FINAL

Fifth Five-Year Review Report





Air Force Plant 4 Superfund Site
Tarrant County, Texas

OCTOBER 2024

AFCEC Project Number: ACFJ20237005

Prepared by:
The U.S. Army Corp of Engineers
Regional Planning & Environmental Center – Fort Worth District
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List of Abbreviations & Acronyms

%	percent
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
1,2-DCE	1,2-dichloroethene
AAJV	Ayuda Auxilio Joint Venture
ACL	alternative concentration limit
AFCEC	Air Force Civil Engineering Center
AFFF	aqueous film forming foam
AFP4	Air Force Plant 4
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BRA	baseline risk assessment
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylene
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
C/I	Commercial/Industrial
cis-1,2-DCE	cis-1,2-dichloroethene
COC	Contaminant of Concern
cVOC	chlorinated VOC
DNAPL	Dense Non-Aqueous Phase Liquid
DoD	Department of Defense
DSHS	Department of State Health Services
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERH	Electrical Resistance Heating
ESD	Explanation of Significant Differences
FDTA	Fire Department Training Area
FFA	Federal Facilities Agreement
FFS	focused feasibility study
FS	Feasibility Study
FSA	Fuel Saturation Area
FYR	Five-Year Review
GWRPM	Groundwater Remediation Performance Monitoring
HHRA	human health risk assessment
ICs	Institutional Controls
IDP	Installation Development Plan
ILCR	Incremental Lifetime Cancer Risk
IRA	Interim Remedial Action
IRP	Installation Restoration Program
JP	Jet Propulsion
LKR	LATA-Kemron Remediation, LLC

LM	Lockheed Martin
LTM	long-term monitoring
LUC	Land Use Control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
NAS Fort Worth	Naval Air Station Fort Worth Joint Reserve Base
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Not Detected
NFA	No Further Action
No.	Number
NPL	National Priorities List
O&M	Operation and Maintenance
OTIE	Oneida Total Integrated Enterprises
OU	Operable Unit
PCB	polychlorinated biphenyl
PCLs	Protective Concentration Limits
PFAS	per- and polyflouroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PRB	permeable reactive barrier
RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objectives
RG	remediation goal
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSLs	Regional Screening Levels
SVE	Soil Vapor Extraction
SVOC	semivolatile organic compound
TBC	to be considered
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TDH	Texas Department of Health
TI	technical impracticability
TMDL	Total Maximum Daily Load
TPH	total petroleum hydrocarbon
trans-1,2-DCE	trans-1,2-dichloroethene
TRRP	Texas Risk Reduction Program
UCL	Upper Confidence Level
URS	URS Group, Inc.
USAF	United States Air Force
USGS	United States Geological Survey

UST	underground storage tank
UU/UE	Unlimited Use and Unrestricted Exposure
VC	vinyl chloride
VI	vapor intrusion
VISL	Vapor Intrusion Screening Level
VOC	volatile organic compound

1.0 INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Army Corp of Engineers (USACE) Regional Planning and Environmental Center – Fort Worth District, on behalf of the United States Air Force (USAF), is preparing this five-year review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(c), consistent with the National Contingency Plan (NCP)(40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)), and considering United States Environmental Protection Agency (EPA), Department of Defense (DoD) and USAF policy. The Air Force Plant 4 (AFP4) Superfund Site FYR was led by USACE chemist Ramon Roman-Sanchez Ph.D., with assistance from USACE chemist Amanda Jackson Mojica.

This is the fifth FYR for the AFP4 Superfund Site. The triggering action for this statutory fifth FYR was completion of the previous FYR on 30 September 2019, five years from the date the fourth FYR. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The facility consists of a single, sitewide Operable Unit (OU), which contains multiple Installation Restoration Program (IRP) sites that will be addressed in this FYR.

The review began on 25 October 2023 with site visits in July 2023 and 07 February 2024.

1.1. Site Background

AFP4 is a government-owned (USAF), contractor-operated (Lockheed Martin [LM]) facility located in Tarrant County, Texas, northwest of Fort Worth (Figure B-1). The facility occupies 760 acres and has manufactured aircraft for the military since 1942. Approximately 70 percent (%) of the AFP4 surface area is covered by buildings, concrete, or asphalt. The remaining 30% of the surface area (the west and north portions of the facility) is primarily grass-covered soil.

The plant is bordered to the north by Lake Worth, a municipal water supply for the City of Fort Worth and the City of White Settlement. Lake Worth serves to recharge the underlying Paluxy Aquifer. The Naval Air Station Fort Worth Joint Reserve Base (NAS Fort Worth), formerly Carswell Air Force Base, borders to the east. Residential property within the City of White Settlement borders to the south and west.

During historical manufacturing operations, waste oil, solvents, and fuels were disposed of at on-site landfills or were burned in fire-training exercises. Chemical process wastes were initially discharged to the sanitary sewer system and treated by the City of Fort Worth's treatment system. Beginning in the 1970s, chemical process wastes were treated on-site at a newly constructed chemical waste-treatment system before being discharged to the sanitary sewer system. Currently,

waste oils and solvents are disposed of offsite.

Contamination stemming from AFP4 was first noted in 1982 along Meandering Road Creek to the west of the property, prompting immediate response action and formation of what is now the Restoration Advisory Board (RAB). The RAB maintains communication among government bodies and the community, exchanging information regarding remedial progress for the facility.

1.2. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Air Force Plant 4		
EPA ID: TX7572024605		
Region: 6	**State:** TX	**City/County:** Fort Worth/Tarrant
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: United States Air Force *[If "Other Federal Agency", enter Agency name]*:		
Author name: Ramon Roman-Sanchez Ph.D.		
Author affiliation: United States Army Corp of Engineers		
Review period: October 25 2023 – March 4 2024		
Date of site inspection: February 7 2024		
Type of review: Statutory		
Review number: 5		
Triggering action date: 9/30/2019		
Due date *(five years after triggering action date)*: 9/30/2024		

2.0 RESPONSE ACTION SUMMARY

Text and tables within the Response Actions section were taken (with some modifications) from the 1996 USAF Record of Decision (ROD) (Rust Geotech, 1996). Additional information was adapted from the fourth USAF FYR (URS, 2019) and the 2023 USAF ROD Amendment (LATA, 2023).

2.1. Basis for Taking Action

The sitewide OU involves historical impacts to multiple environmental media. The following IRP sites and media were identified in the ROD as having contaminant concentrations that potentially pose an excess risk to human health or the environment (ecological receptors), or which exceeded the lower threshold of an acceptable risk range:

- Soil associated with AFP4 Landfills 3 and 4;
- Soil under Building 181;
- Sediment along Meandering Road Creek and the inlet of Meandering Road Creek to Lake Worth;
- Groundwater beneath the East Parking Lot as part of the greater Terrace Alluvial Flow System; and
- Groundwater in the Middle and Upper Paluxy Aquifers and Upper Paluxy Sand Channels Groundwater.

The contaminant of concern (COC) concentrations shown in the following sub-sections are taken directly from the ROD. Samples informing the ROD were collected in 1994 and 1995.

Landfill 3

Located along the western boundary of AFP4 adjacent to Meandering Road Creek, Landfill 3 is a grass covered area approximately 5 acres in size (Figure B-1). The landfill is presently enclosed by a chain-link fence on its front and sides, but not on its backside, as there is a 20-foot drop to Meandering Road Creek. Miscellaneous wastes, including mixed oils and solvents, were discarded at this site from 1942 to 1945. The landfill was closed in 1945 and remained inactive from 1945 to 1966. Dirt and rubble were used to fill and grade the landfill during 1966 and 1967.

The highest metal concentrations were detected in samples collected along the western edge of the landfill and east of Meandering Road Creek. The highest concentrations of the other constituents were detected in samples collected from historic drainage ditches that have since been filled. According to the ROD, the range of concentrations for key COCs detected in soil samples from Landfill 3 are:

- Trichloroethene (TCE) (not detected [ND] to 19 milligrams per kilogram [mg/kg]);
- Cadmium (ND to 96.2 mg/kg);
- Copper (ND to 5,590 mg/kg);
- Lead (2 to 10,400 mg/kg); and
- Zinc (3.8 to 17,400 mg/kg).

Landfill 4

AFP4 Landfill 4, which is located near the southwest boundary of the AFP4 facility, occupies approximately 4 acres of land between Bomber Road (sometimes referred to as Meandering Road) and Meandering Road Creek (Figure B-1). AFP4 Landfill 4 is grass-covered but is not capped with an engineered cap. This landfill was used for disposal of construction rubble from 1956 to the early 1980s. Other types of wastes may have been disposed there between 1966 and 1973, including small quantities of solvents, oils, fuels, and thinners.

The highest concentrations of metals and semivolatile organic compounds (SVOCs) were detected in samples collected along the western shoulder of the landfill. According to the ROD, the ranges of concentrations for key COCs detected in all soil samples from AFP4 Landfill 4 were:

- TCE (ND-0.03 mg/kg);
- Benzo[a]pyrene (ND-13 mg/kg);
- Arsenic (2.4-170 mg/kg);
- Cadmium (ND-160 mg/kg);
- Copper (ND-3,200 mg/kg); and
- Zinc (4.6-12,200 mg/kg).

Building 181

Building 181, the Chemical Process Facility, is part of the Assembly Building/Parts Plant, which is a mile-long building located in the approximate center of AFP4 (Figure B-1). Spills of TCE reportedly occurred within the Chemical Process Facility. Trenches, sumps, floor drains, and buried pipelines are present throughout this manufacturing facility and are possible pathways for contamination migration under this building.

The key COC at Building 181 is TCE, which was detected at concentrations ranging from ND to 0.22 mg/kg in soil samples collected from borings up to depths of approximately 59 feet near the perimeter of Building 181 (Rust Geotech, 1996). Soils saturated with TCE were also found during the installation of a Soil Vapor Extraction (SVE) system under Building 181. TCE in the soil under Building 181 is the main source of TCE contamination in the Basewide TCE Groundwater Plume (formerly referred to as the East Parking Lot Plume).

Meandering Road Creek and Lake Worth

According to the ROD, the ranges of concentrations for key COCs detected in samples of Meandering Road Creek sediments were:

- Arsenic (3.1-6.1 mg/kg);

- Cadmium (ND-2.4 mg/kg);
- Copper (13.4-17.8 mg/kg);
- Lead (10-77.4 mg/kg);
- Silver (ND-6.9 mg/kg); and
- Zinc (17.8-87 mg/kg).

Lake Worth sediment samples were collected off the shore north of AFP4, in a cove at the northwest corner of AFP4, and in Woods Inlet, at the mouth of Meandering Road Creek. Several volatile organic compounds (VOCs) were detected in the sediment samples at concentrations less than 1.0 mg/kg. SVOCs were detected at concentrations between 1.3 and 7.9 mg/kg. Two polychlorinated biphenyl (PCB) compounds, Aroclor 1254 and Aroclor 1260, were detected in two sediment samples at concentrations of 0.10 and 0.11 mg/kg, respectively. The Aroclor 1260 concentration was less than concentrations measured elsewhere in Lake Worth and was considered to be below the anthropogenic background in an urban lake. Only three Meandering Road Creek and Lake Worth samples had concentrations high enough to potentially cause excess risk to the environment. The ROD also identified several metal COCs detected in Lake Worth sediments. The ranges of concentrations of those compounds were:

- Arsenic (3.5-6 mg/kg);
- Cadmium (0.4-11.4 mg/kg);
- Copper (8.5-88.4 mg/kg);
- Lead (8-444 mg/kg);
- Silver (ND-13 mg/kg); and
- Zinc (21.9-303 mg/kg).

Terrace Alluvial Flow System

The ROD identified three separate plumes within the Terrace Alluvial flow system, which are distinguished in part by different groundwater flow directions within the Terrace Alluvium. Subsequent monitoring and investigations have further refined the nature of TCE contamination in the Terrace Alluvium. The plumes identified in the ROD are the:

- Basewide TCE Groundwater Plume (East Parking Lot Plume);
- West Plume; and

- North Plume.

The largest plume of groundwater contamination is the Basewide TCE Groundwater Plume. This plume begins on the east side of the groundwater divide located south and west of the Assembly Building/Parts Plant (Building 181). The plume extends in an easterly and northeasterly direction toward the East Parking Lot and then spreads east and southeast in the direction of NAS Fort Worth (Figure B-10).

The primary AFP4 sources of the Basewide TCE Groundwater Plume appear to be two former degreaser tanks in Building 181 and possibly former Chrome Pit 1, also beneath Building 181. A relatively low-level TCE source near the north end of Building 5 was identified during the 2003 Northeast Parking Lot source investigation (Earth Tech, 2003). This source appears to be on or near the Terrace Alluvium groundwater divide, so that relatively low concentrations of dissolved TCE are transported to the east to merge with the Basewide TCE Groundwater Plume and to the west to merge with the West Plume.

The ROD also identified several former IRP sites southwest of Building 181 as potential contributors to the Basewide TCE Groundwater Plume, including Chrome Pit 2, the former Die Yard Chemical Pits, Fire Department Training Area (FDTA) Number (No.) 5 (FDTA-5), and the Wastewater Collection Basins. These potential sources are also located west of the groundwater divide. Chrome Pit 3, also proposed in the ROD as a potential source, was shown during detailed groundwater level measurements in 2005 to be west of the groundwater divide and an unlikely source for the Basewide TCE Groundwater Plume. Historical and recent analytical results and past RAs suggest that former Carswell Landfills 4 and 5 and Waste Pile 7 may also contribute as sources of TCE to the southern lobe of the plume, and that a source in the vicinity of the NAS Fort Worth North Apron may contribute TCE to the northern lobe of the plume. The AFP4 Remedial Investigation/Feasibility Study (RI/FS) (Rust Geotech, 1995a; Rust Geotech, 1995b), ROD, and first five-year review (Jacobs, 2002) indicated that Carswell Landfill 6 was also a potential contributor to the plume.

The extent of the Basewide TCE Groundwater Plume is defined primarily by elevated concentrations of TCE, although cis-1,2-dichloroetheene (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride (VC) are also detected in some areas. TCE concentrations in excess of 100,000 micrograms per liter (µg/L) were detected in groundwater samples from beneath Building 181 prior to electrical resistive heating (ERH), although most concentrations in that area have been below the 10,000 µg/L remediation goal (RG) since 2002. The current plume, as defined by the 5 µg/L contour, covers approximately 890 acres, reduced from an estimated 1,100 acres in 1993. The plume size in 1993 is less precise because groundwater sampling on NAS Fort Worth (then Carswell Air Force Base) was relatively limited during that period.

A second plume of groundwater contamination in the Terrace Alluvial flow system is the West Plume (Figure B-10). The West Plume was defined in the ROD as a broad area extending from the Assembly Building/Parts Plant westward toward Meandering Road Creek. Subsequent investigations indicate that it is in fact several different areas of groundwater contamination with different sources. It includes a relatively isolated area of TCE-contaminated groundwater around

former Chrome Pit 3 that may have once extended to Meandering Road Creek; a plume that flows west into Landfills 1 and 3 from the groundwater divide at the north end of Building 5; a localized area of TCE-contaminated groundwater at FDTA-2; and an area within Landfills 1 and 3 that is sourced primarily by dense non-aqueous phase liquid (DNAPL) and light non- aqueous phase liquid from the former waste oil pits in Landfill 1. Groundwater flow within the West Plume is generally to the west, toward Meandering Road Creek. Historical TCE concentrations in groundwater samples from the West Plume have ranged from ND to 490,000 µg/L. The extremely high VOC concentrations recorded in Landfills 1 and 3 may be partly a result of the sampling methods used (i.e., traditional bailer methods that would induce mixing between DNAPL and groundwater within and adjacent to the monitoring wells). Because favorable conditions for biodegradation of TCE exist in Landfills 1 and 3 and in FDTA-2, the highest solvent concentrations in these areas normally are of cis-1,2-DCE, a daughter product of TCE, which has been reported in groundwater at concentrations as high as 0.13% (i.e., 1,300 parts per million) in Landfill 3.

The RI/FS and ROD identified a large area on the northern part of AFP4 as the North Plume (Figure B-10). Historically, TCE concentrations in this area were unevenly distributed and generally less than 10 µg/L, except for the FSA-3 area, where up to 500 µg/L TCE was reported during the 1980s. Bedrock is relatively shallow at the north end of the plant, generally dipping to the east, but with an uneven surface that influences groundwater flow in the North Plume. Groundwater flow is generally to the east and north but locally would be expected to follow the bedrock surface contours. In addition to TCE, Jet Propulsion (JP)-4 jet fuel has been identified on top of the groundwater in monitoring wells in the FSA-3 area. The potential source of this contamination was thought to be leaking fuel lines and storage tanks surrounding the former Jet Engine Test Stand. Although FSA-3 is within approximately 500 feet of Lake Worth, a groundwater migration pathway has never been identified, and contaminant concentrations in samples from Lake Worth have never exceeded ROD RGs, EPA Safe Drinking Water Act Maximum Contaminant Levels (MCLs), or state and federal surface water standards.

Paluxy Aquifers and Upper Paluxy Sand Channels Groundwater

TCE has been detected in Upper Paluxy Sand Channels groundwater beneath AFP4 in the vicinity of the Window Area. The Window Area refers to an area in the East Parking Lot where the Goodland Limestone is absent, and the Walnut Formation is thin or absent because of past deep erosion of the bedrock caused by former channels of the West Fork of the Trinity River. Vertical migration of TCE from the Terrace Alluvial flow system has likely occurred through the Window Area into the groundwater. TCE concentrations in samples of the Upper Paluxy Sand Channels groundwater ranged from ND to 5,300 µg/L during comprehensive monitoring of the Upper Paluxy Sand Channels in October 2006.

TCE and related compounds have been detected in the Upper and Middle Paluxy Aquifers in the vicinity of Landfills 1 and 3 and in the East Parking Lot. At Landfills 1 and 3, past evidence suggested that contaminants may have been reaching the Paluxy by vertical migration through faulty well seals of two Middle Paluxy wells (P-22M and WITCPM006) installed before the extent of DNAPL was known. These two wells were later abandoned to prevent further contamination. Contaminants in the Upper Paluxy; however, are more widely distributed within and downgradient of Landfills 1 and 3, and it is not certain that vertical migration via the abandoned wells would

have resulted in a plume of that size and shape.

2.2. 2023 ROD Amendment

The following text has been taken directly from section 1.3 of the 2023 ROD Amendment (LATA, 2023) with minor modifications.

The ROD Amendment implements new cleanup goals and selected remedies for AFP4 surface water and groundwater (Table 2-3 under Response Actions). The 1996 ROD surface water and groundwater cleanup goals were developed using site-specific assumptions. The seven surface water and groundwater locations specified in the 1996 ROD included: Landfill No. 4 (LF04) Terrace Alluvium groundwater, Landfill No. 3 (LF03) Terrace Alluvium groundwater, Meandering Road Creek surface water, the Paluxy aquifer, the Upper Sand (now referred to as the Upper Paluxy Sand Channels) groundwater, the East Parking Lot (EPL) Terrace Alluvium groundwater, and Building 181 (B181) Terrace Alluvium groundwater. The 1996 ROD-selected cleanup approaches for the specific locations included:

- Monitoring of Terrace Alluvium groundwater and surface water in LF04, LF03, and Meandering Road Creek;
- Groundwater extraction and treatment with near-zero off-gas emissions in the Paluxy aquifer and Upper Paluxy Sand Channels groundwater;
- Enhanced dense non-aqueous phase liquid (DNAPL)/groundwater extraction and treatment with air stripping and destruction of contaminants in the EPL Terrace Alluvium groundwater;
- Soil vapor extraction (SVE) of the vadose zone to the B181 Terrace Alluvium groundwater; and
- Institutional controls (ICs) to prevent Terrace Alluvium groundwater under AFP4 and NASFW to be used as a drinking water source.

The remedy for the EPL Terrace Alluvium groundwater also included a contingency clause to initiate containment actions to prevent groundwater contamination above the maximum contaminant levels (MCLs) from migrating beyond the AFP4 or Naval Air Station Fort Worth (NASFW) boundaries.

The Air Force submitted ESDs in 2002 (AR# 05028) and 2007 (AR# 05045) to address changes to remedial strategies at AFP4. In the 2002 ESD, electrical resistance heating (ERH) was chosen to replace surfactant-enhanced dissolution to optimize DNAPL removal in the B181/EPL Terrace Alluvium groundwater.

The 2007 ESD was issued in response to the contingency clause in the 1996 ROD. Although groundwater contaminant concentrations above MCLs were within the federal property boundary at the time of the 2007 ESD, the federal property boundary was anticipated to change due to the

pending transfer of a 187-acre parcel of the former Carswell Air Force Base (hereafter referred to as Base Realignment and Closure [BRAC] Parcel G) to the local redevelopment authority under the BRAC program.

Therefore, the 2007 ESD memorialized the Air Force's implementation of the contingency clause through the construction of a permeable reactive barrier (PRB) in 2002. This was done because the sale of the BRAC Parcel G would realign the federal property boundary in a way that part of the east side Terrace Alluvium groundwater plume would no longer be within the federal property boundaries. Also included in the 2007 ESD were monitored natural attenuation (MNA), ICs (deed restrictions) restricting use of groundwater under the property conveyed to local authorities by the federal government, and an additional Remedial Action Objective (RAO) to ensure that human health and the environment are adequately protected in areas where Terrace Alluvial groundwater contaminants occur off site above the MCLs, and ensure the existing remedies (including MNA) will reduce off-site Terrace Alluvial groundwater concentrations to below the MCLs within a reasonable timeframe.

After the third Five-Year Review in 2014 (AR# 13123), the EPA indicated that the site was protective in the short term, but it was not protective in the long term because the cleanup goals for surface water and groundwater needed to be updated to meet the MCLs specified under the Safe Drinking Water Act. The EPA indicated the Air Force needed to submit a ROD Amendment which identifies the MCLs as applicable or relevant and appropriate requirements (ARARs) for surface water and groundwater at AFP4 and documents any voluntary or interim remedial action as part of the final selected remedy.

In 2015, the Air Force performed a Complex Site Initiative (CSI) to provide a technical evaluation of the groundwater plume characteristics at AFP4, identify data gaps, and develop a schedule to develop a ROD Amendment. The CSI identified several data gaps which needed to be addressed to fully characterize the groundwater plumes across the site. These data gaps were closed during several pilot studies. The major conclusions drawn from the studies were that MNA was occurring within all groundwater bearing units and the contaminant mass flux was decreasing downgradient from source areas. In addition to closing the data gaps, the Air Force updated the conceptual site model (CSM).

The 2017 updated CSM showed that there was not a hydraulic connection between the Terrace Alluvium and Paluxy Aquifer where the Walnut Formation was eroded, and that the Upper Paluxy Sand Channels were largely fine-grained estuarine deposits with isolated channel-fill sands encased in clay and silt. This was a major change from the previous CSM used for the development of the 1996 ROD.

In 2019, the Air Force submitted the fourth Five-Year Review for AFP4 to the EPA summarizing the efforts the Air Force undertook since the Third Five-Year Review and presenting the proposed schedule to complete a Focused Feasibility Study (FFS), Proposed Plan, and ROD Amendment. The EPA concurred with the recommended actions and protectiveness statements in the Fourth Five-Year Review.

The Air Force completed the FFS in July 2021 which presented updated remedial alternatives for

the Upper/Middle Paluxy groundwater, Upper Paluxy Sand Channels groundwater, East Side Terrace Alluvium/Walnut Formation groundwater, West Side (Landfill No. 1 [LF01]/LF03) Terrace Alluvium/Walnut Formation groundwater, and West Side (Chrome Pit No. 3 [CP3]) Terrace Alluvium/Walnut Formation groundwater. The East Side Terrace Alluvium/Walnut Formation groundwater and West Side Terrace Alluvium/Walnut Formation groundwater alternatives also addressed surface water in Farmers Branch Creek (which feeds into the West Fork of the Trinity River) and Meandering Road Creek (which feeds into Lake Worth), respectively. The 2021 FFS also included the potential ARARs for AFP4, which included the MCLs or the Texas Risk Reduction Program (TRRP) Tier 1 protective concentration levels (PCLs), if they were more stringent than the MCLs, as the cleanup standards for groundwater and surface water.

Based on the detailed and comparative analyses presented in the 2021 FFS, the Preferred Alternatives for cleaning up the contaminated groundwater at AFP4 were published in the Proposed Plan (August 2022) and presented at a Public Meeting (September 2022).

Based on the EPA's response to the third Five-Year Review, the Air Force amended the 1996 ROD ARARs to select the MCLs as the cleanup standards for groundwater and surface water contaminants of concern (COCs). The COCs for all groundwater and surface water addressed by this ROD Amendment are trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), trans-1,2-dichloroethene (tDCE), and vinyl chloride (VC). Total chromium is also considered a COC for the West Side (CP3) Terrace Alluvium/Walnut Formation groundwater. The updated list of ARARs for the Selected Remedy for AFP4 Groundwater and Surface Water is provided in Appendix G.

2.3. Site Risks per the 1996 ROD

Table 2-1. Summary of Risks From 1995 Baseline Site Assessment*

Site	Human Health Risk	Ecological Risk
Air Force Plant 4 (AFP4) Landfill 3	Contaminants do not pose an excess risk to human health.	Concentrations of copper, lead, and zinc exceed ecological risk thresholds.
AFP4 Landfill 4	Concentrations of benzo[*a*]pyrene exceed human health risk thresholds.	Concentrations of arsenic, cadmium, and copper exceed ecological risk thresholds.
Building 181	Inaccessible soil contaminants located beneath Building 181 do not pose an excess risk to human health, although the presence of trichloroethene (TCE) in the vadose zone causes groundwater contamination.	Contaminants do not pose an excess risk to the environment (no pathway for exposure to soils beneath the building).
Meandering Road Creek and Lake Worth	Contaminants do not currently pose an excess risk to human health under current uses. The monitoring program ensures protectiveness.	Concentrations of silver and Aroclor 1254 exceed ecological risk thresholds.

East Parking Lot – Terrace Alluvial Flow System	TCE and dichloroethene (DCE) contamination is the source of contamination in the Paluxy aquifer. Suspected DNAPL beneath the Assembly Building. Upper zone flow system is hydraulically connected to the Upper Paluxy Sand Channels.	Contaminants do not pose an excess risk to the environment (the Remedial Investigation/Feasibility Study [RI/FS] risk assessment indicated hazard quotients of less than 1.0 for plume contaminants in all surface waters).
Paluxy Aquifers and Upper Paluxy Sand Channels Groundwater	Presence of TCE and 1,2-DCE in the Upper Paluxy Sand Channels beneath the East Parking Lot area and in the Upper Paluxy on the west side of the facility beneath Landfills 1 and 3 could cause excess human health risk in the future.	Contaminants do not pose an excess risk to the environment (no pathway).

* Table 2-1 is reproduced from Table 6-15 in the ROD and does not present any new risk conclusions and has not been edited for clarity.

2.4. Updated Site Risks per the 2023 ROD Amendment

Since the 1996 ROD was established, all but one of the White Settlement production wells have been abandoned, and the one remaining well (WS-H3) has been taken out of service; therefore, there is no domestic use of the groundwater. The sampling results from WS-H3 (the one remaining production well, which is currently not in use) have had COC concentrations below detection levels since 2000. ICs are in place on AFP4, NASFW, and BRAC Parcel G that ban the use of groundwater on these properties for purposes other than sampling. The ICs for BRAC Parcel G are provided in Section VII, Part 3 of the Deed Without Warranty in Appendix C. Therefore, the potential for direct exposure of groundwater to the nearby residents is considered incomplete.

The potential for AFP4 and NASFW workers to be exposed to chlorinated volatile organic compounds (cVOCs) through inhalation via vapor intrusion is negligible since cVOCs would have to migrate through the clayey Terrace Alluvium vadose zone, which is likely to adsorb the cVOCs prior to migration to the atmosphere. This was confirmed by the risk assessment in the RI. An additional vapor intrusion study (AR# 13163) was performed in B181 in 2021-2022. Results from the study indicated that the indoor air concentrations were one to four times lower in magnitude than the subslab vapor concentrations. B181 is only used for storage purposes; therefore, the potential for exposure is considered negligible.

There is a potential for dermal contact by site workers with groundwater during sampling and construction activities; however, this potential is considered negligible, as depth to groundwater is typically greater than the depth of construction activities. In addition, a Health and Safety Plan is required for all sampling and construction activities at the site, which dictates monitoring and personal protective equipment requirements to limit exposure.

There is a potential for dermal contact by the general public to surface water. In 2017, TCE, cDCE, and tDCE were detected in at least one of the samples collected from the seeps along the southwest edge of LF03. None of the detected concentrations from the seep samples were above their contact

recreation PCLs. The closest downstream surface water sampling location to the seeps in Meandering Road Creek had no cVOCs above detection limits. Based on the comparison of the data to the human health PCLs that are based on incidental ingestion and dermal exposure to the seep and closest surface water sampling point, there is no unacceptable human exposure at the seeps or in the surface water of Meandering Road Creek, which feeds into Lake Worth.

The risk assessment in the RI did not identify any ecological risks based on exposure to groundwater or surface water. Furthermore, the TCEQ established freshwater chronic benchmarks for TCE, VC and cDCE/tDCE mixed in August 2019. All the detected concentrations in the seeps and surface water are well below the freshwater chronic benchmarks, indicating that there is no risk to the aquatic community.

2.5. Response Actions

Once possible exposure pathways and potential risk have been identified at a site, cleanup alternatives are developed to address the Remedial Action Objectives (RAOs) identified for the site. Please note that 1996 action levels denoted in Table 2-2 were Alternative Concentration Levels (ACL) developed using site-specific data.

Table 2-2. 1996 ROD Summary of Selected Remedies

Site or Area	ROD/ESD Remedy [1]	Remediation Goals (RGs) or Objectives [9]	Numeric Goals or ACLs
AFP4 Landfill 3 (soil)	No Action (with monitoring)[2]	Prevent ecological exposure to concentrations of copper, lead, and zinc in soil.	563 mg/kg copper 2,000 mg/kg Lead 1,000 mg/kg zinc
AFP4 Landfill 4 (soil)	No Action (with monitoring)[2]	Prevent human ingestion of soil with benzo[*a*]pyrene at concentrations that cause an excess ILCR. Prevent ecological exposure to arsenic, cadmium, and copper in soil at concentrations greater than ecological risk thresholds.	29.1 mg/kg arsenic 132 mg/kg cadmium 563 mg/kg copper (No ROD action level for benzo(*a*) pyrene)
Building 181 (soil)	Soil Vapor Extraction	Prevent TCE concentrations in the soil from causing unacceptable groundwater contamination in the Paluxy Aquifer.	11.5 mg/kg TCE in soil
Meandering Road Creek (sediment, surface water)	No Action (with monitoring)[2]	Monitor concentrations of silver and Aroclor 1254 in Meandering Road Creek sediments for concentrations that may exceed ecological risk thresholds. (The 5,000 µg/L RG for TCE is based on an unreferenced risk calculation in the BRA)	<u>Sediment</u> 1.0 mg/kg silver 0.1 mg/kg Aroclor 1254 <u>Surface Water</u> 5,000 µg/L TCE [8]

Lake Worth (sediment, surface water)	No Action (with monitoring) [2]	Monitor concentrations of Aroclor 1254 in Lake Worth sediments for concentrations that may exceed ecological risk thresholds. (Lake Worth surface water monitoring and surface water RGs [MCLs] are related to the Basewide TCE Groundwater Plume)	Sediment 1.0 mg/kg silver 0.1 mg/kg Aroclor1254 Surface Water 5 µg/L TCE 70 µg/L cis-1,2-DCE 100 µg/L trans-1,2-DCE 2 µg/L VC
East Parking Lot – Terrace Alluvial Flow System (groundwater)	• Enhanced DNAPL removal using ERH [4] • Extraction and Treatment of Terrace Alluvium Groundwater • In situ contaminant destruction at the property boundary (Carswell zero-valent iron PRB) [5] • Institutional controls and land use controls [6] • Monitored natural attenuation [6] • Monitoring	• Prevent TCE concentrations from exceeding 400 ug/L in the Window Area. • Remove DNAPL from the groundwater in the area under Building 181 and under the southern portion of the Assembly Buildings/Parts Plant. • Prevent Terrace Alluvium groundwater with contamination above MCLs from migrating off AFP4 or NAS Fort Worth. • Prevent groundwater contamination from causing excess risk in surface water. • Ensure that human health and the environment are adequately protected in areas where Terrace Alluvium groundwater contaminants occur off federal property above the MCLs, and that the existing remedies (including MNA) will reduce Terrace Alluvium groundwater concentrations off federal property to below the MCLs within a reasonable timeframe.[6]	Building 181 Source Area 10,000 µg/L TCE [7, 8] At Property Boundary 5 µg/L TCE 70 µg/L cis-1,2-DCE 100 µg/L trans-1,2-DCE 2 µg/L VC In Window Area 400 µg/L TCE [8] Farmers Branch Creek 5,000 µg/L TCE [8] West Fork Trinity River 5 µg/L TCE
Paluxy Aquifer and Upper Paluxy Sand Channels Groundwater (groundwater)	• Extraction and Treatment of Paluxy and Upper Paluxy Sand Channels Groundwater. • Monitoring	• Paluxy Aquifer: Prevent future human exposure by ingestion or inhalation and dermal exposure during showering to VOC concentrations above the MCLs. Upper Paluxy Sand Channels: Prevent contamination in the Upper Paluxy Sand Channels from causing TCE contaminant levels in the PaluxyAquifer to exceed 5.0 ug/L.	Paluxy Aquifer 5µg/L TCE 70 µg/L cis-1,2-DCE 100 µg/L trans-1,2-DCE Upper Paluxy Sand Channels 400 ug/L TCE [3, 8]

[1] This table includes remedies specified in the ROD and in subsequent ESDs.
[2] 1996 ROD-selected remedy. Current practices would identify this as just "Monitoring".
[3] The 400 µg/L TCE RG for the Window area is based on a mixing calculation to be protective of the Paluxy Aquifer.
[4] The 2002 ESD changed the selected DNAPL-removal technology from surfactant-enhanced pumping to ERH.
[5] Remedy added by the 2007 ESD to maintain protectiveness after the 2007 sale of the Carswell BRAC Parcel G.
[6] Remedial action objectives added by the 2007 ESD to maintain protectiveness after the 2007 sale of the Carswell BRAC Parcel G.
[7] The 10,000 µg/L RG for Building 181 groundwater was based on the solubility of TCE and was chosen as an indicator that source removal had been completed.
[8] Texas regulations specify a standard of 5 µg/L for TCE in groundwater and surface water.
[9] ICs/LUCs are needed if RGs do not achieve unlimited use and unrestricted exposure.

2.5.1. 2023 ROD Amendment Summary of Selected Remedies

The 2021 FFS readdressed RAOs for AFP4 and updated RAOs were incorporated in the 2023 ROD Amendment. The updated RAOs for the AFP4 are the following:

- Restoration of the groundwater to satisfy MCLs established under the Safe Drinking Water Act (equivalent to the Tier 1 PCLs under TRRP);
- Prevent source area migration/expansion and contribution to the existing dissolved phase plume;
- Prevent current and future use of the groundwater impacted by past site operations with groundwater contaminants in excess of the MCLs;
- Prevent the potential that groundwater contaminants in excess of the MCLs to migrate laterally or vertically to off-site wells.

The following table, adapted from the 2023 ROD Amendment, compares and summarizes RAOs as identified in previous decision documents.

Table 2-3. ROD Summary of Selected Remedies

Groundwater Bearing Unit	1996 Record of Decision	2002 Explanation of Significant Differences	2007 Explanation of Significant Differences	2023 Record of Decision Amendment
Middle and Upper Paluxy				
Remedial Action Objectives	Prevent future human exposure by ingestion, inhalation during showering, and dermal exposure during showering to • 5 µg/L for TCE • 70 µg/L for cDCE • 100 µg/L for tDCE	No Change to the 1996 ROD	No Change to the 1996 ROD	Restoration of groundwater to satisfy MCLs established under the Safe Drinking Water Act (equivalent to the Tier 1 PCLs under TRRP): • 5 µg/L for TCE • 70 µg/L for cDCE • 100 µg/L for tDCE • 2 µg/L for VC Prevent source area migration/expansion and contribution to the existing dissolved phase plume. Prevent current and future use of the groundwater impacted by past site operations with groundwater contaminants in excess of the MCLs. Prevent the potential that groundwater contaminants in excess of the MCLs to migrate laterally or vertically to off-site wells.
Remedial Alternative	Groundwater extraction and treatment with near-zero off-gas emissions. Monitoring groundwater COC concentrations. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.	No Change to the 1996 ROD	No Change to the 1996 ROD	MNA ICs will be implemented through an Installation Development Plan. The ICs will include restricting use of any groundwater under AFP4 and NASFW property. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.

Groundwater Bearing Unit	1996 Record of Decision	2002 Explanation of Significant Differences	2007 Explanation of Significant Differences	2023 Record of Decision Amendment
<u>Upper Paluxy Sand Channels</u>				
Remedial Action Objectives	Prevent contamination in the Upper Paluxy Sand Channels from causing TCE contaminant levels in the Paluxy aquifer to exceed 5 µg/L by achieving: • 400 µg/L for TCE If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.	No Change to the 1996 ROD	No Change to the 1996 ROD	Restoration of groundwater to satisfy MCLs established under the Safe Drinking Water Act (equivalent to the Tier 1 PCLs under TRRP): • 5 µg/L for TCE • 70 µg/L for cDCE • 100 µg/L for tDCE • 2 µg/L for VC Prevent source area migration/expansion and contribution to the existing dissolved phase plume. Prevent current and future use of the groundwater impacted by past site operations with groundwater contaminants in excess of the MCLs. Prevent the potential that groundwater contaminants in excess of the MCLs to migrate laterally or vertically to off-site wells.
Remedial Alternative	Groundwater extraction and treatment with near-zero off-gas emissions. Monitoring groundwater COC concentrations.	No Change to the 1996 ROD	No Change to the 1996 ROD	MNA ICs will be implemented through an Installation Development Plan. The ICs will include restricting use of any groundwater under AFP4 and NASFW property. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.

Groundwater Bearing Unit	1996 Record of Decision	2002 Explanation of Significant Differences	2007 Explanation of Significant Differences	2023 Record of Decision Amendment
<u>Terrace Alluvium (includes Walnut Formation groundwater and surface water)</u>				
Remedial Action Objectives	Remove DNAPL from the groundwater in the area under B181 and under the southern portion of the Assembly Building/Parts Plant. Prevent groundwater in the Terrace Alluvium with contamination above MCLs from migrating off AFP4 or NASFW and prevent groundwater contamination from causing excess risk in surface water. RGs at AFP4 property boundaries are the EPA MCLs for drinking water: • 5 µg/L for TCE • 70 µg/L cDCE • 100 µg/L tDCE • 2 µg/L for VC RGs for groundwater in the vicinity of the B181 source area are: • 10,000 µg/L for TCE Prevent groundwater concentrations in the vicinity of the Window Area from exceeding: • 400 µg/L for TCE Reduce TCE concentrations in Farmers Branch Creek and Meandering Road Creek to: • 5,000 µg/L for TCE Reduce sediment concentrations in Meandering Road Creek to: • 1 mg/kg for silver • 0.1 mg/kg for Arochlor-1254	No Change to the 1996 ROD	Ensure that human health and the environment are adequately protected in areas where Terrace Alluvial groundwater contaminants occur off site above the MCLs and ensure the existing remedies (including MNA) will reduce off-site Terrace Alluvium groundwater concentrations to below the MCLs within a reasonable timeframe.	Restoration of groundwater to satisfy MCLs established under the Safe Drinking Water Act (equivalent to the Tier 1 PCLs under TRRP): • 5 µg/L for TCE • 70 µg/L for cDCE • 100 µg/L for tDCE • 2 µg/L for VC • 100 µg/L for total chromium (CP3 area only) A TI Waiver for the ARAR of achieving MCLs in the Terrace Alluvium/Walnut Formation groundwater in the DNAPL area of the LF01/LF03 area will be invoked. Prevent source area migration/expansion and contribution to the existing dissolved phase plume. Prevent current and future use of the groundwater impacted by past site operations with groundwater contaminants in excess of the MCLs. Prevent the potential that groundwater contaminants in excess of the MCLs to migrate laterally or vertically to off-site wells. *Reduce sediment concentrations in Meandering Road Creek to: • 1 mg/kg for silver • 0.1 mg/kg for Arochlor-1254

Groundwater Bearing Unit	1996 Record of Decision	2002 Explanation of Significant Differences	2007 Explanation of Significant Differences	2023 Record of Decision Amendment
<u>Terrace Alluvium (includes Walnut Formation groundwater and surface water)</u>				
Remedial Alternative East Side	Monitoring groundwater and surface-water (Farmers Branch Creek). Enhanced DNAPL/groundwater extraction and treatment with air stripping and destruction of contaminants SVE of the vadose zone to the B181 groundwater Initiating ICs to restrict future use of the Terrace Alluvium groundwater on AFP4 and NASFW. Contingency clause to initiate containment actions to prevent groundwater contamination above the MCLs from migrating beyond the AFP4 or NASFW boundaries. These included: • ERH (see 2002 ESD) • PRB (see 2007 ESD) • Excavation of landfilled material[1] • Phytoremediation[1] • In-situ chemical oxidation[1] • In-situ bioremediation[1]	ERH replaced surfactant-enhanced dissolution to optimize DNAPL removal in the B181/EPL groundwater	Memorialized the Air Force's implementation of the contingency clause through the construction of a PRB in 2002 prior to realignment of the federal property boundary. MNA in the now offsite areas of Hawks Creek Golf Club. ICs filed for the BRAC Parcel G.	MNA (monitoring includes groundwater and surface-water [Farmers Branch Creek]). *PRB will remain in place. ICs will be implemented through an Installation Development Plan. The ICs will include restricting use of any groundwater under AFP4 and NASFW property. * ICs filed for the BRAC Parcel G will remain in effect. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.

[1] Voluntary action taken by the Air Force.

Groundwater Bearing Unit	1996 Record of Decision	2002 Explanation of Significant Differences	2007 Explanation of Significant Differences	2023 Record of Decision Amendment
<u>Terrace Alluvium (includes Walnut Formation groundwater and surface water)</u>				
Remedial Alternative West Side – Landfills No. 1 & 3	Monitoring groundwater, surface-water (Meandering Road Creek and in Lake Worth), and sediment (Meandering Road Creek). Implementing contingency measures if monitoring indicates an increase in the concentrations of COCs. These included: • VEP[1] • Biowall[1] • ART well • In-situ bioremediation[1] • DNAPL extraction[1]	No Change to the 1996 ROD	No Change to the 1996 ROD	MNA (monitoring includes groundwater, surface-water [Meandering Road Creek], and *sediment [Meandering Road Creek]). Physical DNAPL removal from the Terrace Alluvium/Walnut Formation groundwater will be performed to the extent practicable in the LF01/LF03 area. *Biowall will remain in place. ICs will be implemented through an Installation Development Plan. The ICs will include restricting use of any groundwater under AFP4 property. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, contingency measures will be implemented.
Remedial Alternative West Side – Chrome Pit No. 3	None specifically noted for CP3 groundwater.	No Change to the 1996 ROD	No Change to the 1996 ROD	MNA. ICs will be implemented through an Installation Development Plan. The ICs will include prohibiting use of any groundwater under AFP4 property. If implementation of the selected remedy demonstrates it is technically impracticable to achieve and maintain the RGs, the selected remedy will be addressed in an additional ROD Amendment.

[1] Voluntary action taken by the Air Force.
* Maintained from either the 1996 ROD, 2002 ESD, or 2007 ESD.

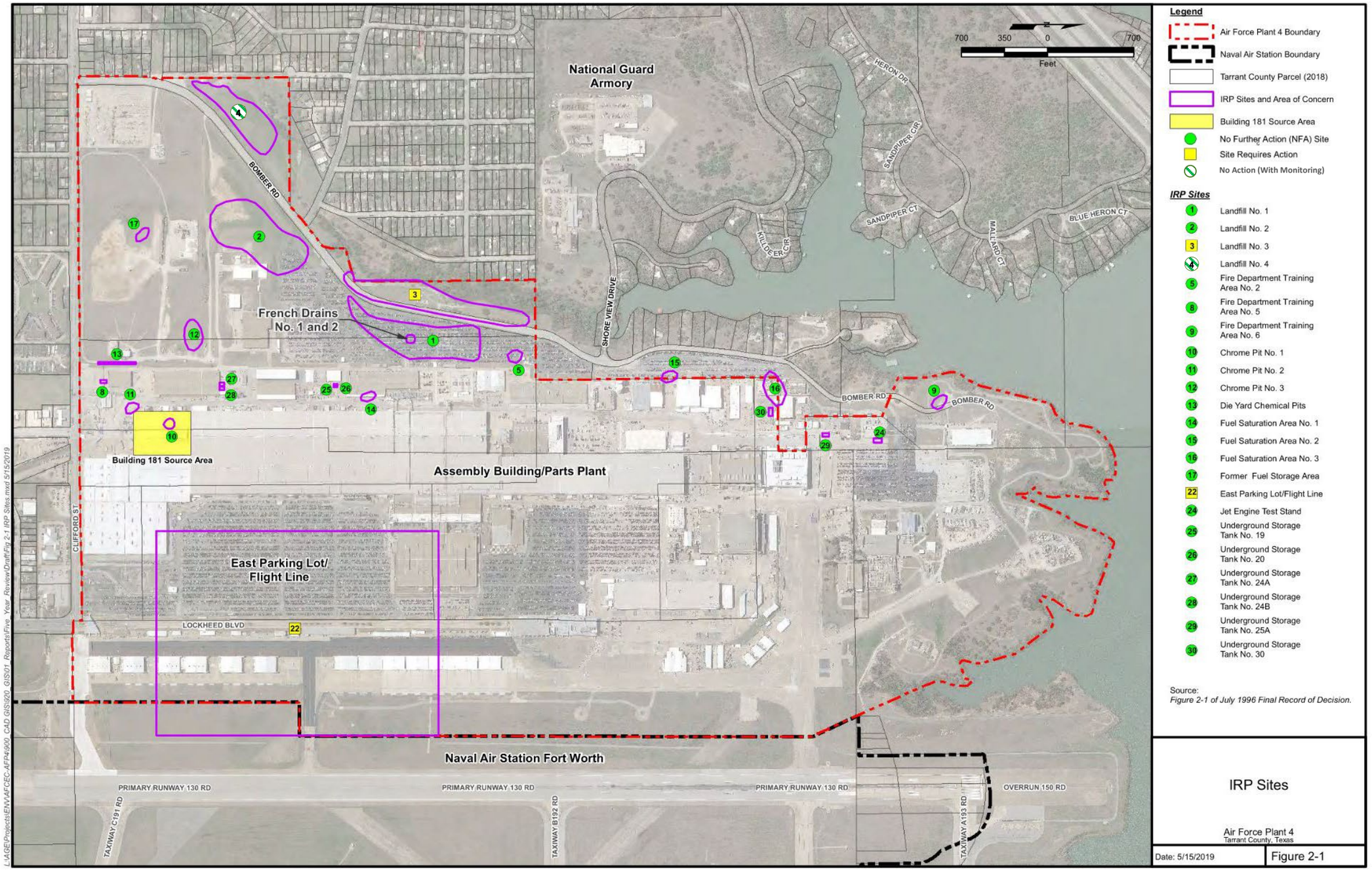
µg/L - micrograms per liter
AFP4 - Air Force Plant 4
ARAR - applicable or relevant and appropriate requirement
ART - Accelerated Remediation Technologies
B181 - Building 181
BRAC - Base Realignment and Closure
cDCE - cis-1,2-dichloroethene
COC - contaminant of concern
CP3 - Chrome Pit No. 3
DNAPL - dense non-aqueous phase liquid
EPA - United States Environmental Protection Agency
EPL - East Parking Lot
ERH - electrical resistance heating
ESD - Explanation of Significant Differences
IC - Institutional control
LF01 - Landfill No. 1 LF03 - Landfill No. 3
MCL - maximum contaminant level
mg/kg - milligrams per kilogram
MNA - monitored natural attenuation
NASFW - Naval Air Station Fort Worth
PCL - protective concentration level
PRB - permeable reactive barrier
RG - remediation goal
ROD - Record of Decision
SVE - soil vapor extraction
TCE - trichloroethene
tDCE - trans-1,2-dichloroethene
TI - Technical Impracticability
TRRP - Texas Risk Reduction Program
VEP - vacuum enhanced pumping

2.6. No Further Action Sites

The following No Further Action Sites and discussion were taken, with minor modifications, from the fourth FYR (URS, 2019) and the Final AFP4 2023 Annual Inspection Report (LKR, 2023).

- Jet Engine Test Stand (**OT000**)
- Landfill No. 1 (**LF001**)
- Landfill No. 2 (**LF002**)
- Fuel Saturation Area 1 (**SS014**)
- Fuel Saturation Area 2 (**SS015**)
- Fuel Saturation Area 3 (**SS016**)
- Former Fuel Storage Area (**SS017**)
- FDTA 2 (**FT005**)
- FDTA 5 (**FT008**)
- FDTA 6 (**FT009**)
- UST 19 (**ST025**) / UST 20 (**ST026**)
- UST 24A (**ST027**) / UST 24B (**ST028**)
- UST 25A (**ST029**)
- UST 30 (**ST030**)
- Chrome Pit 1 (**DP010**)
- Chrome Pit 2 (**DP011**)
- Chrome Pit 3 (**DP012**)
- Dye Pits (**DP013**)

Twenty of these sites were evaluated for Commercial/Industrial land use. Therefore, annual LUC inspections are performed at these 20 sites to document that no change in land use has occurred, the soil has not been disturbed, and appropriate signage is in place. Any impacted groundwater associated with these sites is addressed by the groundwater remedies. The locations of the 20 NFA sites per the 1996 ROD are shown in the IRP Sites map below. Brief descriptions of the 20 NFA sites are provided below. There was no change in land use or soil disturbance, and appropriate signage was in place during this review period.


National Guard Armory
French Drains No. 1 and 2
Building 181 Source Area
Assembly Building/Parts Plant
East Parking Lot/ Flight Line
Naval Air Station Fort Worth
BOMBER RD
CLIFFORD ST
LOCKHEED BLVD
PRIMARY RUNWAY 130 RD
TAXIWAY C191 RD
TAXIWAY B192 RD
TAXIWAY A193 RD
OVERRUN 150 RD
SHORE VIEW DRIVE
HERON DR
SANDPIPER CIR
SANDPIPER CT
KILLDEER CIR
MALLARD CT
BLUE HERON CT
700 350 0 700
Feet
Legend
Air Force Plant 4 Boundary
Naval Air Station Boundary
Tarrant County Parcel (2018)
IRP Sites and Area of Concern
Building 181 Source Area
No Further Action (NFA) Site
Site Requires Action
No Action (With Monitoring)
IRP Sites
1 Landfill No. 1
2 Landfill No. 2
3 Landfill No. 3
4 Landfill No. 4
5 Fire Department Training Area No. 2
8 Fire Department Training Area No. 5
9 Fire Department Training Area No. 6
10 Chrome Pit No. 1
11 Chrome Pit No. 2
12 Chrome Pit No. 3
13 Die Yard Chemical Pits
14 Fuel Saturation Area No. 1
15 Fuel Saturation Area No. 2
16 Fuel Saturation Area No. 3
17 Former Fuel Storage Area
22 East Parking Lot/Flight Line
24 Jet Engine Test Stand
25 Underground Storage Tank No. 19
26 Underground Storage Tank No. 20
27 Underground Storage Tank No. 24A
28 Underground Storage Tank No. 24B
29 Underground Storage Tank No. 25A
30 Underground Storage Tank No. 30
Source:
Figure 2-1 of July 1996 Final Record of Decision.
IRP Sites
Air Force Plant 4
Tarrant County, Texas
Date: 5/15/2019
Figure 2-1
I:\AGE\Projects\ENVAFCEC_AFP4\900_CAD GIS\920_GIS\01_Reports\Five_Year_Review\Draft\Fig 2-1 IRP Sites.mxd 5/15/2019

Jet Engine Test Stand (**OT000**)

Located in the northern portion of AFP4, the OT000 site is in a fuel test center with previously documented fuel contamination. In 1987, the site was identified as having VOC contaminated soil and groundwater. This was reported in historical employee accounts of jet fuel and gasoline in sumps.

Shallow polynuclear aromatic hydrocarbon contamination in soil is present to the west (0 to 5 feet depth). The COCs are coal tar derivatives that are not commonly found in jet fuel. The nature of the COCs and the shallow depth of impacted soils suggest the source is asphalt. The estimated volume of contaminated soil in this area is about 3,000 cubic yards. The other area of identified contamination in the vadose zone is associated with the removal of underground storage tank (UST) 25A. Soil samples collected in 1986 contained up to 1,700 mg/kg fuel hydrocarbons. In 1991, seven soil samples from three borings along the site periphery exhibited a maximum total petroleum hydrocarbon (TPH) concentration of 5.1 mg/kg.

The site currently meets a C/I land use criterion and is protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

Landfill 1 (**LF001**)

The LF001 site is a 6-acre site, which was used from 1942 to approximately 1966 for the disposal of general refuse, construction debris, solvents, thinners, paint sludges, oil, fuels, and unspecified liquid wastes. The landfill was closed in 1966 and paved for employee parking. Multiple improvements including French Drains 1 and 2 and excavation of contaminated soils have been made to prevent leachate from entering the storm sewer. During the 2019 FYR, a pilot study was underway at LF001 that involves physical removal of DNAPL using a system of extraction wells. The study was completed by the time of this inspection and minimal amounts of DNAPL are now removed from these wells. Inspections of French Drains 1 and 2 show they are well maintained with the surrounding land remaining as paved employee parking.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment.

Landfill 2 (**LF002**)

The site consists of an 8-acre landfill west of Building 14 in the northern part of the Radar Range and approximately 300 feet east of Meandering Road Creek. LF002 was operational from 1942-1960s and reportedly received construction rubble, plaster, lumber, and tires. The landfill presently has a non-engineered cap and is covered with grass. No reports exist of hazardous wastes being disposed in this landfill.

Soil in LF002 was sampled in 1982 and again in 1989. In 1982, three VOCs were detected in soil

during the installation of a monitoring well at concentrations less than 1 mg/kg. In 1989, 39 samples were collected from seven borings; toluene was detected in only one sample at a concentration less than 1 mg/kg. Historical groundwater investigations determined that metals (chromium and lead) were present in groundwater above drinking water MCLs in one well.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

FDTA 2 (**FT005**)

The FT005 Former Fire Department Training Area is located north of Landfill 1 and beneath the West Parking Lot. The former 50-foot diameter earthen ring fire pit operated from 1955 to 1956 and was used for fire training exercises about twice per year using about 250 gallons of waste oil and fuel per exercise.

Approximately 5,700 cubic yards of soil was excavated in 1993 after fuel-related free product was identified in site soils. On-site biological treatment of non-excavated soils began in 1993 and was completed in 1996. The status of any remaining contaminants in soil or groundwater is not known. The site is currently paved/capped with asphalt, which further protects human health and the environment.

The site currently meets commercial/industrial (C/I) land use criteria and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment.

FDTA 5 (**FT008**)

The FT008 Former Fire Department Training Area located south of Building 96 operated in the mid-1960s. The approximately 35- by 45-foot shallow pit was used for fire training exercises burning waste fuels, oils, and unspecified chemicals.

Previous investigations found VOC and SVOC contamination in site soil and groundwater, and fuel related hydrocarbons (including free product in one well near the site) and arsenic in site monitoring wells at concentrations greater than the MCL (which was 0.05 milligrams per liter (mg/L) at the time of the investigation). The RI report (Rust Geotech, 1995a) estimated soil impact to depths of 15-20 feet below ground surface (bgs), which is close to the estimated 23 feet depth to the water table. The FS (Rust Geotech, 1995b) stated that under the excavation alternative, 900 cubic yards of soil would have to be excavated. However, the BRA concluded that the contaminants do not pose an unacceptable risk to human health or the environment.

Therefore, no response action was taken and the status of any remaining contaminants in soil or groundwater is not known. The FT008 Former Fire Department Training Area is currently

paved/capped with asphalt and is underneath one of the most heavily used roadways at AFP4. The asphalt cover prevents any remaining contaminant migration via infiltrating precipitation.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

FDTA 6 (**FT009**)

Site FT009, located in the northernmost portion of AFP4 and a few hundred feet west of Lake Worth, is a former fire training site that consisted of a 50-square foot gravel-lined ring used as the plant's primary fire training area from the 1950s to 1980. Periodic training exercises used approximately 250 gallons of waste fuels and oils per exercise. Before 1970, training exercises were conducted twice a year; after 1970, exercises were conducted monthly.

During previous investigations, groundwater samples were not collected because Terrace Alluvium groundwater was not encountered in borings drilled in the underlying Walnut Formation, an aquitard, which was encountered at depths of less than 3 feet. Because the depth to the Walnut Formation is so shallow, and groundwater was not encountered, groundwater contamination in the Terrace Alluvium has not been a concern in the past.

The area was excavated under an IRA and some, but not all, of the impacted soil was removed in 1982-1983. A subsequent investigation in 1986 continued to show residual impact to the soils. The previous IRA and various earth-moving activities are reported to have redistributed the impacted soils around the site. The 1996 USAF Fact Sheet for the site states that removal of an estimated 170 cubic yards of contaminated soil would be required for remediation, but the basis of this estimate and the goal of the remediation (e.g., to attain industrial or residential standards) were not provided.

The site currently meets a C/I land use criterion and was previously determined to be protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site. Please see section 6.0 Issues/Recommendations for suggested actions.

Chrome Pit 1 (**DP010**)

Chrome Pit 1 is reported to be an unlined pit that was operational in the 1940s. Historical reports note that in addition to the chrome waste, miscellaneous liquids and solid wastes were disposed of here. The actual location was not confirmed, but it is reported that Building 181 is built on top of the former disposal pit. The 1991 Draft Final NFA Decision Document for this site has a figure that indicates the approximate location as about 125 feet east of the western wall, and about 300 feet north of the southern wall of Building 181. However, the actual location could not be confirmed through interviews, aerial photographs, or by other means and therefore, the site cannot

conclusively be determined to be a source of any of the groundwater contaminants present in the Building l81 area.

Since the exact location of the former pit underlies Building 181 and has not been confirmed, it is uncertain whether findings from previous investigations within Building 181 relate to potential contamination from Chrome Pit 1 or other confirmed sources in the area. Because the pit is beneath the building it was determined that surface water and dermal contact pathways were not complete and that the Chrome Pit 1 was not a significant source of contamination at AFP4.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

Chrome Pit 2 (**DP011**)

Chrome Pit 2 was located in the southwest corner of the Building 181 Assembly/Parts Plant; however, the exact site location is unknown. Whether the former location was under the current Building 181 or just outside, it is currently capped/paved with concrete and/or asphalt. This unlined chrome disposal pit was operational in the 1940s, and in addition to the chromate sludge, there were miscellaneous liquids and solid wastes reportedly disposed in the pit.

During previous investigations, two soil borings and two monitoring wells were installed in the suspected Chrome Pit 2 vicinity. One of the wells was installed in the suspected Chrome Pit 2 location and one hydraulically upgradient. There were no soil contaminants detected at levels indicative of a source area, and although TCE was detected above the MCL in the presumed site well, the upgradient well had a much higher concentration; therefore, the TCE is believed to be associated with the larger base wide plume emanating from the Building 181 source. Chromium was not detected above the MCL.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

Chrome Pit 3 (**DP012**)

DP012 was a large earthen pit located in the southern portion of Plant 4 west of Building 12. It was operational from 1957 to 1973 and received chromate sludge, dilute metal solutions, and other unidentified liquids. A soil removal action was completed in 1984. Confirmation sampling revealed low levels of organic compounds. A set of pilot studies to evaluate enhanced bioremediation at DP012 occurred between 2008 and 2015. Soil sampling between 2016 and 2017 found that limited areas of vadose and saturated zone soils still contained chromium concentrations indicative of potential leaching into the groundwater. The addition of monitoring wells to delineate

groundwater contamination between 2017 and 2019 revealed that little lateral migration was occurring away from the former pit area but some vertical migration into the Upper Paluxy aquifer was observed. No lateral migration within the Upper Paluxy aquifer was observed.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment.

Dye Pits (**DP013**)

The DP013 Dye Pits are located south of Building 12, just east of the Radar Range, and about 400 feet southwest of the Building 181 Assembly/Parts Plant. The pits were constructed in 1956 and are reported to have been three pits that were overall 20 feet wide, 90 feet long, and 10 feet deep and contained chromate sludge, metal solutions and chemical wastes. TCE is reported in both the soil and groundwater from the surface to bedrock depths, and the site was considered a source of TCE and other VOCs to the site-wide groundwater.

In 1983 and 1984, the pits were remediated by excavating approximately 1,100 cubic yards of contaminated soil; however, the 1996 USAF Fact Sheet for this site states that significant contamination was detected post excavation, and it is suspected that contaminated soil was originally used in the post-excavation soil grading which would extend the area of remaining contamination. Based on the soil boring data, approximately 4,750 cubic yards of soil is impacted with TCE and an additional amount of soil to the west may be impacted in the area where underground utilities prevented the investigation of the soils. The site is currently paved.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment.

Fuel Saturation Area 1 (**SS014**)

The FSA-1 site is located just west of the Parts Plant and underneath and east of Building 14. The ground at this location reportedly became saturated by leaking fuel lines from the mid-1970s to the early 1980s. The saturated area was immediately north of a former UST site where three fuel tanks (containing JP-5 and gasoline) and a fuel pumping station were removed prior to 1988. A 4-inch JP-4 pipeline also passed through the FSA-1 area with several bends at this location. This pipeline was abandoned and filled with concrete. In addition, a fuel pumping station and two 12,000-gallon-capacity USTs, UST 19 and UST 20, were removed prior to 22 December 1988, which was the effective date of Federal Subtitle I regulations. These tanks were formerly located south of Building 14 and contained 2-butanone (UST 19) and xylene (UST 20). No further remedial action was performed after removal of the tanks. The excavations were backfilled and paved.

RI vadose and saturated zone soil samples collected near former UST 19 and UST 20 indicated

the presence of 2-butanone, toluene, chloroform, ethylbenzene, xylene, and bromodichloromethane. Concentrations of 2-butanone, toluene, chloroform, and bromodichloromethane up to 1,800, 12,000, 1,900, and 600 mg/kg, respectively, were detected in two boreholes from a zone between 15 and 25 feet bgs. A sample obtained from this zone failed the toxicity characteristic leaching procedure test for 2-butanone. Floating product was identified in one monitoring well, and product sample analysis determined the composition to be closest to weathered JP-4 fuel.

Petroleum-related hydrocarbons found in soil samples reflected leaks in different parts of the underground fuel pipeline. Relatively low concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) occurred mostly in samples obtained from the saturated zone. TPH appeared more widespread than BTEX, occurring in both vadose and saturated zone samples. TPH concentrations were below 10 mg/kg. Several SVOCs that are typically related to petroleum products were detected. These compounds were present only in soil samples associated with the most southern TPH contamination, which indicates the source was related to fuel leaks and the underground piping.

In 1992, as a voluntary measure, the USAF installed groundwater collection and treatment and bioventing systems to address identified FSA-1 contaminated soils and groundwater. The groundwater collection and treatment system were designed to extract and treat groundwater and light non-aqueous phase liquid. The FSA-1 treatment plant, which received the extracted site fluids, is located about 400 feet northwest of the SS014 site and not a part of the site delineated by the approximate extent of the former leaked fuels. The plant had the capacity to treat 70 gallons of contaminated groundwater per minute with an air stripper and carbon adsorption.

Bioventing and groundwater treatment were stopped for the FSA-1 site in 1995, presumably based on diminishing contaminant returns.

The FSA-1 treatment plant treated groundwater collected in French Drains 1 and 2 within LF001. Presently, FSA-1 treatment plant operations are suspended during implementation of LTM and physical removal of DNAPL by pumping and hand bailing using a system of extraction wells.

Based on the RI data, the baseline risk assessment determined that the soil contamination at FSA-1 does not cause an excess risk to human health or the environment, and the ROD designated this site as NFA for soils. Any groundwater contamination at FSA-1 is considered part of the West Plume. The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at the SS014 site.

Fuel Saturation Area 2 (**SS015**)

The FSA-2 site, located northwest of Building 176, was reported to be saturated in the 1970s and early 1980s with fuel from a buried leaking pipeline. The RI, which included soil borings, a soil gas survey, and groundwater samples from two monitoring wells, found negligible amounts of

TPH in the soil and no groundwater contaminants exceeding regulatory criteria. There may still be small amounts of TPH (fuels) in the site soils.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

Fuel Saturation Area 3 (**SS016**)

The FSA-3 site is located east of Bomber Road between Buildings 154 and 142 in the northwestern portion of AFP4. Buried fuel pipelines leaked in the 1970s to 1980s and free product (light nonaqueous phase liquids) was detected in 7 of 13 monitoring wells in earlier investigations. Significant contamination from JP-4 related compounds was found in soils from the FSA-3 area. The highest levels of contamination occurred in a boring near the suspected location of leakage from an underground fuel line. This westernmost source area was believed to be the main contributor to the widespread groundwater contamination with floating product found to exist in the FSA-3 area. The total estimated volume of soil contaminated with TPH was estimated to be approximately 40,000 cubic yards.

An interim remedial action consisting of a groundwater treatment system and SVE was installed in 1992 to address site soil and groundwater contamination. The treatment system is still at the site but has not been operated for several years, as the concentrations of contaminants have been significantly reduced through the interim remedial action.

Based on the results of the completed investigations and the results of the baseline risk assessment, the 1996 ROD designated this site as NFA for soil. The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

Former Fuel Storage Area (**SS017**)

The Former Fuel Storage Area is located in an open field approximately 600 feet south of LF002. The 100,000-gallon above ground storage tank, reportedly used to store aviation fuel (JP- 4), leaked sometime between the 1940s and 1962 when it was removed from service and the contaminated soil was excavated. The 1995 RI found low levels of VOCs and SVOCs, with the primary contaminants including oil and grease, methylene chloride, and di-n-butyl phthalate.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in

the near future. There are no USAF plans for changing land use at this site.

UST 19 (**ST025**) / UST 20 (**ST026**)

UST 19 and UST 20 were two 12,000-gallon USTs installed adjacent to each other in the 1970s. The tanks were co-located south of Building 14. UST 19 was reported to contain 2-butanone and UST 20 contained 2-butanone, ethylbenzene, and xylene.

The USTs and a fuel pumping station were removed in 1988 and four soil samples were collected from the tank excavation. Xylene, ethylbenzene, and 2-butanone were detected at the following concentrations: xylene (0.14 to 46 mg/kg), ethylbenzene (0.051 to 22 mg/kg), and 2- butanone (2.7 to 43 mg/kg). In 1991, 27 soi1 samples were collected from five borings drilled at the tank excavation sites. Detected concentrations of 2-butanone, xylene, and ethylbenzene in the soil samples were less than 1.0 mg/kg. The 1996 USAF Fact Sheet for these sites states that residual soil contamination probably exists in a 100- by 200-feet area about 20 to 25 feet bgs. This residual soil contamination exists because closure was performed based on a risk assessment that assumes low potential exposure and frequency as the site usage is industrial in nature. The excavation was backfilled, and the sites are currently paved over. The sites are located in a very active portion of the facility.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

UST 24A (**ST027**) / UST 24B (**ST028**)

UST 24A and UST 24B were two 8,000-gallon USTs co-located north of Building 12 and reportedly contained gasoline. After removal of the adjacent tanks in 1988, the excavation was backfilled and paved. The sites are currently in an area of heavy AFP4 traffic. During UST removal, no attempt was made to determine the extent of impacted soils. The USTs reportedly stored gasoline, but soil sampling showed the presence of 1,1,1-trichloroethane, trans-1,2-dichloroethane, tetrachloroethene, methylene chloride, TCE, toluene and xylene. The 1996 USAF Fact Sheet for these sites states that further testing resulted in an estimate of 240 cubic yards of contaminated soil associated with this site.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

UST 25A (**ST029**)

The UST 25A site consists of two tanks (unknown size vertical tanks) that were reportedly used to store JP-4 fuel and were removed in 1988. The site is located in the northern portion of AFP4, northeast of Building 142, and adjacent to Building 21 and the Jet Engine Test Stand area.

The site was paved over following tank removal and backfilling in 1988. During tank removal, impacted soils were not excavated and removed. One tank was noted as having fist-sized holes, and the pipeline supplying the tanks was observed to have leaked. Nine confirmatory soil samples collected from the excavation were submitted for fuel hydrocarbon analyses. One soil sample contained benzene (2.2 mg/kg), ethylbenzene (3.6 mg/kg), and toluene (8.3 mg/kg). In 1991, four soil borings were drilled at the site of the UST 25A tank excavation. Eleven soil samples were submitted for SVOC and VOC analysis. Ethylbenzene was detected at less than 1.0 mg/kg and 2-methylnaphthalene was detected at 3.9 mg/kg. The 1996 USAF Fact Sheet associated with this site states that an estimated 100 cubic yards of contaminated soil are associated with this site. No information was located concerning any groundwater investigative activities that may have been performed at the site.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

UST 30 (**ST030**)

UST 30 was located in the northern portion of AFP4 north of Building 157 and the Down Lot to the east, near FSA-3 and Building 142. UST 30 was a 2,000-gallon steel tank that reportedly stored JP-4 jet fuel before being removed in 1988.

Soil was not excavated during the tank removal, and the area was backfilled and paved with asphalt. A soil sample from the bottom of the excavation contained BTEX at concentrations between 1.0 and 3.1 mg/kg. Subsequent sampling in 1991 from four boreholes (8 samples total) at the location of the former UST had no detections of VOC or SVOC constituents. There does not appear to be any groundwater data available for the site.

The site currently meets a C/I land use criterion and is protective of human health and the environment. Annual inspections and the five-year review document that site conditions continue to be compliant. This documentation ensures the site status remains protective of human health and the environment. It is unlikely that the current C/I land use at the AFP4 facility will change in the near future. There are no USAF plans for changing land use at this site.

No additional *No Further Action Sites* have been identified.

2.7. Status of Implementation

The following text has been taken, with minor modifications, from the 2019 FYR and the 2023 ROD Amendment.

The implementation of ERH in 2002 at Building 181 was deemed successful in eliminating TCE concentrations in soil from leaching to groundwater in the Paluxy Aquifer. Intermittent operation of the SVE system and groundwater extraction in the area ceased in January 2009. ICs are being implemented and will be formalized through an Installation Development Plan to restrict the use of any groundwater under AFP4 and NASFW property. ICs filed for the BRAC Parcel G remain in effect.

Long-term monitoring of surface water and sediment within Meandering Road Creek remains in effect. However, since 2006, surface water is only sampled for TCE and daughter products as part of the Terrace Alluvial Flow System monitoring. Voluntary monitoring of metals was discontinued after concentrations were proven stable, decreasing, or non-detect. Surface water sampling occurs at the inlet to Lake Worth for TCE and daughter products, also as part of the Terrace Alluvial monitoring program. Bed sediment sampling for Lake Worth was discontinued in 2006, although transported sediment sampling continues near the mouth of Meandering Road Creek at the inlet to Lake Worth.

With concurrence from EPA and TCEQ, treatment of groundwater within the Terrace Alluvial and Paluxy Aquifers was suspended in 2014 while enhanced in-situ bioremediation and MNA were being evaluated. LTM, implementation of the Carswell PRB (Terrace Alluvial only) and the biowall at Landfill 3 continue. Monitoring optimizations based on concentration trends allow for various well locations to be sampled either semi-annually, annually, or biennially. The most recent optimization plan was finalized in 2016 (LKR, 2016a), and implemented in 2019. Additionally, several restrictive covenants (which prevents all uses of groundwater, except for sampling, and excavation of soils until UU/UE levels are attained, as described in Table 2-3) were recorded at the Tarrant County Registry of Deeds when BRAC Parcel G was transferred to the Westworth Redevelopment Authority and are serving to protect against contact with impacted media which has migrated off federal property. A Copy of the Deed Without Warranty containing these restrictive covenants can be found in Appendix C.

Operation of groundwater recirculation within French Drains 1 and 2 continued until January 2020 and groundwater treatment through the FSA-1 treatment system was discontinued as it was not directly addressing the source area or appreciably contributing to mass recovery. An enhanced in-situ biodegradation approach was then evaluated while periodic manual recovery of DNAPL continues. A pilot study to directly address the DNAPL source area using EISB was implemented in 2013. The EISB pilot study was terminated after 1 of 4 carbon-source injections resulted in groundwater with depleted DO content and elevated total organic carbon (TOC) concentrations had infiltrated a damaged storm water pipe and discharged to the creek, creating inhospitable conditions for the fish. Although repairs were made to the storm drain, they did not eliminate groundwater infiltration. The FSA-1 treatment system has remained offline.

In July 2021, the Air Force finalized an FFS, which developed new alternative remedies for the five distinct groundwater bearing units at the site. The alternatives developed for the West Side

Terrace Alluvium and Walnut Formation groundwater in the LF01 and LF03 area included a TI Waiver for the MCL ARARs in the area with persistent DNAPL in fractured bedrock. This is necessary because site conditions make it unfeasible for remediating the aquifer in a reasonable time frame. The TI Waiver area encompasses approximately 3 acres (Appendix B-1) and extends to the bottom of the fractured bedrock at approximately 45 feet bgs. The TI Waiver area accounts for <1% of the total 534-acre Terrace Alluvium/Walnut Formation groundwater plume that extends across AFP4.

On 17 March 2022, the EPA acknowledged in an email that AFP4 had successfully met the TI consultation requirements and the waiver was to be formally implemented with the completion of the ROD Amendment.

2.8. IC Summary Table

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date [1]
Multiple Media (e.g., soils and groundwater)	Yes	Yes	BRAC Parcel G, now Hawks Creek Golf Club (18 individual parcels): 187.29 acres	To prohibit use of property for residential purposes, hospitals for human care, public or private schools for persons under 18-year-old, or daycare centers for children.	Deed Without Warranty 30 April 2007
Soil	Yes	Yes	BRAC Parcel G, now Hawks Creek Golf Club (18 individual parcels): 187.29acres	To prohibit excavation in shallow groundwater areas within footprint of plume.	Deed Without Warranty 30 April 2007
Groundwater	Yes	Yes	BRAC Parcel G, now Hawks Creek Golf Club (18 individual parcels): 187.29 acres	To prohibit extraction of any water from below ground, except for monitoring purposes.	Deed Without Warranty 30 April 2007
Multiple Media (e.g., soils and groundwater)	Yes	Yes	BRAC Parcel G, now Hawks Creek Golf Club (18 individual parcels): 187.29 acres	To prohibit any construction activity which would interfere with remediation efforts, including the integrity of the PRB wall.	Deed Without Warranty 30 April 2007

[1] See Appendix C.
BRAC - Base Realignment and Closure
ICs - Institutional Controls
UU/UE - Unlimited Use and Unlimited Exposure
PRB – Permeable Reactive Barrier

2.9. Systems Operations/Operations & Maintenance

Groundwater extraction and treatment in the Terrace Alluvial and Paluxy Aquifers was suspended in 2014 but the biowall at Landfill 3 is still operational. Operation and maintenance (O&M) of the system is still conducted on a monthly basis to ensure it will function if needed; however, a transition to MNA was promulgated in the 2023 ROD Amendment. Suspending operation has resulted in a significant annual cost saving.

The Carswell PRB is a remedy which utilizes in-situ zero-valent iron to reduce contaminant mass migrating off federal property. Injection of in-situ chemical reduction agent EHC®-L within recirculation wells along the Carswell PRB was performed in 2015 and the barrier will remain in place per the 2023 ROD Amendment as MNA becomes the selected remedy.

Monthly bailing/collection of DNAPL (take to an off-site disposal facility) and maintenance of the well network, including repair of damaged well pads, monuments, bollards, casing, and caps, is ongoing. Costs associated with both activities is minimal and recurring.

3.0 PROGRESS SINCE LAST REVIEW

This section includes the protectiveness determinations and statements from the last five-year review as well as the recommendations from the last five-year review and the current status of those recommendations.

Table 3-1. 2019 FYR Protectiveness Statements

Protectiveness Statement(s)	
Operable Unit: 1 (Sitewide)	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at AFP4 is protective of human health and the environment in the short-term. Exposure pathways that could result in unacceptable risk are being addressed through institutional controls. However, to ensure that the remedy remains protective in the long-term, the following actions will be taken: • The ongoing alternative remedy pilot studies, MNA evaluation, and TI waivers will be completed and incorporated into a FFS. The FFS will also incorporate new ARARs and TBC criteria to ensure long-term protectiveness of human health and the environment as it relates to surface water and groundwater contamination both onsite and off-site. • A vapor intrusion assessment for Building 181 is programed for fiscal year 2020. LM is currently designing a sub-slab vapor mitigation system to address potential unacceptable human health risks from the vapor intrusion pathway. The Final Focused Feasibility Study is scheduled for 30 June 2020, the Final Proposed Plan is scheduled for 8 December 2020, and the Final ROD Amendment is scheduled for 28 December 2021 such that protectiveness can be re-evaluated in the Fifth Five-Year Review Report. The ROD Amendment will also incorporate all interim and voluntary remedial actions that were not memorialized in the 1996 ROD.	

Table 3-2. 2024 FYR Protectiveness Statements

Protectiveness Statement(s)	
Operable Unit:	***Protectiveness Determination:***
1 Sitewide	Short-term Protective
Protectiveness Statement: The remedy at AFP4 protects human health and the environment and presently there is no evidence of exposure. The 2023 ROD Amendment addressed concerns raised following the previous Five-Year Review as it contains a new set of RAOs that were developed upon completion of the FFS. Human and ecological exposure pathways that could otherwise result in unacceptable risks are being managed by institutional controls, such as land and building use controls, to prevent exposure to contaminated media. Threats are currently being addressed in the TCE plume by a combination of removal and degradation of COCs by MNA, however long-term protectiveness will require optimization of the Sampling and Analysis Plan. Protectiveness of the new RAOs will continue to be verified by the long- term monitoring program, which monitors sediment, surface water, and groundwater concentrations of COCs.	

Detailed recommendations from the 2019 FYR are listed in Table 3-3 below**.** All recommendations have been addressed and revised by the 2023 ROD Amendment.

Table 3-3. Status of Recommendations from the 2019 FYR

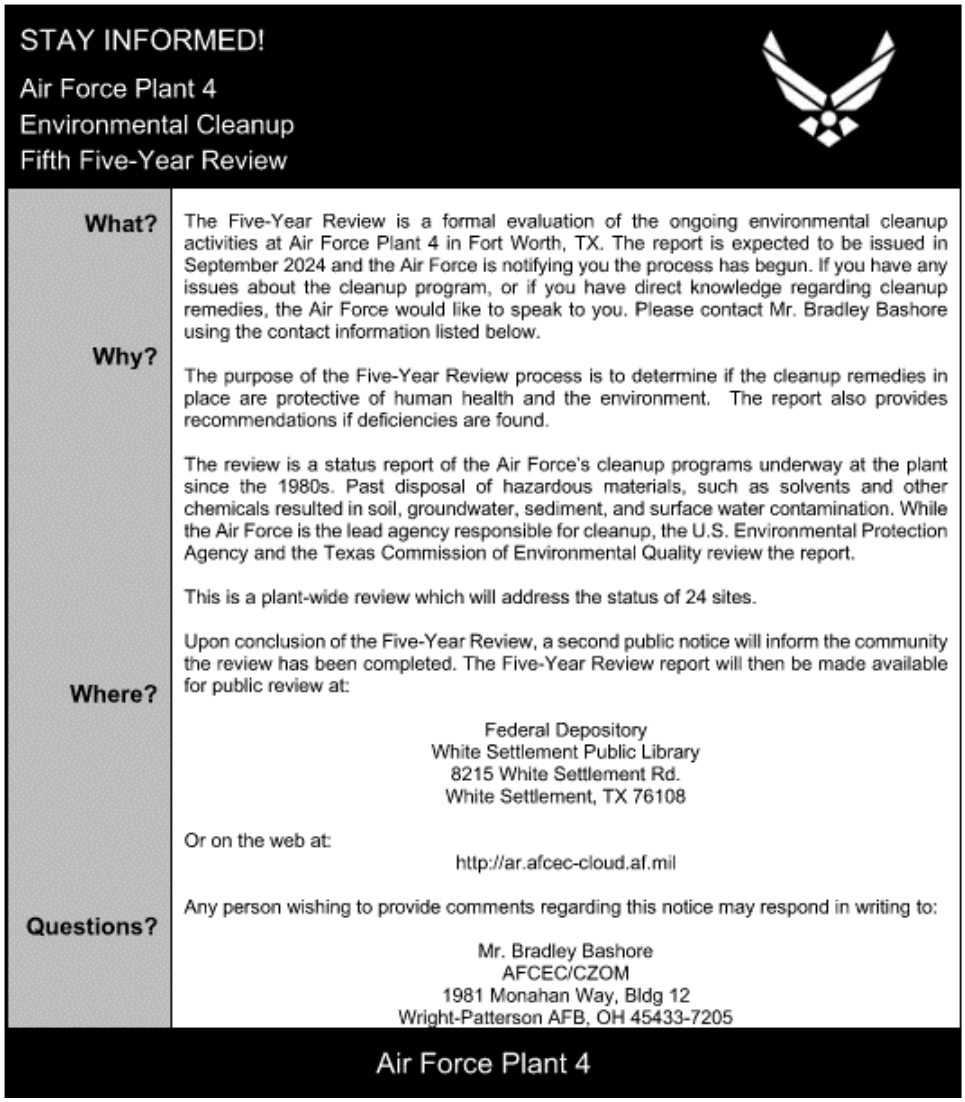
OU #	Issue	Recommendations	Status	Current Implementation Status Description	Completion Date (if applicable)
1 (Site-wide)	Current RGs for surface water and groundwater do not meet the appropriate cleanup standards (MCLs) for TCE, as documented by a 30 September 2014 letter from the EPA disputing protectiveness determinations from the previous FYR.	Submittal of a ROD Amendment to assess and redevelop ARARs for the long-term protectiveness of human health and the environment as it relates to surface water and groundwater contamination both on site and off site.	Completed	The 2023 ROD Amendment updated ARARs, including alternative remedies and modifying the remedy to include MNA and a TI waiver.	ROD Amendment Completed April 2023.
1 (Site-wide)	Voluntary or interim remedial action remedies not memorialized according to CERCLA requirements.	Submittal of a ROD Amendment to include all voluntary or interim remedial actions performed in relation to the IRP sites, and as part of a final selected remedy under CERCLA. This should include the LUC inspections that are currently performed at the sites designated as NFA in the 1996 ROD.	Completed	Per the 2023 ROD Amendment, a MNA/LTM program must be formalized in an updated Sampling and Analysis Plan. ICs will be implemented through an Installation Development Plan (IDP). The ICs will include restricting use of any groundwater under AFP4 and NASFW property.	MNA Ongoing Completed Sampling and Analysis Plan expected in 2024. Completed IDP expected in 2024.
1 (Site-wide)	The ROD does not address the vapor intrusion pathway for protection against human health and the environment. Findings from the 2018 Burns & McDonnell studies at Building 181.	Expanded vapor intrusion investigation, to include multiple rounds of sub-slab and indoor air sampling from Building 181, and submittal of a ROD Amendment, if necessary, to establish RAOs and RGs for the mitigation of potential vapor concerns as they relate to human health.	Completed	While the B181 VI study was completed in 2022, however, the potential for vapor intrusion affecting indoor air quality in the office and laboratory adjacent to Building 181 should be evaluated.	Vapor intrusion study for building B181 completed in 2022.

1 (Site-wide)	The Final Site Inspection Report for the Site Inspection of six AFFF Release Areas at AFP4 was published in March 2019 and identified PFAS impacts to soil, subsurface soil, groundwater, and sediment.	Implement appropriate follow-on actions in accordance with AFCEC policy and CERCLA guidance.	Ongoing	The USAF identified AFFF-impacted areas during a 2023 SI. AFFF impacted areas and non-AFFF potential sources of PFAS are being addressed by the USAF with four currently in the early stages of remedial actions.	AFFF SI Completed in 2023.

4.0 FIVE-YEAR REVIEW PROCESS

4.1. Community Notification, Involvement & Site Interviews

A public notice was made available in the Fort Worth Star-Telegram newspaper on 19 February 2024, stating that a five-year review was underway and inviting the public to submit any comments to the Air Force Remedial Project Manager (RPM). Proof of the public notice is provided in Appendix D. The results of the review and the report will be made available at the AFP4 information repository located at the White Settlement Public Library, and online at: http://ar.afcec-cloud.af.mil.



STAY INFORMED!

Air Force Plant 4
Environmental Cleanup
Fifth Five-Year Review

What?

The Five-Year Review is a formal evaluation of the ongoing environmental cleanup activities at Air Force Plant 4 in Fort Worth, TX. The report is expected to be issued in September 2024 and the Air Force is notifying you the process has begun. If you have any issues about the cleanup program, or if you have direct knowledge regarding cleanup remedies, the Air Force would like to speak to you. Please contact Mr. Bradley Bashore using the contact information listed below.

Why?

The purpose of the Five-Year Review process is to determine if the cleanup remedies in place are protective of human health and the environment. The report also provides recommendations if deficiencies are found.

The review is a status report of the Air Force's cleanup programs underway at the plant since the 1980s. Past disposal of hazardous materials, such as solvents and other chemicals resulted in soil, groundwater, sediment, and surface water contamination. While the Air Force is the lead agency responsible for cleanup, the U.S. Environmental Protection Agency and the Texas Commission of Environmental Quality review the report.

This is a plant-wide review which will address the status of 24 sites.

Where?

Upon conclusion of the Five-Year Review, a second public notice will inform the community the review has been completed. The Five-Year Review report will then be made available for public review at:

Federal Depository
White Settlement Public Library
8215 White Settlement Rd.
White Settlement, TX 76108

Or on the web at:
http://ar.afcec-cloud.af.mil

Questions?

Any person wishing to provide comments regarding this notice may respond in writing to:

Mr. Bradley Bashore
AFCEC/CZOM
1981 Monahan Way, Bldg 12
Wright-Patterson AFB, OH 45433-7205

Air Force Plant 4

A second public notice will be published in the Fort Worth Star-Telegram newspaper upon completion of the review process and finalization of the fifth FYR. This notice will briefly summarize the review, note how and where the public can view the final FYR, and list the point of contact for community members who would like to obtain more information or ask questions about the results of the review.

4.2. Site Interviews

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. In person interviews were conducted with representatives from AFCEC, LM and performance-based remediation contractor LKR. They were not aware of any spills, vandalism, trespassing, emergency response, complaints, or violations at AFP4 over the past five years that resulted in contaminating environmental media. No information was provided during the interviews which would question the protectiveness of the current remedies.

4.3. E-Mailed Five-Year Review Questionnaires

A total of three responses were received to our emailed questionnaires. Midori Campbell, Project Manager at TCEQ, James Hoelke, Environmental Engineer at LM's Environment, Safety and Health and John Wolfe, Previous RPM at AFCEC. Responses can be found in Appendix D. No information was provided which would question the protectiveness of the current remedies.

4.4. Data Review

4.4.1. Long-Term Monitoring

The LTM program objectives are to monitor contaminants in sediment, surface water (including seep samples), and groundwater associated with contaminated sites to provide data necessary to recognize if additional evaluations are necessary to protect public health and the environment.

LTM activities are performed semiannually, annually, or biennially. Semiannual locations are sampled in the spring and fall of each year, and annual locations are sampled in the spring only. Biennial sampling locations are sampled in the spring of even-numbered years only.

The Final Biennial Groundwater Remediation Performance Monitoring (GWRPM) Reports for the sampling events of March 2020 (LKR, 2020) and March 2022 (LKR, 2022), Final Semiannual GWRPM Reports for the sampling events of October 2020 (LKR, 2021), October 2021 (LKR, 2022), October 2022 (LKR, 2023) and October 2023 (LKR, 2024), Final 2019 Annual GWRPM Report (LKR, 2019), Final 2023 Annual GWRPM Report (LKR, 2023) and Final 2021−2022 Vapor Intrusion Assessment Report (USACE 2022), are the documents used for this data review.

Sediment

Sediment in Meandering Road Creek is sampled semiannually (spring and fall) at location C-5, near the mouth of the creek where it discharges into Woods Inlet/Lake Worth. This location comprises the current LTM program for sediment at AFP4 and was most recently sampled in March 2023. The silver result (0.785 mg/kg) is below the RG of 1.0 mg/kg. The non-detect Aroclor-1254 result (0.0057 U mg/kg) is below the RG of 0.1 mg/kg.

Surface Waters

Given the elevated groundwater concentrations of cVOCs in some portions of AFP4, surface water is also monitored for these compounds. Four surface water samples were collected in March 2023, two from MRC and two from Farmers Branch Creek.

- Meandering Road Creek – TCE was not detected in either MRC sample, C-5 or SW-08. cDCE was detected in both MRC samples, C-5 (0.70 J ug/L) and SW-08 (1.2 ug/L), however, both detections were below the RG. Neither tDCE nor VC were detected in the MRC surface water samples.

- Farmers Branch Creek – TCE was detected in the Farmers Branch Creek samples EGL-2 (2.7 ug/L) and LF05-S6 (0.72 J ug/L); however, both detections were below the RG. cDCE was detected in the sample from EGL-2 (0.73 J ug/L), but not in the downstream location LF05-S6. Neither tDCE nor VC were detected in the Farmers Branch Creek surface water samples.

Groundwater

The groundwater LTM program includes a total of 86 monitoring wells and one City of White Settlement municipal water supply well. The 2023 Annual GWRPM Report (LKR, 2024) included a Mann Kendall trend analysis using data collected from 2000 through 2023 and this trend analysis and the LTM reports are the primary sources of information summarized in this section. The full Mann Kendall trend analysis is provided in Appendix E.

Middle Paluxy Aquifer

No cVOCs were detected above the RGs in samples from the Middle Paluxy wells. The March 2023 results for the Middle Paluxy wells are consistent with historical results; cVOCs are only sporadically detected in samples from Middle Paluxy wells. No cVOCs were detected in the water supply well WS-H3 in March 2023.

The three wells sampled in this formation had cVOC concentrations below the RGs for at least the last three years.

Upper Paluxy Aquifer

TCE was detected above the RG of 5 ug/L in only one LTM Upper Paluxy sample from well P-8UN on the east edge of the East Parking Lot (EPL). The TCE concentration of 6.3 J ug/L in this well was the first detection since 2014. TCE was periodically observed above the RG in this well from 2000 to 2008. TCE was detected at a concentration of 1,230 ug/L in the CP3 MNA well LKRPU005 in October 2020. The Upper Paluxy TCE plume increased in 2023 due to a detection above the RG in P- 8UN in the EPL.

cDCE was detected above the RG of 70 ug/L in two LTM Upper Paluxy wells located in the LF01 area, with a high concentration of 150 ug/L detected in well P-27U. The trend analyses indicated

cDCE concentrations were decreasing in both wells. cDCE concentrations are expected to achieve the RG within the 70-year MNA timeframe stated in the ROD Amendment.

All tDCE results were below the RG. The cDCE plume area decreased because of decreasing concentrations in the four Upper Paluxy monitoring wells in the LF01/LF03 area.

VC was detected above the RG in four Upper Paluxy wells in the LF01/LF03 area (P-22U, P-27U, WETPU001, and WITCPU006). The trend analyses indicated VC concentrations were decreasing in all four wells. VC concentrations are expected to achieve the RG within the 70- year MNA timeframe stated in the ROD Amendment. The VC plume area decreased because of decreasing concentrations in the four Upper Paluxy monitoring wells in the LF01/LF03 area.

Upper Paluxy Sand Channel Wells

The TCE concentrations in four LTM wells exceeded the RG of 5 ug/L, with a maximum detection of 430 ug/L in well WITCUS001. WITCUS001 is located in the "Window Area", which is an area to the east of the EPL with a thin layer of the Walnut/Goodland Formation separating the Terrace Alluvium from the Upper Paluxy. The additional plumes shown in Figures B-6 through B-9 represent results from MNA wells that had TCE concentrations above the RG in January 2018 (LATA, June 2018a) or biennial LTM wells that had TCE concentrations above the RG in March 2022 (LKR, November 2022). The trend analyses indicated TCE concentrations were decreasing in all wells except P-9US, where the trend was stable. TCE concentrations in P-9US have fluctuated over the last six years, but they have been declining since a concentration of 467 ug/L was observed in 2019. TCE concentrations are expected to achieve the RG within the 50-year MNA timeframe stated in the ROD Amendment.

cDCE was observed in the Upper Paluxy Sand Channel wells at concentrations up to 82 ug/L in well WITCUS001 (the only LTM well with a detection above the RG). All tDCE results were below the RG. VC was not detected above the RG of 2 ug/L in any LTM Upper Paluxy Sand Channel well. The trend analyses indicated cDCE concentrations was decreasing in the well, and the cDCE concentration is expected to achieve the RG within the 50-year MNA timeframe stated in the ROD Amendment.

tDCE and VC were not detected above their RGs in any of the five Upper Paluxy Sand Channel monitoring wells. The results are generally consistent with recent historical analytical results for this hydrogeologic unit.

Terrace Alluvium Wells

East Side Wells – TCE was detected above the RG of 5 ug/L in 20 of the 30 LTM Terrace Alluvium wells sampled on the eastern side of the groundwater divide. The highest concentration observed was in well MW-10R-URS (8,400 ug/L) in Building 181 (B181), which is considered the source area for this plume. TCE was observed above the RG in well WITCTA004 (6.9 ug/L) in the northeastern corner of NASFW for the first time since 2015. Detections above the RG were observed in this well from 2013 to 2015 after being below the RG for the previous five years. TCE was not detected again until 2022, and the concentration was above the RG in 2023 for the first

time since 2015. The reason for the detection is unknown. Current and historical data from nearby wells indicate the detection is an isolated incidence. TCE was detected above the RG in the southern border wells LKRTA015 (13 ug/L) and WSETAHM31R (5.3 ug/L). A new monitoring well (LKRTA017) was installed offsite downgradient from these wells in February 2024 to determine if contaminants are migrating offsite or if the bedrock high in this area is preventing offsite migration. TCE, tDCE and VC were not detected in well LKRTA017 at the time of construction (LKR, 2024c).

TCE was detected above the RG in 20 Terrace Alluvium East Side wells. The trend analyses indicated TCE concentrations were decreasing or probably decreasing in 13 of those 20 wells.

cDCE was detected above the RG of 70 ug/L in six LTM Terrace Alluvium wells sampled on the eastern side of the groundwater divide, with a high concentration of 450 ug/L detected in well MW-10R-URS. The cDCE detections above the RGs are generally located in wells within B181, the EPL, or along the AFP4 and NASFW property line. Historical exceedances in eight MNA monitoring wells define the plume in the EPL and NASFW areas. All of the wells with detections above the RG were in B181 (MW-10R-URS, MW-11, and WJETA061) or the EPL (F-218, HM-88, and W-149). The trend analyses indicate cDCE concentrations were decreasing in all wells except HM-88, which had a stable trend. cDCE concentrations in all of these wells are expected to achieve the RG within the 95-year MNA timeframe stated in the ROD Amendment.

All tDCE results were below the RG. There were five detections of VC over the RG, with concentrations up to 78 ug/L in WJETA061 in B181. tDCE was not detected above its RG in any of the 30 Terrace Alluvium wells monitored on the East Side for at least the last three years.

VC was detected above the RG in five Terrace Alluvium wells monitored on the East Side. MW-10R-URS, MW-11, and WJETA061 are in the B181 source area and had stable or decreasing trends. The VC concentrations in these wells are expected to reach the RG within the 95-year MNA timeframe stated in the ROD Amendment (LATA, May 2023). LF04-4F is on Hawks Creek Golf Club, and the VC concentration trend is stable. The VC concentration is expected to reach the RG within the 95-year MNA timeframe. WCHMHTA010 is in the northeastern comer of NASFW. The trend is stable in this well, but the VC concentration is not expected to reach the RG within the 95-year MNA timeframe based on the 2017-2023 data. cDCE is still present in the groundwater at this well, which appears to be contributing to the stable VC concentrations. The current VC concentration in this well is below the peak concentration observed in 2018.

The results are generally consistent with recent historical analytical results for this geologic unit (Appendix E).

West Side Wells – The detectable TCE concentrations in four LTM wells exceeded the RG of 5 ug/L, with a maximum detection of 8.7 ug/L in well VEP- 13. The TCE concentration in well VEP-29 was non-detectable; however, the detection limit (50 ug/L) was above the RG. The plume shown on Appendix B-10 also represents results from MNA wells that had TCE concentrations above the RG in December 2017 (LATA, June 2018b), biennial LTM wells that had TCE concentrations above the RG in March 2022 (LKR, November 2022), or older historical data taken from the Environmental Resources Program Information Management System (ERPIMS)

database. The trend analyses indicated TCE concentrations were decreasing in two wells (HM-36 and VEP-13) and there were "no trends" in the other two wells (HM-29 and VEP-26). HM-29 is to the east of the landfill area by the north-south contractor road that runs along the main assembly building. There had not been a detection of TCE above the RG in this area since 2017. VEP-26 is in LF03 and is just to the west of the DNAPL area. The TCE concentration in this well was the lowest observed since 2017. Even with the Mann-Kendall "no trends", TCE concentrations in HM-29 and VEP-26 are still expected to reach the RGs within the 100-year MNA timeframe stated in the ROD Amendment.

cDCE was observed above the RG in three LTM wells. The highest concentration (770,000 ug/L) was observed in well VEP-29, which is inside the TI Waiver area. Historical data from December 2017 MNA sampling (LATA, June 2018b), biennial LTM sampling in March 2022 (LKR, November 2022), or older historical data taken from the ERPIMS database define the plume area away from the AFP4 boundary (Appendix B-11).

All tDCE results were below the RG except in well VEP-29 (1,800 ug/L) in the TI Waiver area. The only historical results above the RG were in wells AR-2 and VEP-30, which are also in the TI Waiver area. The tDCE results are shown on Appendix B-12. VC was detected above the RG in five of the LTM wells. Two of these wells (VEP-4 and VEP- 29) are in the TI Waiver area. Historical data from December 2017 MNA sampling (LATA, June 2018b), biennial LTM sampling in March 2022 (LKR, November 2022), or older historical data taken from the ERPIMS database define the plume area away from the AFP4 boundary (Appendix B-13).

The results are generally consistent with recent historical analytical results for this geologic unit (Appendix E).

West Side CP3 Area Wells – Only four wells in the CP3 area are sampled during the annual LTM events. Three of the four wells had TCE detections above the RG, with the highest concentration observed in well F-220 (19,000 ug/L). The plume shown on Appendix B-10 is mainly defined by historical data taken from MNA sampling in 2017 and 2020 (LKR, January 2021).

cDCE was observed above the RG in LTM well F-220 (3,300 ug/L). The plume shown on Appendix B-11 is mainly defined by historical data taken from MNA sampling in 2017 and 2020 (LKR, January 2021). tDCE was observed above the RG in LTM well F-220 (110 ug/L). The plume shown on Appendix B-12 is mainly defined by historical data taken from MNA sampling in 2017 and 2020 (LKR, January 2021). VC was observed above the RG in LTM well HM-17 (36 J ug/L); however, the detection limit (10 ug/L) for the sample from F-220 was also above the RG. The plume shown on Appendix B-13 is mainly defined by historical data taken from MNA sampling in 2017 and 2020 (L-KR, January 2021). It should be noted that all of the historical concentrations above the RG were non- detectable values, but the detection limits are above the RG.

4.4.2. Soil Vapor Sampling

Ayuda Auxilio Joint Venture (AAJV, 2021-2022) has conducted sub-slab vapor, indoor air, and outdoor air sampling for a vapor intrusion (VI) study at AFP4 over four quarterly sampling events

in May 2021, August 2021, November 2021 and March 2022. The sampling effort included 16 discrete locations for sub-slab vapor, eight indoor air locations, and eight outdoor air locations. The project objective was to conduct a VI study of the Site OT022 source area located beneath Building 181 at AFP4 that characterizes environmental conditions, defines the nature and extent of vapor contamination, and quantitatively estimates the risk to human health at the site.

Figures for the 2021-2022 VI assessments found in Appendix F and data with risk assessment in Appendix H.

- Indoor Air Measurements – Indoor air at Building 181 was found to contain concentrations of CHFM, NAPHTH, and TCE in excess of the respective Residential and/or Industrial RSLs. Concentrations of CHFM exceeded the Residential RSL of 0.12 µg/m3 at sampling location IV2020-01 where it was found at 0.15 µg/m3. All other indoor air locations did exhibit concentrations of CHFM that were greater than the detection limit but less than the Residential RSL for CHFM. Concentrations of NAPHTH in indoor air at all sampling locations exceeded the Residential RSL of 0.083 µg/m3, ranging from 0.089J µg/m3 to 0.69 µg/m3. One location, IV2020-06, exceeded the NAPHTH Industrial RSL of 0.36 µg/m3, at 0.69 µg/m3. The TCE Industrial RSL of 0.88 µg/m3 was exceeded at all indoor air sampling locations, ranging from 1.3 µg/m3 to 2.6 µg/m3. As shown on Figure F-4, concentrations of TCE appear to generally be greater on the western side of Building 181. B181 is only used for storage purposes; therefore, the potential for exposure is considered negligible.

- Sub-slab Vapor Measurements – Concentrations of CHFM exceeded the Industrial RSL of 0.53 µg/m^3 at 15 of the 16 sub-slab vapor sampling locations. Concentrations ranged from 0.77 µg/m^3 at SSV2020-07 to 580 µg/m^3 at SSV2020-01. The concentration of CHFM in sub-slab vapor at SSV2020-06 was detected at 0.15J µg/m^3 and exceeded the Residential RSL of 0.12 µg/m^3. Concentrations of TCE also exceeded the Industrial RSL of 0.88 µg/m^3 at each of the 16 sub-slab vapor sampling locations. Concentrations of TCE ranged from 1.0 µg/m^3 at SSV2020-08 to 94,000 µg/m^3 at SSV2020-01. Concentrations of TCE were generally greatest along the west side of the building, with the maximum occurring in the northwest quadrant of Building 181.

  NAPHTH was not detected in eight of the sub-slab vapor locations, the remaining eight sampling locations contained concentrations of NAPHTH in excess of the Residential RSL of 0.083 µg/m^3 and at one location, SSV2020-12, the Industrial RSL of 0.36 µg/m^3 was exceeded at a concentration of 1.9 µg/m^3. BDCM was also not detected in 12 sub-slab vapor sampling locations; however, where it was detected, it exceeded the Residential RSL of 0.076 µg/m^3 and/or Industrial RSL of 0.33 µg/m^3. Sub-slab vapor sample SSV2020-07 exceeded the Residential RSL at 0.30 µg/m^3, which is less than the Industrial RSL. Samples SSV2020-05, SSV2020-08, and SSV2020-11 exhibited concentrations of BDCM at 1.8 µg/m^3, 0.77J µg/m^3, and 0.73 µg/m^3, respectively, and each exceeded the Industrial RSL. In sub-slab vapor, 1,1,2-TCA was the only analyte that was not detected and cis-1,2-DCE was detected but does not currently have USEPA Residential or Industrial RSLs. Concentrations of trans-1,2-DCE were less than the Residential RSL of 4.2 µg/m^3 at all but sampling location SSV2020-01, where it was found at 5.2J µg/m^3. The compound, CTET,

was also detected in most sub-slab samples and exceeded the Residential RSL of 0.47 µg/m^3 at sample locations SSV2020-04, SSV2020-05, SSV2020-07, and SSV2020-11, where it was detected at 0.8J µg/m^3, 0.85J µg/m3, 0.67 µg/m^3, and 0.64 µg/m^3, respectively. The compound, VC, was also detected in most sub-slab samples and exceeded the Residential RSL of 0.17 µg/m^3 at sample locations SSV2020-03, SSV2020-05, SSV2020-08, SSV2020-13, and SSV2020-14, where it was detected at 0.19J µg/m^3, 0.37J µg/m^3, 0.36J µg/m^3, 0.31J µg/m^3, and 0.25 µg/m^3, respectively.

- Outdoor Air Measurements - Analytical results indicate that outdoor air contains NAPHTH at concentrations that exceed the Residential RSL of 0.083 µg/m3 near Building 181. Outdoor air sampling locations OV2020-01, OV2020-02, OV2020-03, OV2020-06, and OV2020-07 exhibited concentration of NAPHTH at 0.083J µg/m^3, 0.095J µg/m^3, 0.11J µg/m^3, 0.14J µg/m^3, and 0.12J µg/m^3, respectively. Sampling locations were located along the west and south portions of the building. All other analytes did not exceed the respective Residential RSLs.

The sub-slab vapor and indoor air samples from four rounds of quarterly sampling indicate exceedances of one or more VOCs above their respective industrial screening level. Using conservative assumptions, the VISL calculator also estimated an unacceptable carcinogenic risk based on the highest sub-slab vapor concentration for all rounds and a potential carcinogenic risk based on the highest indoor air sample concentration across all rounds.

Based on the indoor air risk of 3.35E-06 and the current use of the building as a warehouse, a remediation system is not necessary at this time. However, if the building use changes such that personnel are occupying the building on an 8-hour daily basis, a remediation system and monitoring will be required to ensure protection of human health.

4.4.3. Emerging Contaminants

A Final Site Inspection (SI) Report was published in March 2019 to document the results of site investigation activities conducted from 30 November to 6 December 2017 and 24 February 2018 at six aqueous film forming foam (AFFF) release areas at AFP4 (Oneida Total Integrated Enterprises [OTIE], 2019). All six suspected AFFF release areas can be found in Appendix B-15. The objectives of the investigation were to: 1) determine if PFAS are present in soil, sediment, and/or groundwater at AFFF release areas selected for investigation; 2) determine if PFAS concentrations exceed applicable EPA Health Advisories (HAs), Regional Screening Levels (RSLs), or Texas Risk Reduction Program (TRRP) Tier 1 Residential Protection Concentration Levels (PCLs); and 3) identify potential receptor pathways with immediate impacts to human health.

PFAS were detected in surface and subsurface soils at concentrations above EPA RSLs and/or TRRP Tier 1 Residential PCLs at AFFF Release Areas 1, 2, 3, and 4. Perfluorooctane Sulfonate (PFOS), Perfluorooctanoic Acid (PFOA), and/or the sum of PFOS and PFOA were detected above the 2016 EPA HAs (replaced April 2024 by the Final PFAS National Primary Drinking Water Regulations) and the TRRP Tier 1 Residential PCLs in groundwater in AFFF Release Areas 1, 2, and 4. Perfluorobutanesulfonic Acid (PFBS) was detected above the June 2017 EPA Tapwater

RSL and the TRRP Tier 1 Residential PCLs in groundwater in AFFF Release Area 1. Several other PFAS were detected above the TRRP Tier 1 Residential PCLs in groundwater in AFFF Release Areas 1, 2, and 4. PFAS were detected in sediment at AFFF Release Area 6, with three PFAS above the TRRP Tier 1 Residential PCLs at Outfall 3 (OTIE, 2019).

No significant threat to human health through ingestion of PFAS-impacted groundwater or surface water was identified. However, it was noted that further investigation and evaluation of specific exposure conditions is necessary to determine if exposure pathways are complete. Further investigation and evaluation of PFAS impacts to groundwater are also necessary (OTIE, 2019).

Additionally, AFCEC performed a supplemental SI at AFFF Release Area 5 (Wastewater Treatment Plant) in January 2023 to investigate potential AFFF releases.

The initial SI Report concluded that concentrations of PFOS, PFOA, and PFBS in effluent water collected at AFFF Release Area 5 were detected below the screening levels used during the initial SI. The SI Report recommended that no further response actions were necessary and concluded there were no human exposure pathways, and no further response actions were planned at AFFF Release Area 5 (AMEC and OTIE, 2019).

During the initial SI, only one effluent water sample was included in the scope of the investigation. Because no soil or groundwater samples were collected during the initial on-base SI, AFCEC determined that a data gap exists with respect to the evaluation of soil and groundwater quality and potential receptors, and that existing data was insufficient to support a No Further Response Action Planned (NFRAP) decision. As such, the additional site-specific SI was necessary to further evaluate the possible presence of AFFF-related substances at the site.

Additional sampling was conducted at AFFF Release Area 5 to clearly document either NFRAP or advancement of the site to the Remedial Investigation (RI) phase. The investigation was designed to collect soil and groundwater samples to address the data gaps discussed above. Analytical results indicated that PFOS was above its respective screening levels in surface and subsurface soil samples collected from three soil boring locations at AFFF Release Area 5. Because this area is covered with approximately twelve inches of concrete, surface soil samples were collected from 1.0 to 1.5 feet below ground surface after removing the concrete. Concentrations of PFOS, PFOA, and PFHxS also were above their respective screening levels in one groundwater sample collected from an existing monitoring well located at AFFF Release Area 5. However, AFP 4 obtains its potable water from the city of Forth Worth; therefore, potential on-base drinking water has an incomplete exposure pathway to PFAS-impacted groundwater under current site conditions. Based on the analytical data collected during the 2023 SI, as well as analytical results from the effluent sample collected during the 2017 SI (AMEC and OTIE, 2019), PFAS are present in soil, groundwater, and effluent at concentrations above May 2022 EPA RSLs at AFFF Release Area 5. Therefore, further evaluation in the RI phase has been recommended to characterize the nature and extent of PFAS. (HydroGeoLogic, 2023).

At present, additional sites are being validated through RIs; therefore, no additional data has been generated and published. Upon completion of the RIs, efforts will then continue through the CERCLA process.

4.5. Site Inspection

The IRP inspections at AFP4, required as part of this FYR, were initially conducted in July 2023 with USACE, LM, LKR, TCEQ and EPA in attendance. The initial author of this FYR left USACE so a second site inspection was conducted on 07 February 2024 by the new authors to assess the protectiveness of the selected remedies. In attendance were personnel from USACE, LM, and LKR. Clear and sunny weather through the visit allowed for USACE to put eyes on all IRP sites. Pictures taken during site visit can be found in Appendix J.

Stockpiled clean soil was noted in the Landfill 2 area. The stockpiled soil is a product of construction activities on site and is used to fill in depressions during ground leveling operations. The landfill was not completed with an engineered cap. Vegetative cover is in good condition. Side slopes and silt fence were observed to be in good condition around the perimeter and thus the site remains protective of human health and the environment.

Signs are clearly posted throughout the sites denoting government property and no trespassing, and security fencing prevents the general public from access to the majority of sites. Therefore, the sites do not currently pose a protectiveness risk and are considered protective based on visual observation during the July 2023 and February 2024 site inspections.

5.0 TECHNICAL ASSESSMENT

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

Yes. ICs for protection at offsite properties, are functioning as intended. The 2023 ROD Amendment identified MNA with Safe Drinking Water MCLs as RGs alongside TI waivers as the new RAOs. Historical data shows that MNA is indeed occurring on site.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. There have been significant changes to exposure assumptions and toxicity data since the 1995 human health risk assessment (HHRA). However, the 2023 ROD Amendment incorporated these changes. ARARs for the 2023 ROD Amendment selected remedy are detailed in Appendix G. These changes do not impact the short-term protectiveness of the selected remedy.

Changes in Standards and TBCs

On 30 September 2014, EPA documented that the ROD did not select the appropriate ARAR for TCE-contaminated surface water and groundwater. The Clean Water Act MCL of 5 µg/L was cited as the appropriate ARAR for surface water and groundwater (EPA, 2014c). The 2023 ROD Amendment re-evaluated applicable ARARs for groundwater and surface water to ensure long-term protectiveness of the remedy. ARARs for the site are provided in Appendix G.

Changes in Toxicity and Other Contaminant Characteristics

Toxicity values have been updated and developed for a number of chemicals since the 1995 HHRA. Toxicity values used in the 1995 HHRA and a comparison to recent toxicity values (EPA, 2018) are detailed in Appendix H.

The majority of chemicals considered in the 1995 HHRA have updated or new values. As a result, risks and hazards to receptors may increase due to the inclusion of new chemicals and exposure pathways. However, the majority of human health risks in the 1995 HHRA were attributed to hypothetical ingestion of groundwater as drinking water and incidental ingestion, dermal contact, and inhalation of volatiles while showering/bathing. The selected remedy contained in the 2023 ROD Amendment prevents current and future human exposure from these pathways. As such, updated toxicity values are not expected to have an impact on the current protectiveness of the remedy.

Changes in Risk Assessment Methods

The methods used to perform a BRA for AFP4 have not significantly changed between review periods.

Changes in Exposure Pathways

The risks to populations on and near AFP4 were characterized based on potential exposure to the groundwater and surface water. The 1996 ROD listed the following exposure pathways for groundwater and surface water:

- Ingestion of groundwater from White Settlement production wells by hypothetical future residents (adult);
- Inhalation of and dermal contact with groundwater by hypothetical future residents (adults) during showering in water from White Settlement production wells;
- Dermal contact with surface water (Lake Worth) by current residents.

The current conceptual exposure model, however, illustrates these potential contaminant exposure pathways for the groundwater at AFP4 are no longer complete. Since the 1996 ROD was established, all but one of the White Settlement production wells have been abandoned, and the one remaining well (WS-H3) has been taken out of service; therefore, there is no domestic use of the groundwater. The sampling results from the WS-H3 (the one remaining production well, which is currently not in use) have had COC concentrations below detection levels since 2000. ICs are in place on AFP4, NASFW, and BRAC Parcel G that ban the use of groundwater on these properties for purposes other than sampling. The ICs for BRAC Parcel G are provided in Section VII, Part 3 of the Deed Without Warranty in Appendix C. Therefore, the potential for direct exposure of groundwater to the nearby residents is considered incomplete.

TCE and its breakdown/daughter products volatilize readily into the air. One of the known exposure pathways for site workers to these constituents is via volatilization from contaminated groundwater into the pore spaces of soil above the groundwater and then into the air above the ground surface. If these chemicals reach the ground surface in an open area, the contaminants dissipate rapidly in the large volume of outdoor air and are not a concern to human health or the environment. If the constituents surface beneath an inhabited building, there is a potential for them to migrate through cracks or gaps in the buildings floor and contaminate the breathing air of the building's inhabitants. The potential for AFP4 and NASFW workers to be exposed to chlorinated volatile organic compounds (cVOCs) through inhalation via vapor intrusion is considered to be negligible since cVOCs would have to migrate through the clayey Terrace Alluvium vadose zone, which is likely to adsorb the cVOCs prior to migration to the atmosphere. This was confirmed by the risk assessment in the RI. An additional vapor intrusion study (AR# 13163) was performed in B181 in 2021-2022. Results from the study indicated that the indoor air concentrations were one to four times lower in magnitude than the subslab vapor concentrations. B181 is only used for storage purposes; therefore, the potential for exposure is considered negligible. However, if the building use changes such that personnel are occupying the building on an 8-hour daily basis, a remediation system and monitoring may be required to ensure protection of human health.

There is a potential for dermal contact by site workers with groundwater during sampling and construction activities: however, this potential is considered negligible, as depth to groundwater is typically greater than the depth of construction activities. In addition, a Health and Safety Plan is required for all sampling and construction activities at the site, which dictates monitoring and personal protective equipment requirements to limit exposure.

There is a potential for dermal contact by the general public to surface water. In 2017, TCE, cDCE, and tDCE were detected in at least one of the samples collected from the seeps along the southwest edge of LF03. None of the detected concentrations from the seep samples were above their contact recreation PCLs. The closest downstream surface water sampling location to the seeps in Meandering Road Creek had no cVOCs above detection limits. Based on the comparison of the data to the human health PCLs that are based on incidental ingestion and dermal exposure to the seep and closest surface water sampling point, there is no unacceptable human exposure at the seeps or in the surface water of Meandering Road Creek, which feeds into Lake Worth.

The risk assessment in the RI did not identify any ecological risks based on exposure to groundwater or surface water. Furthermore, the TCEQ established freshwater chronic benchmarks for TCE, VC and cDCE/tDCE mixed in August 2019.

All the detected concentrations in the seeps and surface water are well below the freshwater chronic benchmarks, indicating that there is no risk to the aquatic community.

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

A Site Inspection was conducted in 2017, 2018 and 2023 to investigate the presence of PFAS in soil, groundwater, and sediment at AFP4 (OTIE, 2019 and Hydrogeologic, 2023). The results identified PFAS above various regulatory screening criteria in soil, groundwater, and sediment.

Therefore, further evaluation in the RI phase is required to characterize the nature and extent of PFAS for AFFF Release Areas 1, 2, 3, 4 and 5. The Air Force is currently conducting Due Diligence for Supplemental PFAS Sources (i.e. non-AFFF sources), which includes but is not limited to NFA sites at AFP 4. Ongoing investigations to identify PFAS-impacted areas, from both AFFF and non-AFFF sources, should address the prospect of PFAS contamination within NFA and IRP sites and how ICs may mitigate potential exposure.

Additional PFAS contaminated areas, if any, will be discussed in the context of NFA/IRP sites during future reviews. There have been no impacts from natural disasters.

6.0 ISSUES/RECOMMENDATIONS

Issues / Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:

1 Sitewide

Issues identified in the 2014 and 2019 FYRs are addressed by the 2023 ROD Amendment.

Issues and Recommendations Identified in the Five-Year Review:

OU(s): None **Issue Category:** Other **Issue:** None

Recommendations:

IDP & Sampling & Analysis Plan (SAP) - At present, the 2023 ROD Amendment has been in effect for less than a year. Historical data shows natural attenuation is happening facility-wide and the combination of MNA, ICs and TI waiver address concerns brought up during previous reviews. However, per the 2023 ROD Amendment, an IDP and an optimized SAP must be developed.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	Federal Facility	EPA/State	2024

Indoor Air - The installation should consider a supplemental Indoor Air Study to evaluate the potential for vapor intrusion affecting indoor air quality in the office and laboratory adjacent to Building 181. Issues associated with the new RAOs, if any, may become evident during future reviews.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	Federal Facility	EPA/State	2025

FDTA 5 - FDTA 5 (FT008) was identified in this FYR as a potential issue. The site has been labeled as a NFA site and determined to not pose an unacceptable risk to human health and the environment. However, when initially investigated, free product was observed in one well near the site, arsenic concentrations in site wells were determined to be above the MCL (0.05mg/L at the time) and the status of any remaining contaminants remains unknown. Since then, the MCL for arsenic has been updated to 0.01mg/L. Because of these concerns, it is recommended that FDTA 5 is further evaluated to determine if its NFA status remains justifiable.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	Federal Facility	EPA/State	2025

Seeps - The current seep that is sampled as part of the GWMP (SW-08) is collected a fair distance away from monitoring wells with the highest concentrations of contaminants. It is recommended to re-evaluate the current seep location during the pending revision to the Sampling & Analysis Plan. If a seep is encountered in closer proximity to the wells with higher contaminant concentrations, then consideration should be made to replace, or supplement, sampling from SW-08 during future sampling events.

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	No	Federal Facility	EPA/State	2025

PFAS - The Air Force is currently conducting Due Diligence for Supplemental PFAS Sources (i.e. non-AFFF sources), which includes but is not limited to NFA sites at AFP 4. Ongoing investigations to identify PFAS-impacted areas, from both AFFF and non-AFFF sources, should address the prospect of PFAS contamination within NFA and IRP sites and how ICs may mitigate potential exposure. Additional PFAS contaminated areas, if any, will be discussed in the context of NFA/IRP sites during future reviews.				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	2028

7.0 PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: 1 Sitewide	***Protectiveness Determination:*** Short-term Protective
Protectiveness Statement: The remedy at AFP4 protects human health and the environment and presently there is no evidence of exposure. The 2023 ROD Amendment addressed concerns raised following the previous Five-Year Review as it contains a new set of RAOs that were developed upon completion of the FFS. Human and ecological exposure pathways that could otherwise result in unacceptable risks are being managed by institutional controls, such as land and building use controls, to prevent exposure to contaminated media. Threats are currently being addressed in the TCE plume by a combination of removal and degradation of COCs by MNA, however long-term protectiveness will require optimization of the Sampling and Analysis Plan. Protectiveness of the new RAOs will continue to be verified by the long- term monitoring program, which monitors sediment, surface water, and groundwater concentrations of COCs.	

8.0 NEXT REVIEW

Consistent with the EPA Comprehensive Five-Year Review Guidance (OSWER No. 9355.7-03B-P), CERCLA Section 121(c), and the FFA, the next FYR is programmed for FY2028 with completion in 2029.

9.0 AUTHORIZING SIGNATURE

This document provides the results of a Five-Year Review at AFP4. The IRP sites addressed are Landfill 3, Landfill 4, Building 181, Meandering Road Creek, Lake Worth, Terrace Alluvial Flow Systems, Middle and Upper Paluxy Aquifers, Upper Paluxy Sand Channels Groundwater, and 20 additional sites that were designated as NFA in the 1996 ROD and 2023 ROD Amendment. This document is approved by the undersigned.

APPROVED:

JOHNSON.KENNY.R.1231177740 Digitally signed by JOHNSON.KENNY.R.1231177740 Date: 2024.12.05 15:21:53 -06'00'

5 December 2024
Date

KENNY R. JOHNSON, P.E., GS-15, DAF
Director, Environmental Management

APPENDIX A

Reference List

Reference List

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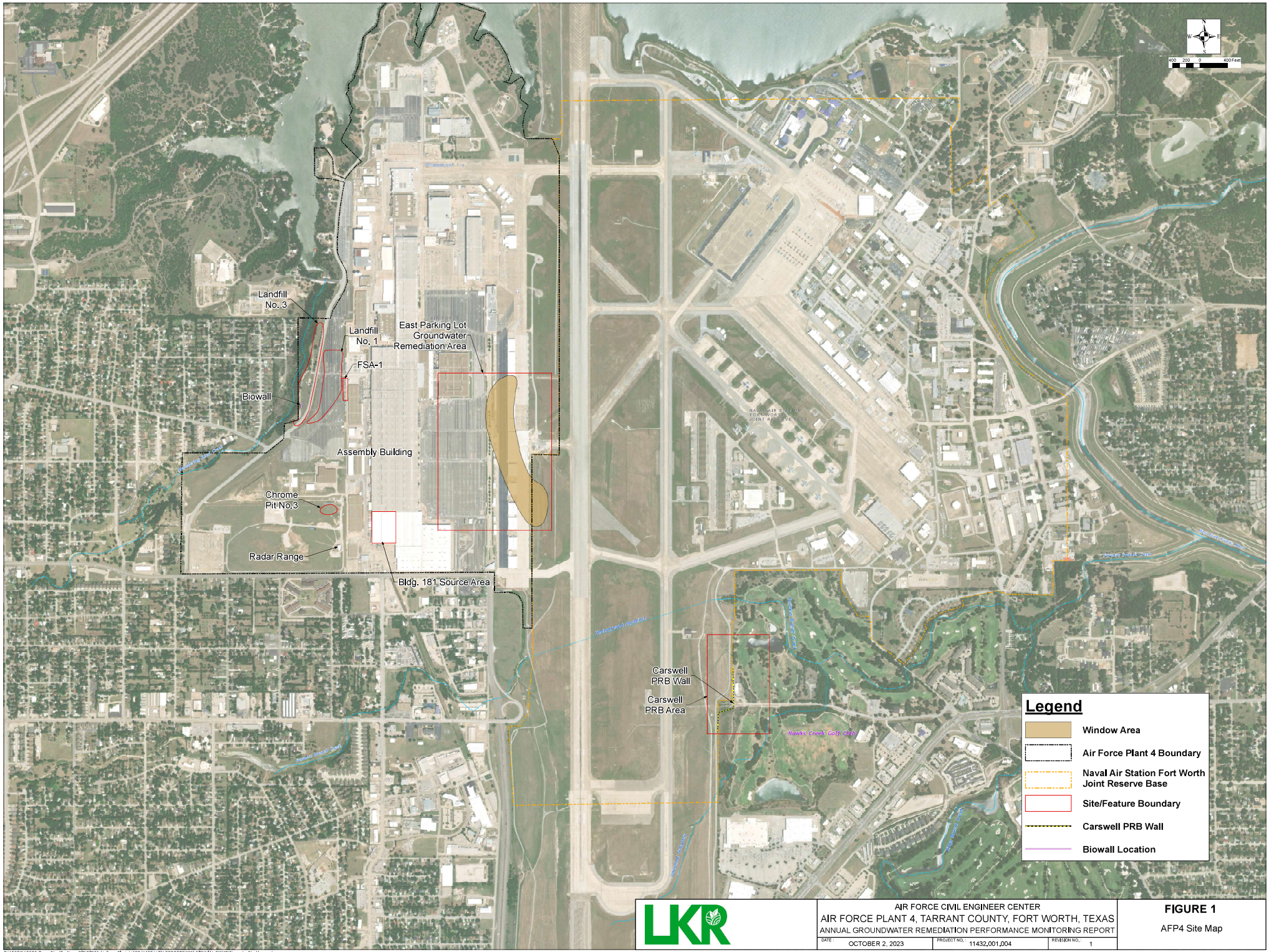
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APPENDIX B
Figures

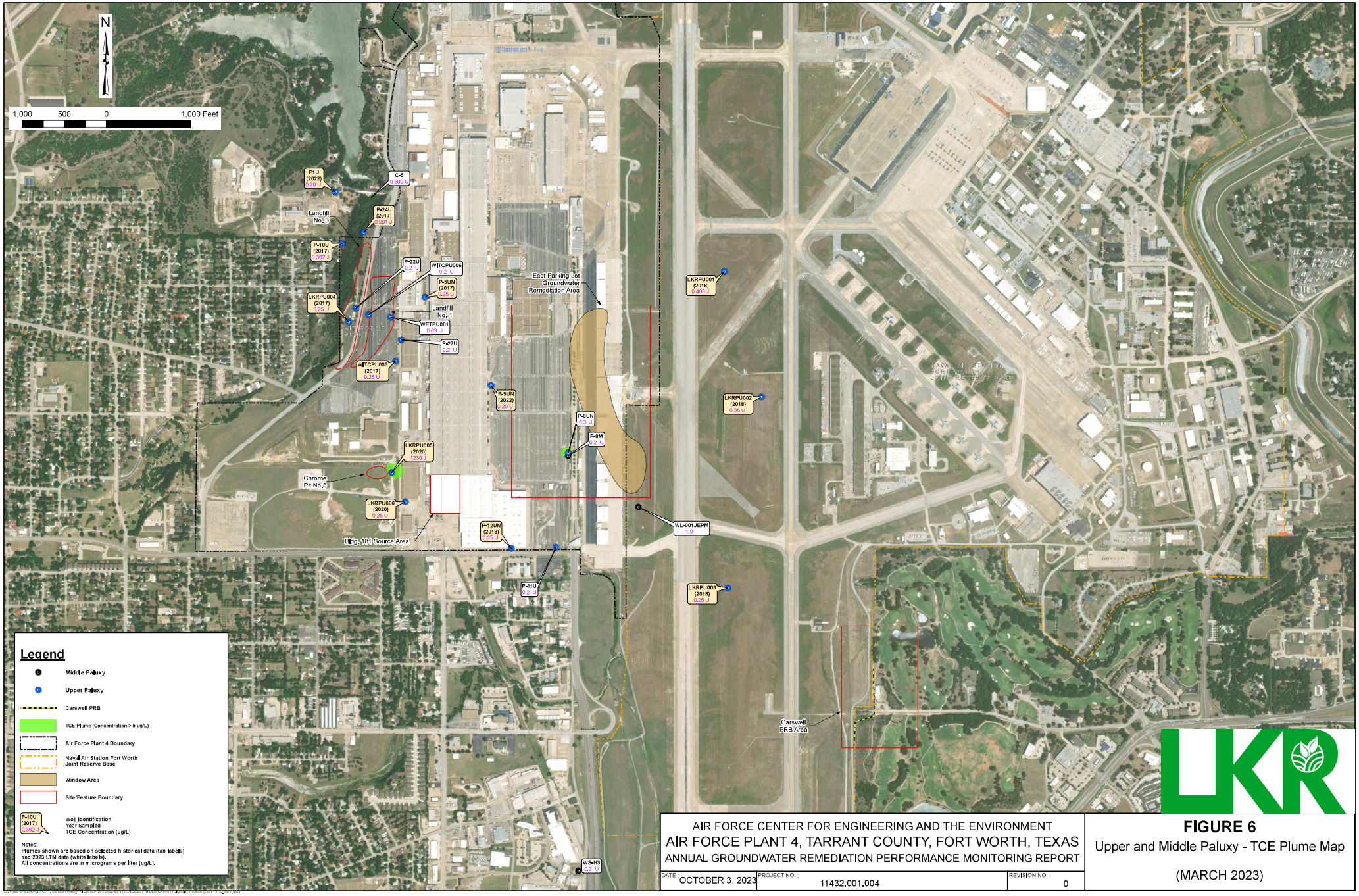


AIR FORCE CIVIL ENGINEER CENTER
AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

DATE: OCTOBER 2, 2023 | PROJECT NO.: 11432.001.004 | REVISION NO.: 1

FIGURE 1
AFP4 Site Map

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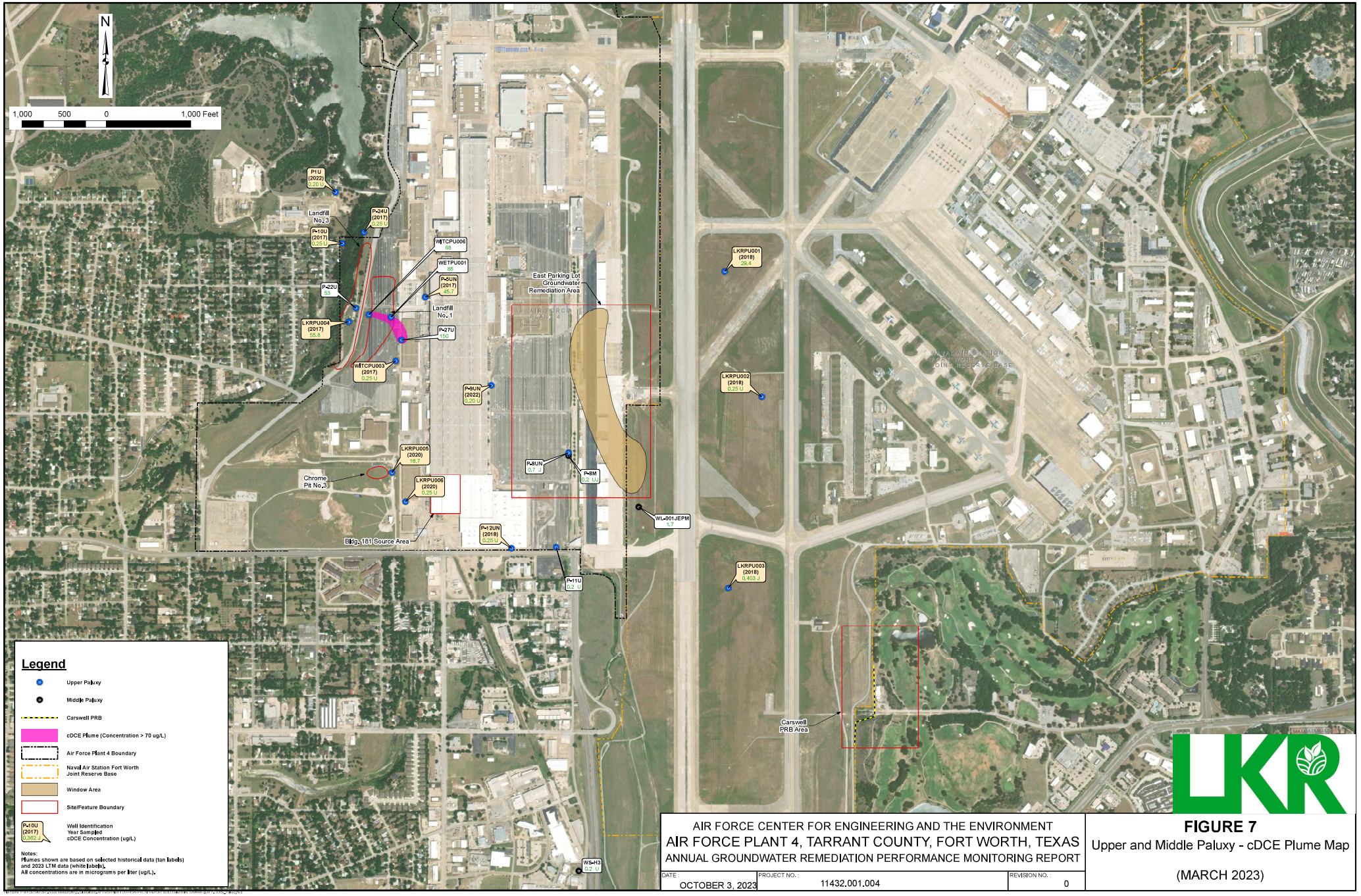


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FIGURE 6
Upper and Middle Paluxy - TCE Plume Map

(MARCH 2023)



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FIGURE 7
Upper and Middle Paluxy - cDCE Plume Map

(MARCH 2023)



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FIGURE 8
Upper and Middle Paluxy - tDCE Plume Map

(MARCH 2023)

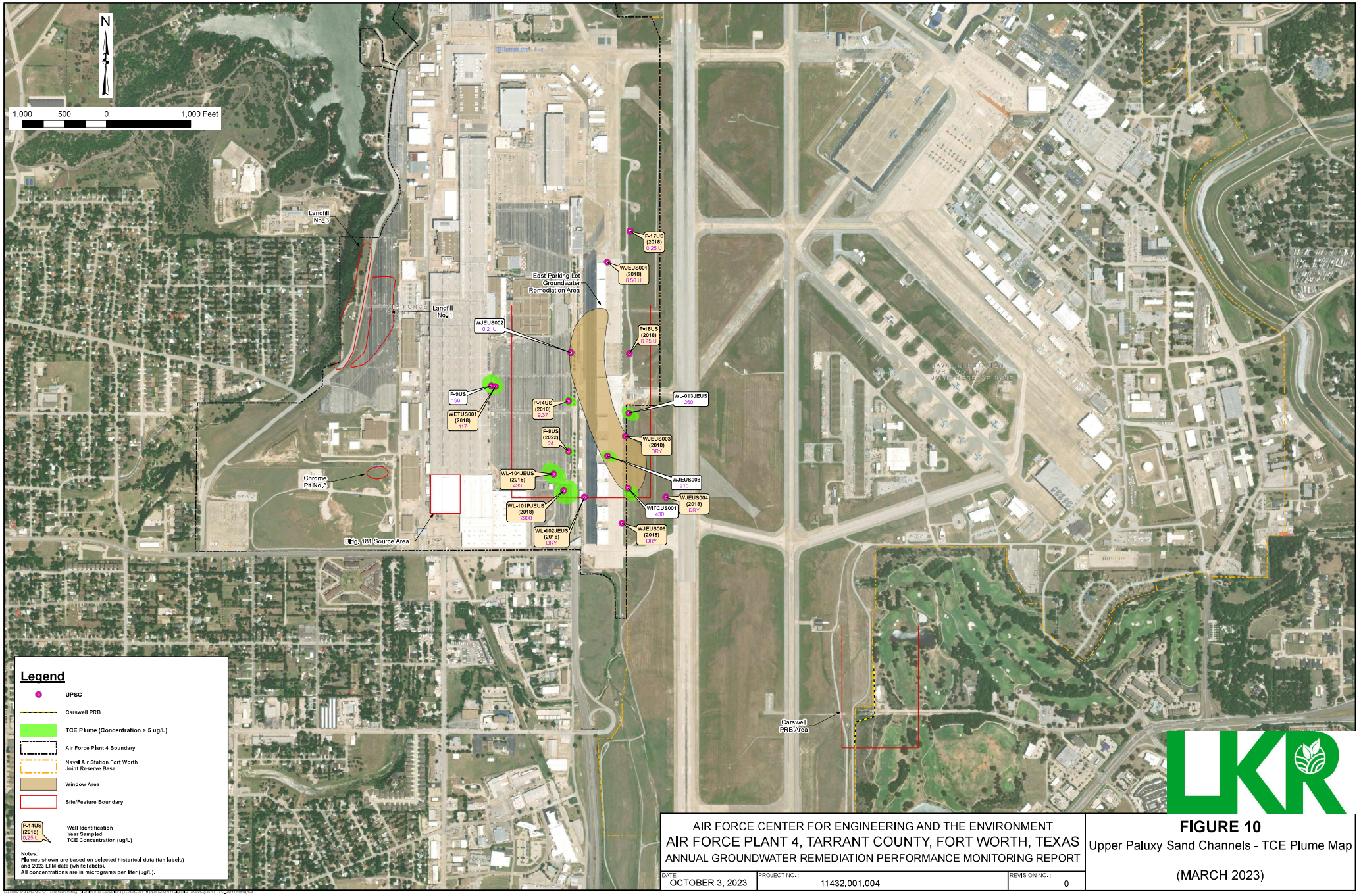


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FIGURE 9
Upper and Middle Paluxy - VC Plume Map

(MARCH 2023)

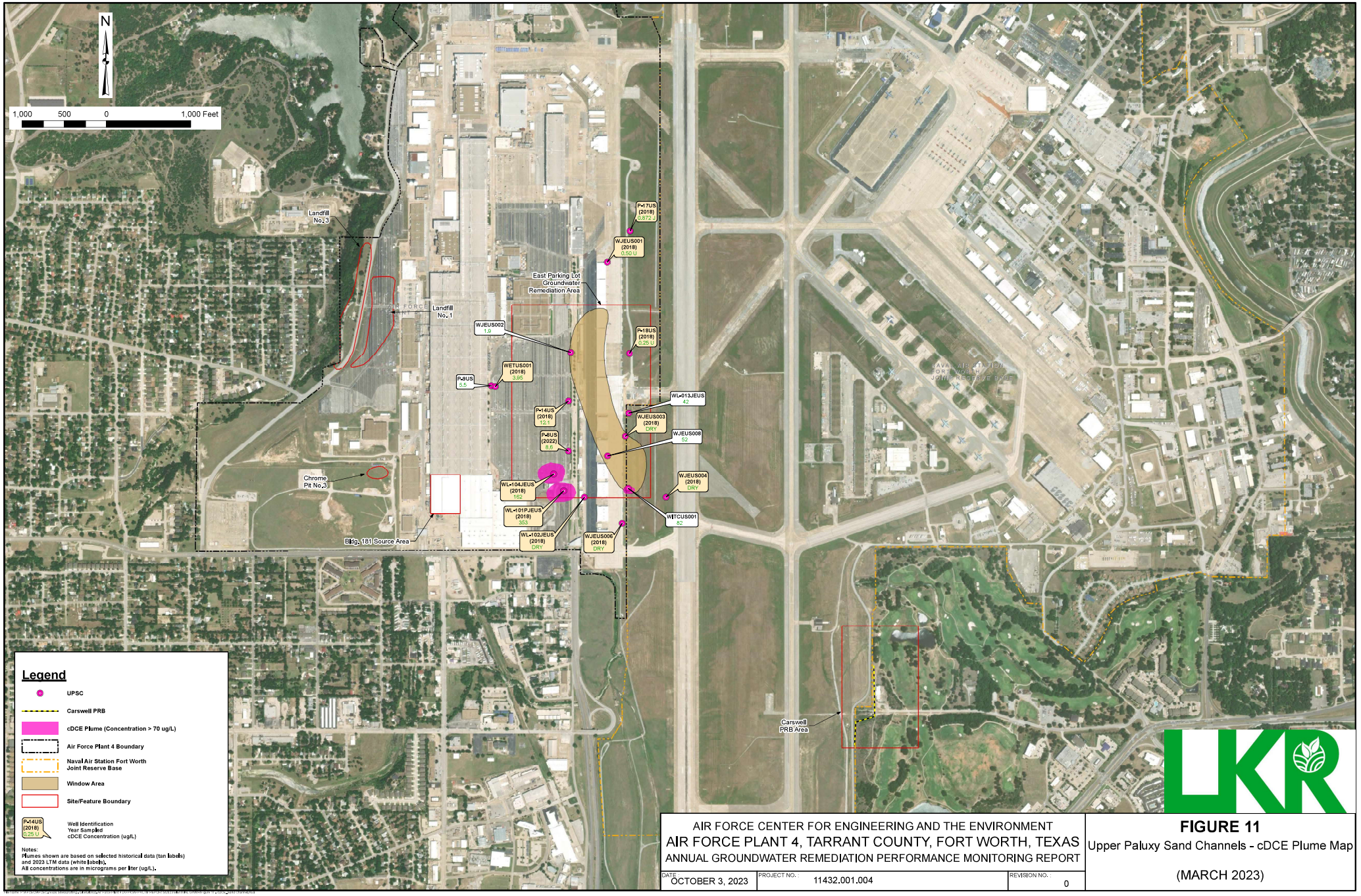


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FIGURE 10
Upper Paluxy Sand Channels - TCE Plume Map

(MARCH 2023)

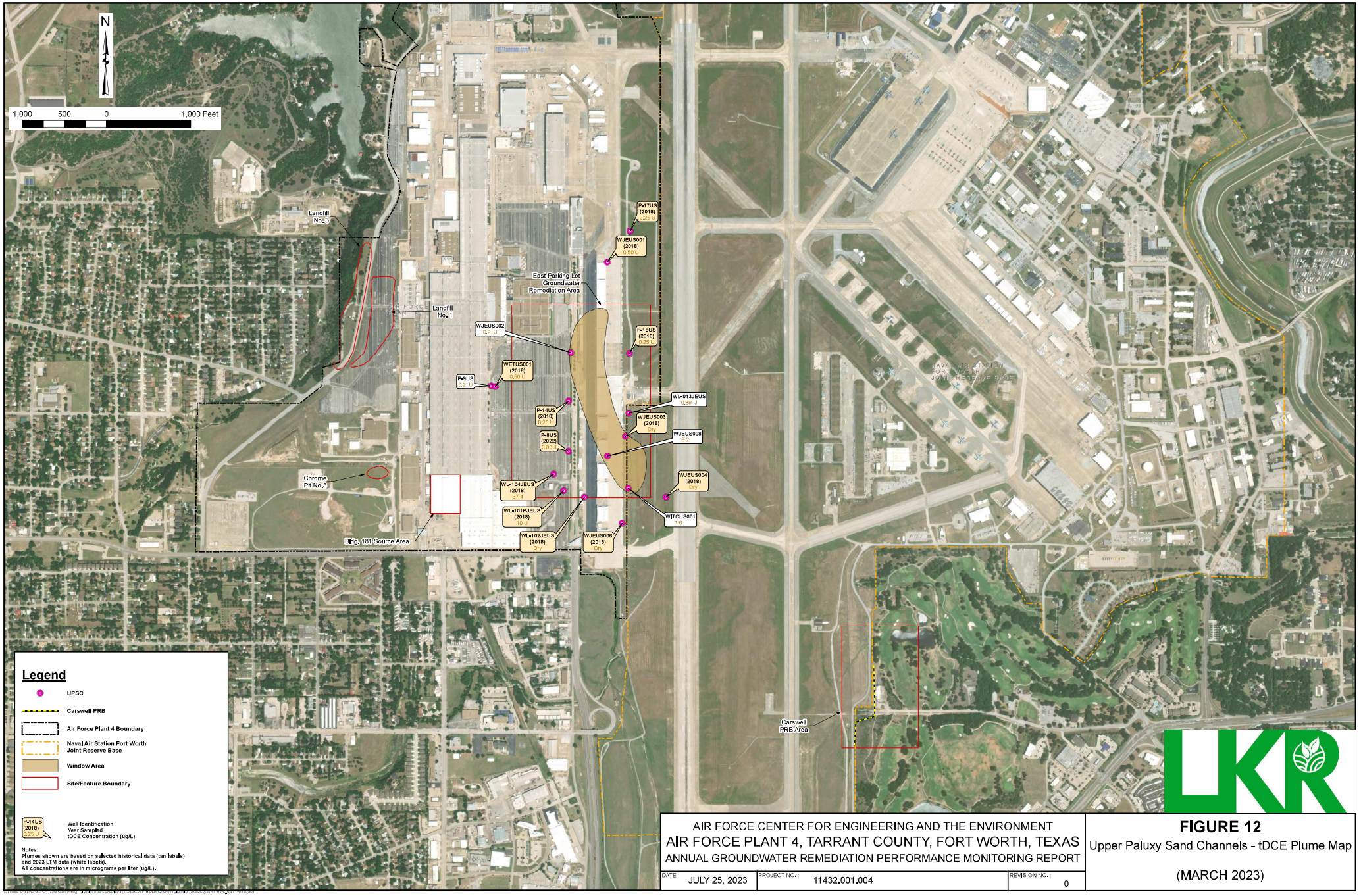


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FIGURE 11
Upper Paluxy Sand Channels - cDCE Plume Map

(MARCH 2023)

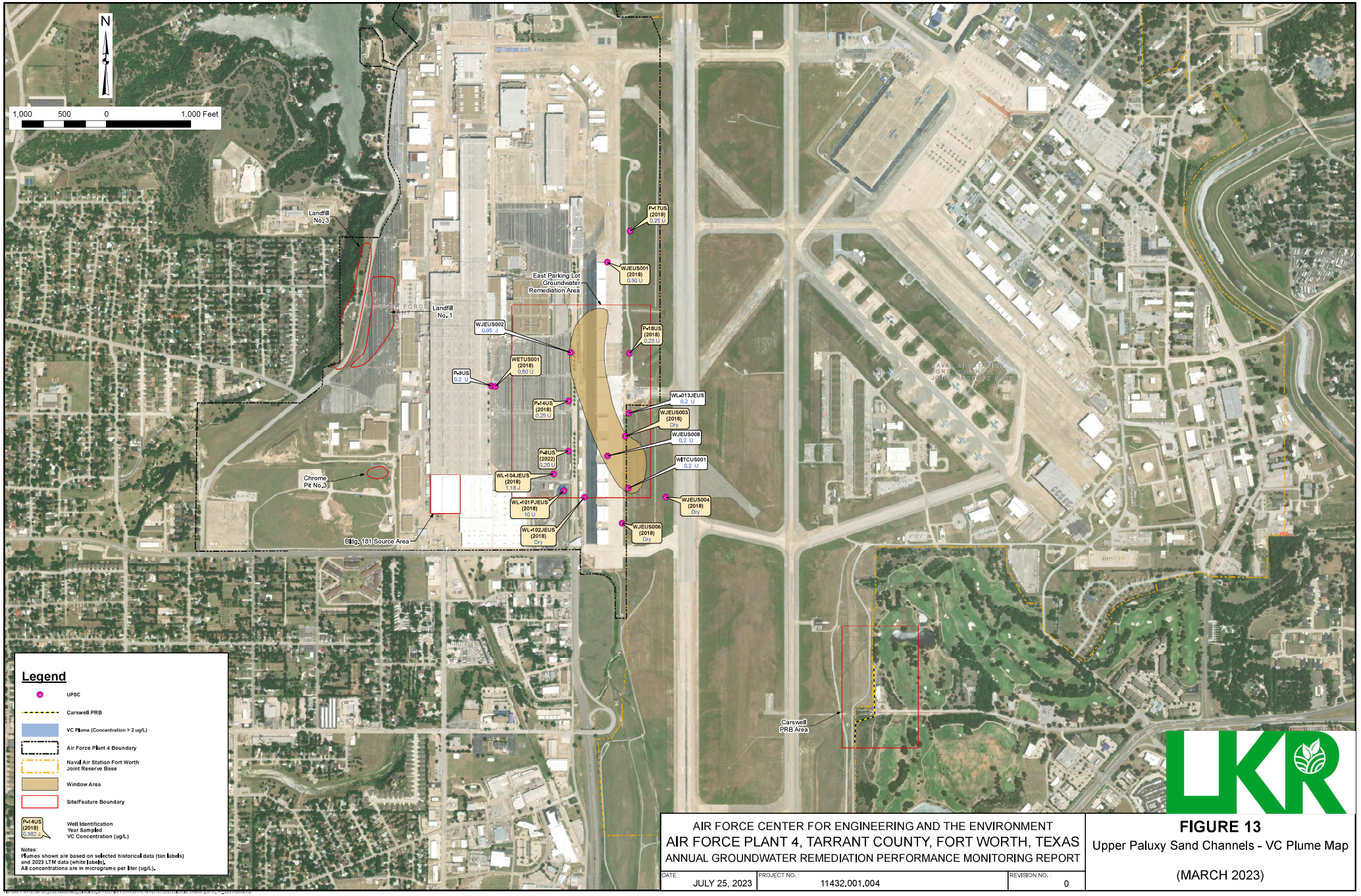


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FIGURE 12
Upper Paluxy Sand Channels - tDCE Plume Map

(MARCH 2023)

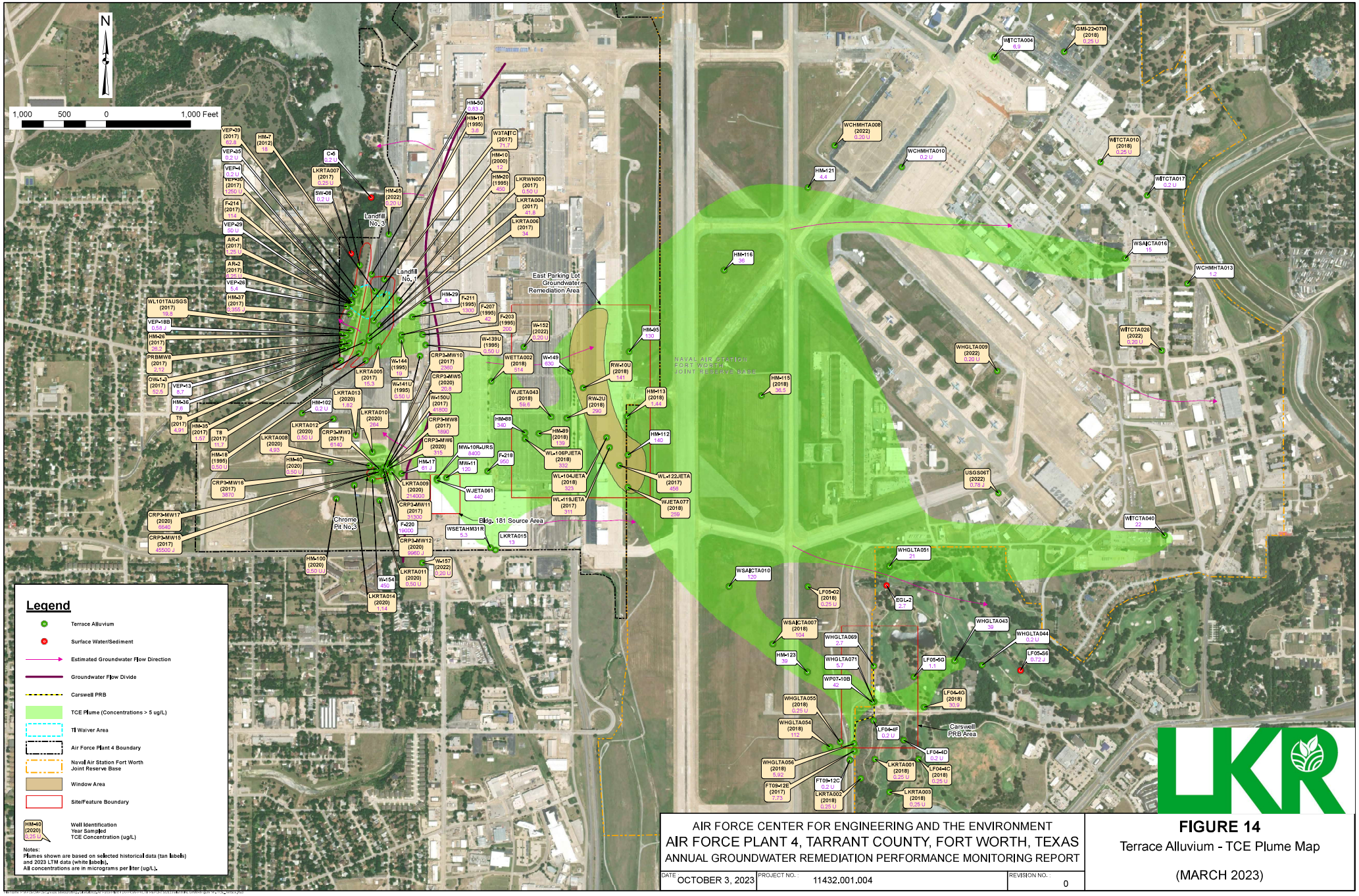


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FIGURE 13
Upper Paluxy Sand Channels - VC Plume Map

(MARCH 2023)

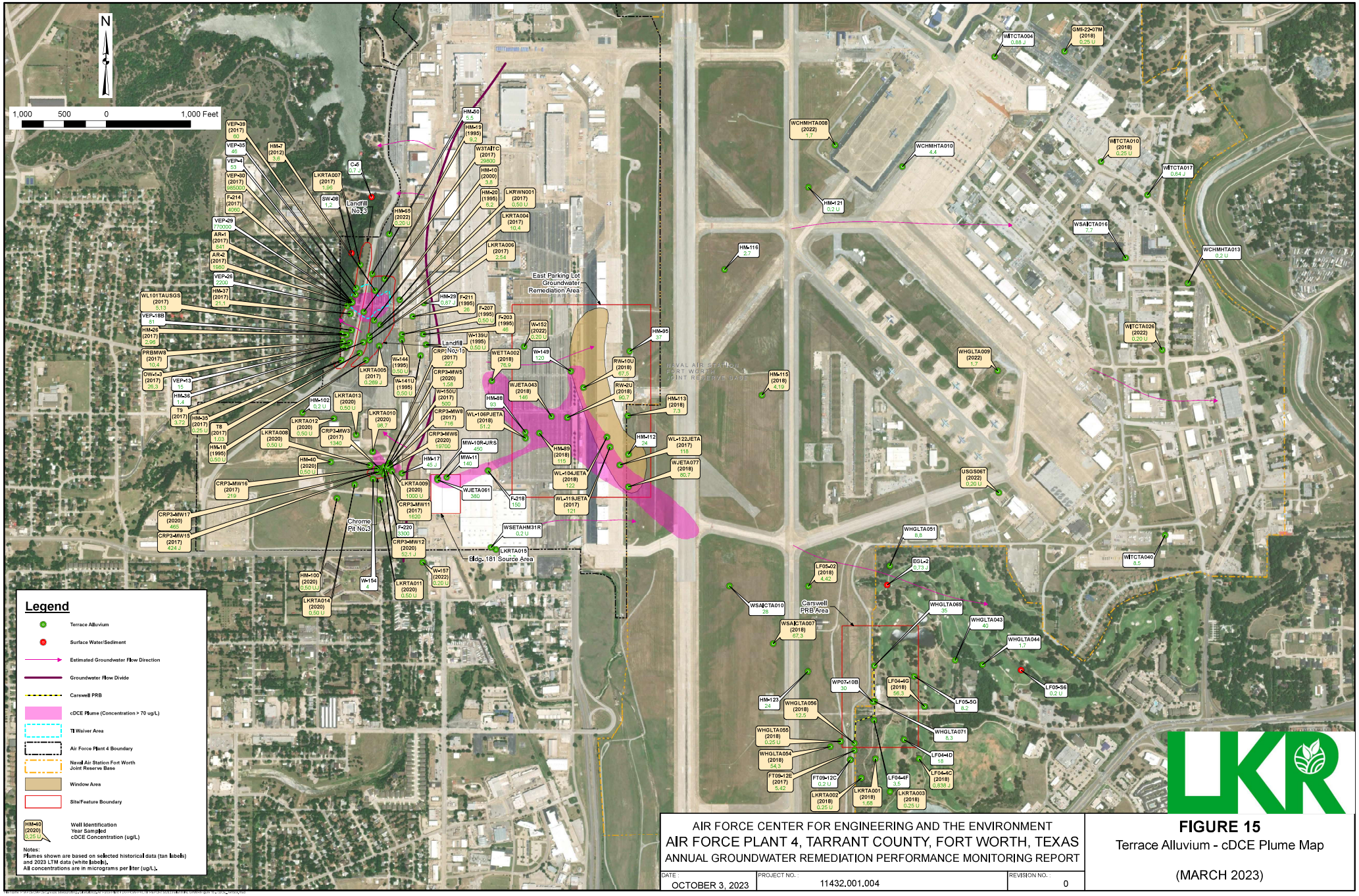


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FIGURE 14
Terrace Alluvium - TCE Plume Map

(MARCH 2023)

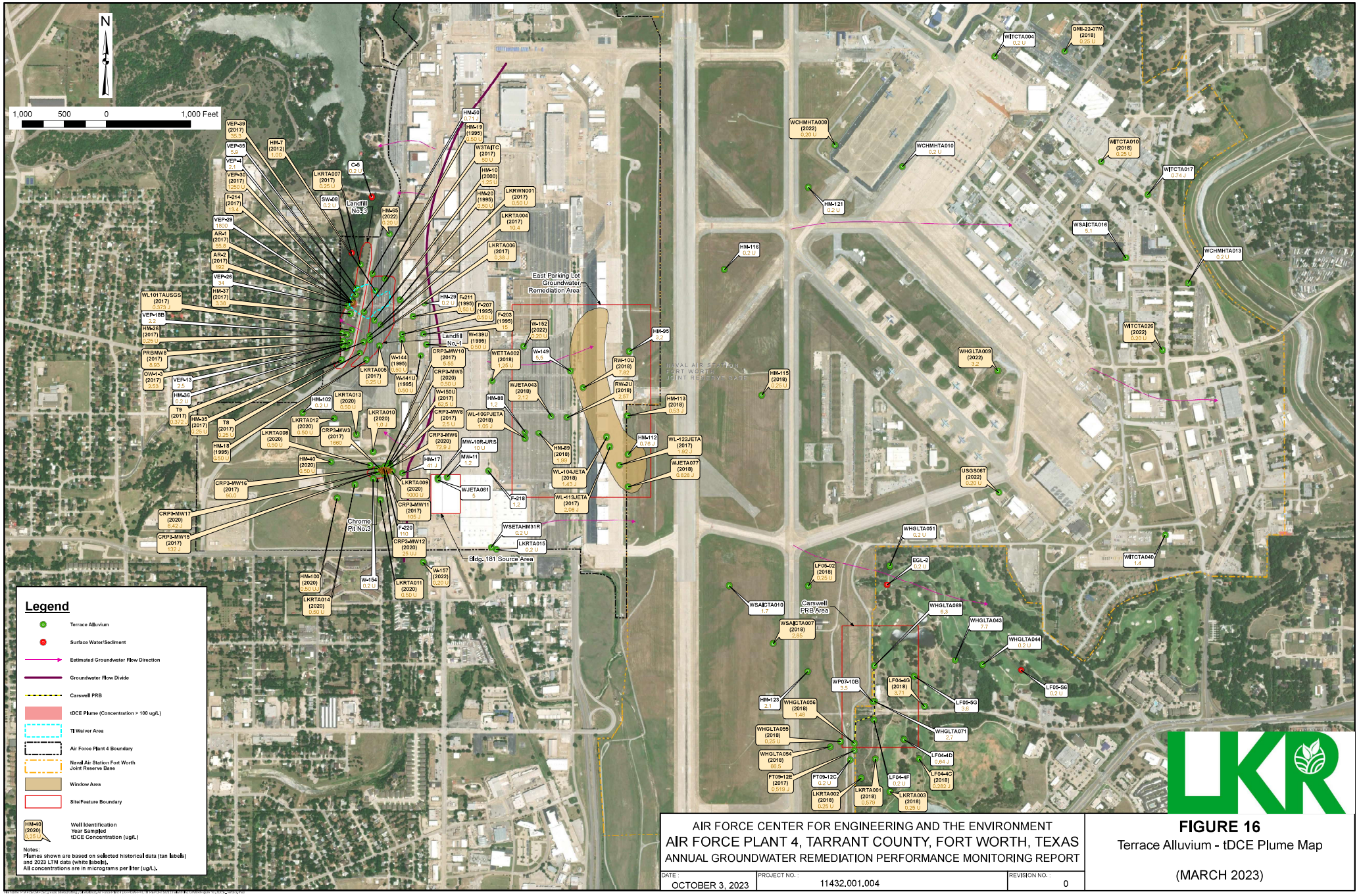


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FIGURE 15
Terrace Alluvium - cDCE Plume Map

(MARCH 2023)

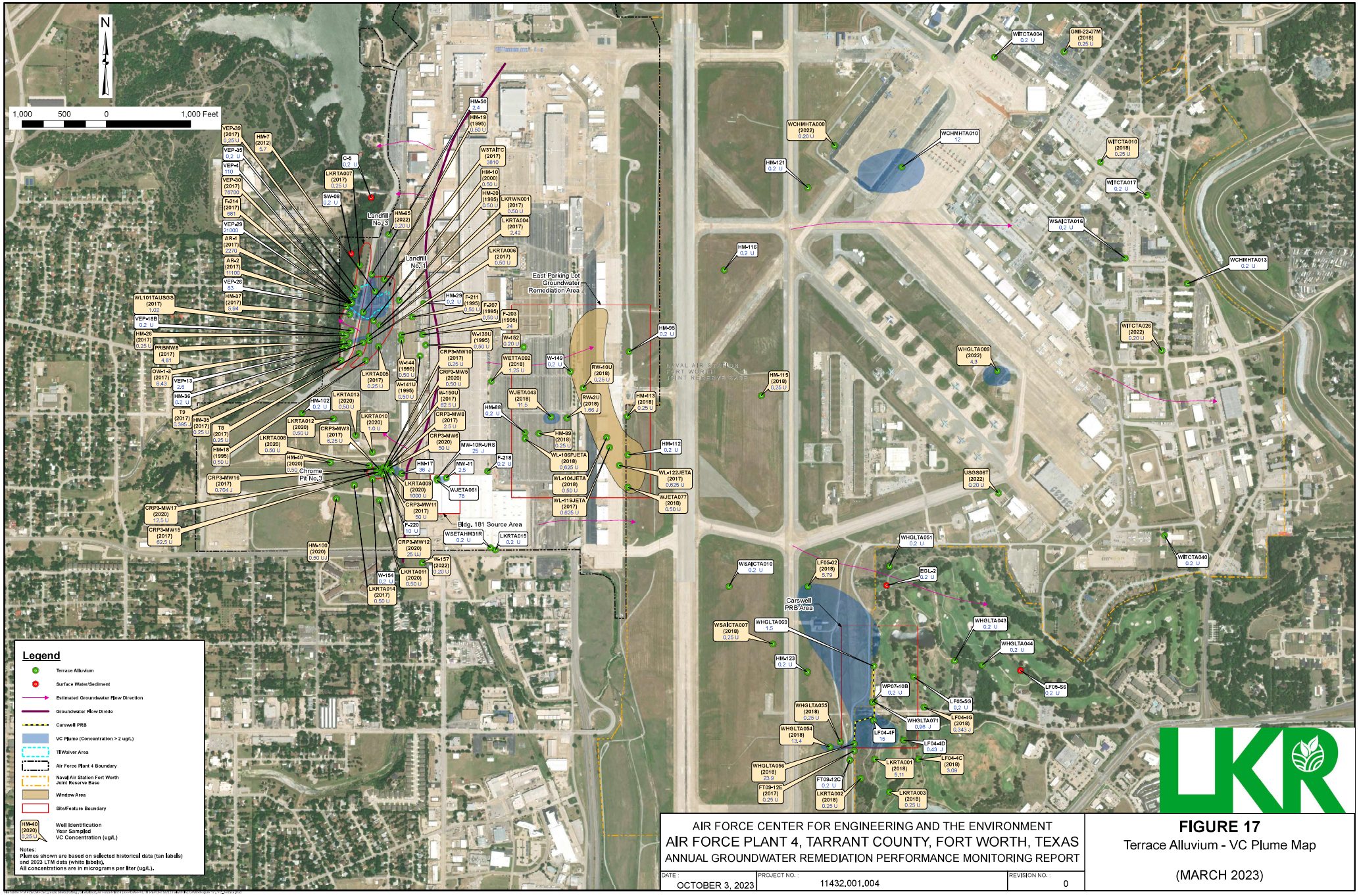


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FIGURE 16
Terrace Alluvium - tDCE Plume Map

(MARCH 2023)

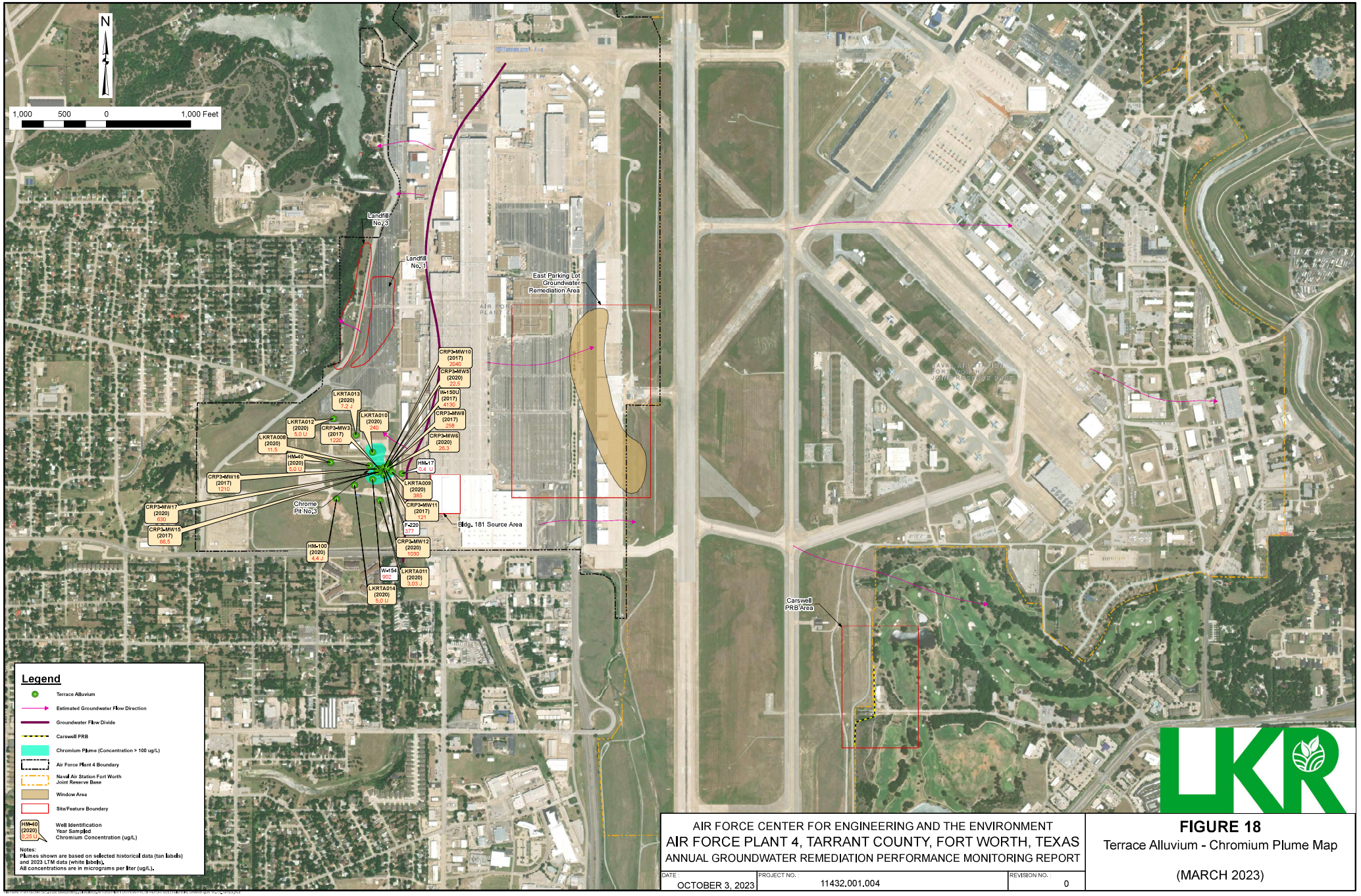


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FIGURE 17
Terrace Alluvium - VC Plume Map

(MARCH 2023)



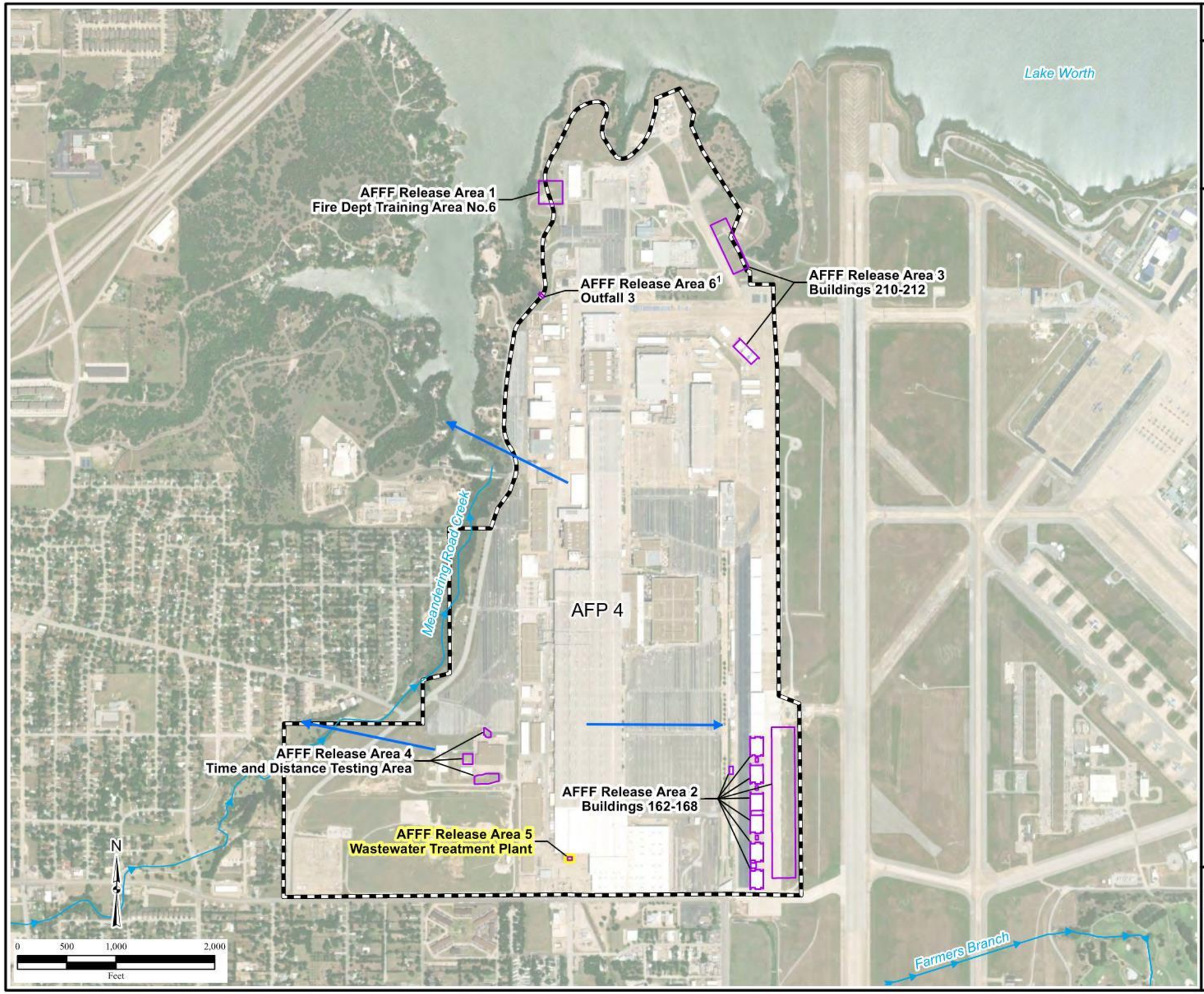
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FIGURE 18
Terrace Alluvium - Chromium Plume Map

(MARCH 2023)

Figure 2.2
Installation Layout and AFFF Release Areas
Air Force Plant 4



Legend

- Groundwater Flow Direction
- Surface Water Course Flow Direction
- AFFF Release Area Investigated Under 2017 Site Inspection
- AFFF Release Area Subject of Current 2023 Site Inspection
- Air Force Plant 4

Notes:
[1] AFFF Release Area 6, Outfall 3 is an active outfall and not considered a PFAS source area for restoration purposes.

AFFF = aqueous film-forming foam
AFP = Air Force Plant
PFAS = perfluoroalkyl and polyfluoroalkyl substances
SI=Site Inspection

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9/25/2023 CNL
Source: HGL, Esri, USAF, ArcGIS Online Imagery, ArcGIS Online World Street Map

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APPENDIX C

BRAC Parcel G Deed Without Warranty

Carswell AFB-187.29 Acres

DEED WITHOUT WARRANTY

THE STATE OF TEXAS §
§ **KNOW ALL MEN BY THESE PRESENTS**
COUNTY OF TARRANT §

NOTICE OF CONFIDENTIALITY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OF THE FOLLOWING INFORMATION FROM THIS INSTRUMENT BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

I. PARTIES

THIS DEED is made and entered into this _____day of _____, 2007, by and between THE UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force (the "United States" or "Grantor") as delegated to the AIR FORCE REAL PROPERTY AGENCY (AFRPA), of 143 Billy Mitchell Blvd., Suite 1, San Antonio, Bexar County, State of Texas 78226-1858, under and pursuant to the powers and authority contained in the Defense Base Closure and Realignment Act of 1990 ("DBCRA 90"), as amended (10 U.S.C. § 2687 note), and delegations and regulations promulgated thereunder and the Westworth Redevelopment Authority, a Local Redevelopment Authority, organized under the laws of the State of Texas (the "Grantee"). (When used in this Deed, unless the context specifies otherwise, "Grantor" shall include the assigns of the Grantor, and "Grantee" shall include the successors and assigns of the Grantee.)

II. CONSIDERATION AND CONVEYANCE

KNOW ALL MEN BY THESE PRESENTS, that the Grantor, in consideration of the sum of _____ DOLLARS ($000.00) to the Grantor in hand paid by the Grantee, the receipt of which is hereby acknowledged, has conveyed without express or implied warranty, and excluding all warranties that might arise by common law and the warranties under Section 5.023 of the Texas Property Code (or its successor), and by these presents does **GRANT, SELL,** and **CONVEY** to the Grantee of 6550 White Settlement Road, Westworth Village, County of Tarrant and State of Texas, all of the following described real property, (hereinafter the "Property") in Tarrant County, Texas: 187.29 acres of land, more or less. The Legal Description of the Property is set forth in **Exhibit A** to this Deed. A Survey map depicting the Property is set forth as **Exhibit B** to this Deed.

III. APPURTENANCES AND HABENDUM

A. TOGETHER WITH all the buildings and improvements erected thereon, except for monitoring wells, treatment wells, treatment facilities, and related piping, and all and singular the tenements, hereditaments, appurtenances, and improvements hereunto belonging, or in any wise

appertaining (which, together with the real property above described, is called the "Property" in this Deed).

B. TO HAVE AND TO HOLD the Property unto the Grantee, forever.

IV. EXCEPTIONS

None.

V. RESERVATIONS

THERE IS HEREBY RESERVED UNTO THE GRANTOR, including the United States Environmental Protection Agency ("EPA") and the State of Texas (the "State"), and its and their respective officials, agents, employees, contractors, and subcontractors, the right of access to the Property (including the right of access to, and use of, utilities at reasonable cost to the Grantor), for the following purposes and for such other purposes as are necessary to ensure that a response or corrective action found to be necessary, either on the Property or on adjoining lands, after the date of transfer by this Deed will be conducted:

A. To conduct investigations and surveys, including, where necessary, drilling, soil and water sampling, testpitting, testing soil borings, and other activities relating to any such response or corrective action.

B. To inspect field activities of the Grantor and its contractors and subcontractors in implementing any such response or corrective action.

C. To conduct any test or survey required by the EPA or the State relating to any such response or corrective action, or to verify any data submitted to the EPA or the State by the Grantor relating to any such actions.

D. To conduct, operate, maintain, or undertake any other response, corrective, or remedial action as required or necessary under the applicable law or regulation, or the covenant of the Grantor in Section VII of this Deed including, but not limited to, the installation, closing, or removal of monitoring wells, pumping wells, and treatment facilities that will be owned or operated by the Grantor and its officials, agents, employees, contractors, and subcontractors.

E. To monitor any environmental restrictive use covenants in this Deed and the effectiveness of any other land use or institutional control established by the Air Force on the Premises, either by itself, by its contractor, by any public entity, including the State, or by a private entity registered in the State to monitor environmental covenants.

VI. CONDITIONS

A. The Grantee agrees to accept conveyance of the Property subject to all covenants, conditions, restrictions, easements, rights-of-way, reservations, rights, agreements, and encumbrances, whether or not of record in the office of the County Clerk of Tarrant County, Texas, and affecting the Property.

B. The Grantee acknowledges that it has inspected, is aware of, and accepts the condition and state of repair of the Property, and that the Property is conveyed, "as is," "where is," without any representation, promise, agreement, or warranty on the part of the Grantor regarding such condition and state of repair, or regarding the making of any alterations, improvements, repairs, or additions. The Grantee further acknowledges that the Grantor shall not be liable for any latent or patent defects in the Property, except to the extent required by applicable law.

VII. NOTICES AND COVENANTS RELATED TO SECTION 120(h)(3) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA), AS AMENDED, (42 U.S.C. §9620(h)(3)).

A. Pursuant to section 120(h)(3)(A)(i) of CERCLA, the following is notice of hazardous substances on the Property, and a description of remedial action concerning the Property.

1. The Grantor has made a complete search of its files and records. **Exhibit C** contains a table with the name of hazardous substances stored for one year or more, or known to have been released or disposed of, on the Property; the quantity in kilograms and pounds of the hazardous substance stored for one year or more, or known to have been released, on the property; and the date(s) that such storage, release, or disposal took place.

2. A description of the remedial action(s) taken by the Grantor on the Property regarding hazardous substances is contained in **Exhibit C** of this Deed.

3. Pursuant to section 120(h)(3)(A)(ii) of CERCLA, the United States covenants and warrants:

a. that all remedial action necessary to protect human health and the environment with respect to hazardous substances remaining on the Property has been taken before the date of this Deed;

b. and any additional remedial action found to be necessary after the date of this Deed for contamination on the Property existing prior to the date of this Deed will be conducted by the United States.

The obligation of the United States under this warranty does not include response actions required by an act or omission of the Grantee that either (a) introduces new or additional contamination, or (b) increases the cost of the required response action by improperly managing any CERCLA contamination present on the Property on the date of this Deed from the United States. For the purposes of this warranty, the phrase "remedial action found to be necessary" does not include any performance by the United States, or payment to the Grantee from the United States, for (a) additional remedial action that is required to facilitate use of the Property by the Grantee in a manner that is inconsistent with restrictions set forth in section VIIC. of this Deed, as may be modified or released pursuant to section VII.D., or (b) disposal of soils that do not require response actions if left in place, but must be disposed of when disturbed.

B. The United States has reserved access to the Property in the Reservations section of this deed in order to perform any remedial or corrective action as required by CERCLA section 120(h)(3)(A)(ii).

NOTICE

BREACH OF ANY ENVIRONMENTAL RESTRICTIVE COVENANT CONTAINED IN THIS SECTION VII.C. BELOW, MAY AFFECT THE FOREGOING WARRANTY.

C. Environmental Restrictive Covenants

1. For purposes of the environmental restrictive use covenants in this section, the term "Property" includes any part of the Property specifically described on **Exhibit A** to this Deed to which one or more of these environmental restrictive covenants may apply.

2. The following environmental restrictive use covenants in this section are being prescribed to protect human health and the environment against residual contaminants as a component of the remedial action taken in A.2. above:

- Grantee covenants and agrees that it will not use the Property for residential purposes, except for the residential property as shown in **Exhibit D**, hospitals for human care, public or private schools for persons under 18 years of age, or day care centers for children.

- The Grantee covenants and agrees not to dig or excavate in shallow groundwater areas within the TCE concentration contours shown on the map in **Exhibit E** where exposure by a construction worker in a trench may cause unacceptable risks.

- The Grantee covenants and agrees not to extract or permit to be extracted any water from below the surface of the ground within the boundary of the Property except for monitoring purposes.

- The Grantee covenants and agrees construction activities that would interfere with, negatively impact, or restrict access for cleanup work and/or activities that impact and/or affect treatments systems operations, to include impacting the integrity of the PRB as shown in **Exhibit E** and site monitoring wells as shown on the map in Attachment 6 of the SEBS are prohibited.

    - The Air Force will be responsible for implementing, maintaining, monitoring, enforcing, and reporting on restrictive use covenants also known as institutional controls (ICs). The Air Force will notify the EPA as soon as practicable but not longer than 10 days after discovery of any activity that violates or is inconsistent with the IC objectives or restrictions, or any other action that may interfere with the effectiveness of the ICs.

- The Air Force will not modify or terminate ICs or modify land uses which may impact the effectiveness of the ICs or alter or negate the need for ICs without prior notice to the EPA.

3. It is the intent of the Grantor and the Grantee that the environmental restrictive covenants in this section bind the Grantee and shall run with the land. It is also the intent of the Grantor and the Grantee that the Grantor will retain the right to enforce any restrictive use covenant in this section through the chain of title, in addition to any state law that requires or allows the State to enforce any restrictive covenant in this section. The Grantee covenants to insert all of this section in any deed to the Property that it delivers to a successor in interest.

D. Release of Environmental Restrictive Covenant(s)

The Grantee may request from the United States a modification or release of one or more of the environmental restrictive covenant(s) in whole or in part in this section, subject to the notification and concurrence or approval of the TCEQ and EPA Region VI. In the event the request of the Grantee for modification or release is approved by the United States, TCEQ, and EPA Region VI, the United States agrees to modify or release the covenant (the "Covenant Release") giving rise to such environmental use restriction in whole or in part. The Grantee understands and agrees that all costs associated with the Covenant Release shall be the sole responsibility of the Grantee, without any cost whatsoever to the United States. The United States shall deliver to the Grantee in recordable form the Covenant Release. The execution of the Covenant Release by the United States shall modify or release the environmental use restrictive covenant with respect to the Property in the Covenant Release.

VIII. OTHER COVENANTS AND NOTICES

A. Lead-Based Paint ("LBP") - Housing

1. The Property may include improvements that are presumed to contain LBP because the following housing facilities were constructed prior to 1978. The Grantee hereby acknowledges the required disclosure in accordance with the Residential Lead-Based Paint Hazard Reduction Act of 1992, 42 U.S.C. Section 4852d (Title X), of the presence of any known LBP and/or LBP hazards in target housing constructed prior to 1978. This disclosure includes the receipt of available records and reports pertaining to LBP and/or LBP hazards; receipt of the lead hazard information pamphlet; and inclusion of the 24 C.F.R. 35, Subpart H and 40 C.F.R. 745, Subpart F disclosure and lead warning language in the Title X Lead-Based Paint Disclosure Statement in the contract of sale.

2. The Grantee covenants and agrees that, in any improvements on the Property defined as target housing by Title X and constructed prior to 1978, LBP hazards will be disclosed to potential occupants in accordance with Title X before use of such improvements as a residential dwelling (as defined in Title X). Further, the Grantee covenants and agrees that LBP hazards in target housing constructed prior to 1960 will be abated in accordance with Title X before use and occupancy as a residential dwelling. "Target housing" means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than

six [6] years of age resides, or is expected to reside, in such housing) or any zero-bedroom dwelling.

3. The Grantee covenants and agrees that in its use and occupancy of the Property, it will comply with Title X and all applicable Federal, State, and local laws relating to LBP. The Grantee acknowledges that the Grantor assumes no liability for damages for personal injury, illness, disability, or death to the Grantee, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with LBP on the Property, whether the Grantee has properly warned, or failed to properly warn, the persons injured.

B. Lead-Based Paint – Improvements other than Housing

1. The Grantee is hereby informed and does acknowledge that the Property includes non-residential improvements that were built prior to 1978; however, the facilities were not tested for LBP. The Grantee is responsible for managing all LBP and potential LBP on the Property in compliance with all applicable laws and regulations.

2. The Grantee acknowledges that the Grantor assumes no liability for damages for personal injury, illness, disability, or death to the Grantee, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with LBP on the Property, whether the Grantee has properly warned, or failed to properly warn, the persons injured.

C. General Lead-Based Paint and Lead-Based Paint-Containing Materials and Debris (collectively "LBP")

1. Lead-based paint was commonly used prior to 1978 and may be located on the Property. The Grantee is advised to exercise caution during any use of the Property that may result in exposure to LBP.

2. The Grantee covenants and agrees that in its use and occupancy of the Property, the Grantee is solely responsible for managing LBP, including LBP in soils, in accordance with all applicable Federal, State, and local laws and regulations. The Grantee acknowledges that the Grantor assumes no liability for property damages or damages for personal injury, illness, disability, or death to the Grantee, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, contact, disposition, or other activity involving LBP on the Property, whether the Grantee has properly warned, or failed to properly warn, the persons injured. The Grantee further agrees to notify the Grantor promptly of any discovery of LBP in soils that appears to be the result of Grantor activities and that is found at concentrations that may require remediation. The Grantor hereby reserves the right, in its sole discretion, to undertake an investigation and conduct any remedial action that it determines is necessary.

D. Radon. The Grantee is hereby informed and does acknowledge that currently the Property contains a natural occurrence of radon at levels that require no action.

E. Asbestos-Containing Materials ("ACM"). The Grantee is warned that the Property may contain current and former improvements, such as buildings, facilities, equipment, and pipelines, above and below the ground, which may contain ACM. The Grantee covenants and agrees that in its use and occupancy of the Property, it will comply with all applicable Federal, State, and local laws relating to asbestos. The Grantee is cautioned to use due care during property development activities that may uncover pipelines or other buried ACM. The Grantee covenants and agrees that it will notify the Grantor promptly of any potentially friable ACM that constitutes a release under the federal Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. §§ 9601 *et seq.*). The Grantor's responsibility under this Deed for friable ACM is limited to friable ACM in demolition debris associated with past Air Force activities and is limited to the actions, if any, to be taken in accordance with the covenant contained in Section VII. herein. The Grantee is warned that the Grantor will not be responsible for removing or responding to ACM in or on utility pipelines. The Grantee acknowledges that the Grantor assumes no liability for property damages or damages for personal injury, illness, disability, or death to the Grantee, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with asbestos on the Property, whether the Grantee has properly warned, or failed to properly warn, the person injured.

F. Floodplains. A portion of the Property is located in a 100-Year Floodplain as described in **Exhibit F** hereto. Grantee agrees and covenants for itself, its successors and assigns, that any development of the above described Property will be subject to floodplain regulations and other applicable federal, state, and local statues, and ordinances relating to flood hazards.

G. Non-Discrimination. The Grantee covenants not to discriminate upon the basis of race, color, religion, national origin, sex, age, or handicap in the use, occupancy, sale, or lease of the Property, or in its employment practices conducted thereon. This covenant shall not apply, however, to the lease or rental of a room or rooms within a family dwelling unit, nor shall it apply with respect to religion if the Property is on premises used primarily for religious purposes. The United States of America shall be deemed a beneficiary of this covenant without regard to whether it remains the owner of any land or interest therein in the locality of the Property.

H. Hazards to Air Navigation. Prior to commencing any construction on, or alteration of, the Property, the Grantee covenants to comply with 14 C.F.R. Part 77 entitled "Objects Affecting Navigable Airspace," under the authority of the Federal Aviation act of 1958, as amended.

IX. MISCELLANEOUS

Each covenant of this Deed shall be deemed to touch and concern the land and shall run with the land.

X. LIST OF EXHIBITS

The following Exhibits are attached to and made a part of this Deed:

Exhibit A – Legal Description of the Property
Exhibit B – Survey Map of the Property
Exhibit C – Notice of Hazardous Substances
Exhibit D – Location of Residential and Mixed Use Property
Exhibit E – PRB and TCE GW Plume Map
Exhibit F – Floodplains Map

Carswell AFB-187.29 Acres

IN WITNESS WHEREOF, I have hereunto set my hand at the direction of the Secretary of the Air Force, the day and year first above written.

THE UNITED STATES OF AMERICA

By: Adam G. Antwine
ADAM G. ANTWINE
Senior Representative
Air Force Real Property Agency

STATE OF TEXAS

COUNTY OF BEXAR

This instrument was acknowledged before me on the 24th day of April, 2007, by ADAM G. ANTWINE, Senior Representative of the Air Force Real Property Agency.

KELLY MARIE POLASEK
Notary Public, State of Texas
My Commission Expires
May 19, 2010

Kelly Marie Polasek
Notary Public, State of Texas
My Commission Expire May 19, 2010

(seal)

ACCEPTANCE

The Grantee acknowledges delivery of this Deed and agrees to be bound by all the agreements, covenants, conditions, restrictions, and reservations contained in it.

DATE: 4-30, 2007

WESTWORTH REDEVELOPMENT AUTHORTY

By: _____
Name: Pollard Rogers
Title: President

Attest:

_____
Secretary

THE STATE OF TEXAS §
§
COUNTY OF TARRANT §

This instrument was acknowledged before me on the 30th day of April, 2007, by Pollard Rogers, President of Westworth Redevelopment Authority

ELAINE HUTCHISON
Notary Public
STATE OF TEXAS
My Comm. Exp. 06/21/2009

(Notary's Stamp)

Elaine Hutchison
Notary Public in and for the State of Texas
My Commission expires: 6-21-09

After Recording Return To:

Pollard Rogers
Cantey Hanger LLP
801 Cherry St., Unit #2
Fort worth, Texas 76102

Exhibit A
Legal Description of the Property

PROPERTY DESCRIPTION

HAWKS CREEK GOLF COURSE AREA

Being a tract of land located in the Cornelius Connelly Survey, A-319, L. Samuel Survey A-1467, J.M. Shreeve Survey A-1456, and the John McHorse Survey, A-1088 Tarrant County, Texas known as the Hawks Creek Golf Club Area within the NAS Fort Worth JRB. Said tract being a resurvey of a portion of a tract previously surveyed by T.D. Dishercon in October of 1976 and revised in October of 1978 of which survey is filed with the Corp of Engineers, Fort Worth Division, said tract being more particularly described by metes and bounds as follows:

BEGINNING at a found 5/8 inch capped iron rod (BHB INC) on the West line of Rogner Road also being the most easterly northeast corner of Lot 1, Block 1, The Village at Hawks Creek as recorded in Cabinet A, Slide 10469 of the Plat Records of Tarrant County, Texas;

THENCE South 88 degrees 57 minutes 00 seconds West, leaving said West line and along said Lot 1, Block 1, a distance of 205.50 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE North 48 degrees 18 minutes 46 seconds West, continuing along said Lot 1, Block 1, a distance of 321.91 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE North 01 degrees 45 minutes 19 seconds East, continuing along said Lot 1, Block 1, a distance of 481.24 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE North 89 degrees 36 minutes 49 seconds West, continuing along said Lot 1, Block 1, a distance of 196.88 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 03 degrees 15 minutes 56 seconds West, continuing along said Lot 1, Block 1, a distance of 63.21 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 39 degrees 24 minutes 46 seconds West, continuing along said Lot 1, Block 1, a distance of 185.10 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 50 degrees 43 minutes 22 seconds West, continuing along said Lot 1, Block 1, a distance of 203.96 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 39 degrees 24 minutes 46 seconds West, continuing along said Lot 1, Block 1, a distance of 340.00 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 52 degrees 41 minutes 32 seconds East, continuing along said Lot 1, Block 1 and along the northerly R.O.W. line of Roaring Springs Road, a distance of 418.23 feet to a set 5/8 inch capped iron rod (BHB INC), from said set 5/8 inch capped iron rod (BHB INC) a found C.O.E. monument no. 94 bears North 38 degrees 52 minutes 01 second East, a distance of 22.00 feet;

THENCE South 38 degrees 52 minutes 01 seconds West, departing said Northerly R.O.W. line and crossing said Roaring Springs Road, a distance of 87.95 feet to a found C.O.E. monument (damaged) being at the intersection of the Southerly R.O.W. line of Roaring Springs Road with the Northerly R.O.W. line of White Settlement Road;

THENCE South 45 degrees 25 minutes 33 seconds West, along said Northerly R.O.W. line of White Settlement Road, a distance of 100.60 feet to a found C.O.E. monument (damaged) and also being the beginning of a curve to the right whose chord bears South 65 degrees 25 minutes 14 seconds West, a distance of 90.01 feet and having a radius of 131.82 feet;

THENCE Southwesterly, along said curve to the right along said Northerly R.O.W. line of White Settlement Road, through a central angle of 39 degrees 59 minutes 23 seconds, an arc length of 91.87 feet to a found C.O.E. monument (damaged) for the end of said curve;

THENCE South 85 degrees 24 minutes 56 seconds West, along the North R.O.W. line of White Settlement Road, a distance of 298.00 feet to a found C.O.E. monument no. 98;

THENCE South 00 degrees 43 minutes 46 seconds East, departing said North R.O.W. line of

White Settlement Road, passing at a distance of 62.00 feet a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA in the median of said road, continuing for a total distance of 119.26 feet to a found C.O.E. monument No. 99 being on the south R.O.W. line of White Settlement Road and being the Northwest corner of a tract (Third tract) deeded to a J. M. Leonard per document recorded in Volume 4211, Page 402 of said Deed Records;

THENCE South 00 degrees 47 minutes 01 seconds East, a distance of 124.41 feet to a found 5/8 inch capped iron rod (BHB INC) being the most northerly northeast corner of a tract of land deeded to Westworth Redevellopment Authority (WRA) per instrument no. D205041734 as recorded in said Deed Records,

THENCE South 89 degrees 56 minutes 56 seconds West, along the north line of said WRA tract, a distance of 897.46 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 00 degrees 03 minutes 04 seconds East, continuing along the westerly line of said WRA tract, a distance of 300.00 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 50 degrees 39 minutes 30 seconds West, continuing along the westerly line of said WRA tract, a distance of 613.45 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 89 degrees 56 minutes 56 seconds West, continuing along the westerly line of said WRA tract, a distance of 400.00 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 00 degrees 03 minutes 04 seconds East, continuing along the westerly line of said WRA tract, a distance of 240.00 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 89 degrees 56 minutes 56 seconds West, along the north line of a tract deeded to Westworth Redevelopment Authority (WRA) per document recorded in Volume 14192, Page 82 of said Deed Records, a distance of 1079.17 feet to a found 5/8 inch capped iron rod (BHB INC);

THENCE North 00 degrees 03 minutes 04 seconds West, a distance of 465.79 feet to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-04";

THENCE North 00 degrees 02 minutes 17 seconds West, a distance of 740.72 feet to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-08";

THENCE North 00 degrees 09 minutes 40 seconds West, a distance of 157.83 to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-09";

THENCE South 89 degrees 51 minutes 28 seconds East, a distance of 198.87 to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-10";

THENCE North 00 degrees 19 minutes 02 seconds East, a distance of 1,151.22 to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-11";

THENCE South 89 degrees 31 minutes 29 seconds East, a distance of 38.78 to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-12";

THENCE North 00 degrees 10 minutes 09 seconds East, a distance of 751.07 to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped "N-13";

THENCE North 89 degrees 41 minutes 28 seconds East, a distance of 759.17 to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped "WRA";

THENCE North 89 degrees 26 minutes 28 seconds East, a distance of 778.59 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 00 degrees 19 minutes 01 seconds East, a distance of 179.31 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 26 degrees 32 minutes 21 seconds East, a distance of 208.83 to a found "+" cut in concrete;

THENCE South 29 degrees 17 minutes 48 seconds East, a distance of 67.81 to a found 5/8 inch

iron capped iron rod (BHB INC);

THENCE South 38 degrees 08 minutes 42 seconds West, a distance of 197.97 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE North 89 degrees 33 minutes 10 seconds East, a distance of 181.63 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 01 degrees 07 minutes 13 seconds East, a distance of 325.22 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 00 degrees 35 minutes 46 seconds West, a distance of 96.77 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 24 degrees 39 minutes 57 seconds East, a distance of 44.73 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 50 degrees 23 minutes 10 seconds East, a distance of 461.65 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE North 40 degrees 03 minutes 08 seconds East, a distance of 69.13 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE South 50 degrees 32 minutes 26 seconds West, a distance of 120.53 to a found 5/8 inch iron capped iron rod (BHB INC);

THENCE North 39 degrees 31 minutes 52 seconds East, a distance of 215.38 feet to a found 5/8 inch iron rod with a 1-1/2 aluminum cap stamped N-16;

THENCE North 28 degrees 26 minutes 21 seconds East, a distance of 381.60 feet to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped N-17;

THENCE North 52 degrees 45 minutes 45 seconds West, a distance of 45.61 feet to a found 5/8 inch iron rod with a 1-1/2 aluminum cap stamped N-18;

THENCE North 41 degrees 31 minutes 17 seconds East, a distance of 124.97 feet to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped N-19;

THENCE North 55 degrees 59 minutes 04 seconds East, a distance of 153.92 feet to a found 5/8 inch iron rod with a 1-1/2 inch aluminum cap stamped N-20;

THENCE North 69 degrees 14 minutes 53 seconds East, a distance of 222.46 feet to a found 5/8 inch iron rod;

THENCE North 69 degrees 15 minutes 40 seconds East, a distance of 149.20 feet to a found 5/8 inch iron rod;

THENCE North 12 degrees 34 minutes 42 seconds West, a distance of 107.04 feet to a found 5/8 inch iron rod;

THENCE North 77 degrees 47 minutes 03 seconds East, a distance of 384.39 feet to a found 5/8 inch iron rod also being the beginning of a curve to the right whose chord bears North 84 degrees 00 minutes 03 seconds East, a distance of 146.91 feet and having a radius of 678.34 feet;

THENCE Northeasterly, along said curve to the right through a central angle of 12 degrees 26 minutes 02 seconds, an arc length of 147.20 feet to a 5/8 inch capped iron rod (BHB INC) for the end of said curve;

THENCE South 12 degrees 57 minutes 06 seconds East, a distance of 60.93 to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 36 degrees 05 minutes 43 seconds East, a distance of 19.77 to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 79 degrees 33 minutes 54 seconds East, a distance of 38.57 to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 01 degrees 37 minutes 27 seconds East, a distance of 59.66 to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 84 degrees 37 minutes 15 seconds East, a distance of 39.42 to a found 5/8 inch capped iron rod (BHB INC);

THENCE North 05 degrees 22 minutes 45 seconds East, a distance of 116.28 to a found 5/8 inch capped iron rod (BHB INC);

THENCE South 60 degrees 55 minutes 53 seconds East, a distance of 11.79 feet to a found 5/8 inch iron rod on the West line of Rogner Road;

THENCE South 89 degrees 26 minutes 55 seconds East, crossing said Rogner Road, a distance of
58.36 feet to a found 5/8 inch iron rod on the established East Line of Rogner Road;

THENCE the following along said established East line of Rogner Road and the west line of a tract deeded to Westworth Redevelopment Authority (WRA) per instrument no. D201229388 of said Deed Records;

THENCE South 07 degrees 08 minutes 47 seconds West, a distance of 64.77 feet to a found 5/8 inch iron rod;

THENCE South 05 degrees 11 minutes 00 seconds West, a distance of 534.63 feet to a found 5/8 inch iron rod;

THENCE South 00 degrees 30 minutes 00 seconds East, a distance of 184.16 feet to a found 3/4 inch iron rod being the Northwest corner of a tract deeded to a Jeanne W. Griffin per document recorded in Volume 11384, Page 1537 of said Deed Records also being the southwest corner of said WRA tract;

THENCE South 89 degrees 33 minutes 41 seconds West, departing said established East line and crossing said Rogner Road, passing a "Y" cut in concrete at 9.95 feet and continuing for a total distance of 64.67 feet to a set 5/8 inch iron rod on the West line of Rogner Road;

THENCE South 00 degrees 13 minutes 16 seconds West, along said West line of Rogner Road, a distance of 102.65 feet to a set 5/8 inch iron rod;

THENCE South 01 degrees 03 minutes 00 seconds East, continuing along said West line of Rogner Road, a distance of 505.21 feet to the POINT OF BEGINNING and containing a gross area of 8,166,418 square feet or 187.47 acres of land of which SAVE & EXCEPT an area known as the Thompson Family Cemetery Area being 7,767 square feet or 0.18 acre leaving Hawks Creek Golf Course Area with a net area of 8,158,651 square feet or 187.29 acres of land.

Reference bearing basis per USCGS Monument ELEC and USCGS Monument RUN using NAD 83 datum.

Exhibit B
Survey Map of the Property

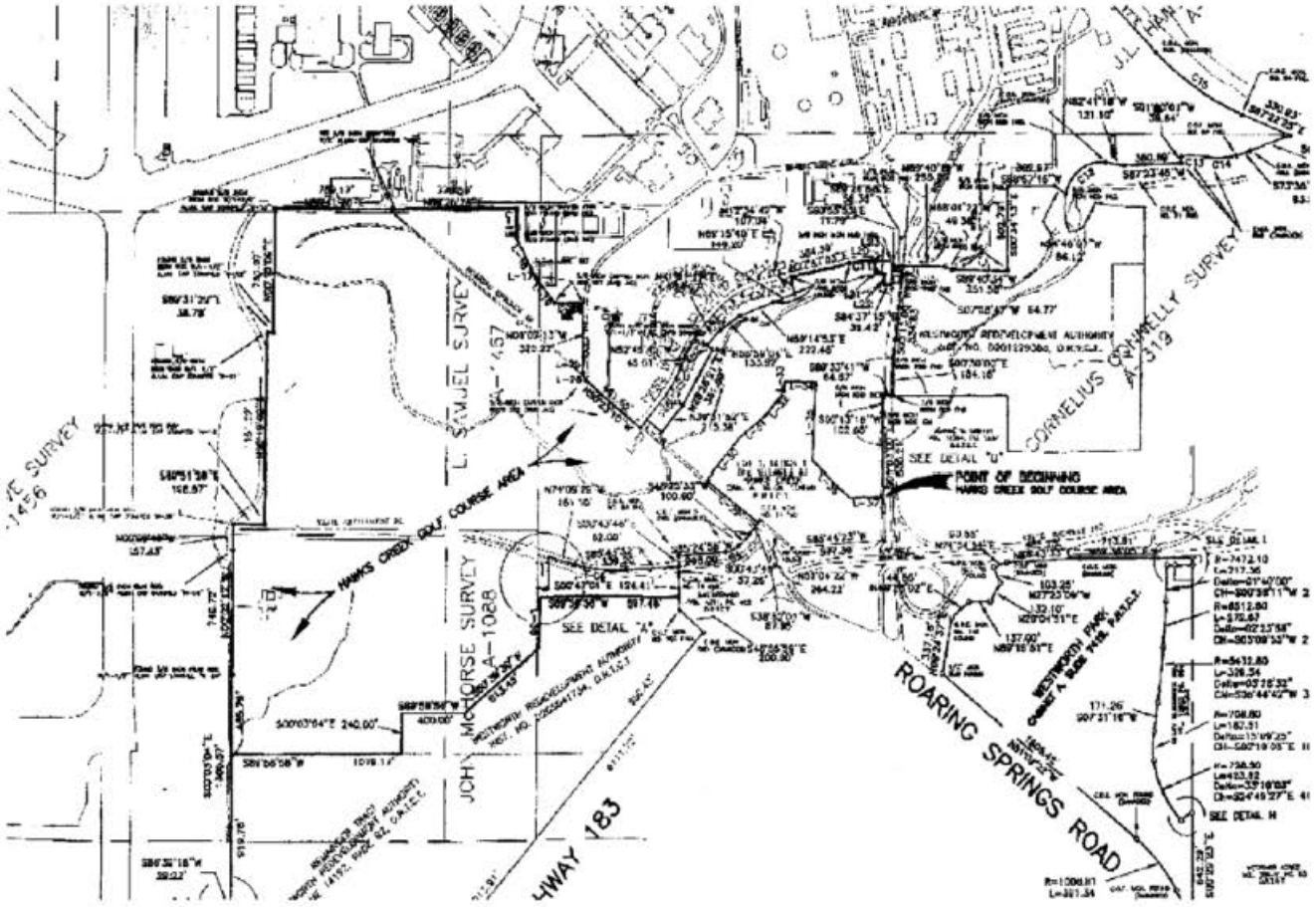

L. SAMUEL SURVEY
A-1457
JOHN MCCORSE SURVEY
A-1028
CORNELIUS CRYWELLY SURVEY
A-313
HAWKS CREEK GOLF COURSE 446A
POINT OF BEGINNING
HAWKS CREEK GOLF COURSE AREA
SEE DETAIL "A"
SEE DETAIL "U"
SEE DETAIL "H"
ROARING SPRINGS ROAD
4WAY 183
WESTWORTH PARK
CHARLIE A. BLISS PARK & RECREATION
WESTWORTH REDEVELOPMENT AUTHORITY

Exhibit C
Notice of Hazardous Substances

NOTICE OF HAZARDOUS SUBSTANCES STORED/DISPOSED

Notice is hereby given that the tables and information provided contain a notice of hazardous substances that have been stored on the Property and the dates that such storage took place. The information contained in this notice is required under the authority of regulations promulgated under section 120(h) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund") 42 U.S.C. section 9620(h).

HAZARDOUS SUBSTANCES STORED/DISPOSED

IRP Site LF004/SWMU 22

Substance Stored	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity mg/kg**	**Dates Stored/Disposed**	**Hazardous Waste ID Number (if applicable)**
Various municipal wastes including paint, thinners, strippers, cadmium batteries , waste solvents, and other burned wastes	NA	NL	Unknown	Landfill used between 1956-1973	NA

IRP Site LF006/SWMU 62

Substance Stored	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity mg/kg**	**Dates Stored**	**Hazardous Waste ID Number (if applicable)**
Construction rubble and drums of hydraulic fluid	NA	NL	Unknown	Unknown. Landfill used between 1975-1978	NA

NA=Not applicable
NL=Not listed

NOTICE OF HAZARDOUS SUBSTANCES RELEASE

Notice is hereby given that the information set out below provides notice of hazardous substances that are known to have been disposed of or released on the Property. The information contained in this notice is required under the authority of regulations promulgated under Section 120(h) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 U.S.C. Section 9620(h).

IRP Site LF004/SWMU 22							
Substance	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity kg/lb**	**Date**	**Hazardous Waste ID Number (if applicable)**	**Response**	**Remarks**
Naphthalene		91-20-3	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site soils = 19 mg/kg at 5 ft bgs (below ground surface)
2-Methylnaphthalene		91-57-6	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site soils = 1.4 mg/kg at 8 ft bgs
Acenapthene		83-32-9	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 1.9 mg/kg
Anthracene		120-12-7	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 5.3 mg/kg
Benzo(a)anthracene	1,2-benzoanthracene	56-55-3	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 34 mg/kg
Benzo(a)pyrene	B(a)P	50-32-8	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 37 mg/kg
Benzo(b)fluoranthene		205-99-2	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 39 mg/kg
Benzo(k)fluoranthene		207-08-9	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils =22 mg/kg
Bis(2-ethylhexyl)phthalate	Dioctylphthalate	117-81-7	Unknown	Unknown	N/A	IRA consisting of 13 cy centered on B406 was completed to remove the remaining RRS3 soil found in the 5' bgs interval. A total of 82 cubic yards was removed. Remaining soil	Maximum concentration remaining in place in site soils = 58 mg/kg

IRP Site LF004/SWMU 22							
Substance	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity kg/lb**	**Date**	**Hazardous Waste ID Number (if applicable)**	**Response**	**Remarks**
						contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	
Chrysene		218-01-9	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 38 mg/kg
Dibenzo (a, h) anthracene		53-70-3	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 4.9 mg/kg
Dibenzofuran		132-64-9	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site surface soils =.92 mg/kg
Fluoranthene		206-44-0	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 60 mg/kg
Fluorene		86-73-7	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils =1.8 mg/kg
Ideno(1.2,3-e,d)pyrene		193-39-5	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils =25 mg/kg
Phenantrene		85-01-8	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 35mg/kg
Pyrene		129-00-0	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 45 mg/kg
1,2 Dichlorobenzene		95-50-1	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site soils = 1.8 mg/kg at 5 ft bgs
1,3 Dichlorobenzene		541-73-1	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site soils = 0.76 mg/kg at 5 ft bgs
1,4 Dichlorobenzene		106-46-7	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in site soils = 0.76mg/kg at 5 ft bgs

*Note : TCEQ Risk Reduction Standard (RRS) 2: Closure/Remediation to Health-Based Standards and Criteria, 30 Texas Administrative Code (TAC) Chapter 335.555. Under TCEQ RRS2 no post-closure care, engineering, or institutional control measures are required; however, public notice and certification of remediation of contaminants left in soil above residential levels is required to achieve final closure. Copies of Industrial Solid Waste Certification of Remediation documents were filed in the Real Property Records of Tarrant County, Texas .

IRP Site PS019/AOC 9

Substance	Regulatory Synonym(s)	CAS Registry Number	Quantity kg/lb	Date	Hazardous Waste ID Number (if applicable)	Response	Remarks
Chlordane	Toxichlor	57-74-9	Unknown	Unknown	NA	Approximately 380 cy of soil were excavated. Soil contaminants left in place were either below background level or below human target levels.	Closed under TCEQ RRS 1 on August 31, 1999. Suitable for unrestricted use.

IRP Site WP011/SWMU 58

Substance	Regulatory Synonym(s)	CAS Registry Number	Quantity Kg/lb	Date	Hazardous Waste ID Number (if applicable)	Response	Remarks
Chlordane	Toxichlor	57-74-9	Unknown	Unknown	NA	Approximately 380 cy of soil were excavated. Soil contaminants left in place were either below background level or below human target levels.	Closed under TCEQ RRS 1 on August 31, 1999. Suitable for unrestricted use

IRP Site LF006/SWMU 62

Substance	Regulatory Synonym(s)	CAS Registry Number	Quantity kg/lb	Date	Hazardous Waste ID Number (if applicable)	Response	Remarks
Antimony		7440-36-0	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 3.3 mg/kg

IRP Site LF006/SWMU 62

Substance	Regulatory Synonym(s)	CAS Registry Number	Quantity kg/lb	Date	Hazardous Waste ID Number (if applicable)	Response	Remarks
Barium		7440-39-3	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils 3 ft bgs = 143 mg/kg
Beryllium		7440-41-7	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 1.1 mg/kg
Lead		7439-92-1	Unknown	Unknown	NA	A total of two excavations were performed as part of an IRA for SWMU 62. Approximately 120 cy of soil were removed centered on boring B640. An additional 20 cy of soils was removed centered on boring B646. IRA excavation confirmation showed all target CoC's were removed. Any remaining soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 38.9mg/kg Maximum concentration remaining in place in surface soils=116 mg/kg
Nickel		7440-02-0	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils=20.5 mg/kg
Selenium		7782-49-2	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 23 mg/kg
Thallium		7440-28-0	Unknown	Unknown	NA	Soil contaminants left in place were below background industrial levels for thallium and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 16.0 mg/kg
Vanadium		27774-13-6	Unknown	Unknown	NA	Soil contaminants left in place were below background levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 47.5 mg/kg Maximum concentration remaining in

IRP Site LF006/SWMU 62							
Substance	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity kg/lb**	**Date**	**Hazardous Waste ID Number (if applicable)**	**Response**	**Remarks**
							place in surface soils = 54.2 mg/kg
Zinc		7440-66-6	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 61.4 mg/kg
Chlordane		57-74-9	Unknown	Unknown	NA	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 1.1 mg/kg
p,p-DDT			Unknown	Unknown	NA	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 0.0051 mg/kg
Acetone		67-64-1	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*	Maximum concentration remaining in place in surface soils = 0.17 mg/kg
Methyl Ethyl Ketone	MEK	78-93-3	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 0.026 mg/kg
Acenapthene		83-32-9	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 1.9 mg/kg
Anthracene		120-12-7	Unknown	Unknown	NA	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 1.6 mg/kg
Benzo(a)anthracene	1,2-benzoanthracene	56-55-3	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 12 mg/kg
Benzo(a)Pyrene		50-32-8	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 13 mg/kg
Benzo(b)fluoranthene		205-99-2	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 14 mg/kg

IRP Site LF006/SWMU 62

Substance	Regulatory Synonym(s)	CAS Registry Number	Quantity kg/lb	Date	Hazardous Waste ID Number (if applicable)	Response	Remarks
Benzo(g,h,i)perlene		191-24-2	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 8.3 mg/kg
Benzo(k)fluoranthene		207-08-9	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 5.7mg/kg
Chrysene		218-01-9	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 11 mg/kg
Dibenzo (a,h)anthracene		53-70-3	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 3.2 mg/kg
Fluoranthene		86-73-7	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 19 mg/kg
Ideno(1,2,3-c,d)pyrene		193-39-5	Unknown	Unknown	N/A	Soil contaminants left in place were below site specific MSC levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in subsurface soils = 11 mg/kg
Phenanthrene		85-01-8	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface and subsurface soils = 5.7 mg/kg
Pyrene		129-00-0	Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface and subsurface soils = 22 mg/kg
Sulfide			Unknown	Unknown	N/A	Soil contaminants left in place were below industrial levels and received state closure under TCEQ RRS2*.	Maximum concentration remaining in place in surface soils = 92.1 mg/kg

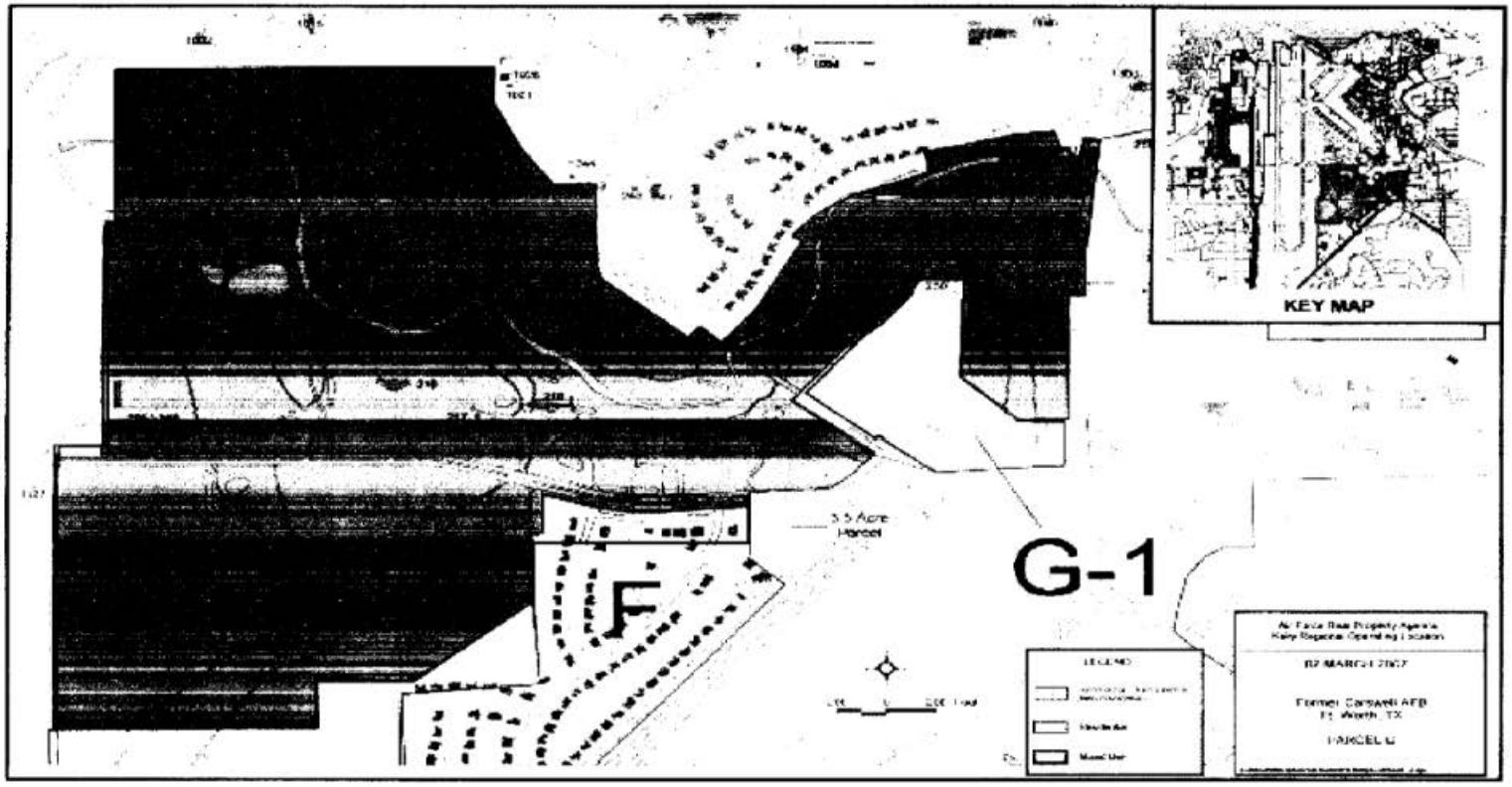
*Note : TCEQ Risk Reduction Standard (RRS) 2: Closure/Remediation to Health-Based Standards and Criteria, 30 Texas Administrative Code (TAC) Chapter 335.555: Under TCEQ RRS2 no post-closure care, engineering, or institutional control measures are required; however, public notice and certification of remediation of contaminants left in soil above residential levels is required to achieve final closure. For additional information, reference

Subsurface soil samples were collected from 5 – 15 ft below ground surface (bgs) intervals.

Air Force Plant (AFP) 4 TCE Groundwater Plume							
Substance	**Regulatory Synonym(s)**	**CAS Registry Number**	**Quantity Kg/lb**	**Date**	**Hazardous Waste ID Number (if applicable)**	**Response**	**Remarks**
Trichloroethene	TCE	79-01-6	Unknown	Unknown	NA	See Note Below*	OPS determination, as demonstrated in indicated that necessary remedies have been implemented and are operating as designed.

*Note : A TCE plume originating from the AFP4 has impacted groundwater underlying a portion of the Property. The site is currently being remediated under a federal facilities agreement (FFA) between EPA Region 6, TCEQ and Aeronautical Systems Center and the AFP 4 Record of Decision. Source area remediation activities include product removal, soil vapor extraction, electrical resistance heating of subsurface soils, and a groundwater pump and treat system immediately downgradient of the area.

Exhibit D
Location of Residential and Mixed Use Property


KEY MAP
G-1
F
3.5 Acre
Parcel

Legal Description and Property Survey for the 3.5 Acre Parcel (Mixed Use)

Tract II:

Being a tract of land located in the John McHorse Survey, A-1088, the Cornelius Connelly Survey, A-319 and the John Collett Survey, A-262 Tarrant County, Texas. Said tract being a portion of Carswell Air Force Base previously surveyed by T. D. Disheroon in October of 1976 and revised in October of 1978 of which survey is filed with the Corp of Engineers, Fort Worth Division, said tract also being a portion of the Wherry Housing Area per plat of survey called boundary resurvey of a tract known as NAS Fort Worth JRB (AKA Carswell Air Force Base) Tarrant County, Texas prepared by Baird, Hampton & Brown, Inc., Fort Worth, Texas, dated January 14, 1998 filed with the Air Force Base Conversion Agency and Westworth Redevelopment Authority said tract also being a portion of a tract deeded to Westworth Redevelopment Authority per Deed Without Warranty as recorded in Volume 14192, Page 82 of the Deed Records of Tarrant County, Texas said tract being more particularly described by metes and bounds as follows:

BEGINNING at a found Corp of Engineers Monument (C.O.E.) (damaged) being located on the Northwesterly R.O.W. line of State Highway 183 also being the most Southerly point of a tract (Third tract) deeded to a J. M. Leonard per document recorded in Volume 4211, Page 402 of the Deed Records of Tarrant County, Texas;

THENCE South 40 degrees 58 minutes 50 seconds West, along said Northwesterly R.O.W. line of State Highway 183, a distance of 1,728.83 feet to a found 5/8 inch capped iron rod stamped "BHB INC";

THENCE North 48 degrees 26 minutes 31 seconds West, leaving said Northwesterly R.O.W. line of State Highway 183, a distance of 580.48 feet to a set 5/8 inch capped iron rod stamped "BHB INC";

THENCE North 00 degrees 06 minutes 30 seconds East, a distance of 375.54 feet to a set 5/8 inch capped iron rod stamped "BHB INC";

THENCE North 84 degrees 31 minutes 16 minutes East, a distance of 555.18 feet to a set 5/8 inch capped iron rod stamped "BHB INC";

THENCE North 02 degrees 25 minutes 24 seconds West, a distance of 753.25 feet to a set 5/8 inch capped iron rod stamped "BHB INC", said set 5/8 inch capped iron rod stamped "BHB INC" being on the south line of the Thompson Family Cemetery as recorded in Volume 310, Page 2 of said Deed Records, from said set 5/8 inch capped iron rod stamped "BHB INC" a found C.O.E. monument (damaged) being the Southwest corner said Thompson Family Cemetery bears South 89 degrees 52 minutes 36 seconds West, a distance of 21.50 feet;

THENCE North 89 degrees 52 minutes 36 seconds East, along the south line of said Thompson Family Cemetery, a distance of 16.00 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA;

THENCE South 00 degrees 07 minutes 24 seconds East, leaving said south line of said Thompson Family Cemetery and along the west line of the Eppie Latimar York Burial Plot, a distance of 7.00 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA;

THENCE North 89 degrees 52 minutes 36 seconds East, along the south line of said Eppie Latimar York Burial Plot, a distance of 16.00 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA;

THENCE North 00 degrees 07 minutes 24 seconds West, along the east line of said Eppie Latimar York Burial Plot, a distance of 7.00 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA, said found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA being on said south line of Thompson Family Cemetery,

THENCE North 89 degrees 52 minutes 36 seconds East, along said south line of Thompson Family Cemetery, a distance of 14.40 feet to a found C.O.E. monument no. C-4;

THENCE North 00 degrees 09 minutes 04 seconds West, passing a found C.O.E. monument (damaged) for the most easterly northeast corner of said Thompson Family Cemetery at a distance of 84.86 feet and continuing for a total distance of 189.86 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA within the median of the centerline of White Settlement Road;

THENCE South 74 degrees 09 minutes 29 seconds East, along the centerline of said White Settlement Road, a distance of 181.10 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA also being the beginning of a curve to the left whose chord bears South 84 degrees 12 minutes 59 seconds East, a distance of 335.65 feet and having a radius of 960.92 feet;

THENCE Southeasterly, along said curve to the left through a central angle of 20 degrees 06 minutes 59 seconds, an arc length of 337.38 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA for the end of said curve,

THENCE North 85 degrees 43 minutes 32 seconds East, a distance of 339.20 feet to a found 5/8 inch iron rod with a 2 inch aluminum cap stamped WRA;

THENCE South 00 degrees 43 minutes 46 seconds East, crossing said White Settlement Road, a distance of 57.26 feet to a found C.O.E. monument no. 99 being on the South R.O.W. line of White Settlement Road and being the Northwest corner of said tract (Third tract) deeded to J.M. Leonard;

THENCE South 00 degrees 47 minutes 01 seconds East, a distance of 204.41 feet to a found C.O.E. monument no. 100;

THENCE South 48 degrees 55 minutes 59 seconds East, a distance of 200.00 feet to the POINT OF BEGINNING and containing 1,290,751 square feet or 29.63 acres of land.

Reference bearing basis per USCGS Monument ELEC and USCGS Monument RUN using NAD 83 datum.

Save and Except:

BEING a 26.146 acre tract of land situated in the Cornelius Connelly Survey, Abstract Number 319, in the John Collett Survey, Abstract Number 262, in the John McHerse Survey, Abstract Number 1088, in the J. M. Shreeve Survey, Abstract Number 1456, in the City of Westworth Village and being a portion of the tract of land described in the deed to Westworth Redevelopment Authority recorded in Volume 14192, Page 82, Deed Records of Tarrant County, Texas also being a portion of the tract of land described in the deed to Westworth Redevelopment Authority recorded in Document Number 205041734, Deed Records of Tarrant County, Texas, said 26.146 acre tract of land being more particularly described as follows:

BEGINNING at a 5/8" iron rod with cap stamped "BHB Inc." found in the northwesterly right-of-way line of State Highway 183 (210 foot wide right-of-way) for the easterly corner of the tract of land described in Memorandum of Ground Lease to Allegiance Commercial Development, LP, recorded in Volume 17309, Page 73, Deed Records of Tarrant County, Texas;

THENCE North 48°26'31" West a distance of 580.48 feet to a 5/8 inch iron rod with a cap stamped "BHB Inc." found for corner;

THENCE North 00°06'30" East a distance of 375.54 feet to a 5/8 inch iron rod with a cap stamped "BHB Inc." found for corner;

THENCE North 84°31'16" East a distance of 555.18 feet to a 5/8 inch iron rod with a cap stamped "BHB Inc." found for corner;

THENCE North 02°25'24" West a distance of 702.74 feet to a 5/8 inch iron rod with a cap stamped "BHB Inc." found for corner;

THENCE with the northerly line of aforementioned Westworth Redevelopment Authority tract (Document Number 205041734) North 89°56'56" East a distance of 892.61 feet to a 5/8 inch iron rod with a cap stamped "BHB Inc." found in the westerly line of the tract of land described in the deed to Margaux Westside Partners, Ltd. recorded in Document Number 204391476, Deed Records of Tarrant County, Texas;

THENCE departing the northerly line of said Westworth Redevelopment tract (Document Number 205041734) with a common line of said Margaux Partners tract and said Westworth Redevelopment tract South 00°47'01" East a distance of 80.00 feet to a U.S. Army Corps of Engineers monument Disk No. 100 found for corner;

THENCE continuing with a common line of said Margaux Partners tract and said Westworth Redevelopment tract (Document Number 205041734) South 48°55'59" East a distance of 200.00 feet to a damaged U.S. Army Corps of Engineers monument Disk found in the northwesterly right-of-way line of State Highway 183;

THENCE with the northwesterly right-of-way line of State Highway 183 South 40°58'50" West a distance of 1,728.83 feet to the POINT OF BEGINNING;

CONTAINING a computed area of 26.146 acres (1,138,931 square feet) of land.

3.488 Acres
Cornelius Connelly Survey, A-319
Westworth Village, Tarrant County, Texas

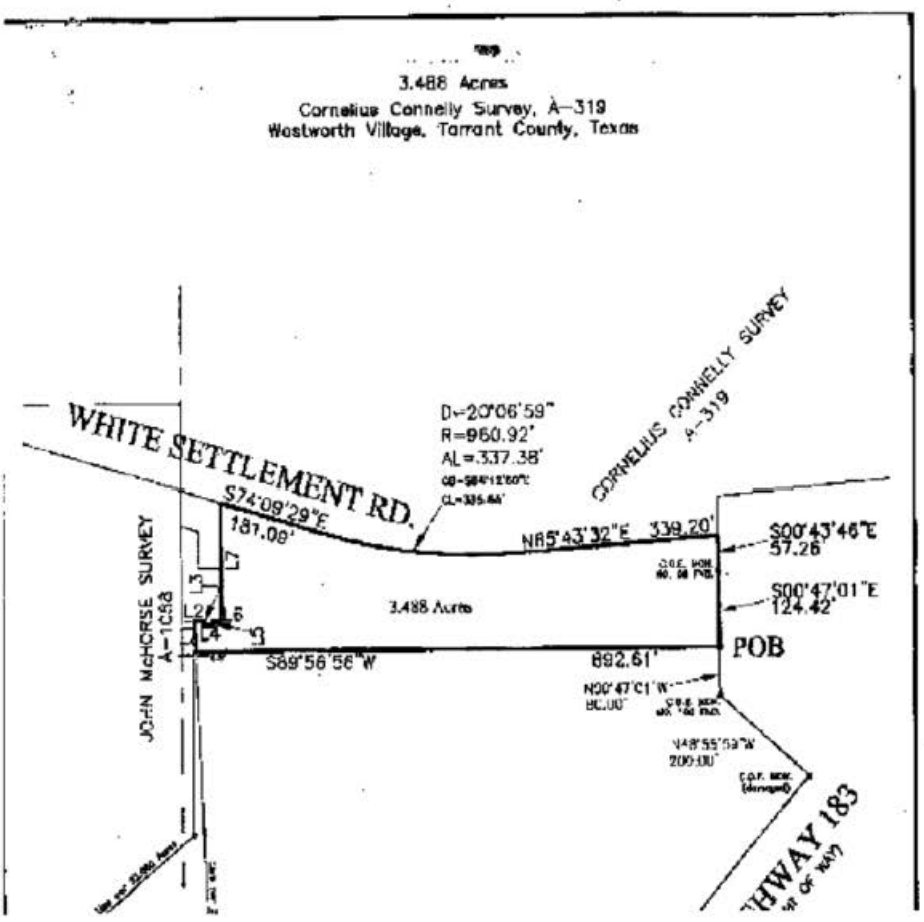


Exhibit E
PRB and TCE GW Plume Map

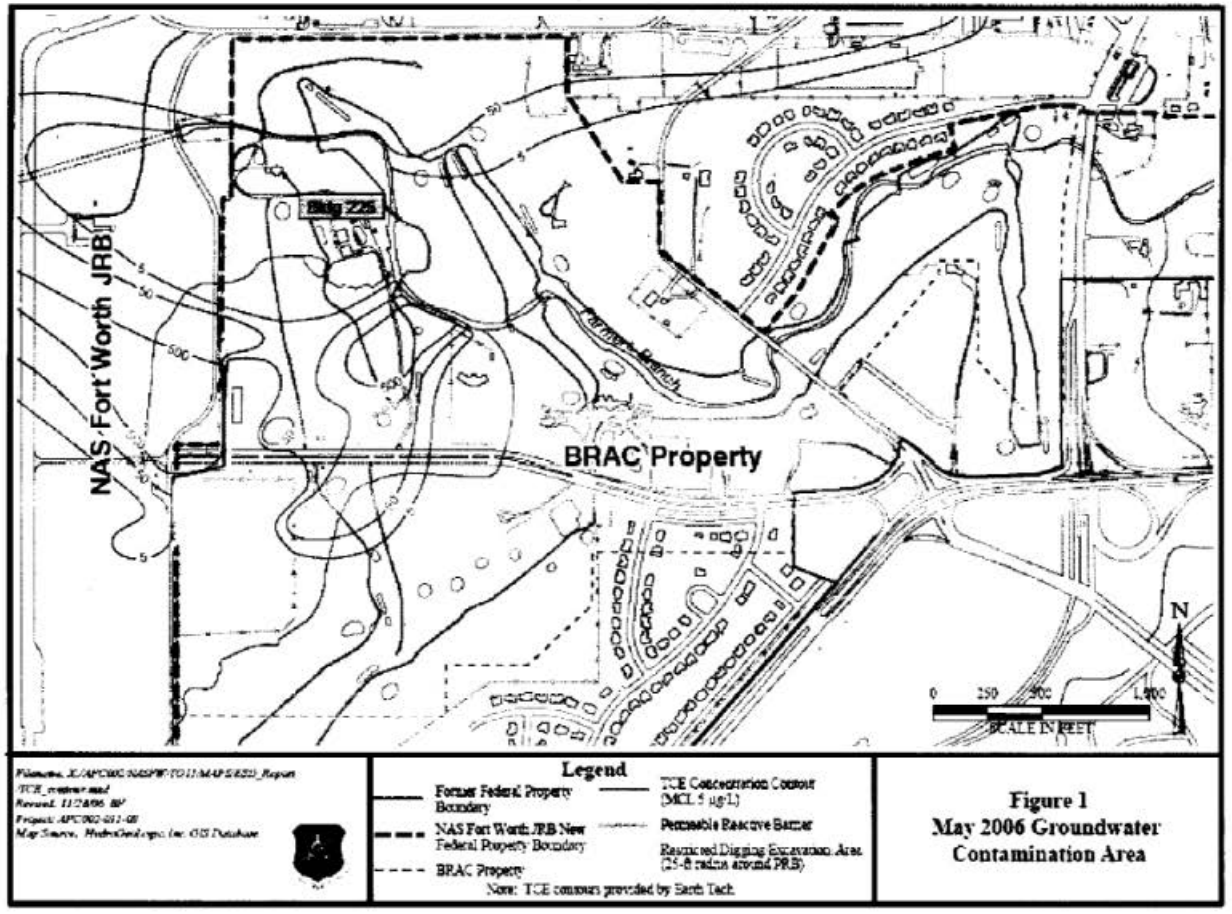


Figure 1
May 2006 Groundwater Contamination Area

Exhibit "A"
Metes and Bounds Description
No Dig Area
1.335 Acres
Naval Air Station, Joint Reserve Base
J.M. Shreeve Survey, Abstract 1456
Fort Worth, Tarrant County, Texas

Being a 1.335 acre tract of land located in the J.M. Shreeve Survey, A-1456, Tarrant County, Texas, said tract being a portion of a tract of land known in the past as Carswell Golf Course Area, now known as Hawks Creek Golf Course Area, within the NAS Fort Worth JRB as shown on Boundary Resurvey of a tract of land known as NAS Fort Worth JRB (aka Carswell Air Force Base), Tarrant County, Texas, last dated February 9, 2001, prepared by Baird, Hampton, & Brown, Inc. for the Air Force Base Conversion Agency of which is on file with the Corp of Engineers, Fort Worth Division and Westworth Redevelopment Authority. Said tract being a resurvey of a portion of a tract previously surveyed by T.D. Disheroon in October of 1976 and revised in October of 1978 of which survey is filed with said Corp of Engineers, Fort Worth Division, said tract being more particularly described by metes and bounds as follows (bearings referenced to said Baird, Hampton and Brown survey):

COMMENCING at a found 5/8 inch iron rod with 1-1/2 inch aluminum cap stamped "N-04" in the west line of the said Hawks Creek Golf Course Area, from which the northwest corner of a tract of land described by deed to Westworth Redevelopment Authority bears S 00°03'04" E, a distance of 465.79 feet;

THENCE N 04°53'41" W for a distance of 427.73 feet to the POINT OF BEGINNING;

THENCE N 00°18'55" E for a distance of 348.35 feet to a point;

THENCE N 82°02'18" E for a distance of 237.21 feet to a point;

THENCE N 00°25'22" E for a distance of 578.05 feet to a point;

THENCE S 89°34'38" E for a distance of 50.00 feet to a point;

THENCE S 00°25'22" W for a distance of 621.22 feet to a point;

THENCE S 82°02'18" W for a distance of 237.13 feet to a point;

THENCE S 00°18'55" W for a distance of 305.10 feet to a point;

THENCE N 89°41'05" W for a distance of 50.00 feet to the POINT OF BEGINNING and containing 1.335 acres of land more or less.

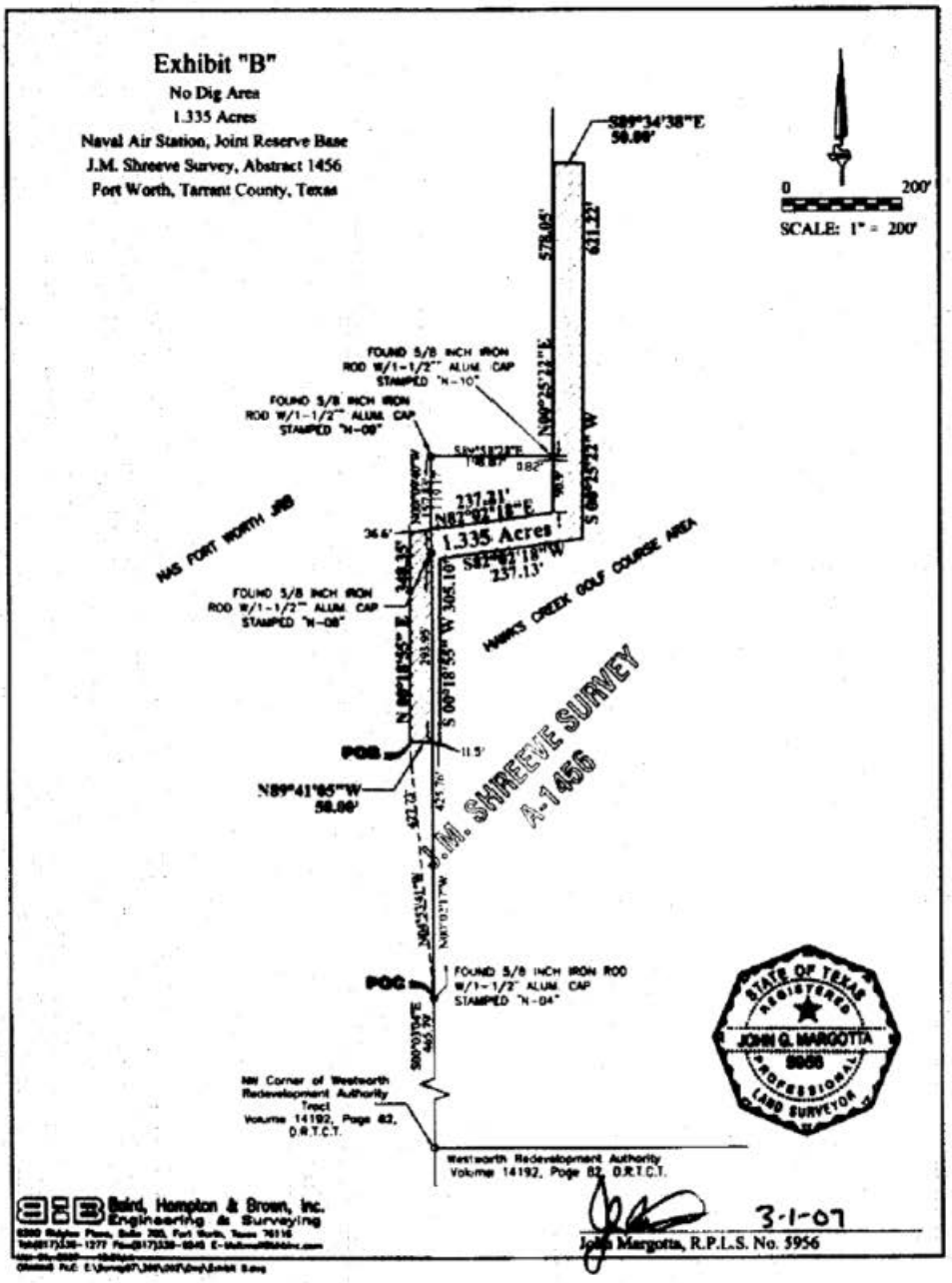
3-1-07

John Margotta — Date
R.P.L.S. No. 5956
Baird, Hampton and Brown Inc.



Exhibit "B"

No Dig Area
1.335 Acres
Naval Air Station, Joint Reserve Base
J.M. Shreeve Survey, Abstract 1456
Fort Worth, Tarrant County, Texas



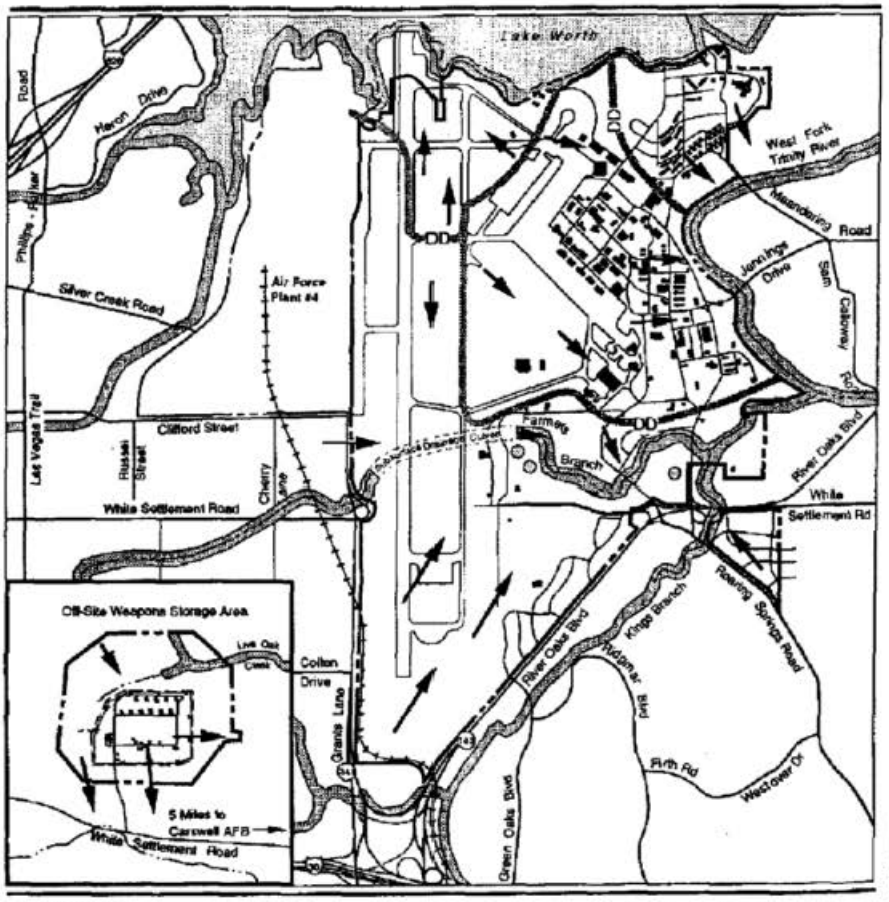
STATE OF TEXAS
REGISTERED
JOHN Q. MARGOTTA
5956
PROFESSIONAL
LAND SURVEYOR

Baird, Hampton & Brown, Inc.
Engineering & Surveying

3-1-07

John Margotta, R.P.L.S. No. 5956

Exhibit F
Floodplains



Surface Hydrology and Drainage Patterns

Figure 3.4-2

CANTEY & HANGER LLP
801 CHERRY ST UNIT #2
ATTN POLLARD ROGERS
FT WORTH TX 76102

Submitter: CANTEY & HANGER LLP

SUZANNE HENDERSON
TARRANT COUNTY CLERK
TARRANT COUNTY COURTHOUSE
100 WEST WEATHERFORD
FORT WORTH, TX 76196-0401

DO NOT DESTROY
WARNING - THIS IS PART OF THE OFFICIAL RECORD.

Filed For Registration: 05/03/2007 10:56 AM
Instrument #: D207152455
WD 40 PGS $168.00

By: _____

D207152455

ANY PROVISION WHICH RESTRICTS THE SALE, RENTAL OR USE OF THE DESCRIBED REAL PROPERTY BECAUSE OF COLOR OR RACE IS INVALID AND UNENFORCEABLE UNDER FEDERAL LAW.

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APPENDIX D

Fifth Five-Year Review Public Notice &
Responses to Emailed Questionnaires



Stay Informed!
Air Force Plant 4
Environmental Cleanup
Fifth Five-Year Review

What? - The Five-Year Review is a formal evaluation of the ongoing environmental cleanup activities at Air Force Plant 4 in Fort Worth, TX. The report is expected to be issued in September 2024 and the Air Force is notifying you the process has begun. If you have any issues about the cleanup program, or if you have direct knowledge regarding cleanup remedies, the Air Force would like to speak to you. Please contact Mr. Bradley Bashore using the contact information listed below.

Why? - The purpose of the Five-Year Review process is to determine if the cleanup remedies in place are protective of human health and the environment. The report also provides recommendations if deficiencies are found.

The review is a status report of the Air Force's cleanup programs underway at the plant since the 1980s. Past dis-

CBII Help

posal of hazardous materials, such as solvents and other chemicals resulted in soil, groundwater, sediment, and surface water contamination. While the Air Force is the lead agency responsible for cleanup, the U.S. Environmental Protection Agency and the Texas Commission of Environmental Quality review the report.

This is a plant-wide review which will address the status of 24 sites.

Where? - Upon conclusion of the Five-Year Review, a second public notice will inform the community the review has been completed. The Five-Year Review report will then be made available for public review at:

Federal Depository
White Settlement Public Library
8215 White Settlement Rd.
White Settlement, TX 76108

Or on the web at:
http://ar.afcec-cloud.af.mil

Questions? - Any person wishing to provide comments regarding this notice may respond in writing to:

Mr. Bradley Bashore
AFCEC/CZOM
1981 Monahan Way, Bldg 12
Wright-Patterson AFB, OH 45433-7205
W00000000
Publication Dates

CBII Help

THANK YOU for your legal submission!

Your legal has been submitted for publication. Below is a confirmation of your legal placement. You will also receive an email confirmation.

ORDER DETAILS

Order Number:
IPL0160267
Order Status:
Submitted
Classification:
Legals & Public Notices
Package:
FTW - Legal Ads
Final Cost:
$1,562.90
Referral Code:
P2 513811
Payment Type:
Mastercard
User ID:
IPL0034133

ACCOUNT INFORMATION

Karlene Kneeling
819 Taylor Street, Suite 3A12
Fort Worth, TX 76102
817-886-1857
Suzanne.Simpson@usace.army.mil

PAYMENT DETAILS

Mastercard**********3296 03/2025

TRANSACTION REPORT

Date
February 15, 2024 1:52:21 PM EST
Amount:
$1,562.90

SCHEDULE FOR AD NUMBER IPL01602670

February 19, 2024

PREVIEW FOR AD NUMBER IPL01602670

CBII Help

Fort Worth Star-Telegram Print

CBII Help

Interview Questionnaire – 2024 Air Force Plant 4 Five-Year Review

Interviewer: Ramon Roman-Sanchez, U.S. Army Corp of Engineers, Fort Worth District
Interviewee: Midori Campbell, Texas Commission on Environmental Quality
Date: June 25, 2024

1. What is your overall impression of the project? (General sentiment)

   Overall, the scope of the remedial action processes addresses the elements of the 2023 Record of Decision (ROD) Amendment No. 1. Long-term contaminant trends indicate that the contaminant mass is stable or decreasing with time. Physical DNAPL removal from the Terrace Alluvium/Walnut Formation groundwater is being performed to the extent practicable in the LF01/LF03 Area in support of a Technical Impracticability (TI) Waiver from achieving the Safe Drinking Water Act Maximum Contaminant Levels (MCLs) in this area. MCLs have replaced Alternative Concentration Limits established in the 1996 ROD as the cleanup standards for groundwater and surface water chemicals of concern (COCs). Monitored natural attenuation (MNA) has been implemented in all groundwater units in conjunction with long-term monitoring to reduce contaminant levels and to confirm protection of public health and welfare of the environment. If MNA is determined to be ineffective at attaining MCLs in groundwater within a reasonable timeframe, enhanced in-situ bioremediation (EISB) would be implemented and addressed in an Explanation of Significant differences (ESD). Institutional Controls (ICs) are implemented through an Installation Development Plan.

2. Is the remedy functioning as expected? How well is the remedy performing?

   In general, the remedy components are performing as intended and currently remains functional and protective of human health and the environment. Land Use Controls (LUCs) and dig permits limit dermal contact with and ingestion of contaminants in soil. Institutional controls at the site prevent use of the groundwater for any purpose other than sampling. Long-term contaminant trends documented in the 2021 Focused Feasibility Study (FFS) indicate that the contaminant mass is stable or decreasing with time. As prescribed in the 2023 ROD Amendment, the groundwater Sampling and Analysis Plan is currently being updated to formalize the Long Term Monitoring (LTM) program, and MNA will be evaluated for each of the groundwater COC plumes based on multiple lines of evidence.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

   An MNA evaluation in the FFS demonstrated that natural attenuation is occurring and is effectively controlling COCs in the shallow groundwater zones across the site. The size of the COC plumes has decreased over time.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

   O&M is performed by Los Alamos Technical Associates (LATA), the Air Force Contractor. LATA has one full time staff onsite. O&M activities consist of the following:

   - Monthly DNAPL removal at the LF01/LF03 DNAPL area;
   - Monthly LF01 Fluid Level Survey;
   - Monthly inspection of the East Parking Lot treatment system;
   - Semi-Annual, Annual, and Biennial Groundwater Performance Monitoring;
   - Annual surface water and sediment sampling;
   - Annual LUC Inspections; and
   - Annual groundwater synoptic survey.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.

   Over the past two years, three additional offsite wells have been installed immediately to the south of the facility's southern boundary to evaluate the southern extent of the TCE plume in the Terrace Alluvium. These wells will provide additional data to evaluate the protectiveness of the groundwater remedy. The Sampling and Analysis Plan is being updated to comply with 2023 ROD Amendment and to evaluate performance objectives and the effectiveness of MNA. Additionally, the MCLs established as cleanup goals for the groundwater and surface water will increase the protectiveness of the remedy.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

   I am not aware of any unexpected O&M difficulties or costs in the last five years.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

   Long term groundwater monitoring for evaluating natural attenuation is being initiated per the 2023 ROD Amendment. The opportunity for optimization of O&M and/or sampling efforts will be identified following several years of data collection.

8. Do you have any comments, suggestions, or recommendations regarding the project?

   I do not have any comments, suggestions, or recommendations regarding the project.

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Midori Campbell	Project Manager	TCEQ	June 25, 2024
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date

Interview Questionnaire – 2024 Air Force Plant 4 Five-Year Review

Interviewer: Ramon Roman-Sanchez, U.S. Army Corp of Engineers, Fort Worth District
Interviewee: James Hoelke **Date**: March 11, 2024

1. What is your overall impression of the project? (General sentiment)
   The Installation Restoration Program (IRP) project has been running fairly well during the past year period. There has been good interaction between the U.S. Air Force, their contractors, and Lockheed Martin Aeronautics. This has ensured that IRP project needs are met while ensuring that aircraft production is not impacted by on-site IRP activities.

2. Is the remedy functioning as expected? How well is the remedy performing?
   Based on my review of reports and attendance at regulator status meetings and Restoration Advisory Board (RAB) meetings, the remedies in the ROD appear to be functioning as expected with good performance.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
   Based on information provided as referenced in question 2, the data shows that contaminant levels continue to decrease with the TCE groundwater plume staying on property without offsite migration.

4. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.
   The U.S. Air Force has a contractor, Los Alamos Technical Associates (LATA), with a permanent contractor (Mr. Randall McDaniel) on-site each week. Mr. McDaniel conducts routine monitoring and removal of DNAPL from the Landfill 1 area (JSF parking lot). Additional LATA staff has been brought on-site twice annually for periods of routine monitoring. Annually a land use control inspection has been conducted of the IRP sites with photographs taken that are included in the annual inspection report. In addition, the U.S. Air Force has used pilot projects during the five-year period to provide additional data that were used in submitting the Record of Decision (ROD) amendment to the U.S. Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality. The ROD amendment was finalized between the U.S. Air Force and U.S. EPA in May 2023.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
   Not aware of any significant changes in the O&M requirements, maintenance schedules, or sampling routine in the last five years. Since start-up the most significant recent change was that the pump and treat facility (Site 900) has been inactive since 2013.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.

Not aware of any unexpected costs in the last five years. The pump and treat facility has aging infrastructure and must be run manually now from my understanding. This is primarily due to technological obsolescence of the control equipment. Upgrading the site control equipment would likely involve significant expense that is not currently budgeted to my knowledge.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

In the last five years, LATA has attempted to optimize sampling efforts by planning multiple projects during the same time period to eliminate extra site visits (e.g. semi-annual sampling event and land use control inspection).

8. Do you have any comments, suggestions, or recommendations regarding the project?

The U.S. Air Force is currently developing an Installation Development Plan (IDP) for Air Force Plant 4. The IDP is expected to be complete in late 2024. The primary component of the IDP will be a land use control plan. Lockheed Martin Aeronautics developed its own land use control plan to help protect remediation infrastructure on -site in October 2020. It is reviewed and updated annually.

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
James Hoelke	Environmental Engineer Staff	Lockheed Martin Aeronautics Environment, Safety and Health (ESH)	3/11/2024

Interview Questionnaire – 2024 Air Force Plant 4 Five-Year Review

Interviewer: Ramon Roman-Sanchez, U.S. Army Corp of Engineers, Fort Worth District
Interviewee: (*John Wolfe*) **Date**: (*8 March 2024*)

1. What is your overall impression of the project? (General sentiment) The 1996 Record of Decision (ROD) was previously deemed by USEPA and the Texas Commission on Environmental Quality (TCEQ) to be protective in the short-term, but not the long-term. Therefore, the 1996 ROD was amended in 2023 with the approval of USEPA and TCEQ. Groundwater contamination at Air Force Plan 4 (AFP 4) remains under Federal property (AFP 4 and Naval Air Station Fort Worth) except for the former Carswell AFB golf course. However, the deed transferring this property contains groundwater extraction and use restrictions (2007 Explanation of Significant Differences). Groundwater use from AFP 4 and NAS Fort Worth are also restricted by the 1996 ROD and 2023 ROD Amendment.

2. Is the remedy functioning as expected? How well is the remedy performing? The 1996 ROD was amended in 2023 and changed the remedial action objectives (RAOs) for groundwater and surface water to the Safe Drinking Water Act Maximum Contaminant Levels (MCLs). It also changed the groundwater remedy from extraction and treatment to monitored natural attenuation (MNA) with a Technical Impracticability (TI) Waiver of the MCLs for the Dense Non-Aqueous Phase Liquid (DNAPL) area at Landfills 1 and 3. The regulatory approved Focused Feasibility Study and Proposed Plan demonstrate MNA is effective and will achieve the RAOs within a reasonable timeframe.

3. What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? Yes, groundwater monitoring data indicate contaminant trends have been and continue to decrease with the exception of a few monitoring wells in the DNAPL TI Waiver area. Water from the nearest public water supply well (White Settlement production well WS-H3) has been below the MCLs for more than 20 years of monitoring.

4. Is there a continuous on-site O&M presence? Yes If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. The contractor, LKR, provides an on-site staff member in accordance with their contract. This individual ensures systems remain operational, recovers DNAPL, and serves as the on-site eyes and ears of the RPM. This ensures that daily plant operations do not impact the Air Force's CERCLA responsibilities.

5. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the

protectiveness or effectiveness of the remedy? Please describe changes and impacts. Yes. As described above, the 2023 ROD Amendment changes the surface water and groundwater RAOs in the 1996 ROD from alternate concentration limits to the Safe Drinking Water Act MCLs. The amendment also changes the groundwater remedy from extraction and treatment to MNA with a Technical Impracticability Waiver of the MCLs in the DNAPL area of Landfills 1 and 3. The 2023 ROD Amendment is now considered by USEPA, TCEQ, and the public to be protective in both the short-term and long-term. The ROD Amendment was a request by both USEPA and TCEQ during previous Five-Year Reviews.

6. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details. No.

7. Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency. No, not since the 2023 ROD Amendment was approved. More monitoring data is needed before optimization can occur.

8. Do you have any comments, suggestions, or recommendations regarding the project? No, the 2023 ROD Amendment has addressed all outstanding concerns, suggestions, and recommendations.

INTERVIEW DOCUMENTATION FORM

The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

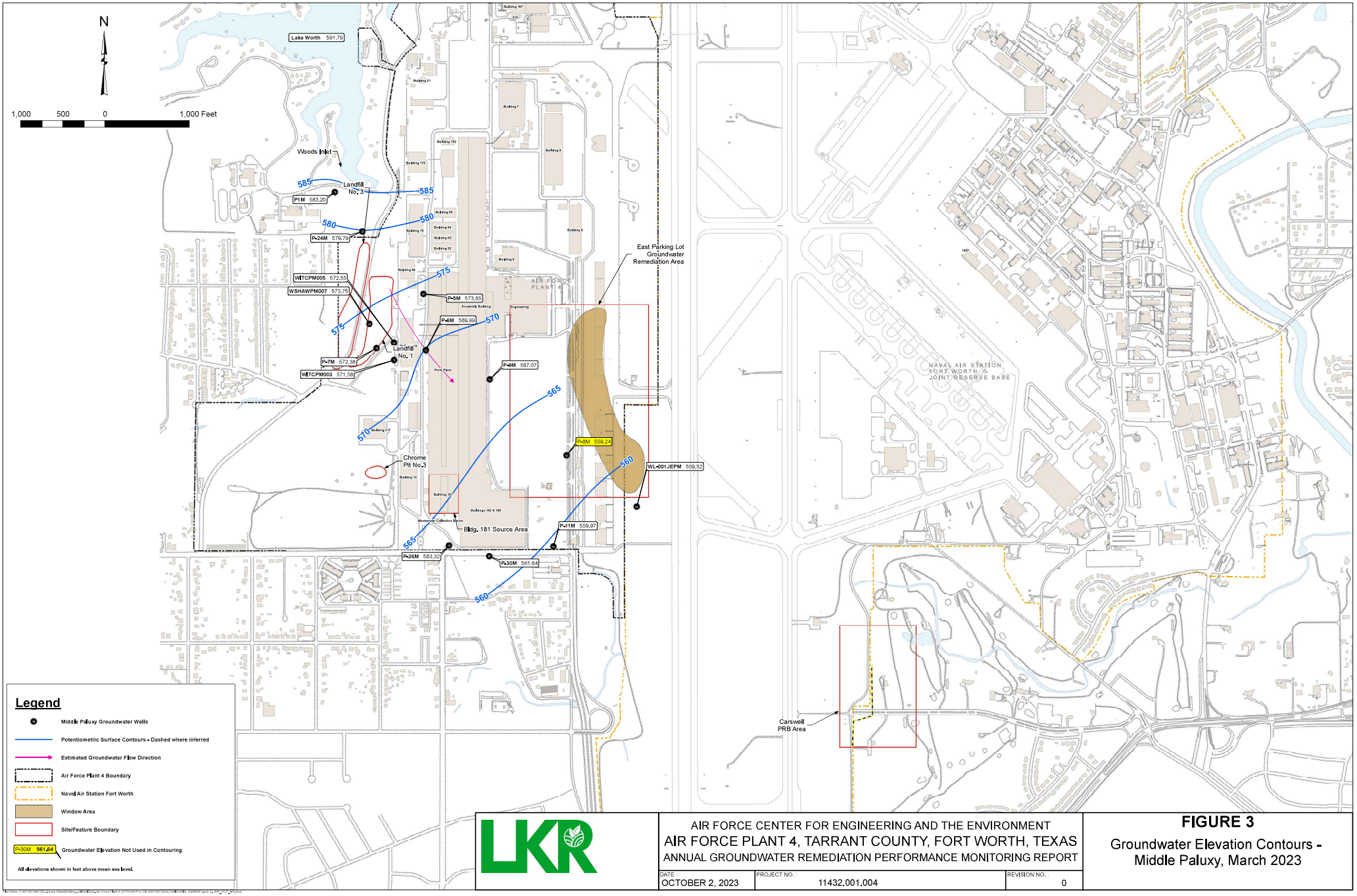
John Wolfe	Previous RPM	AFCEC/CZOM-GOCO	8 March 2023
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date
Name	Title/Position	Organization	Date

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APPENDIX E

Select Long-Term Monitoring Figures and Tables and Conceptual Site Model

Potentiometric Surface Figures

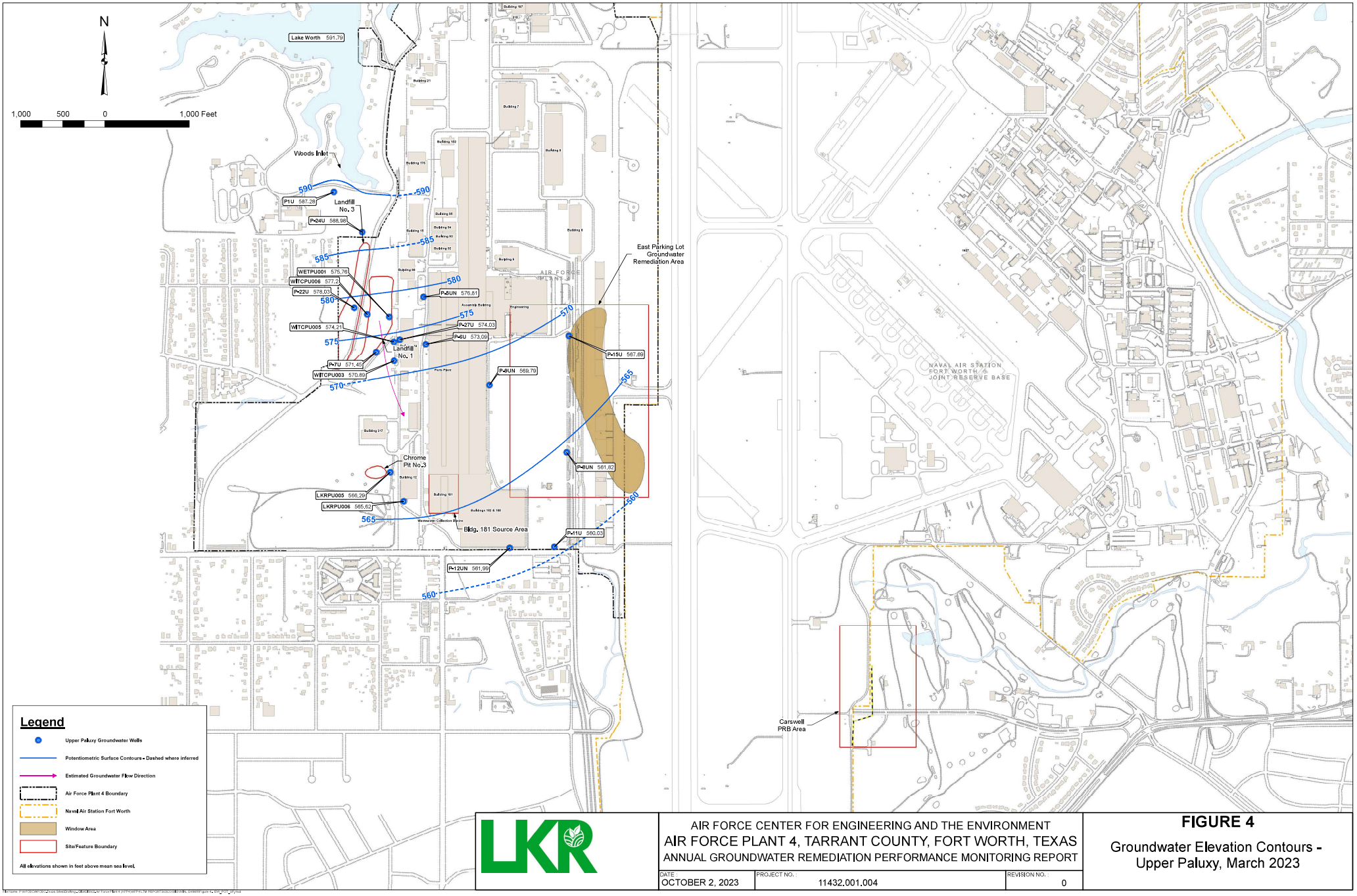


AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT
AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

DATE :	PROJECT NO. :	REVISION NO. :
OCTOBER 2, 2023	11432.001.004	0

FIGURE 3

Groundwater Elevation Contours - Middle Paluxy, March 2023

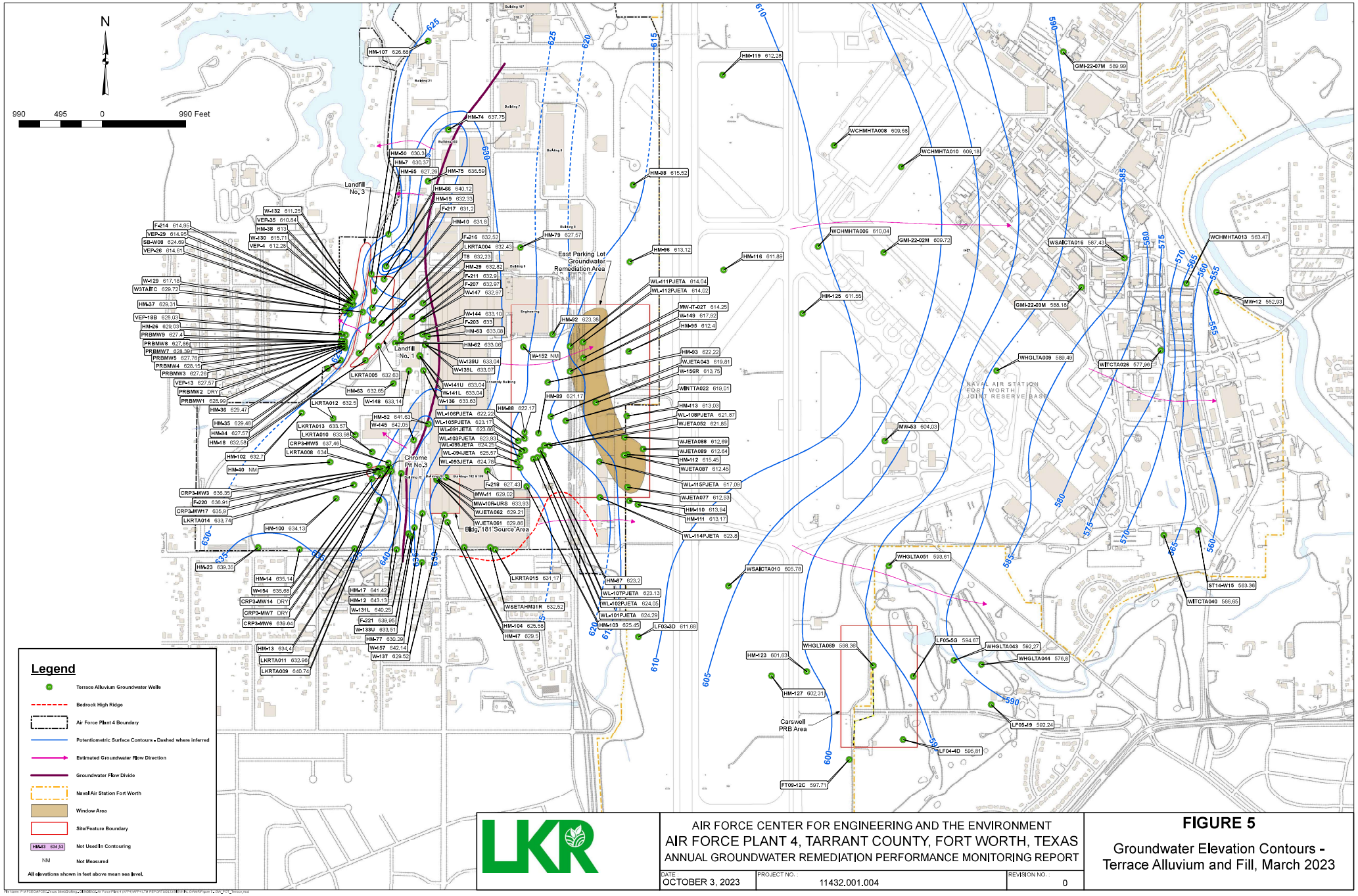


AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT
AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

DATE :	PROJECT NO. :	REVISION NO. :
OCTOBER 2, 2023	11432.001.004	0

FIGURE 4

Groundwater Elevation Contours - Upper Paluxy, March 2023



AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT
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ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

DATE	PROJECT NO.	REVISION NO.
OCTOBER 3, 2023	11432.001.004	0

FIGURE 5

Groundwater Elevation Contours - Terrace Alluvium and Fill, March 2023

BIENNIAL SAMPLING LOCATIONS

N
W E
S

400 200 0 400 Feet

Landfill No. 3
Landfill No. 1
East Parking Lot Groundwater Remediation Area
Chrome Pit No. 3
Bldg. 181 Source Area
Carswell PRB Area
Carswell PRB Wall
Mosier Valley Road
Underground Aqueduct
Farmers Branch Creek
Farmers Branch Creek
Farmers Branch Creek
West Fork Trinity River
Marine Creek Lake
Marine Creek

P1U P1M CB-5 HM-65 SW-08 HM-50 VEP-5R VEP-4 VEP-2I VEP-2S P-2ZU WITCPU006 VEP-18S VEP-1S HM-58 WSHAWPM007 WETPU001 P-27U HM-29 HM-102 F-22O WJETA063 W-154 MW-10R-URS MW-11 HM-17 F-21R P-9M P-9UN P-9US HM-88 P-8US P-8UN P-8M W-152 W-149 HM-93 WJEUS002 WJEUS008 HM-79 HM-98 WL-013JEUS HM-95 HM-112 WITCUS001 WL-001JEPM WSETAHM31R P-26M W-157 P-30M P-11M P-11U LF03-3D WS-H3 HM-120 HM-119 HM-121 HM-116 HM-125 HM-123 HM-122 WITCTA004 WCHMHTA008 WCHMHTA01D WITCTA017 GMI-22-05M WSAICTA018 GMI-22-02M GMI-22-03M WCHMHTA013 MW-12 WITCTA026 WHGLTA009 MW-53 USGS087 WITCTA042 ST14-W15 WHGLTA051 WSAICTA01D EGL-2 WHGLTA069 LF05-5B HM-123 HM-122 WHGLTA043 WHGLTA044 LF05-5E LF05-5G LF05-1S WP07-10B WHGLTA071 LF04-4F LF04-4D FT09-12C

Legend

- Terrace Alluvium
- Upper Paluxy
- UPSC
- Middle Paluxy
- Surface Water/Sediment
- Window Area
- DNAPL Area
- Air Force Plant 4 Boundary
- Naval Air Station Fort Worth Joint Reserve Base
- Site/Feature Boundary
- Carswell PRB

AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT
AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

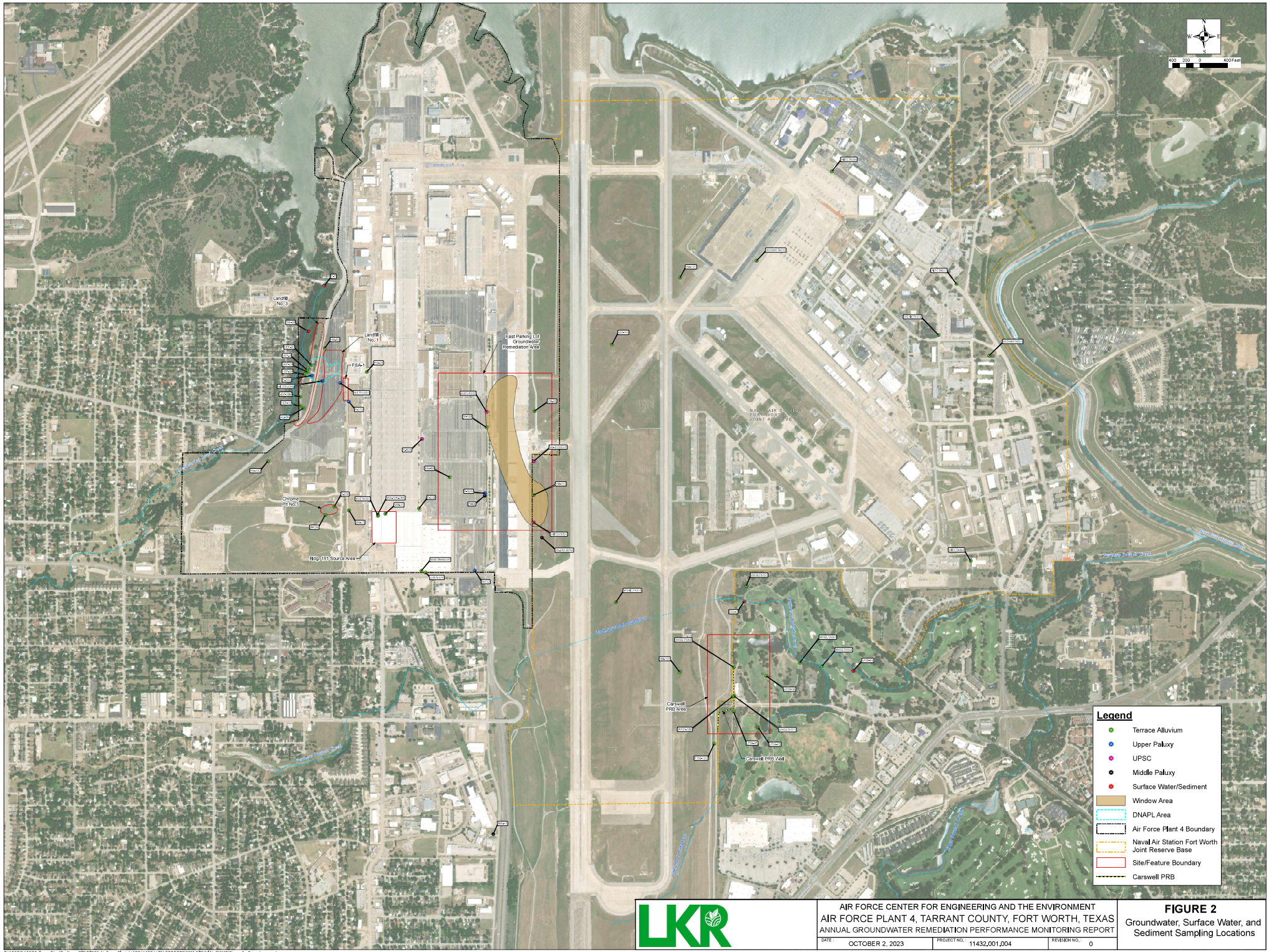
DATE : JUNE 24, 2022 | PROJECT NO. : 11432.001.002 | REVISION NO. : 0

FIGURE 2

Groundwater, Surface Water, and Sediment Sampling Locations

P:\AFCEC\AFCEC-Texas Sites\Drafting - GIS\GIS\02-Air Force Plant 4 (AFP4)\AFP4 LTM REPORTS\2022 BIENNIAL GWMR\Figure 2 - Samp Locs.mxd

ANNUAL SAMPLING LOCATIONS



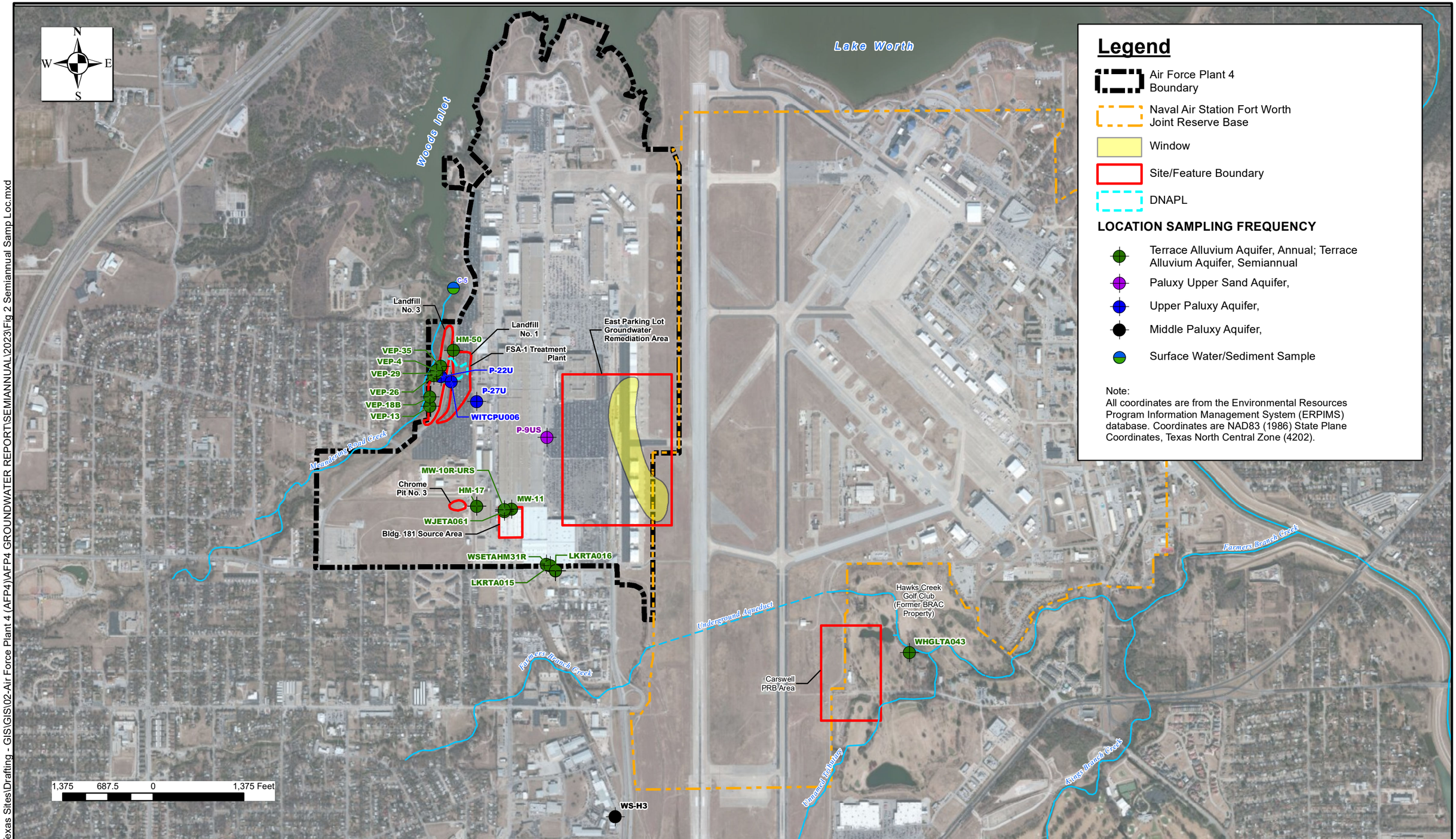
AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT
AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
ANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING REPORT

DATE	PROJECT NO.	REVISION NO.
OCTOBER 2, 2023	11432.001.004	0

FIGURE 2
Groundwater, Surface Water, and Sediment Sampling Locations

P:\AFCEC\AFCEC-Texas Sites\Drafting – GIS\GIS\02-Air Force Plant 4 (AFP4)\AFP4 LTM REPORTS\2023 BIENNIAL GWMR\Figure 2 – Samp Locs.mxd

SEMIANNUAL SAMPLING LOCATIONS



P:\AFCEC\AFCEC-Texas Sites\Drafting - GIS\GIS\02-Air Force Plant 4 (AFP4)\AFP4 GROUNDWATER REPORT\SEMIANNUAL\2023\Fig 2 Semiannual Samp Loc.mxd

AIR FORCE CIVIL ENGINEER CENTER

AIR FORCE PLANT 4, TARRANT COUNTY, FORT WORTH, TEXAS
SEMIANNUAL GROUNDWATER REMEDIATION PERFORMANCE MONITORING
REPORT OCTOBER 2023 SAMPLING EVENT

FIGURE 2

SEMIANNUAL SAMPLING LOCATIONS

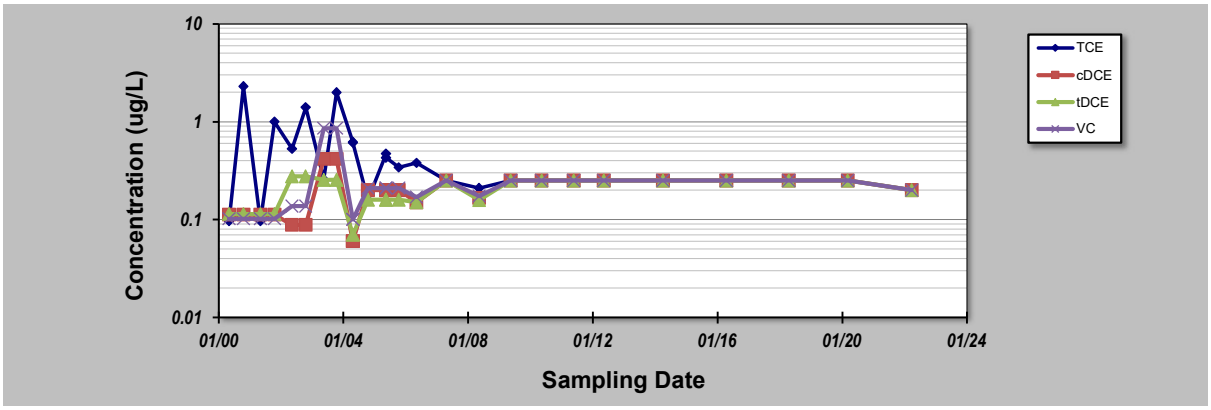
DATE:	PROJECT NO.:	REVISION NO:
1/9/2024	111432.001.004	0

HISTORICAL DATA
WITH
MANN KENDALL TREND ANALYSIS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P1M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	0.096	0.112	0.114	0.102			
2	10/16/2000	2.30	0.112	0.114	0.102			
3	5/4/2001	0.096	0.112	0.114	0.102			
4	10/18/2001	1.00	0.112	0.114	0.102			
5	5/9/2002	0.530	0.088	0.276	0.137			
6	10/16/2002	1.40	0.088	0.276	0.137			
7	5/16/2003	0.259	0.415	0.255	0.854			
8	10/14/2003	1.99	0.415	0.255	0.854			
9	4/22/2004	0.620	0.060	0.070	0.100			
10	4/22/2004	0.610	0.060	0.070	0.100			
11	10/15/2004	0.160	0.200	0.160	0.210			
12	5/13/2005	0.470	0.200	0.160	0.210			
13	5/13/2005	0.430	0.200	0.160	0.210			
14	10/12/2005	0.340	0.200	0.160	0.210			
15	5/5/2006	0.380	0.150	0.150	0.170			
16	4/20/2007	0.250	0.250	0.250	0.250			
17	5/9/2008	0.210	0.166	0.158	0.174			
18	5/13/2009	0.250	0.250	0.250	0.250			
19	5/12/2010	0.250	0.250	0.250	0.250			
20	5/24/2011	0.250	0.250	0.250	0.250			
21	5/10/2012	0.250	0.250	0.250	0.250			
22	4/1/2014	0.250	0.250	0.250	0.250			
23	4/12/2016	0.250	0.250	0.250	0.250			
24	4/15/2018	0.250	0.250	0.250	0.250			
25	3/6/2020	0.250	0.250	0.250	0.250			
26	3/25/2022	0.200	0.200	0.200	0.200			
27								
28								
29								
30								
Coefficient of Variation:		1.09	0.47	0.35	0.80			
Mann-Kendall Statistic (S):		-118	122	70	131			
Confidence Factor:		99.6%	99.7%	93.6%	99.8%			
Concentration Trend:		Decreasing	Increasing	Prob. Increasing	Increasing			



Notes:

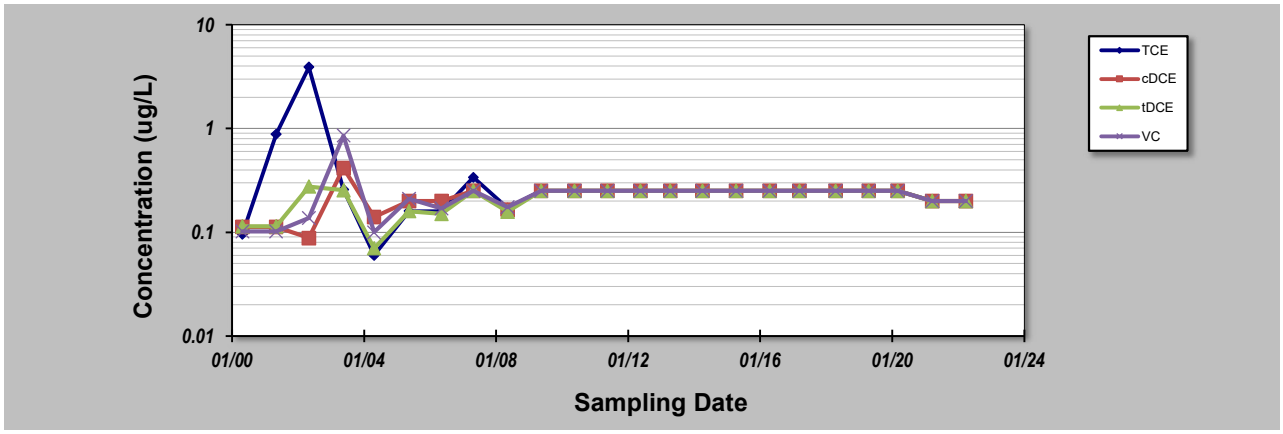
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-8M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/25/2000	0.096	0.112	0.114	0.102			
2	5/4/2001	0.880	0.112	0.11	0.102			
3	5/1/2002	3.90	0.088	0.276	0.137			
4	5/20/2003	0.259	0.415	0.255	0.854			
5	4/21/2004	0.060	0.140	0.070	0.100			
6	5/12/2005	0.160	0.200	0.160	0.210			
7	5/8/2006	0.160	0.200	0.150	0.170			
8	4/23/2007	0.338	0.250	0.250	0.250			
9	5/8/2008	0.171	0.166	0.158	0.174			
10	5/12/2009	0.250	0.250	0.250	0.250			
11	5/17/2010	0.250	0.250	0.250	0.250			
12	5/17/2011	0.250	0.250	0.250	0.250			
13	5/14/2012	0.250	0.250	0.250	0.250			
14	4/12/2013	0.250	0.250	0.250	0.250			
15	4/4/2014	0.250	0.250	0.250	0.250			
16	4/8/2015	0.250	0.250	0.250	0.250			
17	4/13/2016	0.250	0.250	0.250	0.250			
18	3/8/2017	0.250	0.250	0.250	0.250			
19	4/14/2018	0.250	0.250	0.250	0.250			
20	4/14/2019	0.250	0.250	0.250	0.250			
21	3/1/2020	0.250	0.250	0.250	0.250			
22	3/20/2021	0.200	0.200	0.200	0.200			
23	3/27/2022	0.200	0.200	0.200	0.200			
24								
25								
Coefficient of Variation:		1.89	0.31	0.27	0.60			
Mann-Kendall Statistic (S):		-11	68	33	67			
Confidence Factor:		60.3%	96.2%	79.9%	95.9%			
Concentration Trend:		No Trend	Increasing	No Trend	Increasing			



Notes:

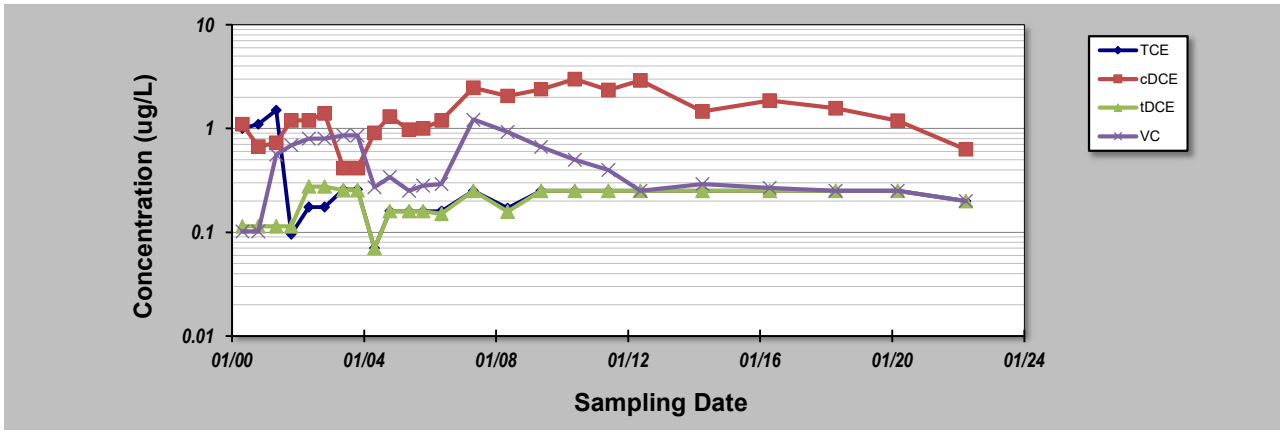
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-9M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/25/2000	1.00	1.10	0.114	0.102			
2	10/18/2000	1.10	0.670	0.114	0.102			
3	5/5/2001	1.50	0.730	0.114	0.560			
4	10/18/2001	0.096	1.20	0.114	0.690			
5	4/30/2002	0.175	1.20	0.276	0.800			
6	10/19/2002	0.175	1.40	0.276	0.800			
7	5/17/2003	0.259	0.415	0.255	0.854			
8	10/19/2003	0.259	0.415	0.255	0.854			
9	4/25/2004	0.070	0.910	0.070	0.270			
10	10/14/2004	0.160	1.30	0.160	0.340			
11	5/12/2005	0.160	0.970	0.160	0.250			
12	10/14/2005	0.160	1.00	0.160	0.280			
13	5/8/2006	0.160	1.20	0.150	0.290			
14	4/23/2007	0.250	2.47	0.250	1.220			
15	5/8/2008	0.171	2.06	0.158	0.930			
16	5/12/2009	0.250	2.39	0.250	0.662			
17	5/19/2010	0.250	3.00	0.250	0.500			
18	5/27/2011	0.250	2.35	0.250	0.398			
19	5/14/2012	0.250	2.91	0.250	0.250			
20	4/3/2014	0.250	1.46	0.250	0.291			
21	4/14/2016	0.250	1.86	0.250	0.268			
22	4/14/2018	0.250	1.57	0.250	0.250			
23	3/1/2020	0.250	1.19	0.250	0.250			
24	3/26/2022	0.200	0.630	0.200	0.200			
25								
Coefficient of Variation:		1.06	0.52	0.32	0.64			
Mann-Kendall Statistic (S):		-4	90	53	-51			
Confidence Factor:		52.9%	98.7%	90.1%	89.2%			
Concentration Trend:		No Trend	Increasing	Prob. Increasing	Stable			



Notes:

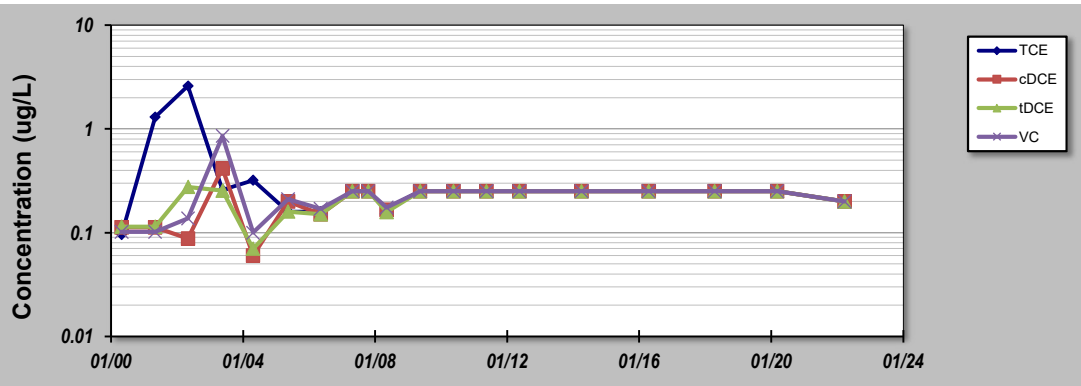
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-11M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2000	0.096	0.112	0.114	0.102			
2	5/3/2001	1.30	0.112	0.114	0.102			
3	5/2/2002	2.60	0.088	0.276	0.137			
4	5/19/2003	0.259	0.415	0.255	0.854			
5	4/21/2004	0.320	0.060	0.070	0.100			
6	5/12/2005	0.160	0.200	0.160	0.210			
7	5/8/2006	0.160	0.150	0.150	0.170			
8	4/23/2007	0.250	0.250	0.250	0.250			
9	10/16/2007	0.250	0.250	0.250	0.250			
10	5/8/2008	0.171	0.166	0.158	0.174			
11	5/11/2009	0.250	0.250	0.250	0.250			
12	5/17/2010	0.250	0.250	0.250	0.250			
13	5/16/2011	0.250	0.250	0.250	0.250			
14	5/14/2012	0.250	0.250	0.250	0.250			
15	4/3/2014	0.250	0.250	0.250	0.250			
16	4/13/2016	0.250	0.250	0.250	0.250			
17	4/14/2018	0.250	0.250	0.250	0.250			
18	3/6/2020	0.250	0.250	0.250	0.250			
19	3/22/2022	0.200	0.200	0.200	0.200			
20								
Coefficient of Variation:		1.44	0.39	0.29	0.67			
Mann-Kendall Statistic (S):		-19	56	31	59			
Confidence Factor:		73.3%	97.3%	85.1%	97.9%			
Concentration Trend:		No Trend	Increasing	No Trend	Increasing			



Notes:

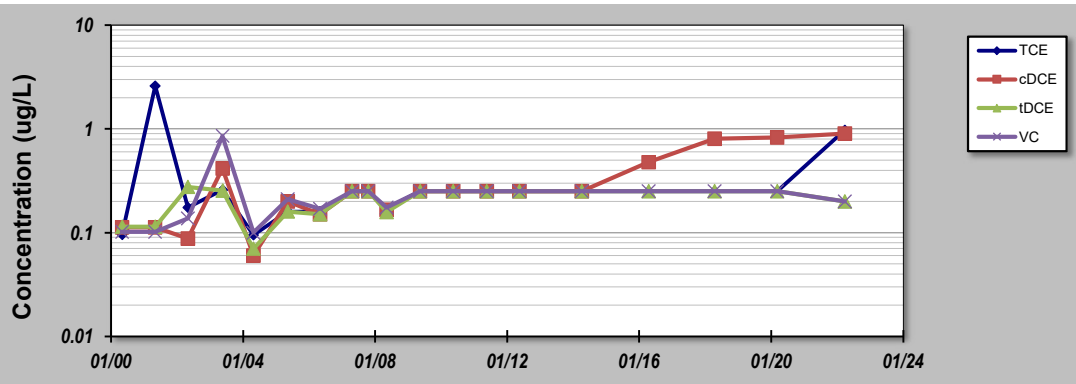
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-26M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2000	0.096	0.112	0.114	0.102			
2	5/3/2001	2.60	0.112	0.114	0.102			
3	5/1/2002	0.175	0.088	0.276	0.137			
4	5/19/2003	0.259	0.415	0.255	0.854			
5	4/26/2004	0.095	0.060	0.070	0.100			
6	5/11/2005	0.160	0.200	0.160	0.210			
7	5/1/2006	0.160	0.150	0.150	0.170			
8	4/22/2007	0.250	0.250	0.250	0.250			
9	10/16/2007	0.250	0.250	0.250	0.250			
10	5/7/2008	0.171	0.166	0.158	0.174			
11	5/13/2009	0.250	0.250	0.250	0.250			
12	5/14/2010	0.250	0.250	0.250	0.250			
13	5/18/2011	0.250	0.250	0.250	0.250			
14	5/14/2012	0.250	0.250	0.250	0.250			
15	4/7/2014	0.250	0.250	0.250	0.250			
16	4/13/2016	0.250	0.478	0.250	0.250			
17	4/13/2018	0.250	0.805	0.250	0.250			
18	3/6/2020	0.250	0.830	0.250	0.250			
19	3/27/2022	0.970	0.900	0.200	0.200			
20								
Coefficient of Variation:		1.50	0.80	0.29	0.67			
Mann-Kendall Statistic (S):		49	109	31	59			
Confidence Factor:		95.3%	>99.9%	85.1%	97.9%			
Concentration Trend:		Increasing	Increasing	No Trend	Increasing			



Notes:

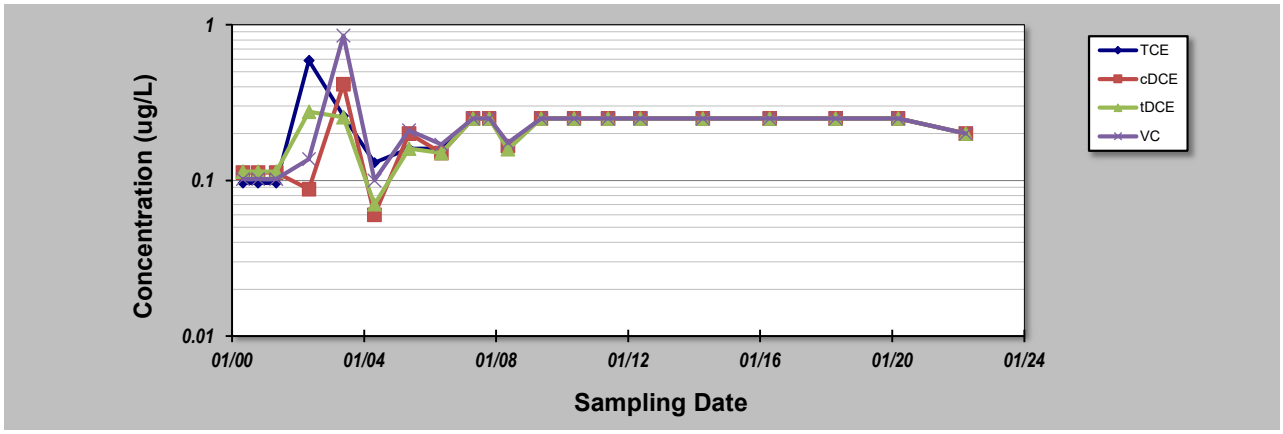
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-30M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/2/2000	0.096	0.112	0.114	0.102			
2	10/17/2000	0.096	0.112	0.114	0.102			
3	5/6/2001	0.096	0.112	0.114	0.102			
4	5/2/2002	0.590	0.088	0.276	0.137			
5	5/17/2003	0.259	0.415	0.255	0.854			
6	4/26/2004	0.130	0.060	0.070	0.100			
7	5/13/2005	0.160	0.200	0.160	0.210			
8	5/4/2006	0.160	0.150	0.150	0.170			
9	4/22/2007	0.250	0.250	0.250	0.250			
10	10/16/2007	0.250	0.250	0.250	0.250			
11	5/9/2008	0.171	0.166	0.158	0.174			
12	5/13/2009	0.250	0.250	0.250	0.250			
13	5/12/2010	0.250	0.250	0.250	0.250			
14	5/23/2011	0.250	0.250	0.250	0.250			
15	5/14/2012	0.250	0.250	0.250	0.250			
16	4/7/2014	0.250	0.250	0.250	0.250			
17	4/14/2016	0.250	0.250	0.250	0.250			
18	4/14/2018	0.250	0.250	0.250	0.250			
19	3/5/2020	0.250	0.250	0.250	0.250			
20	3/27/2022	0.200	0.200	0.200	0.200			
21								
22								
23								
24								
25								
Coefficient of Variation:		0.47	0.40	0.31	0.68			
Mann-Kendall Statistic (S):		55	69	46	74			
Confidence Factor:		96.0%	98.7%	92.7%	99.2%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

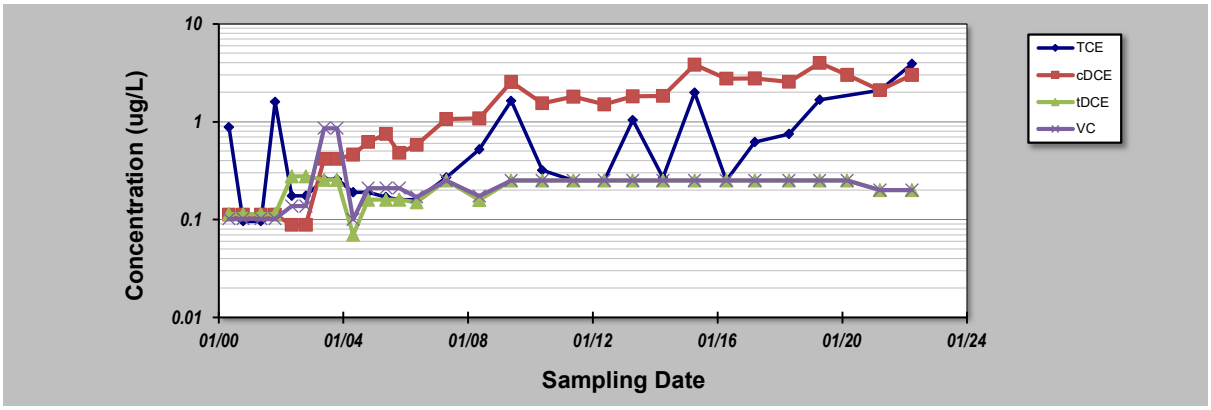
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WL-001JEPM
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/29/2000	0.880	0.112	0.114	0.102			
2	10/13/2000	0.096	0.112	0.114	0.102			
3	5/9/2001	0.096	0.112	0.114	0.102			
4	10/21/2001	1.60	0.112	0.114	0.102			
5	5/5/2002	0.175	0.088	0.276	0.137			
6	10/20/2002	0.175	0.088	0.276	0.137			
7	5/21/2003	0.259	0.415	0.255	0.854			
8	10/18/2003	0.259	0.415	0.255	0.854			
9	4/23/2004	0.190	0.460	0.070	0.100			
10	10/16/2004	0.190	0.620	0.160	0.210			
11	5/14/2005	0.170	0.750	0.160	0.210			
12	10/15/2005	0.160	0.480	0.160	0.210			
13	5/7/2006	0.160	0.580	0.150	0.170			
14	4/21/2007	0.269	1.06	0.250	0.250			
15	5/11/2008	0.520	1.08	0.158	0.174			
16	5/19/2009	1.63	2.55	0.250	0.250			
17	5/18/2010	0.318	1.54	0.250	0.250			
18	5/19/2011	0.250	1.80	0.250	0.250			
19	5/15/2012	0.250	1.50	0.250	0.250			
20	4/12/2013	1.04	1.82	0.250	0.250			
21	4/2/2014	0.268	1.84	0.250	0.250			
22	4/7/2015	1.98	3.82	0.250	0.250			
23	4/12/2016	0.250	2.75	0.250	0.250			
24	3/14/2017	0.619	2.76	0.250	0.250			
25	4/17/2018	0.748	2.56	0.250	0.250			
26	4/12/2019	1.67	3.98	0.250	0.250			
27	2/26/2020	1.93	3.00	0.250	0.250			
28	3/19/2021	2.10	2.10	0.200	0.200			
29	3/28/2022	3.90	3.00	0.200	0.200			
30								
Coefficient of Variation:		1.22	0.84	0.29	0.73			
Mann-Kendall Statistic (S):		196	327	66	140			
Confidence Factor:		>99.9%	>99.9%	88.8%	99.6%			
Concentration Trend:		Increasing	Increasing	No Trend	Increasing			



Notes:

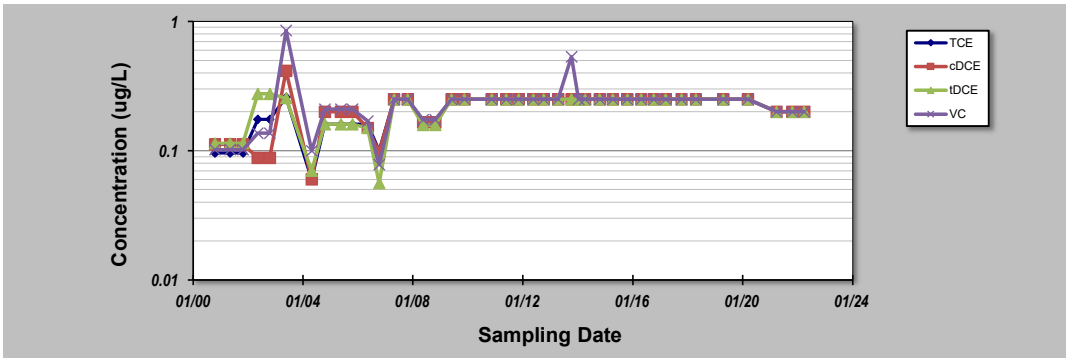
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WS-H3
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/18/2000	0.096	0.112	0.114	0.102			
2	5/7/2001	0.096	0.112	0.114	0.102			
3	10/25/2001	0.096	0.112	0.114	0.102			
4	5/9/2002	0.175	0.088	0.276	0.137			
5	10/16/2002	0.175	0.088	0.276	0.137			
6	5/22/2003	0.259	0.415	0.255	0.854			
7	4/26/2004	0.060	0.060	0.070	0.100			
8	10/15/2004	0.160	0.200	0.160	0.210			
9	5/17/2005	0.160	0.200	0.160	0.210			
10	10/18/2005	0.160	0.200	0.160	0.210			
11	5/9/2006	0.160	0.150	0.150	0.170			
12	10/10/2006	0.100	0.098	0.056	0.078			
13	4/25/2007	0.250	0.250	0.250	0.250			
14	10/22/2007	0.250	0.250	0.250	0.250			
15	5/13/2008	0.171	0.166	0.158	0.174			
16	10/21/2008	0.171	0.166	0.158	0.174			
17	5/26/2009	0.250	0.250	0.250	0.250			
18	11/13/2009	0.250	0.250	0.250	0.250			
19	11/10/2010	0.250	0.250	0.250	0.250			
20	5/25/2011	0.250	0.250	0.250	0.250			
21	11/3/2011	0.250	0.250	0.250	0.250			
22	5/17/2012	0.250	0.250	0.250	0.250			
23	10/2/2012	0.250	0.250	0.250	0.250			
24	4/11/2013	0.250	0.250	0.250	0.250			
25	10/8/2013	0.250	0.250	0.250	0.533			
26	1/9/2014	0.250	0.250	0.250	0.250			
27	4/4/2014	0.250	0.250	0.250	0.250			
28	10/16/2014	0.250	0.250	0.250	0.250			
29	4/9/2015	0.250	0.250	0.250	0.250			
30	10/20/2015	0.250	0.250	0.250	0.250			
31	4/20/2016	0.250	0.250	0.250	0.250			
32	10/4/2016	0.250	0.250	0.250	0.250			
33	3/10/2017	0.250	0.250	0.250	0.250			
34	10/9/2017	0.250	0.250	0.250	0.250			
35	4/17/2018	0.250	0.250	0.250	0.250			
36	4/15/2019	0.250	0.250	0.250	0.250			
37	3/9/2020	0.250	0.250	0.250	0.250			
38	3/24/2021	0.200	0.200	0.200	0.200			
39	10/20/2021	0.200	0.200	0.200	0.200			
40	3/25/2022	0.200	0.200	0.200	0.200			
Coefficient of Variation:		0.27	0.32	0.27	0.53			
Mann-Kendall Statistic (S):		253	239	122	232			
Confidence Factor:		99.9%	99.8%	92.0%	99.7%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

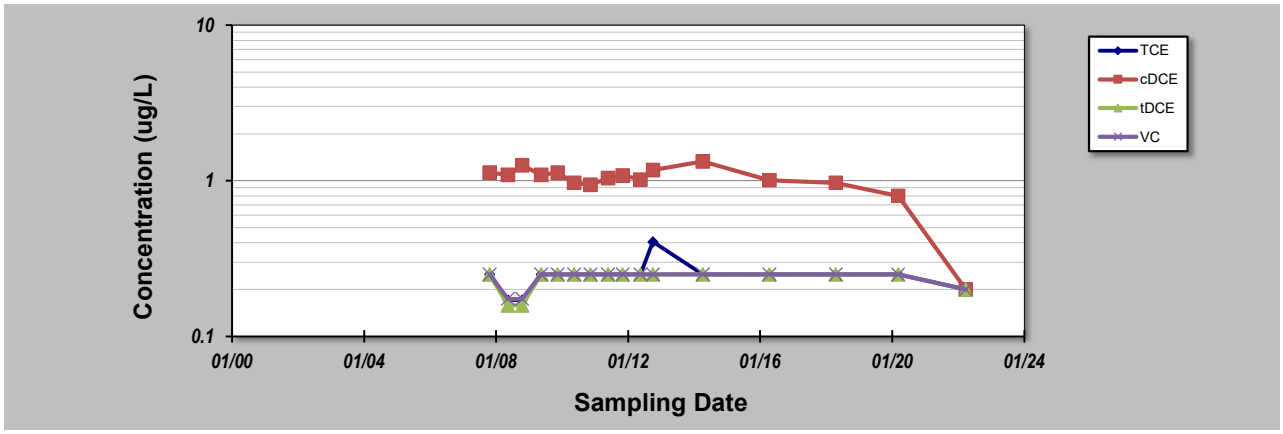
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WSHAWPM007
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/21/2007	0.250	1.13	0.250	0.250			
2	5/9/2008	0.171	1.09	0.158	0.174			
3	10/15/2008	0.171	1.26	0.158	0.174			
4	5/15/2009	0.250	1.09	0.250	0.250			
5	11/11/2009	0.250	1.13	0.250	0.250			
6	5/13/2010	0.250	0.971	0.250	0.250			
7	11/10/2010	0.250	0.942	0.250	0.250			
8	5/25/2011	0.250	1.04	0.250	0.250			
9	11/1/2011	0.250	1.08	0.250	0.250			
10	5/14/2012	0.250	1.02	0.250	0.250			
11	10/2/2012	0.405	1.17	0.250	0.250			
12	4/7/2014	0.250	1.33	0.250	0.250			
13	4/12/2016	0.250	1.01	0.250	0.250			
14	4/15/2018	0.250	0.970	0.250	0.250			
15	3/6/2020	0.250	0.800	0.250	0.250			
16	3/24/2022	0.200	0.200	0.200	0.200			
17								
18								
19								
20								
Coefficient of Variation:		0.21	0.25	0.14	0.12			
Mann-Kendall Statistic (S):		15	-50	11	11			
Confidence Factor:		73.3%	98.7%	67.1%	67.1%			
Concentration Trend:		No Trend	Decreasing	No Trend	No Trend			



Notes:

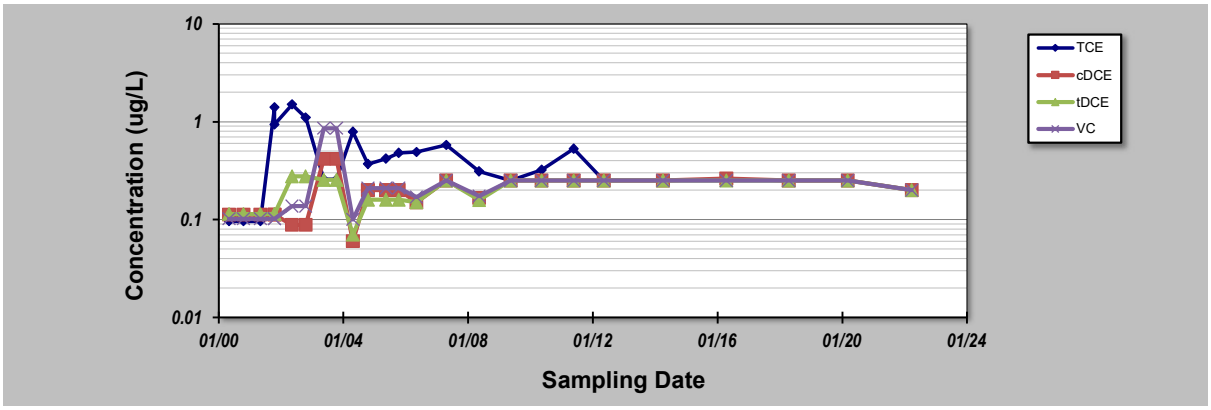
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P1U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	0.096	0.112	0.114	0.102			
2	10/16/2000	0.096	0.112	0.114	0.102			
3	5/4/2001	0.096	0.112	0.114	0.102			
4	10/18/2001	1.40	0.112	0.114	0.102			
5	10/18/2001	0.940	0.112	0.114	0.102			
6	5/9/2002	1.50	0.088	0.276	0.137			
7	10/16/2002	1.10	0.088	0.276	0.137			
8	5/16/2003	0.259	0.415	0.255	0.854			
9	10/14/2003	0.259	0.415	0.255	0.854			
10	4/22/2004	0.790	0.060	0.070	0.100			
11	10/15/2004	0.370	0.200	0.160	0.210			
12	5/13/2005	0.420	0.200	0.160	0.210			
13	10/12/2005	0.480	0.200	0.160	0.210			
14	5/5/2006	0.490	0.150	0.150	0.170			
15	4/20/2007	0.577	0.250	0.250	0.250			
16	5/9/2008	0.310	0.166	0.158	0.174			
17	5/13/2009	0.250	0.250	0.250	0.250			
18	5/11/2010	0.322	0.250	0.250	0.250			
19	5/24/2011	0.529	0.250	0.250	0.250			
20	5/10/2012	0.250	0.250	0.250	0.250			
21	4/1/2014	0.250	0.250	0.250	0.250			
22	4/12/2016	0.250	0.262	0.250	0.250			
23	4/15/2018	0.250	0.250	0.250	0.250			
24	3/6/2020	0.250	0.250	0.250	0.250			
25	3/25/2022	0.200	0.200	0.200	0.200			
26								
27								
28								
29								
30								
Coefficient of Variation:		0.82	0.46	0.33	0.81			
Mann-Kendall Statistic (S):		-69	120	71	131			
Confidence Factor:		94.4%	99.8%	94.9%	99.9%			
Concentration Trend:		Prob. Decreasing	Increasing	Prob. Increasing	Increasing			



Notes:

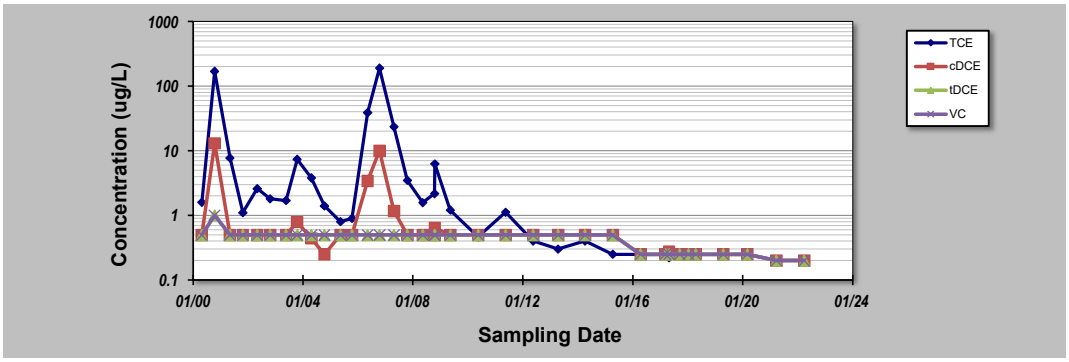
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-8UN
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/25/2000	1.60	0.500	0.500	0.500			
2	10/12/2000	170	13.0	1.00	1.00			
3	5/4/2001	7.75	0.500	0.500	0.500			
4	10/23/2001	1.10	0.500	0.500	0.500			
5	5/1/2002	2.60	0.500	0.500	0.500			
6	10/19/2002	1.80	0.500	0.500	0.500			
7	5/20/2003	1.70	0.500	0.500	0.500			
8	10/15/2003	7.37	0.790	0.500	0.500			
9	4/21/2004	3.80	0.440	0.500	0.500			
10	10/12/2004	1.40	0.250	0.500	0.500			
11	5/12/2005	0.800	0.500	0.500	0.500			
12	10/13/2005	0.900	0.500	0.500	0.500			
13	5/8/2006	39.0	3.40	0.500	0.500			
14	10/14/2006	190	10.0	0.500	0.500			
15	4/23/2007	23.4	1.17	0.500	0.500			
16	10/17/2007	3.48	0.500	0.500	0.500			
17	5/8/2008	1.58	0.500	0.500	0.500			
18	10/14/2008	2.17	0.500	0.500	0.500			
19	10/16/2008	6.28	0.640	0.500	0.500			
20	5/12/2009	1.21	0.500	0.500	0.500			
21	5/17/2010	0.466	0.500	0.500	0.500			
22	5/17/2011	1.12	0.500	0.500	0.500			
23	5/14/2012	0.400	0.500	0.500	0.500			
24	4/11/2013	0.300	0.500	0.500	0.500			
25	4/4/2014	0.400	0.500	0.500	0.500			
26	4/8/2015	0.250	0.500	0.500	0.500			
27	4/13/2016	0.250	0.250	0.250	0.250			
28	3/8/2017	0.250	0.250	0.250	0.250			
29	4/26/2017	0.222	0.276	0.250	0.250			
30	9/13/2017	0.250	0.250	0.250	0.250			
31	1/8/2018	0.250	0.250	0.250	0.250			
32	4/14/2018	0.250	0.250	0.250	0.250			
33	4/14/2019	0.250	0.250	0.250	0.250			
34	3/1/2020	0.250	0.250	0.250	0.250			
35	3/20/2021	0.200	0.200	0.200	0.200			
36	3/27/2022	0.200	0.200	0.200	0.200			
37								
38								
39								
40								
Coefficient of Variation:		3.18	2.30	0.34	0.34			
Mann-Kendall Statistic (S):		-400	-286	-299	-299			
Confidence Factor:		>99.9%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

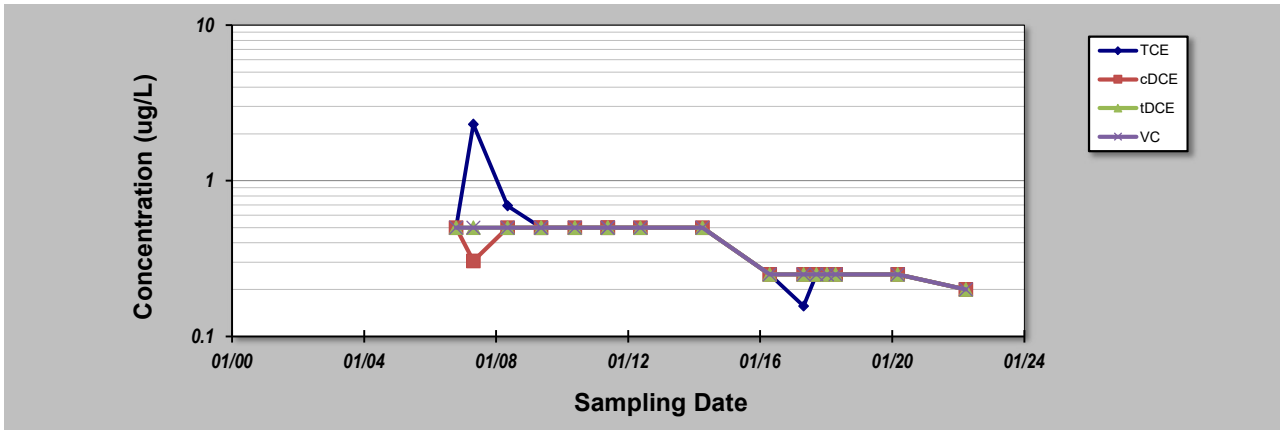
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-9UN
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/15/2006	0.500	0.500	0.500	0.500			
2	4/25/2007	2.31	0.305	0.500	0.500			
3	5/8/2008	0.690	0.500	0.500	0.500			
4	5/12/2009	0.500	0.500	0.500	0.500			
5	5/12/2009	0.500	0.500	0.500	0.500			
6	5/19/2010	0.500	0.500	0.500	0.500			
7	5/18/2011	0.500	0.500	0.500	0.500			
8	5/18/2011	0.500	0.500	0.500	0.500			
9	5/14/2012	0.500	0.500	0.500	0.500			
10	4/3/2014	0.500	0.500	0.500	0.500			
11	4/14/2016	0.250	0.250	0.250	0.250			
12	4/26/2017	0.157	0.250	0.250	0.250			
13	9/13/2017	0.250	0.250	0.250	0.250			
14	1/8/2018	0.250	0.250	0.250	0.250			
15	4/14/2018	0.250	0.250	0.250	0.250			
16	2/29/2020	0.250	0.250	0.250	0.250			
17	3/26/2022	0.200	0.200	0.200	0.200			
18								
19								
20								
Coefficient of Variation:		0.97	0.34	0.33	0.33			
Mann-Kendall Statistic (S):		-84	-69	-76	-76			
Confidence Factor:		>99.9%	99.8%	99.9%	99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

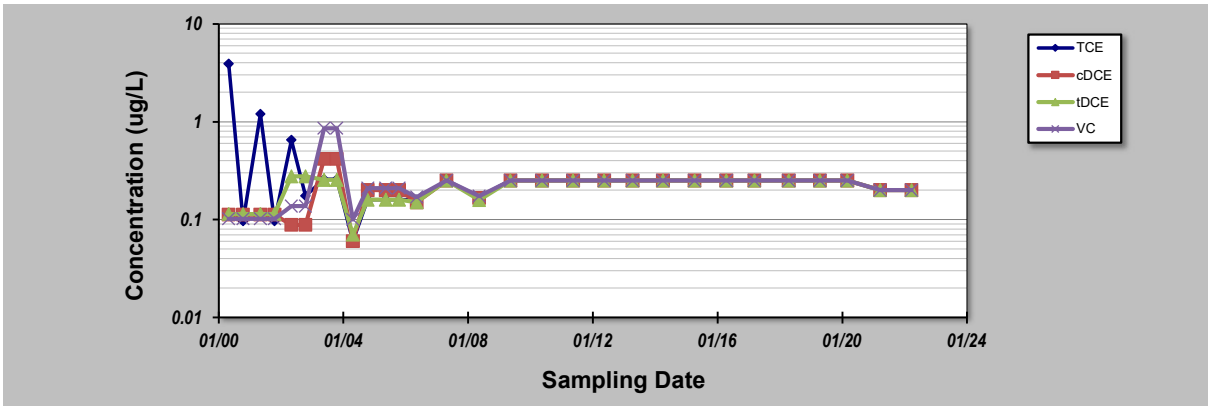
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-11U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2000	3.90	0.112	0.114	0.102			
2	10/12/2000	0.096	0.112	0.114	0.102			
3	5/3/2001	1.20	0.112	0.114	0.102			
4	10/18/2001	0.096	0.112	0.114	0.102			
5	5/1/2002	0.650	0.088	0.276	0.137			
6	10/15/2002	0.175	0.088	0.276	0.137			
7	5/19/2003	0.259	0.415	0.255	0.854			
8	10/15/2003	0.259	0.415	0.255	0.854			
9	4/21/2004	0.060	0.060	0.070	0.100			
10	10/12/2004	0.160	0.200	0.160	0.210			
11	5/12/2005	0.160	0.200	0.160	0.210			
12	10/13/2005	0.160	0.200	0.160	0.210			
13	5/8/2006	0.160	0.150	0.150	0.170			
14	4/23/2007	0.250	0.250	0.250	0.250			
15	5/8/2008	0.171	0.166	0.158	0.174			
16	5/12/2009	0.250	0.250	0.250	0.250			
17	5/17/2010	0.250	0.250	0.250	0.250			
18	5/16/2011	0.250	0.250	0.250	0.250			
19	5/14/2012	0.250	0.250	0.250	0.250			
20	4/10/2013	0.250	0.250	0.250	0.250			
21	4/3/2014	0.250	0.250	0.250	0.250			
22	4/8/2015	0.250	0.250	0.250	0.250			
23	4/13/2016	0.250	0.250	0.250	0.250			
24	3/8/2017	0.250	0.250	0.250	0.250			
25	4/14/2018	0.250	0.250	0.250	0.250			
26	4/14/2019	0.250	0.250	0.250	0.250			
27	3/1/2020	0.250	0.250	0.250	0.250			
28	3/20/2021	0.200	0.200	0.200	0.200			
29	3/22/2022	0.200	0.200	0.200	0.200			
30								
Coefficient of Variation:		1.84	0.40	0.29	0.73			
Mann-Kendall Statistic (S):		9	132	66	140			
Confidence Factor:		55.9%	99.3%	88.8%	99.6%			
Concentration Trend:		No Trend	Increasing	No Trend	Increasing			



Notes:

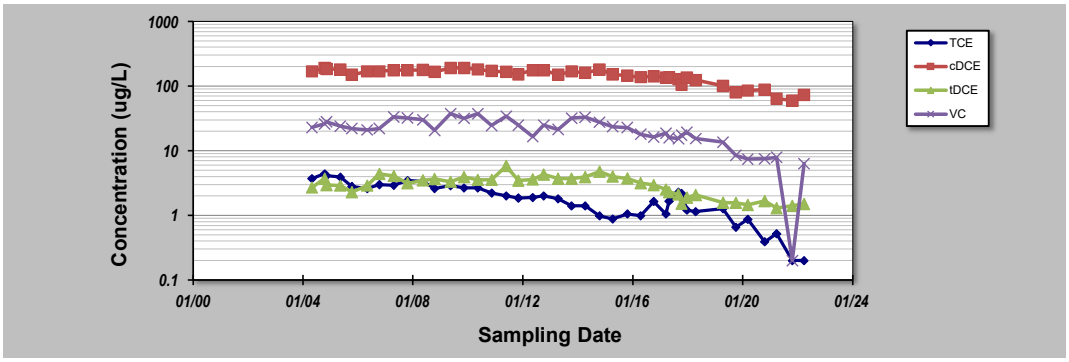
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-22U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2004	3.70	170	2.70	23.0			
2	10/13/2004	4.40	190	3.70	26.0			
3	11/9/2004	4.10	185	2.95	28.0			
4	5/11/2005	3.90	180	2.90	24.0			
5	10/11/2005	2.80	150	2.30	22.0			
6	5/3/2006	2.60	170	2.90	21.0			
7	10/10/2006	3.00	170	4.40	22.0			
8	4/20/2007	2.92	176	4.07	33.4			
9	10/21/2007	3.47	176	3.15	32.1			
10	5/12/2008	3.36	178	3.48	30.3			
11	10/15/2008	2.61	166	3.66	20.7			
12	5/14/2009	2.89	192	3.31	37.5			
13	11/9/2009	2.66	191	3.92	31.8			
14	5/10/2010	2.67	181	3.55	37.4			
15	11/10/2010	2.21	172	3.55	24.6			
16	5/23/2011	2.00	166	5.80	34.2			
17	11/1/2011	1.86	152	3.45	24.8			
18	5/10/2012	1.90	177	3.60	16.6			
19	10/2/2012	2.00	177	4.30	24.8			
20	4/11/2013	1.80	150	3.70	21.3			
21	10/7/2013	1.40	169	3.70	32.0			
22	4/7/2014	1.40	160	3.90	33.0			
23	10/14/2014	0.980	180	4.78	27.7			
24	4/7/2015	0.880	152	4.00	23.7			
25	10/20/2015	1.05	145	3.72	22.8			
26	4/12/2016	0.990	138	3.16	18.0			
27	10/3/2016	1.64	142	2.96	16.3			
28	3/15/2017	1.05	136	2.53	18.7			
29	4/25/2017	1.66	137	2.30	15.9			
30	8/29/2017	2.28	128	2.12	15.4			
31	10/9/2017	2.18	106	1.51	17.5			
32	12/18/2017	1.21	136	1.90	19.3			
33	4/15/2018	1.14	124	2.07	15.5			
34	4/11/2019	1.27	101	1.57	13.6			
35	9/30/2019	0.655	80.6	1.56	8.47			
36	3/5/2020	0.870	85.7	1.45	7.46			
37	10/17/2020	0.390	87.9	1.66	7.48			
38	3/23/2021	0.520	64.0	1.30	7.90			
39	10/19/2021	0.200	60.0	1.40	0.200			
40	3/23/2022	0.200	73.0	1.50	6.30			
Coefficient of Variation:		0.56	0.26	0.36	0.42			
Mann-Kendall Statistic (S):		-584	-542	-298	-434			
Confidence Factor:		>99.9%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

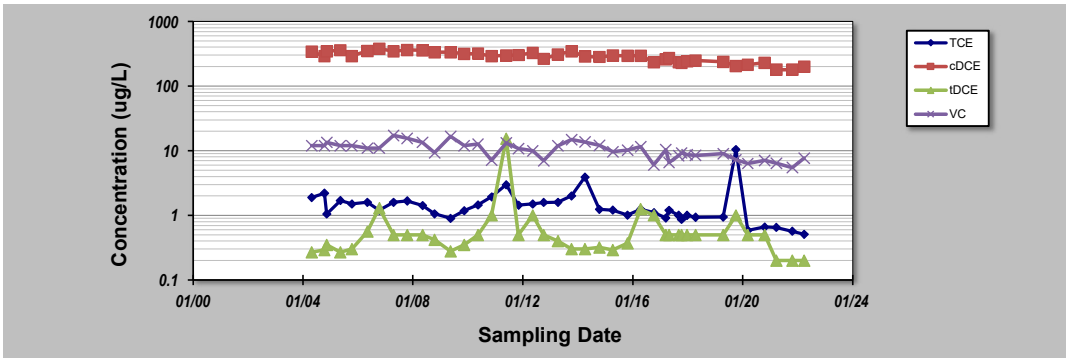
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-27U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/26/2004	1.90	340	0.270	12.0			
2	10/12/2004	2.20	290	0.290	12.0			
3	11/10/2004	1.05	345	0.350	13.5			
4	5/10/2005	1.70	360	0.270	12.0			
5	10/11/2005	1.50	290	0.300	12.0			
6	5/5/2006	1.60	350	0.560	11.0			
7	10/10/2006	1.20	380	1.30	11.0			
8	4/17/2007	1.60	346	0.500	17.3			
9	10/16/2007	1.68	363	0.500	15.6			
10	5/7/2008	1.42	358	0.500	13.5			
11	10/15/2008	1.06	334	0.420	9.35			
12	5/14/2009	0.900	333	0.280	16.7			
13	11/11/2009	1.18	316	0.350	12.0			
14	5/13/2010	1.45	317	0.500	12.7			
15	11/11/2010	1.94	290	1.00	7.14			
16	5/24/2011	2.97	298	15.4	13.2			
17	11/2/2011	1.44	304	0.500	10.8			
18	5/11/2012	1.50	326	1.00	10.0			
19	10/3/2012	1.59	265	0.500	7.00			
20	4/10/2013	1.60	309	0.400	11.9			
21	10/8/2013	2.00	344	0.300	14.8			
22	4/3/2014	3.90	287	0.300	13.7			
23	10/13/2014	1.24	283	0.320	12.1			
24	4/9/2015	1.21	296	0.290	9.65			
25	10/21/2015	1.01	294	0.370	10.2			
26	4/13/2016	1.25	295	1.25	11.6			
27	10/5/2016	1.10	235	1.00	6.04			
28	3/13/2017	0.910	259	0.500	10.4			
29	4/26/2017	1.20	272	0.500	6.60			
30	8/31/2017	1.00	234	0.500	8.39			
31	10/9/2017	0.87	229	0.500	9.26			
32	12/20/2017	1.00	241	0.500	8.71			
33	4/13/2018	0.937	248	0.500	8.50			
34	4/14/2019	0.940	237	0.500	9.00			
35	10/1/2019	10.5	205	1.00	7.30			
36	3/6/2020	0.590	214	0.500	6.37			
37	10/16/2020	0.662	229	0.500	7.07			
38	3/22/2021	0.650	180	0.200	6.40			
39	10/19/2021	0.570	180	0.200	5.50			
40	3/25/2022	0.510	200	0.200	7.70			
Coefficient of Variation:		1.00	0.19	2.70	0.29			
Mann-Kendall Statistic (S):		-360	-547	28	-404			
Confidence Factor:		>99.9%	>99.9%	62.3%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Decreasing			



Notes:

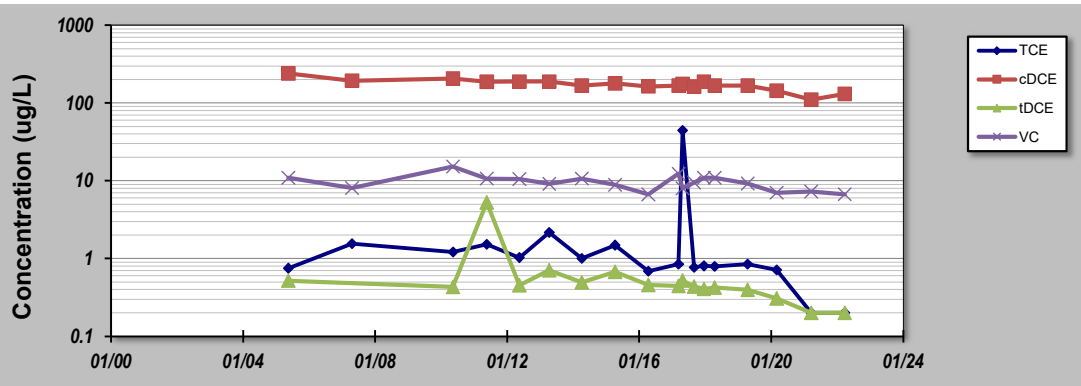
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WETPU001
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/15/2005	0.750	240	0.520	11.0			
2	4/22/2007	1.55	194		8.06			
3	5/12/2010	1.21	206	0.432	15.2			
4	5/20/2011	1.53	187	5.290	10.7			
5	5/14/2012	1.03	189	0.454	10.5			
6	4/11/2013	2.17	188	0.707	9.10			
7	4/7/2014	1.01	167	0.492	10.7			
8	4/7/2015	1.49	179	0.672	8.86			
9	4/12/2016	0.690	163	0.456	6.66			
10	3/11/2017	0.846	168	0.446	12.3			
11	4/25/2017	44.5	176	0.524	8.02			
12	8/29/2017	0.774	162	0.436	9.48			
13	12/18/2017	0.804	188	0.407	10.9			
14	4/15/2018	0.795	168	0.423	11.0			
15	4/14/2019	0.852	168	0.397	9.18			
16	2/29/2020	0.711	143	0.308	7.04			
17	3/20/2021	0.200	110	0.200	7.30			
18	3/24/2022	0.200	130	0.200	6.70			
19								
20								
Coefficient of Variation:		3.02	0.17	1.63	0.23			
Mann-Kendall Statistic (S):		-68	-103	-89	-49			
Confidence Factor:		99.6%	>99.9%	>99.9%	96.6%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

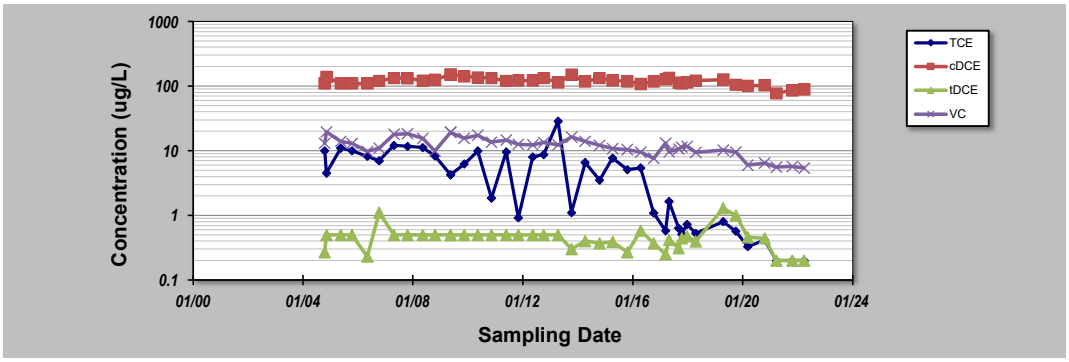
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCPU006
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/14/2004	10.0	110	0.270	13.0			
2	11/9/2004	4.51	139	0.500	19.7			
3	5/16/2005	11.0	110	0.500	14.0			
4	10/12/2005	10.0	110	0.500	13.0			
5	5/4/2006	8.20	110	0.230	9.8			
6	10/9/2006	7.00	120	1.10	11.0			
7	4/22/2007	12.1	133	0.500	18.0			
8	10/20/2007	11.7	132	0.500	18.3			
9	5/10/2008	11.2	121	0.500	15.6			
10	10/19/2008	8.30	125	0.500	9.90			
11	5/15/2009	4.25	151	0.500	19.3			
12	5/15/2009	4.25	151	0.500	19.3			
13	11/11/2009	6.22	142	0.500	15.6			
14	5/11/2010	9.92	136	0.500	17.4			
15	11/8/2010	1.85	133	0.500	13.6			
16	5/23/2011	9.56	120	0.500	14.6			
17	11/1/2011	0.920	122	0.500	12.6			
18	5/11/2012	8.00	122	0.500	12.3			
19	10/3/2012	8.70	133	0.500	13.5			
20	4/11/2013	28.6	114	0.500	12.3			
21	10/8/2013	1.10	151	0.300	16.3			
22	4/7/2014	6.60	118	0.400	14.0			
23	10/15/2014	3.51	133	0.370	12.1			
24	4/7/2015	7.68	123	0.390	10.8			
25	10/20/2015	5.11	118	0.270	10.4			
26	4/12/2016	5.42	108	0.580	9.53			
27	10/4/2016	1.09	118	0.370	7.64			
28	3/11/2017	0.580	128	0.250	13.1			
29	4/25/2017	1.64	134	0.420	9.63			
30	8/30/2017	0.635	113	0.312	10.6			
31	10/10/2017	0.509	110	0.441	11.4			
32	12/20/2017	0.725	114	0.477	11.8			
33	4/15/2018	0.528	121	0.396	9.44			
34	4/14/2019	0.798	126	1.29	10.2			
35	9/30/2019	0.570	105	0.999	9.57			
36	3/5/2020	0.330	101	0.460	5.98			
37	10/17/2020	0.418	103	0.440	6.45			
38	3/20/2021	0.200	77.0	0.200	5.60			
39	10/19/2021	0.200	86.0	0.200	5.70			
40	3/25/2022	0.200	89.0	0.200	5.40			
Coefficient of Variation:		1.03	0.14	0.47	0.32			
Mann-Kendall Statistic (S):		-507	-248	-211	-449			
Confidence Factor:		>99.9%	99.8%	99.3%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

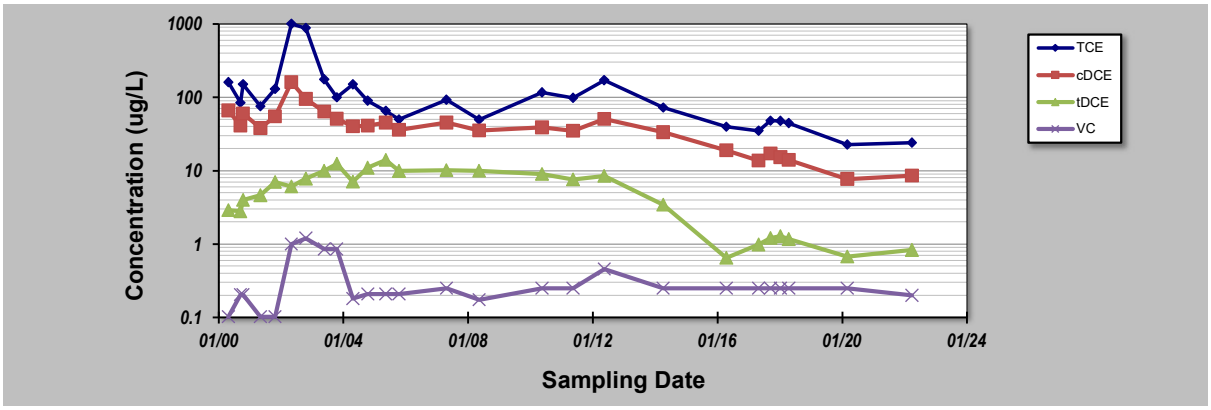
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-8US
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/25/2000	160	66.0	2.90	0.102			
2	9/12/2000	84.0	41.0	2.80	0.205			
3	10/12/2000	150	60.0	4.00	0.205			
4	5/3/2001	75.0	38.0	4.60	0.102			
5	10/23/2001	130	55.0	7.00	0.102			
6	5/1/2002	1000	160	6.10	1.00			
7	10/19/2002	880	95.0	7.80	1.20			
8	5/21/2003	175	64.0	10.0	0.854			
9	10/15/2003	100	50.9	12.4	0.854			
10	4/21/2004	150	40.0	7.10	0.180			
11	10/12/2004	90.0	41.0	11.0	0.210			
12	5/12/2005	65.0	45.0	14.0	0.210			
13	10/13/2005	50.0	36.0	9.90	0.210			
14	4/23/2007	92.0	45.1	10.2	0.250			
15	5/8/2008	49.6	35.3	10.0	0.174			
16	5/17/2010	116	38.9	9.01	0.250			
17	5/16/2011	98.1	34.9	7.61	0.250			
18	5/14/2012	170	50.5	8.46	0.456			
19	4/4/2014	72.3	33.3	3.44	0.250			
20	4/13/2016	39.5	18.9	0.648	0.250			
21	4/26/2017	35.1	13.7	0.989	0.250			
22	9/13/2017	47.8	17.1	1.21	0.250			
23	1/9/2018	47.6	15.2	1.28	0.250			
24	4/14/2018	44.3	14.0	1.17	0.250			
25	3/1/2020	22.6	7.68	0.676	0.250			
26	3/27/2022	24.0	8.60	0.830	0.200			
27								
28								
29								
30								
Coefficient of Variation:		1.55	0.72	0.69	0.87			
Mann-Kendall Statistic (S):		-184	-226	-76	54			
Confidence Factor:		>99.9%	>99.9%	95.1%	87.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

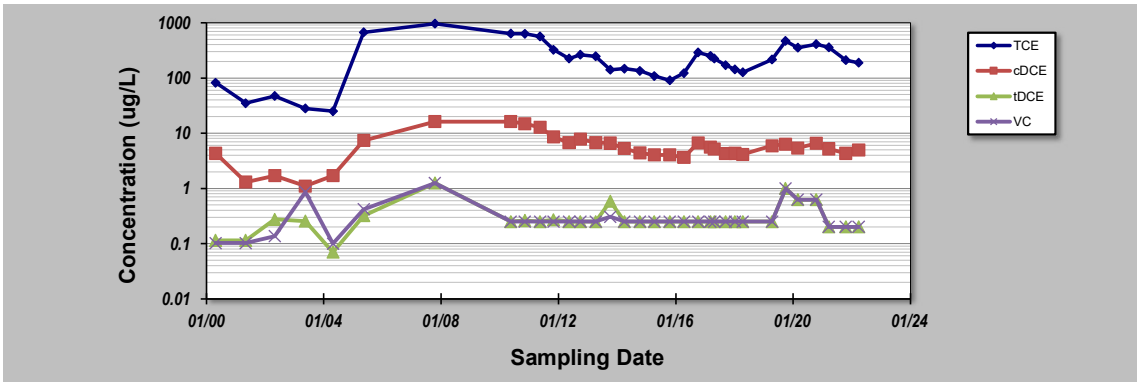
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	P-9US
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/25/2000	82.0	4.30	0.114	0.102			
2	5/5/2001	35.0	1.30	0.114	0.102			
3	5/2/2002	47.0	1.70	0.276	0.137			
4	5/17/2003	28.0	1.10	0.255	0.854			
5	4/25/2004	25.0	1.70	0.070	0.100			
6	5/12/2005	670	7.40	0.320	0.420			
7	10/17/2007	963	16.2	1.250	1.250			
8	5/19/2010	636	16.2	0.250	0.250			
9	11/9/2010	631	14.9	0.261	0.250			
10	5/18/2011	565	12.7	0.250	0.250			
11	11/1/2011	324	8.50	0.271	0.250			
12	5/14/2012	224	6.69	0.250	0.250			
13	10/2/2012	265	7.74	0.250	0.250			
14	4/10/2013	246	6.77	0.250	0.250			
15	10/8/2013	140	6.61	0.583	0.306			
16	4/3/2014	148	5.30	0.250	0.250			
17	10/13/2014	134	4.37	0.250	0.250			
18	4/9/2015	109	4.06	0.250	0.250			
19	10/21/2015	90.6	4.07	0.250	0.250			
20	4/14/2016	123	3.64	0.250	0.250			
21	10/6/2016	290	6.63	0.250	0.250			
22	3/8/2017	252	5.58	0.250	0.250			
23	4/26/2017	224	5.14	0.250	0.250			
24	9/13/2017	171	4.26	0.250	0.250			
25	1/8/2018	143	4.32	0.250	0.250			
26	4/14/2018	127	4.11	0.250	0.250			
27	4/14/2019	215	5.90	0.250	0.250			
28	9/30/2019	467	6.31	1.00	1.00			
29	2/29/2020	353	5.37	0.625	0.625			
30	10/17/2020	408	6.53	0.625	0.625			
31	3/20/2021	360	5.20	0.200	0.200			
32	10/19/2021	210	4.30	0.200	0.200			
33	3/28/2022	190	5.00	0.200	0.200			
34								
35								
Coefficient of Variation:		0.81	0.61	0.75	0.78			
Mann-Kendall Statistic (S):		35	-55	-31	28			
Confidence Factor:		70.0%	79.7%	67.8%	66.1%			
Concentration Trend:		No Trend	Stable	Stable	No Trend			



Notes:

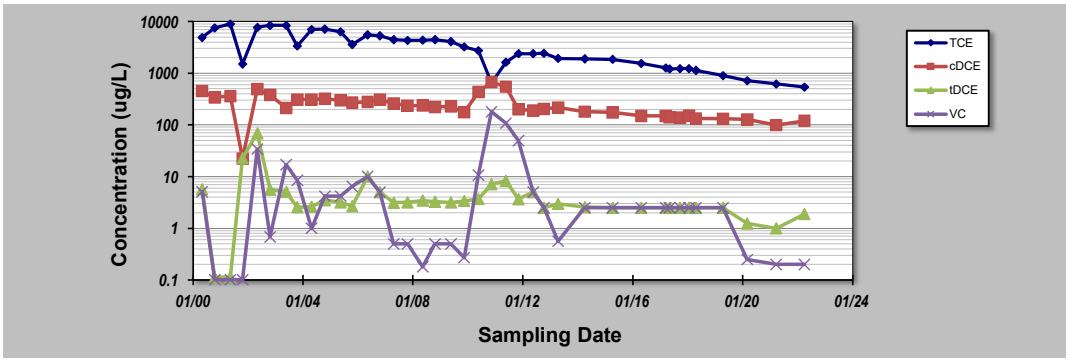
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCUS001
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/29/2000	4900	450	5.70	5.12			
2	10/15/2000	7500	340	0.114	0.102			
3	5/9/2001	8900	360	0.114	0.102			
4	10/21/2001	1500	22.5	22.8	0.102			
5	5/4/2002	7700	490	68.9	34.2			
6	10/20/2002	8400	380	5.60	0.684			
7	5/21/2003	8418	213	5.10	17.1			
8	10/18/2003	3370	310	2.55	8.54			
9	4/23/2004	7000	310	2.60	1.00			
10	10/16/2004	7100	320	3.50	4.20			
11	5/14/2005	6300	300	3.20	4.20			
12	10/15/2005	3600	270	2.70	6.50			
13	5/7/2006	5500	280	10.0	10.0			
14	10/18/2006	5300	310	5.00	5.00			
15	4/21/2007	4470	259	3.13	0.500			
16	10/20/2007	4310	236	3.18	0.500			
17	5/10/2008	4330	238	3.46	0.180			
18	10/18/2008	4470	222	3.27	0.500			
19	5/18/2009	4080	228	3.16	0.500			
20	11/12/2009	3210	176	3.38	0.273			
21	5/18/2010	2740	430	3.70	10.7			
22	11/8/2010	652	673	7.11	179			
23	5/19/2011	1630	550	8.22	108			
24	11/2/2011	2390	200	3.67	49.8			
25	5/15/2012	2380	190	5.00	5.00			
26	10/4/2012	2420	203	2.50	2.50			
27	4/12/2013	1930	216	2.97	0.562			
28	4/1/2014	1890	180	2.58	2.50			
29	4/7/2015	1840	174	2.50	2.50			
30	4/20/2016	1540	149	2.50	2.50			
31	3/14/2017	1270	149	2.50	2.50			
32	5/3/2017	1200	141	2.50	2.50			
33	9/18/2017	1220	139	2.50	2.50			
34	1/15/2018	1220	151	2.50	2.50			
35	4/17/2018	1130	133	2.50	2.50			
36	4/12/2019	904	132	2.50	2.50			
37	2/26/2020	717	127	1.25	0.250			
38	3/19/2021	620	99.0	1.00	0.200			
39	3/28/2022	540	120	1.90	0.200			
40								
Coefficient of Variation:		0.72	0.53	1.98	2.72			
Mann-Kendall Statistic (S):		-561	-469	-299	-62			
Confidence Factor:		>99.9%	>99.9%	>99.9%	76.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

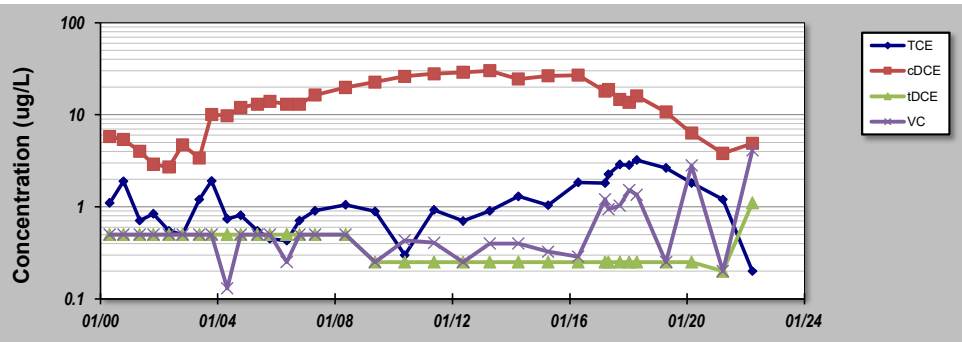
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WJEUS002
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/26/2000	1.10	5.80	0.500	0.500			
2	10/15/2000	1.90	5.40	0.500	0.500			
3	5/6/2001	0.710	4.00	0.500	0.500			
4	10/24/2001	0.840	2.90	0.500	0.500			
5	5/5/2002	0.550	2.70	0.500	0.500			
6	10/19/2002	0.500	4.70	0.500	0.500			
7	5/18/2003	1.20	3.40	0.500	0.500			
8	10/17/2003	1.91	10.1	0.500	0.500			
9	4/27/2004	0.740	9.70	0.500	0.130			
10	10/13/2004	0.810	12.0	0.500	0.500			
11	5/11/2005	0.550	13.0	0.500	0.500			
12	10/13/2005	0.450	14.0	0.500	0.500			
13	5/9/2006	0.430	13.0	0.500	0.250			
14	10/16/2006	0.710	13.0	0.500	0.500			
15	4/26/2007	0.908	16.4	0.500	0.500			
16	5/12/2008	1.05	19.8	0.500	0.500			
17	5/13/2009	0.895	22.6	0.250	0.250			
18	5/18/2010	0.298	26.1	0.250	0.432			
19	5/18/2011	0.927	27.9	0.250	0.408			
20	5/14/2012	0.700	29.0	0.250	0.250			
21	4/10/2013	0.900	30.1	0.250	0.400			
22	4/3/2014	1.30	24.4	0.250	0.400			
23	4/8/2015	1.04	26.6	0.250	0.326			
24	4/15/2016	1.84	26.9	0.250	0.287			
25	3/16/2017	1.81	18.1	0.250	1.21			
26	4/27/2017	2.26	18.7	0.250	0.940			
27	9/15/2017	2.89	14.7	0.250	1.03			
28	1/12/2018	2.84	13.6	0.250	1.52			
29	4/14/2018	3.23	16.0	0.250	1.35			
30	4/14/2019	2.64	10.7	0.250	0.250			
31	2/26/2020	1.82	6.31	0.250	2.81			
32	3/20/2021	1.20	3.80	0.200	0.200			
33	3/26/2022	0.200	4.90	1.10	4.10			
34								
35								
Coefficient of Variation:		0.65	0.61	0.45	1.11			
Mann-Kendall Statistic (S):		153	161	-239	20			
Confidence Factor:		99.2%	99.4%	>99.9%	61.5%			
Concentration Trend:		Increasing	Increasing	Decreasing	No Trend			



Notes:

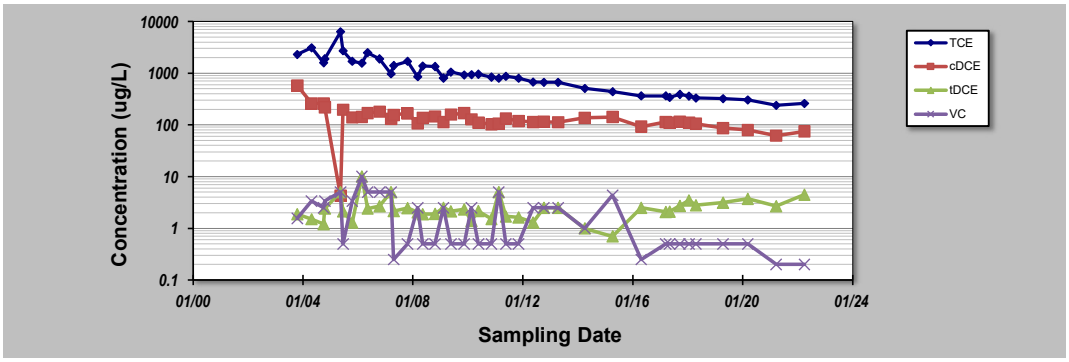
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WJEUS008
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/18/2003	2301	577	1.88	1.55			
2	4/23/2004	3100	260	1.50	3.35			
3	9/30/2004	1600	260	1.20	2.50			
4	10/16/2004	1900	220	2.40	3.35			
5	5/14/2005	6300	4.30	5.00	5.00			
6	6/15/2005	2710	197	2.11	0.500			
7	10/15/2005	1700	140	1.30	3.35			
8	2/20/2006	1570	143	10.0	10.0			
9	5/7/2006	2500	170	2.40	5.00			
10	10/14/2006	1900	180	2.70	5.00			
11	3/15/2007	970	132	5.00	5.00			
12	4/21/2007	1410	156	2.16	0.250			
13	10/20/2007	1690	167	2.47	0.500			
14	3/4/2008	856	107	2.04	2.50			
15	5/10/2008	1380	137	1.88	0.500			
16	10/18/2008	1350	146	1.89	0.500			
17	2/9/2009	804	114	2.50	2.50			
18	5/19/2009	1050	159	2.14	0.500			
19	11/12/2009	922	168	2.33	0.500			
20	2/16/2010	940	128	1.39	2.50			
21	5/19/2010	953	111	2.15	0.500			
22	11/8/2010	841	103	1.52	0.500			
23	2/14/2011	796	105	5.00	5.000			
24	5/19/2011	872	133	1.70	0.500			
25	11/2/2011	796	119	1.63	0.500			
26	5/15/2012	676	114	1.30	2.50			
27	10/4/2012	670	115	2.50	2.50			
28	4/12/2013	668	113	2.50	2.50			
29	4/2/2014	509	137	1.00	1.00			
30	4/7/2015	439	142	0.70	4.35			
31	4/19/2016	364	92.6	2.50	0.250			
32	3/14/2017	363	114	2.08	0.500			
33	5/3/2017	341	110	2.10	0.500			
34	9/15/2017	389	116	2.72	0.500			
35	1/15/2018	360	111	3.49	0.500			
36	4/17/2018	331	105	2.81	0.500			
37	4/12/2019	322	86.9	3.14	0.500			
38	3/5/2020	303	79.5	3.71	0.500			
39	3/19/2021	240	62.0	2.70	0.200			
40	3/28/2022	260	75.0	4.50	0.200			
Coefficient of Variation:		0.93	0.60	0.61	1.07			
Mann-Kendall Statistic (S):		-680	-453	125	-280			
Confidence Factor:		>99.9%	>99.9%	92.6%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Prob. Increasing	Decreasing			



Notes:

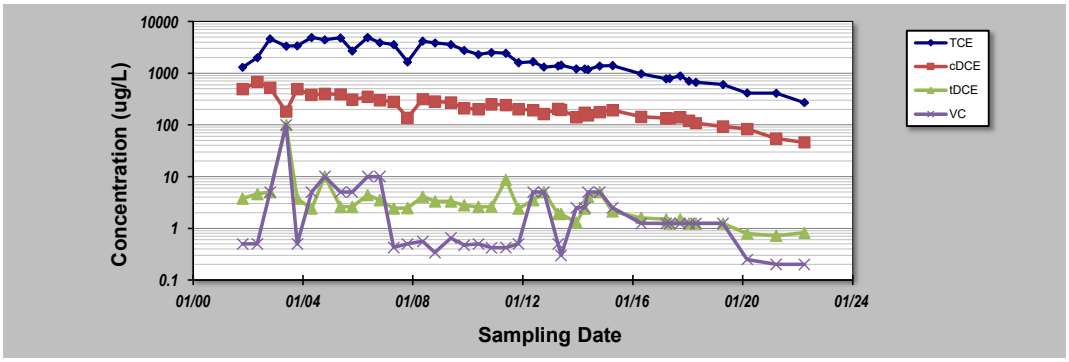
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WL-013JEUS
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/21/2001	1300	490	3.80	0.500			
2	5/4/2002	2000	680	4.60	0.500			
3	10/21/2002	4600	520	5.00	5.00			
4	5/22/2003	3334	180	100	100			
5	10/18/2003	3394	493	3.77	0.500			
6	4/23/2004	4900	380	2.40	5.00			
7	10/16/2004	4400	400	10.0	10.0			
8	5/14/2005	4800	390	2.60	5.00			
9	10/15/2005	2700	310	2.60	5.00			
10	5/7/2006	4900	350	4.40	10.0			
11	10/17/2006	3900	300	3.50	10.0			
12	4/21/2007	3560	279	2.42	0.428			
13	10/20/2007	1650	137	2.48	0.500			
14	5/10/2008	4170	316	4.13	0.560			
15	10/18/2008	3840	284	3.33	0.340			
16	5/18/2009	3570	273	3.34	0.653			
17	11/12/2009	2770	208	2.78	0.469			
18	5/19/2010	2310	201	2.60	0.500			
19	11/8/2010	2520	250	2.62	0.420			
20	5/19/2011	2430	241	8.70	0.423			
21	11/2/2011	1600	202	2.40	0.500			
22	5/15/2012	1660	194	3.50	5.00			
23	10/4/2012	1310	163	5.00	5.00			
24	4/12/2013	1380	204	1.90	0.500			
25	5/23/2013	1430	195	1.90	0.300			
26	12/11/2013	1210	141	1.30	2.50			
27	4/1/2014	1210	173	2.40	2.50			
28	5/15/2014	1170	153	4.10	5.00			
29	10/16/2014	1380	177	5.00	5.00			
30	4/7/2015	1410	193	2.11	2.50			
31	4/19/2016	975	143	1.60	1.25			
32	3/17/2017	781	135	1.49	1.25			
33	5/3/2017	791	134	1.25	1.25			
34	9/19/2017	883	141	1.49	1.25			
35	1/15/2018	704	121	1.25	1.25			
36	4/17/2018	667	108	1.25	1.25			
37	4/12/2019	602	93.5	1.25	1.25			
38	2/26/2020	415	82.8	0.794	0.250			
39	3/19/2021	410	54.0	0.720	0.200			
40	3/28/2022	270	46.0	0.820	0.200			
Coefficient of Variation:		0.66	0.58	2.85	3.23			
Mann-Kendall Statistic (S):		-565	-629	-448	-155			
Confidence Factor:		>99.9%	>99.9%	>99.9%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

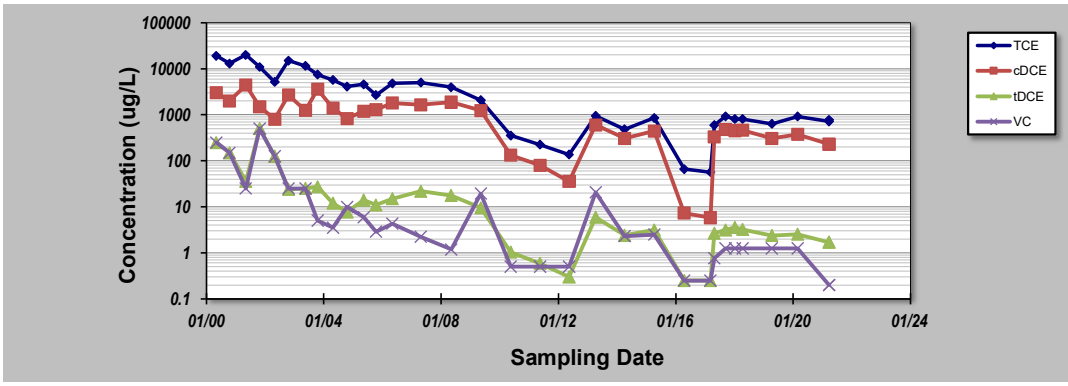
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	F-218
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2000	19000	3000	250	250			
2	10/15/2000	13000	2000	150	150			
3	5/6/2001	20000	4400	36.0	25.00			
4	10/25/2001	11000	1500	500	500			
5	5/3/2002	5200	800	125	125			
6	10/21/2002	15000	2700	24.0	25.0			
7	5/19/2003	11471	1252	25.0	25.0			
8	10/17/2003	7500	3597	27.2	5.00			
9	4/26/2004	5700	1400	12.0	3.50			
10	10/17/2004	4100	830	7.70	10.0			
11	5/12/2005	4600	1200	14.0	6.00			
12	10/14/2005	2700	1300	11.0	2.90			
13	5/6/2006	4800	1800	15.0	4.30			
14	4/25/2007	5030	1640	21.8	2.23			
15	5/6/2008	3980	1880	17.5	1.19			
16	5/11/2009	2080	1240	9.47	19.5			
17	5/17/2010	354	132	1.04	0.500			
18	5/17/2011	225	80.1	0.588	0.500			
19	5/14/2012	136	35.7	0.300	0.500			
20	4/9/2013	949	603	5.90	20.6			
21	4/4/2014	487	306	2.40	2.30			
22	4/9/2015	850	442	3.14	2.50			
23	4/15/2016	66.0	7.27	0.250	0.250			
24	3/8/2017	56.6	5.78	0.250	0.250			
25	4/26/2017	596	329	2.65	0.766			
26	9/12/2017	929	477	3.14	1.25			
27	1/9/2018	809	450	3.60	1.25			
28	4/13/2018	810	463	3.22	1.25			
29	4/13/2019	632	307	2.37	1.25			
30	2/26/2020	918	374	2.54	1.25			
31	3/24/2021	720	230	1.70	0.200			
32	3/24/2021	780	230	1.70	0.200			
33								
34								
35								
Coefficient of Variation:		1.25	1.00	2.48	2.69			
Mann-Kendall Statistic (S):		-312	-271	-317	-316			
Confidence Factor:		>99.9%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

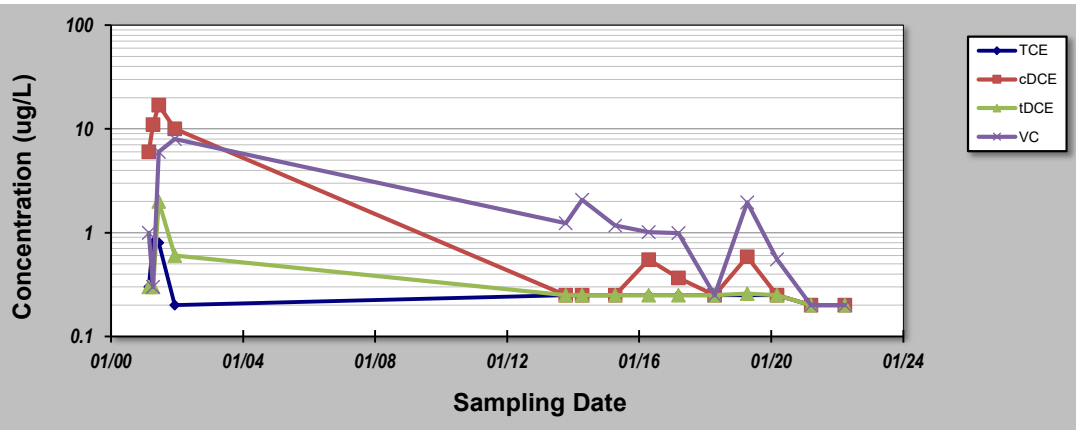
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	FT09-12C
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	2/22/2001	0.300	6.00	0.300	1.00			
2	4/10/2001	0.800	11.0	0.300	0.300			
3	6/12/2001	0.800	17.0	2.00	6.00			
4	12/4/2001	0.200	10.0	0.600	8.00			
5	10/9/2013	0.250	0.250	0.250	1.23			
6	4/9/2014	0.250	0.250	0.250	2.07			
7	4/10/2015	0.250	0.250	0.250	1.17			
8	4/15/2016	0.250	0.548	0.250	1.01			
9	3/10/2017	0.250	0.367	0.250	0.987			
10	4/12/2018	0.250	0.250	0.250	0.250			
11	4/11/2019	0.250	0.586	0.258	1.96			
12	3/3/2020	0.250	0.250	0.250	0.550			
13	3/17/2021	0.200	0.200	0.200	0.200			
14	3/26/2022	0.200	0.200	0.200	0.200			
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.64	1.62	1.17	1.30			
Mann-Kendall Statistic (S):		-39	-48	-48	-42			
Confidence Factor:		98.2%	99.6%	99.6%	98.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

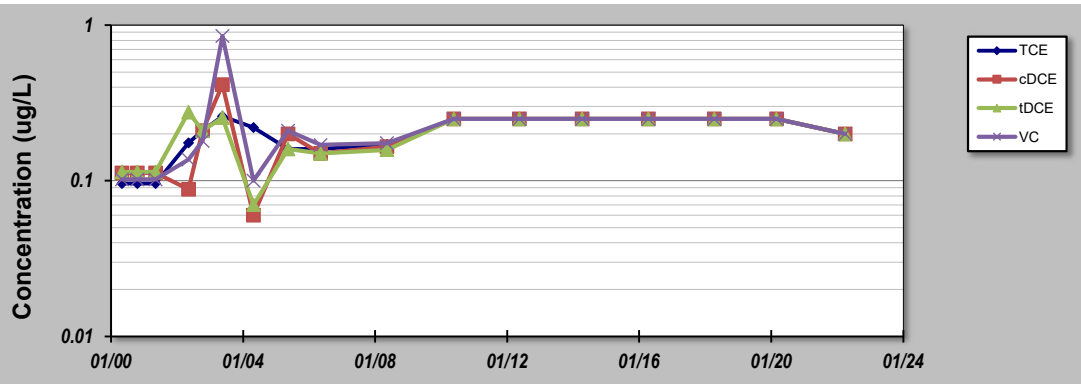
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	GMI-22-02M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	0.096	0.112	0.114	0.102			
2	10/18/2000	0.096	0.112	0.114	0.102			
3	5/8/2001	0.096	0.112	0.114	0.102			
4	5/8/2002	0.175	0.088	0.276	0.137			
5	10/10/2002	0.210	0.210	0.210	0.180			
6	5/17/2003	0.259	0.415	0.255	0.854			
7	4/25/2004	0.220	0.060	0.070	0.100			
8	5/13/2005	0.160	0.200	0.160	0.210			
9	5/7/2006	0.160	0.150	0.150	0.170			
10	5/10/2008	0.171	0.166	0.158	0.174			
11	5/20/2010	0.250	0.250	0.250	0.250			
12	5/15/2012	0.250	0.250	0.250	0.250			
13	4/8/2014	0.250	0.250	0.250	0.250			
14	4/12/2016	0.250	0.250	0.250	0.250			
15	4/11/2018	0.250	0.250	0.250	0.250			
16	2/27/2020	0.250	0.250	0.250	0.250			
17	3/29/2022	0.200	0.200	0.200	0.200			
18								
19								
20								
Coefficient of Variation:		0.30	0.44	0.33	0.77			
Mann-Kendall Statistic (S):		61	55	38	64			
Confidence Factor:		99.4%	98.8%	93.6%	99.6%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

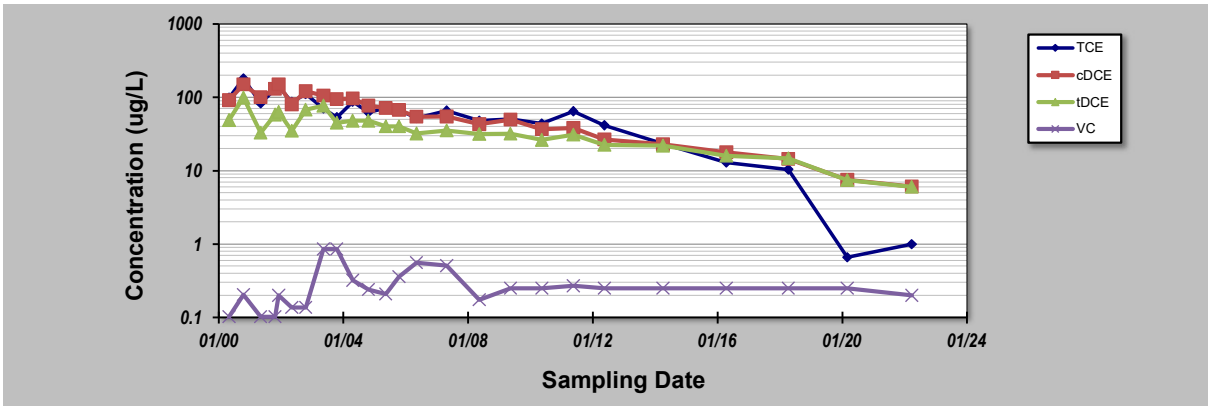
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	GMI-22-03M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	98.0	91.0	49.0	0.102			
2	10/18/2000	180	150	99.0	0.205			
3	5/7/2001	83.0	100	33.0	0.102			
4	10/22/2001	130	130	58.0	0.102			
5	12/3/2001	140	150	63.0	0.200			
6	5/7/2002	86.0	80.0	35.0	0.137			
7	10/17/2002	110	120	68.0	0.137			
8	5/14/2003	70.0	105	77.0	0.854			
9	10/16/2003	53.2	94.0	44.7	0.854			
10	4/20/2004	87.0	96.0	48.0	0.320			
11	10/20/2004	62.0	77.0	48.0	0.240			
12	5/12/2005	71.0	71.0	40.0	0.210			
13	10/14/2005	67.0	67.0	40.0	0.360			
14	5/5/2006	52.0	54.0	32.0	0.560			
15	4/25/2007	65.8	54.4	35.3	0.510			
16	5/11/2008	48.0	43.1	31.5	0.174			
17	5/12/2009	50.5	49.7	31.9	0.250			
18	5/12/2010	43.7	36.8	26.2	0.250			
19	5/18/2011	64.4	38.3	31.0	0.269			
20	5/16/2012	41.4	26.7	22.5	0.250			
21	4/2/2014	23.2	23.0	21.8	0.250			
22	4/14/2016	12.8	17.8	16.0	0.250			
23	4/10/2018	10.4	14.4	14.7	0.250			
24	2/28/2020	0.658	7.51	7.43	0.250			
25	3/26/2022	0.990	6.10	6.00	0.200			
26								
27								
28								
29								
30								
Coefficient of Variation:		0.66	0.63	0.56	0.69			
Mann-Kendall Statistic (S):		-238	-257	-228	67			
Confidence Factor:		>99.9%	>99.9%	>99.9%	93.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Prob. Increasing			



Notes:

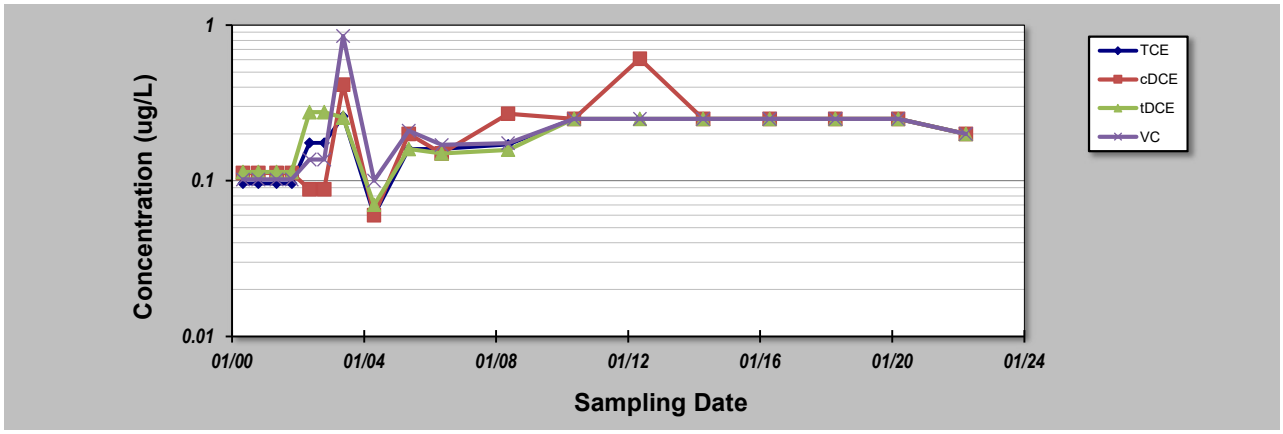
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	GMI-22-05M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	0.096	0.112	0.114	0.102			
2	10/18/2000	0.096	0.112	0.114	0.102			
3	5/8/2001	0.096	0.112	0.114	0.102			
4	10/22/2001	0.096	0.112	0.114	0.102			
5	5/7/2002	0.175	0.088	0.276	0.137			
6	10/17/2002	0.175	0.088	0.276	0.137			
7	5/14/2003	0.259	0.415	0.255	0.854			
8	4/20/2004	0.060	0.060	0.070	0.100			
9	5/11/2005	0.160	0.200	0.160	0.210			
10	5/9/2006	0.160	0.150	0.150	0.170			
11	5/12/2008	0.171	0.270	0.158	0.174			
12	5/12/2010	0.250	0.250	0.250	0.250			
13	5/11/2012	0.250	0.608	0.250	0.250			
14	4/9/2014	0.250	0.250	0.250	0.250			
15	4/14/2016	0.250	0.250	0.250	0.250			
16	4/10/2018	0.250	0.250	0.250	0.250			
17	3/5/2020	0.250	0.250	0.250	0.250			
18	3/26/2022	0.200	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		0.38	0.64	0.36	0.79			
Mann-Kendall Statistic (S):		72	53	37	79			
Confidence Factor:		99.7%	97.6%	91.2%	99.9%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

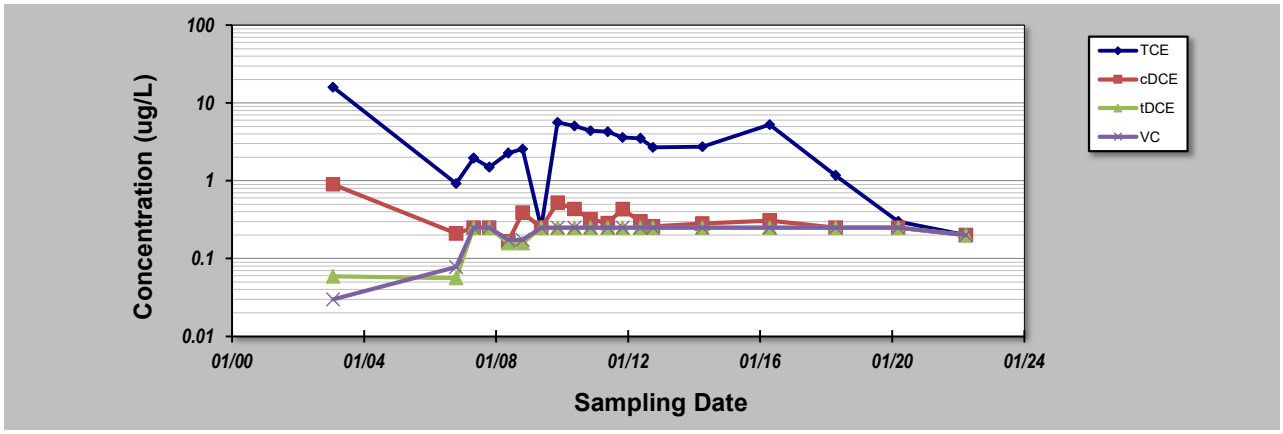
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-79
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	1/23/2003	16.0	0.900	0.059	0.030			
2	10/13/2006	0.920	0.210	0.056	0.078			
3	4/26/2007	1.96	0.250	0.250	0.250			
4	10/17/2007	1.50	0.250	0.250	0.250			
5	5/14/2008	2.28	0.166	0.158	0.174			
6	10/19/2008	2.58	0.390	0.158	0.174			
7	5/14/2009	0.250	0.250	0.250	0.250			
8	11/11/2009	5.64	0.520	0.250	0.250			
9	5/17/2010	5.07	0.434	0.250	0.250			
10	11/8/2010	4.41	0.320	0.250	0.250			
11	5/18/2011	4.30	0.284	0.250	0.250			
12	11/1/2011	3.58	0.431	0.250	0.250			
13	5/15/2012	3.51	0.300	0.250	0.250			
14	10/2/2012	2.67	0.258	0.250	0.250			
15	4/2/2014	2.73	0.282	0.250	0.250			
16	4/15/2016	5.27	0.308	0.250	0.250			
17	4/13/2018	1.17	0.250	0.250	0.250			
18	3/5/2020	0.300	0.250	0.250	0.250			
19	3/25/2022	0.200	0.200	0.200	0.200			
20								
Coefficient of Variation:		1.04	0.50	0.29	0.29			
Mann-Kendall Statistic (S):		-23	-23	41	43			
Confidence Factor:		77.7%	77.7%	91.8%	92.8%			
Concentration Trend:		No Trend	Stable	Prob. Increasing	Prob. Increasing			



Notes:

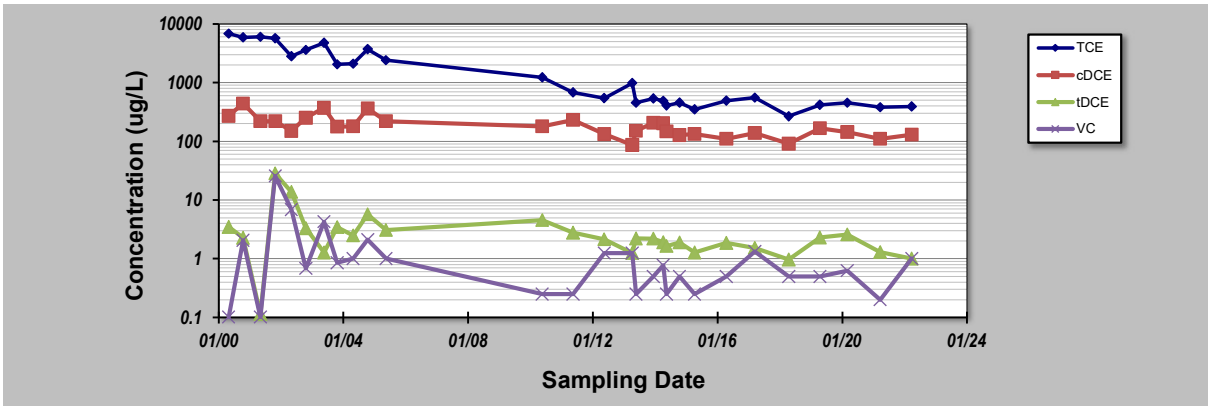
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-88
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2000	6800	270	3.50	0.102			
2	10/13/2000	5900	440	2.28	2.05			
3	5/4/2001	6000	220	0.114	0.102			
4	10/25/2001	5700	220	28.5	25.6			
5	5/2/2002	2800	150	13.8	6.84			
6	10/19/2002	3600	250	3.30	0.684			
7	5/18/2003	4768	372	1.28	4.27			
8	10/21/2003	2051	178	3.45	0.854			
9	4/24/2004	2100	180	2.50	1.00			
10	10/12/2004	3700	360	5.70	2.10			
11	5/14/2005	2400	220	3.10	1.00			
12	5/17/2010	1220	180	4.53	0.250			
13	5/16/2011	682	232	2.77	0.250			
14	5/15/2012	544	132	2.15	1.25			
15	4/9/2013	985	86.5	1.25	1.25			
16	5/22/2013	455	152	2.21	0.250			
17	12/11/2013	534	205	2.20	0.500			
18	4/4/2014	489	203	1.90	0.769			
19	5/14/2014	407	147	1.65	0.250			
20	10/13/2014	456	128	1.88	0.500			
21	4/8/2015	350	133	1.27	0.250			
22	4/13/2016	492	110	1.85	0.500			
23	3/14/2017	552	138	1.52	1.33			
24	4/14/2018	267	90.9	0.972	0.500			
25	4/14/2019	417	167	2.29	0.500			
26	2/29/2020	450	144	2.58	0.625			
27	3/20/2021	380	110	1.30	0.200			
28	3/25/2022	390	130	1.00	1.00			
29								
30								
Coefficient of Variation:		1.07	0.45	1.52	2.48			
Mann-Kendall Statistic (S):		-294	-203	-160	-67			
Confidence Factor:		>99.9%	>99.9%	99.9%	90.3%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Prob. Decreasing			



Notes:

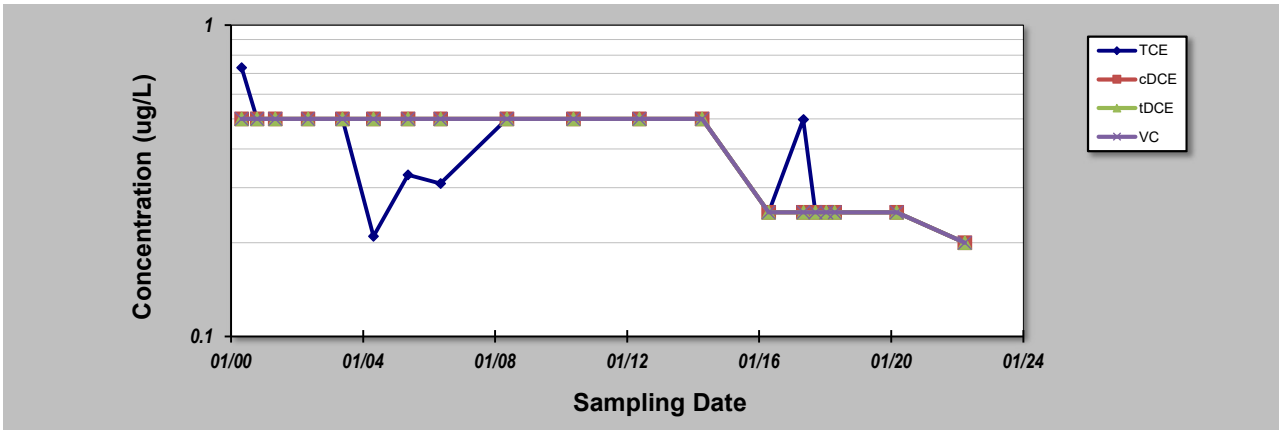
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-93
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2000	0.730	0.500	0.500	0.500			
2	10/15/2000	0.500	0.500	0.500	0.500			
3	5/6/2001	0.500	0.500	0.500	0.500			
4	5/2/2002	0.500	0.500	0.500	0.500			
5	5/18/2003	0.500	0.500	0.500	0.500			
6	4/25/2004	0.210	0.500	0.500	0.500			
7	5/14/2005	0.330	0.500	0.500	0.500			
8	5/6/2006	0.310	0.500	0.500	0.500			
9	5/11/2008	0.500	0.500	0.500	0.500			
10	5/17/2010	0.500	0.500	0.500	0.500			
11	5/15/2012	0.500	0.500	0.500	0.500			
12	4/9/2014	0.500	0.500	0.500	0.500			
13	4/14/2016	0.250	0.250	0.250	0.250			
14	5/5/2017	0.497	0.250	0.250	0.250			
15	9/14/2017	0.250	0.250	0.250	0.250			
16	1/12/2018	0.250	0.250	0.250	0.250			
17	4/15/2018	0.250	0.250	0.250	0.250			
18	2/29/2020	0.250	0.250	0.250	0.250			
19	3/26/2022	0.200	0.200	0.200	0.200			
20								
Coefficient of Variation:		0.38	0.32	0.32	0.32			
Mann-Kendall Statistic (S):		-87	-90	-90	-90			
Confidence Factor:		99.9%	99.9%	99.9%	99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

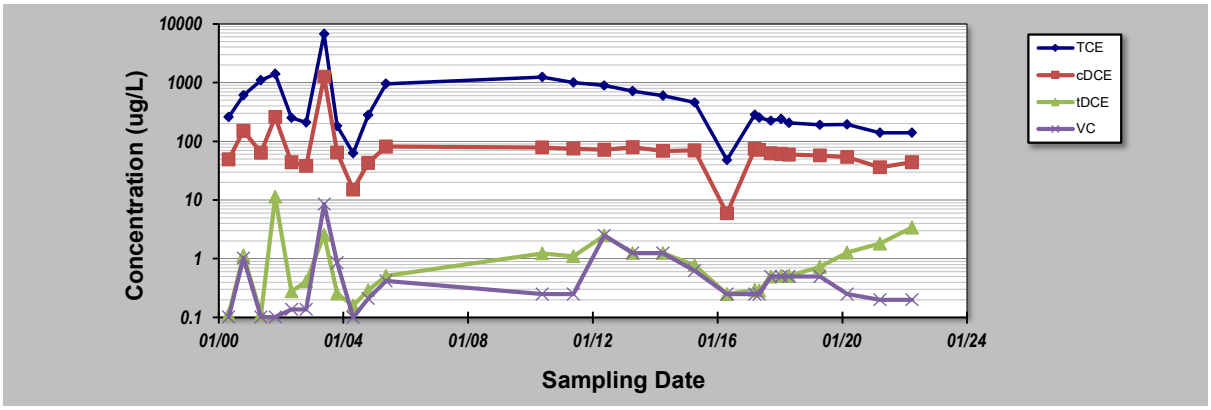
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-95
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/28/2000	260	49.0	0.114	0.102			
2	10/17/2000	610	150	1.14	1.02			
3	5/9/2001	1100	64.0	0.114	0.102			
4	10/24/2001	1400	260	11.4	0.102			
5	5/4/2002	250	44.0	0.276	0.137			
6	10/21/2002	210	38.0	0.410	0.137			
7	5/21/2003	6724	1258	2.55	8.54			
8	10/18/2003	182	64.5	0.255	0.854			
9	4/23/2004	63	15.0	0.160	0.100			
10	10/16/2004	280	43.0	0.290	0.210			
11	5/14/2005	960	81.0	0.510	0.420			
12	5/19/2010	1250	78.8	1.23	0.250			
13	5/19/2011	1010	74.4	1.10	0.250			
14	5/15/2012	896	71.4	2.50	2.50			
15	4/12/2013	716	79.0	1.25	1.25			
16	4/2/2014	597	68.7	1.25	1.25			
17	4/7/2015	460	69.4	0.776	0.625			
18	4/20/2016	47.9	5.90	0.250	0.250			
19	3/14/2017	284	74.0	0.297	0.250			
20	5/4/2017	252	70.9	0.287	0.250			
21	9/14/2017	224	62.6	0.500	0.500			
22	1/15/2018	239	60.8	0.512	0.500			
23	4/17/2018	206	59.1	0.512	0.500			
24	4/14/2019	191	57.3	0.725	0.500			
25	2/26/2020	194	53.7	1.27	0.250			
26	3/19/2021	140	36.0	1.80	0.200			
27	3/28/2022	140	44.0	3.40	0.200			
28								
29								
30								
Coefficient of Variation:		1.81	2.08	1.69	2.08			
Mann-Kendall Statistic (S):		-146	-94	92	42			
Confidence Factor:		99.9%	97.4%	97.2%	80.2%			
Concentration Trend:		Decreasing	Decreasing	Increasing	No Trend			



Notes:

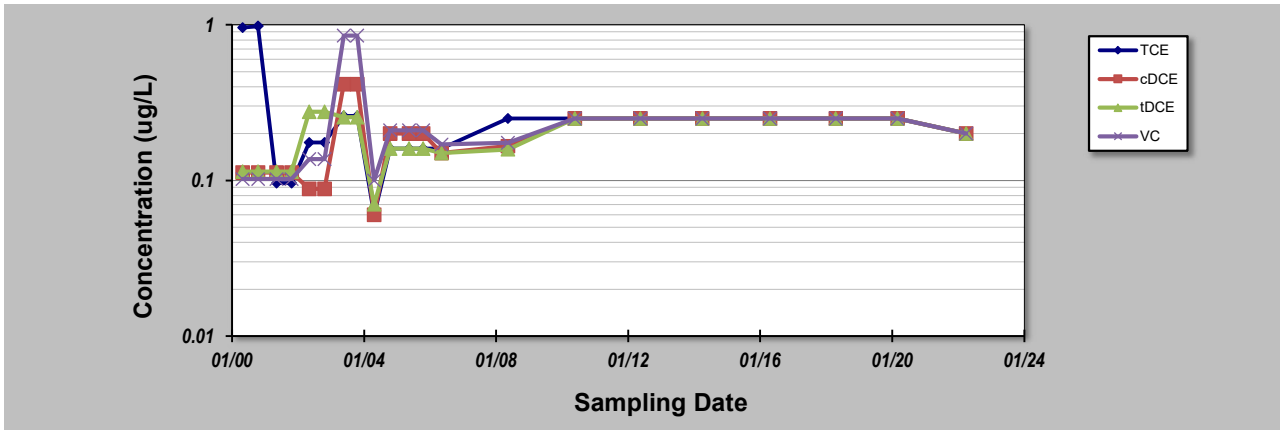
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-98
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/28/2000	0.960	0.112	0.114	0.102			
2	10/17/2000	0.980	0.112	0.114	0.102			
3	5/9/2001	0.096	0.112	0.114	0.102			
4	10/21/2001	0.096	0.112	0.114	0.102			
5	5/4/2002	0.175	0.088	0.276	0.137			
6	10/21/2002	0.175	0.088	0.276	0.137			
7	5/22/2003	0.259	0.415	0.255	0.854			
8	10/18/2003	0.259	0.415	0.255	0.854			
9	4/23/2004	0.060	0.060	0.070	0.100			
10	10/16/2004	0.160	0.200	0.160	0.210			
11	5/14/2005	0.160	0.200	0.160	0.210			
12	10/15/2005	0.160	0.200	0.160	0.210			
13	5/7/2006	0.160	0.150	0.150	0.170			
14	5/11/2008	0.250	0.166	0.158	0.174			
15	5/19/2010	0.250	0.250	0.250	0.250			
16	5/15/2012	0.250	0.250	0.250	0.250			
17	4/2/2014	0.250	0.250	0.250	0.250			
18	4/20/2016	0.250	0.250	0.250	0.250			
19	4/15/2018	0.250	0.250	0.250	0.250			
20	2/26/2020	0.250	0.250	0.250	0.250			
21	3/28/2022	0.200	0.200	0.200	0.200			
22								
23								
24								
25								
Coefficient of Variation:		0.89	0.49	0.34	0.86			
Mann-Kendall Statistic (S):		14	77	40	88			
Confidence Factor:		65.1%	99.0%	87.9%	99.6%			
Concentration Trend:		No Trend	Increasing	No Trend	Increasing			



Notes:

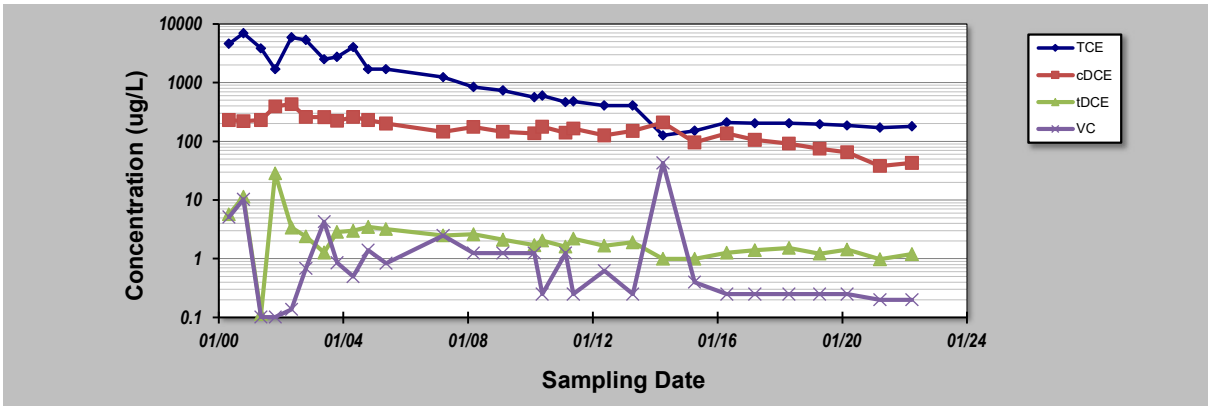
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2021	Job ID:	HM-112
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/29/2000	4600	230	5.70	5.12			
2	10/17/2000	6900	220	11.4	10.2			
3	5/9/2001	3800	230	0.114	0.102			
4	10/24/2001	1700	390	28.5	0.102			
5	5/4/2002	5900	430	3.40	0.137			
6	10/20/2002	5300	260	2.40	0.684			
7	5/21/2003	2488	256	1.28	4.27			
8	10/18/2003	2720	223	2.86	0.854			
9	4/23/2004	4000	260	3.00	0.500			
10	10/16/2004	1700	230	3.50	1.40			
11	5/14/2005	1700	200	3.20	0.840			
12	3/16/2007	1240	145	2.50	2.50			
13	3/5/2008	840	175	2.61	1.25			
14	2/11/2009	734	145	2.11	1.25			
15	2/16/2010	563	137	1.70	1.25			
16	5/18/2010	598	177	2.04	0.250			
17	2/16/2011	462	140	1.61	1.25			
18	5/19/2011	480	165	2.20	0.250			
19	5/15/2012	409	125	1.68	0.625			
20	4/12/2013	409	150	1.91	0.250			
21	4/1/2014	126	209	1.00	42.7			
22	4/7/2015	151	95.4	0.991	0.398			
23	4/19/2016	209	136	1.26	0.250			
24	3/14/2017	203	106	1.40	0.250			
25	4/17/2018	203	91.6	1.53	0.250			
26	4/12/2019	196	74.7	1.22	0.250			
27	2/26/2020	186	65.2	1.43	0.250			
28	3/19/2021	170	38.0	0.980	0.200			
29	3/28/2022	180	43.0	1.20	0.200			
30								
Coefficient of Variation:		1.19	0.51	1.61	2.97			
Mann-Kendall Statistic (S):		-337	-299	-234	-116			
Confidence Factor:		>99.9%	>99.9%	>99.9%	98.5%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

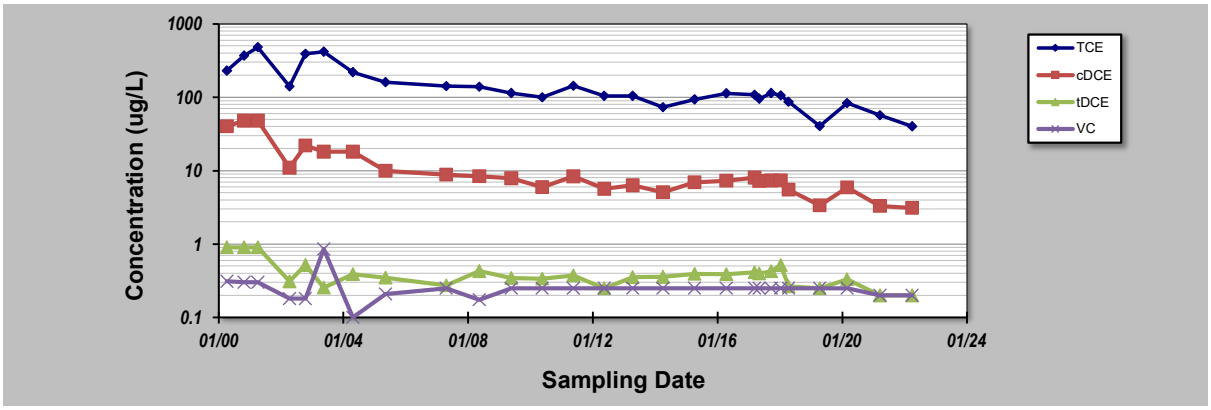
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-116
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/6/2000	230	40.0	0.900	0.310			
2	10/26/2000	370	48.0	0.900	0.300			
3	4/3/2001	480	48.0	0.900	0.300			
4	4/11/2002	140	11.0	0.310	0.180			
5	10/14/2002	390	22.0	0.520	0.180			
6	5/16/2003	416	18.0	0.255	0.854			
7	4/22/2004	220	18.0	0.390	0.100			
8	5/10/2005	160	10.0	0.350	0.210			
9	4/21/2007	142	8.80	0.273	0.250			
10	5/10/2008	139	8.43	0.430	0.174			
11	5/20/2009	114	7.86	0.344	0.250			
12	5/19/2010	100	5.99	0.337	0.250			
13	5/19/2011	143	8.36	0.373	0.250			
14	5/14/2012	104	5.65	0.250	0.250			
15	4/12/2013	104	6.29	0.354	0.250			
16	4/3/2014	73.1	5.08	0.356	0.250			
17	4/8/2015	93.3	6.93	0.391	0.250			
18	4/12/2016	113	7.26	0.389	0.250			
19	3/10/2017	108	8.04	0.413	0.250			
20	5/2/2017	95.3	7.21	0.399	0.250			
21	9/19/2017	114	7.35	0.427	0.250			
22	1/11/2018	106	7.39	0.514	0.250			
23	4/11/2018	87.0	5.51	0.266	0.250			
24	4/12/2019	40.5	3.36	0.250	0.250			
25	2/27/2020	83.5	5.90	0.330	0.250			
26	3/17/2021	57.0	3.30	0.200	0.200			
27	3/29/2022	40.0	3.10	0.200	0.200			
28								
29								
30								
Coefficient of Variation:		0.75	1.02	0.48	0.49			
Mann-Kendall Statistic (S):		-247	-249	-96	-36			
Confidence Factor:		>99.9%	>99.9%	97.7%	76.6%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

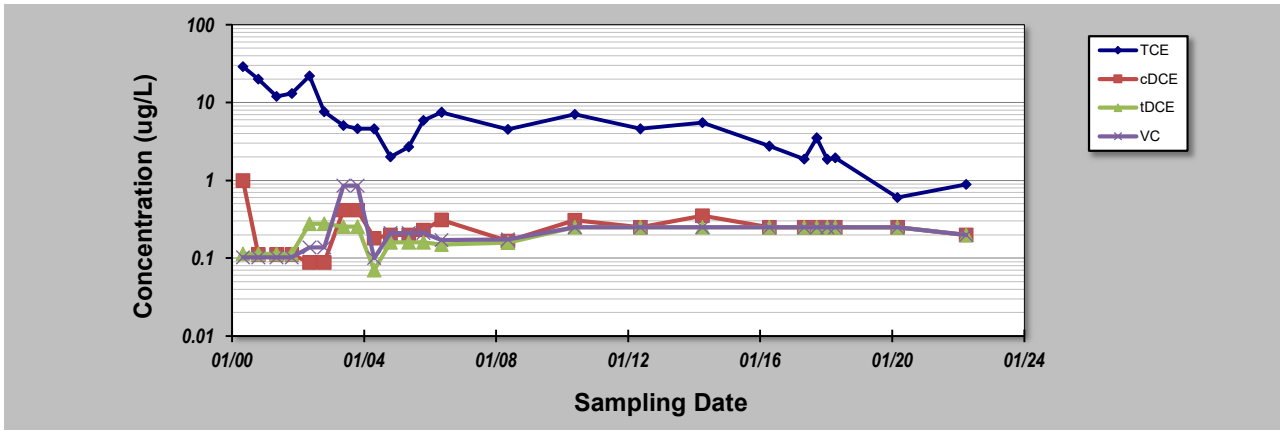
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-119
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/2/2000	29.0	1.00	0.114	0.102			
2	10/19/2000	20.0	0.112	0.114	0.102			
3	5/8/2001	12.0	0.112	0.114	0.102			
4	10/22/2001	13.0	0.112	0.114	0.102			
5	5/8/2002	22.0	0.0880	0.276	0.137			
6	10/18/2002	7.60	0.088	0.276	0.137			
7	5/16/2003	5.10	0.4150	0.255	0.854			
8	10/20/2003	4.63	0.415	0.255	0.854			
9	4/22/2004	4.60	0.180	0.070	0.100			
10	10/18/2004	2.00	0.200	0.160	0.210			
11	5/10/2005	2.70	0.200	0.160	0.210			
12	10/18/2005	5.90	0.2300	0.160	0.210			
13	5/8/2006	7.50	0.310	0.150	0.170			
14	5/10/2008	4.54	0.166	0.158	0.174			
15	5/19/2010	7.04	0.306	0.250	0.250			
16	5/14/2012	4.59	0.250	0.250	0.250			
17	4/3/2014	5.52	0.351	0.250	0.250			
18	4/12/2016	2.76	0.250	0.250	0.250			
19	5/2/2017	1.88	0.250	0.250	0.250			
20	9/19/2017	3.53	0.250	0.250	0.250			
21	1/12/2018	1.87	0.250	0.250	0.250			
22	4/11/2018	1.95	0.250	0.250	0.250			
23	2/27/2020	0.601	0.250	0.250	0.250			
24	3/29/2022	0.890	0.200	0.200	0.200			
25								
Coefficient of Variation:		1.01	0.70	0.32	0.80			
Mann-Kendall Statistic (S):		-188	51	55	115			
Confidence Factor:		>99.9%	89.2%	90.9%	99.8%			
Concentration Trend:		Decreasing	No Trend	Prob. Increasing	Increasing			



Notes:

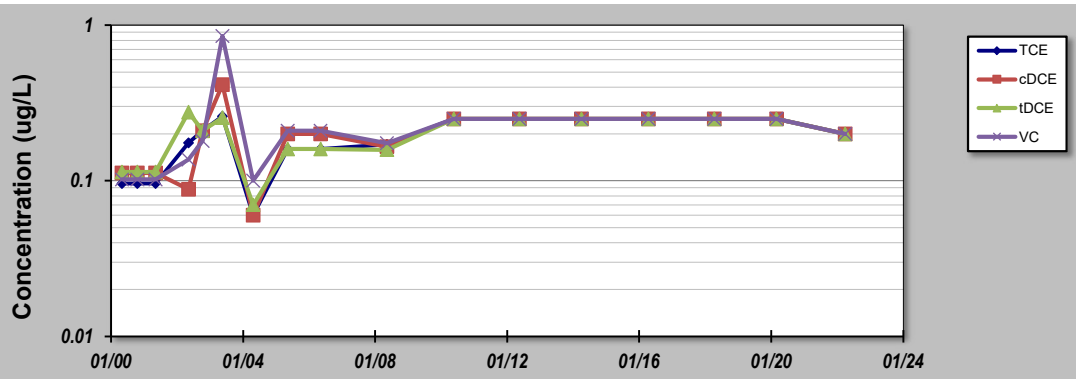
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-120
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/2/2000	0.096	0.112	0.114	0.102			
2	10/19/2000	0.096	0.112	0.114	0.102			
3	5/8/2001	0.096	0.112	0.114	0.102			
4	5/8/2002	0.175	0.088	0.276	0.137			
5	10/11/2002	0.210	0.210	0.210	0.180			
6	5/16/2003	0.259	0.415	0.255	0.854			
7	4/22/2004	0.060	0.060	0.070	0.100			
8	5/10/2005	0.160	0.200	0.160	0.210			
9	5/8/2006	0.160	0.200	0.160	0.210			
10	5/10/2008	0.171	0.166	0.158	0.174			
11	5/19/2010	0.250	0.250	0.250	0.250			
12	5/14/2012	0.250	0.250	0.250	0.250			
13	4/3/2014	0.250	0.250	0.250	0.250			
14	4/12/2016	0.250	0.250	0.250	0.250			
15	4/11/2018	0.250	0.250	0.250	0.250			
16	2/27/2020	0.250	0.250	0.250	0.250			
17	3/28/2022	0.200	0.200	0.200	0.200			
18								
19								
20								
Coefficient of Variation:		0.36	0.43	0.33	0.76			
Mann-Kendall Statistic (S):		59	53	37	62			
Confidence Factor:		99.2%	98.5%	93.0%	99.5%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

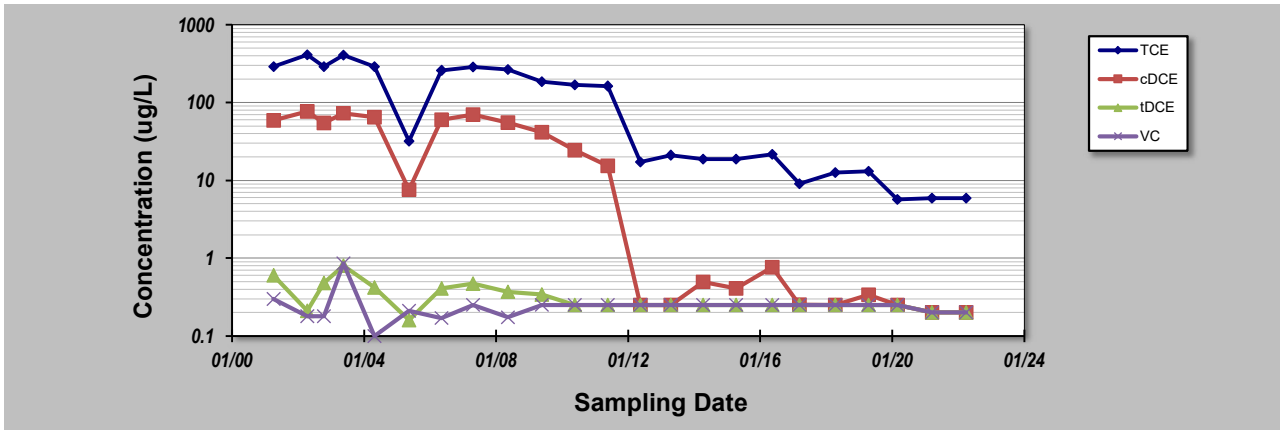
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-121
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/4/2001	290	59.0	0.600	0.300			
2	4/11/2002	410	77.0	0.210	0.180			
3	10/14/2002	290	55.0	0.480	0.180			
4	5/17/2003	407	73.0	0.800	0.854			
5	4/25/2004	290	65.0	0.420	0.100			
6	5/13/2005	32.0	7.60	0.160	0.210			
7	5/7/2006	260	60.0	0.410	0.170			
8	4/21/2007	288	69.9	0.470	0.250			
9	5/10/2008	267	55.1	0.370	0.174			
10	5/20/2009	186	41.5	0.340	0.250			
11	5/20/2010	169	24.6	0.250	0.250			
12	5/19/2011	163	15.3	0.250	0.250			
13	5/15/2012	17.2	0.250	0.250	0.250			
14	4/16/2013	21.1	0.250	0.250	0.250			
15	4/8/2014	18.8	0.496	0.250	0.250			
16	4/8/2015	18.8	0.411	0.250	0.250			
17	5/12/2016	21.6	0.761	0.250	0.250			
18	3/10/2017	9.09	0.253	0.250	0.250			
19	4/11/2018	12.6	0.250	0.250	0.250			
20	4/12/2019	13.1	0.338	0.250	0.250			
21	2/27/2020	5.68	0.250	0.250	0.250			
22	3/17/2021	5.90	0.200	0.200	0.200			
23	3/28/2022	5.90	0.200	0.200	0.200			
24								
25								
Coefficient of Variation:		1.03	1.15	0.47	0.55			
Mann-Kendall Statistic (S):		-202	-182	-119	19			
Confidence Factor:		>99.9%	>99.9%	99.9%	68.1%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

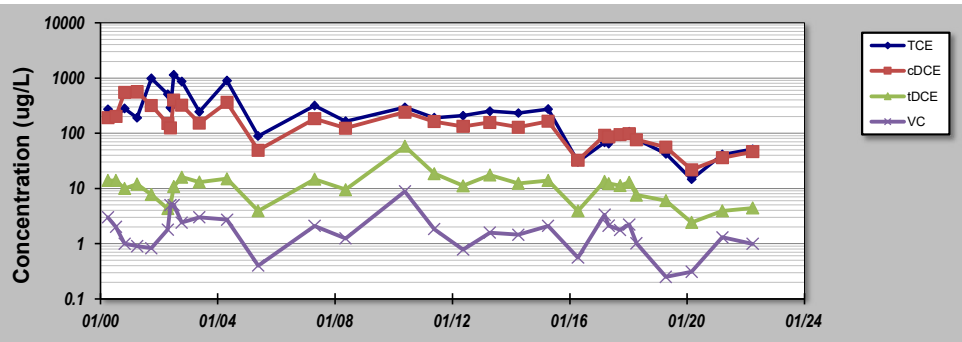
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-123
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/5/2000	270	190	14.0	3.00			
2	7/12/2000	200	200	14.0	2.00			
3	10/27/2000	280	550	10.0	1.00			
4	4/2/2001	190	560	12.0	0.900			
5	9/27/2001	978	317	7.74	0.825			
6	4/18/2002	510	150	4.30	1.80			
7	5/23/2002	290	124	5.10	5.00			
8	7/1/2002	1130	398	10.8	5.00			
9	10/10/2002	860	320	16.0	2.40			
10	5/18/2003	244	153	13.0	3.00			
11	4/26/2004	890	360	15.0	2.70			
12	5/18/2005	89.0	49.0	3.90	0.400			
13	4/20/2007	315	182	14.7	2.10			
14	5/10/2008	165	123	9.52	1.24			
15	5/21/2010	295	240	58.0	8.86			
16	5/19/2011	190	162	18.5	1.82			
17	5/14/2012	207	133	11.2	0.775			
18	4/12/2013	251	157	17.4	1.58			
19	4/3/2014	232	129	12.4	1.45			
20	4/8/2015	272	165	14.0	2.10			
21	4/12/2016	30.3	32.2	3.91	0.556			
22	3/10/2017	68.5	91.1	13.5	3.33			
23	5/1/2017	64.9	85.0	12.3	2.12			
24	9/20/2017	88.1	93.6	11.3	1.76			
25	1/11/2018	106	98.0	12.9	2.22			
26	4/11/2018	77.6	76.3	7.64	1.01			
27	4/12/2019	42.2	55.8	6.01	0.250			
28	2/27/2020	14.7	21.8	2.42	0.309			
29	3/17/2021	41.0	36.0	3.90	1.30			
30	3/28/2022	51.0	46.0	4.40	0.99			
31								
32								
33								
34								
35								
Coefficient of Variation:		1.05	0.80	0.82	0.85			
Mann-Kendall Statistic (S):		-227	-259	-87	-96			
Confidence Factor:		>99.9%	>99.9%	93.7%	95.5%			
Concentration Trend:		Decreasing	Decreasing	Prob. Decreasing	Decreasing			



Notes:

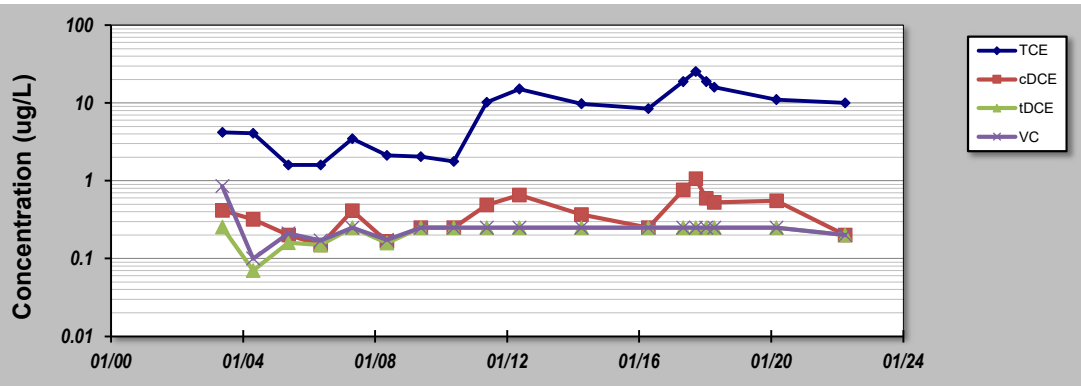
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-125
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/16/2003	4.20	0.415	0.255	0.854			
2	4/22/2004	4.10	0.320	0.070	0.100			
3	5/18/2005	1.60	0.200	0.160	0.210			
4	5/8/2006	1.60	0.150	0.150	0.170			
5	4/22/2007	3.47	0.413	0.250	0.250			
6	5/10/2008	2.12	0.166	0.158	0.174			
7	5/20/2009	2.04	0.250	0.250	0.250			
8	5/20/2010	1.77	0.250	0.250	0.250			
9	5/19/2011	10.2	0.486	0.250	0.250			
10	5/14/2012	15.1	0.653	0.250	0.250			
11	4/3/2014	9.80	0.369	0.250	0.250			
12	4/12/2016	8.48	0.250	0.250	0.250			
13	5/2/2017	18.8	0.766	0.250	0.250			
14	9/18/2017	25.5	1.06	0.250	0.250			
15	1/12/2018	18.9	0.594	0.250	0.250			
16	4/11/2018	16.0	0.527	0.250	0.250			
17	2/27/2020	11.1	0.549	0.250	0.250			
18	3/28/2022	10.0	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		0.79	0.57	0.24	0.59			
Mann-Kendall Statistic (S):		72	45	23	21			
Confidence Factor:		99.7%	95.2%	79.5%	77.3%			
Concentration Trend:		Increasing	Increasing	No Trend	No Trend			



Notes:

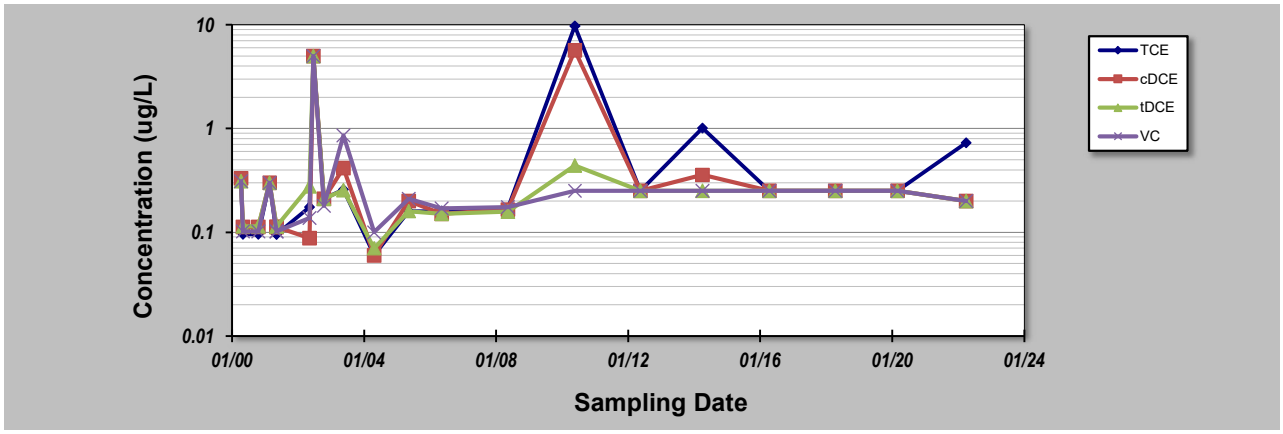
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-127
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/10/2000	0.300	0.330	0.310	0.310			
2	5/2/2000	0.096	0.112	0.114	0.102			
3	10/19/2000	0.096	0.112	0.114	0.102			
4	2/20/2001	0.300	0.300	0.300	0.300			
5	5/8/2001	0.096	0.112	0.114	0.102			
6	5/8/2001	0.096	0.112	0.114	0.102			
7	5/8/2002	0.175	0.088	0.276	0.137			
8	6/21/2002	5.00	5.00	5.00	5.00			
9	10/14/2002	0.210	0.210	0.210	0.180			
10	5/16/2003	0.259	0.415	0.255	0.854			
11	4/22/2004	0.060	0.060	0.070	0.100			
12	5/11/2005	0.160	0.200	0.160	0.210			
13	5/8/2006	0.160	0.150	0.150	0.170			
14	5/10/2008	0.171	0.166	0.158	0.174			
15	5/21/2010	9.73	5.68	0.440	0.250			
16	5/15/2012	0.250	0.250	0.250	0.250			
17	4/3/2014	1.01	0.356	0.250	0.250			
18	4/12/2016	0.250	0.250	0.250	0.250			
19	4/11/2018	0.250	0.250	0.250	0.250			
20	2/27/2020	0.250	0.250	0.250	0.250			
21	3/28/2022	0.730	0.200	0.200	0.200			
22								
23								
24								
25								
Coefficient of Variation:		2.43	2.23	2.38	2.32			
Mann-Kendall Statistic (S):		56	35	14	41			
Confidence Factor:		95.1%	84.6%	65.1%	88.5%			
Concentration Trend:		Increasing	No Trend	No Trend	No Trend			



Notes:

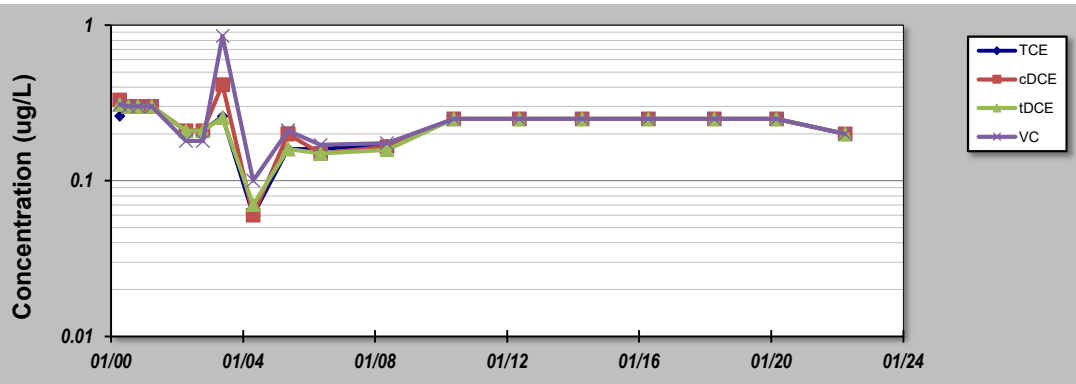
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF03-3D
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/6/2000	0.260	0.330	0.310	0.310			
2	7/12/2000	0.300	0.300	0.300	0.300			
3	10/26/2000	0.300	0.300	0.300	0.300			
4	3/27/2001	0.300	0.300	0.300	0.300			
5	4/10/2002	0.210	0.210	0.210	0.180			
6	10/15/2002	0.210	0.210	0.210	0.180			
7	5/20/2003	0.259	0.415	0.255	0.854			
8	4/23/2004	0.060	0.060	0.070	0.100			
9	5/14/2005	0.160	0.200	0.160	0.210			
10	5/14/2005	0.160	0.200	0.160	0.210			
11	5/7/2006	0.160	0.150	0.150	0.170			
12	5/10/2008	0.171	0.166	0.158	0.174			
13	5/18/2010	0.250	0.250	0.250	0.250			
14	5/15/2012	0.250	0.250	0.250	0.250			
15	4/9/2014	0.250	0.250	0.250	0.250			
16	4/12/2016	0.250	0.250	0.250	0.250			
17	4/11/2018	0.250	0.250	0.250	0.250			
18	2/27/2020	0.250	0.250	0.250	0.250			
19	3/28/2022	0.200	0.200	0.200	0.200			
20								
Coefficient of Variation:		0.27	0.32	0.28	0.58			
Mann-Kendall Statistic (S):		-31	-37	-43	-27			
Confidence Factor:		85.1%	89.5%	92.8%	81.6%			
Concentration Trend:		Stable	Stable	Prob. Decreasing	Stable			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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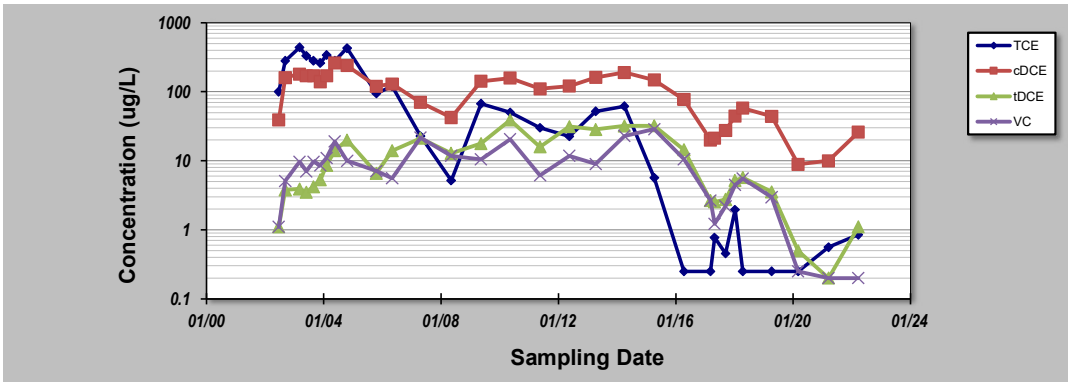
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF04-4D
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	6/20/2002	100	39.0	1.10	1.10			
2	9/10/2002	280	160	3.80	5.10			
3	3/6/2003	440	180	3.90	9.70			
4	5/29/2003	330	170	3.50	7.00			
5	8/27/2003	280	170	4.20	9.70			
6	11/20/2003	260	140	5.30	8.60			
7	2/5/2004	340	170	8.60	11.0			
8	5/18/2004	280	260	14.0	19.0			
9	10/19/2004	430	240	20.0	10.0			
10	10/17/2005	95.0	120	6.60	7.10			
11	5/2/2006	120	130	14.0	5.60			
12	4/18/2007	22.8	70.2	21.2	21.6			
13	5/6/2008	5.21	42.2	12.8	11.8			
14	5/12/2009	67.2	142	17.8	10.5			
15	5/11/2010	50.3	158	39.0	20.5			
16	5/17/2011	30.1	110	15.9	6.16			
17	5/16/2012	22.5	121	31.3	11.8			
18	4/11/2013	52.0	161	28.5	8.95			
19	4/3/2014	61.8	190	32.0	22.9			
20	4/9/2015	5.68	148	32.2	28.7			
21	4/14/2016	0.250	77.1	14.5	10.6			
22	3/9/2017	0.250	20.0	2.66	2.66			
23	4/27/2017	0.775	21.3	2.54	1.22			
24	9/14/2017	0.454	27.5	2.76	2.19			
25	1/8/2018	1.96	44.4	5.21	4.47			
26	4/16/2018	0.250	58.1	5.73	5.51			
27	4/10/2019	0.250	44.1	3.55	2.96			
28	3/2/2020	0.250	8.87	0.495	0.250			
29	3/18/2021	0.560	10.0	0.200	0.200			
30	3/23/2022	0.850	26.0	1.10	0.200			
31								
32								
33								
34								
35								
Coefficient of Variation:		1.31	0.65	0.95	0.82			
Mann-Kendall Statistic (S):		-294	-204	-15	-99			
Confidence Factor:		>99.9%	>99.9%	59.8%	96.0%			
Concentration Trend:		Decreasing	Decreasing	Stable	Decreasing			



Notes:

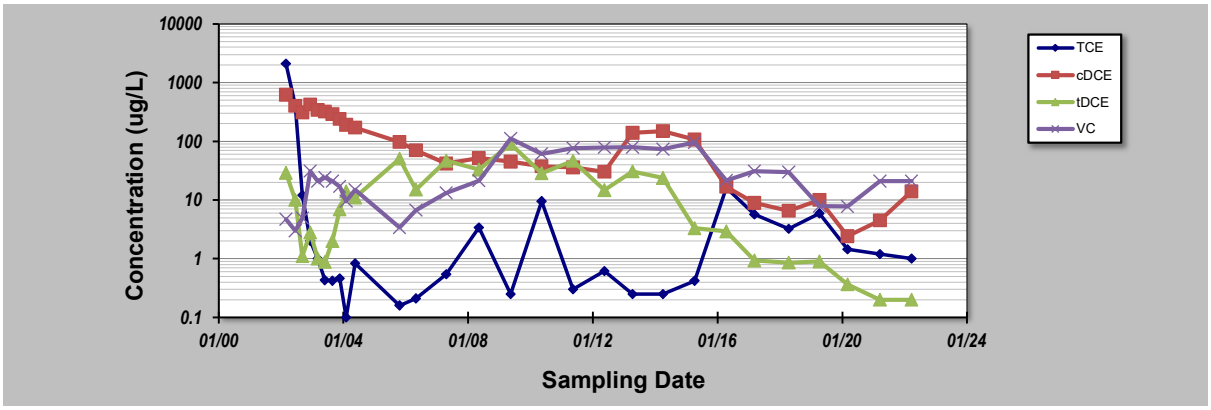
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF04-4F
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	2/26/2002	2100	620	29.0	4.70			
2	6/17/2002	410	400	10.0	3.00			
3	9/9/2002	12.0	310	1.10	4.90			
4	12/9/2002	2.00	420	2.80	31.0			
5	3/5/2003	1.00	340	1.00	21.0			
6	5/29/2003	0.430	320	0.88	24.0			
7	8/27/2003	0.420	290	2.00	21.0			
8	11/19/2003	0.460	240	6.90	17.0			
9	2/3/2004	0.100	190	14.0	9.50			
10	5/18/2004	0.830	170	11.0	15.0			
11	10/18/2005	0.160	97.0	51.0	3.40			
12	5/2/2006	0.210	70.0	15.0	6.70			
13	4/19/2007	0.541	41.6	46.5	13.2			
14	5/6/2008	3.39	51.7	33.0	21.3			
15	5/13/2009	0.250	44.9	90.1	111			
16	5/10/2010	9.53	37.5	28.6	61.1			
17	5/16/2011	0.300	35.8	46.1	76.8			
18	5/16/2012	0.615	30.1	14.8	78.8			
19	4/11/2013	0.250	139	30.6	79.5			
20	4/3/2014	0.250	149	23.8	73.2			
21	4/8/2015	0.421	107	3.32	95.8			
22	4/13/2016	16.0	16.8	2.92	21.6			
23	3/9/2017	5.65	8.91	0.932	30.9			
24	4/16/2018	3.24	6.55	0.860	29.9			
25	4/10/2019	5.94	10.0	0.900	7.83			
26	3/2/2020	1.45	2.41	0.365	7.77			
27	3/18/2021	1.20	4.50	0.200	21.0			
28	3/23/2022	1.00	14.0	0.200	21.0			
29								
30								
Coefficient of Variation:		4.36	1.08	1.28	0.96			
Mann-Kendall Statistic (S):		-10	-300	-83	86			
Confidence Factor:		57.0%	>99.9%	94.7%	95.3%			
Concentration Trend:		No Trend	Decreasing	Prob. Decreasing	Increasing			



Notes:

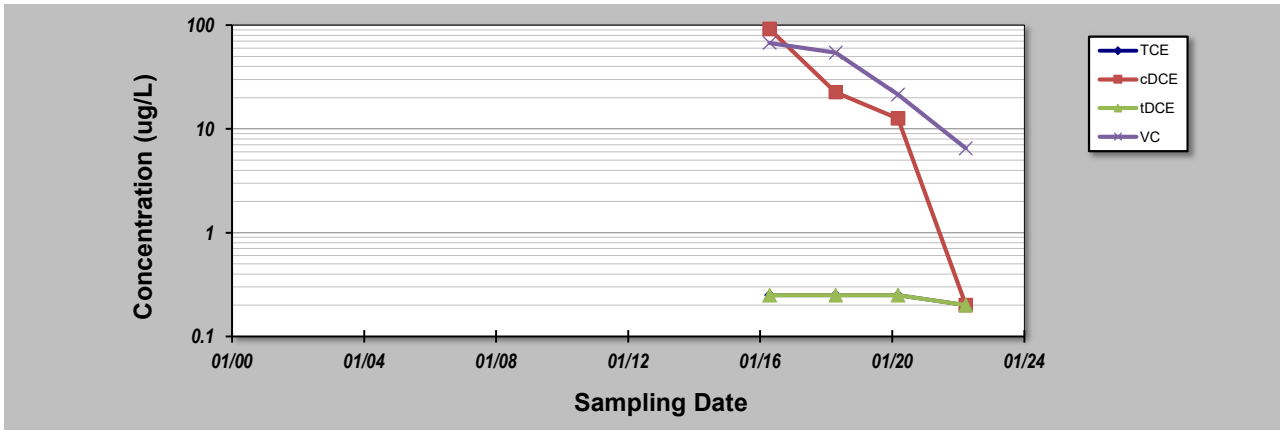
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF05-5B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/13/2016	0.250	91.8	0.250	67.4			
2	4/16/2018	0.250	22.6	0.250	54.4			
3	3/3/2020	0.250	12.6	0.250	21.5			
4	3/24/2022	0.200	0.200	0.200	6.50			
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.11	1.29	0.11	0.75			
Mann-Kendall Statistic (S):		-3	-6	-3	-6			
Confidence Factor:		72.9%	95.8%	72.9%	95.8%			
Concentration Trend:		Stable	Decreasing	Stable	Decreasing			



Notes:

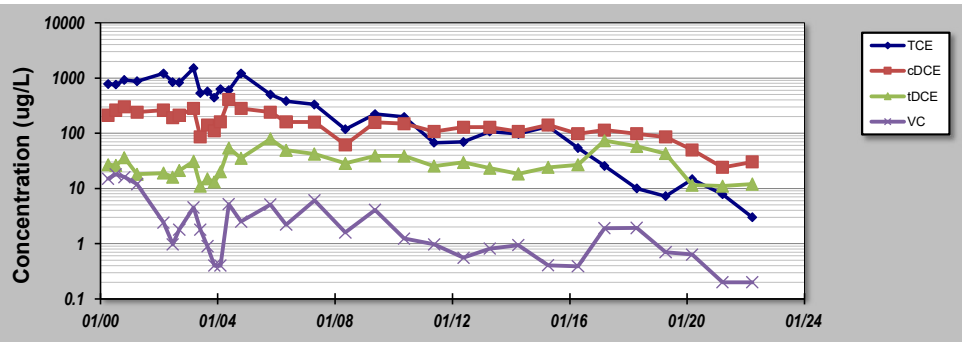
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF05-5G
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/6/2000	780	210	27.0	15.0			
2	7/11/2000	760	260	26.0	18.0			
3	10/25/2000	920	300	36.0	16.0			
4	4/2/2001	870	240	18.0	12.0			
5	2/25/2002	1200	260	19.0	2.40			
6	6/20/2002	840	190	16.0	0.970			
7	9/10/2002	830	210	21.0	1.80			
8	3/6/2003	1500	280	31.0	4.50			
9	5/29/2003	530	85.0	11.0	1.80			
10	8/27/2003	570	140	15.0	0.900			
11	11/18/2003	440	110	13.0	0.400			
12	2/4/2004	630	160	20.0	0.400			
13	5/19/2004	600	410	54.0	5.20			
14	10/19/2004	1200	280	35.0	2.50			
15	10/18/2005	500	240	79.0	5.10			
16	5/2/2006	380	160	49.0	2.20			
17	4/18/2007	333	159	41.9	6.10			
18	5/7/2008	118	61.7	28.4	1.60			
19	5/12/2009	222	157	38.8	4.08			
20	5/11/2010	197	148	38.6	1.23			
21	5/17/2011	67.3	107	25.4	0.974			
22	5/18/2012	69.4	129	29.5	0.553			
23	4/11/2013	107	128	23.3	0.813			
24	4/3/2014	96.6	107	18.4	0.939			
25	4/8/2015	133	141	24.2	0.407			
26	4/13/2016	54.0	98.0	26.6	0.390			
27	3/9/2017	25.5	114	73.2	1.91			
28	4/16/2018	10.0	97.9	57.6	1.93			
29	4/10/2019	7.21	85.1	42.8	0.701			
30	3/2/2020	14.7	49.8	11.5	0.632			
31	3/18/2021	7.80	24.0	11.0	0.200			
32	3/24/2022	3.00	30.0	12.0	0.200			
33								
34								
35								
Coefficient of Variation:		0.95	0.54	0.57	1.39			
Mann-Kendall Statistic (S):		-389	-302	13	-249			
Confidence Factor:		>99.9%	>99.9%	57.7%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Decreasing			



Notes:

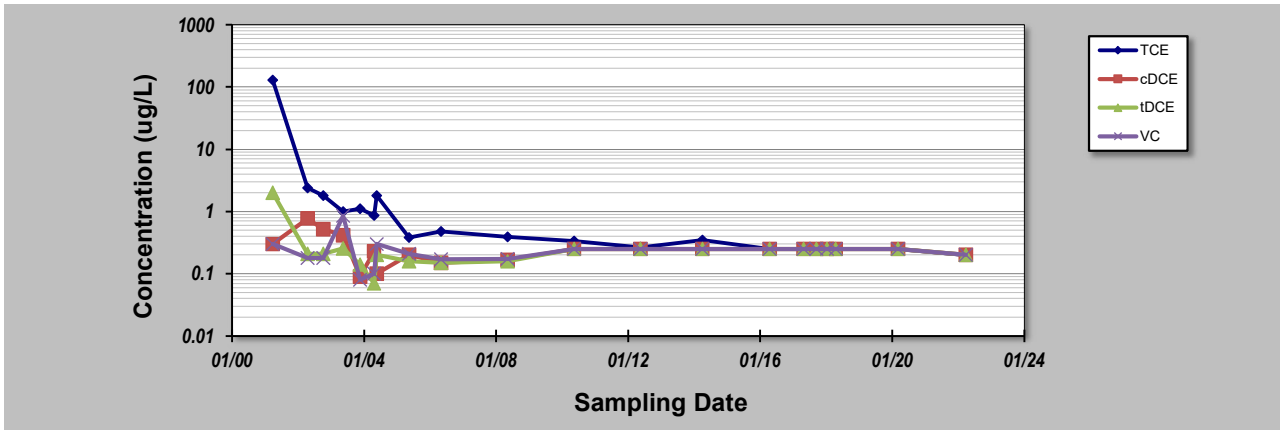
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF05-19
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/26/2001	130	0.300	2.00	0.300			
2	4/18/2002	2.40	0.770	0.210	0.180			
3	10/8/2002	1.80	0.520	0.210	0.180			
4	5/15/2003	1.00	0.415	0.255	0.854			
5	11/20/2003	1.10	0.090	0.140	0.080			
6	4/20/2004	0.860	0.230	0.0700	0.100			
7	5/20/2004	1.80	0.100	0.200	0.300			
8	5/12/2005	0.380	0.200	0.160	0.210			
9	5/3/2006	0.480	0.150	0.150	0.170			
10	5/7/2008	0.390	0.166	0.158	0.174			
11	5/12/2010	0.334	0.250	0.250	0.250			
12	5/16/2012	0.265	0.250	0.250	0.250			
13	4/2/2014	0.346	0.250	0.250	0.250			
14	4/13/2016	0.250	0.250	0.250	0.250			
15	4/27/2017	0.250	0.250	0.250	0.250			
16	9/13/2017	0.250	0.250	0.250	0.250			
17	1/8/2018	0.250	0.250	0.250	0.250			
18	4/16/2018	0.250	0.250	0.250	0.250			
19	3/3/2020	0.250	0.250	0.250	0.250			
20	3/25/2022	0.200	0.200	0.200	0.200			
21								
22								
23								
24								
25								
Coefficient of Variation:		4.05	0.56	1.34	0.61			
Mann-Kendall Statistic (S):		-158	-13	24	20			
Confidence Factor:		>99.9%	65.0%	77.0%	72.9%			
Concentration Trend:		Decreasing	Stable	No Trend	No Trend			



Notes:

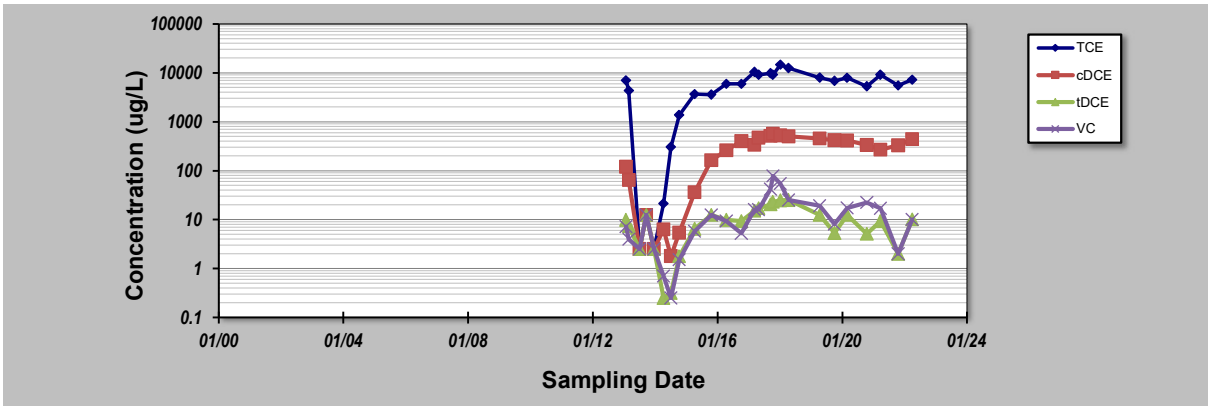
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	MW-10R-URS
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	1/25/2013	7000	120	9.85	7.20			
2	2/26/2013	4330	64.4	7.29	3.97			
3	7/2/2013	2.50	2.50	2.50	2.50			
4	9/19/2013	12.5	12.5	12.5	12.5			
5	12/17/2013	2.50	2.50	2.50	2.50			
6	4/8/2014	21.2	6.35	0.250	0.704			
7	7/2/2014	304	1.79	0.314	0.250			
8	10/8/2014	1370	5.37	1.78	1.51			
9	4/8/2015	3650	36.1	6.47	5.76			
10	10/20/2015	3590	162	12.5	12.5			
11	4/14/2016	5900	261	9.81	9.38			
12	10/5/2016	5940	400	9.25	5.20			
13	3/8/2017	10400	335	15.2	16.1			
14	4/26/2017	9130	470	17.1	15.9			
15	9/12/2017	9760	511	20.4	41.6			
16	10/10/2017	9100	565	23.1	78.0			
17	1/6/2018	14600	525	24.8	54.3			
18	4/13/2018	12500	503	25.0	25.0			
19	4/13/2019	7930	453	12.5	19.1			
20	10/2/2019	6860	419	5.34	8.09			
21	2/26/2020	7870	415	12.5	17.2			
22	10/16/2020	5270	334	5.11	22.4			
23	3/22/2021	9100	270	9.30	17.0			
24	10/19/2021	5500	330	2.00	2.0			
25	3/29/2022	7200	440	10.0	10.0			
26								
27								
28								
29								
30								
Coefficient of Variation:		0.69	0.76	0.72	1.17			
Mann-Kendall Statistic (S):		124	131	63	102			
Confidence Factor:		99.8%	99.9%	92.6%	99.1%			
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing			



Notes:

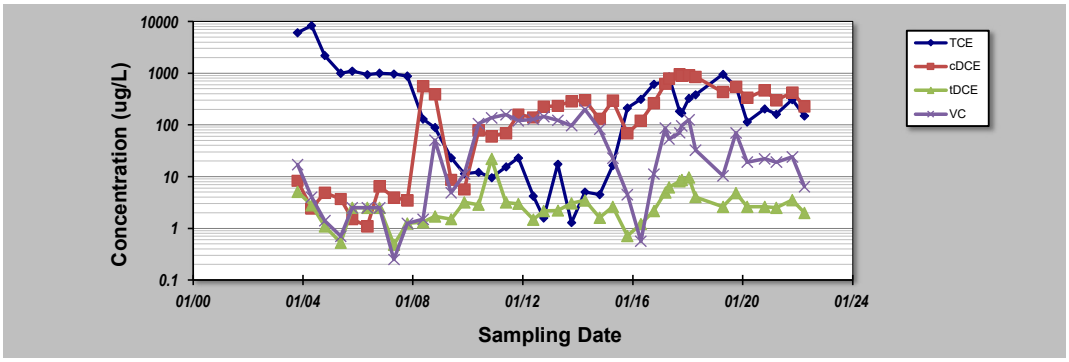
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	MW-11
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/19/2003	6035	8.30	5.10	17.1			
2	4/24/2004	8300	2.40	2.80	4.00			
3	10/17/2004	2200	4.90	1.10	1.40			
4	5/15/2005	1000	3.70	0.53	0.700			
5	10/16/2005	1100	1.50	2.50	2.50			
6	5/6/2006	940	1.10	2.50	2.50			
7	10/13/2006	1000	6.50	2.50	2.50			
8	4/22/2007	962	3.96	0.487	0.250			
9	10/16/2007	878	3.48	1.25	1.25			
10	5/14/2008	129	556	1.31	1.49			
11	10/18/2008	89.0	394	1.70	50.6			
12	5/20/2009	23.0	8.67	1.50	4.90			
13	11/12/2009	11.3	5.66	3.19	11.2			
14	5/21/2010	12.1	78.0	2.85	106			
15	11/11/2010	9.53	60.1	22.0	137			
16	5/20/2011	15.4	69.4	3.16	158			
17	11/1/2011	23.0	158	2.99	121			
18	5/17/2012	4.19	140	1.48	128			
19	10/3/2012	1.58	225	2.17	145			
20	4/10/2013	17.3	234	2.21	123			
21	10/7/2013	1.29	287	3.06	96.6			
22	4/4/2014	5.01	298	3.49	199			
23	10/16/2014	4.51	130	1.61	83.0			
24	4/8/2015	16.5	294	2.60	22.9			
25	10/20/2015	212	68.8	0.713	4.48			
26	4/14/2016	312	120	1.21	0.561			
27	10/5/2016	612	262	2.18	11.2			
28	3/8/2017	691	622	4.93	86.2			
29	4/26/2017	839	795	6.21	53.0			
30	9/12/2017	183	945	8.11	70.3			
31	10/10/2017	168	899	8.62	96.0			
32	1/16/2018	326	912	9.64	126			
33	4/13/2018	383	847	4.01	32.4			
34	4/13/2019	951	432	2.59	10.4			
35	10/2/2019	551	546	4.82	70.1			
36	2/26/2020	114	334	2.60	19.0			
37	10/16/2020	203	465	2.59	22.1			
38	3/21/2021	160	300	2.50	19.0			
39	10/19/2021	310	420	3.50	24.0			
40	3/29/2022	150	230	2.00	6.40			
Coefficient of Variation:		2.20	1.04	1.04	1.08			
Mann-Kendall Statistic (S):		-140	446	180	133			
Confidence Factor:		94.7%	>99.9%	98.2%	93.8%			
Concentration Trend:		Prob. Decreasing	Increasing	Increasing	Prob. Increasing			



Notes:

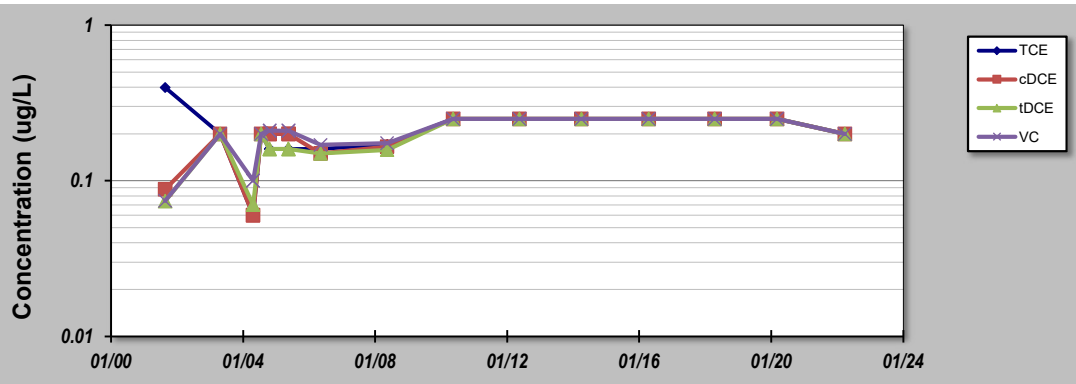
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	MW-12
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	8/22/2001	0.397	0.088	0.074	0.074			
2	4/22/2003	0.200	0.200	0.200	0.200			
3	4/21/2004	0.060	0.060	0.070	0.100			
4	4/21/2004	0.060	0.060	0.070	0.100			
5	7/19/2004	0.200	0.200	0.200	0.200			
6	10/20/2004	0.160	0.200	0.160	0.210			
7	10/20/2004	0.160	0.200	0.160	0.210			
8	5/18/2005	0.160	0.200	0.160	0.210			
9	5/18/2005	0.160	0.200	0.160	0.210			
10	5/6/2006	0.160	0.150	0.150	0.170			
11	5/12/2008	0.171	0.166	0.158	0.174			
12	5/13/2010	0.250	0.250	0.250	0.250			
13	5/15/2012	0.250	0.250	0.250	0.250			
14	4/2/2014	0.250	0.250	0.250	0.250			
15	4/14/2016	0.250	0.250	0.250	0.250			
16	4/12/2018	0.250	0.250	0.250	0.250			
17	3/3/2020	0.250	0.250	0.250	0.250			
18	3/27/2022	0.200	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		0.39	0.33	0.35	0.28			
Mann-Kendall Statistic (S):		50	72	68	80			
Confidence Factor:		96.9%	99.7%	99.6%	99.9%			
Concentration Trend:		Increasing	Increasing	Increasing	Increasing			



Notes:

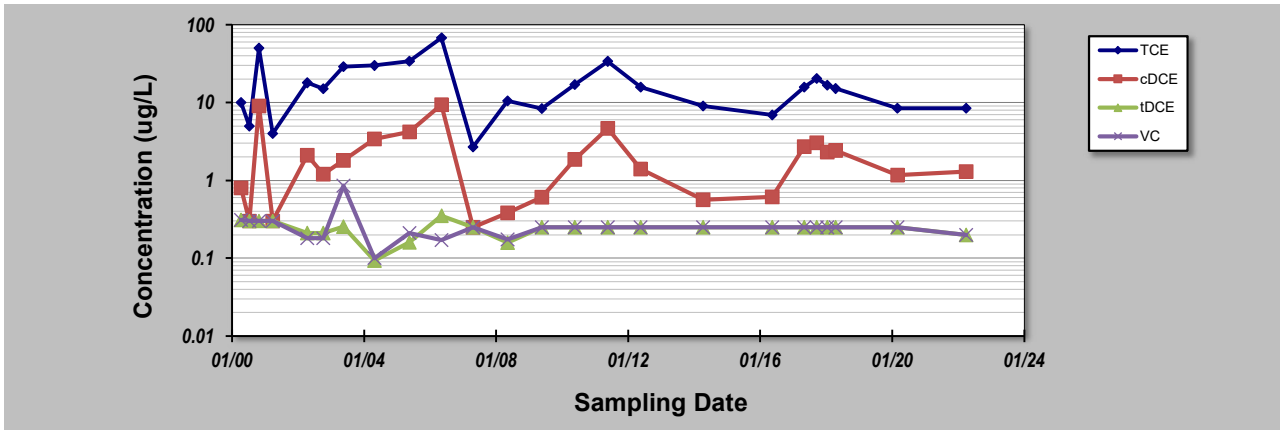
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	MW-53
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/10/2000	10.0	0.800	0.310	0.310			
2	7/12/2000	5.00	0.300	0.300	0.300			
3	10/25/2000	50.0	9.00	0.300	0.300			
4	3/26/2001	4.00	0.300	0.300	0.300			
5	4/11/2002	18.0	2.10	0.210	0.180			
6	10/8/2002	15.0	1.20	0.210	0.180			
7	5/18/2003	29.0	1.80	0.255	0.854			
8	4/26/2004	30.0	3.40	0.093	0.100			
9	5/18/2005	34.0	4.20	0.160	0.210			
10	5/8/2006	68.0	9.40	0.350	0.170			
11	4/22/2007	2.68	0.250	0.250	0.250			
12	5/9/2008	10.5	0.380	0.158	0.174			
13	5/20/2009	8.38	0.606	0.250	0.250			
14	5/20/2010	17.0	1.86	0.250	0.250			
15	5/19/2011	33.9	4.65	0.250	0.250			
16	5/17/2012	15.8	1.40	0.250	0.250			
17	4/8/2014	9.01	0.561	0.250	0.250			
18	5/12/2016	6.91	0.616	0.250	0.250			
19	5/2/2017	15.8	2.71	0.250	0.250			
20	9/15/2017	20.4	3.05	0.250	0.250			
21	1/12/2018	16.7	2.31	0.250	0.250			
22	4/12/2018	15.1	2.42	0.250	0.250			
23	2/28/2020	8.51	1.17	0.250	0.250			
24	3/29/2022	8.40	1.30	0.200	0.200			
25								
Coefficient of Variation:		0.82	1.05	0.22	0.52			
Mann-Kendall Statistic (S):		-23	25	-56	-30			
Confidence Factor:		70.6%	72.2%	91.3%	76.2%			
Concentration Trend:		Stable	No Trend	Prob. Decreasing	Stable			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

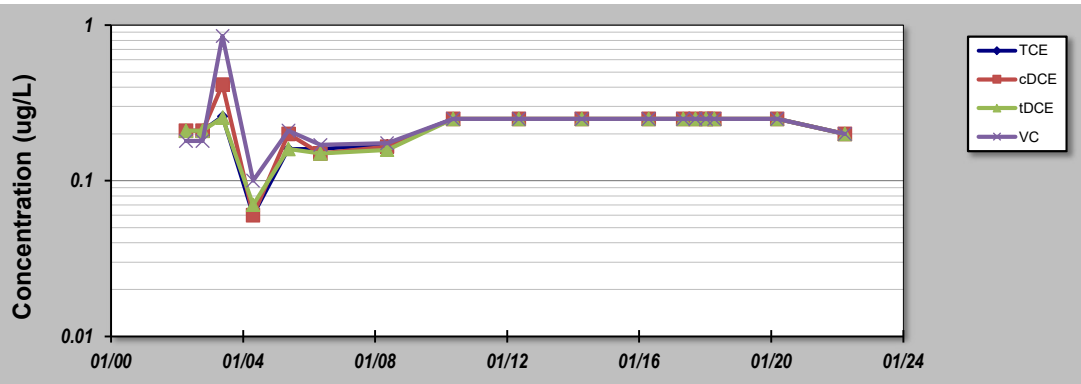
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	ST14-W15
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/9/2002	0.210	0.210	0.210	0.180			
2	10/9/2002	0.210	0.210	0.210	0.180			
3	5/19/2003	0.259	0.415	0.255	0.854			
4	4/20/2004	0.060	0.060	0.070	0.100			
5	5/17/2005	0.160	0.200	0.160	0.210			
6	5/4/2006	0.160	0.150	0.150	0.170			
7	5/13/2008	0.171	0.166	0.158	0.174			
8	5/13/2010	0.250	0.250	0.250	0.250			
9	5/11/2012	0.250	0.250	0.250	0.250			
10	4/7/2014	0.250	0.250	0.250	0.250			
11	4/14/2016	0.250	0.250	0.250	0.250			
12	5/1/2017	0.250	0.250	0.250	0.250			
13	9/13/2017	0.250	0.250	0.250	0.250			
14	1/10/2018	0.250	0.250	0.250	0.250			
15	4/10/2018	0.250	0.250	0.250	0.250			
16	3/5/2020	0.250	0.250	0.250	0.250			
17	3/26/2022	0.200	0.200	0.200	0.200			
18								
19								
20								
Coefficient of Variation:		0.25	0.31	0.24	0.63			
Mann-Kendall Statistic (S):		32	28	29	35			
Confidence Factor:		89.8%	86.5%	87.4%	91.8%			
Concentration Trend:		No Trend	No Trend	No Trend	Prob. Increasing			



Notes:

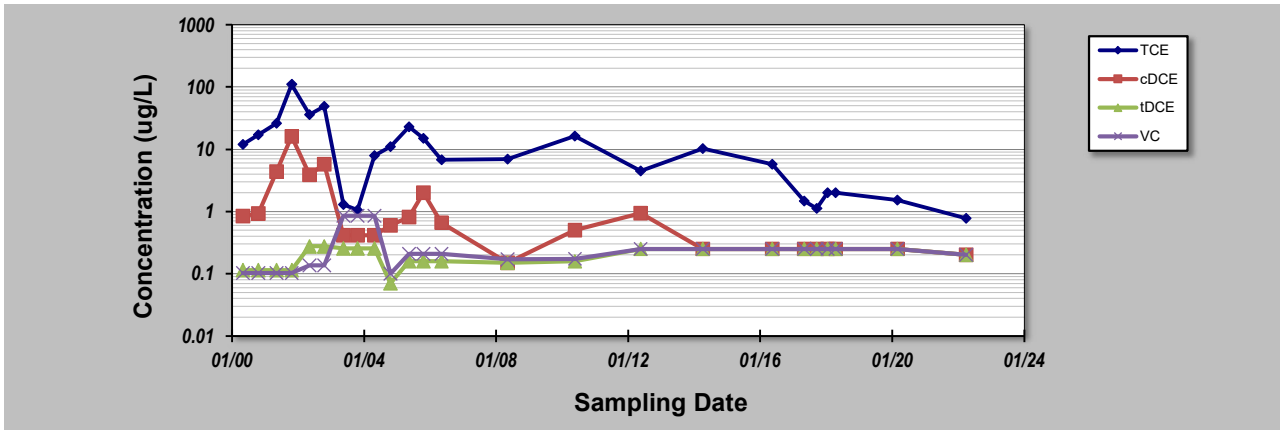
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	USGS06T
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	12.0	0.840	0.114	0.102			
2	10/18/2000	17.0	0.930	0.114	0.102			
3	5/8/2001	26.0	4.40	0.114	0.102			
4	10/22/2001	110	16.0	0.114	0.102			
5	5/8/2002	36.0	3.90	0.276	0.137			
6	10/18/2002	49.0	5.70	0.276	0.137			
7	5/18/2003	1.30	0.415	0.255	0.854			
8	10/20/2003	1.06	0.415	0.255	0.854			
9	4/25/2004	7.90	0.415	0.255	0.854			
10	10/18/2004	11.0	0.600	0.070	0.100			
11	5/13/2005	23.0	0.810	0.160	0.210			
12	10/18/2005	15.0	2.00	0.160	0.210			
13	5/8/2006	6.80	0.660	0.160	0.210			
14	5/9/2008	6.96	0.150	0.150	0.170			
15	5/21/2010	16.3	0.500	0.158	0.174			
16	5/17/2012	4.45	0.939	0.250	0.250			
17	4/7/2014	10.2	0.250	0.250	0.250			
18	5/13/2016	5.73	0.250	0.250	0.250			
19	5/2/2017	1.48	0.250	0.250	0.250			
20	9/18/2017	1.12	0.250	0.250	0.250			
21	1/16/2018	2.00	0.250	0.250	0.250			
22	4/12/2018	2.00	0.250	0.250	0.250			
23	2/28/2020	1.52	0.250	0.250	0.250			
24	3/29/2022	0.780	0.200	0.200	0.200			
25								
Coefficient of Variation:		1.53	2.00	0.32	0.85			
Mann-Kendall Statistic (S):		-139	-148	37	97			
Confidence Factor:		>99.9%	>99.9%	81.2%	99.2%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Increasing			



Notes:

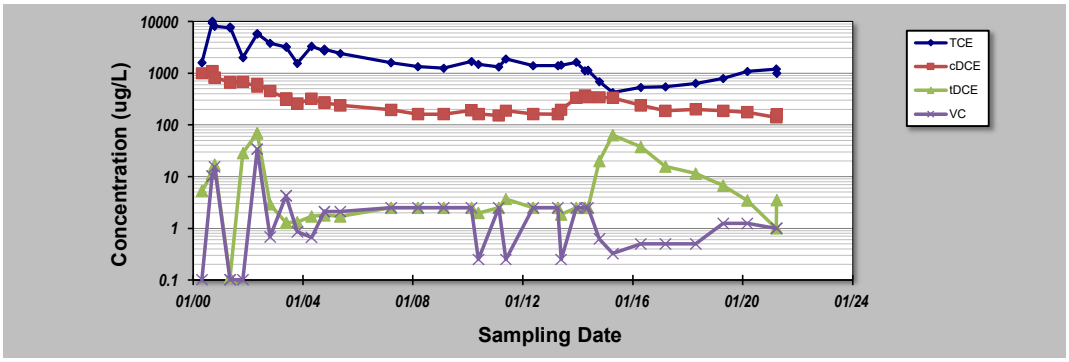
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	W-149
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/26/2000	1600	1000	5.30	0.102			
2	9/12/2000	9300	1100	11.4	10.2			
3	9/12/2000	10000	1100	11.4	10.2			
4	10/13/2000	8100	830	17.1	15.4			
5	5/6/2001	7500	670	0.114	0.102			
6	5/6/2001	7800	660	0.114	0.102			
7	10/25/2001	2000	680	28.5	0.102			
8	5/2/2002	5700	550	68.9	34.2			
9	5/2/2002	5800	620	68.9	34.2			
10	10/19/2002	3800	450	2.90	0.684			
11	5/21/2003	3220	329	1.28	4.27			
12	5/21/2003	3184	308	1.28	4.27			
13	10/17/2003	1542	259	1.32	0.854			
14	4/22/2004	3300	320	1.70	0.670			
15	10/12/2004	2700	270	1.80	2.10			
16	10/12/2004	2900	270	1.80	2.10			
17	5/11/2005	2400	240	1.70	2.10			
18	3/14/2007	1600	195	2.50	2.50			
19	3/5/2008	1330	161	2.50	2.50			
20	2/10/2009	1250	162	2.50	2.50			
21	2/17/2010	1680	191	2.50	2.50			
22	5/18/2010	1480	163	1.97	0.250			
23	2/14/2011	1320	152	2.50	2.50			
24	5/18/2011	1880	188	3.69	0.250			
25	5/15/2012	1390	163	2.50	2.50			
26	4/10/2013	1390	162	2.50	2.50			
27	5/22/2013	1430	196	1.85	0.250			
28	12/11/2013	1620	335	2.50	2.50			
29	4/3/2014	1120	369	2.50	2.50			
30	5/14/2014	1130	344	2.50	2.50			
31	10/13/2014	683	344	20.0	0.625			
32	4/8/2015	421	333	63.7	0.326			
33	4/14/2016	530	239	37.6	0.500			
34	3/8/2017	546	187	15.7	0.500			
35	4/14/2018	632	200	11.5	0.500			
36	4/14/2019	793	187	6.67	1.25			
37	3/1/2020	1080	176	3.45	1.25			
38	3/20/2021	1200	140	1.00	1.00			
39	3/26/2021	1000	160	3.50	1.00			
40								
Coefficient of Variation:		0.95	0.73	1.70	1.96			
Mann-Kendall Statistic (S):		-529	-413	108	-102			
Confidence Factor:		>99.9%	>99.9%	90.2%	88.9%			
Concentration Trend:		Decreasing	Decreasing	Prob. Increasing	No Trend			



Notes:

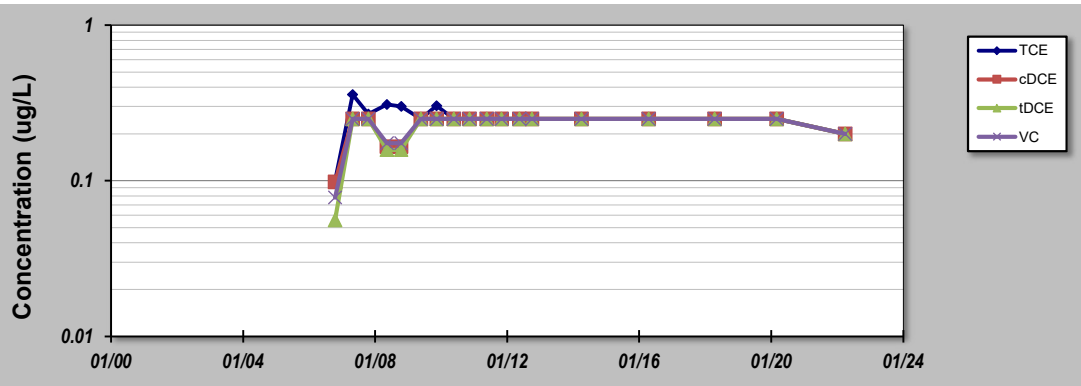
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	W-152
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/14/2006	0.100	0.098	0.056	0.078			
2	4/26/2007	0.359	0.250	0.250	0.250			
3	10/20/2007	0.268	0.250	0.250	0.250			
4	5/11/2008	0.310	0.166	0.158	0.174			
5	10/15/2008	0.300	0.166	0.158	0.174			
6	5/19/2009	0.250	0.250	0.250	0.250			
7	11/13/2009	0.303	0.250	0.250	0.250			
8	5/20/2010	0.250	0.250	0.250	0.250			
9	11/9/2010	0.250	0.250	0.250	0.250			
10	5/18/2011	0.250	0.250	0.250	0.250			
11	11/2/2011	0.250	0.250	0.250	0.250			
12	5/15/2012	0.250	0.250	0.250	0.250			
13	10/3/2012	0.250	0.250	0.250	0.250			
14	4/4/2014	0.250	0.250	0.250	0.250			
15	4/14/2016	0.250	0.250	0.250	0.250			
16	4/14/2018	0.250	0.250	0.250	0.250			
17	2/29/2020	0.250	0.250	0.250	0.250			
18	3/29/2022	0.200	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		0.20	0.19	0.23	0.20			
Mann-Kendall Statistic (S):		-54	25	25	25			
Confidence Factor:		97.8%	81.6%	81.6%	81.6%			
Concentration Trend:		Decreasing	No Trend	No Trend	No Trend			



Notes:

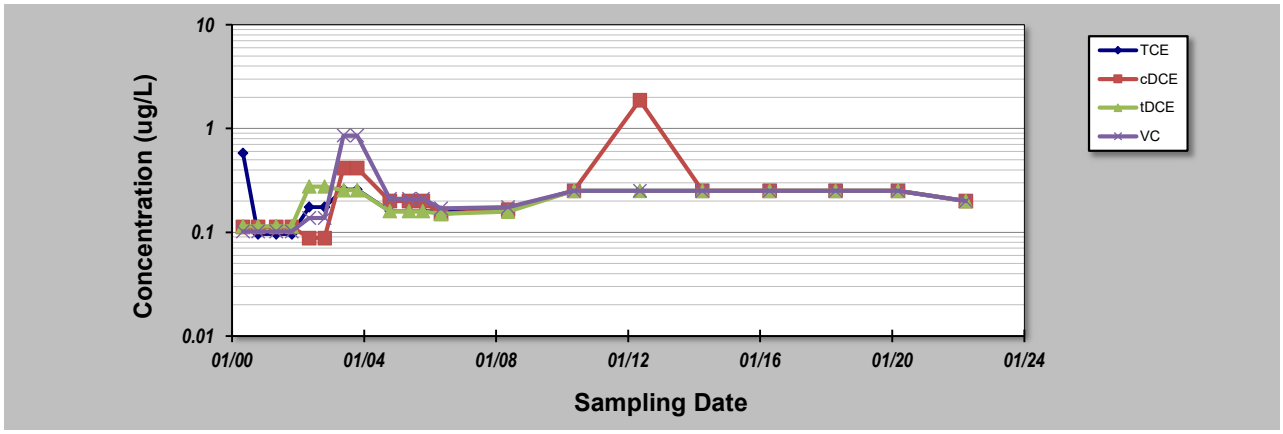
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	W-157
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/2/2000	0.580	0.112	0.114	0.102			
2	10/17/2000	0.096	0.112	0.114	0.102			
3	5/6/2001	0.096	0.112	0.114	0.102			
4	10/23/2001	0.096	0.112	0.114	0.102			
5	5/5/2002	0.175	0.088	0.276	0.137			
6	10/22/2002	0.175	0.088	0.276	0.137			
7	5/19/2003	0.259	0.415	0.255	0.854			
8	10/17/2003	0.259	0.415	0.255	0.854			
9	10/13/2004	0.160	0.200	0.160	0.210			
10	5/13/2005	0.160	0.200	0.160	0.210			
11	10/12/2005	0.160	0.200	0.160	0.210			
12	5/2/2006	0.160	0.150	0.150	0.170			
13	5/12/2008	0.171	0.166	0.158	0.174			
14	5/13/2010	0.250	0.250	0.250	0.250			
15	5/11/2012	0.250	1.87	0.250	0.250			
16	4/1/2014	0.250	0.250	0.250	0.250			
17	4/14/2016	0.250	0.250	0.250	0.250			
18	4/13/2018	0.250	0.250	0.250	0.250			
19	3/3/2020	0.250	0.250	0.250	0.250			
20	3/27/2022	0.200	0.200	0.200	0.200			
21								
22								
23								
24								
25								
Coefficient of Variation:		0.49	1.35	0.31	0.84			
Mann-Kendall Statistic (S):		46	74	36	84			
Confidence Factor:		92.7%	99.2%	87.0%	99.7%			
Concentration Trend:		Prob. Increasing	Increasing	No Trend	Increasing			



Notes:

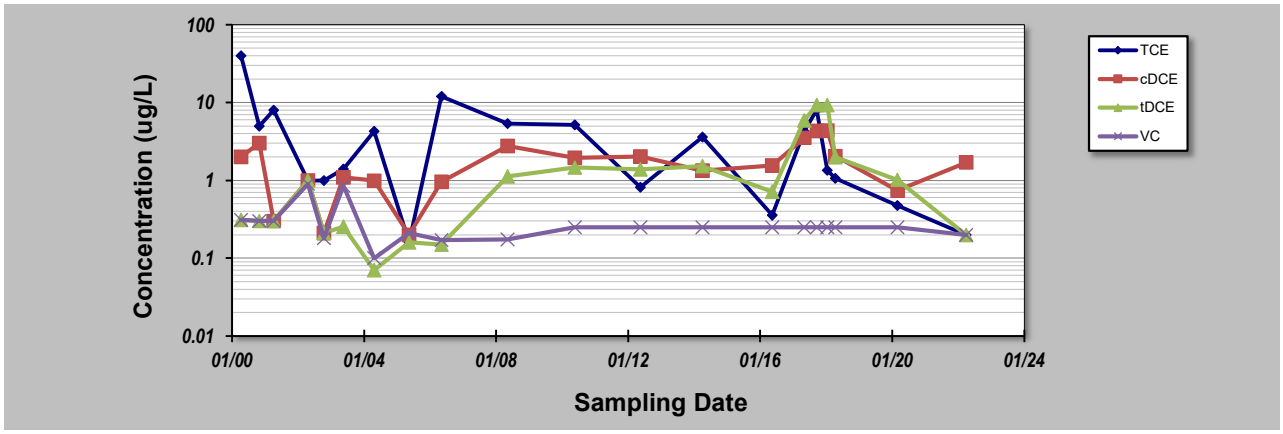
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WCHMHTA008
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/11/2000	40.0	2.00	0.310	0.310			
2	10/30/2000	5.00	3.00	0.300	0.300			
3	4/5/2001	8.00	0.300	0.300	0.300			
4	4/19/2002	1.00	1.00	1.00	0.900			
5	10/16/2002	1.00	0.210	0.210	0.180			
6	5/17/2003	1.40	1.10	0.255	0.854			
7	4/24/2004	4.30	0.990	0.070	0.100			
8	5/13/2005	0.160	0.200	0.160	0.210			
9	5/6/2006	12.0	0.960	0.150	0.170			
10	5/8/2008	5.38	2.78	1.13	0.174			
11	5/20/2010	5.17	1.95	1.46	0.250			
12	5/15/2012	0.81	2.03	1.38	0.250			
13	4/3/2014	3.63	1.34	1.52	0.250			
14	5/12/2016	0.36	1.55	0.716	0.250			
15	5/2/2017	4.27	3.52	5.92	0.250			
16	9/19/2017	8.11	4.31	9.26	0.250			
17	1/12/2018	1.35	4.36	9.26	0.250			
18	4/11/2018	1.06	2.06	1.98	0.250			
19	2/27/2020	0.475	0.739	1.02	0.250			
20	3/28/2022	0.200	1.70	0.200	0.200			
21								
22								
23								
24								
25								
Coefficient of Variation:		1.70	0.69	1.56	0.69			
Mann-Kendall Statistic (S):		-59	48	64	-31			
Confidence Factor:		97.1%	93.6%	98.0%	83.3%			
Concentration Trend:		Decreasing	Prob. Increasing	Increasing	Stable			



Notes:

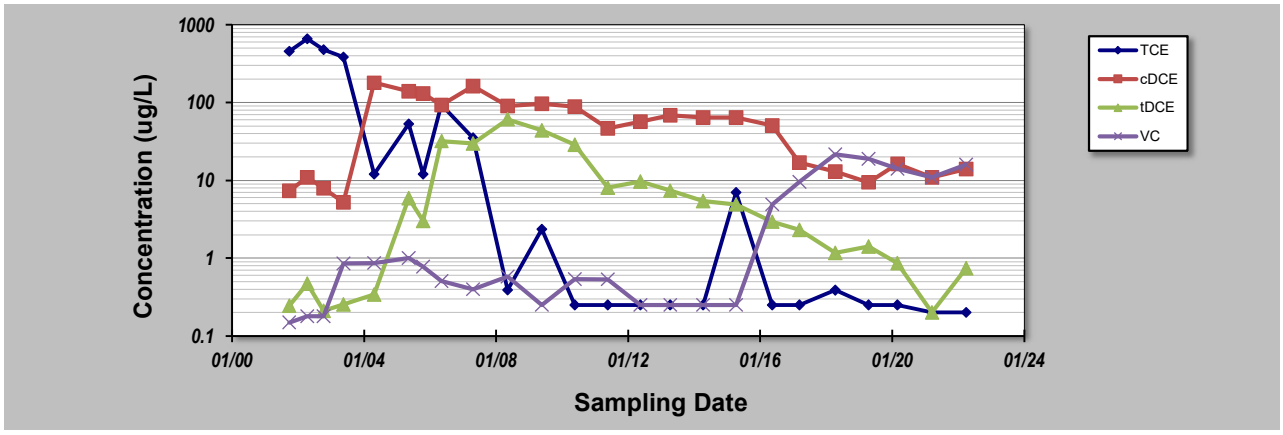
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WCHMHTA010
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	9/26/2001	457	7.31	0.246	0.149			
2	4/11/2002	660	11.0	0.470	0.180			
3	10/11/2002	480	7.90	0.210	0.180			
4	5/17/2003	387	5.20	0.255	0.854			
5	4/24/2004	12.0	180	0.340	0.870			
6	5/10/2005	53.0	140	5.90	1.00			
7	10/14/2005	12.0	130	3.00	0.780			
8	5/6/2006	94.0	93.0	32.0	0.510			
9	4/22/2007	35.1	162	29.9	0.399			
10	5/8/2008	0.390	90.2	61.0	0.580			
11	5/20/2009	2.36	96.6	44.2	0.250			
12	5/20/2010	0.250	88.4	28.7	0.540			
13	5/19/2011	0.250	46.7	8.05	0.533			
14	5/15/2012	0.250	56.6	9.63	0.250			
15	4/12/2013	0.250	68.7	7.38	0.250			
16	4/8/2014	0.250	64.2	5.45	0.250			
17	4/8/2015	6.97	64.3	4.89	0.250			
18	5/12/2016	0.250	50.6	2.95	4.90			
19	3/10/2017	0.250	16.8	2.32	9.57			
20	4/11/2018	0.389	12.9	1.17	21.6			
21	4/12/2019	0.250	9.43	1.41	18.9			
22	2/27/2020	0.250	16.3	0.861	14.1			
23	3/17/2021	0.200	11.0	0.200	11.0			
24	3/28/2022	0.200	14.0	0.740	16.0			
25								
Coefficient of Variation:		2.08	0.88	1.56	1.58			
Mann-Kendall Statistic (S):		-192	-75	-34	109			
Confidence Factor:		>99.9%	96.7%	79.1%	99.7%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Increasing			



Notes:

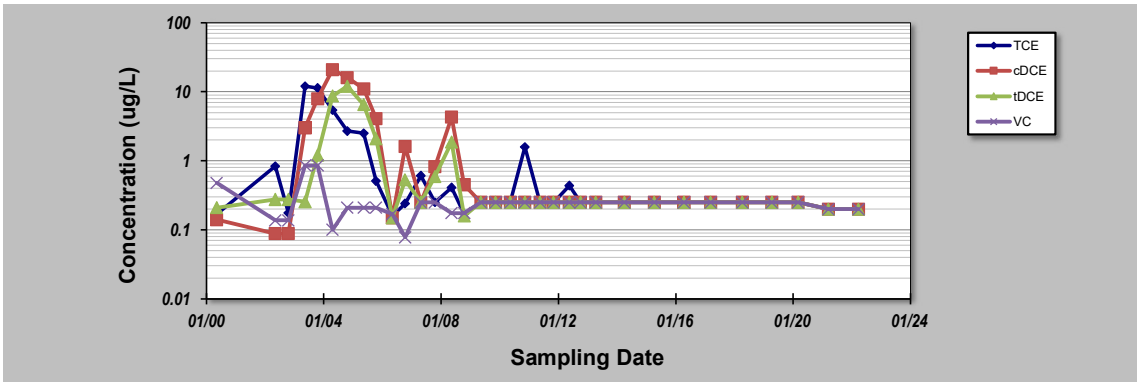
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WCHMHTA013
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/9/2000	0.170	0.140	0.210	0.480			
2	5/7/2002	0.830	0.088	0.276	0.137			
3	10/17/2002	0.175	0.088	0.276	0.137			
4	5/14/2003	12.0	3.00	0.255	0.854			
5	10/16/2003	11.3	7.95	1.20	0.854			
6	4/20/2004	5.40	21.0	8.70	0.100			
7	10/20/2004	2.70	16.0	12.0	0.210			
8	5/12/2005	2.50	11.0	6.50	0.210			
9	10/14/2005	0.510	4.10	2.10	0.210			
10	5/5/2006	0.160	0.150	0.150	0.170			
11	10/11/2006	0.240	1.60	0.530	0.078			
12	4/25/2007	0.606	0.250	0.250	0.250			
13	10/18/2007	0.250	0.823	0.591	0.250			
14	5/12/2008	0.410	4.28	1.87	0.174			
15	10/17/2008	0.171	0.450	0.158	0.174			
16	5/11/2009	0.250	0.250	0.250	0.250			
17	11/9/2009	0.250	0.250	0.250	0.250			
18	5/13/2010	0.250	0.250	0.250	0.250			
19	11/10/2010	1.58	0.250	0.250	0.250			
20	5/18/2011	0.250	0.250	0.250	0.250			
21	11/3/2011	0.250	0.250	0.250	0.250			
22	5/17/2012	0.439	0.250	0.250	0.250			
23	10/3/2012	0.250	0.250	0.250	0.250			
24	4/10/2013	0.250	0.250	0.250	0.250			
25	4/2/2014	0.250	0.250	0.250	0.250			
26	4/9/2015	0.250	0.250	0.250	0.250			
27	4/14/2016	0.250	0.250	0.250	0.250			
28	3/10/2017	0.250	0.250	0.250	0.250			
29	4/10/2018	0.250	0.250	0.250	0.250			
30	4/11/2019	0.250	0.250	0.250	0.250			
31	3/3/2020	0.250	0.250	0.250	0.250			
32	3/17/2021	0.200	0.200	0.200	0.200			
33	3/26/2022	0.200	0.200	0.200	0.200			
34								
35								
Coefficient of Variation:		2.18	2.13	2.22	0.63			
Mann-Kendall Statistic (S):		-140	-134	-182	68			
Confidence Factor:		98.5%	98.1%	99.8%	84.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

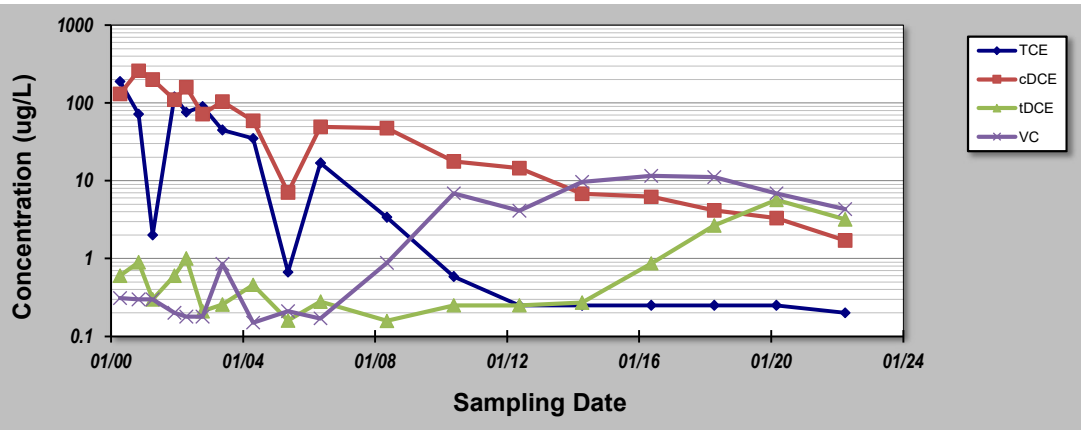
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA009
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/10/2000	190	130	0.600	0.310			
2	10/31/2000	72.0	260	0.900	0.300			
3	4/5/2001	2.00	200	0.300	0.300			
4	12/4/2001	120	110	0.600	0.200			
5	4/11/2002	76.0	160	1.000	0.180			
6	10/10/2002	90.0	72.0	0.210	0.180			
7	5/18/2003	45.0	104	0.255	0.854			
8	4/24/2004	35.0	59.0	0.460	0.150			
9	5/13/2005	0.67	7.10	0.160	0.210			
10	5/7/2006	17.0	49.0	0.280	0.170			
11	5/10/2008	3.39	47.5	0.158	0.880			
12	5/20/2010	0.589	17.7	0.250	6.90			
13	5/15/2012	0.250	14.5	0.250	4.10			
14	4/8/2014	0.250	6.81	0.272	9.68			
15	5/12/2016	0.250	6.21	0.870	11.6			
16	4/11/2018	0.250	4.17	2.68	11.1			
17	2/28/2020	0.250	3.31	5.67	6.88			
18	3/29/2022	0.200	1.70	3.20	4.30			
19								
20								
Coefficient of Variation:		1.49	1.10	1.43	1.29			
Mann-Kendall Statistic (S):		-117	-135	17	65			
Confidence Factor:		>99.9%	>99.9%	72.5%	99.3%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Increasing			



Notes:

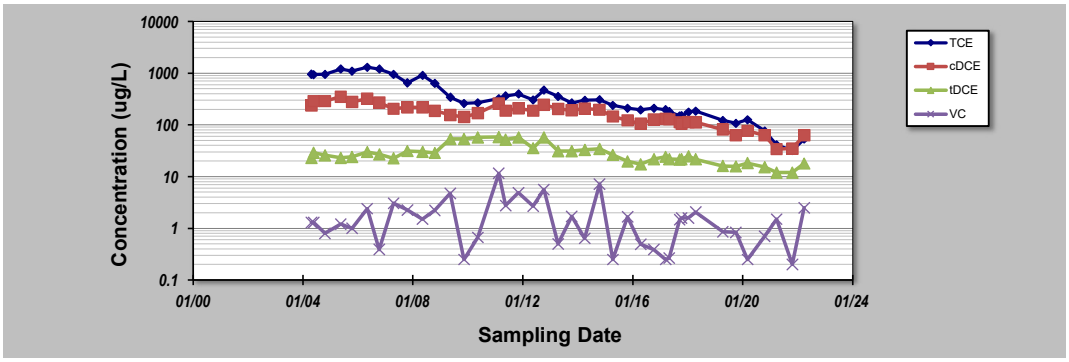
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA043
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/21/2004	960	240	23.0	1.30			
2	5/20/2004	940	290	29.0	1.30			
3	10/19/2004	950	290	26.0	0.800			
4	5/16/2005	1200	350	23.0	1.20			
5	10/14/2005	1100	280	24.0	1.00			
6	5/2/2006	1300	320	30.0	2.40			
7	10/11/2006	1200	270	27.0	0.390			
8	4/18/2007	952	206	22.7	3.07			
9	10/18/2007	649	219	31.4	2.27			
10	5/6/2008	906	218	30.2	1.51			
11	10/17/2008	635	187	28.8	2.22			
12	5/12/2009	343	156	53.4	4.71			
13	11/9/2009	261	142	53.5	0.250			
14	5/11/2010	267	168	57.3	0.667			
15	2/14/2011	323	260	58.6	11.6			
16	5/17/2011	365	188	51.6	2.75			
17	11/3/2011	397	209	57.6	4.91			
18	5/16/2012	303	188	35.7	2.69			
19	10/4/2012	469	245	57.6	5.62			
20	4/11/2013	355	203	31.1	0.500			
21	10/9/2013	265	191	31.1	1.70			
22	4/2/2014	299	207	33.0	0.640			
23	10/15/2014	307	196	34.4	7.18			
24	4/9/2015	239	146	26.3	0.250			
25	10/21/2015	210	123	19.7	1.66			
26	4/13/2016	195	105	17.4	0.489			
27	10/6/2016	211	127	21.8	0.388			
28	3/9/2017	196	132	24.3	0.25			
29	4/27/2017	180	128	21.9	0.266			
30	9/13/2017	149	113	21.5	1.47			
31	10/9/2017	151	106	21.6	1.59			
32	1/9/2018	178	114	24.8	1.59			
33	4/16/2018	185	112	21.7	2.07			
34	4/10/2019	122	81.6	16.0	0.856			
35	9/30/2019	107	63.1	15.8	0.834			
36	3/2/2020	126	77.0	18.3	0.250			
37	10/17/2020	76.4	63.2	15.3	0.700			
38	3/23/2021	41.0	34.0	12.0	1.50			
39	10/18/2021	32.0	35.0	12.0	0.200			
40	3/25/2022	53.0	63.0	18.0	2.50			
Coefficient of Variation:		0.87	0.47	0.46	1.14			
Mann-Kendall Statistic (S):		-643	-584	-314	-120			
Confidence Factor:		>99.9%	>99.9%	>99.9%	91.7%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Prob. Decreasing			



Notes:

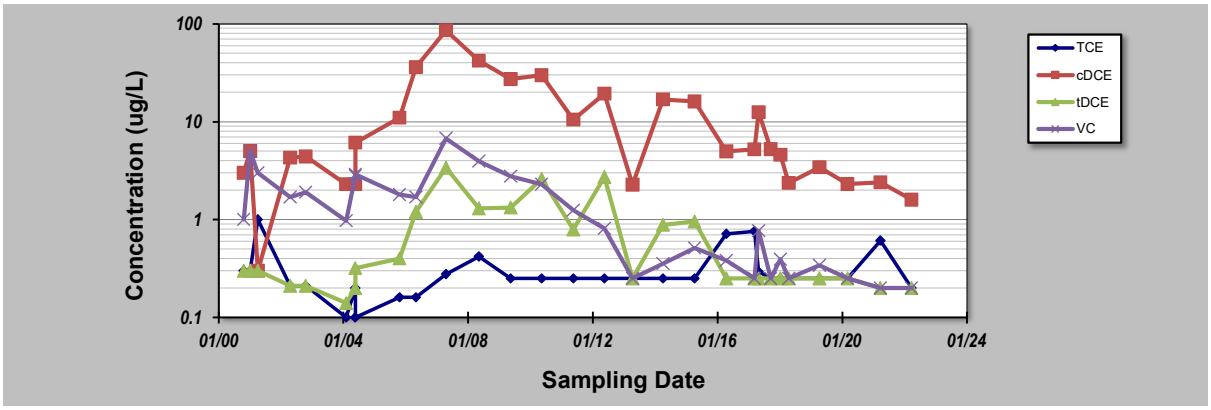
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA044
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/20/2000	0.300	3.00	0.300	1.00			
2	1/4/2001	0.300	5.00	0.300	5.00			
3	4/3/2001	1.00	0.300	0.300	3.00			
4	4/18/2002	0.210	4.30	0.210	1.70			
5	10/17/2002	0.210	4.40	0.210	1.90			
6	2/3/2004	0.100	2.30	0.140	0.970			
7	5/20/2004	0.200	2.30	0.200	2.80			
8	5/20/2004	0.100	6.10	0.320	2.90			
9	10/18/2005	0.160	11.0	0.400	1.80			
10	5/2/2006	0.160	36.0	1.20	1.70			
11	4/18/2007	0.278	85.7	3.39	6.75			
12	5/7/2008	0.420	42.1	1.30	3.95			
13	5/13/2009	0.250	27.2	1.33	2.78			
14	5/11/2010	0.250	29.8	2.60	2.30			
15	5/17/2011	0.250	10.5	0.790	1.25			
16	5/16/2012	0.250	19.3	2.72	0.811			
17	4/11/2013	0.250	2.27	0.250	0.250			
18	4/2/2014	0.250	16.9	0.883	0.355			
19	4/8/2015	0.250	16.1	0.955	0.512			
20	4/13/2016	0.714	4.98	0.250	0.382			
21	3/9/2017	0.761	5.20	0.250	0.250			
22	4/27/2017	0.294	12.5	0.250	0.773			
23	9/15/2017	0.250	5.24	0.250	0.250			
24	1/9/2018	0.250	4.59	0.250	0.392			
25	4/16/2018	0.250	2.37	0.250	0.250			
26	4/10/2019	0.250	3.42	0.250	0.340			
27	3/3/2020	0.250	2.31	0.250	0.252			
28	3/23/2021	0.610	2.40	0.200	0.200			
29	3/23/2022	0.200	1.60	0.200	0.200			
30								
Coefficient of Variation:		0.66	1.40	1.22	1.04			
Mann-Kendall Statistic (S):		41	-47	-59	-248			
Confidence Factor:		77.2%	80.4%	86.0%	>99.9%			
Concentration Trend:		No Trend	No Trend	No Trend	Decreasing			



Notes:

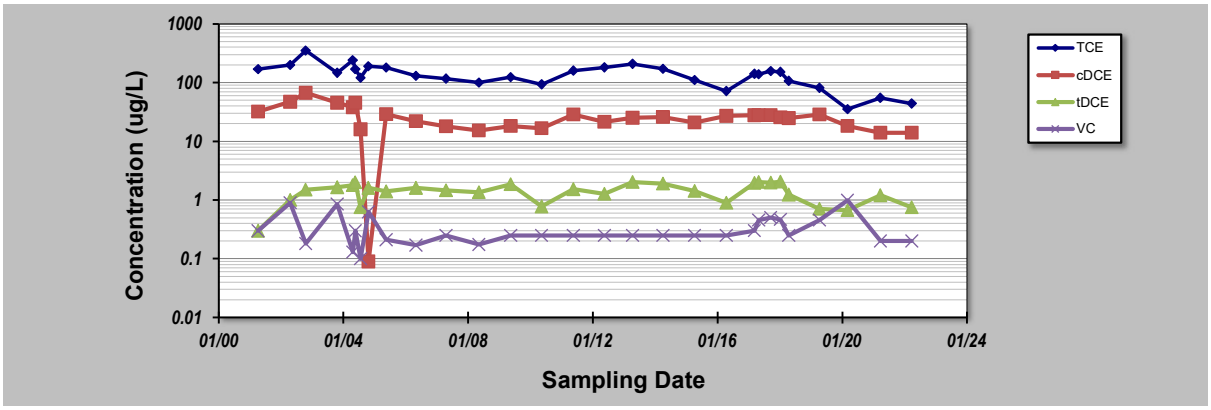
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA051
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/6/2001	170	32.0	0.300	0.300			
2	4/19/2002	200	47.0	1.00	0.900			
3	10/16/2002	350	67.0	1.50	0.180			
4	10/21/2003	147	45.2	1.65	0.854			
5	4/20/2004	240	38.0	1.80	0.130			
6	5/20/2004	170	45.0	2.00	0.300			
7	7/20/2004	120	16.0	0.750	0.100			
8	10/20/2004	190	0.090	1.60	0.630			
9	5/16/2005	180	29.0	1.40	0.210			
10	5/2/2006	130	22.0	1.60	0.170			
11	4/18/2007	116	18.0	1.46	0.250			
12	5/6/2008	100	15.3	1.35	0.174			
13	5/13/2009	123	18.3	1.86	0.250			
14	5/11/2010	93.5	16.6	0.779	0.250			
15	5/19/2011	159	28.6	1.53	0.250			
16	5/16/2012	181	21.4	1.27	0.250			
17	4/11/2013	207	25.0	2.03	0.250			
18	4/2/2014	171	25.9	1.91	0.250			
19	4/8/2015	111	20.9	1.43	0.250			
20	4/13/2016	71.7	27.1	0.901	0.250			
21	3/9/2017	140	27.7	1.96	0.301			
22	4/27/2017	138	27.9	2.03	0.453			
23	9/14/2017	157	28.0	1.97	0.504			
24	1/9/2018	152	25.4	2.05	0.467			
25	4/16/2018	107	24.9	1.23	0.250			
26	4/10/2019	81.4	28.6	0.708	0.456			
27	3/2/2020	35.1	18.3	0.672	0.988			
28	3/23/2021	55.0	14.0	1.20	0.200			
29	3/24/2022	44.0	14.0	0.75	0.200			
30								
Coefficient of Variation:		0.45	0.48	0.36	0.66			
Mann-Kendall Statistic (S):		-191	-103	-8	53			
Confidence Factor:		>99.9%	97.3%	55.2%	83.4%			
Concentration Trend:		Decreasing	Decreasing	Stable	No Trend			



Notes:

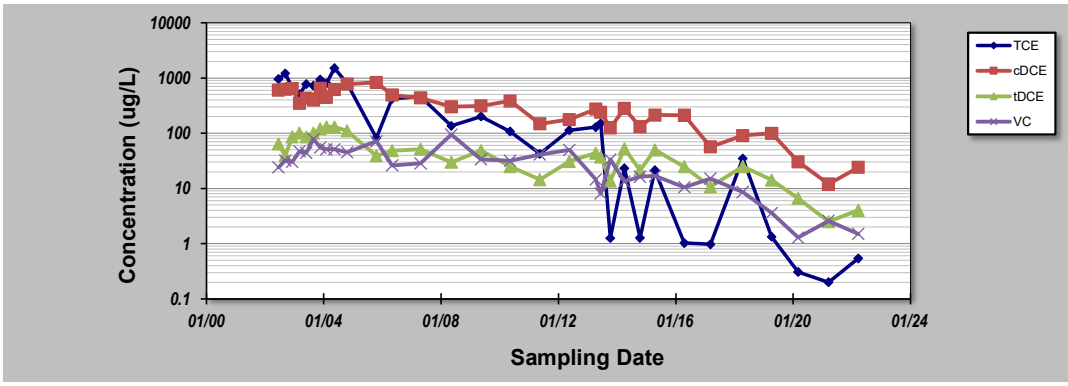
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA069
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	6/18/2002	960	600	64.0	24.0			
2	9/9/2002	1200	630	39.0	32.0			
3	12/5/2002	670	640	86.0	30.0			
4	3/4/2003	510	350	100	47.0			
5	5/29/2003	770	430	86.0	44.0			
6	8/26/2003	720	400	100	78.0			
7	11/18/2003	940	650	120	55.0			
8	2/3/2004	800	450	130	51.0			
9	5/14/2004	1500	620	130	51.0			
10	10/18/2004	800	770	110	45.0			
11	10/18/2005	82.0	830	39.0	71.0			
12	5/3/2006	420	490	48.0	26.0			
13	4/23/2007	454	437	51.6	28.4			
14	5/8/2008	135	303	29.8	94.2			
15	5/13/2009	201	312	48.7	33.7			
16	5/10/2010	107	384	24.9	31.8			
17	5/16/2011	42.5	147	14.4	40.8			
18	5/16/2012	113	176	31.0	49.9			
19	4/11/2013	128	273	43.5	14.5			
20	6/11/2013	151	240	36.9	8.05			
21	10/9/2013	1.25	125	13.6	33.3			
22	4/3/2014	23.0	279	52.6	13.2			
23	10/14/2014	1.27	131	21.4	16.2			
24	4/16/2015	21.4	213	49.8	16.9			
25	4/18/2016	1.02	211	24.7	10.5			
26	3/9/2017	0.97	56.7	10.7	15.1			
27	4/16/2018	34.7	90.6	24.9	8.54			
28	4/10/2019	1.33	99.2	14.2	3.60			
29	3/2/2020	0.307	30.3	6.59	1.29			
30	3/18/2021	0.200	12.0	2.50	2.60			
31	3/23/2022	0.540	24.0	4.00	1.50			
32								
33								
34								
35								
Coefficient of Variation:		1.21	0.69	0.77	0.74			
Mann-Kendall Statistic (S):		-342	-321	-268	-248			
Confidence Factor:		>99.9%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

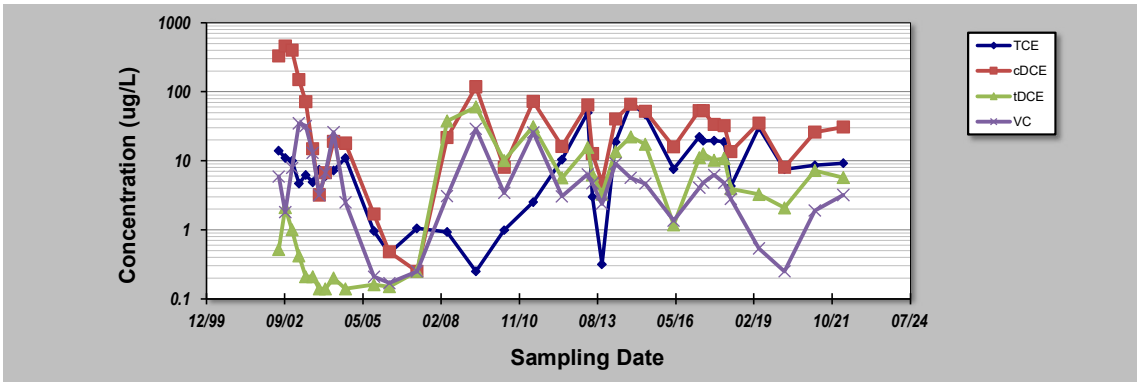
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WHGLTA071
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	6/18/2002	14.0	330	0.520	5.90			
2	9/10/2002	11.0	460	2.10	1.80			
3	12/5/2002	10.0	400	1.00	7.90			
4	3/5/2003	4.70	150	0.420	35.0			
5	5/29/2003	6.20	72.0	0.210	32.0			
6	8/26/2003	4.90	15.0	0.210	13.0			
7	11/18/2003	7.40	3.20	0.140	3.20			
8	2/4/2004	6.00	6.70	0.140	6.70			
9	5/18/2004	7.20	19.0	0.200	26.0			
10	10/19/2004	11.0	18.0	0.140	2.50			
11	10/18/2005	0.960	1.70	0.160	0.210			
12	5/2/2006	0.460	0.480	0.150	0.170			
13	4/19/2007	1.05	0.250	0.250	0.250			
14	5/8/2008	0.930	21.7	37.8	3.06			
15	5/13/2009	0.250	118	60.4	29.1			
16	5/10/2010	0.988	8.02	10.1	3.42			
17	5/16/2011	2.51	72.6	31.4	25.8			
18	5/16/2012	10.4	16.2	5.64	3.04			
19	4/11/2013	50.0	64.5	15.6	6.36			
20	6/11/2013	3.00	12.7	6.25	4.71			
21	10/8/2013	0.315	4.80	3.28	2.38			
22	4/2/2014	18.7	40.3	13.6	9.11			
23	10/14/2014	67.7	66.1	22.2	5.63			
24	4/16/2015	46.8	52.3	17.3	4.67			
25	4/13/2016	7.58	15.9	1.18	1.36			
26	3/9/2017	22.2	53.4	11.1	4.07			
27	4/27/2017	19.4	52.9	12.6	4.82			
28	9/14/2017	19.6	33.6	10.2	6.26			
29	1/19/2018	18.8	32.1	10.8	4.75			
30	4/16/2018	4.28	13.6	3.94	2.79			
31	4/10/2019	30.5	35.3	3.27	0.537			
32	3/2/2020	7.51	8.06	2.08	0.250			
33	3/23/2021	8.60	26.0	7.20	1.90			
34	3/24/2022	9.20	31.0	5.70	3.20			
35								
Coefficient of Variation:		1.20	1.67	1.48	1.26			
Mann-Kendall Statistic (S):		94	-67	141	-129			
Confidence Factor:		91.6%	83.5%	98.1%	97.1%			
Concentration Trend:		Prob. Increasing	No Trend	Increasing	Decreasing			



Notes:

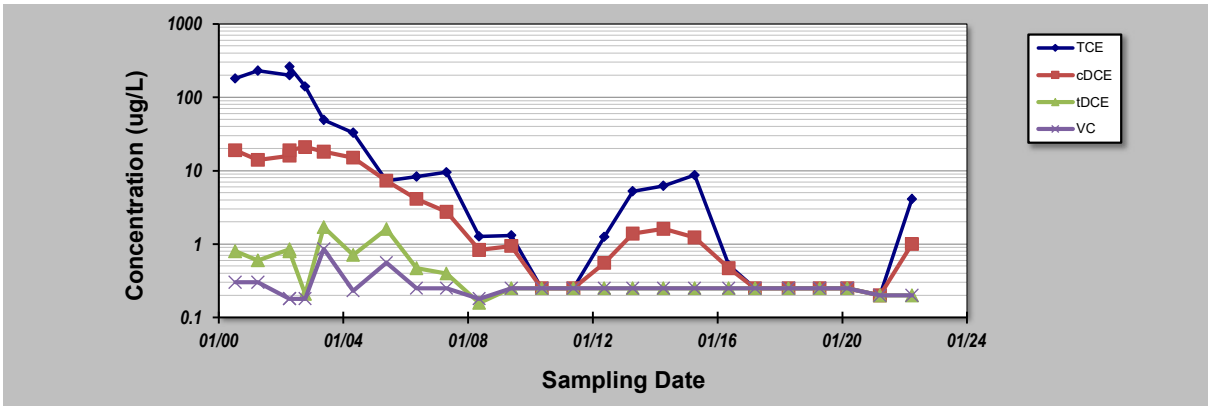
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCTA004
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	7/13/2000	180	19.0	0.800	0.300			
2	4/3/2001	230	14.0	0.600	0.300			
3	4/10/2002	200	16.0	0.850	0.180			
4	4/10/2002	260	19.0	0.790	0.180			
5	10/8/2002	140	21.0	0.210	0.180			
6	5/17/2003	49.4	18.1	1.70	0.854			
7	4/24/2004	33.0	15.0	0.710	0.230			
8	5/18/2005	7.30	7.30	1.60	0.560			
9	5/6/2006	8.30	4.10	0.470	0.250			
10	4/22/2007	9.53	2.75	0.398	0.250			
11	5/8/2008	1.27	0.830	0.158	0.180			
12	5/21/2009	1.31	0.939	0.250	0.250			
13	5/14/2010	0.250	0.250	0.250	0.250			
14	5/19/2011	0.250	0.250	0.250	0.250			
15	5/15/2012	1.25	0.550	0.250	0.250			
16	4/12/2013	5.26	1.39	0.250	0.250			
17	4/8/2014	6.23	1.61	0.250	0.250			
18	4/8/2015	8.72	1.23	0.250	0.250			
19	5/12/2016	0.517	0.470	0.250	0.250			
20	3/15/2017	0.250	0.250	0.250	0.250			
21	4/11/2018	0.250	0.250	0.250	0.250			
22	4/12/2019	0.250	0.250	0.250	0.250			
23	2/28/2020	0.250	0.250	0.250	0.250			
24	3/17/2021	0.200	0.200	0.200	0.200			
25	3/28/2022	4.10	1.00	0.200	0.200			
26								
27								
28								
29								
30								
Coefficient of Variation:		1.80	1.31	0.89	0.51			
Mann-Kendall Statistic (S):		-197	-200	-145	-24			
Confidence Factor:		>99.9%	>99.9%	>99.9%	70.3%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

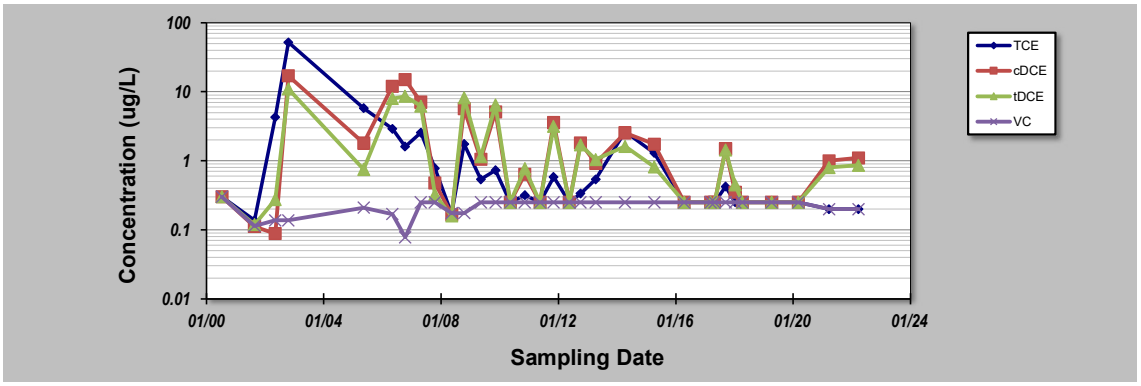
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCTA017
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	7/12/2000	0.300	0.300	0.300	0.300			
2	8/23/2001	0.137	0.112	0.119	0.114			
3	5/7/2002	4.30	0.088	0.276	0.137			
4	10/17/2002	52.0	17.0	11.0	0.137			
5	5/12/2005	5.80	1.80	0.750	0.210			
6	5/5/2006	2.90	12.0	8.00	0.170			
7	10/11/2006	1.60	15.0	8.60	0.078			
8	4/25/2007	2.56	7.07	6.20	0.250			
9	10/18/2007	0.780	0.477	0.325	0.250			
10	5/13/2008	0.171	0.166	0.158	0.174			
11	10/17/2008	1.75	5.66	8.14	0.174			
12	5/11/2009	0.537	1.050	1.14	0.250			
13	11/9/2009	0.733	5.14	6.43	0.250			
14	5/12/2010	0.250	0.250	0.250	0.250			
15	11/10/2010	0.318	0.639	0.769	0.250			
16	5/18/2011	0.250	0.250	0.250	0.250			
17	11/3/2011	0.582	3.56	3.15	0.250			
18	5/15/2012	0.250	0.250	0.250	0.250			
19	10/3/2012	0.335	1.82	1.70	0.250			
20	4/10/2013	0.536	0.916	1.04	0.250			
21	4/9/2014	2.65	2.54	1.62	0.250			
22	4/9/2015	1.30	1.74	0.815	0.250			
23	4/15/2016	0.250	0.250	0.250	0.250			
24	3/10/2017	0.250	0.250	0.250	0.250			
25	4/28/2017	0.250	0.250	0.250	0.250			
26	9/12/2017	0.422	1.490	1.44	0.250			
27	1/10/2018	0.250	0.350	0.446	0.250			
28	4/11/2018	0.250	0.250	0.250	0.250			
29	4/9/2019	0.250	0.250	0.250	0.250			
30	3/5/2020	0.250	0.250	0.250	0.250			
31	3/24/2021	0.200	1.00	0.800	0.200			
32	3/26/2022	0.200	1.10	0.860	0.200			
33								
34								
35								
Coefficient of Variation:		3.53	1.67	1.48	0.22			
Mann-Kendall Statistic (S):		-210	-82	-86	109			
Confidence Factor:		>99.9%	90.5%	91.5%	96.0%			
Concentration Trend:		Decreasing	Prob. Decreasing	Prob. Decreasing	Increasing			



Notes:

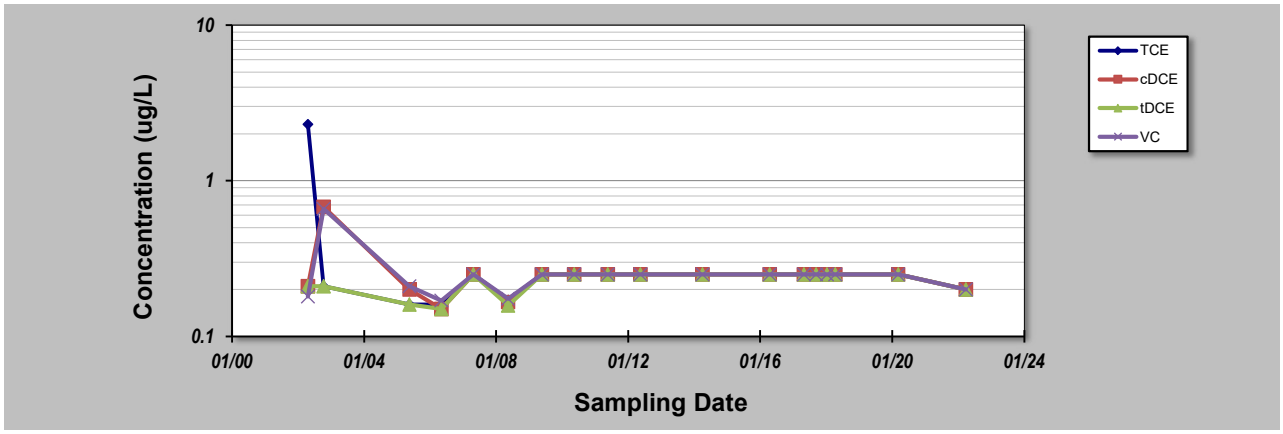
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCTA026
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/19/2002	2.30	0.210	0.210	0.180			
2	10/9/2002	0.210	0.680	0.210	0.660			
3	5/17/2005	0.160	0.200	0.160	0.210			
4	5/4/2006	0.160	0.150	0.150	0.170			
5	4/25/2007	0.250	0.250	0.250	0.250			
6	5/13/2008	0.171	0.166	0.158	0.174			
7	5/21/2009	0.250	0.250	0.250	0.250			
8	5/14/2010	0.250	0.250	0.250	0.250			
9	5/18/2011	0.250	0.250	0.250	0.250			
10	5/16/2012	0.250	0.250	0.250	0.250			
11	4/4/2014	0.250	0.250	0.250	0.250			
12	4/14/2016	0.250	0.250	0.250	0.250			
13	4/28/2017	0.250	0.250	0.250	0.250			
14	9/12/2017	0.250	0.250	0.250	0.250			
15	1/10/2018	0.250	0.250	0.250	0.250			
16	4/10/2018	0.250	0.250	0.250	0.250			
17	3/5/2020	0.250	0.250	0.250	0.250			
18	3/27/2022	0.200	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		1.42	0.43	0.16	0.41			
Mann-Kendall Statistic (S):		18	16	40	19			
Confidence Factor:		73.8%	71.3%	92.9%	75.0%			
Concentration Trend:		No Trend	No Trend	Prob. Increasing	No Trend			



Notes:

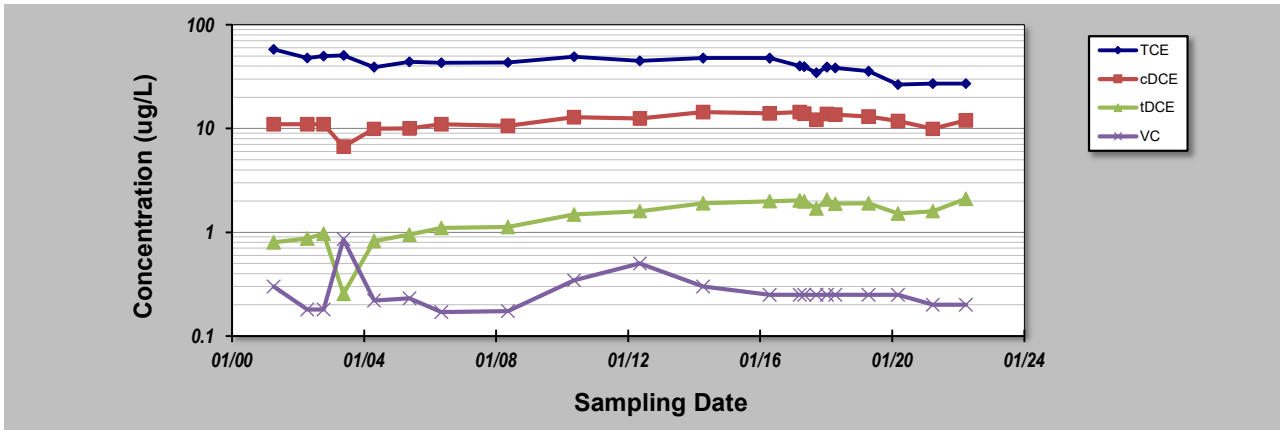
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WITCTA040
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/5/2001	58.0	11.0	0.800	0.300			
2	4/11/2002	48.0	11.0	0.870	0.180			
3	10/9/2002	50.0	11.0	0.970	0.180			
4	5/21/2003	50.8	6.70	0.255	0.854			
5	4/21/2004	39.0	9.90	0.820	0.220			
6	5/17/2005	44.0	10.0	0.950	0.230			
7	5/4/2006	43.0	11.0	1.10	0.170			
8	5/10/2008	43.3	10.6	1.12	0.174			
9	5/13/2010	49.2	12.9	1.48	0.344			
10	5/11/2012	44.9	12.5	1.60	0.500			
11	4/9/2014	47.6	14.4	1.90	0.300			
12	4/14/2016	47.8	14.0	1.99	0.250			
13	3/15/2017	40.1	14.4	2.03	0.250			
14	5/1/2017	39.4	13.9	1.98	0.250			
15	9/13/2017	34.6	12.1	1.70	0.250			
16	1/10/2018	39.0	13.8	2.06	0.250			
17	4/10/2018	38.2	13.6	1.88	0.250			
18	4/12/2019	35.7	13.0	1.90	0.250			
19	3/3/2020	26.5	11.8	1.52	0.250			
20	3/24/2021	27.0	9.90	1.60	0.200			
21	3/26/2022	27.0	12.0	2.10	0.200			
22								
23								
24								
25								
Coefficient of Variation:		0.20	0.16	0.37	0.54			
Mann-Kendall Statistic (S):		-140	50	132	-7			
Confidence Factor:		>99.9%	93.0%	>99.9%	57.1%			
Concentration Trend:		Decreasing	Prob. Increasing	Increasing	Stable			



Notes:

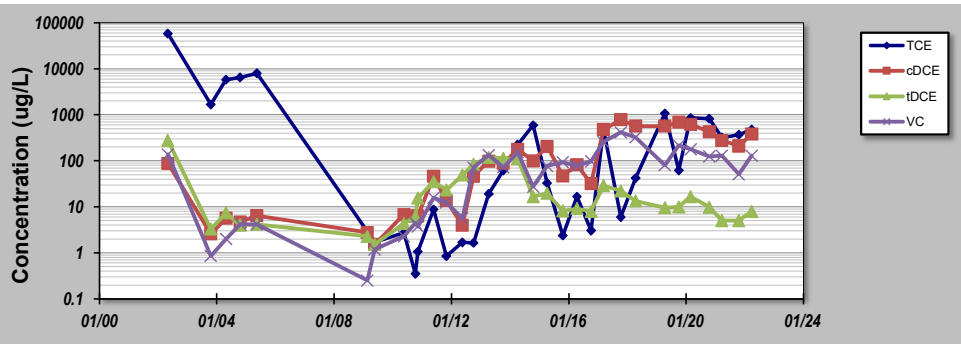
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WJETA061
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2002	58000	87.8	276	137			
2	10/19/2003	1679	2.59	3.28	0.854			
3	4/24/2004	5800	5.60	7.40	2.00			
4	10/17/2004	6500	4.70	4.00	4.20			
5	5/15/2005	8000	6.40	4.20	4.20			
6	2/18/2009	2.91	2.76	2.29	0.250			
7	5/21/2009	1.68	1.51	1.53	1.19			
8	5/21/2010	2.73	6.74	4.32	2.29			
9	10/11/2010	0.35	6.27	6.14	4.45			
10	11/11/2010	1.06	6.31	15.5	3.73			
11	5/24/2011	8.75	46.0	35.3	15.7			
12	10/31/2011	0.85	13.7	23.1	12.5			
13	5/17/2012	1.68	3.98	49.1	5.62			
14	10/3/2012	1.65	46.3	84.0	71.5			
15	4/10/2013	19.1	97.9	119	134			
16	10/7/2013	61.6	88.4	112	72.3			
17	4/4/2014	226	176	111	152			
18	10/15/2014	587	99.9	16.6	27.4			
19	4/8/2015	32.8	206	19.7	77.3			
20	10/20/2015	2.38	47.0	8.13	93.3			
21	4/14/2016	16.7	81.5	9.06	77.7			
22	10/5/2016	3.05	32.1	7.99	97.5			
23	3/8/2017	486	474	28.9	258			
24	10/10/2017	6.01	785	22.3	418			
25	4/13/2018	42.0	567	13.5	326			
26	4/13/2019	1070	568	9.54	80.6			
27	10/2/2019	62.2	688	10.0	217			
28	2/26/2020	855	617	16.7	178			
29	10/16/2020	823	431	9.80	124			
30	3/22/2021	320	280	5.00	130			
31	10/19/2021	370	210	5.00	51.0			
32	3/29/2022	480	380	8.00	130			
33								
34								
35								
Coefficient of Variation:		3.85	1.26	1.69	1.12			
Mann-Kendall Statistic (S):		60	312	27	282			
Confidence Factor:		82.9%	>99.9%	66.2%	>99.9%			
Concentration Trend:		No Trend	Increasing	No Trend	Increasing			



Notes:

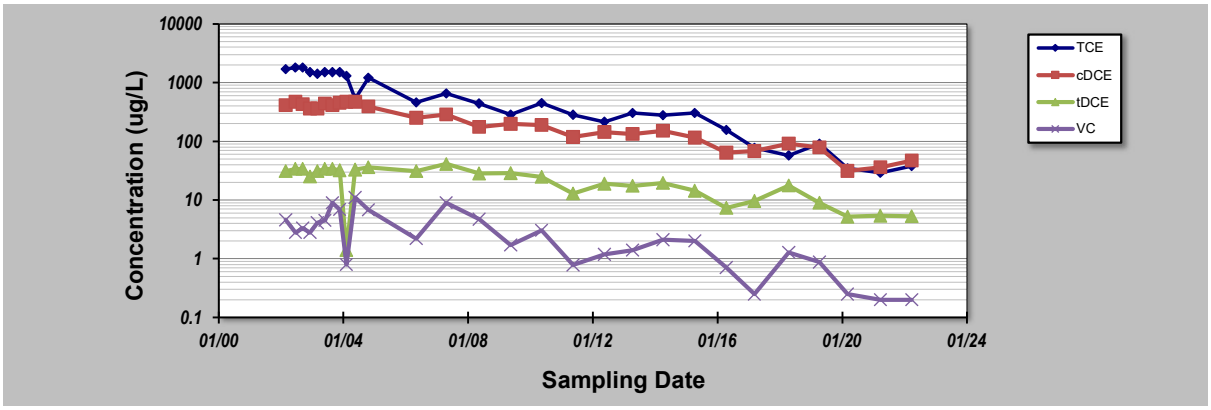
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WP07-10B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	2/25/2002	1700	410	31.0	4.60			
2	6/18/2002	1800	470	34.0	2.80			
3	9/11/2002	1800	430	34.0	3.30			
4	12/6/2002	1500	360	25.0	2.80			
5	3/4/2003	1400	360	31.0	4.10			
6	5/29/2003	1500	440	34.0	4.50			
7	8/26/2003	1500	410	34.0	9.00			
8	11/18/2003	1500	450	32.0	6.90			
9	2/4/2004	1300	470	1.40	0.800			
10	5/18/2004	530	470	33.0	11.0			
11	10/19/2004	1200	390	36.0	6.80			
12	5/3/2006	460	250	31.0	2.20			
13	4/19/2007	651	288	41.2	9.00			
14	5/8/2008	438	175	28.1	4.69			
15	5/13/2009	285	197	28.7	1.72			
16	5/10/2010	447	189	24.9	3.05			
17	5/16/2011	283	118	12.9	0.782			
18	5/16/2012	214	144	18.8	1.18			
19	4/11/2013	301	133	17.5	1.40			
20	4/3/2014	277	152	19.6	2.11			
21	4/9/2015	303	115	14.4	2.02			
22	4/13/2016	155	64.2	7.31	0.710			
23	3/9/2017	77.3	68.1	9.59	0.250			
24	4/16/2018	57.4	91.4	17.6	1.28			
25	4/10/2019	90.8	78.8	8.98	0.873			
26	3/3/2020	34.5	31.2	5.19	0.250			
27	3/23/2021	29.0	36.0	5.40	0.200			
28	3/24/2022	38.0	47.0	5.30	0.200			
29								
30								
Coefficient of Variation:		0.91	0.65	0.53	0.94			
Mann-Kendall Statistic (S):		-325	-281	-221	-204			
Confidence Factor:		>99.9%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

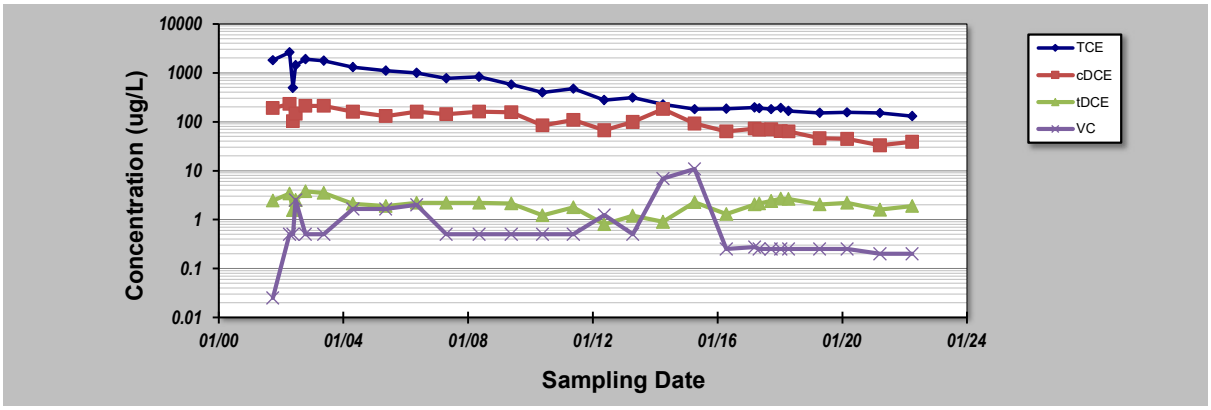
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WSAICTA010
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	9/27/2001	1810	190	2.44	0.025			
2	4/11/2002	2600	230	3.40	0.500			
3	5/20/2002	490	103	1.56	0.500			
4	6/20/2002	1430	146	2.50	2.50			
5	10/15/2002	1900	210	3.80	0.500			
6	5/16/2003	1767	211	3.50	0.500			
7	4/22/2004	1300	160	2.10	1.65			
8	5/11/2005	1100	130	1.90	1.65			
9	5/8/2006	1000	160	2.20	2.00			
10	4/20/2007	775	143	2.20	0.500			
11	5/10/2008	830	162	2.20	0.500			
12	5/21/2009	575	157	2.15	0.500			
13	5/20/2010	396	85	1.22	0.500			
14	5/19/2011	471	109	1.78	0.500			
15	5/14/2012	276	66.9	0.800	1.25			
16	4/12/2013	309	98.9	1.20	0.500			
17	4/3/2014	227	183	0.900	6.88			
18	4/8/2015	181	91.4	2.28	10.9			
19	4/12/2016	185	63.2	1.30	0.250			
20	3/10/2017	196	72.5	2.04	0.273			
21	5/2/2017	188	69.1	2.14	0.250			
22	9/20/2017	180	69.7	2.40	0.250			
23	1/11/2018	191	64.2	2.69	0.250			
24	4/11/2018	167	63.3	2.62	0.250			
25	4/12/2019	152	45.8	2.03	0.250			
26	2/27/2020	154	44.3	2.20	0.250			
27	3/17/2021	150	33.0	1.60	0.200			
28	3/29/2022	130	39.0	1.90	0.200			
29								
30								
Coefficient of Variation:		0.99	0.51	0.34	1.89			
Mann-Kendall Statistic (S):		-326	-267	-67	-142			
Confidence Factor:		>99.9%	>99.9%	90.3%	99.8%			
Concentration Trend:		Decreasing	Decreasing	Prob. Decreasing	Decreasing			



Notes:

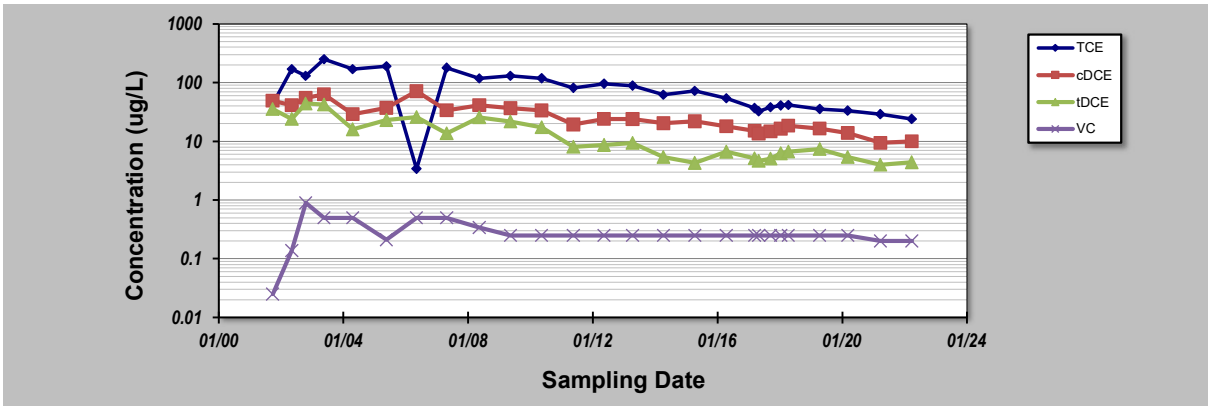
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WSAICTA016
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	9/25/2001	44.0	49.2	35.6	0.025			
2	5/7/2002	170	41.0	24.0	0.137			
3	10/17/2002	130	55.0	44.0	0.890			
4	5/19/2003	249	63.0	42.0	0.500			
5	4/20/2004	170	29.0	16.0	0.500			
6	5/18/2005	190	37.0	23.0	0.210			
7	5/5/2006	3.40	71.0	26.0	0.500			
8	4/25/2007	179	33.9	13.7	0.500			
9	5/11/2008	117	41.0	25.5	0.340			
10	5/11/2009	130	36.4	21.6	0.250			
11	5/12/2010	118	33.5	17.4	0.250			
12	5/18/2011	81.6	19.2	8.03	0.250			
13	5/11/2012	95.7	24.1	8.60	0.250			
14	4/10/2013	88.4	23.8	9.40	0.250			
15	4/8/2014	62.1	20.2	5.40	0.250			
16	4/9/2015	72.4	21.9	4.27	0.250			
17	4/14/2016	54.0	18.0	6.59	0.250			
18	3/10/2017	36.9	15.2	5.14	0.250			
19	4/28/2017	32.4	13.6	4.63	0.250			
20	9/12/2017	37.9	14.8	5.06	0.250			
21	1/10/2018	40.8	16.4	6.24	0.250			
22	4/10/2018	41.5	18.4	6.70	0.250			
23	4/11/2019	35.5	16.5	7.42	0.250			
24	3/6/2020	33.3	13.8	5.40	0.250			
25	3/24/2021	29.0	9.40	4.00	0.200			
26	3/26/2022	24.0	10.0	4.40	0.200			
27								
28								
29								
30								
Coefficient of Variation:		0.73	0.58	0.83	0.55			
Mann-Kendall Statistic (S):		-205	-246	-222	-79			
Confidence Factor:		>99.9%	>99.9%	>99.9%	95.7%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

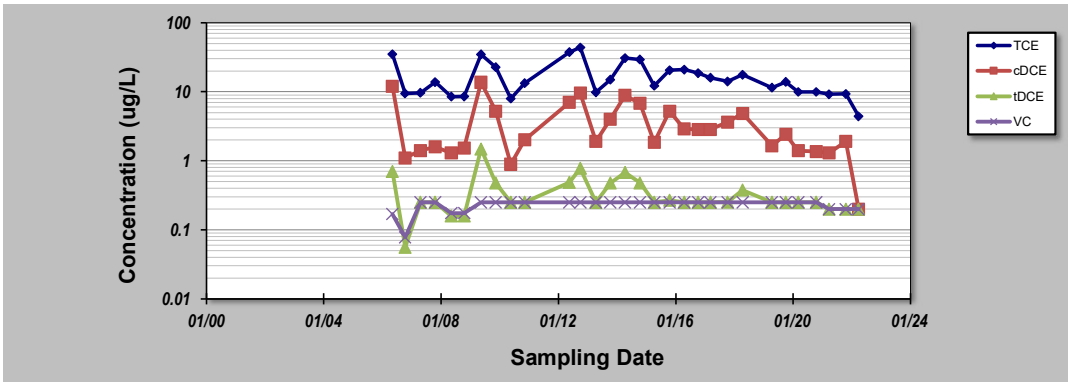
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	WSETAHM31R
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/5/2006	35.0	12.0	0.700	0.170			
2	10/10/2006	9.50	1.10	0.056	0.078			
3	4/18/2007	9.68	1.41	0.250	0.250			
4	10/19/2007	13.8	1.59	0.250	0.250			
5	5/7/2008	8.52	1.30	0.158	0.174			
6	10/16/2008	8.57	1.53	0.158	0.174			
7	5/14/2009	34.8	13.7	1.48	0.250			
8	11/12/2009	22.7	5.22	0.475	0.250			
9	5/17/2010	7.97	0.89	0.250	0.250			
10	11/8/2010	13.3	2.01	0.250	0.250			
11	5/15/2012	37.5	7.04	0.485	0.250			
12	10/2/2012	43.8	9.53	0.777	0.250			
13	4/12/2013	9.83	1.90	0.250	0.250			
14	10/8/2013	15.0	4.02	0.475	0.250			
15	4/9/2014	30.7	8.87	0.678	0.250			
16	10/14/2014	29.2	6.80	0.478	0.250			
17	4/9/2015	12.2	1.85	0.250	0.250			
18	10/19/2015	20.5	5.23	0.267	0.250			
19	4/15/2016	21.0	2.88	0.250	0.250			
20	10/5/2016	18.6	2.85	0.250	0.250			
21	3/8/2017	15.9	2.84	0.250	0.250			
22	10/9/2017	14.1	3.63	0.251	0.250			
23	4/13/2018	17.7	4.85	0.376	0.250			
24	4/13/2019	11.5	1.65	0.250	0.250			
25	10/2/2019	13.9	2.41	0.250	0.250			
26	3/5/2020	9.93	1.40	0.250	0.250			
27	10/17/2020	9.97	1.36	0.250	0.250			
28	3/24/2021	9.20	1.30	0.200	0.200			
29	10/20/2021	9.30	1.90	0.200	0.200			
30	3/27/2022	4.40	0.20	0.200	0.200			
31								
32								
33								
34								
35								
Coefficient of Variation:		0.59	0.91	0.76	0.17			
Mann-Kendall Statistic (S):		-81	-71	-74	30			
Confidence Factor:		92.3%	89.3%	90.3%	69.6%			
Concentration Trend:		Prob. Decreasing	Stable	Prob. Decreasing	No Trend			



Notes:

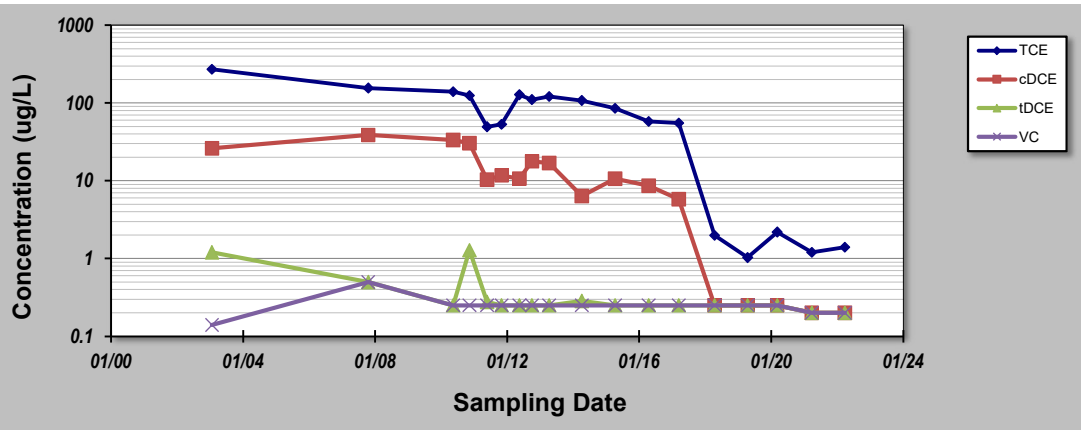
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-29
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	1/22/2003	270	26.0	1.20	0.140			
2	10/16/2007	156	38.8	0.500	0.500			
3	5/13/2010	140	33.3	0.250	0.250			
4	11/11/2010	124	30.5	1.28	0.250			
5	5/24/2011	49.4	10.3	0.278	0.250			
6	11/2/2011	53.0	11.7	0.250	0.250			
7	5/14/2012	128	10.7	0.250	0.250			
8	10/2/2012	111	17.8	0.250	0.250			
9	4/9/2013	121	16.8	0.250	0.250			
10	4/7/2014	108	6.37	0.285	0.250			
11	4/9/2015	85.5	10.6	0.250	0.250			
12	4/13/2016	57.9	8.63	0.250	0.250			
13	3/13/2017	55.3	5.76	0.250	0.250			
14	4/13/2018	1.98	0.250	0.250	0.250			
15	4/14/2019	1.03	0.250	0.250	0.250			
16	3/6/2020	2.20	0.250	0.250	0.250			
17	3/23/2021	1.20	0.200	0.200	0.200			
18	3/25/2022	1.40	0.200	0.200	0.200			
19								
20								
Coefficient of Variation:		0.88	0.96	0.87	0.27			
Mann-Kendall Statistic (S):		-109	-121	-77	-27			
Confidence Factor:		>99.9%	>99.9%	99.9%	83.5%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

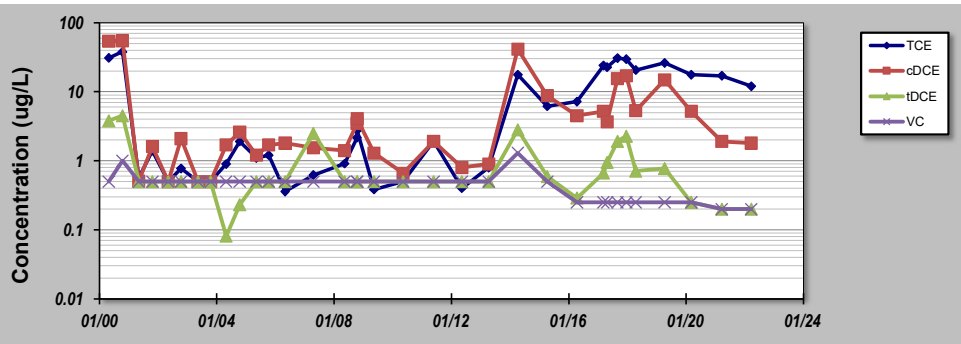
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-36
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/27/2000	31.0	54.0	3.80	0.500			
2	10/16/2000	38.0	55.0	4.50	1.00			
3	5/5/2001	0.570	0.510	0.500	0.500			
4	10/23/2001	1.40	1.60	0.500	0.500			
5	5/6/2002	0.500	0.500	0.500	0.500			
6	10/15/2002	0.770	2.10	0.500	0.500			
7	5/15/2003	0.500	0.500	0.500	0.500			
8	10/16/2003	0.500	0.500	0.500	0.500			
9	4/27/2004	0.900	1.70	0.081	0.500			
10	10/13/2004	1.90	2.60	0.230	0.500			
11	5/11/2005	1.10	1.20	0.500	0.500			
12	10/11/2005	1.20	1.70	0.500	0.500			
13	5/3/2006	0.360	1.80	0.500	0.500			
14	4/20/2007	0.620	1.54	2.50	0.500			
15	5/12/2008	0.910	1.41	0.500	0.500			
16	10/14/2008	2.16	3.49	0.500	0.500			
17	10/17/2008	2.78	4.07	0.500	0.500			
18	5/14/2009	0.384	1.29	0.500	0.500			
19	5/11/2010	0.500	0.662	0.500	0.500			
20	5/25/2011	1.92	1.90	0.500	0.500			
21	5/10/2012	0.400	0.800	0.500	0.500			
22	4/11/2013	0.80	0.900	0.500	0.500			
23	4/7/2014	17.7	41.6	2.80	1.30			
24	4/9/2015	6.15	8.78	0.590	0.500			
25	4/12/2016	7.23	4.50	0.288	0.250			
26	3/8/2017	24.0	5.18	0.666	0.250			
27	4/24/2017	22.7	3.67	0.941	0.250			
28	8/30/2017	30.8	15.5	1.91	0.250			
29	12/18/2017	29.7	17.0	2.27	0.250			
30	4/15/2018	20.7	5.29	0.713	0.250			
31	4/9/2019	26.3	14.9	0.771	0.250			
32	3/6/2020	17.7	5.21	0.250	0.250			
33	3/21/2021	17.0	1.90	0.200	0.200			
34	3/23/2022	12.0	1.80	0.200	0.200			
35								
Coefficient of Variation:		1.25	1.82	1.14	0.46			
Mann-Kendall Statistic (S):		188	153	6	-255			
Confidence Factor:		99.8%	98.8%	52.9%	>99.9%			
Concentration Trend:		Increasing	Increasing	No Trend	Decreasing			



Notes:

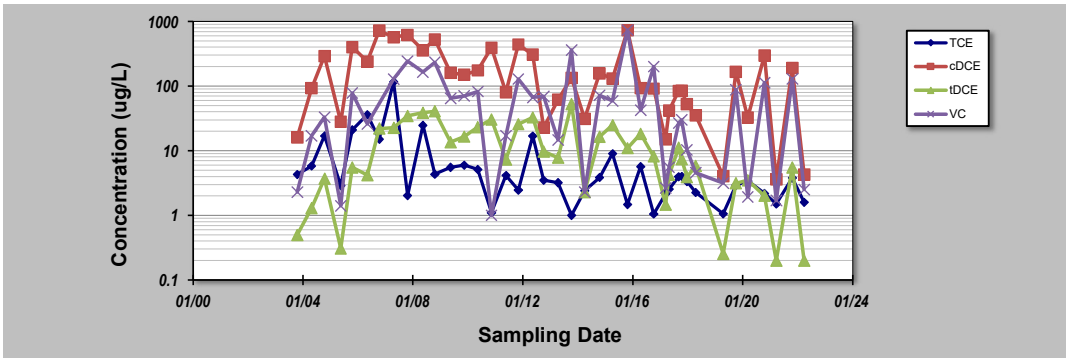
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-50
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/16/2003	4.30	16.1	0.500	2.29			
2	4/22/2004	5.80	93.0	1.30	17.0			
3	10/14/2004	17.0	290	3.70	33.0			
4	5/16/2005	2.90	28.0	0.310	1.40			
5	10/16/2005	21.0	400	5.50	78.0			
6	5/4/2006	36.0	240	4.20	26.0			
7	10/10/2006	15.0	720	22.0				
8	4/20/2007	116	573	22.7	128			
9	10/21/2007	2.03	616	34.7	244			
10	5/12/2008	24.8	358	38.7	165			
11	10/16/2008	4.33	526	40.9	234			
12	5/14/2009	5.53	162	13.6	64.8			
13	11/10/2009	5.96	150	16.6	70.6			
14	5/12/2010	5.13	175	23.2	82.4			
15	11/9/2010	1.10	392	30.4	1.00			
16	5/20/2011	4.15	81	7.36	17.1			
17	11/1/2011	2.45	441	25.8	129			
18	5/10/2012	16.9	308	32.8	66.9			
19	10/2/2012	3.50	22.9	9.80	69.3			
20	4/11/2013	3.20	61.5	7.80	14.7			
21	10/8/2013	1.00	134	52.5	363			
22	4/2/2014	2.40	31.3	2.30	2.30			
23	10/15/2014	3.86	157	16.4	72.0			
24	4/7/2015	9.0	131	25.0	59.0			
25	10/21/2015	1.47	731	11.0	739			
26	4/12/2016	5.68	92.6	18.2	42.3			
27	10/4/2016	1.05	91.7	8.20	201			
28	3/11/2017	2.15	15.0	1.46	2.67			
29	4/25/2017	2.55	41.9	4.21	5.55			
30	8/30/2017	3.97	84.1	11.1	26.9			
31	10/10/2017	4.02	85.1	7.45	30.1			
32	12/18/2017	3.35	52.7	3.91	10.3			
33	4/15/2018	2.27	35.3	5.82	4.59			
34	4/14/2019	1.06	4.06	0.254	3.17			
35	9/30/2019	2.91	167	3.15	87.6			
36	3/5/2020	3.41	32.5	3.50	1.94			
37	10/15/2020	2.19	299	2.01	113			
38	3/21/2021	1.50	3.60	0.200	1.70			
39	10/19/2021	3.80	190	5.500	130			
40	3/25/2022	1.60	4.30	0.200	2.50			
Coefficient of Variation:		2.12	1.02	1.02	1.57			
Mann-Kendall Statistic (S):		-302	-254	-186	-83			
Confidence Factor:		>99.9%	99.9%	98.5%	83.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

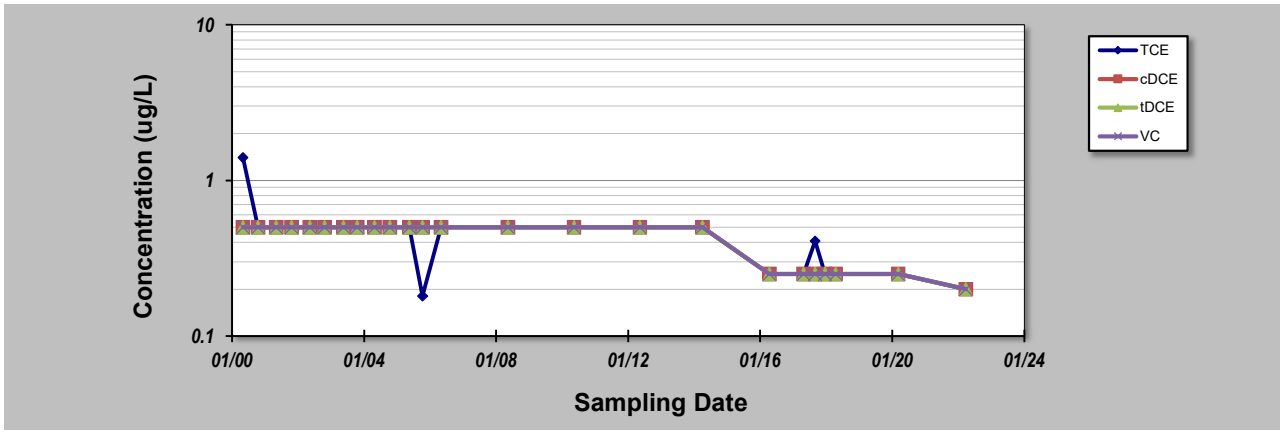
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-65
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	1.40	0.500	0.500	0.500			
2	10/15/2000	0.500	0.500	0.500	0.500			
3	5/5/2001	0.500	0.500	0.500	0.500			
4	10/20/2001	0.500	0.500	0.500	0.500			
5	5/9/2002	0.500	0.500	0.500	0.500			
6	10/20/2002	0.500	0.500	0.500	0.500			
7	5/16/2003	0.500	0.500	0.500	0.500			
8	10/16/2003	0.500	0.500	0.500	0.500			
9	4/25/2004	0.500	0.500	0.500	0.500			
10	10/14/2004	0.500	0.500	0.500	0.500			
11	5/15/2005	0.500	0.500	0.500	0.500			
12	10/11/2005	0.180	0.500	0.500	0.500			
13	5/3/2006	0.500	0.500	0.500	0.500			
14	5/10/2008	0.500	0.500	0.500	0.500			
15	5/13/2010	0.500	0.500	0.500	0.500			
16	5/10/2012	0.500	0.500	0.500	0.500			
17	4/3/2014	0.500	0.500	0.500	0.500			
18	4/12/2016	0.250	0.250	0.250	0.250			
19	4/24/2017	0.250	0.250	0.250	0.250			
20	8/30/2017	0.407	0.250	0.250	0.250			
21	12/20/2017	0.250	0.250	0.250	0.250			
22	4/15/2018	0.250	0.250	0.250	0.250			
23	3/5/2020	0.250	0.250	0.250	0.250			
24	3/25/2022	0.200	0.200	0.200	0.200			
25								
Coefficient of Variation:		0.52	0.28	0.28	0.28			
Mann-Kendall Statistic (S):		-133	-125	-125	-125			
Confidence Factor:		>99.9%	99.9%	99.9%	99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

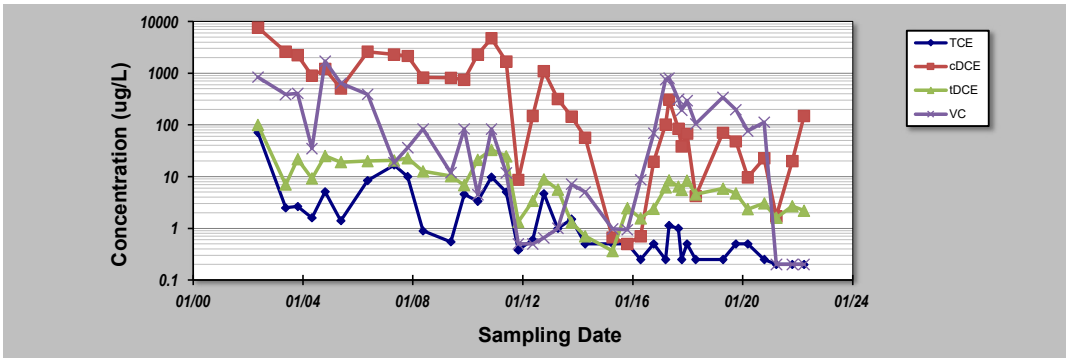
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-4
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/12/2002	71.0	7600	100	840			
2	5/14/2003	2.50	2607	7.00	386			
3	10/22/2003	2.64	2224	21.8	407			
4	4/27/2004	1.60	890	9.20	35.0			
5	10/20/2004	5.10	1200	25.0	1700			
6	5/17/2005	1.40	510	19.0	640			
7	5/9/2006	8.40	2600	20.0	390			
8	4/24/2007	16.7	2310	20.6	18.6			
9	10/22/2007	10.0	2150	22.9	36.2			
10	5/13/2008	0.890	827	12.6	83.2			
11	5/20/2009	0.547	812	10.2	11.9			
12	11/10/2009	4.57	744	6.85	83.6			
13	5/10/2010	3.33	2300	21.2	4.48			
14	11/9/2010	9.75	4710	32.9	82.7			
15	5/25/2011	5.00	1680	24.8	11.8			
16	10/31/2011	0.381	8.68	1.33	0.500			
17	5/10/2012	0.600	150	3.40	0.500			
18	10/4/2012	4.70	1100	8.93	0.654			
19	4/9/2013	1.00	317	5.60	1.00			
20	10/8/2013	1.50	144	1.30	7.10			
21	4/7/2014	0.500	56.4	0.700	5.00			
22	4/7/2015	0.500	0.669	0.365	0.975			
23	10/20/2015	0.500	0.500	2.48	0.943			
24	4/12/2016	0.250	0.701	1.55	8.68			
25	10/4/2016	0.500	19.4	2.38	68.7			
26	3/11/2017	0.250	102	6.16	758			
27	4/26/2017	1.14	307	8.46	802			
28	8/29/2017	1.00	84.7	6.45	311			
29	10/11/2017	0.250	38.5	5.50	194			
30	12/20/2017	0.500	67.6	8.40	296			
31	4/15/2018	0.250	4.18	4.52	104			
32	4/11/2019	0.250	70.2	5.84	339			
33	10/1/2019	0.500	48.1	4.71	197			
34	3/5/2020	0.500	9.67	2.35	75.9			
35	10/12/2020	0.250	22.6	3.05	113			
36	3/21/2021	0.200	1.70	1.60	0.200			
37	10/18/2021	0.200	20.0	2.70	0.200			
38	3/23/2022	0.200	150	2.20	0.200			
39								
40								
Coefficient of Variation:		2.79	1.64	1.46	1.64			
Mann-Kendall Statistic (S):		-433	-398	-325	-147			
Confidence Factor:		>99.9%	>99.9%	>99.9%	96.7%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

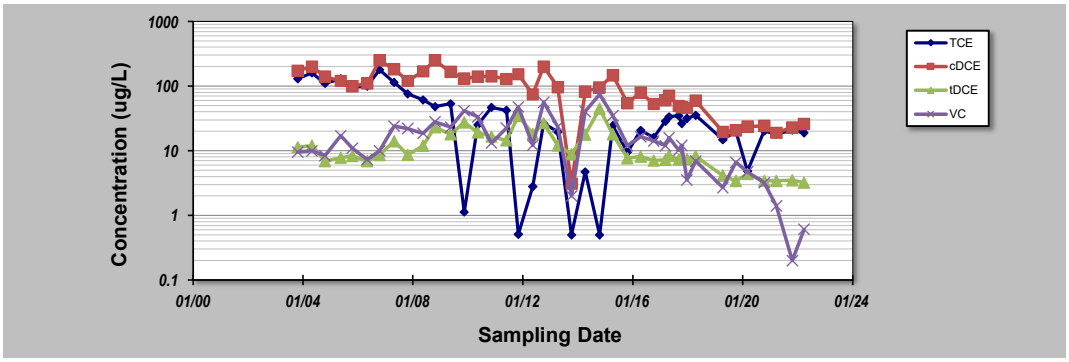
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-13
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/22/2003	130	173	11.4	9.52			
2	4/27/2004	160	200	12.0	10.0			
3	10/19/2004	110	140	6.90	8.40			
4	5/16/2005	130	120	7.80	17.0			
5	10/17/2005	96	100	8.30	11.0			
6	5/3/2006	100	110	6.90	7.30			
7	10/12/2006	180	250	8.60	10.0			
8	4/24/2007	114	183	14.1	24.2			
9	10/22/2007	76.0	120	8.67	22.0			
10	5/13/2008	61.2	169	11.9	18.6			
11	10/20/2008	48.1	250	23.2	28.1			
12	5/14/2009	53.3	166	18.0	23.2			
13	11/10/2009	1.13	131	27.4	41.6			
14	5/11/2010	25.2	141	19.2	33.6			
15	11/9/2010	46.8	142	16.6	13.2			
16	5/26/2011	42.3	129	14.4	22.4			
17	10/31/2011	0.510	153	34.7	47.8			
18	5/10/2012	2.80	74.5	18.3	12.2			
19	10/3/2012	26.6	199	26.7	56.4			
20	4/9/2013	19.5	96.5	12.1	23.6			
21	10/7/2013	0.500	3.10	8.90	2.00			
22	4/7/2014	4.70	82.2	17.9	40.6			
23	10/14/2014	0.500	95.4	44.8	74.4			
24	4/8/2015	24.5	147	18.0	35.0			
25	10/20/2015	9.44	54.3	7.72	12.0			
26	4/12/2016	20.7	79.5	8.13	16.5			
27	10/3/2016	16.0	52.8	7.02	14.2			
28	3/8/2017	28.7	60.2	7.26	12.0			
29	4/24/2017	33.5	71.0	8.40	15.9			
30	8/30/2017	34.9	49.6	7.30	10.2			
31	10/10/2017	26.3	47.3	8.11	12.1			
32	12/18/2017	31.7	46.2	7.46	3.53			
33	4/15/2018	35.5	59.3	8.23	6.96			
34	4/9/2019	14.8	19.5	4.13	2.68			
35	10/1/2019	19.8	20.8	3.40	6.64			
36	3/3/2020	4.84	23.6	4.35	4.74			
37	10/12/2020	20.4	24.3	3.44	3.21			
38	3/21/2021	18.0	19.0	3.40	1.40			
39	10/18/2021	21.0	23.0	3.50	0.200			
40	3/23/2022	19.0	26.0	3.20	0.610			
Coefficient of Variation:		1.03	0.65	0.73	0.91			
Mann-Kendall Statistic (S):		-344	-494	-273	-226			
Confidence Factor:		>99.9%	>99.9%	99.9%	99.6%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

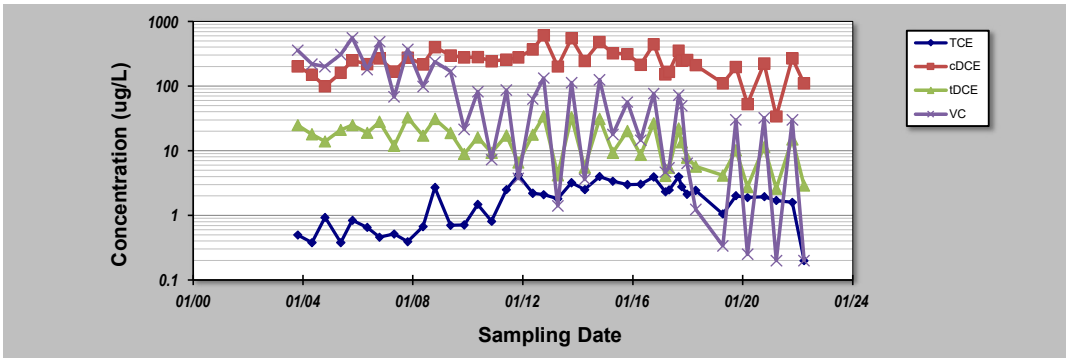
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-18B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/22/2003	0.500	202	25.0	360			
2	4/27/2004	0.380	150	18.0	220			
3	10/19/2004	0.930	100	14.0	200			
4	5/16/2005	0.380	160	21.0	310			
5	10/17/2005	0.840	250	25.0	560			
6	5/3/2006	0.650	220	19.0	180			
7	10/12/2006	0.460	270	28.0	490			
8	4/24/2007	0.517	168	11.9	68.1			
9	10/22/2007	0.392	275	32.8	373			
10	5/13/2008	0.670	216	17.1	98.7			
11	10/20/2008	2.70	400	31.0	238			
12	5/14/2009	0.702	298	18.8	168			
13	11/10/2009	0.711	277	8.97	21.5			
14	5/11/2010	1.48	281	16.1	82.2			
15	11/10/2010	0.813	244	9.33	7.27			
16	5/26/2011	2.51	258	17.3	86.7			
17	10/31/2011	4.21	277	6.56	3.74			
18	5/11/2012	2.20	370	17.7	62.8			
19	10/3/2012	2.10	609	34.3	133			
20	4/9/2013	1.80	201	4.20	1.40			
21	10/7/2013	3.20	550	33.1	113			
22	4/2/2014	2.50	245	5.50	3.60			
23	10/14/2014	4.00	479	31.3	125			
24	4/8/2015	3.38	323	9.34	17.8			
25	10/20/2015	3.00	314	20.2	56.8			
26	4/12/2016	3.04	214	8.62	14.5			
27	10/3/2016	3.94	444	26.7	76.7			
28	3/8/2017	2.33	152	4.10	4.66			
29	4/25/2017	2.48	167	5.46	5.47			
30	8/30/2017	3.96	354	22.0	72.8			
31	10/11/2017	2.78	249	13.5	49.8			
32	12/21/2017	2.13	253	7.86	6.40			
33	4/15/2018	2.44	211	5.71	1.24			
34	4/9/2019	1.05	111	4.16	0.339			
35	10/1/2019	2.01	197	10.2	30.1			
36	3/3/2020	1.90	52.7	2.76	0.250			
37	10/12/2020	1.95	224	11.6	32.3			
38	3/21/2021	1.70	34.0	2.60	0.200			
39	10/18/2021	1.60	270	15.0	30.0			
40	3/23/2022	0.200	110	2.90	0.200			
Coefficient of Variation:		0.63	0.48	0.62	1.30			
Mann-Kendall Statistic (S):		217	-46	-293	-459			
Confidence Factor:		99.5%	69.9%	>99.9%	>99.9%			
Concentration Trend:		Increasing	Stable	Decreasing	Decreasing			



Notes:

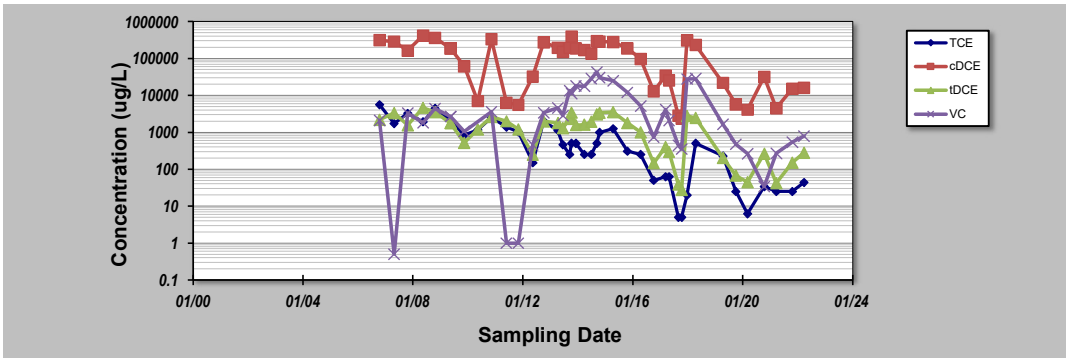
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-26
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/12/2006	5600	310000	2200	2100			
2	4/24/2007	1720	286000	3340	0.500			
3	10/22/2007	3250	163000	1540	3340			
4	5/13/2008	1920	414000	4590	1820			
5	10/20/2008	4450	360000	3550	4400			
6	5/14/2009	2080	185000	1770	2680			
7	5/14/2009	2080	185000	1770	2680			
8	11/10/2009	837	61200	523	1060			
9	5/10/2010	1160	7000	1200				
10	11/9/2010	2490	329000	2610	3630			
11	5/26/2011	1390	6300	1990	1.00			
12	10/31/2011	1030	5510	1210	1.00			
13	5/11/2012	151	32400	247	465			
14	10/3/2012	2020	274000	1970	3360			
15	4/9/2013	1120	195000	1780	4530			
16	6/14/2013	461	149000	1300	2830			
17	9/11/2013	250	193000	2300	13400			
18	10/7/2013	500	389000	3430	11200			
19	12/4/2013	500	186000	1570	18000			
20	3/26/2014	250	169000	1600	17600			
21	6/26/2014	250	135000	1910	28300			
22	9/10/2014	500	292000	3060	42800			
23	10/14/2014	1000	284000	3390	30200			
24	4/14/2015	1250	278000	3540	24900			
25	10/19/2015	309	186000	1780	12000			
26	4/12/2016	250	96700	1010	5100			
27	10/3/2016	50.0	12900	146	740			
28	3/11/2017	62.5	34000	399	4140			
29	4/25/2017	62.5	25400	293	2090			
30	8/28/2017	5.00	2820	38.5	443			
31	10/11/2017	5.00	2360	27.8	353			
32	12/21/2017	19.9	306000	2800	27600			
33	4/15/2018	500	231000	2440	28400			
34	4/11/2019	228	21800	202	1650			
35	10/1/2019	25.0	5710	67.1	474			
36	3/3/2020	6.25	4090	44.8	264			
37	10/12/2020	34.2	31700	264	34.2			
38	3/21/2021	25.0	4500	42.0	270			
39	10/18/2021	25.0	15000	150	540			
40	3/23/2022	44.0	16000	280	790			
Coefficient of Variation:		1.33	0.89	0.80	1.41			
Mann-Kendall Statistic (S):		-520	-280	-290	-9			
Confidence Factor:		>99.9%	>99.9%	>99.9%	53.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	No Trend			



Notes:

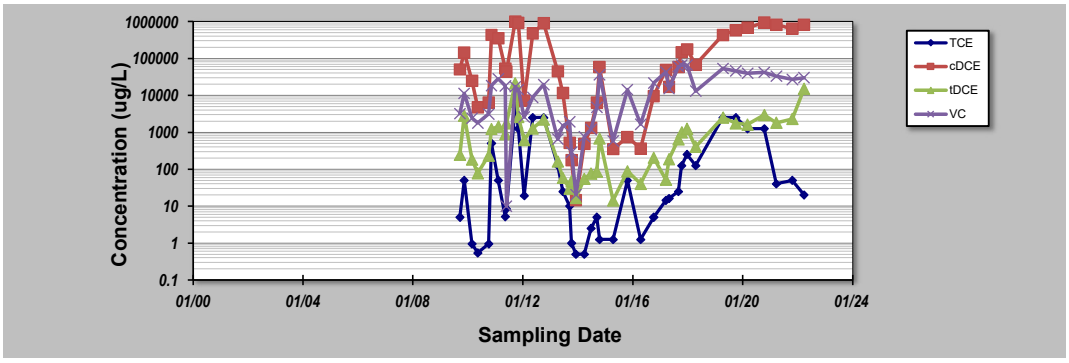
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-29
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	9/15/2009	5.00	50200	244	3210			
2	11/10/2009	50.0	144000	2830	11300			
3	2/24/2010	0.950	24800	183	2420			
4	5/10/2010	0.539	4730	77.7	1780			
5	10/4/2010	0.951	6380	235	3150			
6	11/9/2010	500	434000	1240	18500			
7	2/8/2011	50.0	355000	1430	28200			
8	5/10/2011	5.17	53500	897	18100			
9	5/26/2011	8.47	44300	1750	10			
10	9/21/2011	5000	997000	21100	17100			
11	10/31/2011	1250	915000	2630	14400			
12	1/18/2012	19.10	7200	624	2580			
13	5/11/2012	2500	473000	1280	8770			
14	10/3/2012	2500	900000	2220	19600			
15	4/9/2013	125	44900	162	657			
16	6/14/2013	25.00	11600	58.5	1520			
17	9/11/2013	10.00	516	29.8	1950			
18	10/8/2013	1.00	175	46.9	291			
19	12/4/2013	0.500	14.5	16.7	20.6			
20	3/26/2014	0.500	491	54.6	763			
21	6/25/2014	2.50	1330	76.5	1210			
22	9/10/2014	5.00	6350	86.9	4690			
23	10/14/2014	1.25	58200	682	35900			
24	4/14/2015	1.25	352	14.4	589			
25	10/19/2015	50.0	746	88.0	14300			
26	4/12/2016	1.25	366	40.4	1650			
27	10/3/2016	5.00	9600	204	21500			
28	3/15/2017	14.40	49500	51.6	42900			
29	4/25/2017	16.25	16900	188	15200			
30	8/28/2017	25.00	59200	646	60700			
31	10/11/2017	125	148000	1000	65500			
32	12/20/2017	250	178000	1250	65800			
33	4/15/2018	125	67300	403	13100			
34	4/11/2019	2500	428000	2500	53500			
35	10/1/2019	2500	582000	1750	46100			
36	3/3/2020	1250	675000	1630	39600			
37	10/12/2020	1250	938000	2950	41900			
38	3/21/2021	40	820000	1800	33000			
39	10/18/2021	50	640000	2300	27000			
40	3/23/2022	20	810000	15000	30000			
Coefficient of Variation:		2.11	1.35	2.27	1.03			
Mann-Kendall Statistic (S):		156	154	103	250			
Confidence Factor:		96.5%	96.3%	88.2%	99.8%			
Concentration Trend:		Increasing	Increasing	No Trend	Increasing			



Notes:

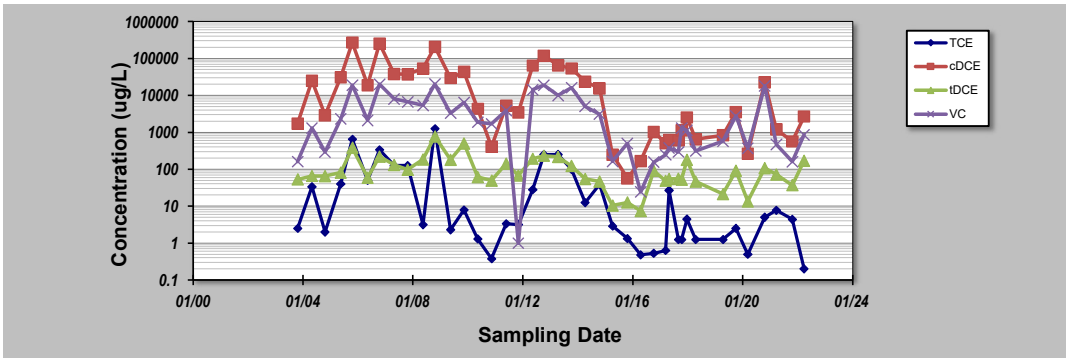
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	VEP-35
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/22/2003	2.50	1716	53.0	162			
2	4/27/2004	33.5	25000	66.0	1300			
3	10/19/2004	2.00	2900	65.0	290			
4	5/16/2005	40.0	31000	82.0	2300			
5	10/17/2005	650	270000	380	19000			
6	5/7/2006	50.0	19000	59.0	2100			
7	10/12/2006	335	250000	220	20000			
8	4/25/2007	125	38000	131	8030			
9	10/23/2007	125	36800	97.5	6670			
10	5/13/2008	3.14	52600	184	5400			
11	10/20/2008	1250	207000	775	20200			
12	5/14/2009	2.29	29300	180	3310			
13	11/9/2009	7.90	43400	496	6470			
14	5/10/2010	1.30	4330	61.4	1880			
15	11/11/2010	0.38	407	49.4	1680			
16	5/25/2011	3.34	5220	142	3910			
17	10/31/2011	3.20	3470	68.2	1.00			
18	5/11/2012	28.0	63900	192	14100			
19	10/4/2012	250	118000	230	19000			
20	4/11/2013	250	64500	215	9850			
21	10/7/2013	100	53300	122	16100			
22	4/7/2014	12.5	23400	54.1	5010			
23	10/14/2014	38.9	15500	46.4	3110			
24	4/7/2015	2.90	248	10.4	164			
25	10/19/2015	1.32	57.1	12.6	499			
26	4/12/2016	0.480	168	7.4	24.3			
27	10/3/2016	0.530	1020	90.8	155			
28	3/11/2017	0.630	510	48.7	245			
29	4/25/2017	26.9	613	54.3	378			
30	8/29/2017	1.25	607	55.9	294			
31	10/11/2017	1.25	1140	52.2	1290			
32	12/19/2017	4.43	2530	180	1120			
33	4/15/2018	1.25	646	46.5	311			
34	4/11/2019	1.25	832	21.4	571			
35	10/1/2019	2.50	3500	90.7	2770			
36	3/5/2020	0.500	263	13.5	369			
37	10/17/2020	5.00	22700	108	18000			
38	3/21/2021	7.70	1200	72.0	470			
39	10/19/2021	4.40	570	37.0	160			
40	3/23/2022	0.200	2700	170	850			
Coefficient of Variation:		2.67	1.87	1.15	1.34			
Mann-Kendall Statistic (S):		-247	-264	-183	-175			
Confidence Factor:		99.8%	99.9%	98.4%	97.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

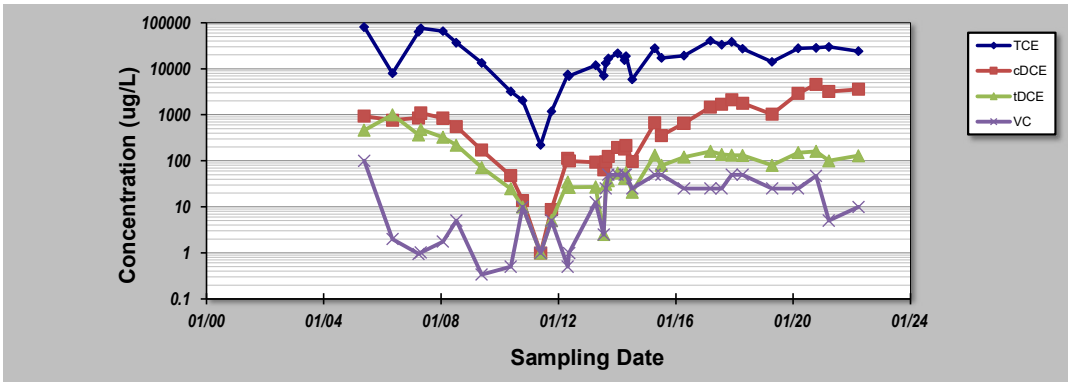
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	F-220
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/18/2005	81000	940	460	100			
2	5/7/2006	8000	760	1000	2.00			
3	3/28/2007	63500	852	365	0.950			
4	4/25/2007	76200	1090	482	1.02			
5	1/24/2008	65900	846	325	1.75			
6	7/8/2008	36800	555	218	5.00			
7	5/20/2009	13400	170	71.3	0.337			
8	5/17/2010	3200	47.3	24.7	0.500			
9	10/12/2010	2030	13.7	10.0	10.0			
10	5/24/2011	221	1.00	1.00	1.00			
11	10/7/2011	1190	8.75	5.00	5.00			
12	4/25/2012	7470	113	34.4	0.500			
13	5/14/2012	6960	99.40	26.4	1.00			
14	4/9/2013	11900	92.9	26.9	12.5			
15	7/18/2013	7070	63.3	2.50	2.50			
16	8/12/2013	13100	95.1	31.3	25.0			
17	9/16/2013	16700	124	36.8	50.0			
18	1/8/2014	21700	195	54.4	50.0			
19	4/4/2014	15300	181	41.3	50.0			
20	4/23/2014	18800	216	54.6	50.0			
21	7/8/2014	5840	96.0	20.8	25.0			
22	4/15/2015	28000	667	133	50.0			
23	7/8/2015	17100	354	79.4	50.0			
24	4/13/2016	19300	652	121	25.0			
25	3/8/2017	40700	1470	161	25.0			
26	7/27/2017	33400	1690	138	25.0			
27	11/29/2017	38100	2120	132	50.0			
28	4/13/2018	27200	1780	131	50.0			
29	4/15/2019	14100	1030	79.8	25.0			
30	3/3/2020	27800	2910	151	25.0			
31	10/15/2020	28300	4600	160	46.8			
32	3/21/2021	30000	3200	100	5.00			
33	3/27/2022	24000	3600	130	10.0			
34								
35								
Coefficient of Variation:		0.87	1.26	1.36	1.02			
Mann-Kendall Statistic (S):		88	214	38	173			
Confidence Factor:		91.0%	>99.9%	71.5%	99.7%			
Concentration Trend:		Prob. Increasing	Increasing	No Trend	Increasing			



Notes:

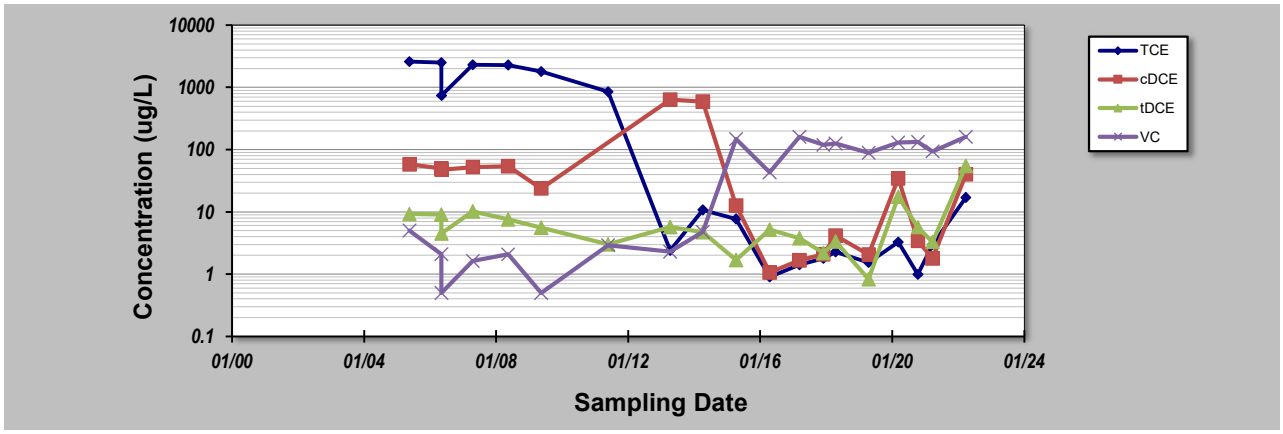
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-17
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/18/2005	2600	58.0	9.20	5.00			
2	5/5/2006	2500	50.0	9.10	2.10			
3	5/7/2006	740	48.0	4.50	0.500			
4	4/18/2007	2320	52.5	10.2	1.62			
5	5/12/2008	2290	54.4	7.57	2.07			
6	5/14/2009	1810	23.7	5.56	0.500			
7	5/24/2011	854		3.02	2.91			
8	4/9/2013	2.40	637	5.70	2.30			
9	4/7/2014	10.8	592	4.70	4.80			
10	4/9/2015	7.71	12.6	1.69	149			
11	4/13/2016	0.900	1.06	5.21	43.1			
12	3/8/2017	1.41	1.66	3.78	160			
13	11/30/2017	1.79	2.08	2.18	119			
14	4/13/2018	2.27	4.13	3.35	125			
15	4/14/2019	1.54	2.06	0.829	89.2			
16	3/5/2020	3.26	34.7	17.5	130			
17	10/13/2020	0.99	3.44	5.66	133			
18	3/22/2021	3.00	1.80	3.30	94.0			
19	3/27/2022	17.0	40.0	55.0	160			
20								
Coefficient of Variation:		1.49	2.14	1.43	1.02			
Mann-Kendall Statistic (S):		-93	-57	-37	101			
Confidence Factor:		100.0%	98.4%	89.5%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	No Trend	Increasing			



Notes:

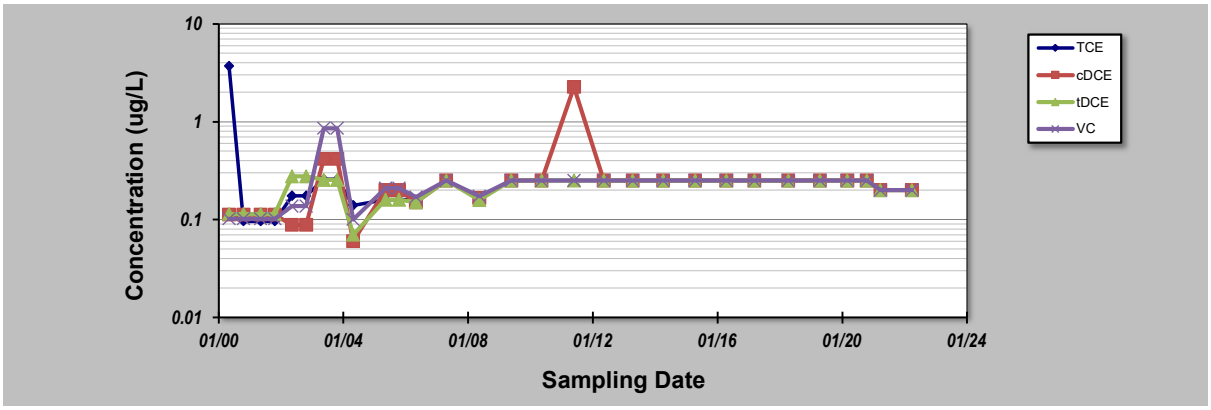
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	HM-102
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/1/2000	3.70	0.112	0.114	0.102			
2	10/17/2000	0.096	0.112	0.114	0.102			
3	5/6/2001	0.096	0.112	0.114	0.102			
4	10/19/2001	0.096	0.112	0.114	0.102			
5	5/9/2002	0.175	0.088	0.276	0.137			
6	10/22/2002	0.175	0.088	0.276	0.137			
7	5/15/2003	0.259	0.415	0.255	0.854			
8	10/21/2003	0.259	0.415	0.255	0.854			
9	4/23/2004	0.140	0.060	0.070	0.100			
10	5/10/2005	0.160	0.200	0.160	0.210			
11	10/13/2005	0.160	0.200	0.160	0.210			
12	5/1/2006	0.160	0.150	0.150	0.170			
13	4/20/2007	0.250	0.250	0.250	0.250			
14	5/12/2008	0.171	0.166	0.158	0.174			
15	5/20/2009	0.250	0.250	0.250	0.250			
16	5/11/2010	0.250	0.250	0.250	0.250			
17	5/26/2011	0.250	2.260	0.250	0.250			
18	5/10/2012	0.250	0.250	0.250	0.250			
19	4/12/2013	0.250	0.250	0.250	0.250			
20	4/4/2014	0.250	0.250	0.250	0.250			
21	4/14/2015	0.250	0.250	0.250	0.250			
22	4/13/2016	0.250	0.250	0.250	0.250			
23	3/8/2017	0.250	0.250	0.250	0.250			
24	4/10/2018	0.250	0.250	0.250	0.250			
25	4/15/2019	0.250	0.250	0.250	0.250			
26	2/28/2020	0.250	0.250	0.250	0.250			
27	10/15/2020	0.250	0.250	0.250	0.250			
28	3/22/2021	0.200	0.200	0.200	0.200			
29	3/28/2022	0.200	0.200	0.200	0.200			
30								
Coefficient of Variation:		1.98	1.39	0.29	0.72			
Mann-Kendall Statistic (S):		88	120	55	134			
Confidence Factor:		94.8%	98.8%	84.3%	99.4%			
Concentration Trend:		Prob. Increasing	Increasing	No Trend	Increasing			



Notes:

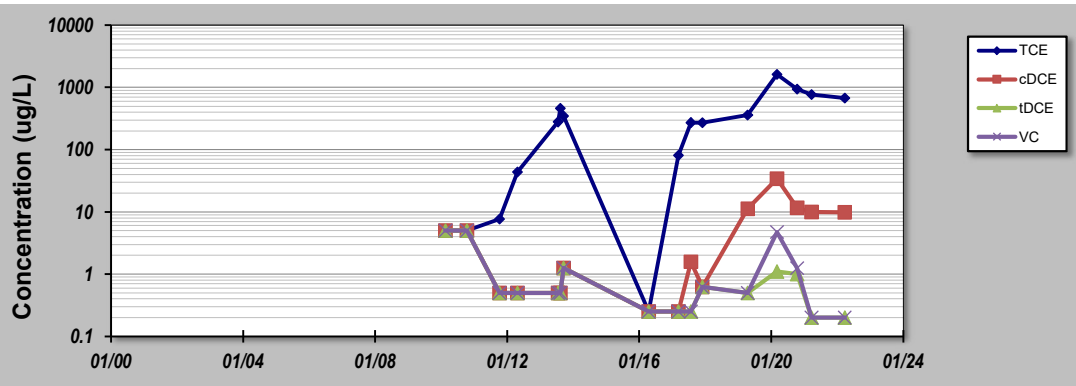
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	W-154
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	2/16/2010	5.00	5.00	5.00	5.00			
2	10/13/2010	5.00	5.00	5.00	5.00			
3	10/10/2011	7.63	0.500	0.500	0.500			
4	4/25/2012	43.9	0.500	0.500	0.500			
5	7/18/2013	279	0.500	0.500	0.500			
6	8/13/2013	463	0.500	0.500	0.500			
7	9/17/2013	346	1.25	1.25	1.25			
8	4/14/2016	0.250	0.250	0.250	0.250			
9	3/10/2017	81.1	0.250	0.250	0.250			
10	7/26/2017	273	1.58	0.250	0.250			
11	11/28/2017	271	0.625	0.625	0.625			
12	4/15/2019	361	11.2	0.500	0.500			
13	3/3/2020	1610	34.1	1.10	4.75			
14	10/15/2020	936	11.6	1.00	1.24			
15	3/21/2021	770	10.0	0.200	0.200			
16	3/24/2022	670	9.90	0.200	0.200			
17								
18								
19								
20								
Coefficient of Variation:		1.14	1.50	1.41	1.34			
Mann-Kendall Statistic (S):		69	36	-41	-39			
Confidence Factor:		99.9%	94.2%	96.5%	95.7%			
Concentration Trend:		Increasing	Prob. Increasing	Decreasing	Decreasing			



Notes:

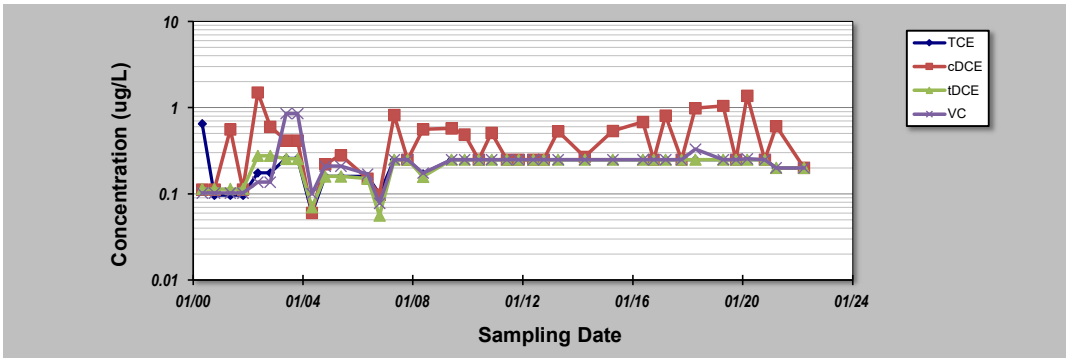
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	C-5
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2000	0.650	0.112	0.114	0.102			
2	10/11/2000	0.096	0.112	0.114	0.102			
3	5/10/2001	0.096	0.560	0.114	0.102			
4	10/26/2001	0.096	0.112	0.114	0.102			
5	5/9/2002	0.175	1.50	0.276	0.137			
6	10/23/2002	0.175	0.600	0.276	0.137			
7	5/22/2003	0.259	0.415	0.255	0.854			
8	10/23/2003	0.259	0.415	0.255	0.854			
9	4/28/2004	0.060	0.060	0.070	0.100			
10	10/21/2004	0.160	0.220	0.160	0.210			
11	5/17/2005	0.160	0.280	0.160	0.210			
12	5/8/2006	0.160	0.150	0.150	0.170			
13	10/12/2006	0.100	0.098	0.056	0.078			
14	4/26/2007	0.250	0.822	0.250	0.250			
15	10/21/2007	0.250	0.250	0.250	0.250			
16	5/13/2008	0.171	0.560	0.158	0.174			
17	5/26/2009	0.250	0.575	0.250	0.250			
18	11/16/2009	0.250	0.489	0.250	0.250			
19	5/24/2010	0.250	0.250	0.250	0.250			
20	11/11/2010	0.250	0.510	0.250	0.250			
21	5/31/2011	0.250	0.250	0.250	0.250			
22	11/4/2011	0.250	0.250	0.250	0.250			
23	5/17/2012	0.250	0.250	0.250	0.250			
24	10/2/2012	0.250	0.250	0.250	0.250			
25	4/12/2013	0.250	0.534	0.250	0.250			
26	4/2/2014	0.250	0.270	0.250	0.250			
27	4/8/2015	0.250	0.536	0.250	0.250			
28	5/13/2016	0.250	0.682	0.250	0.250			
29	10/4/2016	0.250	0.250	0.250	0.250			
30	3/9/2017	0.250	0.808	0.250	0.250			
31	10/9/2017	0.250	0.250	0.250	0.250			
32	4/10/2018	0.250	0.987	0.250	0.329			
33	4/15/2019	0.250	1.05	0.250	0.250			
34	10/2/2019	0.250	0.250	0.250	0.250			
35	2/28/2020	0.250	1.38	0.250	0.254			
36	10/19/2020	0.250	0.250	0.250	0.250			
37	3/19/2021	0.200	0.610	0.200	0.200			
38	3/24/2022	0.200	0.200	0.200	0.200			
39								
40								
Coefficient of Variation:		0.41	0.76	0.28	0.64			
Mann-Kendall Statistic (S):		141	132	90	233			
Confidence Factor:		96.1%	95.0%	86.8%	99.8%			
Concentration Trend:		Increasing	Prob. Increasing	No Trend	Increasing			



Notes:

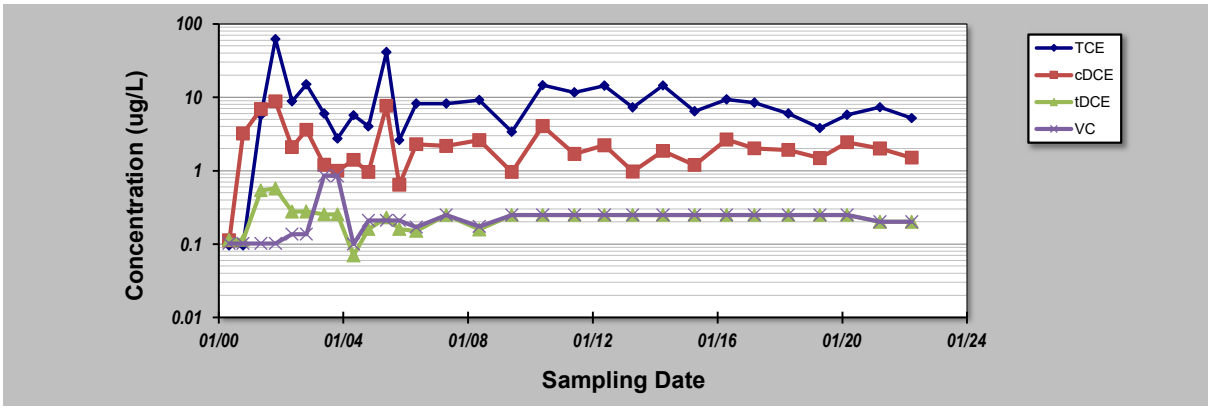
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	EGL-2
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2000	0.096	0.112	0.114	0.102			
2	10/11/2000	0.096	3.20	0.114	0.102			
3	5/8/2001	5.70	6.90	0.540	0.102			
4	10/26/2001	62.0	8.80	0.570	0.102			
5	5/10/2002	8.80	2.10	0.276	0.137			
6	10/23/2002	15.0	3.60	0.276	0.137			
7	5/22/2003	6.00	1.20	0.255	0.854			
8	10/23/2003	2.74	1.00	0.255	0.854			
9	4/28/2004	5.70	1.40	0.070	0.100			
10	10/20/2004	4.00	0.960	0.160	0.210			
11	5/18/2005	41.0	7.60	0.230	0.210			
12	10/17/2005	2.60	0.640	0.160	0.210			
13	5/2/2006	8.20	2.30	0.150	0.170			
14	4/19/2007	8.19	2.17	0.250	0.250			
15	5/12/2008	9.14	2.60	0.158	0.174			
16	5/26/2009	3.38	0.955	0.250	0.250			
17	5/24/2010	14.6	4.03	0.250	0.250			
18	5/31/2011	11.6	1.69	0.250	0.250			
19	5/16/2012	14.4	2.22	0.250	0.250			
20	4/12/2013	7.26	0.969	0.250	0.250			
21	4/2/2014	14.5	1.85	0.250	0.250			
22	4/8/2015	6.42	1.19	0.250	0.250			
23	4/15/2016	9.38	2.64	0.250	0.250			
24	3/9/2017	8.46	2.01	0.250	0.250			
25	4/10/2018	5.99	1.91	0.250	0.250			
26	4/15/2019	3.79	1.48	0.250	0.250			
27	2/28/2020	5.75	2.43	0.250	0.250			
28	3/19/2021	7.30	2.00	0.200	0.200			
29	3/25/2022	5.20	1.50	0.200	0.200			
30								
Coefficient of Variation:		1.21	0.83	0.43	0.73			
Mann-Kendall Statistic (S):		16	-30	-29	140			
Confidence Factor:		61.0%	70.5%	69.9%	99.6%			
Concentration Trend:		No Trend	Stable	Stable	Increasing			



Notes:

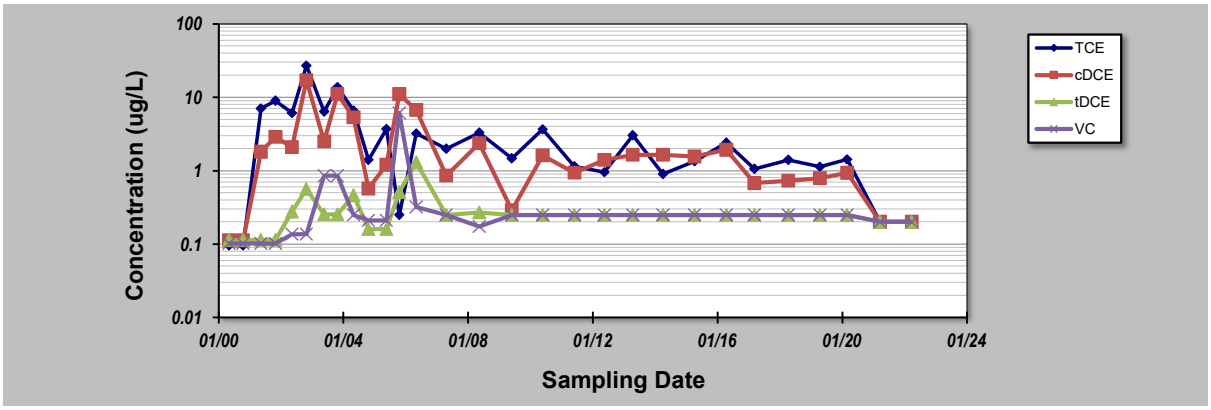
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	LF05-S6
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	5/3/2000	0.096	0.112	0.114	0.102			
2	10/11/2000	0.096	0.112	0.114	0.102			
3	5/8/2001	7.00	1.80	0.114	0.102			
4	10/26/2001	9.00	2.90	0.114	0.102			
5	5/8/2002	6.10	2.10	0.276	0.137			
6	10/23/2002	27.0	17.0	0.560	0.137			
7	5/22/2003	6.40	2.50	0.255	0.854			
8	10/23/2003	13.7	11.1	0.255	0.854			
9	4/28/2004	6.60	5.30	0.460	0.250			
10	10/20/2004	1.40	0.570	0.160	0.210			
11	5/18/2005	3.70	1.20	0.160	0.210			
12	10/17/2005	0.250	11.0	0.510	6.10			
13	5/2/2006	3.20	6.70	1.30	0.320			
14	4/19/2007	1.98	0.860	0.250	0.250			
15	5/12/2008	3.29	2.36	0.270	0.174			
16	5/26/2009	1.47	0.289	0.250	0.250			
17	5/24/2010	3.65	1.61	0.250	0.250			
18	5/31/2011	1.14	0.936	0.250	0.250			
19	5/16/2012	0.948	1.40	0.250	0.250			
20	4/12/2013	3.04	1.64	0.250	0.250			
21	4/2/2014	0.902	1.64	0.250	0.250			
22	4/8/2015	1.35	1.55	0.250	0.250			
23	4/14/2016	2.40	1.92	0.250	0.250			
24	3/9/2017	1.06	0.677	0.250	0.250			
25	4/10/2018	1.40	0.728	0.250	0.250			
26	4/15/2019	1.13	0.790	0.250	0.250			
27	2/28/2020	1.42	0.931	0.250	0.250			
28	3/19/2021	0.200	0.200	0.200	0.200			
29	3/25/2022	0.200	0.200	0.200	0.200			
30								
Coefficient of Variation:		1.44	1.43	0.77	2.40			
Mann-Kendall Statistic (S):		-153	-107	-13	83			
Confidence Factor:		99.8%	97.7%	58.8%	93.8%			
Concentration Trend:		Decreasing	Decreasing	Stable	Prob. Increasing			



Notes:

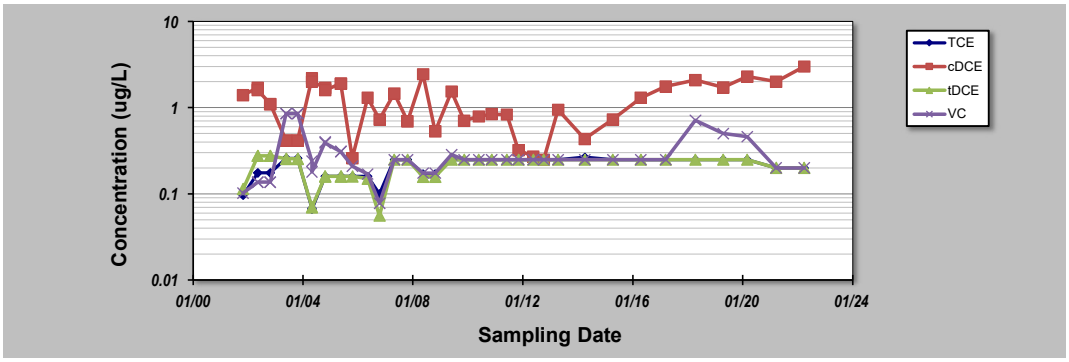
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2022	Job ID:	F-218
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	10/26/2001	0.096	1.40	0.114	0.102			
2	5/10/2002	0.175	1.70	0.276	0.137			
3	5/10/2002	0.175	1.60	0.276	0.137			
4	10/23/2002	0.175	1.10	0.276	0.137			
5	10/23/2002	0.175	1.10	0.276	0.137			
6	5/22/2003	0.259	0.415	0.255	0.854			
7	5/22/2003	0.259	0.415	0.255	0.854			
8	10/23/2003	0.259	0.415	0.255	0.854			
9	10/23/2003	0.259	0.415	0.255	0.854			
10	4/28/2004	0.068	2.200	0.070	0.240			
11	4/28/2004	0.066	2.00	0.070	0.180			
12	10/20/2004	0.160	1.70	0.160	0.400			
13	10/20/2004	0.160	1.60	0.160	0.390			
14	5/17/2005	0.160	1.90	0.160	0.310			
15	5/17/2005	0.160	1.90	0.160	0.310			
16	10/17/2005	0.160	0.260	0.160	0.210			
17	5/8/2006	0.160	1.30	0.150	0.170			
18	10/12/2006	0.100	0.730	0.056	0.078			
19	4/26/2007	0.250	1.46	0.250	0.250			
20	10/21/2007	0.250	0.693	0.250	0.250			
21	5/13/2008	0.171	2.44	0.158	0.174			
22	10/21/2008	0.171	0.530	0.158	0.174			
23	5/26/2009	0.250	1.54	0.250	0.285			
24	11/11/2009	0.250	0.706	0.250	0.250			
25	5/24/2010	0.250	0.793	0.250	0.250			
26	11/10/2010	0.250	0.841	0.250	0.250			
27	5/31/2011	0.250	0.832	0.250	0.250			
28	11/4/2011	0.250	0.321	0.250	0.250			
29	5/17/2012	0.250	0.271	0.250	0.250			
30	10/2/2012	0.250	0.250	0.250	0.250			
31	4/12/2013	0.250	0.945	0.250	0.250			
32	4/2/2014	0.266	0.434	0.250	0.250			
33	4/8/2015	0.250	0.728	0.250	0.250			
34	4/14/2016	0.250	1.30	0.250	0.250			
35	3/9/2017	0.250	1.76	0.250	0.250			
36	4/10/2018	0.250	2.09	0.250	0.714			
37	4/15/2019	0.250	1.72	0.250	0.500			
38	2/28/2020	0.250	2.30	0.250	0.461			
39	3/19/2021	0.200	2.00	0.200	0.200			
40	3/25/2022	0.200	3.00	0.200	0.200			
Coefficient of Variation:		0.28	0.58	0.29	0.68			
Mann-Kendall Statistic (S):		177	60	-58	82			
Confidence Factor:		98.1%	75.3%	74.5%	82.6%			
Concentration Trend:		Increasing	No Trend	Stable	No Trend			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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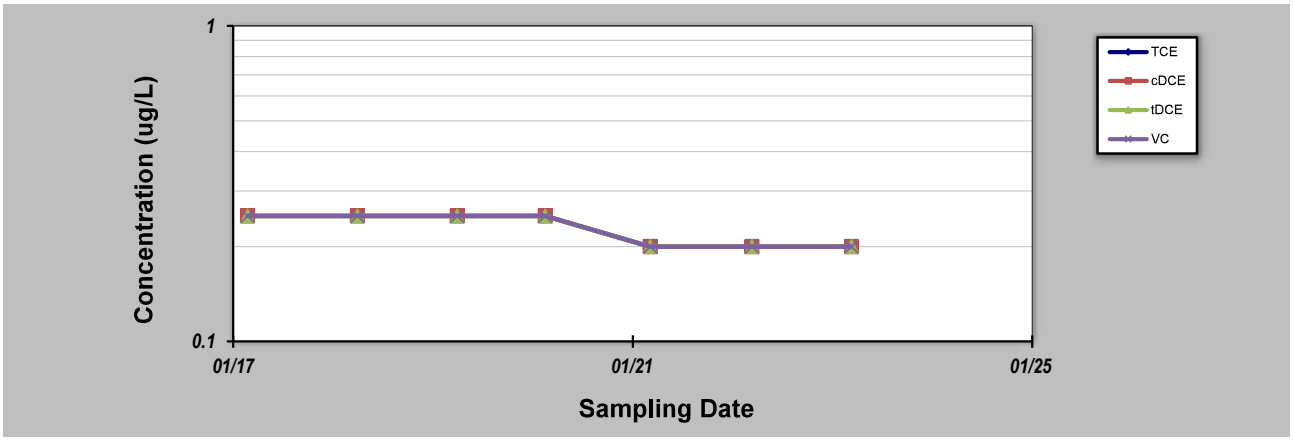
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ANNUAL LOCATIONS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-8M
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	0.250	0.250	0.250	0.250			
2	4/14/2018	0.250	0.250	0.250	0.250			
3	4/14/2019	0.250	0.250	0.250	0.250			
4	3/1/2020	0.250	0.250	0.250	0.250			
5	3/20/2021	0.200	0.200	0.200	0.200			
6	3/27/2022	0.200	0.200	0.200	0.200			
7	3/26/2023	0.200	0.200	0.200	0.200			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.12	0.12	0.12	0.12			
Mann-Kendall Statistic (S):		-12	-12	-12	-12			
Confidence Factor:		94.9%	94.9%	94.9%	94.9%			
Concentration Trend:		Prob. Decreasing	Prob. Decreasing	Prob. Decreasing	Prob. Decreasing			



Notes:

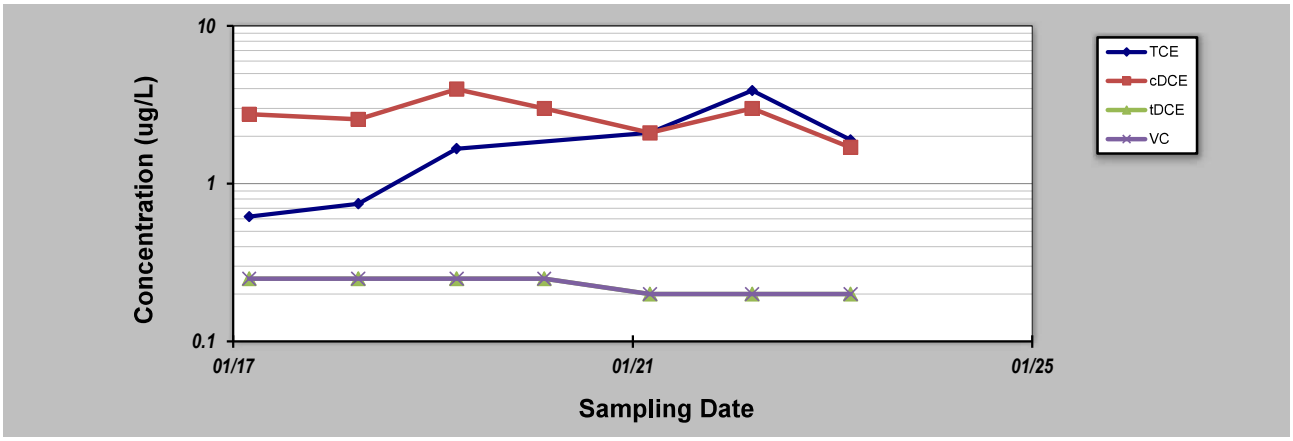
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WL-001JEPM
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	0.619	2.76	0.250	0.250			
2	4/17/2018	0.748	2.56	0.250	0.250			
3	4/12/2019	1.67	3.98	0.250	0.250			
4	2/26/2020	1.93	3.00	0.250	0.250			
5	3/19/2021	2.10	2.10	0.200	0.200			
6	3/28/2022	3.90	3.00	0.200	0.200			
7	3/23/2023	1.90	1.70	0.200	0.200			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.65	0.27	0.12	0.12			
Mann-Kendall Statistic (S):		11	-6	-12	-12			
Confidence Factor:		97.2%	76.4%	94.9%	94.9%			
Concentration Trend:		Increasing	Stable	Prob. Decreasing	Prob. Decreasing			



Notes:

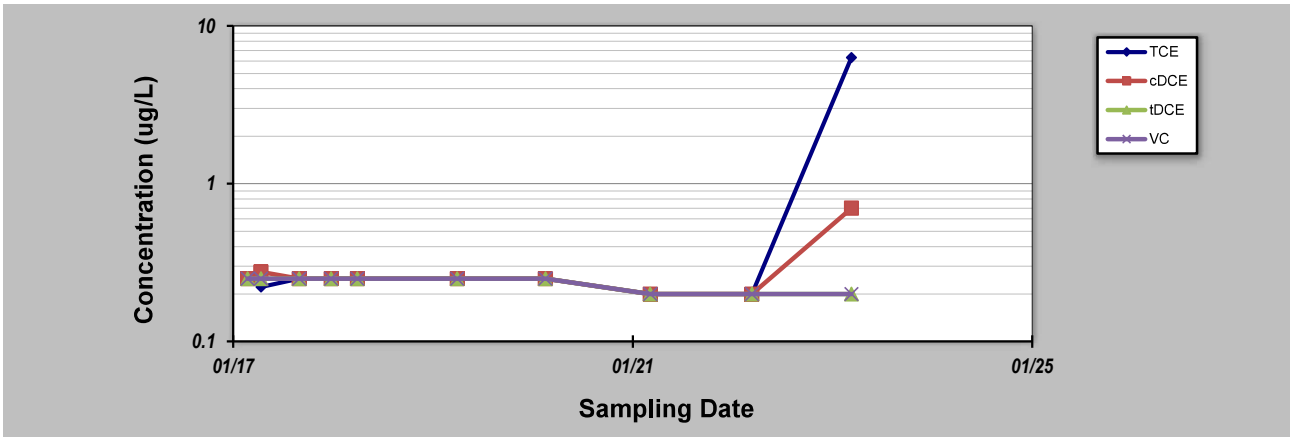
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-8UN
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	0.250	0.250	0.250	0.250			
2	4/26/2017	0.222	0.276	0.250	0.250			
3	9/13/2017	0.250	0.250	0.250	0.250			
4	1/8/2018	0.250	0.250	0.250	0.250			
5	4/14/2018	0.250	0.250	0.250	0.250			
6	4/14/2019	0.250	0.250	0.250	0.250			
7	3/1/2020	0.250	0.250	0.250	0.250			
8	3/20/2021	0.200	0.200	0.200	0.200			
9	3/27/2022	0.200	0.200	0.200	0.200			
10	3/26/2023	6.30	0.700	0.200	0.200			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		2.28	0.51	0.10	0.10			
Mann-Kendall Statistic (S):		-1	-9	-21	-21			
Confidence Factor:		50.0%	75.8%	96.4%	96.4%			
Concentration Trend:		No Trend	Stable	Decreasing	Decreasing			



Notes:

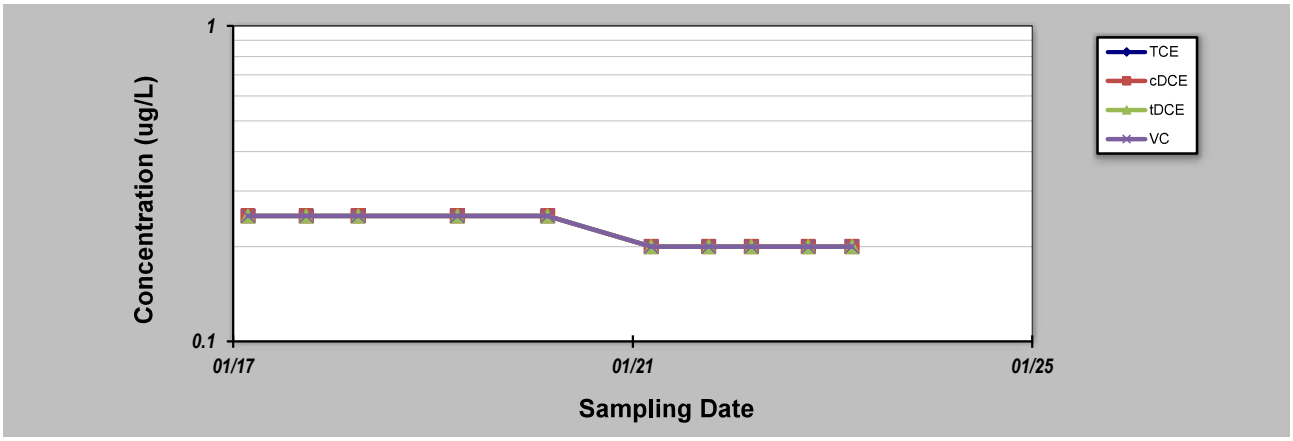
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WS-H3
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	0.250	0.250	0.250			
2	10/9/2017	0.250	0.250	0.250	0.250			
3	4/17/2018	0.250	0.250	0.250	0.250			
4	4/15/2019	0.250	0.250	0.250	0.250			
5	3/9/2020	0.250	0.250	0.250	0.250			
6	3/24/2021	0.200	0.200	0.200	0.200			
7	10/20/2021	0.200	0.200	0.200	0.200			
8	3/25/2022	0.200	0.200	0.200	0.200			
9	10/19/2022	0.200	0.200	0.200	0.200			
10	3/28/2023	0.200	0.200	0.200	0.200			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.12	0.12	0.12	0.12			
Mann-Kendall Statistic (S):		-25	-25	-25	-25			
Confidence Factor:		98.6%	98.6%	98.6%	98.6%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

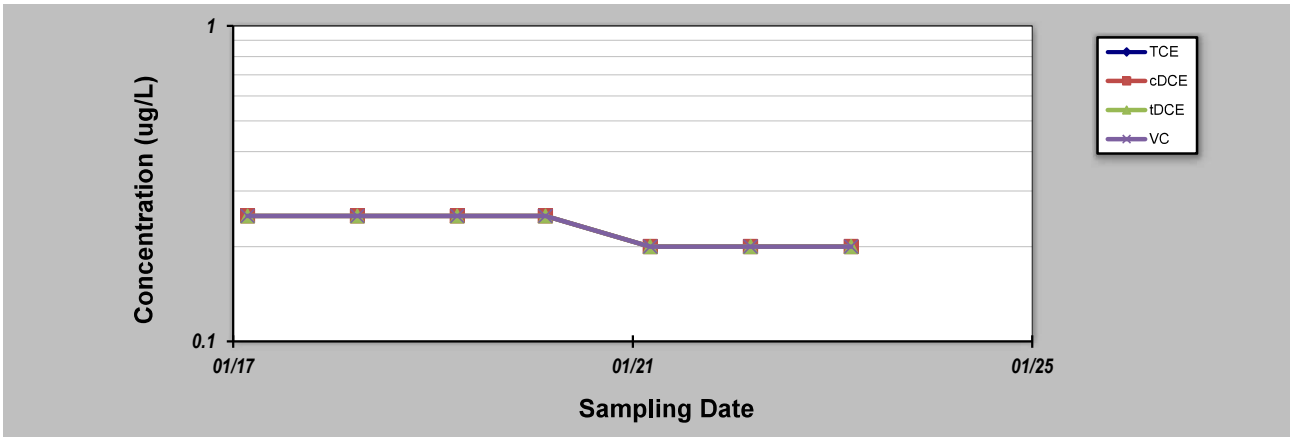
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-11U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	0.250	0.250	0.250	0.250			
2	4/14/2018	0.250	0.250	0.250	0.250			
3	4/14/2019	0.250	0.250	0.250	0.250			
4	3/1/2020	0.250	0.250	0.250	0.250			
5	3/20/2021	0.200	0.200	0.200	0.200			
6	3/22/2022	0.200	0.200	0.200	0.200			
7	3/25/2023	0.200	0.200	0.200	0.200			
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9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.12	0.12	0.12	0.12			
Mann-Kendall Statistic (S):		-12	-12	-12	-12			
Confidence Factor:		94.9%	94.9%	94.9%	94.9%			
Concentration Trend:		Prob. Decreasing	Prob. Decreasing	Prob. Decreasing	Prob. Decreasing			



Notes:

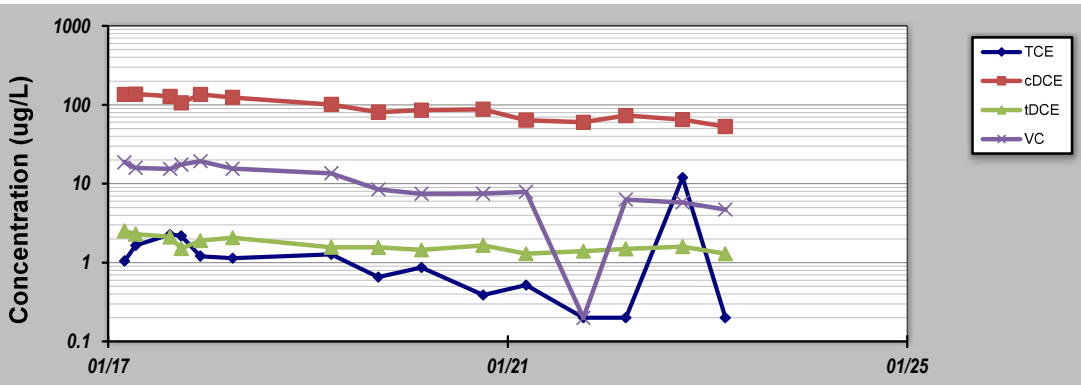
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-22U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	1.05	136	2.53	18.7			
2	4/25/2017	1.66	137	2.30	15.9			
3	8/29/2017	2.28	128	2.12	15.4			
4	10/9/2017	2.18	106	1.51	17.5			
5	12/18/2017	1.21	136	1.90	19.3			
6	4/15/2018	1.14	124	2.07	15.5			
7	4/11/2019	1.27	101	1.57	13.6			
8	9/30/2019	0.655	80.6	1.56	8.47			
9	3/5/2020	0.870	85.7	1.45	7.46			
10	10/17/2020	0.390	87.9	1.66	7.48			
11	3/23/2021	0.520	64.0	1.30	7.90			
12	10/19/2021	0.200	60.0	1.40	0.200			
13	3/23/2022	0.200	73.0	1.50	6.30			
14	10/17/2022	12.0	65.0	1.60	5.80			
15	3/22/2023	0.20	53.0	1.30	4.70			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.70	0.32	0.22	0.54			
Mann-Kendall Statistic (S):		-52	-82	-64	-79			
Confidence Factor:		99.5%	>99.9%	100.0%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

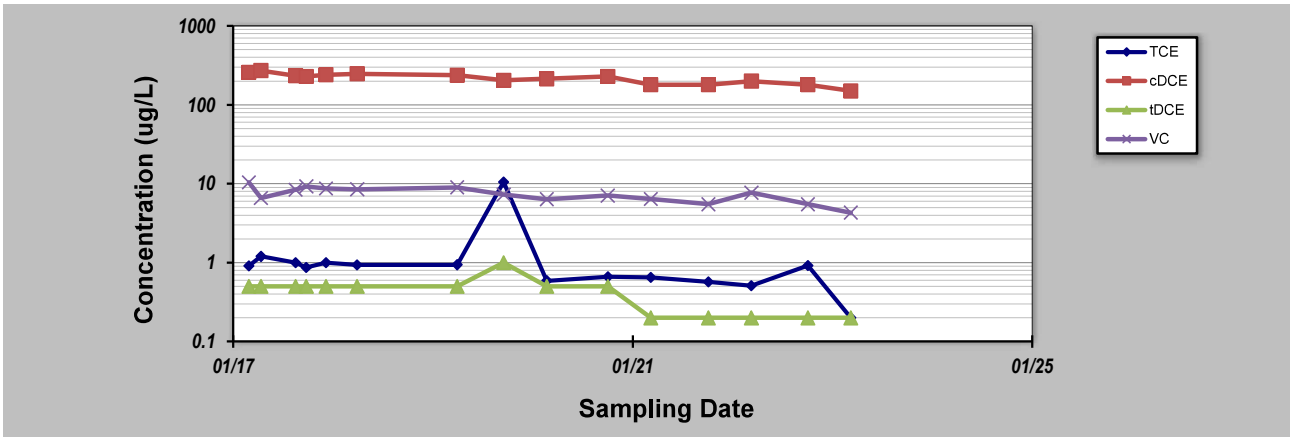
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-27U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/13/2017	0.910	259	0.500	10.4			
2	4/26/2017	1.20	272	0.500	6.60			
3	8/31/2017	1.00	234	0.500	8.39			
4	10/9/2017	0.87	229	0.500	9.26			
5	12/20/2017	1.00	241	0.500	8.71			
6	4/13/2018	0.937	248	0.500	8.50			
7	4/14/2019	0.940	237	0.500	9.00			
8	10/1/2019	10.5	205	1.00	7.30			
9	3/6/2020	0.590	214	0.500	6.37			
10	10/16/2020	0.662	229	0.500	7.07			
11	3/22/2021	0.650	180	0.200	6.40			
12	10/19/2021	0.570	180	0.200	5.50			
13	3/25/2022	0.510	200	0.200	7.70			
14	10/18/2022	0.920	180	0.200	5.50			
15	3/24/2023	0.200	150	0.200	4.3			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.76	0.16	0.49	0.22			
Mann-Kendall Statistic (S):		-54	-75	-45	-62			
Confidence Factor:		99.7%	>99.9%	98.6%	99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

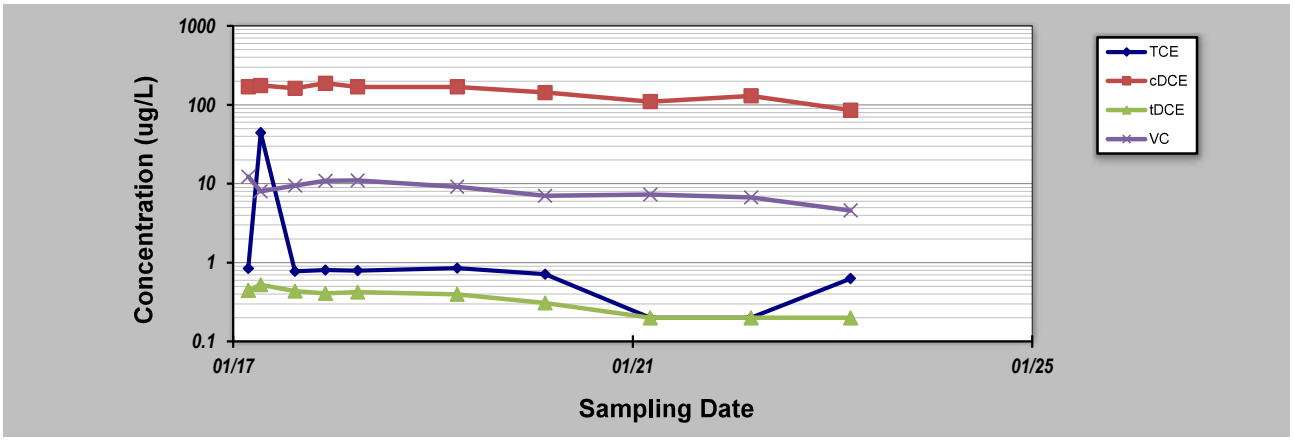
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WETPU001
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.846	168	0.446	12.3			
2	4/25/2017	44.5	176	0.524	8.02			
3	8/29/2017	0.774	162	0.436	9.48			
4	12/18/2017	0.804	188	0.407	10.9			
5	4/15/2018	0.795	168	0.423	11.0			
6	4/14/2019	0.852	168	0.397	9.18			
7	2/29/2020	0.711	143	0.308	7.04			
8	3/20/2021	0.200	110	0.200	7.30			
9	3/24/2022	0.200	130	0.200	6.70			
10	3/23/2023	0.630	86	0.200	4.60			
11								
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15								
16								
17								
18								
19								
20								
Coefficient of Variation:		2.76	0.22	0.34	0.27			
Mann-Kendall Statistic (S):		-26	-28	-38	-29			
Confidence Factor:		98.9%	99.4%	>99.9%	99.5%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

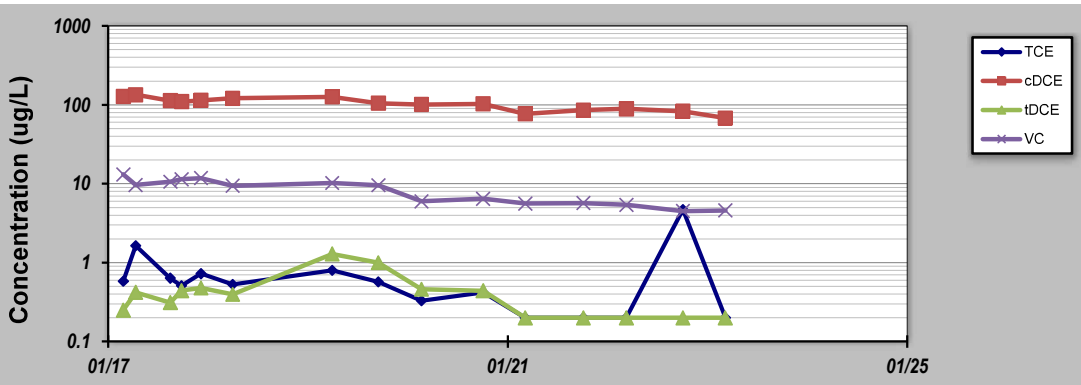
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WITCPU006
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.580	128	0.250	13.1			
2	4/25/2017	1.64	134	0.420	9.63			
3	8/30/2017	0.635	113	0.312	10.6			
4	10/10/2017	0.509	110	0.441	11.4			
5	12/20/2017	0.725	114	0.477	11.8			
6	4/15/2018	0.528	121	0.396	9.44			
7	4/14/2019	0.798	126	1.29	10.2			
8	9/30/2019	0.570	105	0.999	9.57			
9	3/5/2020	0.330	101	0.460	5.98			
10	10/17/2020	0.418	103	0.440	6.45			
11	3/20/2021	0.200	77.0	0.200	5.60			
12	10/19/2021	0.200	86.0	0.200	5.70			
13	3/25/2022	0.200	89.0	0.200	5.40			
14	10/18/2022	4.70	83.0	0.200	4.50			
15	3/22/2023	0.200	68.0	0.200	4.60			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.39	0.19	0.73	0.35			
Mann-Kendall Statistic (S):		-45	-75	-31	-81			
Confidence Factor:		98.6%	>99.9%	93.0%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Prob. Decreasing	Decreasing			



Notes:

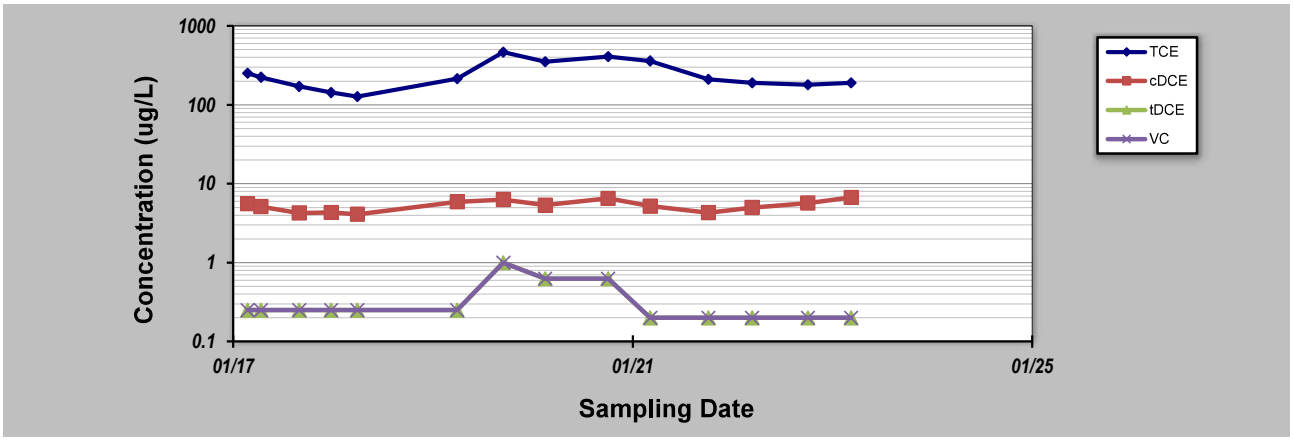
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	P-9US
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	252	5.58	0.250	0.250			
2	4/26/2017	224	5.14	0.250	0.250			
3	9/13/2017	171	4.26	0.250	0.250			
4	1/8/2018	143	4.32	0.250	0.250			
5	4/14/2018	127	4.11	0.250	0.250			
6	4/14/2019	215	5.90	0.250	0.250			
7	9/30/2019	467	6.31	1.00	1.00			
8	2/29/2020	353	5.37	0.625	0.625			
9	10/17/2020	408	6.53	0.625	0.625			
10	3/20/2021	360	5.20	0.200	0.200			
11	10/19/2021	210	4.30	0.200	0.200			
12	3/28/2022	190	5.00	0.200	0.200			
13	10/18/2022	180	5.70	0.200	0.200			
14	3/25/2023	190	6.70	0.200	0.200			
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19								
20								
Coefficient of Variation:		0.42	0.16	0.71	0.71			
Mann-Kendall Statistic (S):		-6	21	-29	-29			
Confidence Factor:		60.6%	86.0%	93.7%	93.7%			
Concentration Trend:		Stable	No Trend	Prob. Decreasing	Prob. Decreasing			



Notes:

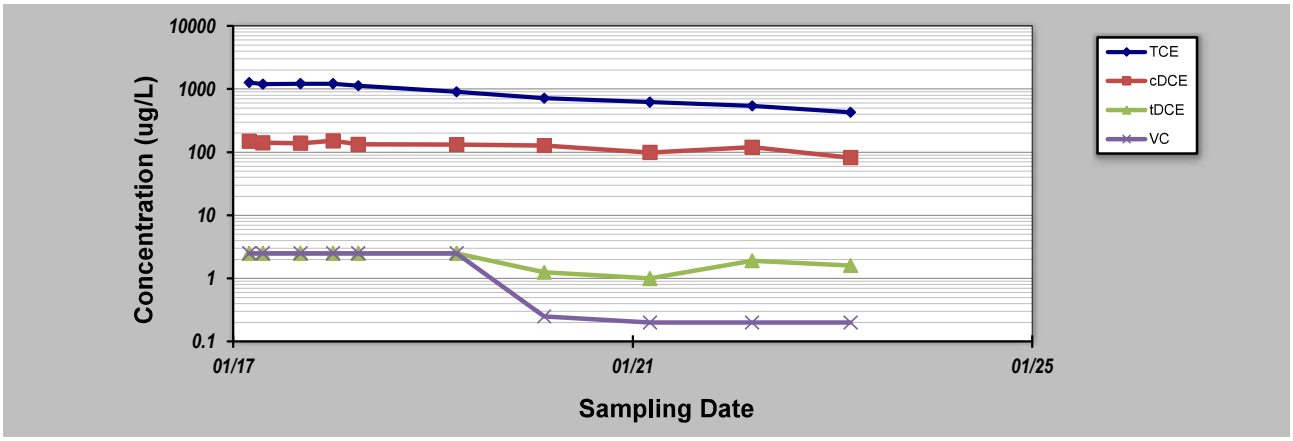
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WITCUS001
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	1270	149	2.50	2.50			
2	5/3/2017	1200	141	2.50	2.50			
3	9/18/2017	1220	139	2.50	2.50			
4	1/15/2018	1220	151	2.50	2.50			
5	4/17/2018	1130	133	2.50	2.50			
6	4/12/2019	904	132	2.50	2.50			
7	2/26/2020	717	127	1.25	0.250			
8	3/19/2021	620	99.0	1.00	0.200			
9	3/28/2022	540	120	1.90	0.200			
10	3/23/2023	430	82	1.60	0.200			
11								
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17								
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19								
20								
Coefficient of Variation:		0.35	0.17	0.29	0.75			
Mann-Kendall Statistic (S):		-40	-37	-22	-27			
Confidence Factor:		>99.9%	>99.9%	97.1%	99.2%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

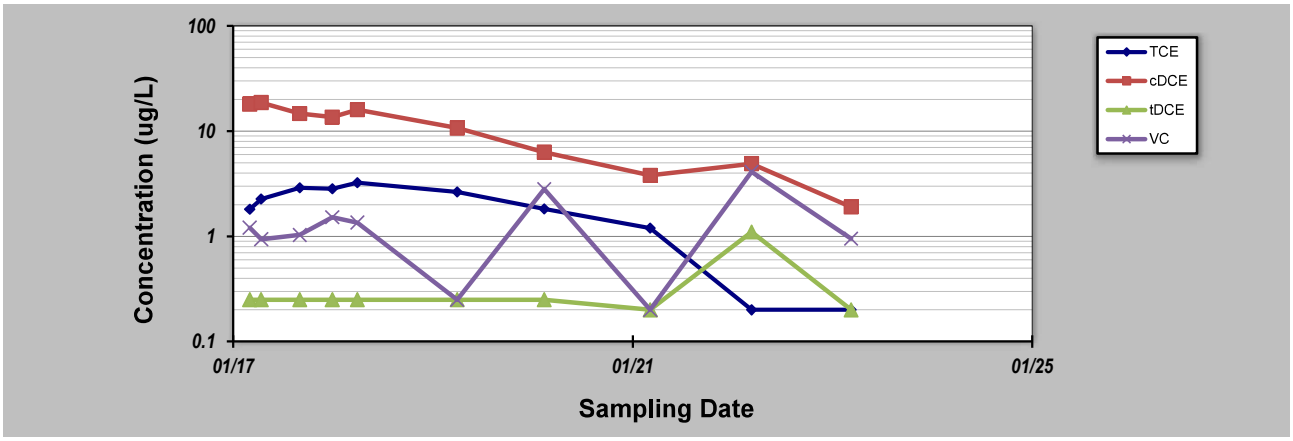
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WJEUS002
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/16/2017	1.81	18.1	0.250	1.21			
2	4/27/2017	2.26	18.7	0.250	0.940			
3	9/15/2017	2.89	14.7	0.250	1.03			
4	1/12/2018	2.84	13.6	0.250	1.52			
5	4/14/2018	3.23	16.0	0.250	1.35			
6	4/14/2019	2.64	10.7	0.250	0.250			
7	2/26/2020	1.82	6.31	0.250	2.81			
8	3/20/2021	1.20	3.80	0.200	0.200			
9	3/26/2022	0.200	4.90	1.10	4.10			
10	3/25/2023	0.200	1.90	0.200	0.950			
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Coefficient of Variation:		0.57	0.57	0.84	0.83			
Mann-Kendall Statistic (S):		-20	-37	-7	3			
Confidence Factor:		95.5%	>99.9%	70.0%	56.9%			
Concentration Trend:		Decreasing	Decreasing	Stable	No Trend			



Notes:

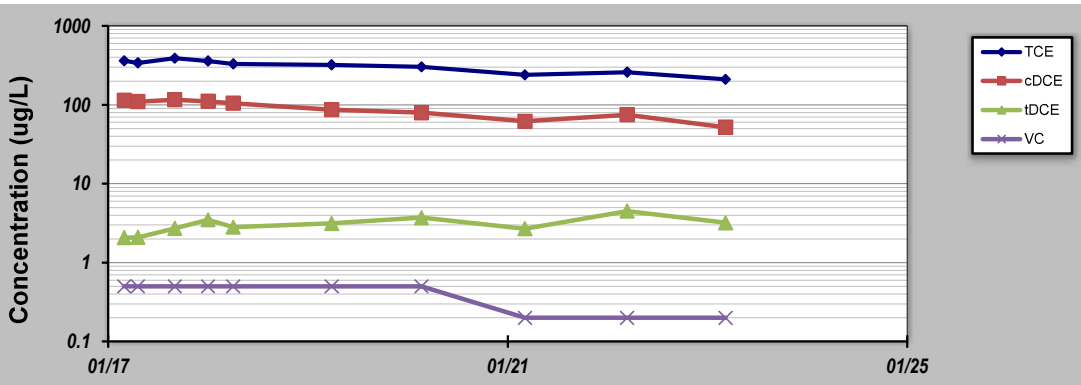
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WJEUS008
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	363	114	2.08	0.500			
2	5/3/2017	341	110	2.10	0.500			
3	9/15/2017	389	116	2.72	0.500			
4	1/15/2018	360	111	3.49	0.500			
5	4/17/2018	331	105	2.81	0.500			
6	4/12/2019	322	86.9	3.14	0.500			
7	3/5/2020	303	79.5	3.71	0.500			
8	3/19/2021	240	62.0	2.70	0.200			
9	3/28/2022	260	75.0	4.50	0.200			
10	3/23/2023	210	52.0	3.20	0.200			
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Coefficient of Variation:		0.19	0.26	0.24	0.35			
Mann-Kendall Statistic (S):		-37	-37	25	-21			
Confidence Factor:		>99.9%	>99.9%	98.6%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Increasing	Decreasing			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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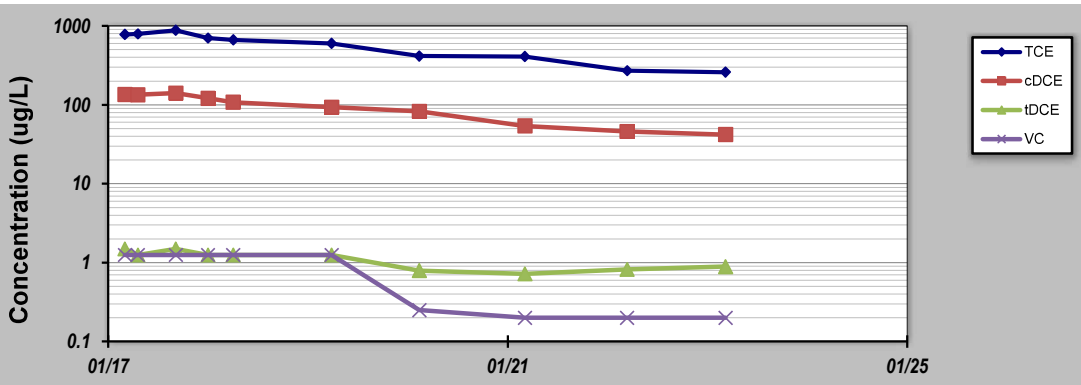
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WL-013JEUS
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/17/2017	781	135	1.49	1.25			
2	5/3/2017	791	134	1.25	1.25			
3	9/19/2017	883	141	1.49	1.25			
4	1/15/2018	704	121	1.25	1.25			
5	4/17/2018	667	108	1.25	1.25			
6	4/12/2019	602	93.5	1.25	1.25			
7	2/26/2020	415	82.8	0.794	0.250			
8	3/19/2021	410	54.0	0.720	0.200			
9	3/28/2022	270	46.0	0.820	0.200			
10	3/23/2023	260	42.0	0.890	0.200			
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Coefficient of Variation:		0.39	0.40	0.26	0.64			
Mann-Kendall Statistic (S):		-39	-41	-26	-27			
Confidence Factor:		>99.9%	>99.9%	98.9%	99.2%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

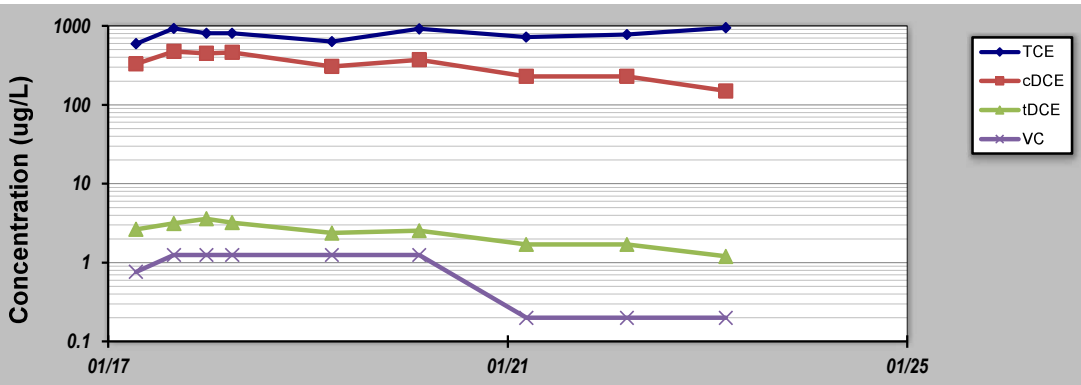
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	F-218
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	4/26/2017	596	329	2.65	0.766			
2	9/12/2017	929	477	3.14	1.25			
3	1/9/2018	809	450	3.60	1.25			
4	4/13/2018	810	463	3.22	1.25			
5	4/13/2019	632	307	2.37	1.25			
6	2/26/2020	918	374	2.54	1.25			
7	3/24/2021	720	230	1.70	0.200			
8	3/27/2022	780	230	1.70	0.200			
9	3/24/2023	950	150	1.20	0.200			
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Coefficient of Variation:		0.16	0.35	0.33	0.60			
Mann-Kendall Statistic (S):		8	-23	-23	-13			
Confidence Factor:		76.2%	99.1%	99.1%	89.0%			
Concentration Trend:		No Trend	Decreasing	Decreasing	Stable			



Notes:

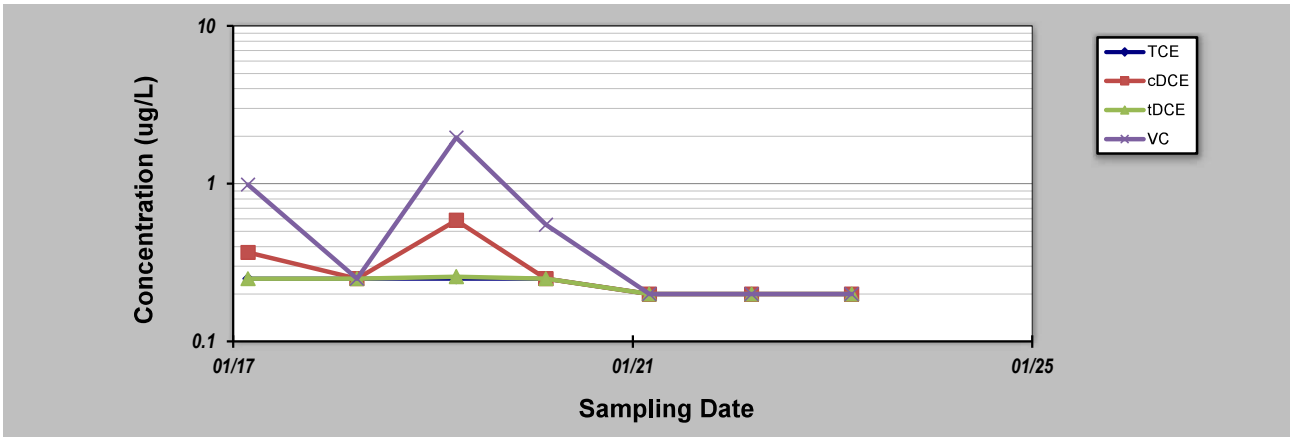
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	FT09-12C
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	0.367	0.250	0.987			
2	4/12/2018	0.250	0.250	0.250	0.250			
3	4/11/2019	0.250	0.586	0.258	1.96			
4	3/3/2020	0.250	0.250	0.250	0.550			
5	3/17/2021	0.200	0.200	0.200	0.200			
6	3/26/2022	0.200	0.200	0.200	0.200			
7	3/27/2023	0.200	0.200	0.200	0.200			
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Coefficient of Variation:		0.12	0.48	0.12	1.06			
Mann-Kendall Statistic (S):		-12	-13	-11	-12			
Confidence Factor:		94.9%	96.5%	93.2%	94.9%			
Concentration Trend:		Prob. Decreasing	Decreasing	Prob. Decreasing	Prob. Decreasing			



Notes:

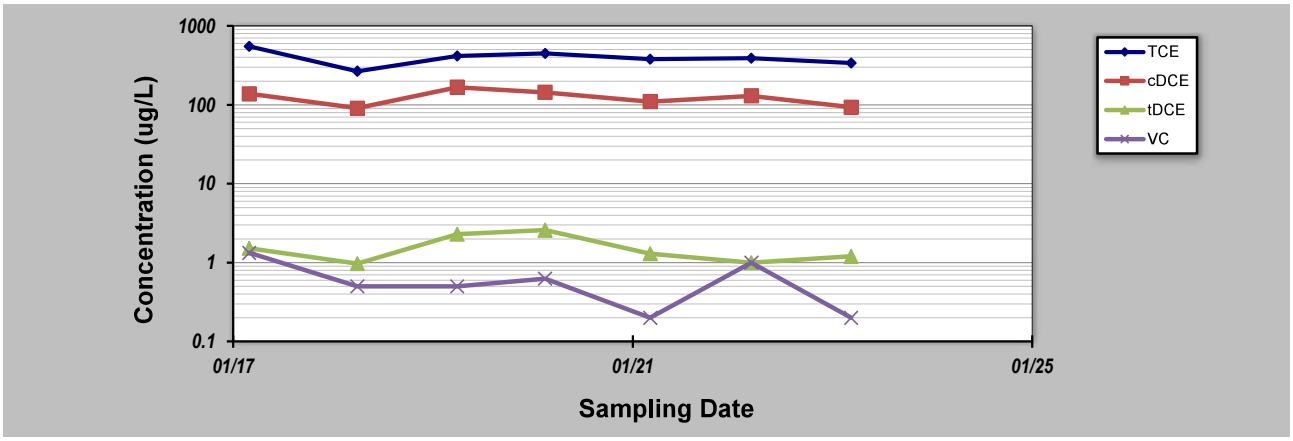
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-88
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	552	138	1.52	1.33			
2	4/14/2018	267	90.9	0.972	0.500			
3	4/14/2019	417	167	2.29	0.500			
4	2/29/2020	450	144	2.58	0.625			
5	3/20/2021	380	110	1.30	0.200			
6	3/25/2022	390	130	1.00	1.00			
7	3/25/2023	340	93	1.20	0.200			
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Coefficient of Variation:		0.22	0.23	0.41	0.67			
Mann-Kendall Statistic (S):		-7	-5	-3	-7			
Confidence Factor:		80.9%	71.9%	61.4%	80.9%			
Concentration Trend:		Stable	Stable	Stable	Stable			



Notes:

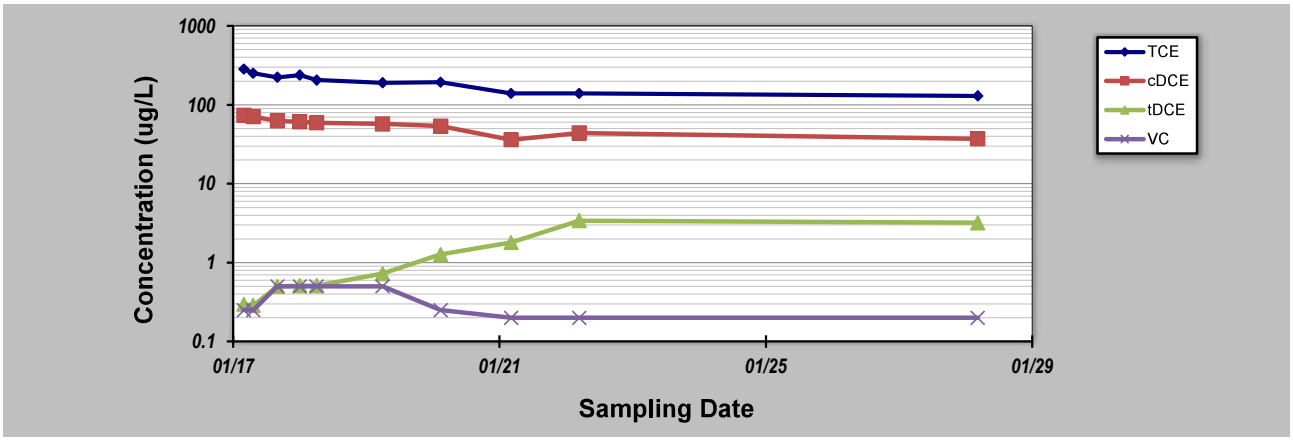
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-95
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	284	74.0	0.297	0.250			
2	5/4/2017	252	70.9	0.287	0.250			
3	9/14/2017	224	62.6	0.500	0.500			
4	1/15/2018	239	60.8	0.512	0.500			
5	4/17/2018	206	59.1	0.512	0.500			
6	4/14/2019	191	57.3	0.725	0.500			
7	2/26/2020	194	53.7	1.27	0.250			
8	3/19/2021	140	36.0	1.80	0.200			
9	3/28/2022	140	44.0	3.40	0.200			
10	3/23/2028	130	37.0	3.20	0.200			
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Coefficient of Variation:		0.26	0.23	0.94	0.43			
Mann-Kendall Statistic (S):		-40	-41	40	-17			
Confidence Factor:		>99.9%	>99.9%	>99.9%	92.2%			
Concentration Trend:		Decreasing	Decreasing	Increasing	Prob. Decreasing			



Notes:

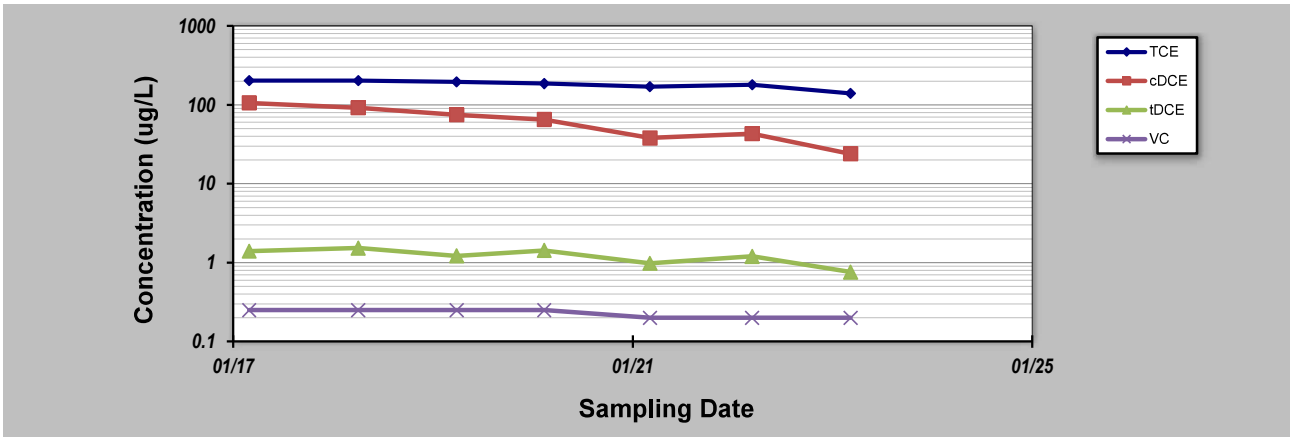
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-112
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/14/2017	203	106	1.40	0.250			
2	4/17/2018	203	91.6	1.53	0.250			
3	4/12/2019	196	74.7	1.22	0.250			
4	2/26/2020	186	65.2	1.43	0.250			
5	3/19/2021	170	38.0	0.980	0.200			
6	3/28/2022	180	43.0	1.20	0.200			
7	3/23/2023	140	24.0	0.76	0.200			
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Coefficient of Variation:		0.12	0.47	0.22	0.12			
Mann-Kendall Statistic (S):		-18	-19	-13	-12			
Confidence Factor:		99.7%	99.9%	96.5%	94.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Prob. Decreasing			



Notes:

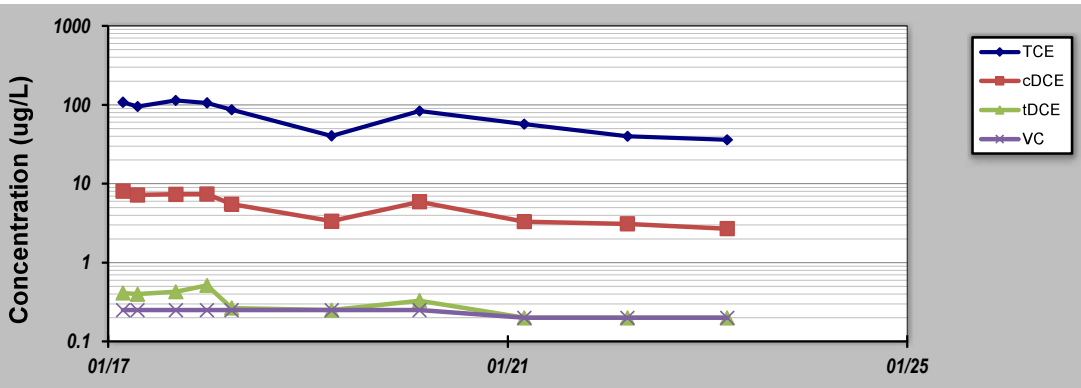
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-116
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	108	8.04	0.413	0.250			
2	5/2/2017	95.3	7.21	0.399	0.250			
3	9/19/2017	114	7.35	0.427	0.250			
4	1/11/2018	106	7.39	0.514	0.250			
5	4/11/2018	87.0	5.51	0.266	0.250			
6	4/12/2019	40.5	3.36	0.250	0.250			
7	2/27/2020	83.5	5.90	0.330	0.250			
8	3/17/2021	57.0	3.30	0.200	0.200			
9	3/29/2022	40.0	3.10	0.200	0.200			
10	3/29/2023	36.0	2.70	0.200	0.200			
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Coefficient of Variation:		0.40	0.39	0.35	0.10			
Mann-Kendall Statistic (S):		-35	-35	-28	-21			
Confidence Factor:		100.0%	100.0%	99.4%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

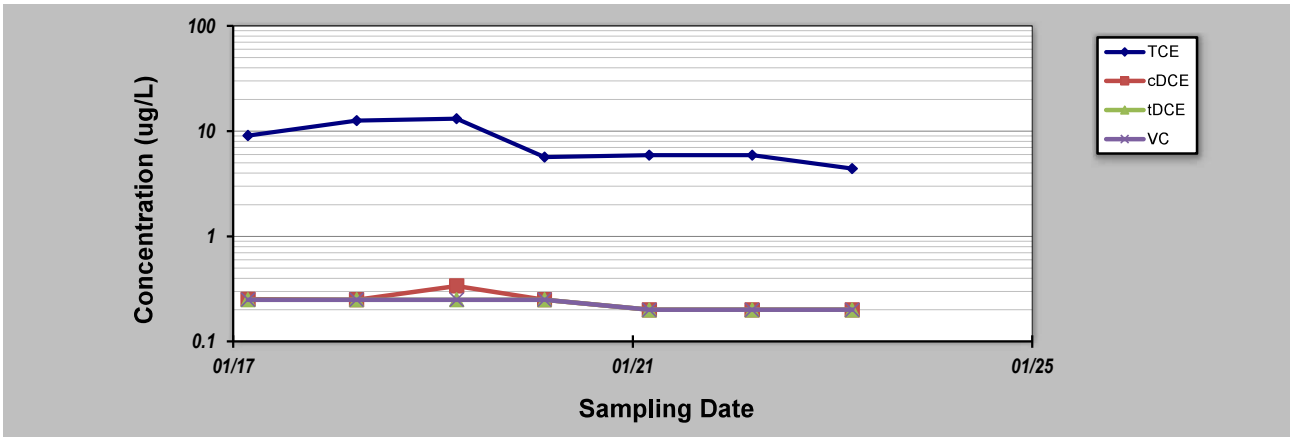
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-121
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	9.09	0.253	0.250	0.250			
2	4/11/2018	12.6	0.250	0.250	0.250			
3	4/12/2019	13.1	0.338	0.250	0.250			
4	2/27/2020	5.68	0.250	0.250	0.250			
5	3/17/2021	5.90	0.200	0.200	0.200			
6	3/28/2022	5.90	0.200	0.200	0.200			
7	3/29/2023	4.40	0.200	0.200	0.200			
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Coefficient of Variation:		0.44	0.21	0.12	0.12			
Mann-Kendall Statistic (S):		-10	-13	-12	-12			
Confidence Factor:		90.7%	96.5%	94.9%	94.9%			
Concentration Trend:		Prob. Decreasing	Decreasing	Prob. Decreasing	Prob. Decreasing			



Notes:

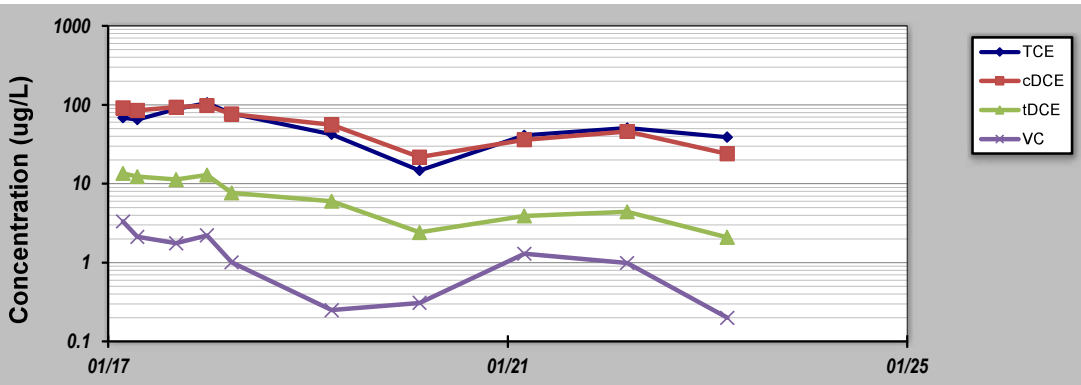
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-123
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	68.5	91.1	13.5	3.33			
2	5/1/2017	64.9	85.0	12.3	2.12			
3	9/20/2017	88.1	93.6	11.3	1.76			
4	1/11/2018	106	98.0	12.9	2.22			
5	4/11/2018	77.6	76.3	7.64	1.01			
6	4/12/2019	42.2	55.8	6.01	0.250			
7	2/27/2020	14.7	21.8	2.42	0.309			
8	3/17/2021	41.0	36.0	3.90	1.30			
9	3/28/2022	51.0	46.0	4.40	0.99			
10	3/29/2023	39.0	24.0	2.10	0.200			
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Coefficient of Variation:		0.46	0.47	0.59	0.75			
Mann-Kendall Statistic (S):		-21	-27	-35	-29			
Confidence Factor:		96.4%	99.2%	100.0%	99.5%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

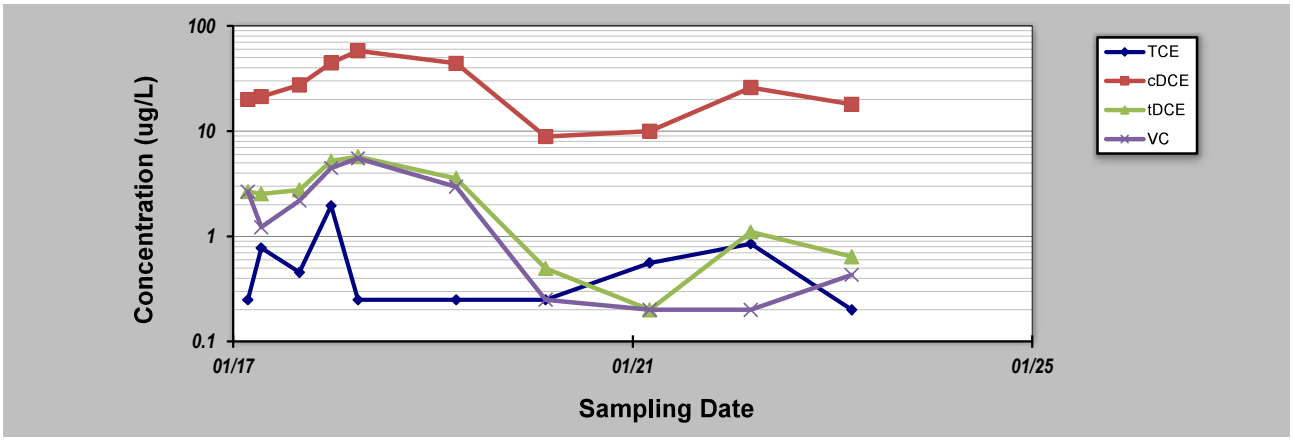
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	LF04-4D
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	0.250	20.0	2.66	2.66			
2	4/27/2017	0.775	21.3	2.54	1.22			
3	9/14/2017	0.454	27.5	2.76	2.19			
4	1/8/2018	1.96	44.4	5.21	4.47			
5	4/16/2018	0.250	58.1	5.73	5.51			
6	4/10/2019	0.250	44.1	3.55	2.96			
7	3/2/2020	0.250	8.87	0.495	0.250			
8	3/18/2021	0.560	10.0	0.200	0.200			
9	3/23/2022	0.850	26.0	1.10	0.200			
10	3/27/2023	0.200	18.0	0.640	0.430			
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Coefficient of Variation:		0.93	0.58	0.78	0.94			
Mann-Kendall Statistic (S):		-5	-5	-13	-16			
Confidence Factor:		63.6%	63.6%	85.4%	90.7%			
Concentration Trend:		Stable	Stable	Stable	Prob. Decreasing			



Notes:

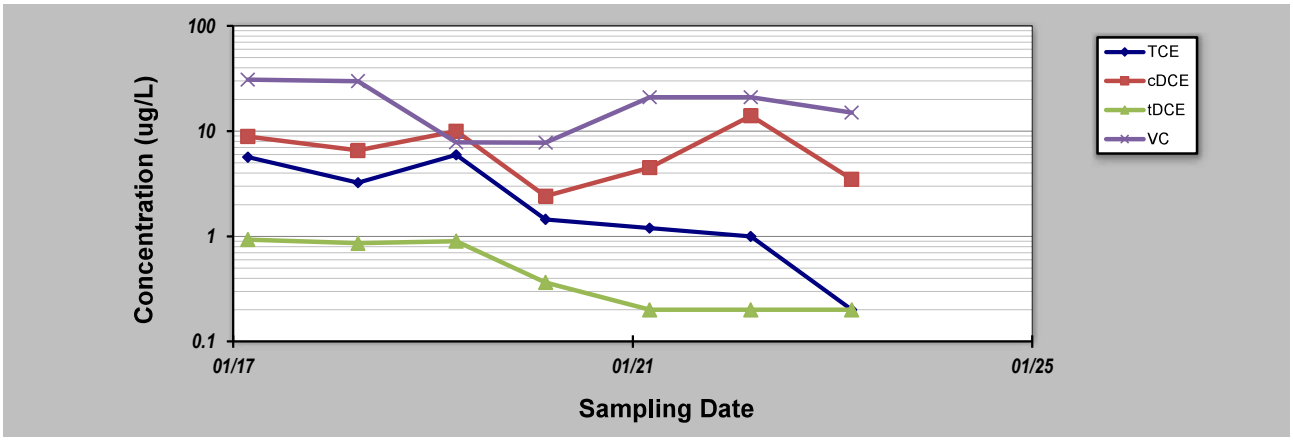
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	LF04-4F
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	5.65	8.91	0.932	30.9			
2	4/16/2018	3.24	6.55	0.860	29.9			
3	4/10/2019	5.94	10.0	0.900	7.83			
4	3/2/2020	1.45	2.41	0.365	7.77			
5	3/18/2021	1.20	4.50	0.200	21.0			
6	3/23/2022	1.00	14.0	0.200	21.0			
7	3/27/2023	0.200	3.5	0.200	15.0			
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Coefficient of Variation:		0.87	0.58	0.68	0.50			
Mann-Kendall Statistic (S):		-17	-3	-16	-8			
Confidence Factor:		99.5%	61.4%	99.0%	84.5%			
Concentration Trend:		Decreasing	Stable	Decreasing	Stable			



Notes:

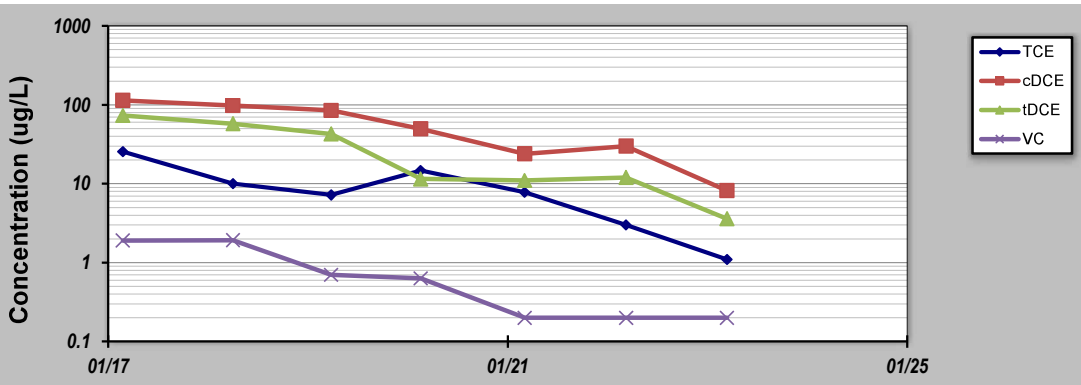
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	LF05-5G
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	25.5	114	73.2	1.91			
2	4/16/2018	10.0	97.9	57.6	1.93			
3	4/10/2019	7.21	85.1	42.8	0.701			
4	3/2/2020	14.7	49.8	11.5	0.632			
5	3/18/2021	7.80	24.0	11.0	0.200			
6	3/24/2022	3.00	30.0	12.0	0.200			
7	3/28/2023	1.10	8.2	3.60	0.200			
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Coefficient of Variation:		0.83	0.70	0.91	0.94			
Mann-Kendall Statistic (S):		-15	-19	-17	-16			
Confidence Factor:		98.5%	99.9%	99.5%	99.0%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

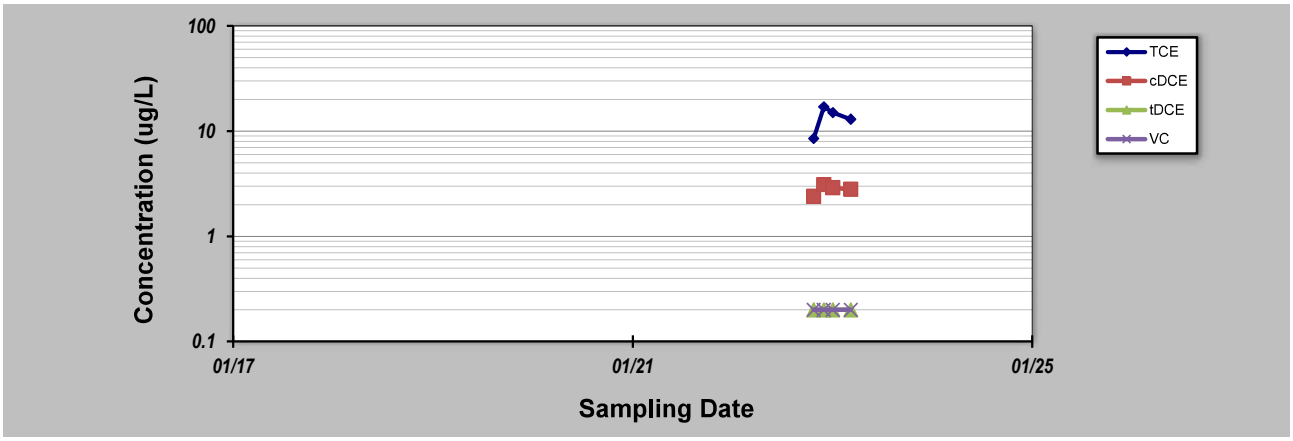
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	LKRTA015
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	11/8/2022	8.50	2.40	0.200	0.200			
2	12/15/2022	17.0	3.10	0.200	0.200			
3	1/17/2023	15.0	2.90	0.200	0.200			
4	3/24/2023	13.0	2.80	0.200	0.200			
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Coefficient of Variation:		0.27	0.11	0.00	0.00			
Mann-Kendall Statistic (S):		0	0	0	0			
Confidence Factor:		37.5%	37.5%	37.5%	37.5%			
Concentration Trend:		Stable	Stable	Stable	Stable			



Notes:

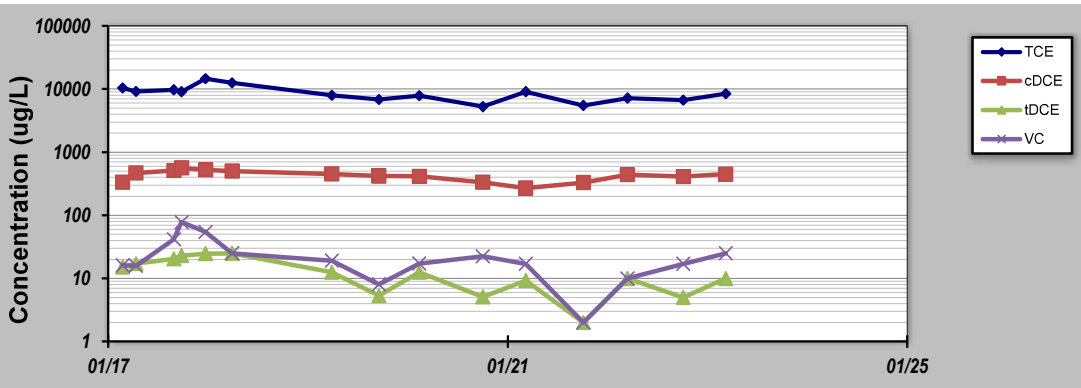
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	MW-10R-URS
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	10400	335	15.2	16.1			
2	4/26/2017	9130	470	17.1	15.9			
3	9/12/2017	9760	511	20.4	41.6			
4	10/10/2017	9100	565	23.1	78.0			
5	1/6/2018	14600	525	24.8	54.3			
6	4/13/2018	12500	503	25.0	25.0			
7	4/13/2019	7930	453	12.5	19.1			
8	10/2/2019	6860	419	5.34	8.09			
9	2/26/2020	7870	415	12.5	17.2			
10	10/16/2020	5270	334	5.11	22.4			
11	3/22/2021	9100	270	9.30	17.0			
12	10/19/2021	5500	330	2.00	2.0			
13	3/29/2022	7200	440	10.0	10.0			
14	10/19/2022	6700	410	5.00	17.0			
15	3/24/2023	8400	450	10.0	25.0			
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20								
Coefficient of Variation:		0.29	0.19	0.57	0.80			
Mann-Kendall Statistic (S):		-50	-39	-47	-23			
Confidence Factor:		99.3%	97.1%	99.0%	85.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

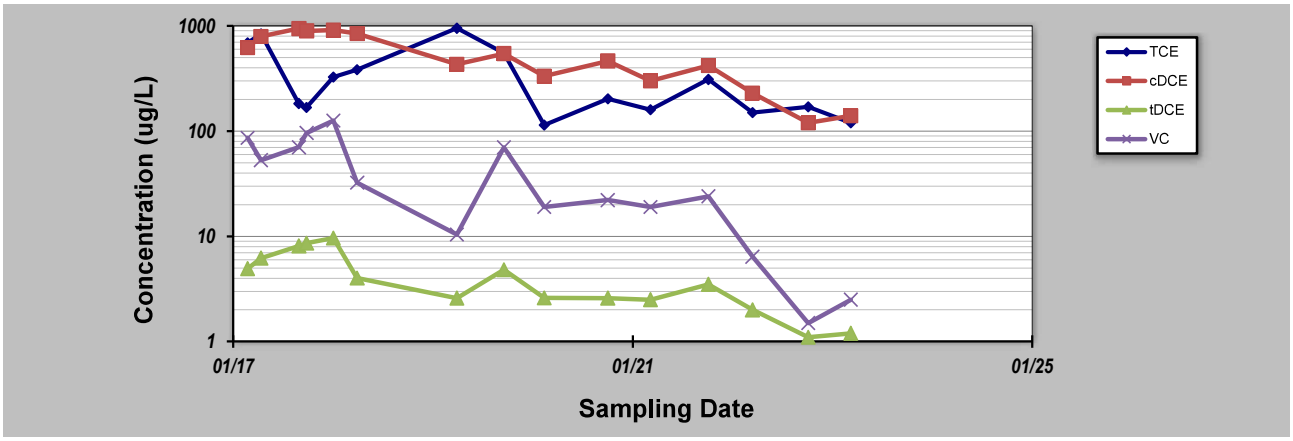
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	MW-11
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	691	622	4.93	86.2			
2	4/26/2017	839	795	6.21	53.0			
3	9/12/2017	183	945	8.11	70.3			
4	10/10/2017	168	899	8.62	96.0			
5	1/16/2018	326	912	9.64	126			
6	4/13/2018	383	847	4.01	32.4			
7	4/13/2019	951	432	2.59	10.4			
8	10/2/2019	551	546	4.82	70.1			
9	2/26/2020	114	334	2.60	19.0			
10	10/16/2020	203	465	2.59	22.1			
11	3/21/2021	160	300	2.50	19.0			
12	10/19/2021	310	420	3.50	24.0			
13	3/29/2022	150	230	2.00	6.40			
14	10/19/2022	170	120	1.10	1.50			
15	3/24/2023	120	140	1.20	2.50			
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18								
19								
20								
Coefficient of Variation:		0.78	0.54	0.63	0.91			
Mann-Kendall Statistic (S):		-43	-73	-68	-64			
Confidence Factor:		98.2%	>99.9%	>99.9%	100.0%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

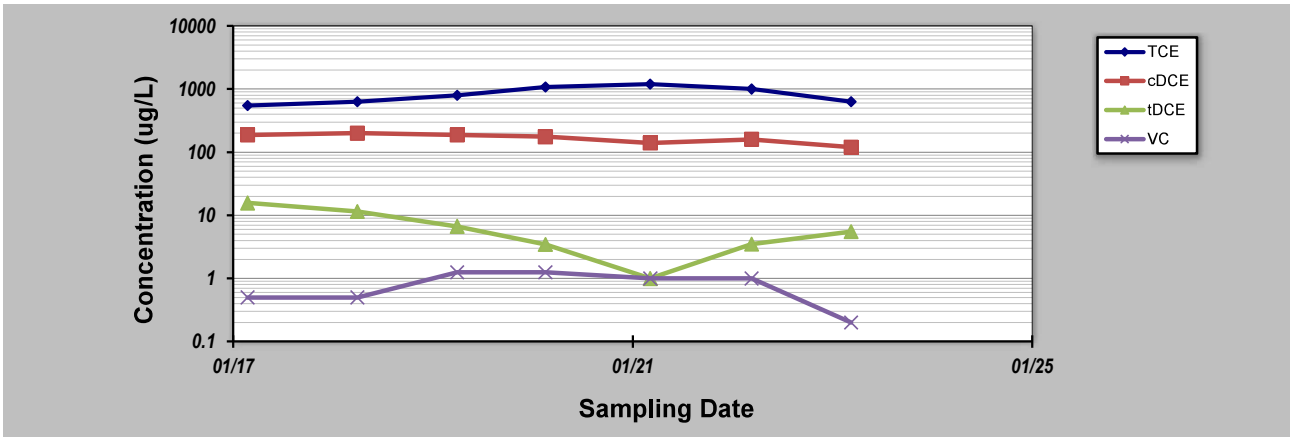
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	W-149
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	546	187	15.7	0.500			
2	4/14/2018	632	200	11.5	0.500			
3	4/14/2019	793	187	6.67	1.25			
4	3/1/2020	1080	176	3.45	1.25			
5	3/20/2021	1200	140	1.00	1.00			
6	3/26/2022	1000	160	3.50	1.00			
7	3/25/2023	630	120	5.5	0.200			
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Coefficient of Variation:		0.30	0.17	0.76	0.51			
Mann-Kendall Statistic (S):		7	-16	-11	-2			
Confidence Factor:		80.9%	99.0%	93.2%	55.7%			
Concentration Trend:		No Trend	Decreasing	Prob. Decreasing	Stable			



Notes:

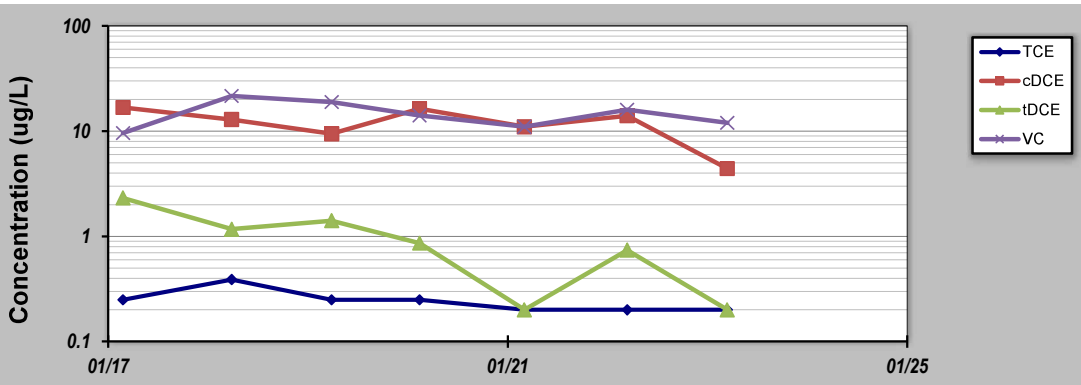
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WCHMHTA010
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	16.8	2.32	9.57			
2	4/11/2018	0.389	12.9	1.17	21.6			
3	4/12/2019	0.250	9.43	1.41	18.9			
4	2/27/2020	0.250	16.3	0.861	14.1			
5	3/17/2021	0.200	11.0	0.200	11.0			
6	3/28/2022	0.200	14.0	0.740	16.0			
7	3/29/2023	0.200	4.40	0.200	12.0			
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Coefficient of Variation:		0.27	0.36	0.75	0.30			
Mann-Kendall Statistic (S):		-13	-9	-16	-3			
Confidence Factor:		96.5%	88.1%	99.0%	61.4%			
Concentration Trend:		Decreasing	Stable	Decreasing	Stable			



Notes:

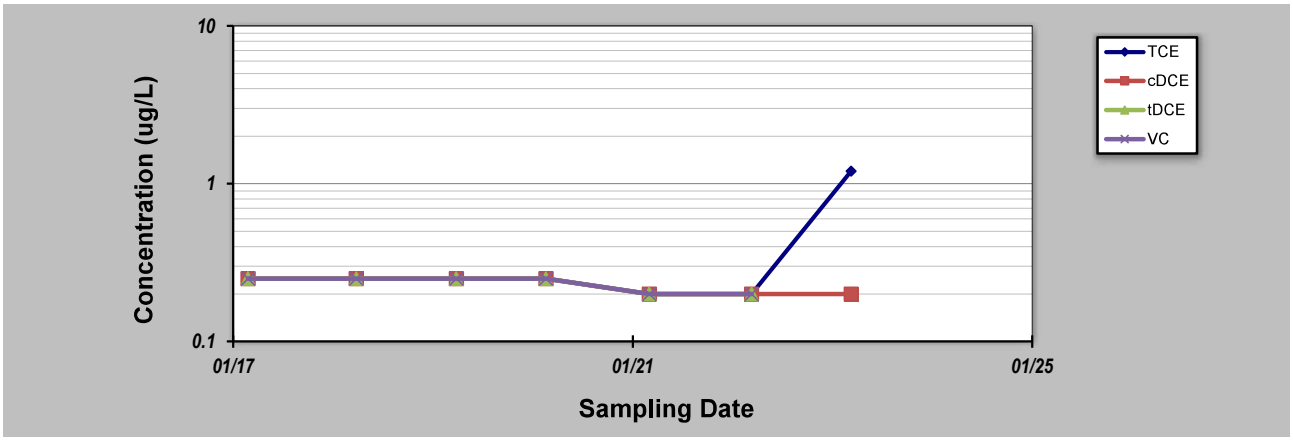
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WCHMHTA013
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	0.250	0.250	0.250			
2	4/10/2018	0.250	0.250	0.250	0.250			
3	4/11/2019	0.250	0.250	0.250	0.250			
4	3/3/2020	0.250	0.250	0.250	0.250			
5	3/17/2021	0.200	0.200	0.200	0.200			
6	3/26/2022	0.200	0.200	0.200	0.200			
7	3/25/2023	1.20	0.2					
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Coefficient of Variation:		0.99	0.12	0.11	0.11			
Mann-Kendall Statistic (S):		-2	-12	-8	-8			
Confidence Factor:		55.7%	94.9%	89.8%	89.8%			
Concentration Trend:		Stable	Prob. Decreasing	Stable	Stable			



Notes:

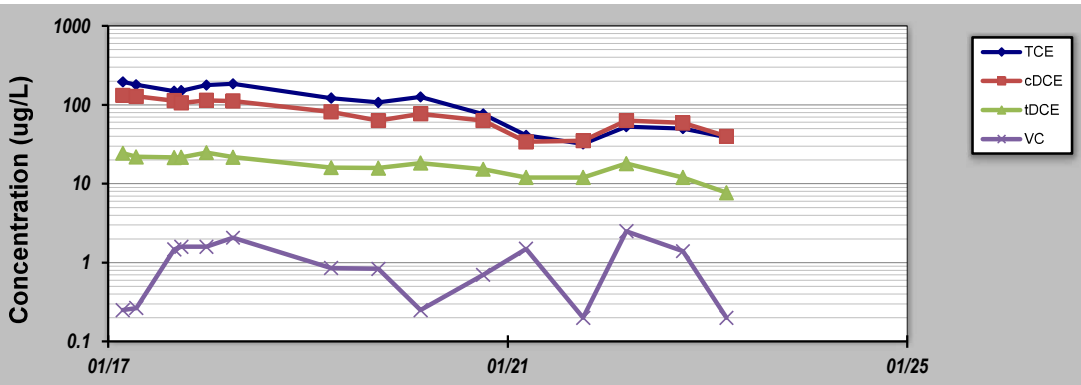
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WHGLTA043
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	196	132	24.3	0.25			
2	4/27/2017	180	128	21.9	0.266			
3	9/13/2017	149	113	21.5	1.47			
4	10/9/2017	151	106	21.6	1.59			
5	1/9/2018	178	114	24.8	1.59			
6	4/16/2018	185	112	21.7	2.07			
7	4/10/2019	122	81.6	16.0	0.856			
8	9/30/2019	107	63.1	15.8	0.834			
9	3/2/2020	126	77.0	18.3	0.250			
10	10/17/2020	76.4	63.2	15.3	0.700			
11	3/23/2021	41.0	34.0	12.0	1.50			
12	10/18/2021	32.0	35.0	12.0	0.200			
13	3/25/2022	53.0	63.0	18.0	2.50			
14	10/18/2022	50.0	59.0	12.0	1.40			
15	3/26/2023	39.0	40.0	7.70	0.200			
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Coefficient of Variation:		0.53	0.42	0.29	0.71			
Mann-Kendall Statistic (S):		-77	-81	-74	-8			
Confidence Factor:		>99.9%	>99.9%	>99.9%	63.3%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

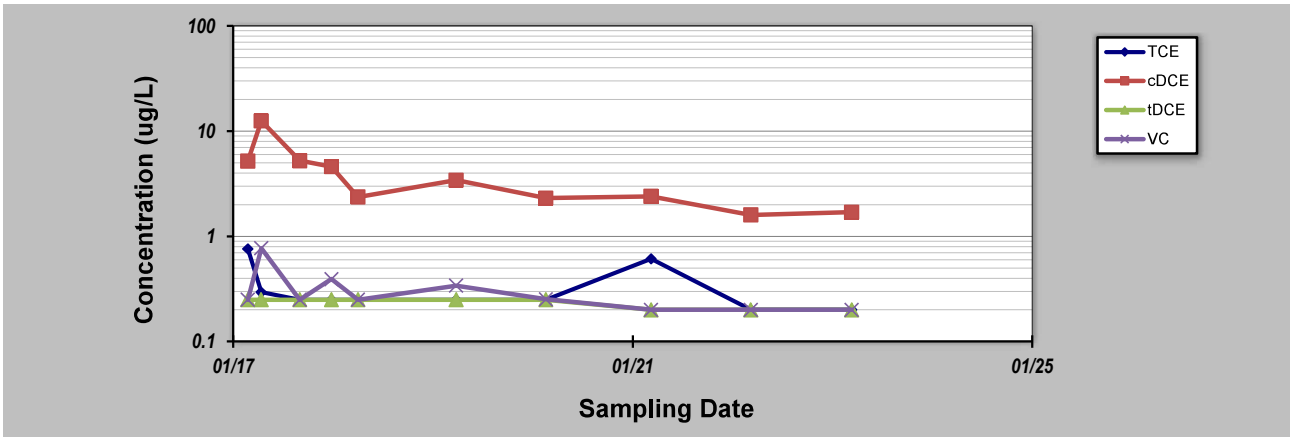
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WHGLTA044
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	0.761	5.20	0.250	0.250			
2	4/27/2017	0.294	12.5	0.250	0.773			
3	9/15/2017	0.250	5.24	0.250	0.250			
4	1/9/2018	0.250	4.59	0.250	0.392			
5	4/16/2018	0.250	2.37	0.250	0.250			
6	4/10/2019	0.250	3.42	0.250	0.340			
7	3/3/2020	0.250	2.31	0.250	0.252			
8	3/23/2021	0.610	2.40	0.200	0.200			
9	3/23/2022	0.200	1.60	0.200	0.200			
10	3/27/2023	0.200	1.7	0.200	0.200			
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Coefficient of Variation:		0.58	0.79	0.10	0.56			
Mann-Kendall Statistic (S):		-22	-33	-21	-21			
Confidence Factor:		97.1%	99.9%	96.4%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

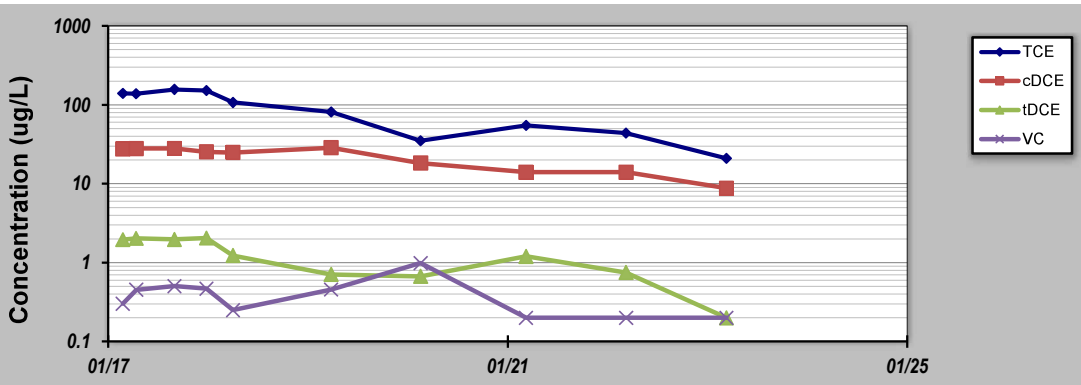
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WHGLTA051
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	140	27.7	1.96	0.301			
2	4/27/2017	138	27.9	2.03	0.453			
3	9/14/2017	157	28.0	1.97	0.504			
4	1/9/2018	152	25.4	2.05	0.467			
5	4/16/2018	107	24.9	1.23	0.250			
6	4/10/2019	81.4	28.6	0.708	0.456			
7	3/2/2020	35.1	18.3	0.672	0.988			
8	3/23/2021	55.0	14.0	1.20	0.200			
9	3/24/2022	44.0	14.0	0.75	0.200			
10	3/26/2023	21.0	8.80	0.200	0.200			
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Coefficient of Variation:		0.56	0.34	0.54	0.60			
Mann-Kendall Statistic (S):		-33	-28	-27	-14			
Confidence Factor:		99.9%	99.4%	99.2%	87.3%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

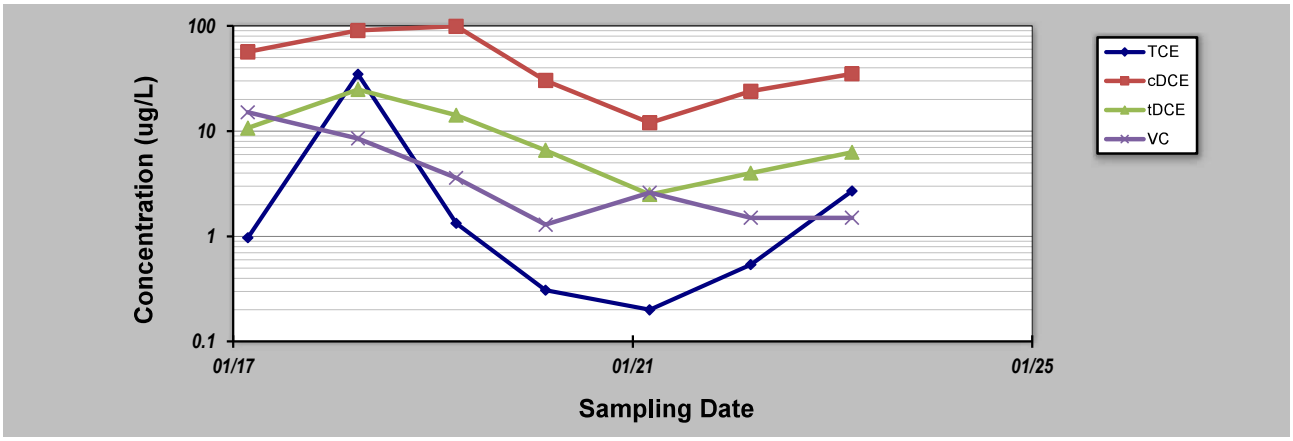
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WHGLTA069
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	0.97	56.7	10.7	15.1			
2	4/16/2018	34.7	90.6	24.9	8.54			
3	4/10/2019	1.33	99.2	14.2	3.60			
4	3/2/2020	0.307	30.3	6.59	1.29			
5	3/18/2021	0.200	12.0	2.50	2.60			
6	3/23/2022	0.540	24.0	4.00	1.50			
7	3/28/2023	2.70	35.0	6.30	1.50			
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Coefficient of Variation:		2.19	0.68	0.78	1.06			
Mann-Kendall Statistic (S):		-3	-7	-11	-14			
Confidence Factor:		61.4%	80.9%	93.2%	97.5%			
Concentration Trend:		No Trend	Stable	Prob. Decreasing	Decreasing			



Notes:

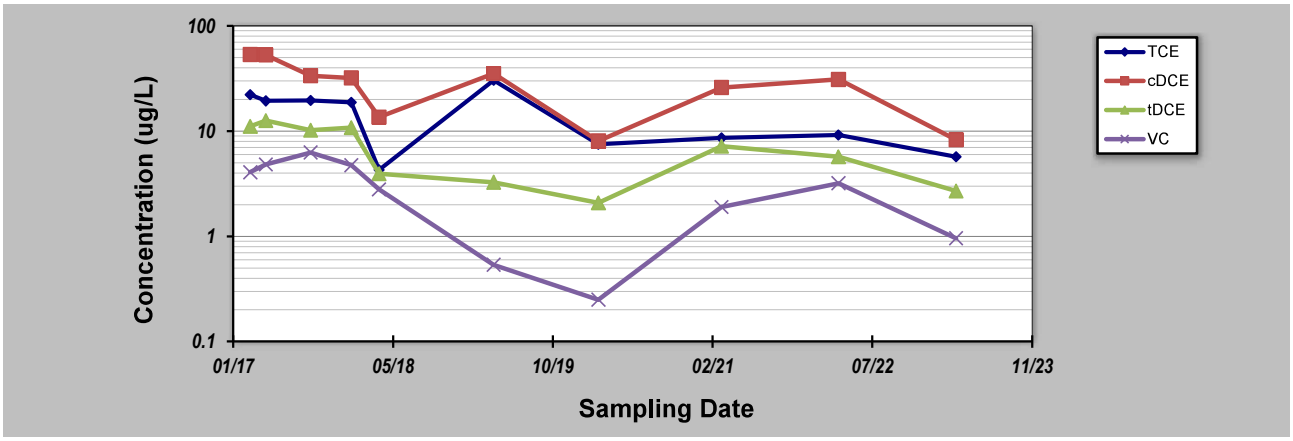
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WHGLTA071
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	22.2	53.4	11.1	4.07			
2	4/27/2017	19.4	52.9	12.6	4.82			
3	9/14/2017	19.6	33.6	10.2	6.26			
4	1/19/2018	18.8	32.1	10.8	4.75			
5	4/16/2018	4.28	13.6	3.94	2.79			
6	4/10/2019	30.5	35.3	3.27	0.537			
7	3/2/2020	7.51	8.06	2.08	0.250			
8	3/23/2021	8.60	26.0	7.20	1.90			
9	3/24/2022	9.20	31.0	5.70	3.20			
10	3/27/2023	5.70	8.30	2.70	0.960			
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Coefficient of Variation:		0.60	0.55	0.57	0.69			
Mann-Kendall Statistic (S):		-19	-27	-27	-21			
Confidence Factor:		94.6%	99.2%	99.2%	96.4%			
Concentration Trend:		Prob. Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

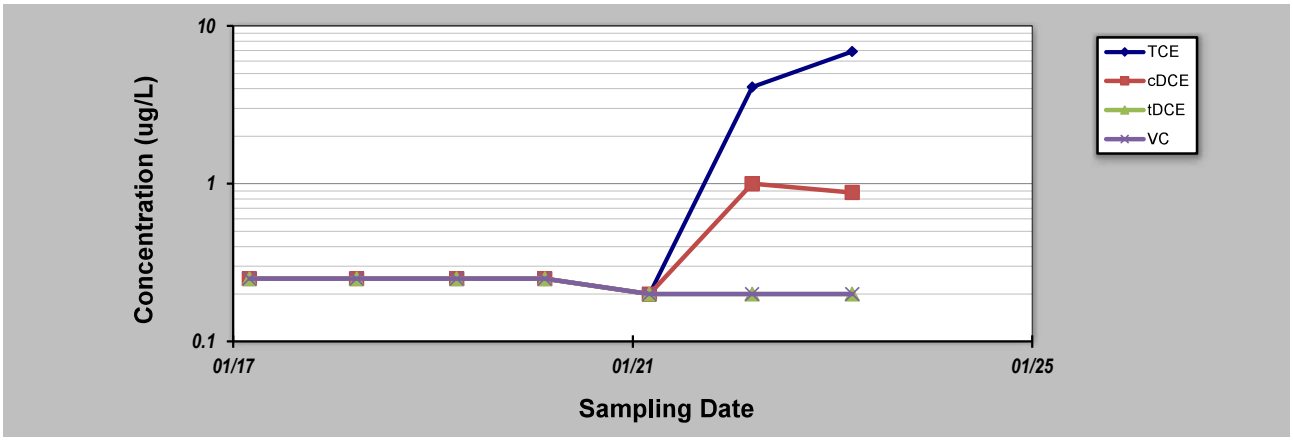
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WITCTA004
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	0.250	0.250	0.250	0.250			
2	4/11/2018	0.250	0.250	0.250	0.250			
3	4/12/2019	0.250	0.250	0.250	0.250			
4	2/28/2020	0.250	0.250	0.250	0.250			
5	3/17/2021	0.200	0.200	0.200	0.200			
6	3/28/2022	4.10	1.00	0.200	0.200			
7	3/29/2023	6.90	0.880	0.200	0.200			
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Coefficient of Variation:		1.54	0.78	0.12	0.12			
Mann-Kendall Statistic (S):		7	5	-12	-12			
Confidence Factor:		80.9%	71.9%	94.9%	94.9%			
Concentration Trend:		No Trend	No Trend	Prob. Decreasing	Prob. Decreasing			



Notes:

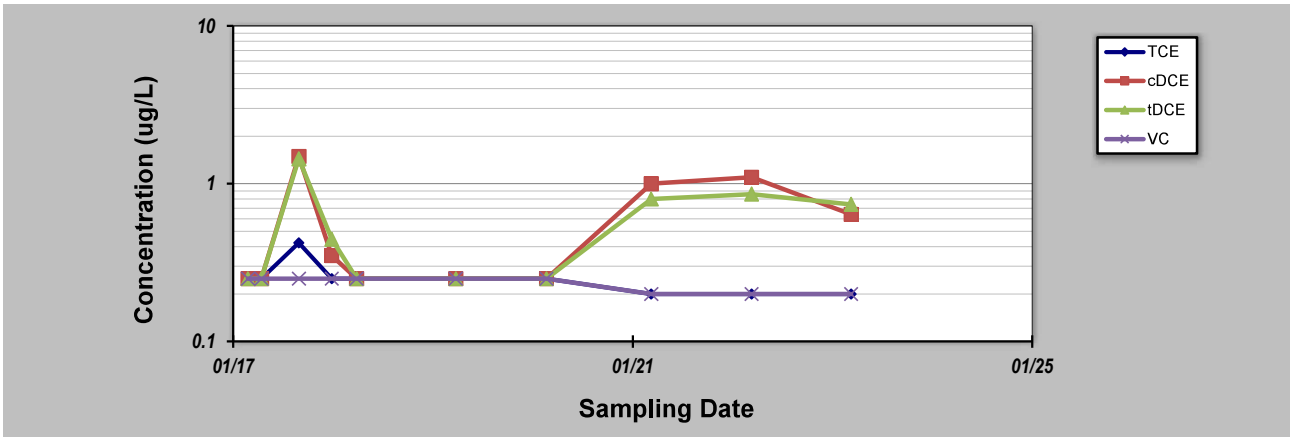
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WITCTA017
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	0.250	0.250	0.250			
2	4/28/2017	0.250	0.250	0.250	0.250			
3	9/12/2017	0.422	1.490	1.44	0.250			
4	1/10/2018	0.250	0.350	0.446	0.250			
5	4/11/2018	0.250	0.250	0.250	0.250			
6	4/9/2019	0.250	0.250	0.250	0.250			
7	3/5/2020	0.250	0.250	0.250	0.250			
8	3/24/2021	0.200	1.00	0.800	0.200			
9	3/26/2022	0.200	1.10	0.860	0.200			
10	3/25/2023	0.200	0.640	0.740	0.200			
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Coefficient of Variation:		0.25	0.78	0.72	0.10			
Mann-Kendall Statistic (S):		-23	11	11	-21			
Confidence Factor:		97.7%	81.0%	81.0%	96.4%			
Concentration Trend:		Decreasing	No Trend	No Trend	Decreasing			



Notes:

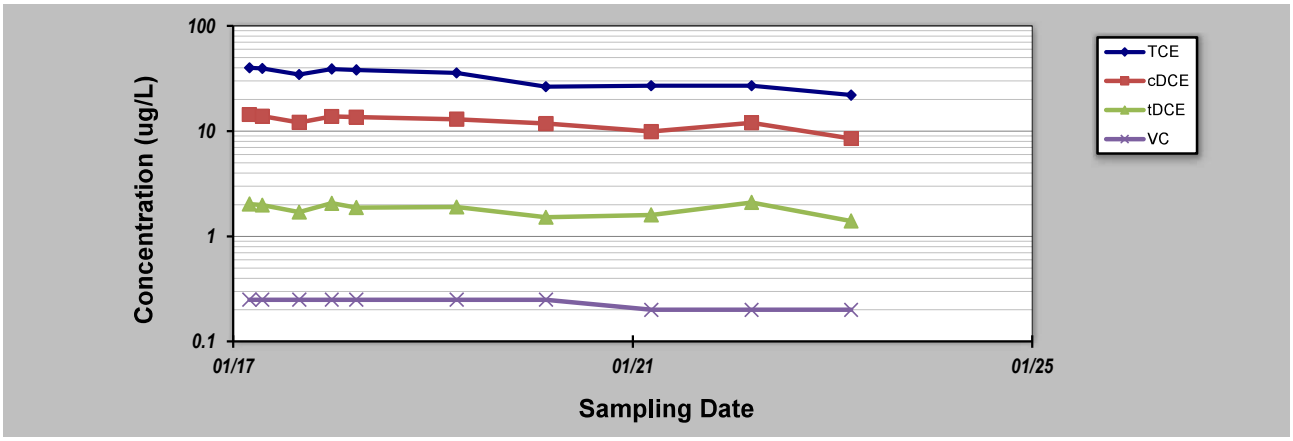
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WITCTA040
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	40.1	14.4	2.03	0.250			
2	5/1/2017	39.4	13.9	1.98	0.250			
3	9/13/2017	34.6	12.1	1.70	0.250			
4	1/10/2018	39.0	13.8	2.06	0.250			
5	4/10/2018	38.2	13.6	1.88	0.250			
6	4/12/2019	35.7	13.0	1.90	0.250			
7	3/3/2020	26.5	11.8	1.52	0.250			
8	3/24/2021	27.0	9.90	1.60	0.200			
9	3/26/2022	27.0	12.0	2.10	0.200			
10	3/25/2023	22.0	8.50	1.40	0.200			
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Coefficient of Variation:		0.20	0.15	0.14	0.10			
Mann-Kendall Statistic (S):		-34	-35	-15	-21			
Confidence Factor:		100.0%	100.0%	89.2%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Stable	Decreasing			



Notes:

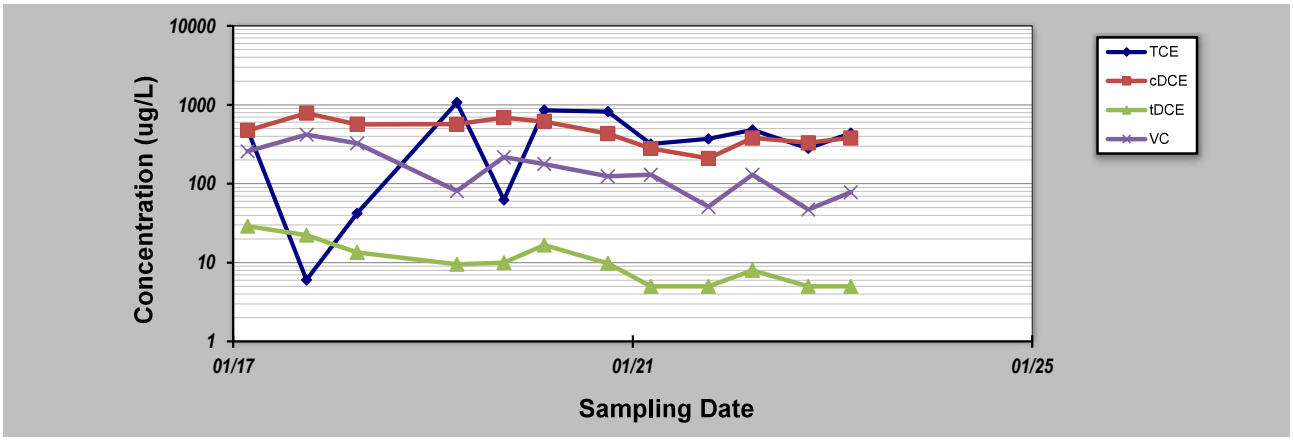
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WJETA061
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	486	474	28.9	258			
2	10/10/2017	6.01	785	22.3	418			
3	4/13/2018	42.0	567	13.5	326			
4	4/13/2019	1070	568	9.54	80.6			
5	10/2/2019	62.2	688	10.0	217			
6	2/26/2020	855	617	16.7	178			
7	10/16/2020	823	431	9.80	124			
8	3/22/2021	320	280	5.00	130			
9	10/19/2021	370	210	5.00	51.0			
10	3/29/2022	480	380	8.00	130			
11	10/19/2022	280	330	5.00	47.0			
12	3/24/2023	440	380	5.00	78.0			
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Coefficient of Variation:		0.77	0.36	0.66	0.68			
Mann-Kendall Statistic (S):		4	-31	-46	-41			
Confidence Factor:		58.0%	98.1%	100.0%	99.8%			
Concentration Trend:		No Trend	Decreasing	Decreasing	Decreasing			



Notes:

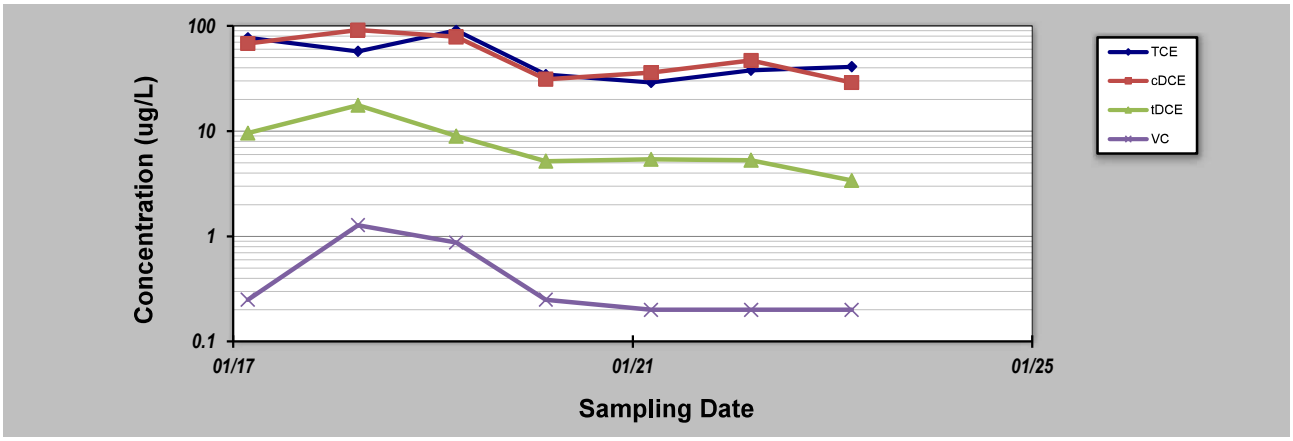
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WP07-10B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	77.3	68.1	9.59	0.250			
2	4/16/2018	57.4	91.4	17.6	1.28			
3	4/10/2019	90.8	78.8	8.98	0.873			
4	3/3/2020	34.5	31.2	5.19	0.250			
5	3/23/2021	29.0	36.0	5.40	0.200			
6	3/24/2022	38.0	47.0	5.30	0.200			
7	3/27/2023	41.0	29.0	3.40	0.200			
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Coefficient of Variation:		0.45	0.46	0.61	0.94			
Mann-Kendall Statistic (S):		-7	-11	-15	-13			
Confidence Factor:		80.9%	93.2%	98.5%	96.5%			
Concentration Trend:		Stable	Prob. Decreasing	Decreasing	Decreasing			



Notes:

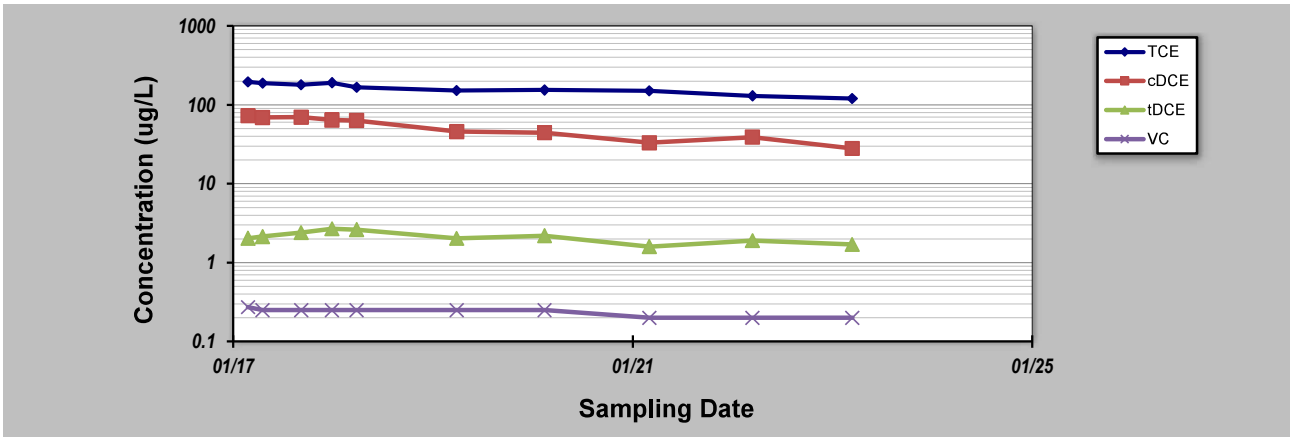
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WSAICTA010
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	196	72.5	2.04	0.273			
2	5/2/2017	188	69.1	2.14	0.250			
3	9/20/2017	180	69.7	2.40	0.250			
4	1/11/2018	191	64.2	2.69	0.250			
5	4/11/2018	167	63.3	2.62	0.250			
6	4/12/2019	152	45.8	2.03	0.250			
7	2/27/2020	154	44.3	2.20	0.250			
8	3/17/2021	150	33.0	1.60	0.200			
9	3/29/2022	130	39.0	1.90	0.200			
10	3/29/2023	120	28.0	1.70	0.200			
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Coefficient of Variation:		0.16	0.32	0.17	0.11			
Mann-Kendall Statistic (S):		-39	-41	-17	-27			
Confidence Factor:		>99.9%	>99.9%	92.2%	99.2%			
Concentration Trend:		Decreasing	Decreasing	Prob. Decreasing	Decreasing			



Notes:

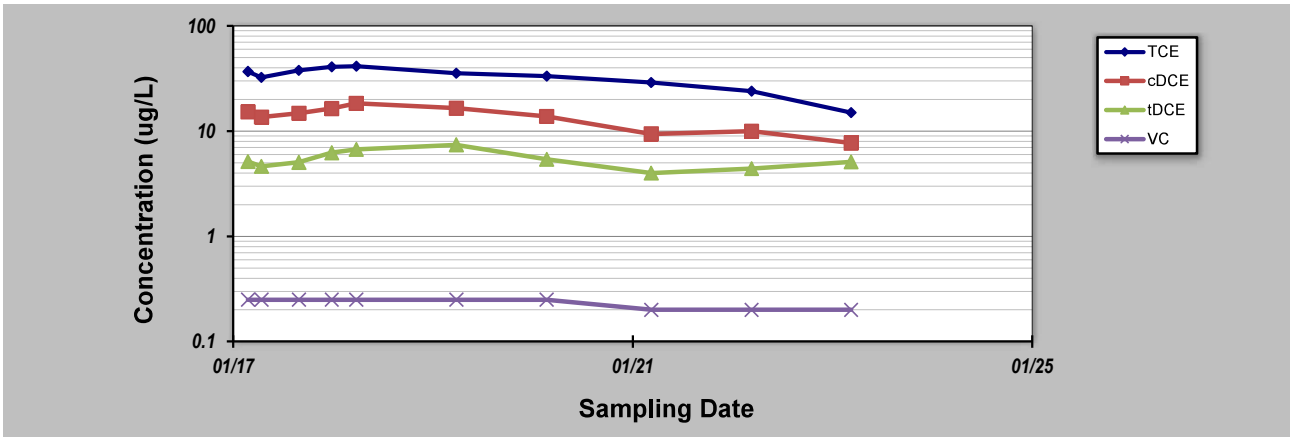
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WSAICTA016
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	36.9	15.2	5.14	0.250			
2	4/28/2017	32.4	13.6	4.63	0.250			
3	9/12/2017	37.9	14.8	5.06	0.250			
4	1/10/2018	40.8	16.4	6.24	0.250			
5	4/10/2018	41.5	18.4	6.70	0.250			
6	4/11/2019	35.5	16.5	7.42	0.250			
7	3/6/2020	33.3	13.8	5.40	0.250			
8	3/24/2021	29.0	9.40	4.00	0.200			
9	3/26/2022	24.0	10.0	4.40	0.200			
10	3/25/2023	15.0	7.70	5.10	0.200			
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Coefficient of Variation:		0.25	0.26	0.20	0.10			
Mann-Kendall Statistic (S):		-23	-17	-3	-21			
Confidence Factor:		97.7%	92.2%	56.9%	96.4%			
Concentration Trend:		Decreasing	Prob. Decreasing	Stable	Decreasing			



Notes:

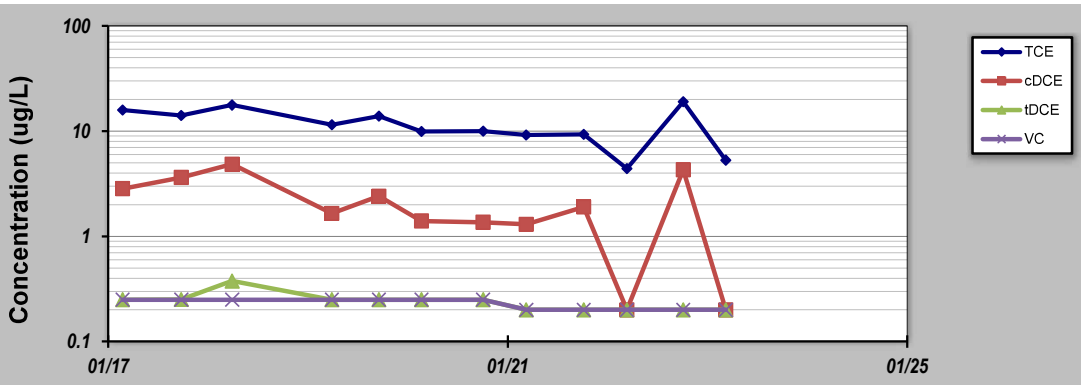
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	WSETAHM31R
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	15.9	2.84	0.250	0.250			
2	10/9/2017	14.1	3.63	0.251	0.250			
3	4/13/2018	17.7	4.85	0.376	0.250			
4	4/13/2019	11.5	1.65	0.250	0.250			
5	10/2/2019	13.9	2.41	0.250	0.250			
6	3/5/2020	9.93	1.40	0.250	0.250			
7	10/17/2020	9.97	1.36	0.250	0.250			
8	3/24/2021	9.20	1.30	0.200	0.200			
9	10/20/2021	9.30	1.90	0.200	0.200			
10	3/27/2022	4.40	0.20	0.200	0.200			
11	10/19/2022	19.0	4.30	0.200	0.200			
12	3/24/2023	5.30	0.200	0.200	0.200			
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20								
Coefficient of Variation:		0.39	0.69	0.21	0.11			
Mann-Kendall Statistic (S):		-34	-31	-40	-35			
Confidence Factor:		99.0%	98.1%	99.7%	99.2%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

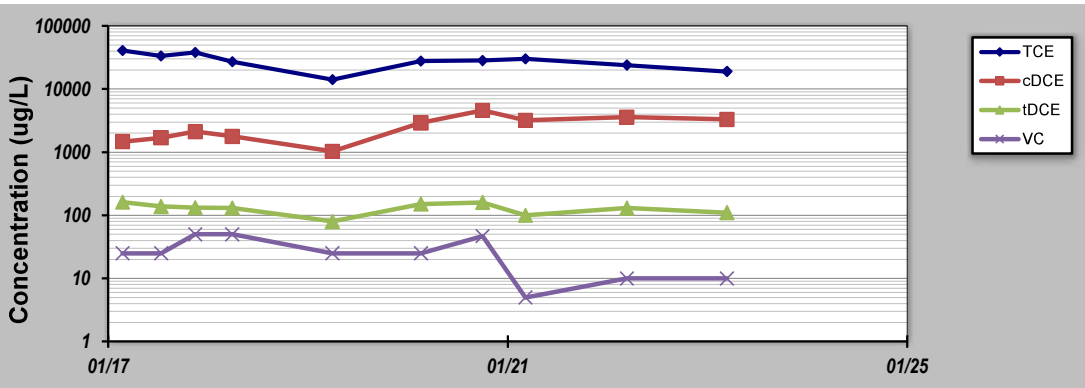
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	F-220
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	40700	1470	161	25.0			
2	7/27/2017	33400	1690	138	25.0			
3	11/29/2017	38100	2120	132	50.0			
4	4/13/2018	27200	1780	131	50.0			
5	4/15/2019	14100	1030	79.8	25.0			
6	3/3/2020	27800	2910	151	25.0			
7	10/15/2020	28300	4600	160	46.8			
8	3/21/2021	30000	3200	100	5.00			
9	3/27/2022	24000	3600	130	10.0			
10	3/28/2023	19000	3300	110	10.0			
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20								
Coefficient of Variation:		0.29	0.44	0.20	0.62			
Mann-Kendall Statistic (S):		-21	27	-17	-17			
Confidence Factor:		96.4%	99.2%	92.2%	92.2%			
Concentration Trend:		Decreasing	Increasing	Prob. Decreasing	Prob. Decreasing			



Notes:

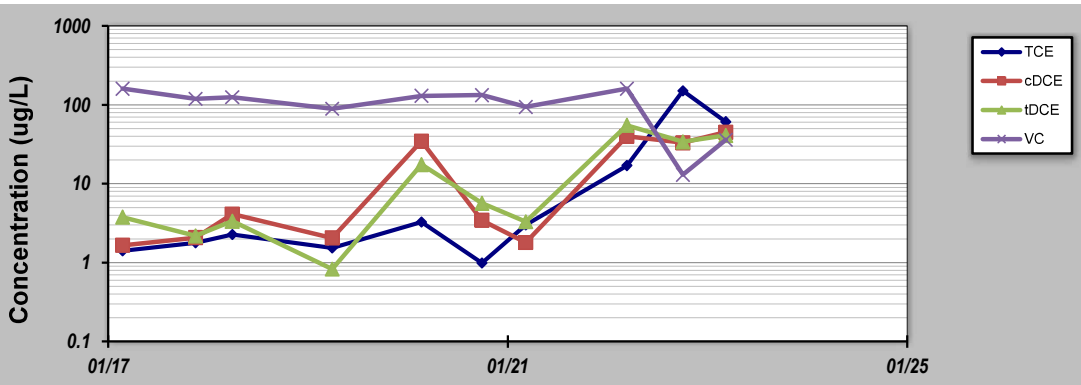
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-17
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	1.41	1.66	3.78	160			
2	11/30/2017	1.79	2.08	2.18	119			
3	4/13/2018	2.27	4.13	3.35	125			
4	4/14/2019	1.54	2.06	0.829	89.2			
5	3/5/2020	3.26	34.7	17.5	130			
6	10/13/2020	0.99	3.44	5.66	133			
7	3/22/2021	3.00	1.80	3.30	94.0			
8	3/27/2022	17.0	40.0	55.0	160			
9	10/18/2022	150	33.0	34.0	13.0			
10	3/24/2023	61.0	45.0	41.0	36.0			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		1.98	1.11	1.18	0.46			
Mann-Kendall Statistic (S):		27	23	21	-12			
Confidence Factor:		99.2%	97.7%	96.4%	83.2%			
Concentration Trend:		Increasing	Increasing	Increasing	Stable			



Notes:

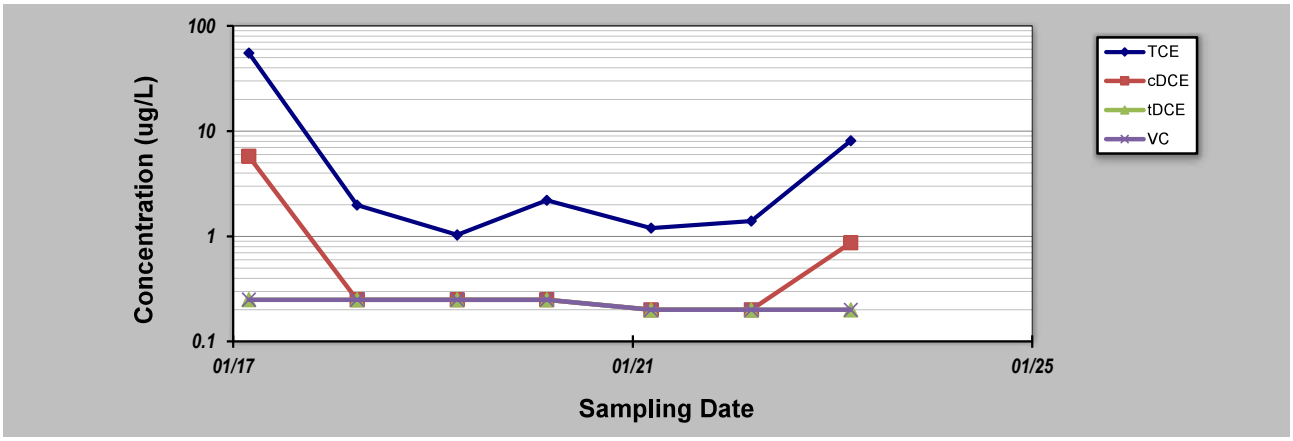
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-29
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/13/2017	55.3	5.76	0.250	0.250			
2	4/13/2018	1.98	0.250	0.250	0.250			
3	4/14/2019	1.03	0.250	0.250	0.250			
4	3/6/2020	2.20	0.250	0.250	0.250			
5	3/23/2021	1.20	0.200	0.200	0.200			
6	3/25/2022	1.40	0.200	0.200	0.200			
7	3/24/2023	8.10	0.870	0.200	0.200			
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19								
20								
Coefficient of Variation:		1.97	1.86	0.12	0.12			
Mann-Kendall Statistic (S):		-1	-7	-12	-12			
Confidence Factor:		50.0%	80.9%	94.9%	94.9%			
Concentration Trend:		No Trend	No Trend	Prob. Decreasing	Prob. Decreasing			



Notes:

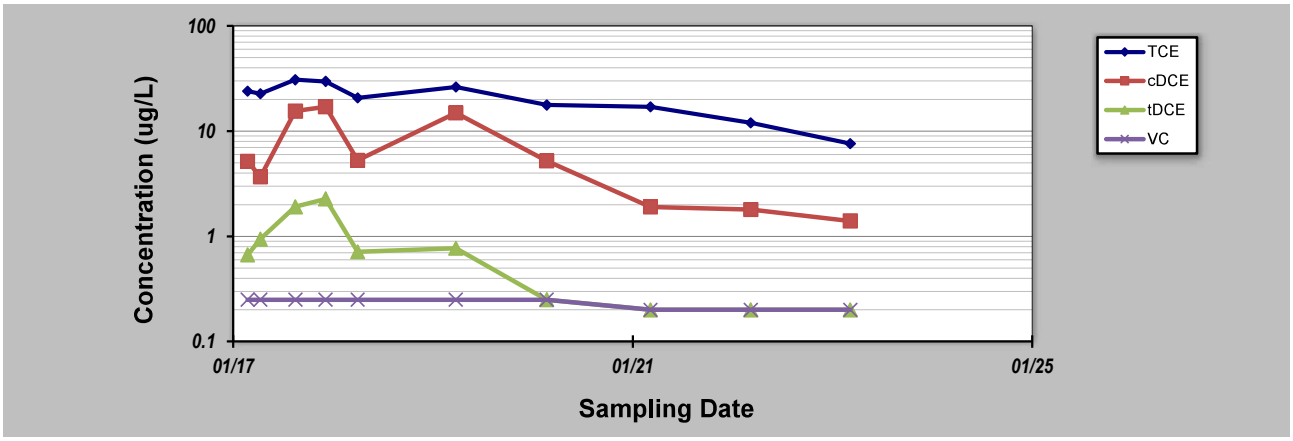
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-36
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	24.0	5.18	0.666	0.250			
2	4/24/2017	22.7	3.67	0.941	0.250			
3	8/30/2017	30.8	15.5	1.91	0.250			
4	12/18/2017	29.7	17.0	2.27	0.250			
5	4/15/2018	20.7	5.29	0.713	0.250			
6	4/9/2019	26.3	14.9	0.771	0.250			
7	3/6/2020	17.7	5.21	0.250	0.250			
8	3/21/2021	17.0	1.90	0.200	0.200			
9	3/23/2022	12.0	1.80	0.200	0.200			
10	3/22/2023	7.60	1.40	0.200	0.200			
11								
12								
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17								
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20								
Coefficient of Variation:		0.36	0.85	0.90	0.10			
Mann-Kendall Statistic (S):		-31	-21	-24	-21			
Confidence Factor:		99.8%	96.4%	98.2%	96.4%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

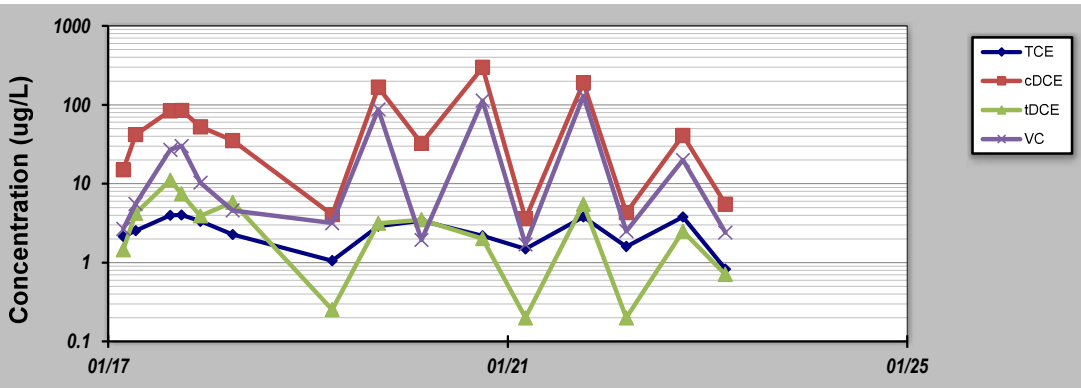
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-50
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	2.15	15.0	1.46	2.67			
2	4/25/2017	2.55	41.9	4.21	5.55			
3	8/30/2017	3.97	84.1	11.1	26.9			
4	10/10/2017	4.02	85.1	7.45	30.1			
5	12/18/2017	3.35	52.7	3.91	10.3			
6	4/15/2018	2.27	35.3	5.82	4.59			
7	4/14/2019	1.06	4.06	0.254	3.17			
8	9/30/2019	2.91	167	3.15	87.6			
9	3/5/2020	3.41	32.5	3.50	1.94			
10	10/15/2020	2.19	299	2.01	113			
11	3/21/2021	1.50	3.60	0.200	1.70			
12	10/19/2021	3.80	190	5.500	130			
13	3/25/2022	1.60	4.30	0.200	2.50			
14	10/18/2022	3.80	41.0	2.50	20.0			
15	3/22/2023	0.830	5.50	0.710	2.40			
16								
17								
18								
19								
20								
Coefficient of Variation:		0.41	1.20	0.88	1.48			
Mann-Kendall Statistic (S):		-18	-9	-40	-7			
Confidence Factor:		79.6%	65.1%	97.4%	61.5%			
Concentration Trend:		Stable	No Trend	Decreasing	No Trend			



Notes:

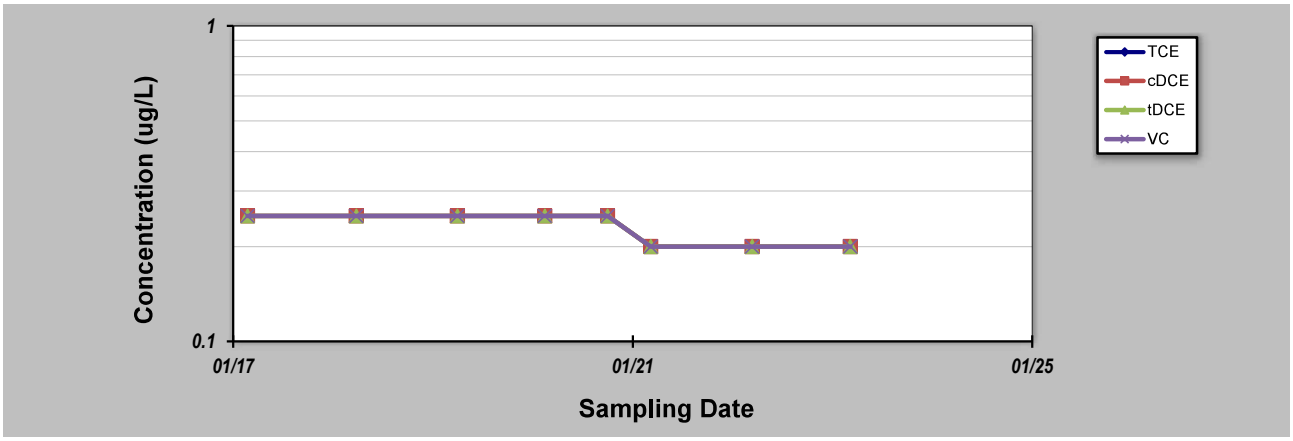
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-102
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	0.250	0.250	0.250	0.250			
2	4/10/2018	0.250	0.250	0.250	0.250			
3	4/15/2019	0.250	0.250	0.250	0.250			
4	2/28/2020	0.250	0.250	0.250	0.250			
5	10/15/2020	0.250	0.250	0.250	0.250			
6	3/22/2021	0.200	0.200	0.200	0.200			
7	3/28/2022	0.200	0.200	0.200	0.200			
8	3/22/2023	0.200	0.200	0.200	0.200			
9								
10								
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19								
20								
Coefficient of Variation:		0.11	0.11	0.11	0.11			
Mann-Kendall Statistic (S):		-15	-15	-15	-15			
Confidence Factor:		95.8%	95.8%	95.8%	95.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

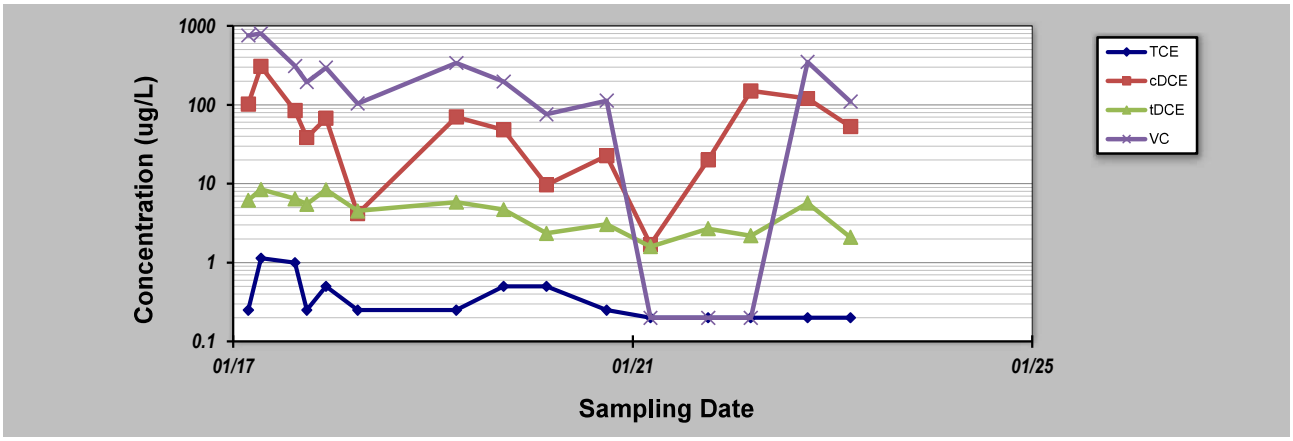
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-4
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.250	102	6.16	758			
2	4/26/2017	1.14	307	8.46	802			
3	8/29/2017	1.00	84.7	6.45	311			
4	10/11/2017	0.250	38.5	5.50	194			
5	12/20/2017	0.500	67.6	8.40	296			
6	4/15/2018	0.250	4.18	4.52	104			
7	4/11/2019	0.250	70.2	5.84	339			
8	10/1/2019	0.500	48.1	4.71	197			
9	3/5/2020	0.500	9.67	2.35	75.9			
10	10/12/2020	0.250	22.6	3.05	113			
11	3/21/2021	0.200	1.70	1.60	0.200			
12	10/18/2021	0.200	20.0	2.70	0.200			
13	3/23/2022	0.200	150	2.20	0.200			
14	10/17/2022	0.200	120	5.70	350			
15	3/23/2023	0.200	53.0	2.10	110			
16								
17								
18								
19								
20								
Coefficient of Variation:		0.76	1.07	0.48	1.02			
Mann-Kendall Statistic (S):		-58	-21	-63	-50			
Confidence Factor:		99.9%	83.6%	99.9%	99.3%			
Concentration Trend:		Decreasing	No Trend	Decreasing	Decreasing			



Notes:

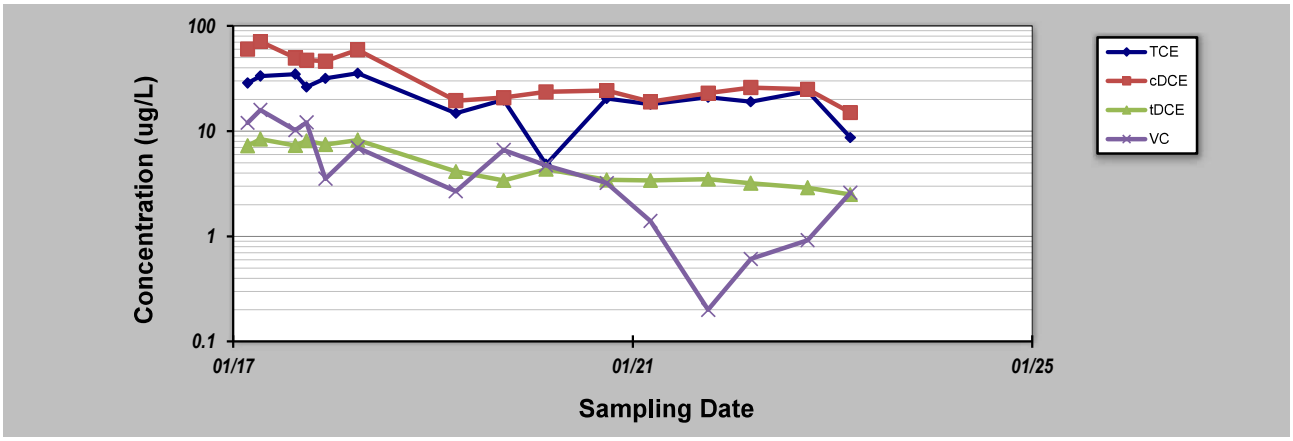
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-13
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	28.7	60.2	7.26	12.0			
2	4/24/2017	33.5	71.0	8.40	15.9			
3	8/30/2017	34.9	49.6	7.30	10.2			
4	10/10/2017	26.3	47.3	8.11	12.1			
5	12/18/2017	31.7	46.2	7.46	3.53			
6	4/15/2018	35.5	59.3	8.23	6.96			
7	4/9/2019	14.8	19.5	4.13	2.68			
8	10/1/2019	19.8	20.8	3.40	6.64			
9	3/3/2020	4.84	23.6	4.35	4.74			
10	10/12/2020	20.4	24.3	3.44	3.21			
11	3/21/2021	18.0	19.0	3.40	1.40			
12	10/18/2021	21.0	23.0	3.50	0.200			
13	3/23/2022	19.0	26.0	3.20	0.610			
14	10/17/2022	24.0	25.0	2.90	0.920			
15	3/22/2023	8.70	15.0	2.50	2.60			
16								
17								
18								
19								
20								
Coefficient of Variation:		0.41	0.52	0.44	0.88			
Mann-Kendall Statistic (S):		-41	-55	-72	-73			
Confidence Factor:		97.7%	99.7%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

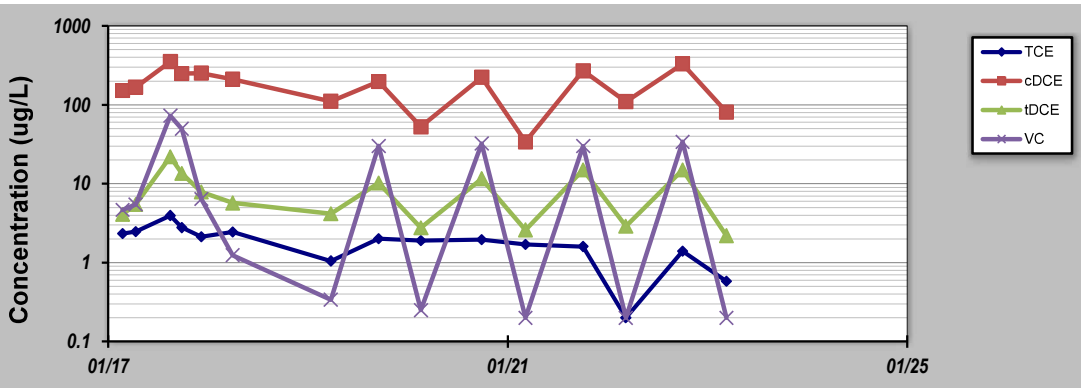
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-18B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	2.33	152	4.10	4.66			
2	4/25/2017	2.48	167	5.46	5.47			
3	8/30/2017	3.96	354	22.0	72.8			
4	10/11/2017	2.78	249	13.5	49.8			
5	12/21/2017	2.13	253	7.86	6.40			
6	4/15/2018	2.44	211	5.71	1.24			
7	4/9/2019	1.05	111	4.16	0.339			
8	10/1/2019	2.01	197	10.2	30.1			
9	3/3/2020	1.90	52.7	2.76	0.250			
10	10/12/2020	1.95	224	11.6	32.3			
11	3/21/2021	1.70	34.0	2.60	0.200			
12	10/18/2021	1.60	270	15.0	30.0			
13	3/23/2022	0.200	110	2.90	0.200			
14	10/17/2022	1.40	330	15.0	34.0			
15	3/26/2023	0.580	81.0	2.20	0.200			
16								
17								
18								
19								
20								
Coefficient of Variation:		0.48	0.52	0.72	1.26			
Mann-Kendall Statistic (S):		-73	-15	-14	-28			
Confidence Factor:		>99.9%	75.2%	73.7%	90.8%			
Concentration Trend:		Decreasing	Stable	Stable	Prob. Decreasing			



Notes:

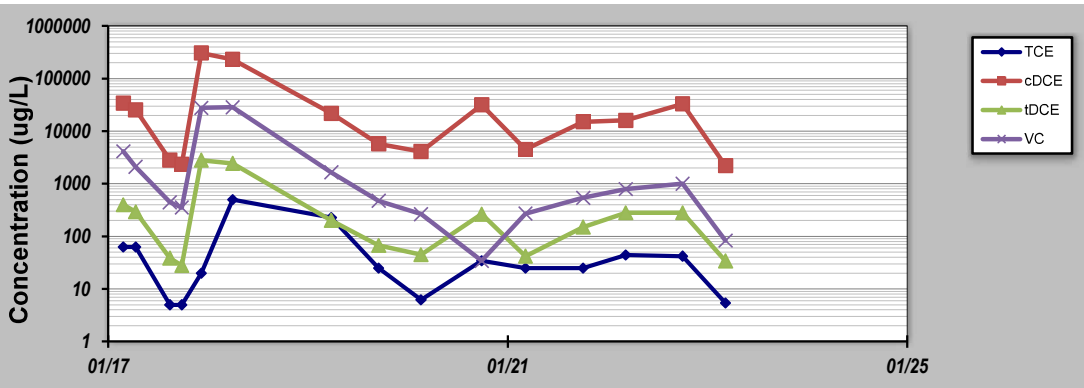
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-26
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	62.5	34000	399	4140			
2	4/25/2017	62.5	25400	293	2090			
3	8/28/2017	5.00	2820	38.5	443			
4	10/11/2017	5.00	2360	27.8	353			
5	12/21/2017	19.9	306000	2800	27600			
6	4/15/2018	500	231000	2440	28400			
7	4/11/2019	228	21800	202	1650			
8	10/1/2019	25.0	5710	67.1	474			
9	3/3/2020	6.25	4090	44.8	264			
10	10/12/2020	34.2	31700	264	34.2			
11	3/21/2021	25.0	4500	42.0	270			
12	10/18/2021	25.0	15000	150	540			
13	3/23/2022	44.0	16000	280	790			
14	10/17/2022	42.0	33000	280	1000			
15	3/23/2023	5.40	2200	34.0	83.0			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.79	1.86	1.78	2.11			
Mann-Kendall Statistic (S):		-4	-17	-18	-31			
Confidence Factor:		55.8%	78.2%	79.6%	93.0%			
Concentration Trend:		No Trend	No Trend	No Trend	Prob. Decreasing			



Notes:

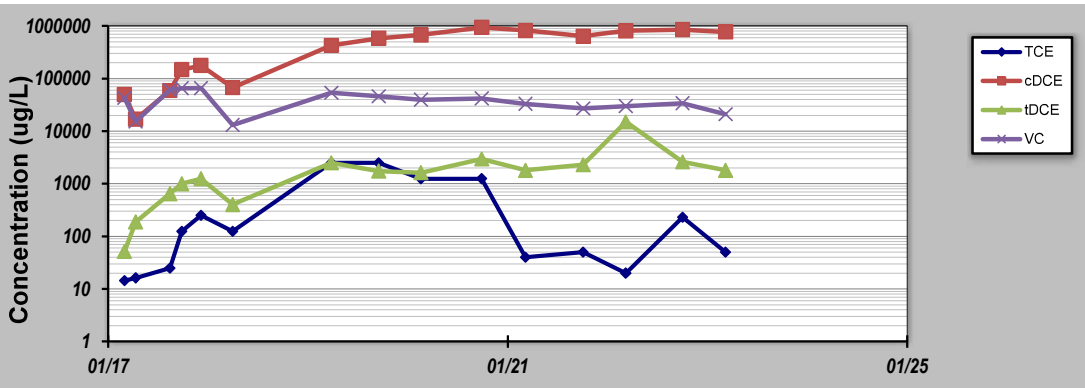
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-29
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	14.4	49500	51.6	42900			
2	4/25/2017	16.3	16900	188	15200			
3	8/28/2017	25.0	59200	646	60700			
4	10/11/2017	125	148000	1000	65500			
5	12/20/2017	250	178000	1250	65800			
6	4/15/2018	125	67300	403	13100			
7	4/11/2019	2500	428000	2500	53500			
8	10/1/2019	2500	582000	1750	46100			
9	3/3/2020	1250	675000	1630	39600			
10	10/12/2020	1250	938000	2950	41900			
11	3/21/2021	40.0	820000	1800	33000			
12	10/18/2021	50.0	640000	2300	27000			
13	3/23/2022	20.0	810000	15000	30000			
14	10/17/2022	230	850000	2600	34000			
15	3/23/2023	50.0	770000	1800	21000			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.58	0.74	1.51	0.43			
Mann-Kendall Statistic (S):		17	77	70	-37			
Confidence Factor:		78.2%	>99.9%	>99.9%	96.3%			
Concentration Trend:		No Trend	Increasing	Increasing	Decreasing			



Notes:

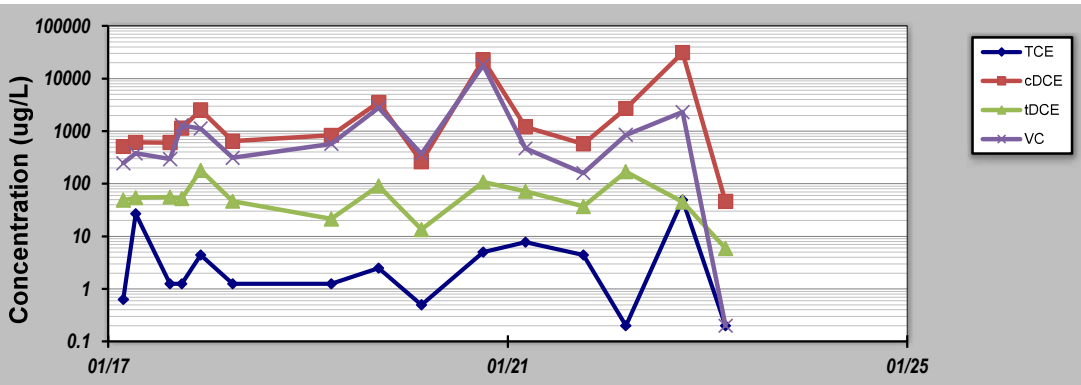
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	VEP-35
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.630	510	48.7	245			
2	4/25/2017	26.9	613	54.3	378			
3	8/29/2017	1.25	607	55.9	294			
4	10/11/2017	1.25	1140	52.2	1290			
5	12/19/2017	4.43	2530	180	1120			
6	4/15/2018	1.25	646	46.5	311			
7	4/11/2019	1.25	832	21.4	571			
8	10/1/2019	2.50	3500	90.7	2770			
9	3/5/2020	0.500	263	13.5	369			
10	10/17/2020	5.00	22700	108	18000			
11	3/21/2021	7.70	1200	72.0	470			
12	10/19/2021	4.40	570	37.0	160			
13	3/23/2022	0.200	2700	170	850			
14	10/17/2022	49.0	31000	45.0	2300			
15	3/23/2023	0.200	46.0	5.90	0.200			
16								
17								
18								
19								
20								
Coefficient of Variation:		1.88	2.01	0.77	2.32			
Mann-Kendall Statistic (S):		2	23	-15	9			
Confidence Factor:		52.0%	85.9%	75.2%	65.1%			
Concentration Trend:		No Trend	No Trend	Stable	No Trend			



Notes:

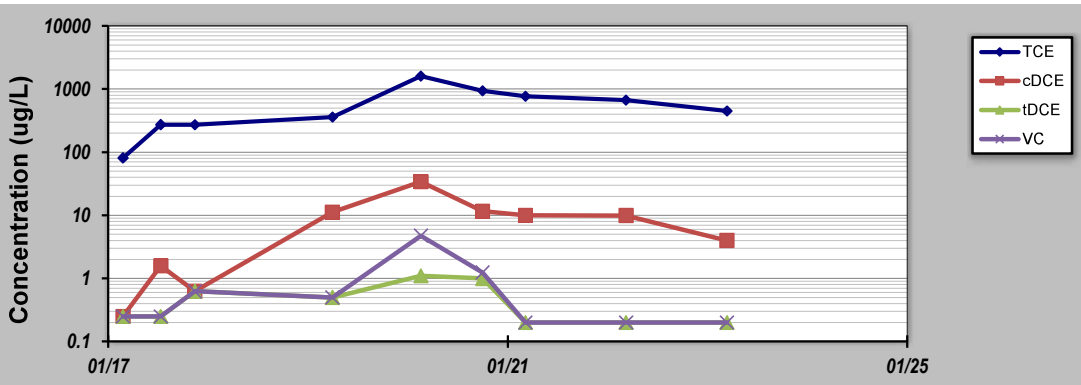
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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	W-154
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	81.1	0.250	0.250	0.250			
2	7/26/2017	273	1.58	0.250	0.250			
3	11/28/2017	271	0.625	0.625	0.625			
4	4/15/2019	361	11.2	0.500	0.500			
5	3/3/2020	1610	34.1	1.10	4.75			
6	10/15/2020	936	11.6	1.00	1.24			
7	3/21/2021	770	10.0	0.200	0.200			
8	3/24/2022	670	9.90	0.200	0.200			
9	3/28/2023	450	4.0	0.200	0.200			
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.77	1.13	0.74	1.62			
Mann-Kendall Statistic (S):		14	8	-8	-8			
Confidence Factor:		91.0%	76.2%	76.2%	76.2%			
Concentration Trend:		Prob. Increasing	No Trend	Stable	No Trend			



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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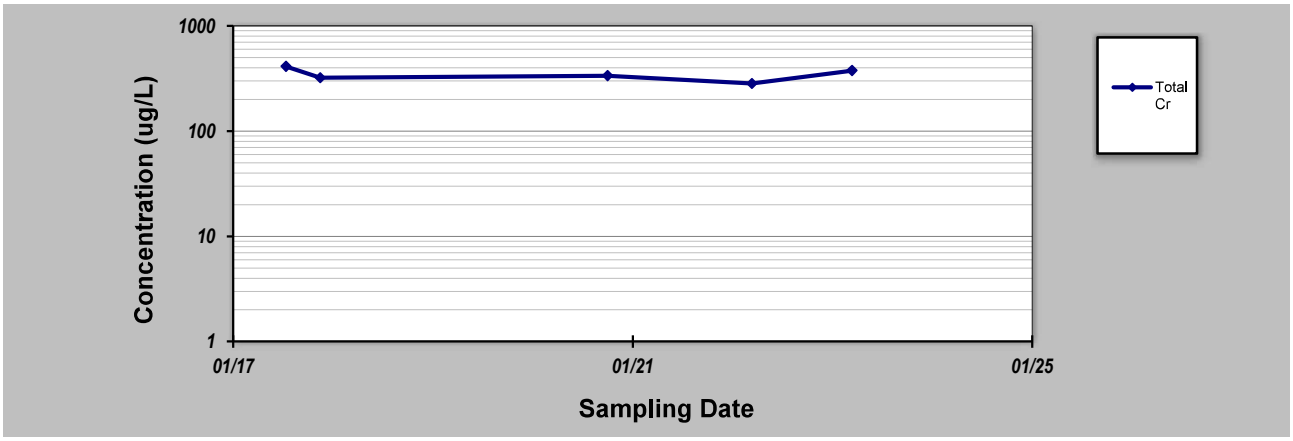
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	F-220
Facility Name:	Air Force Plant 4	Constituent:	Total Chromium
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID: Total Cr

Sampling Event	Sampling Date	TOTAL CHROMIUM CONCENTRATION (ug/L)
1	7/27/2017	413
2	11/29/2017	322
3	10/15/2020	337
4	3/27/2022	284
5	3/28/2023	377
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.14
Mann-Kendall Statistic (S):		-2
Confidence Factor:		59.2%
Concentration Trend:		Stable



Notes:

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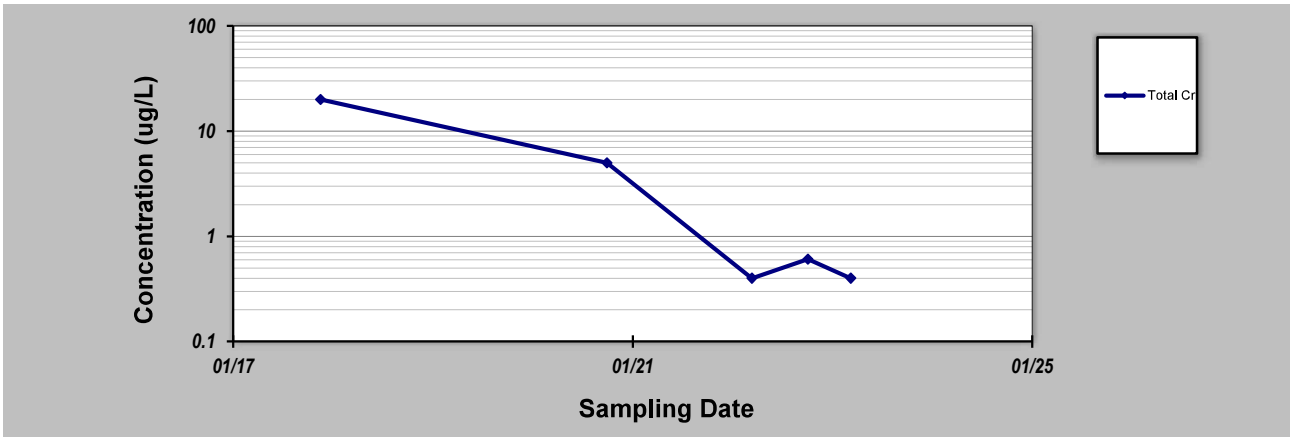
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	HM-17
Facility Name:	Air Force Plant 4	Constituent:	Total Chromium
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID: Total Cr

Sampling Event	Sampling Date	TOTAL CHROMIUM CONCENTRATION (ug/L)
1	11/30/2017	20.0
2	10/13/2020	5.00
3	3/27/2022	0.400
4	10/18/2022	0.606
5	3/24/2023	0.400
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		1.60
Mann-Kendall Statistic (S):		-7
Confidence Factor:		92.1%
Concentration Trend:		Prob. Decreasing



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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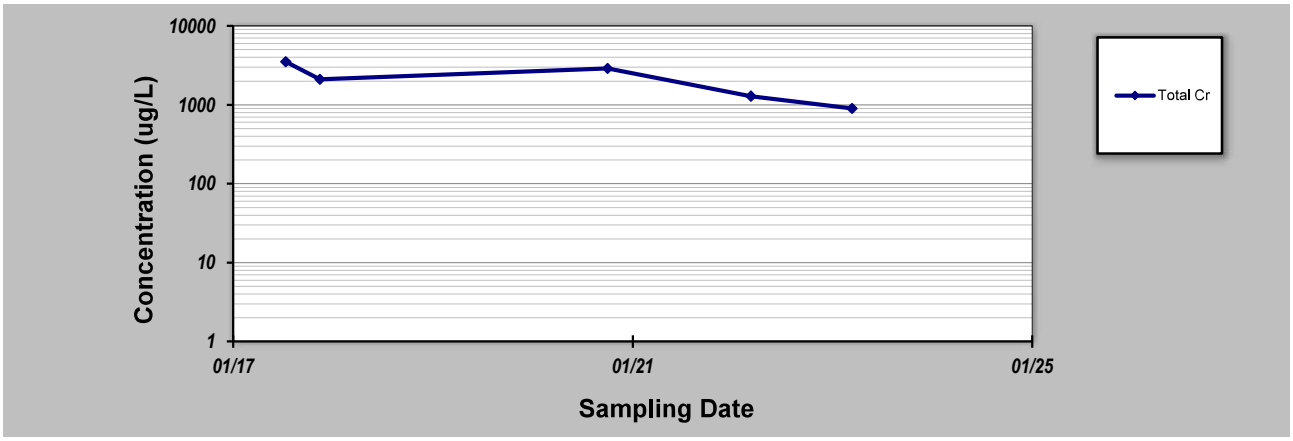
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	W-154
Facility Name:	Air Force Plant 4	Constituent:	Toal Chromium
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID: Total Cr

Sampling Event	Sampling Date	TOAL CHROMIUM CONCENTRATION (ug/L)
1	7/26/2017	3530
2	11/28/2017	2100
3	10/15/2020	2890
4	3/24/2022	1290
5	3/28/2023	902
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
Coefficient of Variation:		0.51
Mann-Kendall Statistic (S):		-8
Confidence Factor:		95.8%
Concentration Trend:		Decreasing



Notes:

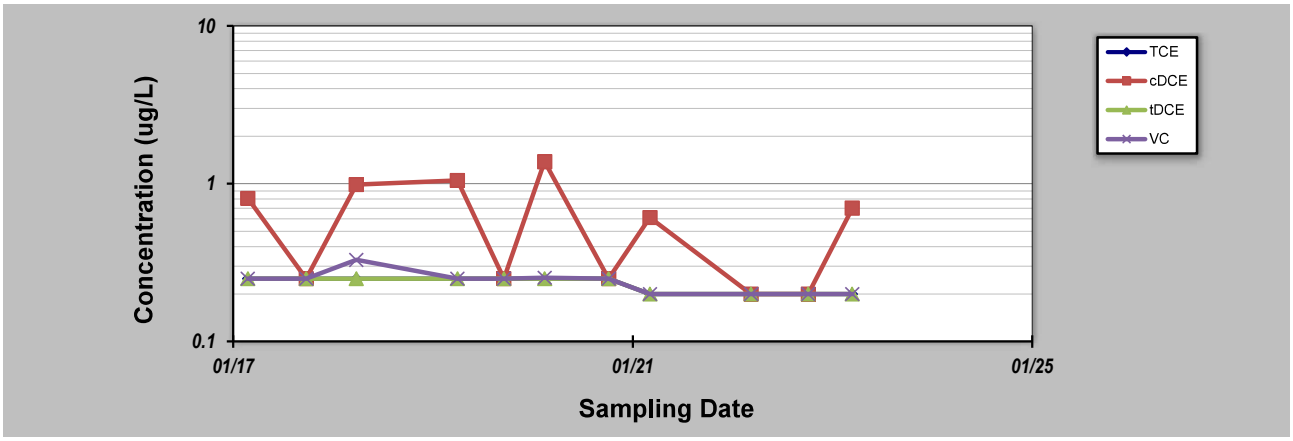
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	C-5
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	0.250	0.808	0.250	0.250			
2	10/9/2017	0.250	0.250	0.250	0.250			
3	4/10/2018	0.250	0.987	0.250	0.329			
4	4/15/2019	0.250	1.05	0.250	0.250			
5	10/2/2019	0.250	0.250	0.250	0.250			
6	2/28/2020	0.250	1.38	0.250	0.254			
7	10/19/2020	0.250	0.250	0.250	0.250			
8	3/19/2021	0.200	0.610	0.200	0.200			
9	3/24/2022	0.200	0.200	0.200	0.200			
10	10/19/2022	0.200	0.200	0.200	0.200			
11	3/29/2023	0.200	0.700	0.200	0.200			
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.11	0.68	0.11	0.16			
Mann-Kendall Statistic (S):		-28	-13	-28	-27			
Confidence Factor:		98.4%	82.1%	98.4%	98.0%			
Concentration Trend:		Decreasing	Stable	Decreasing	Decreasing			



Notes:

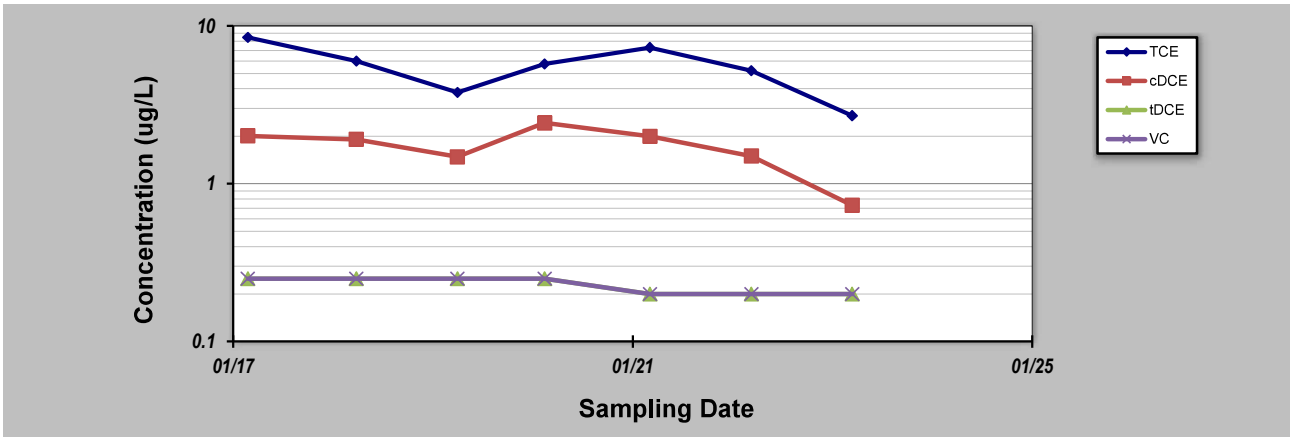
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	EGL-2
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	8.46	2.01	0.250	0.250			
2	4/10/2018	5.99	1.91	0.250	0.250			
3	4/15/2019	3.79	1.48	0.250	0.250			
4	2/28/2020	5.75	2.43	0.250	0.250			
5	3/19/2021	7.30	2.00	0.200	0.200			
6	3/25/2022	5.20	1.50	0.200	0.200			
7	3/29/2023	2.70	0.730	0.200	0.200			
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.35	0.32	0.12	0.12			
Mann-Kendall Statistic (S):		-11	-9	-12	-12			
Confidence Factor:		93.2%	88.1%	94.9%	94.9%			
Concentration Trend:		Prob. Decreasing	Stable	Prob. Decreasing	Prob. Decreasing			



Notes:

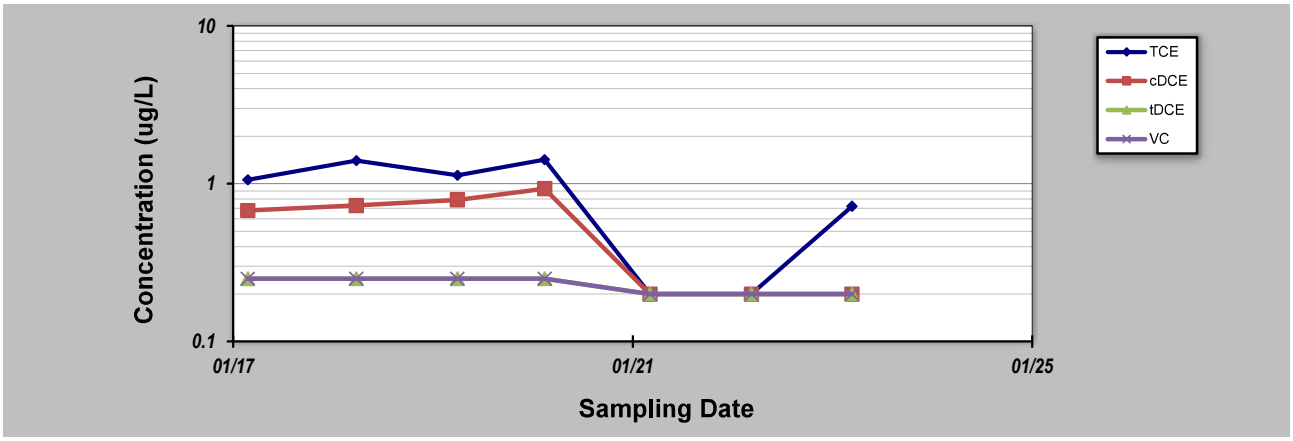
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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	LF05-S6
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	1.06	0.677	0.250	0.250			
2	4/10/2018	1.40	0.728	0.250	0.250			
3	4/15/2019	1.13	0.790	0.250	0.250			
4	2/28/2020	1.42	0.931	0.250	0.250			
5	3/19/2021	0.200	0.200	0.200	0.200			
6	3/25/2022	0.200	0.200	0.200	0.200			
7	3/28/2023	0.720	0.20	0.200	0.200			
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9								
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17								
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19								
20								
Coefficient of Variation:		0.59	0.60	0.12	0.12			
Mann-Kendall Statistic (S):		-6	-6	-12	-12			
Confidence Factor:		76.4%	76.4%	94.9%	94.9%			
Concentration Trend:		Stable	Stable	Prob. Decreasing	Prob. Decreasing			



Notes:

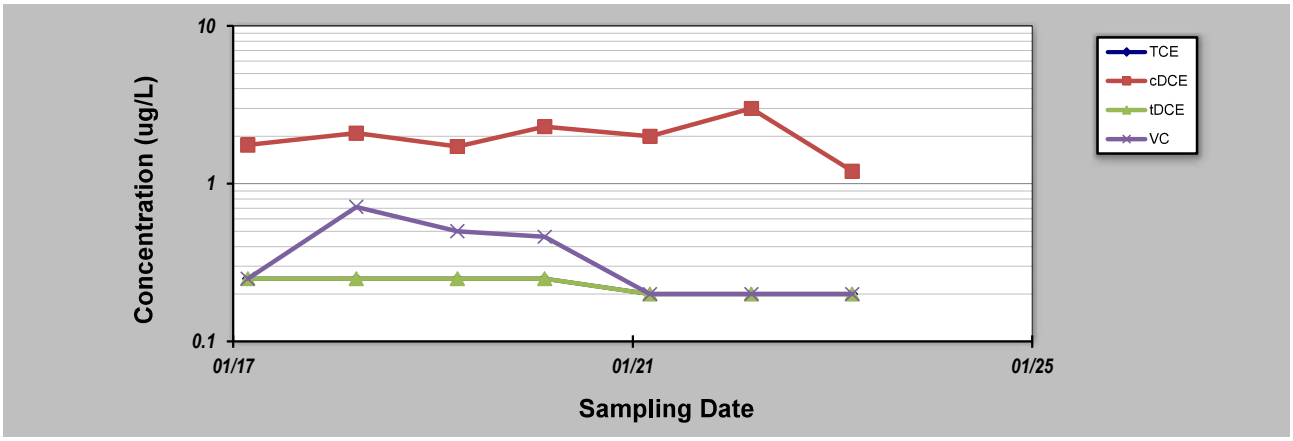
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	March 2023	Job ID:	SW-08
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	0.250	1.76	0.250	0.250			
2	4/10/2018	0.250	2.09	0.250	0.714			
3	4/15/2019	0.250	1.72	0.250	0.500			
4	2/28/2020	0.250	2.30	0.250	0.461			
5	3/19/2021	0.200	2.00	0.200	0.200			
6	3/25/2022	0.200	3.00	0.200	0.200			
7	3/29/2023	0.200	1.20	0.200	0.200			
8								
9								
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11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.12	0.28	0.12	0.56			
Mann-Kendall Statistic (S):		-12	1	-12	-12			
Confidence Factor:		94.9%	50.0%	94.9%	94.9%			
Concentration Trend:		Prob. Decreasing	No Trend	Prob. Decreasing	Prob. Decreasing			



Notes:

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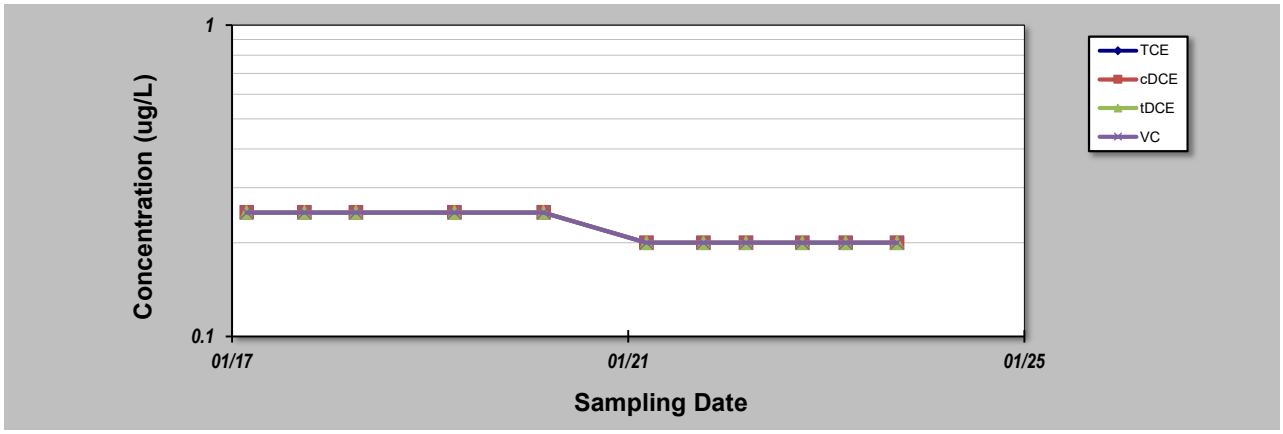
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SEMIANNUAL LOCATIONS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	WS-H3
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/10/2017	0.250	0.250	0.250	0.250			
2	10/9/2017	0.250	0.250	0.250	0.250			
3	4/17/2018	0.250	0.250	0.250	0.250			
4	4/15/2019	0.250	0.250	0.250	0.250			
5	3/9/2020	0.250	0.250	0.250	0.250			
6	3/24/2021	0.200	0.200	0.200	0.200			
7	10/20/2021	0.200	0.200	0.200	0.200			
8	3/25/2022	0.200	0.200	0.200	0.200			
9	10/19/2022	0.200	0.200	0.200	0.200			
10	3/28/2023	0.200	0.200	0.200	0.200			
11	10/4/2023	0.200	0.200	0.200	0.200			
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.12	0.12	0.12	0.12			
Mann-Kendall Statistic (S):		-30	-30	-30	-30			
Confidence Factor:		99.0%	99.0%	99.0%	99.0%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

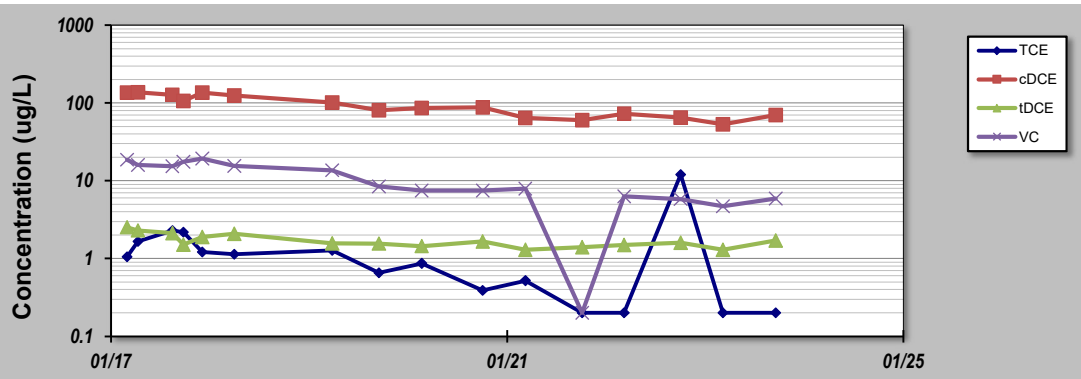
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	P-22U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	1.05	136	2.53	18.7			
2	4/25/2017	1.66	137	2.30	15.9			
3	8/29/2017	2.28	128	2.12	15.4			
4	10/9/2017	2.18	106	1.51	17.5			
5	12/18/2017	1.21	136	1.90	19.3			
6	4/15/2018	1.14	124	2.07	15.5			
7	4/11/2019	1.27	101	1.57	13.6			
8	9/30/2019	0.655	80.6	1.56	8.47			
9	3/5/2020	0.870	85.7	1.45	7.46			
10	10/17/2020	0.390	87.9	1.66	7.48			
11	3/23/2021	0.520	64.0	1.30	7.90			
12	10/19/2021	0.200	60.0	1.40	0.200			
13	3/23/2022	0.200	73.0	1.50	6.30			
14	10/17/2022	12.0	65.0	1.60	5.80			
15	3/22/2023	0.20	53.0	1.30	4.70			
16	10/3/2023	0.20	70.0	1.70	5.90			
17								
18								
19								
20								
Coefficient of Variation:		1.75	0.32	0.21	0.55			
Mann-Kendall Statistic (S):		-64	-89	-59	-88			
Confidence Factor:		99.8%	>99.9%	99.7%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

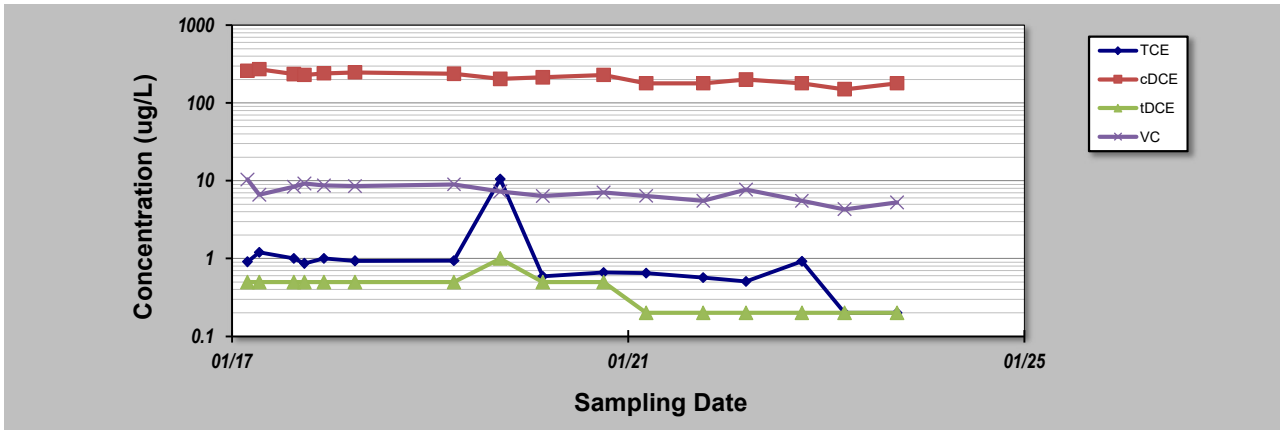
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	P-27U
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/13/2017	0.910	259	0.500	10.4			
2	4/26/2017	1.20	272	0.500	6.60			
3	8/31/2017	1.00	234	0.500	8.39			
4	10/9/2017	0.87	229	0.500	9.26			
5	12/20/2017	1.00	241	0.500	8.71			
6	4/13/2018	0.937	248	0.500	8.50			
7	4/14/2019	0.940	237	0.500	9.00			
8	10/1/2019	10.5	205	1.00	7.30			
9	3/6/2020	0.590	214	0.500	6.37			
10	10/16/2020	0.662	229	0.500	7.07			
11	3/22/2021	0.650	180	0.200	6.40			
12	10/19/2021	0.570	180	0.200	5.50			
13	3/25/2022	0.510	200	0.200	7.70			
14	10/18/2022	0.920	180	0.200	5.50			
15	3/24/2023	0.200	150	0.200	4.3			
16	10/4/2023	0.200	180	0.200	5.3			
17								
18								
19								
20								
Coefficient of Variation:		1.81	0.16	0.51	0.23			
Mann-Kendall Statistic (S):		-68	-85	-55	-75			
Confidence Factor:		99.9%	>99.9%	99.3%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

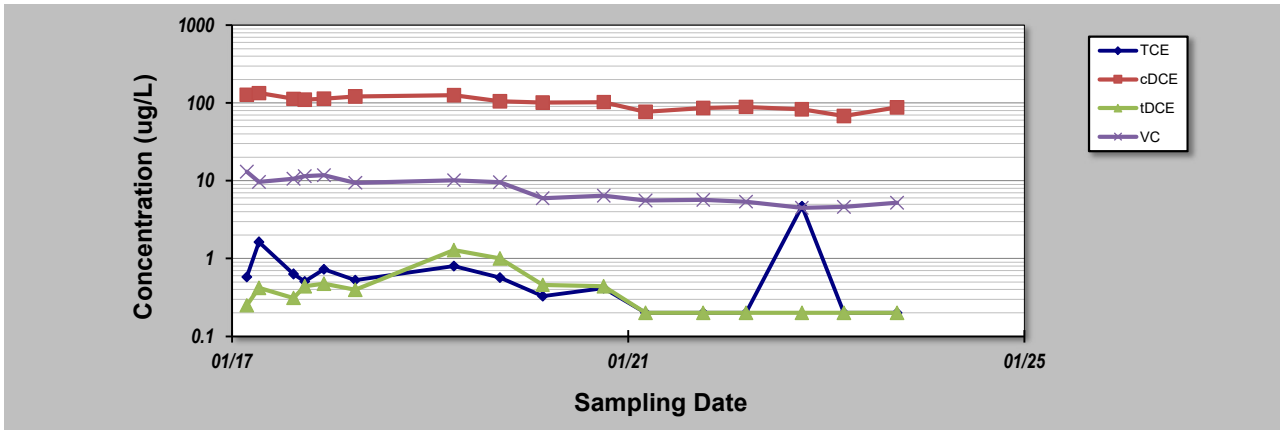
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	WITCPU006
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.580	128	0.250	13.1			
2	4/25/2017	1.64	134	0.420	9.63			
3	8/30/2017	0.635	113	0.312	10.6			
4	10/10/2017	0.509	110	0.441	11.4			
5	12/20/2017	0.725	114	0.477	11.8			
6	4/15/2018	0.528	121	0.396	9.44			
7	4/14/2019	0.798	126	1.29	10.2			
8	9/30/2019	0.570	105	0.999	9.57			
9	3/5/2020	0.330	101	0.460	5.98			
10	10/17/2020	0.418	103	0.440	6.45			
11	3/20/2021	0.200	77.0	0.200	5.60			
12	10/19/2021	0.200	86.0	0.200	5.70			
13	3/25/2022	0.200	89.0	0.200	5.40			
14	10/18/2022	4.70	83.0	0.200	4.50			
15	3/22/2023	0.200	68.0	0.200	4.60			
16	10/4/2023	0.200	88.0	0.200	5.20			
17								
18								
19								
20								
Coefficient of Variation:		1.42	0.19	0.74	0.36			
Mann-Kendall Statistic (S):		-56	-82	-41	-92			
Confidence Factor:		99.4%	>99.9%	96.5%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

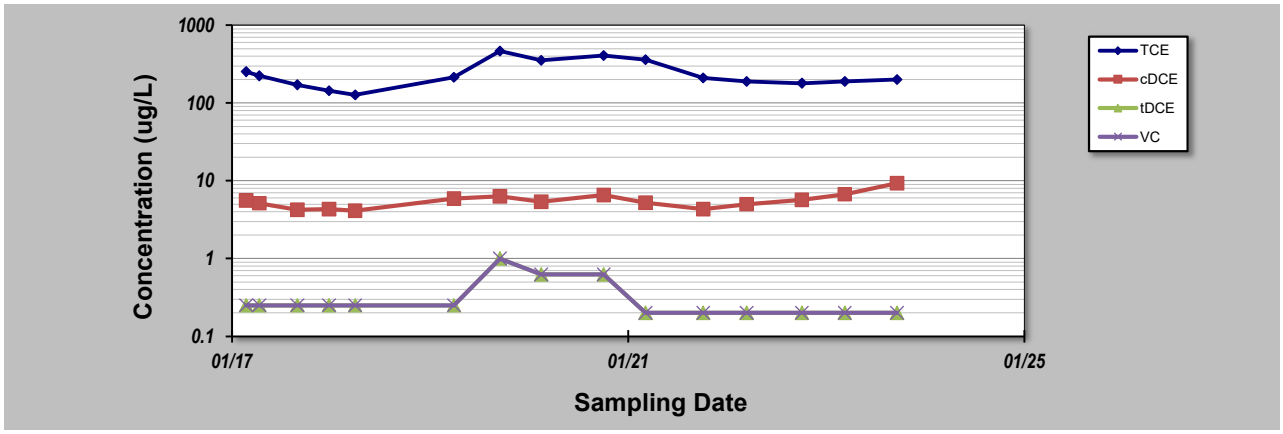
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	P-9US
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	252	5.58	0.250	0.250			
2	4/26/2017	224	5.14	0.250	0.250			
3	9/13/2017	171	4.26	0.250	0.250			
4	1/8/2018	143	4.32	0.250	0.250			
5	4/14/2018	127	4.11	0.250	0.250			
6	4/14/2019	215	5.90	0.250	0.250			
7	9/30/2019	467	6.31	1.00	1.00			
8	2/29/2020	353	5.37	0.625	0.625			
9	10/17/2020	408	6.53	0.625	0.625			
10	3/20/2021	360	5.20	0.200	0.200			
11	10/19/2021	210	4.30	0.200	0.200			
12	3/28/2022	190	5.00	0.200	0.200			
13	10/18/2022	180	5.70	0.200	0.200			
14	3/25/2023	190	6.70	0.200	0.200			
15	10/4/2023	200	9.30	0.200	0.200			
16								
17								
18								
19								
20								
Coefficient of Variation:		0.41	0.24	0.71	0.71			
Mann-Kendall Statistic (S):		-8	35	-38	-38			
Confidence Factor:		63.3%	95.4%	96.7%	96.7%			
Concentration Trend:		Stable	Increasing	Decreasing	Decreasing			



Notes:

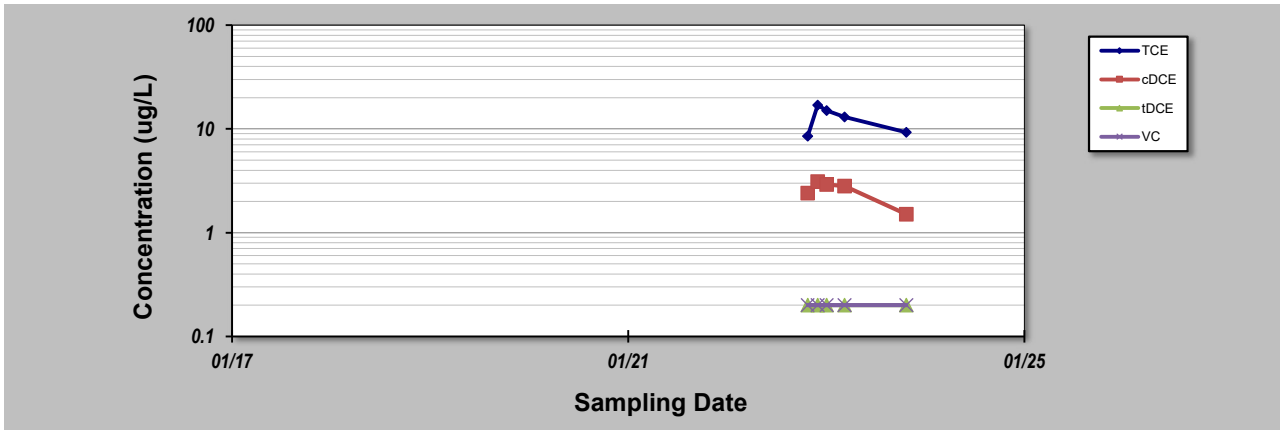
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	November 2023	Job ID:	LKRTA015
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	11/8/2022	8.50	2.40	0.200	0.200			
2	12/15/2022	17.0	3.10	0.200	0.200			
3	1/17/2023	15.0	2.90	0.200	0.200			
4	3/24/2023	13.0	2.80	0.200	0.200			
5	11/7/2023	9.3	1.50	0.200	0.200			
6								
7								
8								
9								
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11								
12								
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14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.29	0.25	0.00	0.00			
Mann-Kendall Statistic (S):		-2	-4	0	0			
Confidence Factor:		59.2%	75.8%	40.8%	40.8%			
Concentration Trend:		Stable	Stable	Stable	Stable			



Notes:

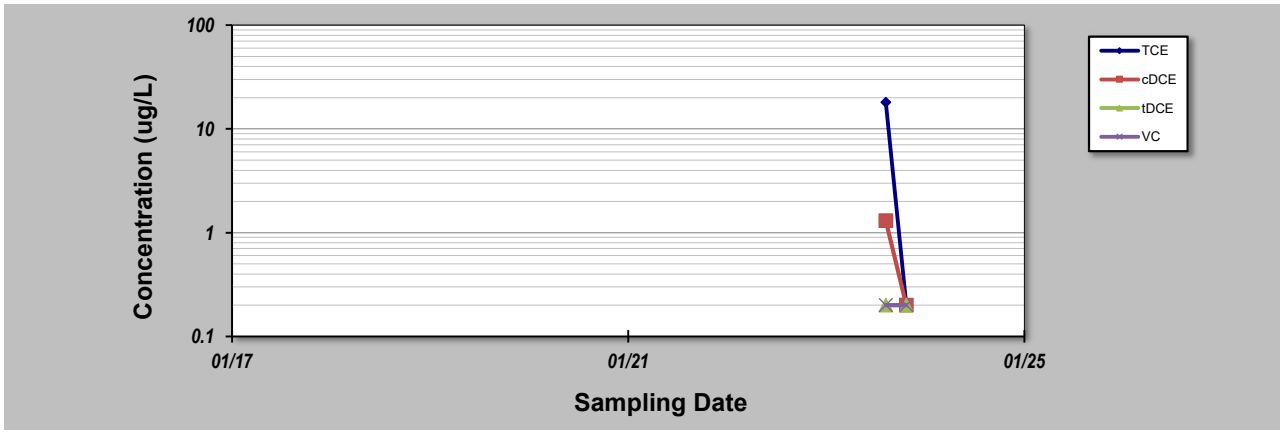
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	November 2023	Job ID:	LKRTA016
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	8/23/2023	18.0	1.30	0.200	0.200			
2	11/7/2023	0.200	0.200	0.200	0.200			
3								
4								
5								
6								
7								
8								
9								
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11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		1.38	1.04	0.00	0.00			
Mann-Kendall Statistic (S):		-1	-1	0	0			
Confidence Factor:								
Concentration Trend:								



Notes:

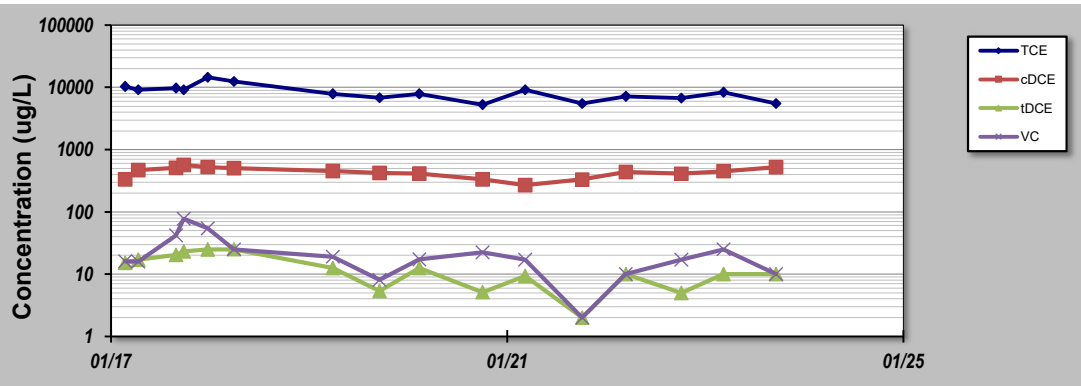
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	MW-10R-URS
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	10400	335	15.2	16.1			
2	4/26/2017	9130	470	17.1	15.9			
3	9/12/2017	9760	511	20.4	41.6			
4	10/10/2017	9100	565	23.1	78.0			
5	1/6/2018	14600	525	24.8	54.3			
6	4/13/2018	12500	503	25.0	25.0			
7	4/13/2019	7930	453	12.5	19.1			
8	10/2/2019	6860	419	5.34	8.09			
9	2/26/2020	7870	415	12.5	17.2			
10	10/16/2020	5270	334	5.11	22.4			
11	3/22/2021	9100	270	9.30	17.0			
12	10/19/2021	5500	330	2.00	2.0			
13	3/29/2022	7200	440	10.0	10.0			
14	10/19/2022	6700	410	5.00	17.0			
15	3/24/2023	8400	450	10.0	25.0			
16	10/4/2023	5500	520	10.0	10.0			
17								
18								
19								
20								
Coefficient of Variation:		0.30	0.19	0.57	0.81			
Mann-Kendall Statistic (S):		-62	-28	-50	-33			
Confidence Factor:		99.8%	88.6%	98.7%	92.4%			
Concentration Trend:		Decreasing	Stable	Decreasing	Prob. Decreasing			



Notes:

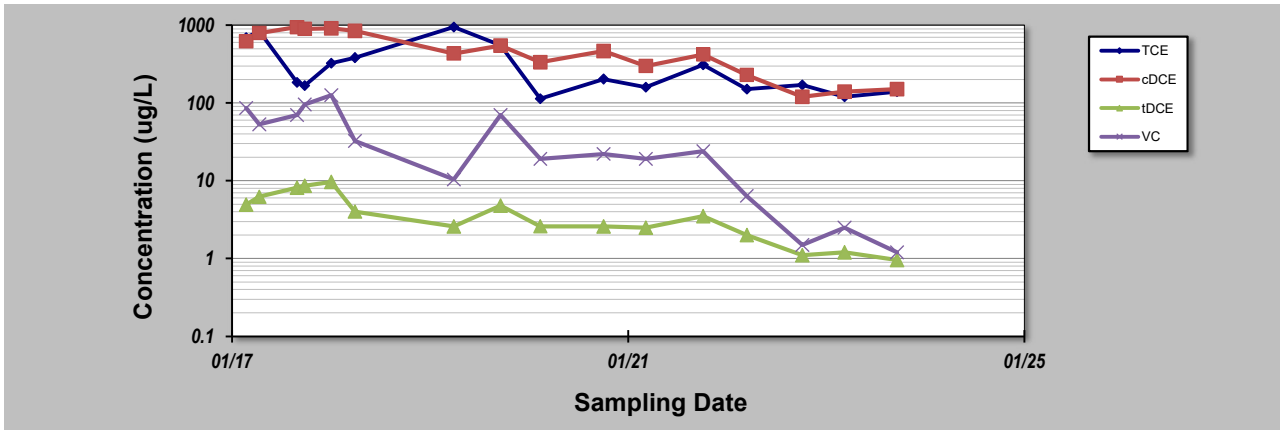
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	MW-11
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	691	622	4.93	86.2			
2	4/26/2017	839	795	6.21	53.0			
3	9/12/2017	183	945	8.11	70.3			
4	10/10/2017	168	899	8.62	96.0			
5	1/16/2018	326	912	9.64	126			
6	4/13/2018	383	847	4.01	32.4			
7	4/13/2019	951	432	2.59	10.4			
8	10/2/2019	551	546	4.82	70.1			
9	2/26/2020	114	334	2.60	19.0			
10	10/16/2020	203	465	2.59	22.1			
11	3/21/2021	160	300	2.50	19.0			
12	10/19/2021	310	420	3.50	24.0			
13	3/29/2022	150	230	2.00	6.40			
14	10/19/2022	170	120	1.10	1.50			
15	3/24/2023	120	140	1.20	2.50			
16	10/4/2023	140	150	0.96	1.20			
17								
18								
19								
20								
Coefficient of Variation:		0.79	0.58	0.68	0.97			
Mann-Kendall Statistic (S):		-54	-84	-83	-79			
Confidence Factor:		99.2%	>99.9%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

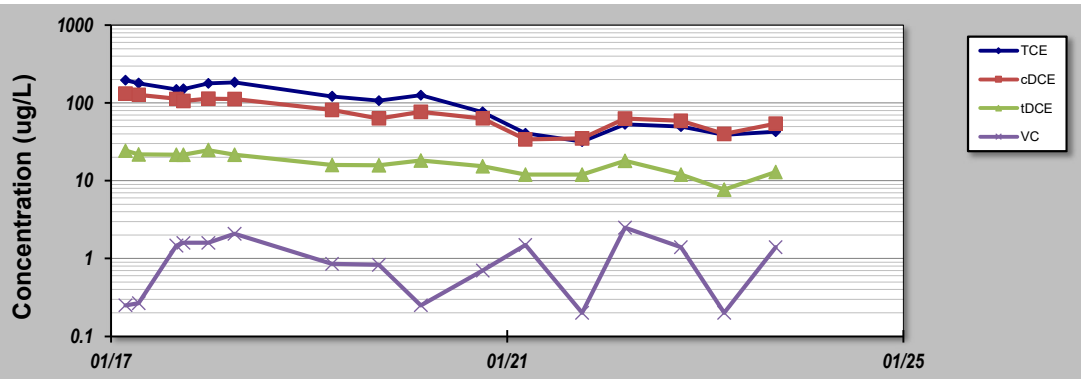
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	WHGLTA043
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/9/2017	196	132	24.3	0.25			
2	4/27/2017	180	128	21.9	0.266			
3	9/13/2017	149	113	21.5	1.47			
4	10/9/2017	151	106	21.6	1.59			
5	1/9/2018	178	114	24.8	1.59			
6	4/16/2018	185	112	21.7	2.07			
7	4/10/2019	122	81.6	16.0	0.856			
8	9/30/2019	107	63.1	15.8	0.834			
9	3/2/2020	126	77.0	18.3	0.250			
10	10/17/2020	76.4	63.2	15.3	0.700			
11	3/23/2021	41.0	34.0	12.0	1.50			
12	10/18/2021	32.0	35.0	12.0	0.200			
13	3/25/2022	53.0	63.0	18.0	2.50			
14	10/18/2022	50.0	59.0	12.0	1.40			
15	3/26/2023	39.0	40.0	7.70	0.200			
16	10/2/2023	43.0	54.0	13.0	1.40			
17								
18								
19								
20								
Coefficient of Variation:		0.56	0.42	0.29	0.68			
Mann-Kendall Statistic (S):		-86	-90	-81	-6			
Confidence Factor:		>99.9%	>99.9%	>99.9%	58.8%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Stable			



Notes:

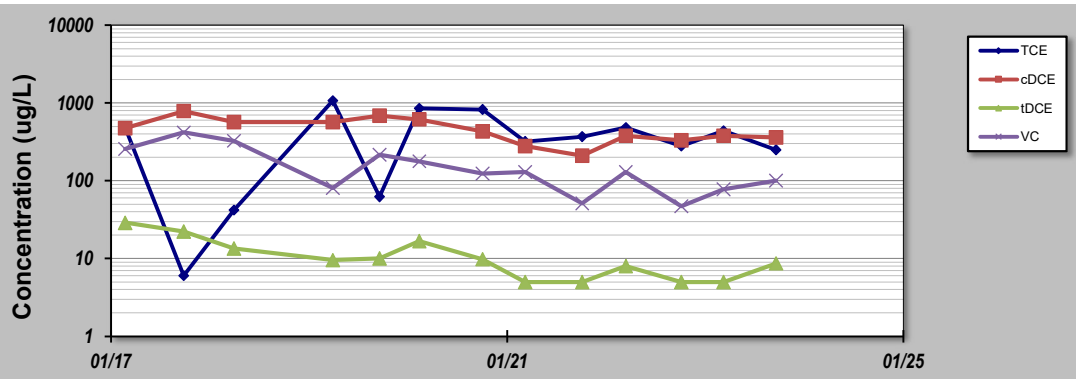
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	WJETA061
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	486	474	28.9	258			
2	10/10/2017	6.01	785	22.3	418			
3	4/13/2018	42.0	567	13.5	326			
4	4/13/2019	1070	568	9.54	80.6			
5	10/2/2019	62.2	688	10.0	217			
6	2/26/2020	855	617	16.7	178			
7	10/16/2020	823	431	9.80	124			
8	3/22/2021	320	280	5.00	130			
9	10/19/2021	370	210	5.00	51.0			
10	3/29/2022	480	380	8.00	130			
11	10/19/2022	280	330	5.00	47.0			
12	3/24/2023	440	380	5.00	78.0			
13	10/4/2023	250	360	8.70	100			
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.78	0.36	0.65	0.68			
Mann-Kendall Statistic (S):		-2	-37	-48	-45			
Confidence Factor:		52.4%	98.7%	99.9%	99.8%			
Concentration Trend:		Stable	Decreasing	Decreasing	Decreasing			



Notes:

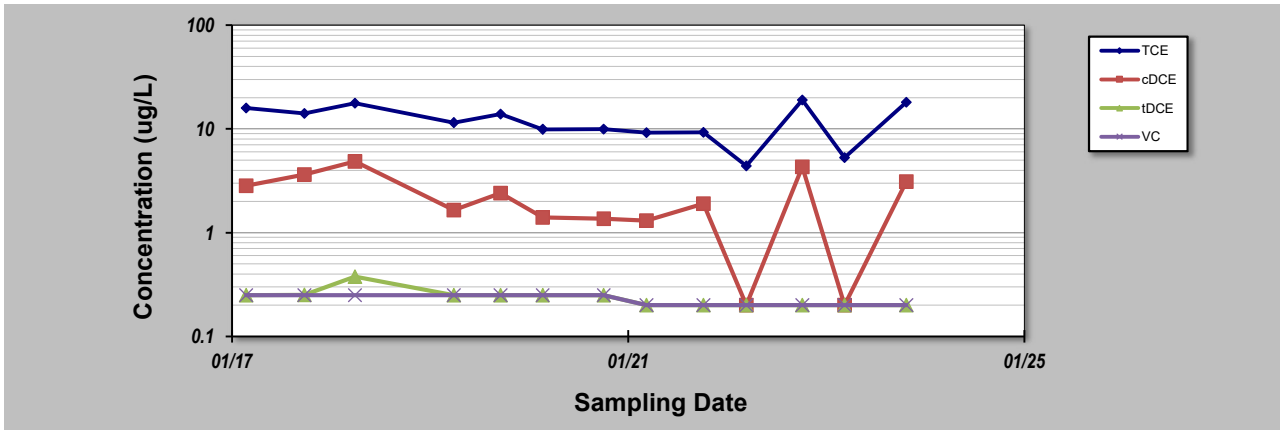
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	November 2023	Job ID:	WSETAHM31R
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	15.9	2.84	0.250	0.250			
2	10/9/2017	14.1	3.63	0.251	0.250			
3	4/13/2018	17.7	4.85	0.376	0.250			
4	4/13/2019	11.5	1.65	0.250	0.250			
5	10/2/2019	13.9	2.41	0.250	0.250			
6	3/5/2020	9.93	1.40	0.250	0.250			
7	10/17/2020	9.97	1.36	0.250	0.250			
8	3/24/2021	9.20	1.30	0.200	0.200			
9	10/20/2021	9.30	1.90	0.200	0.200			
10	3/27/2022	4.40	0.20	0.200	0.200			
11	10/19/2022	19.0	4.30	0.200	0.200			
12	3/24/2023	5.30	0.200	0.200	0.200			
13	11/7/2023	18.0	3.10	0.200	0.200			
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.39	0.65	0.21	0.11			
Mann-Kendall Statistic (S):		-24	-25	-47	-42			
Confidence Factor:		91.8%	92.7%	99.9%	99.5%			
Concentration Trend:		Prob. Decreasing	Prob. Decreasing	Decreasing	Decreasing			



Notes:

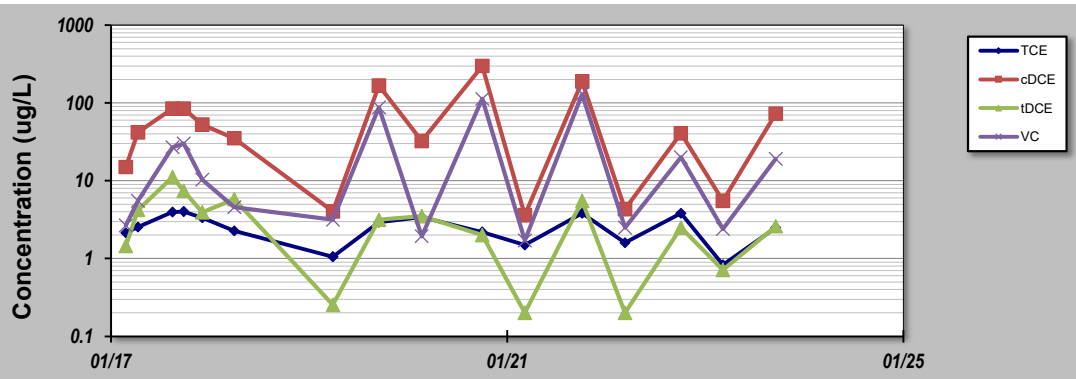
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	HM-50
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	2.15	15.0	1.46	2.67			
2	4/25/2017	2.55	41.9	4.21	5.55			
3	8/30/2017	3.97	84.1	11.1	26.9			
4	10/10/2017	4.02	85.1	7.45	30.1			
5	12/18/2017	3.35	52.7	3.91	10.3			
6	4/15/2018	2.27	35.3	5.82	4.59			
7	4/14/2019	1.06	4.06	0.254	3.17			
8	9/30/2019	2.91	167	3.15	87.6			
9	3/5/2020	3.41	32.5	3.50	1.94			
10	10/15/2020	2.19	299	2.01	113			
11	3/21/2021	1.50	3.60	0.200	1.70			
12	10/19/2021	3.80	190	5.500	130			
13	3/25/2022	1.60	4.30	0.200	2.50			
14	10/18/2022	3.80	41.0	2.50	20.0			
15	3/22/2023	0.830	5.50	0.710	2.40			
16	10/3/2023	2.50	73.0	2.60	19.0			
17								
18								
19								
20								
Coefficient of Variation:		0.40	1.16	0.87	1.46			
Mann-Kendall Statistic (S):		-19	-4	-41	-4			
Confidence Factor:		78.8%	55.3%	96.5%	55.3%			
Concentration Trend:		Stable	No Trend	Decreasing	No Trend			



Notes:

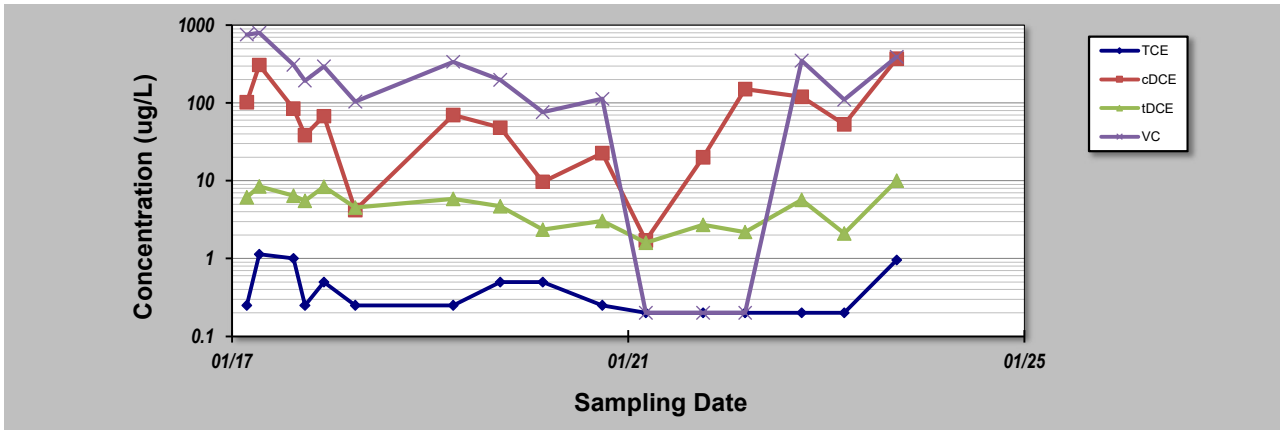
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-4
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.250	102	6.16	758			
2	4/26/2017	1.14	307	8.46	802			
3	8/29/2017	1.00	84.7	6.45	311			
4	10/11/2017	0.250	38.5	5.50	194			
5	12/20/2017	0.500	67.6	8.40	296			
6	4/15/2018	0.250	4.18	4.52	104			
7	4/11/2019	0.250	70.2	5.84	339			
8	10/1/2019	0.500	48.1	4.71	197			
9	3/5/2020	0.500	9.67	2.35	75.9			
10	10/12/2020	0.250	22.6	3.05	113			
11	3/21/2021	0.200	1.70	1.60	0.200			
12	10/18/2021	0.200	20.0	2.70	0.200			
13	3/23/2022	0.200	150	2.20	0.200			
14	10/17/2022	0.200	120	5.70	350			
15	3/23/2023	0.200	53.0	2.10	110			
16	10/3/2023	0.960	370	10.0	390			
17								
18								
19								
20								
Coefficient of Variation:		0.75	1.15	0.51	0.96			
Mann-Kendall Statistic (S):		-47	-6	-48	-39			
Confidence Factor:		98.2%	58.8%	98.4%	95.7%			
Concentration Trend:		Decreasing	No Trend	Decreasing	Decreasing			



Notes:

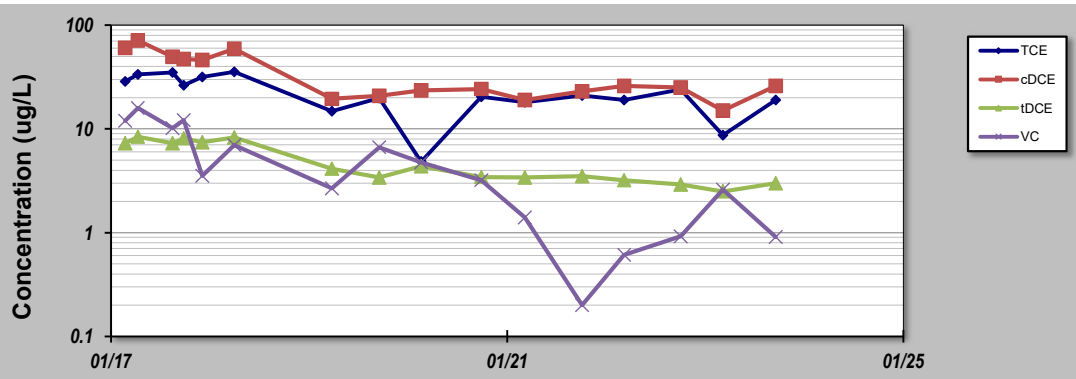
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-13
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	28.7	60.2	7.26	12.0			
2	4/24/2017	33.5	71.0	8.40	15.9			
3	8/30/2017	34.9	49.6	7.30	10.2			
4	10/10/2017	26.3	47.3	8.11	12.1			
5	12/18/2017	31.7	46.2	7.46	3.53			
6	4/15/2018	35.5	59.3	8.23	6.96			
7	4/9/2019	14.8	19.5	4.13	2.68			
8	10/1/2019	19.8	20.8	3.40	6.64			
9	3/3/2020	4.84	23.6	4.35	4.74			
10	10/12/2020	20.4	24.3	3.44	3.21			
11	3/21/2021	18.0	19.0	3.40	1.40			
12	10/18/2021	21.0	23.0	3.50	0.200			
13	3/23/2022	19.0	26.0	3.20	0.610			
14	10/17/2022	24.0	25.0	2.90	0.920			
15	3/22/2023	8.70	15.0	2.50	2.60			
16	10/3/2023	19.0	26.0	3.00	0.910			
17								
18								
19								
20								
Coefficient of Variation:		0.40	0.51	0.45	0.92			
Mann-Kendall Statistic (S):		-47	-53	-83	-84			
Confidence Factor:		98.2%	99.1%	>99.9%	>99.9%			
Concentration Trend:		Decreasing	Decreasing	Decreasing	Decreasing			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

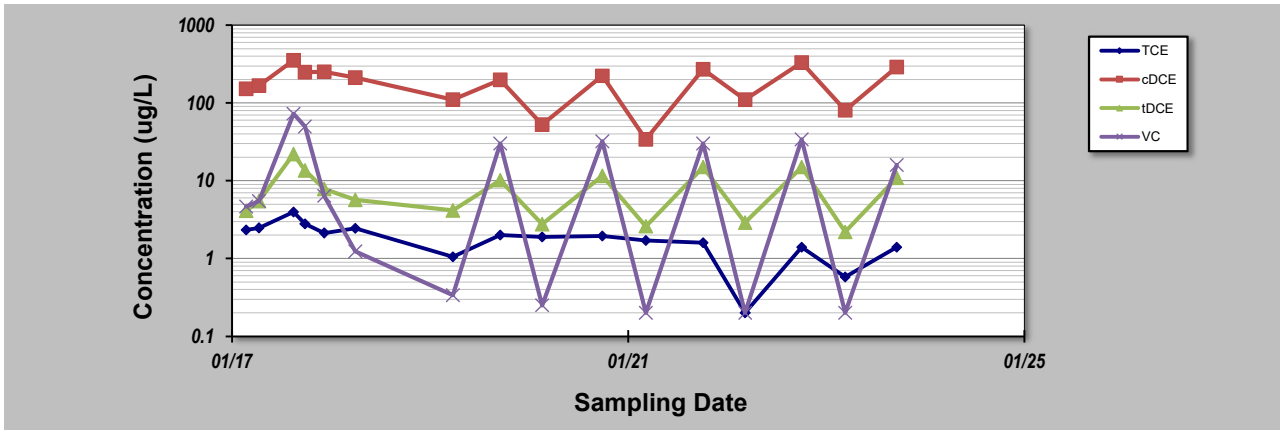
DISCLAIMER: *The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.*

GSI Environmental Inc., www.gsi-net.com

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-18B
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/8/2017	2.33	152	4.10	4.66			
2	4/25/2017	2.48	167	5.46	5.47			
3	8/30/2017	3.96	354	22.0	72.8			
4	10/11/2017	2.78	249	13.5	49.8			
5	12/21/2017	2.13	253	7.86	6.40			
6	4/15/2018	2.44	211	5.71	1.24			
7	4/9/2019	1.05	111	4.16	0.339			
8	10/1/2019	2.01	197	10.2	30.1			
9	3/3/2020	1.90	52.7	2.76	0.250			
10	10/12/2020	1.95	224	11.6	32.3			
11	3/21/2021	1.70	34.0	2.60	0.200			
12	10/18/2021	1.60	270	15.0	30.0			
13	3/23/2022	0.200	110	2.90	0.200			
14	10/17/2022	1.40	330	15.0	34.0			
15	3/26/2023	0.580	81.0	2.20	0.200			
16	10/3/2023	1.40	290	11.0	16.0			
17								
18								
19								
20								
Coefficient of Variation:		0.48	0.50	0.68	1.23			
Mann-Kendall Statistic (S):		-81	-4	-9	-25			
Confidence Factor:		>99.9%	55.3%	63.9%	85.7%			
Concentration Trend:		Decreasing	Stable	Stable	No Trend			



Notes:

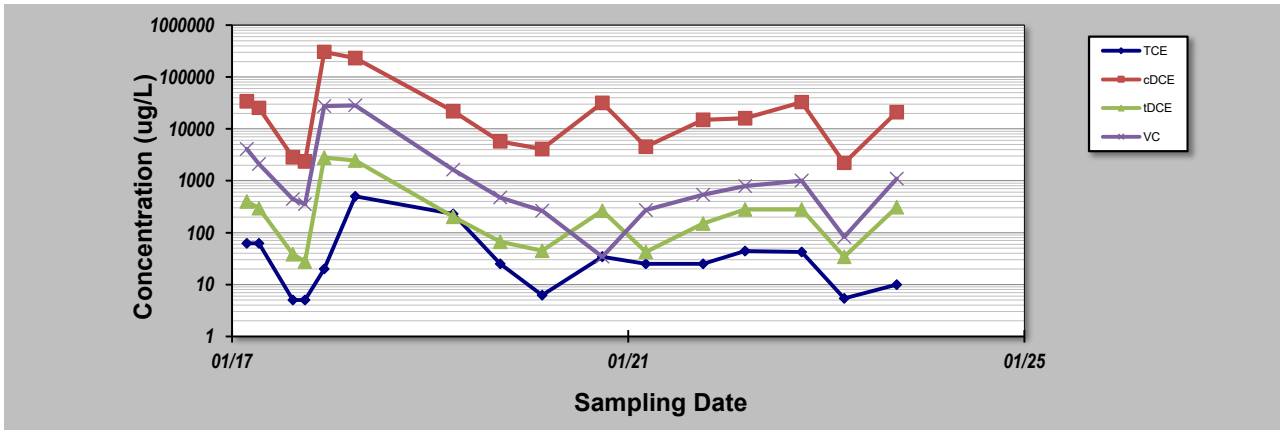
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-26
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	62.5	34000	399	4140			
2	4/25/2017	62.5	25400	293	2090			
3	8/28/2017	5.00	2820	38.5	443			
4	10/11/2017	5.00	2360	27.8	353			
5	12/21/2017	19.9	306000	2800	27600			
6	4/15/2018	500	231000	2440	28400			
7	4/11/2019	228	21800	202	1650			
8	10/1/2019	25.0	5710	67.1	474			
9	3/3/2020	6.25	4090	44.8	264			
10	10/12/2020	34.2	31700	264	34.2			
11	3/21/2021	25.0	4500	42.0	270			
12	10/18/2021	25.0	15000	150	540			
13	3/23/2022	44.0	16000	280	790			
14	10/17/2022	42.0	33000	280	1000			
15	3/23/2023	5.40	2200	34.0	83.0			
16	10/3/2023	10.0	21000	310	1100			
17								
18								
19								
20								
Coefficient of Variation:		1.85	1.86	1.77	2.15			
Mann-Kendall Statistic (S):		-11	-16	-9	-26			
Confidence Factor:		67.1%	74.7%	63.9%	86.7%			
Concentration Trend:		No Trend	No Trend	No Trend	No Trend			



Notes:

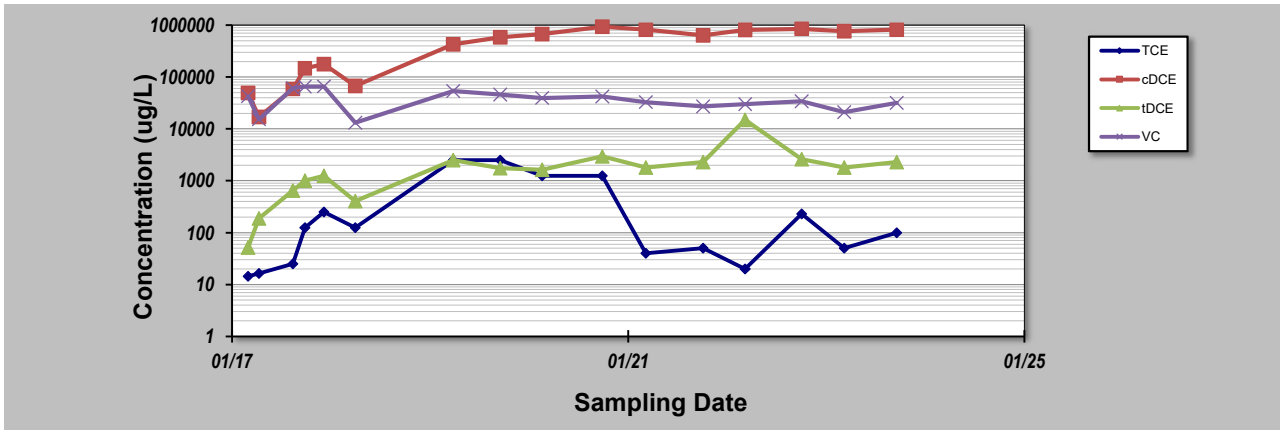
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-29
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/15/2017	14.4	49500	51.6	42900			
2	4/25/2017	16.3	16900	188	15200			
3	8/28/2017	25.0	59200	646	60700			
4	10/11/2017	125	148000	1000	65500			
5	12/20/2017	250	178000	1250	65800			
6	4/15/2018	125	67300	403	13100			
7	4/11/2019	2500	428000	2500	53500			
8	10/1/2019	2500	582000	1750	46100			
9	3/3/2020	1250	675000	1630	39600			
10	10/12/2020	1250	938000	2950	41900			
11	3/21/2021	40.0	820000	1800	33000			
12	10/18/2021	50.0	640000	2300	27000			
13	3/23/2022	20.0	810000	15000	30000			
14	10/17/2022	230	850000	2600	34000			
15	3/23/2023	50.0	770000	1800	21000			
16	10/3/2023	100	820000	2300	32000			
17								
18								
19								
20								
Coefficient of Variation:		1.62	0.70	1.46	0.42			
Mann-Kendall Statistic (S):		16	87	76	-42			
Confidence Factor:		74.7%	>99.9%	>99.9%	96.8%			
Concentration Trend:		No Trend	Increasing	Increasing	Decreasing			



Notes:

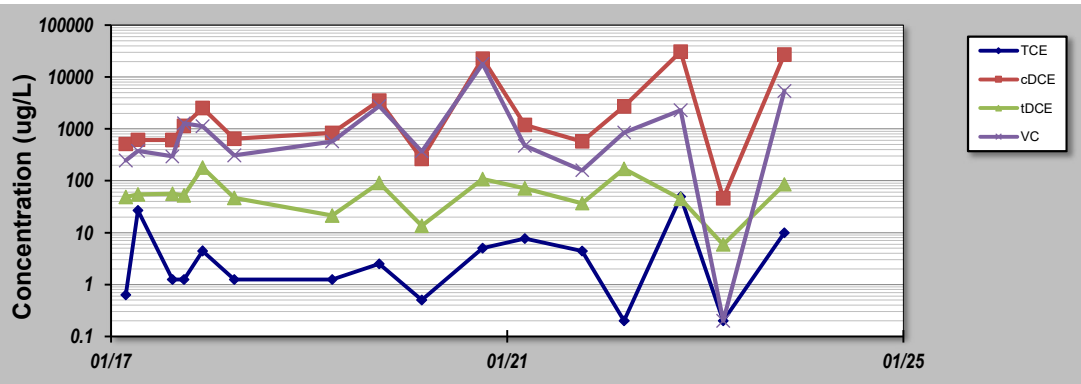
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	October 2023	Job ID:	VEP-35
Facility Name:	Air Force Plant 4	Constituent:	cVOC
Conducted By:	JRW	Concentration Units:	ug/L

Sampling Point ID:	TCE	cDCE	tDCE	VC			
Sampling Event	Sampling Date	CVOC CONCENTRATION (ug/L)						
1	3/11/2017	0.630	510	48.7	245			
2	4/25/2017	26.9	613	54.3	378			
3	8/29/2017	1.25	607	55.9	294			
4	10/11/2017	1.25	1140	52.2	1290			
5	12/19/2017	4.43	2530	180	1120			
6	4/15/2018	1.25	646	46.5	311			
7	4/11/2019	1.25	832	21.4	571			
8	10/1/2019	2.50	3500	90.7	2770			
9	3/5/2020	0.500	263	13.5	369			
10	10/17/2020	5.00	22700	108	18000			
11	3/21/2021	7.70	1200	72.0	470			
12	10/19/2021	4.40	570	37.0	160			
13	3/23/2022	0.200	2700	170	850			
14	10/17/2022	49.0	31000	45.0	2300			
15	3/23/2023	0.200	46.0	5.90	0.200			
16	11/3/2023	10.0	27000	85.0	5400			
17								
18								
19								
20								
Coefficient of Variation:		1.78	1.76	0.73	2.06			
Mann-Kendall Statistic (S):		13	36	-8	22			
Confidence Factor:		70.3%	94.2%	62.2%	82.5%			
Concentration Trend:		No Trend	Prob. Increasing	Stable	No Trend			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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APPENDIX F
Soil Vapor Sampling Figures and Tables



USACE, Tulsa District

SITE:

SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:

VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:

SITE LAYOUT MAP

LEGEND:

- Installed Indoor Air Sample Locations
- Installed Outdoor Air Sample Locations
- Installed Sub-Slab Soil Vapor Sample Locations
- 2018 Abandoned Soil Vapor Sample Locations
- Existing Monitoring Well
- Building 181 Outline

Note:
2018 Abandoned Soil Vapor Sample locations are approximate

SCALE:

N

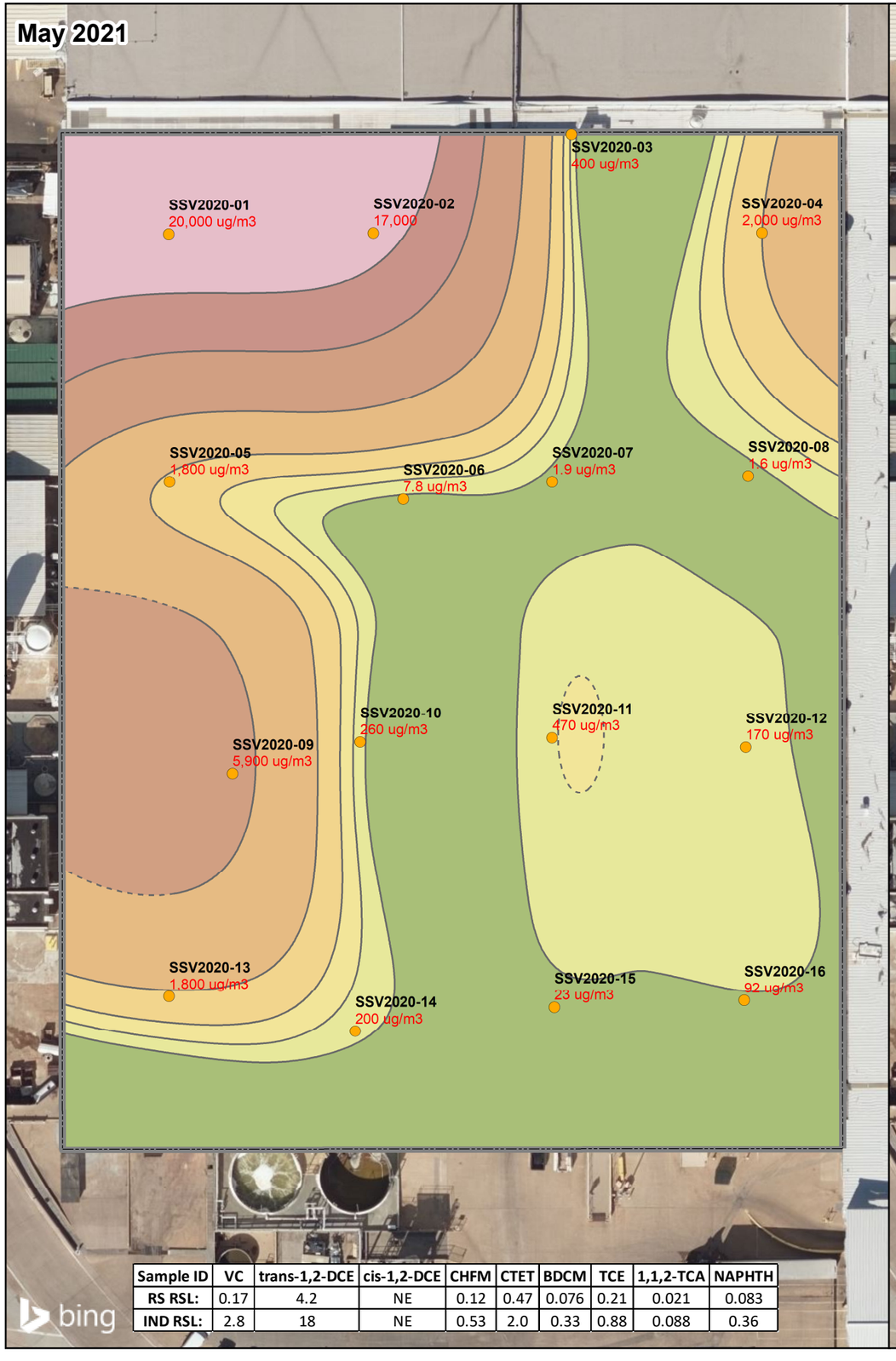
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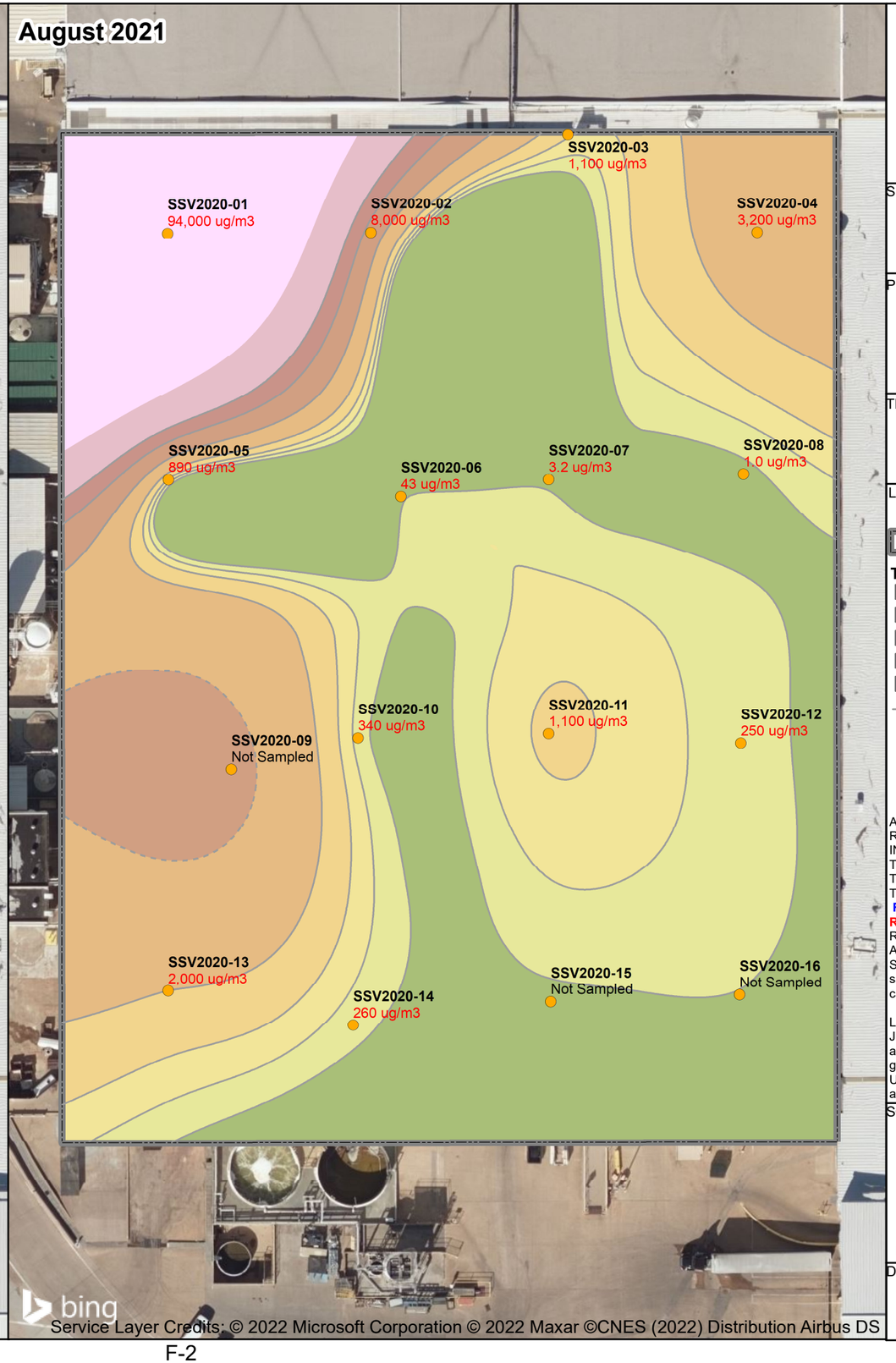
0 100 200

Feet

NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	9/20/2022	2
	REV: N/A	





Sample ID	VC	trans-1,2-DCE	cis-1,2-DCE	CHFM	CTET	BDCM	TCE	1,1,2-TCA	NAPHTH
RS RSL:	0.17	4.2	NE	0.12	0.47	0.076	0.21	0.021	0.083
IND RSL:	2.8	18	NE	0.53	2.0	0.33	0.88	0.088	0.36

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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
MAY2021 AND AUGUST 2021
SUB-SLAB VAPOR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Sub-Slab Soil Vapor Sample Locations
- Bulilding 181 Outline

TCE Concentrations (ug/m3)
- < IND RSL of 0.88
- 0.88 - 100
- 100 - 500
- 500- 1,000
- 1,000 - 2,000
- 2,000 - 5,000
- 5,000 - 10,000
- 10,000 - 15,000
- 15,000 - 95,000

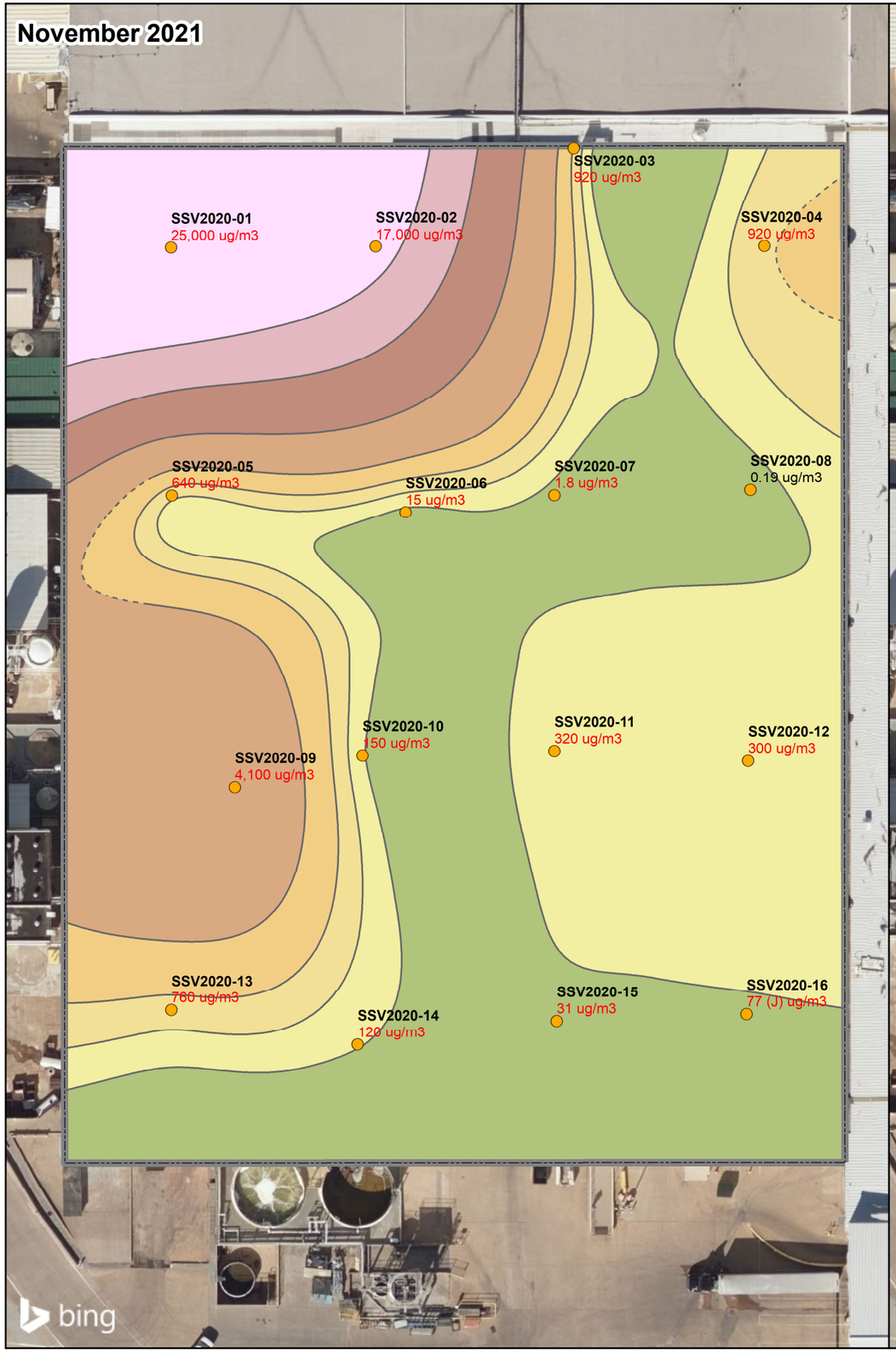
Interpolated – – Extrapolated

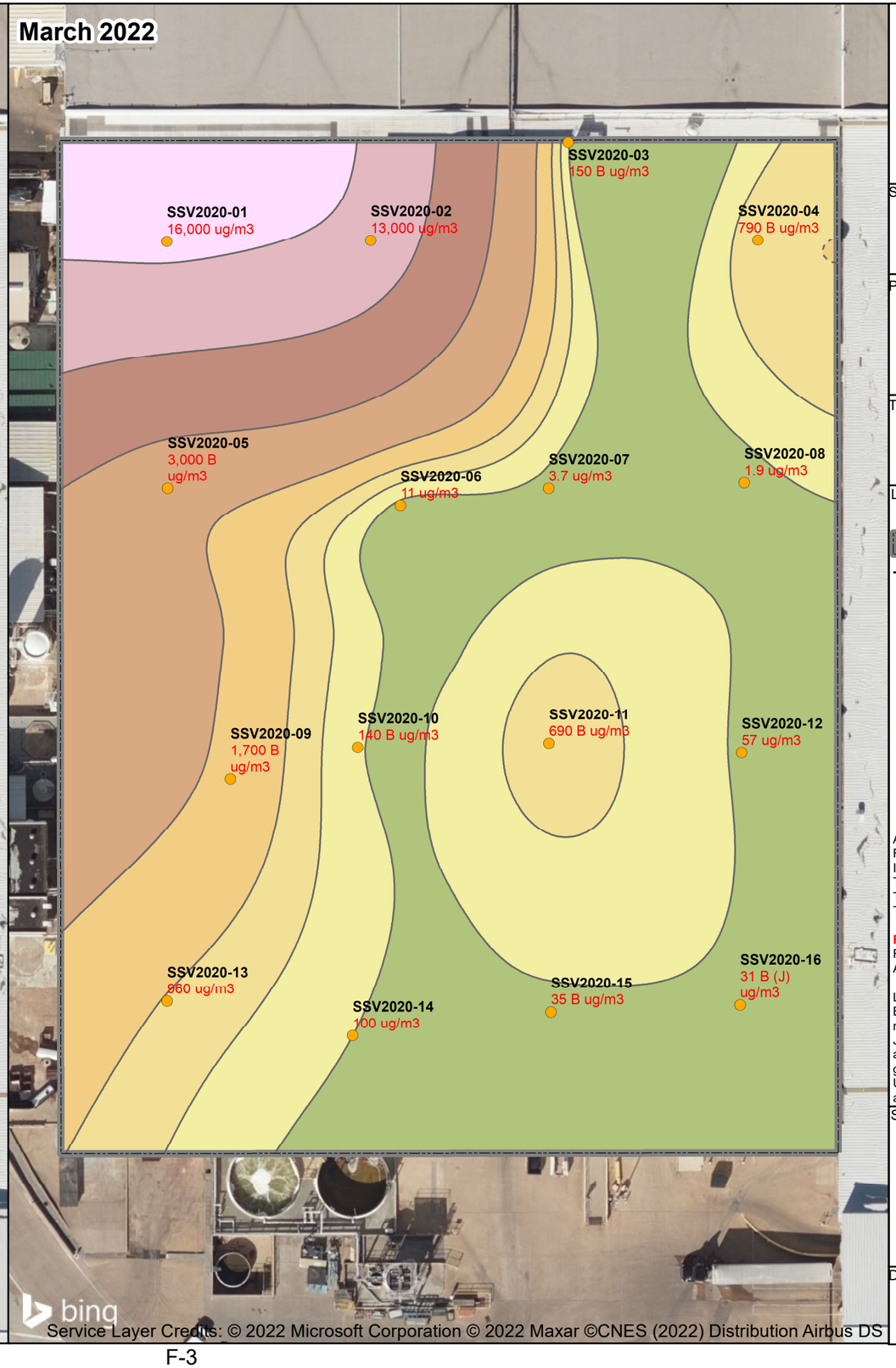
All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the Building 181 outline. Areas outside of the Building 181 outline were not evaluated. Since SSV2020-09, SSV2020-15, and SSV2020-16 were not sampled in August 2021, May 2021 data was used in contour calculations.

Lab Flags:
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE: N
0 1:700 70 140
Feet
NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	9/20/2022 REV: N/A	3a





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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
NOVEMBER 2021 AND MARCH 2022
SUB-SLAB VAPOR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Sub-Slab Soil Vapor Sample Locations
- Bulilding 181 Outline

TCE Concentrations (ug/m3)
- < IND RSL of 0.88
- 0.88 - 100
- 100 - 500
- 500 - 1,000
- 1,000 - 2,000
- 2,000 - 5,000
- 5,000 - 10,000
- 10,000 - 15,000
- 15,000 - 95,000
- Interpolated - - - Extrapolated

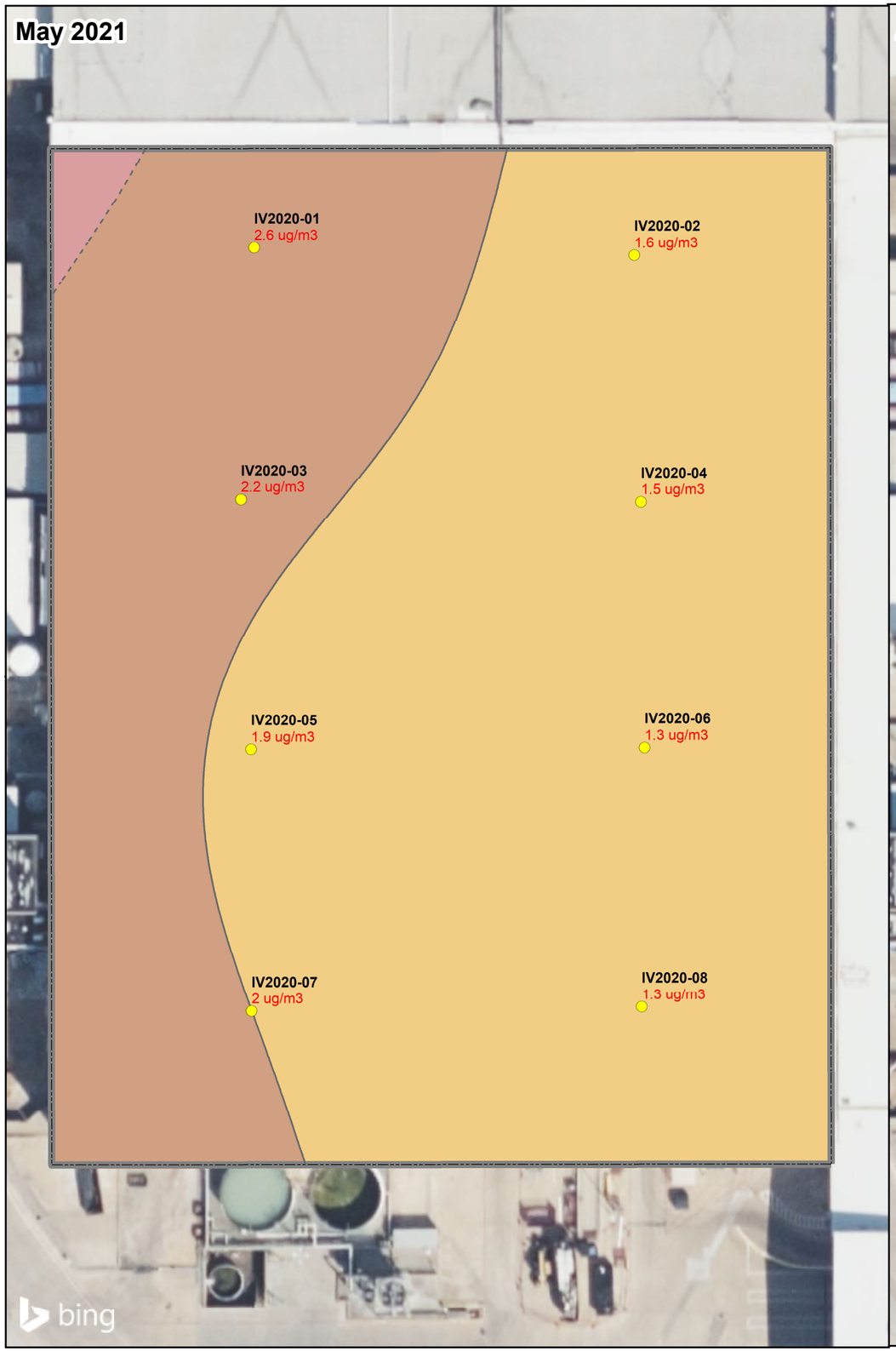
All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the Building 181 outline.
Areas outside of the Building 181 outline were not evaluated.

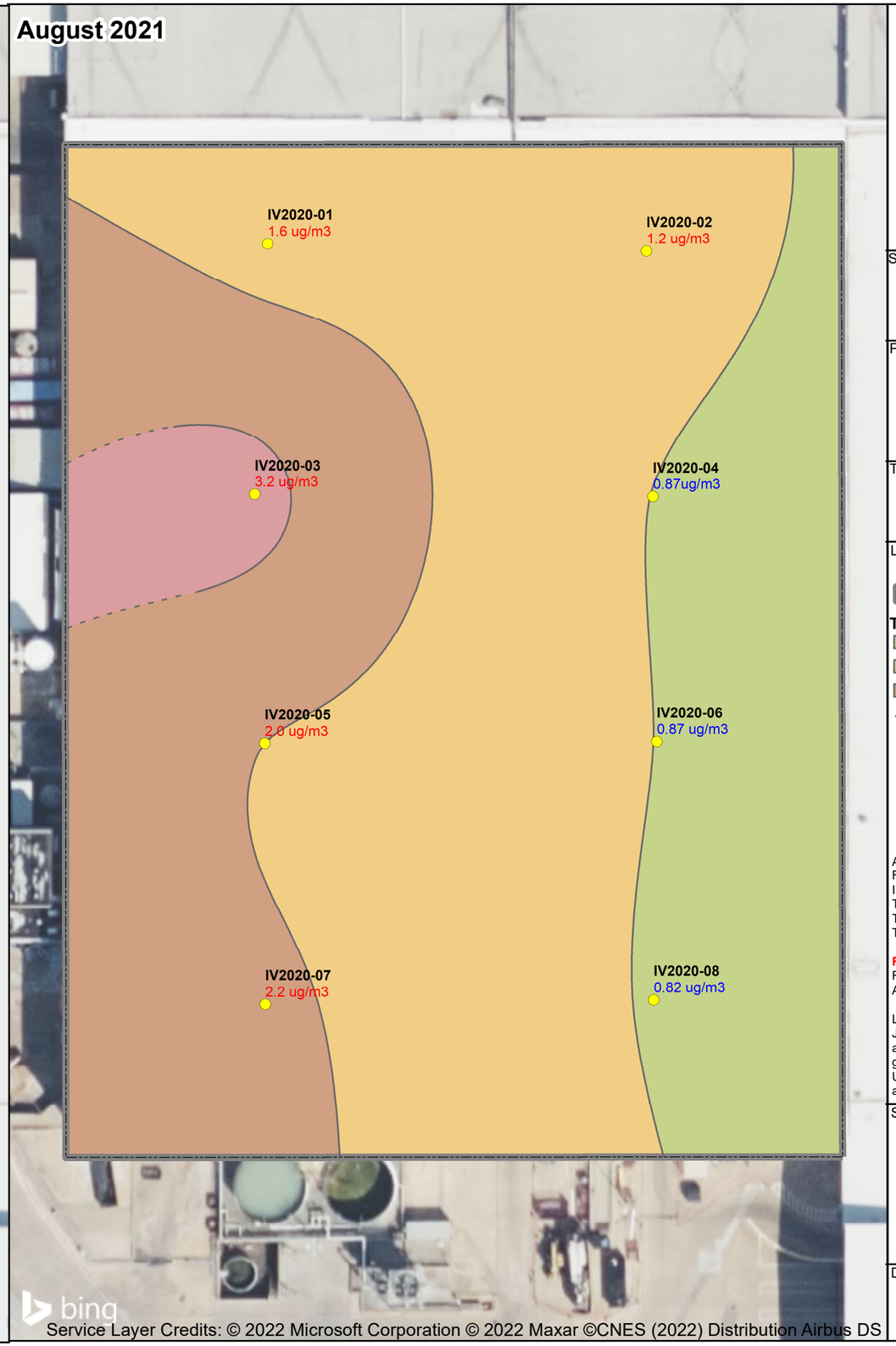
Lab Flags:
B = Analyte detected in both the sample and associated method blank.
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE:
N
0 50 100
Feet
1:700

NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	7/18/2022 REV: N/A	**3b**





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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
MAY 2021 AND AUGUST 2021
INDOOR AIR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Indoor Air Sample Locations
- Building 181 Outline

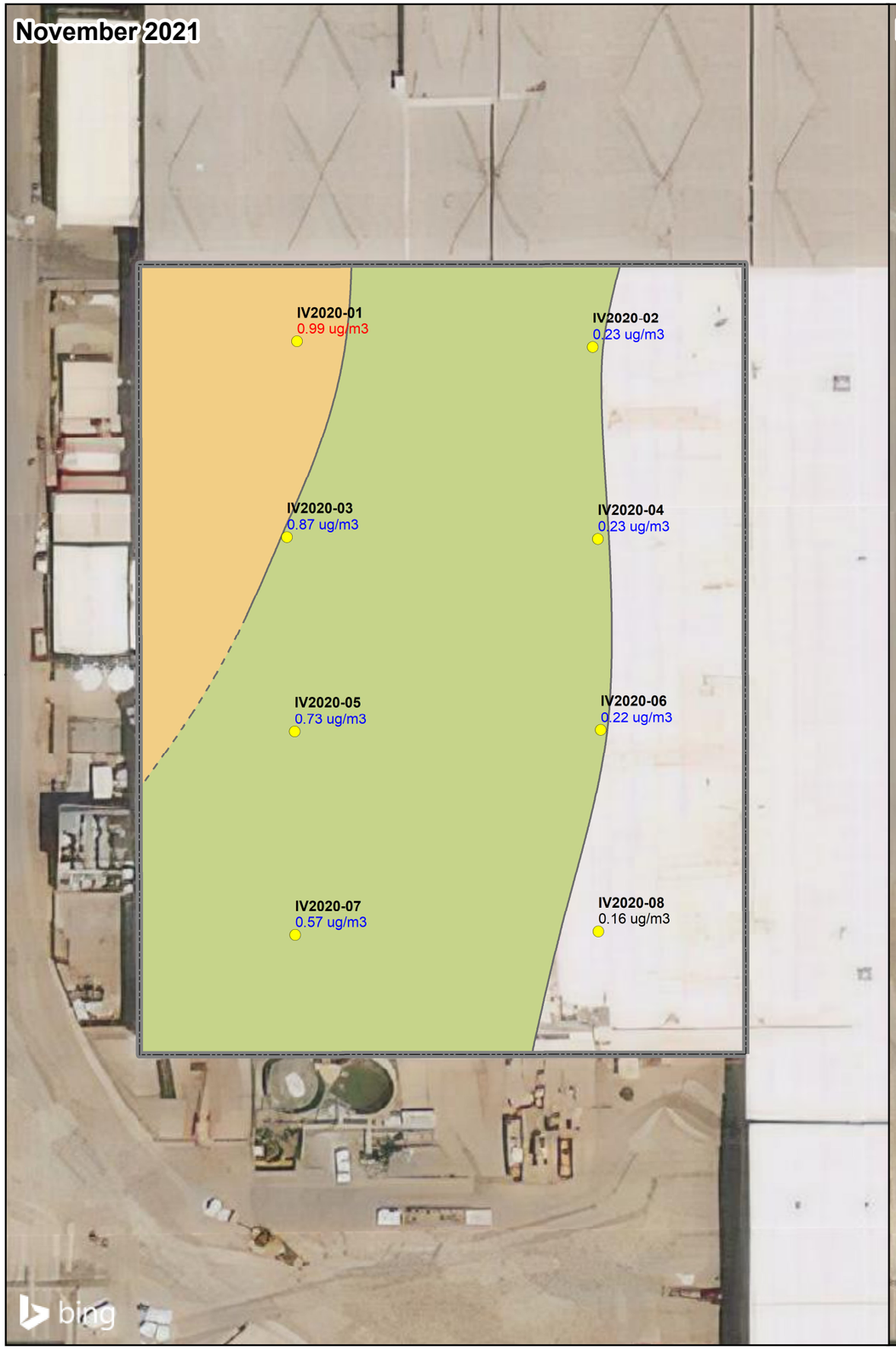
TCE Concentrations (ug/m3)
- < Ind RSL (0.88)
- 0.88 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- Interpolated
- Extrapolated

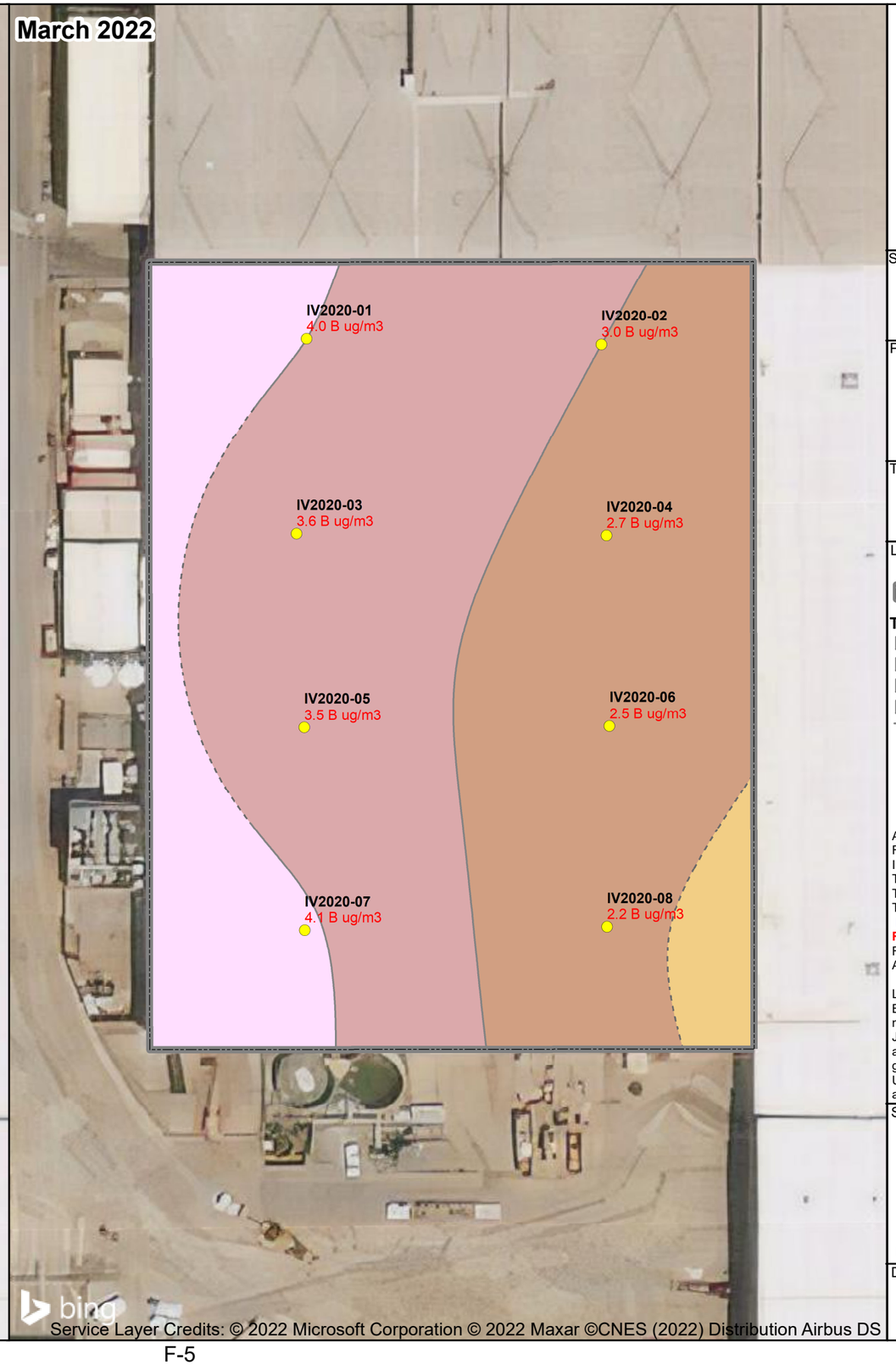
All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the Building 181 outline.
Areas outside of the Building 181 outline were not evaluated.

Lab Flags:
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE: 1:700
N
0 70 140
Feet
NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	10/14/2022	**4a**
	REV: N/A	





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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
NOVEMBER 2021 AND MARCH 2022
INDOOR AIR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Indoor Air Sample Locations
- Building 181 Outline

TCE Concentrations (ug/m3)
- < RS RSL (0.21)
- 0.21 - IND RSL (0.88)
- IND RSL (0.88) - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- Interpolated - - - Extrapolated

All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the Building 181 outline.
Areas outside of the Building 181 outline were not evaluated.

Lab Flags:
B = Analyte detected in both the sample and associated method blank.
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE:
N
1:900
0 90 180
Feet
NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	9/20/2022	**4b**
	REV: N/A	



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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
MAY 2021 AND AUGUST 2021
OUTDOOR AIR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Outdoor Air Sample Locations
- Building 181 Outline
- Limit of Outdoor Air Study

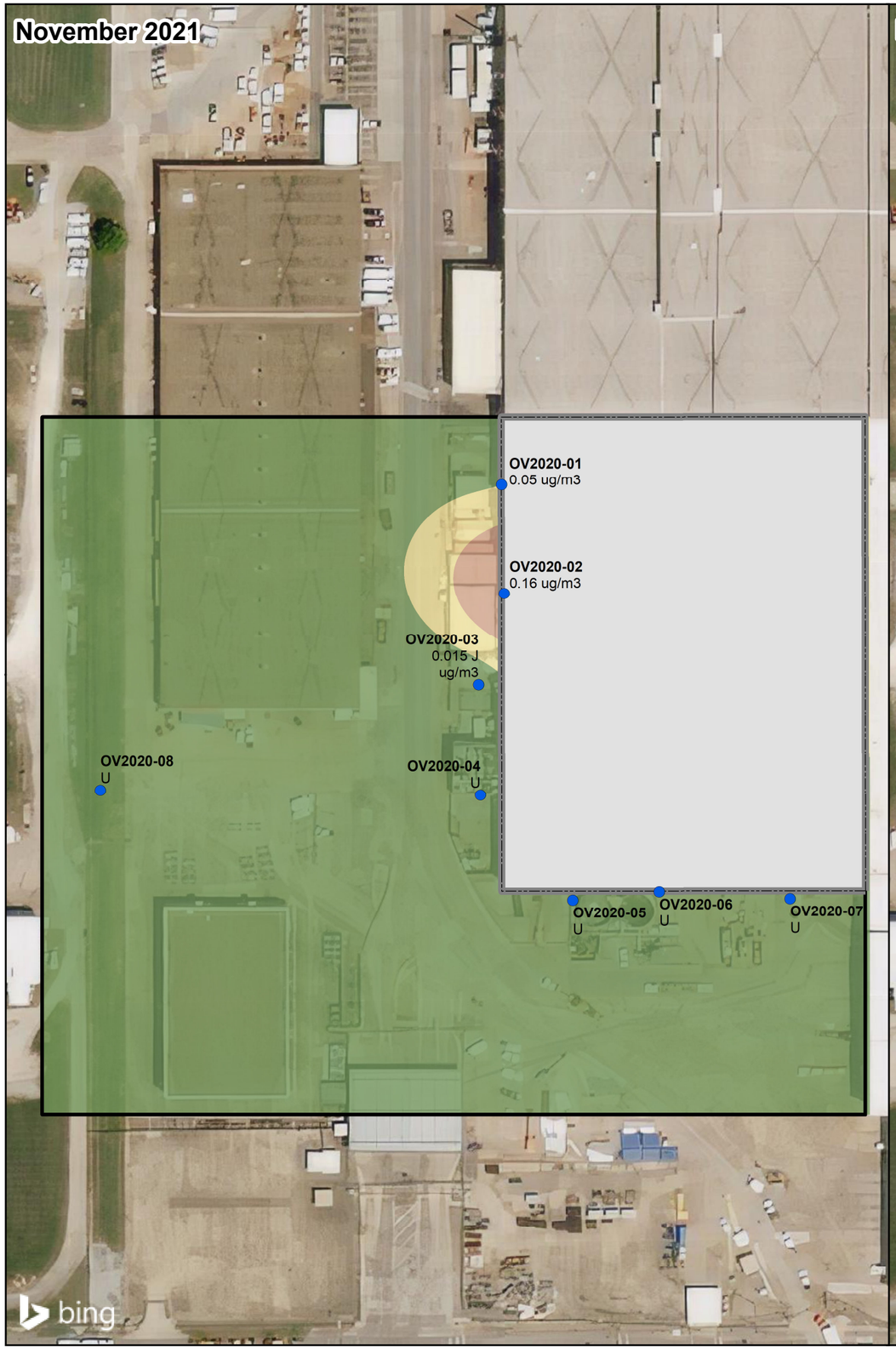
TCE Concentrations (ug/m3)
- 0.0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.21
- 0.21 - 0.4
- Interpolated
- Extrapolated

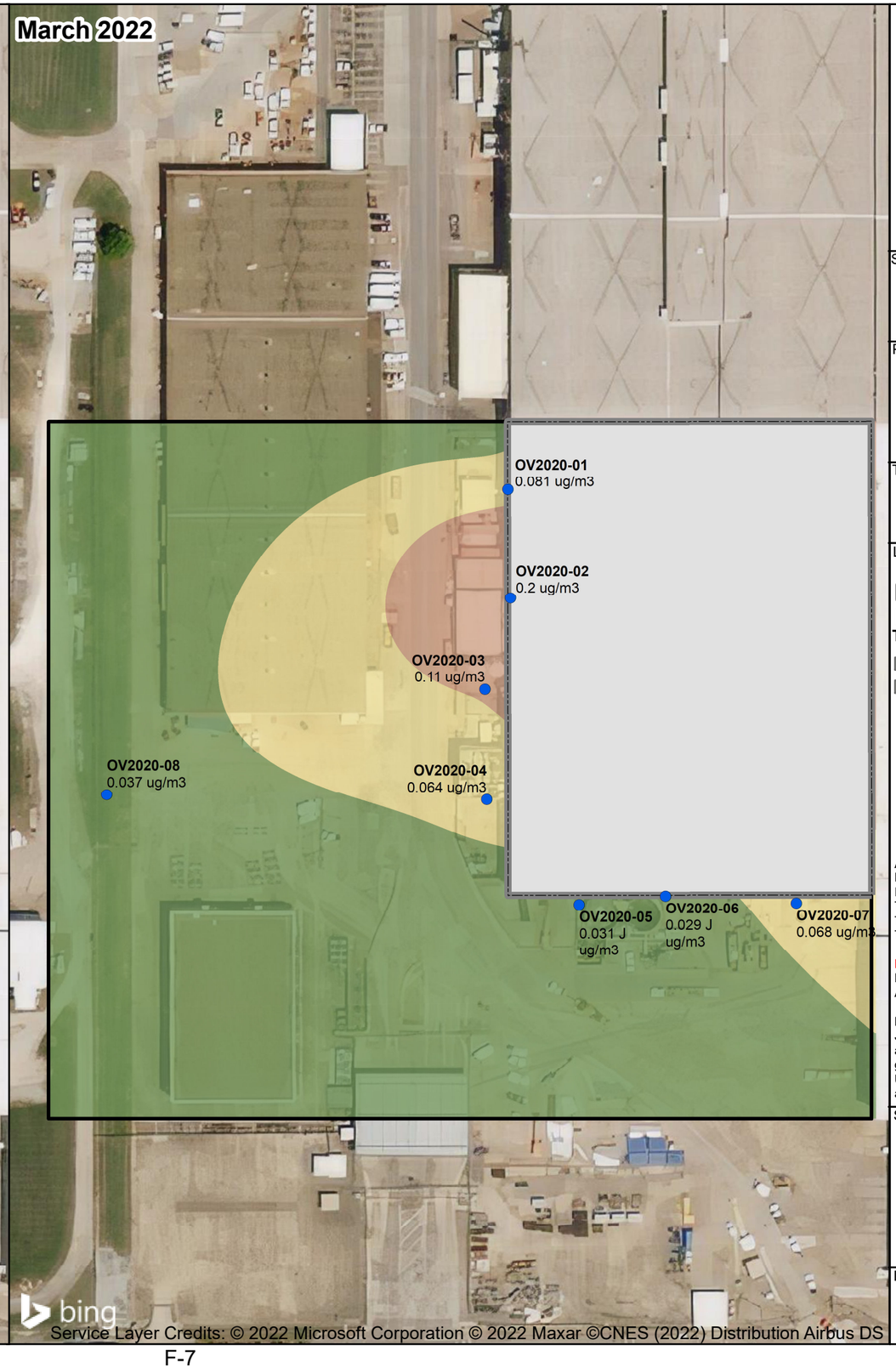
All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the outdoor study area.
Areas outside of the study area were not evaluated.

Lab Flags:
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE: N
0 1:1,500 150 300
Feet
NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	9/20/2022	**5a**
	REV: N/A	





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USACE, Tulsa District

SITE:
SITE OT022
AIR FORCE PLANT 4
TARRANT COUNTY, TX
32.767419°, -97.451133°

PROJECT:
VAPOR INTRUSION STUDY
AT SITE OT022

CONTRACT NO. W912BV19D0012
TO NO. W912BV20F0127

TITLE:
NOVEMBER 2021 AND MARCH 2022
OUTDOOR AIR TCE
RESULTS AND PLUME MAP

LEGEND:
- Installed Outdoor Air Sample Locations
- Building 181 Outline
- Limit of Outdoor Air Study

TCE Concentrations (ug/m3)
- 0.0 - 0.05
- 0.05 - 0.1
- 0.1 - 0.21
- 0.21 - 0.4

All results in micrograms per cubic meter (ug/m3)
RS RSL = Residential Air RSL
IND RSL = Industrial Air RSL
TCE = Trichloroethene
TCE RS RSL = 0.21 ug/m3
TCE IND RSL = 0.88 ug/m3
Result in blue text exceeds RS RSL
Result in red text exceeds IND RSL
Results are only applicable within the outdoor study area.
Areas outside of the study area were not evaluated.

Lab Flags:
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = The analyte was analyzed for but not detected at or above the specified detection limit.

SCALE: N
0 1:1,500 150 300
Feet
NAD 1983 StatePlane Texas North Central FIPS 4202 Feet

DRN/MOD BY:	DATE:	FIGURE:
MKM	9/20/2022	**5b**
	REV: N/A	

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APPENDIX G
Applicable or Relevant and Appropriate Requirements

Description of ARARs for the Selected Remedy

Standard, Requirement, Criteria, or Limitation	Status	Citation	Description	Comment
Chemical-Specific				
Safe Drinking Water Act	Federal	40 CFR 141, 143	National primary and secondary drinking water standards	Established MCLs for organics, inorganics, radioactivity, and turbidity. These standards may be relevant and appropriate for finished drinking water and can serve as groundwater and surface water cleanup standards at CERCLA sites.
Texas Risk Reduction Program	State	30 TAC §350	State of Texas PCLs	Relevant and appropriate if more stringent than federal standards.
Texas Water Quality Standards	State	30 TAC §307	State surface water quality standards	Substantive portions that are more stringent than federal requirements must be complied with for treatment alternatives that involve discharge to surface water.
Action-Specific				
Hazardous Materials Transportation Act	Federal	49, CFR 171, 172, 173, 174, 177	Hazardous materials regulations	Includes general information, communication requirements, emergency response information, and carriage by rail and public highway. Carriage by vessel or aircraft is not anticipated. Standards regarding packaging, labeling and containerizing hazardous materials may apply to wastes removed from the site

Description of ARARs for the Selected Remedy (continued)

Standard, Requirement, Criteria, or Limitation	Status	Citation	Description	Comment
Action-Specific				
Resource Conservation and Recovery Act	Federal	40 CFR 261	Hazardous waste classification	Waste may be generated if wells are installed or if DNAPL is recovered. Any waste will need to be classified prior to disposal.
		40 CFR 262	Hazardous waste generator standards	Waste may be generated if wells are installed or if DNAPL is recovered.
		40 CFR 263	Hazardous waste transportation standards	Waste will be transported, including samples, as a result of remediation. Manifests are required.
		40 CFR 264	Standards for TSD facilities	Specific standards may be relevant and appropriate to alternatives that require the management of hazardous wastes, such as DNAPL recovery. Standards regarding waste analysis for incinerators may apply.
		40 CFR 265	Interim status standards	Specific standards may be relevant and appropriate to alternatives that require the management of hazardous wastes.
		40 CFR 268	Land disposal restrictions	Identifies wastes restricted from land disposal unless specific exemptions exist. Standards regarding soils exhibiting toxicity characteristics for metals and PCBs as well as halogenated organic compounds may apply.

Description of ARARs for the Selected Remedy (continued)

Standard, Requirement, Criteria, or Limitation	Status	Citation	Description	Comment
Action-Specific				
Texas Risk Reduction Program	State	30 TAC Chapter 350	Substantive requirements for cleanup	Remedial actions must comply with the state program cleanup requirements, including remedy standards, PCLs that are more stringent than MCLs, and filing institutional controls.
Texas Solid Waste Disposal Act	State	Title 5, Chapter 361 Texas Health and Safety Code	Includes implementation of the Federal Resource Conservation and Recovery Act	Regulates the management and control of municipal hazardous waste and industrial wastes. Includes generators, transporters, and owners/operators of TSD facilities.
Texas Industrial Solid Waste and Municipal Hazardous Waste Regulations	State	30 TAC §335 Subchapters A, B, C, D, E, F, and H	Texas requirements for solid and hazardous waste management	Relevant and appropriate requirements for potential remedial actions, including record keeping, shipping, labeling, and reporting.
Texas Department of Licensing and Regulation	State	16 TAC §76	Regulations regarding the installation and abandonment of wells	Remedial activities include the installation and eventual abandonment of monitoring wells. EISB contingency remedy activities include installation of injection wells.
		30 TAC § 331	Applicable for EISB contingency to selected remedy	Establishes regulatory requirements for underground injection of fluids. EISB contingency remedy activities include injections.

ARAR – Applicable or relevant and appropriate requirement.
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act.
CFR – Code of Federal Regulations.
DNAPL – Dense non-aqueous phase liquid.
EISB – enhanced in-situ bioremediation
MCL – Maximum contaminant level.
PCB – Polychlorinated biphenyl.
PCL – Protective concentration level.
TAC – Texas Administrative Code.
TSD – Treatment, storage, and disposal

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APPENDIX H
Risk Evaluation Tables

Table 4-1: Summary of Analytical Results in Sub-Slab Vapor, Indoor Air, and Outdoor Air
November 2021 Q3 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

Analyte		Vinyl Chloride				trans-1,2-Dichloroethene				cis-1,2-Dichloroethene				Chloroform				Carbon Tetrachloride				Bromodichloromethane				Trichloroethene				1,1,2-Trichloroethane				Naphthalene			
		Residential RSL: 0.17				Residential RSL: 4.2				Residential RSL: NE				Residential RSL: 0.12				Residential RSL: 0.47				Residential RSL: 0.076				Residential RSL: 0.21				Residential RSL: 0.021				Residential RSL: 0.083			
		Industrial RSL: 2.8				Industrial RSL: 18				Industrial RSL: NE				Industrial RSL: 0.53				Industrial RSL: 2.0				Industrial RSL: 0.33				Industrial RSL: 0.88				Industrial RSL: 0.088				Industrial RSL: 0.36			
		Sample Date				Sample Date				Sample Date				Sample Date				Sample Date				Sample Date				Sample Date				Sample Date				Sample Date			
Sample Source	Sample Identification	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022	Q1 5/19/2021	Q2 8/31/2021	Q3 11/16/2021	Q4 3/01/2022
Sub-Slab Vapor	SSV2020-01	< 11	< 230	< 51	< 30	5.2 J	< 230	< 51	< 30	48	280 J	120 J	61	580	1,700	790	370	< 10	< 210	< 48	< 29	< 11	< 230	< 51	< 30	20,000	94,000	25,000	16,000	< 10	< 230	< 51	< 29	< 20	< 420	190	< 57
	SSV2020-01-D	--	< 200	--	--	--	< 200	--	--	--	270 J	--	--	--	1,600	--	--	--	< 190	--	--	--	< 200	--	--	--	86,000	--	--	--	< 200	--	--	--	< 360	--	--
	SSV2020-02	< 8.8	< 17	< 36	< 5.7	< 8.8	< 17	< 36	< 5.7	87	69	96 J	81	24 J	23 J	35 J	19 J	< 8.4	< 16	< 34	< 5.5	< 8.8	< 17	< 36	< 5.7	17,000	8,000	16,000	13,000 D	< 8.4	< 17	< 36	< 5.5	< 16	< 30	56 J	< 11
	SSV2020-02-D	< 8.7	--	< 35	< 14	< 8.7	--	< 35	< 14	89	--	96 J	100	23 J	--	36 J	23 J	< 8.3	--	< 33	< 13	< 8.7	--	< 35	< 14	16,000	--	17,000	13,000 B	< 8.3	--	< 35	< 13	< 16	--	< 64	< 26
	SSV2020-03	0.19 J	< 0.43	< 1.8	< 0.22	0.78	1.5	< 1.8	0.20 J	17	25	16	4.2	4.8	8.8	6.8	2.1	< 0.18	< 0.41	< 1.7	0.38	< 0.19	< 0.43	< 1.8	< 0.22	400	1,100 D	920	150 B	< 0.18	< 0.41	< 1.8	< 0.21	< 0.35	< 0.80	< 3.3	< 0.41
	SSV2020-04	< 0.85	< 7.0	< 1.8	< 0.029	0.85 J	< 7.0	< 1.8	0.40	3.5	< 7.0	1.2 J	1.3	25	40	17	10	0.80 J	< 6.6	< 1.7	0.38	< 0.85	< 7.0	< 1.8	< 0.029	2,000	3,200	920	790 B D	< 0.82	< 7.0	< 1.8	< 0.028	< 1.6	< 13	< 3.2	0.10 J
	SSV2020-05	0.37 J	< 0.39	< 1.3	< 0.74	0.52 J	0.22 J	< 1.3	0.95	4.9	2.0	1.5 J	9.3	50	26	11	26	0.85 J	0.58	< 1.2	< 0.70	1.8	1.7	0.82 J	< 0.74	1,800	890 D	640	3,000 B D	< 0.77	< 0.38	< 1.3	< 0.70	< 1.5	< 0.73	< 2.4	< 1.4
	SSV2020-06	< 0.083	0.038 J	< 0.034	< 0.031	< 0.083	< 0.038	< 0.034	< 0.031	< 0.079	0.071	< 0.032	< 0.029	0.15 J	0.20	0.085 J	0.087 J	< 0.079	< 0.036	< 0.032	0.35	< 0.083	< 0.038	< 0.034	< 0.031	7.8	43 D	15	11	< 0.079	< 0.036	< 0.032	< 0.029	0.24 J	0.37	0.10 J	0.090 J
	SSV2020-07	0.14	0.057 J	< 0.14	< 0.029	< 0.032	< 0.080	< 0.14	< 0.029	< 0.03	< 0.077	< 0.13	< 0.028	0.77	0.22 J	0.12 J	0.072 J	0.67	0.35	0.34	0.37	0.30	< 0.080	< 0.14	< 0.029	1.9	3.2	1.8	3.7	< 0.03	< 0.077	< 0.13	< 0.028	0.28	0.089 J	< 0.25	0.10 J
	SSV2020-08	0.36 J	0.17	0.030 J	< 0.030	< 0.89	< 0.12	< 0.050	< 0.030	< 0.85	< 0.11	< 0.047	< 0.029	5.6	0.93	0.25	0.15	< 0.85	< 0.11	0.34	0.31	0.77 J	< 0.12	< 0.050	< 0.03	1.6	1.0	0.19	1.9	< 0.85	< 0.11	< 0.047	< 0.029	< 1.7	0.33 J	< 0.093	0.12 J
	SSV2020-09	< 3.1	NS	< 8.6	< 1.2	2.3 J	NS	< 8.6	1.7	26	NS	15 J	29	73	NS	59	50	< 2.9	NS	< 8.1	< 1.1	< 3.1	NS	< 8.6	< 1.2	5,900	NS	4,100	1,700 B D	< 2.9	NS	< 8.6	< 1.1	< 5.7	NS	< 16	< 2.1
	SSV2020-10	< 0.12	< 0.42	< 0.11	< 0.028	< 0.12	< 0.42	< 0.11	< 0.028	< 0.11	< 0.40	< 0.10	< 0.027	1.2	1.1 J	0.41 J	0.46	< 0.11	0.43 J	0.32	0.26	< 0.12	< 0.42	< 0.11	< 0.028	260	340	150 D	140 B D	< 0.11	< 0.40	< 0.10	< 0.027	0.27 J	< 0.78	0.16 J	0.14
	SSV2020-11	0.14 J	< 0.30	< 0.13	< 0.30	0.072 J	< 0.30	< 0.13	< 0.30	0.65	0.10 J	0.049 J	1.4	12	6.6	3.4	11	0.64	0.43	0.35	0.36	0.73	< 0.30	< 0.13	< 0.30	470	1,100 D	320 D	690 B	< 0.18	< 0.29	< 0.12	< 0.29	0.17 J	< 0.56	< 0.24	< 0.56
	SSV2020-11-D	--	< 0.29	--	--	--	< 0.29	--	--	--	< 0.28	--	--	--	5.9	--	--	--	0.43	--	--	--	< 0.29	--	--	--	830 D	--	--	--	< 0.28	--	--	--	< 0.55	--	--
	SSV2020-12	0.082	< 0.31	< 0.22	< 0.037	0.21	< 0.31	< 0.22	0.049	11	3.9	5.3	2.9	8.7	4.3	4.2	1.5	< 0.041	0.46	0.29 J	0.38	< 0.043	< 0.31	< 0.22	< 0.037	170	250	300 D	57 D	< 0.041	< 0.30	< 0.22	< 0.035	1.9	< 0.58	< 0.40	0.054 J
	SSV2020-13	0.31 J	< 1.0	< 1.4	< 0.036	0.65 J	< 1.0	< 1.4	0.26	30	23	6.6	9.2	61	60	33	31	< 0.69	0.51 J	< 1.3	0.28	< 0.72	< 1.0	< 1.4	< 0.036	1,800	2,000 D	760 D	960 D	< 0.69	< 0.97	< 1.4	< 0.035	< 1.3	< 1.9	< 2.5	0.055 J
	SSV2020-14	0.25	< 0.30	< 0.30	< 0.030	0.040 J	< 0.30	< 0.30	< 0.030	0.13	0.21 J	< 0.29	0.072	1.6	3.1	1.4	0.91	< 0.092	0.41	0.43	0.37	< 0.096	< 0.30	< 0.30	< 0.03	200	260 D	120	100 D	< 0.092	< 0.29	< 0.29	< 0.029	0.20 J	< 0.56	< 0.56	0.14
	SSV2020-15	0.14	NS	< 0.084	< 0.031	0.017 J	NS	< 0.084	< 0.031	0.041	NS	< 0.080	0.067	1.9	NS	0.32 J	0.51	< 0.030	NS	0.34	0.32	< 0.031	NS	< 0.084	< 0.031	23	NS	31	35 B	< 0.030	NS	< 0.080	< 0.030	0.18	NS	0.13 J	0.12 J
	SSV2020-16	< 0.098	NS	< 0.034	< 0.24 *	< 0.098	NS	0.019 J	< 0.24 *	< 0.093	NS	< 0.033	< 0.23 *	2.3	NS	0.44	< 0.47 *	0.44	NS	0.21	0.24 J *	< 0.098	NS	< 0.034	< 0.24 *	92	NS	77 D (J)	15 (J) *	< 0.093	NS	< 0.033	< 0.23 *	0.21 J	NS	0.13 J	< 0.44 *
	SSV2020-16-D	< 0.059	NS	< 0.027	< 0.031	0.028 J	NS	< 0.027	< 0.031	0.043 J	NS	< 0.026	< 0.029	2.1	NS	0.23	0.13 J	< 0.056	NS	0.14	0.21	< 0.059	NS	< 0.027	< 0.031	92	NS	34 D (J)	31 B (J)	< 0.056	NS	< 0.026	< 0.029	1.2	NS	0.12 J	0.077 J
Indoor Air	IV2020-01	< 0.028	< 0.028	< 0.033	< 0.028	< 0.028	< 0.028	< 0.033	< 0.028	0.028 J	< 0.27	< 0.032	0.044	0.15	0.36 J	0.07 J	0.090 J	0.41	0.42	0.40	0.38	< 0.028	< 0.28	< 0.033	< 0.028	2.6	1.6	0.99	4.0 B	< 0.026	< 0.27	< 0.032	< 0.027	0.089 J	< 0.52	0.061 J	0.079 J
	IV2020-02	< 0.029	< 0.032	< 0.042	< 0.029	< 0.029	< 0.032	< 0.042	< 0.029	0.021 J	0.023 J	< 0.040	0.032 J	0.096 J	0.077 J	0.082 J	0.085 J	0.40	0.39	0.39	0.39	< 0.029	< 0.032	< 0.042	< 0.029	1.6	1.2	0.23	3.0 B	< 0.028	< 0.03	< 0.040	< 0.028	0.094 J	0.11 J	0.062 J	< 0.055 ^
	IV2020-03	< 0.027	< 0.028	0.019 J	< 0.029	< 0.027	< 0.028	0.043	< 0.029	< 0.026	0.055	0.042	0.041	0.088 J	0.091 J	0.12 J	0.084 J	0.40	0.39	0.40	0.39	< 0.027	< 0.028	0.026 J	< 0.029	2.2	3.2	0.87	3.6 B	< 0.026	< 0.027	0.016 J	< 0.028	0.098 J	0.19	0.13 J	0.10 J
	IV2020-04	< 0.028	< 0.030	< 0.034	< 0.029	< 0.028	< 0.030	< 0.034	< 0.029	0.019 J	0.017 J	< 0.033	0.029 J	0.091 J	0.081 J	0.073 J	0.079 J	0.41	0.38	0.40	0.38	< 0.028	< 0.030	< 0.034	< 0.029	1.5	0.87	0.23	2.7 B	< 0.027	< 0.029	< 0.033	< 0.028	0.11 J	0.16	0.036 J	< 0.054
	IV2020-05	< 0.029	< 0.028	< 0.037	< 0.029	< 0.029	0.014 J	< 0.037	< 0.029	< 0.028	0.032	< 0.035	0.030 J	0.090 J	0.078 J	0.082 J	0.10 J	0.41	0.39	0.40	0.39	< 0.029	< 0.028	< 0.037	< 0.029	1.9	2.0	0.73	3.5 B	< 0.028	< 0.027	< 0.035	0.13	0.10 J	0.28	0.070 J	0.041 J
	IV2020-06	< 0.028	< 0.028	< 0.033	< 0.029	0.013 J	< 0.028	< 0.033	< 0.029	0.057	0.015 J	< 0.031	< 0.028	0.10 J	0.074 J	0.074 J	0.080 J	0.42	0.37	0.40	0.39	< 0.028	< 0.028	< 0.033	< 0.029	1.3	0.87	0.22	2.5 B	< 0.027	< 0.027	< 0.031	< 0.028	0.69	0.10 J	0.051 J	0.068 J
	IV2020-07	< 0.039	< 0.031	< 0.033	< 0.030	< 0.039	< 0.031	< 0.033	< 0.030	< 0.037	0.054	< 0.032	0.037	0.090 J	0.079 J	0.069 J	0.085 J	0.40	0.38	0.41	0.39	< 0.039	< 0.031	< 0.033	< 0.030	2.0	2.2	0.57	4.1 B	< 0.037	< 0.029	< 0.032	< 0.028	0.11 J	0.17	0.067 J	< 0.055
	IV2020-08	< 0.028	< 0.033	< 0.032	< 0.029	< 0.028	< 0.033	< 0.032	< 0.029	0.022 J	0.032 J	< 0.031	< 0.028	0.099 J	0.070 J	0.073 J	0.081 J	0.40	0.45	0.40	0.38	< 0.028	< 0.033	< 0.032	< 0.029	1.3	0.82	0.16	2.2 B	< 0.027	< 0.031	< 0.031	< 0.028	0.091 J	0.18	0.085 J	< 0.054
	IV2020-08-D	< 0.03	< 0.03	--	< 0.03	< 0.03	< 0.03	--	< 0.03	0.02 J	0.022 J	--	< 0.028	0.1 J	0.072 J	--	0.080 J	0.39	0.41	--	0.38	< 0.030	< 0.030	--	< 0.030	1.2	0.88	--	2.2	< 0.028	< 0.028	--	< 0.028	0.026 J	0.47	--	0.082 J
Outdoor Air	OV2020-01	< 0.030	< 0.034	< 0.035	< 0.029	< 0.030	< 0.034	< 0.035	< 0.029	< 0.028	< 0.033	< 0.033	< 0.028	0.082 J	0.064 J	0.068 J	0.29	0.40	0.37	0.38	0.40	< 0.030	< 0.034	< 0.035	< 0.029	0.050	0.18	0.05	0.081	< 0.028	< 0.033	< 0.033	< 0.028	0.083 J	< 0.064	< 0.064	0.094 J
	OV2020-01-D	< 0.029	< 0.031	--	< 0.031	< 0.029	< 0.031	--	< 0.031	< 0.027	< 0.029	--	< 0.029	0.085 J	0.062 J	--	0.24	0.40	0.39	--	0.41	< 0.029	< 0.031	--	< 0.031	0.045	0.19	--	0.12	< 0.027	< 0.029	--	< 0.029	0.14	0.093 J	--	0.071 J
	OV2020-02	< 0.030	< 0.031	< 0.041	< 0.030	< 0.030	< 0.031	< 0.041	< 0.030	< 0.028	< 0.029	< 0.039	< 0.029	0.085 J	0.066 J	0.072 J	0.13 J	0.39	0.38	0.40	0.40	< 0.030	< 0.031	< 0.041	< 0.030	0.055	0.36	0.16	0.20	< 0.028	< 0.029	< 0.039	< 0.029	0.095 J	0.074 J	0.12 J	0.060 J
	OV2020-03	< 0.028	< 0.033	< 0.037	< 0.030	< 0.028	0.020 J	< 0.037	< 0.030	< 0.027	< 0.032	< 0.035	< 0.028	0.10 J	0.087 J	0.069 J	0.075 J	0.39	0.31	0.40	0.32	< 0.028	< 0.033	< 0.037	< 0.030	0.050	0.052	0.015 J	0.11	< 0.027	< 0.032	< 0.035	< 0.028	0.11 J	0.14 J	< 0.068	< 0.055
	OV2020-04	< 0.028	< 0.031	< 0.039	< 0.030	< 0.028	< 0.031	< 0.039	< 0.030	< 0.026	< 0.029	< 0.037	< 0.029	0.080 J	0.067 J	0.071 J	0.079 J	0.40	0.38	0.40	0.40	< 0.028	< 0.031	< 0.039	< 0.030	0.039	0.046	< 0.037	0.064	< 0.026	< 0.029	< 0.037	< 0.029	0.075 J	0.093 J	0.092 J	0.081 J
	OV2020-05	< 0.039	< 0.029	< 0.039	< 0.029	< 0.039	0.017 J	< 0.039	< 0.029	< 0.037	< 0.028	< 0.037	< 0.028	0.083 J	0.082 J	0.07 J	0.082 J	0.38	0.38	0.39	0.40	< 0.039	< 0.029	< 0.039	< 0.029	0.043 J	0.068	< 0.037	0.031 J	< 0.037	< 0.028	< 0.037	< 0.028	0.041 J	0.21	0.069 J	0.052 J
	OV2020-06	< 0.060	< 0.031	< 0.035	< 0.032	< 0.060	< 0.031	< 0.035	< 0.032	< 0.057	< 0.030	< 0.033	< 0.030	0.089 J	0.065 J	0.064 J	0.071 J	0.39	0.38	0.38	0.39	< 0.060	< 0.031	< 0.035	< 0.032	0.026 J	0.12	< 0.033 U^ (U)	0.029 J	< 0.057	< 0.030	< 0.033	< 0.030	0.14 J	0.073 J	< 0.065	0.041 J
	OV2020-07	< 0.029	< 0.031	0.022 J	< 0.031	< 0.029	< 0.031	< 0.034	< 0.031	< 0.028	0.039	< 0.032	< 0.030	0.087 J	0.063 J	0.072 J	0.072 J	0.41	0.39	0.40	0.40	< 0.029	< 0.031	< 0.034	< 0.031	0.051	0.094	< 0.032	0.068	< 0.028	< 0.029	< 0.032	< 0.030	0.12 J	0.50	< 0.063	0.074 J
	OV2020-08	< 0.028	< 0.033	< 0.034	< 0.031	< 0.028	< 0.033	< 0.034	< 0.031	< 0.027	< 0.031	< 0.032	< 0.030	0.084 J	0.061 J	0.069 J	0.071 J	0.41	0.40	0.40	0.40	< 0.028	< 0.033	< 0.034	< 0.031	< 0.027	0.019 J	< 0.032 U^ (U)	0.037	< 0.027	< 0.031	< 0.032	< 0.030	0.048 J	0.20	< 0.063	0.044 J

Notes:
1) Sampling period for Q1 May 2021: 19 May 2021 through 20 May 2021
2) Sampling period for Q2 August 2021: 31 August 2021 through 01 September 2021
3) Sampling period for Q3 November 2021: 16 November 2021 through 17 November 2021
3) Sampling period for Q4 March 2022: 01 March 2022 through 02 March 2022
3) Data shown in units of µg/m^3 (micrograms per cubic meter)
4) **Bold text indicates analyte detected at a concentration at or above the limit of detection (LOD)**

Lab Flags:
B = Analyte detected in both the sample and associated method blank.
D = The reported result is from a dilution.
J = Estimated concentration, analyte is positively identified and the result is less than the Limit of Quantitation (LOQ), but greater than the Detection Limit (DL).
U = Non-detect

Definitions:
< = Less than the Limit of Detection (LOD)
NE = Not Established
NS = Not sampled due to inaccessibility
RSL = Regional Screening Level for Air, Hazard Quotient [HQ]= 0.1 (USEPA, May 2021)

Table 4-1: Summary of Analytical Results in Sub-Slab Vapor, Indoor Air, and Outdoor Air
November 2021 Q3 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

^ = Lab flag "J" updated to "U" based on blank detection discovered during data validation.

Validation Qualifiers:

J = Estimated detect; the analyte was positively identified by the laboratory, however, the reported concentration is estimated due to non-conformances discovered during data validation.

U = Non-detect; the analyte was positively identified by the laboratory, however, the analyte should be considered non-detect at the reported concentration due to non-conformances discovered during data validation.

5) **Result in red font exceeds the Residential RSL**

6) **Result in red text/gray background exceeds the Industrial RSL**

* For the March 2022 soil vapor sample SSV2020-16, the results from field duplicate sample SSV2020-16-D should be used; see Section 4.1.4 and the March 2022 DUS for further details.

Table 5-1: Indoor Air Risk Calculations Based on Highest Indoor Air Concentration Across all Rounds
2021-2022 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

Commercial Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; U = user provided; G = see RSL User's Guide Section 5; CA = cancer; NC = noncancer.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m^3)	Toxicity Basis	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m^3)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp} (25 ºC) (µg/m^3)	Maximum Groundwater Vapor Concentration C_{hc} (µg/m^3)	Temperature for Maximum Groundwater Vapor Concentration (ºC)	Lower Explosive Limit LEL (% by volume)	LEL Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$(µg/m^3)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$(µg/m^3)
Chloroform	67-66-3	Yes	Yes	Yes	Yes	5.33E-01	CA	1.78E+01	3.55E+00	Yes (80)	1.26E+09	1.19E+09	2.50E+01	-		2.30E-05	U	9.77E-02	U	No	5.33E-01	4.28E+01
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	3.61E-01	CA	1.20E+01	2.01E+01	--	5.86E+05	5.58E+05	2.50E+01	9.00E-01	U	3.40E-05	U	3.00E-03	U	No	3.61E-01	1.31E+00
Trichloroethylene	79-01-6	Yes	Yes	Yes	Yes	8.76E-01	NC	2.92E+01	2.18E+00	Yes (5)	4.88E+08	5.15E+08	2.50E+01	8.00E+00	U	4.10E-06	U	2.00E-03	U	Mut	2.99E+00	8.76E-01

Commercial Air Inputs

Variable	Commercial Air Default Value	Site-Specific Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
AT_w (averaging time - composite worker)	365	365
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) yr	70	70
TR (target risk) unitless	0.000001	0.000001

Commercial Vapor Intrusion Risk

Chemical	Site Indoor Air Concentration $C_{i,a}$ (µg/m^3)	VI Carcinogenic Risk CDI (µg/m^3)	VI Carcinogenic Risk CR	VI Hazard CDI (mg/m^3)	VI Hazard HQ	IUR (ug/m^3)$^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (ºC) for Groundwater Vapor Concentration	Mutagen?
Chloroform	3.60E-01	2.94E-02	6.75E-07	8.22E-05	8.41E-04	2.30E-05	U	9.77E-02	U	2.50E+01	No
Naphthalene	4.70E-01	3.83E-02	1.30E-06	1.07E-04	3.58E-02	3.40E-05	U	3.00E-03	U	2.50E+01	No
Trichloroethylene	4.10E+00	3.34E-01	1.37E-06	9.36E-04	4.68E-01	4.10E-06	U	2.00E-03	U	2.50E+01	Mut
*Sum	-	-	*3.35E-06*	-	*5.05E-01*	-		-		-	

Table 5-1: Indoor Air Risk Calculations Based on Highest Indoor Air Concentration Across all Rounds
2021-2022 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

Chemical Properties

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T_C (K)	T_C Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ (cal/mol)	$\Delta H_{v,b}$ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Chloroform	67-66-3	Yes	Yes	1.19E+02	U	1.97E+02	U	7.95E+03	U	8.00E+01	3.67E-03	1.50E-01	U	1.50E-01	#####	U	5.36E+02	U	######	U	-	
Naphthalene	91-20-3	Yes	Yes	1.28E+02	U	8.50E-02	U	3.10E+01	U	-	4.40E-04	1.80E-02	U	1.80E-02	#####	U	7.48E+02	U	######	U	9.00E-01	U
Trichloroethylene	79-01-6	Yes	Yes	1.31E+02	U	6.90E+01	U	1.28E+03	U	5.00E+00	9.85E-03	4.03E-01	U	4.03E-01	#####	U	5.71E+02	U	######	U	8.00E+00	U

Table 5-2: Indoor Air Risk Calculations Based on Highest Sub-Slab Concentration Across all Rounds
2021-2022 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

Commercial Vapor Intrusion Screening Levels (VISL)

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; U = user provided; G = see RSL User's Guide Section 5; CA = cancer; NC = noncancer.

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? (C_{vp} > $C_{i,a}$,Target?)	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? (C_{hc} > $C_{i,a}$,Target?)	Target Indoor Air Concentration (TCR=1E-06 or THQ=0.1) MIN($C_{ia,c}$,$C_{ia,nc}$) (µg/m^3)	Toxicity Basis	Target Sub-Slab and Near-source Soil Gas Concentration (TCR=1E-06 or THQ=0.1) C_{sg},Target (µg/m^3)	Target Groundwater Concentration (TCR=1E-06 or THQ=0.1) C_{gw},Target (µg/L)	Is Target Groundwater Concentration < MCL? (C_{gw} < MCL?)	Pure Phase Vapor Concentration C_{vp} (25 ºC) (µg/m^3)	Maximum Groundwater Vapor Concentration C_{hc} (µg/m^3)	Temperature for Maximum Groundwater Vapor Concentration (ºC)	Lower Explosive Limit LEL (% by volume)	LEL Ref	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Mutagenic Indicator	Carcinogenic VISL TCR=1E-06 $C_{ia,c}$(µg/m^3)	Noncarcinogenic VISL THQ=0.1 $C_{ia,nc}$(µg/m^3)
Chloroform	67-66-3	Yes	Yes	Yes	Yes	5.33E-01	CA	1.78E+01	3.55E+00	Yes (80)	1.26E+09	1.19E+09	2.50E+01	-		2.30E-05	U	9.77E-02	U	No	5.33E-01	4.28E+01
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	3.61E-01	CA	1.20E+01	2.01E+01	--	5.86E+05	5.58E+05	2.50E+01	9.00E-01	U	3.40E-05	U	3.00E-03	U	No	3.61E-01	1.31E+00
Trichloroethylene	79-01-6	Yes	Yes	Yes	Yes	8.76E-01	NC	2.92E+01	2.18E+00	Yes (5)	4.88E+08	5.15E+08	2.50E+01	8.00E+00	U	4.10E-06	U	2.00E-03	U	Mut	2.99E+00	8.76E-01

Commercial Air Inputs

Variable	Commercial Air Default Value	Site-Specific Value
AF_{gw} (Attenuation Factor Groundwater) unitless	0.001	0.001
AF_{ss} (Attenuation Factor Sub-Slab) unitless	0.03	0.03
AT_w (averaging time - composite worker)	365	365
ED_w (exposure duration - composite worker) yr	25	25
EF_w (exposure frequency - composite worker) day/yr	250	250
ET_w (exposure time - composite worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	0.1
LT (lifetime) yr	70	70
TR (target risk) unitless	0.000001	0.000001

Commercial Vapor Intrusion Risk

Chemical	CAS Number	Site Sub-Slab and Exterior Soil Gas Concentration C_{sg} (µg/m^3)	Site Indoor Air Concentration $C_{i,a}$ (µg/m^3)	VI Carcinogenic Risk CDI (µg/m^3)	VI Carcinogenic Risk CR	VI Hazard CDI (mg/m^3)	VI Hazard HQ	IUR (ug/m^3)$^{-1}$	IUR Ref	Chronic RfC (mg/m^3)	RfC Ref	Temperature (ºC) for Groundwater Vapor Concentration	Mutagen?
Chloroform	67-66-3	1.70E+03	5.10E+01	4.16E+00	9.56E-05	1.16E-02	1.19E-01	2.30E-05	U	9.77E-02	U	2.50E+01	No
Naphthalene	91-20-3	1.90E+02	5.70E+00	4.65E-01	1.58E-05	1.30E-03	4.34E-01	3.40E-05	U	3.00E-03	U	2.50E+01	No
Trichloroethylene	79-01-6	9.40E+04	2.82E+03	2.30E+02	9.43E-04	6.44E-01	3.22E+02	4.10E-06	I	2.00E-03	IRIS	2.50E+01	Mut
*Sum		-	-	-	1.05E-03	-	3.22E+02	-		-		-	

Table 5-2: Indoor Air Risk Calculations Based on Highest Sub-Slab Concentration Across all Rounds
2021-2022 Vapor Intrusion Assessment Report
Vapor Intrusion Study at Site OT022, Air Force Plant 4, Tarrant County, Texas

Chemical Properties

Chemical	CAS Number	Does the chemical meet the definition for volatility? (HLC>1E-5 or VP>1)	Does the chemical have inhalation toxicity data? (IUR and/or RfC)	MW	MW Ref	Vapor Pressure VP (mm Hg)	VP Ref	S (mg/L)	S Ref	MCL (ug/L)	HLC (atm-m^3/mole)	Henry's Law Constant (unitless)	H` and HLC Ref	Henry's Law Constant Used in Calcs (unitless)	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T_C (K)	T_C Ref	Enthalpy of vaporization at the normal boiling point $\Delta H_{v,b}$ (cal/mol)	$\Delta H_{v,b}$ Ref	Lower Explosive Limit LEL (% by volume)	LEL Ref
Chloroform	67-66-3	Yes	Yes	1.19E+02	U	1.97E+02	U	7.95E+03	U	8.00E+01	3.67E-03	1.50E-01	U	1.50E-01	3.34E+02	U	5.36E+02	U	6.99E+03	U	-	
Naphthalene	91-20-3	Yes	Yes	1.28E+02	U	8.50E-02	U	3.10E+01	U	-	4.40E-04	1.80E-02	U	1.80E-02	4.91E+02	U	7.48E+02	U	1.03E+04	U	9.00E-01	U
Trichloroethylene	79-01-6	Yes	Yes	1.31E+02	U	6.90E+01	U	1.28E+03	U	5.00E+00	9.85E-03	4.03E-01	U	4.03E-01	3.60E+02	U	5.71E+02	U	7.50E+03	U	8.00E+00	U

Changes in Toxicity and Other Contaminant Characteristics - 1995 vs 2023

Analyte	CAS No.	1995 HHRA Toxicity Values				2023 EPA Toxicity Values			
		SFO (mg/kg-day)$^{-1}$	CSFi^{2} mg/kg-day	RfD$_o$ (mg/kg-day)	RfC$_i$ (mg/m^3)	SFO (mg/kg-day)$^{-1}$	CSFi^{2} mg/kg-day	RfD$_o$ (mg/kg-day)	RfC$_i$ (mg/m^3)
Benzene	71-43-2	2.9E-02	2.9E-02	1.0E-01	1.0E-01	**5.5E-02**	**2.7E-02**	**4.0E-03**	**3.0E-02**
Benz[a]anthracene	56-55-3	5.8E-01	--	--	--	**1.0E-01**	*2.1E-01*	--	--
Benzo[a]pyrene	50-32-8	5.8E+00	--	--	--	**1.0E+00**	*2.1E+00*	*3.0E-04*	*2.0E-06*
Benzo[b]fluoranthene	205-99-2	5.8E-01	--	--	--	**1.0E-01**	*2.1E-01*	--	--
Benzo[k]fluoranthene	207-08-9	5.8E-01	--	--	--	**1.0E-02**	*2.1E-02*	--	--
Cadmium (Diet)	7440-43-9	--	6.1E+00	1.0E-03	--	--	**6.3E+00**	**1.0E-04**	*1.0E-05*
Chromium(VI)	18540-29-9	--	4.1E+01	5.0E-03	2.0E-06	*5.0E-01*	**2.9E+02**	**3.0E-03**	**1.0E-04**
Chrysene	218-01-9	--	--	--	--	*1.0E-03*	*2.1E-03*	--	--
Dichloroethylene, cis-1,2-	156-59-2	--	--	1.0E-02	--	--	--	**2.0E-03**	*4.0E-02*
Copper	7440-50-8	--	--	3.7E-02	--	--	--	4.0E-02	--
Dichlorobenzene, 1,2-	95-50-1	--	--	9.0E-02	4.0E-02	--	--	9.0E-02	**2.0E-01**
Dichlorobenzene, 1,4-	106-46-7	--	--	2.4E-02	1.4E-01	*5.4E-03*	*3.9E-02*	**7.0E-02**	**8.0E-01**
Dichloroethane, 1,1-	75-34-3	--	--	1.0E-01	5.0E-01	*5.70E-03*	*5.6E-03*	**2.00E-01**	--
Dichloroethylene, 1,1-	75-35-4	--	--	9.0E-03	--	--	--	**5.0E-02**	*2.0E-01*
Dichloroethylene, trans-1,2-	156-60-5	--	--	1.0E-02	--	--	--	**2.0E-02**	*4.0E-02*
Dimethylphenol, 2,4-	105-67-9	--	--	2.0E-02	--	--	--	**2.0E-02**	--
Ethylbenzene	100-41-4	--	--	--	--	*1.1E-02*	*8.8E-03*	*5.0E-02*	*1.0E+00*
Fluoranthene	206-44-0	--	--	4.0E-02	--	--	--	4.0E-02	--
Freon (Trichloro-1,2,2-trifluoroethane, 1,1,2-)	76-13-1	--	--	--	--	--	--	*3.0E+01*	*5.0E+00*
Lead Compounds	7439-92-1	--	--	6.9E-04	4.3E-04	--	--	--	--
Methylene Chloride	75-09-2	7.5E-03	1.6E-03	6.0E-02	9.0E-01	**2.0E-03**	**3.5E-05**	**6.0E-03**	**6.0E-01**
Methylnaphthalene, 2-	91-57-6	--	--	--	--	--	--	4.0E-03	--
Cresol, o- (surr for Methylphenol)	95-48-7	--	--	5.0E-02	--	--	--	5.0E-02	*6.0E-01*
Naphthalene	91-20-3	--	--	4.0E-02	--	*1.2E-01*	*1.2E-01*	2.0E-02	*3.0E-03*
Nickel Soluble Salts	7440-02-0	--	8.4E-01	2.0E-02	--	--	**9.1E-01**	2.0E-02	*1.4E-05*
Phenanthrene	85-01-8	--	--	--	--	--	--	*3.0E-02*	--
Pyrene	129-00-0	--	--	3.0E-02	--	--	--	3.0E-02	--
Toluene	108-88-3	--	--	2.0E-01	6.0E-01	--	--	**8.0E-02**	**5.0E+00**
Trichloroethane, 1,1,1-	71-55-6	--	--	9.0E-02	3.0E-01	--	--	**2.0E+00**	**5.0E+00**
Trichloroethylene	79-01-6	1.1E-02	1.7E-02	--	--	**4.6E-02**	**1.4E-02**	*5.0E-04*	*2.0E-03*
Trimethylbenzene, 1,2,4-	95-63-6	--	--	--	--	--	--	*1.0E-02*	*6.0E-02*
Trimethylbenzene, 1,3,5-	108-67-8	--	--	--	--	--	--	*1.0E-02*	*6.0E-02*
Vinyl Chloride	75-01-4	1.9E+00	--	--	--	**7.2E-01**	*1.5E-02*	*3.0E-03*	*1.0E-01*
Zinc and Compounds	7440-66-6	--	--	2.0E-01	--	--	--	**3.0E-01**	--

Notes:

Bold - denotes updated value
Italics - denotes new value
CSFo - oral cancer slope factor
CSFi - inhalation cancer slope factor
HHRA - human health risk assessment
RfDo - oral noncancer reference dose
RfCi - inhalation noncancer reference concentration mg/kg-day - milligram per kilogram per day
µg/m3 - microgram per cubic meter
mg/m3 - milligram per cubic meter

1) The following surrogates were used for chemicals without toxicity values or multiple forms:
Cadmium (water) used for cadmium, *Chromium VI* used for chromium, *Lead and compounds* used for lead, *Cresol* used for methylphenol and *Pyrene* used for phenanthrene.
2) CSFi calculated from inhalation unit risk as follows:

$$CSF_i = IUR \times \left(\frac{BW}{Inh}\right) \times CF$$

Where:
IUR = inhalation unit risk (chemical-specific)
BW = body weight (70 kilograms)
Inh = inhalation rate (20 cubic meters per day)
CF = conversion factor (1000 microgram per milligram)

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APPENDIX I
2023 ROD Amendment State Concurrence Letter

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Erin E. Chancellor, *Interim Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 11, 2023

Ms. Judy M. Lopez
Director, Environmental Management
AFCEC/CZ
2261 Hughes Avenue
Lackland AFB, Texas 78236-9853

Re: State Concurrent with Record of Decision (ROD) Amendment 1 for Air Force Plant 4 Federal Superfund Site (TX7572024605), Fort Worth, Tarrant County, Texas

Dear Ms. Lopez:

On April 6, 2023, the Texas Commission on Environmental Quality (TCEQ) received the final abovementioned ROD. TCEQ has completed the review of the ROD and concurs that the described action is appropriate.

Sincerely,

Erin E. Chancellor

Erin E. Chancellor
Interim Executive Director

cc: Ms. Lisa Price, Acting Director, Superfund and Emergency Management Division, Environmental Protection Agency, Region 6

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APPENDIX J
Site Visit Pictures



Caption 0237: Fire training area (FT009) west of Bldg 609. Looking north.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0239: Former site of engine test stand (OT000). Looking west.	
Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0240: Monitoring well adjacent to site of engine test stand (OT000). Looking north.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0241: Former site of engine test stand (OT000). Looking south.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



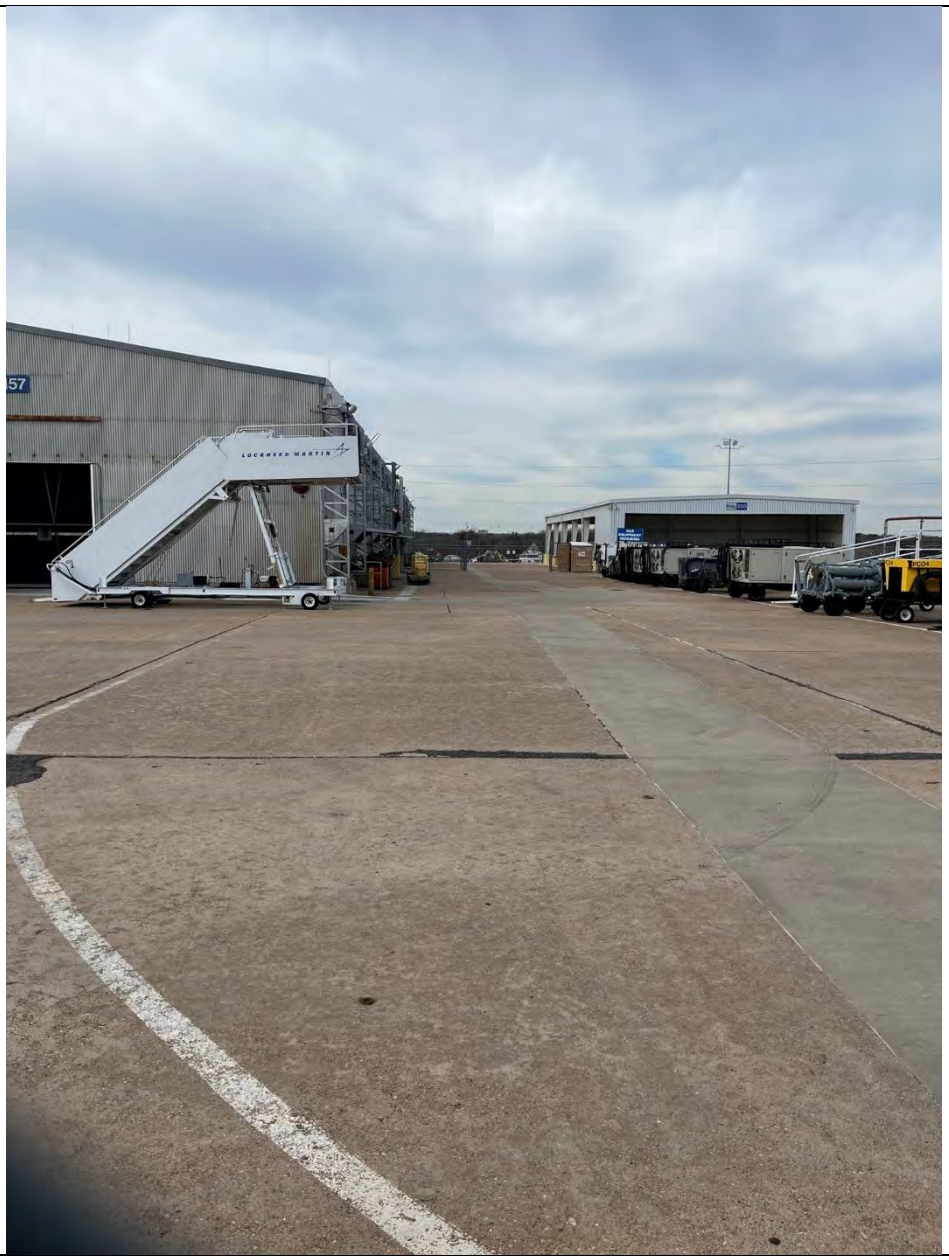
Caption 0242: FSA 3 (SS016). Looking north toward Building 142.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0243: Former remediation site tanks for FSA. Looking northeast.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



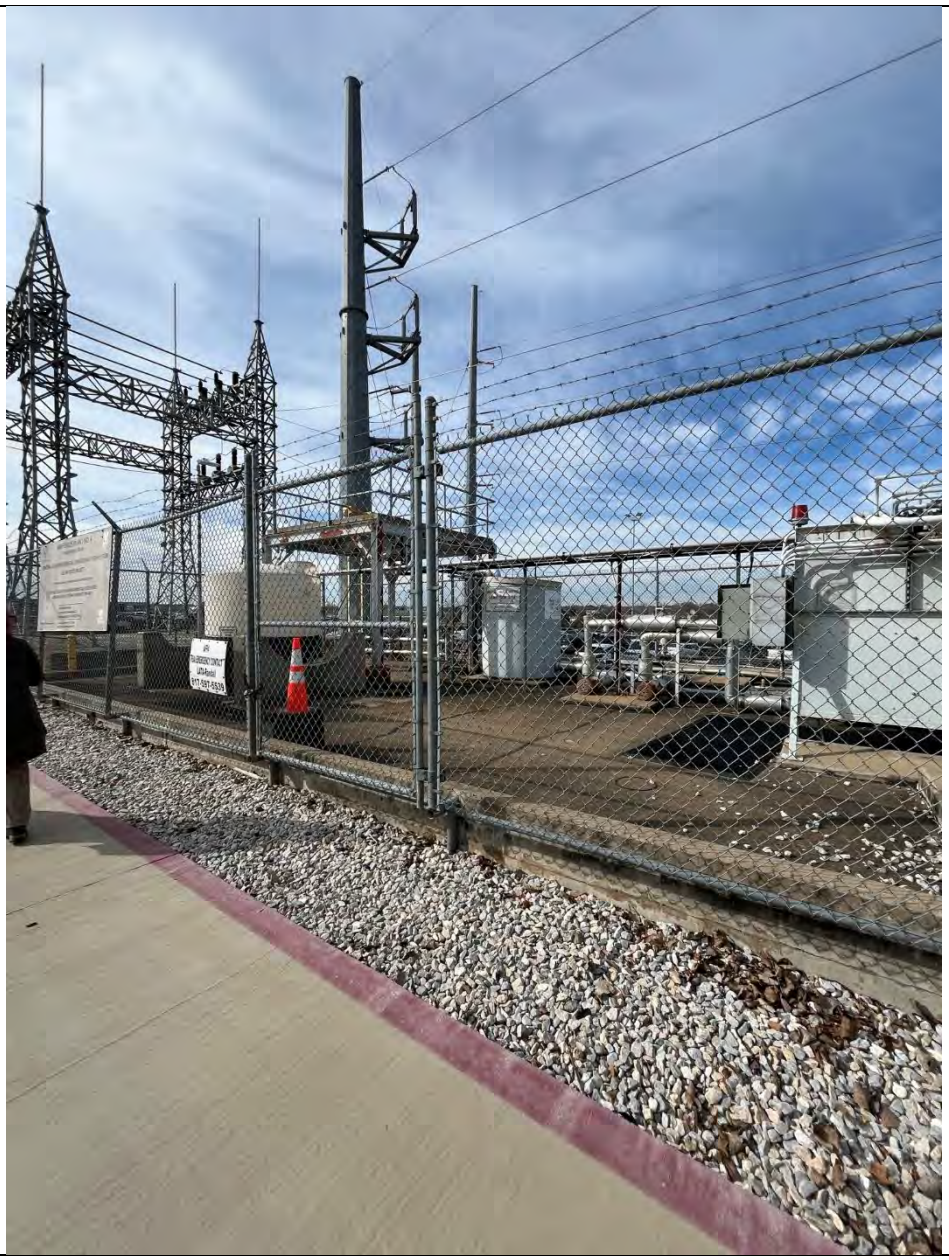
Caption 0244: UST 30 (ST030). Looking west toward Bldg 157 (left) and Site 250 (right).

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0247: FSA1 (SS014). Looking north towards Building 14.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



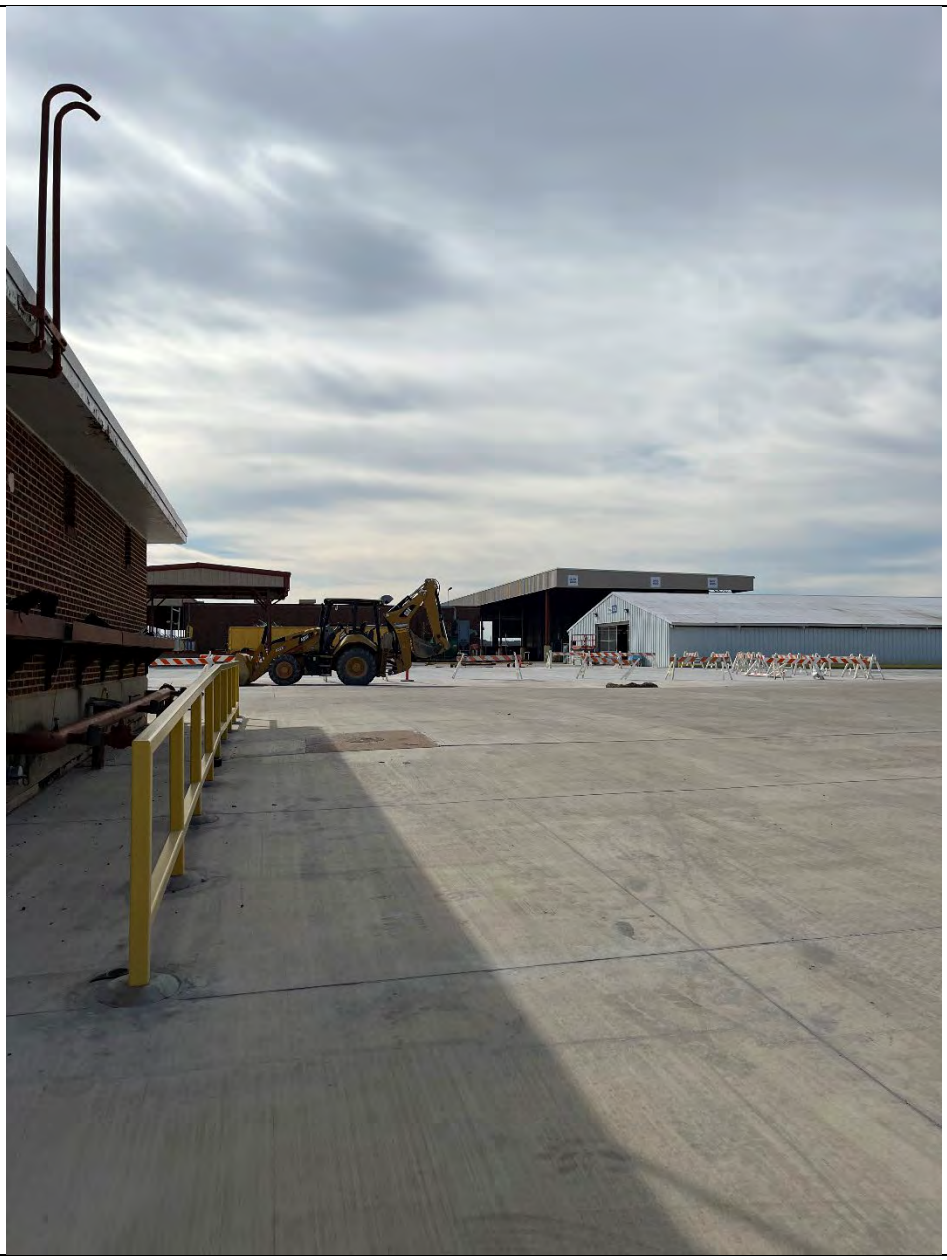
Caption 0248: FSA treatment system. Looking southwest toward JSF parking lot (Landfill 1).

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0249: FSA treatment system. Looking northwest toward JSF parking lot (Landfill 1).

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024

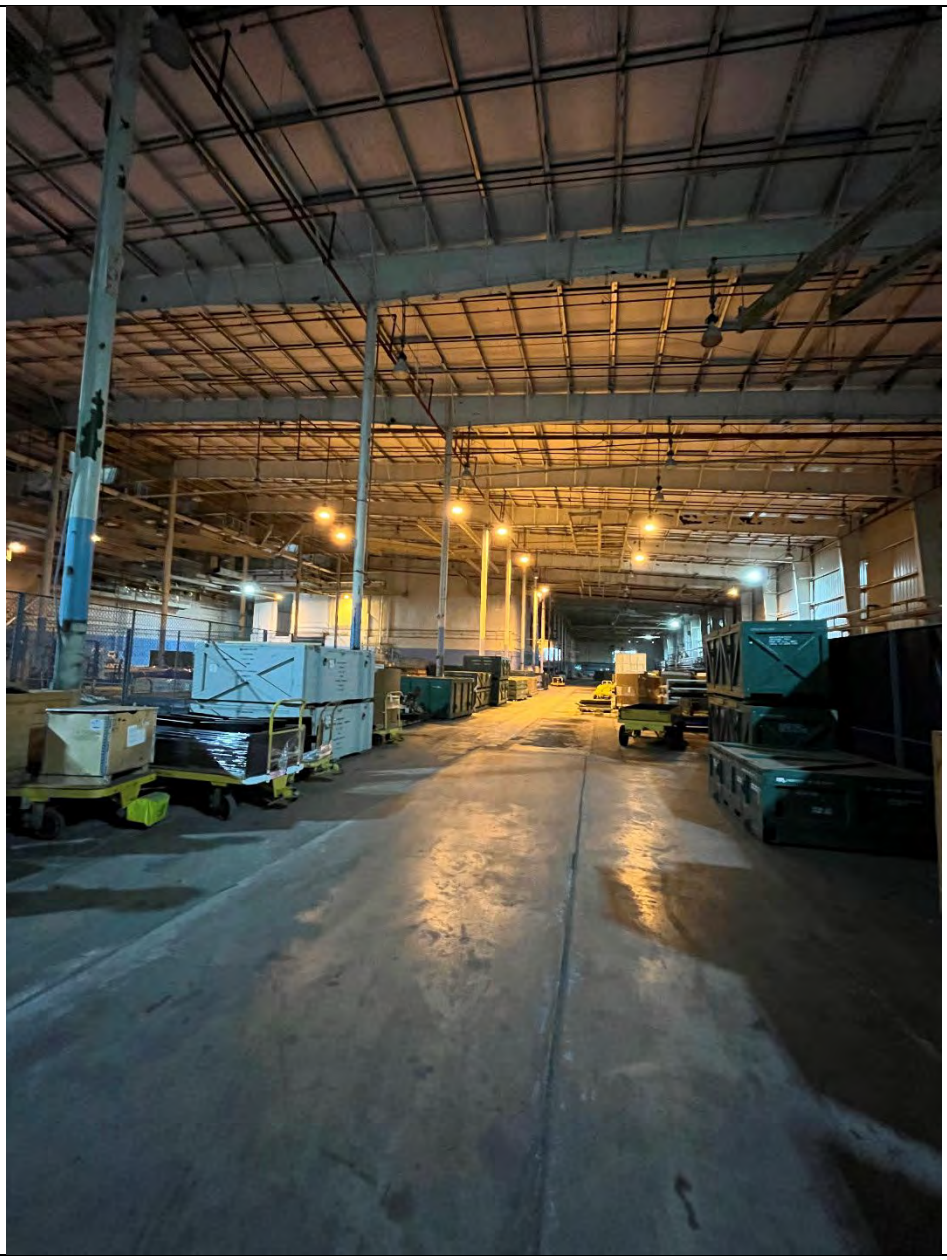


Caption 0250: USTs 19 & 20 (ST025 & ST026 respectively). Looking south toward Building 30 (left).	
Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0251: UST 24A & 24B (ST027 & ST028 respectively). Looking southeast toward Building 13.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0252: Chrome Pit 1 (DP010). Inside of Building 181 looking south.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0253: Chrome Pit 2 (DP011). Looking east toward southwest corner of Building 181.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0254: Dye Pits (DP013). Looking northeast toward Building 96 (right) and south end of Building 12 (left).

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



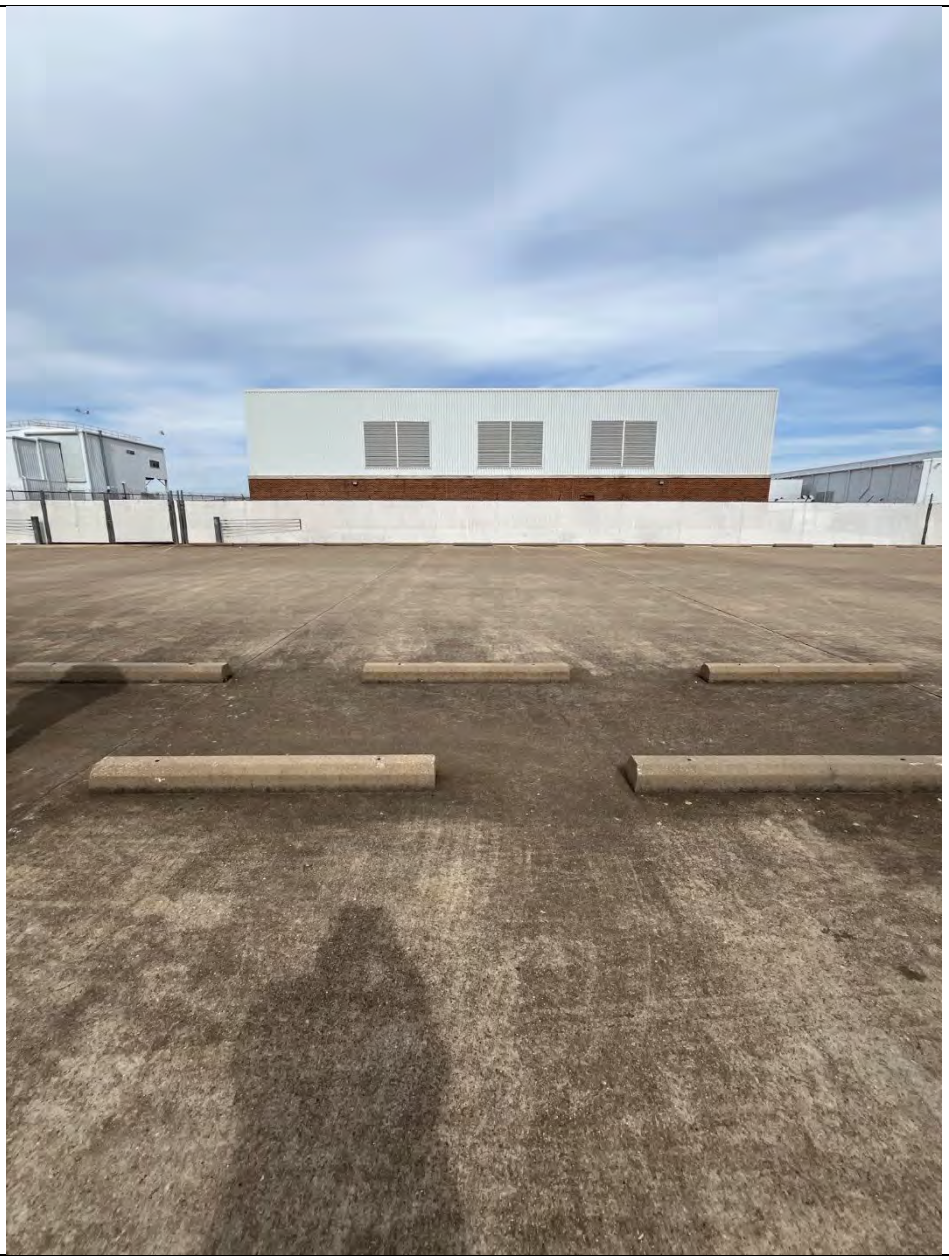
Caption 0255: Former Fuel Storage (SS017). Looking west from Building 179.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



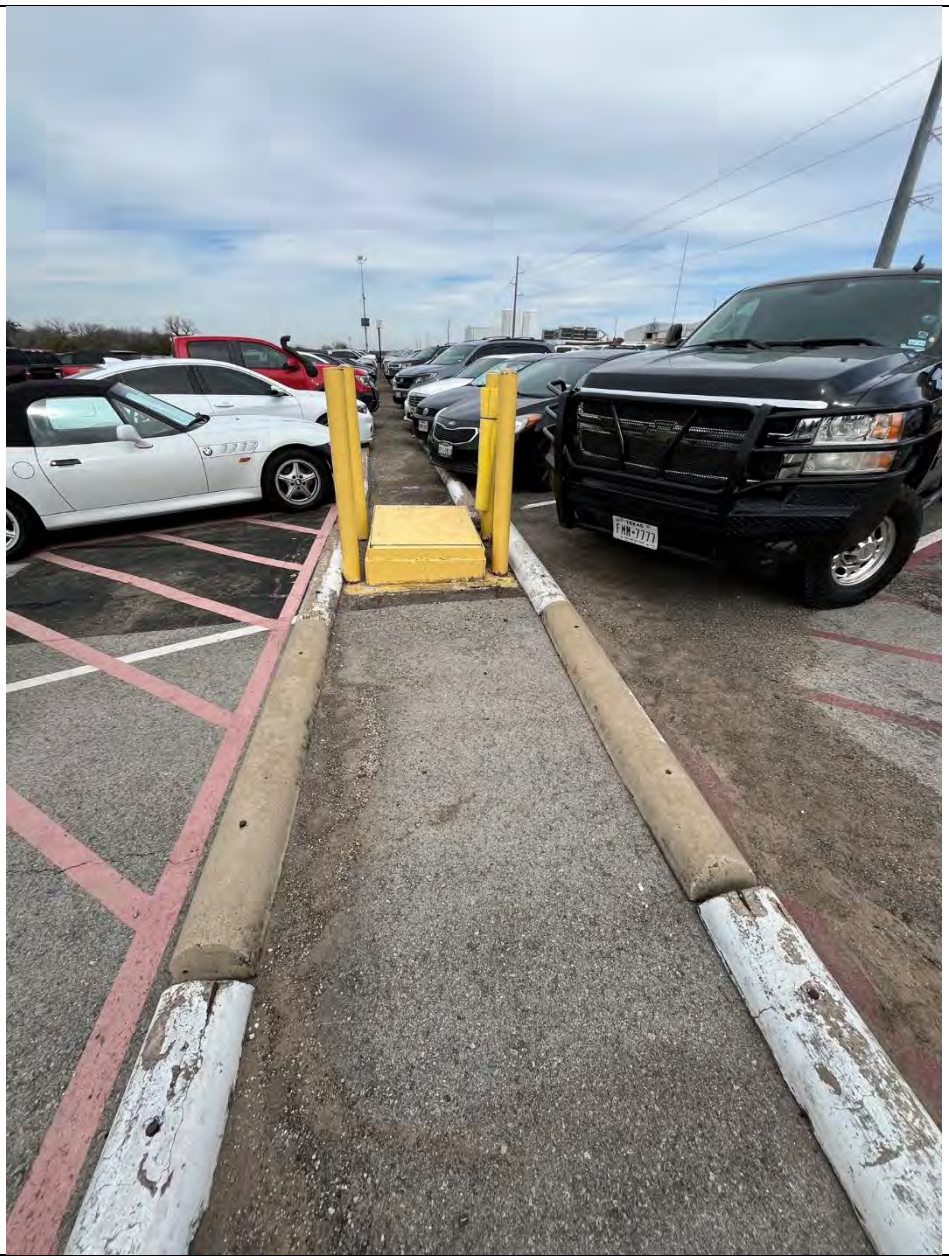
Caption 0256: Landfill 2 a.k.a. Moose Mountain (LS002). Looking west from autogate.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0257: FDTA005 (FT008). Looking north toward Building 96 (right) and Building 179 (left).

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0258: Landfill 1 (LF001). Looking north.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0259: Landfill 1 (LF001). Looking east from Bomber Rd toward Gate 3A.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024



Caption 0260: Landfill 3 (LF03). Looking west across Bomber Rd from Landfill 1.

Project: AFP 4 Five-Year Review	**Image Date**: 07 February 2024

END OF REPORT