U. S. EPA Superfund Program

Proposed Plan for Record of Decision Amendment

Berks Sand Pit Superfund Site
Longswamp Township, Berks County, Pennsylvania

EPA ANNOUNCES PROPOSED PLAN **June 2019**

Dates to Remember

June 12, 2019 to
July 12, 2019
Public Comment Period on
EPA's Proposed Plan

Public Meeting
June 27, 2019
6:00 to 7:00 pm
Longswamp Township Hall
1112 State Street
Mertztown, PA 19539

The United States Environmental Protection Agency (EPA) is issuing this Proposed Remedial Action Plan (Proposed Plan) to present EPA's Preferred Alternative for addressing groundwater at the Berks Sand Pit Superfund Site (the Site). The Preferred Alternatives described herein will modify the existing remedy selected in the September 29, 1988 Record of Decision (ROD), as amended by five subsequent Explanations of Significant Differences (ESDs). EPA is the lead agency for developing and implementing the remedy at the Site. The Pennsylvania Department of Environmental Protection (PADEP) is the support agency and is currently responsible for the operations and maintenance (O&M) of the remedy. This Proposed Plan summarizes information from the 2019 Focused Feasibility Study and the Fifth Five Year Review Report dated August 2, 2016. These documents and all other documents relied on by EPA to formulate this Proposed Plan are contained in the Administrative Record for the Site.

The Site is located in Longswamp Township, Berks County, Pennsylvania, about 15 miles northeast of Reading, near the unincorporated communities of Huffs Church and Seisholtzville. The Site consists of an approximately four-acre property that includes a treatment plant, other site features, and is surrounded by undeveloped woodlands and residential properties. The former sand pit was originally created by the removal of sand and gravel from the area, and was located on one of the current lots where a home was later built. The location of the Site is shown in Figure 1 and the Site layout is depicted on Figure 2. The National Superfund Database Identification Number is PAD980691794.

EPA is proposing to use a combination of in-situ biological and chemical reduction treatment (ISB/ISCR) to address contaminated groundwater at the Site. This proposed modification is explained in detail in this document. This proposed modification will alter the existing Selected Remedy for groundwater, which consists of intermittent groundwater extraction and treatment combined with in-situ chemical oxidation (ISCO).

In-situ chemical injections involve the injection or direct mixing of treatment chemicals in groundwater and soil. It is described as "in-situ," or in place, because the contaminated groundwater will not be extracted and treated. The specific treatment chemical can be poured into a well or injected under pressure to aid in its distribution in the aquifer.

ISCO is a remediation technology where a chemical oxidant is injected into the subsurface to rapidly oxidize or transform contaminants in groundwater into harmless end products. ISB/ISCR is a relatively newer method of remediation that combines both chemical reduction and biological processes to reduce contaminants into harmless end products, but in a slower manner than ISCO which uses chemicals that pose a higher risk to people handling them.

EPA is issuing this Proposed Plan as part of EPA's public participation requirements under Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. § 9617, commonly known as Superfund, and Section 300.430(f)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. § 300.430(f)(ii).

After the close of the public comment period, EPA will announce its selection of the remedy modification for groundwater in an amendment to the 1988 ROD, as modified. The public's comments will be considered and presented with discussion in the Responsiveness Summary of the ROD Amendment. EPA encourages the public to review the documents that make up the Administrative Record to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site.

The Administrative Record for the Site can be accessed at https://semspub.epa.gov, or at the following locations:

Brandywine Community Library
60 Tower Drive
Topton, Pennsylvania 19562
Hours: Monday through Wednesday
10:0AM to 8:00PM
Thursday and Friday
12:00PM to 5:00PM
Saturday
9:00AM to 2:00PM
Phone: (610) 682-7115

EPA Administrative Records Room
Administrative Coordinator
1650 Arch Street
Philadelphia, PA 19103
Phone: (215) 814-3157
Hours: Monday – Friday
8:30AM to 4:30PM
(By Appointment Only)

Comments should be submitted in writing or emailed to:

Nick Tymchenko
Remedial Project Manager
U.S. Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-2022
tymchenko.nick@epa.gov

Or

Amanda Miles
Community Involvement Coordinator
U.S. Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-5557
miles.amanda@epa.gov

I. SITE BACKGROUND

Site Location and Description

The Site is situated in Longswamp Township, Berks County, Pennsylvania, about 15 miles northeast of Reading, near the unincorporated communities of Huffs Church and Seisholtzville. The Site is comprised of approximately four acres in which groundwater contamination was identified, including a former sand pit, undeveloped woodlands, and residential properties. The forested portion of the Site contains private gravel-and-dirt access roads into the more remote areas of the property and a groundwater treatment plant structure.

Today, the forested portion of the Site remains undeveloped, except for the groundwater extraction and treatment system (GWETS). Several residential properties along Benfield and Walker Roads comprise the western portion of the Site.

Approximately 100 people live in single-family houses or mobile homes within one-half mile of the Site, and this residential land use is not anticipated to change. Drinking water for local residents is obtained from private wells in the area of the Site. As a result of the remedial action implemented pursuant to the 1988 ROD and subsequent ESDs, nearby residential wells are no longer impacted by contaminants above the maximum contaminant levels (MCLs).

History of Contamination and Past and On-going Response Actions

The sand pit was historically utilized as a borrow pit for sand and gravel. The reported size of the pit was approximately 100 feet in diameter and 30 feet in depth. The source of contamination is unknown; however, it reportedly was used by area residents for refuse disposal until it was backfilled in 1978, and industrial waste was alleged to have been disposed of in the area around the pit. Around the same time when the pit was backfilled, homes with private wells were constructed in the immediate vicinity of the Site. In 1982 residents reported a chemical taste and odor problem in their drinking water.

In response to the residential well taste and odor problems, the Pennsylvania Department of Environmental Resources, now PADEP, collected a private well sample from a residence built over the former sand pit. A number of volatile organic compounds (VOCs), including 1,1,1-trichloroethane (TCA); 1,1-dichloroethene (DCE); 1,1-dichloroethane (DCA); dichloromethane; 1,2-dichloroethane; and toluene were detected in the residential well sample at the following concentrations:

TCA	>45,000 micrograms per liter (µg/L)
DCE	>800 µg/L
DCA	>300 µg/L
dichloromethane	>300 µg/L
1,2-dichloroethane	>150 µg/L
toluene	>150 µg/L

EPA conducted an emergency removal action from 1983 to 1984 during which the sand pit was partially excavated and backfilled with clean soil. EPA also installed a multi-property water supply well during the removal action to supply safe drinking water to four residential properties. No source of groundwater contamination, such as buried drums, was found during the removal action. This water supply well is no longer in use since each affected property owner chose to use their own private well for drinking water as contaminant levels dissipated.

EPA proposed the Site to the National Priorities List (NPL) on September 8, 1983 and listed it on September 1, 1984.

Basis for Taking Action

PADEP and their contractor Baker/TSA, Inc. completed a remedial investigation (RI) and feasibility study (FS) at the Site in 1988. Sampling activities during the RI showed VOCs at levels that posed an unacceptable risk to human health and the environment. TCA, DCE, DCA, and tetrachloroethene (PCE) were identified as contaminants of concern (COCs).

The groundwater contaminant plume at the time of the RI/FS extended from the residential areas along Benfield and Walker Roads to an unnamed tributary of Perkiomen Creek. Three residential wells had been contaminated by TCA and DCE at concentrations exceeding the MCL for at least one of the compounds. VOCs were also detected in monitoring wells, surface water and sediments at the Site. The RI/FS identified an unacceptable risk to human health due to contaminated groundwater via inhalation, ingestion, and dermal contact by residents using contaminated residential wells and an unacceptable risk to the environment due to surface water and sediment impacted by seepage of contaminated groundwater to the surface water.

EPA performed an FS to evaluate seven alternatives including no action, extraction and treatment of contaminated groundwater, excavation and disposal/treatment of contaminated sediment, and installation of an alternative water supply system for impacted residences.

Remedy Selection

On September 29, 1988, EPA issued a ROD for the Site.

The major components of the 1988 ROD included the following:

1. Installation and operation of a groundwater extraction and treatment system (GWETS) utilizing an air-stripper for liquid phase treatment, a vapor phase carbon treatment unit, and reinjection of treated water back into the aquifer.
2. Chemical and biological monitoring of surface water and groundwater quality.
3. Local restrictions to prevent installation of any future drinking water wells in the contaminated areas of the aquifer.
4. Construction of an alternative water supply system.
5. Excavation of contaminated sediment, and off-site treatment and disposal by incineration.
6. The 1988 ROD established the following COC Cleanup Goals

Groundwater COC	ROD Cleanup Level
TCA	200 µg/L
DCE	7 µg/L

The 1988 ROD also identified the analytical detection limit of 1 µg/L for both DCA and tetrachloroethene (PCE) as secondary target levels to be used as a guideline to determine when the groundwater no longer poses an unacceptable risk.

Since the ROD, EPA has issued five Explanations of Significant Differences (ESDs) for the Site to modify components of the remedy, as follows.

- 1994: ESD #1 eliminated the requirement for construction of an alternative water supply, eliminated excavation and off-site incineration of contaminated sediment, and allowed discharge of treated water/effluent directly to Perkiomen Creek in lieu of reinjection.

- 2001: ESD #2 eliminated the requirement for restrictions of drinking water wells in the vicinity of the Site.
- 2003: ESD #3 eliminated the requirement for vapor phase carbon treatment of air emissions from GWETS.
- 2006: ESD #4 eliminated surface water monitoring requirements, and allowed intermittent operation of the GWETS combined with ISCO to treat contaminated groundwater.
- 2011: ESD #5 added the requirement for institutional controls (ICs) requiring coordination with EPA and PADEP before installing drinking water wells in the vicinity of the Site.

Based upon the decision documents, the current remedy consists of these components:

- Intermittent groundwater extraction and treatment of contaminated groundwater, combined with ISCO to enhance breakdown of groundwater contaminants.
- ICs to require coordination with EPA and PADEP prior to installation of drinking water wells on parcels impacted by groundwater contamination attributable to the Site.

Remedy Implementation

EPA completed a remedial design for the GWETS in January 1990 that consisted of a treatment plant, monitoring and extraction wells. Construction of the GWETS began on December 17, 1990 and the plant became operational on February 16, 1995. Monitoring data of wells and the influent and effluent from the GWETS indicated that the system was effectively reducing the contaminant concentrations and the extent of the plume.

EPA operated the GWETS from 1995 to 2005, and groundwater data were regularly reviewed. A continuous decrease in the area of the plume and a decrease in TCA and DCE concentrations were noted by January 2005.

In March 2005, PADEP took responsibility for the system's O&M. EPA issued ESD #4 in 2006 that added ISCO to the remedy. This ESD gave PADEP the option of operating the GWETS intermittently during periods of ISCO injections. Between March 2005 and December 2006, PADEP operated the GWETS for short periods of time, because the influent concentrations were below MCLs, and there were maintenance issues that required downtime and repairs. After PADEP performed maintenance, the system was restarted in December 2006. The system continued to operate at 6 to 7 gallons per minute (gpm).

PADEP installed an additional recovery well (RW-3S) in July 2010 and began evaluating a focused pumping strategy that considered converting monitoring wells MW-3S and MW-3D to extraction wells to better capture the remaining plume. In July 2011, PADEP took the GWETS offline due to damage incurred after several lightning strikes. The treatment plant has not operated since that time and repairs have not been made. As described below in more detail, PADEP has since conducted pilot studies of ISB/ISCR.

II. SITE CHARACTERISTICS

The information summarized in this section is compiled from the RI, FS, and 2018 FFS along with other reports. The reports can be found in the Administrative Record for the Site.

Hydrogeologic Setting

The general Site area is characterized by sloping hills separated by small streams. From the former sand pit, the Site topography slopes downward to the east towards an unnamed tributary to the West Branch of Perkiomen Creek (see Figure 2).

Groundwater beneath the Site is found within soil, weathered bedrock, and unweathered fractured bedrock. In the vicinity of the Site, the soil overburden is quite variable, consisting of clay, silt, sand and quartz and feldspar fragments. In general, no distinct boundary between the overburden and weathered bedrock exists, and the bedrock has low primary porosity and permeability, but has a significant secondary porosity and permeability due to the presence of a complex fracture system. The groundwater moves along preferential pathways provided by these fractures and highly weathered and altered fracture zones.

Two groundwater flow regimes have been identified at the Site: the shallow groundwater flows within the overburden, and the deep groundwater flows in the fractured bedrock. The volume of groundwater moving through bedrock in the deeper aquifer depends on the hydraulic gradient and conductivity of the bedrock fractures. In general, there are a large number of interconnected fractures oriented in both a northeasterly and northwesterly direction, resulting in a highly complex flow of groundwater at the Site. The groundwater predominantly flows to the northeast toward an unnamed tributary to the West Branch of Perkiomen Creek.

Nature and Extent of Contamination

As summarized in the 1988 RI, soil samples were collected when the wells were drilled on the Site. The maximum depth of soil sampling was less than 20 feet below ground surface. No significant soil contamination was detected at the Site.

Surface water and sediment were initially identified as an exposure route for contamination in the RI. ESD #1 (1994) eliminated excavation and off-Site incineration of sediments because the installation of the groundwater extraction wells resulted in the lowering of the shallow groundwater table and, as a result, contaminated groundwater no longer discharged to surface water. The primary contaminants present in groundwater include TCA and DCE. DCA and PCE were also detected during the RI, but at lower concentrations and less frequently. As noted in the 1988 ROD, the plume was elongated in an east-northeasterly direction and historically centered on monitoring well MW-4, which had maximum TCA and DCE concentrations of 7,310 µg/L and 3,500 µg/L, respectively.

Figures 3 and 4 show the current extent of TCA and DCE in deep groundwater at the Site based on sampling conducted in May 2018. The areal extent of the TCA plume has decreased as a result of the groundwater remedy and recent pilot studies, and the highest concentrations are now centered around monitoring well MW-3. Elevated concentrations of DCE in deep groundwater are centered around well MW-16VD. DCE concentrations in shallow groundwater measured in 2018 are shown in Figure 5, which shows the plume centered around MW-3S. The cleanup goals for TCA and DCE are the applicable MCLs of 200 µg/L and 7 µg/L, respectively.

DCA and PCE have been detected above the ROD's secondary target level of 1 µg/L in both shallow and deep wells during sampling events for DCE in 2016, 2017 and 2018. DCA is present in many wells as it is a breakdown product of TCA. PCE continues to be detected in two Site wells (MW-7S and nearby injection well IW-3) at concentrations of 1.1 µg/L or less.

III. SUPPLEMENTAL INVESTIGATIONS AND ACTIVITIES

Since its operation in February 1995 the GWETS was effective in reducing the extent of the groundwater contaminant plume. However, to expedite the cleanup, EPA and PADEP performed pilot studies, summarized below, which have also been effective in reducing groundwater contaminant concentrations. Before transitioning Site O&M to PADEP in 2005, EPA performed a series of optimizing pilot studies to expedite cleanup. This effort resulted in ESD #4 (2006), which allowed intermittent operation of the GWETS combined with ISCO to treat contaminated groundwater. Following completion of PADEP's recent pilot study, EPA issued a focused feasibility study (FFS) in 2018.

EPA Pilot Studies

In an effort to optimize treatment, EPA investigated alternate treatment methods to enhance the remedy. Chemical oxidation was selected as a pilot remedial technology because it was a proven technology that can accelerate remediation of VOCs in groundwater. EPA performed the first pilot study in June 2001. Fenton's reagent was selected as the oxidizing agent; the goal of this study was to determine if Fenton's reagent could oxidize TCA in the aquifer and to gain an understanding of its migration in the aquifer. Fenton's reagent is a strong oxidizer. Over 11 days there were two applications of a conditioning chemical and an oxidizer. The chemicals were targeted to treat the groundwater contamination at 58 to 155 feet below ground surface (bgs). The conditioning chemicals included a dilute hydrochloric acid/ferrous sulfate solution and the oxidizer was a dilute hydrochloric acid/hydrogen peroxide solution. After conditioning, each well received 550 gallons of 35% hydrogen peroxide. The oxidizer was injected into several screened wells and open-boreholes with both high and low contaminant concentrations. An open-borehole is an unlined well that is drilled in competent material such as bedrock while a screened well is lined with a material and is open with a screen at a specific depth to target groundwater flow in specific fractures. The open-borehole well allows the groundwater throughout the entire well to interact with the injectates. The pilot study resulted in decreases in contaminant concentrations in the injection wells and nearby monitoring wells but did not fully distribute the oxidant throughout the intended area. Additional information regarding the pilot study methodology and results can be found in the 2001 *CleanOx® Pilot-Scale Treatability Study Assessment Report*, available in the Administrative Record.

EPA performed a second ISCO pilot study in March 2004 that focused on the part of the groundwater plume with the highest levels of TCA. Modified Fenton's Reagent (MFR) was injected into well pairs MW-3S/D (58 to 90 feet bgs) and MW-7S/D (120 to 155 feet bgs) over six days. The MFR was modified with catalysts and chelating agents to increase the reagent's persistence and enable better distribution in the aquifer. This study resulted in increased distribution of the reagents and identified a possible area of residual contamination.

The third ISCO study, performed by EPA in December 2004, repeated injection of MFR over seven days into the same well pairs used in March 2004. The GWETS was turned off during the study to limit migration of the reagent from the treatment area. In combination with the injections, the wells (MW-3S/D and WM-9S/D) were pumped to draw upgradient stagnant groundwater into the treatment area. Study results showed significant decreases in TCA and DCE concentrations at injection points and in downgradient wells nearly 750 feet away. Since the pilot study results were positive, EPA issued ESD #4 in 2006 that modified the remedy to include ISCO treatment.

It is difficult to attribute what part of the reduction in TCA and DCE in the groundwater plume is due to the ISCO treatment versus the operation of the GWETS. EPA concluded that the ISCO treatment was at least partially responsible for reducing the plume's size and concentrations during this period.

PADEP Pilot Studies

In 2010 and 2011 PADEP reviewed historical groundwater sampling results, well construction specifications, groundwater level data and the results of the ISCO pilot studies. PADEP subsequently prepared a technical memorandum recommending additional remedial options for the Site to expedite and optimize remediation of contaminated groundwater. The memo indicated that the GWETS was only recovering an estimated 4 pounds of VOC contamination per year and evaluated a focused pumping strategy to remediate the remaining groundwater contaminant plume. In 2011 PADEP took the GWETS offline due to damage incurred by lightning strikes and requested that EPA approve a pilot study that would not require repairs to the GWETS until the pilot study was completed. EPA approved this pilot study in a 2011 letter that is available in the Administrative Record.

In October 2012, PADEP initiated pilot studies to evaluate whether ISB/ISCR would more effectively achieve remedy objectives. ISB/ISCR is a newer technology that injects chemicals called reducing agents to help change the contaminants into less toxic forms, and bioremediation is a treatment process that uses naturally-occuring bacteria to break down the contaminants. Both processes work together, are longer lasting than ISCO, and can be applied without operating a GWETS. PADEP has since performed two ISB/ISCR pilot studies, which were completed in 2017.

PADEP performed a study on ISB/ISCR to evaluate if groundwater contaminants would degrade through bioremediation and chemical reduction. Phase I included injections in two new injection wells using an emulsified, lecithin-based carbon substrate with a soluble iron component. PADEP used a liquid substrate (EHC-L®) for the first injections in October 2012, then switched to a powder substrate (EHC®) for the second injections (Phase II) in September 2013. EHC® and carbonate (a buffer) were injected in equal amounts into the injection wells from October 1 to 3, 2013. The powder substrate had a longer residence time, allowing it to interact with and degrade more contaminants. The powder also combined a solid carbon source for reducing bacteria with zero valent iron (ZVI), which resulted in more aggressive chemical reduction. Microbial population analyses of the aquifer was performed to determine if sufficient dehalococcoides (DHC) cells were present in the Site's aquifer to promote natural dechlorination of TCA and DCE. DHC are commonly found in groundwater where natural dechlorination (reduction) is taking place and if suitable quantities of DHC are not available, the microbial population can be supplemented via a process referred to as bioaugmentation. Bioaugmentation cultures with DHC were injected during Phase II because the aquifer did not appear to contain a sufficient population of bacteria to effectively biodegrade TCA and DCE. Results from Phase II indicated that the amendment effectively reduced contaminant concentrations in the shallow groundwater aquifer.

In 2013, PADEP developed a cost estimate to restart the GWETS. Based upon this cost estimate, the results from the ISCO pilot studies, and the ongoing ISB/ISCR pilot study, PADEP recommended to EPA to keep the GWETS offline until the conclusion of their pilot study. EPA approved PADEP's recommendation in a 2014 letter which is available in the Administrative Record.

The second PADEP pilot study began in May 2015 and was completed in 2017. This study involved installing three new bedrock injection wells for new injections and deepening existing injection well IW-1 to about 150 feet bgs to reach the deep aquifer. PADEP conducted two separate injections into the deep aquifer in fall 2015, and injected EHC® dry powder mix between September 14 and 18, 2015. Sampling results indicated these injections did not progress chemical reduction at the anticipated rate, even with bioaugmentation because the dry powder mix did not distribute with the groundwater due to the geology of the deep aquifer and the dry powder particle sizes. Consequently, PADEP returned to using EHC-L® for the November 2015 injections.

Between November 17 and December 23, 2015, PADEP injected EHC-L® mixed with groundwater, ZVI, and carbonate. During these injections, a homeowner informed PADEP and EPA that their residential well was producing cloudy water. Bottled water was provided to the resident, and a point of entry treatment (POET) system was installed at the residence in early December 2015. The treatment consisted of sediment removal, ion exchange, carbon filtration, and ultraviolet treatment. PADEP sampled the residential well on December 17, 2015, and the results showed that the water met drinking water standards and no site-related contaminants or injection materials were detected. PADEP turned over the POET to the homeowner.

Sampling was performed in July 2016 to evaluate progress of the injections. Injected amendment in the southwestern portion of the Site appears to effectively reduce contaminants in shallow wells MW-3S, IW-1, and IW-2. The monitoring after the injections indicates that maintaining reducing conditions in wells MW-3D, MW-7S, and MW-7D is difficult. The concentrations of contaminants and the number of bacteria in deep well MW-3D remained relatively similar after the injections as prior to the injections. This data suggested that delivery of the amendment to the deep aquifer was insufficient and deepening of well IW-1 had no effect on the geochemical conditions in well MW-3D.

After the completion of the two pilot studies the extent of the TCA and DCE plumes continued to decrease. Figure 3 shows the TCA plume based on sampling results from May 2018. The contour of the DCE plume based on 7 µg/L was approximately 1.1 acres in the shallow aquifer and approximately 2.5 acres in the deep aquifer. The overall extent of DCE at concentrations above the 7 µg/L has decreased from roughly 6.5 acres in 2010. Figure 4 of the deep aquifer and Figure 5 of the shallow aquifer depict the extent of the respective DCE plumes.

IV. SCOPE AND ROLE OF THIS ACTION

The remedy at the Site is protective of human health and the environment in the short-term. Concentrations of groundwater contamination are declining, the plume is contained to the Site property and reducing in size, there are no current exposure pathways to contamination, and institutional controls are in place. EPA is proposing to modify the remedy to address the areas where contaminants are above their respective MCL or cleanup level. The proposed modification will ensure that the remedy is protective of human health and the environment in the long term by reducing contaminants to their respective MCL or clean-up level and allowing for unlimited use and unlimited exposure to groundwater.

The Preferred Alternative will restore groundwater within the Site to beneficial use in a more effective manner than the remedy selected by the 1988 ROD and subsequent modifications, through the use of treatment technologies which will permanently reduce the toxicity, mobility, and volume of contaminants in groundwater. The Preferred Alternative will also ensure the protection of human health by eliminating potential future exposure to contaminated groundwater.

V. SUMMARY OF SITE RISKS

During the RI/FS, a human health risk assessment (HHRA) was conducted to determine the current and potential future effects of contaminants in media on human health and the environment in the absence of any cleanup actions at the Site. An evaluation of human health risks conducted as part of the 1988 RI identified TCA and DCE as the primary contaminants of concern (COCs) for groundwater. While no complete exposure pathway to groundwater contamination currently exist, TCA and DCE levels remain in groundwater above their respective MCLs. Institutional Controls (IC) are in place and prevent the installation of new wells on parcels affected by groundwater contamination to prevent exposure. An informational IC is in place through the township's permitting process where the permitting official notifies EPA and PADEP if a drinking water well permit application is submitted for any Site properties. EPA and PADEP would then work with the property owner to site a well outside the contamination plume.

The RI/FS also determined that the contaminants in the surface water and sediments, while not posing a risk to human receptors, could potentially affect aquatic life and the environment in the West Branch of Perkiomen Creek. Components of the 1988 ROD included excavation of contaminated sediments and off-Site treatment and disposal and chemical and biological monitoring of the surface water quality. EPA concluded cleanup criteria for the surface water were not necessary because groundwater remediation would prevent further discharge of contaminated groundwater into surface water seeps. Early in the Remedial Action, extraction wells were placed in areas that eliminated the source of contamination in the sediments and surface water. In 1994, ESD #1 eliminated the need for excavation and off-site treatment of sediment and in 2004, ESD #4 removed surface water sampling from the monitoring program. No cleanup criteria for the surface water were stated in the ROD.

The Preferred Alternative presented in this Proposed Plan, or one of the other measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

VI. REMEDIAL ACTION OBJECTIVE

The remedial action objective of the ROD is to reduce the contaminants in groundwater to their MCLs as listed in the Safe Drinking Water Act (SDWA). The cleanup goal, or MCLs, for TCA is 200 µg/L and for DCE is 7 µg/L. Secondary target levels at the analytical detection limit of 1 µg/L for DCA and PCE were also identified in the 1988 ROD and that a cumulative risk assessment for all COCs will be performed when cleanup goals are met for TCA and DCE.

The Preferred Alternative includes revised cleanup levels for DCA and PCE and includes vinyl chloride (VC) as a COC.

EPA issued a Five-Year Review Report in 2016 that identified DCA and VC at levels in groundwater exceeding their respective MCLs, EPA regional screening levels (RSL) for tap water, or PADEP medium specific concentration (MSC). These contaminants are breakdown products of TCA and DCE and have historically been detected at the Site; however, since 2015, VC has only been detected twice above its MCL of 2 µg/L, with both results occurring in shallow well MW-3S at concentrations up to 5.7 µg/L. During sampling events conducted in 2016, 2017, and 2018 DCA has been detected in both shallow and deep wells at concentrations above its secondary remedy target level of 1.0 µg/L and its EPA risk-based screening level (RSL) of 2.8 µg/L. The highest concentration of 164 µg/L was detected in both IW-2 and MW 7-D. DCA does not have an MCL but DCA levels have exceeded the PADEP MSC cleanup number of 31 µg/L. The MSC for DCA will be used as the cleanup level.

PCE has been detected in two wells at concentrations of approximately 1 µg/L. The MCL for PCE is 5 µg/L and the Preferred Alternative changes the secondary target level of 1.0 µg/L to the MCL as cleanup level for PCE. Concentrations in these wells are below the RSL of 11 µg/L and the MCL; however, PCE should be included in the final risk assessment because it still could contribute to the overall cumulative risk posed by the remaining contaminants when Site cleanup levels are achieved.

A final site-wide risk assessment for all COCs will be performed when cleanup levels for all COCs are met (i.e., the MCLs or MSC) for TCA, DCE, DCA, VC and PCE. This risk assessment will determine the cumulative risks of remaining contaminants and will use the most current data available at the time cleanup levels are achieved.

The MCLs or MSC, listed below, will be used as clean up levels for the remediation of groundwater at this Site.

Contaminant of Concern	1988 ROD Cleanup Level (µg/L)	Proposed Groundwater Performance Standard based on MCLs or MSC (µg/L)
1,1,1-trichloroethene (TCA)	200 (MCL)	200 (MCL)
1,1-dichloroethene (DCE)	7 (MCL)	7 (MCL)
1,1-dichloroethane (DCA)	1 (secondary target level)	31 (MSC)
Tetrachloroethane (PCE)	1 (secondary target level)	5 (MCL)
Vinyl chloride (VC)	Not identified	2 (MCL)

VII. SUMMARY OF REMEDIAL ALTERNATIVES

The current groundwater plume underlies the undeveloped portion of the Site and an area of an adjacent residential property. As noted in the 2016 Five-Year Review, the remedy provides short-term protection of human health and the environment. The proposed Remedial Alternatives presented in this section address VOC groundwater contaminants remaining in both the shallow and deep aquifer.

Common Elements

The following are common elements to each of the Remedial Alternatives that were evaluated. These are existing components of the current remedy, as outlined in Section I of this PRAP (Site Background, Remedy Selection):

- Long-term monitoring, and
- Institutional controls requiring coordination with EPA and PADEP before installing drinking water wells on Site properties.

In addition, five-year reviews for each alternative would be required until Site-wide cleanup goals are met allowing for unlimited use and unlimited exposure to Site ground water.

The following Remedial Alternatives were evaluated to modify the Selected Remedy:

<u>Alternative No. 1 – Intermittent Groundwater Extraction, Treatment, and Discharge with ISCO Injections</u>

Estimated Capital Cost GWETS: $741,700
Estimated ISCO Costs: $962,900
Estimated Annual O&M Cost: $120,200
Estimated Annual Monitoring Costs: $43,200
Estimated Five Year Review Cost: $25,000
Estimated Present Worth Cost: $2,214,000
Estimated Time to Completion: 4 Years

Alternative No. 1 is the existing remedy described in the 1988 ROD and subsequent ESDs and consists of three components: (1) intermittent groundwater extraction, treatment, on site discharge of treated groundwater to surface water, (2) if necessary, ISCO injections in elevated concentration areas (elevated concentration areas are specific locations where pump and treat has been less effective or injections from the pilot studies have not shown significant treatment progress; EPA is choosing not to call these areas hotspots as the contaminant concentrations are not very high and are usually only slightly elevated above a cleanup level), and (3) common elements to each alternative, ICs and the long-term groundwater monitoring program.

Based on combined intermittent GWETS and ISCO treatment technologies, long-term, permanent protection is estimated after a treatment duration of four years or less.

<u>Component 1: Intermittent Groundwater Extraction, Treatment, and Discharge</u> – Under Alternative No. 1, the inoperable GWETS and associated infrastructure would be repaired and updated to allow the GWETS to operate. Two existing injection wells could be modified and converted into extraction/pumping wells, and electrical and system repairs would be completed in order to restart the GWETS and extract groundwater from the contamination plume. The updated and repaired GWETS would operate at a reduced capacity (50 gpm), as compared to its original design volume (165 gpm), due to the decreased size of the contaminant plume.

The GWETS would be optimized to achieve maximum effectiveness while minimizing potential impacts to existing residential wells. Individual extraction well flow rates would be adjusted depending on analytical results obtained from groundwater monitoring once groundwater MCLs are achieved at or near a specific well location. For cost estimating, in addition to converting wells, two new pipelines would be installed from wells IW-1 and IW-4 to existing pipelines of RW-1S and RW-1D, respectively (see Figure 6).

The existing air stripping tower would be used for treatment as currently included in the remedy. Influent groundwater would be passed through the air stripping tower for treatment; effluent has historically achieved required discharge limits. Given low level influent concentrations of VOCs remaining within the targeted treatment zones, off-gassing from the air stripper effluent stream would not require pre-treatment and would be discharged directly to the atmosphere in accordance with ESD #3.

Treated groundwater would be discharged to the existing outfall located behind the existing treatment building, and gravity fed to surface waters of the unnamed tributary of Perkiomen Creek as outlined in the existing decision documents.

<u>Component 2: ISCO Injections</u> - ESD #4 allowed intermittent operation of the GWETS combined with ISCO to treat contaminated groundwater. ISCO injections could be conducted at elevated concentration areas using MFR to enhance COC breakdown. For cost estimating, two new 150 feet deep six-inch-diameter injection wells (IW-6 and IW-7) would be installed between nested well pairs MW-3S/D and MW-7S/D (well locations are shown on Figure 6). Two ISCO events using MFR would be conducted to treat areas where groundwater pump-and-treat extraction wells have been less effective.

MFR is an aggressive treatment technology, is highly reactive, can instantaneously oxidize and destroy the COCs on contact, and is non-persistent in the environment (it only persists in the subsurface from minutes to hours). The duration of the injection event is estimated to be one month.

ISCO injections would take place with intermittent use of the GWETS. After the completion of an ISCO injection, the groundwater extraction would be started to continuously remove COC mass from the elevated concentration areas. Groundwater extraction would then cease to allow the aquifer to rebound and achieve normal static water levels. Contaminant concentrations decrease when ISCO is applied but sometimes will increase, or rebound, if the oxidant did not reach all of the contamination, or if the oxidant is used up before all the contamination is treated. A second ISCO injection event would be conducted in the same manner as the first injection event if rebound occurs or COCs are not reduced to cleanup levels. The GWETS can operate intermittently during periods of ISCO injections until clean up goals are achieved. This provides PADEP flexibility to evaluate the ISCO progress during these periods.

<u>Component 3: Common elements to each alternative, ICs and long-term groundwater monitoring</u> - Existing ICs would be maintained until cleanup goals area achieved. Based on combined intermittent GWETS and ISCO treatment technologies, long-term, permanent protection is estimated after a treatment duration of four years or less.

Performance monitoring of groundwater would be conducted to assess the effectiveness of GWETS and ISCO applications. A pre-injection, baseline groundwater sampling event would be conducted with samples analyzed for COCs. One round of performance monitoring would be conducted after each ISCO injection to assess the effectiveness of ISCO treatment. Performance monitoring would also be conducted to assess the effectiveness of groundwater extraction and treatment.

Long-term monitoring would be conducted for the duration of the remediation period to assess effectiveness of the remedy and would continue until groundwater cleanup goals are achieved. Groundwater samples would be collected from existing monitoring wells and analyzed for VOCs on a frequency determined by PADEP and EPA.

GWETS monitoring would be performed periodically by sampling and analysis of the system's influent and effluent for VOCs. This sampling would ensure that discharge limits are not exceeded.

<u>Alternative No. 2 – Combined In-Situ Biological and Chemical Groundwater Treatment</u>

Estimated Capital Cost: $219,200
Estimated Annual ISB/ISCR Costs $302,900
Estimated Annual O&M Cost: $0
Estimated Annual Monitoring Cost: $75,800
Estimated Five Year Review Cost: $25,000
Estimated Present Worth Cost: $1,550,400
Estimated Time to Completion: 6 Years

Alternative No. 2 builds on the injection pilot studies and consists of three components: (1) combined in-situ biological and chemical groundwater treatment, (2) controlled groundwater re-circulation to target elevated concentration areas of the groundwater plume, and (3) common elements to each alternative, ICs, long-term groundwater monitoring program. Under Alternative No. 2, the existing GWETS infrastructure would not be repaired other than to provide electrical power to submersible pumps, if required, in the wells. These pumps would be installed as part of component (2) in areas of the plume where contaminant concentrations remain elevated above cleanup levels after injections. Elevated concentration areas may indicate the amendments are not being distributed through the aquifer and this component would provide the flexibility to distribute the injected amendments across the targeted treatment zone by using the extraction wells to draw amendments through the aquifer. New wells could be installed with A-SOX™ canisters near residential wells to address COCs where current injections could not be implemented due to potential impacts to nearby residential wells. This technology (A-SOX™ canisters) is a passive remedial approach using only ISCR and will limit any impacts to residential wells caused by injections of ISB and ISCR injections. A-SOX™ canisters are a localized treatment delivery mechanism and consist of a fabric sleeve filled with an ISCR amendment which is placed in a stainless-steel canister and lowered into a well. Groundwater comes into contact with the treatment amendment as it passes through the well and is treated downgradient of the well. This passive approach minimizes the risk of injections impacting any upgradient residential wells.

Achievement of long-term permanent protection is estimated to be six years, based on combined ISB/ISCR treatment technologies and controlled groundwater re-circulation.

<u>Component 1: In-situ groundwater treatment via ISB and ISCR injections and A-SOX™ applications</u> – ISB/ISCR has been successfully applied at the Site during various pilot studies. Combining ISB and ISCR under Alternative No. 2 offers a more comprehensive treatment approach as compared to using these processes individually.

Enhanced bioremediation includes both biostimulation and bioaugmentation processes, and would involve the use of a carbon-based substrate, microorganisms, and nutrients to breakdown or degrade COCs into nontoxic and/or less toxic forms. ISB would consist of injecting an electron-donor compound such as EHC-L® into groundwater to create strong reducing conditions and enhance anaerobic COC dechlorination by promoting both biotic and abiotic reactions. Bioaugmentation would consist of injecting specialized bacterial cultures to further enhance the dechlorination process. The addition of cultures would supplement naturally-occurring bacterial population to degrade the COCs. ISCR would include injecting micro-scale ZVI to create and help maintain strong reducing conditions favorable for COC degradation.

Controlling pH levels is a key component for maintaining stable chemical and/or microbiological processes critical for COC degradation. Therefore, potassium bicarbonate (i.e., a pH buffer) would be added to groundwater within the targeted treatment zone to maintain a neutral pH level (i.e., between 6 and 8) so bacteria populations could continue to thrive.

For purposes of cost estimating, two new six-inch-diameter IWs (IW-6 and IW-7) would be installed at elevated concentrations areas between nested well pairs MW-3S/D and MW-7S/D (locations are shown on Figure 7). A series of six injections were presumed for purposes of the cost estimate; however, injections will take place when water quality parameters indicate additional injections are necessary. An updated Site Sampling Plan will reflect the water quality parameters that would indicate when additional injections would be necessary.

Data from the 2016 and 2017 pilot studies indicate that A-SOX™ units have some success in decreasing COC concentrations. No EHC-L® injections would be conducted at IW-3, MW-7S, and MW-7D due to the potential to impact residential supply wells. A-SOX™ units are proposed for these wells and would be replenished semi-annually and/or on an appropriate frequency until the remedy is completed.

<u>Component 2: Controlled groundwater re-circulation in elevated concentration areas</u> – If amendments are not distributing through the aquifer, controlled and limited groundwater re-circulation would be employed to increase distribution of the ISB/ISCR amendments throughout the targeted treatment zone. For purposes of the cost estimate, one round of controlled and limited groundwater re-circulation was presumed to be conducted using a closed loop configuration to distribute ISB/ISCR amendments throughout elevated concentration areas and to support bioremediation process.

<u>Component 3: Existing components, including ICs, long-term groundwater monitoring</u> – Existing ICs would be maintained until groundwater cleanup goals are achieved. Monitoring would be conducted to assess the effectiveness of ISB/ISCR applications. It is estimated that four rounds of post-injection process monitoring would be performed, with events occurring approximately three, six, nine, and twelve months after the injection event.

Performance monitoring would be performed for in-situ bioremediation approximately nine months after the first injection event is completed. PADEP will evaluate the results and then determine the subsequent frequency of injection events, modifications to amendment dosage, and injection volumes/durations.

<u>Long-term groundwater monitoring</u> – Groundwater monitoring and sampling would be conducted for the duration of the remediation period to assess the effectiveness of ISB/ISCR applications, and would continue until cleanup goals are achieved. Achievement of long-term permanent protection is estimated to be six years, based on combined ISB/ISCR treatment technologies and controlled groundwater re-circulation.

VIII. EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the Remedial Alternatives individually and against each other in order to propose a preferred alternative. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine criteria are discussed below. Additional detailed analysis of the remedial alternatives can be found in the 2019 FFS Report which may be found in the Administrative Record for the Site.

Evaluation Criteria for Superfund Remedial Alternatives
1. Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
3. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5. Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
6. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
7. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
8. State/ Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.
9. Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Detailed Analysis of Proposed Remedial Alternatives

1. Overall Protection of Human Health and the Environment

Alternatives No. 1 and No. 2 would protect human health and the environment by eliminating or reducing risk through treatment and institutional controls. Chemicals of concern would be treated to reduce concentrations to risk-based levels in each alternative. Under Alternative No. 1, the inoperable GWETS and associated infrastructure would be repaired and updated to allow the GWETS to operate and ISCO injections could be conducted in areas with elevated concentrations using MFR to enhance COC breakdown. Groundwater would be extracted and treated in the existing GWETS through the existing air stripping tower and discharged to the unnamed tributary of Perkiomen Creek. ISCO injections would convert VOCs to nonhazardous or less toxic compounds. Under Alternative No. 2, COCs would be destroyed or biodegraded under ISB/ISCR processes. Chemical-reducing agents and microorganisms would be injected into the aquifer to degrade contaminantes without the GWETS for this alternative. Off-site transportation and disposal of spent treatment media would not be required for either alternatives.

Both alternatives would eliminate unacceptable human health risks from direct contact with contaminated ground water through treatment. Maintaining ICs implemented under the 1988 ROD and ESD #6 would prevent the installation of new drinking water wells and the use of groundwater as a potable water source until remediation is completed and cleanup levels are achieved, thereby preventing residential exposures to COCs or chemical reagents. Long-term monitoring would protect human health and the environment by evaluating the effectiveness of remedies of each alternative and would effectively detect any potential plume migration until cleanup levels are met.

2. Compliance with Applicable or Relevant and Appropriate Requirements ARARs)

Both Alternatives No. 1 and No. 2 would comply with location and action-specific ARARs and TBCs as outlined in the 2019 FFS, including meeting cleanup goals (i.e., MCLs) for COCs. These ARARs are described in detail in Tables 2-1 through 2-3 of the FFS.

3. Long Term Effectiveness and Permanence

Alternatives No. 1 and No. 2 both provide long-term effectiveness and permanence through a combination of active treatment and ICs. Both alternatives would be effective and permanent in restoring groundwater quality by attaining drinking water standards in a reasonable time frame. Alternative No. 1 is expected to achieve the cleanup goals more rapidly as compared with Alternative No. 2. Long term monitoring and ICs would be maintained for both alternatives until cleanup levels are met. All unacceptable risk posed by exposures (ingestion, inhalation, and dermal contact) resulting from the use of untreated groundwater would eventually be eliminated with both alternatives after cleanup levels are met and cumulative risk assessment is performed to determine the protectiveness of the remedy.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Both alternatives would achieve reductions in COC toxicity and volume through different treatment methods. Alternative No. 1 would treat and remove COCs through intermittent GWETS operation and ISCO injections. Alternative No. 2 would treat and remove COCs through ISB/ISCR injections and biodegradation. No treatment residues would be generated by Alternative No. 1 or Alternative No. 2

5. Short-Term Effectiveness

Alternative No. 1 would result in a greater level of short-term exposure to workers as compared with Alternative No. 2, given the necessary repairs to the GWETS and the notable health and safety issues involved with the handling and application of strong oxidizer materials. Additional exposure to contaminated groundwater could also occur during O&M of GWETS under Alternative No. 1. However, these exposure risks would be effectively controlled by having the workers wear appropriate PPE and comply with proper safety procedures.

Implementation of Alternative No. 1 could adversely impact the surrounding community or environment if exposure to oxidizers were to impact surrounding residential wells and there is slight risk to the surrounding community during the transport of oxidizers. If oxidizers are not used to treat contaminated groundwater near residential wells, the time estimated to achieve cleanup goals with only the GWETS could be significantly increased. Implementation of Alternative No. 2 would not adversely impact the surrounding community or environment.

For Alternative No. 2, A-SOX™ canisters can be placed in Site wells near residential wells to address COCs where current injections could not be implemented due to potential impacts to nearby residential wells.

Initial construction activities associated with Alternative No. 1 would be completed in 2-4 months, while initial construction activities associated with Alternative No. 2 would be completed in 1-2 months. The longer time for initial construction activities in Alternative No.1 are necessary for repairs to be made to the electrical control systems in the GWETS and to install water lines to new extraction wells before it resumes operations. It is estimated that Alternative No. 1 would achieve RAO's in four years and in order to meet the estimate cleanup timeframe, ISCO injections would be necessary in elevated concentration areas where pump and treat has been less effective. Alternative No. 2 would require a slightly longer time frame of six years to achieve RAOs.

6. Implementability

Alternative No. 1 and No.2 are readily implementable as contractors, equipment and supplies are available for both alternatives, however, Alternative No. 2 is less complicated to implement. Alternative No. 2 would require more detailed annual monitoring costs but was successfully demonstrated during multiple pilot studies and would continue implementation from the point of the last PADEP pilot study. Alternative No. 2. would not require the O&M associated with operating a GWETS. Alternative No. 1 is expected to be more complicated to implement given its use of strong oxidants and specialized hydrofracturing requirements. Additionally, two existing IWs would be modified and converted into extraction/pumping wells, and electrical controls system repairs would need to be completed before the GWETS is restarted. Technical implementation of various components of Alternative No. 2 would be safer to implement because handling chemical reagents associated with ISB/ISCR is less hazardous than handling the oxidizing agents associated with Alternative No. 1.

7. Cost

Groundwater Restoration

The present worth costs of Alternatives No. 1 and No. 2 are summarized in the table below. The present worth estimates were calculated using a 7 percent discount rate. Alternative No. 1 was calculated over a four-year period, based on the expected remediation timeframe. Alternative No. 2 was calculated over an estimated six-year period for remediation of groundwater.

Alternative	Capital Cost	Injection Costs	Annual O&M Costs	Annual Monitoring Costs	Five Year Review Cost	Net Present Worth Costs
No. 1	$741,700	$962,900	$120,200 (Years 1-4)	$43,200 (Years 1-4)	$25,000	$2,214,400
No. 2	$219,100	$302,900 (Years 1-6)	N/A	$75,800 (Years 1-6)	$25,000	$1,550,400

Alternative No. 1 has a higher cost than Alternative No. 2 due to higher capital costs related to the extensive repair requirements of the GWETS and implementation of the ISCO within the remaining elevated concentration areas. Capital Cost for repair of the GWETS are approximately $250,000, the additional $497,700 in capital costs for Alternative No. 1 includes the additional costs to convert former injection wells to recovery wells and the associated water lines. This is necessary because, at the time the GWETS was damaged, it no longer was drawing water from the more contaminated wells and PADEP was evaluating optimization strategies to extract water from areas with elevated concentrations of contamination. The O&M costs for Alternative No. 1 is required to maintain the GWETS over four years. Alternative No. 2 does not require O&M but slightly higher annual monitoring costs to evaluate ground water chemistry necessary to determine when best to apply ISB/ISCR injections. The cost for Alternative No.2 is lower and can be spread out over several years while the cost of the Alternative No. 1 ISCO injections are high and are focused on a much shorter time period.

8. State Acceptance

PADEP has been working closely with EPA throughout the ISB/ISCR pilot studies and during preparation of the FFS and has indicated a preference for Alternative 2.

9. Community Acceptance

EPA will evaluate community acceptance of the preferred alternative after the public comment period ends. Community comments and EPA's response to any such comments will be available in the Responsiveness Summary of the ROD Amendment.

IX. EPA'S PREFERRED ALTERNATIVE

EPA's Preferred Alternative is Alternative No. 2, Combined In-Situ Biological and Chemical Groundwater Treatment. Alternative No. 2 would protect human health and the environment by reducing and eventually eliminating current and potential health risks associated with exposure to COCs. COC concentrations in excess of cleanup goals (i.e., MCLs and MSC) would be reduced through the introduction of chemical reducing agents and bacteria into the groundwater aquifer to directly treat the contamination. Once cleanup levels of individual contaminants are achieved, a cumulative risk assessment would be performed to confirm the remedy is protective.

Rationale for Preferred Alternative

Compared to Alternative 1, Alternative 2 has less complicated implementation through the application of ISB/ISCR in-situ injections, less infrastructure requirements as it does not involve the extensive repairs to the GWETS and has lower implementation costs.

Statutory Determination

Based on the information currently available, EPA has determined that the Preferred Alternative would be protective of human health and the environment, would comply with ARARs and would be cost effective. The final remedy selected by EPA may differ from the Preferred Alternative described in this Proposed Plan based on public comments or new information.

X. COMMUNITY PARTICIPATION

EPA relies on public input so that the remedy selected for each Superfund site meets the needs and concerns of the local community.

<u>Public Comment Period</u> – To ensure that the community's concerns are being addressed, a public comment period will open ***June 12, 2019*** and close ***July 12, 2019.*** During this time, the public is encouraged to submit to EPA any comments on the Proposed Plan.

<u>Public Meeting</u> – A public meeting will be held to discuss the Proposed Plan on ***June 27, 2019*** from 6:00 p.m. to 7:00 p.m. The public meeting will be held at the Longswamp Township Municipal Building.

Although EPA has proposed a Preferred Alternative, EPA has not yet selected the final remedy for the Site. All relevant comments received will be considered and addressed by EPA before the final remedy is selected for the Site.

Detailed information on the material discussed herein may be found in the Administrative Record for the Site, which includes the 2019 Focused Feasibility Study, pilot study reports and groundwater monitoring data and other information used by EPA in the decision-making process. EPA encourages the public to review the Administrative Record in order to gain a more comprehensive understanding of the Site and the Superfund activities that have taken place there. Copies of the Administrative Record are available for review at www.epa.gov/arweb, or at the following locations:

Brandywine Community Library
60 Tower Drive
Topton, Pennsylvania 19562
Hours: Monday through Wednesday
10:0AM to 8:00PM
Thursday and Friday
12:00PM to 5:00PM
Saturday
9:00AM to 2:00PM
Phone: (610) 682-7115

EPA Administrative Records Room
Administrative Coordinator
1650 Arch Street
Philadelphia, PA 19103
Phone: (215) 814-3157
Hours: Monday – Friday
8:30AM to 4:30PM
(By Appointment Only)

Comments should be submitted in writing or emailed to:

Nick Tymchenko
Remedial Project Manager
U.S. Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-2022
tymchenko.nick@epa.gov

Or

Amanda Miles
Community Involvement Coordinator
U.S. Environmental Protection Agency Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-5557
miles.amanda@epa.gov

Following the conclusion of the public comment period on this Proposed Plan, EPA will prepare a Responsiveness Summary. The Responsiveness Summary will summarize and respond to comments on EPA's Preferred Alternatives. EPA will then prepare a formal decision document, the ROD Amendment, which summarizes the decision process and the remedy modification for the Site. The ROD Amendment will include the Responsiveness Summary. Copies of the ROD Amendment will be available for public review in the designated repositories, described above.

XI. GLOSSARY OF TERMS

%	percent
µg/L	micrograms per liter
ARAR	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemicals or contaminants of concern
DCA	dichloroethane
DCE	dichloroethene
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
FFS	Focused Feasibility Study
gpm	gallons per minute
GWETS	groundwater extraction and treatment system
HHRA	human health risk assessment
IC	institutional control
ISB/ISCR	in-situ biological and chemical reduction treatment
ISCO	in-situ chemical oxidation
IW	injection well
MCL	maximum contaminant level
MFR	modified Fenton's reagent
MSC	medium specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operations and maintenance
PADEP	Pennsylvania Department of Environmental Protection
PCE	tetrachloroethene
RAO	remedial action objective
RI/FS	remedial investigation and feasibility study
ROD	Record of Decision
RSL	regional screening levels
TCA	trichloroethene
VC	vinyl chloride
VOC	volatile organic compound
ZVI	zero valent iron

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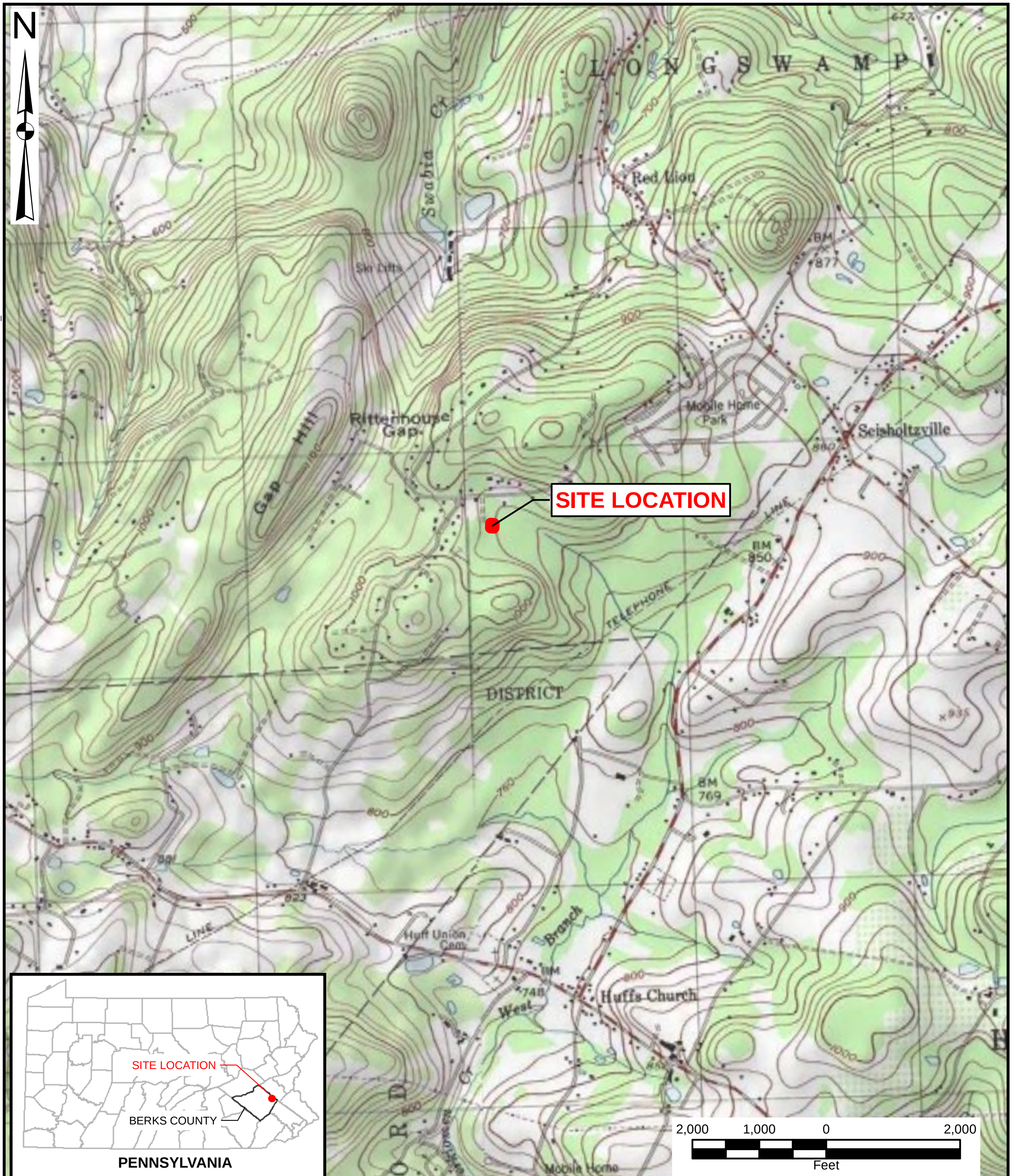

TETRA TECH

LOCATION MAP
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	
PER SCALE BAR	
FILE	
SITE LOCATION MAP.MXD	
REV	DATE
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FIGURE NUMBER	
FIGURE 1	

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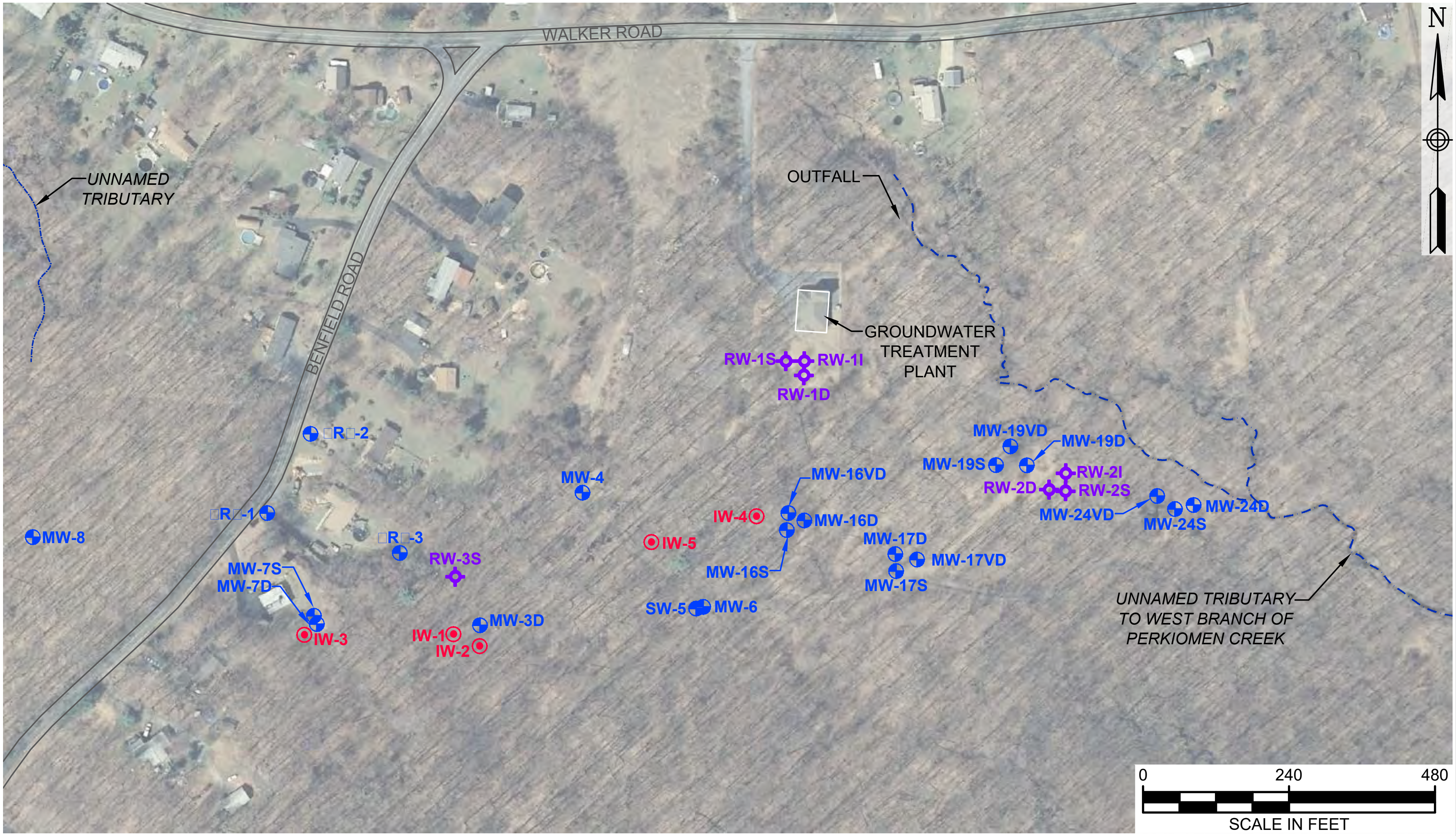

LEGEND

- MONITORING WELL
- RECOVERY WELL
- INJECTION WELL

SOURCE□"BERKS FORMER SANDPIT SUPERFUND SITE IN-SITU BIOREMEDIATION□ CHEMICAL REDUCTION PILOT STUDY PHASE II INJECTION SUMMARY AND PROGRESS REPORT□" WESTON□JULY 20□□□

TETRA TECH

CURRENT SITE LAYOUT
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G07936GM15-1
REV	0
DATE	6/11/19
FIGURE NUMBER	FIGURE 2

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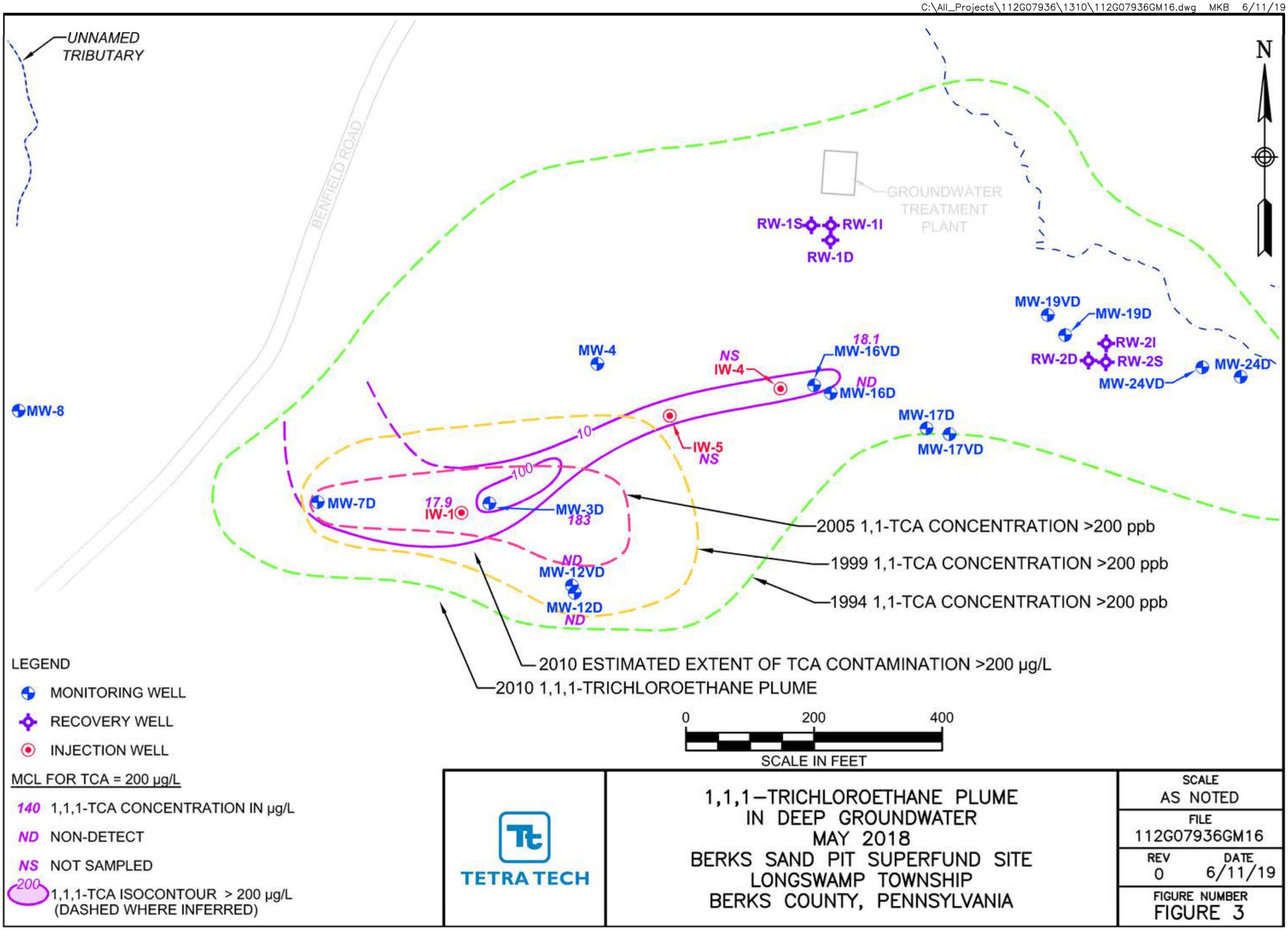
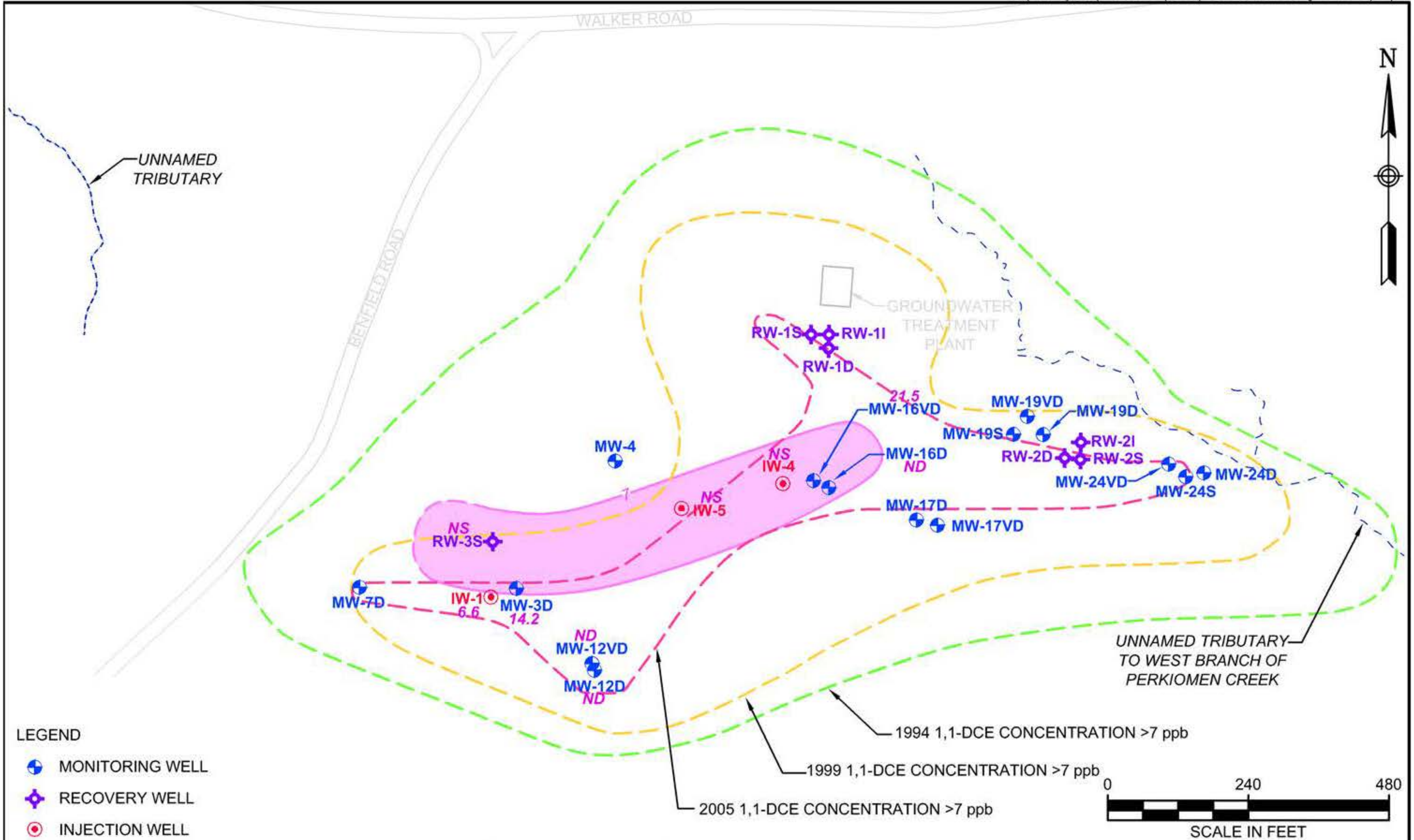


TETRA TECH

1,1,1–TRICHLOROETHANE PLUME
IN DEEP GROUNDWATER
MAY 2018
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	
AS NOTED	
FILE	
112G07936GM16	
REV 0	DATE 6/11/19
FIGURE NUMBER	
FIGURE 3	



LEGEND

- MONITORING WELL
- RECOVERY WELL
- INJECTION WELL

MCL FOR DCE = 7 μg/L

28.3 1,1-DCE CONCENTRATION IN μg/L

ND NON-DETECT

NS NOT SAMPLED

7 1,1-DCE ISOCONTOUR > 7 μg/L (DASHED WHERE INFERRED)

TETRA TECH

1,1-DICHLOROETHENE PLUME
IN DEEP GROUNDWATER
MAY 2018
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G07936GM17
REV	0
DATE	6/11/19
FIGURE NUMBER	FIGURE 4

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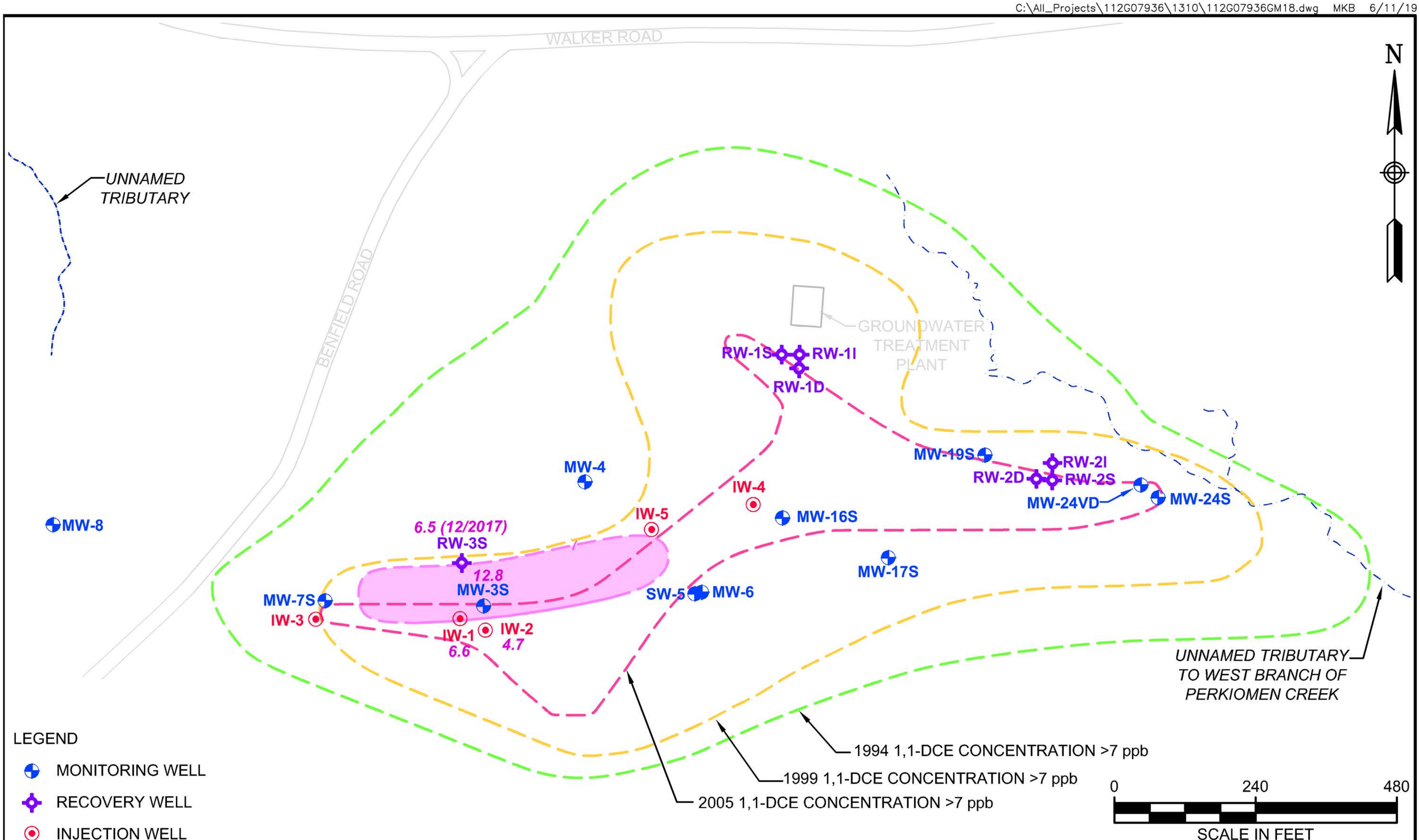


LEGEND

MONITORING WELL

RECOVERY WELL

INJECTION WELL

MCL FOR DCE = 7 µg/L

9.8 1,1-DCE CONCENTRATION IN µg/L

ND NON-DETECT

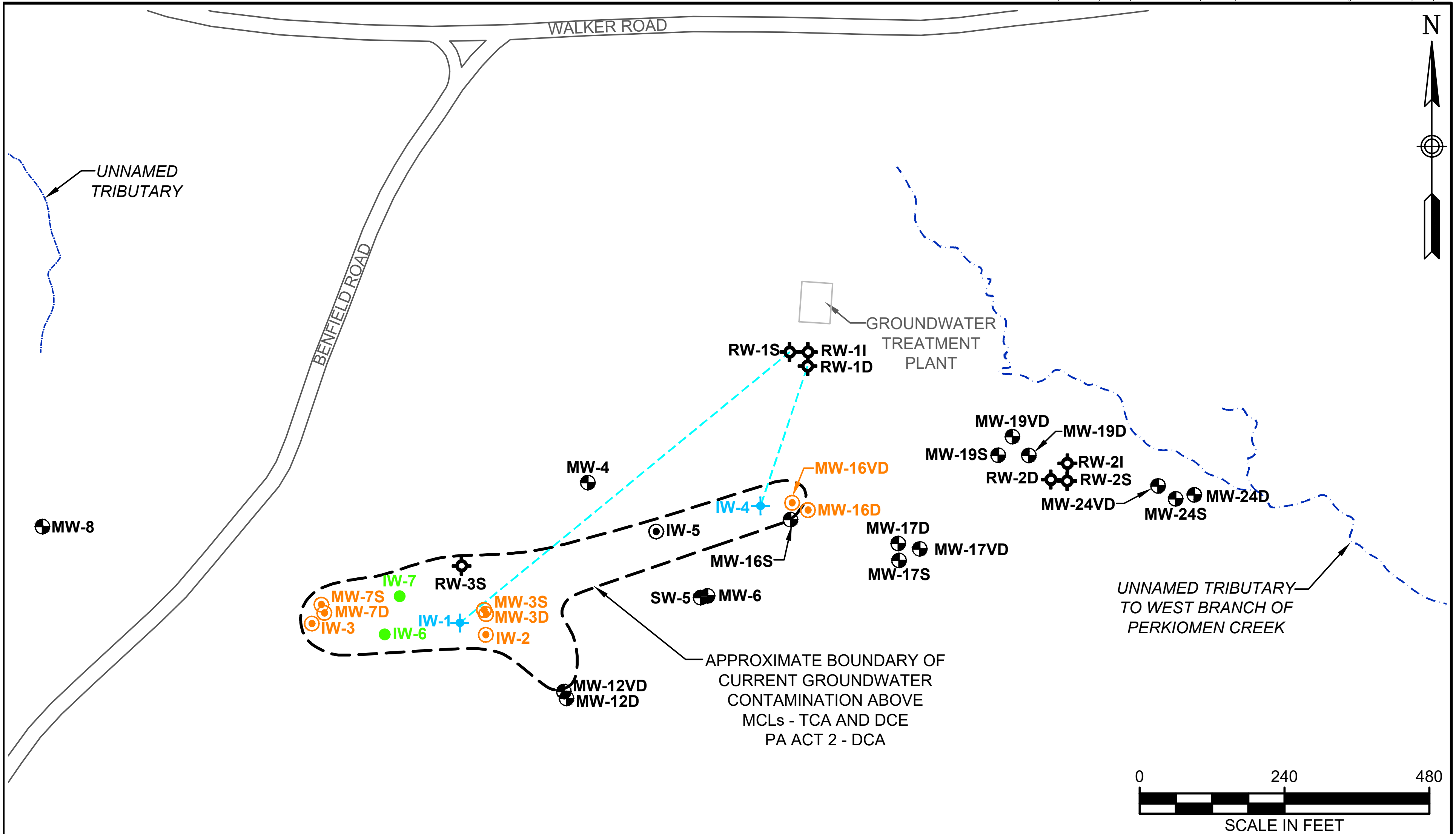
NS NOT SAMPLED

7 1,1-DCE ISOCONTOUR > 7 µg/L (DASHED WHERE INFERRED)

TETRA TECH

1,1–DICHLOROETHENE PLUME
IN SHALLOW GROUNDWATER
MAY 2018
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G07936GM18
REV 0	DATE 6/11/19
FIGURE NUMBER	FIGURE 5



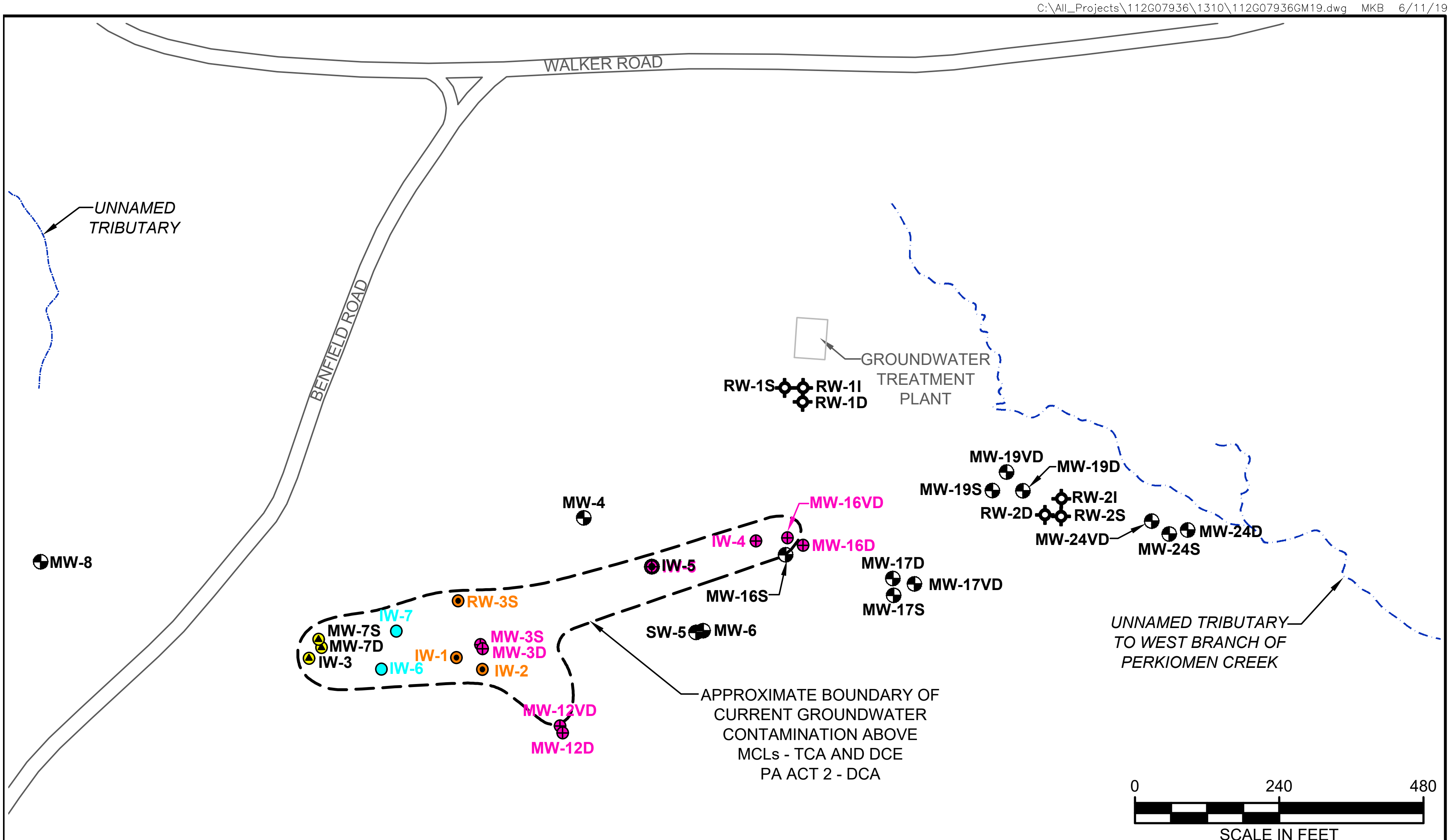
LEGEND

- MONITORING WELL
- RECOVERY WELL
- NEW RECOVERY WELL
- ISCO INJECTION WELL
- PREVIOUS INJECTION WELL
- PROPOSED NEW INJECTION WELL
- PROPOSED NEW WATER PIPELINE

TETRA TECH

FOCUSED FEASIBILITY STUDY
ALTERNATIVE 1
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G07936GM19-1
REV 0	DATE 6/11/19
FIGURE NUMBER	FIGURE 6



LEGEND

- MONITORING WELL
- A-SOX WELL
- EHC-L INJECTION WELL
- PROPOSED EHC INJECTION WELL
- PROPOSED NEW EHC INJECTION WELL

TETRA TECH

FOCUSED FEASIBILITY STUDY
ALTERNATIVE 2
BERKS SAND PIT SUPERFUND SITE
LONGSWAMP TOWNSHIP
BERKS COUNTY, PENNSYLVANIA

SCALE	AS NOTED
FILE	112G07936GM19-1
REV 0	DATE 6/11/19
FIGURE NUMBER	FIGURE 7