



# PANTEX QUARTERLY PROGRESS REPORT

## Remedial Action Progress

### Second Quarter 2023

In support of Hazardous Waste Permit #50284 and  
Pantex Plant Interagency Agreement  
September 2023

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

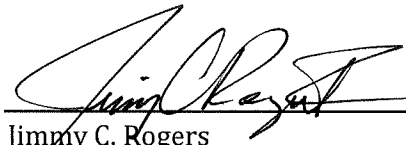




CERTIFICATION STATEMENT

Second Quarter 2023 Remedial Action Progress Report  
Pantex Plant, September 2023

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, Environment, Safety and Health  
Consolidated Nuclear Security, LLC

09/18/2023  
Date






**Remedial Action Progress Report  
Second Quarter 2023  
in Support of Hazardous Waste Permit #50284  
and Pantex Plant Interagency Agreement  
for the Pantex Plant, Amarillo, Texas  
September 2023**

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.



  
\_\_\_\_\_  
Tony Biggs  
Licensed Professional Geologist No. 2693  
Environmental Projects  
Consolidated Nuclear Security, LLC

9/14/2023  
Date

Project Team: Tony Biggs  
Dr. Maeghan Brundrett  
Michelle Jarrett



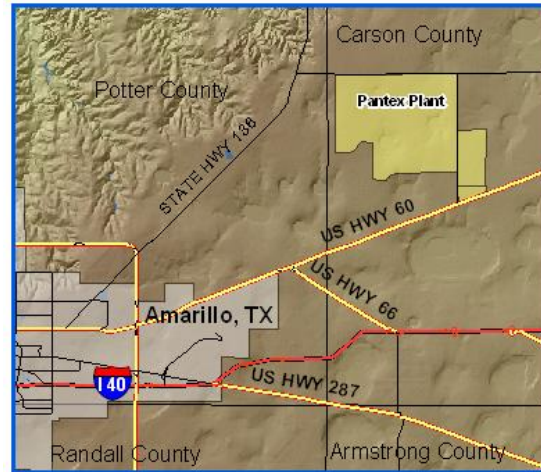
## LIST OF ACRONYMS

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
MEW	mobile extraction wells
Mgal	million gallons
mV	millivolts
NAPL	non-aqueous phase liquid
ORP	oxidation-reduction potential
P1PTS	Playa 1 Pump and Treat System
ppmv	parts per million by volume
PQL	practical quantitation limit
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
REC	recirculation extraction well
SAP	Sampling and Analysis Plan
scfm	standard cubic feet per minute
SE ISB	Southeast <i>In Situ</i> Bioremediation system
SE ISB EXT	Southeast <i>In Situ</i> Bioremediation Extension system
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
Z11 ISB	Zone 11 <i>In Situ</i> Bioremediation system



## 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 second quarter of 2023.



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 information required by 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 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 for irrigation, general Plant needs, and/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.

The subsurface drip irrigation system filter bank break that occurred in late June 2017 continued to impact operations of SEPTS and P1PTS during the second quarter of 2023. 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 were completed and the system became operationally available in late September 2022. However, a mishap with a bird caused an electrical failure of the system in early December 2022. The system is currently under repair. Operation of the subsurface system will also be hindered by lowered lagoon storage capacity due to ongoing construction of repairs to the Plant’s WWTF storage lagoons. During periods the drip irrigation system is unavailable, Pantex continues to release WWTF water to Playa 1 as approved in the Texas Commission on Environmental Quality wastewater permit (WQ0002296000). However, the permit restricts the amount of water that can be released to the playa, so pump and treat throughput is reduced.

Current and future operations of both pump and treat systems will be impaired by the permit-restricted flow to Playa 1 until the subsurface drip and/or new center pivot irrigation systems are fully operational. The SEPTS system has operated at a higher capacity using injection, release to

<b>Pump and Treat System Second Quarter 2023 Operation</b>	
<b><i>Playa 1 Pump and Treat System (P1PTS)</i></b>	
Days Operated	0
% Operation Time	0%
Volume Water Treated (Mgal)	0
HE Mass Removal (lbs)	0
Beneficial Use of Water	0%
<b><i>Southeast Pump and Treat System (SEPTS)</i></b>	
Days Operated	91
% Operation Time	96%
Volume Water Treated (Mgal)	35.4
HE Mass Removal (lbs)	109.7
Chromium Mass Removal (lbs)	12.6
Perchlorate Mass Removal (lbs)	41.1
Beneficial Use of Water	1.7%
<i>*Value below operational goals</i>	

Playa 1, and scheduled shutdowns of P1PTS. 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. However, P1PTS was shut down at the end of April 2022 to construct the connection to the new center pivot irrigation system east of FM 2373. The system remained down during the second quarter. However, the connection to the pivot system was completed in July 2023, allowing P1PTS to begin operations during the third quarter.

Graphs of monthly operation and throughput are included in Appendix B. The SEPTS wellfield had six wells that required repair during the second quarter due to electrical and equipment issues. Pantex has issued a contract to address the problems, and most wells will be operational in 2023.

SEPTS treated about 35 million gallons (Mgal) during the second quarter. Almost 40% of the treated water was released to Playa 1, with the remaining 58% injected into SEPTS injections wells (PTX06-INJ10, PTX06-INJ13, PTX06-INJ14, and PTX06-INJ15). SEPTS primarily treats RDX, hexavalent chromium [Cr(VI)] and perchlorate. Figure 1 provides SEPTS mass removal information for RDX, other high explosives (HEs), perchlorate, and Cr(VI) for the second quarter, as well as totals since system startup. P1PTS was not operated during the second quarter, but had previously removed over 770 pounds (lbs) of high explosives (HEs). Overall, the systems have removed over

16,800 lbs of HEs, perchlorate and chromium contaminants from perched groundwater since operations began.

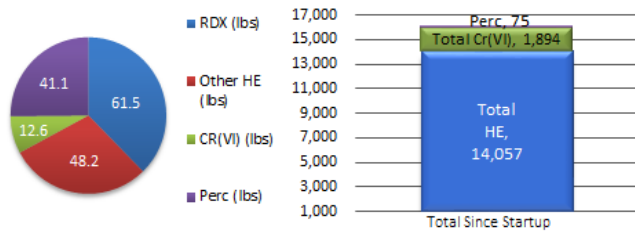


Figure 1. SEPTS Mass Removal

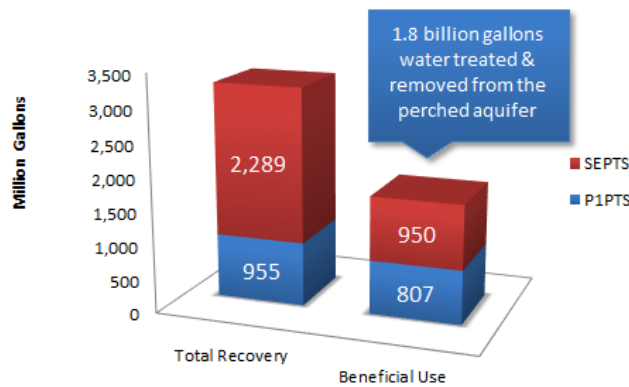


Figure 2. System Recovery and Use

The total recovery and treatment from both systems since startup has been calculated at about 3.2 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 1.8 billion gallons of treated water beneficially used since startup of the irrigation system. The recovery and beneficial use totals are presented in Figure 2. In the second quarter, SEPTS released water to the WWTF and then to Playa 1, to SEPTS injection wells and to the Zone 11 ISB, with approximately ~ 2% beneficial reuse in the second quarter. Evaluation of effluent data from SEPTS indicates that all COCs were treated to levels below the groundwater protection standard (GWPS).

Pantex installed 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 the system became operational in August 2023. The first irrigated crops are expected to be planted in late September for the fall 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 began in March 2023. The Playa 2 injection wells provide a consistent outlet for a portion of the treated water from SEPTS when irrigation is not an available method for beneficial use of the treated water. These wells also provide a method to inject the treated water without affecting movement and capture of plumes in the southeast area.

## ISB SYSTEMS

Four ISB systems (Zone 11 ISB, Southeast ISB, Southeast ISB Extension, and Offsite ISB) were operating at Pantex during the second quarter of 2023. 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. 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 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



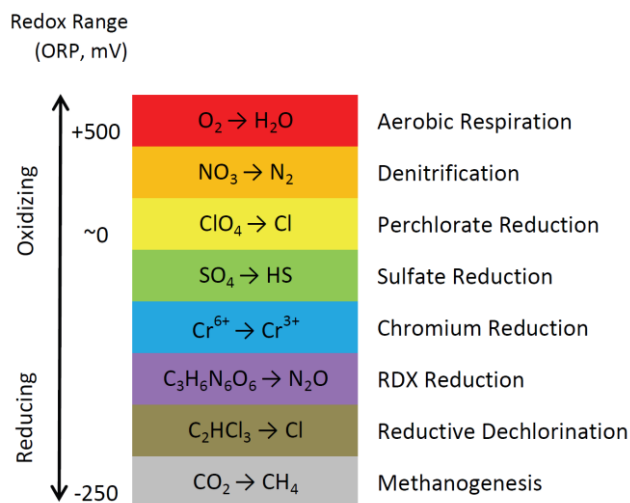


Figure 3. Redox Range for COCs

to determine if the treatment zone is rebounding to baseline conditions, thus requiring amendment injection.

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.

*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 for each system will be assessed during the current quarter. In the second quarter, the Zone 11, Southeast ISB Extension and Offsite ISBs were sampled completely. Table 1 summarizes the injection activities for 2023. Injection activities were started at the Zone 11 ISB and the Offsite ISB in the second quarter.

Table 1. ISB Systems Activities

Month (2023)	SE ISB EXT	SE ISB	Z11 ISB	Offsite ISB <sup>1</sup>
January				
February		Sample		Maintenance
March	Sample	Sample	Maintenance	Injection
April	Sample		Sample	Injection
May			Sample/Injection	Sample/Injection
June			Injection	Sample/Injection
July	Sample/Maintenance		Injection	Injection
August	Injection	Sample	Injection	Injection
September	Injection	Sample	Injection	Injection
October				Sample/Injection
November	Sample		Sample	Sample/Injection
December			Sample	

<sup>1</sup>All sampled wells in the Offsite ISB are extraction wells (REC) and (MEW) and not injected; therefore, injection will not affect the sampling of the REC and MEW wells.

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. Fourteen injection events have been completed at the current system, with the first injection event occurring in the expansion zone in 2015. The 15th injection event for the Zone 11 ISB system is anticipated to be completed at the system in September. 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) at widely spaced wells. More frequent injections are required for molasses and have been planned annually for the Zone 11 ISB to maintain reducing conditions. For the 2023 injection at Zone 11, injection on the west side of the system continues to use molasses as amendment. In an effort to further affect reducing conditions, a mixture of EVO and molasses is being used at selected wells on the east side of the system, which were recently installed with closer spacing. Pantex will continue to evaluate the system to ensure appropriate timing of injections and the most effective amendment.

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 five injections, so deeper reducing conditions are likely established at the injection wells. Five injected wells, seven treatment zone monitoring (TSM) wells, and nine downgradient ISPM were sampled in the Zone 11 ISB system in the second quarter.

Reduction of nitrate and the measured ORP indicate whether conditions across the treatment zone are present for reductive dechlorination. Evaluation of data in the treatment zone indicates mild to strong reducing conditions, with ORP ranging from -132 to -11.4 mV across the Zone 11 ISB. Monitored conditions inside the treatment zone indicate nitrate was reduced and negative ORP was measured in all treatment zone wells, indicating deeper reducing conditions in most areas. Soluble metals (arsenic and manganese) increased and methane was measured in all treatment zone wells, indicating that deeper reducing conditions are established. 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 nine monitored wells inside of the treatment zone and cis-1,2-DCE present at concentrations below the GWPS in eleven of the twelve 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 seven sampled wells inside the treatment zone, but ethene was only detected in three wells. 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 across the treatment zone.

Pantex evaluates performance at nine downgradient ISPM wells for the Zone 11 ISB. Seven of nine ISPM wells exhibit perchlorate concentrations below the GWPS in the second quarter. TCE concentrations are at or below the GWPS in five of nine ISPM wells. The first breakdown product of TCE, cis-1,2-DCE, was below the GWPS in all 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.

#### *SOUTHEAST ISB EXTENSION REMEDIAL EFFECTIVENESS*

The Southeast ISB Extension was installed in 2017 as an extension of the chosen remedy for the southeast perched groundwater. Four additional wells were installed in late 2020 and an additional two in 2021 along the eastern property line in a north-south alignment to further encompass the plume (Appendix A). These new wells were injected for the first time in April 2021, with the exception of PTX06-ISB331, which was injected in August 2022. Two treatment zone monitoring (TZM) wells were also installed in late 2021. Overall, six injection events have been completed at this system, with the next injection scheduled for August 2023. Due to the success with distribution of a more soluble carbon (molasses), Pantex began injection at the Southeast ISB Extension using only soluble carbon (molasses), as recommended in the *Fourth Quarter 2018 Progress Report*. Pantex plans to continue injection at this system using only molasses to improve distribution and treatment. Because this system has not been treated with EVO, injections have been scheduled at approximately every nine months.

Four ISB wells, two TZM wells and two downgradient ISPM wells were sampled during the second quarter of 2023. Treatment zone data indicates strong to very mild reducing conditions are present for treatment of HEs. ORP was between -106.9 mV and 55.3 mV and nitrate was reduced in all but one well. Soluble metals (arsenic and manganese) increased, indicating that reducing conditions are established. Total organic carbon results indicate that a sufficient food source is available to support establishment of reducing conditions at the wells.

Downgradient wells in the slower moving areas of the plume did not demonstrate partial treatment during this quarter. The downgradient wells are not expected to establish complete treatment until 2025. TOC has slightly increased in downgradient wells since beginning of sampling in 2018. Monitoring results for the system indicate that RDX and breakdown products are present in downgradient performance monitoring wells and metals (i.e. arsenic and manganese) are starting to increase.

#### *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 at the leading edge of the plume. Three new ISB wells were installed on the neighboring property in late 2021 and were injected in 2022. The system was further expanded in 2022 with nineteen new ISB wells, which were injected for the first time in 2023. The last phase of wells was installed in summer 2023, but will not be injected until spring 2024. 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 beneath 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. Six ISB extraction wells (labeled REC wells due to the recirculation they provide) were sampled in the second quarter 2023. Two TZM wells were also sampled. Evaluation of the baseline data from 2022 at these wells indicated very mild reducing conditions with ORP ranging from 19 to 281 mV. As of the second quarter 2023, reducing conditions improved and ORP ranged from -95.5 mV to 74.9. Concentrations of HEs remain low in the REC wells at the leading edge of the plume. Total organic carbon was also present at a higher concentration in all six REC wells. Treatment zone data for the two new TZM wells does not indicate an established treatment zone and portions of the plume are not expected to establish treatment until 2025 or later.

## 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 during the second quarter of 2023. 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 shutdown in March, when an unexpected failure of the catalytic oxidizer occurred. The system was restarted on August 22, 2022 and ran until the end of October 2022 when another failure of the catalytic oxidizer shutdown the system. The system is expected to be repaired and operational by fall 2023.

As total VOC concentrations remained below 100 ppmv in 2022, Pantex has been pulsing the system to determine current recovery efforts and feasibility of system closure. Pantex will request closure of the system with the renewal of the Hazardous Waste Permit. A more detailed discussion was included in the *2022 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 second quarter indicates unexpected conditions at one Ogallala Aquifer well, PTX06-1076. Detections exceeded the PQL. There were no unexpected conditions at perched uncertainty management wells in the second quarter.

4-amino-2,6-dinitrotoluene (DNT4A), a breakdown product of 2,4,6-trinitrotoluene (TNT), has been detected at PTX06-1076, with the initial detection occurring in June 2020. Sample results collected since that time have been variable, with values from May 2023 exceeding the PQL for the first time. As a result, a verification sample was completed at PTX06-1076 in August 2023. Results from the verification sample confirmed detections of DNT4A above the PQL. In accordance with the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan*, sampling will be increased from semi-annual to monthly sampling for a three-month duration starting in October 2023. Notification to regulators will be sent in advance of sampling actions. Further actions will be determined based on future sampling results and in continued accordance with the *Pantex Plant Ogallala Aquifer and Perched Groundwater Contingency Plan*.

#### Summary of Unexpected Ogallala Detections, Second Quarter 2023

Well ID	Sample Date	Analyte	Measured Value (µg/L)	PQL (µg/L)	GWPS (µg/L)
PTX06-1076	5/1/2023	DNT4A	0.14	0.102	1.2
	8/1/2023	DNT4A	0.11	0.102	1.2

## OTHER UNEXPECTED CONDITIONS

Pantex routinely evaluates data received from the laboratory to determine if it presents off-trend, all-time high or new detection conclusions 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. No unexpected conditions were noted in the second quarter.

## SCHEDULE UPDATE

Pantex provided a detailed schedule of upcoming work in the *2022 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:

- Pantex awarded a new well drilling contract in January 2023 with scope including installation of two new Ogallala monitoring wells in response to detections at PTX06-1056. Additional scope was recently added to the contract to drill an additional Ogallala monitoring well. Completion of the well is expected by end of September 2023, with sampling occurring in late

2023. In the Fiscal Year 23 well drilling contract, scope was also included for all Phase 4 wells for the Offsite ISB. Drilling on these wells commenced in April 2023 with anticipated completion in September 2023.

- The initial 2023 injection event was completed at the northern and southern Offsite ISB wells in August 2023.
- 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 and construction of the systems was completed in March 2023. Trailers were delivered to Pantex at the end of May and final commissioning occurred at the beginning of September.
- The design of the new center pivot 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. Construction and testing of the system was complete in late August.
- Work began to evaluate the Pantex perched groundwater network, acquire LiDAR Survey information for assessing landfill cover deficiencies and acquisition of new toxicity data for Pantex COCs for use in evaluating its effect on risk in Five-Year Review. The Five-Year Review activities were initiated on August 1, 2022. A draft report was submitted to Pantex in February. Pantex reviewed, signed and submitted a draft final report to TCEQ and EPA in May. The final approved report was completed in September.
- Pantex awarded a contract for construction of two new ISB injection trailers to be used for future injection events. Trailers were delivered to Pantex and were put into production in June and July 2023.
- Injections are anticipated to be completed at the Southeast ISB Extension and Zone 11 ISB by the end of September.

Pantex continues progress toward completion of the following items:

- Pantex submitted a Request for Proposal for the design of the upgrade to the SCADA system for SEPTS and P1PTS. The contract was awarded in September 2022 and the 60% design was submitted and approved in March. Due to funding expectations in the upcoming fiscal years, a phased design approach is being added. The final phased design is expected to be completed by October 2023.

## 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 existing remediation systems. 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 Southeast Pump and Treat System continued 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 will continue to inject and release water to Playa 1 until the subsurface irrigation system is fully operational or construction of other options finish.

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. System repairs were completed and the system became available in late September 2022. Full operation of the subsurface system is currently hindered by lowered lagoon storage capacity due to ongoing repair of the WWTF's storage lagoons and an electrical failure caused by wildlife. Pantex has installed perched injection wells east of the Playa 2 area, as previously recommended. These wells provide a consistent outlet for release of treated water from SEPTS when beneficial use is not possible. Pantex is injecting approximately 150 gpm of treated perched groundwater as of March 2023. Pantex completed construction of a center pivot irrigation system east of FM 2373 in August 2023. The first irrigated crops are expected to be planted in late September for the fall 2023 growing season. Both pump and treat systems are expected to fully operate at that time.

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 indicates injection of a more soluble carbon source (molasses) has distributed widely where injected and that reducing conditions have improved in areas, where wells are widely spaced. Molasses is the primary amendment used at the system, but a mixture of EVO and molasses was used at select wells during the 2023 injection to establish deeper reducing conditions at newer wells, that are closely spaced. Pantex will continue to evaluate the data and make appropriate recommendations for treatment in the upcoming progress reports.

The Southeast ISB Extension was installed at the Pantex fence line to arrest the continued movement of COCs to offsite properties. The system has been operating and is being evaluated for its effectiveness at the offsite property. The Southeast ISB Extension is demonstrating treatment in the zone where injection has occurred, but downgradient monitoring wells are not expected to exhibit the effects of complete treatment until 2025. Pantex continues 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 completed in 2021 and the first injection into the system was completed in October 2021, with semi-annual injections occurring afterward. Phase 3 well construction is also complete and construction of Phase 3 and 4 infrastructure is anticipated to be completed in September 2023. As more injections occur at the system, concentrations of HEs are trending downward in sampled REC wells, including those at the leading edge of the plume.

Since 2002, the SVE system has treated soil gas and residual NAPL in the solvent evaporation pit/chemical burn pit area of the Burning Ground, mitigating vertical movement of VOCs to

groundwater. Pantex was unable to complete rebound tests successfully, and was 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 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 pulsing the system to evaluate final closure of the system. Based on data collected since 2020, Pantex is planning to recommend closure of the system in the upcoming renewal of the Hazardous Waste Permit.

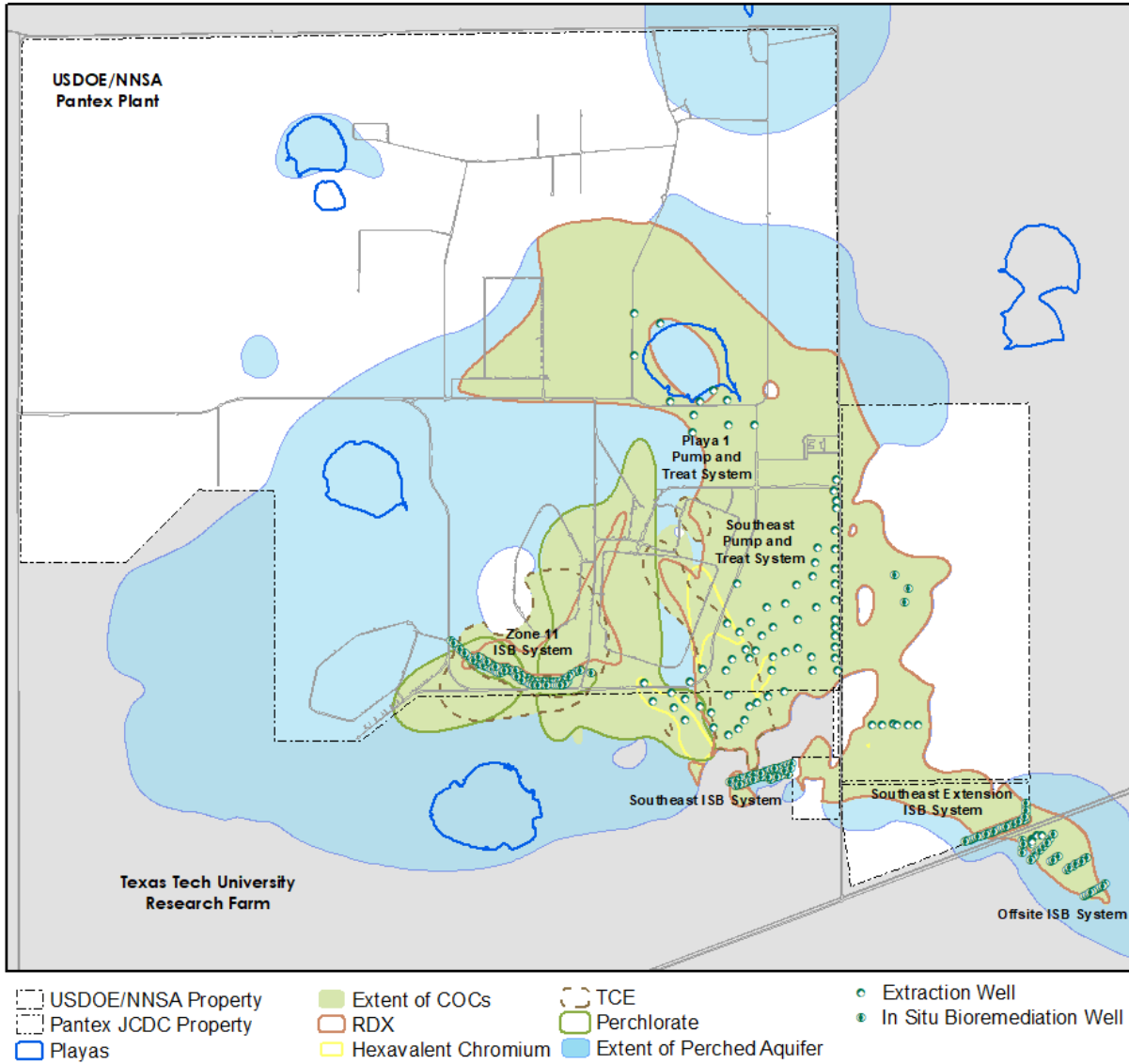
The groundwater remedies are considered protective for the short-term, as untreated perched groundwater usage is controlled to prevent human contact and monitoring data continue to indicate that the remedial actions remain generally protective of the Ogallala Aquifer. Additional investigation of the area of the Ogallala Aquifer near PTX06-1056 began in early 2023 with installation of two new monitoring wells. Installation of a third well is planned for September 2023.



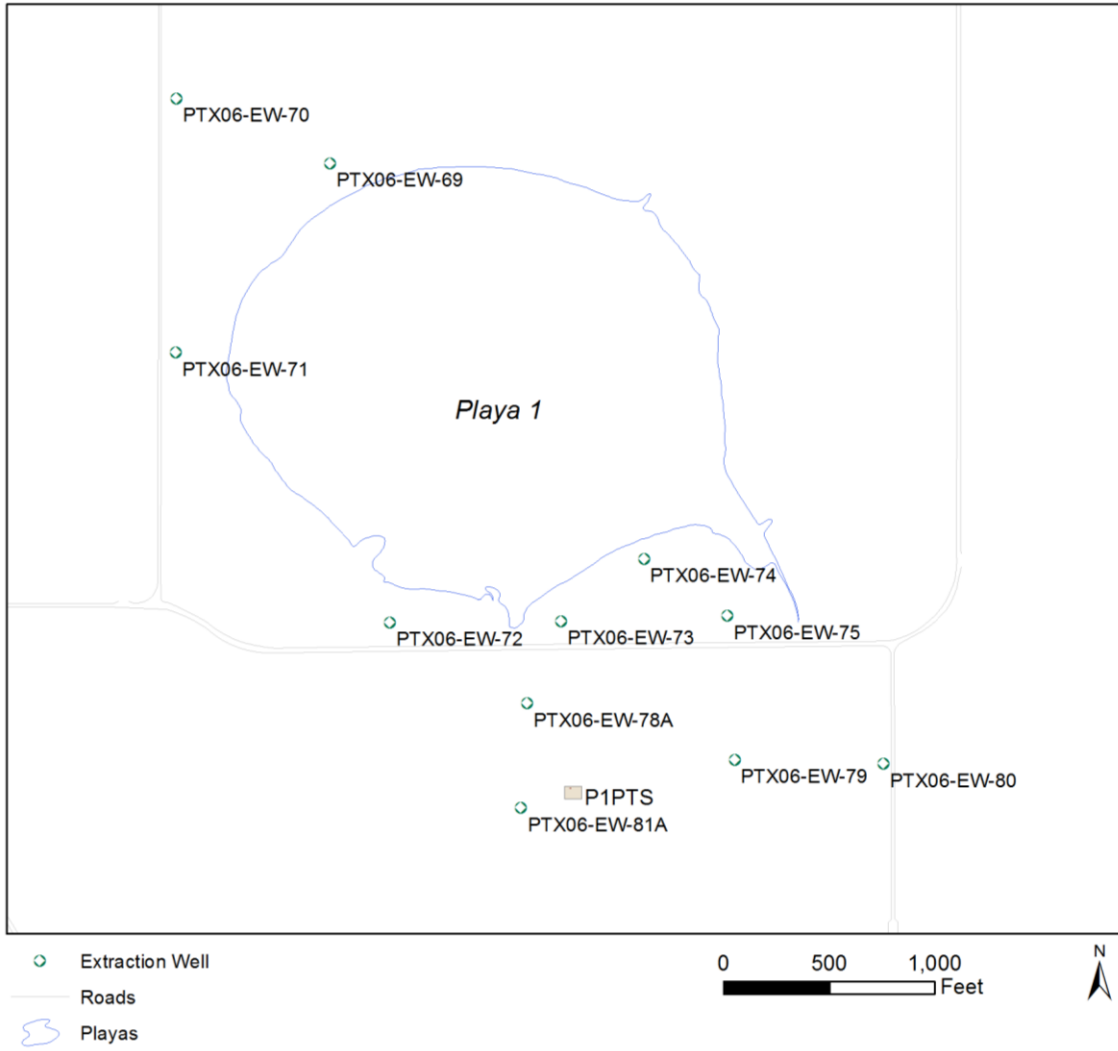
## **Appendix A**

### **Maps**

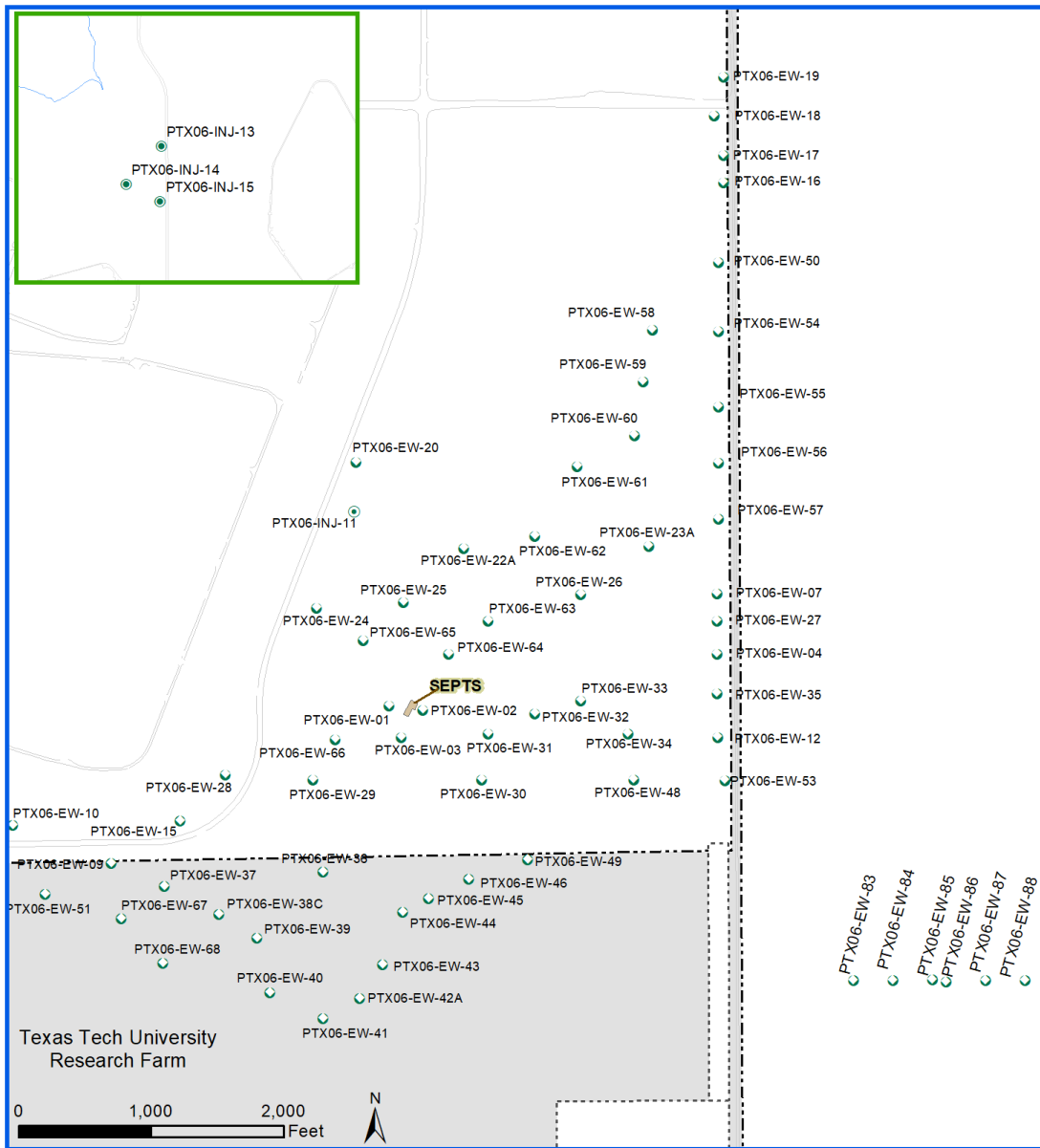




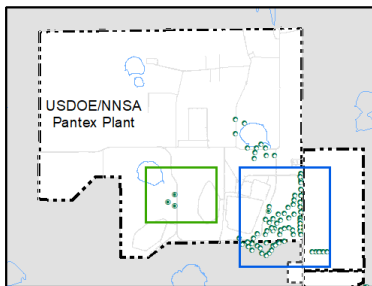
Extent of Perched Groundwater and Contaminant Plumes



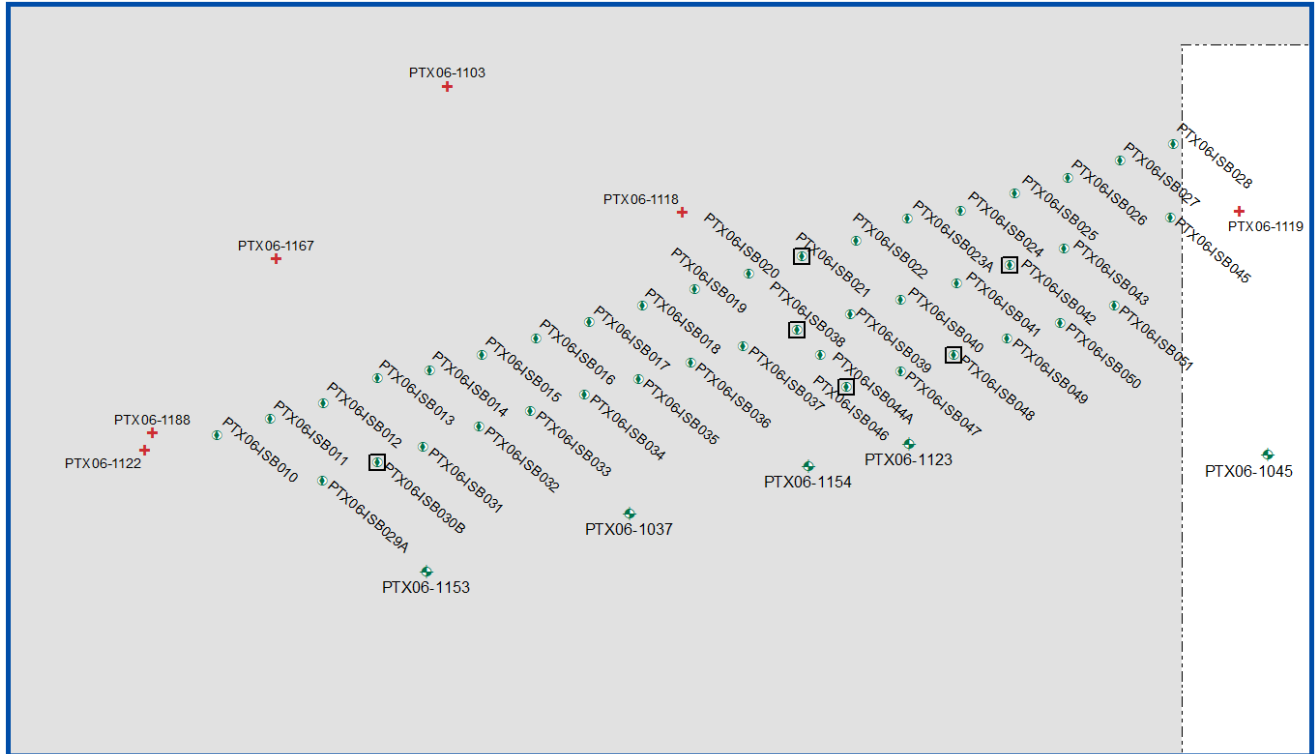
Playa 1 Pump and Treat System Wells



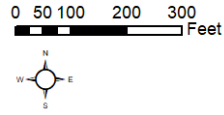
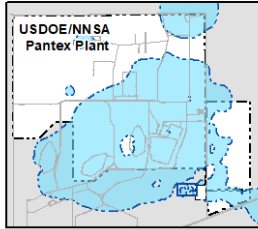
- Extraction Well
- Injection Well
- Roads
- - - DOE Property
- - - Pantex ASC LLC Property



Southeast Pump and Treat System Wells

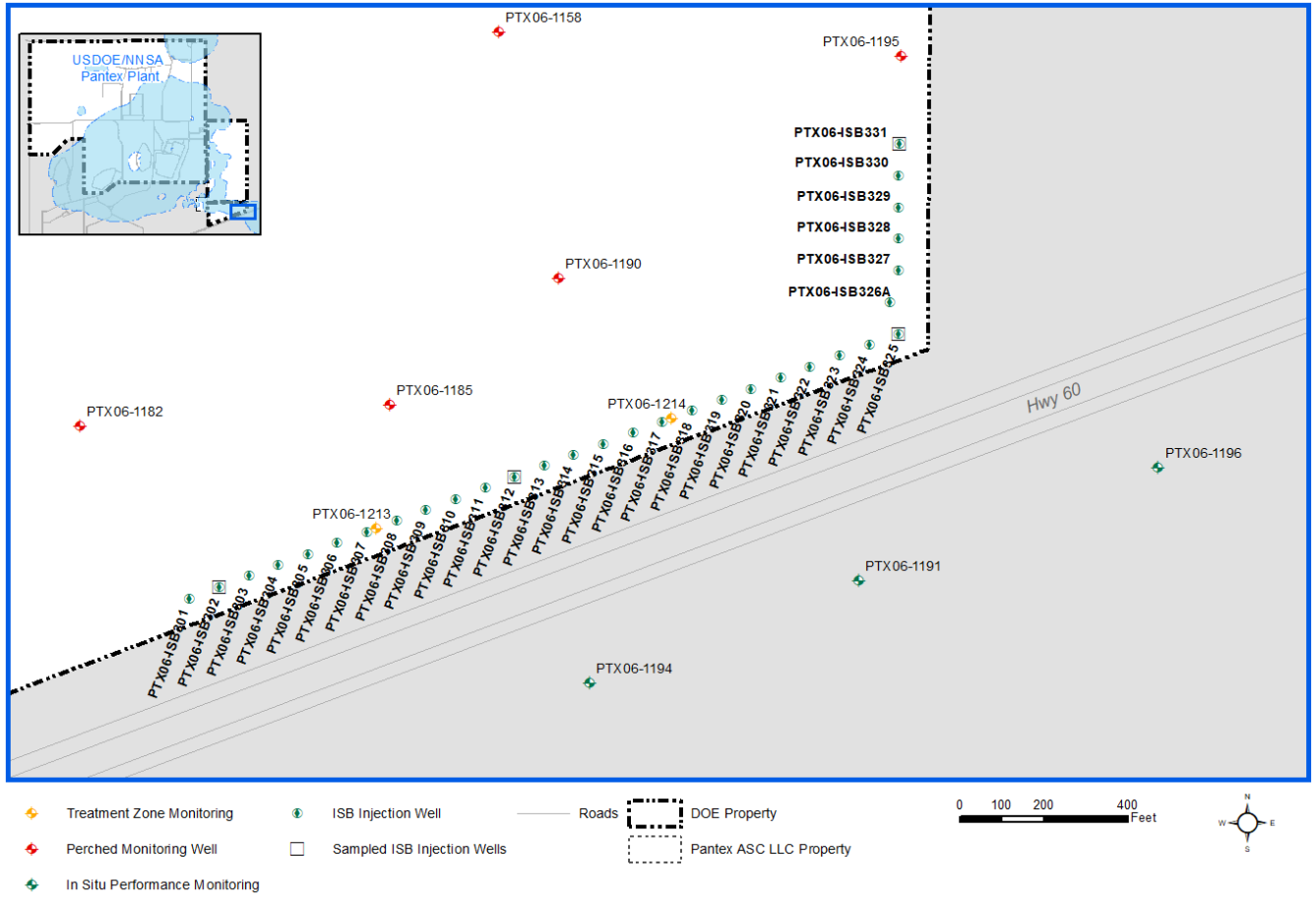


- + ISPM Well
- ISB Injection Well
- Sampled ISB Injection Well
- + Dry Monitoring Well
- Pantex ASC Property
- DOE Property



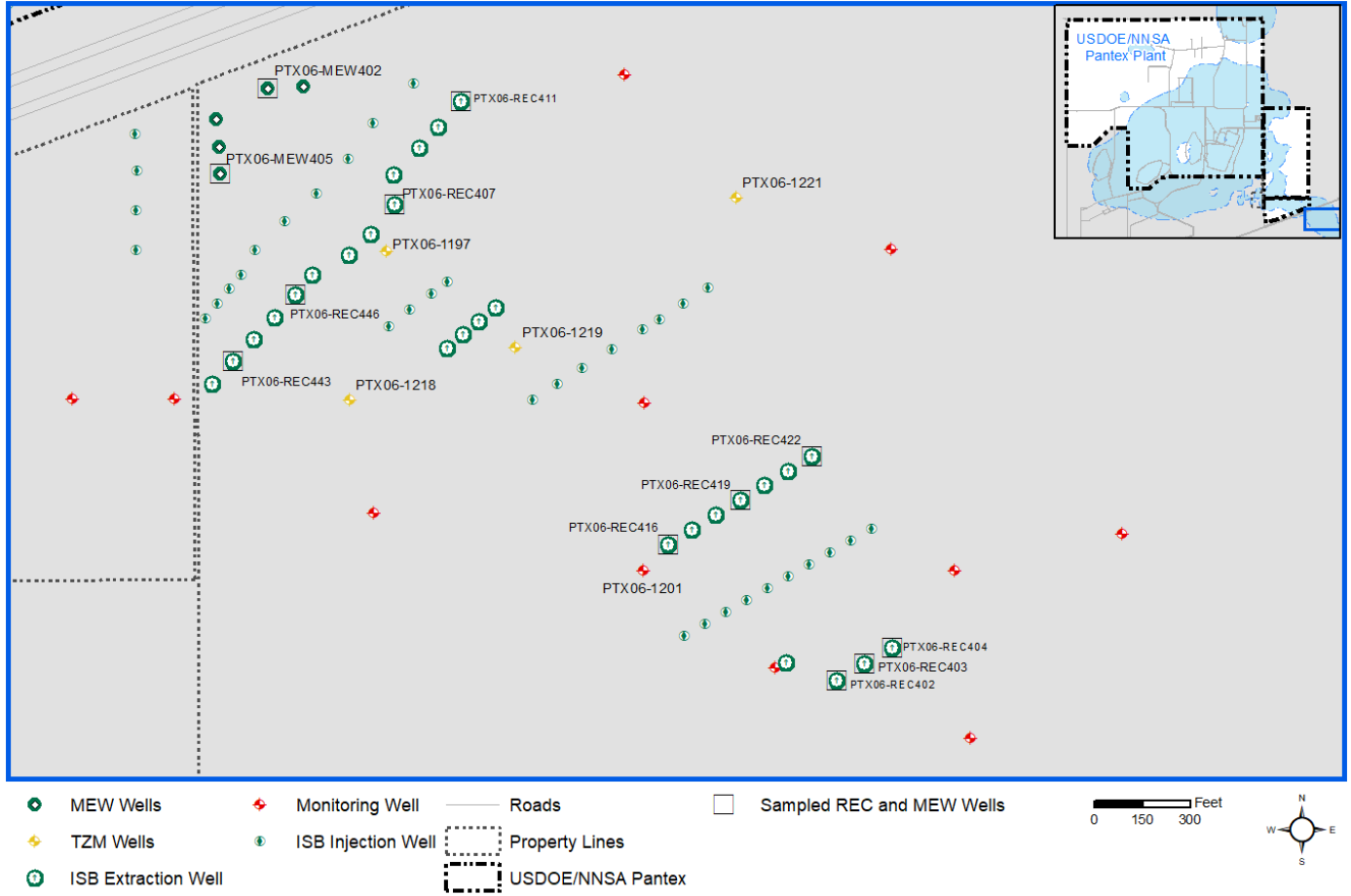
**Southeast ISB Wells and Sampling Locations**



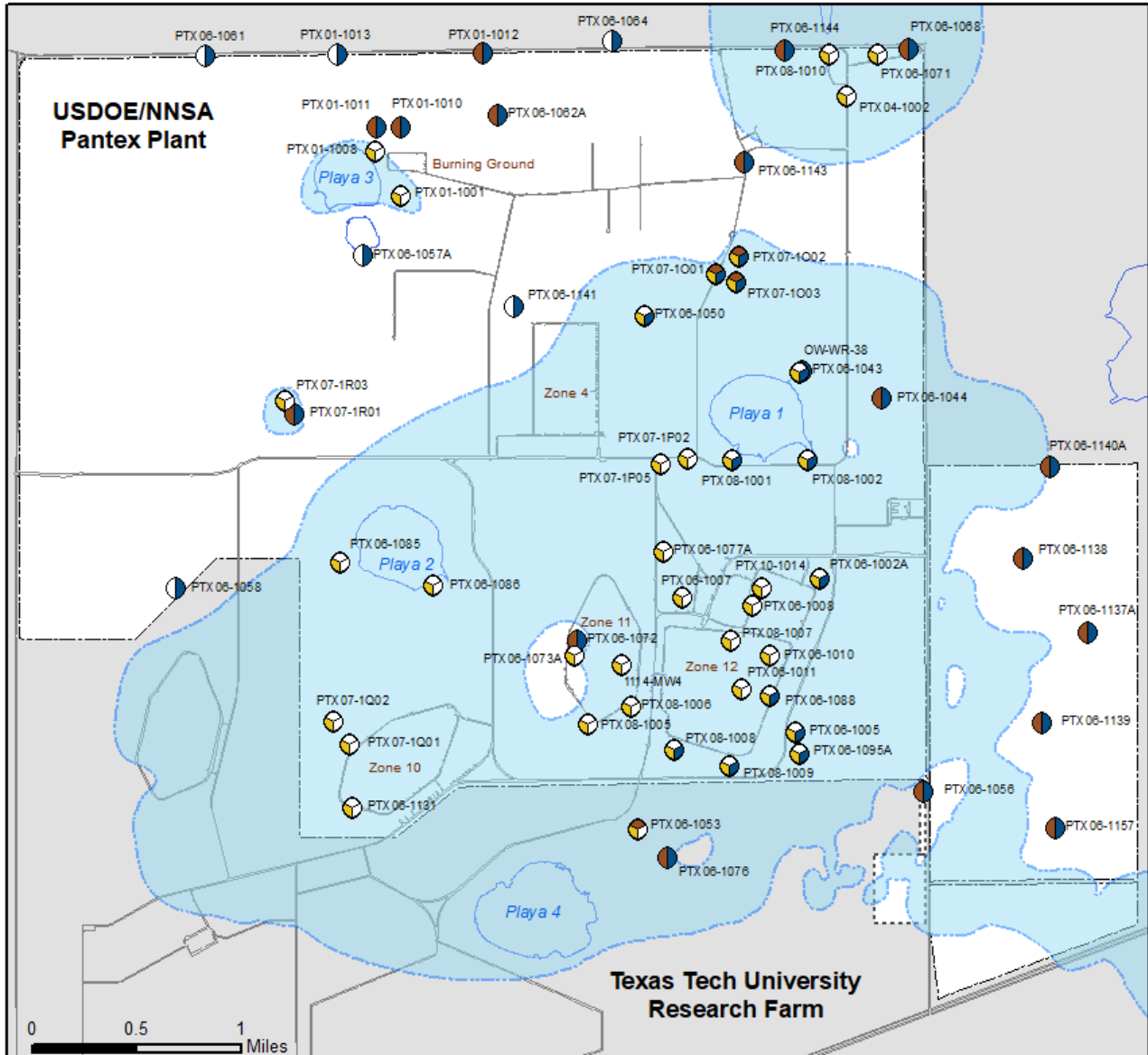


Southeast ISB Extension Wells and Sampling Locations



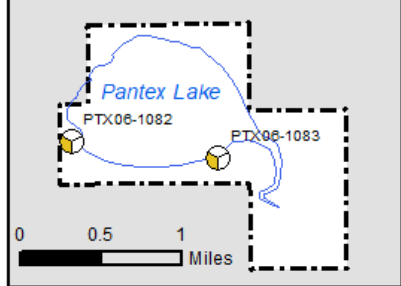
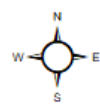


Offsite ISB Wells and Sampling Locations



- Ogallala Well Objectives**
- Early Detection
  - Uncertainty Management
- Perched Well Objectives**
- Plume Stability
  - Uncertainty Management
  - Response Action

- USDOE/NNSA Property
- Perched Extent



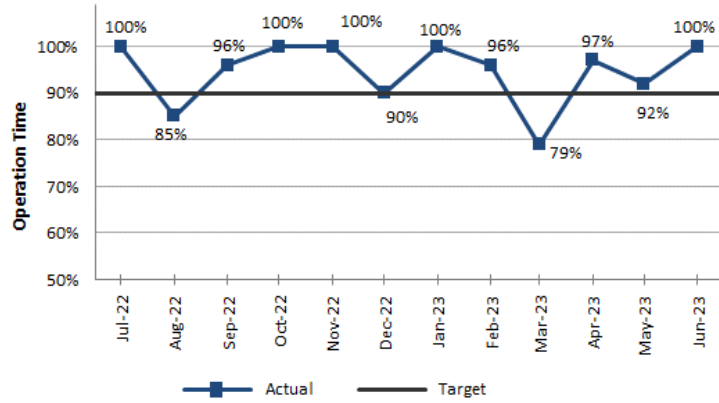
Uncertainty Management and Early Detection Wells Evaluated in the Quarterly Progress Report

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

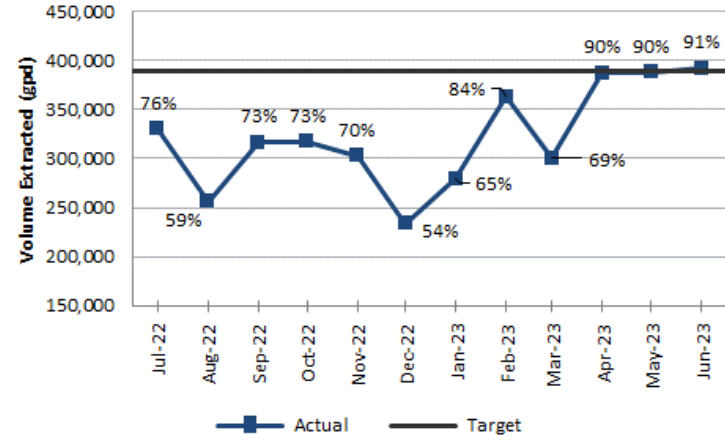


## **Southeast Pump and Treat System Graphs**

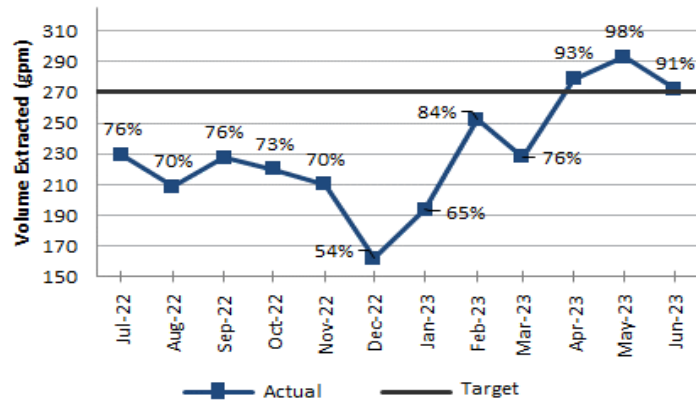




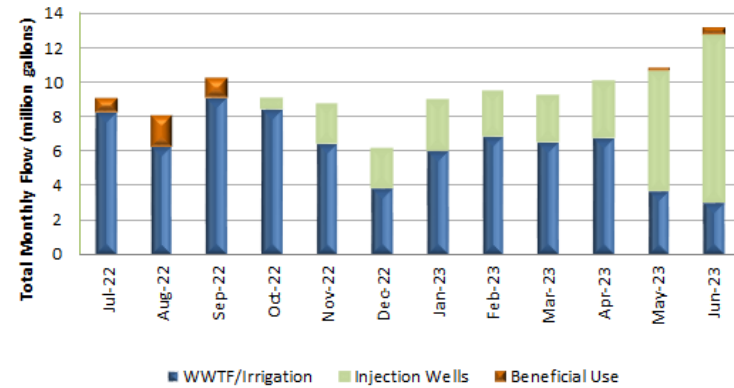
SEPTS Operation Time vs Target



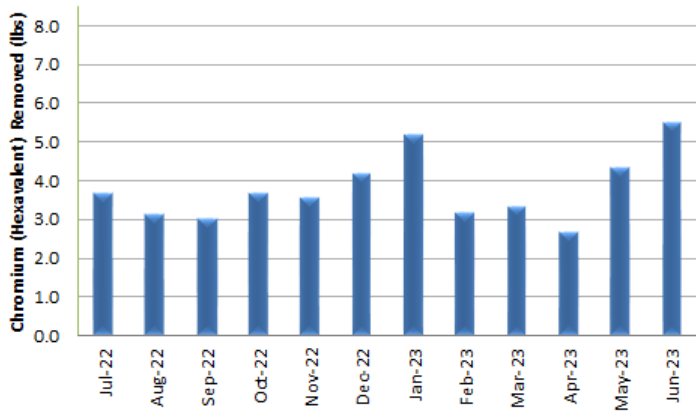
SEPTS GPD and % Capacity



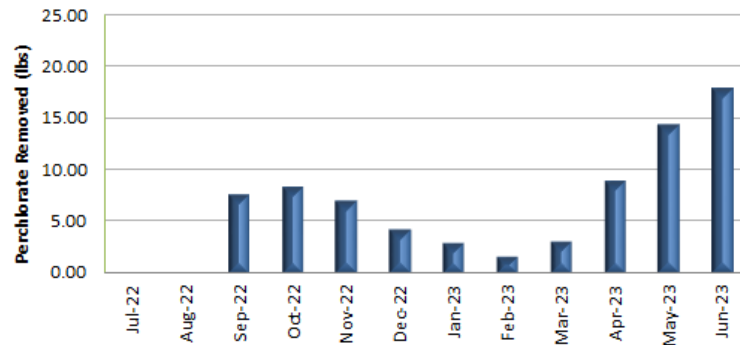
SEPTS Average GPM and % Capacity



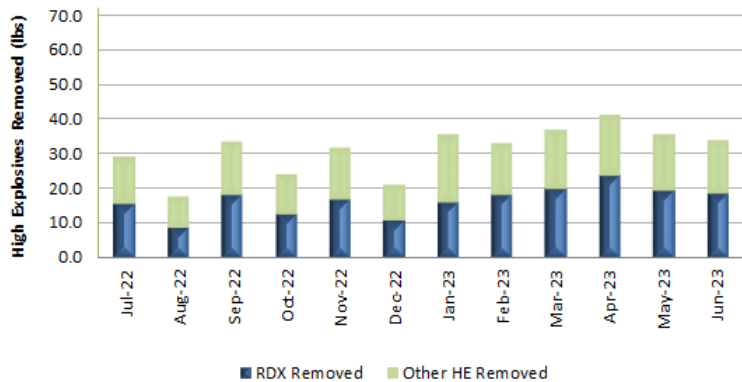
SEPTS Monthly Total Flow



SEPTS Chromium Removal by Month



SEPTS Perchlorate Removal by Month

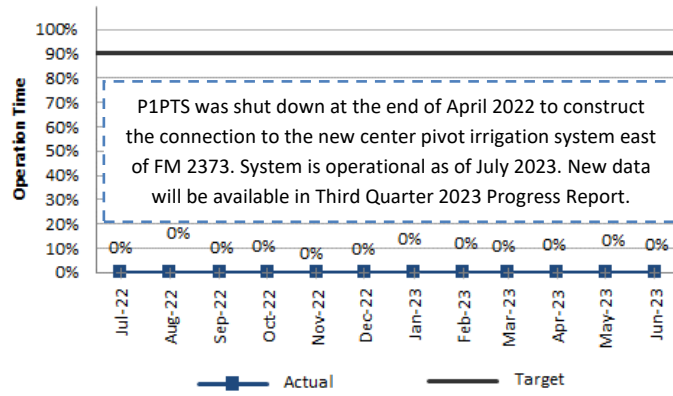


SEPTS HE Removal by Month

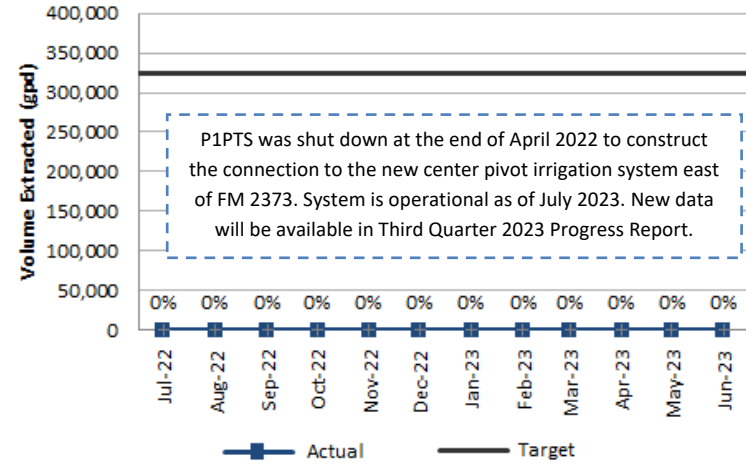


## **Playa 1 Pump and Treat System Graphs**

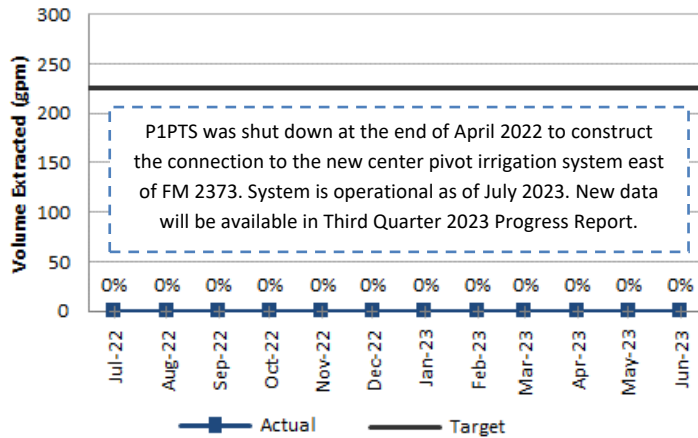




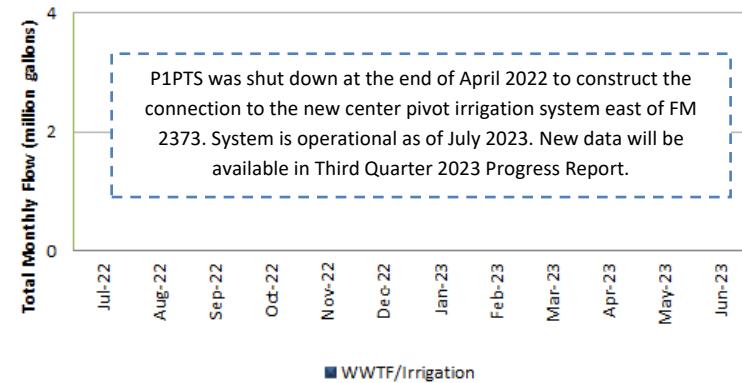
P1PTS Operational Time Vs Target



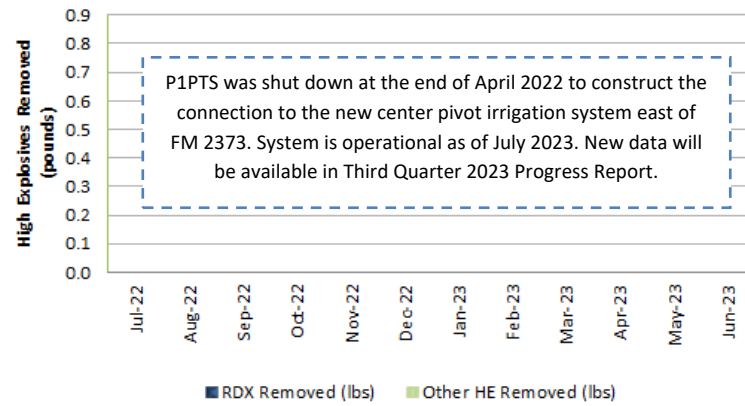
P1PTS Average GPD and % Capacity



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.

Page left intentionally blank.

## **Appendix C**

### **ISB Graphs**

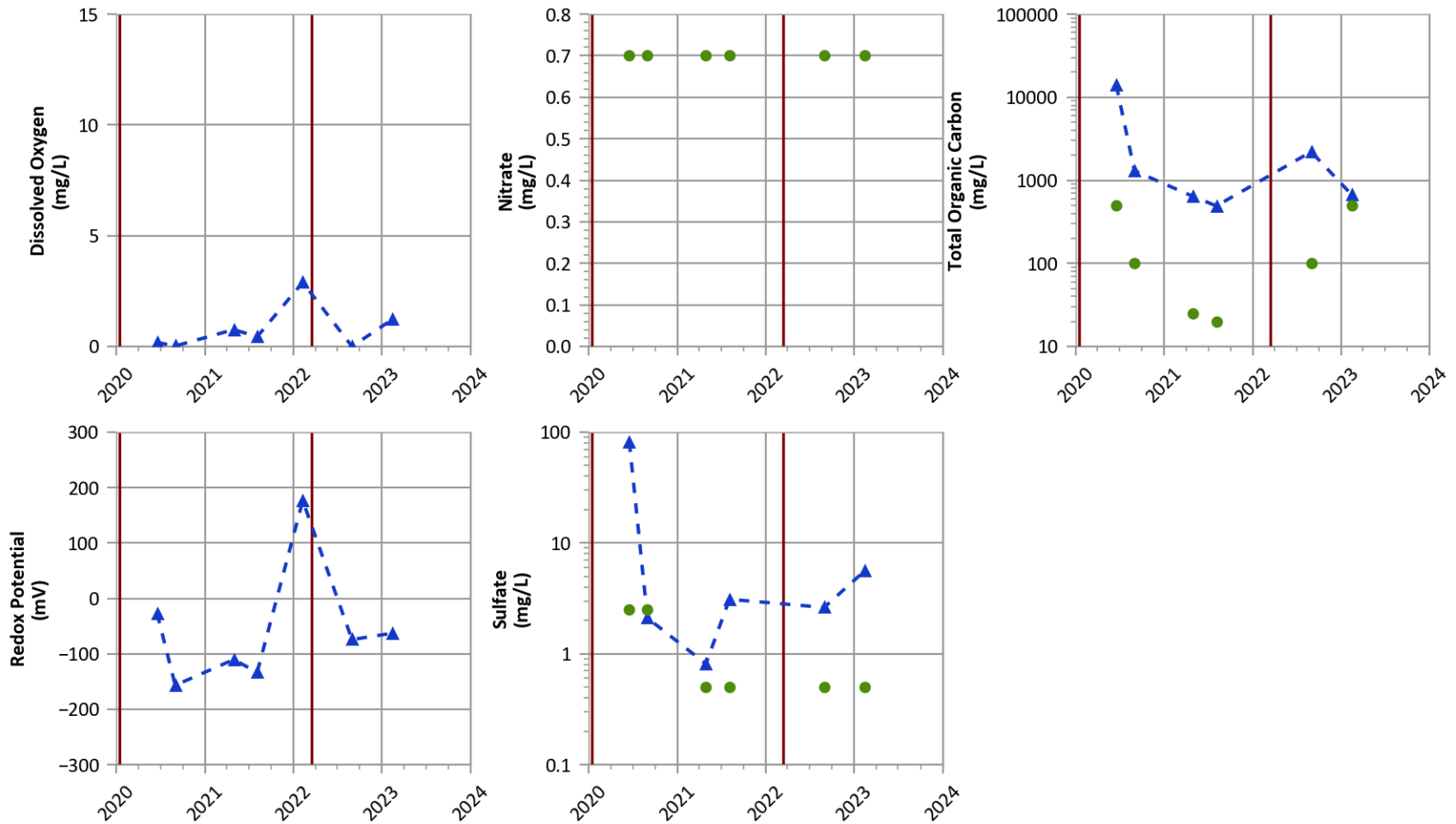




## Southeast ISB Graphs



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



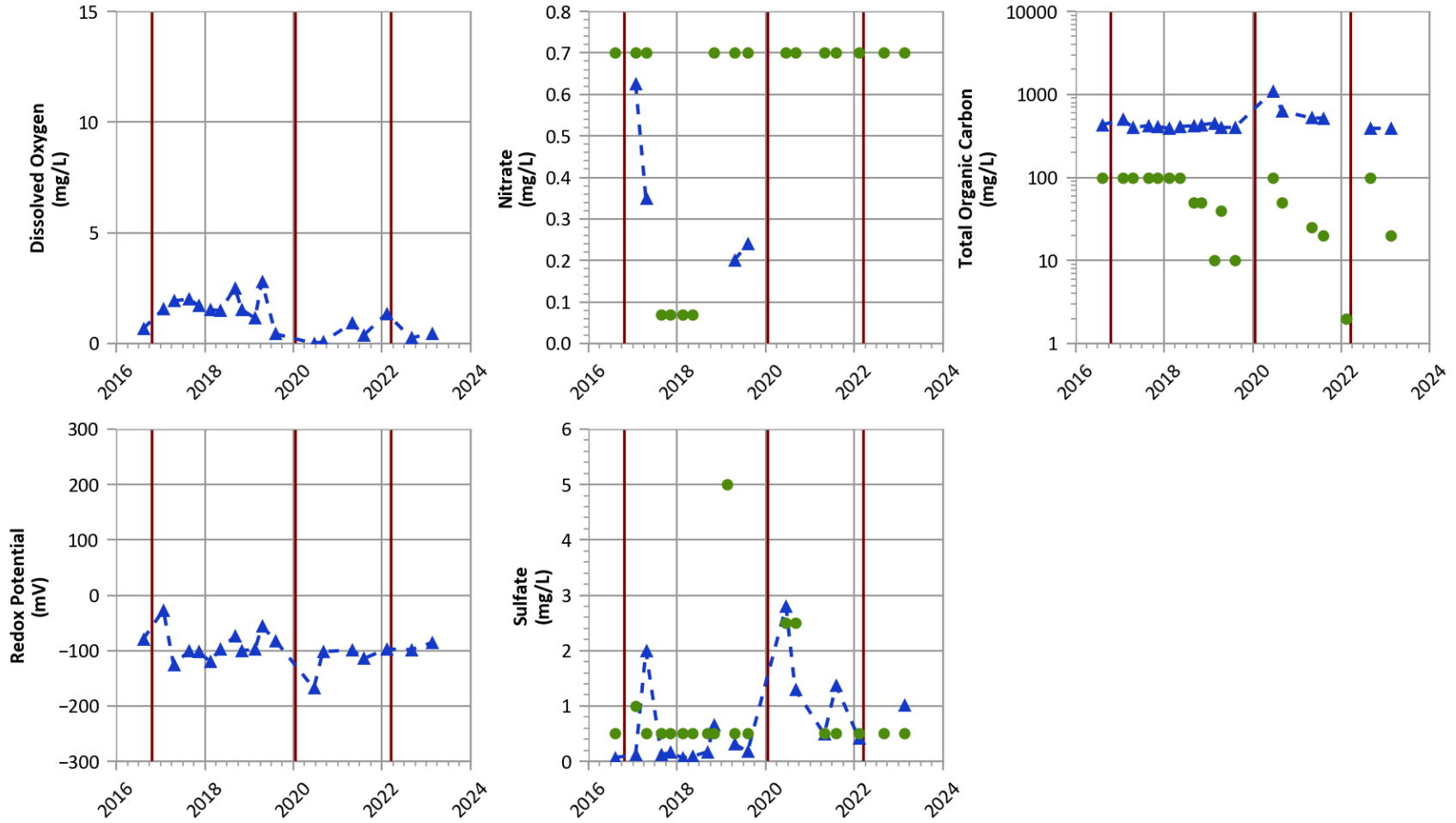
**Typical Baseline Concentrations in Perched Groundwater**

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



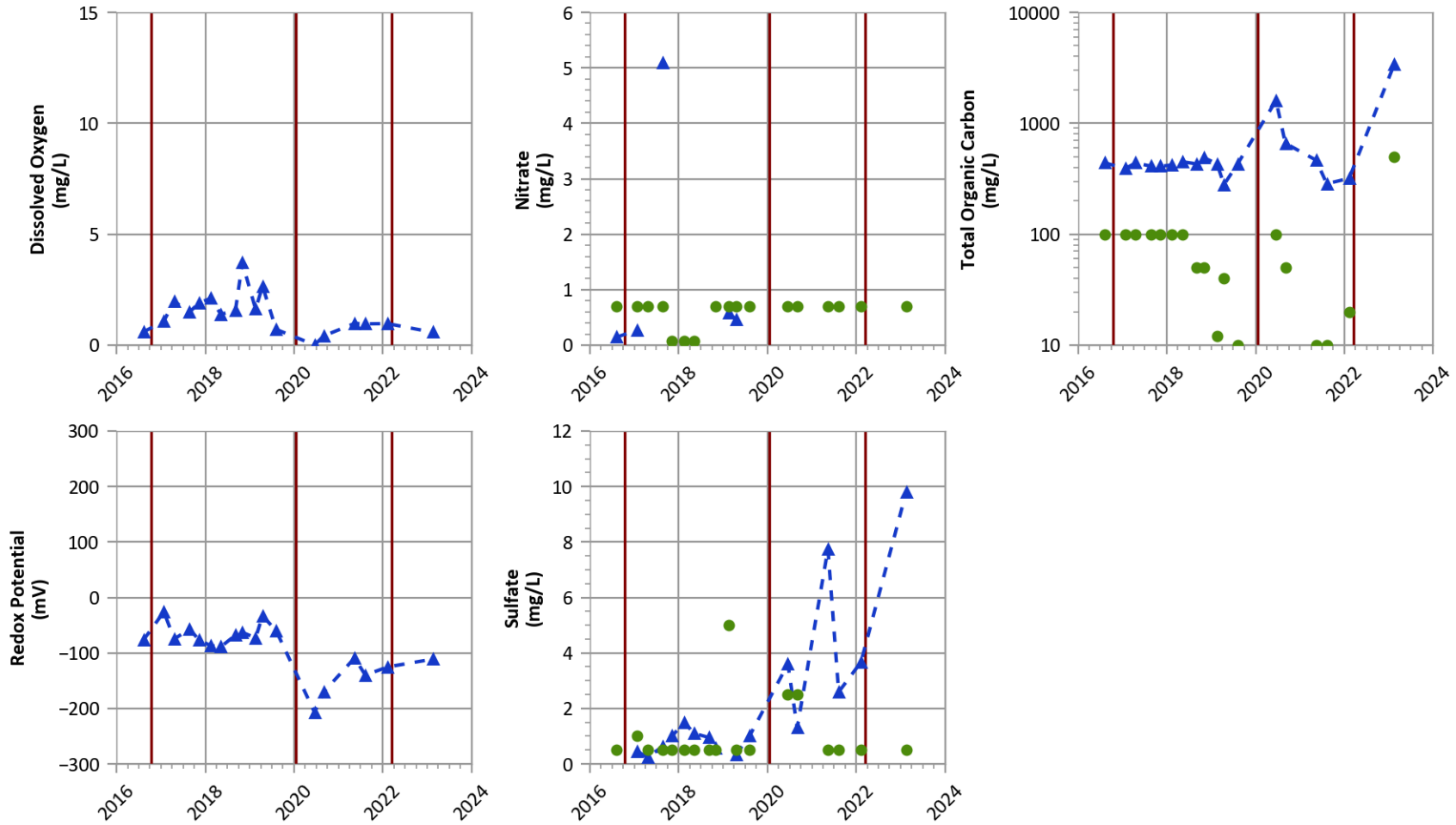
Typical Baseline Concentrations in Perched Groundwater

- 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



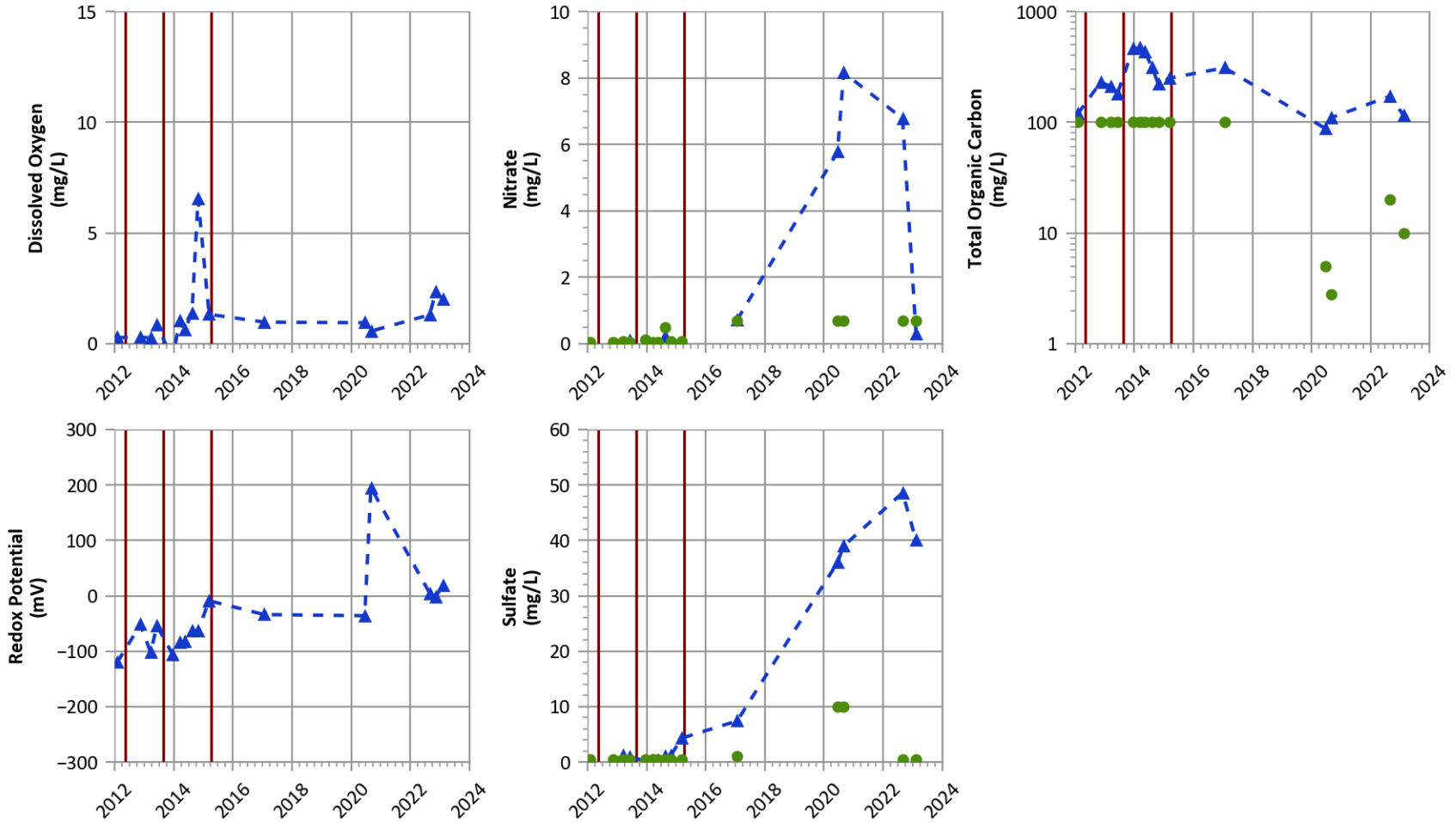
Typical Baseline Concentrations in Perched Groundwater

- 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



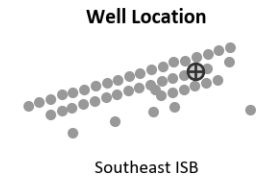
PTX06-ISB042 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



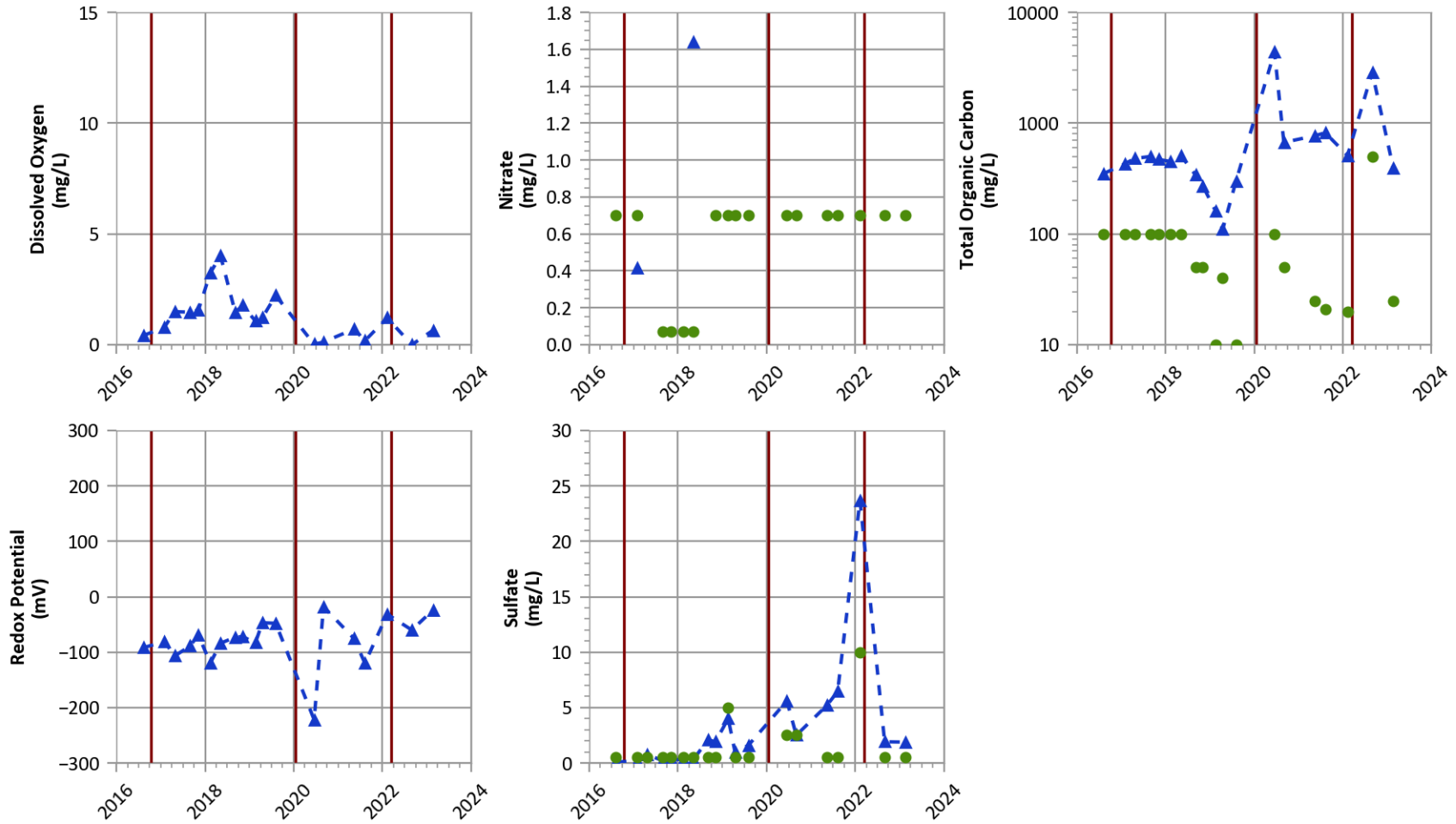
Typical Baseline Concentrations in Perched Groundwater

- 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



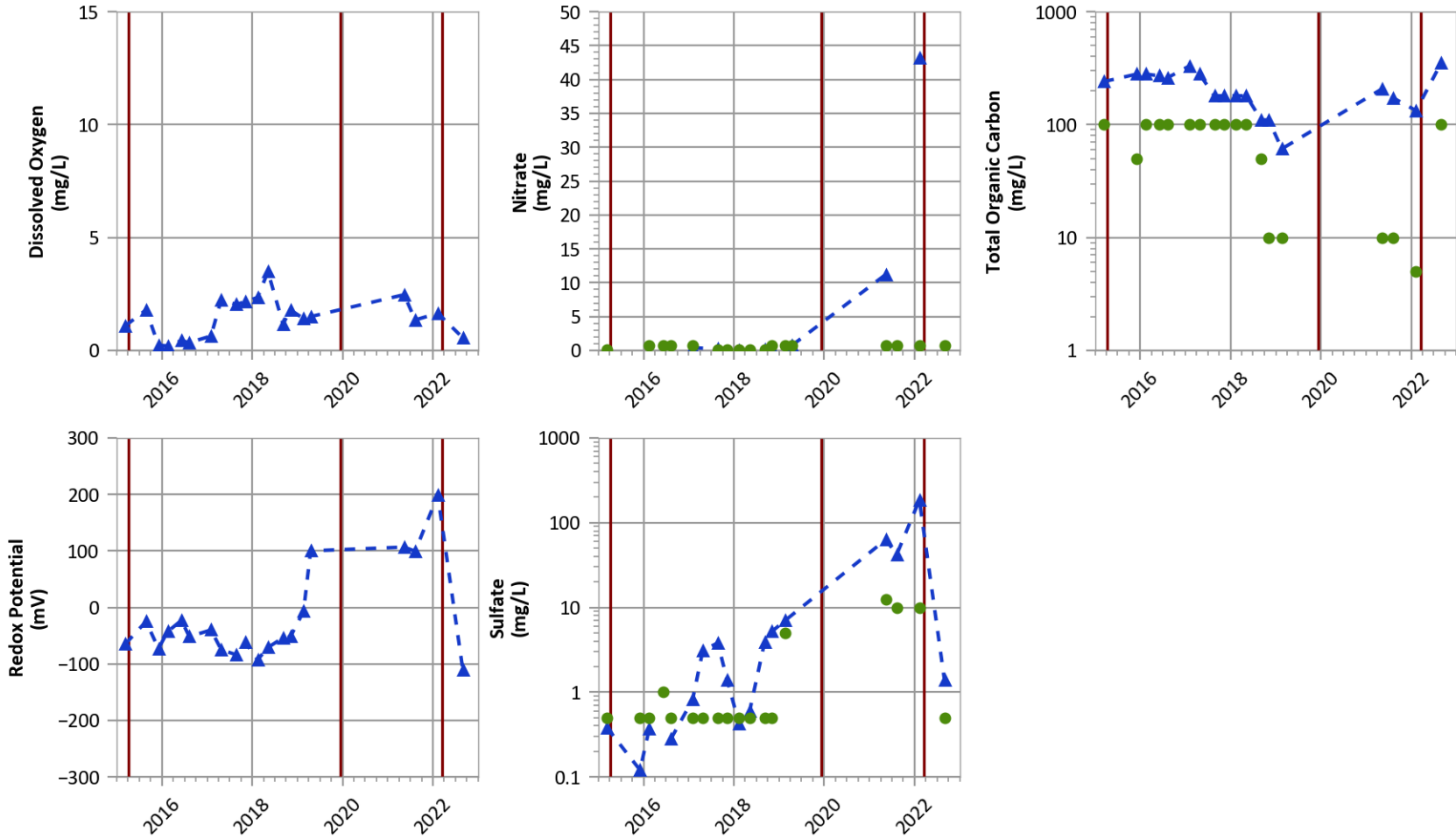
Typical Baseline Concentrations in Perched Groundwater

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**

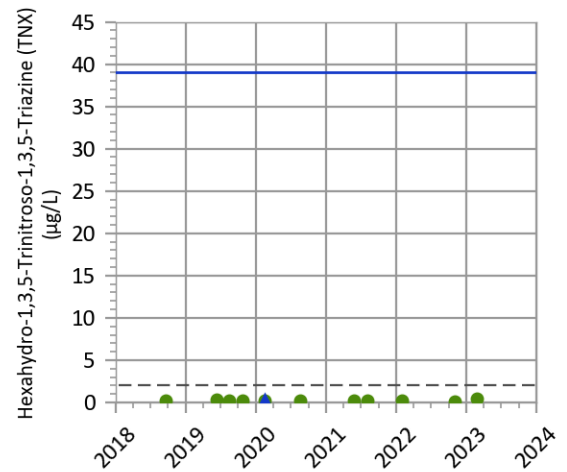
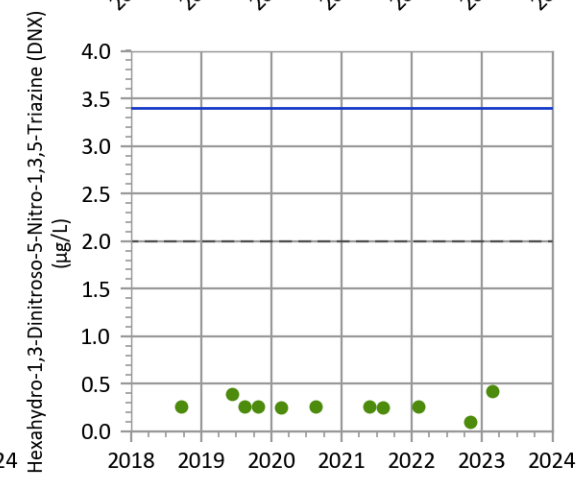
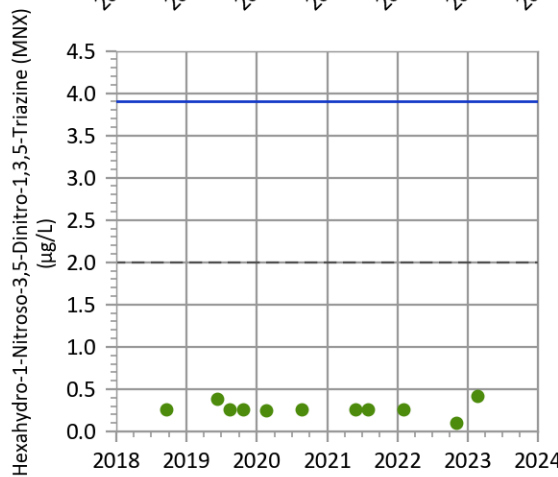
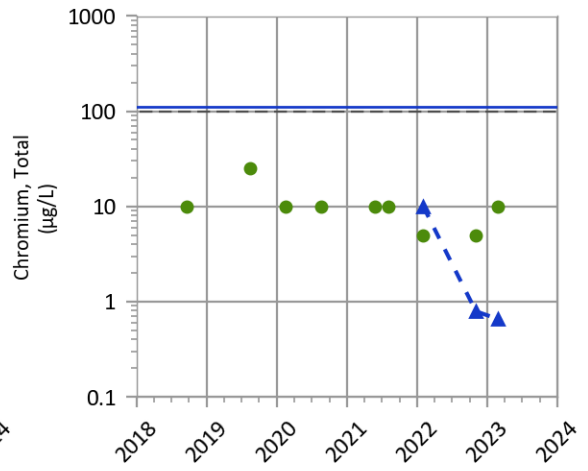
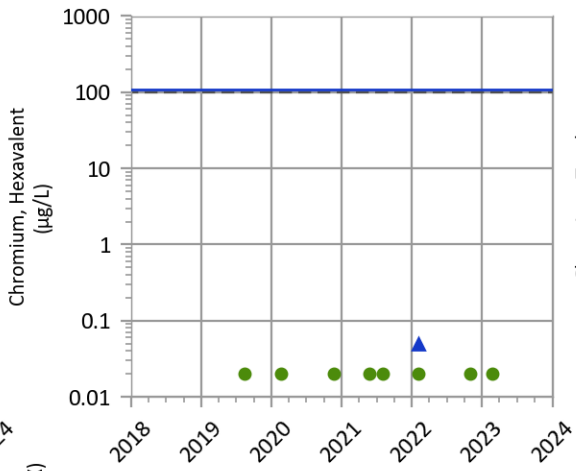
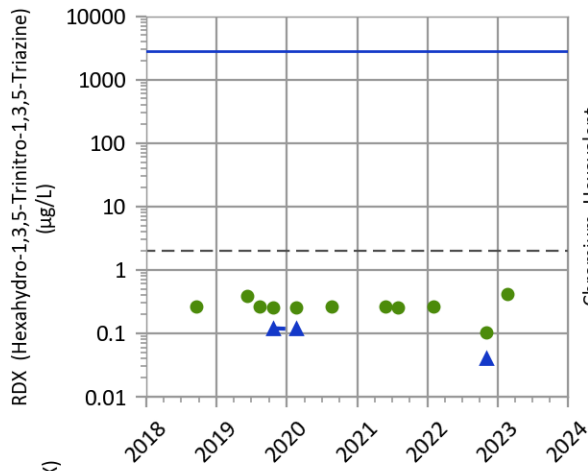
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

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





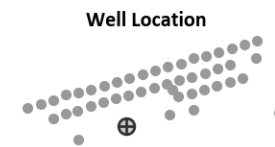
**PTX06-1037 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



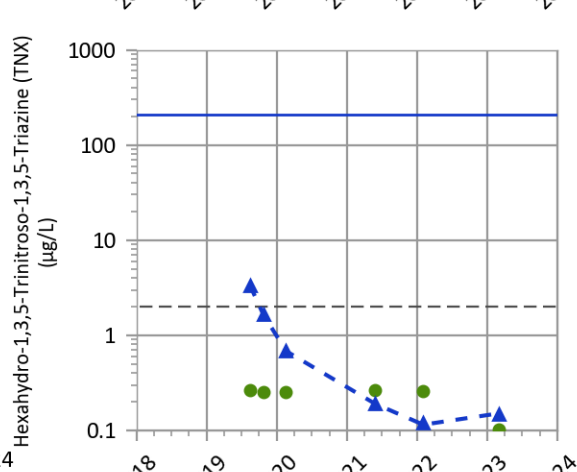
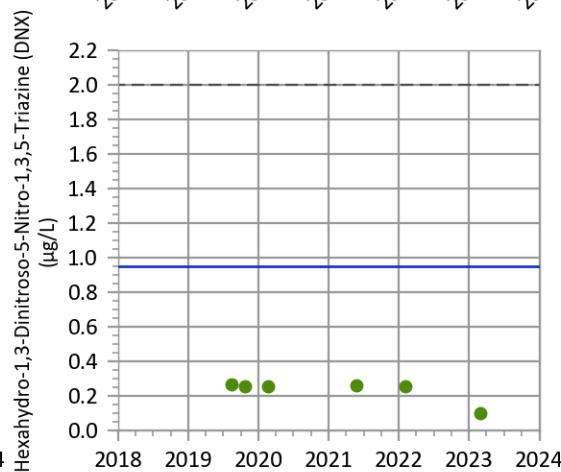
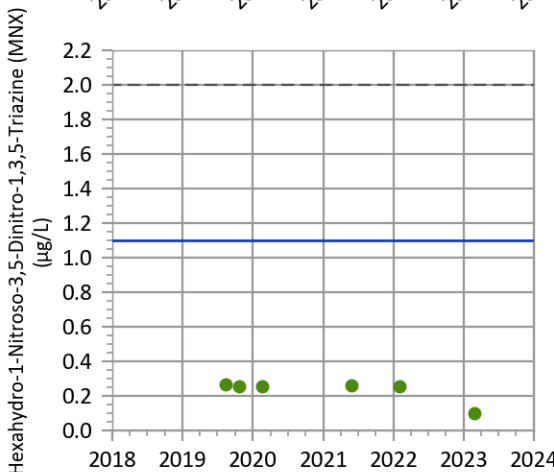
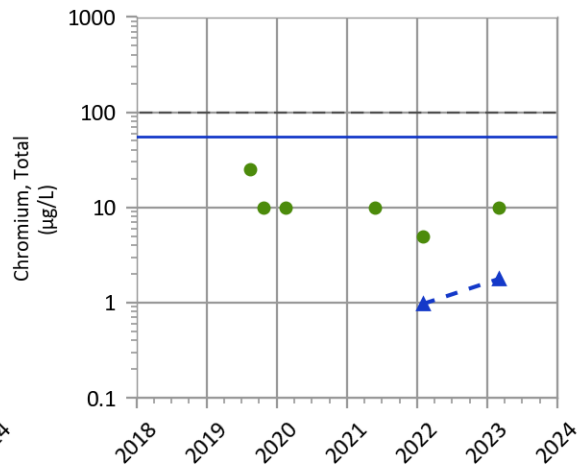
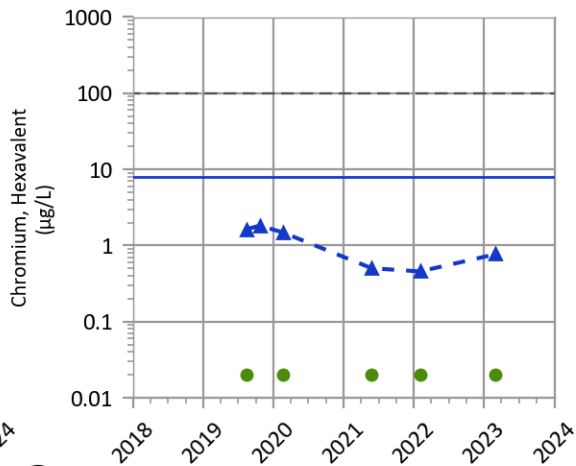
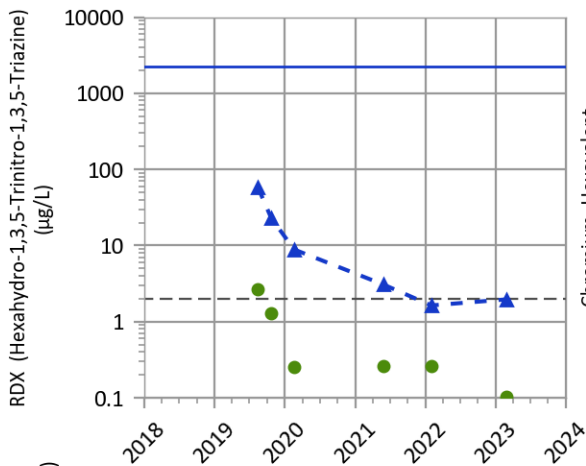
Most Recent Measured COC Concentrations (Feb 18, 2020)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	Non-Detect	2.0
MNX	Non-Detect	2.0
CR-6	Non-Detect	100.0
DNX	Non-Detect	2.0
CR	0.66	100.0
TNX	Non-Detect	2.0

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



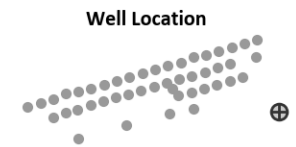
**PTX06-1045 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



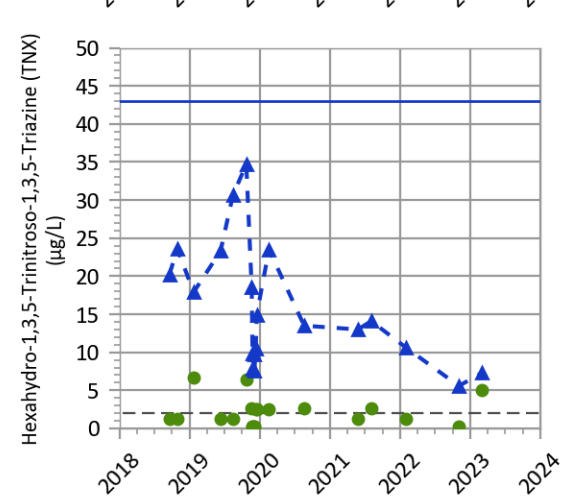
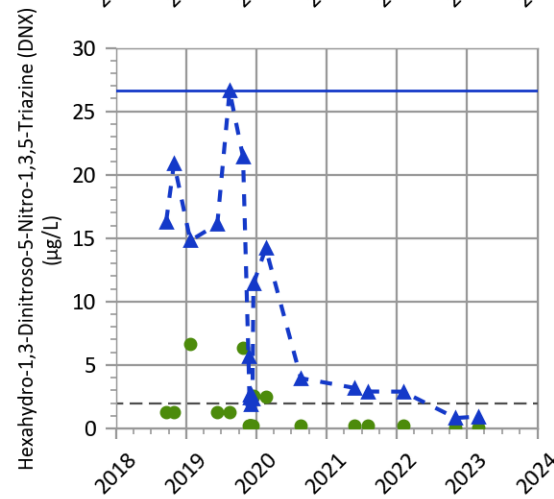
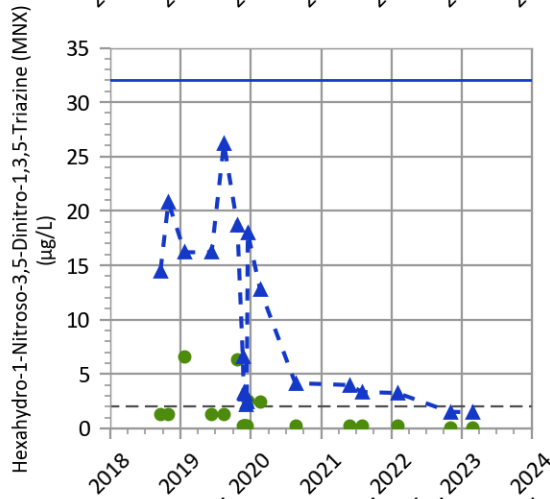
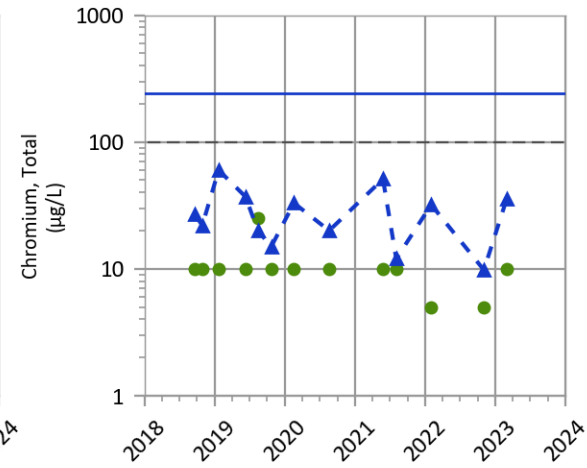
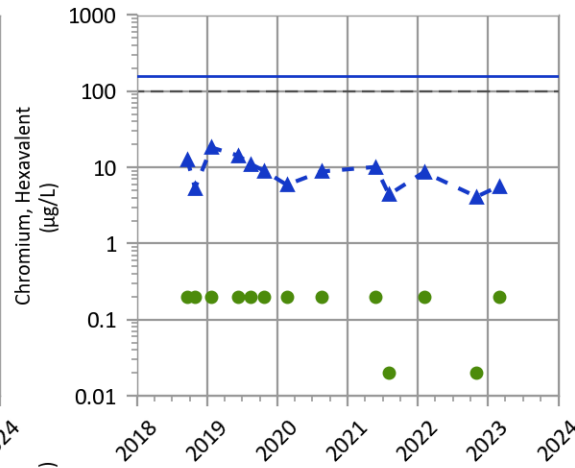
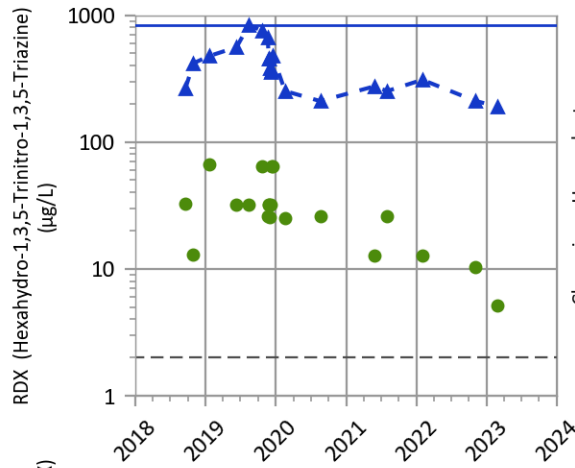
Most Recent Measured COC Concentrations (Feb 28, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	1.96	2.0
MNX	Non-Detect	2.0
CR-6	0.77	100.0
DNX	Non-Detect	2.0
CR	1.77	100.0
TNX	0.15	2.0

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



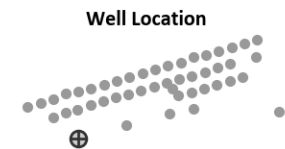
**PTX06-1153 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



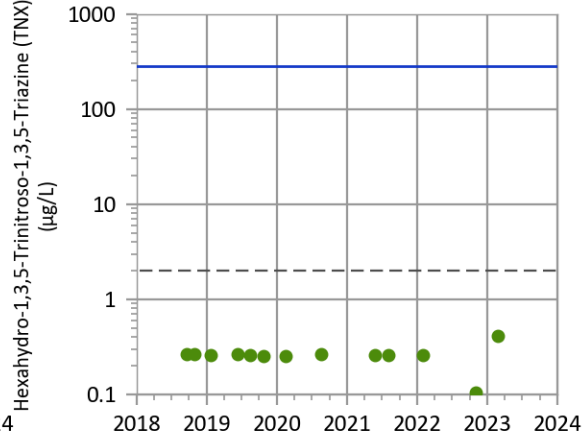
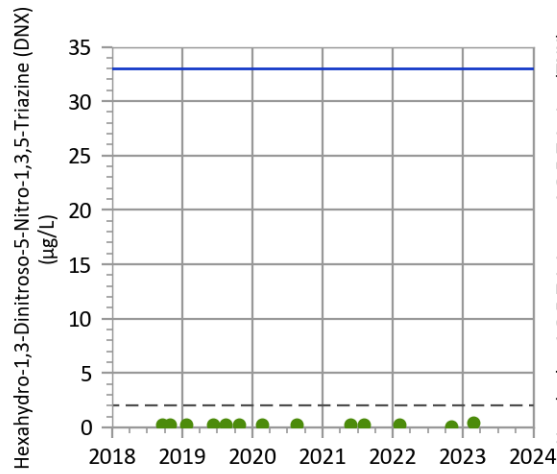
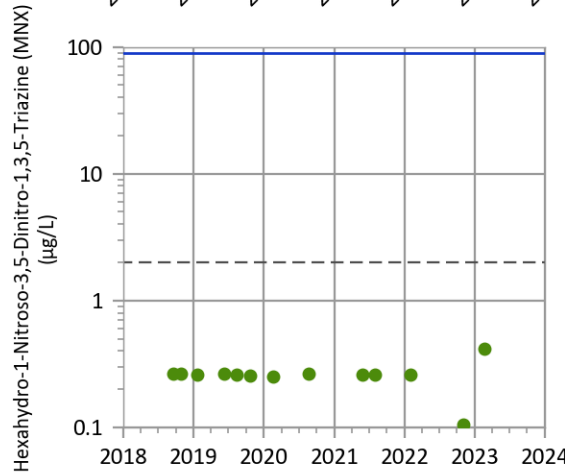
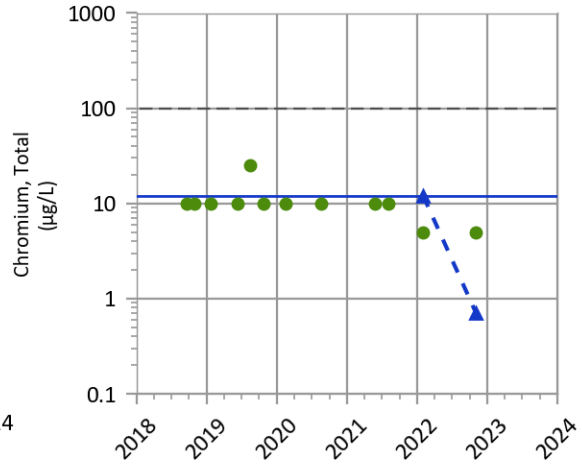
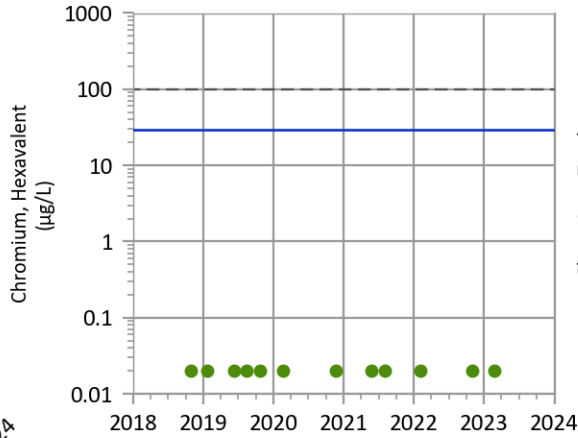
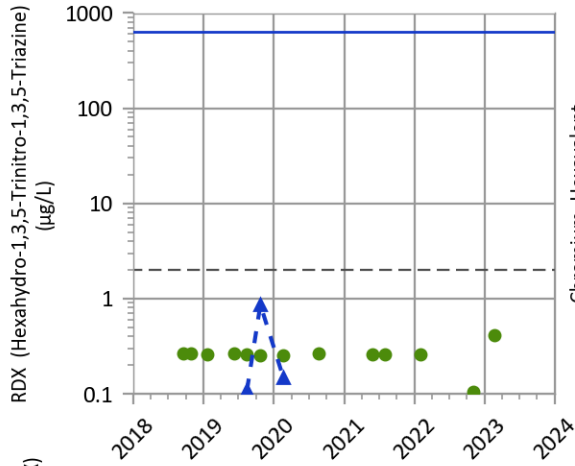
Most Recent Measured COC Concentrations (Feb 28, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	190.0	2.0
MNX	1.49	2.0
CR-6	5.68	100.0
DNX	0.94	2.0
CR	35.3	100.0
TNX	7.28	2.0

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



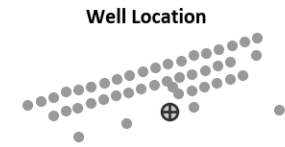
**PTX06-1154 Downgradient Performance Indicators  
Southeast In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Feb 22, 2023)

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	0.71	100.0
TNX	Non-Detect	2.0

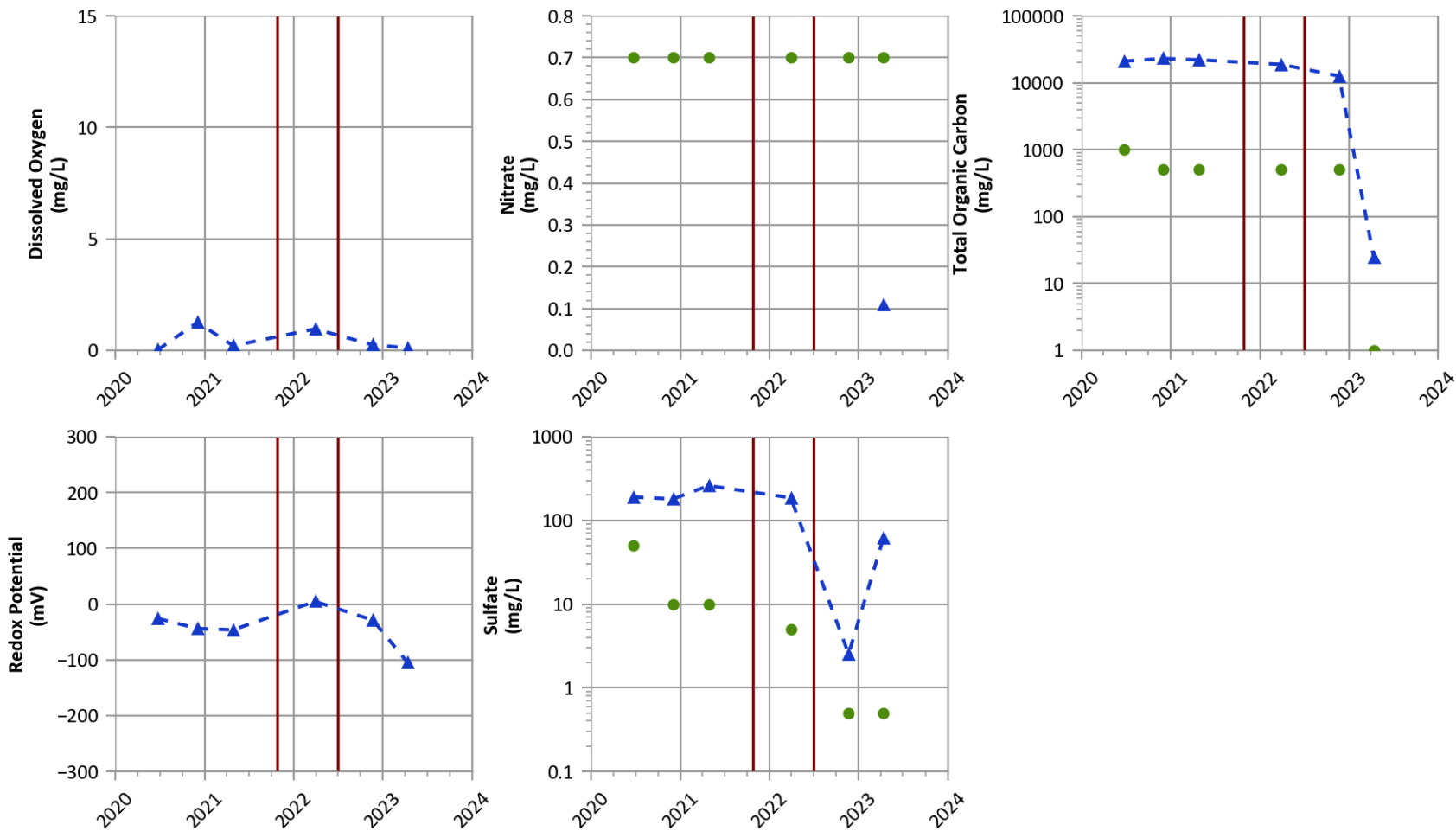
- ▲ Measured Value
- Sample Detection Limit
- - - Concentration Trend
- Maximum Concentration
- - - Groundwater Protection Standard



## Zone 11 ISB Graphs



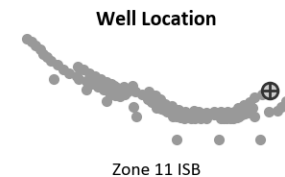
PTX06-ISB055 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



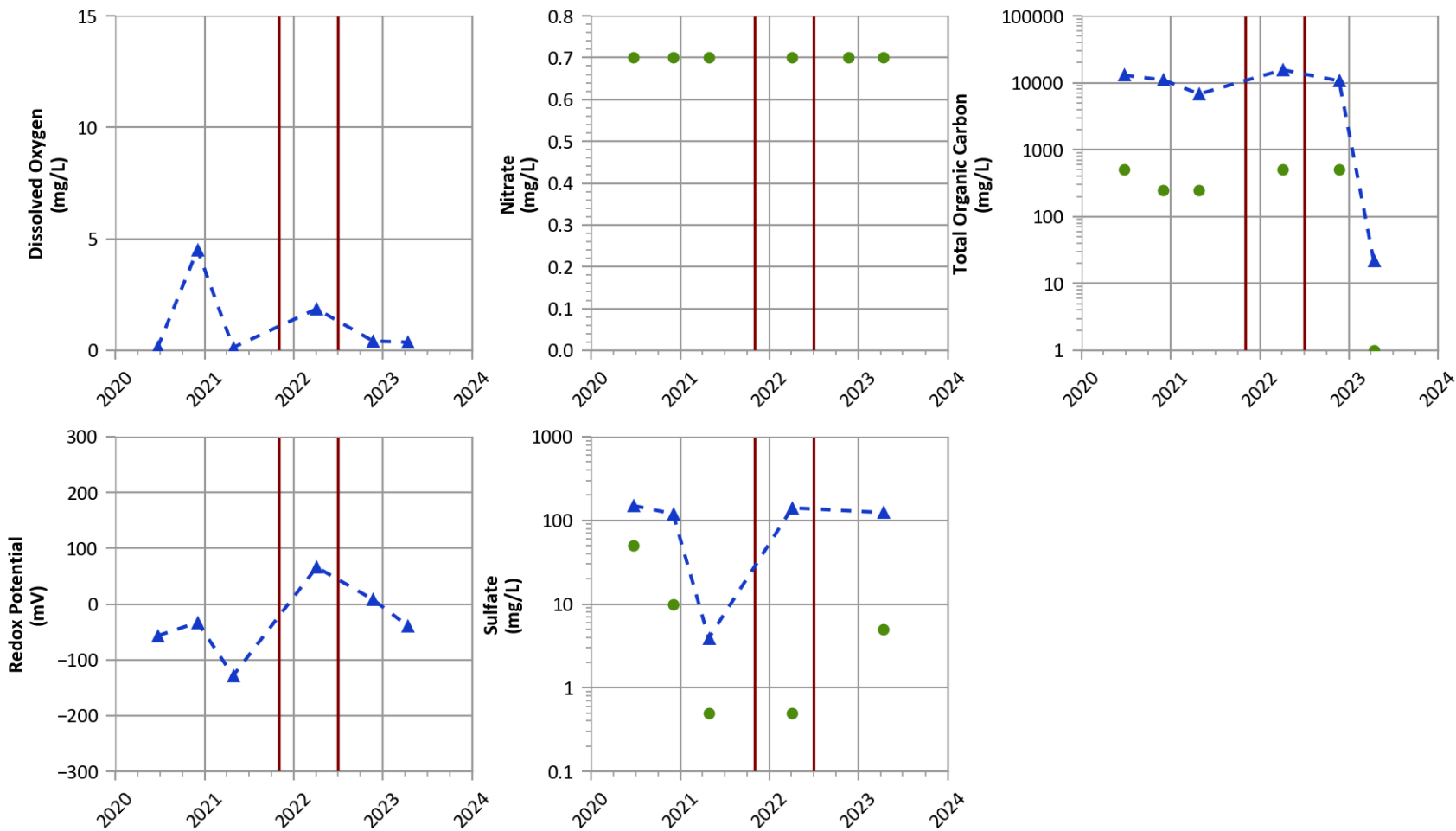
Typical Baseline Concentrations in Perched Groundwater

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



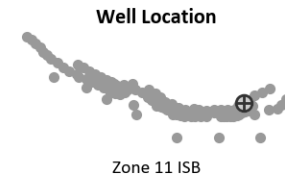
PTX06-ISB059 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



Typical Baseline Concentrations in Perched Groundwater

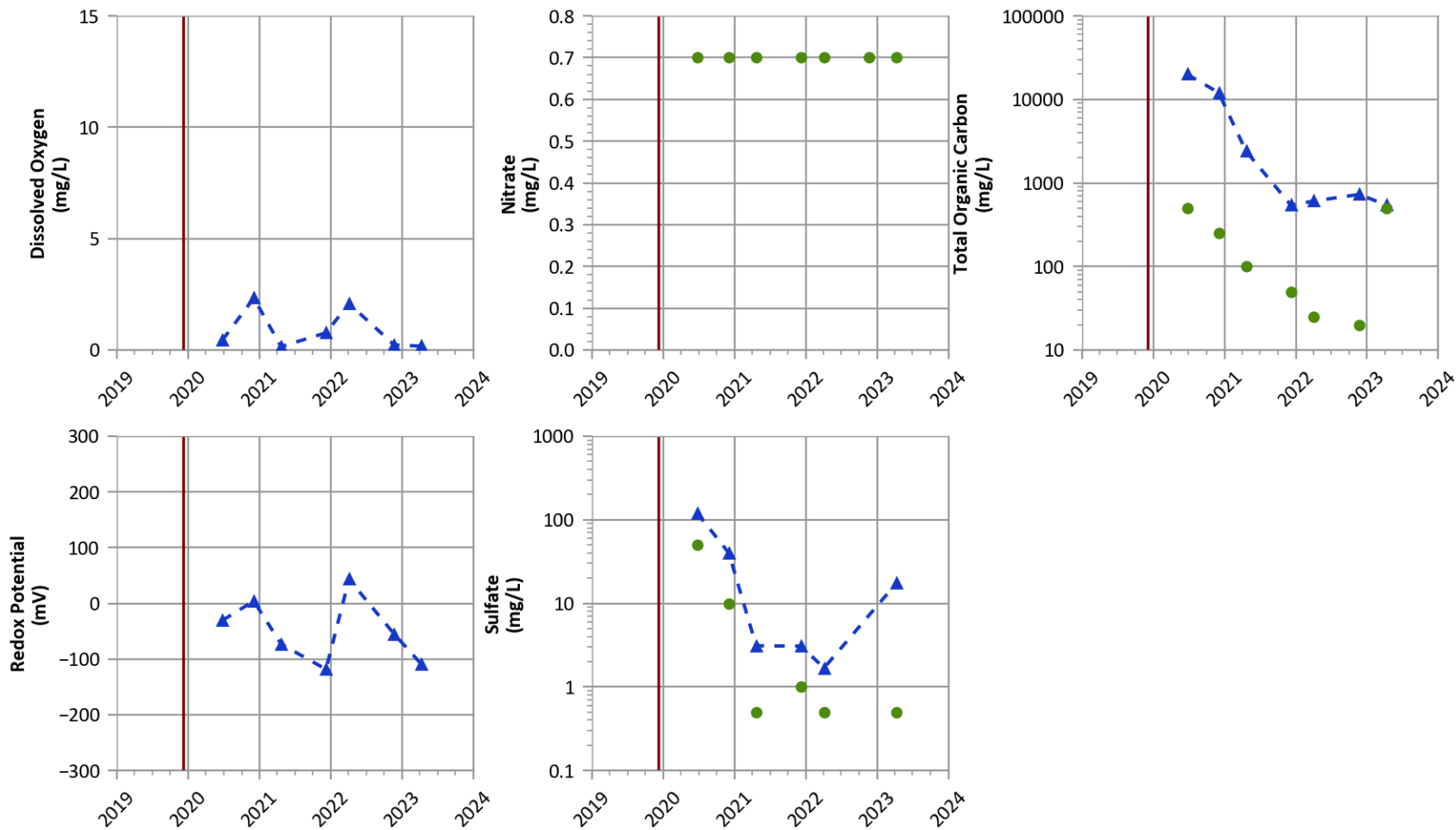
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

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





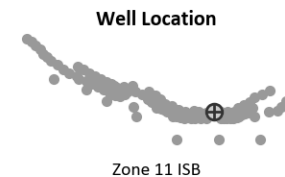
PTX06-ISB064 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



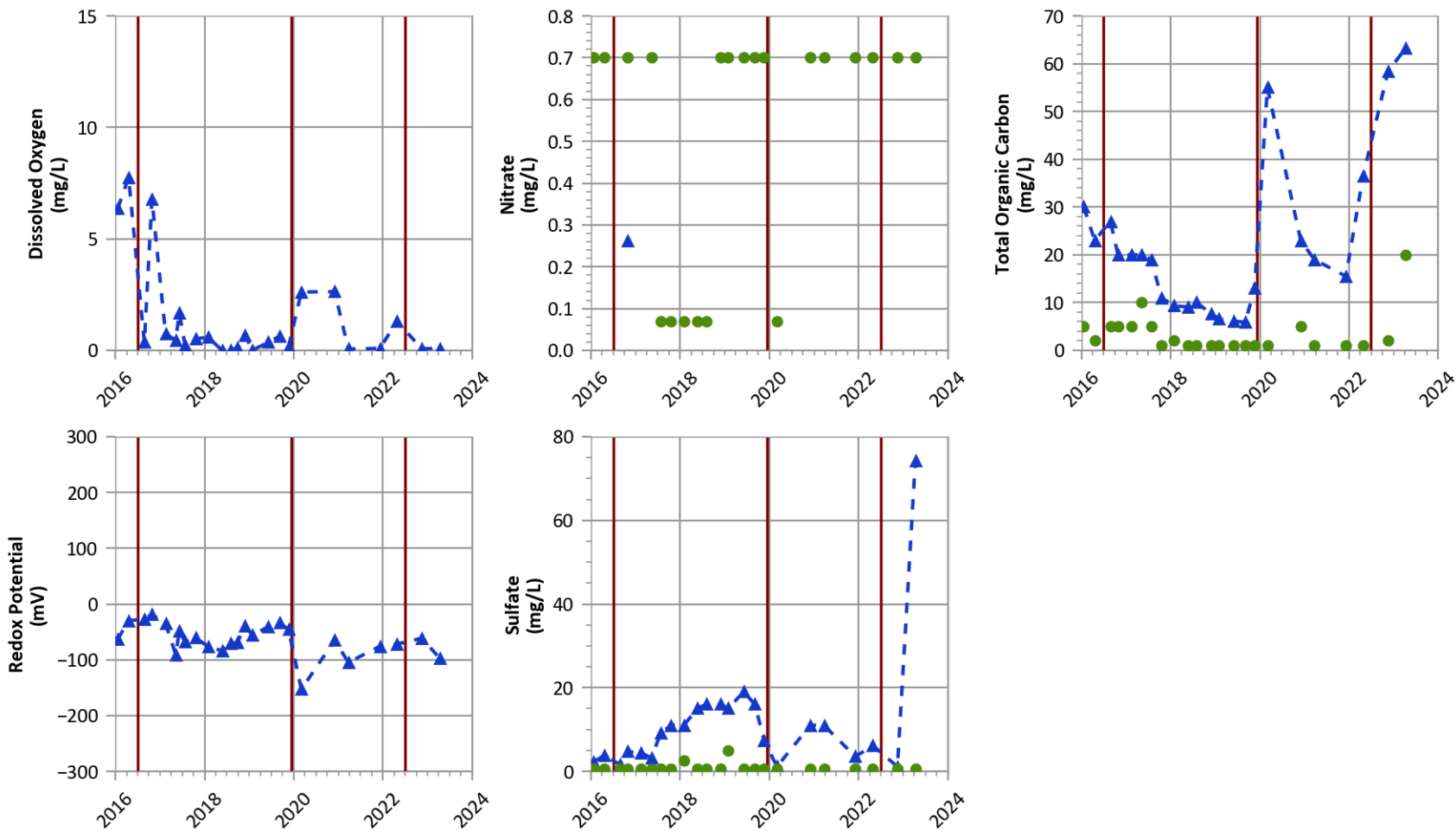
Typical Baseline Concentrations in Perched Groundwater

- 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



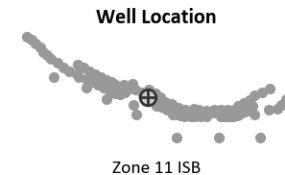
PTX06-ISB075 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



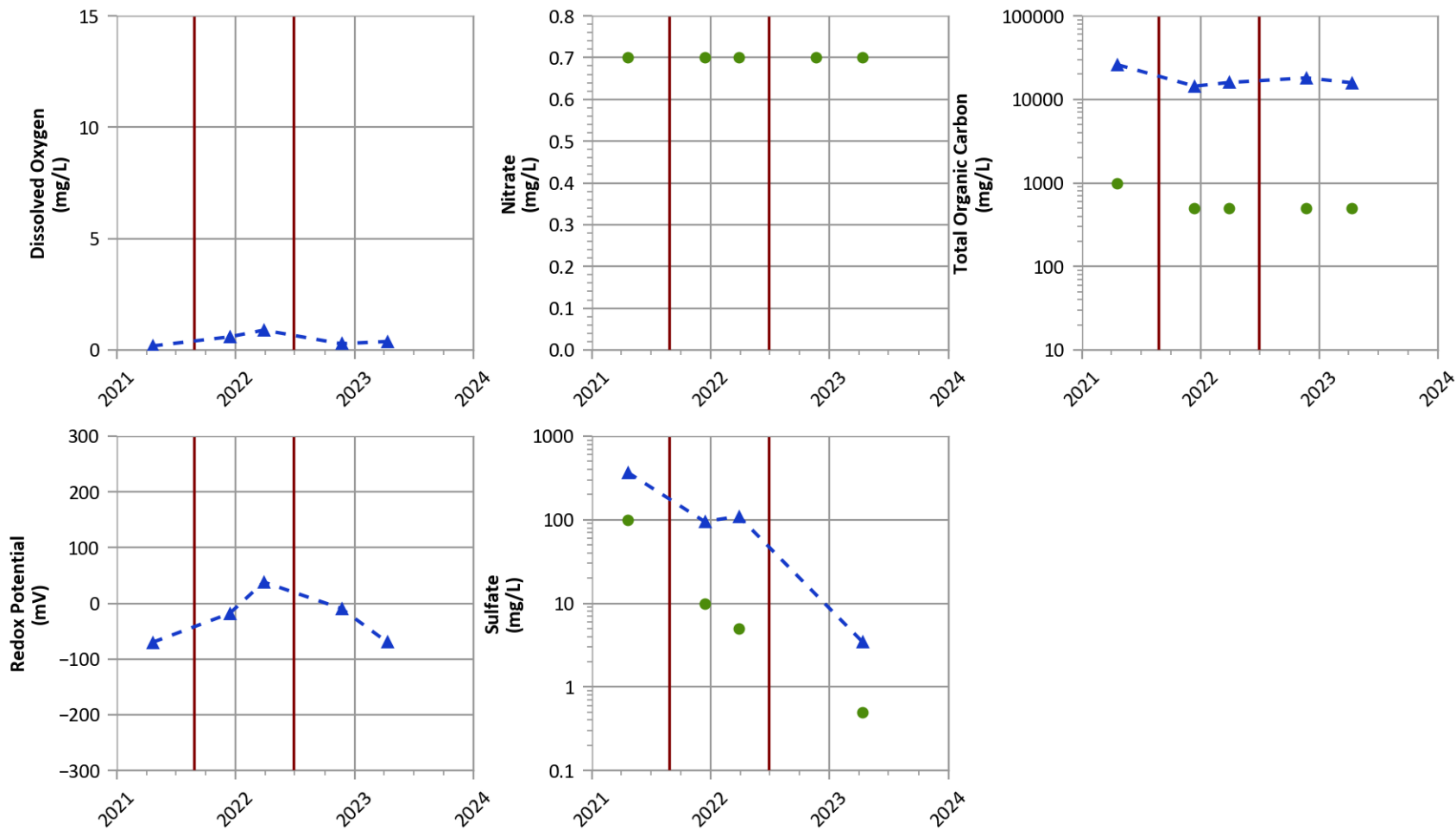
Typical Baseline Concentrations in Perched Groundwater

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



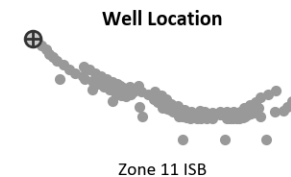
PTX06-ISB137 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



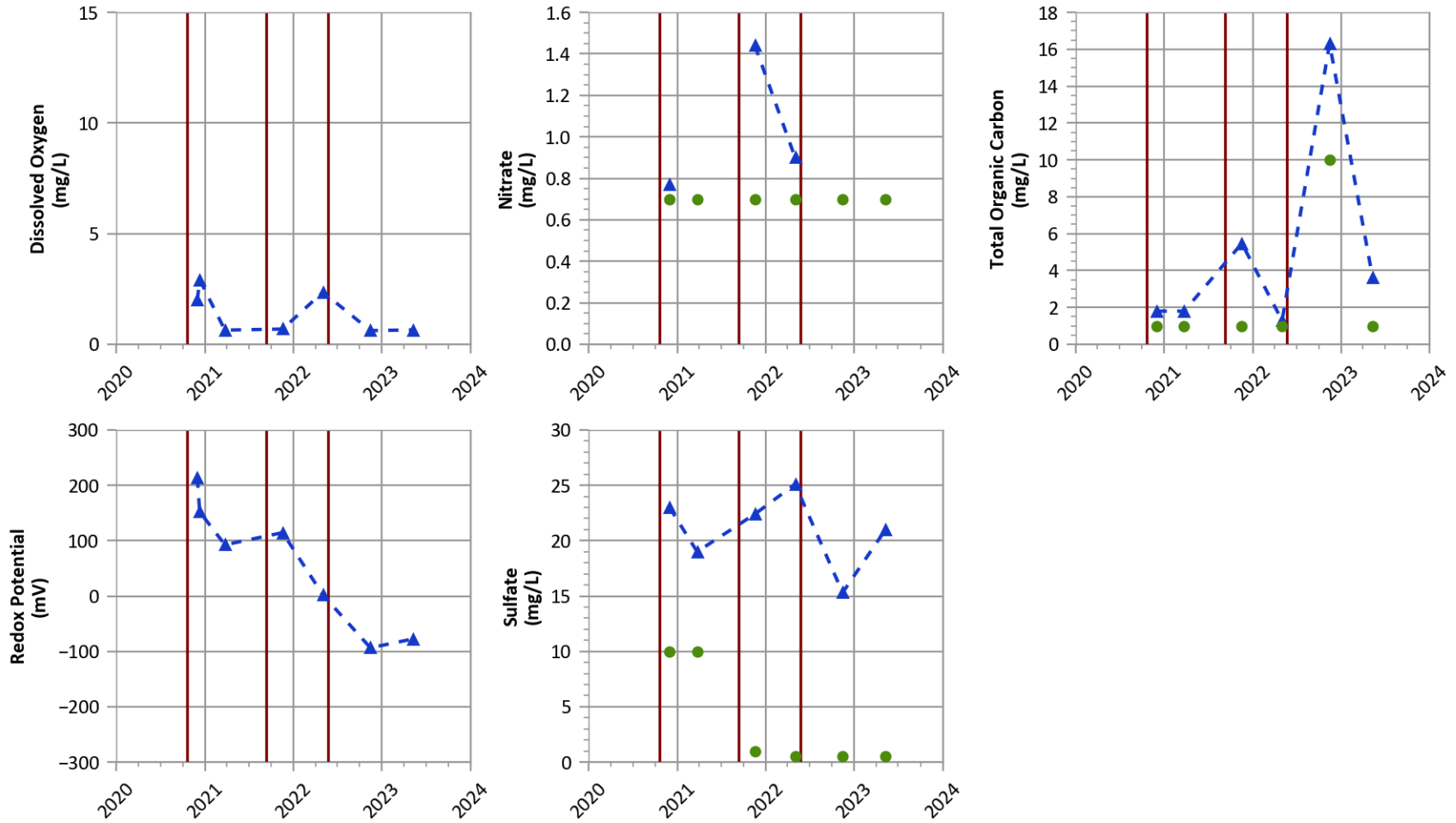
Typical Baseline Concentrations in Perched Groundwater

- 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



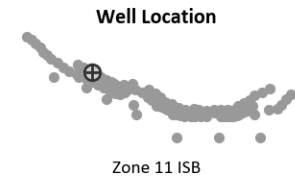
**PTX06-1164 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



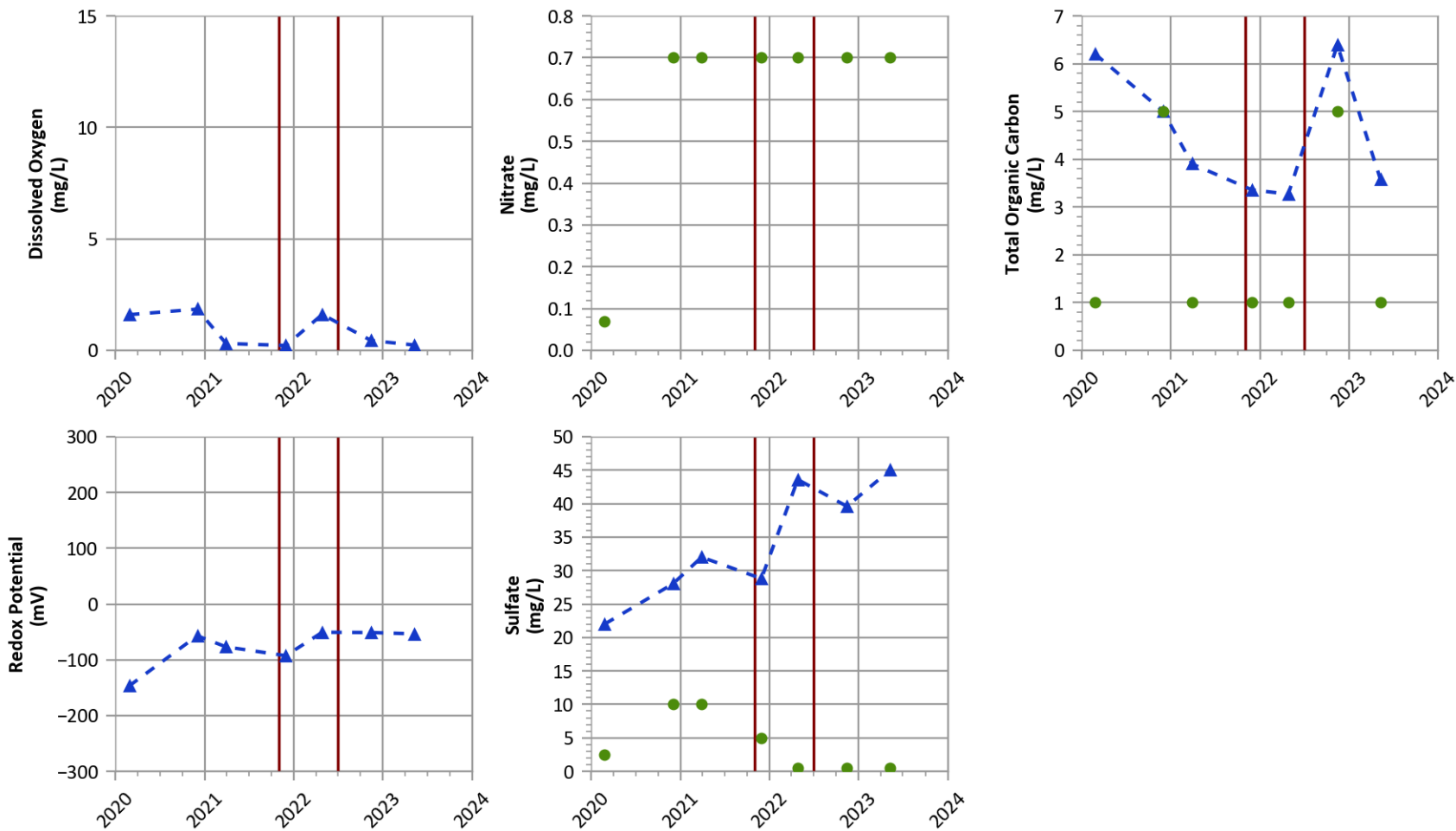
**Typical Baseline Concentrations in Perched Groundwater**

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



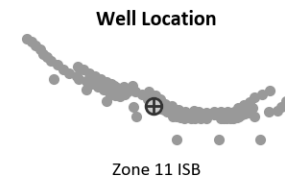
PTX06-1169 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



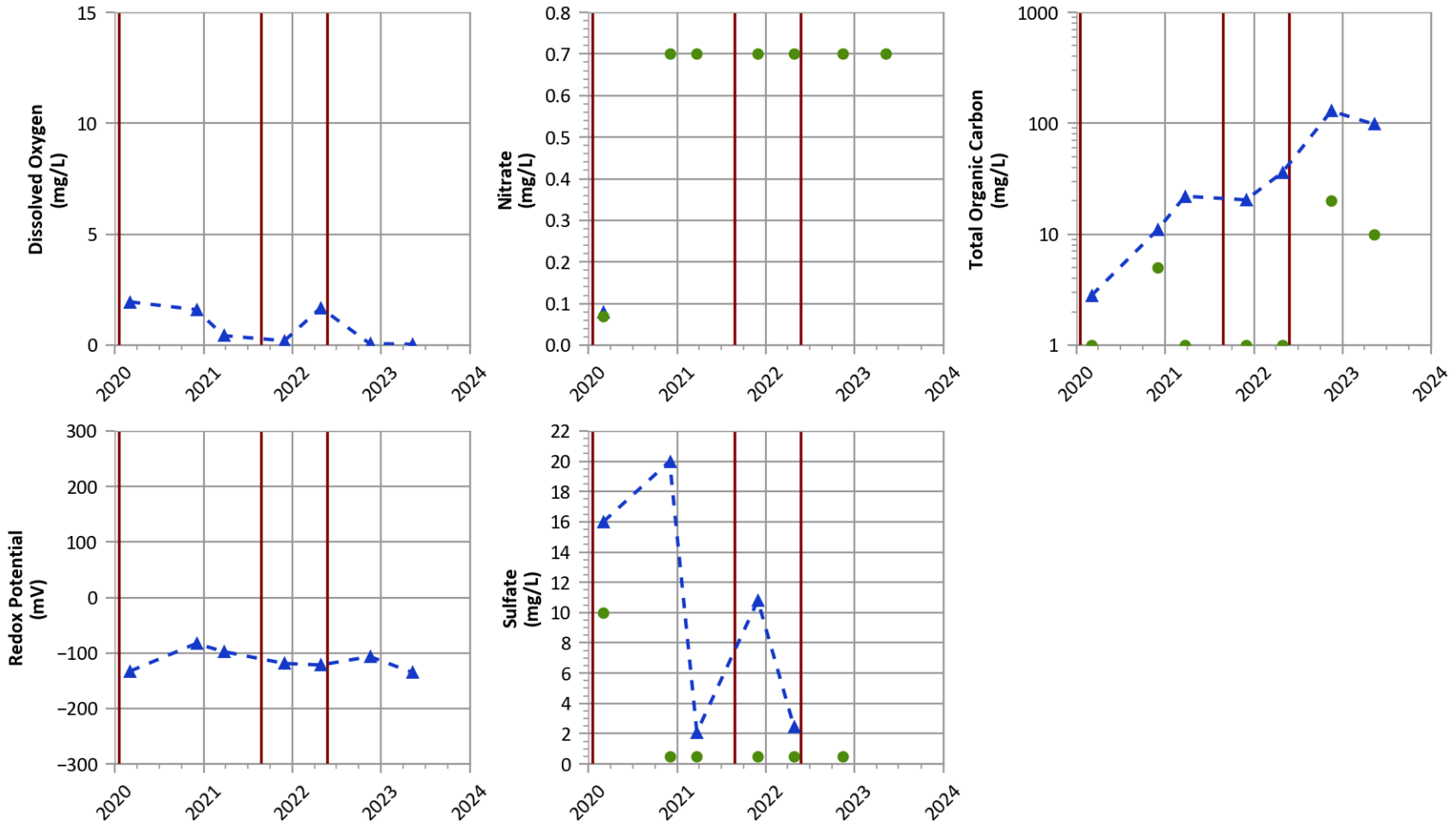
Typical Baseline Concentrations in Perched Groundwater

- 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



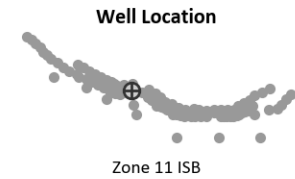
**PTX06-1170 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



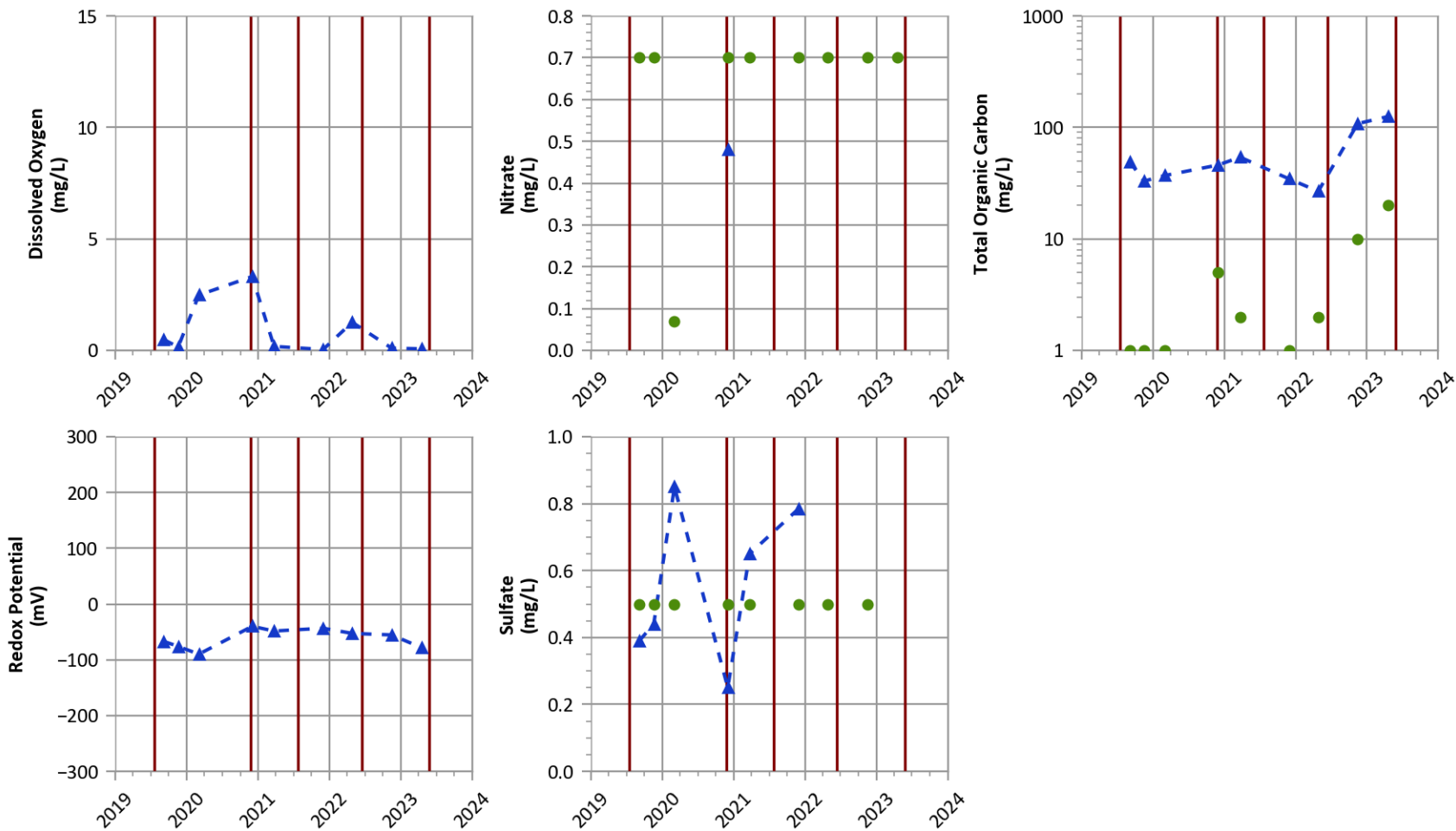
**Typical Baseline Concentrations in Perched Groundwater**

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



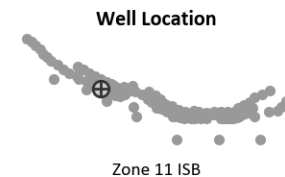
**PTX06-1176 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



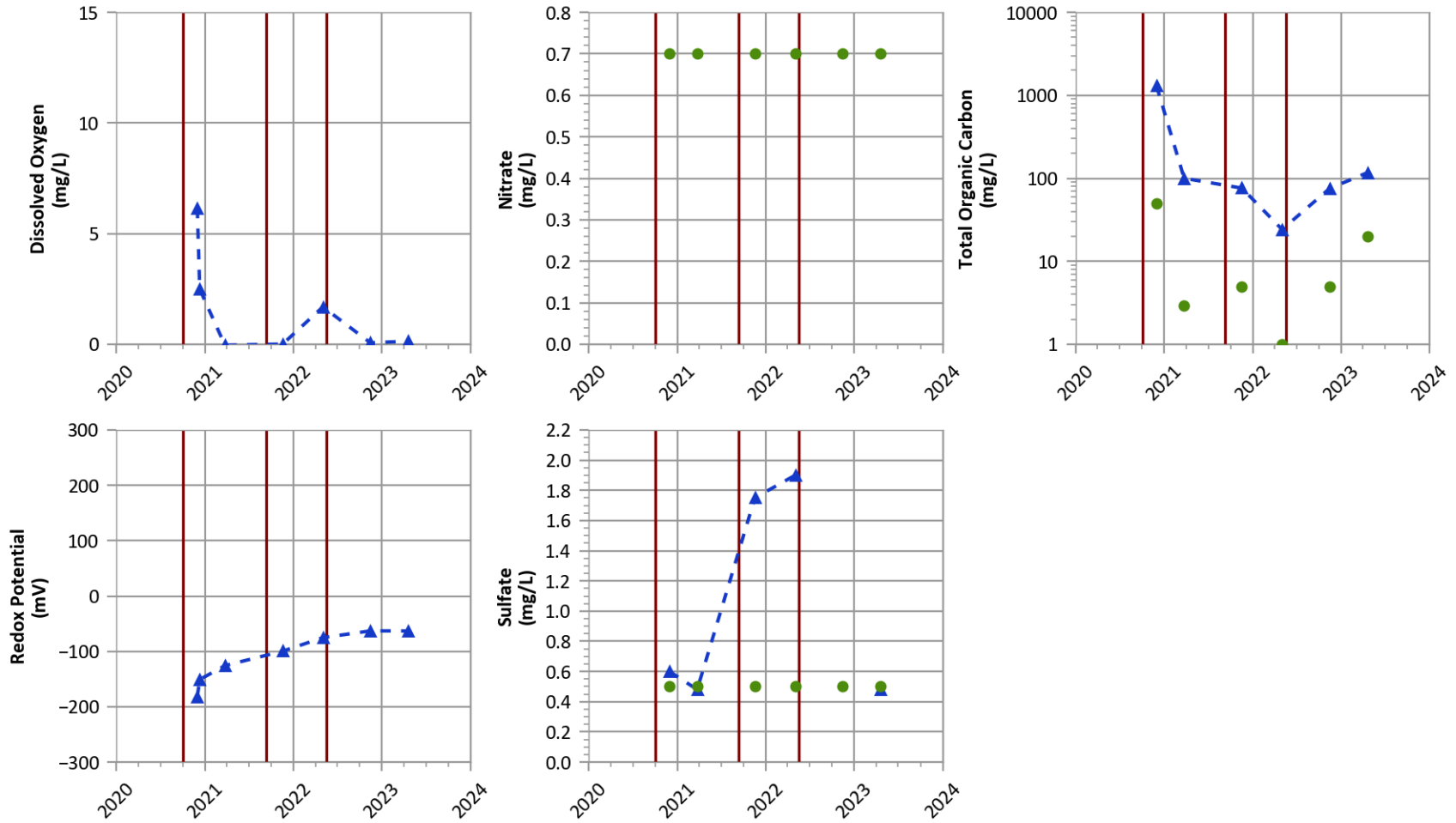
**Typical Baseline Concentrations in Perched Groundwater**

- 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



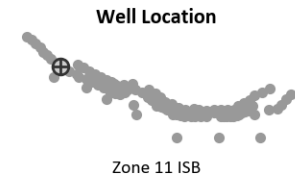
**PTX06-1177 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



**Typical Baseline Concentrations in Perched Groundwater**

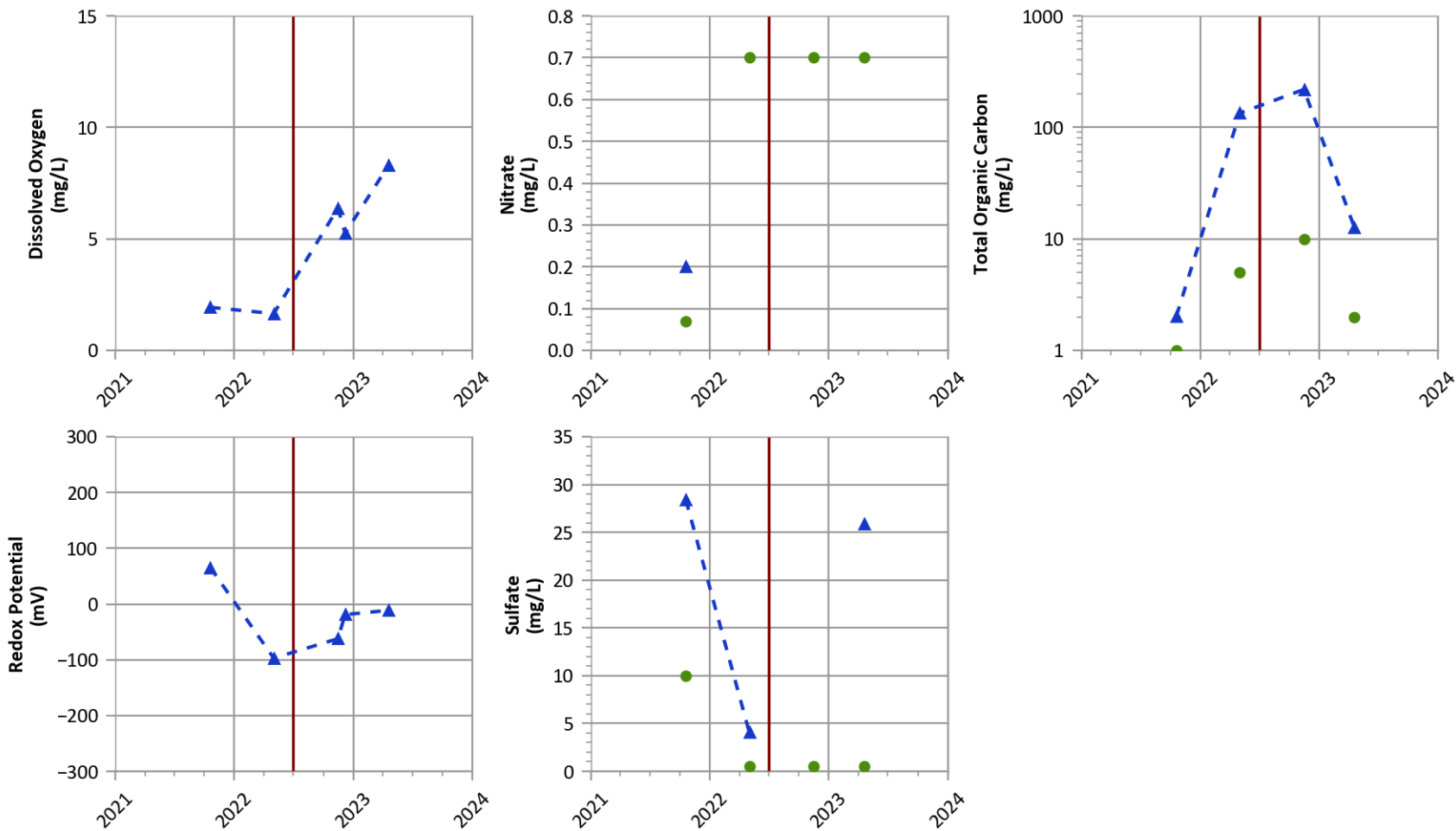
Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

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





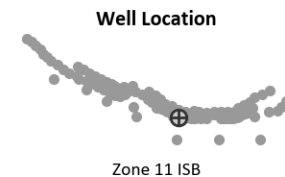
PTX06-1209 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



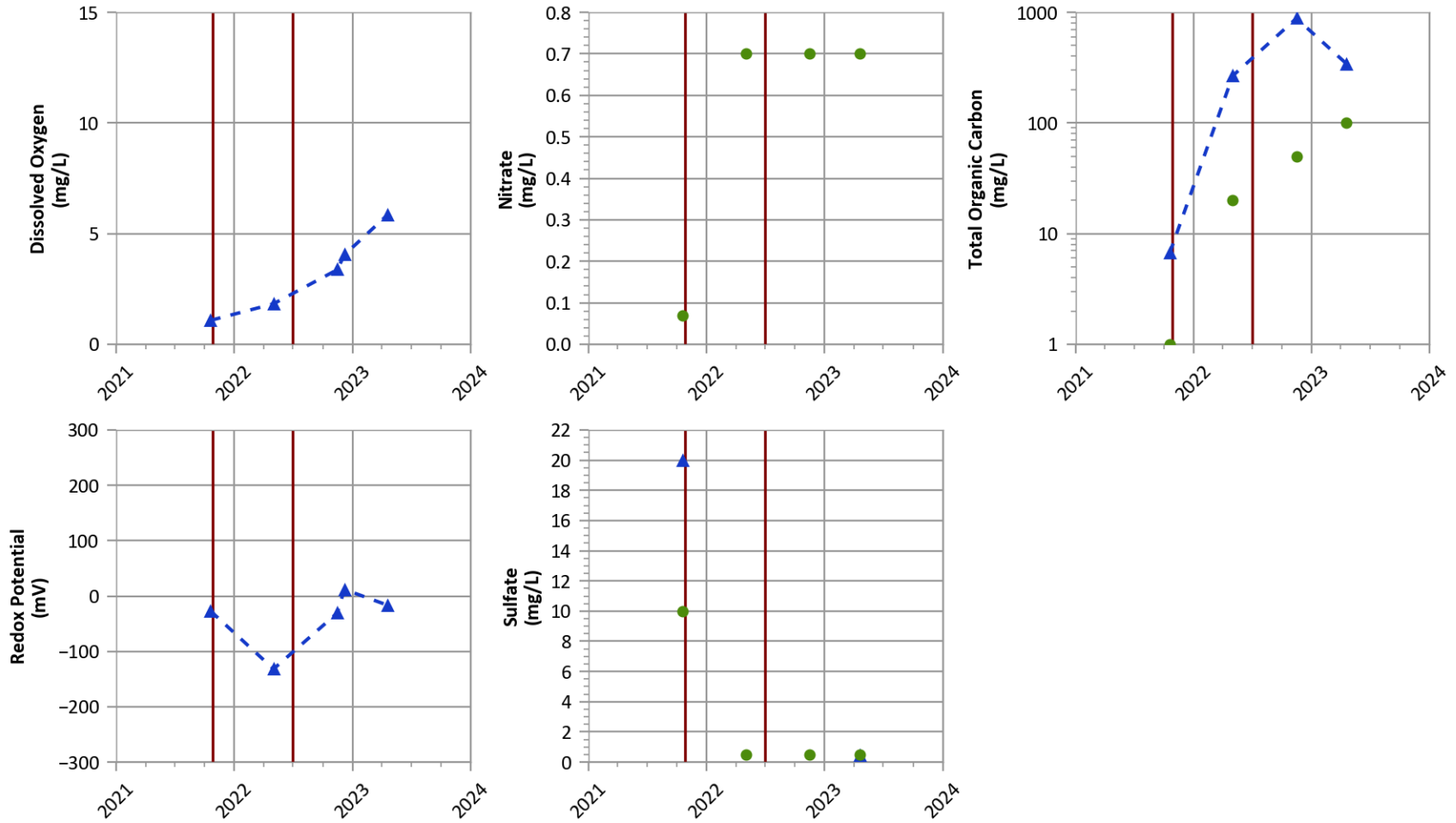
Typical Baseline Concentrations in Perched Groundwater

- 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



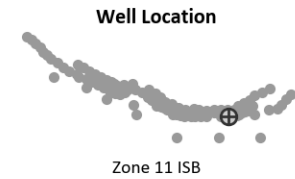
**PTX06-1210 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



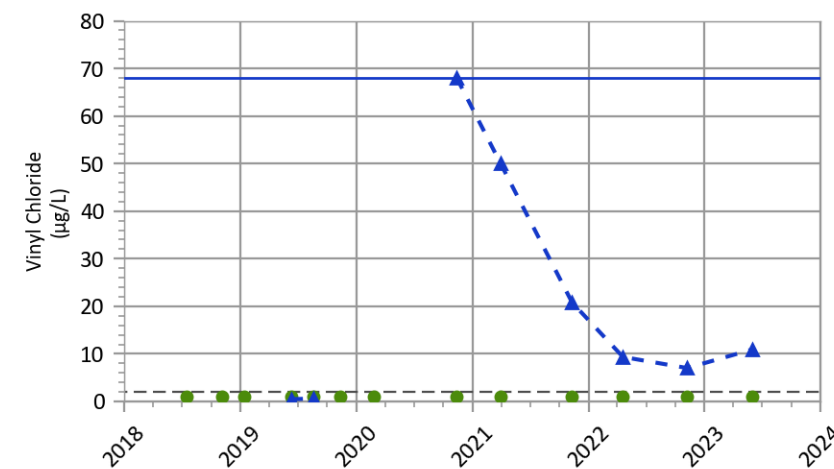
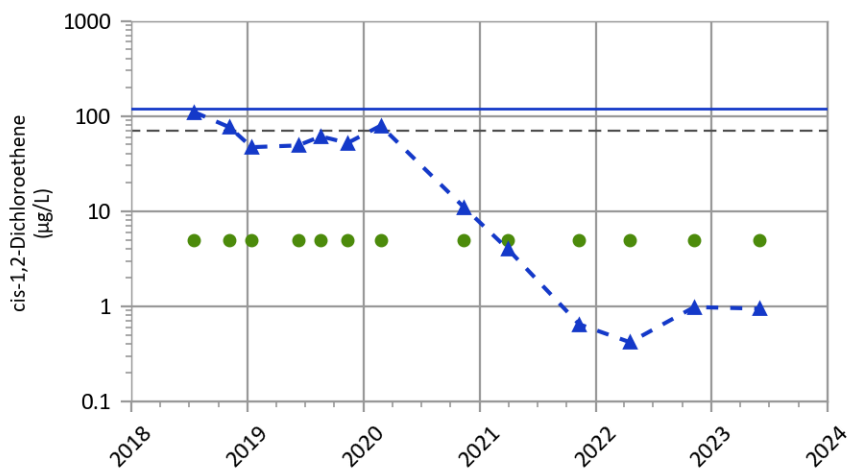
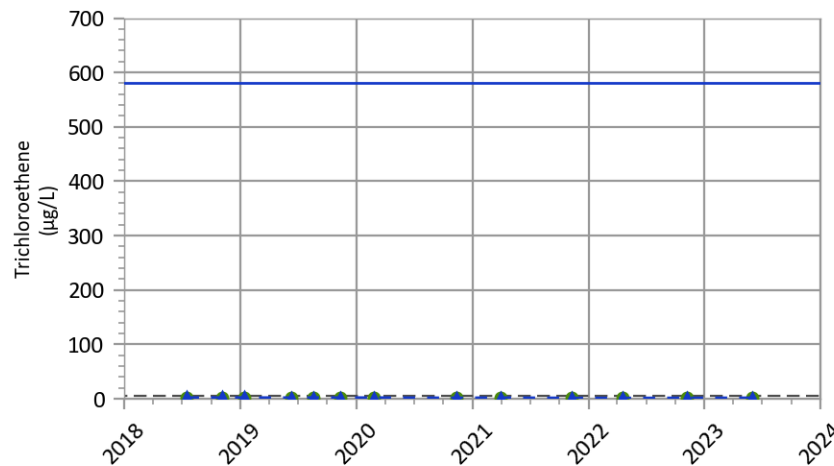
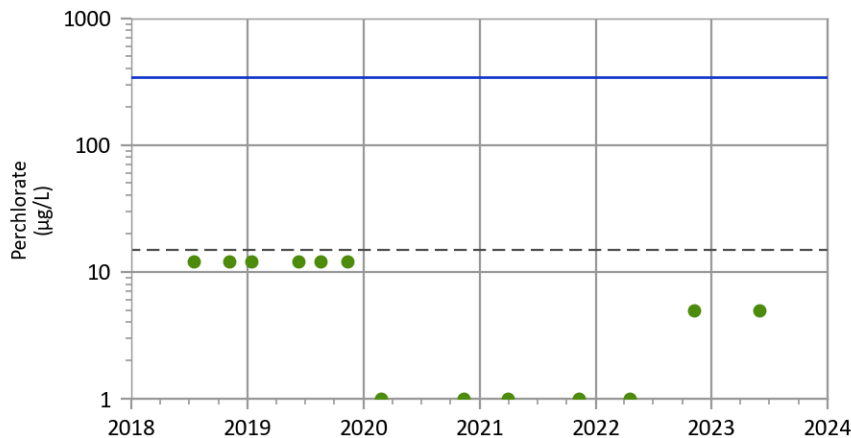
**Typical Baseline Concentrations in Perched Groundwater**

- 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



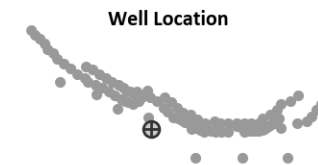
**PTX06-1012 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



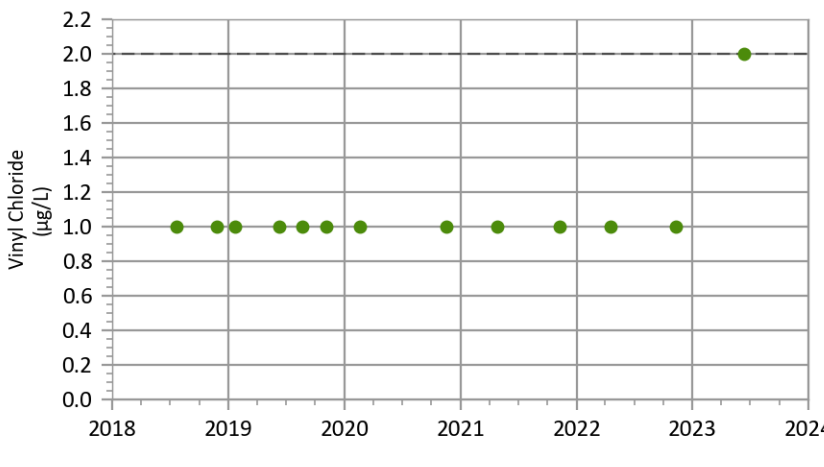
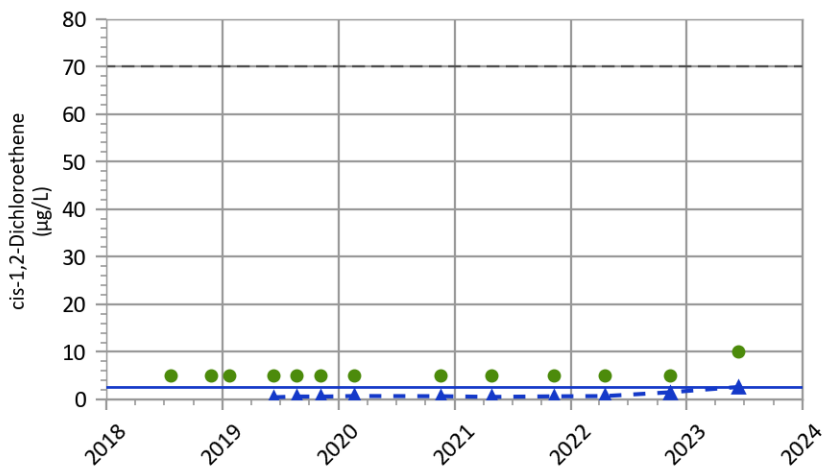
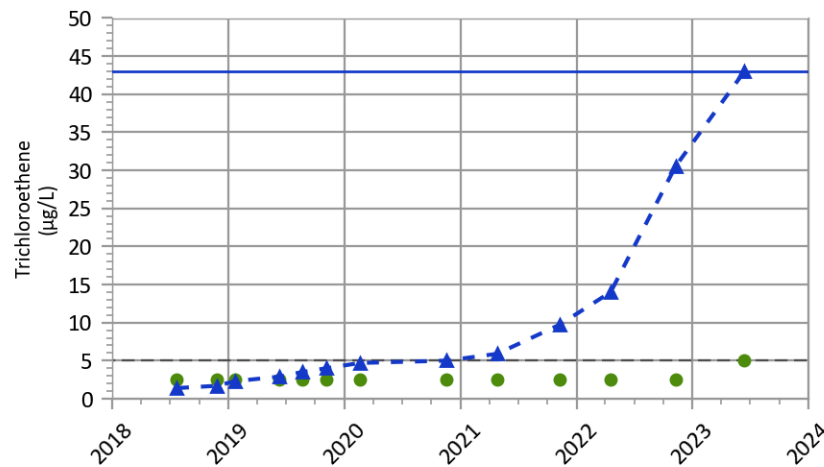
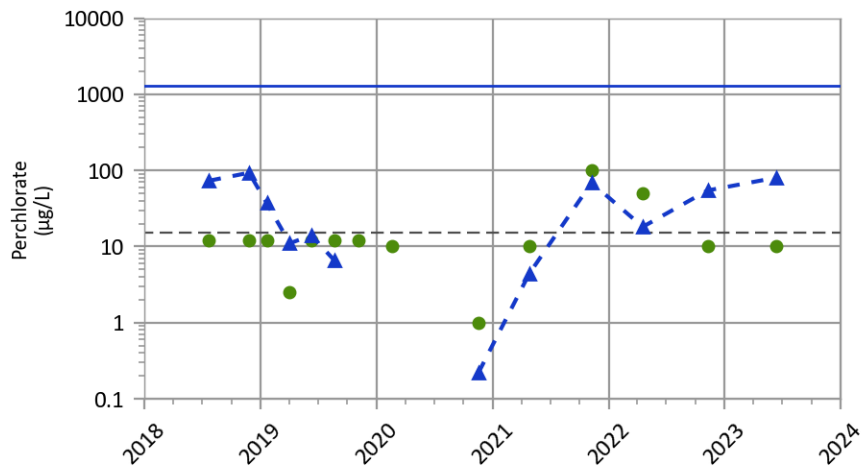
Most Recent Measured COC Concentrations (May 30, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	0.945	70.0
TCE	0.52	5.0
VC	10.9	2.0

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



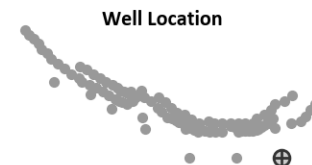
**PTX06-1148 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



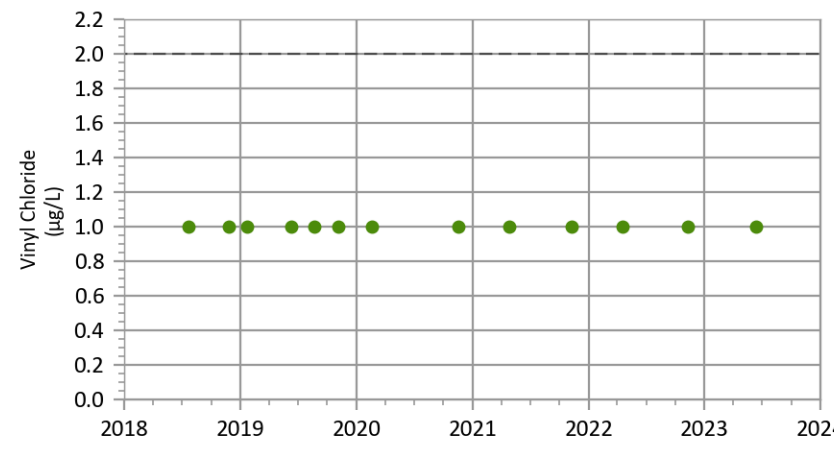
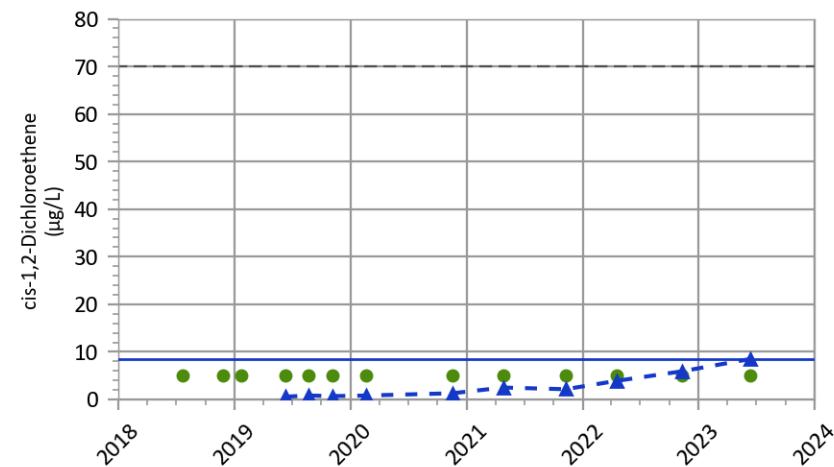
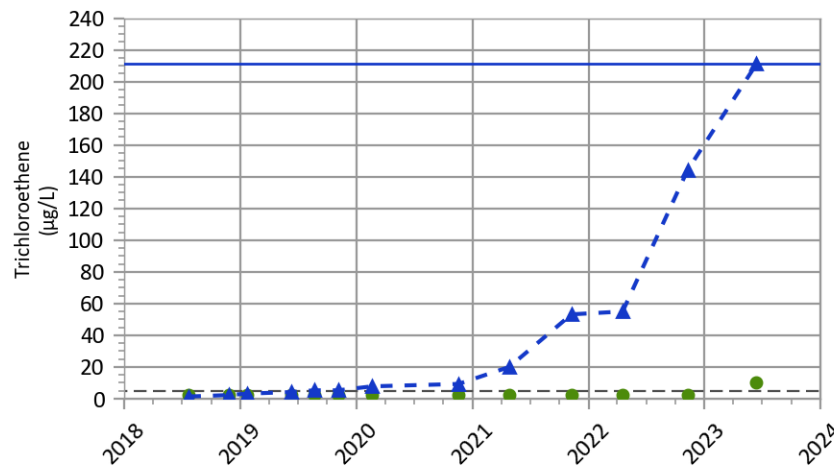
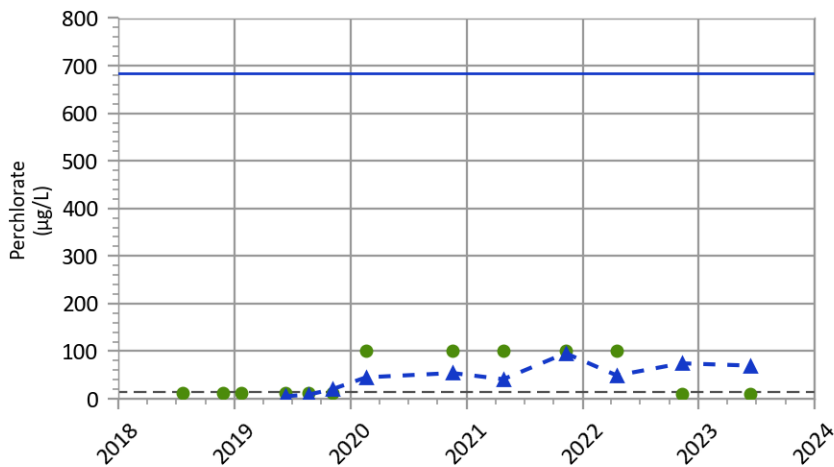
Most Recent Measured COC Concentrations (Jun 13, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	80.2	15.0
DCE12C	2.62	70.0
TCE	43.0	5.0
VC	Non-Detect	2.0

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



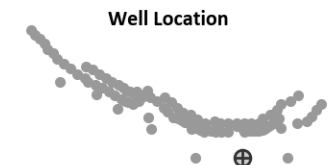
**PTX06-1149 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



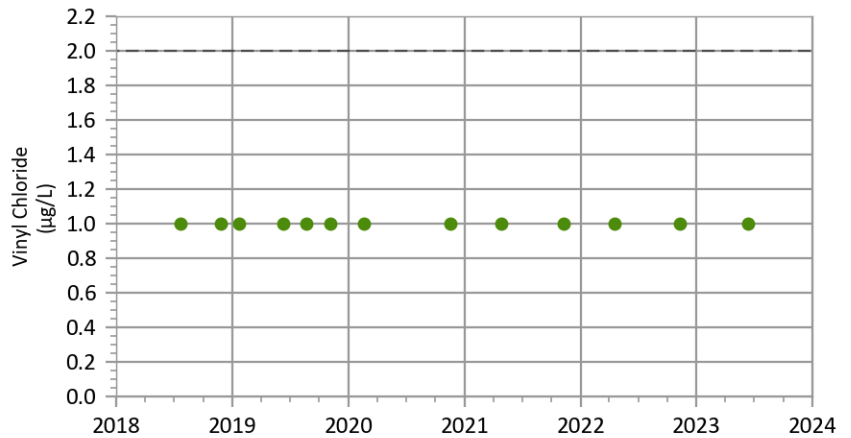
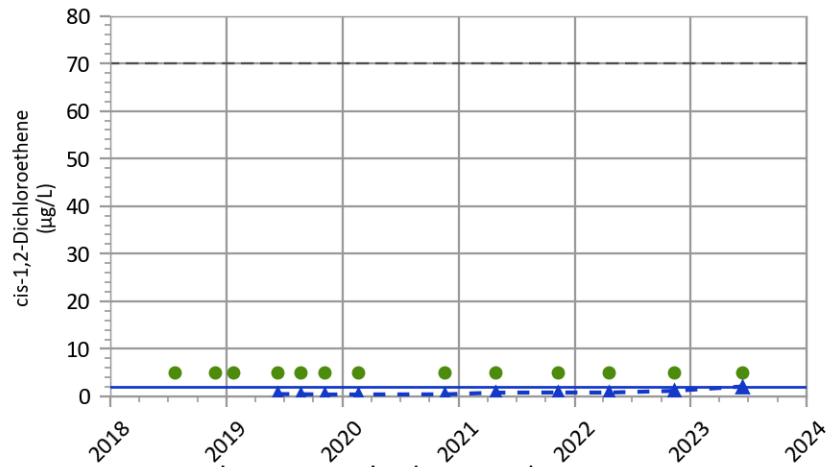
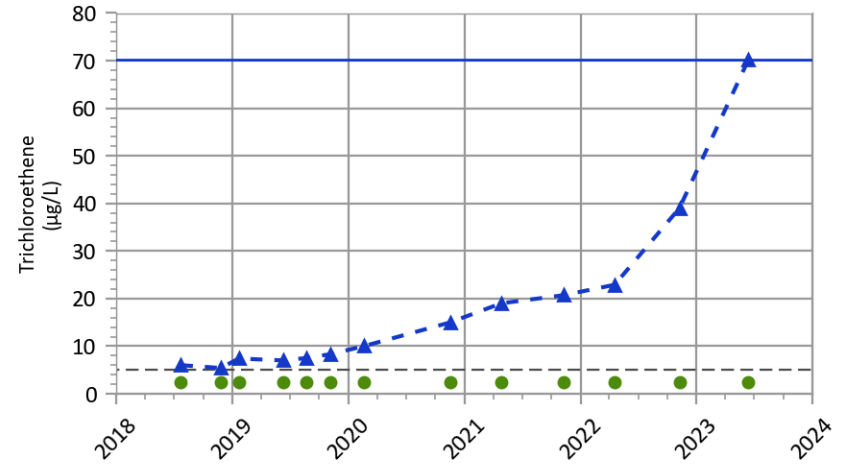
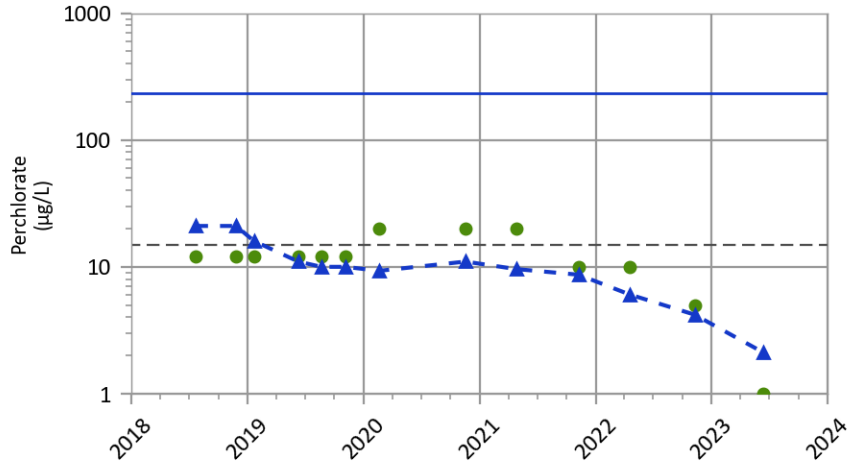
Most Recent Measured COC Concentrations (Jun 13, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	69.6	15.0
DCE12C	8.51	70.0
TCE	211.0	5.0
VC	Non-Detect	2.0

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



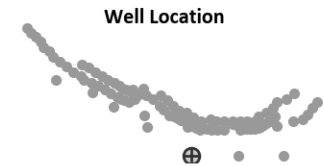
**PTX06-1150 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



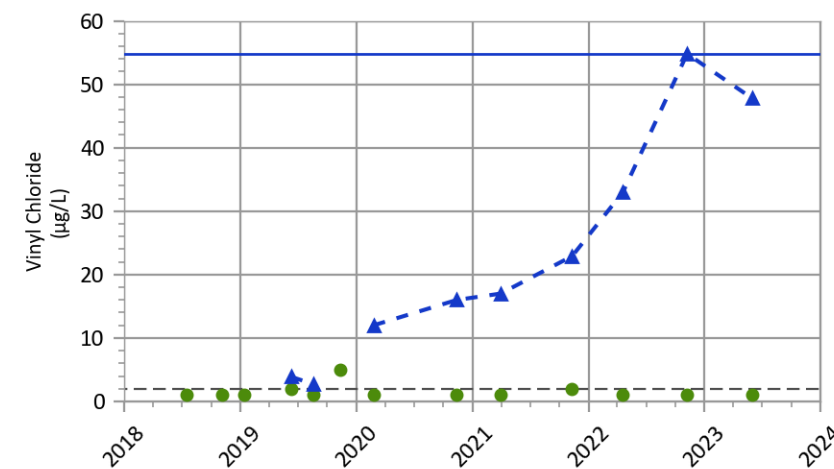
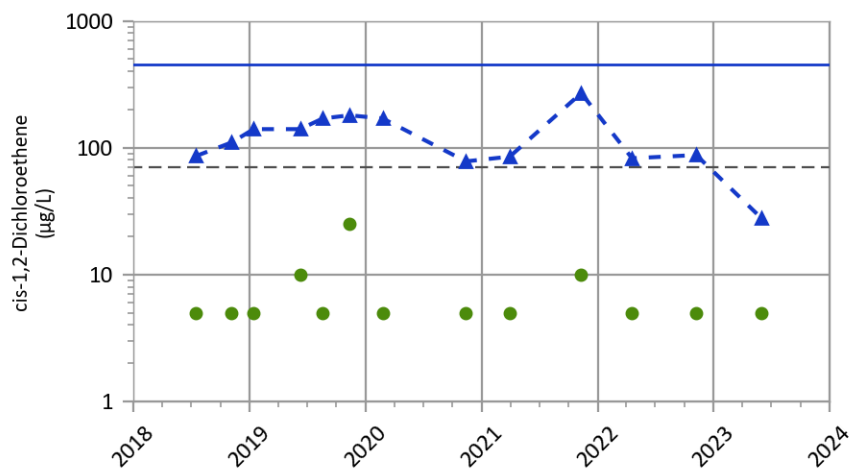
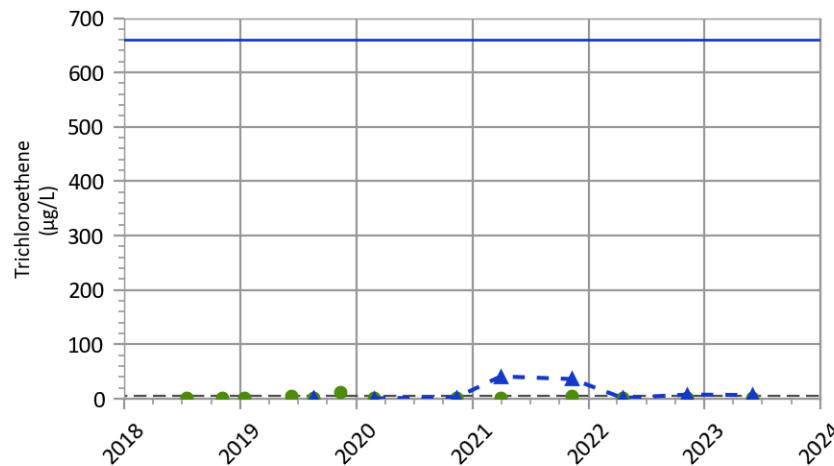
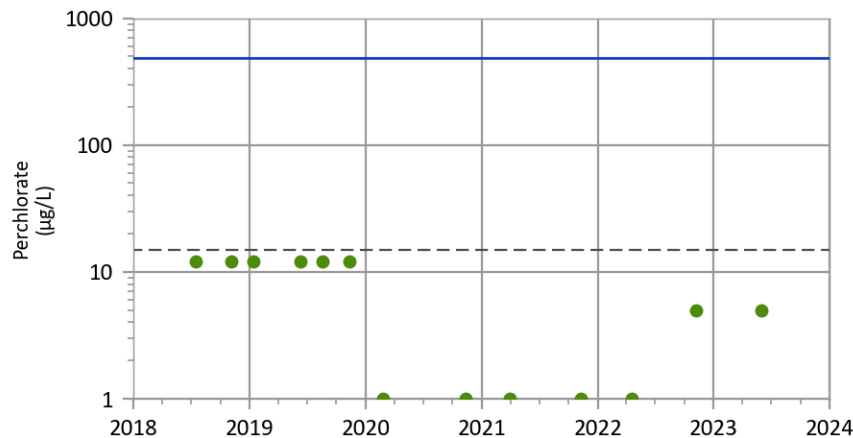
Most Recent Measured COC Concentrations (Jun 13, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	2.11	15.0
DCE12C	2.09	70.0
TCE	70.2	5.0
VC	Non-Detect	2.0

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



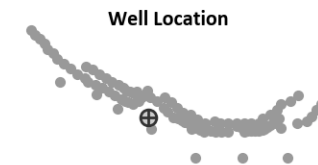
**PTX06-1155 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



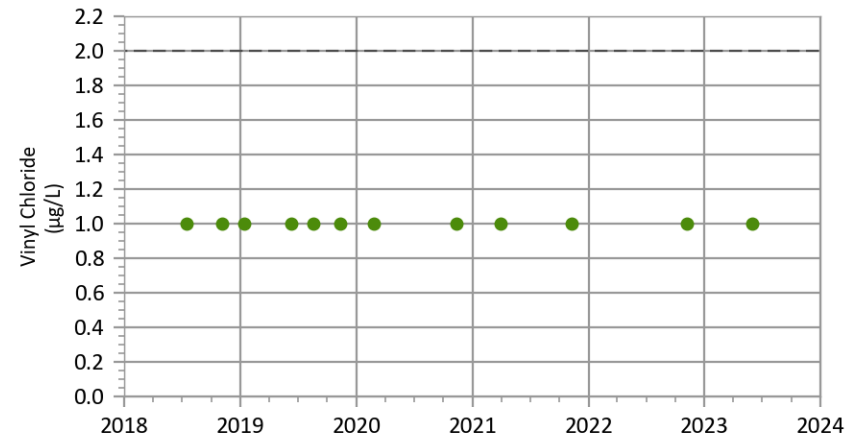
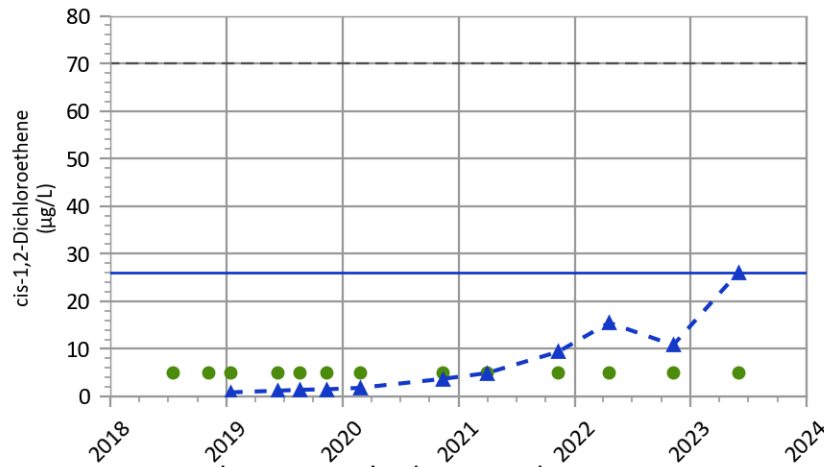
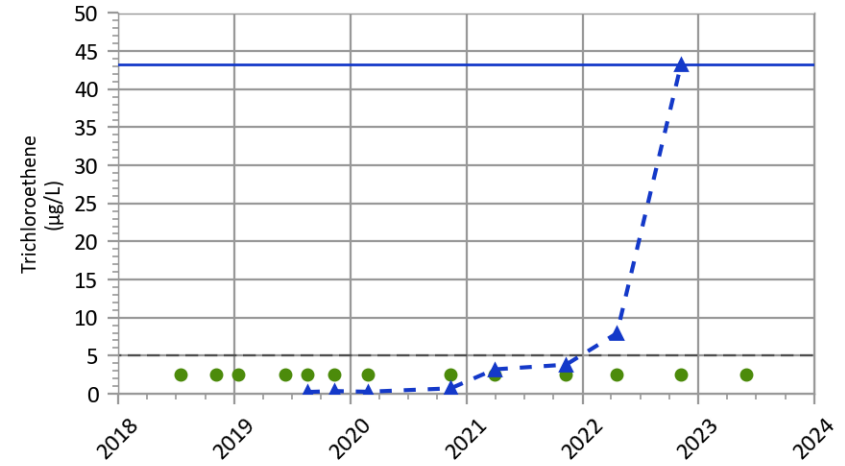
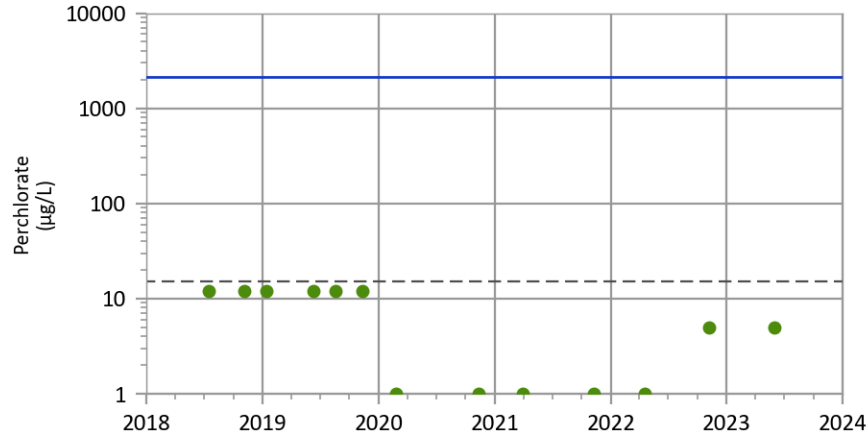
Most Recent Measured COC Concentrations (May 30, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	28.0	70.0
TCE	6.73	5.0
VC	47.8	2.0

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



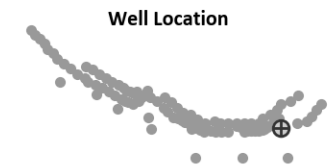
**PTX06-1156 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (May 30, 2023)

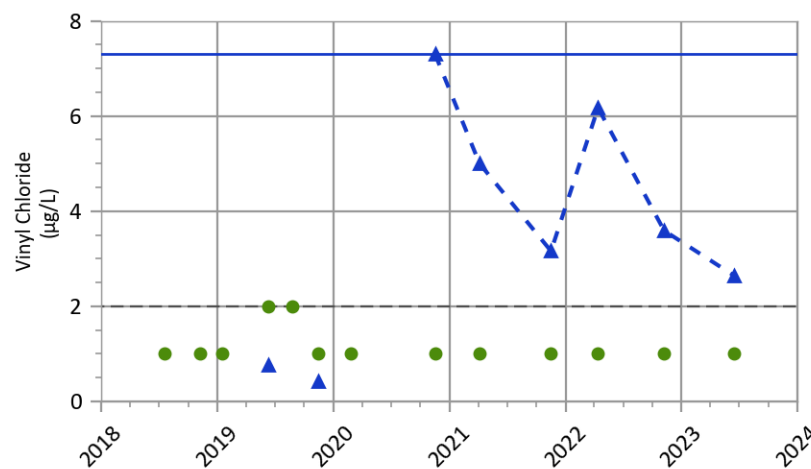
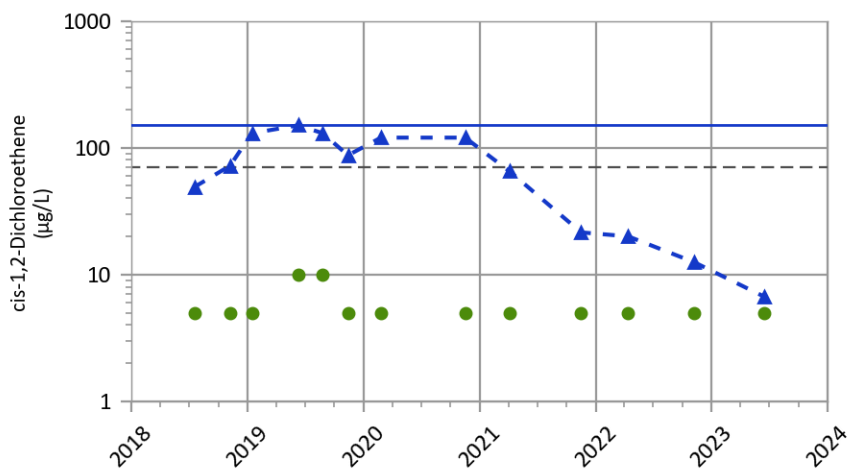
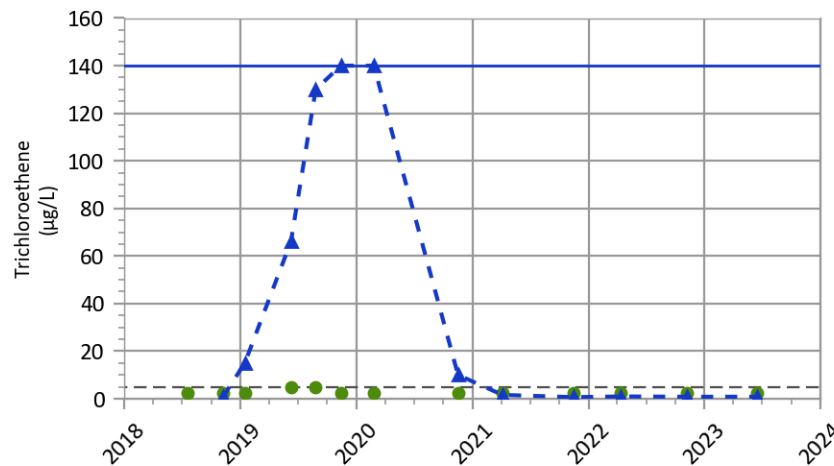
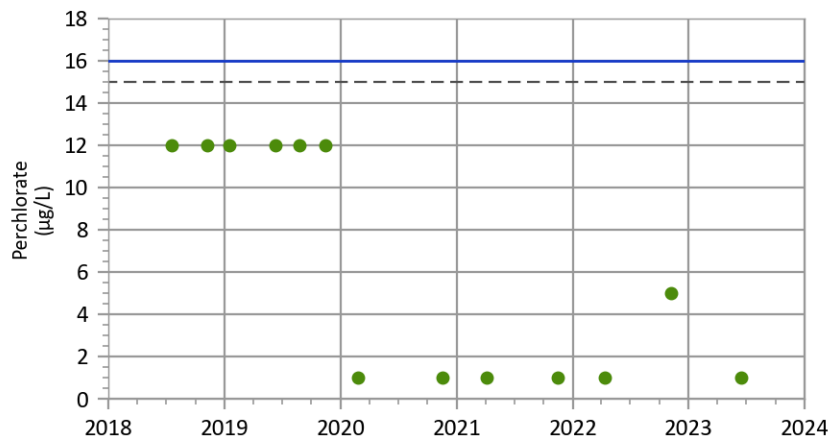
COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	26.0	70.0
TCE	Non-Detect	5.0
VC	Non-Detect	2.0

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





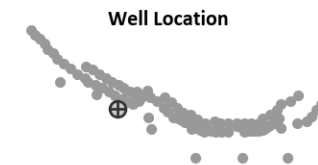
**PTX06-1173 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



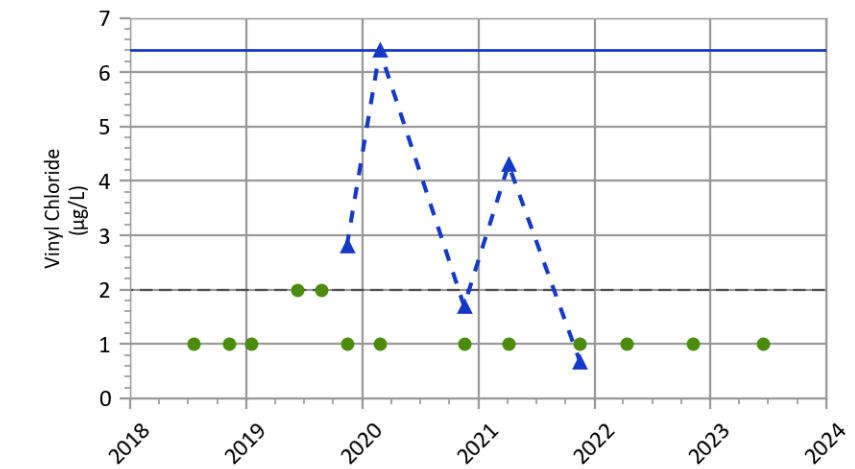
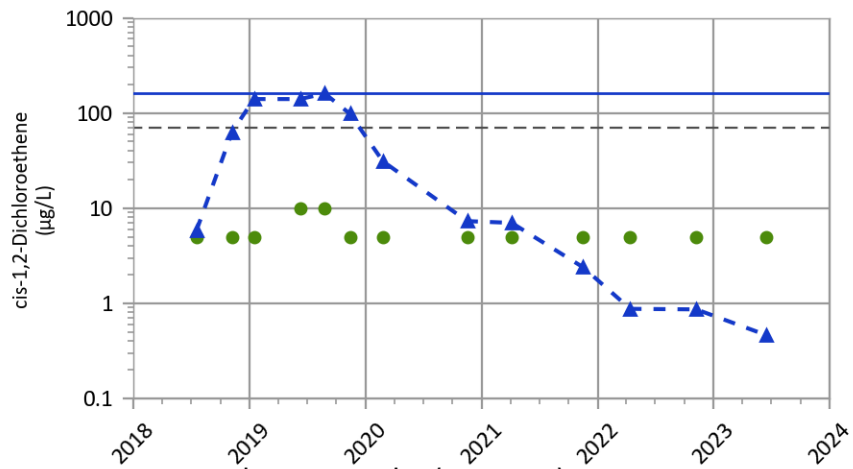
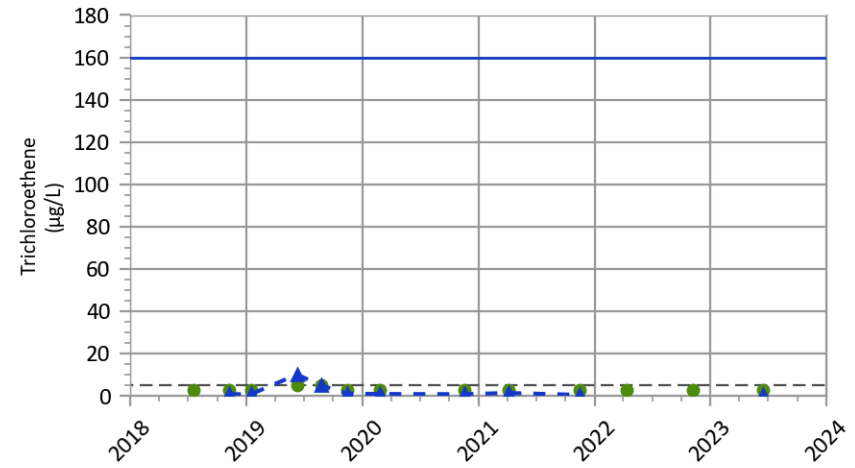
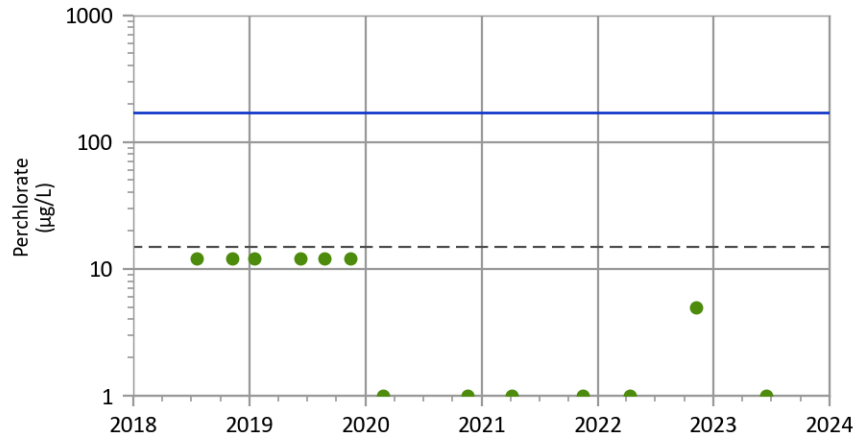
Most Recent Measured COC Concentrations (Jun 14, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	6.72	70.0
TCE	0.848	5.0
VC	2.65	2.0

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



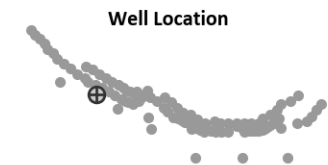
**PTX06-1174 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



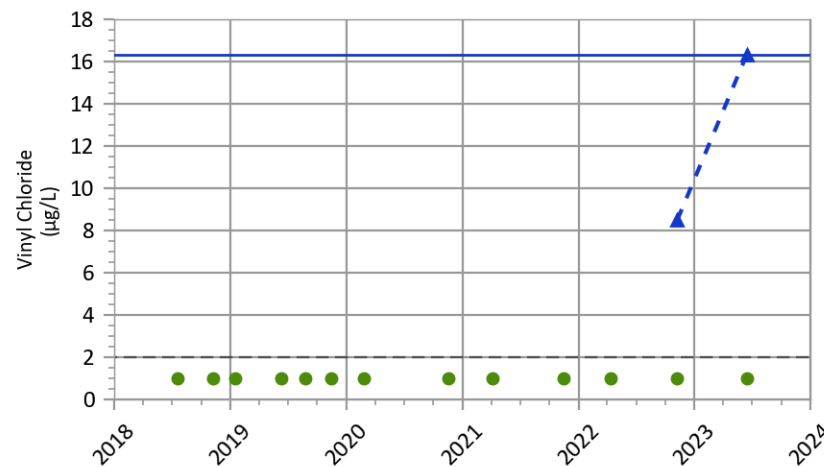
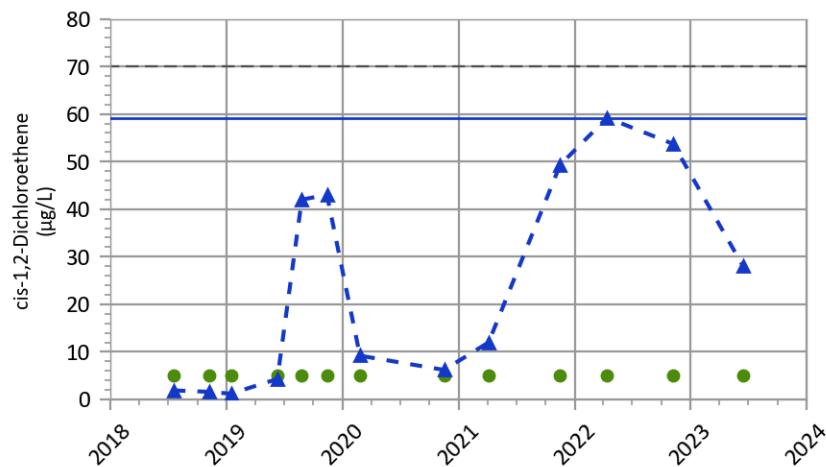
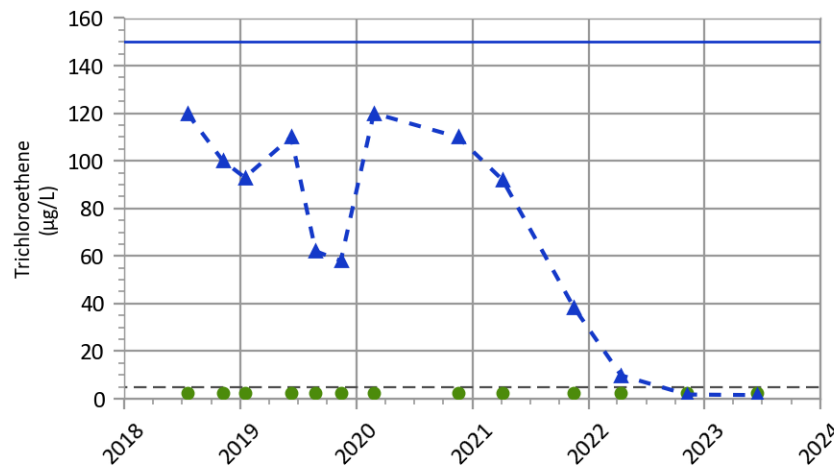
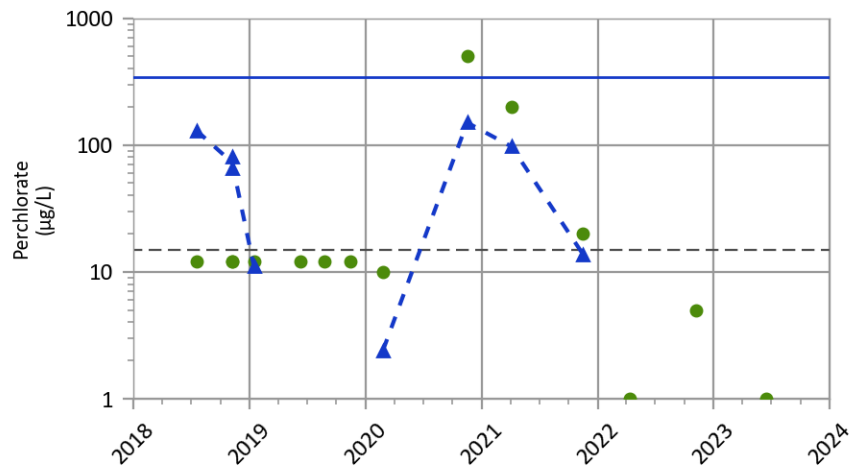
Most Recent Measured COC Concentrations (Nov 16, 2021)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	0.465	70.0
TCE	0.624	5.0
VC	Non-Detect	2.0

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



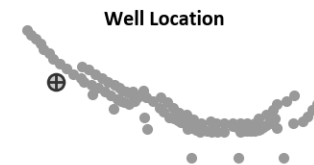
**PTX06-1175 Downgradient Performance Indicators  
Zone 11 In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Jun 14, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
PERC	Non-Detect	15.0
DCE12C	28.1	70.0
TCE	1.53	5.0
VC	16.3	2.0

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

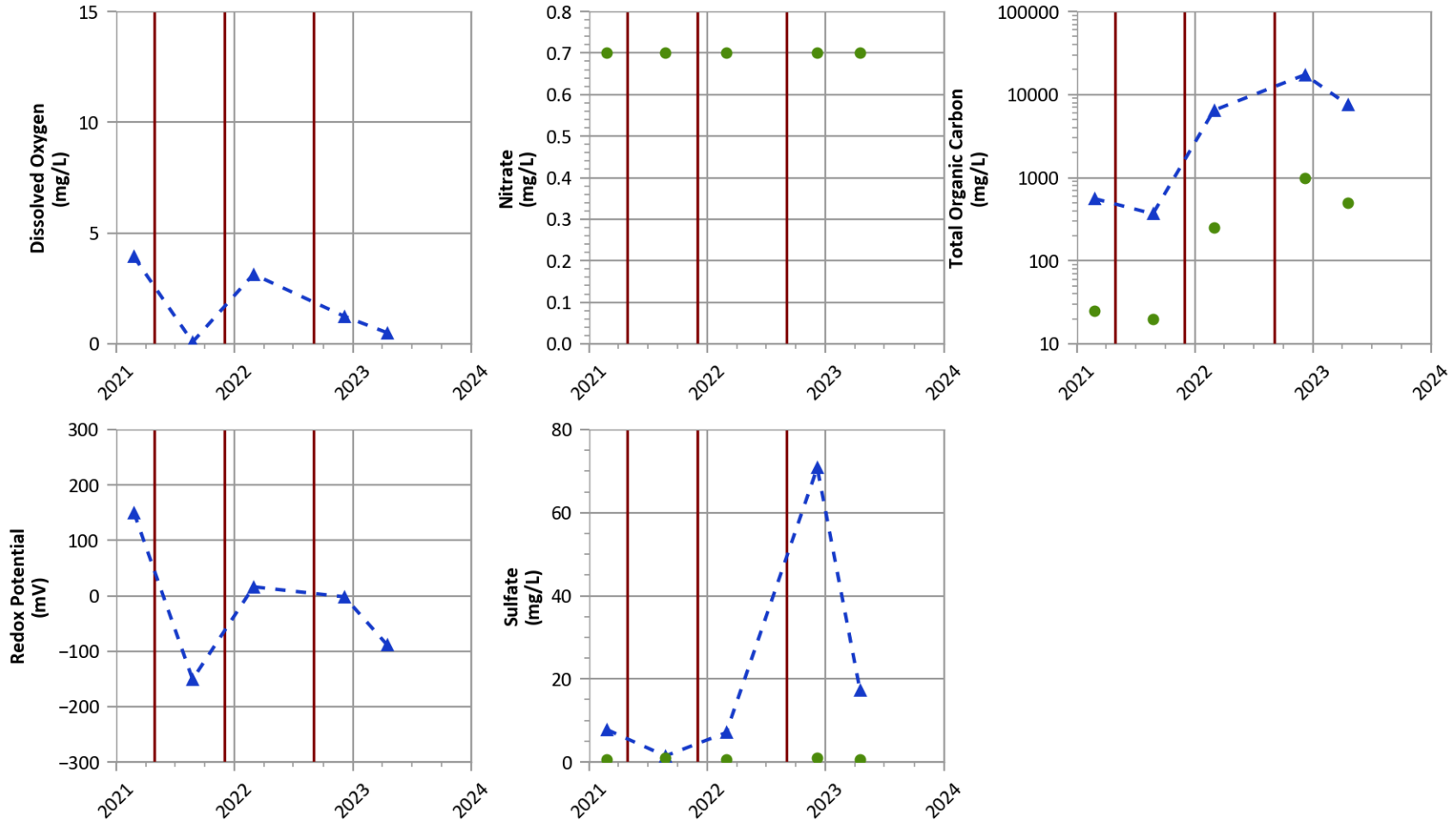




## **Southeast ISB Extension**



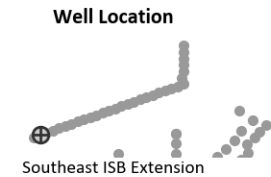
PTX06-ISB302 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



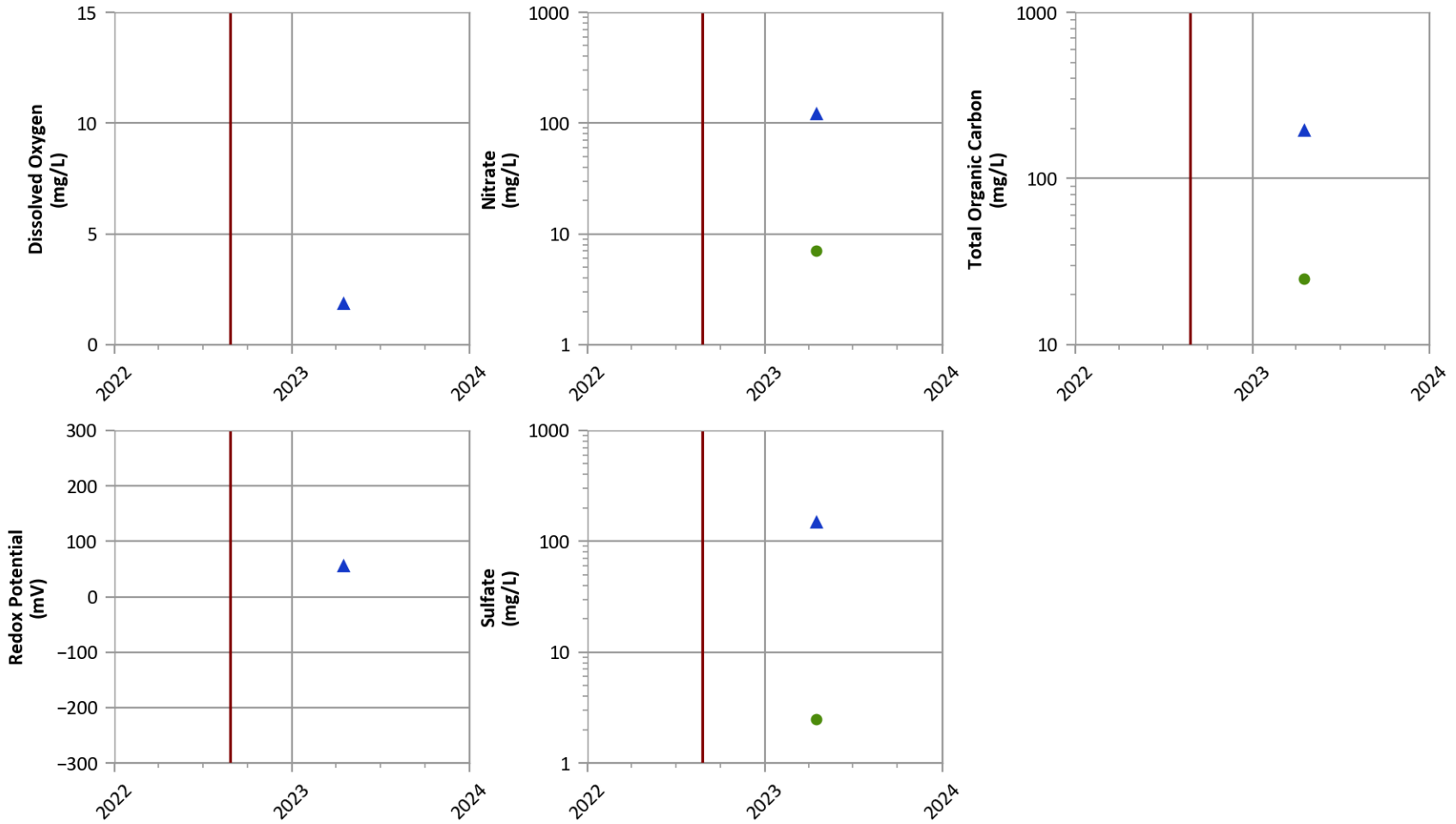
Typical Baseline Concentrations in Perched Groundwater

- 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



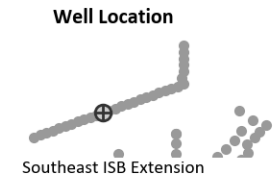
PTX06-ISB312 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



Typical Baseline Concentrations in Perched Groundwater

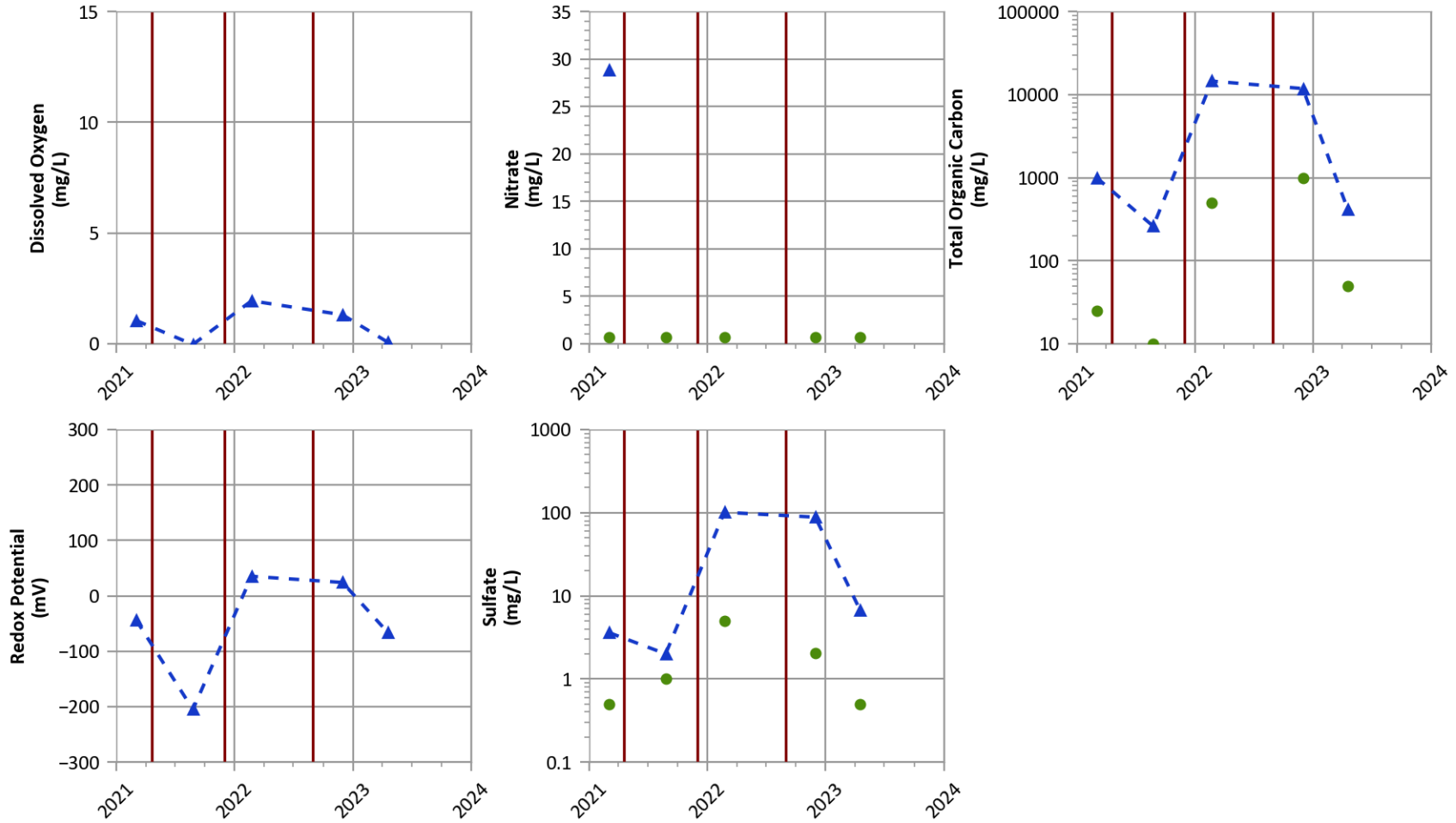
- Dissolved Oxygen: 5-10 mg/L
- Redox Potential: > 100 mV
- Nitrate: > 1 mg/L
- Sulfate: > 10 mg/L
- Total Organic Carbon: < 5 mg/L
- Total Volatile Fatty Acids: Not Detected

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





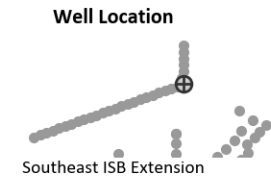
PTX06-ISB325 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



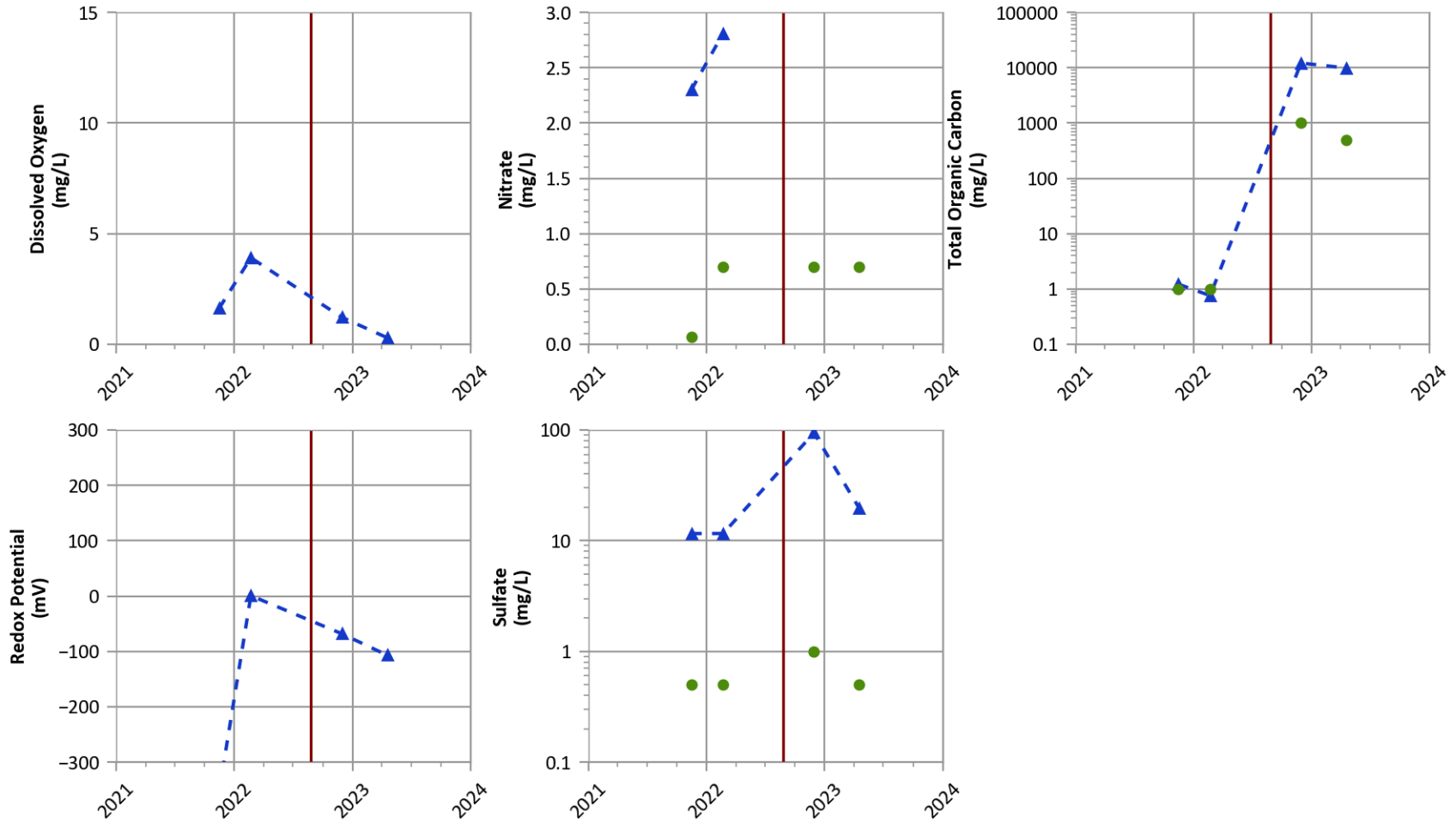
Typical Baseline Concentrations in Perched Groundwater

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



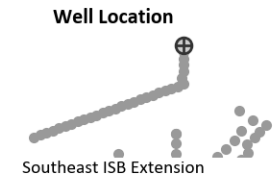
PTX06-ISB331 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



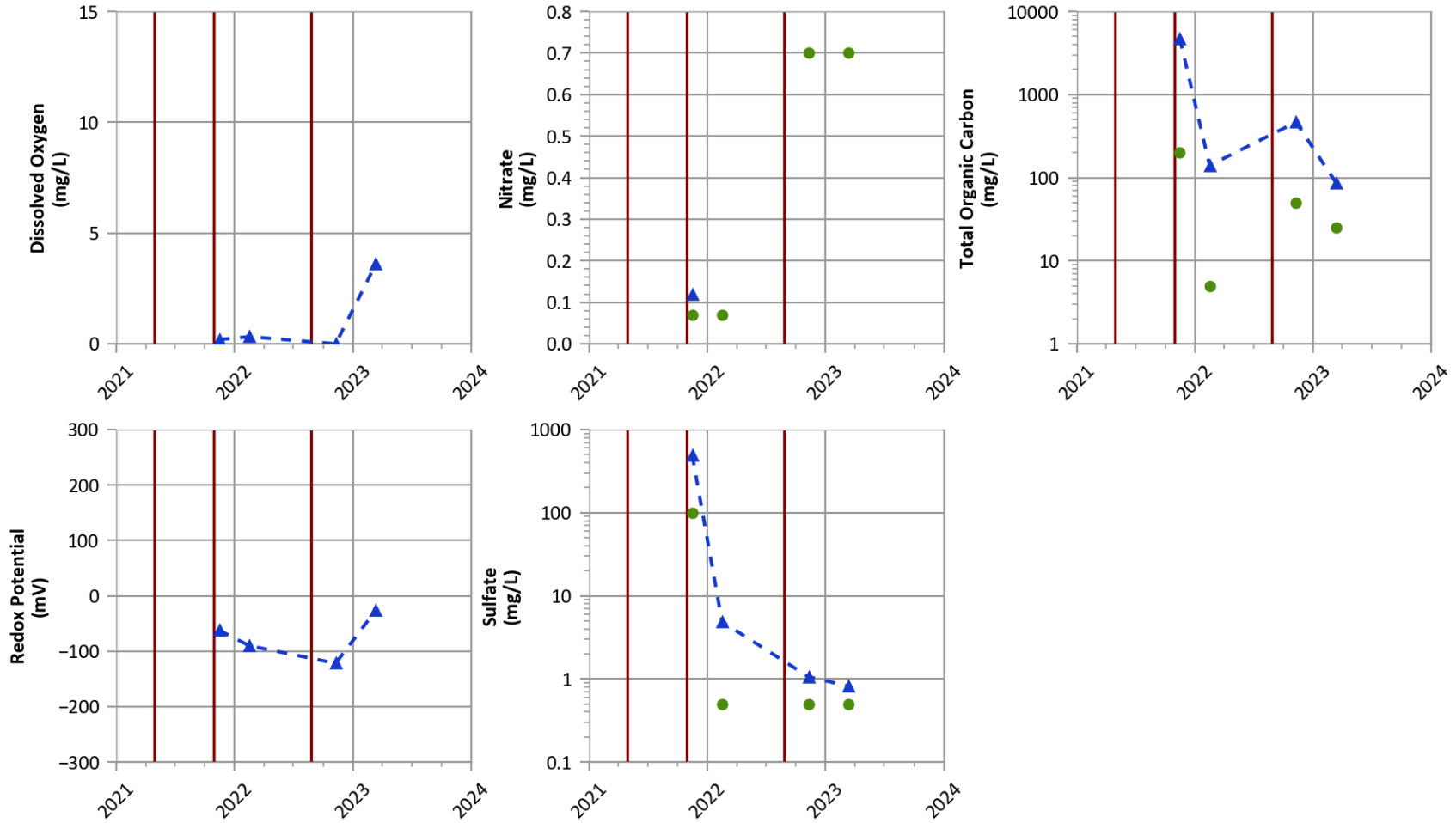
Typical Baseline Concentrations in Perched Groundwater

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



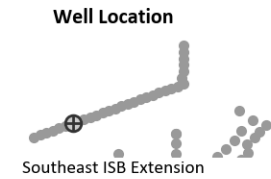
**PTX06-1213 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



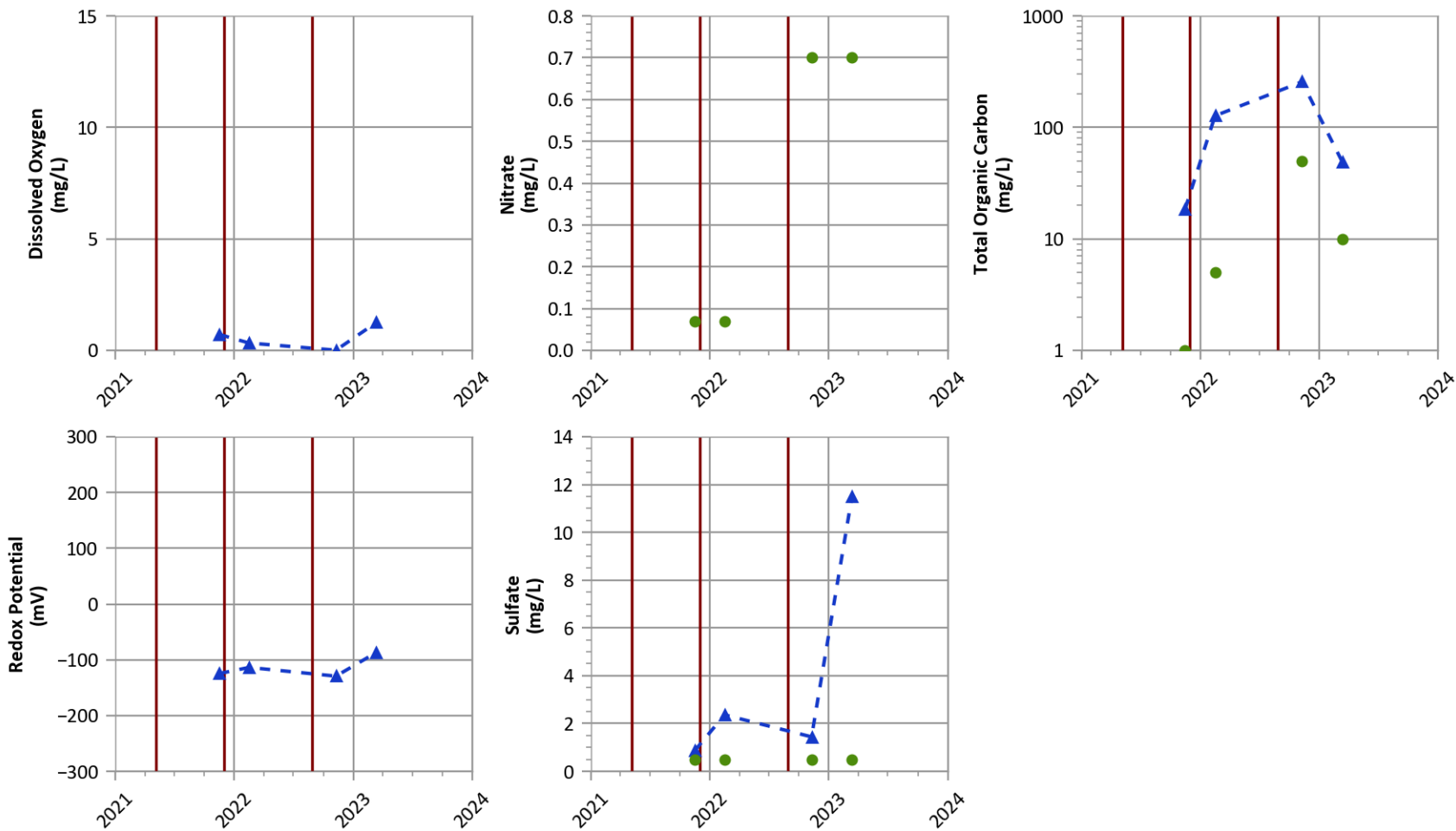
**Typical Baseline Concentrations in Perched Groundwater**

- 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



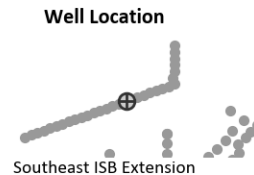
**PTX06-1214 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



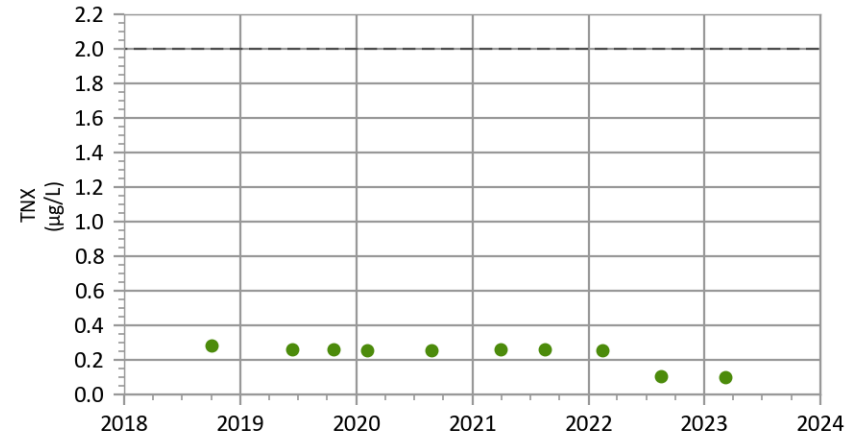
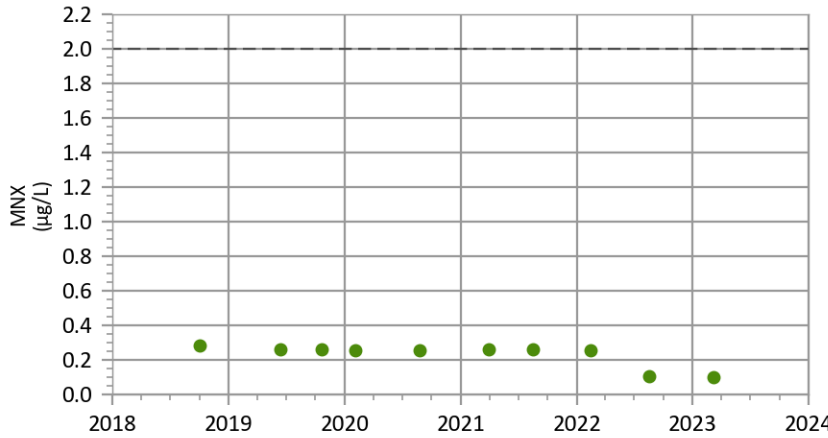
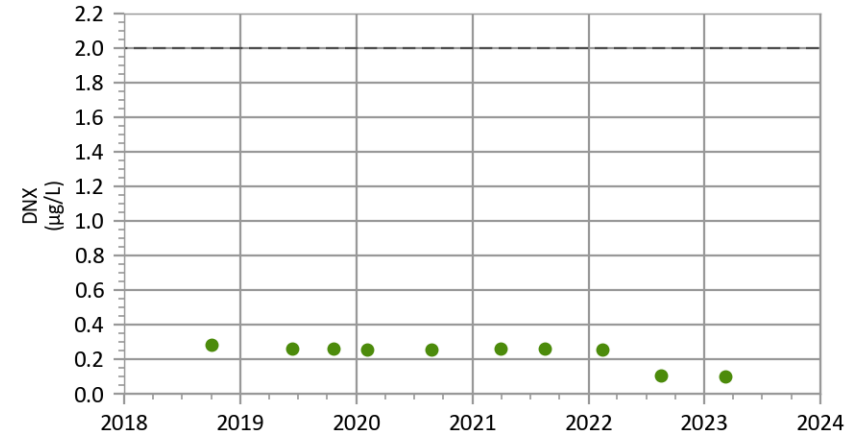
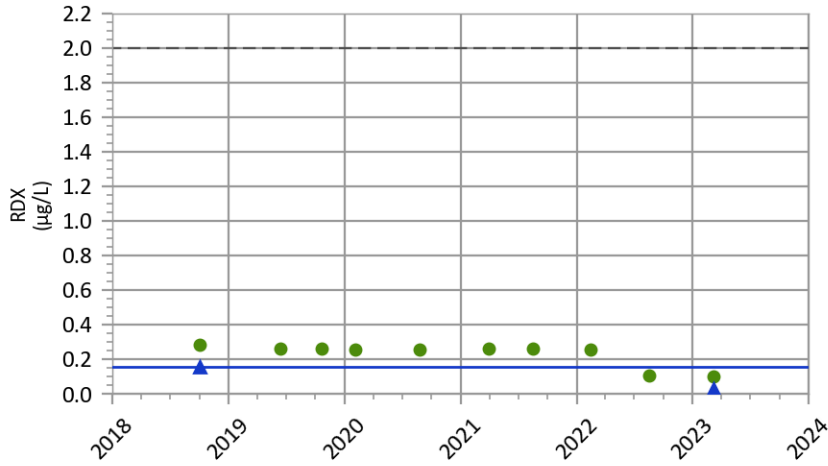
**Typical Baseline Concentrations in Perched Groundwater**

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



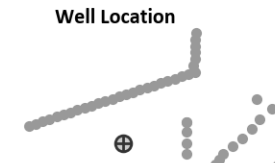
**PTX06-1194 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



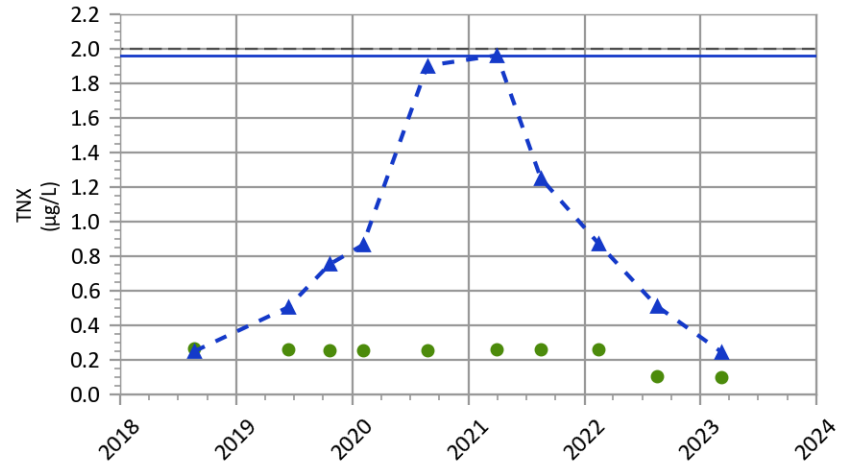
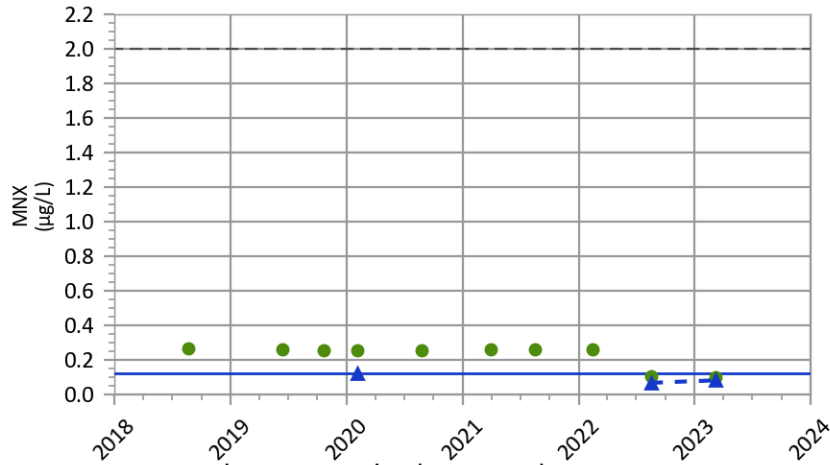
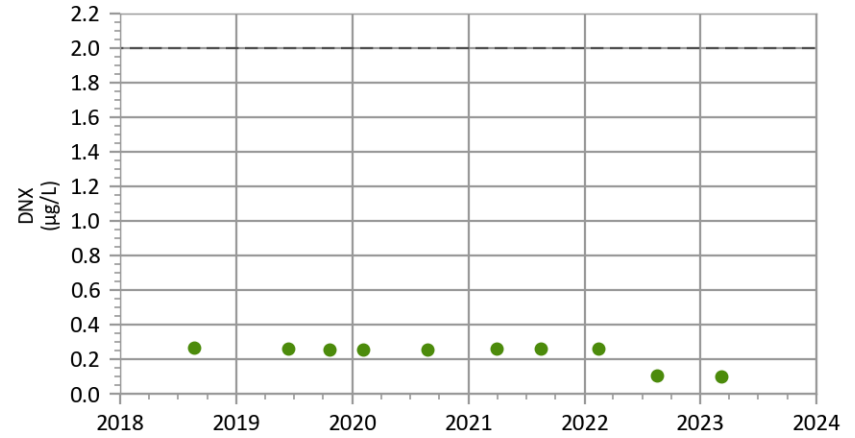
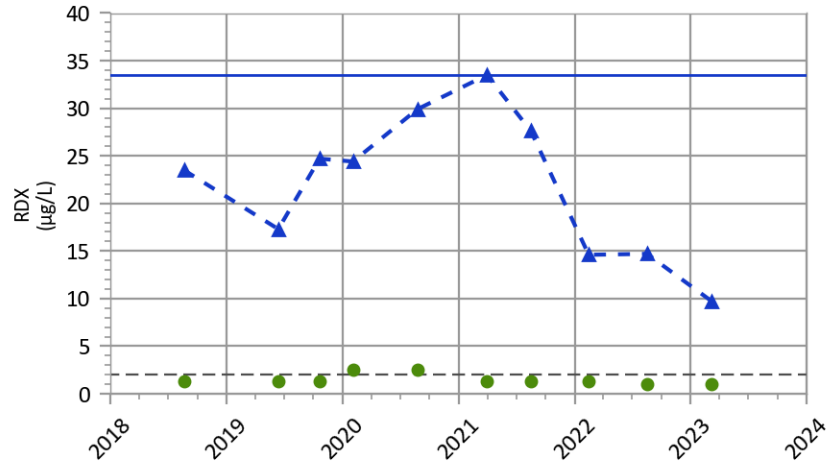
Most Recent Measured COC Concentrations (Mar 08, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	0.0285	2.0
MNX	Non-Detect	2.0
DNX	Non-Detect	2.0
TNX	Non-Detect	2.0

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



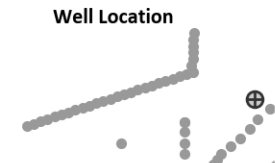
**PTX06-1196 Downgradient Performance Indicators  
Southeast Ext In Situ Bioremediation System  
USDOE/NNSA Pantex Plant**



Most Recent Measured COC Concentrations (Mar 08, 2023)

COC	Concentration (µg/L)	GWPS (µg/L)
RDX	9.72	2.0
MNX	0.0815	2.0
DNX	Non-Detect	2.0
TNX	0.245	2.0

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

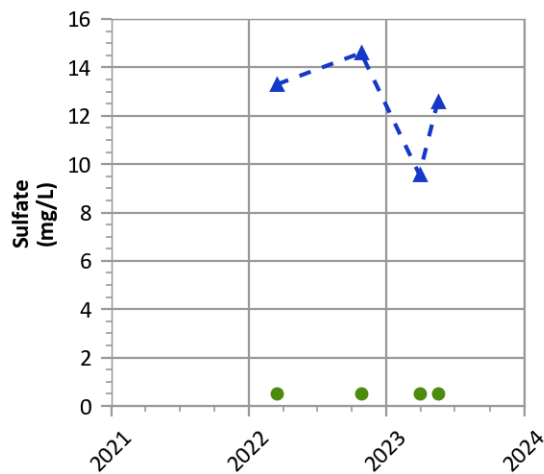
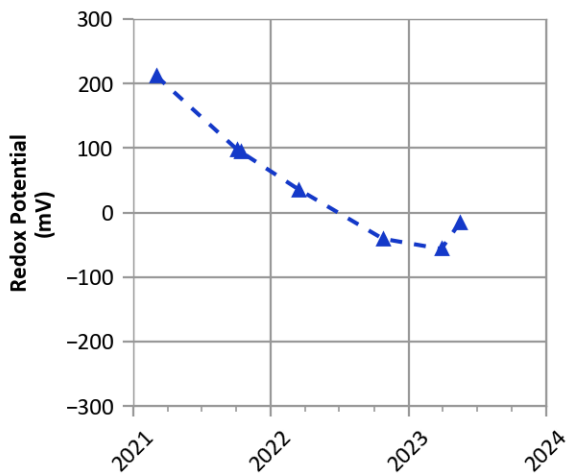
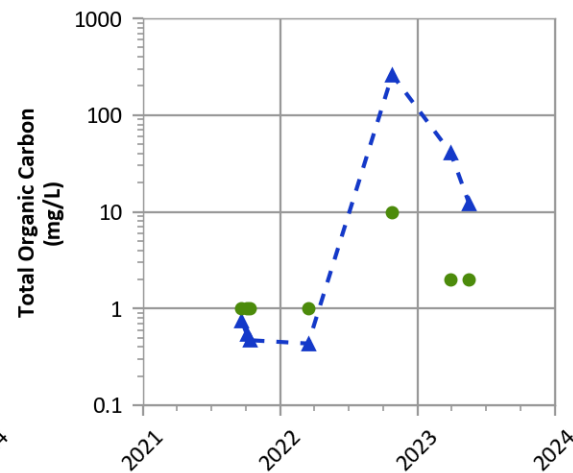
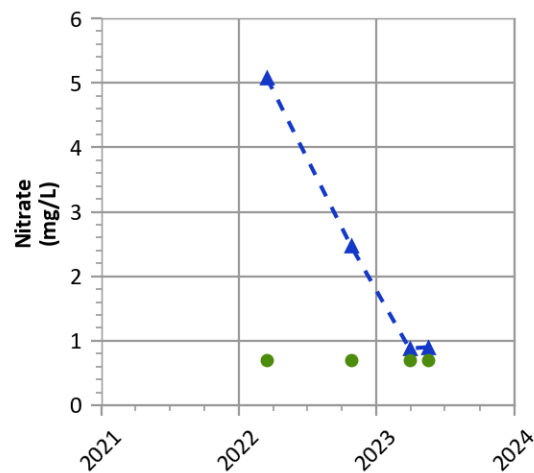
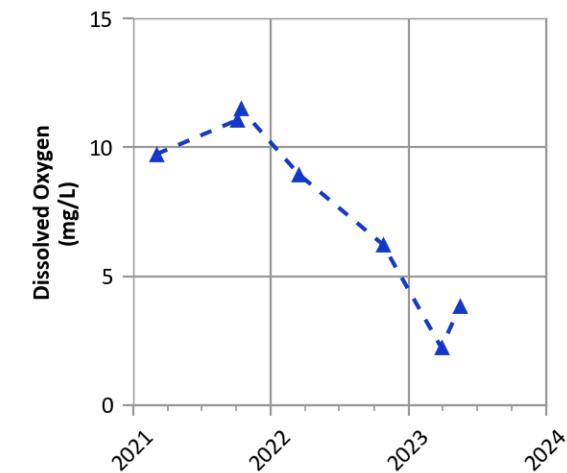


## Offsite ISB





PTX06-REC402 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



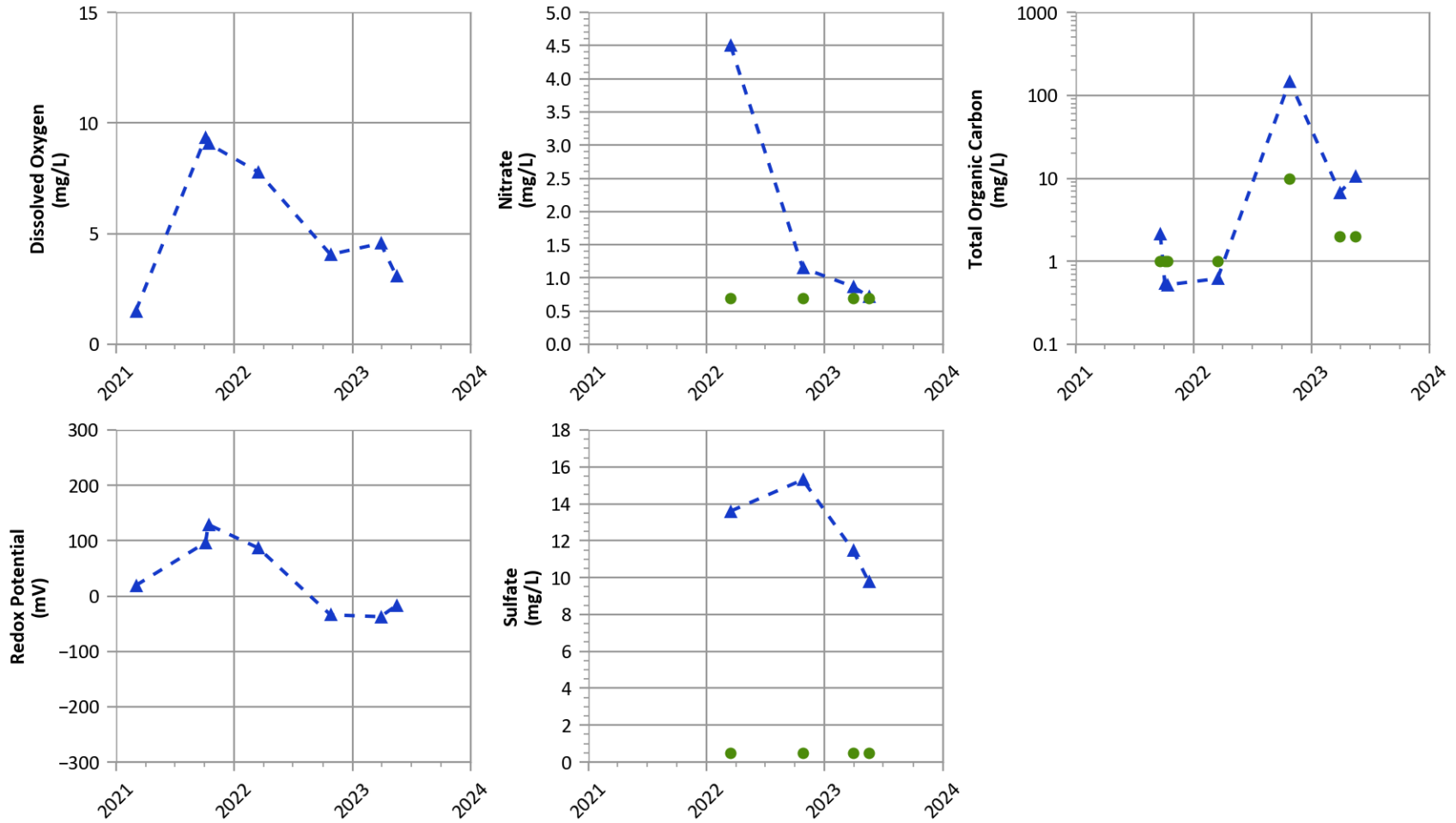
Typical Baseline Concentrations in Perched Groundwater

- 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



**PTX06-REC403 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



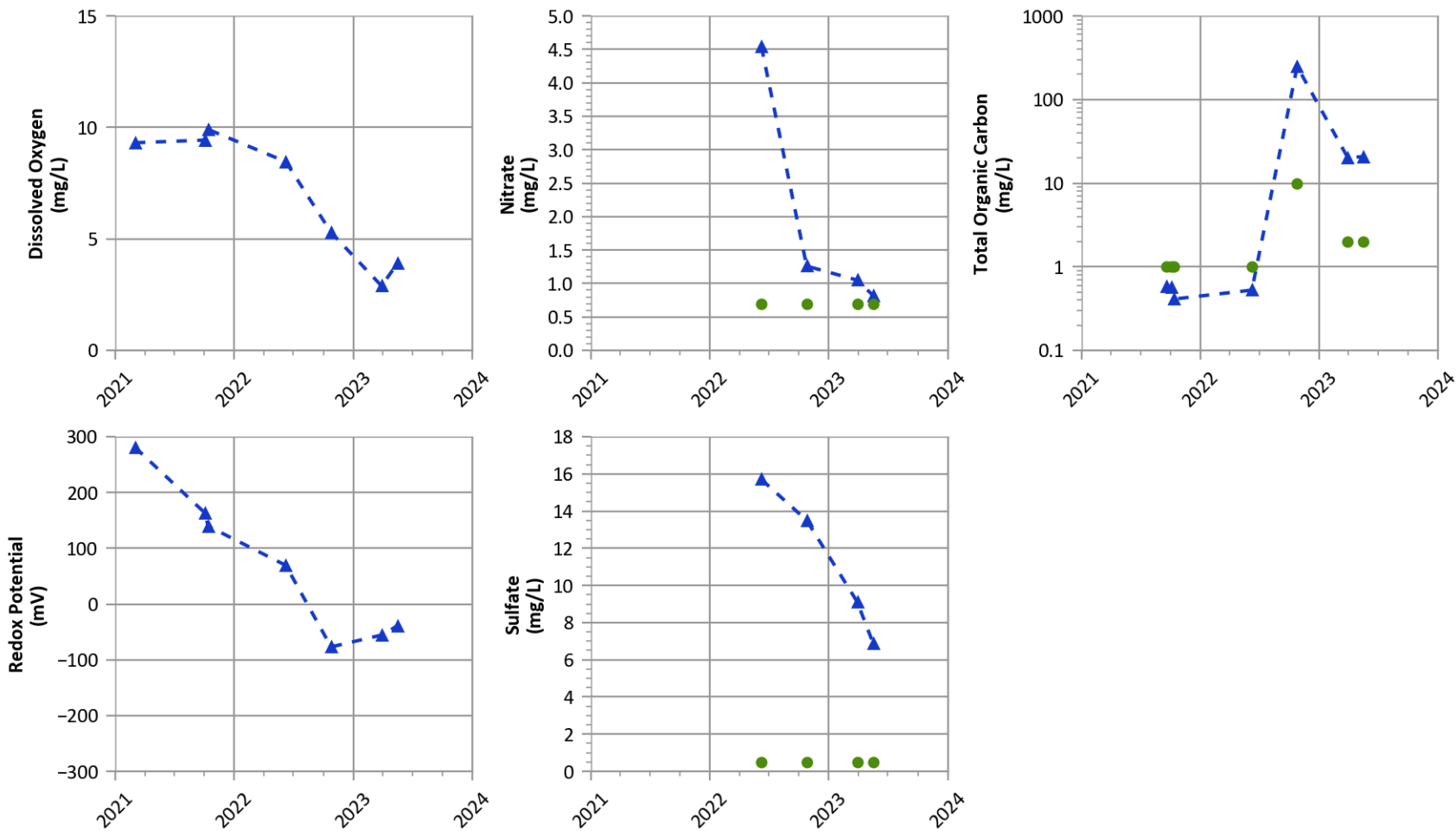
**Typical Baseline Concentrations in Perched Groundwater**

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



PTX06-REC404 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant



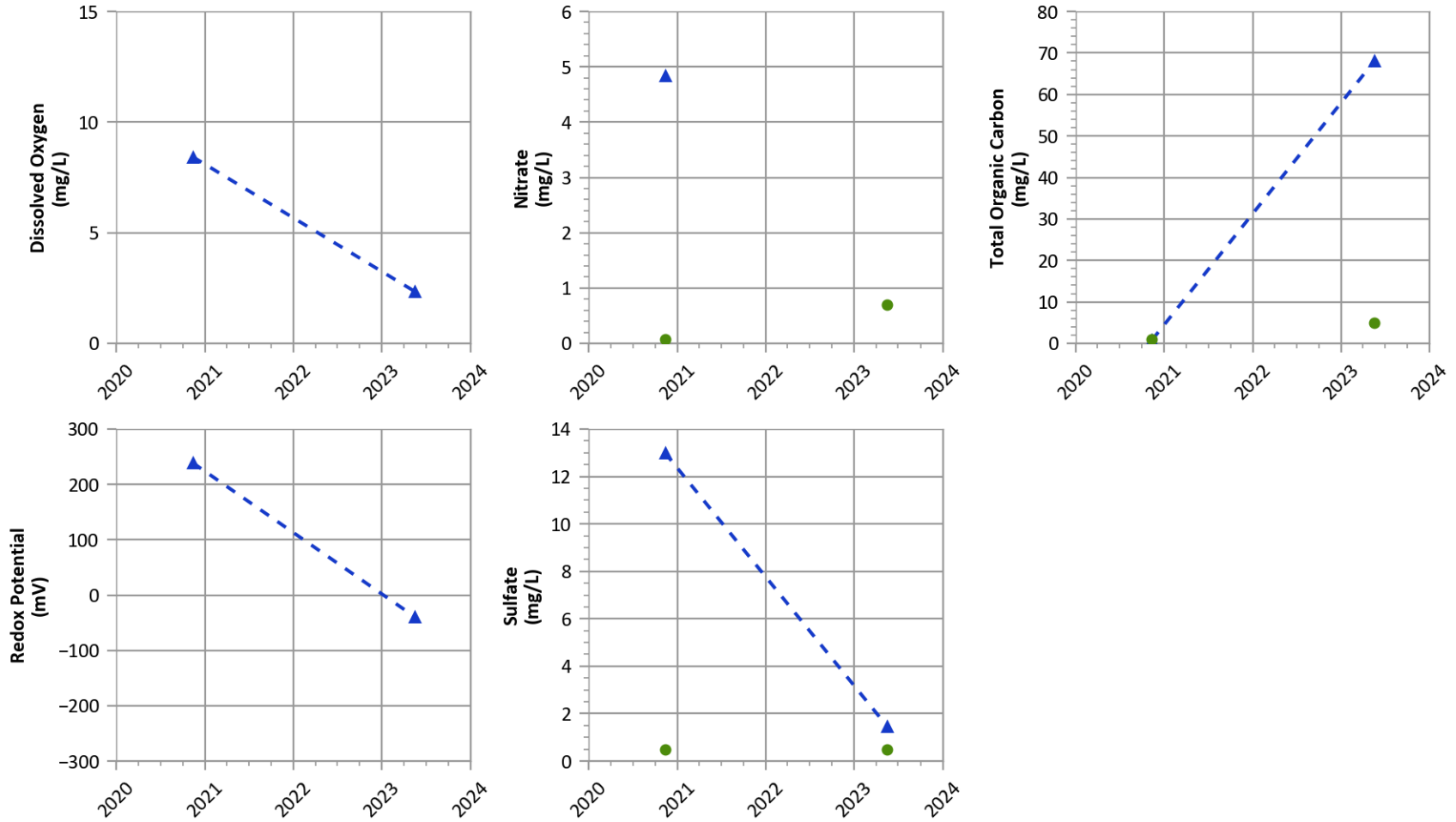
Typical Baseline Concentrations in Perched Groundwater

- 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



**PTX06-REC407 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



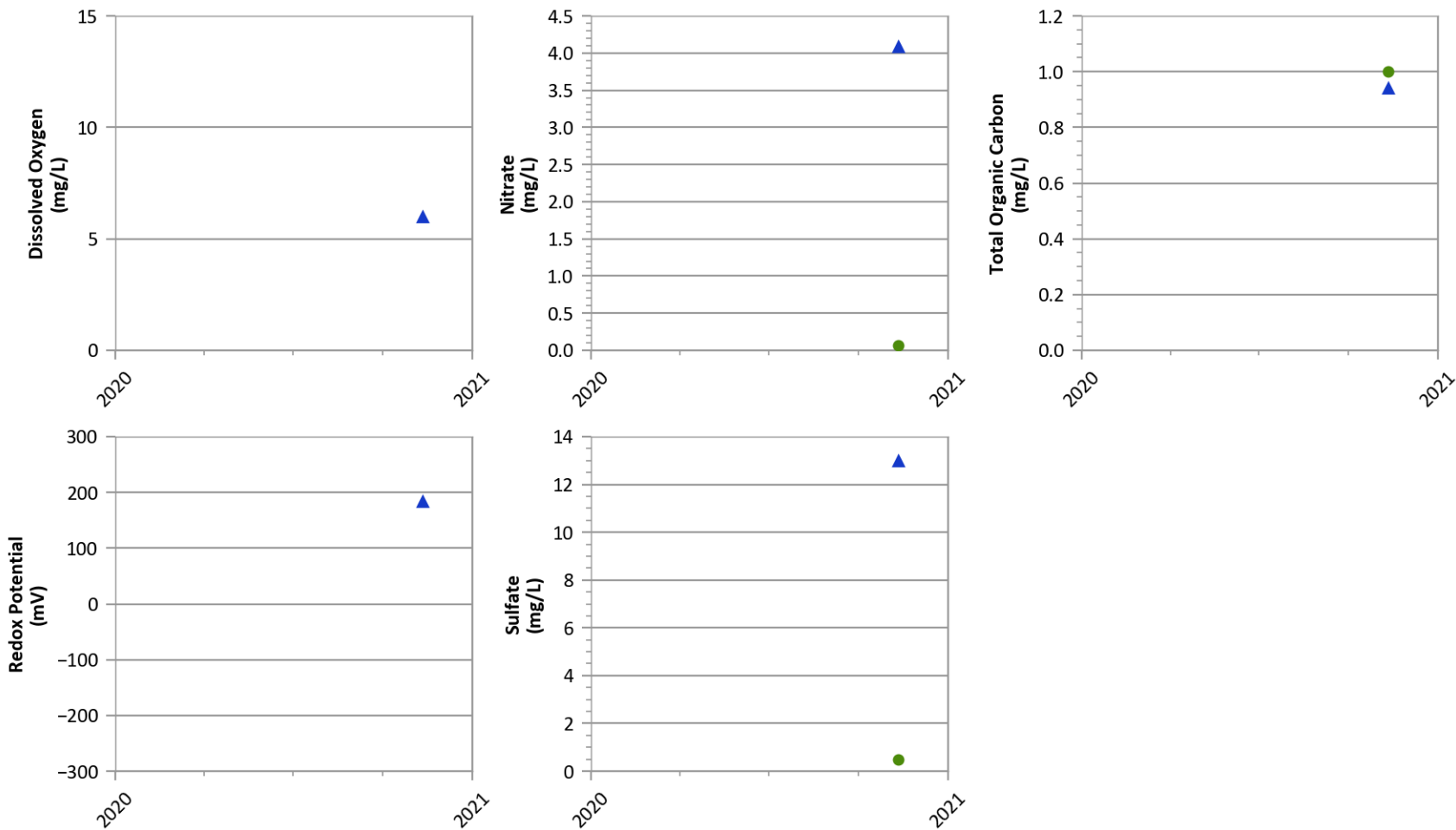
**Typical Baseline Concentrations in Perched Groundwater**

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



**PTX06-REC411 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



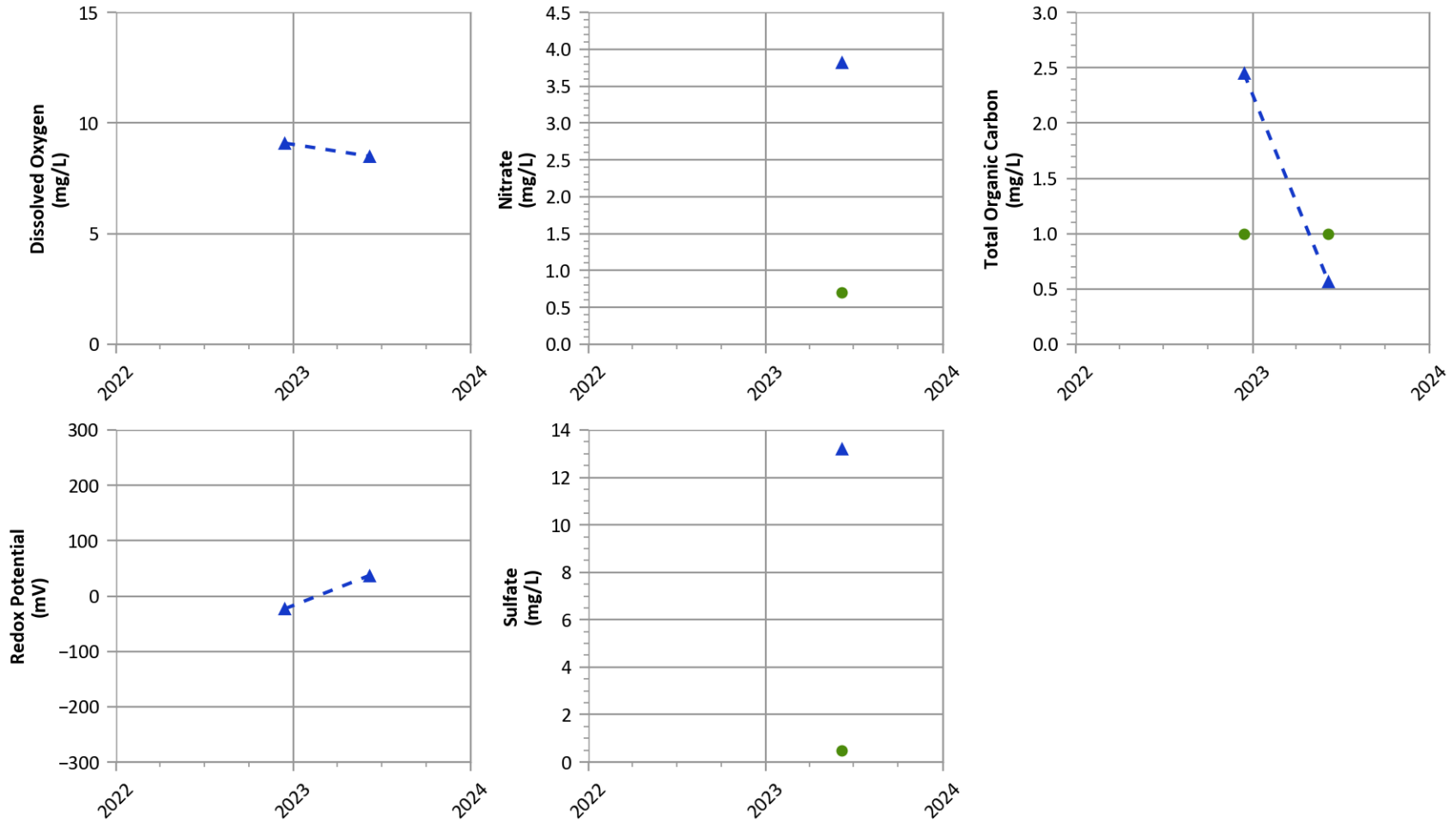
**Typical Baseline Concentrations in Perched Groundwater**

- 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



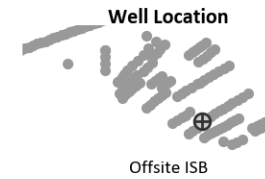
**PTX06-REC416 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



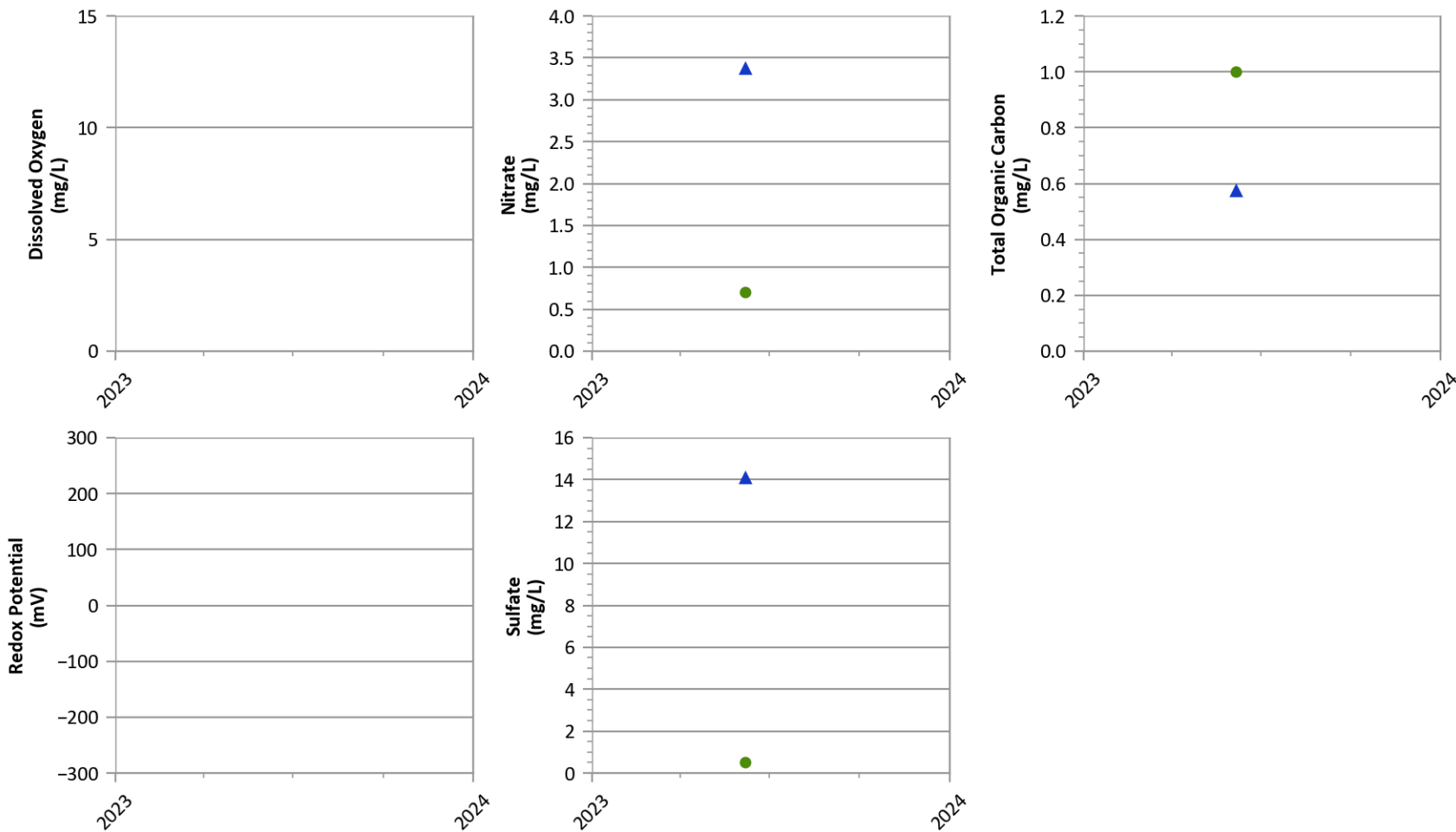
**Typical Baseline Concentrations in Perched Groundwater**

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



**PTX06-REC419 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



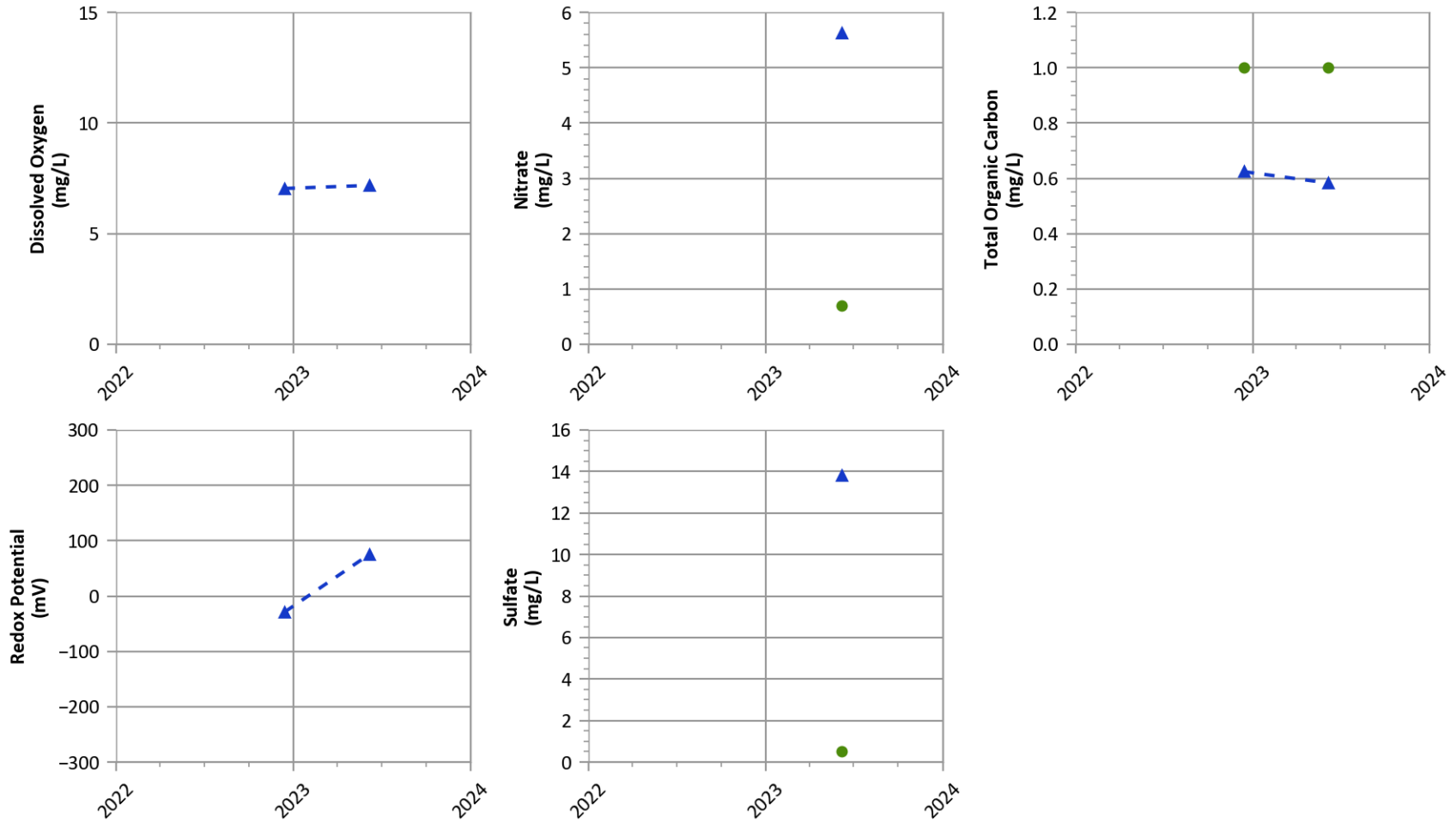
**Typical Baseline Concentrations in Perched Groundwater**

- 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

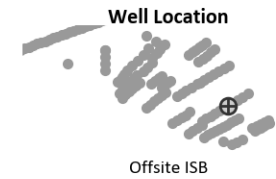


**PTX06-REC422 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



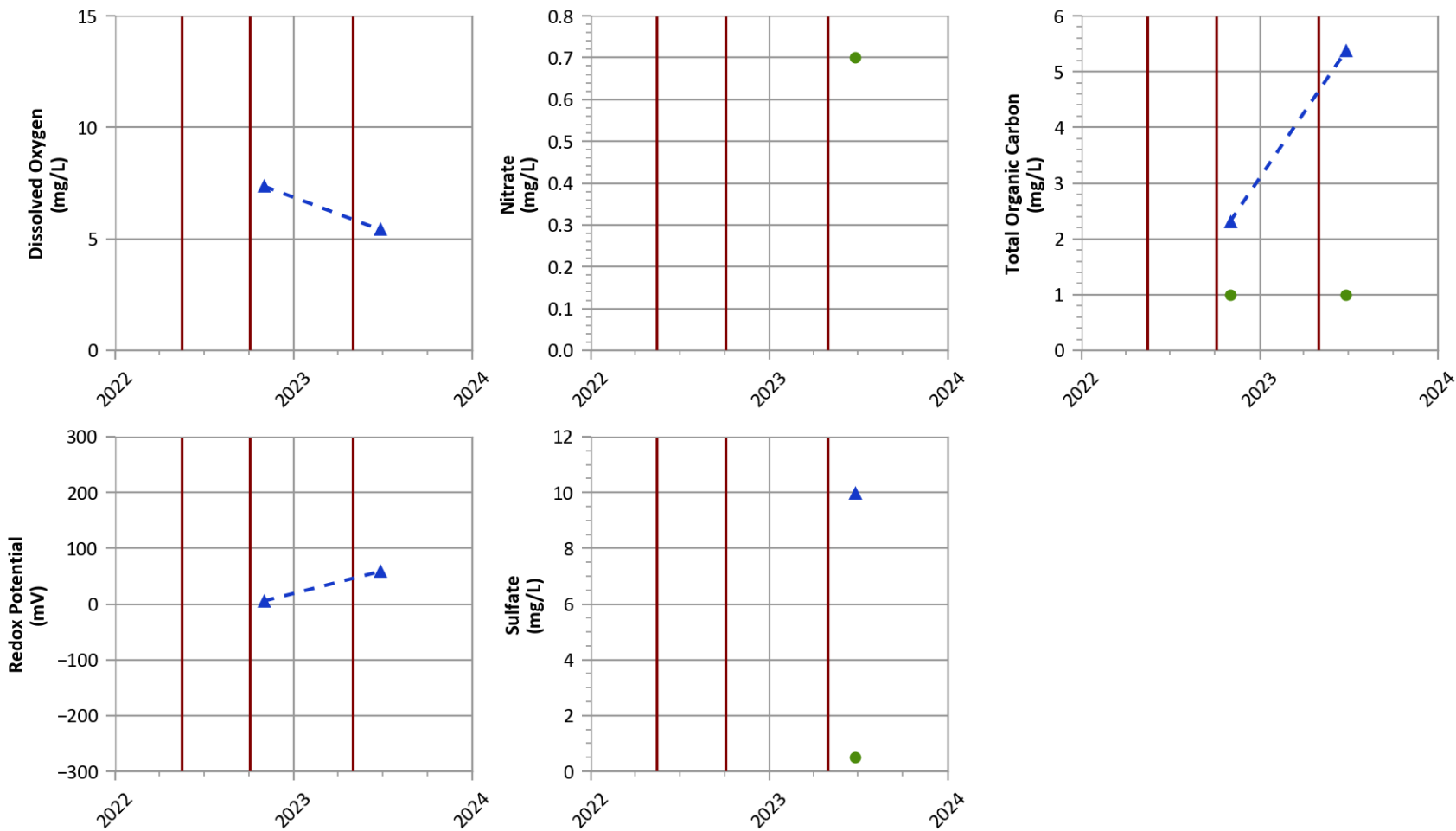
**Typical Baseline Concentrations in Perched Groundwater**  
 Dissolved Oxygen: 5-10 mg/L  
 Redox Potential: > 100 mV  
 Nitrate: > 1 mg/L  
 Sulfate: > 10 mg/L  
 Total Organic Carbon: < 5 mg/L  
 Total Volatile Fatty Acids: Not Detected

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





**PTX06-1218 Treatment Zone Performance Indicators  
USDOE/NNSA Pantex Plant**



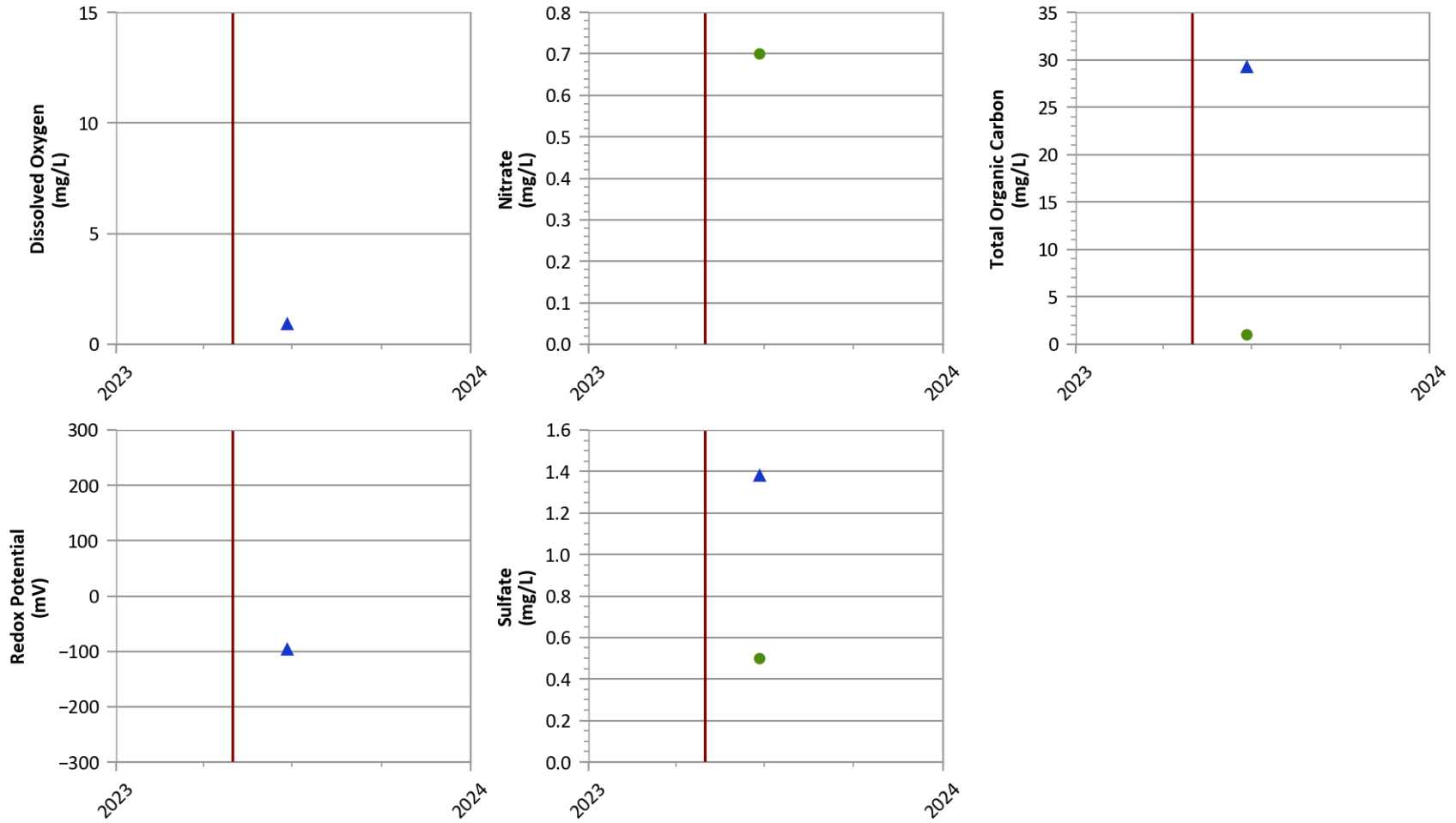
**Typical Baseline Concentrations in Perched Groundwater**

- 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



**PTX06-1219 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

