National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
White Sands Test Facility
P.O. Box 20
Las Cruces, NM 88004-0020

March 9, 2026

Reply to Attn of: RE-26-033

Mr. JohnDavid Nance, Bureau Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505

Subject: Proposal to Withdraw the Abbreviated Drilling Work Plan (ADWP) for Three Well Installations Downgradient of the 200 and 400 Areas

National Aeronautics and Space Administration (NASA) submitted a *Report on Tracer Testing in the 200/600 Areas and Mid-plume Constriction Area* at White Sands Test Facility (WSTF) to the New Mexico Environment Department (NMED) on August 31, 2020. NMED issued an approval with modification on April 5, 2022, that consisted of one comment that included a request for "1a) the installation of at least three additional groundwater monitoring wells immediately downgradient of the 200 Area". The wells were requested to support "vertical and horizonal refinement of the groundwater contaminant plume conceptual model." In response to the NMED directive, NASA submitted the *Abbreviated Drilling Work Plan for Installation of Monitoring Wells Downgradient of the 200 and 400 Areas* to the NMED on December 20, 2022 (NASA, 2022). NMED issued an approval with modification on July 18, 2023 (NMED, 2023). The current schedule requires that a report documenting project activities be submitted to NMED by December 31, 2026 (NMED, 2025).

On April 30, 2025, NASA submitted a *Request to Indefinitely Defer Submittal of Completion Report for Monitoring Wells 200-001-GW, 200-002-GW, and 400-002-GW*. NMED issued disapproval of that request on July 21, 2025. However, in a conference call between NASA and NMED staff on DATE, NMED indicated a willingness to consider additional technical rationale to withdraw the ADWP. NASA hereby requests withdrawal of the ADWP for the installation of three monitoring wells downgradient of the 200 and 400 Areas based on additional review and technical justification. NASA instead proposes to prioritize the monitoring well network at the leading edge of the plume. Future work should be focused on well replacements, modifications of existing multiport wells, and one additional well installation (600C-006-GW) for enhanced conceptualization. Enclosure 1 provides NASA's *Proposal to Withdraw the Abbreviated Drilling Work Plan for Three Well Installations Downgradient of the 200 and 400 Areas.*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with 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.

If you have any questions or comments concerning this submittal, please contact Antonette Doherty at 575-202-5406.

ANTONETT E Doherty
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Date: 2026.03.09 10:57:08 -07'00'

For: Amanda G. Skarsgard
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Enclosure

cc:
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Proposal to Withdraw the ADWP for Three Well Installations Downgradient of the 200 and 400 Areas Based on Hydrostratigraphic Controls on Contaminant Migration

Regulatory Background	The National Aeronautics and Space Administration (NASA) *Report on Tracer Testing in the 200/600 Areas and Mid-Plume Constriction Area* was submitted to the New Mexico Environment Department (NMED) on August 31, 2020 (NASA, 2020). Based on the report, NMED issued an approval with modification on April 5, 2022, that included a requirement for the installation of three new monitoring wells (NMED, 2022; comment 1a) at the NASA White Sands Test Facility (WSTF; Figure 1) within the area located topographically and hydrologically downgradient of the WSTF 200 and 400 Areas. The required locations of the three monitoring wells (200-001-GW, 200-002-GW, and 400-002-GW) are intended to expand the monitoring well network and support conceptualization of the groundwater plume downgradient of the 200 and 400 Areas. The locations are primarily based on the results of the tracer dye releases in 2014 and subsequent tracer monitoring responses within the existing 200 Area well network through 2020. Approximately 8,000 gallons each of dilute Fluorescein and Sulforhodamine B (SRB) dyes released in the 200 Area were not identified within the 200 Area monitoring wells network between 2014 and 2020. The dyes were first detected within distal monitoring wells located approximately two miles to the west within the Mid-plume Area (SRB in well MPE-8) and approximately two miles to the west (Flourescein in well BLM-6-488). In response to the NMED directive, NASA submitted the *Abbreviated Drilling Work Plan for Installation of Monitoring Wells Downgradient of the 200 and 400 Areas* to the NMED on December 20, 2022 (NASA, 2022). NMED issued an approval with modification on July 18, 2023 (NMED, 2023). The current schedule requires that the three wells be installed and a report documenting project activities be submitted to NMED by December 31, 2026 (NMED, 2025).
200 Area Hydrogeological Conceptualization	The most effective indicator of groundwater flow pathways in the 200 Area is the currently mapped distribution of volatile organic compounds (VOCs) in groundwater through monitoring of the existing well network designed strategically based on the results of several investigations. The 200 Area is historically associated with the highest concentration of trichloroethene (TCE), tetrachloroethene (PCE) and Freons at WSTF as presented in time-concentration (T-C) data in quarterly Periodic Monitoring Reporting (PMRs; NASA, 2025b). Current and historical analytical data are effectively documented through the existing 200 Area well network and show that T-C trends for VOCs have declined by an order of magnitude since historical highs in the mid-1990's. The WSTF 200 Area is centered on the industrial area providing laboratories services where groundwater is monitored through wells 200-F, 200-G, 200-H, 200-LV-150, 200-KV-150, and other proximal wells (Figure 2). The locations

200 Area Hydrogeological Conceptualization, Cont.	of buildings, Hazardous Waste Management Units (HWMUs), Solid waste Management Units (SWMUs), dye tracer release locations, and select topographic and geologic information are provided on the figure. Line of cross-section 2A - 2A' is utilized to support conceptualization of the area and extends from Gardner Spring Arroyo (GSA) in the east (2A') to the alluvial slopes downgradient of the well 200-B-240 arroyo in the west (2A; Figure 3). The cross-section incorporates multiport monitoring wells 200-F and 200-H (both installed in 1994) and conventional monitoring well 200-B-240 (installed 1988) that support definition of an elevated horst-block in a sequence of Paleozoic limestone bedrock (Hueco Formation) below the 200 Area buildings. Quaternary Camp Rice Formation alluvial fan deposits overlie Permian Hueco limestone below the industrialized 200 Area with a minimum thickness of 18 ft above the crest of the horst block. Well-defined bedding in the limestone dips at 22 degrees to the northwest and strikes northeast-southwest as defined in boreholes (NASA, 2015) and adjacent surface outcrops to the east (Seager, 1981). Building 200 in the vicinity of the West HWMU is coincident with the elevated crest of the horst block. Bedrock is faulted to depth along half-graben normal faults on both the east GSA and west (well 200-B-240 arroyo) sides of the block, where the depth to bedrock increases to greater than 100 ft below ground surface (bgs) in both directions (Figure 3). VOCs discharged to the shallow subsurface from the Chemistry Laboratory Tanks (East HWMU) on the east side of the 200 Area near Building 803 (Figure 2) infiltrated porous alluvial soils to shallow Hueco limestone bedrock stratigraphy at 50 ft bgs (Figure 3). The VOCs subsequently infiltrated significant secondary porosity bedding plane solution channels and fracture pathways at the bedrock surface. Infiltration took place within a specific (also referred to as target) stratigraphic interval and migrated southwest down the alluvial-bedrock surface toward GSA while also migrating into bedding plane solution channels at the bedrock interface. Similarly, VOCs discharged to the shallow subsurface from the Clean Room Tanks (West HWMU) on the west side of the 200 Area at Building 200 infiltrated the limestone bedrock stratigraphy at 18 ft bgs. The defined target stratigraphic interval (Figure 2) extends over approximately 500 ft of section, striking to the southwest and incorporates the East and West HWMUs. Although the regional groundwater flow direction across the WSTF test areas is east to west under the influence of a steep hydraulic gradient of 0.05 ft/ft from the mountain front, a significant component of migration specific to 200 Area limestones is influenced by the strike direction of the bedding plane solution channels. As a result, 200 Area groundwater flow has a strong southwest component toward monitoring wells in GSA (200-D-240 and 200-SG-1, Figure 2) and subsequently farther southwest into the adjacent 100 and 600 Areas. In contrast to the VOC sources, the results from the tracer test clarified the significance of the release locations for both tracer dyes (Fluorescein southeast of the East HWMU in GSA and SRB northwest of the West HWMU) being outside the target stratigraphic interval (Figure 2 and Figure 3). Fluorescein was released in GSA utilizing a shallow (15 feet [ft]) trench in GSA to the east of the 200 Area, approximately 200 ft lower in the limestone stratigraphic

200 Area Hydrogeological Conceptualization, Cont.	section than the Chemistry Lab Tanks location. SRB was released within the Clean Room Drainage ditch located on the west side of Apollo Blvd, approximately 80 ft higher in the limestone stratigraphic section than the Clean Room Tanks. Tracer dyes released outside the target stratigraphic interval associated with groundwater VOCs are hypothesized to have been isolated from the VOC release locations by hydrostratigraphic controls in the form of intercalated shale, siltstone, and sandstone interbeds within the Hueco limestone stratigraphy. These interbeds serve as confining or low permeability intervals that form barriers to groundwater migration pathways based on observations recorded when drilling through the stratigraphy during the installation of deep multiport wells in the 200 Area (200-F, 200-G, and 200-H; NASA, 1996).
Technical Rationale and Proposal for Withdrawal	Technical rationale to support the request to withdraw the abbreviated drilling work plan (ADWP) for three source area wells (200-001-GW, 200-002-GW, and 400-002-GW) proposed downgradient of the 200 and 400 Areas is based on using the 200 Area dye tracer results to evaluate the pathway of VOC releases in groundwater. Unlike the existing well network in the 200 Area (where VOCs are detected and tracer dyes were not), tracer identification was prioritized over hydrostratigraphy as the primary factor in identifying well locations. Hydrostratigraphic controls at WSTF are most influential within the bedded Hueco limestones below the 200 and adjacent areas. Although the dye tracers define the expected regional east to west flow direction for groundwater across WSTF, the absence of tracers in proximal 200 Area monitoring wells highlights the significance of groundwater migration along bedding plane solution channels in the limestones. Available data suggests that the tracer dyes, although released as proximally as feasible to the two HWMU locations at the time of the investigation, were introduced outside the target stratigraphic interval and subsequently infiltrated bedrock stratigraphy at alternate entry points to the VOC releases. A summary of the proposal for withdrawal of three well locations downgradient of the 200 Area based on results of the tracer test report is provided in Figure 2 and Figure 3. Tracer dye migration from the release locations outside the target stratigraphic interval was influenced by alternate migration pathways along secondary porosity bedding plane solution channels and fractures within the Paleozoic limestone section.
Prioritization of Plume Front Monitoring Well Installations	Ongoing work in the Plume Front area is currently prioritized due to the requirement of replacing existing deteriorating wells in prominent locations. Plume Front prioritization provides additional monitoring and protection for the potential receptors in the Jornada del Muerto Basin to the west. The importance of prioritized monitoring in the Plume Front area is prompted by the irregular detections of contaminants and changing operational dynamics of the Plume Front Treatment System (PFTS) presented in recent PMR (e.g. NASA, 2025a). NASA proposes the continued prioritization of new monitoring well installations in the vicinity of the Plume Front area and northern plume boundary focused on perimeter gaps and vertical delineation. The well groups of primary interest are the Plume Front, Sentinel, and Northern Boundary

Prioritization of Plume Front Monitoring Well Installations, Cont.	monitoring well groups (NASA, 2024a). The rationale for prioritization of these groups is to: • Enhance the monitoring of the alluvial aquifer located between the leading edge of the plume and the most proximal potential receptors (e.g. WSTF supply wells) in response to the recent occurrence of irregular low-level detections of N-Nitrosodimethylamine (NDMA) (0.34 nanograms per liter [ng/L; Detection Limit] to >4.9 ng/L [cleanup level]) using low level analyses. • Improve horizontal and vertical delineation at the leading edge of the plume. • Improve the monitoring of behavior of the groundwater potentiometric surface in the vicinity of the active PFTS at a time when the PFE and PFI well configuration may be adjusted based on well condition and the re-apportioning of flow between wells.

Recommendations	The following recommendations are made based on the technical rationale and proposal presented:
	• Withdrawal of the ADWP for the installation of monitoring wells 200-001-GW, 200-002-GW, and 400-002-GW downgradient of the 200 and 400 Areas.
	• Continue with the ongoing (initiated December 2025) field replacement of three Plume Front monitoring wells based on the age and condition of well casings and/or internal sampling equipment:
	  ○ PL-6 (being replaced by 600C-002-GW).
	  ○ BLM-1-435 (replaced by 600C-003-GW).
	  ○ PL-3-453 (replaced by 600C-004-GW).
	• Continue prioritization of the monitoring well network in the vicinity of the Plume Front area. A new dual zone conventional monitoring well 600C-006-GW (Figure 4) is proposed at a location west/southwest of well BLM-5-527 near the leading edge of the northwest arm of the Mid-plume and northern Plume Front boundaries. At this location, irregular low-level detections of NDMA above the cleanup level of 4.9 ng/L have been reported farther north (JER wells) and the presence of contaminant movement to the west is under evaluation (NASA, 2025b). Bedrock within this area is anticipated between approximately 450 to 550 ft bgs.
	• Continue with the *NASA WSTF Westbay Well Reconfiguration Work Plan for Wells PL-7, PL-8, PL-10, ST-5, and WW-3* (NASA, 2024b) approved by NMED (NMED, 2026) in order to provide enhanced Plume Front conceptualization.

Proposed Schedule	• Complete the installation of the remaining sentinel well 600C-002-GW and provide the well completion report to the NMED by April 30, 2026. Proceed with the sampling and reporting of results for wells 600C-002-GW, 600C-003-GW, and 600C-004-GW. • NASA's submittal *Corrective Action Projects; Proposal to Restructure Priorities and Schedule* (NASA, 2025a), proposed submittal of drilling work plans for then-designated Target Areas 1 and 3 by May 31, 2026.

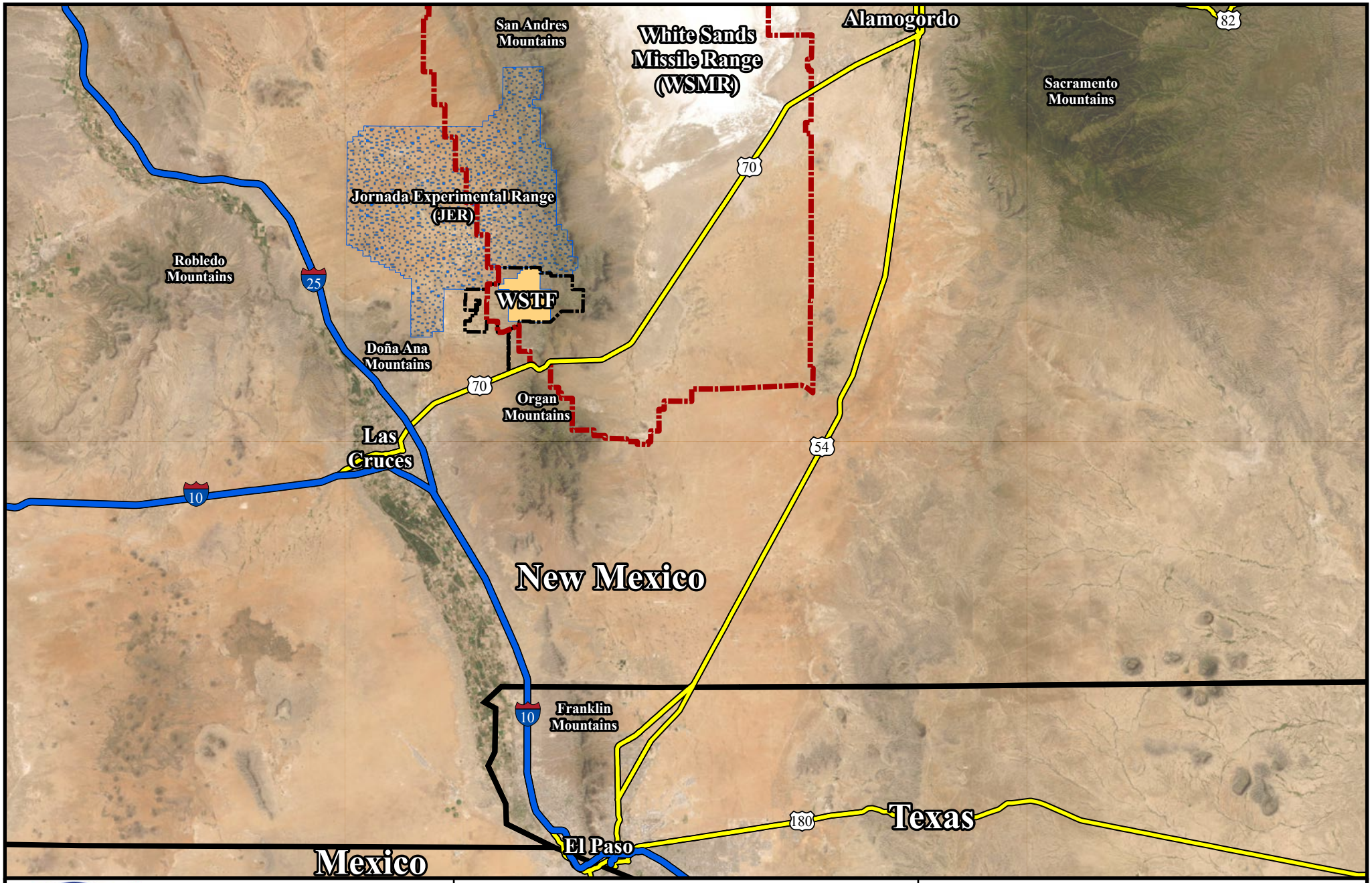
	The target area concept was designed as a single planning strategy focused on the importance of monitoring the Plume Front and sentinel well areas. NASA's intent with target area concept was to illustrate NASA's priorities for plume monitoring, not as proposal for the new long-term planning tool. Future well planning strategies will not utilize the target area concept. • Submit an ADWP for new well 600C-006-GW by May 31, 2026. • Install new well 600C-006-GW and provide a well completion report to NMMED by June 30, 2027. • Proceed in accordance with the *NASA WSTF Westbay Well Reconfiguration Work Plan for Wells PL-7, PL-8, PL-10, ST-5, and WW-3*. The earliest timeframe NASA will be able to resume monitor well installation is FY26. In the case NASA concludes that nested wells are appropriate for reconfiguring any or all Westbay wells, a phased approach was proposed in which one nested well is constructed and evaluated to determine the success of the well design.
References	NASA Johnson Space Center White Sands Test Facility. (1996, May 2). *Draft RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) for NASA WSTF.* Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2015, June 29). *NASA WSTF 200 Area Phase II Investigation Report.* Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2020, August 31). *Report on Tracer Testing in the 200/600 Areas and Mid-plume Constriction Area.* Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2022, December 20). *Abbreviated Drilling Work Plan in Response to the NMED Approval with Modification of the Report on Tracer Testing in the WSTF 200/600 Areas and Mid-plume Constriction Area.* Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2024a, April 29). *NASA WSTF Groundwater Monitoring Plan Update for 2024*. Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2024b, August 30). *Response to Disapproval of the NASA WSTF Westbay Well Reconfiguration Work Plan for Wells PL-7, PL-8, PL-10, ST-5, and WW-3.* Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2025a, April 30). *Corrective Action Projects; Proposal to Restructure Priorities and Schedule*. Las Cruces, NM. NASA Johnson Space Center White Sands Test Facility. (2025b, December 18). *NASA WSTF Periodic Monitoring Report – Third Quarter 2025.* Las Cruces, NM. NMED Hazardous Waste Bureau. (2022, April 5). *Approval With Modification Report on Tracer Testing in the 200/600 Areas and Mid-Plume Constriction Area.* Santa Fe, NM.

References. Cont.	NMED Hazardous Waste Bureau. (2023, July 18). *Approval with Modification Abbreviated Drilling Work Plan for the Installation of Monitoring Wells in the WSTF 200 and 400 Areas.* Santa Fe, NM. NMED Hazardous Waste Bureau. (2025, July 21). *Disapproval Request to Indefinitely Defer Submittal of Completion Reports for Monitoring Wells 200-001-GW, 200-002-GW and 400-002-GW.* Santa Fe, NM. NMED Hazardous Waste Bureau. (2026, January 22). *Approval with Comment to Disapproval of the Westbay Well Reconfiguration Work Plan for Wells PL-7, PL-8, PL-10, ST-5, and WW-3.* Santa Fe, NM. Seager, W.R., 1981. *Geology of Organ Mountains and Southern San Andres Mountains, New Mexico*, New Mexico Bureau of Mines and Mineral Resources Memoir 36.

Figures

Figure 1 **WSTF Location Map**

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March 2026

Miles
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- WSMR Boundary
- WSTF Boundary
- Jornada Experimental Range (JER)
- WSTF Industrial Area

WSTF Location Map

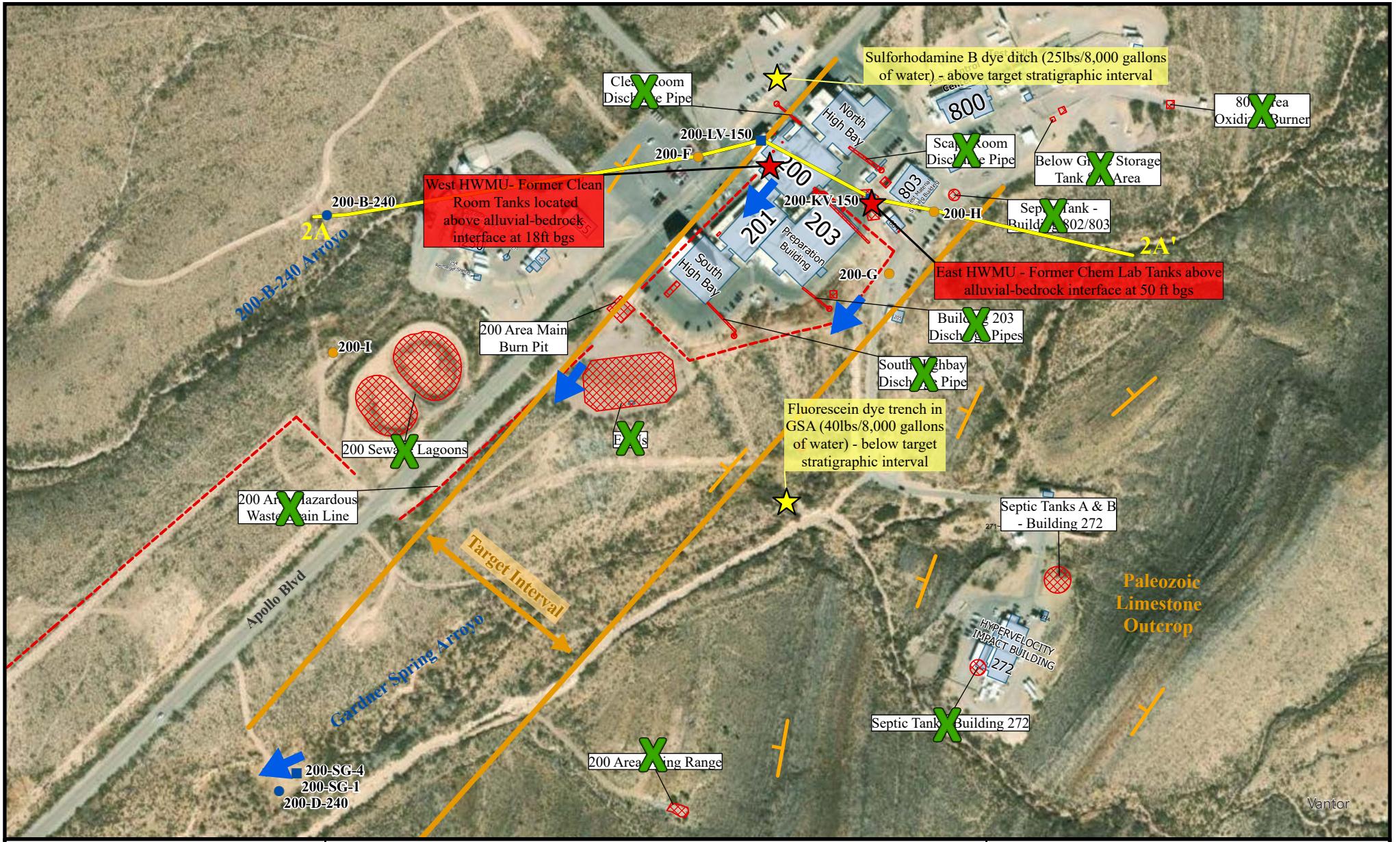
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Coordinate System:
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Figure 2 200 Area Location, Buildings, and HWMUs

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- Conventional Well
- Multiport Well
- MSVGM Well
- Dye Tracer Location
- VOC Source Area
- SWMUs
- Buildings
- General Bedding Orientation
- Target Stratigraphic Interval
- Hazardous Waste Transmission Line
- Groundwater Flow Direction
- No evidence of VOCs in vadose zone alluvium based on soil boring investigations
- Cross-section Location

200 Area Location, Buildings, and HWMUs

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Figure 3 200 Area East-West Cross-section A – A'

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200 AREA SITE CROSS-SECTION

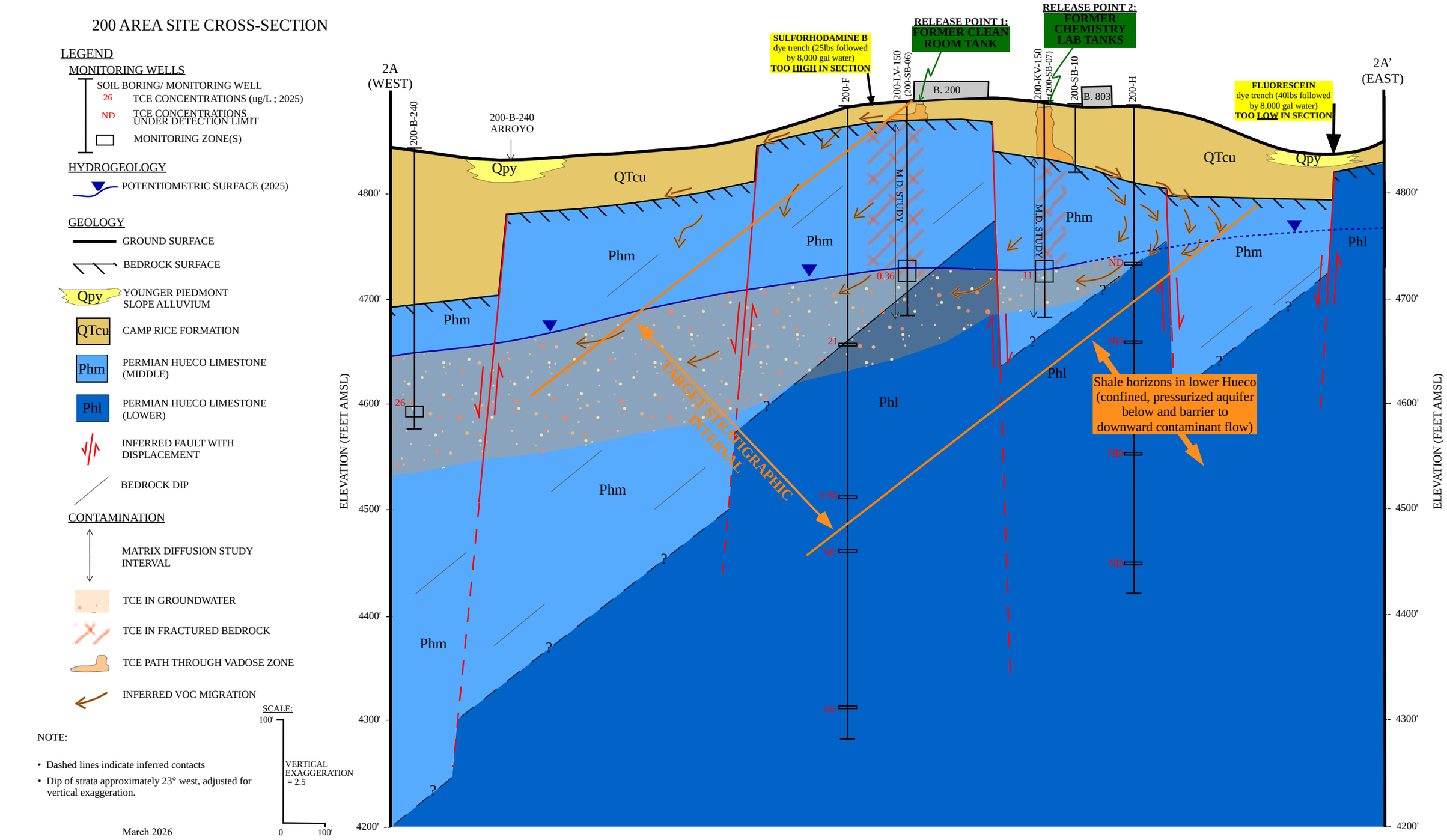
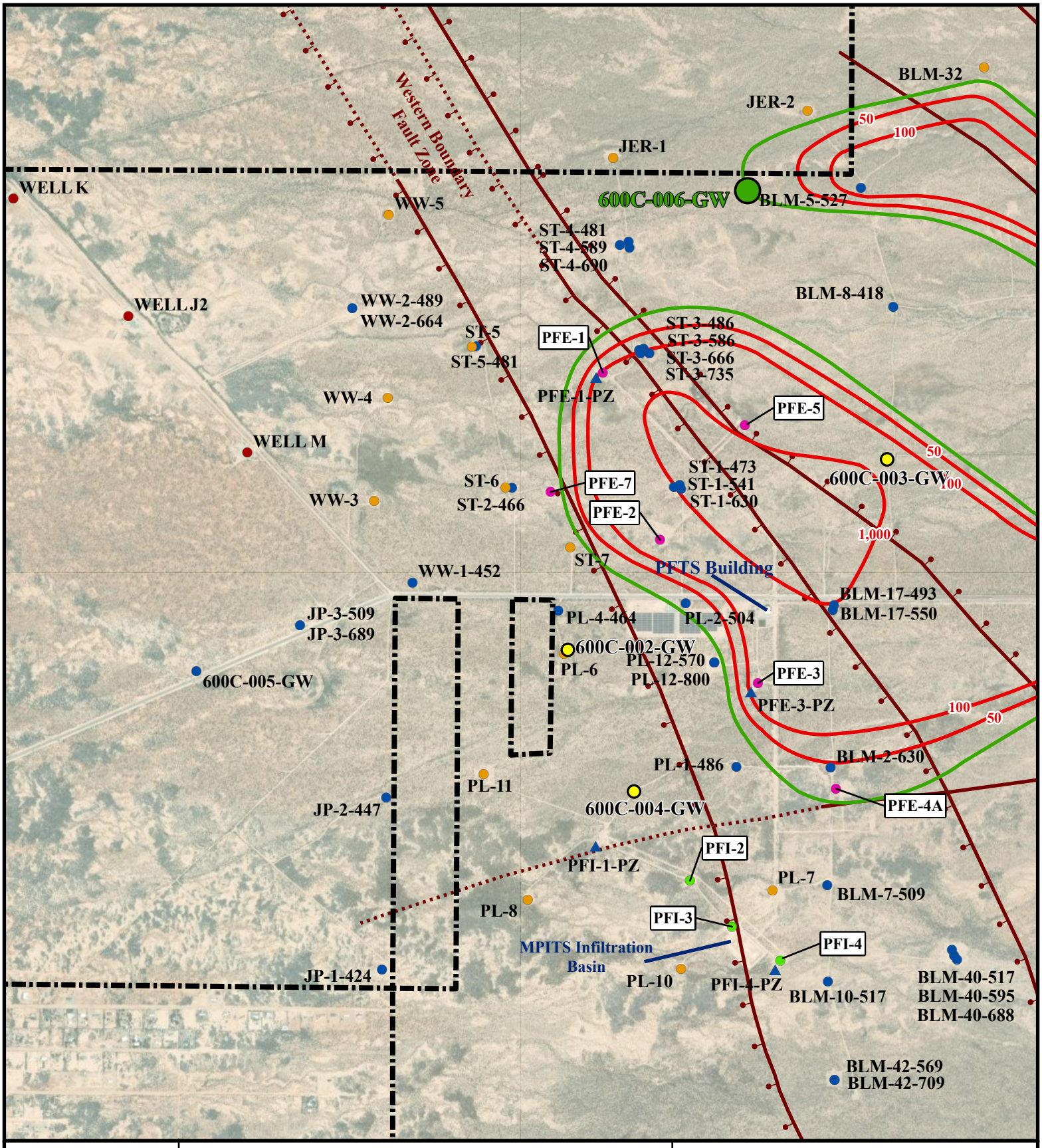


Figure 4 Proposed Plume Front Monitoring Well Location

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March 2026

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- Conventional Well
- Extraction Well
- Injection Well
- Multiport
- Piezometer
- Production Well
- WSTF Boundary
- Proposed Well Location
- 50 Equiconcentration Line (ng/L)
- NDMA Cleanup Level (4.9 ng/L)
- Inferred Fault
- Fault
- Conventional Wells In-Progress

Proposed Well Location with NDMA Plume Extent Third Quarter 2025

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Coordinate System:
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