Proposed Plan

Garden City Groundwater Plume Site

Garden City
Bartholomew County, Indiana

May 2018

The Public Comment Period for this Proposed Plan will run from

May 29, 2018 to June 28, 2018

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Proposed Plan

Garden City Groundwater Plume Superfund Site

Garden City, Indiana

A. Introduction

The United States Environmental Protection Agency (EPA), in consultation with the Indiana Department of Environmental Management (IDEM), is issuing this Proposed Plan to recommend its Preferred Alternative to address contaminated groundwater at the Garden City Groundwater Plume Superfund site (Garden City site or "site") in Bartholomew County, Indiana. EPA is proposing to implement Alternative 2, Groundwater Monitoring with Contingency for Wellhead Treatment to address the groundwater contaminant plume. This Proposed Plan discusses the rationale for the Preferred Alternative and includes summaries of other cleanup alternatives EPA evaluated for potential use at this site.

EPA is issuing this Proposed Plan as the lead agency for site remedial activities. IDEM as the support agency, has indicated that they concur with the Preferred Alternative described in this Proposed Plan. EPA, in consultation with IDEM, will select a final remedy in a Record of Decision (ROD) after reviewing and considering all information submitted during a 30-day public comment period. EPA may modify its Preferred Alternative or select another response action based on new information or public comments. Therefore, the public is also encouraged to review and comment on the alternatives presented in this Proposed Plan.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. §§ 9601-9675, and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) report (February 2017), the Feasibility Study (FS) report (July 2017), and other documents contained in the Administrative Record file for the Garden City site. EPA and IDEM encourage the public to review these documents to gain a more comprehensive understanding of the site and of the Superfund activities that were conducted to date.

The Administrative Record file is available for review at the Cleo Rogers Memorial Library, 536 Fifth Street, Columbus, Indiana (Hours: Monday – Thursday, 8:30 am - 9 pm; Friday – Saturday 8:30 am – 6 pm, Sunday 1 - 4 pm) and at the EPA Region 5 office, 7th Floor Record Center, 77 W. Jackson Blvd., Chicago, Illinois (Hours: Monday – Friday, 8 am- 4 pm).

B. Site Background

1. Site Location and Description

Garden City is an unincorporated community located about one mile south of Columbus and 40 miles south of Indianapolis, Indiana (Figure 1). Garden City includes approximately 50 individual residences, a mobile home park of 47 units, and several small businesses. The area immediately surrounding Garden City is primarily rural land used for agricultural purposes. Several large lakes and wetlands and the East Fork of the White River are less than one mile to the east. Several county playgrounds and recreational facilities are located directly south of Garden City, as is the water treatment plant for the City of Columbus (Figure 2).

2. Site History

In May 1989, IDEM received a report of petroleum odors in drinking water at a residence located in Garden City and its Office of Emergency Response began sampling drinking water wells in area homes and businesses. The sample results showed contamination of groundwater with petroleum-related and chlorinated volatile organic compounds (VOCs), including benzene, toluene, and trichloroethene (TCE). In 1990, IDEM installed granular activated carbon (GAC) treatment systems at three residences and one business with TCE in their drinking water supply wells. All but one of the residential wells had TCE levels that exceeded the federal Safe Drinking Water Act Maximum Contaminant Level (MCL) of 5 micrograms per liter (μg/L). To date, IDEM has been servicing these units on an annual basis. The four wells are located near the center of Garden City at the intersection of Jonesville Road (State Road 11) and Garden Street (County Road 100 South).

In 1991, IDEM's Leaking Underground Storage Tank (LUST) Section discovered TCE in groundwater at the (former) Kiel Brothers property (Figure 3). The TCE concentrations were higher in the Kiel Brothers drinking water well than in the well water samples collected from the other residences and businesses at that time.

During a 1994 investigation, TCE was detected in a well located upgradient immediately to the north of the Kiel Brothers property. This finding indicated that the former Kiel Brother's property was not the likely source of the TCE. IDEM's LUST Section therefore referred the investigation to IDEM's Site Investigation Section because neither TCE nor its parent compound tetrachloroethene (PCE) were known to exist in any Kiel Brothers underground storage tanks. Kiel Brothers was required to complete the LUST activities, but was not responsible for the TCE in area groundwater.

In August 2011, IDEM conducted an Expanded Site Investigation to evaluate the sources of TCE in area groundwater. The investigation showed that TCE was also in the mobile home park water supply well serving 47 residences (Figure 3). Records document that the TCE plume extends from approximately 300 feet north to 1,000 feet south of the intersection of Jonesville Road and Garden Street in Garden City.

In 2013, the state of Indiana referred the site to EPA to investigate the nature and extent of contamination. EPA subsequently, with the support of IDEM, placed the site on the Superfund National Priorities List (NPL).

Based on current data, EPA has determined that the entire Garden City site groundwater contaminant plume is within the Wellhead Protection Area (WHPA) administered by the Columbus City Utilities for the City of Columbus, which operates 15 groundwater production wells in the WHPA serving an estimated population of 45,000 people. Three municipal drinking water wells are located less than one mile south of Garden City. Though the plume is within the WHPA, the Columbus municipal groundwater production wells are not impacted above MCLs.

EPA conducted a search in 2014 to identify parties potentially liable for the site contamination, known as Potentially Responsible Parties (PRPs). The search identified no viable PRPs; therefore, EPA conducted the RI from 2015 to 2016, taking groundwater samples, private/commercial well samples, water supply well samples, and soil vapor gas samples to define the nature and extent of chlorinated solvents in soil and groundwater at the site. EPA also performed a baseline human health risk assessment (HHRA) and screening level ecological risk assessment (SLERA) to support remedy selection.

C. Site Characteristics

1. Geography and Topography

Garden City area topography is generally flat with slight grades and little relief. Garden City is on the 100-year flood plain of the East Fork of the White River and is characterized by gently sloping terrain.

The East Fork of the White River is less than 0.5 mile east of the center of Garden City and flows to the south (Figure 3). From January 2008 to August 2016, hydrographic data indicated that flooding over minor flood stage occurred on average twice yearly. Moderate and major flooding have occurred twice over the eight-year period, with one moderate flooding event occurring during the RI. An evaluation of the relationship between surface water in the East Fork of the White River and local groundwater indicated a strong hydraulic connection between the two.

2. Hydrogeology and Climate

Regionally, Garden City is in an area underlain by a buried bedrock valley, with bedrock composed of black shale. The unconsolidated sediments overlying the bedrock consist of alluvial silt and sand, as well as sand and gravel outwash deposits. The unconsolidated silt, sand, and gravel deposits range from 70 to 100 feet thick in the project area. The surficial soil is composed of well- to poorly-drained loam up to 20 feet thick. The water table occurs generally 20 feet below ground surface (bgs) in the coarser aquifer material, with a hydraulic gradient towards the south to southeast. Groundwater hydraulic conductivity in the alluvium ranges from 1 to 1,000 feet per day.

Locally, an alluvial aquifer extends from ground surface to the top of shale bedrock, ranging in thickness from about 75 to 96 feet. Soils observed during RI soil boring activities indicate that the alluvial aquifer primarily consists of fine to coarse sand and poorly-sorted gravel.

Fill material consisting of black foundry sand, wood, and metal fragments, is present throughout most of the site at ground surface and ranges in thickness from approximately 1 to 10 feet. In the area of the Devening Block property, which is situated mainly in the northeast quadrant of the intersection between Jonesville Road and Garden Street, fill containing possible foundry sand extends from ground surface to approximately 23 to 40 feet bgs.

Isolated lenses of silt and clay are predominately in the upper portion of the alluvial material but are also seen as deep as 75 feet bgs. The thicknesses of the isolated silt and clay lenses range from approximately 1 to 15 feet. A dry, discontinuous clay layer with an average thickness of approximately 20 feet was observed in the northern and western areas of the site, occurring generally from 50 to 80 feet bgs. The clay may be acting as a localized confining layer due to its dry nature. The thickness of the saturated interval above this aquifer zone ranges from 30 to 80 feet.

Garden City's climate features hot, muggy summers and cold, dry winters, and is classified as a humid continental climate. The monthly mean temperatures range from 22.3 degrees Fahrenheit (°F) in January to 70.8°F in July. Snow is moderate, with a normal seasonal accumulation from November to March of 23.7 inches. Precipitation averages 46.14 inches annually, with highest monthly rainfall in April.

3. Nature and Extent of Contamination

During the RI, EPA established the horizontal and vertical extent of TCE contamination in groundwater; however, EPA was unable to identify a source area for the groundwater plume. Conditions that would indicate an uncontrolled source of groundwater contamination (e.g., free product, staining, odor, sheen) were not observed in any of the soil samples collected. Therefore, there is no source material constituting a principal threat at the site.

EPA collected groundwater samples from the three area aquifers with the respective depths to the water table: shallow (8-23 feet bgs), intermediate (31-46 feet bgs) and deep (68-91 feet bgs). Residential and commercial wells in the area are screened within the shallow and intermediate aquifers, while the Columbus municipal wells tap the deep aquifer. EPA detected 14 different VOCs in groundwater samples. Because seven VOCs are related to petroleum compounds managed under the state's LUST program and three are common laboratory artifacts that were detected in five percent or less of the samples taken, they were not carried forward as chemicals of concern (COC). The other four VOCs detected are chlorinated solvents, including PCE, TCE, and associated degradation products *cis*-1,2-dichloroethene (DCE) and vinyl chloride (VC). Of the four chlorinated VOCs, only PCE and TCE were detected at concentrations above their respective MCLs. DCE and VC were detected sporadically at low concentrations downgradient of the TCE plume in the deep zone of the aquifer at GW-011-D, Municipal-9, and Municipal-12 (Figure 4).

PCE was detected in a shallow and intermediate depth groundwater sample at one location (GW-014). The highest PCE concentration was detected in the shallow sample interval at 45 µg/L, decreasing to 19 µg/L in the intermediate sample interval. Both concentrations exceed the PCE MCL of 5 µg/L, and the shallow concentration of 45 µg/L is also greater than the residential vapor intrusion screening level (VISL) of 24.6 µg/L. There is, however, no defined PCE groundwater contaminant plume because the detection of PCE in area groundwater is limited to this one location (Figure 4).

During the RI, TCE was detected in 24 out of 111 groundwater samples taken at 15 of 69 locations. TCE exceeded its MCL of 5 µg/L at five of the locations. These locations include pre-filtered groundwater at two residences already fitted with GAC units (PW-007, PW-008) and a third well (PW-004) that does not have a GAC unit and is sited in a commercial office building. The two other exceedances were found in groundwater grab samples from the former Kiel Brothers property. For clarification, it should be noted that PW-007 and PW-008 are the only wells of the original four wells fitted with GAC units that still show pre-filtered groundwater exceeding the TCE MCL. One of the original wells with a GAC filter (identified as PW-001) did not show TCE above MCL in the pre-filtered water. The other original well with a GAC filter just south of the mobile home park was not sampled during the RI due to access issues; however, a sample collected in June 2009 showed low levels of TCE (0.66 µg/l), benzene (0.12 µg/L) and 1,1,1-trichloroethane (0.29 µg/L). Each of the three chemical concentrations were below their respective MCLs. TCE was not detected at concentrations greater than the residential VISL of 1.86 µg/L in any shallow groundwater sample. Table 1 (see attached) summarizes the results and locations where TCE was detected during the RI.

For the most part, contaminant fate and transport mechanisms determine the TCE plume characteristics. The primary mechanism is that the dissolved contaminants within the plume move laterally with the flow of groundwater. Since the East Fork of the White River is nearby and is hydraulically connected to the groundwater, it influences the direction of groundwater flow, causing it to change direction according to the stage of the river. This causes the plume to spread out or disperse, thereby reducing TCE concentrations at the downgradient edge of the plume.

In general, attenuation is the reduction of TCE concentration within the plume, and is caused by various chemical, physical and biological processes. Attenuation can be estimated if enough data are available at one or more locations within a plume. At Garden City, quarterly TCE data from a private water supply well were available from December 2007 through June 2016. The well is nearby, but not within the plume itself. This is currently the only well with sufficient data to calculate the rate of attenuation. The calculated rate from this well was then used to evaluate the attenuation of TCE along the centerline of the groundwater plume. The data that were collected from the plume during the RI appear to follow the same trend as that of the private well.

The process of calculating an attenuation rate for TCE at the site requires a plot of the TCE data over time. In this case, TCE data from the private water supply well was plotted over nine years. A trend line was fit to the plotted data, from which the slope of the line was calculated. The slope showed a downward trend (Figure 5), indicating that the TCE concentration is slowly declining, or attenuating. From this assessment, EPA estimates that TCE will reach its MCL (5 µg/L) in the well within about three years. Based on the TCE concentrations measured within the groundwater plume, the projected timeframe to achieve the TCE MCL throughout the plume itself is approximately five years.

The breakdown of TCE is generally biological in nature, however, because there are no TCE breakdown products, such as DCE and VC, seen within the plume or other indicators of natural attenuation, it is unlikely that TCE is being biologically mitigated. Instead, attenuation is most likely due to dispersion and/or dilution of TCE from the influx of uncontaminated water from the East Fork of the White River during flood events.

The TCE plume in groundwater beneath Garden City was delineated laterally and vertically during the RI and appears to be shrinking. The distribution of TCE exceeding the MCL is a narrow, discontinuous plume along Jonesville Road from north of the former Kiel Brothers property to approximately 700 feet south (Figure 4). One of two private water supply wells located near the center of Garden City has shown intermittent TCE concentrations exceeding the MCL since 1997. The data indicate that the plume is not continuous, with limited migration to the east or west. This is particularly evident at GW-002-I and MW-014-I; here, TCE was reported at 6 µg/L (GW-002-I) located approximately 55 feet from MW-104-I, where TCE was only detected in two of four samples at concentrations near the reporting limit of 0.5 µg/L (Figure 4).

The vertical distribution of TCE is shown in Figure 6, cross section A-A. The distribution of TCE indicates that the plume is primarily located within the intermediate portion of the alluvial aquifer. The extent of TCE is delineated both laterally and vertically as represented by the conceptual site model in Figure 7.

Results of exterior soil vapor sampling indicate that of the compounds analyzed, only PCE, TCE, and benzene were detected in soil vapor, but no concentrations were reported above VISLs.

D. Scope and Role of the Response Action

This Proposed Plan recommends a remedial alternative to mitigate human health risk posed by TCE in groundwater that is used for drinking by Garden City residents and businesses. Because EPA found no materials that constitute a principal threat (i.e., the source of the VOC groundwater contamination in soil), the remedial approach is limited to addressing the existing groundwater contamination.

IDEM has already achieved significant risk reduction by installing and maintaining whole house GAC filters on three affected homes and one business. The RI identified a second commercial property as needing a filter. The recommended approach to address the VOC contamination includes the continued use of GAC filters on affected drinking water wells and groundwater monitoring with the contingency for installing GAC filters at locations if the TCE is discovered at or exceeding its MCL of 5 µg/L. This alternative is described in more detail in Section I (Preferred Alternative).

E. Summary of Site Risks

1. Human Health Risk Assessment

The NCP, which specifies the broad framework for RI/FS and the remedy selection process, states that the purpose of the remedial process for Superfund site is to implement remedies that reduce, control, or eliminate risks to human health and the environment. A baseline HHRA evaluates the potential current and future risks to human health posed by site contaminants. The HHRA includes:

- Data collection and evaluation, and identification of chemicals of potential concern (COPCs)
- Exposure assessment
- Toxicity assessment
- Risk characterization

1.1. Data Collection and Evaluation

The HHRA for the Garden City site is based on groundwater data collected during the four investigation phases conducted in August 2015, September 2015, November 2015 and April/May 2016, and soil vapor measurements collected in August 2016.

Groundwater exposure via potable use and dermal contact in an excavation was evaluated using EPA’s tap water regional screening levels for site contaminants. The National Primary Drinking Water MCLs were also compared to groundwater data to evaluate nature and extent of contamination. The more conservative of these two criteria were used to select the groundwater COPCs. By definition, COPCs have the greatest potential to cause adverse human health effects if receptors come in contact with contaminated site media. The COPCs were identified as TCE in private wells serving residential and commercial buildings and the Columbus municipal water supply wells. Vinyl chloride was also identified as a COPC as it was found in Columbus municipal well # 9 at 0.26 µg/L. Similarly, site soil vapor was evaluated for potential vapor intrusion to indoor air using EPA-derived VISLs. No COPCs were identified in soil vapor.

1.2. Exposure Assessment

EPA identified current and future anticipated land and groundwater use to be residential, commercial, agricultural and recreational based on site visits and numerous conversations with citizens (Figure 7). Residential and commercial buildings are located throughout Garden City, but primarily along Jonesville Road and Garden Street. Garden City is surrounded by rural agricultural land and surface water bodies associated with recreational use. Groundwater is used for agricultural, residential and commercial activities.

The potentially complete exposure pathways quantified for each receptor group and the exposure media are as follows:

Residents:

- Private Wells (potable use)—Ingestion, dermal contact, and inhalation exposures (during showering) to COPCs in groundwater.
- Municipal Wells (potable use)—Ingestion, dermal contact, and inhalation exposures (during showering) to COPCs in groundwater.
- Sitewide Groundwater (potable use)—Ingestion, dermal contact, and inhalation exposures (during showering) to the COPC in groundwater.

Industrial Workers:

- Private Wells (potable use)—Ingestion and dermal contact exposures to COPCs in groundwater.
- Municipal Wells (potable use)—Ingestion and dermal contact exposures to COPCs in groundwater.
- Sitewide Groundwater (drinking water)—Ingestion and dermal contact exposures to the COPCs in groundwater.

1.3. Toxicity Assessment

Chemical-specific toxicity values were used in the HHRA to estimate potential health effects resulting from exposure to the COPCs. COPCs typically have carcinogenic and noncarcinogenic properties which can produce cancer and/or other adverse noncancer health effects to exposed receptors. In the case of Garden City, toxicity values for the COPCs (TCE and VC) used in the HHRA were obtained from EPA toxicity value resources.

1.4. Risk Characterization

Carcinogenic risks are probabilities that are expressed in scientific notation (e.g., $1x10^{-6}$). An excess lifetime cancer risk (ELCR) of $1x10^{-6}$ indicates that an individual experiencing a reasonable maximum exposure to a contaminant has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an ELCR because it is in addition to the cancer risk a person might face from other causes such as smoking or exposure to too much sun. EPA's acceptable risk range for site-related exposures is one-in-ten thousand ($1x10^{-4}$) to one-in-one-million ($1x10^{-6}$).

The potential for noncarcinogenic adverse effects is evaluated by comparing an exposure level over a specific time (e.g., life-time) with a chemical-specific reference dose (RfD) for the same period. A RfD is a level that an individual may be exposed to that is not expected to cause any adverse effects. The ratio of exposure to toxicity is called a Hazard Quotient (HQ). The Hazard Index (HI) is arrived at by adding the HQs for all COPCs that affect the same target organ or behave similarly within a medium (in this case groundwater) to which a person may be exposed. An HI below 1 indicates that toxic, noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a noncarcinogenic risk.

The COPC screening step looked at groundwater and soil vapor and identified the COPCs as TCE and VC in groundwater. The HHRA quantitatively evaluated the potential cancer and noncancer risks from exposure to the COPCs in groundwater. The risk assessment results are summarized below, however Section 5 and Appendix F of the RI Report should be consulted for a more thorough explanation and analysis of site risks.

Site-related COCs are a subset of the COPCs and are identified when the potential carcinogenic risk estimate (i.e., ELCR) for a receptor group exceeds the upper end of EPA’s target risk management range of $1x10^{-4}$ to $1x10^{-6}$ and/or the noncarcinogenic HI is greater than 1. To be protective, risk estimates were calculated for potential receptors and exposure pathways using conservative assumptions for exposure factors and exposure concentrations.

- Risk estimates for potential current and future industrial/commercial workers for all plausible exposure scenarios listed in Section 1.2 of this document were less than or within EPA’s target carcinogenic risk range ($1x10^{-4}$ to $1x10^{-6}$) and noncarcinogenic HI threshold of 1. Therefore, no COCs were identified for industrial/commercial workers.

- Risk estimates for potential current/future adult and child residents exposed to untreated groundwater at two properties were $2x10^{-6}$, which is within EPA’s acceptable ELCR range. The noncancer estimates exceed the HI threshold of 1, with the HI for adult and child receptors at 3 and 2 respectively. In all cases, TCE is the risk driver for both wells. Therefore, TCE in groundwater at these wells was identified as a COC for residential use of groundwater.

- Although PCE concentrations in shallow groundwater exceeded VISLs, soil vapor sample results indicated that PCE is not a vapor intrusion concern. Furthermore, TCE was not detected above its VISL in shallow groundwater. Therefore, no COCs were identified for residential exposure via vapor intrusion.

Because site residents use groundwater from private residential or commercial wells, whole house GAC filters have been installed at those residences with private wells located where TCE concentrations exceed the MCL. Not all Garden City residents currently require filters; therefore, if changes in plume conditions are identified based on groundwater monitoring results, then filters at these locations may be recommended in the future. Additionally, at locations where filters are currently used, if GAC filters are no longer in-place or become ineffective in the future, there is a potential for risk due to TCE in groundwater. The COCs, in this case TCE, are ultimately addressed by the remedial response action selected in the ROD.

Screening-level Ecological Risk Assessment Summary

The screening-level ecological risk assessment (SLERA) evaluated the potential risks of VOCs in groundwater where it interacts with surface water. A discontinuous dissolved-phase TCE groundwater plume extends from the former Kiel Brothers property along Jonesville Road. Groundwater typically flows in an east-southeast direction toward lakes, ponds, and the East Fork of the White River; therefore, the SLERA evaluated the potential risks of VOCs in groundwater to aquatic receptors within the lakes, ponds, and the East Fork of the White River via the groundwater to surface water interface (GSI) pathway.

The results of the SLERA indicate that if groundwater was discharging to the river, VOCs in the groundwater would not pose unacceptable risk to ecological receptors. There were no complete exposure pathways for terrestrial receptors. Based on the findings of the SLERA, the site does not pose unacceptable risk to ecological receptors and, as such, no further ecological risk evaluation was warranted.

Based on the previous information, it is EPA's current judgment that the Preferred Alternative identified later in this Proposed Plan, or one of the other active 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, pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

F. Remedial Action Objectives for Groundwater Contamination

Remedial Action Objectives (RAOs) are medium- or site-specific goals for protecting human health and the environment based on the nature and extent of the contamination, the resources that are currently and potentially threatened, and the potential for human and environmental exposure. To achieve the established RAOs, the Preliminary Remediation Goals (PRGs) must be met. PRGs are site-specific, quantitative goals that define the extent of cleanup required. In general, PRGs are conservative, media-specific concentrations of COCs that are protective of human health and the environment. The groundwater PRG for TCE selected to address the RAOs is 5 μg/L, which is its MCL.

EPA developed the RAOs for contaminated groundwater at the site based on the understanding of the conceptual site model at the time the FS was being prepared. EPA will finalize the RAOs and preliminary remediation goals (PRGs) in the ROD.

The RAOs for the Garden City site are as follows:

- **RAO 1**—Protect human health from exposure to COCs in groundwater at concentrations above their respective MCLs.

- **RAO 2**—Provide a safe, long-term potable water supply for all current and future potential receptors in the Garden City area, i.e., restore the contaminated groundwater to its beneficial use (potable).

Under CERCLA and the NCP, groundwater remedial actions (RAs) must (1) be protective of human health and the environment and (2) meet Applicable or Relevant and Appropriate Requirements (ARARs) or satisfy criteria for an ARAR to be waived.

ARARs are cleanup standards, standards of control, and other substantive environmental statutes or regulations that are either "applicable" or "relevant and appropriate" to the RA (CERCLA §121 (d)(2)(A)). Applicable requirements are legally applicable to address a hazardous substance, pollutant, contaminant, RA, location, or other circumstances at an NPL site. Relevant and appropriate requirements are those that while not legally applicable, address problems or situations sufficiently similar to those encountered at the NPL site that their use is well-suited to environmental or technical factors at a site.

ARARs are specific for site-related contaminants, site location, and proposed cleanup activities. The ARARS categories and examples of key ARARS are discussed below. A comprehensive listing of ARARs is provided in Table 2 (see attached).

Chemical-Specific ARARs

Chemical-specific ARARs are numerical values or procedures that, when applied to a specific site, establish limits for individual chemicals or groups of chemicals. These ARARs typically govern the extent of remediation by providing either actual cleanup goals and standards, or the basis for calculating such levels.

For example, under the federal Safe Drinking Water Act, EPA promulgated MCLs, which are measured at the point of use from public water supplies (that serve 25 or more people). MCLs are developed for each chemical using conservative assumptions to arrive at a concentration in water that does not pose adverse effects to humans based on daily use over a lifetime. MCLs are relevant and appropriate to the site cleanup because the groundwater is and can be used for potable purposes, both as a water source to municipal wells (which are regulated at the distribution point or tap, not water source) and private potable wells.

Location-Specific ARARs

Location-specific ARARs set restrictions on the concentrations of hazardous substances or the performance of activities due to their location. These ARARs set restrictions relative to special locations, such as wetlands, floodplains, sensitive ecosystems, and historical or archeological sites, and provide a basis for assessing existing site conditions. A floodplain exists along the East Fork of the White River within a one-mile radius of the site, and forested wetlands are along the floodplain; however, potential remedial alternatives are not anticipated to occur within these areas.

For example, the Migratory Bird Treaty Act (MBTA) under 16 USC 703, protects all species of native birds from unregulated taking. The MBTA is almost always an ARAR at NPL sites because every area within the U.S. is located within a migratory flyway. In Bartholomew County where the Garden City site is located, migratory bird species inhabit the area. As such, the MBTA will be applicable to the site and activities if site activities are determined to impact any migratory bird activities.

Action-Specific ARARs

Action-specific ARARs are technology or activity-based limitations that determine how RAs are conducted. These ARARs regulate the specific type of RA or technology under consideration, or the management of regulated materials at a site.

For example, the identification and listing of hazardous waste under 329 Indiana Administrative Code (IAC) 3.1-6-1 is applicable if a listed or characteristic hazardous waste, such as TCE, is present. The regulation requires that a hazardous waste determination be made on all wastes generated from RAs. At Garden City, hazardous waste would include spent GAC filters that were used to treat tap water containing TCE.

Another category of Information EPA uses to develop RAs consists of non-promulgated advisories or guidance issued by the federal or state government that are not legally binding, and do not have the status of ARARs. If there are no specific ARARs for a chemical or site condition, or if existing ARARs are not deemed sufficiently protective, then guidance or advisory criteria may be used in determining the necessary level of, or approach to, cleanup for protection of human health or the environment.

G. Summary of Remedial Alternatives

CERCLA§121(b)(1), 42U.S.C. §9621(b)(1), mandates that RAs must be protective of human health and the environment, cost-effective, comply with ARARS, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent possible. The statute also establishes a preference for treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. EPA evaluated the following three alternatives in this Proposed Plan to achieve the RAOs:

Alternative 1: No Action

Alternative 2: Wellhead treatment, groundwater monitoring and Institutional Controls (ICs)[1] – Continue existing wellhead treatment, monitor groundwater to track TCE levels and plume migration until MCLs are met, and implement ICs as needed.

Alternative 3: Connect affected residents to the Columbus municipal water system, monitor groundwater monitoring to track TCE levels and plume migration until MCLs are met, and implement ICs as needed.

1. Description of Remedial Alternatives

Alternative 1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: None

In accordance with NCP (40 CFR 300), EPA requires that the "No Action" alternative be evaluated to establish a baseline for comparing the remedial alternatives. Under Alternative 1, EPA would take no actions to reduce the levels of TCE in groundwater. Additionally, this option does not include the continuation of wellhead treatment, nor does it include groundwater

[1] ICs are non-engineered instruments such as administrative and legal controls that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy. ICs can play an important role in site remedies because they reduce exposure to contamination by limiting land or resource use and guide human behavior. For instance, zoning restrictions prevent land uses that are not consistent with the level of cleanup.

monitoring to track TCE concentrations and plume migration or ICs.

<u>Alternative 2</u>: Wellhead Treatment, Groundwater Monitoring, Implement ICs as needed

Estimated Capital Cost: $70,000
Estimated Annual O&M Cost: $45,511
Estimated Present Worth Cost: $320,000
Estimated Construction Timeframe: Within 3 months
Estimated Time to Achieve RAOs: Within 5 years

This alternative uses treatment technology, wellhead treatment with GAC filters, to reduce or eliminate TCE from the drinking water source such that MCLs are met, thereby mitigating residential and commercial exposures to TCE in potable water. Wellhead treatment would continue at two of the four locations with existing GAC systems (PW-007, and PW-008). A GAC unit would be installed in an office building (PW-004) situated within the TCE plume footprint delineated by TCE levels above the MCL (Figure 4). At the two previously affected wells where TCE has since declined to below the MCL (PW-001, and at another residence on Jonesville Road), pre-filtered samples confirming sub-MCL levels will be collected prior to removing the GAC units. A round of samples will be collected at private wells that currently do not have GAC filters, but are in and around those locations that have shown TCE detections. This is estimated to be about 4-5 wells. For each of the current and potential future wellhead treatment systems, it is assumed that the GAC filter canisters would be replaced annually until TCE plume concentrations decline to below the MCL.

Under this alternative, groundwater monitoring would also be conducted to track TCE levels and plume migration. The data would also help to identify any at-risk wells that may need to be further assessed for wellhead treatment. Any wells showing a TCE concentration at or above the MCL would be provided GAC filters. It is assumed that three monitoring wells would need to be installed and monitored semiannually for approximately five years - or longer, if necessary. This timeframe was selected because preliminary analyses indicate TCE levels in the plume (Figure 4) are projected to decline below the MCL in five years.

As previously discussed, the TCE attenuation rate was estimated using data available from a Garden City private well that is located nearby, but not within the plume itself. The well was the only location with sufficient time-series data (i.e., quarterly TCE data over a nine-year period) to develop an attenuation rate for TCE. The private well attenuation rate was then used to evaluate attenuation along the center line of the plume as there are insufficient data from wells within the center line. The calculated attenuation rate was applied to the RI groundwater results within the plume, and they appear to follow the same trend. The projected time for TCE to decline below the MCL in the plume is estimated to be five years, making active groundwater restoration impracticable. Receptors will be protected from current and future potential exposures via GAC filters. Unfiltered groundwater that is safe for potable use is estimated to be available in the plume area after approximately five years. ICs would also be implemented as needed.

Alternative 3: Connect Affected Residents to the Columbus Municipal Water System, Groundwater Monitoring, Implement ICs as needed.

Estimated Capital Cost: $330,000
Estimated Annual O&M Cost: $34,288
Estimated Present Worth Cost: $480,000
Estimated Construction Timeframe: Within 3-5 months
Estimated Time to Achieve RAOs: Within 5 years

Alternative 3 consists of isolating receptors from contaminated groundwater by providing an alternate supply of drinking water. This would be achieved by connecting the affected residences to the Columbus municipal water supply.

Connection to the Columbus water supply would involve extending the water main along multiple streets and installing service connections to individual residences. For the purposes of cost estimating, it is assumed that a water main extension would be connected to the existing 24-inch water main located 2,000 feet south of the site. The extension will be constructed using approximately 2,900 feet of six-inch ductile iron pipe, 750 feet of four-inch ductile iron pipe, and 700 feet of two-inch polyvinyl chloride pipe as shown in Figure 8. Individual pipe connections would be made to wells with TCE concentrations at or exceeding the MCL in pre-filtered water (PW-004, PW-007 and PW-008). In addition, other wells showing lower levels of TCE (i.e., PW-001), as well as three additional residences located at or within the current plume boundaries where TCE concentrations are near the MCL (PW-009, PW-003, and PW-006) may also be connected to the municipal system.

A round of samples would be collected at private wells in and around those locations that have shown TCE detections to verify the need for connection to the municipal system. In addition, groundwater monitoring would be conducted to track TCE plume concentration and migration and to determine the need for other residences to be connected to the water main. As with Alternative 2, EPA assumes that three groundwater monitoring wells would need to be installed and that monitoring would be conducted semiannually for approximately five years or until MCLs are met throughout the plume area. ICs would also be implemented as needed.

Common and Distinguishing Features

All alternatives involve the attenuation of TCE levels within the plume mainly through dispersion and/or dilution due to the influx of uncontaminated water from the East Fork of the White River. Because the TCE plume concentrations have declined since the contamination was first discovered, it is reasonable to assume this trend will continue, and TCE levels will eventually decline in the groundwater aquifer over time. Alternatives 2 and 3 also include a groundwater monitoring component to track the progress of TCE attenuation, as well as detect any future potential groundwater contaminant concerns in order to ensure the protection of public health and the environment. As previously discussed, trend analysis of TCE concentration data collected from a representative private water supply well projects the MCL to be achieved in approximately three years at that well. Further, data collected over the duration of the RI indicate that the MCL will be achieved throughout the site plume in approximately five years. For the purposes of cost estimating, EPA assumed that three additional monitoring wells would be installed and monitoring would be conducted semiannually for five years to track TCE levels in groundwater and potential plume migration.

Both alternatives would use ICs as necessary to prevent human exposure to contaminated groundwater. Potable use of groundwater would be restricted in areas of the site where contamination is located. Given the relatively short anticipated remediation time frame, the necessary controls can be achieved via deed notices. None of the alternatives rely exclusively on ICs to achieve protectiveness.

The distinction between Alternatives 2 and 3 involves the approach to preventing exposure to contaminated groundwater for current and potentially affected residents. Alternative 2 involves treating existing contaminated groundwater with point-of-use GAC units so that it is safe for consumption, while Alternative 3 prescribes providing a new potable water supply altogether.

H. Evaluation of Alternatives

In selecting a remedy for a site, EPA considers the factors set forth in CERCLA §121, 42 U.S.C. §9621, by conducting a detailed analysis of the viable remedial alternatives pursuant to 40 CFR §300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis of the remedial alternatives consists of an assessment of the individual remedial alternatives against each of nine evaluation criteria presented in Table 3 below. This analysis can be found in the EPA Feasibility Study, pages 4-3 to 4-7 and Table 4-1 ("Detailed Analysis of Remedial Alternatives"). A Comparative Analysis, which focuses on the relative performance of each alternative against the nine criteria was also included in the FS and is summarized below. The Preferred Alternative must meet the threshold criteria of protecting human health and the environment and complying with ARARs. If a proposed alternative meets these two criteria, it is then evaluated against the five balancing criteria and the two modifying criteria to arrive at a final recommended alternative.

Table 3: The Nine Criteria

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Threshold Criteria
1. Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to the public health and the environment through engineering controls, treatment, or ICs**.**
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.
Balancing Criteria
3. Long-term Effectiveness and Performance 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 relative availability of goods and services.
7. **Cost** includes estimated capital and annual operation 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%.
Modifying Criteria
8. State Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and the 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.

1. Comparative Analysis of Garden City Remedial Alternatives

1.1 Overall Protection of Human Health and the Environment

Alternative 1 is not protective of human health and the environment because taking no action would allow for the exposure of receptors to contaminated groundwater supplies under residential and commercial use scenarios. No groundwater monitoring would be performed to verify that TCE concentrations have met the MCL. With the discontinuation of wellhead treatment under this alternative, exposure to TCE concentrations above the MCL would occur.

Both Alternatives 2 and 3 would be protective of human health and the environment. Alternative 2 would be protective of human health by removing TCE from groundwater obtained from private wells via GAC filtration. Alternative 3 would be protective of human health by providing an alternate water source to affected residents from the City of Columbus. Under Alternatives 2 and 3, groundwater monitoring would be performed to verify that the TCE concentrations in the plume are declining and that the plume is not migrating or expanding. Any identified exposures to TCE can be easily and promptly addressed by either alternative, hence all potential future exposures to TCE in groundwater would be mitigated. In addition, ICs can be used as needed to prevent potential exposures.

1.2 Compliance with ARARs

Alternative 1 would not comply with ARARs because no action would be taken to achieve the federal and state groundwater cleanup goals, defined as MCLs. Although the TCE levels will likely decline below the MCL in approximately five years, no groundwater monitoring would be conducted to verify that chemical-specific ARARs have been met. Without wellhead treatment, exposure to TCE concentrations above the MCL would occur. Due to its inability to meet the threshold criteria, Alternative 1 will not be considered for further evaluation.

Both Alternatives 2 and 3 comply with ARARs. Under both alternatives, TCE concentrations within the plume are projected to decline to below the MCL within five years. This progress would be tracked via monitoring to verify that chemical-specific ARARs (MCLs) have been met and no exposures to TCE will occur.

Alternative 2 requires little construction, aside from the installation of three new monitoring wells, and would pose little to no impact to migratory birds. GAC wastes generated by the wellhead treatment systems would be properly stored, transported, and disposed of in compliance with state and federal regulations.

Alternative 3, in addition to new monitoring well construction, requires trenching and the installation of a water main and service piping. Inspection for migratory bird nesting habitats would be conducted prior to construction activities. Dust generated during construction would be properly monitored and mitigated as needed, and waste generated would be properly stored, treated and disposed.

1.3. Long-Term Reliability and Effectiveness

Under Alternatives 2 and 3, decreases in TCE concentrations are expected to be permanent via natural processes. Significant concentration rebound is not expected to occur in the long term due to the predominance of sand and gravel in the alluvial aquifer, which lessens the potential for back-diffusion of TCE that is mass stored in finer-grained sediments.

For mitigating exposure to TCE in groundwater, Alternative 3 is more reliable and effective in the long term than Alternative 2 because it provides a permanent alternative water source, rather than relying on the maintenance of wellhead treatment to remove TCE. Both alternatives are the same regarding the groundwater monitoring component and implementation of ICs to protect the remedy and to provide information to potential future property owners in the plume area.

1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Both Alternatives 2 and 3 anticipate that TCE concentrations in groundwater will decline and that the area and volume of the TCE plume will decrease over time via natural attenuation. Groundwater monitoring will be used to track the TCE concentrations in the plume as well as plume migration. Alternative 2 will treat TCE in groundwater extracted from private wells via GAC treatment at the wellhead, however does not treat the TCE within the groundwater plume. Alternative 3 provides no treatment of the contaminated groundwater.

1.5 Short-Term Effectiveness

Based on a preliminary qualitative assessment, Alternatives 2 and 3 are considered sustainable and both are estimated to achieve the MCL within five years. Under both alternatives, installing monitoring wells and conducting groundwater monitoring would pose very few inconveniences to the community. Minimal amounts of energy/water/materials would be consumed and minimal emission-generating heavy equipment operation is needed during remedy implementation.

Alternative 3 provides less short-term effectiveness because in addition to monitoring well installation, it includes the construction work associated with the water main extension and residential hookups. This would pose additional short-term impacts to the community and workers. Moderate quantities of energy/water/materials would be consumed, along with the generation of moderate amounts of emission from heavy trucks and construction equipment during remedy implementation.

1.6 Implementability

Alternative 2 would be more implementable than Alternative 3 because the only action required would be the installation, operation and maintenance of the monitoring wells and the wellhead GAC treatment systems. Alternative 3, in addition to monitoring well installation, involves the extension of the water main and service connections to affected residents. Alternative 3 has implementability concerns because the community has resisted proposals to connect residents to the Columbus water supply system on several occasions in the past. Groundwater monitoring to track TCE levels and plume migration under both alternatives can be easily implemented.

1.7 Cost

Alternative 2 has considerably lower capital costs ($70,000) than Alternative 3 ($330,000). Alternative 2 also has a lower estimated net present value cost ($320,000) compared to Alternative 3 ($480,000). The lowest cost differential is under annual operation and maintenance (O&M), for which Alternative 2 costs exceed those of Alternative 3 by approximately $2,325.

I. Preferred Alternative

Based on information currently available, EPA's Preferred Alternative for addressing contamination at the Garden City site is Alternative 2 (Wellhead Treatment, Groundwater Monitoring and ICs). This involves the continued treatment of groundwater at the wellhead with GAC filters, and groundwater monitoring to track decreases in the TMV of the dissolved-phase TCE plume. ICs would be implemented if needed to prevent consumption of impacted drinking water until TCE levels fall below the MCL.

The Preferred Alternative will meet site RAOs by protecting human receptors from exposure to contaminated groundwater above the MCLs, and will ensure safe potable water over the long term. Under the Preferred Alternative, wellhead treatment would continue at the existing systems installed at two of the residences within the current TCE plume footprint (PW-007, PW-008) that show TCE above the MCL in the pre-filtered groundwater. EPA and IDEM anticipate that the remaining two filters installed at a third residence and a business (PW-001) can be removed, however sampling would be performed to verify that TCE in the pre-filtered groundwater is below the MCL. Because TCE levels can fluctuate, a round of samples will also be collected at private wells that currently do not have GAC filters, but are in and around those locations that have shown TCE detections. This is estimated to be about 4-5 wells. In addition, a GAC filter would be installed and maintained at a small business facility (PW-004) where TCE concentrations were detected above the MCL. For each of the wellhead treatment systems, it is assumed that the GAC filter canisters would be replaced annually until TCE concentrations in the plume decline to below the MCL, which is estimated to be five years.

Attenuation of the TCE plume is likely already occurring. Trend analysis of TCE concentration data collected from a nearby private water supply well situated near the TCE plume projected that the MCL will be achieved in approximately three years at that well. Based on the RI data collected throughout the site, it is estimated that the MCL will be achieved within the site plume in approximately five years. Although attenuation mechanisms have not been completely characterized, biodegradation and other chemical pathways are unlikely to be contributing to the decrease in TCE concentrations due to aquifer conditions and other chemical parameter data collected. Any attenuation is most likely attributable to physical processes, such as plume dispersion and dilution effects resulting from the hydraulic connection between the groundwater and the East Fork of the White River. For the purposes of cost estimating, it is assumed that three additional monitoring wells would be installed within the plume to track plume TCE levels and plume migration to determine whether other residences are at risk from TCE exposures. Monitoring would be conducted semiannually for five years to sample and analyze groundwater for TCE.

Pursuant to Section 121 of CERCLA as amended, consistent with the NCP (40 CFR Section 300.430(f)(4)(ii)), every five years EPA conducts assessments to ensure that Superfund remedies remain protective of human health and the environment where hazardous substances, pollutants or contaminants remain at the site above health-based levels. The findings, and conclusions are documented in Five-Year Review reports. These will provide regular opportunities for EPA to evaluate the remedy's effectiveness in achieving RAOs as well as monitoring and enforcing ICs. Once the RAOs are achieved at the Garden City site, Five-Year reviews will no longer be necessary.

Although both Alternative 2 and 3 will be protective of human health and the environment and attain ARARs, EPA prefers Alternative 2 because installation and maintenance of GAC filters will achieve human health protection, be more easily implementable, and be more cost-effective than Alternative 3. EPA believes that the infrastructure developments required under Alternative 3 for water main extension and service connections are not cost-effective considering estimations that the size and concentration of the dissolved-phase TCE plume will attenuate to acceptable levels within about five years.

Based on information currently available, EPA believes that Alternative 2 meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects that Alternative 2 will satisfy the following statutory requirements of CERCLA Section 121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

The IDEM, as the support agency, concurs with EPA's Preferred Alternative. EPA may modify its Preferred Alternative in response to public comments or if new information is received.

J. Community Participation

This document presents EPA's proposed plan to mitigate human exposure to TCE in groundwater at the Garden City site. EPA's site-related documents are available for review at the Cleo Rogers Memorial Library, 536 Fifth Street, Columbus, Indiana, and online at **www.epa.gov/superfund/garden-city-groundwater**.

Share Your Opinion

EPA encourages the public to comment on any aspects of the Proposed Plan and will consider written comments received by the end of the 30-day public comment period. Your input helps EPA determine the best course of action. The comment period is from May 29 to June 28, 2018.

Send comments to:

Susan Pastor, Community Involvement Coordinator
U.S. Environmental Protection Agency, Mail code SI-6J
77 West Jackson Blvd.
Chicago, IL 60604
pastor.susan@epa.gov
Contact Susan Pastor by June 5, 2018 to request a meeting.

For More Information

EPA's Web page:

www.epa.gov/superfund/garden-city-groundwater

The Administrative Record, which houses the legal documentation supporting EPA's proposal, is available for review at the Cleo Rogers Memorial Library, 536 Fifth Street, Columbus, Indiana (Hours: Monday – Thursday, 8:30 am - 9 pm; Friday – Saturday 8:30 am – 6 pm; Sunday 1 – 4 pm). Tel: (812) 379-1255.

A copy is also at the EPA Region 5 office in Chicago at the 7th Floor Record Center.

For further information on the Garden City Superfund site, please contact:

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Table 1 – Summary of Results at Locations where TCE was Detected

Remedial Investigation Report

Garden City Groundwater Plume Site, Garden City, Indiana

Station ID	TCE Concentrations Jun-15	Aug-15	Sep-15	Nov-15	Apr/ May-16	No. of Samples Collected	No. of Detects of TCE	No. of TCE Exceedances
Monitoring Wells								
MW-104-I	0.53	0.5 U	NS	0.5 U	0.46	4	2	0
MW-110-I	1.8	2.8	NS	2.6	2	4	4	0
Private Wells								
PW-003	NS	NS	NS	0.64	0.66	2	2	0
PW-006	NS	NS	NS	NS	1.5	1	1	0
PW-004	NS	NS	NS	**11**	**8.3**	2	2	2
PW-007-PRE	NS	NS	NS	**8.3**	**6.8**	2	2	2
PW-008-PRE	NS	NS	NS	**8.3**	**7.5**	2	2	2
PW-009	NS	NS	NS	1	1.1	2	2	0
Grab Sample locations								
GW-001-S	NS	NS	0.32 J	NS	NS	1	1	0
GW-002-I	NS	NS	**6**	NS	NS	1	1	1
GW-003-I	NS	NS	**5.2**	NS	NS	1	1	1
GW-007-I	NS	NS	4.3	NS	NS	1	1	0
GW-009-I	NS	NS	1.8	NS	NS	1	1	0
City of Columbus Supply Wells								
Municipal-9	NS	NS	NS	0.36 J	0.5 U	2	1	0
Municipal-12	NS	NS	NS	0.63	NS	1	1	0

Notes:

TCE - Trichloroethene

Concentrations shown in micrograms per liter (µg/L).

No. - number

Concentrations in bold exceed the EPA maximum contaminant level of 5 µg/L.

EPA - U.S. Environmental Protection Agency

J - estimated detected concentration

NS - not sampled during this phase

U - result not detected

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

Requirement, Criteria, Standard Limit	Citation	Description	Type of ARAR	Rationale
CHEMICAL SPECIFIC ARARS				
Federal				
Groundwater quality for potable use	40 CFR Part 141.60 to 141.63, Federal Safe Drinking Water Act of 1974.	The National Primary Drinking Water Regulations establish health-based standards, i.e., Maximum Contaminant Levels (MCLs). These levels are the maximum permissible concentration in public drinking water supplies, and take into consideration availability and cost of treatment technology. MCLs are enforced at the water tap.	Relevant and Appropriate	Under Alternatives 2 and 3, groundwater that is or may potentially be used as a drinking water supply should demonstrate the ability to meet concentrations that are at least equivalent to those required for drinking water supplies. The Garden City area includes both public (at least 15 service connections or serves at least 25 residents year-round) and private wells for drinking water. Therefore, MCLs are applicable in the case of the public water supplies and relevant and appropriate to the private groundwater supplies.
State				
Groundwater Quality For potable use	Indiana Drinking Water Standards (327 Indiana Administrative Code [IAC] 2-11, 327 IAC 8)	These rules establish MCLs in accordance with SDWA (40 CFR 141.11), as well as groundwater classification methods and associated standards.	Relevant and Appropriate	Applicable to facility practices and activities which may affect groundwater quality. Also Applicable to drinking water within the State of Indiana, and applicable to groundwater outside of established groundwater management zones.
Groundwater Quality	Groundwater Quality Standards (327 IAC 2-11-2(e))	These regulations provide the standards for groundwater quality in Indiana. Provides that no person shall cause the groundwater in a drinking water supply well to have a contaminant concentration that results in an exceedance of numeric criteria contained within the rule for drinking	Relevant and Appropriate	Most Garden City residents obtain their potable water from private groundwater supply wells. Untreated groundwater from some of the wells exceed state and federal drinking water standards.

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

Requirement, Criteria, Standard Limit	**Citation**	**Description**	**Type of ARAR**	Rationale
		water class groundwater, creates a condition that is injurious to human health, creates an exceedance of specific indicator criteria levels contained within the rule, or renders the well unusable for normal domestic use.		
LOCATION SPECIFIC				
Federal				
Establishes compliance boundary for groundwater protection	NCP Preamble (55 FR 8753 (March 8, 1990))	Requires that groundwater cleanup standards be attained throughout the contaminant plume or at and beyond the edge of the waste management area when waste is left in place.	Applicable	Both Alternatives 2 and 3 include a groundwater monitoring component to determine when MCLs are met throughout the plume.
Protection of Migratory Birds	16 USC 703, Migratory Bird Treaty Act (MBTA)	Protects almost all species of native birds from unregulated taking. Activities must be suspended if determined to impact any migratory birds that may be nesting on the site.	Applicable	Both Alternatives 2 and 3 include a groundwater monitoring component that may require the construction of monitoring wells. Alternative 3 also includes the installation of a water main line and service connections. Such activities could potentially disrupt bird habitat.
State				
Indiana Wellhead Protection Program	(327 IAC 8-4.1)	This rule establishes MCLs (40 CFR 141 and 327 IAC 8) as cleanup standards for impacted groundwater within established wellhead protection areas.	Applicable	Garden City is located within a wellhead protection area established for the city of Columbus water supply wells.

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

Requirement, Criteria, Standard Limit	Citation	Description	Type of ARAR	Rationale
ACTION SPECIFIC				
Federal				
Interim Status Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities -Use and Management of Containers,	40 CFR 265, Subpart I	Provides minimum national standards that define acceptable management of hazardous waste during interim status and until certification of final closure or until post-closure responsibilities are fulfilled. if an alternative includes excavating soil or generation of other remediation wastes that are determined hazardous per 40 CFR Part 261, and that hazardous waste is managed in a container, and the container is being stored on the site for less than 90 days, the container will be managed in accordance with 40 CFR 265 Subpart I.	Applicable if hazardous waste is generated.	Alternatives 2 and 3 involve activities that could potentially produce low levels and volumes of hazardous waste: Alternatives 2 and 3 may potentially generate hazardous wastes from the construction activities involving the installation of three or more monitoring wells within and beyond the TCE plume. Alternative 2 involves the treatment of private water supplies with whole house GAC units. The units are regularly maintained and produce spent activated carbon waste. Alternative 3 involves excavation/trenching activities for the extension of the Columbus municipal water mains to Garden City, and the installation of service piping to the affected buildings.
Hazardous Waste Determination	40 CFR 262.11, 262.10(a)	Requires that a proper hazardous waste determination be made on all wastes generated from remedial actions including soil cuttings, spent activated carbon, and extracted groundwater. The substantive provisions of this requirement may be potentially applicable for a remedial action where hazardous waste is generated such as the soil from excavation and offsite disposal	Applicable if hazardous waste is generated.	
Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes standards for generators of hazardous waste that address waste accumulation, preparation for shipment, and completion of the uniform hazardous	Applicable if hazardous waste is generated	

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

Requirement, Criteria, Standard Limit	Citation	Description	Type of ARAR	Rationale
		waste manifest. If an alternative involves generation of hazardous wastes, the generator will have an EPA generator ID prior to treatment, storage, disposal, or transporting the wastes. If an alternative involves off-site transport of hazardous wastes, the material must be managed, manifested, packaged, labeled, and placarded in accordance with these regulations.		
State				
Water Well Driller Licensing Requirements	IC 25-39-3 and 312 IAC 13)	This regulation provides for licensing of water well drillers.	Applicable	Alternatives 2 and 3 include groundwater monitoring components for which the installation of monitoring wells is anticipated.
Regulation of Water Well Drilling	(IC 25-39-4 and 312 IAC 13)	This regulation outlines the requirements for construction and abandonment of groundwater wells for non-personal use.	Applicable	
Damage to Underground Utilities	(IC 8-1 Chapter 26)	This is the underground utility location law that requires that a notice via the Indiana one-call system be made seeking utility locations prior to excavation.	Applicable	Alternatives 2 and 3 calls for the installation of monitoring wells. Also, under Alternative 3, excavation activities will be necessary for the installation of a water main and service line connections to affected buildings.
Construction/Land Disturbance Storm Water Permitting	327 IAC 15-5-7(b); 327 IAC 15-5-8 through 17; 19 through 20	Defines use of best management practices for effluent management, erosion and sediment control plans, plans for minimizing discharge and erosion during and after construction, and other general provisions, including best management practices, storm water controls, and	Relevant and appropriate if more than one acre of land is disturbed.	Under Alternative 3, excavation activities will be necessary for the installation of a water main and service line connections to affected buildings.

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

<table>
<tr><th>Requirement, Criteria, Standard Limit</th><th>Citation</th><th>Description</th><th>Type of ARAR</th><th>Rationale</th></tr>
<tr><td></td><td></td><td>monitoring, and other requirements for construction activities disturbing more than one acre of land. Obtaining an NPDES permit is an administrative requirement and is not required for on-site activities. The permit requirements may be relevant and appropriate for a proposed remedial alternative and should be adhered to.</td><td></td><td></td></tr>
<tr><td>Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</td><td>329 IAC 3.1-10</td><td>Hazardous waste stored onsite in containers for 90 days or less shall comply with this regulation. Containers must be in good condition; compatible with the waste placed in the container; always closed during storage except when it is necessary to add or remove waste; and must not be opened, handled, or stored in a manner that could cause it to rupture or leak.</td><td>Relevant and Appropriate if hazardous waste is generated.</td><td rowspan="3">Alternatives 2 and 3 involve activities that could potentially produce low levels and volumes of hazardous waste:

Alternatives 2 and 3 may potentially generate hazardous wastes from the construction activities involving the installation of three or more monitoring wells within and beyond the TCE plume.

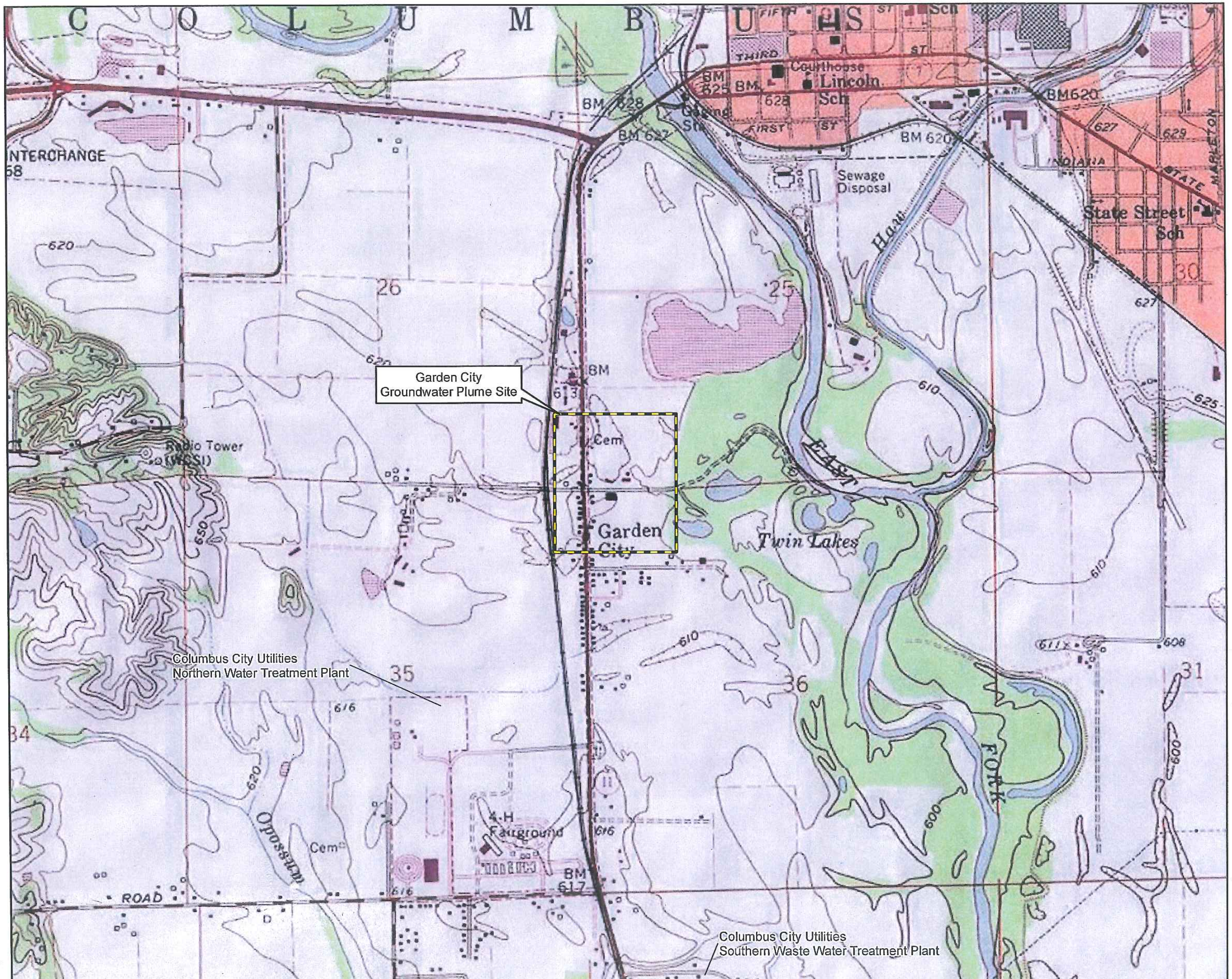
Alternative 2 involves the treatment of private water supplies with whole house GAC units. The units are regularly maintained and produce spent activated carbon waste.

Alternative 3 involves excavation/trenching activities for the extension of the Columbus municipal water mains to Garden City, and the installation of service piping to the affected buildings.</td></tr>
<tr><td>Identification and Listing of Hazardous Waste</td><td>329 IAC 3.1-6-1</td><td>A proper hazardous waste determination must be made on all wastes generated from remedial actions.</td><td>Applicable if listed or characteristic hazardous waste is present.</td></tr>
<tr><td>Standards Applicable to Generators of Hazardous Waste</td><td>329 IAC 3.1-7-1 and 3.1-7-2</td><td>A generator needs to characterize all wastes that are generated and then appropriately manage any hazardous waste. If waste is nonhazardous, the waste will be disposed of in a permitted solid waste disposal facility.</td><td>Relevant and Appropriate if hazardous waste is generated.</td></tr>
</table>

Table 2: Summary of ARARs for Remedial Alternatives for Groundwater Remediation for the Garden City Groundwater Plume, Garden City, Indiana

Requirement, Criteria, Standard Limit	Citation	Description	Type of ARAR	Rationale
Standards Applicable to Transporters of Hazardous Waste	329 IAC 3.1-8	All hazardous waste must be properly packaged, with labels, markings, and placards, prior to transport. Hazardous waste must be manifested as such for transport to a permitted treatment, storage, or disposal facility.	Relevant and Appropriate if hazardous waste is generated.	
Fugitive Dust Emissions	326 IAC 6-4-2(4)	Defines fugitive emission dust limitations. Visible fugitive dust must not cross an adjacent property line.	Applicable	Alternatives 2 and 3 involve the generation of dust during monitoring well construction activities. Alternative 3 also involves excavation/trenching activities for the installation of water mains and service line connections to the affected buildings.

Figures



LEGEND

Approximate Study Boundary

Note:
1. U.S. Geological Survey Topographic Quadrangle: Columbus, IN (published 1981)

0 0.25 0.5 Miles

1 inch = 0.25 miles

Figure 1

Site Location Map
Garden City Groundwater Plume Site
Remedial Investigation Report
Garden City, Indiana

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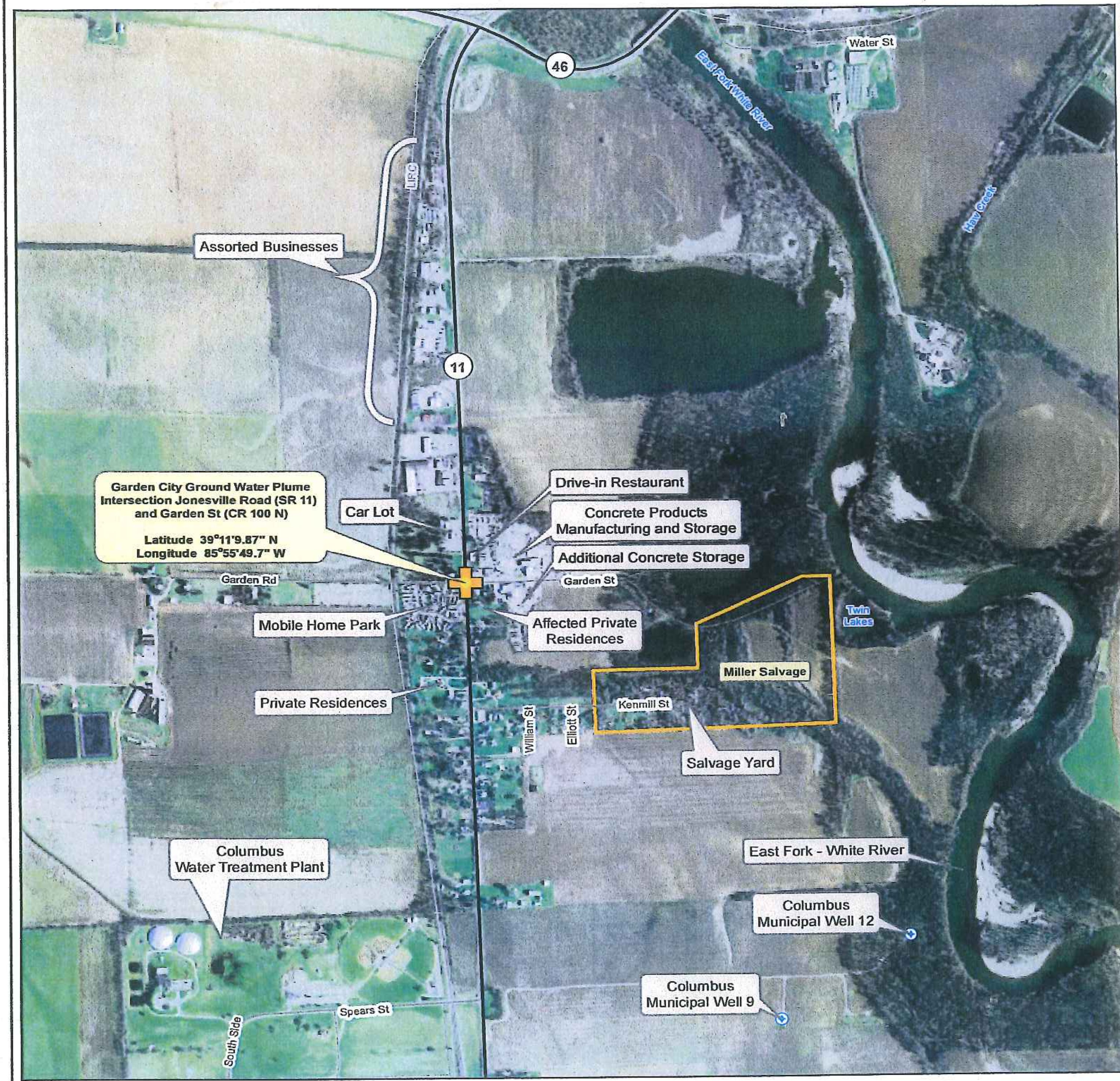
CIN \\CANOPUS\GROUPS\GIS\00_PROJ\G\GARDENCITY\MAPFILES\GW_PLUME_SITE_REMEDIAL_INVESTIGATION\FIGURE 1-1 - SITE LOCATION MAP.MXD AESPEJO 11/16/2016

Garden City Ground Water Plume - EPA FID INN000508642
Garden City, Bartholomew County, IN
Area Features Map



This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Diane Osborn, Office of Land Quality
Date: March 12, 2013

0 200 400 800 1,200 Feet
0 50 100 200 300 400 Meters

- Municipal Well
- Garden City Ground Water Plume
- Miller Salvage

Sources:
Non Orthophotography Data
- Obtained from the State of Indiana Geographical Information Office Library
- Municipal Well locations obtained from IDEM OLQ Sampling Database (SampDB)

Orthophotography
- Obtained from 2005 Indiana Map Framework Data (www.indianamap.org)

Map Projection: UTM Zone 16 N
Map Datum: NAD83

Document Sources:
- IDEM Expanded Site Inspection Report for Garden City GW Plume, INN000508642, January, 2012
- IDEM Site Reassessment Report for Miller Salvage Site, IND980607618, January, 2012

Figure 2

Garden City Ground Water Plume - EPA FID IND000508642
Garden City, Bartholomew County, IN

This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By: Diane Osborn, Office of Land Quality
Date: December 14, 2011

0 150 300 600 900 Feet
0 50 100 200 300 Meters

IDEM

August 2011 Sample Location

Ground Water

VOC[1] = Volatile Organic Compound
CRQL[2] = Contract Required Quantitation Limit
SCDM[3] = Superfund Chemical Data Matrix
J[4] = Estimated Value

Garden City

Miller Salvage Site

Former Kiel Brothers Property

Sources:
Non Orthophotography Data
- Obtained from the State of Indiana Geographical Information Office Library
- Sample Locations obtained from IDEM OLQ Sampling Database (SampDB)
Orthophotography
- Obtained from 2005 Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N
Map Datum: NAD83

Figure 3
Volatile Organic Compounds in Groundwater (ESI 2011)
Garden City Groundwater Plume Site
Remedial Investigation Report
Garden City, Indiana

Note:
Figure modified from 2011 Expanded Site Investigation (ESI) Report

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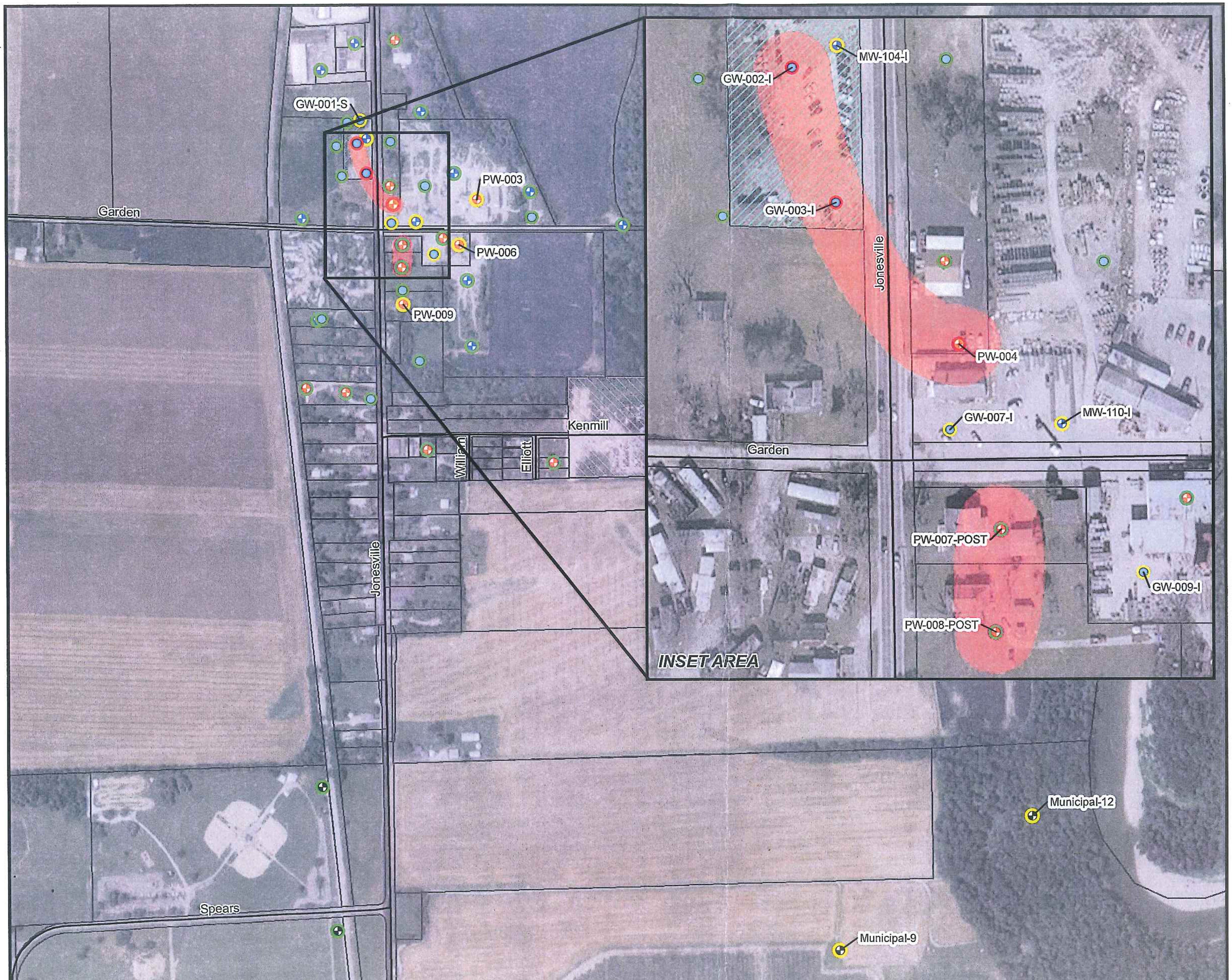
Figure_1-3_REF 07- Garden City Contamination HRS-02-11-2013 23_TABLOID.ai



LEGEND

- Grab Sample Location
- Monitoring Well
- Municipal Well
- Private Well
- TCE Not Detected
- TCE Detected Below the MCL
- TCE Exceeded the MCL in One or More Samples
- Road
- TCE Plume (>5 µg/L)
- Former Kiel Brothers Property
- Miller Salvage Property
- Parcel Boundary

Notes:
1. 2014 ESRI World Imagery Basemap
2. Parcel boundaries were obtained through the Indiana Department of Homeland Security database publication dated June 2015
3. S/I/D - indicates the sample interval(s) collected at each boring where S is shallow, I is intermediate, and D is deep
4. Sample locations collected on private (residential or commercial) property are approximate
5. TCE MCL - EPA Maximum Contaminant Level of 5 micrograms per liter (µg/L)
6. EPA - U.S. Environmental Protection Agency

0 500 1,000 Feet

1 inch = 500 feet

Figure 4

Summary of Trichloroethene Results

Garden City Groundwater Plume Site

Feasibility Study Report

Garden City, Indiana

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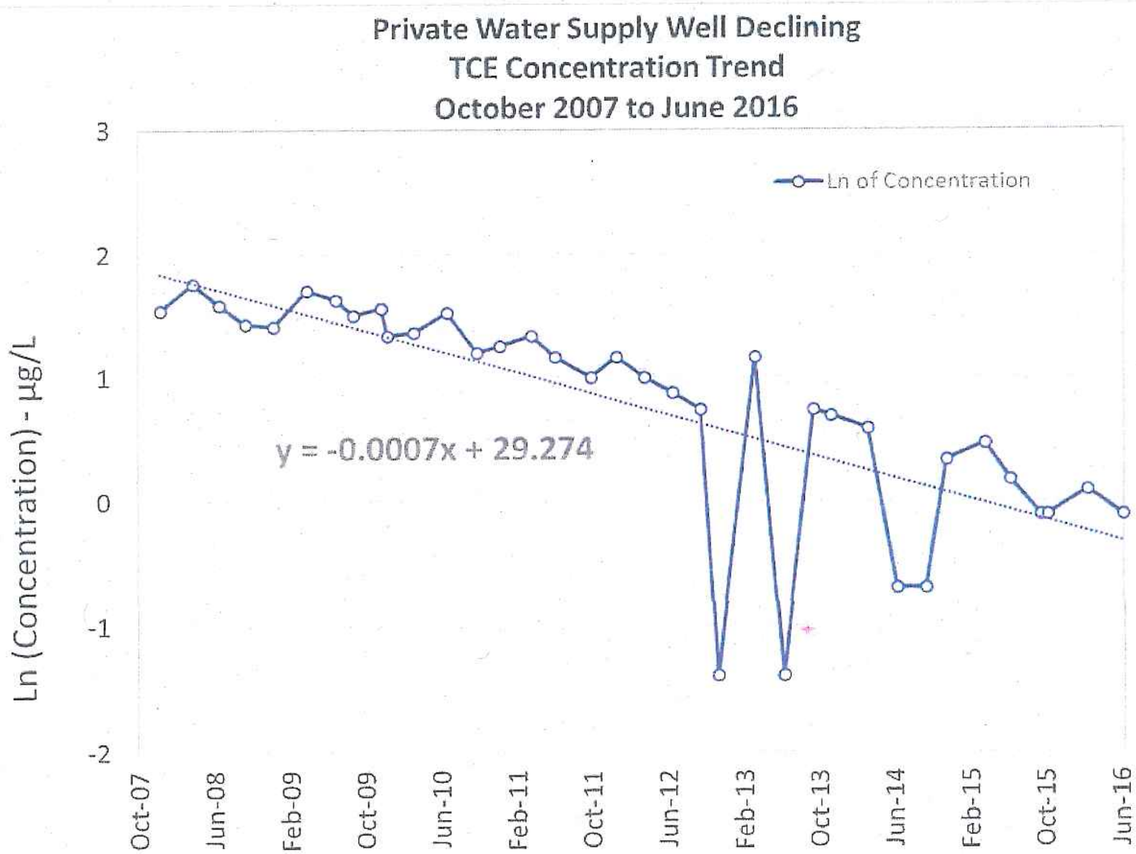
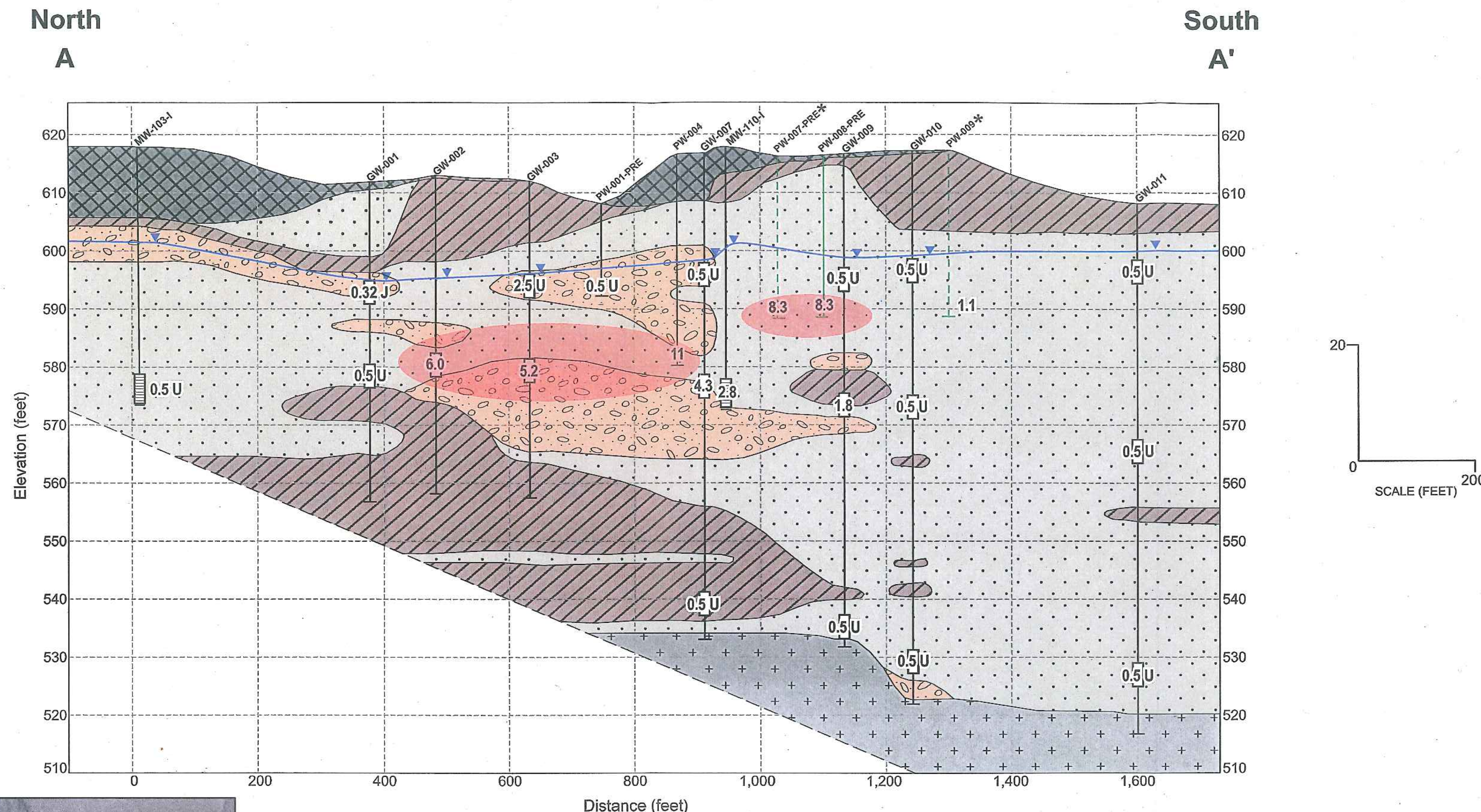
R:\ENBG\00_PROJ\G\GARDENCITY\MAPFILES\FSR\FIGURE 1-7 - SUMMARY OF TRICHLOROETHENE RESULTS.MXD AESPEJO 2/13/2017



Notes:
TCE – trichloroethene
Ln – natural log
Concentrations in micrograms per liter (µg/L)

Figure 5

Private Water Supply Well Declining TCE Concentration Trend
Garden City Groundwater Plume Site
Remedial Investigation Report
Garden City, Indiana



LEGEND

- Potentiometric Surface
- Fill
- Sand
- Gravel
- Clay/Silt
- Bedrock
- Well Screen Interval
- Grab Sample Interval
- Private Well (dashed where depth is estimated)
- 5.0 µg/L isoconcentration contour

Notes:
1. Lithologic contacts dashed where inferred.
2. Potentiometric surface based on the September 2015 synoptic water level event.
3. Private wells added to show distribution of TCE but were not used for lithologic interpretation.
4. *The depth of the locations PW-007-PRE and PW-008-PRE are estimated based on adjacent well installations.
5. Trichloroethene (TCE) results shown in micrograms per liter (µg/L).
6. At locations where more than one sample was collected, the highest detected concentration is shown (Table 4-5).
7. U = result not detected
8. J = estimated detected result

Figure 6

Distribution of TCE along Cross Section A-A'
Garden City Groundwater Plume Site
Feasibility Study Report
Garden City, Indiana

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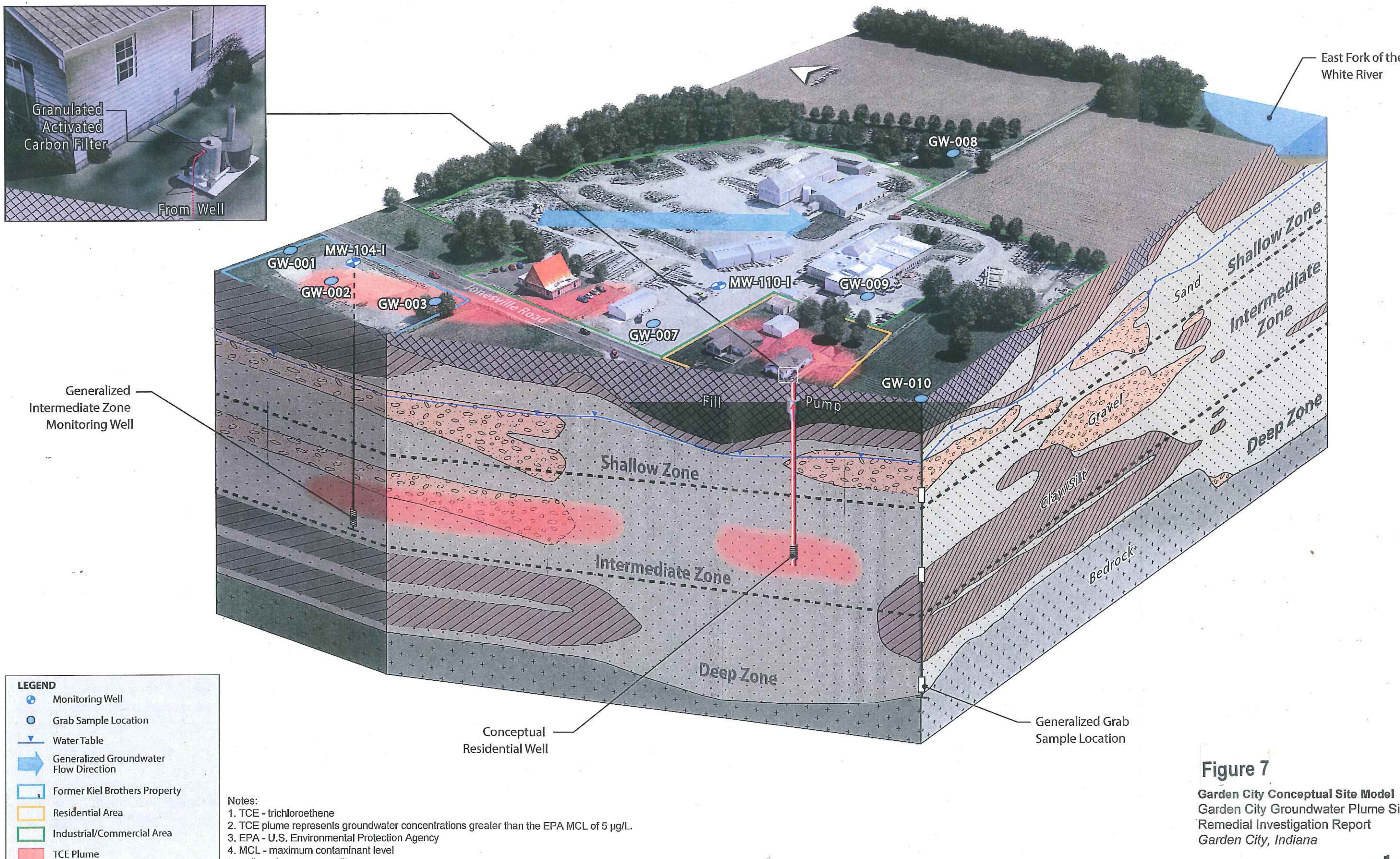
SCO651434.RR.01 garden_city_AA_distribution_TCE_feb2017_rev1.ai 2/17



Notes:
1. TCE - trichloroethene
2. TCE plume represents groundwater concentrations greater than the EPA MCL of 5 µg/L.
3. EPA - U.S. Environmental Protection Agency
4. MCL - maximum contaminant level
5. µg/L - micrograms per liter

Not to scale.

Figure 7

Garden City Conceptual Site Model
Garden City Groundwater Plume Site
Remedial Investigation Report
Garden City, Indiana

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EN1027161136DEN FigES-2_GardenCityCSM_rev9 01/19/17 CDC

LEGEND

- Private Well
- Road
- Existing Water Main
- Proposed Water Main Extension
- Proposed Private Property Pipe Connection
- TCE Plume (>5 µg/L)
- Former Kiel Brothers Property
- Miller Salvage Property
- Parcel Boundary

Notes:
1. 2014 ESRI World Imagery Basemap
2. Parcel boundaries were obtained through the Indiana Department of Homeland Security database publication dated June 2015
3. Sample locations collected on private (residential or commercial) property are approximate
4. TCE MCL - EPA Maximum Contaminant Level of 5 micrograms per liter (µg/L)
5. EPA - U.S. Environmental Protection Agency

N

0 500 1,000 Feet

1 inch = 500 feet

Figure 8

Conceptual Water Main Extension and Private Property Connections (Alternative 3)
Garden City Groundwater Plume Site
Feasibility Study Report
Garden City, Indiana

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R:\ENBG\00_PROJ\G\GARDENCITY\MAPFILES\FSR\FIGURE 4-1 - WATER LINE INSTALLATION.MXD AESPEJO 2/20/2017