THIRD FIVE-YEAR REVIEW REPORT FOR HOOKER CHEMICAL/RUCO POLYMERS SUPERFUND SITE NASSAU COUNTY, NEW YORK

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Community Involvement Coordinator
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CY	Cubic Yards
DCE	1,2-Dichloroethylene
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
ERH	Environmental Resource Holdings, LLC
FYR	Five-Year Review
GSH	Glenn Springs Holdings, Inc.
HHRA	Human Health Risk Assessment
ICs	Institutional Controls
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NWIRP	Naval Weapons Industrial Reserve Plant
OM&M	Operation, Maintenance, and Monitoring
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethylene
PDB	Passive Diffusion Bag
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PPB	Parts Per Billion
PPM	Parts Per Million
PPT	Parts Per Trillion
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCE	Trichloroethylene
TCR	Target Cancer Risk
THQ	Target Hazard Quotient
TIC	Tentatively Identified Compounds
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
UU/UE	Unlimited Use and Unrestricted Exposure
VCM	Vinyl Chloride Monomer
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the third FYR for the Hooker Chemical/Ruco Polymers Superfund Site (Site). The triggering action for this statutory review is the completion of the previous FYR. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of five operable units (OUs). Federal lead response actions at the Site addressed three OUs (OU1, OU2, OU3). The response actions were conducted by the potentially responsible party (PRP) under EPA oversight. OU1 addresses contaminated soils and associated impacts on groundwater at the Hooker Ruco Facility (Facility) and OU2 addresses surface soils contaminated with polychlorinated biphenyls (PCBs). OU3 addresses the contaminated groundwater beneath the Facility and the downgradient commingled contaminated groundwater plume beyond the Facility. OU1, OU2, and OU3 will be addressed in this FYR. Cleanups at the two other OUs at the Site, OU4 and OU5, were conducted under New York State Department of Environmental Conservation (NYSDEC) cleanup programs and are not subject to the CERCLA FYR process.

The Hooker Chemical/Ruco Polymers Superfund Site FYR was led by Aidan Conway, EPA Remedial Project Manager in the New York Remediation Branch. Participants included Joe Hayes, EPA Hydrogeologist; Tara Bhat, EPA Human Health Risk Assessor; Abigail Debofsky, EPA Ecological Risk Assessor; and Shereen Kandil, EPA Community Involvement Coordinator. Steven Scharf and Alexander Klein, representatives for the NYSDEC, also assisted in the preparation of this report. Occidental Chemical Corporation, the PRP that has conducted the Site work, was notified of the initiation of the FYR, as was the Hamlet of Hicksville, the municipality in which the Site is located. The review began on 10/21/2025.

Site Background

The Site is located in an industrial park area of the Hamlet of Hicksville in Nassau County, New York and was a 14-acre former polymer manufacturing facility (see Site Location Map, Appendix B). Immediately to the south and hydraulically downgradient of the Facility is the Northrop Grumman site and Naval Weapons Industrial Reserve Plant (NWIRP). Groundwater remediation, both on and off the Northrop Grumman and NWIRP property, is being conducted and overseen by the NYSDEC pursuant to the Resource Conservation and Recovery Act (RCRA) and NYSDEC Superfund Program.

The Site was originally developed by the Rubber Corporation of America, which was a small, privately held company. Operations at the Site began in 1945 and included natural latex storage, concentration, and compounding. From 1946 to 1978, a pilot plant at the Facility used a heat transfer fluid called Therminol, which contained PCBs. During this period, a release of Therminol occurred, and industrial process wastewater and storm water runoff from the Facility was discharged to six on-Site recharge basins or sumps. Drums containing various chemicals were also stored on-Site where occasional spills would occur. Some of the contaminated soil was spread onto surrounding areas by surface water runoff, sediment transport, and truck traffic.

Various entities subsequently operated at the Site including the Ruco Division of the Hooker Chemical Company (currently known as Environmental Resource Holdings, LLC (ERH)). In 1998, Sybron Chemicals Inc. acquired the Ruco Polymer Corporation. Operations at the Site included the production of various polymers, polyvinyl chloride, styrene/butadiene latex, vinyl chloride/vinyl acetate copolymer and polyurethane, as well as ester plasticizers. In 2000, the Bayer Corporation acquired the stock of Sybron Chemical Corporation. Operations at the Facility ceased in 2002, and in 2003 Bayer Polymers LLC (currently Bayer Materials Science LLC) assumed ownership of the Facility. As a result of the cessation of operations, Bayer entered into a Consent Order for closure and followed the RCRA hazardous waste facility closure and corrective action requirements for industrial land use, under NYSDEC oversight. The actions required by NYSDEC included additional soil remediation (OU4) and a soil vapor investigation (OU5); these additional OUs performed under NYSDEC oversight are not part of this FYR.

The Site was proposed to the National Priorities List (NPL) on October 15, 1984 and listed on the NPL on June 10, 1986. In September 1988, Occidental entered into an Administrative Order on Consent with EPA to perform a remedial investigation and feasibility study (RI/FS).

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Hooker Chemical/Ruco Polymers Superfund Site		
EPA ID: NYD002920312		
Region: 2	**State:** NY	**City/County:** Hicksville/Nassau County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Aidan Conway
Author affiliation: EPA
Review period:10/21/2025 - 8/1/2025
Date of site inspection: 2/4/2026
Type of review: Statutory
Review number: 3
Triggering action date: 8/23/2021
Due date *(five years after triggering action date)*: 8/23/2026

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

During the implementation of the RI/FS it was decided that PCB-contaminated areas of the Site should be the subject of a focused investigation and FS, designated OU2 and completed in 1990. Therefore, PCBs, specifically Aroclor 1248, the commercial name of one PCB, is the OU2 main contaminant of concern (COC). OU2 specifically dealt with the PCBs in soils at the Facility resulting from past Site activities. A Human Health Risk Assessment (HHRA) determined that exposure to PCB-contaminated Site soils may present a risk to on-Site workers based on reasonable maximum exposure estimates. The risk assessment evaluated exposures to soils through ingestion and dermal contact. The calculated cancer risks for these receptors exceeded the acceptable risk range, and the COC was PCBs.

The OU1 COCs were identified for both soils and groundwater. Shallow soil borings indicated tetrachloroethylene (PCE) as a COC as well as a number of tentatively identified compounds (TICs). A deep soil boring at one area of the Site contained trichloroethylene (TCE), PCE, 1,2-dichloroethylene (DCE), phthalates, ethylbenzene, toluene, xylene, phenols, and TICs which were also identified as COCs. Groundwater beneath the Site property contained vinyl chloride monomer (VCM), PCE, DCE, TCE, TICs, and arsenic at levels above New York State (NYS) Groundwater Quality Criteria and EPA maximum contaminant levels (MCLs) for drinking water and were also identified as COCs.

The 1994 ROD for OU1 identified risks associated with future groundwater use for adult and child residents. The main chemical contributors were vinyl chloride, arsenic, beryllium, and PCE. The main chemicals contributing to the cancer risk for the child trespasser exposed to surface water, sediment, and soil were beryllium, PCBs, and polycyclic aromatic hydrocarbons (PAHs). The main risks and hazards for the site worker from dermal contact with soil and ingestion and dermal contact with surface soils were from PCBs, PAHs and beryllium.

OU3 consists of the contaminated groundwater plume that has migrated downgradient from the Hooker Ruco Facility. Downgradient of the Facility, a portion of the contaminated groundwater emanating from the Hooker Ruco Site has commingled with groundwater contamination from the adjacent Northrop Grumman and NWIRP sites, which are under the supervision of NYSDEC, EPA and NYSDEC. Sampling of the commingled plume identified chemical constituents above NYS drinking water standards and EPA MCLs. The COCs for OU3 are volatile organic compounds (VOCs), primarily TCE, PCE, and VCM. The COCs identified for each of the OUs were examined based on frequency of detection and magnitude of exceedance compared to screening criteria in a Human Health Risk Assessment (HHRA), and historical activities to determine which contaminants were related to Site operations. The OU3 HHRA determined that the potential for carcinogenic risks and noncarcinogenic hazards exist for future adult and child residents through exposure to contaminated groundwater, particularly from the chemical VCM.

In its evaluation of risk at Superfund sites, EPA also considers the risk to ecological receptors. The Hooker Ruco Site is a fully developed industrial facility surrounded by industries and residential properties. For the three OUs at the Site, it was determined that in the absence of natural surface water bodies or wetlands within the Site vicinity, there is no potential for the migration of Site contamination to ecological resources.

Response Actions

OU2 ROD

The 1990 OU2 Record of Decision (ROD) addressed on-Site exposures to PCBs in surface soils by Site workers, trespassers, future residents and construction workers. The remedial action objectives (RAOs) for the 1990 OU2 ROD were to protect human health by addressing exposures via ingestion of soil, inhalation of suspended Site soils, and direct contact (ingestion and dermal contact) with the soil. The major components of the selected remedy included the following:

- Excavation of PCB-contaminated soils in excess of 10 parts per million (ppm) in the direct spill area and transport areas surrounding the pilot plant. Soils at the bottom of the recharge basin will be excavated to ten feet. Confirmatory sampling will be performed to ensure soils that remain after the excavation will have PCB concentrations that do not exceed 10 ppm.
- Soils with PCB concentrations between 10 and 500 ppm, approximately 1,100 cubic yards (CY), will be shipped for disposal to an off-Site hazardous waste landfill permitted under the Toxic Substances Control Act (TSCA).
- Stockpiled soils, which were previously excavated during the removal of an underground fuel oil tank, will be included in the disposal of PCB-contaminated soils at an off-Site chemical waste landfill.
- Soils with PCB concentrations exceeding 500 ppm, approximately 36 cubic yards, will be shipped off-Site to a TSCA-permitted incineration facility. Residuals will be disposed of, as appropriate, by the incineration facility.
- Excavated areas will be backfilled with clean soil, and these soils, excluding the recharge basin will be paved with asphalt as appropriate.
- The PCB contamination in former sump five will be left in-place[1].

OU1 ROD

The RAOs for the OU1 ROD, issued in 1994, included reduction of risks to human health associated with potential exposure to Site-related compounds by controlling the migration of groundwater downgradient from the Hooker Ruco property and attaining the groundwater cleanup criteria established by applicable or relevant and appropriate requirements (ARARs) beneath the property (see Appendix B Table A). In addition, the RAOs for soils at the Site are protection of the sole source aquifer groundwater quality, and ultimately human health, as well as limit exposure to surface soil contaminants.

The major components of the selected remedy included the following:

- Installation of groundwater extraction wells to control the flow of contaminated groundwater from leaving the Hooker Ruco property and migrating downgradient.
- Installation of a groundwater treatment system to treat the extracted groundwater.
- Installation of a discharge system to dispose of the majority of the treated groundwater.
- Additional soil testing in the bottom of sump two to determine if contaminants are present in the deep soils and to compare the levels present in the soil to cleanup criteria that are considered protective of groundwater quality.

[1] In former sump five, PCBs were detected in one sample at a concentration of 24 ppm at a depth of approximately 10 feet. The risk from this relatively low concentration is therefore reduced by approximately ten orders of magnitude. Such a risk is below EPA's acceptable risk range and therefore did not warrant remediation.

- Soil flushing for the deep soils in sump one, and possibly sump two (based upon the results of additional soil testing).
- Additional soil testing in the area around monitoring well E to determine if contaminants are present.
- Excavation of the soils in the former drum storage area and possibly the area around well E (to be determined by subsequent soil borings).
- Periodic monitoring of the groundwater extraction system to assure adequate control is maintained; periodic sampling of the groundwater treatment system discharge, to assure treatment standards are achieved; and periodic sampling of the soils in sump one and possibly sump two to measure the progress of the selected remedy in achieving the cleanup standards.
- The use of institutional controls in the form of deed restrictions and groundwater use restrictions at the Hooker Ruco property.

OU3 ROD

The ROD for OU3 was issued in 2000 and addressed the contaminated groundwater beneath the Facility and the contaminated groundwater plume that has migrated downgradient from the Hooker Ruco Facility. The RAOs for OU3 were to: protect human health from exposure (via ingestion, inhalation, and dermal contact) to VCM, TCE, PCE, and TICs in groundwater at concentrations in excess of state and federal drinking water standards; and restore the aquifer to meet New York State groundwater standards, New York State drinking water standards, and federal MCLs in a timely manner (see Appendix B Table B[2]). The major components of the OU3 selected remedy included the following:

- The use of biosparging technology in an in-situ application to enhance the VCM degradation with the goal of achieving state drinking water standards or federal MCLs.
- Vertical injection wells will be installed in the area of the VCM sub-plume to a depth of 200 to 400 ft. Additives (air/oxygen, nutrients) will be forced into the formation using either static head within the well or using pump-supplied pressure.
- A vadose zone or unsaturated zone monitoring program will be implemented to ensure that air stripping of VOCs, particularly VCM, is not occurring as a result of biosparging.
- If necessary, the selected remedy will also utilize a supplemental aerobic bioremediation technology following biosparging treatment. Supplemental bioremediation would involve the injection of nutrients (potentially including nitrogen and phosphorus along with suitable carbon sources such as methane) to enhance the growth and metabolic activities of indigenous microbial populations to effect the degradation of VCM in the aquifer.
- A long-term monitoring program will be developed to monitor groundwater quality in the area of the VCM sub-plume and to evaluate the fate and migration of VOCs southward and westward beyond the VCM sub-plume. New monitoring wells would be added to the existing network of monitoring wells to increase the network's area of coverage. The objective of the long-term monitoring program is to evaluate the effectiveness of the selected remedy.
- If necessary, a contingency remedy would be implemented to install a groundwater extraction and treatment system to remediate the VCM sub-plume. The contingency remedy will be implemented if it is determined that biosparging is not effectively treating the sub-plume. If the Northrop Grumman groundwater treatment system should cease operation before the aquifer is restored or if the

[2] The OU3 ROD identifies VCM, PCE and TCE as the primary COCs. While Appendix B Tables A and B include groundwater remediation goals for other chemicals, the OU3 remedy focused only on VCM, PCE and TCE. Additionally, the OU3 ROD states, “A complete list of the groundwater ARARs is included in Table 17. The treatment of groundwater will also address compounds which are not COCs, but exceed the ARARs.”

system is not capturing the contamination emanating from the Hooker Ruco Site, the contingency remedy would involve the installation of a groundwater extraction and treatment system to remediate the sub-plume.

Status of Implementation

OU2 Remedial Actions

Occidental mobilized at the Site for the performance of the OU2 remedial action work on May 4, 1992. Approximately 52 CY of soil with PCB concentrations exceeding 500 ppm were excavated and shipped off-Site for thermal destruction at a TSCA-permitted incineration facility. Approximately 1,957 CY of soil with PCB concentrations between 10 and 500 ppm were shipped off-Site and disposed of at a TSCA permitted landfill. EPA inspected the Site on September 3, 1992, and concluded that the remedial action was completed. Occidental's Remedial Action Report was approved on March 12, 1993. Additional PCB-contaminated soil was revealed, however, during Bayer's implementation of a New York State RCRA closure action in 2000. This additional contamination was removed from the Site by Bayer under NYSDEC oversight under the state hazardous waste and remediation programs in September 2014.

OU1 Remedial Actions

On June 30, 1994, EPA unilaterally issued an administrative order to the Occidental Chemical Corporation and to the Ruco Polymer Corporation for implementation of the OU1 ROD. Soil sampling in the MW-E area, the sump 1 area, and the sump 2 area, took place in December 1998. Based upon the analysis of the soil sampling data collected in 1998, and the NYSDEC soil cleanup guidance, EPA determined that the MW-E area and the sump 2 area were not source areas of contamination to groundwater. In November 2000, the concrete tank in sump 1 was removed. The tank demolition debris was disposed of at the Chemical Waste Management Facility in Model City, New York.

Excavation of PCB-impacted soils was necessary in the former drum-storage area since sampling indicated that the NYS cleanup criterion of 10 ppm had been exceeded. The excavation of 310 tons of soil occurred in early December 2001. Later in December 2001, based on confirmatory results, an additional 17 tons of soil were removed. The PCB-impacted soil was disposed of at the Chemical Waste Management Facility in Model City, New York.

The soil-flushing system for the OU1 remedy was installed in December 2001. The system consisted of one run of approximately 100 feet of perforated pipe installed in a rectangular, horizontal profile at a depth of 8 to 10 feet below ground surface. Four soil flushing events occurred at sump 1 in August 2002, March 2003, March 2004, and March 2005. The volume of water used for each event was approximately 16,000 gallons. Since the flushing system was installed approximately 8 to 10 feet below the ground surface in an unsaturated zone which extends to approximately 50 feet below ground surface, the flushing system was abandoned in place.

EPA's final inspection of the OU1 remedial action occurred in January 2006. On March 16, 2006, Occidental submitted to EPA the sampling data which demonstrated that the operation achieved the soil cleanup goals for PCBs, arsenic, zinc and chromium. On September 28, 2007, EPA approved a Remedial Action Report which documented the completion of the OU1 remedial action.

Table 1: OU1 Soil Cleanup Goals (ppm)

Compound	To-Be-Considered Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
PCBs	10
Arsenic	21
Zinc	110
Chromium	40

Additionally, the RAO for soils at the Site includes protection of the sole source aquifer groundwater quality. This RAO became the focus of OU3 and more information on the actions taken to protect and restore groundwater quality is discussed under OU3.[3]

OU3 Remedial Actions

The ROD for OU3 was issued on September 29, 2000. The remedy called for the use of in-situ bio treatment of the VCM sub-plume using air biosparging to reduce the concentration of VCM to 2 parts per billion (ppb) which is the NYS drinking water standard and the federal MCL for VCM.

The VCM sub-plume's perimeter contains oxygen, nutrients, carbon sources, and microbes that biodegrade peripheral concentrations of VCM. It is in the core area of high VCM concentrations where the oxygen has been consumed, thus limiting the VCM biodegradation process. Low level PCE and TCE concentrations within the sub-plume have been biodegraded due to the anaerobic conditions created by the VCM. The injection of oxygen into the central core of the VCM sub-plume replenishes the oxygen supply to restart and enhance the VCM biodegradation process after the PCE and TCE have been degraded.

PCE and TCE associated with the Site that is not degraded flows from the Hooker Ruco Site towards the treatment system constructed by Northrop Grumman under NYSDEC oversight. The groundwater is extracted from a recovery well and treated by the system at the Northrop Grumman property for PCE and TCE contamination from the Northrop Grumman and NWIRP sites and discharged to a series of recharge basins installed as part of the Northrop Grumman groundwater containment and treatment system.

The air injection system for the Site is comprised of two injection well fences, or lines of injection wells. These two injection fences are identified as the middle and northern fences. There are eight injection locations for the middle fence and seven for the northern fence. A cluster of two air injection wells at different depths were installed at each injection location. The system was installed in two phases. The first phase, implemented between November 2005 and September 2006, was the pilot system which included the construction of a control building and the first four injection well nests of the middle fence. The second phase included the remainder of the biosparging system and associated system components and was completed in August 2012. EPA and the NYSDEC conducted a final inspection of the system on September 12, 2012 and on September 17, 2012, the system became fully operational.

[3] The OU3 ROD documented the determination that the groundwater extraction and treatment system included in the OU1 ROD was not necessary due to the operation of the downgradient Northrop Grumman treatment system, which was effectively capturing commingled groundwater contamination emanating from the Hooker Ruco Facility.

A Remedial Action Report for OU3 was approved by EPA on June 30, 2013. Operation, maintenance, and monitoring (OM&M) activities are currently carried out by ERH[4] in accordance with the OM&M Plan submitted by Occidental in September 2012 and updated in March 2015.

Significant progress has been made by the biosparging treatment system in reducing VCM concentrations in groundwater. As a result, on November 2, 2021, the PRP submitted a work plan to EPA for a trial/partial shutdown of the biosparge system to evaluate the performance of the in-situ bioremediation for OU3. The work plan proposed the shutdown of four injection wells associated with the north injection well fence, and four injection wells associated with the middle injection well fence. The work plan also outlined a groundwater monitoring program to determine whether "rebound" of VCM concentrations was occuring in the monitoring wells. On August 18, 2022, the trial/partial shutdown work plan was approved by EPA. The trial/partial shutdown commenced on January 25, 2023. Certain injection wells associated with the north and middle injection well fences were shut down, and groundwater samples were collected from monitoring wells on a quarterly basis for VCM, PCE, and TCE, as well as measurement of field dissolved oxygen (DO) readings on a monthly basis. Six quarterly monitoring events were conducted from 2023 through 2024 to evaluate the effectiveness of the trial/partial shutdown. Injection wells associated with the middle fence remain offline for maintenance, however, performance monitoring of the biosparge system continues to be conducted concurrently with the semi-annual monitoring events. Results are discussed below.

IC Summary Table

Table 2: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil and groundwater (OU1)	Yes	Yes	Site Property	Restrict use of the Facility property to industrial development only and restrict installation of groundwater wells and groundwater use.	Environmental Easement/ Restrictive Covenants filed in the Nassau County Clerk's office on June 29, 2017.

Systems Operations/Operation & Maintenance

OM&M activities are currently carried out by ERH in accordance with the OM&M Manual. The most recent version of the OM&M Manual is dated March 2015. The plan addresses the long-term operation, maintenance, and monitoring of the biosparging system and provides a summary of maintenance requirements for the various components of the system. Semi-annual OM&M Reports are provided to EPA and the data are evaluated to confirm the efficacy of the remedial system. Prior to 2019 these reports were provided quarterly.

[4] On March 4, 2026, OxyChem informed EPA and NYSDEC that OxyChem completed an internal corporate reorganization and name change. As a result of the reorganization, Environmental Resource Holdings, LLC (ERH) is the new name of the successor to OxyChem for the Site. No transfer, assignment or change of ownership or operational control of the Site has taken place as a result of the reorganization and name change. ERH, as OxyChem's successor, will continue to perform its obligations at the Site. Glenn Springs Holdings, Inc. (GSH) will continue to manage ERH's responsibilities. The GSH project manager and associated personnel will remain the same. Both ERH and GSH remain wholly owned subsidiaries of Occidental Petroleum Corporation.

The OM&M Manual contains detailed information regarding the description and specifications of the equipment used in the biosparge treatment system. Operating parameters for each piece of equipment are provided, including the instrumentation parameters for determining the proper function of each piece of equipment, the reason for monitoring, and troubleshooting potential problems. Treatment startup and shutdown procedures are provided as well as any personal protective equipment that may be necessary in the routine inspection and operation of the system. Current operations are conducted in accordance with the 2022 Revised Work Plan for Trial/Partial Biosparge System Shutdown and In-Situ Bioremediation Performance Evaluation.

The system is shut down monthly to allow for inspections, which include the following tasks:

- Inspection of oil levels in the compressor;
- Inspection to verify proper instrument operation;
- Inspection of piping, valves, and vessels for leakage;
- Inspection of injection wells to verify proper operation of the valves; and
- Inspection of monitoring wells to verify well cap is securely fastened, relief valve is closed, and that no air or water has leaked out of the well cap.

Additionally, semi-annual inspections are conducted to confirm that the surface features of all monitoring wells are intact. Routine maintenance is performed as necessary and includes the cleaning/repair of the metering pump, the cleaning/repair of the mixing unit, and the cleaning/repair of the compressor. Groundwater monitoring is performed on the three groups of well nests as well as additional monitoring wells as needed. Monitoring is generally performed quarterly for the first year of operation and semiannually thereafter. Sample collection methodology and parameter analysis has been refined over time but initially each well is monitored for VOCs (including TICs) and conditional parameters of the groundwater such as total organic carbon (TOC), dissolved oxygen, pH, temperature, and conductivity. Process monitoring targets the rate of VCM biodegradation, injection material distribution and migration, and the monitoring of groundwater flow pathways. Remedy logic is also provided in the OM&M Manual based upon VCM concentrations, redox conditions, and TOC concentrations to make adjustments in the field to maximize the efficiency of the system. Quarterly monitoring reports are provided to EPA containing validated biosparge system performance data. Beginning in 2019, monitoring reports were provided semi-annually. In March 2025, EPA approved a reduction in sampling frequency for certain wells where VCM had not been detected for three or more years (see Appendix B Table C).

In October 2024, redevelopment activities at the Facility were completed, including the construction of a warehouse building, stormwater infiltration basins, asphalt parking areas, and landscaping. Construction activities included the characterization and export of topsoil, concrete, and asphalt, excavation for building foundation elements, import of NYSDEC-approved clean fill, and the installation of a vapor mitigation system. Potential site impacts from severe weather events have been assessed, and the performance of the remedy is currently not at risk due to these expected effects (see Appendix C).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR.

Table 3: Protectiveness Determinations/Statements from the 2021 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 is protective of human health and the environment.
2	Protective	The remedy at OU2 is protective of human health and the environment.
3	Protective	The remedy at OU3 is protective of human health and the environment.
Sitewide	Protective	The implemented remedies are protective of human health and the environment.

There were no Issues or Recommendations identified in the last FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On July 21, 2025, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, and the U.S. Virgin Islands, including the Hooker Chemical/Ruco Polymers Superfund Site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, the EPA Community Involvement Coordinator (CIC) for the Site, Shereen Kandil, provided a public notice to the Town of Oyster Bay by email on March 11, 2026, with a request that the notice be posted in municipal offices and on the town website, and provided the notice to the Hicksville Public Library in Hicksville, NY, which serves as a repository for the Site administrative records. On March 12, 2026, EPA posted the public notice at www.epa.gov/superfund/hooker-ruco-polymer. This notice indicated that a FYR would be conducted at the Hooker Chemical/Ruco Polymers Superfund Site to ensure that the cleanup at the Site continues to be protective of human health and the environment. Once the FYR is completed, the results will be made available at the following repositories: Hicksville Public Library, 169 Jerusalem Avenue, Hicksville, Nassau County, NY and the EPA Region 2 Superfund Records Center, 290 Broadway, 18th Floor, New York, NY. In addition, EPA will post the final report on the following website: https://www.epa.gov/superfund/hooker-ruco-polymer. The CIC will make efforts to reach out to local public officials to inform them of the results.

Data Review

Data are collected and reviewed to ensure that RAOs are met following implementation of the remedial action(s). For this Site, groundwater data for the three OUs were evaluated and discussed below. OU1 and OU2 soils were remediated below NYSDEC guidance values for industrial use. There is no soil data collected, other than evaluation of ICs.

OM&M Performance

OM&M performance data collected and reported to EPA since the biosparge treatment system began operating to confirm that the system is effective in maintaining elevated DO levels and removing VCM from the aquifer. Appendix B Table D provides sampling data of the VCM subplume over time since the last FYR (November 2020 through April 2025). Evaluation of the VCM data collected from core plume wells from that period show a stabilization in plume size and decreasing VCM concentrations. Groundwater VCM concentrations were non-

detect, low level, or decreased between the November 2020 and April 2025 performance monitoring events in 49 of the 55 monitoring wells for the biosparge system. Six of the 55 total monitoring wells (MW-70D1, MW-72D1, MW-76D1, MW-82D1, MW-58D2, and MW-3-1) experienced VCM concentration stabilization with no notable increase in VCM concentrations. Sampling at two wells revealed VCM concentrations above 25 ppb (MW-76D1 and MW-82D1). VCM concentrations in MW-76D1 have been relatively stable from November 2020 (12.4 ppb) to May 2022 (25 ppb) with the maximum concentration during this period in May 2022 (25 ppb). VCM concentrations increased in MW-82D1 from 13.4 ppb in April 2021 to 122 ppb in October 2021, then decreased to 2.4 ppb in May 2022. Since 2022, MW-82D1 has been consistently non-detect for VCM.

Although PCE and TCE concentrations are trending downward or have remained relatively stable since the start of the biosparge system in most wells, PCE and TCE concentrations have increased in two wells (MW-86D2 (screened from 350 to 360 feet below ground surface (bgs)) and MW-89D1 (screened from 345 to 355 feet bgs)). PCE concentrations trended upward in MW-86D2 from 49.3 ppb in November 2020 to 84.6 ppb in April 2021 but then decreased to 40 ppb in October 2024. Prior to this FYR, a decreasing trend was noticed. The historical minimum PCE concentration for this well was 4.3 ppb in October of 2019, and the historical maximum concentration was 84.6 ppb in April 2021. In November of 2020, the concentration of PCE in MW-89D1 was 3.4 ppb, and a steady increase of PCE was shown afterwards leading to a historically high concentration of 39 ppb in April 2025. MW-86D2 is located in proximity to the western edge of the VCM plume and MW-89D1 is located in proximity to the eastern edge of the VCM plume. These wells are screened in the deeper interval that showed higher PCE and TCE concentrations and lower VCM concentrations during the installation of the biosparge system in 2011. During the time period of this review, multiple air injection wells in both the north fence and middle fence areas (IW-1D1, IW-3D1 and D2, IW-4D1 and D2, IW-5D2, IW-6D1 and D2, IW-7D2, IW-16D1 and D2, IW-17D1 and D2, IW-18D1, IW-19D2, IW-21D1 and D2, IW-22D1 and D2) were inoperable due to the need for well repairs or due to the trial/partial biosparge system shutdown. The resulting increases in wells MW-86D2 and MW-89D1 may be related to the changing displacement of various air injection wells being repaired or in a trial shutdown period. In the second 2021 semi-annual report, seven wells were in need of repair. In the most recent sampling event, 19 wells were not functional. Additional monitoring data will be evaluated to determine whether certain air injection wells should remain offline or be restarted.

Trial/Partial Biosparge System Shutdown and In-Situ Bioremediation Performance Evaluation

The trial/partial shutdown commenced on January 25, 2023. Injection wells associated with the north (IW-3D1, IW-3D2, IW-4D1, and IW-4D2) and middle (IW-16D1, IW-16D2, IW-17D1, and IW-17D2) injection well fences were shut down, and groundwater samples were collected from monitoring wells on a quarterly basis for VCM, PCE, and TCE, as well as monthly measurement of field DO readings on a monthly basis. The primary purpose of the trial/partial shutdown was to demonstrate that “rebound” of VCM concentrations was not occuring. Rebound was defined as VCM concentrations exceeding 2 ppb for two consecutive sampling events, or an increase in VCM concentrations at monitoring well MW-76D1.

Six quarterly monitoring events have been conducted during this FYR period as part of the trial/partial shutdown. The most recent sampling event in August 2024 indicated stable or decreasing concentrations of VCM in monitoring wells associated with the north injection well fence compared to pre-shutdown concentrations. MW-76D1 decreased from pre-shutdown concentrations of 25 ppb in April 2022 to 13 ppb in August 2024. VCM was not detected in any of the monitoring wells associated with the middle injection well fence during the trial/partial shutdown (see Appendix B Table E).

Based on the data collected during the trial/partial shutdown, MW-70D1, MW-72D, and MW-76D1 associated with the northern injection well fence exhibited sustained VCM concentrations above 2 ppb, therefore, it was determined that rebound may be occuring. As a result, air injections were restarted at IW-3 and IW-4, with continued groundwater monitoring of wells associated with the northern injection well fence. VCM was not

detected in monitoring wells associated with the middle injection well fence. As a result, injection wells IW-16 and IW-17 associated with the middle injection well fence remain offline as a continuation of the trial/partial shutdown, however, groundwater monitoring of wells associated with the middle fence continues to be conducted concurrently with the semi-annual monitoring events.

Per-and Poly-Fluoroalkyl Substances (PFAS)

In November 2018, NYSDEC conducted groundwater sampling to evaluate the presence of per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane from three monitoring wells located along the northern injection well fence (MW-75D1, MW-76S, MW-77D2). In April 2024, EPA finalized federal drinking water MCLs for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) at 4 parts per trillion (ppt) along with three other PFAS compounds. In 2020, NYSDEC established drinking water MCLs for PFOA and PFOS of 10 ppt. In 2023, NYSDEC released Ambient Water Quality Guidance Values (AWQGVs) of 6.7 ppt for PFOA and 2.7 ppt for PFOS. The maximum concentrations of PFOA and PFOS detected were 38 ppt (MW-77D2) and 180 ppt (MW-77D2), respectively. Revisiting the sampling results in the context of the state and federal MCLs and state guidance values, both compounds exceeded NYS AWQGVs and the most recent EPA MCLs.

In 2020, New York State established an MCL of 1.0 ppb for 1,4-dioxane. In 2023, NYSDEC released an AWQGV of 0.35 ppb. In 2018, three wells were sampled for 1,4-dioxane at the Site. The maximum concentration of 1,4-dioxane detected was 98 ppb (MW-75D1), exceeding the NYS MCL and AWQGVs. Concentrations of 1,4-dioxane at the two other wells sampled were also detected above NYS AWQGVs and at or above the NYS MCL at 2.4 ppb (MW-77D2) and 1.0 ppb (MW-76S).

No PFAS or 1,4-dioxane sampling has been completed this FYR period. Additional analysis for the presence of PFAS and 1,4-dioxane in groundwater at the Site is suggested.

Dissolved Oxygen

The target level for DO concentrations in monitoring wells associated with the biosparge system is 2 mg/L and above. During the October 2024 sampling event, only two of the 45 wells sampled showed DO concentrations below the 2 mg/L target level: MW-86D1 (0.56 mg/L) and MW-59D2 (1.39 mg/L). Although these wells showed DO levels below the target level during their most recent sampling event within the FYR window, DO concentrations were above 2 mg/L for the majority of their previous sampling events. Additionally, VCM concentrations were non-detect in the same sampling event in those wells.

DO was not measured in MW-90D1 and MW-90D2 during this FYR period due to the one-inch diameter of the wells. Additionally, the wells have not been sampled for DO since 2011. VCM concentrations have been consistently non-detect in these wells. DO was not consistently measured in four monitoring wells that were sampled during this FYR period (MW-73D2, MW-88D2, MW-67S, and MW-67D) due to the periodic damage of super sleeve samplers during sampling events at the other monitoring wells. VCM was non-detect in these wells during the most recent sampling event for each monitoring well.

In March 2025, EPA approved a reduction in sampling frequency for certain wells where VCM had not been detected for three or more years (see Appendix B Table C). The wells mentioned in the above paragraph that have had a history of issues recovering non-agitated samples through their passive diffusion bags (PDBs) are exempt from sampling in the future due to their historical concentrations of VCM. During the April 2025 sampling event, twelve monitoring wells (MW-68S, MW-70D1, MW-72D1, MW-75D1, MW-75D2, MW-76D1, MW-81D1, MW-82D1, MW-85D1, MW-85D2, MW-89D1, and MW-89D2) were sampled for DO, all twelve of which showed DO concentrations above the 2 mg/L target level.

Supplemental Treatment System

Additionally, since some of the residual concentrations of VCM, PCE, and TCE are treated at the Northrop Grumman property, EPA also evaluates the treatment data provided by Northrop Grumman to NYSDEC to ensure that downgradient plume contamination is collected and treated in accordance with design protocols and RAOs. Review of this data also confirm that remedial objectives are being met. VCM, PCE, and TCE (and any additional VOCs) are pumped from recovery well 3R to the treatment facility on the Northrop Grumman property.

The PRP constructed a pre-treatment aerobic bioremediation treatment system (the Supplemental Treatment System) on the Northrop Grumman property to treat residual VCM in the groundwater prior to treatment of VOCs via air stripping. This was a polishing system that ran continuously and was operated by Northrop Grumman, but maintained by the PRP. On January 26, 2017, the PRP received concurrence from the State to stop treatment of VCM with the supplemental air treatment. Operation, maintenance and monitoring of the Supplemental Treatment System was thereafter taken over by Northrop. It is noted that the VCM concentrations in Well 3R ranged between 1.3 (August 2024) and 4.4 (November 2021) ppb with the most recent concentration from November 2024 being 1.8 ppb.

Evaluation of the data collected for the treatment of groundwater at the Hooker Chemical/Ruco Polymers Site confirms that RAOs for groundwater are being met.

Soil Vapor Intrusion

As part of the redevelopment activities at the Facility property, the potential for soil vapor intrusion (SVI) was assessed by NYSDEC as part of OU4 by taking samples in the new warehouse building in October 2024. The assessment included four SVI samples (one from each of the two enclosed office spaces and two samples from the warehouse area) and one ambient air sample. The samples were tested for VOCs, including Site COCs TCE, vinyl chloride, PCE, cis-1,2-DCE, and 1,2-dichloroethane. With the exception of one PCE detection (0.23 J micrograms per cubic meter ($\mu g/m^3$)) in an indoor air sample, all of the five Site COCs were non-detect in the indoor air samples.

At this time, the building is unoccupied, however, future building use is expected to reflect a typical commercial scenario. For this reason, the results from the four indoor air samples were compared against the USEPA Commercial Vapor Intrusion Screening Levels (VISLs). None of the detected compounds had results that exceeded the most conservative VISLs (protective of target cancer risk [TCR] of 1×10^{-4} and target hazard quotient [THQ] of 1). Therefore, future building occupants are not expected to face unacceptable risk from vapor intrusion. The hypothetical future residential exposure scenario is unlikely due to the Environmental Easement/Restrictive Covenants filed in 2017 which restrict land use to commercial and industrial uses. However, if the building is used for residential purposes in the future, the data will need to be re-examined.

Site Inspection

The inspection of the Site was conducted on 2/4/2026. In attendance were Aidan Conway, EPA remedial project manager; Joe Hayes, EPA hydrogeologist; Tara Bhat, EPA human health risk assessor; Alexander Klein of the NYSDEC, Paul Bluestein of Glenn Springs Holdings, Inc., John Pentilchuk of GHD, and Bill Schlageter of Preferred Environmental Services. The purpose of the inspection was to assess the protectiveness of the remedy. No issues or adverse conditions were observed and no indications of trespassing were observed.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

The remedy is functioning as intended by each of the three RODs for the Site.

Pursuant to the OU2 ROD, PCB contaminated soil that exceeded the cleanup criteria of 10 ppm has been removed from the Site and disposed of in an appropriate manner. Excavated areas have been backfilled with clean fill. The OU2 remedy was deemed complete upon approval of the OU2 Remedial Action Report in 1993.

For OU1, contaminated soil that acted as a source of groundwater contamination was excavated from the Site and disposed of appropriately. Other soil at the Site that contributed to groundwater contamination was treated on-Site by soil flushing. The OU1 remedial action for soils was completed upon approval of the OU1 Remedial Action Report in 2007.

The VCM plume associated with OU3 is being treated through biosparging and evaluation of the data indicates that the process is effective. Additionally, downgradient VCM and PCE/TCE groundwater contamination is being effectively captured and treated by the Northrop Grumman groundwater treatment system. The Northrop Grumman groundwater extraction wells nearby constitute both the deep (519 to 570 feet bgs in GP-1 and 421 to 437 feet bgs, 471 to 497 feet bgs, and 511 to 531 feet bgs in GP-3R) and intermediate (288 to 366 feet bgs in GP-6) zones. For example, the VCM result in MW-75D2 of 19.7 ppb in November 2020 was reduced to 1.4 ppb in April 2025 (see Appendix B Figure 3), below the MCL of 2 ppb. Several semi-annual sampling reports noted that the PDB super sleeve samplers in certain monitoring wells, including MW-63D1, MW-67S, MW-68S, MW-73D2, MW-84D2, MW-88D2, and MW-93D2, were ripped. As a result, these monitoring wells were only able to be analyzed for VOCs during the respective monitoring event. The PDB super sleeve samplers are one-time use samplers and are replaced for each monitoring event. In addition, as noted in the Per-and Poly-Fluoroalkyl Substances (PFAS) section above, no PFAS or 1,4-dioxane sampling from this FYR period was available for review.

The deeper PCE/TCE groundwater contamination is not addressed through biosparging and is instead captured by extraction well GP-3R, which is part of Northrop Grumman's groundwater treatment system. While EPA is in receipt of the quarterly influent and effluent data for VCM and PCE/TCE provided to NYSDEC by Northrop Grumman for the Northrop Grumman groundwater treatment system, NYSDEC is the lead agency overseeing the cleanup performed at the Northrop Grumman facility. As such, NYSDEC is the lead agency for reviewing the treated groundwater effluent data as it relates to the State Pollutant Discharge Elimination System permit issued by NYSDEC to Northrop Grumman.

Completion of the construction of the OU3 remedy was documented in the OU3 Remedial Action Report approved by EPA in 2013. OM&M of the OU3 remedy is ongoing. A trial/partial shutdown of the biosparge system commenced in 2023 to determine whether "rebound" of VCM concentrations was occurring following shut down of certain injection wells. Data collected during the trial/partial shutdown demonstrated that rebound may be occurring in the northern injection well fence, while VCM concentrations remained non-detect in monitoring wells associated with the middle injection well fence. The trial/partial shutdown remains ongoing with air injections being restarted at injection wells associated with the northern injection well fence. Groundwater monitoring continues to be conducted semi-annually.

The OU3 remedy also allowed for a contingency extraction and treatment remedy should biosparging of the VCM plume prove to be ineffective. Based on the results observed from implementation of the pilot system in 2006, review of subsequent OM&M data, and based on results of the trial/partial shutdown of the biosparge system, it is not anticipated that the contingency remedy will be exercised.

Additionally, in October 2024, redevelopment activities at the Facility were completed, including the construction of a warehouse building, stormwater infiltration basins, asphalt parking areas, and landscaping. Construction activities included the characterization and export of topsoil, concrete, and asphalt, excavation for building foundation elements, import of NYSDEC-approved clean fill, and the installation of a vapor mitigation system. These activities did not impact the protectiveness of the remedy and were conducted consistent with implemented ICs.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure assumptions and the toxicity values that were used to estimate the potential risks and hazards to human health followed general risk assessment practice at the time the risk assessment was performed and are generally consistent with current practice. Although construction of a warehouse building, stormwater infiltration basins, asphalt parking areas, and landscaping was completed at the Facility in October 2024, these changes in physical conditions do not affect the protectiveness of the remedy. The redevelopment activities included the characterization and export of topsoil, concrete, and asphalt, excavation for building foundation elements, import of NYSDEC-approved clean fill, and the installation of a vapor mitigation system. There are no currently complete exposure pathways present. In addition, the Site has limited access based on its location in an industrial area and partial fencing around the property to restrict entry onto the Site. At the Site visit, no indications of trespassing were observed.

As described above, the main COCs identified in soil were PCBs. The soil remediation goal for PCBs was 10 ppm, which is below NYSDEC guidance values for industrial use (25 ppm). The PCB concentrations are protective based on comparison of the remedial concentrations to risk-based concentrations indicating that the risks are within the EPA target risk range ($1x10^{-6}$ to $1x10^{-4}$) and below the goal of protection of a Hazard Index (HI) = 1 (e.g., Aroclor 1254 concentration of 15 ppm is associated with a non-cancer HI = 1).

The OU1 and OU3 RODs established federal MCLs and state groundwater quality standards as the cleanup criteria for the COCs for groundwater, namely VCM, PCE, and TCE. The cleanup goals identified in the ROD are listed in Tables A and B; while these tables include other chemicals, the OU3 remedy was selected to address VCM, PCE and TCE. In support of this idea, the OU3 ROD states, “A complete list of the groundwater ARARs is included in Table 17. The treatment of groundwater will also address compounds which are not COCs, but exceed the ARARs.” A similar statement is made in the OU1 ROD. The cleanup criteria for these COCs remain valid.

Exposure to the contaminated groundwater underlying the Facility is considered unlikely because of the general availability of a municipal water supply (e.g., Hicksville Water Supply District). This supply is periodically tested to ensure its quality in accordance with New York State law. Additionally, institutional controls restrict the use of Facility property to industrial development and restrict installation of groundwater wells and groundwater use until it has been fully remediated.

In April 2024, EPA finalized federal drinking water MCLs for PFOA and PFOS at 4 ppt along with three other PFAS compounds. In 2020, NYSDEC established drinking water MCLs for PFOA and PFOS of 10 ppt. In 2023, NYSDEC released AWQGVs of 6.7 ppt for PFOA and 2.7 ppt for PFOS. Although there is currently no exposure at the Site to groundwater due to the existing institutional controls and a municipal drinking water supply, additional periodic sampling of groundwater for these emerging contaminants should be conducted as part of the OM&M Manual.

As part of the redevelopment activities at the Facility property, soil vapor intrusion samples were taken in the new warehouse building in October 2024 as part of OU4, as discussed in the Data Review section. The indoor air

samples were compared against the USEPA Commercial Vapor Intrusion Screening Levels (VISLs). None of the detected compounds had results that exceeded the most conservative VISLs (protective of target cancer risk [TCR] of 1 x 10^{-4} and target hazard quotient [THQ] of 1). Therefore, future building occupants are not expected to face unacceptable risk from vapor intrusion. If the building is used for residential purposes in the future, the data will need to be re-examined.

The vapor intrusion pathway for buildings in OU3 (off-property groundwater) was modeled by comparing the maximum groundwater concentrations of TCE, DCE, PCE, and VCM against the Commercial VISLs for the volatile COCs protective of TCR of 1 x 10^{-6} and THQ of 1. The maximum concentration of 610 ppb of PCE in well MW-87D2 exceeded the PCE commercial cancer VISL of 65.2 ppb (TCR of 1 x 10^{-6}) and the noncancer commercial VISL of 242 ppb (THQ of 1). The maximum concentration of 277 ppb of TCE in well MW-87D2 exceeded the TCE commercial cancer VISL of 7.43 ppb (TCR of 1 x 10^{-6}) and the noncancer commercial VISL of 21.8 ppb (THQ of 1). For vinyl chloride, the maximum concentration of 122 ppb in well MW-68S exceeded the commercial cancer VISL of 2.45 ppb (TCR of 1 x 10^{-6}) but not the noncancer commercial VISL of 197 ppb (THQ of 1). However, the PCE, TCE, and VCM contamination is located deep within the aquifer (at depths greater than 100 feet bgs), therefore, vapor intrusion is not expected to be a concern since the contaminants are not expected to travel to the surface from that depth. Of the three COCs, TCE had the most exceedances of the noncancer commercial VISL, however, none of these exceedances occurred above 300 feet bgs, which suggests a layer of clean groundwater at shallower intervals. For these reasons, additional indoor air sampling is not recommended at this time. Concentrations of cis-1,2-DCE and trans-1,2-DCE were below the commercial and residential VISLs. Currently, the buildings over the off-property groundwater plume are used for commercial purposes. The hypothetical future residential exposure scenario is unlikely due to the Environmental Easement/Restrictive Covenants filed in 2017 which restrict land use to commercial and industrial uses. However, if the building is used for residential purposes in the future, the data will need to be re-examined.

The RAOs remain valid.

Because of the developed and industrial nature of the Site, ecological receptors would not likely be exposed to site soils. Additionally, in the absence of natural surface water bodies or wetlands within the Site vicinity, there is no potential for the migration of Site contamination to ecological resources. Therefore, exposure to ecological receptors has been interrupted.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy. There have been no changes at the Site as a result of natural disasters or climate change impacts.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1, OU2, OU3

OTHER FINDINGS

The five-year review did not identify any issues that impact current or future protectiveness. However, the following suggestion was identified during the FYR:

1. Levels of emerging contaminants have been found in groundwater at the Site above federal MCLs and state standards. Although there is currently no exposure at the Site to groundwater due to the existing institutional controls and a municipal drinking water supply, additional periodic sampling of groundwater for these emerging contaminants should be conducted as part of the OM&M Plan.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU1	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment.	

Protectiveness Statement(s)	
Operable Unit: OU2	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU2 is protective of human health and the environment.	

Protectiveness Statement(s)	
Operable Unit: OU3	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU3 is protective of human health and the environment.	

Sitewide Protectiveness Statement
Protectiveness Determination: Protective
Protectiveness Statement: The implemented remedies are protective of human health and the environment.

VIII. NEXT REVIEW

The next FYR report for the Hooker Chemical/Ruco Polymers Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Document Title, Author	Date
OU2 Record of Decision, Hooker Chemical/Ruco Polymer Site, EPA	September 28, 1990
OU1 Record of Decision, Hooker Chemical/Ruco Polymer Site, EPA	January 28, 1994
OU3 Record of Decision, Hooker Chemical/Ruco Polymer Site, EPA	September 29, 2000
Preliminary Site Close Out Report, EPA	July 1, 2015
Hicksville Biosparge System Operation, Maintenance and Monitoring Manual, Occidental	March 2015
Annual Operation Maintenance and Monitoring Report for the Northrop Grumman Bethpage Facility	March 31, 2019
Quarterly and Semi-Annual Reports and Addendums, Hooker Chemical/Ruco Polymer Site, Occidental	January 20, 2021 – July 15, 2025
Revised Work Plan for Trial/Partial Biosparge System Shutdown and In-Situ Bioremediation Performance Evaluation, Occidental	May 3, 2022
Quarterly Monitoring Reports Trial/Partial Biosparge System Shutdown, Occidental	October 9, 2023 – October 9, 2024

APPENDIX B – Figures and Tables

Figure 1: Site Location Map

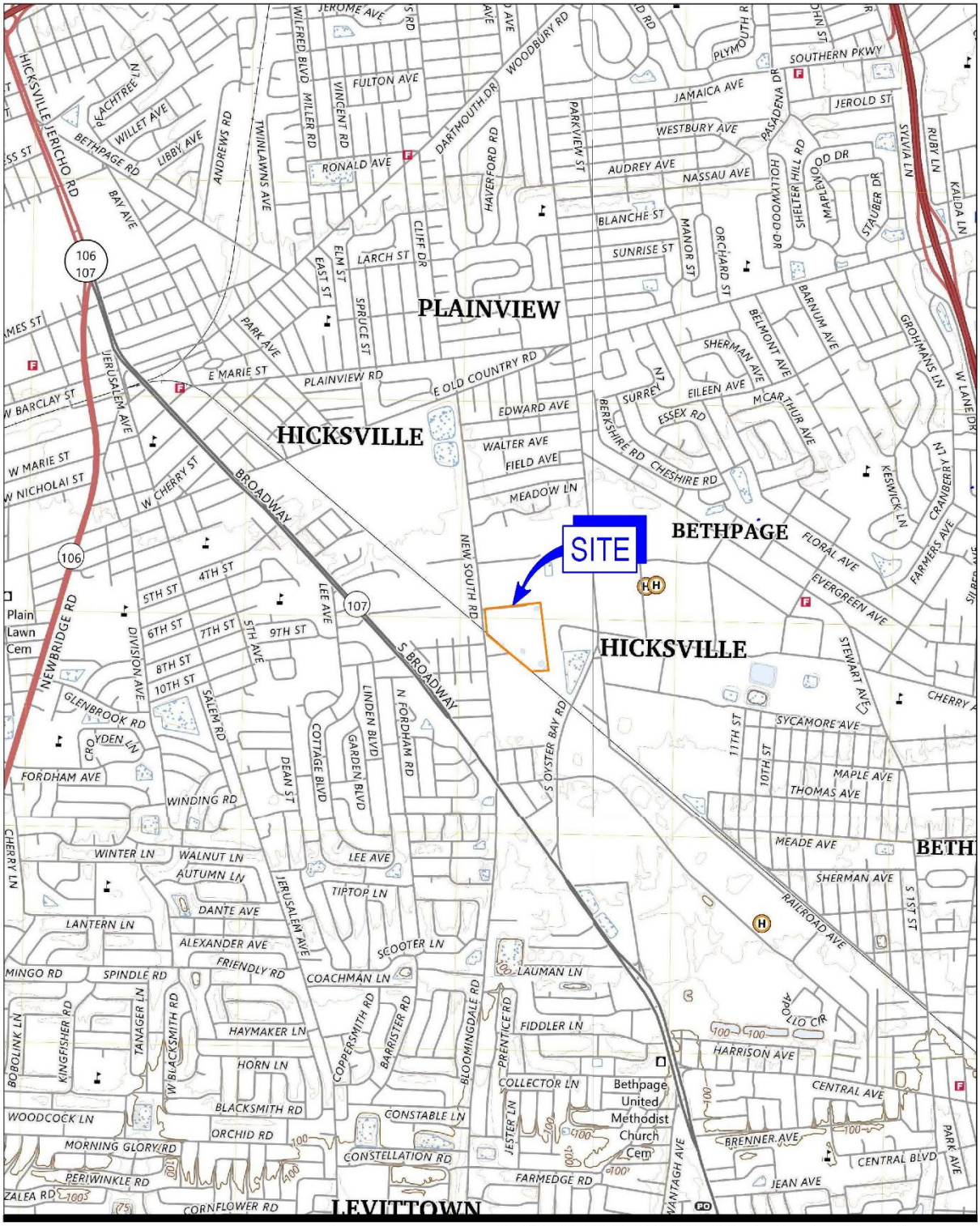


Figure 2: Constructed Biosparge Treatment System Layout with April 2025 VCM Groundwater Concentrations (ppb)

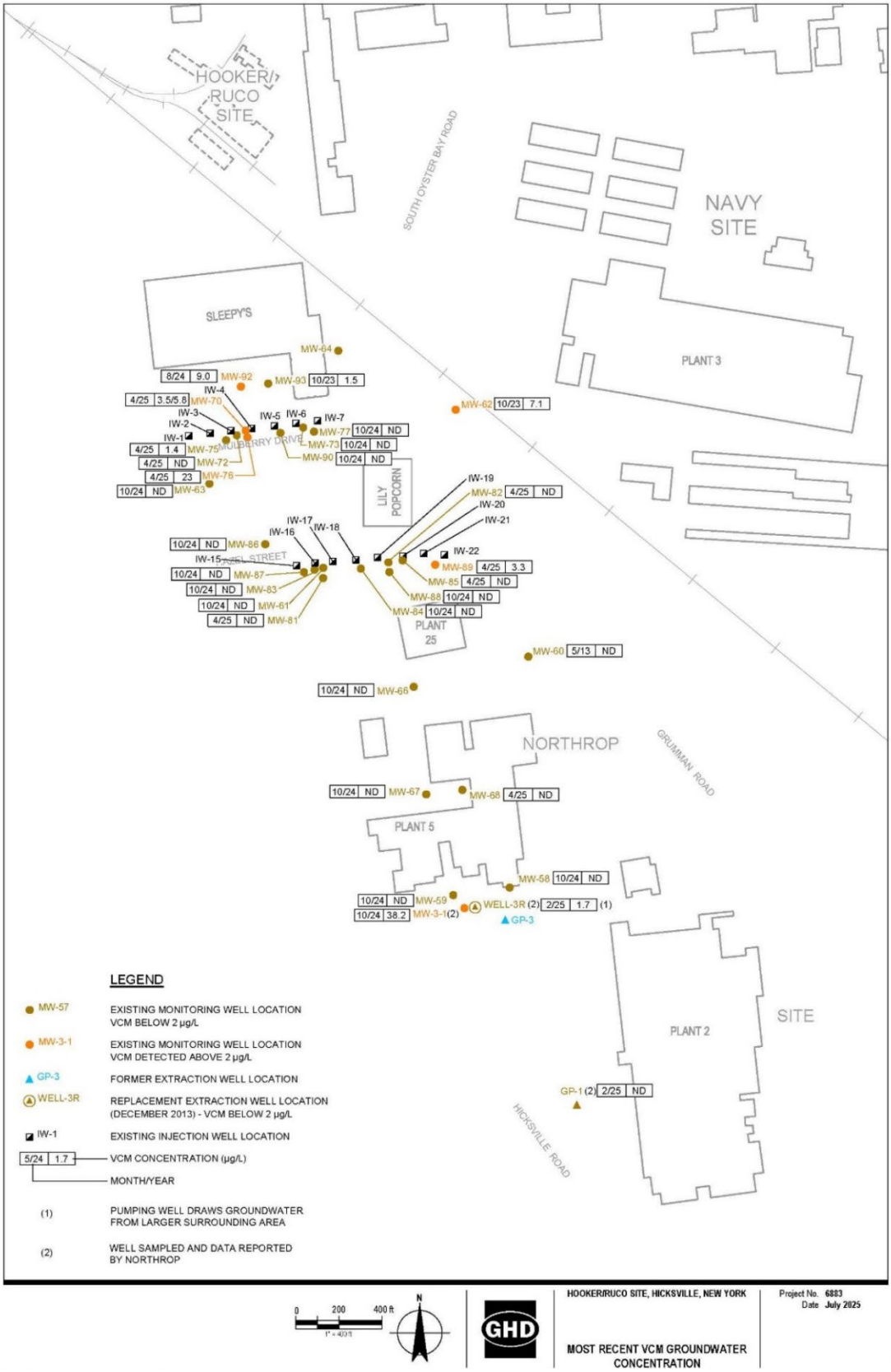


Figure 3: VCM Concentrations (ppb) Over Time for MW-75D2 (2020-2026)

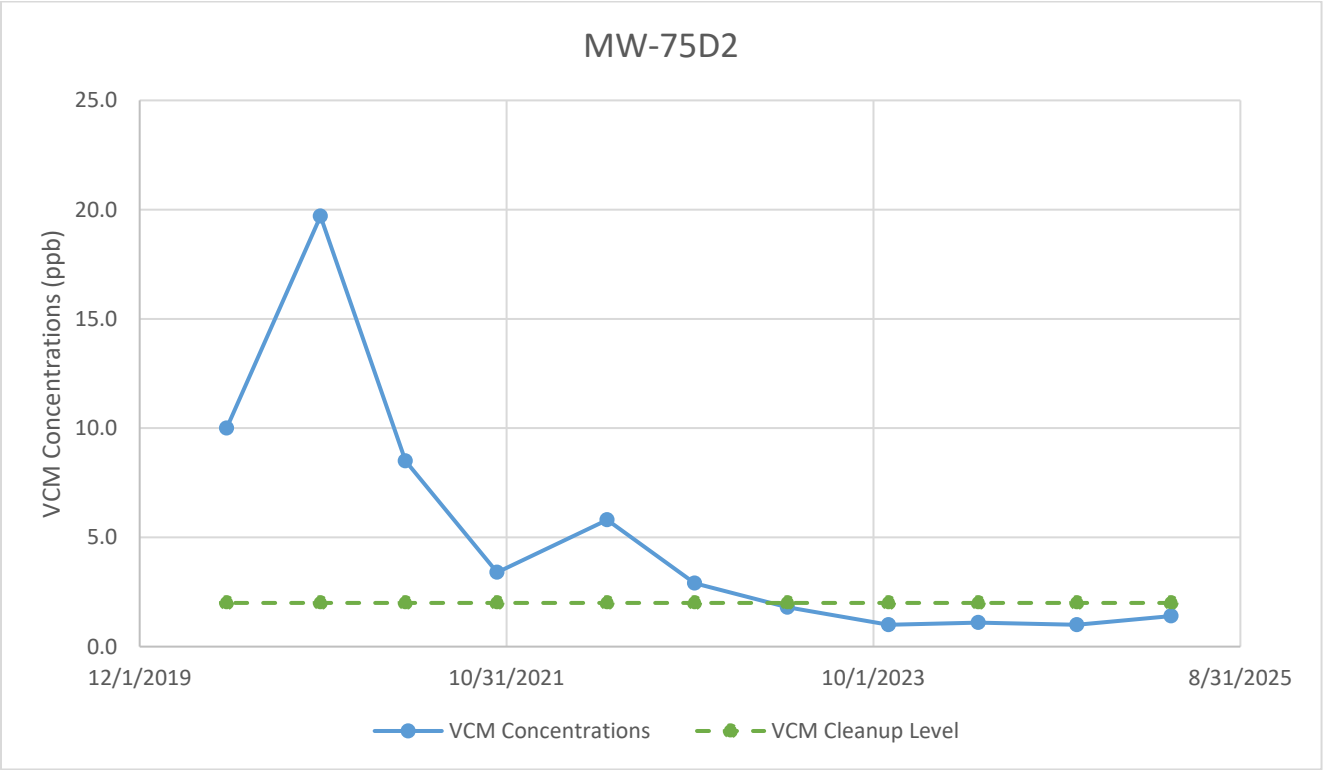


Table A: OU1 ROD Chemical Specific ARARs for Groundwater Cleanup Criteria

Compound	Minimum ARAR-Based Groundwater Cleanup Criteria (ppb)
Acetone	50
Benzene	0.7
Bis (2-ethylhexyl) phthalate	50
2-Butanone	50
Carbon disulfide	50
Chlorobenzene	5
Chloroform	7
Chloromethane	5
Dieldrin	ND2.5
1,2-Dichloroethylene (total)	5
Di-n-butyl-phthalate	50
Di-n-octyl-phthalate	50
Ethylbenzene	5
Heptachlor epoxide	ND2.2
4-Methyl-2-pentanone	50
Naphthalene	50
Tetrachloroethylene	5
Trichloroethylene	5
Vinyl chloride	2
Xylenes	5
TICs	50
Aluminum	NR
Antimony	6
Arsenic	25
Barium	1000
Beryllium	1
Cadmium	5
Calcium	NR
Chromium III	50
Chromium VI	50
Cobalt	NR
Copper	200
Iron	300
Lead	15
Magnesium	NR
Manganese	300
Nickel	NR
Potassium	NR
Selenium	10
Silver	50
Sodium	20000
Vanadium	NR
Zinc	300

Notes:
NR = Not regulated NDx = Not detected at or above X
The OU3 ROD identifies VCM, PCE and TCE as the primary COCs. While Table 17 in the OU3 ROD includes groundwater remediation goals for other chemicals, the OU3 remedy focused only on VCM, PCE and TCE. Additionally, the OU3 ROD states, "A complete list of the groundwater ARARs is included in Table 17. The treatment of groundwater will also address compounds which are not COCs, but exceed the ARARs."

Table B: OU3 ROD ARARs/TBCs for Groundwater COCs

Compound	**RG (ppb)**
Trichloroethylene	5
Toluene	5
1,1-Dichloroethane	5
1,2-Dichloroethylene	5
1,1,1-Trichloroethane	5
Tetrachloroethylene	5
1,1-Dichloroethene	5
Carbon tetrachloride	5
Xylenes	5
Vinyl chloride	2
Bis (2-ethylhexyl) phthalate	6
Total phenols (h)	1 (total phenols)
Benzo(b)fluoranthene	0.002
Aluminum	200
Arsenic	25
Cadmium	5
Chromium, Total	50
Chromium, Hexavalent	50
Copper	200
Iron	300
Lead	15
Manganese	200
Thallium	2
Vanadium	250
Cyanide	100
Nickel	100

Notes:
RG = Remediation Goal – most stringent of Federal MCLs, Groundwater Quality Standards, or Contained-in Policy
The OU3 ROD identifies VCM, PCE and TCE as the primary COCs. While Table 17 in the OU3 ROD includes groundwater remediation goals for other chemicals, the OU3 remedy focused only on VCM, PCE and TCE. Additionally, the OU3 ROD states, “A complete list of the groundwater ARARs is included in Table 17. The treatment of groundwater will also address compounds which are not COCs, but exceed the ARARs.”

Table C: Monitoring Program Summary

Well ID	Date of Last Exceedance of VCM Performance Standard	Date of Last VCM Detection	Current Sampling Frequency	Proposed Revised Frequency
MW-58D	Never	Never	Semi-Annual	Biennial
MW-58D1	Never	Never	Semi-Annual	Biennial
MW-58D2	Never	Never	Semi-Annual	Biennial
MW-59D2	Never	Never	Semi-Annual	Biennial
MW-61D2	5/2/2013	4/24/2015	Semi-Annual	Annual
MW-62D	10/18/2017	10/18/2017	Based on Observed	None
MW-62I	11/2/2023	11/2/2023	Based on Observed	None
MW-63D1	10/21/2014	10/14/2021	Annual	None
MW-63I	11/14/2014	10/29/2021	Annual	None
MW-63S	5/15/2014	5/15/2014	Annual	None
MW-66D2	Never	4/23/2019	Annual	None
MW-67S	10/24/2014	11/5/2018	Semi-Annual	Biennial
MW-68D	5/19/2010	4/23/2015	Semi-Annual	Biennial
MW-68S	5/10/2022	5/10/2022	Semi-Annual	None
MW-70D1	4/18/2024	8/9/2024	Semi-Annual	None
MW-70D2	4/26/2013	10/24/2013	Semi-Annual	Annual
MW-72D1	9/8/2024	9/8/2024	Semi-Annual	None
MW-72D2	Never	7/21/2014	Semi-Annual	Annual
MW-73D2	7/24/2013	1/24/2014	Annual	None
MW-75D1	10/25/2022	8/9/2024	Semi-Annual	None
MW-75D2	10/25/2022	4/18/2024	Semi-Annual	None
MW-76D1	8/9/2024	8/9/2024	Semi-Annual	None
MW-76D2	1/24/2014	10/21/2014	Semi-Annual	Annual
MW-76I	1/24/2014	10/23/2023	Annual	None
MW-77D2	7/24/2013	10/23/2015	Semi-Annual	Annual
MW-81D1	4/21/2021	10/18/2021	Semi-Annual	None
MW-81D2	10/14/2009	11/5/2012	Semi-Annual	Biennial
MW-82D1	5/12/2022	5/12/2022	Semi-Annual	None
MW-82D2	10/26/2012	10/26/2012	Semi-Annual	Annual
MW-83D1	10/30/2014	11/6/2020	Semi-Annual	Annual
MW-83D2	11/30/2011	11/30/2011	Semi-Annual	Annual
MW-84D1	10/17/2007	12/1/2011	Semi-Annual	Annual
MW-84D2	1/28/2008	5/25/2010	Semi-Annual	Annual
MW-85D1	11/12/2018	4/23/2019	Semi-Annual	None
MW-85D2	4/19/2021	4/19/2021	Semi-Annual	None
MW-86D1	4/24/2015	4/24/2015	Semi-Annual	Annual
MW-86D2	Never	7/17/2014	Semi-Annual	Biennial
MW-87D1	4/29/2014	4/29/2014	Semi-Annual	Annual
MW-87D2	11/15/2010	11/15/2010	Semi-Annual	Annual

MW-88D1	4/24/2015	4/20/2018	Semi-Annual	Annual
MW-88D2	5/13/2020	5/13/2020	Semi-Annual	Annual
MW-89D1	4/19/2023	4/19/2023	Semi-Annual	None
MW-89D2	4/23/2015	10/15/2021	Semi-Annual	None
MW-90D1	4/24/2015	10/19/2017	Semi-Annual	Annual
MW-90D2	1/23/2014	4/23/2014	Semi-Annual	Annual
MW-92D1	9/8/2024	9/8/2024	Biennial	Annual
MW-92D2	Never	Never	Biennial	Annual
MW-93D1	10/23/2015	10/25/2023	Biennial	None
MW-93D2	Never	10/18/2017	Biennial	None

Table D: Groundwater Monitoring Results Since Last FYR – VCM Concentrations (ppb)

Well ID	2020 H2	2021 H1	2021 H2	2022 H1	2022 H2	2023 H1	2023 H2	2024 H1	2024 H2	2025 H1
MW-58D	1.0 U	1.0 U	1.0 UJ	2.0 U	1.0 U	1.0 U	1.0 U	4.0 U	1.0 U	NS
MW-58D1	1.0 U	1.0 U	1.0 UJ	2.0 U	4.0 U	1.0 U	1.0 U	2.0 U	1.0 U	NS
MW-58D2	1.0 U	1.0 U	1.0 U	2.0 UJ	4.0 U	2.0 U	1.0 U	1.0 U	1.0 U	NS
MW-59D2	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-61D2	1.0 U	NS	NS	NS	1.0 U	1.0 U	4.0 U	2.0 U	1.0 U	NS
MW-62I	5.8	NS	NS	NS	NS	NS	7.1	NS	NS	NS
MW-63D1	1.0 U	NS	1.9	NS	1.0 U	NS	1.0 U	NS	1.0 U	NS
MW-63I	1.0 U	NS	1.0 J	NS	1.0 U	NS	1.0 U	NS	1.0 U	NS
MW-63S	1.0 U	NS	1.0 UJ	NS	1.0 U	NS	1.0 U	NS	1.0 U	NS
MW-66D2	1.0 UJ	NS	1.0 U	NS	1.0 U	NS	1.0 U	NS	1.0 U	NS
MW-67S	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-68D	1.0 UJ	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-68S	1.0 UJ	1.0 U	1.0 U	2.4 J	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1
MW-70D1	1.0 U	NS	1.0 U	7.1 J	1.0 U	1.2	2.1	7.2	1.0 U	5.8
MW-70D2	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-72D1	NS	NS	NS	NS	NS	2.1	3.7	3.5	4.5	1.0 U
MW-72D2	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-73D1	NS	NS	1.0 U	NS	NS	NS	NS	NS	NS	NS
MW-73D2	1.0 U	NS	NS	NS	1.0 U	NS	NS	NS	1.0 U	NS
MW-75D1	1.0 U	NS	1.0 U	1.0 UJ	5.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-75D2	19.7	NS	3.4	5.8 J	2.9	1.8	1.0 U	1.1	1.0 U	1.4
MW-76D1	12.4	NS	13.7	25 J	16	12	9.6	13	12 J	23
MW-76D2	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	NS
MW-76I	1.0 U	NS	1.4	NS	1.0 U	NS	2	NS	1.0 U	NS
MW-77D2	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-81D1	1.0 U	NS	1.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-81D2	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-82D1	1.0 U	NS	122	2.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-82D2	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-83D1	1.1 J	NS	1.0 U	4.0 U	2.0 U	1.0 U	1.0 U	4.0 U	1.0 U	NS
MW-83D2	1.0 UJ	NS	1.0 U	4.0 U	2.0 U	1.0 U	1.0 U	4.0 U	1.0 U	NS
MW-84D1	1.0 UJ	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-84D2	1.0 UJ	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-85D1	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-85D2	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-86D1	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-86D2	1.0 U	NS	1.0 U	4.0 U	1.0 U	2.0 U	1.0 U	5.0 U	2.0 U	NS
MW-87D1	1.0 UJ	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-87D2	1.0 UJ	NS	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	NS
MW-88D1	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-88D2	1.0 U	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-89D1	1.0 U	NS	1.1	2.2	12	6.6	1.0 U	1.0 U	3	3.3
MW-89D2	1.6	NS	1.2	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-90D1	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NS
MW-90D2	1.0 U	NS	1.0 U	1.0 UJ	1.0 U	4.0 U	1.0 U	1.0 U	1.0 U	NS
MW-92D1	NS	NS	8.3	NS	NS	NS	9.8	NS	NS	NS
MW-92D2	NS	NS	1.0 U	NS	NS	NS	1.0 U	NS	NS	NS
MW-93D1	NS	NS	1.5	NS	NS	NS	1.5	NS	NS	NS
MW-93D2	NS	NS	1.0 U	NS	NS	NS	1.0 U	NS	NS	NS

The remediation goal for VCM is 2 ppb
U – Non-detect
J – Estimated value
UJ – Not detected; associated reporting limit is estimated
NS – Not sampled
H1 – First half
H2 – Second half

Table E: Trial/Partial Biosparge System Shutdown VCM Results (ppb)

Monitoring Well VCM Concentrations (ppb) North Injection Well Fence								
Well	Pre-Shutdown		Post Shutdown					
	April 2022	October 2022	April 2023	August 2023	October 2023	February 2024	April 2024	August 2024
MW-75D1	ND	5.5	ND	ND	ND	ND	ND	1.6
MW-72D1	ND	ND	2.1	3.1	3.7	3.3/3.1	3.5	5.2
MW-72D2	ND	ND	ND	ND	ND	ND	ND	ND
MW-70D1	7.1J	ND	1.2	2.9	2.1	6.3	7.2	1.5
MW-70D2	ND	ND	ND	ND	ND	ND	ND	ND
MW-76D1	25	16	12	9.6	9.6	10	13	13
MW-76D2	ND	ND	ND	ND	ND	ND	ND	ND
Monitoring Well VCM Concentrations (ppb) Middle Injection Well Fence								
Well	Pre-Shutdown		Post-Shutdown					
	April 2022	October 2022	April 2023	August 2023	October 2023	February 2024	April 2024	August 2024
MW-87D2	ND	ND	ND	ND	ND	ND	ND	ND
MW-83D2	ND	ND	ND	ND	ND	ND	ND	ND
MW-61D2	ND	ND	ND	ND	ND	ND	ND	ND
MW-81D1	ND	ND	ND	ND	ND	ND	ND	ND
MW-81D2	ND	ND	ND	ND	ND	ND	ND	ND

APPENDIX C – Remedy Resilience

Appendix C – Remedy Resilience
Hooker Chemical/Ruco Polymers Superfund Site

In line with regional practice, three tools were utilized to assess the Hooker Chemical/Ruco Polymers Superfund Site. Screenshots from each of the tools assessed are included in this Appendix.

The first tool used to assess the Site was the Climate Mapping for Resilience and Adaptation (*CMRA*). The tool examined five hazards for Nassau County, New York the county in which the Site is located. According to this tool, the National Risk Index Rating for extreme heat is "Relatively Moderate" (see Figure C-1). However, no impacts from these hazards to the Site area or to the implementation of the remedy have been observed. The CMRA tool reported the risk for drought and wildfire as "Very Low" (see Figure C-2 and Figure C-3). The risk of flooding and coastal inundation, however, were reported as "Relatively High" and "Relatively Moderate," respectively (see Figure C-4 and Figure C-5).

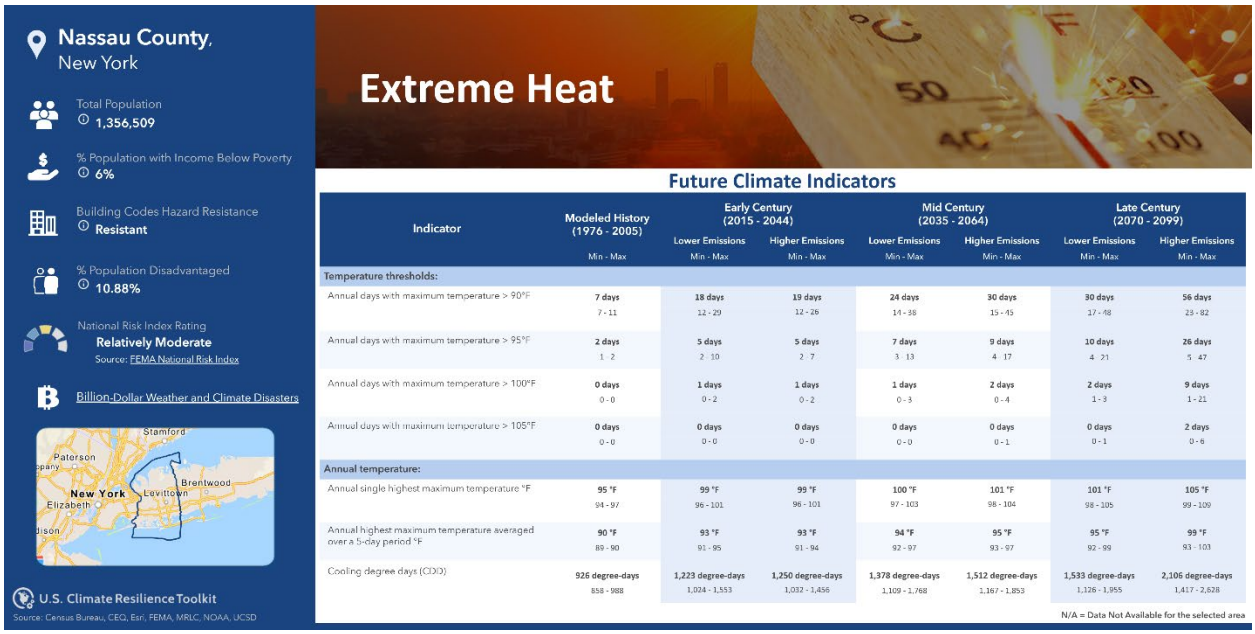
The second tool utilized to assess the Site was the NOAA Sea Level Rise Viewer (SLRV) (see https://coast.noaa.gov/slr/). This tool assessed the potential for impacts to the Site vicinity from sea level rise and coastal flooding. The Site is located in central Nassau County, approximately 8 miles south of the Long Island Sound, and approximately 8 miles north of the Atlantic Ocean, therefore coastal flooding is unlikely to impact the Site. The SLRV tool shows that a 10-foot increase in the current mean higher water level would not result in any increased risk of impacts from sea level rise to the Site vicinity (see Figure C-6 and Figure C-7). Note the red star on Figures C-6 through C-9 designate the approximate location of the Site.

The final tool utilized is called the U.S. Geological Survey (USGS) U.S. Landslide Inventory & Susceptibility Map (see https://www.usgs.gov/tools/us-landslide-inventory-and-susceptibility-map). According to the tool, there have been no landslides recorded in the vicinity of the Site, and the site is likely not susceptible to landslide activity in the future (see Figure C-8 and Figure C-9).

As shown by Figure C-9, there have been no landslides recorded in the vicinity of the site, and the site is likely not susceptible to landslide activity in the future.

Based on this information, potential Site impacts from severe weather have been assessed, and the performance of the remedy is currently not at risk due to these effects in the region and in the vicinity of the Site.

Figure C-1

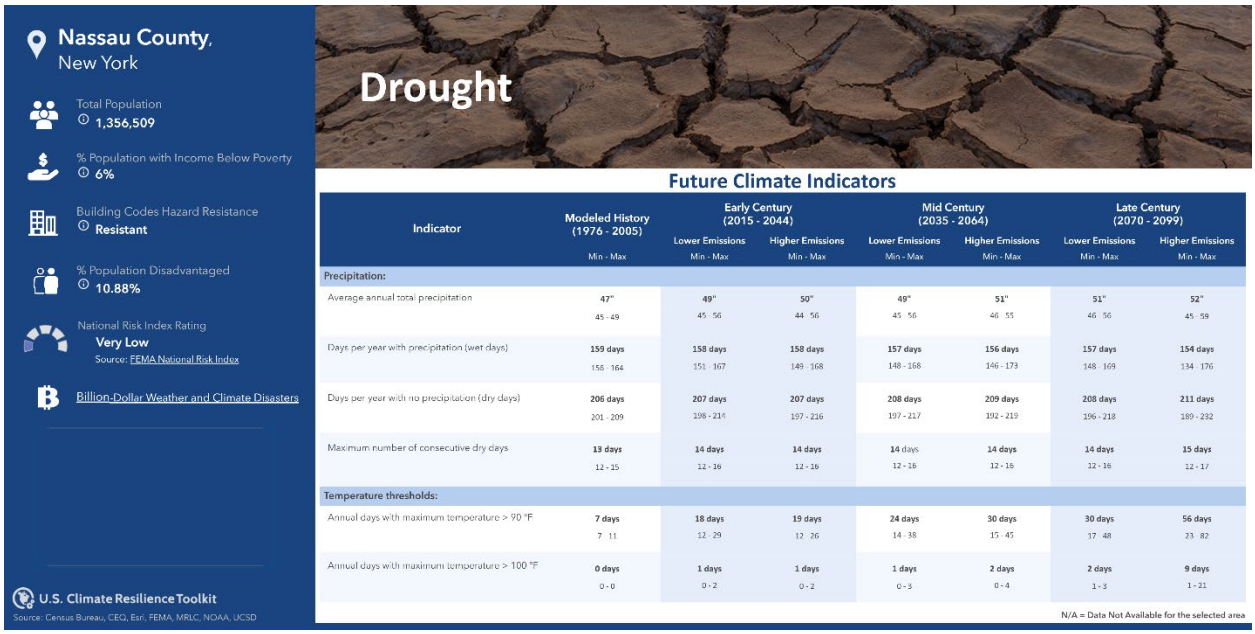


Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Temperature thresholds:							
Annual days with maximum temperature > 90°F	7 days 7 - 11	18 days 12 - 29	19 days 12 - 26	24 days 14 - 38	30 days 15 - 45	30 days 17 - 48	56 days 23 - 82
Annual days with maximum temperature > 95°F	2 days 1 - 2	5 days 2 - 10	5 days 2 - 7	7 days 3 - 13	9 days 4 - 17	10 days 4 - 21	26 days 5 - 47
Annual days with maximum temperature > 100°F	0 days 0 - 0	1 days 0 - 2	1 days 0 - 2	1 days 0 - 3	2 days 0 - 4	2 days 1 - 3	9 days 1 - 21
Annual days with maximum temperature > 105°F	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 1	0 days 0 - 1	2 days 0 - 6
Annual temperature:							
Annual single highest maximum temperature °F	95 °F 94 - 97	99 °F 96 - 101	99 °F 96 - 101	100 °F 97 - 103	101 °F 98 - 104	101 °F 98 - 105	105 °F 99 - 109
Annual highest maximum temperature averaged over a 5-day period °F	90 °F 89 - 90	93 °F 91 - 95	93 °F 91 - 94	94 °F 92 - 97	95 °F 93 - 97	95 °F 92 - 99	99 °F 93 - 103
Cooling degree days (CDD)	926 degree-days 858 - 988	1,223 degree-days 1,024 - 1,553	1,250 degree-days 1,032 - 1,456	1,378 degree-days 1,109 - 1,768	1,512 degree-days 1,167 - 1,853	1,533 degree-days 1,126 - 1,955	2,106 degree-days 1,417 - 2,628

N/A = Data Not Available for the selected area

Figure C-2



Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Average annual total precipitation	47" 45 - 49	49" 45 - 56	50" 44 - 56	49" 45 - 56	51" 46 - 55	51" 46 - 56	52" 45 - 59
Days per year with precipitation (wet days)	159 days 156 - 164	158 days 151 - 167	158 days 149 - 168	157 days 148 - 168	156 days 146 - 173	157 days 148 - 169	154 days 134 - 176
Days per year with no precipitation (dry days)	206 days 201 - 209	207 days 198 - 214	207 days 197 - 216	208 days 197 - 217	209 days 192 - 219	208 days 196 - 218	211 days 189 - 232
Maximum number of consecutive dry days	13 days 12 - 15	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	15 days 12 - 17
Temperature thresholds:							
Annual days with maximum temperature > 90 °F	7 days 7 - 11	18 days 12 - 29	19 days 12 - 26	24 days 14 - 38	30 days 15 - 45	30 days 17 - 48	56 days 23 - 82
Annual days with maximum temperature > 100 °F	0 days 0 - 0	1 days 0 - 2	1 days 0 - 2	1 days 0 - 3	2 days 0 - 4	2 days 1 - 3	9 days 1 - 21

N/A = Data Not Available for the selected area

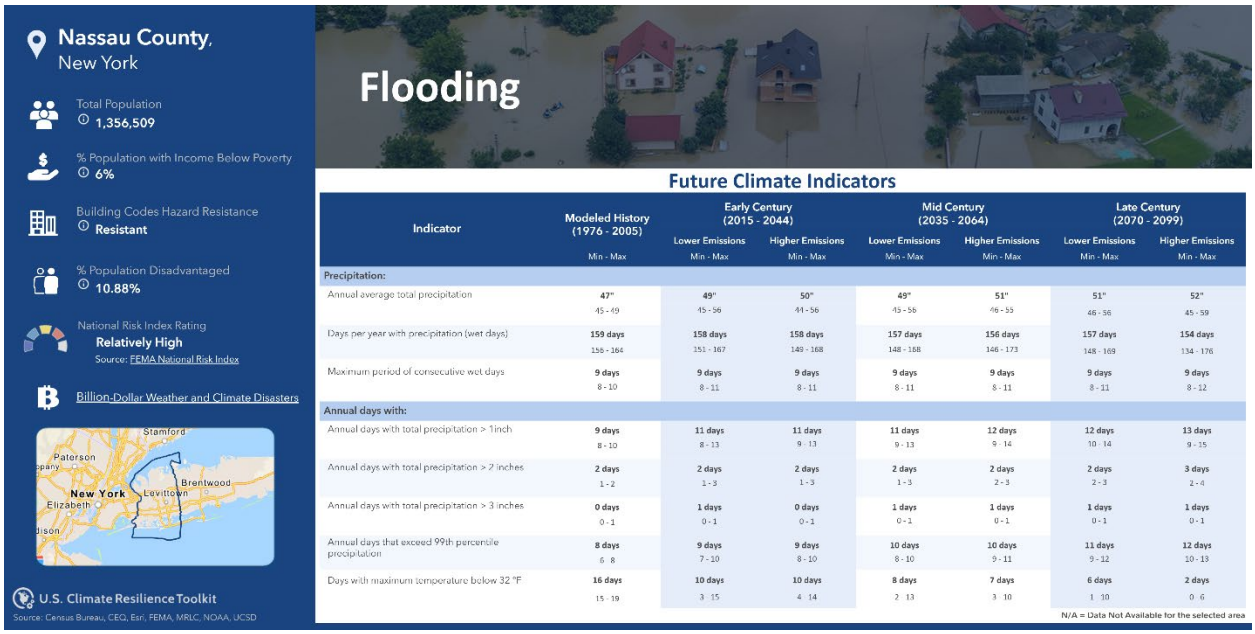
Figure C-3

Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Days per year with no precipitation (dry days)	206 days 201 - 209	207 days 198 - 214	207 days 197 - 216	208 days 197 - 217	209 days 192 - 219	208 days 196 - 218	211 days 189 - 232
Maximum number of consecutive dry days	13 days 12 - 15	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	14 days 12 - 16	15 days 12 - 17
Days per year with precipitation (wet days)	159 days 156 - 164	158 days 151 - 167	158 days 149 - 168	157 days 148 - 168	156 days 146 - 173	157 days 148 - 169	154 days 134 - 176
Temperature thresholds:							
Annual days with maximum temperature > 90°F	7 days 7 - 11	18 days 12 - 29	19 days 12 - 26	24 days 14 - 38	30 days 15 - 45	30 days 17 - 48	56 days 23 - 82
Annual days with maximum temperature > 100°F	0 days 0 - 0	1 days 0 - 2	1 days 0 - 2	1 days 0 - 3	2 days 0 - 4	2 days 1 - 3	9 days 1 - 21

N/A = Data Not Available for the selected area

Figure C-4



Future Climate Indicators

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Annual average total precipitation	47" 45 - 49	49" 45 - 56	50" 44 - 56	49" 43 - 56	51" 46 - 55	51" 46 - 56	52" 45 - 59
Days per year with precipitation (wet days)	159 days 156 - 164	158 days 151 - 167	158 days 149 - 168	157 days 148 - 168	156 days 146 - 173	157 days 148 - 169	154 days 134 - 176
Maximum period of consecutive wet days	9 days 8 - 10	9 days 8 - 11	9 days 8 - 11	9 days 8 - 11	9 days 8 - 11	9 days 8 - 11	9 days 8 - 12
Annual days with:							
Annual days with total precipitation > 1 inch	9 days 8 - 10	11 days 8 - 13	11 days 9 - 13	11 days 9 - 13	12 days 9 - 14	12 days 10 - 14	13 days 9 - 15
Annual days with total precipitation > 2 inches	2 days 1 - 2	2 days 1 - 3	2 days 1 - 3	2 days 1 - 3	2 days 2 - 3	2 days 2 - 3	3 days 2 - 4
Annual days with total precipitation > 3 inches	0 days 0 - 1	1 days 0 - 1	0 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1
Annual days that exceed 99th percentile precipitation	8 days 6 - 8	9 days 7 - 10	9 days 8 - 10	10 days 8 - 10	10 days 9 - 11	11 days 9 - 12	12 days 10 - 13
Days with maximum temperature below 32 °F	16 days 15 - 19	10 days 3 - 15	10 days 4 - 14	8 days 2 - 13	7 days 3 - 10	6 days 1 - 10	2 days 0 - 6

N/A = Data Not Available for the selected area

Figure C-5

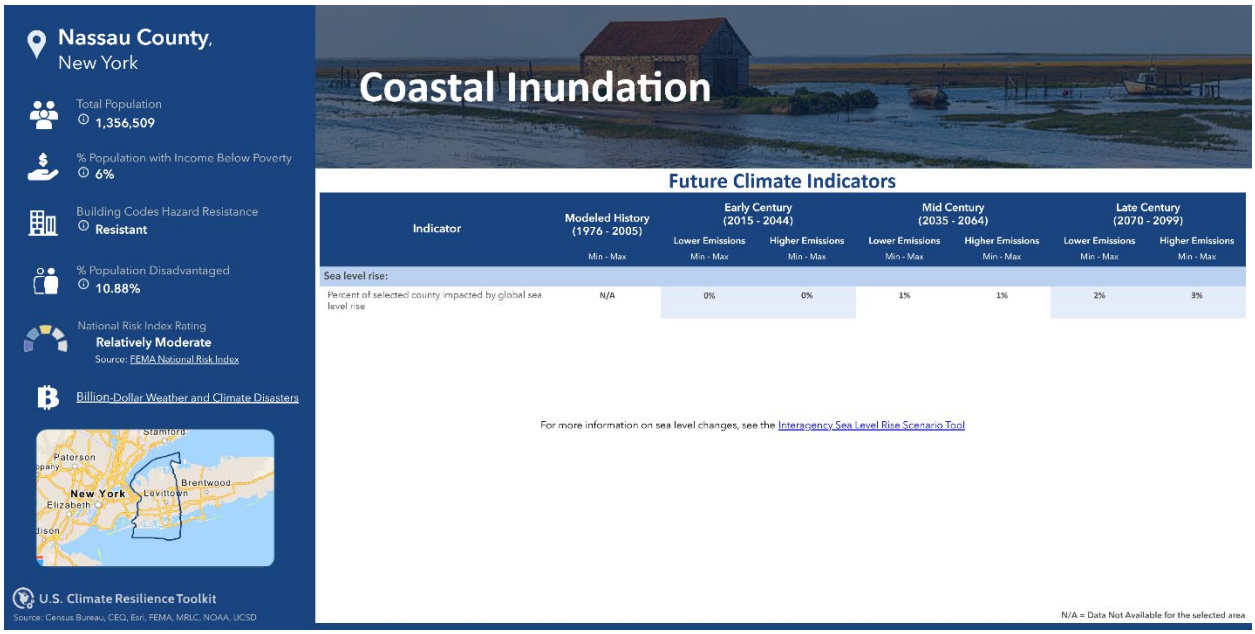


Figure C-6

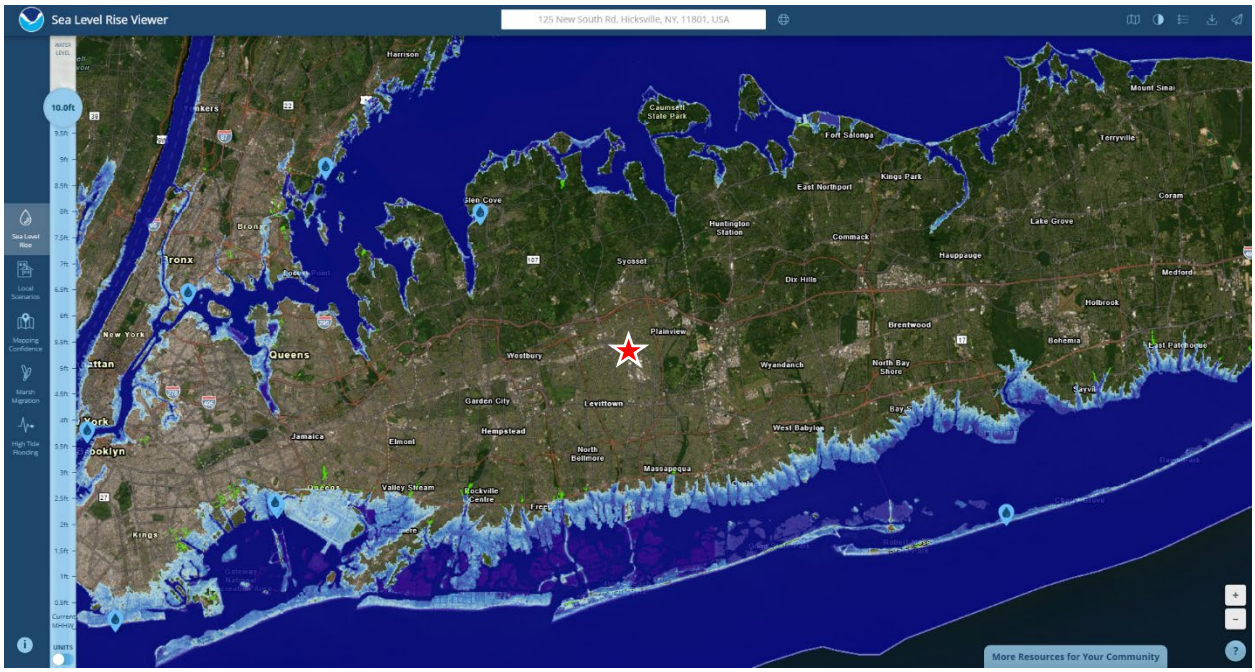


Figure C-7

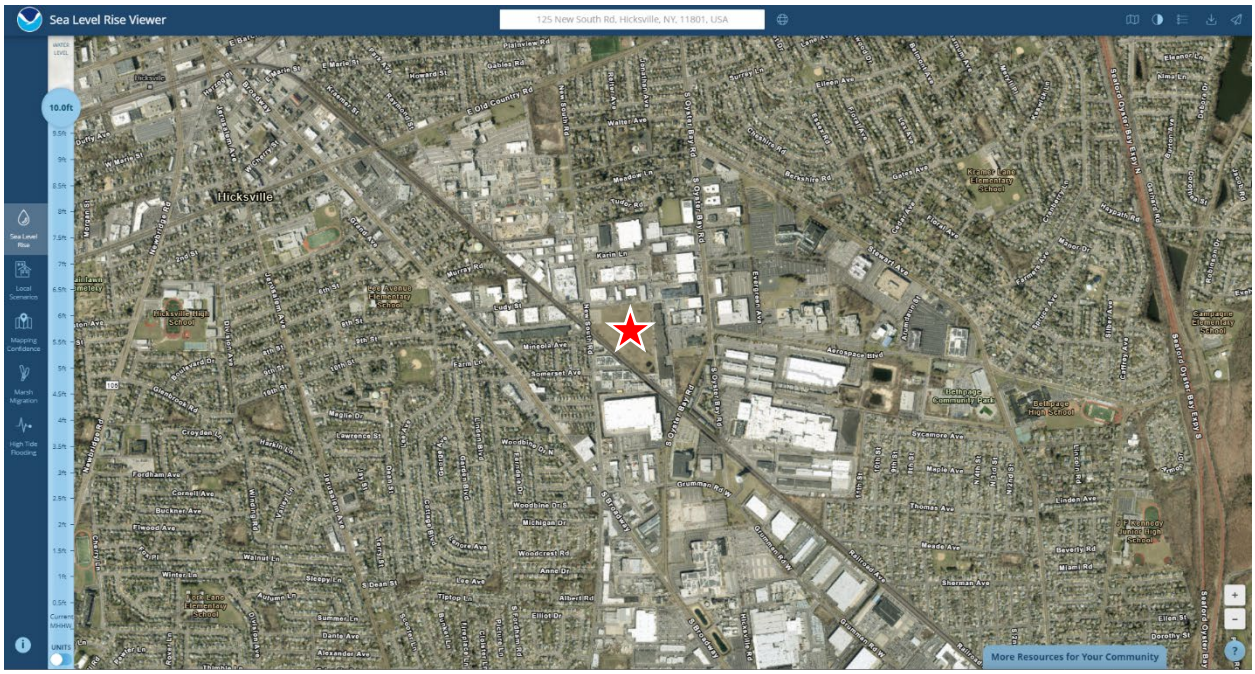


Figure C-8

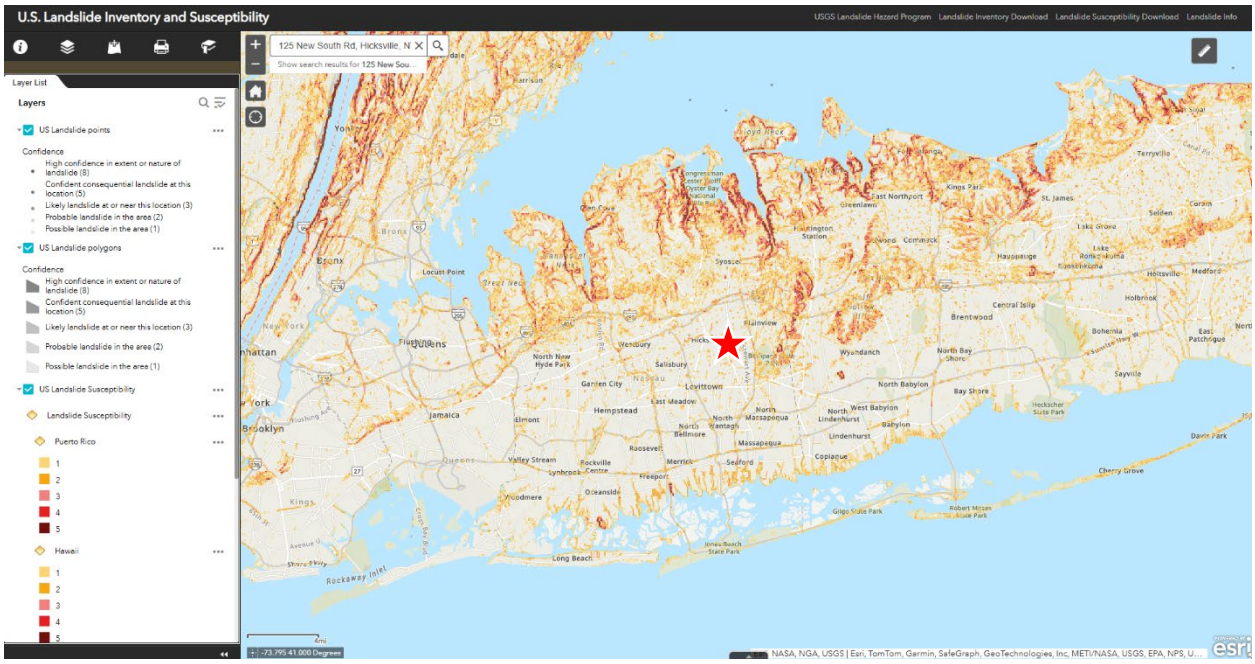
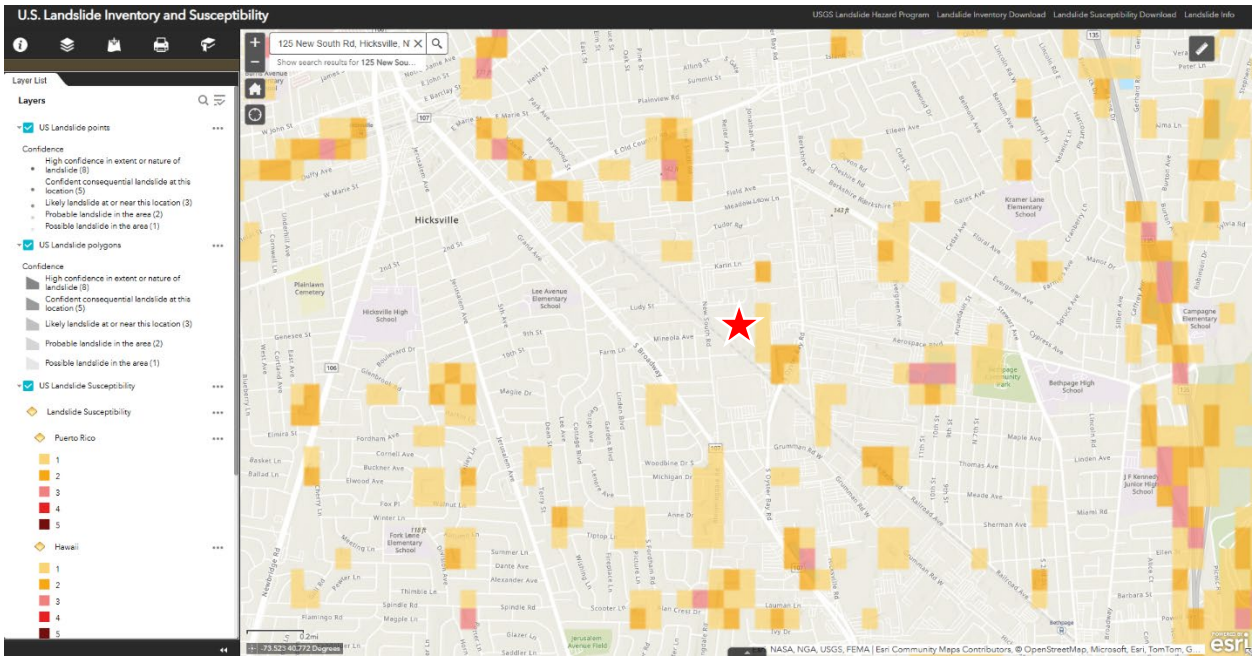


Figure C-9


U.S. Landslide Inventory and Susceptibility
USGS Landslide Hazard Program
Landslide Inventory Download
Landslide Susceptibility Download
Landslide Info
Layer List
Layers
US Landslide points
Confidence
High confidence in extent or nature of landslide (8)
Confident consequential landslide at this location (5)
Likely landslide at or near this location (3)
Probable landslide in the area (2)
Possible landslide in the area (1)
US Landslide polygons
Confidence
High confidence in extent or nature of landslide (8)
Confident consequential landslide at this location (5)
Likely landslide at or near this location (3)
Probable landslide in the area (2)
Possible landslide in the area (1)
US Landslide Susceptibility
Landslide Susceptibility
Puerto Rico
1
2
3
4
5
Hawaii
1
2
3
4
5
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