

**FIFTH FIVE-YEAR REVIEW REPORT  
AMERICAN CYANAMID SUPERFUND SITE  
SOMERSET COUNTY, NEW JERSEY**



Prepared by

**U.S. Environmental Protection Agency  
Region II  
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A handwritten signature in black ink, appearing to read "Pat Evangelista".

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**Pat Evangelista, Acting Director  
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A handwritten date "9/11/19" in black ink.

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Date

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## LIST OF ABBREVIATIONS & ACRONYMS

ACO	Administrative Consent Orders
ARAR	Applicable or Relevant and Appropriate Requirement
CAMU	Corrective Action Management Unit
CD	Consent Decree
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Community Involvement Coordinator
COCs	Contaminants of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
FYR	Five-Year Review
GWTF	Groundwater Treatment Facility
HBW	Hydraulic Barrier Wall
IC	Institutional Controls
NCP	National Contingency Plan
NJGWQS	New Jersey Ground Water Quality Standards
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polycyclic biphenyls
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RD/RA	Remedial Design/Remedial Action
ROD	Record of Decision
RPM	Remedial Project Manager
SVOCs	Semi-Volatile Organic Compounds
TSD	Treatment/Storage/Disposal
UU/UE	Unlimited use/unrestricted exposure
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds
WRA	Well Restriction Area

## 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 fifth FYR for the American Cyanamid Superfund site (site). The triggering action for this statutory review is the completion of the previous FYR on June 26, 2014. A FYR is required at this site 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 originally consisted of seven Operable Units (OUs), and an eighth OU was subsequently added.

- A remedy was selected and has been implemented, or partially implemented, for OU1, OU2, OU3 and OU6.
- The remedy for OU6, the Hill Property portion of the site, consisted of no further action with monitoring and institutional controls (ICs). As part of the remedy, the New Jersey Department of Environmental Protection (NJDEP) established a classification exception area (CEA) and a well restriction area (WRA) for the Hill Property, which was subsequently removed in June 2008 based on sampling results. OU6 was deleted from the National Priorities List (NPL) in 1998 and was redeveloped for commercial use (i.e., retail stores, a professional baseball stadium and a commuter/stadium parking lot). As such, OU6 is not subject to this FYR.
- OU4, OU5 and OU7, as well as the portions of the remedies for OU1, OU2 and OU3 that were not already implemented, have been combined and are being addressed under the existing OU4, for which a remedy was selected in 2012. Design and implementation of the OU4 remedy is currently underway.
- While the OU4 remedy was being developed, EPA decided to address impoundments 1 and 2 separately as part of an eighth operable unit. A remedy for OU8 was selected in 2018, and the design of the remedy is being initiated. As such, OU8 is also not part of this FYR.

In Summary, the following OUs are addressed in this FYR:

- OU 1 (impoundments 11 and 19);
- OU 2 (impoundments 15, 16 and 18);,
- OU 3 (impoundments 14, 20 and 26); and
- OU4 (impoundments 3, 4, 5, 13,17 and 24, and site-wide soil, groundwater and wetlands).

The site's fifth FYR team was led by the EPA Remedial Project Manager (RPM) Mark Schmidt. Participants from EPA also included: Stephanie Vaughn –Chief, Mega Projects Section; Mark Austin – RPM for OU8; Sharissa Singh – Hydrogeologist; Julie McPherson – Human Health Risk Assessor; Michael Clementson – Ecological Risk Assessor; and, Melissa Dimas – Community Involvement Coordinator (CIC). The PRP was notified of the initiation of the five-year review. The review began on 9/24/2018.

### **Site Background**

The 435-acre site, EPA Superfund site Identification Number NJD002173276, is located within the southeastern section of Bridgewater Township, Somerset County, in the north-central portion of New Jersey (Attachment 1). Bridgewater Township has a population of approximately 45,000 people.

Due to its size, the site is divided into five identifiable areas: North Area, South Area, West Area, East Area, and the Impoundment 8 Facility (Attachment 2). The Impoundment 8 Facility is designated as a Corrective Action Management Unit (CAMU), and regulated under the Resource Conservation and Recovery Act (RCRA).

The site was used for more than eight decades to manufacture a range of products including rubber-based chemicals, dyes, pigments, chemical intermediates, petroleum-based products, and pharmaceuticals.

The surrounding land use is a mix of light industrial and residential. The nearest residences are towards the southeast approximately 1,800 feet away from the site. The nearest local business is approximately 400 feet to the north. To the immediate north of the site, a baseball stadium, a commuter train rail station and several commercial businesses are located on redeveloped land that was once part of the site.

According to the Federal Emergency Management Agency (FEMA), the entire site, with the exception of the CAMU located in the far northwest portion, lies within a Special Flood Hazard Area designated as Zone AE (base flood elevations are established using a 100-year flood event). Over the past twenty or so years, the area has been subject to frequent, and sometimes intense flooding, such as from Hurricanes Irene (2011) and Floyd (1999).

The site has had several owners/operators since a chemical and dye manufacturing facility was built in 1915. The American Cyanamid Company purchased the facility in 1929 and expanded it into one of the nation's largest dye and organic chemical plants. As production increased from

the 1930s through the 1970s, buildings and support services were expanded to accommodate increased demands for the products. The manufacture of bulk pharmaceuticals continued throughout the early 1990s, generating untreated waste material that was managed in on-site waste impoundments.

In 1981 preliminary investigations verified that approximately one-half of the site was utilized to support manufacturing, waste storage, or waste disposal activities. Most of the wastes were stored in as many as twenty-seven (27) on-site surface impoundments, while general facility wastes, debris and other materials were primarily disposed of on the ground at various locations resulting in extensive on-site soil and groundwater impacts.

Through investigations conducted in the late 1980s and early 1990s, sixteen (16) of the 27 impoundments were identified for remediation under CERCLA (Attachment 3). The remaining 11 impoundments are regulated under RCRA and generally contain non-hazardous substances.

In 1988, the 16 CERCLA impoundments were organized into three groups resulting in a separate Record of Decision (ROD) for each:

- OU1 Group I – Impoundments 11\*, 13, 19\*, and 24
  - OU2 Group II – Impoundments 1, 2, 15, 16, 17, and 18\*
  - OU3 Group III – Impoundments 3, 4, 5, 14\*, 20\*, and 26\*
- (\* – remediation complete)

Due to the toxicity of Impoundments 1 and 2, EPA subsequently decided to move them into Group III.

A ROD for the revised listing of Group III Impoundments was issued in September 1998. However, a pilot test confirmed that the selected remedy for Impoundments 1 and 2 (low temperature thermal treatment and placement of material in the CAMU) was technically infeasible due to anticipated difficulties in both the extensive handling of the acid tar material and complications with controlling air emissions during the treatment phase of remedy implementation. This finding resulted in the suspension of some remediation activities for the Group III Impoundments. However, some impoundments under the 1998 ROD (Impoundments 14, 20, and 26) have since been remediated and the contents permanently placed in the CAMU.

Due to the complexity of the remaining Group III Impoundments (1, 2, 3, 4, and 5), in 2004 a comprehensive FS re-evaluated remedial alternatives for the remaining impoundments and included the on-site soils and site-wide groundwater. Further by 2009, both Impoundments 1 and 2 were separated from the other planned remedial work (now known as OU4) into a new OU called OU8.

On September 27, 2012, a ROD for OU4 was finalized which included a remedy for six impoundments (3, 4, 5, 13, 17, and 24) and all site-wide contaminated soil, groundwater (originally OU5) and wetlands (originally OU7). The design and implementation of the OU4 remedy is currently underway.

On September 23, 2018, a ROD for OU8 was finalized which included a remedy for impoundments 1 and 2. Plans for the remedial design are currently underway. OU8 is expected to be the last operable unit at the site.

### Enforcement Activities

The American Cyanamid Company entered into several Administrative Consent Orders (ACOs) with the NJDEP in 1982 and 1988 (amended in 1994) to investigate and remediate the site. In 1983, EPA listed the site on the NPL, and environmental remediation and restoration activities have been ongoing at the site since that time under CERCLA.

In December 1994, American Home Products Corporation purchased the American Cyanamid Company, and assumed full responsibility for environmental remediation as required under the NJDEP ACO for this site. In December 2002, American Home Products Corporation changed its name to Wyeth Corporation (Wyeth). In October 2009, Wyeth was purchased by Pfizer Inc., and became a wholly owned subsidiary of Pfizer. Ownership of the site is held in the name of Wyeth Holdings, a wholly owned subsidiary of Wyeth.

NJDEP was the lead agency for the site until March 2009, when EPA assumed the lead role.

On July 19, 2011, Wyeth Holdings entered an Administrative Settlement Agreement and Order on Consent with EPA requiring Wyeth Holdings to address site-wide contaminated groundwater, soil and impoundments 3, 4, 5, 13, 17 and 24.

In 2012, the requirements of the Site-wide remedy, which includes in-situ solidification/stabilization of the highly contaminated impoundments, the installation of an engineered capping systems to address Site soils, and the collection and treatment of Site-related contaminated groundwater, were outlined in a Record of Decision (ROD) for OU4.

Under a December 8, 2015 Consent Decree (CD) between EPA (in consultation with NJDEP) and Wyeth Holdings, the design of the OU4 remedy is now underway.

Historically, the impacted bedrock groundwater was being extracted by an existing bedrock groundwater extraction system and was discharged to the Somerset Raritan Valley Sewerage Authority (SRVSA) for treatment prior to discharge to the Raritan River. As called for in the OU4 remedy, the existing bedrock production well system was expanded to comprehensively address sitewide groundwater. The design activities have been completed for the groundwater component and the new groundwater system became operational in March 2019.

## FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: American Cyanamid Superfund site		
EPA ID: NJD002173276		
Region: 2	State: NJ	City/County: Somerset
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? No	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Mark Schmidt		
Author affiliation: US EPA Region 2		
Review period: 6/27/2014 - 5/24/2019		
Date of site inspection: 3/14/2019		
Type of review: Statutory		
Review number: 5		
Triggering action date: 6/26/2014		
Due date ( <i>five years after triggering action date</i> ): 6/26/2019		

## II. RESPONSE ACTION SUMMARY

### Basis for Taking Action

Since the NPL placement, site conditions have been characterized through a series of remedial investigations in order to determine the nature and extent of the contamination. An impoundment characterization program was completed in 1990 and a soils investigation was completed in May 1992 to characterize and delineate contaminated soils. A remedial investigation of groundwater was completed in February 2006 and a supplemental groundwater investigation was completed in February 2008.

A number of human health and ecological risk assessments have been conducted since the site. A baseline endangerment assessment was conducted in 1992 to evaluate cancer risks and noncancer

health hazards associated with potential exposures to the impoundments, surface soils and groundwater. A human health risk assessment was conducted in 2006 for the same exposures as in the 1992 baseline endangerment assessment. A streamlined human health risk assessment was also completed in February 2010 to evaluate the cancer risks and noncancer hazards. These assessments generally concluded that impoundments, soils and groundwater presented an unacceptable human health risk to current and potential future receptors.

Ecological risks at the site were addressed through the 1992 baseline endangerment assessment, as well as through a baseline ecological risk assessment conducted in 2005. The baseline ecological risk assessment concluded that the level of potential impact of site-related contaminants to ecological receptors is likely to be below levels of concern. As required by the September 2012 OU4 ROD, an additional ecological risk assessment was performed for impoundments 13, 17 and 24 to confirm the appropriate treatment for these materials. This assessment determined that their contents require relocations to the North Area, as per the September 2012 OU4 ROD.

The following are the main COCs for the affected media at the site:

- Impoundments: benzene, nitrobenzene, naphthalene, N-nitrosodiphenylamine and 1,2-dichlorobenzene;
- Site soils: antimony, arsenic, benzo(a)pyrene, chromium IV, cobalt and total polychlorinated biphenyls; and,
- Groundwater: benzene, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, nitrobenzene, n-Nitrosodiphenylamine, toluene and xylene.

### **Response Actions**

Due to the size of nature of contamination, the site was originally divided into the following seven OUs:

- OU1 (Group I): Impoundments 11, 13, 19 and 24
- OU2 (Group II): Impoundments 15, 16, 17 and 18
- OU3 (revised Group III): Impoundments 1, 2, 3, 4, 5, 14, 20 and 26
- OU4: Site soil
- OU5: Site groundwater
- OU6: Hill Property soil
- OU7: Site-related wetlands

Remedies were selected for OU1, OU2 and OU3 in RODs issued in 1993, 1996 and 1998, respectively. An Explanation of Significant Differences (ESD) was issued for OU2 in 1998 and for OU3 in 2007. The completed portions of OU1, OU2 and OU3 are the subject of this FYR.

OU6 was deleted from the NPL in 1998. A groundwater CEA/WRA was established as part of the OU6 ROD; however, the CEA/WRA was closed in June 2008 after residual groundwater contaminant concentrations were reported below NJDEP groundwater quality standards. Therefore, this OU is not covered in this FYR.

The portions of OU1, OU2 and OU3 that were not completed or undergoing active remediation, as well as the remaining OUs (OU4, OU5 and OU7) that had not been addressed at the time of the issuance of the OU4 ROD were combined and added to the existing OU4, with the exception of impoundments 1 and 2 which are being addressed under OU8.

The following elements are specifically included in this FYR:

- Operable Unit 1: Impoundments 11 and 19
  - A ROD was signed for Impoundments 11, 13, 19 and 24 in September 1993. The remedies for Impoundments 11 and 19 were completed in November 1997 and November 1995, respectively. Note: The remedial activities for Impoundments 13 and 24 are now being addressed under OU4.
  - The 1993 OU1 ROD called for the excavation of impoundments 11 and 19, the on-site solidification of excavated material, and the consolidation of solidified material into the impoundment 8 facility.
  - The remedial action objectives per the 1993 OU1 ROD were to:
    - Eliminate source of contamination; and
    - Contribute to compliance with applicable or relevant and appropriate requirements (ARARs) for groundwater.
  
- Operable Unit 2: Impoundments 15, 16, and 18
  - A ROD was signed for impoundments 15, 16, 17 and 18 in July 1996. The remedy for impoundment 18 was completed in April 1998. The remedy for impoundments 15 and 16 was modified through an ESD in November 1998, and their remediation is ongoing.
  - The 1998 OU2 ESD for impoundments 15 and 16 called for the excavation of iron oxide material, transport and reuse of the material at an off-site recycling facility, the backfilling and revegetation of the former impoundment areas and the monitoring of groundwater. The remedial action objectives for the 1998 OU2 ESD remained the same as the remedial action objectives in the 1996 OU2 ROD.
  - The remedial activities for impoundment 17 are now being addressed under OU4.
  - The 1996 OU2 ROD called for the construction of a fence, maintenance of natural vegetation and groundwater monitoring for impoundment 18.
  - The remedial action objectives per the 1996 OU2 ROD were to:
    - Eliminate and/or control source(s) of contamination;
    - Eliminate the potential for incidental ingestion, dermal contact and inhalation of impoundments' solids; and,
    - Contribute to compliance with groundwater ARARs.
  
- Operable Unit 3: Impoundments 14, 20 and 26
  - A ROD was signed for impoundments 1, 2, 3, 4, 5, 14, 20 and 26 in September 1998. The remedy for impoundment 26 was completed in March 2002 per the OU3 ROD. The remedies for impoundments 14 and 20 were completed in December 2009 per a 2007 ESD.
    - The remedial activities for impoundments 1 and 2 are now being addressed under OU8, and the remedial activities for impoundments 3, 4 and 5 are now being addressed under OU4.

- The OU3 ROD for impoundment 26 called for the excavation, solidification and placement of silts, tars and underlying soils within into the impoundment 8 facility.
- The 2007 ESD for impoundments 14 and 20 called for the excavation, solidification and placement of materials into the impoundment 8 facility.
- The remedial action objectives per the OU3 ROD were to:
  - Eliminate the migration of constituents from the impoundments to air, soil, groundwater and surface water at levels representing an unacceptable human health or environmental risk or resulting in exceedance of ARARs; and,
  - Reduce the risk associated with potential exposure from contaminated material in the impoundments.
- Operable Unit 4: Impoundments 3, 4, 5, 13, 17, and 24, and site-wide contaminated soil, groundwater and wetlands
  - The OU4 ROD was signed in September 2012. The remedy called for:
    - The treatment of all waste material located within Impoundments 3, 4 and 5 through in-situ solidification/stabilization followed by placement of an engineered vapor control barrier and engineered soil cover system.
    - Placement of either a vapor control or direct contact barrier cap over contaminated site-wide soil, as determined to be appropriate.
    - Relocation and consolidation of waste material in impoundments 13, 17 and 24, if determined to be necessary based on the results of an ecological risk assessment.
    - Improvement of the existing groundwater collection and treatment system.
    - Institutional controls, monitoring and periodic reviews.
  - The remedial action objectives per the OU4 ROD for Principal Threat Waste are to:
    - Remove or treat material that meets the definition of principal threat waste, to the extent practical
    - Prevent current or potential future migration of material that meets the definition of principal threat waste from the Site that would result in direct contact or inhalation exposure, to the extent practicable.
  - The remedial action objectives per the OU4 ROD for groundwater are to
    - Prevent or minimize human and ecological exposure to contaminants in soils and impoundment materials at levels above relevant risk-based remediation criteria
    - Prevent or minimize sources of groundwater impacts (i.e., reduce chemical loadings to groundwater) resulting in longterm improvement of groundwater quality and eventual achievement of applicable regulatory standards.
  - The remedial action objectives per the OU4 ROD for soil/impoundment material are to:
    - Restore, as practicable, the overburden and bedrock aquifers within the area of attainment to its expected beneficial use and to concentrations

below the more stringent of federal MCLs and NJ GWQS within a reasonable period

- Eliminate the migration of contaminants exceeding the more stringent of federal MCLs and NJ GWQS in the overburden and bedrock aquifers beyond the point of compliance through a combination of source actions and hydraulic controls to the extent practicable.

### **Status of Implementation**

The following is a summary of the implemented remedies that are the subject of this FYR:

- Operable Unit 1: Impoundments 11 and 19
  - The remediation of impoundment 11 was initiated in August 1996 and concluded in June 1997 following restoration and demobilization work. The closure consisted of the excavation, solidification and placement of approximately 30,000 cubic yards of sludge and underlying soils into the impoundment 8 facility. A certification closure report was approved by NJDEP in November 1997.
  - The remediation of impoundment 19 was initiated in October 1994 and concluded in June 1995. The closure consisted of the excavation, solidification and placement of approximately 12,000 cubic yards of sludge into the impoundment 8 facility. A certification closure report was completed in August 1995 and revised in November 1995 with NJDEP approval.
- Operable Unit 2: Impoundment 15, 16 and 18
  - The remediation of impoundments 15 and 16 was initiated in 2000 and is ongoing. To date, approximately 147,086 tons of iron oxide material has been transported to an off-site recycling facility for reuse. The backfilling, grading and revegetation of these areas will be completed along with the implementation of the OU4 remedy.
  - The remediation of impoundment 18 was initiated in September 1997 and concluded in January 1998. The closure of impoundment 18 consisted of fencing around the perimeter of the impoundment, harvesting of large diameter trees, and the construction of a spillway to control potential erosion during large flood events.
- Operable Unit 3: Impoundments 14, 20 and 26
  - The remediation of impoundment 26 was initiated in November 2000 and concluded in June 2001. The closure consisted of the excavation, solidification and placement of approximately 20,600 cubic yards of silt, tar and underlying soils into the impoundment 8 facility. A certification closure report for impoundment 26 was completed in November May 2002, with NJDEP approval.
  - The remediation of impoundments 14 and 20 was initiated in September 2007 and concluded in September 2009. The closure consisted of the excavation, solidification and placement of approximately 33,101 cubic yards of material into the impoundment 8 facility. A certification closure report was completed with NJDEP approval in December 2009.

- Operable Unit 4: Impoundments 3, 4, 5, 13, 17, and 24, and site-wide contaminated soil, groundwater and wetlands
  - Design and implementation of the OU4 remedy is currently underway. The groundwater treatment facility is now operating and related construction activities will be complete in September 2019.

### **IC Summary**

There are no formal ICs related specifically to OU1, OU2 or OU3. Engineering and Site access controls that include fencing, site security and access restrictions, are in place. The September 2012 OU4 ROD requires that the following site-wide institutional controls be implemented as part of the remedy: deed restrictions, restrictive covenants and the establishment of a groundwater CEA/WRA. A site-wide CEA/WRA is currently being developed by Wyeth with NJDEP to restrict potable use of groundwater until groundwater has been restored and chemical-specific ARARs have been met.

### **Systems Operations/Operation & Maintenance**

Groundwater, surface water, sediment and air monitoring are conducted regularly at the site.

Groundwater: A comprehensive groundwater monitoring program consistent with the requirements of the OU1, OU2 and OU3 RODs is currently in place. This program will be superseded by the OU4 site-wide remedy requirements. The OU4 groundwater treatment facility is now fully operational and began extracting and re-injecting treated groundwater in March 2019. The Remedial Action Report is expected to be approved by September 2019, which will outline the revisions to the monitoring program.

In accordance with the 1988 NJDEP ACO, a groundwater monitoring program was initially established and included site-wide bedrock groundwater pumping and monitoring of both overburden and bedrock groundwater. This system has been expanded as part of the OU4 efforts to control sitewide groundwater. The groundwater pumping system induces vertical hydraulic gradients between the overburden and bedrock aquifers. Upon completion of the OU4 groundwater remedy, hydraulic containment of overburden and bedrock groundwater within the North Area is expected to be achieved. In addition, a Hydraulic Barrier Wall (HBW) has also been implemented to eliminate the local discharge of overburden groundwater to the Raritan River, Cuckel's Brook and Middle Brook. Overburden and Bedrock groundwater contour maps are presented in Attachments 4 and 5 respectively. The groundwater monitoring program consisted of quarterly monitoring from 1988 to 2008 and semi-annual monitoring from 2009 to present. The groundwater monitoring well locations, are presented in Attachment 6.

Surface Water and Sediment: During the preparation of the 2005 baseline ecological risk assessment, NJDEP requested that a monitoring program be developed to evaluate the impacts of affected media to Cuckel's Brook and the Raritan River. The monitoring program consisted of semi-annual surface water and sediment monitoring and included a number of site-specific contaminants. This program was discontinued in 2008 after it was concluded that contaminants of concern were not migrating from the site into Cuckel's Brook and the Raritan River, based upon the consistency between current concentrations and historical concentrations. Following the discovery of an overburden groundwater discharge from the site into the Raritan River in December 2010 and the initiation of a removal action

to address the discharge of contamination in the impoundments 1 and 2 area, an updated surface water and sediment monitoring program was developed. This monitoring program began in 2012 and includes more than 20 monitoring stations located throughout the Raritan River, Cuckel’s Brook, Millstone River and Middle Brook, as shown in Attachment 7. The monitoring program, undertaken on a semi-annual basis, includes additional sampling locations for both surface water and sediment and a more expansive analyte list than previously used. In August 2013, two groundwater discharges were observed in Cuckel’s Brook during standard site reconnaissance activities. In order to address these discharges, which were found to contain elevated concentrations of VOCs, carbon bags were installed as an interim measure. The OU4 site-wide groundwater remedy, will address these discharges on a long-term basis.

Ambient Air: An ambient air monitoring program was initiated in mid-2012 to collect quarterly ambient air sampling data throughout the site to use as a baseline during the implementation of the OU4 site-wide remedy. Currently, ambient air samples are collected semi annually. The results of the monitoring events generally have exhibited low level concentrations of constituents consistent with urban background monitoring stations measured by the NJDEP.

Potential Site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and at the Site. Additional climate change measures, that include a Site-wide Flood Management and Response Plan and relocation of electrical instrumentation above historic flood levels have been implemented in advance of the OU4 remedy.

### III. PROGRESS SINCE THE LAST REVIEW

The following are the protectiveness statements for OUs 1, 2 and 3 were included in the previous FYR, completed in June 2014:

**Table1:** Protectiveness Determinations/Statements from the 2014 FYR

<b>OU #</b>	<b>Protectiveness Determination</b>	<b>Protectiveness Statement</b>
1	Protective	The remedy at OU1 is protective of human health and the environment.
2	Protective	The remedy at OU2 will be protective of human health and the environment.
3	Protective	The remedy at OU3 is protective of human health and the environment.

No issues, recommendations or follow-up actions were identified during the completion of the 2014 FYR.

## IV. FIVE-YEAR REVIEW PROCESS

### Community Notification, Involvement & Site Interviews

On March 5, 2019, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 31 Superfund sites in New York and New Jersey, including the American Cyanamid Superfund Site. The announcement can be found at the following web address: [https://www.epa.gov/sites/production/files/2018-10/documents/five\\_year\\_reviews\\_fy2019\\_for\\_web\\_posting.pdf](https://www.epa.gov/sites/production/files/2018-10/documents/five_year_reviews_fy2019_for_web_posting.pdf)

Once the FYR is completed, the results will be made available on the site website (<https://www.epa.gov/superfund/american-cyanamid>) and at the local site repository, which is at the Bridgewater Township Library located at 1 Vogt Drive, Bridgewater, New Jersey..

Communications with the property owners, surrounding community and local government officials is an ongoing and critical component of the remedial work. Project records are available at the Bridgewater Township Library in Bridgewater, New Jersey. Project updates are prepared and sent out to the local community on a routine basis. EPA's website includes project documents, maps, notices and updates.

### Data Review

Groundwater, surface water, sediment and air monitoring are conducted regularly at the site.

#### Groundwater

A site-wide groundwater monitoring program has been implemented since 1988 with quarterly monitoring from 1988 to 2008 and semi-annual monitoring from 2009 to present. The locations of the wells in the groundwater monitoring program are shown in Attachment 6. Groundwater concentrations in monitoring wells downgradient or near the remediated impoundments have generally shown decreasing trends since the remedies for these impoundments have been implemented. However, some of these wells have exhibited stable and/or increasing contaminant concentrations more recently. The groundwater portion of the OU4 remedy is being designed and implemented to address these concerns. The most recent groundwater sampling results from monitoring wells within each OU addressed in this FYR indicate the following:

- OU1:
  - Impoundment 11: VOC concentrations in downgradient monitoring well 42-R exhibit decreasing and/or stable trends; however, concentrations remain above regulatory standards. Benzene was present in this well at concentrations in excess of 150 micrograms per liter (ug/L) in the late 1990s and concentrations have decreased to 17-25 ug/L over the past five years. Chlorobenzene concentrations appear to be decreasing over the last five years as well. However, they still remain several orders of magnitude above regulatory standards. Arsenic concentrations, which have ranged from 15 to 20 ug/L over the past five years, appear to be decreasing overall, with seasonal fluctuations. SVOC concentrations in well 42-R exhibit increasing and/or stable trends and are above regulatory standards. For example, aniline exhibits long-term increasing trends with variable concentrations

over the last five years. Attachments 9-11 include groundwater trend plots for VOCs, SVOCs and metals in well 42-R.

- Impoundment 19: VOC and SVOC concentrations in the monitoring well 38-R, which is the closest in proximity to Impoundment 19, exhibit decreasing trends; however, concentrations remain above regulatory standards. Benzene concentrations in this well were present in excess of 1,000 ug/L in the late 1990's and have decreased to below 100 ug/L over the past five years. No metals were detected above laboratory method detection limits and/or regulatory standards in well 38-R in the most recent groundwater monitoring event. Attachments 12-14 include groundwater trend plots for VOCs and SVOCs in well 38-R. VOC and SVOC concentrations in downgradient monitoring well TFP-94-1R appear to be increasing and/or stable and are above regulatory standards. For example, chlorobenzene concentrations appear to be increasing and were present in excess of 5,000 ug/L in the most recent monitoring event; however, benzene concentrations appear to have stabilized with a concentration of 105 ug/L during the most recent monitoring event. Arsenic concentrations have decreased over the past five years but remain above regulatory standards. Attachments 15-17 include groundwater trend plots for VOCs, SVOCs and metals in well TFP-94-1R.
- OU2:
  - Impoundments 15 and 16: VOC and SVOC concentrations within the vicinity of impoundments 15 and 16 (downgradient monitoring well 16-MW-2) were either not detected above the laboratory method detection limits and/or are below regulatory standards during the past five years. Metals concentrations in well 16-MW-2 exhibit decreasing and/or stable trends; however, concentrations of arsenic, iron, lead and manganese were present above regulatory standards in the most recent monitoring event. Attachment 18 includes a groundwater trend plot for metals in 16-MW-2 that exceeded regulatory standards over the past five years.
  - Impoundment 18: Metal concentrations for wells within the vicinity of impoundment 18 (MWs KKK, CCC-R, EEE-R and III) appear to be decreasing and/or stable but remain above regulatory standards over the past five years. For example, manganese concentrations in well EEE-R exhibit decreasing trends, while arsenic concentrations appear to have stabilized in the well. VOC and SVOC concentrations in these monitoring wells are either not detected above laboratory method detection limits and/or are below regulatory standards, with the exception of well KKK where bis(2-ethylhexyl) phthalate was detected slightly above the regulatory standards twice in the last five years with a maximum detection at 4.2 ug/L. Attachments 19-24 include groundwater trend plots for wells KKK, CCC-R, EEE-R and III where parameters exceeded regulatory standards.
- OU3:
  - Impoundment 14: VOC, SVOC and metal concentrations within the vicinity of impoundment 14 (MW 21-R) are either not detected above the laboratory method detection limits and/or are below regulatory standards over the past five years.
  - Impoundment 20: The only VOC detected above regulatory standards in crossgradient monitoring well MW-17 in the past five years was benzene, which

exhibits a stable trend with some seasonal fluctuations. No SVOCs were detected above laboratory method detection limits and/or regulatory standards in the past five years. The only metals detected above regulatory standards in MW-17 in the past five years were iron and manganese, which both appear to exhibit stable trends.

- Impoundment 26: VOC, SVOC and metal concentrations within the vicinity of impoundment 26 (MW-2) appear to be decreasing and/or stable but are above regulatory standards. For example, benzene concentrations in MW-2 over the past five years appear to exhibit a decreasing trend with a concentration of 400 ug/L during the most recent monitoring event. Naphthalene concentrations in MW-2 appear to exhibit a stable trend over the past five years with a concentration of 550 ug/L during the most recent monitoring event. Additionally, 1,4 dioxane was detected above regulatory standards at a concentration of 8.0 ug/L in the most recent sampling event. Attachments 25-27 include groundwater trend plots for VOCs, SVOCs and metals in MW-2.

The overburden wells that show the highest impacts and/or broadest range of impacts of major contaminants coincide with known or potential source areas that have not undergone, or currently are undergoing, remediation. These wells are generally located in the South Area in the vicinity of impoundments 1 and 2. Although high concentrations of benzene have been detected in the overburden groundwater, the discharge of overburden groundwater to surface water in this area is prevented by a removal action collection and treatment system that was implemented from 2011 to 2012.

For bedrock groundwater, the highest impacts of major contaminants generally are observed in the bedrock extraction wells in the North Area of the site (PW-2 and PW-3), monitoring wells MW32D and LA07-MP1 (in the vicinity of former impoundment 24) and in the South Area within the vicinity of Impoundments 1 and 2. This area will be address by the OU4 site-wide remedy that is currently in design.

#### Surface Water and Sediment

Surface water and sediment have been monitored on a quarterly basis since August 2012 and semi annual starting in 2015 with monitoring stations located throughout the Raritan River, Cuckel's Brook, Millstone River and Middle Brook.

In surface water, arsenic and manganese concentrations were found to be elevated in some of the sampling locations collected from the Raritan River. The concentrations were relatively similar to historical concentrations. Since there are exceedances of the ecological screening values the monitoring of surface water and sediment will continue.

Based on the recent sampling data it appears that sediment from Cuckel's Brook exhibits sporadic exceedances of the NJDEP ecological screening criteria. However, there are no clear trends associated with the exceedances and they appear to be similar to similar to historical sampling results.

In August 2013, following the discovery of two groundwater discharges in Cuckel's Brook containing elevated concentrations of VOCs, carbon bags were installed at the discharge points as an interim measure. This interim measure will remain in place until the groundwater portion of the OU4 site-wide remedy is fully implemented. While concentrations of major contaminants (e.g., benzene, naphthalene) in the Raritan River and Cuckel's Brook have been reported above surface water quality standards in recent monitoring events, interim measures (e.g., carbon bag installation and the South Area groundwater recovery system) have been implemented to reduce surface water impacts in advance of full implementation of the OU4 site-wide remedy. Surface water and sediment concentrations in Cuckel's Brook and Raritan River samples continue to decrease and stabilize following these modifications.

#### Ambient Air

The ambient air monitoring program initiated in mid-2012 collected quarterly ambient air sampling data throughout the site to use as a baseline during the implementation of the OU4 site-wide remedy. Currently ambient samples are collected semi annually. The results of the monitoring events generally have exhibited low level concentrations of constituents consistent with urban background monitoring stations measured by the NJDEP.

#### Site Inspection

The inspection of the Site was conducted on 3/14/2019. In attendance were Mark Schmidt, RPM, Mark Austin – Acting Chief, Mega Projects Section (at time of visit); Sharissa Singh – Hydrogeologist; and Michael Clementson – Ecological Risk Assessor; Representatives from Pfizer and BSI were also in attendance. The purpose of the inspection was to assess the protectiveness of the remedy.

The site visit began with a review and presentation of the major events and activities that have occurred over the past five years pertaining to the FYR. These items included a review of the completed remediation of OU1, OU2 and OU3, an update on the ongoing site-wide monitoring program, an update on the OU4 site-wide groundwater and soil remedial activities and an update on OU8.

A visual inspection of the former impoundments 11, 14, 15, 16, 18, 19, 20 and 26 was completed to assess the protectiveness of their respective remedies. The impoundment 8 facility where solidified material from the previously remediated impoundments was placed, was visually inspected. The active area of the impoundment has been overlain by temporary geomembrane covers to provide a barrier between the impoundment contents and stormwater. The maintenance and monitoring activities for the facility were discussed with the Pfizer representatives. The statistical analyses from the latest Impoundment 8 groundwater monitoring event (2018) indicate there are no statistically significant differences in groundwater quality of the downgradient monitoring wells as compared to the upgradient monitoring wells. Leachate monitoring results for 2018 did not exceed the current Action Leakage Rates. No other issues or concerns were identified.

The site inspection did not identify any issues that affected the protectiveness of the previously implemented remedies, or the progress of the ongoing remediation efforts.

## V. TECHNICAL ASSESSMENT

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

The remedies selected and implemented in the OU1, OU2 and OU3 RODs, as well as the OU2 and OU3 ESDs, are functioning as intended.

The objectives of the remedies selected for impoundments 11, 14, 15, 16, 19, 20 and 26 were to eliminate/control the sources of contamination and migration of contaminants, reduce the risk of potential exposures and contribute to compliance with ARARs for groundwater. The remedies for impoundments 11, 14, 19, 20 and 26 included excavation, solidification and placement in the impoundment 8 facility, while the remedy for impoundments 15 and 16 required the excavation and off-site recycling of iron oxide material. The remediation of impoundments 15 and 16 is ongoing and is expected achieve the remedial action objectives for these impoundments.

The OU2 ROD for impoundment 18 consisted of fencing, berm improvements and groundwater monitoring to eliminate/control the sources of contamination, eliminate potential exposures and contribute to compliance with ARARs for groundwater.

The implemented OU1, OU2 and OU3 remedies will or have achieved their respective RAOs and the completed activities are providing source control which is contributing to the compliance with groundwater ARARs. The implemented remedies have eliminated the exposure of humans to contaminated impoundment material and have eliminated these sources of contamination. While compliance with groundwater ARARs has not yet been achieved, overall groundwater trends for most site-related contaminants in areas downgradient of the remediated impoundments indicate stable and/or decreasing concentrations. Attainment of ARARs is expected to occur following the completion of the OU4 remedy, which will address groundwater impacts from other on-site sources.

Contaminant concentrations exceed regulatory standards in both the overburden and bedrock aquifers; however, based on the completed status of the remedies selected for OU1, OU2 and OU3, it appears that the remedial actions selected for each OU continue to operate and function as designed.

Once the groundwater portion of the OU4 remedy is fully implemented, the collection and treatment of site-related contaminated groundwater is expected to prevent the discharge of contaminated groundwater to nearby surface water bodies and restore groundwater quality in the overburden and bedrock aquifers within the area of attainment to their expected beneficial use. In the interim, the groundwater removal system has prevented the discharge of overburden groundwater to surface water in the impoundments 1 and 2 area. Interim measures have also been implemented to address contaminated groundwater discharges into Cuckel's Brook.

In addition, the site-wide CEA/WRA currently being put in place will serve to restrict potable use of groundwater until it has been restored. The surrounding communities are serviced by a public water supply, with the exception of residents located south of the Raritan River who

utilize private wells that are not hydraulically connected to the contaminated groundwater at the site.

An updated surface water and sediment monitoring program was developed in July 2012 to evaluate the potential migration of contaminated groundwater into adjacent surface water bodies. While concentrations of benzene in the Raritan River have decreased significantly since the installation of the removal action groundwater collection and treatment system, contaminant concentrations of some contaminants of concern in both Cuckel's Brook and the Raritan River remain above ecological screening values for sediment and above surface water quality standards for surface water. The OU4 remedy includes capture and treatment of contaminated groundwater that is currently impacting surface water and sediment. In the interim, the removal action groundwater collection and treatment system has reduced benzene discharges to the Raritan River and Cuckel's Brook, and the installation of carbon bags at two locations in Cuckel's Brook has reduced discharges of VOCs to the brook.

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

The exposure assumptions, toxicity data and cleanup levels that were identified in the RODs for OUs 1, 2, and 3 may have changed as science or policies change. In order to account for any changes in toxicity and exposure assumptions, the groundwater concentrations of the contaminants of concern were compared to their respective Regional Screening Levels (RSLs), New Jersey Department of Environmental Protection Groundwater Quality Standards (NJDEPGWQS), and their respective National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs). The MCL is the highest level of contaminant that is allowed in drinking water. MCLs are promulgated standards that apply to public water systems and are intended to protect human health by limiting the levels of contaminants in drinking water. RSLs are a human health risk-based value that is equivalent to a cancer risk of  $1 \times 10^{-6}$  or a hazard index of 1.

A review of the groundwater data indicates that concentrations of the site-related contaminants of concern continue to exceed their respective RSLs, NJDEP GWQS and MCLs. Currently, residents in the area are connected to the water supply. Therefore, the exposure pathway has been interrupted and is considered protective.

The implemented soil remedies are protective due to the engineering and access controls in place. The impoundment 8 facility, where solidified material from the previously remediated impoundments was placed, has been overlain by temporary geomembrane covers to provide a barrier between the impoundment contents and stormwater. The underlying primary and secondary liners are involved with detecting, collecting, and conveying leachate and stormwater away from the impoundment cells for subsequent treatment. On-going monitoring of the groundwater and leachate is conducted semi-annually and the results are regularly reviewed by EPA.

Due to the presence of VOCs in the shallow overburden groundwater, vapor intrusion (VI) assessments have been conducted at a warehouse building on the STS property located northeast

of the Site boundary. Although the investigations have not identified a complete VI pathway, the assessments will continue until the groundwater source is controlled under the OU4 remedy.

Although the ecological risk assessment screening and toxicity values used to support the various RODs may not necessarily reflect the current values, the excavation, solidification and/or capping of soil and/or impoundment material has or will eliminate any potential risk from surface soil and impoundment material contaminants to terrestrial receptors. A baseline ecological risk assessment conducted in 2005 concluded that the potential risks to ecological receptors from exposure to Raritan River sediment and/or surface water were low. Groundwater discharge mass loading calculations completed as part of this assessment suggested that exposure to overburden groundwater discharge of site contaminants is unlikely to affect the health and diversity of aquatic biota in the Raritan River. While recent surface water and sediment monitoring data do not suggest significant impacts to the environment, the continued monitoring of surface water and sediment will be performed to assess impacts to the river and the brook, and the further migration of any contaminated groundwater to surface water will be addressed by full implementation of the groundwater remedy for OU4.

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

No.

## VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
<b>OU(s) without Issues/Recommendations Identified in the Five-Year Review:</b>
OU1, 2, 3 and 4

No issues and recommendations were identified as part of this FYR.

## VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU1	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> <a href="#">Click here to enter a date</a>
<i>Protectiveness Statement:</i> The remedy at OU1 is protective of human health and the environment		

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU2	<i>Protectiveness Determination:</i> Will be Protective	<i>Planned Addendum Completion Date:</i> <a href="#">Click here to enter a date</a>
<i>Protectiveness Statement:</i> The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.		

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU3	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> <a href="#">Click here to enter a date</a>
<i>Protectiveness Statement:</i> The remedy at OU3 is protective of human health and the environment		

Protectiveness Statement(s)		
<i>Operable Unit:</i> OU4	<i>Protectiveness Determination:</i> Will be Protective	<i>Planned Addendum Completion Date:</i> <a href="#">Click here to enter a date</a>
<i>Protectiveness Statement:</i> The remedy at OU4 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.		

## VIII. NEXT REVIEW

The next FYR report for the American Cyanamid Superfund site, located in the Township of Bridgewater, Somerset County, New Jersey, is required five years from the completion date of this review.

## APPENDIX A – REFERENCE LIST

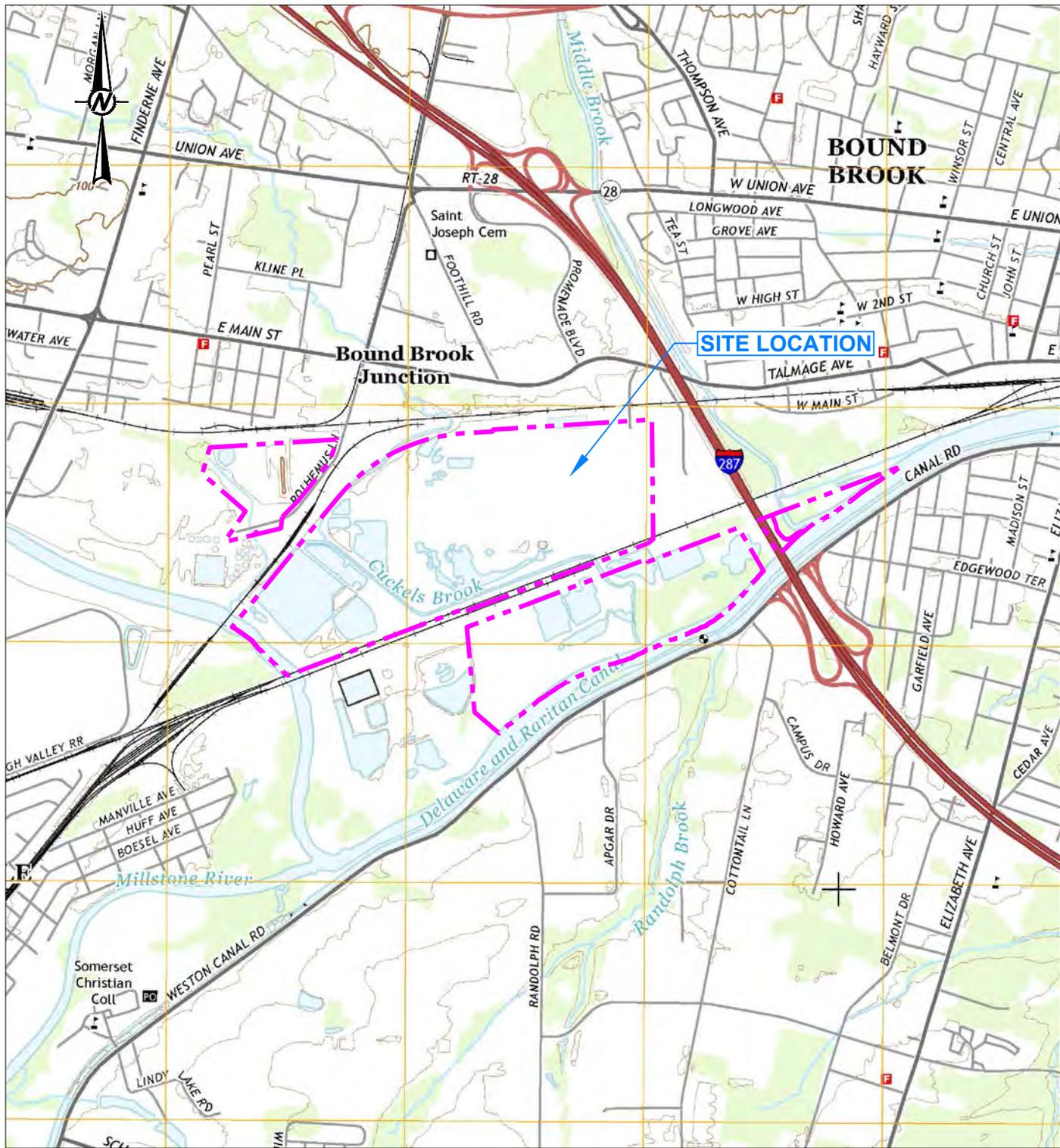
<b>Table 1: Chronology of Site Events</b>	
<b>Event</b>	<b>Date(s)</b>
Calco Chemical Company began manufacturing intermediate chemicals and dyes	1915
Calco facility purchased by American Cyanamid	1929
American Cyanamid notified EPA of release of hazardous substances	1981
Final NPL listing	Sep 1983
American Cyanamid enters ACO with NJDEP to address 16 impoundments, contaminated soils and groundwater	May 1988
Soils Remedial Investigation completed	May 1992
OU1 ROD executed for impoundments 11, 13, 19 & 24	Sep 1993
NJDEP executes ACO Amendment to include additional groundwater monitoring requirements	May 1994
American Cyanamid purchased by American Home Products Corporation	Dec 1994
Remediation of impoundment 19 completed per OU1 ROD	Nov 1995
OU2 ROD executed for impoundments 15, 16, 17 & 18	Jul 1996
OU6 ROD executed for Hill Property	Jul 1996
Remediation of impoundment 11 completed per OU1 ROD	Nov 1997
OU3 ROD executed for impoundments 1, 2, 3, 4, 5, 14, 20 & 26	Sep 1998
NJDEP issued ESD for part of OU2 (impoundments 15 & 16)	Nov 1998
Remediation of impoundment 18 completed per OU2 ROD	April 1998
OU6 Hill Property deleted from NPL	Dec 1998
All manufacturing at the site ceased	June 1999
First FYR	Sep 1999
American Home Products Corporation changes its name to Wyeth Holdings Corporation	Mar 2002
Most remedial activities at the site are suspended pending the reevaluation of previously selected remedies. Initiation of a Comprehensive Site-Wide FS	Spring 2004
Second FYR	Sep 2004
Baseline Ecological Risk Assessment	Jan 2005

Human Health Risk Assessment	Dec 2006
Remedial Investigation for Groundwater	Apr 2007
NJDEP issued ESD for part of OU3 (impoundments 14 & 20)	May 2007
EPA and NJDEP agree to separate impoundments 1 & 2 from the OU4 Site-wide remedy and address the two impoundments through a FFS under a newly created OU8	2009
Third FYR	Sep 2009
Pfizer, Inc. purchases Wyeth Holdings Corporation	Oct 2009
Remediation of impoundments 14 & 20 completed per 2007 OU3 ESD	Aug 2010
EPA Removal Action initiated following discovery of groundwater discharges into the Raritan River containing elevated levels of benzene	Dec 2010
Removal Action AOC executed between EPA and PRP to address groundwater discharges	July 2011
Comprehensive Site-wide FS completed	Feb 2012
EPA issues proposed plan for the OU4 Site-wide remedy	Feb 2012
Removal Action groundwater capture system completed and begins operating	May 2012
OU4 ROD executed for impoundments 3, 4, 5, 13, 17, 24, and site groundwater and soils	Sep 2012
AOC executed between EPA and PRP for the OU4 RD and OU8 FFS	Mar 2013
OU4 Remedial Design Start	Mar 2013
Execution of Amendments to OU4 RD/OU8 FFS AOC and Removal Action AOC	Aug 2013
Initiation of impoundments 1 & 2 pilot study	Jan 2014
Quarterly & Semi-Annual Groundwater Monitoring	2006-2019
Quarterly & Semi-Annual Surface Water & Sediment Monitoring	2005-2019
Quarterly Ambient Air Monitoring	2012-2019
Consent Decree for OU4 remedy construction/O&M	2015
OU8 ROD for Impoundments 1 and 2 Remedy	Aug 2018
Complete Design for OU4 groundwater component	Sep 2018

<b>Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review</b>	
<b>Document Title, Author</b>	<b>Submittal Date</b>
OU1 ROD, EPA Region 2	Sep 1993
OU2 ROD, EPA Region 2	Jul 1996
OU2 ESD, NJDEP	Nov 1998
OU3 ROD, EPA Region 2	Sep 1998
OU3 ESD, NJDEP	May 2007
OU6 ROD, EPA Region 2	Jul 1996
NJDEP ACO, NJDEP	May 1988
NJDEP ACO (Amended), NJDEP	May 1994
Removal Action AOC, EPA Region 2	Jul 2011
OU4 RD/OU8 FFS AOC, EPA Region 2	Mar 2013
Certification Report for Impoundment 19 Closure, O'Brien & Gere (OBG)	Nov 1995
Certification Report for Impoundment 11 Closure, OBG	Nov 1997
Certification Report for Impoundment 18 Closure, OBG	Apr 1998
Certification Report for Impoundment 26 Closure, OBG	May 2002
Certification Report for Impoundments 14 and 20 Closure, OBG	Dec 2009
First FYR Report, EPA Region 2	Sep 1999
Second FYR Report, EPA Region 2	Sep 2004
Third FYR Report, EPA Region 2	Sep 2009
Impoundment Characterization Program Report, Blasland, Bouck & Lee (BBL)	Aug 1990
Natural Resource Assessment, BBL	Apr 1994
Soils Remedial Investigation Report, BBL	May 1992
Remedial Investigation Report for Groundwater, OBG	Feb 2006
Supplemental Remedial Investigation Report for Groundwater, OBG	Apr 2007
Baseline Endangerment Assessment, BBL	Mar 1992

<b>Table 2: Documents, Data and Information Reviewed in Completing the Five-Year Review</b>	
Baseline Ecological Risk Assessment, OBG	Jan 2005
Human Health Risk Assessment, OBG	Dec 2006
Streamlined Human Health Risk Assessment, EPA Region 2	Feb 2010
Comprehensive Site-wide Feasibility Study, OBG	Feb 2012
OU4 ROD, EPA Region 2	Sep 2012
Quarterly & Semi-Annual Groundwater Monitoring Reports, OBG & Golder Associates	2006-2018
Quarterly & Semi-Annual Surface Water & Sediment Monitoring Reports, OBG & Golder Associates	2005-2018
Quarterly Ambient Air Monitoring Reports, CH2M Hill	2012-2014
Semi-Annual Ambient Air Monitoring Reports	2014-2016
Annual Monitoring Report	2017
Groundwater Extraction and Injection Remedial Design Report	Feb 2019

## **APPENDIX B - Attachments**



**REFERENCE(S)**

1. MAP FROM 7.5 MINUTE U.S.G.S. QUADRANGLE OF BOUND BROOK, NEW JERSEY, DATED 2014.
2. PROPERTY LINE FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.



CLIENT  
**WYETH HOLDINGS LLC.**  
**AMERICAN CYANAMID SUPERFUND SITE**  
**BRIDGEWATER TOWNSHIP, NEW JERSEY**

PROJECT  
**2017 ANNUAL MONITORING REPORT**

CONSULTANT

YYYY-MM-DD 2019-06-12

DESIGNED JAS

PREPARED GLS

REVIEWED PLL

APPROVED SDM

TITLE

**SITE LOCATION MAP**

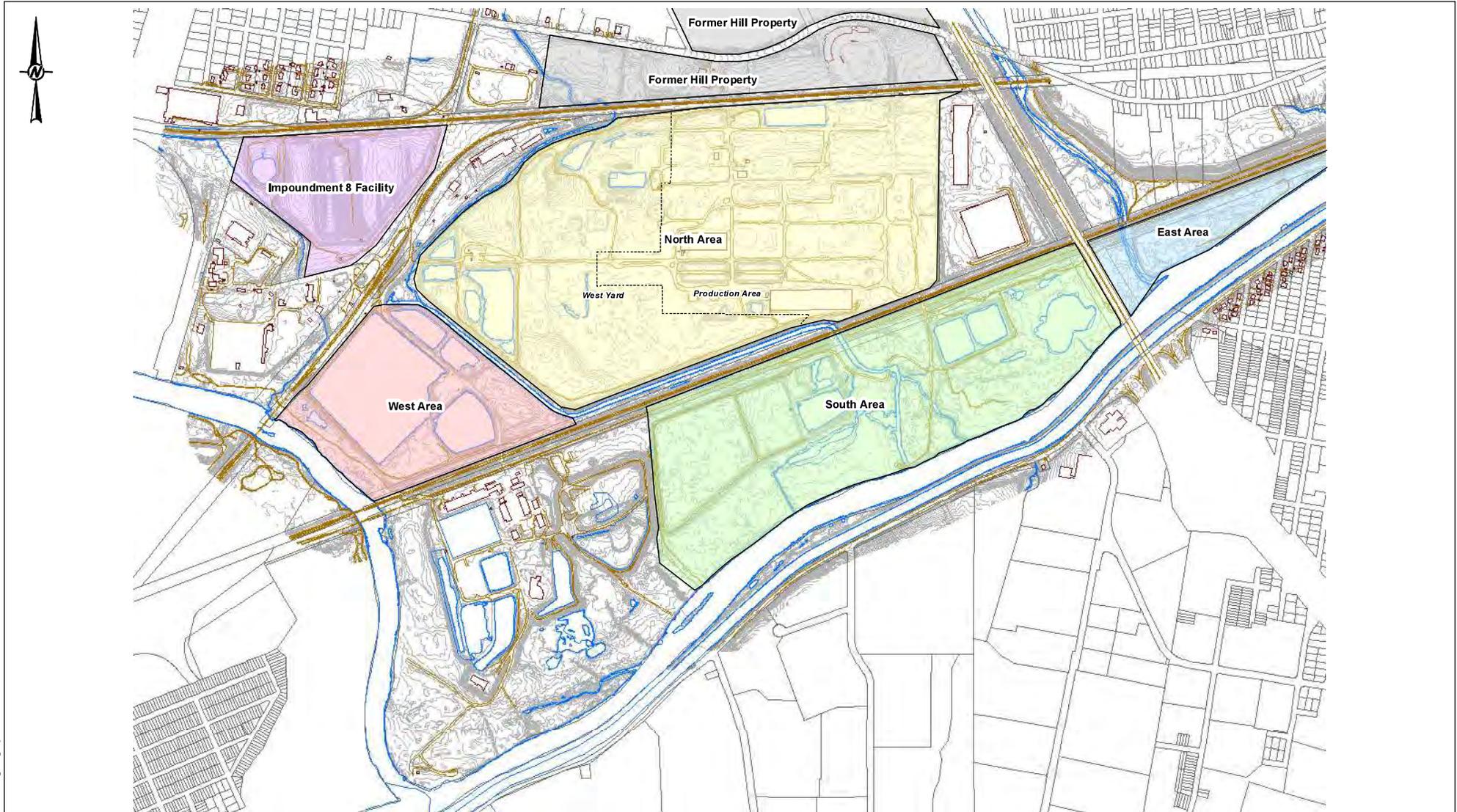
PROJECT NO.  
**1772614**

CONTROL  
**0005-001**

REV.  
**0**

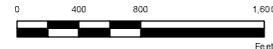
FIGURE  
**1**





LEGEND	
<span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span>	NORTH AREA
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<span style="display:inline-block; width:15px; height:15px; background-color:pink; border:1px solid black;"></span>	WEST AREA
<span style="display:inline-block; width:15px; height:15px; background-color:lightblue; border:1px solid black;"></span>	EAST AREA
<span style="display:inline-block; width:15px; height:15px; background-color:purple; border:1px solid black;"></span>	IMPOUNDMENT 8 FACILITY
<span style="display:inline-block; width:15px; height:15px; background-color:grey; border:1px solid black;"></span>	FORMER HILL PROPERTY
<span style="display:inline-block; width:15px; border-bottom:1px dashed black;"></span>	APPROXIMATE BOUNDARY BETWEEN THE WEST YARD AND PRODUCTION AREA
<span style="display:inline-block; width:15px; border-bottom:1px solid blue;"></span>	WATER FEATURE
<span style="display:inline-block; width:15px; border-bottom:1px solid brown;"></span>	TOPOGRAPHIC CONTOUR

**REFERENCE(S)**  
 1. BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED MAY 17, 2013), PREPARED BY VARGO ASSOCIATES.



CLIENT  
**WYETH HOLDINGS LLC**  
**AMERICAN CYANAMID SUPERFUND SITE**  
**BRIDGEWATER TOWNSHIP, NEW JERSEY**

PROJECT  
**100% GWEIS DESIGN**

CONSULTANT	DATE
<b>Golden Associates</b>	2018-12-20
DESIGNED	BAC
PREPARED	AM
REVIEWED	BAC
APPROVED	RSW

TITLE  
**MAP DEPICTING MAIN AREAS OF THE SITE**

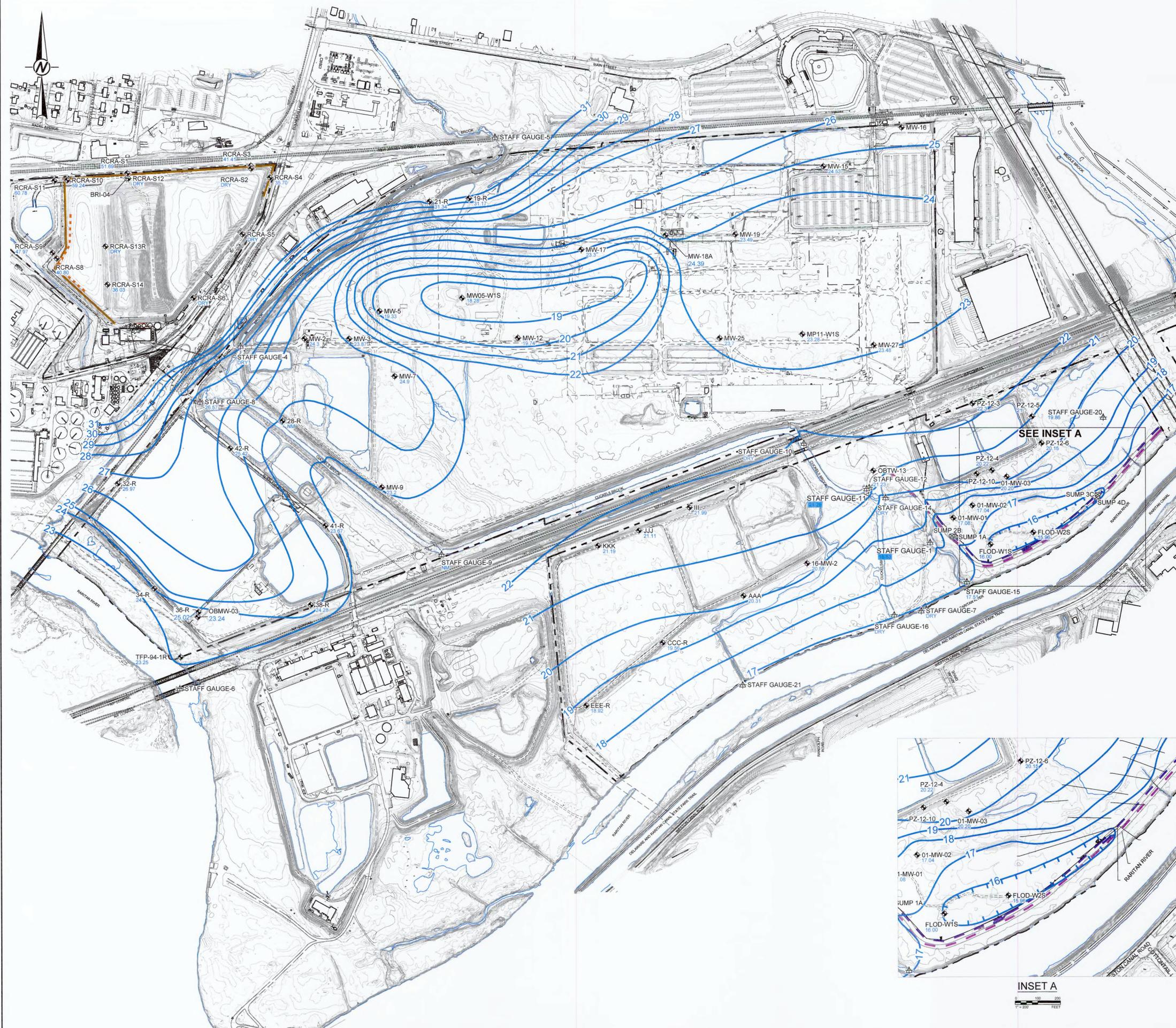
PROJECT NO.	CONTROL	REV.
103-86245	ZZB45	0

FIGURE  
**3**

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IF THIS INSTRUMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANEB 25mm





**LEGEND**

	PROPERTY LINE
	TOPOGRAPHIC CONTOUR
	GROUNDWATER CONTOUR (DASHED WHERE INFERRED)
	GROUNDWATER ELEVATION (OCTOBER 2017)
	VALUE NOT MEASURED
	GROUNDWATER ELEVATION DETERMINED USING MEASURING POINT ELEVATION CONVERTED FROM SITE DATUM NAVD 29 TO NAD 88.
	GROUNDWATER CUT-OFF WALL (SEE REFERENCE 3)
	GROUNDWATER INTERCEPTOR TRENCH (SEE REFERENCE 3)
	EXISTING SOUTH AREA GROUNDWATER CONTAINMENT WALL (SEE REFERENCE 4)
	EXISTING SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 4)
	OVERBURDEN MONITORING WELL
	EXISTING SOUTH AREA GROUNDWATER COLLECTION SUMP
	STAFF GAUGE

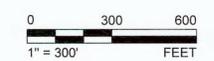
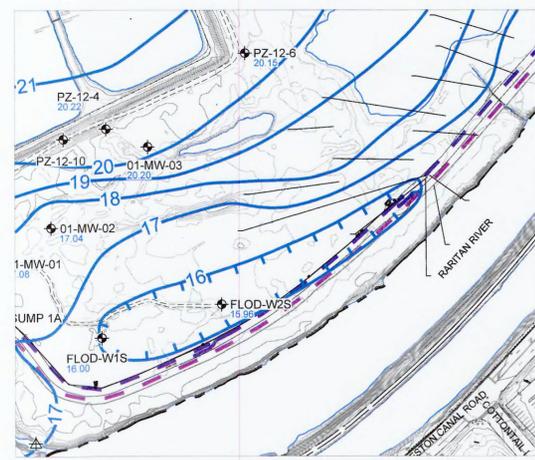
**NOTE(S)**

- STAFF GAUGE REFERENCE ELEVATIONS WERE RESURVEYED IN SITE DATUM (FEB 2012). REFERENCE ELEVATIONS IN SITE DATUM WERE CONVERTED TO APPROXIMATE FT MSL IN NGVD29 (SITE DATUM OF 69.29 FT = APPROXIMATE MSL NGVD29). WATER ELEVATIONS WERE DETERMINED USING CONVERTED REFERENCE ELEVATIONS IN APPROXIMATE NGVD29.

**REFERENCE(S)**

- BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.
- HORIZONTAL DATUM: NJSPCS NAD83; VERTICAL DATUM: NAVD88
- GROUNDWATER CUT-OFF WALL AND GROUNDWATER INTERCEPTOR TRENCH DIGITIZED FROM FIGURE 4-1, ENTITLED "IMPONDMENT 8 MONITORING WELL LOCATION PLAN," PREPARED BY O'BRIEN & GERE, DATED FEBRUARY 16, 2012.
- SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
- WELL LOCATIONS FROM VARGO ASSOCIATES.

SEE INSET A



CLIENT  
**WYETH HOLDINGS LLC.**  
 AMERICAN CYANAMID SUPERFUND SITE  
 BRIDGEWATER TOWNSHIP, NEW JERSEY  
 PROJECT  
**2017 ANNUAL MONITORING REPORT**

TITLE  
**OVERBURDEN GROUNDWATER POTENTIOMETRIC CONTOUR MAP  
 OCTOBER 2017**

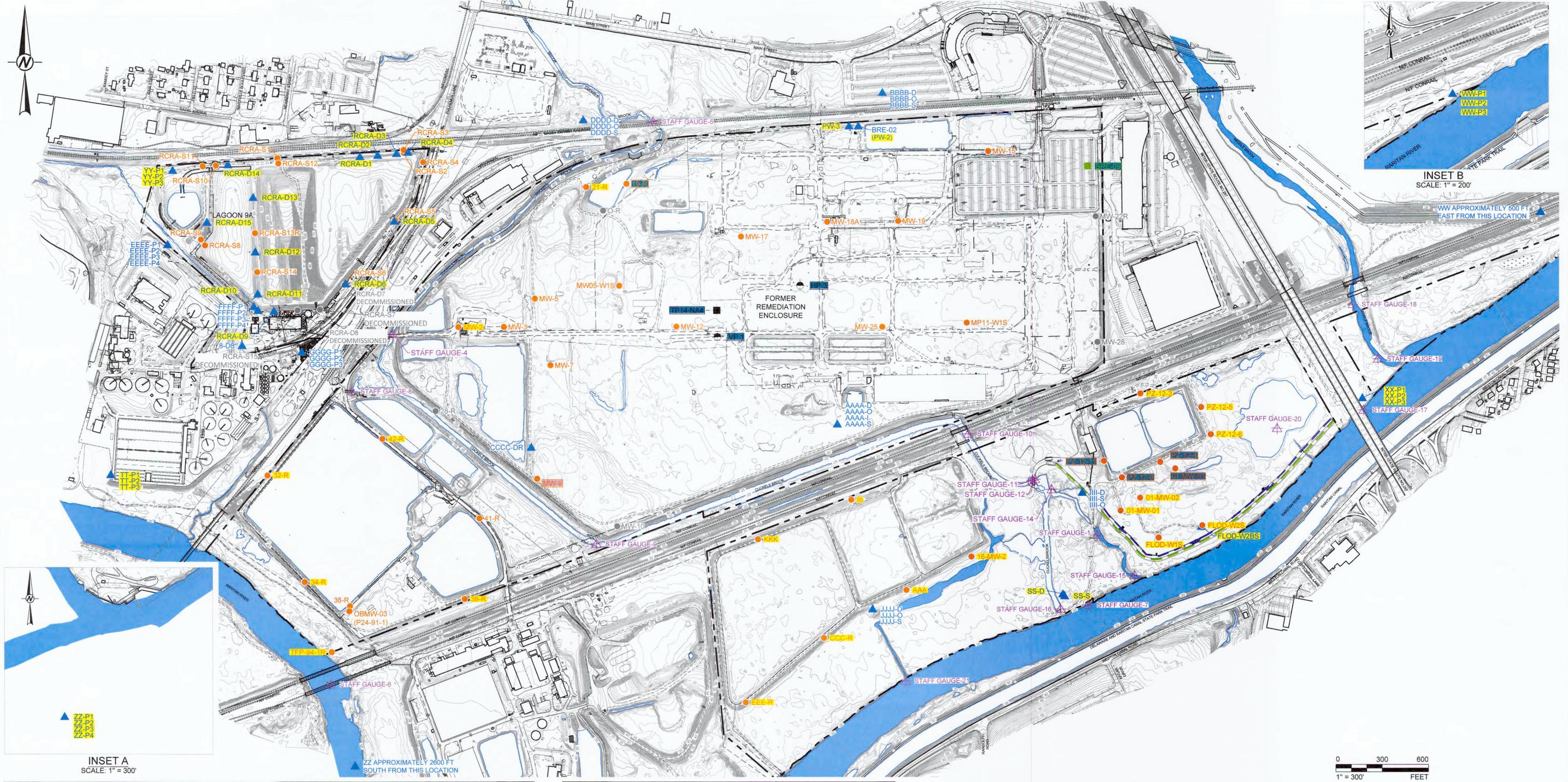
CONSULTANT	YYYY-MM-DD	2019-06-12
	DESIGNED	JAS
	PREPARED	GLS
	REVIEWED	BAC
	APPROVED	ACK

PROJECT NO. 1772614 CONTROL 0005-007 REV. 0 FIGURE 6

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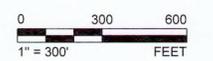
1 in. IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ARCH/D





LEGEND	
	BUILDING
	PROPERTY LINE
	EASEMENT
	TOPOGRAPHIC CONTOUR LINE
	RAILROAD
	FENCE
	ROAD
	OVERHEAD WIRES
	GUIDE RAIL
	SOUTH AREA HBW (SEE REFERENCE 4)
	SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 4)
	BEDROCK MONITORING (SAMPLED)
	BEDROCK MONITORING (WATER LEVEL ONLY)
	OVERBURDEN MONITORING (SAMPLED)
	OVERBURDEN MONITORING (WATER LEVEL ONLY)
	STAFF GAUGE
	DECOMMISSIONED MONITORING WELL
	BEDROCK EXTRACTION WELL
	TEST PIT (SEE REFERENCE 6)
	LOCATION OF OBSERVED NAPL
	LOCATION OF SUSPECTED NAPL

- REFERENCE(S)**
1. BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.
  2. WELL LOCATIONS FROM FILES BRIDGEWATER\_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGEWATER\_SURVEY\_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
  3. HORIZONTAL DATUM REFERENCES THE NEW JERSEY STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88).
  4. GROUNDWATER CUT-OFF WALL AND GROUNDWATER INTERCEPTOR TRENCH DIGITIZED FROM FIGURE 4-1, ENTITLED "IMPOUNDMENT & MONITORING WELL LOCATION PLAN," PREPARED BY O'BRIEN & GERE, DATED FEBRUARY 16, 2012.
  5. EXISTING SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
  6. TEST PIT LOCATION TAKEN FROM 10-24AND27-14\_BOR\_ASB.XLSX SURVEYED BY VARGO ASSOCIATES.



CLIENT  
**WYETH HOLDINGS LLC.**  
 AMERICAN CYANAMID SUPERFUND SITE  
 BRIDGEWATER TOWNSHIP, NEW JERSEY

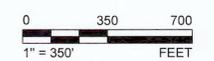
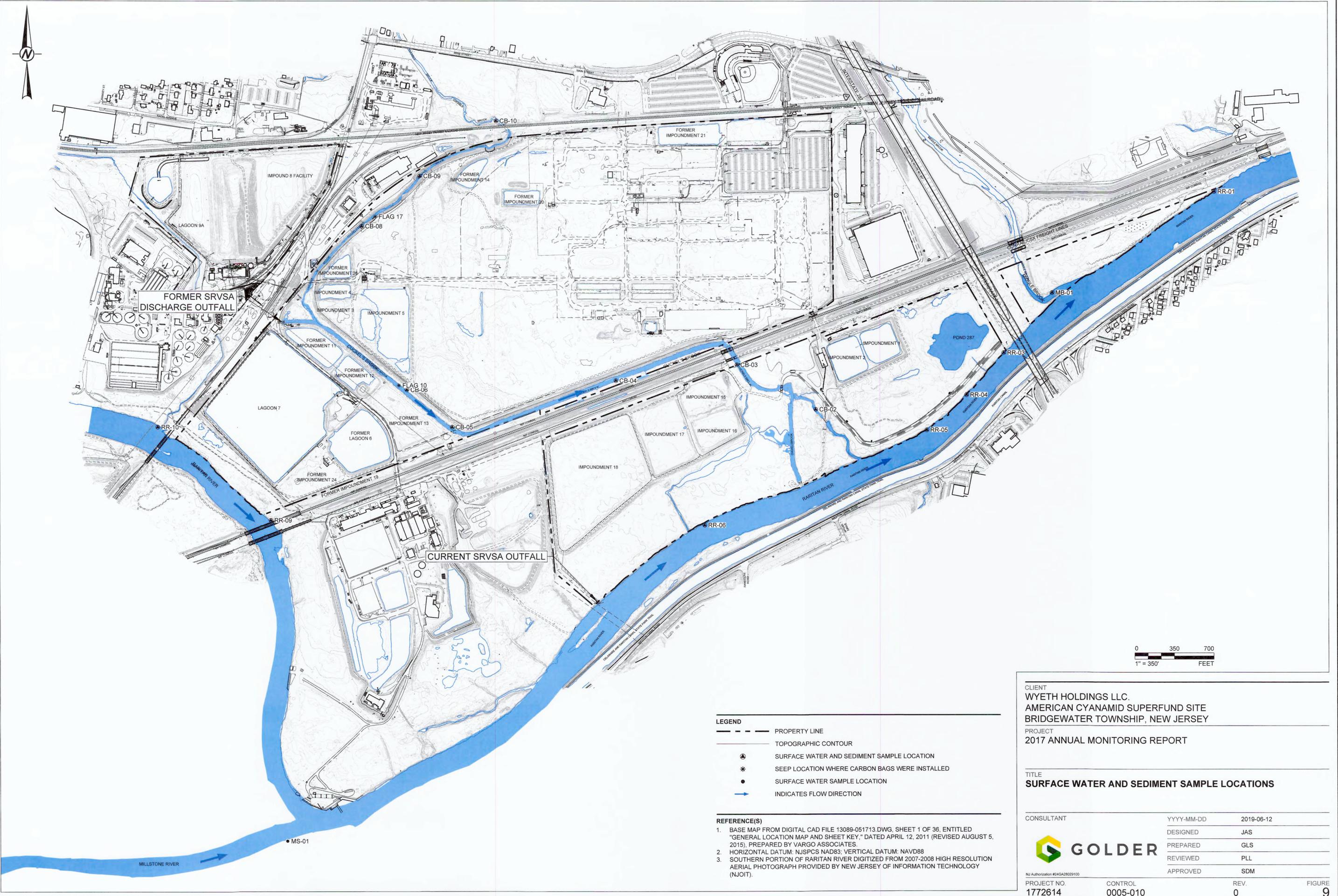
PROJECT  
**2017 ANNUAL MONITORING REPORT**

TITLE  
**GROUNDWATER MONITORING LOCATIONS**

CONSULTANT	DATE
YYYY-MM-DD	2019-06-12
DESIGNED	JAS
PREPARED	GLS
REVIEWED	PLL
APPROVED	SDM

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ARCH.D



**LEGEND**

- — — — — PROPERTY LINE
- — — — — TOPOGRAPHIC CONTOUR
- (with dot) SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- \* SEEP LOCATION WHERE CARBON BAGS WERE INSTALLED
- SURFACE WATER SAMPLE LOCATION
- INDICATES FLOW DIRECTION

**REFERENCE(S)**

1. BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.
2. HORIZONTAL DATUM: NJSPCS NAD83; VERTICAL DATUM: NAVD88
3. SOUTHERN PORTION OF RARITAN RIVER DIGITIZED FROM 2007-2008 HIGH RESOLUTION AERIAL PHOTOGRAPH PROVIDED BY NEW JERSEY OF INFORMATION TECHNOLOGY (NJIT).

CLIENT  
**WYETH HOLDINGS LLC.**  
 AMERICAN CYANAMID SUPERFUND SITE  
 BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT  
 2017 ANNUAL MONITORING REPORT

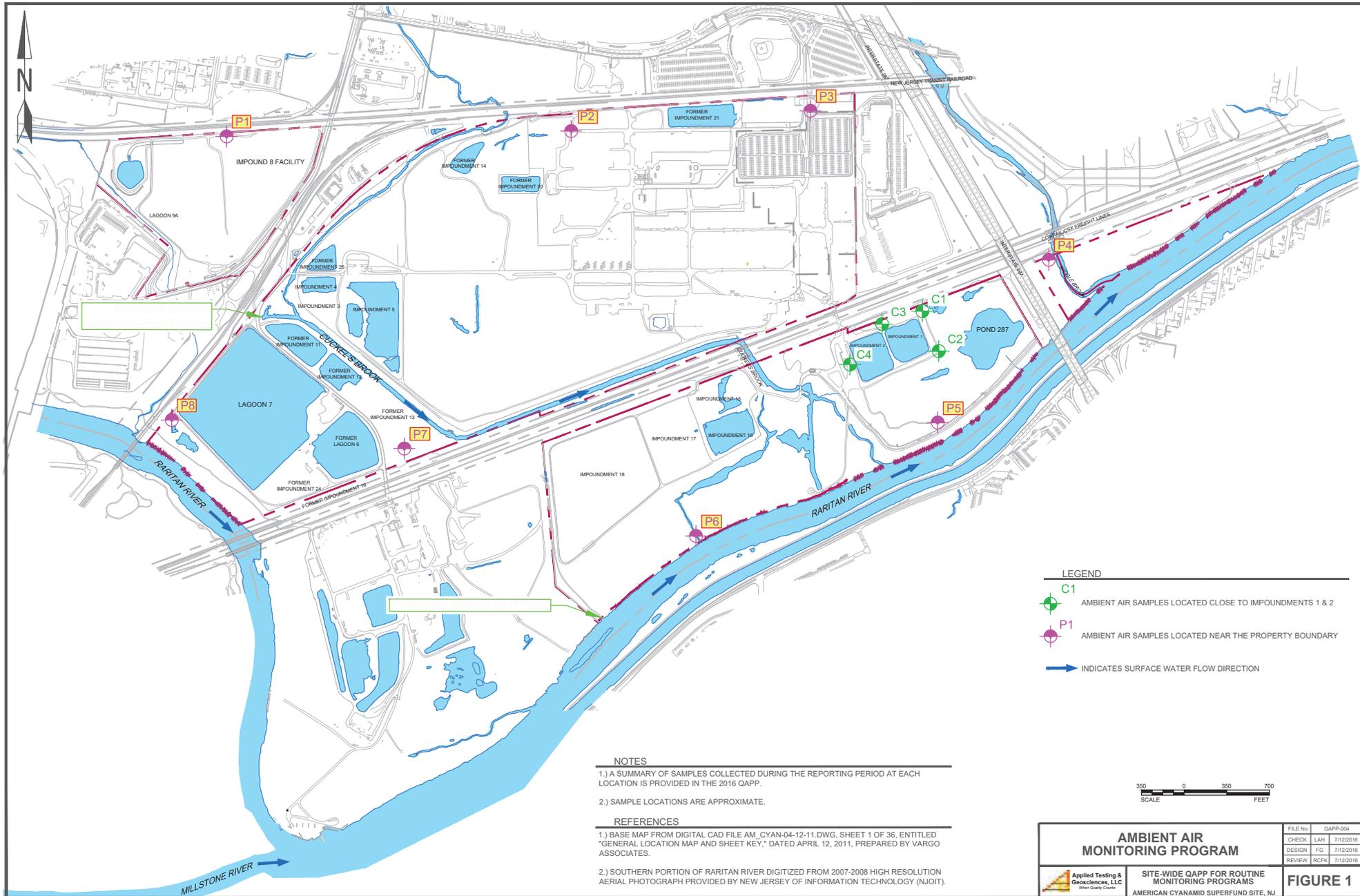
TITLE  
**SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS**

CONSULTANT	YYYY-MM-DD	2019-06-12
 <b>GOLDER</b>	DESIGNED	JAS
	PREPARED	GLS
	REVIEWED	PLL
	APPROVED	SDM

PROJECT NO. 1772614	CONTROL 0005-010	REV. 0	FIGURE 9
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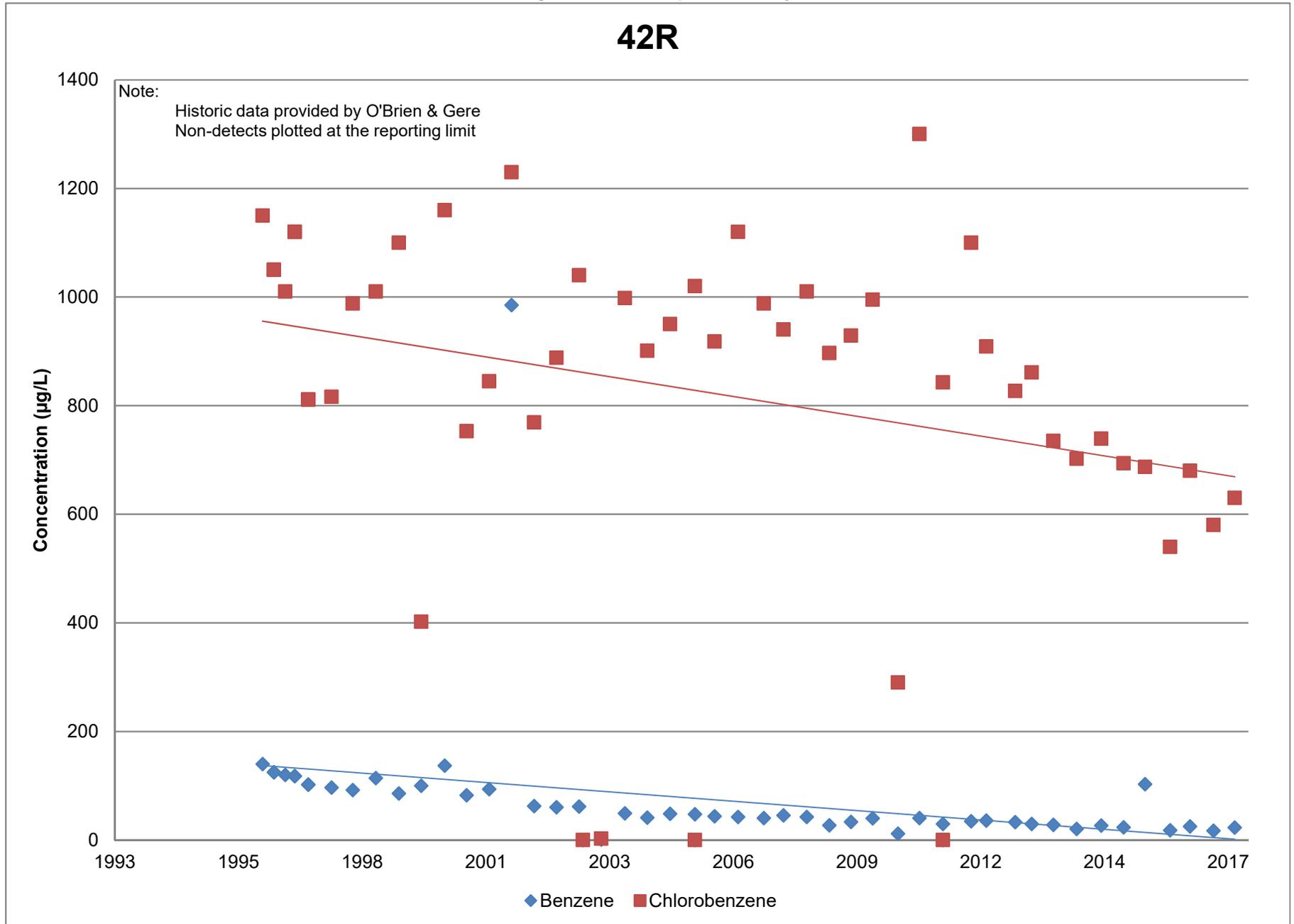


# Attachment 9

May 2018

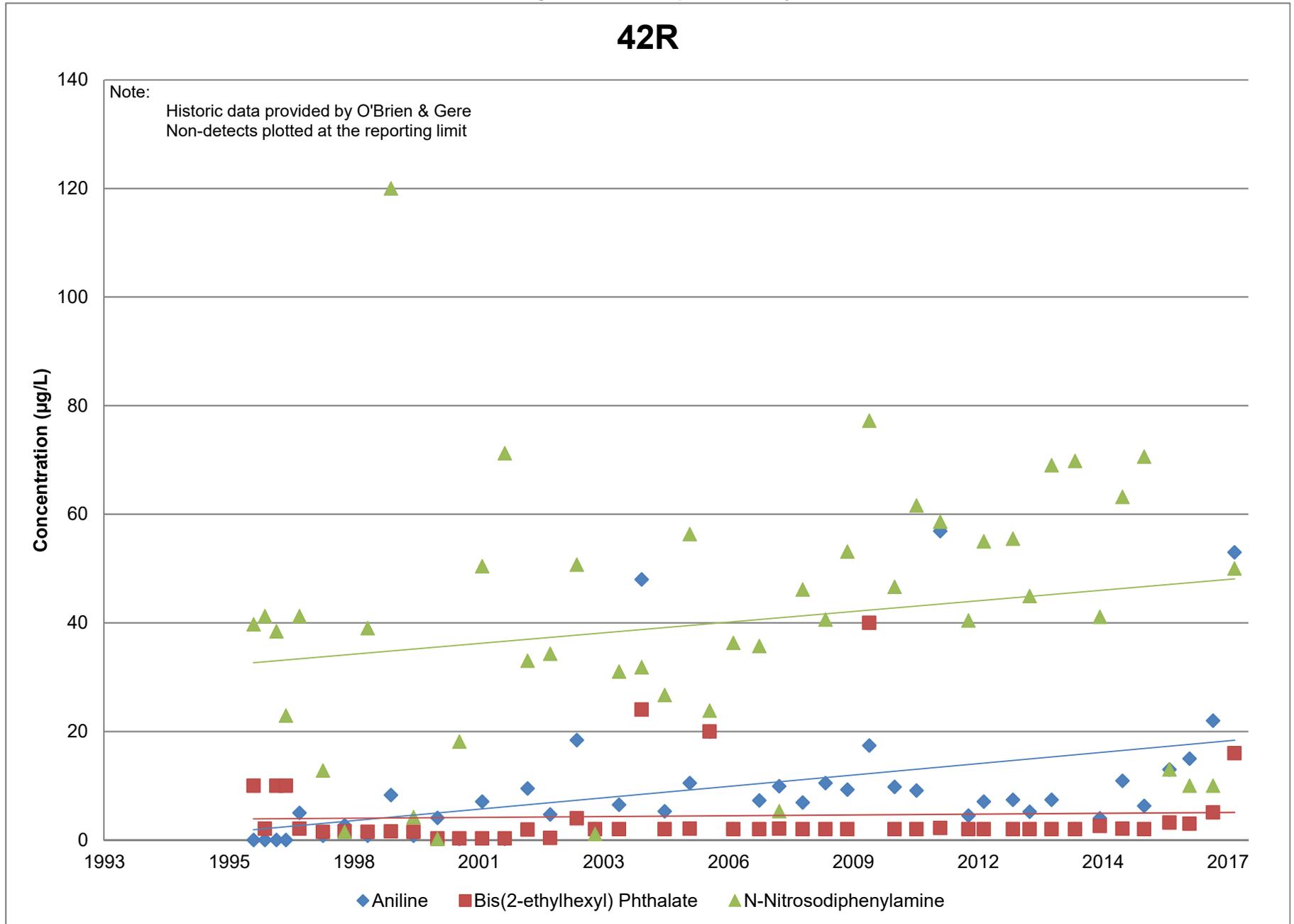
Appendix E - Groundwater Concentration vs. Time Trends  
American Cyanamid Superfund Site  
Bridgewater Township, New Jersey

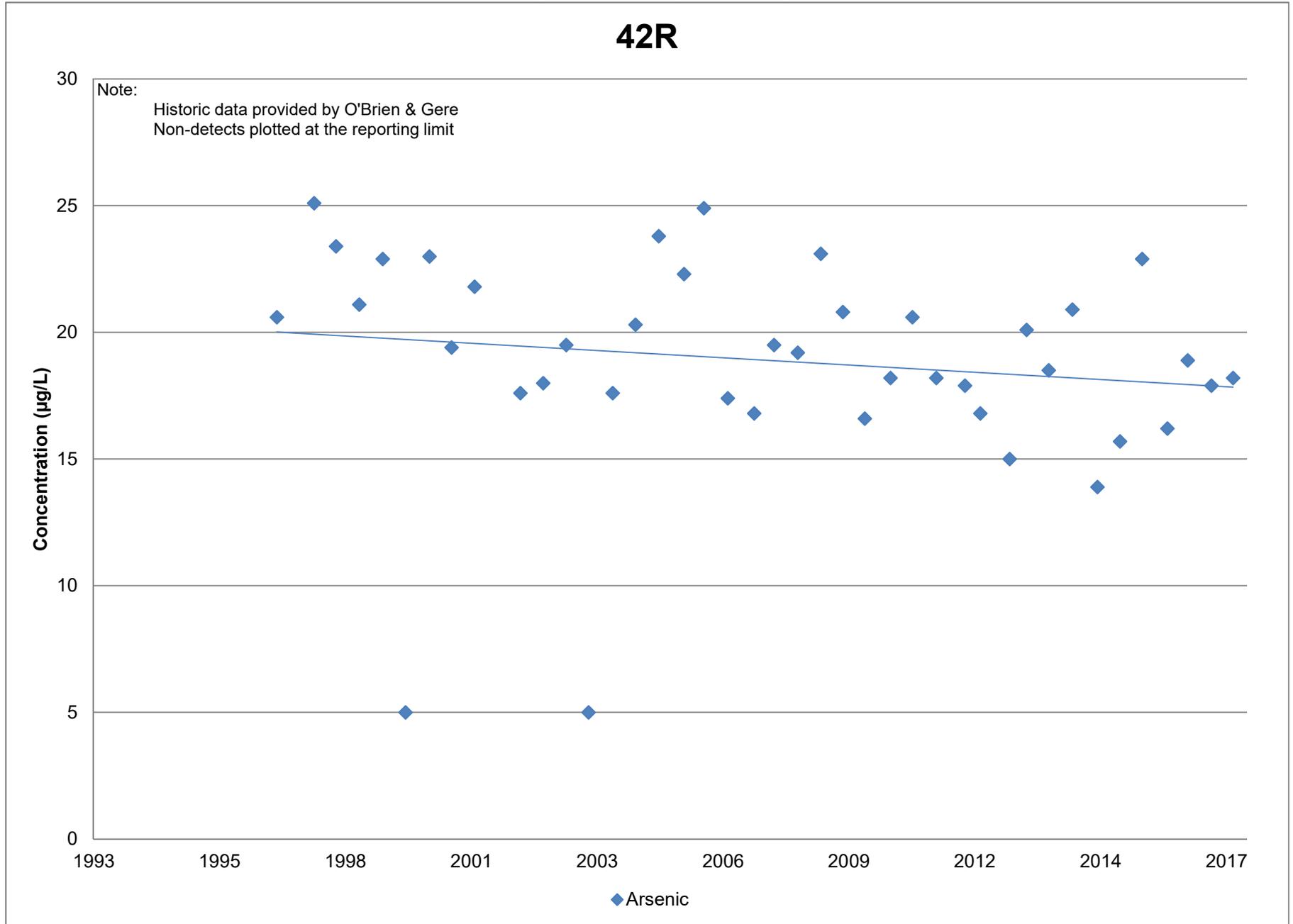
1772614

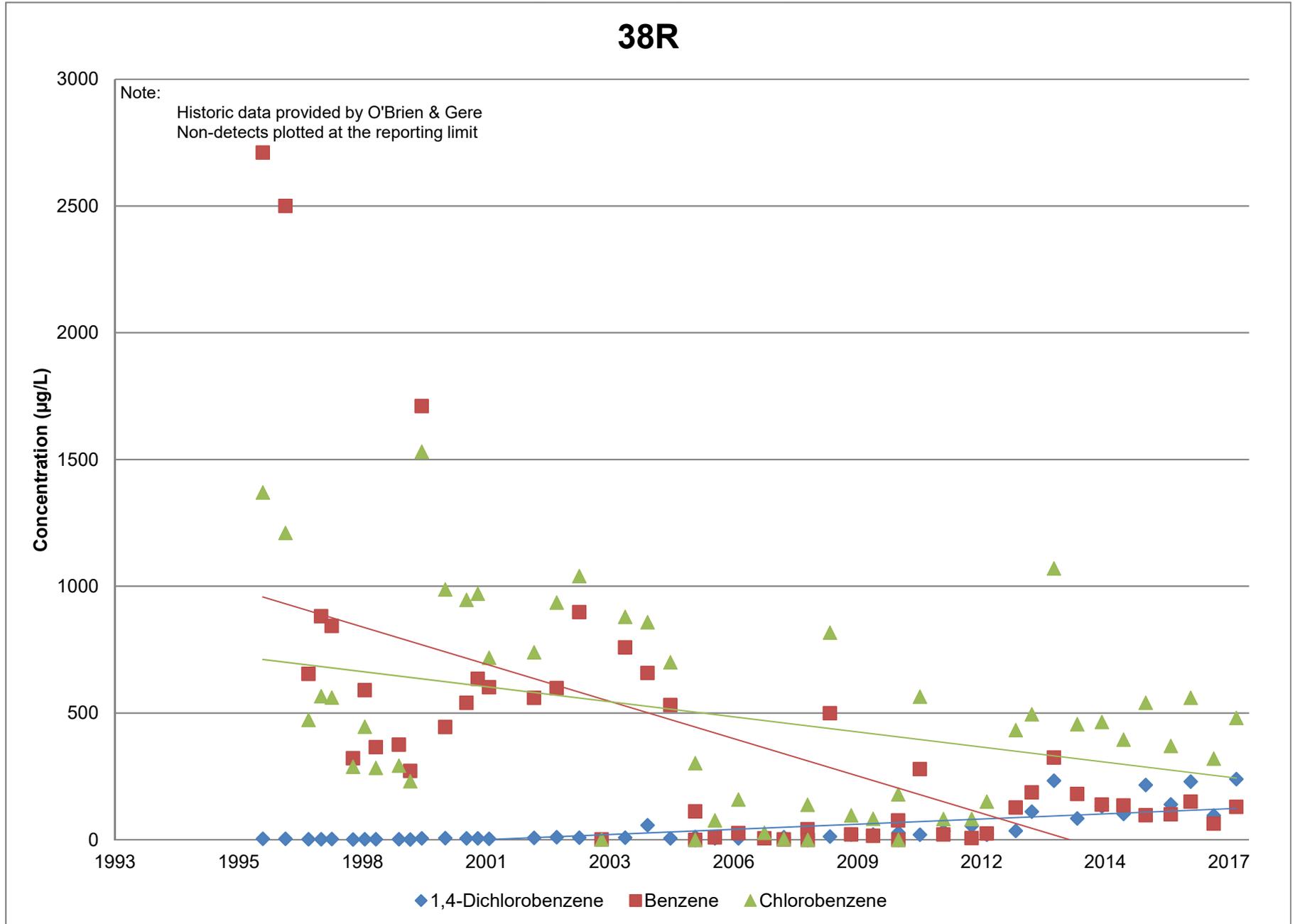


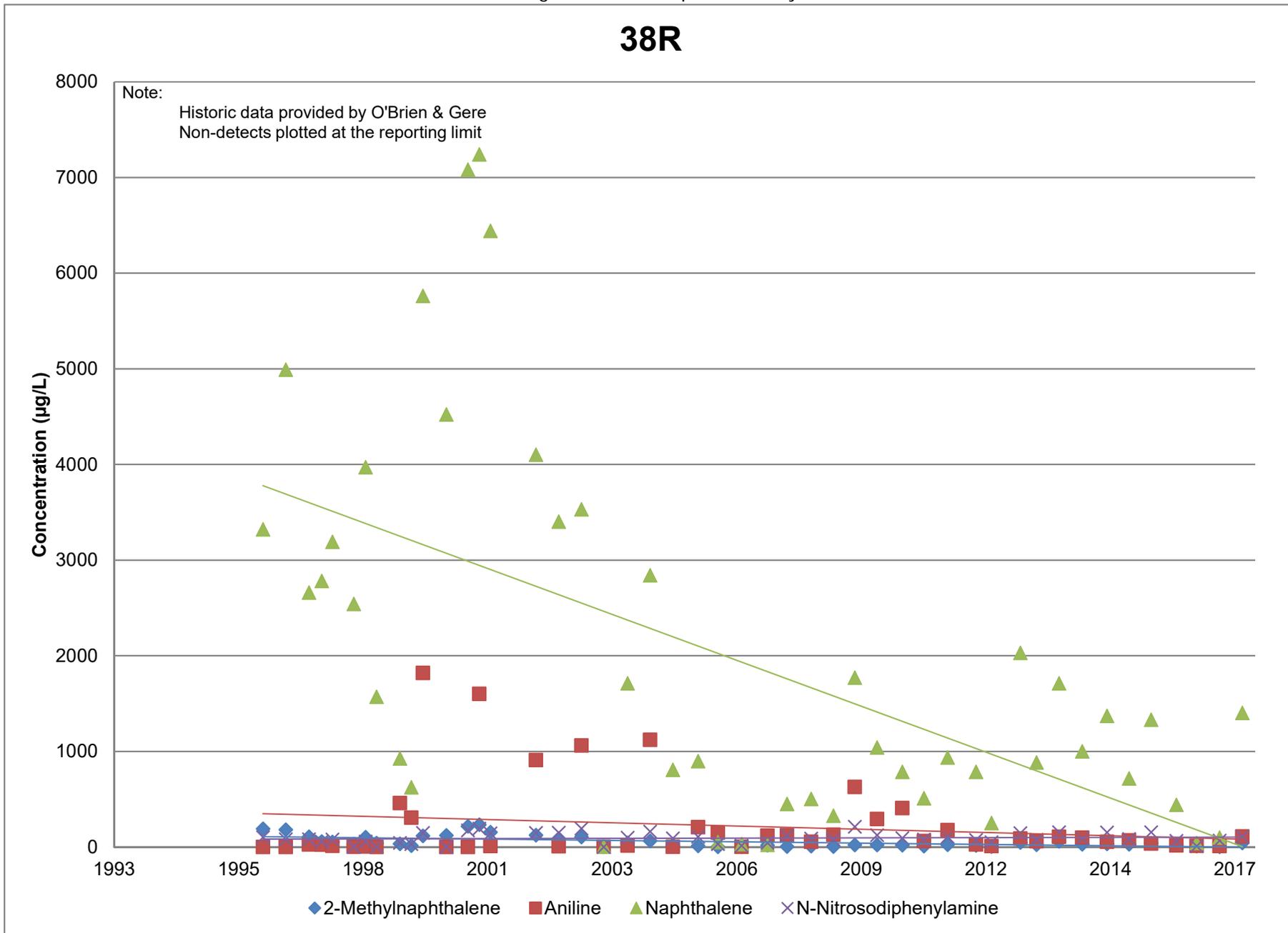
American Cyanamid Superfund Site

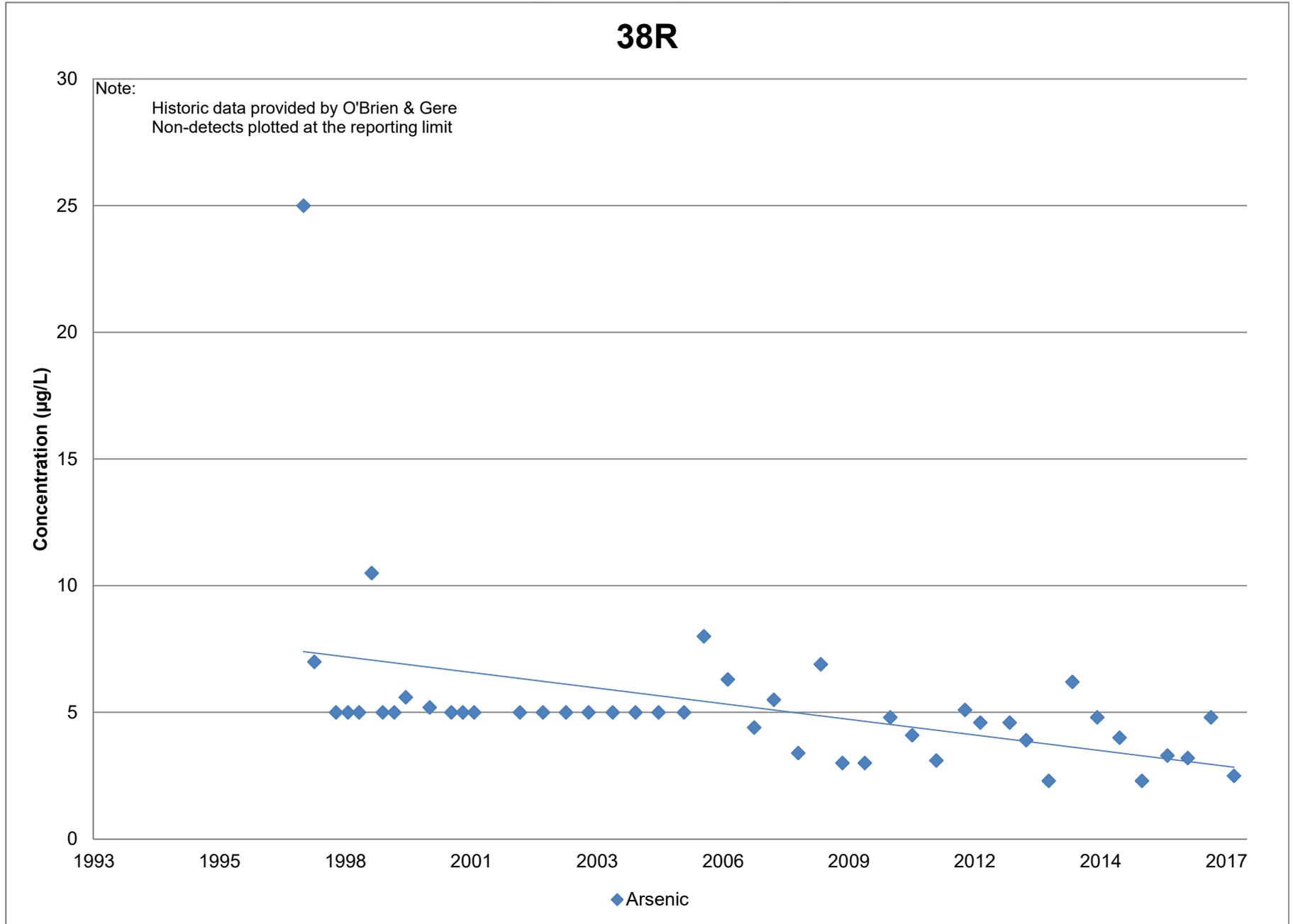
Bridgewater Township, New Jersey







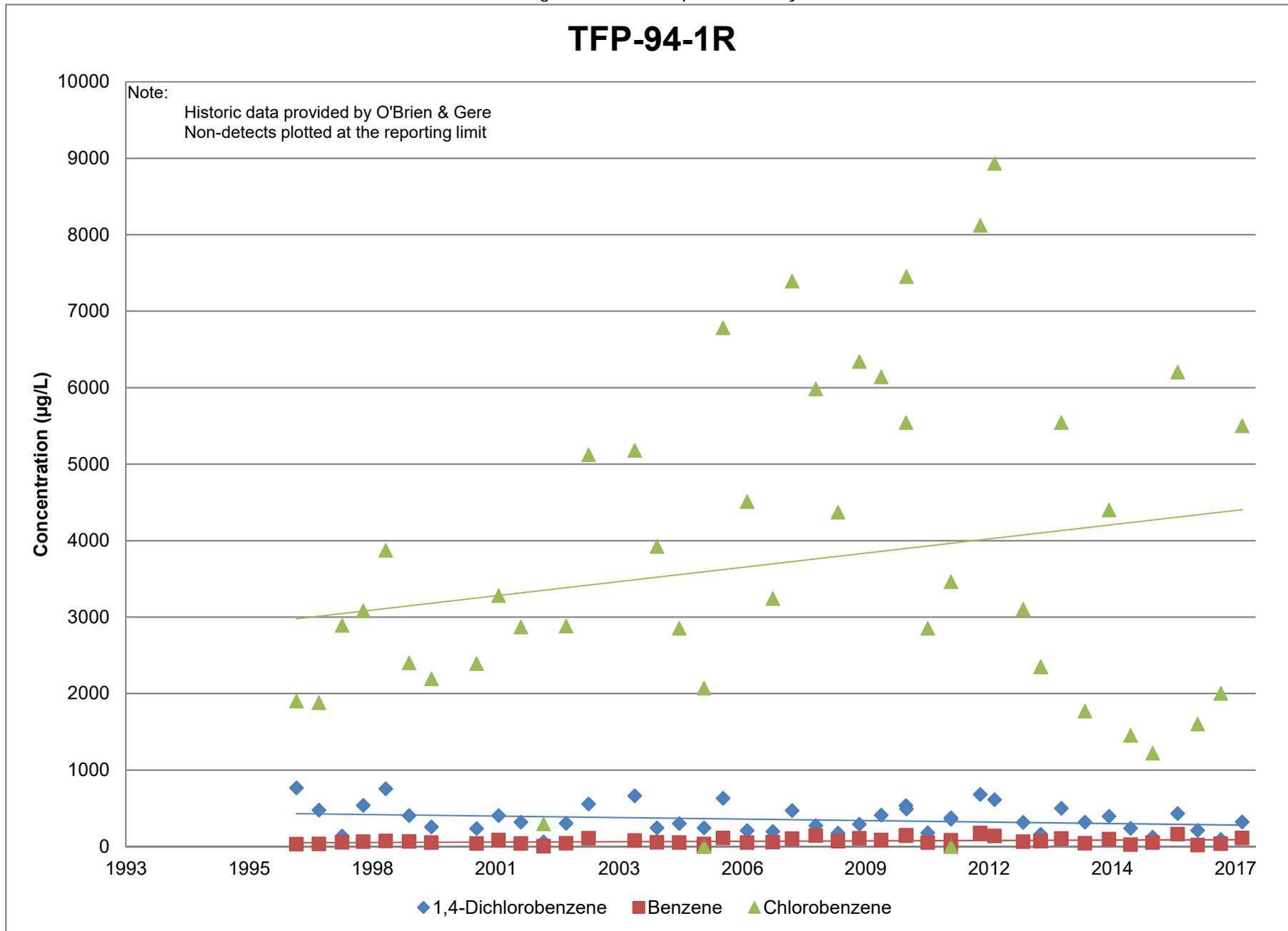


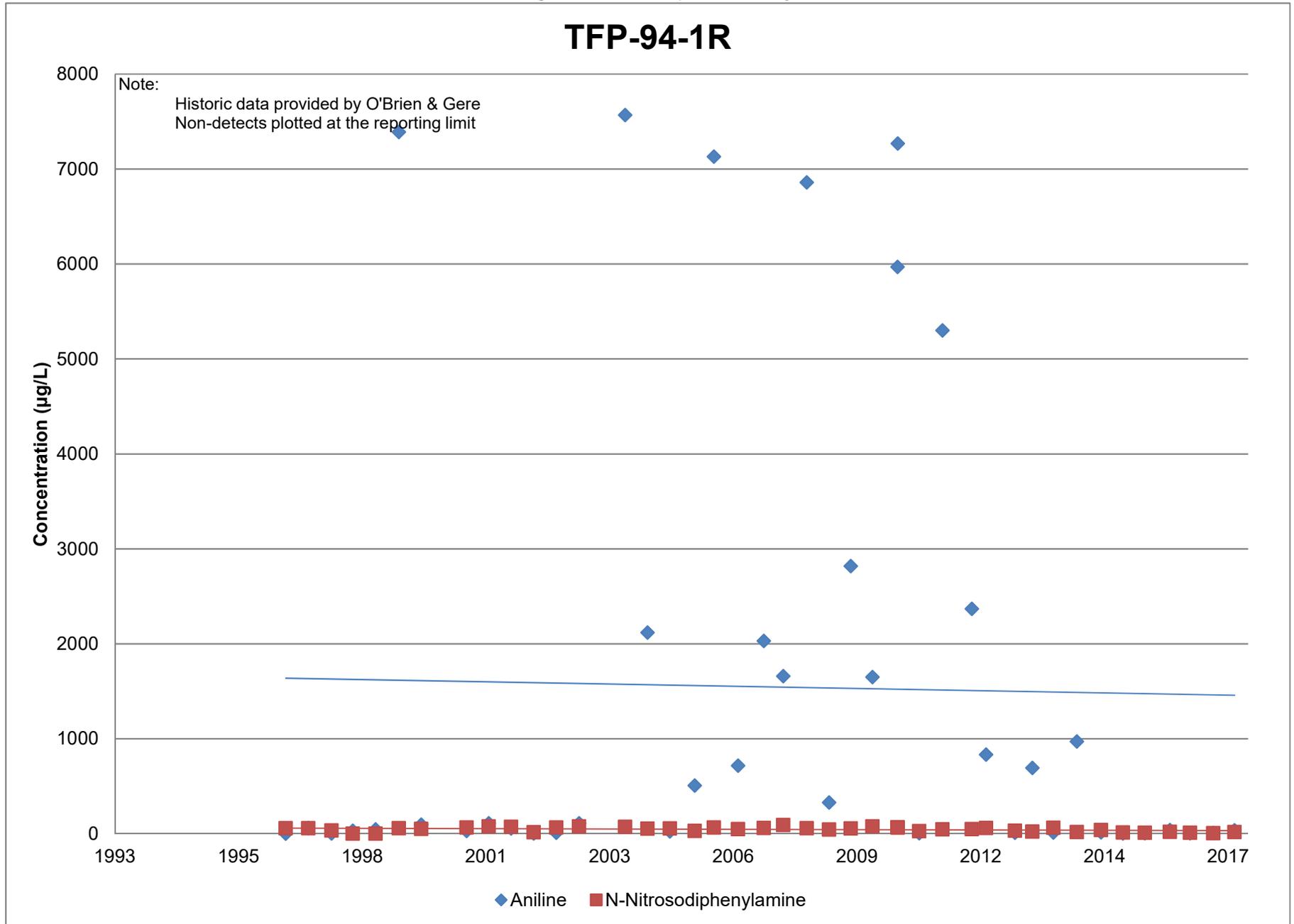


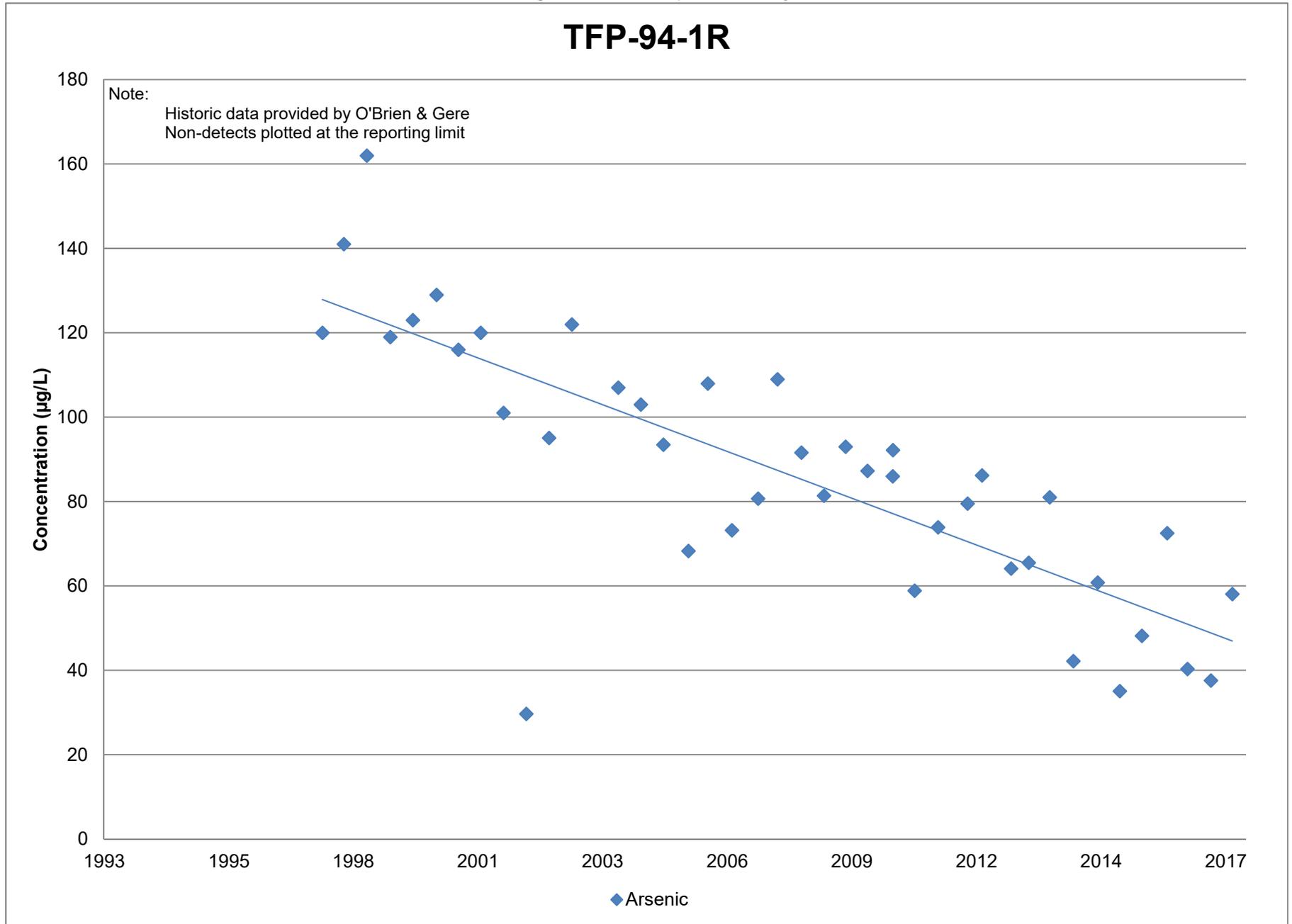
American Cyanamid Superfund Site

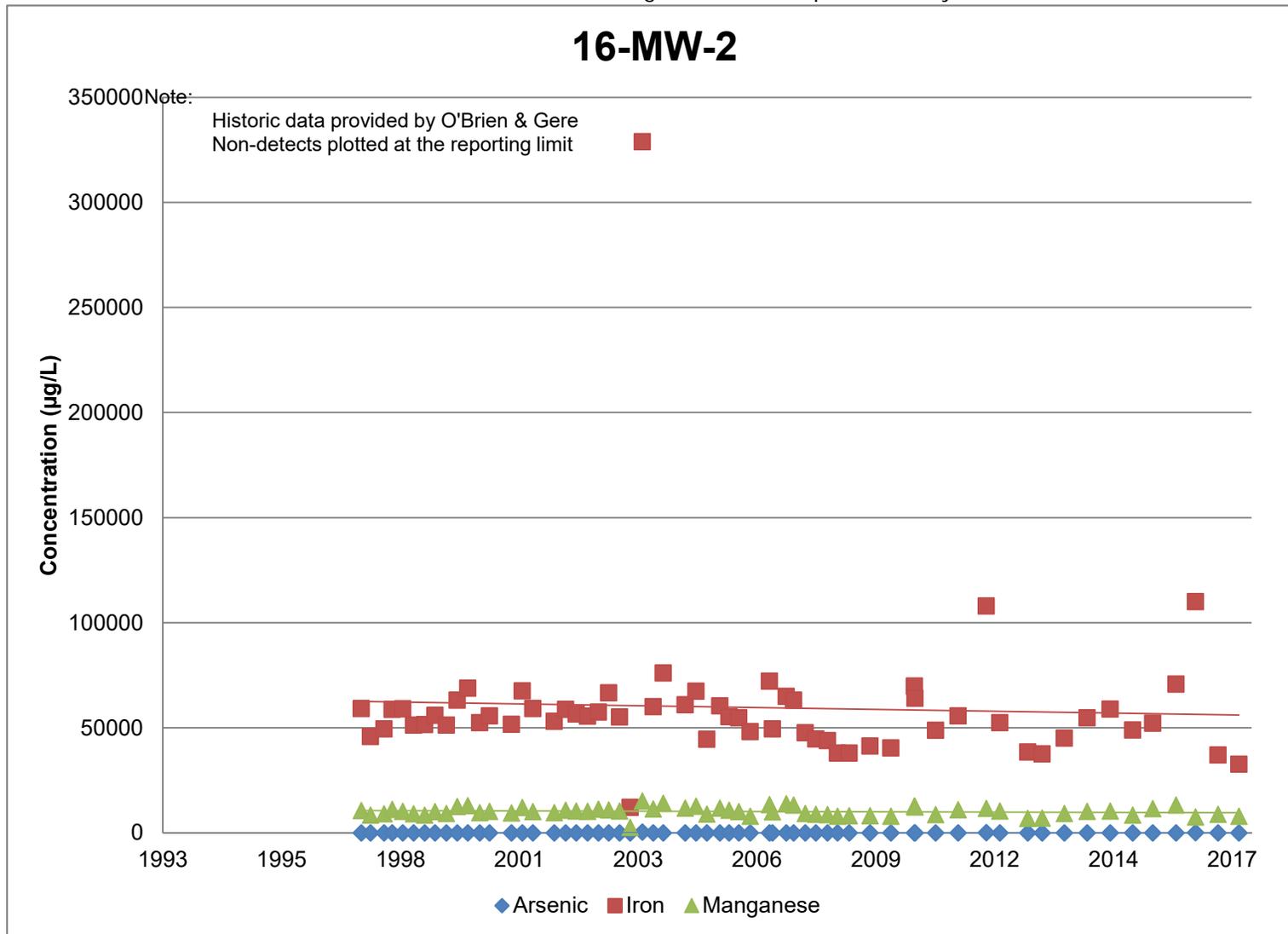
Bridgewater Township, New Jersey

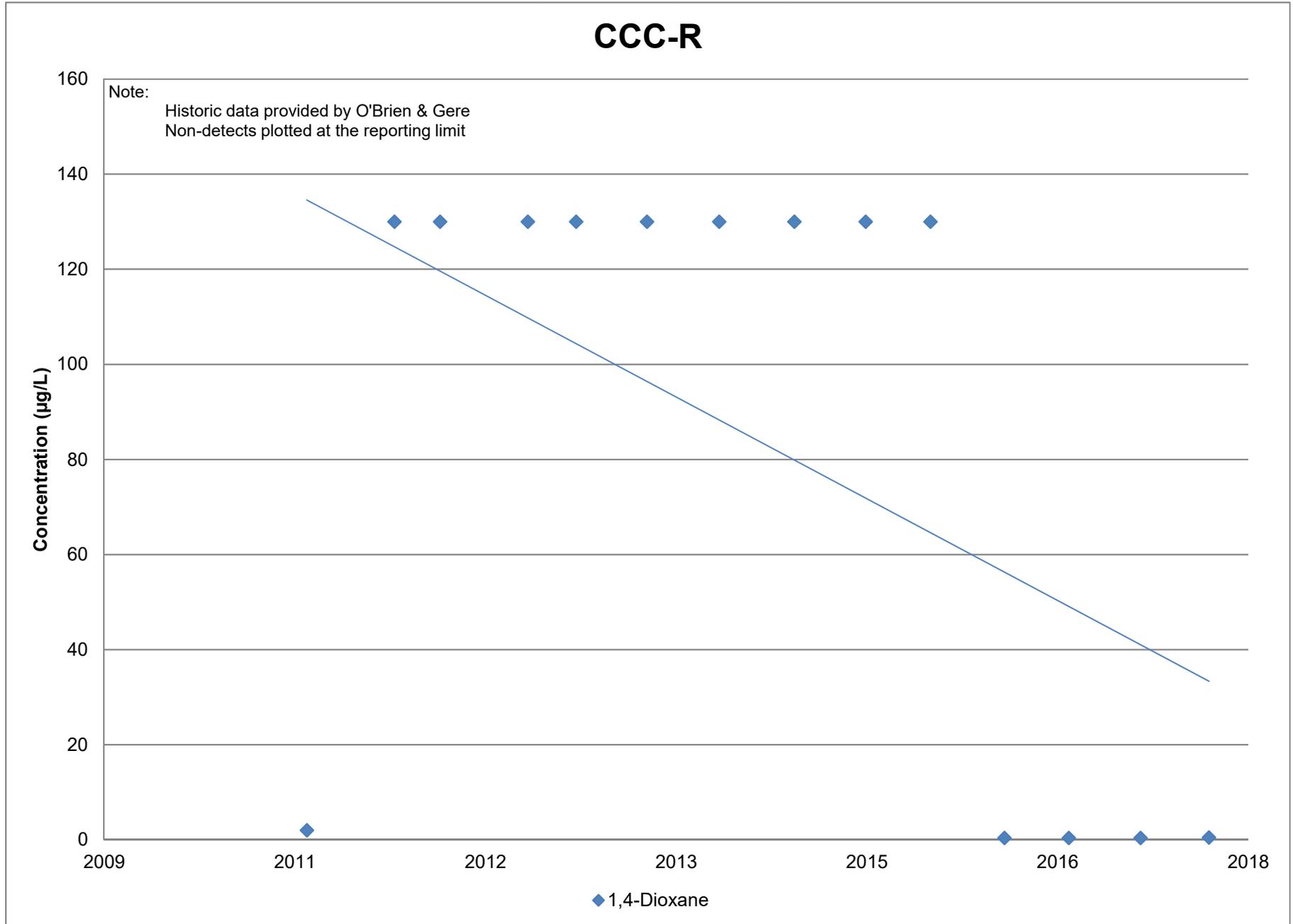
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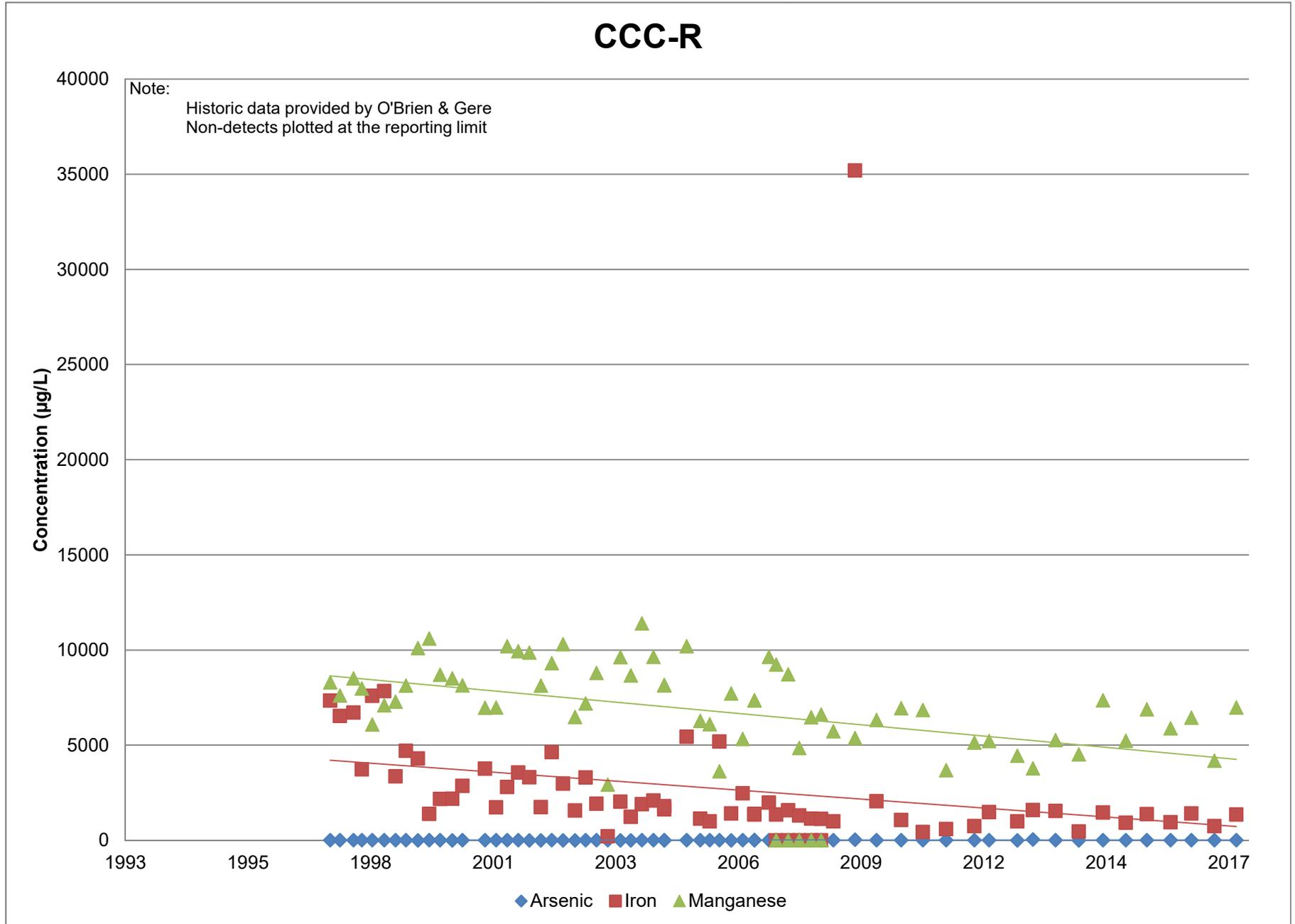


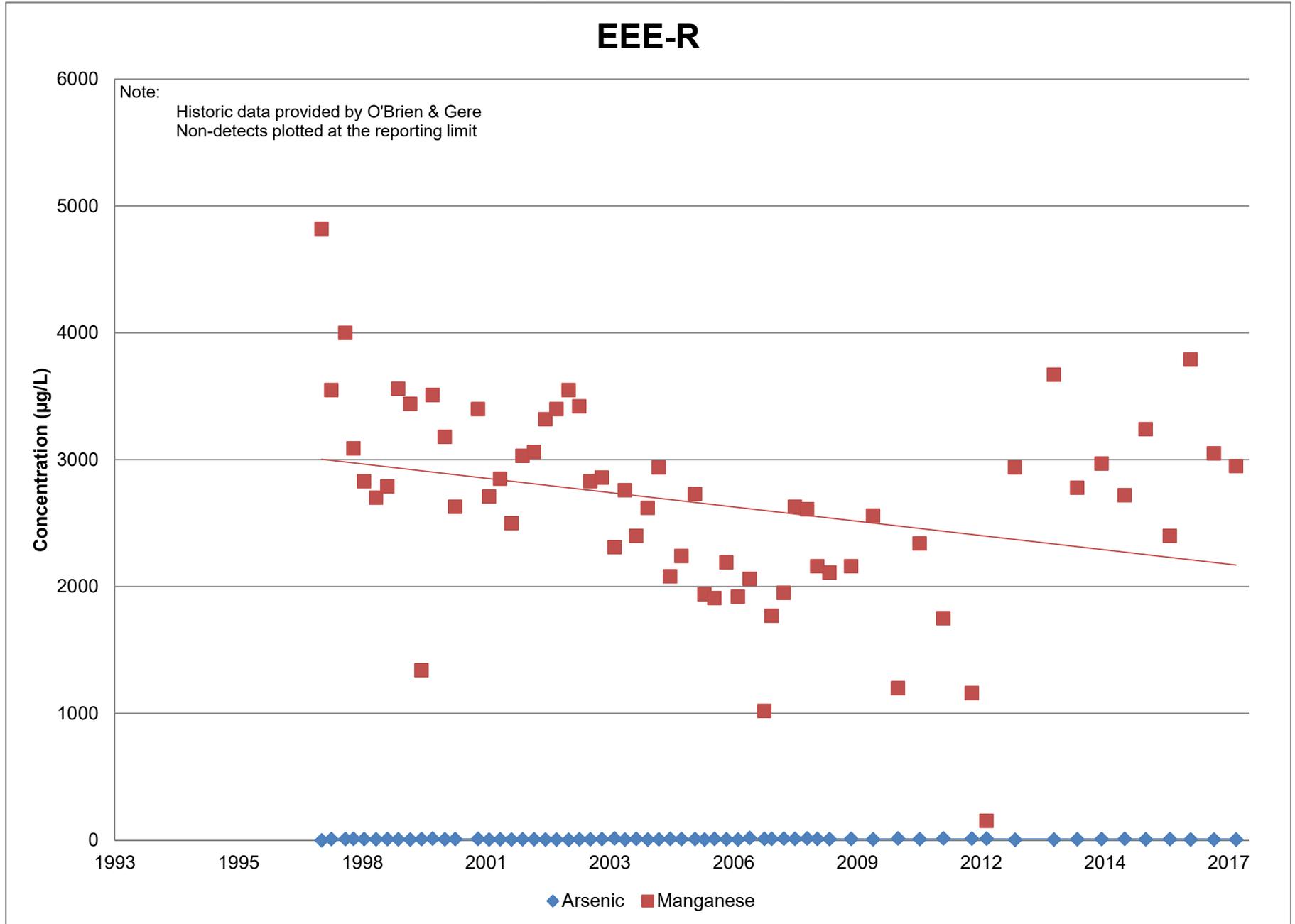


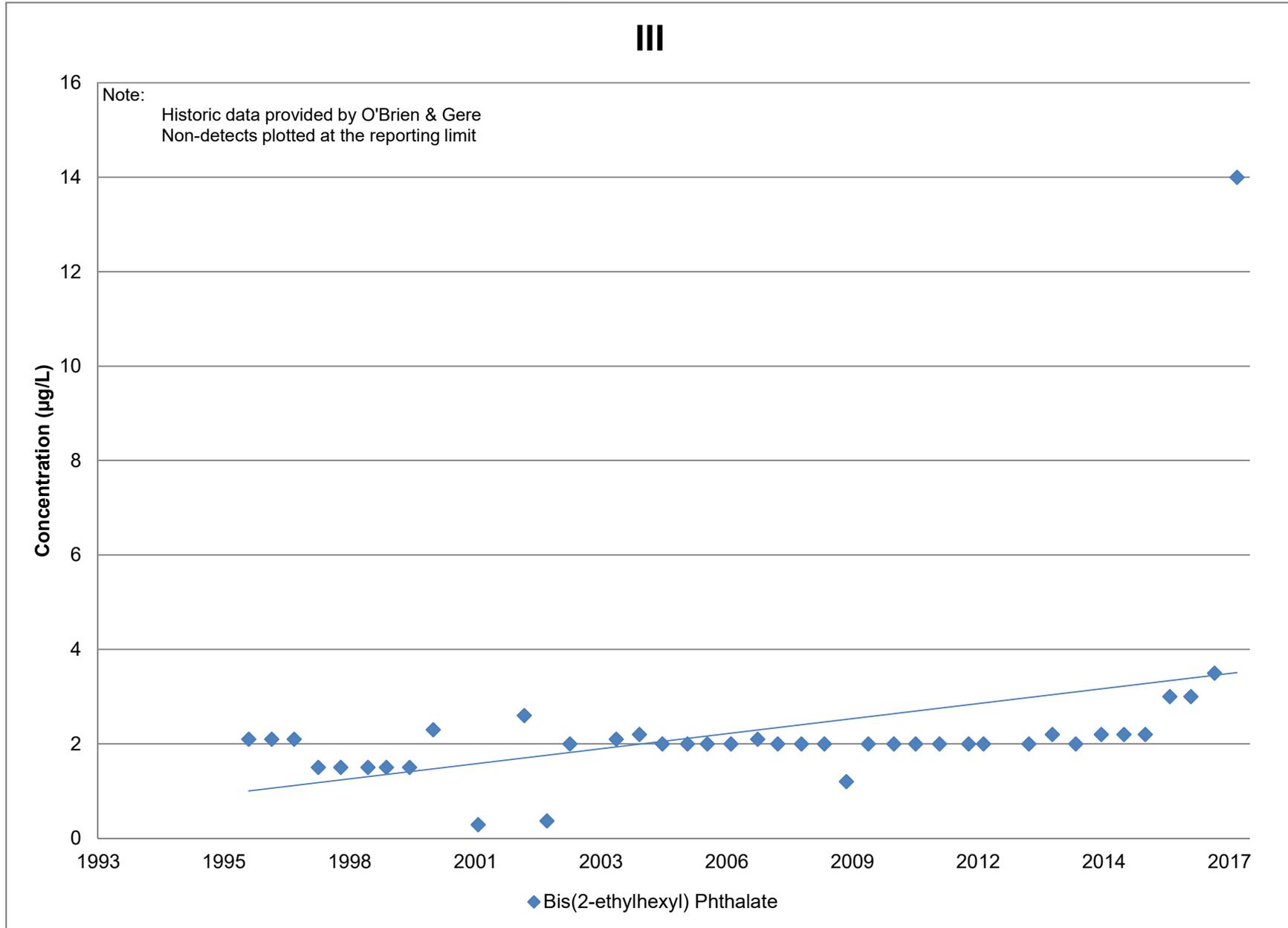










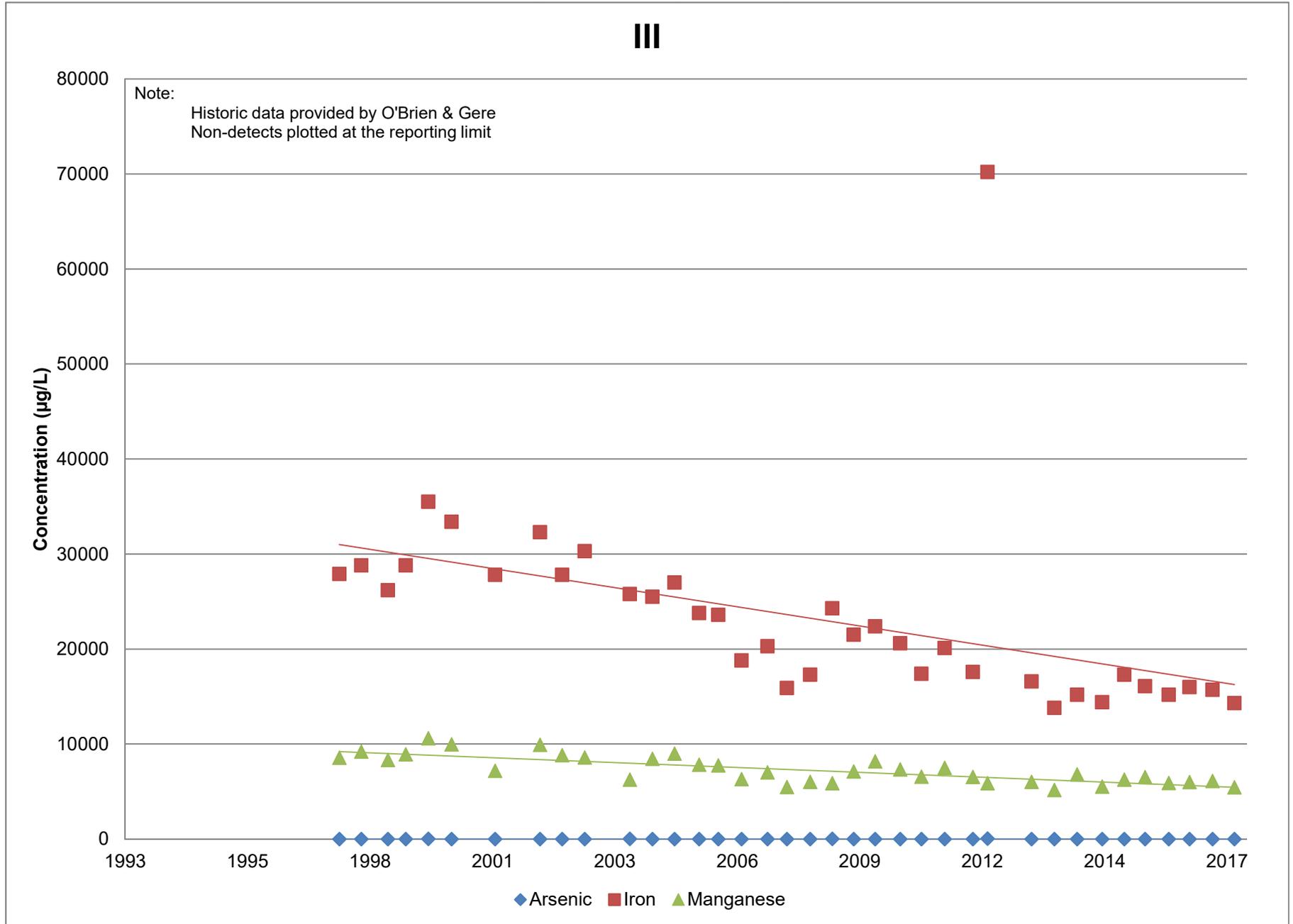


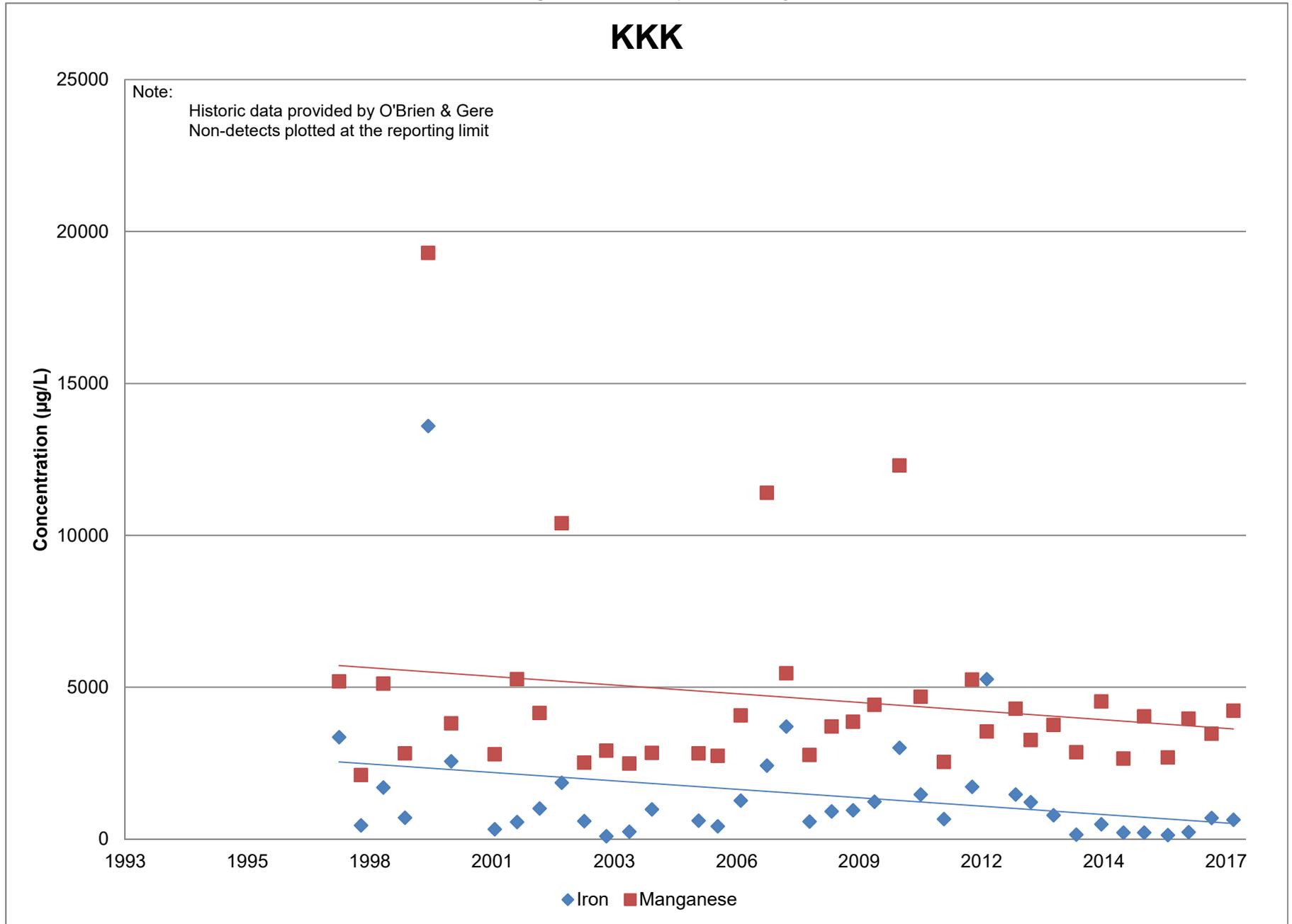
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May 2018

Appendix E - Groundwater Concentration vs. Time Trends  
American Cyanamid Superfund Site  
Bridgewater Township, New Jersey

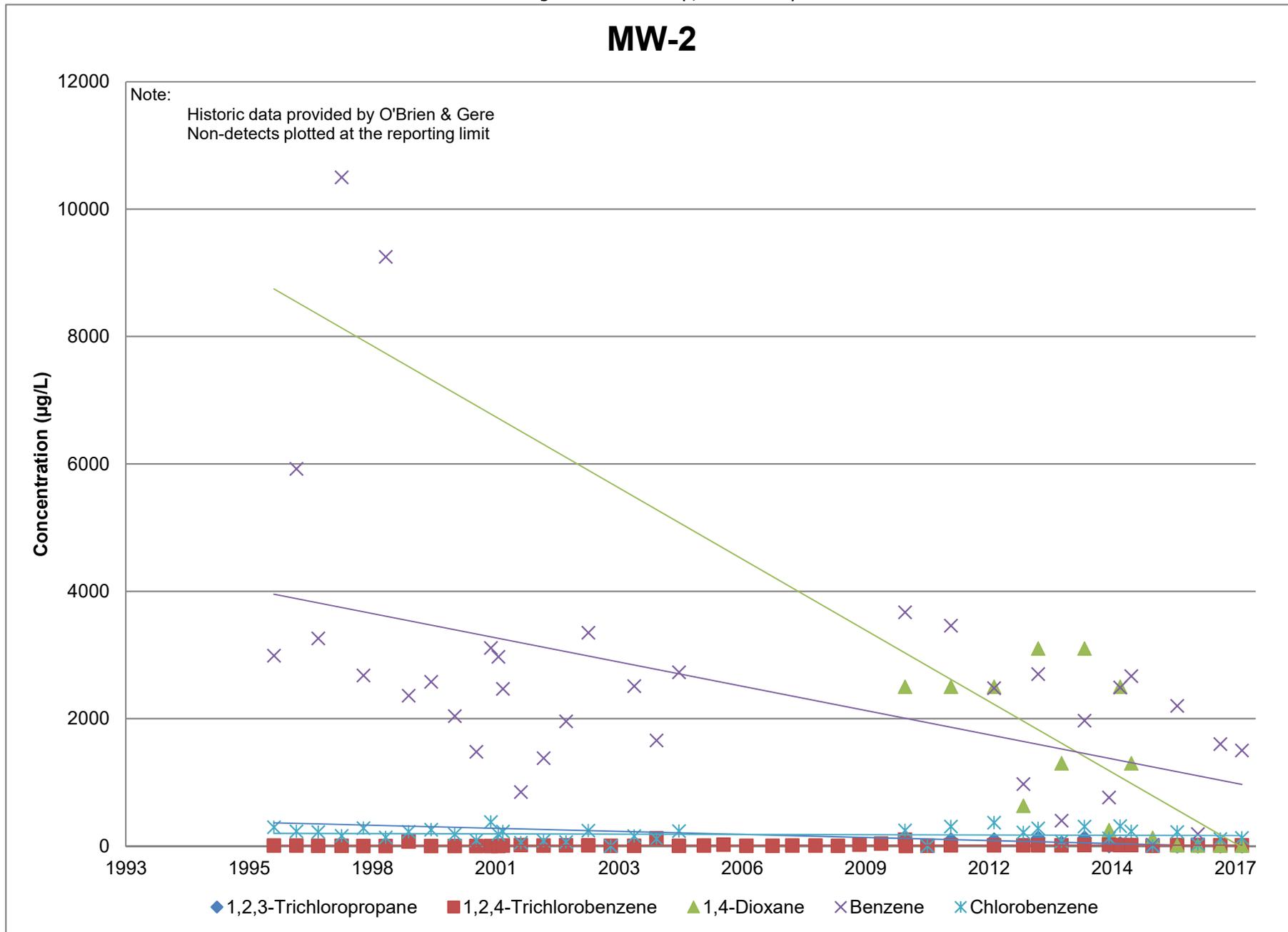
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American Cyanamid Superfund Site

Bridgewater Township, New Jersey



American Cyanamid Superfund Site

Bridgewater Township, New Jersey

