SITE MANAGEMENT TEAM ON-SITE MEETING SUMMARY
FORMER DEFENSE DEPOT MEMPHIS, TENNESSEE
19 OCTOBER 2022
9:00 AM CDT

Army, Base Realignment and Closure Division (DAIN-ISE) (BRAC) – Jay Foster
Army BRAC chief – Dick Ramsdell
CALIBRE BEC – Bill Millar
USACE, Mobile – Melissa Shirley, Chase Carter
TDEC Division of Remediation, DDMT Remedial Project Manager – Jamie Woods
U.S. EPA, Region 4, DDMT Remedial Project Manager – Fernando Martinez
U.S. EPA, Region 4, Scientific Support – Ben Bentkowski
HDR EOC – Tom Holmes, Clay Mokri, Denise Cooper
Koman Government Solutions – Larry Pannell
TechLaw – Mac McRae

Mr. Foster began the meeting by expressing his thanks for the team members. Each team member took a few moments to introduce themselves, describing their educational background and their time working at DDMT.

Mr. Holmes presented a PowerPoint slideshow that covered the Depot's operational history, hydrogeology of the site, and remedial actions. The slides are self-explanatory; additional comments from Mr. Holmes and others are noted below. The slides are included as Attachment A.

Slide 3. The Main Installation (MI) is approximately 570 acres and Dunn Field is approximately 70 acres.

Slide 4. The DDMT site was originally a cotton field.

Slide 6. The loess is continuous across the Memphis area. The loess combined with the upper layer of the fluvial deposits provides a lower permeability cap above the fluvial deposits and the Fluvial Deposits Aquifer (FDAQ). The upper Claiborne Group is a regional confining unit above the Memphis Aquifer (MAQ), but can have a significant amount of sand layers in some areas, such as the MI. At DDMT, the groundwater in sand layers of the upper Claiborne is designated the Intermediate Aquifer (IAQ). In places where the clay is thin or absent, however, connections can be made between the FDAQ, the IAQ and the MAQ.

Slides 8 and 9. These slides are from the CH2M Hill remedial investigation and are included to address discussion about leakage from the FDAQ to deeper aquifers in the Dunn Field area. The cross sections show there is a continuous clay layer at the base of the FDAQ in this area.

Slide 10 and 11. Groundwater flow in the MAQ is from DDMT toward the Allen Well Field. The regional contours are based on only one or two wells in the Allen Well Field. Extraction well locations were deleted from Slide 10 (figure from 2022 Supplemental Remedial Investigation [SRI] Report) due to homeland security concerns. The 2015 contours for MAQ LTM wells are consistent with the regional contours but show flow direction to the southwest, toward the closest extraction wells.

Slide 19. The air sparge/soil vapor extraction (AS/SVE) system began operation in December 20009 and was intended to operate for five years. Expansion of the system was necessary to meet the active remediation objective, but the property is owned by Memphis Light, Gas and Water (MLGW) and revision of the access agreement took a long time. Access was granted following an EPA letter to MLGW.

Slide 21. After initial implementation of SVE and in situ thermal desorption (ISTD), all the wells on Dunn Field were below maximum contaminant levels (MCLs) in 2012 and 2013 except for wells on the northern boundary that are affected by the offsite plume. Well concentrations remained below MCLs except for two wells in the west-central Dunn Field area, MW-06 and MW-87. That increase in concentrations prompted the Dunn Field West Post-ROD Supplemental Investigation. The contaminants exceed criteria in soil, groundwater and soil vapor (Slides 25 and 26), but there are no complete exposure pathways at present due to lack of development on Dunn Field, land use controls (LUCs) and groundwater use restrictions. The need for additional action prior to development on Dunn Field is still being considered.

Slide 23. 1,1-dichloroethene (DCE) is present only in the offsite plume. Soil contamination in the northwest corner of Dunn Field contributed to the plume with tetrachloroethene (PCE) and trichloroethene (TCE) concentrations >1,000 µg/L in that area; concentrations of PCE, TCE and DCE upgradient of the northwest corner were consistently below 50 µg/L. Following remedial action on Dunn Field, concentrations were generally below 50 µg/L and consistent throughout the plume, indicating contamination on Dunn Field had been reduced and was no longer impacting groundwater.

Mr. McRae asked if the intersection at northeast corner of Dunn Field was re-engineered. Mr. Holmes answered yes; Hays Road was originally along the eastern boundary of Dunn Field, but a few acres were transferred to the city of Memphis for re-alignment of the road. The original property boundary is shown on Slide 23 with Hays Road moved onto Dunn Field south of the intersection with Person Avenue.

Slide 24. Mr. Holmes said that he had seen a recent email with question from Mr. Martinez and Mr. McRae regarding drums being discovered during realignment of Hays Road. However, neither Mr. Holmes nor Ms. Cooper recall reports of drums being observed there or any reference in recent SMT call summaries. Mr. McRae asked if any contamination was found during realignment of the road. Mr. Holmes replied he did not believe contamination had been observed.

Mr. Holmes stated buried ‘drums’ had been discovered on Dunn Field during soil boring for installation of an SVE well; some metal and tarry soil was observed in the soil cuttings. A geophysical survey and trenching identified a burial area for empty 5-gallon drums of roofing tar used in resurfacing warehouse roofs on the MI. Several thousand cubic yards of contaminated soil and crushed drums were excavated and disposed as non-hazardous waste in a local landfill authorized to receive CERCLA waste. The excavated area is shown on Slide 24.

Mr. Holmes stated that MW-87 was the first well to show elevated concentration of contaminants, specifically chloroform (CF) and trichloroethene (TCE). MW-06 later showed

increased concentrations of CF and TCE. The Dunn Field West investigation for the source of the increased groundwater concentrations included soil samples from borings, soil vapor samples from vapor monitoring points and groundwater samples from soil borings (grab samples) and from new and existing monitoring wells.

Slide 25. The soil boring locations and concentrations of chlorinated volatile organic compounds (CVOCs) and petroleum-related volatile organic compounds (VOCs) are shown. An overlapping area of soil contamination with CVOCs and petroleum-related VOCs is also shown. The extent of contamination was delineated horizontally and vertically. Mr. Holmes noted the site is not developed and there is no current exposure.

Slide 26. LTM well locations and CVOC concentrations in groundwater are shown. Mr. Holmes noted the elevated CVOC concentrations south of MW-87, primarily CF. Concentrations of 1,1,2,2-tetrachloroethane (TeCA) exceed the target concentration from the Dunn Field Record of Decision at offsite wells. Mr. Martinez asked how far are the residences from the west boundary? Mr. Holmes answered approximately 600 feet from the boundary. He said elevated soil vapor concentrations are not expected on the offsite property, because the soil contamination was limited to a defined area on Dunn Field, offsite groundwater concentrations are low and the fine-grained soil at the surface should limit vapor intrusion (VI) from contaminated groundwater.

The discussion turned to VI potential in the offsite plume area north and east of Dunn Field. Mr. Woods said he has talked with Steve Spurlin, On-scene Coordinator (OSC) for EPA Region 4 Emergency Response program, about sampling near the Hays Road/Person Avenue intersection. Vapor sampling of crawl spaces and indoor air at 3 to 4 houses is planned in the area. Mr. Woods said if they find anything from that investigation, which is upgradient of Dunn Field, he will relay it to the team.

Mr. Woods said he remembered that years ago, he and Jim Morrison, the former TDEC Remedial Project Manager (RPM) for DDMT, had talked to a property owner in the vicinity of the Hays Road/Person Avenue intersection. The property owner was a “shade tree mechanic” who worked on old cars on his property and had drums on the property, presumably for working on the vehicles. Mr. Woods believes the Army’s offsite groundwater investigation has addressed the TDEC data gaps for that area.

Mr. Bentkowski said that the well on the southwest corner of the Hays-Boyle intersection (MW-322) has the highest concentrations. He noted that while the concentrations are above VI screening levels, the Johnson-Ettinger model, which accounts for the fine-grained soils at the surface, indicates the concentration is not above risk levels. That is why EPA is plans vapor sampling to confirm the VI risk.

Mr. Woods said that typically there will not be vapor intrusion from groundwater contamination when there is an intervening 30 feet of silt. If contamination is present in the silt, then there will be higher potential for vapor intrusion. But with everything he has seen about the groundwater plumes, he doesn’t expect there will be vapor intrusion.

Mr. Martinez said the EPA will be investigating the area north of Person Avenue in the high concentration areas. He said he does not expect it to impact any of the on-site areas.

Ms. Cooper noted the information will help her respond to calls on the Community Information Line. Mr. Martinez said that EPA will be contacting the residents directly in order to gain access, and will be able to answer questions at that time. Ms. Cooper noted that HDR has contact information for residences in the area that can be shared with EPA.

Mr. Bentkowski said groundwater sampling at nearby LTM wells will be conducted at the same time for comparison with the vapor samples. He said it is a mystery why an area that has been residential for such a long time has contamination at these levels. Mr. Woods noted the ground rises to the northeast and a groundwater divide is located along that ridge; Mr. Holmes added that the railway visible on Slide 22 is the approximate location of the divide.

Slide 28. Mr. Holmes noted the Dunn Field ROD has target concentrations to be met as well as MCLs. The target concentrations were developed because multiple groundwater contaminants are present and human health risk criteria might be exceeded even if all concentrations were slightly below the MCLs. However, as concentrations have decreased on Dunn Field and to the west, the number of contaminants have decreased and meeting MCLs will likely achieve the RAO.

Slide 29. Enhanced bioremediation treatment (EBT) was performed in TTA-1 and TTA-2 from 2006 to 2009. It reduced CVOC concentrations in groundwater but concentrations then rebounded. EBT was performed in five areas from 2012 to 2014. CVOC concentrations were again reduced but it was apparent that EBT would not achieve the RAO in a reasonable period of time. The SRI and Focused Feasibility Study (FFS) were then proposed to identify an alternative remedy.

Slides 31 and 32. The gray horseshoe shape in the northwest portion of the MI shows the approximate area where the FDAQ is dewatered (saturated thickness=0 ft). FDAQ groundwater north and east of the window has to flow around the dewatered area to the southeast to enter the window and flow into the IAQ and MAQ. The area of elevated PCE concentrations in the FDAQ within the window may be the source of the plume in the IAQ wells. Mr. Holmes noted the clay at the base of the FDAQ is not present within the window or in the central part of the MI (see Slide 7); the FDAQ and the IAQ act as a single water-table aquifer in that area.

Slide 33. The FFS identified three alternatives for active remediation with varying combinations and locations for AS/SVE, SVE and monitored natural attenuation (MNA). Alternative 4 includes all target locations for remedial action. Areas with individual parent CVOC (PCE, TCE and carbon tetrachloride) concentrations greater than 40 µg/L are shown as potential sites. A pre-design investigation would identify areas with soil vapor contamination as potential sites for SVE or AS/SVE, while areas downgradient of source areas (e.g., locations on the property boundary where plumes migrate onto the MI) would require AS/SVE.

Mr. Woods asked about remaining vapor concentrations after the SVE pilot test, and asked where the VMPs were located. Mr. Holmes answered that 6 VMPS were installed in the coarse-

grained, lower fluvial deposits at TTA-1N and TTA-2 and in the window near Bldg 720. The concentrations at TTA-2 where a factor of 10 higher than the other areas and it was selected for the pilot test. All the VMPs remain in place. The vapor concentrations at TTA-2 at the end of the test were still high enough to provide sufficient mass removal with continued SVE.

Slide 35. CVOC concentrations above VI screening levels are shown with a 100-ft buffer. Mr. Holmes noted vinyl chloride (VC), a breakdown product from PCE and TCE, is present only where EBT was performed.

Slide 36. The screening samples were located using a 1,000-foot grid sitewide, and a 500-foot grid within the vapor inclusion zones; sample locations were shifted for accessibility. The plan is to collect the initial samples; if a sample is above screening levels, four samples will be collected around the original sample. These screening samples would be followed by soil vapor samples from VMPs and sub-slab sample points and indoor air samples.

Mr. Bentkowski pointed out that several screening samples are on the perimeter of the inclusion zones. Mr. Holmes agreed that was true for some samples, explaining that was due to positioning the samples 500 feet from each other. Mr. Bentkowski acknowledged that; however, he was concerned that the samples might miss contamination because vapor has very little lateral migration. Mr. Holmes said sampling locations could be adjusted per comments where necessary. Mr. Bentkowski and Mr. Martinez agreed to send comments for specific changes of sampling locations.

Mr. Bentkowski asked if a Beacon sampler would be used. Mr. Holmes answered that yes, it would be.

Slide 38 and 39. Soil samples for dioxins and furans analysis were collected from borings and from surface samples. Samples from borings were collected at the surface, at 2 feet and at 5 feet. Some samples were collected at 1985 sample locations for comparison. Surface samples were collected adjacent to outfall locations along with sediment and surface water locations.

Slide 42. Mr. Foster said the Army has produced an Environmental Condition of Property (ECP) update, followed by a Finding of Suitability to Transfer (FOST) for Dunn Field West. These are Army internal documents designed to capture key elements that are important for the deed. Although these documents are often sent to regulatory agencies for review, they are internal Army documents intended to move toward a real estate action.

Mr. Foster stated that currently the ECP and FOST are in review by the Army's Environmental Legal Division (ELD). Next, they will be reviewed by the legal counsel of the USACE real estate division. Once that review is complete, the documents will be sent for review by the regulatory agencies and for a 30-day public review period.

After the public review, the FOST is submitted to the General Services Administration (GSA). At that point, the USACE will give a draft deed to GSA. GSA will then move to a public sale.

Mr. Foster said that there are currently 38 qualified bidders interested in the property. He said the public sale will take approximately 120 to 180 days. He believes the property will be conveyed by end of fiscal year (FY) 2023 (September 2023).

Mr. Bentkowski mentioned that he has worked with a BRAC site where the property has been returned to the community but the Army is still involved with long-term monitoring. Mr. Foster recognized the name of the site and said that the sampling budget for FY23 at the site had been approved. Mr. Bentkowski said he has seen that the land can go forward to its most appropriate use, but the Army will continue remedial activities and monitoring.

Mr. Millar said that the ECP update and the FOST are able to move forward independently of the Explanation of Significant Differences (ESD). The ESD will follow Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the property transfer does not need to wait for the ESD to be completed. The Army will work environmental issues and the ESD in the meantime, but the transfer can continue on its own track.

Mr. Foster said that the primary purpose of the FOST is to indicate land use controls or environmental protection provisions that need to be included in the quitclaim deed that is filed with the county. He said that although the FOST straddles the fence between environmental document and real estate document, the Army uses it primarily as a real estate document. He noted that all property on the MI has been conveyed, yet the Army is still involved with long-term monitoring and care of the site.

Mr. Martinez mentioned the Operating Properly and Successfully (OPS) document from 2010 and asked if the Army ELD would be willing to meet directly with the EPA legal department to speed up the process. He said it is possible that his legal department will have questions about remedies and a discussion between the legal departments, perhaps early in 2023, would streamline resolution of any concerns. Mr. Foster said he would present the idea to Army ELD.

Mr. Holmes said that the remedies in the OPS are mostly complete. There is no ongoing action that was part of the OPS. He said the Dunn Field AS/SVE system was not tied to the OPS as it is offsite. Mr. Martinez acknowledged that but still expects some people to have questions because the OPS was signed so many years ago.

Mr. Woods asked whether an OPS would be needed for the MI soil vapor work. Mr. Holmes did not think it would be needed because the property has already transferred.

Slide 43. Mr. Holmes noted the Fifth Five-Year Review has been sent to the regulatory agencies for review and there are approximately 30 days remaining in the review period. He asked Mr. Martinez if it had been provided to EPA headquarters. Mr. Martinez answered that EPA headquarters is reviewing the document.

Mr. Woods asked if DDMT is cleaned up except for the orphan plumes coming onto the site, will the Army still need to produce Five-Year Review documents. Mr. Millar said he would check, but he believes that the Five-Year Reviews continue as long as there is contamination onsite, even when the contamination is not produced at the site.

Mr. Holmes said two FFS active remediation alternatives include addressing the offsite plumes; the goal is to see if the AS/SVE system can stop contaminant migration onto the MI. If it can be shown that there is no VI health risk from the plume, then the system could be shut off.

Diedre Lloyd, the previous EPA project manager, had suggested DDMT follow OSWER 9283.1-44, *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Monitoring Well* (https://semspub.epa.gov/work/HQ/173689.pdf), which discusses moving from the remediation phase to the attainment phase. Mr. Holmes said the active remediation goal for the AS/SVE system is 50 µg/L, which has recently been attained. Many wells have four samples (or more) with results below the remediation goal. Mr. Holmes said sampling frequency is reviewed in each annual LTM report on a well-by-well basis. The sample frequencies in use are semiannual, annual and biennial; additional longer periods should be considered.

Mr. Bentkowski suggested the monitoring frequency could be changed. Mr. Martinez asked if there was a requirement was for the number of samples below the remediation goal. Mr. Holmes answered that four samples were required for the remediation phase and eight samples were required for the attainment phase, but all the samples did not have to be below the remediation goal as long as an approved statistical method shows+ the goal has been met

Mr. Bentkowski said that there are ways to optimize the monitoring program. He said that if a well has been below the MCL or remedial action objective (RAO) for six time periods, two more samples could be taken in two months and that would fulfill the requirement for monitoring. He said it is a well-by-well, contaminant-by-contaminant evaluation. Mr. Bentkowski said he hasn't seen that many sites get that far along, but those sites build a spreadsheet, use the statistical tool to analyze the sampling results, and decrease the number of wells accordingly. He said the fewer samples taken, the fewer discussions and meetings need to be held.

Ms. Shirley asked what would be the proper document in which to record such evaluation. Mr. Bentkowski answered he did not believe there was a rule about that.

Mr. Holmes expressed appreciation for Mr. Martinez ' timely reviews and his review comments. He requested Mr. Martinez refrain from using the phrase "Revision 2" in his comments. The Federal Facilities Agreement (FFA) for DDMT stipulates that if the parties cannot agree on a Revision 1 document, then the document goes into dispute resolution. Mr. Holmes stated there can be multiple rounds of comments and responses to resolve comments prior to submittal of Revision 1. However, there will not be a Revision 2 document. Mr. Martinez agreed that he has used "Revision 2" only to indicate minor phrasing changes from the original response to comments.

Mr. Holmes said that KGS and HDR would like to omit semi-annual reports. A summary of site activities, field measurements and analytical results will be compiled for inclusion in the annual reports and discussions on the monthly site management team call; submittal of a data report is not currently planned. Any significant changes in the sampling results would be discussed during a monthly team meeting, and all analytical data would be included in the annual report. Mr. Bentkowski noted that a significant change in contamination level at the semi-annual

sampling would not pose an immediate risk because of the lack of immediate receptors. Mr. Martinez said EPA does not have a problem with this planned change.

Mr. Holmes noted that many of the scheduled documents through Quarter 1 of FY23 will be delayed past their original due date. He asked if extension request letters were required or if the schedule could be updated in the 2023 Site Management Plan instead. Mr. Martinez said he did not need extension letters for secondary documents, but might need extension letters for primary documents. Mr. Holmes said he would check the delayed documents against the FFA, and would provide extension letters for any primary documents. Mr. Millar suggested writing one extension letter for all documents.

Mr. Martinez expressed appreciation for the update of the document tracker. He said that assists him in tracking the work and proper allocation of his resources.

The meeting was adjourned for lunch, followed by a site tour.

The site tour included viewing and discussion at the following locations:

1. TTA-2 – EBT injection wells and the SVE pilot test location.
2. Window area near Building 720 – Discussed groundwater flow direction in the three site aquifers. Mr. Bentkowski asked about the time required to meet RAOs and the concentrations targeted for remedial action. Mr. Holmes replied it is discussed in the FFA. Mr. Bentkowski noted that the wording is important.
3. Dunn Field West – Pointed out the investigation area, groundwater flow direction and location of offsite residences.
4. North end of Dunn Field – Pointed out the MIP and soil sampling investigation area, original boundary of Dunn Field extending across current location of Hays Road.
5. Hays Road and Boyle Street intersection – Location of MW-322, MW-129 and MW-130, nearby residences and planned vapor sampling by TDEC and EPA.
6. Off Depot – AS/SVE area, equipment compound, location of MW-159 and AS wells added in 2020.
7. Kyle-Rozelle Street – Undeveloped property and residences hydraulically downgradient of Dunn Field.
8. Northwest MI – Location MAQ well MW-254, IAQ wells MW-256 and MW-310 (offsite), and direction of groundwater flow offsite in IAQ and MAQ.
9. TTA-1N – Location of MW-21 and PMW21-01 and offsite wells for plume migrating onto the MI

The next meeting will be held via Webex on Tuesday, 8 November, at 11:00 am EST, 10:00 am CST.

Attachment A

October 2022 SMT
Meeting Slides

Headquarters, Department of the Army
Office of the Deputy Chief of Staff, G9

Environmental Division ~
Base Realignment and Closure

G-9 Mission

The DCS, G-9 administers the II PEG, leads the Army's Quality of Life effort, implements, integrates, supervises and assesses execution of policies, resources, plans, and programs for the Installation Enterprise to enable ready, prompt, and sustained land dominance by Army forces.

Installation Readiness and Resiliency

Quality of Life – People First

G-9 Vision

Professional experts championing Installation Enterprise Readiness and delivering unmatched Quality of Life to our People.

Defense Depot Memphis, Tennessee ~ Site Team Meeting

19 October 2022

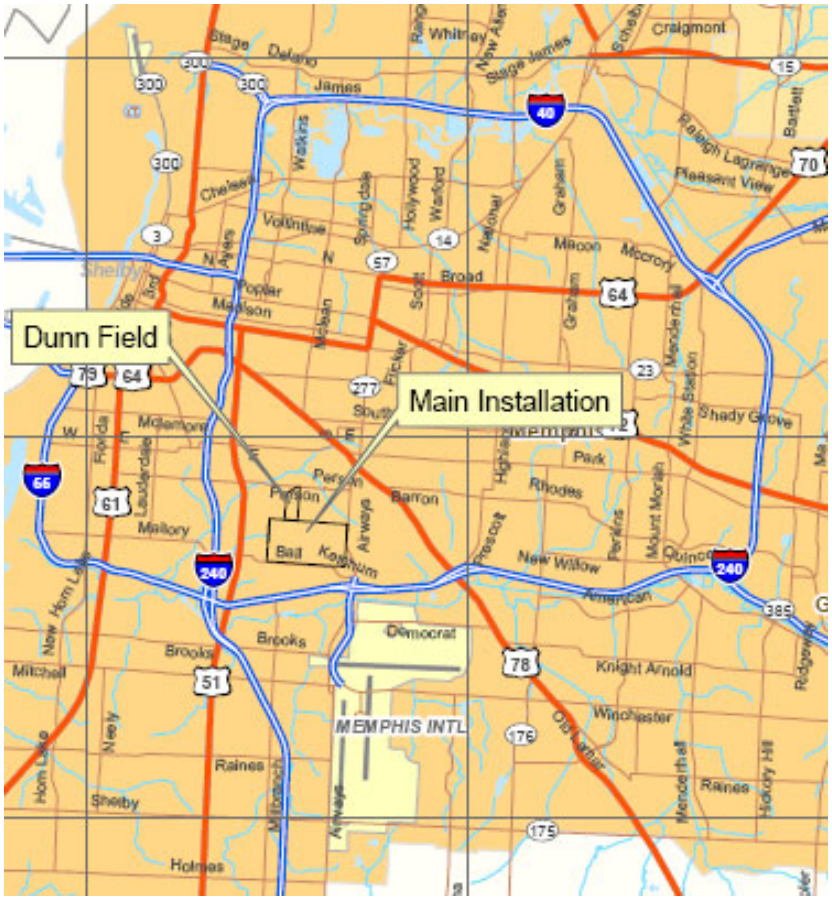
Environmental Division ~
Base Realignment and Closure

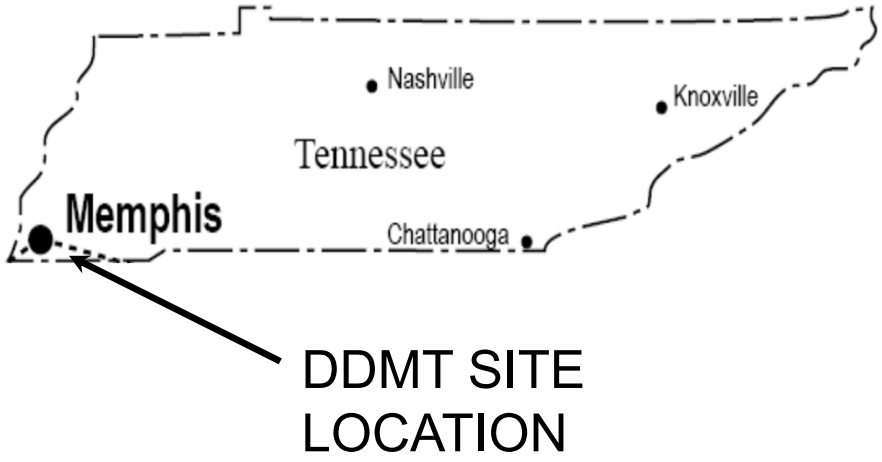
Defense Depot Memphis, TN
Project review Meeting, 19 October 2022
Overview

For:

Site Management Team

Defense Depot Memphis, TN (DDMT)





DDMT consists of two areas – Dunn Field and the Main Installation

Installation History

- Activated by the U.S. Army Corps of Engineers in January 1942
- Mission - to supply the U.S. Army with food, clothing, tools, and engineering equipment
- During World War II, DDMT employed 4,726 civilians and 162 military personnel, and served as an internment camp for 800 German and Italian prisoners of war

Installation History

- Performed U.S. Army supply mission until 1962 when the mission expanded to include general supply support to all military branches
- In July 1995, DDMT was selected for closure under the Base Realignment and Closure Act; operations ceased in September 1997.

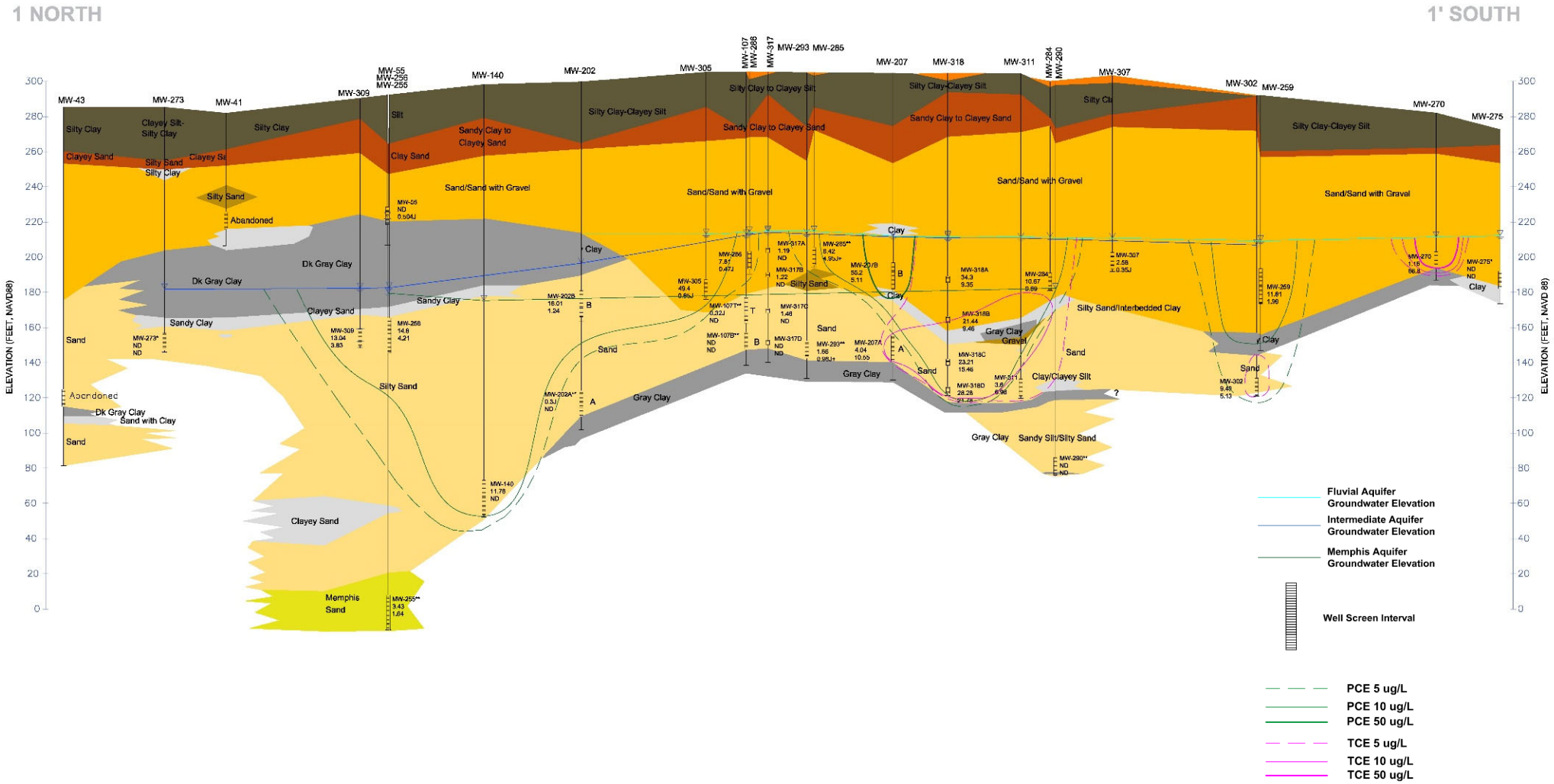
- At closure, DDMT contained:
  634 acres,
  118 buildings,
  26 miles of railroad tracks,
  28 miles of paved roads,
  126 acres of covered storage,
  138 acres of open storage,
  a family housing area,
  and a golf course

Site Hydrogeology

- Geologic units of interest
  - Loess: clayey silt to silty clay, 20 to 30 ft thick, present over DDMT area, low permeability.
  - Fluvial deposits: upper layer of silty, sandy clay to clayey sand,0 to 30 feet thick, low permeability; lower layer of interlayered sand and gravel, 30 to 100 feet thick, med-high permeability. Unconfined Fluvial Deposits Aquifer (FDAQ) in the lower unit.
  - Jackson Formation/upper Claiborne Group: clays, silts, and sands deposited in lenses; a confining unit where clays predominate; upper clay layer is absent across much of the MI. Sand units comprise the Intermediate Aquifer.
  - Memphis Sand: thick-bedded, very fine-grained to coarse sand, 500 to 890 feet thick with upper surface at a depth of 300 feet at DDMT. The Memphis Aquifer is a regional deep, semi-confined to confined aquifer and is the primary source of water for the City of Memphis.

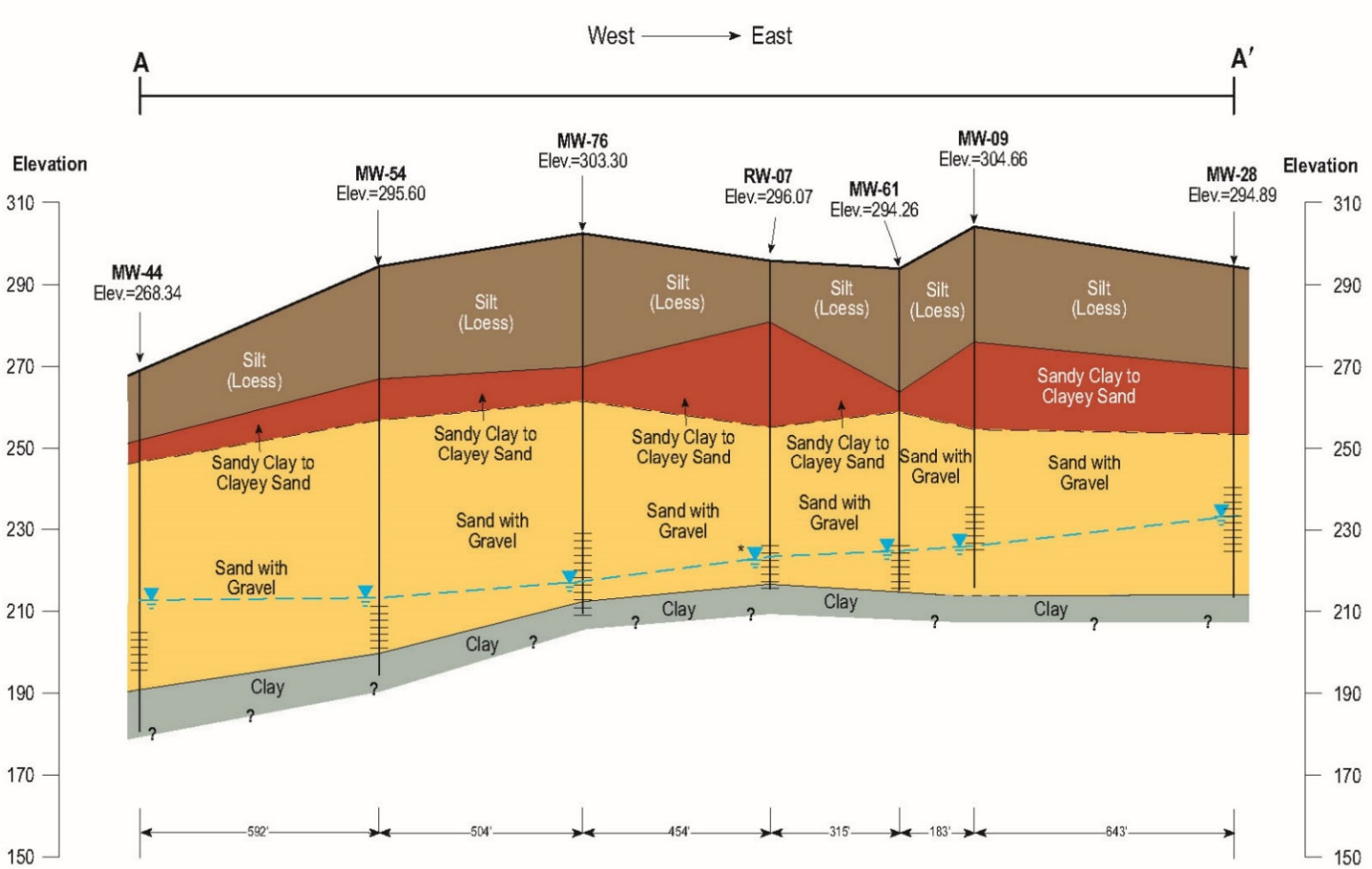
Site Hydrogeology

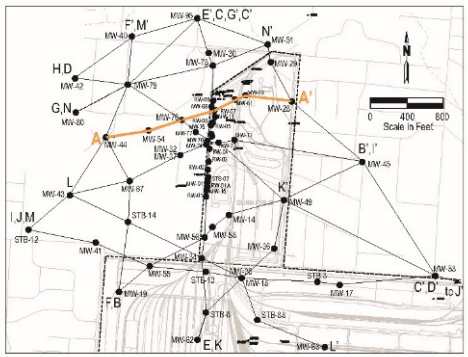
Main Installation



Site Hydrogeology

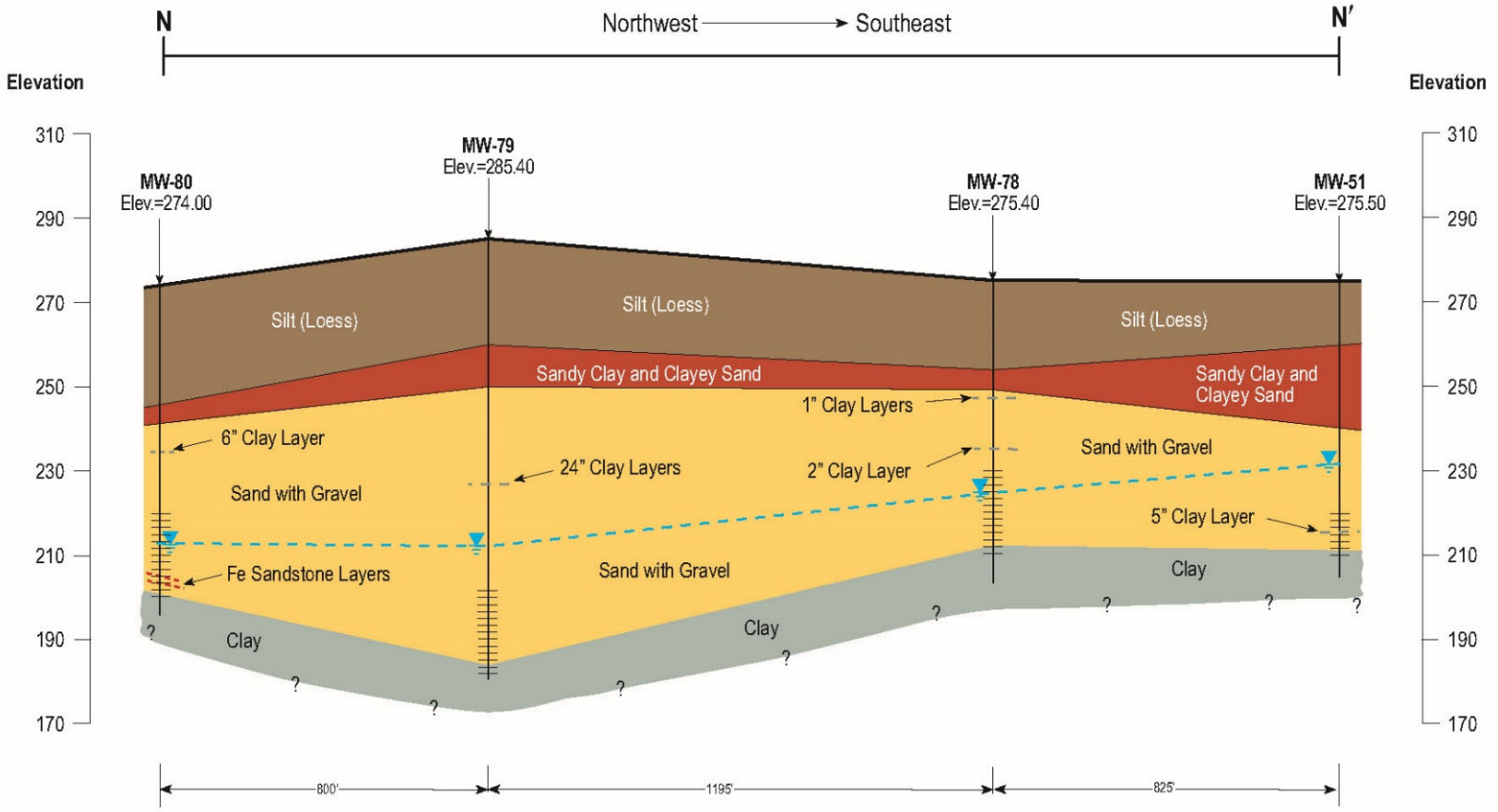
Dunn Field

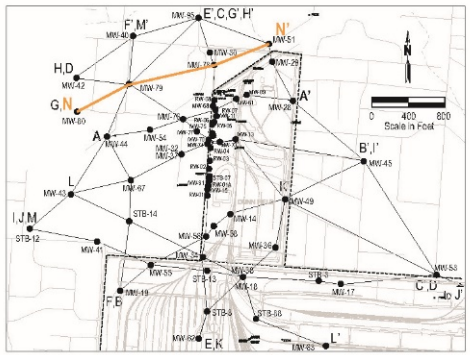




Site Hydrogeology

Dunn Field

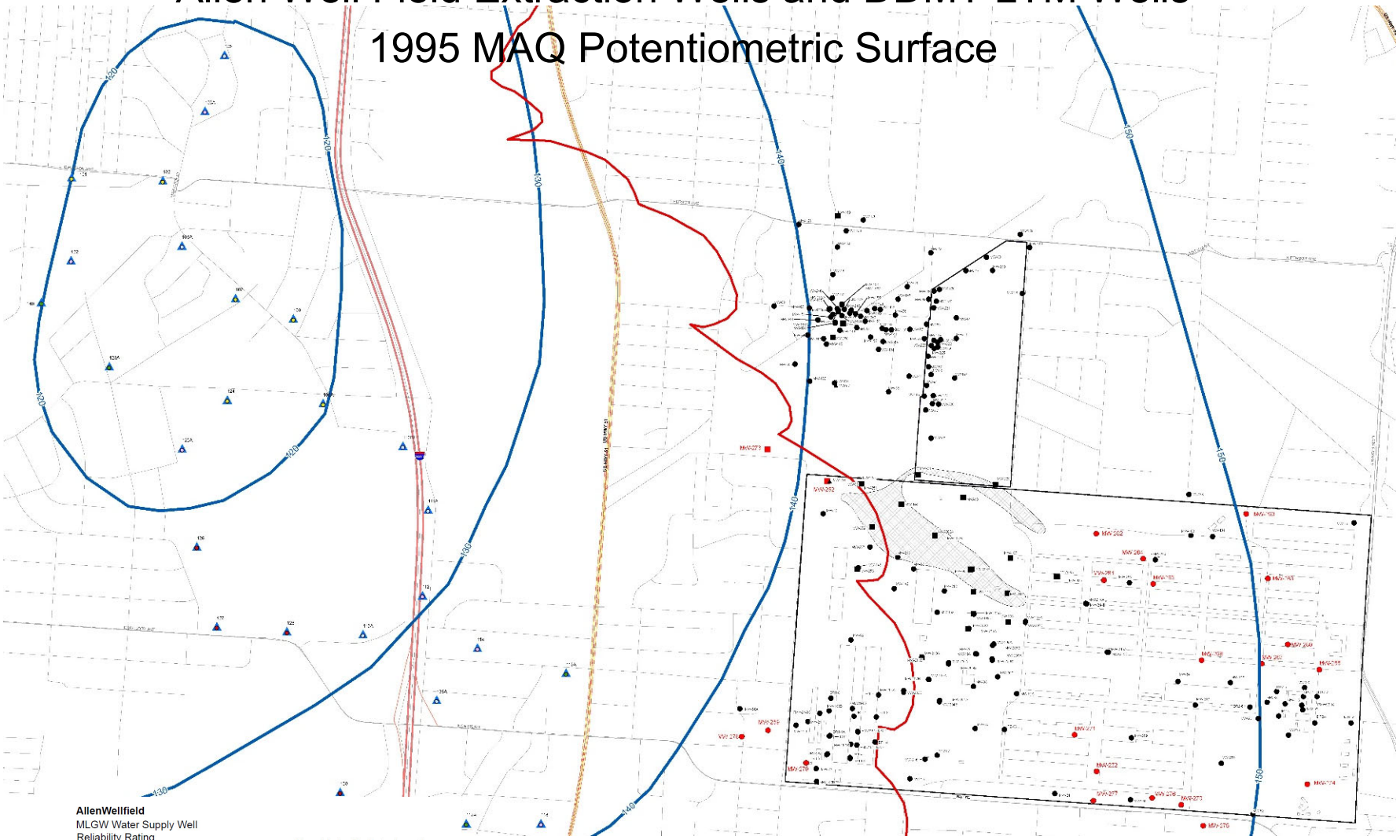




Site Hydrogeology

Allen Well Field Extraction Wells and DDMT LTM Wells

1995 MAQ Potentiometric Surface



Legend

Aquifer

- Fluvial
- Intermediate
- Memphis
- MW-270 — SRI Phase 1-2 Well Screened in the Fluvial Aquifer
- MW-262 — SRI Phase 1-2 Well Screened in the Intermediate Aquifer

AllenWellfield

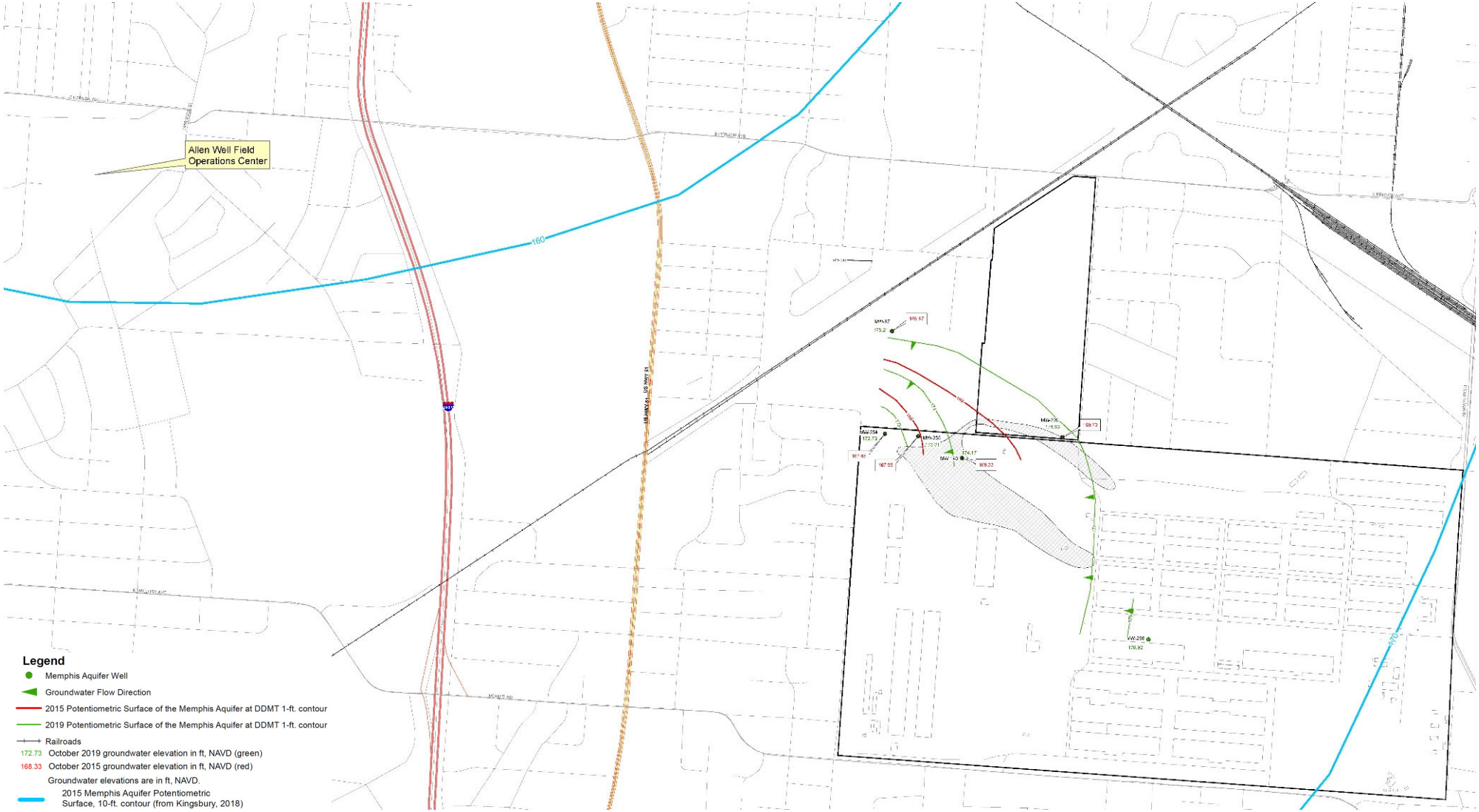
MLGW Water Supply Well Reliability Rating

- 1-20+ Years
- 2-10+ Years
- 3-Less than 10 Years
- 4-Current Failure
- A-Abandoned

- Memphis Aquifer Potentiometric Surface, 1995 (from Kingsbury, 1996)
- Allen Wellfield 40-Year Capture Zone (from 2005 Wellhead Protection Plan)

Site Hydrogeology

DDMT MAQ LTM Wells and 2015 MAQ Potentiometric Surface



Property Transfer

634 acres. All property transferred except DF West (26 acres)

Environmental Restoration Program

- Restoration program was initiated in 1981
- Initial studies
  - Geohydrologic Study, Defense Depot Memphis, Tennessee 1982
  - Defense Depot Memphis, Tennessee Remedial Investigation, 1990
- RCRA Part B permit for storage of hazardous waste, 1990.
  - RCRA Facilities Assessment Report, 1990
  - Final Hazard Ranking System Scoring, 1992
  - HSWA permit not renewed January 2005; all remedial action under CERCLA
- DDMT added to the National Priorities List in October 1992
  - Dunn Field, Operable Unit 1
  - Main Installation, Operable Units 2, 3 and 4
- Restoration Advisory Board formed in July 1994; adjourned in 2009
- Federal Facilities Agreement with the USEPA and Tennessee Department of Environment and Conservation (TDEC) in March 1995
- Fifth Five-Year Review in progress for completion in January 2023

Environmental Restoration Program

Dunn Field

Site Designations and Initial Response Actions

- Defense National Stockpile Center
  - Bauxite and fluorspar piles removed in 1998
- Interim Remedial Action Record of Decision, 1996
  - Groundwater extraction (discharge to sewer, no treatment) 1998 to 2009
- Chemical Warfare Materiel (CWM) Clearance
  - Investigations (1998/1999)
  - Removal of approximately 2,000 CY of soil, 2001
- Pistol Range Removal (2003)

Dunn Field

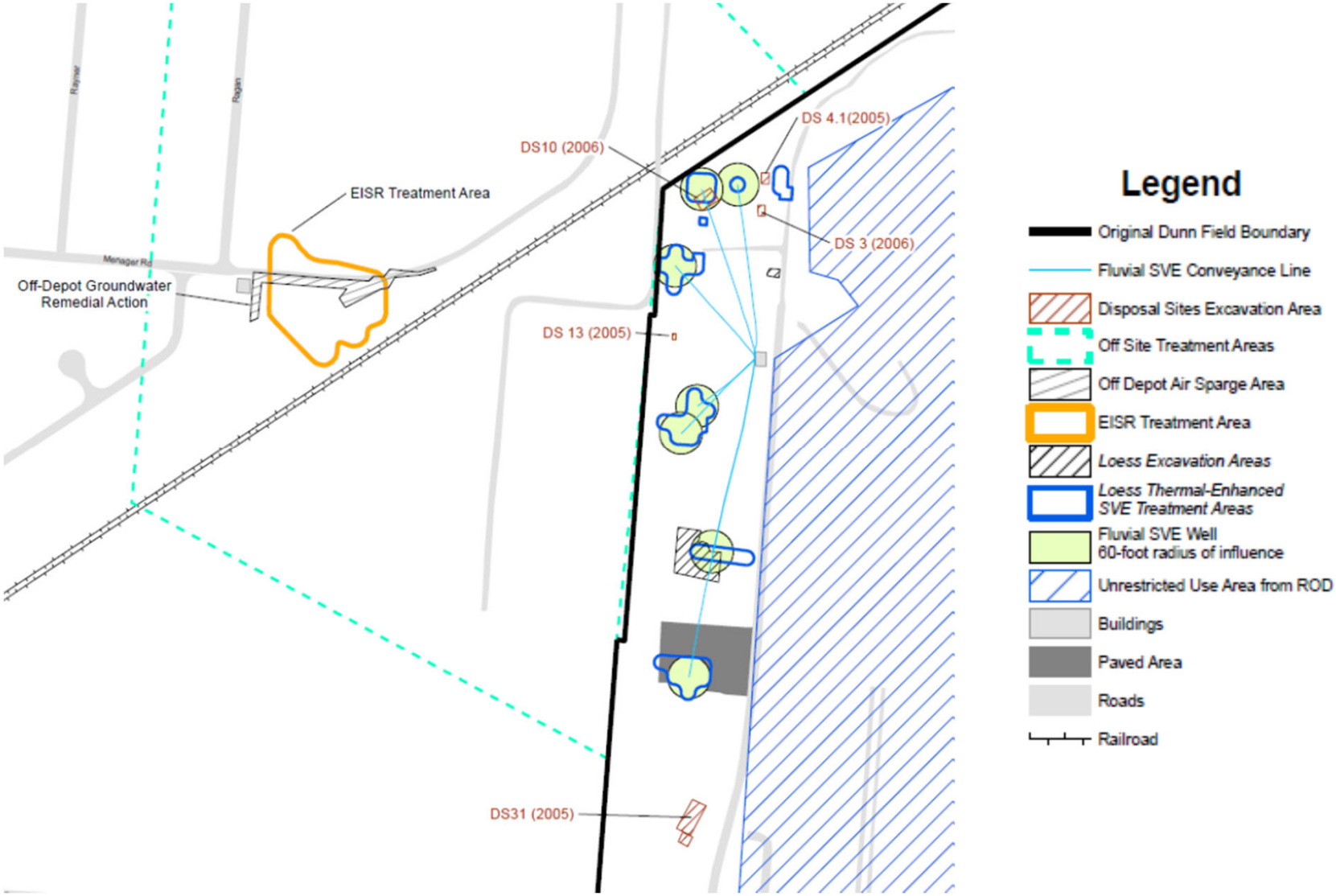
- Investigations and Feasibility Studies
  - Dunn Field Remedial Investigation Report, 2002
  - Dunn Field Feasibility Study Report, 2003
  - Dunn Field Remedial Design Investigation, 2006
- Selected Remedy - Dunn Field Record of Decision, 2004 and ROD Amendment, 2009
  - Excavation, transport and off-site disposal of soil/waste in Disposal Sites.
  - SVE to reduce VOC concentrations in subsurface soil. In situ thermal desorption (ISTD) in the shallow fine-grained soils (5 to 30 ft). Conventional SVE in the deeper coarse-grained soils (30 to 60 ft).
  - Zero-valent iron injection on Dunn Field to treat CVOCs in areas with groundwater total CVOC concentrations above 1,000 µg/L.
  - Air sparging with soil vapor extraction (AS/SVE) at the core of the Off Depot groundwater plume to reduce individual CVOC concentrations to 50 µg/L or less.
  - Monitored natural attenuation and LTM of groundwater to document changes in plume concentrations, detect potential plume migration to off-site areas or into deeper aquifers, and track progress toward TCs.
  - LUCs to prevent residential land use or other child-occupied in the western portion of Dunn Field and production/consumptive use of groundwater

Dunn Field

- Disposal Sites Remedial Action
  - Excavations at 5 locations on Dunn Field in 2005 and 2006. 2,700 CY disposed at a local non-hazardous waste landfill and 234 CY disposed at a hazardous waste landfill. Confirmation samples met the remediation goals.
- Source Areas Remedial Action
  - Fluvial SVE system operated from 2007 to 2012 under permit from Shelby County. 4,000 pounds of VOCs removed. System left in place until site remediation completed.
  - Additional excavations conducted at two areas in 2007 and 2009. 7,400 CY disposed at a local non-hazardous waste landfill.
  - ISTD conducted in four areas with high soil concentrations from May to November 2008. 12,500 pounds of VOCs were removed during treatment.
  - Soil samples met remediation goals in all areas.
  - ZVI was not required because groundwater criteria objectives were achieved through the soil remedies.

Dunn Field

Remedial Actions

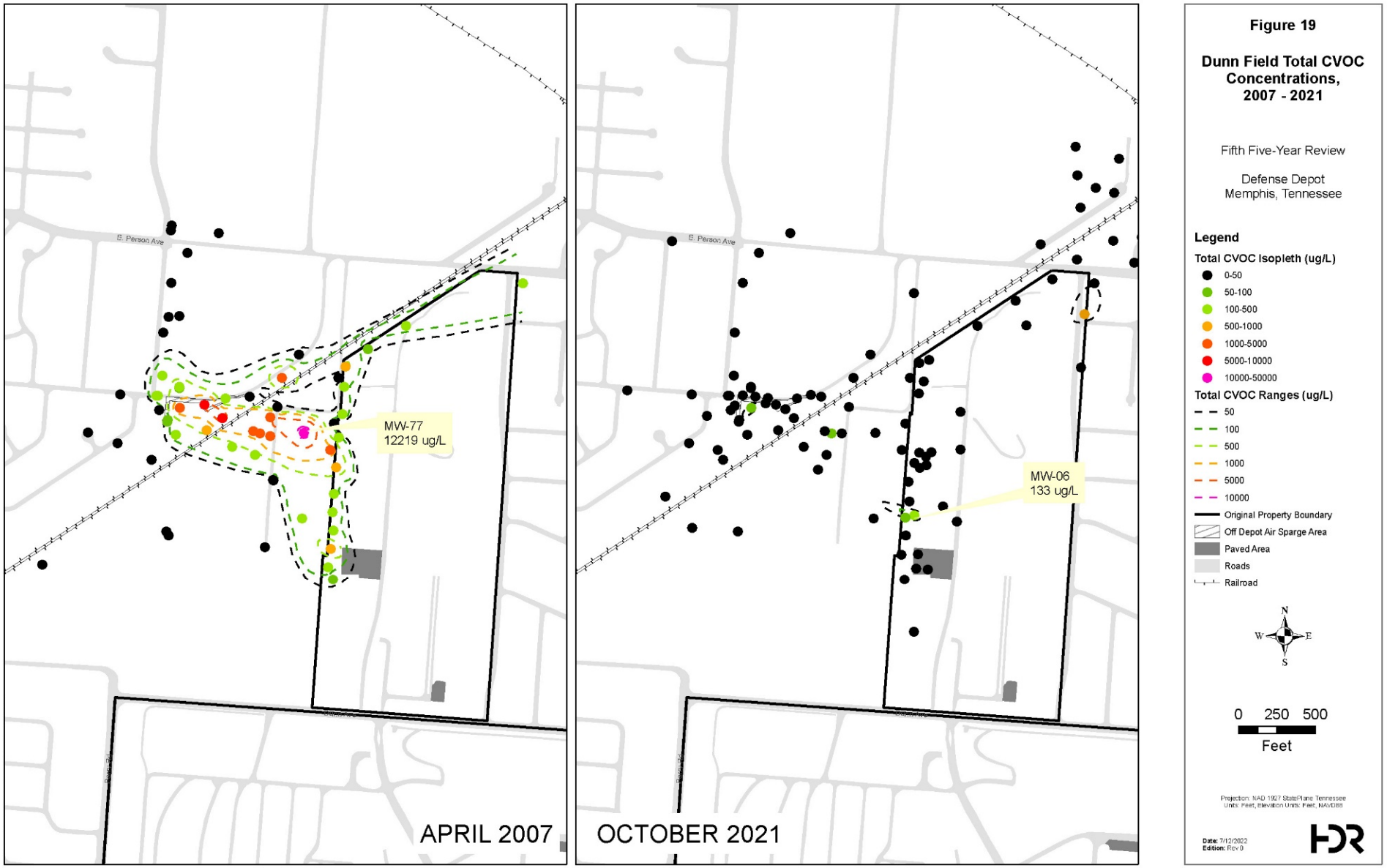


Dunn Field

- Off Depot Remedial Action
  - Early Implementation of Selected Remedy (EISR)
    - Zero Valent Iron injected in shallow aquifer to reduce concentrations at leading edge of plume in 2004. Limited effectiveness.
  - AS/SVE System
    - Operations began in 2009. Active remediation objective to reduce individual CVOC concentrations below 50 µg/L. Met in most wells by April 2012.
    - Additional AS wells installed in 2020; objective initially met in December 2022.
- Land Use Controls (LUC)
  - Notice of Land Use Restriction recorded 2009
  - Annual LUC Site Inspection performed since 2009
- Long-term Monitoring
  - Regular groundwater monitoring conducted for Interim Remedial Action from 1999 to 2009
  - LTM began in 2010. Currently, 90 monitoring wells for Dunn Field; sample frequency varies from semiannual to biennial.

Dunn Field

Reduced CVOC Concentrations in Groundwater from Remedial Action



Dunn Field

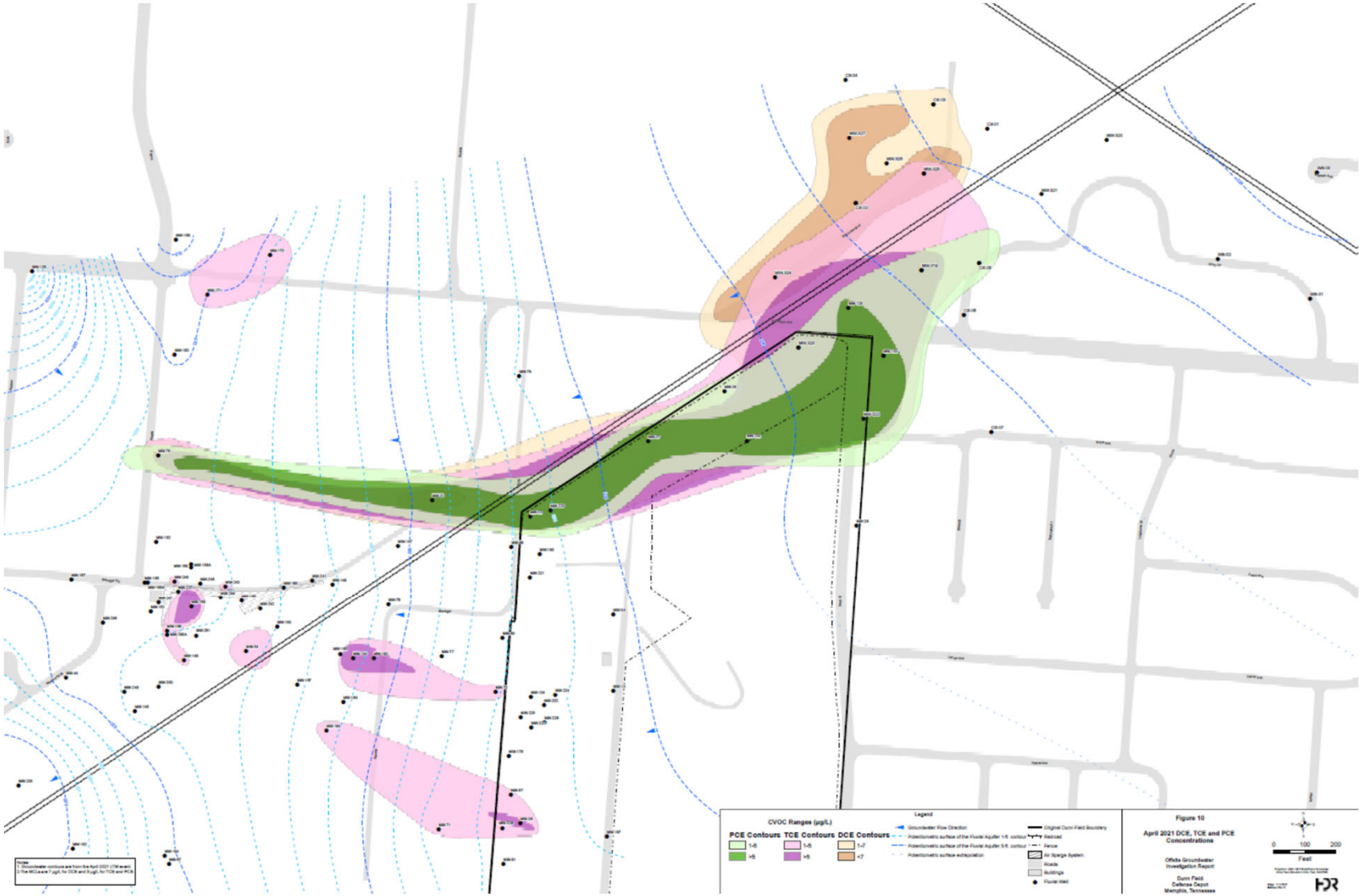
- Offsite Groundwater Investigation
  - Purpose – Evaluate multiple lines of evidence for presence of an offsite source for plume located along northern boundary of Dunn Field
    - Review of previous TDEC investigations in the offsite area north of Dunn Field.
    - MIP and Soil Sampling in northeast section of Dunn Field
    - Installation of 10 monitoring wells and quarterly sampling of new wells and TDEC wells for one year. Completed July 2010.
    - Final Offsite Groundwater Investigation Report, October 2022: Analytical results provide sufficient evidence of an unidentified contaminant source contributing to contaminant concentrations in groundwater on Dunn Field.
- Dunn Field West Post-ROD Supplemental Investigation
  - Purpose – Investigation and risk assessment increasing CVOC concentrations in groundwater in west-central Dunn Field
    - Soil, soil vapor and groundwater samples collected May 2020 to August 2021. Risk assessment conducted.
    - Draft Report, September 2021: Contaminants exceed criteria in soil, groundwater and soil vapor but there are no complete pathways of exposure at present due to LUC and groundwater use restrictions.

Dunn Field

Offsite Groundwater Investigation – Well Locations

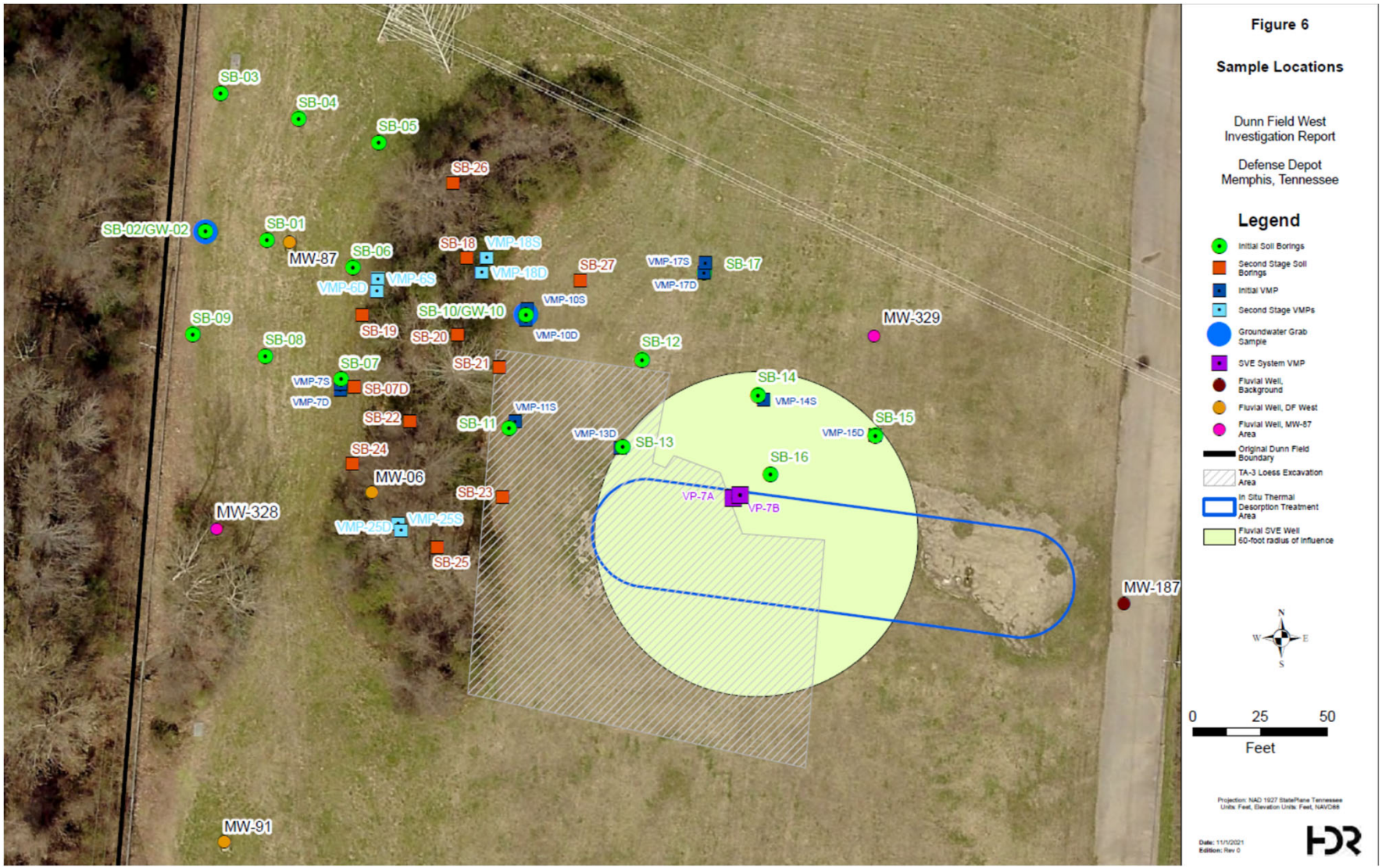
Dunn Field

Offsite Groundwater Investigation



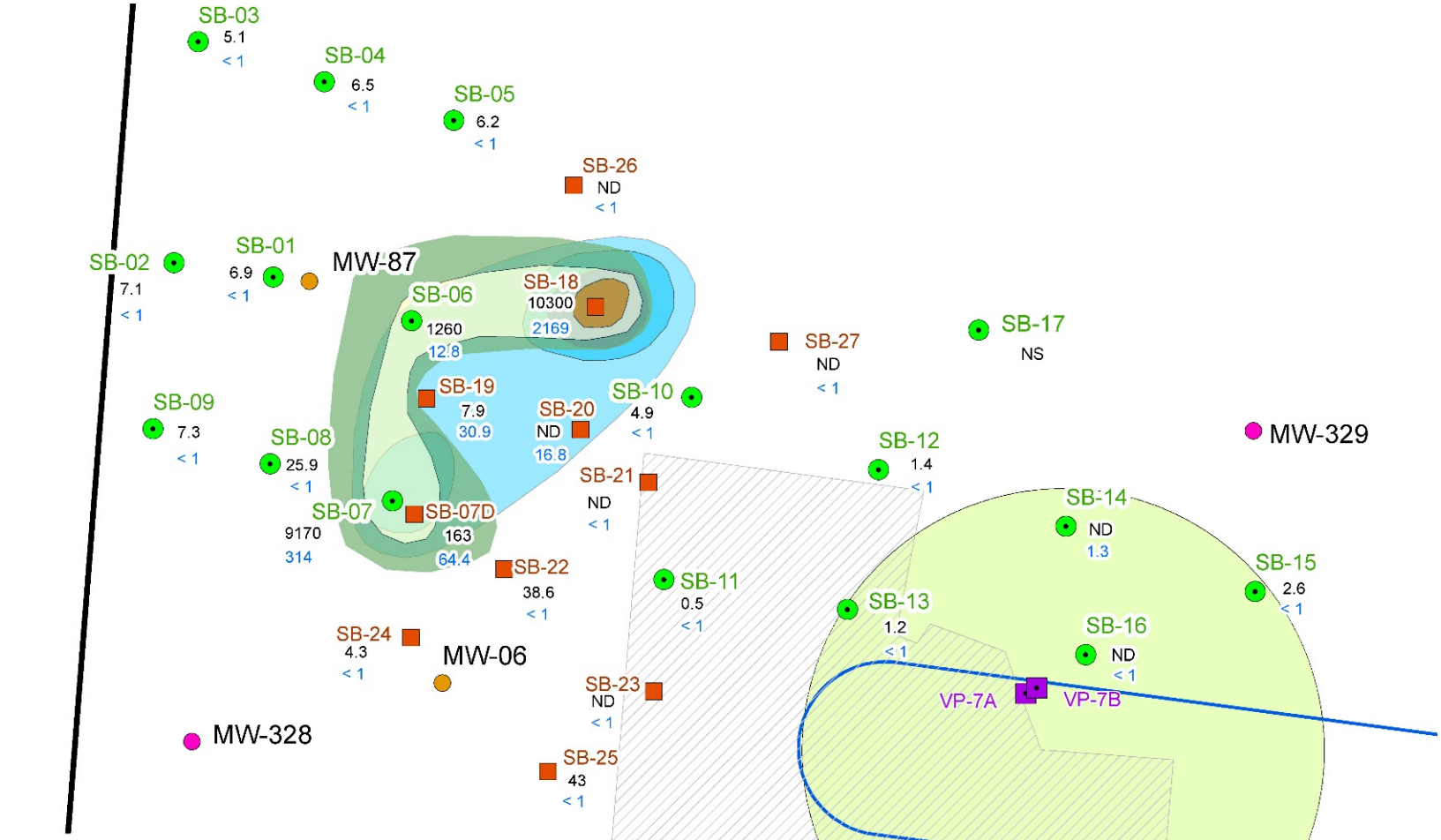
Dunn Field

Dunn Field West Investigation Sample Locations



Dunn Field

Dunn Field West Investigation, CVOCs and Other VOCs in Soil

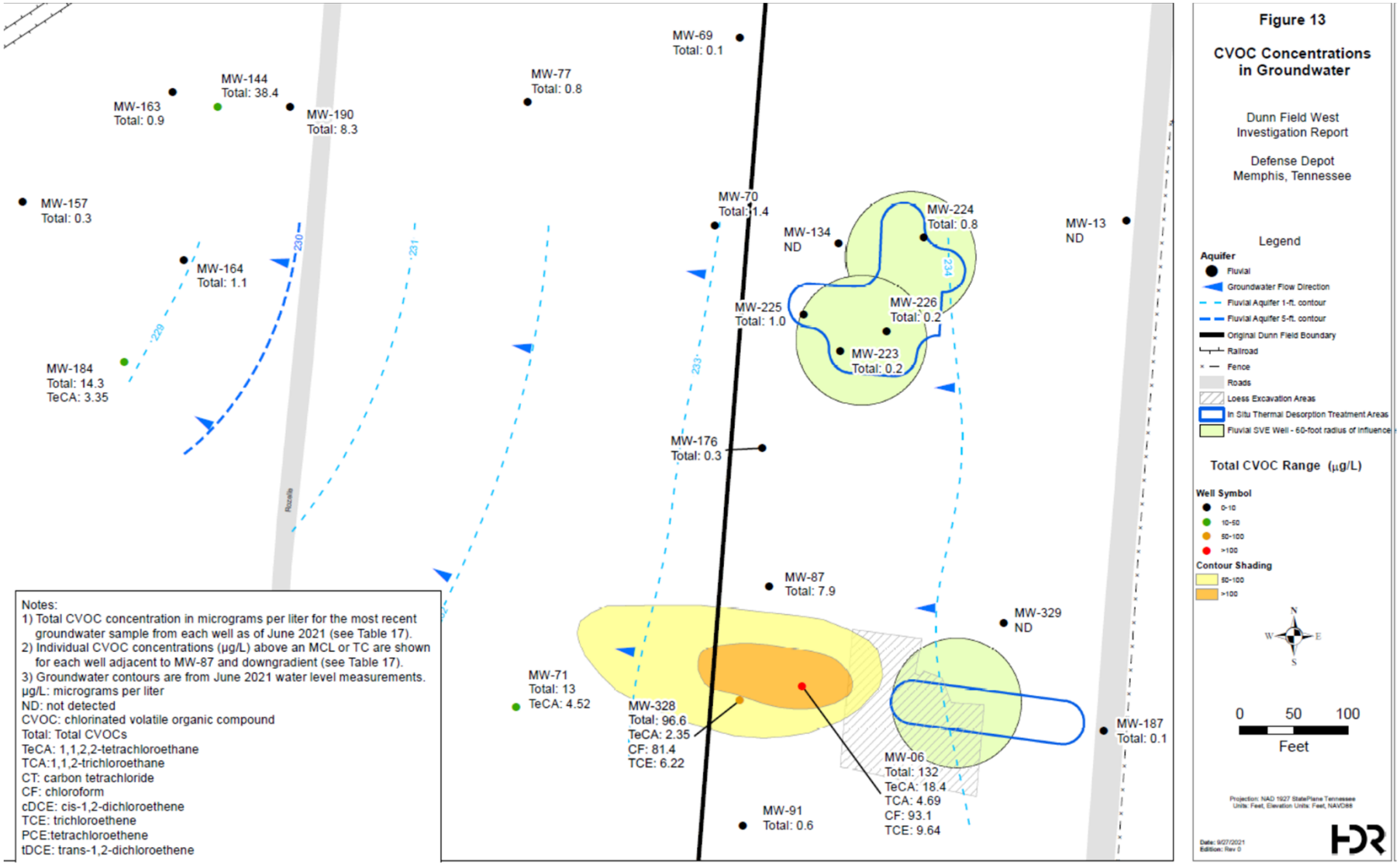


Note:
The highest total CVOC concentration in micrograms per kilogram for the samples from each boring is shown.

LSV: Loess Screening Value
FDSV: Fluvial Deposits Screening Value
ND: CVOCs not detected
NS: not sampled

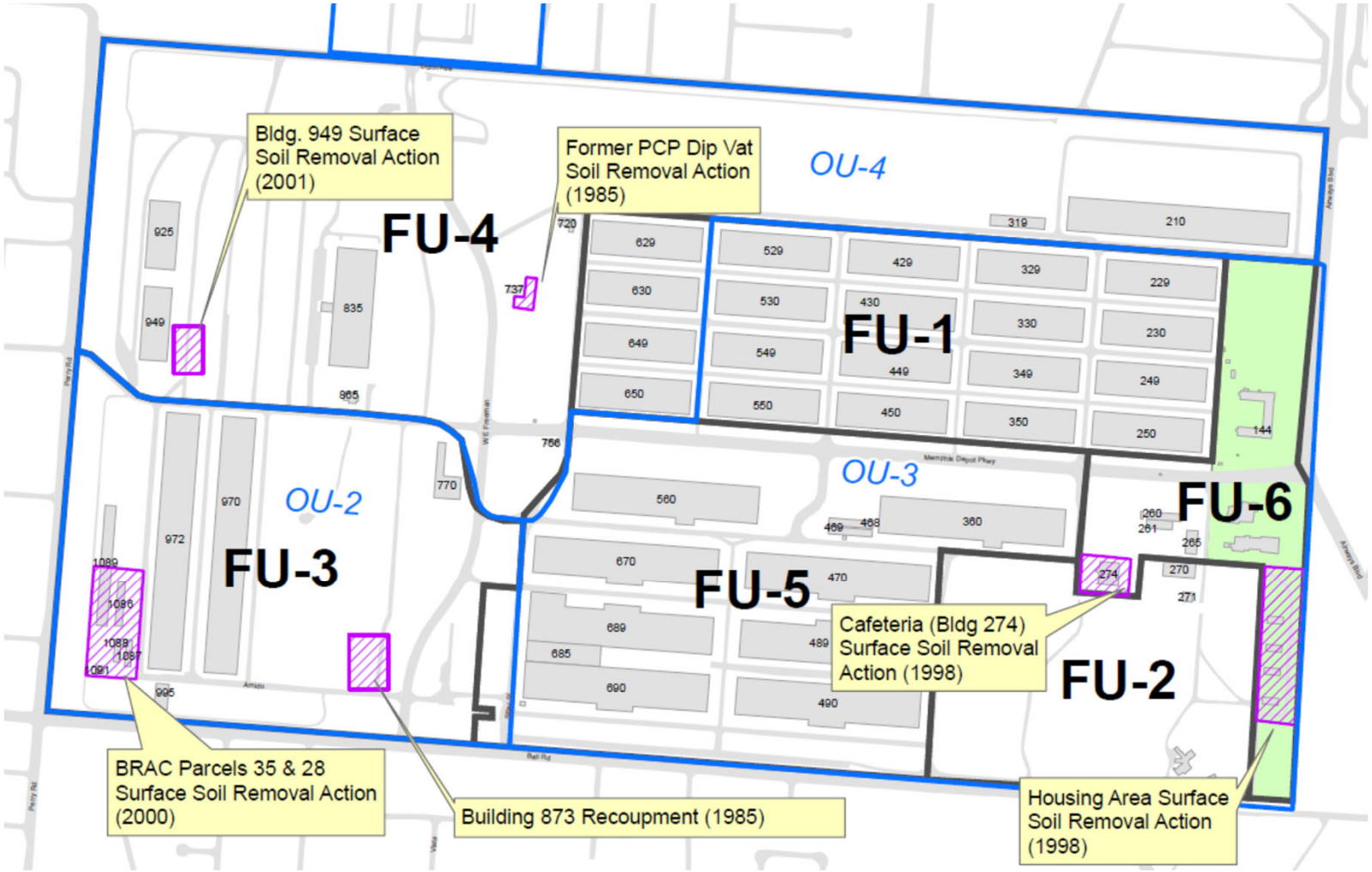
Dunn Field

Dunn Field West Investigation, CVOCs in Groundwater



Main Installation

Site Designations and Initial Response Actions

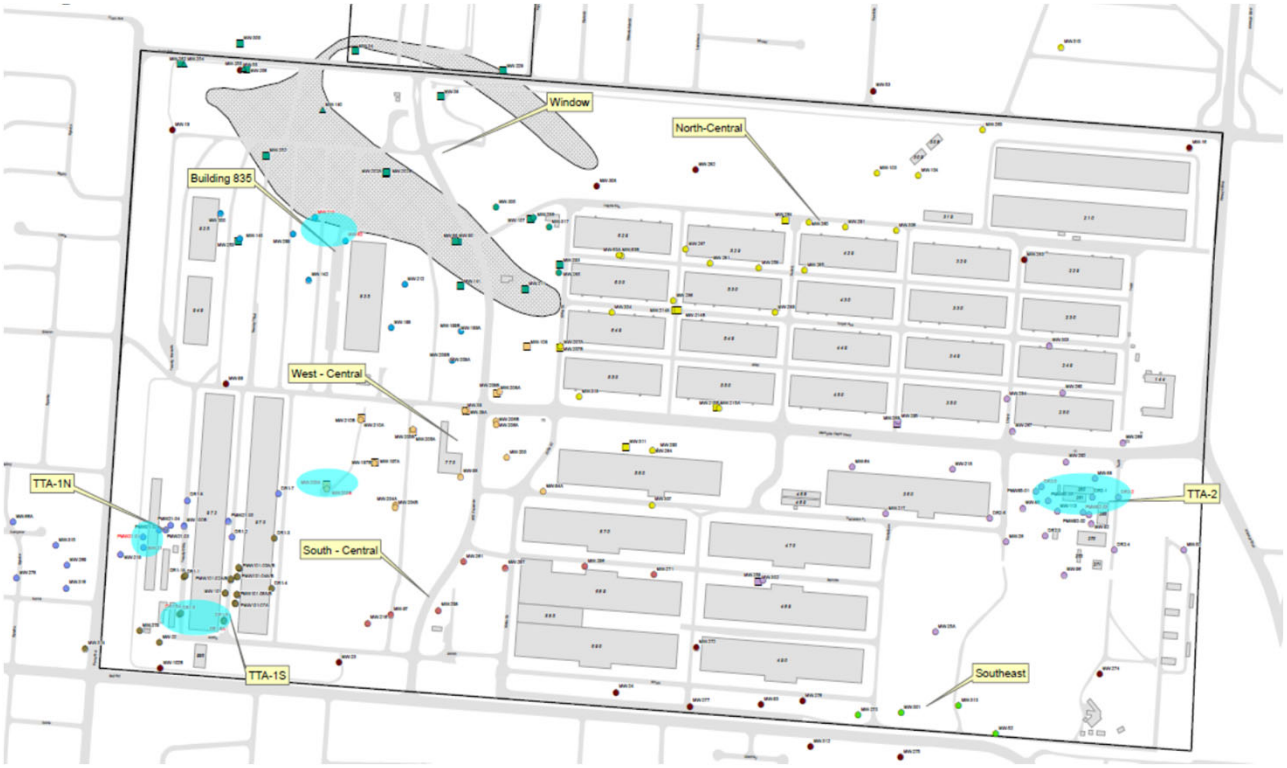


Main Installation

- Investigations and Feasibility Studies
  - Main Installation Remedial Investigation Report, 2000
  - Main Installation Groundwater and Soil Feasibility Studies, 2000
- Selected Remedy - Main Installation Record of Decision, 2001
  - Excavation, transport and off-site disposal of lead contaminated surface soil near Building 949. [Completed prior to final execution of the ROD to accommodate the economic redevelopment; noted in ROD as a significant change.]
  - Deed restrictions and land use controls (LUCs) to prevent residential and daycare land use; production/consumptive use of groundwater; casual access through the golf course.
  - Enhanced bioremediation treatment (EBT) of chlorinated volatile organic compounds (CVOCs) in the most contaminated part of the groundwater plume.
  - Long-term groundwater monitoring to document changes in plume concentrations and to detect plume migration to off-site areas or into deeper aquifers.
  - EPA maximum contaminant levels are the groundwater remedial action objective

Main Installation

- Remedial Action
  - Enhanced bioremediation treatment (EBT): sodium lactate solution injected in groundwater to create anaerobic conditions and stimulate bacterial activity which reduces groundwater contaminants.



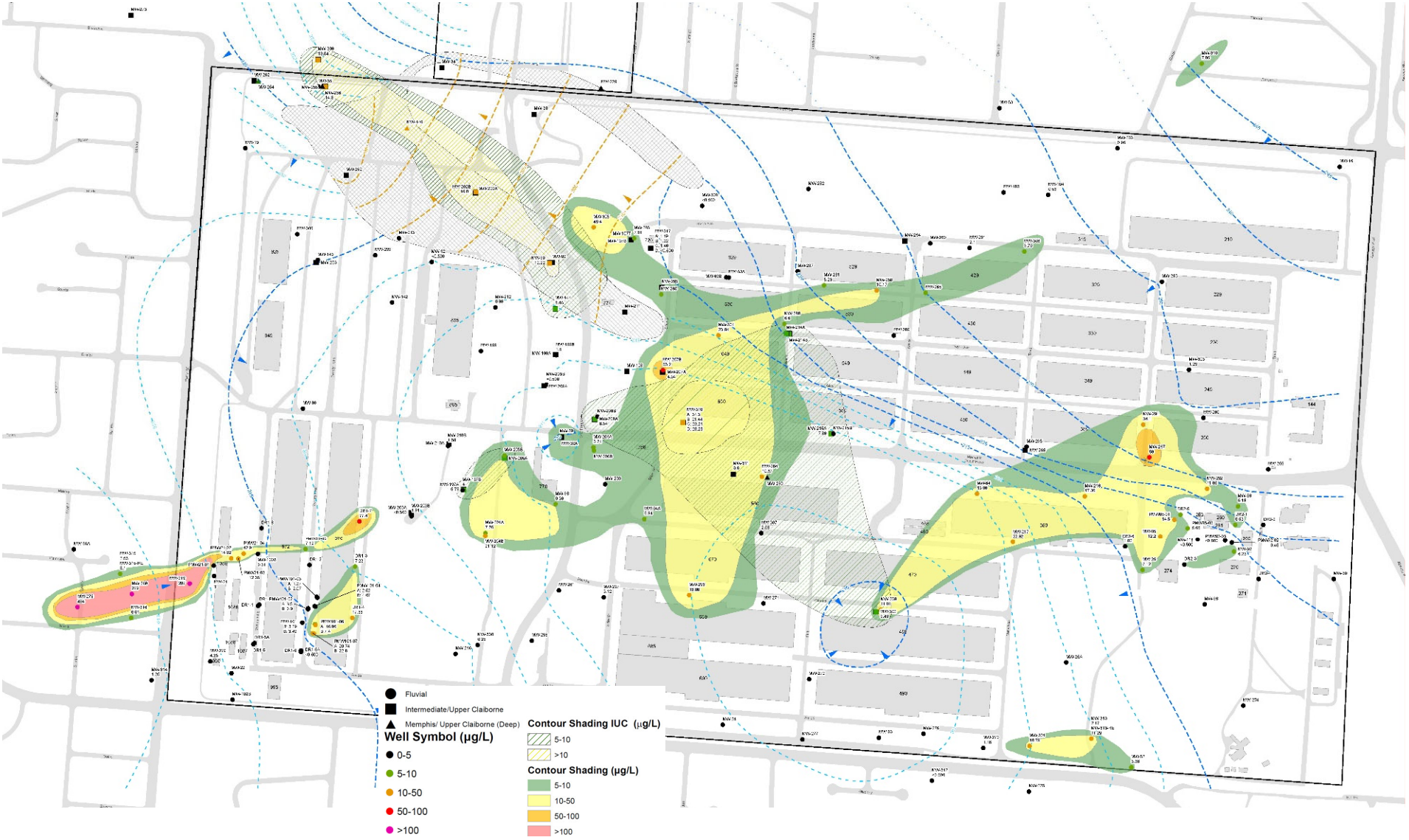
- EBT implemented in areas with CVOC concentrations above 100 micrograms per liter (µg/L)
- Three treatment areas from 2006 to 2009 and five areas from 2012 to 2014.
- Concentrations reduced approximately 80% in treatment areas but little reduction outside those areas.
- Aerobic aquifer conditions are not conducive to EBT.

Main Installation

- Land Use Controls (LUC)
  - Notice of Land Use Restriction recorded 2005
  - Annual LUC Site Inspection performed since 2005
- Long-term Monitoring
  - LTM began in 2004. Currently, 188 monitoring wells for the MI; sample frequency varies from semiannual to biennial.
- Supplemental Remedial Investigation (SRI)
  - Phased study with 63 monitoring wells installed from 2015 to 2019 in the Fluvial Deposits, Intermediate and Memphis Aquifers
  - Vertical profiling, conceptual site model update and soil vapor extraction pilot test
  - Final SRI report submitted to EPA and TDEC in July 2021
- Focused Feasibility Study (FFS)
  - Groundwater concentrations exceed maximum contaminant levels but are at lower limit for remedial action.
  - Combination of AS/SVE, SVE and MNA is recommended. SVE component will reduce potential for vapor intrusion. MNA only has physical processes (dispersion, dilution, sorption, and volatilization).
  - FFS Revision 0 provided to EPA and TDEC for review 30 September 2022.

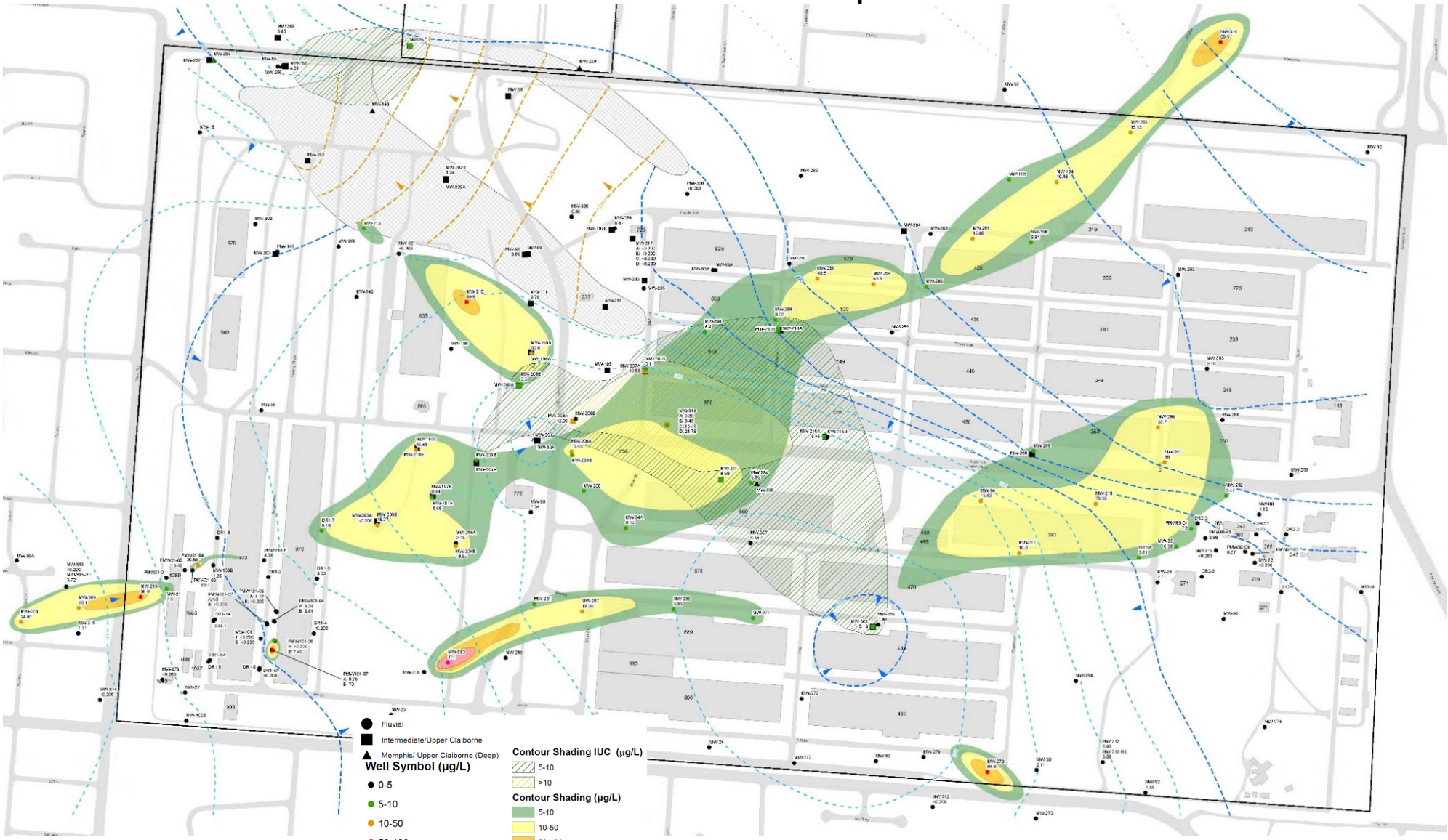
Main Installation

PCE Concentrations April 2022



Main Installation

TCE Concentrations April 2022



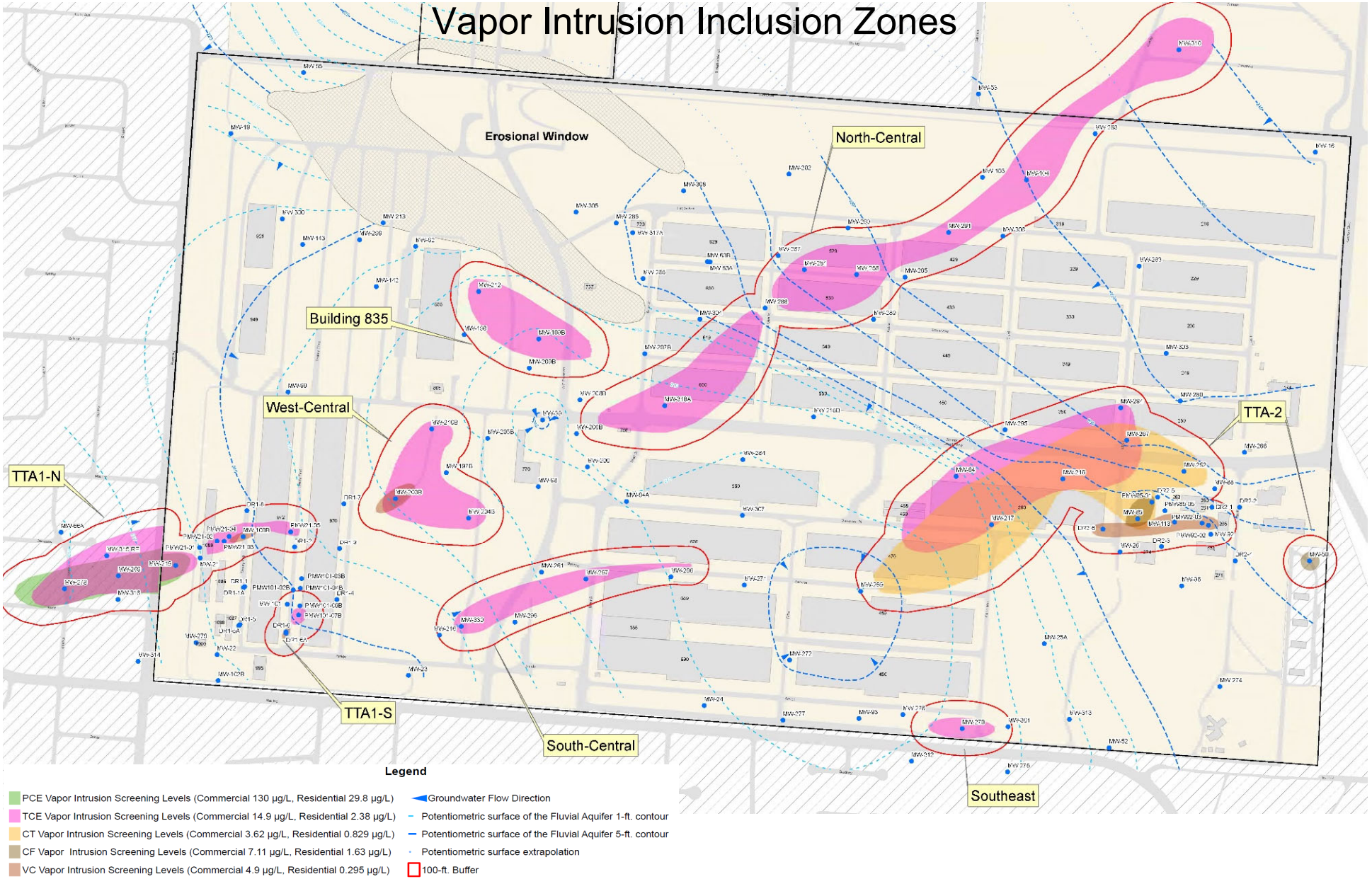
Main Installation

FFS Alternative 4, AS/SVE, SVE and MNA

Main Installation

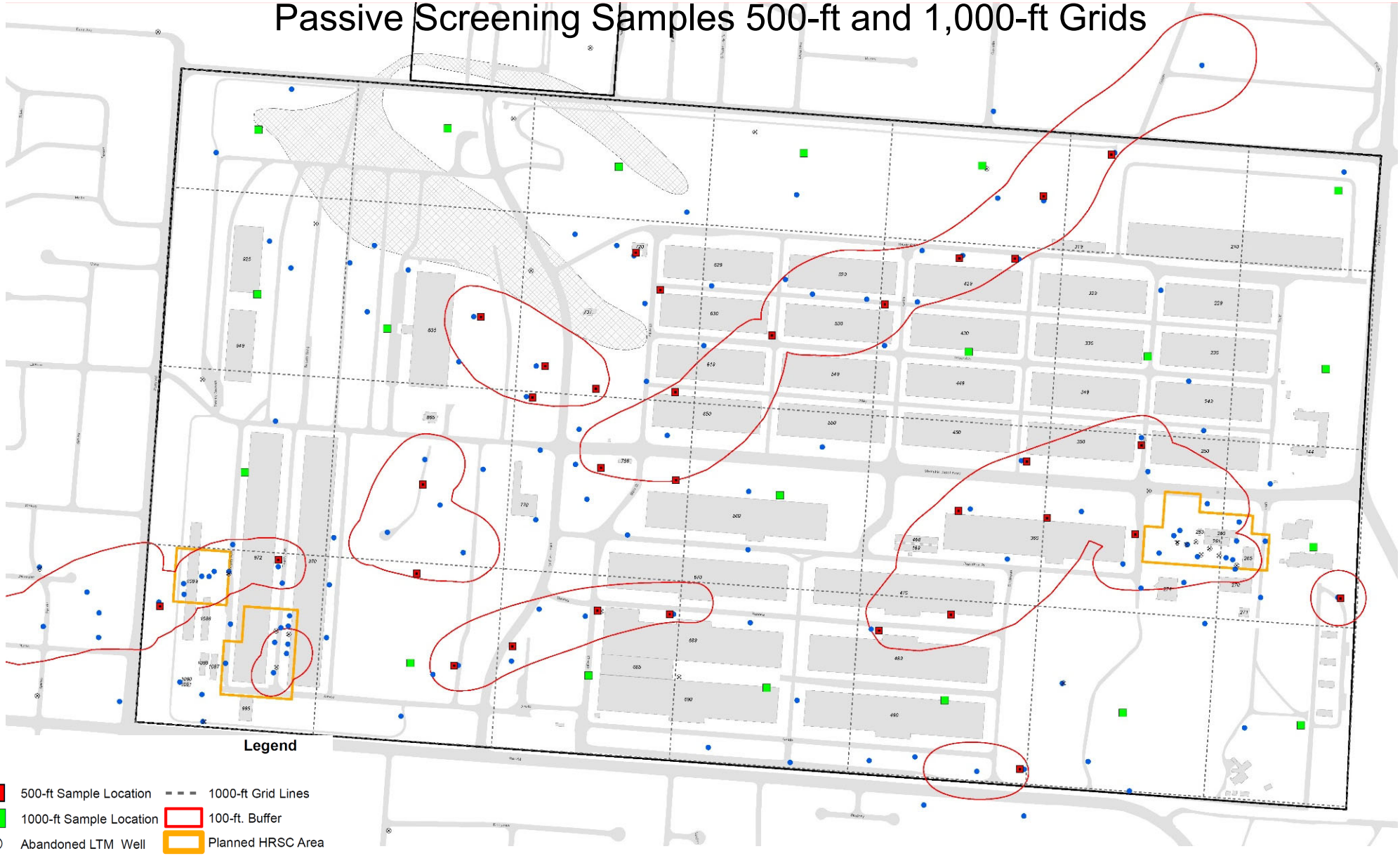
- Vapor Intrusion Study
  - Initial sampling in 2018
  - Meeting with EPA in 2020 to discuss sampling activities
  - Final vapor intrusion conceptual site model submitted in June 2022
  - VI Sampling and Analysis Plan submitted for review October 2022
- Risk Assessment Update
  - Baseline risk assessment conducted for the 2000 RI
  - Groundwater Update and Soil and Ecological Reviews presented in Human Health and Ecological Risk Assessment completed February 2020.
  - Additional review performed to determine sampling requirements. Final Sampling and Analysis Plan submitted May 2022. Sampling required for chromium speciation in shallow soils and for dioxins and furans in soil sediment and surface water.
  - Sampling conducted in July and August 2022. Final analytical results received, and data validation completed in October 2022.

Main Installation



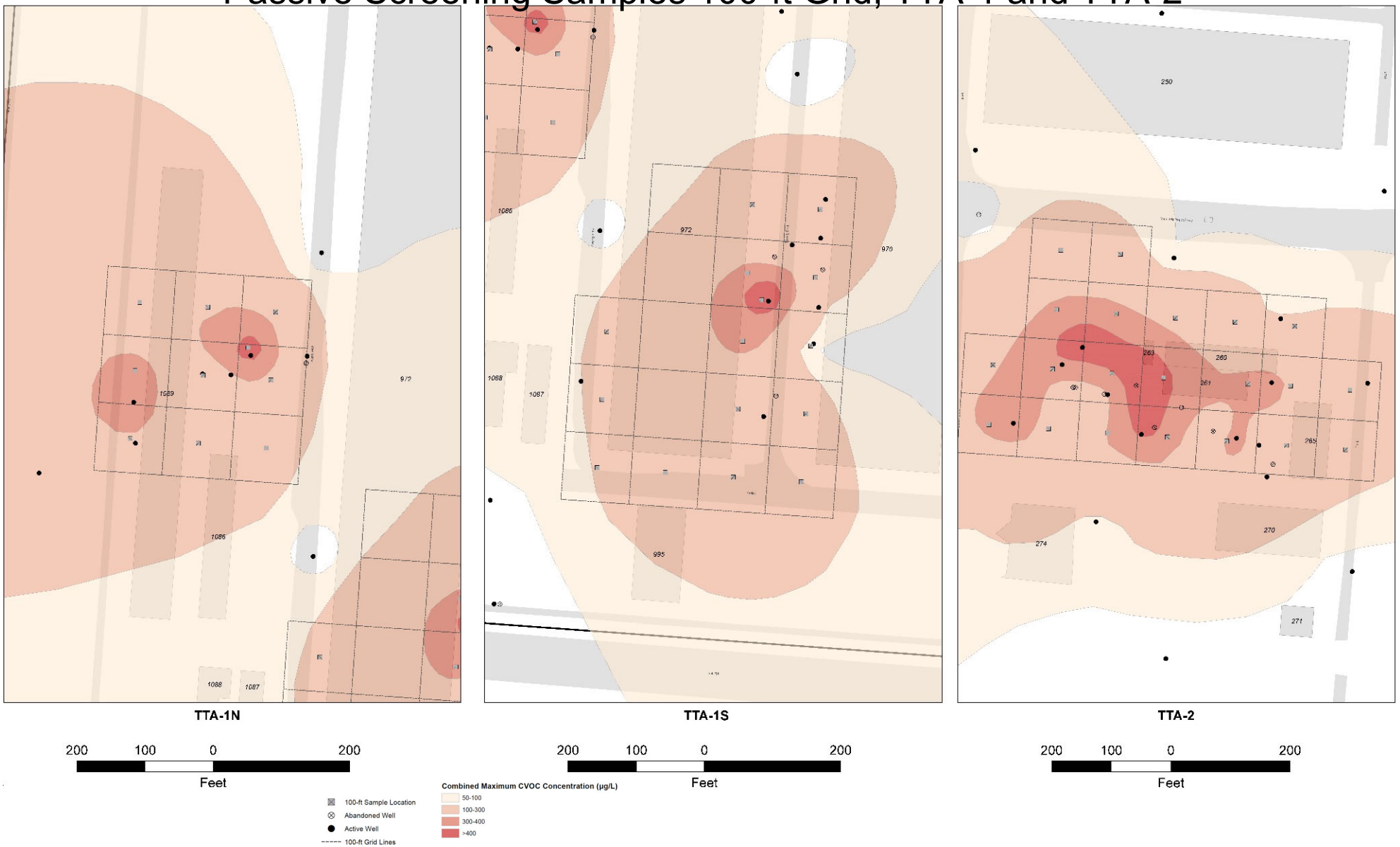
Main Installation

Passive Screening Samples 500-ft and 1,000-ft Grids



Main Installation

Passive Screening Samples 100-ft Grid, TTA-1 and TTA-2

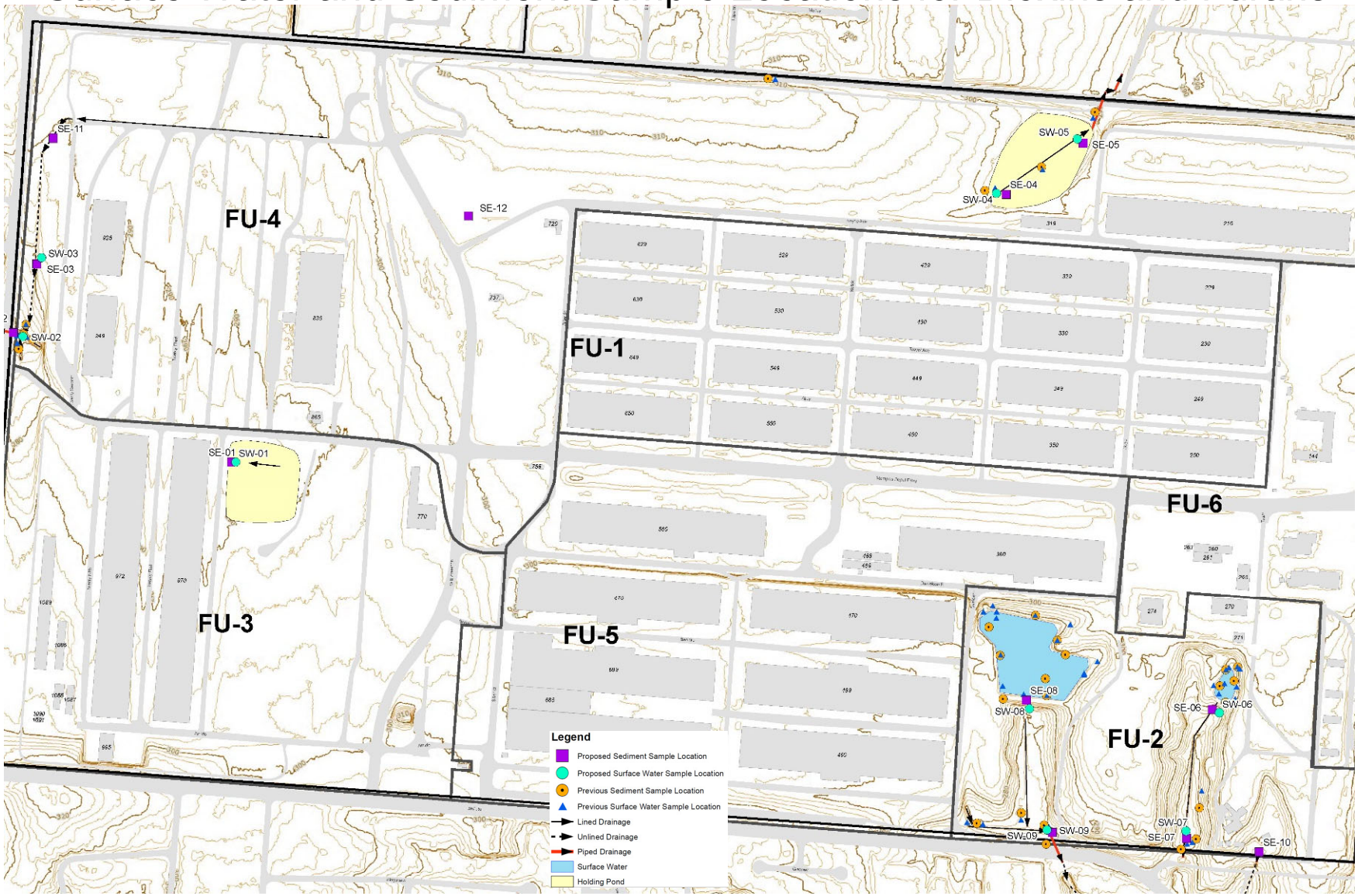


Main Installation

Soil Sample Locations for Dioxins and Furans

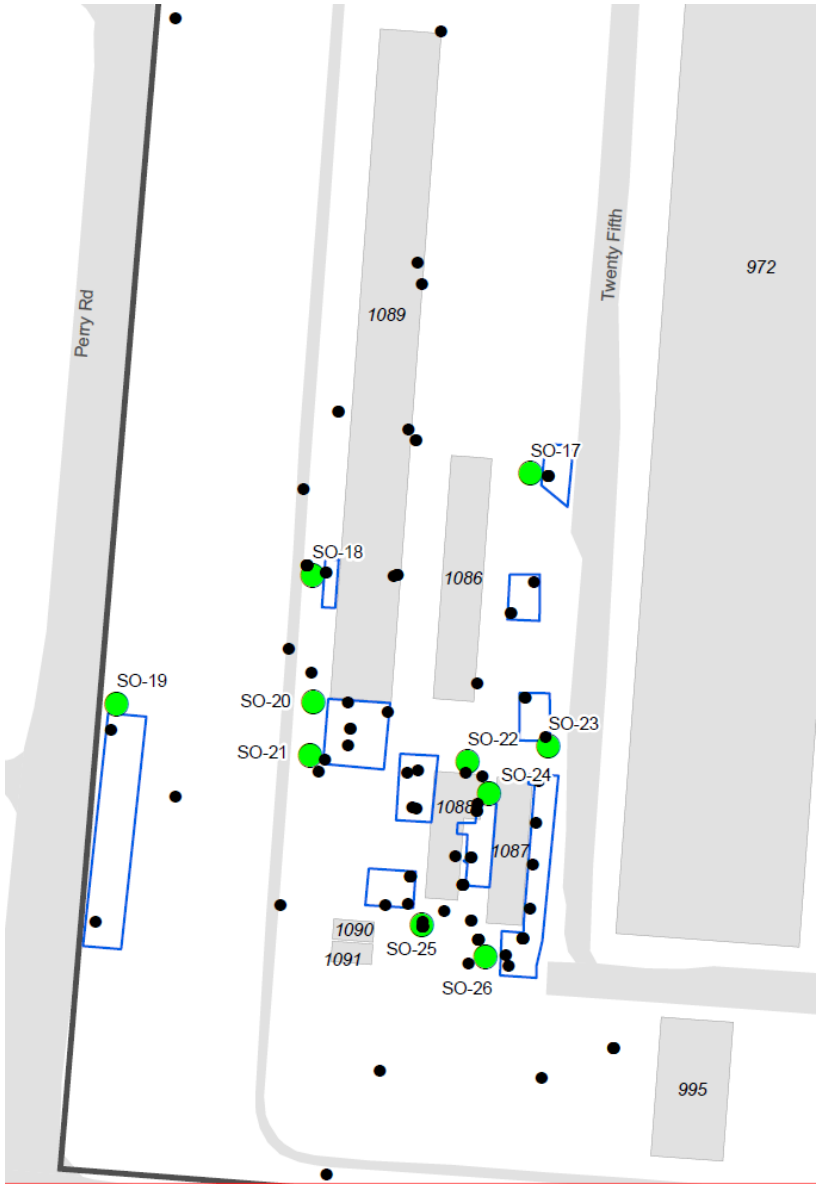
Main Installation

Surface Water and Sediment Sample Locations for Dioxins and Furans



Main Installation

Soil Sample Locations for Chromium Speciation, FU3

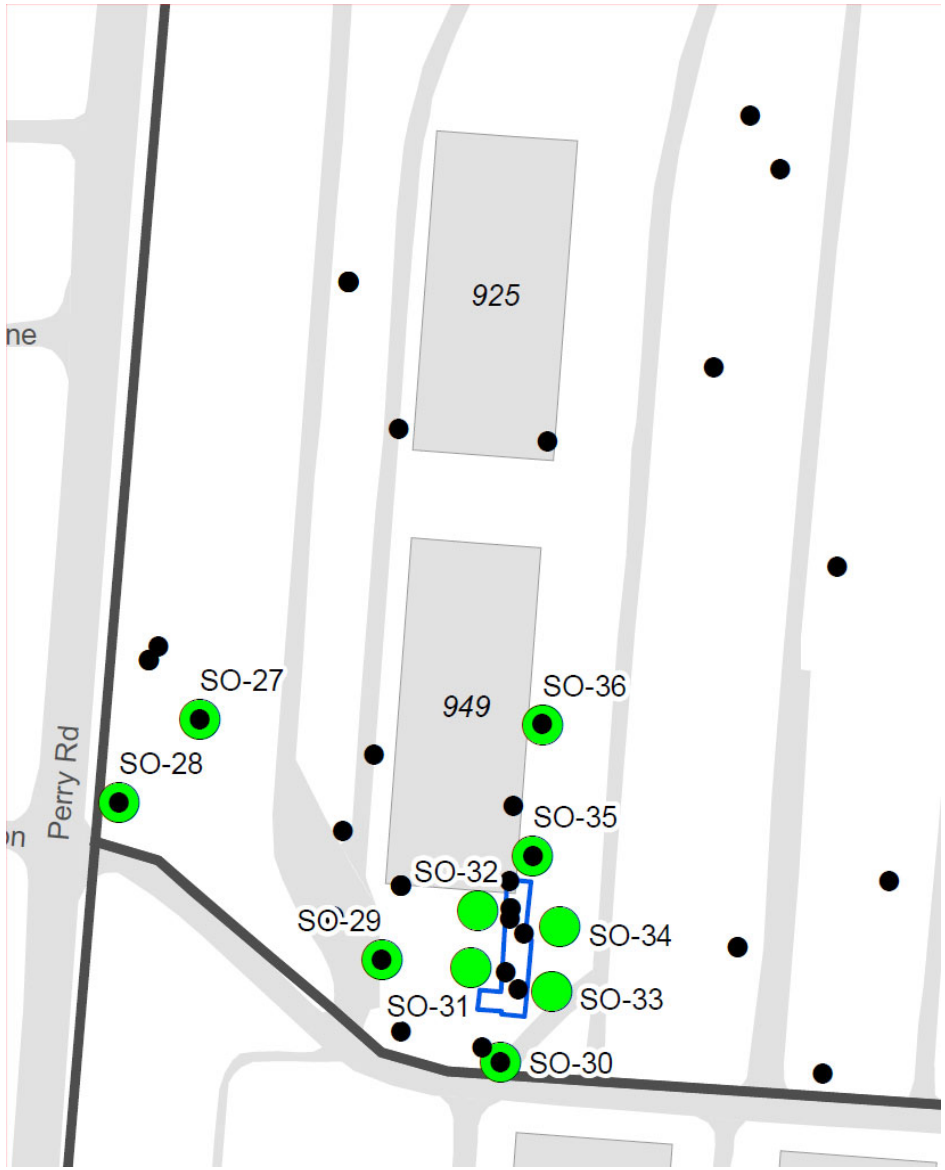


Legend

- Previous Sample Location
- Proposed Sample Location

Main Installation

Soil Sample Locations for Chromium Speciation, FU4



Legend

- Previous Sample Location
- Proposed Sample Location

Defense Depot Memphis

PLACE HOLDER

GSA ~ Public Sale Updates

Defense Depot Memphis

DISCUSSIONS

Q & A