ARF-024253

Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken. South Carolina 29802

JUL 25 2023

Ms. Susan B. Fulmer, P. G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Jon Richards
Savannah River Site Remedial Project Manager
Superfund Division
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Calendar Year 2022 D-Area Oil Seepage Basin Operable Unit (631-G) Groundwater Mixing Zone Letter Report, SEMS Number: 27

In accordance with the terms of the Federal Facility Agreement, the U. S. Department of Energy (DOE) is submitting this letter report for your review. Please review the subject letter report and provide your comments within one hundred twenty (120) days of receipt. The effort and time that the South Carolina Department of Health and Environmental Control and the U. S. Environmental Protection Agency have given on the subject operable unit are greatly appreciated.

Comments or questions from your staff may be directed to me at (803) 952-8365 or the DOE Operable Unit Manager, Ms. Karen Adams, at (803) 952-7871.

Sincerely,

Brian T. Hennessey Digitally signed by Brian T. Hennessey
Date: 2023.07.24 10:29:28 -04'00'

Brian T. Hennessey
FFA Project Manager, DOE-Savannah River
Remediation and Deactivation & Decommissioning Division

RDDD-23-019

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Calendar Year 2022 D-Area Oil Seepage Basin Operable Unit (631-G)
Groundwater Mixing Zone Letter Report

Introduction

This letter report was prepared to support the regulatory reporting requirements for the D-Area Oil Seepage Basin (DOSB) Operable Unit (OU) (631-G). The DOSB OU is listed as a Resource Conservation and Recovery Act 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act unit in Appendix C of the Federal Facility Agreement for the Savannah River Site (SRS). The reporting requirements are specified in the Groundwater Mixing Zone (GWMZ) Application for the DOSB (WSRC-RP-97-422, Revision 1.5, May 2009), a document approved by the U.S. Environmental Protection Agency (USEPA) and the South Carolina Department of Health and Environmental Control (SCDHEC).

In accordance with the GWMZ Application, a report must be submitted on or before July 31 to present groundwater data and conditions for the previous calendar year (CY). During even-numbered years, a mixing zone report that contains groundwater data tables, contaminant plume maps, and descriptions of groundwater monitoring data and results will be submitted. During odd-numbered years (such as this one), a letter report that summarizes groundwater monitoring data and results will be submitted. This is the sixth letter report submitted for the DOSB OU.

Groundwater monitoring is performed at the DOSB OU to ensure that established groundwater concentration limits (maximum contaminant levels [MCLs] at GWMZ boundaries and mixing zone concentration limits [MZCLs] within the boundaries) are not exceeded for the DOSB GWMZ constituents. The GWMZ constituents include tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethylene (cDCE), 1,1-dichloroethylene (1,1-DCE), vinyl chloride (chloroethene) (VC), benzene, and dichloromethane (methylene chloride). The monitoring well network consists of 18 wells including two background wells, nine plume compliance wells, and seven boundary compliance wells. In addition, there are four near-source "additional" monitoring wells, and one surface water station that are sampled but are not a part of the approved GWMZ monitoring network (Figure 1). The background wells are sampled biennially (i.e., second quarter CY during even years) while the plume compliance wells, boundary compliance wells, and additional monitoring wells are sampled annually during the second quarter of the CY. In addition, a surface water sample is collected on an annual basis.

The concentrations of the GWMZ constituents detected in groundwater are compared to the MZCLs from the Revision 1.5 GWMZ Application. If the concentration of a GWMZ constituent exceeds the MZCL at a plume compliance well (or the standards listed in Regulation 61-58: State Primary Drinking Water Regulations or the USEPA safe drinking water MCL at a boundary compliance well, as appropriate), the well will be resampled within 30 days of receipt of a valid data report to confirm that the exceedances occurred. If the event is validated by the confirmation sample results, SRS will notify the USEPA and SCDHEC of the occurrence. As shown in Table 1, there were no exceedances of the MZCLs in the plume compliance wells and no exceedances of MCL standards in the boundary compliance wells in 2022.

2022 Data Analyses

The DOSB OU groundwater monitoring well samples were collected on June 7 and 8 for the 2022 sampling event.

Rainfall conditions were below average for calendar year 2022. The average rainfall amount since 1982 as measured at station 400-D at the Site is 45.25 inches. The 2022 rainfall amount totaled 40.31 inches, which was approximately five (5) inches below average and eight (8) inches below the 2021 rainfall amounts (48.72 inches). The DOSB OU water elevations were approximately five (5) feet (ft) below 2020 levels. Water elevations are provided in Table 2. Horizontal groundwater flow rates for 2022 were calculated at 31.5 ft/year (yr) in the AQ1/AQ2 aquifer zone and 6.8 ft/yr in the AQ3 aquifer zone, both of which are lesser compared to flow rates calculated in 2020. Figure 2 provides the potentiometric map of water levels indicating that the flow directions in AQ1/AQ2 and AQ3 are in the south-southeast direction whereas the flow direction in the Gordon aquifer is towards south-southwest. Figure 3 presents a conceptual cross section depicting the regional hydrostratigraphy at the DOSB OU.

Groundwater data for 2022 indicates that the DOSB OU groundwater plumes have not increased in size. Table 1 provides the groundwater results from the 2022 sampling.

Background wells DOB 9 and DOL 1 were non-detect for all analytes.

The "additional" monitoring wells (DOB 11, DOB 12, DOB 13, and DOB 14) are located near the original source area. Maximum concentrations of the GWMZ contaminants at these locations are as follows: 1,1-DCE (not detected); benzene (not detected); VC (not detected); cDCE (J-qualified 2.78 micrograms per liter [μg/L], well DOB 12); methylene chloride (not detected); TCE (2.78 μg/L, well DOB 11); and PCE (J-qualified 1.49 μg/L, well DOB 12). The GWMZ constituents that were detected do not exceed their respective MZCLs (1,1-DCE [7 μg/L], benzene [5 μg/L], VC [147 μg/L], cDCE [1,164 μg/L], PCE [78 μg/L], and TCE [200 μg/L]) at the "additional" monitoring wells. Concentrations at wells DOB 13 and DOB 14 were non-detect for all GWMZ contaminants. Upper AQ1-screened well DOB 12 has displayed decreasing concentrations for the last eight years and lower AQ2-screened well DOB 11 has displayed variable concentrations for the last few years.

The maximum concentrations in DOSB OU Plume Compliance wells include: 1,1-DCE (not detected); benzene (0.49 μg/L, J-qualified, well DOB 15); VC (12.2 μg/L well DOB 15); cDCE (72 μg/L, well DOB 15); methylene chloride (not detected); TCE (16.6 μg/L, well DOB 15); and PCE (6.16 μg/L, well DOB 15). Some of these wells continue to have contaminant concentrations above the MCLs for VC (2 μg/L), cDCE (70 μg/L), PCE (5 μg/L) and TCE (5 μg/L). However, the GWMZ constituents that were above their respective MCLs do not exceed their respective MZCLs (VC [147 μg/L], cDCE [1,164 μg/L], PCE [78 μg/L] and TCE [200 μg/L]) at the Plume Compliance wells.

The DOSB OU Boundary Compliance wells were non-detect for all GWMZ constituents.

The surface water station DOBSW1 was dry and unable to be sampled in 2022.

Two of the nine Plume Compliance wells (DOB 15 and DOL 2) show contamination above MCLs (Table 1). Plume maps for TCE, cDCE, and VC are provided in Figures 4 through 6, respectively. Figure 7 shows the VC plume in cross-section. None of the Plume Compliance wells exceeded their respective MZCLs. These wells are located near the original source area. Contaminant trends at wells farther downgradient remain below MCLs and display decreasing trends indicating the total mass in the aquifers is decreasing. In general, most volatile organic compound (VOC) concentrations continue to show an overall decreasing trend in the DOSB OU wells. However, VOC concentrations intermittently increase/decrease in various wells, including one additional well DOB 11 and Plume Compliance wells DOB 15A, DOB 16 and DOB 15D. These fluctuations may indicate: 1) core plume movement downgradient from the original source area; 2) effects of increased/decreased rainfall; and 3) degradation of parent VOC contaminants. Periods of high water-levels may correlate with increased contaminant concentrations. Furthermore, residual vadose zone contaminants may be released into the groundwater as water elevations rise from lower to higher water elevations. During times of increased VOC concentrations, contaminant levels in the DOB wells are still far below historical highs and remain below the MZCLs.

Contaminant trends at the highest concentration well DOB 15 show steady concentrations of PCE, TCE, cDCE, and VC (Figure 8). At current trends, the data indicates that it will take longer to achieve MCLs than the modeled cleanup time of 20 years (~2027). Data also indicates that bio-degradation has significantly decreased since the source removal action conducted in 1996, which removed the carbon source. As for the dispersion/dilution of VOCs, it is speculated that VOCs are being retarded by the aquitards and clayey zones and/or restricted groundwater flow zones through tighter aquifer zones. Wells DOB 15, DOL 2, and DOB 16 are located within or below clayey zones in which VOCs may be sorbing to those clays thereby prolonging the physical attenuation process (dispersion) as well as slowing the transport vertically. Figure 7 shows the VC plume in cross-section and vertical well distribution. The amount of aerobic degradation of VC at these locations may be less than the amount being physically transported from previously higher concentrated areas located above and upgradient of those zones as well as what is desorbing from clayey zones. As shown in Figure 8, trends of parent and daughter VOCs at wells DOB 11 (source), DOL 2 (near source), and DOB 15 (intermediately located) show that there has not been much divergence of contaminant trends (increases of degradation products compared to parent products), which indicates that reductive dechlorination is no longer a significant process.

Contaminant levels in wells downgradient of well cluster DOB 15 (wells DOB 19 and DOB 19A) display decreasing trends (Figure 9). Previous groundwater modeling performed in 2007 indicated that an increase in VC could have occurred around 2016; however, the trends shown at well DOB 15 show that an increase in VC has not occurred and contaminant transport has more retardation than modeling indicated. Subsequently, additional modeling work has been planned which will include updating the previous model analysis using more recent data. Additionally, farther downgradient boundary compliance wells (well clusters DOB 20, DOB 21, and DOB 22) and surface water concentrations continue to be below MCLs or remain non-detect; therefore, the DOSB OU GWMZ is performing adequately.

Due to the presence of chlorinated solvents at the site, the potential that 1,4-dioxane could be present in groundwater exists, because it was often added to chlorinated solvents as a stabilizer and corrosion inhibitor. A recommendation came from the Fourth Five-Year Remedy Review Report for SRS OUs with Groundwater Remedies (SRNS-RP-2015-00419, Revision 1, July 2016) to sample for 1,4-dioxane at the DOSB OU. Per the recommendation, all wells at the DOSB OU were sampled for 1,4-dioxane during the second quarters of 2016 and 2017. 1,4-Dioxane was only detected in three of the monitoring wells (DOB 15, DOL 2, and DOB 16). Results from these three wells are shown in Figure 10. 1,4-Dioxane will continue to be sampled at these three wells to collect sufficient trending data. Over the past five years 1,4-dioxane concentrations have been the greatest at DOB 16 with a maximum concentration of 6 μg/L in 2016 and displaying overall decreasing concentrations since. There is currently no MCL for 1,4-dioxane, but the current USEPA tap water regional screening level is 0.46 μg/L. The sampling result from 2022 indicates only one detected value measuring 3.5 μg/L at DOB 16.

VOC Degradation and Field Parameter Measurements

As stated in the *Groundwater Mixing Zone Application for the D-Area Oil Seepage Basin (631-G) (U)* (WSRC-RP-97-422, Revision 1.5, May 2009), reductive dechlorination is not considered a continuous viable process at DOSB. At SRS, groundwater aquifers are normally depleted in natural carbon. However, petroleum hydrocarbons and chlorinated solvents were co-disposed with PCE and TCE at the DOSB (1952-1975), which provided an "optimum" situation for the reductive dechlorination of PCE and TCE in groundwater. Biodegradation of PCE and TCE likely occurred in the vadose zone, but the water table is shallow at the DOSB (2.4 to 6.5 meters [8 to 21 ft] below ground surface). Thus, the pathway to groundwater is relatively short. At the DOSB, past biogeochemical zonation may have included reductive dechlorination zones near the source, followed by oxidative degradation of VC at some point downgradient. Over time and with the source removal/treatment of DOSB (1995-1997), the concentrations of PCE and TCE have significantly declined, as well as the concentrations of the petroleum hydrocarbons themselves.

The co-disposal of petroleum hydrocarbons provided a carbon source for biological degraders, and the presence of degradation products (cDCE and VC) in the plume wells suggest that past biodegradation has effectively degraded the parent compounds. Since the source of the carbon has become depleted, groundwater has reverted to natural aerobic conditions in the existing carbon-poor environment. Overall, data do not show reductive dechlorination as a viable process. However, it is possible that reductive dechlorination is still occurring at the DOSB in discrete zones near the source and in "pockets" along the centerline of the plume. Natural attenuation at the DOSB relies mainly on physical processes (dispersion/dilution), except for possible localized aerobic degradation of VC depending on the availability of carbon.

The 2022 natural attenuation field parameters (pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), and alkalinity) were collected at monitoring wells and are shown in Table 2. For evaluation, trends for pH, ORP, DO, and alkalinity sampled between 2000 and 2006 are compared to the 2022 data and discussed below.

In terms of pH, wells sampled between 2000 and 2006 had values of pH ranging from 3.5 to 7.8; while the 2022 data (Table 2) show pH values ranging from 4.2 to 6.8. The pH of groundwater has an effect on the presence and activity of microbial populations in groundwater. This is especially true for methanogens. Microbes capable of degrading chlorinated aliphatic hydrocarbons and petroleum hydrocarbons generally prefer pH values ranging from 6 to 8; however, the majority of the higher pH levels occur at wells farther downgradient from the VOC plumes.

Data regarding ORP show that wells sampled between 2000 and 2006 had ORP values ranging from -30 to 600 millivolts (mV); while the 2022 data show ORP values ranging from -21 to 435 mV. The ORP of groundwater is an indicator of the relative tendency of a solution to accept or transfer electrons. Redox reactions in groundwater containing organic compounds are usually biologically mediated, and therefore, the ORP of a groundwater system depends upon and influences rates of biodegradation. In addition, ORP is important because some biological processes operate only within a prescribed ORP range. Reductive dechlorination typically occurs at an ORP range of -200 to 50 mV; however, 19 of the 22 groundwater measurements were above this range with the majority of them above 100 mV.

Wells sampled between 2000 and 2006 had DO values ranging from 0 to 8.4 milligrams (mg)/L, while the 2022 data show DO values ranging from 0.89 to 4.8 mg/L. DO is the most thermodynamically favored electron acceptor used by microbes for the biodegradation of organic carbon, whether natural or anthropogenic. Anaerobic bacteria generally cannot function at DO concentrations greater than 0.5 mg/L, hence reductive dechlorination will not occur. DO concentrations decrease during aerobic respiration.

For alkalinity, wells sampled between 2000 and 2006 had values ranging from 0 to 180 mg/L; while the 2022 data show alkalinity values ranging from 0 to 94 mg/L. Eight out of 22 measurements were 0 mg/L. There is a positive correlation between zones of microbial activity and increased alkalinity. Increases in alkalinity result from the dissolution of rock driven by the production of CO_2 produced by the metabolism of microorganisms. Alkalinity is important in the maintenance of groundwater pH because it buffers the groundwater against acids generated during both aerobic and anaerobic biodegradation. However, the biodegradation of organic compounds does not generate enough acid to impact the pH of groundwater.

Conclusion
In summary, the groundwater data presented in the 2022 DOSB OU letter report show that, in general, concentrations of most of the GWMZ constituents continue to show an overall decreasing trend in the DOSB OU wells. The DOSB OU contaminant plume continues to remain below the MZCLs for the plume compliance and near-source "additional" wells and below the MCLs for the boundary compliance wells. In 2022, the DOSB OU boundary compliance wells were non-detect for all GWMZ constituents. 1,4-Dioxane was only detected in one of the three wells sampled in 2022 with a result of 3.5 µg/L at DOB 16.

Field data collected in 2022 indicate that the groundwater conditions do not support reductive dechlorination. Natural attenuation at the DOSB OU relies mainly on physical processes (dispersion/dilution) except for possible aerobic degradation of VC depending on the availability of carbon. Sampling data obtained during 2022 confirms that the existing GWMZ boundaries are adequate and continue to enclose the DOSB OU plumes.

A full CY 2023 data report, including multiple plume maps and time-series trends of contaminant data, will be submitted in July 2024. The planned groundwater modeling analysis for DOSB will also be discussed in the full CY 2023 data report.

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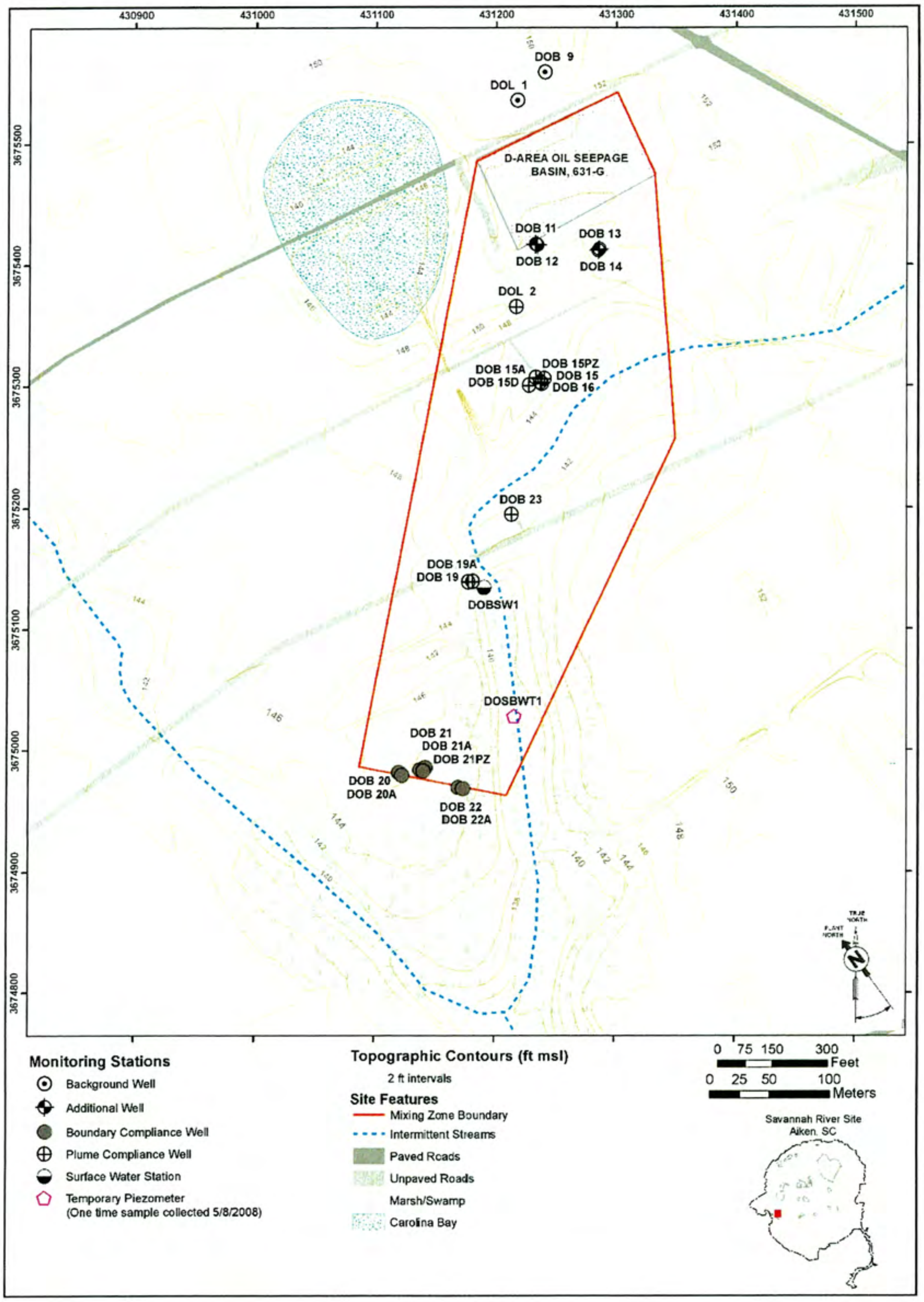

Figure 1. Monitoring Well Network at the DOSB OU

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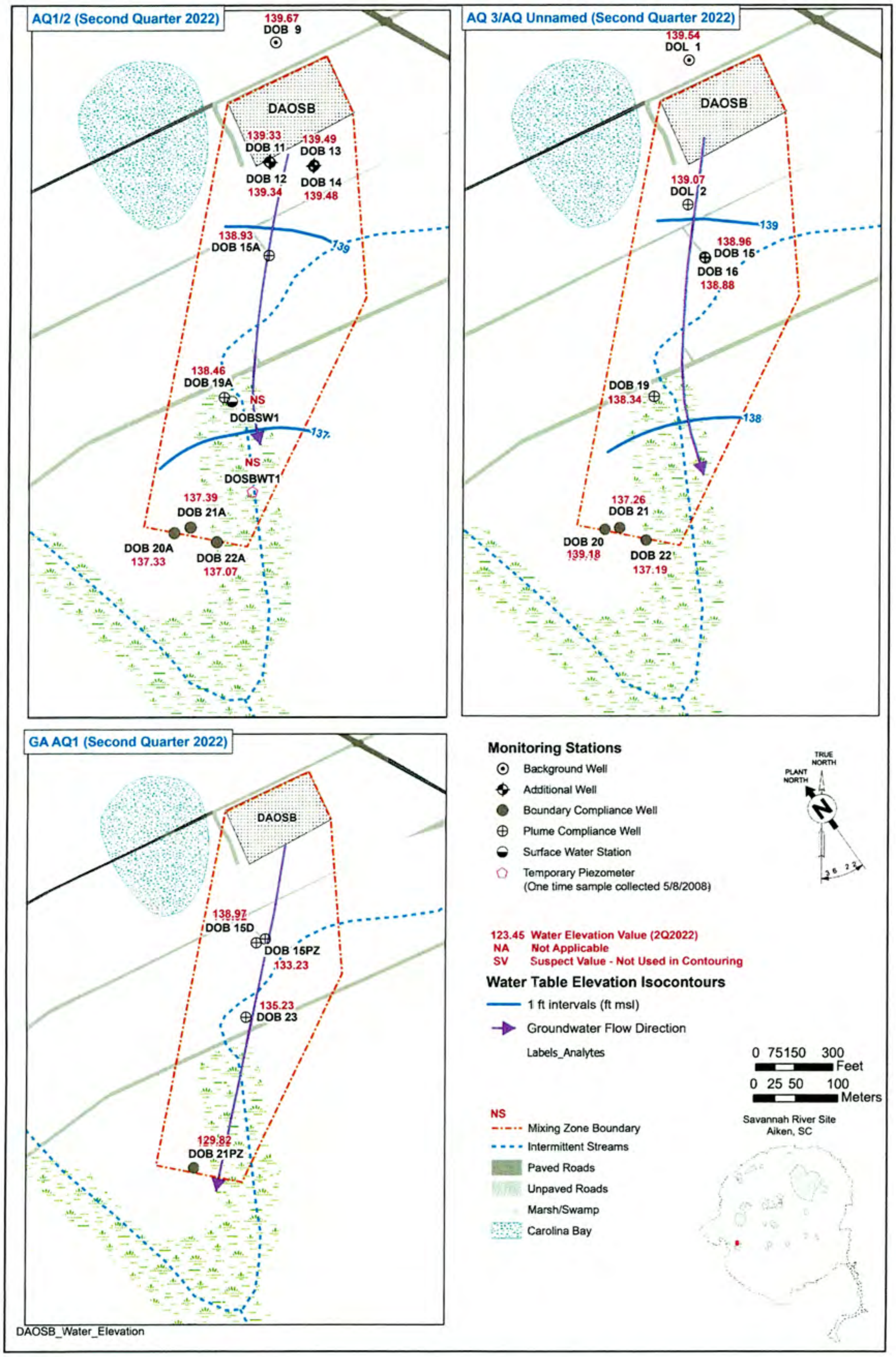

Figure 2. Potentiometric Map of Water Level Elevations at the DOSB OU in 2022

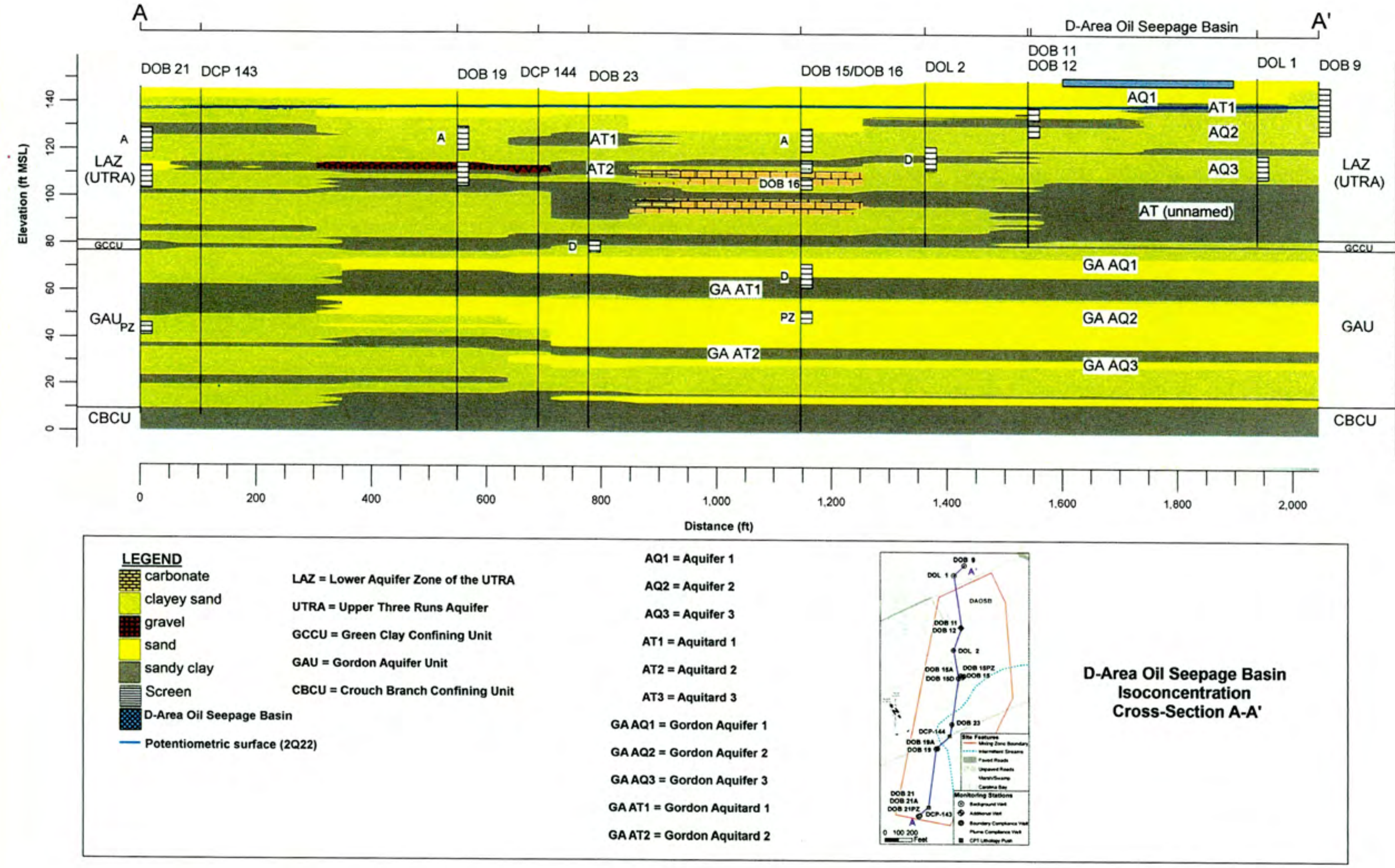

Figure 3. DOSB Conceptual Cross-Section A-A'

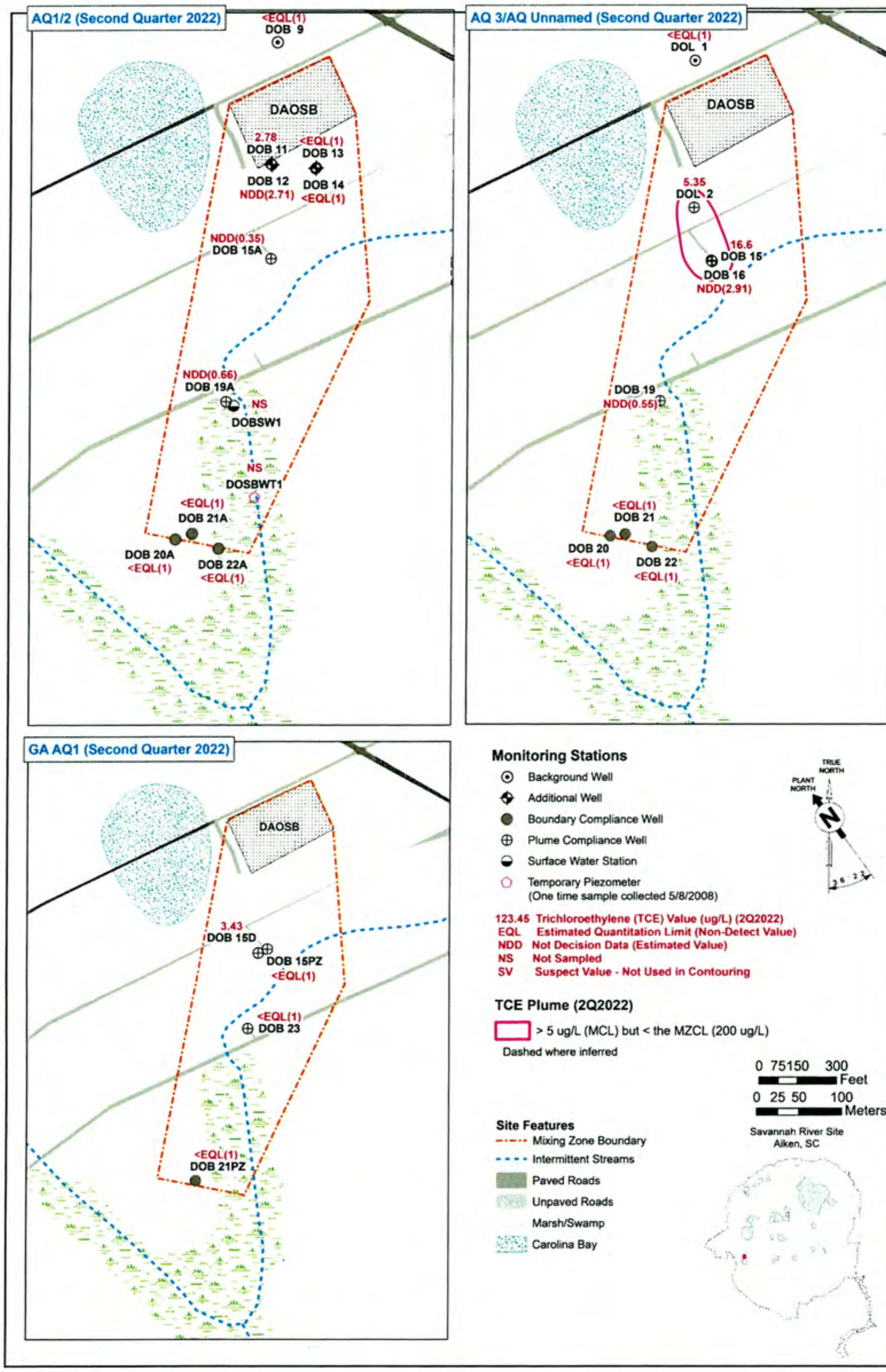

Figure 4. 2022 TCE Plume and Concentrations at the DOSB OU

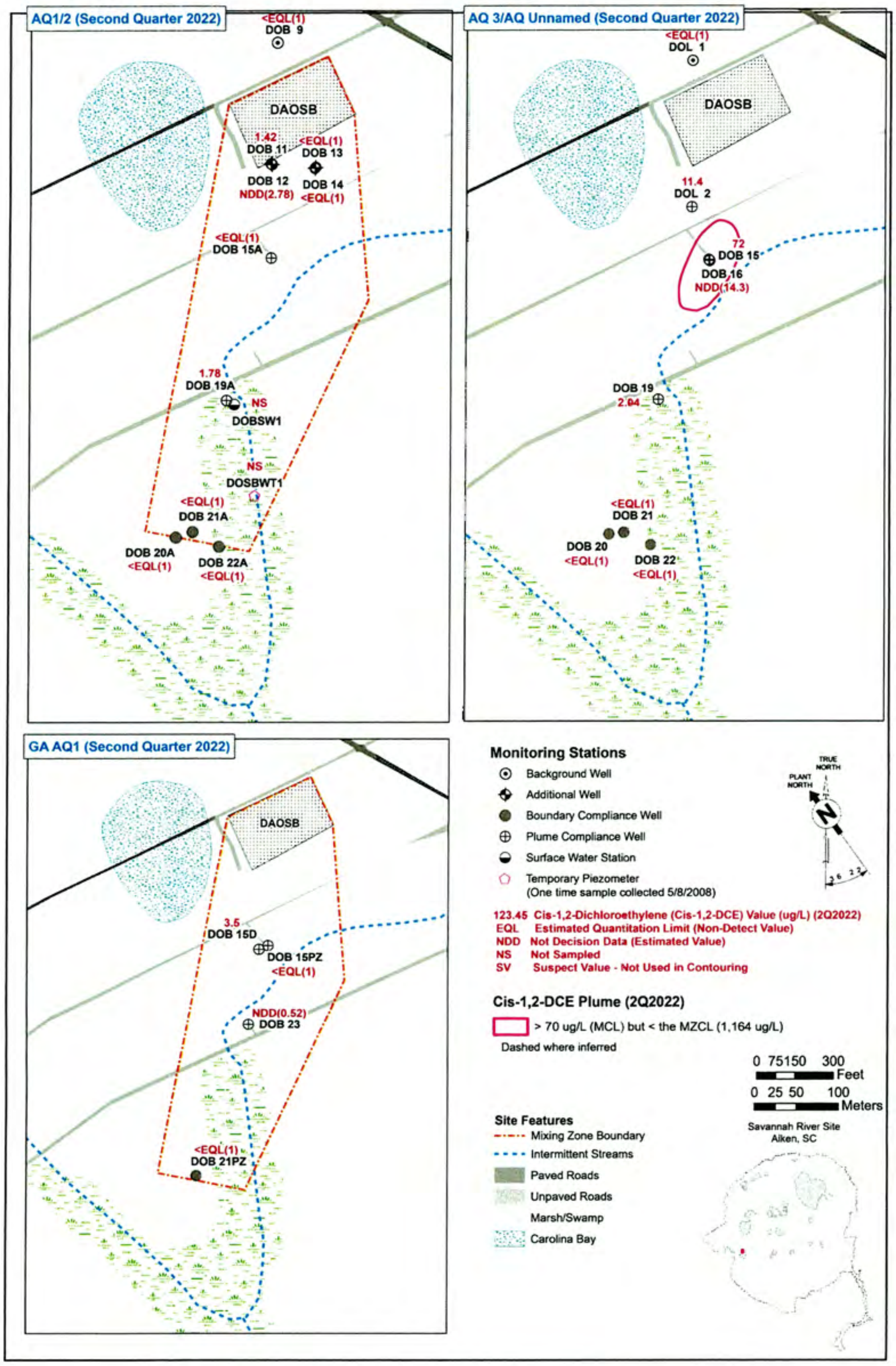

Figure 5. **2022 cDCE Plume and Concentrations at the DOSB OU**

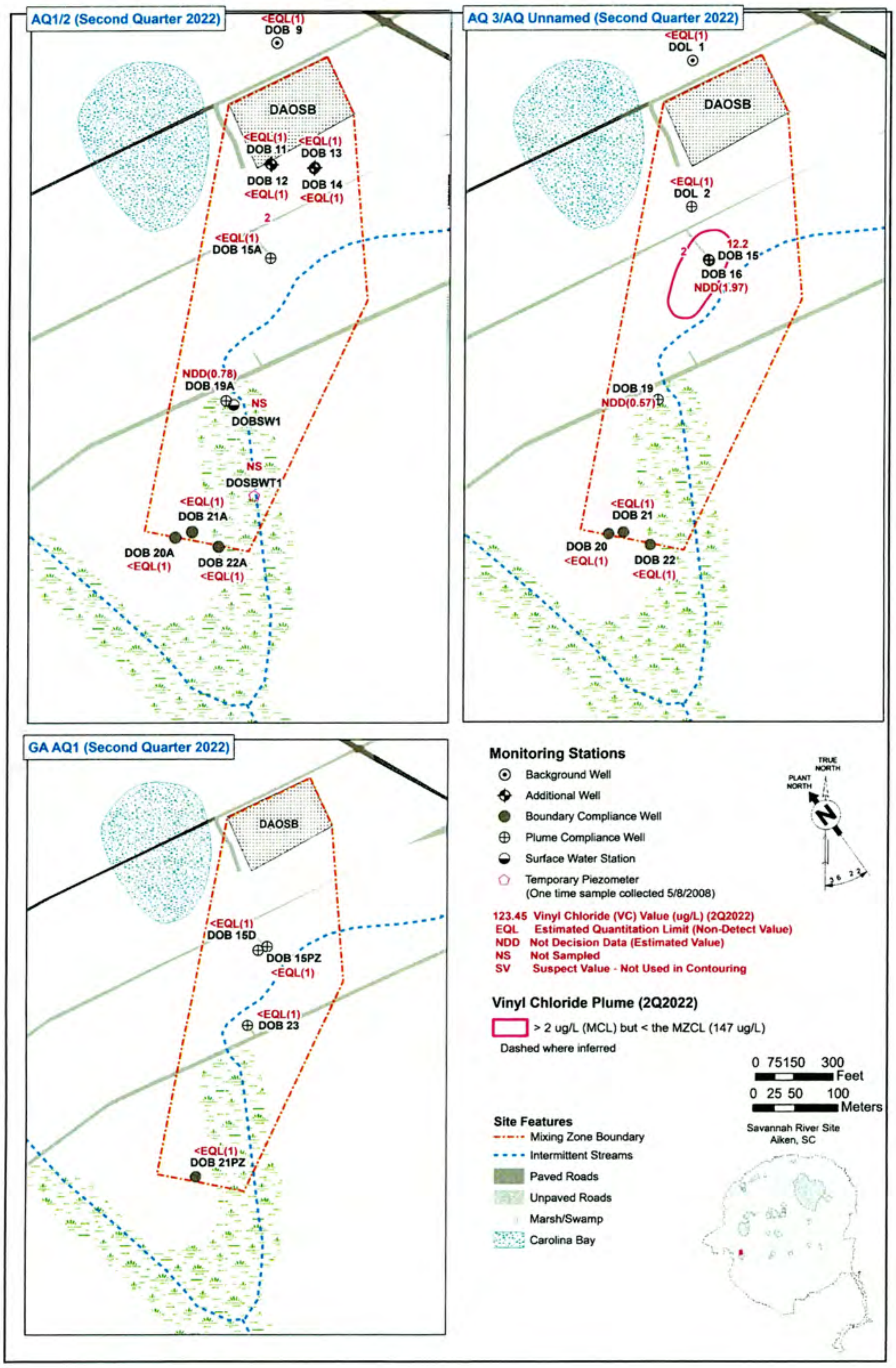

Figure 6. 2022 VC Plume and Concentrations at the DOSB OU

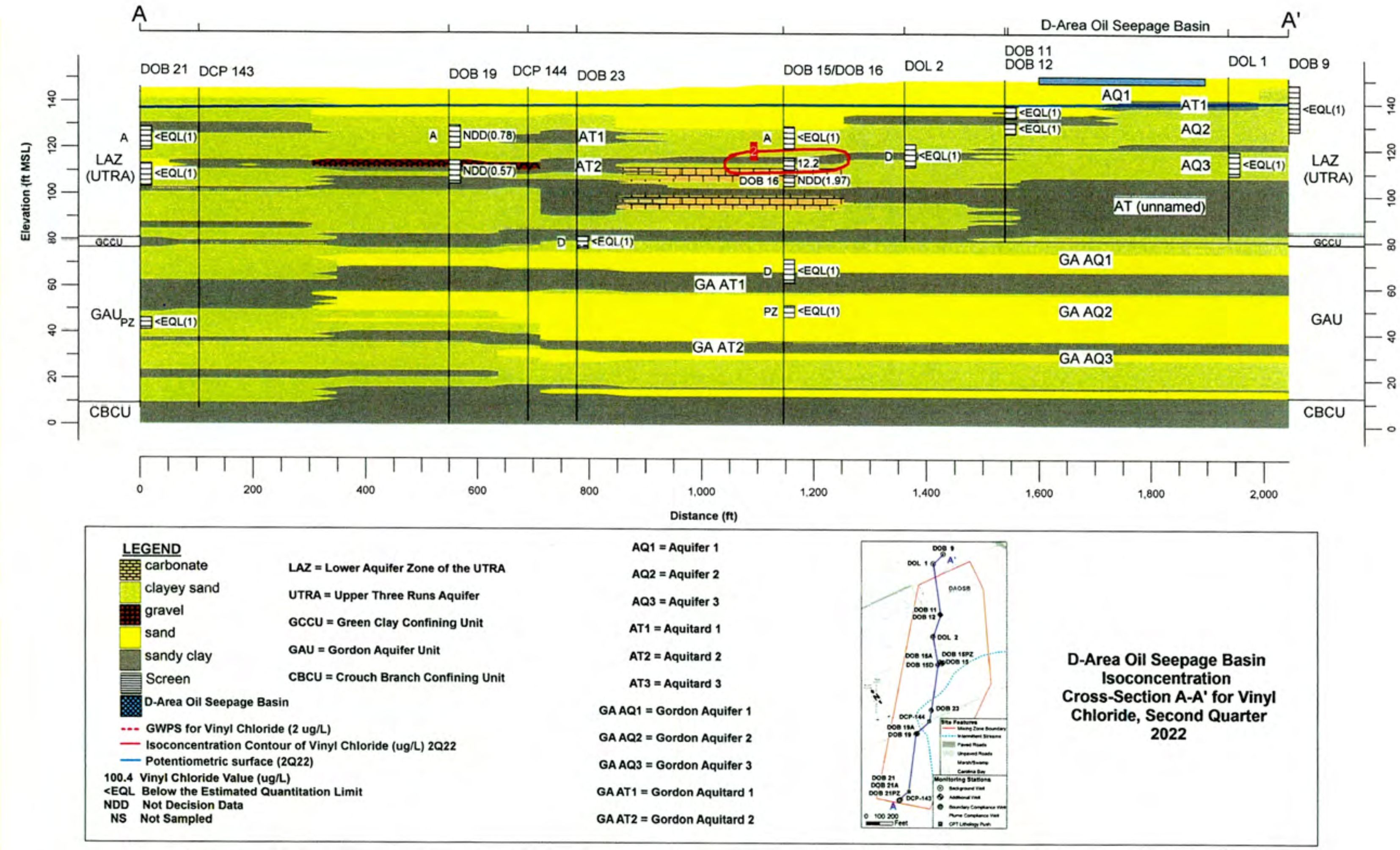

Figure 7. **Cross Section A – A' of the DOSB Area with 2022 VC Plume and Results**

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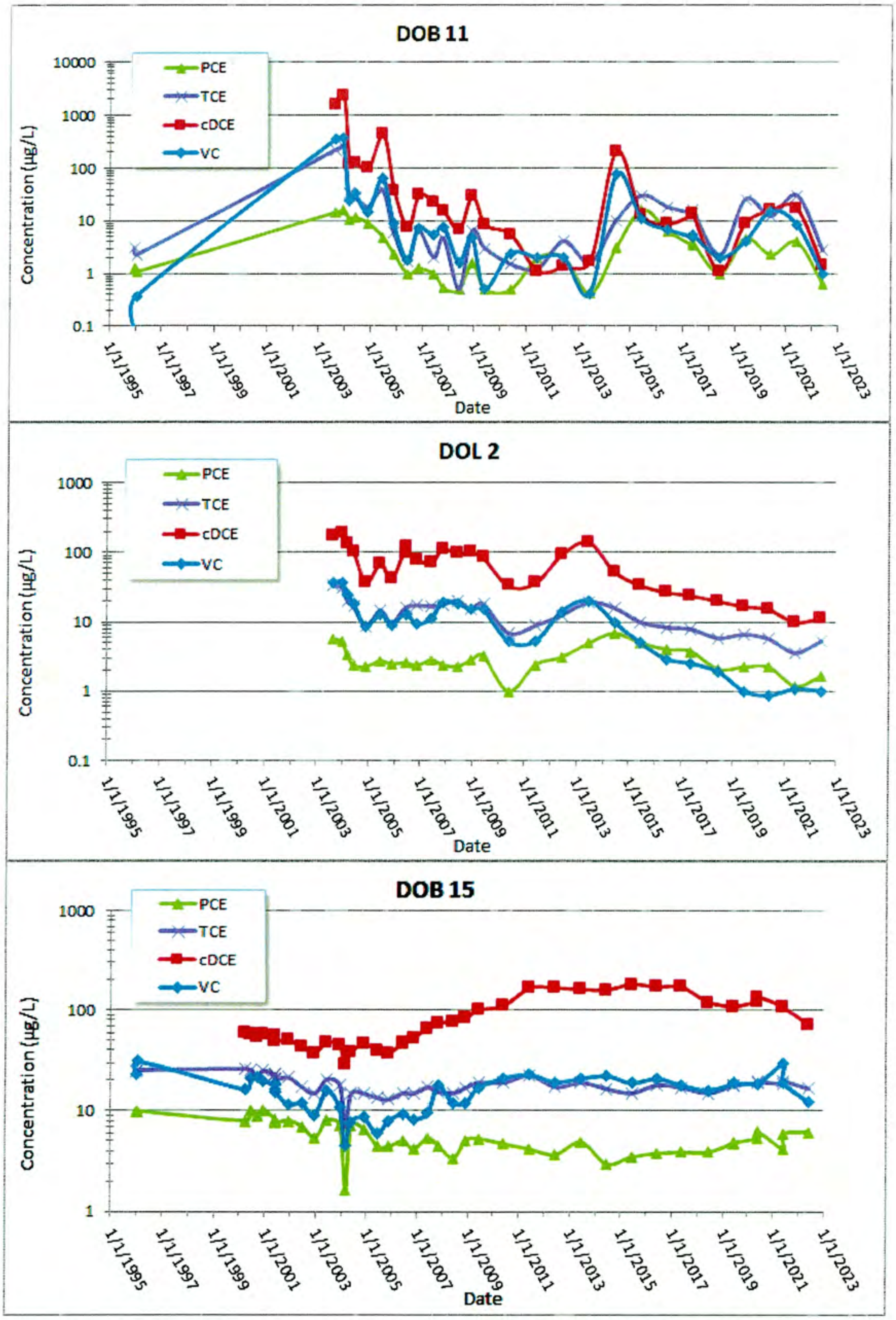
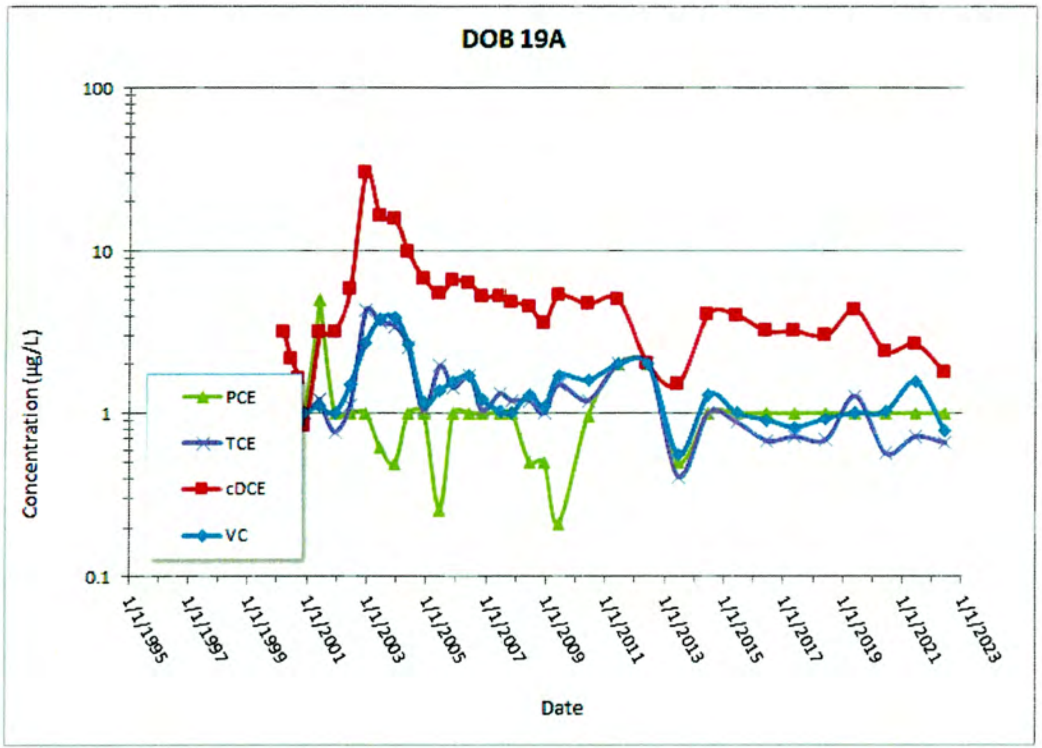


Figure 8. **Time Series Plots of PCE, TCE, cDCE, and VC at Additional Well DOB11 and Plume Compliance Wells DOL 2 and DOB 15 at the DOSB OU**



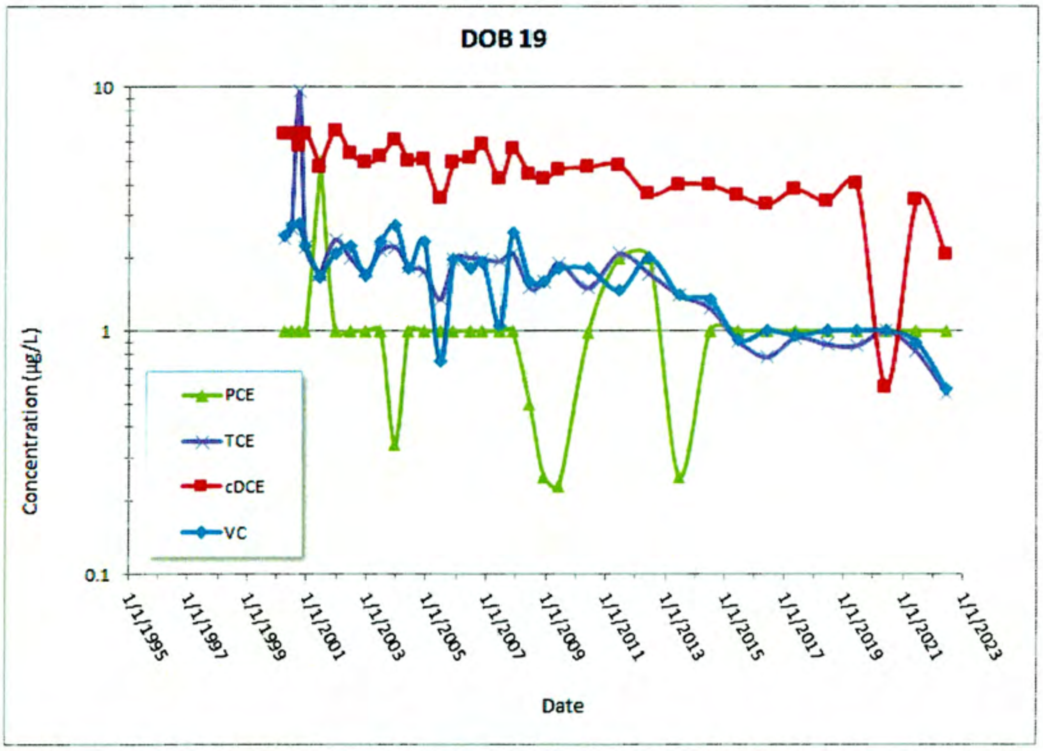


Figure 9. **Time Series Plots of PCE, TCE, cDCE, and VC at Plume Compliance Wells DOB 19A and DOB 19 at the DOSB OU**

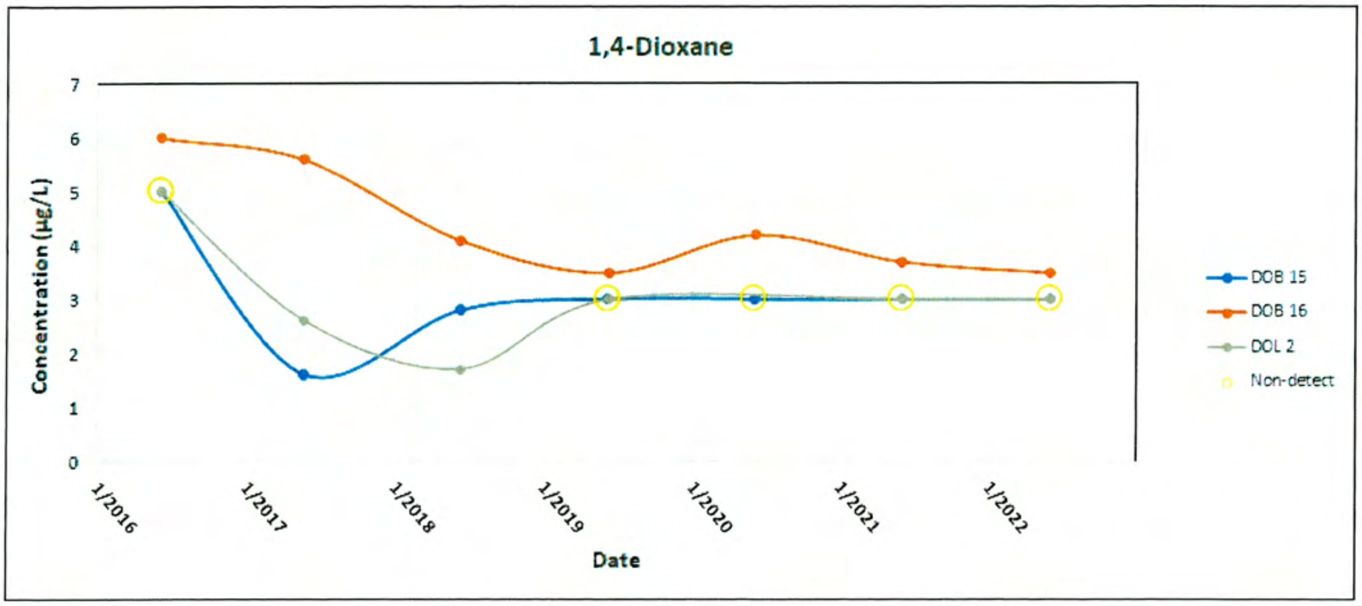


Figure 10. **Time Series Plots of 1,4-Dioxane at Wells DOB 15, DOB 16, and DOL 2 at the DOSB OU**

Table 1. 2022 DOSB OU Groundwater Mixing Zone Monitoring Results

Station	Well Use	Aquifer Zone	Sample Collection Date	Field Comments	TETRACHLOROETHYLENE (PCE)	TRICHLOROETHYLENE (TCE)	1,1-DICHLOROETHYLENE	CIS-1,2-DICHLOROETHYLENE	CHLOROETHENE (VINYL CHLORIDE OR VC)	DICHLOROMETHANE (METHYLENE CHLORIDE)	BENZENE	1,4-DIOXANE
				Constituent								
				Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
			Limit for Plume Compliance and Additional Wells	MZCL	78	200	7	1164	147	5	5	5
			Limit for Background and Boundary Wells	MCL	5	5	7	70	2	5	5	5
DOB 9	Background Well	AQ1/2	07-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOL 1	Background Well	AQ3	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 12	Additional	AQ2	07-Jun-2022	No Comments	[1.49]	[2.71]	<EQL (1)	[2.78]	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 11	Additional	AQ2	07-Jun-2022	No Comments	[0.64]	2.78	<EQL (1)	1.42	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 14	Additional	AQ2	07-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 13	Additional	AQ2	07-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOL 2	Plume Compliance	AQ3	08-Jun-2022	No Comments	1.66	5.35	<EQL (1)	11.4	<EQL (1)	<EQL (5)	<EQL (1)	<EQL (3)
DOB 15A	Plume Compliance	AQ2	08-Jun-2022	No Comments	<EQL (1)	[0.35]	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 15	Plume Compliance	AQ3	08-Jun-2022	No Comments	6.16	16.6	<EQL (1)	72	12.2	<EQL (5)	[0.49]	<EQL (3)
DOB 16	Plume Compliance	AQ_Unnamed	08-Jun-2022	No Comments	[0.75]	[2.91]	<EQL (1)	[14.3]	[1.97]	<EQL (5)	<EQL (1)	3.5
DOB 15D	Plume Compliance	GAU	08-Jun-2022	No Comments	2.39	3.43	<EQL (1)	3.5	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 15PZ	Plume Compliance	GAU	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 23	Plume Compliance	GAU	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	[0.52]	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 19A	Plume Compliance	AQ2	07-Jun-2022	No Comments	<EQL (1)	[0.66]	<EQL (1)	1.78	[0.78]	<EQL (5)	<EQL (1)	NS
DOB 19	Plume Compliance	AQ3	07-Jun-2022	No Comments	<EQL (1)	[0.55]	<EQL (1)	2.04	[0.57]	<EQL (5)	<EQL (1)	NS
DOB 21A	Boundary Compliance	AQ1/2	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 21	Boundary Compliance	AQ3	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 21PZ	Boundary Compliance	GAU	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 20A	Boundary Compliance	AQ1/2	07-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 20	Boundary Compliance	AQ3	07-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 22A	Boundary Compliance	AQ1/2	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOB 22	Boundary Compliance	AQ3	08-Jun-2022	No Comments	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (5)	<EQL (1)	NS
DOBSW1	Surface Water	AQ1/2	NS	Dry	NS	NS	NS	NS	NS	NS	NS	NS

Explanation:
MZCL: Mixing Zone Concentration Limit
MCL: Maximum Contaminant Limit

[##]	EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quanity.
<EQL(##)	Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
	Result exceeds applicable MZCL. (Plume Compliance and Additional Wells only)
	Result exceeds applicable MCL
	Result is less than the applicable limit and without EPA Functional Guidline qualifiers.
NS	Requested to be sampled but was not. See comments as to why not.
	Well clusters are separated by color. Wells are listed in downgradient order and wells within a cluster

Table 2. 2022 DOSB OU Natural Attenuation Field Parameters

			SAMPLE COLLECTION DATE	PH	OXIDATION/REDUCTION POTENTIAL (OR	DISSOLVED OXYGEN (DO)	TOTAL ALKALINITY (AS CaCO3)	SAMPLING EVENT WATER ELEVATION	DEPTH TO WATER	TURBIDITY	VOLUME PURGED	WATER TEMPERATURE	FIELD CONDITIONS
			Unit	pH	mV	mg/L	mg/L	ft	ft	NTU	gal	degC	
Station	**Well Use**	**Aquifer Zone**	**day-month-year**										
DOB 9	Background Well	AQ1/2	07-Jun-2022	5.1	295	3.28	6	139.67	14.46	4.7	3	18.7	No Comments
DOL 1	Background Well	AQ3	08-Jun-2022	5.2	301	2.17	8	139.54	15.21	0.3	10	20.2	No Comments
DOB 12	Additional	AQ2	07-Jun-2022	5	160	2.41	0	139.34	13.41	14.3	3	18.1	No Comments
DOB 11	Additional	AQ2	07-Jun-2022	6.6	20	1.75	94	139.33	12.26	2.2	5	19.3	No Comments
DOB 14	Additional	AQ2	07-Jun-2022	5.2	209	1.15	2	139.48	12.97	7.6	4	18.3	No Comments
DOB 13	Additional	AQ2	07-Jun-2022	5.5	248	2.75	10	139.49	13.11	0.3	4	19.1	No Comments
DOL 2	Plume Compliance	AQ3	08-Jun-2022	4.2	435	1.13	0	139.07	13.93	0.2	8	18.8	No Comments
DOB 15A	Plume Compliance	AQ2	08-Jun-2022	5.8	190	5.82	20	138.93	10.73	0.5	6	18.2	No Comments
DOB 15	Plume Compliance	AQ3	08-Jun-2022	4.6	320	1.17	0	138.96	11.63	0.2	9	18.7	No Comments
DOB 16	Plume Compliance	AQ_Unnamed	08-Jun-2022	6.3	-21	1.69	51	138.88	12.21	1.2	11	20.1	No Comments
DOB 15D	Plume Compliance	GAU	08-Jun-2022	5.1	243	4.98	1	140.02	10.25	0.9	30	19.3	No Comments
DOB 15PZ	Plume Compliance	GAU	08-Jun-2022	4.5	203	4.26	0	133.23	16.45	0.9	29	19	No Comments
DOB 23	Plume Compliance	GAU	08-Jun-2022	5.5	243	4.86	2	135.23	11.24	0.8	20	19.5	No Comments
DOB 19A	Plume Compliance	AQ2	07-Jun-2022	5.9	-20	2.03	11	138.46	8.1	1.8	7	19.6	No Comments
DOB 19	Plume Compliance	AQ3	07-Jun-2022	6	125	0.89	15	138.34	8.62	0.5	13	19.2	No Comments
DOB 21A	Boundary Compliance	AQ1/2	08-Jun-2022	4.8	288	1.98	0	137.39	11.6	1.2	8	18.6	No Comments
DOB 21	Boundary Compliance	AQ3	08-Jun-2022	6.3	91	2.47	45	137.26	11.6	0.7	14	20.2	No Comments
DOB 21PZ	Boundary Compliance	GAU	08-Jun-2022	4.8	202	2.31	0	127.28	21.54	0.5	33	19.4	No Comments
DOB 20A	Boundary Compliance	AQ1/2	07-Jun-2022	4.9	354	2.18	0	137.33	12.3	5.1	8	17.8	No Comments
DOB 20	Boundary Compliance	AQ3	07-Jun-2022	6.8	205	1.97	39	137.18	12.5	1.3	13	18.7	No Comments
DOB 22A	Boundary Compliance	AQ1/2	08-Jun-2022	4.8	259	2.88	0	137.07	10.4	1.1	9	18.8	No Comments
DOB 22	Boundary Compliance	AQ3	08-Jun-2022	6.4	109	1.63	29	137.19	10.54	0.7	12	19.6	No Comments
DOBSW1	Surface Water	AQ1/2	08-Jun-2022	NS	NS	NS	NS	NS	NS	NS	0	NS	Dry

Explanation:
mV: millivolt
mg/L: milligrams per liter
ft: feet
gal: gallons
degC: degrees Celcius
pH: pondus Hydrogenium; negative log of the activity of [H]+ ions
NTU: Nephelometric Turbidity Unit
CaCO3: Calcium Carbonate

Optimum Range for Reductive Declorination
pH: 6 to 8
ORP: -200 to 50 mV
DO: less than 0.5 mg/L
Alkalinity: greater than 0 mg/L as CaCO3

(green)	Measurement is within range for VOC degradation process
Blue Text	Not a required analysis
(gray)	Well clusters are separated by color. Wells are listed in downgradient order and wells within a cluster