Royal Demolition Explosives (RDX) Campaign at Los Alamos National Laboratory

Presentation to Northern New Mexico Citizens' Advisory Board

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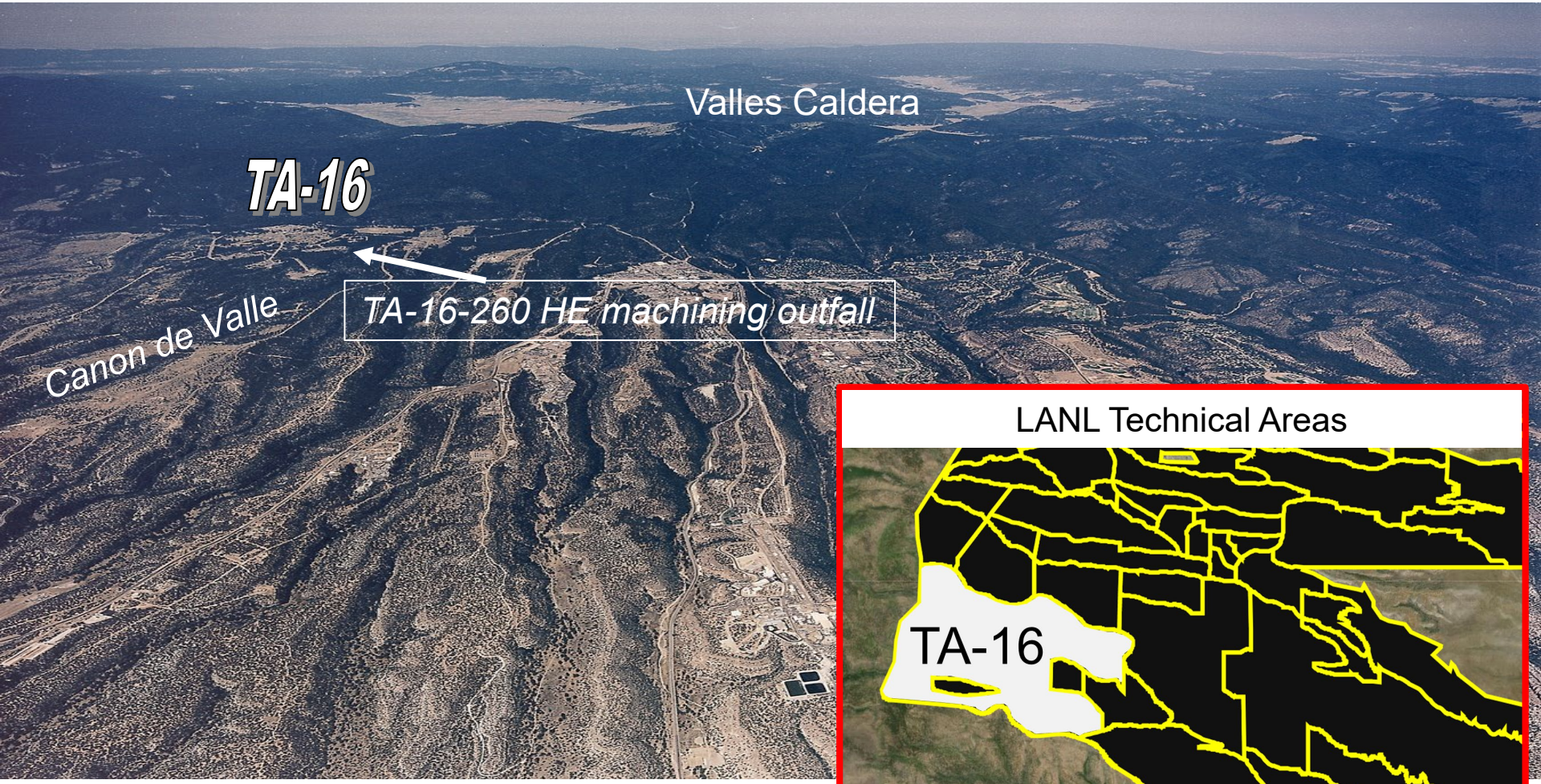
16 July 2025

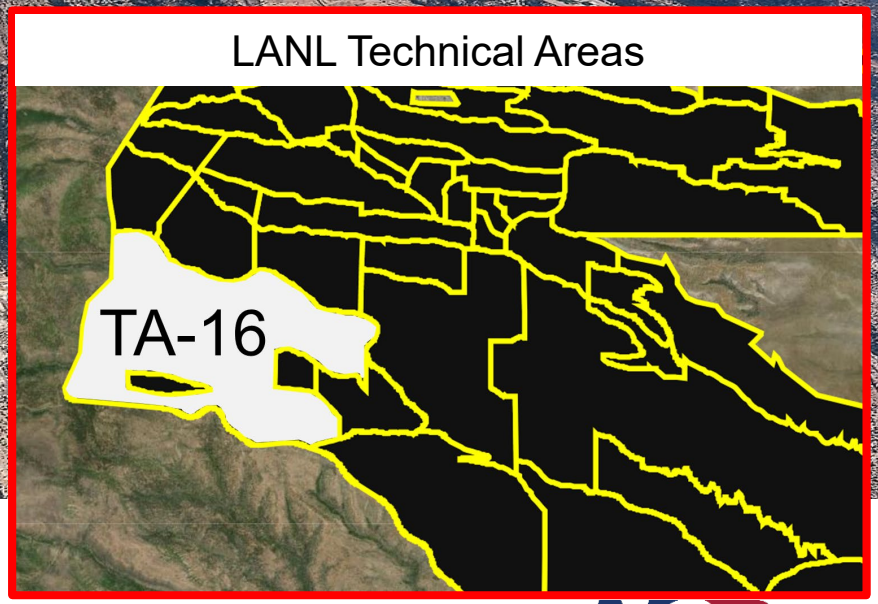
Driving Cleanup ▪ Honoring the Past ▪ Strengthening Communities

RDX Campaign – Presentation Topics

- RDX Plume Status and Comparison to Chromium Plume
- Background and History of High Explosives (HE) Outfall
- Surface and Shallow Groundwater (GW) Remediation
- RDX in Deep GW – Beneath LANL
- Ongoing Work - Characterization and Monitoring
- Conclusions and Future Activities

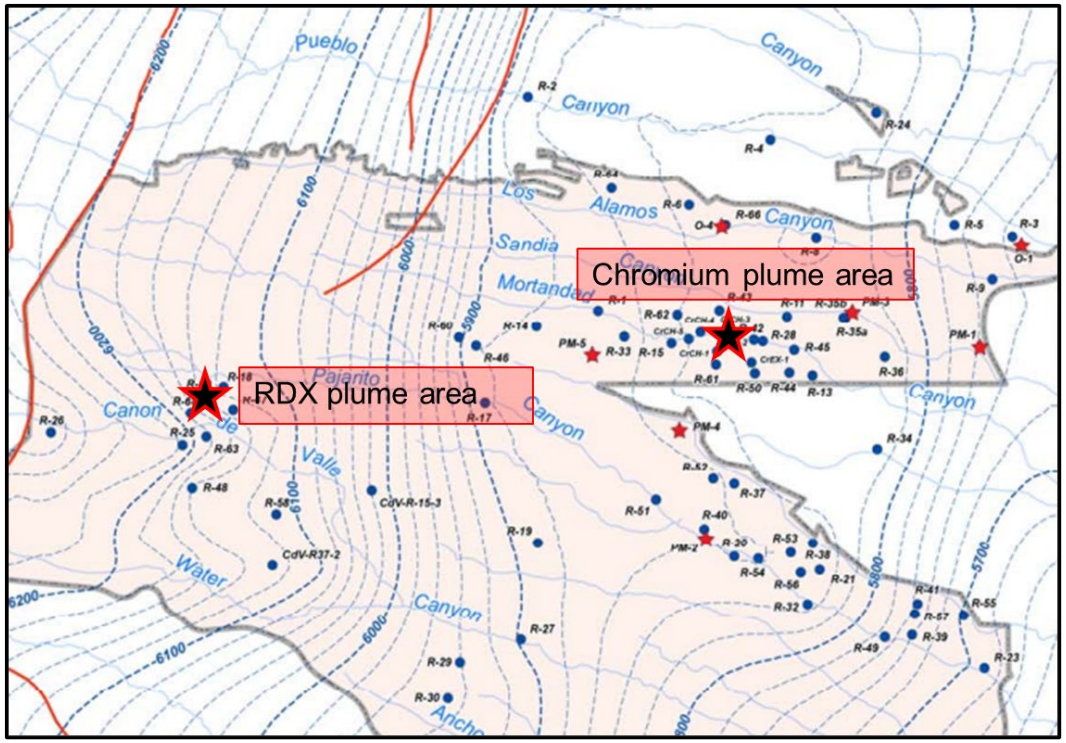
Location of TA-16 – LANL HE Production Site





RDX Bottom Line Up Front

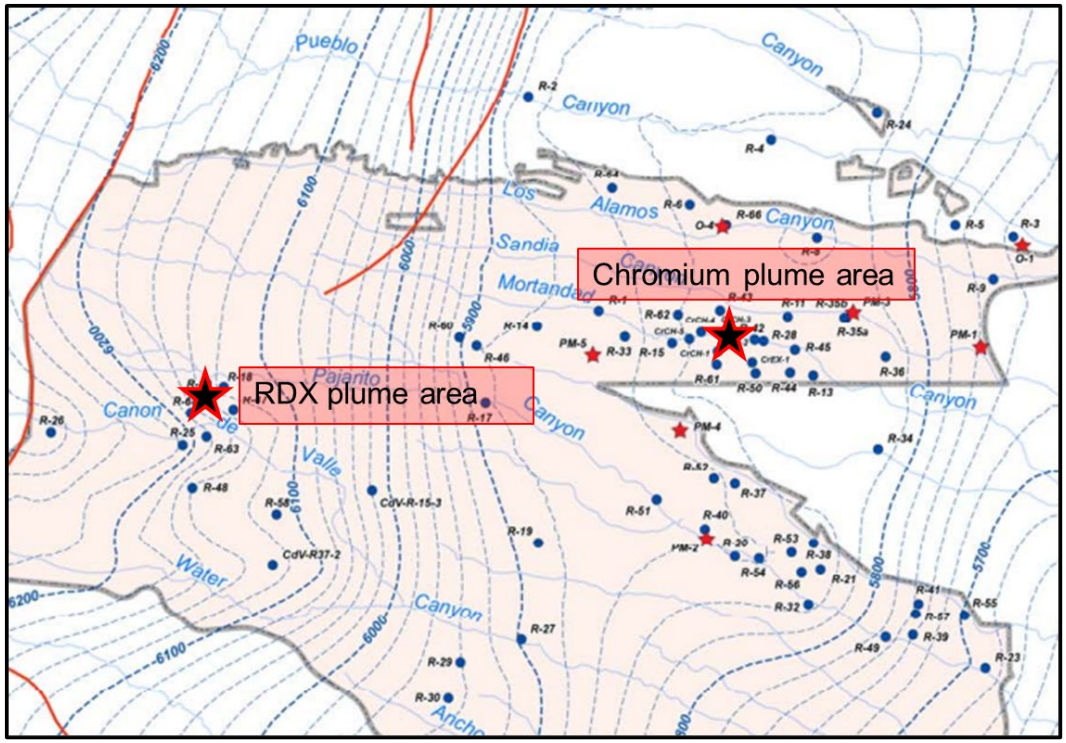
Relative to the chromium plume, the RDX plume is farther away from the nearest municipal supply well and is a lower risk to receptors. Modeling of RDX through 2200 AD indicates the plume is a low risk to supply wells.



Modified Figure 2.3-2 from N3B 2022, 702351

RDX Plume Status and Comparison to Chromium Plume

	Approximate Distance to Nearest Municipal Well	Flow Modeling Shows Institutional Controls Sufficient?	GW Interim Measure Necessary for Control?	Removal of Surface Contamination Inventory?
Chromium Plume	**~1/4 mile**	**No**	**Yes**	**No**
RDX Plume	**~2.8 miles**	**Yes**	**No**	**Yes**



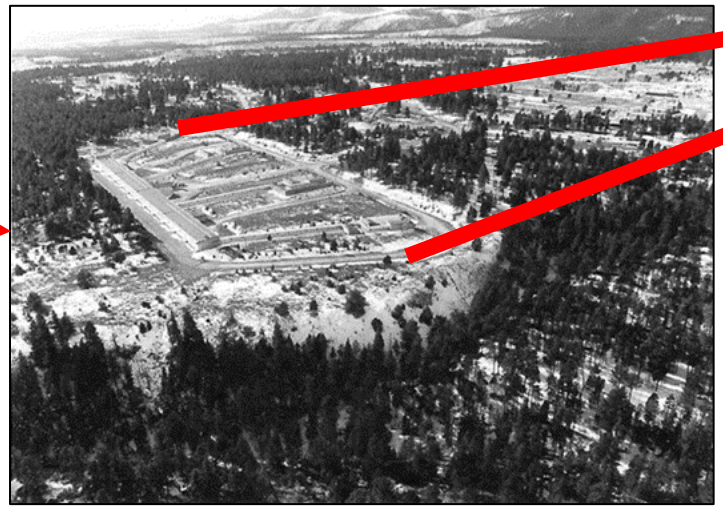
Modified Figure 2.3-2 from N3B 2022, 702351

The New Mexico Environment Department (NMED) and Newport News-Nuclear BWXT (N3B)/Department of Energy Environmental Management - Los Alamos Field Office (EM-LA) agree that they should prioritize the chromium plume over the RDX plume.

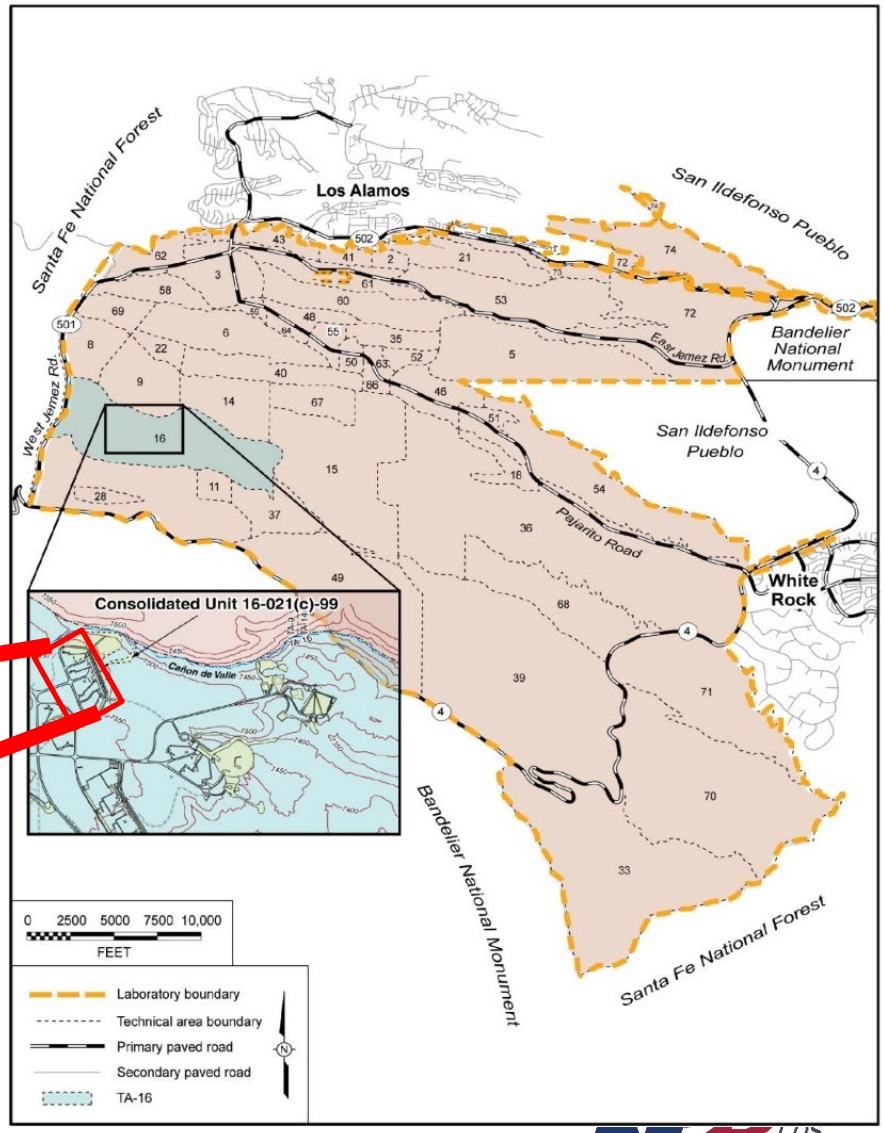
Background and History of High Explosives (HE) Outfall

- High Explosives (RDX, Her Majesty's Explosive [HMX], 2,4,6-trinitrotoluene [TNT]) production discharged several million gal/yr of contaminated water to Cañon de Valle (CdV) between 1951 and 1996 *(LANL 1998, 059891).*
- Soil and groundwater investigations began in the mid 1990s *(LANL 1998, 059891)*
- Surface and alluvial GW remedy completed in 2017 *(LANL 2017, 602597).*
- Deep GW monitored by observation wells through the Interim Facility-wide Groundwater Monitoring Plan (IFGMP)

Modified figure 1.0-1 from LANL 2017, 602597



260 Outfall



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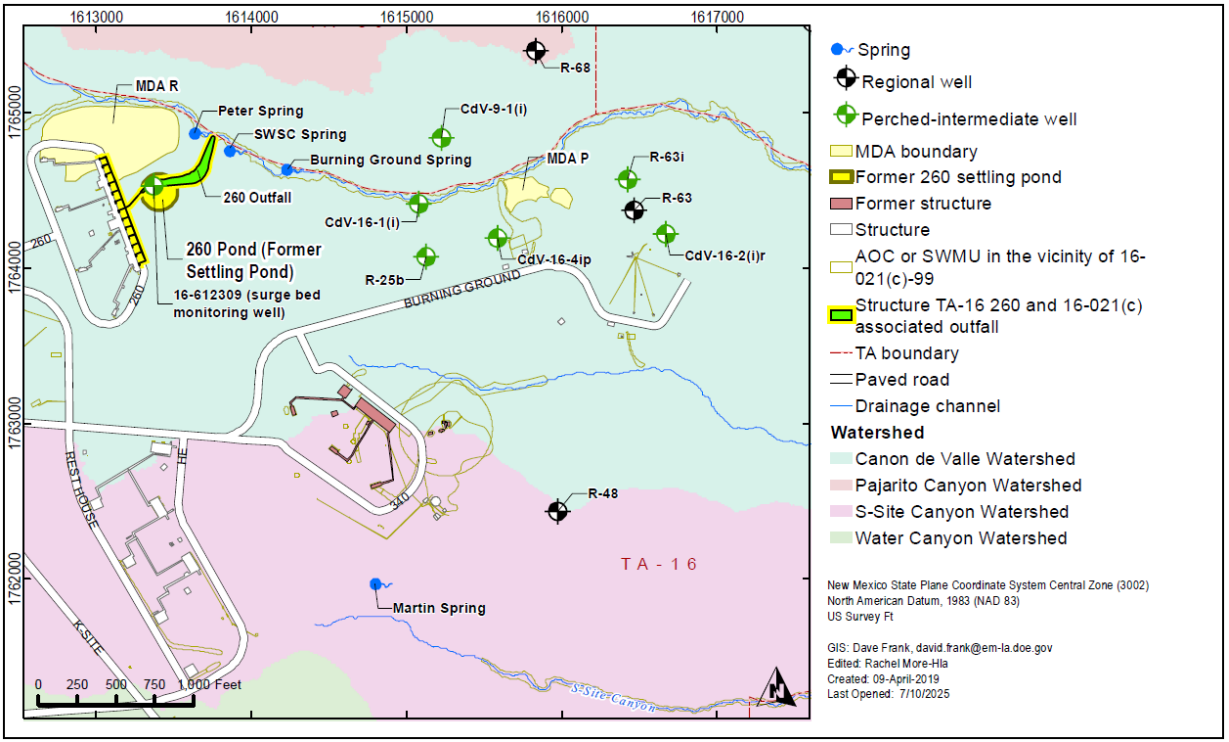
TA-16-260 Outfall Site Background

Back of HE machining building TA-16-260 showing HE sumps & blowout walls – sumps discharged to single outfall to northeast of building

- 260 outfall was highly contaminated with HE (RDX, HMX, TNT) and barium (used in the HE - Baratol) *(LANL 1998, 059891)*
- 260 outfall is the principal source of RDX at TA-16
- RDX is a class C carcinogen that is mobile in GW
- Remediation has been divided into surface and shallow GW, and deep GW components

TA-16-260 Outfall Site Background Continued

Subset of figure 2.1-2 from N3B 2022, 702351



Map of northern TA-16 showing 260 outfall in green, springs, Canon de Valle and a portion of the deep GW monitoring network

- Nearby springs, seeps, surface and alluvial GW contaminated with HE and barium
- Deep regional and perched-intermediate GW contaminated with RDX above the 9.66 ug/L NMED tap water screening level (TWSL)
- Contamination mostly came from the TA-16-260 outfall

Surface and Shallow GW Remediation

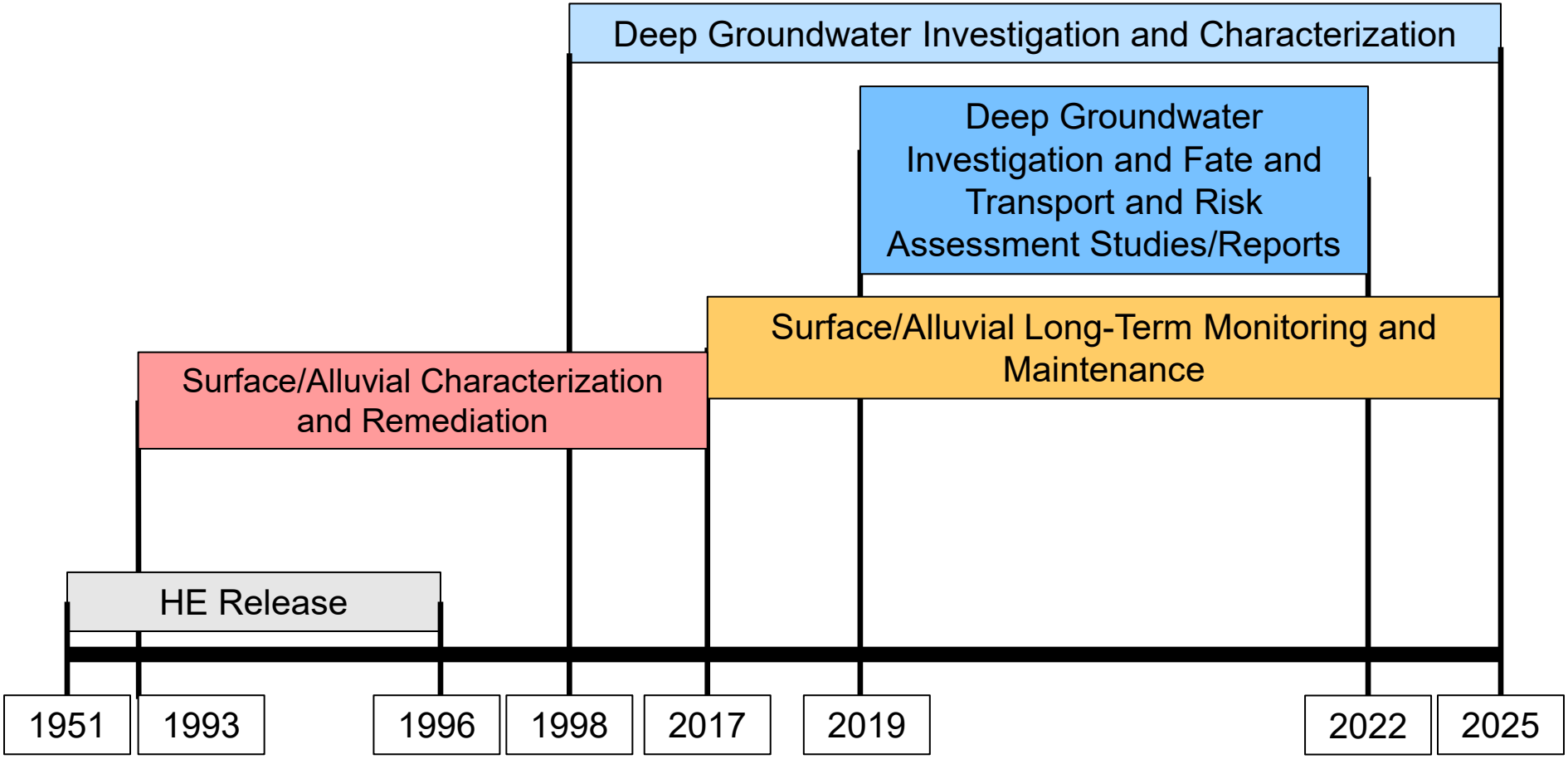
- Surface soil cleanup removed more than 1,300 yd^3 of HE contaminated soils, reducing the risk of further leaching to groundwater *(LANL 2002, 073706; LANL 2007, 098192; LANL 2017, 602597)*

- Reduction of risk to deep GW *(LANL 2007, 098192)*
  - Grout injections in infiltration pathways
  - Permeable reactive barriers
  - Low-permeability cap

- Remedy Completion Report *(LANL 2017, 602597)*
  - No further action required
  - Defined Long-Term Monitoring Plan
  - NMED approved

Interim Measure cleanup operations at 260 outfall

Timeline of Activities (Not to Scale)



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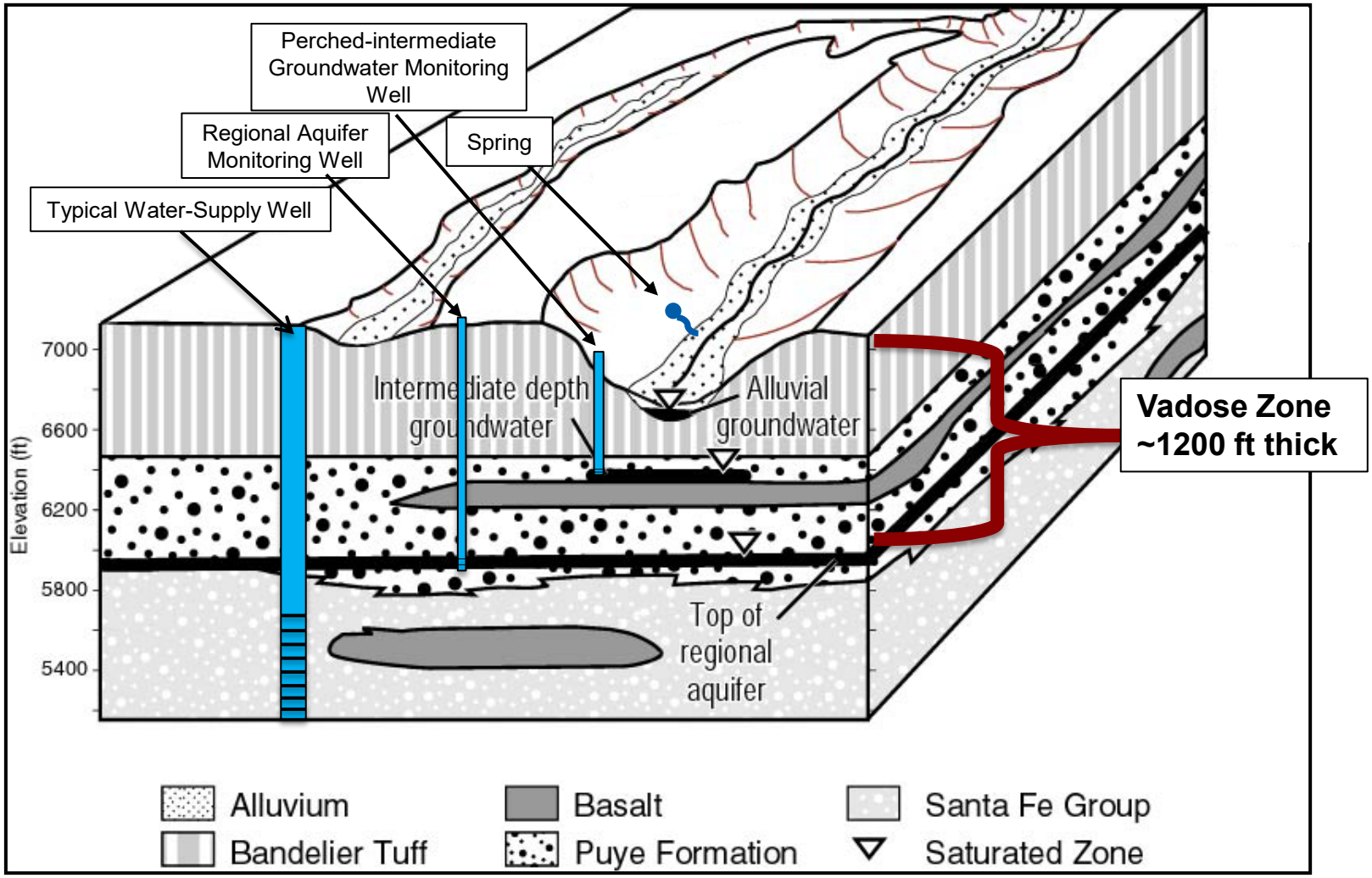
RDX in Deep GW – Beneath LANL



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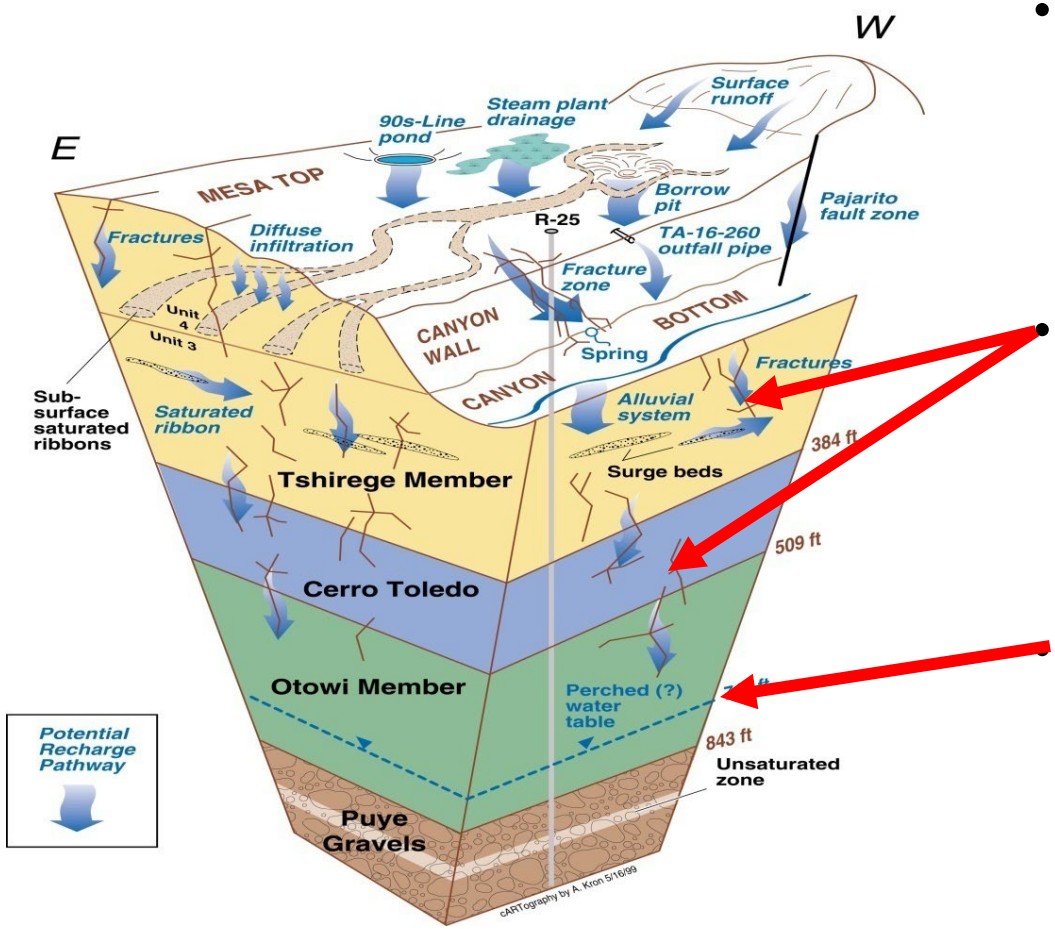
Hydrogeologic Conceptual Model (HCM) - Vadose Zone

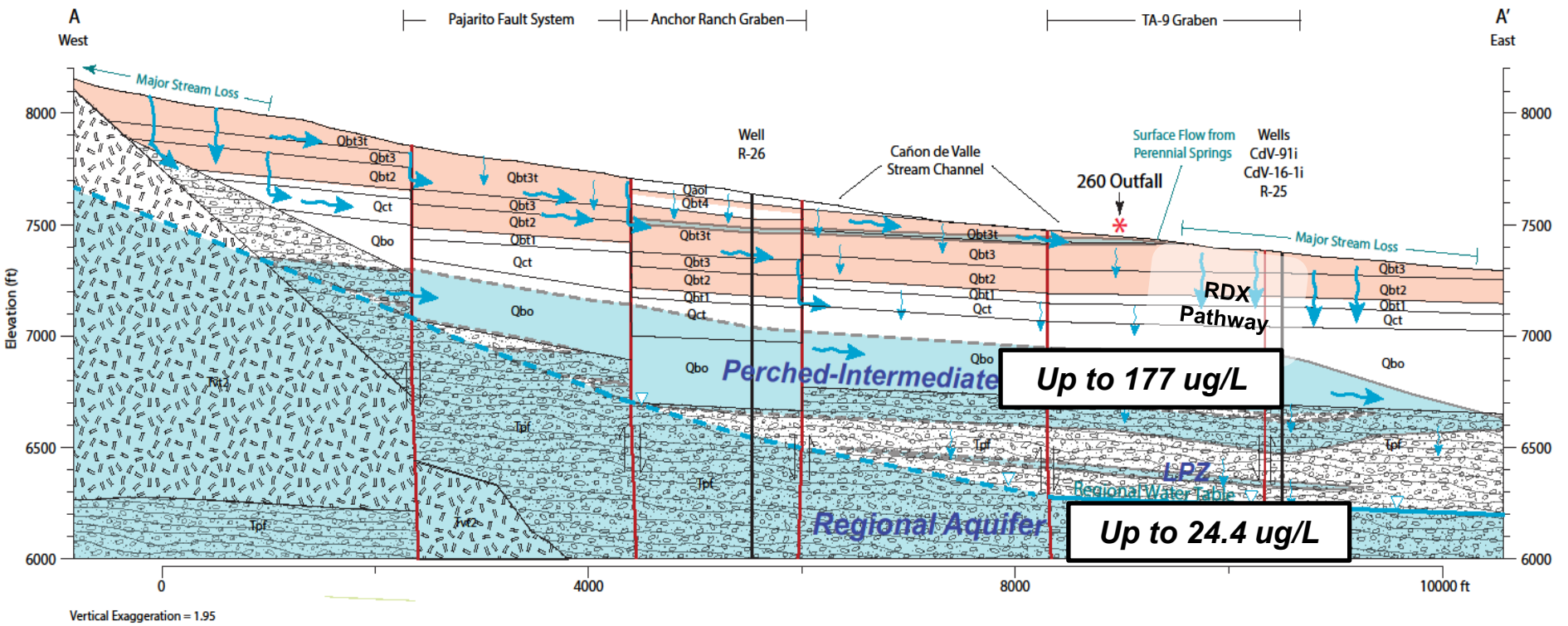


Hydrologic conceptual model for HE releases, alluvial system, & vadose zone

- Conceptual model used to define pathways for risk assessments and select monitoring locations
- Vadose zone transport characterized by ‘fast transport’ pathways, very heterogeneous contamination
- Deep perched-intermediate GW has the highest RDX concentrations

Hydrogeologic Conceptual Model – Regional Aquifer

Modified figure 3.2-1 from N3B 2019, 700561



Mountain block recharge mixes with contaminated mountain front recharge

- Shallow alluvial water infiltrates vadose zone via heterogeneous/fracture pathways
- Perched-intermediate groundwater in lower Bandelier tuff & upper Puye Formation (Fm); eastward flow
- Regional aquifer in Puye Fm; eastward flow

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Deep GW Characterization Activities

- Install monitoring wells to characterize “nature and extent” of contamination
  - Regional aquifer measured depths range from approximately 1,200 to 1,400 ft
  - Deep perched-intermediate GW depths range from ~130 to 1,200 ft bgs
  - Currently 22 monitoring locations (10 regional; 12 perched-intermediate) *(N3B 2024, 703382)*
  - GW flow ~20 – 40 ft/yr to east; RDX in GW slightly slower

- Conduct studies to understand the hydrology, “fate and transport” of contamination and refine conceptual model *(LANL 2018, 602963; N3B 2022, 702351)*

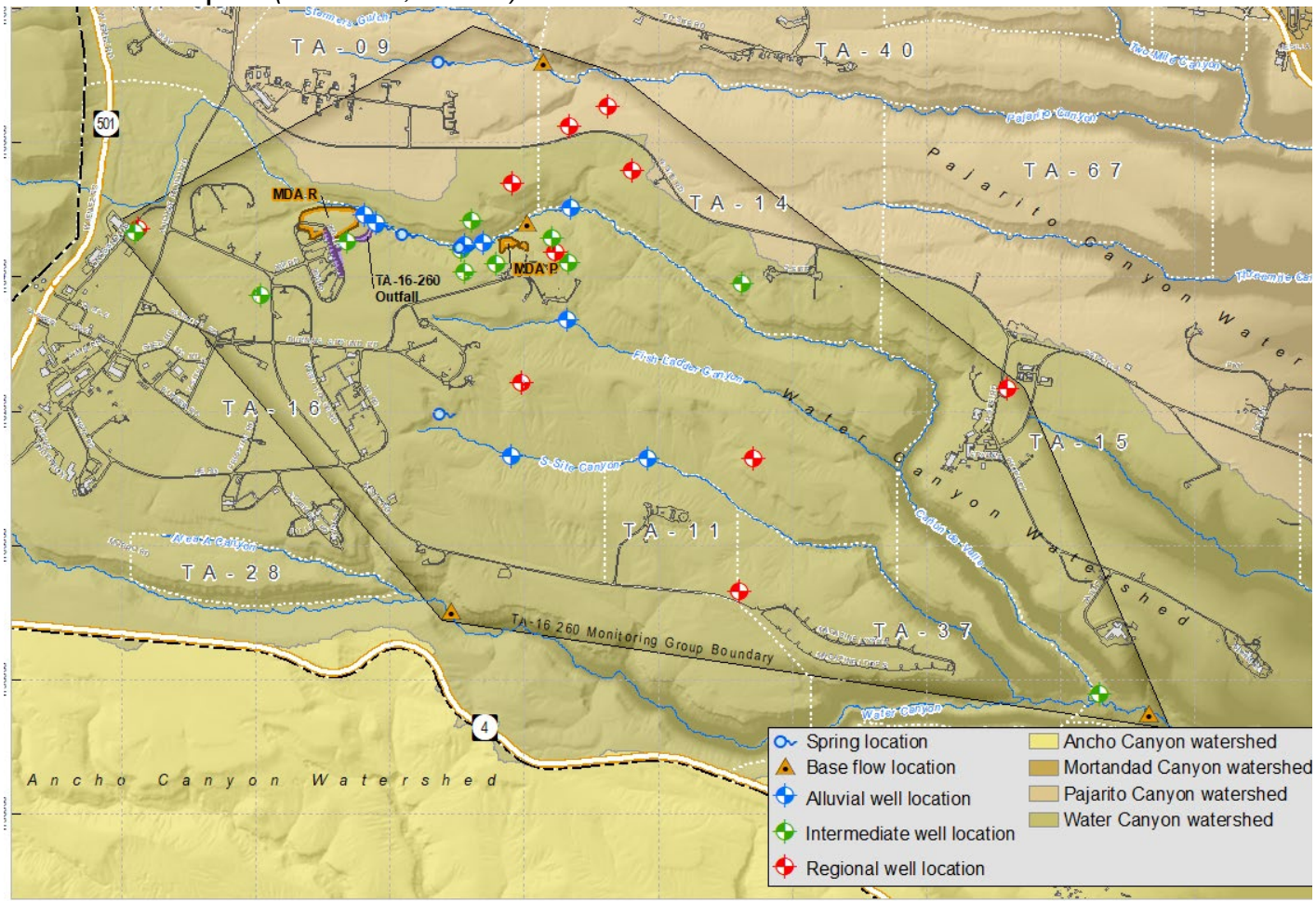
Ongoing Work - Characterization and Monitoring

SURFACE/ALLUVIAL LONG-TERM MONITORING

- Interim Facility-wide Groundwater Monitoring Plan (IFGMP) sampling *(N3B 2024, 703382)*
- Cap inspection, maintenance, and trends discussed in annual long-term monitoring and maintenance report *(N3B 2024, 703371)*

GROUNDWATER

- IFGMP sampling (including for tracer breakthrough)
- Annual progress report *(N3B 2024, 703443)*



IFGMP TA-16 Monitoring Group - Figure 6.1-1 from N3B 2024, 703382

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RDX in Regional Aquifer

- Two onsite monitoring wells (R-68 and R-69) have measured RDX more than two times the 9.66 ug/L TWSL
- RDX is <u>not present</u> in municipal supply wells (approximately 2.8 miles away)

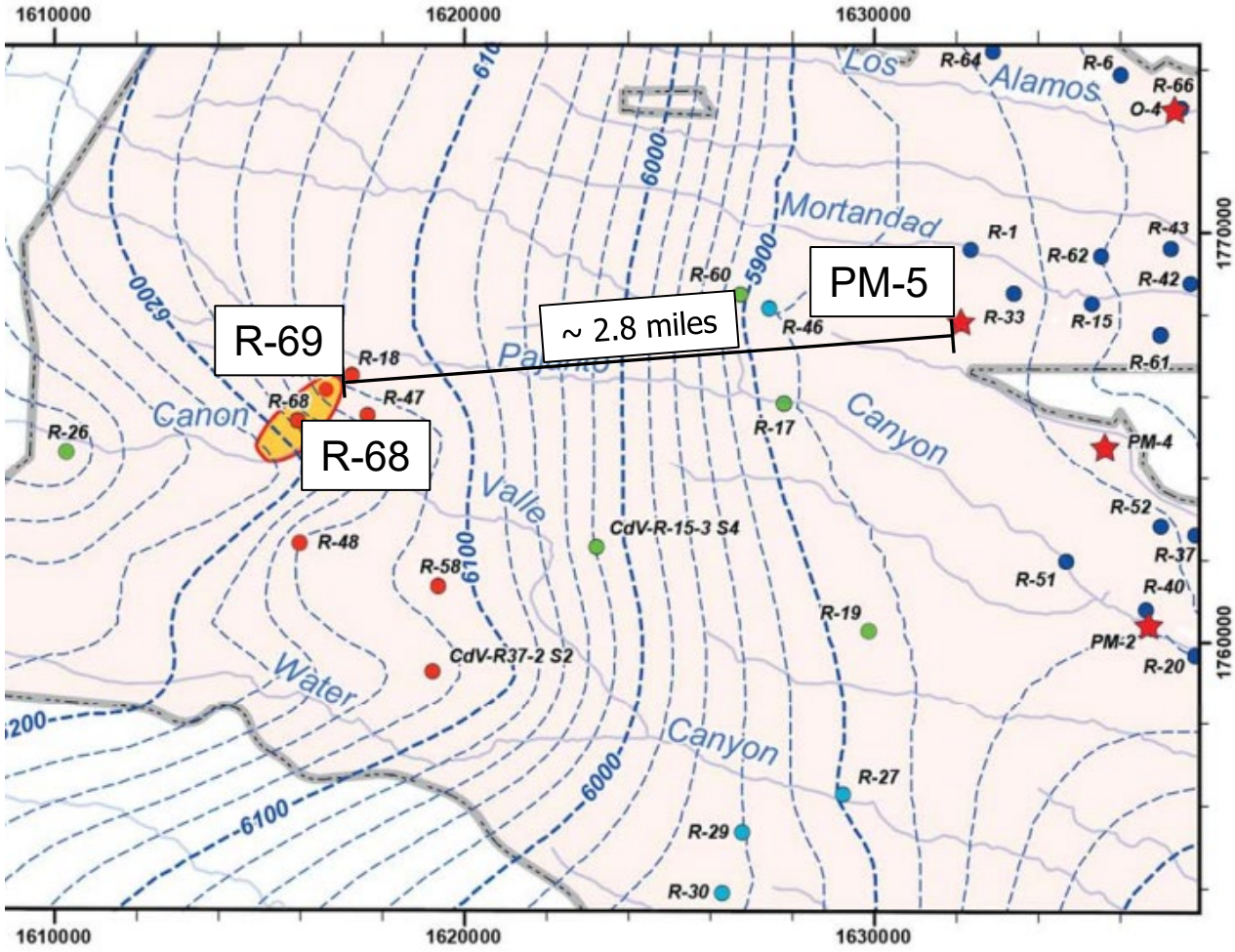

Figure 3.2-13 from N3B 2019, 700561

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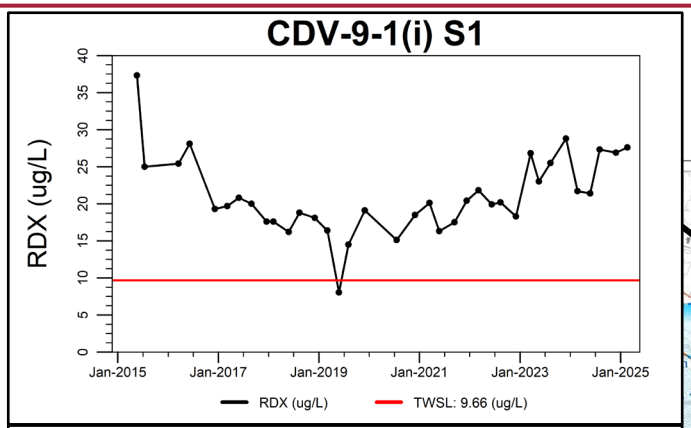
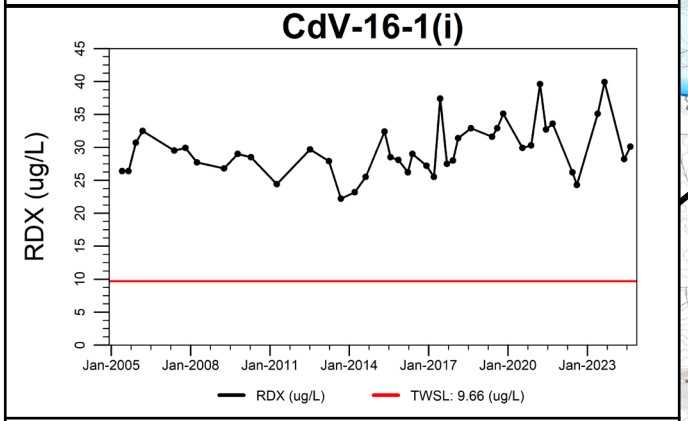
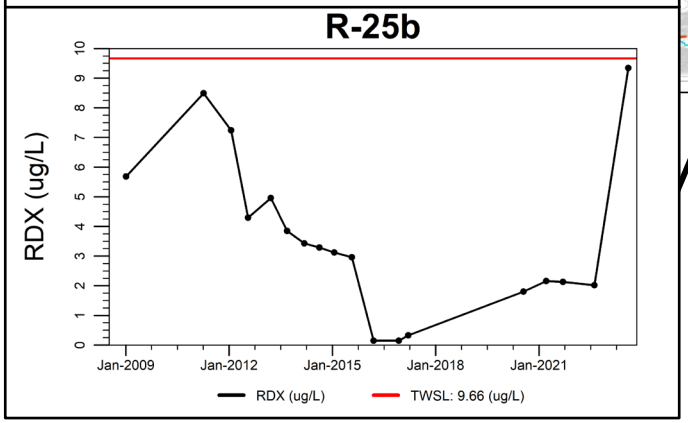
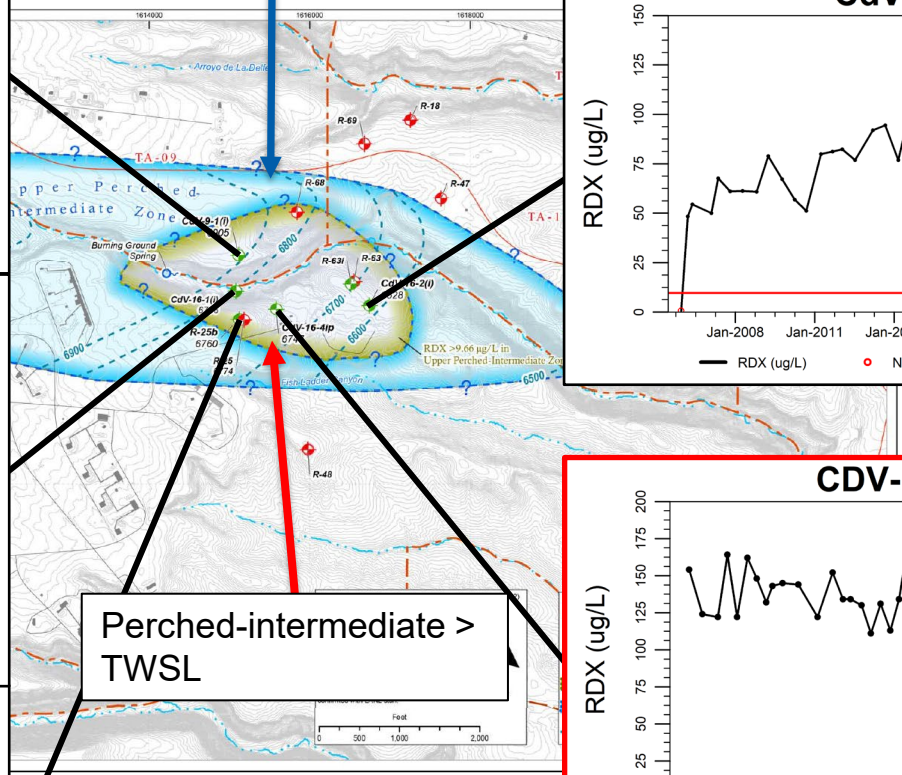
RDX in Select Upper Perched-Intermediate Monitoring Wells







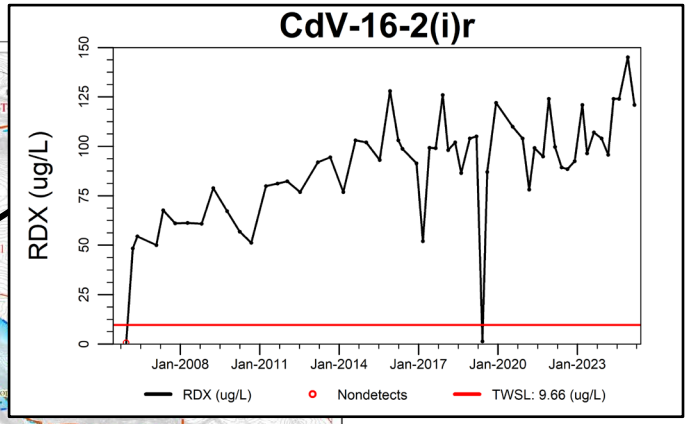
Extent of perched-intermediate zone

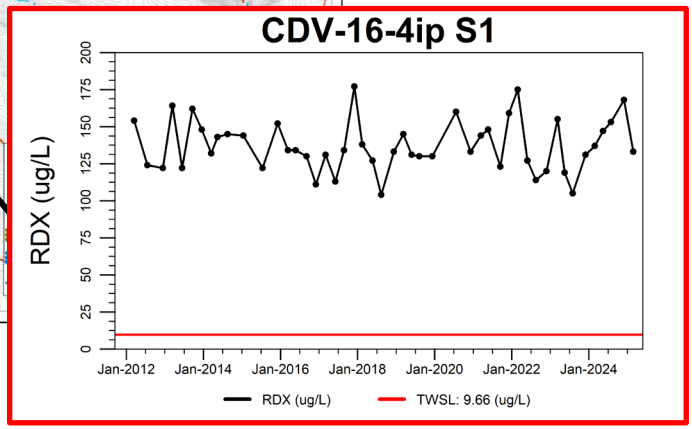


Perched-intermediate > TWSL

Modified figure 2.3-1 from N3B 2022, 702351

Red line in graphs depicts TWSL





Highest contamination

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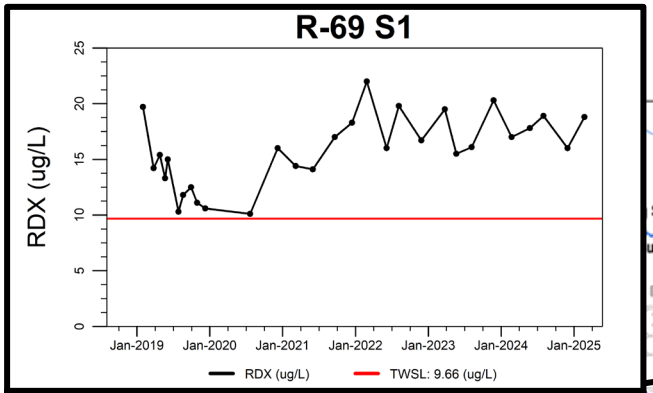
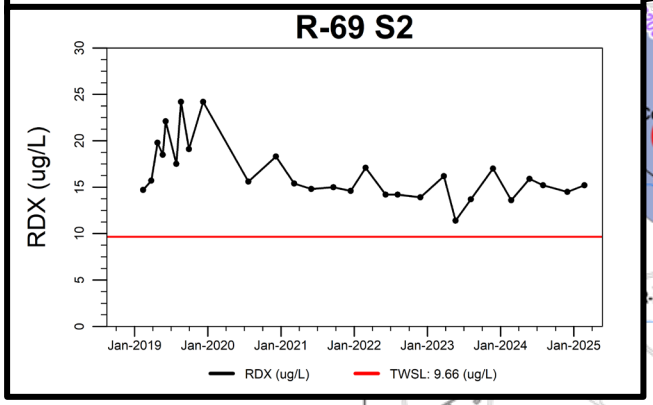
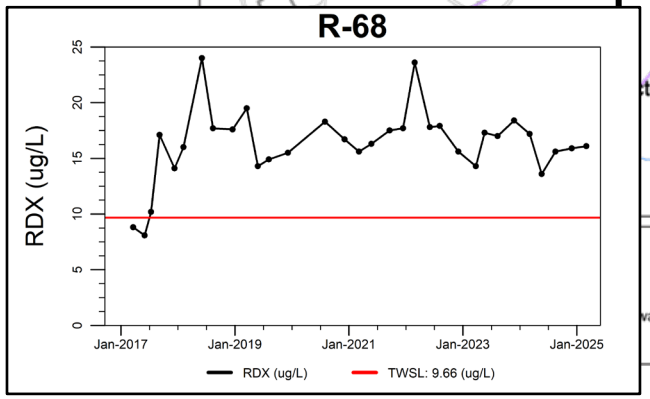
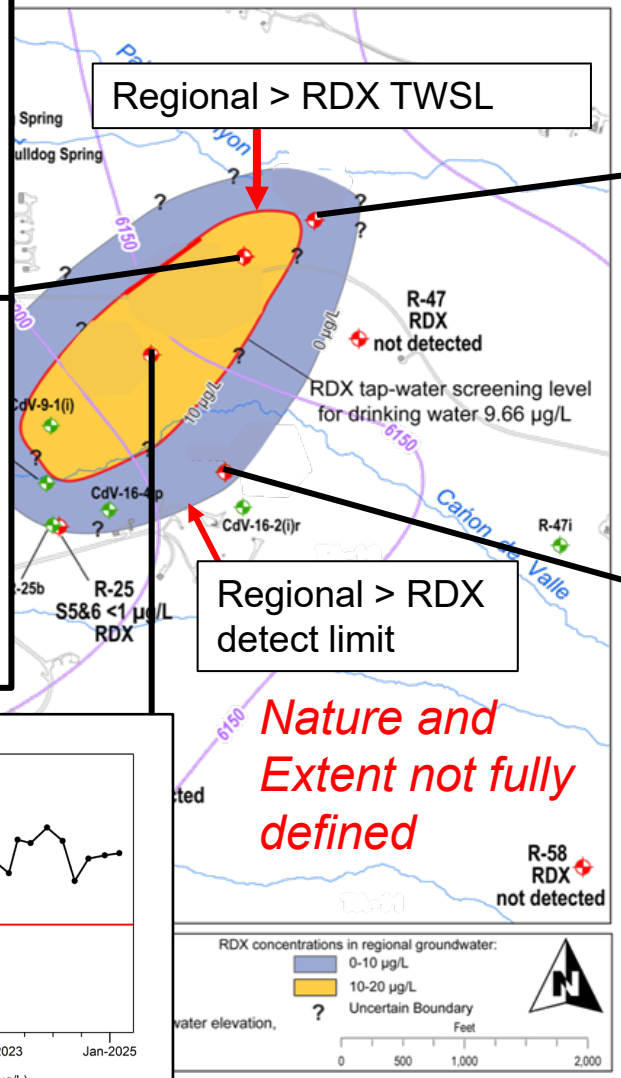
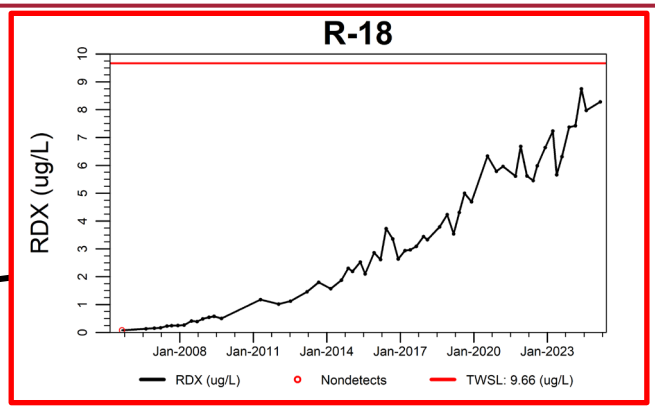
Regional RDX Plume – Nature and Extent & Times Series



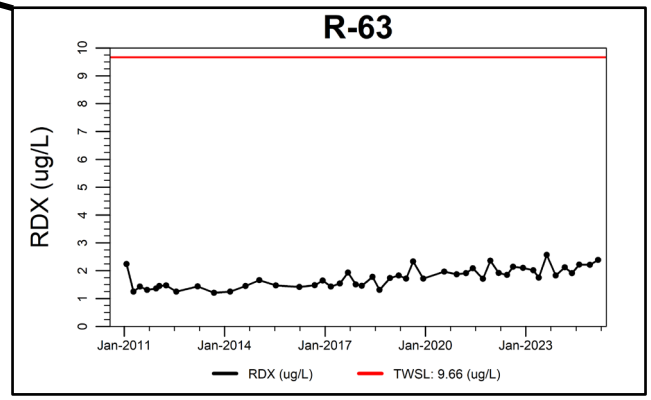








Trending towards TWSL



Red line in graphs depicts TWSL

Modified figure 2.3-3 from N3B 2022, 702351

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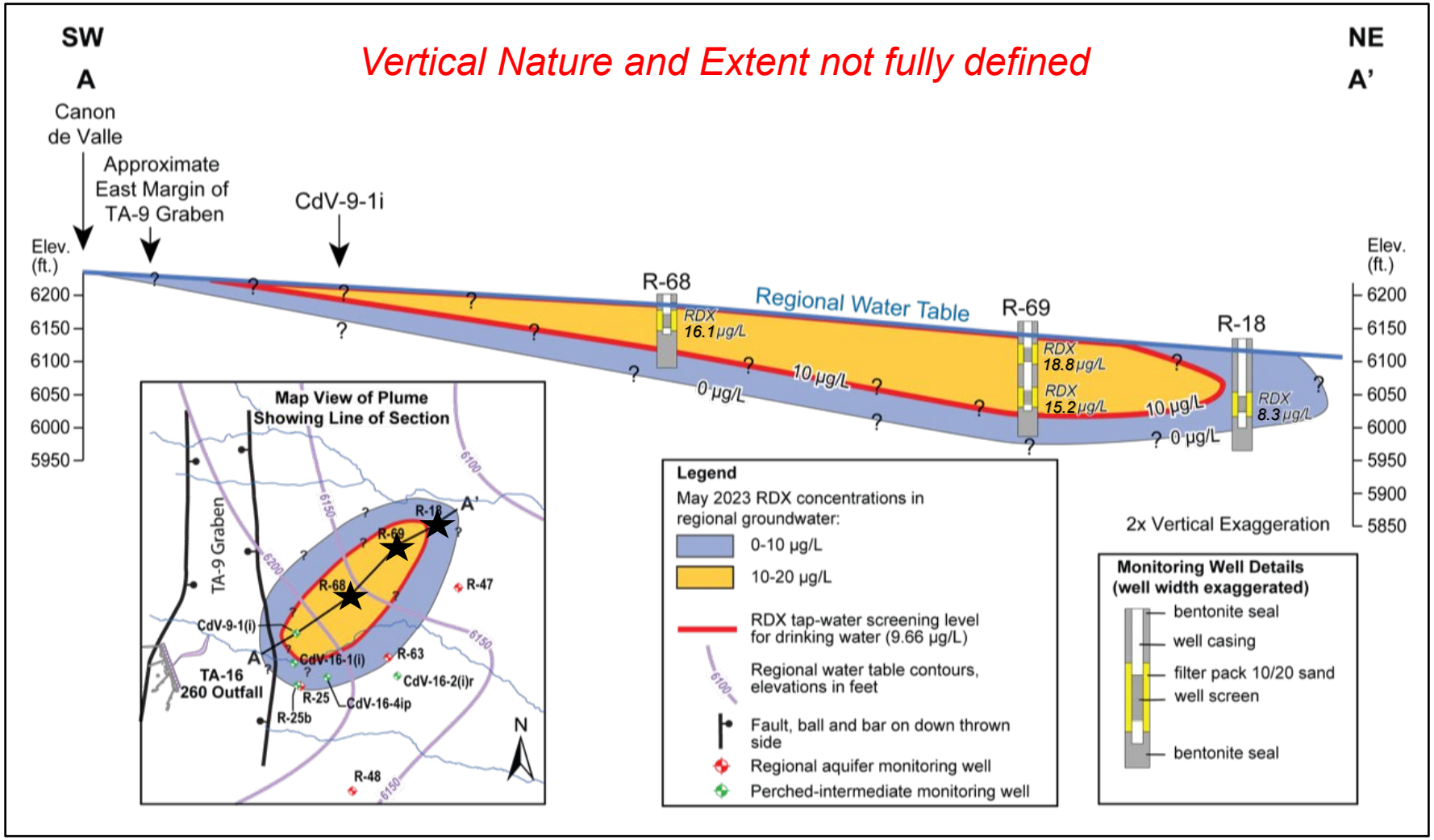
Regional RDX Plume – Nature and Extent continued



Modified figure 3.1-4 from N3B 2019, 700561

Summary of 2022 Risk Assessment and Model Results

1. Risk assessment (RA) and the RDX model used to evaluate RDX transport over large spatial distances through 2200 AD *(N3B 2022, 702351)*
2. On-site risks acceptable with institutional controls
3. Modeling shows “effectively no probability of RDX exceeding 2 ppb at any [supply] well” through 2200 AD *(N3B 2022, 702351)*
4. Based on RA, relative to the chromium plume, the RDX plume is a lower-risk *(NMED 2023, 702800)*

Conclusions and Future Activities

Deep GW RDX Plume

- The RDX plume presents a low risk. Modeling shows negligible risk of exceeding RDX Tap Water Screening Level (TWSL) at supply wells through 2200 AD *(NMED 2023, 702800)*
- Planning for future regional monitoring wells to further characterize nature and extent of contamination and revised RA report

Remediated Surface/Alluvial RDX

- Continue monitoring, maintenance, and reporting as prescribed in the Long-term Monitoring and Maintenance Plan *(LANL 2017, 602597, N3B 2024, 703371)*

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NMED (New Mexico Environment Department), June 28, 2023. "Review Fate and Transport Modeling and Risk Assessment Report for RDX Contamination in Deep Groundwater, Revision 1," New Mexico Environment Department letter to A. Duran (DOE-EM-LA) from R. Shean (NMED), Santa Fe, New Mexico. (NMED 2023, 702800)


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