FIFTH FIVE-YEAR REVIEW REPORT FOR YORK OIL SUPERFUND SITE FRANKLIN COUNTY, MOIRA, NEW YORK

Prepared by

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

Eric Wilson, Acting Director
Superfund and Emergency Management Division

1/14/20

Date

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LIST OF ABBREVIATIONS & ACRONYMS

bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CFR	Code of Federal Regulations
CY	Cubic Yard
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
ISCR	In Situ Chemical Reduction
LAC	Liquid Activated Carbon
Mg/kg	Milligrams per Kilogram
MNA	Monitored Natural Attenuation
NPL	National Priorities List
NYCRR	New York Codes, Rules and Regulation
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
PFCs	Per- and Poly-Fluorinated Compounds
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PRB	Permeable Reactive Barrier
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RD/RA	Remedial Action/Remedial Design
ROD	Record of Decision
TAGM	Technical and Administrative Guidance Memorandum
TCE	Trichloroethylene
TPH	Total Petroleum Hydrocarbons
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use/Unrestricted Exposure
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy 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 Section 121, consistent with the National Contingency Plan (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the York Oil Superfund site. The triggering action for this statutory review is the completion date of the previous FYR, which was December 29, 2014. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Subsite above levels that allow for unlimited use and unrestricted exposure (UU/UE).

For investigation and remediation purposes, the site has been divided into two operable units (OUs)—the "Site Proper" and the "Contamination Pathways" (OU1 and OU2, respectively). Both OUs are reviewed in this FYR.

This FYR was conducted by EPA remedial project manager George Jacob. Participants included Charles Nace, EPA risk assessor, Rachel Griffiths, EPA hydrogeologist, Larisa Romanowski, EPA community involvement coordinator, and Samantha Salotto of the New York State Department of Environmental Conservation (NYSDEC).

Site Background

The site, located approximately one mile northwest of the Hamlet of Moira in Franklin County, New York, is situated to the southwest of North Lawrence Road. See Figure 1.

The 17-acre Site Proper includes a 7.2-acre fenced area previously owned and used by the York Oil Company and a 1,000-foot by 200-foot strip of land west of the fenced area and north of an abandoned railroad grade, known as the "Western Drainage Area."

The Contamination Pathways includes areas impacted by the migration of contaminants from the Site Proper—uplands; wetlands; streams; and part of Lawrence Brook. The Contamination Pathways study area is divided into several areas—the 17 acre "Western Wetland" and the 82 acre "Southern Wetland," located immediately to the west and south of the Site Proper, respectively, and the 50 acre "Northwestern Wetland," located to the northwest of the Western Wetland, along the drainage paths from the Site Proper.

Site Proper surface water drains to the west and passes through the Western Drainage Area via a drainage ditch. From the drainage ditch, the water flows north-northwest through the Northwestern Wetland before entering Lawrence Brook approximately three miles downstream of the Site Proper.

The York Oil facility was constructed in the 1950s by the York Oil Company, which recycled used oils collected from service stations, car dealers, and industrial facilities. The oils, some of which contained polychlorinated biphenyls (PCBs), were processed to remove impurities and resold to other businesses.

The oil recycling operation was discontinued around 1962; the property was then used by Pierce Brothers Oil Services, Inc. from 1962 to 1967 for used oil storage. The collected oils were stored or processed in eight aboveground metal storage tanks, three earthen-dammed settling lagoons, and at least one underground storage tank. The recycled oil either was sold as No. 2 fuel oil or was used in dust control for the unpaved roads in the vicinity of the site.

During heavy rains and spring thaws, the oil-water mixture from the lagoons would often overflow onto surrounding lands and into adjacent wetlands, land that Pierce Brothers Oil Services, Inc., purchased in 1964. Contamination at the site first was reported by a state road crew in 1979.

Appendix A, attached, summarizes the documents utilized to prepare this FYR. Appendix B, attached, provides a chronology of site events. Appendix C, attached, summarizes the site's topography and geology/hydrogeology. For more details related to background, physical characteristics, geology/hydrogeology, land/resource use, and history related to the site, please refer to www.epa.gov/superfund/york-oil.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: York Oil Superfund Site		
EPA ID: NYD000511733		
Region: 2	**State:** NY	**City/County:** Moira/Franklin County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): George Jacob		
Author affiliation: EPA		
Review period: 11/1/2014 - 10/31/2019		
Date of site inspection: 7/16/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 12/29/2014		
Due date *(five years after triggering action date)*: 12/29/2019		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

A remedial investigation and feasibility study associated with the Site Proper was completed in 1987 by Erdman, Anthony, Associates on behalf of NYSDEC. EPA conducted additional investigation work at the Site Proper in 1994 and 1995. NYSDEC initiated an investigation of the Contamination Pathways in 1986; the potentially responsible parties (PRPs) continued the work into 1998.

The results of the sampling and analysis were used to conduct ecological and human health risk assessments for the site. Potential ecological risks were posed by the presence of PCBs and lead in soils and sediments. Human health risks were attributable to the ingestion of and dermal contact with PCBs and lead in surface soil, shallow sediment, and surface water by those using the site for recreation; ingestion of and dermal contact with PCBs and lead in surface soil by utility/maintenance workers; and ingestion of, dermal contact with, and inhalation of PCBs, cadmium, lead, arsenic, benzene, 1,1-dichloroethane (1,1-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), benzene, ethylbenzene, antimony, arsenic, cadmium, and zinc in the groundwater by residents under a future-use scenario in the vicinity of the Southern Wetland.

Response Actions

In 1980, EPA began emergency cleanup activities at the site. It secured the property with fencing to limit access and to reduce the threat of direct contact with hazardous substances and it removed oil and contaminated water from the lagoons, which then were filled with a concrete by-product and sand. In addition, the top three feet of the oil-soaked soil were excavated from the neighboring wetlands. Contaminated oil was transferred to aboveground storage tanks and contaminated soil was contained on-site. Contaminated water from one of the lagoons was treated and discharged into the wetlands. An interceptor trench was dug to alter the flow of surface water and groundwater. In 1983, EPA conducted additional emergency actions, including the collection of oil seeping into drainage ditches, installation of a new filter fence system, and posting of warning signs.

In February 1988, EPA signed a Record of Decision (ROD), selecting a remedy for controlling the source of the contamination at the Site Proper. The remedial action objectives (RAOs) identified in the 1988 ROD were to eliminate the potential for human/animal direct contact with site wastes, eliminate the migration of PCB-contaminated oil and other contaminants through surface and groundwater and eliminate the potential for precipitation to infiltrate/infiltration with the wastes. The remedy featured excavating approximately 22,000 cubic yards (CY) of contaminated soils and 8,000 CY of contaminated sediments and treating this material through solidification/stabilization prior to on-site disposal; backfilling the solidified soil into the excavated areas; installing deep groundwater drawdown wells at the edges of the Site Proper to collect the sinking plume of phenol-contaminated groundwater; installing shallow dewatering wells to collect contaminated groundwater and oil during excavation, and treating these liquids prior to discharging the treated groundwater in accordance with state environmental requirements; removing and transporting about 25,000 gallons of contaminated tank oils, as well as other oils collected at the site, to an EPA-approved facility to be incinerated; cleaning and demolishing the empty storage tanks; and inspecting the site every five years to assure that human health and the environment continue to be protected. The ROD called for the cleanup of PCBs exceeding 10 milligrams

per kilogram (mg/kg) in soil and sediment and groundwater exceeding Maximum Contaminant Levels (MCLs).

The Contamination Pathways studies culminated in the selection of a remedy set forth in a ROD issued in September 1998. The RAOs identified in the 1998 ROD were to mitigate the migration of contaminated groundwater, restore groundwater quality underlying the Southern Wetland to levels which meet state and federal MCLs; to prevent future human contact with contaminated groundwater underlying the Southern Wetland and minimize exposure of fish and wildlife to contaminated sediments in the Western and Northwestern Wetlands. The selected remedy included the excavation of contaminated sediments from the Western Wetland, followed by solidification/stabilization and on-site disposal; removal of the lead- and PCB-contaminated sediments exceeding 1 milligrams per kilogram (mg/kg) PCB from the Northwestern Wetland as called for in the OU2 ROD, followed by solidification/stabilization and on-site disposal, contingent upon the results of design phase studies to determine whether these sediments pose a significant ecological threat; monitored natural attenuation (MNA) of the groundwater contamination in the Southern Wetland; institutional controls (ICs) to prevent the installation and use of groundwater wells in the Southern Wetland; and long-term groundwater monitoring.

Status of Implementation

PRP-led designs were completed for the Site Proper and the Contamination Pathways in June 1999 and September 1999, respectively. The following summarizes the RA work undertaken at the Site Proper and Contamination Pathways.

The Site Proper ROD called for the excavation of soils with PCB contamination exceeding 10 mg/kg PCBs. Following the signing of the ROD, New York State developed Technical and Administrative Guidance Memorandum (TAGM)[1] objectives for contaminated soils. The TAGM objectives for PCB-contaminated soils are 1 mg/kg at the surface and 10 mg/kg at depth. While there are portions of the Western Drainage Area where the post-remediation PCB surface soil concentrations are between the 1 mg/kg TAGM objective and the 10 mg/kg ROD-defined cleanup level, the levels of PCBs in the rest of the Site Proper comply with the PCB TAGM objectives. Because there are sections of the Western Drainage Area that exceed the 1 mg/kg PCB TAGM objective in the surface soil, to ensure that the remedy is protective (relative to current cleanup requirements), the area was covered with one foot of clean soil and ICs (deed restrictions) to limit the future use of the Western Drainage Area were implemented.[2]

Tanks and Drums Remedy Implementation

In 1994, Alcoa removed 9,654 gallons of PCB-contaminated oil (in on-site storage tanks) and 230 drums of PCB-contaminated debris from the site. The contaminated oil from the storage tanks was incinerated at an EPA-approved facility. The drums of PCB contaminated debris were removed from the site. In addition, approximately 15,000 tons of steel from the waste oil storage tanks was decontaminated, cut up, and disposed of off-site.

Soils and Sediments Remediation

[1] Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels, Division of Hazardous Waste Remediation, January 24, 1994.

[2] The soil TAGM objectives, soil cover requirements and ICs were selected in a March 2011 Explanation of Significant Differences (ESD).

Site Proper construction work commenced in 1999. A pugmill and associated equipment were mobilized for the stabilization/solidification of soils and sediments that would be excavated. In addition, a stockpile containment area consisting of ten bermed cells underlined with a 40-mil high- density polyethylene liner was constructed adjacent to the soils processing area.

During the course of the remediation, 22,192 CY of Site Proper soils and sediments exceeding the 10 mg/kg PCB action level called for in the 1988 ROD were excavated, solidified with Portland cement, and placed in the excavated area. A temporary cover was installed over the solidified material for approximately a year to protect it, while waiting for the placement of solidified sediments from the Contamination Pathways RA.

The Contamination Pathways RA commenced in 2000, with the draining of a 5-acre beaver pond and establishing water diversion measures in preparation for the removal of the contaminated sediments in the Western Wetland. In 2001, 15,125 CY of PCB-contaminated sediments exceeding the 1 mg/kg PCB action level called for in the 1998 ROD were excavated, solidified with Portland cement, and consolidated with the Site Proper solidified materials.

The consolidated solidified material was then covered with a Resource Conservation and Recovery Act cap designed in conformance with 6 NYCRR Part 360 requirements. The cap includes a cushion geotextile, textured 40-mil linear low-density polyethylene liner, 12-inch drainage layer, 12-inch barrier protection layer, and 6-inch topsoil layer.

Disturbed areas of the site were subsequently restored with clean soil. In addition, the Western Drainage Area was replanted with wetlands and uplands vegetation and an engineered earth dam replaced the beaver dam removed during the remedy, restoring the open water pond in the Western Wetlands. This wetland area was restored through natural succession, with maintenance conducted periodically to remove purple loosestrife.

The Site Proper ROD called for the excavation of soils with PCBs exceeding 10 mg/kg. Following the signing of the ROD, New York State developed Technical and Administrative Guidance Memorandum (TAGM) objectives for contaminated soils. The TAGM objectives for PCB-contaminated soils are 1 mg/kg at the surface and 10 mg/kg at depth. While there are portions of the Western Drainage Area where the post-remediation PCB surface soil concentrations are between the 1 mg/kg TAGM objective and the 10 mg/kg ROD-defined cleanup level, the levels of PCBs in the rest of the Site Proper comply with the PCB TAGM objectives. Because there are sections of the Western Drainage Area which exceed the 1 mg/kg PCB TAGM objective in the surface soil, to ensure that the remedy is protective (relative to current cleanup requirements), the area was covered with one foot of clean soil and ICs (deed restrictions) to limit the future use of the Western Drainage Area were implemented.

Groundwater Remediation

In accordance with the Site Proper ROD, a groundwater extraction and treatment system was constructed in 1999. The original groundwater treatment system consisted of influent equalization, pre-filtration, air stripping, granular activated carbon, and post filtration. At startup in May 2001, foaming occurred within the air stripper. The system was shut down. Startup was initiated again in June 2001, following the addition of anti-foam equipment. After a few days of operation, iron accumulation within the bag filters was significant enough that operation could not continue without inordinate maintenance. The system was

again shut down until an inclined plate clarifier and gravity bag dewatering system was designed and installed. The system became fully operational in April 2002.

Institutional Controls Summary Table

Table 1, below, summarizes the status of the institutional controls.

Table 1: Summary of Planned and/or Implemented Institutional Controls

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)
Groundwater	Yes	Yes	Southern Wetlands, Site Proper, and Rail Road Road	Restrict installation of groundwater wells and ground water use.	Declaration of Restrictive Covenants 4/16/2001, 7/15/2002, and 12/1/2003, respectively
Soil Remedy/Cap	Yes	Yes	Site Proper	Prohibit use of property in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial measures.	Declaration of Restrictive Covenant 7/15/2002.

Systems Operations/Operation & Maintenance

The implemented Site Proper remedy requires maintenance of the disposal area, operation and performance monitoring of the groundwater extraction and treatment system and groundwater monitoring. Specifically, the following activities are performed:

- Mowing of the grassed area approximately three times from May through September;
- Inspection and maintenance (as needed) of permanent erosion control structures;
- Inspection and maintenance (as needed) of the gravel access road and wells onsite;
- Inspection and maintenance (as needed) of security fencing around the upland area; and
- Inspection and maintenance (as needed) of the final cap

Post-remediation sampling confirmed that the contaminated soils and sediments were remediated to the action levels. The biota data indicate that widespread bioaccumulation of PCBs and lead is not occurring. Sampling of surface water, sediment and biota was being performed every other year, but was discontinued following the September 2006 sampling event because post-remediation sampling confirmed that the contaminated soils and sediments were remediated to the cleanup levels. The biota data indicate that widespread bioaccumulations of PCBs and lead is not occurring. Groundwater continues to be sampled on a semiannual basis (usually in the March–May and October–November timeframe).

Groundwater extraction and treatment was selected in the 1988 ROD to treat a plume of groundwater contamination, originally thought to consist, primarily, of phenolic compounds. The ROD anticipated reaching clean up targets within three years of operation of the groundwater extraction and treatment system. Consistent with the ROD, a groundwater extraction and treatment system was constructed. Phenolics were not found to be an issue; however, cis-1,2-DCE was found in the system influent. An investigation was conducted in 2009 of the area immediately upgradient from the groundwater extraction system, which revealed approximately 2,000 CY of subsurface soil containing total petroleum hydrocarbons (TPH). In addition to the TPH, some soil samples contained cis-1,2-DCE and tetrachloroethene (PCE). PCE degrades to cis-1,2-DCE through an intermediate product, trichloroethene (TCE). It was theorized by de maximis inc. (demaximis), the PRPs' consultant, that PCE and TCE had partitioned into the TPH, and were continually dissolving into the groundwater.

Analysis of natural attenuation data identified the absence of an electron donor as a limiting factor for successful biological degradation of cis-1,2-DCE. Because biostimulation using soluble electron donors has been successfully applied at a number of hazardous waste sites, the PRPs proposed installing injection wells and injecting a soluble electron donor to stimulate the biodegradation of the cis-1,2-DCE emanating from the Site Proper and complete the degradation process within the Contamination Pathways plume. An evaluation of viable options was performed and a proprietary in-situ chemical reduction (ISCR) reagent, which consists of a combination of controlled-release carbon and zero valent iron particles, was identified as the preferred option.

A work plan to perform a pilot-scale treatability study to address the volatile organic compounds (VOCs) was approved by EPA in 2009. The pilot study required the shutdown of the extraction and treatment system to avoid short-circuiting of the injected media. Phase I of the pilot study included the installation of a 200-foot long permeable reactive barrier (PRB) at a depth of six to 35 feet below ground surface (bgs). The barrier uses EHC® media, a patented combination of controlled-release carbon and zero valent iron particles that has been shown to establish reducing conditions, result in abiotic dechlorination of cis-1,2-DCE, and to provide a long-term electron donor to stimulate anaerobic bioremediation. In 2011, de maximis proposed a Phase II to the pilot study with the goal of enhancing the performance of the PRB through application of additional ISCR reagent. The ISCR reagent was to be injected using direct push technology, with locations spaced closer together as compared to Phase I to ensure creation of a continuous treatment zone. See Figure 2 for the ISCR reagent injection points. In addition, the barrier would be extended laterally from 200 feet to approximately 240 feet and vertically to a depth of 6 to 43 feet bgs. Numerous attempts were made to direct push to 43 feet bgs, but this effort was ultimately unsuccessful due to subsurface conditions (cobble layer). One injection point was drilled to depth, but the ISCR reagent could not be injected because the hydrostatic pressures acting on the injection tip would not allow the injection screen to open. Once the injection tip was retrieved, it was evident the cobble layer had damaged the injection tip, rendering the rod unusable. After two days of unsuccessful attempts, the Phase II ISCR reagent injection was abandoned.

In 2015, de maximis proposed and EPA approved injecting LactOil®. Five new injection wells were installed in the overburden. A fracturing process was used to emplace enhanced permeability sand lenses out to a radius of approximately 15 to 20 feet from the injection boreholes. Approximately 1,400 gallons of a 5% solution of LactOil® was pumped into the injection wells in 2015. Groundwater monitoring was performed in 2016 to evaluate the effectiveness of the treatment. Because of only limited effectiveness, in October 2018, de maximis proposed to inject PlumeStop®, a liquid activated carbon (LAC) to address the cis-1,2-DCE and increasing benzene, toluene, ethylbenzene, and xylene (BTEX) compounds in the upgradient portion of the Southern Wetlands. After EPA's approval, injections occurred in November

2018. Approximately 4,800 gallons of LAC/water slurry was injected into each well. The wells were sampled in May 2019. These data show some decreases in BTEX concentrations Additional sampling was performed in October 2019. The results of this sampling as well as ongoing pilot sampling analysis will be used to assess the effectiveness of ongoing bioremediation and the PlumeStop® injection.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

III. PROGRESS SINCE THE LAST REVIEW

The protectiveness determinations from the last FYR are summarized in Table 2, below.

Table 2: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
01	Short-term Protective	The remedy protects human health and the environment in the short-term because the remedy for OU1 has been implemented, and ICs prevent unacceptable use of soil and groundwater. In order for the remedy to be protective in the long-term, further evaluation of the extent of natural attenuation needs to be conducted.
02	Short-term Protective	The remedy protects human health and the environment in the short-term because the remedies have been completed and addressed all ecological risks, and all ICs are in place preventing unacceptable use of groundwater. In order for the remedy to be protective in the long-term, the conceptual site model needs to be updated and treatment options in the deep aquifer need to be evaluated and implemented.
Sitewide	Short-term Protective	The remedy protects human health and the environment in the short-term because the remedies have been completed and have addressed all human and ecological risks and all ICs are in place preventing unacceptable use of soil and groundwater. In order for the remedy to be protective in the long-term, further evaluation of the extent of natural attenuation, updating the conceptual site model for the site and treatment options in the deep aquifer need to be evaluated and implemented.

The previous FYR had several recommendations. The status of the recommendations is summarized in Table 3, below.

Table 3: Status of Recommendations from the 2015 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1/2	Natural attenuation parameters are not being evaluated in the monitoring wells.	Conduct a full evaluation of the extent of natural attenuation parameters in monitoring wells where degradation	Completed	An evaluation of natural attenuation processes, updating the site conceptual model relating to acetone and 2-butanone sources	4/15/2015

		should be occurring.		and distribution and bedrock flow, and evaluating further enhancements to improve biodegradation in OU2 was performed.	
2	Monitoring results indicate increasing concentrations of chlorinated volatile organic compounds and the presence of benzene, toluene, ethylbenzene and xylene in the deep aquifer monitoring wells.	Update the conceptual site model to better understand acetone, 2-butanone and bedrock groundwater flow.	Completed	An additional bedrock monitoring well and four permanent injection wells were installed. Approximately 5,000 pounds of LactOil® electron donor was injected.	11/6/2015
2	Groundwater contaminant concentrations are increasing in Southern Wetland and natural attenuation is not adequately addressing the plume.	Evaluate technologies to address the contaminant plume.	Ongoing	To proactively address increasing BTEX concentrations in OU2 monitoring wells immediately downgradient of the OU1/OU2 boundary, 8,800 pounds of PlumeStop® was injected into the four injection wells in November 2018. The first post-injection groundwater sampling was conducted in May 2019. These data show some decreases in BTEX concentrations.	Ongoing

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2019, 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, Puerto Rico and the U.S. Virgin Islands including the York Oil Superfund site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, a notice of the commencement of the FYR was sent to local public officials. The notice was provided to the town of Moira by email on September 18, 2019, with a request that the notice be posted in public areas in the town hall. The purpose of the public notice was to inform the community that the EPA would be conducting a FYR to ensure that the remedy implemented at the site remains protective of public health and is functioning as designed. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the FYR process or the site.

Once the FYR is completed, the results of the review and the FYR report will be made available online (www.epa.gov/superfund/york-oil) and at the site information repositories. The information repositories are maintained at the Moira Town Hall, N. Lawrence Road, Moira, New York and the EPA Region 2 Superfund Records Center, 290 Broadway, 18th Floor, New York, New York.

Data Review

Site Proper (OU1)

In the Site Proper, groundwater samples are collected semiannually and analyzed for VOCs from seven monitoring locations (see Figure 3), including upgradient shallow and deep monitoring wells YO-30SX and YO-30DX and downgradient shallow monitoring wells YO-110S, YO-118, and YO-119 and deep monitoring well YO-110D. During the review period, all OU1 monitoring wells met the cleanup criteria established in the 1988 ROD.

Contamination Pathways (OU2)

In the Southern Wetland, the results from groundwater sampling performed in May 2019 indicate exceedances in 15 of the 20 monitoring wells; the contaminants exceeding criteria include cis-1,2-DCE, vinyl chloride, benzene, ethylbenzene, toluene, total xylenes, 1,2-DCA, 2-butanone, and acetone. The monitoring network (see Figure 4) is comprised of 20 shallow and deep monitoring wells sampled semiannually and analyzed for VOCs, with a subset of eight monitoring wells also analyzed for natural attenuation parameters. The shallow groundwater is characterized by monitoring wells that are screened in the fill, sand, and/or reworked till while the deep groundwater monitoring wells are screened in the glacial till just above bedrock or in the upper 10-15 feet of bedrock.

A limited subset of the monitoring wells had benzene detections below the MCL of 5 micrograms per liter (µg/L), but above the New York State Ambient Water Quality Cleanup Standard (AWQS) of 1 µg/L. During the review period, monitoring wells YO-58, YO-14X, YO-111D, YO-117S, and YO-117D consistently exceeded the MCLs. Three of these monitoring wells (YO-117S, YO-117D, and YO-14X)

are located immediately downgradient of the OU1 boundary and have the highest VOC concentrations. Only one monitoring well of the subset, YO-58, is located in the shallow monitoring zone.

Concentrations of contaminants in monitoring well YO-117D were both the highest and the only location with a notable increasing trend of BTEX (see Figure 5). VOC concentrations above their respective MCLs at monitoring well YO-117D included cis-1,2-DCE (5 µg/L), vinyl chloride (2 µg/L), 1,2-DCA (5 µg/L), acetone (5 µg/L), benzene (5 µg/L), ethylbenzene (5 µg/L), toluene (5 µg/L), and total xylenes (5 µg/L). Concentrations at this location had generally been stable or decreasing since 2011, with the exception of BTEX. Benzene concentrations have been increasing since 2011, with a maximum concentration of 62 µg/L in 2018, as well as ethylbenzene (maximum of 38 µg/L in 2018), toluene (maximum 210 µg/L in 2018), and total xylenes (maximum 145 µg/L in 2018). Since the upgradient PlumeStop injection in November 2018, only results from the May 2019 sampling are available, but show lower concentrations in monitoring well YO-117D compared to 2018 results.

Monitoring well YO-14X, located immediately downgradient of the OU1 boundary, has concentrations of benzene and ethylbenzene above the MCLs, though both show decreasing trends. The maximum benzene concentration during the review period was 36 µg/L in 2016 and the overall concentration has been decreasing since 2011. The highest ethylbenzene concentration during the review period was 29 µg/L noted in 2016, and concentrations have been decreasing since 2016. Contaminants of concern (COC) concentrations above the MCLs at monitoring well YO-117S, located immediately downgradient of the OU1 boundary, include cis-1,2-DCE (sporadically above cleanup levels with a maximum of 19 µg/L in 2018), vinyl chloride (sporadically above cleanup levels with a maximum of 16 µg/L in 2018), benzene (stable around 5 µg/L since 2011 with a maximum of 9.7 µg/L in 2017), and ethylbenzene (stable around 5 µg/L since 2011 with a maximum of 5.5 µg/L in 2019). Monitoring wells will continue to be monitored to evaluate the efficacy of PlumeStop®.

There were limited exceedances of the MCLs further downgradient in OU2. At monitoring well YO-58, a deep well located approximately 200 feet downgradient of the OU1 boundary, benzene was detected during the review period above cleanup levels for the first time since 2001. The maximum detection was 8.5 µg/L in 2015 and is likely related to contaminants migrating from upgradient monitoring well YO-117D. Concentrations are expected to attenuate following the injection of PlumeStop®. Approximately 600 feet downgradient of the OU1 boundary, deep monitoring well YO-111D had detections of cis-1,2-DCE consistently above the MCLs with a maximum of 34 µg/L detected in 2015. Concentrations of vinyl chloride at this location marginally exceed the MCLs and are stable with a maximum concentration of 4.2 µg/L in 2015. These concentrations are not detected at monitoring wells further downgradient, thereby delineating the extent of contamination. COC concentrations at monitoring well YO-111D are expected to attenuate following the installation of PlumeStop®.

A BTEX soil source still exists between the OU1 landfill and OU2 monitoring wells, which accounts for the continued presence of BTEX in OU2 groundwater. The injection of PlumeStop® in November 2018 is expected to intercept contaminant migration from the soil source to OU2 wells, thus allowing OU2 contaminants to continue to biodegrade and attenuate to meet the MCLs.

Previous FYRs noted a groundwater plume comprised of ketones (acetone and 2-butanone). Based on the ongoing MNA-related monitoring (and triggers for future reagent injection), and the results of nature, extent, and site-relatedness of ketones, there is no "site-related" acetone plume remaining to monitor or remediate. It has been determined that the previous extent of ketones was associated with the 2009 EHC injection, and that pulse has now attenuated. During this review period, detections of ketones were

extremely limited and confined to a single detection of acetone at monitoring well YO-102R and sporadic detections of acetone and 2-butanone below their MCLs at monitoring well YO-116R.

Emerging contaminants sampling was performed on-site in October 2018 to evaluate the presence of per- and poly-fluorinated compounds (PFCs) and 1,4-dioxane. Sampling results indicate low detections of PFCs, with a maximum concentration of 16.2 nanograms per liter of Perfluorobutanesulfonic acid. Concentrations of 1,4-dioxane are more prevalent, with a maximum detection of 3.8 µg/L. Concentrations of 1,4-dioxane will continue to be monitored, but should respond positively to PlumeStop®.

Site Inspection

The inspection of the site was conducted on July 16, 2019. In attendance were George Jacob, Samantha Salotto, Bruce Thompson from de maximis and Ryan Kingsly from CDM Smith, the PRPs' contractor. The purpose of the inspection was to assess the protectiveness of the remedy.

No issues were observed during the inspection, impacting current and/or future protectiveness.

V. TECHNICAL ASSESSMENT

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

Post-remediation sampling confirmed that the contaminated soils and sediments met the cleanup levels specified in the Site Proper ROD. The biota data indicate that widespread bioaccumulation of PCBs and lead is not occurring.

The groundwater remedy is extraction and treatment for the Site Proper and MNA for the Contamination Pathways. The groundwater portion of the remedy is not currently functioning as intended by the decision documents. The groundwater extraction and treatment system has been turned off since 2009 to prevent short-circuiting of the injected media as part of the ongoing pilot-scale studies. In 2015, LactOil® was injected to enhance bioremediation of VOCs in OU2. The efficacy of the LactOil® on VOCs was noted during the review period, but a remaining BTEX soil source area prevented a positive response of BTEX in the OU2 groundwater. In 2018, PlumeStop® was injected into the groundwater to effectively cut off the migration of COCs from the soil source to OU2 groundwater. The results from a May 2019 groundwater monitoring event indicate that concentrations have decreased from their 2018 levels. Monitoring will need to continue to ensure that the PlumeStop® is functioning as intended.

Given that the contaminated soils and sediment have been removed or capped, the exposure pathways associated with human and ecological receptors have been eliminated and there is no exposure to the contaminated groundwater. ICs restrict the installation of groundwater wells and groundwater use and prohibit use of property in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial measures.

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 previous FYR evaluated the exposure assumptions and toxicity data and indicated that the exposure assumptions and toxicity data were still valid. The exposure assumptions and toxicity data were reviewed as part of this FYR and they remain valid at this time.

As was noted in the "Remedy Implementation" section, above, the Site Proper ROD calls for the excavation of soils with PCB contamination exceeding 10 mg/kg PCBs. Following the signing of the ROD, New York State developed TAGM objectives for contaminated soils. The TAGM objectives for PCB-contaminated soils are 1 mg/kg at the surface and 10 mg/kg at depth. While there are portions of the Western Drainage Area where the post-remediation PCB surface soil concentrations are between the 1 mg/kg TAGM objective and the 10 mg/kg ROD-defined cleanup level, the levels of PCBs in the rest of the Site Proper comply with the PCB TAGM objectives. Because there are sections of the Western Drainage Area which exceed the 1 mg/kg PCB TAGM objective in the surface soil, to ensure that the remedy is protective (relative to current cleanup requirements), the area was covered with one foot of clean soil and ICs limit the future use of the Western Drainage Area. This change to the PCB soil TAGM objective was clarified in the 2011 ESD. The cleanup levels for lead in soil and sediment and the cleanup levels for VOCs in groundwater (federal and/or state MCLs) have not changed since the last FYR; therefore, they are still valid.

The RAOs that were used at the time of the implementation of the Site Proper and the Contamination Pathways remedies are still valid.

After the 1988 ROD was signed, NYSDEC developed AWQS. While all of the OU1 monitoring wells met the cleanup criteria established in the 1988 ROD (*i.e.*, MCLs) during the review period, AWQS were marginally exceeded for benzene, vinyl chloride, and cis-1,2-DCE. The cleanup levels presented in the RODs and ESD remain valid, however.

Sites that contain volatile organic compounds in the soil or groundwater are reevaluated in the FYR to determine if vapor intrusion is a completed pathway. Given that there are no buildings within 100 feet of the groundwater plume, vapor intrusion is not a completed pathway at this site. Because the site is mostly not constructible due to the presence of the large capped area and a large wetland area, vapor intrusion does not appear to be a future concern.

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

No.

Technical Assessment Summary

Based upon the results of the FYR, it has been concluded that:

- Site soils and sediments have been cleaned to protective levels.
- Groundwater extraction and treatment system is not occurring.
- Three phases of ISCR reagent pilot study have been conducted.
- The cap and vegetative cover are intact and in good condition.
- The fence is intact and in good repair.
- The groundwater monitoring wells are functional.
- Maintenance activities are being performed according to schedule.

- There is no evidence of trespassing, vandalism or damage (to the monitoring wells or the fence).
- There are no drinking water wells within the contaminant plume and none are expected to be drilled.
- The ICs on the Site Proper and the Southern Wetland portion of the Contamination Pathways are in place and effective.
- Groundwater monitoring wells in the Site Proper and upgradient areas show groundwater quality improvement.
- In the Southern Wetland, five of twenty monitoring locations have VOC concentrations that exceed the MCLs.
- Sufficient natural attenuation of groundwater to meet target clean up levels is not yet occurring in the Southern Wetland, but has been successful in maintaining stable to decreasing trends of VOCs and most BTEX (with the exception of monitoring well YO-117D).
- Though only one round of analytical results is available following the PlumeStop® injection, the concentrations of contaminants in monitoring wells immediately downgradient of the injection wells have decreased when compared to 2018 levels.
- The additional site characterization and use of innovative treatment technologies is expected to improve site conditions to a point where biodegradation and natural attenuation can successfully address contaminant concentrations in the groundwater plume downgradient of the PlumeStop® barrier.

VI. ISSUES/RECOMMENDATIONS

Table 4, below, presents the recommendations and follow-up actions for this FYR.

Table 4: Issues and Recommendations

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
None				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): **OU2**	**Issue Category: Remedy Performance**			
	Issue: Elevated groundwater contaminant concentrations remain in the Southern Wetland and natural attenuation is not adequately addressing the plume.			
	Recommendation: The ongoing in-situ groundwater pilot study for treatment of the deep aquifer needs to be completed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2021

VII. PROTECTIVENESS STATEMENT

Table 5, below, presents the operable unit and sitewide protectiveness statements.

Table 5: Protectiveness Statements

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: The OU1 remedy protects human health and the environment.		
Operable Unit: OU2	*Protectiveness Determination:* Short-term Protective	*Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: The OU2 remedy protects human health and the environment in the short-term because the remedies have been completed and addressed all human and ecological risks and all ICs are in place preventing unacceptable use of the groundwater. For the remedy		

to be protective in the long-term, the ongoing in-situ groundwater treatment pilot study for the deep aquifer needs to be completed.
Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective — *Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: The remedy protects human health and the environment in the short-term because the remedies have been completed and have addressed all human and ecological risks and all ICs are in place preventing unacceptable use of soil and groundwater. For the remedy to be protective in the long-term, the ongoing in-situ groundwater treatment pilot study for the deep aquifer needs to be completed.

VIII. NEXT REVIEW

The next FYR report for the York Oil Superfund site is required five years from the completion date of this review.

APPENDIX A – DOCUMENTS, DATA, AND INFORMATION REVIEWED IN COMPLETING FIVE YEAR REVIEW

Documents, Data, and Information Reviewed in Completing Five-Year Review	
Remedial Investigation and Feasibility Study Report, Erdman, Anthony, Associates	Aug 1985
Addendum Feasibility Study Report, Erdman, Anthony, Associates	Nov 1987
Site Proper Record of Decision, EPA	Feb 1988
Removal Investigation Preliminary Report, EPA	Sept 1995
Predesign Investigation Report for York Oil Operable Unit No. 1, Parsons Engineering Science, Inc.	Apr 1997
Addendum to the Predesign Investigation Report for York Oil Operable Unit No.1, Engineering Science, Inc.	Dec 1997
Contamination Pathways Remedial Investigation Report, Blasland, Bouck & Lee, Inc.	Mar 1998
Contamination Pathways Addendum Feasibility Study Report, Blasland, Bouck & Lee, Inc.	Mar 1998
Contamination Pathways Record of Decision, EPA	Sep 1998
Western Wetland Supplemental Sediment Investigation Report, Parsons Engineering Science	Jan 1999
Contamination Pathways Pre-Remedial Design/Remedial Design Work Plan, including Supplemental Sediment Investigation and Ecological Study Work Plan, de maximis, inc., Parsons Engineering Science, Blasland, Bouck and Lee, Inc.	Mar 1999
Final Design Report for York Oil Superfund Site Proper, Parsons Engineering Science	May 1999
Western Wetland Site Treatability Testing Final Report, Kiber Environmental Services	Aug 1999
Final Design Report for Western Wetland Portion of Contamination Pathways at the York Oil Superfund Site, Parsons Engineering Science	Sept 1999
Solidification/ Stabilization Pilot Demonstration Report for the York Oil Superfund Site (Operable Unit No. 1), Parsons Engineering Science and Kiber	Oct 1999
Five-Year Review Report, EPA	Nov 1999
Monthly Progress Reports for Site Proper and Contamination Pathways, de maximis, inc.	Nov 2004 to Sept 2009
Operations and Maintenance Manual for Groundwater Treatment Facility, York Oil Superfund Site., WRS Infrastructure and Environment, Inc.	May 2000

2003 Annual Report for the York Oil Site, CDM	Aug 2004
Second Five-Year Review Report, EPA	Nov 2004
Post-Remedial Ecological Monitoring Report #2, Blasland, Bouck & Lee, Inc.	Apr 2005
Results of Passive Diffusion Bags versus Low-Flow Sampling Technique	June 2005
2004 Annual Report for the York Oil Site, CDM	Jul 2005
2005 Annual Report for the York Oil Site, CDM	Jun 2006
Capture Zone Analysis, CDM	Aug 2006
Post-Remedial Ecological Monitoring Report #3, Blasland, Bouck & Lee, Inc.	Feb 2007
2006 Annual Report for the York Oil Site, CDM	May 2007
2007 Annual Report for the York Oil Site, CDM	Aug 2008
Revised Operations and Maintenance Manual for Groundwater Treatment Facility, York Oil Superfund Site, CDM	Mar 2008
Source Zone Investigation, CDM	Jun 2008
2008 Annual Report for the York Oil Site, CDM	Jul 2009
ISCR reagent Pilot Injection Work Plan, Adventus, Inc.	Jul 2009
Third FYR Report, EPA	Nov 2009
Fourth FYR Report, EPA	Dec 2014
2015-2019 Annual Report for York Oil Site, CDM Smith	2015-2019

APPENDIX B: CHRONOLOGY OF SITE EVENTS

Event	Date
York Oil Company processes used oils.	1954- 1962
Peirce Brothers Oil Service, Inc. stores and processes used oils.	1962-1977
Environmental Protection Agency (EPA) performs emergency cleanup activities at site.	1980-1983
Site is placed on National Priorities List	1983
Site Proper remedial investigation and feasibility study (RI/FS) undertaken by New York State Department of Environmental Conservation (NYSDEC)	1983-1987
Site Proper Record of Decision signed	1988
Contamination Pathways RI/FS undertaken by NYSDEC; and then potentially responsible parties (PRPs) (pursuant to 1992 Administrative Order on Consent with EPA)	1986-1998
Contamination Pathways Record of Decision signed	1998
Site Proper Consent Decree signed by EPA and several PRPs	1990
Consent Decree lodged in federal district court	1991
Revised Consent Decree lodged.	1992
Consent Decree withdrawn in attempt to achieve a global settlement with all of the PRPs.	1993
Revised Consent Decree signed by EPA and expanded group of PRPs.	1994
EPA issues Unilateral Administrative Order (UAO) to Alcoa to perform several components of the Site Proper remedy (removal of contents of tanks and removal of on-site drums)	1994
Tank and drum remediation performed	1994
EPA issues second UAO to Alcoa, requiring installation of interceptor trench to collect oil seeping into the wetlands.	1995
Consent Decree entered by the court.	1996
Site Proper remedial design (RD) undertaken	1996-1999
EPA issues a UAO to Alcoa to conduct Contamination Pathways RD.	1998
Site Proper remediation performed.	1999-2002
Contamination Pathways RD completed	1999
Lodging and entry of Consent Decree (superseding 1998 UAO) under which Alcoa consents to perform RD/RA and other PRPs agree to contribute financially toward cost of work.	2000
Contamination Pathways remediation performed.	2000-2001
Contamination Pathways monitored natural attenuation monitoring commences.	2000
First Five-Year Review conducted.	1999
Preliminary Site Close-Out Report.	2002
First Post-Remedial Ecological Sampling Event	2002
Second Five-Year Review conducted.	2004
Second Post-Remedial Ecological Sampling Event	2004
Groundwater Capture Zone Analysis	2006
Final Post-Remedial Ecological Sampling Event	2006

Pre-Certification of Completion of Remedial Design & Remedial Action – Site Proper	2006
Source Zone Investigation for Site Proper	2008
Third Five-Year Review conducted.	2009
Implement in-situ chemical reduction reagent injection work plan.	2009
In-situ remedial pilot groundwater performance monitoring	2009-2014
Fourth Five-Year Review conducted.	2014
PlumeStop® injection in the OU2 deep aquifer	2018

APPENDIX C: SITE TOPOGRAPHY, GEOLOGY, AND HYDROGEOLOGY

Site Geology/Hydrogeology

Subsurface conditions at the site generally consist of glacial overburden deposits that overlie sedimentary bedrock. While the thickness of the overburden varies, it is about forty feet thick within the fenced boundaries of the site. The overburden and bedrock occur in layers of more permeable and less permeable materials that are capable of producing and/or transmitting ground water, or are barriers to groundwater flow, respectively. Groundwater is typically encountered three to five feet below ground surface. A significant feature of the site geology is the presence of a glacial till layer ranging in thickness from five to twenty feet which exists throughout the site overburden. The till layer overlying bedrock has an average hydraulic conductivity of approximately 3 x 10 4 feet/day, which retards groundwater flow. The bedrock, particularly along discontinuities and fracture zones, is a transmissive zone capable of producing and carrying groundwater. The bedrock groundwater contours reveal a divide located immediately north of the site, which protects local residential users of groundwater located north of the site, as the contamination from the site flows to the south. Groundwater flow is generally vertically to the deep zone within the Site Proper and then horizontally downgradient to the south to the Southern Wetland.

Southern Wetland overburden and shallow bedrock can be classified as two groundwater zones - shallow and deep. The shallow zone consists of unconsolidated glaciated material, less dense and coarser than the dense till directly beneath, located approximately 15 to 35 feet below ground surface. The deep zone is approximately 35 to 50 feet below ground surface, and consists of the base of the dense till and the upper few feet of weathered bedrock. The bedrock underlying the overburden in the Contamination Pathways is comprised of Theresa Formation (sedimentary layers of sandy dolomite and calcareous sandstone) and Potsdam Sandstone.

Land and Resource Use

Wetlands and woodlands comprise much of the area in the vicinity of the site. Residences are present along the main roads interspersed with active/inactive agriculture and pasture land. The site Proper is fenced and posted with warning signs. The Contamination Pathways wetlands areas are used for hunting and logging. An adjacent abandoned railroad grade is occasionally transited by all-terrain vehicles and snowmobiles.

The EPA considers state-designated wetlands to be lands that are in use. Since wetlands were investigated as part of the site, the acreage is considered in use, but restricted. The Site Proper is suitable for restricted use.

There are no potable drinking water wells downgradient of the site that could be impacted by the contaminated groundwater.

Figure 1: Site Location Map

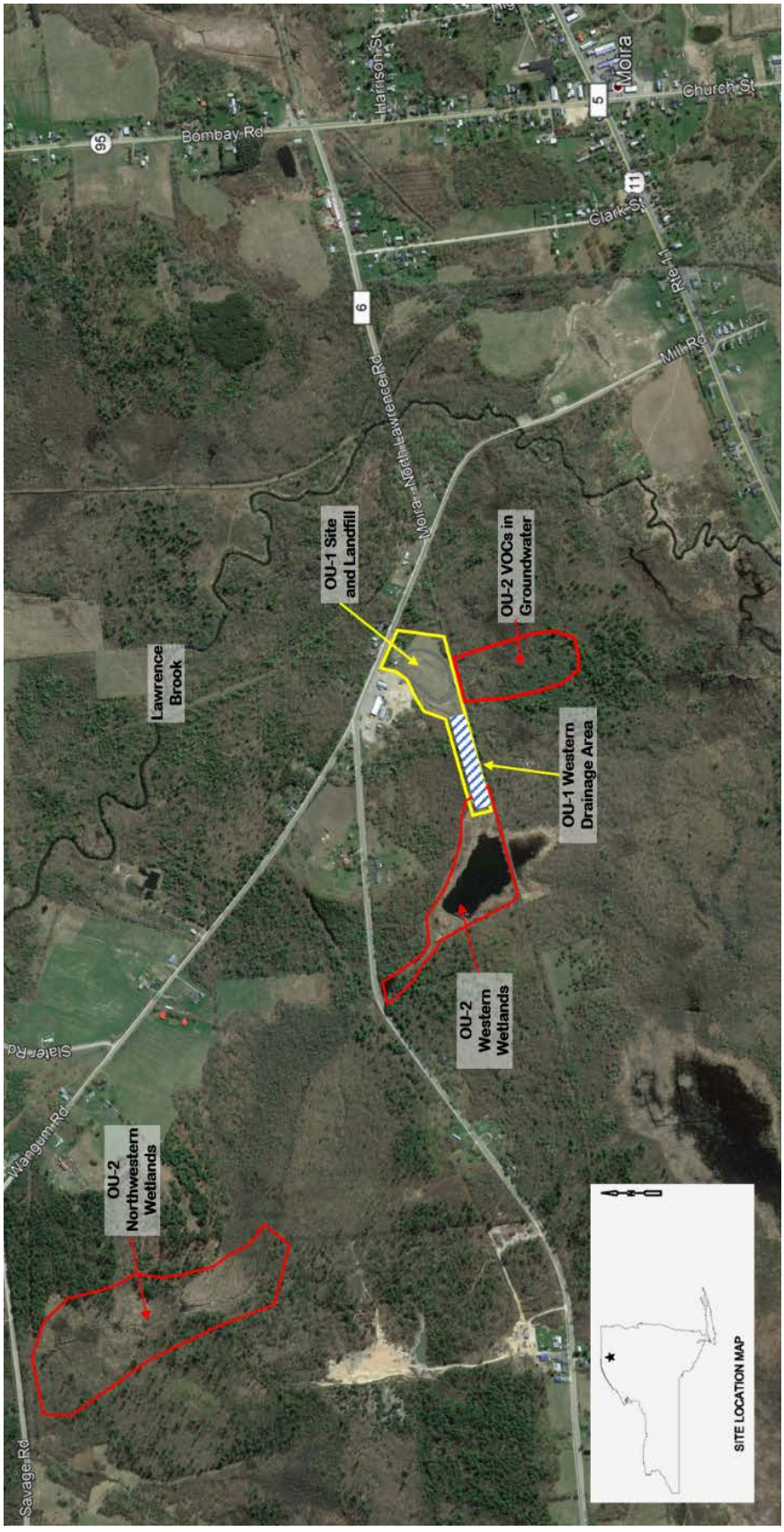

Figure 2: ISCR Reagent Injection Points

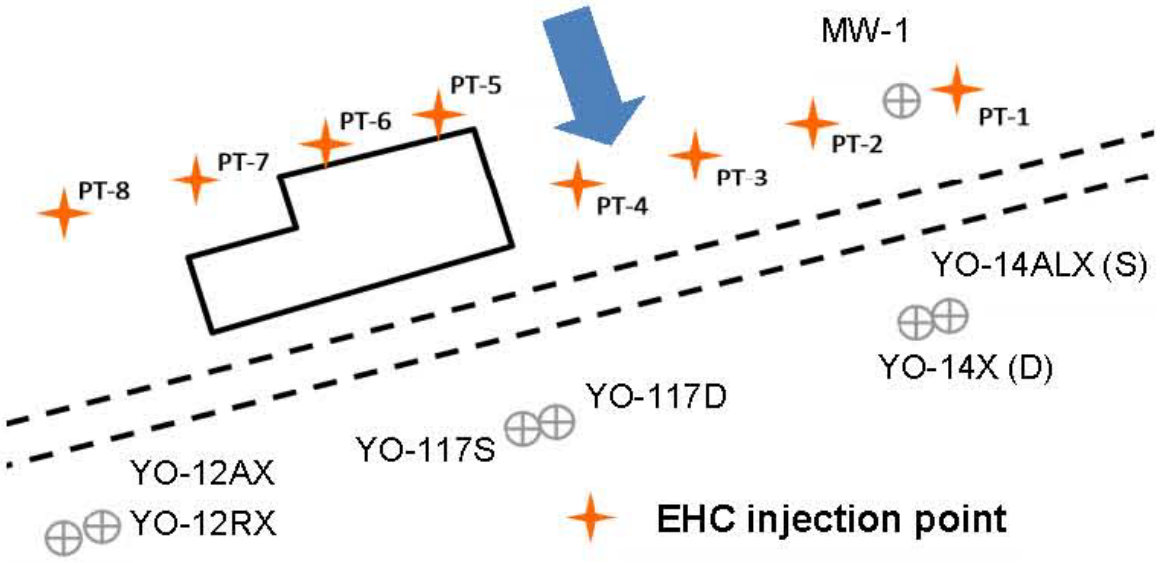

Figure 3: Site Proper Monitoring Wells

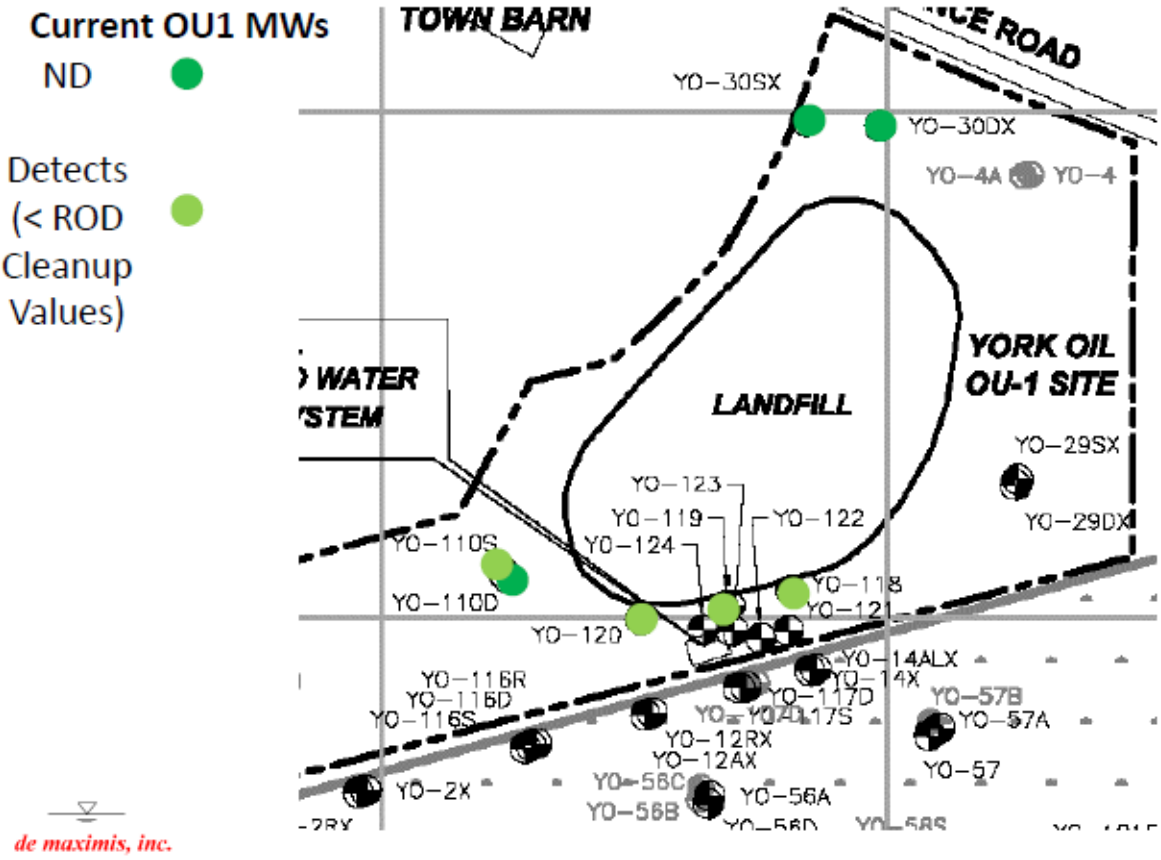

Figure 4: Contamination Pathways Monitoring Wells

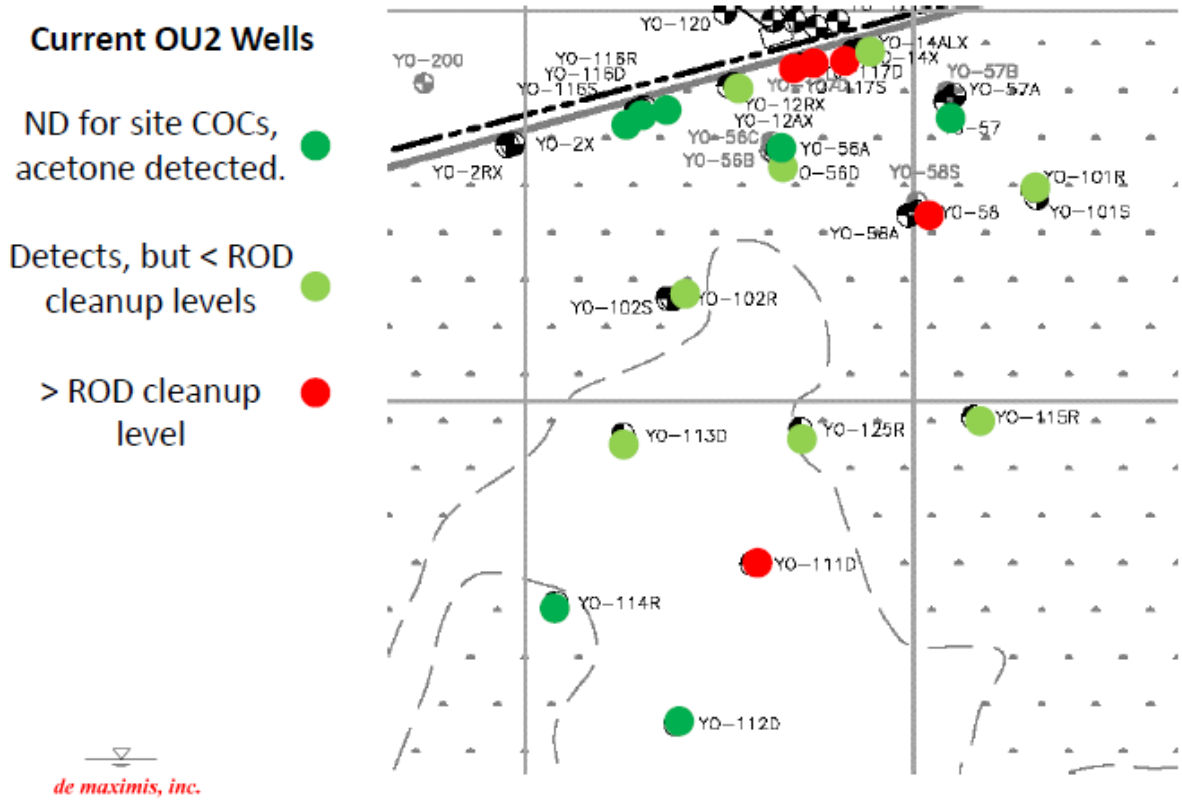

Figure 5: Concentrations of Contaminants in Monitoring Well YO-117D