



U.S. DEPARTMENT OF  
**ENERGY**

OFFICE OF  
**ENVIRONMENTAL  
MANAGEMENT**



# Chromium Project Core Team Briefing to the Northern New Mexico Citizen's Advisory Board

David S. Rhodes, Director  
Office of Quality and Regulatory Compliance  
Environmental Management Los Alamos Field Office  
May 29, 2019



ENVIRONMENTAL MANAGEMENT  
SAFETY ♦ PERFORMANCE ♦ CLEANUP ♦ CLOSURE



- Environmental Priorities
- Cleanup Contract Requirements
- Chromium Campaign A - Characterization
- Chromium Campaign I - Remedy
- Compliance Order on Consent Processes and Timelines
- Challenges to Timeline
- Core Team Approach
- Core Team Meetings
- Progress with New Mexico Environment Department
- Near-Term Next Steps





- ❑ Framework Agreement documented (not-enforceable)
  - Surface-stored Contact-Handled Transuranic (TRU) Waste
  - Groundwater contamination for hexavalent chromium and RDX
- ❑ Compliance Order on Consent priorities by Campaign
  - **Campaign A, Chromium Interim Measures and Characterization**
  - Campaign B, Historical Properties Completion (almost done)
  - Campaign C, Royal Demolition Explosives (RDX) Characterization (working)
  - Campaign D, Supplemental Investigation Reports (almost done)
  - Campaign E, TA-21 D&D and Cleanup (working)
  - Campaign F, RDX Remedy (working)
  - Campaign G, Known Cleanup Sites (almost done)
  - Campaign H, Material Disposal Areas A and T Remedy
  - **Campaign I, Chromium Final Remedy**





# Cleanup Contractor Requirements

- C.10.1.1 Plume Control at Los Alamos National Laboratory Boundary
  - Work Plan and installation of components
  - Interim Measures operations, and
  - Annual report of performance (performance feeds CME)
- C.10.1.2 Plume-Center Characterization (feeds CME)
- C.10.2 Continuation and Completion of Studies (feeds CME)
  - Geotechnical studies;
  - Monitored Natural Attenuation studies;
  - Injection studies including tracer, bio-treatability, chemical treatability, and field pilot testing
- C.10.3 Groundwater Modeling and Hydrology (feeds CME)
- C.10.4 Additional Well Need Determinations and Criteria (feeds CME)
- C.10.5 Corrective Measures Evaluation Report  
(Appendix B Target 9/30/2021)





- ❑ C.10.6 Facilitate NMED review of the CME
  - Facilitate NMED development of Statement of Basis
  - Including public meetings and comment resolution
- ❑ C.10.7 Corrective Measures Implementation Planning (CMIP)
  - Design of the Remedy (C.10.11.4.)
  - Remedy Operational Plan (C.10.11.5.)
- ❑ C.10.8 Corrective Measures Implementation
  - Implement the CMIP - installation of remedy [means all components]
- ❑ C.10.9 Final Remedy Operations
  - Is Remedy performing as designed through evaluation
  - Adjust operations as necessary (**adaptive management**)
  - Annual report of remedy performance (C.10.11.6.)
  - Remedy operations extend through the [remaining] life of this contract
  - Remedy Completion Report is not possible during contract period (remediation objectives are not met)





## ❑ Campaign A, Chromium Interim Measures and Characterization

- Interim measures operation for boundary protection (operational)
- Amendment phase I pilot test and resolution of potential unexpected effects (currently suspended for analysis of effects)
- Amendment phase II pilot test is currently indeterminate because of potential adverse effects
- Resolution of uncertainties on North and southwest sides of plume (R-71/R-72)
- **Possible public meetings before CME submittal**
- CME of remedial technologies and combinations (target date 9/30/2021)





## □ Campaign I, Chromium Final Remedy

- Follows NMED Statement of Basis (GAP between campaigns)
- Corrective Measures Implementation Plan (CMIP)
- Implementation of specified remedy / installation of infrastructure
- **Adaptive management\*** of remedy as results come in
- Partial Corrective Measures Implementation Report (CMIR)\* for remedy implementation (without remediation objectives being met) and long-term operational plan for remedy

## □ Campaign I – after current contract

- Long-term operation and maintenance of the remedy infrastructure until remediation objectives are met
- Remaining CMIR\* after remediation objectives are met (expected to be long time)





- ❑ Adaptive Management – the progressive implementation of the infrastructure necessary to execute the remedy
  - Building and implementing in prioritized stages
  - Performance in each stage informing specific design for the next stage (i.e., location of extraction, injection, amendment wells)
- ❑ Corrective Measures Implementation Report
  - C.O. XVIII.C. Each CMI Report shall document implementation and completion of the remedy in accordance with its NMED-approved CMI Plan. (also expected to describe certificates of completion expectations)
  - C.O. Appendix E. VIII)g) Description of Corrective Measures that were Implemented. (also includes a statement that the remedy has been completed)
- ❑ Remedy Completion Report not specifically used in C.O.





# Compliance Order on Consent Processes and Timelines

<input type="checkbox"/> Appendix B Target for CME Report (C.10.5)	DOE		9/30/2021
<input type="checkbox"/> App. D Review Time CME Report (C.10.6)	NMED	280 days	7/10/2022
<input type="checkbox"/> App. D Revision Time CME Report	DOE	150 days	12/10/2022
<input type="checkbox"/> EM-LA - CMI Plan development (C.10.7&8)	DOE	<b>280 days</b>	10/20/2023
<input type="checkbox"/> App. D Review Time CMI Plan	NMED	210 days	5/20/2024
<input type="checkbox"/> App. D Revision Time CMI Plan	DOE	120 days	9/20/2024
<input type="checkbox"/> <b>Remedy Implementation/Execution (C.10.8)</b>	DOE	<b>2 years</b>	9/20/2026
<input type="checkbox"/> Remedy operations/adaptive management/annual report of remedy performance (C.10.9)	DOE	<b>2 years</b>	<b>9/20/2028</b>
<input type="checkbox"/> N3B maximum contract end date			<b>4/29/2028</b>
<input type="checkbox"/> Develop Final CMI Report*	DOE	Unknown	Unknown



\* See previous page for discussion



- ❑ Facilitated discussion sessions
  - Savannah River Site personal that have gone through this themselves
- ❑ Decision makers on the team/in the room
  - briefed by Project Team members from each agency
- ❑ Focus on the end-state now
  - provide framework to negotiate and document remediation objectives
- ❑ Look ahead instead of just the next step
  - keep all activities in perspective of the remediation objectives
- ❑ Keep moving down the road as a project
  - not a never-ending scientific investigation
- ❑ Adds management objectives to project management





## □ Core Team Meetings

- 12/4-5/2018 – Initial kickoff, Identified Core Team members as Neelam Dhawan (NMED) and David Rhodes (EM-LA), initial conceptual site model (CSM), initial problem statement, preliminary corrective measures objectives, likely corrective measures, and uncertainties
- 1/28/2019 – Technical Team progress, schedule for addressing uncertainties, brought up points of compliance for future discussion, include adaptive management concept in CME,
- 4/24/2019 – Adjusted conceptual site model, discussed preliminary corrective measures objectives, updated uncertainties table, decided on R-71 infrastructure for data points, discussed expectations for CME (high-level), sharing of model data before CME



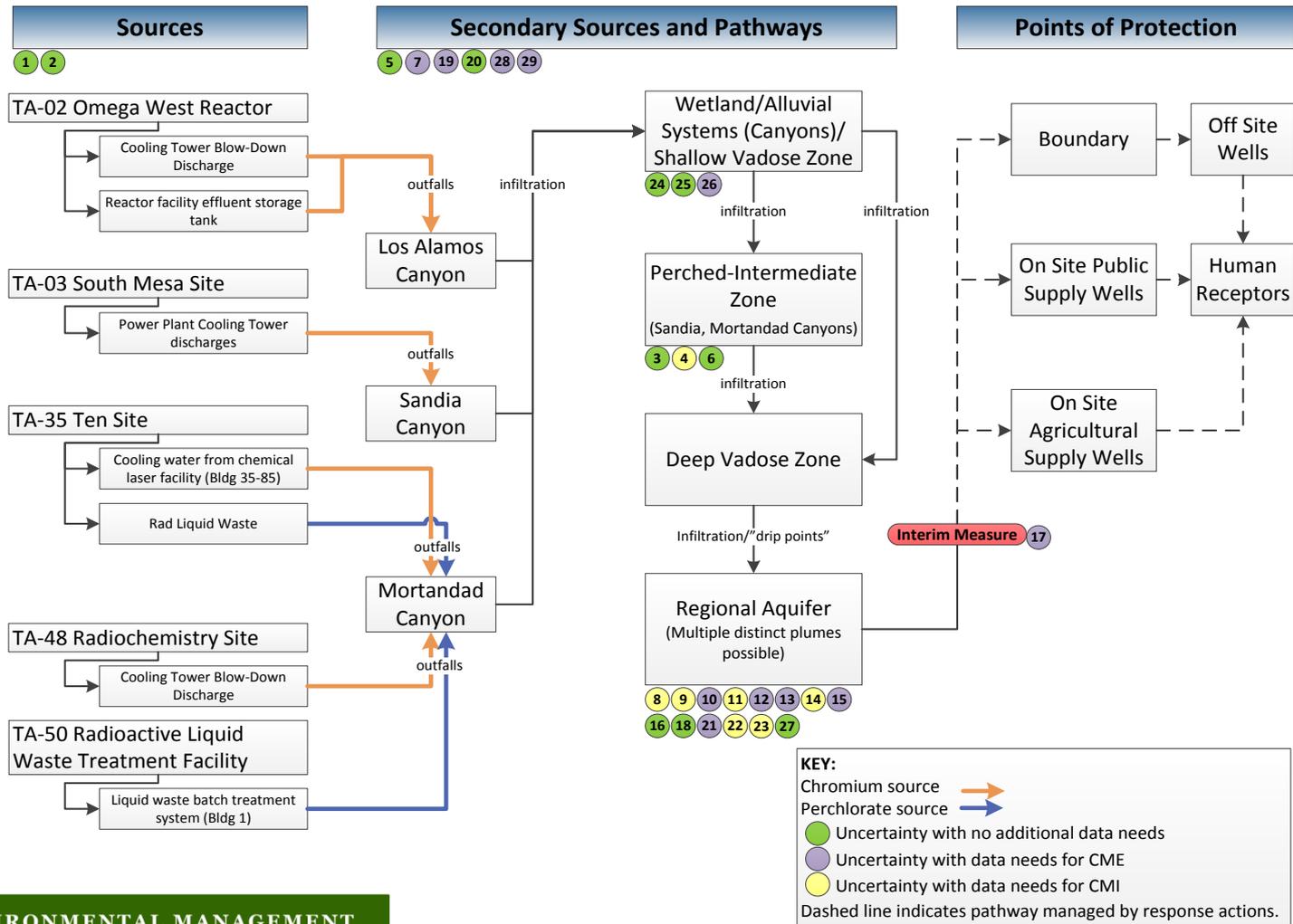


- Focused on a succinct problem statement
  - Focus on all groundwater with a 50 ppb standard
- Identified risks and questions
  - Needed for Corrective Measures Evaluation (CME) development
- Identified infrastructure necessary now to support CME
  - Multipurpose wells on the north and southwest edges of plume
- Initiated conversations about end-state standards
  - Whether or where a specific remediation objective is to be met in what timeframes
- Prompted first brief look at contract end-state
  - N3B contract final products
  - Long-term remediation operations and maintenance plan and contract
  - Criteria for future CMI Report





## Chromium Plume Conceptual Site Model





	Uncertainty / Potential Data Need	Future Data Need Timing	Comment	Contact	Approach	Status	Target Date
7	Fate & transport mechanism and timeframe from source to regional aquifer	CME	Transport time through vadose zone to aquifer.	May inform the potential for secondary source to remain in the vadose zone. Could have implications on remediation approach and duration.	Explore molybdenum and chlorate (from MIOX disinfection) as a potential tracer for travel times. Moly was used and discharged from the power plant from 1992-2000. MIOX disinfection was operated in 2002 timeframe. The following wells would potentially be along the pathway: SC-1, SC-2, MCO-5, MCO-6, R-15, R-42, R-38, CR2-4, CR2-5. Inclusion of TA-518 would incorporate a potential pathway for moly that originated in LA Canyon. Explore decreases in perchlorate concentrations in Mortandad Canyon perched-intermediate wells that may be associated with improved treatment of COH at RLW beginning in 2000 and subsequent elimination of outfall approximately 2008. Explore stable isotope signal from "light" nitric acid release in Mortandad Canyon.	Data pull and evaluation underway. Not complete as of April.	June Tech Team meeting
10	Plume center and drip points into regional aquifer	CME	Evaluate whether additional boring could refine approach to corrective measure (i.e., targeted vs. more broadly applied corrective measure) and estimate of corrective measure duration. Technical Team will evaluate the cost/benefit of a boring prior to CMI versus managing the uncertainty as part of corrective measure design (CME). A future performance monitoring location would likely be required in the high concentration area of the plume.	Having an appropriate monitoring configuration and strategy will be critical to identify early indications of performance of remedial actions.	Factor uncertainty into conceptual remediation designs.	Per Item 13, Well R-71 will be installed and provide additional information. Monitoring configuration will need to be included in alternative in CMI and in the CME.	Complete in terms of Core Team process. R-71 to be drilled in Fall 2019.
12	Nature and extent of Cr(VI) and perchlorate south of CR2-6 and west of CR2-1	C&L/CMI 11/24/19	Use current Cr concentration distribution ("heat map") to inform CMI design. Additional resolution on extent may be needed to support design and implementation of the corrective measure.	May be necessary for remediation design.	Discuss options for how to address uncertainty with Tech Team.	Changed from yellow (CMI) to purple (CMI) per discussion at 1/24/19 Tech Team meeting. R-71 is planned. Ongoing discussions regarding location and purpose for this well.	Location of Well 4-72 to be determined by May 31, 2019
13	Nature and extent of Cr(VI) northwest of R-62	CME	Difficult drilling access. Expected condition is that there is a lobe of contamination in the R-62 area (see current concentration distribution "heat map"). Technical Team will evaluate existing information and determine if more information is needed prior to the CME.	May be necessary for remediation design.	Technical team agrees that a monitoring well may be needed north or northwest of R-62. Need to determine when the well would be installed relative to CME schedule. Need for the well will also be evaluated as part of the conceptual remediation strategy if the well can be constructed/configured for additional purposes.	Well R-71 will be installed. Location agreed upon in Tech Team meeting. Workplan submitted to follow.	Complete in terms of Core Team process. Workplan for Well R-71 to be submitted to NMED in late April/early May 2019. R-71 to be drilled in Fall 2019.
15	Nature and extent of Cr(VI) "nose" to north east	C&L/CMI 11/24/19	Data from future boring R-70 (performance monitoring of IM) will provide additional information in this area.	May be necessary for remediation design.	Address with R-70, 3-screen well	Changed from yellow (CME) to purple (CMI) per discussion at 1/24/19 Tech Team meeting. No further action needed with the installation of R-70.	Complete in terms of Core Team process. R-70 completion pending. Initial complex scheduled for late May 2019.





Uncertainty / Potential Data Need	Future Data Need Timing	Comment	Context	Approach	Status	Target Date
17 Aquifer response to IM (i.e., How is hydraulic control affecting the plume configuration?)	OME	Incorporate what is learned from IM into analysis supporting CME as it becomes available.	Provides direct insight into effectiveness of IM and informs potential remedial actions for CME.	Track time-series data for performance monitoring wells. If necessary, explore statistical methods to look for statistically significant changes in Cr concentrations that result from the IM. Use tracer breakthrough curves to refine the hydrological conceptual model for capture and flow paths that are being developed in response to pumping and injection.	Discussed in Tech Team meetings. Presented current information in March 29, 2019 Semi-Annual IM Performance Monitoring Report.	To be completed in May/June Tech Team meetings.
19 Where are the preferential flow pathways resulting from varied hydraulic conductivity zones? (i.e., flow field in a lateral sense throughout plume)	OME	Current model provides a representation of the hydraulic variability throughout the plume. Additional information from the IM will be incorporated into the existing model. Technical Team will evaluate how model accounts for range of conditions, including incorporation of information gained from IM.	Flow fields under ambient groundwater flow conditions are likely to be modified under a continuous pumping and injection scenario. This will have high relevance to CME design.	Apply evaluations being conducted under item #13 to refine conceptual understanding of flow field under pumping/injection vs ambient conditions. Flow field under ambient conditions helps interpret plume evolution to date. Flow field under pumping/injection conditions will inform remediation strategies.	K distributions under ambient groundwater flow conditions have been derived from existing model and will be shared with the Tech Team in a future meeting. An updated depiction will be developed in updated model calibration efforts and will incorporate capture zone analysis and tracer data.	Model will be available for Tech Team meetings later in 2019
21 Interaction of 4 "sub-plumes"	OME	Expected condition is that there are multiple "sub-plumes" (see current concentration distribution "heat map"). Corrective measure design will have to account for the potential presence of multiple sub-plumes.	Important for remediation design.	Factor into conceptual remediation design. Relates to items 12, 13, and 15, above. Tech team to evaluate the potential need for wells west of R-61 (perchlorate) and north-northeast of R-62.	Discussed in 1/24/19 Tech Team meeting. Incorporate into updated calibrated model.	Model will be available for Tech Team meetings later in 2019
26 Is Cr(VI) infiltration window larger (i.e., further up-canyon) than the currently defined dominant infiltration zone?	OME	Dominant window defined overall extent uncertain. 0.5 to 0.75 km range. Maybe a bit further up canyon.	Related to confidence in location and extent of subplumes. Could have relevance to remediation design in northwestern portion of the plume.	Will likely need to have adequate monitoring and identified response actions in place. Explore geosurface from Compendium that may have controlled Vadose Zone migration. Additional investigation is not required. Remediation strategy will ensure that the drip points are captured. Will be addressed in remediation design. Mine existing piezometer data for additional insights.	Geosurface discussed in 1/24/19 Tech Team meeting. Incorporate into uncertainty analysis in updated calibrated model.	Model will be available for Tech Team meetings later in 2019
28 Could Cr(II) be re-oxidized to Cr(VI) over time?	OME	Technical Team will evaluate this potential through literature review and case studies from other projects.	Important to ensure that any in situ approach that is proposed is sufficiently protective against plume "rebound".	Several technical papers have been shared with Tech Team. Additional geochemical modeling will also be conducted by the Tech Team to explore the question. Tech Team will conduct literature search on other Cr cleanup sites and determine if those sites have experienced significant Cr(VI) rebound.	Discussed in 1/24/19 Tech Team meeting. Literature review is sufficient to close this item.	Complete in terms of Core Team process.
29 Will technologies that reduce Cr(VI) to Cr(III) result in the mobilization of other contaminants (e.g., arsenic, sulfate, selenium, iron, manganese) at concentrations that create other remediation challenges?	OME	Addressed by amendment pilot tests and bench-scale studies. Technical Team will evaluate the scale of potential impacts and need for contingencies.	Has importance in corrective measure design. Need to ensure that remediation of Cr doesn't cause adverse effect, especially as it relates to water-supply wells and Laboratory boundary. This could also have relevance to treatment system design to ensure that extracted water meets water quality criteria for injection.	Study underway as part of Phase 1 amendments testing. Data are being reported in quarterly reports. Will also leverage the Cr(III)-II evaluation to better understand the nature and source of the condition at Cr(III).	Discussed in Tech Team meetings. Additional data from Phase 1 amendment testing will be shared / discussed in periodic reports and Tech Team meetings and in reports as additional amendments information is available.	Complete in terms of Core Team process. Phase 1 amendments testing reports that included analysis of Cr(III)-II impacts will draw conclusions and make recommendations for amendment use.





- ❑ Continue CME content discussions with NMED
- ❑ Start planning DOE/N3B hosted public meetings on technical considerations inherent in potential remedies in advance of NMED Statement of Basis
- ❑ Finish two infrastructure items (R-71 and R-72) and data evaluation for reducing CME uncertainties
- ❑ Develop interim and final completion criteria
  - ❑ Interim to allow determining whether remedy installation is behaving as expected
  - ❑ Final to define long-term operation and maintenance criteria for being able to secure the operations and record success (Final CMI Report)





U.S. DEPARTMENT OF  
**ENERGY**

OFFICE OF  
**ENVIRONMENTAL  
MANAGEMENT**

# Questions

?



**ENVIRONMENTAL MANAGEMENT**  
SAFETY ♦ PERFORMANCE ♦ CLEANUP ♦ CLOSURE