



**Explanation of Significant Difference
for
Zone 11 ISB, Southeast ISB Extension, Offsite ISB,
Southeast Pump & Treat System, and the Action Level
for Perchlorate in Perched Groundwater**

**Pantex Plant
Carson County, Texas
U.S. EPA ID No. TX4890110527**

Prepared for:

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
ARS	Aleut Remediation Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNS	Consolidated Nuclear Security, LLC
COC	Constituent of Concern
DOE	Department of Energy
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
EW	Extraction Well
FGZ	Fine-Grained Zone
FM	Farm to Market
HE	High Explosives
HGL	HydroGeoLogic, Inc.
IAG	Interagency Agreement
IC	Institutional Control
IRAR	Interim Remedial Action Report
ISB	<i>In Situ</i> Bioremediation
NCP	National Contingency Plan
NNSA	National Nuclear Security Administration
NPL	National Priorities List
O&M	Operations and Maintenance
P&T	Pump and Treat
PIPTS	Playa 1 Pump and Treat System
PCL	Protective Concentration Level
RAO	Remedial Action Objective
RDX	Cyclotrimethylene-trinitramine
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SEPTS	Southeast Pump and Treat System
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TTRF	Texas Tech Research Farm
TTU	Texas Tech University
TZM	Treatment Zone Monitoring
USDOE	United States Department of Energy

1.0 THE DECISION SUMMARY

Site Name and Location

The United States Department of Energy/National Nuclear Security Administration's (USDOE/NNSA) Pantex Plant is located 17 miles northeast of Amarillo, Texas in Carson County. The National Superfund Database Identification Number is TX4890110527. On July 29, 1991, EPA proposed the Site for inclusion on the National Priorities List (NPL). EPA listed the Site on the NPL on May 31, 1994. In the late 1980s, the DOE Office of Environmental Management (EM) initiated the Environmental Restoration Project at the Pantex Site. In 2000, the USDOE/NNSA succeeded DOE EM as the designated lead federal agency to investigate, assess, and remediate environmental releases at the Pantex Site. The U.S. Environmental Protection Agency (EPA) is the primary CERCLA oversight authority for the Site. The State of Texas, as represented by the Texas Commission on Environmental Quality (TCEQ), is the primary Resource Conservation and Recovery Act oversight authority for the Site and also provides CERCLA oversight support at the Site.

The Pantex Plant is charged with maintaining the safety, security, and reliability of the nation's nuclear weapons stockpile. The Pantex Plant is a federal facility owned by the U.S. Department of Energy/National Nuclear Security Administration (USDOE/NNSA) and is managed and operated by Consolidated Nuclear Security, LLC (CNS).

The Pantex Plant site consists of a total of 17,559 acres comprised of USDOE/NNSA owned land, including 5,856 acres of safety and security buffer owned by the Texas Tech University (TTU). TTU leases the property back to USDOE/NNSA; Texas Tech Research Farm (TTRF), manages the buffer zone as range and farm land. Figure 1-1 illustrates the regional setting and major site features of the Pantex Plant.

The USDOE/NNSA-owned main property covers 10,177 acres. Industrial operations occur in major operational areas, identified as Zones 10, 11, and 12, on approximately 2,000 acres in the central portion of the Pantex Plant. The remainder of this USDOE/NNSA main property is managed to support and secure the industrial operations, including more than 6,000 acres used for agricultural purposes. USDOE/NNSA also owns 1,526 acres east of FM 2373 which is readily accessible for implementing changes to the Selected Remedy to improve attainment of remedial action objectives like those described herein.

Most surface water runoff at the Pantex Plant flows through several major drainage ditches into four local playa basins (Playa 1, 2, 3, and 4) on, or adjacent to, the site. All four playas hold water intermittently throughout the year. USDOE/NNSA also owns Pantex Lake, which is 2.5 miles northeast of the Plant boundary.

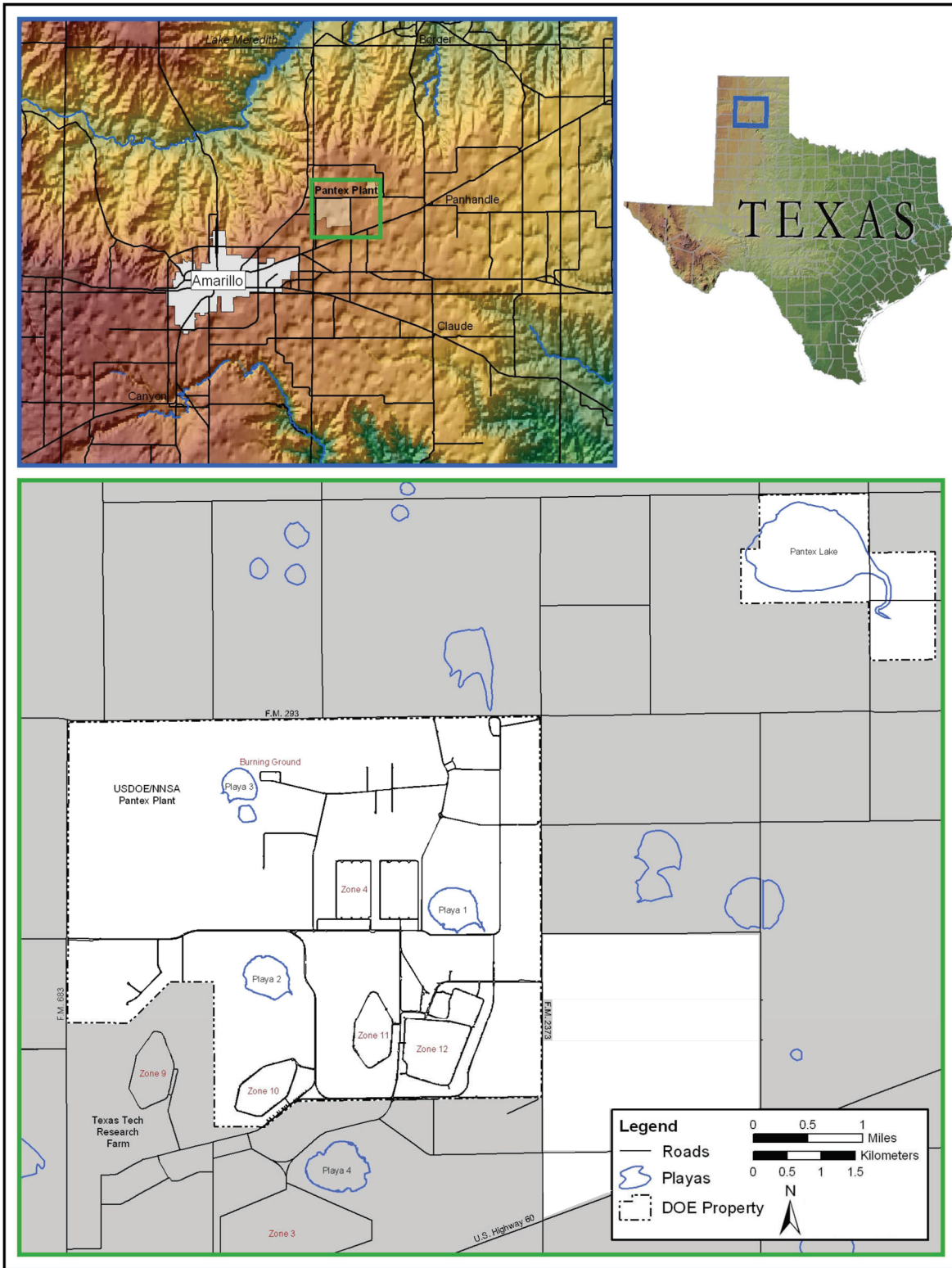


Figure 1-1. Regional Setting and Major Site Features at Pantex

Historical Operations and Releases to the Environment

The Pantex Plant was established in 1942 to build conventional munitions and high explosives compounds in support of World War II. The Plant was deactivated in 1945 and sold to Texas Technological University, currently known as Texas Tech University, subject to recall by the War Assets Administration. TTU used the property for agricultural purposes until 1951, when the Pantex Plant was reclaimed for use by the Atomic Energy Commission, as a nuclear weapons production facility. Portions of the conventional weapons plant were renovated, and new facilities were built for the manufacture of high explosive (HE) compounds. Current operations include the development, testing, and fabrication of HE components; nuclear weapons assembly and disassembly, interim storage of plutonium and weapon components; and component surveillance.

The Pantex Plant's historical waste management practices have included thermal treatment of explosives, explosive components, and contaminated liquids and solvents (including test residues of explosives and depleted uranium); burial of industrial, construction, and sanitary waste in unlined landfills; disposal of solvents in pits or sumps; discharge of untreated industrial wastewaters to unlined ditches and playas; and the use of surface impoundments for the disposal of chemical constituents. These prior practices have resulted in the release of both chemical and radionuclide constituents to the environment.

Statement of Basis and Purpose

The USDOE/NNSA "Selected Remedy" for Pantex Plant is defined in the Record of Decision (ROD) signed on September 25, 2008. This Explanation of Significant Difference (ESD) describes:

- (1) Differences between several components of the "Selected Remedy" for the Pantex Plant, and the actual systems constructed, operated, and maintained to achieve remedial action objectives. The changes listed below by remedial action system and documented in more detail in this Explanation of Significant Differences were selected in accordance with the Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. § 9617(c), and the National Contingency Plan (NCP) at 40 C.F.R. § 300.435(c)(2)(i).
- (2) The difference between the action level in the ROD and protective levels and health advisories established for perchlorate since issuance of the ROD.

Zone 11 ISB System – Dose response testing conducted as part of the Zone 11 ISB Injection in 2018 informed the need for injection of a more mobile carbon source at higher volumes for each event to improve distribution and treatment.

Southeast ISB Extension – A need was identified for additional treatment through perched groundwater monitoring results obtained from PTX06-1182 and additional wells installed in 2018. Reference the 2018 Annual Progress Report for information regarding the basis for installing, operating, and maintaining an In Situ Bioremediation System at the southeastern property boundary.

Offsite ISB System – Evaluation of perched groundwater plume movement (southeast lobe) via PTX06-1191, -1196, -1197, -1198 led to confirmation of plume expansion beyond the Pantex property. This formed the basis for additional institutional controls and an additional treatment system to stabilize and remediate the plume beneath neighboring property. No completed exposure pathways were identified. Reference the 2019 Annual Progress Report for details on the basis for this change.

Perchlorate/Chromium ISB System – Evaluation of perchlorate movement southeast of Zone 11 identified a need for treatment; reference 2019 Annual Progress Report and the Pump and Treat Optimization Report.

County Road 8 ISB System – Evaluation of perched groundwater data for SE Lobe identified a need for additional treatment to ensure future effectiveness of the Southeast ISB Extension; reference 2019 Annual Progress Report and the Pump and Treat Optimization Report.

Southeast Pump and Treat System - Influent and well-field monitoring identified a need for perchlorate treatment. Also, evaluation of the high explosives plume in the southeast area of the perched groundwater identified a need for extraction east of FM 2373 to reduce mass and flow toward the southern property boundary.

The United States Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ) concur with incorporation of changes to address the significant differences from the Selected Remedy as described herein.

The Administrative Record for the site is maintained at the Pantex Plant and review may be arranged by contacting Public Affairs by email at pantex_communications@pxy12.doe.gov or by calling 806.477.3000; hours of availability are 8 am to 4 pm.

Assessment of the Site

Changes to the action level for perchlorate and other remedial actions described in the ESD are necessary to protect the public health, welfare and environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

Description of the Selected Remedy

The overall cleanup strategy for the Pantex Plant is to continue to protect human health and the environment through control of potential exposure to contaminated soils and perched groundwater for both human and ecological receptors, to restore the perched groundwater to drinking water standards, and to protect the underlying Ogallala Aquifer. The components of the Selected Remedy address soil sites requiring a remedial response, and perched groundwater contaminants in two focus areas, the Southeast Area and Zone 11. The Selected Remedy for soils is:

- Institutional controls (ICs) for select sites (Limited Action Soil Units, Burn Pads 11 through 13 (SWMUs 25, 26 and 27), and SWMU 5/12a).
- Presumptive Remedy of Soil Vapor Extraction (with future modifications to effectively reduce the source term) and ICs for SWMU 47.
- Containment and ICs for the following sites:
 - Covers installed for the Burning Ground Former Ash Disposal Trench (SWMU 14-24); and the former operational area of Firing Site 5 (SWMU 70) will control the potential for exposure to contaminants in soil and minimize the potential for migration of contaminants from soil to groundwater via infiltration. ICs will be implemented to maintain these protective covers and provide for continued containment of contaminated soils, while also restricting access and land use.

- Installed synthetic liners in Zone 12 ditches (SWMU 2 and SWMU 5/05) will prevent leaching of contaminants to perched groundwater via infiltration. ICs will restrict access, land use, and protect the integrity of the covers or liners.
- Containment (presumptive remedy) and ICs for the Pantex Plant landfills. Covers installed will prevent exposure to soil contaminants, minimize the potential for contaminant leaching to groundwater, and promote surface water runoff and erosion control. ICs will restrict access and property use, and ensure continued integrity of the covers.

The Selected Remedy for perched groundwater is:

- Continued operation of the installed Southeast Pump and Treat System (SEPTS) to stabilize migration and treat perched groundwater contaminants.
- Construction and operation of the Playa 1 Pump and Treat System (PIPTS) to reduce the mounding of perched groundwater in the Playa 1 area, mitigating the potential for contaminant migration from the perched groundwater to the Ogallala Aquifer.
- Continued operation of the Southeast ISB System to treat high explosive (HE) contaminants.
- Operation of an ISB system to treat trichloroethene (TCE) and perchlorate contaminants down-gradient of Zone 11.
- ICs to prevent exposure to contaminants and cross-contamination to the regional Ogallala Aquifer.

Effectiveness of the Selected Remedy for the Pantex Plant site is evaluated through groundwater monitoring implemented through a Long-Term Groundwater Monitoring Plan, developed as part the Remedial Design, in accordance with the Interagency Agreement for the Pantex Superfund Site.

Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with Federal, State, and local requirements that are applicable or relevant and appropriate (ARAR) to the remedial actions, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The Selected Remedy for soil does not satisfy the statutory preference for treatment as a principal element of the remedy because treatment of Constituents of Concern (COCs) in soil is impracticable due to site characteristics (primarily depth to contamination), increases short-term risks to workers, and is cost prohibitive. The Selected Remedy for groundwater satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every 5 years after initiation of remedial actions to ensure that the remedy is, or will be, protective of human health and the environment. Groundwater monitoring data will be reviewed on a more frequent basis to ensure continued protection of human health.

This ESD is being issued under the authority provided at CERCLA Section 117(c), 42 U.S.C. § 9617(c), and the NCP at 40 C.F.R. § 300.435(c)(2)(i). This ESD summarizes information that can be found in greater detail in other documents contained in the Administrative Record for this Site and will be available for the public to review.

Public Participation

NNSA encourages public participation via Annual Public Meetings in accordance with NCP §300.435(c)(2)(i). In accordance with NCP §300.435(c)(2)(i)(B), NNSA will publish a notice of availability and brief description of this ESD in the Amarillo Globe News and Panhandle Herald after concurrence by both TCEQ and EPA. Also, the ESD will be available to the public via the Administrative Record file and information repositories [NCP §§300.435(c)(2)(i)(A) and 300.825(a)(2)]. Primary documents are available on the Pantex website at <https://pantex.energy.gov/mission/environment/environmental-cleanup-documents-0>.

Roles and Responsibilities

This ESD documents significant changes to the Selected Remedy for the Pantex Plant. These changes have been selected by USDOE/NNSA as the lead agency under CERCLA, and approved by EPA Region 6, with the concurrence of the TCEQ. The NNSA Production Office Manager has the authority to issue the ESD for the Pantex Plant; the Director of the EPA (Region 6) Superfund and Emergency Management Division has the authority to approve the ESD; and the Executive Director of TCEQ, or appointed designee, has the authority to concur with the ESD.

2.0 REMEDIAL ACTION SYSTEMS WITH SIGNIFICANT DIFFERENCES

Since issuance and approval of the Record of Decision for Pantex Plant, several of the ISB systems have been expanded significantly to improve treatment of perched groundwater contaminants in the targeted areas of impact. These systems include the Zone 11 ISB System, the Southeast ISB System via expansion to include the Southeast ISB Extension and the Offsite ISB System. Two future ISB systems, the Perchlorate/Chromium ISB System and the County Road 8 ISB System, are also planned for installation in FY24 and FY25 as part of the expanded Southeast ISB System. Installation of these future systems is contingent on receipt of funding, as requested.

In addition, extraction and treatment of contaminated perched ground water is planned for enhancement via construction of two mobile pump and treat (P&T) systems; the East Mobile P&T System and the Offsite P&T System. The East Mobile P&T system will be installed to enhance the Southeast P&T System performance by increasing overall mass removal and treatment of contaminants from the southeastern area of the perched groundwater. The Offsite Mobile P&T System will be installed to aid the Offsite ISB remedy by pulling water from beneath an adjacent property and removing contaminants concurrently.

Collectively, expansion of these systems target the two main areas of contamination present in the perched groundwater underlying and adjacent the Pantex Plant. Figure 2-1 depicts the perched groundwater beneath Pantex and contours of the plumes for the primary contaminants of concern relative to the remedial action systems.

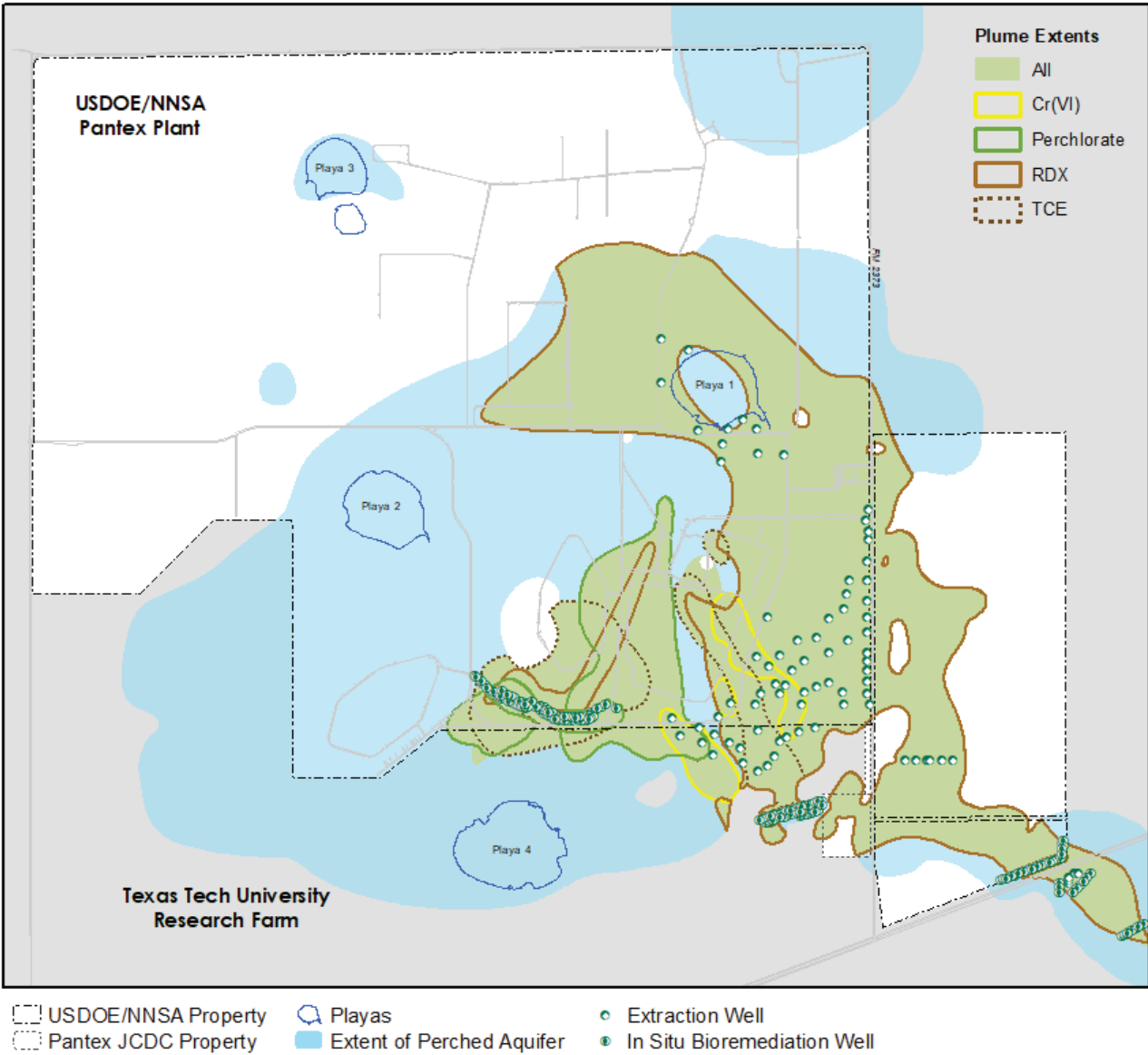


Figure 2-1. Perched Groundwater Plumes Extents in Excess of Ground Water Protection Standards

Table 2-1. Summary of Groundwater Remedial Actions and Significant Changes

Remedial Action System	Post-ROD Significant Difference	Comments	Human Health Exposure Pathway
Southeast Pump and Treat	Added Extraction Wells and Perchlorate Treatment Adding operation and maintenance of a mobile treatment system in areas east of FM 2373.	Addresses expanding plume.	None completed
Playa 1 Pump and Treat	N/A	No Significant differences	N/A
Southeast In Situ Bioremediation	Added Southeast ISB Extension and Offsite ISB Systems with operation of a mobile pump and treat system to enhance the ISB.	Addresses expanded southeast plume in areas not under active treatment	None completed
Zone 11 In Situ Bioremediation	Added 34 injection wells	Improved amendment distribution and plume coverage to the west	None Completed
Institutional Controls	Added deed restrictions for two properties in Carson County records.	Includes drilling restriction without specific notice and approval by NNSA.	Restrictions to prevent potential completion of pathway.

Additional details of the systems and their expansions are provided as Figure 2-2.

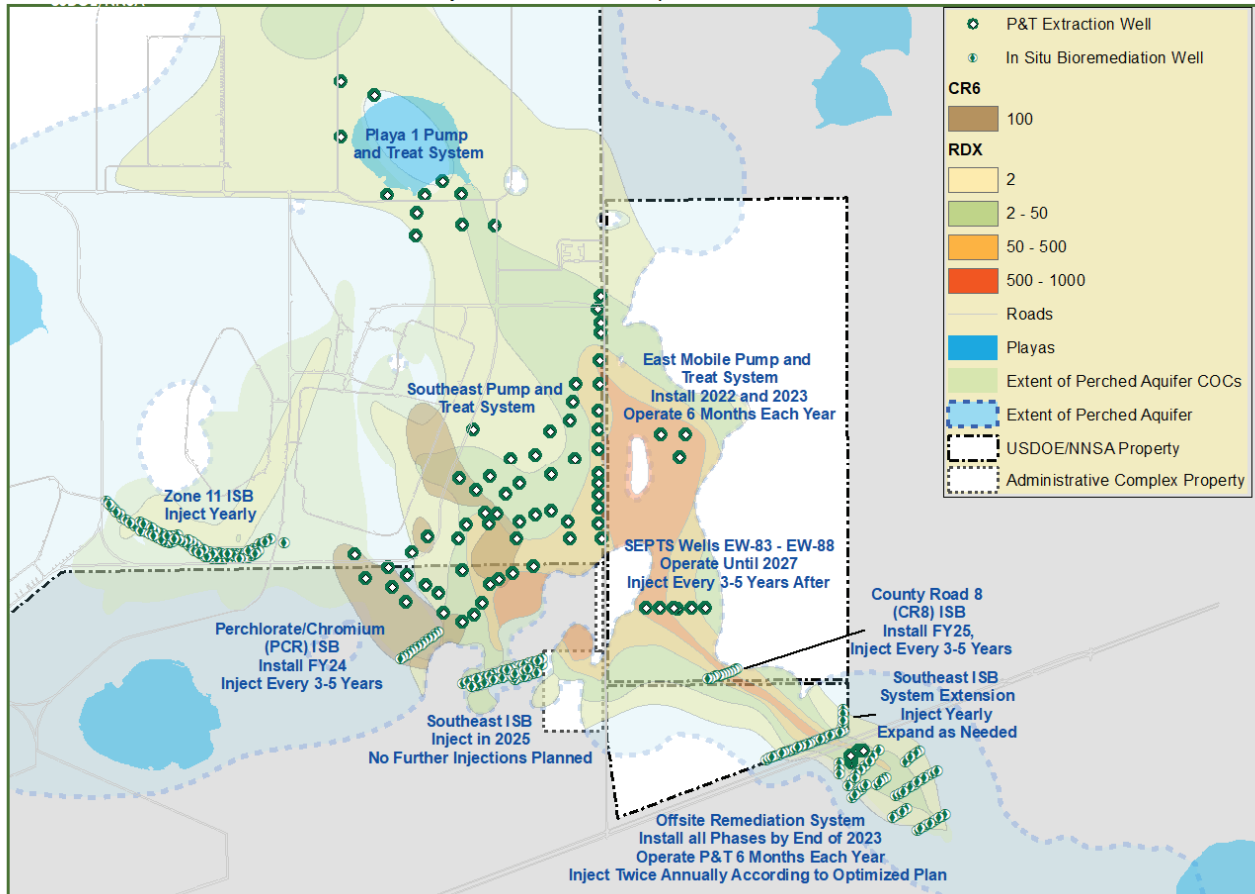


Figure 2-2. Remedial Action Systems with Significant Differences

2.1 Zone 11 ISB System

The Zone 11 ISB System is on Pantex property, south of Zone 11 (see Figure 2-3). The system, as operated in 2021, consists of 89 active and inactive injection wells, 7 Treatment Zone Monitoring (TSM) wells, and 9 down-gradient *In Situ* Performance Monitoring (ISPM) wells installed in a zone of saturated thickness of approximately 15 to 20 feet.

The Zone 11 ISB System, originally consisting of 23 wells and 3 down-gradient performance monitoring wells, was installed by March 2009. An additional 9 wells were installed in September 2009 to better treat the perchlorate plume on the eastern side and the TCE plume on the western side of the ISB system. One of the original wells, PTX06-ISB082, was removed from active injection in 2013, and three other wells on the eastern side, PTX06-ISB079 through PTX06-ISB081, were also removed from active injection by 2015.

Installation of the initial wells in 2009 provided data showing perched groundwater exhibited both southwestern and southeastern components of flow as it moved south beneath Zone 11. As a result, Pantex expanded the Zone 11 ISB System in late 2014 to include an additional 20 injection wells

(i.e., 18 new injection wells and 2 previously installed pump test wells identified as PTX06-ISB087 through PTX06-ISB106). Additional monitoring wells were also installed to improve performance monitoring (e.g., PTX06-1173 through PTX06-1177).

As operation of the remedy continued, performance data indicated effective degradation of perchlorate on the east side of the system, but incomplete degradation and general resistance to treatment of TCE in the middle and western areas of the system.

In 2018, dose response testing was performed as part of the injection event to better understand amendment distribution within the system. Results of the test indicated that a more soluble carbon like molasses needed to be injected at greater volumes to improve distribution. Injection volumes are now planned for approximately 300 percent of previous targets and changes implemented in the operations and maintenance of the system have improved treatment performance. While the molasses improves distribution, it is consumed more quickly. Thus, this system has been scheduled for injection every 12 months.

In late 2019, Pantex extended the system again with 6 new injection wells (PTX06-ISB132 through PTX06-ISB137) to the northwest. The expansion wells were installed to fully encompass the TCE and perchlorate plumes that extended northwest of the original system.

In 2021 a second row of wells, consisting of 26 ISB injection wells (PTX06-ISB138 through PTX06-ISB163), was added across the southern side of the Zone 11 ISB System to address the higher concentrations of TCE that are now moving to the southeast in response to removal of perched water via the SEPTS well-field. Those wells were spaced approximately 50 feet apart to allow for use of emulsified soybean oil, which does not distribute as widely as a more soluble carbon. Five wells were infilled on the western side of the ISB system due to the loss of injection capacity at nearby wells. Additionally, 2 TZM wells were added to the southern expanded area. One up-gradient monitoring well was added to evaluate the incoming TCE plume.

Fourteen injection events have been completed for this Zone 11 ISB System. Table 2-2 provides the list of injection events, dates of completion, injection volumes, type of amendment, approximate injection concentration, and number of wells injected.

Table 2-2. Zone 11 ISB Injection Events

Injection Event	Completion Date	Mixed Amendment Injected (millions of gallons)	Type of Amendment	Amendment Concentration	No. Wells Injected
1	June 2009	1.54	Newman Zone™	5%	23
2	November 2009	0.47	Newman Zone™	3.5% to 5%	9
3	September 2010	1.8	Newman Zone™	6%	32
4	October 2011	1.7	Newman Zone™	7%	32
5	September 2012	1.8	Newman Zone™	7%	32
6	July 2013	1.8	Newman Zone™	7%	32
7	July 2014	2.0	Newman Zone™	6%	33
8	November 2015	3.1	Newman Zone™	7%	51
9	August 2016	2.6	Newman Zone™	7%	46
10	October 2018	1.8	Newman Zone™/ Molasses	3%/ 2.5%	22
11	January 2020	1.8	Molasses	2%	48
12	January 2021	2.7	Molasses	3%	26
13	November 2021	4.2	Molasses	2%	61
14	October 2022	4.6	Molasses	2%	68

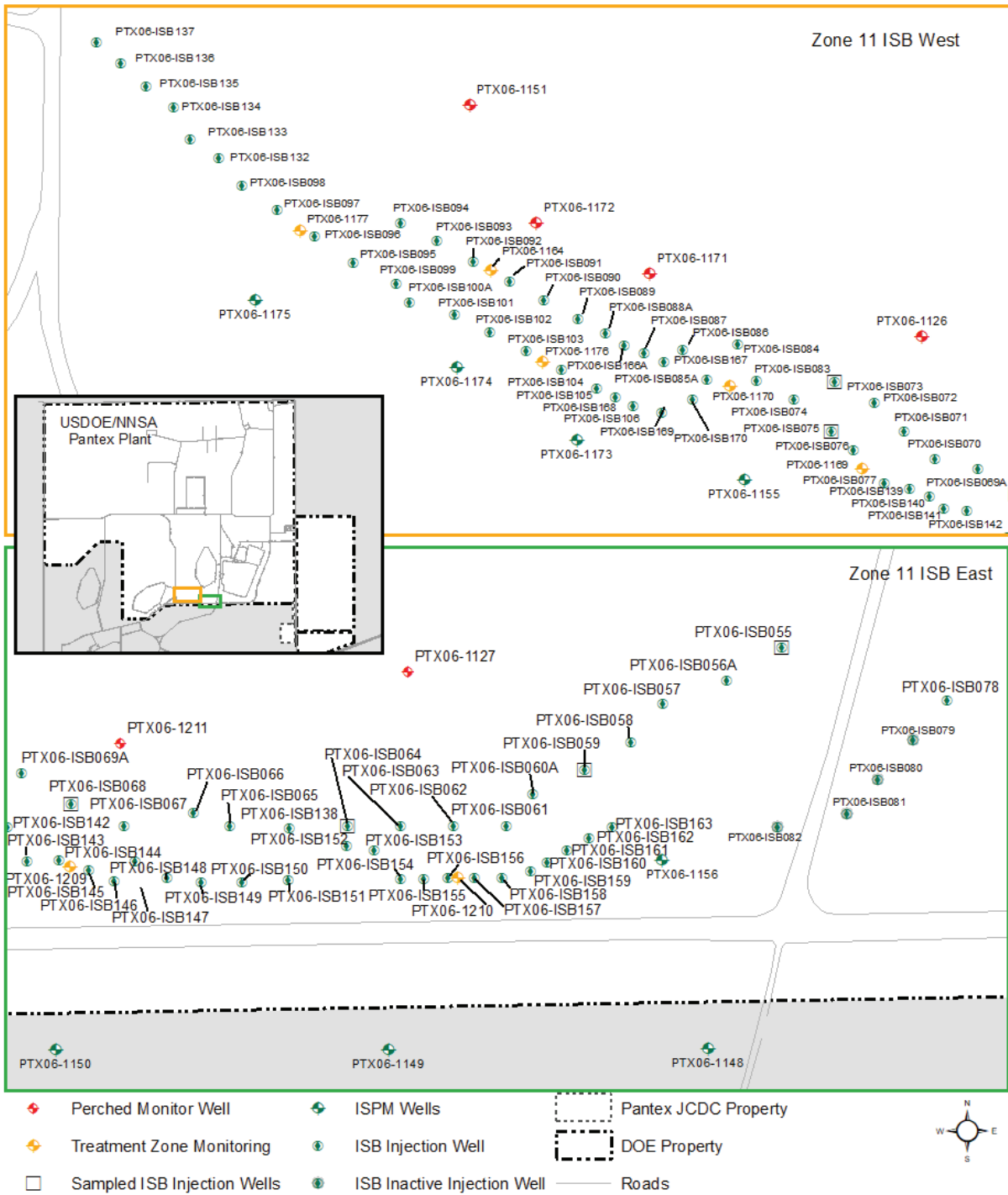


Figure 2-3. Zone 11 ISB Treatment Zone and Performance Monitoring Wells

The *In Situ Bioremediation Corrective Measures Construction Zone 11 South Implementation Report* (Aquifer Solutions, 2009) documents the implementation of the Zone 11 ISB System. That report was included with the *Final Pantex Interim Remedial Action Report (IRAR)* (Pantex, 2010a). The installation of the nine new wells is documented in the *Well Installation Implementation Report Perched Aquifer Injection Wells for the In Situ Bioremediation System* (Stoller, 2009) included in the *2009 Annual Progress Report* (Pantex, 2010b).

Pantex expanded the Zone 11 ISB in 2014 by installing an equipment pad, roads, and water conveyance (Trihydro Corporation, 2014a and 2014b). The well design followed the original design document for the Zone 11 ISB (Aquifer Solutions, 2009). Well installations are documented in the *Well Drilling Implementation Report* (Trihydro, 2014b).

The 2019 well installations follow the design of the original well installation. The 2021 expansion was developed based on the original design, although spacing was varied depending on the type of injection expected at the wells (ARS, 2022). Additional capital expenditure for these significant differences is approximately \$6 million; additional annual operation and maintenance is approximately \$0.6 million.

2.2 Southeast ISB System (SEISB Extension, Offsite ISB, and Future ISBs)

Installed in 2007 as an early action, the original Southeast ISB System is on TTU property south of Pantex and consists of 42 injection wells within the treatment zone and 5 ISPM wells (see Figure 2-4). The injection wells were drilled in a line perpendicular to the hydraulic gradient so the water flowing through the treatment zone will be treated before reaching the area beneath TTU property where the fine grained zone (FGZ) becomes less resistant to vertical migration. The system is designed to treat HEs and hexavalent chromium.

Based on the rate of perched groundwater flow and estimated longevity of the Newman Zone[®] soybean oil, injections were necessary about every 12 to 24 months. Pantex has recently used molasses during injection events to more widely distribute the carbon source; injection frequency at this ISB are now informed by system performance data and the presence of water in the system.

Molasses is also a less persistent substrate, so another injection occurred in early 2022. As a result of continued extraction up-gradient via the SEPTS wellfield and associated water level decline, injections are expected to cease in upcoming years. Current injections are limited to approximately 50% of the system due to expanding dry areas across the injection wellfield. Eight injection events have been completed for the Southeast ISB, as shown in Table 2-3.

Table 2-3. Southeast ISB Injection Events

Injection Event	Completion Date	Mixed Amendment Injected (millions of gallons)	Type of Amendment	Amendment Concentration	No. Wells Injected
1	March 2008	0.94	Newman Zone TM	5%	42
2	April 2010	0.9	Newman Zone TM	5%	42
3	May 2012	0.71	Newman Zone TM	~7%	35
4	September 2013	0.72	Newman Zone TM	~7%	35
5	April 2015	0.64	Newman Zone TM	~6%	36
6	October 2016	0.41	Newman Zone TM	~5.5%	21
7	January 2020	0.99	Molasses	2%	25
8	May 2022	1.1	Molasses	2%	25

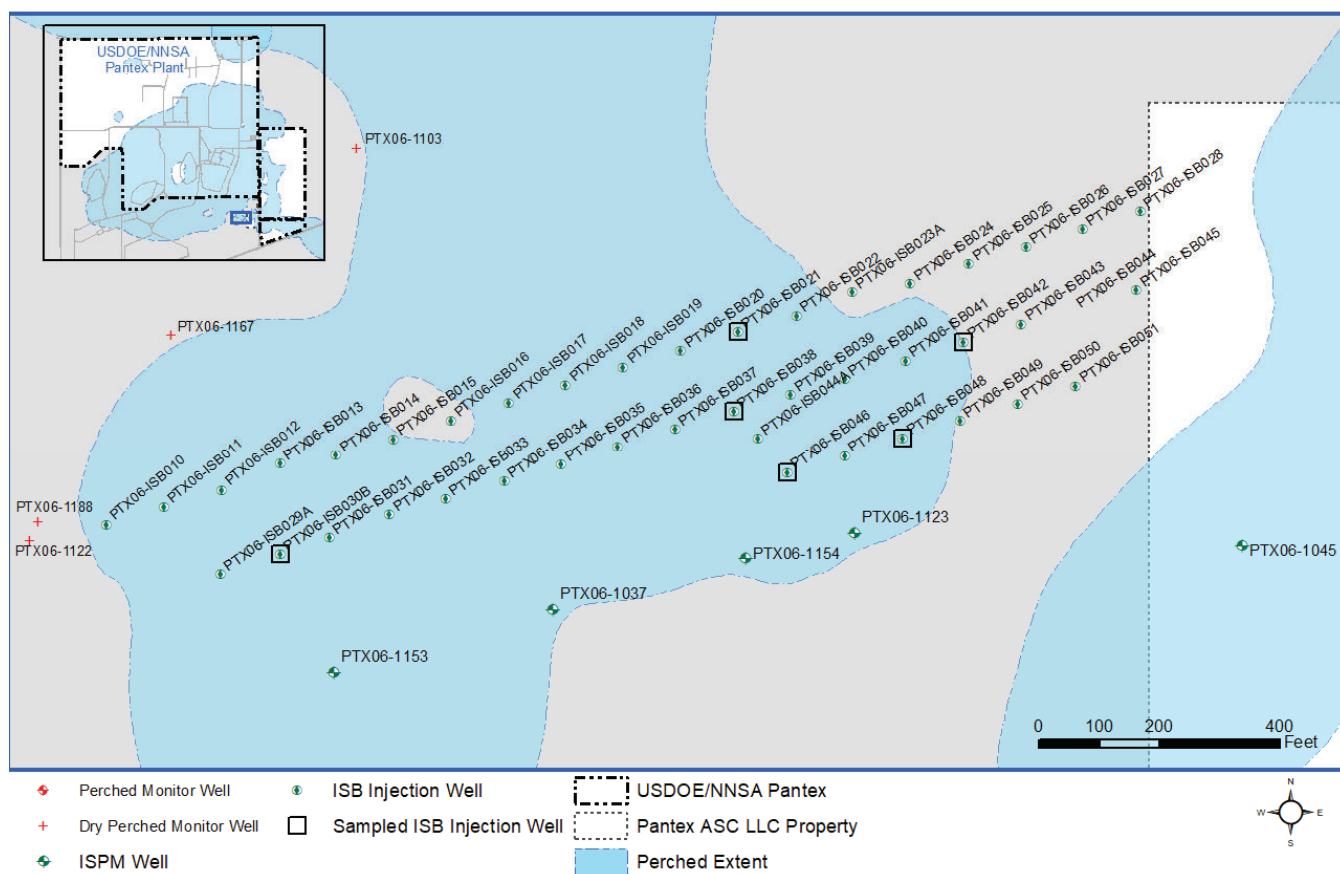


Figure 2-4. Southeast ISB Treatment Zone and Performance Monitoring Wells

The *Revised Implementation Report, Southeast Plume In Situ Bioremediation Corrective Measures Design and Construction* (Aquifer Solutions, 2009b) documents the design and construction of the Southeast ISB. That report was included in the IRAR (Pantex, 2010a).

The system established in this local area has not changed significantly since the ROD, but the southeast lobe of the perched groundwater plume has expanded, so the need for additional ISB treatment has increased. As a result, both the Southeast ISB Extension and the Offsite ISB System have been installed to remedy contaminants in the area of the plume expansion. Details of these systems are provided in Sections 2.2.1 and 2.2.2, below.

2.2.1 Southeast ISB Extension

Pantex installed a new system in 2017 to address another area of contamination in the southeast perched groundwater. The new system is an extension of the original ISB remedy for the southeast perched groundwater plume, authorized in the ROD.

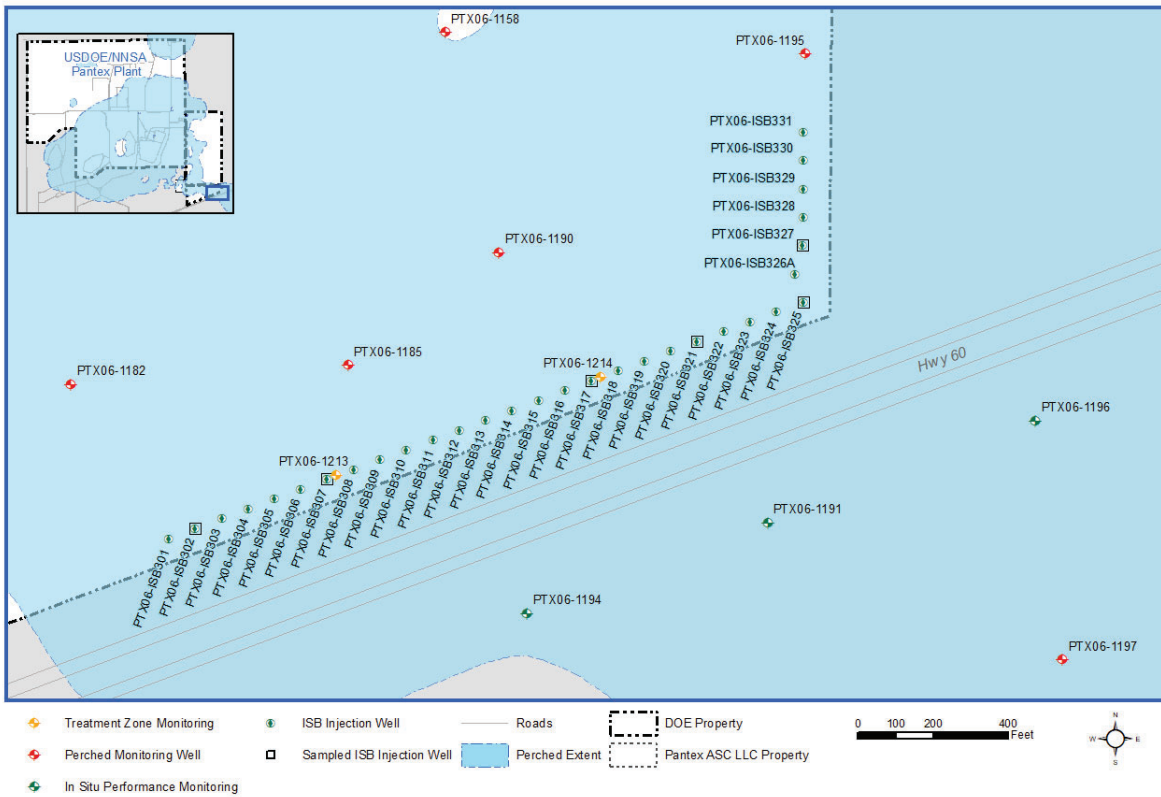


Figure 2-5. Southeast ISB Extension Treatment Zone and Performance Monitoring Wells

The system consists of 31 ISB injection wells, 2 TZM wells, and 3 ISPM wells. The system was originally installed in 2017 with 24 new injection wells and 1 monitoring well that was converted for use as an injection well. The system was expanded northward with 4 new ISB injection wells in 2020 and further expanded in 2021 with 2 new ISB injection wells and 2 new TZM wells. Further expansion to the north is anticipated in the future, due to observed and modeled expansion of the plume toward the east property boundary. Figure 2-5 depicts the Southeast ISB Extension.

Table 2-4. Southeast ISB Extension Injection Events

Injection Event	Completion Date	Mixed Amendment Injected (millions of gallons)	Type of Amendment	Amendment Concentration	No. of Wells Injected
1	February 2019	1.0	Molasses	2%	25
2	September 2019	1.0	Molasses	3%	25
3	August 2020	0.87	Molasses	3%	25
4	May 2021	0.90	Molasses	2%	29
5	December 2021	0.95	Molasses	2.4%	30
6	August 2022	0.95	Molasses	2.1%	31

The system is positioned to treat HE contaminants, particularly RDX, in perched groundwater that is moving beneath property that is not owned by USDOE/NNSA. As a result of removal of water at the up-gradient extraction wells added to expand the SEPTS wellfield, water levels are anticipated to decline in this system over time. Water levels will be monitored to determine how to adjust operations and maintenance in the future.

Based on the rate of perched groundwater flow and estimated amendment longevity of molasses, injections are estimated to be necessary every 9 months. As depicted in Table 2-4, six injection events have been completed at this system.

This system was installed using a similar design to the Southeast ISB. Wells were spaced more closely at 75 feet to ensure better distribution of amendment. The construction of this system was documented in the implementation reports for drilling (Stoller Newport News Nuclear, 2018) and supporting infrastructure (Trihydro Corporation, 2019). Additional capital expenditure for these significant differences is approximately \$4 million; additional annual operation and maintenance is approximately \$0.6 million.

2.2.2 Offsite ISB System

To address HE contamination that moved beneath a neighboring property, Pantex began installing an Offsite ISB system in 2020 under right-of-entry and temporary access agreements with two neighboring landowners. These agreements contained restriction provisions to mitigate the potential for use and exposure to perched groundwater contaminants. When full agreements were established in 2022, institutional controls were placed as deed restrictions in the Carson County records.

This ISB system is located to the southeast of Pantex-owned property, south of Highway 60, and currently consists of 19 new ISB injection wells and 11 extraction wells, as part of the full system depicted in Figure 2-6. One ISPM well was converted to injection recently to better treat beneath the adjacent neighboring property, where a small portion of the plume occurs. The first phase of installation in 2020 focused on beginning treatment at the leading edge and in the heart of the plume near the property's northern boundary. Three new ISB injection wells were installed in 2021, 16 more were installed in 2022, and a final expansion of the system is planned in 2023. Overall, the system will include ISB injection, ISB extraction, injection of pump and treat water to minimize dispersion of the plume, and down-gradient ISPM wells for monitoring treatment effectiveness.

All water used in the injection process must be withdrawn from beneath the offsite property, so down-gradient ISB extraction wells were installed. Down-gradient removal also assists in pulling the amendment towards the removal wells, providing an expanded zone for COC treatment.

Based on the use of molasses, injections are planned every 6 months at differing parts of the system. Injection plans will follow the schedule that was designed using fate and transport and optimization modeling. No injections occurred in 2020 and early 2021 due to required planning, issuance of new contracts, and development of necessary infrastructure for injection. Injection began in June 2021. Injection events already completed for this system are described in Table 2-5.

Designed to complete clean-up within 25 years, the system was developed using the updated perched groundwater fate and transport model (HGL, 2021a). The final placement of wells was driven by the data collected from new system wells installed in 2020, with modeling used to determine optimum placement and timing of injections to achieve clean-up.

Based on final analytical and aquifer data collected at the initial system wells installed in 2020, the system’s final modeling update and optimization occurred in 2021 (HGL, 2022). That modeling effort has guided the plans for final placement of system wells in 2022 and 2023 as well as the future injection timing for the system wells. Based on the optimization modeling, all or portions of the injection wells are injected twice per year; projected duration of O&M is 13 years. Additional capital expenditure for these significant differences is approximately \$16 million; additional annual operation and maintenance is approximately \$1 million.

Table 2-5. Offsite ISB Injection Events

Injection Event	Completion Date	Mixed Amendment Injected (millions of gallons)	Type of Amendment	Amendment Concentration	No. Of Wells Injected
1	October 2021	0.56	Molasses	2%	10
2	July 2022	0.99	Molasses	2%	16
3	November 2022	1.47	Molasses	2%	20

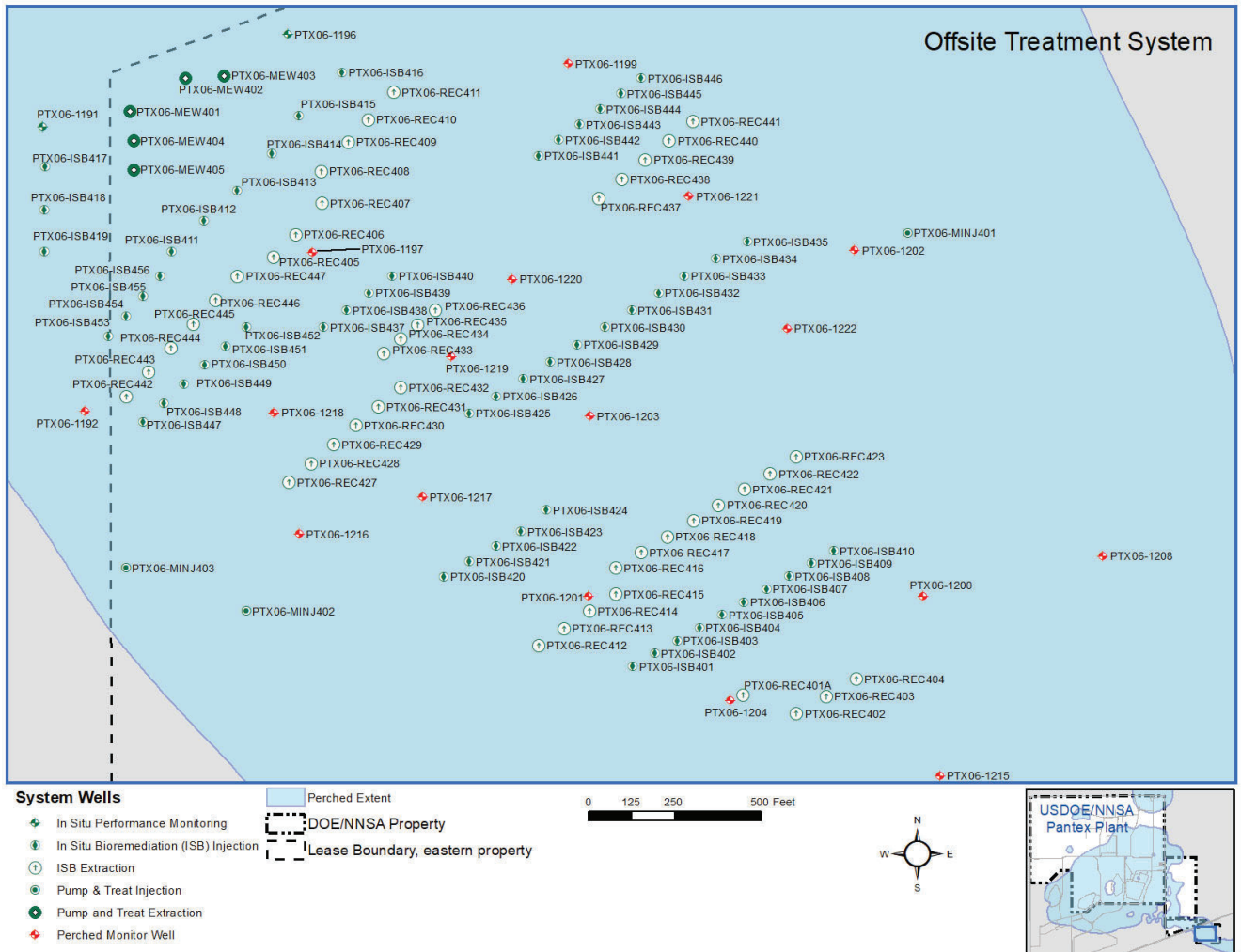


Figure 2-6. Offsite Treatment Zone and Performance Monitoring Wells

2.2.3 County Road 8 ISB System

In FY25, Pantex plans to install approximately 15 injection wells near County Road 8 (CR8), east of FM 2373 to treat high explosive contaminant mass based on optimization modeling performed for the southeast perched groundwater (HGL, 2021b). Figure 2-2 depicts the area for installation of this system. Reduction of the mass in this area will increase confidence in consistent mass removal through the SEISB Extension System, resulting in effective performance of the Offsite ISB and attainment of predicted treatment milestones.

Additional capital expenditure for this system is approximately \$1.5 million; additional injection operation and maintenance to be performed every 3 to 5 years is estimated to be \$0.3 million.

2.2.4 Perchlorate – Chromium ISB System

In FY24, Pantex plans to install approximately 15 wells near perched groundwater monitoring well PTX06-1183 to treat perchlorate and hexavalent chromium in an area between Zone 11 ISB and the original SEISB that is not actively addressed. This action is based on optimization modeling performed for the southeast perched groundwater (HGL, 2021b). The area of this action is depicted in Figure 2-2. This action will strengthen the treatment of the SE plume by addressing contaminants that are not under the influence of actions in the Zone 11 area and the westernmost extent of the SEPTS extraction wellfield.

Additional capital expenditure for this system is approximately \$1.5 million; additional operation and maintenance to be performed each 3 to 5 years is approximately \$0.3 million.

2.3 Pump and Treat of the Southeast Area of Perched Groundwater

In 2016, five extraction wells were added to the SEPTS well-field (PTX06-EW83 through PTX06-EW88) east of FM 2373 to remove water from the perched aquifer with the goal of reducing the flow toward the SEISB Extension at the south property boundary. The goal is to reduce mass and water volume flowing toward the south boundary. Additional capital expenditure was about \$1 million; additional annual O&M cost is nominal.

In 2017, perchlorate began to be detected in the influent to SEPTS and several extraction wells (PTX06-EW9, PTX06-EW10, and PTX06-EW51) on the southwest edge of the wellfield. Influent samples were monitored closely to determine when these wells should be paused until treatment to address perchlorate was added to the system through a contingent action, in accordance with the Contingency Plan, approved as part of the Interim Remedial Action Report (Pantex, 2010a) and Hazardous Waste Permit No. 50284 issued by TCEQ. In 2020, operation of these wells was paused. The treatment was installed in 2022 and operation of these wells resumed. Additional capital expenditure was about \$0.8 million; additional annual O&M cost will be approximately \$0.1 million.

Also, two mobile pump and treat systems are planned for construction to extract perched groundwater from areas that are not under the influence of the SEPTS. These mobile systems will enhance the existing remedies. One of the systems, the Mobile P&T System east of FM 2373, will target elevated concentrations of high explosives up-gradient of PTX06-1146. The other system will pull perched groundwater from beneath an adjacent property to improve cleanup effectiveness while also reducing the mass of high explosives in the northwest portion of the plume being addressed by the Offsite ISB System, south of the Southeast ISB Extension (south of U.S. Highway 60). Both actions are based on optimization modeling performed for the southeast perched groundwater (HGL, 2021b and HGL, 2021c).

2.3.1 East Mobile Pump & Treat System

A new mobile pump and treat system (the East Mobile Pump & Treat System) is planned for installation in an area of perched groundwater saturated thickness that is sufficient for extraction, contains the highest concentrations of RDX in areas east of FM 2373, and is not under the influence of the current SEPTS system. Please reference Figure 2-2 which depicts the location and layout of the extractions wells and supporting infrastructure. This system will minimize continued movement of high explosives to the southeast.

The optimization modeling indicates a need to operate this system for approximately 20 years. Operation is anticipated to be during warm weather (spring and summer). Additional capital expenditure will be about \$1 million; additional annual O&M cost will be approximately \$0.3 million.

2.3.2 Mobile Pump & Treat System for Offsite ISB

A new mobile pump and treat system is planned for installation in the northwest portion of the plume that is beneath the Offsite ISB System south of U.S. Highway 60. This portion of the southeast area of perched groundwater is not under the influence of the current SEPTS system, reference Figure 2-2. This system will enhance the Offsite ISB by pulling perched groundwater underneath adjacent property toward treatment areas while reducing the mass of high explosives in the plume. The optimization modeling indicates a need to operate this system for approximately 13 years. Operation is anticipated to be during warm weather (spring and summer). Additional capital expenditure will be about \$1 million; additional annual O&M cost will be approximately \$0.3 million.

3.0 PERCHLORATE ACTION LEVEL ADJUSTMENT

The ROD defines the groundwater protection standard for perchlorate as 26 ppb. A recommended level of 15 ppb has been issued by EPA as an appropriate screening level Health Advisory since issuance of the ROD. Also, the TCEQ has issued a Protective Concentration Level (PCL) of 17 ppb as part of the Texas Risk Reduction Program. NNSA does not perceive a significant difference in the application of one of these numbers instead of the other for the Pantex Plant groundwater cleanup efforts; accordingly, the Lifetime Health Advisory level of 15 ppb issued by EPA is selected as the new protective standard for perchlorate, and as such, it shall replace the previous action level.

Implementation of 15 ppb instead of 26 ppb will tighten the controls needed to ensure treatment at the SEPTS, but will not affect institutional controls already established/provided. Furthermore, ISB systems have been demonstrated to treat substantial concentrations to levels less than detection of 5 ppb in perched groundwater, so it is anticipated that efficacy of the ISB systems will continue.

4.0 RESPONSIVENESS SUMMARY

Comments were received on this ESD from both the USEPA and TCEQ. The following is a summary of the comments and the changes made to address them.

The USEPA identified the following comments:

- Institutional controls and land use controls were not discussed for the southeast perched ground water plume that has expanded beneath properties not owned by NNSA.
 - **NNSA Response: Section 2.2.2 was revised to recognize agreements with neighboring landowners and deed restrictions filed in the Carson County records.**
- Inform the reader that the ESD and additional information is available through the Administrative Record.
 - **NNSA Response: Information regarding access to the Administrative Record and Environmental Cleanup documents posted on the Pantex webpage was included in the *Public Participation* section on page 6.**
- Provide better understanding of the reasons/basis for making the changes to the remedial action systems.
 - **NNSA Response: A summary of the rationale/basis for the changes is included in the *Statement of Basis and Purpose* paragraph starting on page 3, Table 2-1 on page 8, and in the detailed descriptions for each system throughout the document.**
- Include reference to the statutes that provide for use of an ESD and describe the conditions for its implementation.
 - **NNSA Response: References were included in the *Statement of Basis and Purpose* paragraph on page 3 and the *Statutory Determination* paragraph on page 5.**
- Provide additional detail on the standards and advisories available for establishing an action level for perchlorate, the need for a change from what was selected in the Pantex ROD, and the rationale for the action level selected through this ESD.
 - **NNSA Response: Additional detail was provided in Section 3.0, page 19.**
- Include a table of the changes addressed in the ESD, since there are many changes being addressed.
 - **NNSA Response: Table 2-1 was added on page 8.**
- Some changes are to be implemented in the future; recognize that implementation is contingent on receipt of funding as requested.
 - **NNSA Response: Recognition that these future actions are contingent on receipt of funding was added to the first paragraph of Section 2.0 on page 6.**
- Add detail to tables and figures to help explain the rationale for each change; especially for ones like the Zone 11 ISB which doubled in size/effort since construction completion.
 - **NNSA Response: Detail was added to Tables 2-2 through 2-5 and to the text describing changes to each of the systems throughout.**
- Better explain the switch from Newman ZoneTM to molasses as the amendment being injected into the ISB Systems.
 - **NNSA Response: Better information on the basis for switching to molasses for injections was included in the *Statement of Basis and Purpose* paragraph on page 3 and Section 2.1 on page 10.**
- Add a figure showing how the contaminant plumes relate to the layout of the systems.
 - **NNSA Response: Figure 2-1 was added on page 7 to show this important context.**

- Include information to explain expansion of the southeast perched ground water plume, the expansion to the southeast NNSA property boundary and migration beneath neighboring properties.
 - **NNSA Response: Information was added to the *Statement of Basis and Purpose* paragraph on page 3 and Section 2.2 (primarily subsections 2.2.1 and 2.2.2) on pages 13 through 17 to better explain this expansion.**
- Include information that describes what wells are new to the systems that have changed.
 - **NNSA Response: Text has been added to discussions throughout the document to identify new wells for each system; the figures for each system are labeled with the well identification numbers.**

The TCEQ identified the following comments:

- Add recognition that the Executive Director of TCEQ of an authorized designee has the authority to concur with the ESD.
 - **NNSA Response: Language was modified in the *Roles and Responsibilities* paragraph on page 6.**
- The designation of 15 ppb as the new cleanup standard for perchlorate is an acceptable alternative to the level of 26 ppb established in the ROD. However, additional evaluation of perchlorate toxicity with respect to the protectiveness of the existing cleanup standard should continue to be part of the Five-Year Reviews.
 - **NNSA Response: Agreed; toxicity assessment and changes to guidance are being reviewed as part of the Five-Year review that is underway. No changes have been identified that would alter the selected standard in Section 3.0**
- TCEQ final concurrence with the changes to the groundwater protection standard for perchlorate will be granted upon issuance of the permit modification/amendment to the Industrial HW-50284.
 - **NNSA Response: Agreed and acknowledged; no change to the document is necessary.**
- Include a summary of the comments provided on the ESD.
 - **NNSA Response: Agreed; provided as Section 4.0.**

5.0 REFERENCES

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- HGL, 2021a. *Perched Groundwater Conceptual Site Model and Numerical Model, USDOE NNSA Pantex Plant, Texas*.
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