January 19, 2023

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January 2023 Citizens Advisory Board Meeting Agenda

5:30 pm
Call to order, introductions
Review of agenda

DOE Comments

Federal Coordinator Comments

Liaison Comments

Administrative Issues

Presentation

C-400 Remedial Investigation/Feasibility Study

Public Comments

Final Comments

Adjourn

U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Citizens Advisory Board
C-400 Complex Remedial Investigation Feasibility Study

Jennifer Woodard, Deputy Designated Federal Officer

United States Department of Energy

January 19, 2023

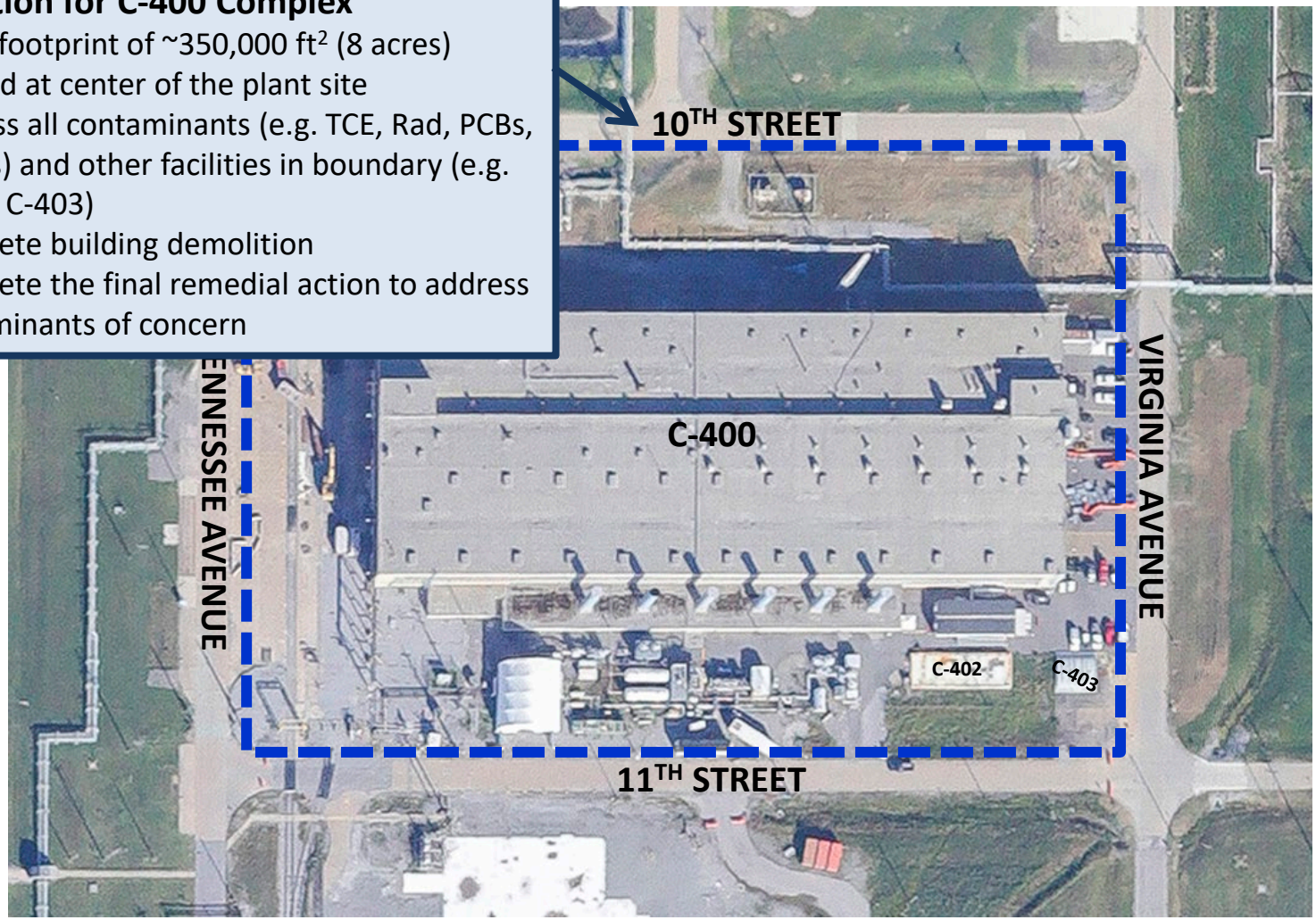
Background
C-400 Cleaning Building

- The C-400 Cleaning Building cleaned parts and equipment used in the enrichment process
- Over time, the solvent trichloroethylene (TCE) leaked at the C-400 complex
- C-400 complex is the primary source of off-site TCE and technetium-99 (Tc-99) groundwater contamination at the Paducah site

C-400 Complex

Final Action for C-400 Complex

- Aerial footprint of ~350,000 ft^2 (8 acres)
- Located at center of the plant site
- Address all contaminants (e.g. TCE, Rad, PCBs, metals) and other facilities in boundary (e.g. C-402, C-403)
- Complete building demolition
- Complete the final remedial action to address contaminants of concern



Scope of the C-400 Complex OU Final Remedial Action

- Investigate all remaining building structures (e.g. slab and subsurface structures)
- Investigate releases of any hazardous substances to soils and or groundwater associated with the C-400 Cleaning Building and C-400 Complex area operations
- Fully define the contamination found within the C-400 Complex
- Remedy selection to address source areas of contamination and related contaminants of concern (COC), including demolition of the C-400 Cleaning Building

Investigation Techniques

Field Activities

- **Gamma walkover surveys:** to delineate areas of high radiological activity and identify locations for collecting samples of surface soil
- **Monitoring wells** (rehabilitation, new construction, sampling, borescope): to provide a more in-depth look at groundwater contamination addressed in the RI/FS
- **Defined sample borings**: drilling/sample locations and depths
- **Geotechnical borings:** provides technical data to support remedy selection
- **Concrete samples:** indicate present contaminants; determine if the concrete is a source to the underlying media

Investigation Techniques

Field Activities

- **Piezometers:** to monitor water levels in the sub-slab grave beneath the building
- **Five-Point composite sampling on a 50 x 50 ft. grid:** provides an average concentration across the grid
- **Membrane interface probe /Dye-enhanced laser induced fluorescence**: tools used to define the extent of TCE source zones
- **Contingency sample borings:** used to delineate all potential source areas further and address potential data gaps.

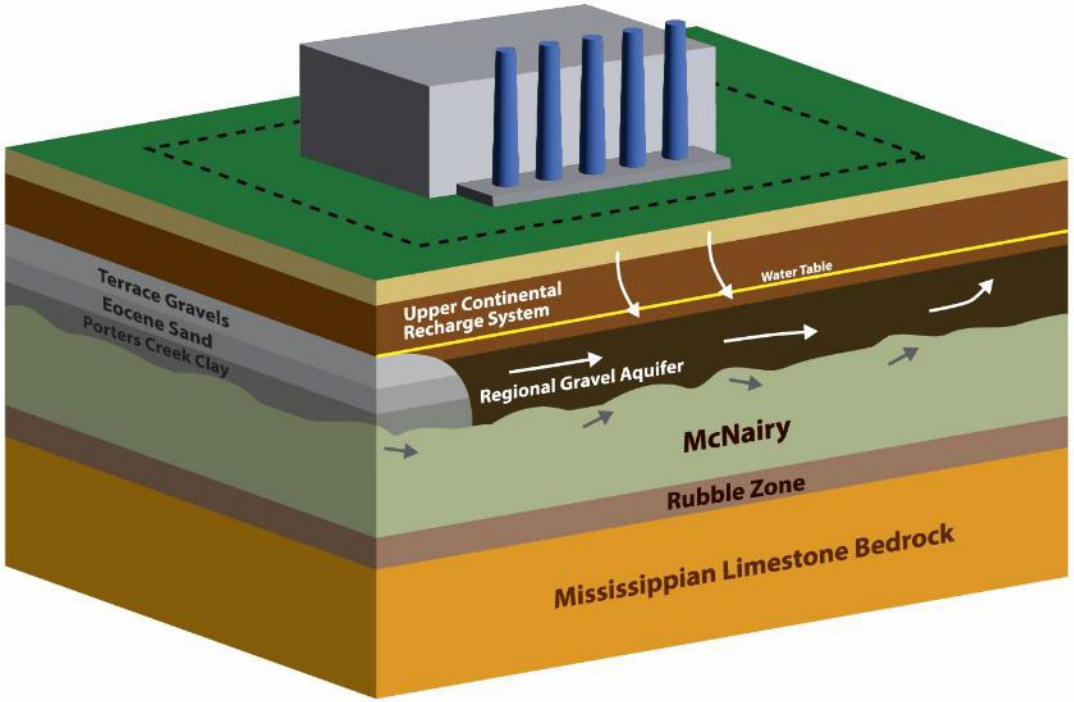
C-400 Complex RI/FS Field Work

- October 1, 2019 – EPA and KDEP approved the C-400 Complex RI/FS Work Plan
- November 11, 2019 – Field work began
  - Rehabilitation/maintenance of existing monitoring wells (MWs)
  - Gamma Walkover Surveys
- March 3, 2020 – Drilling activities began
- March 3, 2020 to March 31, 2022 – Collected information during RI/FS field work to develop the RI/FS Report and subsequently to support remedy selection for a final remedial action at the C-400 Complex
- March 31, 2022 – Completed field work, including disposition of waste

FFA Key Points of Agreement

Federal Facilities Agreement (FFA) parties agreed to the following key points:

- Incorporate the physical demolition of the C-400 Cleaning Building into the C-400 Complex Final Remedial Action
- Final remedial action expected to address contamination in the Upper Continental Recharge System (UCRS) and Regional Gravel Aquifer to include the Upper McNairy



C-400 Complex RI/FS Report

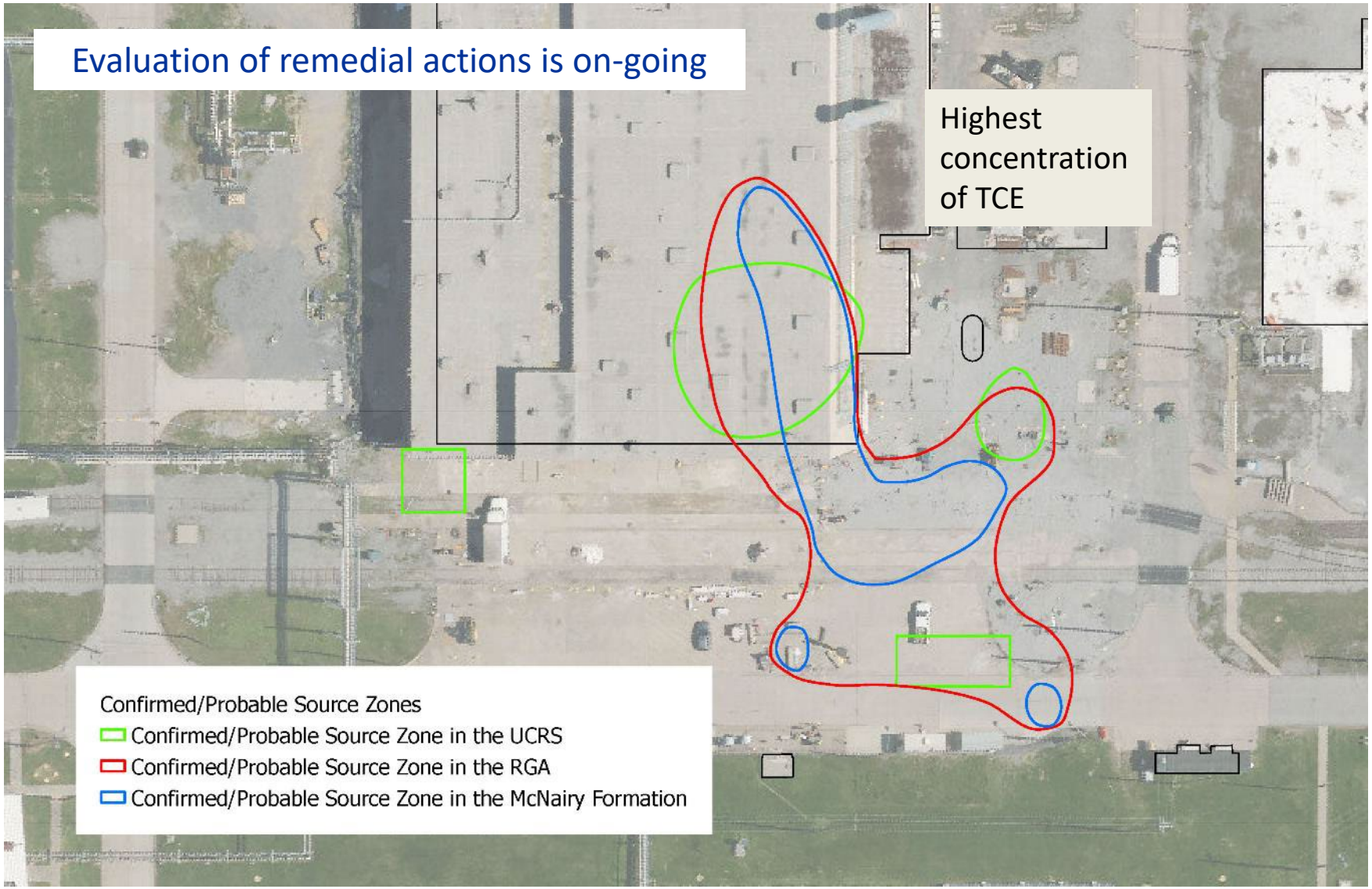
The RI/FS Report was developed to:

- Characterize Nature of Source Zone(s)
- Define Extent of Source and Contamination in Soil and Remaining Structures
- Evaluate Transport Mechanisms and Pathways
- Complete a Risk Assessment for the C-400 Complex
- Identify, develop and evaluate remedial alternatives

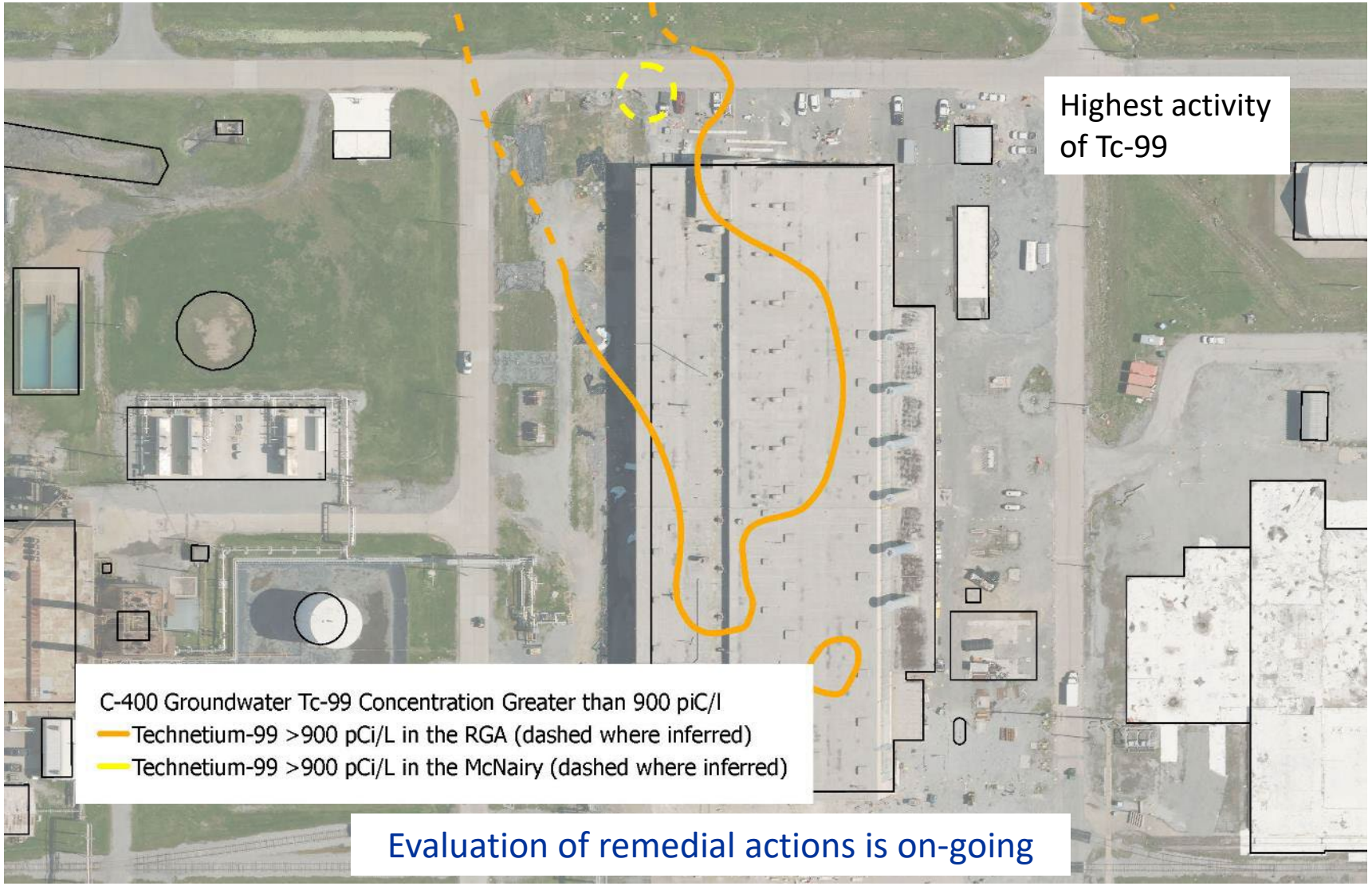
Results of the Remedial Investigation

- **Surface Soil (0-1 ft)**
  - Identified uranium-238 as primary risk driver
  - Examples of other contaminants include thorium-230, uranium metal and uranium isotopes
- **Surface and Subsurface Soils (0-16 ft.)**
  - Identified uranium metal as primary risk driver
  - Examples of other contaminants include thorium-230 and TCE
- **Groundwater**
  - Identified TCE as the primary risk driver
  - Examples of other contaminants include chromium, *cis*-1,2 dichloroethene (DCE), 1, 1, 2-tricholorethane (TCA) and Tc-99 in Regional Gravel Aquifer

C-400 Complex RI/FS Conclusions



C-400 Complex RI/FS Conclusions



Evaluation of remedial actions is on-going

Examples of Potential Cleanup Remedies

- Demolish Buildings and Slabs
- Excavate Soils
- Bioremediation
- Barrier Wall
- Pump & Treat
- Thermal Heating

C-400 Complex RI/FS

Questions?

PADUCAH GASEOUS DIFFUSION PLANT

CITIZENS ADVISORY BOARD

MINUTES OF THE THURSDAY, JANUARY 19, 2023, CAB BOARD MEETING • 5:30 P.M.

Location: Emerging Technology Building, WKCTC, Paducah, Kentucky

Citizens Advisory Board (CAB) Members Present: Don Barger, Fran Johnson, Clint Combs, Phil Brown, Elizabeth Wilson, Myron Wessell, Eric Butterbaugh, Hannah Chretien, William Murphy

CAB Members Absent: Billy Bob Clark, Victoria Caldwell, Riley Willett, Blake Summarell

U.S. Department of Energy (DOE) and Contractors: Buz Smith, Jennifer Woodard (TEAMS), Hayly Wiggins, EHI Consultants (EHI)

Liaisons: Brian Begley (TEAMS), Division of Waste Management; Christopher Travis (TEAMS), Commonwealth of Kentucky Energy and Environment Cabinet; Brian Lainhart (TEAMS), Steve Christmas, Four Rivers Nuclear Partnership

Attendees: Zachary Boyarski, Gaye Brewer

Facilitator: Eric Roberts, EHI

Approved by Don Barger, Board Chair

Signature on file

Don Barger

Call to Order: 5:30 pm Don Barger.

Barger:
Welcome to the January Board Meeting. Thank everyone for attending.

Attendees introduced themselves.

Review of Agenda: You have a copy of tonight's agenda in front of you. Are there any changes that need to be made on the agenda tonight? Hearing none, we will proceed.

DOE comments provided by Jennifer Woodard: The bill for 2023's Budget passed, and the site is working through the contract changes with the additional funds that have been received. The goal is to spend the additional funds by the end of the summer.

Federal Coordinator Comments provided by Buz Smith: We got the Notice to Proceed on the next switchyard work at 535. This work will differ from 537, which was entirely done by a contractor. For this work, Four Rivers Nuclear Partnership will use United Steel Workers to do this switchyard. Hoping this work will start in the next 60 days. We have notified PACRO on this next project since any harvested commodities will be transferred to them for sale or use. One note of interest, we have been asked to locate a 911 weather transponder at the site. DOE is working with the community to try to help with this project.

Liaison Comments provided by Brian Begley Division of Waste Management. DOE: We have a website, Paducah Gaseous Diffusion Plant (PGDP) - Kentucky Energy and Environment Cabinet , **where we uploaded two annual reports from 2020 and 2021. And we also uploaded the 2023 AIP sampling strategy document detailing all samples we plan on taking this calendar year. Around January 5th, we received the C-400 Remedial Investigation/Feasibility Study report. It is one of the largest documents we have received. We have 90 days to review it.**

Barger: Are there other questions for our liaisons? None

You will see before you the recommendations and responses received from DOE. They could have been accepted or rejected, and all four were accepted.

Smith: These recommendations were excellent. Each had several bullet points, so DOE has accepted the entire document and will report to the CAB on each bullet point as it gets addressed.

Roberts: Getting a response on a recommendation is no small feat. Typically, a response can take 4 -6 months. However, because of our open dialogue with DOE,

they were preparing the response as we discussed the recommendation, which is why we had these responses in 5 weeks.

Barger: Thank you, Buz, and our CAB members and support staff who assisted in preparing these recommendations.

Jennifer Woodard, Deputy Designated Federal Officer, DOE
Presentation-C-400 Complex Remedial Investigation Feasibility Study

Question/Comment:	***Answer:***
	Begley: Just a comment here, before DOE's contractor ever went into the field held in Lexington and Paducah where EPA, Kentucky, DOE, and its contractors got together to determine where the sample locations were going to be. We looked at historical data and used computer models to decide where to sample, and we had at least one boring in each 50 x 50-foot grid. Then we had additional contingency samples to work with. This was essential to the sampling process.
Barger: On the Field Activities slide, what is Sub-Slab Grave?	**Murphy:** That is a typo. It should read Sub-Slab Gravel.
Smith: Why are we removing the slab for C-400 when we did not remove the slab for other buildings?	**Woodard:** We do Removal Actions to take down buildings, but slabs are handled under a separate project called Soils and Slabs and will be Remedial Actions. We always treated the D & D buildings under Removal Actions and the slabs under Remedial Actions, but we wanted this whole city block remediated. We knew there was contamination within the slab itself. We knew that if we wanted to address the entire city block, we needed to address the slab at the same time. This is a new, more holistic approach for the site.
Brown: People think of C-400 as equipment moving in, being cleaned, and moving out of the building. But C-409 cleaned the equipment, then the solutions	**Woodard:** C-409 is a separate project and has yet to be characterized but is in the future plans.

used were pumped into C-400. So, C-409 would also seem to be a part of the cleanup.	**Begley:** We carefully looked at all the systems and processes to evaluate where all the drain lines and repairs were done to ensure we had borings to characterize the samples. **Woodard:** I believe we held 18 meetings, not short meetings, but half-day to all-day meetings to decide where to sample and strategy to get the best data for all decisions.
Murphy: What is the health risk of Uranium 238?	**Woodard:** When you take the samples and see the concentrations and run those through the risk models, you see there is a Human Health risk 10^-6. Per our FFA agreement, we are required to clean this up. **Begley:** EPA, Kentucky, and DOE meet quarterly to discuss the risk methods and what those levels are based on the most recent scientific data. **Roberts:** A quick Google search states that U-238 has a risk of lung cancer when inhaled or ingested. Its toxicity level is more concerning than any radiation level.
Butterbaugh: What was the biggest surprise finding from the investigation?	**Begley:** Before we began the investigation, we had data on the east side of C-400 and the southeast side, but we knew nothing of what was under the building. When we took the site back from USEC, we wanted to see what was under this building, but we didn't want to dig down and hit piping that might make more of a mess. We knew there were miles of piping that may have deteriorated or not be in the best shape. So we attempted video borescope work within the drains to see if there were obvious obstructions or something not working as designed, then we would put borings down to make sure no contaminant would go straight down. There was a lot of mystery about how thick the gravel beneath the building was, which was a concern because if there was contamination within the

	gravel layer, it would flow down with water, but what we found through the borings was that the gravel layer was bone dry, no evidence of water pooling at all. Also, the TCE concentration levels under the building were lower than expected. **Woodard:** The real surprise was that there wasn't more TCE under the building. We did not find any unexpected contaminants.
Smith: The lesser amount of TCE in the shallower area, is that due to the ERH (Electric Resistant Heating) that has been used there?	**Woodard:** We did do ERH on the east side corner, which did reduce the TCE level in the UCRS (Upper Continental Recharge System), but we cannot use the same heating technology in the RGA (Regional Gravel Aquifer) because it moves so fast. and the configuration wasn't tight enough to effectively heat the water when we did the heating. We have done no EHR under the building, only on corners adjacent to the building.
Brown: What year were the floor drains in C-400 capped off? I seem to remember that they were capped around 2000.	**Woodard**: Somewhere between 2015 – 2017. There may have been some sealed before we got the site back from USEC, but I know that we had to seal a lot of drains between 2015 and 2017. **Begley:** I looked into this, as well, because I wondered why there were so many sealed drains. Essentially, DOE had a policy where if they were sealed, we would not unseal them to do the video borescope work. I found out there was a large effort by USEC to seal drains. They wanted to make sure that whatever actions were happening in C-400, they wouldn't get dinged on a Kentucky permit. DOE sealing the drains was in preparation for a building demo. When you are demoing a building, you have atmospheric water and dust suppression water. So you want to ensure that you are not allowing contaminants to mobilize with open floor drains.

	Woodard: Part of the prep for final deactivation is to make sure all floor drains are completely sealed.
Smith: The reason you don't hear more about Technitium-99 is that there has been nothing found off the property. TC-99 was introduced as a byproduct of the feedstock uranium from other sites.	**Woodard:** Tc-99 is found off DOE property, but it is below the 900 picocuries per liter allowed by the EPA maximum contaminant level. Anything above 900 piC/l is found on DEO property. This is because we worked to eliminate the source and the pump and treat system. C-400 did other work than cleaning, such as gold dissolving and other systems in that building, and the Tc-99 is under these areas of the building as well. We also had spent fuel from Hanford and Savannah River back through our system, and it had Tc-99 in it.
Brown: It was part of the seed as early as the 1950s. It was fed into the reactor to produce plutonium, and that process was discontinued in the 1970s. When I worked in the feed plant, the reactor return material was widely used, and we processed that through the system for a good many years. Back in the early 1960s, they did not know what Tc-99 was, and the scientists in Oak Ridge were trying to find uses for it. We had a recovery system in C-410, C-420, and UF6 production facilities. We used Magnesium fluoride to do that, and then that mag fluoride was taken to C-400 for cleanup.	**Woodard:** We have more Tc-99 than Portsmouth does because of the feedstock that came here, and it will be one of our more considerable challenges. From a groundwater standpoint, it is one of the easier contaminants to use pump and treat as passive remediation.
Murphy: Assuming no surprises, when do you anticipate completing the C-400 block? Between now and that end date, what percentage of your budget will C-400 take up? So, 20% - 25% of your total budget?	**Woodard:** Tentatively**,** 2031, but that depends on which remedial actions are approved. 30 – 50 million per year of the budget. The demo alone will run us 15 – 20 million. Yes, that is correct.
Barger: As you look at the remedies, how much emphasis do you place on cost, time frame, ease of method, efficiency, and employment levels?	**Woodard:** When you look under CERCLA **(**Comprehensive Environmental Response, Compensation, and Liability Act) at alternatives, you have nine criteria, and we have to choose based on compliance with

	these criteria. We go through all these criteria in the feasibility study, and each alternative is looked at in relation to all nine criteria.
Brown: The drought we had this summer and the floods of 2011, what impact did that have on the aquifer and the work being performed there?	**Woodard:** I don't think it changes the aquifer, but it changes our water table. When we have floods, the aquifer flow changes, but within the plant, we are more concerned with the water table. In excavation, it matters when digging to know when you would hit the water. **Begley:** We have seen in some of the sampling wells in periods when the water table is higher, we tend to see higher concentration with TCE than when the water table is lower. The thought there is that the water is coming into contact with some contamination that might not always be in saturated water. It is bound up in the soil. One thing that DOE's contractor has done is to go around to the monitoring wells and get a water table measurement, and we collect water table measurements on TVA property to watch the water table. There is a plume map produced each year. The next one should be for 2022 and out in August of this year. **Woodard:** That map fluctuates based on treatment. Sometimes the treatment can break up the contaminants, which looks like the plume is larger, but it settles back down in the following map to be smaller. So there will always be fluctuation.

Roberts: Thank you for the presentation and information. This is one of the items that is earmarked for a recommendation from the CAB. You are looking for something other than a technical recommendation from us. What kind of recommendation are you looking for from the CAB?

Woodard: As representatives of the community, we would like to hear from you what would be a hindrance to the community. How does a particular treatment affect the future use of the site? You can say that any alternatives will work or say we like all but one.

An Ad Hoc Subcommittee is formed to consider a recommendation based on the C-400 RI/FS.

Bill Murphy, Hannah Chretien, and Don Barger volunteered. Any other members of the CAB are invited to participate in this subcommittee.

The meeting adjourned at 7:08 pm.