FOURTH FIVE-YEAR REVIEW REPORT FOR ROCKAWAY TOWNSHIP WELLS SUPERFUND SITE MORRIS COUNTY, NEW JERSEY

Prepared by

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LIST OF ABBREVIATIONS & ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
DTP	Denville Technical Park
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GWTS	Groundwater Treatment System
HQ	Hazard Quotient
HVAC	Heating, Ventilation, and Air Conditioning
ICs	Institutional Controls
MCL	Maximum Contaminant Level
MW	Monitoring Well
µg/L	micrograms/Liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NJGWQS	New Jersey Groundwater Quality Standards
ng/L	Nanograms/liter
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PPM	Parts Per Million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI / FS	Remedial Investigation / Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	Soil Vapor Extraction
TCL	Target Compound List
UU/UE	Unlimited Use and Unrestricted Exposure
VI	Vapor Intrusion
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 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 fourth FYR for the Rockaway Township Wells Superfund Site (Site). The triggering action for this statutory review is the completion date of the previous FYR report, on September 23, 2020. The FYR has been prepared due to the fact that the remedial action will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OUs), and both will be addressed in this FYR. OU 1 addresses the contaminated groundwater, and OU 2 addresses soils which adversely impact the groundwater.

The Rockaway Township Wells Superfund Site FYR was led by Lawrence Granite, EPA's Remedial Project Manager (RPM) for the Site. Participants included Dr. John Mason (geologist), Pat Seppi (community involvement coordinator), Dr. Lora Smith (human health risk assessor), and Dr. Detbra Rosales (ecological risk assessor). The Potentially Responsible Party (PRP) was notified of the initiation of the FYR. The review began on July 13, 2023.

Site Background

The Site is located in both Rockaway and Denville Townships in Morris County, New Jersey. The Site as defined by the areal extent of the contaminated groundwater plume, lies in the center of a Y-shaped valley in an otherwise hilly area of the New Jersey Highlands on approximately 0.29 square miles located immediately north of Interstate 80 (Figure 1). The general area is predominantly non-residential, industrial-zoned land which includes the Denville Technical Park (DTP), an industrial building complex. Area development includes commercial businesses, light industries including service stations, restaurants, hotels, plastic manufacturers, truck/transit companies and commercial office complexes.

The source area of site-related contamination is predominantly located in Denville Township, while the impacted downgradient water supply wells are located in Rockaway Township. The Site sits atop the Buried Valley Aquifer Complex in the Rockaway River Basin. Both a shallow (not uniformly present over the entire site) and deep aquifer are present at the Site. The municipal wells that are impacted by Site contamination are high-yielding (approximately 500 gallons per minute) municipal supply/ production wells which are located approximately 1,000 feet north-northwest of the initial release/spill

source zone (near Buildings 1 and 2 in the DTP). The municipal wells are screened in sand and gravel deposits approximately 130 to 160 feet below the ground surface. The capture zone (area of influence) of the municipal wells extends horizontally and vertically to the source area in the DTP.

Groundwater is used as a drinking water source for approximately 14,000 residents in Rockaway Township. The groundwater will continue to be the source of drinking water for the foreseeable future. The surface waters of the White Meadow Brook and the Beaver Brook (nearby surface water bodies) flow into the Rockaway River and are not used for drinking water. Wetlands associated with these brooks exist in the vicinity of the Site.

Water samples collected by Rockaway Township and the New Jersey Department of Environmental Protection (NJDEP) from the Rockaway Township wells in late 1979 and early 1980 indicated the presence of trichloroethene (TCE) and other volatile organic compounds (VOCs). The Township installed an activated carbon adsorption treatment system in response to this contamination. In October 1980, the treated water developed an unpleasant taste and odor. Analysis showed it to be contaminated with the gasoline additives, di-isopropyl ether and methyl tertiary-butyl ether.

Following the discovery of contamination in the wellfield, NJDEP performed an area-wide industrial survey to identify potential sources of the groundwater contamination. The survey, along with additional information, revealed that petroleum hydrocarbon products were present in groundwater at a Shell Gas Station and the Town and Country Gas Station, which are both located on Green Pond Road to the west of the wellfield. Chlorinated VOCs were present in groundwater at the DTP.

For more details related to the Site background, physical characteristics, geology/hydrogeology, and land/resource use please see documents in the Site repositories or at: https://epa.gov/superfund/Rockaway-Township-Wellfield (see section on webpage titled Site Documents and Data). Document references used to complete this FYR are included in Appendix A. Additional information pertaining to Site events is included in Appendix B.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Rockaway Township Wells Superfund Site		
EPA ID: NJD980654214		
Region: 2	**State:** NJ	**City/County:** Rockaway & Denville Townships, Morris County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: State		
Author name (Federal or State Project Manager): Lawrence A. Granite, CHMM		
Author affiliation: EPA		
Review period: 9/24/2020 - 3/3/2025		
Date of site inspection: 6/26/2024		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/23/2020		
Due date *(five years after triggering action date)*: 9/23/2025		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Remedial Investigation/Feasibility Study (RI/FS) documents, which addressed the groundwater contamination, were completed in June 1993. A focused RI was subsequently completed to address the contaminated soils.

The contaminants of concern (COCs) presented in the baseline human health risk assessment for groundwater (OU 1) were VOCs including TCE, 1,1,1-trichloroethane (TCA), vinyl chloride, methylene chloride and arsenic. The OU 2 COCs identified for both soil and outdoor soil gas include TCE, tetrachloroethene (PCE), TCA and cis-1,2-dichloroethene (cis-1,2-DCE).

Potential impacted resources/targets included potable water supply users on the township public supply, as well as employees working in buildings overlying the plume where the vapor intrusion (VI) pathway was completed.

The baseline risk assessment stated that the domestic use of untreated groundwater was considered unlikely under both current and future land use scenarios because the groundwater is treated at the wellfield prior to distribution to the public. The evaluation of hypothetical use of untreated groundwater yielded risks above acceptable limits. The baseline risk assessment also indicated that adverse impacts to ecological receptors were unlikely. A risk assessment was conducted for OU 2 and found that while subsurface soils did not present an adverse impact to human or ecological receptors from direct contact, the COC concentrations were above New Jersey Impact to Groundwater screening levels and, as a result, soil remediation was warranted in order to protect groundwater. In conjunction with the groundwater and soil remedies being implemented for the Site, NJDEP performed VI assessments of Buildings 1 and 2 within the DTP. The VI assessments identified exceedances of the NJDEP and EPA screening levels for both indoor air and sub-slab soil gas at a number of locations within the technical park which required remediation to protect workers.

Response Actions

In June 1986, pursuant to the New Jersey Spill Compensation and Control Act (Spill Act), N.J.S.A. 58:10-23.11 et. seq., NJDEP issued Directives to Morton Thiokol Incorporated (Thiokol) (then owner of the DTP property), Shell Oil Company (Shell), and the Town and Country Gas Station requiring payment to NJDEP to conduct a RI/FS, and payment to Rockaway Township for the operation and maintenance of the air stripping unit. In May 1987, pursuant to the Spill Act, NJDEP entered into an Administrative Consent Order (ACO) with Thiokol and Shell in which the two companies agreed to make the above payments. An RI was performed and completed in November 1988.

Based on the information from the 1988 RI Report, NJDEP determined that additional studies were necessary and began a Phase II RI. The Phase II RI Report and an FS Report were finalized in September 1992 and December 1992, respectively.

Northrop Grumman Systems Corporation (NGC, a successor to Alliant Techsystems and Thiokol) continues to pay for power costs related to the operation of the Township's air stripping unit. In addition, NGC, in accordance with ACO requirements, continues to implement the groundwater and soil remedial actions at the Site.

OU 1 Remedy Selection

EPA issued an OU l ROD on October 5, 1993. The remedial action objectives (RAOs) as identified in the ROD are as follows:

- Prevent potential human exposure to contaminants in the deep aquifer groundwater which pose a carcinogenic risk to human health in excess of 10^{-4} to 10^{-6} and/or which have a Hazard Index greater than 1;
- Prevent potential human exposure to contaminants in the shallow aquifer groundwater which pose a carcinogenic risk to human health in excess of 10^{-4} to 10^{-6} and/or which have a Hazard Index greater than 1; and
- Restoration of water quality of the shallow and deep aquifers to appropriate Federal and New Jersey water quality standards.

The major components of the OU 1 groundwater remedy include:

- Extraction of contaminated groundwater and restoration of the aquifer to the more stringent of the federal and New Jersey Maximum Contaminant Levels (MCLs) and New Jersey Ground Water Quality Standards (NJGWQS);
- Treatment of the extracted groundwater to levels attaining the more stringent of the federal and New Jersey MCLs and NJGWQS;
- Reinjection of the treated groundwater to the extent needed to promote groundwater restoration, with discharge of any surplus to the public water supply; (this was subsequently changed in the OU 2 ROD to surface water discharge);
- Replacement of the deteriorated air stripping treatment system at the Rockaway Township Wellfield; and,
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

Three distinct groundwater contaminant plumes are associated with the discrete source areas at the Site (see Figures 2 and 3). The areas of concern are as follows: the eastern plume (associated with the Former Degreaser Area in DTP Building 2); the middle plume (associated with the Former Waste Oil Underground Storage Tank (UST) Area between DTP Buildings 1 and 2); and the western plume (associated with Building 1).

The primary COC in the eastern and western plume areas is TCE. The middle plume contains both 1,1,1-TCA and TCE with lesser concentrations of their respective decay products.

OU 2 Remedy Selection

The October 8, 2002 OU 2 ROD addressed contaminated soil adversely impacting the groundwater. The RAOs established for the soils at the Rockaway Township Wells Site, OU 2, are: 1) provide protection for the Rockaway Township Wells, and 2) remediate the contaminant source areas in the soil at the DTP to meet the Impact to Groundwater New Jersey Soil Cleanup Criteria. The major components of the OU 2 remedy included the following:

- Soil vapor extraction (SVE) of VOCs in both the Former Degreaser Pit Area and the Former UST Area;

- Treatment, if required, for the extracted vapors prior to release to the atmosphere; and,
- Operation of the SVE system for approximately 3 to 5 years to attain the New Jersey Impact to Groundwater Soil Cleanup Criteria.

In addition, through the 2002 OU2 ROD, EPA modified the 1993 OU1 ROD to allow the treated groundwater to be discharged to the surface water (Beaver Brook) instead of being re-injected or reused as a potable source.

For soil/source areas, seven areas of concern were initially evaluated which were then reduced to two major areas of contamination requiring soil remediation. The two areas included the Former UST adjacent to Building 2 and a Former Degreaser Area in Building 2.

NJDEP performed VI assessments of Buildings 1 and 2 within the DTP. The VI assessment identified exceedances of the NJDEP and EPA screening levels for both indoor air and sub-slab soil gas at a number of locations within the technical park. Upon determination that the heating and ventilation system adjustments could not rectify the indoor air condition, it was determined that a sub-slab depressurization system (SSDS) would be installed.

On September 29, 2022, EPA issued an Explanation of Significant Differences (ESD) for the two RODs which incorporated institutional controls (ICs) in the selected remedy (see Table 1: Summary of Implemented ICs).

Status of Implementation

The groundwater and SVE remediation systems were put into service in 2005 and operation of both systems is ongoing.

Groundwater Remedy

Groundwater Extraction and Treatment System

Operation of the groundwater extraction and treatment system was initiated in June 2005. The extraction wells were constructed in geographic locations that allowed for groundwater remediation of the most contaminated portion of the plume, thereby reducing the contamination migrating to the Rockaway Township Wellfield and aiding in the restoration of groundwater to the existing quality standards. Figure 2 shows the location of the extraction wells, designated as EW. Extracted groundwater is treated through use of an air stripper to remove VOCs prior to discharge to surface water. Discharge is regulated and meets the requirements of a New Jersey Pollution Discharge Elimination System permit. The air from the groundwater treatment system's (GWTS's) air stripper is discharged to the atmosphere in accordance with an NJDEP air permit.

Soil Remedy

The SVE remediation system was installed in June 2005 and consists of 10 SVE wells used in conjunction with three dual-phase wells capable of removing both vapor and liquid phase contamination. Figure 2 shows the location of these wells. Extracted vapors are routed to vapor-phase carbon for treatment prior to discharge in accordance with an air permit issued by the State of New Jersey. Air samples collected from the carbon treatment system effluent show that air permit discharge requirements for the system are being met.

Since start-up, a number of SVE wells have been closed to optimize withdrawal from the remaining wells. In 2018, eight SVE points remained active. These wells continue to withdraw VOCs. The estimate provided in the 2022 progress report indicates that approximately 23 pounds of VOCs were extracted from the soil during the 2022 operating period. Since the initial SVE system start-up in June 2005, approximately 1,711 pounds of VOCs have been removed.

In conjunction with the groundwater and soil remedies being implemented for the Site, the SSDS was constructed and became operational in Buildings 1 and 2 in 2010. Following installation of the SSDS Mitigation Systems, indoor air and soil vapor sampling results indicated areas requiring additional monitoring in Building 2. Subsequent sampling in 2011 indicated the systems were functioning properly. The PRP does not perform annual sampling in Buildings 1 and 2 as part of the VI mitigation measures at the Site. However, as per the NJDEP's VI guidance, the PRP performs annual performance inspections of the SSDS Mitigation Systems. This includes physical inspections of the system equipment and piping and measurements of vacuum and air flow for each suction point. Repairs/ replacements are based on the comparison of these values to those established at the time of system commissioning. The most recent inspection (August 2024) of the SSDS confirmed that the systems are performing satisfactorily and that vacuums greater than 0.004 inches of water column are being maintained for the target treatment areas in the respective buildings.

The results of the above inspections indicate that the SSDS Mitigation Systems are operating as designed. A round of indoor air sampling performed by the responsible party in both buildings in 2018 confirmed these results. It is anticipated that the responsible party will perform another round of indoor air sampling in 2025 to confirm that the changes to air handling and chemical storage have improved air quality.

Institutional Controls

Table 1: Summary of 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 Document	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date
Groundwater	Yes	Yes	NJDEP Program Interest Number: PI# G000004876 Rockaway Township Block 22103, Lots 1, 2, 3, 4 and 10; and Denville Township Block 62101, Lots 1, 3, and 5	Restrict installation of groundwater wells and groundwater use	Classification Exception Area/Well Restriction Area Established by NJDEP on November 17, 2000
Soils	Yes	Yes	Block 62101 Lot 1 & Block 62101 Lot 3	Provide notice of contamination in Restricted Areas	Deed Notices Recorded October 3, 2023

Systems Operations/Operation & Maintenance

Long-term groundwater and soil vapor monitoring are performed to track the performance of the remedial systems, delineate the extent of the contaminant plumes, and to evaluate compliance with the remediation goals. The groundwater monitoring network consists of 16 monitoring wells which are sampled for VOCs, and 23 monitoring wells measured for groundwater levels. In addition, three extraction wells are sampled for VOCs and monitored for groundwater levels, and three dual-phase wells are sampled for VOCs. To monitor the effectiveness of the GWTS, the monitoring well network, the individual extraction wells, and the combined dual-phase wells are sampled on an annual frequency, and a combined influent sample for the GWTS is collected on a monthly basis.

The SVE system consists of ten extraction points and three dual-phase wells. To optimize the efficiency of the SVE system, two extraction points and all three dual-phase wells (vapor phase) have been closed since 2011. The effectiveness of the SVE system is monitored by collecting combined influent air samples and effluent air samples for laboratory analysis for VOCs. The influent air samples are collected on a quarterly basis and the effluent air samples are collected on a monthly basis. Air permit requirements are being met for operation of the SVE vapor-phase carbon treatment systems.

The GWTS and SVE system are automated systems that are located within a stand-alone treatment building at the south end of the property. The treatment building is unstaffed. The entire Site is a State-lead PRP Site. Under NJDEP oversight, the PRP monitors the Site several times per week via a mobile connection. The PRP's operator is alerted by phone of any system alarms or shutdowns. In addition, the PRP's operator performs monthly inspections.

The SSDS was constructed and became operational in Building 2 in July 2010 and the Building 1 system went on-line in November 2010. The results of quarterly rounds of indoor air/soil vapor sampling performed in 2011 indicated that site-related contaminants were below a level of concern but a non-site related chemical that was being used in an industrial operation was contributing to the elevated VOC concentrations in Building 2. The PRP performs annual performance inspections of the SSDS Mitigation Systems to ensure that the Systems continue to operate as designed. A round of indoor air sampling performed in both buildings in 2018 confirmed that the subslab system continues to reduce indoor air concentrations below those seen in 2010; however, the use of products containing TCE and chloroform by some of the tenants may continue to impact indoor air. It is anticipated that the responsible party will perform another round of indoor air sampling in 2025.

The frequency for inspections for the SSDS Mitigation System was changed from quarterly in 2011 to annually in 2012. Operation, maintenance and monitoring activities for these systems are ongoing.

Remedy Resilience

Potential Site impacts from severe weather were assessed and the performance of the remedies is currently not at risk due to these effects in the region and near the Site. Additional information is included in Appendix D.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 2: Protectiveness Determinations/Statements from the 2020 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The groundwater remedy at OU 1 is protective of human health and the environment.

OU #	Protectiveness Determination	Protectiveness Statement
2	Short-term Protective	The OU 2 remedy protects human health and the environment in the short-term because the SVE continues to remove contaminant mass from the source area and the Site is covered with buildings and pavement. In order for the remedy to be protective in the long-term, further characterization of the shallow contaminant distribution should be conducted in order to inform the evaluation and optimization of the SVE-dual phase well system; a deed notice should be established for Site soils; and optimization of the subslab depressurization systems for buildings 1 and 2 should occur.

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Short-term Protective	The remedies are protective of human health and the environment in the short-term because the SVE continues to remove contaminant mass from the source area and the Site is covered with buildings and pavement. In order for the remedy to be protective in the long-term, further characterization of the shallow contaminant distribution should be conducted in order to inform the evaluation and optimization of the SVE-dual phase well system; a deed notice should be established for Site soils; and optimization of the subslab depressurization systems for buildings 1 and 2 should occur.

Table 3: Status of Recommendations from the 2020 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	Surface soil exposure was not evaluated in the risk assessment.	A deed notice is needed to ensure long-term protectiveness	Completed	Two deed notices were recorded.	October 3, 2023
2	Increasing concentrations of 1,1,1-TCA and TCE have been observed in the shallow groundwater system.	It is recommended that further characterization of shallow contaminant distribution be conducted. This data will inform the optimization of the SVE-dual phase well system in order to reduce contaminant concentrations in the shallow groundwater.	Ongoing	Following the previous review, the groundwater concentrations of 1,1,1-TCA and TCE in the shallow overburden aquifer returned to stable-to-decreasing trends before subsequent sharp increases in the latter part of the review period. The contamination potentially extends beneath the buildings at the Site. Due to existing operation of the active businesses, no additional efforts to characterize the shallow aquifer contaminant distribution were made. Instead, soil gas data were used to assist with contaminant distribution in preparing two deed notices with broad restricted areas. The notices were documented as part of the remedy in an ESD issued by EPA in 2022. Although the 2023 deed notices address concerns for the contaminated soils, the recommendation to characterize and delineate the shallow groundwater plume remains.	N/A
2	Recent indoor air data confirms that the subslab	Optimize subslab depressurization systems in buildings	Completed	The subslab depressurization systems are inspected and evaluated on an annual basis. A system	December 2023

	system continues to reduce indoor air concentrations below those seen in 2010; however, the use of products containing TCE and chloroform in some businesses continues to impact indoor air quality. Additionally, the negative pressure underneath the slab has been steadily decreasing over the years.	1 and 2 to improve negative pressure on the system and sample spaces that are not currently using TCE and chloroform to ensure they are not impacted from concentrations in the subslab or neighboring businesses.		evaluation conducted in 2023 and resulting optimization activities indicated that the SSDSs were continuing to produce a vacuum of at least 0.004" water column across the entire focus areas for each building. As such, both SSDSs were considered to provide protection from vapor intrusion. It was also determined that the low-level concentrations of TCE and chloroform are from the use of these chemicals within some of the units in the buildings and not from any sub-surface accumulation of soil vapors. As such, their migration throughout the buildings is independent of the operation of the subslab depressurization systems. As discussed in more detail below, the property owner has made efforts to maximize the fresh air intake and ensure that tenants are aware of safe handling and storge practices for the chemicals in use.	

The last FYR did not identify any other formal issues and recommendations. However, there were suggestions included as Other Findings to improve performance of the remedy, reduce costs and improve management of O&M, but that did not affect current and/or future protectiveness. These suggestions were:

- The PRP should continue to analyze groundwater samples for 1,4-dioxane across the monitoring well network and continue to perform rehabilitations as needed at extraction wells;

- Increase the groundwater sampling frequency to quarterly for the analysis of 1,4-dioxane at MW-6D;

- Incorporate analysis for per- and polyfluoroalkyl substances (PFAS) in groundwater samples within the next five years; and

- EPA suggested that NJDEP work with the PRP to ensure that all tenants practice safe handling practices of chemicals that minimize worker exposure.

The PRP has continued to analyze groundwater samples for 1,4-dioxane. The results are discussed in the Data Review section of this FYR. The PRP has also continued to perform rehabilitations as needed at extraction wells. This included well rehabilitations performed in March 2022 and in March 2024. The groundwater sampling frequency for the analysis of 1,4-dioxane at MW-6D was not increased to

quarterly because the overall data for 1,4-dioxane concentrations at MW-6D and the municipal wellfield have exhibited a decreasing trend since 2018. However, due to recent rising concentrations since early 2022, more frequent groundwater sampling and water level measurements at this location are recommended. Groundwater samples have been analyzed for PFAS. The results are discussed in the Data Review section of this FYR. Lastly, EPA contacted a representative of the property owner in 2021 and 2024 regarding safe handling practices of chemicals that minimize worker exposure. On April 22, 2021, the representative of the property owner replied that the following actions would be put into place immediately: discuss with individual tenants the Occupational Safety and Health Administration-recommended safe handling and storage of TCE-containing chemicals and chloroform; and adjust economizers for the HVAC systems in these areas to effectuate the maximum amount of outside (fresh) air to be circulated within the buildings. On June 21, 2024, the property owner representative indicated that he would remind the individual tenants of safe handling and storge practices of chemicals. The representative noted that the owner has not had any new tenants that use TCE or chloroform and that there has been a permanent adjustment to maximize fresh air intake in the building.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On August 7, 2024, the 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 Puerto Rico, including the Rockaway Township Wells 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, Pat Seppi, provided a notice to Rockaway and Denville Townships by email on February 13, 2025 with a request that the notice be posted to their webpages. This notice indicated that a FYR would be conducted at the Rockaway Township Wells 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 EPA Region 2 (290 Broadway, 18th floor, New York, New York 10007). In addition, the final report will be posted on the following website: www.epa.gov/superfund/rockaway-township-wellfield. Efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Groundwater monitoring occurs on an annual basis and has been performed consistently since 2005. The current monitoring well network consists of 16 monitoring wells sampled for target compound list (TCL) VOCs and 1,4-dioxane, and 22 monitoring wells measured for groundwater elevations measured to the nearest 0.01 ft. Additionally, the three extraction wells are sampled for TCL VOCs and 1,4-dioxane as well as monitored for groundwater elevations. Three dual-phase extraction wells treat VOCs in the shallow aquifer within the central area of the plume.

The direction of groundwater flow, as measured in the monitoring well network prior to the startup of the GWTS, is in the north-northwest direction. Thus, groundwater in the vicinity of the Site flows toward the wellfield and is thought to be recharged by natural precipitation falling on the area, groundwater drainage along the valley walls, groundwater flowing from areas upgradient of the Site and infiltration from surface streams. Since the start-up of the GWTS, groundwater flow has been locally influenced by the extraction wells. The groundwater flow direction is still generally to the north toward the wellfield, but some localized effects from pumping are evident, particularly at extraction well EW-3 where there is a noticeable cone of depression. During 2023, EW-1, EW-2, and EW-3 were maintained at average pumping rates of 1.9 gallons per minute (gpm), 13 gpm, and 61 gpm, respectively. Well rehabilitation was performed on EW-1 during the current review period in 2022 and 2024 and is planned as needed moving forward. Rehabilitation removes scaling and temporarily allows the well to return to the designed operational flow rate of approximately 5 gpm, although variability in water table elevation can counteract the restoration of the extraction rate at this location.

This FYR covers groundwater sampling data from monitoring and extraction wells between June 2020 and May 2024. Groundwater sampling results collected during this review period generally indicate steady to decreasing concentrations for site-related COCs, with some exceptions further discussed below. TCE and 1,1,1-TCA are the primary contaminants. During the 2024 sampling event, exceedances of GWQS were observed in 14 of the 19 wells which were sampled, with TCE detected above the 1 microgram per liter (µg/L) GWQS in each of the affected wells. Most recently, the maximum concentrations of TCE and 1,1,1-TCA detected onsite were 94 µg/L TCE in MW-6D, (05/2024) and 1,510 µg/L 1,1,1-TCA in MW-1 (05/2024). The maximum concentration of TCE detected during this review period was 228 µg/L in 2020 (EW-1) a decrease from 554 µg/L in the previous review period (EW-1, 06/2015). The May 2024 1,1,1-TCA concentration of 1,510 µg/L at MW-1 represents a decrease compared to the 3,010 µg/L observed at this location in 2019, although concentrations remain elevated and fluctuate significantly. This value remains below the historically observed 1,1,1-TCA concentration at this well, which was most elevated in 2004 at 100,000 µg/L. Other site-related COCs which were detected above regulatory standards during the review period include PCE, 1,1-dichloroethene (1,1-DCE), 1,4-dioxane, and 1,1,2-TCA.

There are three main source areas contributing to the plume of groundwater contamination that migrates toward the municipal wellfield: the eastern plume (Former Degreaser Pit Area), the central plume (Former Waste Oil UST Area), and the western plume (Figures 2 and 3).

Eastern Plume

EW-1 is located on the north side of Building 2, downgradient of the Former Degreaser Area. EW-1 was designed specifically to provide source-area capture and treatment of groundwater impacted from the Former Degreaser Pit Area. TCE and PCE are the primary COCs at EW-1, although TCE is generally more elevated and was most recently recorded at 89 µg/L in May 2024. TCE concentrations consistently remained above the NJ Groundwater Quality Standard (GWQS = 1 µg/L) at EW-1, although concentrations have historically fluctuated significantly. This fluctuation may be a result of residual soil contamination that is being intercepted by the rising water table in years in which there

was above-average precipitation and recharge. During this review period, TCE concentrations decreased overall, and varied between 53 µg/L (06/2023) and 228 µg/L (06/2020). Well rehabilitation, which is performed as needed and most recently in 2022, has been an effective means of temporarily improving the flow rate of EW-1 while water levels in the aquifer permit. Continued monitoring of the eastern plume and downgradient wells during the next review period will ensure the effectiveness of EW-1 at reducing contamination concentrations in the subsurface.

Monitoring well MW-14D is located downgradient of the Former Degreaser Area and immediately adjacent to EW-1. TCE groundwater concentrations at MW-14D have decreased over time from 10,600 µg/L in 2001 (prior to the initiation of the GWTS) to less than 11 µg/L since 2009. The most recent TCE concentration at MW-14D was 1.5 µg/L. Long-term TCE concentration trends at MW-14D and two other wells in the eastern plume cited in the previous FYR (MW-9D and MW-12D) show that TCE concentrations generally remain above the MCL, and that concentrations are oscillatory in the three wells. The eastern plume monitoring network has been augmented through the addition of MW-4(701) and MW-5D to the groundwater sampling plan (See section *Downgradient Monitoring Wells* below).

Central Plume

The central plume consists of both 1,1,1-TCA and TCE as well as the decay products 1,1,2-TCA, cis-l,2-DCE and 1,1-DCE. In addition, PCE and chloroform have been detected within the central plume. Monitoring wells MW-l, MW-2 and MW-3 demarcate the shallow central plume source area.

EW-2 is located between Buildings 1 and 2, in the vicinity of the Former Waste Oil UST Area. This well was designed specifically to provide source-area capture and treatment of groundwater impacted by the Former Waste Oil UST Area. The primary COC captured by EW-2 is TCE. At this well, concentrations were stable and varied between 7 µg/L (06/2023) and 9 µg/L (05/2024) during this review period. Similar to the previous review period, PCE was not detected at EW-2.

At shallow aquifer well MW-3, the TCE concentrations have decreased significantly from the historical high of 23,000 µg/L. Although the most recently observed concentration at this location remained above the regulatory standard of 1 µg/L (detected at 4 µg/L in May 2024), concentrations below state and federal standards were observed during two of the five monitoring events across the review period.

The maximum concentrations of 1,1,1-TCA, PCE and 1,1-DCE observed onsite were recorded in shallow well MW-1, with concentrations of 1,510 µg/L 1,1,1-TCA, 13 µg/L PCE and 32 µg/L 1,1-DCE recorded in May 2024. VOC concentrations at this well have decreased significantly since the historical high concentrations observed at the start-up of the GWTS (110,900 µg/L, 06/2004) and dropped significantly from those observed at the end of the previous review period (3,010 µg/L, 06/2019). However, 1,1,1-TCA concentrations at MW-1 have fluctuated significantly across the review period, with a range between 123 µg/L (06/2021) and 1,510 µg/L (05/2024). This well is screened within the shallow aquifer and appears to be effectively separated from the deep aquifer in the immediate vicinity by a silt and clay unit. Neither EW-2 nor MW-21D, deep aquifer wells with surface

positions within 100 feet of MW-1, indicated any 1,1,1-TCA detections during this review period. Similarly, no regulatory exceedances of 1,1,1-TCA were shown by nearby shallow aquifer wells MW-2 or MW-3.

The shallow aquifer in this area is treated via three dual-phase extraction wells, DP-1, DP-2, and DP-3. These wells removed between 0.1 and 0.7 pound/year of VOCs during the review period based on concentrations observed in combined influent and have removed an estimated 27.3 pounds of VOCs from the subsurface since 2005. Concentration data for combined influent from the review period showed exceedances of TCE and PCE. 1,1,1-TCA, which is present at elevated concentrations in MW-1, was not detected in the influent samples from the nearby dual-phase wells.

Downgradient of these Former Waste Oil UST Area wells, monitoring well MW-32D provides a monitoring point in the deep regional aquifer. At MW-32D, a thin (~5 ft) silt and clay layer provides some degree of isolation from overlying contamination within the shallow overburden aquifer. Here, TCE concentrations were stable above the regulatory standard, and consistently less than 10 µg/L during the review period (maximum concentration of 8 µg/L in 2020).

The mechanism for the sudden and significant concentration spikes of VOCs in the central shallow plume has not been definitively characterized; however, rising concentrations appear to correlate with fluctuation in the elevation of the water table in the shallow aquifer at MW-1 (Figure 3c). Through 2023, these concentration increases have not been accompanied by concurrent spikes in VOC concentrations in, or mass removal from, groundwater influent from the dual-phase wells. The amount of VOC mass removed annually via the SVE system has remained relatively stable (see below). Additionally, 1,1,1-TCA has not been observed in the groundwater influent from the dual-phase wells at concentrations comparable to those observed in MW-1. Data collected during this review period appear to confirm the observation in the previous review that 1,1,1-TCA and other chlorinated VOCs are periodically entering the shallow groundwater system and are not being effectively captured by the remedy. The layout and effectiveness of the dual-phase well system should be evaluated to ensure capture of the entirety of the shallow plume. Additional monitoring downgradient of the central plume source areas is recommended.

Western Plume

EW-3 is located downgradient of the potential source area beneath Building 1. EW-3 was designed specifically to provide source-area capture and treatment of groundwater impacted from historical Building 1 operations. TCE is the primary COC at EW-3 with concentration ranges during this review period of 25 µg/L to 28 µg/L. Low levels of other VOCs, including 1,1,1-TCA and cis-1,2-DCE, were routinely detected at EW-3 throughout the review period, however, concentrations of these contaminants were decreasing to stable, and did not exceed regulatory limits. Most recently, 1,1,1-TCA was not detected and a concentration of 2 µg/L of cis-1,2- DCE was recorded.

The monitoring network for the western plume is defined by samples collected from MW-11S, MW-

20D and MW-29D and is associated with historical operations in the vicinity of Building 1. Sampling of MW-11S showed no detectable concentrations of COCs throughout the review period and has consistently remained beneath the GWQS since 2008. Sampling of MW-20D consistently showed exceedances of the 1 µg/L NJDEP GWQS for TCE, at concentrations less than 10 µg/L. Sampling of MW-29D reported higher contaminant concentrations, which were stable to declining across the review period. During this review period, regulatory exceedances were recorded at MW-29D for TCE and 1,1-DCE, with maximum concentrations of 24 µg/L (06/2021; GWQS = 1 µg/L), and 3 µg/L (06/2021; GWQS = 1 µg/L) respectively. At MW-29D, TCE was detected over the NJ GWQS during every sampling event, however, concentrations at this well have exhibited a decreasing trend since 2010.

Downgradient Monitoring Wells

Four monitoring wells (MW-4(701), MW-5DB and MW-6D) make up the downgradient monitoring network which is sampled by the PRP to provide data that characterizes the VOC plume as it migrates toward the Rockaway Township Wellfield. MW-5D was previously included within the monitoring network, but was damaged beyond repair in 2021. These wells are located adjacent to the property where the discharges occurred.

Well MW-6D is located approximately 500 ft from the southeastern extent of the Rockaway Township Wellfield. At this well, regulatory exceedances were recorded during this review period for TCE and 1,1-DCE (GWQS = 1 µg/L, for each contaminant). Concentrations of TCE were consistently above the MCL and generally the highest observed onsite throughout the review period. Following a sharp increase from 3 µg/L to 97 µg/L in 2020-2021, TCE concentrations were stable between 94 and 97 µg/L through 2024. The stabilization of TCE concentrations above 90 µg/L at this well differs significantly with the previous two review periods, in which sudden spikes were followed by sharply declining concentrations. The results at this well may be indicative of sustained contaminant migration beyond the Site property boundary and the influence of the extraction and treatment system.

At the Rockaway Township Wellfield, two wells (RTWF-6 and RTWF-7) currently pump water from the deep regional aquifer. The water treatment system at the Rockaway Township facility reduces VOC concentrations in the public water supply to non-detectable levels. Another well, RTWF-7A, functions in a backup capacity. These wells are sampled monthly for VOCs, and VOC concentrations in untreated groundwater sampled from these public supply wells have decreased significantly since the onset of treatment operations in 2005. Between 2020 and 2023, VOC concentrations were stable, although concentrations of TCE in exceedance of the MCL of 1 µg/L were regularly recorded in untreated samples from RTWF-6. Concentrations at RTWF-7 declined when compared to the previous five-year review period, with TCE concentrations below 2 µg/L. During 2023, no state or federal MCL exceedances were observed in untreated samples from RTWF-7. Well RTWF-7A, which became operational in 2015, operated only during 2021 with a maximum observed TCE concentration of 11 µg/L. The TCE concentrations currently observed at locations RTWF-6, RTWF-7 and RTWF-7A are

significantly lower than the values observed at the wellfield during the RI (300 µg/L at RTWF-6; 130 µg/L at P-7 (as per the 1993 ROD, P-7 was a test well in the Rockaway Township Wellfield Area); 51 µg/L at RTWF-7).

1,4-Dioxane and PFAS

Groundwater samples have been regularly analyzed for 1,4-dioxane in all monitoring wells since 2016. Given the observed distribution, and its common co-occurrence with TCE and 1,1,1-TCA, the 1,4-dioxane is likely site-related. Concentrations above the 0.4 µg/L NJ GWQS were observed at three wells within the monitoring network during the current review period. During the previous review period, five wells exceeded the 0.4 µg/L threshold. The highest recorded concentration occurred at well MW-6D, downgradient of Site property. This well is located slightly upgradient of the Rockaway Township Wellfield, and concentrations have been oscillatory since 2016, although they decreased from 6 µg/L in 2020 to 0.5 µg/L in 2022. Concentrations of 1,4-dioxane in the public supply wells varied between nondetectable levels and 0.08 µg/L (RTWF-6, 2020). The highest observed 1,4-dioxane concentration was lower than the maximum observed in the previous review period (0.2 µg/L, 2019), and no 1,4-dioxane has been detected in any of the supply wells since 2021. Quarterly sampling and analysis for 1,4-dioxane and other COCs at well MW-6D will continue.

In April 2024, EPA finalized MCLs for Perfluorooctanoic acid (PFOA) (4 nanograms per liter (ng/L)) and Perfluorooctane sulfonic acid (PFOS) (4 ng/L). New Jersey has adopted MCLs of 14 ng/L for PFOA, 13 ng/L for PFOS, and 13 ng/L for PFNA.

Groundwater samples from the three extraction wells and three monitoring wells (MW-7D, MW-16DB, NJDEP-3D) at the property boundary, upgradient of the extraction wells, were analyzed for PFAS in 2021. Concentrations of PFOA and PFOS were found in exceedance of the EPA MCLs at each well, including upgradient wells. PFOS did not exceed the 13 ng/L NJ GWQS at any location. The maximum observed concentration of PFOA occurred at upgradient well NJDEP-3D at a concentration of 22 ng/L, and the maximum concentration of PFOS was 15 ng/L, at EW-1 and MW-7D, several hundred feet upgradient of EW-1. PFNA was detected only at upgradient well MW-16DB, at a concentration below the federal MCL and state GWQS (2 ng/L). These results suggest the potential influence of an offsite source of PFAS. EPA will continue to work with NJDEP to determine potential future sampling needs moving forward.

In summary, three distinct groundwater contaminant plumes originate from three different source areas. Extraction wells EW-1, EW-2 and EW-3 are dedicated to reducing contaminant mass in the eastern, central and western plumes, respectively. Data from this review period indicate that EW-3 removes the most VOC mass from the system while EW-1 has shown the highest and most variable contaminant concentrations observed in the extraction wells. MW-1 had the highest 1,1,1-TCA concentration during this review period at 1,510 µg/L in 2024. TCE and 1,4-dioxane concentrations in monitoring wells were the most elevated at downgradient well MW-6D (97 µg/L TCE, 2022; 6 µg/L 1,4-dioxane, 2021). Well rehabilitation efforts have been able to temporarily restore the flow rates of

extraction wells, in particular EW-1. At the Rockaway Township Municipal Wellfield, concentrations of TCE have gradually declined, but generally remain above the MCL in untreated water in RTWF-6. Municipal treatment operations have remained effective at removing VOCs from these wells.

Soil-Vapor Extraction System

During the current review period, the SVE system was operational for at least 94% of each year. Five wells (the three dual-phase wells, SVE-7 and SVE-8) have been inactive since 2011 as a result of optimization efforts intended to increase the efficacy of the soil remedy via an increase in vacuum pressure at the active monitoring points. Currently, six of the eight active wells are recording higher concentrations of total VOCs than were observed prior to the effort to increase efficacy of the remedy.

Total VOC concentration data are acquired from combined SVE influent sampling which occurs during four sampling events per year. Concentrations observed across the review period are similar to those observed at the end of the previous review period. Measurements are collected from the combined SVE line prior to entering the SVE carbon unit and are used to estimate the total VOC mass removed annually from affected soils. Based upon these measurements, approximately 17 pounds of VOCs were extracted from the soil during the 2023 operating period. Between the onset of SVE treatment in 2005 and June 2019, approximately 1,729 pounds of VOCs were removed. While the time to reach soil remediation goals was estimated to initially be in the three- to five-year range, based on data through 2023, the system will continue to operate until RAOs are achieved.

Site Inspection

An inspection of the Site was conducted on June 26, 2024. In attendance at the June 26 inspection were Lawrence Granite, Dr. John Mason and Dr. Detbra Rosales (EPA representatives) and Matt Alfonse, David Brown, Bryan Foulke and Jonas Holliss (PRP representatives). The purpose of the inspection was to assess the protectiveness of the remedy. The Site is being properly maintained. No issues associated with the remedy were observed. The Site is relatively flat. Surface water run-off is directed to a storm sewer system associated with the parking areas for the Site. Deciduous wooded wetlands border the Site to the east and south.

V. TECHNICAL ASSESSMENT

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

Groundwater contamination exists on-site as a result of three contaminant sources located on the western, central and eastern portions of the Site. The western plume is tied to historical operations in the vicinity of Building 1 and is being intercepted by groundwater extraction well EW-3. EW-3 removes significant contaminant mass from the Site and creates a significant cone of depression in the water table which acts as a hydraulic boundary to the contamination. The monitoring wells in this location showed

declining to stable concentrations within this review period, and declining concentrations since treatment operations began.

Residual soil contamination in the central source area is addressed by the SVE system. Contaminated groundwater in the shallow overburden aquifer is captured by dual-phase extraction wells. Contamination within the deeper overburden aquifer is captured by EW-2, where TCE and 1,1,1-TCA levels are well below historic highs. Overall, the VOC mass removal rate from soils via the SVE wells and dual-phase wells was stable across the review period. Concentrations of 1,1,1-TCA in MW-1 varied considerably across the review period, most recently spiking to 1,510 µg/L in 2024. The absence of 1,1,1-TCA in EW-2 suggests that the majority of the contamination in this area is not migrating into the deeper regional aquifer in this location, although the low-permeability horizon above the deep aquifer is not universally present. Due to a lack of monitoring capability in the shallow aquifer downgradient of the central plume source area, EPA requested additional monitoring capacity in December 2024. EPA recommends the installation of one or more wells in the shallow aquifer to verify that the high and variable concentrations of 1,1,1-TCA observed in MW-1 are not migrating offsite.

Within the eastern plume, the performance of EW-1 has been addressed through well rehabilitation efforts during the review period. These activities have been effective at restoring the flow rate to its original operational level, as conditions in the aquifer allow. EW-1 is capturing contaminant mass in its immediate vicinity, and contaminant concentrations in MW-9D, MW-12D and MW-14D continue to exhibit stable to decreasing levels of site-related contamination.

Elevated contaminant concentrations at downgradient well MW-6D and regulatory exceedances in raw water samples collected at the Rockaway Township Municipal Wellfield indicate that, at least for some portion of this review period, some contamination escaped the extraction well network. The PRP regularly monitors the groundwater extraction system and adjusts extraction rates as necessary. Monitoring of well MW-6D, as well as the other monitoring and extraction wells, is an effective tool for evaluating the remedy effectiveness, and will continue. Sustained elevated contaminant concentrations at MW-6D are potentially indicative of an issue with contaminant capture in the regional aquifer, and it is recommended that the performance of the extraction network on the central and eastern portions of the Site are evaluated and upgraded as necessary to prevent offsite migration of contaminants. The evaluation should consider the installation of an additional extraction well in the regional aquifer.

The remedy is generally functioning as intended by the decision documents, although there are adjustments that could be made to improve performance, including improving contaminant capture in the regional aquifer and expanding the monitoring well network in the shallow aquifer. The extraction wells continue to remove contaminant mass from groundwater, and concentrations have decreased across the monitoring network since the remedy became operational. Concentrations of contaminants decreased in the municipal supply wells downgradient of the Site property, where continued water treatment prevents human exposure to contaminants.

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 1991 baseline and 1997 focused risk assessments were completed prior to much of the Risk Assessment Guidance for Superfund used currently by EPA. However, the process that was used remains valid.

The 1991 baseline risk assessment evaluated exposures to hypothetical future residents (children and adults) via ingestion of groundwater as drinking water and/or inhalation of volatiles while showering and current/future residents via dermal contact with surface water and/or sediments from on-site water bodies. The 1991 baseline risk assessment stated that the domestic use of untreated groundwater was considered unlikely under both current and future land use scenarios because the groundwater is treated at the wellfield prior to distribution to the public. The evaluation of hypothetical use of untreated groundwater yielded risks above acceptable limits. However, as noted, these risks are being addressed by the remedial action selected for OU 1 in addition to a CEA/WRA restricting the use of groundwater for potable purposes outside of the municipal wells. Exposure to the onsite streams and lagoon/marshy area were and are expected to be infrequent. The following lines of evidence support not quantitatively evaluating this pathway: low concentrations of contaminants detected in surface water and sediment; a vast majority of contaminants being metals which are not readily dermally absorbed; and the surface water being very shallow, making the ingestion pathway unlikely.

The 1997 focused risk assessment evaluated exposures to future industrial/commercial workers, construction workers and trespassers who may have dermal contact with or incidentally ingest contaminated subsurface Site soils or who may breathe contaminated Site air and current/future industrial/commercial workers and construction workers who may breathe contaminated indoor air at the Site. The focused risk assessment found that the subsurface soils did not directly present an adverse impact to human or ecological receptors. The subsurface soil COC concentrations were above New Jersey Impact to Groundwater screening levels and, as a result, soil remediation was warranted. Surface soils were not evaluated as the medium of concern, however, most surfaces of the DTP are covered with buildings or paved so the direct contact pathway has been interrupted. Deed notices also restrict future use to commercial/industrial. However, if the buildings were to be demolished and the current paving removed, surface soil sampling will likely be necessary to determine whether direct contact would pose a risk.

Soil VI is evaluated when soils and/or groundwater are known or suspected to contain VOCs. Due to elevated concentrations of VOCs in the groundwater at the Site, soil gas sampling was performed in Buildings 1 and 2. TCE in Building 1 and TCE and PCE in Building 2 appeared to have a complete VI pathway. As a result of the soil gas investigation, SSDSs were installed in both buildings, are inspected regularly, and modified as needed. Based on the most recent 2023 Annual Report, the SSDSs are currently functioning as intended. It is anticipated that the PRP will collect another round of indoor air samples in 2025 to confirm that modifications were effective.

In the last five-year review, it was observed that some of the tenants use TCE- and chloroform-containing products which are contributing to elevated levels in indoor air and are not a result of VI. A recommendation was made to better store and handle TCE- and chloroform-containing products, as well as optimize the HVAC system. The property owner has completed these tasks.

The RAOs remain valid, and no additional sources of contamination, exposed populations or exposure pathways have been identified since the last five-year review.

Although the ecological risk assessment screening values used to support the 1993 ROD may not necessarily reflect the current values, the Site is in a highly developed area covered with buildings and pavement and may not provide suitable habitats for ecological receptors. Samples collected from Beaver Brook and associated marsh areas during the RI indicated that the sediment and surface water contaminant levels were not significant. Therefore, sediment and surface water samples are no longer collected. Groundwater treated at the Site is regulated in accordance with a New Jersey Pollution Discharge Elimination System permit and it is not a concern to ecological receptors found in Beaver Brook. Additionally, the groundwater plume flow is toward the extraction wells rather than the Brook. Therefore, the exposure assumptions for ecological receptors are still valid.

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

At this time there is no other information that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU 2

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU 1	**Issue Category: Operations and Maintenance**			
	Issue: Data collected during this review period appear to confirm the observation in the previous review that 1,1,1-TCA and other chlorinated VOCs are periodically entering the shallow groundwater system and are not being effectively captured by the remedy.			
	Recommendation: The shallow groundwater plume should be further characterized and the dual-phase extraction well system should be evaluated to ensure capture of the entirety of the shallow plume. Additional well installation and monitoring downgradient of the central plume source areas is recommended to ensure site-related contaminants are not migrating offsite.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	6/30/2027
OU(s): OU 1	**Issue Category: Operations and Maintenance**			
	Issue: Sustained elevated contaminant concentrations at MW-6D are potentially indicative of an issue with contaminant capture in the regional aquifer.			
	Recommendation: It is recommended that the performance of the extraction network on the central and eastern portions of the Site are evaluated and upgraded as necessary, including consideration of the installation of additional extraction wells in the regional aquifer, to prevent offsite migration of contaminants.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	6/30/2027

VII. PROTECTIVNESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU 1	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The groundwater remedy at OU 1 protects human health and the environment in the short-term because the concentrations of COCs in the regional supply wells remain nondetectable in treated water and have been declining over time in raw water samples. In order for the remedy to be protective in the long-term, the shallow groundwater plume should be further characterized; the dual-phase extraction well system should be evaluated to ensure capture of the entirety of the shallow plume; additional monitoring downgradient of the central plume source areas should be performed and the performance of the extraction well network on the central and eastern portions of the Site should be evaluated and upgraded as necessary to prevent offsite migration of contaminants.	
Operable Unit: OU 2	*Protectiveness Determination:* Protective
Protectiveness Statement: The OU 2 remedy is protective of human health and the environment.	
Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	
Protectiveness Statement: The remedies are protective of human health and the environment in the short-term because the concentrations of COCs in the regional supply wells remain nondetectable in treated water and have been declining over time in raw water samples. In order for the remedy to be protective in the long-term, the shallow groundwater plume should be further characterized; the dual-phase extraction well system should be evaluated to ensure capture of the entirety of the shallow plume; additional monitoring downgradient of the central plume source areas should be performed and the performance of the extraction well network on the central and eastern portions of the Site should be evaluated and upgraded as necessary to prevent offsite migration of contaminants.	

VIII. NEXT REVIEW

The next FYR for the Rockaway Township Wells Superfund Site is required five years from the completion date of this review.

Figures

Figure 1 – Site Location Map

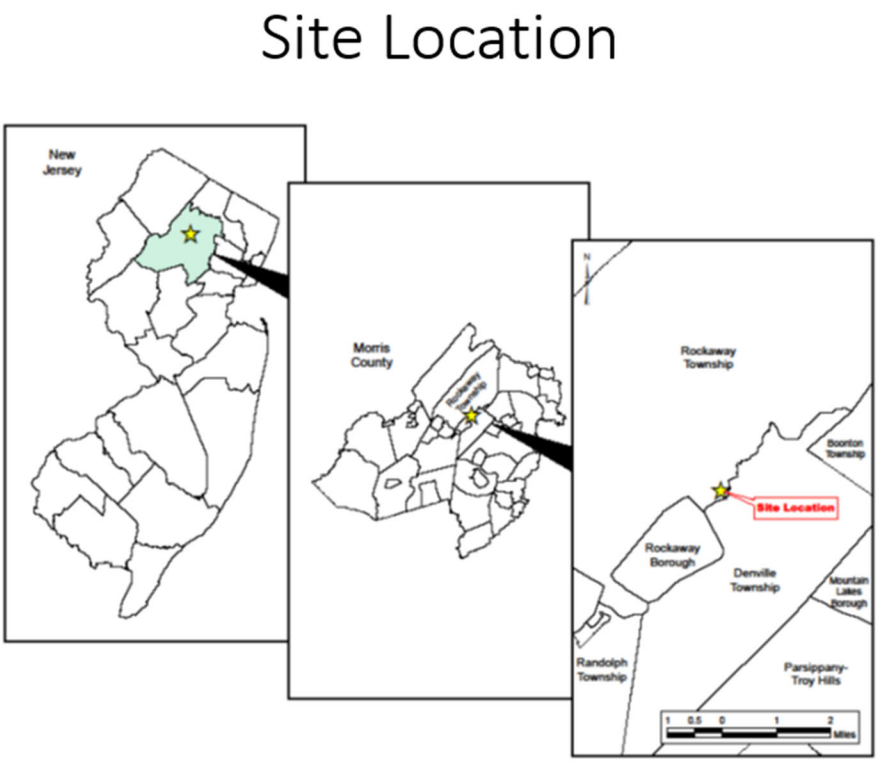
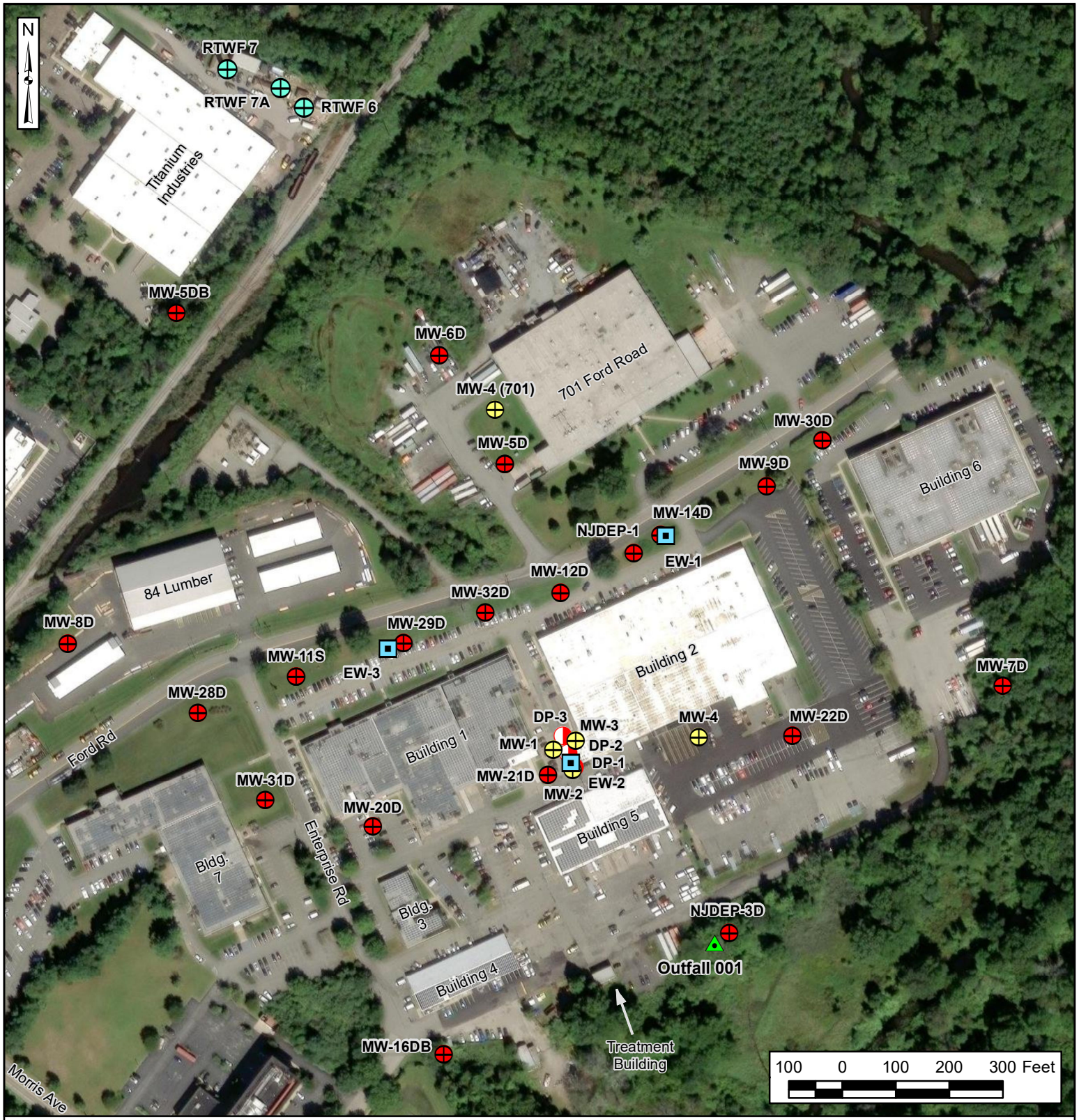


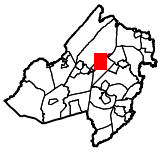
Figure 2 - Monitoring Well Locations



BaseSource: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Regional Overburden Aquifer Monitoring Well
- Shallow Overburden (Perched) Aquifer Monitoring Well
- Extraction Well
- Dual-Phase Well
- Public Community Water Supply (PCWS) Well
- Treatment System Outfall



Morris County Location

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Site Plan

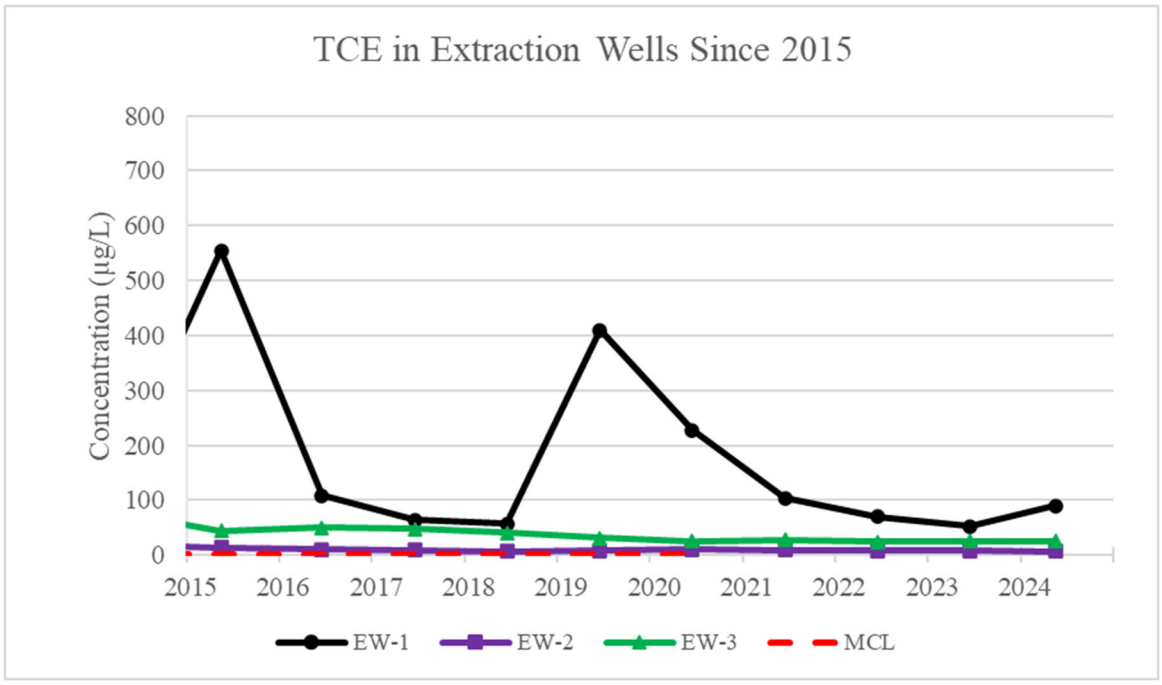
Prepared by:

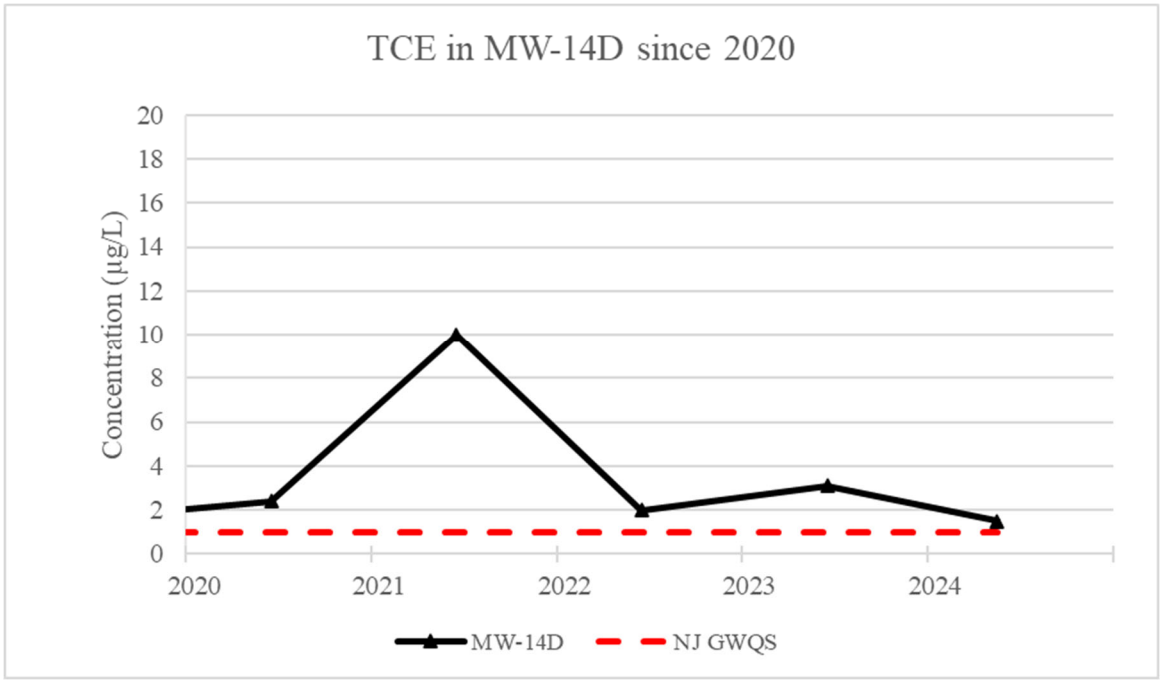
WSP USA Inc.
350 Mount Kemble Avenue, Suite 200
Morristown, New Jersey 07960
www.wsp.com

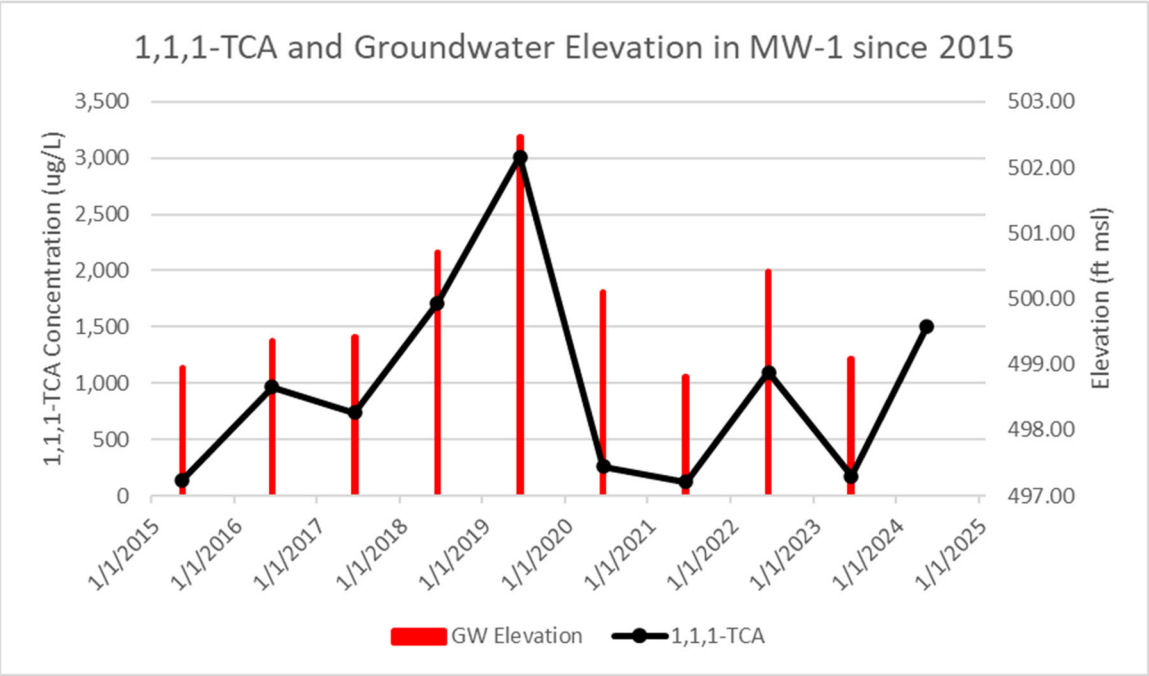
DATE: 01/23/25

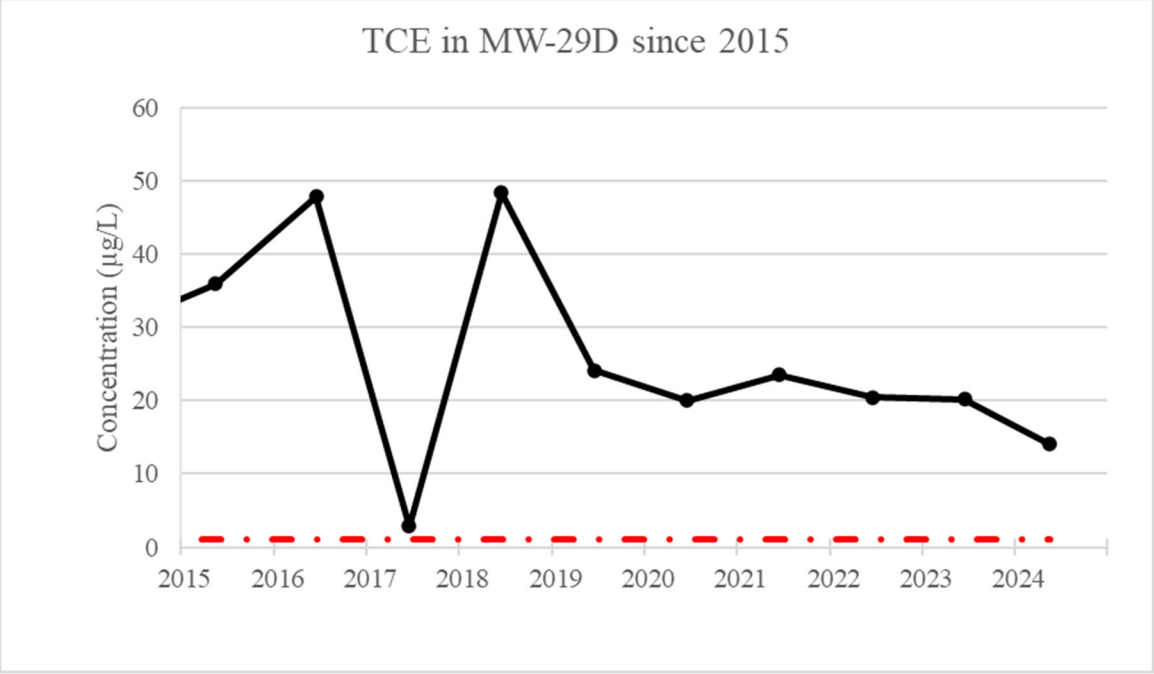
FILE: B:\ATK_sites\DTP_site\gis\RAPR\Fig1-SitePlan-noXSec.mxd | DRAWN BY: JH | FIGURE: 2

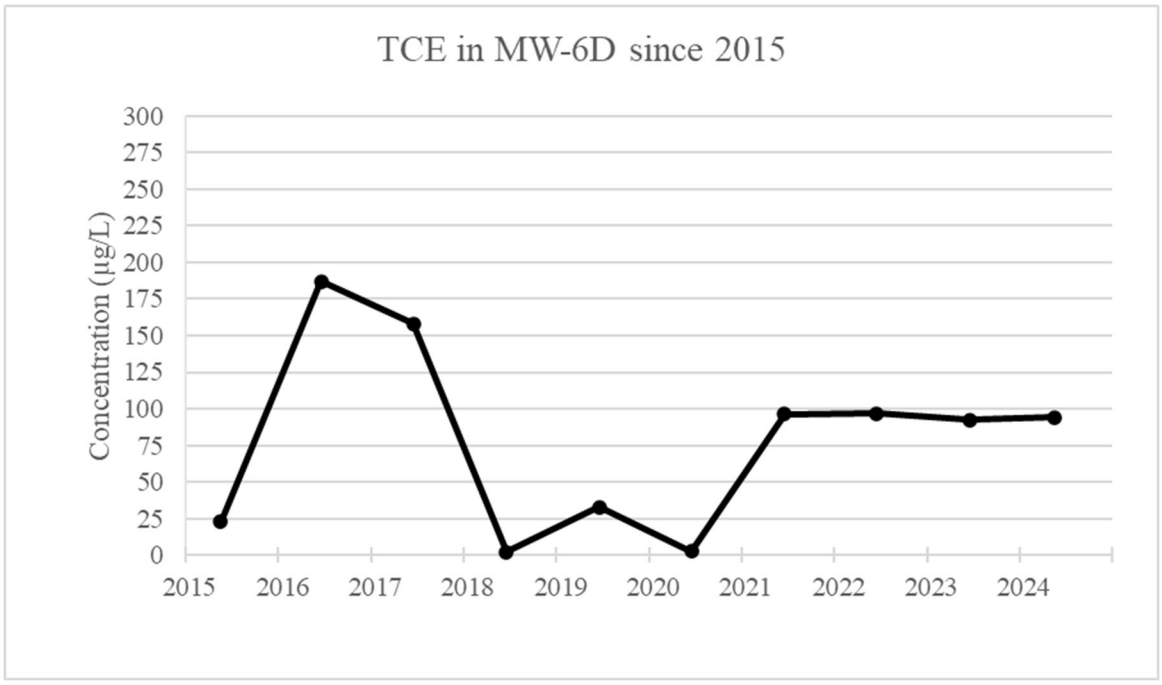
Figure 3 - Key Groundwater Trends

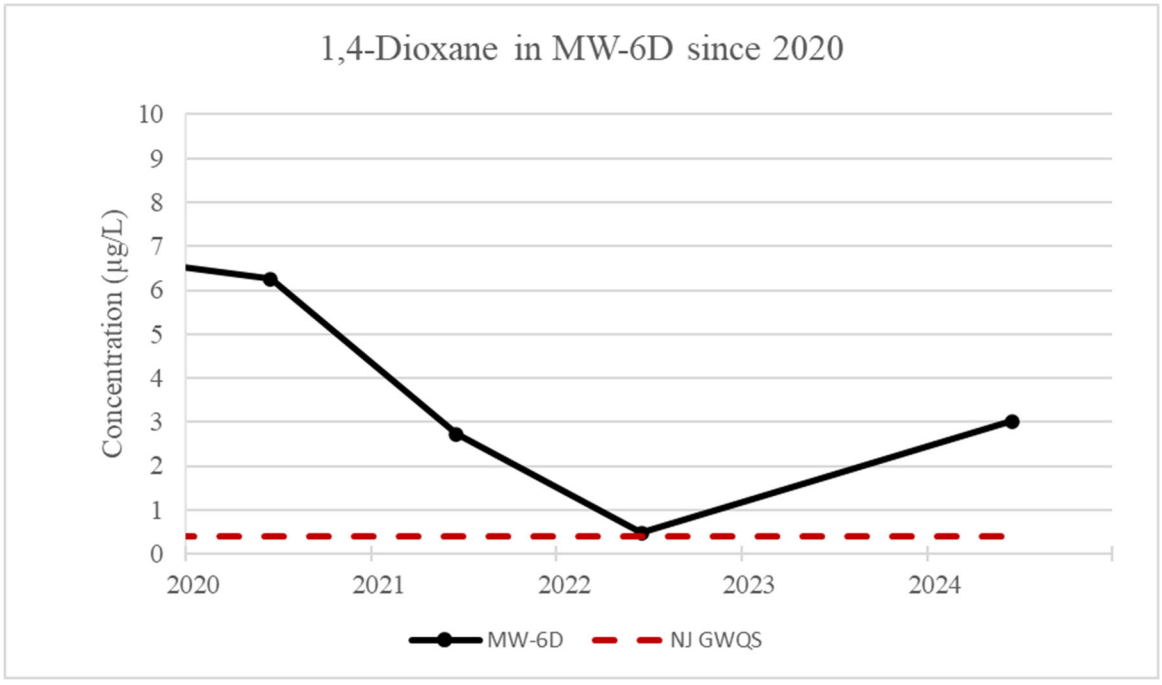

TCE in Extraction Wells Since 2015
Concentration (µg/L)
800
700
600
500
400
300
200
100
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
EW-1
EW-2
EW-3
MCL


TCE in MW-14D since 2020
Concentration (µg/L)
20
18
16
14
12
10
8
6
4
2
0
2020
2021
2022
2023
2024
MW-14D
NJ GWQS


1,1,1-TCA and Groundwater Elevation in MW-1 since 2015
1,1,1-TCA Concentration (ug/L)
Elevation (ft msl)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
503.00
502.00
501.00
500.00
499.00
498.00
497.00
1/1/2015
1/1/2016
1/1/2017
1/1/2018
1/1/2019
1/1/2020
1/1/2021
1/1/2022
1/1/2023
1/1/2024
1/1/2025
GW Elevation
1,1,1-TCA


TCE in MW-29D since 2015
Concentration (µg/L)
60
50
40
30
20
10
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024

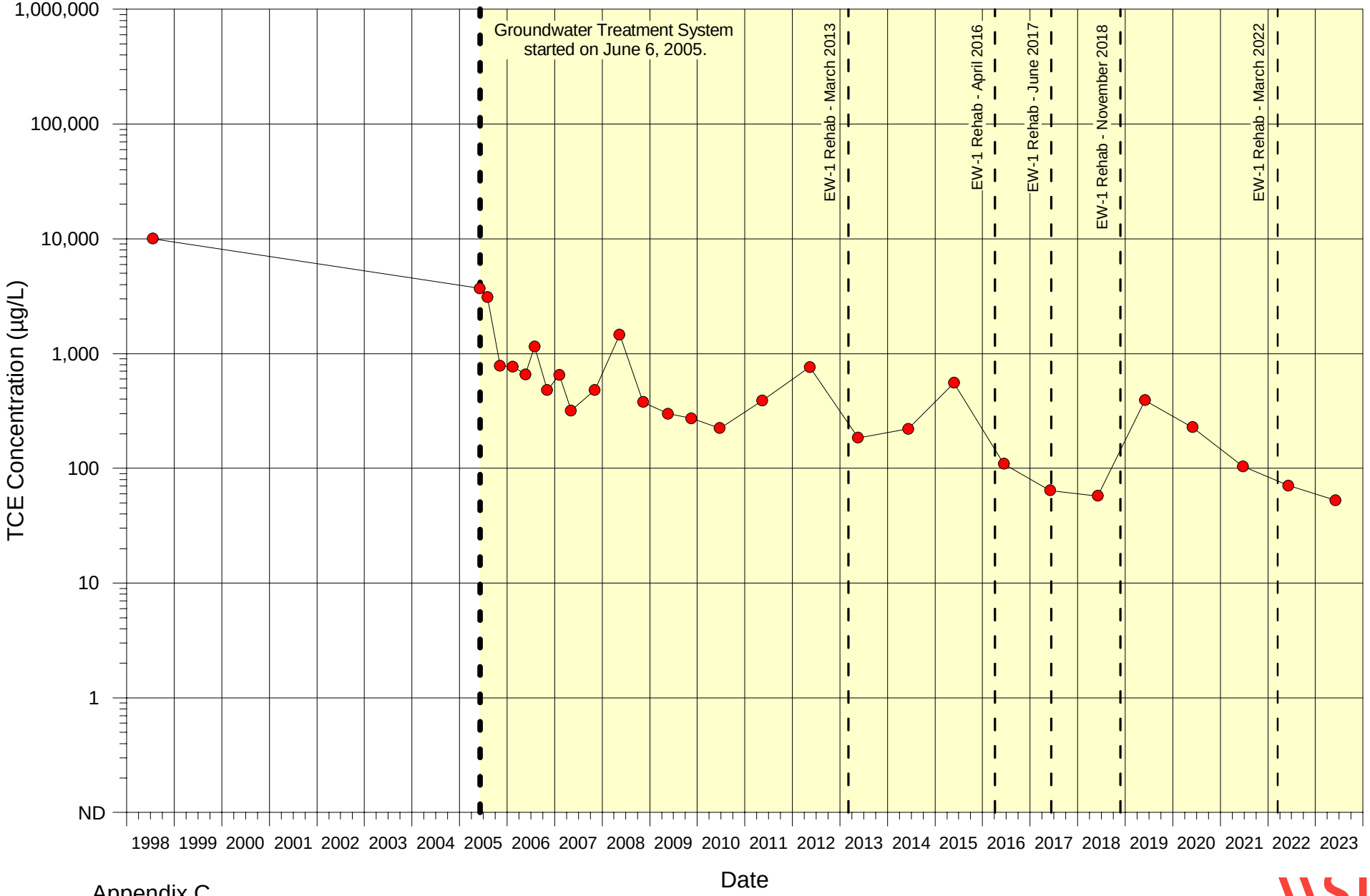

TCE in MW-6D since 2015
Concentration (µg/L)
300
275
250
225
200
175
150
125
100
75
50
25
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024


1,4-Dioxane in MW-6D since 2020
Concentration (µg/L)
10
9
8
7
6
5
4
3
2
1
0
2020
2021
2022
2023
2024
MW-6D
NJ GWQS

Figures 4 through 24

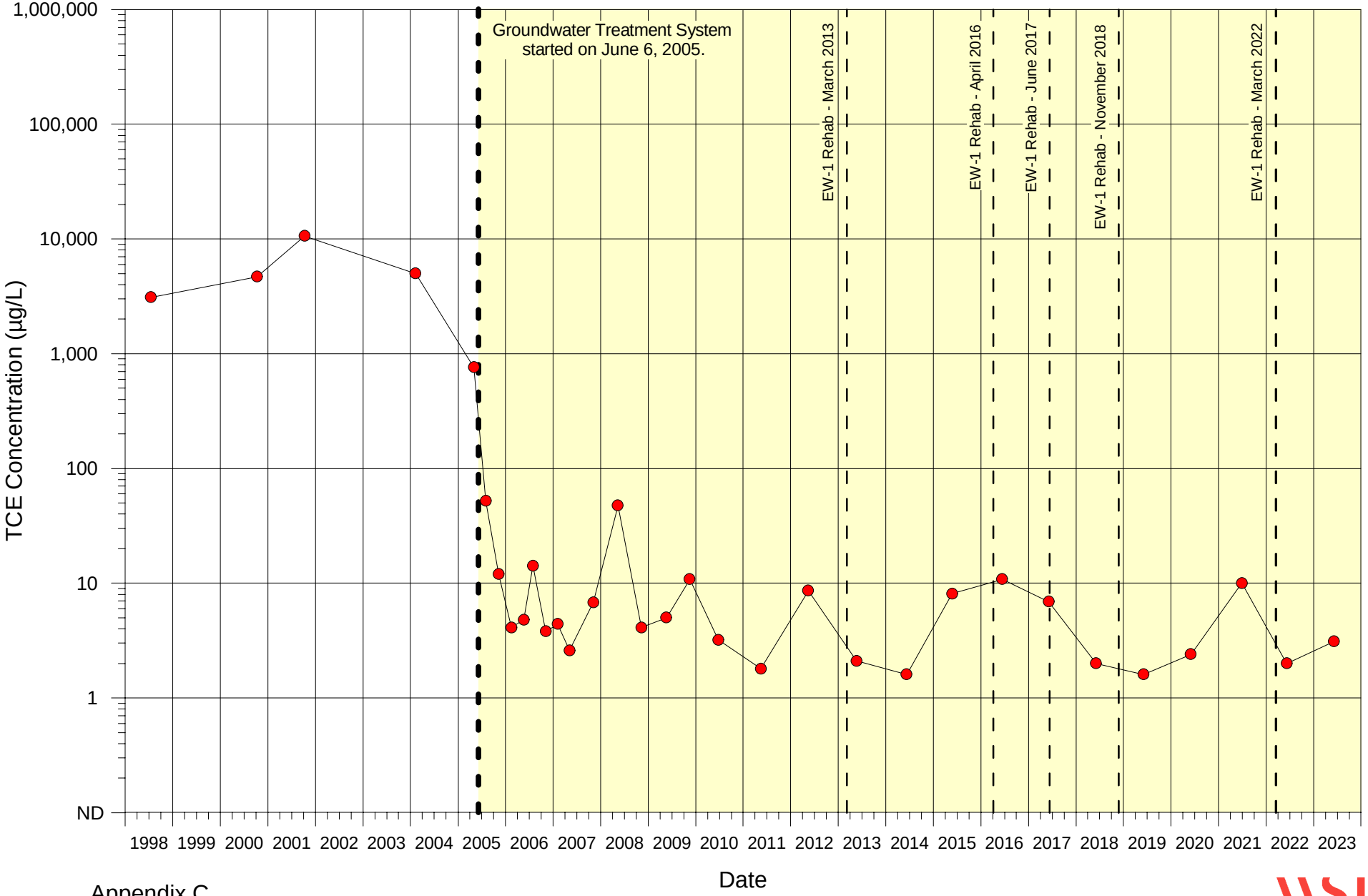
Contaminant Concentration Trend Analysis Plots

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - EW-1
Trichloroethene (TCE) Concentration vs. Time



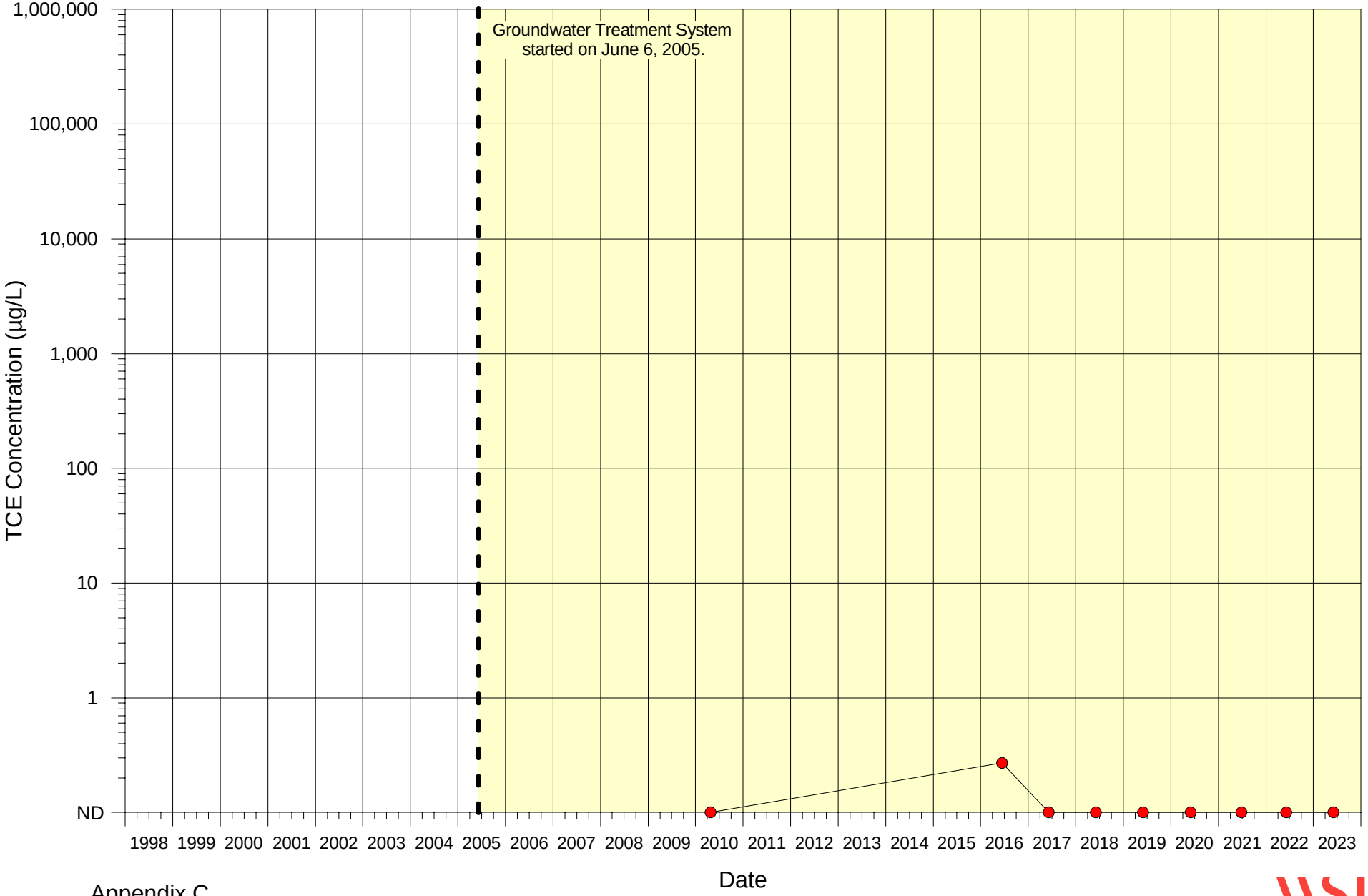
Appendix C
Figure 1

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - MW-14D
Trichloroethene (TCE) Concentration vs. Time



Appendix C
Figure 2

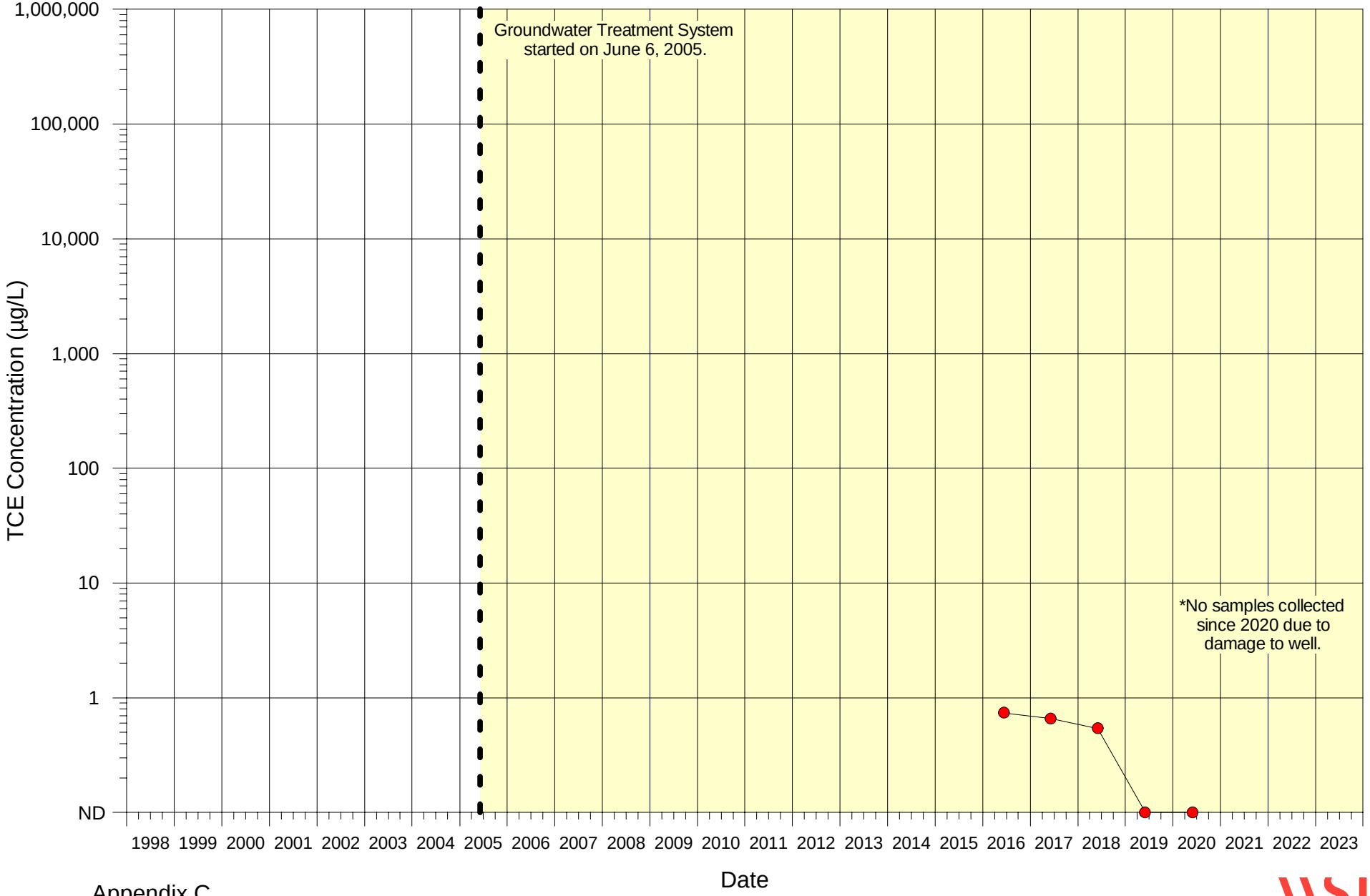
Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - MW-4 (701)
Trichloroethene (TCE) Concentration vs. Time



Appendix C

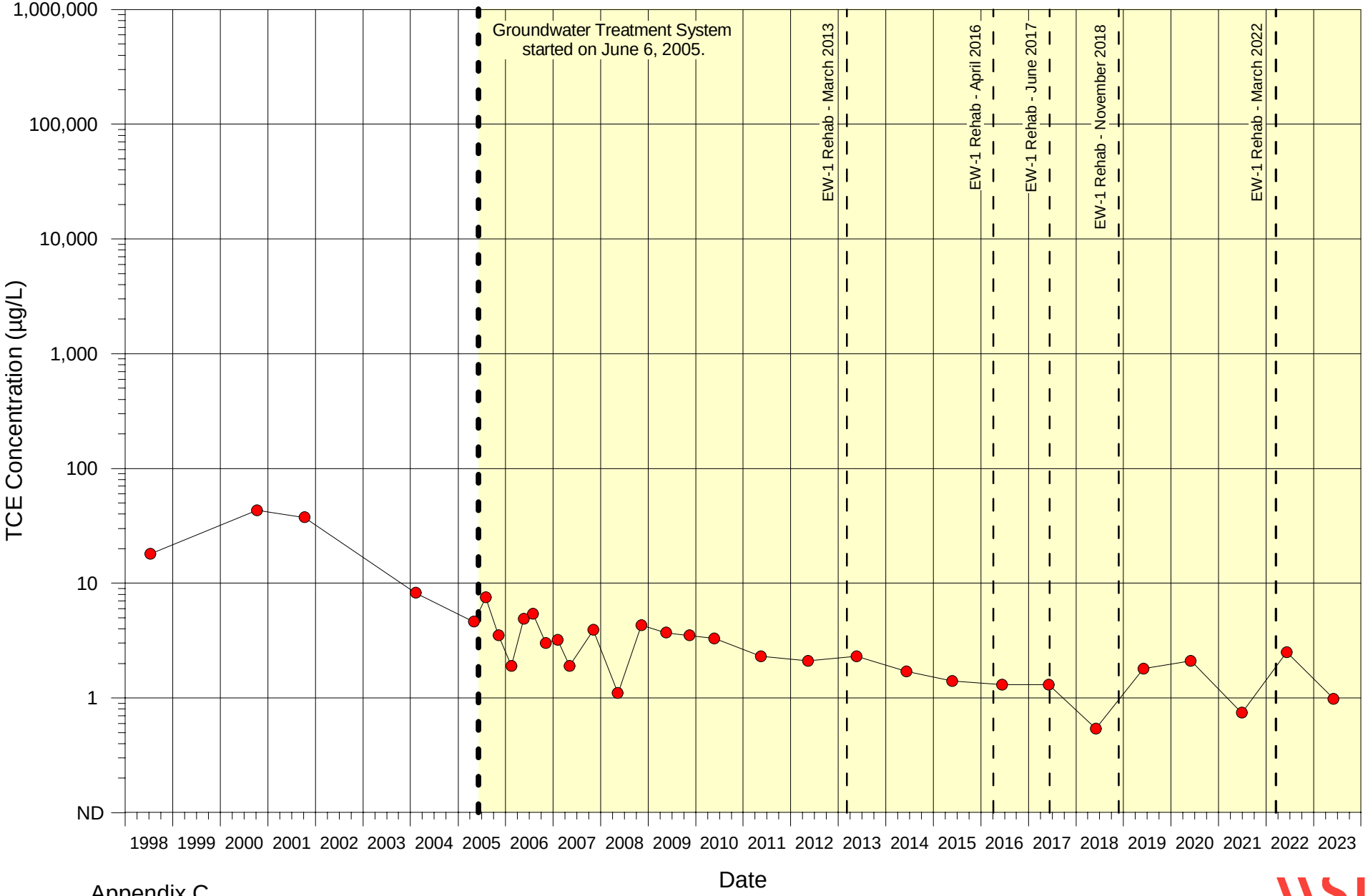
Figure 3

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - MW-5D
Trichloroethene (TCE) Concentration vs. Time



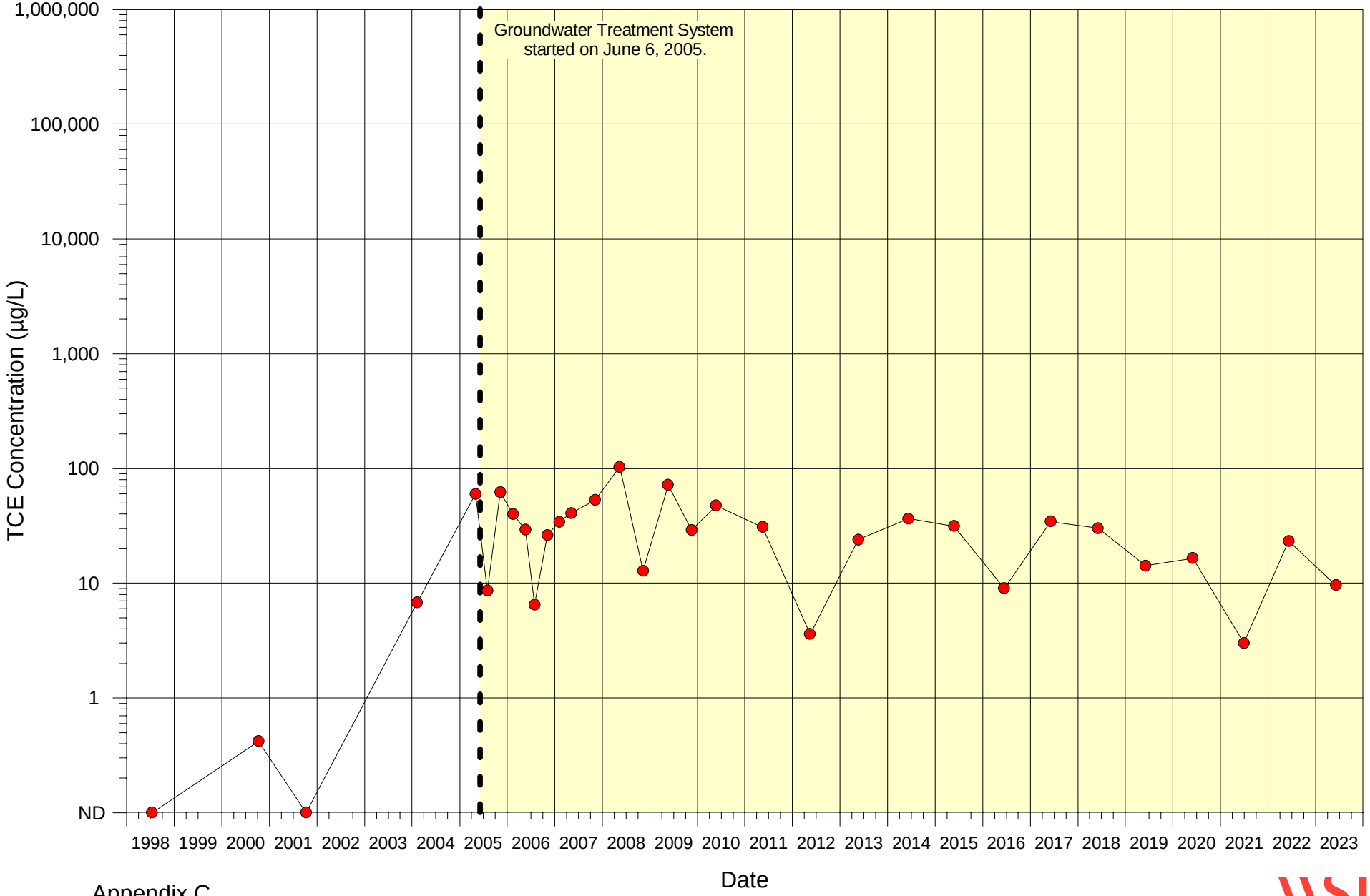
Appendix C
Figure 4

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - MW-9D
Trichloroethene (TCE) Concentration vs. Time



Appendix C
Figure 5

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Eastern Plume - MW-12D
Trichloroethene (TCE) Concentration vs. Time

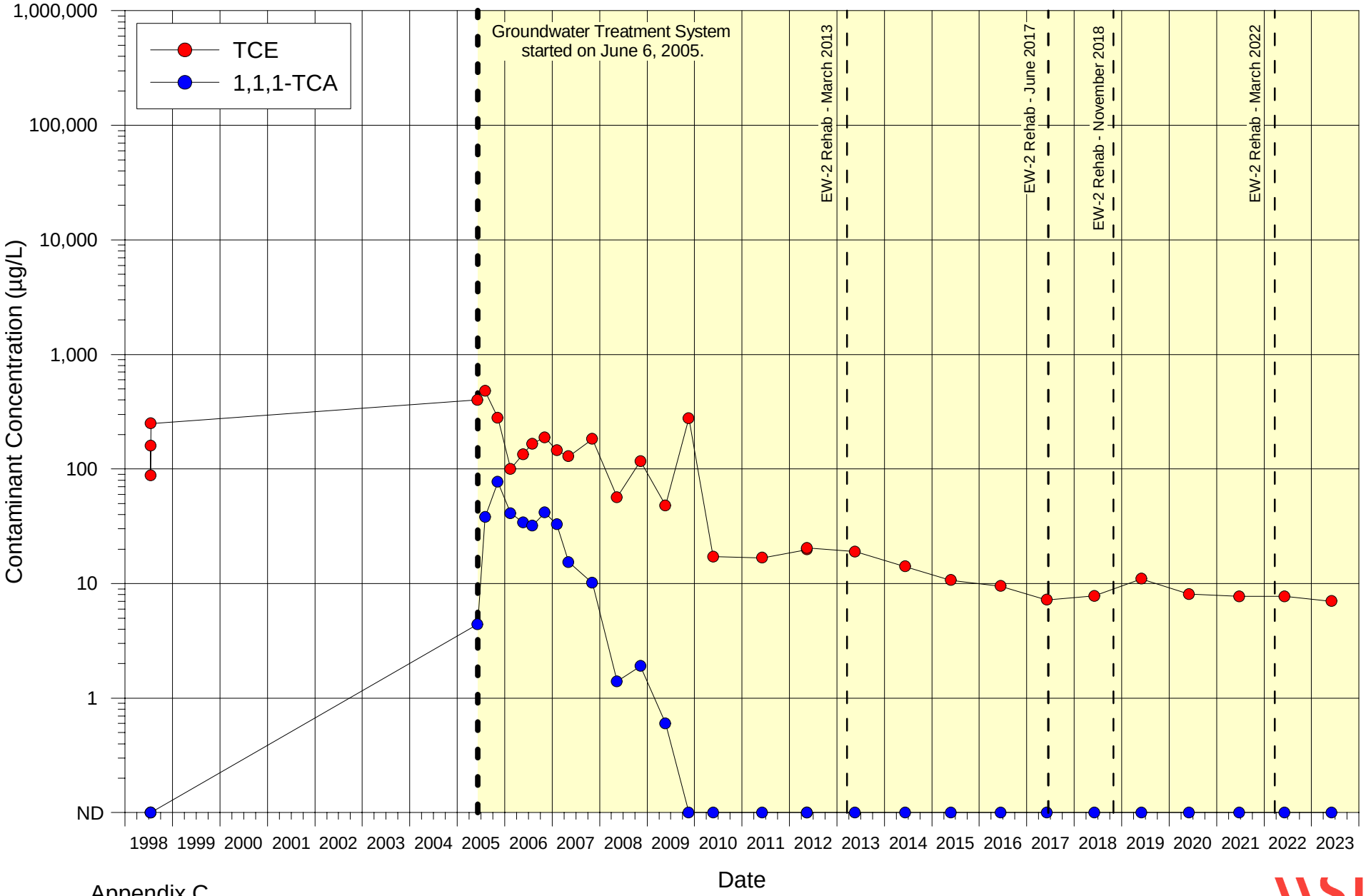


Appendix C
Figure 6

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume - EW-2

Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



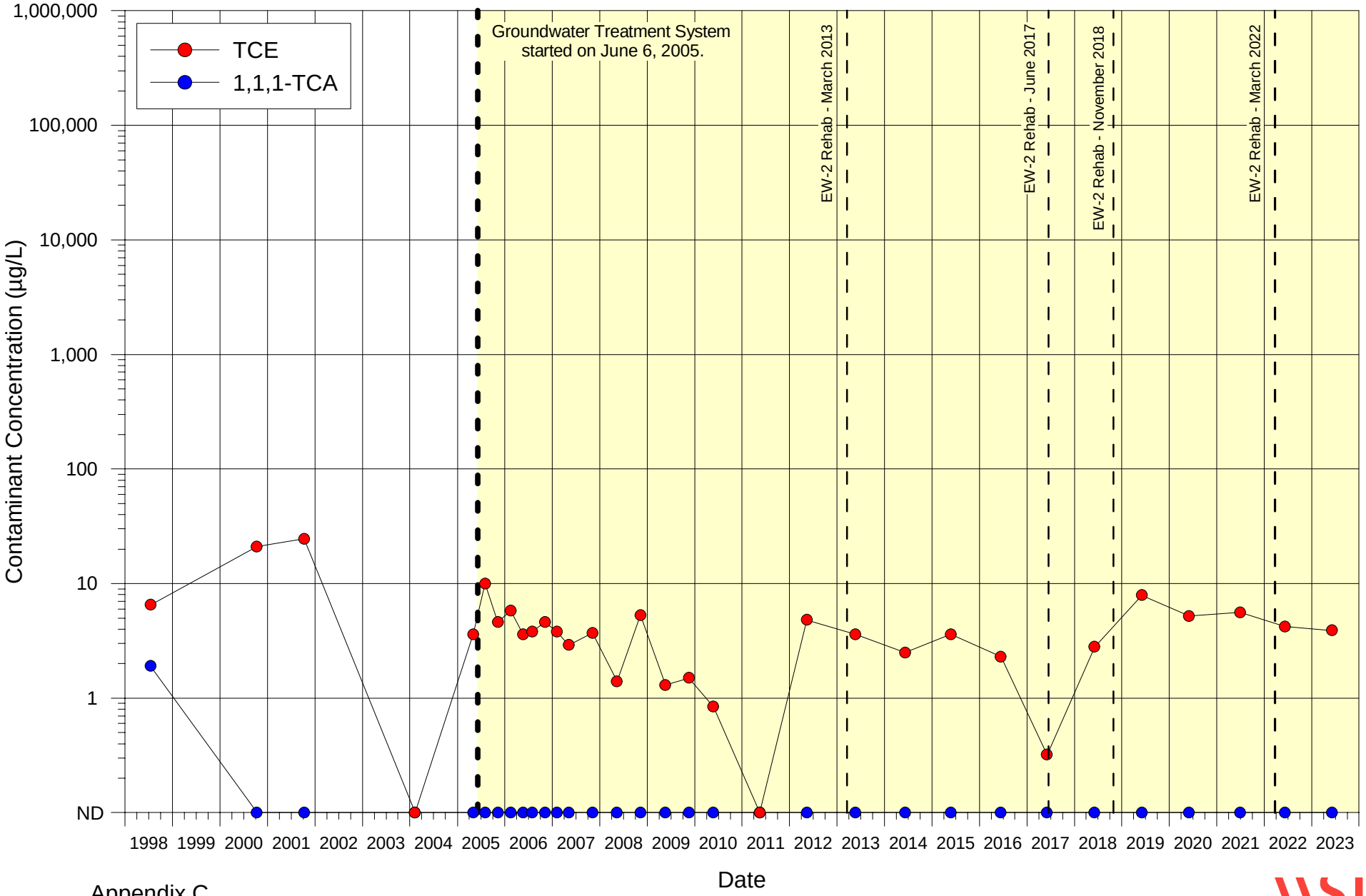
Appendix C

Figure 7

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume - MW-21D

Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



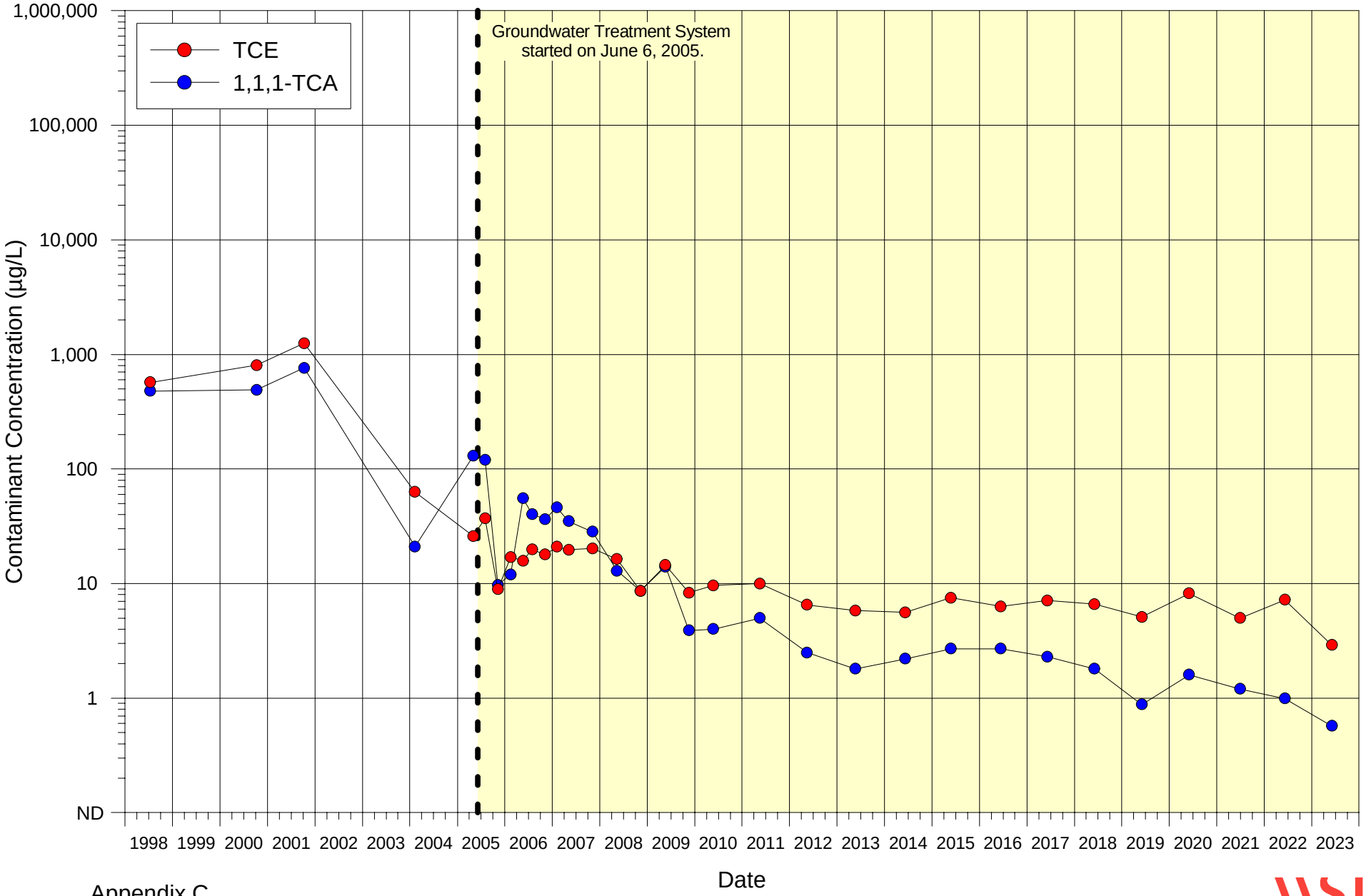
Appendix C

Figure 8

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume - MW-32D

Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



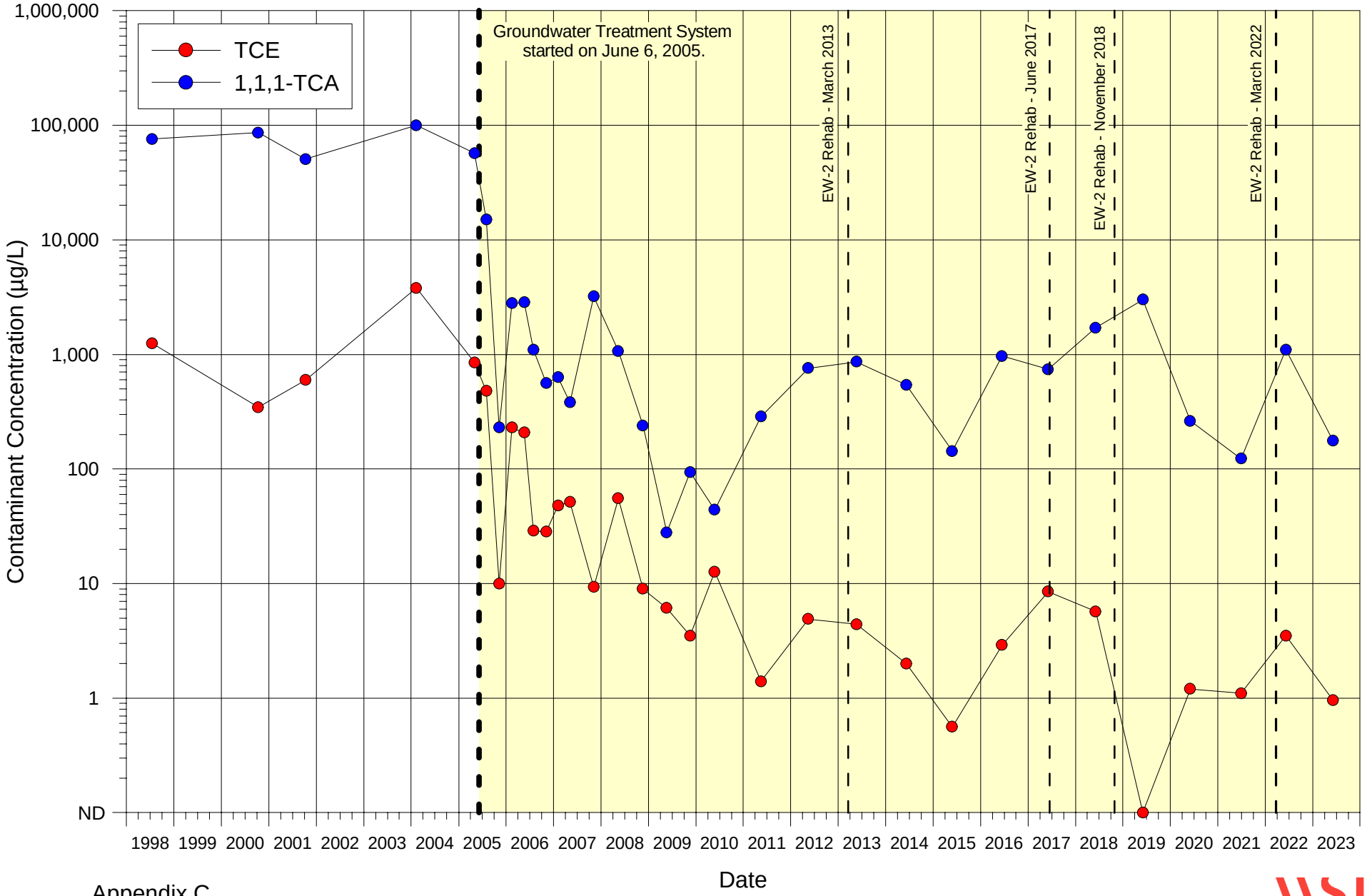
Appendix C

Figure 9

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume (Perched Aquifer) - MW-1

Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



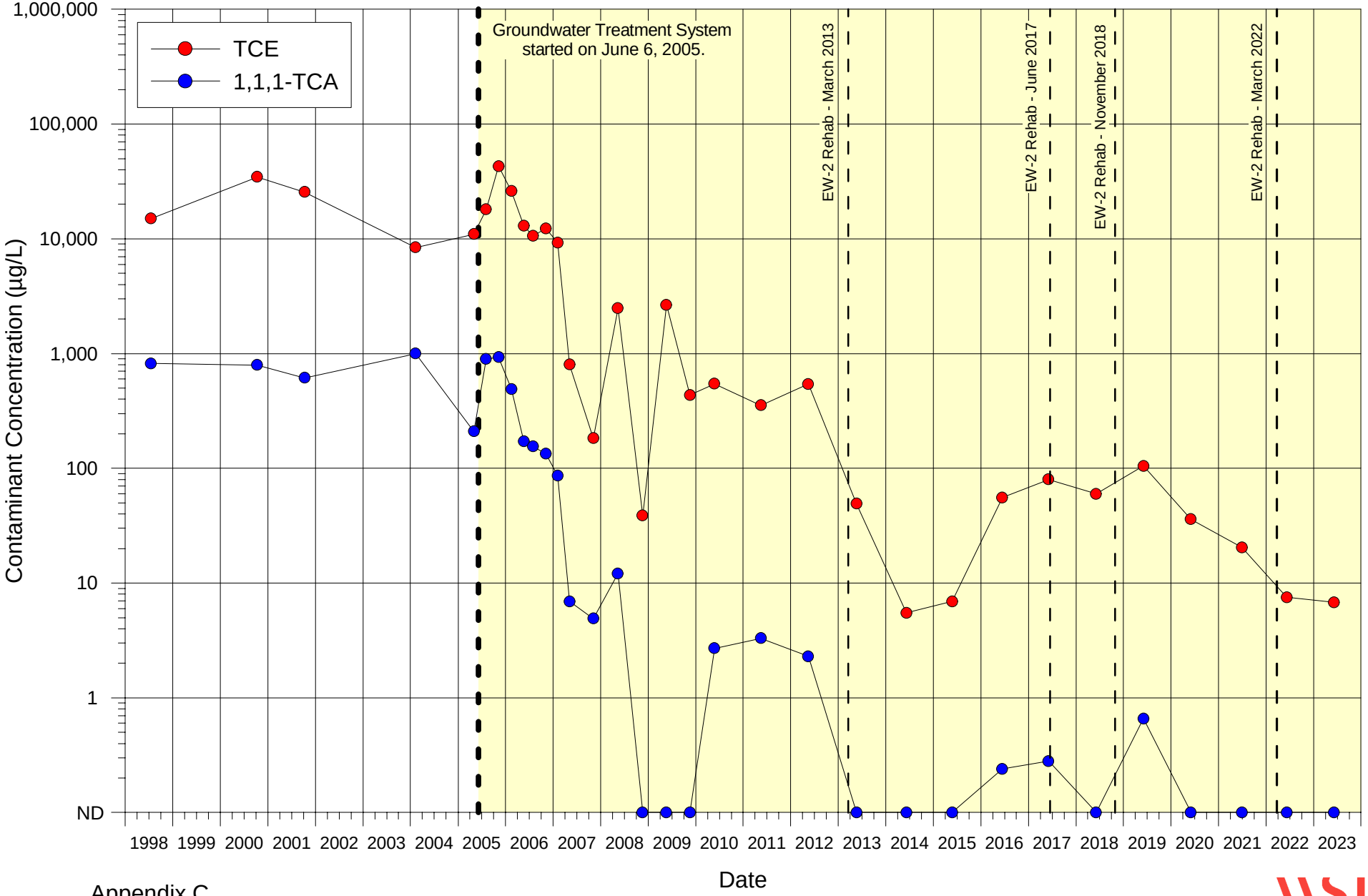
Appendix C

Figure 10

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume (Perched Aquifer) - MW-2

Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



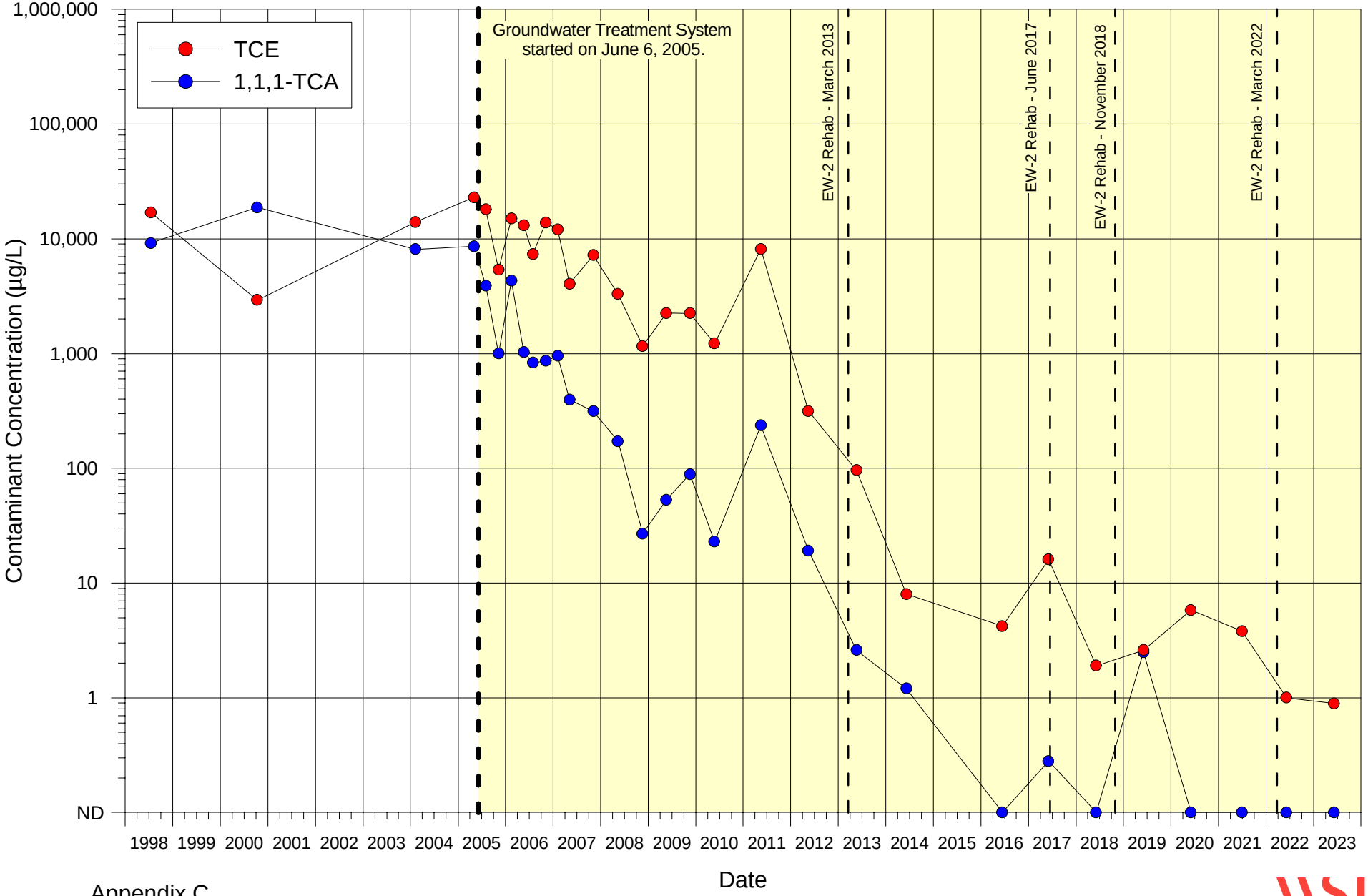
Appendix C

Figure 11

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Middle Plume (Perched Aquifer) - MW-3

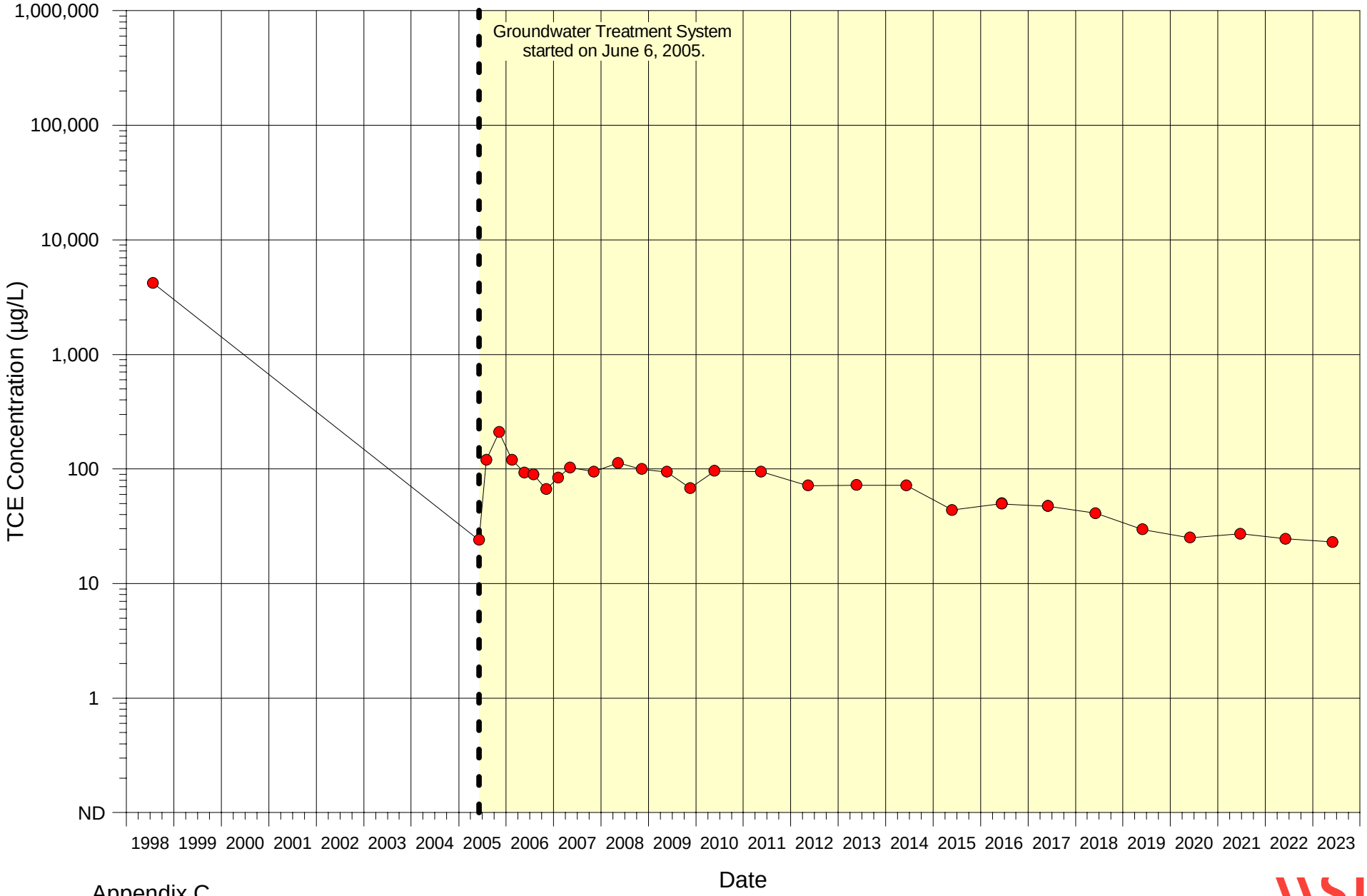
Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



Appendix C

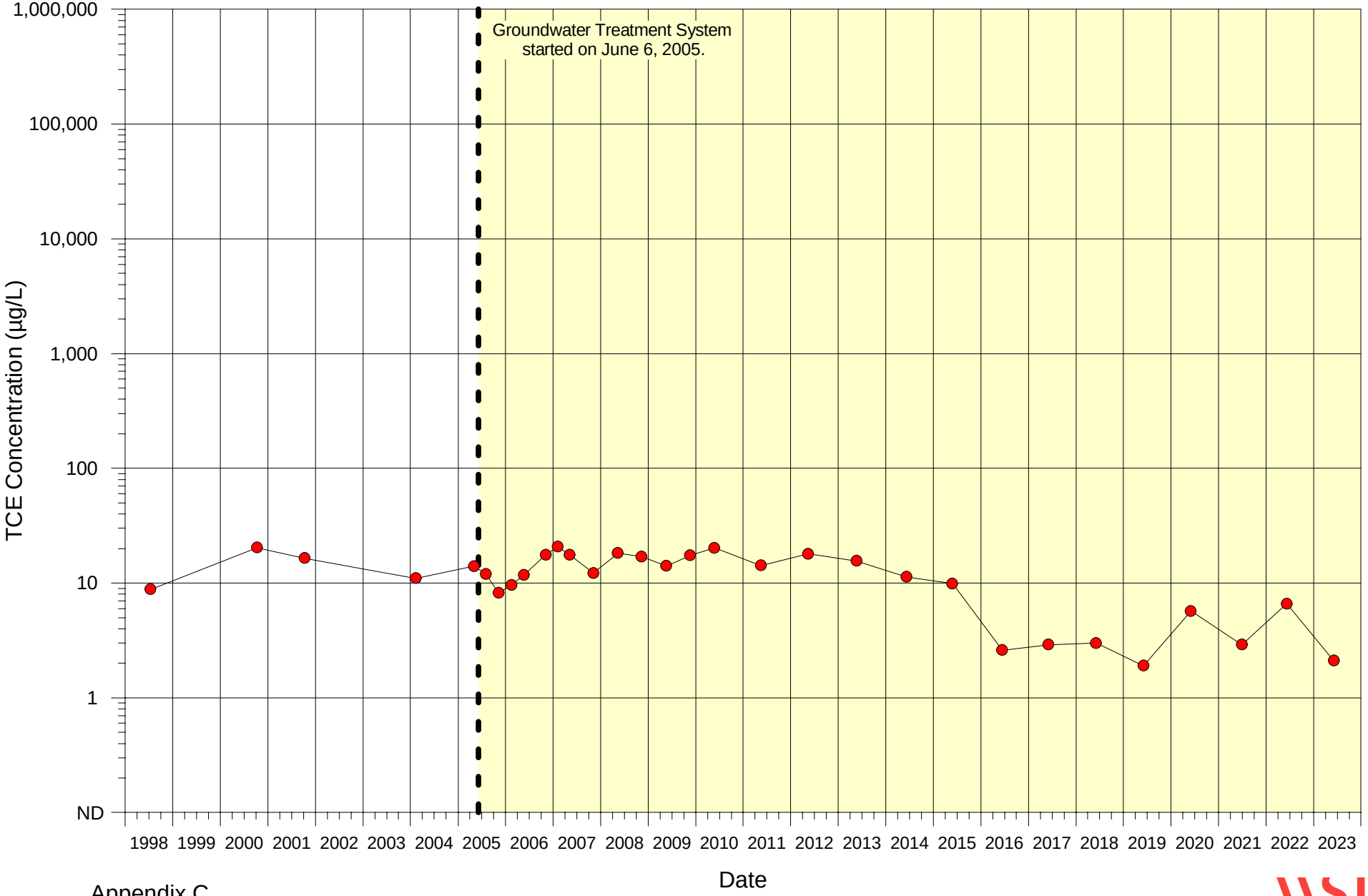
Figure 12

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Western Plume - EW-3
Trichloroethene (TCE) Concentration vs. Time



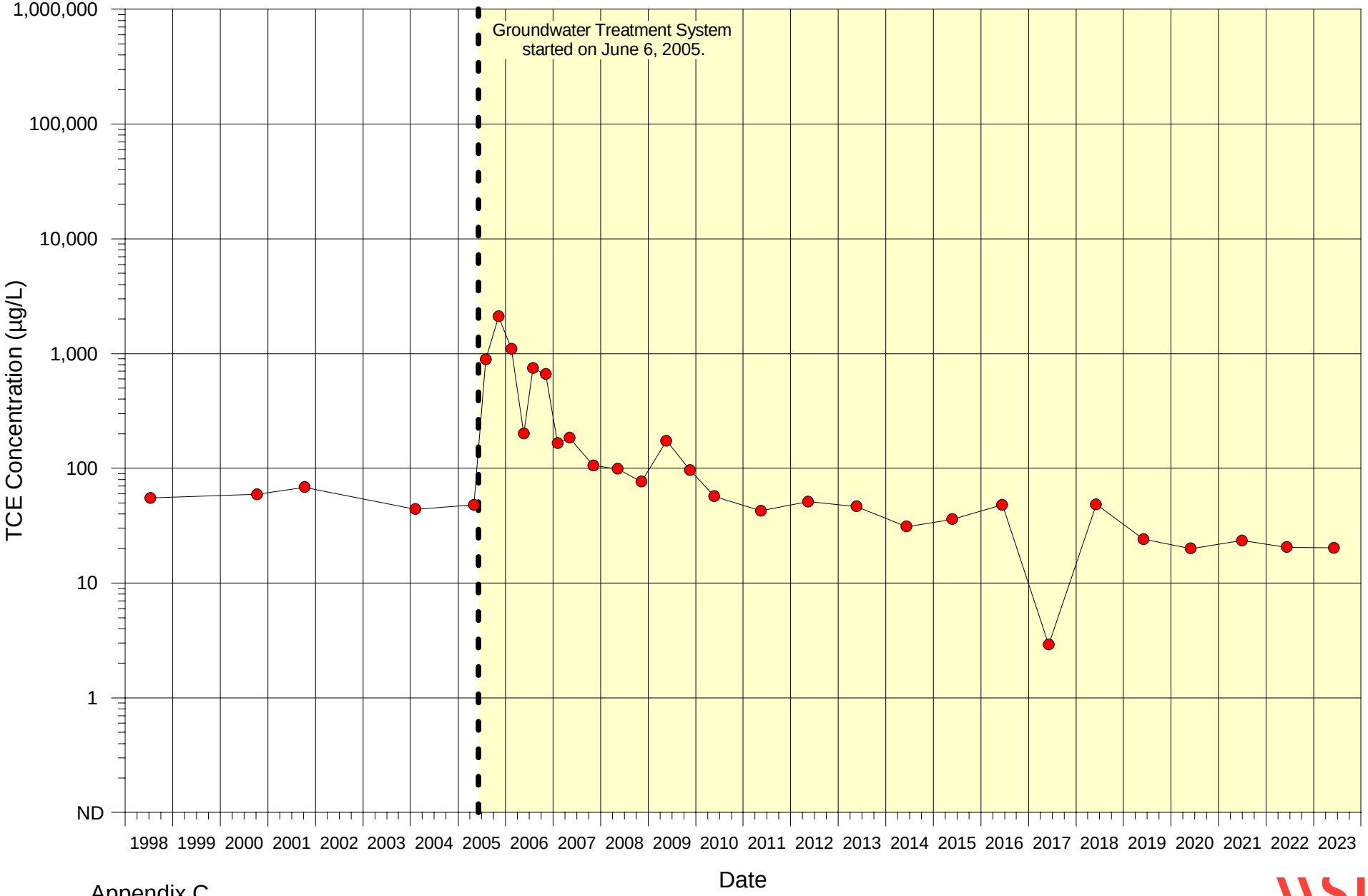
Appendix C
Figure 13

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Western Plume - MW-20D
Trichloroethene (TCE) Concentration vs. Time



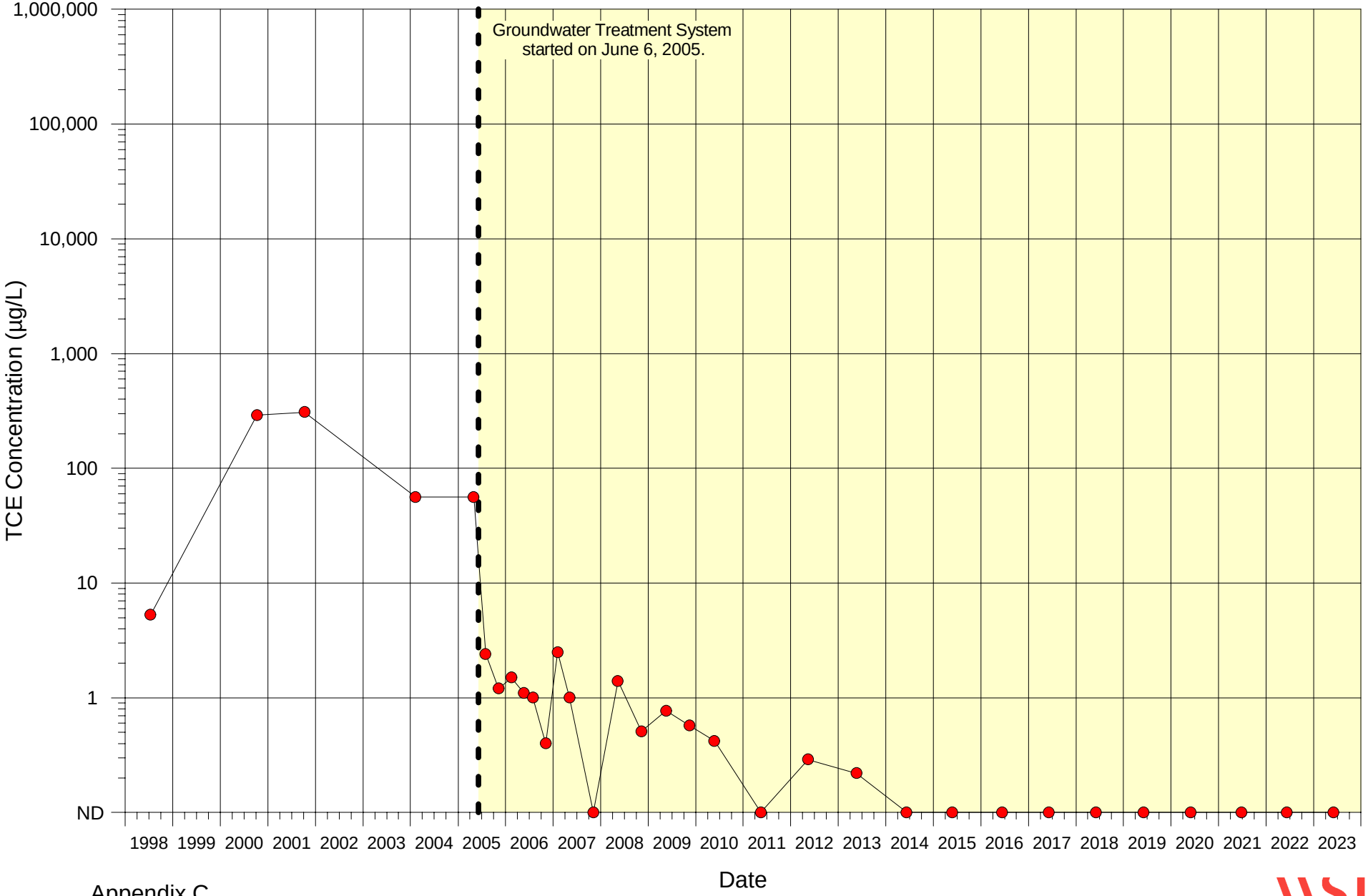
Appendix C
Figure 14

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Western Plume - MW-29D
Trichloroethene (TCE) Concentration vs. Time



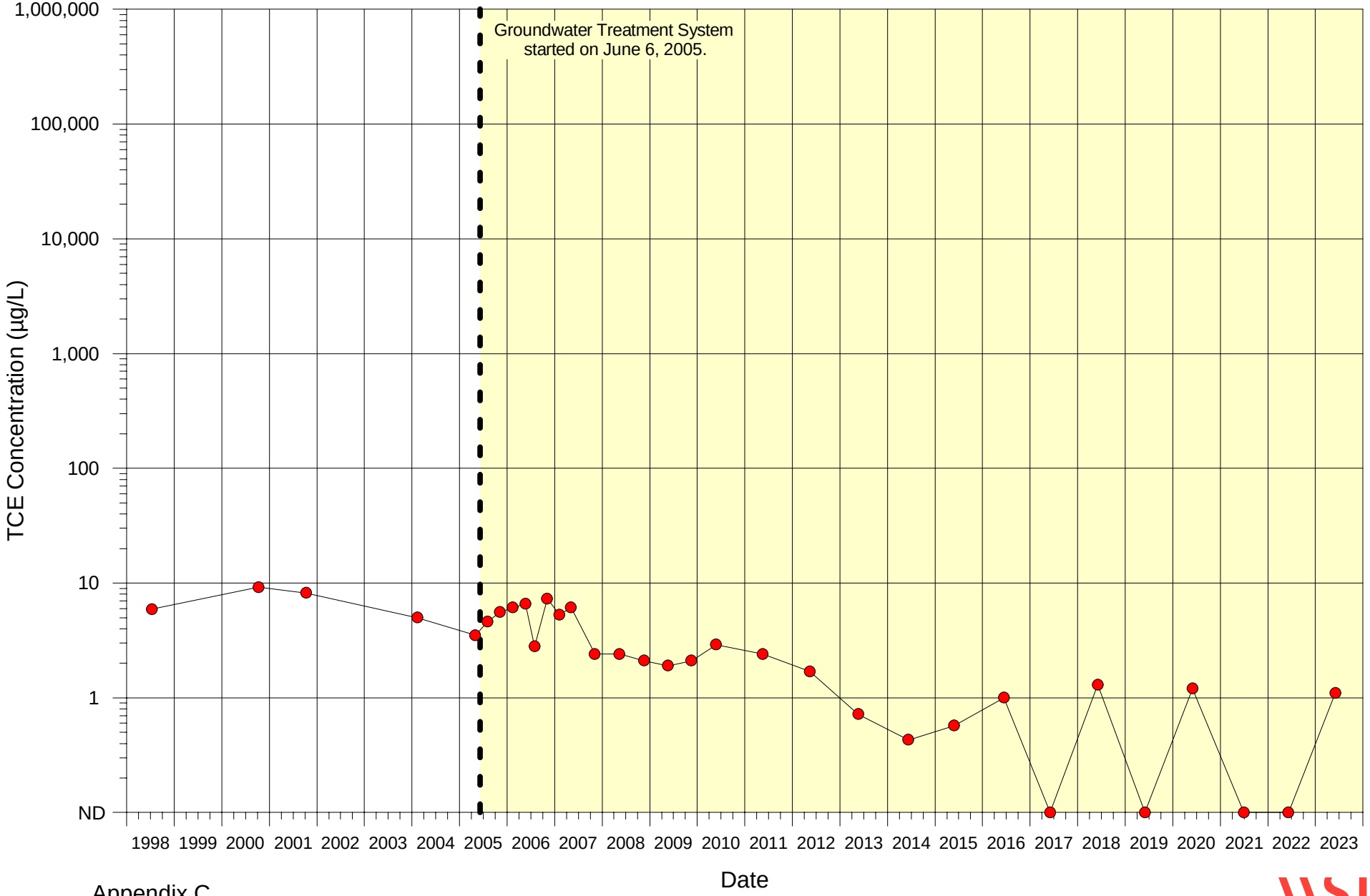
Appendix C
Figure 15

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Western Plume - MW-11S
Trichloroethene (TCE) Concentration vs. Time



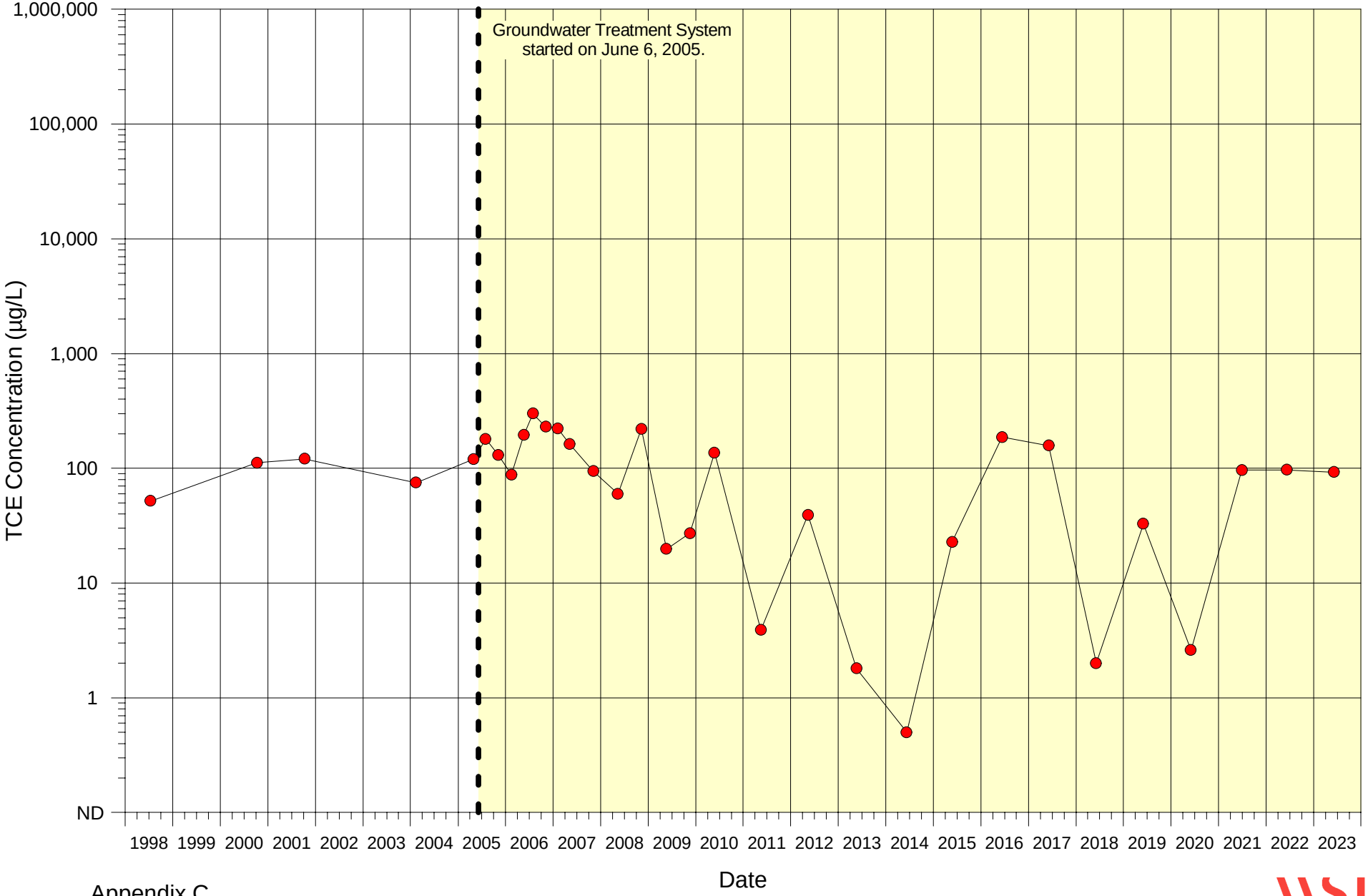
Appendix C
Figure 16

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Off-Site Wells - MW-5DB
Trichloroethene (TCE) Concentration vs. Time



Appendix C
Figure 17

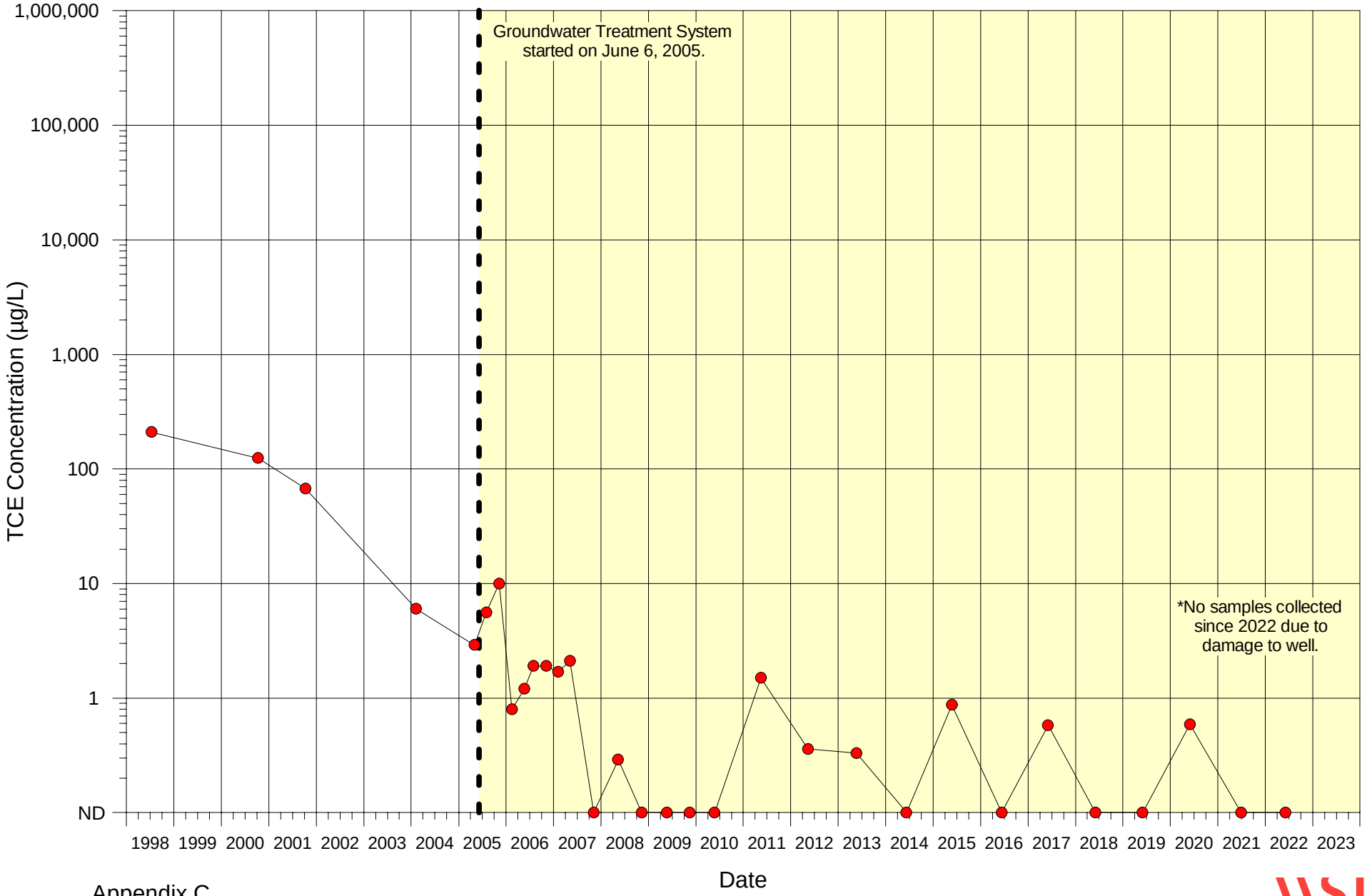
Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Off-Site Wells - MW-6D
Trichloroethene (TCE) Concentration vs. Time



Appendix C
Figure 18

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

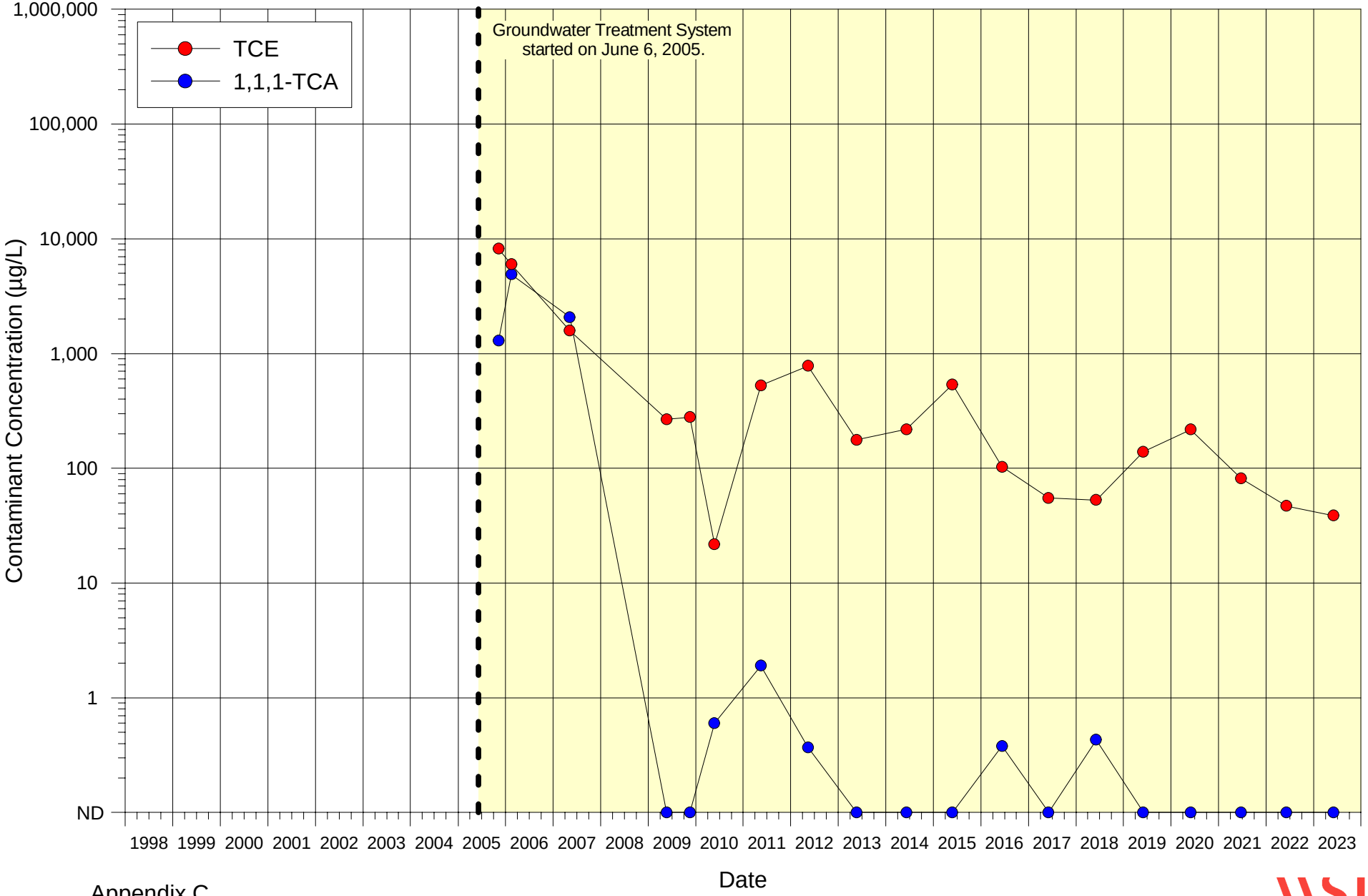
Former Petroleum Underground Storage Tank (UST) Area - MW-4
Trichloroethene (TCE) Concentration vs. Time



Appendix C
Figure 19

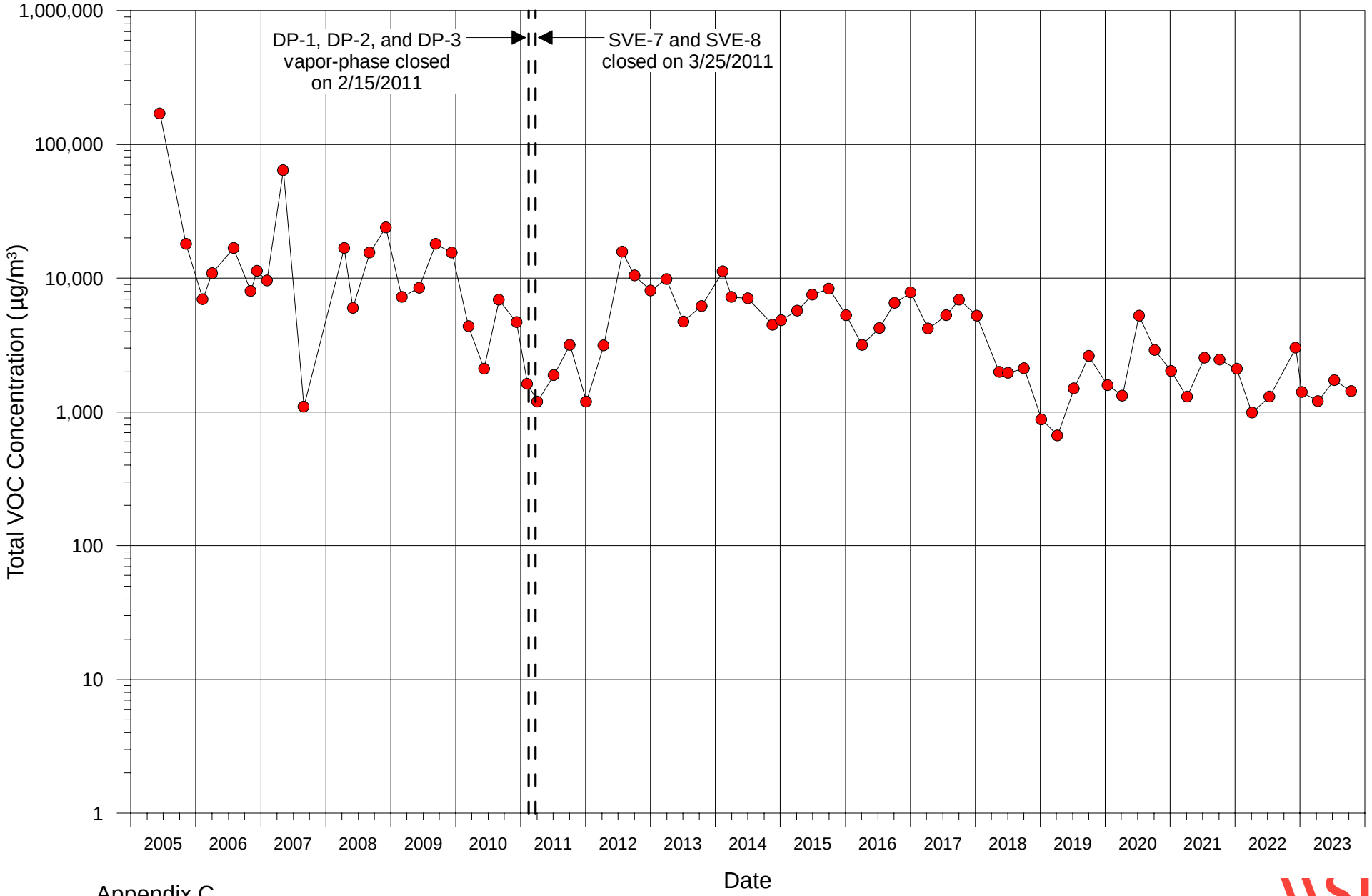
Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey

Combined Dual Phase Wells - DP-1, DP-2, and DP-3
Trichloroethene (TCE) and 1,1,1-Trichloroethane (1,1,1-TCA) Concentrations vs. Time



Appendix C
Figure 20

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Soil Vapor Extraction (SVE) System Influent
Total Volatile Organic Compound (VOC) Concentration vs. Time



Appendix C
Figure 21

APPENDIX A – Reference List

- Record of Decision for OU l, EPA, October 5, 1993
- Administrative Consent Order, NJDEP, March 13, 1996
- Record of Decision for OU 2, NJDEP, October 8, 2002
- Groundwater and Soil Remedial Action Work Plan, NJDEP, September 8, 2004
- Superfund Preliminary Close Out Report, EPA, September 21, 2005
- Remedial Action Progress Reports, PRP, 2005 - present
- Five-Year Review Reports, EPA, September 2010, September 2015 and September 2020
- Explanation of Significant Differences, EPA, September 2022
- Deed Notices, recorded by property owners, October 2023

APPENDIX B

Chronology of Site Events	
Event	**Date(s)**
Water samples collected from the Rockaway Township Wells by the Rockaway Health Department and NJDEP indicated the presence of contamination.	1979-1980
Township installed an activated carbon adsorption treatment system in response to contamination.	1980
Final NPL listing.	1983
NJDEP issued Directives to Potentially Responsible Parties requiring payment to NJDEP to conduct a RI/FS, and payment to Rockaway Township for the operation and maintenance of an air stripping unit.	9/1983
NJDEP enters into Administrative Consent Order with Potentially Responsible Parties for payments.	1986
Initial Groundwater RI/FS study completed	1987
Phase II RI finalized	9/1989
Feasibility Study finalized	9/1992
OU 1 ROD signature	10/1993
Air stripper replaced by Potentially Responsible Parties	10/1993
Source Area Remedial Investigation/Feasibility Study completed	5/1995
Institutional Control (CEA/WRA) implemented by NJDEP	11/2000
OU 2 ROD signature	10/2002
Remedial design completed	9/2004

Chronology of Site Events	
Preliminary Close-Out Report	9/2005
Remedial Action Report completed	9/2005
Quarterly sampling begins	9/2005
Semi-annual sampling begins	1/2008
Vapor intrusion investigations begin	8/2008
Sub-Slab Depressurization System installed in Buildings 1/2	7/2010
EPA issued the First Five-Year Review Report for the Site	9/2010
Groundwater annual sampling begins	2012
EPA issued the Second Five-Year Review Report for the Site	9/2015
EPA issued the Third Five-Year Review Report for the Site	9/2020
EPA issued an Explanation of Significant Differences which documented that Institutional Controls were part of the remedy	9/2022
Two deed notices were recorded	10/2023

Appendix C – Groundwater Monitoring Data

Northrop Grumman Systems Corporation
Denville Technical Park
Denville Township, New Jersey
Groundwater Analytical Data - Detected Volatile Organic Compounds (VOCs)
05/20/24 - 05/22/24

Compound	NJDEP Groundwater Remediation Standard (GWRS) [µg/L]	Sample Concentration (µg/L)																				
		EW-1	EW-2	REP-1 (EW-2)	EW-3	REP-2 (EW-3)	MW-1	MW-2	MW-3	MW-4 (701)	MW-5DB	MW-6D	MW-9D	MW-11S	MW-12D	MW-14D	MW-20D	MW-21D	MW-28D	MW-29D	MW-30D	MW-32D
		05/21/24	05/21/24	05/21/24	05/21/24	05/21/24	05/21/24	05/22/24	05/20/24	05/21/24	05/20/24	05/22/24	05/20/24	05/20/24	05/21/24	05/21/24	05/21/24	05/21/24	05/20/24	05/21/24	05/20/24	05/21/24
Acetone	*6,000*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	*4*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	*10*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	*300*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	*700*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	*50*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	*70*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	ND	ND
Chloromethane	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	*0.02*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	*0.03*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	*600*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	*600*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	*75*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	*1,000*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	*50*	ND	ND	ND	ND	ND	4.0	ND	ND	ND	0.83 J	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.79 J
1,2-Dichloroethane	*2*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	*1*	ND	ND	ND	ND	ND	32.0	ND	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND	1.2	ND	1.4
cis-1,2-Dichloroethene	*70*	ND	1.2	1.1	1.6	1.5	ND	50.3	0.70 J	ND	ND	3.9	ND	ND	ND	ND	ND	0.68 J	ND	0.55 J	ND	ND
trans-1,2-Dichloroethene	*100*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	*700*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.74 J
2-Hexanone	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl actetate	*7,000*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert butyl ether (MTBE)	*70*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone(MIBK)	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	*3*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	*100*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	*1*	1.1	ND	ND	ND	ND	8.9	0.60 J	ND	ND	ND	ND	ND	ND	0.71 J	0.78 J	ND	ND	ND	0.67 J	ND	ND
Toluene	*600*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	*9*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	*30*	ND	ND	ND	ND	ND	1,510	ND	0.74 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.8	ND	0.98 J
1,1,2-Trichloroethane	*3*	ND	ND	ND	ND	ND	3.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	*1*	89.3	8.6	8.9	24.9	25.5	5.1	32.6	4.4	ND	1.0	94.0	1.7	ND	18.5	1.5	5.8	5.8	0.88 J	14.1	ND	4.9
Trichlorofluoromethane	*2,000*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	*1*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	*N/A*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	*1,000*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total VOCs	***N/A***	**90.4**	**9.8**	**10.0**	**26.5**	**27.0**	**1,563**	**83.5**	**5.8**	**0**	**1.8**	**102.9**	**1.7**	**0**	**19.2**	**2.3**	**5.8**	**6.5**	**0.88**	**21.8**	**0**	**8.8**
Total TIC, Volatile	*500*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: µg/L - micrograms per liter
N/A - standard not available
ND - not detected
J indicates an estimated concentration

Indicates concentration exceeds GWRS

Appendix D – Remedy Resilience Assessment

Potential impacts from severe weather were evaluated using two tools.

- The CMRA – for temperature, precipitation, drought impacts, etc.
- USGS National Landslide Inventory – for landslide impacts

The CMRA tool provides a National Risk Index for five factors within the county the site is located in: Coastal inundation, drought, wildlfire, flooding and heat. The risk indices for each of these factors was "not applicable", "relatively low", "very low", "relatively high" and "relatively moderate", respectively (see Figures D-1 through D-5 below). Given the distance from the coast and the elevation at which the Site is located, coastal inundation is not a present or future concern for the Site. As such, no modifications to the groundwater and soil remedies are required to address this matter. Related to drought, there is very little change to the predicted precipitation for the area. There is a significant increase in the forecasted number of days with temperatures exceeding 90- and 100-degrees Fahrenheit. This condition will likely increase demand on the tapped aquifer and may lower water levels in the extraction wells operating on the Site. However, it is likely that remediation goals will have been met and the groundwater treatment system decommissioned prior to this becoming a cause of concern at this Site. As such, no modifications are proposed for the system due to drought.

The back of the treatment building is bordered by a forested area. However, this forested area is mostly set in the floodplain of Beaver Brook. As such, vegetation in this area is not typically stressed during dry conditions and is not at a risk of wildfires. Despite the higher risk index designated for Morris County, flooding has not been a cause of concern at the Site during its operational history and the projected data presented above does not deviate significantly from historical data. As such, no modifications are proposed for the Site due to potential flooding risks. Lastly, the treatment system is housed within a building equipped with an adequate HVAC system. It is anticipated that the treatment system will have met its remediation goals and been decommissioned prior to the forecasted increases in extreme heat conditions that may require upgrades to the HVAC system. As such, no modifications to the system are planned at this time.

The *USGS National Landslide Inventory* shows no potential for a landslide affecting the Site (Figure D-6). The nearest hills are miles away from the Site and are, at the most, a couple of hundred feet higher than their respective bases. Soil/sediment cover on these hills is typically on the order of tens of feet and thinning upwards in the steeper/higher slide-risk area. As such, a landslide would not likely travel more than a few hundred feet and there would be no potential for any direct impact to the Site from a debris flow.

The Sea Level Rise Viewer was not used because this tool pertains to major bodies of water like larger rivers or oceans, which this Site is not nearby. Screenshots from each of the utilized tools are displayed below.

Based on this information, potential Site impacts from severe weather were assessed and the performance of the remedies are currently not at risk due to these effects in the region and near the Site.

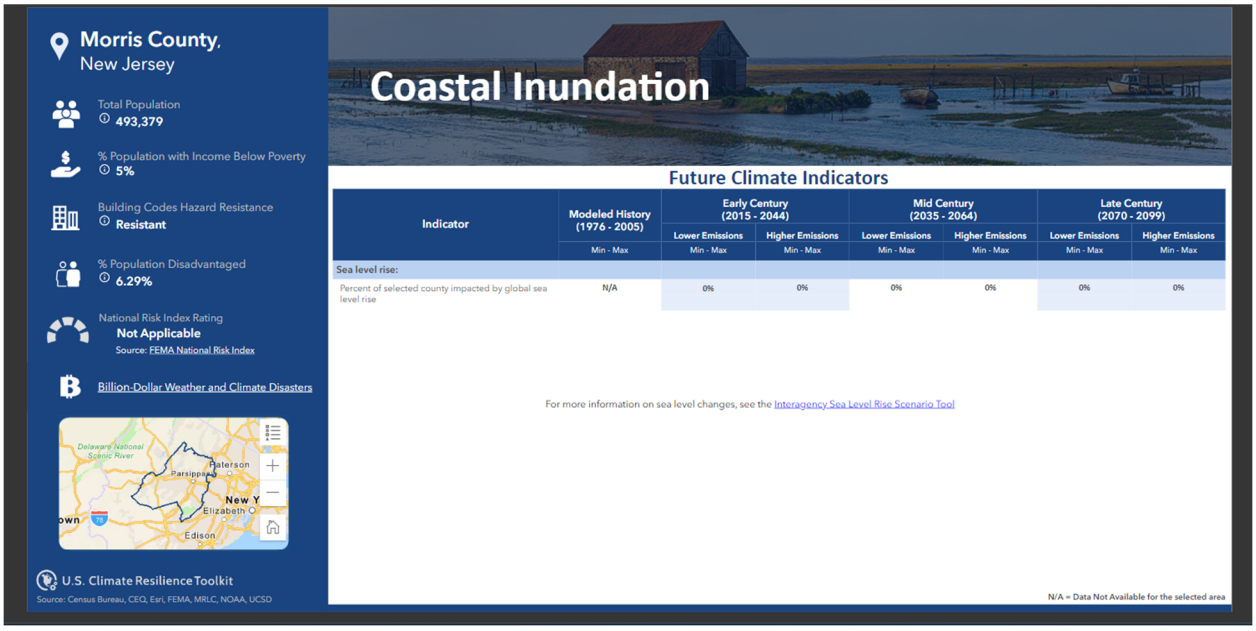


Figure D-1

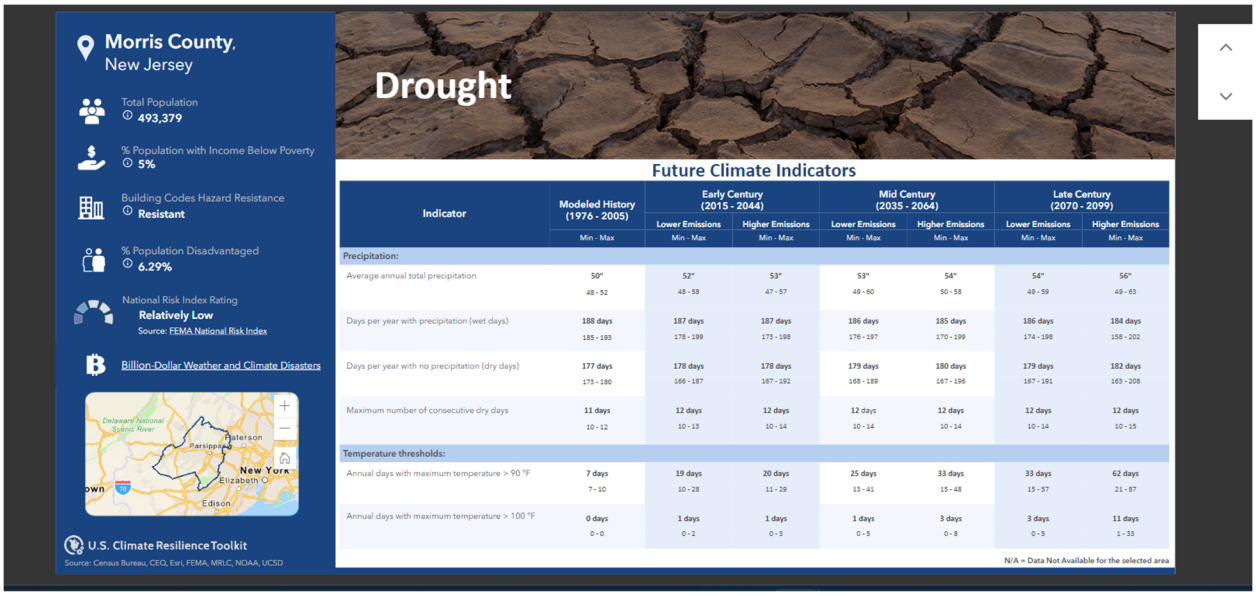
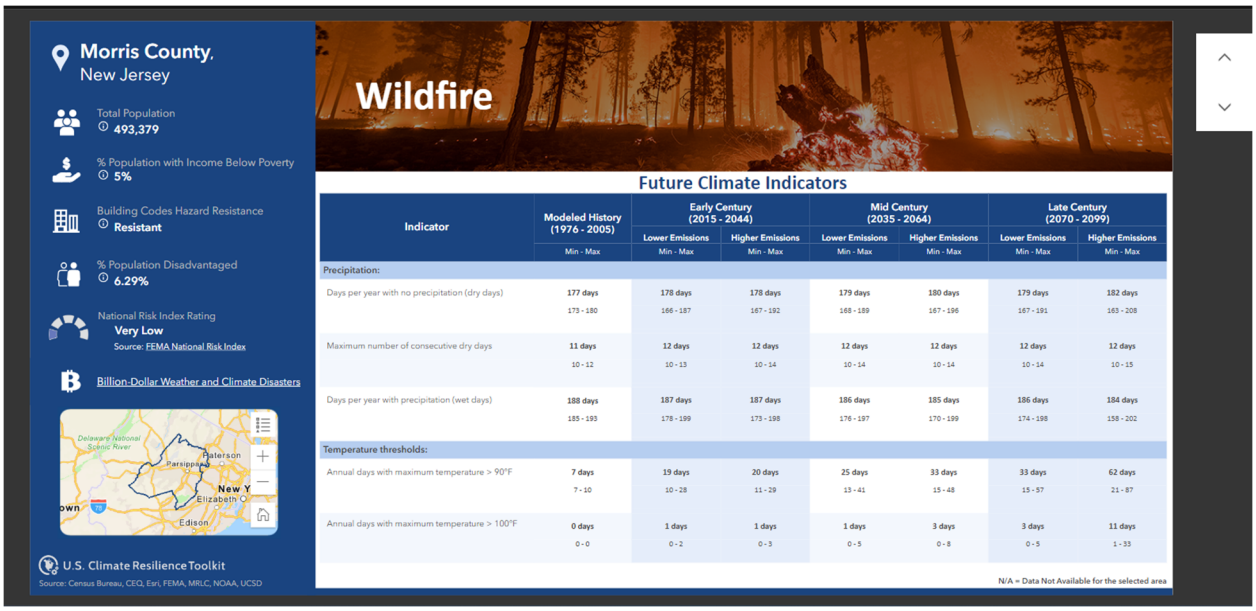
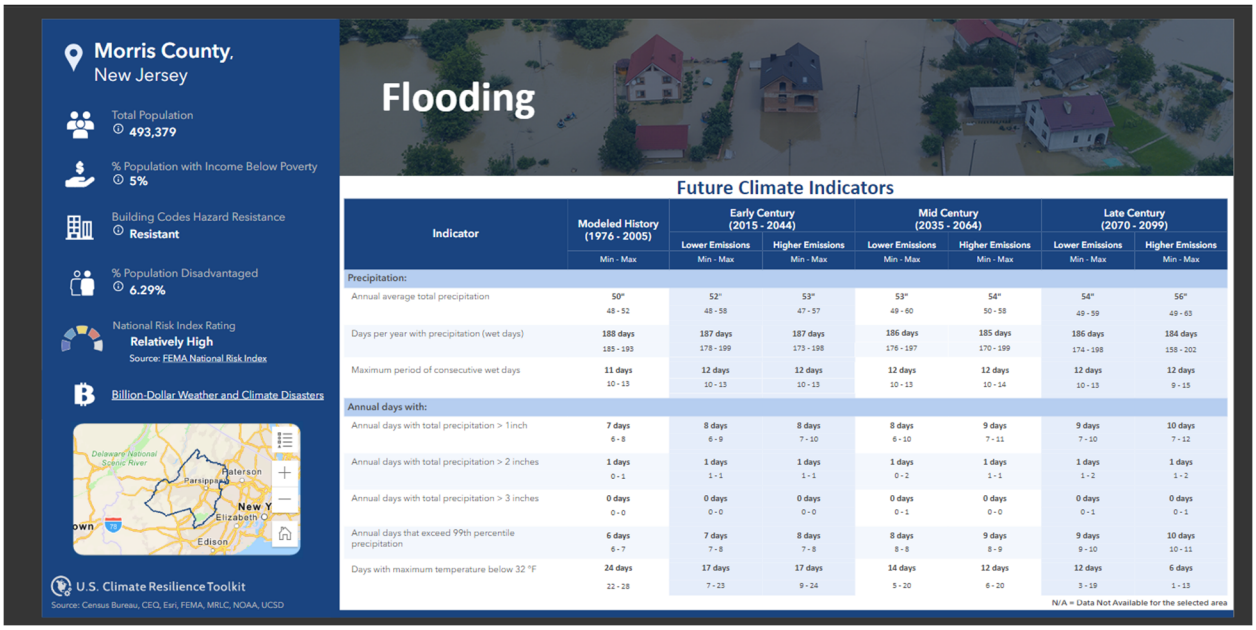


Figure D-2



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)	177 days 173 - 180	178 days 166 - 187	178 days 167 - 192	179 days 168 - 189	180 days 167 - 196	179 days 167 - 191	182 days 163 - 208
Maximum number of consecutive dry days	11 days 10 - 12	12 days 10 - 13	12 days 10 - 14	12 days 10 - 14	12 days 10 - 14	12 days 10 - 14	12 days 10 - 15
Days per year with precipitation (wet days)	188 days 185 - 193	187 days 178 - 199	187 days 173 - 198	186 days 176 - 197	185 days 170 - 199	186 days 174 - 198	184 days 158 - 202
Temperature thresholds:							
Annual days with maximum temperature > 90°F	7 days 7 - 10	19 days 10 - 28	20 days 11 - 29	25 days 13 - 41	33 days 15 - 48	33 days 15 - 57	62 days 21 - 87
Annual days with maximum temperature > 100°F	0 days 0 - 0	1 days 0 - 2	1 days 0 - 3	1 days 0 - 5	3 days 0 - 8	3 days 0 - 5	11 days 1 - 33



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	50" 48 - 52	52" 48 - 58	53" 47 - 57	53" 49 - 60	54" 50 - 58	54" 49 - 59	56" 49 - 63
Days per year with precipitation (wet days)	188 days 185 - 193	187 days 178 - 199	187 days 173 - 198	186 days 176 - 197	185 days 170 - 199	186 days 174 - 198	184 days 158 - 202
Maximum period of consecutive wet days	11 days 10 - 13	12 days 10 - 13	12 days 10 - 13	12 days 10 - 13	12 days 10 - 14	12 days 10 - 13	12 days 9 - 15
Annual days with:							
Annual days with total precipitation > 1inch	7 days 6 - 8	8 days 6 - 9	8 days 7 - 10	8 days 6 - 10	9 days 7 - 11	9 days 7 - 10	10 days 7 - 12
Annual days with total precipitation > 2 inches	1 days 0 - 1	1 days 1 - 1	1 days 1 - 1	1 days 0 - 2	1 days 1 - 1	1 days 1 - 2	1 days 1 - 2
Annual days with total precipitation > 3 inches	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 1	0 days 0 - 0	0 days 0 - 1	0 days 0 - 1
Annual days that exceed 99th percentile precipitation	6 days 6 - 7	7 days 7 - 8	8 days 7 - 8	8 days 8 - 8	9 days 8 - 9	9 days 9 - 10	10 days 10 - 11
Days with maximum temperature below 32 °F	24 days 22 - 28	17 days 7 - 23	17 days 9 - 24	14 days 5 - 20	12 days 6 - 20	12 days 3 - 19	6 days 1 - 13

Figure D-4

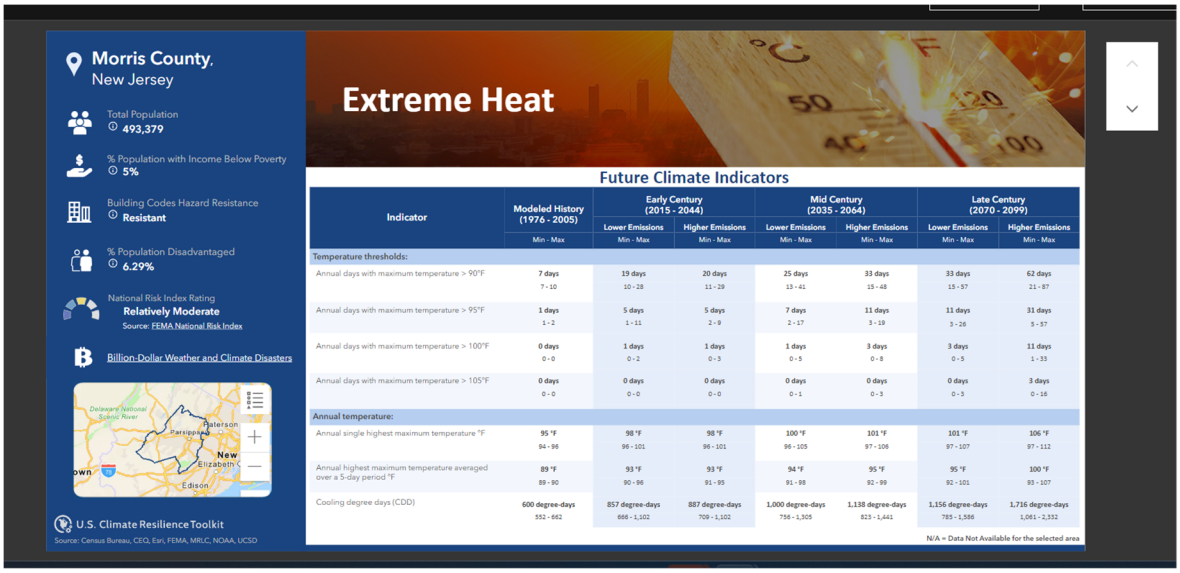


Figure D-5

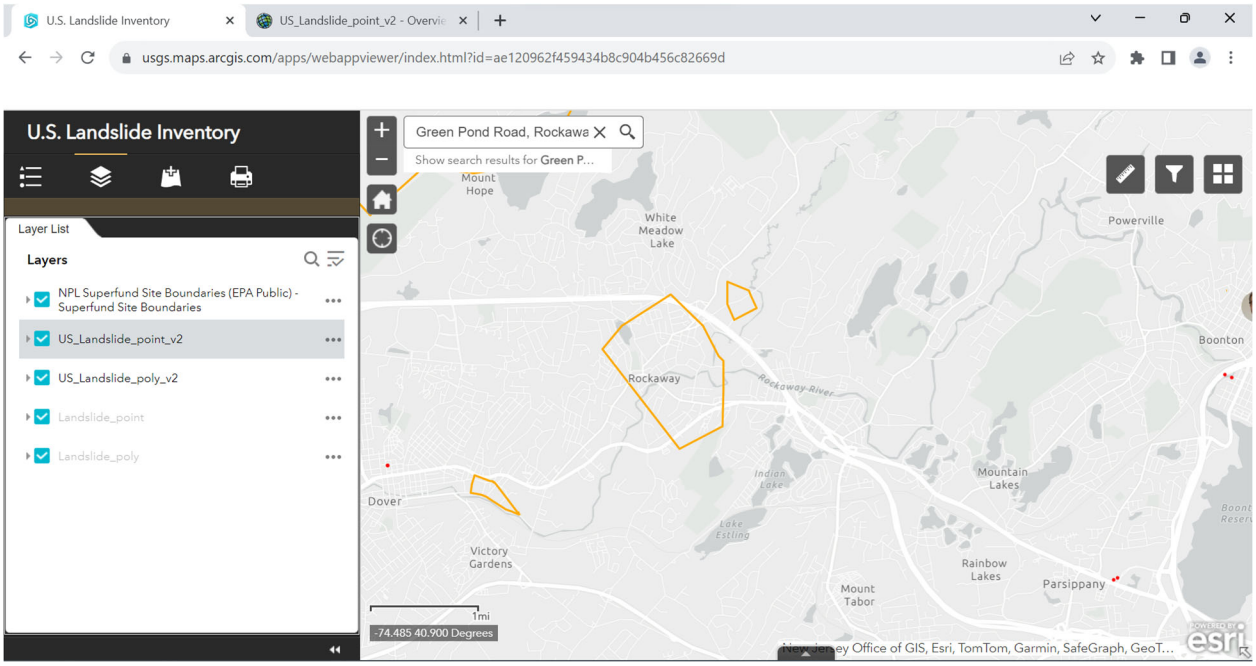


Figure D-6