FOURTH FIVE-YEAR REVIEW REPORT FOR FEDERAL CREOSOTE SUPERFUND SITE SOMERSET COUNTY, NEW JERSEY

Prepared by

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

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	United States Environmental Protection Agency
ERT	Environmental Response Team
ESD	Explanation of Significant Differences
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAHs	Polycyclic Aromatic Hydrocarbons
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To be considered
TI	Technical Impracticability

I. INTRODUCTION

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

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

This is the fourth FYR for the Federal Creosote Superfund Site. The triggering action for this statutory review is the completion date of the previous FYR on January 20, 2017. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of three operable units (OUs) which will be addressed in this FYR. OU1 addressed the permanent relocations of residents and the excavation and off-site treatment and disposal of materials from the buried lagoons and canals on residential properties. OU2 included permanent relocations of residents and the excavation and off-site disposal, with treatment as necessary, of residual creosote soil contamination on residential properties. OU3 consisted of the excavation of soils containing source material and residual creosote soil contamination from the commercial section of the Site, known as the Rustic Mall, as well as site-wide, long-term groundwater monitoring and institutional controls. All three OUs are addressed in this FYR.

The Federal Creosote Superfund Site FYR was led by David Montoya, EPA Remedial Project Manager. Participants included Abbey States, Human Health Risk Assessor; Rachel Griffiths, Hydrogeologist; Pat Seppi, Community Involvement Coordinator; and Michael Clemetson, the ecological risk assessor. The review began on 10/7/2020

Site Background

The Federal Creosote Superfund Site is located in the Borough of Manville, Somerset County, New Jersey. The Site was the location of a wood treatment facility that treated railroad ties with coal tar creosote, resulting in the production of creosote-contaminated sludge, process residuals, preservative drippings, and spent process liquids. Creosoting materials and contaminated soils associated with the wood treating facility were not removed prior to construction of residential and commercial portions of the site. Two unlined creosote sludge lagoons, located beneath the residential development, were found as shallow as two to five feet below ground surface and extended in some places 25 to 35 feet below ground surface. Two unlined canals used to transport the creosote waste sludge to the lagoons were also located two to 14 feet beneath the residential and commercial portions of the site.

The Site is comprised of a 35-acre residential community, the Claremont Development, consisting of 129 single-family houses, home to approximately 350 residents. A 15-acre commercial mall, Rustic Mall, makes up the other portion of the site. According to the Borough of Manville, it is anticipated that the future land use for the Claremont Development will remain residential. The Borough of Manville and the owners of the Rustic Mall are contemplating revitalization of the mall, which includes a combination of commercial and residential use of the Mall property.

The Site is situated on a topographic high that is nearly equidistant from the Raritan and Millstone Rivers and approximately a mile west (upstream) of their confluence. The Raritan River is located approximately 2,000 feet north and east of the Site and the Millstone River is located approximately 1,200 feet to the southeast. The Site is bordered to the west by commercial properties that line the east side of Main Street. To the north, on the opposite

side of the Norfolk Southern railroad tracks, is the former Johns-Manville Company property. The Johns-Manville property has been redeveloped for a variety of commercial and retail uses, including automobile storage, warehousing, and large retail stores. To the south, on the opposite side of the CSX Transportation tracks, is a primarily residential area known as Lost Valley. There are no open streams or drainage ways (other than storm sewers) within the residential and commercial development. Drainage from the commercial mall and residential development is discharged to the Millstone River by a storm sewer system. No wetlands are associated with the Site. Groundwater and surface water in the area are both current and potential future sources of drinking water. The groundwater beneath the Site is classified by the New Jersey Department of Environmental Protection (NJDEP) as Class IIA, potable groundwater, and surface water intakes for the American Water Company facility are within a mile of the Site near the confluence of the Millstone and Raritan Rivers.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Federal Creosote		
EPA ID: NJ0001900281		
Region: 2	**State:** NJ	**City/County:** Manville/Somerset

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

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): David Montoya
Author affiliation: EPA
Review period: 1/20/2017 - 11/1/2021
Date of site inspection: 6/24/2021
Type of review: Statutory
Review number: 4
Triggering action date: 1/20/2017
Due date *(five years after triggering action date)*: 1/20/2022

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In October 1997, EPA initiated a site investigation limited to properties believed to contain creosote contamination based on analysis of historic aerial photographs as well as input from residents. The results of this investigation indicated that the contamination was extensive, uncontrolled, and had impacted sediment, soil, and groundwater in the area.

The Site was placed on the National Priorities List on January 19, 1999. EPA performed a Remedial Investigation and Feasibility Study (RI/FS) to determine the nature and extent of contamination at the Site, including a Human Health Risk Assessment. This risk analysis concluded that an unacceptable risk to human health and the environment was present due to polycyclic aromatic hydrocarbons (PAHs) exposure in the soil of the residential properties and the commercial area, and groundwater if used as a potable water supply, and that a remedial action to address these risks was warranted.

An ecological risk assessment was conducted as part of the OU3 remedial investigation and found no site-related contamination in downgradient wetlands or sediments in the Raritan and Millstone Rivers. The Site is located in a residential and commercial area, and therefore the potential for significant ecological impacts is very low.

Response Actions

In 1998, EPA collected soil samples on 133 properties in and adjacent to the Claremont Development to determine if an immediate health risk existed. EPA identified some properties with surface soil in yards containing elevated levels of creosote that posed a long-term health risk. As a result, EPA applied topsoil, mulch, seed, and sod to 11 of the properties that contained elevated levels of creosote in surface soil, to limit the potential for exposure.

EPA addressed the Site in three separate operable units (OUs).

OU1 – addressed the permanent relocations of residents and the excavation and off-site treatment and disposal of materials from the buried lagoons and canals on residential properties. The OU1 ROD was issued September 28, 1999. The following remedial action objectives were established for OU1 of the Federal Creosote site:

- clean up the canal and lagoon source areas to levels that will allow for unrestricted land use;
- remove as much source material as possible in order to minimize a potential source of groundwater contamination.

The major components of the OU1 selected remedy include:

- permanent relocation of residents from certain properties within the canal and lagoon source areas, and temporary relocation where necessary to implement the remedy;
- excavation of source material from the canal and lagoon source areas, backfilling with clean fill, and property restoration as necessary; and
- transportation of the source material for off-site thermal treatment and disposal.

OU2 – included permanent relocations of residents and the excavation and off-site disposal, with treatment as necessary, of residual creosote soil contamination on residential properties. The OU2 ROD was issued in

September 29, 2000. The following remedial action objectives were established for OU2 of the Federal Creosote site:

- prevent human exposure, via direct contact, with contaminated soils, considering the current and future residential site use;
- prevent future impacts to underlying groundwater quality by contaminated soils;
- prevent exposure and minimize disturbance to the Claremont Development residents, and the surrounding community of Manville, during implementation of the remedial action.

The major components of the OU2 Selected Remedy include:

- excavation of soils containing PAHs in excess of site-specific remediation goals from approximately 82 properties, backfilling with clean fill, and property restoration as necessary; and
- transportation of the contaminated soil off site for disposal, with treatment as necessary.

OU3 – consisted of the excavation of soils containing source material and residual creosote soil contamination from the commercial section of the Site, known as the Rustic Mall, as well as site-wide, long-term groundwater monitoring and institutional controls. The OU3 ROD was issued September 30, 2002. The following remedial action objectives were established for OU3 of the Federal Creosote site:

- prevent human exposure via direct contact, inhalation, and ingestion of contaminated soils, considering the future potential residential site use;
- prevent future impacts to underlying groundwater quality by contaminated soils that can act as a continuing source of groundwater contamination; and
- prevent exposure and minimize disturbance of the Rustic Mall occupants and consumers, and the surrounding community of Manville, during implementation of the remedial action.

The OU3 ROD also addressed site groundwater. The following remedial action objectives were established for site groundwater for the Federal Creosote site:

- prevent ingestion and direct contact with groundwater that has contaminant concentrations greater than the Applicable or Relevant and Appropriate Requirements (ARARs);
- minimize the potential for additional off-site migration of groundwater with contaminant concentrations that exceed the ARARs; and
- minimize the potential for transfer of groundwater contamination to the other media (e.g., surface water) at concentrations in excess of ARARs.

The major components of the OU3 Soil Remedy include:

- excavation of soils containing polycyclic aromatic hydrocarbons (PAHs) in excess of site-specific remediation goals on the Rustic Mall, backfilling with clean fill, and property restoration as necessary; and,
- transportation of the contaminated soil off-site for disposal, with treatment as necessary.

As described in more detail in the Decision Summary of the OU2 ROD, the Selected Remedy may leave residual levels of PAHs (but not source material as defined by the September 1999 Record of Decision) at depths greater than approximately 14 feet below the ground surface in the Rustic Mall. The backfilled clean fill would act as a barrier or “engineering control” to prevent contact with any residual contamination. In addition, a deed notice would be required to prevent direct contact with any remaining residual soil contamination.

The major components of the OU3 Groundwater Remedy include:

- implementation of a long-term groundwater sampling and analysis program to monitor the concentrations of creosote components in the groundwater at the Site, in order to assess the migration and attenuation of the creosote in groundwater over time; and
- institutional controls to restrict the installation of wells and the use of groundwater in the vicinity of the contaminated groundwater.

The evaluation of remedial alternatives for remediation of the dense non-aqueous liquid (DNAPL) creosote contamination, including contamination found in the fractured bedrock aquifer, concluded that no practicable alternatives could be implemented. As a result, EPA invoked an ARAR waiver for the groundwater at this site due to technical impracticability (TI). The area for the TI waiver covers approximately 119 acres. The area includes three distinct subareas: the north off-site subarea, the on-site subarea, and the south off-site subarea (see Figure 1.1). The TI waiver includes both the overburden aquifer and the bedrock aquifer within the area. The contaminants for which the ARAR waiver apply include: acenaphthene, benzene, napthalene, 2,4-dimethylphenol, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, fluorine, chrysene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene.

Cleanup Goals

Table 1: Federal Creosote Soil Remediation Goals

Contaminant of Concern	Remediation Goal (ppm)
Benzo(a)pyrene	0.66
Benzo(a)anthracene	0.90
Chrysene	90.0
Benzo(b)fluoranthene	0.90
Benzo(k)fluoranthene	9.0
Indeno(1,2,3-cd)pyrene	0.90
Dibenzo(a,h)anthracene	0.66

Table 2: Federal Creosote Groundwater Remediation Goals (outside TI waiver zone)

Contaminant of Concern	Remediation Goal (ppb)
Benzo(a)pyrene	5
Benzo(a)anthracene	5
Chrysene	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Indeno(1,2,3-cd)pyrene	5
Dibenzo(a,h)anthracene	5
Benzene	1
Naphthalene	300

Status of Implementation

EPA has completed remediation of a total of 93 residential properties. The remediation of these properties required permanent and temporary relocation of residents, excavation to depths ranging from 1 to 35 feet below ground surface and the removal of over 260,000 tons of soil from the residential development.

OU1

The OU1 ROD estimated that 32 properties contained source material and that residents of 19 of these residential properties needed to be permanently relocated in order to excavate and dispose of the source material. The OU1 remedial action included removal of source material from 29 residential properties, required the permanent relocation of 21 OU1 property owners, and the demolition of 18 homes. The residual soil contamination that remained at depth (typically at least 14 feet below ground surface) was found to exceed OU2 soil cleanup goals. These areas were covered with clean backfill, and institutional controls (discussed below) were placed on these properties to prevent access to contaminated residual soils.

The cleanup of OU1 was divided into three phases. Phase 1 focused on the cleanup of the southern lagoon; Phase 2 focused on the cleanup of the northern lagoon and canal; Phase 3 focused cleanup efforts on the southern canal.

The OU1 Phase 1 remedial action involved the permanent relocation of the residents from eight properties, demolition of eight single-family homes, and excavation and removal of 55,000 tons of soil to off-site treatment and disposal facilities. Remediation of Phase 1 was completed in June 2002. Ownership of these eight properties was transferred to NJDEP in 2003. NJDEP sold the eight properties to a residential developer and each property has been redeveloped into single family residential housing.

The OU1 Phase 2 remedial action included the permanent relocation of residents from eight properties located over the northern lagoon and canal. The houses on the eight lots were demolished and excavation of creosote-contaminated soil from this northern lagoon and canal started in April 2002. Excavation on this phase reached a depth of 35 feet below the ground surface. Approximately 116,000 tons of soil were excavated and shipped off-site to treatment and disposal facilities. These properties were backfilled with clean soil and were used as a staging area for stockpiling of wastes from other areas of the Site through 2007. The eight residential lots that were remediated during OU1 Phase 2 are currently owned by the Borough of Manville and await redevelopment.

The OU1 Phase 3 remedial action included the excavation and off-site disposal of 30,000 tons of contaminated soil from 13 residential properties and roadways located above the buried southern creosote canal. Phase 3 included the permanent relocation of residents from five properties built over a portion of the buried southern creosote canal, and the demolition of two properties. After cleanup, EPA sold two properties that required demolition to a developer. These two properties were redeveloped into single family residences. The remaining three residential properties were also sold by EPA and returned to residential use.

OU2

The cleanup of OU2 consisted of two phases. The OU2 Phase 1 remedial action consisted of soil removal at 14 residential properties that surrounded the southern lagoon area (addressed, as discussed above, in OU1 Phase 1). The OU2 Phase 1 remedial action involved no permanent relocations and no demolitions. The remedial action of this phase started in February 2002, and by June 2002, 8,900 tons of contaminated soil had been excavated, treated, and disposed of off-site. The 14 properties were completely restored, and temporarily relocated residents returned to their homes.

The OU2 Phase 2 remediation began in June 2003. Cleanup activities occurred on 50 residential properties and portions of roadways in need of remediation. The OU2 Phase 2 remedial action involved two permanent relocations and no building demolitions. The remediation of a daycare center was included in this phase. In

August 2001, the daycare center playground was remediated, and in 2006 the daycare center parking lot was remediated. The remedial action of OU2 Phase 2 resulted in the excavation and off-site disposal (with treatment as necessary) of 51,000 tons of soil.

OU3

The OU3 remediation addressed soil contamination in the commercial mall. Remediation of OU3 began in August 2005 and was completed in February 2008. The remedial action of OU3 resulted in the excavation and off-site disposal (with treatment as necessary) of 178,000 tons of soil.

Due to an increased volume of soils from those considered for remediation under the OU1, OU2, and OU3 RODs, the resulting costs to address soils were considered a significant change in scope to the remedies. As such, the change in cost was documented in the 2006 Explanation of Significant Differences (ESD).

Groundwater Monitoring

Long-term monitoring of Site groundwater started in November 2005, as required by the OU3 ROD. Groundwater monitoring was conducted on an annual basis until 2015 and is now conducted biennially. Twelve rounds of groundwater monitoring have been completed since long-term monitoring of groundwater was initiated.

IC Summary Table

Institutional Controls for Soils

The human health risk assessment considered that subsurface soil contamination could pose a direct contact risk to residents over time, through typical residential activities such as gardening or through the removal and surface deposition of subsurface soils during future residential construction activities. At greater depths (deeper than approximately 10 feet), soils are expected to be inaccessible to residential property owners. Deeper excavations (below 10 feet) on OU1 properties were needed to remove source areas, but the OU2 ROD expected that soils with lower concentrations of PAHs (identified as “OU2 soils”) could be left in place if the soils were deeper than approximately 10 feet. This was true for OU1 properties (after the source areas were remediated) as well as at a number of OU2 properties.

The OU2 RI/FS identified a number of properties where the extent of creosote contamination was found at the top of the clay layer, which ranged between approximately eight to 14 feet below the ground surface. The OU2 ROD anticipated remediation depths beyond 10 feet, to as deep as 14 feet (to the top of the clay) to remediate these lots, if excavating to the top of the clay would address all site contamination on the lot. However, the OU2 ROD also identified properties in the Claremont Development where residual soil contamination was found at depths greater than 14 feet below the ground surface. The OU2 ROD concluded that soils at those depths were inaccessible and did not pose an unacceptable health risk through direct contact; however, NJDEP would not concur with an action that left soils in exceedance of the remediation goals at depth, without an additional step of a deed notice for affected properties. While EPA concluded that institutional controls (the deed notices) were not necessary for protectiveness, to facilitate the placement of the deed notices, the OU2 remedy called for the permanent relocation (and purchase) of residential properties if the homeowners did not voluntarily agree to place deed notices on their property. Two OU2 property owners did not agree to place deed notices on their properties. EPA purchased the two OU2 properties, placed deed notices on the properties, and then sold both properties.

During the implementation of the remedy in the residential development, all source material encountered in the Claremont Development was removed and residual contamination above the cleanup goals was left beneath 21 properties. These 21 properties required deed notices, and all deed notices have been filed with the appropriate local offices.

Of the 21 properties that required deed notices, six properties received deed notices because of conditions that are consistent with expectations of the OU2 ROD, that is, residual contamination remains below approximately 14 feet on those properties. The remaining 15 properties that required deed notices have contamination shallower than 14 feet. While the ROD did not expect that institutional controls, in the form of deed notices, would be necessary for protectiveness, EPA did rely on these deed notices as part of the remedy, and an Explanation of Significant Differences was issued on August 8, 2008 to explain this variance.

In addition to residential properties, the Borough of Manville applied deed notices to portions of Borough roads that contained residual levels of creosote above remediation goals pursuant to the 2008 ESD.

A deed notice for residual contamination remaining 14 feet below the Rustic Mall property has been implemented by the property owner.

Institutional Controls for Groundwater

The OU3 ROD required an institutional control for the area of groundwater contamination. A Classification Exception Area (CEA) was established to provide notice that the constituent standards for a Class IIA aquifer classification are not or will not be met in the area of the Federal Creosote Site and that designated aquifer uses are suspended in the affected area for the term of the CEA. Additional monitoring wells were installed to delineate the CEA, which was established in January 2010.

Table 3: 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 Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soils	Yes	Yes	Claremont Development (21 properties)	Prevent direct contact with soil containing residual contamination	Deed Notices August 2008
Soils	Yes	Yes	Rustic Mall Property	Prevent direct contact with soil below 14 feet containing residual contamination	Deed Notices December 2011
Soils	Yes	Yes	Borough of Manville Roads in Claremont Development	Prevent direct contact with soil containing residual contamination	Deed Notices September 2010

Groundwater	Yes	Yes	Area delineated by monitoring network	Reduce exposure to contaminants by restricting the installation of wells and the use of groundwater in the affected area of the CEA	Classification Exception Area January 2010

Climate Change

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

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last five-year review as well as the recommendations from the last five-year review and the current status of those recommendations.

Table 4: Protectiveness Determinations/Statements from the 2017 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The implemented actions at OU1 are protective of human health and the environment. All exposure pathways that could result in unacceptable risks are being controlled.
2	Protective	The implemented actions at OU2 are protective of human health and the environment. All exposure pathways that could result in unacceptable risks are being controlled.
3	Protective	The implemented actions at OU3 currently protect human health and the environment because a CEA has been implemented to prevent ingestion of contaminated groundwater and soils have been remediated preventing direct exposure to contaminated material.
Sitewide	Protective	The implemented actions at the site currently protect human health and the environment because soil excavation activities and institutional controls prevent direct exposure to contaminated soils. In addition, a CEA is in place to prevent exposure to contaminated groundwater.

The 2017 FYR did not identify any issue or recommend any action at the Site needed to protect public health and/or the environment that is not addressed by the remedy selected in Site decision documents. In addition, no new activities of note (i.e., redevelopment or changed site use) have occurred since the last FYR was completed.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On Friday, August 6, 2021, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the Virgin Islands, including the Federal Creosote Site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, effort will be made to reach out to local public officials to inform them of the results. The EPA Community Involvement Coordinator (CIC) for the site, Pat Seppi, arranged for a notice to be posted on the township website, as well as the EPA website, https://www.epa.gov/superfund/federal-creosote. This notice indicated that a Five-Year Review (FYR) would be conducted at the Federal Creosote Site to ensure that the site is protective of human health and the environment. Once the FYR is completed the results will be made available at the following repository: EPA Region 2, 290 Broadway, 18th Floor, New York, New York, 10007, and at the Manville Public Library, 100 South 10th Avenue, Manville, New Jersey, 08835, (908) 722-9722. In addition, the final report will be posted on the following website: https://www.epa.gov/superfund/federal-creosote.

Data Review

Soils on residential and commercial properties have been remediated to levels (Table 1) that would allow for unrestricted use, or, in some cases, residually contaminated soil was left at depth, and institutional controls have been used to prevent direct contact. Because there is little potential for direct contact with residual soil contamination, this review focuses on groundwater.

Two rounds of groundwater sampling were conducted in 1999, prior to the start of soil remediation. As per the Groundwater Monitoring Plan, a round of groundwater samples was obtained from a monitoring well network of over 30 wells on an annual basis starting in November 2005. Data collected between 2005 and 2013 showed that the source areas did not appear to be migrating and contaminant concentrations were decreasing downgradient; therefore, the long-term monitoring program was reduced to biennial groundwater sampling beginning in 2015. Several monitoring wells were abandoned in 2012 due to the expansion of the railroad on the CSX property, thus the current biennial sampling program consists of 27 monitoring wells screened in the overburden aquifer, shallow bedrock, or deep bedrock.

Two rounds of groundwater sampling occurred during the review period, in 2017 and 2019, and analyzed for trace volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and natural attenuation parameters. The only VOC that exceeded its site-specific screening criteria during the review period was benzene, which was limited to shallow bedrock monitoring well MW-2RI at a maximum concentration of 1.4 ug/L in 2019. The data review focuses on SVOCs, which are the most prevalent COCs.

Semi-volatile organic compounds:

Overburden Aquifer

Semi-volatile compounds (SVOCs) were the most commonly detected organic compounds in the overburden aquifer. The primary indicator compound for groundwater contamination at the Site is naphthalene. During the most recent round of groundwater sampling in 2019, naphthalene was detected in the overburden aquifer in the immediate vicinity of the former northern and southern lagoons (Lagoons A and B, respectively) and the southwest end of Canal B. The naphthalene results, and results for PAHs in general, indicated that shallow

groundwater contamination remains in the vicinity of these areas. At monitoring wells located within the footprints of the lagoons (MW-6S, MW-7S, MW-2RS), naphthalene concentrations stayed near their pre-remediation levels over their respective monitoring periods due to presence of DNAPL (see Figure 1). The last available data in the footprint of Lagoon B (MW-6S and MW-7S) is from October 2011 as these wells were removed due to expansion of the railroad tracks. Evaluation of these wells is included in the second five-year review, which indicated concentrations consistent with pre-remediation levels. Monitoring data from MW-111S indicated an increasing concentration of naphthalene in groundwater in the vicinity of the former wood treatment plant, however, at an order of magnitude lower than concentrations detecting in the vicinity of the lagoons. The monitoring data downgradient of the wood treatment plant indicated that the concentration of the plume remained within the footprint of the 119-acre TI zone.

The stability of this plume in the overburden is currently monitored by downgradient off-site well MW-114S (approximately 200 feet downgradient of Lagoon B). Site contaminants have not been detected above remediation goals in this well in any sampling round. No contaminants of concern have been detected at MW-114S since 2011. The highest concentrations and greatest number of analytes exceeding remediation goals were reported in groundwater collected from MW-2RS for all exceedances except 2-methylnapthene. Naphthalene concentration in MW-2RS at former Lagoon A have fluctuated since 2011, but the overall trend of SVOCs at this location is stable (Figure 2). Monitoring data at MW-111S in the vicinity of the former wood treatment plant indicates increasing contaminant concentrations since 2013 (see Figure 3). Creosote-related SVOCs at this well which exceed remediation goals in 2019 include carbazole at 210 µg/L, dibenzofuran at 200 µg/L, and naphthalene at 1,100 µg/L. While concentrations of carbazole and dibenzofuran at MW-111S had exceeded their Site-specific screening criteria since 2015, they are within the range of fluctuation observed in previous sampling events. Naphthalene concentrations reported at this well location in 2019 was the highest observed over the course of the LTM program; however, groundwater outside the TI zone does not show impacts.

Bedrock Aquifer

Semi-volatile organic compounds were the most commonly detected organic compounds in the intermediate and deep bedrock wells. SVOCs were only detected above remediation goals at 3 bedrock wells during the review period: MW-2RI, MW-114I, and MW-2RD. It is worth noting that despite increases of creosote-related contaminants observed at MW-111S (overburden), no such contaminants were detected at associated bedrock wells, MW-111I and MW-111D, indicating contamination is not migrating vertically. Vertical migration of the dissolved phase plume is generally limited sitewide by the upward hydraulic gradient between overburden and bedrock.

Naphthalene concentrations at MW-2RI in the Lagoon A footprint have fluctuated throughout the LTM program, but have never exceeded pre-remediation concentrations. Associated PAHs at MW-2RI have also remained stable or exhibited slight fluctuations, with no clear trends (Figure 4). In 2012, MW-5I was abandoned due to railroad expansion on the CSX property. Since then, the stability of the Lagoon B plume has been monitored by downgradient, off-site well MW-114I. In 2019, SVOCs were present at some of their highest observed concentrations after exhibiting primarily non-detect concentrations since 2011 (Figure 5). Naphthalene concentrations reported at MW-114I in 2019 were 450 ug/L, the highest observed at this location over the course of the LTM program and above its remediation goal of 300 ug/L. Carbazole at MW-114I was detected at 52 ug/L, exceeding its remediation goal of 5 µg/L for the first time since 2011. The SVOC exceedances associated with Lagoon B and MW-114I are delineated by the sentinel well MW-125I, at which no site-related contaminants were detected during the review period.

The only detection of creosote-related contaminants above remediation goals in deep bedrock was observed at MW-2RD (10 µg/L carbazole in 2019), where Site contaminants are expected to persist due to the presence of DNAPL associated with Lagoon A (Figure 6). However, concentrations in MW-2RD have exhibited an overall decreasing trend since the RI in 1999 and appear to be stable. No creosote-related contaminants were detected at MW-114D from 2011 to 2013, however trace concentrations of acenaphthene were reported at MW-114D, with

concentrations demonstrating an increasing trend from 2015 to 2019. Concentrations of the relatively soluble fraction of creosote demonstrated decreasing trends at MW-114D (Figure 7).

Natural Attenuation:

Evidence of natural attenuation was observed at both A and B source areas. Groundwater samples from the overburden, intermediate bedrock, and deep bedrock in the vicinity of the former Canal A/Lagoon had low dissolved oxygen (DO), low oxidation-reduction potential (ORP), depleted nitrate/nitrite, elevated concentrations of manganese, elevated concentrations of methane, and elevated concentrations of alkalinity; elevated concentrations of ferrous iron in the overburden; and reduced concentrations of sulfate in the overburden and intermediate bedrock. Similar conditions were observed downgradient which supports evidence of ongoing natural attenuation. These characteristics and the trend of creosote-related contaminants in the source area well cluster (MW-2R) and downgradient wells (MW-12RS and MW-101I) strongly suggest that natural attenuation is occurring within and downgradient from the former Canal A/Lagoon A source area.

The bedrock groundwater at well cluster MW-114 exhibited similar geochemical characteristics as the Canal A/Lagoon A wells, suggesting ongoing natural attenuation at and downgradient of the Lagoon B/Canal B source area. Conditions at MW-111S also support evidence of natural attention in the overburden, however, the increase in creosote-related contamination over time indicates a continuous source of contamination in the overburden.

Summary

Overburden and bedrock data collected and analyzed over this FYR period indicate that the source area groundwater concentrations remain above NJGWQS and the contamination plume remains within the footprint of the 119-acre Technical Impracticability (TI) zone. Although there was a noticeable increase in the concentration of contaminants in MW-111S, sitewide data indicates no significant migration of site-related contaminants in groundwater.

Site Inspection

The inspection of the Site was conducted on 6/24/2021. In attendance were EPA Remedial Project Manager David Montoya and EPA Section Chief, Rich Puvogel. The purpose of the inspection was to assess the protectiveness of the remedy. At the time of inspection it was observed that the former northern lagoon area (Lagoon A) was undergoing construction for residential redevelopment. It was observed that disturbances to the soil in the redevelopment area did not encroach into the deed notice zone. Other deed noticed areas of the Site exhibited no evidence of disturbance. Monitoring wells were observed to be intact and accessible for future sampling.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Yes. Soil contamination at the Site has been addressed by the removal of contaminated soil and off-site treatment and/or disposal, along with deed notices. The selected remedy for the groundwater (long-term groundwater monitoring) has been implemented and groundwater monitoring is conducted on a biennial basis. Groundwater data for both the overburden and the bedrock indicate that the groundwater contamination remains localized within the former area of the lagoons and treatment plant and within the area of the TI zone. Institutional controls have been implemented at all properties and a CEA is in place to prevent unacceptable use of the groundwater within the TI zone.

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?

Although other specific parameters may have changed since the time the risk assessment was completed, the process that was used remains valid and is not expected to affect the remedy. The exposure assumptions, toxicity data, cleanup levels, and RAOs identified for all OUs remain valid. There have been no physical changes to the site that would adversely affect the protectiveness of the remedy. Residential land use assumptions, exposure assumptions, and pathways evaluated in the RI/FS and considered in the decision documents remain valid.

In the 2012 FYR, the soil remediation goals for all carcinogenic PAHs were re-evaluated using Age Dependent Adjustment Factors (ADAFs) which were identified in EPA's 2005 Cancer Guidance and Supplemental Guidance. The risk levels for the remediation goals were found to be within the risk range of 10^{-6} to 10^{-4}; therefore, the remediation goals for soil remain protective.

The evaluation of groundwater in this five-year review focused on two primary exposure pathways, ingestion (as a potable water source) and the possibility of vapor intrusion into residential and commercial buildings in proximity to the plume. The evaluation of the ingestion pathway showed that although exceedances of COCs remain in the localized groundwater plume areas, all nearby residents are connected to municipal water. Since there are no residential or public supply wells in the contaminated area, there is no current exposure through the use of potable water. Additionally, usage of groundwater in the affected areas is restricted through institutional controls. Long-term groundwater monitoring will continue to be conducted to assess natural attenuation over time.

Indoor air sampling was conducted inside residences at the site in 1997. EPA collected sub-slab and indoor air samples in residential properties in late February 2007 to further evaluate the inhalation pathway. All sample results were below EPA's levels of concern. Groundwater sampling results from this five-year review period were compared to EPA vapor intrusion screening levels (VISLs) for residential exposure set at a cancer risk of 10^{-4} and hazard quotient of 1. These upper bound VISLs were exceeded in the shallow aquifer for benzene and naphthalene at MW-2RS and for naphthalene at MW-111S. MW-2RS is located in within the Lagoon A groundwater plume. Residential structures under construction in the vicinity of MW-2RS have been equipped with 6 mm vapor barriers. Vapor barriers were installed beneath the structures in accordance with Uniform Commercial Code requirements (see Figure 8). Vapor intrusion will continue to be evaluated in future FYRs.

The Site is located within a residential and commercial area, and all surface soils have been remediated as part of the OU1, OU2, and OU3 remedial action, eliminating any pathways for ecological receptors. During the OU3 remedial investigation, an ecological risk assessment was conducted and found no site-related contamination in downgradient wetlands or sediments in the Raritan and Millstone Rivers.

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

There is no information that calls into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

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

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: Operable Unit 1	*Protectiveness Determination:* Protective
Protectiveness Statement: The implemented actions at OU1 are protective of human health and the environment.	

Protectiveness Statement(s)	
Operable Unit: Operable Unit 2	*Protectiveness Determination:* Protective
Protectiveness Statement: The implemented actions at OU2 are protective of human health and the environment.	

Protectiveness Statement(s)	
Operable Unit: Operable Unit 3	*Protectiveness Determination:* Protective
Protectiveness Statement: The implemented actions at OU3 are protective of human health and the environment.	

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

VIII. NEXT REVIEW

The next FYR report for the Federal Creosote Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Reference List	Date
Operable Unit 1 Record of Decision	1999
Operable Unit 2 Record of Decision	2000
Operable Unit 2 Record of Decision	2002
Remedial Action Report Operable Unit 1 Phase 1	2004
Remedial Action Report Operable Unit 2 Phase 1	2005
Remedial Action Report Operable Unit 1 Phase 3	2006
Remedial Action Report Operable Unit 2 Phase 2	2006
Remedial Action Report Operable Unit 1 Phase 2	2008
Explanation of Significant Differences	2008
Remedial Action Report Operable Unit 3	2008
Federal Creosote Third Five Year Review	2017
Groundwater Monitoring Report	2019

APPENDIX B – CHRONOLOGY OF EVENTS

Chronology of Events	Date
Operations of the creosoting facility	1911-1955
Construction of the Claremont Development consisting of 137 single-family residences beings on 35 acres of the former Federal Creosoting property	1961
Construction of the Rustic Mall begins on 15 acres of the former Federal Creosoting property	1963
Manville Health Department responds to a call regarding a basement sump pump discharge of creosote from a Claremont residence onto Valerie Drive	1997
NJDEP and EPA begin soil investigation in the Claremont Development	1997
Responsibility for the Site transferred from NJDEP to EPA	1998
Engineering Evaluation and Cost Analysis for Lagoons and Canals	1998-1999
Remedial Investigations/Feasibility Study	1998-2002
Site placed on the National Priorities List	1999
Record of Decision OU1 addressing residential soils containing source areas	1999
Remedial Design	1999-2004
Record of Decision OU2 addressing residential areas containing residually contaminated soils	2000
Record of Decision OU3 addressing contaminated soil in the Rustic Mall and Site-wide groundwater contamination	2002
Explanation of Significant Differences	2008
Remedial Action	2000-2008

APPENDIX C – FIGURES

Figure 1

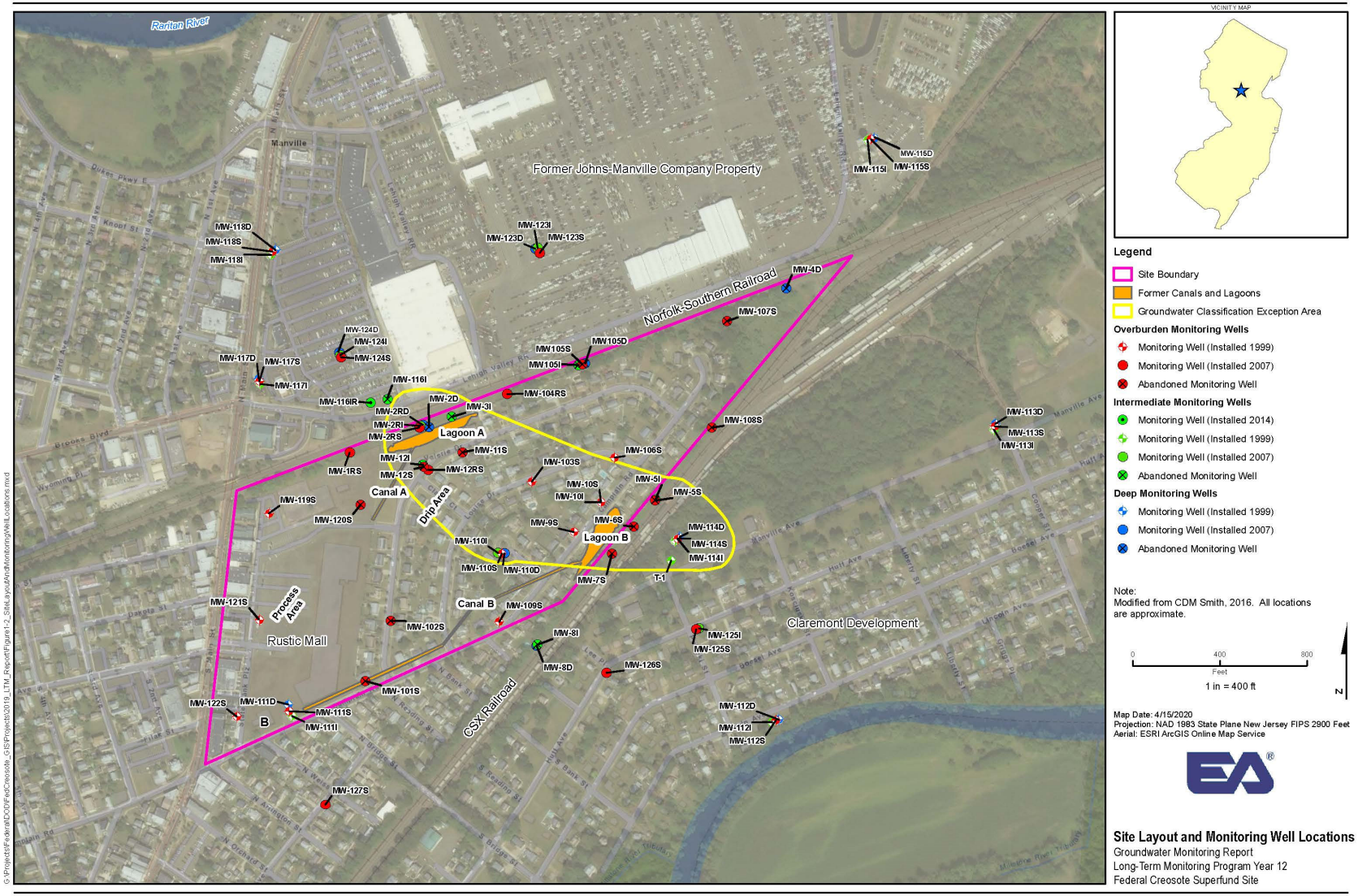
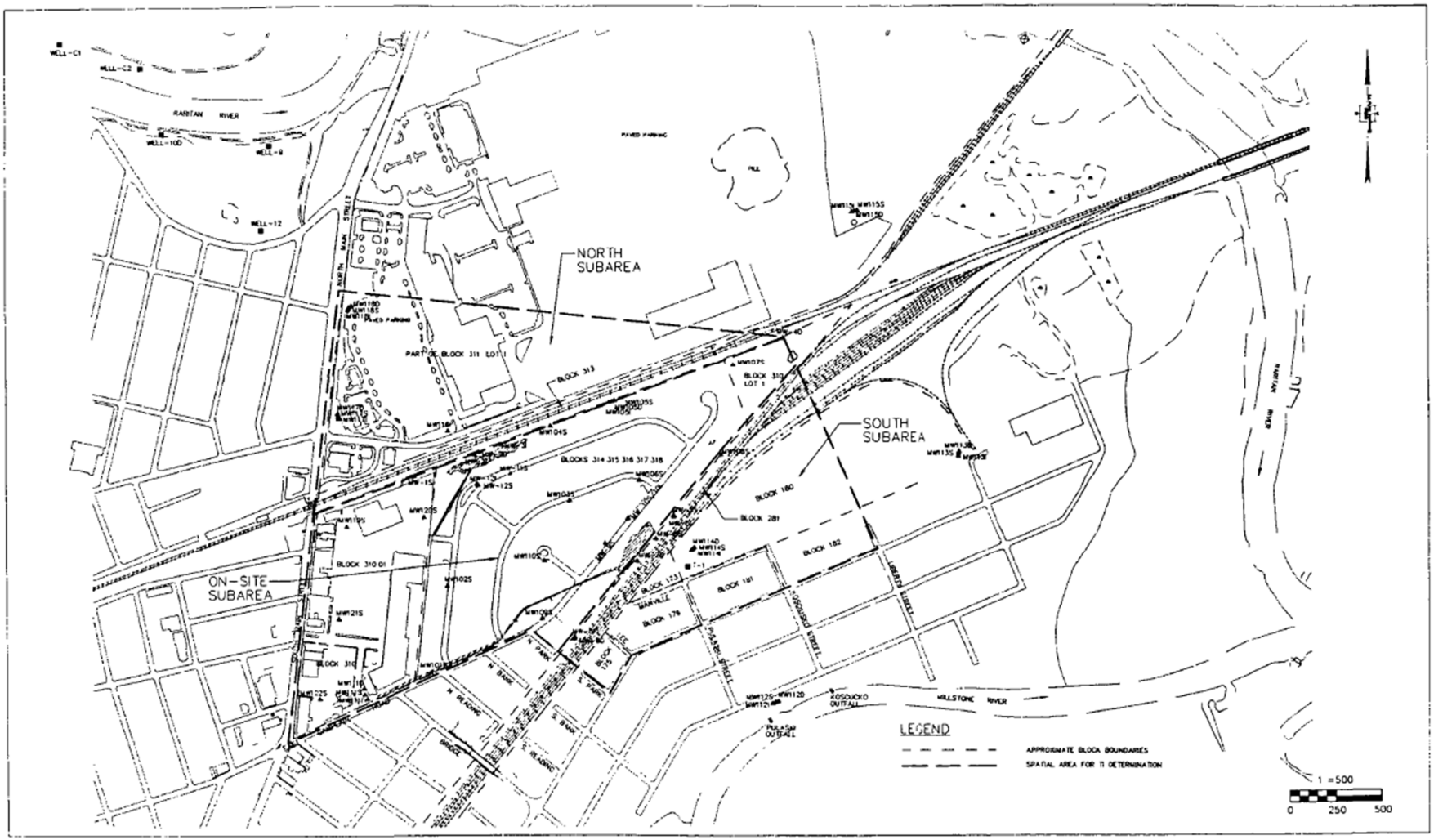

Raritan River
Former Johns-Manville Company Property
Norfolk-Southern Railroad
CSX Railroad
Lagoon A
Lagoon B
Canal A
Canal B
Drip Area
Process Area
Rustic Mall
Claremont Development
Manville
MW-118D
MW-118S
MW-118I
MW-123I
MW-123D
MW-123S
MW-115D
MW-115I
MW-115S
MW-4D
MW-107S
MW-124D
MW-124I
MW-124S
MW-105S
MW-105D
MW-105I
MW-117D
MW-117S
MW-117I
MW-116I
MW-116IR
MW-104RS
MW-2D
MW-3I
MW-2RD
MW-2RI
MW-2RS
MW-108S
MW-113D
MW-113S
MW-113I
MW-11S
MW-106S
MW-12I
MW-12RS
MW-1RS
MW-12S
MW-103S
MW-5I
MW-5S
MW-10S
MW-10I
MW-119S
MW-120S
MW-9S
MW-6S
MW-114D
MW-114S
MW-114I
MW-110I
MW-110S
MW-110D
MW-7S
T-1
MW-121S
MW-102S
MW-109S
MW-8I
MW-8D
MW-125I
MW-125S
MW-126S
MW-122S
MW-111D
MW-111S
MW-111I
B
MW-101S
MW-112D
MW-112I
MW-112S
MW-127S
VICINITY MAP
Legend
Site Boundary
Former Canals and Lagoons
Groundwater Classification Exception Area
Overburden Monitoring Wells
Monitoring Well (Installed 1999)
Monitoring Well (Installed 2007)
Abandoned Monitoring Well
Intermediate Monitoring Wells
Monitoring Well (Installed 2014)
Monitoring Well (Installed 1999)
Monitoring Well (Installed 2007)
Abandoned Monitoring Well
Deep Monitoring Wells
Monitoring Well (Installed 1999)
Monitoring Well (Installed 2007)
Abandoned Monitoring Well
Note:
Modified from CDM Smith, 2016. All locations are approximate.
0
400
800
Feet
1 in = 400 ft
N
Map Date: 4/15/2020
Projection: NAD 1983 State Plane New Jersey FIPS 2900 Feet
Aerial: ESRI ArcGIS Online Map Service
Site Layout and Monitoring Well Locations
Groundwater Monitoring Report
Long-Term Monitoring Program Year 12
Federal Creosote Superfund Site

Figure 1.1



CDM

FEDERAL CREOSOTE SUPERFUND SITE
MANVILLE NEW JERSEY

SPATIAL AREA FOR TECHNICAL IMPRACTICABLITY DETERMINATION
JUNE 2002

Figure 2

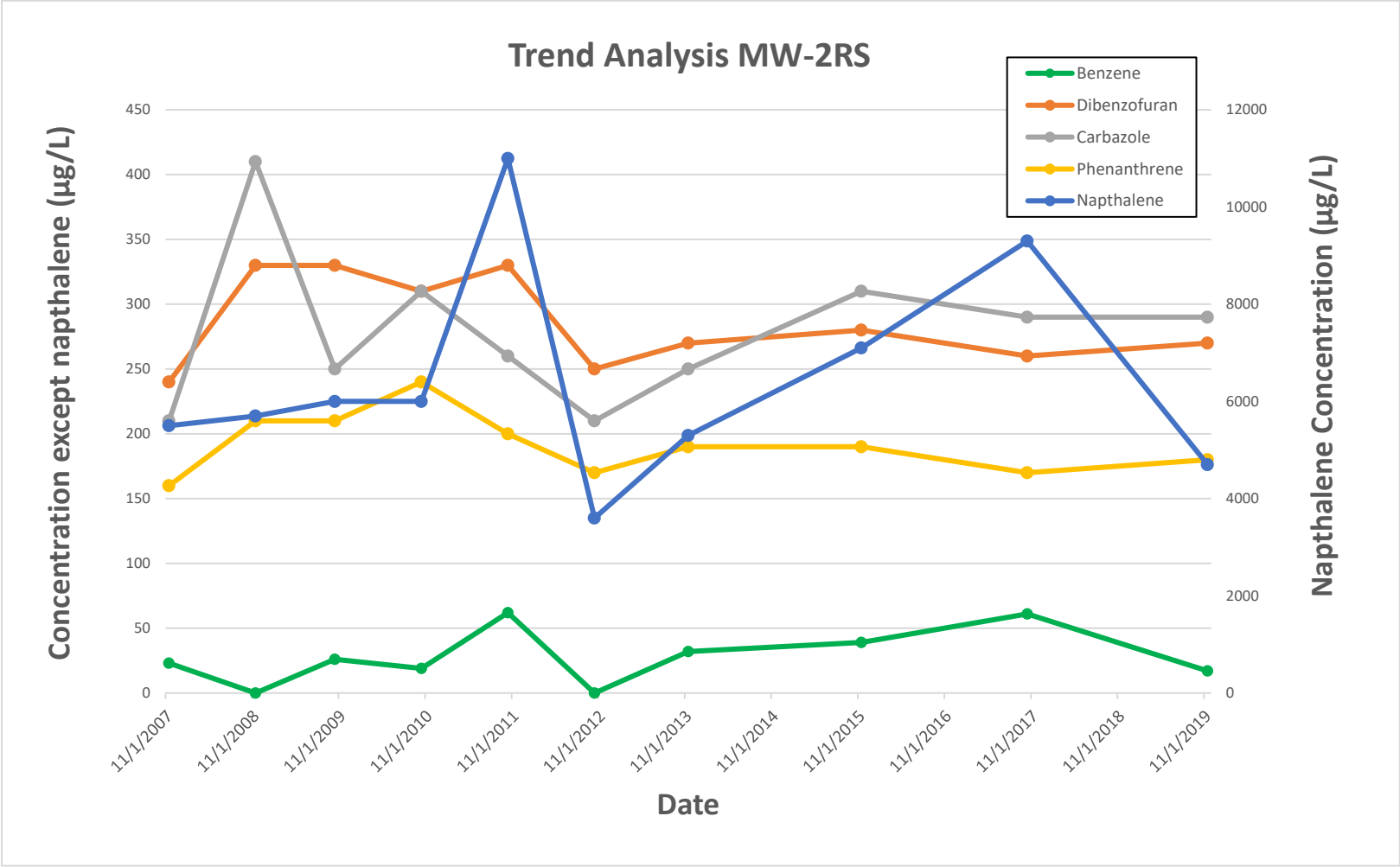

Trend Analysis MW-2RS
Benzene
Dibenzofuran
Carbazole
Phenanthrene
Napthalene
Concentration except napthalene (µg/L)
Napthalene Concentration (µg/L)
Date
0
50
100
150
200
250
300
350
400
450
0
2000
4000
6000
8000
10000
12000
11/1/2007
11/1/2008
11/1/2009
11/1/2010
11/1/2011
11/1/2012
11/1/2013
11/1/2014
11/1/2015
11/1/2016
11/1/2017
11/1/2018
11/1/2019

Figure 3

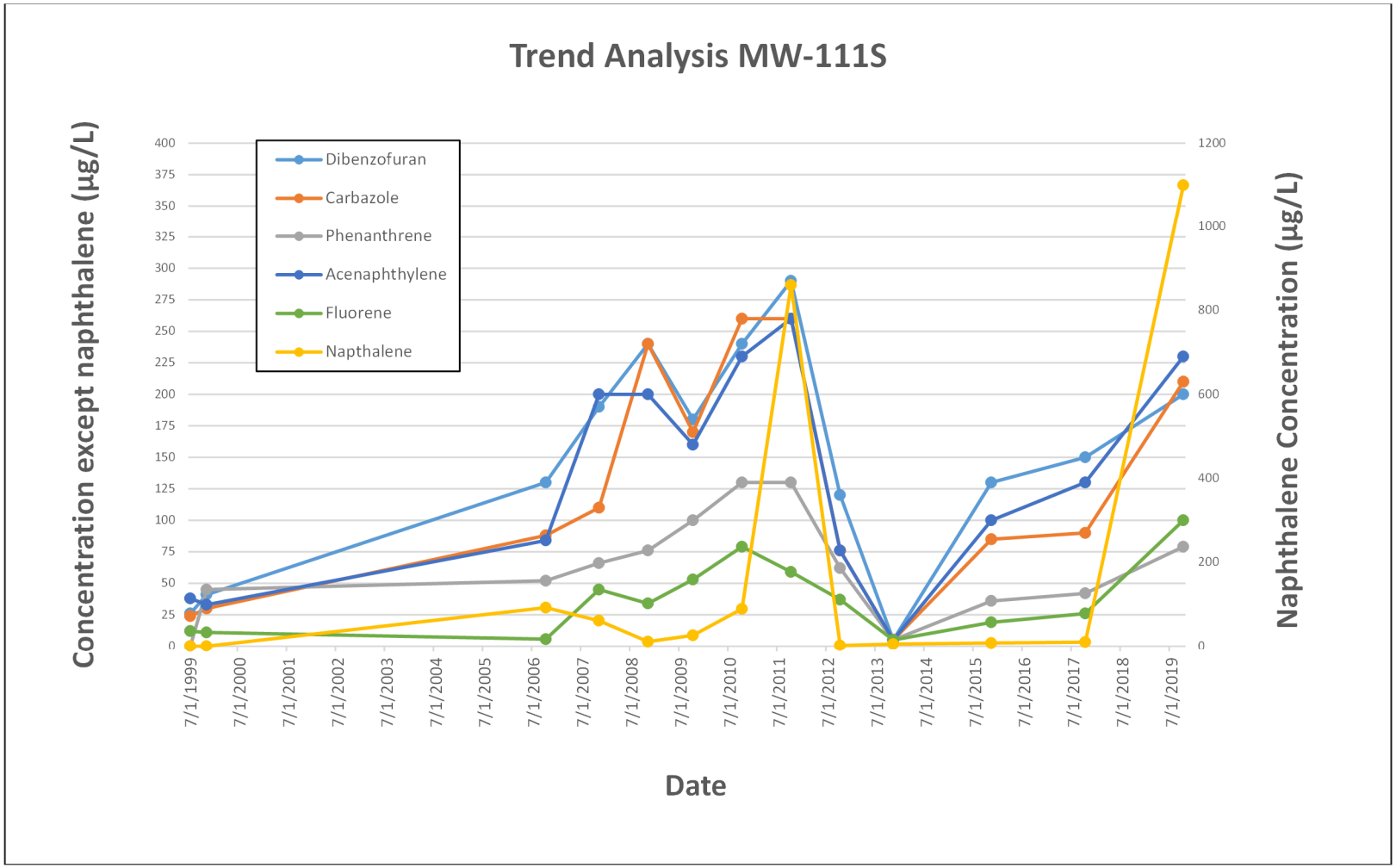

Trend Analysis MW-111S
Concentration except naphthalene (µg/L)
Naphthalene Concentration (µg/L)
Dibenzofuran
Carbazole
Phenanthrene
Acenaphthylene
Fluorene
Napthalene
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
1200
1000
800
600
400
200
0
7/1/1999
7/1/2000
7/1/2001
7/1/2002
7/1/2003
7/1/2004
7/1/2005
7/1/2006
7/1/2007
7/1/2008
7/1/2009
7/1/2010
7/1/2011
7/1/2012
7/1/2013
7/1/2014
7/1/2015
7/1/2016
7/1/2017
7/1/2018
7/1/2019
Date

Figure 4

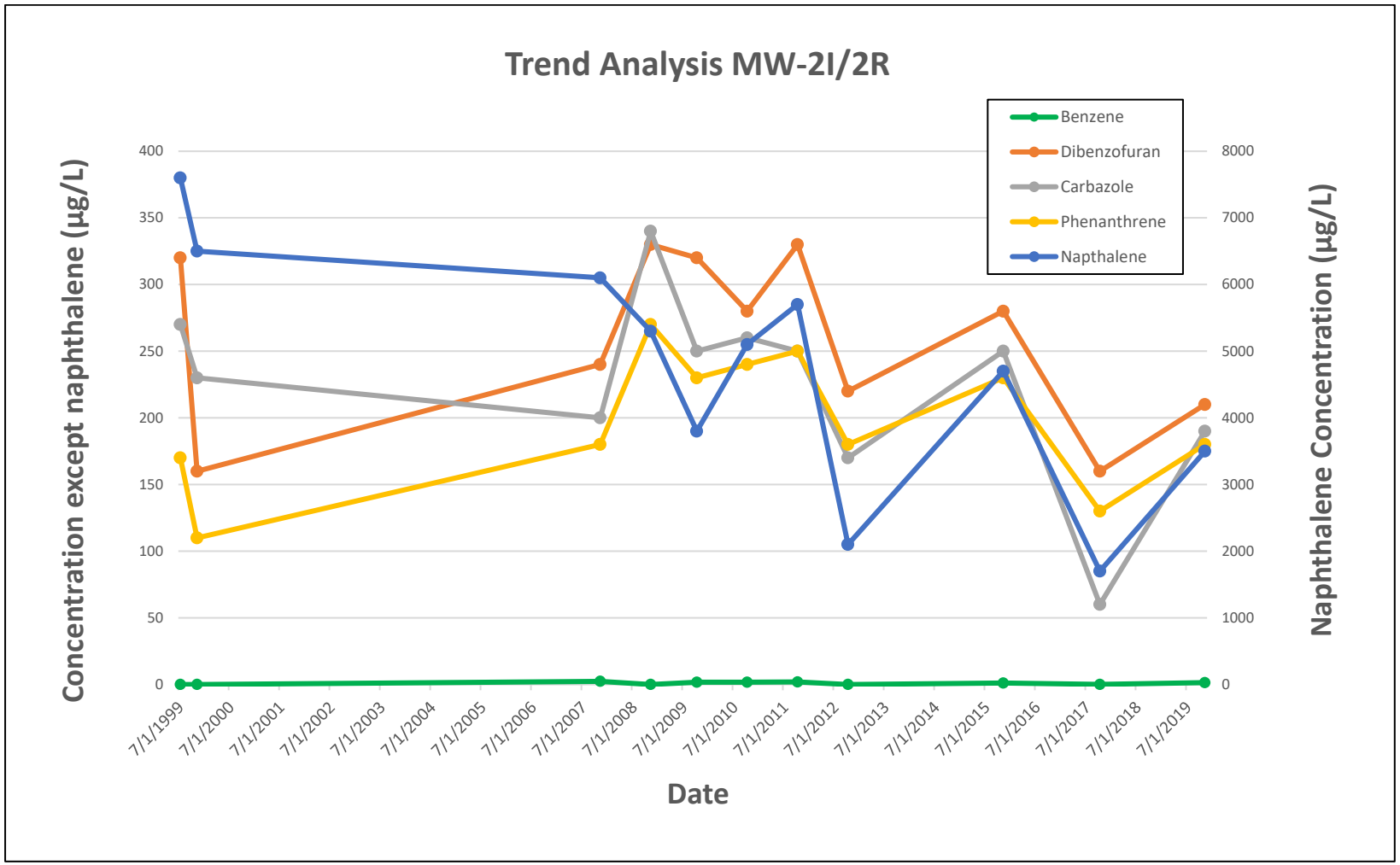

Trend Analysis MW-2I/2R
Benzene
Dibenzofuran
Carbazole
Phenanthrene
Napthalene
Concentration except naphthalene (µg/L)
Naphthalene Concentration (µg/L)
Date
400
350
300
250
200
150
100
50
0
8000
7000
6000
5000
4000
3000
2000
1000
0
7/1/1999
7/1/2000
7/1/2001
7/1/2002
7/1/2003
7/1/2004
7/1/2005
7/1/2006
7/1/2007
7/1/2008
7/1/2009
7/1/2010
7/1/2011
7/1/2012
7/1/2013
7/1/2014
7/1/2015
7/1/2016
7/1/2017
7/1/2018
7/1/2019

Figure 5

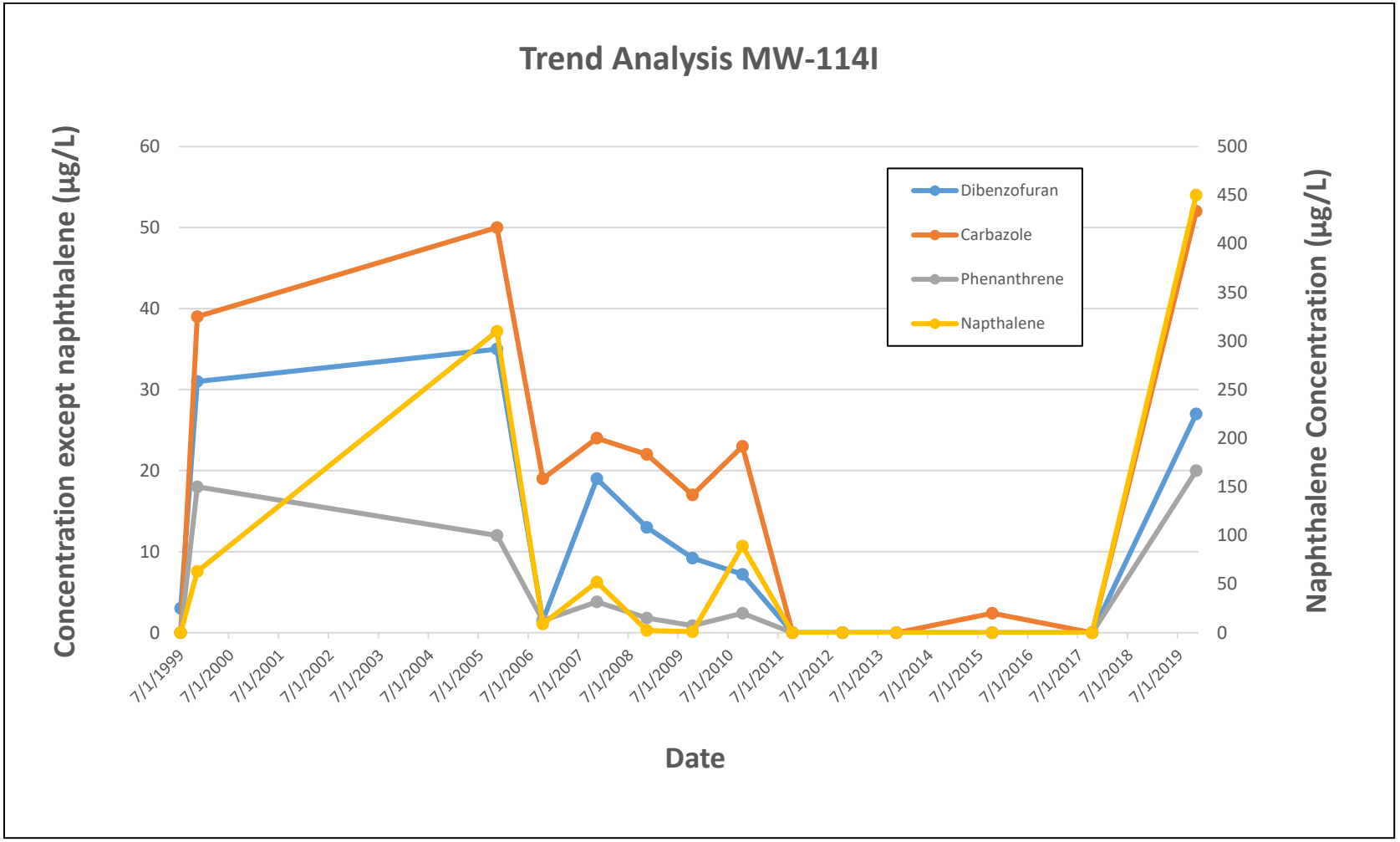

Trend Analysis MW-114I
Concentration except naphthalene (µg/L)
Naphthalene Concentration (µg/L)
Date
Dibenzofuran
Carbazole
Phenanthrene
Napthalene
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
450
500
7/1/1999
7/1/2000
7/1/2001
7/1/2002
7/1/2003
7/1/2004
7/1/2005
7/1/2006
7/1/2007
7/1/2008
7/1/2009
7/1/2010
7/1/2011
7/1/2012
7/1/2013
7/1/2014
7/1/2015
7/1/2016
7/1/2017
7/1/2018
7/1/2019

Figure 6

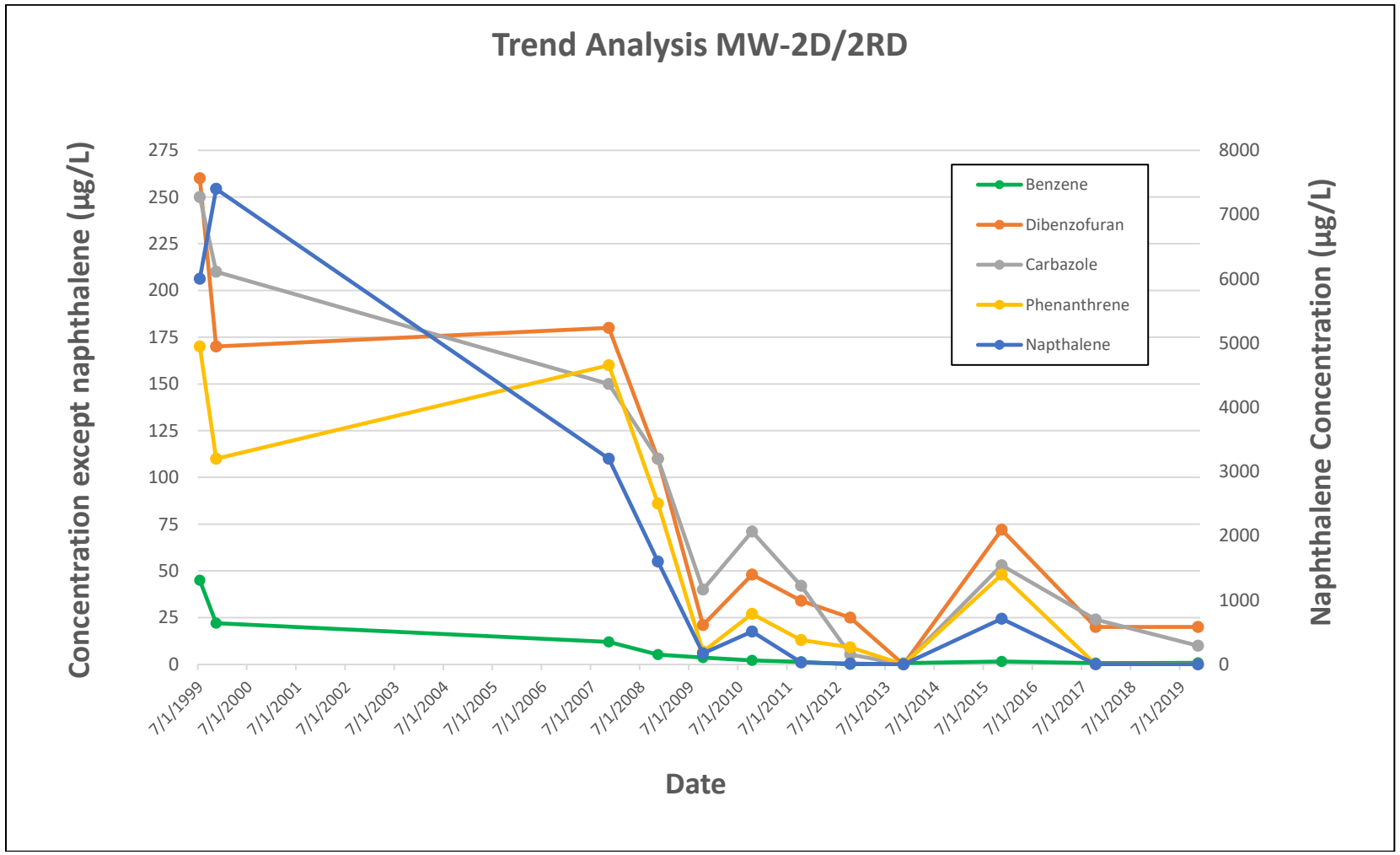

Trend Analysis MW-2D/2RD
Concentration except naphthalene (µg/L)
Naphthalene Concentration (µg/L)
Date
Benzene
Dibenzofuran
Carbazole
Phenanthrene
Napthalene
275
250
225
200
175
150
125
100
75
50
25
0
8000
7000
6000
5000
4000
3000
2000
1000
0
7/1/1999
7/1/2000
7/1/2001
7/1/2002
7/1/2003
7/1/2004
7/1/2005
7/1/2006
7/1/2007
7/1/2008
7/1/2009
7/1/2010
7/1/2011
7/1/2012
7/1/2013
7/1/2014
7/1/2015
7/1/2016
7/1/2017
7/1/2018
7/1/2019

Figure 7

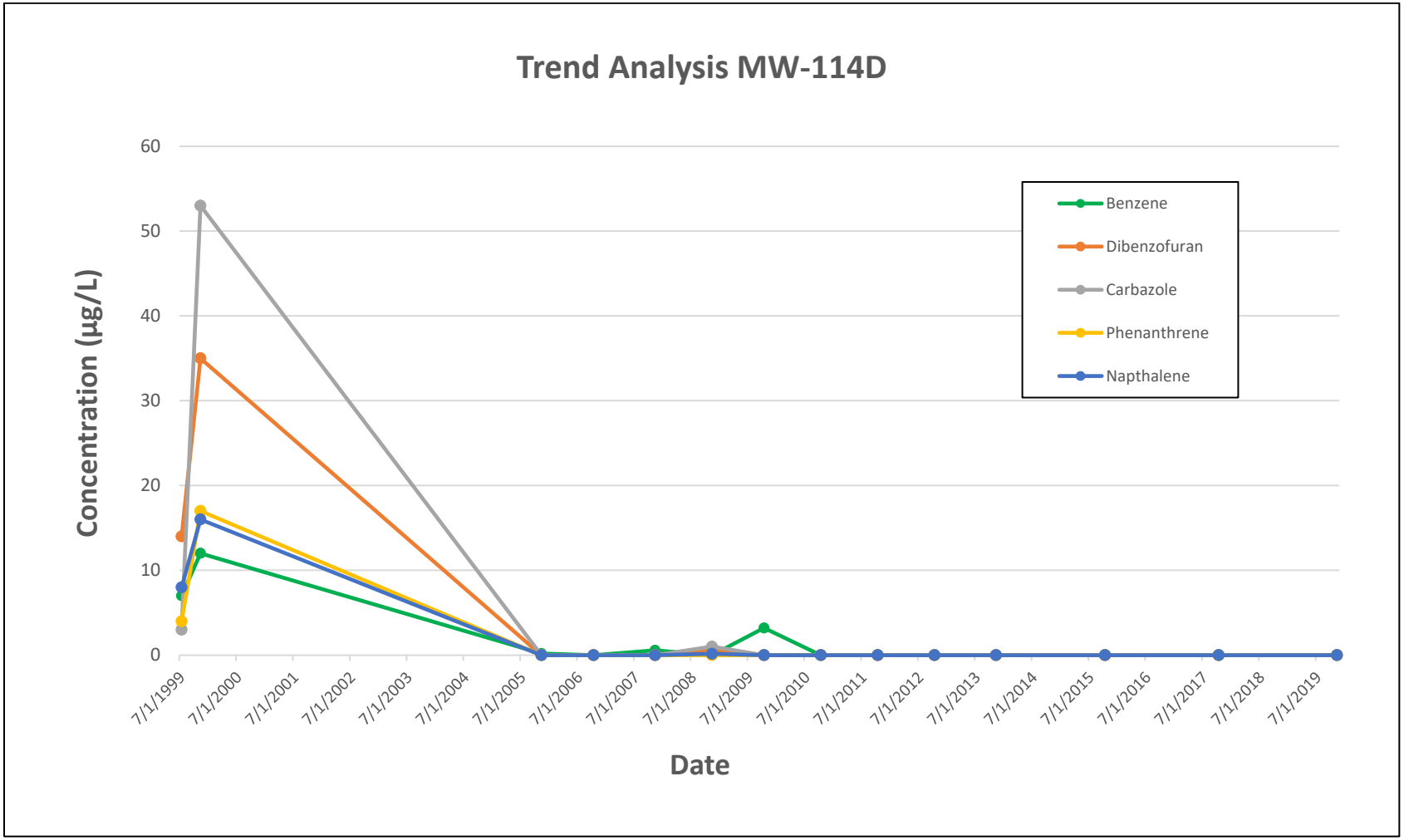

Trend Analysis MW-114D
Concentration (µg/L)
60
50
40
30
20
10
0
7/1/1999
7/1/2000
7/1/2001
7/1/2002
7/1/2003
7/1/2004
7/1/2005
7/1/2006
7/1/2007
7/1/2008
7/1/2009
7/1/2010
7/1/2011
7/1/2012
7/1/2013
7/1/2014
7/1/2015
7/1/2016
7/1/2017
7/1/2018
7/1/2019
Date
Benzene
Dibenzofuran
Carbazole
Phenanthrene
Napthalene

Figure 8

Installation of vapor barriers at residential construction: