



# PANTEX QUARTERLY PROGRESS REPORT

## Remedial Action Progress

### 2nd Quarter 2022

In support of Hazardous Waste Permit #50284 and  
Pantex Plant Interagency Agreement  
September 2022

Pantex Plant  
FM 2373 and U.S. Highway 60  
P.O. Box 30030  
Amarillo, TX 79120

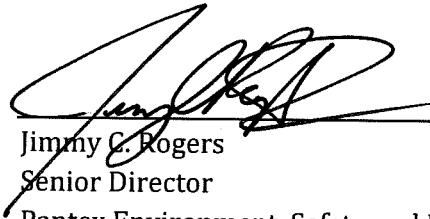




CERTIFICATION STATEMENT

2nd Quarter 2022 Remedial Action Progress Report  
Pantex Plant, September 2022

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Jimmy C. Rogers  
Senior Director

09/16/2022  
Date

Pantex Environment, Safety and Health  
Consolidated Nuclear Security, LLC

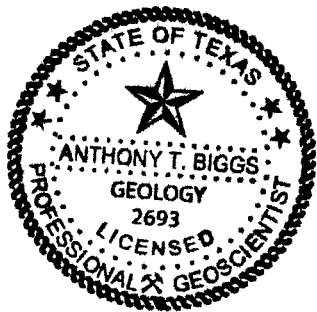


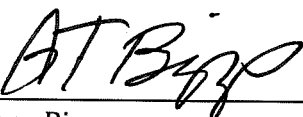


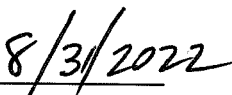
**Remedial Action Progress Report  
2nd Quarter 2022  
in Support of Hazardous Waste Permit #50284  
and Pantex Plant Interagency Agreement  
for the Pantex Plant, Amarillo, Texas  
September 2022**

Prepared by  
Consolidated Nuclear Security, LLC  
Management and Operating Contractor  
for the  
Pantex Plant and Y-12 National Security Complex  
under Contract No. DE-NA0001942  
with the  
U.S. Department of Energy  
National Nuclear Security Administration

In accordance with 30 TAC §335.553 (g), this report has been prepared and sealed by an appropriately qualified licensed professional engineer or licensed professional geoscientist.



  
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Environmental Projects  
Consolidated Nuclear Security, LLC

  
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Date

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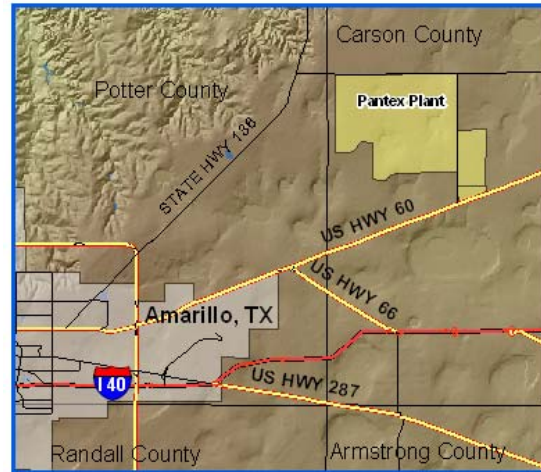
## LIST OF ACRONYMS

µg/L	micrograms per liter
CatOX	catalytic oxidation
COC	contaminant of concern
CP	Compliance Plan
Cr(VI)	hexavalent chromium
DCE	dichloroethene
DNT4A	4-amino-2,6-dinitrotoluene
EVO	emulsified vegetable oil
FGZ	fine-grained zone
GWPS	groundwater protection standard
HE	high explosive
ISB	<i>In Situ</i> bioremediation
ISPM	<i>In Situ</i> performance monitoring
lbs	Pounds
Mgal	million gallons
mV	millivolts
NAPL	non-aqueous phase liquid
ORP	oxidation-reduction potential
P1PTS	Playa 1 Pump and Treat System
PID	photoionization detector
ppmv	parts per million by volume
PQL	practical quantitation limit
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
SAP	Sampling and Analysis Plan
Scfm	standard cubic feet per minute
SEPTS	Southeast Pump and Treat System
SVE	soil vapor extraction
TAC	Texas Administrative Code
TCE	Trichloroethene
TZM	treatment zone monitoring
VOC	volatile organic compound
WWTF	wastewater treatment facility



## INTRODUCTION

The Pantex Plant, located in the Texas Panhandle 17 miles northeast of Amarillo, has implemented a response action to remediate perched groundwater and soils. Two types of systems have been installed for the groundwater response action: pump and treat systems in two areas and *In Situ* bioremediation (ISB) systems in four areas. A soil vapor extraction (SVE) system has been installed to remediate volatile organic compounds (VOCs) in soils at the Burning Ground area. This quarterly report addresses progress achieved through implementation of the remedial actions for 2nd Quarter of 2022.



This report provides an intermediate data summary for response action systems throughout the year. More intensive data reporting is included in the annual progress reports. The quarterly progress reports address three of the five evaluations included in the annual progress reports: response action effectiveness, uncertainty management, and early detection. The reports provide required information from Hazardous Waste Permit #50284 CP Table VII and the Pantex Interagency Agreement.

Maps of the plumes, remedial action systems, sampling locations, and system wells are provided in Appendix A. Graphs of operation and flow rates for the pump and treat systems are provided in Appendix B. Graphs of important parameters for the ISB treatment zone and downgradient wells are provided in Appendix C.

## RESPONSE ACTION EFFECTIVENESS

This quarterly progress report focuses on specific criteria for the pump and treat systems, ISB systems, and a small-scale SVE system. System operation, mass removal, and evaluation of effluent in reference to established operational goals are reported for the pump and treat systems. For the ISB systems, this report evaluates geochemical conditions and availability of food source in the treatment zone and reduction of concentrations of contaminants of concern (COCs) in downgradient performance monitoring wells to evaluate whether the treatment zone is working effectively. System operation, mass removal, and effluent photoionization detector (PID) readings are evaluated for the SVE system.

## PUMP AND TREAT SYSTEMS

The groundwater remedial action at the Pantex Plant includes two pump and treat systems: Southeast Pump and Treat System (SEPTS) and Playa 1 Pump and Treat System (P1PTS). The pump and treat systems are designed to extract water and remove contaminant mass from the water before the effluent is beneficially used by the wastewater treatment facility (WWTF) and irrigation system, for general Plant needs, or for amendment injections at the ISB systems. The systems were also designed to remove water from the perched aquifer to reduce saturated thickness. This reduction in saturated thickness reduces migration of contaminants both vertically and horizontally so that natural breakdown processes can occur over time. Reducing migration provides protection for the underlying High Plains Aquifer (also known as and referred to herein as the Ogallala Aquifer). SEPTS has the capability to inject the treated water back into the perched aquifer when beneficial use is not possible. Operational priorities for the pump and treat systems emphasize beneficial use of water.

<b>Pump and Treat System 2nd Quarter 2022 Operation</b>	
<b><i>Playa 1 Pump and Treat System (P1PTS)</i></b>	
Days Operated	10
% Operation Time	11%
Volume Water Treated (Mgal)	2.2
HE Mass Removal (lbs)	0.5
Beneficial Use of Water	0%
<b><i>Southeast Pump and Treat System (SEPTS)</i></b>	
Days Operated	91
% Operation Time	99%
Volume Water Treated (Mgal)	32.6
HE Mass Removal (lbs)	102.7
Chromium Mass Removal (lbs)	11.5
Beneficial Use of Water	7.7%
*Value below operational goals	

The subsurface drip irrigation system filter bank break that occurred in late June 2017 continued to impact operations of SEPTS and P1PTS during the 2nd Quarter of 2022. Due to the severity of the break, an engineering evaluation, contracting, and major repairs were required to restore the irrigation system. Repairs to the filter bank were completed in May 2019 and after completion of startup testing and repairs on the communication systems, a portion of the system became operational in March 2022. However, in April 2022, the communication interface on the system failed. System repairs are in progress and the system is expected to be operational again in September 2022. Meanwhile, Pantex continues to release all WWTF water to Playa 1 as approved in the Texas Commission of Environmental Quality wastewater permit (WQ0002296000).

Current and future operations of both pump and treat systems will be impaired by the permit-restricted flow to Playa 1 until the irrigation system is operational. The SEPTS system has operated at a higher capacity using injection, release to Playa 1, and scheduled shutdowns of P1PTS. Pantex continues to run P1PTS one week per quarter in the 2022 calendar year based on technical evaluations of Pantex’s current overall system requirements. Reduction of operational time at P1PTS allows SEPTS to operate at a greater capacity and support capture of water along the FM 2373 fence line, at wells east of FM 2373, and at the highest plume concentrations to the south on

Texas Tech property. When P1PTS is operational, SEPTS is operated at a lower capacity to meet permit requirements.

Graphs of monthly operation and throughput are included in Appendix B. Almost 90% of the treated water was released to Playa 1. Both systems treated about 35 million gallons (Mgal) during the 2nd quarter. P1PTS primarily treats RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), and SEPTS primarily treats RDX and hexavalent chromium [Cr(VI)]. Figures 1 and 2 provide mass removal information for RDX and other high explosives (HEs) and Cr(VI) for the 2nd quarter, as well as totals since system startup. Concentrations near Playa 1 are much lower due to declining source

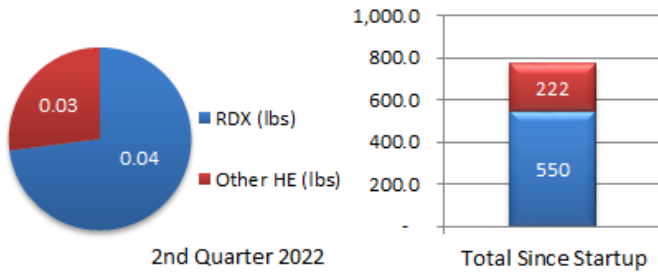


Figure 1. P1PTS Mass Removal

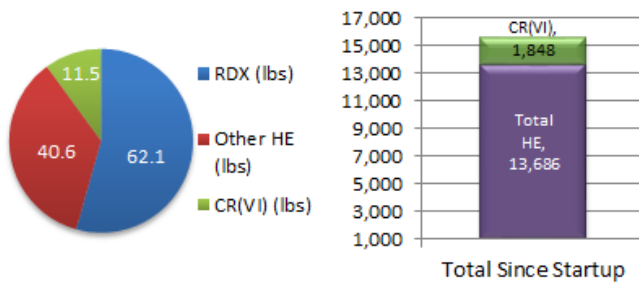


Figure 2. SEPTS Mass Removal

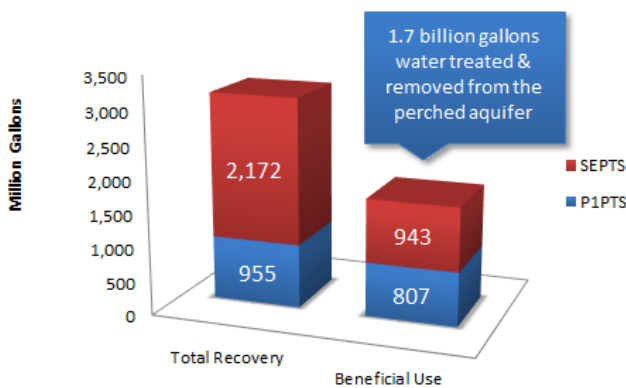


Figure 3. System Recovery and Use

concentrations resulting in reduction of mass removal at P1PTS. Overall, the systems have removed over 16,300 pounds (lbs) of high explosives (HEs) and chromium contaminants from perched groundwater since operations began.

The total recovery and treatment from both systems since startup has been calculated at about 3.1 billion gallons. Because SEPTS was originally designed to inject treated water, all of the treated water prior to 2005 was injected. However, a significant volume of treated water has been used beneficially since 2005, with a total of over 1.7 billion gallons of treated water beneficially used since startup of the irrigation system. The recovery and beneficial use totals are presented in Figure 3.

P1PTS was operated during the month of April in order to send supplemental water to the subsurface irrigation system. Though most of P1PTS flow was beneficially reused for this quarter, we do not include these values in the beneficial use reporting due to the normal variability of the flow release.

Currently, the systems are releasing water to the WWTF and then to Playa 1 or directly to injection wells, so a majority of the treated water is not currently beneficially used. Evaluation of effluent data from SEPTS indicates that all COCs were treated to levels below the groundwater protection standard (GWPS).

Pantex is currently installing an irrigation alternative on the property east of FM 2373 to provide additional long-term use of the treatment system water. Funding was requested in fiscal year 2021 to design and construct infrastructure for irrigation of land east of FM 2373 using five center pivot sprinklers. The design of the new irrigation system was completed in May 2021 and a new construction contract was awarded in August 2021. Construction on the system began in November 2021 and is expected to be operational by the end of 2022. The first irrigated crops are expected to be planted for the summer 2023 growing season.

Pantex also identified funding to design and construct three new perched injection wells to the east of Playa 2; northwest of the Zone 11 ISB System. Construction of the injection wells and infrastructure was completed in February 2022 and operation of the system will begin in early 2023. The Playa 2 injection wells will provide a consistent outlet for a portion of the treated water when irrigation is not an available method for beneficial use of the treated water. These wells will also provide a method to inject the treated water without affecting movement and capture of plumes in the southeast area.

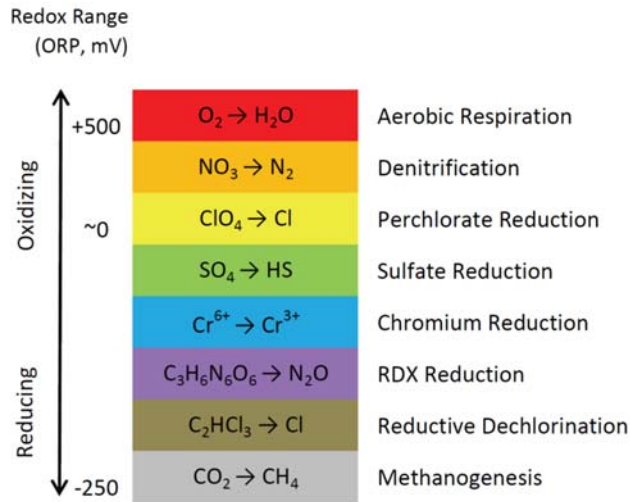
Perchlorate was detected in two SEPTS extraction wells starting in 2017, with concentrations increasing since the first detection. Perchlorate has been identified in two additional extraction wells in 2021. Pantex has contracted to expand the SEPTS with a perchlorate pre-treatment for wells in the southwestern part of the system. The design portion of the contract started in August 2021 and was completed in February 2022. Construction is will be finished in August 2022. The four impacted extraction wells have been shut down until the perchlorate pre-treatment system is operational.

## ISB SYSTEMS

Four ISB systems (Zone 11 ISB, Southeast ISB, Southeast ISB Extension, and Offsite ISB) are installed and operating at Pantex during the 2nd Quarter of 2022. The systems are designed with closely spaced wells to set up a treatment zone in areas of the perched groundwater where pump and treat may not be as effective, or where the area is sensitive to vertical migration of COCs to the Ogallala Aquifer. Amendment is injected into these systems to establish treatment zones where COCs are degraded. Monitoring wells are installed downgradient of the treatment zone to monitor whether the system is effectively degrading the COCs (see maps in Appendix A). The primary COCs at the Zone 11 ISB are trichloroethene (TCE) and perchlorate. The primary COCs at the Southeast ISB are RDX and Cr(VI). The primary COC at the Southeast ISB Extension and the Offsite ISB is RDX.

The following section provides an understanding of the expected conditions at the ISB systems and downgradient concentrations of COCs. For the treatment zone wells, this report evaluates whether the conditions are present, including oxidation reduction (i.e. redox) potential (ORP) and the





reduction of electron acceptors (i.e. sulfate, dissolved oxygen and nitrate), to degrade the COCs in each area. The presence of gases, such as methane, can also be an indication of deeper reducing conditions. The presence of a continued food source (total organic carbon) for the microbial reduction of COCs is also evaluated. Strong reducing conditions (ORP below  $-50$  millivolts (mV) to reduce RDX and TCE and near  $0$  mV to reduce hexavalent chromium and perchlorate) are required to adequately reduce COCs. Figure 3-32 presents the redox ranges for the reduction of various COCs. Dissolved gases, redox potential, nitrate,

and TOC are evaluated in the ISB treatment zone performance wells to determine if the treatment zone is rebounding to baseline conditions, thus requiring amendment injection. At this time, sulfate is not used as an indicator of reducing conditions, due to potential addition of high level of sulfates in the treatment zone from molasses used during injections. Pantex is investigating this issue.

Downgradient monitoring wells are evaluated to determine if the ISB systems are effective in degrading the COCs and any breakdown products of the COCs. Graphs of data from sampled treatment zone wells and downgradient *In Situ* performance monitoring (ISPM) wells are included in Appendix C with the exception of the Offsite ISB wells, which were excluded due to limits in data. Graphs in Appendix C represent all data points since the start of remedial action for each system.

### ISB INJECTION ACTIVITIES

Sampling of the ISB systems has been reduced to a semi-annual frequency. As a system's data is not always available for quarterly evaluation, only new and complete data sets will be assessed during the current quarter. Other systems will be evaluated during the following quarter, if sampled. In the 2nd quarter, the Zone 11 ISB system was sampled completely. Scheduled sampling for the Offsite ISB system was interrupted during the 1st quarter due to an electrical outage that caused the shutdown of two of the extraction wells with required sampling. The two wells were repaired in the 2nd quarter and those results, along with the results from the other Offsite ISB wells sampled in the 1st quarter, are summarized in this report.

Table 1 summarizes the injection activities for 2022. Well maintenance activities were performed in April and May at the Southeast ISB Extension and Zone 11 ISB systems for injection events that are currently ongoing. Injections were completed at the Offsite ISB system in the 2nd quarter of 2022. Future injections are scheduled for the Offsite ISB starting in September 2022.

Table 1. ISB Systems Activities

Month (2022)	SE ISB EXT	SE ISB	Z11 ISB	Offsite ISB <sup>1</sup>
January		Sample		
February	Sample			Sample (Interrupted) /Injection
March		Injection		Injection
April		Injection	Sample	Injection
May	Maintenance		Maintenance	Injection
June	Maintenance		Injection	Sample (Finished)/Injection
July			Injection	
August	Injection		Injection	Maintenance
September	Injection	Sample	Injection	Sample/Injection
October				Injection
November	Sample		Sample	Injection
December				

<sup>1</sup> All scheduled wells in the Offsite ISB are extraction (REC) wells and not injected; therefore, injection will not affect the sampling of the monitored wells. REC wells must be sampled during injection events when wells are operating to support injection.

SE ISB EXT = Southeast ISB Extension

SE ISB = Southeast ISB

Z11 ISB = Zone 11 ISB

### ZONE 11 REMEDIAL EFFECTIVENESS

Installation of the Zone 11 ISB remedial action was completed in 2009, and an expansion to the northwest of PTX06-ISB083 was completed in early 2015 and 2019 (see Appendix A maps). Another expansion was completed in late 2021 to address the southeast moving plume. Thirteen injection events have been completed at the current system, with the first injection event occurring in the expansion zone in 2015. The 14th injection event for the Zone 11 ISB system is currently ongoing and expected to be completed in October 2022. Pantex has moved to the use of a more soluble carbon source, molasses, as studies conducted at the Zone 11 ISB in 2018 indicated that molasses distributed between injection wells at a much higher concentration than emulsified vegetable oil (EVO). More frequent injections are required for molasses and have been planned annually for the Zone 11 ISB to maintain reducing conditions. Pantex will continue to evaluate the system to ensure appropriate timing of injections with the molasses.

The Zone 11 ISB has a well-established treatment zone in the original portion of the system, where injection has occurred since 2009. Portions of the northwest expansion area have received more than four injections, so deeper reducing conditions are likely established at the injection wells. Seven injected wells, seven treatment zone monitoring (TZM) wells, nine downgradient ISPM, and two inactive injection wells were sampled in the Zone 11 ISB system in the 2nd quarter.

Reduction of nitrate and the measured oxidation-reduction potential (ORP) indicate whether conditions across the treatment zone are present for reductive dechlorination. The presences of gases, such as methane, can also be an indication of deeper reducing conditions. Evaluation of data

in the treatment zone indicates very mild to strong reducing conditions, with oxidation-reduction potential (ORP) ranging from 66 to -132 mV across the Zone 11 ISB. Monitored conditions inside the treatment zone indicate nitrate was reduced at all fourteen wells and negative ORP was measured in half of the treatment zone wells, indicating deeper reducing conditions in most areas. Soluble metals (arsenic and manganese) increased, indicating that reducing conditions are being established. Methane was also measured in all treatment zone wells indicating deeper reducing conditions across the treatment zone. Conditions improved at most of the non-injected wells in the northwest expansion area, following the molasses injections that began in 2018. TCE continues to be reduced to cis-1,2-dichloroethene (DCE), with TCE concentrations below GWPS in ten monitored wells inside of the treatment zone and cis-1,2-DCE present at concentrations below the GWPS in twelve of the fourteen monitored wells. When greater amounts of TCE and cis-1,2-DCE are being degraded, ethene and vinyl chloride are expected to be detected. Vinyl chloride was detected in five sampled wells inside the treatment zone, but ethene was only detected in one well. These results could indicate that a portion of the TCE is being completely degraded in some areas of the treatment zone, while other areas have milder reducing conditions. Perchlorate was reduced in all wells, except one (PTX06-1164) across the treatment zone.

Pantex evaluates performance at nine downgradient ISPM wells for the Zone 11 ISB and two former ISB injection wells (PTX06-ISB079 and PTX06-ISB082). Eight of nine ISPM wells exhibit perchlorate concentrations below the GWPS in the 2nd quarter. TCE concentrations are at or below the GWPS in four of nine ISPM wells. The first breakdown product of TCE, cis-1,2-DCE, was below the GWPS in eight of nine downgradient wells. Data indicate that due to treatment, concentrations of TCE and its breakdown products are very close to meeting the GWPS. Two downgradient wells, PTX06-1149 and PTX06-1150, historically did not demonstrate strong treatment. These wells were downgradient of a single row of injection wells. In lieu of installing a recirculation system in 2021, Pantex drilled a second row of closely spaced wells across the southern portion of the ISB to address higher concentrations of TCE moving into those areas. Wells that can no longer be injected were infilled with new wells, rather than replacing the old wells, so that injections can be more closely spaced. Current data at downgradient wells demonstrates that stronger treatment is beginning to occur.

PTX06-ISB079 and PTX06-ISB082 are now monitored to evaluate perchlorate conditions on the eastern side of the ISB, in the second row of injection wells. Pantex no longer injects into these second row of wells, and will evaluate these wells to ensure that treatment continues on the perchlorate side of the ISB. Perchlorate, TCE, and TCE degradation products were not detected in PTX06-ISB079 and PTX06-ISB082.

### *OFFSITE REMEDIAL EFFECTIVENESS*

The installation of the first phase of wells for the Offsite ISB system was completed in 2020. The first phase of the installation focused on treatment at the leading edge of the plume. Infrastructure to support an injection event was completed in June 2021, with first injection of molasses completed in October 2021. Based on the use of molasses, injections are planned every six months

at differing parts of the system. Injection plans will follow the schedule that was designed using fate and transport and optimization modeling.

All water used in the injection process must be withdrawn from the offsite property, so downgradient ISB extraction wells were installed. These wells were installed at the very edge of the plume and assist in pulling the amendment towards the removal wells, providing an expanded zone for COC treatment. Four ISB extraction wells (labeled REC wells due to the recirculation they provide) were sampled in the 1st and 2nd quarter 2022. Evaluation of the baseline data from 2021 at these wells, indicated very mild reducing conditions with ORP ranging from 281 to 19 mV. As of the 2nd quarter 2022, reducing conditions improved and ORP ranged from 86.7 to -22.3 mV. Total organic carbon was not present at a high concentration in three of the wells, but one well (PTX06-RECE401A) demonstrated arrival of treated water.

One Southeast Extension ISPM well will be converted to an Offsite System injection well in the near future to better treat a neighboring property, where a small portion of the plume occurs. Further details about this well and decision will be discussed in the *2022 3rd Quarter Progress Report*.

## BURNING GROUND SVE

The Burning Ground SVE system began operation in 2002 as a large-scale catalytic oxidizer (CatOX) system. Due to a large reduction in VOC concentrations, a small CatOX system has been operating at the Burning Ground SVE system since April 2012. This small-scale system focused on treating residual non-aqueous phase liquid (NAPL) and soil gas at a single extraction well (SVE-S-20) near the source area.

The system did not operate the 2nd Quarter of 2022. The SVE was shut down in October 2021 as part of the pulsing plan for path to closure of the system. The system was restarted in January 2022, but underwent an intermittent shutdown at the end of January, due to freezing conditions. The system was restarted on February 7<sup>th</sup> and ran until March 7<sup>th</sup>, when an unexpected failure of the catalytic oxidizer occurred, shutting down the system until further notice. The system is expected to be repaired and operational by fall 2022. A more detailed discussion of the pulsing plan and path to closure is included in the *2021 Annual Progress Report*.

## UNCERTAINTY MANAGEMENT AND EARLY DETECTION

Uncertainty management and early detection wells are evaluated to determine if there are unexpected conditions in areas where previous groundwater contamination has not been detected or confirmed (Ogallala and perched aquifers), or in previous plume locations where concentrations have fallen below GWPS, background, and the practical quantitation limit (PQL) (e.g., perched wells at the Burning Ground and Old Sewage Treatment Plant areas). Indicator COCs are evaluated at the uncertainty management/early detection wells in the quarterly report. A map depicting the wells evaluated is included in Appendix A.

Review of the uncertainty management/early detection data collected during the 2nd quarter indicates no unexpected conditions at any wells in the perched or Ogallala Aquifers.

As of May 2020, Pantex went back to semi-annual sampling for PTX06-1056 as approved by regulatory agencies. The 1st quarter (February 2022) result detected DNT4A at 1.1 ug/L, just below the GWPS of 1.2 ug/L. As a result, Pantex performed a high volume purge, time-series sampling event beginning on August 7 and completing on August 10. Results of that study will be available in October and summarized in the *2022 3rd Quarter Progress Report*. Further actions will be determined based on sampling results and in accordance with the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan*. The well was also sampled in accordance with the *Sampling and Analysis Plan*, in July 2022. Results of that sampling event will be available in September 2022.

## OTHER UNEXPECTED CONDITIONS

Pantex routinely evaluates data as they come in from the laboratory to determine if data are off-trend, at an all-time high, or represent a new detection that may require further sampling or evaluation. Through the well maintenance program, Pantex also inspects wells at least every five years to ensure they are not silting in and to evaluate whether the well remains in contact with the formation. In the 2<sup>nd</sup> quarter, three monitoring wells had unexpected conditions.

A large perchlorate detect (> 2000 ug/L) was measured at PTX06-1035, a monitoring well located southwest of Zone 11 ISB, during the first quarter sampling event. The reported value was an order of magnitude higher than previous results and as such, the well was resampled in the 2nd quarter. The resample result was within the limits of previous results (~ 250 ug/L) and verified that the 1st quarter result was due to a lab error. The erroneous result will be removed and not used for trending purposes in reporting.

Unexpected perchlorate detects were also measured at PTX06-1052 and PTX06-1183, two wells located southwest of the SEPTS wellfield. The perchlorate detects were first-time detections and resampling confirmed the original detects. However, in FY24 (pending funding availability), a new ISB system, Perchlorate/Chromium (PCR) ISB, will be added northwest of the current Southeast ISB System and south/southwest of the SEPTS wellfield, on Texas Tech property, to address the perchlorate and hexavalent chromium plume that is not captured by the SEPTS. This system will effectively reduce those concentrations to GWPS and prevent further movement to the southeast where the fine-grained zone is more permeable and will allow movement to the deeper drinking water aquifer (Ogallala Aquifer). This system will be injected intermittently, primarily using an EVO every 3-5 years.

## SCHEDULE UPDATE

Pantex provided a detailed schedule of upcoming work in the *2021 Annual Progress Report*. An update of the activities scheduled to be started or completed by the publication date of this report is provided below.

Pantex completed the following:

- Injections into the Southeast ISB were finished in April 2022.

- The initial injection event was completed at the northern Offsite ISB wells in May 2022 and well maintenance activities were completed at the southern Offsite wells in preparation for injection beginning in June 2022.
- Pantex obtained a release agreement with the final offsite neighbor in June. Deed restrictions were filed in late June 2022. This completes the five-year review milestone to deed record offsite properties affected by impacted perched groundwater.
- A design for Phase 3 and 4 infrastructure for the Offsite System was completed in April 2022.
- Construction of the new SEPTS perchlorate pre-treatment completed in August 2022.
- Pantex performed a time-series sampling event with a high volume purge at PTX06-1056 in August 2022.

Pantex continues progress toward completion of the following items:

- Pantex awarded a contract to build two mobile pump and treat systems that will be used at the Offsite Remediation System and in other areas where plume control may be required. Design was completed in April 2022. Construction on the systems has begun and the delivery of the trailers is expected during November 2022.
- The design of the new irrigation system planned to be installed east of FM 2373 was completed in May 2021. The new construction contract was awarded in August 2021 and construction began in November 2021. Operation of the system is expected by the end of 2022.
- Construction of Phase 3 infrastructure for the Offsite System commenced in August 2022. Work is anticipated to be completed in spring 2023.
- Phase 3 drilling at the Offsite System began in April 2022.
- Well maintenance began at the SE ISB Extension in May; injection began in August 2022.
- Contracts have been started for Five-Year Review support, including MAROS and risk assessment evaluation and a LiDAR survey of Pantex. Work for the review began in March 2022 and will continue through early 2023.
- Pantex completed rehabilitation of the wells at the Zone 11 ISB wells in May 2022. Injection into the system also began in May and is anticipated to finish in September 2022.
- Pantex awarded a contract for construction of two new ISB injection trailers to be used for upcoming injection events. These trailers are anticipated to be completed by January 2023.
- Pantex submitted a Request for Proposals for the design of the upgrade to the SCADA system for SEPTS and P1PTS. Award for the contract is expected at the end of the September 2022.
- An explanation of significant difference was started in June 2022. It is expected to be sent to EPA and TCEQ for review in September 2022.

## CONCLUSIONS AND RECOMMENDATIONS FOR CHANGE

The remedial actions continue to operate and meet short-term expectations for cleanup of the perched groundwater in areas under the influence of the remediation systems. Perched water levels are declining, mass is being removed or reduced, and institutional controls provide protection from use of impacted groundwater, while the remedial actions continue to operate to meet long-term goals. Pantex is working to extend treatment systems to areas that are not



currently under the influence of an existing remediation system. Pantex is also working to extend treated water injection and beneficial use to new areas to ensure consistent operation of the pump and treat systems.

The pump and treat systems continue to remove COC mass and water from critical areas in the perched aquifer; thus, decreasing head that drives vertical and lateral movement of perched groundwater. Pantex is continuing to pursue other options for release or use of the treated water. Pantex will continue to inject and release water to Playa 1 until the subsurface irrigation system is operational or other options can be constructed.

System repairs were completed at the subsurface irrigation system, with limited operation starting in March 2022. The system ran during the month of March, but an issue with the communication system caused the system to be shutdown. Pantex is working to get the system back online. Pantex has installed perched injection wells east of the Playa 2 area, as previously recommended. These wells will help provide a consistent outlet for release of treated water from SEPTS when beneficial use is not possible. Pantex expects to inject up to 150 gpm of treated perched groundwater once the system is brought online in 2023. Pantex completed the design and started the construction of a center pivot irrigation system east of FM 2373. Pantex also contracted for design and construction of a perchlorate treatment system to address the perchlorate moving southeast through the SEPTS extraction wellfield.

Monitoring results for areas downgradient of the established ISB systems continue to demonstrate that treatment has been generally effective. Downgradient wells at the Zone 11 ISB are demonstrating treatment. Most downgradient wells meet or are near the GWPS for the primary contaminants and breakdown products. Pantex has changed the injection strategy at the Z11 ISB to attempt better distribution of amendment between wells and provide better treatment of TCE and perchlorate. Data indicate that the injection of a more soluble carbon source (molasses) has distributed widely where injected and that reducing conditions have improved in those areas. In lieu of installing a recirculation system in 2021, Pantex drilled a second row of closely spaced wells across the southern portion of the ISB to address higher concentrations of TCE moving into those areas. Pantex will continue to evaluate the data and make appropriate recommendations for treatment in the upcoming progress reports.

Pantex continues to progress toward cleanup of the southeast lobe of perched groundwater. A new ISB system (Offsite ISB) was designed to address HE contamination found on neighboring properties. Installation of infrastructure for Phase 1 and 2 of the Offsite ISB is complete and the first injection into the system was completed in October 2021.

Sampling was not completed at the other ISB systems. Well maintenance activities are currently ongoing at the Offsite ISB system for the injection events scheduled for late 2022. Injections were ongoing at the Southeast ISB Extension and Zone 11 ISB systems in the 2nd quarter of 2022.

Pantex performed a time-series sampling event with a high volume purge at PTX06-1056 in August. Results of that study will be available in October and summarized in the *2022 3rd Quarter Progress*

*Report.* Further actions will be determined based on sampling results, in accordance with the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan*.

The SVE system was not operational during the 2nd quarter. Pantex has continued to have problems with completing rebound tests, and has been unable to prepare a path to closure as recommended in the first Five-Year Review. Therefore, Pantex has evaluated other paths to closure for this system. In May 2017, Pantex completed a modification to six inactive SVE extraction wells surrounding the active extraction well SVE-S-20 to open the wells to ambient air. This modification enhances airflow through the formation while the system is operating. The airflow was increased from 32 scfm to about 44 scfm over time. Evaluation of hourly VOC removal indicates that the mass removal rate initially increased with the increase in influent airflow; however, influent concentrations and mass removal have greatly decreased since the system was modified. Pantex is actively pulsing the system to evaluate final closure of the system. Pantex will provide further recommendations based on review of influent SVE data in the annual report.

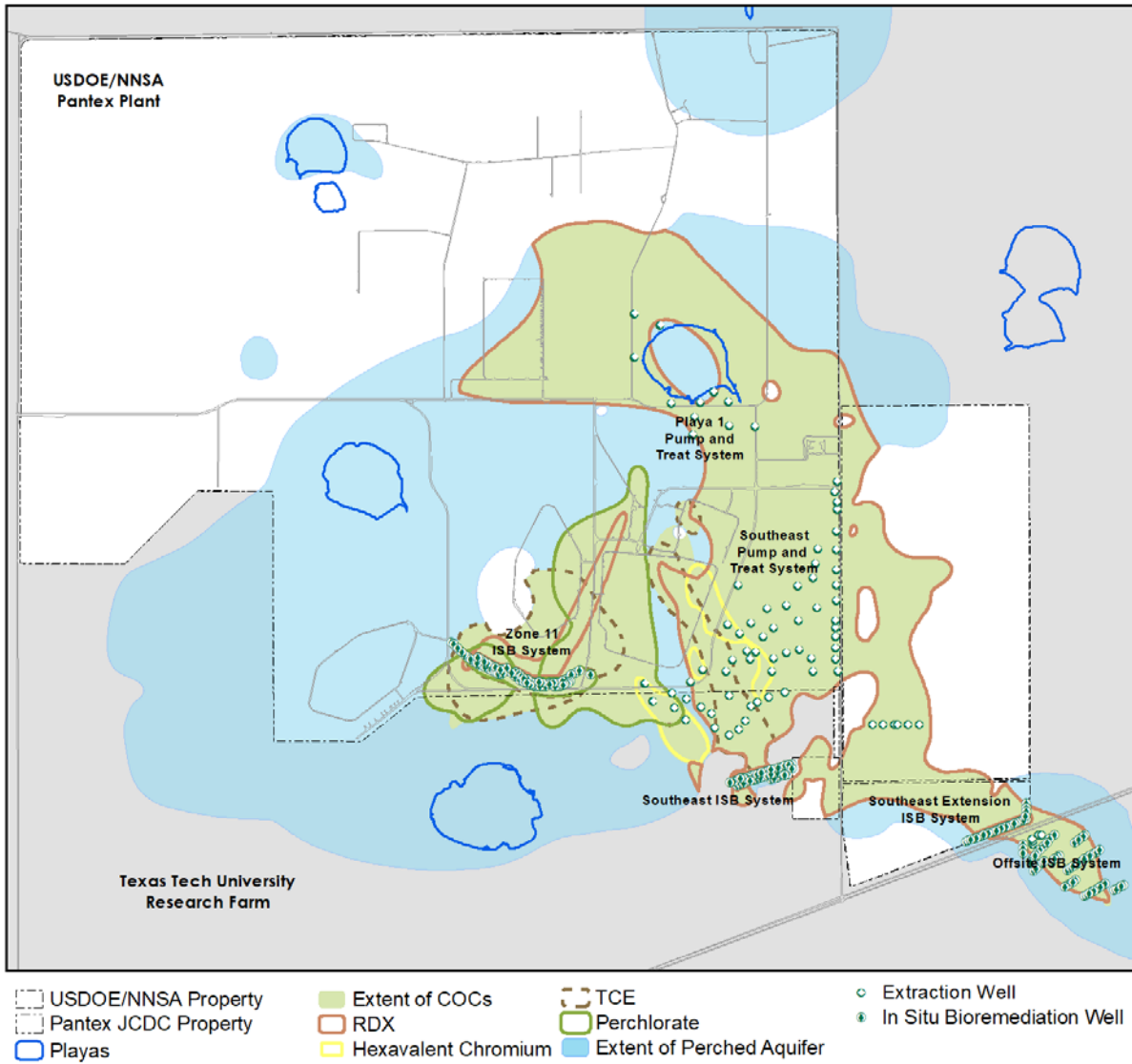
The groundwater remedies are considered to be protected for the short-term, as untreated perched groundwater use is controlled to prevent human contact and monitoring data continue to indicate that the remedial actions remain protective of the Ogallala Aquifer.



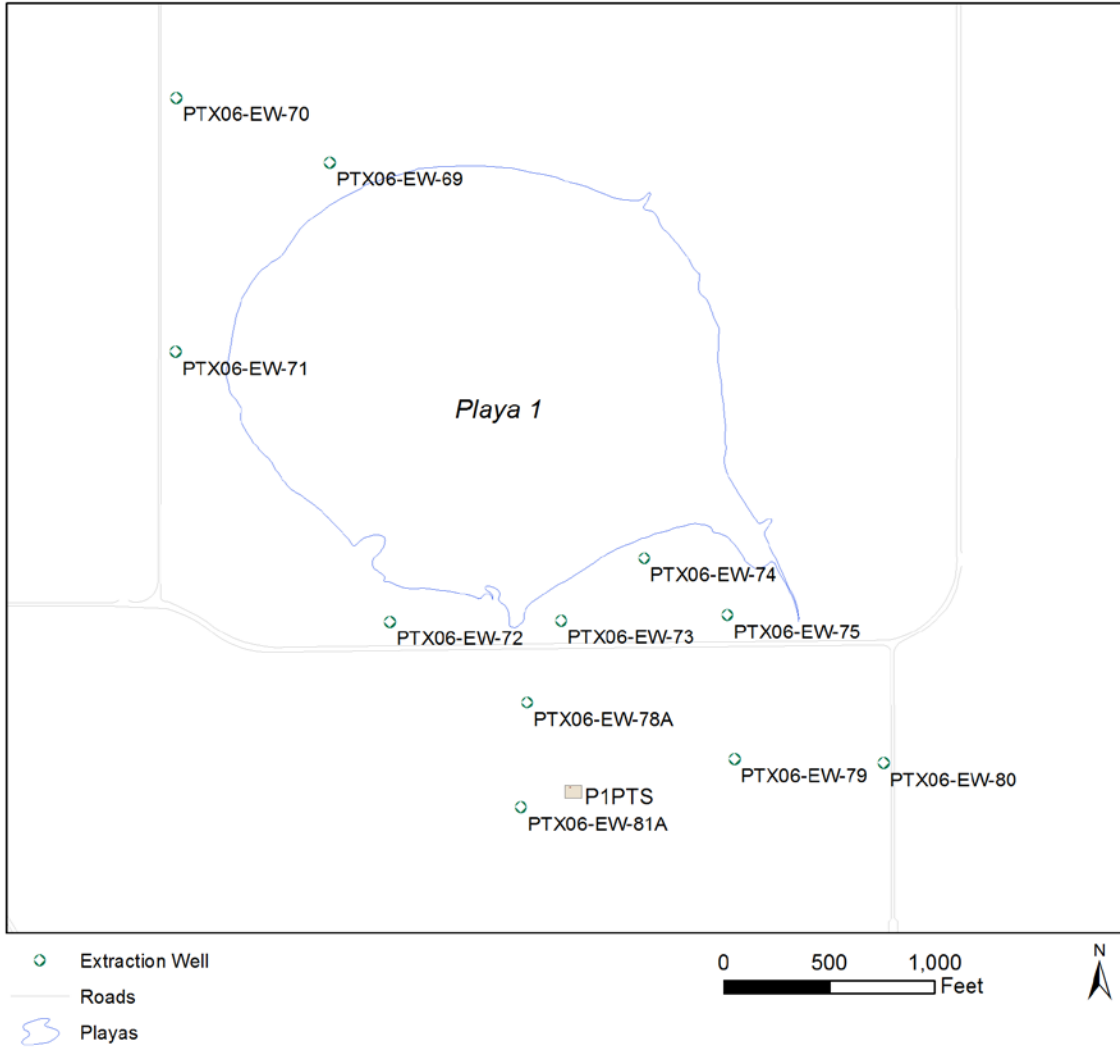
## **Appendix A**

### **Maps**

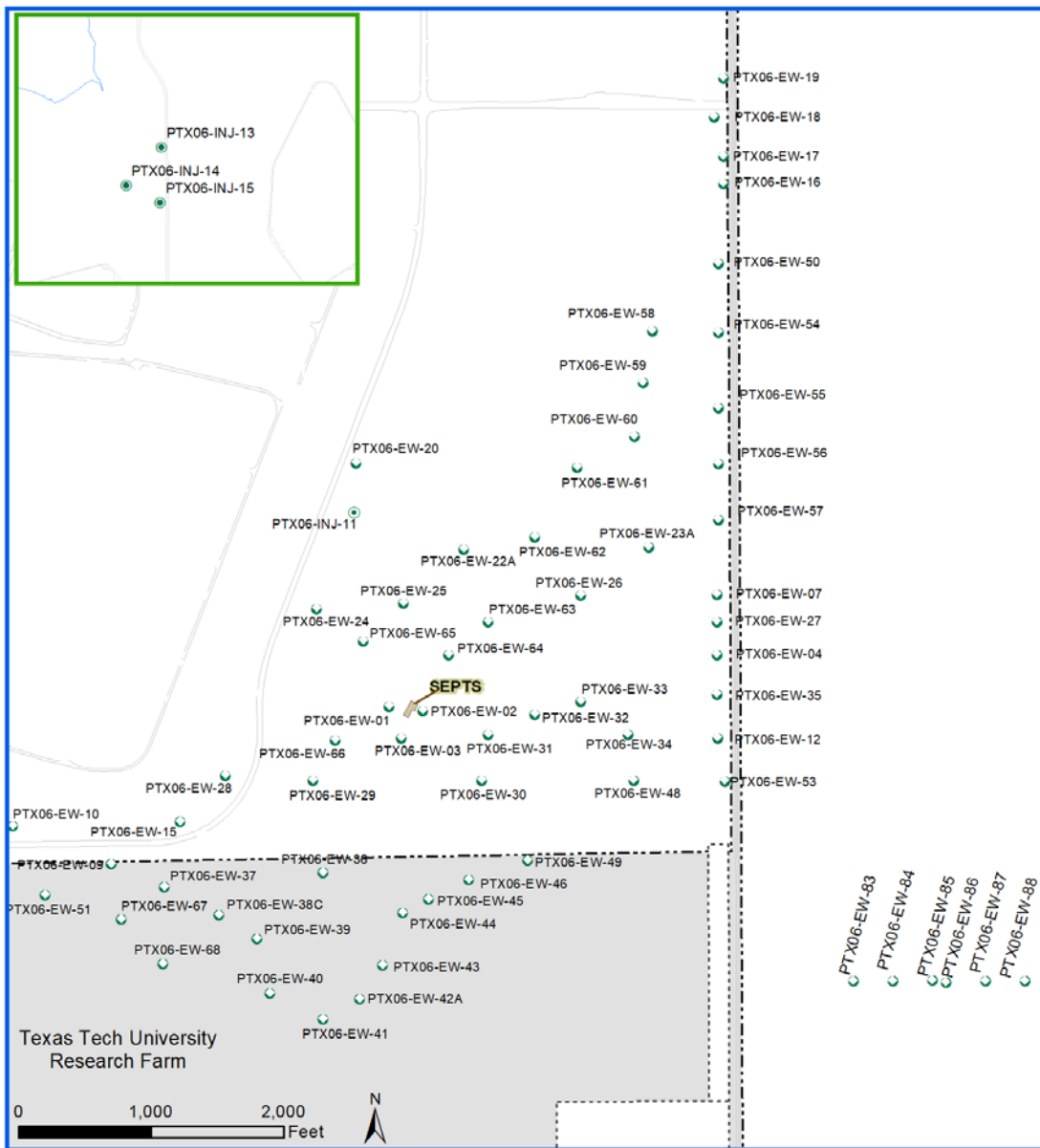




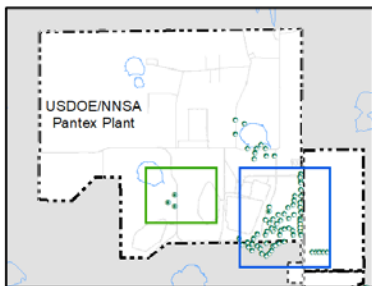
Extent of Perched Groundwater and Contaminant Plumes



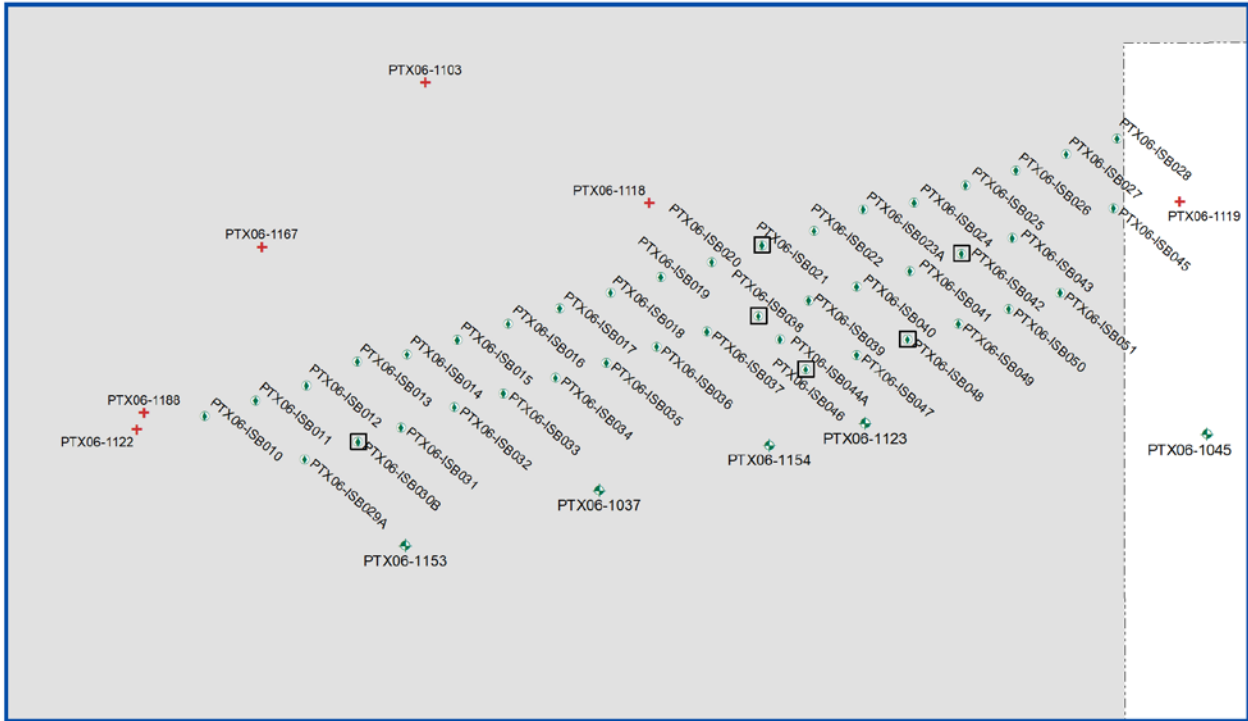
Playa 1 Pump and Treat System Wells



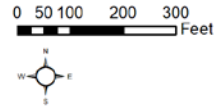
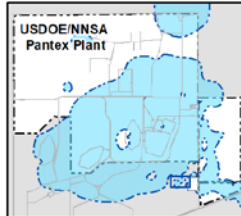
- Extraction Well
- Injection Well
- Roads
- - - DOE Property
- - - Pantex ASC LLC Property



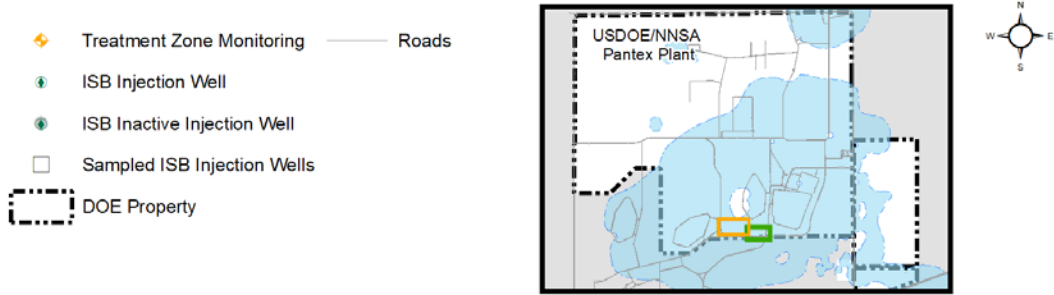
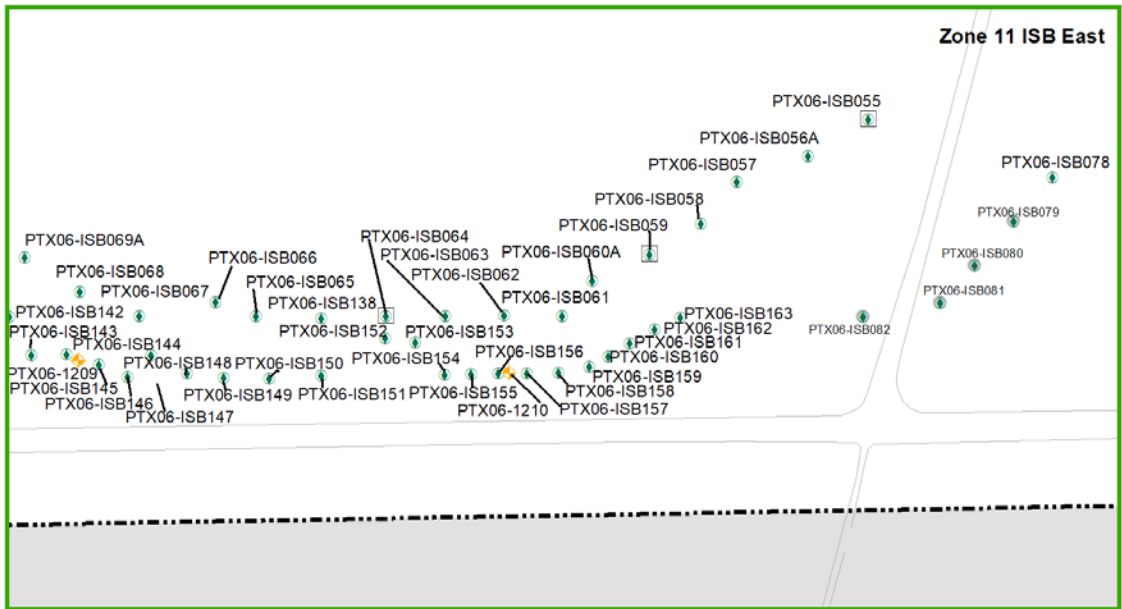
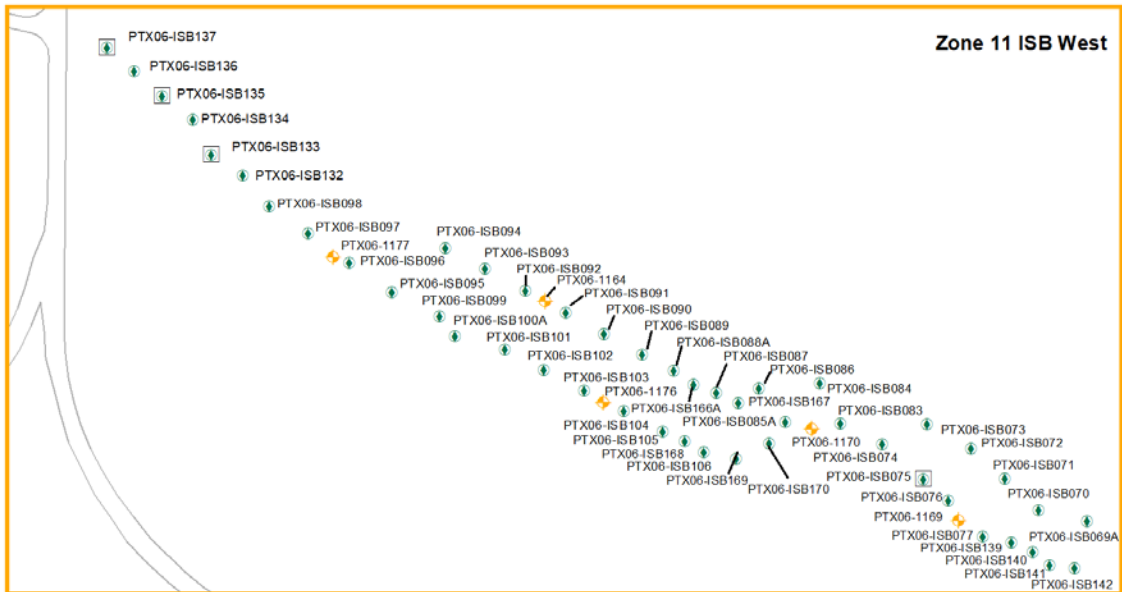
Southeast Pump and Treat System Wells



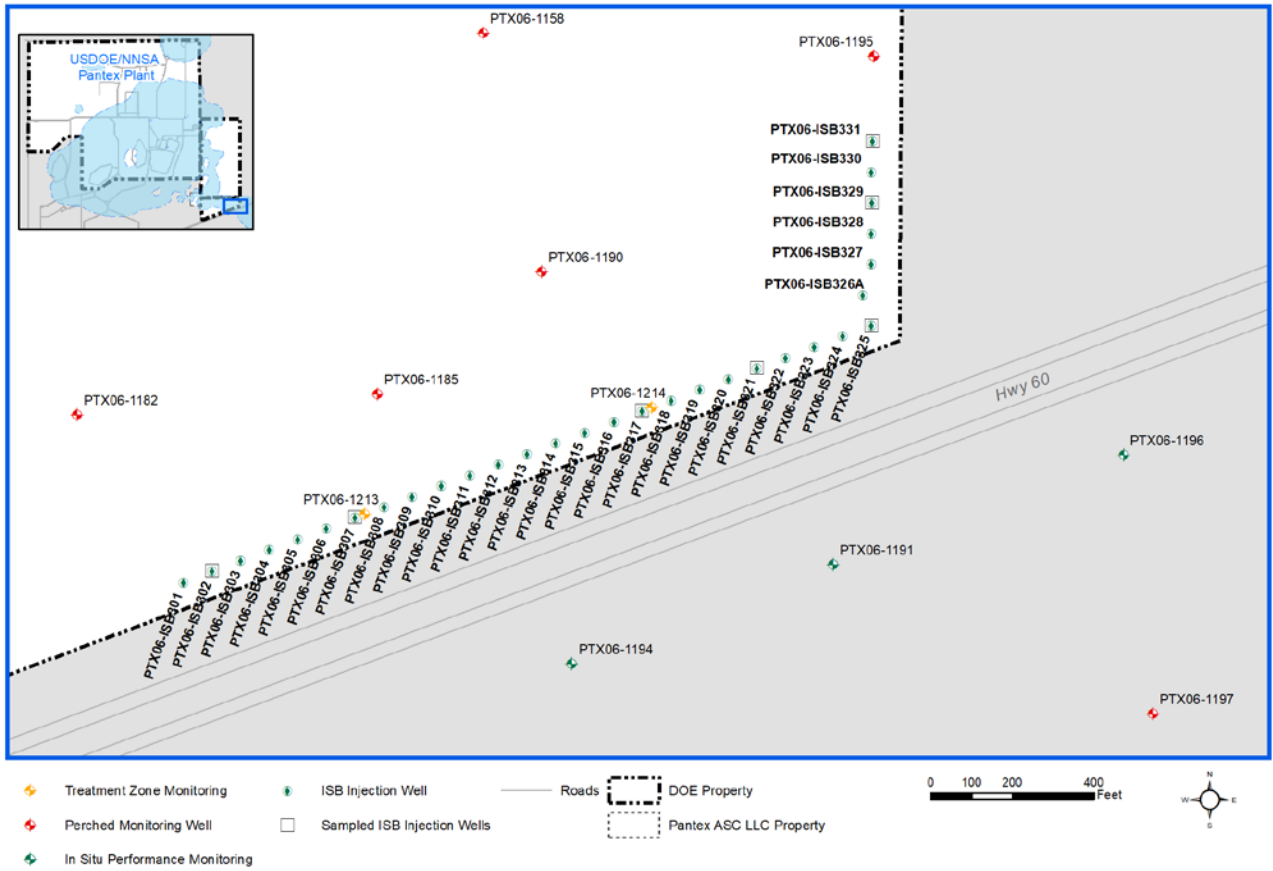
- ◆ ISPM Well
- ◆ ISB Injection Well
- Sampled ISB Injection Well
- + Dry Monitoring Well
- Pantex ASC Property
- ⊞ DOE Property



Southeast ISB Wells and Sampling Locations

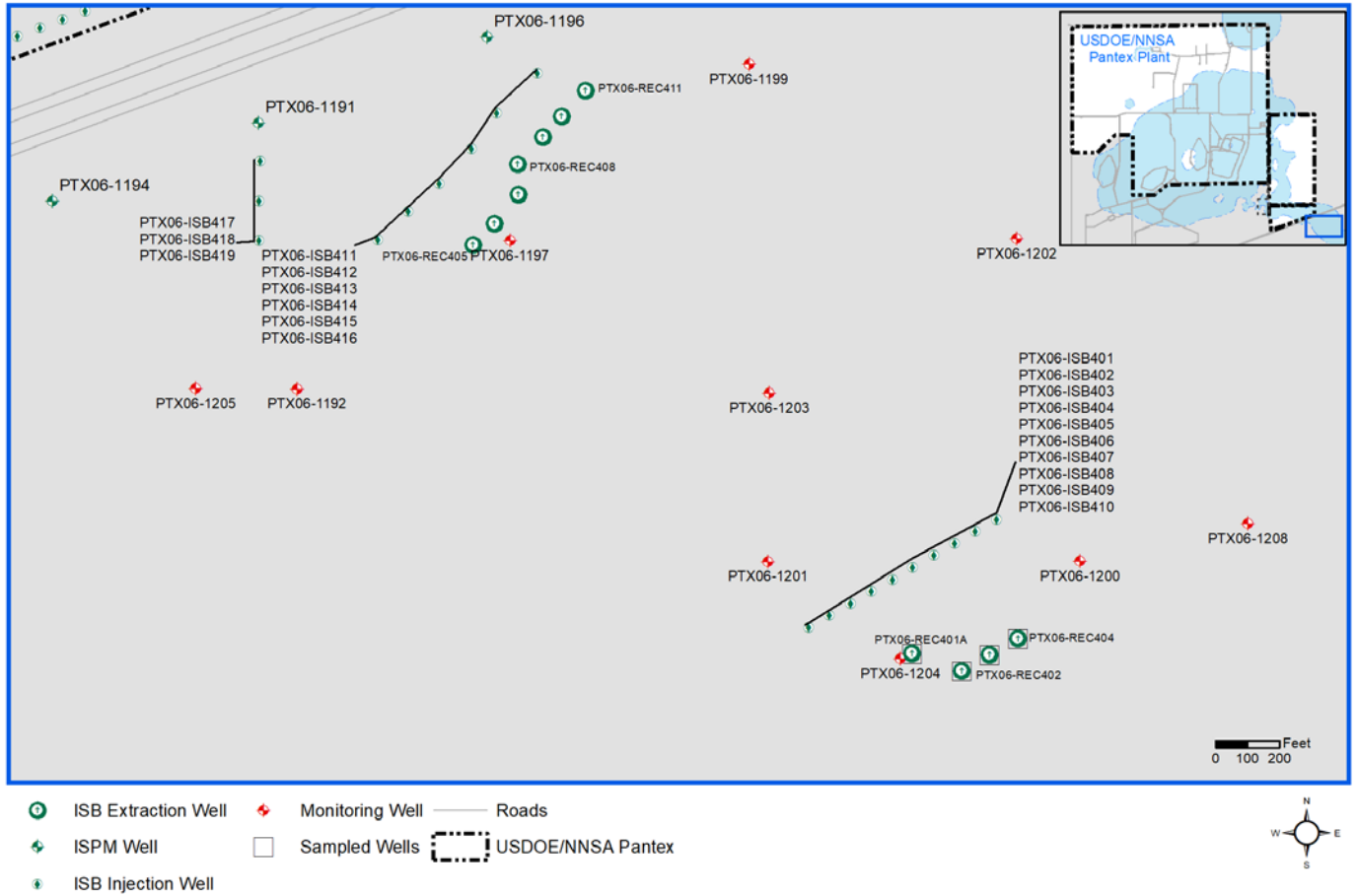


Zone 11 ISB Wells and Sampling Locations

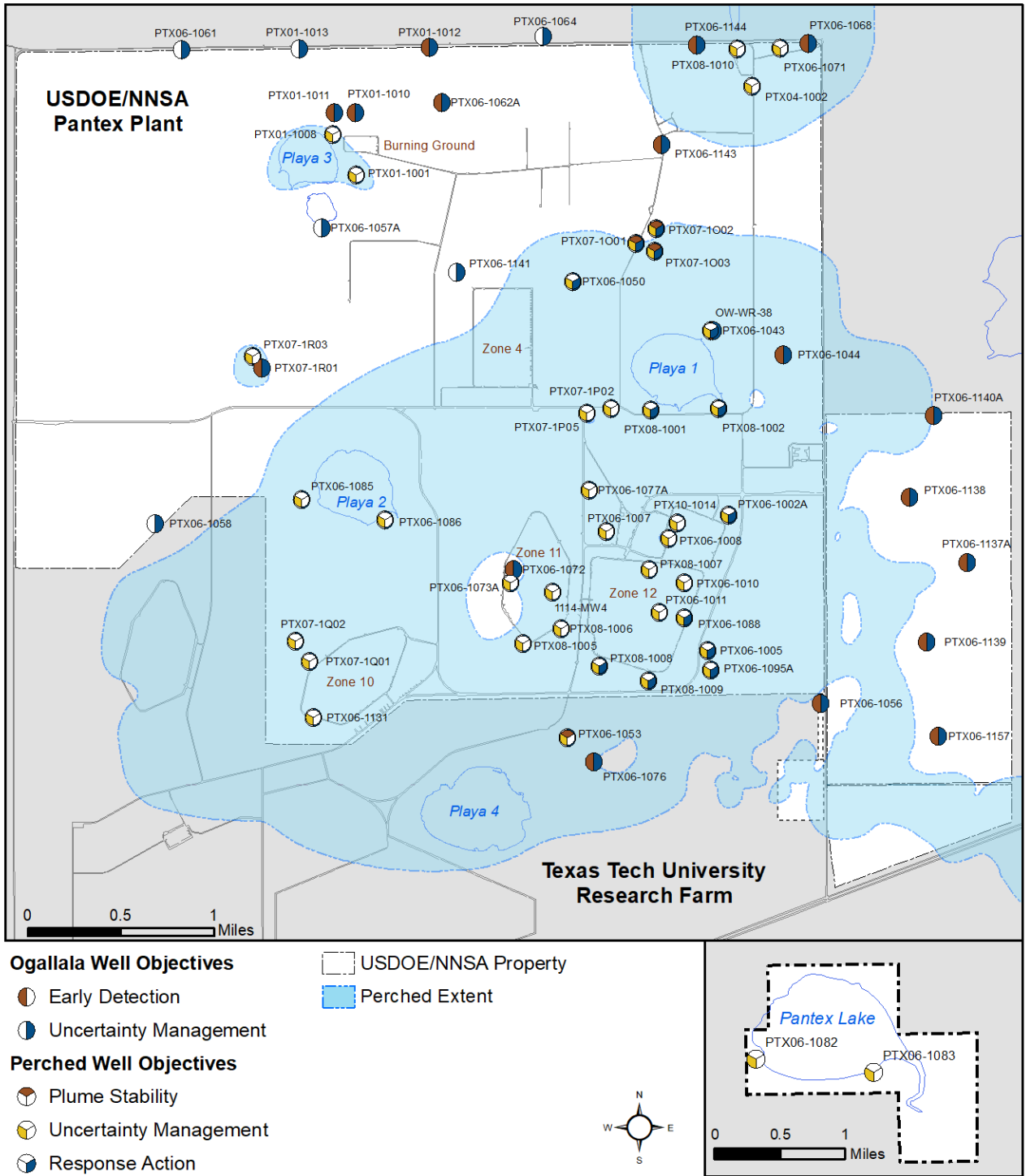


Southeast ISB Extension Wells and Sampling Locations





Offsite ISB Wells and Sampling Locations



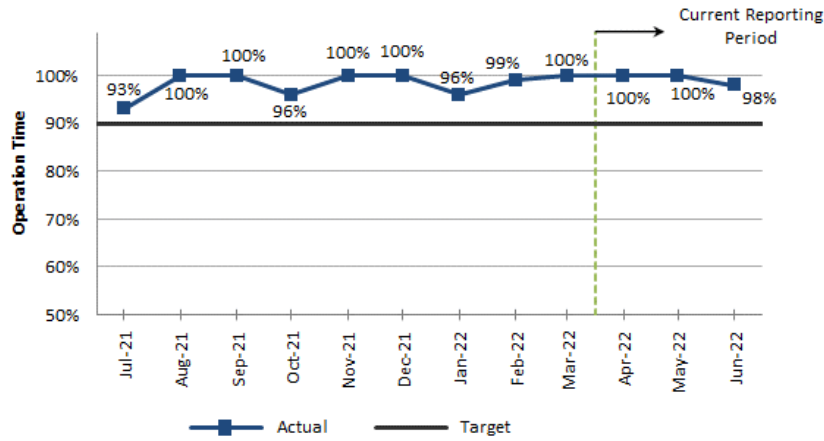
Uncertainty Management and Early Detection Wells Evaluated in the Quarterly Progress Report

**Appendix B**  
**Pump and Treat System Graphs**

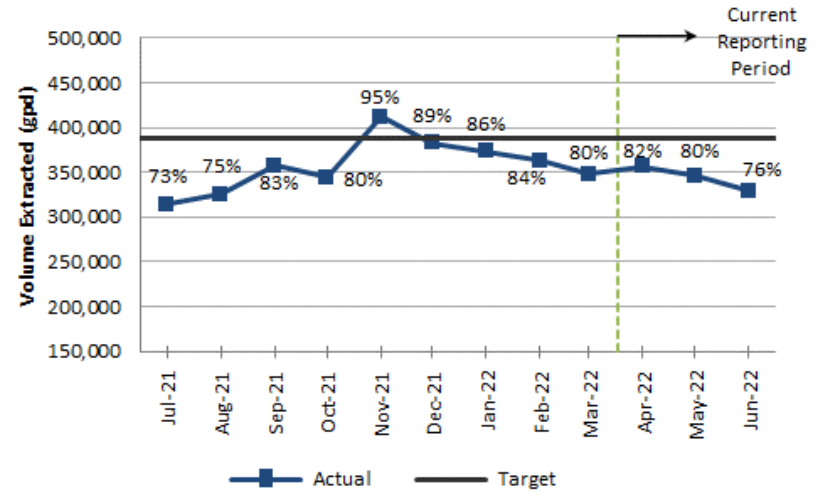


## **Southeast Pump and Treat System Graphs**

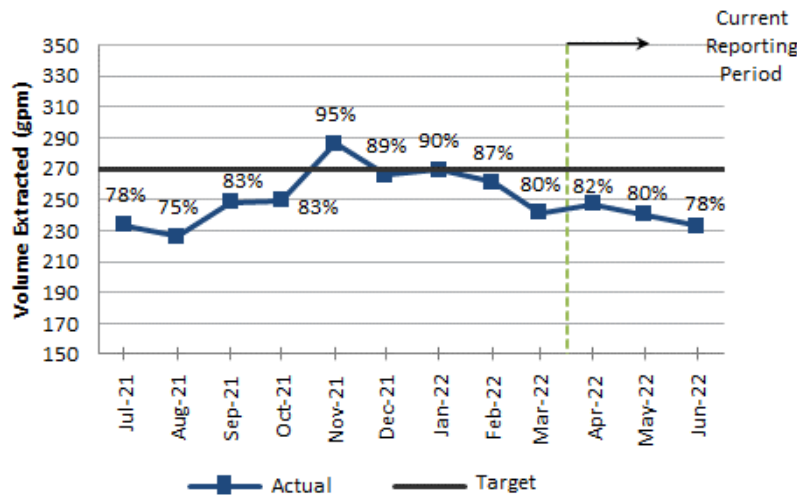




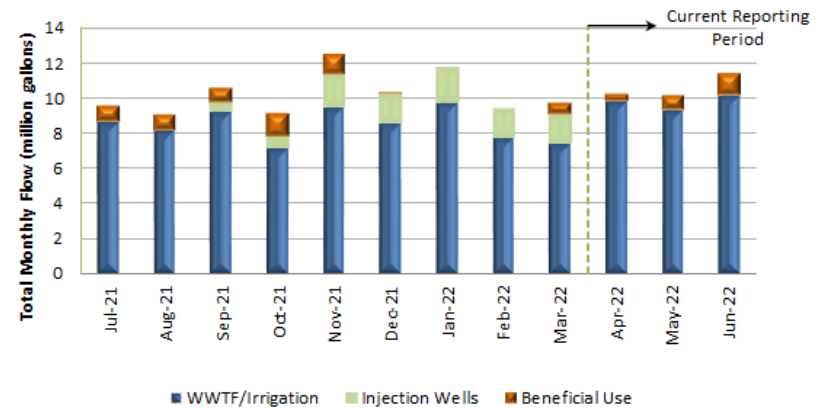
SEPTS Operation Time vs Target



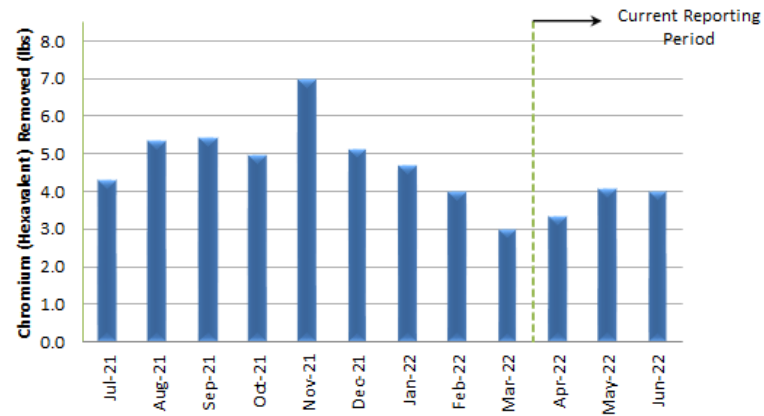
SEPTS GPD and % Capacity



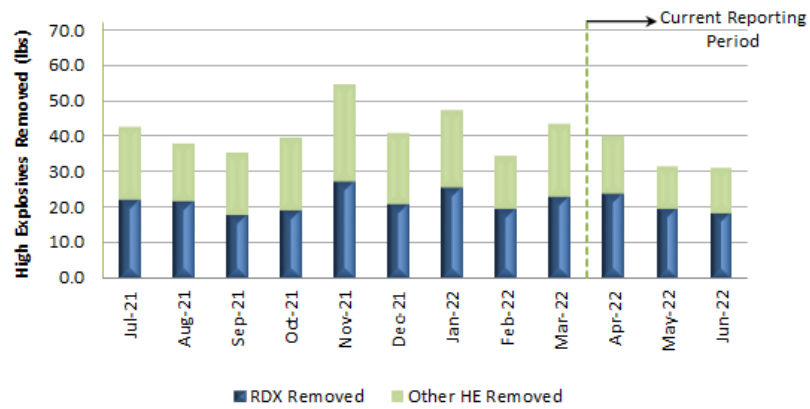
SEPTS Average GPM and % Capacity



SEPTS Monthly Total Flow



SEPTS Chromium Mass Removal by Month

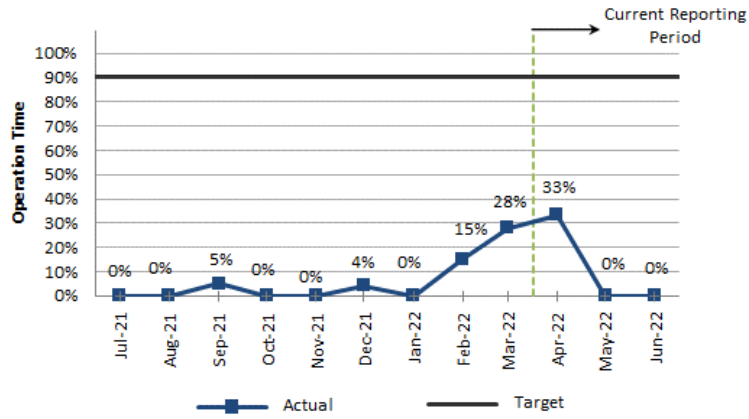


SEPTS HE Mass Removal by Month

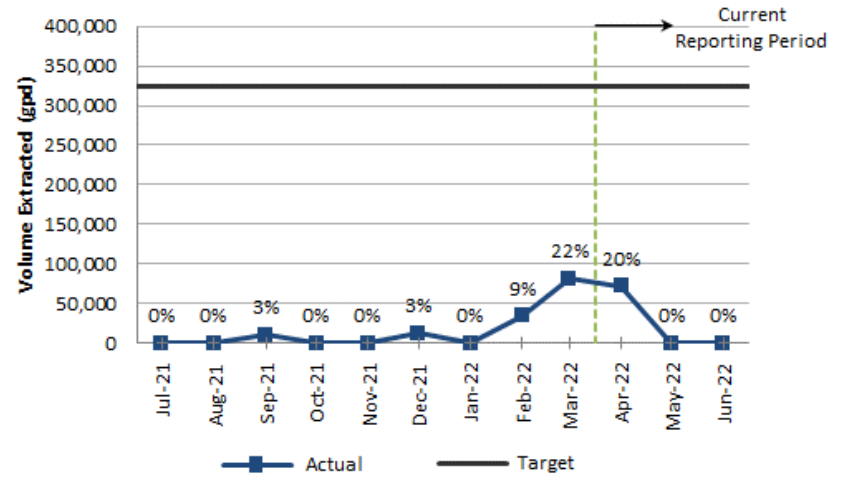


## **Playa 1 Pump and Treat System Graphs**

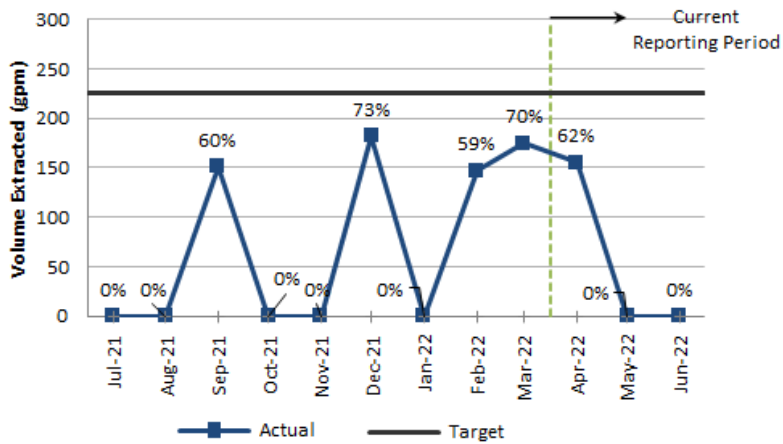




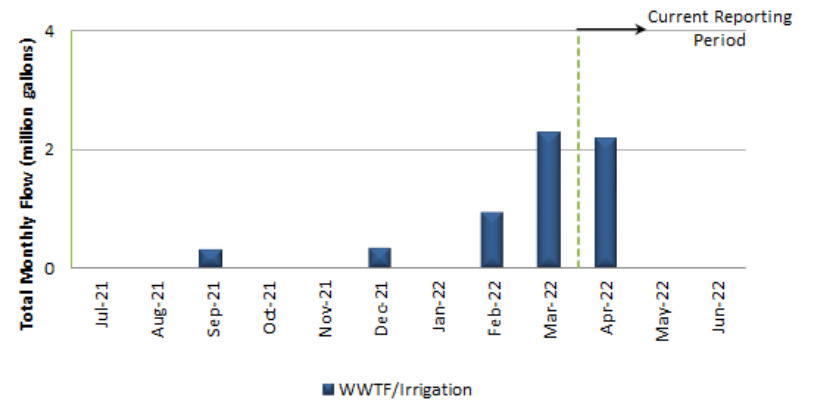
P1PTS Operational Time Vs Target



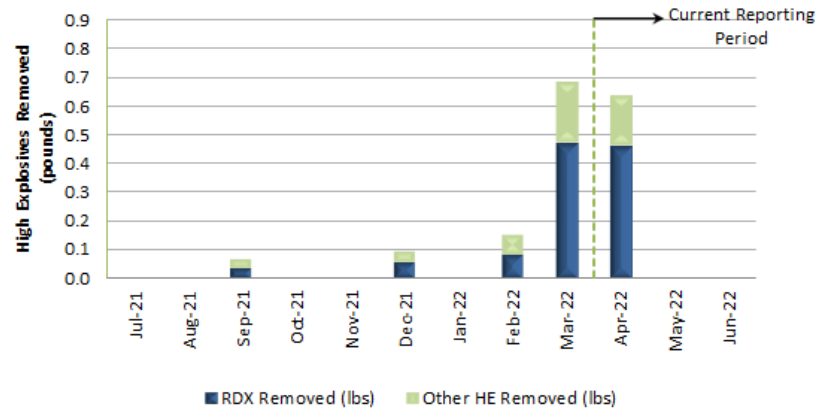
P1PTS Average GPD and % Capacity



P1PTS Average GPM and % Capacity



P1PTS Monthly System Total Flow



P1PTS HE Mass Removal by Month

### Appendix B Glossary

Operation Time	Operation time represents the percentage of the total number of hours the system was actually operated vs. the total possible hours the system could have operated on a monthly basis.
GPM Extraction	The gallons per minute (GPM) extraction rate represents the extraction rate from the well field while the system was operating. This is a measurement of the well field's capability to support the overall system throughput goals. Low well field rates can occur due to inoperable wells or decline in saturated thickness that makes extraction difficult.
GPD Extraction	The gallons per day (GPD) extraction rate represents the system's ability to meet overall throughput goals, considering the well field extraction rate and the system's operational rate. This rate is affected by the ability to extract water from the well field and the system downtime.
Total Monthly Flow	Total monthly flow is the total volume of extracted water measured at the influent point of the pump and treat system. Individual well measurements and flow rates are provided in the annual progress report.

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## **Appendix C**

### **ISB Graphs**

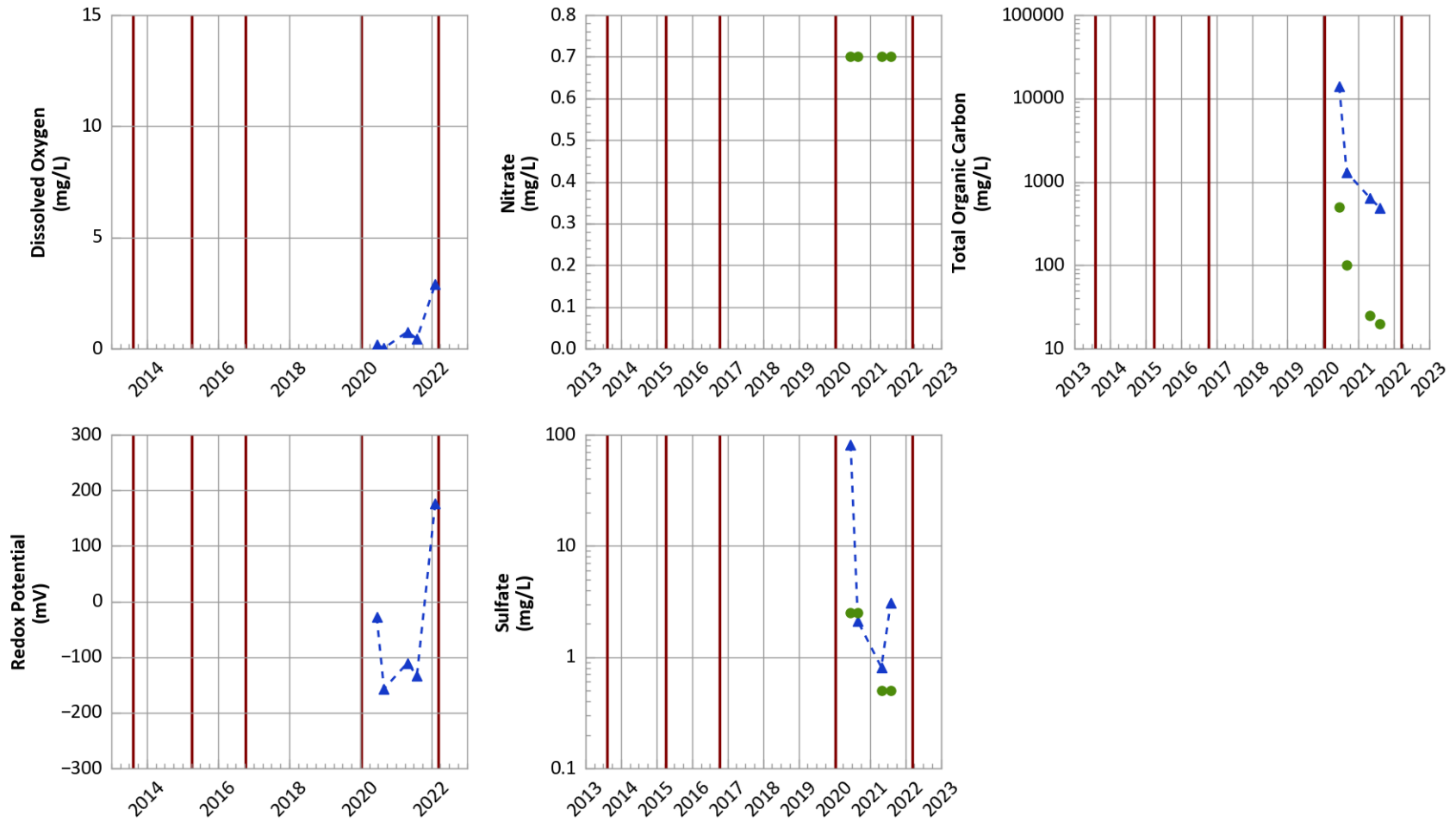




## Southeast ISB Graphs



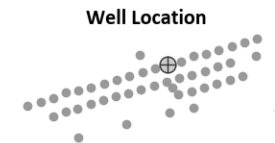
PTX06-ISB021 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



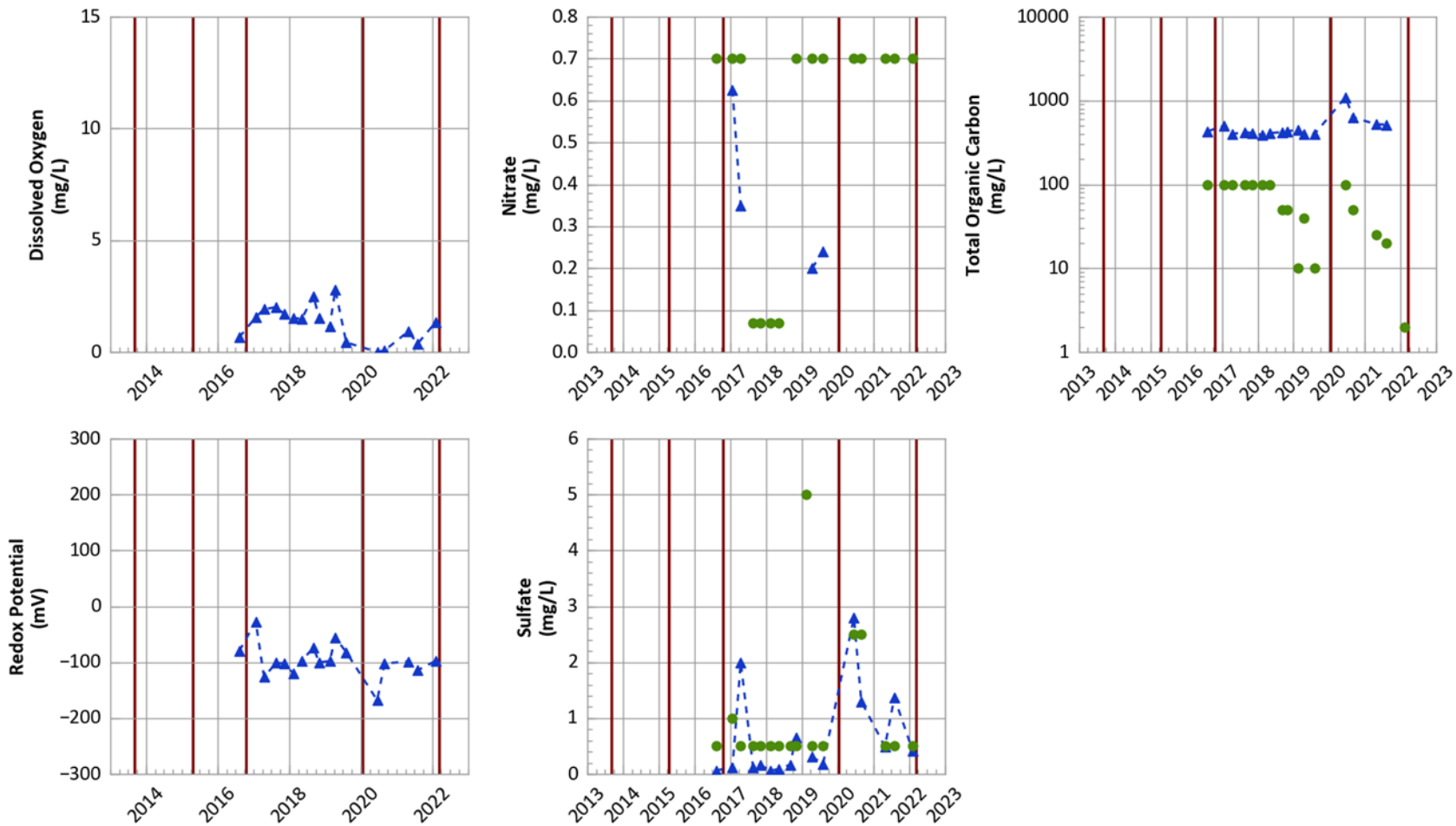
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



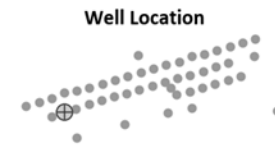
PTX06-ISB030B Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



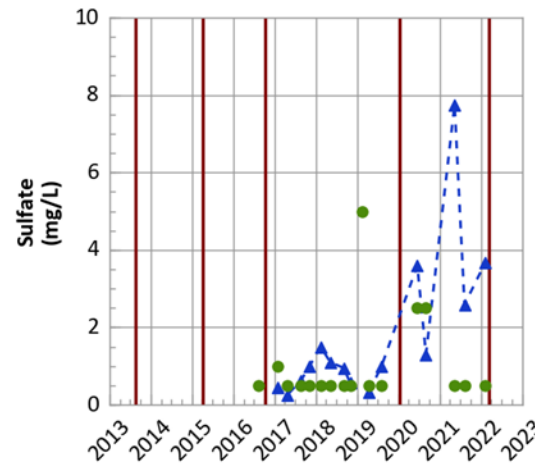
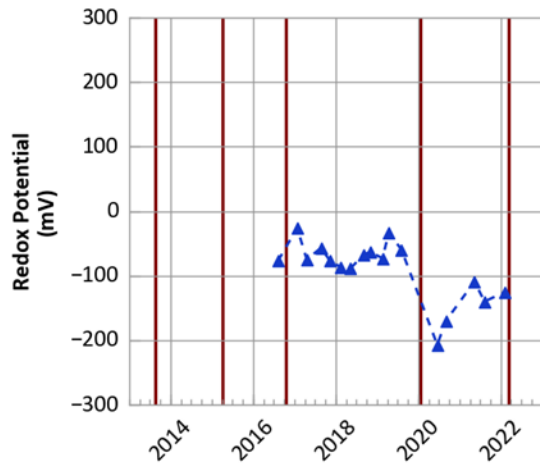
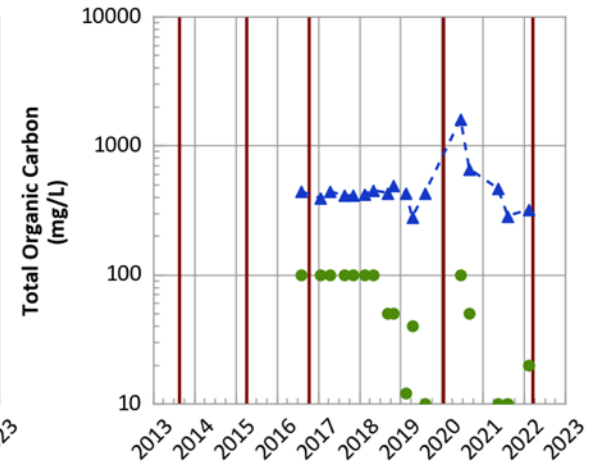
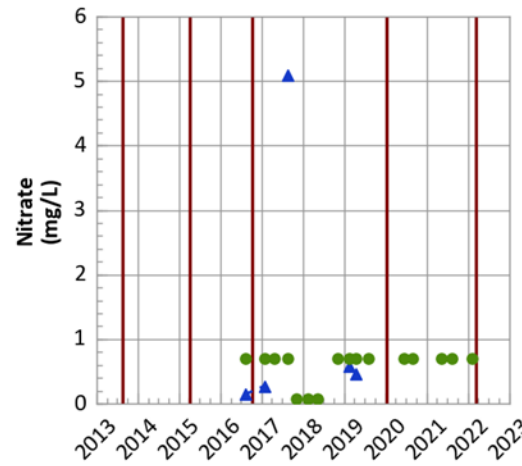
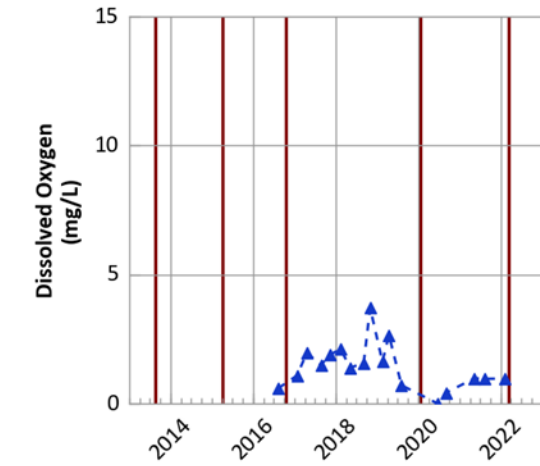
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



PTX06-ISB038 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



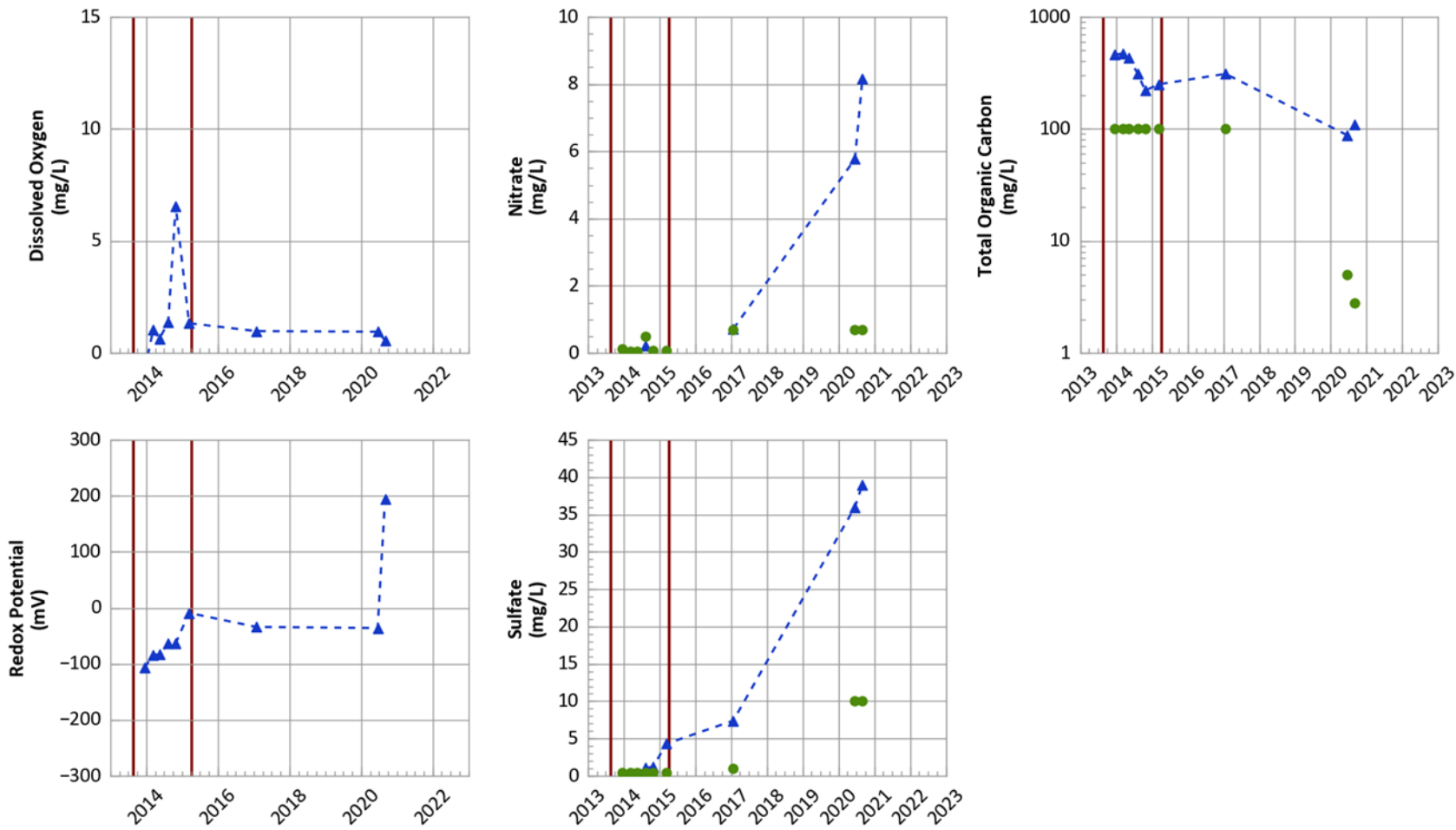
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



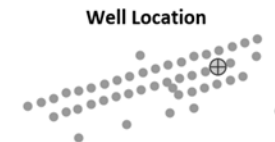
PTX06-ISB042 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



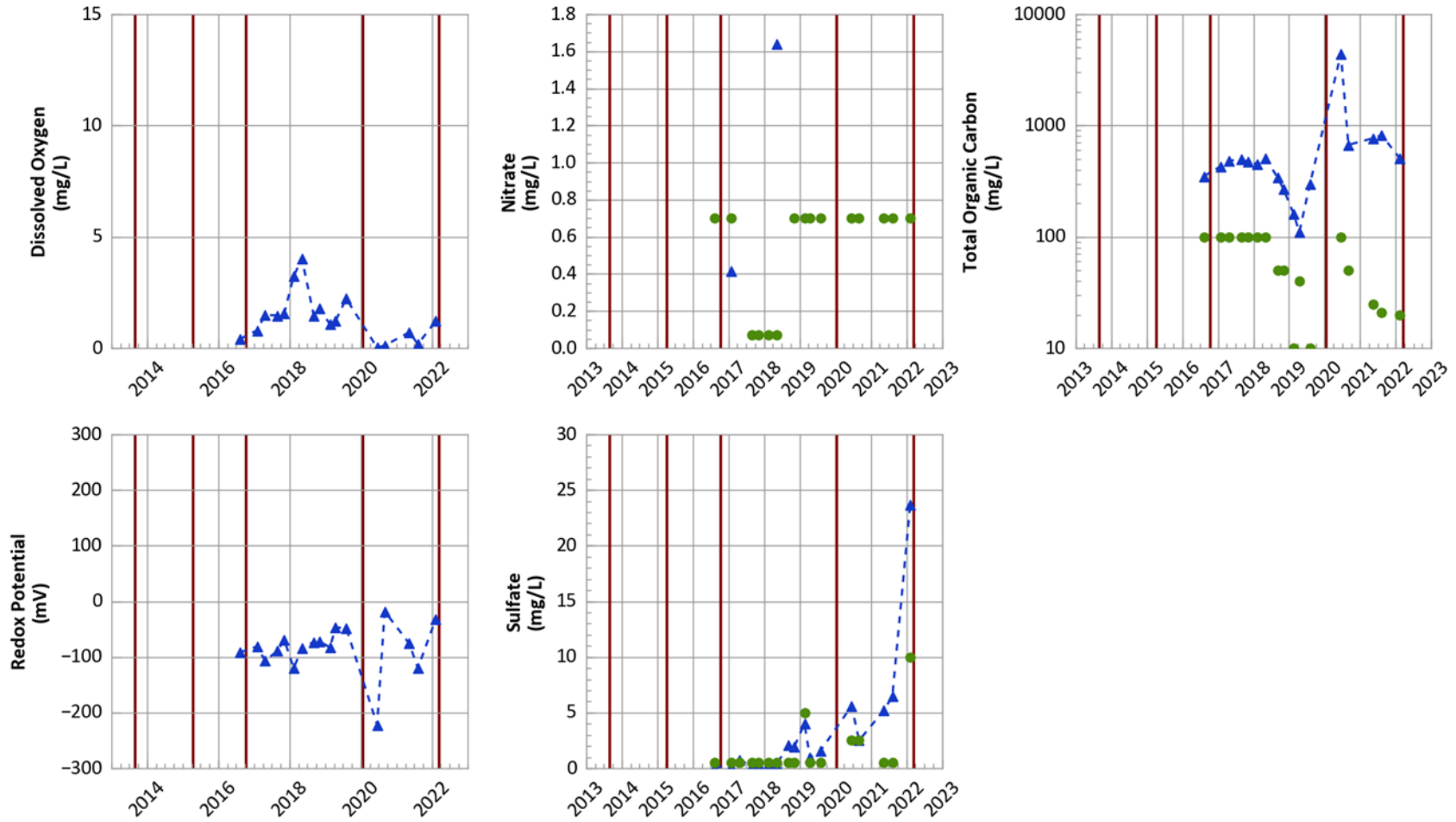
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates

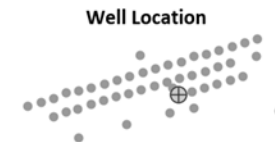


PTX06-ISB046 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant

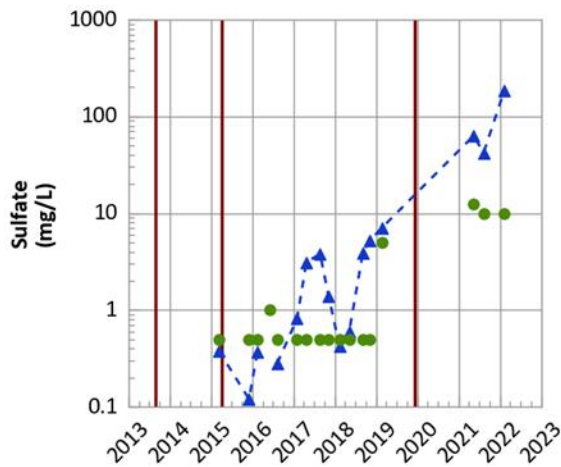
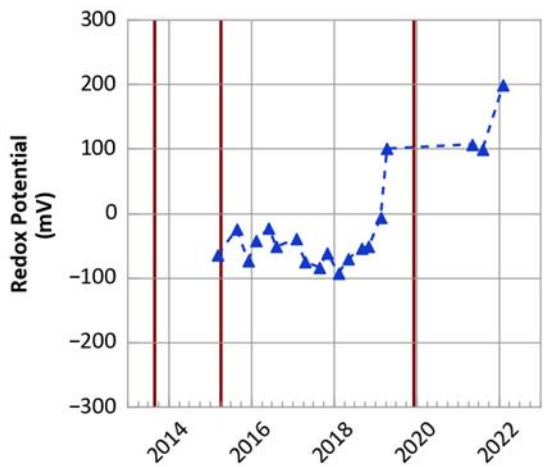
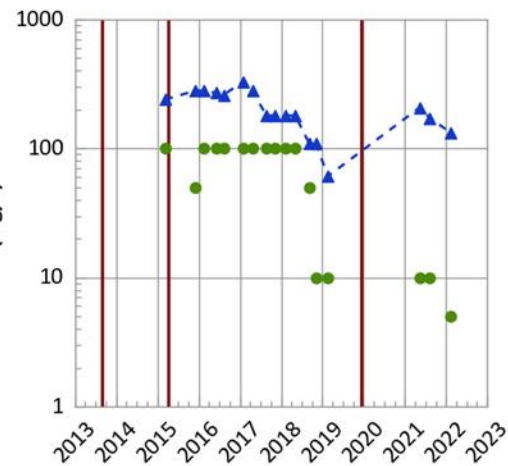
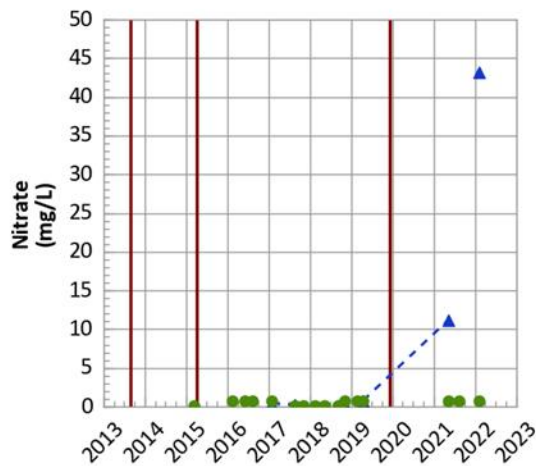
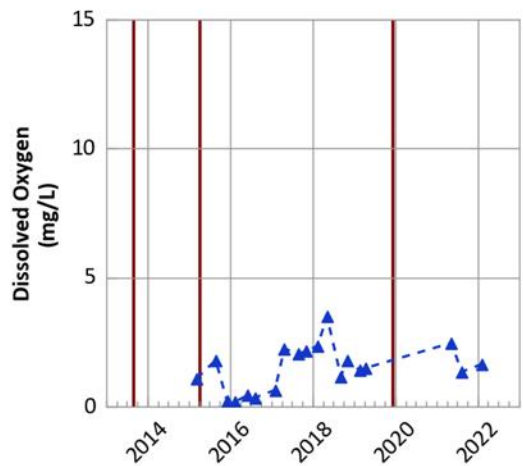


**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates

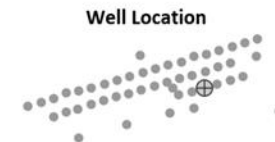


PTX06-ISB048 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



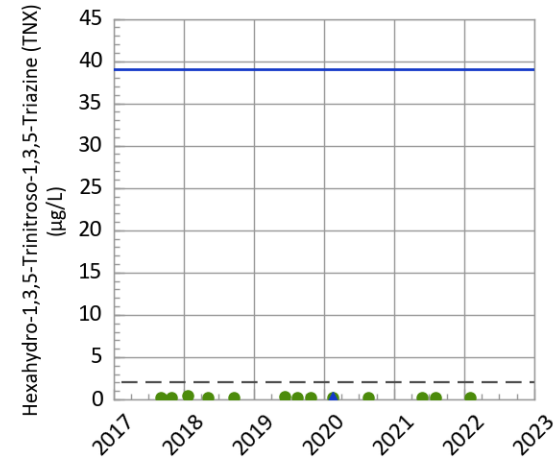
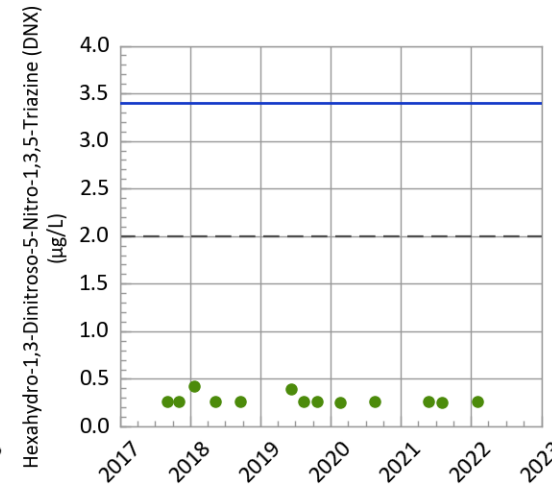
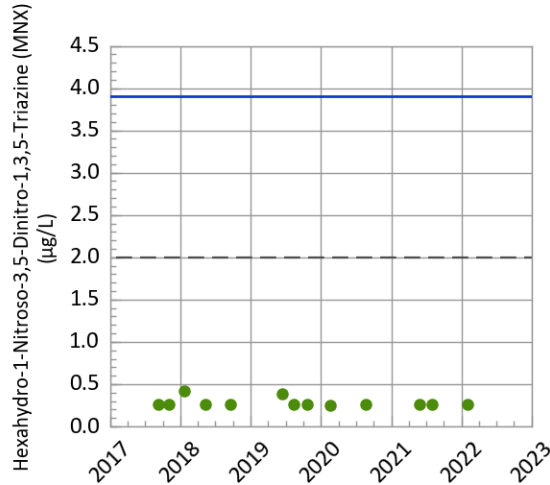
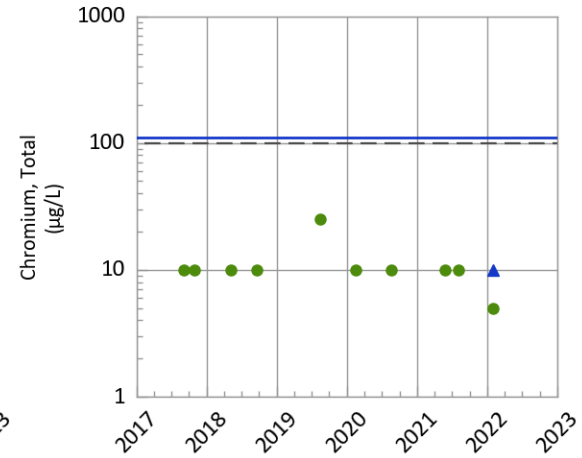
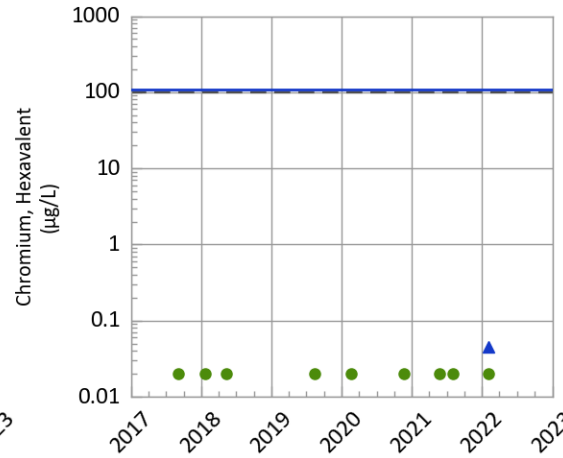
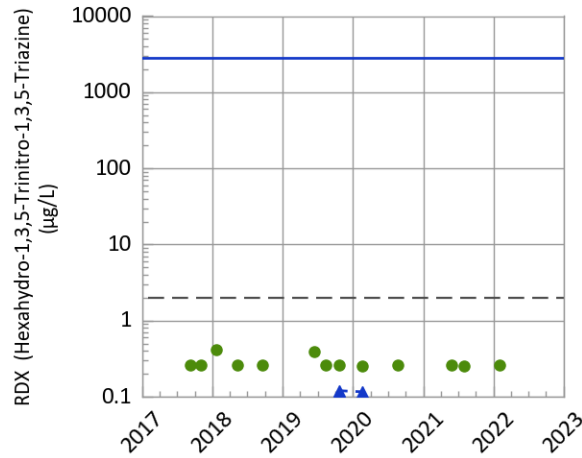
**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates





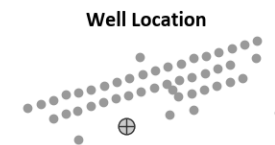
**PTX06-1037 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



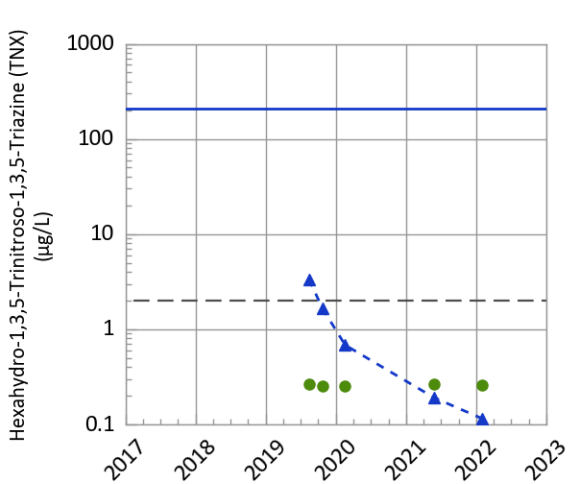
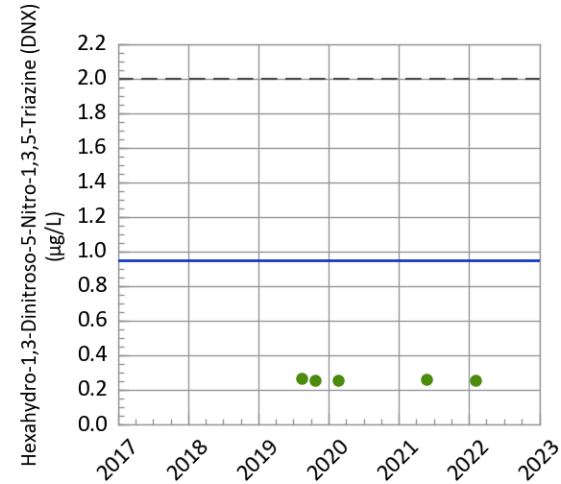
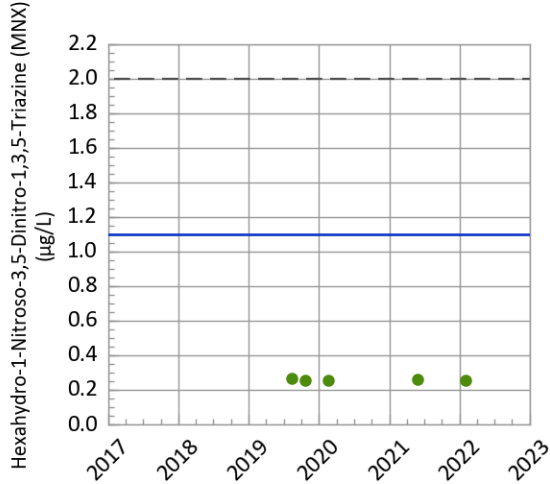
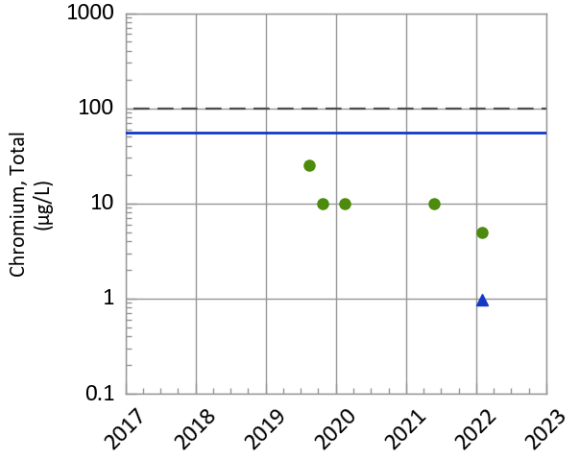
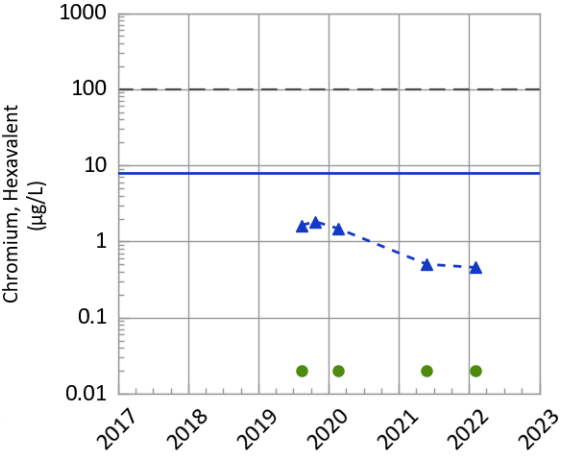
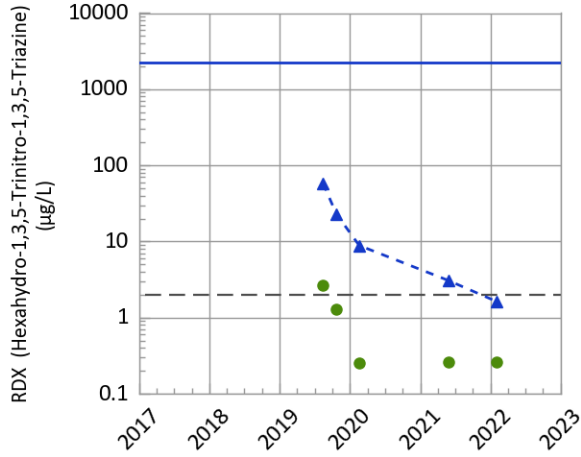
Most Recent Measured COC Concentrations (Feb 18, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	Non-Detect	2.0
MNX	Non-Detect	2.0
CR-6	0.045	100.0
DNX	Non-Detect	2.0
CR	10.0	100.0
TNX	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



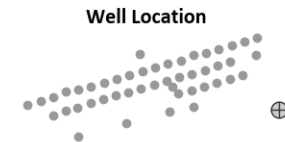
**PTX06-1045 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



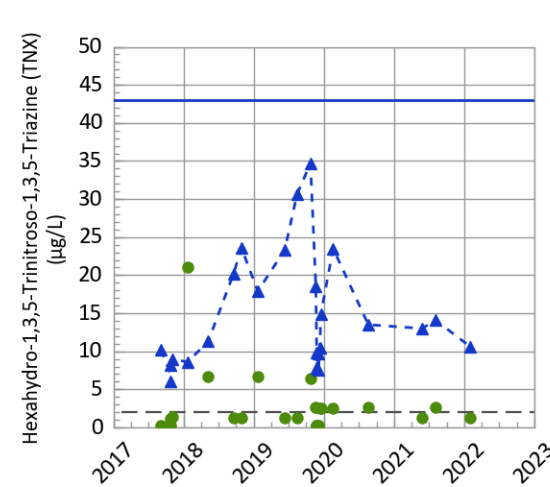
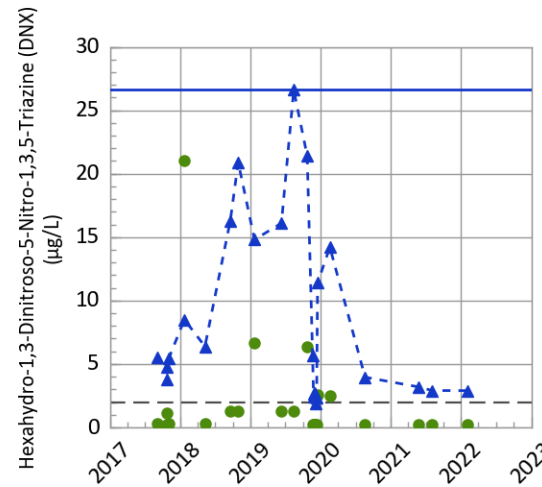
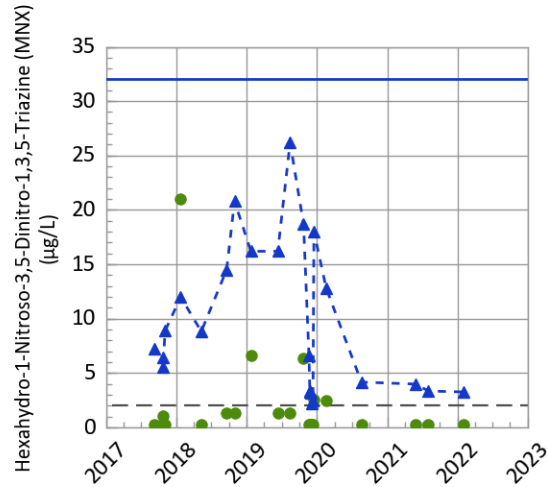
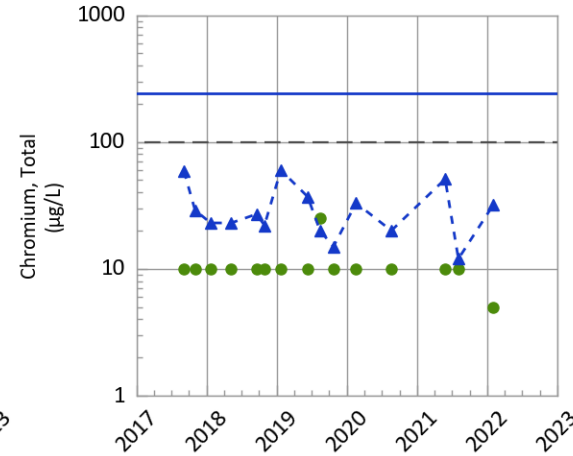
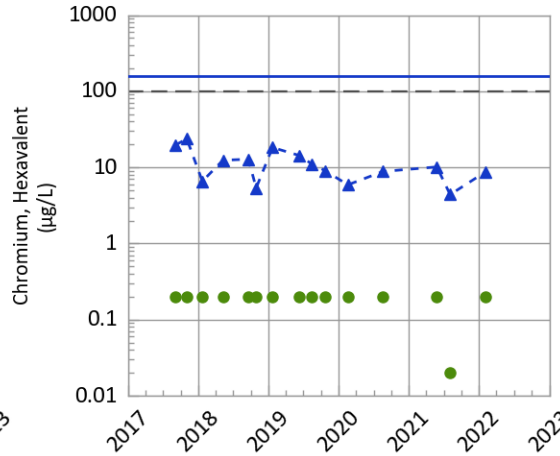
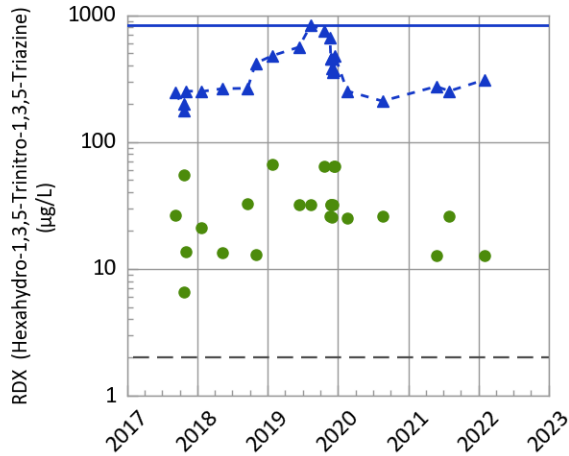
Most Recent Measured COC Concentrations (Feb 01, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	1.63	2.0
MNX	Non-Detect	2.0
CR-6	0.456	100.0
DNX	Non-Detect	2.0
CR	0.97	100.0
TNX	0.115	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



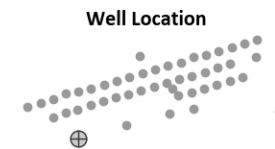
**PTX06-1153 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



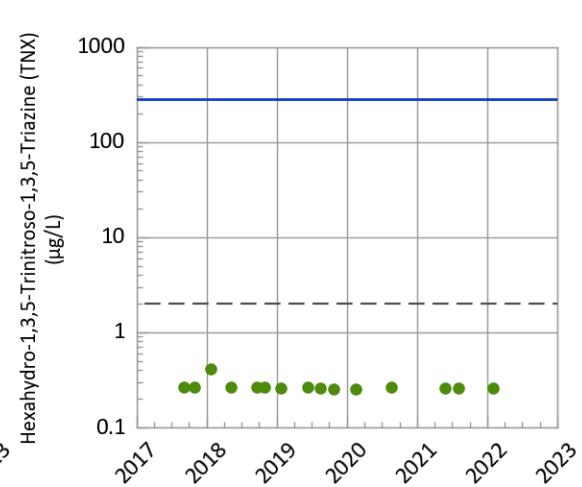
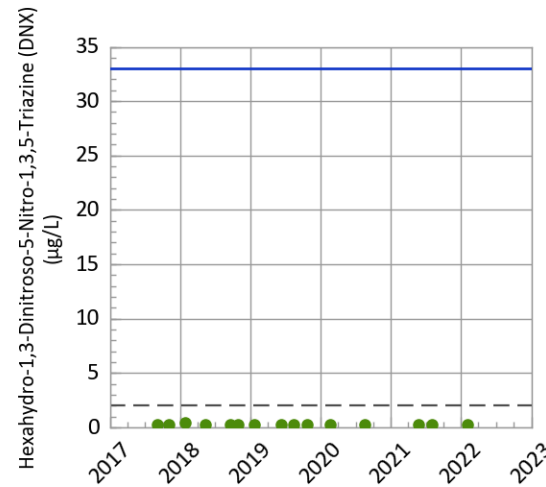
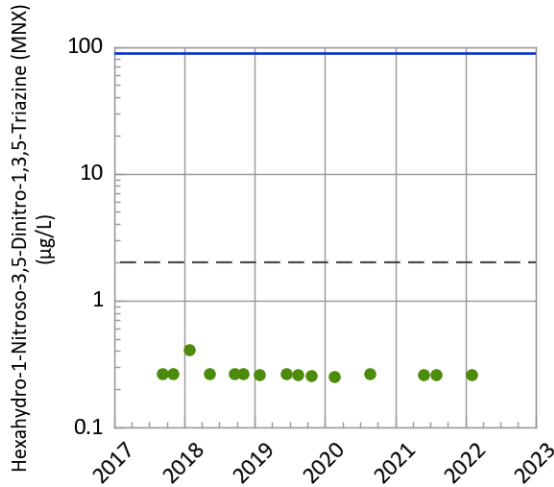
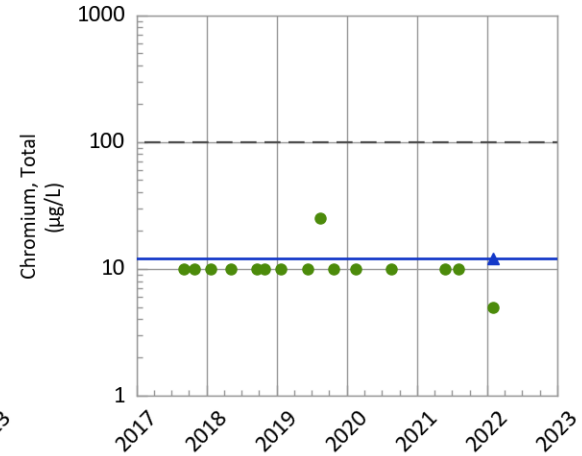
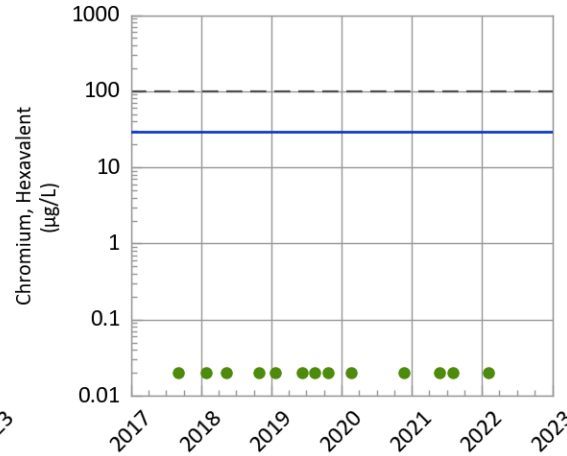
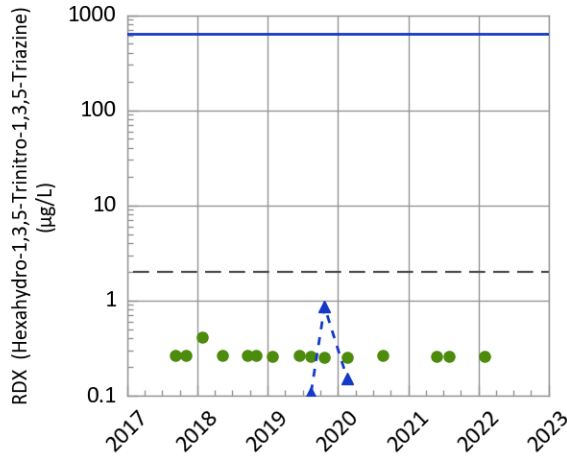
Most Recent Measured COC Concentrations (Feb 01, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	309.0	2.0
MNX	3.26	2.0
CR-6	8.655	100.0
DNX	2.9	2.0
CR	32.0	100.0
TNX	10.6	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1154 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 01, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	Non-Detect	2.0
MNX	Non-Detect	2.0
CR-6	Non-Detect	100.0
DNX	Non-Detect	2.0
CR	12.0	100.0
TNX	Non-Detect	2.0

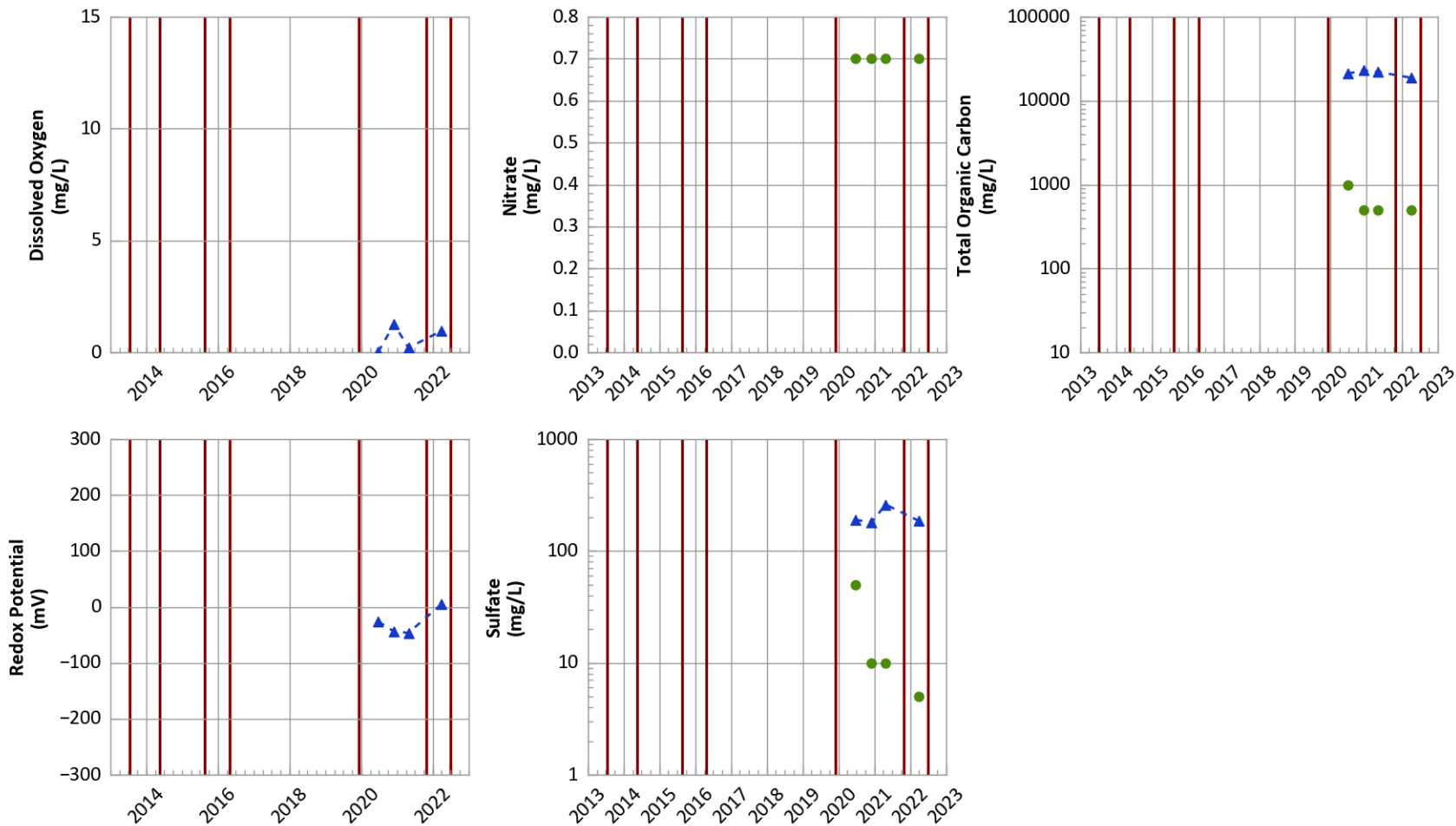
- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



## Zone 11 ISB Graphs



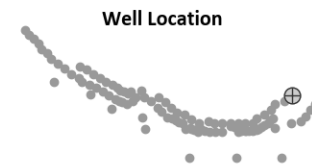
PTX06-ISB055 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



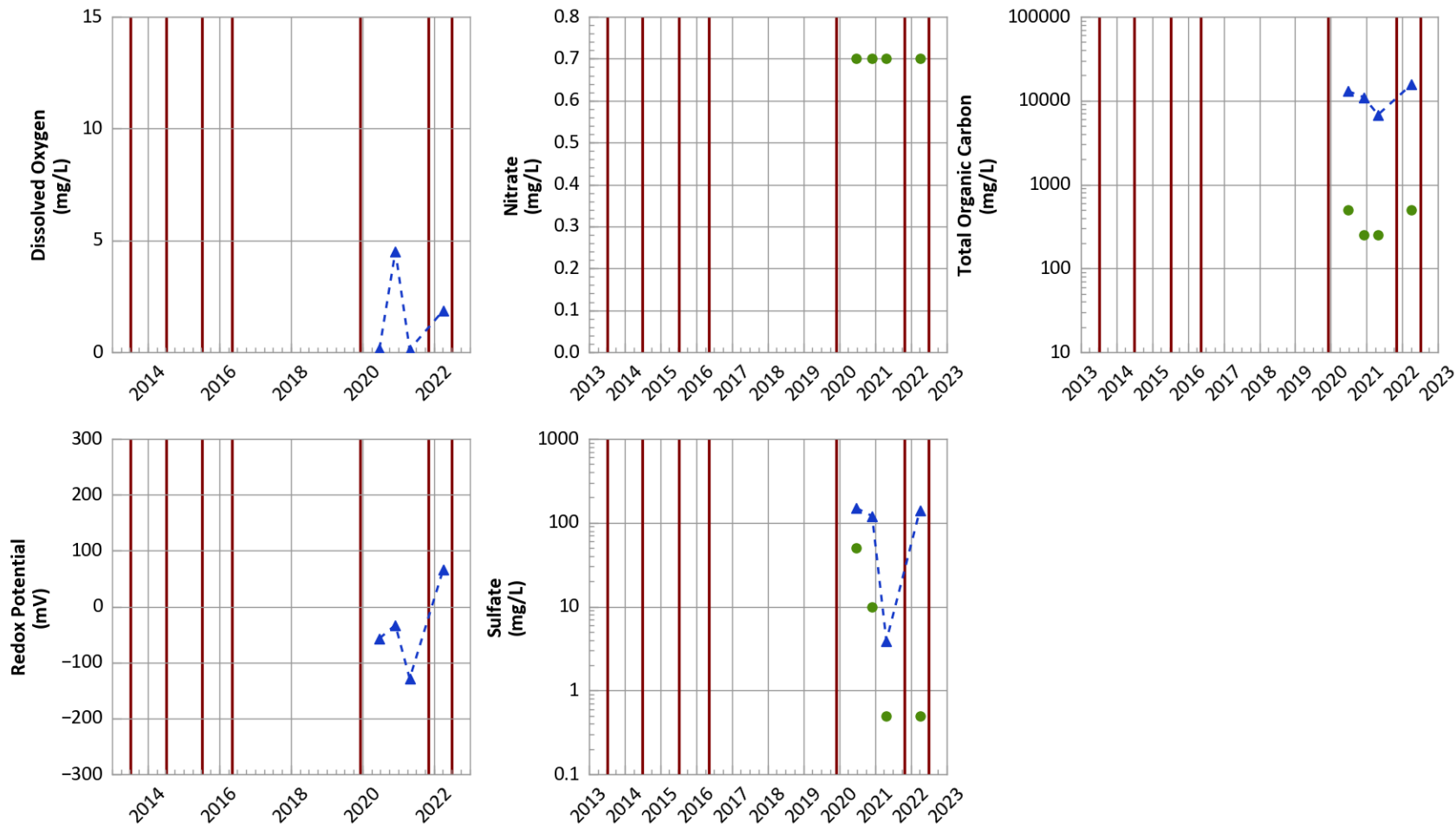
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



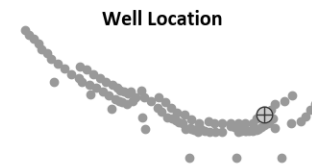
PTX06-ISB059 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



Typical Baseline Concentrations in Perched Groundwater

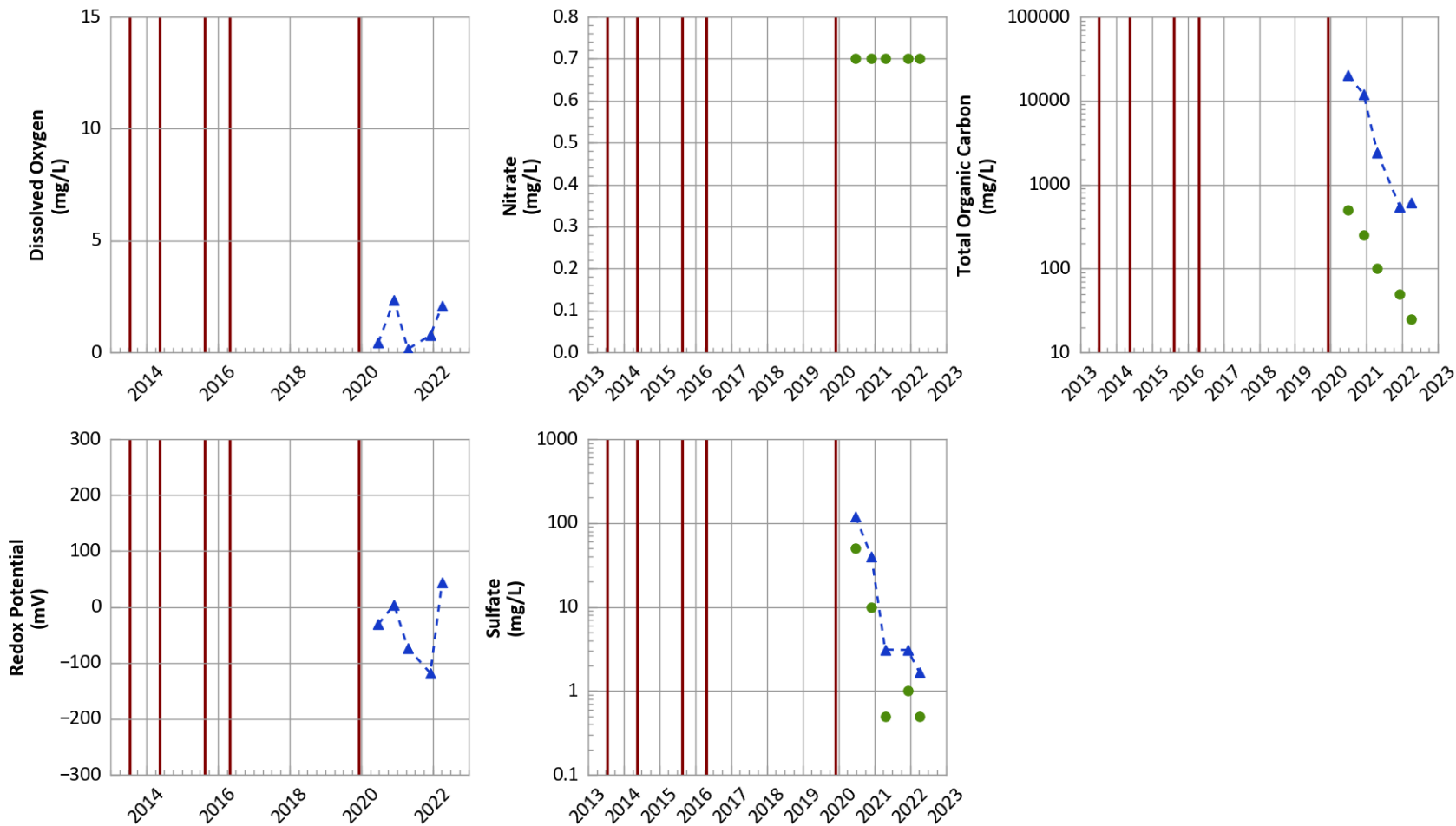
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates





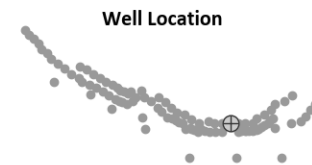
PTX06-ISB064 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



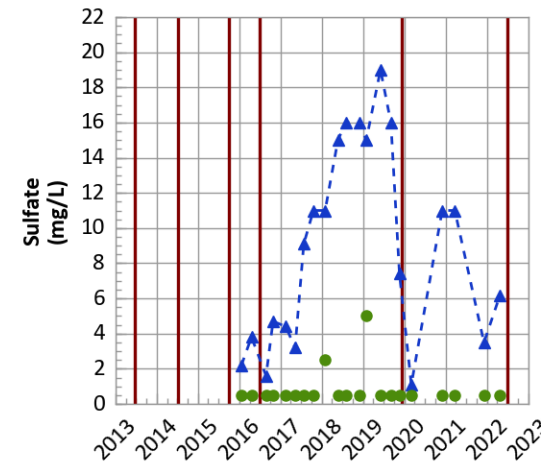
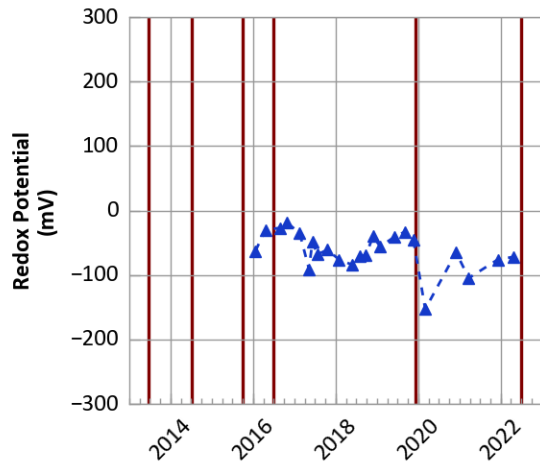
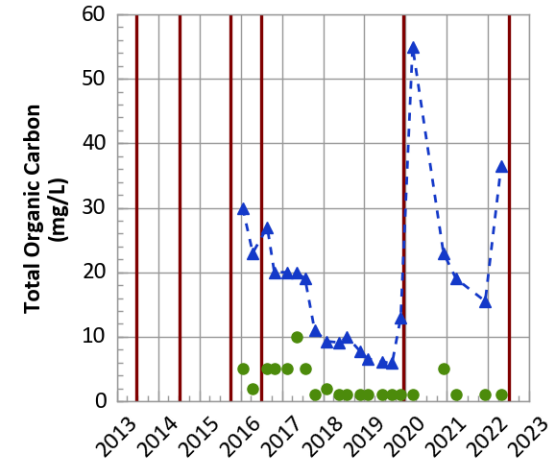
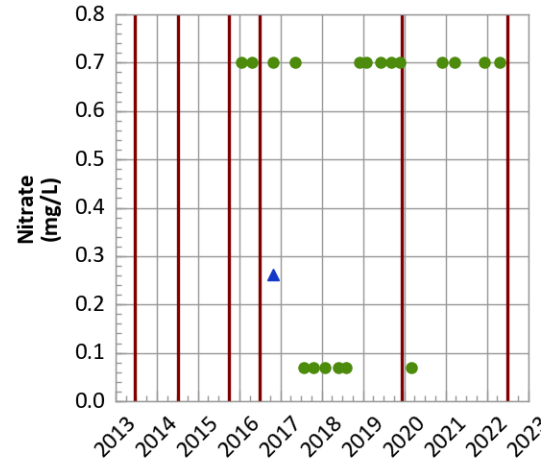
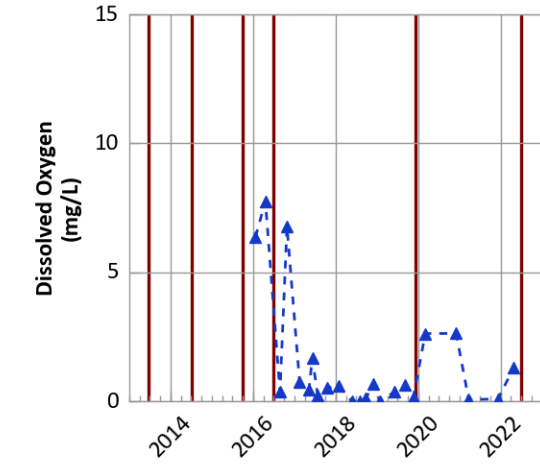
Typical Baseline Concentrations in Perched Groundwater

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates

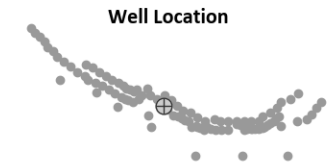


PTX06-ISB075 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant

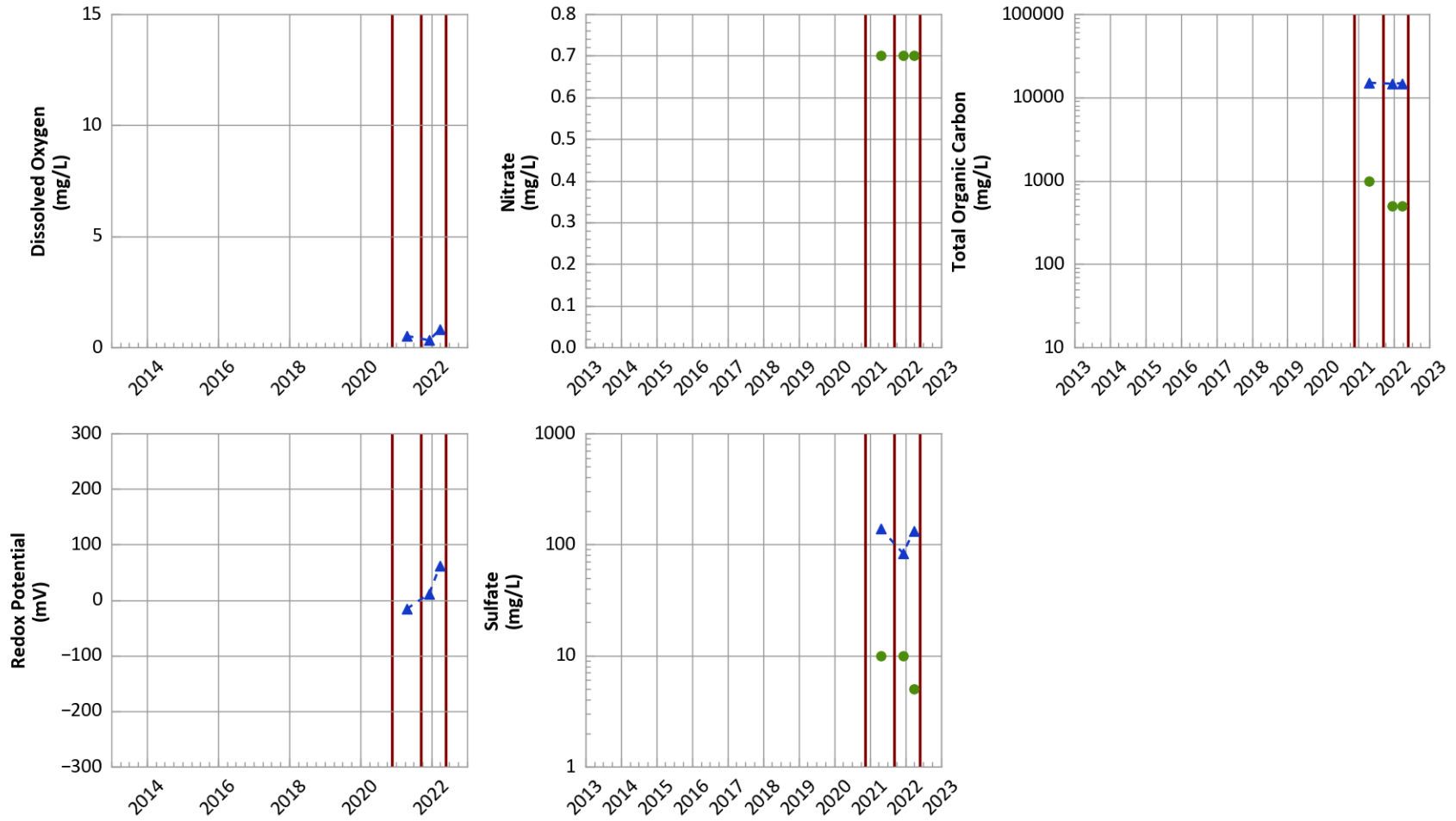


**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



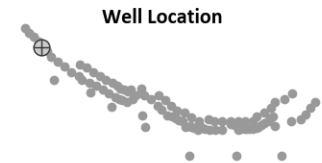
**PTX06-ISB133 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



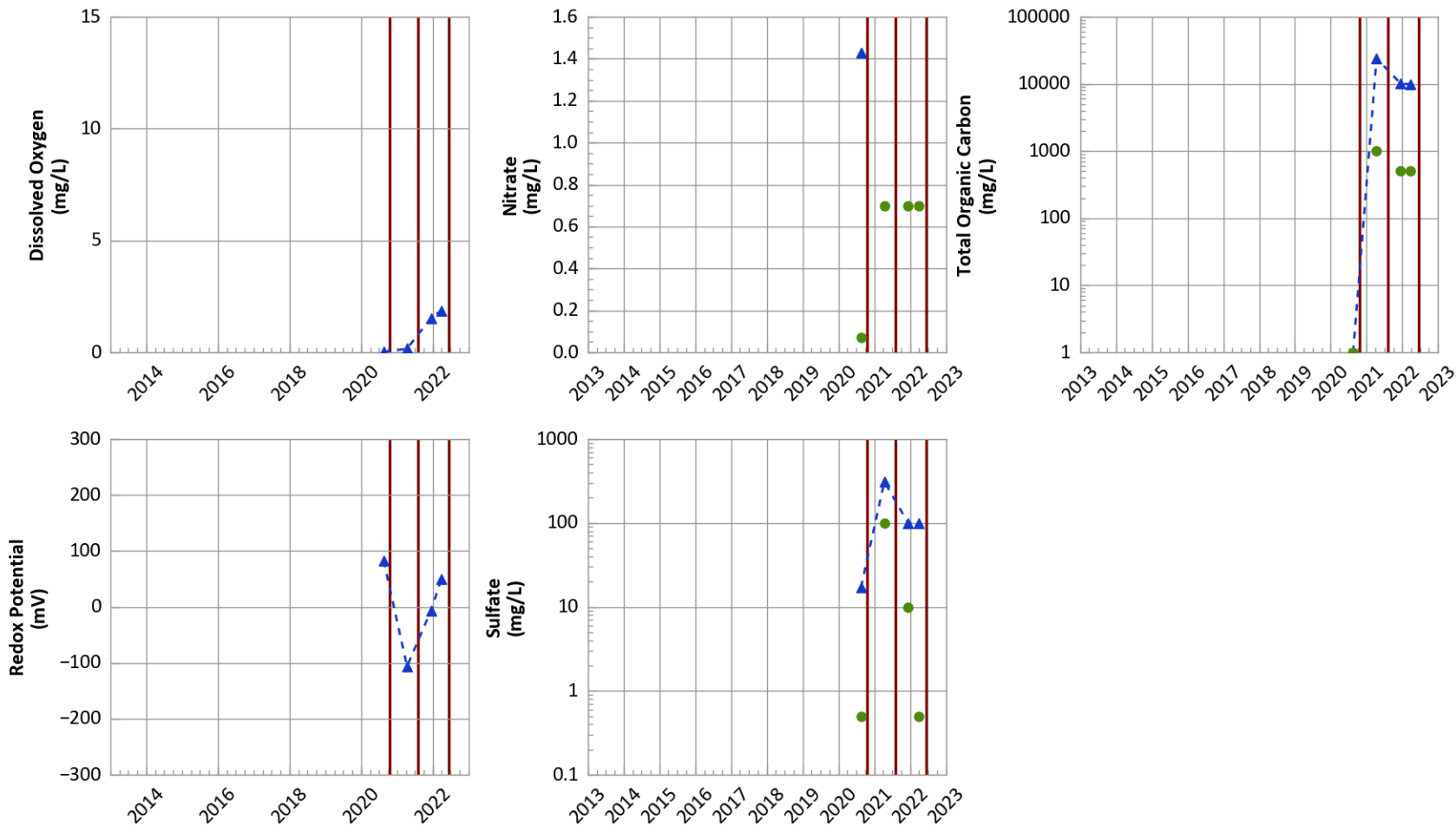
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- Concentration Trend
- Injection Dates



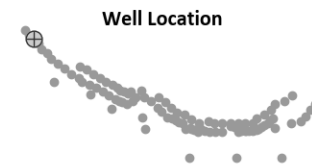
PTX06-ISB135 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



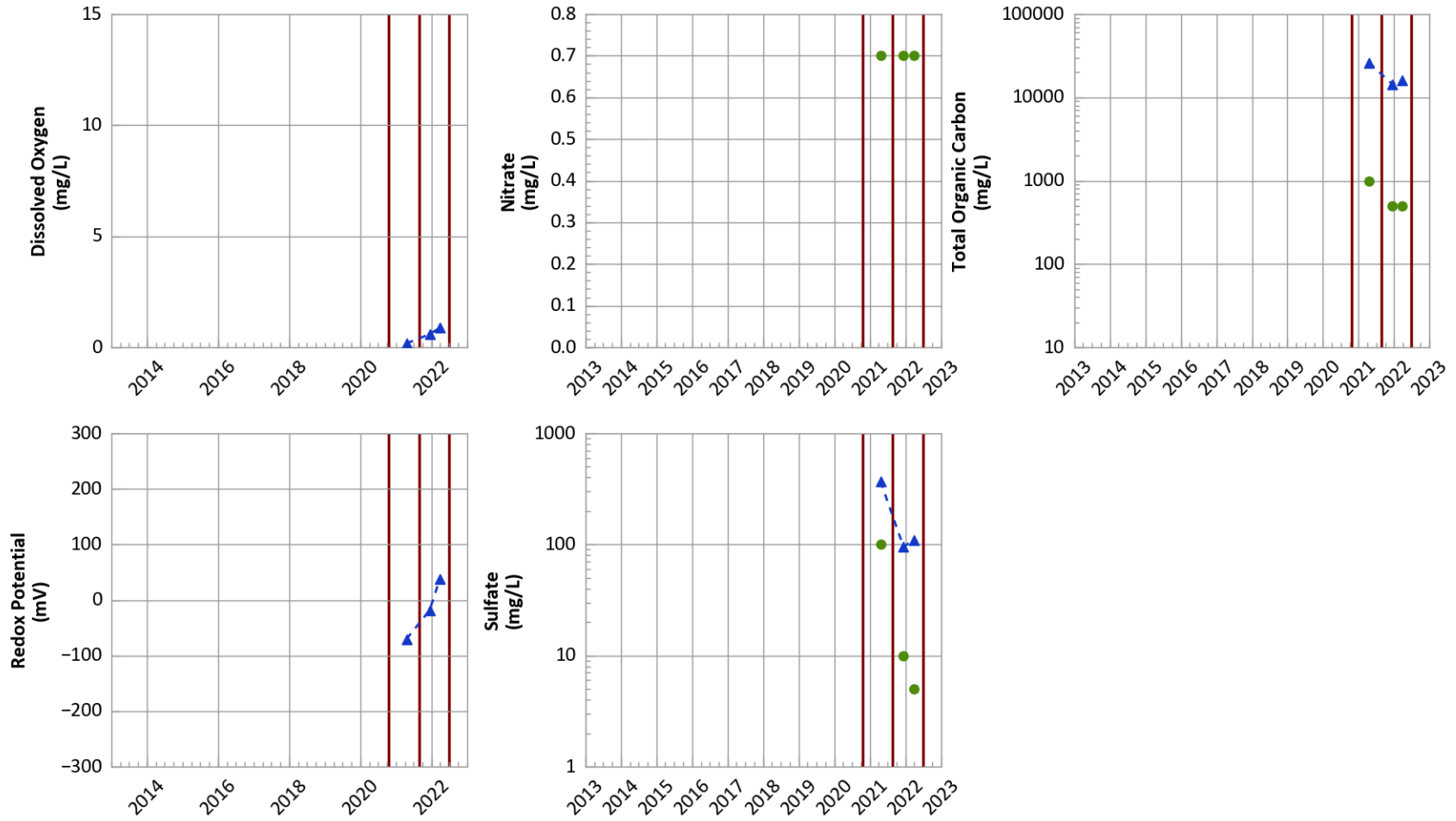
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



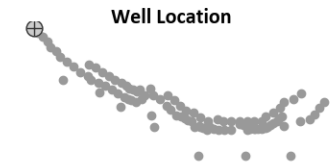
**PTX06-ISB137 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



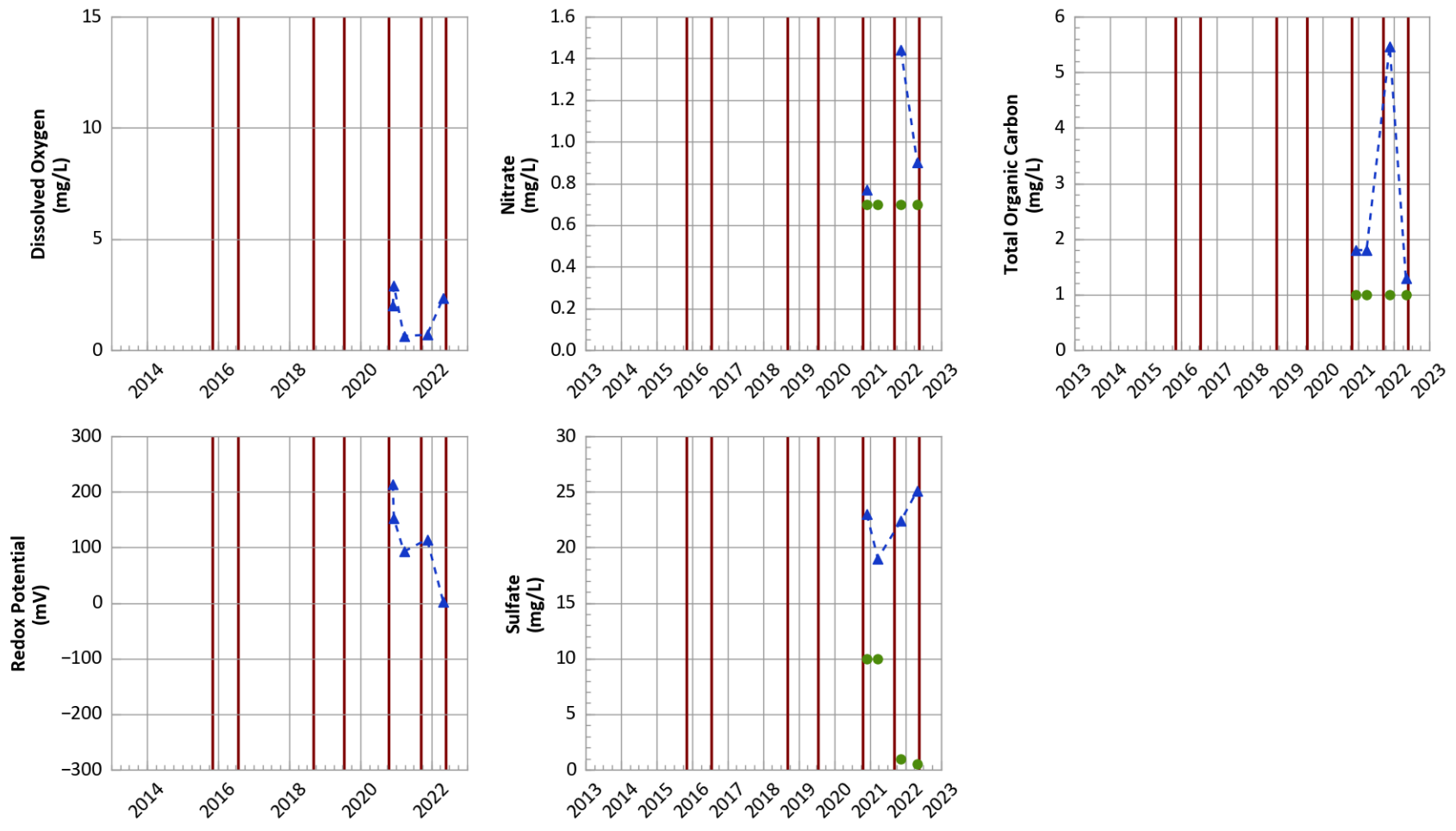
**Typical Baseline Concentrations in Perched Groundwater**

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



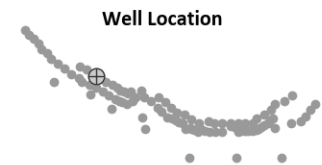
**PTX06-1164 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



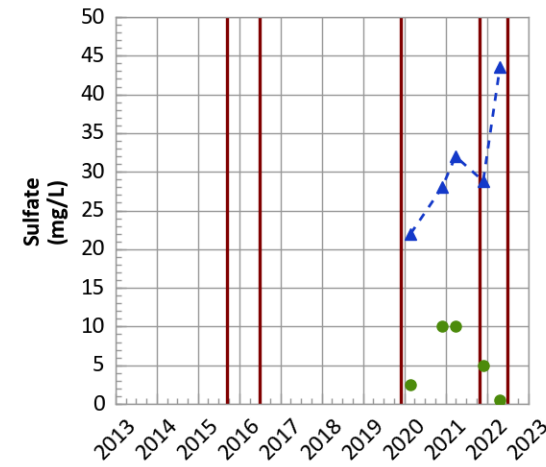
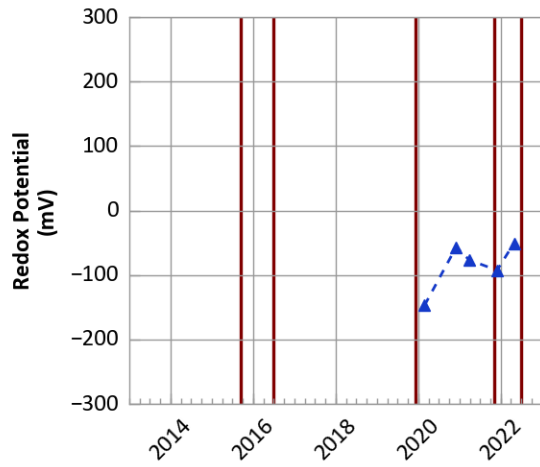
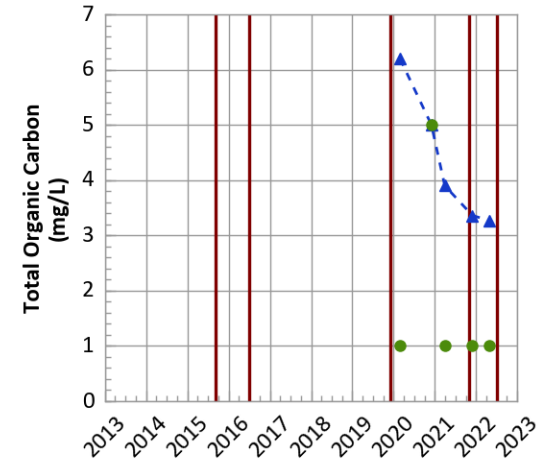
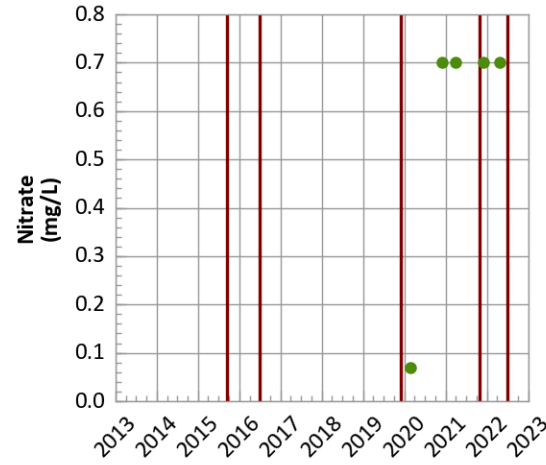
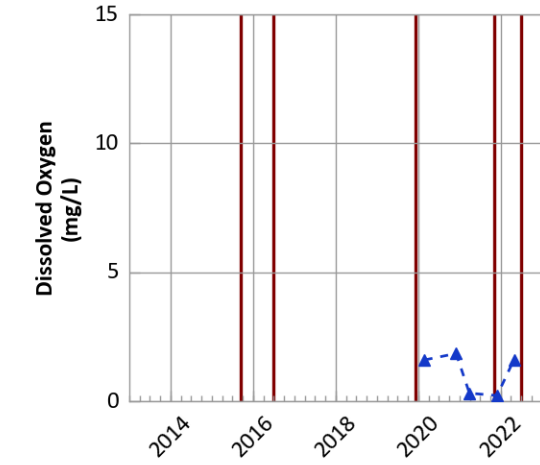
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



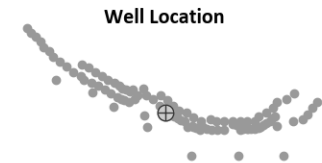
**PTX06-1169 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



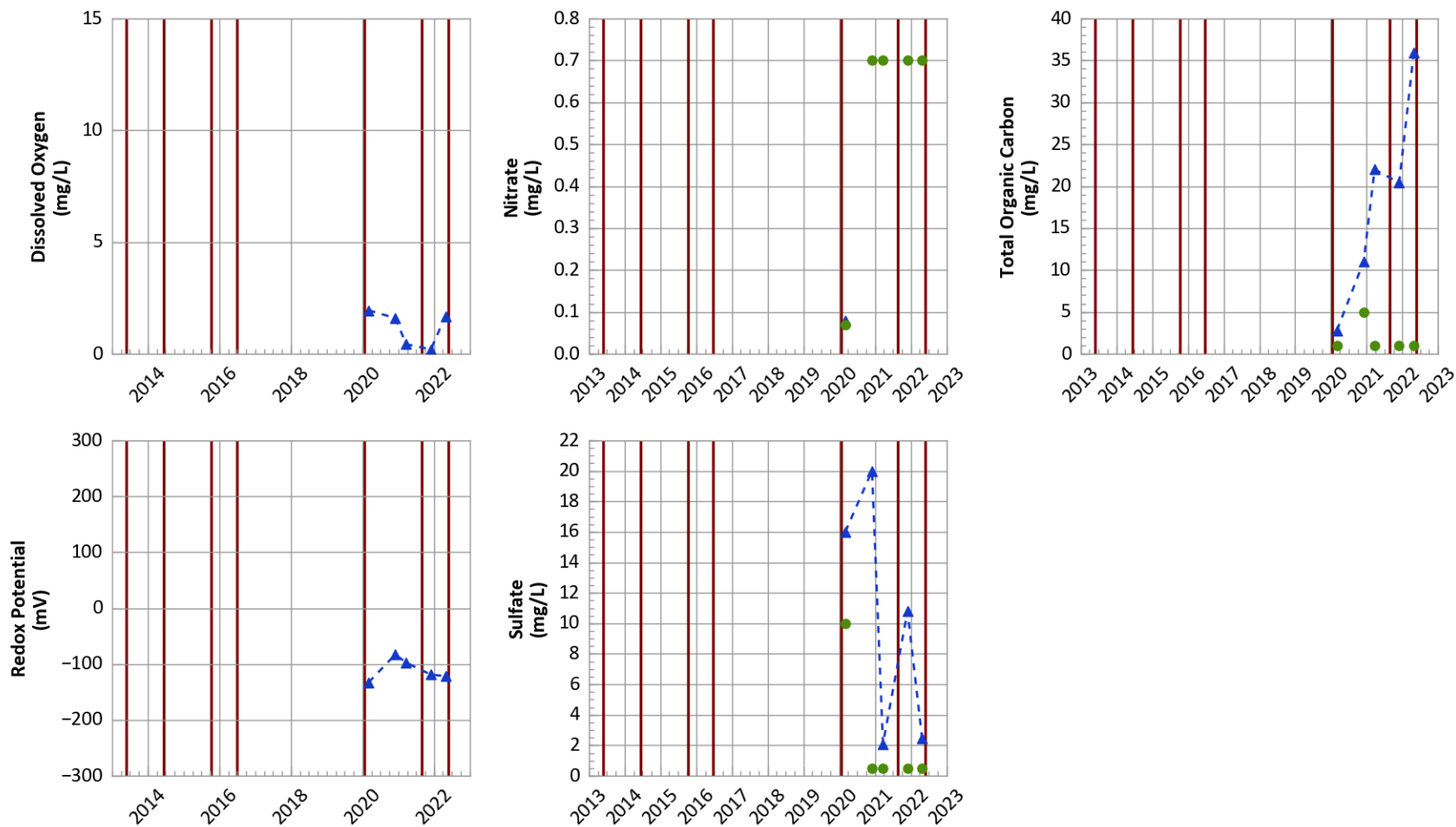
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



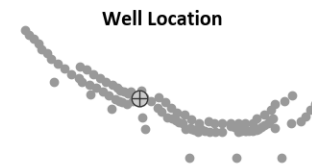
**PTX06-1170 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



**Typical Baseline Concentrations in Perched Groundwater**

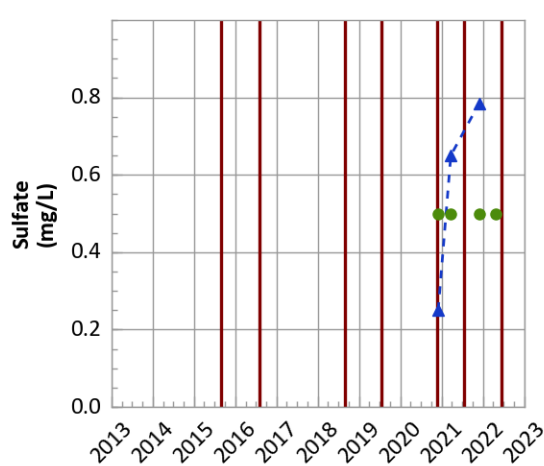
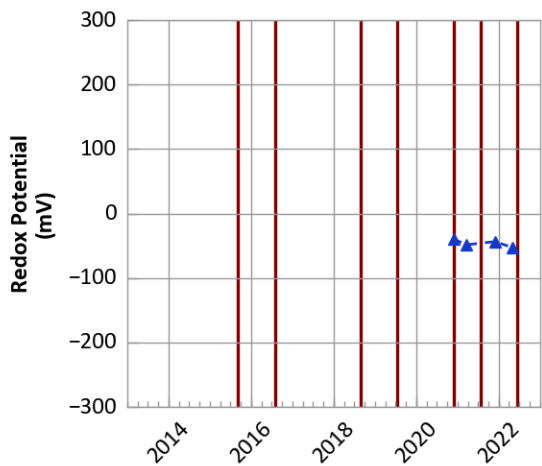
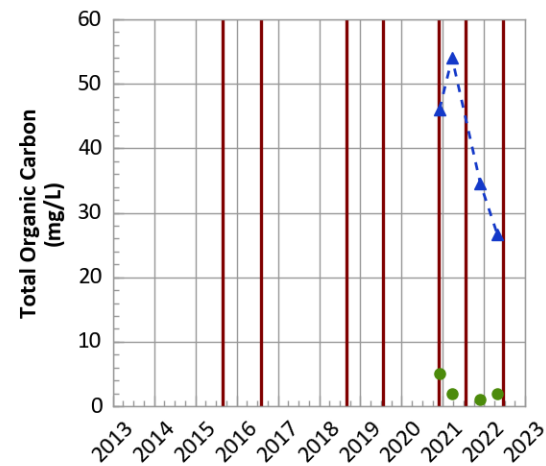
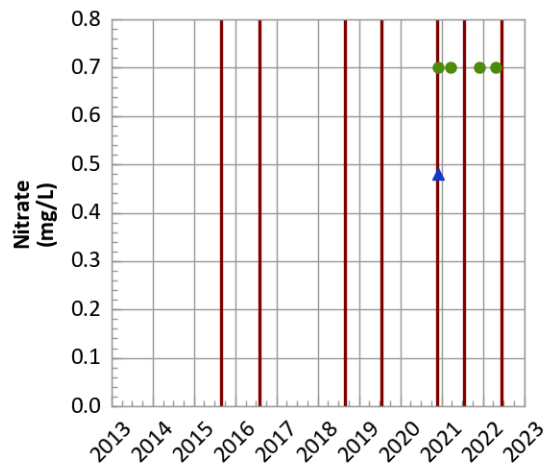
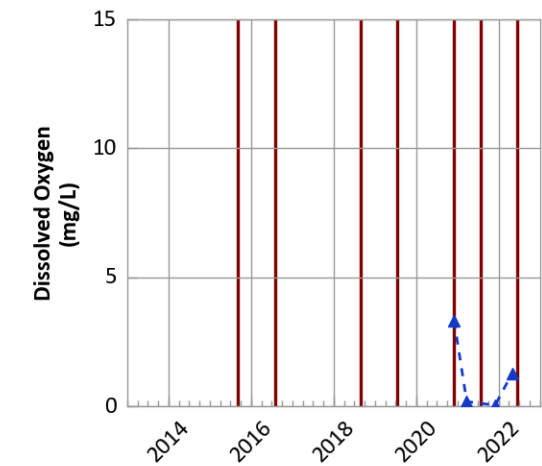
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates





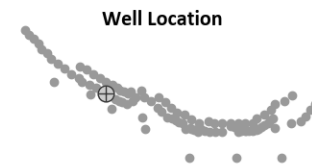
**PTX06-1176 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



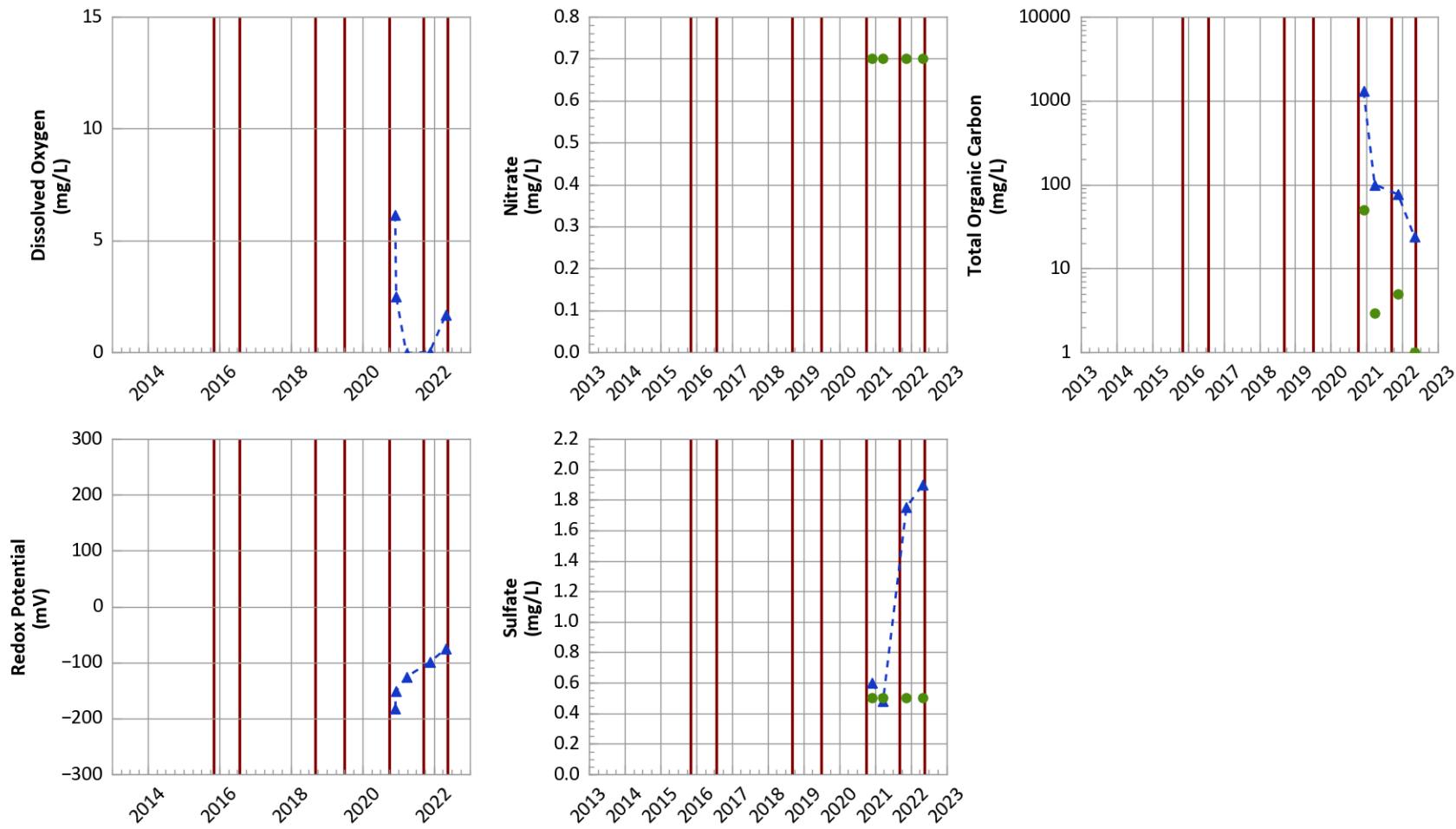
**Typical Baseline Concentrations in Perched Groundwater**

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



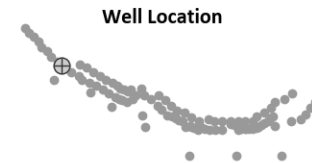
**PTX06-1177 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



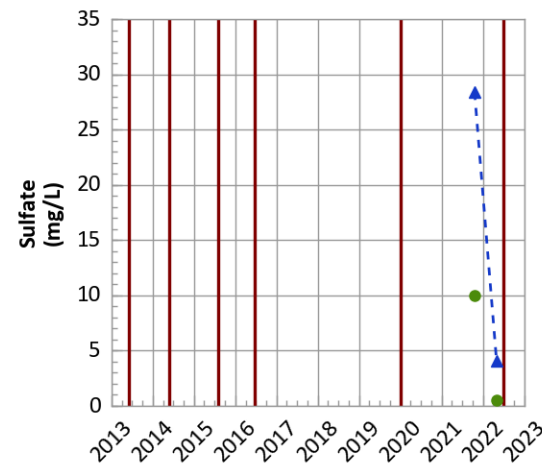
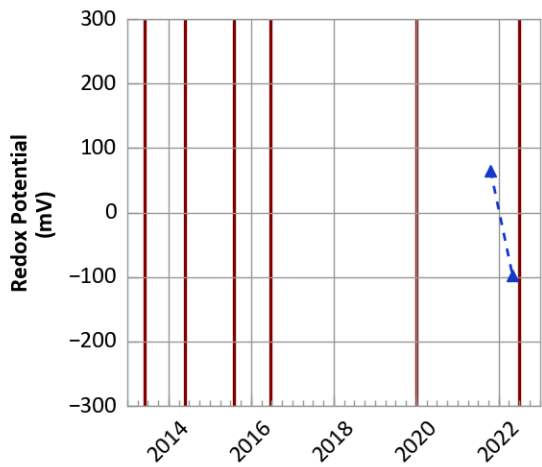
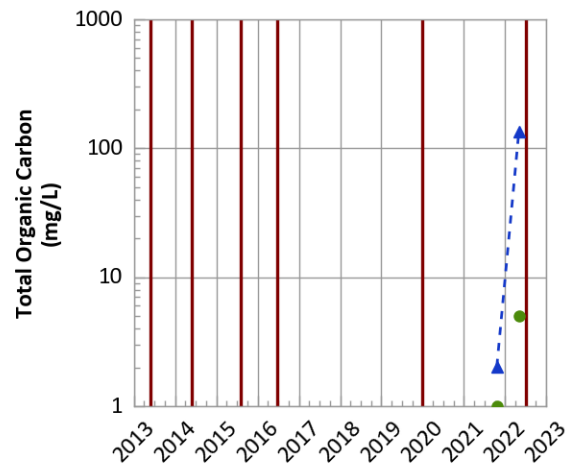
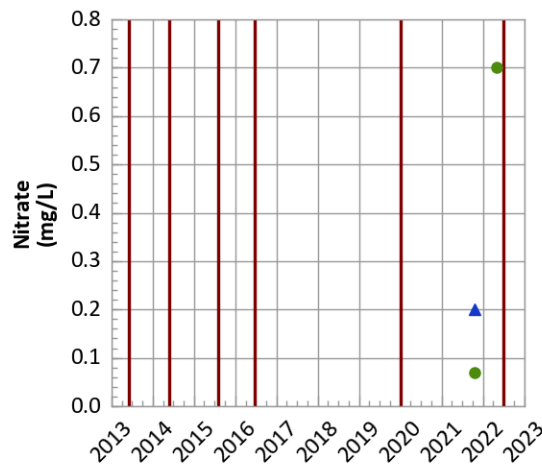
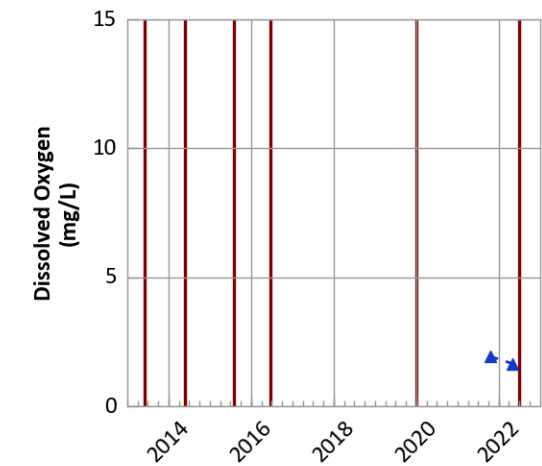
**Typical Baseline Concentrations in Perched Groundwater**

- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



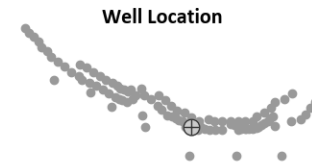
**PTX06-1209 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



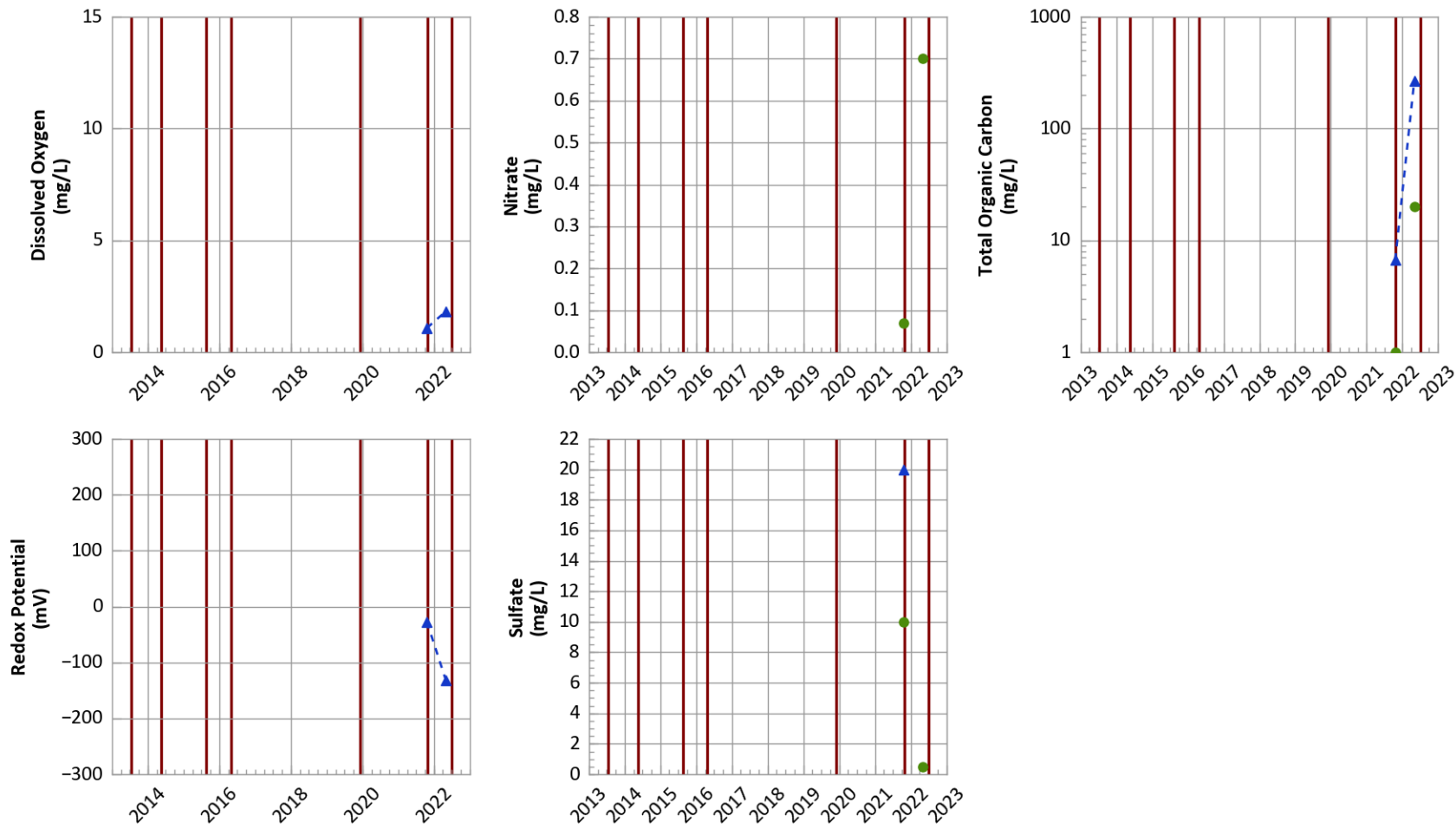
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



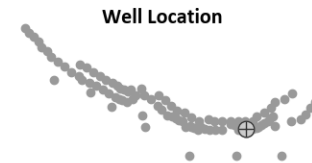
**PTX06-1210 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



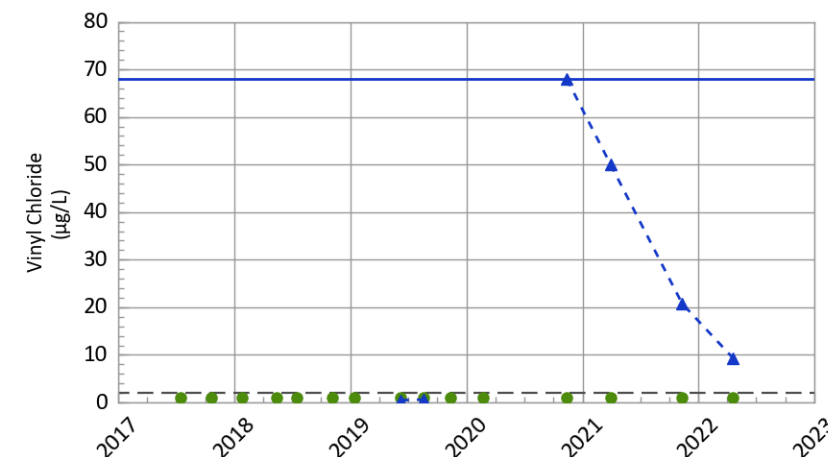
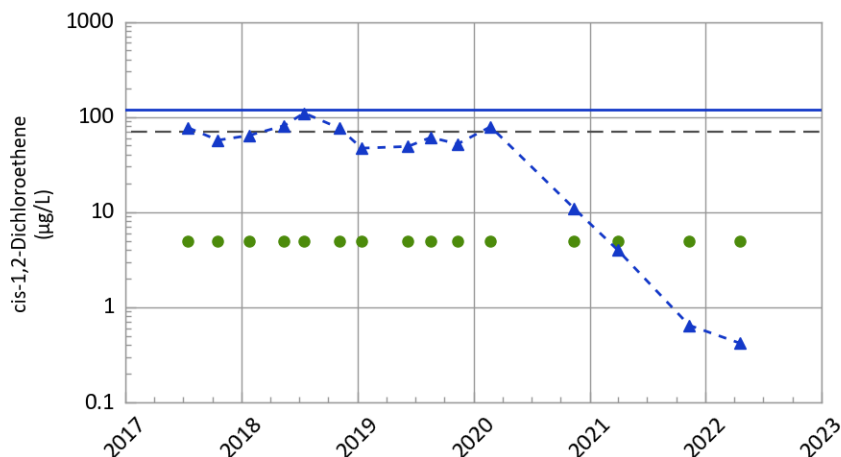
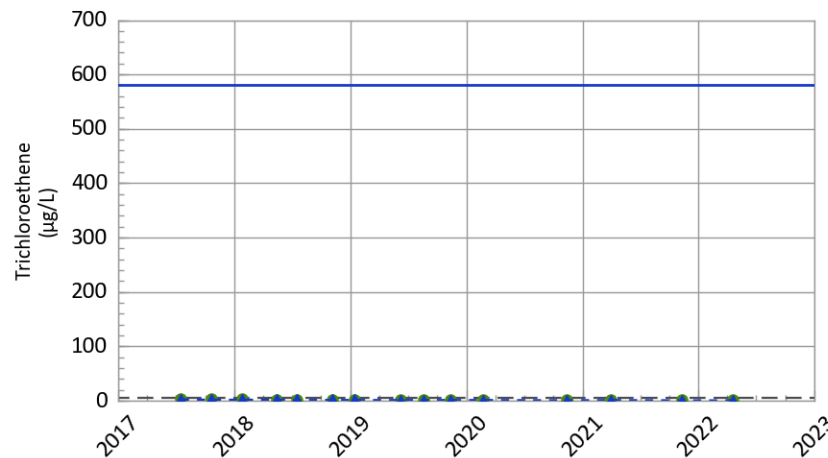
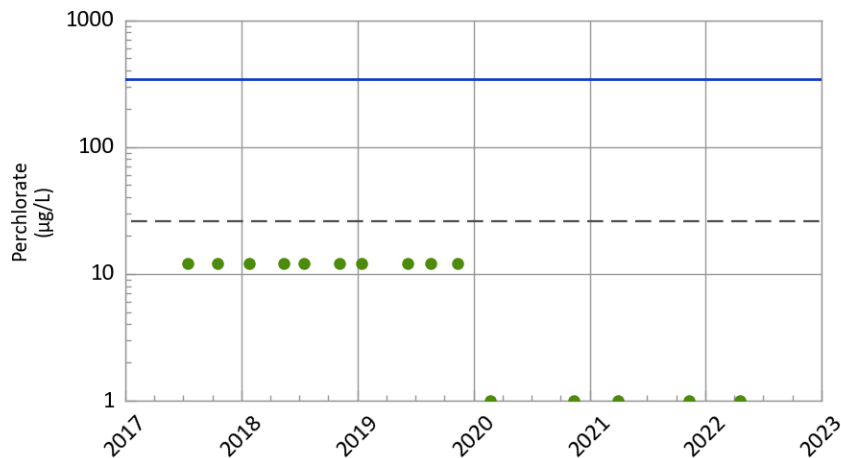
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- Concentration Trend
- Injection Dates



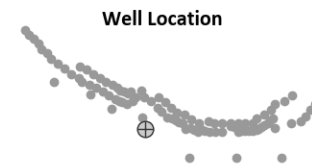
**PTX06-1012 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



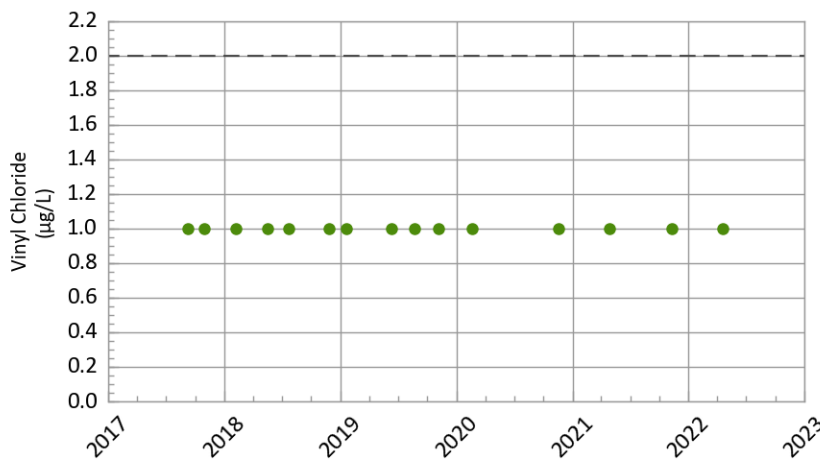
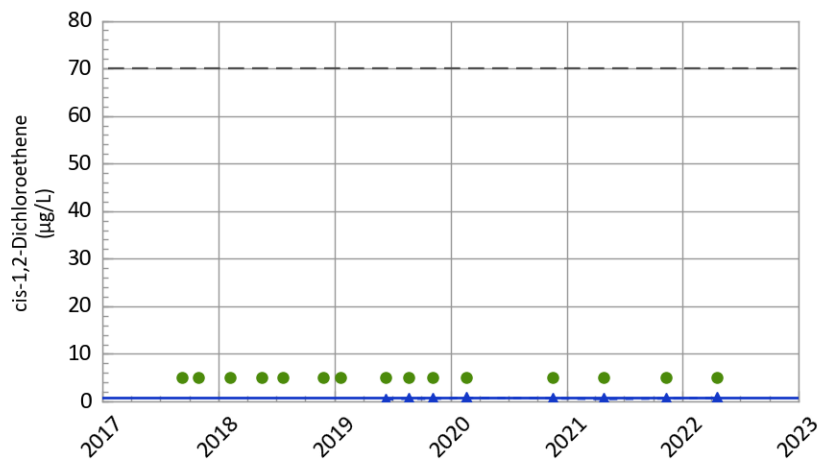
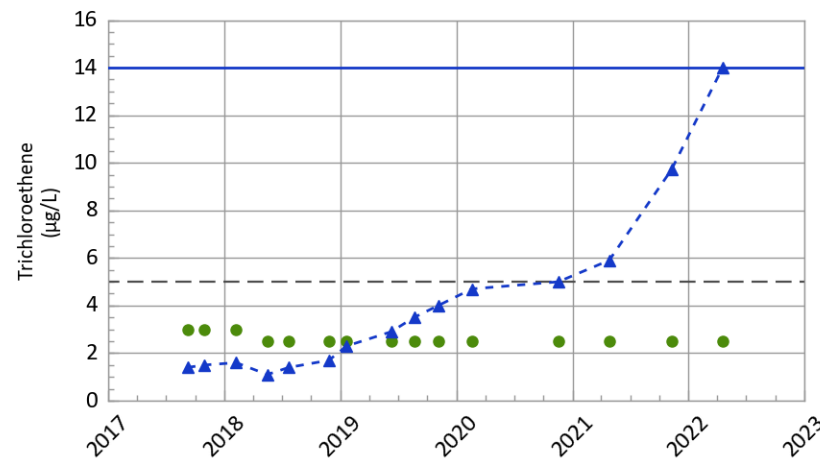
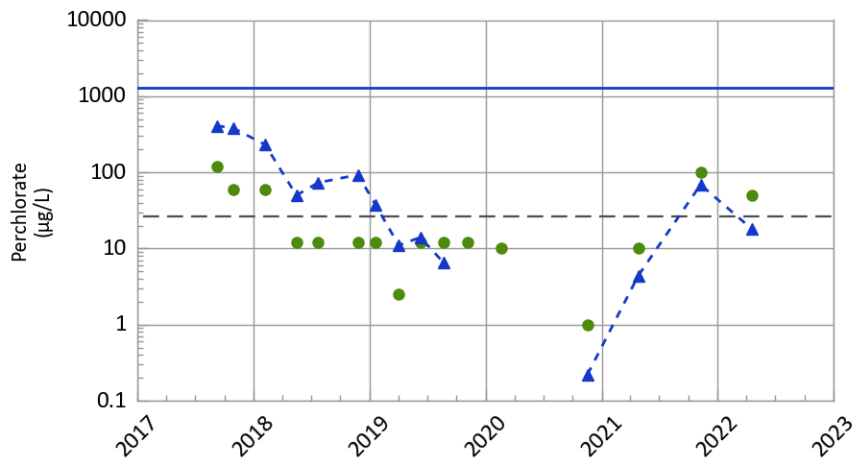
Most Recent Measured COC Concentrations (Apr 19, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	0.419	70.0
TCE	0.199	5.0
VC	9.35	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



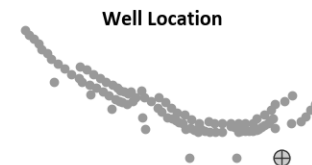
**PTX06-1148 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



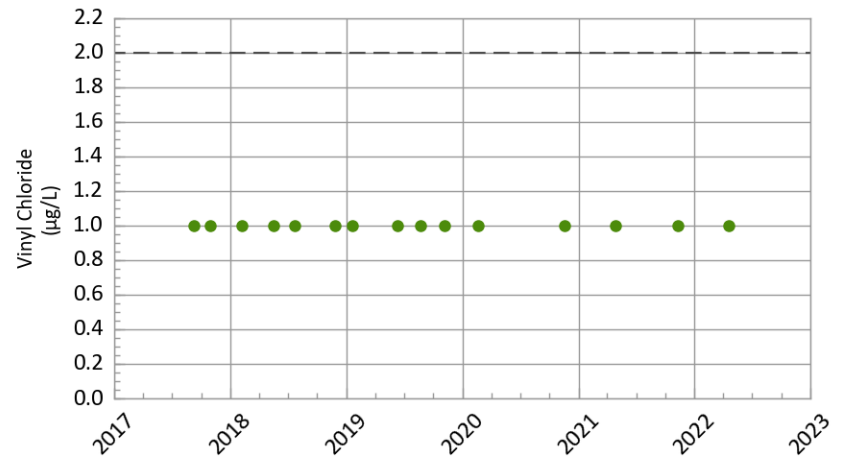
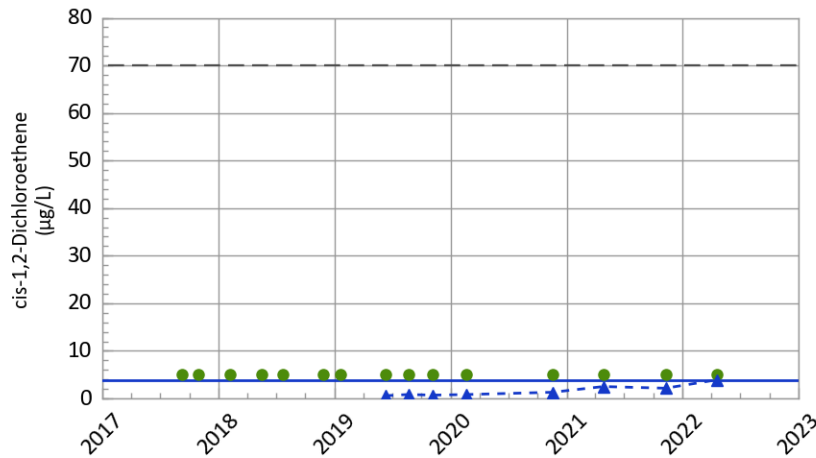
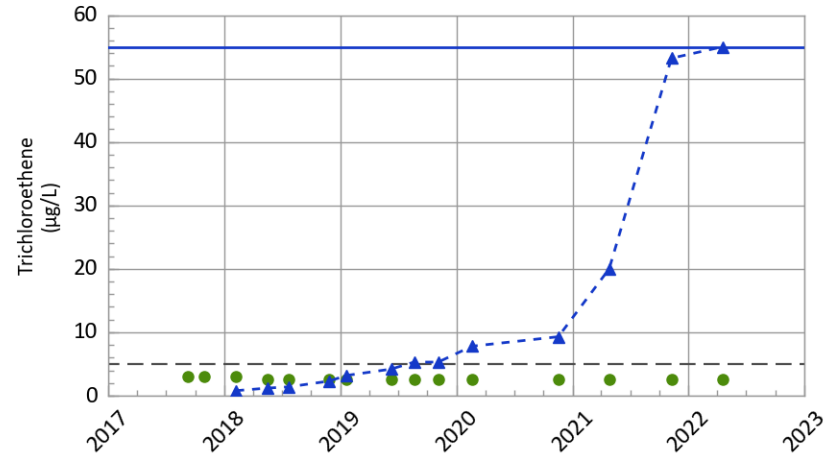
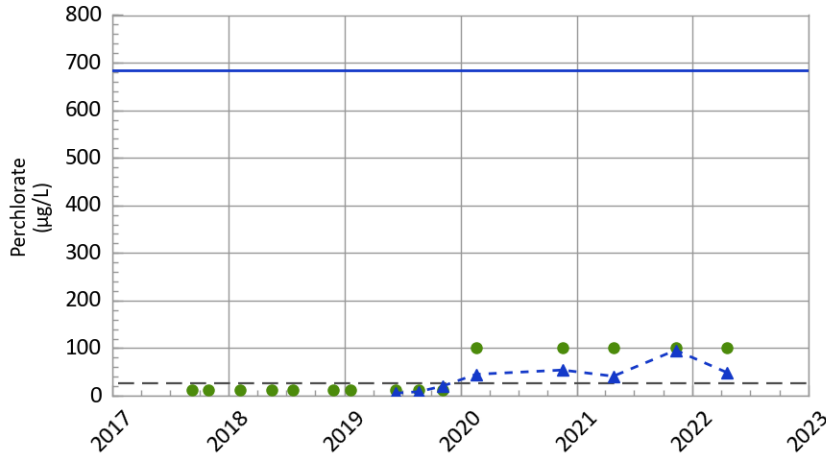
Most Recent Measured COC Concentrations (Apr 18, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	18.1	26.0
DCE12C	0.708	70.0
TCE	14.0	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



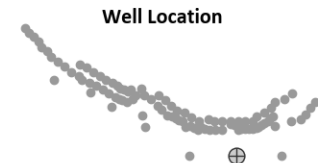
**PTX06-1149 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



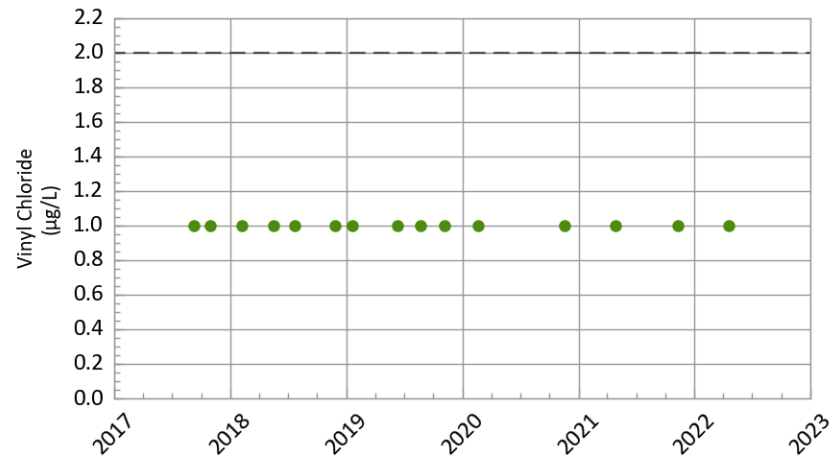
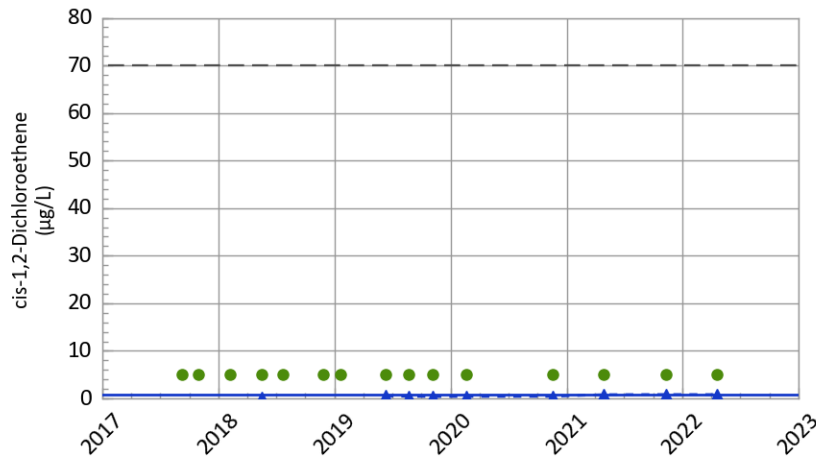
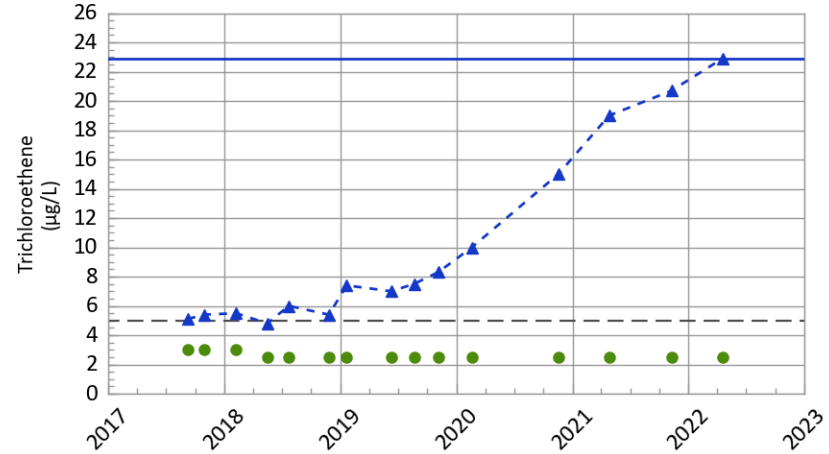
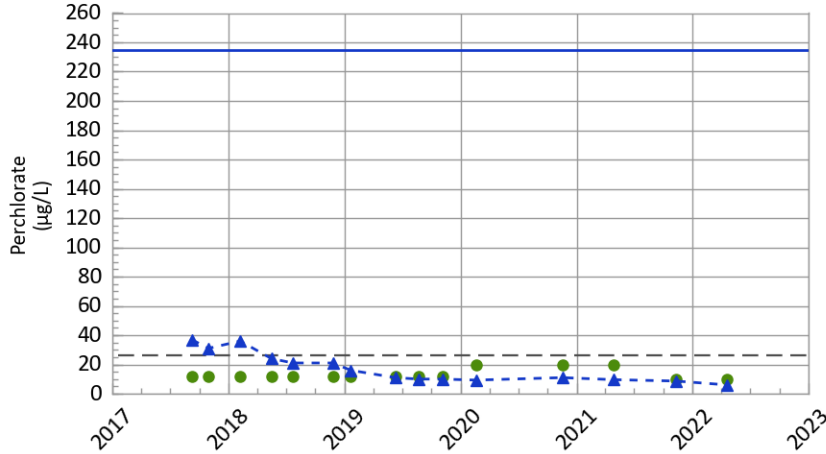
Most Recent Measured COC Concentrations (Apr 18, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	49.0	26.0
DCE12C	3.91	70.0
TCE	55.0	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



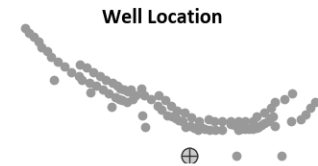
**PTX06-1150 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Apr 18, 2022)

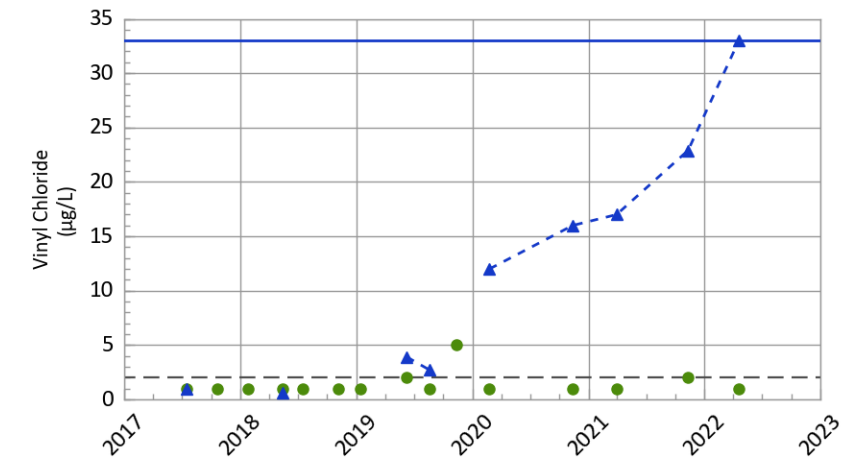
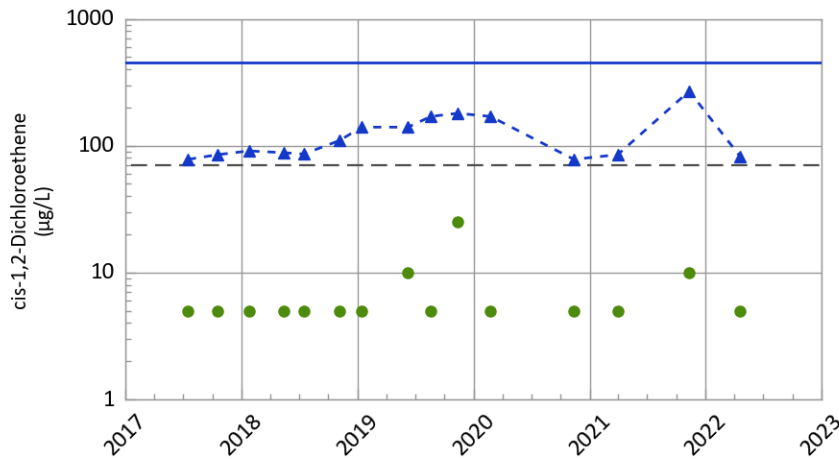
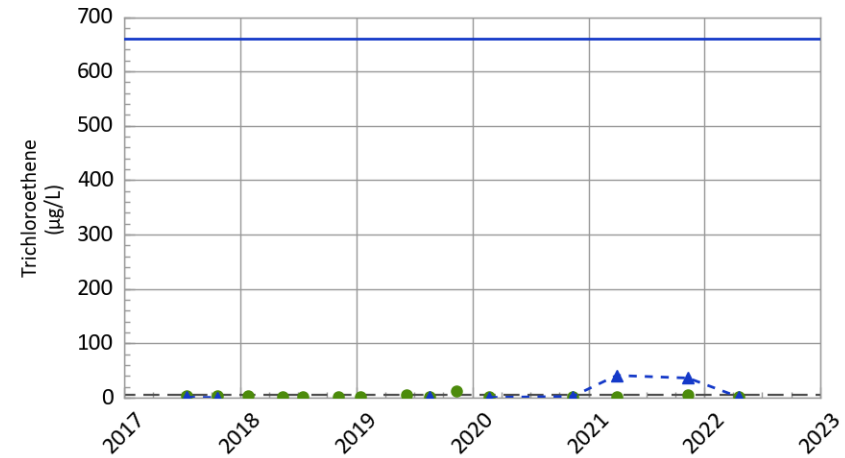
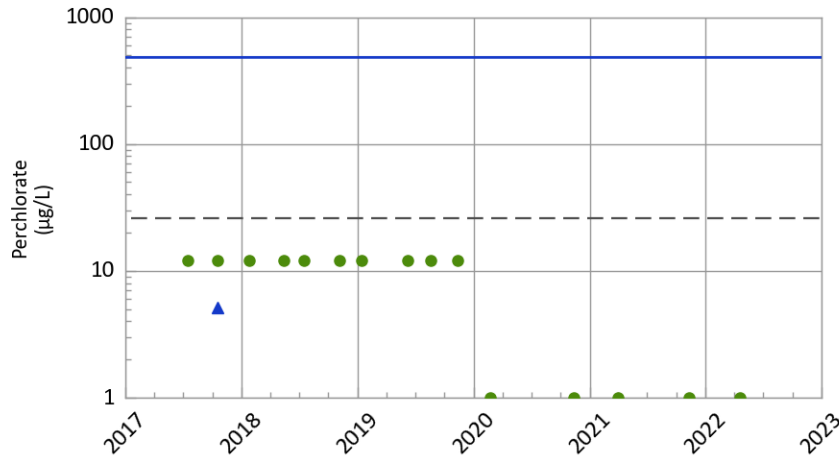
COC	Concentration (µg/L)	GWPS (µg/L)
PERC	6.05	26.0
DCE12C	0.818	70.0
TCE	22.9	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard





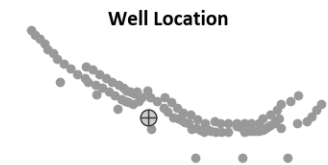
**PTX06-1155 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



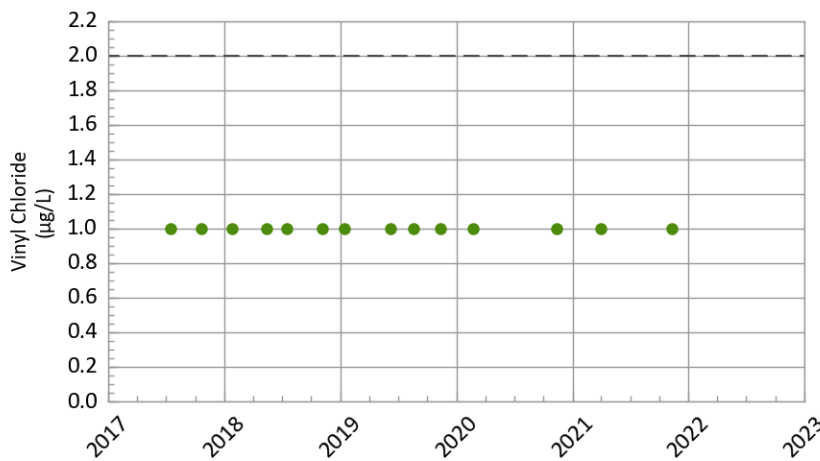
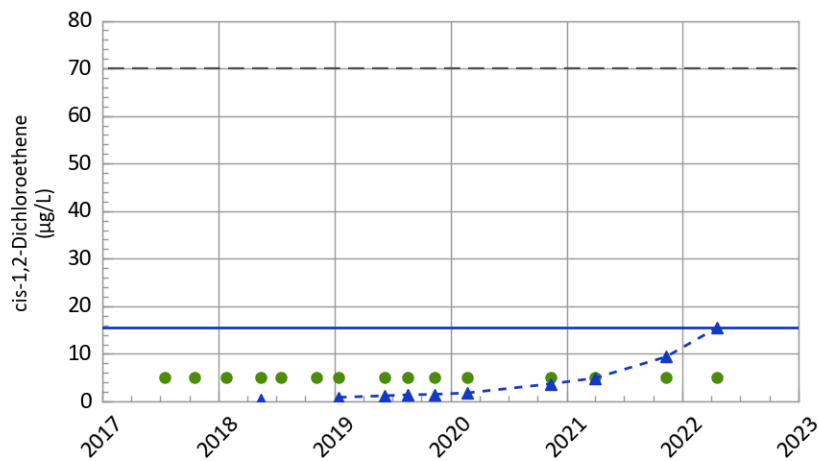
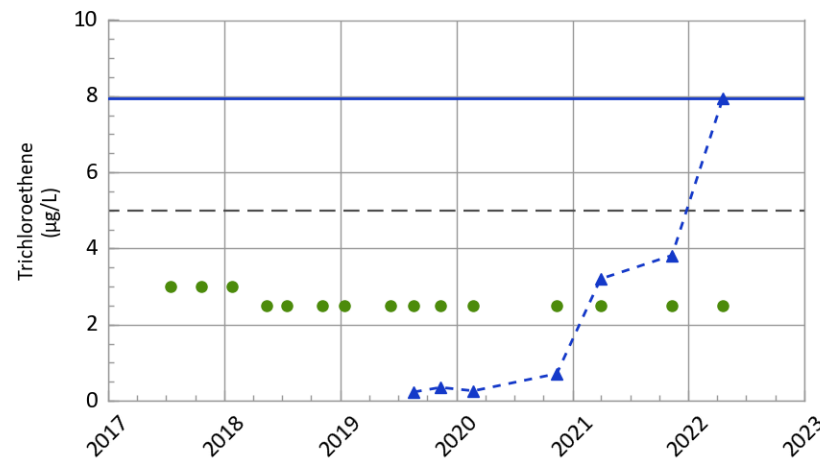
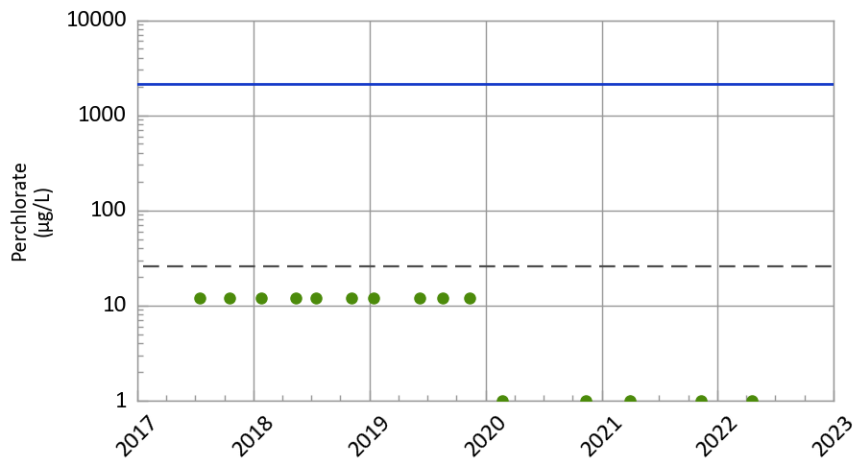
Most Recent Measured COC Concentrations (Apr 19, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	82.5	70.0
TCE	1.26	5.0
VC	33.0	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



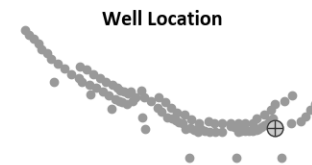
**PTX06-1156 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



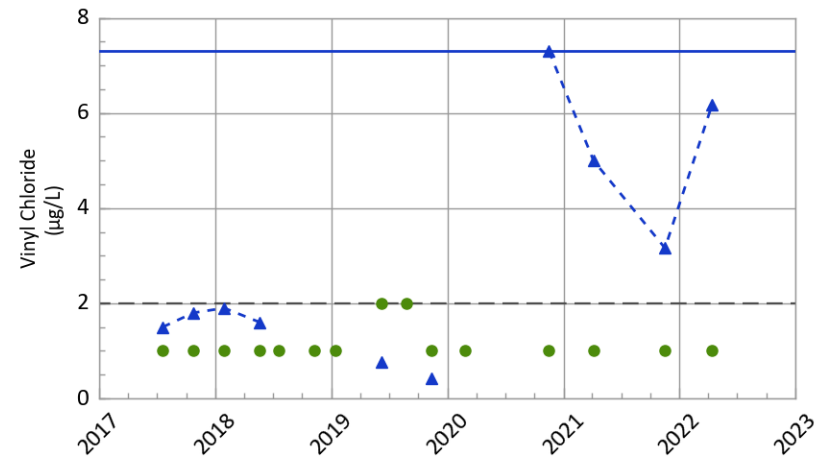
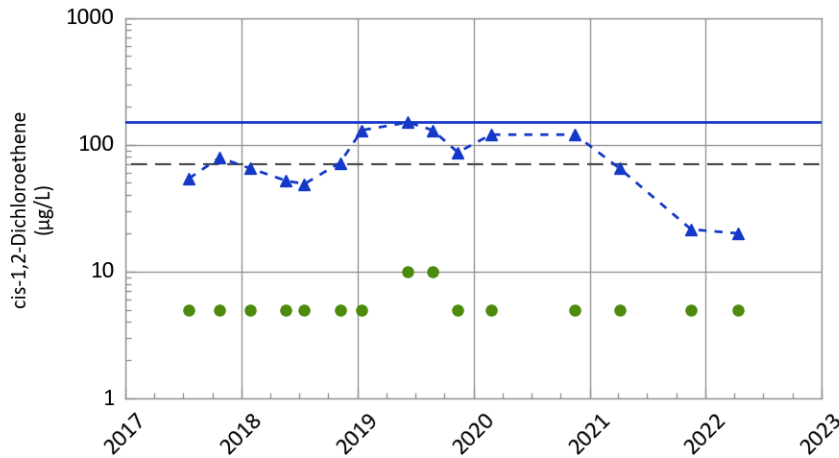
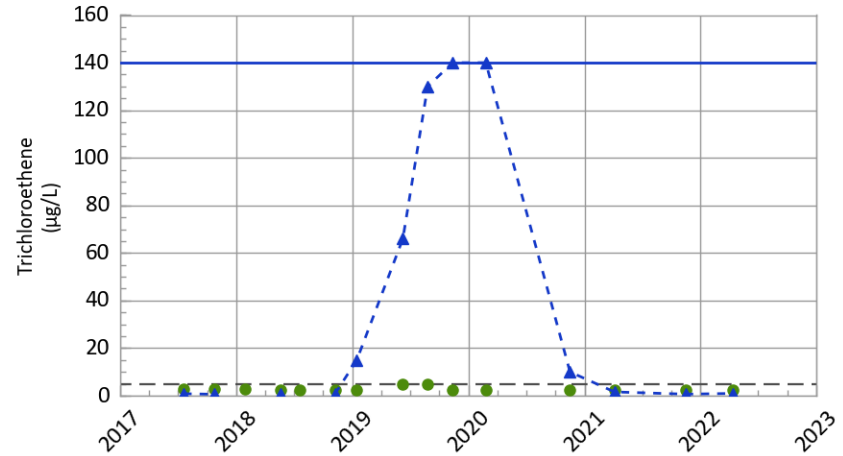
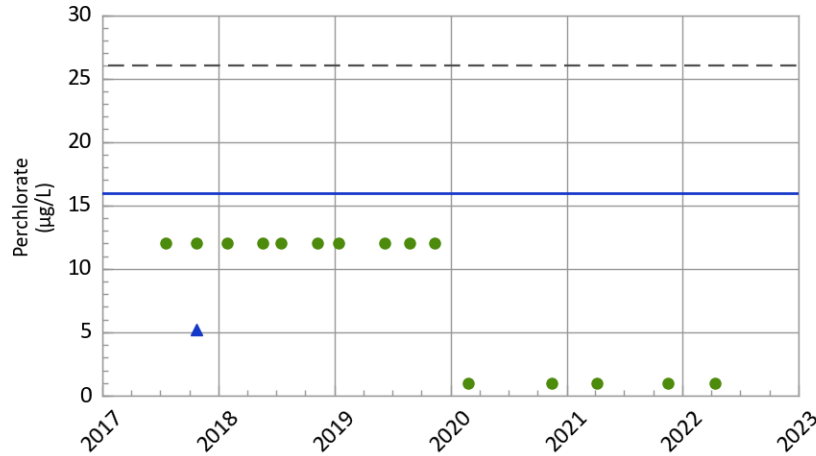
Most Recent Measured COC Concentrations (Nov 10, 2021)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	15.5	70.0
TCE	7.95	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



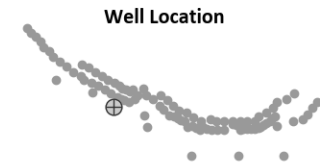
**PTX06-1173 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



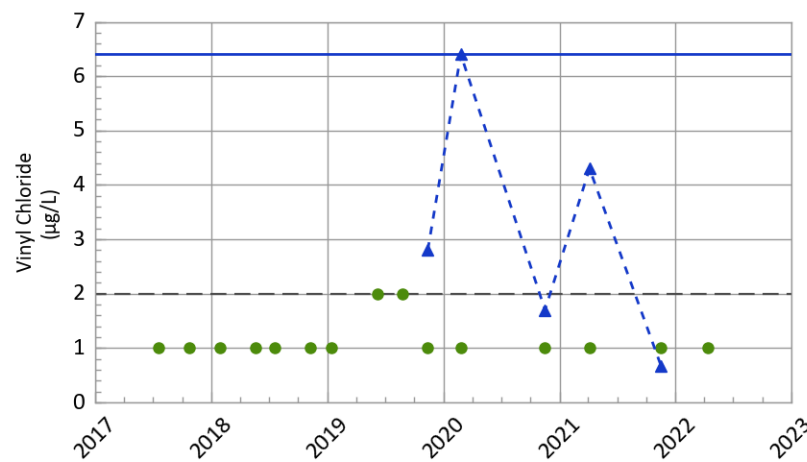
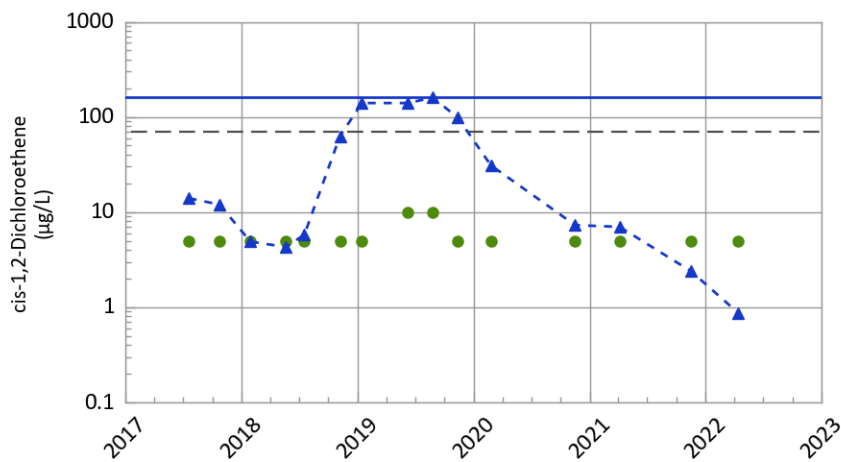
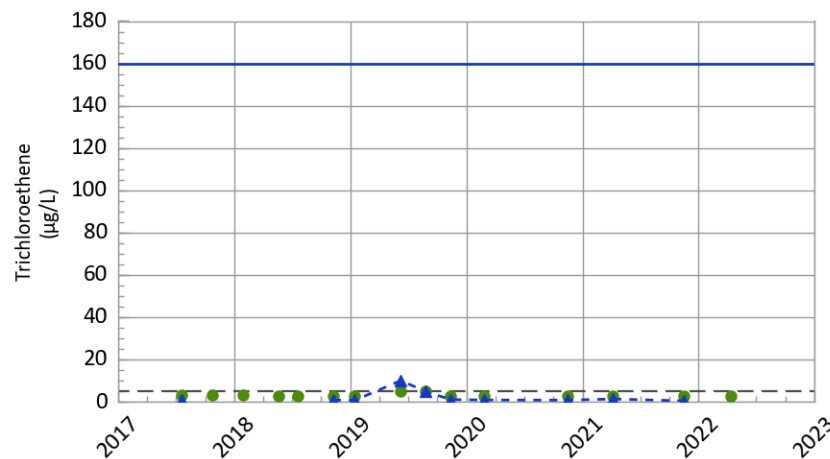
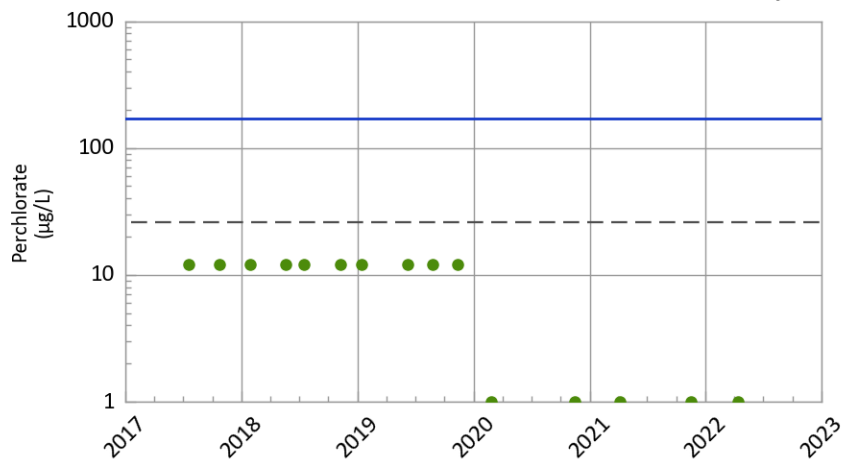
Most Recent Measured COC Concentrations (Apr 13, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	20.0	70.0
TCE	0.964	5.0
VC	6.17	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



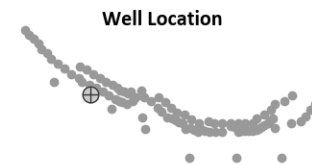
**PTX06-1174 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



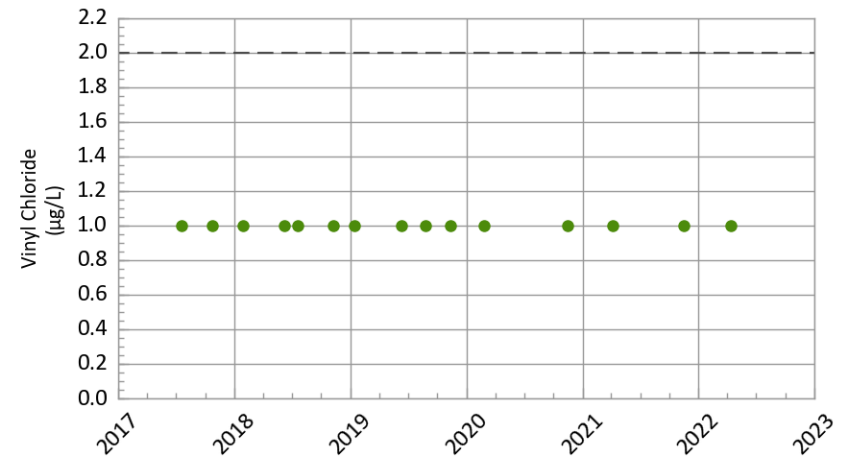
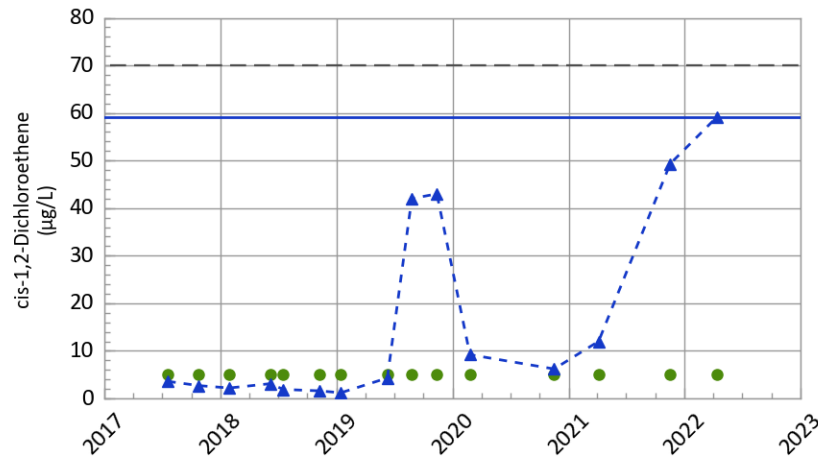
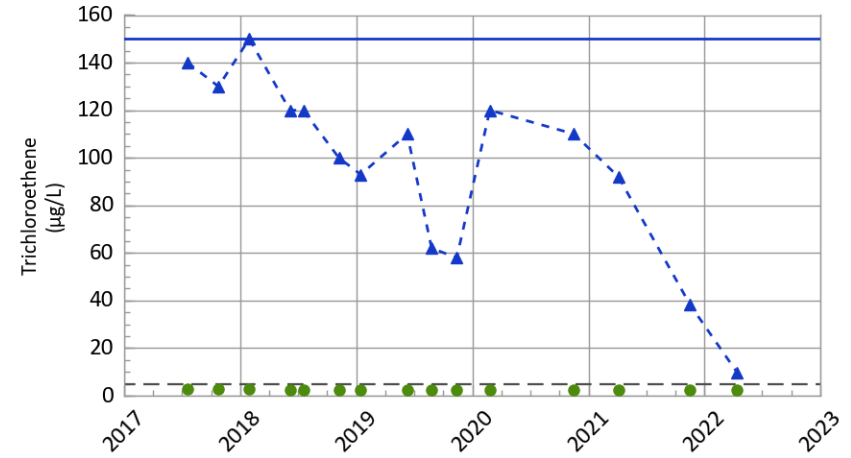
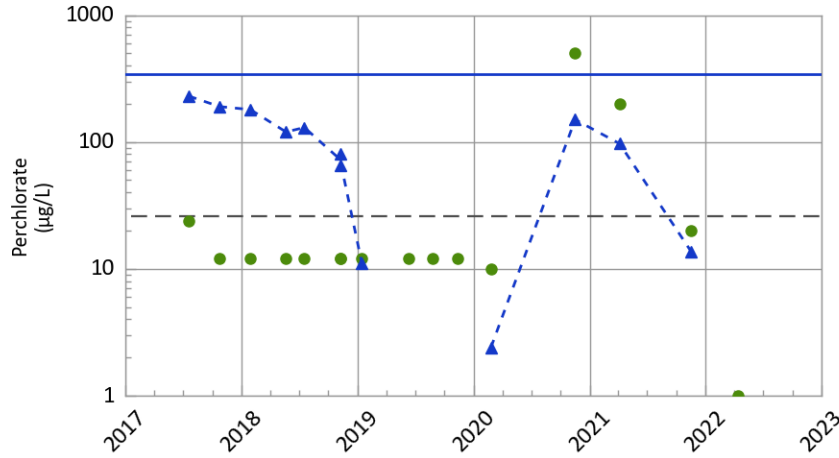
Most Recent Measured COC Concentrations (Nov 16, 2021)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	0.874	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



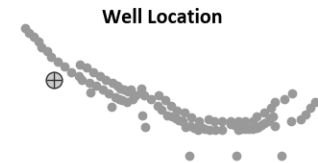
**PTX06-1175 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



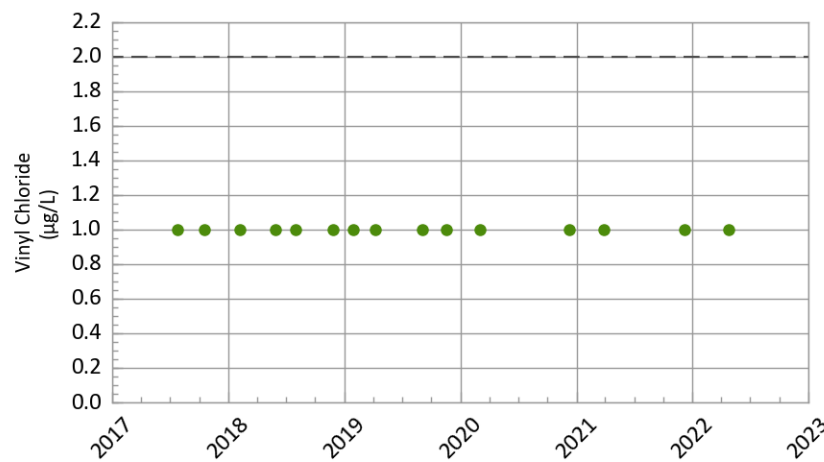
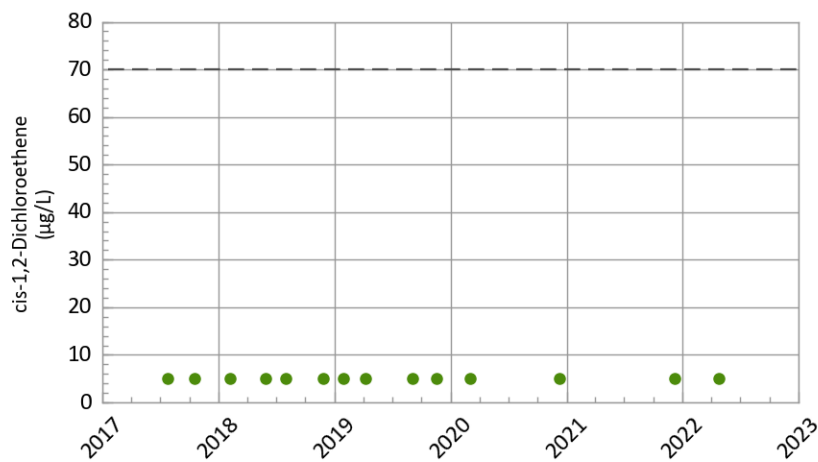
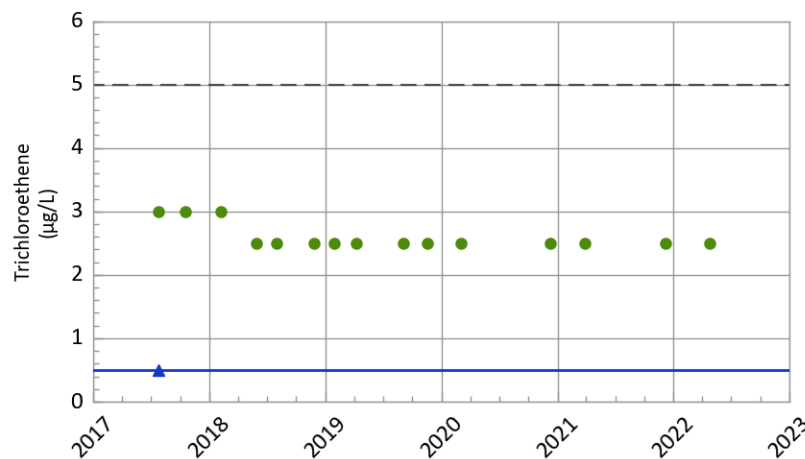
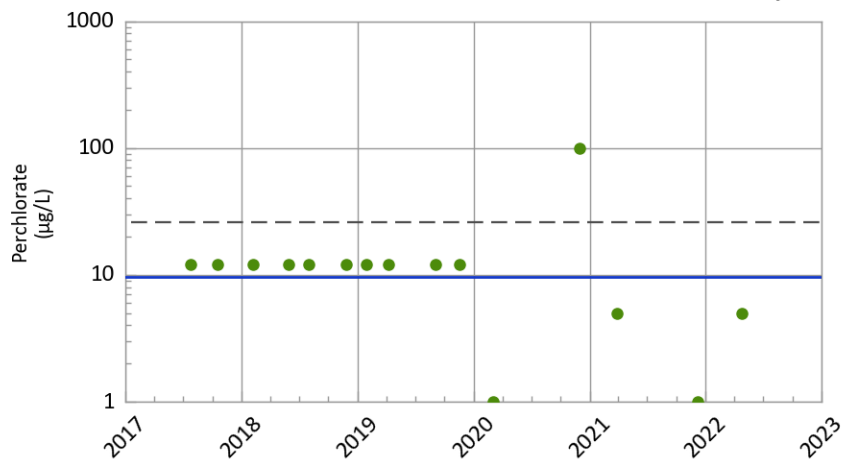
Most Recent Measured COC Concentrations (Apr 13, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	59.2	70.0
TCE	9.83	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



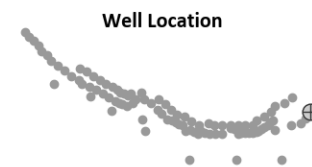
**PTX06-ISB079 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



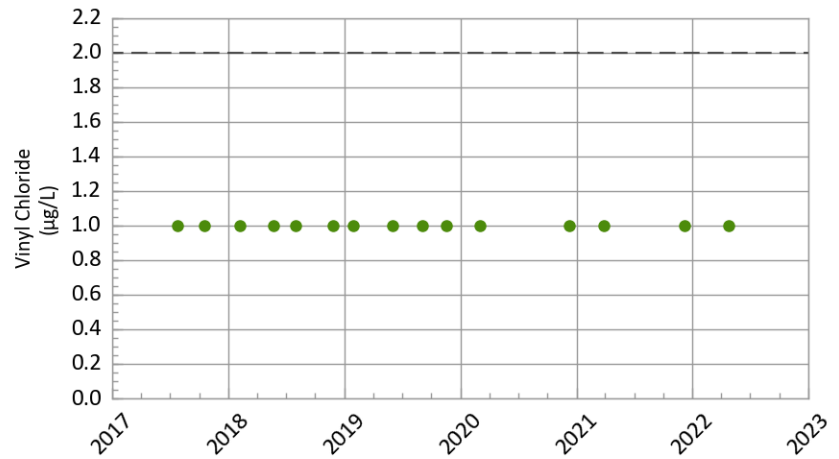
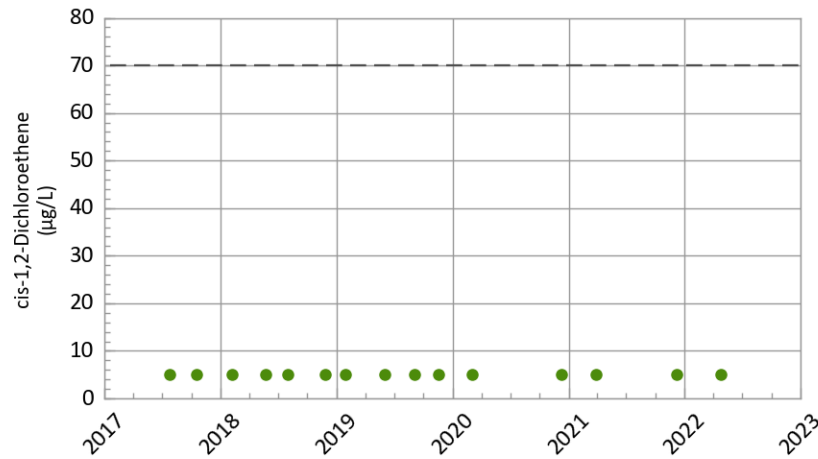
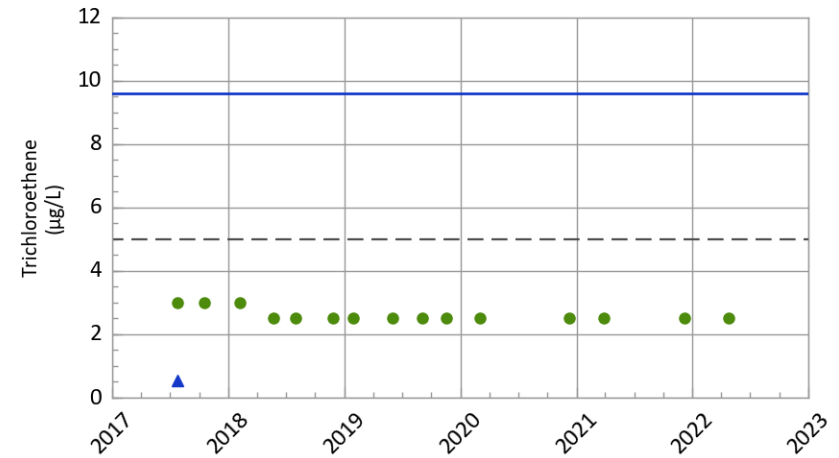
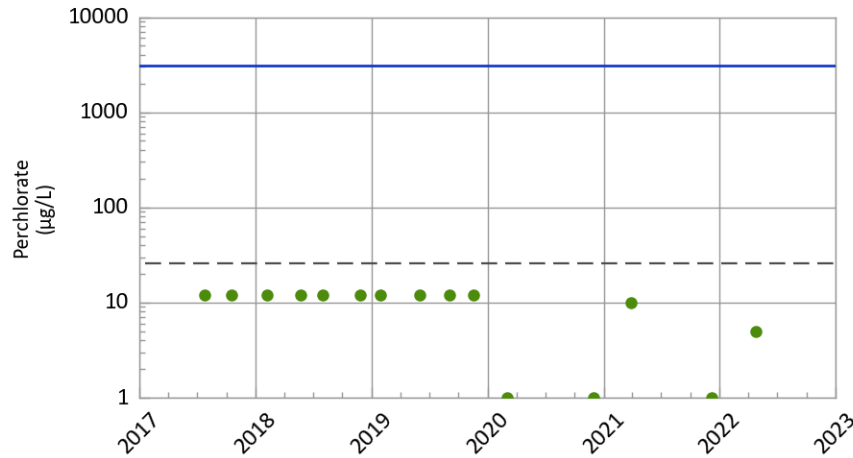
Most Recent Measured COC Concentrations (Apr 26, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	Non-Detect	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



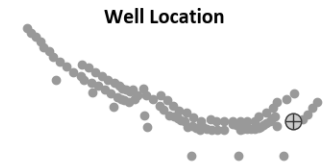
**PTX06-ISB082 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Apr 26, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	26.0
DCE12C	Non-Detect	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



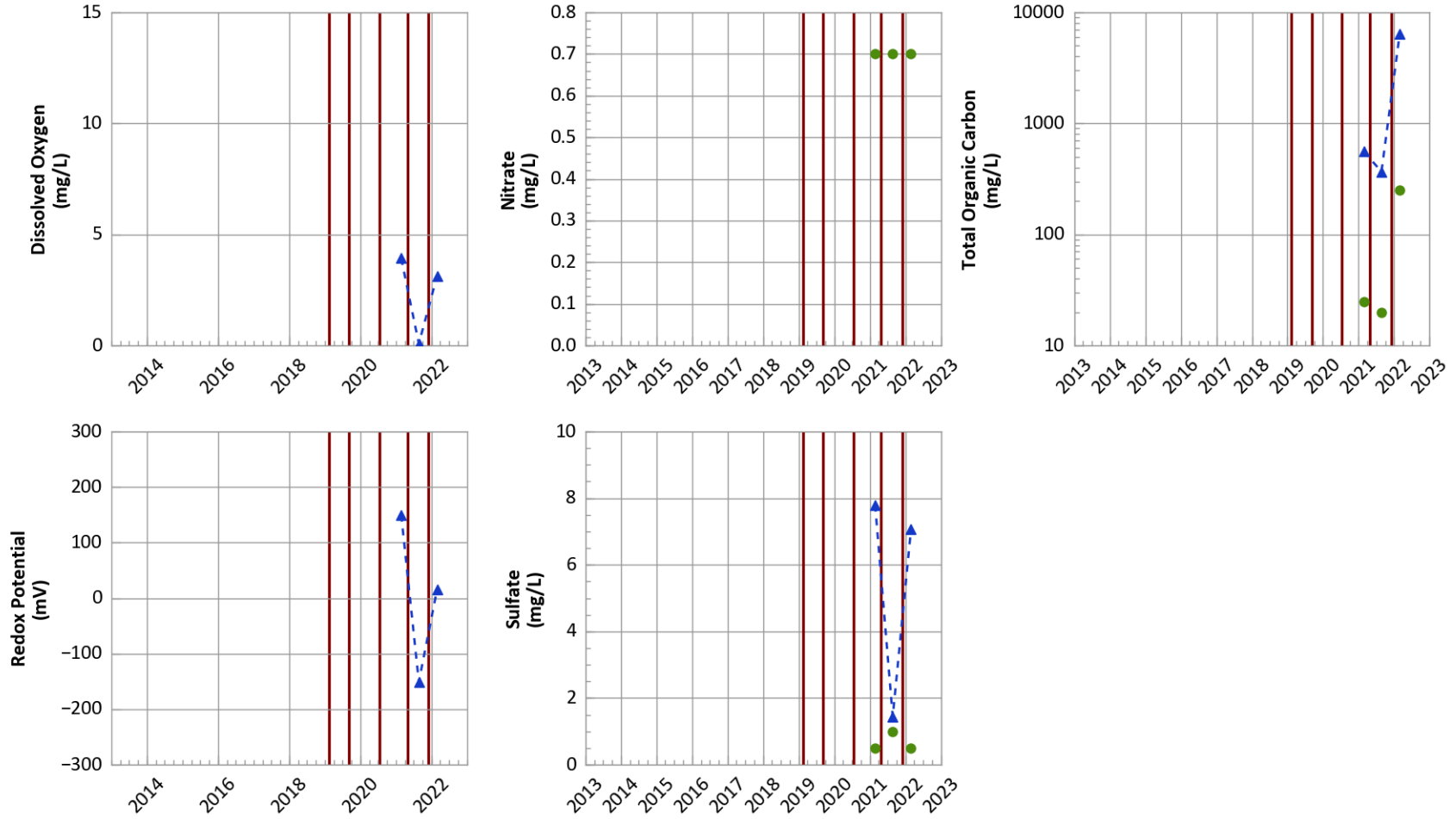
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## **Southeast ISB Extension**



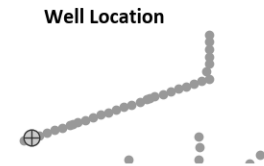
PTX06-ISB302 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



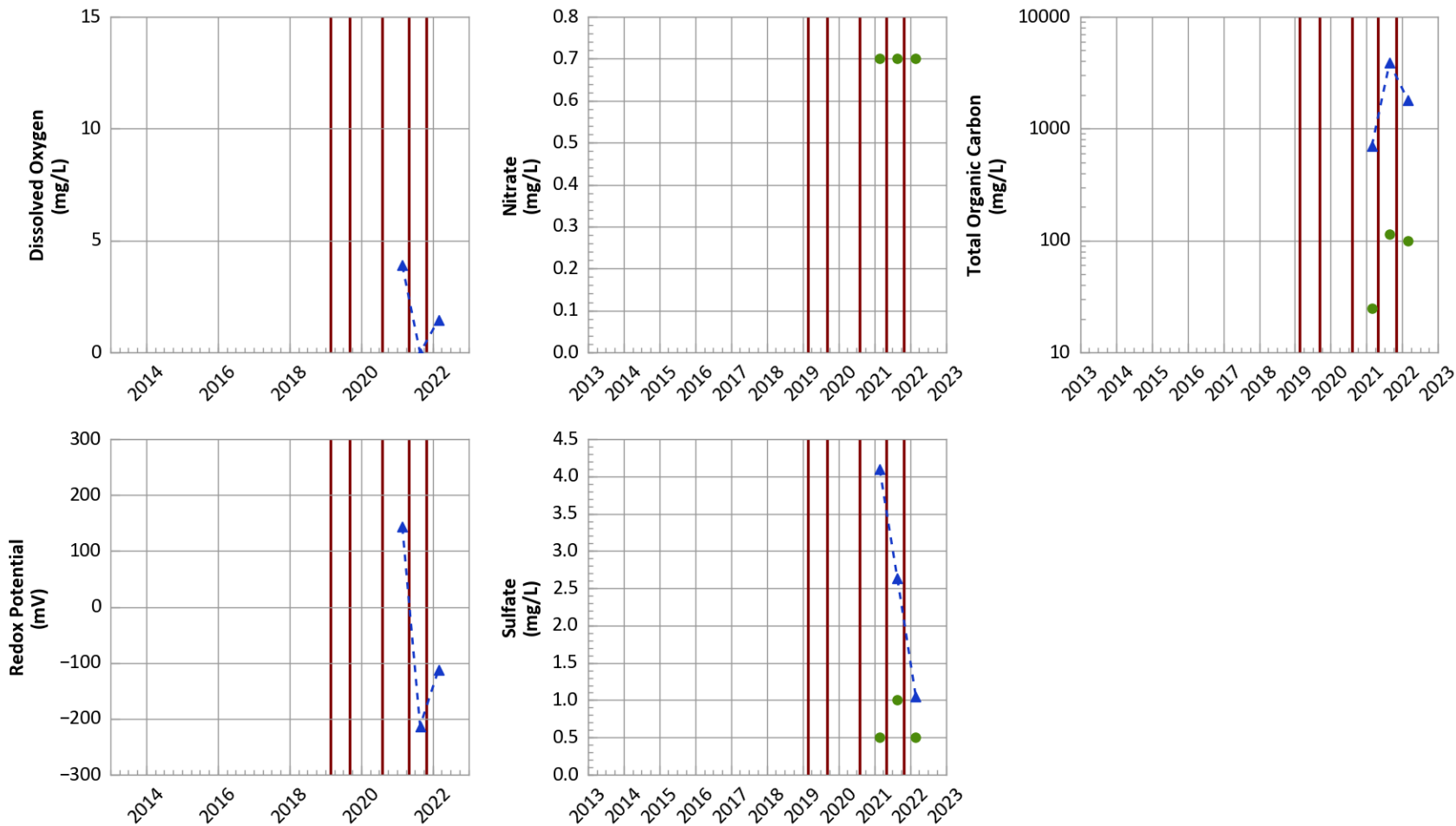
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



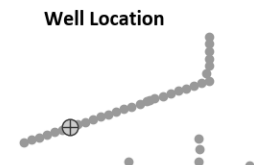
PTX06-ISB307 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



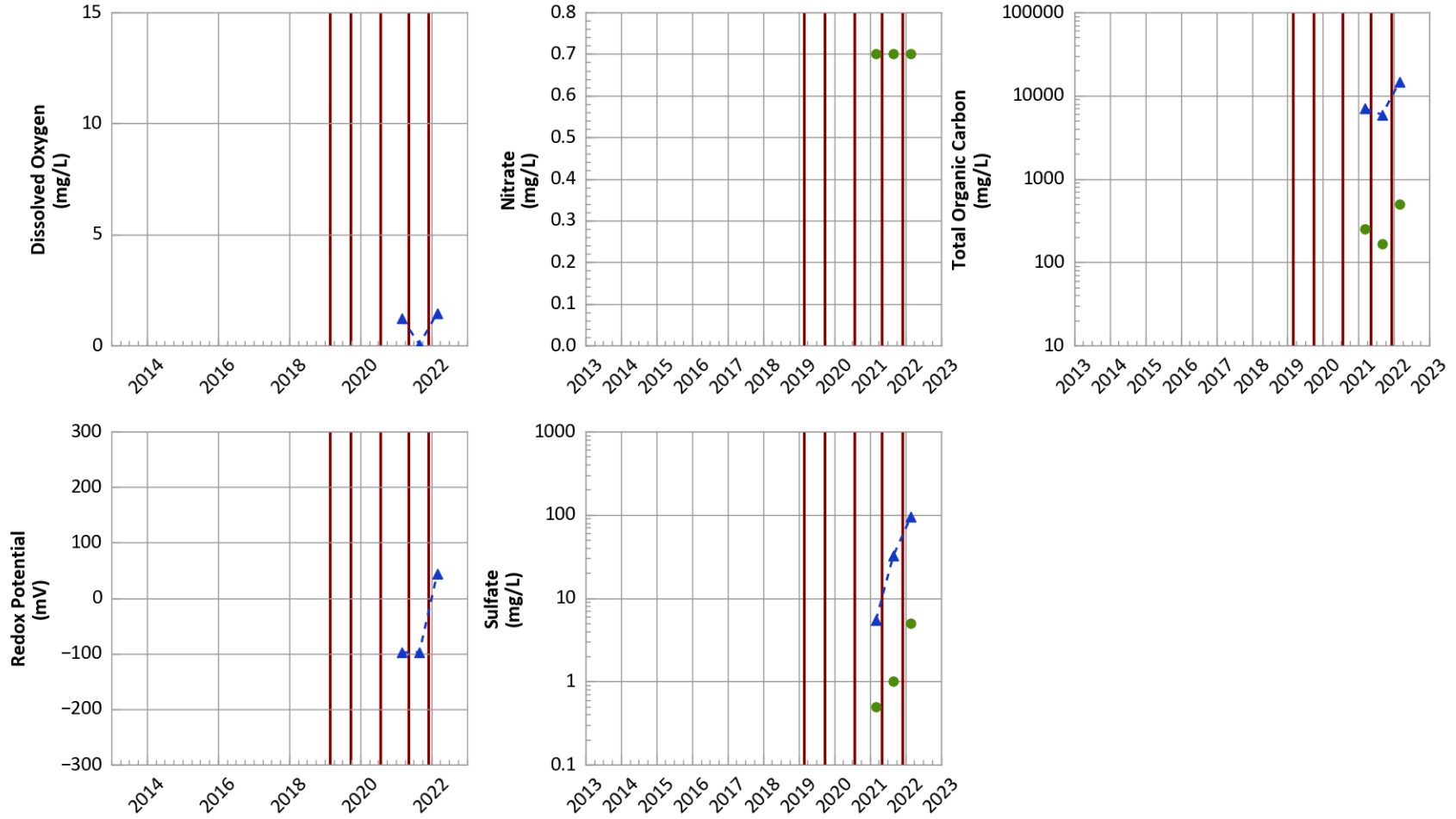
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



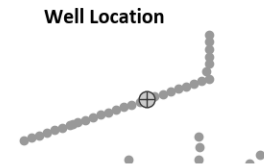
PTX06-ISB317 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



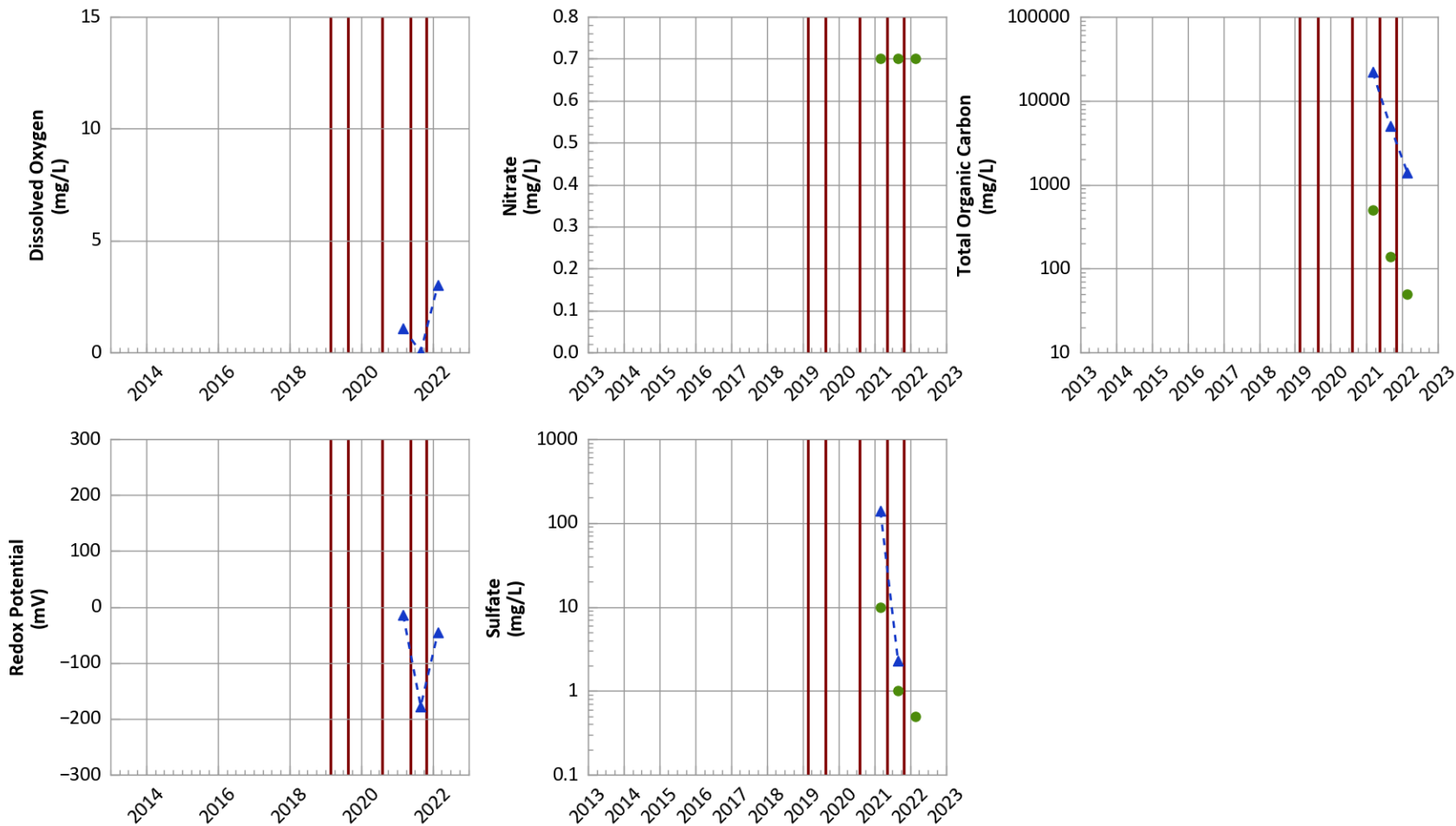
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



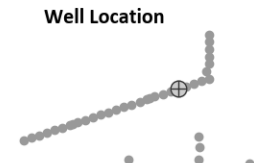
**PTX06-ISB321 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



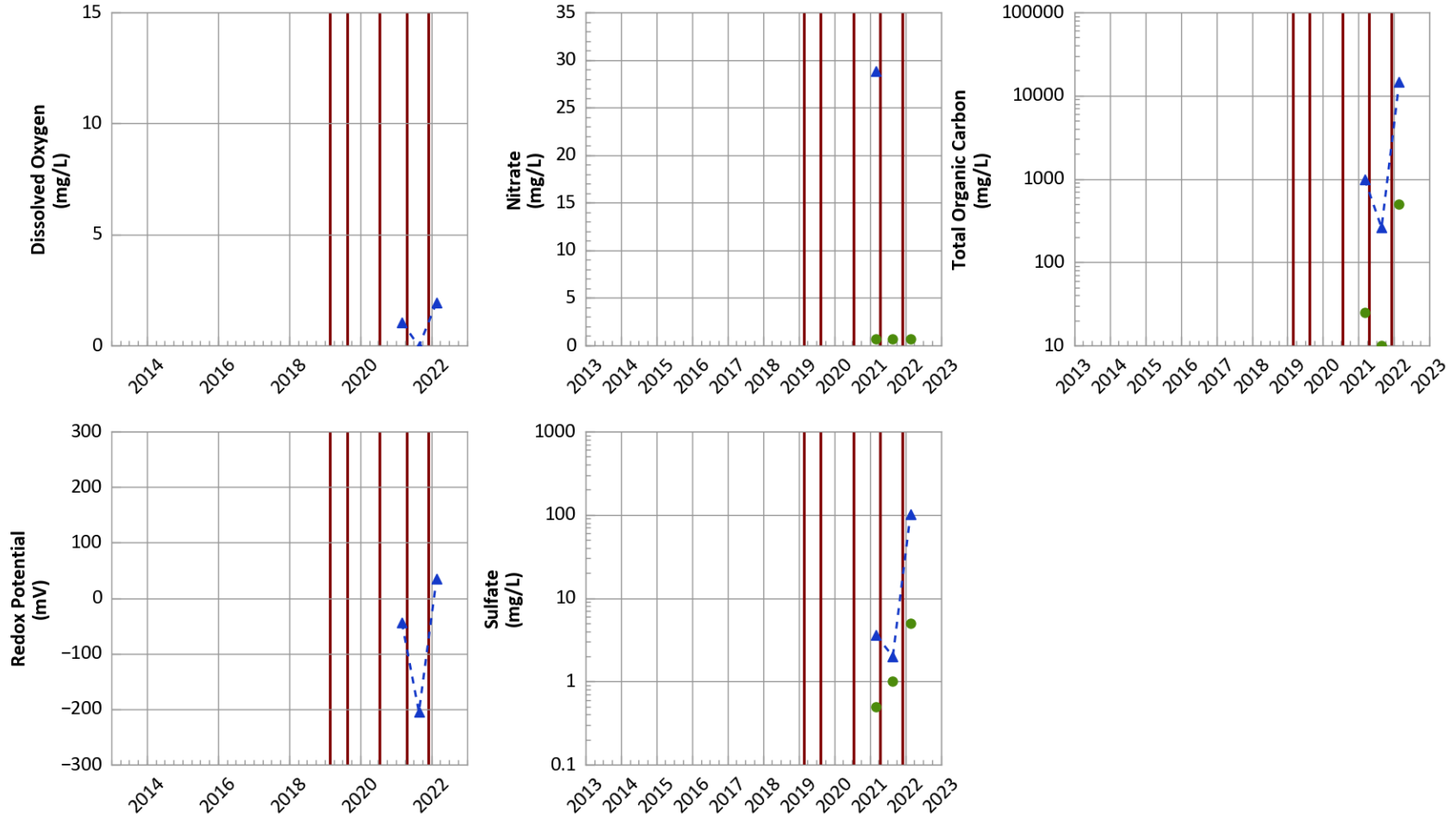
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



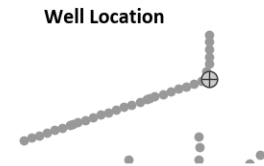
PTX06-ISB325 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



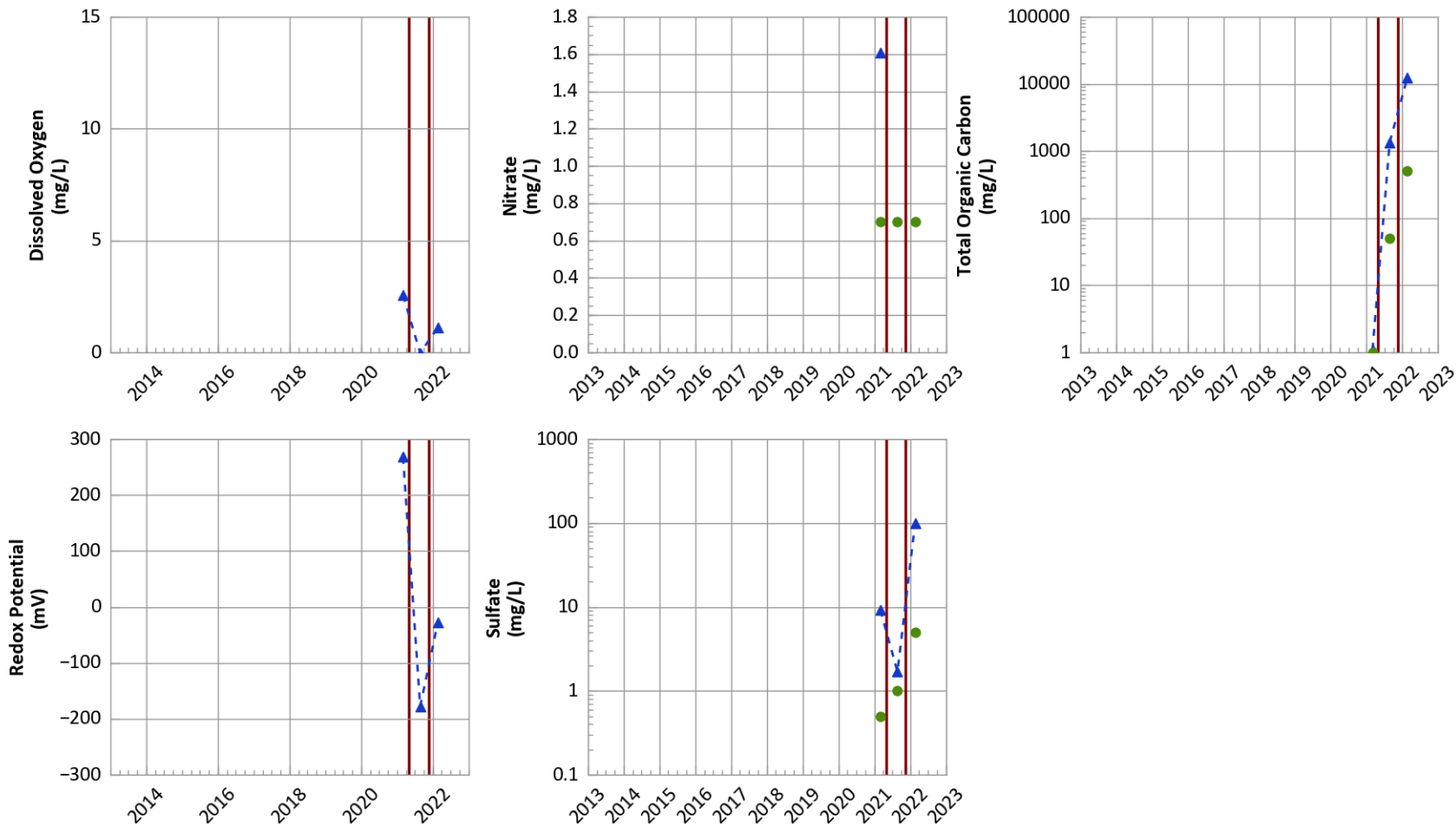
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



PTX06-ISB329 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



Typical Baseline Concentrations in Perched Groundwater

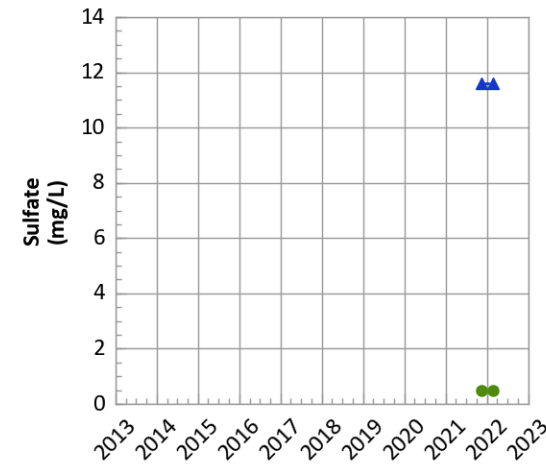
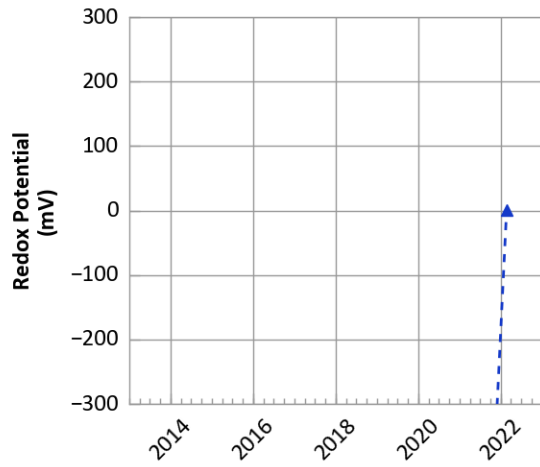
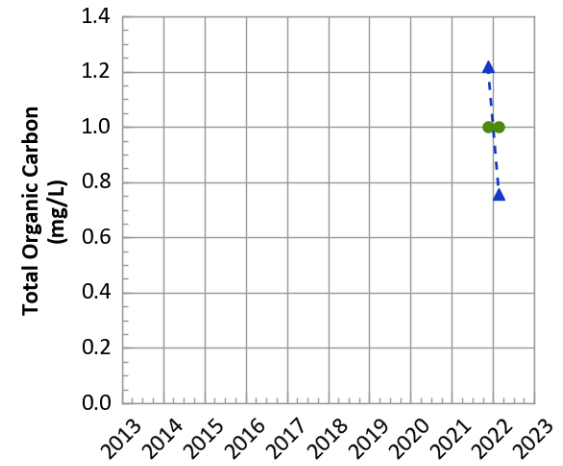
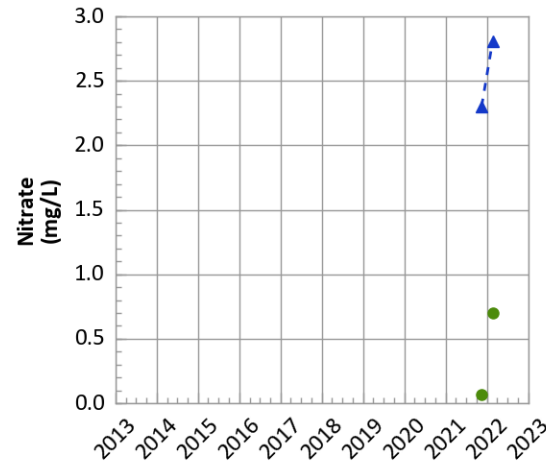
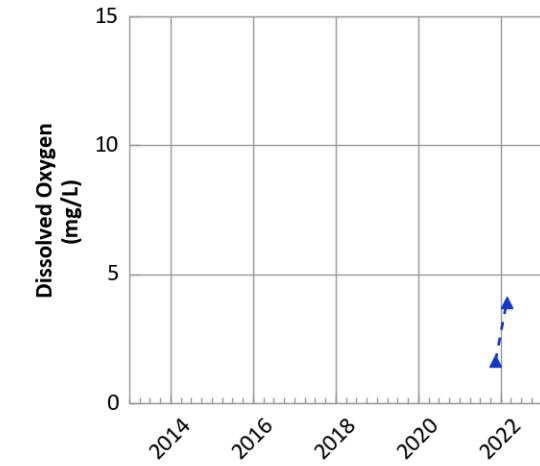
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates





PTX06-ISB331 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



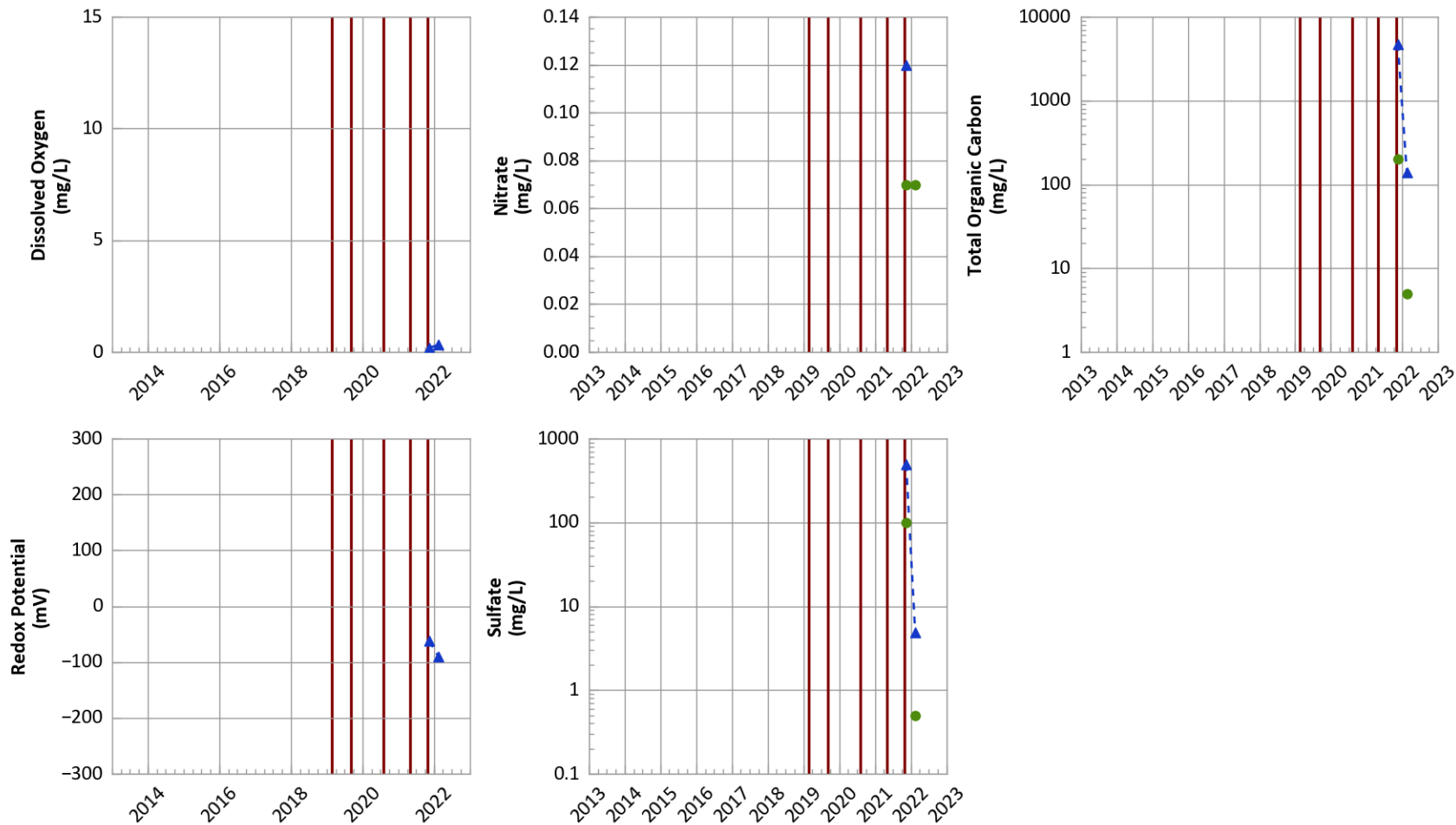
Typical Baseline Concentrations in Perched Groundwater

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



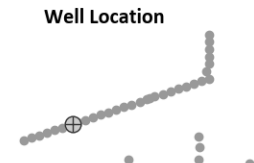
**PTX06-1213 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



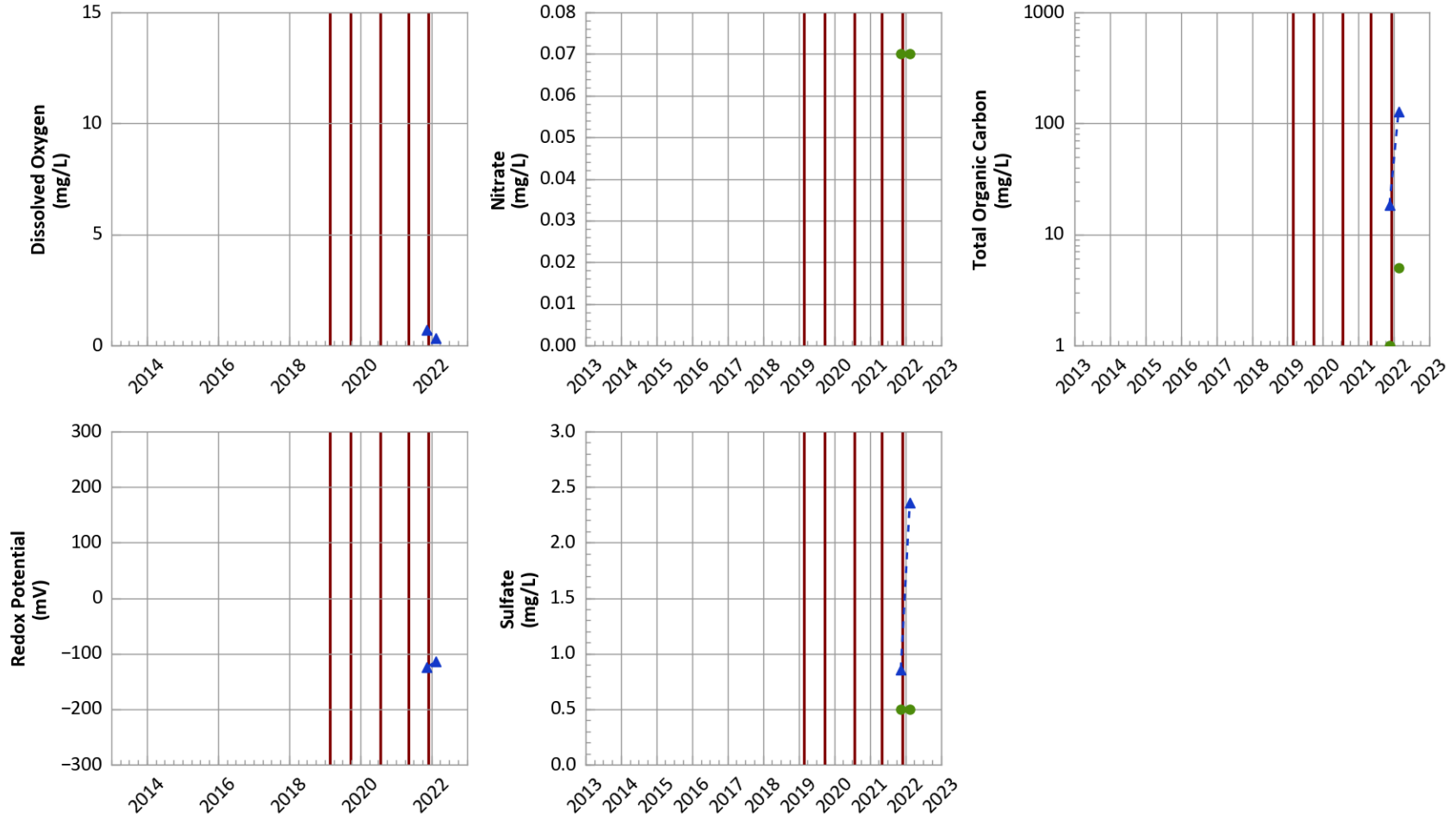
**Typical Baseline Concentrations in Perched Groundwater**

Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates

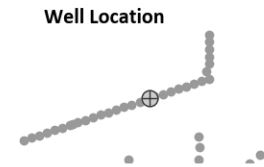


**PTX06-1214 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**

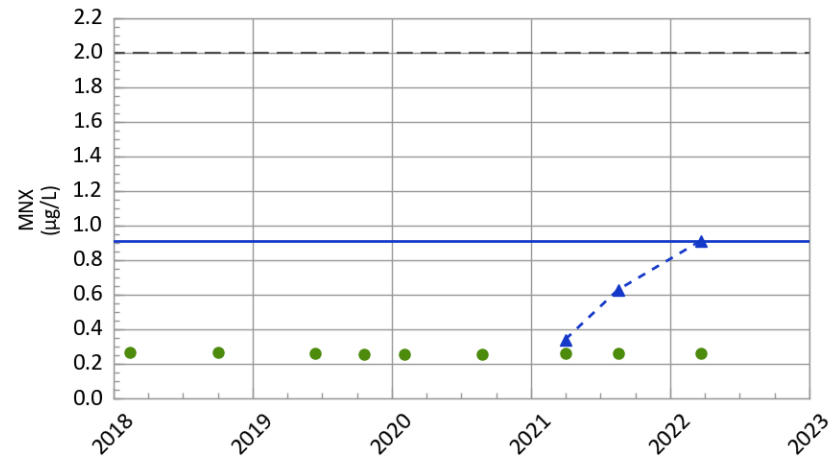
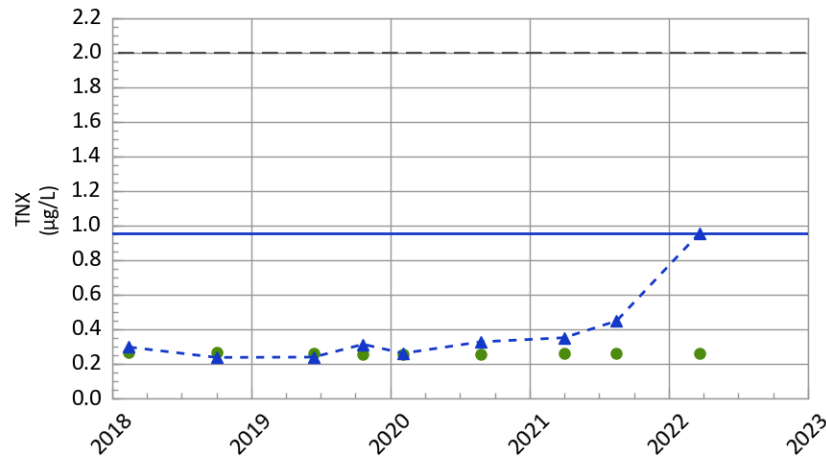
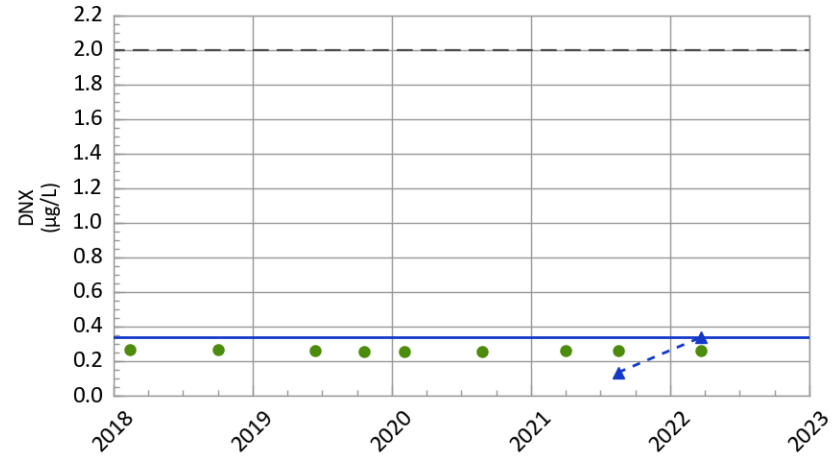
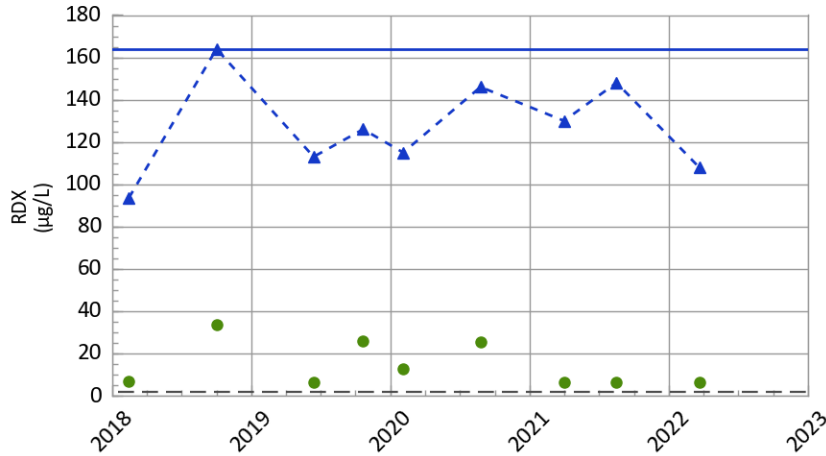


**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Injection Dates



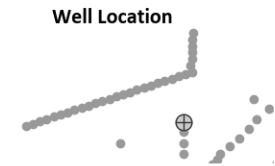
**PTX06-1191 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



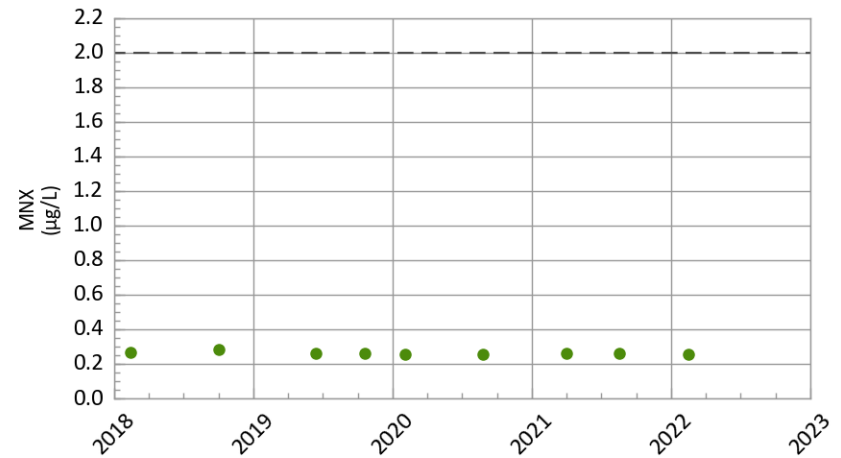
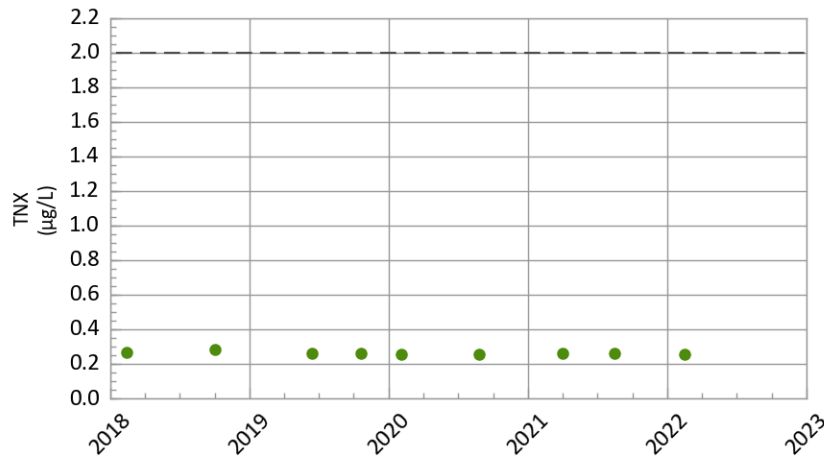
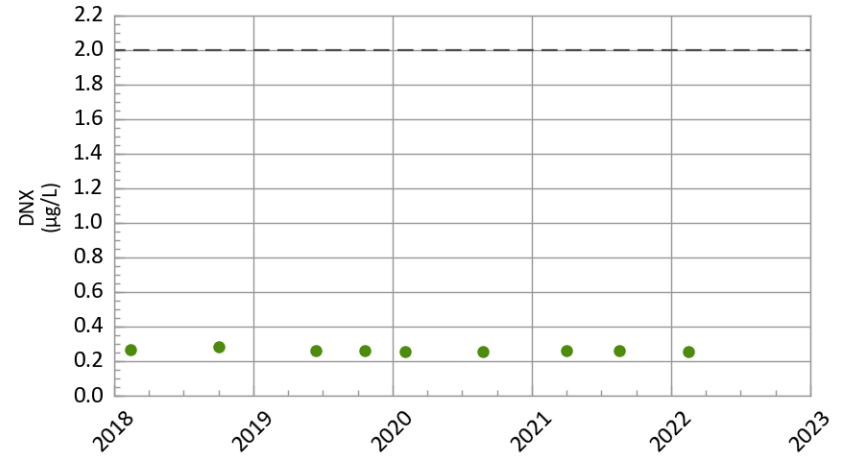
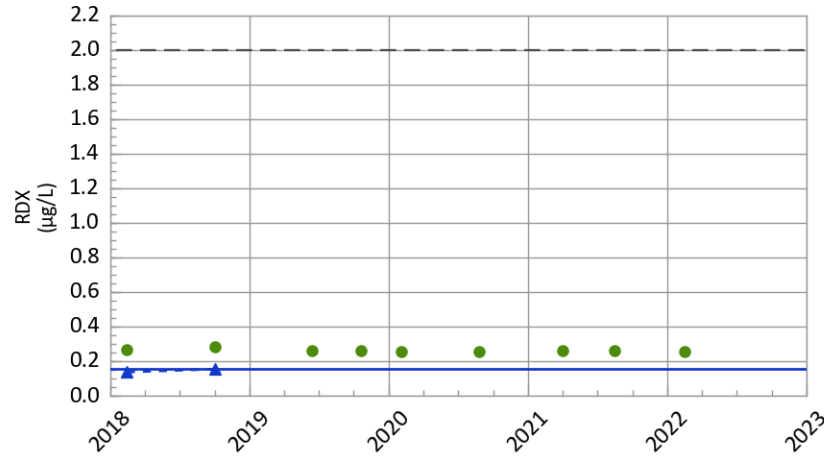
Most Recent Measured COC Concentrations (Mar 21, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	108.0	2.0
TNX	0.954	2.0
DNX	0.337	2.0
MNX	0.911	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1194 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



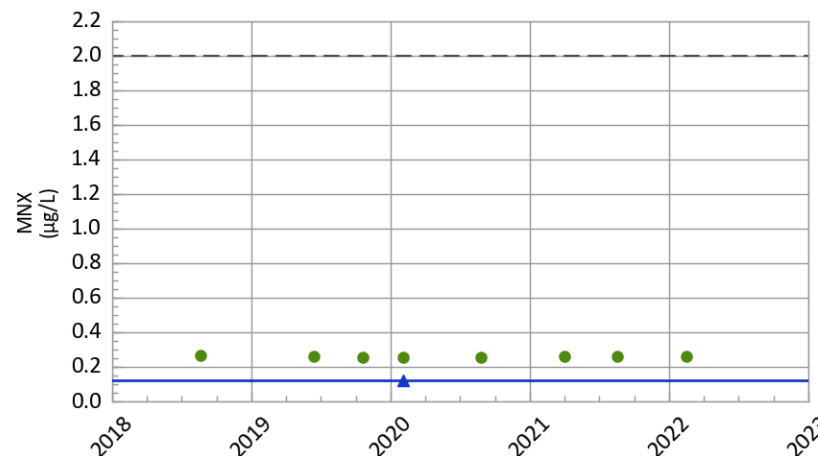
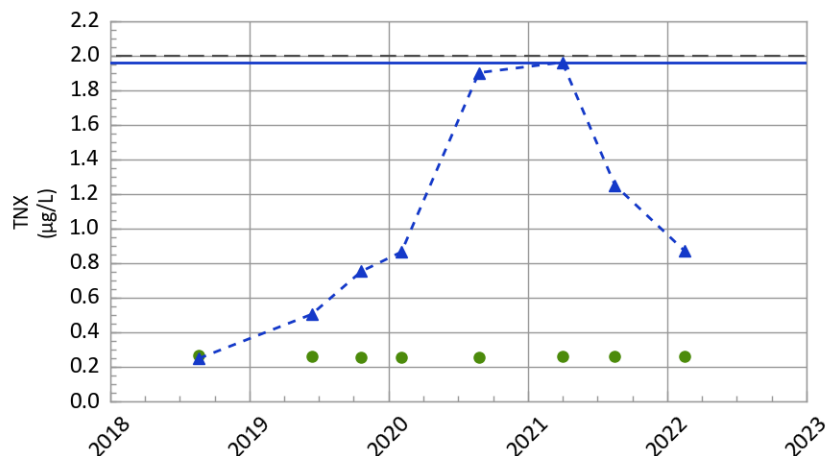
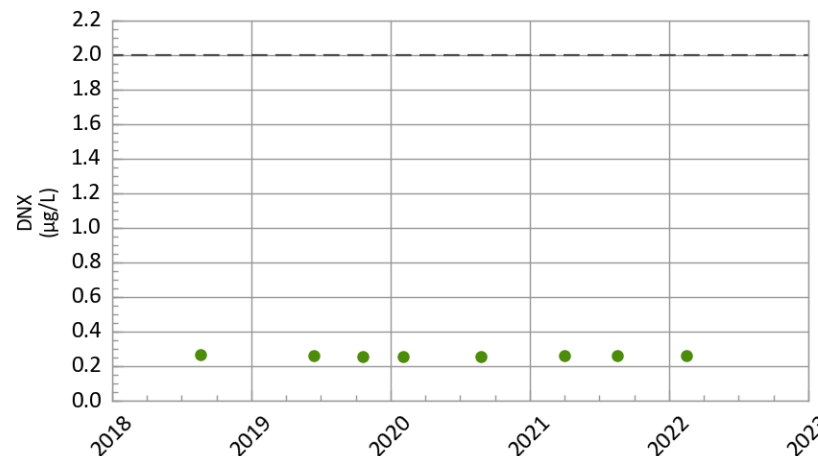
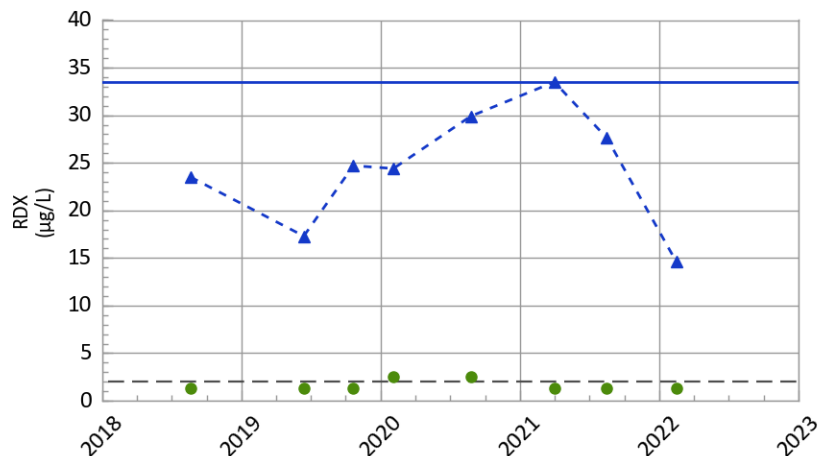
Most Recent Measured COC Concentrations (Feb 14, 2022)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	Non-Detect	2.0
TNX	Non-Detect	2.0
DNX	Non-Detect	2.0
MNX	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



**PTX06-1196 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 03, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	14.6	2.0
TNX	0.872	2.0
DNX	Non-Detect	2.0
MNX	Non-Detect	2.0

- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard

