components and system operation settings will be adjusted to correspond as close to the design parameters as possible (e.g., optimal DNAPL recovery with minimal groundwater recovery). All fail safes will be tested to ensure proper operation.

The air compressor and solenoid valves will be activated to allow for air to be supplied to the pneumatic pumps and DNAPL will be pumped to the containment tank. Above and below grade system piping will be inspected for leaks. Once the pneumatic pumps and solenoid valves are confirmed to be operating properly field parameters (such as air compressor pressure and well flowrates) will be collected and recorded to verify that the system is operating within the design parameters and to optimize system performance. Based on the field measurements, system adjustments will be performed until the system is operating as close to the design parameters as possible.

Following the initial system start up, the system will be inspected at a minimum frequency of once per day for the first three days, then weekly for two weeks. Long-term inspections are expected to be conducted once per month initially with the potential to extend the duration between visits following confirmation of steady state operation. Details regarding the DNAPL recovery system OM&M will be provided in the SMP.

2.8 Waste Management

Waste generated during the DNAPL recovery system construction work will be appropriately containerized, labeled, and transported to a central staging area located on-site pending waste profiling results. Waste (e.g., soil, generated water, personal protective equipment, and spent disposable materials) will be segregated by waste type and placed in appropriate containers such as United Stated Department of Transportation (USDOT)-approved 55-gallon drums or roll-offs.

Each drum/container will be appropriately labeled (e.g., with the contents, generator, location, and date). Waste profile samples will be collected and analyzed as needed based on requirements of the receiving facility(ies). The waste will be profiled and transported under a manifest or bill of lading for off-site treatment/disposal at an appropriate facility in accordance with applicable rules and regulations.

3 Project Implementation Support

This section presents project implementation support activities to be completed to facilitate the construction of the DNAPL recovery system (described in Section 2).

3.1 Mobilization

Mobilization will be initiated following NYSDEC approval of the DNAPL Recovery System Design and solicitation of bids for equipment shed procurement and fabrication. In general, mobilization activities will include establishing personnel, equipment, and materials at the project area necessary to support the system construction activities. Mobilization activities include, but are not limited to, the following:

- Mobilizing necessary labor, equipment, materials, tools, and supervision to commence project work;
- Coordinating with a private utility locator prior to construction activities to mark all on-site underground utilities; and
- Providing and maintaining first-aid facilities and portable sanitary services for use by on-site personnel engaged in the remedial activities.

3.2 Site Preparation

Site preparation activities will generally consist of the following:

- Verifying site conditions and identifying, marking, and verifying the location(s) of all aboveground and underground utilities, equipment, and structures, as necessary, to implement the remedial activities.
- Maintaining appropriate clearances from utilities (e.g., active overhead electric lines, underground conduit/piping).
- Installing erosion and sediment controls (e.g., silt fence or filter sock) downgradient from the anticipated trenching/excavation areas and access areas anticipated to be disturbed during the construction activities. Anticipated erosion and sediment controls to be used during the construction of the DNAPL recovery system are discussed in Section 3.7.
- Posting project signage.
- Establishing survey control for trenching areas and work limits.
- Setting-up work zone community air monitoring equipment (to be relocated, as appropriate, based on wind direction) as required by the NYSDEC-approved CAMP (Arcadis 2019b).

3.3 Project Meetings and Inspections

Anticipated on-site project meetings to be attended by field personnel participating in the construction activities consist of:

- Daily Site Safety (Tailgate Safety) Meetings;
- Bi-weekly Construction Progress Meetings/Calls (NYSDEC and NYSDOH to be invited);

- Pre-Startup Safety Review; and
- Final Inspection.

Inspection activities will be performed under the oversight of a New York State Professional Engineer (NYS PE) or a person under their supervision or responsible charge.

3.4 Survey Control

Survey control will be maintained during construction work. Additionally, following the completion of the DNAPL recovery system construction, a land survey will be conducted in the project area to document the location of the DNAPL recovery system components and to facilitate the preparation of system construction as-built drawings. The survey control/land survey will be completed by a New York State Licensed Surveyor to identify the horizontal and vertical extent of the DNAPL recovery system components and casing location/elevation for the recovery wells and conveyance piping runs. Additional topographic survey information will also be obtained, including existing site features such perimeter fence, gates, equipment shed, adjacent roadways, etc.

The survey information (including final as-built information) will be used to document that the DNAPL recovery system construction activities have been completed consistent with the project design requirements. The survey information (including an as-built survey, sealed, and signed by a NYS licensed surveyor) will be included in the Final Engineering Report (FER) to be submitted to the NYSDEC.

3.5 Site Security, Control, and Access

Access to the project area during construction work will be restricted. Security around the work limits shall be maintained during both work and non-work hours. The level of security will be dependent on the activities being performed and location of activities. Security measures to be implemented may include: (1) temporary fencing and/or barriers; (2) warning tape and signs; (3) maintenance of sign-in/sign-out sheets; and/or (4) implementation of safe work practices.

3.6 Dust, Vapor and Odor Monitoring and Mitigation

As required by the CAMP approved by the NYSDEC (Arcadis 2019b), real-time airborne particulate monitoring will be conducted continuously during intrusive and/or potential dust generating activities (e.g., excavation, backfilling, material handling activities) using instrumentation equipped with electronic data-logging capabilities. Specifically, real-time monitoring for VOCs and particulate matter (dust) less than 10 micrometers in diameter will be performed using (at minimum) two air monitoring stations (upwind and downwind) to provide a proactive measure of protection for the downwind community.

As specified in the CAMP, NYSDEC will be notified in the event of an exceedance of an air monitoring action level for either VOCs or dust due to the field work and an exceedance report will be submitted to the NYSDEC and NYSDOH, within one business day of being informed of an exceedance. The notification will include the monitoring data, the cause of the exceedance, and corrective measures implemented (or to be implemented) in response to the exceedance. Real time exceedances will be addressed immediately.

Dust, vapors, and odors (if any) generated during intrusive activities will be addressed in accordance with the CAMP. The following control measures may be used during these activities, depending upon specific circumstances, visual observations, and air monitoring results:

- Water spray;
- BioSolve® PinkWater®; and
- Polyethylene sheeting.

Imported soil stockpiles will be covered with polyethylene sheeting and surrounded by appropriate erosion controls (see Section 3.7). Excess excavated materials will be direct loaded into containers for off-site transportation/disposal. If excavated materials are stockpiled on-site, stockpiles will be lined, bermed, and covered and surrounded by appropriate erosion controls.

3.7 Erosion and Sediment Controls

Erosion and sediment control measures will be installed and maintained in accordance with the latest edition of the *New York Standards and Specifications for Erosion and Sediment Control* (NYSDEC 2016) (or most recent). Erosion and sediment control measures anticipated to be used during the installation of the DNAPL recovery system will generally consist of silt fencing or filter sock or equivalent. Erosion and sediment controls will be installed downgradient from the anticipated trenching areas and access areas anticipated to be disturbed during the construction activities. The specific configuration and locations of the erosion and sediment controls will be determined in the field during the installation of the DNAPL recovery system.

4 System Operation, Maintenance, and Monitoring

This section presents an overview of the OM&M activities associated with the DNAPL recovery system. Details will be provided NYSDEC-required SMP to ensure continued operation, maintenance, optimization, monitoring, inspection and reporting of any mechanical or physical component of the remedy (NYSDEC 2025).

The DNAPL recovery system OM&M activities will generally include:

- Performance monitoring activities to evaluate the effectiveness of DNAPL recovery;
- OM&M activities to ensure reliable operation and performance in accordance with design-based parameters;
- Periodic DNAPL recharge testing to facilitate continuous optimization of DNAPL recovery while minimizing groundwater recovery; and
- As-needed removal of DNAPL from the above ground containment tank DNAPL for offsite recycling.

4.1 Performance Monitoring

Routine performance monitoring activities will be conducted to evaluate the effectiveness of DNAPL recovery. Prior to starting the recovery system, a baseline groundwater and DNAPL gauging and monitoring event will be conducted. Groundwater and DNAPL gauging events and recharge evaluation will be conducted on a quarterly basis during the first year of operation. This data will aid in determining the following:

- DNAPL thickness trends and treatment progress toward meeting remedial objectives for DNAPL; and
- Pump operational cycling settings (solenoid valve timer settings) to optimize DNAPL recovery and minimize groundwater recovery.

4.2 System Operation and Maintenance

A SMP will be developed for the site and submitted to NYSDEC. The SMP will provide details regarding the DNAPL recovery system operation and maintenance requirements, including manufacturer recommended mechanical and electrical maintenance requirements, equipment make and model, troubleshooting, and manufacturer contact information for DNAPL recovery system components.

OM&M activities will consist of periodic system inspections conducted in conjunction with the performance monitoring activities and in accordance with the current HASP. Routine monitoring activities will generally consist of collecting system pressure and flow readings from each leg of operation and in total, collecting cycle counter readings from each compressed air leg, confirming DNAPL tank level and level sensor calibration, inspecting secondary containment features, and ensuring overall proper operation of the system. Collected data will be documented and recorded. System operational settings (e.g., solenoid valve timers) will be evaluated and then adjusted, as necessary, to optimize system performance based on the site conditions. The monitoring and inspection frequencies may also be modified based on remote data collection or field observations.

5 Schedule and Reporting

The DNAPL installation activities are anticipated to be conducted late 2025. Following the completion of the DNAPL installation activities, a FER will be prepared and submitted to NYSDEC. The FER, as identified in DER-10, will document implementation of the complete remedial program for RH4 and is a mandatory prerequisite to the issuance of the certificate of completion.

Specific to the DNAPL recovery system, the FER will document the DNAPL recovery system installation and ongoing OM&M activities and results at the time of FER preparation as summarized below.

- A summary of the DNAPL recovery system installation activities, including:
  - Record drawings; and
  - Imported material documentation, including bills-of-lading/weight tickets showing materials originated from an approved source.
- Information and documentation regarding the final quantities of materials disposed of/treated off-site, including executed manifests and bills of lading.
- Inspection reports and photographs documenting installation and start-up activities.
- Community air monitoring data results.
- DNAPL recovery performance operational data (e.g., fluid flow and pressure data).
- Correspondence with the NYSDEC relevant to DNAPL recovery system installation and OM&M activities (e.g., meeting minutes).
- Green and sustainable remediation metrics summary.
- Other relevant information.

The FER will include the necessary FER certification of the remedial be certified by a NYS professional consistent with DER-10, Section 1.5.

6 References

Arcadis. 2018. Human Health Exposure Assessment – Red Hook 4, Site No. C224214, 44 and 62 Ferris Street/219 Sullivan Street, Brooklyn, Kings County, New York. June.

Arcadis. 2019a. Supplemental Remedial Investigation Report – Red Hook 4 Revised, Site No. C224214, 44 and 62 Ferris Street/219 Sullivan Street, Brooklyn, New York. March.

Arcadis. 2019b. Community Air Monitoring Plan, Red Hook 3 Site Number C224213 and Red Hook 4 Site Number C224214, Borough of Brooklyn, Kings County, New York. August 2019; Revised September 2019.

Arcadis. 2022a. Construction Completion Report. Red Hook 4 Site No. C224214, 44 and 62 Ferris Street/219 Sullivan Street, Brooklyn, Kings County, New York. February.

Arcadis. 2022b. C7 Notification Letter to NYSDEC. Red Hook 4 Site No. C224214, 44 and 62 Ferris Street/219 Sullivan Street, Brooklyn, Kings County, New York. September 12.

Arcadis. 2025. Remedial Action Work Plan – Red Hook 4, Site No. C224214, 44 and 62 Ferris Street/219 Sullivan Street, Brooklyn, Kings County, New York. February.

NYSDEC. 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 3. Errata Sheet Last Date Revised April 9, 2019. Available online at: https://dec.ny.gov/regulatory/regulations/remediation-guidance-and-policy-documents.

NYSDEC. 2011. DER-31 Green Remediation. Last Date Revised January 20, 2011. Available online at: https://dec.ny.gov/regulatory/regulations/remediation-guidance-and-policy-documents.

NYSDEC. 2016. New York Standards and Specifications for Erosion and Sediment Control. November 2016. Available online at: https://dec.ny.gov/environmental-protection/water/water-quality/stormwater/construction-stormwater-toolbox.

NYSDEC. 2023. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs. April.

NYSDEC. 2025. Decision Document, Red Hook 4 Properties, Brownfield Cleanup Program, Brooklyn, New York, Kings County, Site No. C224214. January. Available online at: https://extapps.dec.ny.gov/datadocs/c224214/.

Table

Table 1
Recovery Well Construction Details
Red Hook 4 - NYSDEC Brownfield Site C224214
Brooklyn, New York

Well ID	Diameter (in)	Total Borehole Depth (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	PVC Sump Length (ft)
A-RH4-RW1R	6	80	65	75	5
A-RH4-RW3	6	85	65	75	10
A-RH4-RW4	6	90	67	77	10
A-RH4-RW5	6	80	59.5	69.5	10

Notes:
bgs = below ground surface
ft = feet
in = inches

Figures

REFERENCE: BASE MAP USGS 7.5 MIN. TOPO. QUADS., JERSEY CITY, NJ-NY, 2016

0 1000' 2000'

Approximate Scale: 1 in. = 1000 ft.

BT RED HOOK, LLC
RED HOOK 4
44 AND 62 FERRIS STREET/219 SULLIVAN STREET
BROOKLYN, NEW YORK

DNAPL RECOVERY SYSTEM DESIGN REPORT

SITE LOCATION MAP

ARCADIS

FIGURE 1

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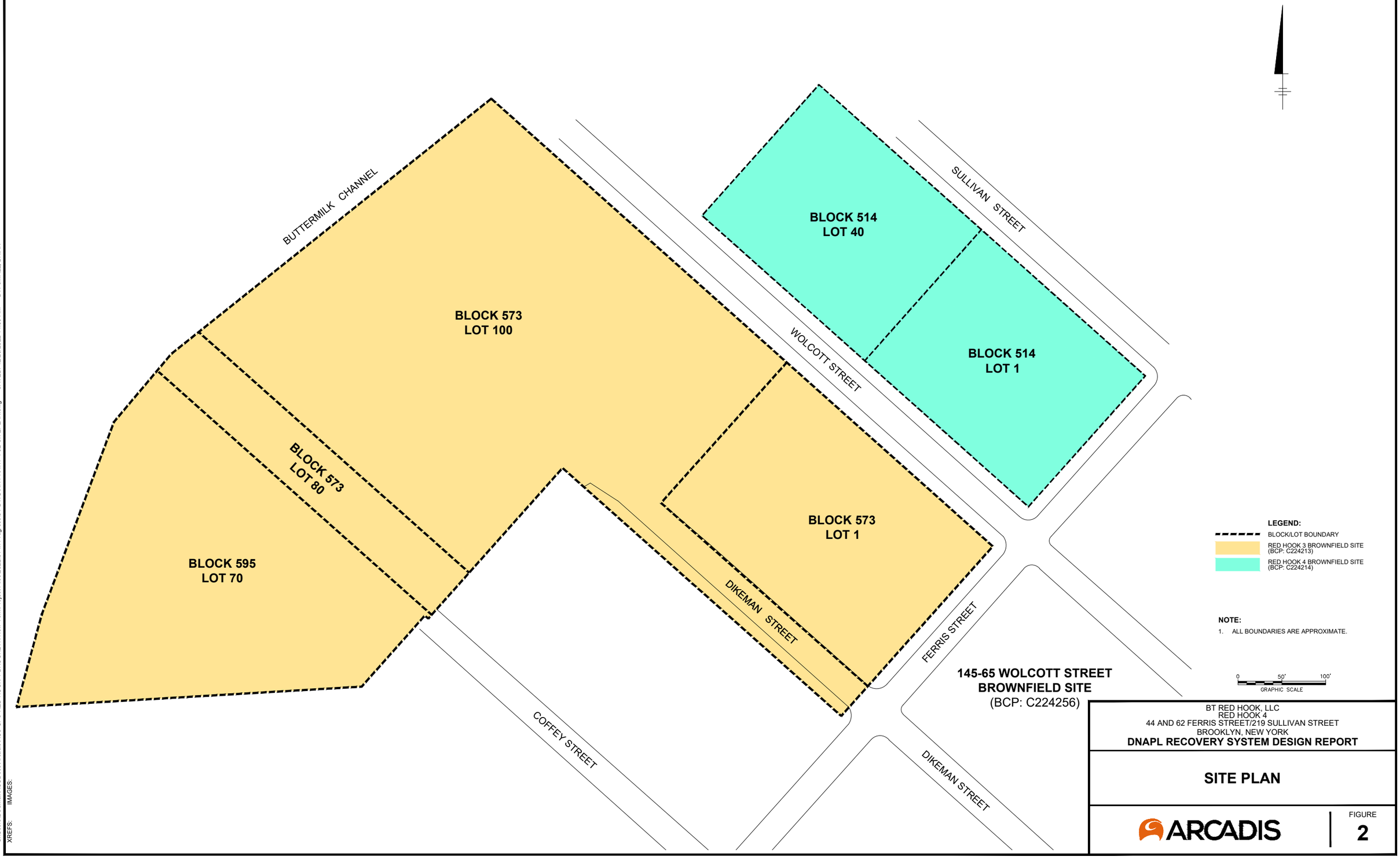
IMAGES: NJ_Jersey_City_20161101_TM_geo.jpg



BT RED HOOK, LLC
RED HOOK 4
44 AND 62 FERRIS STREET/219 SULLIVAN STREET
BROOKLYN, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN REPORT

SITE PLAN

ARCADIS

FIGURE
2

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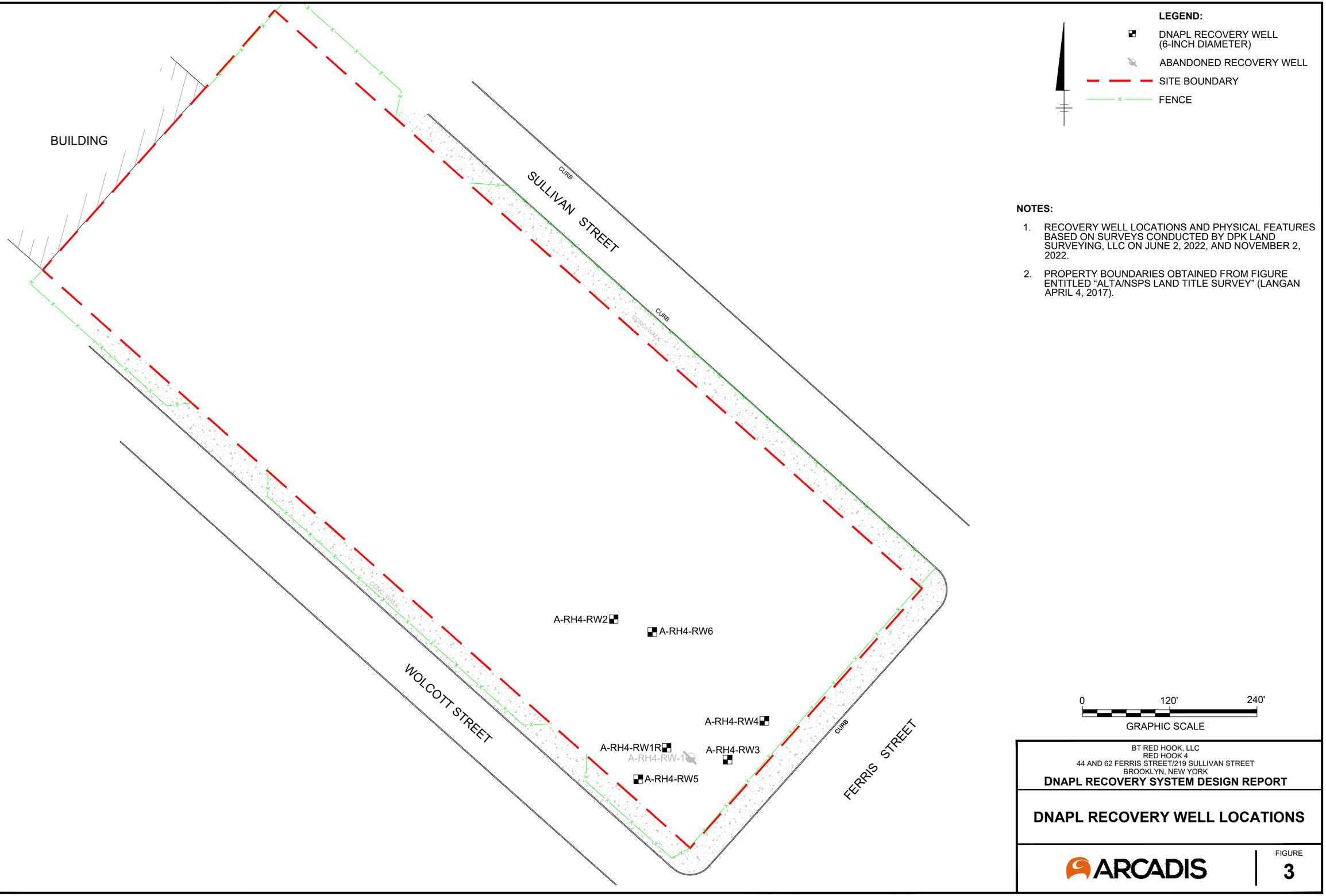

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Appendix A

DNAPL Composition Analytical Data

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Edison
777 New Durham Road
Edison, NJ 08817
Tel: (732)549-3900

Laboratory Job ID: 460-226368-1
Client Project/Site: Red Hook 4, NY

For:
ARCADIS U.S. Inc
One Lincoln Center
110 West Fayette St, Suite 300
Syracuse, New York 13202

Attn: Mr. Andy Korik

Authorized for release by:
1/22/2021 1:19:09 PM

Grace Chang, Project Manager II
(732)593-2579
Grace.Chang@Eurofinset.com

Table of Contents

Definitions/Glossary

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.

GC Semi VOA

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 460-226368-1

Laboratory: Eurofins TestAmerica, Edison

Narrative

CASE NARRATIVE

Client: ARCADIS U.S. Inc

Project: Red Hook 4, NY

Report Number: 460-226368-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

It should be noted that samples with elevated Reporting Limits (RLs) as a result of a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the RLs are unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes or interferences which exceed the calibration range of the instrument.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

RECEIPT

The sample was received on 1/12/2021 6:00 PM; the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 2.6º C.

Receipt Exceptions

The following sample was activated for Total Benzene and TCLP Benzene analysis by the client on 01/14/2021>: RH4-DNAPL-01-12-21 (460-226368-1)This analysis was not originally requested on the chain-of-custody (COC).

The following sample was activated for PCB analysis by the client on <1/19/2021 RH4-DNAPL-01-12-21 (460-226368-1)This analysis was not originally requested on the chain-of-custody (COC).

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

VOLATILE ORGANIC COMPOUNDS (GC-MS)

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for Volatile organic compounds (GC-MS) in accordance with EPA SW-846 Methods 8260C. The samples were prepared on 01/15/2021 and analyzed on 01/18/2021.

1,2-Dichloroethane-d4 (Surr), 4-Bromofluorobenzene, Dibromofluoromethane (Surr) and Toluene-d8 (Surr) failed the surrogate recovery criteria low for RH4-DNAPL-01-12-21 (460-226368-1). Refer to the QC report for details.

The following sample was diluted to bring the concentration of target analytes within the calibration range: RH4-DNAPL-01-12-21 (460-226368-1). Elevated reporting limits (RLs) are provided.

The following sample was diluted to bring the concentration of target analytes within the calibration range: RH4-DNAPL-01-12-21 (460-226368-1). Elevated reporting limits (RLs) are provided.

Job ID: 460-226368-1 (Continued)

Laboratory: Eurofins TestAmerica, Edison (Continued)

The following sample required a dilution due to the nature of the sample matrix: RH4-DNAPL-01-12-21 (460-226368-1). Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.

No other difficulties were encountered during the volatiles analysis.

All other quality control parameters were within the acceptance limits.

TCLP VOLATILE ORGANIC COMPOUNDS

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for TCLP Volatile Organic Compounds in accordance with EPA SW-846 Method 8260D - TCLP/1311. The samples were leached on 01/15/2021 and analyzed on 01/18/2021.

Sample RH4-DNAPL-01-12-21 (460-226368-1)[25X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No difficulties were encountered during the TCLP volatiles analysis.

All quality control parameters were within the acceptance limits.

POLYCHLORINATED BIPHENYLS (PCBS)

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for polychlorinated biphenyls (PCBs) in accordance with EPA SW-846 Method 8082A. The samples were prepared on 01/19/2021 and analyzed on 01/20/2021.

No difficulties were encountered during the PCBs analysis.

All quality control parameters were within the acceptance limits.

METALS

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for Metals in accordance with 6010D. The samples were leached on 01/19/2021, prepared on 01/21/2021 and analyzed on 01/22/2021.

No difficulties were encountered during the metals analysis.

All quality control parameters were within the acceptance limits.

METALS

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for Metals in accordance with 6010D. The samples were prepared on 01/19/2021 and analyzed on 01/20/2021.

No difficulties were encountered during the Metals analysis.

All quality control parameters were within the acceptance limits.

IGNITABILITY (FLASHPOINT)

Sample RH4-DNAPL-01-12-21 (460-226368-1) was analyzed for Ignitability (Flashpoint) in accordance with EPA SW-846 Method 1010A. The samples were analyzed on 01/19/2021.

No difficulties were encountered during the Ignitability (Flashpoint) analysis.

All quality control parameters were within the acceptance limits.

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Client Sample ID: RH4-DNAPL-01-12-21

Date Collected: 01/12/21 11:00
Date Received: 01/12/21 18:00

Lab Sample ID: 460-226368-1

Matrix: Waste

Method: 8260C - Volatile Organic Compounds by GC/MS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	**3800**		48	9.6	mg/Kg		01/15/21 19:31	01/18/21 01:02	5000

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*0*	*D*	*70 - 150*	*01/15/21 19:31*	*01/18/21 01:02*	*5000*
4-Bromofluorobenzene	*0*	*D*	*62 - 150*	*01/15/21 19:31*	*01/18/21 01:02*	*5000*
Dibromofluoromethane (Surr)	*0*	*D*	*54 - 150*	*01/15/21 19:31*	*01/18/21 01:02*	*5000*
Toluene-d8 (Surr)	*0*	*D*	*68 - 148*	*01/15/21 19:31*	*01/18/21 01:02*	*5000*

Method: 8260D - Volatile Organic Compounds by GC/MS - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzene	**8.9**		0.025	0.0050	mg/L			01/18/21 11:19	25

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*110*		*75 - 123*		*01/18/21 11:19*	*25*
4-Bromofluorobenzene	*104*		*76 - 120*		*01/18/21 11:19*	*25*
Dibromofluoromethane (Surr)	*104*		*77 - 124*		*01/18/21 11:19*	*25*
Toluene-d8 (Surr)	*95*		*80 - 120*		*01/18/21 11:19*	*25*

Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor 1016	170	U	1000	170	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1221	220	U	1000	220	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1232	260	U	1000	260	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1242	170	U	1000	170	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1248	170	U	1000	170	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1254	170	U	1000	170	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1260	170	U	1000	170	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor-1262	280	U	1000	280	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Aroclor 1268	280	U	1000	280	ug/Kg		01/19/21 22:13	01/20/21 14:46	1
Polychlorinated biphenyls, Total	280	U	1000	280	ug/Kg		01/19/21 22:13	01/20/21 14:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*132*		*48 - 150*	*01/19/21 22:13*	*01/20/21 14:46*	*1*
DCB Decachlorobiphenyl	*110*		*48 - 150*	*01/19/21 22:13*	*01/20/21 14:46*	*1*
Tetrachloro-m-xylene	*102*		*72 - 150*	*01/19/21 22:13*	*01/20/21 14:46*	*1*
Tetrachloro-m-xylene	*104*		*72 - 150*	*01/19/21 22:13*	*01/20/21 14:46*	*1*

Method: EPA 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**0.86**	**J**	1.0	0.51	mg/Kg		01/19/21 15:07	01/20/21 07:39	1

Method: EPA 6010D - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	**1.1**		1.0	0.29	mg/L		01/21/21 15:09	01/22/21 11:20	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**120**		1.00	1.00	Degrees F			01/19/21 20:35	1

Lab Chronicle

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Client Sample ID: RH4-DNAPL-01-12-21

Date Collected: 01/12/21 11:00
Date Received: 01/12/21 18:00

Lab Sample ID: 460-226368-1

Matrix: Waste

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5035			753131	01/15/21 19:31	AVM	TAL EDI
Total/NA	Analysis	8260C		5000	753329	01/18/21 01:02	MZS	TAL EDI
TCLP	Leach	1311			753047	01/15/21 14:09	BJB	TAL EDI
TCLP	Analysis	8260D		25	753414	01/18/21 11:19	CJM	TAL EDI
Total/NA	Prep	3580A			753884	01/19/21 22:13	JMS	TAL EDI
Total/NA	Analysis	8082A		1	753938	01/20/21 14:46	JHP	TAL EDI
TCLP	Leach	EPA 1311			343897	01/19/21 11:36	GRN	TAL PIT
TCLP	Prep	3050B			344245	01/21/21 15:09	TJO	TAL PIT
TCLP	Analysis	EPA 6010D		1	344364	01/22/21 11:20	RJR	TAL PIT
Total/NA	Prep	3050B			343937	01/19/21 15:07	TJO	TAL PIT
Total/NA	Analysis	EPA 6010D		1	344055	01/20/21 07:39	RJG	TAL PIT
Total/NA	Analysis	EPA 1010A		1	343961	01/19/21 20:35	NAF	TAL PIT

Laboratory References:

TAL EDI = Eurofins TestAmerica, Edison, 777 New Durham Road, Edison, NJ 08817, TEL (732)549-3900

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Accreditation/Certification Summary

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Laboratory: Eurofins TestAmerica, Edison

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
New York	NELAP	11452	04-01-21

Laboratory: Eurofins TestAmerica, Pittsburgh

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	19-033-0	06-27-21
California	State	2891	04-30-21
Connecticut	State	PH-0688	09-30-20 *
Florida	NELAP	E871008	06-30-21
Georgia	State	PA 02-00416	04-30-21
Illinois	NELAP	004375	06-30-21
Kansas	NELAP	E-10350	01-31-21
Kentucky (UST)	State	162013	04-30-21
Kentucky (WW)	State	KY98043	12-31-21
Louisiana	NELAP	04041	06-30-21
Maine	State	PA00164	03-06-22
Minnesota	NELAP	042-999-482	12-31-20 *
Nevada	State	PA00164	07-31-21
New Hampshire	NELAP	2030	04-05-21
New Jersey	NELAP	PA005	06-30-21
New York	NELAP	11182	04-01-21
North Carolina (WW/SW)	State	434	12-31-21
North Dakota	State	R-227	04-30-21
Oregon	NELAP	PA-2151	02-06-21
Pennsylvania	NELAP	02-00416	04-30-21
Rhode Island	State	LAO00362	12-31-20 *
South Carolina	State	89014	04-30-21
Texas	NELAP	T104704528	03-31-21
US Fish & Wildlife	US Federal Programs	058448	07-31-21
USDA	Federal	P-Soil-01	06-26-22
USDA	US Federal Programs	P330-16-00211	06-26-22
Utah	NELAP	PA001462019-8	05-31-21
Virginia	NELAP	10043	09-14-21
West Virginia DEP	State	142	02-01-21
Wisconsin	State	998027800	08-31-21

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Method	Method Description	Protocol	Laboratory
8260C	Volatile Organic Compounds by GC/MS	SW846	TAL EDI
8260D	Volatile Organic Compounds by GC/MS	SW846	TAL EDI
8082A	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL EDI
EPA 6010D	Metals (ICP)	SW846	TAL PIT
EPA 1010A	Ignitability, Pensky-Martens Closed-Cup Method	SW846	TAL PIT
1311	TCLP Extraction	SW846	TAL EDI
3050B	Preparation, Metals	SW846	TAL PIT
3580A	Waste Dilution	SW846	TAL EDI
5030C	Purge and Trap	SW846	TAL EDI
5035	Closed System Purge and Trap	SW846	TAL EDI
EPA 1311	TCLP Extraction	SW846	TAL PIT

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL EDI = Eurofins TestAmerica, Edison, 777 New Durham Road, Edison, NJ 08817, TEL (732)549-3900

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Sample Summary

Client: ARCADIS U.S. Inc
Project/Site: Red Hook 4, NY

Job ID: 460-226368-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
460-226368-1	RH4-DNAPL-01-12-21	Waste	01/12/21 11:00	01/12/21 18:00	

Chain of Custody Record 472600

eurofins | Environment Testing TestAmerica

NYC 222

Address: _____

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TAL-8210

Client Contact	Project Manager: Andrew Kozik	Site Contact: Chris Goldsmith	Date:	COC No:
Company Name: Arcadis	Tel/Email: andrew.kozik@arcadis.com	Lab Contact: Grace Chang	Carrier:	1 of 1 COCs
Address: 17-17 Rt 208 N	Analysis Turnaround Time			Sampler:
City/State/Zip: Fair Lawn, NJ 07410	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
Phone: 315-671-9323	TAT if different from Below 5 day			Walk-in Client:
Fax:	☐ 2 weeks			Lab Sampling:
Project Name: Red Hook 4	☑ 1 week			
Site: Red Hook 4, Brooklyn NY	☐ 2 days			Job / SDG No.: 27656
PO# 30060729	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	1020B-Lead metal	6010B-TCLP Pb	6010D-Lead	Sample Specific Notes:
RH4-DNAPL-01-12-21	1/12/21	1108	C	Product	4			X	X	X	-1

5-Day RUSH

460-226368 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

	Company	Date/Time		Company	Date/Time
Relinquished by:	Arcadis	1/12/21 1325	Received by:		1/22/1325
Relinquished by:		1/22/1640	Received by:		
Relinquished by:			Received in Laboratory by:		1/12/2027 1800

2.6°C IR11

Page 11 of 15

1/22/2021

Eurofins TestAmerica Edison
Receipt Temperature and pH Log

Job Number: 226268

Number of Coolers: 1 **IR Gun #** 11

Cooler Temperatures

	RAW	CORRECTED		RAW	CORRECTED		RAW	CORRECTED
Cooler #1:	2.6 °C	2.6 °C	Cooler #4:	°C	°C	Cooler #7:	°C	°C
Cooler #2:	°C	°C	Cooler #5:	°C	°C	Cooler #8:	°C	°C
Cooler #3:	°C	°C	Cooler #6:	°C	°C	Cooler #9:	°C	°C

TALS Sample Number	Ammonia (pH<2)	COD (pH<2)	Nitrate Nitrite (pH<2)	Metals* (pH<2)	Hardness (pH<2)	Pest (pH 5-9)	EPH or QAM (pH<2)	Phenols (pH<2)	Sulfide (pH>9)	TKN (pH<2)	TOC (pH<2)	Total Cyanide (pH>12)	Total Phos (pH<2)	Other	Other

If pH adjustments are required record the information below:

Sample No(s). adjusted: _____

Preservative Name/Conc.: _____ Volume of Preservative used (ml): _____

Lot # of Preservative(s): _____ Expiration Date: _____

The appropriate Project Manager and Department Manager should be notified about the samples which were pH adjusted.

** Samples for Metal analysis which are out of compliance must be acidified at least 24 hours prior to analysis.*

EDS-WI-038, Rev 4.1
10/22/2019

Initials: [signature] **Date:** 1 12 21

Eurofins TestAmerica, Edison
777 New Durham Road
Edison, NJ 08817
Phone: 732-549-3900 Fax: 732-549-3679

Chain of Custody Record

460-226368 Chain of Custody

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Client Information (Sub Contract Lab)	Sampler:	Lab PM: Chang, Grace	COC No: 460-60567.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Grace.Chang@Eurofinset.com	State of Origin: New York	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - New York	Job #: 460-226368-1
Address: 301 Alpha Drive, RIDC Park,	Due Date Requested: 1/22/2021		
City: Pittsburgh	TAT Requested (days):		
State, Zip: PA, 15238			
Phone: 412-963-7058(Tel) 412-963-2468(Fax)	PO #:		
Email:	WO #:		
Project Name: Red Hook 4, NY	Project #: 46029286		
Site:	SSOW#:		

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	1010A/ Ignitability, Pensky-Martens Closed-Cup	6010D/1311T_M TCLP Lead	6010D/3050B Lead	Total Number of containers	Special Instructions/Note:
			Preservation Code:								
RH4-DNAPL-01-12-21 (460-226368-1)	1/12/21	11:00 Eastern		Waste			X	X	X	3	

Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 1	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 1/14/21 1900	Company ETA	Received by:	Date/Time: 1/15/21 845	Company ETA PH
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 11/01/2020

Login Sample Receipt Checklist

Client: ARCADIS U.S. Inc

Job Number: 460-226368-1

Login Number: 226368
List Number: 1
Creator: Lysy, Susan

List Source: Eurofins TestAmerica, Edison

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	False	WASTE SAMPLE RECEIVED
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: ARCADIS U.S. Inc

Job Number: 460-226368-1

Login Number: 226368
List Number: 2
Creator: Jodis, Matthew V

List Source: Eurofins TestAmerica, Pittsburgh
List Creation: 01/15/21 05:19 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

INTEGRATED GEOSCIENCES LABORATORIES, LLC
*Environmental * Geotechnical * Core Analysis*

6016 Centralcrest Street • Houston, Texas 77092
Telephone (713) 316-1800 • Fax (877) 255-9953

May 25, 2021

Andrew Korik,
Project Manager,
Arcadis.
110 West Fayette St. Suite 300,
Syracuse, NY 13202.

Re: IGL File No: **2105-56**
Project Name: **Red Hook 4 DNAPL Recharge Study**
Project Number: **30088326**
Site Location: **62 Ferris Street Brooklyn, NY**

Subject: Final Report: Fluid Properties Package-(Density/Specific Gravity, Viscosity & Interfacial Tension – (ASTM D1481, ASTM D445, ASTM D971).

Dear Andrew Korik,

Please find enclosed report for Fluid Properties Package analyses conducted on fluid samples received from your "**Red Hook 4 DNAPL Recharge Study"** project. All analyses were performed by applicable ASTM, EPA, or API methodologies. The samples are currently in storage and will be retained for thirty days past the completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples.

Integrated Geosciences Laboratories appreciate the opportunity to be of service. If you have any questions or require additional information, please contact me or Emeka Anazodo at (713) 316-1800.

Sincerely,
Integrated Geosciences Laboratories, LLC.

Wumi Andrew.

Laboratory Technician.
Encl.

Integrated Geosciences Laboratories, LLC.

Project Name:	**Red Hook 4 DNAPL Recharge Study**	**IGL File No:**	**2105-56**
Project Number:	**30088326**	**Client:**	**Arcadis**
Site Location:	**62 Ferris Street Brooklyn, NY**	**Date Received:**	**5/19/2021**

TEST PROGRAM - 20210519

Serial Number	Sample ID	Date; Time Sampled	Depth (feet)	Matix Type	Fluid Properties Package ASTM D445, D1481, D971	Comments
Date Received: 20210519						
1	A-RH4-RW1R	5/12/2021; 09:05	N/A	Water & Product	X	1-[1L plastic bottle] 2- [250mL glass jars]
2	A-RH4-RW2	5/12/2021; 09:00	N/A	Water & Product	X	1-[1L plastic bottle] 2- [250mL glass jars]
	TOTAL				**2**	**6**

Laboratory Test Program Notes

1. Standard TAT for basic analysis is 10-15 business days.
2. Run at 55, 70 and 85 degrees F.

Integrated Geosciences Laboratories, LLC

IGL File No: 2105-56
Client: Arcadis
Report Date: 5/24/2021

VISCOSITY, DENSITY, and SPECIFIC GRAVITY DATA
(METHODOLOGY: ASTM D445, ASTM D1481, API RP40)

Project Name: Red Hook 4 DNAPL Recharge Study
Project No: 30088326
Site Location: 62 Ferris Street Brooklyn, NY

SAMPLE ID	IGL ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY	
						centistokes	centipoise
A-RH4-RW1R	1	Ground Water	55	1.0021	1.0001	1.260	1.260
			70	1.0053	0.9985	1.018	1.017
			85	1.0104	0.9962	0.834	0.830
A-RH4-RW1R	1	DNAPL	55	1.0399	1.0379	29.77	30.90
			70	1.0389	1.0318	19.65	20.28
			85	1.0400	1.0254	13.51	13.85
A-RH4-RW2	2	Ground Water	55	1.0022	1.0002	1.246	1.246
			70	1.0055	0.9987	1.009	1.007
			85	1.0107	0.9965	0.840	0.837
A-RH4-RW2	2	DNAPL	55	1.0383	1.0362	29.53	30.60
			70	1.0374	1.0303	19.79	20.39
			85	1.0384	1.0238	13.48	13.80

QUALITY CONTROL DATA

Date:	05/21/21
FLUID TYPE:	Cannon® CVS S3
TEMPERATURE, °F:	70
DENSITY, MEASURED:	0.8616
DENSITY, PUBLISHED:	0.8615
RPD:	0.01
VISCOSITY, MEASURED:	4.50
VISCOSITY, PUBLISHED:	4.47
RPD:	0.69

CVS Lot #: 17301

CVS = Certified Viscosity Standard

IGL File No: 2105-56
Client: Arcadis
Report Date: 5/24/2021

INTERFACIAL / SURFACE TENSION DATA
(METHODOLOGY: DuNuoy Method - ASTM D971)

Project Name: Red Hook 4 DNAPL Recharge Study
Project No: 30088326
Site Location: 62 Ferris Street Brooklyn, NY

PHASE PAIR		TEMPERATURE,	INTERFACIAL TENSION,
SAMPLE ID / PHASE	SAMPLE ID / PHASE	°F	Dynes/centimeter
A-RH4-RW1R Ground Water	Air	68.7	59.89
A-RH4-RW1R NAPL	Air	68.8	31.86
A-RH4-RW1R NAPL	A-RH4-RW1R Ground Water	68.5	10.85
A-RH4-RW2 Ground Water	Air	68.9	57.61
A-RH4-RW2 NAPL	Air	68.6	31.30
A-RH4-RW2 NAPL	A-RH4-RW2 Ground Water	68.6	10.11

QUALITY CONTROL DATA

Date: **05/21/21**
PHASE PAIR: DIWATER / AIR
TEMPERATURE, °F: 71.0
IFT, MEASURED: 69.4
IFT, PUBLISHED: 72.4
RPD: -4.18

INTEGRATED GEOSCIENCES LABORATORIES, LLC — CHAIN OF CUSTODY — PAGE 1 OF 1

(formerly PTS Laboratories, Inc.)

COMPANY: Arcadis

ADDRESS: CITY ZIP CODE
110 West Fayette St. Suite 300 Syracuse, NY

PROJECT MANAGER NAME: EMAIL PHONE #
Andrew Korik andrew.korik@arcadis.com 315.671.9323

PROJECT NAME: Red Hook 4 DNAPL Recharge Study

PROJECT NUMBER: 30088326

SITE LOCATION: 62 Ferris Street Brooklyn, NY

SAMPLER SIGNATURE:

PO #:

BILLING ADDRESS: See work authorization

BILLING EMAIL: See work authorization

BILLING CONTACT:

BILLING PHONE #:

TURNAROUND TIME

24 HOURS		5 DAYS	
72 HOURS		NORMAL	X
OTHERS:			

SAMPLE INTEGRITY (CHECK):
INTACT: TEMP (F)

IGL QUOTE NO/DATE

IGL FILE NO
2105-56

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FEET	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY/HYDRAULIC CONDUCTIVITY PACKAG	PORE FLUID SATURATION PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR-FILLED, WATER-FILLED	PROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA 9100/API RP40 OR ASTM D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or D6913 or D4464	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	RESIDUAL SATURATION BY WATER DRIVE			COMMENTS
A-RH4-RW1R	5/12/21	0905		3						X																	Run at 55, 70 and 85 degrees F
A-RH4-RW2	5/12/21	0900		3						X																	Run at 55, 70 and 85 degrees F
																											2 product samples
																											2 water samples

1. RELINQUISHED BY	2: RECEIVED BY:	1. RELINQUISHED BY	2: RECEIVED BY:
COMPANY Arcadis	COMPANY IGL	COMPANY	COMPANY
DATE 5/14/21 TIME 0800	DATE 5/19/21 TIME 0330	DATE TIME	DATE TIME

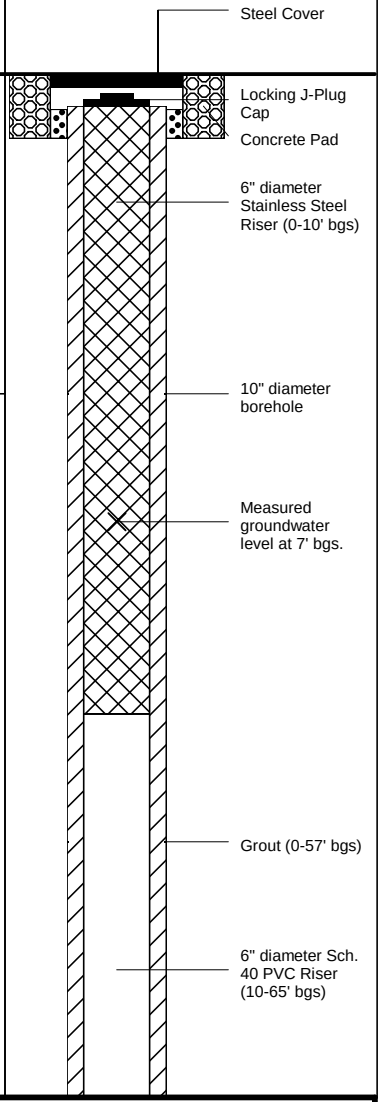
Appendix B

Recovery Well Construction Logs

Date Start/Finish:	12/8-12/9/2020	**Northing:**	186823.81	**Well/Boring ID:**	**A-RH4-RW1R**
Drilling Company:	Aquifer Drilling	**Easting:**	979892.96	**Client:**	BT Red Hook, LLC
Driller's Name:	B. Karshick	**Borehole Depth:**	80 feet	**Location:**	44 and 62 Ferris Street / 219 Sullivan Street, Brooklyn, NY
Drilling Method:	Sonic	**Casing Elevation**	7.79 ft AMSL		
Sampling Method:	5' x 3 1/2" Sonic Sampler	**Surface Elevation:**	8.03 ft AMSL		
Rig Type:	Sonic	**Descriptions By:**	C. Goldsmith		

Depth (feet bgs) / Elevation (feet AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
10						
0						Pre-cleared from 0-5' bgs.
5	NA	0-5	NA	NA		
5						
0						
10	NA	NA	NA	NA		Blind drilled to 50' bgs. See A-RH4-RW1 for stratigraphic descriptions from 0-50' bgs.
-5						
15						

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

Remarks: bgs = below ground surface; NAPL = non-aqueous phase liquid;
NA = not applicable/available; PID = photoionization detector; ppm = parts per million.

Horizontal Datum: NY State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

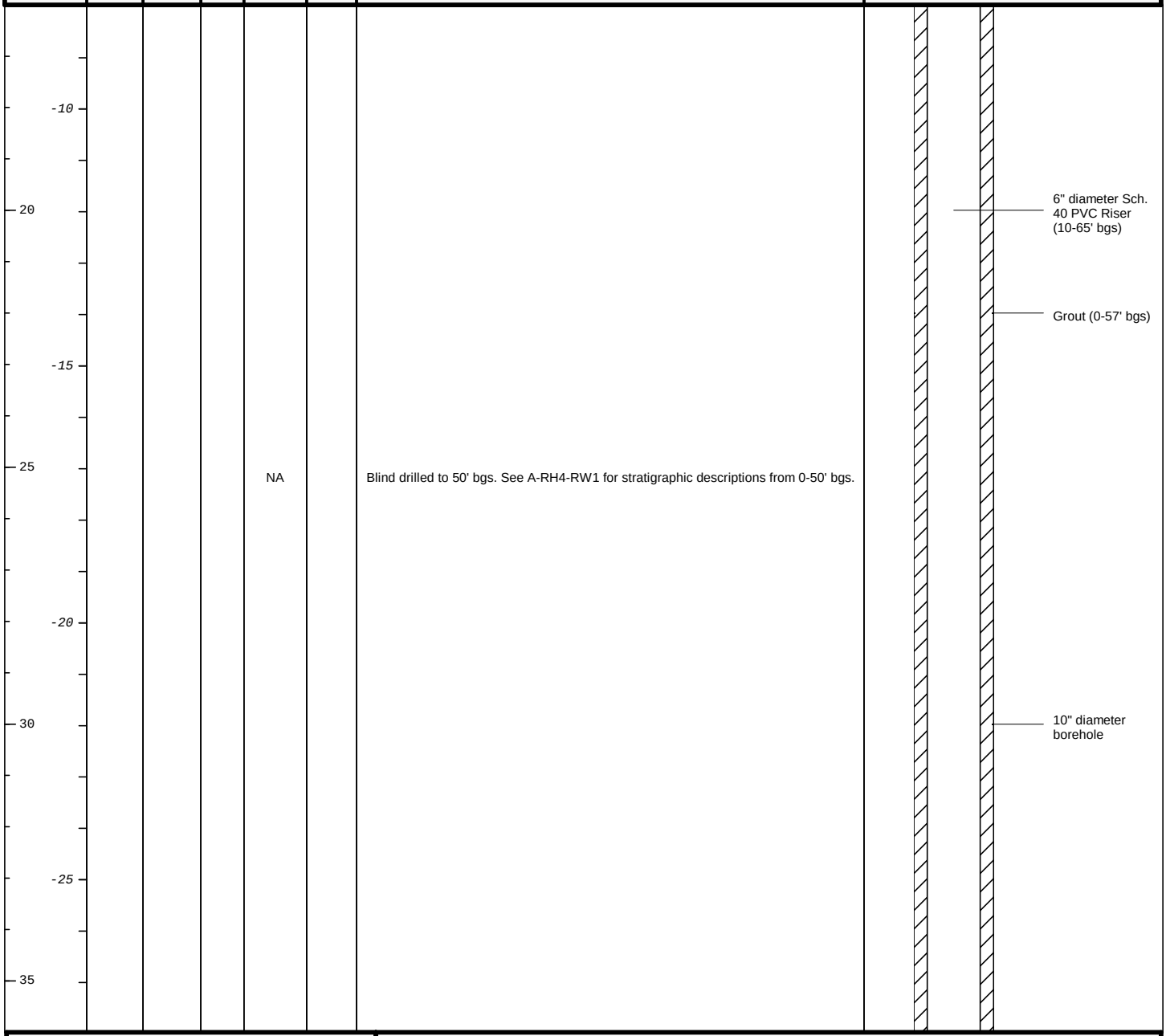
Well/Boring ID: **A-RH4-RW1R**

Borehole Depth: 80 feet

Site Location:

44 and 62 Ferris Street /
219 Sullivan Street,
Brooklyn, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
25 / -20				NA		Blind drilled to 50' bgs. See A-RH4-RW1 for stratigraphic descriptions from 0-50' bgs.	6" diameter Sch. 40 PVC Riser (10-65' bgs); Grout (0-57' bgs); 10" diameter borehole



ARCADIS Design & Consultancy for natural and built assets

Remarks: bgs = below ground surface; NAPL = non-aqueous phase liquid;
NA = not applicable/available; PID = photoionization detector; ppm = parts per million.

Horizontal Datum: NY State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: A-RH4-RW1R

Borehole Depth: 80 feet

Site Location:

44 and 62 Ferris Street /
219 Sullivan Street,
Brooklyn, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-30 / 40							6" diameter Sch. 40 PVC Riser (10-65' bgs)
-35 / 45				NA		Blind drilled to 50' bgs. See A-RH4-RW1 for stratigraphic descriptions from 0-50' bgs.	Grout (0-57' bgs)
-40 / 50						No recovery. Rock in drill head.	10" diameter borehole
-45 / 55	1	50-55	0.0	NA			
	2	55-60	1.5	0.0		Dark brown fine to medium SAND, trace Silt and fine round Gravel, loose, wet.	

ARCADIS Design & Consultancy for natural and built assets

Remarks: bgs = below ground surface; NAPL = non-aqueous phase liquid;
NA = not applicable/available; PID = photoionization detector; ppm = parts per million.

Horizontal Datum: NY State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

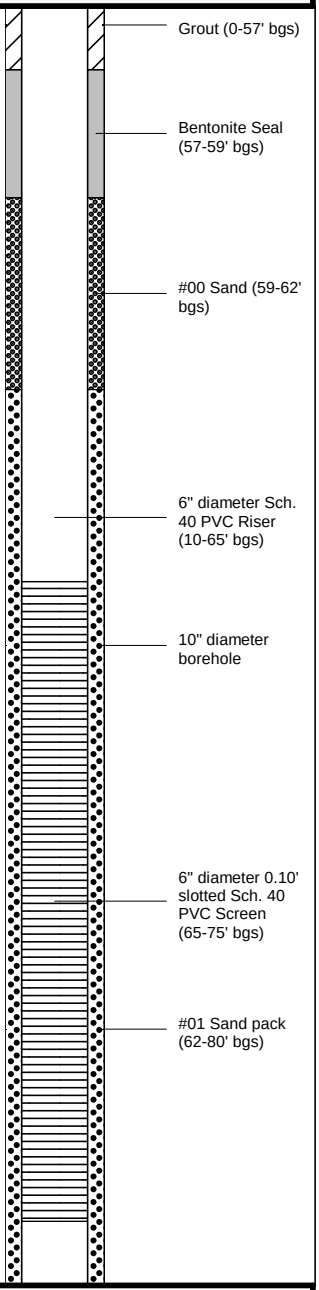
Well/Boring ID: **A-RH4-RW1R**

Borehole Depth: 80 feet

Site Location:

44 and 62 Ferris Street /
219 Sullivan Street,
Brooklyn, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
				0.0		Dark brown fine to medium SAND, trace Silt and fine round Gravel, loose, wet.
-50	2	55-60	1.5	0.0		
				0.0		
60				0.0		
				0.0		
	3	60-65	1.8	0.0		
-55				0.0		
				0.0		
65				279		Brown fine to medium SAND, trace Silt, wet, odor.
				251		
	4	65-70	5.0	278		
-60				352		Staining from 68-70' bgs.
				502		
70				480		Brown fine to medium SAND, trace Silt, soft, strong odor, staining, free-phase NAPL from 70-73' bgs
				816		
	5	70-75	5.0	411		
-65				1360		
				1105		
75	6	75-80	5.0	332		Brown fine to medium SAND, trace Silt, loose, wet, staining, odor.



Well/Boring Construction

ARCADIS Design & Consultancy for natural and built assets

Remarks: bgs = below ground surface; NAPL = non-aqueous phase liquid;
NA = not applicable/available; PID = photoionization detector; ppm = parts per million.

Horizontal Datum: NY State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW1R**

Borehole Depth: 80 feet

Site Location:

44 and 62 Ferris Street /
219 Sullivan Street,
Brooklyn, NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-70	6	75-80	5.0	126 257 29 27		Brown fine to medium SAND, trace Silt, loose, wet, staining, odor. Light brown fine to coarse SAND, some fine to coarse subangular Gravel, wet. End of boring at 80' bgs.	6" diameter Sch. 40 PVC Sump (75-80' bgs)
80							
-75							
85							
-80							
90							
-85							
95							

ARCADIS Design & Consultancy for natural and built assets

Remarks: bgs = below ground surface; NAPL = non-aqueous phase liquid;
NA = not applicable/available; PID = photoionization detector; ppm = parts per million.

Horizontal Datum: NY State Plane NAD 83
Vertical Datum: NAVD 88

Date Start/Finish:	4-29-22/5-2-22	**Northing:**	186816.99	**Well/Boring ID:**	**A-RH4-RW3**
Drilling Company:	Summit	**Easting:**	979927.93	**Client:**	BT Red Hook, LLC
Driller's Name:	M. Wilson	**Borehole Depth:**	85'	**Location:**	Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY
Drilling Method:	Rotary Sonic	**Casing Elevation**	7.47 ft AMSL		
Sampling Method:	5' x 3 1/2" Sonic Sampler	**Surface Elevation:**	8.04 ft AMSL		
Rig Type:	Rotary Sonic	**Descriptions By:**	K. Barber		

Depth (feet bgs) / Elevation (feet AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
10							
0						Blind Drilled (0-50' bgs)	Steel Cover Locking J-plug cap Concrete Pad
5							
0							Grout (1-59' bgs) 6" Diameter Sch. 40 PVC Riser (0.5-65' bgs)
5							
10							
-5							
15							

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW3**

Borehole Depth: 85'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
						Blind Drilled (0-50' bgs)	Grout (1-59' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-65' bgs)

-10
20
-15
25
-20
30
-25
35

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW3**

Borehole Depth: 85'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
						Blind Drilled (0-50' bgs)	Grout (1-59' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-65' bgs)
50 / -45	1	50-60'	9'	0		7.5YR 4/3 Brown medium to fine SAND, trace Silt, loose, moist, non-plastic.	
55							

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW3**

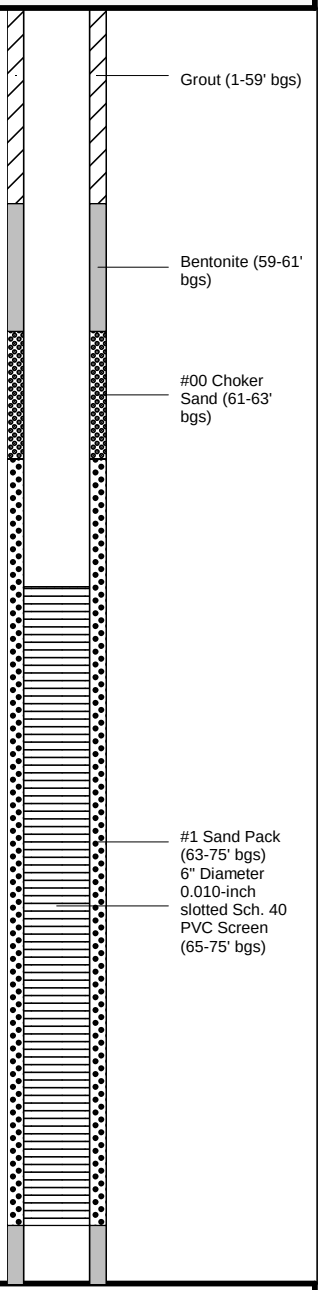
Borehole Depth: 85'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
-50						7.5YR 4/3 Brown medium to fine SAND, trace Silt, loose, moist, non-plastic.
60						
-55						
65	2	60-70'	9'	750 300 65		
-60						7.5YR 3/1 Very Dark Gray medium to fine SAND, trace Silt, strong odor, saturated with reddish-brown NAPL.
70						
-65	3	70-75'	4'	1 227 843		7.5YR 3/1 Very Dark Gray medium to fine SAND, trace Silt, strong odor, staining.
75						

Well/Boring Construction



ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW3**

Borehole Depth: 85'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-70 / 80	4	75-80'	5'	250 438 279		10YR 5/2 Dark Grayish Brown SILT, some medium to fine Sand, strong odor, semi dense, moist, slightly plastic.	
						Rock, Quartz, Mica, Gneiss	
						5YR 5/3 Reddish Brown coarse SAND, trace Silt, mild odor, loose, moist, non-plastic. Sheen observed at top of recovered soils, possibly from slough.	6" Diameter Sch. 40 PVC Sump (75-85' bgs)
-75 / 85	5	80-85'	5'	111.8 95.7 7.47		5YR 5/3 Reddish Brown coarse SAND, no odor, loose, moist, non-plastic.	Bentonite (75-85' bgs) 2-Inches Bentonite
-80 / 90							
-85 / 95							

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Date Start/Finish:	5-4-22	**Northing:**	186839.21	**Well/Boring ID:**	**A-RH4-RW4**
Drilling Company:	Summit	**Easting:**	979949.12	**Client:**	BT Red Hook, LLC
Driller's Name:	M. Wilson	**Borehole Depth:**	90'	**Location:**	Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY
Drilling Method:	Rotary Sonic	**Casing Elevation**	6.56 ft AMSL		
Sampling Method:	5' x 3 1/2" Sonic Sampler	**Surface Elevation:**	7.13 ft AMSL		
Rig Type:	Rotary Sonic	**Descriptions By:**	K. Barber		

Depth (feet bgs) / Elevation (feet AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
10							
0						Blind Drilled (0-60' bgs)	Steel Cover Locking J-plug cap Concrete Pad
5							
0							Grout (1-61' bgs) 6" Diameter Sch. 40 PVC Riser (0.5-67' bgs)
5							
10							
-5							
15							

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW4**

Borehole Depth: 90'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
						Blind Drilled (0-60' bgs)	Grout (1-61' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-67' bgs)

-10
20
-15
25
-20
30
-25
35

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW4**

Borehole Depth: 90'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-30 / 40 / -35 / 45 / -40 / 50 / -45 / 55						Blind Drilled (0-60' bgs)	Grout (1-61' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-67' bgs)

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

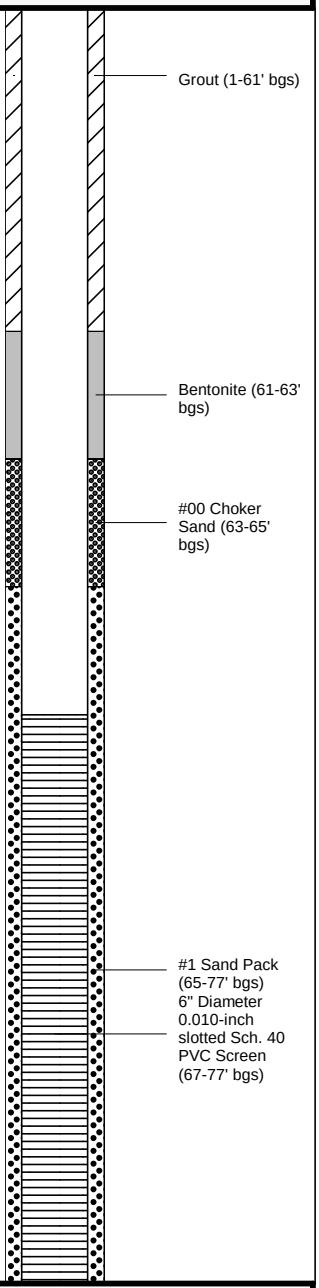
Well/Boring ID: **A-RH4-RW4**

Borehole Depth: 90'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
-50						Blind Drilled (0-60' bgs)
60						
-55	1	60-65'	5'	0.1		7.5YR 4/3 Brown medium to fine SAND, some Silt, semi dense, no odor, moist, non-plastic.
65						
-60	2	65-70'	5'	866.1 743.1		10YR 3/1 Very Dark Gray medium to fine SAND, some Silt, semi dense, strong odor, moist, non-plastic. Saturated with reddish-brown NAPL.
70						
-65	3	70-75'	4.5'	1601.3 1234		10YR 3/1 Very Dark Gray medium to fine SAND, some Silt, semi dense, strong odor, moist, non-plastic. Saturated with reddish-brown NAPL.
75						7.5YR 5/2 Brown fine SAND and SILT, dense, strong odor, moist, slightly plastic, decreased NAPL content below 74 feet bgs.



ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW4**

Borehole Depth: 90'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-70	4	75-80'	5'	1347 1243		7.5YR 5/2 Brown fine SAND and SILT, dense, strong odor, moist, slightly plastic, NAPL staining.	
						5YR 4/4 Reddish Brown Sandy SILT, dense, strong odor, moist, non-plastic. Trace drag-down sheen.	
80							
-75	5	80-85'	4.5'	4.6 6.3		5YR 4/4 Reddish Brown Sandy SILT, loose, no odor, moist, non-plastic. Trace sheen in slough.	6" Diameter Sch. 40 PVC Sump (77-87' bgs)
85							Bentonite (77-90' bgs)
-80	6	85-90'	1.25'	1.2		7.5 YR 5/2 Brown medium to coarse SAND, trace Silt, no odor, loose, moist, non-plastic.	Bentonite (77-90' bgs)
90							
-85							
95							

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Date Start/Finish:	5-16-22	**Northing:**	186805.71	**Well/Boring ID:**	**A-RH4-RW5**
Drilling Company:	Summit	**Easting:**	979876.60	**Client:**	BT Red Hook, LLC
Driller's Name:	M. Wilson	**Borehole Depth:**	80'	**Location:**	Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY
Drilling Method:	Rotary Sonic	**Casing Elevation**	7.67 ft AMSL		
Sampling Method:	5' x 3 1/2" Sonic Sampler	**Surface Elevation:**	8.18 ft AMSL		
Rig Type:	Rotary Sonic	**Descriptions By:**	K. Barber		

Depth (feet bgs) / Elevation (feet AMSL)	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
10 / 0						Blind Drilled (0-50' bgs)	Steel Cover; Locking J-plug cap; Concrete Pad; Grout (1-53.5' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-59.5' bgs)
5 / -5							
0 / -10							
-5 / -15							

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW5**

Borehole Depth: 80'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
						Blind Drilled (0-50' bgs)	Grout (1-53.5' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-59.5' bgs)

-10
20
-15
25
-20
30
-25
35

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW5**

Borehole Depth: 80'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-30 / 40						Blind Drilled (0-50' bgs)	Grout (1-53.5' bgs); 6" Diameter Sch. 40 PVC Riser (0.5-59.5' bgs)
-35 / 45							
-40 / 50							
-45 / 55	1	50-60'	8'	0.2		7.5YR 4/3 Brown medium to coarse SAND, trace Silt, semi dense, no odor, moist, non-plastic.	Bentonite (53.5-55.5' bgs)

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW5**

Borehole Depth: 80'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-50 / 60							#00 Choker Sand (55.5-57.5' bgs)
	2	60-65'	4'	35.5 1365 2119 1976		7.5YR 4/3 Brown medium to coarse SAND, trace Silt, semi dense, strong odor, moist, non-plastic, NAPL staining.	
-55 / 65						7.5 YR 2/1 Very Dark Gray coarse SAND, trace Silt, semi dense, strong odor, moist, non-plastic. Saturated with reddish-brown NAPL.	#1 Sand Pack (57.5-69.5' bgs) 6" Diameter 0.010' slotted Sch. 40 PVC Screen (59.5-69.5' bgs)
-60 / 70	3	65-70'	4.5'	1311 2177 665		7.5YR 3/1 Very Dark Gray medium to fine SAND and SILT, semi dense, strong odor, NAPL staining decreasing with depth, moist, slightly plastic.	
						7.5 YR 5/2 Brown medium SAND and SILT, semi dense, strong odor, slight sheen in slough, moist, slightly plastic.	
-65 / 75	4	70-75'	5'	50 636 1215 297		7.5 YR 3/1 Very Dark Gray medium SAND and SILT, semi dense, strong odor, Saturated with Reddish-brown NAPL, moist, slightly plastic. (4-inch NAPL seam)	Bentonite (69.5-80' bgs)
						5YR 4/4 Reddish Brown medium SAND and SILT, slight sheen, semi dense, moist, slightly plastic.	6" Diameter Sch. 40 PVC Sump (69.5-79.5' bgs)
						7.5 YR 4/3 Brown Coarse SAND, trace Silt, slight odor, slight staining, wet, non-plastic. Trace sheen in slough.	

Remarks: Boring hand cleared to 5' bgs.

Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

ARCADIS Design & Consultancy for natural and built assets

Client: BT Red Hook, LLC

Well/Boring ID: **A-RH4-RW5**

Borehole Depth: 80'

Site Location:

Red Hook 4: 44 and 62 Ferris St. / 219 Sullivan St., Brooklyn NY

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
-70	5	75-80'	2'	112 50 32 29		7.5 YR 4/3 Brown Coarse SAND, trace Silt, slight odor, slight staining, wet, non-plastic. Trace sheen in slough.	Bentonite (69.5-80' bgs) 6" Diameter Sch. 40 PVC Sump (69.5-79.5' bgs) 6-Inches Bentonite
80							
-75							
85							
-80							
90							
-85							
95							

ARCADIS Design & Consultancy for natural and built assets

Remarks: Boring hand cleared to 5' bgs.

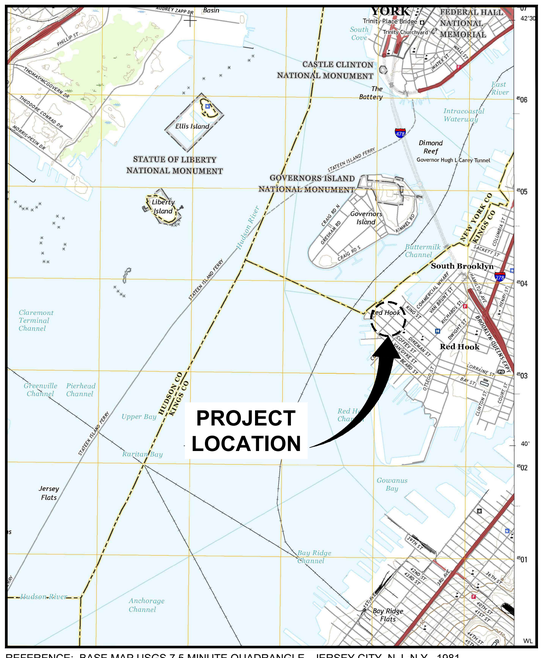
Horizontal Datum: NY Long Island State Plane NAD 83
Vertical Datum: NAVD 88

Appendix C

Design Drawings – Red Hook 4 DNAPL Recovery System Design

DESIGN DRAWINGS

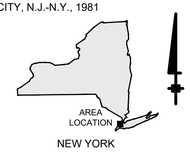
RED HOOK 4
DNAPL RECOVERY SYSTEM DESIGN



REFERENCE: BASE MAP USGS 7.5 MINUTE QUADRANGLE., JERSEY CITY, N.J.-N.Y., 1981

LOCATION MAP

0 2000' 4000'
GRAPHIC SCALE



AREA LOCATION
NEW YORK

DATE ISSUED / DATE REVISED
JULY 2025

BT RED HOOK, LLC
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK

INDEX TO DRAWINGS

ARCADIS

ARCADIS OF NEW YORK, INC.

GENERAL NOTES:

SAFETY:

1. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. SUCH RESPONSIBILITY DOES NOT RELIEVE SUBCONTRACTORS OF THEIR RESPONSIBILITY FOR THE SAFETY OF PERSONS OR PROPERTY IN THE PERFORMANCE OF THEIR WORK, NOR FOR COMPLIANCE WITH APPLICABLE SAFETY LAWS AND REGULATIONS. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE THE NECESSARY PROTECTION TO PREVENT DAMAGE, INJURY, OR LOSS TO: ALL PERSONS ON THE SITE, REGARDLESS OF EMPLOYER, OR WHO MAY BE AFFECTED BY THE WORK; ALL THE WORK AND MATERIALS AND EQUIPMENT TO BE INCORPORATED THEREIN, WHETHER IN STORAGE ON OR OFF THE SITE; AND OTHER PROPERTY AT THE SITE OR ADJACENT THERETO, INCLUDING TREES, SHRUBS, LAWNS, WALKS, PAVEMENTS, ROADWAYS, STRUCTURES, OTHER WORK IN PROGRESS, UTILITIES, AND UNDERGROUND FACILITIES NOT DESIGNATED FOR REMOVAL, RELOCATION, OR REPLACEMENT IN THE COURSE OF CONSTRUCTION.

2. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS AND REGULATIONS RELATING TO THE SAFETY OF PERSONS OR PROPERTY, OR TO THE PROTECTION OF PERSONS OR PROPERTY FROM DAMAGE, INJURY, OR LOSS; AND SHALL ERECT AND MAINTAIN ALL NECESSARY SAFEGUARDS FOR SUCH SAFETY AND PROTECTION. CONTRACTOR SHALL NOTIFY OWNER, CONSTRUCTION MANAGER, AND ENGINEER; THE OWNERS OF ADJACENT PROPERTY, UNDERGROUND FACILITIES, AND OTHER UTILITIES; AND OTHER CONTRACTORS AND UTILITY OWNERS PERFORMING WORK AT OR ADJACENT TO THE SITE, WHEN PROSECUTION OF THE WORK MAY AFFECT THEM, AND SHALL COOPERATE WITH THEM IN THE PROTECTION, REMOVAL, RELOCATION, AND REPLACEMENT OF THEIR PROPERTY OR WORK IN PROGRESS.

3. EACH EMPLOYER WORKING AT THE SITE SHALL DEVELOP AND IMPLEMENT A WRITTEN HEALTH AND SAFETY PLAN FOR ITS EMPLOYEES AND OTHER INDIVIDUALS FOR WHOM SUCH EMPLOYER IS RESPONSIBLE. HEALTH AND SAFETY PLAN SHALL INCLUDE PROCEDURES THAT WILL BE USED TO ENSURE THE SAFE HANDLING OF CONTAMINANTS DURING EXCAVATING, LOADING, AND TRANSPORTING ACTIVITIES. HEALTH AND SAFETY PLAN SHALL COMPLY WITH 29 CFR 1904, 29 CFR 1910, 29 CFR 1926, OTHER LAWS AND REGULATIONS, AND SPECIFICATIONS SECTION 01 35 29 (CONTRACTOR'S HEALTH AND SAFETY PLAN).

EXISTING CONDITIONS, STRUCTURES, AND UNDERGROUND FACILITIES:

1. SITE CONDITIONS AT THE TIME OF CONSTRUCTION MAY BE DIFFERENT THAN THOSE SHOWN OR INDICATED ON THE DRAWINGS. CONTRACTOR SHALL VERIFY THE ACCURACY AND COMPLETENESS OF THE INFORMATION SHOWN OR INDICATED ON THE DRAWINGS BEFORE STARTING WORK. PROMPTLY NOTIFY CONSTRUCTION MANAGER AND ENGINEER IN WRITING OF ANY DISCREPANCIES WITH THE POTENTIAL TO AFFECT THE WORK.

2. UNDERGROUND FACILITIES KNOWN TO OWNER AND ENGINEER, EXCEPT WATER, GAS, SEWER, ELECTRIC, AND COMMUNICATIONS SERVICES TO INDIVIDUAL BUILDINGS AND PROPERTIES, ARE SHOWN ON THE DRAWINGS. INFORMATION SHOWN FOR UNDERGROUND FACILITIES IS THE BEST AVAILABLE TO OWNER AND ENGINEER BUT, IS NOT GUARANTEED TO BE CORRECT OR COMPLETE.

3. CONTRACTOR SHALL EXPLORE AHEAD OF SELECTIVE TRENCHING, EXCAVATING, OR OTHER SUBSURFACE WORK, AND SHALL SUFFICIENTLY UNCOVER UNDERGROUND FACILITIES THAT WILL OR MAY INTERFERE WITH THE WORK TO DETERMINE THEIR LOCATION, TO PREVENT DAMAGE TO UNDERGROUND FACILITIES, AND TO PREVENT SERVICE INTERRUPTION TO STRUCTURES AND PROPERTIES SERVED BY UNDERGROUND FACILITIES.

4. COORDINATE WITH UTILITY OWNERS FOR SHUT OFF OF SERVICES IN ACTIVE PIPING AND CONDUITS, AND FOR TESTING, SHUT OFF OF SERVICES, AND DRAINING, PURGING, OR DE-ENERGIZING WHERE SPECIFIED OR REQUIRED OF PIPING AND CONDUITS OF UNKNOWN STATUS. WHEN REQUIRED BY UTILITY OWNER, OWNER WILL ASSIST CONTRACTOR WITH UTILITY OWNER NOTIFICATIONS. COMPLETELY REMOVE BURIED PIPING AND CONDUITS INDICATED FOR REMOVAL AND NOT OTHERWISE INDICATED AS BEING ABANDONED OR TO REMAIN IN PLACE.

5. CONTRACTOR SHALL SUSTAIN IN THEIR PLACES AND PROTECT FROM DIRECT OR INDIRECT INJURY ALL UNDERGROUND FACILITIES AND SURFACE STRUCTURES LOCATED WITHIN OR ADJACENT TO THE LIMITS OF THE WORK. SUCH SUSTAINING AND SUPPORTING SHALL BE DONE CAREFULLY AND AS REQUIRED BY THE PARTY OWNING OR CONTROLLING SUCH FACILITY OR STRUCTURE.

6. IF CONTRACTOR DAMAGES AN UNDERGROUND FACILITY, OR THE MATERIAL SURROUNDING OR SUPPORTING THE SAME, CONTRACTOR SHALL IMMEDIATELY NOTIFY OWNER, ENGINEER, AND THE OWNER OF THE DAMAGED FACILITY AND RESTORE IT TO ITS PRE-CONSTRUCTION CONDITION, IN ACCORDANCE WITH REQUIREMENTS OF THE OWNER OF THE DAMAGED FACILITY AND THE GENERAL CONDITIONS. SUCH REPAIR OR RESTORATION WORK SHALL BE PERFORMED AT NO ADDITIONAL COST TO OWNER.

7. DO NOT INTERRUPT EXISTING UTILITIES SERVING FACILITIES OCCUPIED AND USED BY OWNER OR OTHERS, EXCEPT WHEN ALLOWED IN WRITING BY ENGINEER AFTER ACCEPTABLE TEMPORARY UTILITY SERVICES ARE PROVIDED BY CONTRACTOR FOR THE AFFECTED STRUCTURE OR PROPERTY.

GENERAL REFERENCE DRAWINGS:

WASTE MANAGEMENT:

1. CONTRACTOR IS RESPONSIBLE FOR SCHEDULING, COORDINATING, LOADING, TRANSPORTING, AND DISPOSING OF WASTE MATERIALS AT APPROPRIATE, OWNER-APPROVED FACILITIES IN ACCORDANCE WITH LAWS AND REGULATIONS AND SPECIFICATION SECTIONS 01 74 19 (CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL) AND 02 60 05 (CONTAMINATED WASTE MANAGEMENT AND DISPOSAL).

2. EXISTING SITE FEATURES NOT SPECIFICALLY SHOWN OR INDICATED ON THE DRAWINGS MAY REQUIRE REMOVAL BY CONTRACTOR TO ACCOMMODATE THE WORK. THE REMOVAL OF SUCH FEATURES SHALL NOT BE PERFORMED WITHOUT THE PRIOR APPROVAL OF OWNER OR ENGINEER.

3. ALL WATER GENERATED DURING THE PROJECT (E.G., FROM EXCAVATION/MATERIAL DEWATERING, DECONTAMINATION OF EQUIPMENT, ETC.) SHALL BE COLLECTED, AND CONTAINERIZED FOR OFFSITE DISPOSAL.

SITE MANAGEMENT AND TEMPORARY CONTROLS:

1. CONTRACTOR IS RESPONSIBLE FOR ALL FEDERAL, STATE, AND LOCAL PERMITS THAT MAY BE REQUIRED TO PERFORM THE WORK.

2. ALL WORK SHALL BE PERFORMED WITHIN THE PROJECT WORK LIMITS. NO WORK SHALL BE PERFORMED BEYOND THE PROJECT WORK LIMITS WITHOUT OWNER'S AND/OR ENGINEER'S PRIOR APPROVAL.

3. ALL WORK SHALL BE PERFORMED IN A NEAT AND ORDERLY MANNER, IN CONFORMANCE WITH BEST MODERN TRADE PRACTICE, AND BY COMPETENT, EXPERIENCED PERSONNEL. MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH ALL LAWS AND REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

4. CONSTRUCTION VEHICLES AND EQUIPMENT SHALL BE DECONTAMINATED BEFORE ARRIVING ON-SITE AND BEFORE LEAVING THE SITE. VEHICLES AND EQUIPMENT THAT COME IN CONTACT WITH CONTAMINATED MATERIAL SHALL BE APPROPRIATELY DECONTAMINATED BEFORE HANDLING OFF-SITE FILL MATERIALS OR ON-SITE MATERIALS.

5. OWNER SHALL PROVIDE AND MAINTAIN SITE SECURITY MEASURES TO PREVENT UNAUTHORIZED ENTRY OF PERSONS/VEHICLES INTO THE PROJECT WORK LIMITS DURING BOTH WORKING AND NON-WORKING HOURS (24 HOURS A DAY, SEVEN DAYS A WEEK).

6. SURFACE STRUCTURES AND FACILITIES DAMAGED OR DISTURBED DURING THE WORK SHALL BE RESTORED AT CONTRACTOR'S EXPENSE TO THEIR ORIGINAL CONDITION.

7. CONTRACTOR SHALL COMPLY WITH ALL NOISE ORDINANCES AND MAKE EVERY EFFORT TO MINIMIZE NOISE CAUSED BY CONSTRUCTION OPERATIONS. EQUIPMENT SHALL BE EQUIPPED WITH SILENCERS OR MUFFLERS DESIGNED TO OPERATE WITH THE LEAST POSSIBLE NOISE IN COMPLIANCE WITH LAWS AND REGULATIONS.

8. CONTRACTOR SHALL PROVIDE MEANS, METHODS, AND FACILITIES REQUIRED TO CONTROL NAPL-RELATED ODORS, VAPORS, AND DUST GENERATED DURING THE WORK.

9. COMMUNITY AIR MONITORING WILL BE PERFORMED ON A CONTINUOUS BASIS DURING ALL GROUND INTRUSIVE WORK OR DUST-GENERATING WORK.

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: **TERRY W. YOUNG**

Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by	**Drawn by**	**Checked by**
DJR	JDL	TWY

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

ARCADIS

ARCADIS OF NEW YORK, INC.

BT RED HOOK, LLC ● RED HOOK, NEW YORK
RED HOOK 4
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

GENERAL NOTES

ARCADIS Project No.
30034367.00001

Date
JULY 2025

ARCADIS
110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

G-002

BUTTERMILK CHANNEL

BLOCK 573
LOT 100

BLOCK 573
LOT 80

BLOCK 595
LOT 70

BLOCK 514
LOT 40

BLOCK 514
LOT 1

BLOCK 573
LOT 1

SULLIVAN STREET

WOLCOTT STREET

DIKEMAN STREET

FERRIS STREET

COFFEY STREET

DIKEMAN STREET

145-65 WOLCOTT STREET
BROWNFIELD SITE
(BCP: C224256)

LEGEND:

- BLOCK/LOT BOUNDARY
- RED HOOK 3 BROWNFIELD SITE (BCP: C224213)
- RED HOOK 4 BROWNFIELD SITE (BCP: C224214)

NOTE:

1. ALL BOUNDARIES ARE APPROXIMATE.

0 50' 100'
GRAPHIC SCALE

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Professional Engineer's Name: **TERRY W. YOUNG**
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NY	7/16/2025	CG
Designed by: DJR	Drawn by: JDL	Checked by: TWY

STATE OF NEW YORK · TERRY WILLIAM YOUNG · 074847 · LICENSED PROFESSIONAL ENGINEER

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

SITE PLAN

ARCADIS Project No.
30034367.00001

Date
JULY 2025

ARCADIS
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STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

G-003

LEGEND:

- DNAPL RECOVERY WELL (6-INCH DIAMETER)
- SITE BOUNDARY
- FENCE

NOTES:

1. RECOVERY WELL LOCATIONS AND PHYSICAL FEATURES BASED ON SURVEYS CONDUCTED BY DPK LAND SURVEYING, LLC ON JUNE 2, 2022, AND NOVEMBER 2, 2022.
2. PROPERTY BOUNDARIES OBTAINED FROM FIGURE ENTITLED “ALTA/NSPS LAND TITLE SURVEY” (LANGAN APRIL 4, 2017).
3. TRAILER SHOWN IN AERIAL IMAGING IS NO LONGER PRESENT AT THE SITE.

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LISA BOWE PE STAMP.png
TWY PE 11.30.17.tiff

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GRAPHIC SCALE

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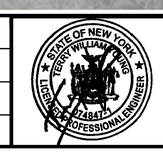
USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name
TERRY W. YOUNG
Professional Engineer's No.
074847

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by	Drawn by	Checked by
DJR	JDL	TWY



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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

DNAPL RECOVERY WELL LOCATIONS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

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110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
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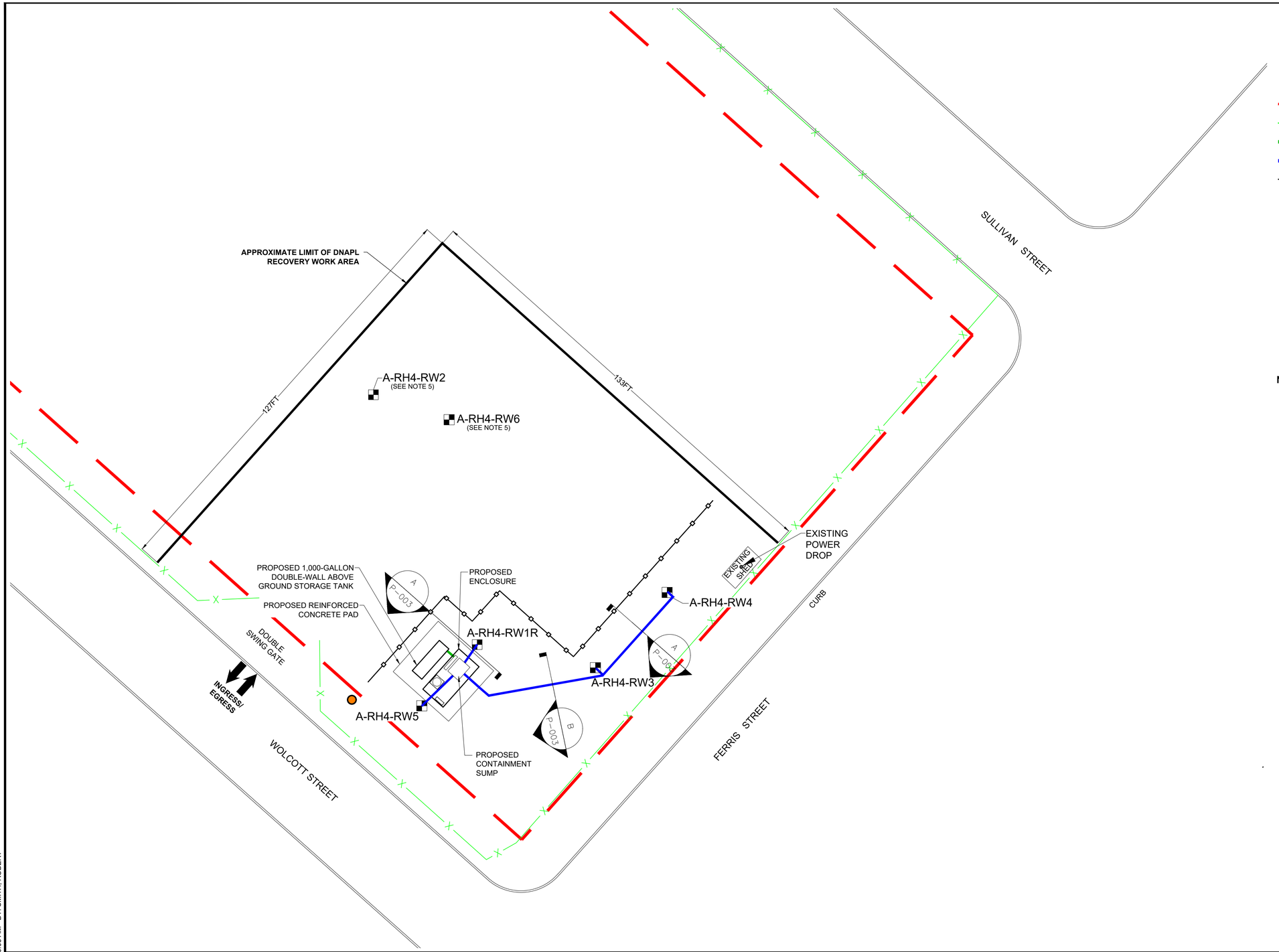
G-004



LEGEND:

- EXISTING DNAPL RECOVERY WELL (6-INCH DIAMETER)
- SITE BOUNDARY
- EXISTING FENCE
- PROPOSED ABOVE GROUND PIPING
- PROPOSED TRENCH
- PROPOSED JERSEY BARRIERS
- PROPOSED REMOVABLE BOLLARD

NOTES:

1. RECOVERY WELL LOCATIONS AND PHYSICAL FEATURES BASED ON SURVEYS CONDUCTED BY DPK LAND SURVEYING, LLC ON JUNE 2, 2022, AND NOVEMBER 2, 2022.
2. PROPERTY BOUNDARIES OBTAINED FROM FIGURE ENTITLED "ALTA/NSPS LAND TITLE SURVEY" (LANGAN APRIL 4, 2017).
3. ACTUAL LOCATIONS OF DNAPL RECOVERY SYSTEM COMPONENTS INCLUDING (BUT NOT LIMITED TO) PROPOSED FEATURES SHOWN HEREON, THE CONTROL PANEL, AND COMPRESSOR MAY VARY BASED ON FIELD CONDITIONS.
4. DNAPL RECOVERY TANK SHALL BE A 1,000 GALLON CAPACITY DOUBLE WALL CONTAINMENT TANK THAT INCLUDES BUILT-IN SECONDARY CONTAINMENT AND INTERSTITIAL MONITORING.
5. RECOVERY WELLS RW2 AND RW6 ARE NOT INCLUDED IN THE DNAPL RECOVERY SYSTEM DUE TO LACK OF RECOVERABLE DNAPL, AS AGREED UPON BY NYSDEC IN A MARCH 5, 2025 EMAIL TO ARCADIS.

0 15' 30'
GRAPHIC SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: **TERRY W. YOUNG**
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by	Drawn by	Checked by
DJR	JDL	TWY

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

PROPOSED DNAPL SYSTEM LAYOUT

ARCADIS Project No.
30034367.00001

Date
JULY 2025

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110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

G-005

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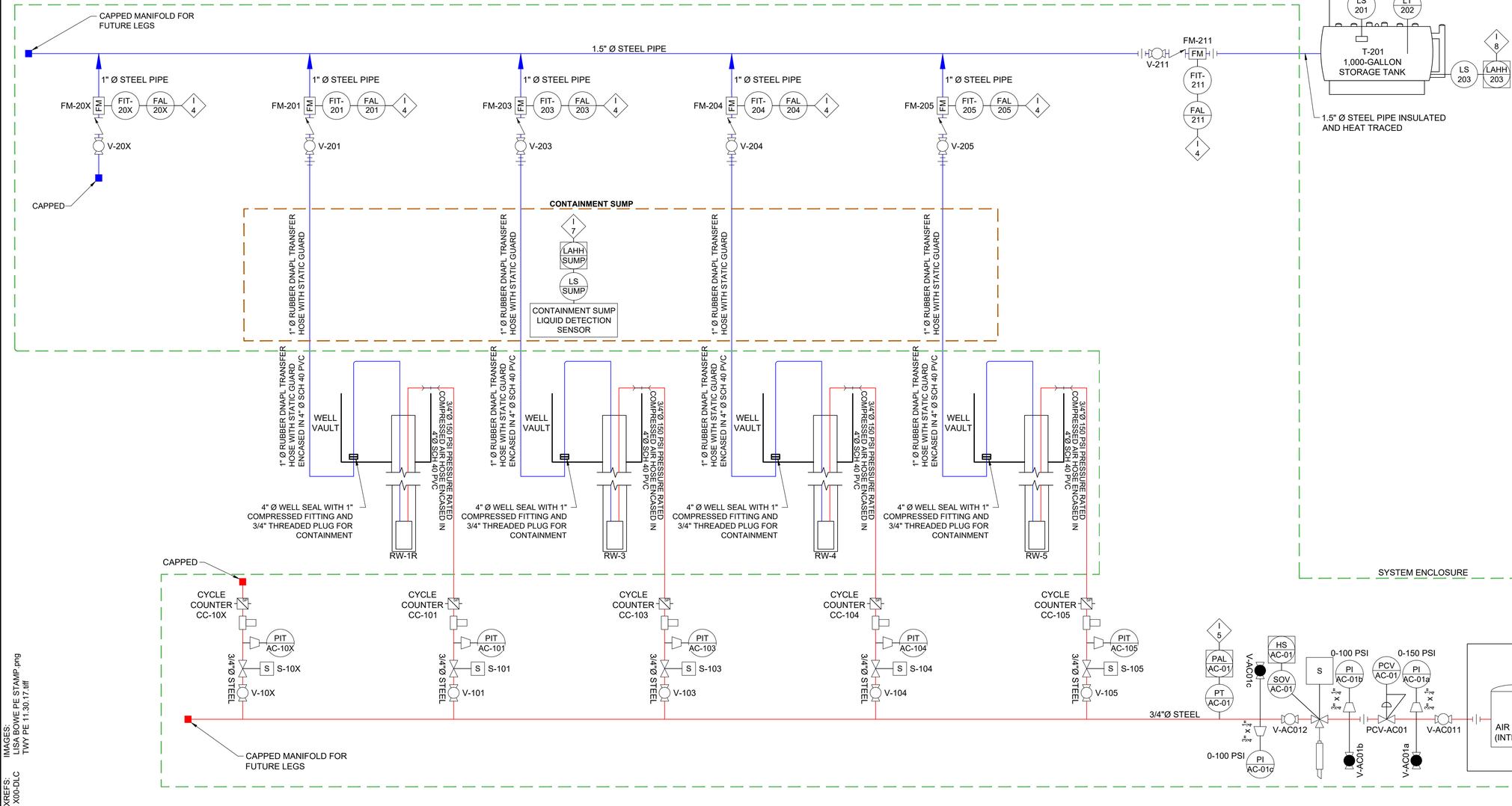
LOGIC TABLE

ALARM	CONDITION	EQUIPMENT	SET POINT	ACTION	DELAY
1	LAHH-201	LS-201	15 IN FROM TOP OF TANK	SHUT DOWN AIR COMPRESSOR, SEND OUT NOTIFICATION	5 SECONDS
2	LAHH-202	LT-202	10 IN FROM TOP OF TANK	SHUT DOWN AIR COMPRESSOR, SEND OUT NOTIFICATION	5 SECONDS
3	LAH-202	LT-202	20 IN FROM TOP OF TANK	SENDS OUT NOTIFICATION	15 SECONDS
4	FAL-20X	FI-20X	0 GPM IN 24 HOURS	SENDS OUT NOTIFICATION	NO DELAY
5	PAL-AC-01	PS-AC-01	5 PSI	SHUT DOWN AIR COMPRESSOR, SEND OUT NOTIFICATION	15 SECONDS
6	YA-AC-01	YI-AC-01	N/A	AC MOTOR OVERLOAD, SEND OUT NOTIFICATION	NO DELAY
7	LAHH-SUMP	LS-SUMP	N/A	SHUT DOWN AIR COMPRESSOR, SEND OUT NOTIFICATION	5 SECONDS
8	LAHH-203	LS-203	N/A	INTERSTITIAL CONTAINMENT LIQUID DETECTION,SHUT DOWN AIR COMPRESSOR, SENT OUT NOTIFICATION	NO DELAY



LEGEND:

- AIR RELIEF VALVE
- BALL VALVE (CLOSED)
- BALL VALVE (OPEN)
- CHECK VALVE
- CONTAINMENT SEAL (4" Ø)
- FM — FLOW METER
- SILENCER
- MATERIAL TRANSITION FITTING
- QUICK CONNECT FITTING
- PRESSURE REGULATING VALVE
- REDUCER
- SAMPLE PORT
- S — SOLENOID - PROGRAMMABLE TIMER
- SOLENOID - THREE WAY
- UNION

SCALE(S) AS INDICATED

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: **TERRY W. YOUNG**
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by: DJR	Drawn by: JDL	Checked by: TWY

STATE OF NEW YORK · TERRY WILLIAM YOUNG · 074847 · LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

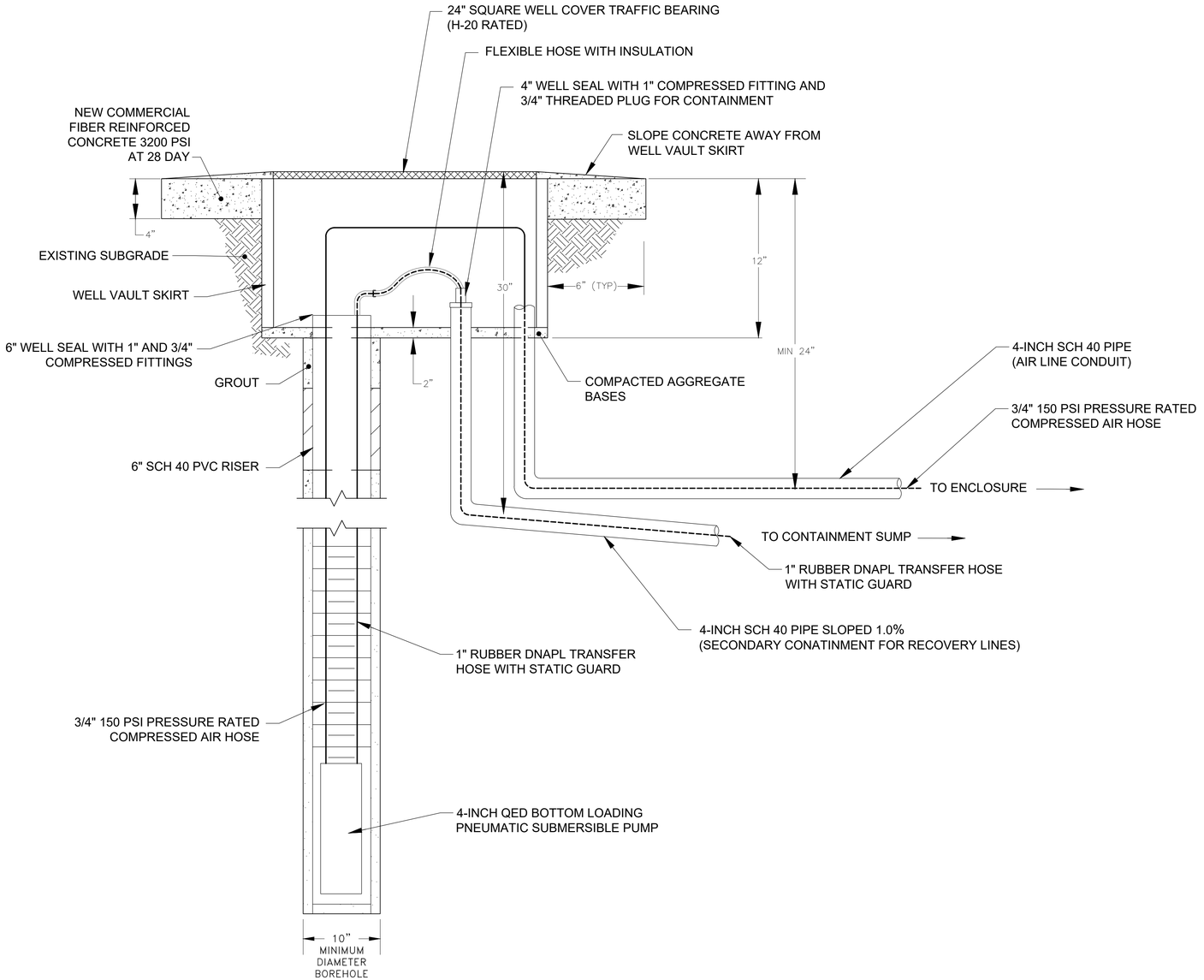
BT RED HOOK, LLC ● RED HOOK, NEW YORK
RED HOOK 4
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

PIPING AND INSTRUMENTATION DIAGRAM

ARCADIS Project No.: 30034367.00001
Date: JULY 2025

ARCADIS
110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

P-001



EXISTING RECOVERY WELL

NOT TO SCALE

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Professional Engineer's No.: 074847

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NY	7/16/2025	CG

Designed by	Drawn by	Checked by
DJR	JDL	TWY

ARCADIS

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BT RED HOOK, LLC • RED HOOK, NEW YORK
RED HOOK 4
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

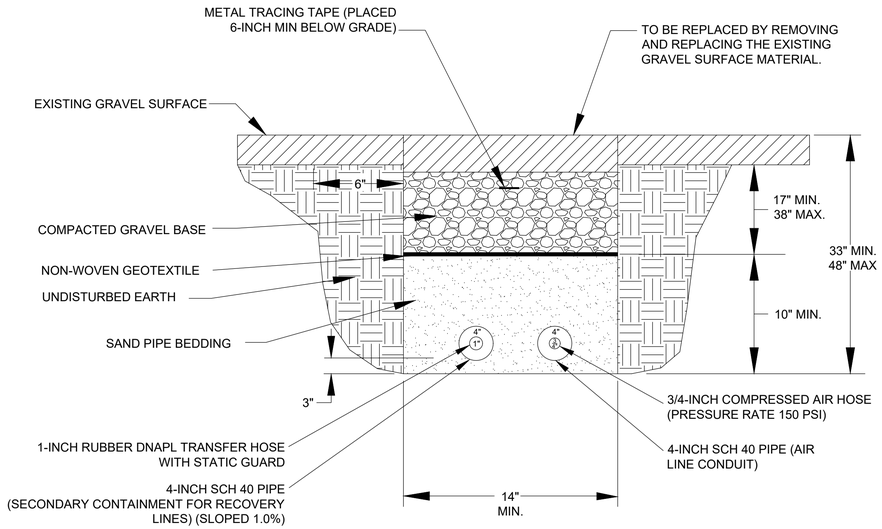
RECOVERY WELL CONSTRUCTION DETAILS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

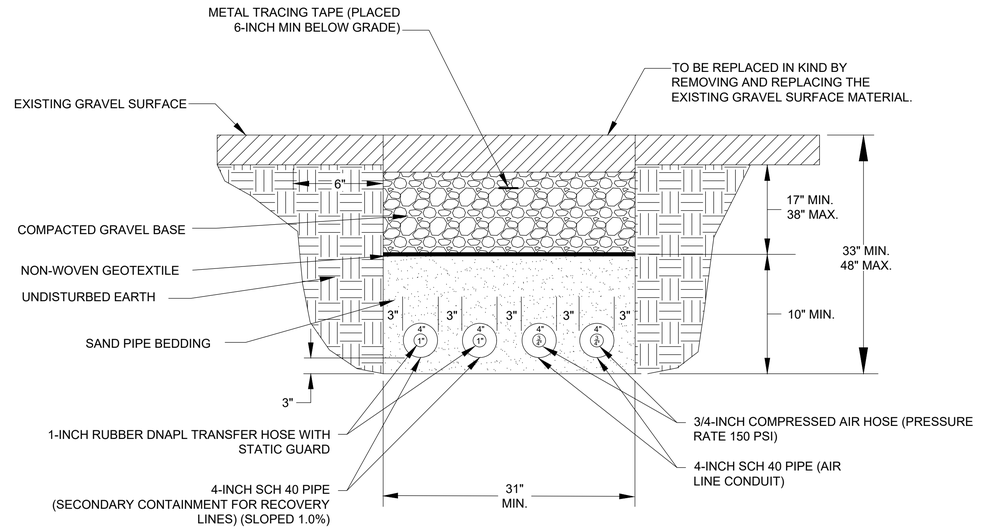
ARCADIS
110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

P-002



A G-005 **SECTION**

NOT TO SCALE



B G-005 **SECTION**

NOT TO SCALE

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Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by	Drawn by	Checked by
DJR	JDL	TWY

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ARCADIS

ARCADIS OF NEW YORK, INC.

BT RED HOOK, LLC ● RED HOOK, NEW YORK
RED HOOK 4
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

TRENCH CROSS SECTION DETAILS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

ARCADIS
110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

P-003

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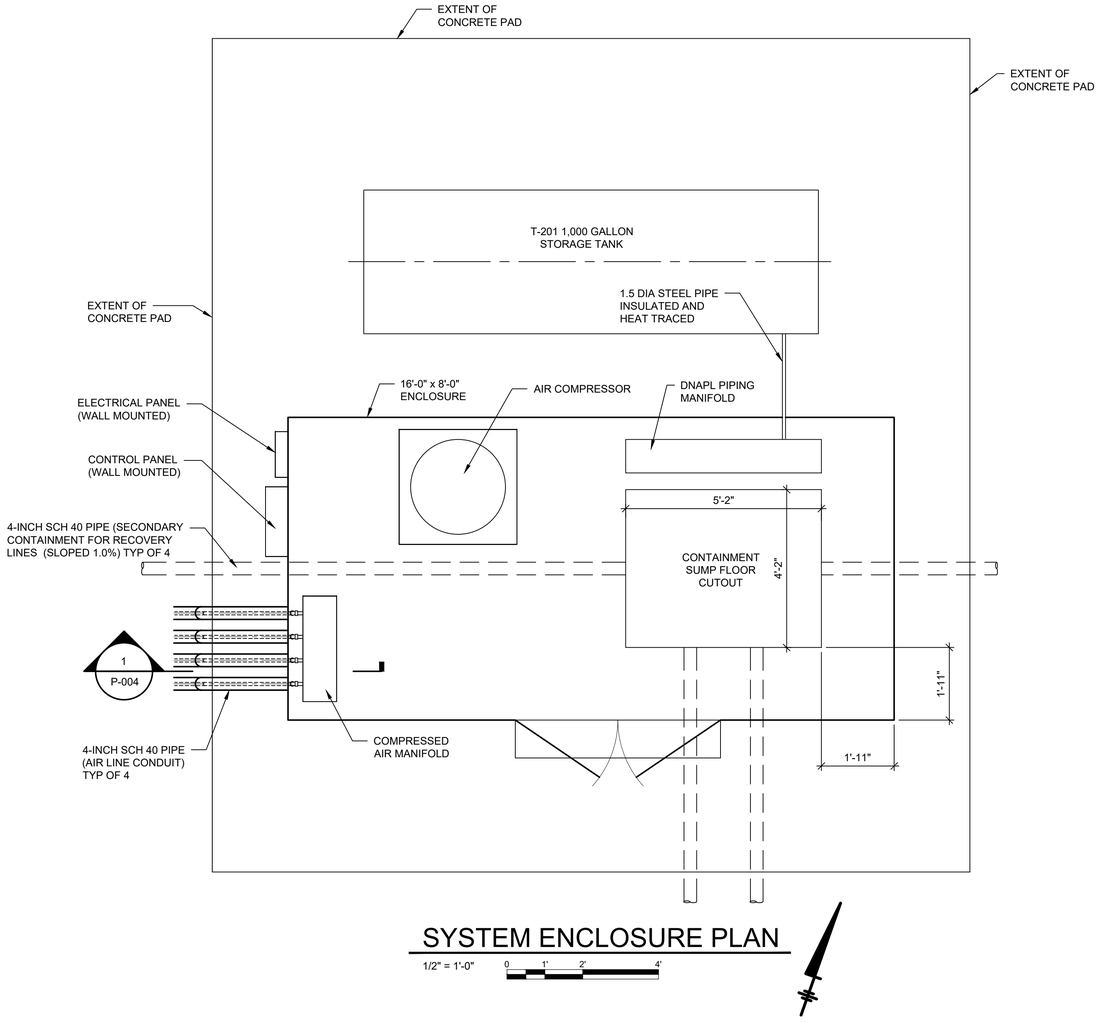
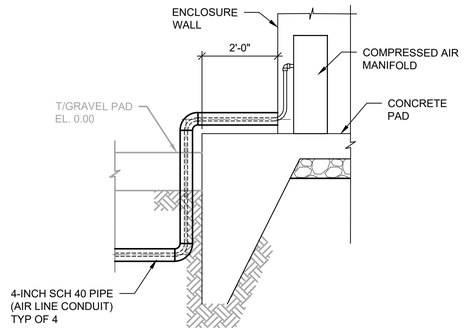


SYSTEM ENCLOSURE PLAN

1/2" = 1'-0"



1 P-004 **SECTION**

1/2" =1'-0"

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SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TERRY W. YOUNG		
Professional Engineer's No.: 074847		
State: NY	Date Signed: 7/16/2025	Project Mgr.: CG
Designed by: DJR	Drawn by: JDL	Checked by: TWY

STATE OF NEW YORK · TERRY WILLIAM YOUNG · 074847 · LICENSED PROFESSIONAL ENGINEER

ARCADIS

ARCADIS OF NEW YORK, INC.

BT RED HOOK, LLC ● RED HOOK, NEW YORK
RED HOOK 4
44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK

DNAPL RECOVERY SYSTEM DESIGN

SYSTEM ENCLOSURE AND COMPRESSED AIR PIPING DETAILS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

ARCADIS
110 WEST FAYETTE STREET
STE 300
SYRACUSE, NEW YORK 13202
TEL. 315.446.9120

P-004

DESIGN AND CODE INFORMATION

1. ALL CONSTRUCTION SHALL CONFORM TO NEW YORK CITY BUILDING CODE (2022 EDITION), INTERNATIONAL BUILDING CODE (2015 EDITION), ASCE 7–16.

2. LIVE LOADS:
   EQUIPMENT: SEE PLAN

3. WIND LOADS:
   ULTIMATE WIND SPEED: 120 MPH
   WIND IMPORTANCE FACTOR: 1.0
   INTERNAL PRESSURE COEFFICIENT: N/A FOR TANKS
   WIND EXPOSURE CATEGORY: C
   BUILDING RISK CATEGORY: II

4. SEISMIC LOADS:
   SEISMIC IMPORTANCE FACTOR: 1.0
   SEISMIC OCCUPANCY RISK CATEGORY: II
   SPECTRAL RESPONSE ACCELERATIONS: S_S = 0.286, S_1 = 0.059
   SITE CLASS: D
   SPECTRAL RESPONSE COEFFICIENTS: S_{DS} = 0.299, S_{D1} = 0.095
   SEISMIC DESIGN CATEGORY: B
   ANALYSIS PROCEDURE: TANKS – SEISMIC DESIGN REQUIREMENTS FOR NON–BUILDING STRUCTURES – ASCE 7–16 SECTION 15.4 & 15.7

5. SNOW LOADS: N/A

6. FLOOD LOADS: N/A

7. FOUNDATION DESIGN: 1500 PSF (PRESUMPTIVE ALLOWABLE BEARING PRESSURE PER IBC 2015 TABLE 1806.2)

ABBREVIATIONS USED IN DRAWINGS:

@	AT	HP	HIGH POINT
ARCH	ARCHITECT OR ARCHITECTURAL	I.D.	INSIDE DIAMETER
ACI	AMERICAN CONCRETE INSTITUTE	INT.	INTERIOR
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	LBS	POUNDS
B/W	BETWEEN	LP	LOW POINT
CL	COLUMN CENTER LINE	MAX	MAXIMUM
℄&C/L	CENTERLINE	MFG	MANUFACTURER
C/C	CENTER TO CENTER	MIN	MINIMUM
COL	COLUMN	N.T.S.	NOT TO SCALE
CONC	CONCRETE	O.C.	ON CENTER
CONT	CONTINUOUS	O.D.	OUTSIDE DIAMETER
CRSI	CONCRETE REINFORCING STEEL INSTITUTE	O/	OVER
DIA	DIAMETER	O/O	OUT TO OUT
DWG	DRAWING	P	PERIODIC
ø	DIAMETER	SQ	SQUARE
EA	EACH	STD	STANDARD
E.W.	EACH WAY	STL	STEEL
EL.	ELEVATION	SST	STAINLESS STEEL
EX	EXISTING	T&B	TOP & BOTTOM
EXT.	EXTERIOR	TBD	TO BE DETERMINED
FDN	FOUNDATION	T/	TOP
FTG.	FOOTING	TYP.	TYPICAL
F.F.	FINISHED FLOOR	UON	UNLESS OTHERWISE NOTED
F.F.E.	FINISHED FLOOR ELEVATION	VERT	VERTICAL
HORIZ	HORIZONTAL	W/	WITH

TANK AND ENCLOSURE ANCHORAGE NOTES:

1. 1,000 GALLON TANK CAPACITY (PROVIDED) OR LESS:
   a. PROVIDE A MINIMUM OF (2) CLIP ANGLES WELDED TO TANK LEGS ON EACH SIDE OF TANK (4 TOTAL) WITH (1) 1/2" DIAMETER STAINLESS STEEL ADHESIVE ANCHOR WITH 4" EMBEDMENT (TYP EACH CLIP ANGLE) INTO TANK PAD (TANK MANUFACTURER TO DESIGN CLIP ANGLE AND CLIP ANGLE ATTACHMENT TO TANK LEGS). MINIMUM EDGE DISTANCE SHALL BE 6".

   b. STRUCTURAL DESIGN OF CONCRETE PAD AND TANK ANCHORAGE ASSUMES A 1,000 GALLON TANK CAPACITY (PROVIDED) OR LESS OF THE FOLLOWING GEOMETRY:
      i. HORIZONTAL SKID SUPPORTED STEEL TANK.
         ii. TANK DIAMETER AND CAPACITY = AS LISTED ON SHEET S–101 WITH LIQUID SPECIFIC GRAVITY SIMILAR TO WATER.

2. ENCLOSURE:
   a. PROVIDE (1) CLIP ANGLE WELDED TO EACH CORNER OF THE ENCLOSURE (4 TOTAL) WITH (1) 1/2" DIAMETER STAINLESS STEEL ADHESIVE ANCHOR WITH 4" EMBEDMENT (TYP EACH CLIP ANGLE) INTO CONCRETE PAD (ENCLOSURE MANUFACTURER TO DESIGN CLIP ANGLE AND CLIP ANGLE ATTACHMENT TO ENCLOSURE). MINIMUM EDGE DISTANCE SHALL BE 5".
   b. ENCLOSURE ANCHORAGE DESIGN IS BASED ON THE FOLLOWING GEOMETRY AND WEIGHT:
   i. ENCLOSURE DIMENSIONS: LxWxH OF 16'–0" x 8'–0" x 9'–10".
   ii. SHIPPING WEIGHT: 14,000 LBS.
   iii. OPERATING WEIGHT: 22,750 LBS.

GENERAL:

1. QUALITY OF CONSTRUCTION REQUIRED, PERFORMANCE LEVELS OF WORKMANSHIP, MANUFACTURING AND INDUSTRY STANDARDS, STRENGTH AND PHYSICAL REQUIREMENTS OF MATERIALS, CONFORMANCE TO CODES AND REGULATIONS, GUARANTEES AND OTHER PROJECT REQUIREMENTS ARE SPECIFIED IN THESE NOTES.

2. IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED, OR NOTED SHALL BE PROVIDED.

3. PERFORM ALL WORK IN COORDINATION WITH ALL DRAWINGS AND INFORMATION RELATED TO STRUCTURAL WORK. ANY CHANGES TO THE EQUIPMENT REQUIRING CHANGES TO THE STRUCTURAL SYSTEMS SHALL BE REDESIGNED BY A PROFESSIONAL ENGINEER AT NO COST TO THE OWNER AND SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW. SUBMITTAL SHALL BE ACKNOWLEDGED IN WRITING BEFORE BEGINNING CONSTRUCTION.

4. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE–DOWNS MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER COMPLETION OF THE PROJECT.

5. STRUCTURAL ITEMS HAVE BEEN DESIGNED FOR DESIGN LOADS SHOWN OR SPECIFIED IN THESE NOTES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR STRUCTURAL ITEMS SUBJECT TO CONSTRUCTION LOADS EXCEEDING THE DESIGN LOADS AND SHALL NOTIFY THE ENGINEER OF ANY SUCH ADDITIONAL LOADS.

6. ALL DIMENSIONS AND ELEVATIONS NOTED THUS (*) SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD OR WITH THE EQUIPMENT MANUFACTURER/BUILDING VENDOR AND SHALL CONFORM TO THOSE SHOWN ON OTHER DRAWINGS.

7. NO STRUCTURAL MEMBERS SHALL BE CUT FOR PIPES, DUCTS, ETC. UNLESS SPECIFICALLY DETAILED OR APPROVED IN WRITING BY THE ENGINEER.

8. ALL SPECIFIED CONCRETE TESTING DURING CONSTRUCTION AND ALL SPECIFIED LABORATORY TEST MIXES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

9. ENGINEER OF RECORD FOR STRUCTURAL DESIGN WILL REVIEW AND APPROVE ALL CONSTRUCTION SUBMITTALS FOR STRUCTURAL WORK PRIOR TO ORDERING MATERIALS OR BEGINNING CONSTRUCTION OF THOSE COMPONENTS. SUBMITTALS REQUIRED FOR THE FOLLOWING:
   CONCRETE MIX (INCLUDING ADMIXTURE DATA, AGGREGATE GRADATION REPORTS, AND HISTORICAL MIX STRENGTH DATA), REINFORCING STEEL, ANCHOR BOLTS, ADHESIVE AND EXPANSION ANCHORS, JOINT SEALANTS, ENGINEERED FILL, EPOXY GROUT, GRATING, AND LEVELING GROUT.

10. DESIGN LOADS: BASED ON THE NEW YORK BUILDING CODE (2022 EDITION), INTERNATIONAL BUILDING CODE (2015 EDITION), ASCE 7–16. SEE DESIGN INFORMATION TABLE ON THIS SHEET FOR LOAD VALUES.

11. VERIFY EXISTING CONDITIONS AND DIMENSIONS AND NOTIFY ENGINEER OF ANY CONDITIONS WHICH DO NOT COMPLY WITH PLANS AND SPECIFICATIONS. STRUCTURAL DRAWINGS MUST BE COORDINATED WITH CIVIL AND MECHANICAL DRAWINGS.

12. SHOP DRAWINGS WILL NOT BE REVIEWED BY THE ENGINEER UNTIL AFTER THE GENERAL CONTRACTOR HAS THOROUGHLY REVIEWED THE SHOP DRAWINGS, VERIFIED EXISTING CONDITIONS, AND COORDINATED THE SHOP DRAWINGS WITH OTHER AFFECTED TRADES. REPRODUCTION OF STRUCTURAL DRAWINGS FOR SHOP DRAWINGS IS NOT PERMITTED.

13. DO NOT SCALE STRUCTURAL DRAWINGS, AND FOR LOCATION OF MISCELLANEOUS ITEMS (OPENINGS, BENT PLATES, INSERTS, ETC.) AFFECTING STRUCTURAL WORK, SEE CIVIL, MECHANICAL AND ELECTRICAL DRAWINGS.

FOUNDATIONS:

1. NET ALLOWABLE SOIL BEARING PRESSURE USED FOR CONCRETE PAD AND FOUNDATION DESIGN IS A PRESUMPTIVE 1500 PSF.

2. THE SOIL BEARING CAPACITY AND CONSISTENCY SHALL BE VERIFIED FOR THE PAD AND FOUNDATION LIMITS BY A REGISTERED GEOTECHNICAL ENGINEER AND THEIR REPRESENTATIVES WHEN CONCRETE PAD AND FOUNDATION EXCAVATIONS HAVE BEEN CARRIED DOWN TO THE PROPOSED ELEVATIONS. REMOVAL OF UNSUITABLE SOIL SUBGRAD EMATERIALS AT THE DIRECTION OF THE GEOTECHNCIAL ENGINEER SHALL BE REPLACED WITH ENGINEERED BACKFILL IN ACCORDANCE WITH NOTE 4.

3. TOPSOIL IS NOT SUITABLE FOR FOUNDATION SUPPORT. ALL FOUNDATIONS SHALL BEAR ON UNDISTURBED NATIVE SOILS OR ENGINEERED FILL IN ACCORDANCE WITH THESE NOTES.

4. ENGINEERED FILL SHALL CONSIST OF SANDS OR SAND–GRAVEL MIXTURES (ASTM D2487) WITH A MAXIMUM SIZE OF 2 INCHES, FREE OF ORGANIC MATERIALS , AND NOT MORE THAN 12 PERCENT PASSING THE US STANDARDS #200 SIEVE. ENGINEERED FILL SHALL BE UNIFORMLY PLACED IN 8" LIFTS AND COMPACTED TO A FIRM AND STABLE CONDITION AND TO AT LEAST 95 PERCENT OF THE ASTM D 1557 MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT +/– 2%.

5. SUBGRADE (LEVEL & DRY): RECOMPACT TOP 12" TO 95% RELATIVE COMPACTION (ASTM D 1557, LATEST VERSION) AT OPTIMUM CONTENT ±3%.

CAST–IN–PLACE CONCRETE:

1. COMPLY WITH ACI 301–16, ACI 318–14, AND ACI 350–06 UNLESS SPECIFICALLY NOTED OTHERWISE.

2. FORM MATERIALS
   FORMS FOR FINISH CONCRETE: PLYWOOD, LUMBER, METAL, OR OTHER ACCEPTABLE MATERIAL. PROVIDE LUMBER DRESSED ON AT LEAST TWO EDGES AND ONE SIDE FOR TIGHT FIT.
   EARTH FORMS: SUBJECT TO ENGINEER'S APPROVAL.
   FORM TIES: FACTORY–FABRICATED REMOVABLE OR SNAP–OFF METAL TYPE DESIGNED TO PREVENT FORM DEFLECTION AND TO PREVENT SPALLING CONCRETE UPON REMOVAL. UNITS TO LEAVE NO METAL CLOSER THAN 1 INCH TO SURFACE.

3. FORM RELEASE AGENT: COLORLESS MINERAL OIL WHICH WILL NOT STAIN CONCRETE OR ABSORB MOISTURE, OR IMPAIR NATURAL BONDING OR COLOR CHARACTERISTICS OF COATING INTENDED FOR USE ON CONCRETE INCLUDING CURING COMPOUND, SEALER, OR WATER–PROOFING.

4. REINFORCEMENT
   REINFORCING STEEL: ASTM A615, 60 KSI YIELD GRADE, DEFORMED BILLET STEEL BARS, UNFINISHED; OR ASTM A616, 60 KSI YIELD GRADE, DEFORMED RAIL STEEL BARS, UNFINISHED.

5. CONCRETE MATERIALS AND ADMIXTURES
   CEMENT: ASTM C150, TYPE I/II – NORMAL PORTLAND TYPE.
   FINE AND COARSE AGGREGATES: ASTM C33 (NORMAL WEIGHT AGGREGATE); MATERIALS CONTAINING DELETERIOUS SUBSTANCES (SPALLING CAUSING) ARE NOT ACCEPTABLE.
   WATER: CLEAN AND NOT DETRIMENTAL TO CONCRETE.
   AIR ENTRAINMENT: ASTM C260; MASTER BUILDERS MICRO–AIR, OR AS APPROVED.
   CHEMICAL: ASTM C494 TYPE A – WATER–REDUCING, TYPE B – RETARDING, TYPE D – WATER–REDUCING AND RETARDING, TYPE F – WATER–REDUCING, HIGH RANGE, TYPE G – WATER–REDUCING, HIGH RANGE AND RETARDING; CONTAINING NO CHLORIDES; MASTER BUILDERS, W.R. GRACE, OR AS APPROVED.
   FLY ASH: ASTM C618 CLASS F OR C; LOSS ON IGNITION LESS THAN 3 PERCENT.

6. CURING MATERIALS
   MEMBRANE CURING COMPOUND: ASTM C309, TYPE I–D, CLASS B, CLEAR WITH FUGITIVE DYE WHICH DISAPPEARS APPROXIMATELY 24 HOURS AFTER EXPOSURE TO SUNLIGHT; SPRAY–CURE SAFE CURE CLEAR, EUCLID CHEMICAL COMPANY KUREZ DR, OR AS APPROVED. CURING COMPOUND SHALL BE COMPATIBLE WITH COATINGS WHICH ARE TO BE APPLIED TO THE CONCRETE SURFACE.
   ABSORPTIVE MATS: BURLAP–POLYETHYLENE, MINIMUM 8 OUNCES PER SQUARE YARD BONDED TO PREVENT SEPARATION DURING HANDLING AND PLACING.
   WATER: POTABLE, NOT DETRIMENTAL TO CONCRETE.

7. ACCESSORIES
   NON–SHRINK GROUT: PRE–MIXED COMPOUND CONSISTING OF NON–METALLIC AGGREGATE, CEMENT, WATER REDUCING AND PLASTICIZING AGENTS; CAPABLE OF DEVELOPING MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS; MASTER BUILDERS MASTERFLOW 713, OR AS APPROVED.
   EPOXY GROUT: INJECTABLE TWO–COMPONENT EPOXY ADHESIVE AS LISTED IN STRUCTURAL STEEL NOTE 11 – ADHESIVE ANCHORS.
   JOINT FILLER: ASTM D994; ASPHALT–IMPREGNATED FIBERBOARD OR FELT; W.R. MEADOWS ASPHALT JOINT, OR AS APPROVED.
   JOINT SEALANT: POLYURETHANE SEALANT: SINGLE COMPONENT, GUN GRADE; MINIMUM 1/4 INCH JOINT WIDTH; MAXIMUM 1 INCH JOINT WIDTH; +35 PERCENT MOVEMENT CAPABILITY; PAINTABLE; FEDERAL SPECIFICATION TT–S–00230C, TYPE II, CLASS A; SIKAFLEX – 1A BY SIKA CORPORATION, OR AS APPROVED.

8. CONCRETE MIX
   CONCRETE PROPORTIONS: COMPLY WITH ACI 301, 4.2.
   CLASS I CONCRETE: PROVIDE CONCRETE TO THE FOLLOWING CRITERIA:
   COMPRESSIVE STRENGTH (7 DAY): 3,600 PSI.
   COMPRESSIVE STRENGTH (28 DAY): 4,500 PSI.
   WATER/CEMENT RATIO (MAXIMUM): 0.42 BY WEIGHT.
   AIR ENTRAINED: 6 PERCENT, +1 PERCENT.
   FLY ASH CONTENT: MAXIMUM 25 PERCENT OF CEMENT CONTENT.
   SLUMP (MAXIMUM): 3 INCHES (DUE TO WATER).
   MID OR HIGH RANGE WATER REDUCER: ADD TO INCREASE SLUMP TO 6 INCHES, +1–1/2 INCHES.
   MUDMAT CONCRETE: PROVIDE CONCRETE TO THE FOLLOWING CRITERIA:
   COMPRESSIVE STRENGTH (28 DAY): 1,000 PSI.

9. ERECTION – FORMWORK
   ALIGN JOINTS AND MAKE WATER–TIGHT.
   COORDINATE WITH WORK OF OTHER SECTIONS IN FORMING AND PLACING OPENINGS, RECESSES, SLEEVES, BOLTS, ANCHORS, OTHER INSERTS, AND COMPONENTS OF OTHER WORK.
   PROVIDE CHAMFER STRIPS ON ALL EXTERNAL CORNERS.

10. PLACEMENT OF REINFORCEMENT
    PLACE, SUPPORT, AND SECURE REINFORCEMENT AGAINST DISPLACEMENT. DO NOT DEVIATE FROM REQUIRED POSITION. UNLESS NOTED OTHERWISE, MAINTAIN CONCRETE COVER FOR REINFORCEMENT AS FOLLOWS:
    FOOTINGS AND CONCRETE FORMED AGAINST EARTH: 3 INCH
    SLABS ON FILL: 3 INCH
    ALL OTHER: 2 INCH
    LAP SPLICES IF NOT INDICATED TO BE A MINIMUM OF 36 BAR DIAMETERS.
    DO NOT FIELD–CUT REINFORCEMENT WITHOUT ENGINEER'S PERMISSION.
    THE LONGINTUDINAL REINFORCING STEEL IN WALLS AND FOOTINGS SHALL BE CONTINUOUS AROUND CORNERS. CONCRETE WALLS AND SLABS SHALL BE REINFORCED AROUND ALL OPENINGS WITH (2) #5 BARS IN EACH FACE, ON ALL SIDES AND EXTENDED 2'–0" BEYOND THE OPENING, UNLESS SHOWN OTHERWISE. FIELD BENDING OF REINFORCEMENT SHALL NOT BE PERMITTED.

11. GENERAL
    USE CLASS I CONCRETE FOR STRUCTURAL CONCRETE. VERIFY CONSTRUCTION JOINTS, WATERSTOP, AND REINFORCEMENT ARE ACCEPTABLE. PLACE EPOXY GROUT IN FULL ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, INCLUDING COMPRESSED AIR CLEANING OF ALL CONTACT SURFACES.

12. PLACING CONCRETE
    WHEN CLASS I CONCRETE ARRIVES AT THE PROJECT WITH SLUMP BELOW 3 INCHES, WATER MAY BE ADDED ONLY IF NEITHER THE MAXIMUM PERMISSIBLE WATER–CEMENT RATIO NOR THE MAXIMUM SLUMP IS EXCEEDED. SLUMP ADJUSTMENT, WITH WATER, SHALL BE MADE ONLY ONE TIME. PLACEMENT OF CONCRETE UNDER WATER IS NOT PERMITTED. CONSOLIDATE CONCRETE PER ACI 301 SECTION 5.3.2.5.

13. CONCRETE FINISHING
    PROVIDE 3/4" CHAMFER ON ALL EXPOSED EDGES
    CONCRETE FLOOR SURFACES AND EXTERIOR TRAFFIC SURFACES: ACI 301, 5.3.4.2.D, BROOM FINISH.
    MAXIMUM VARIATION OF SURFACE FLATNESS FOR EXPOSED CONCRETE FLOORS: 1/8 INCH IN 10 FEET.
    CONCRETE SURFACES NOT EXPOSED: ACI 301, 5.3.3.3.A, ROUGH FORM FINISH.
    EXPOSED FORMED SURFACES: ACI 301, 5.3.3.4.B, GROUT–CLEANED FINISH.

14. CURING
    HORIZONTAL SURFACES: CURE FLOOR SURFACES IN ACCORDANCE WITH ACI 301 USING ANY OF THE FOLLOWING ACCEPTED PROCEDURES:
    SPRAYING: SPRAY WATER OVER FLOOR SLAB AREAS AND MAINTAIN WET FOR 7 DAYS.
    ABSORPTIVE MAT: SATURATE BURLAP–POLYETHYLENE AND PLACE BURLAP–SIDE DOWN OVER FLOOR SLAB AREAS, LAPPING ENDS AND SIDES; MAINTAIN IN PLACE FOR 7 DAYS.
    MEMBRANE CURING COMPOUND.
    VERTICAL SURFACES: CURE SURFACES USING ANY OF THE FOLLOWING ACCEPTED PROCEDURES:
    FORMWORK: KEEP FORMS IN PLACE FOR 7 DAYS.
    MEMBRANE CURING COMPOUND.

15. FIELD QUALITY CONTROL
    TESTS OF CONCRETE SLUMP, AIR CONTENT AND STRENGTH SHALL BE MADE IN ACCORDANCE WITH ACI RECOMMENDATIONS. SAMPLES FOR AIR CONTENT AND STRENGTH SHOULD BE TAKEN AS NEAR AS PRACTICAL TO THE POINT OF PLACEMENT INTO THE FORMWORK OR AT A LOCATION WHICH CLOSELY MATCHES THE HANDLING CONDITIONS WHEN THE CONCRETE IS PLACED IN THE FORMS. PRIOR TO THE ADDITION OF A MID OR HIGH RANGE WATER REDUCER, A SLUMP TEST MAY BE MADE FROM A SAMPLE TAKEN FROM THE VERY FIRST CONCRETE OUT OF THE LOAD.

16. CONCRETE SEALER
    HORIZONTAL SURFACES:
    PROVIDE WATER–BASED SILOXANE/SILANE PENETRATING WATER REPELLENT SEALER THAT DOES NOT ALTER THE APPEARANCE OR TEXTURE OF THE SUBSTRATE, NON FILM–FORMING; EUCLID CHEMICAL, BARACADE WB 244, OR AS APPROVED.

17. WATERSTOPS
    1. PREFORMED ADHESIVE WATERSTOP (PPAWS–FR):
       A. NON–SWELLING PREFORMED JOINT SEALANT WITH SOLVENT RESISTANT ELASTOMERS AND PLASTICIZERS DESIGNED TO CONTROL THE INGRESS AND EGRESS OF HYDROCARBONS AND CONTAINING LIQUIDS AT THE CONTROL JOINTS BETWEEN CONCRETE TO CONCRETE AND CONCRETE AND DISSIMILAR PRODUCTS. 1 INICH LAP SPLICE, FURNISH WITH PRIMER, 2" COVER MIN.
       B. SYNKO–FLEX WATERSTOP FR (SF–312), OR AS APPROVED.

STRUCTURAL STEEL:

1. NON–SHRINK LEVELING GROUT: PRE–MIXED NON–SHRINK GROUT COMPOUND CONSISTING OF NON–METALLIC AGGREGATE, CEMENT, WATER–REDUCING AND PLASTICIZING AGENTS;
   CAPABLE OF DEVELOPING A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS.

   A. MANUFACTURERS;
      1. EUCLID CHEMICAL COMPANY, NS GROUT.
      2. OR AS APPROVED.

2. ADHESIVE ANCHORS:

   A. MANUFACTURERS;
      1. HILTI HIT–RE 500–V3 EPOXY ADHESIVE ANCHORS.
      2. OR AS APPROVED.
   B. INJECTABLE TWO–COMPONENT EPOXY ADHESIVE.
   C. HILTI ANCHOR ROD HAS–R 316 STAINLESS STEEL THREADED ROD COMPLYING WITH ASTM F593 CONDITION CW.
   D. ADHESIVE ANCHORAGE SYSTEM SHALL BE SEISMIC QUALIFIED PER IBC 2018 WITH CURRENT ICC–ES ESR REPORT (ICC–ES–ESR 2322).
   E. INSTALLERS TO BE TRAINED BY ANCHOR MANUFACTURER.
   F. 10% OF ALL ADHESIVE ANCHORS TO BE LOAD TESTED, AS INSTALLED IN FIELD, TO ENSURE ALLOWABLE MANUFACTURER LOADS ARE ACHIEVED.

3. EXPANSION ANCHORS

   A. GENERAL:
      1. CONCRETE WEDGE EXPANSION ANCHORS SHALL CONSIST OF STUD, WEDGE, NUT, AND WASHER.
   B. MANUFACTURERS;
      1. KWIK BOLT TZ WEDGE ANCHOR BY HILTI FASTENING SYSTEMS, INC.
      2. STRONG BOLT 2 WEDGE ANCHOR, BY SIMPSON STRONG–TIE COMPANY, INC.
      3. OR AS APPROVED.
   C. ANCHORS SHALL COMPLY WITH PHYSICAL REQUIREMENTS OF FS A–A–1923A, TYPE 4. PROVIDE CONCRETE WEDGE EXPANSION ANCHORS SUITABLE FOR USE IN CRACKED AND UNCRACKED CONCRETE IN ACCORDANCE WITH ACI318 AND ACI350, APPENDIX D.
   D. PROVIDE EXPANSION ANCHORS COMPLETE WITH NUTS AND WASHERS, AISI TYPE 316 STAINLESS STEEL ANCHOR BODY, IN ACCORDANCE WITH ASTM A276 OR ASTM A493.
   E. CONCRETE WEDGE EXPANSION ANCHORS SHALL HAVE A CURRENT ICC EVALUATION SERVICE REPORT FOR USE IN BOTH CRACKED AND UNCRACKED CONCRETE WITH SEISMIC RECOGNITION IN SEISMIC DESIGN CATEGORIES A THROUGH F WHEN TESTED AND ASSESSED IN ACCORDANCE WITH ICC–ES AC193.

ALUMINUM PLANK GRATING:

A. SYSTEM PERFORMANCE:
   1. GRATING DESIGN LOADS: 300 PSF UNIFORM LIVE LOAD AND 500LBS. CONCENTRATED LIVE LOAD (NOT ACTING SIMULTANEOUSLY)
   2. MAXIMUM CLEAR SPAN DEFLECTION FOR UNIFORM LIVE LOADS: 1/120 OF SPAN, BUT NOT MORE THAN 1/4 INCH AT 100 PSF UNIFORM LIVE LOAD.
   3. RECTANGULAR BANDING BARS SHALL BE OF SAME HEIGHT AND MATERIAL AS BEARING BARS.

B. MANUFACTURERS:
   1. OHIO GRATINGS, HEAVY DUTY, RECTANGULAR–PUNCHED.
   2. IKG BORDEN, HEAVY DUTY, RECTANGULAR–PUNCHED.
   3. OR APPROVED EQUAL.

C. MATERIALS:
   1. ALUMINUM ALLOY 6061–T6 OR 6063–T6, CONFORMING TO ASTM B221.
   2. FRAMES: ALUMINUM ALLOY 6061–T6 OR ALLOY 6063–T6, COMPLYING WITH ASTM B221. FRAMES SHALL HAVE MITERED CORNERS AND WELDED JOINTS AND SHALL BE SIZED TO MATCH GRATING DEPTH.
   3. STUD ANCHORS WELDED TO STEEL SUPPORTS AND OTHER FASTENERS SHALL BE TYPE 316 STAINLESS STEEL.
   4. PERIMETER BANDING: SAME MATERIAL AS GRATING; PROVIDE ACROSS END OF BEARINGS BARS, ALONG ANY CUT SIDES, AND ON ALL SIDES OF CUT–OUTS. BANDING AT CUT–OUTS SHALL BE WELDED TO EACH BEARING BAR.

D. FABRICATION AND MANUFACTURE:
   1. COMPRISED OF SMOOTH–SIDED, SIX–INCH WIDE ALUMINUM EXTRUSIONS WITH INTEGRAL I–BEAM SECTIONS AT 1.2 INCHES ON CENTERS. SECTIONS SHALL BE BANDED TOGETHER TO FORM STANDARD PANEL WIDTHS.
   2. DEPTH: AS SHOWN ON DRAWINGS. IF NOT LISTED ON DRAWINGS, DEPTH AS REQUIRED TO COMPLY WITH PERFORMANCE CRITERIA IN THE CONTRACT DOCUMENTS.
   3. TOP SURFACE SHALL BE PUNCHED WITH THREE–INCH BY 19/32–INCH RECTANGULAR OPENINGS, AND HAVE CONTINUOUS RAISED LONGITUDINAL RIDGES FOR SKID RESISTANCE.
   4. FINISH: MILL.

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: LISA BOWE
Professional Engineer's No.: 086254

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by: ALS	Drawn by: CLK	Checked by: LAB

STATE OF NEW YORK · LISA A. BOWE · 086254 · LICENSED PROFESSIONAL ENGINEER

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44 AND 62 FERRIS STREET / 219 SULLIVAN STREET
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

STRUCTURAL NOTES

ARCADIS Project No.: 30034367.00001
Date: JULY 2025

ARCADIS
110 WEST FAYETTE STREET
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S-001

STRUCTURAL QUALITY ASSURANCE PLAN

THIS STRUCTURAL QUALITY ASSURANCE PLAN IDENTIFIES THE RESPONSIBILITIES OF THE CONTRACTOR AND THE SPECIAL INSPECTOR IN PERFORMING THE TESTING AND INSPECTION OF THE WORK REQUIRED BY CHAPTER 17 OF THE BUILDING CODE THAT IS WITHIN THE SCOPE OF THE STRUCTURAL ENGINEERING SERVICES FOR THIS PROJECT.

SPECIAL INSPECTOR'S RESPONSIBILITIES:

GENERAL:

THE SPECIAL INSPECTOR SHALL BE A LICENSED ENGINEER IN THE STATE OF NEW YORK OR PERFORMING APPROPRIATE DUTIES DIRECTLY UNDER THE SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF NEW YORK AND HAVE A THOROUGH UNDERSTANDING OF THE SPECIAL INSPECTION REQUIREMENTS OF THE 2022 NEW YORK CITY BUILDING CODE AND 2015 IBC. THE SPECIAL INSPECTOR SHALL BE AN INDIVIDUAL OR INDIVIDUALS CERTIFIED OR EXPERIENCED TO PERFORM SUCH INSPECTIONS IN A PARTICULAR FIELD.

THE SPECIAL INSPECTOR SHALL KEEP RECORDS OF ALL INSPECTIONS AND FURNISH REPORTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. PERIODIC REPORTS SHALL BE PROVIDED AND SHALL INDICATE THAT WORK INSPECTED WAS DONE IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THE DISCREPANCIES ARE NOT CORRECTED TO THE SATISFACTION OF THE SPECIAL INSPECTOR, THE DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE COUNTY BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE WORK.

A WEEKLY REPORT OF INSPECTIONS DOCUMENTING REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED. AT THE COMPLETION OF THE SPECIAL INSPECTIONS, THE LICENSED PROFESSIONAL ENGINEER IN CHARGE OF PERFORMING THE SPECIAL INSPECTION SHALL CERTIFY THE FINAL SPECIAL INSPECTION REPORT AND AFFIX HIS/HER SEAL TO THE SPECIAL INSPECTOR'S FINAL REPORT. PROVIDE THREE (3) COPIES OF THIS REPORT; TWO TO THE COUNTY BUILDING OFFICIAL AND ONE TO THE STRUCTURAL ENGINEER OF RECORD.

CAST-IN-PLACE CONCRETE:

CONTRACTOR SHALL PERFORM THE FOLLOWING:

1. ESTABLISH CONCRETE MIX DESIGN PROPORTIONS PER ACI 318, CHAPTER 5. SUBMIT THREE COPIES OF THE CONCRETE MIX DESIGNS. INCLUDE THE FOLLOWING:

   A. TYPE AND QUANTITIES OF MATERIALS
   B. SLUMP
   C. AIR CONTENT
   D. FRESH UNIT WEIGHT
   E. AGGREGATES SIEVE ANALYSIS
   F. DESIGN COMPRESSIVE STRENGTH
   G. LOCATION OF PLACEMENT IN STRUCTURE
   H. METHOD OF PLACEMENT
   I. METHOD OF CURING
   J. SEVEN-DAY AND 28-DAY COMPRESSIVE STRENGTHS

2. SUBMIT A CERTIFICATION FROM EACH MANUFACTURER OR SUPPLIER STATING THAT MATERIALS MEET THE REQUIREMENTS OF THE SPECIFIED ASTM AND ACI STANDARDS.

3. SUBMIT CERTIFICATION THAT THE READY-MIXED CONCRETE PLANT COMPLIES WITH THE REQUIREMENTS OF THE NATIONAL READY MIX CONCRETE ASSOCIATION.

SPECIAL INSPECTOR SHALL PERFORM THE FOLLOWING:

REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION

VERIFICATION AND INSPECTION	C	P	ACI 318-14 REFERENCE	IBC 2015 REFERENCE
1. INSPECTION OF REINFORCING STEEL AND PLACEMENT.		X	ACI 318: CH. 20, 25.2, 25.3, 26.6.1-26.3	1908.4, 1910.4
2. INSPECTION OF ANCHORS CAST IN CONCRETE PRIOR TO PLACEMENT OF CONCRETE.		X	ACI 318: CH. 17.8.2	-
3. INSPECTION OF ANCHORS POST INSTALLED IN HARDENED CONCRETE.			ACI 318:	
A. ADHESIVE - HORIZONTAL AND UPWARDLY INCLINED	X		CH. 17.8.2.4	-
B. ALL OTHER		X	CH. 17.8.2	-
4. VERIFY USE OF REQUIRED DESIGN MIX.		X	ACI 318: CH. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
5. AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X		ASTM C 172 ASTM C 31 ACI 318: CH. 26.4, 26.12	1908.10
6. INSPECTION OF CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES.	X		ACI 318: CH. 26.5	1908.6, 1908.7, 1908.8
7. INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.		X	ACI 318: CH. 26.5.3-26.5.5	1908.9
8. INSPECT FORMWORK FOR SHAPE, LOCATION, AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.		X	ACI 318: CH. 26.11.1.2(b)	-

C=CONTINUOUS P=PERIODIC

SOILS:

CONTRACTOR SHALL PERFORM THE FOLLOWING:

1. SUBMIT CERTIFIED MATERIAL TEST REPORTS FOR ENGINEERED FILL.

SPECIAL INSPECTOR SHALL PERFORM THE FOLLOWING:

REQUIRED VERIFICATION AND INSPECTION OF SOILS

VERIFICATION AND INSPECTION	C	P
1. VERIFY MATERIALS BELOW FOOTINGS AND SLAB-ON-GRADE ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.		X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.		X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS. AS A MINIMUM, PERFORM ONE TEXT PER LIFT FOR EVERY 2,500 SQUARE FEET OF FILL PLACED.		X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES, AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	
5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.		X

C=CONTINUOUS P=PERIODIC

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: LISA BOWE
Professional Engineer's No.: 086254
State: NY | Date Signed: 7/16/2025 | Project Mgr.: CG
Designed by: ALS | Drawn by: CLK | Checked by: LAB

STATE OF NEW YORK · LISA A. BOWE · 086254 · LICENSED PROFESSIONAL ENGINEER

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
DNAPL RECOVERY SYSTEM DESIGN

STRUCTURAL SPECIAL INSPECTION REQUIREMENTS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

ARCADIS
110 WEST FAYETTE STREET
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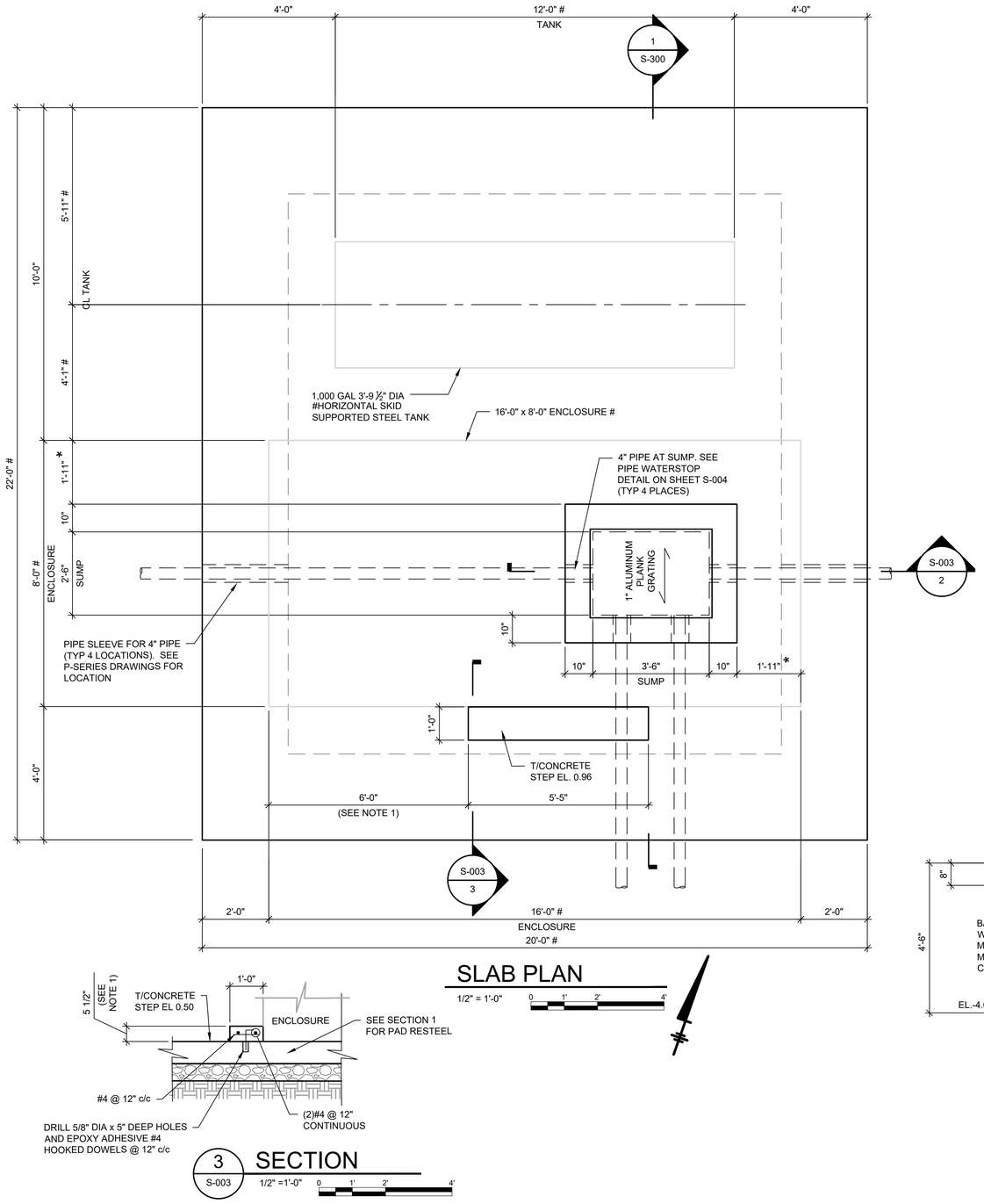
S-002



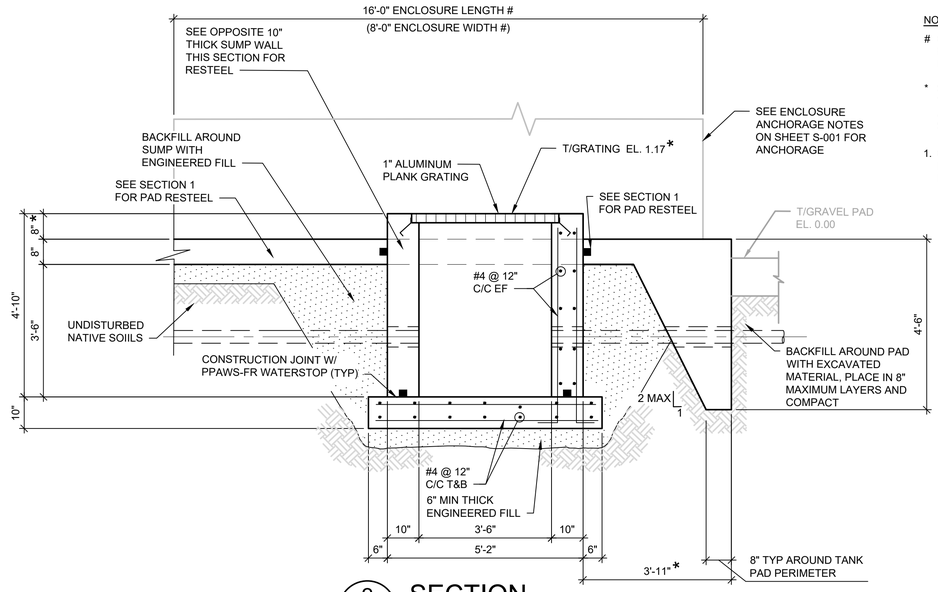
SLAB PLAN

1/2" = 1'-0"

3 SECTION

S-003

1/2" =1'-0"



2 SECTION

S-003

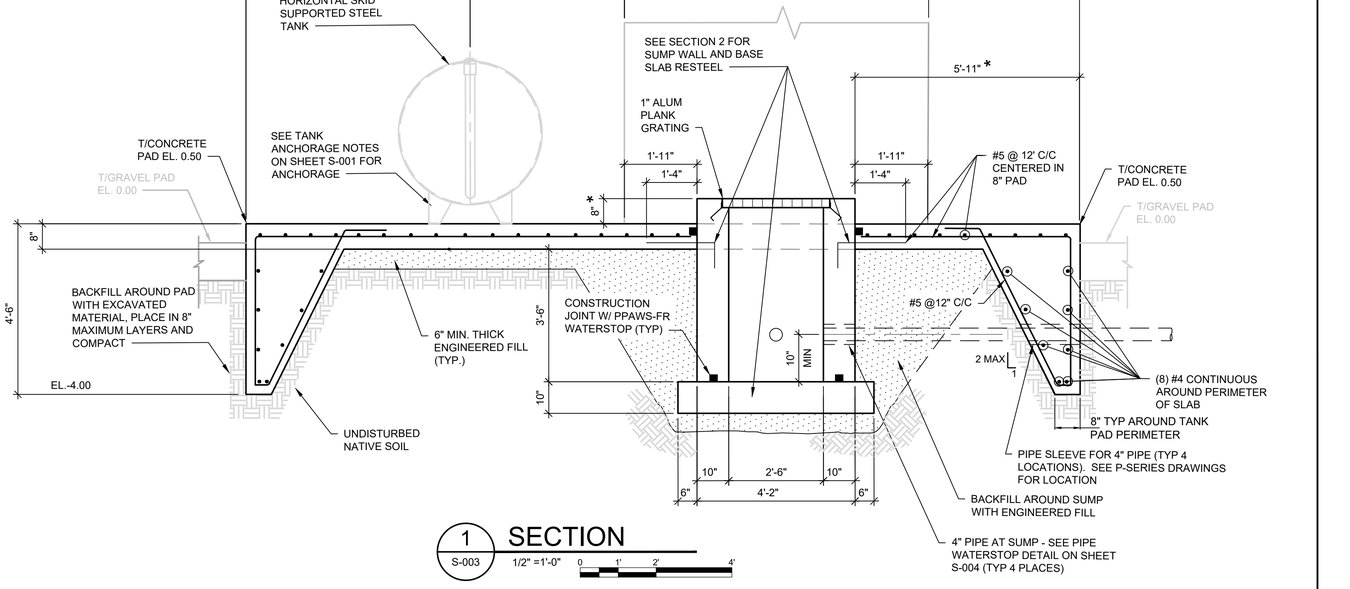
1/2" =1'-0"

NOTES:

CONCRETE PAD DIMENSIONS TO BE VERIFIED PER APPROVED ENCLOSURE AND TANK MANUFACTURER'S SHOP DRAWINGS.

* SUMP LOCATION AND WALL HEIGHT TO BE VERIFIED PER FLOOR THICKNESS SHOWN IN APPROVED ENCLOSURE MANUFACTURER'S SHOP DRAWINGS.

1. CONCRETE STEP LOCATION AND HEIGHT TO BE VERIFIED PER APPROVED ENCLOSURE MANUFACTURER'S SHOP DRAWINGS.



1 SECTION

S-003

1/2" =1'-0"

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: _____ USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: **LISA BOWE**

Professional Engineer's No.: 086254

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by: ALS	Drawn by: CLK	Checked by: LAB

STATE OF NEW YORK · LISA A. BOWE · 086254 · LICENSED PROFESSIONAL ENGINEER

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DNAPL RECOVERY SYSTEM DESIGN

STRUCTURAL SECTIONS AND DETAILS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

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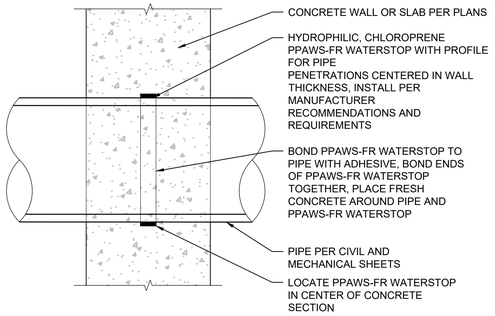
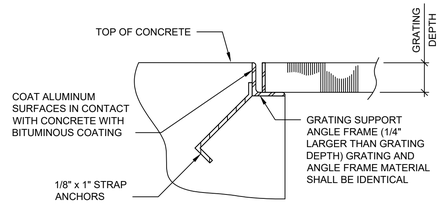
S-003



PIPE WATERSTOP DETAIL

SCALE: 3" = 1'-0"



SECTION
GRATING SUPPORT DETAILS

SCALE: NTS

REINFORCEMENT BAR LAP SPLICE DIMENSION TABLE - CONCRETE

BAR SIZE		TOP BARS	OTHER BARS
US	METRIC		
#3	#10	16"	12"
#4	#13	20"	16"
#5	#16	26"	20"
#6	#19	30"	24"
#7	#22	42"	34"
#8	#25	48"	38"
#9	#29	56"	44"
#10	#32	62"	50"
#11	#36	68"	54"

1. WHEN LAPPING TWO DIFFERENT SIZE BARS, THE SPLICE DIMENSION OF THE SMALLER BAR SHALL BE USED.
2. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS.
3. THE ABOVE TABLE IS BASED UPON 4500 PSI CLASS I CONCRETE, UNCOATED 60 KSI STEEL, MINIMUM BAR SPACING = 5 BAR DIAMETERS AND ACI CLASS B SPLICES. WHEN THESE CONDITIONS ARE NOT MET, SPLICE LENGTH SHALL BE DETERMINED IN ACCORDANCE WITH ACI 318-14.

SECTIONAL PLAN
TYPICAL WALL INSTERSECTION
REINFORCING DETAILS

SCALE: 1/2" = 1'-0"

0 1' 2' 4'

SCALE(S) AS INDICATED

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USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: LISA BOWE
Professional Engineer's No.: 086254

State	Date Signed	Project Mgr.
NY	7/16/2025	CG
Designed by	Drawn by	Checked by
ALS	CLK	LAB

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DNAPL RECOVERY SYSTEM DESIGN

STANDARD STRUCTURAL DETAILS

ARCADIS Project No.
30034367.00001

Date
JULY 2025

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110 WEST FAYETTE STREET
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S-004

C:\Users\bsmith\DC\ACCDocs\Arcadis ACC US\AUS-99999999-UPS_RED HOOK_BROOKLYN_NY\Project Files\10_WIP\10T_ARC_ENV\2025\01-DWG\SRRH4-12-F09A-STRUCTURAL SECTION DETAILS S-004.dwg LAYOUT: S-004 SAVED: 7/7/2025 10:39 AM ACADVER: 24.2S (LMS TECH) PAGESETUP: ----
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