RECORD OF DECISION

Vienna Wells Site
Operable Unit 01
Vienna, Maries County, Missouri

Prepared by:

U. S. Environmental Protection Agency
Region 7
11201 Renner Blvd
Lenexa, Kansas 66219

September 2017

Mary P. Peterson
Mary P. Peterson, Director
Superfund Division

9/28/2017
Date

TABLE OF CONTENTS

RECORD OF DECISION

DECLARATION

Site Name and Location

Vienna Wells Site
Operable Unit 01 (OU-01)
Vienna, Maries County, Missouri
CERCLIS ID #: MON000705803

Statement of Basis and Purpose

This decision document presents the Selected Remedy for the Vienna Wells site, or Site, in Vienna, Maries County, Missouri. This decision was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act Section 121, as amended by the Superfund Amendments and Reauthorization Act and, to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (40 CFR § 300.430(f)(4)(ii)). This decision is based on the Administrative Record for the Site. The Administrative Record is located at the following information repositories:

Heartland Regional Library System - Vienna Branch 315 3rd Street Vienna, Missouri 65582 Hours: Sunday and Monday (Closed) Tuesday (1:00 p.m.–5:00 p.m.) Wednesday (1:00 p.m.–5:00 p.m.) Thursday (2:00 p.m.–8:00 p.m.) Friday (1:00 p.m.–5:00 p.m.) Saturday (9:00 a.m.–1:00 p.m.)	U.S. Environmental Protection Agency Region 7 11201 Renner Blvd Lenexa, Kansas 66219	Site Profile Page: www.epa.gov/superfund/viennawells Administrative Record: https://semspub.epa.gov/src/collections/07/SC32109

The state of Missouri, as represented by the Missouri Department of Natural Resources, or MDNR, concurs with the Selected Remedy as outlined in the Proposed Plan for the Site. The MDNR did not have any comments during the public comment period.

Assessment of the Site

The response action selected in this Record of Decision, or ROD, is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of Selected Remedy

The Selected Remedy will be the first and final response action for the Site and addresses the principal current and potential risks to human health and the environment. Specifically, the Selected Remedy addresses volatile organic compounds, or VOCs, contamination from the source area, the former

Langenburg Hat Factory. The response action for cleaning up the Site includes components to address both contaminated soil and groundwater, and the Selected Remedy is the combination of Soil Alternative 3, or S3, – Excavation and Off-site Disposal; and Groundwater Alternative 3, or GW3, – Groundwater Extraction and Treatment, or GET, for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3). The major components of the Selected Remedy include the following:

Soil Remedy – Excavation and Off-site Disposal

- The remaining portions of the former hat factory, along with the foundation, will be demolished and removed.
- Excavation and off-site disposal of contaminated soil with tetrachloroethylene concentrations above the cleanup level of 2.3 micrograms/kilogram. Approximately 45,000 cubic yards of soil will be excavated, of which approximately 23,000 cubic yards of soil will be treated to meet land disposal regulations, as needed, and transported to a permitted landfill for disposal.
- Excavated soil below cleanup levels will be used as backfill. Additional clean backfill will be obtained from another source to replace the soil transported off-site.
- Institutional Controls, or ICs, to prevent exposure to residual contaminated soil at depth. After on-site construction of the soil remedy is completed, residual soil contamination will remain at depth in the bedrock. An environmental covenant will be implemented on the site property to restrict activities, such as excavation, that would cause exposure to soil contamination in the bedrock. The environmental covenant will be compliant with the Missouri Environmental Covenants Act.

Groundwater Remedy – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3)

- GET for the shallow zone of the contaminated groundwater plume. The shallow zone is defined as the contaminated groundwater plume from the top of the water table at approximately 35 feet below ground surface, or bgs, down to approximately 120 feet bgs. GET for the shallow zone will include installing an extraction well network to extract the shallow groundwater for treatment. The pumping rates will be high enough to extract shallow groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the shallow zone to levels that allow for protection of human health and beneficial use as a drinking water source.
- GET for the deep zone of the contaminated groundwater plume using the city's existing groundwater drinking supply Well #3. The deep zone is defined as the contaminated groundwater plume below the shallow zone from approximately 120 feet bgs down to the lowest depth of the plume. The plume extends to at least 300 bgs, which is the intake depth of Well #3. The GET system will use Well #3 to extract the deep groundwater for treatment. The pumping rates for Well #3 currently extracts deep groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the deep zone. The response action will ensure that Well #3 continues to operate to contain the deep contaminant plume and to remove contamination from the deep zone to levels that allow for protection of human health and beneficial use as a drinking water source.
- Groundwater extracted from both the shallow zone and the deep zone of the contaminated groundwater plume will be treated by the city's existing remediation system, or air stripper system. The air stripper system currently eliminates VOCs from groundwater to meet Maximum Contaminant Levels, or MCLs, as defined by the Safe Drinking Water Act. Treated effluent

water from the air stripper is currently being used for drinking water. The response action will ensure that the city's air stripper system continues to treat groundwater to below MCLs.

- Groundwater monitoring to ensure that the contaminant plume, in both the shallow zone and the deep zone, is stable or decreasing and contaminant levels are decreasing over time.
- Monitoring of the influent groundwater into the air stripper system and treated effluent water from the air stripper system to ensure that the city's air stripper system continues to treat groundwater to meet safe drinking water standards, as defined by MCLs.
- Maintenance activities associated with the continued operation of the GET system. Maintenance activities will include components of the city's existing water distribution infrastructure that will be incorporated into the GET system and repurposed to also address contamination from the Site. This will include the city's existing Well #3 and air stripper system.
- ICs to restrict groundwater use on the site property. An environmental covenant will be implemented on the site property to prohibit the installation of groundwater wells. The prohibition on the installation of groundwater wells will exclude extraction wells or monitoring wells constructed for the response action. The environmental covenant will be compliant with the Missouri Environmental Covenants Act.
- ICs to restrict groundwater use throughout the contaminated plume. The contaminated plume lies within city limits. A city ordinance will be implemented to prohibit the installation of private groundwater wells within city limits. The prohibition on the installation of groundwater wells will exclude municipal wells that use the air stripper for treatment and extraction wells or monitoring wells constructed for the response action.

Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with federal, state and local requirements that are applicable or relevant and appropriate to the remedial action, or RA, is cost-effective and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This Selected Remedy also satisfies the statutory preference for treatment as a principal element of the remedy by reducing the toxicity, mobility or volume of hazardous substances, pollutants or contaminants as a principal element through treatment.

The Selected Remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory review will be conducted within five years after initiation of the RA to ensure that the remedy is, or will be, protective of human health and the environment.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for the Site.

- Contaminants of concern, or COCs, and their respective concentrations
- Baseline risk represented by the COCs
- Cleanup levels established for COCs and the basis for these levels
- How source materials constituting principal threats are addressed

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD
- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy
- Estimated capital, annual operation and maintenance and total present worth costs, discount rate and the number of years over which the remedy cost estimates are projected
- Key factor(s) that led to selecting the remedy

Authorizing Signatures

Mary P. Peterson

Mary P. Peterson, Director
Superfund Division
U.S. EPA, Region 7

9/28/2017
Date

RECORD OF DECISION
DECISION SUMMARY
Vienna Wells Site
Operable Unit 01
Vienna, Maries County, Missouri

Site Name, Location and Brief Description

This Record of Decision, or ROD, for the Vienna Wells Site, or Site, Operable Unit 01, or OU-01, concerns upcoming remedial actions, or RAs, to address contaminated soil and groundwater at the Site. It provides background information, summarizes recent information driving the Selected Remedy, identifies the Selected Remedy for cleanup and its rationale and summarizes public review and comment on the Selected Remedy.

This ROD is a document that the U.S. Environmental Protection Agency, or EPA, as the lead agency for the Site is required to issue to fulfill the statutory and regulatory requirements found in Section 117(a), of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, or CERCLA, 42 U.S.C. § 9617, as amended, and in the National Oil and Hazardous Substance Pollution Contingency Plan, or NCP, 40 CFR § 300.430(f)(4), respectively. The support agency is the Missouri Department of Natural Resources, or MDNR. The EPA plans to conduct the RA as federal fund-lead work.

The Site covers the extent of site boundaries and includes soil and groundwater impacted by volatile organic compounds, or VOCs, mainly related to manufacturing activities at the source area, the former Langenburg Hat Factory. The Site is located in Vienna, Missouri, which is approximately 37 miles south of Jefferson City, Missouri (Appendix B, Figure B-1). The Site generally consists of the source area, a former hat factory, and three public drinking water wells contaminated with VOCs (Appendix B, Figure B-1). The Comprehensive Environmental Response, Compensation and Liability Information System, or CERCLIS, identification number is MON000705803. A citizen can use the CERCLIS number on the EPA's website to obtain information on the Site.

This ROD highlights key information from the Remedial Investigation Report, or RI Report, Baseline Risk Assessment Report, or BLRA Report, Feasibility Study Report, or FS Report, and Proposed Plan for the Site. These and other documents regarding the upcoming RA are available in the Site's Administrative Record. The Administrative Record is located at the following information repositories:

Heartland Regional Library System - Vienna Branch 315 3rd Street Vienna, Missouri 65582 Hours: Sunday and Monday (Closed) Tuesday (1:00 p.m.–5:00 p.m.) Wednesday (1:00 p.m.–5:00 p.m.) Thursday (2:00 p.m.–8:00 p.m.) Friday (1:00 p.m.–5:00 p.m.) Saturday (9:00 a.m.–1:00 p.m.)	U.S. Environmental Protection Agency Region 7 11201 Renner Blvd Lenexa, Kansas 66219	Site Profile Page: www.epa.gov/superfund/viennawells Administrative Record: https://semspub.epa.gov/src/collections/07/SC32109

Site History and Enforcement Activities

The Langenberg Hat Company purchased the site property in 1953 and operated a hat factory on the premises until the early 1990's. In the mid-1990's, a second company named Top This, Inc. took over the hat factory, or facility, and continued manufacturing hats until the facility was closed in 1996. Top This, Inc. dissolved as a corporate entity in the state of Missouri in 1997, and the Langenberg Hat Company dissolved in 2000. The current owner of the site property purchased the land in 1999. The current owner uses the facility for storage.

The city of Vienna operates the public water supply and has drilled three drinking water wells. Well #1 was drilled in 1954 and serves as a supplemental water supply. Well #2 was drilled in 1985. The groundwater from Well #2 had elevated levels of iron. As a result, Well #2 was taken out of service. The pump was removed from Well #2 in 2008, and a permanent float was installed to monitor the water level of the Ozark Aquifer. Well #3 was drilled in 1994 and serves as the primary source of drinking water for the city.

The Public Drinking Water Branch of the MDNR began routine monitoring for VOCs at the city of Vienna's drinking water wells in the early 1990's. In May 1991, tetrachloroethylene, or PCE, contamination was initially detected in trace amounts at Well #1. The MDNR continued monitoring the drinking water wells in Vienna, and the levels of PCE contamination gradually increased over time. In August 2006, PCE contamination exceeded the Maximum Contaminant Level, or MCL, as defined by the Safe Drinking Water Act, for the first time at Well #3. In 2011, the city installed a treatment system, an "air stripper" system, near Well #3 to remove VOCs from the groundwater before the water was used for drinking water. The air stripper system is currently operating as designed, and local residents are not being exposed to contaminated drinking water.

In early 2007, the Hazardous Waste Program Superfund Section Site Assessment Unit of the MDNR conducted an investigation to determine the source of PCE in the city of Vienna's public drinking water. The Site was entered into CERCLIS on November 29, 2007. The MDNR completed an abbreviated preliminary assessment on March 28, 2007 and recommended further assessment under CERCLA.

MDNR initiated a site investigation, or SI, on April 1, 2007. The purpose of the SI was to identify potential sources of the PCE, to determine if the release poses a significant threat to human health or the environment and to evaluate the Site using the Hazardous Ranking System for proposal to the National Priorities List, or NPL. The SI was completed on March 31, 2009. The Site was listed on the final NPL on September 30, 2010.

The EPA completed the search for potentially responsible parties, or PRPs, in September 2010. The search did not identify any viable PRPs that were capable of conducting the remedial investigation/feasibility study, or RI/FS, for the Site. Therefore, the EPA performed the RI/FS as a fund-lead project through an interagency agreement with the United States Geological Survey, or USGS, and anticipates that the RA will also be fund-lead.

Areas of Historical or Archeological Significance

The search for PRPs included research of historical records to ascertain whether any known areas of historical or archeological significance existed near the Site. No areas of historical or archeological significance were identified.

Community Participation

The RI Report, Draft Final FS Report and Proposed Plan for the Site in Vienna, Missouri, were made available to the public in June 2017. The documents can be found in the Administrative Record. The Administrative Record is located at the following information repositories:

Heartland Regional Library System - Vienna Branch 315 3rd Street Vienna, Missouri 65582 Hours: Sunday and Monday (Closed) Tuesday (1:00 p.m.–5:00 p.m.) Wednesday (1:00 p.m.–5:00 p.m.) Thursday (2:00 p.m.–8:00 p.m.) Friday (1:00 p.m.–5:00 p.m.) Saturday (9:00 a.m.–1:00 p.m.)	U.S. Environmental Protection Agency Region 7 11201 Renner Blvd Lenexa, Kansas 66219	Site Profile Page: www.epa.gov/superfund/vienna wells Administrative Record: https://semspub.epa.gov/src/collections/07/SC32109

The notice of availability of these documents was published in the weekly editions of both the Maries County Gazette and the Maries County Advocate throughout June and July of 2017. A public comment period was held from June 22, 2017 to July 22, 2017. The EPA conducted a public availability session on June 29, 2017 and a public meeting on July 11, 2017, and representatives from MDNR, the Missouri Department of Health and Senior Services and the city of Vienna attended both events. The purpose of the events was to present the Proposed Plan to a broader community audience than those that had already been involved at the Site. At the events, representatives from the EPA answered questions about the problems at the Site and the remedial alternatives. The EPA also used the events to solicit a wider cross-section of community input on the reasonably anticipated future land use and potential beneficial groundwater uses at the Site. Comments from the two events, along with responses from the EPA, are provided in the Responsiveness Summary at the end of this ROD.

The EPA also encouraged the public to submit comments through other forms of communication, including traditional mail, electronic mail, telephone and internet submissions via the site profile page. No comments were submitted through these other forms during the public comment period.

Scope and Role of Operable Unit or Response Action

The Site is addressed as one OU, and this response action will be the first and final action for the entire Site. The Selected Remedy will be implemented in two phases. The first phase will address the soil contamination. The majority of contaminated soil is underneath the former hat factory; therefore, the remaining portions of the facility, along with the building foundation, will be demolished and disposed of in an off-site landfill. Once the building and foundation are removed, on-site construction activities to excavate and dispose of the contaminated soil will take approximately five months. The excavation will then be backfilled with clean soil. No long term operation and maintenance, or O&M, is required for the soil component once on-site construction activities are completed.

The second phase will implement the groundwater component of the Selected Remedy. The construction of the groundwater component will begin after the soil component is completed. Construction of the

groundwater component, extraction wells and monitoring wells, will take approximately five months to complete. The groundwater component will require 30 years of O&M.

Site Characteristics

Overview of the Site

The Site generally consists of the source area, a former hat factory, and three public drinking water wells contaminated with VOCs. The site property is a 7.9 acres parcel of land that begins at the southeast corner of the 10th Street and Chestnut Street intersection. The facility is located at the northwest corner of the site property (Appendix B, Figure B-1). The address for the facility is 547 Chestnut Street. The facility consists of two adjoining buildings that form a sideways "L". The main building is the longer of the two buildings and runs east and west. The main building has been mostly demolished down to the concrete slab with sections of steel framing and rotting overhang roofing on the south central and northwest edges of the building. The secondary building is attached to the west side of the main building, runs north and south, and remains intact.

Surface Features

The town lies across a topographic divide between the Gasconade River about 2.0 miles to the east and the Maries River about 1.9 miles to the west-northwest. The town is in the Salem Plateau physiographic subprovince of the Ozark Plateaus Province. The Salem Plateau is characterized by a moderate to rugged terrain with thin soils and narrow steep-walled valleys. Topographic relief is the result of gradual uplift of the Ozark Dome in southern Missouri and erosion of the uplifted rocks by precipitation, runoff and streamflow. The topographic relief in the Vienna area is accentuated because of its proximity to the Gasconade River, which controls the base level for streams in the region. Land-surface elevation ranges from 615 feet above the North American Vertical Datum 88, along the Gasconade River to about 900 feet on a hilltop within the central part of the town. Fly Creek, a tributary to the Maries River with an elevation of about 760 feet, is less than 1.0 mile west of town. Indian Creek, a tributary to the Gasconade River with an elevation of about 710 feet, is directly east of town. The region is generally rural and consists of gently rolling hills with farmland, pastures and scattered deciduous forest.

Three small dumps are located in the wooded area on the site property. These dumps are referred to in the RI Report as the "central dump", the "eastern dump" and the "metal dump" (Appendix B, Figure B-2). Large metal debris, roofing material, old drums, bricks and various metals cans are scattered in the central dump to a depth of as much as 4 feet. The metal dump contains buried and partially buried metal debris in a roughly rectangular area about 150 feet by 30 feet to a depth of about 3 feet. The eastern dump is located on the east side of the site property and has a depth ranging from a few inches to 2 feet. The debris in the eastern dump mostly consists of old fur and occasional leather strips. Material in the central and eastern dumps appears to have been deposited on the surface, and material in the metal dump appears to have been deposited in an excavation.

Regional Hydrogeology

The Ozark Aquifer is about 1,000 feet thick and supplies all domestic, industrial and public water used in the Vienna area. For the purposes of developing and evaluating remedial alternatives, the contaminated groundwater plume within the Ozark Aquifer was separated into two zones, a shallow zone and a deep zone. The shallow zone is defined as the contaminated groundwater plume from the top

of the water table at approximately 35 feet bgs down to approximately 120 feet bgs. The deep zone is defined as the contaminated groundwater plume below the shallow zone from approximately 120 feet bgs down to the lowest depth of the plume. The plume extends to at least 300 bgs, which is the intake depth of Well #3.

Ozark Aquifer and St. Francois Confining Unit

The Ozark Aquifer is underlain by the St. Francois confining unit, which is composed of the Derby-Doe Run Dolomite. The uppermost bedrock unit varies with surface topography in the Vienna area and includes the Jefferson City Dolomite, Roubidoux Formation and Gasconade Dolomite. The Jefferson City Dolomite, where present ranges from 20 feet to a maximum of about 70 feet in thickness north of Vienna, is a tan to light gray, fine- to medium-crystalline dolostone (equivalent to dolomite) or argillaceous dolostone. The unit contains thin greenish-gray mudstone and shale beds and several chert-rich zones. Overall, the Jefferson City Dolomite is a poor water-producing formation and typically has low vertical and horizontal hydraulic conductivity. Where the Jefferson City Dolomite is exposed at the surface, vertical infiltration of precipitation can be impeded more than in older formations.

The Roubidoux Formation underlies the Jefferson City Dolomite and is present at the land surface in the vicinity of the former hat factory. Regionally, the lithology of the Roubidoux Formation is variable and includes sandstone, sandy dolostone, dolostone, mudstone, chert and cherty dolostone. Where the Roubidoux Formation is present in the Vienna area, the unit is about 25 to 170 feet thick. The Roubidoux Formation can be distinguished from the overlying Jefferson City Dolomite by an abrupt increase in chert, 20 percent or more, at the top of the formation. Weathered surfaces range in color from brownish-gray to yellowish-orange, and unweathered surfaces appear creamy-tan to white. Regionally, the Roubidoux Formation yields 15 to 35 gallons per minute, or gpm, where shallow and 50 to 75 gpm where deeply buried. The hydraulic conductivity of the Roubidoux Formation has only been measured in Arkansas where they range from 0.02 to 1.76 feet/day. Although the Roubidoux Formation is cased out in the city public-supply wells, many of the domestic wells in Vienna are open to the Roubidoux Formation. Most on-site monitoring wells installed during the RI are open to the Roubidoux Formation.

The Gasconade Dolomite, which underlies the Roubidoux Formation, has an average thickness in the Vienna area of about 260 feet. The Gasconade Dolomite is divided into two informal units (upper and lower Gasconade Dolomite) and the basal Gunter Sandstone Member. The upper Gasconade Dolomite generally is a massively bedded, medium crystalline, light gray dolostone with small amounts of chert and sandstone and is about 20 to 70 feet thick in Vienna. The upper Gasconade Dolomite tends to be less permeable than the overlying Roubidoux Formation or the underlying lower Gasconade Dolomite. Because of this lower permeability, the surface casing in many large-capacity production wells, including city public-supply wells Well #1, Well #2 and Well #3, is set near or at the bottom of this unit. The lower Gasconade Dolomite contains abundant chert, some of which forms massive chert beds 10 to 20 feet thick and is light-brownish gray in color. Yields from wells open to both the upper and lower Gasconade Dolomite generally range from 10 to 20 gpm. The Gunter Sandstone Member is the basal unit of the Gasconade Dolomite, ranges from 20 to 35 feet thick in the Vienna area and is a target zone for many large-capacity wells in Missouri including Vienna public-supply wells. Although referred to as a sandstone, the Gunter Sandstone Member contains less than 10 percent sand according to geologic logs from the Vienna area. Wells open to the Gunter Sandstone Member in the region typically yield 20 to 70 gpm. The hydraulic conductivity of the Gunter Sandstone Member has only been measured in Arkansas where they range from 0.01 to 1.90 feet/day.

The Eminence Dolomite, Potosi Dolomite and Derby-Doe Run Dolomite are the oldest geologic units used by wells in the Vienna area and are primarily accessed by public-supply wells. The Eminence Dolomite, which underlies the Gasconade Dolomite, is a medium- to coarsely-crystalline dolostone with little or no chert. Well logs indicate that the Eminence Dolomite is about 240 feet thick in the Vienna area. The Potosi Dolomite is the lowermost geologic unit in the Ozark Aquifer and consists primarily of massive to thickly bedded "vuggy" dolostone with abundant drusy quartz. The Potosi Dolomite is about 200 feet thick in the Salem Plateau and about 315 feet thick in the Vienna area. The hydraulic conductivity of the Potosi Dolomite has only been measured in Arkansas where they range from 0.12 to 1.78 feet/day. The lower Gasconade Dolomite and underlying Eminence and Potosi Dolomites are important sources of water for large-capacity wells in Vienna and throughout much of southern Missouri. Collective yields from these units to wells are typically in the range of hundreds of gpm or more. Regionally, the Potosi Dolomite is the most permeable and most reliable source of water in the Ozark Aquifer for large-capacity wells in southern Missouri. The Derby-Doe Run Dolomite is composed of shale, siltstone, fine-grained sandstone, dolostone and limestone conglomerate and has low chert content. Public supply Well #3 penetrates into the Derby-Doe Run Dolomite, the upper formation of the St. Francois confining unit, which yields 30 to 50 gpm in upper sections.

Geological Structure

No known geologic structures exist within a 10-mile radius of Vienna, and bedrock units are essentially horizontal. The closest geologic structure is a 13-mile-long fault more than 10 miles to the southwest and extends to the northwest into Miller County. Other geologic structures outside of the Vienna area include a 10-mile-long anticline and 7-mile-long fault about 13 miles to the southeast.

Groundwater Flow

Groundwater in the Ozark Aquifer generally is unconfined throughout the Salem Plateau. Regional groundwater movement generally is from upland areas between major rivers and streams toward valleys where groundwater discharges as base flow to the streams. The regional flow system generally is present in the deeper parts of the aquifer, except near regional recharge or discharge areas where flow enters or leaves the aquifer. Regional groundwater flow in the Vienna area is northeast toward the Gasconade River. Horizontal hydraulic conductivity ranging from 0.10 to 5.0 feet per day and vertical hydraulic conductivity ranging from $1x10^{-3}$ to $1x10^{-1}$ feet per day have been used in modeling groundwater flow in the full thickness of the Ozark Aquifer.

Sampling Strategy

The EPA Superfund program managed the RI/FS as a fund-lead site. Fund-lead sites are funded and managed directly by the EPA because a viable responsible party has not been identified to perform the work. The EPA tasked the USGS to perform an RI to characterize the contamination at the Site. The USGS began the RI in 2011 and completed it in 2017.

Sampling activities for the RI were performed in three phases. Phase 1 focused on the geohydrology of the area, groundwater flow to the contaminated city wells, investigations of other locations where PCE may have been disposed to find or eliminate other potential source areas and the development of a conceptual site model, or CSM, of PCE transport to city wells (Appendix B, Figure B-3). Phase 1 confirmed PCE contamination at the hat factory and did not find additional source areas. Phase 2 focused on the hat factory as the only source of PCE contaminating the city wells. The nature and extent

of contamination were characterized by collecting soil and groundwater samples at the hat factory and the surrounding areas. Phase 3 focused on the data needs for the site specific BLRA. Phase 3 sampling activities included additional soil sampling to assess the risk for various potential future use scenarios at the site property and air quality sampling to assess the risk from vapor intrusion to current residents living in close proximity to the site property and Well #3.

Types of Contamination and the Affected Media

The primary contaminant is PCE. An estimated 56,000 cubic yards of PCE-contaminated soils are above the protection-to-groundwater threshold of 5.1 micrograms per kilogram, or µg/kg, with about 26,000 cubic yards of PCE-contaminated soils above 100 µg/kg. These soils contain an estimated total of approximately 5.5 gallons of pure PCE. PCE-contaminated soils are generally beneath the foundation of the facility and in the area south, within 150 feet, of the facility (Appendix B, Figure B-4).

The RI investigated the three small dumps that are located in the wooded area on the site property. These dumps were referred to in the RI Report as the "central dump", the "eastern dump" and the "metal dump". The dumps contained a variety of construction debris and leftover materials from manufacturing hats. Materials in the central dump and eastern dump appeared to have been deposited on the surface, and materials in the metal dump appeared to have been deposited in an excavation. PCE contamination was not found in the metal dump and the eastern dump. The metal dump and the eastern dump are not a part of the remedy but will be cleaned up to prepare the site property for future reuse. The central dump had detections of PCE and will be remediated, as part of the soil component of the Selected Remedy (Appendix B, Figure B-4).

The Ozark Aquifer is the primary source of drinking water for the city of Vienna, Missouri and both public and private wells outside of city limits. PCE from the Site has migrated from soil and into the Ozark Aquifer. The area of the groundwater plume containing PCE concentrations above the MCL of 5 micrograms per liter, or µg/L, as defined by the federal Safe Drinking Water Act, is approximately 57,000 square yards and contains an estimated 9.9 pounds of PCE in the shallow zone (Appendix B, Figure B-5). The extent of contamination in the deep zone has not been delineated, but data collected from Well #3 were used to make reasonable assumptions regarding the extent of PCE contamination in the deep zone. PCE concentrations from groundwater samples at Well #3 have been in a stable range, between 7 µg/L to 8 µg/L, for several years and suggest that levels of PCE throughout the deep zone exists within a similar range. Well #3 extracts groundwater at a sufficient volume to contain the contaminant plume laterally, therefore, the extent of lateral migration of PCE in the deep zone is assumed to be similar to the shallow zone. The mass of PCE in deeper groundwater could not be estimated because of a lack of data. However, monthly sampling data from Well #3 indicate that around 16 pounds of PCE have been removed from the groundwater in the 20 years between July 1995 to June 2015. The PCE concentrations in groundwater are not high enough to indicate the presence of a dense non-aqueous phase liquid form.

The contaminated soils in the area of the site property are considered to be "principal threat wastes" because the contaminants are highly mobile and found at concentrations that pose a significant risk should exposure occur. Although contaminated groundwater also poses a risk, it is not considered a "principal threat" as defined by EPA guidance.

The EPA conducted an assessment to investigate the vapor intrusion pathway. Vapor intrusion occurs when vapors from contaminated soil and groundwater enter buildings and impact occupants. The EPA

assessed residential properties in close proximity to the site property and Well #3 from April 2014 to January 2015. The EPA completed the assessment and found no adverse impacts to residences from vapor intrusion.

Current and Potential Future Site and Resource Uses

According to the 2010 Census, Vienna has a population of 610 and an incorporated area of around 1.06 square miles. Vienna has a median age of 47.3 years and an average household size of 2.1. Vienna's land use is mixed urban and rural with much of the rural area classified as cropland or deciduous forest. The areas directly outside of Vienna are almost exclusively deciduous forest and cropland. The mixed urban area predominantly consists of single-family residences, multifamily residences, commercial facilities and several churches. The downtown area of Vienna, which is on the southeast corner of the intersection of U.S. Highway 63 and Missouri Route 42, is small and consists of about four blocks of small businesses and the Maries County courthouse.

A hat factory operated on the site property from 1953 until the mid-1990's, but no manufacturing activities have taken place since the facility closed in 1996. The current land use in the areas surrounding the site property are generally rural, agricultural and residential. The site property is bounded by 10th Street and wooded areas to the north; wooded areas and one residential property to the east; one residential/agricultural property to the south; and Chestnut Street to the west. In addition to the properties that are adjacent to the site property, residential properties nearest the site property include single family homes on the west side Chestnut Street and multi-family units on the north side of 10th Street.

The site property has historically been used for manufacturing, but future land use is anticipated to be residential or recreational. The change in anticipated land use is due to the site property being bordered by residential properties on three sides, the surrounding areas being residential or rural and the preference of the city of Vienna and local residents to not want manufacturing in the area. The areas surrounding the Site have been residential for several decades, and no changes in land use are anticipated for the surrounding areas.

The city of Vienna operates the public water supply and uses groundwater from the Site for drinking water. The Site was discovered when PCE was detected in the city wells in the early 1990's. In 2011, the city installed an air stripper system near Well #3 to remove VOCs from the groundwater before the water is used for drinking water. The air stripper system is currently operating as designed, and local residents are not being exposed to contaminated drinking water. All residents within city limits receive drinking water from the municipal water supply.

Besides the three city wells, one domestic well to the south of the site property is located within the contaminant plume. This domestic well is primarily used for agricultural purposes (i.e., irrigation) and not used for drinking water. The levels of contamination in this domestic well are relatively low and do not pose an acceptable risk for non-potable use.

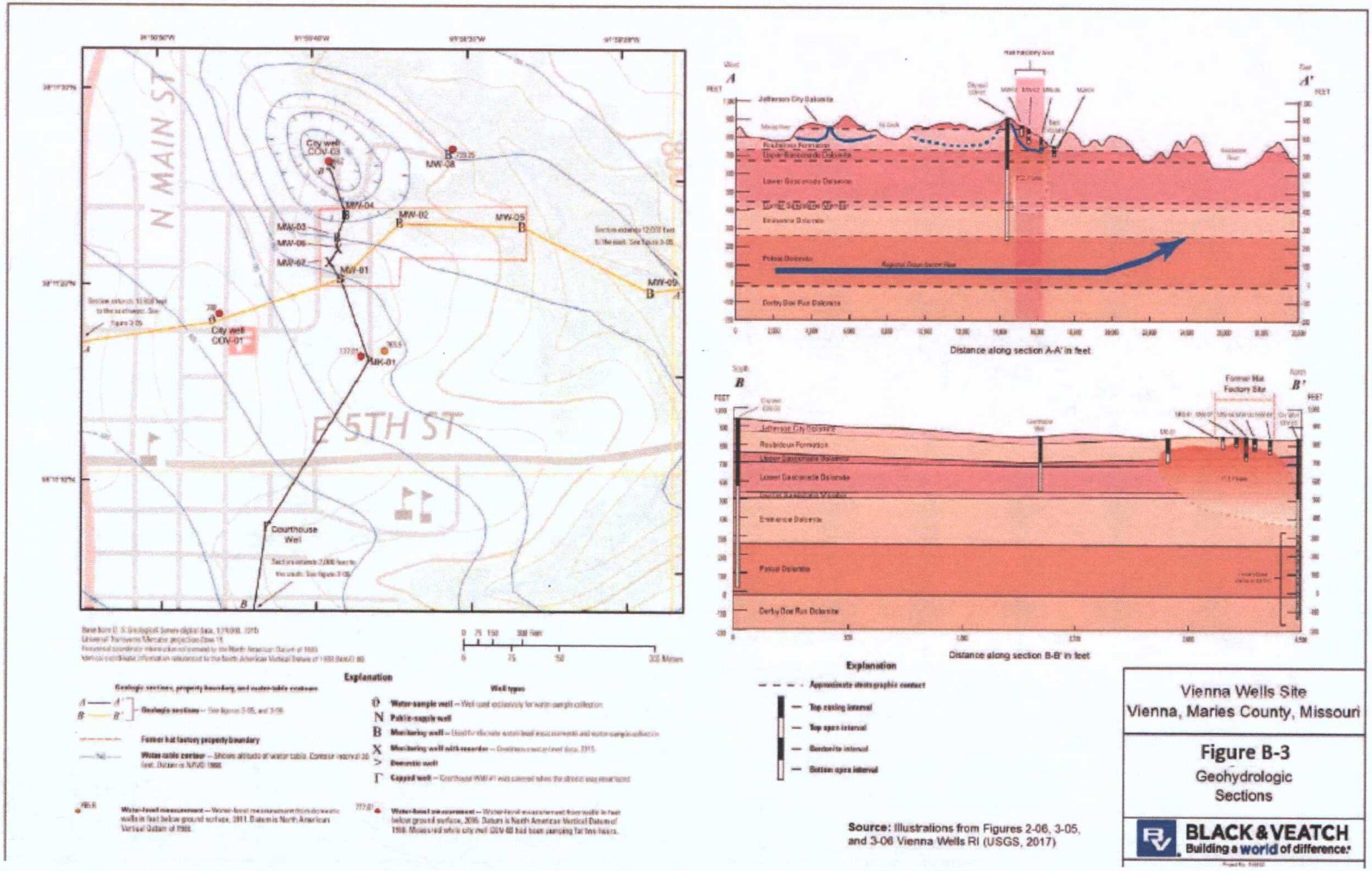
Future groundwater use at the Site is anticipated to remain the same. The city of Vienna has recently made substantial investments to install the air stripper system and to upgrade the water distribution system throughout the city. No additional changes are planned for groundwater use in the area.

Summary of Site Risks

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Conceptual Site Model

The evaluation of site risks begins with the development of a CSM that depicts the migration of contamination from the source to potential receptors (Appendix B, Figure B-3 and below). The CSM was derived using data collected from the RI, such as groundwater sampling data, groundwater flow data and site specific geology. The distance between the source area, the facility, and Well #3 is less than 300 feet, and groundwater flow at the Site is primarily influenced by Well #3. Therefore, computer modeling was not necessary to evaluate groundwater flow at the Site.



Source: Illustrations from Figures 2-06, 3-05, and 3-06 Vienna Wells RI (USGS, 2017)

Summary of Human Health Risk Assessment

The city of Vienna operates an air stripper system that eliminates contamination from the city's public drinking water before it is distributed to residents, and residents are not being exposed to contaminated drinking water. Site risks were calculated using a theoretical "baseline" scenario in which the groundwater would not be treated. A BLRA was the appropriate method for calculating risk, but the baseline approach did not reflect actual site conditions and overstated actual exposure to contaminated groundwater.

The BLRA estimated what risks the Site posed if no action were taken. In this case, "no action" would also mean that the city's air stripper system was not operating or did not exist. The BLRA provided the basis for taking action and identified the contaminants and exposure pathways that need to be addressed by the RA. This section summarizes the results of the BLRA for the Site, as documented in the Final Baseline Risk Assessment, Vienna Wells Site dated October 2016.

Section 1: Identification of Chemical of Concern

Data Selection and Evaluation

Data evaluated for the BLRA consisted of the analytical results from surface soil, subsurface soil, sediment, surface water, groundwater, subslab soil gas and indoor air samples collected during the RI (Appendix C, Table C-1).

Data Quality

Quality assurance and quality control, or QA/QC, measures were incorporated into the investigation methods and procedures to help ensure quality, precision, accuracy and completeness of data and sample analysis. Field laboratory quality checks were incorporated into sample collection and analysis procedures as part of the QA/QC measures. Field quality checks were implemented into the sample collection procedures to minimize the potential for interference or introduction of contaminants during sample collection and processing, storage, transport and equipment decontamination. These measures included collection of blank and duplicate samples among others. Laboratory quality checks were implemented to ensure laboratory systems operated within acceptable guidelines and to minimize or document the occurrence of laboratory contamination and variability in analytical results and included method blanks among other measures.

Only those samples with corresponding supporting documentation, including custody records and field notes, were included in the quantitative analysis. QA/QC measures associated with each of these samples were reviewed to ensure that the quality of the data met requirements for risk assessment purposes.

Data Usability

The analytical data were subjected to a data validation process in accordance with the EPA guidelines. The analytical data had qualifiers from the analytical laboratory quality control or from the data validation process that reflect the level of confidence in the data. Data results that were qualified as "estimated" were used in the BLRA. None of the data were qualified as "detected in associated blank

sample" or "tentative identification". Data qualified as "chemical may or may not be present" were not used in the BLRA.

Selection of Chemical of Concern

The chemicals of concern, or COCs, for the Site were determined by first selecting the chemicals of potential concern, or COPCs. COPCs were identified using the results of a risk-based screening. Maximum detected concentrations and maximum laboratory reporting limits were compared to Regional Screening Levels, or RSLs. All data selected for the quantitative risk assessment were included in this screening. COPCs are generally selected as a subset of all chemicals positively identified at the Site. The process of determining the COPCs for the Site included a detailed evaluation of the analytical data, a careful analysis of the sources of contamination and areas that the sources impact and a review of site characteristics.

For the purposes of selecting COPCs, the analytical data were grouped by media and location. Location groupings included the on-site area, off-site areas and city wells. Soil samples were subdivided into surface (0 to 0.5 foot bgs) and subsurface (0.5 to 18 feet bgs). Water samples from the city of Vienna's public water supply wells were considered as a separate off-site exposure area. All surface water, sediment, subslab soil gas and indoor air samples were collected only from areas off the site property.

The COPCs were identified and screened during the BLRA and FS to determine which ones would be retained as COCs. The screening used multiple criteria based on the statistical information about the chemicals detected in each medium, the laboratory reporting limits of chemicals analyzed and risk-based screening values. Criteria for screening COPCs were specific to each media.

A total of 171 constituents were initially identified as COPCs for the Site because the maximum detected concentrations or maximum laboratory reporting limits for that constituent were above RSLs (Appendix C, Table C-2). The next step of the screening process was to determine the "risk drivers" that affect final remedy selection at the Site. The initial set of 171 COPCs included 127 constituents that were not detected in any samples but were retained because the maximum laboratory reporting limit for the constituent exceeded the RSLs. These 127 COPCs were not retained during the screening process because the maximum reporting limits were low enough to eliminate each constituent as risk drivers. The screening process then evaluated the remaining 44 COPCs that were detected above the RSLs (Appendix C, Table C-3) and eliminated an additional 20 COPCs for various reasons (Appendix C, Table C-4). Detected COPCs that were eliminated included VOCs that were detected in indoor air samples, collected from residences near the site property and Well #3, but were determined to not originate from the Site and inorganics (aluminum, arsenic, chromium, manganese and thallium) that were detected in soil samples but were determined to be attributable to background.

After completing the screening process, the 24 COPCs that were retained became the final COCs for the Site. The COCs include VOCs, SVOCs, PAHs, PCBs and metals in soil/sediment (Appendix C, Table C-5 and below) and VOCs, PCBs and metals in surface water/groundwater (Appendix C, Table C-6 and as follows).

Contaminants of Concern

Soil/Sediment	
Contaminants of Concern (COCs)	**CAS No.**
Volatile Organic Compounds (VOCs)	
Tetrachloroethylene	127-18-4
Trichloroethylene	79-01-6
Semi-Volatile Organic Compounds (SVOCs)	
Polynuclear Aromatic Hydrocarbons (PAHs)	
Acenaphthylene	83-32-9
Benzo[a]anthracene	56-55-3
Benso[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[k]fluoranthene	207-38-0
Dibenzo[a,h]anthracene	53-70-3
Indeno[1,2,3-cd]pyrene	193-39-5
Phenanthrene	85-01-6
Pesticides/PCBs	
Aroclor 1254	11097-69-1
Dieldrin	60-57-1
Inorganic (Metals/Ions)	
Antimony	7440-36-0
Cadmium	7440-43-9
Cobalt	7440-48-4
Copper	7440-50-8
Iron	7439-89-6
Lead	7439-92-1
Mercury	7439-97-6
Vandium	7440-62-2

Groundwater/Surface Water	
Contaminants of Concern (COCs)	**CAS No.**
Volatile Organic Compounds (VOCs)	
Benzene	71-43-2
Tetrachloroethylene	127-18-4
Trichloroethylene	79-01-6
Vinyl Chloride	75-01-4
Pesticides/PCBs	
Dieldrin	60-57-1
Inorganic (Metals/Ions)	
Flouride	16984-48-8
Nitrate	14797-55-8

Section 2: Exposure Assessment

Exposure refers to the potential contact of an individual (the receptor) with a contaminant. The exposure assessment evaluates the magnitude, frequency, duration, and route of potential exposure. The reasonable maximum exposure, or RME, scenarios are developed using current exposure pathways given existing land uses and also exposures which might reasonably be predicted based upon expected or logical future land use assumptions.

The exposure assessment process involved three main steps:

- Characterization of the exposure setting
- Identification of the exposure pathways
- Quantification of the exposure

Characterization of the Exposure Setting

The BLRA Report documented site conditions that were used in the characterization of the exposure setting. These site conditions included topography and physiography, climate, site specific geology, site specific hydrology, groundwater and surface water.

Human Population Characteristics

Demographic information for the city of Vienna was evaluated to assess whether any sensitive subpopulations were exposed to site contamination. The BLRA Report summarized the demographic profile for the city (Appendix C, Table C-7). An evaluation of demographic information did not identify any sensitive subpopulations that were potentially highly exposed or more susceptible to contamination.

Identification of Potential Exposure Pathways

Based on the nature of the COCs detected and physical characteristics of the Site, the potential routes of contaminant migration relevant to human exposure included the following:

- Soil to groundwater migration
- Soil to surface water migration
- Soil to sediment migration
- Soil to air migration
- Groundwater to air migration
- Groundwater to surface water migration

Human Exposure Points

The BLRA evaluated the exposure points associated with each medium. The determination of exposure routes was based on the media contaminated and the anticipated activities at the exposure point. Exposure routes for each receptor at the Site are provided below.

- Residents (lifetime residents and children) – Quantitative evaluation of ingestion of surface soil, dermal contact with surface soil, inhalation of dust from surface soil, inhalation of vapors from surface and subsurface soil, ingestion of groundwater, dermal absorption of groundwater, inhalation of vapors from groundwater used in home and inhalation of indoor vapor intrusion from groundwater;
- Industrial/Commercial Workers (adults) – Quantitative evaluation of ingestion of surface soil, dermal contact with surface soil, inhalation of dust from surface soil, inhalation of vapors from surface and subsurface soil, ingestion of groundwater and indoor vapor intrusion;
- Recreational Users (adolescents) – The recreational visitor included consideration of the trespasser that may occasionally visit the area. Quantitative evaluation of ingestion of surface soil, dermal contact with surface soil, inhalation of dust from surface soil, inhalation of vapors from surface and subsurface soil, indoor vapor intrusion, ingestion of surface water, dermal contact with surface water, ingestion of sediment and dermal contact with sediment;
- Construction Workers (adults) – Quantitative evaluation of ingestion of surface and subsurface soil, dermal contact with surface and subsurface soil, inhalation of dust from surface and subsurface soil, inhalation of vapors from surface and subsurface soil, incidental ingestion of

groundwater and dermal absorption of groundwater if the depth to groundwater was such that it could pool in an excavated trench; and inhalation of vapors from groundwater in an excavated trench.

Human Health Conceptual Exposure Model

The human health conceptual site exposure model integrated and summarized the information concerning sources, constituent migration pathways and exposure routes into a combination of exposure pathways. The human health conceptual site exposure model identified the key potential release mechanisms, transport media, exposure points, exposure media, exposure routes and potential receptors for the Site (Appendix B, Figure B-6, Appendix C, Table C-8).

Quantification of Pathway-Specific Constituent Intakes

In the risk assessment process, potential risk was estimated as a function of exposure with the potential risk of adverse effects increasing as exposure increases. Information on the levels of exposure experienced by different members of the population was key to understanding the range of potential risks that may occur. Exposure estimates were calculated for each of the potentially exposed human receptor groups identified for each exposure pathway selected.

Exposure Point Concentrations

An exposure point concentration, or EPC, is the concentration of a COC in an environmental medium that may reach the potential receptor. The exposure concentration is typically defined as the average concentration contacted by the receptor at the exposure point. A conservative estimate of this average concentration is the 95th percent upper confidence limit, or 95 percent UCL, of the arithmetic mean. The 95 percent UCL concentration was determined for each COC. Exposures at the Site were quantitatively evaluated for soil, groundwater, indoor air, surface water and sediment based on measured or estimated concentrations.

The BLRA developed EPCs for the following groups of data:

- Exposure to on-site surface and subsurface soil (directly measured)
- Exposure to dust from on-site soil (estimated)
- Exposure to outdoor vapors from on-site soil (estimated)
- Exposure to on-site groundwater (directly measured)
- Exposure to on-site indoor air (estimated subsurface vapor intrusion)
- Exposure to off-site groundwater (directly measured)
- Exposure to off-site indoor air (directly measured)
- Exposure to off-site surface water (directly measured)
- Exposure to off-site sediment (directly measured)

Quantification of Human Exposure to COCs

Receptor intakes were calculated separately for carcinogenic and non-carcinogenic effects. The degree of potential exposure via each pathway was determined by exposure parameters, human intake factors, or HIFs, and chemical specific exposure factors. Exposure parameters are behavioral and physiological

factors that vary with each use scenario. Exposure parameters were calculated for residents, industrial/commercial workers, construction workers and recreational visitors (Appendix C, Table C-9, Table C-10, Table C-11 and Table C-12). HIFs describe the average amount of an environmental media contacted by the exposed receptor each day. HIFs were calculated for residents, industrial/commercial workers, construction workers and recreational visitors (Appendix C, Table C-13, Table C-14, Table C-15 and Table C-16). Chemical specific exposure parameters are needed for quantifying intake for specific COCs (Appendix C, Table C-17).

Section 3: Toxicity Assessment

The potential for health risks considered both carcinogenic and non-carcinogenic effects. Non-carcinogenic effects were calculated using reference doses, of RfDs, and reference concentrations, or RfCs (Appendix C, Table C-18). In addition to RfDs and RfCs, carcinogenic effects were calculated using cancer slope factors, or CSFs, and inhalation unit risks, or IURs (Appendix C, Table C-19).

Mutagens

Chemicals that act through a mutagenic mode of action, rather than other non-genotoxic pathways, are treated specifically through the application of specific cancer potency adjustment factors to protect sensitive populations during early-life exposures.

The COCs at the Site that were considered to act through a mutagenic mode of action include: the carcinogenic PAHs (including benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene and indeno[1,2,3-cd]pyrene), TCE and vinyl chloride. The CSFs for these COCs were adjusted to account for mutagenic effects.

Lead

For lead, mathematical models were used to estimate the distribution of Pb-B values in a population of people exposed to lead under a specified set of conditions. Risks to children were evaluated using the Integrated Exposure Uptake Biokinetic model. Risks to adults were evaluated using the Adult Lead Methodology.

Section 4: Risk Characterization

The objective of the risk characterization for the BLRA was to integrate the exposure and toxicity assessments into quantitative and qualitative expressions of risk. The risk characterization evaluated the nature and degree of potential carcinogenic and non-carcinogenic health risks posed to current and future receptors at the Site.

Non-carcinogenic and carcinogenic risks were evaluated for each exposure pathway and scenario by integrating the exposure doses calculated in the exposure assessment with the toxicity criteria identified in the toxicity assessment for the COCs. The results of the risk characterization were summarized in the BLRA Report (Appendix C, Tables C-20, Table C-21 and below).

Summary of Human Health Risks and Hazards

Soil (All COCs, except Lead)

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Site Wide Exposure	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing B(a)A, B(a)P, B(b)F, D(ah)A, As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE, and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on Skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			32	27	
	Future Lifetime Resident	Soil	9E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
	Current/Future Recreational User	Total	3E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.2	0.1	No COCs - Non-cancer hazards are not expected.
	Future Industrial/ Commercial Worker	Total	5E-05	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion with groundwater and vapor intrusion containing PCE.
	Future Construction Worker	Total	6E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Al, As, and Mn.

Soil (Lead)

On Site Site Wide Exposure	Resident	Soil	56.0	mg/kg	< 5%
	Current/Future Trespasser	Soil	56.0	mg/kg	< 5%
	Future Industrial Worker	Soil	56.0	mg/kg	< 5%
	Future Construction Worker	Soil	56.0	mg/kg	< 5%

Groundwater

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Current/Future Off Site Exposure Areas							
Off Site Residential Well at JW 01	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion of, dermal contact with and inhalation of groundwater containing PCE and vapor intrusion containing PCE.
	Current/Future Lifetime Resident	Total	3E-05				
Off Site Residential Well at MK-01	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	1	No COCs - The total HI is greater than 1; however, no target organ HIs are greater than 1. (Non cancer hazards are not expected)
	Current/Future Lifetime Resident	Total	3E-05				
Offsite City Wells	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.8	0.3	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	3E-06				
Offsite Creeks	Current/Future Recreational	Total	3E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.07	0.06	No COCs - Non-cancer hazards are not expected.

Summary of Ecological Risk Assessment

Screening-Level Ecological Risk Assessment

A baseline ecological risk assessment, or BERA, has eight total steps. The first two steps are referred to as a screening-level ecological risk assessment, or SLERA. A SLERA evaluates data to determine if ecological risks are negligible or whether there is a potential for adverse ecological effects.

The SLERA for the Site was documented in the BLRA Report and provided a general discussion of the following issues:

- Ecological setting and contaminants known or suspected at the Site;
- Contaminant fate and transport mechanisms that might of existed at the Site;
- Mechanisms of ecotoxicity associated with contaminants and likely categories of receptors that could have been affected;
- Identification of completed exposure pathways; and
- Selection of endpoints to screen for ecological risk.

Section 1: Identification of Chemicals of Concern

Data Selection and Evaluation

Data used in the ecological risk evaluation include analytical results from environmental samples collected from the Site collected during the SI and RI. Based on historical site activities and the available data, the primary site contaminants included VOCs, SVOCs, PAHs, pesticides, PCBs metals and other inorganics. Data used for the BERA consisted of the analytical results from the surface soil, sediment, surface water and groundwater samples collected during field investigations from 2007 through 2015.

Data Quality

QA/QC measures were incorporated into the investigation methods and procedures to help ensure quality, precision, accuracy and completeness of data and sample analysis. Field laboratory quality checks were incorporated into sample collection and analysis procedures as part of the QA/QC measures. Field quality checks were implemented into the sample collection procedures to minimize the potential for interference or introduction of contaminants during sample collection and processing, storage, transport and equipment decontamination. These measures included collection of blank and duplicate samples among others. Laboratory quality checks were implemented to ensure laboratory systems operated within acceptable guidelines and to minimize or document the occurrence of laboratory contamination and variability in analytical results and included method blanks among other measures.

Only those samples with corresponding supporting documentation, including custody records and field notes, were included in the quantitative analysis. QA/QC measures associated with each of these samples were reviewed to ensure that the quality of the data met requirements for risk assessment purposes.

Data Usability

The analytical data were subjected to a data validation process in accordance with the EPA guidelines. The analytical data had qualifiers from the analytical laboratory quality control or from the data validation process that reflected the level of confidence in the data. Data results that were qualified as "estimated" were used in the BERA. None of the data were qualified as "detected in associated blank sample" or "tentative identification". Data qualified as "chemical may or may not be present" were not used in the BERA.

Selection of Chemical of Concern

Site contaminants that potentially impact ecological receptors included VOCs, SVOCs, PAHs, pesticides, PCBs and metals. Analytical data from the soil, surface water, sediment and groundwater sampling were used to identify the initial set of contaminants of potential ecological concern, or COPECs. The initial set of COPECs were compared to screening-level risk to ecological receptors. Screening-level risks were calculated by calculating a hazard quotient, or HQ, for each contaminant for each medium. The HQ is the ratio of the exposure concentration to the ecological screening value. An HQ of less than one (<1) indicated that the contaminant alone was unlikely to cause adverse effects to ecological receptors; whereas an HQ greater than or equal to one (≥1) indicated a potential for ecological impacts from exposure to that chemical existed at the Site. The results of this screening served to determine whether a contaminant presented negligible risk or whether additional site-specific information needed to be further evaluated (Appendix C, Table C-22, Table C-23, Table C-24 and Table C-25).

After the screening-level risk evaluation, the COPECs were refined further to produce the final set of COCs for ecological risk. The refinement screening used exposure estimates based on calculated EPCs. The refinement screening was conducted for soil, sediment and groundwater (Appendix C, Tables C-26, Table C-27, Table C-28 and Table C-29).

Section 2: Exposure Assessment

Based on the nature of the contaminants detected and physical characteristics of the Site, the potential routes of contaminant migration considered relevant to ecological exposures included the following:

- Soil to groundwater migration
- Soil to surface water migration
- Soil to sediment migration
- Groundwater to surface water migration
- Biological/food chain migration

Section 3: Ecological Effects Assessment

The initial screening of pathways and receptors assumed that ecological exposures to contaminated media may occur at the Site by both direct and indirect pathways to the contaminated media and that surface soils at the Site supported terrestrial receptors such as plants, soil invertebrates, small mammals and birds. The exposure routes to these terrestrial ecological receptors included the following:

- Direct uptake by vegetation;

- Direct contact to contaminated media by invertebrates or vertebrates;
- Direct ingestion of medium (e.g., surface soil, surface water or sediment); and
- Indirect exposure of predatory wildlife to bioaccumulative contaminants in contaminated prey tissue.

Since the creeks, springs and seeps located in the immediate vicinity of the Site are ephemeral in nature, no fish were expected to be present. Consequently, aquatic life in the vicinity of the Site is expected to be limited to a variety of semi-aquatic invertebrate species that can survive in small isolated pools or puddles. The exposure routes to these aquatic and benthic receptors included the following:

- Direct contact to contaminated media by aquatic and benthic invertebrates;
- Direct ingestion of medium (e.g., surface water or sediment); and
- Indirect exposure to bioaccumulative contaminants. For purposes of the initial screening of pathways and receptors, it was assumed that ecological exposures at the Site may result from contaminated soil, surface water, sediment and groundwater (groundwater discharge to surface water).

Conceptual Site Model

An exposure pathway is considered to be potentially complete if the ecological receptor can have contact with COCs in a medium. The exposure pathways for the Site are represented in the CSM for ecological receptors (Appendix B, Figure B-7).

Section 4: Ecological Risk Characterization

Risk Estimates

The BLRA Report documented the site specific risk estimated for terrestrial and aquatic receptors.

Risks to Terrestrial Receptors

The potential risk to terrestrial receptors was considered to be low based on the potential for exposure and adverse effects at the Site.

Risks to Aquatic Receptors

The potential risk to aquatic receptors was considered to be very low based on the potential for exposure and adverse effects at the Site.

Management Decision Point

At the end of Step 2, the BERA reached a management decision point to determine whether the information available was adequate to make a risk management decision. The three possible decisions at that point were:

1. There was adequate information to conclude that ecological risk were negligible and therefore no need for remediation on the basis of ecological risk;

2. The information was not adequate to make a decision at that point, and the ecological risk assessment process would continue to Step 3; or
3. The information indicated a potential for adverse ecological effects, and a more thorough assessment was warranted.

The SLERA concluded that the potential overall adverse risks at the Site to terrestrial and aquatic receptors were negligible. Potential risks to plants, soil invertebrates, mammals and birds exposed to contaminated soils appeared to be very low, and potential risks to aquatic life and benthic invertebrates in the intermittent stream were also considered to be acceptably low. The information presented in the BLRA Report regarding the BERA was sufficient to support the RI/FS process and the development of a final remedy. No further data was required to assess ecological risks. In summary, the management decision point at the end of Step 2 concluded that there was adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk.

Basis for Action

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Remedial Action Objectives

RAOs provide a general description of what the cleanup will accomplish. These goals typically serve as the design basis for many of the remedial alternatives. Discussion of RAOs provides a basis for evaluating the cleanup options for the Site and an understanding of how the risks identified at the Site will be addressed by the response action. A clear statement of the RAOs also facilitates the five-year review determination of protectiveness of human health and the environment.

The RAOs for the Site are to:

- Prevent human exposure to COCs in surface soil through ingestion, dermal contact and inhalation above levels that are protective of residential use.
- Prevent human exposure to COCs in groundwater through ingestion, dermal contact and inhalation above levels that are protective of human health.
- Prevent migration of COCs from soils to groundwater above levels that are protective for human health.
- Restore contaminated groundwater throughout the plume in both the shallow zone and deep zone to levels that allow for beneficial use as drinking water source.

The Selected Remedy will reduce the excess cancer risk associated with exposure to contaminated soil to one in one million, or 1×10^{-6}. This will be attained by reducing soil contamination to concentrations suitable for residential use.

There are no federal or state cleanup standards for soil contamination. Therefore, the EPA established site-specific cleanup levels for soil. Cleanup levels for soil are both protective for residential use and ensure minimal migration of site contaminants into the groundwater (Appendix C, Table C-5 and below). Cleanup levels for groundwater are based on federal and state standards (Appendix C, Table C-6 and below).

Soil/Sediment		
Contaminants of Concern (COCs)	CAS No.	Cleanup Levels Soil µg/kg
Volatile Organic Compounds (VOCs)		
Tetrachloroethylene	127-18-4	2.3
Trichloroethylene	79-01-6	1.8
Semi-Volatile Organic Compounds (SVOCs)		
Polynuclear Aromatic Hydrocarbons (PAHs)		
Acenaphthylene	83-32-9	360,000
Benzo[a]anthracene	56-55-3	160
Benso[a]pyrene	50-32-8	16
Benzo[b]fluoranthene	205-99-2	1,600
Benzo[k]fluoranthene	207-38-0	1,600
Dibenzo[a,h]anthracene	53-70-3	16
Indeno[1,2,3-cd]pyrene	193-39-5	160
Phenanthrene	85-01-6	NL
Pesticides/PCBs		
Aroclor 1254	11097-69-1	120
Dieldrin	60-57-1	0.071
Inorganic (Metals/Ions)		
Antimony	7440-36-0	3,100
Cadmium	7440-43-9	71,000
Cobalt	7440-48-4	2,300
Copper	7440-50-8	310,000
Iron	7439-89-6	5,500,000
Lead	7439-92-1	400,000
Mercury	7439-97-6	1,100
Vandium	7440-62-2	39,000

Groundwater		
Contaminants of Concern (COCs)	CAS No.	Cleanup Levels Groundwater µg/L
Volatile Organic Compounds (VOCs)		
Benzene	71-43-2	5
Tetrachloroethylene	127-18-4	5
Trichloroethylene	79-01-6	5
Vinyl Chloride	75-01-4	2
Pesticides/PCBs		
Dieldrin	60-57-1	0.0018
Inorganic (Metals/Ions)		
Flouride	16984-48-8	2,000
Nitrate	14797-55-8	10,000

Groundwater		
Contaminants of Concern (COCs)	CAS No.	Cleanup Levels Surface Water µg/L
Volatile Organic Compounds (VOCs)		
Tetrachloroethylene	127-18-4	0.8

Description of Alternatives

No Action Alternatives

Alternative S1/GW1 – No Action

Estimated Capital Cost: $0
Estimated O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Timeframe: None
Estimated Time to Attain RAOs: Does not meet RAOs

Regulations governing the Superfund program generally require that the "no action" alternative be evaluated to establish a baseline for comparison. Under these alternatives, the EPA would take no action at the Site to prevent exposure to soil and groundwater contamination. Therefore, no capital or operation and maintenance, or O&M, costs will be incurred. These alternatives would not attain RAOs for soil or groundwater.

Soil Alternatives

Alternative S2 – Soil Cap

Estimated Capital Cost: $2,526,000
Estimated O&M Cost: $213,800
Estimated Present Worth Cost: $2,740,000
Estimated Construction Timeframe: 3 months
Estimated Time to Attain RAOs: 3 months

This alternative includes isolating the contaminated unsaturated soil, sediment and rock with a low permeability non-engineered cap and cover. A cap would be installed to provide physical isolation from contaminated soil at the ground surface. The cap would cover an estimated 169,000 square feet or 3.88 acres. This area has been selected to cover the bulk of the soil with concentrations of PCE above the cleanup level of 2.3 µg/kg.

A standard asphalt cap would be installed across the surface to reduce infiltration of surface water and subsequent leaching of site contaminants to groundwater. Alternate cap materials, such as concrete or composite material, may be evaluated during the remedial design. Storm water controls of the site property and long-term O&M of the cap would be required.

Alternative S3 – Excavation and Off-Site Disposal

Estimated Capital Cost: $10,971,000
Estimated O&M Cost: $0
Estimated Present Worth Cost: $10,971,000
Estimated Construction Timeframe: 5 months
Estimated Time to Attain RAOs: 5 months

This alternative includes excavating the contaminated soil, temporarily storing the soil in storage piles, analyzing the soil, treating the soil, as needed, to meet land disposal regulations and shipping the soil above cleanup levels to a permitted landfill. The area of excavation would address soil with PCE concentrations above the cleanup level of 2.3 µg/kg. Approximately 45,000 cubic yards of soil would be excavated, of which approximately 23,000 cubic yards of soil will be treated to meet land disposal regulations, as needed, and transported to a permitted landfill for disposal. Excavated soil below cleanup levels would be used as backfill. Additional clean backfill would be obtained from another source to replace the soil transported off-site.

Alternative S4 – Excavation and On-Site Treatment

Estimated Capital Cost: $10,219,000
Estimated O&M Cost: $0
Estimated Present Worth Cost: $10,219,000
Estimated Construction Timeframe: 6 months
Estimated Time to Attain RAOs: 6 months

This alternative includes excavating the contaminated soil, temporarily storing the soil in storage piles, analyzing the soil and treating the soil above cleanup levels with on-site thermal desorption. The area of

excavation would address soil with PCE concentrations above the cleanup level of 2.3 µg/kg. Approximately 45,000 cubic yards of soil would be excavated, and approximately 23,000 cubic yards of soil would be treated on-site by thermal desorption. Both treated and untreated soil would meet cleanup levels and be used as backfill. No backfill would be needed from another source.

S4 would require a significant amount of electricity to operate the thermal desorption system. The analysis of S4, including the cost estimates, assumes that the electrical infrastructure near the site property has sufficient capacity to supply the thermal desorption system.

Groundwater Alternatives

Alternative GW2 – Hydraulic Containment in the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3)

Estimated Capital Cost: $1,089,000
Estimated O&M Cost: $6,797,000
Estimated Present Worth Cost: $7,886,000
Estimated Construction Timeframe: 3 months
Estimated Time to Attain RAOs: Greater than 30 years

This alternative involves the use of hydraulic containment for the shallow zone of the contaminated groundwater plume and GET for the deep zone of the contaminated groundwater plume using the existing Well #3. Hydraulic containment of the shallow zone would include installing ten permanent groundwater extraction wells at an approximate depth of 120 feet below ground surface. Eight of the wells would capture the plume in the vicinity of the hat factory, and two wells would capture the portion of the plume adjacent to a tributary on the east side of the site property. The pumping rates for GW2 would extract shallow groundwater at volumes sufficient to capture the contaminant plume.

GET for the deep zone would be conducted through continued operation of Well #3 and the city's air stripper system. This alternative assumes that the contaminated groundwater plume in the deep zone is contained and remediated by Well #3. Groundwater monitoring wells would be installed in the deep zone to determine the lateral and vertical extent of the contaminated plume, to confirm the contaminated plume is stable and to monitor remedy performance.

The recovered groundwater would be treated with granular activated carbon and other specialized media for minor constituents, as needed. The groundwater would be treated to drinking water standards and used to supplement the city's public drinking water supply.

Alternative GW3 – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3)

Estimated Capital Cost: $1,089,000
Estimated O&M Cost: $7,533,000
Estimated Present Worth Cost: $8,622,000
Estimated Construction Timeframe: 5 months
Estimated Time to Attain RAOs: 30 years

This alternative involves the use of GET for the shallow zone and GET for the deep zone using the existing Well #3. GET for the shallow zone would include installing an extraction well network for the shallow groundwater that is similar to GW2. However, the pumping rates for GW3 would be higher than GW2 and would extract shallow groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the shallow zone to levels that allow for protection of human health and beneficial use as a drinking water source.

GET for the deep zone would use Well #3 in the same manner as GW2. Treatment of groundwater would be the same for GW3 as GW2.

Alternative GW4 – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3 and Additional Groundwater Extraction Wells)

Estimated Capital Cost: $5,294,000
Estimated O&M Cost: $9,674,000
Estimated Present Worth Cost: $14,968,000
Estimated Construction Timeframe: 5 months
Estimated Time to Attain RAOs: 20 years

This alternative would use GET for the shallow zone and GET for the deep zone using the existing Well #3 and additional groundwater extraction wells. GET of the shallow zone for GW4 would be the same as GW3.

GET for the deep zone would install ten permanent deep groundwater extraction wells at an approximate depth of 400 feet bgs over the course of two phases. In Phase 1, five of the extraction wells would be installed to capture the plume in the vicinity of the hat factory and to the northeast, along the regional flow direction. Sampling results from Phase 1 extraction wells and from the additional deep groundwater monitoring wells would be used to determine the location of remaining extraction wells. In Phase 2, the five remaining extraction wells would be installed to capture the entire deep groundwater plume.

Once all ten extraction wells are in place, the extraction well network would pump at a sufficient rate to remove contamination from the deep zone to levels that allow for protection of human health and beneficial use as a drinking water source.

<u>Common Elements and Distinguishing Features of Each Alternative</u>

Many of these alternatives include common components. These common elements generally apply to all soil and/or groundwater alternatives, except the "no action" alternatives.

A majority of the contaminated soils exist beneath the foundation of the hat factory building. The remaining portions of the hat factory, along with the foundation, would be demolished and removed in order to excavate contaminated soil. Cost and time to demolish and remove the hat factory and foundation have been added to the soil alternatives costs.

The city's existing Well #3 and air stripper system remediate contaminated groundwater in the deep zone similar to a GET system. Rather than building redundant systems, alternatives GW2 and GW3 propose using Well #3 for extraction of contaminated groundwater from the deep zone and the city's air

stripper system for treatment. GW4 also proposes to use Well #3 and the city's air stripper system in the same manner as GW2 and GW3, but GW4 would add more extraction wells in the deep zone. The cost for operation and maintenance, O&M, of the city's systems have been added to the groundwater alternatives. All the alternatives require ICs to prevent exposure to contaminated media. The soil alternatives require ICs on the site property to prevent exposure to contaminated soil at depth. The groundwater alternatives require ICs to restrict groundwater use on the site property and throughout the area wide plume. Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on ICs to attain protectiveness.

Each alternative has different components (e.g. technology and cleanup levels) that distinguish that alternative from the others. The distinguishing features of each alternative are compared to one another by using the nine criteria specified in the NCP. Each soil alternative calls for a different technology to remediate soil. S2 would install a cap to prevent direct exposure to contaminated soil. S2 would leave contaminated soil in place and require long-term O&M. S3 and S4 would remove soil contamination from the Site through treatment. S3 and S4 would not require O&M after on-site construction activities are completed. S3 would excavate, treat and dispose of contaminated soil off-site and require clean soil from another location to backfill the excavation. S4 would excavate and treat contaminated soil on-site and use the treated soil to backfill the excavation. S4 would not require clean soil from another location.

All the groundwater alternatives, GW2, GW3 and GW4, use extraction and treatment. The distinguishing features for each alternative is based on volume of groundwater extracted and cleanup objectives. In the shallow zone, GW2 would extract groundwater to hydraulically control the shallow plume. GW3 and GW4 are the same for shallow zone. Both would extract shallow groundwater at higher volumes than GW2 and would restore the shallow zone to beneficial use. In the deep zone, GW2 and GW3 would rely exclusively on Well #3 to remediate the deep groundwater, while GW4 would install additional extraction wells to supplement Well #3. GW4 would extract deep groundwater at a higher volume and would attain RAOs at a faster rate than GW2 and GW3.

Summary of Comparative Analysis of Alternatives

The NCP provides that the ROD must explain how the nine criteria were used to select the remedy (NCP§300.430(f)(5)(i)). Thus, this section of the ROD summarizes the comparative analysis of alternatives presented in the detailed analysis section of the FS Report. The major objective is to evaluate the relative performance of the alternatives with respect to the nine evaluation criteria so that the advantages and disadvantages of each are clearly understood.

Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced or controlled, through treatment, engineering controls and/or institutional controls. Although the primary COC is PCE, the evaluation of overall protection of human health and the environment was based on all the COCs for the Site.

All of the soil and groundwater alternatives, except the "no action" alternatives, would provide adequate protection of human health and the environment by eliminating, reducing or controlling risk through treatment, engineering controls and/or institutional controls. S2 would install a cap to prevent direct

exposure to contaminated soil. S3 and S4 would remove soil contamination from the Site. GW2, GW3 and GW4 would capture the contaminant plume and prevent exposure to contaminated groundwater.

S2, S3 and S4 would meet the RAOs to prevent exposure to contaminated soil and to prevent migration of site contaminants from soil to groundwater. S2 would install a soil cap to prevent direct exposure to contaminated soil and to prevent migration of site contaminants from soil to groundwater by inhibiting surface water infiltration. S3 would excavate, treat and dispose of contaminated soil off-site, and S4 would excavate and treat contaminated soil on-site.

GW2, GW3 and GW4 would meet the RAOs to prevent exposure to contaminated groundwater. GW2, GW3 and GW4 would capture the contaminant plume and prevent exposure to contaminated groundwater. In the shallow zone, GW2 would hydraulically control the shallow plume and would take in excess of 30 years to attain RAOs, and GW3 and GW4 would remediate shallow groundwater with extraction and treatment. GW3 and GW4 would extract shallow groundwater at higher volumes and would attain RAOs at a faster rate than GW2. In the deep zone, GW2, GW3 and GW4 would remediate deep groundwater by extraction and treatment. GW2 and GW3 would rely on Well #3 to remediate the deep zone, while GW4 would install additional extraction wells to supplement Well #3. GW4 would extract deep groundwater at a higher volume and would attain RAOs at a faster rate than GW2 and GW3.

Overall protection of human health and the environment is a threshold criterion, and alternatives that do not meet threshold requirements are eliminated from further consideration. Alternatives S1 and GW1, the "no action" alternatives, are not protective of human health and the environment, therefore both alternatives were eliminated from consideration.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and the NCP at § 300.430(f)(1)(ii)(B) require that RAs at Superfund sites meet or satisfy legally applicable or relevant and appropriate federal, state and local requirements, standards, criteria and limitations which are collectively referred to as Applicable or Relevant and Appropriate Requirements, or ARARs, unless such ARARs are waived under CERCLA § 121(d)(4). This criterion evaluates whether the alternative meets federal, state and local ARARs that pertain to the Site or whether a waiver is justified.

Applicable requirements are those cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under Federal environmental, State environmental, local environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site. State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under Federal environmental, State environmental, local environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

All soil and groundwater alternatives, except the "no action" alternatives, would meet their respective ARARs. ARARs for the Site were identified in the FS Report (Appendix D, ARARs).

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

S2 would leave contaminated soil beneath the surface and would require maintenance and inspections to ensure long-term effectiveness. S3 and S4 would both eliminate contamination from soil down to bedrock and attain long-term effectiveness and permanence without additional actions. S3 and S4 would leave contaminated soil at depth in the bedrock. All soil alternatives require ICs on the site property to prevent exposure to contaminated soil at depth.

All groundwater alternatives would be effective in the long-term by reducing contaminant concentrations in groundwater. The adequacy and reliability of groundwater extraction and treatment technologies have been well proven for the site contaminants. All groundwater alternatives require ICs to restrict groundwater use on the site property and throughout the area wide plume.

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives because hazardous substances would remain on-site in concentrations above health-based levels.

Reduction of Toxicity, Mobility or Volume Through Treatment

Reduction of toxicity, mobility or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

S2 would install a cap that would reduce the mobility of contamination in soil, but the cap would not reduce the toxicity or volume. S3 would reduce toxicity, mobility and volume of soil contamination through excavation, treatment and off-site disposal. S4 would reduce toxicity, mobility and volume of soil contamination through excavation and on-site treatment. S3 and S4 would satisfy the preference for treatment in accordance with EPA guidance.

GW2 would reduce mobility of contaminants in the shallow zone, but reductions in toxicity and volume would be slower than GW3 and GW4. GW3 and GW4 would both reduce toxicity, mobility and volume of contaminants in the shallow zone at a similar rate. GW2 and GW3 would reduce the toxicity, mobility and volume at a slower rate than GW4 in the deep zone.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

S2 would be effective in the short term by installing a cap to prevent direct exposure to contaminated soil. S2 would not require extraordinary efforts to protect workers during cap installation. The environmental impacts of installing a cap would be minimal. Once the cap is installed, it would prevent

direct exposure to contaminated soil and prevent contaminant migration from soil to groundwater by inhibiting surface water infiltration.

S3 and S4 would be effective in the short-term by eliminating contaminant mass from the Site. S3 and S4 involve excavating contaminated soil, and preventive measures would be implemented to protect the community and workers during on-site construction activities. S3 would include additional measures for treatment and off-site disposal. The implementation of S4 would require monitoring, and possible mitigation, of exhaust from the thermal desorption system. Both S3 and S4 would meet RAOs once on-site activities are complete.

GW2, GW3 and GW4 would not pose a risk to the community or workers during on-site construction, and environmental impacts while implementing these remedies would be minimal. GW4 would require a longer construction period than GW2 and GW3. GW2, GW3 and GW4 would be effective in the short-term by meeting the RAO to prevent direct contact with groundwater contamination.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

All soil technologies and remedies are readily available and generally proven. S2 would require the least effort to design and implement. On-site construction of the cap would be completed in the least amount of time. The excavation component of S3 and S4 would not require complicated engineering design, but the excavation would require the use of heavy machinery to physically move contaminated soil. Excavation activities would not pose significant exposure risk to soil contamination, but waste piles would be managed to mitigate potential exposure to particulates.

S3 would require a permitted landfill to accept the contaminated soil and a borrow area to supply clean backfill. S3 would also require trucks to transport the contaminated soil and backfill. S4 would require a significant amount of electricity to operate the thermal desorption system, and the electrical infrastructure near the site property may not be able to provide the needed power. Without an adequate source of electricity, the thermal desorption system would not be implementable. If a thermal desorption system is implemented, the emissions from the system would have to be monitored and mitigated, if needed.

Groundwater extraction and treatment is a proven technology capable of removing site contaminants from groundwater. All groundwater alternatives have similar designs and should be implementable for the shallow zone. In the deep zone, GW2 and GW3 would use the existing Well #3 and air stripper system and should be easily implemented. On the other hand, GW4 poses some implementability issues in the deep zone. GW4 would construct an additional extraction well network and air stripper system. The additional extraction wells in the deep zone may impact the performance of Well #3, which is the primary source of drinking water for the city. GW4 would treat groundwater in a similar manner as GW2 and GW3, but the volume of groundwater extracted would be much higher. Groundwater would be treated to drinking water standards and used to supplement the city's public drinking water supply. The volume of treated drinking water produced by GW4 may be more than can be used by the city. In such a case, GW4 would require an alternate discharge method for the excess treated water that may not

be readily available. The city of Vienna is small rural town with limited storm sewers, and the nearest surface water body that can accept the treated water is approximately a mile away.

Cost

Total costs for each alternative consist of direct capital costs, indirect capital costs and O&M costs. Direct capital costs are those directly attributable to construction activity, such as materials, labor and equipment. Indirect capital costs are administrative and overhead expenses associated with construction activity and may include engineering expenses, licenses and permits and contingency allowances. O&M costs are post-construction expenses that are necessary to ensure the effectiveness of the remedial action.

S2 would have lower direct and indirect capital costs than S3 and S4. S2 would require some O&M costs for inspection of the cap. S3 and S4 do not require O&M. The total present worth costs of S2 would be lower than S3 and S4.

The cost of excavation associated with S3 and S4 would be similar. S3 would require less indirect capital costs, for engineering design, than S4. S3 has low fixed startup costs, but operational costs are high and directly proportional to the volume of contaminated soil being disposed off-site. S4 has high startup costs, but operational costs are low once the thermal desorption system is running. Generally, S3 would be more cost effective when the volume of contaminated soil is relatively low, and S4 would be more cost effective as volumes increase. For the volumes of soil contamination at the Site, the estimated total present worth costs of S3 would be slightly higher than S4.

S4 would require a significant amount of electricity to operate the thermal desorption system. The analysis of S4, including the cost estimates, assumes that the electrical infrastructure near the site property has sufficient capacity to supply the thermal desorption system. If sufficient electricity is not readily available, S4 would require another source of electricity and would incur additional capital costs that would need to be added to the current estimate.

GW2, GW3 and GW4 have similar extraction well networks to address the shallow groundwater. Consequently, the direct and indirect capital costs to address the shallow zone would be similar for all three alternatives.

GW2 and GW3 use Well #3 to remediate the deep zone and do not require additional direct or indirect capital costs to implement. GW4 would install an additional extraction well network for the deep zone. The extraction wells for the deep zone would require much more direct and indirect capital costs than the extraction wells for the shallow zone.

For the shallow aquifer, the costs for O&M would be similar for GW2, GW3 and GW4. In the deep zone, GW2 and GW3 use Well #3 to address the deep zone and have the same O&M costs. The costs for O&M for GW4 would be higher than GW2 and GW3. The total present worth costs of GW2 is lower than GW3, and both are lower than GW4.

Cost Comparison of Remedial Alternatives

	S1	S2	S3	S4
Cost	**No Action**	**Soil Cap**	**Excavation and Off-site**	**Excavation and On-site Treatment**
Construction Costs	$0	$2,526,000	$10,971,000	$10,219,000
NPW O&M Costs	$0	$213,800	$0	$0
O&M Period (yrs.)	30	30	-	-
Net Present Worth Cost (@ 7%	$0	$2,740,000	$10,971,000	$10,219,000

	GW1	GW2	GW3	GW4
Cost	**No Action**	**Hydraulic Containment for the Contaminated Shallow Zone and Get for the Contaminated Deep Zone (Using Existing City Well #3)**	**GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone**	**GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using Existing**
Construction Costs	$0	$1,089,000	$1,089,000	$5,294,000
NPW O&M Costs	$0	$6,797,000	$7,533,000	$9,674,000
O&M Period (yrs.)	30	30	30	20
Net Present Worth Cost (@ 7%	$0	$7,886,000	$8,622,000	$14,968,000

State/Support Agency Acceptance

The state of Missouri, as represented by MDNR, concurs with the Selected Remedy as outlined in the Proposed Plan for the Site. MDNR did not have any comments during the public comment period.

Community Acceptance

The Proposed Plan with the Preferred Alternative for remediating the Site was made available to the public on June 22, 2017, and a public comment period was held from June 22, 2017 to July 22, 2017. During the public comment period, the EPA solicited comments from the public at a public availability session on June 29, 2017 and a public meeting on July 11, 2017. Comments from the two public events, along with responses from the EPA, are provided in the Responsiveness Summary. The EPA also encouraged the public to submit comments through other forms of communication, including traditional mail, electronic mail, telephone and internet submissions via the site profile page. No comments were submitted through these other forms during the public comment period.

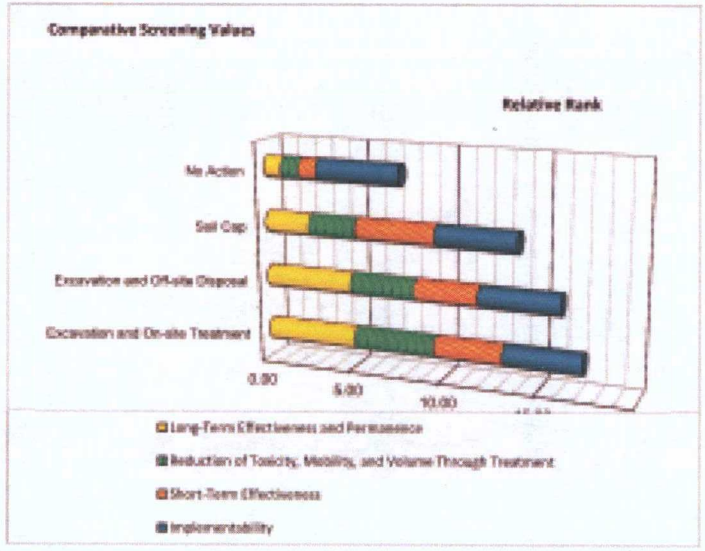
Community acceptance of the Preferred Alternative was evaluated after the public comment period ended. Based on the discussions by the community during the two public events, the community generally supported the Preferred Alternative. No public comments were made that affected the Preferred Alternative, therefore, the Preferred Alternative became the Selected Remedy.

Quantitative Comparison Analysis of Soil Remedial Alternatives

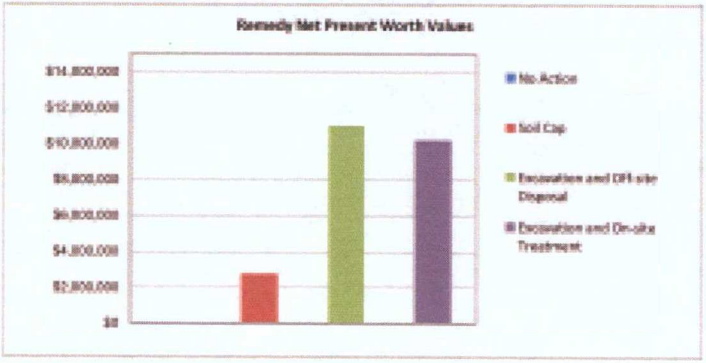
The quantitative comparison of costs was documented in the FS Report (Appendix C, Table C-30 and Table C-31 and as follows).

Table C-30
Quantitative Comparison Analysis of Soil Remedial Alternatives
Vienna Wells Site

Criteria	Criterion Weight	Remedial Alternative 1: No Action	2: Soil Cap	3: Excavation and Off-site Disposal	4: Excavation and On-site Treatment
Overall Protection of Human Health and the Environment	Must Pass	No	YES	YES	YES
How alternative provides human health and environmental protection		No	YES	YES	YES
Compliance with ARARs	Must Pass	No	YES	YES	YES
Compliance with Action-Specific ARARs		No	YES	YES	YES
Compliance with Chemical-Specific ARARs		No	YES	YES	YES
Compliance with Location-Specific ARARs		-	-	-	-
Compliance with To Be Considered (other criteria, advisories, and guidances		-	-	-	-
Long-Term Effectiveness and Permanence	25.00%	1.00	2.50	4.00	5.00
Magnitude of Residual (Post-Remediation) Risks		1	2.5	5	5
Adequacy and Reliability of Controls		-	3	5	5
Treatment Irreversibility		-	2	4.5	5
Reduction of Toxicity, Mobility, and Volume Through Treatment	25.00%	1.00	2.60	3.90	4.40
Treatment Process and Remedy		1	2.5	3.5	4.5
Amount of Hazardous Materials Destroyed or Treated		1	2	2.5	4.5
Degree of Expected Reductions in T/M/V		1	2.5	4.5	4.5
Type and Quantity of Treatment Residuals		-	4	4	2.5
Statutory Preference for Treatment		1	2	3	5
Short-Term Effectiveness	25.00%	1.00	4.10	3.44	3.69
Protection of Community During Remedial Action		-	4.5	5	5.5
Protection of Workers During Remedial Action		-	4.5	4	4
Environmental Impacts		1	4	3	3.5
Time Until Remedial Action Objectives are Achieved		-	4.5	2.75	2.75
Implementability	25.00%	4.50	4.35	4.38	4.38
Ability to Construct and Operate the Technology		5	4.5	4.25	3.5
Technology Reliability		-	4.5	4.5	4.5
Ease of Remedial Modifications		4	5	4	4
Ability to Monitor Remedial Effectiveness		-	4.5	4	4
Coordination with Other Agencies		-	4	4	4
Availability of Off-site T&D Services and Capacity		-	4	3.5	4
Equipment and Specialist Availability		-	5	5	4.5
Availability of Prospective Technologies		-	5	5	4.5
Total Composite Score	100%	7.50	13.8	16.1	17.2
Cost					
Construction Costs		$0	$2,526,000	$30,971,000	$30,219,000
NPW O&M Costs		$0	$213,800	$0	$0
O&M Period (yrs.)		30	30	-	-
Net Present Worth Cost (@ 7% discount rate)		$0	$2,748,000	$30,971,000	$30,219,000



"Overall Protection of Human Health and the Environment" and "Compliance with ARARs" are statutory requirements and are identified as either meeting "Yes" or not meeting "No" the requirement.



The "Criterion Weight" is the relative weight (quantified as a percentage) that each individual evaluation criterion or question has on the overall score.
The "Criterion Weight" for each evaluation criterion is multiplied by each evaluation criterion's score to arrive at a weighted score for that criterion.

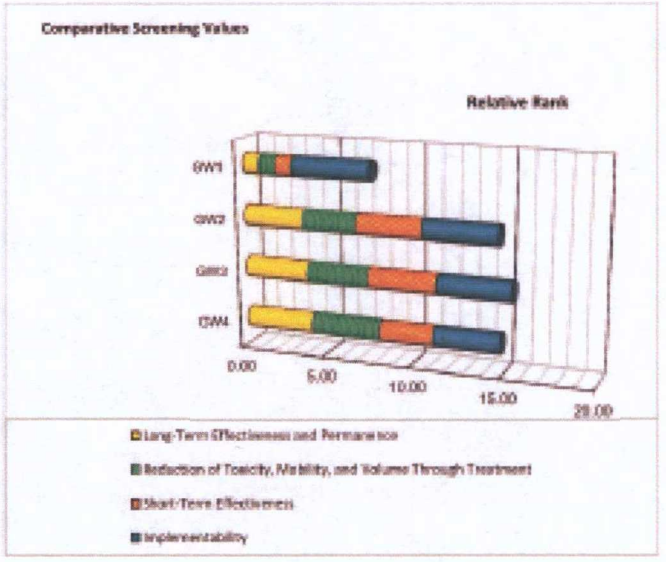
Notes:
ARAR - Applicable or Relevant and Appropriate Requirements
NPW - Net Present Worth
O&M - Operation & Maintenance
T/M/V - Toxicity, Mobility and Volume
T&D - Treatment, Storage, and Disposal

Key to Evaluation Ratings
Very Good - 5
Good - 4
Average - 3
Fair - 2
Poor - 1

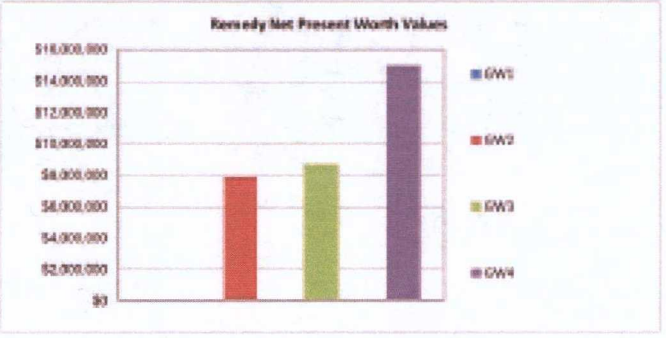
Ratings are based on the RWPC project team's assessments, using reference materials, work experience, and the team's understanding of conditions at the VWS.

Table C-31
Quantitative Comparison Analysis of Groundwater Remedial Alternatives
Vienna Wells Site

Criteria	Criterion Weight	GW1 No Action	GW2 Hydraulic Containment for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03	GW3 GET for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03	GW4 GET for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03 and Additional GW Extraction Wells
Overall Protection of Human Health and the Environment	Must Pass	No	YES	YES	YES
How alternative provides human health and environmental protection		No	YES	YES	YES
Compliance with ARARs	Must Pass	No	YES	YES	YES
Compliance with Action-Specific ARARs		No	YES	YES	YES
Compliance with Chemical-Specific ARARs		No	YES	YES	YES
Compliance with Location-Specific ARARs		-	-	-	-
Compliance with To Be Considered /other criteria, advisories, and guidances		-	-	-	-
Long Term Effectiveness and Permanence	15.00%	1.00	3.58	3.83	4.08
Magnitude of Residual (Post-Remediation) Risks		1	3.5	4	4.5
Adequacy and Reliability of Controls		-	3.25	3.5	3.75
Treatment Irreversibility		-	4	4	4
Reduction of Toxicity, Mobility, and Volume Through Treatment	15.00%	1.00	3.58	3.83	4.08
Treatment Process and Remedy		1	2.5	3.5	4.5
Amount of Hazardous Material Is Destroyed or Treated		1	2.5	3.5	4.5
Degree of Expected Reductions in T/M/V		1	2.5	3.5	4.5
Type and Quantity of Treatment Residuals		-	4	3	2
Statutory Preference for Treatment		1	4	4	4
Short-Term Effectiveness	15.00%	1.00	3.75	3.94	3.13
Protection of Community During Remedial Action		-	4	4	3
Protection of Workers During Remedial Action		-	4	4	3
Environmental Impacts		1	3	4.75	2.5
Time Until Remedial Action Objectives are Achieved		-	2	3	4
Implementability	15.00%	4.50	4.18	4.09	3.66
Ability to Construct and Operate the Technology		5	4.5	4.5	4
Technology Reliability		-	4	4	3.5
Ease of Remedial Modifications		4	4	3.75	3.5
Ability to Monitor Remedial Effectiveness		-	4	4	3.5
Coordination with Other Agencies		-	4	3.75	3
Availability of Offsite T&D Services and Capacity		-	4	3.75	3
Equipment and Specialist Availability		-	4	4	3.75
Availability of Prospective Technologies		-	5	5	5
Total Composite Score	100%	7.50	14.6	15.4	14.8
Cost					
Construction Costs		$0	$1,069,000	$1,069,000	$5,204,000
NPW O&M Costs		$0	$6,797,000	$7,533,000	$8,874,000
O&M Period (yrs.)		30	30	30	20
Net Present Worth Cost (@ 7% discount rate)		$0	$7,866,000	$8,602,000	$14,068,000



"Overall Protection of Human Health and the Environment" and "Compliance with ARARs" are statutory requirements and are identified as either meeting "Yes" or not meeting "No" the requirement.



The "Criterion Weight" is the relative weight (quantified as a percentage) that each individual evaluation criterion or question has on the overall score.
The "Criterion Weight" for each evaluation criterion is multiplied by each evaluation criterion's score to arrive at a weighted score for that criterion.

Notes:
ARAR - Applicable or Relevant and Appropriate Requirements
GET - Groundwater Extraction and Treatment
NPW - Net Present Worth
O&M - Operation & Maintenance
T/M/V - Toxicity, Mobility and Volume
T&D - Treatment, Storage, and Disposal

Key to Evaluation Ratings
Very Good - 5
Good - 4
Average - 3
Fair - 2
Poor - 1
Not Applicable - "-"

Ratings are based on the RVSPC project team's assessments, using reference materials, work experience, and the team's understanding of conditions at the VWS.

Principal Threat Wastes

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP §300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and that would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied.

The contaminated soils in the area of the site property are considered to be principal threat wastes because the contaminants are highly mobile and found at concentrations that pose a significant risk should exposure occur. Although contaminated groundwater also poses a risk, it is not considered a principal threat as defined by the EPA guidance. Through the use of treatment technologies, this response will permanently reduce the toxicity, mobility and volume of those source materials that constitute the principal threat wastes. Because it will treat the source materials constituting principal threats, the Selected Remedy will meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

Selected Remedy

1) Summary of the Rationale for the Selected Remedy

The soil component of the Selected Remedy was selected over other alternatives because it is expected to attain substantial and long-term risk reduction in soil through disposal. The soil remedy is expected to allow the property to be used for the reasonable anticipated future land use, which is residential or recreational. The groundwater component of the Selected Remedy was selected over the other alternatives because it is expected to attain substantial risk reduction through treatment of contaminants in the groundwater and provides measures to prevent future exposure to currently contaminated groundwater. Overall, the Selected Remedy reduces risks and provides for long-term reliability of the remedy.

Based on the information available at this time, the EPA believes the Selected Remedy will be protective of human health and the environment, will comply with ARARs, will be cost-effective and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because it will treat the source materials constituting principal threats, the Selected Remedy also will meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

2) Description of the Selected Remedy

The Selected Remedy is the combination of S3 – Excavation and Off-site Disposal; and GW3 – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3). The major components of the Selected Remedy include the following:

Soil Remedy – Excavation and Off-site Disposal

- The remaining portions of the former hat factory, along with the foundation, will be demolished and removed.
- Excavation and off-site disposal of contaminated soil with PCE concentrations above the cleanup level of 2.3 µg/kg. Approximately 45,000 cubic yards of soil will be excavated, of which approximately 23,000 cubic yards of soil will be treated to meet land disposal regulations, as needed, and transported to a permitted landfill for disposal.
- Excavated soil below cleanup levels will be used as backfill. Additional clean backfill will be obtained from another source to replace the soil transported off-site.
- ICs to prevent exposure to residual contaminated soil at depth. After on-site construction of the soil remedy is completed, residual soil contamination will remain at depth in the bedrock. An environmental covenant will be implemented on the site property to restrict activities, such as excavation, that would cause exposure to soil contamination in the bedrock. The environmental covenant will be compliant with the Missouri Environmental Covenants Act.

Groundwater Remedy – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3)

- GET for the shallow zone of the contaminated groundwater plume. The shallow zone is defined as the contaminated groundwater plume from the top of the water table at approximately 35 feet bgs down to approximately 120 feet bgs. GET for the shallow zone will include installing an extraction well network to extract the shallow groundwater for treatment. The pumping rates will be high enough to extract shallow groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the shallow zone to levels that allow for protection of human health and beneficial use as a drinking water source.
- GET for the deep zone of the contaminated groundwater plume using the city's existing groundwater drinking supply Well #3. The deep zone is defined as the contaminated groundwater plume below the shallow zone from approximately 120 feet bgs down to the lowest depth of the plume. The plume extends to at least 300 bgs, which is the intake depth of Well #3. The GET system will use Well #3 to extract the deep groundwater for treatment. The pumping rates for Well #3 currently extracts deep groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the deep zone. The response action will ensure that Well #3 continues to operate to contain the deep contaminant plume and to remove contamination from the deep zone to levels that allow for protection of human health and beneficial use as a drinking water source.
- Groundwater extracted from both the shallow zone and the deep zone of the contaminated groundwater plume will be treated by the city's existing remediation system, or air stripper system. The air stripper system currently eliminates VOCs from groundwater to meet MCLs, as defined by the Safe Drinking Water Act. Treated effluent water from the air stripper is currently being used for drinking water. The response action will ensure that the city's air stripper system continues to treat groundwater to below MCLs.
- Groundwater monitoring to ensure that the contaminant plume, in both the shallow zone and the deep zone, is stable or decreasing and contaminant levels are decreasing over time.
- Monitoring of the influent groundwater into the air stripper system and treated effluent water from the air stripper system to ensure that the city's air stripper system continues to treat groundwater to meet safe drinking water standards, as defined by MCLs.

- Maintenance activities associated with the continued operation of the GET system. Maintenance activities will include components of the city's existing water distribution infrastructure that will be incorporated into the GET system and repurposed to also address contamination from the Site. This will include the city's existing Well #3 and air stripper system.
- ICs to restrict groundwater use on the site property. An environmental covenant will be implemented on the site property to prohibit the installation of groundwater wells. The prohibition on the installation of groundwater wells will exclude extraction wells or monitoring wells constructed for the response action. The environmental covenant will be compliant with the Missouri Environmental Covenants Act.
- ICs to restrict groundwater use throughout the contaminated plume. The contaminated plume lies within city limits. A city ordinance will be implemented to prohibit the installation of private groundwater wells within city limits. The prohibition on the installation of groundwater wells will exclude municipal wells that use the air stripper for treatment and extraction wells or monitoring wells constructed for the response action.

The city of Vienna is currently extracting groundwater from the deep zone with Well #3 and treating the groundwater with an air stripper system to eliminate VOCs. The primary purpose of the city's systems is to supply residents with clean drinking water, but the city's systems function in the same manner as a dedicated GET system for groundwater remediation. If the city's systems were not in place, the groundwater remedy would still be GET for the deep zone, but instead of using the city's existing systems, a new GET system would be installed. Rather than building redundant systems, the Selected Remedy will incorporate the city's systems into the overall groundwater remedy. Incorporating the city's systems into the overall groundwater remedy will also ensure that the city continues to provide clean drinking water to residents without interruption.

3) Summary of the Estimated Remedy Costs

The information for cost estimates is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record, an Explanation of Significant Differences or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. The discount rate used for calculating total present worth costs is 7 percent.

O&M activities are expected to exceed 30 years, but the cost estimate does not forecast beyond that time period. The cost estimate accounts for long-term O&M costs associated with replacement costs that are assumed as part of O&M estimate. Capital costs are recalculated after 30 years. Data obtained from RA and five-year reviews will be utilized to refine long-term O&M cost estimates.

The cost estimates for all the remedial alternatives, including the Selected Remedy, to address contaminated soil and groundwater were documented in the FS Report.

Cost Estimates for Selected Remedy

	Construction Cost	O&M Cost	Yrs	NPW Total
Soil Remedy	$10,971,000	$0	-	$10,971,000
Groundwater Remedy	$1,089,000	$7,533,000	30	$8,622,000
Selected Remedy (Total)	$12,060,000	$7,533,000	-	$19,593,000

4) Expected Outcomes of the Selected Remedy

The soil component of the Selected Remedy is expected to take approximately 2 years to complete, which includes 5 months of on-site construction. Upon completion, the soil remedy is expected to meet the RAOs to prevent exposure to contaminated soil and to prevent migration of site contaminants from soil to groundwater. The soil remedy is expected to be effective in the short-term by eliminating contaminant mass from the Site and attain long-term effectiveness and permanence without additional actions. The soil remedy is expected to restore soil at the Site to residential use.

The site property is a 7.9 acres parcel of land with the former hat factory, or facility, near the northwest corner of the property. The facility consists of two adjoining buildings that form a sideways "L". The main building is the longer of the two buildings and runs east and west. The main building has been mostly demolished down to the concrete slab with sections of steel framing and rotting overhang roofing on the south central and northwest edges of the building. The secondary building is attached to the west side of the main building, runs north and south and remains intact. The secondary building has broken windows and a rotting roof. In general, the facility is currently in poor condition and a safety hazard to the public.

The soil component of the Selected Remedy will require that the facility be removed in order to excavate the contaminated soil beneath the slab. The excavation will be backfilled with uncontaminated soil excavated from the Site or clean backfill from another source. Once completed, the final site conditions will improve the area for local residents by removing the rest of the facility, along with the associated safety hazards. The completed soil remedy will remediate the Site to residential standards, and the site property could be reused with few restrictions. Potential future reuse of the site property will include options, such as leaving the land as greenspace, building a park or adding walking/bike paths, that will benefit the local community.

The groundwater component of the Selected Remedy is expected to take approximately two years to implement, which includes 5 months of on-site construction. After construction, the groundwater remedy is expected to meet the RAO to prevent exposure to contaminated groundwater. The timeframe to attain RAOs to restore contaminated groundwater to levels that allow for beneficial use, as a drinking water source, is estimated to be 30 years. The groundwater remedy is expected to be effective in the short-term by meeting the RAO to prevent direct contact with groundwater contamination and be effective in the long-term by reducing contaminant concentrations in groundwater.

The Selected Remedy will remediate the primary contaminant, PCE, in soil and groundwater to levels that achieve RAOs. The soil cleanup level for PCE (2.3 µg/kg) is based on levels that are protective of residential use and prevent migration of PCE to groundwater. The groundwater cleanup level for PCE (5.0 µg/L) are based on MCLs, which are federal drinking water standards specified in the Safe Drinking Water Act. The groundwater cleanup level will be protective of human health and return the aquifer to beneficial use.

Although PCE is the primary COC at the Site, the Selected Remedy will remediate all COCs in soil and groundwater to below cleanup levels. The soil component of the Selected Remedy will achieve cleanup levels for all COCs to meet the RAOs for soil and will restore soil at the Site to residential use. The groundwater component of the Selected Remedy will attain cleanup levels for all COCs to meet RAOs for groundwater and will restore contaminated groundwater to levels that allow for beneficial use, as a drinking water source.

Statutory Determinations

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

1) Protection of Human Health and the Environment

The Selected Remedy will adequately protect human health and the environment through treatment, engineering controls and/or ICs (NCP §300.430(f)(5)(ii)). Specifically, the existing or potential risks posed by the Site will be eliminated, reduced or controlled by the response action. The exposure levels will be reduced to protective ARAR levels or to within the EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for noncarcinogens. The Selected Remedy will not pose unacceptable short-term risks or cross-media impacts. The Site does not pose unacceptable ecological risks,

2) Compliance with Applicable and Relevant and Appropriate Requirements

The Selected Remedy, the combination of S3 – Excavation and Off-site Disposal and GW3 – GET for the Contaminated Shallow Zone and GET for the Contaminated Deep Zone (Using the Existing City Well #3), will comply with ARARs, including Chemical, Location and Action-Specific ARARs (Appendix D, ARARs).

Other Criteria, Advisories or Guidance To Be Considered (TBCs) for This Remedial Action

In implementing the Selected Remedy, the EPA and the State have agreed to consider a number of non-binding criteria that are To-be-considereds, or TBCs. TBCs are non-promulgate advisories or guidance documents issued by federal or state governments. TBCs may also be site specific cleanup targets that are not promulgated requirements. The following are TBCs that were identified for the Site:

Standard, Requirement, Criteria or Limitation	Source	Description	Comment
Soil Cleanup Levels	BLRA Report	Cleanup targets for protection to human health and the environment.	These TBCs are cleanup goals are based on the site specific risk assessments to ensure protection of human health and the environment.
Soil Cleanup Levels	RI Report	Cleanup targets for protection of groundwater.	These TBCs are cleanup goals are base on site specific calculations to ensure protection of groundwater.

3) Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence the Selected Remedy represents a reasonable value for the money to be spent.

The estimated present worth cost of the Selected Remedy is $19,593,000 (S3 = $10,971,000 and GW3 = $8,622,000). Although S3 ($10,971,000) is more expensive than S2 ($2,745,000) and S4 ($10,219,000), S3 is a more cost effective remedy than S2 because excavating contaminated soil and disposing of it off-site achieves the balancing criteria of long-term effectiveness and permanence and reduction of toxicity, mobility or volume of contaminants through treatment more effectively than capping. S3 is more cost effective than S4 because S4 has implementability issues that may make it costlier than S3. S4 assumes that the electrical infrastructure near the site property has sufficient capacity to supply the thermal desorption system. If sufficient electricity is not readily available, S4 would require another source of electricity and would incur additional capital costs that would need to be added to the current estimate.

GW3 ($8,622,000) is more expensive than GW2 ($7,886,000). The cost difference between GW2 and GW3 is about 10 percent. However, the pumping rates for GW3 will be higher than GW2 and will extract shallow groundwater at volumes sufficient to capture the contaminant plume and to remove contamination from the shallow groundwater to levels that allow for protection of human health and beneficial use. GW3 will achieve the balancing criterion of reduction of toxicity, mobility or volume of contaminants through treatment at a faster rate than GW2. Therefore, GW3 will be the most cost effective remedy.

4) Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

The EPA has determined that the Selected Remedy represents the maximum extent to which permanent solution and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The Selected Remedy treats the source materials constituting principal threats at the Site, achieving significant reductions in PCE concentrations in soil and ground water. The Selected Remedy satisfies the criteria for long-term effectiveness by removing PCE contamination from soil. The Selected Remedy does not present short-term risks different from the other treatment alternatives. There are no special implementability issues that will affect the Selected Remedy.

5) Preference for Treatment as a Principle Element

The contaminated soils in the area within the site property are considered to be principal threat wastes because the contaminants are highly mobile and found at concentrations that pose a significant risk should exposure occur. Although contaminated groundwater also poses a risk, it is not considered a principal threat as defined by the EPA guidance. Through the use of treatment technologies, the Selected Remedy will permanently reduce the toxicity, mobility and volume of those source materials that constitute the principal threat wastes. Because it will treat the source materials constituting principal threats, the Selected Remedy also will meet the statutory preference for the selection of a remedy that involves treatment as a principal element.

6) Five-Year Review Requirements

The Selected Remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory review will be conducted within five years after initiation of the RA to ensure the remedy is, or will be, protective of human health and the environment. The review will be in accordance with Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(C).

Discontinuation of Five-Year Reviews

Statutory five-year reviews may be discontinued when no hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. These reviews are discontinued only when a five-year review report documents that the contaminants of concern are reported at acceptable levels based on an appropriate period of monitoring.

Documentation of Significant Changes

The Proposed Plan, which identified the Preferred Alternative for the Site, was released for public comment in June 2017. The EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

RESPONSIVENESS SUMMARY
Vienna Wells Site
Operable Unit 01
Vienna, Maries County, Missouri

This Responsiveness Summary has been prepared in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, or CERCLA, as amended by the Superfund Amendments and Reauthorization Act, or SARA, and the National Contingency Plan, or NCP, 40 C.F.R § 300.430(f). This document provides the United States Environmental Protection Agency's, or EPA's, response to all significant comments received from the public on the Proposed Plan for the Vienna Wells Site during the comment period.

The Responsiveness Summary consists of two components: an overview of the public process and comments from the public, along with responses from the EPA. This document is provided to accompany the Record of Decision, or ROD, and reflects input resulting from the public comment process.

Overview

The Remedial Investigation Report, Draft Final Feasibility Study Report and Proposed Plan for the Site in Vienna, Missouri, were made available to the public in June 2017. The documents can be found in the Administrative Record. The Administrative Record is located at the following information repositories:

Heartland Regional Library System - Vienna Branch 315 3rd Street Vienna, Missouri 65582 Hours: Sunday and Monday (Closed) Tuesday (1:00 p.m.–5:00 p.m.) Wednesday (1:00 p.m.–5:00 p.m.) Thursday (2:00 p.m.–8:00 p.m.) Friday (1:00 p.m.–5:00 p.m.) Saturday (9:00 a.m.–1:00 p.m.)	U.S. Environmental Protection Agency Region 7 11201 Renner Blvd Lenexa, Kansas 66219	Site Profile Page: www.epa.gov/superfund/vienna wells Administrative Record: https://semspub.epa.gov/src/collections/07/SC32109

The notice of availability of these documents was published in the weekly editions of both the Maries County Gazette and the Maries County Advocate throughout June and July of 2017. A public comment period was held from June 22, 2017 to July 22, 2017. The EPA conducted a public availability session on June 29, 2017 and a public meeting on July 11, 2017, and representatives from the Missouri Department of Natural Resources, Missouri Department of Health and Senior Services and the city of Vienna attended both events. The purpose of the events was to present the Proposed Plan to a broader community audience than those that had already been involved at the Site. At public events, representatives from the EPA answered questions about the problems at the Site and the remedial alternatives. The EPA also used this meeting to solicit a wider cross-section of community input on the reasonably anticipated future land use and potential beneficial groundwater uses at the Site.

Comments from the two events, along with responses from the EPA, are provided below. The EPA also encouraged the public to submit comments through other forms of communication, including traditional

mail, electronic mail, telephone and internet submissions via the site profile page. No comments were submitted through these other forms during the public comment period.

Comments from Public Availability Session on June 29, 2017

Comment #1: Resident (6/29/2017)

In 2006, I had a well drilled on my residential property. Then, the EPA found PCE in the well during the Remedial Investigation. Once the EPA removes the hat factory building and the contaminated soil, will PCE still be in my well or the monitoring well network? Will PCE still be in my well?

EPA Response to Comment #1:

The soil component of the Selected Remedy will remove the source of contamination that is migrating to groundwater, and the groundwater component of the Selected Remedy will remove contamination from the groundwater. The combination of the two components will lower levels of contamination in the groundwater and restore the groundwater to beneficial use. Consequently, the levels of PCE detected in groundwater wells (monitoring wells and the private well) will trend lower over time.

Comment #2: Resident (6/29/2017)

Will the contamination come back again once the EPA removes the Hat Factory? Does the contamination usually go away?

EPA Response to Comment #2:

Once it is removed from soil and groundwater, total mass of PCE is eliminated from the system and will not return.

Comment #3: Resident (6/29/2017)

Has the EPA selected what it believes to be the best remedy for the city of Vienna, Missouri?

Comment #4: Resident (6/29/2017)

The Preferred Alternative in the Proposed Plan looked the most feasible to me.

EPA Response to Comment #3 and #4:

Remedial alternatives were evaluated through the nine-criteria specified in the NCP. The Selected Remedy met the requirements of the threshold criteria and scored the highest when evaluated by the balancing criteria. The EPA believes the Selected Remedy is the best remedy for the Site.

Comment #5: Resident (6/29/2017)

Is the EPA going to change its mind on the Preferred Alternative provided in the Proposed Plan?

EPA Response to Comment #5:

The Preferred Alternative may be amended, pending the modifying criteria (state and public acceptance). The Proposed Plan, which identified the Preferred Alternative for the Site, was released for public comment in June 2017. The EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate. Therefore, the Preferred Alternative became the Selected Remedy.

Comment #6: Resident (6/29/2017)

What do ordinary citizens really know about the Preferred Alternative?

EPA Response to Comment #6:

The public can get information about the Preferred Alternative by reading the Proposed Plan and reading the supporting documents in the Administrative Record. The EPA also conducted a public availability session on June 29, 2017 and a public meeting on July 11, 2017 to discuss the Preferred Remedy in the Proposed Plan. The EPA delivered presentations on the Proposed Plan and Preferred Alternative at both events. The EPA also provided the names and contact information of the Remedial Project Manager and Community Engagement Specialist for any questions and/or comments.

Comment #7: Resident (6/29/2017)

Can I tell the people of Vienna that this is the Proposed Plan and the plan is to remove contaminated soil from the Site?

Comment #8: Resident (6/29/2017)

What is EPA's Proposed Plan and Preferred Alternative?

EPA Response to Comment #7 and #8:

The Proposed Plan is a document the EPA distributes to the public to announce the Preferred Alternative for the cleanup at the Site. For the Vienna Wells Site, the Preferred Alternative is a combination of Soil Alternative 3 - Excavation and Off-site Disposal of contaminated soil and Groundwater Alternative 3 - Groundwater Extraction and Treatment of the Contaminated Shallow Zone and Groundwater Extraction and Treatment of the Contaminated Deep Zone (Using Existing City Well #3). The Preferred Alternative is now the Selected Remedy.

Comment #9: Resident (6/29/2017)

Is the water in the city of Vienna, Missouri going to be safe?

EPA Response to Comment #9:

The city of Vienna currently provides safe drinking water to the city's residents. The city treats groundwater with an "air stripper" system to remove PCE from groundwater before it is used as drinking

water. The Selected Remedy would continue to use the city's treatment systems to provide clean drinking water.

One of the Remedial Action Objectives is to restore contaminated groundwater throughout the plume in both the shallow zone and deep zone to levels that allow for beneficial use as drinking water source. The EPA believes that the Selected Remedy will achieve this objective.

Comment #10: Resident (6/29/2017)

Can you tell where the other contamination is?

Comment #11: Resident (6/29/2017)

Are the contaminants concentrated at a particular zone in the soil and/or groundwater?

Comment #12: Resident (6/29/2017)

How far away from the hat factory have you found contaminated water? 500 feet?

Comment #13: Resident (6/29/2017)

How far has the contamination spread and is it impacting private wells for drinking water?

EPA Response to Comments #10, #11, #12 and #13:

The soil and groundwater contamination was characterized during the Remedial Investigation. The details and results of the sampling are documented in the Remedial Investigation Report that is available in the Administrative Record. Generally speaking, soil contamination is within the boundaries of the site property, and groundwater contamination has not migrated more than 500 feet from the site property.

Besides the three city wells, one domestic well to the south of the site property is located within the contaminant plume. This domestic well is primarily used for agricultural purposes (i.e., irrigation) and not used for drinking water. The levels of contamination in this domestic well are relatively low and do not pose an acceptable risk for non-potable use. No other public or private wells are being impacted by groundwater contamination from the Site.

Comment #14: Resident (6/29/2017)

How does PCE behave as it migrates from soil to groundwater? Does it dissipate? Does the PCE become weaker as it migrates through soil? Does the PCE spread out to a broader area?

EPA Response to Comment #14:

PCE contamination in soil is migrating to groundwater. Some dilution occurs as the PCE migrates, but the EPA believes that the Selected Remedy is necessary to remediate soil and groundwater at the Site.

Comment #15: Resident (6/29/2017)

How have levels of PCE changed over the years that the EPA has been monitoring this? Has it gone up and down? Are the levels of PCE not as high as it once was?

EPA Response to Comment #15:

The Public Drinking Water branch of MDNR began routine monitoring for volatile organic compounds, or VOCs, including PCE, at the city of Vienna's drinking water wells in the early 1990's. In May 1991, PCE contamination was initially detected in trace amounts at Well #1. MDNR continued monitoring the drinking water wells in the city of Vienna, and the levels of PCE contamination gradually increased over time. In August 2006, PCE contamination exceeded the Maximum Contaminant Level of 5 micrograms per liter, or µg/L, as defined by the Safe Drinking Water Act, for the first time at Well #3. Currently, the levels of PCE at Well #3 have hovered between 7 µg/L and 8 µg/L for several years.

Comment #16: Resident (6/29/2017)

What has kept the PCE from going into groundwater and migrating to my property two miles away? Is the extraction well going to take the PCE down so that people further away from the Site will not be affected? Is the PCE going down to the river? Is the PCE going downhill? Is the PCE migrating to private wells?

EPA Response to Comment #16:

The groundwater flow at the Site is controlled by Well #3, which draws contamination from the site property towards itself. The primary purpose of Well #3 and the City's air stripper is to provide the residents of Vienna with clean drinking water, but the systems essentially work as a groundwater extraction and treatment system to contain the plume and has kept contamination from migrating off-site.

Comment #17: City Alderwoman (6/29/2017)

The remedy that the city of Vienna put in place ensures that the water is still safe to drink, safe to shower in and safe to put in a baby's bottle. It is very important to note that the EPA's cleanup is to continue to clean up the area where the contamination originated.

EPA Response to Comment #17:

The EPA concurs with this statement.

Comment #18: Mr. Westart (6/29/2017)

The city of Vienna, Missouri treats drinking water to non-detect for VOCs.

EPA Response to Comment #18:

The EPA concurs with this statement.

Comment #19: Resident (6/29/2017)

Are the citizens actually benefitting with the Site going through the remedial process? Its been 20 years since the hat factory stopped operating. Is the contamination going away on its own?

Comment #20: Resident (6/29/2017)

Is it worth cleaning up since the hat factory has been there that long? What would happen if the EPA leaves the Site "as is" in terms of risk to residents?

EPA Response to Comment #19 and #20:

The Remedial Action Objectives for the Site are to:

- Prevent human exposure to the Contaminant of Concern, or COC, in surface soil through ingestion, dermal contact and inhalation above levels that are protective of residential use.
- Prevent human exposure to COCs in groundwater through ingestion, dermal contact and inhalation above levels that are protective of human health.
- Prevent migration of COCs from soils to groundwater above levels that are protective for human health.
- Restore contaminated groundwater throughout the plume in both the shallow zone and deep zone to levels that allow for beneficial use as drinking water source.

The EPA believes that the Selected Remedy will achieve all these objectives and the community will benefit once these objectives are met.

Comment #21: Resident (6/29/2017)

Is the Site going to get the funds needed to complete the Remedial Action? Or, will this get all jacked up because the EPA will not have the money to put into this Site?

Comment #22: Resident (6/29/2017)

Once remedy is selected, what is the next step? How would the cleanup be funded? Is there anything the residents of Vienna can do to help that along any better? Is there anything that we can do to help us along?

EPA Response to Comment #21 and #22:

Once the remedy is selected and documented in the Record of Decision, the next step is to implement the remedial action. The Site is a fund-lead site. Fund-lead sites are funded and managed directly by the EPA because a viable responsible party has not been identified to perform the work. The availability of funds for the remedial action is unknown at this time. The EPA will keep the city of Vienna aware of the process as we move toward the actual construction of the Selected Remedy.

Comment #23:

Did the EPA investigate off-site dumps, such as the one on Chapel Road?

EPA Response to Comment #23:

The site investigation, conducted by the Missouri Department of Natural Resources, and the remedial investigation for the Site searched for other potential sources of PCE, besides the hat factory. This included several off-site dumps in the area. Other than the hat factory, no other sources of PCE were found.

Comment #24: Resident (6/29/2017)

Who is available to answer questions about the Site?

EPA Response to Comment #24:

The public may contact the Remedial Project Manager for the Site, Mr. Hoai Tran, or the Community Engagement Specialist, Ms. Elizabeth Kramer, with general questions regarding the Site, the Proposed Plan and/or the Selected Remedy. Mr. Tran and Ms. Kramer's contact information was made available to the community through various mechanisms, including the Public Notice, Power Point Presentations and the Proposed Plan.

Comments from Formal Public Meeting on July 11, 2017

Comment #25: Bill Bicknell (7/11/2017)

In your acceptance criteria you have a slide going though several steps, and down at the bottom, it looked like one of them said, State acceptance and local acceptance. What parties are involved in making that acceptance?

EPA Response to Comment #25:

From the State's standpoint, the State is represented generally by the Missouri Department of Natural Resources. As the lead agency, the EPA works with MDNR throughout the remedial investigation process to coordinate and make sure they're on board with everything we do. At the end of the process, MDNR would concur with the Record of Decision, and there is a formal concurrence process with the state. As far as the public, anybody generally in the public can provide comments.

Comment #26: Ms. Wagner (7/11/2017)

In your opinion, what, if any, impact do you think all this cleanup will do to the value of the property that surrounds the hat factory?

EPA Response to Comment #26:

The EPA is going to do our best to clean up the contamination which should benefit the local community.

Comment #27: Ms. Wagner (7/11/2017)

Normally in cleanup on a site this size, how close of the area around the Site would be considered -- I don't want to say not habitable, but for instance, you said, like, 500 feet out from the Site. What does that mean?

EPA Response to Comment #27:

For this Site, we don't see any current exposure pathways that would impact human health. Though your reference to the 500 feet, that's groundwater at depth, and so people are not in contact with that groundwater because the City provides clean groundwater by treating it with their system before it's distributed to the public.

The one pathway which we discussed earlier that can be a current completed pathway or risk to the community is that vapor intrusion pathway, and we did that assessment in the local area concentrating on homes closest to the Site and also closest to City Well 3. And we, basically, sampled every home that would allow us to sample, and we did not find any impacts from vapor intrusion.

So that being said, no impacts from vapor intrusion, the residents are getting their water from the city of Vienna, which is being treated and is safe to drink. The soil contamination is generally underneath the slab, and there's nobody living on the property itself. So there's no direct contact with the soil. There is no completed pathway where contamination is currently impacting residential properties.

Comment #28: Ms. Wagner (7/11/2017)

So is the question about traffic or just impacts to roads?

EPA Response to Comment #28:

As part of the design, we'll look at truck routes.

Comment #29: Ms. Wagner (7/11/2017)

The soil is contaminated. So what about, you know, the wind blowing, kids are playing outside, elderly or anybody that's got a weak immune system?

EPA Response to Comment #29:

The EPA would take actions to minimize particulates coming off the Site. We might do some air monitoring to make sure that particulates aren't coming off. We cover the trucks. We decontaminate trucks as they come in and out. There's a lot of steps we take to make sure that we're not spreading contamination and that we're not impacting the local community. That's always something that is very much a concern to us.

Comment #30: Ms. Wagner (7/11/2017)

So in other sites that have been cleaned up or you've dealt with in an area that's - this probably isn't a big site to what - maybe what you're used to, but in other states, have the people that lived close to that area

have to not be at their homes the whole time the Site is being cleaned up? What about outside pets, or pets that you take outside to relieve themselves?

EPA Response to Comment #30:

The EPA would take measures to make sure that particulates are not impacting the neighboring residences. The EPA would take measures to make sure that site contaminants are not impacting residences, pets and anybody that can potentially be exposed to it. The EPA would take steps to make sure that no one was exposed to contaminated soils. The EPA does not anticipate any resident would need to leave his/her home during the construction and implementation of the Selected Remedy.

Comment #31: Ms. Wagner (7/11/2017)

As far as our city of Vienna water is concerned - and maybe you can't answer it, but maybe you can. Is it going to taste anymore like a pool than it does, a swimming pool, the chlorine, and smell like it when you take a shower?

EPA Response to Comment #31:

The EPA's concern is to make sure the water meets Federal drinking water standards. That's more of an aesthetic issue and is generally outside the remedial action. The city of Vienna is responsible for the distribution of the water to its residents.

Comment #32: Ms. Schiermeier (7/11/2017)

In this brochure you handed out, it says, Hazard Ranking System. Do you have a number? What did we rank?

EPA Response to Comment #32:

The Hazard Ranking System is part of pre-remedial activities. The pre-remedial process includes site discovery, preliminary assessment and the site investigation. The information is incorporated into what is called a Hazardous Ranking System and is used to score the Site for listing on the National Priorities List. This Site scored high enough to be listed on the National Priorities List.

Comment #33: Mr. Wagner (7/11/2017)

The hat factory is private property. Have the owners agreed to all of this?

EPA Response to Comment #33:

Generally speaking, the EPA is coordinating with the owner for access, and that's an ongoing conversation. To date, the owners have been supportive of the actions being proposed.

Comment #34: Ms. Schiermeier (7/11/2017)

Who's the lucky community who gets this soil that you're hauling off? I wouldn't want to live next to that.

EPA Response to Comment #34:

There are landfills that accept this type of waste. These landfills are designed specifically to accept this type of waste.

Comment #35: Mr. Viessman (7/11/2017)

If you pump the water out of the aquifer, does it run through the same system or where does it go that you pump it out?

EPA Response to Comment #35:

The EPA is working with the City to use their existing infrastructure to treat the contaminated groundwater. The water is extracted from the ground and treated using the existing treatment system operated by the City to remove the contamination.

Comment #36: Mr. Viessman (7/11/2017)

If you chose the more expensive method, including the soil, does the City owe money on that?

EPA Response to Comment #36:

The City is not a responsible party at this Site. The EPA would work with them to implement the remedy, but the City is not a responsible party that has to pay for it.

Comment #37: Mr. Viessman (7/11/2017)

What happens to the Site finally? Is there anything after the soil removal? Is there another treatment, like planting the trees, or is it zoned so you can't build on that Site?

EPA Response to Comment #37:

The goal is to clean the Site up to residential use, which is the most conservative cleanup level. This means people could live there. The EPA's preference is to reuse and put these sites back into productive use. The EPA would coordinate with the City, the landowner and the general public to see what would be the best reuse of the Site.

Comment #38: Mr. Wagner (7/11/2017)

Do they lose control of their property? Use and access for future use? Well, it's not that -- I don't want them to lose it. It's their property. It's what they're going to do with it.

EPA Response to Comment #38:

No, the property owners are going to let the EPA clean up the property, but they will not lose control of their property. The owners will continue to own the former hat factory property.

Appendix A
Acronyms Used in This Document
Units of Measure

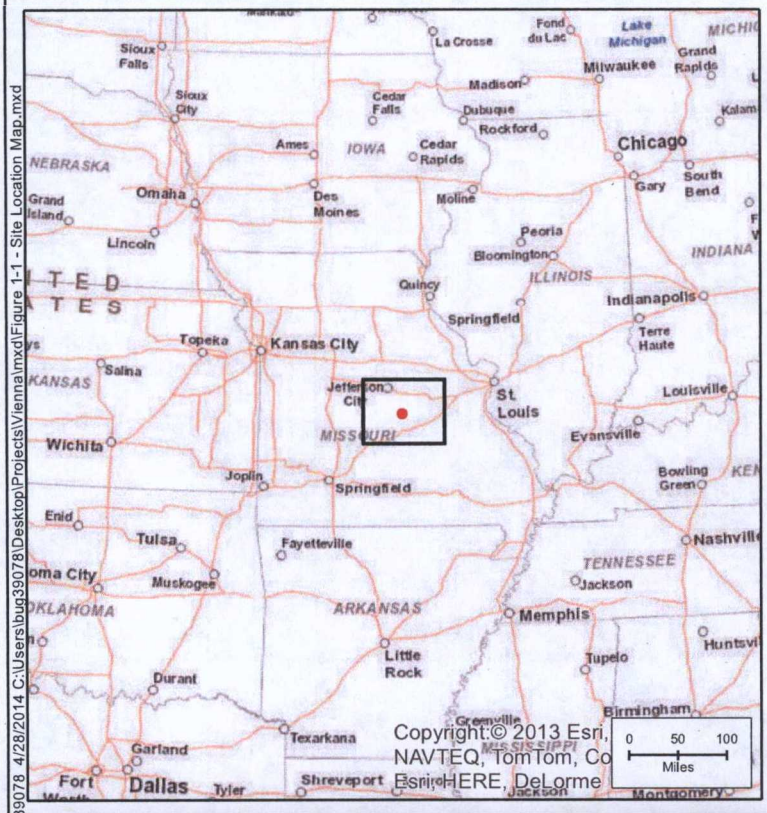
Acronyms Used in This Document

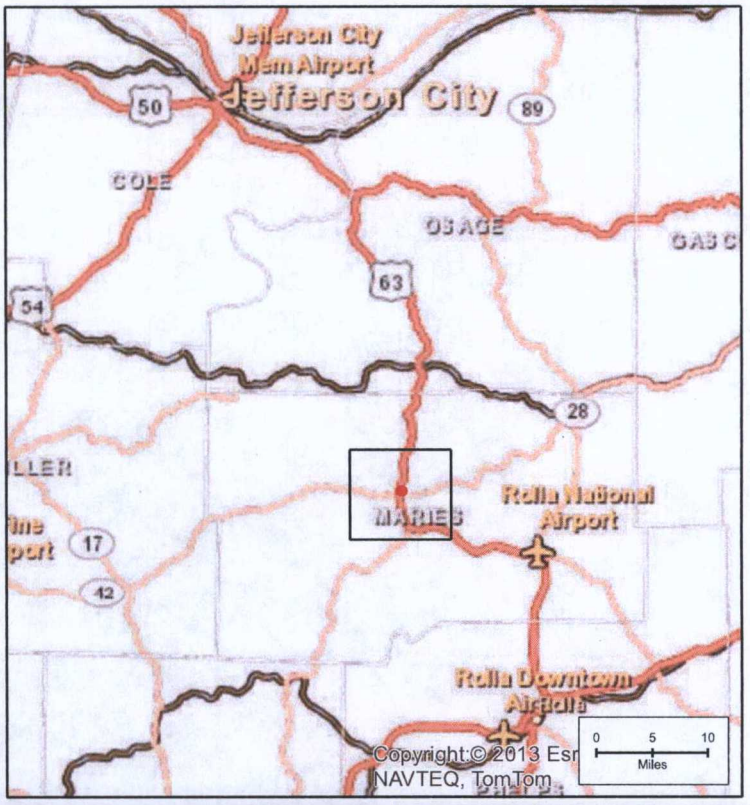
1,2-DCE	1,2-Dichloroethylene
ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Baseline Ecological Risk Assessment
BGS	Below Ground Surface
BLRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	CERCLA Information System
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
COPEC	Contaminant of Potential Ecological Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
FS	Feasibility Study
GET	Groundwater Extraction and Treatment
GW	Groundwater Alternative
HI	Hazard Index
HIF	Human Intake Factors
HQ	Hazard Quotient
IC	Institutional Control
IUR	Inhalation Unit Risk
MCL	Maximum Contaminant Level
MDNR	Missouri Department of Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychloronated Biphenyl
PCE	Tetrachloroethylene
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
QA	Quality Assurance
QC	Quality Control
RA	Remedial Action
RAO	Remedial Action Objective
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Level
S	Soil Alternative
SARA	Superfund Amendments and Reauthorization Act of 1986
SF	Slope Factor
SI	Site Investigation
SLERA	Screening-Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TBC	To Be Considered
TCE	Trichloroethylene
UCL	Upper Confidence Limit
USGS	United State Geological Survey
VOC	Volatile Organic Compound

Units of Measure

Acre
Day
Feet
Gallon
Gallons Per Minute (gpm)
Kilogram (kg)
Liter (L)
Micrograms (µg)
Micrograms Per Kilogram (µg/kg)
Micrograms Per Liter (µg/L)
Mile
Minute
Yard

bug39078 4/28/2014 C:\Users\bug39078\Desktop\Projects\Vienna\mxd\Figure 1-1 - Site Location Map.mxd





N

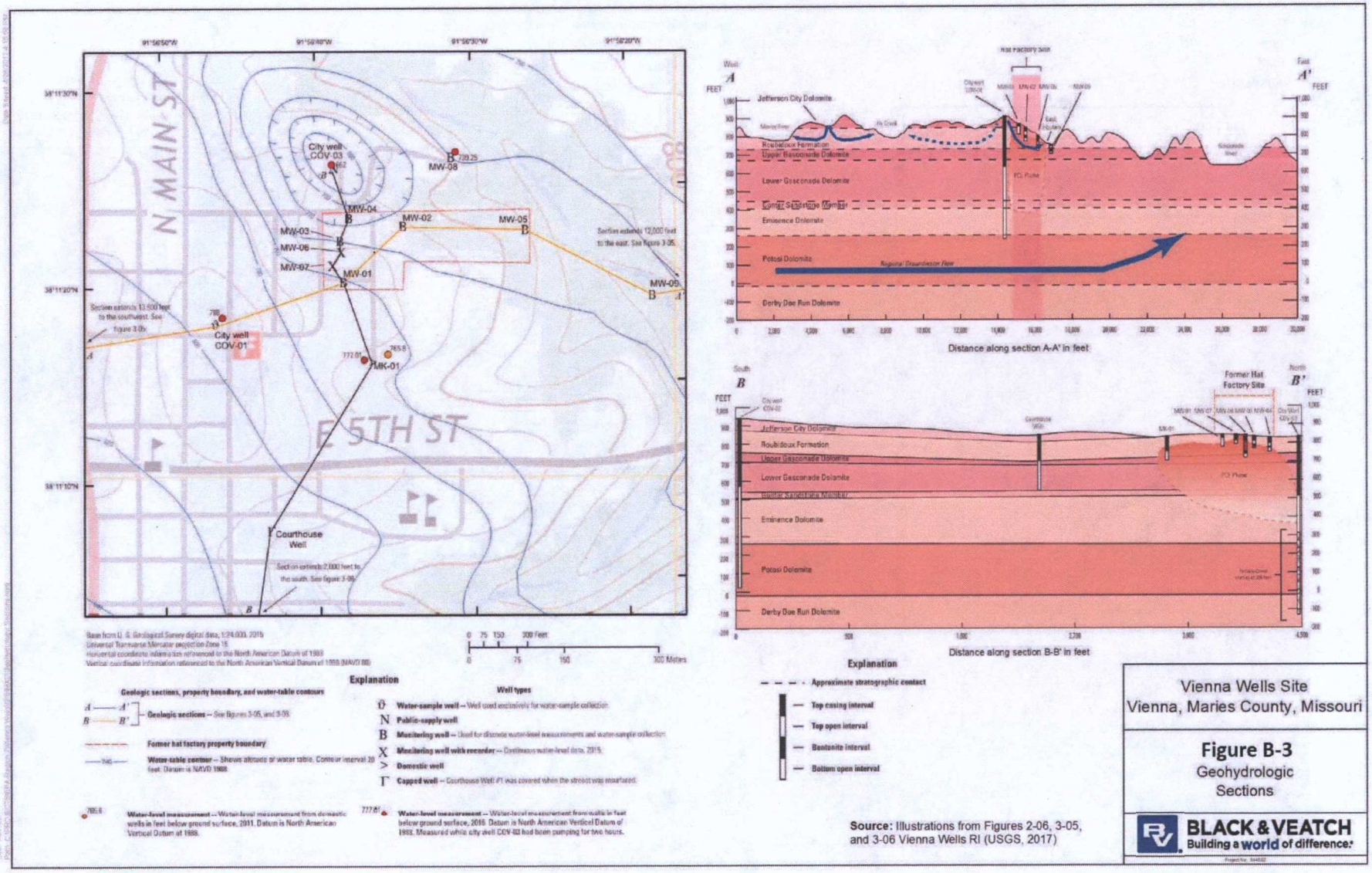
0 0.25 0.5
Miles

State Plane MO Central (feet)

Site Location Map
Vienna Wells OU1 Site
Vienna, Marie County, MO

Figure B-1


Vienna City Well #3
11th St
N Oak St
10th St
Metal Dump
Central Dump
Eastern Dump
N Chestnut St
9th Street
Vienna Wells Site
Legend
Public Drinking Water Well
Dump Area (approximate)
Former Langenberg Hat Factory
Site Boundary
N
W
E
S
100 50 0 100
Scale in Feet
Sources: 2014 NAIP imagery via Esri, USGS
Vienna Wells Site
Vienna, Maries County, Missouri
Figure B-2
Vienna Wells
Location Map
BLACK & VEATCH
Building a world of difference.



Source: Illustrations from Figures 2-06, 3-05, and 3-06 Vienna Wells RI (USGS, 2017)

Vienna Wells Site
Vienna, Maries County, Missouri

Figure B-3
Geohydrologic Sections

BLACK & VEATCH
Building a world of difference.

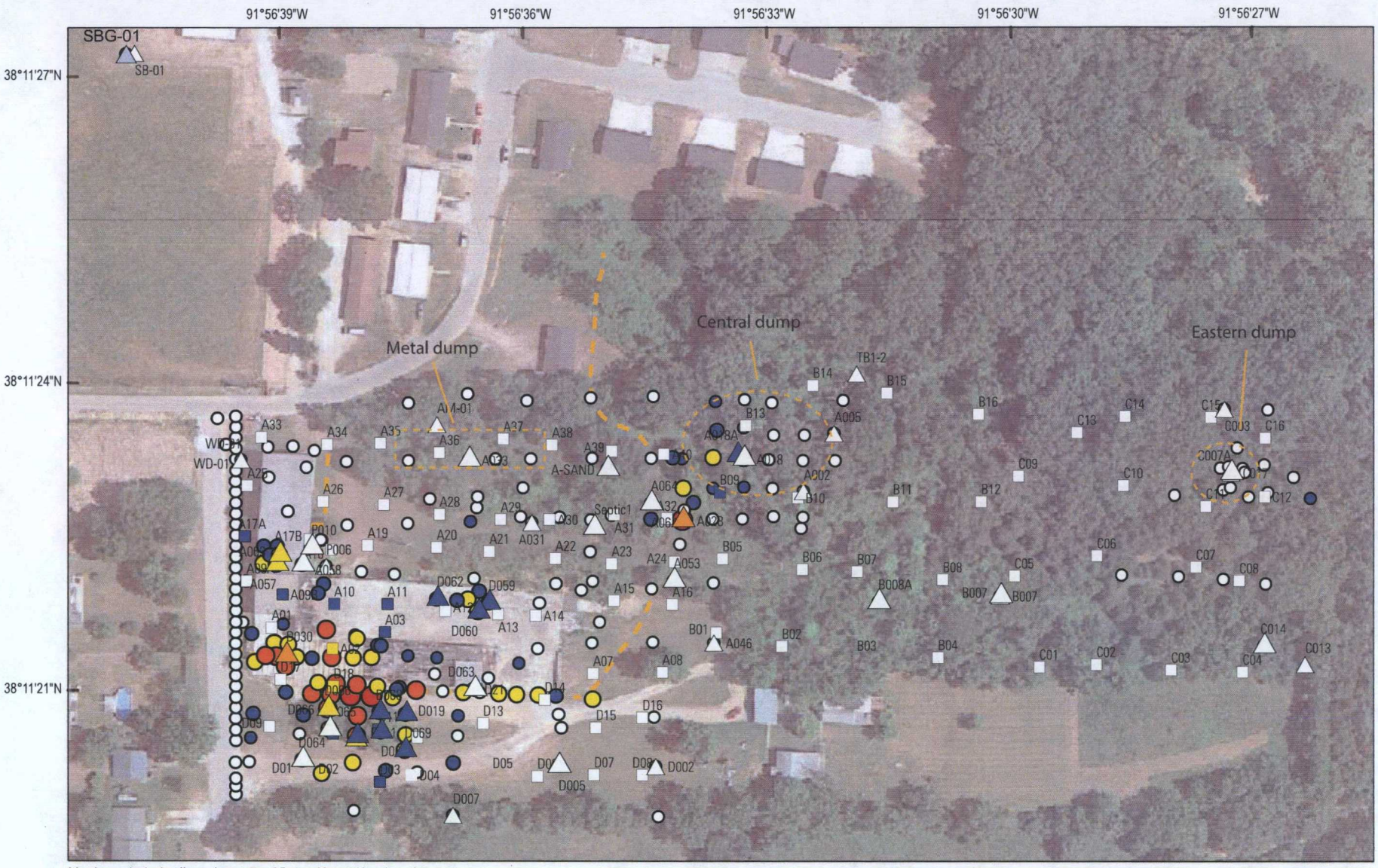
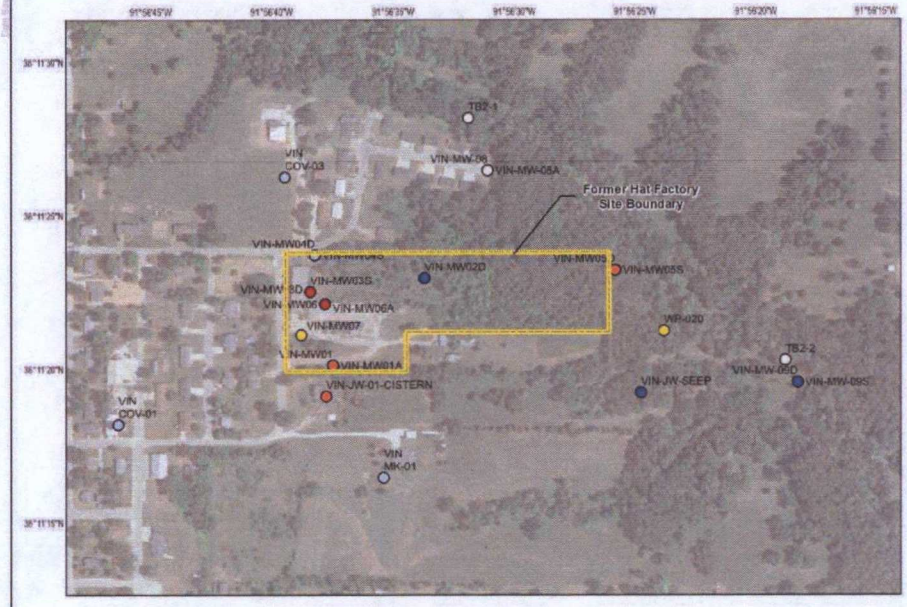


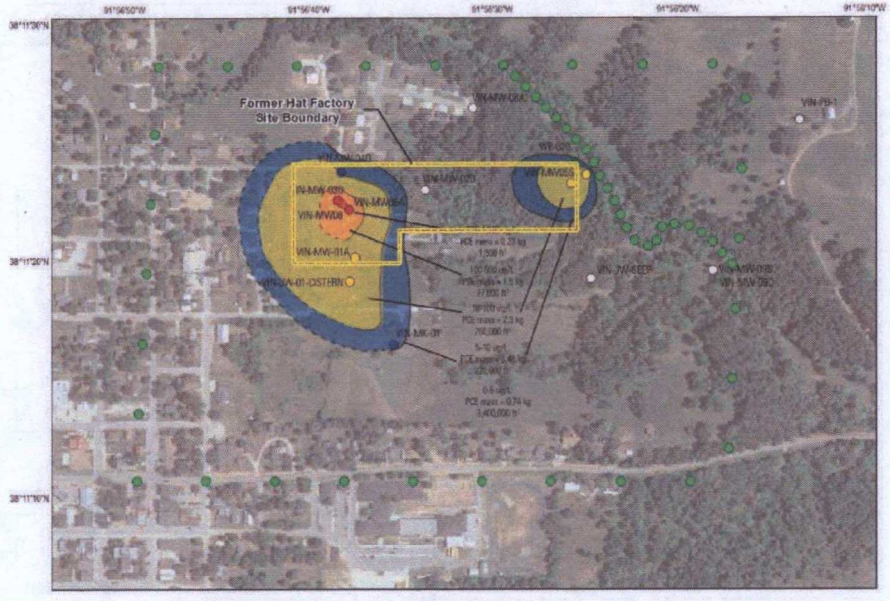
Figure B-4. Maximum concentration of tetrachloroethene (PCE) in soil samples in each soil boring collected by the U.S. Environmental Protection Agency (USEPA) and U.S.

Maximum concentrations of tetrachloroethene (PCE) in groundwater and surface-water samples collected during 2012-2016, Vienna, Missouri.



PCE concentration, in micrograms per liter
- Not detected
- Less than 5 (less than the maximum contaminant level)
- 5.1 to 11 (greater than 1x10⁻⁶ cancer risk)
- 11.1 to 41 (greater than target non-cancer threshold)
- 41.1 to 110
- 110 to 1,200 (greater than 1x10⁻⁴ cancer risk)

Estimated spatial distribution of tetrachloroethene (PCE) concentrations in shallow groundwater above an altitude of 710 feet at the Vienna Wells site, Vienna, Missouri.



PCE concentration, in micrograms per liter, March 2016
- Less than 5
- 5 to 10
- 10 to 100
- 100 to 500
- 500 to 1,000

Estimated PCE concentration, in micrograms per liter, March 2016
- Less than 5
- 5 to 10
- 10 to 100
- 100 to 500
- 500 to 1,000

Presumed PCE concentration of 0 micrograms per liter

Note: Altitude of 710 feet typically <100 Feet below ground surface at site.

Source: Illustrations from Figures 3-07 and 3-08 Vienna Wells RI (USGS, 2017)

Vienna Wells Site
Vienna, Maries County, Missouri

Figure B-5
PCE in Groundwater

BLACK & VEATCH
Building a world of difference.

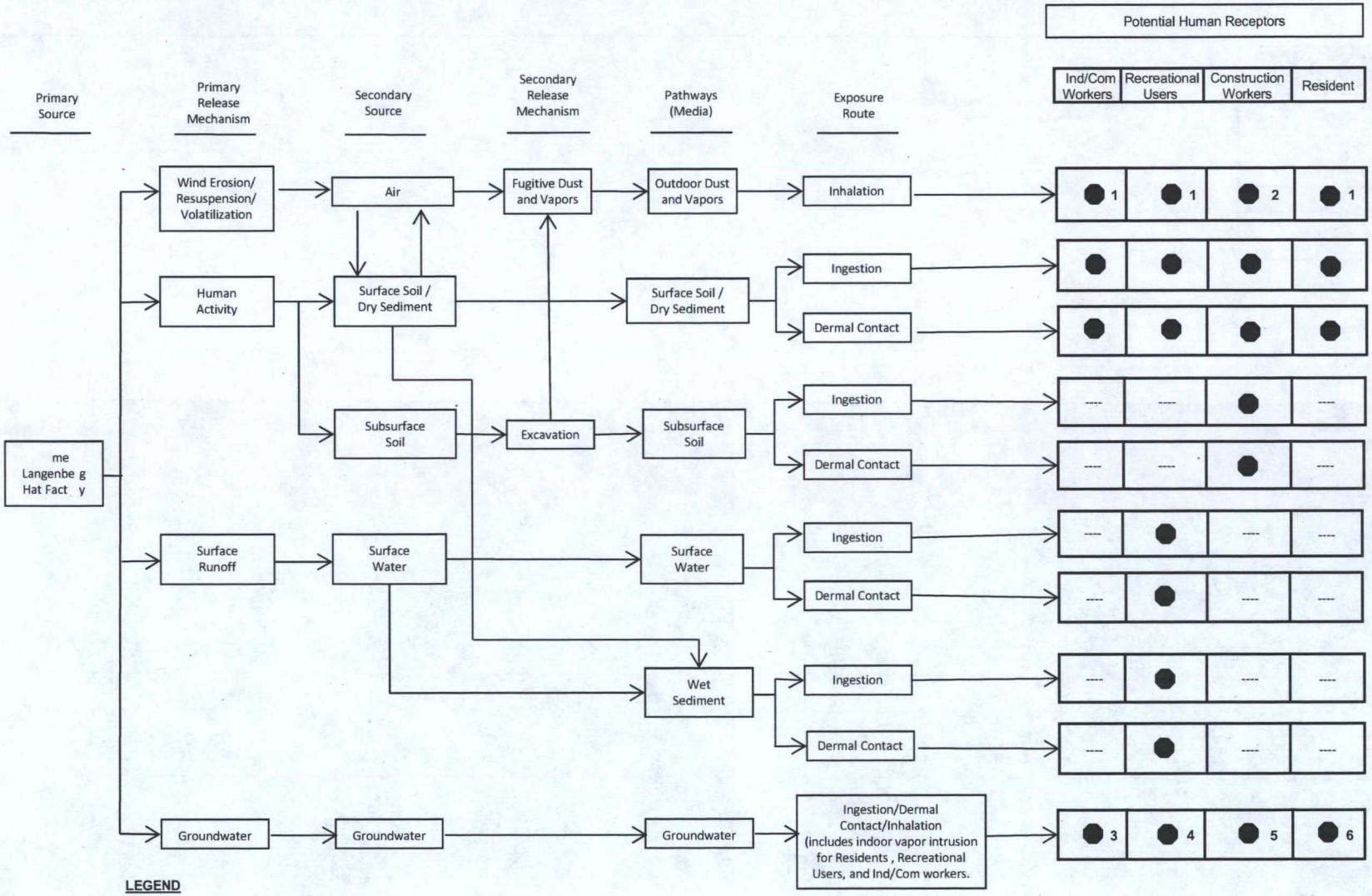


Figure B-6
Human Health Risk Assessment
Conceptual Exposure Model
Vienna Wells Site
Maries County, Missouri

Notes:

1 Inhalation of dust for residents, industrial commercial workers and recreational users will be evaluated using surface soil data only. Inhalation of vapors for residents, industrial commercial workers and recreational users will be evaluated using surface and subsurface soil data.

2 Inhalation of dust for construction workers will be evaluated using surface soil and subsurface data Inhalation of vapors for construction workers will be evaluated using surface and subsurface soil data.

3 Ingestion and inhalation of vapors associated with indoor vapor intrusion will be evaluated for the industrial/commercial worker. Dermal contact and inhalation of volatiles associated with household potable water use are de minimus pathways for the industrial/commercial worker and will not be quantified.

4 Inhalation of vapors associated with indoor vapor intrusion will be evaluated for the onsite recreational user/trespasser. Ingestion , dermal contact and inhalation of volatiles associated with household potable water use are de minimus pathways for the recreational user/trespasser and will not be quantified.

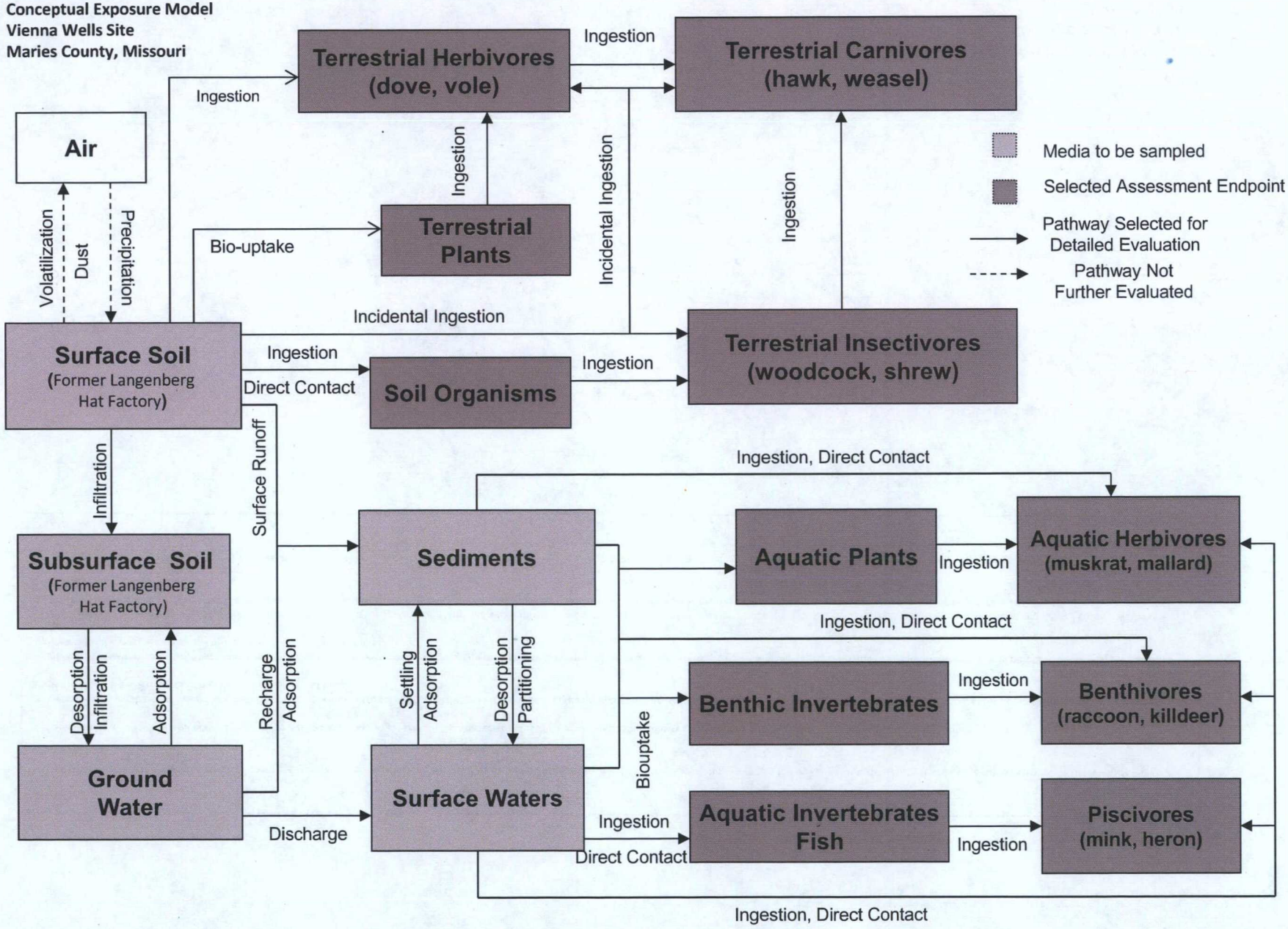
5 Direct ingestion and inhalation of vapors associated with whole house groundwater use and vapor intrusion will not be quantitatively evaluated for the construction worker. However, incidental ingestion and dermal contact will be quantified for the construction worker if the depth to groundwater is such that it could pool in an excavated trench. Construction worker exposure to volatiles in a trench will be evaluated using the Virginia Department of Environmental Quality trench model.

6 Ingestion, dermal contact, inhalation of volatiles associated with household potable water use and inhalation of vapors associated with indoor vapor intrusion will be evaluated for the residential scenario.

Figure B-6
Human Health Risk Assessment
Conceptual Exposure Model
Vienna Wells Site
Maries County, Missouri

Figure B-7

Eco ogical R s Assessment
Conceptual Exposure Model
Vienna Wells Site
Maries County, Missouri



Appendix C
Tables

Table C-1
Summary of Soil, Groundwater, Surface Water, Sediment and Indoor Air Samples
Included in Human Health Risk Assessment
Vienna Wells Site

Medium/Location							
On Site Surface Soil	On Site Subsurface Soil	Groundwater Monitoring Wells	Off Site Domestic Wells	City of Vienna Wells	Surface Water	Sediment	Soil Gas & Indoor Air
Sample IDs							
MDNR-SB-19 (0.5-1)	MDNR-SS-01	VIN-MW-01	VIN-JW-01	VIN-COV-01	VIN-SW-TB2-1	VIN-SD-TB1-2	6414-1 (IA)
MDNR-SB-20 (0.5-1)	MDNR-SS-07	VIN-MW-01A	VIN-MK-01	VIN-COV-03	VIN-SW-TB2-2	VIN-SD-TB2-1	6414-2 (CS)
USGS-VIN-SO-A002	MDNR-SS-10	VIN-MW-02D	VIN-MK-12		VIN-SW-WP-020	VIN-SD-TB2-2	6414-3 (IA)
USGS-VIN-SO-A005	MDNR-SS-11	VIN-MW-03D	VIN-MK-29		VIN-JW-SEEP	VIN-SD-WD-01	6414-4 (CS)
USGS-VIN-SO-A018A	MDNR-SS-12	VIN-MW-03S	VIN-MK-34		VIN-Vienna Spring	VIN-SD-WP-020	6414-5 (IA)
USGS-VIN-SO-A031	MDNR-SS-13	VIN-MW-04D	VIN-MK-35				6414-6 (IA)
USGS-VIN-SO-A046	MDNR-SS-14	VIN-MW-04S	VIN-MK-43				6414-7 (IA)
USGS-VIN-SO-AM01	MDNR-SS-15	VIN-MW-05D	VIN-PB-01				6414-8 (CS)
USGS-VIN-SO-B7	MDNR-SS-16	VIN-MW-05S	VIN-PB-02				6414-9 (IA)
USGS-VIN-SO-C007	MDNR-SS-17	VIN-MW-06					6414-10 (SG)
USGS-VIN-SO-C13	MDNR-SS-18	VIN-MW-06A					6414-11 (IA)
USGS-VIN-SO-C3	MDNR-SB-19	VIN-MW-07					6414-12 (SG)
USGS-VIN-SO-D002	MDNR-SB-20						6414-13 (IA)
USGS-VIN-SO-D007	MDNR-SB-21						6414-14 (IA)
USGS-VIN-SO-D011	MDNR-SB-22						6414-15 (CS)
USGS-VIN-SO-P-6	MDNR-SB-23						6414-16 (IA)
EPA-Cell A-1 (SS)	MDNR-SB-24						6414-18 (SG)
EPA-Cell A-7 (SS)	MDNR-SB-25						6414-20 (IA)
EPA-Cell A-8 (SS)	MDNR-SB-26						6414-21 (SG)
EPA-Cell A-9 (SS)	USGS-VIN-SD-Septic1						6414-22 (IA)
EPA-Cell A-15 (SS)	USGS-VIN-SO-A018						6414-23 (CS)
EPA-Cell A-16 (SS)	USGS-VIN-SO-A028						6414-24 (IA)
EPA-Cell A-17 (SS)	USGS-VIN-SO-A033						6414-25 (CS)
EPA-Cell A-18 (SS)	USGS-VIN-SO-A053						6414-26 (IA)
EPA-Cell A-19 (SS)	USGS-VIN-SO-A057						6414-27 (SG)
EPA-Cell A-20 (SS)	USGS-VIN-SO-A058						6414-28 (IA)
EPA-Cell A-21 (SS)	USGS-VIN-SO-A063						6414-29 (CS)
EPA-Cell A-22 (SS)	USGS-VIN-SO-A064						6414-30 (IA)
EPA-Cell A-23 (SS)	USGS-VIN-SO-B007						6414-31 (IA)
EPA-Cell A-24 (SS)	USGS-VIN-SO-B008A						6414-32 (CS)
EPA-Cell A-25 (SS)	USGS-VIN-SO-C014						6414-33 (IA)
EPA-Cell A-26 (SS)	USGS-VIN-SO-C017						6414-34 (SG)
EPA Cell A-27 (SS)	USGS-VIN-SO-D005						6414-35 (IA)
EPA-Cell A-28 (SS)	USGS-VIN-SO-D011						6484-1 (IA)
EPA-Cell A-29 (SS)	USGS-VIN-SO-D019						6484-2 (CS)
EPA-Cell A-30 (SS)	USGS-VIN-SO-D030						6484-3 (IA)
EPA-Cell A-31 (SS)	USGS-VIN-SO-D059						6484-4 (SG)
EPA-Cell A-32 (SS)	USGS-VIN-SO-D060						6484-5 (IA)
EPA-Cell A-33 (SS)	USGS-VIN-SO-D062						6484-6 (IA)
EPA-Cell A-34 (SS)	USGS-VIN-SO-D063						6484-7 (CS)
EPA-Cell A-35 (SS)	USGS-VIN-SO-D064						6484-8 (IA)

Table C-1
Summary of Soil, Groundwater, Surface Water, Sediment and Indoor Air Samples Included in Human Health Risk Assessment
Vienna Wells Site

Medium/Location							
On Site Surface Soil	On Site Subsurface Soil	Groundwater Monitoring Wells	Off Site Domestic Wells	City of Vienna Wells	Surface Water	Sediment	Soil Gas & Indoor Air
Sample IDs							
EPA-Cell A-36 (SS)	USGS-VIN-SO-D065						6484-9 (SG)
EPA-Cell A-37 (SS)	USGS-VIN-SO-D066						6484-10 (IA)
EPA-Cell A-38 (SS)	USGS-VIN-SO-D067						6484-11 (SG)
EPA-Cell A-39 (SS)	USGS-VIN-SO-D068						6484-12 (IA)
EPA-Cell A-40 (SS)	USGS-VIN-SO-D069						6484-13 (SG)
EPA-Cell B-1 (SS)	USGS-VIN-SO-P010						6484-14 (IA)
EPA-Cell B-2 (SS)	USGS-VIN-SO-SAND						6484-15 (IA)
EPA-Cell B-3 (SS)	USGS-VIN-SP006						6484-16 (CS)
EPA-Cell B-4 (SS)	USGS-VIN-SP010 3.5'-4'						6484-17 (IA)
EPA-Cell B-5 (SS)	USGS-VIN-SP010 7.5'-8'						6484-18 (IA)
EPA-Cell B-6 (SS)	USGS-VIN-SP010 7.5'-8'						6484-19 (CS)
EPA-Cell B-7 (SS)	EPA-Cell A-1 (4-5' bgs)						6484-20 (IA)
EPA-Cell B-8 (SS)	EPA-Cell A-1 (7-8' bgs)						6484-21 (CS)
EPA-Cell B-9 (SS)	EPA-Cell A-10 (4-5' bgs)						6484-22 (IA)
EPA-Cell B-10 (SS)	EPA-Cell A-10 (6-7' bgs)						6484-23 (SG)
EPA-Cell B-11 (SS)	EPA-Cell A-11 (4-5' bgs)						6484-24 (IA)
EPA-Cell B-12 (SS)	EPA-Cell A-11 (7-8' bgs)						6484-25 (CS)
EPA-Cell B-13 (SS)	EPA-Cell A-12 (4-5' bgs)						6484-26 (IA)
EPA-Cell B-14 (SS)	EPA-Cell A-13 (4-5' bgs)						6484-28 (SG)
EPA-Cell B-15 (SS)	EPA-Cell A-13 (7-8' bgs)						6484-30 (IA)
EPA-Cell B-16 (SS)	EPA-Cell A-14 (4-5' bgs)						6484-31 (SG)
EPA-Cell C-1 (SS)	EPA-Cell A-14 (7-8' bgs)						6484-32 (IA)
EPA-Cell C-2 (SS)	EPA-Cell A-15 (4-5' bgs)						6484-33 (IA)
EPA-Cell C-3 (SS)	EPA-Cell A-15 (7-8' bgs)						6484-34 (CS)
EPA-Cell C-4 (SS)	EPA-Cell A-16 (4-5' bgs)						6484-35 (IA)
EPA-Cell C-5 (SS)	EPA-Cell A-16 (7-8' bgs)						6484-36 (CS)
EPA-Cell C-6 (SS)	EPA-Cell A-17A (4-5' bgs)						6541-1 (IA)
EPA-Cell C-7 (SS)	EPA-Cell A-17B (4-5' bgs)						6541-2 (CS)
EPA-Cell C-8 (SS)	EPA-Cell A-18 (4-5' bgs)						6541-3 (IA)
EPA-Cell C-9 (SS)	EPA-Cell A-18 (7-8' bgs)						6541-4 (SG)
EPA-Cell C-10 (SS)	EPA-Cell A-19 (4-5' bgs)						6541-5 (IA)
EPA-Cell C-11 (SS)	EPA-Cell A-19 (7-8' bgs)						6541-6 (IA)
EPA-Cell C-12 (SS)	EPA-Cell A-2 (4-5' bgs)						6541-7 (CS)
EPA-Cell C-13 (SS)	EPA-Cell A-2 (7-8' bgs)						6541-8 (IA)
EPA-Cell C-14 (SS)	EPA-Cell A-20 (4-5' bgs)						6541-9 (SG)
EPA-Cell C-15 (SS)	EPA-Cell A-20 (7-8' bgs)						6541-10 (IA)
EPA-Cell C-16 (SS)	EPA-Cell A-21 (4-5' bgs)						6541-11 (SG)
EPA-Cell D-1 (SS)	EPA-Cell A-21 (7-8' bgs)						6541-12 (IA)
EPA-Cell D-2 (SS)	EPA-Cell A-22 (4-5' bgs)						6541-13 (SG)
EPA-Cell D-3 (SS)	EPA-Cell A-22 (7-8' bgs)						6541-14 (IA)
EPA-Cell D-4 (SS)	EPA-Cell A-23 (4-5' bgs)						6541-15 (IA)

Table C-1
Summary of Soil, Groundwater, Surface Water, Sediment and Indoor Air Samples
Included in Human Health Risk Assessment
Vienna Wells Site

Medium/Location							
On Site Surface Soil	On Site Subsurface Soil	Groundwater Monitoring Wells	Off Site Domestic Wells	City of Vienna Wells	Surface Water	Sediment	Soil Gas & Indoor Air
Sample IDs							
EPA-Cell D-5 (SS)	EPA-Cell A-23 (7-8' bgs)						6541-16 (CS)
EPA-Cell D-6 (SS)	EPA-Cell A-24 (4-5' bgs)						6541-17 (IA)
EPA-Cell D-7 (SS)	EPA-Cell A-24 (7-8' bgs)						6541-18 (IA)
EPA-Cell D-8 (SS)	EPA-Cell A-25 (4-5' bgs)						6541-19 (CS)
EPA-Cell D-9 (SS)	EPA-Cell A-26 (4-5' bgs)						6541-20 (IA)
EPA-Cell D-10 (SS)	EPA-Cell A-26 (7-8' bgs)						6541-21 (CS)
EPA-Cell D-11 (SS)	EPA-Cell A-27 (4-5' bgs)						6541-22 (IA)
EPA-Cell D-12 (SS)	EPA-Cell A-27 (7-8' bgs)						6541-24 (SG)
EPA-Cell D-13 (SS)	EPA-Cell A-28 (4-5' bgs)						6541-26 (IA)
EPA-Cell D-14 (SS)	EPA-Cell A-28 (7-8' bgs)						6541-27 (SG)
EPA-Cell D-15 (SS)	EPA-Cell A-29 (4-5' bgs)						6541-28 (IA)
EPA-Cell D-16 (SS)	EPA-Cell A-29 (7-8' bgs)						6541-29 (CS)
EPA-Cell D-17 (SS)	EPA-Cell A-3 (4-5' bgs)						6541-30 (IA)
	EPA-Cell A-31 (4-5' bgs)						6541-31 (SG)
	EPA-Cell A-31 (7-8' bgs)						6541-32 (IA)
	EPA-Cell A-32 (4-5' bgs)						6541-33 (IA)
	EPA-Cell A-32 (7-8' bgs)						6541-34 (CS)
	EPA-Cell A-33 (4-5' bgs)						6541-35 (IA)
	EPA-Cell A-33 (7-8' bgs)						6541-36 (CS)
	EPA-Cell A-34 (4-5' bgs)						6541-38 (CS)
	EPA-Cell A-34 (7-8' bgs)						6542-1 (IA)
	EPA-Cell A-35 (4-5' bgs)						6542-2 (CS)
	EPA-Cell A-35 (7-8' bgs)						6542-3 (IA)
	EPA-Cell A-36 (4-5' bgs)						6542-4 (IA)
	EPA-Cell A-36 (7-8' bgs)						6542-5 (CS)
	EPA-Cell A-37 (4-5' bgs)						6542-6 (IA)
	EPA-Cell A-37 (7-8' bgs)						6542-7 (SG)
	EPA-Cell A-38 (4-5' bgs)						6542-8 (IA)
	EPA-Cell A-38 (7-8' bgs)						6542-9 (SG)
	EPA-Cell A-39 (4-5' bgs)						6542-10 (IA)
	EPA-Cell A-39 (7-8' bgs)						6542-11 (CS)
	EPA-Cell A-40 (4-5' bgs)						6542-12 (IA)
	EPA-Cell A-40 (7-8' bgs)						6542-13 (CS)
	EPA-Cell A-7 (4-5' bgs)						6542-14 (IA)
	EPA-Cell A-7 (7-8' bgs)						6542-15 (IA)
	EPA-Cell A-9 (4-5' bgs)						6542-16 (IA)
	EPA-Cell A-9 (7-8' bgs)						6542-17 (SG)
	EPA-Cell A-9B (4-5' bgs)						6542-18 (IA)
	EPA-Cell A-9B (7-8' bgs)						6542-20 (SG)
	EPA-Cell B-1 (4-5' bgs)						6542-22 (IA)
	EPA-Cell B-1 (7-8' bgs)						6542-23 (SG)

Table C-1
Summary of Soil, Groundwater, Surface Water, Sediment and Indoor Air Samples Included in Human Health Risk Assessment
Vienna Wells Site

Medium/Location							
On Site Surface Soil	On Site Subsurface Soil	Groundwater Monitoring Wells	Off Site Domestic Wells	City of Vienna Wells	Surface Water	Sediment	Soil Gas & Indoor Air
Sample IDs							
	EPA-Cell B-10 (4-5' bgs)						6542-24 (IA)
	EPA-Cell B-10 (7-8' bgs)						6542-25 (CS)
	EPA-Cell B-11 (4-5' bgs)						6542-26 (IA)
	EPA-Cell B-11 (6-7' bgs)						6542-27 (CS)
	EPA-Cell B-2 (4-5' bgs)						6542-28 (IA)
	EPA-Cell B-2 (7-8' bgs)						6542-29 CS)
	EPA-Cell B-5 (4-5' bgs)						6542-30 (IA)
	EPA-Cell B-5 (7-8' bgs)						6542-31 (IA)
	EPA-Cell B-6 (4-5' bgs)						6542-32 (CS)
	EPA-Cell B-6 (7-8' bgs)						6542-33 (IA)
	EPA-Cell B-7 (4-5' bgs)						6542-34 (CS)
	EPA-Cell B-7 (7-8' bgs)						6542-35 (IA)
	EPA-Cell B-8 (4-5' bgs)						6542-36 (SG)
	EPA-Cell B-8 (7-8' bgs)						
	EPA-Cell B-9 (4-5' bgs)						
	EPA-Cell B-9 (7-8' bgs)						
	EPA-Cell C-1 (4-5' bgs)						
	EPA-Cell C-1 (6-7' bgs)						
	EPA-Cell C-12 (4-5' bgs)						
	EPA-Cell C-12 (7-8' bgs)						
	EPA-Cell C-14 (4-5' bgs)						
	EPA-Cell C-14 (6-7' bgs)						
	EPA-Cell C-15 (4-5' bgs)						
	EPA-Cell C-15 (6-7' bgs)						
	EPA-Cell C-16 (4-5' bgs)						
	EPA-Cell C-16 (6-7' bgs)						
	EPA-Cell C-2 (4-5' bgs)						
	EPA-Cell C-2 (7-8' bgs)						
	EPA-Cell C-3 (4-5' bgs)						
	EPA-Cell C-3 (7-8' bgs)						
	EPA-Cell C-4 (4-5' bgs)						
	EPA-Cell C-4 (7-8' bgs)						
	EPA-Cell C-5 (4-5' bgs)						
	EPA-Cell C-5 (7-8' bgs)						
	EPA-Cell C-6 (4-5' bgs)						
	EPA-Cell C-6 (7-8' bgs)						
	EPA-Cell C-7 (4-5' bgs)						
	EPA-Cell C-7 (7-8' bgs)						
	EPA-Cell C-8 (4-5' bgs)						
	EPA-Cell C-8 (6-7' bgs)						
	EPA-Cell C-9 (4-5' bgs)						

Table C-1
Summary of Soil, Groundwater, Surface Water, Sediment and Indoor Air Samples Included in Human Health Risk Assessment
Vienna Wells Site

Medium/Location							
On Site Surface Soil	On Site Subsurface Soil	Groundwater Monitoring Wells	Off Site Domestic Wells	City of Vienna Wells	Surface Water	Sediment	Soil Gas & Indoor Air
Sample IDs							
	EPA-Cell C-9 (6-7' bgs)						
	EPA-Cell D-1 (4-5' bgs)						
	EPA-Cell D-10 (4-8' bgs)						
	EPA-Cell D-11 (4-8' bgs)						
	EPA-Cell D-12 (4-8' bgs)						
	EPA-Cell D-13 (4-6' bgs)						
	EPA-Cell D-15 (3-5' bgs)						
	EPA-Cell D-16 (4-5' bgs)						
	EPA-Cell D-16 (7-8' bgs)						
	EPA-Cell D-18 (4-5.5' bgs)						
	EPA-Cell D-2 (4-5.5' bgs)						
	EPA-Cell D-21 (3-4' bgs)						
	EPA-Cell D-3 (4-6.5' bgs)						
	EPA-Cell D-4 (4-6.5' bgs)						
	EPA-Cell D-5 (4-6' bgs)						
	EPA-Cell D-6 (4-6' bgs)						
	EPA-Cell D-7 (4-6' bgs)						
	EPA-Cell D-8 (4-8' bgs)						
	EPA-Cell D-9 (4-8' bgs)						

Data Collected 2007 thru 2015

SG - Subslab Soil Gas

CS - Crawl Space

IA - Indoor Air

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
Organics								
1,1,1,2-Tetrachloroethane			*	*	*			
1,1,2,2-Tetrachloroethane			*	*	*	*		*
1,1,2-Trichloroethane		*	*	*	*	*		✓
1,1-Dichloroethane			*					*
1,1-Dichloropropanone	*	*						
1,1-Dichloropropene	*	*	*	*	*	*	*	
1,2,3,4-Tetramethylbenzene			*	*	*	*		
1,2,3,5-Tetramethylbenzene			*	*	*	*		
1,2,3-Trichlorobenzene			*	*	*	*		
1,2,3-Trichloropropane	*	*	*	*	*		*	
1,2,3-Trimethylbenzene			*					
1,2,4-Trichlorobenzene			*	*	*			*
1,2,4-Trimethylbenzene			*					✓
1,2,4,5-Tetrachlorobenzene	*							
1,2-Dibromo-3-Chloropropane	*	*	*	*	*	*	*	
1,2-Dibromoethane	*	*	*	*	*	*	*	*
1,2-Dichloroethane		*	*	*	*	*		✓
1,2-Dichloropropane			*	*	*	*		*
1,3,5-Trimethylbenzene								✓
1,3-Dichlorobenzene	*	✓	*	*	*		*	*
1,4-Dichlorobenzene			*	*	*			
2,2-Dichloropropane	*	*	*	*	*	*	*	
2,4,6-Trichlorophenol	*		*	*	*	*		
2,4-Dichlorophenol			*	*	*			
2,4-Dinitrophenol	*		*	*	*			
2,4-Dinitrotoluene	*		*	*	*	*		
2,6-Diethylaniline			*	*	*	*		
2,6-Dinitrotoluene	*	*	*	*	*	*		

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
2-Chloro-4-isopropylamino-6-amino-s-triazine			*	*	*	*		
2-Chlorophenol						*		
2-Ethyltoluene			*	*	*	*		
2-Methyl-4,6-dinitrophenol	*	*	*	*	*		*	
2-Nitrophenol	*	*	*	*	*	*		
2-Nitropropane		*						
3,3'-Dichlorobenzidine	*	*	*	*	*	*	*	
3-Chloropropene			*					
3-Nitroaniline	*	*	*	*	*	*	*	
4-Bromophenyl-phenylether	*	*	*	*	*	*	*	
4-Chloroaniline	*		*	*	*	*		
4-Chlorophenyl-phenylether	*	*	*	*	*	*	*	
4-Isopropyltoluene	*	*	✓	✓	*	✓	*	
4-Nitroaniline			*	*	*	*		
4-Nitrophenol	*	*	*	*	*		*	
alpha-HCH	*		*	*	*	*		
Acenaphthylene	✓	*	*	*	*	*	✓	
Acrylonitrile		*	*	*	*	*		
Aldrin	*		*	*	*	*		
Allyl Chloride		*						
Aroclor 1016	*							
Aroclor 1221	*		*	*	*	*		
Aroclor 1232	*		*	*	*	*		
Aroclor 1242	*		*	*	*	*		
Aroclor 1248	*		*	*	*	*		
Aroclor 1254	✓		*	*	*	*		
Aroclor 1260	*		*	*	*	*		
Aroclor 1262	*		*	*	*	*		
Aroclor 1268	*		*	*	*	*		
Atrazine	*							
Benzene			✓	*	*			✓
Benzo[a]anthracene	✓	*	*	*	*	*	✓	

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
Benzo[a]pyrene	✓	✓					✓	
Benzo[b]fluoranthene	✓	*	*	*	*	*	✓	
Benzo[k]fluoranthene	✓		*	*	*	*		
beta-HCH						*		
Biphenyl	*							
bis(2-Chloroethyl)ether	*	*	*	*	*	*	*	
Bis(2-chloroisopropyl) ether	*	*	*	*	*		*	
Bis(2-ethylhexyl) phthalate						*		
Bromodichloromethane		*	*	✓	*	*		✓
Bromoethene			*					
Bromomethane		*	*	*	*			✓
Carbazole	*	*	*	*	*	*	✓	
Chlordane			*	*	*	*		
Chloroacetonitrile	*	*						
Chloroform		*	✓	✓	*			✓
Chloromethane		*						
Chrysene						*		
cis-1,2-Dichloroethene			*					*
cis-1,3-Dichloropropene			*	*	*	*		*
cis-Chlordane						*		
Coumaphos	*	*	*	*	*	*	*	
delta-HCH						*		
Demeton-O	*	*	*	*	*	*	*	
Demeton-S	*	*	*	*	*	*	*	
Desulfinylfipronil amide			*	*	*	*		
Desulfinylfipronil			*	*	*	*		
Dibenzo[a,h]anthracene	✓	*	*	*	*	*	✓	
Dibenzofuran	*		*	*	*	*		
Dibromochloromethane			*	*	*	*		*
Dibromomethane			*	*	*	*		
Dichloromethane								✓
Dieldrin	✓		✓	*	*	*		
Dimethylphthalate	*	*	*	*	*		*	

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
Disulfoton			*	*	*			
Endrin aldehyde						*		
Endrin ketone						*		
Endrin						*		
EPN			*	*	*	*		
Ethalfluralin			*	*	*	*		
Ethoprop	*	*	*	*	*	*	*	
Ethylbenzene			*					✓
Fensulfothion	*	*	*	*	*	*	*	
Fenthion	*	*	*	*	*	*	*	
Fipronil sulfide			*	*	*	*		
Fipronil sulfone			*	*	*	*		
Fipronil			*	*	*	*		
gamma-Chlordane						*		
Heptachlor	*		*	*	*	*		
Heptachlor Epoxide	*		*	*	*	*		
Heptane								*
Hexachlorobenzene	*	*	*	*	*	*	*	
Hexachlorobutadiene	*		*	*	*	*		*
Hexachlorocyclopentadiene	*		*	*	*		*	
Hexachloroethane	*		*	*	*	*		
Indeno[1,2,3-cd]pyrene	✓		*	*	*	*	*	
Iodomethane	*	*	*	*	*	*		
Merphos			*	*	*	*		
Methyl acrylate			*					
Methyl acrylonitrile			*	*	*	*		
Methyl parathion						*		
Methyl tert-pentyl ether			*	*	*	*		
Methylcyclohexane	*	*						
Mevinphos	*	*	*	*	*	*	*	
Monocrotophos	*	*	*	*	*	*	*	

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
Naphthalene	*		*	*	*			
n-Butyl methyl ketone			*	*	*	*		✓
Nitrobenzene	*		*	*	*			
N-Nitrosodimethylamine	*	*	*	*	*	*	*	
N-nitroso-di-n-propylamine	*	*	*	*	*	*	*	
N-Nitrosodiphenylamine						*		
Orthophosphate			*	*	*	*		
p,p'-DDD						*		
p,p'-DDE						*		
p,p'-DDT						*		
Total PCBs			*	*	*	*		
Pentachlorophenol	*		*	*	*	*		
Phenanthrene	✓	✓	*	*	*	*	✓	
Propionitrile	*	*						
Sulprofos	*	*	*	*	*	*	*	
tert-Butyl ethyl ether			*	*	*	*		
Tetrachloroethene		✓	✓	✓	✓	✓		✓
Tetrachloromethane			*	*	*	*		✓
Tetraethyl pyrophosphate (TEPP)	*	*	*	*	*	*	*	
Tokuthion	*	*	*	*	*	*	*	
Toxaphene	*		*	*	*	*		
trans-1,2-Dichloroethene								*
trans-1,3-Dichloropropene			*	*	*	*		*
trans-1,4-Dichloro-2-butene		*	*	*	*	*		
Tribromomethane			*					*
Trichloroethene		✓	✓	✓	✓			✓
Trichloronate	*	*	*	*	*	*	*	
Vinyl Chloride	*	*	✓	*	*	*	*	*
Xylene								✓

Table C-2
Summary of Chemicals of Potential Concern
(Detected and Non-Detected)
Vienna Wells Site

Chemical	Medium/Location							
	Soil		Groundwater			Surface Water	Sediment	Indoor Air
	On-site Surface Soil	On-site Subsurface Soil	On-site Groundwater Monitoring Wells	Off-site Residential Wells	Vienna City Wells	Off-site Surface Water	Off-site Sediment	Off-site Indoor Air & Subslab Soil Gas
Inorganics (Metals and Anions)								
Aluminum	✓	✓						
Antimony	✓	✓	*	*	*			
Arsenic	✓	✓	*	✓	*	✓	✓	
Cadmium	✓	✓	*	*	*			
Chromium	✓	✓	✓	*	*		✓	
Cobalt	✓	✓						
Copper	✓							
Iron	✓	✓						
Lead	✓							
Manganese	✓	✓						
Mercury	✓	✓	*	*	*			
Thallium	✓	✓	*	✓	*	*	✓	
Vanadium	✓	✓						
Bromide			*	*	*	*		
Chloride			*	*	*			
Fluoride			✓		✓			
Nitrate			✓		✓			
Sulfate			*	*	*			

* Constituent selected as COPC because the maximum laboratory reporting limit exceeded the applicable screening level or there was no screening level available.

✓ Constituent selected as COPC because maximum detected concentration exceeded the applicable screening level.

Table C-3
Chemicals of Potential Concern
(Detected)
Vienna Wells Site

Chemical	Soil		Groundwater			Surface Water	Sediment	Indoor Vapor
	Surface/Shallow (0 – 0.5 ft bgs)	Subsurface (0.5 - 18 ft bgs)	On-Site	Off-Site	COV-03			
VOC								
1,1,2-Trichloroethane								X
1,2,4-Trichlorobenzene								X
1,2-Dichloroethane								X
1,3-Dichlorobenzene		X						
1,3,5-Trichlorobenzene								X
4-Isopropyltoluene			X	X		X		
Benzene			X					X
Bromodichloromethane				X				X
Bromomethane								X
Carbon Tetrachloride (Tetrachloromethane)								X
Chloroform (Trichloromethane)			X	X				X
Ethylbenzene								X
m,p-Xylenes								X
Methylene Chloride (Dichloromethane)								X
n-Butyl methyl ketone (2-Hexanone)								X
o-Xylene								X
Tetrachloroethene		X	X	X	X	X		X
Trichloroethene		X	X	X	X			X
Vinyl Chloride			X					

Table C-3
Chemicals of Potential Concern
(Detected)
Vienna Wells Site

Chemical	Soil		Groundwater			Surface Water	Sediment	Indoor Vapor
	Surface/Shallow (0 – 0.5 ft bgs)	Subsurface (0.5 - 18 ft bgs)	On-Site	Off-Site	COV-03			
SVOC								
Acenaphthylene	X						X	
Benzo[a]anthracene	X						X	
Benzo[a]pyrene	X	X					X	
Benzo[b]fluoranthene	X						X	
Benzo[k]fluoranthene	X							
Dibenzo[a,h]anthracene	X						X	
Indeno[1,2,3-cd]pyrene	X							
Phenanthrene	X	X					X	
Pesticide/PCBs								
Aroclor 1254	X							
Dieldrin	X		X					
Inorganic (Metals/Ions)								
Aluminum	X	X						
Antimony	X	X						
Arsenic	X	X		X		X	X	
Cadmium	X	X						
Chromium (Total)	X	X	X				X	
Cobalt	X	X						
Copper	X							
Iron	X	X						
Lead	X							
Manganese	X	X						
Mercury (assume elemental)	X	X						

Table C-3
Chemicals of Potential Concern
(Detected)
Vienna Wells Site

Chemical	Soil		Groundwater			Surface Water	Sediment	Indoor Vapor
	Surface/Shallow (0 – 0.5 ft bgs)	Subsurface (0.5 - 18 ft bgs)	On-Site	Off-Site	COV-03			
Thallium	X	X		X			X	
Vanadium	X	X						
Fluoride			X		X			
Nitrate			X		X			

Table C-4
Chemicals of Potential Concern
(Detected - Not Retained)
Vienna Wells Site

Chemical	Soil		Groundwater			Surface Water	Sediment	Indoor Vapor[3]
	Surface/Shallow (0-0.5 ft bgs)	Subsurface (1-18 ft bgs)	On-Site	Off-Site	COV-03			
Volatile Organic Compounds (VOCs)								
1,1,2-Trichloroethane								X
1,2,4-Trichlorobenzene								X
1,2-Dichloroethane								X
1,3-Dichlorobenzene		X[5]						
1,3,5-Trichlorobenzene								X
4-Isoproyltoluene			X[5]	X[5]		X[5]		
Bromodichloromethane				X[4]				X
Bromomethane								X
Carbon Tetrachloride (Tetrachloromethane)								X
Chloroform (Trichloromethane)			X[4]	X[4]				
Ethylbenzene								X
m,p-Xylenes								X
Methylene Chloride (Dichloromethane)								X
n-Butyl methyl ketone (2-Hexanone)								X
o-Xylene								X
Inorganic (Metals/Ions)								
Aluminum[1]	X	X						
Arsenic[1]	X	X		X		X	X	
Chromium[1]	X	X	X				X	
Manganese[1]	X	X						
Thallium[2]	X	X		X			X	

Table C-4
Chemicals of Potential Concern
(Detected - Not Retained)
Vienna Wells Site

[1] As discussed in the uncertainties for risks section in the BLRA report, these metals were not analyzed in the soil background samples. The levels of these elements detected at the VWS could be attributed to background. Background levels are based on typical naturally occurring concentrations, typical Maries County background concentrations or typical background concentrations in the five countries surrounding Maries County.
[2] As discussed in the uncertainties for risks section in the BLRA report, the concentration of thallium measured in the soil background sample could be attributed to background characteristics.
[3] As discussed in the uncertainties for risks section in the BLRA report, the PCOCs detected in the indoor vapor samples were from indoor sources on the properties and not from the VWS.
[4] Chloroform and bromodichloromethane were detected in the indoor vapor samples but were not detected above MCLs in any groundwater samples.
[5] Risk levels have not been established for 1,3-dichlorobenzene in soil or for 4-isoproyltoluene in water. However, remedial technologies that remediate VOCs would likely address these COCs.

Table C-5
Chemicals of Concern
(Preliminary Remediation Goals for Soil/Sediment)
Vienna Wells Site

Chemical of Concern (COC)	CAS No.	Maximum Soil Concentration[5] (µg/kg)		Maximum Sediment Conc[5] (µg/kg)	Soil/Sediment EPA Soil Regional Screening Levels[6] (µg/kg)			Preliminary Remedial Goal (PRG)	
		Surface/ Shallow 0-0.5 ft	Subsurface 0.5-18 ft	Off-Site Max	Residential SSL; 10^6; HI<0.1	GWP Risk SSL	GWP MCL SSL	µg/kg	Rationale
Volatile Organic Compounds (VOCs)									
Benzene[1]	71-43-2	Not identified in soil above risk levels, only identified in groundwater or surface water.							
Tetrachloroethene	127-18-4		65,400		8,100	1.8	2.3	2.3	TBC, GWP MCL SSL, identified in GW
Trichloroethene	79-01-6		1,210		410	0.10	1.8	1.8	
Vinyl Chloride[1]	75-01-4	Not identified in soil above risk levels, only identified in groundwater or surface water.							
Semi-volatile Organic Compounds (SVOCs) All of these SVOCs are Polynuclear Aromatic Hydrocarbons (PAHs)									
Acenaphthylene[2]	83-32-9	1,600J		0.077 J	360,000	55	NL	360,000	TBC, Residential SSL; only in surface soil, extent is limited, and not present in GW
Benzo[a]anthracene[2]	56-55-3	9,100		240J	160	4.20	NL	160	
Benzo[a]pyrene[2]	50-32-8	6,400	58J	280J	16	4	240	16	
Benzo[b]fluoranthene[2]	205-99-2	12,000		650J	1,600	41	NL	1,600	
Benzo[k]fluoranthene[2]	207-38-0	4,300			1,600	400	NL	1,600	
Dibenzo[a,h]anthracene[2]	53-70-3	47J		39J	16	13	NL	16	
Indeno[1,2,3-cd]pyrene[2]	193-39-5	1,600J			160	130	NL	160	
Phenanthrene[2]	85-01-6	650	20J	31J	NL	NL	NL	NL	

Table C-5
Chemicals of Concern
(Preliminary Remediation Goals for Soil/Sediment)
Vienna Wells Site

Chemical of Concern (COC)	CAS No.	Maximum Soil Concentration[5] (µg/kg)		Maximum Sediment Conc[5] (µg/kg)	Soil/Sediment EPA Soil Regional Screening Levels6 (µg/kg)			Preliminary Remedial Goal (PRG)	
		Surface/ Shallow 0-0.5 ft	Subsurface 0.5-18 ft	Off-Site Max	Residential SSL; 10^6; HI<0.1	GWP Risk SSL	GWP MCLSSL	µg/kg	Rationale
Pesticide/PCBs									
Dieldrin	60-57-1	50			34	0.071	NL	0.071	TBC, GWP Risk SSL, identified in GW
Aroclor 1254[2]	11097-69-1	1,200J			120	2	NL	120	TBC, Residential SSL; only in surface soil, not present in GW
Inorganic (Metals/Ions)									
Antimony[3]	7440-36-0	25,000J	4,500J		3,100	35	270	3,100	TBC, Residential SSL; but not above MCL in GW
Cadmium[4]	7440-43-9	16,000	8,900		71,000	69	380	71,000	
Cobalt[4]	7440-48-4	18,600J	88,900		2,300	27	NL	2,300	
Copper[3]	7440-50-8	1,500,000			310,000	2,800	46,000	310,000	
Iron[4]	7439-89-6	27,400,000	95,600,000		5,500,000	35,000	NL	5,500,000	

Table C-5
Chemicals of Concern
(Preliminary Remediation Goals for Soil/Sediment)
Vienna Wells Site

Chemical of Concern (COC)	CAS No.	Maximum Soil Concentration5 (µg/kg)		Maximum Sediment Conc [5] (µg/kg)	Maximum Soil Concentration[5] (µg/kg)			Maximum Sediment Conc [5] (µg/kg)	
		Surface/ Shallow 0-0.5 ft	Subsurface 0.5-18 ft	Off-Site Max	Residential SSL; 10^6; HI<0.1	GWP Risk SSL	GWP MCL SSL	µg/kg	Rationale
Lead[4]	7439-92-1	1,000,000J			400,000	NL	14,000	400,000	
Mercury[4]	7439-97-6	970	1,600		1,100	3.3	100	1,100	TBC, Residential SSL; but not above MCL in GW
Vanadium[4]	7440-62-2	52,300	126,000		39,000	8,600	NL	39,000	
Fluoride[1]	16984-48-8	Not identified in soil above risk levels, only identified in groundwater or surface water.							
Nitrate[1]	14797-55-8								

Table C-5
Chemicals of Concern
(Preliminary Remediation Goals for Soil/Sediment)
Vienna Wells Site

General Abbreviations: ARAR - Applicable or Relevant and Appropriate Requirement; COC - Chemical of Concern; BLRA – Final Baseline Risk Assessment Report (BVSPC, 2016); facility – former hat factory; GW - groundwater; GWP - groundwater protection (e.g., protection of domestic groundwater use pathway); MCL - Maximum Contaminant Level; NL - no limit/criteria listed; PAHs – Polynuclear aromatic hydrocarbons; PRG - Preliminary Remedial Goal; SVOCs – semi-volatile organic compounds; SSL - soil screening level; TBC - to be considered; VOCs – volatile organic compounds.

Notes (COC Considerations)

[1]Several of the COCs were identified in groundwater or surface water above risk levels.

[2]As discussed in the BLRA, some of the organics detected in the soils and sediments are ubiquitous in the environment, and could be present due to non-Site related or anthropogenic sources. Including the risks from these compounds could result in overestimate of risk. The PAHs identified as COCs were only detected in limited areas on-Site in shallow soil or sediments. In addition, reviews of the facility's process information did not identify processes that would generate PAHs. Therefore, although PAHs were retained as COCs and were used in the evaluation and screening of remedial technologies and process options, because of their limited extent and possible non-Site related origin they were not used as the primary COCs used to determine what remedial activities would need to be implemented. The limited volumes of PAH contaminated soils will be addressed as needed.

[3]Aroclor 1254 was only detected in limited areas on-Site in shallow soil. Although it was retained as a COC and considered in the evaluation and screening of RT/POs, because of its limited extent it was not used as the primary COCs used to determine what remedial activities would need to be implemented. The limited volume of Aroclor 1254 contaminated soils will be addressed as needed.

[4]As discussed in the BLRA, some of the inorganics detected in the soils and sediments are ubiquitous in the environment and could be present due to non-Site related sources. The detected levels of the metals identified as COCs may actually be within the background ranges for these metals.

The BLRA and this FS could not eliminate these metals as being at or below background levels due to the lack of background soil samples for comparison. The need for additional metals background sampling is noted as a data gap in Table 1-1. In addition, reviews of the facility's process information did not identify processes that would generate metals' releases. Therefore, although these metals were retained as COCs and were used in the evaluation and screening of remedial technologies and process options, because of their probable non-Site related origin they were not used as the primary COCs used to determine what remedial activities would need to be implemented.

References

[5]Maximum soil and sediment concentration data source: RI Report (USGS, 2017).

[6]Soil and sediment screening levels: EPA, 2017.

Table C-6
Chemicals of Concern
(Preliminary Remediation Goals for Groundwater/Surface Water)
Vienna Wells Site

Chemical	CAS No.	Groundwater Maximum Concentration (µg/L)[3]			Groundwater Regional Screening Levels (µg/L)[4]		Preliminary Remediation Goal		Surface Water Max Conc	Surface Water Regional Screening Levels (µg/L)			Preliminary Remediation Goal	
		On-Site	Off-Site	COV-03 Max	Tap Risk[1] c:10[6], n:0.1	MCL	µg/L	Rationale	(µg/L)[3]	NRWQS	MoWQS[5]		µg/L	Rationale
Volatile Organic Compounds (VOCs)														
Benzene	71-43-2	4.19			0.45 c	5	5	ARAR, MCL	Not identified in surface water above screening levels.[2]					
Tetrachloroethene	127-18-4	1140	49	7.11	4.1 n	5	5		8.32	0.69	0.8	0.8	TBC, MoWQS	
Trichloroethene	79-01-6	3.3	0.423	0.462	0.28 n	5	5		Not identified in surface water above screening levels.[2]					
Vinyl Chloride	75-01-4	0.06			0.019 c	2	2							
Semi-volatile Compounds (SVOCs)														
Acenaphthylene	83-32-9	Not identified in groundwater screening levels.[2]				NL	NA	Not detected above risk levels in GW	Not identified in surface water above screening levels.[2]					
Benzo[a]anthracene	56-55-3					NL								
Benzo[a]pyrene	50-32-8					0.2								
Benzo[b]fluoranthene	205-99-2					NL								
Benzo[k]fluoranthene	207-38-0					NL								
Dibenzo[a,h]anthracene	53-70-3					NL								
Indeno[1,2,3-cd]pyrene	193-39-5					NL								
Phenanthrene	85-01-6					NL								

Table C-6
Chemicals of Concern
(Preliminary Remediation Goals for Groundwater/Surface Water)
Vienna Wells Site

Chemical	CAS No.	Groundwater Maximum Concentration (µg/L)3			Groundwater Regional Screening Levels (µg/L)4		Preliminary Remediation Goal		Surface Water Max Conc	Surface Water Regional Screening Levels (µg/L)		Preliminary Remediation Goal	
		On-Site	Off-Site	COV-03 Max	Tap Risk[1] c:10^6, n:0.1	MCL	µg/L	Rationale	(µg/L)[3]	NRWQS	MoWQS[5]	µg/L	Rationale
Pesticide/PCBs													
Aroclor 1254	11097-69-1	Not identified in groundwater screening levels.[2]				NL	NA	Not detected above risk levels in GW	Not identified in surface water above screening levels.[2]				
Dieldrin	60-57-1	0.008			0.0018 c	NL	0.0018	TBC, No MCL, Tap Risk	Not identified in surface water above screening levels.[2]				
Inorganic (Metals/Ions)													
Antimony	7440-36-0	Not identified in groundwater screening levels.[2]				6	NA	Not detected above risk levels in GW	Not identified in surface water above screening levels.[2]				
Cadmium	7440-43-9					5							
Cobalt	7440-48-4					NL							
Copper	7440-50-8					1,300							
Iron	7439-89-6					NL							
Lead	74-39-97-6					15							
Mercury	7439-97-6					2							

Table C-6
Chemicals of Concern
(Preliminary Remediation Goals for Groundwater/Surface Water)
Vienna Wells Site

Chemical	CAS No.	Groundwater Maximum Concentration (µg/L)[3]			Groundwater Regional Screening Levels (µg/L)[4]		Preliminary Remediation Goal		Surface Water Max Conc	Surface Water Regional Screening Levels (µg/L)		Preliminary Remediation Goal	
		On-Site	Off-Site	COV-03 Max	Tap Risk[1] c:10^6, n:0.1	MCL	µg/L	Rationale	(µg/L)[3]	NRW QS	MoW QS[5]	µg/L	Rationale
Vanadium	7440-62-2	Not identified in groundwater screening levels.[2]				NL	NA	Not detected above risk levels in GW	Not identified in surface water above screening levels.[2]				
Fluoride	16984-48-8	100		100	80 n	2,000 SDWR	2,000	TBC, SDWR					
Nitrate	14797-55-8	3,700		7,400	3,200 n	10,000	10,000	ARAR, MCL					

General Abbreviations: ARAR-Applicable or Relevant and Appropriate Requirement; COC-Chemical of Concern; SDWR-Safe Drinking Water Requirement; GW-groundwater; MCL-Maximum Contaminant Limit; MoWQS-Missouri Water Quality Standard; NA-not applicable; NL-no limit/criteria listed; Secondary Drinking Water Requirement; NRWQC-National Recommended Water Quality Criteria; TBC-to be considered.

Notes (General)

[1]For tap water risk "c" - 10^6 cancer risk; "n" - 0.1 non-cancer hazard risk.

Notes (COC Considerations)

[2]Several of the COCs that were identified in soil and sediment were not identified in groundwater or surface water above risk levels.

References

[3]Maximum groundwater and surface water concentration data source: BVSPC, 2016.

[4]Groundwater screening levels: EPA, 2017.

[5]Sufarce water quality levels: MNDR, 2017.

Table C-7
Demographic Profile of Vienna, Missouri (2010 Census)
Vienna Wells Site

Subject	Vienna City, Missouri		Maries County, Missouri		Missouri	
	Number	Percent	Number	Percent	Number	Percent
SEX AND AGE						
Total population	610	100.0	9,176	100.0	5,988,927	100.0
Under 5 years	40	6.6	562	6.1	390,237	6.5
5 to 9 years	39	6.4	586	6.4	390,463	6.5
10 to 14 years	29	4.8	627	6.8	396,925	6.6
15 to 19 years	28	4.6	601	6.5	423,786	7.1
20 to 24 years	37	6.1	468	5.1	413,289	6.9
25 to 29 years	29	4.8	450	4.9	403,239	6.7
30 to 34 years	27	4.4	483	5.3	372,228	6.2
35 to 39 years	28	4.6	504	5.5	368,070	6.1
40 to 44 years	31	5.1	564	6.1	380,546	6.4
45 to 49 years	46	7.5	763	8.3	444,766	7.4
50 to 54 years	44	7.2	701	7.6	443,806	7.4
55 to 59 years	27	4.4	644	7.0	389,985	6.5
60 to 64 years	29	4.8	577	6.3	333,293	5.6
65 to 69 years	43	7.0	528	5.8	257,053	4.3
70 to 74 years	31	5.1	423	4.6	193,437	3.2
75 to 79 years	26	4.3	310	3.4	155,271	2.6
80 to 84 years	33	5.4	235	2.6	118,754	2.0
85 years and over	43	7.0	150	1.6	113,779	1.9
Median age (years)	47.3	(X)	42.8	(X)	37.9	(X)
16 years and over	493	80.8	7,273	79.3	4,730,501	79.0
18 years and over	483	79.2	7,022	76.5	4,563,491	76.2
21 years and over	467	76.6	6,702	73.0	4,300,988	71.8
62 years and over	192	31.5	1,961	21.4	1,030,757	17.2
65 years and over	176	28.9	1,646	17.9	838,294	14.0
Male population	290	47.5	4,638	50.5	2,933,477	49.0
Under 5 years	17	2.8	310	3.4	199,528	3.3
5 to 9 years	22	3.6	288	3.1	199,591	3.3
10 to 14 years	19	3.1	324	3.5	203,213	3.4
15 to 19 years	11	1.8	326	3.6	216,939	3.6
20 to 24 years	21	3.4	239	2.6	207,793	3.5
25 to 29 years	15	2.5	225	2.5	201,438	3.4
30 to 34 years	14	2.3	256	2.8	186,306	3.1
35 to 39 years	15	2.5	259	2.8	183,144	3.1
40 to 44 years	19	3.1	259	2.8	188,854	3.2
45 to 49 years	23	3.8	406	4.4	220,099	3.7
50 to 54 years	20	3.3	352	3.8	218,081	3.6
55 to 59 years	15	2.5	336	3.7	188,437	3.1
60 to 64 years	15	2.5	292	3.2	159,520	2.7
65 to 69 years	17	2.8	240	2.6	121,239	2.0
70 to 74 years	12	2.0	213	2.3	88,753	1.5
75 to 79 years	9	1.5	153	1.7	67,506	1.1
80 to 84 years	15	2.5	107	1.2	47,180	0.8
85 years and over	11	1.8	53	0.6	35,856	0.6
Median age (years)	42.8	(X)	41.7	(X)	36.5	(X)
16 years and over	228	37.4	3,649	39.8	2,289,523	38.2
18 years and over	225	36.9	3,514	38.3	2,203,779	36.8
21 years and over	216	35.4	3,334	36.3	2,070,483	34.6
62 years and over	73	12.0	929	10.1	452,502	7.6
65 years and over	64	10.5	766	8.3	360,534	6.0
Female population	320	52.5	4,538	49.5	3,055,450	51.0
Under 5 years	23	3.8	252	2.7	190,709	3.2
5 to 9 years	17	2.8	298	3.2	190,872	3.2
10 to 14 years	10	1.6	303	3.3	193,712	3.2
15 to 19 years	17	2.8	275	3.0	206,847	3.5

Table C-7
Demographic Profile of Vienna, Missouri (2010 Census)
Vienna Wells Site

Subject	Vienna City, Missouri		Maries County, Missouri		Missouri	
	Number	Percent	Number	Percent	Number	Percent
20 to 24 years	16	2.6	229	2.5	205,496	3.4
25 to 29 years	14	2.3	225	2.5	201,801	3.4
30 to 34 years	13	2.1	227	2.5	185,922	3.1
35 to 39 years	13	2.1	245	2.7	184,926	3.1
40 to 44 years	12	2.0	305	3.3	191,692	3.2
45 to 49 years	23	3.8	357	3.9	224,667	3.8
50 to 54 years	24	3.9	349	3.8	225,725	3.8
55 to 59 years	12	2.0	308	3.4	201,548	3.4
60 to 64 years	14	2.3	285	3.1	173,773	2.9
65 to 69 years	26	4.3	288	3.1	135,814	2.3
70 to 74 years	19	3.1	210	2.3	104,684	1.7
75 to 79 years	17	2.8	157	1.7	87,765	1.5
80 to 84 years	18	3.0	128	1.4	71,574	1.2
85 years and over	32	5.2	97	1.1	77,923	1.3
Median age (years)	50.7	(X)	43.5	(X)	39.2	(X)
16 years and over	265	43.4	3,624	39.5	2,440,978	40.8
18 years and over	258	42.3	3,508	38.2	2,359,712	39.4
21 years and over	251	41.1	3,368	36.7	2,230,505	37.2
62 years and over	119	19.5	1,032	11.2	578,255	9.7
65 years and over	112	18.4	880	9.6	477,760	8.0
RACE						
Total population	610	100.0	9,176	100.0	5,988,927	100.0
One Race	605	99.2	9,072	98.9	5,864,338	97.9
White	600	98.4	8,964	97.7	4,958,770	82.8
Black or African American	1	0.2	24	0.3	693,391	11.6
American Indian and Alaska Native	4	0.7	54	0.6	27,376	0.5
Asian	0	0.0	5	0.1	98,083	1.6
Asian Indian	0	0.0	0	0.0	23,223	0.4
Chinese	0	0.0	0	0.0	22,104	0.4
Filipino	0	0.0	2	0.0	10,914	0.2
Japanese	0	0.0	0	0.0	3,186	0.1
Korean	0	0.0	3	0.0	9,249	0.2
Vietnamese	0	0.0	0	0.0	14,523	0.2
Other Asian [1]	0	0.0	0	0.0	14,884	0.2
Native Hawaiian and Other Pacific	0	0.0	1	0.0	6,261	0.1
Native Hawaiian	0	0.0	0	0.0	958	0.0
Guamanian or Chamorro	0	0.0	1	0.0	969	0.0
Samoan	0	0.0	0	0.0	1,557	0.0
Other Pacific Islander [2]	0	0.0	0	0.0	2,777	0.0
Hispanic or Latino (of any race)	3	0.5	75	0.8	212,470	3.5
Not Hispanic or Latino	607	99.5	9,101	99.2	5,776,457	96.5
Total households	264	100.0	3,705	100.0	2,375,611	100.0
Family households (families) [7]	134	50.8	2,601	70.2	1,552,133	65.3
With own children under 18 years	58	22.0	983	26.5	676,727	28.5
Husband-wife family	100	37.9	2,097	56.6	1,150,929	48.4
With own children under 18 years	36	13.6	714	19.3	449,855	18.9
Male householder, no wife present	13	4.9	206	5.6	109,000	4.6
With own children under 18 years	8	3.0	108	2.9	58,729	2.5
Female householder, no husband	21	8.0	298	8.0	292,204	12.3
With own children under 18 years	14	5.3	161	4.3	168,143	7.1
Nonfamily households [7]	130	49.2	1,104	29.8	823,478	34.7
Householder living alone	124	47.0	970	26.2	672,276	28.3
Male	50	18.9	463	12.5	298,358	12.6
65 years and over	24	9.1	169	4.6	67,247	2.8
Female	74	28.0	507	13.7	373,918	15.7
65 years and over	58	22.0	324	8.7	172,744	7.3

Table C-7
Demographic Profile of Vienna, Missouri (2010 Census)
Vienna Wells Site

Subject	Vienna City, Missouri		Maries County, Missouri		Missouri	
	Number	Percent	Number	Percent	Number	Percent
Households with individuals under 18	62	23.5	1,111	30.0	754,287	31.8
Households with individuals 65 years	116	43.9	1,175	31.7	595,032	25.0
Average household size	2.06	(X)	2.46	(X)	2.45	(X)
Average family size [7]	2.88	(X)	2.92	(X)	3.00	(X)
HOUSING OCCUPANCY						
Total housing units	341	100.0	4,611	100.0	2,712,729	100.0
Occupied housing units	264	77.4	3,705	80.4	2,375,611	87.6
Vacant housing units	77	22.6	906	19.6	337,118	12.4
For rent	43	12.6	105	2.3	92,946	3.4
Rented, not occupied	4	1.2	8	0.2	4,290	0.2
For sale only	4	1.2	39	0.8	44,200	1.6
Sold, not occupied	0	0.0	8	0.2	11,098	0.4
For seasonal, recreational, or	2	0.6	324	7.0	80,374	3.0
All other vacants	24	7.0	422	9.2	104,210	3.8
Homeowner vacancy rate (percent) [8]	2.6	(X)	1.3	(X)	2.6	(X)
Rental vacancy rate (percent) [9]	26.4	(X)	12.1	(X)	11.1	(X)
HOUSING TENURE						
Occupied housing units	264	100.0	3,705	100.0	2,375,611	100.0
Owner-occupied housing units	148	56.1	2,951	79.6	1,633,610	68.8
Population in owner-occupied	336	(X)	7,336	(X)	4,145,569	(X)
Average household size of owner-	2.27	(X)	2.49	(X)	2.54	(X)
Renter-occupied housing units	116	43.9	754	20.4	742,001	31.2
Population in renter-occupied	207	(X)	1,773	(X)	1,669,216	(X)
Average household size of renter-	1.78	(X)	2.35	(X)	2.25	(X)

Source: Obtained from U.S. Census Bureau (2014), based on 2010 Census Data.
NOTE: For more information on confidentiality protection, nonsampling error, and definitions, see http://www.census.gov/prod/cen2010/doc/dpsf.pdf.

xposure Point(s)	Receptor Population	Receptor Age	Exposure Route	On-Site/Off-Site	Type of Analysis [1]	Rationale for Selection or Exclusion of Exposure
eeks and Streams ream from Source Area)	Recreational User	Adolescent	Dermal Absorption	Off-site	Quant	Adolescent recreational users may be exposed (via dermal contact) to contaminants in Surface Water.
			Ingestion	Off-site	Quant	Adolescent recreational users may be exposed (via incidental ingestion) to contaminants in Surface Water.
eeks and Streams ream from Source Area)	Recreational User	Adolescent	Dermal Absorption	Off-site	Quant	Adolescent recreational users may be exposed (via dermal contact) to contaminants in Sediment.
			Ingestion	Off-site	Quant	Adolescent recreational users may be exposed (via incidental ingestion) to contaminants in Sediment.
	Resident	Child	Dermal Absorption	On-site	Quant	Child Residents may be exposed (via dermal contact) to contaminants in surface soil.
			Inhalation (Dust)	On-site	Quant	Child Residents may be exposed (via inhalation) to dusts/particulate matter from surface soil.
			Ingestion	On-site	Quant	Child Residents may be exposed (via ingestion) to contaminants in surface soil.
		Lifetime (Adult/Child Combined)	Dermal Absorption	On-site	Quant	Lifetime residents (adult and child cancer risk combined) may be exposed (via dermal contact) to contaminant
			Inhalation (Dust)	On-site	Quant	Lifetime residents (adult and child cancer risk combined) may be exposed (via inhalation) to dusts/particulate
nsite Source Area			Ingestion	On-site	Quant	Lifetime residents (adult and child cancer risk combined) may be exposed (via ingestion) to contaminants in s
	Industrial/Commercial Worker	Adult	Dermal Absorption	On-site	Quant	Industrial/Commercial Workers may be exposed (via dermal contact) to contaminants while performing work d
			Inhalation (Dust)	On-site	Quant	Industrial/Commercial Workers may be exposed (via inhalation) to dusts/particulate matter from soil while perf
			Ingestion	On-site	Quant	Industrial/Commercial Workers may be exposed (via ingestion) to contaminants while performing work duties.
	Recreational User	Adolescent	Dermal Absorption	On-site	Quant	Adolescent recreational users may be exposed (via dermal contact) to contaminants in surface soil.
			Inhalation (Dust)	On-site	Quant	Adolescent recreational users may be exposed (via inhalation) to dusts/particulate matter from surface soil.
			Ingestion	On-site	Quant	Adolescent recreational users may be exposed (via ingestion) to contaminants in surface soil.
	Resident	Child	Inhalation (Vapors)	On-site	Quant	Child Residents may be exposed (via inhalation) to vapors from surface and subsurface soil.
		Lifetime (Adult/Child Combined)	Inhalation (Vapors)	On-site	Quant	Lifetime residents (adult and child cancer risk combined) may be exposed (via inhalation) to vapors from surfa
	Industrial/Commercial Worker	Adult	Inhalation (Vapors)	On-site	Quant	Industrial/Commercial Workers may be exposed (via inhalation) to vapors from surface and subsurface soil wh
nsite Source Area	Recreational User	Adolescent	Inhalation (vapors)	On-site	Quant	Adolescent recreational users may be exposed (via inhalation) to vapors from surface and subsurface soil.
	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction Workers may be exposed (via dermal contact) to contaminants in surface and subsurface soil wh
			Inhalation (Dust and Vapors)	On-site	Quant	Construction Workers may be exposed (via inhalation) to dusts/particulate matter and vapors from surface an
			Ingestion	On-site	Quant	Construction Workers may be exposed (via ingestion to contaminants in surface and subsurface soil while per
	Industrial/Commercial Worker	Adult	Dermal Absorption	On-site	Qual	Industrial/Commercial workers may be exposed (via dermal contact) to constituents in groundwater; however,
			Inhalation	On-site	Qual	Industrial/Commercial workers may be exposed (via inhalation) to vapors associated with groundwater use; ho
			Ingestion	On-site	Quant	Industrial/Commercial workers may be exposed (via ingestion) to constituents in groundwater.
	Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction workers may be exposed (via dermal contact) to constituents in shallow groundwater (if it could p
			Inhalation	On-site	Quant	Construction workers may be exposed (via inhalation) to vapors from groundwater in an excavation trench.
nsite Source Area			Ingestion	On-site	Quant	Construction workers may be exposed (via incidental ingestion) to constituents in shallow groundwater (if it co
	Resident	Child	Dermal Absorption	On-site	Quant	Child residents may be exposed (via dermal contact) to constituents in groundwater.
			Inhalation	On-site	Quant	Child residents may be exposed (via inhalation) to vapors associated with use of groundwater.
			Ingestion	On-site	Quant	Child residents may be exposed (via ingestion) to constituents in groundwater.
		Lifetime (Adult/Child Combined)	Dermal Absorption	On-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed (via dermal contact) to constituer
			Inhalation	On-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed (via inhalation) to vapors associa
			Ingestion	On-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed (via ingestion) to constituents in g
	Ind/Com Worker	Adult	Inhalation	On-site	Quant	Industrial/Commercial workers may be exposed (via inhalation) to indoor vapors associated with vapor intrusic
nsite Source Area	Recreational User	Adolescent	Inhalation	On-site	Quant	Recreational user/trespasser may be exposed (via inhalation) to indoor vapors associated with vapor intrusion
	Resident	Child	Inhalation	On-site	Quant	Child residents may be exposed (via inhalation) to indoor vapors associated with vapor intrusion from groundv
		Lifetime (Adult/Child Combined)	Inhalation	On-site	Quant	Cancer risk combined for adult/child (lifetime residents) who may be exposed (via inhalation) to indoor vapors
	Resident	Child	Dermal Absorption	Off-site	Quant	Child residents may be exposed (via dermal contact) to constituents in groundwater.
			Inhalation	Off-site	Quant	Child residents may be exposed (via inhalation) to vapors associated with use of groundwater.
te Residential Areas			Ingestion	Off-site	Quant	Child residents may be exposed to constituents in groundwater.
		Lifetime (Adult/Child Combined)	Dermal Absorption	Off-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed (via dermal contact) to contamina
			Inhalation	Off-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed (via inhalation) to vapors associa
			Ingestion	Off-site	Quant	Cancer risk combined for adult/child (lifetime resident) who may be exposed to contaminants in groundwater.
te Residential Areas	Resident	Child	Inhalation	Off-site	Quant	Child residents may be exposed (via inhalation) to indoor vapors associated with vapor intrusion from groundv
		Lifetime (Adult/Child Combined)	Inhalation	Off-site	Quant	Cancer risk combined for adult/child (lifetime residents) who may be exposed (via inhalation) to indoor vapors

ıta available for the respective exposure medium. Quantitative evaluations will only be conducted for those pathways supported with adequate useable data.

Table C-9
Exposure Parameters for Residents
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME			
			Adult	Source	Child	Source
General	Body Weight	kg	80	(1)	15	(1)
	Exposure Time (Inhalation)	hours/day	24	(1)	24	(1)
	Exposure Frequency	days/yr	350	(1)	350	(1)
	Exposure Duration	years	20	(1)	6	(1)
	Averaging Time, Cancer	days	25550	(2, a)	25550	(2, a)
	Averaging Time, Noncancer	days	NA	(b)	2190	(2, a)
Soil Ingestion	Ingestion Rate	mg/day	100	(1)	200	(1)
	Conversion Factor	kg/mg	1.00E-06	--	1.00E-06	--
Soil Vapor Inhalation	Volatilization Factor (VF)	m^3/kg	CS	see Appendix H	CS	see Appendix H
Dust Inhalation	Particulate Emission Factor	m^3/kg	1.36E+09	(4)	1.36E+09	(4)
Soil Dermal Exposure	Exposed Skin Surface Area (SA)	cm^2/event	6,032	(1)	2,690	(1)
	Adherence Factor (AF)	mg/cm^2	0.07	(1)	0.2	(1)
	Event Frequency	events/day	1	(3)	1	(3)
	Dermal Absorption Fraction (ABS)	unitless	CS	see Table 3-13	CS	see Table 3-13
	Conversion Factor	kg/mg	1.00E-06	--	1.00E-06	--
Groundwater Ingestion	Ingestion Rate	L/day	2.5	(1)	0.78	(1)
Groundwater Dermal	Exposed Skin Surface Area (SA)	cm^2/event	20,900	(1)	6,378	(1)
	Dermal Permeability Constant (K_p)	cm/hour	CS	see Table 3-2	CS	see Table 3-2
	t_{event}	hour/event	0.71	(1)	0.54	(1)
	Event Frequency	events/day	1	(3)	1	(3)
	Conversion Factor	L/cm^3	0.001	--	0.001	--
Groundwater Inhalation	Volatilization Factor (K)	L/m^3	0.5	(5)	0.5	(5)
Indoor Vapor Inhalation	No pathway specific parameters	--	--	--	--	--

CS = Chemical Specific value
NA = Not Applicable
RME = Reasonable Maximum Exposure

Sources:
(1) USEPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February, 2014
(2) USEPA 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D. C. EPA/540/1-89/002. December.
(3) USEPA 2004. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/R/99/005. July.
(4) USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December
(5) USEPA, 1991. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals). EPA/540/R-92/003. December

Notes:
(a) Averaging time expressed as days. Noncancer averaging time calculated by muliplying the exposure duration in years by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.
(b) Per EPA Region 7, adult noncancer exposures and hazards will not be calculated.

Table C-10
Exposure Parameters for Industrial/Commercial Workers
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME	
			Adult	Source
General	Body Weight	kg	80	(1)
	Exposure Time (Inhalation)	hours/day	8	(1)
	Exposure Frequency	days/yr	250	(1)
	Exposure Duration	years	25	(1)
	Averaging Time, Cancer	days	25550	(2, a)
	Averaging Time, Noncancer	days	9125	(2, a)
Soil Ingestion	Ingestion Rate	mg/day	100	(1)
	Conversion Factor	kg/mg	1.00E-06	- -
Soil Vapor Inhalation	Volatilization Factor (VF)	m^3/kg	CS	see Appendix H
Dust Inhalation	Particulate Emission Factor	m^3/kg	1.36E+09	(4)
Soil Dermal Exposure	Exposed Skin Surface Area (SA)	cm^2/event	3470	(1)
	Adherence Factor (AF)	mg/cm^2	0.12	(1)
	Event Frequency	events/day	1	(3)
	Dermal Absorption Fraction (ABS)	unitless	CS	see Table 3-13
	Conversion Factor	kg/mg	1.00E-06	- -
Groundwater Ingestion	Ingestion Rate	L/day	1.25	(1, b)
Indoor Vapor Inhalation	No pathway specific parameters	- -	- -	- -

CS = Chemical Specific value
RME = Reasonable Maximum Exposure

Sources:

(1) USEPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February, 2014
(2) USEPA 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D. C. EPA/540/1-89/002. December.
(3) USEPA 2004. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/R/99/005. July.
(4) USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December.

Notes:
(a) Averaging time expressed as days. Noncancer averaging time calculated by muliplying the exposure duration in years by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.
(b) EPA, 2014 does not provide an updated drinking water ingestion rate for a worker. It was assumed that a worker would ingest half of the adult resident drinking water value.

Table C-11
Exposure Parameters for Construction Workers
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME	
			Adult	Source
General	Body Weight	kg	80	(1)
	Exposure Time ($Inhalation_{Dust/Soil\ Vapor}$)	hours/day	8	(4, a)
	Exposure Time ($Inhalation_{Trench\ Vapor}$)	hours/day	2	(4, d)
	Exposure Frequency	days/yr	250	(1, 6, b)
	Exposure Duration	years	1	(1, 6)
	Averaging Time, Cancer	days	25550	(2, 6, c)
	Averaging Time, Noncancer	days	365	(2, 6, c)
Soil Ingestion	Ingestion Rate	mg/day	330	(6, 7)
	Conversion Factor	kg/mg	1.00E-06	- -
Soil Vapor Inhalation	Volatilization Factor (VF)	m^3/kg	CS	see Appendix H
Dust Inhalation	Particulate Emission Factor	m^3/kg	1.28E+06	see Appendix G
Soil Dermal Exposure	Exposed Skin Surface Area (SA)	cm^2/event	5000	(3)
	Adherence Factor (AF)	mg/cm^2	0.3	(5, 6)
	Event Frequency	events/day	1	(5, 6)
	Dermal Absorption Fraction (ABS)	unitless	CS	see Table 3-13
	Conversion Factor	kg/mg	1.00E-06	- -
Groundwater Ingestion	Incidental Ingestion Rate	L/day	0.1	(4)
Groundwater Dermal	Exposed Skin Surface Area (SA)	cm^2/event	4,500	(5)
	Dermal Permeability Constant (K_p)	cm/hour	CS	see Table 3-2
	t_{event}	hour/event	2	(4, d)
	Event Frequency	events/day	1	(4)
	Conversion Factor	L/cm^3	0.001	- -

Table C-11
Exposure Parameters for Construction Workers
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME	
			Adult	Source

CS = Chemical Specific value
RME = Reasonable Maximum Exposure

Sources:
(1) USEPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February, 2014
(2) USEPA 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D. C., EPA/540/1-89/002. December.
(3) USEPA 2011. Exposure Factors Handbook
(4) Professional judgment.
(5) USEPA 2004. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response, Washington, D.C., EPA/540/R/99/005. July.
(6) USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December.
(7) USEPA 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03. March.

Notes:
(a) Assumes a typical work day of 8 hours.
(b) Assumes an RME exposure of 5 days per week for 50 weeks.
(c) Averaging time expressed as days. Noncancer averaging time calculated by muliplying the exposure duration in years by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.
(d) Assumes that a RME construction worker would spend about 2 hours per day in an excavation trench

Table C-12
Exposure Parameters for Recreational Visitors
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME	
			Adolescent	Source
General	Body Weight	kg	43	(2, a)
	Exposure Frequency	days/yr	48	(2, b)
	Exposure Duration	years	10	(3, c)
	Averaging Time, Cancer	days	25550	(1, d)
	Averaging Time, Noncancer	days	3650	(1, d)
Soil Ingestion	Ingestion Rate	mg/day	100	(3, f)
	Conversion Factor	kg/mg	1E-06	- -
Sediment Ingestion	Ingestion Rate	mg/day	100	(3, f)
	Conversion Factor	kg/mg	1E-06	- -
Soil Vapor Inhalation	Exposure Time	hours/day	2	(3, e)
	Volatilization Factor (VF)	m^3/kg	CS	See Appendix H
Dust Inhalation	Exposure Time	hours/day	2	(3, e)
	Particulate Emission Factor	m^3/kg	1.36E+09	(3, k)
Soil Dermal Exposure	Exposed Skin Surface Area (SA)	cm^2/event	7170	(2, g)
	Adherence Factor (AF)	mg/cm^2	0.2	(3, 4, h)
	Event Frequency	events/day	1	(4)
	Dermal Absorption Fraction (ABS)	unitless	CS	see Table 3-13
	Conversion Factor	kg/mg	1E-06	- -
Sediment Dermal Exposure	Exposed Skin Surface Area (SA)	cm^2/event	7170	(2, g)
	Adherence Factor (AF)	mg/cm^2	0.2	(3, 4, h)
	Event Frequency	events/day	1	(4)
	Dermal Absorption Fraction (ABS)	unitless	CS	see Table 3-13
	Conversion Factor	kg/mg	1E-06	- -
Surface Water Ingestion	Ingestion Rate	mL/event	37	(2, l)
	Exposure Time	events/day	1	(3, i)
	Conversion Factor	L/mL	1E-03	- -
Surface Water Dermal	Exposed Skin Surface Area (SA)	cm^2/event	8,060	(2, j)
	Dermal Permeability Constant (K_p)	cm/hour	CS	see Table 3-2
	t_{event}	hour/event	3	(3, i)
	Event Frequency	events/day	1	(4)
	Conversion Factor	L/cm^3	1E-03	- -

Table C-12
Exposure Parameters for Recreational Visitors
Vienna Wells Site

Exposure Pathway	Exposure Parameter	Units	RME	
			Adolescent	Source

NA = not applicable
Adolescent Recreational Visitor = adolescent aged 6 - 16 years
CS = Chemical Specific value
RME = Reasonable Maximum Exposure

Sources:
(1) USEPA 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, D. C., EPA/540/1-89/002. December.
(2) USEPA 2011. Exposure Factors Handbook
(3) Professional judgment.
(4) USEPA 2004. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response, Washington, D.C., EPA/540/R/99/005. July.

Notes:
(a) Mean body weight for a 6 - 16 year old adolescent.
(b) Assumes exposure occurs over the course of 24 weeks (May to September) at a frequency of 2 visits per week for the RME
(c) Assumes the RME exposure duration for adolescents is 10 years.
(d) Averaging time expressed as days. Noncancer averaging time calculated by muliplying the exposure duration in years by 365 days/year. Cancer averaging time calculated by multiplying a 70 year lifetime for cancer effects by 365 days/year.
(e) Assumes that adolescent exposure scenario of an RME visit is 2 hours per day.
(f) Assumes soil/sediment ingestion rate for the adolescent is the same as the soil/sediment ingestion rate for a child. Assumes that the total RME soil/sediment ingestion rate by a recreational visitor is equal to the USEPA default soil ingestion rate for a resident and that half is attributed to soil and the other half is attributed to sediment.
(g) Assumes exposure of head, arms, hands, and legs for a child 6 - 16 years (USEPA, 2011, Table 7-2).
(h) Based on the geometric mean for heavy equipment operators (USEPA, 2004, exhibit 3-3).
(i) Based on professional judgment (1 event per day) for the RME. Based on professional judgment, the RME event is assumed to last for 3 hours.
(j) Exposed skin surface area for the adolescent is based on partial body contact (it is assumed that an adolescent's exposure is limited to head, arms, hands, legs and feet) (USEPA 2011, Table 7-2).
(k) Assumes dust particulate emission factor for recreational adult, adolescent and child same as for resident and industrial/commercial worker.
(l) Per USEPA Region 7 recommendation, used 37 ml/event for the RME adolescent based on wading activity.

Table C-13
Summary of Human Intake Factor (HIF) Values for Residents
Vienna Wells Site

Receptor	Exposure Route	Units	HIF	
			Non-Cancer	Cancer [1]
			RME	RME
Residential Adult	Soil Ingestion	kg/kg-d	NA	3.42E-07
	Soil Dermal Contact	kg/kg-d	NA	1.45E-06
	Soil Vapor Inhalation [2]	unitless	NA	2.74E-01
	Dust Inhalation [3]	kg/m^3	NA	2.01E-10
	Groundwater Ingestion	L/kg-d	NA	8.56E-03
	Groundwater Dermal Contact	cm^2-event/kg-d	NA	7.16E+01
	Groundwater Inhalation	L/m^3	NA	1.37E-01
	Vapor Intrusion Inhalation [4]	unitless	NA	2.74E-01
Residential Child	Soil Ingestion	kg/kg-d	1.28E-05	1.10E-06
	Soil Dermal Contact	kg/kg-d	3.44E-05	2.95E-06
	Soil Vapor Inhalation [2]	unitless	9.59E-01	8.22E-02
	Dust Inhalation [3]	kg/m^3	7.05E-10	6.04E-11
	Groundwater Ingestion	L/kg-d	4.99E-02	4.27E-03
	Groundwater Dermal Contact	cm^2-event/kg-d	4.08E+02	3.49E+01
	Groundwater Inhalation	L/m^3	4.79E-01	4.11E-02
	Vapor Intrusion Inhalation [4]	unitless	9.59E-01	8.22E-02

[1] Lifetime Cancer risk will be calculated by combining the exposures for the adult and child.
[2] Values presented for soil vapor inhalation are unitless. When multiplied by outdoor air concentration (mg/m^3), result in units of mg/m^3.
[3] Values presented for dust inhalation are in units of kg/m^3. When multiplied by soil concentration (mg/kg), result in units of mg/m^3.
[4] Values presented for indoor vapor intrusion inhalation are unitless. When multiplied by indoor air concentration (mg/m^3), result in units of mg/m^3.

Table C-14
Summary of Human Intake Factor (HIF) Values for Industrial/Commercial Workers
Vienna Wells Site

Receptor	Exposure Route	Units	HIF	
			Non-Cancer	Cancer
			RME	RME
Industrial/Commercial Worker	Soil Ingestion	kg/kg-d	8.56E-07	3.06E-07
	Soil Dermal Contact	kg/kg-d	3.57E-06	1.27E-06
	Soil Vapor Inhalation [1]	unitless	2.28E-01	8.15E-02
	Dust Inhalation [2]	kg/m^3	1.68E-10	6.00E-11
	Groundwater Ingestion	L/kg-d	1.07E-02	3.82E-03
	Vapor Intrusion Inhalation [3]	unitless	2.28E-01	8.15E-02

[1] Values presented for soil vapor inhalation are unitless. When multiplied by outdoor air concentration (mg/m^3), result in units of mg/m^3.
[2] Values presented for dust inhalation are in units of kg/m^3. When multiplied by soil concentration (mg/kg), result in units of mg/m^3.
[3] Values presented for indoor vapor intrusion inhalation are unitless. When multiplied by indoor air concentration (mg/m^3), result in units of mg/m^3.

Table C-15
Summary of Human Intake Factor (HIF) Values for Construction Workers
Vienna Wells Site

Receptor	Exposure Route	Units	HIF	
			Non-Cancer	Cancer
			RME	RME
Construction Worker	Soil Ingestion	kg/kg-d	2.83E-06	4.04E-08
	Soil Dermal Contact	kg/kg-d	1.28E-05	1.83E-07
	Soil Vapor Inhalation [1]	unitless	2.28E-01	3.26E-03
	Dust Inhalation [2]	kg/m^3	1.78E-07	2.55E-09
	Groundwater Ingestion (Trench)	L/kg-d	8.56E-04	1.22E-05
	Groundwater Dermal Contact (Trench)	cm^2-event/kg-d	3.85E+01	5.50E-01
	Inhalation of Vapors (Trench) [3]	unitless	5.71E-02	8.15E-04

[1] Values presented for soil vapor inhalation are unitless. When multiplied by outdoor air concentration (mg/m^3), result in units of mg/m^3.
[2] Values presented for dust inhalation are in units of kg/m^3. When multiplied by soil concentration (mg/kg), result in units of mg/m^3.
[3] Values presented for trench vapor inhalation are unitless. When multiplied by trench air concentration (mg/m^3), result in units of mg/m^3.

Table C-16
Summary of Human Intake Factor (HIF) Values for Recreational Visitors
Vienna Wells Site

Receptor	Exposure Route	Units	HIF	
			Non-Cancer RME	Cancer RME
Recreational Adolescent	Soil Ingestion	kg/kg-d	3.06E-07	4.37E-08
	Soil Dermal Contact	kg/kg-d	4.39E-06	6.27E-07
	Soil Vapor Inhalation [1]	unitless	1.10E-02	1.57E-03
	Dust Inhalation [2]	kg/m^3	8.06E-12	1.15E-12
	Sediment Ingestion	kg/kg-d	3.06E-07	4.37E-08
	Sediment Dermal Contact	kg/kg-d	4.39E-06	6.27E-07
	Surface Water Ingestion	L/kg-d	1.13E-04	1.62E-05
	Surface Water Dermal Contact	cm2-event/kg-d	2.46E+01	3.52E+00

[1] Values presented for soil vapor inhalation are unitless. When multiplied by outdoor air concentration (mg/m^3), result in units of mg/m^3.
[2] Values presented for dust inhalation are in units of kg/m^3. When multiplied by soil concentration (mg/kg), result in units of mg/m^3.

Table C-17
Chemical Specific Exposure Parameters for Detected COCs
Vienna Wells Site

COPC	Dermal Absorption Fraction (ABS) unitless	Source	VF (m^3/kg)	Source
Acenaphthylene	NA	(1)	NA	(2)
Aluminum	NA	(1)	NA	(2)
Antimony	NA	(1)	NA	(2)
Arsenic	0.03	(1)	NA	(2)
Benzene	NA	(1)	3.5E+03	(2)
Bromodichloromethane	NA	(1)	4.0E+03	(2)
Bromomethane	NA	(1)	1.4E+03	(2)
Cadmium	0.001	(1)	NA	(2)
Carbazole	NA	(1)	NA	(2)
Carbon Tetrachloride	NA	(1)	1.5E+03	(2)
Chloroform	NA	(1)	2.6E+03	(2)
Chromium (VI)	NA	(1)	NA	(2)
Cobalt	NA	(1)	NA	(2)
Copper	NA	(1)	NA	(2)
1,3-Dichlorobenzene	NA	(1)	NA	(2)
1,2-Dichloroethane	NA	(1)	4.6E+03	(2)
Dieldrin	0.1	(1)	NA	(2)
Ethylbenzene	NA	(1)	5.7E+03	(2)
Fluoride	NA	(1)	NA	(2)
2-Hexanone	NA	(1)	1.3E+04	(2)
Iron	NA	(1)	NA	(2)
4-Isopropyltoluene	NA	(1)	NA	(2)
Lead	NA	(1)	NA	(2)
Manganese	NA	(1)	NA	(2)
Mercury	NA	(1)	3.5E+04	(2)
Methylene Chloride	NA	(1)	2.2E+03	(2)
Nitrate	NA	(1)	NA	(2)
Aroclor 1254	0.14	(1)	8.4E+05	(2)
Benzo(a)anthracene	0.13	(1)	4.4E+06	(2)
Benzo(a)pyrene	0.13	(1)	NA	(2)
Benzo(b)fluoranthene	0.13	(1)	NA	(2)
Benzo(k)fluoranthene	0.13	(1)	NA	(2)
Dibenzo(a,h)anthracene	0.13	(1)	NA	(2)
Indeno(1,2,3-cd)pyrene	0.13	(1)	NA	(2)
Phenanthrene	NA	(1)	NA	(2)
Tetrachloroethylene	NA	(1)	2.4E+03	(2)
Thallium	NA	(1)	NA	(2)
1,1,2-Trichloroethane	NA	(1)	7.2E+03	(2)
Trichloroethylene	NA	(1)	2.2E+03	(2)
1,2,4-Trimethylbenzene	NA	(1)	7.9E+03	(2)
1,3,5-Trimethylbenzene	NA	(1)	6.6E+03	(2)
Vanadium	NA	(1)	NA	(2)
Vinyl Chloride	NA	(1)	9.6E+02	(2)
Xylenes	NA	(1)	5.7E+03	(2)

Notes:
ABS = Dermal Absorption Fraction for soil
VF = Volatilization Factor
NA = According to RAGS Part E, default dermal absorption values are not provided for VOCs. Without dermal absorption values, the dermal exposure to soil route cannot be quantified. For the purposes of this guidance, dermal exposure to soil is only quantified if RAGS Part E provides a dermal absorption value in Exhibit 3-4 or the website, regardless of VOC status.

Source:
(1) USEPA 2004. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part E). Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/R/99/005. July.
(2) USEPA 2015. Regional Screening Levels.

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
Organics								
1,1,1,2-Tetrachloroethane	3.0E-02	Tier 1	9.0E-02	Tier 2	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	2.0E-02	Tier 1	5.0E-02	Tier 1	NA	NA	NA	NA
1,1,2-Trichloroethane	4.0E-03	Tier 1	4.0E-03	Tier 2	2.0E-04	Tier 2	2.0E-03	Tier 2
1,1-Dichloroethane	2.0E-01	Tier 2	2.0E+00	Tier 2	5.0E-01	Tier 3	5.0E+00	Tier 3
1,1-Dichloropropanone	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,4-Tetramethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3,5-Tetramethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	8.0E-04	Tier 2	8.0E-03	Tier 2	NA	NA	NA	NA
1,2,3-Trichloropropane	4.0E-03	Tier 1	8.0E-02	Tier 3	3.0E-04	Tier 1	NA	NA
1,2,3-Trimethylbenzene	NA	NA	NA	NA	5.0E-03	Tier 2	5.0E-02	Tier 3
1,2,4-Trichlorobenzene	1.0E-02	Tier 1	9.0E-02	Tier 2	2.0E-03	Tier 2	2.0E-02	Tier 2
1,2,4-Trimethylbenzene	5.0E-02	Tier 2	NA	NA	7.0E-03	Tier 2	7.0E-02	Tier 3
1,2,4,5-Tetrachlorobenzene	3.0E-04	Tier 1	3.0E-05	Tier 2	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	2.0E-04	Tier 2	2.0E-03	Tier 2	2.0E-04	Tier 1	2.0E-03	Tier 2
1,2-Dibromoethane	9.0E-03	Tier 1	NA	NA	9.0E-03	Tier 1	2.0E-03	Tier 3
1,2-Dichloroethane	6.0E-03	Tier 2	2.0E-02	Tier 2	7.0E-03	Tier 2	7.0E-02	Tier 2
1,2-Dichloropropane	9.0E-02	Tier 3	7.0E-02	Tier 3	4.0E-03	Tier 1	3.2E-02	Tier 3
1,3,5-Trimethylbenzene	1.0E-02	Tier 2	1.0E-01	Tier 2	6.0E-03	Tier 2	1.0E-02	Tier 3
1,3-Dichlorobenzene	NA	NA	2.0E-02	Tier 3	NA	NA	NA	NA
1,4-Dichlorobenzene	7.0E-02	Tier 3	7.0E-02	Tier 3	8.0E-01	Tier 1	1.2E+00	Tier 3
2,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	1.0E-03	Tier 2	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	3.0E-03	Tier 1	2.0E-02	Tier 2	NA	NA	NA	NA
2,4-Dinitrophenol	2.0E-03	Tier 1	2.0E-02	Tier 2	NA	NA	NA	NA
2,4-Dinitrotoluene	2.0E-03	Tier 1	7.0E-03	Tier 3	NA	NA	NA	NA
2,6-Diethylaniline	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	3.0E-04	Tier 2	4.0E-03	Tier 3	NA	NA	NA	NA
2-Chloro-4-isopropylamino-6-amino-s-triazine	NA	NA	NA	NA	NA	NA	NA	NA

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
2-Chlorophenol	5.0E-03	Tier 1	8.0E-03	Tier 2	NA	NA	NA	NA
2-Ethyltoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-4,6-dinitrophenol	8.0E-05	Tier 2	8.0E-04	Tier 2	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	5.0E-04	Tier 2
2-Nitropropane	NA	NA	NA	NA	2.0E-02	Tier 1	2.0E-02	Tier 3
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene	NA	NA	NA	NA	1.0E-03	Tier 1	1.0E-02	Tier 3
3-Nitroaniline	3.0E-04	Tier 2	1.0E-03	Tier 2	1.0E-03	Tier 2	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	4.0E-03	Tier 1	5.0E-04	Tier 2	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Isopropyltoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	4.0E-03	Tier 2	1.0E-02	Tier 2	6.0E-03	Tier 2	2.0E-02	Tier 2
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
alpha-HCH	8.0E-03	Tier 3	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	4.0E-02	Tier 3	1.0E-02	Tier 3	2.0E-03	Tier 1	NA	NA
Aldrin	3.0E-05	Tier 1	4.0E-05	Tier 2	NA	NA	NA	NA
Allyl Chloride	NA	NA	NA	NA	1.0E-03	Tier 1	1.0E-02	Tier 3
Aroclor 1016	7.0E-05	Tier 1	NA	NA	NA	NA	NA	NA
Aroclor 1221	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	0.00002	Tier 1	3.0E-05	Tier 3	NA	NA	NA	NA
Aroclor 1260	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1262	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor 1268	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	3.5E-02	Tier 1	3.0E-03	Tier 3	NA	NA	NA	NA
Benzene	4.0E-03	Tier 1	1.0E-02	Tier 2	3.0E-02	Tier 1	8.0E-02	Tier 2
Benzo[a]anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	NA	NA	NA	NA	NA	NA	NA	NA

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
Benzo[b]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
beta-HCH	NA	NA	6.0E-04	Tier 3	NA	NA	NA	NA
Biphenyl	5.0E-01	Tier 1	1.0E-01	Tier 2	4.0E-04	Tier 2	4.0E-03	Tier 2
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	1.2E-01	Tier 3
Bis(2-chloroisopropyl) ether	NA	NA	4.0E-02	Tier 3	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	2.0E-02	Tier 1	1.0E-01	Tier 3	NA	NA	NA	NA
Bromodichloromethane	2.0E-02	Tier 1	8.0E-03	Tier 2	NA	NA	2.0E-02	Tier 2
Bromoethene	NA	NA	NA	NA	3.0E-03	Tier 1	3.0E-03	Tier 3
Bromomethane	1.4E-03	Tier 1	5.0E-03	Tier 2	5.0E-03	Tier 1	1.0E-01	Tier 2
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chlordane	5.0E-04	Tier 1	6.0E-04	Tier 3	7.0E-04	Tier 1	2.0E-04	Tier 3
Chloroacetonitrile	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	1.0E-02	Tier 1	1.0E-01	Tier 3	9.8E-02	Tier 3	2.4E-01	Tier 3
Chloromethane	NA	NA	NA	NA	9.0E-02	Tier 1	3.0E+00	Tier 2
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	2.0E-03	Tier 1	2.0E-02	Tier 2	NA	NA	NA	NA
cis-1,3-Dichloropropene	3.0E-02	Tier 1	4.0E-02	Tier 3	2.0E-02	Tier 1	3.6E-02	Tier 3
cis-Chlordane	5.0E-04	Tier 1	6.0E-04	Tier 3	7.0E-04	Tier 1	2.0E-04	Tier 3
Coumaphos	NA	NA	NA	NA	NA	NA	NA	NA
delta-HCH	NA	NA	NA	NA	NA	NA	NA	NA
Demeton-O	4.0E-05	Tier 1	NA	NA	NA	NA	NA	NA
Demeton-S	4.0E-05	Tier 1	NA	NA	NA	NA	NA	NA
Desulfinylfipronil amide	NA	NA	NA	NA	NA	NA	NA	NA
Desulfinylfipronil	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	1.0E-03	Tier 2	4.0E-03	Tier 2	NA	NA	NA	NA
Dibromochloromethane	2.0E-02	Tier 1	7.0E-02	Tier 2	NA	NA	NA	NA
Dibromomethane	1.0E-02	Tier 3	9.0E-03	Tier 2	4.0E-03	Tier 2	4.0E-02	Tier 2
Dichloromethane	6.0E-03	Tier 1	6.0E-02	Tier 3	6.0E-01	Tier 1	1.0E+00	Tier 3
Dieldrin	5.0E-05	Tier 1	1.0E-04	Tier 3	NA	NA	NA	NA
Dimethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	4.0E-05	Tier 1	9.0E-05	Tier 3	NA	NA	2.0E-04	Tier 3

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
Endrin aldehyde	3.0E-04	Tier 1	2.0E-03	Tier 3	NA	NA	NA	NA
Endrin ketone	3.0E-04	Tier 1	2.0E-03	Tier 3	NA	NA	NA	NA
Endrin	3.0E-04	Tier 1	2.0E-03	Tier 3	NA	NA	NA	NA
EPN	1.0E-05	Tier 1	NA	NA	NA	NA	NA	NA
Ethalfluralin	NA	NA	NA	NA	NA	NA	NA	NA
Ethoprop	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1.0E-01	Tier 1	5.0E-02	Tier 2	1.0E+00	Tier 1	9.0E+00	Tier 2
Fensulfothion	NA	NA	NA	NA	NA	NA	NA	NA
Fenthion	NA	NA	NA	NA	NA	NA	NA	NA
Fipronil sulfide	NA	NA	NA	NA	NA	NA	NA	NA
Fipronil sulfone	NA	NA	NA	NA	NA	NA	NA	NA
Fipronil	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	5.0E-04	Tier 1	6.0E-04	Tier 3	7.0E-04	Tier 1	2.0E-04	Tier 3
Heptachlor	5.0E-04	Tier 1	1.0E-04	Tier 3	NA	NA	NA	NA
Heptachlor Epoxide	1.3E-05	Tier 1	1.3E-05	Tier 3	NA	NA	NA	NA
Heptane	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	8.0E-04	Tier 1	1.0E-05	Tier 2	NA	NA	NA	NA
Hexachlorobutadiene	1.0E-03	Tier 2	1.0E-03	Tier 2	NA	NA	NA	NA
Hexachlorocyclopentadiene	6.0E-03	Tier 1	1.0E-01	Tier 3	2.0E-04	Tier 1	1.1E-01	Tier 3
Hexachloroethane	7.0E-04	Tier 1	1.0E-02	Tier 3	3.0E-02	Tier 1	5.8E+01	Tier 3
Indeno[1,2,3-cd]pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Iodomethane	NA	NA	NA	NA	NA	NA	NA	NA
Merphos	3.0E-05	Tier 1	3.4E-04	Tier 3	NA	NA	NA	NA
Methyl acrylate	3.0E-02	Tier 3	3.0E-02	Tier 3	2.0E-02	Tier 2	2.0E-02	Tier 2
Methyl acrylonitrile	1.0E-04	Tier 1	5.0E-02	Tier 2	3.0E-02	Tier 2	3.0E-01	Tier 2
Methyl parathion	2.5E-04	Tier 1	7.0E-04	Tier 3	NA	NA	NA	NA
Methyl tert-pentyl ether	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Mevinphos	NA	NA	NA	NA	NA	NA	NA	NA
Monocrotophos	NA	NA	NA	NA	NA	NA	NA	NA

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
Naphthalene	2.0E-02	Tier 1	6.0E-01	Tier 3	3.0E-03	Tier 1	NA	NA
n-Butyl methyl ketone	5.0E-03	Tier 1	NA	NA	3.0E-02	Tier 1	NA	NA
Nitrobenzene	2.0E-03	Tier 1	5.0E-03	Tier 3	9.0E-03	Tier 1	2.0E-02	Tier 3
N-Nitrosodimethylamine	8.0E-06	Tier 2	8.0E-06	Tier 2	4.0E-05	Tier 2	NA	NA
N-nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	2.0E-02	Tier 2	NA	NA	NA	NA	NA	NA
Orthophosphate	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDD	2.0E-03	Tier 2	NA	NA	NA	NA	NA	NA
p,p'-DDE	NA	NA	NA	NA	NA	NA	NA	NA
p,p'-DDT	5.0E-04	Tier 1	5.0E-04	Tier 3	NA	NA	NA	NA
Total PCBs	2.3E-05	Tier 1	3.0E-05	Tier 3	NA	NA	NA	NA
Pentachlorophenol	5.0E-03	Tier 1	1.0E-03	Tier 3	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile	NA	NA	NA	NA	NA	NA	NA	NA
Sulprofos	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butyl ethyl ether	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	6.0E-03	Tier 1	8.0E-03	Tier 3	4.0E-02	Tier 1	4.1E-02	Tier 3
Tetrachloromethane	4.0E-03	Tier 1	7.0E-03	Tier 3	1.0E-01	Tier 1	1.9E-01	Tier 3
Tetraethyl pyrophosphate (TEPP)	NA	NA	NA	NA	NA	NA	NA	NA
Tokuthion	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	1.0E-03	Tier 3	NA	NA	NA	NA
trans-1,2-Dichloroethene	2.0E-02	Tier 1	2.0E-01	Tier 3	6.0E-02	Tier 2	7.9E-01	Tier 3
trans-1,3-Dichloropropene	3.0E-02	Tier 1	4.0E-02	Tier 3	2.0E-02	Tier 1	3.6E-02	Tier 3
trans-1,4-Dichloro-2-butene	NA	NA	NA	NA	NA	NA	NA	NA
Tribromomethane	2.0E-02	Tier 1	3.0E-02	Tier 2	NA	NA	NA	NA
Trichloroethene	5.0E-04	Tier 1	5.0E-04	Tier 3	2.0E-03	Tier 1	2.2E-03	Tier 3
Trichloronate	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	3.0E-03	Tier 1	NA	NA	1.0E-01	Tier 1	7.7E-02	Tier 3
Xylene	2.0E-01	Tier 1	4.0E-01	Tier 2	1.0E-01	Tier 1	4.0E-01	Tier 2

Table C-18
Summary of Non-Cancer Toxicity Data
Vienna Wells Site

COPC	Non-Cancer Toxicity Data							
	Chronic RfDs		Subchronic RfDs		Chronic RfCs		Subchronic RfCs	
	mg/kg-d	Source	mg/kg-d	Source	mg/m^3	Source	mg/m^3	Source
Inorganics (Metals and Anions)								
Aluminum	1.0E+00	Tier 2	1.0E+00	Tier 3	5.0E-03	Tier 2	NA	NA
Antimony	4.0E-04	Tier 1	4.0E-04	Tier 2	NA	NA	0.0004	Tier 2
Arsenic	3.0E-04	Tier 1	5.0E-03	Tier 2	1.5E-05	Tier 3	NA	NA
Cadmium (diet)	1.0E-03	Tier 1	5.0E-04	Tier 3	1.0E-05	Tier 3	0.0009	Tier 2
Cadmium (water)	5.0E-04	Tier 1	2.5E-04	Tier 3	1.0E-05	Tier 3	0.0009	Tier 2
Chromium (as Cr^{+6})	3.0E-03	Tier 1	5.0E-03	Tier 3	1.0E-04	Tier 1	0.0003	Tier 3
Cobalt	3.0E-04	Tier 2	3.0E-03	Tier 2	6.0E-06	Tier 2	0.00002	Tier 2
Copper	4.0E-02	Tier 3	1.0E-02	Tier 3	NA	NA	NA	NA
Iron	7.0E-01	Tier 2	7.0E-01	Tier 2	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (non-diet)	2.4E-02	Tier 1	2.4E-02	Tier 3	5.0E-05	Tier 1	NA	NA
Mercury (as methyl mercury)	1.0E-04	Tier 1	1.5E+00	Tier 3	3.0E-04	Tier 1	0.0003	Tier 3
Thallium	1.0E-05	Tier 2	4.0E-05	Tier 2	NA	NA	NA	NA
Vanadium	5.0E-03	Tier 1	1.0E-02	Tier 3	1.0E-04	Tier 3	NA	NA
Bromide	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA
Fluoride	4.0E-02	Tier 3	NA	NA	1.3E-02	Tier 3	NA	NA
Nitrate	1.6E+00	Tier 1	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA

COPC - Chemical of Potential Concern
RfD - Reference Dose
RfC - Reference Concentration
mg/kg-day - milligram per kilogram per day
mg/m^3 - milligram per cubic meter

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
Organics				
1,1,1,2-Tetrachloroethane	2.6E-02	Tier 1	7.4E-06	Tier 1
1,1,2,2-Tetrachloroethane	2.0E-01	Tier 1	5.8E-05	Tier 3
1,1,2-Trichloroethane	5.7E-02	Tier 1	1.6E-05	Tier 1
1,1-Dichloroethane	5.7E-03	Tier 3	1.6E-06	Tier 3
1,1-Dichloropropanone	NA	NA	NA	NA
1,1-Dichloropropene	NA	NA	NA	NA
1,2,3,4-Tetramethylbenzene	NA	NA	NA	NA
1,2,3,5-Tetramethylbenzene	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NA	NA	NA	NA
1,2,3-Trichloropropane	3.0E+01	Tier 1	NA	NA
1,2,3-Trimethylbenzene	NA	NA	NA	NA
1,2,4-Trichlorobenzene	2.9E-02	Tier 2	NA	NA
1,2,4-Trimethylbenzene	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA
1,2-Dibromo-3-Chloropropane	8.0E-01	Tier 2	6.0E-03	Tier 2
1,2-Dibromoethane	2.0E+00	Tier 1	6.0E-04	Tier 1
1,2-Dichloroethane	9.1E-02	Tier 1	2.6E-05	Tier 1
1,2-Dichloropropane	3.6E-02	Tier 3	1.0E-05	Tier 3
1,3,5-Trimethylbenzene	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA
1,4-Dichlorobenzene	5.4E-03	Tier 3	1.1E-05	Tier 3
2,2-Dichloropropane	NA	NA	NA	NA
2,4,6-Trichlorophenol	1.1E-02	Tier 1	3.1E-06	Tier 1
2,4-Dichlorophenol	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA
2,4-Dinitrotoluene	3.1E-01	Tier 3	8.9E-05	Tier 3
2,6-Diethylaniline	NA	NA	NA	NA
2,6-Dinitrotoluene	1.5E+00	Tier 2	NA	NA
2-Chloro-4-isopropylamino-6-amino-s-triazine	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
2-Ethyltoluene	NA	NA	NA	NA
2-Methyl-4,6-dinitrophenol	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA
2-Nitropropane	NA	NA	2.7E-03	Tier 3
3,3'-Dichlorobenzidine	4.5E-01	Tier 1	3.4E-04	Tier 3
3-Chloropropene	2.1E-02	Tier 3	6.0E-06	Tier 3
3-Nitroaniline	2.1E-02	Tier 2	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA
4-Chloroaniline	2.0E-01	Tier 2	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA
4-Isopropyltoluene	NA	NA	NA	NA
4-Nitroaniline	2.0E-02	Tier 2	NA	NA
4-Nitrophenol	NA	NA	NA	NA
alpha-HCH	6.3E+00	Tier 1	1.8E-03	Tier 1
Acenaphthylene	NA	NA	NA	NA
Acrylonitrile	5.4E-01	Tier 1	6.8E-05	Tier 1
Aldrin	1.7E+01	Tier 1	4.9E-03	Tier 1
Allyl Chloride	2.1E-02	Tier 3	6.0E-06	Tier 3
Aroclor 1016	7.0E-02	Tier 1	2.0E-05	Tier 1
Aroclor 1221	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1232	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1242	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1248	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1254	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1260	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1262	2.0E+00	Tier 1	5.7E-04	Tier 1
Aroclor 1268	2.0E+00	Tier 1	5.7E-04	Tier 1
Atrazine	2.3E-01	Tier 3	NA	NA
Benzene	5.5E-02	Tier 1	7.8E-06	Tier 1
Benzo[a]anthracene	7.3E-01	Tier 1	1.1E-04	Tier 3

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
Benzo[a]pyrene	7.3E+00	Tier 1	1.1E-03	Tier 3
Benzo[b]fluoranthene	7.3E-01	Tier 1	1.1E-04	Tier 3
Benzo[k]fluoranthene	7.3E-02	Tier 1	1.1E-04	Tier 3
beta-HCH	1.8E+00	Tier 1	5.3E-04	Tier 1
Biphenyl	8.0E-03	Tier 1	NA	NA
bis(2-Chloroethyl)ether	1.1E+00	Tier 1	3.3E-04	Tier 1
Bis(2-chloroisopropyl) ether	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	1.4E-02	Tier 1	2.4E-06	Tier 3
Bromodichloromethane	6.2E-02	Tier 1	3.7E-05	Tier 3
Bromoethene	NA	NA	3.2E-05	Tier 3
Bromomethane	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA
Chlordane	3.5E-01	Tier 1	1.0E-04	Tier 1
Chloroacetonitrile	NA	NA	NA	NA
Chloroform	3.1E-02	Tier 3	2.3E-05	Tier 1
Chloromethane	1.3E-02	Tier 3	1.8E-06	Tier 3
Chrysene	7.3E-03	Tier 1	1.1E-05	Tier 3
cis-1,2-Dichloroethene	NA	NA	NA	NA
cis-1,3-Dichloropropene	1.0E-01	Tier 1	4.0E-06	Tier 1
cis-Chlordane	3.5E-01	Tier 1	1.0E-04	Tier 1
Coumaphos	NA	NA	NA	NA
delta-HCH	1.8E+00	Tier 1	5.1E-04	Tier 1
Demeton-O	NA	NA	NA	NA
Demeton-S	NA	NA	NA	NA
Desulfinylfipronil amide	NA	NA	NA	NA
Desulfinylfipronil	NA	NA	NA	NA
Dibenzo[a,h]anthracene	7.3E+00	Tier 1	1.2E-03	Tier 3
Dibenzofuran	NA	NA	NA	NA
Dibromochloromethane	8.4E-02	Tier 1	2.7E-05	Tier 3
Dibromomethane	NA	NA	NA	NA

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
Dichloromethane	2.0E-03	Tier 1	1.0E-08	Tier 1
Dieldrin	1.6E+01	Tier 1	4.6E-03	Tier 1
Dimethylphthalate	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA
Endrin	NA	NA	NA	NA
EPN	NA	NA	NA	NA
Ethalfluralin	NA	NA	NA	NA
Ethoprop	NA	NA	NA	NA
Ethylbenzene	1.1E-02	Tier 3	2.5E-06	Tier 3
Fensulfothion	NA	NA	NA	NA
Fenthion	NA	NA	NA	NA
Fipronil sulfide	NA	NA	NA	NA
Fipronil sulfone	NA	NA	NA	NA
Fipronil	NA	NA	NA	NA
gamma-Chlordane	3.5E-01	Tier 1	1.0E-04	Tier 1
Heptachlor	4.5E+00	Tier 1	1.3E-03	Tier 1
Heptachlor Epoxide	9.1E+00	Tier 1	2.6E-03	Tier 1
Heptane	NA	NA	NA	NA
Hexachlorobenzene	1.6E+00	Tier 1	4.6E-04	Tier 1
Hexachlorobutadiene	7.8E-02	Tier 1	2.2E-05	Tier 1
Hexachlorocyclopentadiene	NA	NA	NA	NA
Hexachloroethane	4.0E-02	Tier 1	1.1E-05	Tier 3
Indeno[1,2,3-cd]pyrene	7.3E-01	Tier 1	1.1E-04	Tier 3
Iodomethane	NA	NA	NA	NA
Merphos	NA	NA	NA	NA
Methyl acrylate	NA	NA	NA	NA
Methyl acrylonitrile	NA	NA	NA	NA
Methyl parathion	NA	NA	NA	NA
Methyl tert-pentyl ether	NA	NA	NA	NA

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
Methylcyclohexane	NA	NA	NA	NA
Mevinphos	NA	NA	NA	NA
Monocrotophos	NA	NA	NA	NA
Naphthalene	NA	NA	3.4E-05	Tier 3
n-Butyl methyl ketone	NA	NA	NA	NA
Nitrobenzene	NA	NA	4.0E-05	Tier 1
N-Nitrosodimethylamine	5.1E+01	Tier 1	1.4E-02	Tier 1
N-nitroso-di-n-propylamine	7.0E+00	Tier 1	2.0E-03	Tier 3
N-Nitrosodiphenylamine	4.9E-03	Tier 1	2.6E-06	Tier 3
Orthophosphate	NA	NA	NA	NA
p,p'-DDD	2.4E-01	Tier 1	6.9E-05	Tier 3
p,p'-DDE	3.4E-01	Tier 1	9.7E-05	Tier 3
p,p'-DDT	3.4E-01	Tier 1	9.7E-05	Tier 1
Total PCBs (high risk PCBs)	2.0E+00	Tier 1	5.7E-04	Tier 1
Pentachlorophenol	4.0E-01	Tier 1	5.1E-06	Tier 3
Phenanthrene	NA	NA	NA	NA
Propionitrile	NA	NA	NA	NA
Sulprofos	NA	NA	NA	NA
tert-Butyl ethyl ether	NA	NA	NA	NA
Tetrachloroethene	2.1E-03	Tier 1	2.6E-07	Tier 1
Tetrachloromethane	7.0E-02	Tier 1	6.0E-06	Tier 1
Tetraethyl pyrophosphate (TEPP)	NA	NA	NA	NA
Tokuthion	NA	NA	NA	NA
Toxaphene	1.1E+00	Tier 1	3.2E-04	Tier 1
trans-1,2-Dichloroethene	NA	NA	NA	NA
trans-1,3-Dichloropropene	1.0E-01	Tier 1	4.0E-06	Tier 1
trans-1,4-Dichloro-2-butene	NA	NA	4.2E-03	Tier 2
Tribromomethane	7.9E-03	Tier 1	1.1E-06	Tier 1
Trichloroethene (Kidney)	9.3E-03	Tier 1	1.0E-06	Tier 1
Trichloroethene (NHL + Liver)	3.7E-02	Tier 1	3.1E-06	Tier 1
Trichloroethene (Total)	4.6E-02	Tier 1	4.1E-06	Tier 1
Trichloronate	NA	NA	NA	NA
Vinyl Chloride (lifetime)	1.4E+00	Tier 1	8.8E-06	Tier 1
Vinyl Chloride (adult)	7.2E-01	Tier 1	4.4E-06	Tier 1
Xylene	NA	NA	NA	NA

Table C-19
Summary of Cancer Toxicity Data
Vienna Wells Site

COPC	Cancer Toxicity Data			
	CSFs		IURs	
	$(mg/kg\text{-}d)^{-1}$	Source	$(\mu g/m^3)^{-1}$	Source
Inorganics (Metals and Anions)				
Aluminum	NA	NA	NA	NA
Antimony	NA	NA	NA	NA
Arsenic	1.5E+00	Tier 1	4.3E-03	Tier 1
Cadmium (diet)	NA	NA	1.8E-03	Tier 1
Cadmium (water)	NA	NA	1.8E-03	Tier 1
Chromium (as Cr^{+6})	5.0E-01	Tier 3	8.4E-02	Tier 1
Cobalt	NA	NA	9.0E-03	Tier 2
Copper	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Mercury	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Bromide	NA	NA	NA	NA
Chloride	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA
Nitrate	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA

COPC - Chemical of Potential Concern
CSF - Cancer Slope Factor
IUR - Inhalation Unit Risk
NHL - Non-Hodgkin Lymphoma
$(mg/kg\text{-}day)^{-1}$ - risk per milligram per kilogram per day
$(\mu g/m^3)^{-1}$ - risk per microgram per cubic meter

Note: COPCs listed in bold font are known mutagens

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Current/Future On Site Exposure Areas							
On Site Exposure Area 1	Future Child Resident	Soil		Excess cancer risk due to ingestion of and dermal contact with soil containing B(a)P, B(b)f, D(ah)A, I(1,2,3cd)P, As, Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	5		Non-cancer hazards (effects on CNS) primarily due to ingestion of soil containing Al, and Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			33	28	
	Future Lifetime Resident	Soil	9E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 2	Future Child Resident	Soil		Excess cancer risk due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	2		Non-cancer hazards (effects on CNS) primarily due to ingestion of soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	27	
	Future Lifetime Resident	Soil	6E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 3	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion of soil containing Al and Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			32	27	
	Future Lifetime Resident	Soil	7E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Exposure Area 4	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing B(a)P, As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion of soil containing Mn; groundwater containing PCE and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	27	
	Future Lifetime Resident	Soil	7E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 5	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion of and dermal contact with soil containing Al and Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	28	
	Future Lifetime Resident	Soil	6E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 6	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	2		Non-cancer hazards (effects on CNS) primarily due to ingestion of and dermal contact with soil containing Al and Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	28	
	Future Lifetime Resident	Soil	7E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Exposure Area 7	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing Aroclor 1254, B(a)A, B(a)P, B(b)F, B(k)F, I(123cd)P, As and Cr; outdoor vapors from soil containing PCE, groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	8		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Al and Mn; outdoor vapors from soil containing PCE; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on IS) primarily due to ingestion of and dermal contact with soil containing Aroclor 1254; groundwater containing TCE; and vapor intrusion containing TCE. Non-cancer hazards (effects on Skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			37	28	
	Future Lifetime Resident	Soil	7E-04				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	1E-03				
On Site Exposure Area 8	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing Dieldrin, Heptachlor Epoxide, As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TEC.	4		Non-cancer hazards (effects on CNS) primarily due to ingestion of and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on Skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			33	28	
	Future Lifetime Resident	Soil	7E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 9	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	4		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on Skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			33	28	
	Future Lifetime Resident	Soil	5E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Exposure Area 10	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	2		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	28	
	Future Lifetime Resident	Soil	5E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 11	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Al and Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on Skin) primarily due to ingestion and dermal contact with soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			32	27	
	Future Lifetime Resident	Soil	4E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	4E-04				
On Site Exposure Area 12	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	2		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	28	
	Future Lifetime Resident	Soil	4E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	4E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Exposure Area 13	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	4		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			32	28	
	Future Lifetime Resident	Soil	5E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
On Site Exposure Area 14	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE and TCE.	2		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			31	27	
	Future Lifetime Resident	Soil	5E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
On Site Site Wide Exposure	Future Child Resident	Soil		Excess cancer risks due to ingestion of and dermal contact with soil containing B(a)A, B(a)P, B(b)F, D(ah)A, As and Cr; groundwater containing Benzene, Dieldrin, PCE, TCE and Cr; and vapor intrusion containing Benzene, PCE, and TCE.	3		Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Mn; groundwater containing PCE; and vapor intrusion containing PCE. Non-cancer hazards (effects on Skin) primarily due to ingestion of soil containing As and Tl.
		Groundwater			17		
		Vapor Intrusion			12		
		Total			32	27	
	Future Lifetime Resident	Soil	9E-05				
		Groundwater	4E-04				
		Vapor Intrusion	5E-05				
		Total	5E-04				
	Current/Future Recreational User	Total	3E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.2	0.1	No COCs - Non-cancer hazards are not expected.
	Future Industrial/ Commercial Worker	Total	5E-05	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion with groundwater and vapor intrusion containing PCE.
	Future Construction Worker	Total	6E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion and dermal contact with soil containing Al, As, and Mn.

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Current/Future Off Site Exposure Areas							
Off Site Residential Well at JW-01	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	4	4	Non-cancer hazards (effects on CNS) primarily due to ingestion of, dermal contact with and inhalation of groundwater containing PCE and vapor intrusion containing PCE.
	Current/Future Lifetime Resident	Total	3E-05				
Off Site Residential Well at MK-01	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	1	No COCs - The total HI is greater than 1; however, no target organ HIs are greater than 1. (Non cancer hazards are not expected)
	Current/Future Lifetime Resident	Total	3E-05				
Off Site Residential Well at MK-12	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Off Site Residential Well at MK-29	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Off Site Residential Well at MK-34	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Off Site Residential Well at MK-35	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Off Site Residential Well at MK-43	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Off Site Residential Well at PB-01	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Off Site Residential Well at PB-02	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	No Detected COPCs	No Detected COPCs	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	No Detected COPCs				
Offsite City Wells	Current/Future Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.8	0.3	No COCs - Non-cancer hazards are not expected.
	Current/Future Lifetime Resident	Total	3E-06				
Offsite Creeks	Current/Future Recreational	Total	3E-06	No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.07	0.06	No COCs - Non-cancer hazards are not expected.

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Off Site Residential at 402 North Chestnut	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.5	0.5	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	7E-06				
Off Site Residential at 411 North Chestnut	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	3	1	No COCs - The total HI is greater than 1; however, no target organ HIs are greater than 1. (Non cancer hazards are not expected)
	Current Lifetime Resident	Total	4E-05				
Off Site Residential at 414 North Olive	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	1	0.7	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	2E-05				
Off Site Residential at 436 8th Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	3	2	Non-cancer hazards (effects on nasal) primarily due to inhalation of indoor vapors containing 1,1,2-Trichloroethane.
	Current Lifetime Resident	Total	9E-05				
Off Site Residential at 461 8th Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	1	No COCs - The total HI is greater than 1; however, no target organ HIs are greater than 1. (Non cancer hazards are not expected)
	Current Lifetime Resident	Total	5E-05				
Off Site Residential at 505 North Olive	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	2	Non-cancer hazards (effects on blood) primarily due to inhalation of indoor vapors containing 1,2,4-Trimethylbenzene, 1.3.5-Trimethylbenzene and Benzene.
	Current Lifetime Resident	Total	4E-05				
Off Site Residential at 506 North Olive	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	2	Non-cancer hazards (effects on CNS) primarily due to inhalation of indoor vapors containing 1,2-Dichloroethane.
	Current Lifetime Resident	Total	1E-04				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Off Site Residential at 545 North Chestnut	Current Child Resident	Total		Excess cancer risk due to inhalation of indoor vapors containing 1,2-Dichloroethane, Benzene, Bromodichloromethane, Carbon Tetrachloride and Chloroform.	1	1	No COCs - The total HI does not exceed 1. (Non cancer hazards are not expected)
	Current Lifetime Resident	Total	8E-04				
Off Site Residential at 640 10th Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	9	7	Non-cancer hazards (effects on CNS) primarily due to inhalation of indoor vapors containing 1,2-Dichloroethane, 1,3,5-Trimethylbenzene, 2-Hexanone, m and/or p-Xylene and o-Xylene. Non-cancer hazards (effects on blood) primarily due to inhalation of 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene and Benzene. Non-cancer hazards (effects on respiratory system) primarily due to inhalation of 1,3,5-Trimethylbenzene.
	Current Lifetime Resident	Total	1E-04				
Off Site Residential at 660 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	2	Non-cancer hazards (effects on nasal) primarily due to inhalation of indoor vapors containing 1,1,2-Trichloroethane.
	Current Lifetime Resident	Total	6E-06				
Off Site Residential at 662 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	7	6	Non-cancer hazards (effects on nasal) primarily due to inhalation of indoor vapors containing 1,1,2-Trichloroethane.
	Current Lifetime Resident	Total	3E-05				
Off Site Residential at 665 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.3	0.2	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	5E-06				
Off Site Residential at 667 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.5	0.3	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	3E-05				
Off Site Residential at 671 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.9	0.5	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	2E-05				

Table C-20
Summary of Human Health Risks and Hazards
Contaminants of Concern
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor		Excess Cancer Risk [1]	Note	Total Non-cancer Hazard Index [2]	Highest Target Organ Non-cancer Hazard Index [3]	Note
Off Site Residential at 672 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	2	2	Non-cancer hazards (effects on blood) primarily due to inhalation of indoor vapors containing 1,2,4-Trimethylbenzene, 1.3.5-Trimethylbenzene and Benzene.
	Current Lifetime Resident	Total	3E-05				
Off Site Residential at 676 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	0.9	0.5	No COCs - Non-cancer hazards are not expected.
	Current Lifetime Resident	Total	6E-06				
Off Site Residential at 682 Oak Street	Current Child Resident	Total		No COCs - Excess cancer risk within EPA's generally acceptable risk range.	12	11	Non-cancer hazards (effects on blood) primarily due to inhalation of indoor vapors containing 1,2,4-Trimethylbenzene, 1.3.5-Trimethylbenzene and Benzene; effects on CNS due to 1,2-dichloroethane, 1,3,5-Trimethylbenzene and m,p,o-xylene; and effects on respiratory system due to 1,3,5-Trimethylbenzene.
	Current Lifetime Resident	Total	1E-04				

Notes:

[1] Excess Cancer Risk

[2] Total Noncancer Hazard Index (sum of all hazard quotients for all chemicals for all media)

[3] Highest Target Organ Noncancer Hazard Index (highest of all of the hazard indices for the individual critical target organ effects)

HI = Hazard Index
COC = Chemical of Concern
Al = Aluminum
As = Arsenic
Cr = Chromium
Mn = Manganese
Tl = Thallium
B(a)A - Benzo(a)anthracene
B(a)P = Benzo(a)pyrene
B(b)F = Benzo(b)fluoranthene
D(ah)A = Dibenzo(a,h)anthracene
I(1,2,3cd)P = Indeno(1,2,3-cd)pyrene
PCE = Tetrachloroethene
TCE = Trichloroethene
CNS = Central Nervous System
IS - Immune System

Table C-21
Summary of Human Health Risks
Associated With Exposures to Lead
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor	Media	Lead EPC	Units	Lead P10 Estimate
Current/Future On Site Exposure Areas					
On Site Exposure Area 1	Resident	Surface Soil	32.3	mg/kg	< 5%
On Site Exposure Area 2	Resident	Surface Soil	38.6	mg/kg	< 5%
On Site Exposure Area 3	Resident	Surface Soil	57.7	mg/kg	< 5%
On Site Exposure Area 4	Resident	Surface Soil	47.6	mg/kg	< 5%
On Site Exposure Area 5	Resident	Soil	21.1	mg/kg	< 5%
On Site Exposure Area 6	Resident	Soil	85.2	mg/kg	< 5%
On Site Exposure Area 7	Resident	Soil	193	mg/kg	< 5%
On Site Exposure Area 8	Resident	Soil	126	mg/kg	< 5%
On Site Exposure Area 9	Resident	Soil	75.9	mg/kg	< 5%

Table C-21
Summary of Human Health Risks
Associated With Exposures to Lead
Reasonable Maximum Exposure
Vienna Wells Site

Location	Receptor	Media	Lead EPC	Units	Lead P10 Estimate
On Site Exposure Area 10	Resident	Soil	28.0	mg/kg	< 5%
On Site Exposure Area 11	Resident	Soil	16.0	mg/kg	< 5%
On Site Exposure Area 12	Resident	Soil	20.3	mg/kg	< 5%
On Site Exposure Area 13	Resident	Soil	25.8	mg/kg	< 5%
On Site Exposure Area 14	Resident	Soil	18.2	mg/kg	< 5%
On Site Site Wide Exposure	Resident	Soil	56.0	mg/kg	< 5%
	Current/Future Trespasser	Soil	56.0	mg/kg	< 5%
	Future Industrial Worker	Soil	56.0	mg/kg	< 5%
	Future Construction Worker	Soil	56.0	mg/kg	< 5%

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	0 / 16	2.5 U	103 U	-	51.5 U	70	d	0.7	None	No	-
1,1,1-Trichloroethane	0 / 90	2.5 U	103 U	-	51.5 U	40	d	1	None	**Yes**	**2**
1,1,2,2-Tetrachloroethane	0 / 90	2.5 U	103 U	-	51.5 U	190	d	0.3	None	No	-
1,1,2-Trichloro-1,2,2-trifluoroethane	0 / 96	2.8 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
1,1,2-Trichloroethane	0 / 90	2.5 U	103 U	-	51.5 U	320	d	0.2	None	No	-
1,1-Dichloroethane	0 / 98	2.5 U	103 U	-	51.5 U	140	d	0.4	None	No	-
1,1-Dichloroethene	0 / 98	2.5 U	103 U	-	51.5 U	40	d	1	None	**Yes**	**2**
1,1-Dichloropropanone	0 / 2	5 U	5 U	-	2.5 U	NV	-	-	-	**Yes**	**4**
1,1-Dichloropropene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trichlorobenzene	0 / 58	2.8 U	103 U	-	51.5 U	70	d	0.7	None	No	-
1,2,3-Trichloropropane	0 / 16	2.5 U	206 U	-	103 U	3,360	e	0.03	None	No	-
1,2,4,5-Tetrachlorobenzene	0 / 86	200 U	9600 U	-	4800 U	180	d	27	None	**Yes**	**2**
1,2,4-Trichlorobenzene	0 / 72	2.8 U	2100 U	-	1050 U	270	c	4	None	**Yes**	**2**
1,2,4-Trimethylbenzene	0 / 16	2.5 U	103 U	-	51.5 U	90	d	0.6	None	No	-
1,2-Dibromo-3-Chloropropane	0 / 58	2.5 U	206 U	-	103 U	35.2	e	3	None	**Yes**	**2**
1,2-Dibromoethane	0 / 90	2.5 U	103 U	-	51.5 U	1230	e	0.04	None	No	-
1,2-Dichlorobenzene	0 / 58	2.5 U	103 U	-	51.5 U	90	d	0.6	None	No	-
1,2-Dichloroethane	0 / 98	2.5 U	103 U	-	51.5 U	400	d	0.1	None	No	-
1,2-Dichloropropane	0 / 90	2.5 U	103 U	-	51.5 U	280	d	0.2	None	No	-
1,3,5-Trimethylbenzene	0 / 16	2.5 U	103 U	-	51.5 U	160	d	0.3	None	No	-
1,3-Dichlorobenzene	0 / 16	2.5 U	103 U	-	51.5 U	80	d	0.6	None	No	-
1,3-Dichloropropane	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
1,4-Dichlorobenzene	**0 / 58**	2.5 U	103 U	-	51.5 U	880	c	0.06	None	No	-
1-Chlorobutane	0 / 2	2.5 U	2.5 U	-	1.25 U	NV	-	-	-	**Yes**	**4**
2,2-Dichloropropane	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
2,4,5-Trichlorophenol	0 / 100	180 U	9600 U	-	4800 U	30	d	160	None	**Yes**	**2**
2,4,6-Trichlorophenol	0 / 100	180 U	9600 U	-	4800 U	90	d	53	None	**Yes**	**2**
2,4-Dichlorophenol	0 / 100	180 U	9600 U	-	4800 U	50	d	96	None	**Yes**	**2**
2,4-Dimethylphenol	**0 /** 100	180 U	9600 U	-	4800 U	40	d	120	None	**Yes**	**2**
2,4-Dinitrophenol	0 / 100	400 U	19000 U	-	9500 U	150	d	63	None	**Yes**	**2**
2,4-Dinitrotoluene	0 / 100	180 U	9600 U	-	4800 U	6000	c	0.8	None	No	-
2,6-Dinitrotoluene	0 / 100	180 U	9600 U	-	4800 U	4100	c	1	None	**Yes**	**2**
2-Butanone	86 / 102	7.6	270 J	A-16	270 J	1000	d	0.3	None	No	-
2-Chloronaphthalene	0 / 100	180 U	9600 U	-	4800 U	12.2	e	393	None	**Yes**	**2**
2-Chlorophenol	0 / 100	180 U	9600 U	-	4800 U	60	d	80	None	**Yes**	**2**
2-Chlorotoluene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
2-Hexanone	0 / 90	5 U	515 U	-	257.5 U	360	c	0.7	None	No	-
2-Methyl-4,6-dinitrophenol	0 / 100	360 U	19000 U	-	9500 U	144	e	66	None	**Yes**	**2**
2-Methylphenol	0 / 100	180 U	9600 U	-	4800 U	100	d	48	None	**Yes**	**2**
2-Nitroaniline	0 / 100	360 U	19000 U	-	9500 U	5400	c	2	None	**Yes**	**2**
2-Nitrophenol	0 / 100	180 U	9600 U	-	4800 U	1600	e	3	None	**Yes**	**2**
2-Nitropropane	0 / 2	2.5 U	2.5 U	-	1.25 U	NV	-	-	-	**Yes**	**4**

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
3,3'-Dichlorobenzidine	0 / 95	200 U	13000 U	-	6500 U	30	d	217	None	**Yes**	**2**
3-Nitroaniline	0 / 100	360 U	19000 U	-	9500 U	3160	e	3	None	**Yes**	**2**
4-Bromophenyl-phenylether	0 / 100	200 U	9600 U	-	4800 U	NV	-	-	-	**Yes**	**4**
4-Chloro-3-methylphenol	0 / 100	180 U	9600 U	-	4800 U	7950	e	0.6	None	No	-
4-Chloroaniline	0 / 100	180 U	9600 U	-	4800 U	1000	c	5	None	**Yes**	**2**
4-Chlorophenyl-phenylether	0 / 100	180 U	9600 U	-	4800 U	NV	-	-	-	**Yes**	**4**
4-Chlorotoluene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
4-Isopropyltoluene	0 / 16	2.5 U	103 U	-	51.5 U	180	d	0.3	None	No	-
4-Methyl-2-Pentanone	0 / 90	2.5 U	515 U	-	257.5 U	443000	e	0.0006	None	No	-
4-Methylphenol	0 / 100	180 U	9600 U	-	4800 U	80	d	60	None	**Yes**	**2**
4-Nitroaniline	0 / 100	360 U	19000 U	-	9500 U	21900	e	0.4	None	No	-
4-Nitrophenol	0 / 100	400 U	19000 U	-	9500 U	7000	b	1	None	**Yes**	**2**
alpha-HCH	0 / 100	0.95 U	140 U	-	70 U	340	d	0.2	None	No	-
Acetone	86 / 102	10	2900 J	A-16	2900 J	1200	c	2	2	**Yes**	**1**
Acrylonitrile	0 / 2	5 U	5 U	-	2.5 U	23.9	e	0.1	None	No	-
Aldrin	0 / 100	0.95 U	140 U	-	70 U	37	c	2	None	**Yes**	**2**
Allyl Chloride	0 / 2	2.5 U	2.5 U	-	1.25 U	13.4	e	0.09	None	No	-
Endosulfan I	0 / 100	0.95 U	140 U	-	70 U	640	c	0.1	None	No	-
Aroclor 1016	0 / 100	38 U	550 U	-	275 U	1000	c	0	None	**Yes**	**2**
Aroclor 1221	0 / 100	38 U	550 U	-	275 U	NV	-	-	-	**Yes**	**4**
Aroclor 1232	0 / 100	38 U	550 U	-	275 U	NV	-	-	-	**Yes**	**4**
Aroclor 1242	0 / 100	38 U	550 U	-	275 U	41	c	7	None	**Yes**	**2**
Aroclor 1248	0 / 100	38 U	550 U	-	275 U	7.2	c	38	None	**Yes**	**2**
Aroclor 1254	3 / 100	130 J	1200 J	A-24	1200 J	41	c	29	3	**Yes**	**1**
Aroclor 1260	0 / 100	38 U	550 U	-	275 U	880	c	0.3	None	No	-
Aroclor 1262	0 / 100	38 U	550 U	-	275 U	NV	-	-	-	**Yes**	**4**
Aroclor 1268	0 / 86	38 U	550 U	-	275 U	NV	-	-	-	**Yes**	**4**
Atrazine	0 / 86	200 U	9600 U	-	4800 U	73	d	66	None	**Yes**	**2**
beta-HCH	7 / 100	1.6	43	B-15	43	270	c	0.2	None	No	-
Benzaldehyde	0 / 86	200 U	9600 U	-	4800 U	NV	-	-	-	**Yes**	**4**
Benzene	0 / 90	2.5 U	61.8 U	-	30.9 U	120	d	0.3	None	No	-
Benzoic acid	0 / 14	110 U	13000 U	-	6500 U	10	d	650	None	**Yes**	**2**
Benzyl alcohol	0 / 14	740 U	8800 U	-	4400 U	1	d	4,400	None	**Yes**	**2**
Butylbenzylphthalate	1 / 95	29 J	29 J	VIN-SO-A005	29 J	590	d	0.05	None	No	-
Endosulfan II	0 / 100	0.95 U	270 U	-	135 U	0.9	d	150	None	**Yes**	**2**
Biphenyl	0 / 86	200 U	9600 U	-	4800 U	200	d	24	None	**Yes**	**2**
bis(2-Chloroethoxy)methane	0 / 100	110 U	9600 U	-	4800 U	302	e	16	None	**Yes**	**2**
bis(2-Chloroethyl)ether	0 / 100	180 U	9600 U	-	4800 U	23700	e	0.2	None	No	-
Bis(2-chloroisopropyl) ether	0 / 14	180 U	2100 U	-	1050 U	NV	-	-	-	**Yes**	**4**
bis(2-Ethylhexyl)phthalate	2 / 95	77 J	1400	VIN-SO-P-6	1400	20	c	70	2	**Yes**	**1**
Bromobenzene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
Bromochloromethane	0 / 98	2.5 U	103 U	-	51.5 U	NV	-	-	-	**Yes**	**4**
Bromodichloromethane	0 / 90	2.5 U	103 U	-	51.5 U	540	e	0.1	None	No	-
Bromoform	0 / 58	2.5 U	103 U	-	51.5 U	70	d	0.7	None	No	-

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Bromomethane	0 / 98	2.8 U	412 U	-	206 U	2	d	103	None	**Yes**	**2**
Caprolactam	0 / 86	200 U	9600 U	-	4800 U	NV	-	-	-	**Yes**	**4**
Carbazole	0 / 100	180 U	9600 U	-	4800 U	160	d	30	None	**Yes**	**2**
Carbon Disulfide	0 / 98	2.5 U	206 U	-	103 U	5	d	21	None	**Yes**	**2**
Carbon Tetrachloride	0 / 90	2.5 U	103 U	-	51.5 U	50	d	1	None	**Yes**	**2**
Chlordane	0 / 14	19 U	220 U	-	110 U	270	c	0.4	None	No	-
Chloroacetonitrile	0 / 2	62.5 U	62.5 U	-	31.25 U	NV	-	-	-	**Yes**	**4**
Chlorobenzene	0 / 90	2.5 U	103 U	-	51.5 U	2400	c	0.02	None	No	-
Chloroethane	0 / 98	2.8 U	515 U	-	257.5 U	NV	-	-	-	**Yes**	**4**
Chloroform	0 / 98	2.5 U	103 U	-	51.5 U	50	d	1	None	**Yes**	**2**
Chloromethane	0 / 98	2.8 U	103 U	-	51.5 U	10400	e	0.005	None	No	-
Chlorpyrifos	0 / 14	7.6 U	19 U	-	9.5 U	3.5	d	3	None	**Yes**	**2**
cis-1,2-Dichloroethene	0 / 98	2.5 U	103 U	-	51.5 U	40	d	1	None	**Yes**	**2**
cis-1,3-Dichloropropene	0 / 90	2.5 U	103 U	-	51.5 U	1	d	52	None	**Yes**	**2**
cis-Chlordane	3 / 100	20 J	430	A-16	430	270	c	2	1	**Yes**	**1**
Coumaphos	0 / 14	7.6 U	97 U	-	48.5 U	NV	-	-	-	**Yes**	**4**
Cyclohexane	0 / 74	2.8 U	13 U	-	6.5 U	NV	-	-	-	**Yes**	**4**
delta-HCH	1 / 100	3.4	3.4	A-23	3.4	9.4	c	0.4	None	No	-
Demeton-O	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	**Yes**	**4**
Demeton-S	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	**Yes**	**4**
Diazinon	0 / 14	7.6 U	19 U	-	9.5 U	2	d	5	None	**Yes**	**2**
Dibenzofuran	0 / 100	180 U	9600 U	-	4800 U	150	d	32	None	**Yes**	**2**
Dibromochloromethane	0 / 90	2.5 U	103 U	-	51.5 U	2050	e	0.03	None	No	-
Dibromomethane	0 / 16	2.5 U	206 U	-	103 U	65000	e	0.002	None	No	-
Dichlorodifluoromethane	0 / 98	2.5 U	103 U	-	51.5 U	39500	e	0.001	None	No	-
Dichloromethane	14 / 98	52.6 J	184 J	VIN-SO-C17	184 J	210	d	0.9	None	No	-
Dichlorvos	0 / 14	7.6 U	97 U	-	48.5 U	NV	-	-	-	**Yes**	**4**
Dieldrin	6 / 100	1.2 J	50	A-16	50	4.9	a	10	5	**Yes**	**1**
Diethyl ether	0 / 2	50 U	50 U	-	25 U	NV	-	-	-	**Yes**	**4**
Diethylphthalate	0 / 100	180 U	9600 U	-	4800 U	230	d	21	None	**Yes**	**2**
Dimethoate	0 / 14	7.6 U	19 U	-	9.5 U	218	e	0.04	None	No	-
Dimethylphthalate	0 / 100	180 U	9600 U	-	4800 U	350	d	14	None	**Yes**	**2**
Di-n-butylphthalate	2 / 100	36 J	42 J	VIN-SO-A002	42 J	11	c	4	2	**Yes**	**1**
Di-n-octylphthalate	0 / 82	180 U	9600 U	-	4800 U	210	c	23	None	**Yes**	**2**
Disulfoton	0 / 14	7.6 U	19 U	-	9.5 U	19.9	e	0.5	None	No	-
Endosulfan Sulfate	0 / 100	0.95 U	270 U	-	135 U	6.5	d	21	None	**Yes**	**2**
Endrin	1 / 100	5.9	5.9	A-24	5.9	1.4	c	4	1	**Yes**	**1**
Endrin Aldehyde	0 / 100	0.95 U	270 U	-	135 U	10.5	e	13	None	**Yes**	**2**
Endrin Ketone	0 / 100	0.95 U	270 U	-	135 U	NV	-	-	-	**Yes**	**4**
EPN	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	**Yes**	**4**
Ethoprop	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	**Yes**	**4**
Ethyl Benzene	0 / 90	2.5 U	103 U	-	51.5 U	270	d	0.2	None	No	-
Ethylmethacrylate	0 / 2	2.5 U	2.5 U	-	1.25 U	30000	e	0.00004	None	No	-
Fensulfothion	0 / 14	7.6 U	97 U	-	48.5 U	NV	-	-	-	**Yes**	**4**

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Fenthion	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
gamma-Chlordane	2 / 14	4.8 J	20	VIN-SO-B7	20	2200	c	0.009	None	No	-
gamma-BHC (Lindane)	1 / 100	3.2	3.2	A-23	3.2	9.4	c	0.3	None	No	-
Heptachlor	2 / 100	2.7	4.7	B-14	4.7	59	c	0.08	None	No	-
Heptachlor Epoxide	5 / 100	2.8	79	A-16	79	0.4	d	198	5	Yes	1
Hexachlorobenzene	0 / 100	180 U	9600 U	-	4800 U	79	c	61	None	Yes	2
Hexachlorobutadiene	0 / 102	5 U	9600 U	-	4800 U	40	e	120	None	Yes	2
Hexachlorocyclopentadiene	0 / 100	180 U	9600 U	-	4800 U	0.8	d	6,000	None	Yes	2
Hexachloroethane	0 / 102	2.5 U	9600 U	-	4800 U	24	d	200	None	Yes	2
Iodomethane	0 / 2	12.5 U	12.5 U	-	6.25 U	1230	e	0.005	None	No	-
Isophorone	0 / 100	180 U	9600 U	-	4800 U	139000	e	0.03	None	No	-
Isopropylbenzene	0 / 90	2.5 U	103 U	-	51.5 U	40	d	1	None	Yes	2
m and/or p-Xylene	0 / 90	2.5 U	206 U	-	103 U	100	d	1	None	Yes	2
Malathion	0 / 14	7.6 U	19 U	-	9.5 U	0.1	d	95	None	Yes	2
Merphos	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Methacrylonitrile	0 / 2	2.5 U	2.5 U	-	1.25 U	57	e	0.02	None	No	-
Methyl Acetate	39 / 83	4.6 J	170	A-27	170	NV	-	-	-	Yes	3
Methyl Acrylate	0 / 2	25 U	25 U	-	12.5 U	NV	-	-	-	Yes	4
Methylmethacrylate	0 / 2	2.5 U	2.5 U	-	1.25 U	984000	e	0.000001	None	No	-
Methyl Parathion	0 / 14	7.6 U	19 U	-	9.5 U	0.262	e	36	None	Yes	2
Methyl tert-butyl ether	0 / 98	2.5 U	206 U	-	103 U	12500	c	0.008	None	No	-
Methylcyclohexane	0 / 88	2.8 U	13 U	-	6.5 U	NV	-	-	-	Yes	4
Mevinphos	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Monocrotophos	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Naled	0 / 14	7.6 U	97 U	-	48.5 U	NV	-	-	-	Yes	4
n-Butylbenzene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	Yes	4
Nitrobenzene	0 / 102	25 U	9600 U	-	4800 U	2200	c	2	None	Yes	2
N-Nitrosodimethylamine	0 / 14	180 U	2100 U	-	1050 U	0.0321	e	32,710	None	Yes	2
N-nitroso-di-n-propylamine	0 / 100	180 U	9600 U	-	4800 U	544	e	9	None	Yes	2
N-nitrosodiphenylamine	0 / 100	180 U	9600 U	-	4800 U	120	d	40	None	Yes	2
n-Propylbenzene	0 / 16	2.5.U	103 U	-	51.5 U	NV	-	-	-	Yes	4
o-Xylene	1 / 90	18.5 J	18.5 J	VIN-SO-A002	18.5 J	100	d	0.2	None	No	-
p,p'-DDD	9 / 100	1.3 J	210	A-16	210	6.3	c	33	4	Yes	1
p,p'-DDE	7 / 100	3.1	1600	B-15	1600	110	c	15	1	Yes	1
p,p'-DDT	10 / 100	1 J	1500	B-15	1500	44	c	34	4	Yes	1
DDD/DDE/DDT Total	13 / 100	2.65 J	3185	B-15	3185	21	a	152	8	Yes	1
p,p'-Methoxychlor	0 / 100	0.95 U	1400 U	-	700 U	5000	c	0.1	None	No	-
Parathion	0 / 14	7.6 U	19 U	-	9.5 U	0.5	d	19	None	Yes	2
PCBs (Total)	0 / 14	38 U	62 U	-	31 U	0.332	e	93	None	Yes	2
Pentachloroethane	0 / 2	2.5 U	2.5 U	-	1.25 U	10700	e	0.0001	None	No	-
Pentachlorophenol	0 / 100	180 U	19000 U	-	9500 U	2100	a	5	None	Yes	2
Phenol	0 / 100	180 U	9600 U	-	4800 U	790	c	6	None	Yes	2
Phorate	0 / 14	7.6 U	19 U	-	9.5 U	0.496	e	19	None	Yes	2
Propionitrile	0 / 2	50 U	50 U	-	25 U	49.8	e	0.5	None	No	-

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Ronnel	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
sec-Butylbenzene	0 / 16	2.5 U	103 U	-	51.5 U	NV	-	-	-	Yes	4
Styrene	0 / 90	2.5 U	103 U	-	51.5 U	1200	c	0.04	None	No	-
Sulfotepp	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Sulprofos	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
tert-Butylbenzene	0 / 16	5 U	103 U	-	51.5 U	NV	-	-	-	Yes	4
Tetrachloroethene	4 / 90	7.19	191	VIN-SO-D011	191	60	d	3	1	Yes	1
Tetraethyl pyrophosphate (TEPP)	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Tetrahydrofuran	0 / 2	12.5 U	12.5 U	-	6.25 U	NV	-	-	-	Yes	4
Tokuthion	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Toluene	3 / 90	4.9	14	A-39	14	150	d	0.09	None	No	-
Toxaphene	0 / 100	19 U	14000 U	-	7000 U	4100	d	2	None	Yes	2
trans-1,2-Dichloroethene	0 / 98	2.5 U	103 U	-	51.5 U	40	d	1	None	Yes	2
trans-1,3-Dichloropropene	0 / 90	2.5 U	103 U	-	51.5 U	1	d	52	None	Yes	2
trans-1,4-Dichloro-2-butene	0 / 2	2.5 U	2.5 U	-	1.25 U	NV	-	-	-	Yes	4
trans-Chlordane	9 / 86	2	310	A-16	310	270	c	1	1	Yes	1
Trichloroethene	0 / 90	2.5 U	103 U	-	51.5 U	60	d	0.9	None	No	-
Trichlorofluoromethane	0 / 98	2.8 U	103 U	-	51.5 U	52000	c	0.001	None	No	-
Trichloronate	0 / 14	7.6 U	19 U	-	9.5 U	NV	-	-	-	Yes	4
Vinyl Chloride	0 / 98	2.5 U	82.4 U	-	41.2 U	30	d	1	None	Yes	2
Xylene (all isomers)	0 / 16	5 U	309 U	-	154.5 U	100	d	2	None	Yes	2
Low mol wt PAHs (µg/kg)											
2-Methylnaphthalene	0 / 100	180 U	9600 U	-	Individual analytes were screened as the summed total concentration.						
Acenaphthene	0 / 100	180 U	9600 U	-							
Acenaphthylene	1 / 100	1600 J	1600 J	VIN-SO-A018A							
Anthracene	1 / 100	1300 J	1300 J	VIN-SO-A018A							
Fluorene	0 / 100	180 U	9600 U	-							
Naphthalene	1 / 102	14 J	14 J	VIN-SO-C17							
Phenanthrene	3 / 100	14 J	650	D-4							
LMW PAHs (Total)	5 / 102	588.5 J	7,709 J	VIN-SO-A018A	7,709	29,000	a	0.3	None	No	-
High mol wt PAHs (µg/kg)											
Benzo[a]anthracene	4 / 95	17 J	9100	VIN-SO-A018A	Individual analytes were screened as the summed total concentration.						
Benzo[a]pyrene	4 / 82	16 J	6400	VIN-SO-A018A							
Benzo[b]fluoranthene	7 / 82	17 J	12000	VIN-SO-A018A							
Benzo[ghi]perylene	3 / 82	170 J	1400 J	VIN-SO-A018A							
Benzo[k]fluoranthene	2 / 82	170 J	4300	VIN-SO-A018A							
Chrysene	4 / 95	21 J	7800	VIN-SO-A018A							
Dibenzo[a,h]anthracene	1 / 82	47 J	47 J	VIN-SO-P-6							
Fluoranthene	3 / 100	27 J	18000	VIN-SO-A018A							
Indeno[1,2,3-cd]pyrene	4 / 82	10 J	1600 J	VIN-SO-A018A							
Pyrene	6 / 95	27 J	15000	VIN-SO-A018A							
HMW PAHs (Total)	8 / 100	418 J	76,650 J	VIN-SO-A018A	76,650	1,100	a	70	5	Yes	1

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Metals (mg/kg)											
Aluminum	86 / 86	2190	10800	A-32	10800	NV (pH)	a	-	-	**Yes**	**3**
Antimony	13 / 100	0.19 J	25 J	VIN-SO-A018A	25 J	0.27	a	93	11	**Yes**	**1**
Arsenic	100 / 100	2.1	13	VIN-SO-D007	13	18	a	0.7	None	No	-
Barium	86 / 86	48.6	298	A-8	298	330	a	0.9	None	No	-
Beryllium	39 / 100	0.12 J	0.81	A-22	0.81	10	b	0.1	None	No	-
Cadmium	57 / 100	0.46	16	VIN-SO-A018A	16	0.36	a	44	57	**Yes**	**1**
Calcium	84 / 86	460	93400	A-8	93400	Nutrient	-	-	-	No	-
Chromium	97 / 100	3.1	82 J	VIN-SO-A018A	82 J	18	a	5	12	**Yes**	**1**
Cobalt	69 / 86	4.7 J	18.6 J	A-25	18.6 J	13	a	1	13	**Yes**	**1**
Copper	87 / 100	2.5	1500	VIN-SO-A018A	1500	28	a	54	10	**Yes**	**1**
Iron	86 / 86	4210	27400	B-9	27400	NV (pH)	a	-	-	**Yes**	**3**
Lead	100 / 100	8.1	1000 J	VIN-SO-A018A	1000 J	11	a	91	99	**Yes**	**1**
Magnesium	85 / 86	485	48600	A-8	48600	Nutrient	-	-	-	No	-
Manganese	86 / 86	375	2030	A-25	2030	220	a	9	86	**Yes**	**1**
Mercury	22 / 100	0.025 J	0.97	A-8	0.97	0.1	b	10	6	**Yes**	**1**
Nickel	98 / 100	5.1	67	VIN-SO-A018A	67	38	a	2	1	**Yes**	**1**
Potassium	33 / 86	448	841 J	B-3	841 J	Nutrient	-	-	-	No	-
Selenium	0 / 100	1.6 U	4.7 U	-	2.35 U	0.52	a	5	None	**Yes**	**2**
Silver	13 / 100	0.21 J	1.8	B-9	1.8	4.2	a	0.4	None	No	-
Sodium	0 / 86	401 U	669 U	-	334.5 U	Nutrient	-	-	-	No	-
Thallium	14 / 100	0.47 J	2 J	VIN-SO-A018A	2 J	0.22	c	9	14	**Yes**	**1**
Vanadium	86 / 86	7.1	52.3	A-16	52.3	7.8	a	7	85	**Yes**	**1**
Zinc	78 / 100	22.4	2200 J	VIN-SO-A018A	2200 J	46	a	48	41	**Yes**	**1**

Notes:

- - Not Applicable
COPC - Chemical of Potential Concern
mg/kg - milligrams per kilogramliter
µg/kg - micrograms per kilogram
NV - no value (value not available)
PAHs - polycyclic aromatic hydrocarbons
PCOPC - Preliminary Chemical of Potential Concern

[1] - Maximum detected or 1/2 of max SQL
[2] - HQ = Exposure Point Concentration / ESV
[3] - PCOPC Categories:
1 - Detected and HQ >= 1
2 - Not Detected, maximum SQL >= ESV
3 - Detected but no ESV
4 - Not Detected and no ESV

Data Qualifiers:

U - Analyte not detected at or above reporting limit. The number is the minimum quanititation limit.
J - Identification of analyte is acceptable; reported value is estimated.

Table C-22
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Soil
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Detected Concentration	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								

Source:

a - EPA Eco-SSL

b - Oak Ridge National Laboratory:

Efroymson, R.A., M.E. Will, and G.W. Suter. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2. http://www.esd.ornl.gov/programs/ecorisk/documents/tm126r21.pdf

Efroymson, R.A., M.E. Will, G.W. Suter, and A.C. Wooten. 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-95/R4. http://www.esd.ornl.gov/programs/ecorisk/documents/tm85r3.pdf

Efroymson, R.A., G.W. Suter, II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. 50 pp. ES/ER/TM-162/R2

c - Los Alamos National Laboratory (LANL). 2012. ECORISK Database Release 3.2. Environmental Programs, Engineering and Technology Division. September 2013. http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php

d - ECOSAR & Region 4 soil model.

e - EPA Region 5 ESV

Table C-23
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Surface Water
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Organics (µg/L)											
1,1,1,2-Tetrachloroethane	0 / 13	0.04 U	1 U		0.5 U	85	b	0.006	None	No	-
1,1,1-Trichloroethane	0 / 13	0.03 U	1 U		0.5 U	76	b	0.007	None	No	-
1,1,2,2-Tetrachloroethane	0 / 13	0.14 U	1 U		0.5 U	200	b	0.003	None	No	-
1,1,2-Trichloro-1,2,2-trifluoroethane	6 / 13	1.23	4.2	VIN-WP-020	4.2	NV	-	-	-	**Yes**	**3**
1,1,2-Trichloroethane	0 / 13	0.046 U	1 U		0.5 U	730	b	0.0007	None	No	-
1,1-Dichloroethane	0 / 13	0.044 U	1 U		0.5 U	410	b	0.001	None	No	-
1,1-Dichloroethene	0 / 13	0.022 U	1 U		0.5 U	130	b	0.004	None	No	-
1,1-Dichloropropene	0 / 13	0.04 U	1 U		0.5 U	0.055	h	9	None	**Yes**	**2**
1,2,3,4-Tetramethylbenzene	0 / 5	0.1 U	0.1 U		0.05 U	NV	-	-	-	**Yes**	**4**
1,2,3,5-Tetramethylbenzene	0 / 5	0.08 U	0.08 U		0.04 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trichlorobenzene	0 / 13	0.06 U	1 U		0.5 U	5	i	0.1	None	No	-
1,2,3-Trichloropropane	0 / 13	0.12 U	5 U		2.5 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trimethylbenzene	0 / 5	0.06 U	0.06 U		0.03 U	NV	-	-	-	**Yes**	**4**
1,2,4-Trichlorobenzene	0 / 16	0.08 U	5.6 U		2.8 U	130	b	0.02	None	No	-
1,2,4-Trimethylbenzene	0 / 13	0.032 U	1 U		0.5 U	15	b	0.03	None	No	-
1,2-Dibromo-3-chloropropane	0 / 13	0.4 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
1,2-Dibromoethane	0 / 13	0.028 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
1,2-Dichlorobenzene	0 / 13	0.028 U	1 U		0.5 U	23	b	0.02	None	No	-
1,2-Dichloroethane	0 / 13	0.08 U	1 U		0.5 U	2000	b	0.0003	None	No	-
1,2-Dichloropropane	0 / 13	0.026 U	1 U		0.5 U	520	b	0.001	None	No	-
1,3,5-Trimethylbenzene	0 / 13	0.032 U	1 U		0.5 U	26	b	0.02	None	No	-
1,3-Dichlorobenzene	0 / 13	0.024 U	1 U		0.5 U	22	b	0.02	None	No	-
1,3-Dichloropropane	0 / 13	0.06 U	1 U		0.5 U	360	f	0.001	None	No	-
1,4-Dichlorobenzene	0 / 13	0.026 U	1 U		0.5 U	9.4	b	0.05	None	No	-
2,2-Dichloropropane	0 / 13	0.06 U	1 U		0.5 U	360	f	0.001	None	No	-
2,4,5-Trichlorophenol	0 / 3	5.2 U	5.6 U		2.8 U	1.9	b	1	None	**Yes**	**2**
2,4,6-Trichlorophenol	0 / 3	4.2 U	4.4 U		2.2 U	4.9	b	0.4	None	No	-
2,4-Dichlorophenol	0 / 3	5.2 U	5.6 U		2.8 U	7	g	0.4	None	No	-
2,4-Dimethylphenol	0 / 3	5.2 U	5.6 U		2.8 U	15	b	0.2	None	No	-
2,4-Dinitrophenol	0 / 3	26 U	28 U		14 U	71	b	0.2	None	No	-
2,4-Dinitrotoluene	0 / 3	5.2 U	5.6 U		2.8 U	44	b	0.06	None	No	-
2,6-Diethylaniline	0 / 1	0.006 U	0.006 U		0.003 U	NV	-	-	-	**Yes**	**4**
2,6-Dinitrotoluene	0 / 3	5.2 U	5.6 U		2.8 U	81	b	0.03	None	No	-
2-Chloro-4-isopropylamino-6-amino-s-triazine	0 / 1	0.01 U	0.01 U		0.005 U	NV	-	-	-	**Yes**	**4**
2-Chloronaphthalene	0 / 3	5.2 U	5.6 U		2.8 U	4300	g	0.0007	None	No	-
2-Chlorophenol	0 / 3	5.2 U	5.6 U		2.8 U	32	b				
2-Chlorotoluene	0 / 13	0.028 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
2-Ethyltoluene	0 / 5	0.032 U	0.032 U		0.016 U	NV	-	-	-	**Yes**	**4**
2-Methyl-4,6-dinitrophenol	0 / 3	10 U	11 U		5.5 U	23	f	0.2	None	No	-
2-Methylnaphthalene	0 / 3	1 U	1.1 U		0.55 U	4.7	b	0.1	None	No	-
2-Nitroaniline	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
2-Nitrophenol	0 / 3	5.2 U	5.6 U		2.8 U	73	b	0.04	None	No	-

Table C-23
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Surface Water
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
3,3'-Dichlorobenzidine	0 / 3	21 U	22 U		11 U	4.5	d	2	None	**Yes**	**2**
3-Chloropropene	0 / 5	0.08 U	0.08 U		0.04 U	NV	-	-	-	**Yes**	**4**
3-Nitroaniline	0 / 3	10 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
4-Bromophenyl phenyl ether	0 / 3	5.2 U	5.6 U		2.8 U	1.5	f	2	None	**Yes**	**2**
4-Chloro-3-methylphenol	0 / 3	5.2 U	5.6 U		2.8 U	7.4	d	0.4	None	No	-
4-Chloroaniline	0 / 3	10 U	11 U		5.5 U	19	j	0.3	None	No	-
4-Chlorophenyl phenyl ether	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
4-Chlorotoluene	0 / 13	0.042 U	2 U		1 U	NV	-	-	-	**Yes**	**4**
4-Isopropyltoluene	3 / 13	0.01	0.07	VIN-JW-SEEP	0.07	16	b	0.004	None	No	-
4-Nitroaniline	0 / 3	10 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
4-Nitrophenol	0 / 3	26 U	28 U		14 U	58	b	0.2	None	No	-
Fluorene	0 / 3	1 U	1.1 U		0.55 U	19	b	0.03	None	No	-
Acenaphthene	0 / 3	1 U	1.1 U		0.55 U	15	b	0.04	None	No	-
Acenaphthylene	0 / 3	1 U	1.1 U		0.55 U	13	b	0.04	None	No	-
Acetochlor	0 / 1	0.01 U	0.01 U		0.005 U	NV	-	-	-	**Yes**	**4**
Acetone	5 / 13	0.8	3.4	VIN-WP-020	3.4	1700	b	0.002	None	No	-
Acrylonitrile	0 / 5	0.56 U	0.56 U		0.28 U	78	b	0.004	None	No	-
Alachlor	0 / 1	0.008 U	0.008 U		0.004 U	NV	-	-	-	**Yes**	**4**
Aldrin	0 / 3	0.01 U	0.011 U		0.0055 U	0.035	b	0.2	None	No	-
alpha-Endosulfan	0 / 3	0.01 U	0.011 U		0.0055 U	0.01	r	0.6	None	No	-
alpha-HCH	0 / 4	0.004 U	0.011 U		0.0055 U	0.004	h	1	None	**Yes**	**2**
Anthracene	0 / 3	1 U	1.1 U		0.55 U	0.02	b	28	None	**Yes**	**2**
Aroclor 1016	0 / 3	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1221	0 / 3	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1232	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1242	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1248	0 / 3	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1254	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1260	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1262	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1268	0 / 3	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Atrazine	0 / 1	0.008 U	0.008 U		0.004 U	12	b	0.0003	None	No	-
Azinphos-methyl	0 / 1	0.12 U	0.12 U		0.06 U	0.01	a,r	6	None	**Yes**	**2**
Benfluralin	0 / 1	0.014 U	0.014 U		0.007 U	NV	-	-	-	**Yes**	**4**
Benzene	0 / 13	0.026 U	1 U		0.5 U	160	b	0.003	None	No	-
Benzo[a]anthracene	0 / 6	1 U	1.1 U		0.55 U	4.7	b	0.1	None	No	-
Benzo[b]fluoranthene	0 / 3	1 U	1.1 U		0.55 U	2.6	b	0.2	None	No	-
Benzo[ghi]perylene	0 / 3	1 U	1.1 U		0.55 U	0.44	q, j	1	None	**Yes**	**2**
Benzo[k]fluoranthene	0 / 3	1 U	1.1 U		0.55 U	0.64	q, i	0.9	None	No	-
Benzoic acid	0 / 3	26 U	28 U		14 U	42	c	0.3	None	No	-
Benzyl alcohol	0 / 3	26 U	28 U		14 U	8.6	c	2	None	**Yes**	**2**
Benzyl n-butyl phthalate	0 / 3	5.2 U	5.6 U		2.8 U	23	b	0.1	None	No	-
beta-Endosulfan	0 / 3	0.01 U	0.011 U		0.0055 U	0.01	r	0.6	None	No	-
beta-HCH	0 / 3	0.01 U	0.011 U		0.0055 U	0.046	d	0.1	None	No	-

Table C-23
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Surface Water
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Bis(2-chloroethoxy)methane	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
Bis(2-chloroethyl) ether	0 / 3	1 U	1.1 U		0.55 U	1900	f	0.0003	None	No	-
Bis(2-chloroisopropyl) ether	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
Bis(2-ethylhexyl) phthalate	0 / 3	5.2 U	5.6 U		2.8 U	3	c	0.9	None	No	-
Bromobenzene	0 / 13	0.022 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Bromochloromethane	0 / 13	0.06 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Bromodichloromethane	0 / 13	0.034 U	1 U		0.5 U	340	b	0.001	None	No	-
Bromoethene	0 / 5	0.12 U	0.12 U		0.06 U	NV	-	-	-	**Yes**	**4**
Bromomethane	0 / 13	0.2 U	5 U		2.5 U	16	b	0.2	None	No	-
Butylate	0 / 1	0.004 U	0.004 U		0.002 U	NV	-	-	-	**Yes**	**4**
Carbaryl	0 / 1	0.06 U	0.06 U		0.03 U	0.5	r	0.06	None	No	-
Carbazole	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
Carbofuran	0 / 1	0.06 U	0.06 U		0.03 U	0.75	r	0.04	None	No	-
Carbon disulfide	0 / 13	0.1 U	1 U		0.5 U	15	b	0.03	None	No	-
Chlordane (technical)	0 / 3	0.21 U	0.22 U		0.11 U	0.0043	a	26	None	**Yes**	**2**
Chlorobenzene	0 / 13	0.026 U	1 U		0.5 U	25	b	0.02	None	No	-
Chloroethane	0 / 13	0.06 U	2 U		1 U	NV	-	-	-	**Yes**	**4**
Chloromethane	1 / 13	0.54 J	0.54 J	VIN-SW-TB2-1	0.54 J	NV	-	-	-	**Yes**	**3**
Chlorpyrifos	0 / 4	0.01 U	0.11 U		0.055 U	0.04	g	1	None	**Yes**	**2**
Chrysene	0 / 3	1 U	1.1 U		0.55 U	4.7	b	0.1	None	No	-
cis-1,2-Dichloroethene	0 / 13	0.022 U	1 U		0.5 U	620	b	0.0008	None	No	-
cis-1,3-Dichloropropene	0 / 13	0.1 U	1 U		0.5 U	1.7	b	0.3	None	No	-
cis-Chlordane	0 / 3	0.01 U	0.011 U		0.0055 U	0.0043	a	1	None	**Yes**	**2**
cis-Permethrin	0 / 1	0.01 U	0.01 U		0.005 U	0.004	d	1	None	**Yes**	**2**
Coumaphos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Cyanazine	0 / 1	0.022 U	0.022 U		0.011 U	270	b	0.00004	None	No	-
DCPA (Dacthal)	0 / 1	0.0076 U	0.0076 U		0.0038 U	NV	-	-	-	**Yes**	**4**
delta-HCH	0 / 3	0.01 U	0.011 U		0.0055 U	0.004	h	1	None	**Yes**	**2**
Demeton-O	0 / 3	0.11 U	0.11 U		0.055 U	0.1	g	0.6	None	No	-
Demeton-S	0 / 3	0.11 U	0.11 U		0.055 U	0.1	g	0.6	None	No	-
Desulfinylfipronil amide	0 / 1	0.029 U	0.029 U		0.0145 U	NV	-	-	-	**Yes**	**4**
Desulfinylfipronil	0 / 1	0.012 U	0.012 U		0.006 U	NV	-	-	-	**Yes**	**4**
Diazinon	0 / 4	0.006 U	0.11 U		0.055 U	0.17	a	0.3	None	No	-
Dibenzo[a,h]anthracene	0 / 3	1 U	1.1 U		0.55 U	0.28	q, j	2	None	**Yes**	**2**
Dibenzofuran	0 / 3	4.2 U	4.4 U		2.2 U	4	b	0.6	None	No	-
Dibromochloromethane	0 / 13	0.12 U	1 U		0.5 U	320	b	0.002	None	No	-
Dibromomethane	0 / 13	0.05 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Dichlorodifluoromethane	0 / 13	0.1 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Dichloromethane	1 / 13	0.35 J	0.35 J	Vienna Spring	0.35 J	1500	b	0.0002	None	No	-
Dichlorvos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Dieldrin	0 / 4	0.008 U	0.011 U		0.0055 U	0.056	a	0.1	None	No	-
Diethyl ether	0 / 5	0.1 U	0.1 U		0.05 U	NV	-	-	-	**Yes**	**4**
Diethyl phthalate	0 / 3	5.2 U	5.6 U		2.8 U	220	b	0.01	None	No	-
Diisopropyl ether	0 / 5	0.06 U	0.06 U		0.03 U	NV	-	-	-	**Yes**	**4**

Table C-23
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Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Dimethoate	0 / 3	0.11 U	0.11 U		0.055 U	0.5	r	0.1	None	No	-
Dimethyl phthalate	0 / 3	5.2 U	5.6 U		2.8 U	1100	b	0.003	None	No	-
Di-n-butyl phthalate	0 / 3	5.2 U	5.6 U		2.8 U	19	b	0.1	None	No	-
Di-n-octyl phthalate	0 / 3	5.2 U	5.6 U		2.8 U	30	f	0.09	None	No	-
Disulfoton	0 / 4	0.04 U	0.11 U		0.055 U	0.0402	f	1	None	**Yes**	**2**
Endosulfan sulfate	0 / 3	0.01 U	0.011 U		0.0055 U	0.056	g	0.1	None	No	-
Endrin aldehyde	0 / 3	0.01 U	0.011 U		0.0055 U	0.036	a	0.2	None	No	-
Endrin ketone	0 / 3	0.01 U	0.011 U		0.0055 U	0.036	a	0.2	None	No	-
Endrin	0 / 3	0.01 U	0.011 U		0.0055 U	0.036	a	0.2	None	No	-
EPN	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
EPTC	0 / 1	0.0056 U	0.0056 U		0.0028 U	NV	-	-	-	**Yes**	**4**
Ethalfluralin	0 / 1	0.006 U	0.006 U		0.003 U	NV	-	-	-	**Yes**	**4**
Ethoprop	0 / 4	0.016 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Ethyl methacrylate	0 / 5	0.2 U	0.2 U		0.1 U	NV	-	-	-	**Yes**	**4**
Ethyl methyl ketone	0 / 13	1.6 U	10 U		5 U	2200	b	0.002	None	No	-
Ethylbenzene	0 / 13	0.036 U	1 U		0.5 U	320	g	0.002	None	No	-
Fensulfothion	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Fenthion	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Fipronil sulfide	0 / 1	0.016 U	0.016 U		0.008 U	NV	-	-	-	**Yes**	**4**
Fipronil sulfone	0 / 1	0.024 U	0.024 U		0.012 U	NV	-	-	-	**Yes**	**4**
Fipronil	0 / 1	0.018 U	0.018 U		0.009 U	NV	-	-	-	**Yes**	**4**
Fluoranthene	0 / 3	1 U	1.1 U		0.55 U	0.8	b	0.7	None	No	-
Fonofos	0 / 1	0.0048 U	0.0048 U		0.0024 U	NV	-	-	-	**Yes**	**4**
gamma-Chlordane	0 / 3	0.01 U	0.011 U		0.0055 U	0.0043	a	1	None	**Yes**	**2**
Heptachlor epoxide	0 / 3	0.01 U	0.011 U		0.0055 U	0.0038	a	1	None	**Yes**	**2**
Heptachlor	0 / 3	0.01 U	0.011 U		0.0055 U	0.0038	a	1	None	**Yes**	**2**
Hexachlorobenzene	0 / 3	1 U	1.1 U		0.55 U	0.0003	f	1,833	None	**Yes**	**2**
Hexachlorobutadiene	0 / 16	0.08 U	5 U		2.5 U	1	b	3	None	**Yes**	**2**
Hexachlorocyclopentadiene	0 / 3	5.2 U	5.6 U		2.8 U	0.5	g	6	None	**Yes**	**2**
Hexachloroethane	0 / 8	0.12 U	5.6 U		2.8 U	12	c	0.2	None	No	-
Indeno[1,2,3-cd]pyrene	0 / 3	1 U	1.1 U		0.55 U	0.28	q, j	2	None	**Yes**	**2**
Iodomethane	0 / 5	0.26 U	0.26 U		0.13 U	NV	-	-	-	**Yes**	**4**
Isobutyl methyl ketone	0 / 13	0.32 U	10 U		5 U	170	c	0.03	None	No	-
Isophorone	0 / 3	5.2 U	5.6 U		2.8 U	920	b	0.003	None	No	-
Isopropylbenzene	0 / 13	0.042 U	1 U		0.5 U	4.8	b	0.1	None	No	-
Lindane	0 / 4	0.004 U	0.011 U		0.0055 U	0.026	f	0.2	None	No	-
Linuron	0 / 1	0.004 U	0.004 U		0.002 U	NV	-	-	-	**Yes**	**4**
Malathion	0 / 4	0.016 U	0.11 U		0.055 U	0.035	r	2	None	**Yes**	**2**
Merphos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Methyl acrylate	0 / 5	0.8 U	0.8 U		0.4 U	NV	-	-	-	**Yes**	**4**
Methyl acrylonitrile	0 / 5	0.26 U	0.26 U		0.13 U	NV	-	-	-	**Yes**	**4**
Methyl methacrylate	0 / 5	0.3 U	0.3 U		0.15 U	2800	f	0.00005	None	No	-
Methyl parathion	0 / 4	0.008 U	0.11 U		0.055 U	0.013	a	4	None	**Yes**	**2**
Methyl tert-butyl ether	0 / 13	0.1 U	1 U		0.5 U	730	b	0.0007	None	No	-

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Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Methyl tert-pentyl ether	0 / 5	0.06 U	0.06 U		0.03 U	NV	-	-	-	**Yes**	**4**
Metolachlor	0 / 1	0.012 U	0.012 U		0.006 U	15	d	0.0004	None	No	-
Metribuzin	0 / 1	0.012 U	0.012 U		0.006 U	NV	-	-	-	**Yes**	**4**
Mevinphos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Molinate	0 / 1	0.008 U	0.008 U		0.004 U	NV	-	-	-	**Yes**	**4**
Monocrotophos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
m-Xylene plus p-xylene	0 / 13	0.08 U	2 U		1 U	27	b	0.04	None	No	-
Naled	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Naphthalene	0 / 16	0.18 U	1.1 U		0.55 U	21	b	0.03	None	No	-
Napropamide	0 / 1	0.01 U	0.01 U		0.005 U	NV	-	-	-	**Yes**	**4**
n-Butyl methyl ketone	0 / 13	0.6 U	5 U		2.5 U	99	c	0.03	None	No	-
n-Butylbenzene	0 / 13	0.08 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Nitrobenzene	0 / 3	3.1 U	3.3 U		1.65 U	380	b	0.004	None	No	-
N-Nitrosodimethylamine	0 / 3	5.2 U	5.6 U		2.8 U	117	e	0.02	None	No	-
N-Nitrosodi-n-propylamine	0 / 3	5.2 U	5.6 U		2.8 U	NV	-	-	-	**Yes**	**4**
N-Nitrosodiphenylamine	0 / 3	5.2 U	5.6 U		2.8 U	25	b	0.1	None	No	-
n-Propylbenzene	0 / 13	0.036 U	1 U		0.5 U	128	e	0.004	None	No	-
o-Cresol	0 / 3	5.2 U	5.6 U		2.8 U	67	b	0.04	None	No	-
Orthophosphate	0 / 3	0.1 U	0.1 U		0.05 U	NV	-	-	-	**Yes**	**4**
o-Xylene	0 / 13	0.032 U	1 U		0.5 U	27	b	0.02	None	No	-
p,p'-DDD	0 / 3	0.01 U	0.011 U		0.0055 U	0.001	a	6	None	**Yes**	**2**
p,p'-DDE	0 / 4	0.005 U	0.011 U		0.0055 U	0.001	a	6	None	**Yes**	**2**
p,p'-DDT	0 / 3	0.01 U	0.011 U		0.0055 U	0.001	a	6	None	**Yes**	**2**
p,p'-Methoxychlor	0 / 3	0.01 U	0.011 U		0.0055 U	0.03	a	0.2	None	No	-
Parathion	0 / 4	0.02 U	0.11 U		0.055 U	0.013	a	4	None	**Yes**	**2**
Total PCBs	0 / 3	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
p-Cresol	0 / 3	10 U	11 U		5.5 U	53	b	0.1	None	No	-
Pebulate	0 / 1	0.016 U	0.016 U		0.008 U	NV	-	-	-	**Yes**	**4**
Pendimethalin	0 / 1	0.012 U	0.012 U		0.006 U	NV	-	-	-	**Yes**	**4**
Pentachlorophenol	0 / 3	5.2 U	5.6 U		2.8 U	8.7	g	0.3	None	No	-
Phenanthrene	0 / 3	1 U	1.1 U		0.55 U	2.3	b	0.2	None	No	-
Phenol	0 / 3	5.2 U	5.6 U		2.8 U	160	b	0.02	None	No	-
Phorate	0 / 4	0.02 U	0.11 U		0.055 U	3.62	f	0.02	None	No	-
Prometon	0 / 1	0.012 U	0.012 U		0.006 U	NV	-	-	-	**Yes**	**4**
Propachlor	0 / 1	0.006 U	0.006 U		0.003 U	NV	-	-	-	**Yes**	**4**
Propanil	0 / 1	0.01 U	0.01 U		0.005 U	NV	-	-	-	**Yes**	**4**
Propargite	0 / 1	0.02 U	0.02 U		0.01 U	NV	-	-	-	**Yes**	**4**
Propyzamide	0 / 1	0.008 U	0.008 U		0.004 U	NV	-	-	-	**Yes**	**4**
Pyrene	0 / 3	1 U	1.1 U		0.55 U	4.6	b	0.1	None	No	-
Ronnel	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
sec-Butylbenzene	0 / 13	0.034 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Simazine	0 / 1	0.006 U	0.006 U		0.003 U	9	b	0.0003	None	No	-
Styrene	0 / 13	0.042 U	1 U		0.5 U	32	b	0.02	None	No	-
Sulfotepp	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**

Table C-23
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Surface Water
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Sulprofos	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Tebuthiuron	0 / 1	0.028 U	0.028 U		0.014 U	NV	-	-	-	**Yes**	**4**
Terbacil	0 / 1	0.024 U	0.024 U		0.012 U	NV	-	-	-	**Yes**	**4**
Terbufos	0 / 1	0.018 U	0.018 U		0.009 U	NV	-	-	-	**Yes**	**4**
tert-Butyl ethyl ether	0 / 5	0.032 U	0.032 U		0.016 U	NV	-	-	-	**Yes**	**4**
tert-Butylbenzene	0 / 13	0.06 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Tetrachloroethene	6 / 13	0.634	5.32	VIN-WP-020	5.32	53	b	0.1	None	No	-
Tetrachloromethane	0 / 13	0.06 U	1 U		0.5 U	77	b	0.006	None	No	-
Tetraethyl pyrophosphate (TEPP)	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Tetrahydrofuran	0 / 5	1.4 U	1.4 U		0.7 U	11000	b	0.00006	None	No	-
Thiobencarb	0 / 1	0.016 U	0.016 U		0.008 U	NV	-	-	-	**Yes**	**4**
Tokuthion	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Toluene	2 / 13	0.03	0.08	VIN-JW-SEEP	0.08	62	b	0.001	None	No	-
Toxaphene	0 / 3	0.21 U	0.22 U		0.11 U	0.0002	a	550	None	**Yes**	**2**
trans-1,2-Dichloroethene	0 / 13	0.018 U	1 U		0.5 U	558	b	0.0009	None	No	-
trans-1,3-Dichloropropene	0 / 13	0.14 U	1 U		0.5 U	1.7	b	0.3	None	No	-
trans-1,4-Dichloro-2-butene	0 / 5	2 U	2 U		1 U	NV	-	-	-	**Yes**	**4**
Triallate	0 / 1	0.0046 U	0.0046 U		0.0023 U	NV	-	-	-	**Yes**	**4**
Tribromomethane	0 / 13	0.1 U	1 U		0.5 U	230	b	0.002	None	No	-
Trichloroethene	2 / 13	0.016	0.04	VIN-JW-SEEP	0.04	200	b	0.0002	None	No	-
Trichlorofluoromethane	0 / 13	0.06 U	1 U		0.5 U	NV	-	-	-	**Yes**	**4**
Trichloromethane	1 / 13	0.08	0.08	VIN-WP-020	0.08	140	b	0.0006	None	No	-
Trichloronate	0 / 3	0.11 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Trifluralin	0 / 1	0.018 U	0.018 U		0.009 U	1.14	r	0.008	None	No	-
Vinyl chloride	0 / 13	0.06 U	1 U		0.5 U	930	b	0.0005	None	No	-
Xylene (all isomers)	0 / 8	3 U	3 U		1.5 U	27	b	0.06	None	No	-
Metals (µg/L)											
Antimony (Dissolved)	0 / 3	2.5 U	2.5 U		1.25 U	190	b	0.007	None	No	-
Antimony (Total)	0 / 3	2.5 U	2.5 U		1.25 U	190	b	0.007	None	No	-
Arsenic (Dissolved)	0 / 3	1.5 U	1.5 U		0.75 U	150	a	0.005	None	No	-
Arsenic (Total)	1 / 3	0.86 J	0.86 J	VIN-SW-WP-020	0.86 J	150	a	0.006	None	No	-
Beryllium (Dissolved)	0 / 3	1.0 U	1.0 U		0.5 U	11	b	0.05	None	No	-
Beryllium (Total)	0 / 3	1.0 U	1.0 U		0.5 U	11	b	0.05	None	No	-
Cadmium (Dissolved)	0 / 3	1.0 U	1.0 U		0.5 U	0.25	a	2	None	**Yes**	**2**
Cadmium (Total)	0 / 3	1.0 U	1.0 U		0.5 U	0.27	a	2	None	**Yes**	**2**
Chromium (Dissolved)	3 / 3	2.0 J	2.7 J	VIN-SW-TB2-2	2.7 J	11	a	0.2	None	No	-
Chromium (Total)	0 / 3	10 U	10 U		5 U	11.4	a	0.4	None	No	-
Copper (Dissolved)	3 / 3	0.9 J	1 J	VIN-SW-WP-020	1 J	9	a	0.1	None	No	-
Copper (Total)	0 / 3	5.0 U	5.0 U		2.5 U	9.32	a	0.3	None	No	-
Lead (Dissolved)	0 / 3	1.0 U	1.0 U		0.5 U	2.5	a	0.2	None	No	-
Lead (Total)	1 / 3	1.0 J	1 J	VIN-SW-WP-020	1 J	3.2	a	0.3	None	No	-
Mercury (Dissolved)	0 / 3	0.2 U	0.2 U		0.1 U	0.77	a	0.1	None	No	-
Mercury (Total)	0 / 3	0.2 U	0.2 U		0.1 U	0.91	a	0.1	None	No	-

Table C-23
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Surface Water
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Samples Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Nickel (Dissolved)	3 / 3	1.4 J	4.4 J	VIN-SW-WP-020	4.4 J	52	a	0.08	None	No	-
Nickel (Total)	0 / 3	10.0 U	10.0 U		5.0 U	52	a	0.1	None	No	-
Selenium (Dissolved)	0 / 3	5.0 U	5.0 U		2.5 U	5	a	0.5	None	No	-
Selenium (Total)	0 / 3	5.0 U	5.0 U		2.5 U	5	a	0.5	None	No	-
Silver (Dissolved)	0 / 3	1.5 U	1.5 U		0.8 U	0.06	b	13	None	**Yes**	**2**
Silver (Total)	0 / 3	1.5 U	1.5 U		0.8 U	0.06	b	13	None	**Yes**	**2**
Thallium (Dissolved)	0 / 3	2.0 U	2.0 U		1.0 U	6	b	0.2	None	No	-
Thallium (Total)	0 / 3	2.0 U	2.0 U		1.0 U	6	b	0.2	None	No	-
Zinc (Dissolved)	1 / 3	3.5 J	3.5 J	VIN-SW-WP-020	3.5 J	120	a	0.03	None	No	-
Zinc (Total)	0 / 3	50.0 U	50.0 U		25.0 U	122	a	0.2	None	No	-
Anions (µg/L)											
Bromide	3 / 3	53.0	170	VIN-SW-WP-020	170	NV	-	-	-	**Yes**	**3**
Chloride	3 / 3	13,000.0	37000	VIN-SW-TB2-1	37000	230000	a	0.2	None	No	-
Fluoride	3 / 3	36.0 J	57 J	VIN-SW-TB2-1	57 J	2700	b	0.02	None	No	-
Nitrate	3 / 3	37.0 J	130 J	VIN-SW-TB2-1	130 J	NV	-	-	-	**Yes**	**3**
Nitrite	0 / 3	50.0 U	50 U	ND	25 U	100	e	0.3	None	No	-
Sulfate	3 / 3	20,000.0	110000	VIN-SW-WP-020	110000	1150000	g	0.1	None	No	-

Notes:

– - Not Applicable
COPC - Chemical of Potential Concern
µg/L - micrograms per liter
NV - no value (value not available)
PAHs - polycyclic aromatic hydrocarbons
PCOPC - Preliminary Chemical of Potential Concern

[1] - Maximum detected of SQL
[2] - HQ = Exposure Point Concentration / ESV
[3] - PCOPC Categories:
1 - Detected and HQ >= 1
2 - Not Detected, maximum SQL >= ESV
3 - Detected but no ESV
4 - Not Detected and no ESV

Data Qualifiers:

U - Analyte not detected at or above reporting limit. The number is the minimum quanititation limit.
J - Identification of analyte is acceptable; reported value is estimated.

Source:

a - National Recommended Water Quality Criteria http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
b - Great Lakes Initiative (GLI) Clearinghouse resources Tier II criteria revised 2013 http://www.epa.gov/gliclearinghouse/
c - Suter, G.W. II, and Tsao, C.L. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 Revision. ES/ER/TM-96/R2. http://www.esd.ornl.gov/programs/ecorisk/documents/tm96r2.pdf
d -EPA Region 4
e -EPA Region 3
f -EPA Region 5
g -Missouri WQS
h - ORNL PRG
i - Region 4 Surface Water Model
j - ECOSAR program predicted lowest chronic or acute value.
q - EPA. 2003. Equilibrium Partitioning Sediment Benchmarks for Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013. http://www.epa.gov/nheerl/download_files/publications/PAHESB.pdf
r - Office of Pesticide Programs (OPP) Aquatic Life Benchmarks: http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	0 / 6	59.1 U	76.2 U		38.1 U	73	a1	0.5	None	No	-
1,1,1-Trichloroethane	0 / 6	59.1 U	76.2 U		38.1 U	34	a1	1	None	**Yes**	**2**
1,1,2,2-Tetrachloroethane	0 / 6	59.1 U	76.2 U		38.1 U	190	a1	0.2	None	No	-
1,1,2-Trichloro-1,2,2-trifluoroethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
1,1,2-Trichloroethane	0 / 6	59.1 U	76.2 U		38.1 U	319	a1	0.1	None	No	-
1,1-Dichloroethane	0 / 6	59.1 U	76.2 U		38.1 U	131	a1	0.3	None	No	-
1,1-Dichloroethene	0 / 6	59.1 U	76.2 U		38.1 U	41	a1	0.9	None	No	-
1,1-Dichloropropene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trichlorobenzene	0 / 6	59.1 U	76.2 U		38.1 U	69	a1	0.6	None	No	-
1,2,3-Trichloropropane	0 / 6	118 U	152 U		76 U	NV	-	-	-	**Yes**	**4**
1,2,4-Trichlorobenzene	0 / 12	118 U	260 U		130 U	1700	c1	0.08	None	No	-
1,2,4-Trimethylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	92	a1	0.4	None	No	-
1,2-Dibromo-3-chloropropane	0 / 6	118 U	152 U		76 U	NV	-	-	-	**Yes**	**4**
1,2-Dibromoethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
1,2-Dichlorobenzene	0 / 6	59.1 U	76.2 U		38.1 U	88	a1	0.4	None	No	-
1,2-Dichloroethane	0 / 6	59.1 U	76.2 U		38.1 U	385	a1	0.1	None	No	-
1,2-Dichloropropane	0 / 6	59.1 U	76.2 U		38.1 U	272	a1	0.1	None	No	-
1,3,5-Trimethylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	157	a1	0.2	None	No	-
1,3-Dichlorobenzene	0 / 6	59.1 U	76.2 U		38.1 U	83	a1	0.5	None	No	-
1,3-Dichloropropane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
1,4-Dichlorobenzene	0 / 6	59.1 U	76.2 U		38.1 U	35	a1	1	None	**Yes**	**2**
2,2-Dichloropropane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
2,4,5-Trichlorophenol	0 / 6	180 U	260 U		130 U	34	d	4	None	**Yes**	**2**
2,4,6-Trichlorophenol	0 / 6	180 U	260 U		130 U	87	d	1	None	**Yes**	**2**
2,4-Dichlorophenol	0 / 6	180 U	260 U		130 U	54	a1	2	None	**Yes**	**2**
2,4-Dimethylphenol	0 / 6	180 U	260 U		130 U	35	c	4	None	**Yes**	**2**
2,4-Dinitrophenol	0 / 6	950 U	1300 U		650 U	202	d	3	None	**Yes**	**2**
2,4-Dinitrotoluene	0 / 6	180 U	260 U		130 U	127	d	1	None	**Yes**	**2**
2,6-Dinitrotoluene	0 / 6	180 U	260 U		130 U	271	d	0.5	None	No	-
2-Chloronaphthalene	0 / 6	180 U	260 U		130 U	417	i	0.3	None	No	-
2-Chlorophenol	0 / 6	180 U	260 U		130 U	61	d	2	None	**Yes**	**2**
2-Chlorotoluene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
2-Methyl-4,6-dinitrophenol	0 / 6	370 U	520 U		260 U	2477	e	0.1	None	No	-
2-Nitroaniline	0 / 6	370 U	520 U		260 U	NV	-	-	-	**Yes**	**4**
2-Nitrophenol	0 / 6	180 U	260 U		130 U	146	d	0.9	None	No	-
3,3'-Dichlorobenzidine	0 / 6	1100 U	1600 U		800 U	30	d	27	None	**Yes**	**2**
3-Nitroaniline	0 / 6	370 U	520 U		260 U	NV	-	-	-	**Yes**	**4**
4-Bromophenyl phenyl ether	0 / 6	230 U	320 U		160 U	46	a1	3	None	**Yes**	**2**
4-Chloro-3-methylphenol	0 / 6	180 U	260 U		130 U	37	d	4	None	**Yes**	**2**
4-Chloroaniline	0 / 6	180 U	260 U		130 U	316	d	0.4	None	No	-
4-Chlorophenyl phenyl ether	0 / 6	180 U	260 U		130 U	NV	-	-	-	**Yes**	**4**
4-Chlorotoluene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
4-Isopropyltoluene	0 / 6	59.1 U	76.2 U		38.1 U	179	a1	0.2	None	No	-
4-Nitroaniline	0 / 6	370 U	520 U		260 U	NV	-	-	-	**Yes**	**4**
4-Nitrophenol	0 / 6	950 U	1300 U		650 U	135	d	5	None	**Yes**	**2**
Acetone	0 / 6	295 U	381 U		190.5 U	40	a1	5	None	**Yes**	**2**
Aldrin	0 / 6	0.94 U	11 U		5.5 U	29	d	0.2	None	No	-
alpha-Endosulfan	0 / 6	0.94 U	11 U		5.5 U	0.46	d	12	None	**Yes**	**2**
alpha-HCH	0 / 6	0.94 U	11 U		5.5 U	1.6	d	3	None	**Yes**	**2**
Aroclor 1016	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1221	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1232	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1242	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1248	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1254	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1260	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Aroclor 1262	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
Benzene	0 / 6	35.4 U	45.7 U		22.85 U	113	a1	0.2	None	No	-
Benzoic acid	0 / 6	1100 U	1600 U		800 U	2900	h	0.3	None	No	-
Benzyl alcohol	0 / 6	750 U	1100 U		550 U	1.4	a1	393	None	**Yes**	**2**
Benzyl n-butyl phthalate	1 / 6	49 J	49 J	VIN-SD-WD-01 dup	49 J	592	a1	0.08	None	No	-
beta-Endosulfan	0 / 6	0.94 U	11 U		5.5 U	0.46	d	12	None	**Yes**	**2**
beta-HCH	0 / 6	0.94 U	11 U		5.5 U	6665	f	0.0008	None	No	-
Bis(2-chloroethoxy)methane	0 / 6	110 U	160 U		80 U	NV	-	-	-	**Yes**	**4**
Bis(2-chloroethyl) ether	0 / 6	180 U	260 U		130 U	4761	e	0.03	None	No	-
Bis(2-chloroisopropyl) ether	0 / 6	180 U	260 U		130 U	NV	-	-	-	**Yes**	**4**
Bis(2-ethylhexyl) phthalate	2 / 6	100 J	290 J	VIN-SD-WD-01	290 J	182	d1	2	1	**Yes**	**1**
Bromobenzene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Bromochloromethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Bromodichloromethane	0 / 6	59.1 U	76.2 U		38.1 U	108	a1	0.4	None	No	-
Bromomethane	0 / 6	236 U	305 U		152.5 U	2	a1	76	None	**Yes**	**2**
Carbazole	1 / 6	16 J	16 J	VIN-SD-WD-01	16 J	900	h	0.02	None	No	-
Carbon disulfide	0 / 6	118 U	152 U		76 U	3.6	a1	21	None	**Yes**	**2**
Chlordane (technical)	0 / 6	19 U	230 U		115 U	3.24	b	35	None	**Yes**	**2**
Chlorobenzene	0 / 6	59.1 U	76.2 U		38.1 U	58	a1	0.7	None	No	-
Chloroethane	0 / 6	295 U	381 U		190.5 U	NV	-	-	-	**Yes**	**4**
Chloromethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Chlorpyrifos	0 / 6	7.6 U	11 U		5.5 U	3.3	d	2	None	**Yes**	**2**
cis-1,2-Dichloroethene	0 / 6	59.1 U	76.2 U		38.1 U	246	a1	0.2	None	No	-
cis-1,3-Dichloropropene	0 / 6	59.1 U	76.2 U		38.1 U	1	a1	38	None	**Yes**	**2**
cis-Chlordane	0 / 6	0.94 U	11 U		5.5 U	3.24	b	2	None	**Yes**	**2**
Coumaphos	0 / 6	8.1 U	46 U		23 U	NV	-	-	-	**Yes**	**4**
delta-HCH	0 / 6	0.94 U	11 U		5.5 U	6400	g	0.0009	None	No	-
Demeton-O	0 / 6	7.6 U	11 U		5.5 U	0.44	d	13	None	**Yes**	**2**
Demeton-S	0 / 6	7.6 U	11 U		5.5 U	0.44	d	13	None	**Yes**	**2**
Diazinon	0 / 6	7.6 U	11 U		5.5 U	4	d	1	None	**Yes**	**2**

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Dibenzofuran	0 / 6	180 U	260 U		130 U	151	a1	0.9	None	No	-
Dibromochloromethane	0 / 6	59.1 U	76.2 U		38.1 U	102	a1	0.4	None	No	-
Dibromomethane	0 / 6	118 U	152 U		76 U	NV	-	-	-	Yes	4
Dichlorodifluoromethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	Yes	4
Dichloromethane	6 / 6	65 J	135 J	VIN-SD-WP-020	135 J	183	a1	0.7	None	No	-
Dichlorvos	0 / 6	8.1 U	46 U		23 U	NV	-	-	-	Yes	4
Dieldrin	0 / 6	0.94 U	11 U		5.5 U	1.9	b, h	3	None	Yes	2
Diethyl phthalate	0 / 6	180 U	260 U		130 U	231	a1	0.6	None	No	-
Dimethoate	0 / 6	7.6 U	11 U		5.5 U	0.36	d	15	None	Yes	2
Dimethyl phthalate	0 / 6	180 U	260 U		130 U	348	a1	0.4	None	No	-
Di-n-butyl phthalate	0 / 6	180 U	260 U		130 U	220	a1	0.6	None	No	-
Di-n-octyl phthalate	0 / 5	180 U	260 U		130 U	513	h	0.3	None	No	-
Disulfoton	0 / 6	7.6 U	11 U		5.5 U	324	i	0.02	None	No	-
Endosulfan sulfate	0 / 6	0.94 U	11 U		5.5 U	1	d	6	None	Yes	2
Endrin aldehyde	0 / 6	0.94 U	11 U		5.5 U	2.22	b	2	None	Yes	2
Endrin ketone	0 / 6	0.94 U	11 U		5.5 U	2.22	b	2	None	Yes	2
Endrin	0 / 6	0.94 U	11 U		5.5 U	2.22	b	2	None	Yes	2
EPN	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
Ethoprop	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
Ethyl methyl ketone	0 / 6	591 U	762 U		381 U	992	a1	0.4	None	No	-
Ethylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	272	a1	0.1	None	No	-
Fensulfothion	0 / 6	8.1 U	46 U		23 U	NV	-	-	-	Yes	4
Fenthion	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
gamma-Chlordane	2 / 6	5.7 J	6.3 J	VIN-SD-WD-01 dup	6.3 J	3.24	b	2	2	Yes	1
Heptachlor epoxide	0 / 6	0.94 U	11 U		5.5 U	2.47	b	2	None	Yes	2
Heptachlor	0 / 6	0.94 U	11 U		5.5 U	1.9	d	3	None	Yes	2
Hexachlorobenzene	0 / 6	180 U	260 U		130 U	0.32	a1	406	None	Yes	2
Hexachlorobutadiene	0 / 12	57 U	81 U		40.5 U	8.8	d	5	None	Yes	2
Hexachlorocyclopentadiene	0 / 6	180 U	260 U		130 U	6.6	d	20	None	Yes	2
Hexachloroethane	0 / 6	180 U	260 U		130 U	24	a1	5	None	Yes	2
Isobutyl methyl ketone	0 / 6	295 U	381 U		190.5 U	2712	b1	0.07	None	No	-
Isophorone	0 / 6	180 U	260 U		130 U	600	a1	0.2	None	No	-
Isopropylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	33	a1	1	None	Yes	2
Lindane	0 / 6	0.94 U	11 U		5.5 U	2.37	b	2	None	Yes	2
Malathion	0 / 6	7.6 U	11 U		5.5 U	0.31	d	18	None	Yes	2
Merphos	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
Methyl parathion	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
Methyl tert-butyl ether	0 / 6	118 U	152 U		76 U	84	a1	0.9	None	No	-
Mevinphos	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
Monocrotophos	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	Yes	4
m-Xylene plus p-xylene	0 / 6	118 U	152 U		76 U	103	a1	0.7	None	No	-
Naled	0 / 6	8.1 U	46 U		23 U	NV	-	-	-	Yes	4
n-Butyl methyl ketone	0 / 6	295 U	381 U		190.5 U	2828	b1	0.07	None	No	-
n-Butylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	Yes	4

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Nitrobenzene	0 / 6	180 U	260 U		130 U	559	a1	0.2	None	No	-
N-Nitrosodimethylamine	0 / 6	180 U	260 U		130 U	NV	-	-	-	**Yes**	**4**
N-Nitrosodi-n-propylamine	0 / 6	180 U	260 U		130 U	NV	-	-	-	**Yes**	**4**
N-Nitrosodiphenylamine	0 / 6	180 U	260 U		130 U	35	a1	4	None	**Yes**	**2**
n-Propylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
o-Cresol	0 / 6	180 U	260 U		130 U	100	d	1	None	**Yes**	**2**
o-Xylene	0 / 6	59.1 U	76.2 U		38.1 U	103	a1	0.4	None	No	-
p,p'-DDD	0 / 6	1.9 U	23 U		11.5 U	4.88	b	2	None	**Yes**	**2**
p,p'-DDE	2 / 6	11 J	12	VIN-SD-WD-01 dup	12	3.16	b	4	2	**Yes**	**1**
p,p'-DDT	2 / 6	26	26	VIN-SD-WD-01	26	4.16	b	6	2	**Yes**	**1**
DDD/DDE/DDT Total	2 / 6	48.5 J	49.5	VIN-SD-WD-01 dup	49.5	5.28	b	9	2	**Yes**	**1**
p,p'-Methoxychlor	0 / 6	0.94 U	11 U		5.5 U	2.4	d	2	None	**Yes**	**2**
Parathion	0 / 6	7.6 U	11 U		5.5 U	0.5	d	11	None	**Yes**	**2**
Total PCBs	0 / 6	38 U	53 U		26.5 U	59.8	b	0.4	None	No	-
p-Cresol	2 / 6	290	440 J	VIN-SD-WD-01 dup	440 J	78	d, h	6	None	**Yes**	**1**
Pentachlorophenol	0 / 6	180 U	260 U		130 U	744	d, h	0.2	None	No	-
Phenol	0 / 6	180 U	260 U		130 U	120	h	1	None	**Yes**	**2**
Phorate	0 / 6	7.6 U	11 U		5.5 U	201	g	0.03	None	No	-
Ronnel	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
sec-Butylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Styrene	0 / 6	59.1 U	76.2 U		38.1 U	116	a1	0.3	None	No	-
Sulfotepp	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
Sulprofos	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
tert-Butylbenzene	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Tetrachloroethene	0 / 6	59.1 U	76.2 U		38.1 U	50	a1	0.8	None	No	-
Tetrachloromethane	0 / 6	59.1 U	76.2 U		38.1 U	34	a1	1	None	**Yes**	**2**
Tetraethyl pyrophosphate (TEPP)	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
Tokuthion	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
Toluene	0 / 6	59.1 U	76.2 U		38.1 U	145	a1	0.3	None	No	-
Toxaphene	0 / 6	19 U	230 U		115 U	0.45	d	256	None	**Yes**	**2**
trans-1,2-Dichloroethene	0 / 6	59.1 U	76.2 U		38.1 U	221	a1	0.2	None	No	-
trans-1,3-Dichloropropene	0 / 6	59.1 U	76.2 U		38.1 U	1	a1	38	None	**Yes**	**2**
Tribromomethane	0 / 6	59.1 U	76.2 U		38.1 U	73	a1	0.5	None	No	-
Trichloroethene	0 / 6	59.1 U	76.2 U		38.1 U	134	a1	0.3	None	No	-
Trichlorofluoromethane	0 / 6	59.1 U	76.2 U		38.1 U	NV	-	-	-	**Yes**	**4**
Trichloromethane	0 / 6	59.1 U	76.2 U		38.1 U	45	a1	0.8	None	No	-
Trichloronate	0 / 6	7.6 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
Vinyl chloride	0 / 6	47.3 U	60.9 U		30.45 U	202	a1	0.2	None	No	-
Xylene (all isomers)	0 / 6	177 U	228 U		114 U	103	a1	1	None	**Yes**	**2**

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Low mol wt PAHs (µg/kg)											
2-Methylnaphthalene	0 / 6	180 U	260 U		Individual analytes were screened as the summed total concentration.						
Acenaphthene	0 / 6	180 U	260 U								
Acenaphthylene	2 / 6	49 J	77 J	VIN-SD-WD-01							
Anthracene	2 / 6	36 J	58 J	VIN-SD-WD-01							
Fluorene	0 / 6	180 U	260 U								
Naphthalene	0 / 12	180 U	381 U								
Phenanthrene	1 / 6	31 J	31 J	VIN-SD-WD-01							
LMW PAHs (Total)	2 / 6	618 J	669 J	VIN-SD-WD-01	669 J	312	d1	2	2	**Yes**	**1**
High mol wt PAHs (µg/kg)											
Benzo[a]anthracene	2 / 6	150 J	240 J	VIN-SD-WD-01	Individual analytes were screened as the summed total concentration.						
Benzo[a]pyrene	2 / 6	180 J	280 J	VIN-SD-WD-01							
Benzo[b]fluoranthene	2 / 6	400 J	650 J	VIN-SD-WD-01							
Benzo[ghi]perylene	2 / 6	110 J	130 J	VIN-SD-WD-01							
Benzo[k]fluoranthene	2 / 6	140 J	190 J	VIN-SD-WD-01							
Chrysene	2 / 6	180 J	300 J	VIN-SD-WD-01							
Dibenzo[a,h]anthracene	1 / 5	39 J	39 J	VIN-SD-WD-01							
Fluoranthene	2 / 6	150 J	300 J	VIN-SD-WD-01							
Indeno[1,2,3-cd]pyrene	2 / 6	88 J	120 J	VIN-SD-WD-01							
Pyrene	2 / 6	450 J	630 J	VIN-SD-WD-01							
HMW PAHs (Total)	2 / 6	1,848 J	2,879 J	VIN-SD-WD-01	2,879 J	655	d1	4	2	**Yes**	**1**
Total PAHs (1/2 detection limit)	2 / 6		3,548	VIN-SD-WD-01	3,548 J	1,610	d1	2	2	**Yes**	**1**
Total PAHs (detected)	2 / 6		3,045 J	VIN-SD-WD-01	3,045 J	1,610	d1	2	2	**Yes**	**1**
Metals (mg/kg)											
Antimony (Total)	6 / 6	0.21 J	1 J	VIN-SD-WD-01	1 J	2	a	0.5	None	No	-
Arsenic (Total)	6 / 6	5.1	11	VIN-SD-TB1-2	11	9.8	b	1	1	**Yes**	**1**
Beryllium (Total)	2 / 6	0.056 J	0.5	VIN-SD-WP-020	0.5	NV	-	-	-	**Yes**	**3**
Cadmium (Total)	6 / 6	1.4	3.5	VIN-SD-WD-01 dup	3.5	1	b	4	6	**Yes**	**1**
Chromium (Total)	6 / 6	13 J	29 J	VIN-SD-WD-01	29 J	43.4	b	0.7	None	No	-
Copper (Total)	4 / 6	13	39	VIN-SD-WD-01 dup	39	31.6	b	1	2	**Yes**	**1**
Lead (Total)	6 / 6	9.4 J	49 J	VIN-SD-WD-01 dup	49 J	35.8	b	1	2	**Yes**	**1**
Mercury (Total)	6 / 6	0.0057 J	0.13 J	VIN-SD-WD-01	0.13 J	0.18	b	0.7	None	No	-
Nickel (Total)	6 / 6	6.1	19	VIN-SD-WP-020 and WP-TB1-2	19	22.7	b	0.8	None	No	-
Selenium (Total)	0 / 6	1.8 U	2.6 U		1.3 U	11	h	0.1	None	No	-
Silver (Total)	0 / 6	0.9 U	1.3 U		0.65 U	1	b	0.7	None	No	-
Thallium (Total)	6 / 6	0.41 J	1.8 J	VIN-SD-TB1-2	1.8 J	NV	-	-	-	**Yes**	**3**
Zinc (Total)	6 / 6	14 J	440 J	VIN-SD-WD-01 dup	440 J	121	b	4	2	**Yes**	**1**

Table C-24
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								

Notes:

-- - Not Applicable
COPC - Chemical of Potential Concern
µg/kg - micrograms per liter
NV - no value (value not available)
PAHs - polycyclic aromatic hydrocarbons
PCOPC - Preliminary Chemical of Potential Concern
VOCs - volatile organic compounds
SVOCs - semi-volatile organic compounds

[1] - Maximum detected of SQL
[2] - HQ = Exposure Point Concentration / ESV
[3] - PCOPC Categories:
1 - Detected and HQ >= 1
2 - Not Detected, maximum SQL >= ESV
3 - Detected but no ESV
4 - Not Detected and no ESV

Data Qualifiers:

U - Analyte not detected at or above reporting limit. The number is the minimum quanititation limit.
J - Identification of analyte is acceptable; reported value is estimated.

Source:

a - Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. Used effects range low (ER-L) for chronic and effects range medium (ER-M) for acute.
b - MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003.
c - MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters.
d - Region 4 Sediment Model based on highest ranked surface water quality ESV from Table 1a. See
e - Region 4 Sediment Model based on: (ECOSAR minimum chronic value). See text.
f - Region 4 Sediment Model based on: (lowest predicted surface water value from McGrath & Di Toro
g - Region 3
h - Region 4
i - Region 5
a1 - Region 4 Sediment Model based on highest ranked surface water quality ESV.
b1 - Region 4 Sediment Model based on: (ECOSAR minimum chronic value).
c1- Region 4 Sediment Model based on: (lowest predicted surface water value from McGrath & Di Toro (2009).
d1 - MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters. Florida Department of Environmental Protection. 1994 Florida Sediment Quality Assessment Guidelines for Florida Coastal Waters.

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Organics (µg/L)											
1,1,1,2-Tetrachloroethane	0 / 74	0.04 U	5 U		2.5 U	85	b	0.03	None	No	-
1,1,1-Trichloroethane	0 / 74	0.03 U	5 U		2.5 U	76	b	0.03	None	No	-
1,1,2,2-Tetrachloroethane	0 / 74	0.14 U	14 U		7 U	200	b	0.04	None	No	-
1,1,2-Trichloro-1,2,2-trifluoroethane	73 / 74	2.47	131	VIN-MW-03D	131	NV	-	-	-	**Yes**	**3**
1,1,2-Trichloroethane	0 / 74	0.046 U	5 U		2.5 U	730	b	0.003	None	No	-
1,1-Dichloroethane	0 / 74	0.044 U	5 U		2.5 U	410	b	0.006	None	No	-
1,1-Dichloroethene	0 / 74	0.022 U	5 U		2.5 U	130	b	0.02	None	No	-
1,1-Dichloropropene	0 / 74	0.04 U	5 U		2.5 U	0.055	h	45	None	**Yes**	**2**
1,2,3,4-Tetramethylbenzene	0 / 40	0.1 U	2 U		1 U	NV	-	-	-	**Yes**	**4**
1,2,3,5-Tetramethylbenzene	0 / 40	0.08 U	8 U		4 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trichlorobenzene	0 / 74	0.06 U	6 U		3 U	5	d, i	0.6	None	No	-
1,2,3-Trichloropropane	0 / 74	0.12 U	25 U		12.5 U	NV	-	-	-	**Yes**	**4**
1,2,3-Trimethylbenzene	0 / 40	0.06 U	6 U		3 U	NV	-	-	-	**Yes**	**4**
1,2,4-Trichlorobenzene	0 / 76	0.08 U	8 U		4 U	130	b	0.03	None	No	-
1,2,4-Trimethylbenzene	0 / 74	0.032 U	5 U		2.5 U	15	b	0.2	None	No	-
1,2-Dibromo-3-chloropropane	0 / 74	0.4 U	40 U		20 U	NV	-	-	-	**Yes**	**4**
1,2-Dibromoethane	0 / 74	0.028 U	5 U		2.5 U	NV	-	-	-	**Yes**	**4**
1,2-Dichlorobenzene	0 / 74	0.028 U	5 U		2.5 U	23	b	0.1	None	No	-
1,2-Dichloroethane	0 / 74	0.08 U	8 U		4 U	2000	b	0.002	None	No	-
1,2-Dichloropropane	0 / 74	0.026 U	5 U		2.5 U	520	b	0.005	None	No	-
1,3,5-Trimethylbenzene	0 / 74	0.032 U	5 U		2.5 U	26	b	0.1	None	No	-
1,3-Dichlorobenzene	0 / 74	0.024 U	5 U		2.5 U	22	b	0.1	None	No	-
1,3-Dichloropropane	0 / 74	0.06 U	6 U		3 U	360	f	0.008	None	No	-
1,4-Dichlorobenzene	0 / 74	0.026 U	5 U		2.5 U	9.4	b	0.3	None	No	-
2,2-Dichloropropane	0 / 74	0.06 U	6 U		3 U	360	f	0.008	None	No	-
2,4,5-Trichlorophenol	0 / 2	5.2 U	5.3 U		2.65 U	1.9	b	1	None	**Yes**	**2**
2,4,6-Trichlorophenol	0 / 2	4.2 U	4.2 U		2.1 U	4.9	b	0.4	None	No	-
2,4-Dichlorophenol	0 / 2	5.2 U	5.3 U		2.65 U	7	g	0.4	None	No	-
2,4-Dimethylphenol	0 / 2	5.2 U	5.3 U		2.65 U	15	b	0.2	None	No	-
2,4-Dinitrophenol	0 / 2	26 U	26 U		13 U	71	b	0.2	None	No	-
2,4-Dinitrotoluene	0 / 2	5.2 U	5.3 U		2.65 U	44	b	0.06	None	No	-
2,6-Diethylaniline	0 / 1	0.006 U	0.006 U		0.003 U	NV	-	-	-	**Yes**	**4**
2,6-Dinitrotoluene	0 / 2	5.2 U	5.3 U		2.65 U	81	b	0.03	None	No	-
2-Chloro-4-isopropylamino-6-amino-s-triazine	1 / 1	0.006 E	0.006 E	VIN-MW-03D	0.006 E	NV	-	-	-	**Yes**	**3**
2-Chloronaphthalene	0 / 2	5.2 U	5.3 U		2.65 U	4300	g	0.0006	None	No	-
2-Chlorophenol	0 / 2	5.2 U	5.3 U		2.65 U	32	b	0.08	None	No	-
2-Chlorotoluene	0 / 74	0.028 U	5 U		2.5 U	NV	-	-	-	**Yes**	**4**
2-Ethyltoluene	0 / 40	0.032 U	3.2 U		1.6 U	NV	-	-	-	**Yes**	**4**
2-Methyl-4,6-dinitrophenol	0 / 2	10 U	11 U		5.5 U	23	f	0.2	None	No	-
2-Methylnaphthalene	0 / 2	1 U	1.1 U		0.55 U	4.7	b	0.1	None	No	-
2-Nitroaniline	0 / 2	5.2 U	5.3 U		2.65 U	NV	-	-	-	**Yes**	**4**
2-Nitrophenol	0 / 2	5.2 U	5.3 U		2.65 U	73	b	0.04	None	No	-

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
3,3'-Dichlorobenzidine	0 / 2	21 U	21 U		10.5 U	4.5	d	2	None	**Yes**	**2**
3-Chloropropene	0 / 40	0.08 U	8 U		4 U	NV	-	-	-	**Yes**	**4**
3-Nitroaniline	0 / 2	10 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
4-Bromophenyl phenyl ether	0 / 2	5.2 U	5.3 U		2.65 U	1.5	f	2	None	**Yes**	**2**
4-Chloro-3-methylphenol	0 / 2	5.2 U	5.3 U		2.65 U	7.4	d	0.4	None	No	-
4-Chloroaniline	0 / 2	10 U	11 U		5.5 U	19	j	0.3	None	No	-
4-Chlorophenyl phenyl ether	0 / 2	5.2 U	5.3 U		2.65 U	NV	-	-	-	**Yes**	**4**
4-Chlorotoluene	0 / 74	0.042 U	10 U		5 U	NV	-	-	-	**Yes**	**4**
4-Isopropyltoluene	1 / 74	0.01	0.01	VIN-MW-01	0.01	16	b	0.0006	None	No	-
4-Nitroaniline	0 / 2	10 U	11 U		5.5 U	NV	-	-	-	**Yes**	**4**
4-Nitrophenol	0 / 2	26 U	26 U		13 U	58	b	0.2	None	No	-
Fluorene	0 / 2	1 U	1.1 U		0.55 U	19	b	0.03	None	No	-
Acenaphthene	0 / 2	1 U	1.1 U		0.55 U	15	b	0.04	None	No	-
Acenaphthylene	0 / 2	1 U	1.1 U		0.55 U	13	b	0.04	None	No	-
Acetochlor	0 / 1	0.01 U	0.01 U		0.005 U	NV	-	-	-	**Yes**	**4**
Acetone	6 / 74	1 J	9.4 J	VIN-MW-03D	9.4 J	1700	b	0.006	None	No	-
Acrylonitrile	0 / 40	0.48 U	56 U		28 U	78	b	0.4	None	No	-
Alachlor	0 / 1	0.008 U	0.008 U		0.004 U	NV	-	-	-	**Yes**	**4**
Aldrin	0 / 2	0.01 U	0.01 U		0.005 U	0.035	b	0.1	None	No	-
alpha-Endosulfan	0 / 2	0.01 U	0.01 U		0.005 U	0.01	r	0.5	None	No	-
alpha-HCH	0 / 3	0.004 U	0.01 U		0.005 U	0.004	h	1	None	**Yes**	**2**
Anthracene	0 / 2	1 U	1.1 U		0.55 U	0.02	b	28	None	**Yes**	**2**
Aroclor 1016	0 / 2	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1221	0 / 2	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1232	0 / 2	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1242	0 / 2	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1248	0 / 2	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Aroclor 1254	0 / 2	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1260	0 / 2	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1262	0 / 2	0.2 U	0.2 U		0.1 U	0.014	a	7	None	**Yes**	**2**
Aroclor 1268	0 / 2	0.1 U	0.1 U		0.05 U	0.014	a	4	None	**Yes**	**2**
Atrazine	0 / 1	0.008 U	0.008 U		0.004 U	12	b	0.0003	None	No	-
Azinphos-methyl	0 / 1	0.12 U	0.12 U		0.06 U	0.01	a,r	6	None	**Yes**	**2**
Benfluralin	0 / 1	0.014 U	0.014 U		0.007 U	NV	-	-	-	**Yes**	**4**
Benzene	8 / 74	0.013	4.19	VIN-MW-03S	4.19	160	b	0.03	None	No	-
Benzo[a]anthracene	0 / 4	1 U	1.1 U		0.55 U	4.7	b	0.1	None	No	-
Benzo[b]fluoranthene	0 / 2	1 U	1.1 U		0.55 U	2.6	b	0.2	None	No	-
Benzo[ghi]perylene	0 / 2	1 U	1.1 U		0.55 U	0.44	q, j	1	None	**Yes**	**2**
Benzo[k]fluoranthene	0 / 2	1 U	1.1 U		0.55 U	0.64	q, i	0.9	None	No	-
Benzoic acid	0 / 2	26 U	26 U		13 U	42	c	0.3	None	No	-
Benzyl alcohol	0 / 2	26 U	26 U		13 U	8.6	c	2	None	**Yes**	**2**
Benzyl n-butyl phthalate	0 / 2	5.2 U	5.3 U		2.65 U	23	b	0.1	None	No	-
beta-Endosulfan	0 / 2	0.01 U	0.01 U		0.005 U	0.01	r	0.5	None	No	-
beta-HCH	0 / 2	0.01 U	0.01 U		0.005 U	0.046	d	0.1	None	No	-

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Bis(2-chloroethoxy)methane	0 / 2	5.2 U	5.3 U		2.65 U	NV	-	-	-	**Yes**	**4**
Bis(2-chloroethyl) ether	0 / 2	1 U	1.1 U		0.55 U	1900	f	0.0003	None	No	-
Bis(2-chloroisopropyl) ether	0 / 2	5.2 U	5.3 U		2.65 U	NV	-	-	-	**Yes**	**4**
Bis(2-ethylhexyl) phthalate	0 / 2	5.2 U	5.3 U		2.65 U	3	c	0.9	None	No	-
Bromobenzene	0 / 74	0.022 U	5 U		2.5 U	NV	-	-	-	**Yes**	**4**
Bromochloromethane	0 / 74	0.06 U	6 U		3 U	NV	-	-	-	**Yes**	**4**
Bromodichloromethane	4 / 74	0.08	0.115	VIN-MW-01A	0.115	340	b	0.0003	None	No	-
Bromoethene	0 / 40	0.12 U	2.4 U		1.2 U	NV	-	-	-	**Yes**	**4**
Bromomethane	0 / 74	0.2 U	25 U		12.5 U	16	b	0.8	None	No	-
Butylate	0 / 1	0.004 U	0.004 U		0.002 U	NV	-	-	-	**Yes**	**4**
Carbaryl	0 / 1	0.06 U	0.06 U		0.03 U	0.5	r	0.1	None	No	-
Carbazole	0 / 2	5.2 U	5.3 U		2.65 U	NV	-	-	-	**Yes**	**4**
Carbofuran	0 / 1	0.06 U	0.06 U		0.03 U	0.75	r	0.04	None	No	-
Carbon disulfide	3 / 74	0.1 E	0.4 E	VIN-MW-03S	0.4 E	15	b	0.03	None	No	-
Chlordane (technical)	0 / 2	0.21 U	0.21 U		0.105 U	0.0043	a	24	None	**Yes**	**2**
Chlorobenzene	0 / 74	0.026 U	5 U		2.5 U	25	b	0.1	None	No	-
Chloroethane	0 / 74	0.06 U	10 U		5 U	NV	-	-	-	**Yes**	**4**
Chloromethane	3 / 74	0.2 E	0.5 E	VIN-MW-03S	0.5 E	NV	-	-	-	**Yes**	**3**
Chlorpyrifos	0 / 3	0.01 U	0.11 U		0.055 U	0.04	g	1	None	**Yes**	**2**
Chrysene	0 / 2	1 U	1.1 U		0.55 U	4.7	b	0.12	None	No	-
cis-1,2-Dichloroethene	12 / 74	0.013	0.743	VIN-MW-03D	0.743	620	b	0.001	None	No	-
cis-1,3-Dichloropropene	0 / 74	0.1 U	10 U		5 U	1.7	b	3	None	**Yes**	**2**
cis-Chlordane	0 / 2	0.01 U	0.01 U		0.005 U	0.0043	a	1	None	**Yes**	**2**
cis-Permethrin	0 / 1	0.01 U	0.01 U		0.005 U	0.004	d	1	None	**Yes**	**2**
Coumaphos	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Cyanazine	0 / 1	0.022 U	0.022 U		0.011 U	270	b	0.00004	None	No	-
DCPA (Dacthal)	0 / 1	0.0076 U	0.0076 U		0.0038 U	NV	-	-	-	**Yes**	**4**
delta-HCH	0 / 2	0.01 U	0.01 U		0.005 U	0.004	h	1	None	**Yes**	**2**
Demeton-O	0 / 2	0.1 U	0.11 U		0.055 U	0.1	g	0.6	None	No	-
Demeton-S	0 / 2	0.1 U	0.11 U		0.055 U	0.1	g	0.6	None	No	-
Desulfinylfipronil amide	0 / 1	0.029 U	0.029 U		0.0145 U	NV	-	-	-	**Yes**	**4**
Desulfinylfipronil	0 / 1	0.012 U	0.012 U		0.006 U	NV	-	-	-	**Yes**	**4**
Diazinon	0 / 3	0.006 U	0.11 U		0.055 U	0.17	a	0.3	None	No	-
Dibenzo[a,h]anthracene	0 / 2	1 U	1.1 U		0.55 U	0.28	q, j	2	None	**Yes**	**2**
Dibenzofuran	0 / 2	4.2 U	4.2 U		2.1 U	4	b	0.5	None	No	-
Dibromochloromethane	0 / 74	0.12 U	12 U		6 U	320	b	0.02	None	No	-
Dibromomethane	0 / 74	0.05 U	5 U		2.5 U	NV	-	-	-	**Yes**	**4**
Dichlorodifluoromethane	0 / 74	0.1 U	10 U		5 U	NV	-	-	-	**Yes**	**4**
Dichloromethane	5 / 74	0.33 J	0.57 J	VIN-MW-06	0.57 J	1500	b	0.0004	None	No	-
Dichlorvos	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Dieldrin	2 / 3	0.0035 J	0.008	VIN-MW-03D	0.008	0.056	a	0.1	None	No	-
Diethyl ether	0 / 40	0.1 U	10 U		5 U	NV	-	-	-	**Yes**	**4**
Diethyl phthalate	1 / 2	10	10	VIN-MW-03D	10	220	b	0.05	None	No	-
Diisopropyl ether	0 / 40	0.06 U	6 U		3 U	NV	-	-	-	**Yes**	**4**

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Dimethoate	0 / 2	0.1 U	0.11 U		0.055 U	0.5	r	0.1	None	No	-
Dimethyl phthalate	0 / 2	5.2 U	5.3 U		2.65 U	1100	b	0.002	None	No	-
Di-n-butyl phthalate	0 / 2	5.2 U	5.3 U		2.65 U	19	b	0.1	None	No	-
Di-n-octyl phthalate	0 / 2	5.2 U	5.3 U		2.65 U	30	f	0.09	None	No	-
Disulfoton	0 / 3	0.04 U	0.11 U		0.055 U	0.0402	f	1	None	**Yes**	**2**
Endosulfan sulfate	0 / 2	0.01 U	0.01 U		0.005 U	0.056	g	0.09	None	No	-
Endrin aldehyde	0 / 2	0.01 U	0.01 U		0.005 U	0.036	a	0.1	None	No	-
Endrin ketone	0 / 2	0.01 U	0.01 U		0.005 U	0.036	a	0.1	None	No	-
Endrin	0 / 2	0.01 U	0.01 U		0.005 U	0.036	a	0.1	None	No	-
EPN	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
EPTC	0 / 1	0.0056 U	0.0056 U		0.0028 U	NV	-	-	-	**Yes**	**4**
Ethalfluralin	0 / 1	0.006 U	0.006 U		0.003 U	NV	-	-	-	**Yes**	**4**
Ethoprop	0 / 3	0.016 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Ethyl methacrylate	0 / 40	0.2 U	20 U		10 U	NV	-	-	-	**Yes**	**4**
Ethyl methyl ketone	1 / 74	1.2	1.2	VIN-MW-03S	1.2	2200	b	0.0005	None	No	-
Ethylbenzene	5 / 74	0.016	0.041	VIN-MW-01	0.041	320	g	0.0001	None	No	-
Fensulfothion	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Fenthion	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Fipronil sulfide	0 / 1	0.016 U	0.016 U		0.008 U	NV	-	-	-	**Yes**	**4**
Fipronil sulfone	0 / 1	0.024 U	0.024 U		0.012 U	NV	-	-	-	**Yes**	**4**
Fipronil	0 / 1	0.018 U	0.018 U		0.009 U	NV	-	-	-	**Yes**	**4**
Fluoranthene	0 / 2	1 U	1.1 U		0.55 U	0.8	b	0.7	None	No	-
Fonofos	0 / 1	0.0048 U	0.0048 U		0.0024 U	NV	-	-	-	**Yes**	**4**
gamma-Chlordane	0 / 2	0.01 U	0.01 U		0.005 U	0.0043	a	1	None	**Yes**	**2**
Heptachlor epoxide	0 / 2	0.01 U	0.01 U		0.005 U	0.0038	a	1	None	**Yes**	**2**
Heptachlor	0 / 2	0.01 U	0.01 U		0.01 U	0.0038	a	3	None	**Yes**	**2**
Hexachlorobenzene	0 / 2	1 U	1.1 U		1.1 U	0.0003	f	3667	None	**Yes**	**2**
Hexachlorobutadiene	0 / 76	0.08 U	25 U		25 U	1	b	25	None	**Yes**	**2**
Hexachlorocyclopentadiene	0 / 2	5.2 U	5.3 U		5.3 U	0.5	g	11	None	**Yes**	**2**
Hexachloroethane	0 / 42	0.1 U	12 U		12 U	12	c	1	None	**Yes**	**2**
Indeno[1,2,3-cd]pyrene	0 / 2	1 U	1.1 U		1.1 U	0.28	q, j	4	None	**Yes**	**2**
Iodomethane	0 / 40	0.26 U	26 U		26 U	NV	-	-	-	**Yes**	**4**
Isobutyl methyl ketone	0 / 74	0.32 U	50 U		50 U	170	c	0.3	None	No	-
Isophorone	0 / 2	5.2 U	5.3 U		5.3 U	920	b	0.006	None	No	-
Isopropylbenzene	0 / 74	0.042 U	5 U		5 U	4.8	b	1	None	**Yes**	**2**
Lindane	0 / 3	0.004 U	0.01 U		0.01 U	0.026	f	0.4	None	No	-
Linuron	0 / 1	0.06 U	0.06 U		0.06 U	NV	-	-	-	**Yes**	**4**
Malathion	0 / 3	0.016 U	0.11 U		0.11 U	0.035	r	3	None	**Yes**	**2**
Merphos	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Methyl acrylate	0 / 40	0.8 U	80 U		80 U	NV	-	-	-	**Yes**	**4**
Methyl acrylonitrile	0 / 40	0.26 U	26 U		26 U	NV	-	-	-	**Yes**	**4**
Methyl methacrylate	0 / 40	0.22 U	30 U		30 U	2800	f	0.01	None	No	-
Methyl parathion	0 / 3	0.008 U	0.11 U		0.11 U	0.013	a	8	None	**Yes**	**2**
Methyl tert-butyl ether	1 / 74	0.03	0.03	VIN-MW-01A	0.03	730	b	0.00004	None	No	-

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Methyl tert-pentyl ether	0 / 40	0.06 U	6 U		6 U	NV	-	-	-	**Yes**	**4**
Metolachlor	0 / 1	0.012 U	0.012 U		0.012 U	15	d	0.0008	None	No	-
Metribuzin	0 / 1	0.012 U	0.012 U		0.012 U	NV	-	-	-	**Yes**	**4**
Mevinphos	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Molinate	0 / 1	0.008 U	0.008 U		0.008 U	NV	-	-	-	**Yes**	**4**
Monocrotophos	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
m-Xylene plus p-xylene	6 / 74	0.03	0.12	VIN-MW-02D, VIN-MW-03S	0.12	27	b	0.004	None	No	-
Naled	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Naphthalene	1 / 76	0.04	0.04	VIN-MW-04S	0.04	21	b	0.002	None	No	-
Napropamide	0 / 1	0.01 U	0.01 U		0.01 U	NV	-	-	-	**Yes**	**4**
n-Butyl methyl ketone	0 / 74	0.4 U	60 U		60 U	99	c	0.6	None	No	-
n-Butylbenzene	0 / 74	0.08 U	8 U		8 U	NV	-	-	-	**Yes**	**4**
Nitrobenzene	0 / 2	3.1 U	3.2 U		3.2 U	380	b	0.008	None	No	-
N-Nitrosodimethylamine	0 / 2	5.2 U	5.3 U		5.3 U	117	e	0.05	None	No	-
N-Nitrosodi-n-propylamine	0 / 2	5.2 U	5.3 U		5.3 U	NV	-	-	-	**Yes**	**4**
N-Nitrosodiphenylamine	0 / 2	5.2 U	5.3 U		5.3 U	25	b	0.2	None	No	-
n-Propylbenzene	0 / 74	0.036 U	5 U		5 U	128	e	0.04	None	No	-
o-Cresol	0 / 2	5.2 U	5.3 U		5.3 U	67	b	0.08	None	No	-
Orthophosphate	0 / 2	0.1 U	0.1 U		0.1 U	NV	-	-	-	**Yes**	**4**
o-Xylene	5 / 74	0.022	0.094	VIN-MW-03S	0.094	27	b	0.003	None	No	-
p,p'-DDD	0 / 2	0.01 U	0.01 U		0.01 U	0.001	a	10	None	**Yes**	**2**
p,p'-DDE	0 / 3	0.005 U	0.01 U		0.01 U	0.001	a	10	None	**Yes**	**2**
p,p'-DDT	0 / 2	0.01 U	0.01 U		0.01 U	0.001	a	10	None	**Yes**	**2**
p,p'-Methoxychlor	0 / 2	0.01 U	0.01 U		0.01 U	0.03	a	0.3	None	No	-
Parathion	0 / 3	0.02 U	0.11 U		0.11 U	0.013	a	8	None	**Yes**	**2**
Total PCBs	0 / 2	0.2 U	0.2 U		0.2 U	0.014	a	14	None	**Yes**	**2**
p-Cresol	0 / 2	10 U	11 U		11 U	53	b	0.2	None	No	-
Pebulate	0 / 1	0.016 U	0.016 U		0.016 U	NV	-	-	-	**Yes**	**4**
Pendimethalin	0 / 1	0.012 U	0.012 U		0.012 U	NV	-	-	-	**Yes**	**4**
Pentachlorophenol	0 / 2	5.2 U	5.3 U		5.3 U	8.7	g	0.6	None	No	-
Phenanthrene	0 / 2	1 U	1.1 U		1.1 U	2.3	b	0.5	None	No	-
Phenol	0 / 2	5.2 U	5.3 U		5.3 U	160	b	0.03	None	No	-
Phorate	0 / 3	0.02 U	0.11 U		0.11 U	3.62	f	0.03	None	No	-
Prometon	0 / 1	0.012 U	0.012 U		0.012 U	NV	-	-	-	**Yes**	**4**
Propachlor	0 / 1	0.006 U	0.006 U		0.006 U	NV	-	-	-	**Yes**	**4**
Propanil	0 / 1	0.01 U	0.01 U		0.01 U	NV	-	-	-	**Yes**	**4**
Propargite	0 / 1	0.02 U	0.02 U		0.02 U	NV	-	-	-	**Yes**	**4**
Propyzamide	0 / 1	0.008 U	0.008 U		0.008 U	NV	-	-	-	**Yes**	**4**
Pyrene	0 / 2	1 U	1.1 U		1.1 U	4.6	b	0.2	None	No	-
Ronnel	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
sec-Butylbenzene	0 / 74	0.034 U	5 U		5 U	NV	-	-	-	**Yes**	**4**
Simazine	0 / 1	0.006 U	0.006 U		0.006 U	9	b	0.0007	None	No	-
Styrene	0 / 74	0.042 U	5 U		5 U	32	b	0.2	None	No	-

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Sulfotepp	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Sulprofos	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Tebuthiuron	0 / 1	0.028 U	0.028 U		0.028 U	NV	-	-	-	**Yes**	**4**
Terbacil	0 / 1	0.024 U	0.024 U		0.024 U	NV	-	-	-	**Yes**	**4**
Terbufos	0 / 1	0.018 U	0.018 U		0.018 U	NV	-	-	-	**Yes**	**4**
tert-Butyl ethyl ether	0 / 40	0.032 U	3.2 U		3.2 U	NV	-	-	-	**Yes**	**4**
tert-Butylbenzene	0 / 74	0.06 U	6 U		6 U	NV	-	-	-	**Yes**	**4**
Tetrachloroethene	74 / 74	0.47 J	1140	VIN-MW-03D	1140	53	b	22	24	**Yes**	**1**
Tetrachloromethane	0 / 74	0.06 U	6 U		6 U	77	b	0.08	None	No	-
Tetraethyl pyrophosphate (TEPP)	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Tetrahydrofuran	0 / 40	1.4 U	140 U		140 U	11000	b	0.01	None	No	-
Thiobencarb	0 / 1	0.016 U	0.016 U		0.016 U	NV	-	-	-	**Yes**	**4**
Tokuthion	0 / 2	0.1 U	0.11 U		0.11 U	NV	-	-	-	**Yes**	**4**
Toluene	5 / 74	0.02 E	9.7	VIN-MW-01A	9.7	62	b	0.2	None	No	-
Toxaphene	0 / 2	0.21 U	0.21 U		0.21 U	0.0002	a	1,050	None	**Yes**	**2**
trans-1,2-Dichloroethene	0 / 74	0.018 U	5 U		5 U	558	b	0.009	None	No	-
trans-1,3-Dichloropropene	0 / 74	0.14 U	14 U		7 U	1.7	b	4	None	**Yes**	**2**
trans-1,4-Dichloro-2-butene	0 / 40	2 U	200 U		100 U	NV	-	-	-	**Yes**	**4**
Triallate	0 / 1	0.0046 U	0.0046 U		0.0023 U	NV	-	-	-	**Yes**	**4**
Tribromomethane	0 / 74	0.1 U	10 U		5 U	230	b	0.02	None	No	-
Trichloroethene	34 / 74	0.013	3.3	VIN-MW-06, VIN-MW-03D	3.3	200	b	0.02	None	No	-
Trichlorofluoromethane	0 / 74	0.06 U	6 U		3 U	NV	-	-	-	**Yes**	**4**
Trichloromethane	10 / 74	0.02	0.28	VIN-MW-01A	0.28	140	b	0.002	None	No	-
Trichloronate	0 / 2	0.1 U	0.11 U		0.055 U	NV	-	-	-	**Yes**	**4**
Trifluralin	0 / 1	0.018 U	0.018 U		0.009 U	1.14	r	0.008	None	No	-
Vinyl chloride	1 / 74	0.06	0.06	VIN-MW-01	0.06	930	b	0.00006	None	No	-
Xylene (all isomers)	0 / 34	3 U	15 U		7.5 U	27	b	0.3	None	No	-
Metals (µg/L)											
Antimony (Total)	0 / 2	2.5 U	2.5 U	ND	1.25 U	190	b	0.007	None	No	-
Arsenic (Total)	0 / 2	1.5 U	1.5 U	ND	0.75 U	150	a	0.005	None	No	-
Beryllium (Total)	0 / 2	1.0 U	1 U	ND	0.5 U	11	b	0.05	None	No	-
Cadmium (Total)	0 / 2	1 U	1 U	ND	0.5 U	0.27	a	2	None	**Yes**	**2**
Chromium (Total)	1 / 2	13 J	13 J	VIN-MW-03D	13 J	11.4	a	1	1	**Yes**	**1**
Copper (Total)	1 / 2	6.8 J	6.8 J	VIN-MW-03D	6.8 J	9.32	a	0.7	None	No	-
Lead (Total)	0 / 2	1 U	1 U	ND	0.5 U	3.2	a	0.2	None	No	-
Mercury (Total)	0 / 2	0.2 U	0.2 U	ND	0.1 U	0.91	a	0.1	None	No	-
Nickel (Total)	0 / 2	10 U	10 U	ND	5 U	52	a	0.1	None	No	-
Selenium (Total)	0 / 2	5 U	5 U	ND	2.5 U	5	a	0.5	None	No	-
Silver (Total)	0 / 2	1.5 U	1.5 U	ND	0.75 U	0.06	b	13	None	**Yes**	**2**
Thallium (Total)	0 / 2	2 U	2 U	ND	1 U	6	b	0.2	None	No	-
Zinc (Total)	0 / 2	50 U	50 U	ND	25 U	122	a	0.2	None	No	-

Table C-25
Screening of Baseline Ecological Risk Assessment
Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Range of Detections or Sample Quantitation Limits (SQL)		Locations of Maximum Concentration or SQL	Exposure Point Concentration[1]	Ecological Screening Value (ESV)	ESV Source	Maximum Hazard Quotient[2]	Number of Detections Exceeding ESV	Preliminary COPC?	PCOPC Category[3]
		Minimum	Maximum								
Anions (µg/L)											
Bromide	7 / 8	90	450	VIN-MW-03D	450	NV	-	-	-	**Yes**	**3**
Chloride	8 / 8	24 J	240000	VIN-MW-03D	240000	230000	a	1	1	**Yes**	**1**
Fluoride	7 / 8	56 J	100	VIN-MW-04D	100	2700	b	0.04	None	No	-
Nitrate	1 / 2	3700 J	3700 J	VIN-SW-TB2-1	3700 J	NV	-	-	-	**Yes**	**3**
Nitrite	0 / 2	50 U	50 U	ND	25 U	100	e	0.3	None	No	-
Sulfate	7 / 8	19600	56000	VIN-MW-03D	56000	1150000	g	0.05	None	No	-

Notes:

– - Not Applicable
COPC - Chemical of Potential Concern
µg/L - micrograms per liter
NV - no value (value not available)
PAHs - polycyclic aromatic hydrocarbons
PCOPC - Preliminary Chemical of Potential Concern

[1] - Maximum detected of SQL
[2] - HQ = Exposure Point Concentration / ESV
[3] - PCOPC Categories:
1 - Detected and HQ >= 1
2 - Not Detected, maximum SQL >= ESV
3 - Detected but no ESV
4 - Not Detected and no ESV

Data Qualifiers:

U - Analyte not detected at or above reporting limit. The number is the minimum quanititation limit.
J - Identification of analyte is acceptable; reported value is estimated.

Source:

a - National Recommended Water Quality Criteria http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
b - Great Lakes Initiative (GLI) Clearinghouse resources Tier II criteria revised 2013 http://www.epa.gov/gliclearinghouse/
c - Suter, G.W. II, and Tsao, C.L. 1996. Toxicological benchmarks for screening potential contaminants of concern for effects on aquatic biota: 1996 Revision. ES/ER/TM-96/R2. http://www.esd.ornl.gov/programs/ecorisk/documents/tm96r2.pdf
d - EPA Region 4
e -EPA Region 3
f -EPA Region 5
g -Missouri WQS
h - ORNL PRG
i - Region 4 Surface Water Model - See text Section 6.1.4 Equation 1.
j - ECOSAR program predicted lowest chronic or acute value. See Section 6.1.4 in text.
q - EPA. 2003. Equilibrium Partitioning Sediment Benchmarks for Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013. http://www.epa.gov/nheerl/download_files/publications/PAHESB.pdf
r - Office of Pesticide Programs (OPP) Aquatic Life Benchmarks: http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm

	Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	ESV_{NOAEL} Plants	Ref.	ESV_{NOAEL} Invertebrates	Ref.	ESV_{NOAEL} Mammals	Ref.	ESV_{NOAEL} Birds	Ref.	HQ_{NOAEL} Plants	HQ_{NOAEL} Invertebrates	HQ_{NOAEL} Mammals	HQ_{NOAEL} Birds	Site Background	Regional Background	US Backgro
	86/102	2900 J	346.6	NA	-	40	d	1200	c	14000	c	NC	9	0.3	0.02	ND	-	-
	3/100	1200 J	78.69	160000	c	NA	-	440	c	41	c	0.0005	NC	0.2	2	ND	-	-
	2/95	1400	269.8	NA	-	230	d	590	c	20	c	NC	1	0.5	13	ND	-	-
	3/100	430	15.83	2200	c	170	d	270	c	280	c	0.007	0.09	0.06	0.06	ND	-	-
	6/100	50	3.488	10000	c	100	d	4.9	a	22	a	0.0003	0.03	0.7	0.2	ND	-	-
	2/100	42 J	42	160000	c	220	d	180000	c	11	c	0.0003	0.2	0.0002	4	ND	-	-
	1/100	5.9	5.9	3.4	c	25	d	23	c	1.4	c	2	0.2	0.3	4	ND	-	-
	5/100	79	4.157	NA	-	0.4	d	NA	-	NA	-	NC	10	NC	NC	ND	-	-
	39/83	170	17.63	NA	-	NA	-	NA	-	NA	-	NC	NC	NC	NC	NA	-	-
	9/100	210	14.91	NA	-	NA	-	4100	c	6.3	c	NC	NC	0.004	2	ND	-	-
	7/100	1600	134.6	NA	-	NA	-	3700	c	110	c	NC	NC	0.04	1	ND	-	-
	10/100	1500	126	4100	c	3370	d	44	c	360	c	0.03	0.04	3	0.4	ND	-	-
	13/100	3185	275.5	4100	c	3370	d	21	a	93	a	0.07	0.08	13	3	ND	-	-
	4/90	191	9.887	10000	c	60	d	180	c	NA	-	0.001	0.2	0.05	NC	ND	-	-
	9/86	310	23.88	2200	c	170	d	270	c	280	c	0.01	0.1	0.09	0.09	NA	-	-
	4/95	9100																
	4/82	6400																
	7/82	12000																
	3/82	1400 J																
	2/82	4300																
	4/95	7800																
	1/82	47 J																
	3/100	18000																
	4/82	1600 J																
	6/95	15000																
	8/100	76,650 J	5349	NA	a	18,000	a	1100	a	NA	a	NC	0.3	5	NC	ND	-	-
	86/86	10800	6215	pH	a	pH	a	pH	a	pH	a	NC	NC	NC	NC	NA	61770	1% - 30
	13/100	25 J	1.416	11	c	78	a	0.27	a	NA	a	0.1	0.02	5	NC	0.41	1	1
	57/100	16	1.309	32	a	140	a	0.36	a	0.77	a	0.04	0.009	4	2	1.6	1.01	0.4
	97/100	82 J	15.43	0.35	c	7.8	a	34	a	26	a	44	2	0.5	0.6	11	55.5	45
	69/86	18.6 J	9.497	13	a	1000	b	230	a	120	a	0.7	NC	0.04	0.08	NA	10.5	8
	87/100	1500	62.93	70	a	80	a	49	a	28	a	0.9	0.8	1	2	8.7	14.6	24
	86/86	27400	13621	pH	a	pH	a	pH	a	pH	a	NC	NC	NC	NC	NA	16990	0.2% - 5
	100/100	1000 J	108.8	120	a	1700	a	56	a	11	a	0.9	0.06	2	10	17	24.7	32
	86/86	2030	877.6	220	a	450	a	4000	a	4300	a	4	2	0.2	0.2	NA	NA	600
	22/100	0.97	0.0899	0.3	b	0.1	b	1.7	c	0.013	c	0.3	0.9	0.05	7	0.034	0.064	-
	98/100	67	11.61	38	a	280	a	130	a	210	a	0.3	0.04	0.09	0.06	9.8	13.7	20
	14/100	2 J	1.278	1	b	NA	-	0.22	c	6.3	c	1	NC	6	0.2	1.5	NA	-
	86/86	52.3	26.82	60	c	20	b	280	a	7.8	a	0.4	1	0.1	3	NA	64.6	75
	78/100	2200 J	154.8	160	a	120	a	79	a	46	a	1	1	2	3	33	47.4	50

Individual analytes were screened as the summed total concentration.

	Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	ESV_{NOAEL} Plants	Ref.	ESV_{NOAEL} Invertebrates	Ref.	ESV_{NOAEL} Mammals	Ref.	ESV_{NOAEL} Birds	Ref.	HQ_{NOAEL} Plants	HQ_{NOAEL} Invertebrates	HQ_{NOAEL} Mammals	HQ_{NOAEL} Birds	Site Background	Regional Background	US Backgro

ximum detected concentration

7a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2.

. Wooten. 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-95/R4.

ɜ D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. 50 pp. ES/ER/TM-162/R2

ECORISK Database Release 3.2. Environmental Programs, Engineering and Technology Division. September 2013.

Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	ESV_{LOAEL} Plants	Ref.	ESV_{LOAEL} Invertebrates	Ref.	ESV_{LOAEL} Mammals	Ref.	ESV_{LOAEL} Birds	Ref.	HQ_{LOAEL} Plants	HQ_{LOAEL} Invertebrates	HQ_{LOAEL} Mammals	HQ_{LOAEL} Birds	Site Background	Regional Background	US Background
86/102	2900 J	346.6	NA	-	120000	d	NA	-	NA	-	NC	0.003	NC	NC	ND	-	-
3/100	1200 J	78.69	NA	-	NA	-	NA	-	410	c	NC	NC	NC	0.2	ND	-	-
2/95	1400	270	NA	-	1900	d	NA	-	200	c	NC	0.1	NC	1	ND	-	-
2/100	42 J	42	NA	-	NA	-	NA	-	110	c	NC	NC	NC	0.4	ND	-	-
1/100	5.9	5.9	34	c	NA	-	NA	-	14	c	0.2	NC	NC	0.4	ND	-	-
5/100	79	4.16	NA	-	0.4	d	NA	-	NA	-	NC	10	NC	NC	ND	-	-
39/83	170	17.6	NA	-	NA	-	NA	-	NA	-	NC	NC	NC	NC	NA	-	-
9/100	210	14.91	NA	-	NA	-	NA	-	33	c	NC	NC	NC	0.5	ND	-	-
7/100	1600	134.6	NA	-	NA	-	NA	-	550	c	NC	NC	NC	0.2	ND	-	-
10/100	1500	126	NA	-	NA	-	NA	-	NA	-	NC	NC	NC	NC	ND	-	-
13/100	3185	276	NA	-	NA	-	105	a	930	a	NC	NC	3	0.3	ND	-	-
4/95	9100	Individual analytes were screened as the summed total concentration.															
4/82	6400																
7/82	12000																
3/82	1400 J																
2/82	4300																
4/95	7800																
1/82	47 J																
3/100	18000																
4/82	1600 J																
6/95	15000																
8/100	76,650 J	5349	NA	-	NA	-	5500	a	NA	-	NC	NC	1	NC	ND	-	-
13/100	25 J	1.416	NA	-	NA	-	2.7	a	NA	-	NC	NC	0.5	NC	0.41	1	1
87/100	1500	62.93	NA	-	NA	-	82	a	84	a	NC	NC	0.8	0.7	8.7	14.6	24
100/100	1000 J	109	NA	-	NA	-	106	a	22	a	NC	NC	1	5	17	24.7	32
86/86	2030	877.6	1100	c	4500	c	NA	-	NA	-	0.8	0.2	NC	NC	NA	NA	600
22/100	0.97	0.0899	NA	-	NA	-	NA	-	0.13	c	NC	NC	NC	0.7	0.034	0.064	-
78/100	2200 J	154.8	NA	-	930	c	790	a	460	a	NC	0.2	0.2	0.3	33	47.4	50

maximum detected concentration

els.

1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-126/R2.
A.C. Wooten. 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-95/R4.
and D.S. Jones. 1997. Preliminary Remediation Goals for Ecological Endpoints. Oak Ridge National Laboratory, Oak Ridge, TN. 50 pp. ES/ER/TM-162/R2

Table C-28
Refinement of Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	RESV	Ref.	HQ_{RESV}	Site Background	Regional Background	US Background	Is HQ > 1 and is EPC > BKGD?	COPC
Organics (ug/kg)											
Bis(2-ethylhexyl) phthalate	2/6	290 J	195	2647	a	0.07	ND	-	-	No	EPC < RESV
cis-Chlordane	0/6	11 U	5.5	17.6	b	0.3	ND	-	-	No	EPC < RESV
gamma-Chlordane	2/6	6 J	6	17.6	b	0.3	ND	-	-	No	EPC < RESV
Total Chlordane	2/6	11.5 J	11.5	17.6	b	0.7	ND	-	-	No	EPC < RESV
p,p'-DDD	0/6	23 U	11.5	28	b	0.4	ND	-	-	No	EPC < RESV
p,p'-DDE	2/6	11.5	11.5	31.3	b	0.4	ND	-	-	No	EPC < RESV
p,p'-DDT	2/6	26	26	62.9	b	0.4	ND	-	-	No	EPC < RESV
Total DDD/DDE/DDT	2/6	49	49	572	b	0.09	ND	-	-	No	EPC < RESV
p-Cresol	2/6	365 J	365	260	c	1	ND	-	-	**Yes**	**EPC > RESV**
Low mol wt PAHs (µg/kg)											
2-Methylnaphthalene	0/6	260 U	Individual analytes were screened as the summed total concentration.								
Acenaphthene	0/6	260 U									
Acenaphthylene	2/6	77 J									
Anthracene	2/6	58 J									
Fluorene	0/6	260 U									
Naphthalene	0/6	320.5 U									
Phenanthrene	1/6	31 J									
LMW PAHs (Total)	2/6	643.5 J	643.5	1442	a	0.4	ND	-	-	No	EPC < RESV
High mol wt PAHs (µg/kg)											
Benzo[a]anthracene	2/6	195 J	Individual analytes were screened as the summed total concentration.								
Benzo[a]pyrene	2/6	230 J									
Benzo[b]fluoranthene	2/6	525 J									
Benzo[ghi]perylene	2/6	120 J									
Benzo[k]fluoranthene	2/6	165 J									
Chrysene	2/6	240 J									
Dibenzo[a,h]anthracene	1/6	39 J									
Fluoranthene	2/6	225 J									
Indeno[1,2,3-cd]pyrene	2/6	104 J									
Pyrene	2/6	540 J									
HMW PAHs (Total)	2/6	2383 J	2383	6676	a	0.4	ND	-	-	No	EPC < RESV
Total PAHs	2/6	3026.5 J	3026.5	22800	b	0.1	ND	-	-	No	EPC < RESV

Table C-28
Refinement of Preliminary Chemicals of Potential Ecological Concern in Sediment
Vienna Wells Site

Analyte	Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	RESV	Ref.	HQ_{RESV}	Site Background	Regional Background	US Background	Is HQ > 1 and is EPC > BKGD?	COPC
Metals (mg/kg)											
Arsenic (Total)	6/6	11	10.4	33	b	0.3	5.1	-	-	No	EPC < RESV
Cadmium (Total)	6/6	3.3	3.3	5	b	0.7	1.4	-	-	No	EPC < RESV
Copper (Total)	4/6	37.5	37.1	149	b	0.2	ND	-	-	No	EPC < RESV
Lead (Total)	6/6	48 J	47.1	128	b	0.4	13	-	-	No	EPC < RESV
Zinc (Total)	6/6	400 J	345	459	b	0.8	20	-	-	No	EPC < RESV

Notes:
– Not Applicable
RESV - Refined Ecological Screening Value
HMW PAHs - high molecular weight polycyclic aromatic hydrocarbons
LMW PAHs - low molecular weight polycyclic aromatic hydrocarbons
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram

Data Qualifiers:
U - Analyte not detected at or above reporting limit. The number is the maximum quanititation limit.
J - Reported value is estimated.

RESV Source:
a - MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Coastal Waters. Florida Department of Environmental Protection. 1994 Florida Sediment Quality Assessment Guidelines for Florida Coastal Waters.
b - MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Used threshold effect concentration (TEC) for the ESV and probable effect concentration (PEC) for the RSV.
c - Region 4 Sediment Model based on equilibrium partitioning with surface water.

Table C-29
Refinement of Preliminary Chemicals of Potential Ecological Concern in Groundwater
Vienna Wells Site

Analyte	Frequency of Detection	Maximum Conc.	Exposure Point Conc. [1]	RESV	Ref.	HQ_{RESV}	Site Background	Regional Background	US Background	Is HQ > 1 and is EPC > BKGD?	COPC
Organics (µg/L)											
Tetrachloroethene	74/74	1140	315.2	430	a	0.7	NA	NA	NA	No	EPC < RESV
Metals (µg/L)											
Chromium (Total)	1/2	13 J	13	16	b	0.8	NA	NA	NA	No	EPC < RESV
Anions (µg/L)											
Chloride	8/8	240000	157500	860000	b	0.2	NA	NA	NA	No	EPC < RESV

[1] - Exposure Point Concentration - 95% UCL or maximum detected concentration

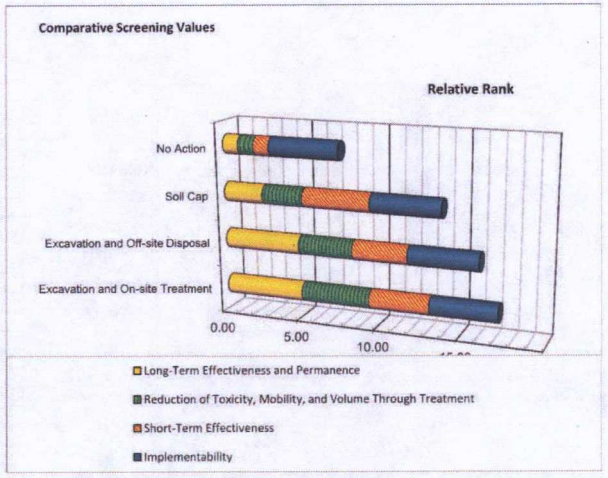
Notes:
ESV - Ecological Screening Value
PAHs - polycyclic aromatic hydrocarbons
µg/L - micrograms per liter
NA - Not Available

RESV Source:
a - Great Lakes Initiative - acute effects
b - National Water Quality Recommendations - acute effects

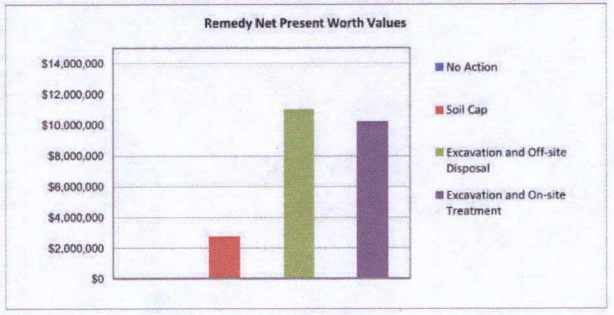
Data Qualifiers:
U - Analyte not detected at or above reporting limit. The number is the maximum quanititation limit.

Table C-30
Quantitative Comparison Analysis of Soil Remedial Alternatives
Vienna Wells Site

Remedial Alternative		S1	S2	S3	S4
Criteria	Criterion Weight	No Action	Soil Cap	Excavation and Off-site Disposal	Excavation and On-site Treatment
Overall Protection of Human Health and the Environment	Must Pass	No	YES	YES	YES
How alternative provides human health and environmental protection		No	YES	YES	YES
Compliance with ARARs	Must Pass	No	YES	YES	YES
Compliance with Action-Specific ARARs		No	YES	YES	YES
Compliance with Chemical-Specific ARARs		No	YES	YES	YES
Compliance with Location-Specific ARARs		-	-	-	-
Compliance with To Be Considered /other criteria, advisories, and guidances		-	-	-	-
Long-Term Effectiveness and Permanence	25.00%	1.00	2.50	4.83	5.00
Magnitude of Residual (Post-Remediation) Risks		1	2.5	5	5
Adequacy and Reliability of Controls		-	3	5	5
Treatment Irreversibility		-	2	4.5	5
Reduction of Toxicity, Mobility, and Volume Through Treatment	25.00%	1.00	2.60	3.50	4.40
Treatment Process and Remedy		1	2.5	3.5	4.5
Amount of Hazardous Materials Destroyed or Treated		1	2	2.5	4.5
Degree of Expected Reductions in T/M/V		1	2.5	4.5	4.5
Type and Quantity of Treatment Residuals		-	4	4	3.5
Statutory Preference for Treatment		1	2	3	5
Short-Term Effectiveness	25.00%	1.00	4.38	3.44	3.69
Protection of Community During Remedial Action		-	4.5	3	3.5
Protection of Workers During Remedial Action		-	4.5	4	4
Environmental Impacts		1	4	3	3.5
Time Until Remedial Action Objectives are Achieved		-	4.5	3.75	3.75
Implementability	25.00%	4.50	4.31	4.28	4.13
Ability to Construct and Operate the Technology		5	4.5	4.25	3.5
Technology Reliability		-	4.5	4.5	4.5
Ease of Remedial Modifications		4	3	4	4
Ability to Monitor Remedial Effectiveness		-	4.5	4	4
Coordination with Other Agencies		-	4	4	4
Availability of Offsite T&D Services and Capacity		-	4	3.5	4
Equipment and Specialist Availability		-	5	5	4.5
Availability of Prospective Technologies		-	5	5	4.5
Total Composite Score	**100%**	**7.50**	**13.8**	**16.1**	**17.2**
Cost					
Construction Costs		$0	$2,526,000	$10,971,000	$10,219,000
NPW O&M Costs		$0	$213,800	$0	$0
O&M Period (yrs.)		30	30	-	-
Net Present Worth Cost (@ 7% discount rate)		**$0**	**$2,740,000**	**$10,971,000**	**$10,219,000**



"Overall Protection of Human Health and the Environment" and "Compliance with ARARs" are statutory requirements and are identified as either meeting "Yes" or not meeting "No" the requirement.



The "Criterion Weight" is the relative weight (quantified as a percentage) that each individual evaluation criterion or question has on the overall score.
The "Criterion Weight" for each evaluation criterion is multiplied by each evaluation criterion's score to arrive at a weighted score for that criterion.

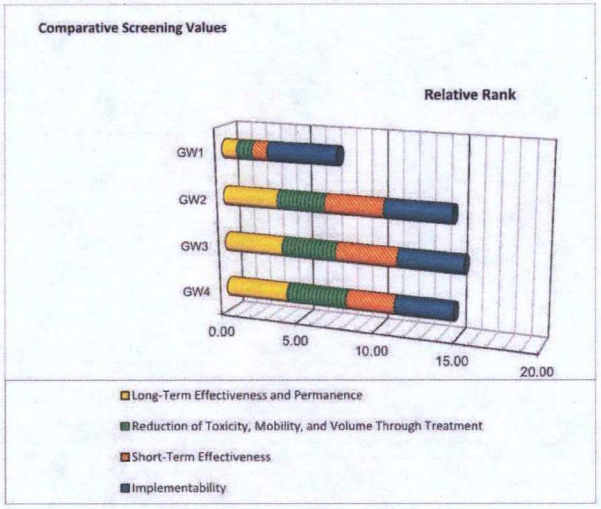
Notes:
ARAR - Applicable or Relevant and Appropriate Requirements
NPW - Net Present Worth
O&M - Operation & Maintenance
T/M/V - Toxicity, Mobility and Volume
T&D - Treatment, Storage, and Disposal

Key to Evaluation Ratings
Very Good - 5
Good - 4
Average - 3
Fair - 2
Poor - 1
Not Applicable - "-"

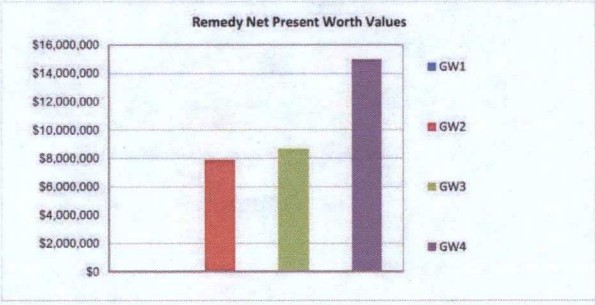
Ratings are based on the BVSPC project team's asessments, using reference materials, work experince, and the team's understanding of conditions at the VWS.

Table C-31
Quantitative Comparison Analysis of Groundwater Remedial Alternatives
Vienna Wells Site

Criteria	Criterion Weight	GW1 No Action	GW2 Hydraulic Containment for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03	GW3 GET for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03	GW4 GET for the Contaminated Shallow Zone and Contaminated Deep Zone GET Using COV-03 and Additional GW Extraction Wells
Overall Protection of Human Health and the Environment	**Must Pass**	**No**	**YES**	**YES**	**YES**
How alternative provides human health and environmental protection		No	YES	YES	YES
Compliance with ARARs	**Must Pass**	**No**	**YES**	**YES**	**YES**
Compliance with Action-Specific ARARs		No	YES	YES	YES
Compliance with Chemical-Specific ARARs		No	YES	YES	YES
Compliance with Location-Specific ARARs		-	-	-	-
Compliance with To Be Considered /other criteria, advisories, and guidances		-	-	-	-
Long-Term Effectiveness and Permanence	**25.00%**	**1.00**	**3.58**	**3.83**	**4.08**
Magnitude of Residual (Post-Remediation) Risks		1	3.5	4	4.5
Adequacy and Reliability of Controls		-	3.25	3.5	3.75
Treatment Irreversibility		-	4	4	4
Reduction of Toxicity, Mobility, and Volume Through Treatment	**25.00%**	**1.00**	**3.10**	**3.50**	**3.90**
Treatment Process and Remedy		1	2.5	3.5	4.5
Amount of Hazardous Materials Destroyed or Treated		1	2.5	3.5	4.5
Degree of Expected Reductions in T/M/V		1	2.5	3.5	4.5
Type and Quantity of Treatment Residuals		-	4	3	2
Statutory Preference for Treatment		1	4	4	4
Short-Term Effectiveness	**25.00%**	**1.00**	**3.75**	**3.94**	**3.13**
Protection of Community During Remedial Action		-	4	4	3
Protection of Workers During Remedial Action		-	4	4	3
Environmental Impacts		1	5	4.75	2.5
Time Until Remedial Action Objectives are Achieved		-	2	3	4
Implementability	**25.00%**	**4.50**	**4.19**	**4.09**	**3.66**
Ability to Construct and Operate the Technology		5	4.5	4.5	4
Technology Reliability		-	4	4	3.5
Ease of Remedial Modifications		4	4	3.75	3.5
Ability to Monitor Remedial Effectiveness		-	4	4	3.5
Coordination with Other Agencies		-	4	3.75	3
Availability of Offsite T&D Services and Capacity		-	4	3.75	3
Equipment and Specialist Availability		-	4	4	3.75
Availability of Prospective Technologies		-	5	5	5
Total Composite Score	**100%**	**7.50**	**14.6**	**15.4**	**14.8**
Cost					
Construction Costs		$0	$1,089,000	$1,089,000	$5,294,000
NPW O&M Costs		$0	$6,797,000	$7,533,000	$9,674,000
O&M Period (yrs.)		30	30	30	20
Net Present Worth Cost (@ 7% discount rate)		**$0**	**$7,886,000**	**$8,622,000**	**$14,968,000**



"Overall Protection of Human Health and the Environment" and "Compliance with ARARs" are statutory requirements and are identified as either meeting "Yes" or not meeting "No" the requirement.



The "Criterion Weight" is the relative weight (quantified as a percentage) that each individual evaluation criterion or question has on the overall score.
The "Criterion Weight" for each evaluation criterion is multiplied by each evaluation criterion's score to arrive at a weighted score for that criterion.

Notes:
ARAR - Applicable or Relevant and Appropriate Requirements
GET - Groundwater Extraction and Treatment
NPW - Net Present Worth
O&M - Operation & Maintenance
T/M/V - Toxicity, Mobility and Volume
T&D - Treatment, Storage, and Disposal

Key to Evaluation Ratings
Very Good - 5
Good - 4
Average - 3
Fair - 2
Poor - 1
Not Applicable - "-"

Ratings are based on the BVSPC project team's asessments, using reference materials, work experince, and the team's understanding of conditions at the VWS.

Appendix D
Applicable or Relevant and Appropriate Requirements (ARARs)

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
FEDERAL			
Soil/Solid Waste			
Identification and Listing of Hazardous Wastes	40 Code of Federal Regulations (CFR)Part 261	Defines those solid wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Would be applicable in identifying if a substance in the soils at the Vienna Wells Site (VWS) is identified as a hazardous waste. Any wastes identified as hazardous wastes would have to be handled as such. These standards may apply as both chemical-specific and action-specific ARARs.
Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262 to 262.11	Waste determination.	The requirements for determining whether a waste is hazardous are applicable or relevant and appropriate. These standards may apply as both chemical-specific and action-specific ARARs.
Surface Water			
Clean Water Act	33 United States Code (USC) §§ 1251-1376+		
Water Quality Criteria	40 CFR Part 131 Water Quality Criteria	Establishes non-enforceable standards to protect aquatic life.	May be applicable or relevant and appropriate in the event that a remedy discharges to surface water, or may be a TBC.
Toxic Pollutant Effluent Standards	40 CFR Part 129	Establishes effluent standards or prohibitions for certain toxic pollutants: aldrin/dieldrin, DDT, endrin, toxaphene, benzidine, and PCBs.	May be applicable or relevant and appropriate because dieldrin and DDT are included as contaminants of concern in the Vienna Wells Risk Assessment (RA). Because these contaminants are present at the VWS, concentration limits will be observed for remedies that may discharge effluent to surface water.

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122, 125	Determines maximum concentrations for the discharge of pollutants from any point source into waters of the United States.	These standards would be applicable to a remedy that discharged to surface water. These standards would be relevant and appropriate if a remedy discharged to surface water that did not flow off-site, but that is not possible at the VWS.
National Pretreatment Standards	40 CFR Part 403	Sets standards to control pollutants that pass through or interfere with treatment processes in publicly owned treatment works or that may contaminate sewage sludge.	These standards are applicable to any remedies that discharge to a publically owned wastewater treatment facility.
Groundwater			
Safe Drinking Water Act (SDWA)	40 USC §300		
National Primary Drinking Water Standards	40 CFR Part 141, Subpart B and G	Establish maximum contaminant levels (MCLs), which are health-based standards for public water systems.	These requirements are applicable to the VWS because the site is contaminating the City of Vienna public water system.
National Secondary Drinking Water Standards	40 CFR Part 143, Subpart F and G	Establish secondary maximum contaminant levels (SMCLs), which are non-enforceable guidelines for public water systems to protect the aesthetic quality of the water.	These requirements are not applicable or relevant and appropriate for the VWS. They may be TBCs, because the VWS is contaminating the City of Vienna public water system.

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Air			
Clean Air Act	42 USC §§.7401 et. seq.		
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare.	In the event any dust or treatment process exhaust/emission is generated during the implementation of a remedy, these regulations will apply. These standards are also discussed in the Action Specific ARARs table.
STATE			
Soil/Solid Waste			
Missouri Hazardous Waste Management System: General	10 CSR Part 25-3	Defines procedures for solid waste management, including special waste.	These standards may be applicable or relevant and appropriate. These standards may apply as both chemical-specific and action-specific ARARs.
Missouri Abandoned or Uncontrolled Hazardous Waste Disposal Sites Regulations	10 CSR Part 25-10	Defines procedures for adding sites to, removing sites from and modifying site classifications in the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites. Establishes procedures to be used by responsible parties to obtain state approval for remedial actions at abandoned or uncontrolled sites.	These standards may be applicable if the VWS has been placed on the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites or if the procedures established in the rule are more stringent than equivalent Federal rules. These standards may be relevant and appropriate if the VWS is not on the Registry and if the procedures in the rule are more stringent than equivalent Federal standards.

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Missouri Hazardous Substance Environmental Remediation Voluntary Cleanup Program (VCP)	10 CSR Part 25-15	Defines those persons who may apply to the Missouri Department of Natural Resources for oversight of an environmental remediation cleanup in accordance with sections 260.565—260.575	This rule is not an applicable or relevant and appropriate requirement for the VWS because the site is not being voluntarily cleaned by the property owner.
Hazardous Waste Management Commission	10 CSR Part 25-18	Missouri Risk-Based Corrective Action (MRBCA) is to provide a framework for cleanup decisions that facilitates the constructive use of contaminated sites.	This rule is not an applicable or relevant and appropriate requirement for the VWS because the MRBCA Technical Guidance document provides a methodology for remediation decisions at contaminated sites, but does not supersede or change applicable federal statutes and regulations.
Missouri Sanitary Landfill Regulations	10 CSR Part 80-3.010	This regulation requires that a waste be tested to determine its handling and disposal requirements. Regulated quantities of hazardous waste are excluded from disposal in permitted solid waste landfills.	In the event any of the solid wastes (i.e., soil from soil sampling activities, excavated soils, etc.) generated through the implementation of the remedy are hazardous or special wastes, these regulations will apply.

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Surface Water			
Missouri Clean Water Commission	10 CSR Part 20-7	This rule sets forth the limits for various pollutants which are discharged to the various waters of the state.	In the event any treatment process effluent is generated through the implementation of a remedy, and if these regulations are more stringent than the equivalent federal requirements, then these requirements will apply.
Missouri Water Resources Law	RSMO 640.400	This Statute requires the MDNR develop and maintain surface and groundwater monitoring programs.	These standards may be applicable to a remedy that required long term monitoring of surface or groundwater if the MDNR monitoring program requires submission of monitoring results.
Groundwater			
Missouri Safe Drinking Water Commission	10 CSR 60-4	Establishes drinking water standards (MCLs), monitoring standards, and other treatment requirements.	Adherence to the sampling and monitoring requirements for public water systems will also be required for all remedies, so those requirements are applicable to all remedies. The drinking water requirements may be applicable or relevant and appropriate for the VWS if the COV-03 air stripper remains a component of the groundwater plume treatment or of other treatment remedies that are being evaluated in the FS.

Chemical-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Air			
Missouri Air Conservation Commission - Air Quality Standards and Regulations	10 CSR Part 10-6	Establishes Ambient Air Quality Standard and regulates emissions of contaminants into the air.	In the event any dust or treatment process exhaust/emission is generated through the implementation of a remedy, and if these regulations are more stringent than the equivalent federal requirements, then these requirements will apply. These standards are also discussed in the Action Specific ARARs table.

Action-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comments
FEDERAL			
Solid Waste/Soil Excavation, Treatment, and Disposal			
Solid Waste Disposal Act (SWDA), Subtitle C as amended by the Resource Conservation and Recovery Act of 1976	42 United States Code (USC) §§ 6901 et. seq.		
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 Code of Federal Regulations (CFR) Part 257	Establishes criteria for determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health, and thereby constitute prohibited open dumps.	If a remediation remedy is developed that involves land disposal of solid waste on-site, this part would be applicable or relevant and appropriate.
Hazardous Waste Management Systems General	40 CFR Part 260 to 268	Establishes procedures and definitions pertaining to solid and hazardous waste.	May be applicable or relevant and appropriate to on-site generation, treatment, storage, or disposal of hazardous wastes.
Identification and Listing of Hazardous Wastes	40 CFR Part 261	Defines those solid wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Would be applicable in identifying if a substance in the soils at the Vienna Wells Site (VWS) is a hazardous waste. Any wastes identified as hazardous wastes would have to be handled as such. These standards may apply as both action-specific and chemical-specific ARARs.
Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262 to 262. 11	Waste determination.	The requirements for determining whether a waste is a hazardous waste are applicable or relevant and appropriate. These standards may apply as both action-specific and chemical-specific ARARs.

Action-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comments
Standards Applicable to Transporters of Hazardous Waste	40 CFR Part 263	Establishes standards that apply to persons transporting hazardous waste if the transportation requires a manifest under 40 CFR Part 262.	If a remedy involved off-site transportation of hazardous wastes, these standards would be applicable. If a remedy involved on-site transportation of hazardous waste these standards would be relevant and appropriate.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	40 CFR Part 264 and 265	Establishes minimum national standards which define the acceptable management of hazardous waste for owners and operators of facilities that treat, store, or dispose of hazardous waste.	May be applicable or relevant and appropriate to off-site and on-site remedial actions if they involve the treatment, storage, or disposal of RCRA-regulated hazardous waste, or materials that are sufficiently similar.
Land Disposal	40 CFR Part 268	Establishes a ban or restrictions on burial of wastes and other hazardous materials.	If a remedy involves land disposal of any restricted wastes, this part may be applicable or relevant and appropriate.
Hazardous Waste Permit Program	40 CFR Part 270	Establishes provisions covering RCRA permitting requirements.	A permit is not required for on-site CERCLA response actions.
Hazardous Materials Transportation Act	49 USC §§ 1801-1813		
Hazardous Materials Transportation Regulations	49 CFR Parts 107, 171-177	Regulates transportation of hazardous materials.	If a remedy involves off-site transportation of hazardous materials, these requirements would be applicable. If a remedy involved on-site transportation of hazardous waste these standards would be relevant and appropriate.
Water Treatment			
Safe Drinking Water Act	42 USC §§ 300(f) et. seq.		
Standards for Owners and Operators of Public Water Supply Systems	40 CFR 141	Provides treatment (water quality) requirements for public water supply systems.	MCLs are applicable to the VWS because the site is contaminating the City of Vienna public water system.

Action-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comments
National Pretreatment Standards	40 CFR Part 403	Sets standards to control pollutants that pass through or interfere with treatment processes in publicly owned treatment works (POTW) or that may contaminate sewage sludge.	If a remedy involves discharge to a publicly owned treatment works, these standards would be applicable.
Water Discharge			
Clean Water Act	33 USC §§ 1251 – 1376		
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122 - 125	Requires permits for the discharge of pollutants from any point source into the waters of the United States.	These standards would be applicable to a remedy that discharged to surface water. These standards would be relevant and appropriate if a remedy discharged to surface water that did not flow off-site, but that is not possible at the VWS.
Water Quality Criteria	40 CFR Part 131 Quality Criteria for Water, 1976, 1980, and 1986	Establishes non-enforceable standards to protect aquatic life.	May be applicable or relevant and appropriate in the event that a remedy discharges to surface water, or may be a TBC.
Injections to Subsurface			
Underground Injection Control (UIC) Regulations	40 CFR Parts 144 - 147	Provides for protection of underground sources of drinking water.	If a remedy involved underground injection, this part would be applicable or relevant and appropriate.

Action-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comments
Air Treatment			
Clean Air Act	42 USC §§. 7401 et. seq.		
National Ambient Air Quality Standards / NESHAPS / NSPS / BACT / PSD / LAER	40 CFR 50.1-.17. .50-.54; .150-.154 .480-.489; 40 CFR 53.1-.33; 40 CFR 61.01-.18 .50-.112, .240-.247	Treatment technology standards for emissions to air from: incinerators, surface impoundments, waste piles, landfills, and fugitive emissions.	If a remedy involves emissions governed by these standards then the requirements would be applicable. These standards may apply as both action-specific and chemical-specific ARARs.
Other			
Noise Control Act of 1972	42 USC §§. 4901 eq. seq..	Federal activities must not result in noise that will jeopardize the health or welfare of the public.	If a remedy includes drilling or soil excavation near a place close to a public access point, this act may be applicable.
STATE			
Solid Waste/Soil Excavation, Treatment, and Disposal			
Missouri Board of Geological Registration Regulations	4 CSR Part 145-1.010	This regulation requires that activities that require interpretation of the subsite geology comply with these regulations.	This regulation is applicable to the remedial remedies prepare for the VWS. Interpretation of the subsite geology will be conducted by, reviewed by, or under the direction of a PG licensed in Missouri.
Missouri Sanitary Landfill Regulations	10 Code of State Regulations (CSR) Part 80-3.010 (2) and (3)	This regulation requires that a waste be tested to determine its handling and disposal requirements. Regulated quantities of hazardous waste are excluded from disposal in permitted solid waste landfills.	In the event any of the solid wastes (i.e., soil from soil sampling activities, excavated soils, etc.) generated through the implementation of the remedy are hazardous or special wastes, these regulations will apply.
Missouri Hazardous Waste Management System: General	10 CSR Part 25-3	Defines procedures for solid waste management, including special waste.	These standards may be applicable or relevant and appropriate. These standards may apply as both action-specific and chemical-specific ARARs.

Action-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comments
Well Drilling			
Missouri Well Construction Rules	10 CSR Part 23-4.010	This regulation requires that monitoring and treatment wells be installed in accordance with the Monitoring Well Construction Code.	This regulation would be applicable for remedies requiring new well installation for purposes of soil treatment, groundwater treatment or groundwater monitoring.
Injections to Subsurface			
Missouri Clean Water Commission Permit Rules	10 CSR Part 20-6	This regulation requires a permit for injection into the subsurface.	The administrative portions of this regulation are not applicable or relevant and appropriate for the VWS. The substantive portions of this requirement are applicable or relevant and appropriate for the VWS if they are more stringent than the federal (UIC) regulations or if they regulate aspects of injection not covered by the federal UIC regulations. The Project Work Plan shall include the substantive information required by the permit.
Air Treatment			
Missouri Air Conservation Commission - Air Quality Standards and Regulations	10 CSR Part 10-6	Establishes Ambient Air Quality Standard and regulates emissions of contaminants into the air.	In the event any dust or treatment process exhaust/emission is generated through the implementation of a remedy, and if these regulations are more stringent than the equivalent federal requirements, then these requirements will apply. These standards are also discussed in the Chemical Specific ARARs table.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
FEDERAL			
Executive Order on Flood Plain Management (Ref 1)	Executive Order No. 11,988; 16 United States Code (USC) 661 et seq.; 40 Code of Federal Regulations (CFR) Part 6, Appendix A and 40 CFR 6.302	Requires Federal agencies to evaluate the potential effects of actions they may take in a flood plain. The intent is to avoid, as much as possible, adverse impacts associated with direct and indirect development of a flood plain.	Because the Vienna Wells Site (VWS) is not located below the 100 - year flood plain, these requirements are not applicable or relevant and appropriate.
100 - Year Flood Plain Management (Ref 1)	40 CFR 264.18(b)	RCRA treatment, storage, or disposal facilities in the 100-year flood plain must be designed, constructed, operated, and maintained to avoid washout.	Because the VWS is not located below the 100 - year flood plain, these requirements are not applicable or relevant and appropriate.
Executive Order on Protection of Wetlands (Ref 2)	Executive Order No. 11,990; 40 CFR 6.302(a) and Appendix A	Requires Federal agencies to avoid, as much as possible, adverse impacts associated with the destruction or loss of wetlands and to avoid new construction in wetlands if a practicablealternative exists.	Because there are no wetlands on or near the VWS these requirements are not applicable or relevant and appropriate.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
FEDERAL, Continued			
Clean Water Act	33 USC Sect. 1251 et. seq.		
Dredge or Fill Requirements (Section 404)	40 CFR Parts 230 and 231	Requires permits for discharge of dredged or fill material into navigable waters.	Not applicable or relevant and appropriate because there are no navigable waters near enough to the VWS to be affected by any remedies and no remedies that will be developed require discharge of dredge or fill material into navigable waters.
Rivers and Harbors Act of 1899	33 USC Sect. 403		
Section 10 Permit	33 CFR Parts 320-330	Requires permits for structures or work in or affecting navigable waters.	Not applicable or relevant and appropriate because there are no navigable waters near enough to the VWS to be affected by any remedies and no remedies that will be developed affect navigable waters.
Wilderness Act	16 USC 1311 et seq.; 50 CFR 35.1 et seq.;	Requires that federally owned wilderness areas be administered to leave them un-impacted.	Not applicable or relevant and appropriate because no wilderness areas exist on or adjacent to the VWS.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
FEDERAL, Continued			
National Wildlife Refuge System (Ref 3)	16 USC 668dd et seq.; 50 CFR 27	Restricts activities within a National Wildlife Refuge to those activities allowed under 16 USC 666dd(c).	Not applicable or relevant and appropriate because there are no wildlife refuge areas at or near the VWS.
National Historic Preservation Act	16 USC § 469 36 CFR Part 65	Requires federal agencies to take action to recover and preserve artifacts in areas where alteration of terrain threatens significant scientific, pre-historical, historical, or archaeological data.	These requirements are not applicable or relevant and appropriate because available information indicates that the VWS does not have areas that contain significant scientific, pre-historical, historical, or archaeological data.
National Historic Preservation Act	16 USC § 470 et seq.; 40 CFR Part 6.301 (b) 36 CFR Part 800	Requires federal agencies to take into account the effect of any federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in, or eligible for, inclusion in the National Register of Historic Places.	These requirements are not applicable or relevant and appropriate. There are no current districts, sites, buildings, structures, or objects listed on or eligible for the National Register on or adjacent to the VWS.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
FEDERAL, Continued			
Endangered Species Act	16 USC 1531 et seq.; 50 CFR Parts 200 and 402	Requires action to conserve endangered species within critical habits upon which the endangered species depend, including consultation with Department of Interior.	As discussed in the ecological section of the Vienna Wells Risk Assessment (RA), no Federal endangered or threatened species are known to inhabit the VWS. Therefore, these requirements are not applicable or relevant and appropriate for the VWS or for activities on the VWS. The RA did find that eight species in Maries County are Federal endangered or threatened. If remedies are developed that would affect large areas around the VWS, these requirements may become ARAR for those areas.
Fish and Wildlife Coordination Act	16 USC Sect. 661-666; 33 CFR Parts 320 - 330; 40 CFR 6.302	Requires consultation when a Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of fish and wildlife resources.	These requirements may be applicable or relevant and appropriate due to the suspected contaminant plume discharge to the small creek east of the Site in seeps and springs. Each remedy will be evaluated for any impacts to the creek.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Wild and Scenic River Act	16 USC 1271 et seq.; Section 7, 40 CFR 6.302(e)	Prohibits adverse effects on any of the scenic rivers listed in 16 USC 1276(a).	These requirements are not applicable or relevant and appropriate because there are no scenic rivers in the area of the VWS.
FEDERAL, Continued			
Historic Site, Buildings, and Antiquities Act	16 USC Sect. 461-467 40 CFR Sect. 6.301(a)	Requires Federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks and to avoid undesirable impacts on such landmarks.	These requirements are not applicable or relevant and appropriate because no current National Landmark is on or adjacent to the VWS.
Migratory Bird Treaty Act (Ref 4)	16 USC 703 et seq.	No federal action may jeopardize the habitat of birds with migratory pathways through the area.	These requirements may be applicable or relevant and appropriate because the entire state of Missouri is in the Mississippi Flyway. All remedies developed for the VWS will need to evaluate potential consequences to migratory bird habitat and mitigate impacts.
EPA Regulations on sole-source aquifers (Ref 5)	40 CFR 149	No activities, including drilling, in an area designated a sole-source aquifer may take place without permission of the EPA.	Although not designated as such by EPA, the Ozark aquifer below the VWS supplies all domestic, industrial, and public water used in the Vienna area. Therefore, this regulation may be relevant and appropriate.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Seismic Considerations	40 CFR 264.18(a)	New RCRA hazardous waste treatment, storage, or disposal facilities are prohibited within 61 meters of a fault displaced in Holocene time.	This requirement is not applicable or relevant and appropriate because no treatment, storage, or disposal facilities located in the VWS would be within 61 meters of a Holocene Age fault.
FEDERAL, Continued			
Salt Dome Formations, Salt Bed Formations, Underground Mines and Caves	40 CFR 264.18	Placement of non-containerized or bulk liquid RCRA hazardous waste is prohibited within salt dome formations, underground mines, or caves.	This requirement is not applicable or relevant and appropriate because none of these types of formations are present on or in the vicinity of the VWS.
STATE			
Missouri Wildlife Code, Endangered Species	3 CSR Part 10-4.111	Requires special protection of endangered wildlife and lists those species considered to be threatened with extinction.	As discussed in the ecological section of the Vienna Wells Risk Assessment (RA), no State endangered or threatened species are known to inhabit the VWS. Therefore, these requirements are not applicable or relevant and appropriate for the VWS or for activities on the VWS. The RA did find that eleven species in Maries County are State endangered. If remedies are developed that would affect large areas around the VWS, these requirements may become ARAR for those areas.

Location-Specific ARARs
Vienna Wells Site

Standard, Requirement, Criteria, or Limitation	Citation	Description	Comment
Missouri Cave Resources Act	RSMO 569.137.1	Prohibits contamination of any cave, cave system or sinkhole or that could violate the Missouri clean water law	These requirements are not applicable or relevant and appropriate because no cave, cave system, sinkholes have been identified in the VWS.