APPENDIX A –
REGULATORY INFORMATION AND CORRESPONDENCE

APPENDIX A.1

TDEC ORDER

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

IN THE MATTER OF:	)	
	)	
TENNESSEE VALLEY AUTHORITY	)	**ORDER NUMBER: OGC15-0177**
	)	
RESPONDENT	)	

COMMISSIONER'S ORDER

PREAMBLE

This Order (Order) has two purposes. First, it is intended to establish a transparent, comprehensive process for the investigation, assessment, and remediation of unacceptable risks, resulting from the management and disposal of coal combustion residuals (CCR) at the Tennessee Valley Authority's (TVA) coal-fired power plants in Tennessee.[1] Second, it is intended to establish the process whereby the Tennessee Department of Environment and Conservation (Department) will oversee TVA's implementation of the federal CCR rule to insure coordination and compliance with Tennessee laws and regulations that govern the management and disposal of CCR.

On December 19, 2014, the Administrator of the Environmental Protection Agency (EPA) signed a final rule that establishes a comprehensive set of requirements for the disposal of CCR from electric utilities. This rule was published in the *Federal Register* on April 17, 2015, 80 Fed. Reg. 21302-21501, and becomes effective on October 19, 2015.

[1] This order does not apply to TVA's Gallatin Fossil Plant. CCR management and disposal activities at that facility are subject to an enforcement lawsuit filed on behalf of the Department on January 7, 2015.

EPA's regulations specifically do not preempt state law requirements, and EPA recognized in its rulemaking the significant role that states play in implementing requirements for managing CCR. EPA strongly encouraged states to adopt and implement the CCR criteria as state law. Following the December 2008 Kingston ash spill, Tennessee amended its laws and regulations to reduce the risk of another such event. Among the changes made are requirements that all new or expanded coal ash disposal facilities must include a Resource Conservation and Recovery Act of 1976 (RCRA) Subtitle D equivalent liner and final cap. Further, pursuant to T.C.A. §68-211-107(c) all solid waste disposal facilities must have groundwater monitoring and if sampling results indicate that ground water protection standards are exceeded, an assessment monitoring program is required. Further, required corrective measures are specified in Chapter 0400-11-01-.04 of the Rules and Regulations of the State of Tennessee.

Therefore, this Order is issued pursuant to the provisions of Tennessee's Waste Management and Remediation laws and in furtherance of the public policies specified therein.

PARTIES

I.

Robert J. Martineau, Jr. is the duly appointed Commissioner of the Tennessee Department of Environment and Conservation.

II.

Tennessee Valley Authority is a federal agency and instrumentality of the United States Government pursuant to the Tennessee Valley Authority Act of 1933, as amended, 16 U.S.C.

Sections 831-831ee. Service of process may be made on William D. Johnson CEO at 400 Summit Hill Drive, Knoxville, TN, 37902-1499

JURISDICTION

III.

Pursuant to T.C.A. §68-211-103(8), "[s]olid waste" is defined as "spent material, byproducts, . . . ash, sludge, and all discarded material including solid, liquid, [or] semisolid . . . material resulting from industrial, commercial, and agricultural operations." CCR are solid waste.

IV.

Pursuant to T.C.A. §68-211-107(a), "[t]he Department is authorized to exercise general supervision over the operation and maintenance of solid waste processing facilities and disposal facilities or sites. Such general supervision shall apply to all the features of operation or maintenance *which* do or *may* affect the public health and safety or the quality of the environment *and which* do or *may affect* the proper processing and disposal of solid wastes." (Emphasis added).

V.

Pursuant to T.C.A. §68-211-107(c) "[t]he Department shall require all solid waste disposal facilities to have a groundwater monitoring program and report sampling results to the department at least once each year. *If sampling results indicate that ground water protection standards are exceeded, the owner or operator of the facility shall commence an assessment monitoring program, in accordance with regulations adopted by the board and carry out all corrective measures specified by the commissioner.*" (Emphasis added). Further, required corrective measures are specified in Chapter 0400-11-01-.04 of the Rules and Regulations of the State of Tennessee.

SCOPE OF THE ORDER

VI.

This Order shall apply to all "CCR disposal areas" at the coal-power plant sites listed below that TVA operates or has operated in Tennessee (hereinafter sites or plants). "CCR disposal areas" include all areas where CCR disposal has occurred, including without limitation, all permitted landfills, all "non-registered" landfills (landfills that existed before they were subject to regulation), and all current and former surface water impoundments that contain CCR.

- Allen Fossil Plant
- Cumberland Fossil Plant
- Johnsonville Fossil Plant
- Kingston Fossil Plant
- Bull Run Fossil Plant
- John Sevier Fossil Plant
- Watts Bar Plant

ORDER

VII.

WHEREFORE, I, Robert J. Martineau, Jr., hereby ORDER TVA to perform the following actions and comply with the conditions set-out below.

A. Site-Wide CCR Investigation, Assessment and Remediation

TVA shall conduct an investigation of CCR disposal areas at the TVA plant sites listed in Section VI by taking the following actions:

a. Within 60 days of the issuance of this Order, an investigation conference shall be scheduled at which TVA shall brief the Department on its CCR management plans at each of the listed plant sites and provide information concerning CCR disposal, releases, existing risk analysis, sampling information, etc. At this briefing, TVA shall discuss and provide information about:

i. Groundwater monitoring and other environmental data at each plant site, including any exceedances of groundwater protection standards and the detection of CCR constituents listed in Appendix III and Appendix IV of the CCR rule in ground water, surface water, or soil;

ii. Biological monitoring reports and whole effluent toxicity testing that TVA may have conducted near each plant site;

iii. The hydrology, geology, and hydrogeology of each plant site with an emphasis on the geology at the locations where TVA has disposed of CCR;

iv. The results of soil borings and analysis of rock cores at each site, including soil, rock, and CCR materials encountered in the borings as well as the analytical work performed on soil boring samples;

v. Any surface seeps and other observable surface releases from CCR impoundments to surface water;

vi. Plans and schedule for closing wet impoundments and converting CCR processes to dry; and

vii. The history of CCR activities at each site.

b. During the investigation conference, the Department and TVA shall discuss what additional documents and/or information TVA shall be required to provide the Department to complete the investigation. Any additional documents requested by the Department shall be provided as expeditiously as practicable, but no later than 45 days, after the conference. Documents may be provided in paper or electronic format or may be posted at a secure internet link.

c. The Department recognizes that TVA and EPA exchanged detailed information about the condition of its CCR impoundments and that this information is at http://www.epa.gov/osw/nonhaz/industrial/special/fossil/surveys2/index.htm. TVA need not provide copies of reports or analyses found at this internet site.

d. Following the initial investigation conference and the review of available information about CCR at each plant site, the Department shall identify what, if any, additional information is needed to complete the investigation of each site. The Department shall discuss with TVA the basis for this determination and a schedule for providing the additional information on a per-site basis. TVA shall develop Environmental Investigation Plans (EIPs) for each site and submit them to the Department. Each EIP shall include a schedule of the work to be performed to fully identify the extent of soil, surface water, and ground water contamination by CCR. TVA shall implement the EIP in accordance with a schedule approved by the Department. Within 60 days of completion of the EIP, TVA shall submit an Environmental Assessment Report (EAR) to the Department. The EAR shall provide an analysis of the extent of soil, surface water, and ground water contamination by CCR at the site. The Department shall evaluate the EAR to determine if the extent of CCR contamination has been fully defined.

e. The process set-out in VII A. item d. above, shall be repeated until the Department determines there is sufficient information to adequately characterize the extent of CCR contamination in soil, surface water, and ground water at each site.

f. Upon approval of each EAR by the Department, TVA shall submit, within 60 days, a Corrective Action/Risk Assessment (CARA) Plan. The CARA Plan shall specify all actions TVA plans to take at the site and the basis of those actions. Corrective measures may include (1) soil, surface water, and ground water remediation, (2) risk assessment and institutional controls, or (3) no further corrective action. As appropriate for the site, the final approved CARA Plan shall include:

i. The method(s) TVA will employ to remove and/or close in place CCR material at the site;

ii. The method(s) TVA will employ to remediate CCR contaminated soil, surface water, and ground water at the site;

iii. The method(s) TVA proposes to restore any natural resources damaged as a result of the CCR waste water treatment and on-site CCR disposal:

iv. A plan for monitoring the air and water in the area during the cleanup process;

v. A plan to ensure that public and private water supplies are protected from CCR contamination and that alternative water supplies are provided to local citizens if CCR contamination above ground water protection standards is detected in ground water drinking wells; and,

vi. A plan addressing both the short term and long term management of CCR at the site, including remediation and stabilization of the CCR surface impoundment(s) and/or landfill and/or non-registered disposal site(s), to include design drawings and appropriate supporting engineering calculations.

g. The CARA Plan shall include a schedule of activities to be completed by TVA. The Department and TVA shall discuss the draft CARA Plan and any changes that the Department may determine are necessary for tentative approval of a plan. Following completion of the Public Involvement process set-out in Section B. of this Order, the Department shall decide to either accept or reject the CARA Plan. Should the Department disapprove the CARA Plan, the Department shall provide comments to TVA identifying the deficiencies. TVA shall correct the deficiencies and resubmit the CARA Plan to TDEC for approval.

B. Public Involvement

The Department shall identify opportunities for TVA and the Department to involve the public during the site investigation, assessment, and remediation processes of this Order. This shall include TVA providing the Public notice of all EIP and CARA Plans. Each Public Notice shall contain a summary of the proposed plan and it shall be published in a manner specified by the Department. The Public shall have a minimum of 30 days to comment on each plan; and, if any comments are received, TVA shall have 30 days to provide the Department responses to the comments. After consideration of all Public comments and TVA's responses, the Department will approve, modify, or reject each EIP and CARA Plan.

C. Additional Time

TVA may request a time extension for any deadline in this Order, or in plans approved pursuant to this Order, prior to the deadline. The Commissioner may grant the time extension for good cause shown by TVA; provided, however, that the Department and TVA recognize that deadlines set by the CCR rule cannot be extended except as allowed therein.

D. CCR Rule Implementation

1. CCR Rule Compliance: The requirements of Sections A. and B. of this Order are supplemental to the CCR rule and are not intended to impede or delay actions that TVA takes in compliance with CCR rule requirements. The Department recognizes that TVA may, in compliance with CCR rule requirements, elect to close CCR surface impoundments and/or landfills before the full extent of contamination at a site has been determined. However, if TVA elects to do so, it may later be required by Section A. of this Order to take other and further remedial actions.

2. Notice of CCR Documents: As required by the CCR rule, TVA shall notify the Department when it posts CCR-related documents on its CCR rule public website. The Department in its discretion may request that TVA provide it electronic or paper copies of specific documents.

3. Department Review Process: The Department shall have 60 days to review CCR rule related plans, demonstrations, and assessments, after they are placed on TVA's public CCR rule website. If the Department does not inform TVA that it has comments on a plan, demonstration, or assessment within this 60-day period, TVA may proceed with such plan, demonstration, or assessment. If the Department informs TVA that it has comments, the Department and TVA shall meet to discuss those comments within 30 days. Thereafter, TVA shall appropriately modify its plans, demonstrations, or assessments to respond to the Department's final comments and resubmit the plan, demonstration, or assessment to the Department. Thirty (30) days thereafter, unless informed otherwise by the Department, TVA may proceed with such plan, demonstration, or assessment. The Department's review and comment on a CCR-rule plan, demonstration, or assessment shall not be deemed its approval of actions required under Section A of this Order. However, TVA may assume the risk of implementing a CCR-rule plan, demonstration, or assessment.

4. Preliminary Activities: Notwithstanding any other provision of this Order, TVA may proceed immediately with preliminary activities (e.g., pond surface water drawdown, contouring, etc.) that are necessary to prepare CCR-surface impoundments and/or landfills for closure; provided, however, that discharges from permitted outfalls must remain within limits set forth in applicable National Pollutant Discharge Elimination System permits.

E. Reimbursement of Costs

TVA shall pay all costs associated with the Department's oversight of the implementation of this Order. These costs shall include, but are not limited to, mileage, lab expense, salary, benefit, and administrative costs for the Department's employees and other state employees actively employed in oversight of work under this Order (including preparation for and attendance at meetings), at the current State overhead rate. Oversight costs also include expenditures for separate office space and related expenses, services contracted for by the Department that facilitate or support the Department's oversight of work under this Order, including, but not limited to, the review of documents submitted by TVA to the Department as required by the CCR rule. The Department shall provide TVA with periodic statements reflecting oversight costs incurred. Within 60 days of the receipt of each such statement, TVA shall pay to the Department the amount invoiced.

F. Point of Contact and Written Communications

The Department and TVA shall designate two individuals to serve as the primary technical and compliance points of contact for implementation of this Order, in writing, sent to the other party. Either party may change a designated point of contact at any time by informing the other party to the change in writing.

G. Assessment Conferences

At any time deemed necessary by the Department, the Department may schedule an assessment conference that TVA shall attend.

H. Termination of Order

Upon completion of all tasks set forth in this Order, the Department shall issue to TVA a letter stating the requirements of this Order have been fulfilled and no further action of TVA is required under this Order; provided, however, that the Department may terminate the Order earlier if changes in conditions warrant this, including changes in applicable regulations

ASSESSMENT OF CIVIL PENALTIES

VIII.

If TVA does not meet the requirements of this Order, TVA shall pay the following administrative penalties upon request by the Department:

a. Failure to comply with any specific requirement, including deadlines set-out in this Order or which are specified in schedules that are approved by the Department pursuant to this Order: FIVE THOUSAND DOLLARS ($5,000) per noncompliance and ONE THOUSAND DOLLARS ($1,000) for each day until the noncompliance is remedied.

b. Failure to comply with CCR rule requirements: FIVE THOUSAND DOLLARS ($5,000) for each noncompliance and ONE THOUSAND DOLLARS ($1,000) for each day until the noncompliance is remedied.

The Department, in its discretion, may waive a potential penalty in whole or in part for good cause including, but not limited to, a showing by TVA that events beyond its control (i.e., a force majeure event such as act of God, acts of war or terrorism, and construction, labor or equipment delays) impeded or prevented it from complying.

SITE ACCESS

IX.

During the effective period of this Order, and until the Department determines that all activities under this Order have been completed, the Department and its representatives or designees, upon presentation of credentials, shall have access during normal business hours and, upon reasonable notice, at non-business hours to the sites listed in Section VI. of this Order. Such access may be for the purpose of monitoring activities; verifying data; conducting investigation; inspecting and copying records, logs, or other documents that are not subject to a legally applicable privilege; and/or conducting other activities associated with the implementation of this Order. Nothing herein shall limit or otherwise affect the Department's right of entry, pursuant to any applicable statute, regulation or permit. The Department and its representative shall comply with all reasonable health and safety plans published by TVA or its contractor and used by site personnel for the purpose of protecting life and property.

RESERVATION OF RIGHTS

X.

This Order shall not be construed as waiving any right or authority available to the Commissioner to further assess TVA for liability for civil penalties or damages incurred by the State. The right to order further investigation, remedial action, and/or monitoring and maintenance is also specifically reserved. Further, this Order shall not be construed as waiving, settling, or in any manner compromising any natural resource damage claims which the Department or the State of Tennessee may have under Section 107 of CERCLA or any other statute, rule, regulation, or common law.

Issued this 6th day of August, 2015, by the Commissioner of the Tennessee Department of Environment and Conservation.

8/6/15
Date

Robert J. Martineau, Jr.
Commissioner
Department of Environment and Conservation

NOTICE OF RIGHTS

Tennessee Code Annotated ("T.C.A.") §68-211-113 and §68-212-215(d) allows the Respondent to appeal this Order. To do so, a written petition setting forth the grounds (reasons) for requesting a hearing must be RECEIVED by the Commissioner within THIRTY (30) DAYS of the date the Respondent received this Order and Assessment or this Order and Assessment become final (not subject to review).

If an appeal is filed, an initial hearing will be conducted by an Administrative Law Judge (ALJ) as a contested case hearing pursuant to the provisions of T.C.A. §68-211-113, T.C.A. §68-212-215(d), T.C.A. §4-5-301 *et seq.* (the Uniform Administrative Procedures Act), and Rule 1360-04-01 *et seq.* (the Department of State's Uniform Rules of Procedures for Hearing Contested Cases Before State Administrative Agencies). Such hearings are legal proceedings in the nature of a trial. Individual Respondents may represent themselves or be represented by an attorney licensed to practice law in Tennessee. Artificial Respondents (corporations, limited partnerships, limited liability companies, etc.) cannot engage in the practice of law and therefore may only pursue an appeal through an attorney licensed to practice law in Tennessee. Low income individuals may be eligible for representation at reduced or no cost through a local bar association or legal aid organization.

At the conclusion of any initial hearing the ALJ has the authority to affirm, modify, or deny the Order. This includes the authority to modify (decrease or increase) the penalty within the statutory confines of T.C.A. §68-211-117 and T.C.A. §68-212-213 (from $100 to $10,000 per day per violation). Furthermore, the ALJ, on behalf of the Board, has the authority to assess additional damages incurred by the Department including, but not limited to, all docketing expenses associated with the setting of the matter for a hearing and the hourly fees incurred due to the presence of the ALJ and a court reporter.

Any petition for review (appeal) must be directed to the Commissioner of the Tennessee Department of Environment and Conservation, c/o E. Joseph Sanders, General Counsel, Department of Environment and Conservation, 2nd Floor William R. Snodgrass Bldg., 312 Rosa Parks Avenue, Nashville, Tennessee 37243-1548. Payments of any civil penalty and/or damages shall be made payable to the "Treasurer, State of Tennessee" and sent to the Division of Fiscal

Services - Consolidated Fees Section, Tennessee Department of Environment and Conservation, 10th Floor, William R. Snodgrass Bldg., 312 Rosa Parks Avenue, Nashville, Tennessee 37243. The case number, OGC15-0177, should be written on all correspondence regarding this matter.

E. Joseph Sanders BPR# 6691
General Counsel
Department of Environment & Conservation
312 Rosa L. Parks Avenue, 2nd Floor
Nashville, Tennessee 37243-1548
PH 615-532-0131

APPENDIX A.2
REGULATORY CORRESPONDENCE

Tennessee Valley Authority, 1101 Market Street, BR 4A-C, Chattanooga, Tennessee 37402-2801

December 10, 2018

Mr. Chuck Head
Assistant Commissioner
Tennessee Department of Environment
and Conservation (TDEC)
Tennessee Tower William R. Snodgrass Building
312 Rosa L. Parks Avenue
Nashville, Tennessee 37243-1548

Dear Mr. Head:

TENNESSEE VALLEY AUTHORITY (TVA) – JOHNSONVILLE FOSSIL PLANT (JOF) – ENVIRONMENTAL INVESTIGATION PLAN (EIP) REVISION 4 – COMMISSIONER'S ORDER NUMBER OGC15-0177 (ORDER), SECTION VII.A.

Enclosed is the EIP Revision 4 for JOF as required by Section VII.A. of the Order. Revision 4 updates Revision 3 to incorporate standardized language and corrections as presented in the enclosed change log.

In accordance with the Order, after Revision 3 was accepted by TDEC on August 13, 2018, TVA solicited and accepted public comments on the EIP. This public comment period extended from September 26, 2018, through November 9, 2018, with TVA hosting a public meeting on October 18, 2018. TVA received no public comments.

If you have questions regarding this information, please contact me at (423) 751-3304, or by email at sstidwell@tva.gov.

Sincerely,

M. Susan Smelley

M. Susan Smelley
Director
Environmental Compliance and Operations

Enclosure

cc (Electronic Distribution - w/o Enclosure):

Ms. Angela Adams
CCR Environmental Consultant
TDEC Division of Water Resources
761 Emory Valley Road
Oak Ridge, Tennessee 37830

Mr. Robert Burnette, P.E.
Tennessee Department of Environment
and Conservation
1301 Riverfront Parkway, Suite 206
Chattanooga, Tennessee 37402

Mr. James Clark
Chief Geologist
TDEC Columbia Field Office
1421 Hampshire Road
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Mr. Britton Dotson
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Ms. Jenny Howard
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Ms. Shari Meghreblian, Ph.D.
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Mr. Caleb Nelson
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Mr. Robert S. Wilkinson
Coal Combustion Residual Technical Manager
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312 Rosa L. Parks Avenue
Nashville, TN 37243
Office: (615) 253-0689
e-mail: Robert.S.Wilkinson@tn.gov

December 12, 2018

M. Susan Smelley
Director
Environmental Compliance and Operations
Tennessee Valley Authority
1101 Market Street, BR 4A-C
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC 15-1077
TVA Johnsonville Coal Fired Fossil Fuel Plant
Environmental Investigation Plan Approval

Dear Ms. Smelley:

Tennessee Valley Authority (TVA) submitted the Environmental Investigation Plan (EIP) Revision 4 TVA Johnsonville Coal Fired Fossil Power Plant (TVA JOF) on December 10, 2018. Tennessee Department of Environment and Conservation (TDEC) has completed its review of the submittal and found it to be acceptable.

TVA is approved to begin field data collection activities as outlined in the TVA JOF EIP Revision 4. Within 30 days of this letter, TVA will schedule a meeting to present and submit a revised schedule for field data collection activities at TVA JOF.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 253-0689.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC: Chuck Head
Rob Burnette
Jennifer Dodd
Jenny Howard
Roy Quinn
Britton Dotson
Angela Adams
Pat Flood
Tisha Calabrese-Benton
Shawn Rudder
James Clark
Caleb Nelson
Joseph E. Sanders
Bryan Wells

Stantec

Memo

To:	Missy Hedgecoth, Roy Quinn, Brandon Boyd, Paul Thomas	From:	Stantec
File:	Proposed Screening Levels for Sample Results in Environmental Assessment Report (EAR)	Date:	March 26, 2021

Reference: Proposed Screening Levels for Sample Results in the EAR

PURPOSE OF THE TECHNICAL MEMORANDUM

On August 6, 2015, the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to the Tennessee Valley Authority (TVA) for coal combustion residuals (CCR) compliance pursuant to the provisions of Tennessee's solid waste management and remediation laws. As part of the TDEC Order, Stantec is implementing Environmental Investigation Plans (EIPs) at seven TVA Fossil Plants in Tennessee. The EIP for each fossil plant provides Sampling and Analysis Plans (SAPs) for the types of investigations to be conducted at each fossil plant. As specified in the TDEC Order, within 60 days of the completion of the environmental investigations TVA is required to submit an Environmental Assessment Report (EAR), which shall provide *"…an analysis of the extent of soil, surface water, and ground water contamination by CCR at the site. The Department shall evaluate the EAR to determine if the extent of CCR contamination has been fully defined".* Collection of environmental samples is complete or nearing completion at all TVA Fossil Plants subject to the TDEC Order, and development of the EARs has commenced.

As required by the TDEC Order, samples of environmental media were analyzed for the following parameters listed in Appendix III and Appendix IV of the Federal CCR Rule, Title 40 of the Code of Federal Regulations Part 257 (40 CFR 257):

- antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, fluoride, lead, lithium, mercury (inorganic), molybdenum, pH (SU), radium 226 & 228, selenium, sulfate, thallium, and total dissolved solids.

Samples were also analyzed for five inorganic constituents listed in Appendix 1 of TN Rule 0400-11-01-.04 that are not listed in 40 CFR 257:

- copper, nickel, silver, vanadium, and zinc.

This Technical Memorandum describes proposed screening levels for the CCR Parameters analyzed in environmental investigation samples. The purpose of the screening levels in the EAR is to identify CCR Parameters in the environmental media that require further assessment in the Corrective Action Risk

Assessment Plan (CARA) to be submitted within 60 days of TDEC approval of the EAR. The screening levels used to evaluate environmental sample results are generic (not specific to an individual person or ecological receptor) and protective – frequently referred to as conservative. Environmental samples were analyzed for up to 26 individual CCR Parameters (listed above), as applicable to the media. CCR Parameters above screening levels will be further evaluated in the human health and ecological risk assessment in the CARA. Screening levels for protection of human health are proposed for groundwater and surface water. Screening levels for protection of ecological receptors are proposed for surface water, mayfly and fish tissue, and sediment. If there is more than one applicable screening level for an environmental medium (e.g. surface water), the lowest value will be selected to evaluate those analytical results in the EAR.

PROPOSED SCREENING LEVELS BY MEDIA

Groundwater

The proposed screening levels for groundwater are protective of the drinking water pathway for residential receptors. Analytical results for parameters detected in groundwater will be compared to screening levels obtained from the following hierarchy of sources:

- US EPA Maximum Contaminant Levels (MCLs)
- Tennessee MCLs in State of Tennessee Solid Waste Processing and Disposal (TN Rule 0400-11-01)
- US EPA groundwater protection standards listed in Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments (40 CFR Part 257.95(h))
- US EPA Secondary Maximum Contaminant Levels (SMCLs)
- US EPA residential tap water Regional Screening Levels (RSL).

The Proposed Human Health Screening Levels for Groundwater for the EAR are presented in Table 1.

Surface Water

Applicable screening levels for surface water are presented for human exposure through use of surface water for drinking water supply and for protection of fish and freshwater aquatic life. When more than one screening level is identified for the same parameter, the lowest of the available values is proposed as the screening level to evaluate surface water analytical results in the EAR.

Analytical results for parameters detected in surface water will be compared to screening levels for domestic water supply obtained from the following hierarchy of sources:

- State of Tennessee Drinking Water Standards (TN DWS) promulgated in the following Rules:
    - General Water Quality Criteria, Surface Water used for Domestic Water Supply (TN Rule 0400-40-03-.03)
    - Solid Waste Processing and Disposal (TN Rule 0400-11-01)

    - Public Water Systems (TN Rule 0400-45-01-.06 MCLS and 0400-45-01-.12 Secondary drinking water regulations)

- US EPA MCLs
- US EPA SMCLs
- US EPA residential tap water RSL
- US EPA Drinking Water Lifetime Health Advisory Level or HAL; (March 2018).

The proposed human health screening levels for surface water are identical to the screening levels for groundwater described previously, except for lead and zinc. The Tennessee criteria for lead for surface water used for Domestic Water Supply (TN Rule 0400-40-03-.03) is 5 micrograms per liter (µg/L) compared to the Tennessee Solid Waste Rule (TN Rule 0400-11-01) criteria of 15 µg/L which is also the alternative GWPS under the CCR Rule. The human health screening level for zinc in surface water is the US EPA Lifetime Health Advisory Level (HAL) of 2,000 µg/L derived from the oral RfD of 0.3 mg/kg bw-day to protect against immune and hematological effects. For groundwater, the screening level for zinc is the SMCL of 5,000 µg/L based on objectionable metallic taste. Selection of the SMCL for groundwater is consistent with the proposed hierarchy of sources.

The Proposed Human Health Screening Levels for Surface Water in the EAR are presented in Table 2.

Surface water screening levels for protection of freshwater aquatic life were identified from the sources described below. Published values for both acute and chronic effects are not available for all parameters analyzed in surface water. Where both acute and chronic values were available, the chronic values were selected since they are lower and more protective than acute values. For some parameters chronic screening levels are published for both total and dissolved concentrations. Hardness-dependent parameters (cadmium, chromium, lead, copper, nickel, silver, and zinc) are expressed as dissolved concentrations and adjusted where appropriate based on stream-specific water chemistry. All other parameters are expressed as total recoverable concentrations (TN Rule 0400-40-03-.03).

The majority of the surface water screening values to be used in the EARs and Ecological Risk Assessments (ERAs) for the TVA fossil plants under the TDEC Order are the Surface Water Screening Values for Hazardous Waste Sites referenced from *USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update)* or the TDEC General Water Quality Criteria (Chapter 0400-40-03, General Water Quality Criteria). Surface water screening levels that are hardness-dependent have been calculated using the formulae presented in the TDEC General Water Quality Criteria guidelines using site-specific hardness values for the major water bodies at each of the fossil plants. The mean hardness values for each of the major water bodies were determined using the data collected during the Environmental Investigations (EI) at each fossil plant and conservatively rounded down for use in the calculations.

The only surface water screening values that were not referenced from the TDEC or USEPA Region 4 sources cited above were for Radium-226 & -228. The surface water screening values for Radium-226 & -228 were the Biota Concentration Guides (BCG) for water referenced from the U. S. Department of Energy (DOE) report titled *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, DOE Standard (DOE-STD-1153-2019). The BCG is the limiting concentration of a radionuclide in soil, sediment, or water that would not cause dose rate criteria for protection of populations of aquatic and terrestrial biota to be exceeded.

Human Health and Ecological Screening Levels for Surface Water are presented in Table 2. The proposed screening level for evaluation of surface water in the EAR is the lowest (most conservative) of the available values for each parameter. National Oceanic and Atmospheric Administration's (NOAA) Screening Quick Reference Tables (SQuiRTs) (Buchman 2008) were also reviewed to determine whether additional surface water screening values could be derived for constituents without screening levels in Table 2. Although the SQuiRTs provide screening levels for the dissolved fraction for several constituents where USEPA Region 4 and TDEC screening levels are unavailable, these screening values were not selected because some primary sources presented in SQuiRTs have been superseded and the SQuiRTs were developed in 2008 and are no longer being maintained by NOAA.

Mayfly Critical Body Residues

The mayfly tissue critical body residue values proposed as screening levels were referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment* (BERA) (Arcadis 2012), which used values from the USEPA/USACE Environmental Residue-Effects Database (ERED). A number of other potential sources of critical body residue data were searched in order to identify additional data and to fill data gaps but no additional data were located. Per Arcadis (2012) "CBR data were selected from literature-derived values from the ERED. The selection process included only whole-body data for the closest relevant species (i.e., mayfly) and life stages (e.g., adult selected over egg) for growth, mortality, or reproductive endpoints. Combined or absorbed doses were preferred over water only exposures. If the data were unpaired (i.e., only a NOAEL or LOAEL was available), either the highest NOAEL or the lowest LOAEL was selected. The corresponding value was extrapolated from the available value by a factor of 10. If only effects concentrations were available (e.g., LC_{50}, ED_{25}, etc.), the lowest effects concentration was selected as the LOAEL, and the estimated NOAEL was set at 1/10th the LOAEL value." The screening levels based on CBR values presented in Arcadis (2012) have been reviewed and accepted by TDEC and USEPA as part of their review and acceptance of the River System BERA (Arcadis 2012). As such, these values have been vetted and deemed acceptable for use as screening levels in the EAR for the fossil plants under the Commissioner's Order. Data presented in the ERED will be further evaluated and CBR values revised, if necessary, as part of the ecological risk assessments presented in the Corrective Action/Risk Assessment (CARA) reports for each of the fossil plants under the Commissioner's Order.

The Proposed Screening Levels for Mayfly Tissue Critical Body Residues for the EAR are presented in Table 3.

Fish Tissue Critical Body Residues

Human consumption of CCR parameters detected in fish fillet samples will be evaluated in the Human Health Risk Assessment in the CARA Plan.

The fish tissue critical body residue values proposed as screening levels for most of the constituents were referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment* (BERA) (Arcadis 2012), which used values from the USEPA/USACE ERED. As discussed above, the methodology for selecting the fish tissue critical body residue values and the screening levels based on CBR values presented in Arcadis (2012) have been reviewed and accepted by TDEC and USEPA as part of their review and acceptance of the River System BERA (Arcadis 2012). As such, these values have been vetted and deemed acceptable for use as screening levels in the EAR for the fossil plants under the Commissioner's Order. Data presented in the ERED will be further evaluated and CBR values revised, if necessary, as part of the ecological risk assessments presented in the CARA reports for each of the fossil plants under the Commissioner's Order.

The fish tissue screening levels for selenium were referenced from the Chronic Ambient Water Quality Criterion for Selenium (USEPA 2016). A number of other potential sources of critical body residue data were searched in order to identify additional data and to fill data gaps but no additional data were located.

The Proposed Screening Levels for Fish Tissue Critical Body Residues for the EAR are presented in Table 4.

Sediment

Most of the proposed sediment screening values to be used to evaluate investigation analytical results in the EAR were derived by MacDonald, et al. (2003) in their paper *Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters* and adopted by USEPA Region 4 as their recommended Freshwater Sediment Screening Values presented in *Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update, Screening Values*. The Threshold Effect Concentration (TEC) and Probable Effect Concentration (PEC) values derived by MacDonald, et al. (2003) are consensus-based values derived from multiple toxicity test results for a number of benthic species and are the basis for the majority of the USEPA Region 4 freshwater sediment screening values and correspond to USEPA Region 4 Ecological Screening Value (chronic) and Refinement Screening Value (acute) sediment screening values, respectively.

The USEPA Region 4 Freshwater Sediment Screening Values are recommended to be used for sediment screening values for the following constituents in sediment: antimony, arsenic, cadmium, chromium, cobalt, lead, mercury, selenium (acute), copper, nickel, silver, and zinc.

Several other sources, including NOAA's Screening Quick Reference Tables (SQuiRTs) (Buchman 2008), were referenced to identify sediment screening values in instances where USEPA Region 4 did not have recommended screening values or where other screening values were deemed more toxicologically defensible.

USEPA Region 4 does not have sediment screening values for percent ash; therefore, site-specific values were referenced from the approved EIP and the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System BERA* (Arcadis 2012). Sediment samples from the Emory and Clinch Rivers submitted for laboratory toxicity testing using standard aquatic organisms contained approximately 20 to 90 percent ash. Exposure to sediment with 40 percent ash was associated with 25 percent decreased survival and growth reduction in the test organisms compared to reference sediments. This was considered a biologically significant effect. 20 percent ash was proposed as the threshold triggering quantitative analysis of a sediment sample in the EIPs approved by TDEC. The EIPs for each fossil plant used a value of 20 percent ash in sediment samples as a Phase 1 screening level to determine if additional chemical analyses would be required. If a sediment sample from the zero to six-inch depth increment had less than 20 percent ash composition, then the sample was deemed to have insufficient ash content to pose deleterious effects from ash itself and sediment samples from deeper depth increments would not be analyzed further. Based on this rationale, the 20 percent ash content is proposed as the chronic sediment screening value for percent ash.

The acute sediment screening value for percent ash is referenced from the *Kingston Ash Recovery Project Non-Time Critical Removal Action River System BERA* (Arcadis 2012). The Kingston BERA (Arcadis 2012) presented multiple toxicity test results that indicated sediment samples with 40 percent ash or greater were associated with statistically and biologically significant adverse effects. Based on these toxicity test results; 40 percent ash content is proposed as the acute sediment screening value for percent ash.

USEPA Region 4 provides sediment screening values for barium based on a study conducted by USEPA Region 5 in 1977 titled *Guidelines for the Pollution Classification of Great Lakes Harbor Sediments*. The sediment ESVs for barium derived by USEPA Region 5 (1977) and cited by USEPA Region 4 (2018) are not effects-based and are not based on measured toxicity to benthic or other organisms, which brings into question their defensibility for use in determining potential ecological risk to sediment-dwelling organisms. An alternative to the USEPA Region 4 sediment screening values for barium (and several other inorganics) is provided by The Netherlands National Institute for Public Health and the Environment (RIVM) in their report titled *Environmental Risk Limits for Nine Trace Elements* (van Vlaardingen, et al., 2005). The RIVM methodology utilizes toxicity data from the scientific literature to derive Environmental Risk Limits (ERL) including: 1) Maximum Permissible Concentration (MPC); and 2) Serious Risk Addition (SRA_{eco}).

The MPC as defined in the Netherlands report (RIVM 2005) is the concentration of a substance in air, water, soil, or sediment that should protect all species in ecosystems from adverse effects of that substance. Depending on the amount of toxicological data available, the lowest toxicity result is divided by a fixed value (assessment factor). When enough data are available, a cut-off value is used. This is the fifth percentile if a species sensitivity distribution of No-Observed-Effect-Concentration (NOEC) is used. This is the hazardous concentration for five percent of the species. This definition correlates well with the definition of the TEC as defined by MacDonald, et al. (2003) and adopted by USEPA Region 4 for chronic sediment screening levels.

The Serious Risk Addition (SRA_{eco}) concentration is the concentration of a substance in soil, sediment, or groundwater at which functions in these compartments will be seriously affected or are threatened to be negatively affected. This is assumed to occur when 50 percent of the species and/or 50 percent of the microbial and enzymatic processes are possibly affected. This definition correlates well with the definition of Probable Effect Concentration (PEC) as defined by MacDonald, et al. (2003) and adopted by USEPA Region 4 for acute sediment screening levels.

Literature-based toxicity data for effects on growth, reproduction or survival are used in the derivation of MPC and SRA_{eco} values. All categories are further subdivided into chronic and acute toxicity values. Chronic values (NOEC or EC_{10}) and acute values (EC_{50} or LC_{50}) are referenced or derived from the relevant studies. The lowest value (the most sensitive toxicity endpoint) of the available data per species is selected. The SRA_{eco} for the water compartment is derived by applying an assessment factor of 10 to the geometric mean of the selected acute toxicity data, which results in an SRA_{eco}, acute. This SRA_{eco}, acute is then compared to the geometric mean of all selected chronic data (SRA_{eco}, chronic). The lower of the SRA_{eco}, acute and the SRA*eco*, chronic value is defined as the SRA_{eco} for the water compartment. No toxicity data were identified for sediment; therefore, all of the MPC and the SRA_{eco} values for sediment were calculated using surface water toxicity data and equilibrium partitioning by applying sediment-to-water partition coefficients.

The MPC of 240 mg/kg is proposed as the chronic sediment screening value for barium and the SRA_{eco} value of 22,925 mg/kg is proposed as the acute sediment screening value for barium.

USEPA Region 4, or any of the other sources researched for potential sediment screening values, does not provide sediment screening values for beryllium, molybdenum, thallium, or vanadium. As such, the MPC and the SRA_{eco} values for these constituents as derived using the RIVM (van Vlaardingen, et al., 2005) methodology are proposed as sediment screening values.

USEPA Region 4 references the Los Alamos National Laboratory (LANL) ECORISK database (2017) as the source for the sediment screening values for selenium. The chronic sediment screening value is identified as the “No Effect Ecological Screening Value” and the acute sediment screening value is identified as the “Low Effect Ecological Screening Value” in the ECORISK database; however, the source and toxicological basis (if any) of these values is not presented in the ECORISK database. Alternatively, Lemly (2002) has proposed a sediment screening value of 2.0 mg/kg in his book *Selenium Assessment in Aquatic Ecosystems* (2002). The screening level proposed by Lemly (2002) is based on selenium concentrations in sediment that result in body residues in benthic invertebrates that result in deleterious effects to fish and aquatic birds that consume benthic invertebrates. According to Lemly (2002), benthic invertebrates can tolerate significantly higher concentrations of selenium in sediment. Thus, the most important aspect of selenium concentrations in sediment is not direct toxicity to benthic invertebrates themselves, but the dietary source of selenium that benthic invertebrates provide to fish and wildlife species that feed on benthic invertebrates. Based on the information presented by Lemly (2002), 2.0 mg/kg is proposed as the chronic screening value for selenium in sediment and the acute sediment screening value is proposed as 2.9 mg/kg, which is the Refinement Screening Value as presented in USEPA Region 4 (2018). These sediment screening values are conservative compared to the remediation goals for selenium in sediment (3.0 – 3.2 mg/kg) presented in *the Kingston Ash Recovery Project Non-Time Critical Removal Action for the River System Long-Term Monitoring Sampling and Analysis Plan* (TVA, 2013).

USEPA Region 4 does not provide sediment screening values for Radium-226 or Radium-228. However, the DOE provides Biota Concentration Guides (BCG) for sediment in their guidance *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE 2019). The BCG is defined as the limiting concentration of a radionuclide in soil, sediment, or water that would not cause dose rate criteria for protection of populations of aquatic and terrestrial biota to be exceeded. DOE (2019) presents BCG of 100 pCi/g for Radium-226 and 90 pCi/g for Radium-228. These values are recommended for sediment screening values for Radium-226 and Radium-228 individually and the lower of these two values (90 pCi/g) is recommended as the sediment screening value for combined Radium-226 & -228.

The Proposed Ecological Screening Levels for Freshwater Sediment for the EAR are presented in Table 5.

REFERENCES

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ATTACHMENTS

Table 1. Proposed Human Health Screening Levels for Groundwater
Environmental Assessment Report

CCR Parameters	Groundwater Screening Levels (µg/L)	Source
CCR Rule Appendix III Constituents :		
Boron	4,000	RSL
Calcium	--	--
Chloride	250,000	SMCL
Fluoride	4,000	MCL
pH	6.5-8.5 S.U.	SMCL
Sulfate	250,000	SMCL
Total Dissolved Solids	500,000	SMCL
CCR Rule Appendix IV Constituents :		
Antimony	6	MCL
Arsenic	10	MCL
Barium	2,000	MCL
Beryllium	4	MCL
Cadmium	5	MCL
Chromium (total)	100	MCL
Cobalt	6	CCR Rule GWPS
Fluoride	4,000	MCL
Lead	15	CCR Rule GWPS
Lithium	40	CCR Rule GWPS
Mercury	2	MCL
Molybdenum	100	CCR Rule GWPS
Radium-226 & 228	5 pCi/L	MCL
Selenium	50	MCL
Thallium	2	MCL
TDEC Appendix I Constituents :		
Copper	1,300	MCLG
Nickel	100	TN MCL
Silver	100	TN MCL
Vanadium	86	RSL
Zinc	5,000	SMCL

Notes:

CCR: coal combustion residuals
GWPS: groundwater protection standards
MCL: USEPA maximum contaminant level
MCLG: Maximum contaminant level goal
pCi/L: picocuries per liter
RSL: USEPA regional screening level
SMCL: USEPA secondary maximum contaminant level
TN MCL: maximum contaminant level promulgated by State of Tennessee
µg/L: micrograms per liter

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Bull Run Fossil Plant																
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels														
			Bull Run Creek (Hardness = 140 mg/L)					Clinch River (Hardness = 120 mg/L)					Worthington Branch (Hardness = 175 mg/L)				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :																	
Boron	4,000	RSL	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b	6 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :																	
Antimony	6	TN DWS/MCL	190	900	NA	NA	a	190	900	NA	NA	a	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a	150	340	150	340	a	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a	220	2,000	NA	NA	a	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a	11	93	NA	NA	a	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	1.03	2.65	0.925	2.47	b	0.914	2.28	0.824	2.14	b	1.23	3.30	1.09	3.04	b
Chromium*	100	TN DWS/MCL	114	2375	97.6	751	b	100	2093	86.1	662	b	136	2851	117	901	b
Cobalt	6	RSL	19	120	NA	NA	a	19	120	NA	NA	a	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	4.88	125	3.62	93.0	b	4.01	103	3.07	78.7	b	6.49	166	4.60	118	b
Lithium	40	RSL	440	910	NA	NA	a	440	910	NA	NA	a	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a	800	7,200	NA	NA	a	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b	3.1	20	NA	NA	b	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a	6	54	NA	NA	a	6	54	NA	NA	a
TDEC Appendix I Constituents :																	
Copper*	1,300	MCL	12.4	19.2	11.9	18.5	b	10.9	16.6	10.5	16.0	b	15.0	23.7	14.4	22.8	b
Nickel*	100	TN DWS	69.3	624	69.1	622	b	60.9	547	60.7	546	b	83.7	753	83.5	752	b
Silver*	100	TN DWS/SMCL	NA	6.75	NA	5.74	b	NA	5.18	NA	4.40	b	NA	9.91	NA	8.42	b
Vanadium	86	RSL	27	79	NA	NA	a	27	79	NA	NA	a	27	79	NA	NA	a
Zinc*	2,000	HAL	159	159	157	156	b	140	140	138	137	b	193	193	190	188	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

Cumberland Fossil Plant

CCR Parameters	Human Health Surface Water Screening Levels (µg/L)	Source	Cumberland River (Hardness = 100 mg/L) Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :							
Boron	4,000	RSL	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :							
Antimony	6	TN DWS/MCL	190	900			a
Arsenic	10	TN DWS/MCL	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.790	1.91	0.718	1.80	b
Chromium*	100	TN DWS/MCL	86.2	1803	74.1	570	b
Cobalt	6	RSL	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	3.18	81.6	2.52	64.6	b
Lithium	40	RSL	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a
TDEC Appendix I Constituents :							
Copper*	1,300	MCL	9.33	14.0	8.96	13.4	b
Nickel*	100	TN DWS	52.2	469	52.0	468	b
Silver*	100	TN DWS/SMCL	NA	3.78	NA	3.22	b
Vanadium	86	RSL	27	79	NA	NA	a
Zinc*	2,000	HAL	120	120	118	117	b

Ecological Surface Water Screening Levels (continued)

CCR Parameters	Wells Creek (Hardness = 140 mg/L) Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :					
Boron	7,200	34,000	NA	NA	a
Calcium	116,000	NA	NA	NA	a
Chloride	230,000	860,000	NA	NA	a
Fluoride	2,700	9,800	NA	NA	a
pH	6.5 - 9	NA	NA	NA	b
Sulfate	NA	NA	NA	NA	
Total Dissolved Solids	NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :					
Antimony	190	900			a
Arsenic	150	340	150	340	a
Barium	220	2,000	NA	NA	a
Beryllium	11	93	NA	NA	a
Cadmium*	1.03	2.65	0.925	2.47	b
Chromium*	114	2375	97.6	751	b
Cobalt	19	120	NA	NA	a
Fluoride	2,700	9,800	NA	NA	a
Lead*	4.88	125	3.62	93.0	b
Lithium	440	910	NA	NA	a
Mercury	0.77	1.4	0.77	1.4	a
Molybdenum	800	7,200	NA	NA	a
Radium-226 & 228	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	3.1	20	NA	NA	b
Thallium	6	54	NA	NA	a
TDEC Appendix I Constituents :					
Copper*	12.4	19.2	11.9	18.5	b
Nickel*	69.3	624	69.1	622	b
Silver*	NA	6.75	NA	5.74	b
Vanadium	27	79	NA	NA	a
Zinc*	159	159	157	156	b

CCR Parameters	Unnamed Tributary (Hardness = 750 mg/L)[d] Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :					
Boron	7,200	34,000	NA	NA	a
Calcium	116,000	NA	NA	NA	a
Chloride	230,000	860,000	NA	NA	a
Fluoride	2,700	9,800	NA	NA	a
pH	6.5 - 9	NA	NA	NA	b
Sulfate	NA	NA	NA	NA	
Total Dissolved Solids	NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :					
Antimony	190	900			a
Arsenic	150	340	150	340	a
Barium	220	2,000	NA	NA	a
Beryllium	11	93	NA	NA	a
Cadmium*	2.39	7.42	2.03	6.58	b
Chromium*	268	5612	231	1773	b
Cobalt	19	120	NA	NA	a
Fluoride	2,700	9,800	NA	NA	a
Lead*	18.6	477	10.9	281	b
Lithium	440	910	NA	NA	a
Mercury	0.77	1.4	0.77	1.4	a
Molybdenum	800	7,200	NA	NA	a
Radium-226 & 228	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	3.1	20	NA	NA	b
Thallium	6	54	NA	NA	a
TDEC Appendix I Constituents :					
Copper*	30.5	51.7	29.3	49.6	b
Nickel*	169	1516	168	1513	b
Silver*	NA	41.1	NA	34.9	b
Vanadium	27	79	NA	NA	a
Zinc*	388	388	382	379	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Johnsonville Fossil Plant							John Sevier Fossil Plant									
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels					Ecological Surface Water Screening Levels									
			Tennessee River (Hardness = 60 mg/L)					Holston River (Hardness = 100 mg/L)					Polly Branch (Hardness = 100 mg/L)				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)		Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :																	
Boron	4,000	RSL	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b	6.5 - 9	NA	NA	NA	b	6 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA		NA	NA	NA	NA		NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :																	
Antimony	6	TN DWS/MCL	190	900	NA	NA	a	190	900	NA	NA	a	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a	150	340	150	340	a	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a	220	2,000	NA	NA	a	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a	11	93	NA	NA	a	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.526	1.16	0.489	1.12	b	0.790	1.91	0.718	1.80	b	0.790	1.91	0.718	1.80	b
Chromium*	100	TN DWS/MCL	56.7	1187	48.8	375	b	86.2	1803	74.1	570	b	86.2	1803	74.1	570	b
Cobalt	6	RSL	19	120	NA	NA	a	19	120	NA	NA	a	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	1.66	42.6	1.44	36.9	b	3.18	81.6	2.52	64.6	b	3.18	81.6	2.52	64.6	b
Lithium	40	RSL	440	910	NA	NA	a	440	910	NA	NA	a	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a	800	7,200	NA	NA	a	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b	3.1	20	NA	NA	b	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a	6	54	NA	NA	a	6	54	NA	NA	a
TDEC Appendix I Constituents :																	
Copper*	1,300	MCL	6.03	8.65	5.79	8.31	b	9.33	14.0	8.96	13.4	b	9.33	14.0	8.96	13.4	b
Nickel*	100	TN DWS	33.9	305	33.8	304	b	52.2	469	52.0	468.24	b	52.2	469	52.0	468	b
Silver*	100	TN DWS/SMCL	NA	1.57	NA	1.34	b	NA	3.78	NA	3.22	b	NA	3.78	NA	3.22	b
Vanadium	86	RSL	27	79	NA	NA	a	27	79	NA	NA	a	27	79	NA	NA	a
Zinc*	2,000	HAL	77.7	77.7	76.6	76.0	b	120	120	118	117	b	120	120	118	117	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

CCR Parameters	Watts Bar Fossil Plant						
	Human Health Surface Water Screening Levels		Ecological Surface Water Screening Levels				
			Tennessee River (Hardness = 75 mg/L)				
	(µg/L)	Source	Total Chronic (µg/L)	Total Acute (µg/L)	Dissolved Chronic (µg/L)	Dissolved Acute (µg/L)	
CCR Rule Appendix III Constituents :							
Boron	4,000	RSL	7,200	34,000	NA	NA	a
Calcium	--	--	116,000	NA	NA	NA	a
Chloride	250,000	SMCL	230,000	860,000	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
pH	6 - 9 S.U.	TN DWS	6.5 - 9	NA	NA	NA	b
Sulfate	250,000	SMCL	NA	NA	NA	NA	
Total Dissolved Solids	500,000	TN DWS/SMCL	NA	NA	NA	NA	
CCR Rule Appendix IV Constituents :							
Antimony	6	TN DWS/MCL	190	900	NA	NA	a
Arsenic	10	TN DWS/MCL	150	340	150	340	a
Barium	2,000	TN DWS/MCL	220	2,000	NA	NA	a
Beryllium	4	TN DWS/MCL	11	93	NA	NA	a
Cadmium*	5	TN DWS/MCL	0.628	1.44	0.579	1.38	b
Chromium*	100	TN DWS/MCL	68.1	1425	58.6	450	b
Cobalt	6	RSL	19	120	NA	NA	a
Fluoride	4,000	MCL	2,700	9,800	NA	NA	a
Lead*	5	TN DWS	2.21	56.6	1.84	47.2	b
Lithium	40	RSL	440	910	NA	NA	a
Mercury	2	TN DWS/MCL	0.77	1.4	0.77	1.4	a
Molybdenum	100	RSL	800	7,200	NA	NA	a
Radium-226 & 228	5 pCi/L	MCL	3 pCi/L	3 pCi/L	NA	NA	c
Selenium	50	TN DWS/MCL	3.1	20	NA	NA	b
Thallium	2	TN DWS/MCL	6	54	NA	NA	a
TDEC Appendix I Constituents :							
Copper*	1,300	MCL	7.30	10.7	7.00	10.2	b
Nickel*	100	TN DWS	40.9	368	40.8	367	b
Silver*	100	TN DWS/SMCL	NA	2.31	NA	1.96	b
Vanadium	86	RSL	27	79	NA	NA	a
Zinc*	2,000	HAL	93.9	93.9	92.6	91.8	b

Table 2. Proposed Human Health and Ecological Site Specific Screening Levels for Surface Water
Environmental Assessment Report

Notes:

* The freshwater screening values are hardness dependent. These screening values were adjusted using the following equations and parameters provided in TDEC 2019:

Acute Screening Levels (dissolved) = exp{mA[ln(hardness)]+bA } (CF)

Chronic Screening Levels (dissolved) = exp{mC [ln(hardness)]+bC} (CF)

Parameters	mA	bA	mC	bC	Conversation Factor (CF)	
					CMC	CCC
Cadmium	0.9798	-3.866	0.7977	-3.909	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]
Chromium III	0.819	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	-1.700	0.8545	-1.702	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Nickel	0.8460	2.555	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.59			0.85	
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

ug/L: micrograms per liter

NA = not applicable

SMCL: USEPA secondary maximum contaminant level

HAL: Health advisory level

MCL: USEPA maximum contaminant level

MCLG: Maximum contaminant level goal

TN DWS: drinking water standard promulgated by State of Tennessee

RSL: USEPA regional screening level for residential tapwater (November 2020)

a USEPA Region 4 Surface Water Screening Values for Hazardous Waste Sites (March 2018 Revision).

b Tennessee Department of Environment and Consevation (TDEC), 2019. Chapter 0400-40-03, General Water Quality Criteria.

c U.S. Department of Energy (DOE), 2019. DOE Standard (DOE-STD-1153-2019), A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. Biota Concentration Guides for water of 4 pCi/L for Radium-226 and 3 pCi/L for Radium-228.

d The mean hardness of surface water in the Unnamed Tributary is approximately 750 mg/L; however, per TDEC water quality guidelines TDEC, 2019), a hardness value of 400 mg/L was used to calculate hardness-dependent water quality criteria.

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 3. Proposed Screening Levels for Mayfly Tissue Critical Body Residues
Environmental Assessment Report

CCR Parameters	Mayfly Tissue Critical Body Residue NOAEL (mg/kg-ww)	Mayfly Tissue Critical Body Residue LOAEL (mg/kg-ww)	
CCR Rule Appendix III Constituents :			
Boron	NA	NA	
Calcium	NA	NA	
Chloride	NA	NA	
Fluoride	NA	NA	
pH	NA	NA	
Sulfate	NA	NA	
Total Dissolved Solids	NA	NA	
CCR Rule Appendix IV Constituents :			
Antimony	NA	NA	
Arsenic	0.0249	0.249	a
Barium	NA	NA	
Beryllium	NA	NA	
Cadmium	15.6	156	a
Chromium (total)	0.144	1.44	a
Cobalt	0.1061	1.061	
Fluoride	NA	NA	
Lead	269	2690	a
Lithium	NA	NA	
Mercury	2.7	27	a
Molybdenum	NA	NA	
Radium-226 & 228	NA	NA	
Selenium	0.051	0.51	a
Thallium	1.206	12.06	a
TDEC Appendix I Constituents :			
Copper	26	260	a
Nickel	0.115	1.15	a
Silver	0.23	2.3	a
Vanadium	0.604	6.04	a
Zinc	382	3820	a

Notes:

a Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).

Toxicity values were selected from the U.S. Army Corps of Engineers/ USEPA Environmental Residue-Effects Database (ERED).

mg/kg-ww - milligrams per kilogram, wet weight

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 4. Proposed Screening Levels for Fish Tissue Critical Body Residues
Environmental Assessment Report

CCR Parameters	Whole Body Fish Tissue Critical Body Residue NOAEL (mg/kg-ww)	Whole Body Fish Tissue Critical Body Residue LOAEL (mg/kg-ww)		Liver Tissue Critical Body Residue NOAEL (mg/kg-ww)	Liver Tissue Critical Body Residue LOAEL (mg/kg-ww)		Muscle Tissue Critical Body Residue NOAEL (mg/kg-ww)	Muscle Tissue Critical Body Residue LOAEL (mg/kg-ww)		Ovary Tissue Critical Body Residue NOAEL (mg/kg-ww)	Ovary Tissue Critical Body Residue LOAEL (mg/kg-ww)	
CCR Rule Appendix III Constituents :												
Boron	NA	NA		NA	NA		NA	NA		NA	NA	
Calcium	NA	NA		NA	NA		NA	NA		NA	NA	
Chloride	NA	NA		NA	NA		NA	NA		NA	NA	
Fluoride	NA	NA		NA	NA		NA	NA		NA	NA	
pH	NA	NA		NA	NA		NA	NA		NA	NA	
Sulfate	NA	NA		NA	NA		NA	NA		NA	NA	
Total Dissolved Solids	NA	NA		NA	NA		NA	NA		NA	NA	
CCR Rule Appendix IV Constituents :												
Antimony	NA	NA		NA	NA		NA	NA		NA	NA	
Arsenic	0.04	0.4	a	0.569	5.69	a	0.076	0.76	a	8.4	84	a
Barium	NA	NA		NA	NA		NA	NA		NA	NA	
Beryllium	5.13	51.3	a	NA	NA		NA	NA		NA	NA	
Cadmium	0.0019	0.019	a	0.0000137	0.000137	a	0.03	0.12	a	NA	NA	
Chromium (total)	0.128	1.28	a	0.042	0.42	a	NA	NA		NA	NA	
Cobalt	NA	NA		NA	NA		NA	NA		NA	NA	
Fluoride	NA	NA		NA	NA		NA	NA		NA	NA	
Lead	0.0278	0.278	a	0.0393	0.393	a	2.3	23	a	NA	NA	
Lithium	NA	NA		NA	NA		NA	NA		NA	NA	
Mercury	0.006	0.06	a	0.0009	0.009	a	0.08	0.8	a	NA	NA	
Molybdenum	NA	NA		NA	NA		NA	NA		NA	NA	
Radium-226 & 228	NA	NA		NA	NA		NA	NA		NA	NA	
Selenium	8.5	8.5	b	0.524	5.24	a	11.3	11.3	b	15.1	15.1	b
Thallium	0.027	0.27	a	NA	NA		NA	NA		NA	NA	
TDEC Appendix I Constituents :												
Copper	0.196	1.96	a	6.52	65.2	a	3.4	34	a	NA	NA	
Nickel	11.81	118.1	a	8.22	82.2	a	11.81	118.1	a	NA	NA	
Silver	0.0114	0.114	a	19	190	a	NA	NA		NA	NA	
Vanadium	0.68	2.7	a	0.03	0.3	a	NA	NA		NA	NA	
Zinc	0.45	4.5	a	3.4	34	a	NA	NA		NA	NA	

Notes:

a Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).
Toxicity values were selected from the U.S. Army Corps of Engineers/USEPA Environmental Residue-Effects Database (ERED).

b USEPA, 2016. Chronic Ambient Water Quality Criterion for Selenium. Fish tissue concentrations expressed as mg/kg-dry weight.

mg/kg-ww - milligrams per kilogram, wet weight

Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

Table 5. Proposed Ecological Screening Levels for Freshwater Sediment
Environmental Assessment Report

CCR Parameters	Freshwater Sediment Screening Values		Sediment Quality Assessment Guidelines[a]	
	Chronic (mg/kg-dw)	Acute (mg/kg-dw)	TEC (mg/kg-dw)	PEC (mg/kg-dw)
CCR Rule Appendix III Constituents :				
Percent Ash	20% b	40% c	NA	NA
Boron	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chloride	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA
pH	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA
Total Dissolved Solids	NA	NA	NA	NA
CCR Rule Appendix IV Constituents :				
Antimony	2	25 e	NA	NA
Arsenic	9.8	33 e	9.8	33
Barium	240	22925 f	NA	NA
Beryllium	1.2	42 f	NA	NA
Cadmium	1	5 e	1	5
Chromium	43.4	111 e	43	110
Cobalt	50	NA e	50	NA
Fluoride	NA	NA	NA	NA
Lead	35.8	128 e	36	130
Lithium	NA	NA	NA	NA
Mercury	0.18	1.1 e	0.18	1.1
Molybdenum	38	69760 f	NA	NA
Radium-226 & 228	90 pCi/g	90 pCi/g d	NA	NA
Selenium	2 g	2.9 e	NA	NA
Thallium	1.2	10 f	NA	NA
TDEC Appendix I Constituents :				
Copper	31.6	149 e	32	150
Nickel	22.7	48.6 e	23	49
Silver	1	2.2 e	NA	NA
Vanadium	66	564 f	NA	NA
Zinc	121	459 e	120	460

Notes:
mg/kg-dw - Milligrams per kilogram dry weight
NA - Not Available

a MacDonald, et al., 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. TEC - Threshold Effect Concentration, PEC - Probable Effect Concentration.
b Environmental Investigation Plans (EIP) for TVA fossil plants under the TDEC Consent Order.
c Arcadis, 2012. Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment (BERA).
d U.S. Department of Energy (DOE), 2019. DOE Standard (DOE-STD-1153-2019), A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota. Biota Concentration Guides for sediment of 100 pCi/g for Radium-226 and 90 pCi/g for Radium-228.
e USEPA Region 4 Sediment Screening Values for Hazardous Waste Sites (March 2018 Revision).
f National Institute for Public Health and the Environment (RIVM), 2005. Environmental Risk Limits for Nine Trace Elements. The Maximum Permissible Concentration (MPC) is used for the chronic value and the Serious Risk Addition (SRAeco) is used for the acute value.
g Lemly, A.D., 2002. Selenium Assessment in Aquatic Ecosystems
Red highlight denotes bioaccumulative constituent (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance (March 2018 Update).

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David W. Salyers, P.E.
Commissioner

Bill Lee
Governor

February 23, 2021

Shawn Rudder
Sr. Manager
Waste Permits, Compliance, and Monitoring
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC15-0177
Environmental Assessment Report Screening Levels
Response to TDEC Comments

Dear Mr. Rudder:

Tennessee Valley Authority (TVA) submitted the Commissioner's Order OGC15-0177 (Order) Proposed Screening Levels for Sample Results in the Environmental Assessment Report (EAR) Technical Memorandum Response to Comments on February 8, 2021. The Tennessee Department of Environment and Conservation (TDEC) has completed its review submittal and found it acceptable with the following comments:

- TVA is proposing to define *"unacceptable risks"* by referring to *"reasonably interpreted to be negligible."* TDEC does not agree with this proposed definition and it is not appropriate to be included in this document. Coal Combustion Residual (CCR) constituent concentrations and the potential risks to human health and the environment will be evaluated in the Corrective Action/Risk Assessment (CARA) phase of the Order process.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 598-3272.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:	Pat Flood	Britton Dotson	James Clark
	Rob Burnette	Angela Adams	Caleb Nelson
	Beth Rowan	Jim Ozment	Anna Fisher
	Brandon Boyd	Kelly Love	Roy Quinn

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
3.1 GENERAL JOF INVESTIGATION CONFERENCE QUESTIONS AND COMMENTS			
3.1 TDEC General Request, 3.1.1	1	The TVA JOF site presents a unique challenge in environmental investigation and remediation because the CCR material generated by burning coal is sluiced from the TVA JOF plant into a surface impoundment that was constructed with Kentucky Lake. Because of this, there are questions about how a ground water monitoring network can be installed to determine if CCR constituents are migrating from the bottom of this CCR surface impoundment into the river or into ground water below the river. Further, the active CCR impoundment is of concern due to its location. The impoundment is in the river channel, subject to continual erosion at the base of the CCR surface impoundment dike, is potentially subject to flooding and may be more subject to a catastrophic loss of CCR material should a substantial seismic event occur.	Chapters 4 - CCR Material Investigations, and 5.1 - Groundwater and Hydrogeological Investigations
3.1 TDEC General Request, 3.1.2	2	TVA will face a considerable challenge conducting environmental investigation and corrective action activities at the TVA JOF site because where CCR materials were disposed at locations where the disposal area is on property owned by two or more persons. TVA must provide documentation to TDEC that TVA has an agreement(s) with adjacent property owners that allow TVA to conduct environmental investigations and corrective actions on neighboring properties. This documentation should be included in the draft TVA JOF Environmental Investigation Plan.	NA - Included in the EIP
3.1 TDEC General Request, 3.1.3	3	TVA should provide the estimated amount and location of CCR material that is disposed on the TVA JOF property and adjacent property, including CCR material in active surface impoundments and landfills. TVA is not required to report the amount and location of CCR material disposed of offsite in properly permitted solid waste landfills. Is there a memorandum of agreement or similar legal document(s), executed between TVA and owners of adjacent property (ies) where CCR material from the TVA JOF site has been disposed? If so, TVA should include those documents in the EIP.	Chapters 4.3 CCR Material Quantity Assessment 5.1 - Groundwater and Hydrogeological Investigations
3.1 TDEC General Request, 3.1.4	4	TVA should include Annual Inspection Reports referenced in its presentation to TDEC. This includes the August 9, 1973 and September 16, 1976 annual inspection reports. If an annual inspection report was prepared for an inspection(s) performed in 1995, provide this document as well.	NA - Included in the EIP
3.1 TDEC General Request, 3.1.5	5	Note 9(c) from drawing 10W211-1 indicates bottom ash and fly ash were obtained from the JOF disposal area and used when TVA implemented the Coal Yard grading plan. TVA should provide information that reports the amount of CCR material disposed in the coal yard and a map with this.	Chapter 4 - CCR Material Investigations
3.2 Groundwater Monitoring			
3.2 TDEC Groundwater Request, 3.2.1	1	TVA shall demonstrate that the proposed background monitoring well at each ash disposal unit represents groundwater that passes under each ash disposal unit. TDEC shall approve the location(s) of the background ground water monitoring wells.	Chapters 5.1- Groundwater and Hydrogeological Investigations
3.2 TDEC Groundwater Request, 3.2.2	2	TVA shall explain how groundwater will be monitored for Ash Disposal Area 1. Monitoring on the North side of the unit should be included.	NA - Included in the EIP
3.2 TDEC Groundwater Request, 3.2.3	3	TVA shall submit reports for all ground water monitoring events for each unit to TDEC.	Chapter 5 - Groundwater and Hydrogeological Investigations, Appendix H
3.2 Miscellaneous Groundwater, 3.2.4	1	We believe it is important to define the differences between the ground water monitoring requirements for the Commissioner's Order and the U.S. EPA regulatory criteria for establishing a Ground Water Monitoring Assessment Plan for CCR sites. The Commissioner's Order requires TVA to create a ground water monitoring network for the entire TVA CUF site. This includes all active and inactive CCR permitted landfills and surface impoundments as well as any locations where CCR material was disposed on site that were not subject to permitting under current or past TDEC statutory or regulatory requirements. The U.S. EPA requirements primarily address only permitted CCR disposal areas.	Chapters 5.1 - Groundwater and Hydrogeological Investigations, and 6 - Seep Investigation
3.3 ACTIVE ASH POND 2			
3.3 TDEC Active Ash Pond 2 Request, 3.3.1	1	JOF94_JOF INSP FY1972 dated September 20, 1972 states on page 1 "Areas A and B are to be reclaimed by TVA. Under an informal agreement DuPont has sole responsibility for area "C." Recommendations on page 4 states "Raise the dike from the south harbor road to the north end of the ash area to elevation 378 as soon as heavy bottom ash is available" indicating ash may be incorporated into the dike construction. Please clarify if the action above was taken.	Chapter 4.3 - CCR Material Quantity Assessment
3.3 TDEC Active Ash Pond 2 Request, 3.3.2	2	JOF94_JOF INSP FY1994 dated September 30, 1974 states on page 2 "DEC has hauled waste material, mixtures of earth and obliterated asphaltic pavement, from the electrostatic precipitators and has piled the material along the outside of the dike (Recommendation, No. 3). Recommendation No. 3 suggests using this material to raise the east dike with the removed asphaltic pavement. Have subsequent subsurface evaluations encountered any of these materials and are they accounted for in stability calculations?	NA - Included in the EIP
3.3 TDEC Active Ash Pond 2 Request, 3.3.3	3	Document JOF45_JOF1977 SOIL EXPLORATION & TESTING on page 4, please clarify the reference to Colbert ash dike. Page 5 states" Softer conditions exist in the foundation soils, particularly in SS-7, 8, and 9, and may require special attention". Are construction records available that document how "special conditions" in these areas were managed during construction?	NA - Included in the EIP
3.3 TDEC Active Ash Pond 2 Request, 3.3.4	4	Document JOF46_JOF 1994 GEOTECHNICAL EVALUATION-ASH POND DIKE on page 4 identifies the discovery of three sinkholes. TVA should provide TDEC with the construction documentation of remediation of the sinkholes, the repair method used for the sinkholes and any information that reports the frequency of new sinkholes occurring. Please describe the methods TVA will use to prevent the occurrence of future sinkholes and the methods TVA uses to "close" sinkholes.	NA - Included in the EIP
3.3 TDEC Active Ash Pond 2 Request, 3.3.5	5	In Document JOF54_JOF-GE-100413 (rpt_jof_final_20100413) Page v of the Executive Summary states, in reference to the dike's construction "this material in not compacted and it contains zones of higher permeability which transmit seepage from the ash disposal area." Given this, has TVA conducted testing that would indicate horizontal permeability of the in-place dike material.	Chapter 4 - CCR Material Investigations
3.4 Miscelleanous			
3.4. TDEC Miscelleanous Request, 3.4.1	1	A complete review of these documents is not possible until TDEC has legible copies. The following list of documents have portions that are not legible: a.Document JOF39_29 JOF ASH POND – SOIL & FOUNDATION EXPLORATION pages 25 through 28. b.Document JOF45_JOF1977 SOIL EXPLORATION & TESTING page 37 is not legible. c.Document JOF48_JOF AUGUST 2003 REPORT OF ASH POND INVESTIGATION page 9. Please provide legible copies of these documents.	NA - Included in the EIP
3.4. TDEC Miscelleanous Request, 3.4.2	2	From our on-site meeting, TDEC is aware that TVA has some information it has collected previously at the TVA JOF site; as an example, data from soil borings and analysis of samples collected from ground water monitoring wells. This information provided a good reference when the data was collected, but the soil borings and ground water monitoring wells may not have been installed and constructed to meet the criteria for environmental investigation of this site per the Order. TVA should consider proposing additional activities at the TVA JOF site to fully determine the amount and location of CCR material disposed, migration of CCR constituents through soil and ground water, identification of the upper most aquifer, migration of ground water with CCR constituents into surface water, structural stability, etc.	NA - Included in the EIP
3.4. TDEC Miscelleanous Request, 3.4.3	3	The TVA JOF EIP should include a schedule of activities to be completed during the environmental investigation of the TVA JOF site. As an example, it is TDEC's expectation that the schedule for installing, developing and sampling ground water monitoring wells will be specifically described in the TVA JOF EIP and the schedule to perform this work will be provided. A full description of the methods used to install, drill, construct and sample ground water monitoring wells may be included in an appendix to the TVA JOF EIP or if TVA plans to use an established method or protocol, it can be included by reference.	NA - Included in the EIP
4.1 A. Site Information		**TVA shall provide information about CCR storage and disposal sites at the TVA Fossil Plant. TDEC expects TVA to include how it will provide the following information about each TVA Fossil Plant site as a part of its EIP:**	
4.1 A. TDEC Site Information Request, 4.1.1	1	All information about the natural chemistry of the soils in the area of the TVA Fossil Plant. This includes the naturally occurring levels of metals and other CCR constituents present in the soil. TVA shall propose, in the EIP, the collection of soil samples within a one-mile radius of the specific fossil plant to supplement the information gained from local soil studies, reports or soil profiles. Of particular interest are all constituents listed in the federal CCR regulations Appendix 3 Detection Monitoring and Appendix 4 Assessment Monitoring found on page 21500 of the Friday, April 17, 2015 Federal Register (Appendices 3 and 4 CCR constituents). TVA shall report the levels of naturally occurring CCR constituents as reported in existing documents and the results of soil samples collected per a TDEC Approved EIS in the (EAR) for that site. TVA shall submit maps that identify the location of soil samples in proximity to the TVA Fossil Plant when the EAR is submitted.	Chapter 3 - Background Soil Investigation
4.1 A. TDEC Site Information Request, 4.1.2	2	TVA shall propose a sampling plan to determine the leachability of CCR constituents from CCR material in surface Impoundments, landfills and non-registered sites at each TVA site. The plan should include sampling points at each disposal area and at different depths in each disposal area. TVA shall describe sample collection methods, sample transport, analytical methodology and the qualifications of the laboratory selected to perform the analyses.	NA - Included in the EIP
4.1 A. TDEC Site Information Request, 4.1.3	3	Information about the area surrounding the TVA Fossil Plant location before the TVA Fossil Plant was constructed. TVA shall provide in its EIP, geologic maps before the impoundment was created; if an impoundment is adjacent to the TVA Fossil Plant site. TVA discuss topographic maps from the pre-embayment time period and how these maps will be used to identify surface water features such as springs, the original flow of surface streams, etc. in the Environmental Assessment Report (EAR);	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.1 A. TDEC Site Information Request, 4.1.4	4	Discuss if construction design information for original CCR surface impoundments, specifically any construction drawings or engineering plans, are available. It is important to identify the surface elevation and location of surface impoundments, landfills or non-registered disposal areas when originally constructed. TVA should explain if/how the information to identify the materials used to construct these disposal areas.	Chapter 4 CCR Material Investigations and Appendix G

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
4.1 A. TDEC Site Information Request, 4.1.5	5	Discuss the information available and additional information that will be gathered to provide a three-dimensional profile of the CCR materials from the current elevation of all surface impoundments, landfills and/or non-registered disposal sites to the natural occurring surface below each structure. Also discuss how TVA plans to provide an estimated amount of CCR material disposed within each structure and the total amount of CCR material disposed at each site. Discuss the methods that TVA will use to provide drawings (to scale) that illustrate the height, length and breadth of the CCR disposal areas in relation to the naturally occurring features of each site. Comprehensively define the amount and location off CCR material at each site.	Chapter 4 CCR Material Investigations and Appendix G
4.1 A. TDEC Site Information Request, 4.1.6	6	Describe the method TVA shall use to provide a water balance analysis for active surface impoundments at each TVA site. This should include all wastewater and surface water runoff entering the impoundment from the TVA site and the amount of water discharged from the surface impoundment(s) into receiving streams at the National Pollution Discharge Elimination System (NPDES) permitted discharge point. TVA shall also describe briefly how it will determine the transpiration rate of water from the surface impoundment(s) into the atmosphere;	NA - Included in the EIP
4.2 B. Water Use Survey		**As a part of the Environmental Assessment, TVA is required to conduct a water use survey. The purpose of the water use survey is to determine if any surface water or ground water (water wells or springs) are being used by local residents or by TVA as domestic water supplies. TVA shall describe how it will conduct a water use survey within ½ mile of the boundary of the TVA site. TVA shall describe how it will determine the construction, depth and location of private water wells identified in the survey. If TVA determines local surface water and/or ground water is used as a source of domestic water supply within a ½ mile radius of the TVA site, the EIP shall include an offsite ground water and surface water sampling plan as a part of the EIP.**	
4.2 B. TDEC Water Use Survey Request, 4.2.1	1	As a part of the Environmental Assessment, TVA is required to conduct a water use survey. The purpose of the water use survey is to determine if any surface water or ground water (water wells or springs) are being used by local residents or by TVA as domestic water supplies. TVA shall describe how it will conduct a water use survey within ½ mile of the boundary of the TVA site. TVA shall describe how it will determine the construction, depth and location of private water wells identified in the survey. If TVA determines local surface water and/or ground water is used as a source of domestic water supply within a ½ mile radius of the TVA site, the EIP shall include an offsite ground water and surface water sampling plan as a part of the EIP.	Chapters 5.3 - Water Use Survey
4.3 C. Groundwater Monitoring and Mapping		**The EPA CCR rule specify constituents that should be included for analysis for ground water sampling. The constituents for Ground Water Detection Monitoring are listed in Appendix 3 of the EPA CCR regulations and the constituents for Ground Water Assessment Monitoring are listed in Appendix 4 of the EPA CCR regulations. TDEC is requiring TVA to include a description of the ground water monitoring plan it will implement at each TVA site. All ground water samples collected as a part of the Ground Water Monitoring Plan will be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations. Items to include in the EIP are:**	
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.1	1	A discussion of all ground water monitoring wells TVA has installed/abandoned/closed at the TVA site as well and any springs that have been monitored at the TVA site or adjacent to the TVA site. TVA shall discuss the data it TVA has generated from historical sampling of ground water monitoring wells and springs. TVA shall include all ground water monitoring construction information, location and historical ground water monitoring data in each TVA site's EAR.	Chapters 2.4 - Physical Characteristics, 4.1 Geotechnical Investigation, and 5.1 Groundwater and Hydrogeological Investigations
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.2	2	A discussion of the location of at least two background ground water monitoring wells including the reasons for proposed their proposed location.	Chapter 5.1 - Hydrogeological Investigaion
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.3	3	A discussion of additional ground water monitoring wells that will be installed to complete a ground water monitoring network at the TVA site around all surface impoundments, landfills and/or non-registered disposal sites; including the location of existing or proposed ground water monitoring wells down gradient of all CCR disposal areas on the TVA site. TVA shall propose a ground water monitoring network that will provide data to develop a TVA site wide ground water potentiometric surface map. TVA shall ensure that the ground water monitoring locations (current and proposed) in the EIP will accurately determine groundwater flow and direction.	NA - Included in the EIP
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.4	4	A discussion of the construction methods TVA will use to install additional ground water monitoring wells. This includes drilling method, methods and personnel for logging cuttings and cores, well construction and well development. A scaled diagram of a properly completed monitoring well shall be provided in the EIP.	NA - Included in the EIP
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.5	5	A ground-water monitoring plan for sampling all wells and springs included in the monitoring network. This should include the methods TVA shall use to collect ground water samples, the analytical methods to be used for ground water sample analyses, methods for sample transport from point of collection to the laboratory and identification and qualification of the laboratory(ies) that will perform sample analyses.	NA - Included in the EIP
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.6	6	Describe any existing information available and additional data needed to develop a map which identifies the current ground water surface elevation under the landfill(s), surface impoundment(s) and/or non-registered site(s). If additional data is needed to provide ground water elevations across the TVA site, below the footprint of the landfill(s), surface impoundment(s) and/or non-registered site(s), describe the methods TVA plans to use to collect the data. TVA shall collect sufficient data to create a map that clearly delineates the ground water surface in the ash disposal areas such that (1) the CCR material between the original ground surface and the top of the current ground water table is defined and (2) CCR material between the current ground water surface and the surface elevation of the CCR disposal area is clearly defined. TVA shall also collect pore water samples from CCR material that is below the current ground water surface and from CCR material that is below the projected ground water surface with closure in place. TDEC has not determined that closure in place is a corrective action option at any TVA site; however, this information is needed should TVA propose closure in place.	NA - Included in the EIP
4.3 C. TDEC Groundwater Monitoring and Mapping Request, 4.3.7	7	Describe how TVA will define groundwater contaminant plumes identified using currently available groundwater monitoring data and new groundwater monitoring data gathered from the installation and sampling of new groundwater monitoring wells. TVA will also discuss its strategy to determine the extent of any CCR constituent plume should the initial groundwater monitoring network not define the full extent of the CCR constituent groundwater plume at the site. This should include the science it will use to extend its groundwater monitoring network.	NA - Included in the EIP
4.4 D. Site Conditions			
4.4 D. TDEC Site Conditions Request, 4.4.1	1	Discuss all current information available about the geologic lithology (formations, bedding planes, etc.) and their relevance to natural seeps, springs and karst features on the TVA site; including the CCR disposal areas. Some limestone formations are very susceptible to solution channeling, especially when they have been disturbed through natural events or construction activities such as blasting. TVA shall describe the methods it will use to determine whether solution channeling has occurred at and near the soil/rock interface;	Chapter 2.4 Physical Characteristics, Chapter 4.1 - Geotechnical Investigation, Chapter 5.1 - JOF Plant Bedrock Surface
4.4 D. TDEC Site Conditions Request, 4.4.2	2	Discuss all current information about the geologic structure below the TVA site and how it may be used to help determine if faults and/or fractures have been identified in the subsurface. TVA shall describe the methods it will use to collect additional data (faults, fractures, bedding planes, karst features, etc.) to determine whether faulting and fracturing has impacted and/or controls groundwater movement. Describe how TVA will determine if identified faults, fractures, bedding planes, karst features, etc. are filled to the point that they limit or eliminate ground water flow.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.3	3	Discuss existing data available to TVA to map top of bedrock; i.e. existing boring and ground water monitoring well construction data. TVA shall describe the methods (surface geophysics; installation of borings/ground water monitoring wells) it will use to collect additional data to map top of bedrock. The EIP shall include a description of the data collection methods TVA will use to determine the thickness and types of natural material overlying bedrock as well as the top of bedrock contours. For all new soil borings, TVA shall provide the location of the borings, the information used to determine boring location, the drilling method to be used, how the borings will be logged. Logging shall be performed by a Professional Geologist licensed to practice in Tennessee. Logs shall provide the following information when presented in the EAR; soil type, depth and changes, identify geologic formations, depth of formation, karst features, fractures, bedding planes, and any other pertinent information. TVA shall provide an example of a boring log in the EIP.	NA - Included in the EIP

EIP Section	Request No.	TDEC Information Request	Associated EAR Section
4.4 D. TDEC Site Conditions Request, 4.4.4	4	When/if TVA divided original Coal Combustion Residual (fly ash, bottom ash and gypsum) surface impoundments into individual units (surface impoundments, non-registered disposal areas and or landfills), TVA shall discuss where this has happened on each TVA site. As a part of the EAR, TVA shall discuss the source of information reviewed to provide the specifications of those structural changes. Discuss if there are as built drawings or engineering plans for the modifications TVA has made at each site made. If there is not existing information that describes the structural changes in the original surface impoundment(s) or non-registered site(s), TVA shall discuss in the EIP how it will collect the information needed to document structural changes over time. This information is needed in determining the structural and seismic stability of each TVA site..	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.5	5	Stipulate whether there are any as-built designs for the interface between the originally disposed CCR material and any disposal structures constructed above the original disposal area.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.6	6	TVA shall discuss any existing stability calculations for final permitted design elevation for all landfills. Unless TDEC specifies otherwise, TVA shall conduct new stability calculations for all landfills, surface impoundments and/or non-registered disposal sites. The EIP shall describe the method TVA will use to determine structural stability. TVA shall provide stability calculations for each disposal area based upon (1) the permitted final elevation or planned final elevation for each landfill, (2) the current elevation for all surface impoundments and/or (3) the current elevation for all non-registered disposal location..	Chapter 4.1 - Geotechnical Investigation
4.4 D. TDEC Site Conditions Request, 4.4.7	7	TVA shall specify how it will determine the construction methods and properties of the drainage layers between each "stacked layer" for permitted CCR landfills; including where the drainage layer discharges.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.8	8	TVA shall review Section VI.D.5 (page 21373) of the section of the Federal CCR Preamble that describes areas of concern regarding overfill at landfills. TVA shall explain how it will determine if there are potential overfill situations for each surface impoundment/landfill at the TVA site.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.9	9	Discuss current information/data that is available to estimate the shear strength of the CCR materials in the landfill(s), surface impoundment(s) and/or nonregistered sites. If there is not sufficient data available to determine shear strength, describe the methods TVA shall use to collect this data. If there is existing data collected during installation of soil/rock borings or construction of ground water monitoring wells, provide a brief description of this data and how it will be presented for use in the EIP.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.10	10	TVA shall provide static, seismic and liquefaction analysis in accordance with 257.63 and 257.73 of the Federal CCR regulations for final permitted design elevations for Landfills that are defined by the Federal Regulations as overfills. If the analyses have not been completed, then TVA shall provide analyses for each landfill based upon either the permitted final elevation for each or for the planned final elevation for each; should TVA decide it does not need to use the entire permitted capacity of any permitted CCR landfill. TVA shall identify and analyze the critical cross section(s) and document that the modeling represents the actual field conditions at the cross-section location(s). TVA shall also address foundation settlement of these Landfills.	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.11	11	TVA shall discuss any current dam safety analysis performed at the TVA site for all landfills, surface impoundments and/or non-registered disposal areas. If dam safety analysis has not been performed for each disposal area or if TDEC determines the dam safety analysis is inadequate, then TVA shall describe the method(s) it will use to determine the "dam safety factor" for all disposal areas at the TVA site.	Chapter 4.1 - Geotechnical Investigation
4.4 D. TDEC Site Conditions Request, 4.4.12	12	TVA shall discuss any current information or assessments regarding seismic stability for the TVA site, including existing seismic analysis for each surface impoundment(s), landfill(s) and/or nonregistered site(s) s at the TVA site. TVA shall describe in the EIP the method it will use to determine the size of the seismic event that would cause structural failure for entire area of the surface impoundments, landfills and/or non-registered disposal sites at the TVA site. The seismic analysis method proposed by TVA shall provide seismic data comparable to the requirements for seismic analysis in the federal CCR regulations at CFR 257.63. The seismic analysis plan shall determine the seismic stability of the entire TVA site and any improvements need to ensure seismic stability for the site, as it exists today and for closure in place. Soils below the surface impoundments and landfill shall be evaluated for liquefaction potential. If these soils are found to be susceptible to liquefaction, stability calculations shall be performed which account for liquefaction.	Chapter 4.1 - Geotechnical Investigation
4.4 D. TDEC Site Conditions Request, 4.4.13	13	TVA shall discuss how the structural integrity of the entire area of CCR disposal (surface impoundment(s), landfill(s) and non-registered sites) shall be determined. TVA shall include in the EIP the methods and models it will use to evaluate structural integrity as discussed in CFR 257.73(d) and (e).	NA - Included in the EIP
4.4 D. TDEC Site Conditions Request, 4.4.14	14	Discuss any current information available that may be used to determine the ability of the local geology to provide sufficient structural stability for the existing surface impoundments, landfills and/or non-registered disposal areas at the TVA site as well as any disposal area considered for closure in place. TDEC anticipates there will not be sufficient existing structural stability information for this analysis. Describe the methods TVA shall employ to collect data that may be used to determine the capability of the geologic formation at the TVA site to provide structurally sound/load bearing strength for existing CCR disposal areas as well as for those disposal areas should TVA consider closure in place of those areas.	Chapter 4.1 - Geotechnical Investigation
4.5 E. Surface Water Impacts		**Because of the long operating history of the TVA Fossil Plants, there have been potential opportunities for CCR materials to move into surface water and for dissolved CCR constituents to migrate via ground water flow into surface water. As a part of the EIP, TVA shall describe how it will determine if CCR material and/or dissolved CCR constituents have entered surface water at or adjacent to TVA sites. TVA shall also describe in the EIP how it will assess any impact CCR material and/or dissolved CCR constituents may have on water quality and/or the impact on fish and aquatic life.**	
4.5 E. TDEC Surface Water Impacts Request, 4.5.1	1	TVA shall discuss any current information it has for the TVA site that identifies CCR deposition on the streambed for surface water on the TVA site or surface water adjacent to the TVA site.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.2	2	TVA shall describe in the EIP the methods it will use to determine if CCR material has moved from the TVA site into surface water on the TVA site or adjacent to the TVA site. TVA shall propose a procedure for sampling the streambed for CCR material. TVA shall describe sample collection methods, sample preservation and sample analysis methods for CCR materials. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations. Further, TVA shall propose how it will test sediment and CCR samples taken from riverbeds to determine if CCR constituents dissolve into surface water.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.3	3	TVA shall describe how streambed sample results will be used to develop a map identifying the location of CCR material on the streambed and the depth of the CCR material on the streambed.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.4	4	TVA shall discuss any current information it has for the TVA site that identifies the movement of ground water with dissolved CCR constituents into surface streams on or adjacent to the TVA site. This includes any surface water analyses TVA has performed for samples taken from the seeps and surface stream(s).	Chapters 5.1 - Groundwater and Hydrogelogical Investigations, 6 - Seep Investigation, and 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.5	5	TVA shall propose a plan to collect and analyze water samples from seeps and surface stream(s) on the TVA site and/or adjacent to the TVA site. This plan shall include sampling locations, sample collection methods, sample preservation and transport and methods for sample analysis. All samples shall be analyzed for the CCR constituents listed in Appendices 3 and 4 of the federal CCR regulations.	NA - Included in the EIP
4.5 E. TDEC Surface Water Impacts Request, 4.5.6	6	TVA shall describe how seep and stream sample results will be used to develop a map identifying the location of seep and stream sampling points and the results of the analyses. This map shall also include the location of any public water intakes within 1 mile of the downstream side of the TVA site.	Chapters 5.3 - Water Use Survey, 6 - Seep Investigation, and 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.7	7	TVA shall provide a brief discussion of any studies conducted by TVA or any other agency to determine if CCR materials or dissolved CCR constituents have impacted fish and/or aquatic life.	Chapter 7 - Surface Streams, Sediment and Ecological Investigations
4.5 E. TDEC Surface Water Impacts Request, 4.5.8	8	Upon a determination by TDEC of the need to assess the impact of CCR material in surface streams or migration of ground water containing dissolved CCR constituents, TVA shall provide a plan to study the impact of CCR materials and/or constituents on fish and/or aquatic life in surface streams on the TVA site or adjacent to the TVA site.	NA - Included in the EIP

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David W. Salyers, P.E.
Commissioner

Bill Lee
Governor

November 14, 2023

Shawn Rudder
Sr. Manager
Waste Permits, Compliance, and Monitoring
Tennessee Valley Authority
1101 Market Street, BR 4A
Chattanooga, TN 37402

RE: TDEC Commissioner's Order OGC15-0177
TVA Johnsonville Coal Fired Fossil Fuel Plant
Environmental Assessment Report Revision 0

Dear Mr. Rudder:

On September 6, 2023, Tennessee Valley Authority (TVA) submitted the Environmental Assessment Report (EAR) Revision 0 for the TVA Johnsonville Coal Fired Fossil Power Plant (TVA JOF) documenting the results from the implementation of the Environmental Investigation Plan (EIP). The Tennessee Department of Environment and Conservation (TDEC) has completed its review of the submittal and is providing comments in the attached table (Attachment 1).

TDEC requested that our subcontractor, Civil & Environmental Consultants, Inc. (CEC), provide subject matter experts to assist in the review of the EAR Revision 0. CEC and their technical consultants, TEA Inc., and Environmental Information Logistics, LLC (EIL) have completed their review and provided comments in the attached table (Attachment 2).

Please address the attached comments in an updated document (EAR Revision 1) with a cover letter summarizing TVA's response to each comment and subsequent modifications to TDEC no later than February 12, 2024.

Should you have any questions, please do not hesitate to contact me via email at Robert.S.Wilkinson@tn.gov or phone at (615) 598-3272.

Sincerely,

Robert Wilkinson, P.G., CHMM

CC:	Pat Flood	Angela Adams	James Clark
	Rob Burnette	Chris Vail	Caleb Nelson
	Judy Low	Anna Fisher	Kelly Love
	Roy Quinn	Matt Aplin	Brandon Boyd

Attachment 1 – Summary of TDEC Comments

TVA JOF EAR Rev 0
Summary of TDEC Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
2.3	Ownership and Surrounding Land Use	32 of 139	3	All	The New Johnsonville Water Department intake is described as being approximately one mile south (downstream). This seems incorrect as south is upstream. Also, this should be shown on a map for reference.
5.1.3.3	Uppermost Aquifer and Groundwater Flow	57 of 139	Figure	NA	This is an overarching comment that will also need to be addressed in Appendix H.1. Although the 1936 topographic map does not show topography it does show the surface streams, and although it is hard to determine where the divide would be based on 1936 alone, combined with the 1950 topographic map it looks like the groundwater divide could correspond more with the ridgetop south of Indian Creek (south of the roadway). Is there enough information that TVA is sure of the placement of the groundwater divide?
5.3.1.1	Desktop Survey Results	65 of 139	1	2	This text indicates the desktop survey identified "five potentially usable wells and two springs"; however, Appendix H.10 indicates that "no springs were identified".
5.3.1.2	Usable Water Well and/or Spring Identification	65 of 139	Figure	NA	This is an overarching comment that will also need to be addressed in Appendix H.10. Although the 1936 topographic map does not show topography it does show the surface streams, and although it is hard to determine where the divide would be based on 1936 alone, combined with the 1950 topographic map it looks like the groundwater divide could correspond more with the ridgetop south of Indian Creek (south of the roadway). Is there enough information that TVA is sure of the placement of the groundwater divide?
5.3.1.2	Figure	67 of 139	NA	NA	What are the numeric identifiers supposed to represent, an explanation is not in the legend? If these are parcels, there appear to be six parcels identified and the text identifies four parcels within the survey area with wells and/or springs.
5.4	Hydrogeological Investigation Summary	69 of 139	NA	NA	See previous comments in section 5.1.3.3, and confirm the location of the southern groundwater divide.
Exhibits	Exhibit 8-1	133 of 139	NA	NA	Ash Disposal Area 1 - Monitoring Well JOF-111 appears screened in the geologic unit identified as primarily silt and clay which overlies the primarily sand and gravel unit that is identified as the uppermost aquifer at the unit. Please explain how the silt and clay unit is not considered the uppermost aquifer at Ash Disposal Area 1.

Section Number	Section Title	Page	Paragraph	Line	Comment
Exhibits	Exhibit 8-2	134 of 139	NA	NA	DuPont Dredge Cell - The "bottom liner" depicted in the exhibit is not described anywhere in the EAR. How was it constructed? What materials does it consist of? Is there geotechnical data available to determine the permeability of the unit?
Exhibits	Exhibit 8-5	137 of 139	NA	NA	Former Coal Yard - Monitoring Well JOF-114 appears to be screened in bedrock, but there is no groundwater flow depicted in the bedrock.
Appendix B	NA	NA	NA	NA	Please provide a reference map in this section depicting the locations of borings, piezometers, and wells included in Appendix B.
Appendix C	NA	NA	NA	NA	Please provide a reference map in this section depicting the locations of piezometers, and wells included in Appendix C.
Appendix D	Exhibit D.2	3 of 5	NA	NA	Ash Disposal Area 1 - Monitoring Well JOF-111 appears screened in the geologic unit identified as primarily silt and clay which overlies the primarily sand and gravel unit that is identified as the uppermost aquifer at the unit. Please explain how the silt and clay unit is not considered the uppermost aquifer at Ash Disposal Area 1.
Appendix D	Exhibit D.2	3 of 5	NA	NA	DuPont Dredge Cell - The "bottom liner" depicted in the exhibit is not described anywhere in the EAR. How was it constructed? What materials does it consist of? Is there geotechnical data available to determine the permeability of the unit?
Appendix D	Exhibit D.4	5 of 5	NA	NA	Former Coal Yard - Monitoring Well JOF-114 appears to be screened in bedrock, but there is no groundwater flow depicted in the bedrock.
Appendix G.1	2.2.3 Results	20 of 3237	Table G.1-1	NA	The FS for Veneer Stability is 1.4 and is discussed in the paragraph below the table. That paragraph says that annual inspections have not identified signs of distress or instability. However, in the 2022 Annual Inspection tension cracks were identified. These annual reports should be provided, if they are going to be referenced.
Appendix G.1	2.2.3 Results	20 of 3237	3	6	States " TVA's routine observations and annual site inspections have not identified signs of distress or instability of the cover" On page 28 of 3237 it says that an area of tension cracks and associated erosion was observed along a portion of the north toe berm.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	4	Please explain why there were no site inspection reports available from 2014-2020.
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	5	States "No signs of tension cracking were documented." On page 28 it states that "In 2022, tension cracks were reported. The cracking has been remediated, as noted in the subsequent annual inspection report." These annual reports should be provided, if they are going to be referenced.
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	1	4	States "In 2022, tension cracks were reported. The cracking has been remediated, as noted in the subsequent annual inspection report." The annual inspection reports that are referenced were not included.
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	6	States "An area of tension cracks and associated erosion was observed along a portion of the north toe berm. The cracking has been remediated" The annual inspection reports from Geosyntec that are referenced through, were not included.
Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	2	3 and 4	The New Johnsonville Water Department intake is described as being approximately one mile south (downstream). This seems incorrect as south is upstream. Also, this should be shown on a map for reference.
Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	8	Reference to Table H.9-1 appears to be mislabeled and it should reference Table H.10-1
Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	2	4	Reference to Table H.9-2 appears to be mislabeled and it should reference Table H.10-2
Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	4	Reference to Table H.9-3 appears to be mislabeled and it should reference Table H.10-3
Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	6	Reference to Exhibit H.9-2 appears to be mislabeled and it should reference Exhibit H.10-2
Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	854 of 872	1	2	Reference to Table H.9-4 appears to be mislabeled and it should reference Table H.10-4
Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	2	1	Reference to Table H.9-1 and Table H.9-2 appear to be mislabeled

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	2	2	Reference to Exhibit H.9-2 appears to be mislabeled.
Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	3	1	Reference to Exhibit H.9-2 appears to be mislabeled.
Appendix H.10	2.1.2 Hydrogeological Considerations	855 of 872	4	7	Reference to Exhibit H.9-3 appears to be mislabeled.
Appendix H.10	2.1.3 Usable Water Well Identification	856 of 872	1	4	Reference to Table H.9-5 and Exhibit H.9-3 appears to be mislabeled.
Appendix H.10	2.1.3 Usable Water Well Identification	856 of 872	2	1	Reference to Exhibit H.9-5 appears to be mislabeled.
Appendix H.10	Table H.10-5	868 of 872	NA	NA	Johnsonville is misspelled in title

Attachment 2 – Summary of Subcontractor Comments

Section Number	Section Title	Page	Paragraph	Line	Comment
2.2.2	Surface Water Hydrology	34 of 139	2	N/A	Please complete the sentence.
7.1.1	Surface Stream Studies and Ongoing Monitoring Activities	73 of 139	1	3	"The studies found that upstream and downstream aquatic communities near the JOF Plant were ecologically similar." Are these studies detailed in a document that can be referenced, like is done for other statements (e.g., TVA 2011 and 2012)? If so, please provide the reference. Also, please briefly describe what is meant by "similar"? Are all of the metrics (pH, dissolved oxygen, temperature, conductivity; etc.) mentioned in the previous sentence similar? What tool was used to monitor the biological communities and how similar were they? Is it beyond the scope of this report to provide at least a cursory description of the data? Without providing any supporting data, the reader is left with taking your word for it. If there is more detail provide in Appendix J that should be mentioned. A suggestion therefore is to provide specific references in this paragraph and to provide some additional detail if available that supports your conclusions.
7.1.2	Sediment and Benthic Invertebrate Studies	73 of 139	1	1	This paragraph provides important history of the sediment sampling in the vicinity of the JOF Plant, however it provides the reader with no details of the significance of the sampling results. Please provide at least a few statements that show the relevance of the results of these historical studies to current results. In other words, were the results of the metals analyses similar to current results? Were there variations? Did these results support current results and conclusions?
7.1.2	Sediment and Benthic Invertebrate Studies	74 of 139	First full paragraph	1	"The 2010 and 2011 JOF Plant benthic sample results showed overall similarities between the upstream and downstream benthic sample locations — in numbers of species, mean densities, and relative compositions of functional feeding groups." Same comment as above regarding use of the term "similarities." Perhaps there is summary information in the referenced reports (TVA 2011 and 2012) that could be included here or more specifically referenced.
7.1.2	Sediment and Benthic Invertebrate Studies	74 of 139	2	1	"Mayfly collections during previous studies were limited to those incorporated into the Reservoir Benthic Index (RBI) sampling." Please provide a statement or two that indicate the significance of this statement. If the reference is to the 2010 and 2011 studies, please indicate.
7.2	TDEC Order Investigation Activities	77 of 139	Summary	N/A	The level of detail provided in this Summary is excellent and is an example of the request from the previous comments (if available).

Section Number	Section Title	Page	Paragraph	Line	Comment
7.4.1.1	Tennessee River	79 of 139	1	1	CCR Parameter concentrations in surface stream samples from the Tennessee River were below human health screening levels and consistently below acute and chronic ESVs. Suggest adding a parenthetical identifying Table with this analysis - (see Table J.1-1)
7.4.1.1	Tennessee River	79 of 139	Bullet Points	N/A	Suggest identifying which Exhibit illustrates these 3 findings. Is it "(see below and Exhibit 7-2)" as stated in the preceding paragraph?
7.4.1.3	Boat Harbor	84 of 139	8	1	Please provide the rationale for not including additional evaluation of gamefish in the CARA Plan although CBR values were exceeded in gamefish muscle tissue samples for arsenic; and liver tissues for arsenic, selenium, copper, and mercury.
7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	1		Please provide a citation to a figure that illustrates the location of the" eleven transect locations." I believe the relevant figures are in Appendix J (Exhibit J.3-2?) but it would be helpful to the reader to have them in the main body of the EAR as well.
7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	1	8	Consider adding the word "qualitative" before ......habitat characteristics.....
7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	3	4	"(and frequently had higher RBI scores than controls)". Since these are identified as "control sites" do you have an explanation for this finding? Is it within expected variability?
7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	4	1	In the Tennessee River, three transect locations adjacent to the CCR management units had the highest richness (TTR) within the study area (TR03, TR04, and TR05), including upstream control locations. Same comment as previously mentioned - identification of a figure that illustrates these locations would be helpful to the reader.
7.4.2	Benthic Macroinvertebrate Community Analysis	87 of 139	First full paragraph	N/A	In summary, benthic communities within adjacent and downstream areas of the Tennessee River, the Intake Channel, and the Boat Harbor appear to be at least as healthy, rich, and sensitive as their respective control locations unimpacted by CCR from the Plant. Same comment as above - do you have an explanation for the reason the "control sites" are apparently more stressed than the sites located adjacent to the facility?

Section Number	Section Title	Page	Paragraph	Line	Comment
Exhibits	N/A	137 of 139	8-5	N/A	Item 1 on Exhibit 8-5 states that the global slope stability and the veneer stability of the Former Coal Yard meets safety criteria. Was a stability analysis performed even though it was not required by the EIP? If it was not , than please remove this statement. If it was, please include the analyses.
Appendix D	CCR Management Unit Cross Sections	N/A	N/A	N/A	There are no flow arrows indicating vertical flow in any of the cross sections. Please make that correction.
Appendix D	CCR Management Unit Cross Sections	3	DuPont Road Dredge Cell B-B'	N/A	Why is there a red pore water phreatic line shown outside of the ash fill area?
Appendix D	CCR Management Unit Cross Sections	4	South Rail Loop C-C'	N/A	Why is there no geosynthetic cap on the lower ash between station71+30 and 74+80? What does the dashed line near station 71+00 represent?
Appendix D	CCR Management Unit Cross Sections	5	Active Ash Pond 2 D-D'	N/A	The Camden Chert is the principal local aquifer (EAR Section 2.4.2). Why are there no flow arrows shown?
Appendix D	CCR Management Unit Cross Sections	5	Coal Yard Loop E-E'	N/A	There appears to be substantial flow gradient within the ash phreatic surface. Please add flow arrows and indicate the leachate discharge location. How is the leachate flow sustained?

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.1	Section 2.2 Estimates of Background Conditions	11 of 362	1	5	The sentence is given as follows: "For example, for a '95% UTL with 95% coverage', there is 95% confidence that, on average, 95% of the data are below the UTL." This should be corrected to state "For example, for a '95% UTL with 95% coverage', there is 95% confidence that, on average, 95% of the data are **at or** below the UTL."
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Tables	N/A	In line 1 of the table for Ash (taken at surficial depths), there are 12 samples with an elevated 33% non-detects percentage with only 1 reporting/detection limit. Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % of non-detects below the lowest reporting/detection limit. However, for the case in line 1 of the table where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15, 16, and 17 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in the background soil data tables on pages 15, 16, and 17 of the PDF. Specifically high % non-detects are listed on this table for boron (surficial, 0.5 to 10', >10', and all depths), chloride (surficial), fluoride (surficial, 0.5 to 10', >10', and all depths), cadmium (0.5' to 10', >10), and silver (surficial). Attention should be paid to the "% Non-Detect" column of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages, can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 and 16 of 362	Tables	N/A	There are two identical, duplicate sections in the tables on pages 15 and 16 for fluoride data. One of these entries needs to be removed.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 through 17 of 362	Tables	N/A	The box-whisker plots in the tables in Attachment E.1-B were used as an initial screening tool to identify whether the underlying distribution for the background soil data appear to be normal or appear to be from a skewed distribution. In addition, the sample size and % of detects were evaluated for each data set to evaluate the calculations performed for the tolerance limits/background threshold values (BTVs). Sample size is important in developing reliable BTVs and also, equally as important, are the number of detected values. It is difficult to identify the underlying distribution of the data if there are a high number of non-detects, even if the overall size of the data set is large. It is important to derive accurate BTVs, especially when moving into corrective action. The accuracy of six (6) of the sample location/constituent pairs in the background soil data table are in question, based on the review of data and the re-evaluation of data by CEC using EPA ProUCL. The specific sample location/constituent pairs in question are discussed in the following line items from line 6 through line 11 below.
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table-Chloride (Surficial Depth)	N/A	The chloride background soil data for surficial depths was tagged for examination due to skewness evident in the box-whisker plot and for the high non-detects % (>66%). The table shows a BTV/upper tolerance limit that is based on a normal distribution. It is very difficult to identify an underlying distribution for the data if you only have 4 detected values out of 12. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would produce a value of 6.61 (the maximum value of the data set), which is more accurate in this case (in lieu of 6.88 shown on the table).
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table-Chloride (0.5 ft. to 10 ft. bgs)	N/A	The chloride background soil data for 0.5 ft. to 10 ft. bgs intervals was tagged for examination due to skewness evident in the box-whisker plot. The background soil table shows a BTV/upper tolerance limit that is based on a normal distribution. The data were re-evaluated by CEC using EPA ProUCL. Kaplan Meier is applicable for use with these data based on multiple reporting limits and lower % non-detects. Based on the results from EPA ProUCL, the data set does not pass the normality test for the Shapiro-Wilk Goodness of Fit test at the 95% confidence level. In addition, the data do not fit a gamma distribution based on the Anderson-Darling Goodness of Fit test for the 95% confidence level. The data appear to best fit a lognormal distribution. The adjusted 95% UTL with 95% coverage (lognormal) using Kaplan Meier is 27.4 (in lieu of 23.8 shown on the table).

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table-Sulfate (>10 ft. bgs)	N/A	The sulfate background soil data for >10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot. The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. The data were re-evaluated by CEC using EPA ProUCL. There are zero non-detects. In addition, there are 29 samples found in the excel data spreadsheet provided by TDEC for sulfate at this depth, whereas the table on page 15 shows n=18. Based on the results from EPA ProUCL runs for the n=29 data measurements, the data set does not pass the normality test for the Shapiro-Wilk Goodness of Fit test at the 95% confidence level. Based on a Goodness of Fit analysis, the data best fit a lognormal distribution. The adjusted 95% UTL with 95% coverage for the lognormal distribution fit is 175.1 (in lieu of 151 shown on the table).
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 of 362	Table-Cadmium (0.5 ft. to 10 ft. bgs)	N/A	The cadmium background soil data for 0.5 ft. to 10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (60.9%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 9 detected values out of 23. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would mean an adjusted value of 0.144 (the maximum value of the data set), which is more accurate in this case (in lieu of 0.115 shown on the table).
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 of 362	Table-Cadmium (>10 ft. bgs)	N/A	The cadmium background soil data for >10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (61.1%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 7 detected values out of 18. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would mean an adjusted value of 0.145 (in lieu of 0.137 shown on the table).

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	Page 17 of 362 of the PDF	Table-Silver (Surficial)	N/A	The silver background soil data for surficial depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (58.3%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 5 detected values out of 12. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case. This results in an adjusted value of 0.0396, which is more accurate in this case (in lieu of 0.0393 shown on the table). This is a marginal change in the BTV, but the fact that we have only 5 detections in a small overall sample size of 12 makes the identification of underlying distribution difficult at this point in the data collection.
Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 and 17 of 362	Tables	N/A	In addition to the sample location/constituent pairs identified in the previous comments above, the following sample location/constituent pairs in the tables in Attachment E.1-A require a second look relative to the development of their BTVs (tolerance limits) to ensure the correct distribution assumption was used: Cr, Pb, Hg, Cu and V, for only the surficial sample locations. A review of the box-whiskers plots for these data appear to show skewness in the distributions.
Appendix E.2	Attachment E.2-A Summary Statistics -CCR Material Characteristics Investigation	41 to 45 of 362	Tables	N/A	High percentage non-detect data (>50% censored) are noted in data tables on pages 41 and 43 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data tables on pages 46 to 49 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.
Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	Zero detects were noted in the data sets presented in the tables on pages 47 and 48. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.
Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	For the following sample location/constituent pairs shown in these tables, there are data sets with non-detects and only one reporting limit listed (with high % non-detect values). This applies to Active Ash Pond 2 (Cd, Cr, Co, Li, Ag, Zn), Ash Disposal Area 1 (Sb, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Ni, V, Zn, Fe), Former Coal Yard (Sb, Be, Cd, Cr, Co, Li, Mo, Se, Cu, V, Zn), DuPont Road Dredge Cell (Be, Cd, Cr, Pb, Li, Hg, Ni, Zn, Fe, Mn), South Rail Loop Area 4 (Ni). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases in the data sets listed above where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.
Appendix E.2	Attachment E.2-A Summary Statistics -Pore Water	50 to 56 of 362	Tables	N/A	There are no comments for the Pore Water data tables because of the extremely small sample sizes for the data sets.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.3	Section 2.2 Comparison of Groundwater Quality Data to Groundwater Screening Levels	96 of 362	2	2 and 7	Reference is made to the comparison of the lower confidence limit (LCL) and the GSL several times in this paragraph. Specifically, in line 7, the sentence is given as: "***In accordance with the methods described in the Unified Guidance***, *constituent concentrations were determined to represent a statistically significant concentration above or equal to a GSL for constituents other than pH.* ..". EPA Unified Guidance (March 2009) on page 2-16 states "*Therefore, the Unified Guidance recommends that the compliance/assessment monitoring* ***null hypothesis*** *be structured so that the* ***compliance population*** *characteristic (e.g., mean, median, upper percentile) is assumed to be less than or equal to the fixed standard unless demonstrated otherwise*." EPA considers a LCL that is equal to the GSL to be in compliance with the standard. The last paragraph on page 4-6 of the Unified Guidance also states that there is an SSI when the LCL **exceeds** the GWPS (or GSL). I understand that the interpretation in the EAR has been to declare SSIs even for LCLs that are equal to the GSL, but this is not the interpretation from the Unified Guidance. This needs to be considered when moving into the Corrective Action phase of the program.
Appendix E.3	Section 2.2.2 Evaluation for Well-Constituent Pairs Using Point-by-Point Method	101 of 362	1	1	Chapter 21, page 24 of the EPA Unified Guidance requires "at least 8 to 10" samples to construct a confidence band around a linear regression line. However, the authors of Appendix E.3, per Section 2.2.2 reference using a standard of a minimum of 5 samples to develop linear regression models with confidence bands. This minimum sample value does not follow the EPA Unified Guidance.
Appendix E.3	Section 3.2 Comparison of Groundwater Quality Data to Approved Groundwater Screening Levels-Table E.3-4	105 of 362	N/A	N/A	Table E.3-4 is titled "Summary of Statistically Significant Concentrations **Greater than** Groundwater Screening Levels " The approach described in E.3 Section 2.2 is that SSIs are determined based on comparing LCLs and lower confidence bands (for data with SS trends) to GSLs and declaring SSIs for lower limits **either equal to or greater than** the GSL. The title of the table is not consistent with the approach described in Section 2.2.
Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	Zero detects were noted in the data sets presented in the tables on pages 108 to 120. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	For the following well/constituent pairs shown in these tables, there are data sets with non-detects and **only one reporting limit** listed (with high % non-detect values). This applies to JOF-109 (As, Cr, Co, Pb, Tl), JOF-112 (As, Cr, Li, Cu, V), JOF-118 (Cr, V), JOF-110 (As, Cr, Pb), JOF-111 (Cr, Cd, Tl, V), JOF-113 (As, Cr, V), JOF-114 (As, Cd, Cr, Tl, V), JOF-117 (Cu, V), 89-B10 (SO4, Ba), B-11 (Co), B-12 (Cd, Co), JOF-105 (Cd, Hg), JOF-107 (Bo), and JOF-102 (F). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases in the data sets listed above where there are non-detects and there is a single reporting/detection limit, it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be **biased too high** because of the way KM is calculated.
Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data tables on pages 108 to 120 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.
Appendix E.3; Attachment E.3-D	Linear Regression Plots	171 of 362	N/A	N/A	Recommend that only the regression plots for data that have statistically significant trends (either increasing or decreasing) be included in Section E.3. These plots are identified on the table on pages 194 and 195 of Attachment E.3-E - Linear Regression Results. These well/constituent pairs with trends are the only plots that we need to see to assess the confidence bands about the mean for compliance with the GSLs.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.4	Table D.3- Summary of Statistical Hypothesis Testing Johnsonville Fossil Plant	217 of 362	Table	N/A	Results of the hypothesis testing for the 4 field parameters for the historical seeps and AOI locations revealed no statistically significant differences between the data groups, except for temperature. However, the samples sizes for most of the groups are low, around n=9 to n=10. Considering the small samples sizes, the Power of the hypothesis tests are most likely low, limiting the capability to detect a difference in the group means (or medians for non-parametric analysis) if a difference really does exist. Therefore, the "not statistically significant" result for these specific constituent groups is not a conclusive result. There may be differences in these comparative groups which we can not see yet due to the small sample sizes. Power Analysis will be required in order to determine the minimum sample sizes required in order to achieve a minimum Power of 80% (minimum statistical goal) for these group comparisons.
Appendix E.4	Statistical Analysis of Seep Investigation	217 of 362	Table	N/A	Based on the text on page 3 of the section (page 204 of 362 of the PDF), the intermediate areas have a sample size of n=58 for each of the 4 measured field parameters collected along the Kentucky Lake/Tennessee River and the Boat Harbor. Also, the sample size for the upstream control areas is n=20 for each of the 4 measured field parameters. There are zero non-detects. Based on Table D.4, bootstrapping was performed to develop the confidence intervals for the intermediate areas and also for the tolerance intervals development for the JOF-UC data. This approach is acceptable and is preferable as long as we have data sets with n>=20. Bootstrapping does not require an assessment and knowledge of the underlying distribution for the data and it works well with all types of data.
Appendix E.5: Section 3.1	Summary Statistics, Exploratory Data Plots, and Outlier Screening	243 of 362	3rd and 4th of section	All lines	I agree with the decision of remove the two outliers specified in this section based on the apparent lab issues discussed in paragraph 4 of the section regarding the reporting of total and dissolved metals.
Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	For 20% of the data sets shown in these tables, there are data with non-detects **and** there is only one reporting limit listed (with high % non-detect values). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases in the 20% of data sets where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	Zero detects were noted in 18% of the data sets presented in the tables. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.
Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	High percentage non-detect data (>50%) are found in the table's data sets. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.
Appendix E.6	Section 3.3.1 Formal Hypothesis Testing	303 of 362	Entire Section	N/A	Results of the hypothesis testing for the arsenic and selenium for the Intake versus the Cove data groups and for arsenic, mercury, and selenium in the Boat Harbor versus Cove data groups revealed no statistically significant differences in the data. However, the samples size for each group is n=9. Considering the small samples sizes, the Power of the hypothesis tests will most likely be low, limiting the capability to detect a difference in the group means (or medians for non-parametric analysis) if a difference really does exist. Therefore, the "not statistically significant" result for these specific constituent groups is not a conclusive result. There may be differences in these comparative groups which we can not see yet due to the small sample sizes. Power Analysis will be required in order to determine the minimum sample sizes required to achieve a minimum Power of 80% (minimum statistical goal) for group comparisons.
Appendix E.6	Attachment E.6-A Summary Statistics	308 and 310 of 362	Tables	N/A	Zero detects were noted in the data for the Coves for Chloride and Tennessee River (upstream and downstream) for Chloride. However, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix E.6	Attachment E.6-A Summary Statistics	308, 309, and 310 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data sets for chloride at the Boat Harbor and Intake Channel and for fluoride at the Boat Harbor, Coves, and Intake Channel. Also, high percentage non-detects were reported for ash in the Coves, and the Tennessee River adjacent for chloride and upstream for fluoride. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.
Appendix E.6	Attachment E.6-A Summary Statistics	308, 309, and 310 of 362	Table	N/A	For ash for Coves, and for samples taken at the Tennessee River upstream and adjacent for boron, downstream for fluoride, and ash upstream, there are data with non-detects **and** there is only one reporting limit listed (with high % non-detect values). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. However, Kaplan Meier is applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases where there are non-detects and there is a single reporting/detection limit, where non-detect percentages are elevated, it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.
Appendix G.1	2.3 Structural Integrity	22 of 3237	1	2	This is the first mention of "non-registered sites". Please elaborate on where they are located.
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	All	All	All	This section lists several relatively recent site inspection reports as "not available": Ash Disposal Area 1: 2014-2020, DuPont Road Dredge Cell: 2014, 2015, South Rail Loop Area 4: 2014-2020. Please explain why these reports were not available.
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	7	N/A	Granular fill was compacted to a minimum of 85% of Standard Proctor. Why was this deemed acceptable? In which area of the embankment dike did this occur? Did any slope stability section pass through this portion of the embankment?

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	9	N/A	Please elaborate on the type of slope failure observed during the 2022 annual inspection on the north toe berm. Was the failure shallow or deep? How far where the tension cracks from the toe bulge? What were the weather conditions prior to the failure? What pore pressures were observed? How was the failure remediated?
Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	9	N/A	This slope failure occurred after the slope stability analyses were completed. Does the failure corroborate the slope stability analyses or are new analyses required that incorporate the lessons learned from this failure? What are the lessons learned? Do the modeled soil strengths or modeled section locations need to be adjusted since none of the modeled scenarios showed static factor of safeties below 1.0.
Appendix G.1	3.1.4 Phreatic Surface Levels	38 of 3237	1	4-6	The report states that "A phreatic surface map was not developed for Ash Disposal Area 1 because this CCR management unit has only two pore water data points, which is not sufficient to provide a representative contour map." While true, this is inconsistent with Cross Section A-A' in Appendix D.
Appendix J.3	2.1 Sediment, Benthic Macroinvertebrates, and Mayfly Investigation	106 of 522	1	1	Similar to the comment on Section 7.1.2, on page 58, please provide a few statements that show the relevance of the results of these historical studies to current results. In other words, were the results of the metals analyses similar to current results? Were there variations? Did these results support current results and conclusions?
Appendix J.3	3.2.1 Metric Computations	113 of 522	1	1	Agree with the compositing procedures to accommodate habitat heterogeneity.
Appendix J.3	3.2.1.1 Tennessee River - RBI	116 of 522	2	1	As summarized in Figure J.3-1, biological integrity is similar for transects adjacent to and downstream of the JOF Plant CCR management units, as compared to upstream controls. Similar to the Boat Harbor section, CV02 scores are very low relative to the other locations.
Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	1	Similar to the results from the Tennessee River, RBI scores in the Boat Harbor were generally higher than their unimpacted controls and reflected consistent conditions throughout the study reach. This finding has been reported at other facilities as well. Do you have any explanation for this? According to the report (p. 13) "Cove transects CV01 through CV03 represent background control conditions presumably unimpacted by JOF plant-related influences, including CCR materials." Is the reason for lower RBI scores in the controls just due to variability?

Section Number	Section Title	Page	Paragraph	Line	Comment
Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	6	....with CV03 also rated as 'Good,' CV02 rated as 'Fair,' and CV01 rated as 'Excellent.' Reviewing the figure it appears that CV02 is an outlier as it is the only one rated "Fair" in this metric. In fact, every other location is "Excellent" or borderline Excellent. Do you have any explanation for this lower score?
Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	7	However, RBI scores throughout the Boat Harbor reach were greater than the mean score among the cove control locations. Is this a reflection of CV02 impact on the "mean score among the cove control locations"?
Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	8	Additionally, as discussed for the Intake Channel, excluding the uncharacteristic control at CV02 demonstrates very consistent biological integrity not only within the Boat Harbor, but comprehensively throughout the study area (Boat Harbor, Intake Channel, Tennessee River, and coves). Please consider providing an explanation of the rationale for eliminating CV02.
Appendix J.3	3.2.1.2 Total Taxa Richness	119 of 522	2	5	As previously discussed, the CV02 control appears to be somewhat degraded in comparison to the rest of the study area, and it had the lowest TTR by a considerable margin. It has the lowest HBI score as well. Clearly this is an impacted transect and the authors should provide an explanation for this consistent result.
Appendix J.3	4.2 Benthic Macroinvertebrate Community Analysis	126 of 522	1	1	In summary, benthic communities within adjacent and downstream areas of the Tennessee River, the Intake Channel, and the Boat Harbor appear to be at least as healthy, rich, and sensitive as their respective unimpacted control locations. As mentioned previously, CV02 does not seem to be "unimpacted" but there isn't any possible explanation provided in the report.
Appendix J.5	Chapter 4 Summary	450 of 522	4	1	Please provide more definitive support for your conclusions that no additional CARA work is necessary for sportfish analysis of CCR parameters in the Intake Channel and Boat Harbor. Inspection of the results from Tables J.5-1, J.5-2, J.5-3 and J.5-4 indicate that whole body shad exceeds arsenic and copper CBR NOAELs as opposed to Tennessee River samples which would indicate that these locations and results are not consistent with Tennessee River results for these constituents. (There was agreement with mercury results however). Similar observations and conclusions can be made with arsenic in muscle and liver from samples taken from Boat Harbor and the Intake Channel (as opposed to the Tennessee River).

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1	TDEC	2.3	Ownership and Surrounding Land Use	32 of 139	3	All	The New Johnsonville Water Department intake is described as being approximately one mile south (downstream). This seems incorrect as south is upstream. Also, this should be shown on a map for reference.	The intake for the City of New Johnsonville Water Department is located near Tennessee River mile marker 101.8R which is approximately 1 mile upstream (south) of the Plant. Exhibit H.10-1 has been updated to illustrate the intake location.
2	TDEC	5.1.3.3	Uppermost Aquifer and Groundwater Flow	57 of 139	Figure	NA	This is an overarching comment that will also need to be addressed in Appendix H.1. Although the 1936 topographic map does not show topography it does show the surface streams, and although it is hard to determine where the divide would be based on 1936 alone, combined with the 1950 topographic map it looks like the groundwater divide could correspond more with the ridgetop south of Indian Creek (south of the roadway). Is there enough information that TVA is sure of the placement of the groundwater divide?	The identified surface stream watershed boundaries for the area of the JOF Plant and Indian Creek are consistent with historical topographic maps from 1936, 1950, and an available construction drawing from 1950. In addition, a hydrogeological divide was mapped approximately coincident with the southern boundary of the JOF Plant using the United States Geological Survey StreamStats tool. The historical stream network that existed where the JOF Plant was constructed, as shown on a USGS topographic map from 1936, is available within the StreamStats tool and can be used to map a hydrogeological divide along the southern boundary of the JOF Plant. The mapped hydrogeological divide is consistent with ground surface elevations and surface stream patterns shown on a USGS topographic map from 1950. The text of Appendix H.1 has been revised and two new exhibits have been added to incorporate this information.
3	TDEC	5.3.1.1	Desktop Survey Results	65 of 139	1	2	This text indicates the desktop survey identified "five potentially usable wells and two springs"; however, Appendix H.10 indicates that "no springs were identified".	Based on the findings of the desktop survey, the text in Appendix H.10 is correct. Section 5.3.1.1 has been updated to reflect this information.
4	TDEC	5.3.1.2	Usable Water Well and/or Spring Identification	65 of 139	Figure	NA	This is an overarching comment that will also need to be addressed in Appendix H.10. Although the 1936 topographic map does not show topography it does show the surface streams, and although it is hard to determine where the divide would be based on 1936 alone, combined with the 1950 topographic map it looks like the groundwater divide could correspond more with the ridgetop south of Indian Creek (south of the roadway). Is there enough information that TVA is sure of the placement of the groundwater divide?	The identified surface stream watershed boundaries for the area of the JOF Plant and Indian Creek are consistent with historical topographic maps from 1936, 1950, and an available construction drawing from 1950. In addition, a hydrogeological divide was mapped approximately coincident with the southern boundary of the JOF Plant using the United States Geological Survey StreamStats tool. The historical stream network that existed where the JOF Plant was constructed, as shown on a USGS topographic map from 1936, is available within the StreamStats tool and can be used to map a hydrogeological divide along the southern boundary of the JOF Plant. The mapped hydrogeological divide is consistent with ground surface elevations and surface stream patterns shown on a USGS topographic map from 1950. The text of Appendix H.1 has been revised and two new exhibits have been added to incorporate this information.
5	TDEC	5.3.1.2	Figure	67 of 139	NA	NA	What are the numeric identifiers supposed to represent, an explanation is not in the legend? If these are parcels, there appear to be six parcels identified and the text identifies four parcels within the survey area with wells and/or springs.	The numeric identifiers represent individual parcels within the Area of Interest where next steps of the Water Use Survey process would be implemented. The parcels do not necessarily correlate with well locations identified during the desktop survey.
6	TDEC	5.4	Hydrogeological Investigation Summary	69 of 139	NA	NA	See previous comments in section 5.1.3.3, and confirm the location of the southern groundwater divide.	The identified surface stream watershed boundaries for the area of the JOF Plant and Indian Creek are consistent with historical topographic maps from 1936, 1950, and an available construction drawing from 1950. In addition, a hydrogeological divide was mapped approximately coincident with the southern boundary of the JOF Plant using the United States Geological Survey StreamStats tool. The historical stream network that existed where the JOF Plant was constructed, as shown on a USGS topographic map from 1936, is available within the StreamStats tool and can be used to map a hydrogeological divide along the southern boundary of the JOF Plant. The mapped hydrogeological divide is consistent with ground surface elevations and surface stream patterns shown on a USGS topographic map from 1950. The text of Appendix H.1 has been revised and two new exhibits have been added to incorporate this information.
7	TDEC	Exhibits	Exhibit 8-1	133 of 139	NA	NA	Ash Disposal Area 1 - Monitoring Well JOF-111 appears screened in the geologic unit identified as primarily silt and clay which overlies the primarily sand and gravel unit that is identified as the uppermost aquifer at the unit. Please explain how the silt and clay unit is not considered the uppermost aquifer at Ash Disposal Area 1.	Well JOF-111 is partially screened in the primarily sand and gravel geologic unit as shown on Exhibit D-2 in Appendix D. Exhibit 8.1 has been revised to show the full depth of the well. The silt and clay geologic unit is not considered to be an aquifer because of its expected lower permeability in comparison to the sand and gravel geologic unit.
8	TDEC	Exhibits	Exhibit 8-2	134 of 139	NA	NA	DuPont Dredge Cell - The "bottom liner" depicted in the exhibit is not described anywhere in the EAR. How was it constructed? What materials does it consist of? Is there geotechnical data available to determine the permeability of the unit?	The Bottom Liner underlies the CCR in the DuPont Road Dredge Cell (DRDC). Based on TVA Drawing Series 10W218 (dated October 25, 1999), the borrow material was clay sourced from within the footprint of the DRDC, similar to the Clay Dike at the DRDC. The foundation soil was excavated (i.e., undercut) a minimum of 3 ft, replaced and recompacted to at least 95% of the maximum dry density and within 3% (+) of optimum moisture content. The material is generally described as a lean clay and is approximately 3 ft thick underlying the CCR material at the DRDC. Narrative will be added to EAR Chapter 2.2.2 to provide a brief description of the bottom liner. Based on the available historical documentation, there was no specified hydraulic conductivity requirement for the bottom liner soil. However, based on limited laboratory testing (3 undisturbed specimens taken from the temporary well borings) of this soil performed as part of the JOF Exploratory Drilling SAR, vertical hydraulic conductivity ranged from 1.71E-09 cm/s to 1.20E-08 cm/s.
9	TDEC	Exhibits	Exhibit 8-5	137 of 139	NA	NA	Former Coal Yard - Monitoring Well JOF-114 appears to be screened in bedrock, but there is no groundwater flow depicted in the bedrock.	The definition of the uppermost aquifer for the former Coal Yard has been revised to include the upper, highly fractured part of the Camden Chert. Exhibit 8-5 has been revised to show groundwater flow arrows in this geologic unit.
10	TDEC	Appendix B	NA	NA	NA	NA	Please provide a reference map in this section depicting the locations of borings, piezometers, and wells included in Appendix B.	These maps were not included in this Appendix in the previously submitted EARs for the other TVA Plants. TVA would like to keep the template and format consistent between the Plants. Maps with all of the borings are included in the Main document and the associated Appendices.
11	TDEC	Appendix C	NA	NA	NA	NA	Please provide a reference map in this section depicting the locations of piezometers, and wells included in Appendix C.	These maps were not included in this Appendix in the previously submitted EARs for the other TVA Plants. TVA would like to keep the template and format consistent between the Plants. Maps with all of the borings are included in the Main document and the associated Appendices.
12	TDEC	Appendix D	Exhibit D.2	3 of 5	NA	NA	Ash Disposal Area 1 - Monitoring Well JOF-111 appears screened in the geologic unit identified as primarily silt and clay which overlies the primarily sand and gravel unit that is identified as the uppermost aquifer at the unit. Please explain how the silt and clay unit is not considered the uppermost aquifer at Ash Disposal Area 1.	Well JOF-111 is partially screened in the primarily sand and gravel geologic unit as shown on Exhibit D-2 in Appendix D. Exhibit 8.1 has been revised to show the full depth of the well. The silt and clay geologic unit is not considered to be an aquifer because of its expected lower permeability in comparison to the sand and gravel geologic unit.
13	TDEC	Appendix D	Exhibit D.2	3 of 5	NA	NA	DuPont Dredge Cell - The "bottom liner" depicted in the exhibit is not described anywhere in the EAR. How was it constructed? What materials does it consist of? Is there geotechnical data available to determine the permeability of the unit?	See response to Comment 8.
14	TDEC	Appendix D	Exhibit D.4	5 of 5	NA	NA	Former Coal Yard - Monitoring Well JOF-114 appears to be screened in bedrock, but there is no groundwater flow depicted in the bedrock.	The definition of the uppermost aquifer for the former Coal Yard has been revised to include the upper, highly fractured part of the Camden Chert. Exhibit 8-5 has been revised to show groundwater flow arrows in this geologic unit.

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15	TDEC	Appendix G.1	2.2.3 Results	20 of 3237	Table G.1-1	NA	The FS for Veneer Stability is 1.4 and is discussed in the paragraph below the table. That paragraph says that annual inspections have not identified signs of distress or instability. However, in the 2022 Annual Inspection tension cracks were identified. These annual reports should be provided, if they are going to be referenced.	The veneer stability results reported in Table G.1-1 are for the cap system that overlies the CCR material, because the focus is on veneer failures that could damage the engineered cap system and expose the CCR material. The "potential tension cracks and associated erosion" noted in the 2022 and 2023 annual inspection reports were within the outslope of a perimeter road berm on the northern side of South Rail Loop 4. This outslope is not part of the engineered cap system and does not overlie CCR material. See attached figure for the vicinity of the potential tension cracking, and see response to Comment 91 for additional context. Text in Section 2.3.1 of Appendix G.1 will also be updated to provide additional context. As requested, TVA will submit to TDEC (under separate cover) the South Rail Loop Area 4 annual inspection reports for 2022 and 2023.
16	TDEC	Appendix G.1	2.2.3 Results	20 of 3237	3	6	States " TVA's routine observations and annual site inspections have not identified signs of distress or instability of the cover" On page 28 of 3237 it says that an area of tension cracks and associated erosion was observed along a portion of the north toe berm.	The results and discussion in Section 2.2.3 are specific to the engineered cap system, whereas the "potential tension cracks and associated erosion" noted in the 2022 and 2023 annual inspection reports is within the outslope of a perimeter road berm on the northern side of South Rail Loop 4. This outslope is not part of the engineered cap system and does not overlie CCR material. See responses to Comments 15 and 91 for additional context.
17	TDEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	4	Please explain why there were no site inspection reports available from 2014-2020.	From 2014-2020, legacy CCR units that were not regulated by the Federal CCR Rule, such as Ash Disposal Area 1, DuPont Road Dredge Cell, and South Rail Loop 4, were not part of TVA's formal annual inspection process at JOF. However, these units were subject to occasional semi-annual inspections (DRDC only) or maintenance facility observations (similar in scope to an annual inspection) and were documented separately from the annual inspections. ADA1 had documented observations in 2018 and 2019, and SRL4 had documented observations in 2017, 2018, 2019, and 2020. DRDC had documented semi-annual inspections in 2016 through 2020. Legacy CCR units at JOF were incorporated into the formal annual inspection process beginning in 2021. Text in Section 2.3.1 will be updated to reference the additional maintenance facility observations and semi-annual inspections that have been reviewed.
18	TDEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	5	States "No signs of tension cracking were documented." On page 28 it states that "In 2022, tension cracks were reported. The cracking has been remediated, as noted in the subsequent annual inspection report." These annual reports should be provided, if they are going to be referenced.	See responses to Comments 15 and 91.
19	TDEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	1	4	States "In 2022, tension cracks were reported. The cracking has been remediated, as noted in the subsequent annual inspection report." The annual inspection reports that are referenced were not included.	See responses to Comments 15 and 91.
20	TDEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	23 of 3237	5	6	States "An area of tension cracks and associated erosion was observed along a portion of the north toe berm. The cracking has been remediated" The annual inspection reports from Geosyntec that are referenced through, were not included.	See responses to Comments 15 and 91.
21	TDEC	Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	2	3 and 4	The New Johnsonville Water Department intake is described as being approximately one mile south (downstream). This seems incorrect as south is upstream. Also, this should be shown on a map for reference.	The intake for the City of New Johnsonville Water Department is located near Tennessee River mile marker 101.8R which is approximately 1 mile upstream (south) of the Plant. Exhibit H.10-1 has bee updated to illustrate the intake location.
22	TDEC	Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	8	Reference to Table H.9-1 appears to be mislabeled and it should reference Table H.10-1	The reference has been corrected.
23	TDEC	Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	2	4	Reference to Table H.9-2 appears to be mislabeled and it should reference Table H.10-2	The reference has been corrected.
24	TDEC	Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	4	Reference to Table H.9-3 appears to be mislabeled and it should reference Table H.10-3	The reference has been corrected.
25	TDEC	Appendix H.10	2.1.1.1 Desktop Survey Results	853 of 872	1	6	Reference to Exhibit H.9-2 appears to be mislabeled and it should reference Exhibit H.10-2	The reference has been corrected.
26	TDEC	Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	854 of 872	1	2	Reference to Table H.9-4 appears to be mislabeled and it should reference Table H.10-4	The reference has been corrected.
27	TDEC	Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	2	1	Reference to Table H.9-1 and Table H.9-2 appear to be mislabeled	The reference has been corrected.
28	TDEC	Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	2	2	Reference to Exhibit H.9-2 appears to be mislabeled.	The reference has been corrected.
29	TDEC	Appendix H.10	2.1.1.2 Summary of Desktop Survey Findings	855 of 872	3	1	Reference to Exhibit H.9-2 appears to be mislabeled.	The reference has been corrected.
30	TDEC	Appendix H.10	2.1.2 Hydrogeological Considerations	855 of 872	4	7	Reference to Exhibit H.9-3 appears to be mislabeled.	The reference has been corrected.
31	TDEC	Appendix H.10	2.1.3 Usable Water Well Identification	856 of 872	1	4	Reference to Table H.9-5 and Exhibit H.9-3 appears to be mislabeled.	The reference has been corrected.
32	TDEC	Appendix H.10	2.1.3 Usable Water Well Identification	856 of 872	2	1	Reference to Exhibit H.9-5 appears to be mislabeled.	The reference has been corrected.
33	TDEC	Appendix H.10	Table H.10-5	868 of 872	NA	NA	Johnsonville is misspelled in title	The spelling has been corrected.
34	CEC	2.2.2	Surface Water Hydrology	34 of 139	2	N/A	Please complete the sentence.	Sentence has been revised to be a complete sentence.

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35	CEC	7.1.1	Surface Stream Studies and Ongoing Monitoring Activities	73 of 139	1	3	"The studies found that upstream and downstream aquatic communities near the JOF Plant were ecologically similar." Are these studies detailed in a document that can be referenced, like is done for other statements (e.g., TVA 2011 and 2012)? If so, please provide the reference. Also, please briefly describe what is meant by "similar"? Are all of the metrics (pH, dissolved oxygen, temperature, conductivity; etc.) mentioned in the previous sentence similar? What tool was used to monitor the biological communities and how similar were they? Is it beyond the scope of this report to provide at least a cursory description of the data? Without providing any supporting data, the reader is left with taking your word for it. If there is more detail provide in Appendix J that should be mentioned. A suggestion therefore is to provide specific references in this paragraph and to provide some additional detail if available that supports your conclusions.	Stantec agrees that citation is needed. As suggested, the references are TVA 2011 and 2012: TVA (2011). *Results of Fish Community Monitoring in the Vicinity of Johnsonville Fossil Plant During Autumn 2010 in Support of a Continued 316(a) Alternative Thermal Limit* . June 2011. TVA (2012). *Biological Monitoring of the Tennessee River Near Johnsonville Fossil Plant Discharge Summer and Autumn 2011* . October 2012. Support for the conclusion that communities were "similar" is provided in those documents and may be obtained directly from the original sources. Stantec will revise the text to clarify: "The studies found that upstream and downstream aquatic communities near the JOF Plant were ecologically similar, based on metric analysis and community compositions." Section 7.1.1 is focused on water quality in the context that it was historically studied at the plant (as part of biological monitoring), so this statement is intentionally general and is later expanded in Section 7.1.2, citing similarities in "numbers of species, mean densities, and relative compositions of functional feeding groups."
36	CEC	7.1.2	Sediment and Benthic Invertebrate Studies	73 of 139	1	1	This paragraph provides important history of the sediment sampling in the vicinity of the JOF Plant, however it provides the reader with no details of the significance of the sampling results. Please provide at least a few statements that show the relevance of the results of these historical studies to current results. In other words, were the results of the metals analyses similar to current results? Were there variations? Did these results support current results and conclusions?	In these historical studies, the closest sediment sampling location was approximately 5 miles upstream from the Plant. In turn, it is difficult to do a direct comparison of historical results to the EI results. However, the general take away is that the historical results in other reaches of the Tennessee River have similar concentrations to the samples collected in the vicinity of the Plant where results were predominantly less than the ESLs.
37	CEC	7.1.2	Sediment and Benthic Invertebrate Studies	74 of 139	First full paragraph	1	"The 2010 and 2011 JOF Plant benthic sample results showed overall similarities between the upstream and downstream benthic sample locations — in numbers of species, mean densities, and relative compositions of functional feeding groups." Same comment as above regarding use of the term "similarities." Perhaps there is summary information in the referenced reports (TVA 2011 and 2012) that could be included here or more specifically referenced.	Please refer to TVA's response to Comment #35. The similarities are summarized as noted: "numbers of species, mean densities, and relative compositions of functional feeding groups." Further specificity can be obtained directly from the original documentation in the 2011 and 2012 references.
38	CEC	7.1.2	Sediment and Benthic Invertebrate Studies	74 of 139	2	1	"Mayfly collections during previous studies were limited to those incorporated into the Reservoir Benthic Index (RBI) sampling." Please provide a statement or two that indicate the significance of this statement. If the reference is to the 2010 and 2011 studies, please indicate.	Sentence has been revised to say "Mayfly collections during previous studies were limited to those incorporated into the Reservoir Benthic Index (RBI) sampling conducted as part of the above referenced activities in 2010 and 2011. Samples collected in 2010 and 2011 were not analyzed for CCR Parameter tissue concentrations."
39	CEC	7.2	TDEC Order Investigation Activities	77 of 139	Summary	N/A	The level of detail provided in this Summary is excellent and is an example of the request from the previous comments (if available).	Comment Acknowledged. Thank you.
40	CEC	7.4.1.1	Tennessee River	79 of 139	1	1	CCR Parameter concentrations in surface stream samples from the Tennessee River were below human health screening levels and consistently below acute and chronic ESVs. Suggest adding a parenthetical identifying Table with this analysis - (see Table J.1-1)	The table reference has been added.
41	CEC	7.4.1.1	Tennessee River	79 of 139	Bullet Points	N/A	Suggest identifying which Exhibit illustrates these 3 findings. Is it "(see below and Exhibit 7-2)" as stated in the preceding paragraph?	The exhibit reference has been added.
42	CEC	7.4.1.3	Boat Harbor	84 of 139	8	1	Please provide the rationale for not including additional evaluation of gamefish in the CARA Plan although CBR values were exceeded in gamefish muscle tissue samples for arsenic; and liver tissues for arsenic, selenium, copper, and mercury.	As outlined in the statistical Appendix E.8 and the Fish Tissue Evaluation Appendix J.5, the Fish Tissue data was evaluated based on two specific criteria - 1) Constituents for which potential risks to aquatic life have been identified based on observations of concentrations greater than applicable EAR ESVs in sediment or surface stream and 2) Constituents with potential to bioaccumulate as identified by the USEPA. This methodology is consistent with how the data was evaluated for each Plant EAR. Thus, the data in Appendix J.5 has been presented in this manner. Although the text does not specifically state that the Fish Tissue data is not carried forth into the CARA, the Risk Assessment does evaluate all of the lines of evidence and conducts an evaluation of the Fish Tissue data.
43	CEC	7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	1		Please provide a citation to a figure that illustrates the location of the" eleven transect locations." I believe the relevant figures are in Appendix J (Exhibit J.3-2?) but it would be helpful to the reader to have them in the main body of the EAR as well.	A reference to the technical appendix and associated exhibit has been added.
44	CEC	7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	1	8	Consider adding the word "qualitative" before ……habitat characteristics…..	The sentence has been revised to include "qualitative".
45	CEC	7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	3	4	"(and frequently had higher RBI scores than controls)". Since these are identified as "control sites" do you have an explanation for this finding? Is it within expected variability?	Given the scope of the EI, available data are not adequate to determine the reason for the noted finding; however, it is likely related to habitat variability and the range of normal variation in a biological data set (and possibly other complex factors). Suitable control sites were selected based on proximity to the Plant and for having similar habitat conditions, but some level of variability is unavoidable in natural systems and community-based biological data. These findings do not suggest that unsuitable controls were used. Regardless of conditions appearing to be slightly less favorable at the noted control locations, the overarching conclusion remains accurate: "The RBI multi-metric does not reflect potential impacts associated with JOF Plant CCR management units."
46	CEC	7.4.2	Benthic Macroinvertebrate Community Analysis	86 of 139	4	1	In the Tennessee River, three transect locations adjacent to the CCR management units had the highest richness (TTR) within the study area (TR03, TR04, and TR05), including upstream control locations. Same comment as previously mentioned - identification of a figure that illustrates these locations would be helpful to the reader.	Please refer to Comment Response #45. Site maps are associated with the Technical Appendices. A reference to Appendix J.3 and the relevant Exhibit will be added, as suggested.
47	CEC	7.4.2	Benthic Macroinvertebrate Community Analysis	87 of 139	First full paragraph	N/A	In summary, benthic communities within adjacent and downstream areas of the Tennessee River, the Intake Channel, and the Boat Harbor appear to be at least as healthy, rich, and sensitive as their respective control locations unimpacted by CCR from the Plant. Same comment as above - do you have an explanation for the reason the "control sites" are apparently more stressed than the sites located adjacent to the facility?	Please refer to Comment Response #45.
48	CEC	Exhibits	N/A	137 of 139	8-5	N/A	Item 1 on Exhibit 8-5 states that the global slope stability and the veneer stability of the Former Coal Yard meets safety criteria. Was a stability analysis performed even though it was not required by the EIP? If it was not , than please remove this statement. If it was, please include the analyses.	The 2nd and 3rd bullets on Item 1 of Exhibit 8-5 are incorrect and will be removed. Related clarification will also be added to Chapter 8.6 of the EAR. The scope of the EIP and the Stability SAP did not require stability analyses or structural integrity evaluations of the former Coal Yard, because CCR material was not placed for disposal purposes; CCR was placed as structural fill.
49	CEC	Appendix D	CCR Management Unit Cross Sections	N/A	N/A	N/A	There are no flow arrows indicating vertical flow in any of the cross sections. Please make that correction.	Flow arrows are only being used to show groundwater flow within the uppermost aquifer.
50	CEC	Appendix D	CCR Management Unit Cross Sections	3	DuPont Road Dredge Cell B-B'	N/A	Why is there a red pore water phreatic line shown outside of the ash fill area?	The cross section has been revised to remove the phreatic surface line outside of the CCR unit.

Appendix A
TVA Johnsonville EAR Rev_0
Summary of Comments and TVA Responses
February 12, 2024

Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
51	CEC	Appendix D	CCR Management Unit Cross Sections	4	South Rail Loop C-C'	N/A	Why is there no geosynthetic cap on the lower ash between station71+30 and 74+80? What does the dashed line near station 71+00 represent?	As shown on the plan view in Exhibit D-1, Cross-Section C-C' crosses both the South Rail Loop 4 and the Former Stilling Pond. On Exhibit D-3, the dashed diagonal line from approximately 71+00 to 71+30 roughly divides the CCR material between the South Rail Loop 4 and the Former Stilling Pond. The portion of the cross-section from approximately 71+30 to 74+80 represents the Former Stilling Pond, which currently does not have a soil cap or a soil and geosynthetic cap. Exhibit D-3 will be updated to label the South Rail Loop 4 and the Former Stilling Pond.
52	CEC	Appendix D	CCR Management Unit Cross Sections	5	Active Ash Pond 2 D- D'	N/A	The Camden Chert is the principal local aquifer (EAR Section 2.4.2). Why are there no flow arrows shown?	Flow arrows are only being used to show groundwater flow within the uppermost aquifer.
53	CEC	Appendix D	CCR Management Unit Cross Sections	5	Coal Yard Loop E-E'	N/A	There appears to be substantial flow gradient within the ash phreatic surface. Please add flow arrows and indicate the leachate discharge location. How is the leachate flow sustained?	Flow arrows are only being used to show groundwater flow within the uppermost aquifer.
54	CEC	Appendix E.1	Section 2.2 Estimates of Background Conditions	11 of 362	1	5	The sentence is given as follows: "For example, for a '95% UTL with 95% coverage', there is 95% confidence that, on average, 95% of the data are below the UTL." This should be corrected to state "For example, for a '95% UTL with 95% coverage', there is 95% confidence that, on average, 95% of the data are **at or** below the UTL."	This language is referenced to **Ofungyu**, 2014. In the textbook it gives the following example: "For instance, a 99% coverage UTL with 95% confidence level is that data value for which there is a 95% probability that 99% of the background data population is lower than (i.e. only 1% of the underlying background data is expected, with 95% confidence, to exceed the UTL value). The statement in the textbook was modified to be representative of 95% UTL with 95% coverage.
55	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Tables	N/A	In line 1 of the table for Ash (taken at surficial depths), there are 12 samples with an elevated 33% non-detects percentage with only 1 reporting/detection limit. Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % of non-detects below the lowest reporting/detection limit. However, for the case in line 1 of the table where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.	The choice of Kaplan Meier (KM) to represent the mean for left-censored datasets is well supported in the literature, for example, see the following quotes and reference sources: - The USEPA ProUCL Guidance manual (USEPA 2022) states that "*it is well known that the KM method yields a good (in terms of bias) estimate of the population mean (Singh, Maichle, and Lee 2006)*". - In Singh, Maichle, and Lee (2006) it is noted that "*the KM estimation method has an added advantage over other methods as it can be used on data sets with multiple detection limits*", but there is no indication that the KM mean method is not appropriate when there is only one detection limit present. -Singh, Maichle, and Lee (2006) also note that "*some researchers, specifically Helsel (2005), have suggested that the KM method perhaps is the most appropriate method to compute the sample mean and SE for left-censored data sets*". In addition, it is noted here that the mean (or KM mean) is provided as one of a number of general summary statistics that are used to characterize the available data, but the mean itself is not relied on as a decision statistic. The final decision statistic reported in the table is the background threshold value. As such, the KM mean is still considered to be appropriate in this table. **Supporting references:** Helsel, D.R. 2005. Nondetects and Data Analysis. Statistics for Censored Environmental Data. John Wiley and Sons, New York. Singh, A., Maichle, R., and Lee, S. 2006. On the Computation of a 95% Upper Confidence Limit of the Unknown Population Mean Based Upon Data Sets with Below Detection Limit Observations. EPA/600/R06/022, March 2006. USEPA. 2022. ProUCL Version 5.2.0 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations.
56	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15, 16, and 17 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in the background soil data tables on pages 15, 16, and 17 of the PDF. Specifically high % non-detects are listed on this table for boron (surficial, 0.5 to 10', >10', and all depths), chloride (surficial), fluoride (surficial, 0.5 to 10', >10', and all depths), cadmium (0.5' to 10', >10), and silver (surficial). Attention should be paid to the "% Non-Detect" column of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages, can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	Analytical results for soils can vary widely for inorganic compounds and tend to be more heterogenous than groundwater data. The Unified Guidance was developed for the statistical analysis of groundwater data and recommends the use non-parametric methods if there is >50% non detects (reported at MDL) in a data set. Non-parametric UTLs are typically represented by the highest detected concentration or MDL in the data set. Given the heterogeneity of soil data, applying this "Rule of Thumb" to soil data can lead to unnecessarily large UTLs. Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. In general UTLs calculated using non-parametric methods are higher than their parametric counterparts, resulting in UTLs that are less conservative from a risk assessment perspective than parametric UTLs. A higher UTL is more likely to mask the presence of Site-related impacts than a lower UTL. The background soil data set may be re-evaluated as part of the CARA if background threshold values are necessary for corrective action.
57	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 and 16 of 362	Tables	N/A	There are two identical, duplicate sections in the tables on pages 15 and 16 for fluoride data. One of these entries needs to be removed.	Fluoride appears twice in the table as it is both an Appendix III and Appendix IV constituent. However, it has now been removed from the Appendix IV list and a footnote added to the table to explain that fluoride has been grouped with Appendix III only to avoid duplication of results.
58	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 through 17 of 362	Tables	N/A	The box-whisker plots in the tables in Attachment E.1-B were used as an initial screening tool to identify whether the underlying distribution for the background soil data appear to be normal or appear to be from a skewed distribution. In addition, the sample size and % of detects were evaluated for each data set to evaluate the calculations performed for the tolerance limits/background threshold values (BTVs). Sample size is important in developing reliable BTVs and also, equally as important, are the number of detected values. It is difficult to identify the underlying distribution of the data if there are a high number of non-detects, even if the overall size of the data set is large. It is important to derive accurate BTVs, especially when moving into corrective action. The accuracy of six (6) of the sample location/constituent pairs in the background soil data table are in question, based on the review of data and the re-evaluation of data by CEC using EPA ProUCL. The specific sample location/constituent pairs in question are discussed in the following line items from line 6 through line 11 below.	See responses to individual comments, below.
59	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table-Chloride (Surficial Depth)	N/A	The chloride background soil data for surficial depths was tagged for examination due to skewness evident in the box-whisker plot and for the high non-detects % (>66%). The table shows a BTV/upper tolerance limit that is based on a normal distribution. It is very difficult to identify an underlying distribution for the data if you only have 4 detected values out of 12. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would produce a value of 6.61 (the maximum value of the data set), which is more accurate in this case (in lieu of 6.88 shown on the table).	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for chloride in surficial soils.

Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
60	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table-Chloride (0.5 ft. to 10 ft. bgs)	N/A	The chloride background soil data for 0.5 ft. to 10 ft. bgs intervals was tagged for examination due to skewness evident in the box-whisker plot. The background soil table shows a BTV/upper tolerance limit that is based on a normal distribution. The data were re-evaluated by CEC using EPA ProUCL. Kaplan Meier is applicable for use with these data based on multiple reporting limits and lower % non-detects. Based on the results from EPA ProUCL, the data set does not pass the normality test for the Shapiro-Wilk Goodness of Fit test at the 95% confidence level. In addition, the data do not fit a gamma distribution based on the Anderson-Darling Goodness of Fit test for the 95% confidence level. The data appear to best fit a lognormal distribution. The adjusted 95% UTL with 95% coverage (lognormal) using Kaplan Meier is 27.4 (in lieu of 23.8 shown on the table).	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be approximate normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for chloride in soils collected from the 0.5 - 10 ft sampling interval.
61	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	15 of 362	Table- Sulfate (>10 ft. bgs)	N/A	The sulfate background soil data for >10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot. The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. The data were re-evaluated by CEC using EPA ProUCL. There are zero non-detects. In addition, there are 29 samples found in the excel data spreadsheet provided by TDEC for sulfate at this depth, whereas the table on page 15 shows n=18. Based on the results from EPA ProUCL runs for the n=29 data measurements, the data set does not pass the normality test for the Shapiro-Wilk Goodness of Fit test at the 95% confidence level. Based on a Goodness of Fit analysis, the data best fit a lognormal distribution. The adjusted 95% UTL with 95% coverage for the lognormal distribution fit is 175.1 (in lieu of 151 shown on the table).	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be approximate normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for sulfate in soils collected from the 0.5 - 10 ft sampling interval. The discrepancy in the number of samples collected from the > 10 ft bgs interval is likely due to the presence of samples collected from saturated soils in the data set provided to CEC from TDEC. These samples were flagged in the data set and excluded from the statistical analysis.
62	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 of 362	Table-Cadmium (0.5 ft. to 10 ft. bgs)	N/A	The cadmium background soil data for 0.5 ft. to 10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (60.9%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 9 detected values out of 23. A <u>non- parametric</u> 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would mean an adjusted value of 0.144 (the maximum value of the data set), which is more accurate in this case (in lieu of 0.115 shown on the table).	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be approximate normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for cadmium in soils collected from the 0.5 - 10 ft bgs sampling interval.
63	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 of 362	Table-Cadmium (>10 ft. bgs)	N/A	The cadmium background soil data for >10 ft. bgs depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (61.1%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 7 detected values out of 18. A <u>non- parametric</u> 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case and this would mean an adjusted value of 0.145 (in lieu of 0.137 shown on the table).	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for cadmium in soils collected from the > 10 ft bgs sampling interval.
64	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	Page 17 of 362 of the PDF	Tables-Silver (Surficial)	N/A	The silver background soil data for surficial depths was tagged for examination due to skewness evident in the box-whisker plot and high % non-detects (58.3%). The table lists a BTV/upper tolerance limit that is based on a normal distribution for these data. It is very difficult to identify an underlying distribution for the data if you only have 5 detected values out of 12. A non-parametric 95% BTV/upper tolerance limit with 95% coverage is more applicable in this case. This results in an adjusted value of 0.0396, which is more accurate in this case (in lieu of 0.0393 shown on the table). This is a marginal change in the BTV, but the fact that we have only 5 detections in a small overall sample size of 12 makes the identification of underlying distribution difficult at this point in the data collection.	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. Normal goodness of fit testing (Shapiro -Wilk) found the detected data to be approximate normally distributed at the 5% significance level. The Kaplan-Meier UTL based on the normal distribution was selected as the UTL for silver in soils collected from the surficial sampling interval.
65	CEC	Appendix E.1	Attachment E.A-1 : Summary Statistics Tables	16 and 17 of 362	Tables	N/A	In addition to the sample location/constituent pairs identified in the previous comments above, the following sample location/constituent pairs in the tables in Attachment E.1-A require a second look relative to the development of their BTVs (tolerance limits) to ensure the correct distribution assumption was used: Cr, Pb, Hg, Cu and V, <u>for only the surficial sample locations</u>. A review of the box-whiskers plots for these data appear to show skewness in the distributions.	Consistent with the Sampling and Analysis Plan, US EPA ProUCL was used to calculate UTLs for background soils. ProUCL was used to identify the data distribution and then calculate parametric UTLs on data sets with 4 or more detected results. The background soil data set may be re-evaluated as part of the CARA if background threshold values are necessary for corrective action.
66	CEC	Appendix E.2	Attachment E.2-A Summary Statistics -CCR Material Characteristics Investigation	41 to 45 of 362	Tables	N/A	High percentage non-detect data (>50% censored) are noted in data tables on pages 41 and 43 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non- detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	We agree that transparency is important with respect to the amount of detected data that are available, which is why the percentage detected is clearly reported in these appendices. Where appropriate, non-parametric methods are used when the proportion of non-detect data is high.
67	CEC	Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data tables on pages 46 to 49 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	See response to Comment 66, above.
68	CEC	Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	Zero detects were noted in the data sets presented in the tables on pages 47 and 48. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non- detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.	This approach is not misleading given that the tables clearly indicate the proportion of detected samples and that the mean, standard deviation, and percentiles were calculated using both detects and non-detects (reported at the method detection limit). For datasets with zero detections: 50th and 95th percentiles represent the percentiles of non-detect (<) data only.
69	CEC	Appendix E.2	Attachment E.2-A Summary Statistics -SPLP	46 to 49 of 362	Tables	N/A	For the following sample location/constituent pairs shown in these tables, there are data sets with non-detects and only one reporting limit listed (with high % non-detect values). This applies to Active Ash Pond 2 (Cd, Cr, Co, Li, Ag, Zn), Ash Disposal Area 1 (Sb, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Se, Ni, V, Zn, Fe), Former Coal Yard (Sb, Be, Cd, Cr, Co, Li, Mo, Se, Cu, V, Zn), DuPont Road Dredge Cell (Be, Cd, Cr, Pb, Li, Hg, Ni, Zn, Fe, Mn), South Rail Loop Area 4 (Ni). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases in the data sets listed above where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.	See response to Comment 55, above, regarding applicability of KM statistics.

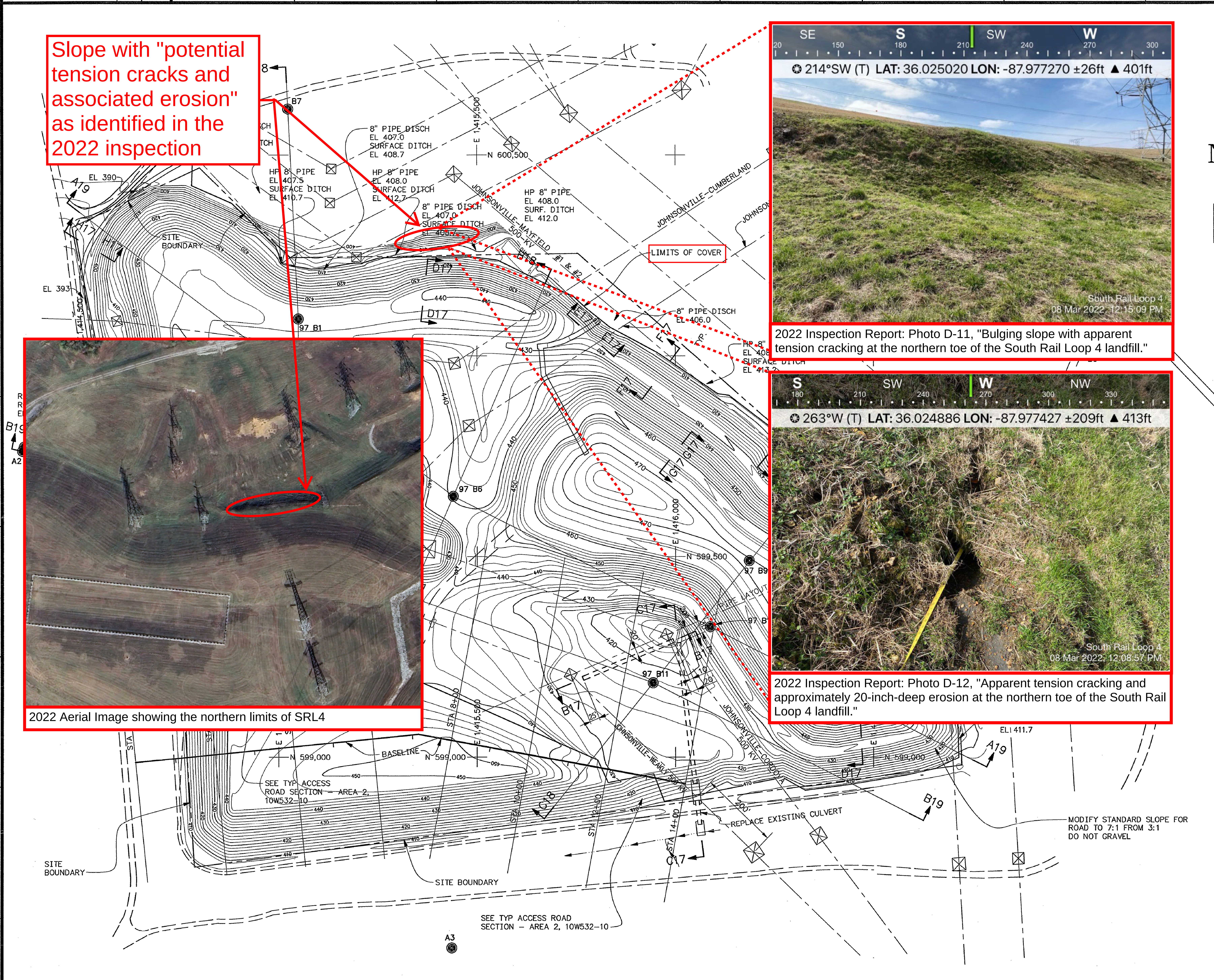
Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
70	CEC	Appendix E.2	Attachment E.2-A Summary Statistics -Pore Water	50 to 56 of 362	Tables	N/A	There are no comments for the Pore Water data tables because of the extremely small sample sizes for the data sets.	No response required
71	CEC	Appendix E.3	Section 2.2 Comparison of Groundwater Quality Data to Groundwater Screening Levels	96 of 362	2	2 and 7	Reference is made to the comparison of the lower confidence limit (LCL) and the GSL several times in this paragraph. Specifically, in line 7, the sentence is given as: "***<u>In accordance with the methods described in the Unified Guidance</u>*** *, constituent concentrations were determined to represent a statistically significant concentration above or equal to a GSL for constituents other than pH. ..".* EPA Unified Guidance (March 2009) on page 2-16 states *"Therefore, the Unified Guidance recommends that the compliance/assessment monitoring **<u>null hypothesis</u>** be structured so that the **<u>compliance population</u>** characteristic (e.g., mean, median, upper percentile) is assumed to be less than or equal to the fixed standard unless demonstrated otherwise* ." EPA considers a LCL that is equal to the GSL to be in compliance with the standard. The last paragraph on page 4-6 of the Unified Guidance also states that there is an SSI when the LCL **<u>exceeds</u>** the GWPS (or GSL). I understand that the interpretation in the EAR has been to declare SSIs even for LCLs that are equal to the GSL, but this is not the interpretation from the Unified Guidance. This needs to be considered when moving into the Corrective Action phase of the program.	We acknowledge that the Unified Guidance specifically indicates that an SSI is only present when the LCL exceeds the GWPS (or GSL). This has been adjusted for the purpose of the EAR (at the request of TVA) to a slightly more conservative evaluation in which groundwater concentrations are considered to be greater than the GSL if the LCL is greater than **or equal to** the GSL. For clarity, we have removed the text stating "in accordance with the methods described in the Unified Guidance" and changed it to "in accordance with this null hypothesis". The full text now reads "*For this dataset, the null hypothesis was that the groundwater concentrations were less than the GSL for constituents other than pH and that levels were within the GSL range for pH. In accordance with this null hypothesis, constituent concentrations were determined to represent a statistically significant concentration above or equal to a GSL for constituents other than pH, only when there were sufficient data to support statistical confidence band or interval evaluation and the applicable lower confidence band or interval was greater than or equal to the GSL as of the most recent sampling event included in the statistical analysis* ."
72	CEC	Appendix E.3	Section 2.2.2 Evaluation for Well-Constituent Pairs Using Point- by-Point Method	101 of 362	1	1	Chapter 21, page 24 of the EPA Unified Guidance requires "at least 8 to 10" samples to construct a confidence band around a linear regression line. However, the authors of Appendix E.3, per Section 2.2.2 reference using a standard of a minimum of 5 samples to develop linear regression models with confidence bands. This minimum sample value does not follow the EPA Unified Guidance.	We acknowledge that statistical power may be limited when sample size is small. However, we have established the described method to support early screening of well-constituent pairs, even if data are limited. In general, the use of a linear regression and confidence band approach will be infrequent when sample size is small as the method only proceeds with linear regression and confidence band when the linear regression is statistically significant (and, as noted, the likelihood of detecting a significant trend when sample size is small is low). Therefore, in most cases if sample size is limited, a confidence interval approach is used rather than confidence band. This analysis does not prevent additional analysis being applied to revisit these categories when additional data become available. We agree that we can expect validity and accuracy of the statistical test results to improve as additional data are collected.
73	CEC	Appendix E.3	Section 3.2 Comparison of Groundwater Quality Data to Approved Groundwater Screening Levels- Table E.3-4	105 of 362	N/A	N/A	Table E.3-4 is titled "Summary of Statistically Significant Concentrations **Greater than** Groundwater Screening Levels " The approach described in E.3 Section 2.2 is that SSIs are determined based on comparing LCLs and lower confidence bands (for data with SS trends) to GSLs and declaring SSIs for lower limits **<u>either equal to or greater than</u>** the GSL. The title of the table is not consistent with the approach described in Section 2.2.	The text 'or equal to' has been added to the table title
74	CEC	Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	Zero detects were noted in the data sets presented in the tables on pages 108 to 120. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non- detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.	See response to Comment 68
75	CEC	Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	For the following well/constituent pairs shown in these tables, there are data sets with non-detects and **<u>only one reporting limit</u>** listed (with high % non-detect values). This applies to JOF-109 (As, Cr, Co, Pb, Tl), JOF-112 (As, Cr, Li, Cu, V), JOF-118 (Cr, V), JOF-110 (As, Cr, Pb), JOF-111 (Cr, Cd, Tl, V), JOF-113 (As, Cr, V), JOF-114 (As, Cd, Cr, Tl, V), JOF-117 (Cu, V), 89-B10 (SO4, Ba), B-11 (Co), B-12 (Cd, Co), JOF-105 (Cd, Hg), JOF-107 (Bo), and JOF-102 (F). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with <u>multiple reporting limits/detection limits</u> where there is a small % non- detect below the lowest reporting/detection limit. However, for these cases in the data sets listed above where there are non-detects and there is a single reporting/detection limit, it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be **<u>biased too high</u>** because of the way KM is calculated.	See response to Comment 55, above, regarding applicability of KM statistics.
76	CEC	Appendix E.3; Attachment E.3-A	Summary Statistics	108 to 120 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data tables on pages 108 to 120 of the PDF. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	See response to Comment 68
77	CEC	Appendix E.3; Attachment E.3-D	Linear Regression Plots	171 of 362	N/A	N/A	Recommend that only the regression plots for data that have statistically significant trends (either increasing or decreasing) be included in Section E.3. These plots are identified on the table on pages 194 and 195 of Attachment E.3-E - Linear Regression Results. These well/constituent pairs with trends are the only plots that we need to see to assess the confidence bands about the mean for compliance with the GSLs.	This attachment provides a visual review for all well-constituent pairs evaluated using either a confidence band or confidence interval approach. It provides a useful visual review for all of these data. As such, well-constituent pairs with no significant trend have not been removed from this attachment.
78	CEC	Appendix E.4	Table D.3- Summary of Statistical Hypothesis Testing Johnsonville Fossil Plant	217 of 362	Table	N/A	Results of the hypothesis testing for the 4 field parameters for the historical seeps and AOI locations revealed no statistically significant differences between the data groups, except for temperature. However, the samples sizes for most of the groups are low, around n=9 to n=10. Considering the small samples sizes, the Power of the hypothesis tests are most likely low, limiting the capability to detect a difference in the group means (or medians for non-parametric analysis) if a difference really does exist. Therefore, the "not statistically significant" result for these specific constituent groups is not a conclusive result. There may be differences in these comparative groups which we can not see yet due to the small sample sizes. Power Analysis will be required in order to determine the minimum sample sizes required in order to achieve a minimum Power of 80% (minimum statistical goal) for these group comparisons.	The comment is correct and addresses achieved sample size. Statistical tests on relatively small sample sizes can lack the power to identify statistical differences between two groups. The number of monitoring results were constrained by the length of the historic seep/AOC locations and the length of the river bank available for sampling. Efforts were made to collect as much data as possible given these constraints. The current sample sizes are typical of an environmental investigation of this nature and are adequate for the purposes of the EAR given that numerous other lines of evidence are being investigated at the site to provide an overall evaluation of current environmental conditions.
79	CEC	Appendix E.4	Statistical Analysis of Seep Investigation	217 of 362	Table	N/A	Based on the text on page 3 of the section (page 204 of 362 of the PDF), the intermediate areas have a sample size of n=58 for each of the 4 measured field parameters collected along the Kentucky Lake/Tennessee River and the Boat Harbor. Also, the sample size for the upstream control areas is n=20 for each of the 4 measured field parameters. There are zero non-detects. Based on Table D.4, bootstrapping was performed to develop the confidence intervals for the intermediate areas and also for the tolerance intervals development for the JOF-UC data. This approach is acceptable and is preferable as long as we have data sets with n>=20. Bootstrapping does not require an assessment and knowledge of the underlying distribution for the data and it works well with all types of data.	Comment Acknowledged.
80	CEC	Appendix E.5: Section 3.1	Summary Statistics, Exploratory Data Plots, and Outlier Screening	243 of 362	3rd and 4th of section	All lines	I agree with the decision of remove the two outliers specified in this section based on the apparent lab issues discussed in paragraph 4 of the section regarding the reporting of total and dissolved metals.	Comment Acknowledged.

Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
81	CEC	Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	For 20% of the data sets shown in these tables, there are data with non-detects **and** there is only one reporting limit listed (with high % non-detect values). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. Kaplan Meier is typically applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases in the 20% of data sets where there are non-detects and there is a single reporting/detection limit (with high % non-detects), it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.	See response to Comment 55, above, regarding applicability of KM statistics.
82	CEC	Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	Zero detects were noted in 18% of the data sets presented in the tables. Even though there are no values detected over the reporting limit for these data sets, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects equal to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.	See response to Comment 66, above.
83	CEC	Appendix E.5; Attachment E.5-A	Summary Statistics by Water Body	247 to 254 of 362	Tables	N/A	High percentage non-detect data (>50%) are found in the table's data sets. Attention should be paid to the "% Non-Detect" columns of this table. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	See response to Comment 66, above.
84	CEC	Appendix E.6	Section 3.3.1 Formal Hypothesis Testing	303 of 362	Entire Section	N/A	Results of the hypothesis testing for the arsenic and selenium for the Intake versus the Cove data groups and for arsenic, mercury, and selenium in the Boat Harbor versus Cove data groups revealed no statistically significant differences in the data. However, the samples size for each group is n=9. Considering the small samples sizes, the Power of the hypothesis tests will most likely be low, limiting the capability to detect a difference in the group means (or medians for non-parametric analysis) if a difference really does exist. Therefore, the "not statistically significant" result for these specific constituent groups is not a conclusive result. There may be differences in these comparative groups which we can not see yet due to the small sample sizes. Power Analysis will be required in order to determine the minimum sample sizes required to achieve a minimum Power of 80% (minimum statistical goal) for group comparisons.	The comment is correct and addresses achieved sample size. Statistical tests on relatively small sample sizes can lack the power to identify statistical differences between two groups. The current sample sizes are typical of an environmental investigation of this nature and are adequate for the purposes of the EAR given that numerous other lines of evidence are being investigated at the site to provide an overall evaluation of current environmental conditions.
85	CEC	Appendix E.6	Attachment E.6-A Summary Statistics	308 and 310 of 362	Tables	N/A	Zero detects were noted in the data for the Coves for Chloride and Tennessee River (upstream and downstream) for Chloride. However, values for the 50th percentile and 95th percentile are shown in the table based on setting the non-detects to the RL/PQL. The true values of the non-detect data are unknown. Listing percentiles for 100% non-detect data is misleading. Maximums, minimums, means, and standard deviations are not listed in the table for these situations. Percentiles should also not be listed.	See response to Comment 66, above.
86	CEC	Appendix E.6	Attachment E.6-A Summary Statistics	308, 309, and 310 of 362	Tables	N/A	High percentage non-detect data (>50%) are noted in data sets for chloride at the Boat Harbor and Intake Channel and for fluoride at the Boat Harbor, Coves, and Intake Channel. Also, high percentage non-detects were reported for ash in the Coves, and the Tennessee River adjacent for chloride and upstream for fluoride. It needs to be clear to all parties that the estimates for descriptive stats (i.e., mean, std. deviation and percentiles) produced using Kaplan Meier, for these high non-detect percentages can be inaccurate. Statistical methods used to derive descriptive stats for data sets with non-detects are typically valid for non-detect percentages that are less than 50% (per Unified Guidance). Non-parametric methods should be used for data sets with non-detect percentages that exceed 50%. Any decisions made using such data should keep in mind the potential for error with the descriptive statistical estimates.	See response to Comment 66, above.
87	CEC	Appendix E.6	Attachment E.6-A Summary Statistics	308, 309, and 310 of 362	Tables	N/A	For ash for Coves, and for samples taken at the Tennessee River upstream and adjacent for boron, downstream for fluoride, and ash upstream, there are data with non-detects **and** there is only one reporting limit listed (with high % non-detect values). Per the notes at the end of the table, Kaplan Meier was used to estimate the mean for these constituents. However, Kaplan Meier is applicable and accurate for data sets with multiple reporting limits/detection limits where there is a small % non-detect below the lowest reporting/detection limit. However, for these cases where there are non-detects and there is a single reporting/detection limit, where non-detect percentages are elevated, it is recommended to use robust Regression on Order Statistics (ROS) to estimate the mean for greater accuracy. The KM in these cases will be biased too high because of the way KM is calculated.	See response to Comment 55, above, regarding applicability of KM statistics.
88	CEC	Appendix G.1	2.3 Structural Integrity	22 of 3237	1	2	This is the first mention of "non-registered sites". Please elaborate on where they are located.	This is boilerplate language taken from the Order and is standard in each EAR. At JOF, there actually are not any non-registered sites. No changes are necessary.
89	CEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	All	All	All	This section lists several relatively recent site inspection reports as "not available": Ash Disposal Area 1: 2014-2020, DuPont Road Dredge Cell: 2014, 2015, South Rail Loop Area 4: 2014-2020. Please explain why these reports were not available.	See response to Comment 17.
90	CEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	7	N/A	Granular fill was compacted to a minimum of 85% of Standard Proctor. Why was this deemed acceptable? In which area of the embankment dike did this occur? Did any slope stability section pass through this portion of the embankment?	The text will be corrected to be consistent with the Static Stability SAR and the source document. The correction will state that the Granular Fill borrow material was compacted to an average relative density of at least 85% (which is quite dense), instead of 85% of Standard Proctor. The borrow material with less than 20% fines was compacted to an average relative density of at least 85%. For borrow material with more than 20% but less than 35% fines, the fill was compacted to at least 95% of standard Proctor maximum dry density. The original design intent of the compaction requirement is not known; however, the existing strength of this material is assigned based on site specific data collected during the TDEC Order work and is properly accounted for in the Static and Seismic Stability SARs. Analyzed cross sections for the SARs include this material (where present, such as Stability Section RL2) and account for its strength.

Appendix A
TVA Johnsonville EAR Rev_0
Summary of Comments and TVA Responses
February 12, 2024

Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
91	CEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	9	N/A	Please elaborate on the type of slope failure observed during the 2022 annual inspection on the north toe berm. Was the failure shallow or deep? How far where the tension cracks from the toe bulge? What were the weather conditions prior to the failure? What pore pressures were observed? How was the failure remediated?	As noted in the response to Comment 15, the potential tension cracking, associated erosion, and slight bulge noted in the 2022 and 2023 annual inspection reports were within the outslope of a perimeter road berm on the northern side of South Rail Loop 4. This outslope is not part of the engineered cap system and does not overlie CCR material. See attached figure for the vicinity of the possible tension cracking. Beyond the observations noted and photographed in the 2022 inspection report, there was no documentation of the observed geometry or location of these features. The current JOF engineering and construction management staff were asked to provide any additional information about these inspection observations and repairs. Although there is no additional documented formal evaluation or repair of the reported tension cracks, staff believe that these features were shallow and may have been filled in with soil as part of animal burrow repairs that were made in the vicinity. Staff have since walked this area and did not observe a downstream bulge as reported in the 2022 and 2023 reports. The 2001 contours (see attached figure) of this area are somewhat irregular, so it is possible that the "slight bulge" was simply the pre-existing irregular slope topography and not an indication of more recent slope movement. Text in Section 2.3.1 of Appendix G.1 will also be updated to provide additional context. The lack of recurring tension cracks in this vicinity would indicate that either: 1) the features were misidentified in 2022 as tension cracks or 2) the outslope has not moved again since the cracks were filled. TVA will continue to observe this area as part of its routine inspection program for JOF CCR management units.
92	CEC	Appendix G.1	2.3.1 Previous Representative Studies and Assessments	28 of 3237	9	N/A	This slope failure occurred after the slope stability analyses were completed. Does the failure corroborate the slope stability analyses or are new analyses required that incorporate the lessons learned from this failure? What are the lessons learned? Do the modeled soil strengths or modeled section locations need to be adjusted since none of the modeled scenarios showed static factor of safeties below 1.0.	Based on the approximate location of the observed tension cracking (see also response to Comment 91), a small/shallow slough in this vicinity would not be in a critical location that would impact global stability of the CCR unit. Nor would a small/shallow slough in the outslope of a perimeter road berm impact veneer stability of the CCR unit engineered cap system (see also response to Comment 15). As such, it does not affect the results and conclusions regarding global and veneer stability of SRL4, as reported in the JOF EAR and Stability SARs.
93	CEC	Appendix G.1	3.1.4 Phreatic Surface Levels	38 of 3237	1	4-6	The report states that "A phreatic surface map was not developed for Ash Disposal Area 1 because this CCR management unit has only two pore water data points, which is not sufficient to provide a representative contour map." While true, this is inconsistent with Cross Section A-A' in Appendix D.	The cross section shows an inferred line, not a surface, based on the measured pore water level in JOF-TW07. The intent is to provide available information without overinterpreting the data.
94	CEC	Appendix J.3	2.1 Sediment, Benthic Macroinvertebrate s, and Mayfly Investigation	106 of 522	1	1	Similar to the comment on Section 7.1.2, on page 58, please provide a few statements that show the relevance of the results of these historical studies to current results. In other words, were the results of the metals analyses similar to current results? Were there variations? Did these results support current results and conclusions?	Per the response to Comment 36: In these historical studies, the closest sediment sampling location was approximately 5 miles upstream from the Plant. In turn, it is difficult to do a direct comparison of historical results to the EI results. However, the general take away is that the historical results in other reaches of the Tennessee River have similar concentrations to the samples collected in the vicinity of the Plant where results we predominantly less than the ESLs.
95	CEC	Appendix J.3	3.2.1 Metric Computations	113 of 522	1	1	Agree with the compositing procedures to accommodate habitat heterogeneity.	Comment acknowledged.
96	CEC	Appendix J.3	3.2.1.1 Tennessee River - RBI	116 of 522	2	1	As summarized in Figure J.3-1, biological integrity is similar for transects adjacent to and downstream of the JOF Plant CCR management units, as compared to upstream controls. Similar to the Boat Harbor section, CV02 scores are very low relative to the other locations.	Agreed. This observation is addressed in the text and it is noted that "CV02 may be limited in its representativeness as a control. Excluding this sampling location, the data demonstrate very consistent biological integrity throughout the study area and support the conclusion that the JOF Plant CCR management units have not adversely impacted benthic communities within the Intake Channel." The results of CV02, included or excluded, do not jeopardize interpretation of the data, as two other cove controls are included in the study that support the aforementioned conclusion.
97	CEC	Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	1	Similar to the results from the Tennessee River, RBI scores in the Boat Harbor were generally higher than their unimpacted controls and reflected consistent conditions throughout the study reach. This finding has been reported at other facilities as well. Do you have any explanation for this? According to the report (p. 13) "Cove transects CV01 through CV03 represent background control conditions presumably unimpacted by JOF plant-related influences, including CCR materials." Is the reason for lower RBI scores in the controls just due to variability?	Suitable control locations were selected based on the best available conditions and professional judgement; however, some habitat differences between the coves and the boat harbor are likely reflected in the RBI scores and/or the differences are within normal variability ranges in biological data sets. A longer term monitoring study and supplemental habitat and water quality testing would be necessary to gain higher resolution understanding of the physical differences and the range of normal variability in the data, but we can only present the relationships, patterns, and comparisons that are observable from the available data set. The take-home message that the results do not provide evidence of impacts from the Plant remains applicable. To speculate for the purposes of answering this comment, it may be that the facilities were constructed in portions of the river with certain characteristics that are particularly favorable to benthic communities. This is the only explanation that seems plausible for why conditions adjacent to the facility appear to be more favorable than control locations at multiple Plants. Again, this relationship may or may not persist in a long term data set.
98	CEC	Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	6	....with CV03 also rated as 'Good,' CV02 rated as 'Fair,' and CV01 rated as 'Excellent.' Reviewing the figure it appears that CV02 is an outlier as it is the only one rated "Fair" in this metric. In fact, every other location is "Excellent" or borderline Excellent. Do you have any explanation for this lower score?	Agreed that CV02 appears to be an outlier. Section 3.2.1.1 identifies this as well and suggests its exclusion: "CV02 may be limited in its representativeness as a control. Excluding this sampling location, the data demonstrate very consistent biological integrity throughout the study area and support the conclusion that the JOF Plant CCR management units have not adversely impacted benthic communities within the Intake Channel." The results of CV02, included or excluded, do not jeopardize interpretation of the data, as two other cove controls are included in the study that support the aforementioned conclusion. Please also refer to Comment Responses #45, #96, and #97.
99	CEC	Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	7	However, RBI scores throughout the Boat Harbor reach were greater than the mean score among the cove control locations. Is this a reflection of CV02 impact on the "mean score among the cove control locations"?	The three Boat Harbor locations each scored 29. The mean value for the Cove control locations, excluding CV02, was 29.5. Including CV02, the mean control score was 26.7. The statement will be revised to clarify: "However, RBI scores throughout the Boat Harbor (29.0) were greater than the mean score among the three Cove control locations (26.7) and were similar to the mean score if CV02 is excluded as an outlier (29.5)."
100	CEC	Appendix J.3	3.2.1.1 Boat Harbor and Coves - RBI	118 of 522	3	8	Additionally, as discussed for the Intake Channel, excluding the uncharacteristic control at CV02 demonstrates very consistent biological integrity not only within the Boat Harbor, but comprehensively throughout the study area (Boat Harbor, Intake Channel, Tennessee River, and coves). Please consider providing an explanation of the rationale for eliminating CV02.	CV02 scored uncharacteristically low compared to the other Cove Controls and was thusly noted as possibly being limited in its representativeness. There is no direct evidence that it is not suitable, is not within normal ranges of variability, or that samples were compromised. The text suggests possible exclusion to provide a more conservative comparison from which to evaluate potential impacts adjacent to and downstream of the Plant; however, the results for CV02 are provided and discussed in the report. As mentioned in Comment Responses #96, #97, and 98, the results from CV02, included or excluded, do not jeopardize interpretation of the data, as the two other cove controls also support the conclusion that the data do not provide evidence of potential impacts from the Plant.

Comment Number	Commentor	Section Number	Section Title	Page	Paragraph	Line	TDEC Comment (November 14, 2023)	TVA Response (February 12, 2024)
101	CEC	Appendix J.3	3.2.1.2 Total Taxa Richness	119 of 522	2	5	As previously discussed, the CV02 control appears to be somewhat degraded in comparison to the rest of the study area, and it had the lowest TTR by a considerable margin. It has the lowest HBI score as well. Clearly this is an impacted transect and the authors should provide an explanation for this consistent result.	The scope of the EI limits the ability to determine the cause of the comparably degraded community at CV02, aside from anecdotal habitat differences; however, it is outside of the influence of the plant and is therefore conclusively not impacted by the JOF facility. As discussed in Comment Responses #96, #97, and 98, the results from CV02, included or excluded, do not affect findings - The two other cove controls also support the conclusion that the data do not demonstrate evidence of potential impacts from the Plant.
102	CEC	Appendix J.3	4.2 Benthic Macroinvertebrate Community Analysis	126 of 522	1	1	In summary, benthic communities within adjacent and downstream areas of the Tennessee River, the Intake Channel, and the Boat Harbor appear to be at least as healthy, rich, and sensitive as their respective unimpacted control locations. As mentioned previously, CV02 does not seem to be "unimpacted" but there isn't any possible explanation provided in the report.	Irrespective of other stressors (water quality, habitat, etc) potentially contributing to apparent lower biological integrity, CV02 is unimpacted by the Plant's CCR Management Units. The use of "unimpacted" is specific to this independent variable (CCR), consistent with the purpose of the study. The supplemental data required to identify and explain the specific causal factors leading to the comparably lower scores at CV02 are not adequate to go beyond speculation within the approved scope of the EI. It is likely that physical habitat differences are the primary cause, potentially exacerbated by normal variability reflected on a limited biological data set. It is possible that other stressors exist that have not been defined under the approved scope of the EI, as well. A comprehensive longer term monitoring study with supplemental habitat and water quality testing would be necessary to gain a confident understanding of the physical differences, range of normal variability in the data, and potential contributing factors to the lower score at CV02 - if the relationship persists across a more robust data set. Please also refer to Comment Responses #97-99 and #101.
103	CEC	Appendix J.5	Chapter 4 Summary	450 of 522	4	1	Please provide more definitive support for your conclusions that no additional CARA work is necessary for sportfish analysis of CCR parameters in the Intake Channel and Boat Harbor. Inspection of the results from Tables J.5-1, J.5-2, J.5-3 and J.5-4 indicate that whole body shad exceeds arsenic and copper CBR NOAELs as opposed to Tennessee River samples which would indicate that these locations and results are not consistent with Tennessee River results for these constituents. (There was agreement with mercury results however). Similar observations and conclusions can be made with arsenic in muscle and liver from samples taken from Boat Harbor and the Intake Channel (as opposed to the Tennessee River).	As outlined in the statistical Appendix E.8 and the Fish Tissue Evaluation Appendix J.5, the Fish Tissue data was evaluated based on two specific criteria - 1) Constituents for which potential risks to aquatic life have been identified based on observations of concentrations greater than applicable EAR ESVs in sediment or surface stream and 2) Constituents with potential to bioaccumulate as identified by the USEPA. This methodology is consistent with how the data was evaluated for each Plant EAR. Thus, the data in Appendix J.5 has been presented in this manner. Edits have been made to Table J.5-1 to reflect the data that was not evaluated and notes have been added to reflect this change. Even though the text does not specifically state that the Fish Tissue data is not carried forth into the CARA, the Risk Assessment does evaluate all of the lines of evidence and conducts an evaluation of the Fish Tissue data.



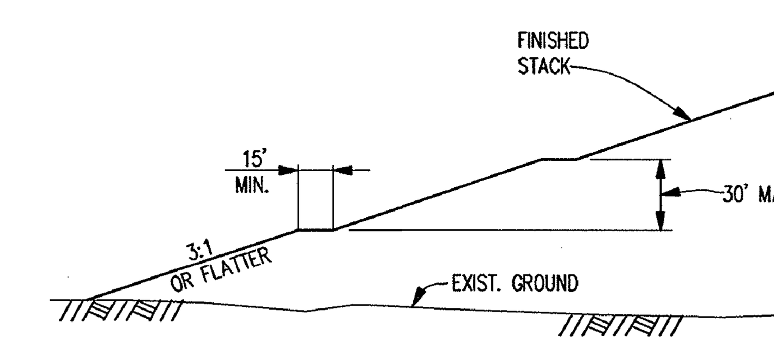
2022 Aerial Image showing the northern limits of SRL4

2022 Inspection Report: Photo D-11, "Bulging slope with apparent tension cracking at the northern toe of the South Rail Loop 4 landfill."

2022 Inspection Report: Photo D-12, "Apparent tension cracking and approximately 20-inch-deep erosion at the northern toe of the South Rail Loop 4 landfill."

BORING LOCATIONS

BORING NO.	LAMBERT COORDINATES NORTH	LAMBERT COORDINATES EAST	PLANT COORDINATES NORTH	PLANT COORDINATES EAST
97 B1	600,092	1,415,050	– 1,827.92	2,151.85
97 B2	599,962	1,415,025	– 1,955.45	2,116.33
97 B3	599,615	1,415,050	– 2,303.33	2,112.92
97 B6	599,650	1,415,440	– 2,300.28	2,504.48
97 B7	599,400	1,415,330	– 2,540.46	2,374.44
97 B8	599,615	1,416,290	– 2,404.53	3,348.79
97 B9	599,490	1,416,187	– 2,520.71	3,235.93
97 B10	599,325	1,416,088	– 2,677.08	3,123.79
97 B11	599,185	1,415,943	– 2,804.78	2,967.85
A1	600,665.06	1,416,402.20	– 1,367.13	3,546.31
A2	599,763.19	1,414,353.22	– 2,098.77	1,430.56
A3	598,524.31	1,415,436.09	– 3,421.89	2,408.71
B5	599,728.77	1,412,954.92	– 2,018.95	34.12
B6	599,773.65	1,414,357.51	– 2,088.69	1,435.69
B7	600,614.90	1,415,023.89	– 1,304.63	2,168.51
B8	599,288.72	1,414,639.17	– 2,594.99	1,676.83
B9	600,017.29	1,417,050.68	– 2,065.67	4,139.76



TYP FILL SECTION
NTS

NOTE: BORING B5 ACTUALLY LOCATED AT N 599,728.77, E 1,412,954.92

R 1 | 1-30-01 | JDP | MGH | JDP | HLP | REP | LAN | 4638
COMPLETELY REDRAWN AND REVISED FINAL CONTOURS
R 0 | 10-18-96 | BNC | BNC | MSD | MSD | KWB | RGJ | 4629
INITIAL ISSUE LAW ENG. AND TRIBBLE & RICHARDSON INC., PROJ. NO. 3822-013-04, SH 2 OF 10

SCALE: 1" = 100' EXCEPT AS NOTED

LAW ENGINEERING AND TRIBBLE & RICHARDSON INC.

RR LOOP ASH STACKING AREA
FINAL CONTOURS

DESIGNED BY: BNC | DRAWN BY: BNC | CHECKED BY: MSD | SUPERVISED BY: MSD | REVIEWED BY: K.W.BURNETT | APPROVED BY: R.G.JOHNSON

JOHNSONVILLE FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R12 | 10-18-96 | 30 | C | 10W532-2 | R 1

LAW ENGINEERING — Tribble & Richardson Inc.

LAW ENG. AND TRIBBLE & RICHARDSON INC. 2-25-93
TASK COMPLETED BY:

PLOT FACTOR:1:100 W_TVA
C.A.D. DRAWING DO NOT ALTER MANUALLY