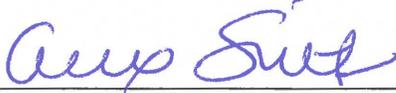
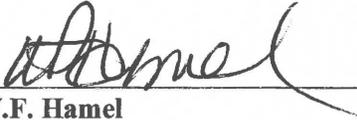




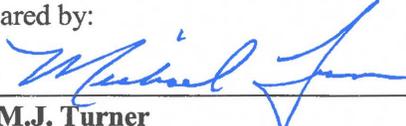
**Inter-Agency Management Integration Team (IAMIT)
Meeting Minutes
February 21, 2019**

Approval:  Date: 4/26/19
A.K. Smith
Ecology IAMIT Representative

Approval:  Date: 3/29/2019
W.F. Hamel
DOE-RL IAMIT Representative

Approval:  Date: 4/11/19
R.G. Hastings
DOE-ORP IAMIT Representative

Approval:  Date: 5/2/19
D.K. Einan
EPA IAMIT Representative

Minutes Prepared by:  Date: 3/27/19
M.J. Turner
Mission Support Alliance

Inter-Agency Management Integration Team (IAMIT)

Meeting Minutes

February 21, 2019

TOPIC: REVIEW IAMIT ACTION TRACKING TABLE (See Attachment)

Table I - Action Items

There are no new action items.

Table II - Status Updates

- A) TPA Five year Review – MSA stated that there is not a lot of activity on proposed changes to the TPA, outside the paragraph 148/149 discussion. There was no change in status. This item remains open.
- B) Milestone M-037-10/Closure Actions for Five Specified TSDs aka “Coordinated Closure” Milestone will change once the review package is completed that changes the TPA and updates it to allow for coordinated closure. Amended package to update milestone is still in review. This action remains open.
- C) Modification to TPA Section 9.4, “Administrative Record,” to Eliminate Hard Copy Requirements – MSA noted that the changes to the Hanford Administrative Record are very close to completion and with that would come a TPA change to allow the electronic records, hopefully by the end of March. The action remains open.
- D) Agreement in Principle for the Negotiation of HFFACO Revisions in Response to Federal Fiscal Year (FFY) 2018 Appropriation and FFY 2019 President’s Budget – DOE preparing to answer some regulator questions and analyze the impacts on the Integrated Priority List and when complete the parties will be ready to meet. The action remains open.

Table III - Recently Closed/Other Agreements

- A) IAMIT Decision/Determination 2018-010: Agreement on the Pipeline Segmentation – This IAMIT Determination was signed and closed at the last IAMIT meeting and will be removed from list next week. This action is closed.

TOPIC: PROPOSED NEW ACTION ITEMS

- A) There were no new action items proposed during today’s IAMIT meeting.

TOPIC: BASELINE RISK ASSESSMENT FOR WASTE MANAGEMENT AREA C – ISSUE RESOLUTION

A) Data Analysis Methods for Judgmental Samples - Ecology Position

See Attachment 1, "Issue: Data Analysis Methods for Judgmental Samples"

Data Analysis Methods for Judgmental Samples – DOE Position

See Attachment 2, "Judgmental Samples Issue"

IAMIT Discussion

The following items were discussed:

- There was disagreement between DOE and Ecology on whether this Baseline Risk Assessment (BRA) is a TPA primary or secondary document. Ecology's position is that this part of a closure plan and therefore a primary document.
- Ecology is asking DOE to revise the BRA.
- DOE is proposing any addition of a sample-by-sample evaluation be included as an appendix with a short explanation, but not issued as a revised BRA, which, in DOE's opinion, would take about a year and cost about \$1m.
- Ecology asked what the difference would be if there were a sample-by-sample analysis done, versus a statistical analysis. DOE responded it believed the conclusions in the BRA would not change.
- DOE stated that any change to the BRA would require a change/update to the already approved RCRA Facility Investigation and Corrective Measures Study.
- Ecology believes the BRA data was evaluated incorrectly, citing Ecology guidance that says you do not evaluate judgmental samples with statistical analysis.
- Ecology framed the argument as "to do it (the analysis) correctly would cost too much, so therefore we shouldn't do it."
- DOE asked if the sampling was done incorrectly per Ecology "guidance" or "regulation". Ecology responded that it was both and cited the pertinent regulations.
- Ecology noted that the work plan and sampling analysis plan did not specify how the data would be analyzed. DOE acknowledged this, but noted that neither DOE nor Ecology identified the problem until late in the process.
- Ecology feels that DOE's contention that the BRA is not a primary document should preclude them from commenting and having those comments responded to.
- EPA asked if the analytics were all done under a residential scenario. DOE (CHPRC) responded that it was not a question of residential versus industrial scenario, but more of a groundwater protection issue.
- No agreement was reached, and Ecology suggested that this issue be elevated into the formal TPA dispute process, with a possible stand-alone IAMIT to further discuss.
- DOE suggested that the IAMIT work on a solution to better define TPA primary and secondary documents to prevent this type of confusion in the future.

B) Hazard Index – Ecology Position

See Attachment 3, "IAMIT Issue: Secondary Effect of Noncancer Chemicals for Segregation of Hazard Index (HI)"

Hazard Index – DOE Position

See Attachment 4, “Hazard Index DOE Proposal”

IAMIT Discussion

The following items were discussed:

- Ecology does not believe that DOE is following Risk Assessment Guidance for Superfund (RAGS) in its entirety by DOE’s use of EPA’s Integrated Risk Information System (IRIS), which does not include secondary effects, so via a hierarchy of databases, DOE must use another database to consider secondary effects. Ecology requests DOE complies with RAGS in its entirety.
- DOE stated they are using the same methods at WMA C: based on Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) guidance: that they have used or are using in the River Corridor and 200 Area RODs or RFI/CMS
- DOE believes that Ecology is asking them to look at all databases all the time for every chemical, which is an extensive process, and not called for in the guidance. Ecology disputed this, saying that RAGS calls for evaluation of secondary effects.
- DOE said it had evaluated more than 180 chemicals in WMA-C.
- There was disagreement over what IRIS covers: only critical effects (Ecology view) or critical and secondary effects (DOE view).
- EPA stated that, according to their human health risk assessor, they generally do not make a Potentially Responsible Party go to secondary levels beyond IRIS.
- Ecology stated that they already have these secondary toxicity levels/effects and there is no “digging through databases all the time”.
- DOE asked what EPA and Ecology do at other sites. EPA offered to bring in their human health risk assessor for further technical discussion.
- DOE stated that a reanalysis would not likely change the basis of the BRA. Ecology partially agreed, but stated that hazard indices could still be exceeded at a secondary level through results of more data.
- No final decision was reached. Ecology will be having further discussions with their representatives and there is a potential meeting with EPA’s risk assessor, DOE and Ecology that could inform this decision.

C) Groundwater Ingestion – Ecology Position

See Attachment 5, “Groundwater Ingestion Issue”

Groundwater Ingestion – DOE Position

See Attachment 6, “Groundwater Ingestion – DOE proposal”

IAMIT Discussion

The following items were discussed:

- Ecology stated that it had issues with relying on the BRA as it is presented in the Remedial Investigation (RI) for 200-BP-5 Operable Unit, because it was based on having a final Record of Decision (ROD), however, jointly with DOE, Ecology

having a final Record of Decision (ROD), however, jointly with DOE, Ecology agreed to an Interim ROD to consider only the existing groundwater plumes. In order to save money, Ecology agreed not to rewrite the RI based on the IROD. However, Ecology still had comments on the RI that were not addressed, but still, the RI went forward and now DOE is using the RI as part of the BRA.

- DOE's future land use is for conservation/preservation RODs make that statement that DOE's future land use is conservation/preservation or conservation/mining (depending on what the Comprehensive Land Use Plan states). DOE has never agreed to the possibility of irrigation in the future, including irrigation on the Central Plateau. We are coming up to a time when the future land use at Hanford is something that the managers are going to have to discuss in great detail.
- There are two different irrigation evaluations that are worth discussing:
 - Using existing contaminated groundwater, bringing that to the surface, irrigating with it, then someone eating those crops and growing livestock and eating the meat.
 - Existing vadose zone contamination or contamination on the soil and then you're irrigating on top of it, which adds a lot more water to push contamination through.
- DOE is evaluating drinking water standards throughout the Central Plateau.
- DOE stated that if irrigation scenarios are allowed and contamination is pushed downward, it may never be able to achieve compliance.
- Ecology stated that it did not believe anything needed be adjusted downward, but more of what needs to be evaluated. The question or disconnect seems to be how WMA-C (TSD) and the groundwater underneath (OU) "communicate".
- EPA noted that not all the data is known to inform final RODs for the groundwater OUs, and asked rhetorically, how that process fits with closing WMA's. This is the over-arching issue, rather than what scenarios to run.

D) Food Chain Pathway- Ecology Position

See Attachment 7, "IAMIT Issue: Nonradionuclide Chemicals in Food Pathway"

Food Chain Pathway – DOE Position

See Attachment 8, "Food chain Pathway DOE Position"

IAMIT Discussion

The following items were discussed:

- Ecology asked if DOE had agreed to evaluate certain pathways (e.g. radionuclides for subsistence farmer) for the River Corridor, but disagreed with that decision, why did it agree to evaluate these same pathways/scenarios for WMA-C. DOE said it was a decision at that time made in conjunction with DOE headquarters after input from regulators, stakeholders and tribes.
- Ecology believes a food exposure pathway evaluation that includes both radionuclides and chemicals for residential and Native American areas is necessary to

- Ecology believes a food exposure pathway evaluation that includes both radionuclides and chemicals for residential and Native American areas is necessary to support remedial decisions and DOE has evaluated food exposure pathways for radionuclides only, and if this is not done, DOE is opening itself up to challenge.
- Ecology stated that it had made several comments during the work plan stage of the Performance Assessment (PA), but DOE did not address them (as the data package/work plan was a TPA secondary document), so made them again during the review of the PA (which is a primary document).
- DOE believes that Ecology's request for food exposure pathway evaluation for chemicals is inconsistent with the residential scenario and the precedent set from the interim action records of decision in the River Corridor. This evaluation and the baseline risk assessment will not change the RCRA facility investigation/corrective measures study conclusions that will lead to a decision at WMA-C.
- Ecology asked how it could state that the scenarios/evaluations Ecology is asking to be done would not change the conclusions of the RFI/CMS, if it had not done the evaluation. Ecology asked DOE to do exactly what they did, i.e. running evaluations for radionuclides and run evaluations for chemical pathways.
- DOE stated as part of their Inner Area Principles, management negotiated with input from staff, EPA and Ecology to define how business would be conducted in the Central Plateau because of these types of disagreements. The disagreement always gets into land use scenarios and what would be run and how they would be run and the very first one is that the land use is industrial. After getting into the Baseline Risk Assessment, DOE specifically decided not to run a residential scenario because that won't factor into decisions on Central Plateau. These factors may or may not factor into a decision on the tank farms, which is a relatively small unit – and to consider growing food there, in that eight-acre area with high soil concentrations, seems unreasonable.
- Ecology pointed out that DOE Order 435.1 does require analysis for food pathways for radionuclides, which was one of the reasons it was done this way. DOE Order 435.1 also takes into consideration what the land use will be. DOE stated if operating to an industrial standard, that is how the decision is made. However, if the decision is to open the land for public use, than the residential farmer scenario comes into play.
- Ecology cites Hanford Advisory Board (HAB) Advice 132, which states industrial land use scenarios will set clean up levels on the Central Plateau, but it also calls for other scenarios; e.g., residential, may be used for comparison purposes to support the decision making process after 150 years. So the words "support the decision making process" is not irrelevant.
- DOE noted that the HAB advice was in 2002 and since that time, numerous decisions have been made in the Central Plateau. DOE has disposed of large quantities of radionuclides there, so the decision as industrial use land has been made for eternity.
- DOE stated there are other factors to consider when comparing industrial vs. farmer scenarios and those are as follows:

- The underground aquifer on the Hanford site will not support the volume of water needed to run a farm. According to Ecology's Natural-Resource Damage Assessment you can only remove enough water to irrigate four square miles someplace on this site, but that volume of water won't come from a single well it would have to come from many wells.
- The other practical issue is whether the water rights are available, groundwater to surface to raise crops here.

TOPIC: OTHER ITEMS

A) Stenography Services for IAMIT Meetings

MSA noted that the TPA IAMIT and other meetings have had the dedicated services of a stenographer for many years. Unfortunately, the dedicated stenographer has chosen to reduce her workload and at some point will retire. MSA put out a Request for Proposal for new stenographer services with very little response in the Tri-City area. MSA will continue to provide meeting minutes but asking for consent among the parties to continue to record all TPA meetings. Verbatim files can still be provided using an audio to text transcription service, if necessary. Ecology stated they are interested in seeing an audio to text transcription for a while longer (at least a quarter) and see how it goes and maybe back off then. EPA responded that they rarely read the verbatim transcript file and are fine with no dedicated stenography services.

B) New Topics Identified

Tank-C-106 is in formal dispute and will be an agenda topic at the next IAMIT on March 21, 2019.

Sensitivity Analysis on Groundwater Recharge Rates and PCB Congeners will be a stand-alone meeting for IAMIT determination and scheduled date to be determined.



TPA Interagency Management Integration Team Meeting
February 21, 2019

<u>Name</u>	<u>Organization</u>
<u>Bill Hame</u>	<u>DOE</u>
<u>Eric Hansen</u>	<u>DOE-ORP</u>
<u>Michael Clone</u>	<u>DOE-RL</u>
<u>Kathy Higgins</u>	<u>DOE-RL</u>
<u>Jim Hansen</u>	<u>RL</u>
<u>ROD COBOS</u>	<u>ORP</u>
<u>JAN BOVIER</u>	<u>ORP</u>
<u>Alba Aly</u>	<u>CHPRC</u>
<u>Laura Buelow</u>	<u>EPA</u>
<u>Dave Einar</u>	<u>EPA</u>
<u>Eric VanMason</u>	<u>WRPS</u>
<u>Maria J. Lopez</u>	<u>WRPS</u>
<u>Craig Cameron</u>	<u>EPA</u>
<u>Sara Austin</u>	<u>CHPRC</u>
<u>ROBIN VARELJA</u>	<u>WRPS</u>
<u>Nina Monard</u>	<u>ECY</u>
<u>John Price</u>	<u>ECY</u>



Inter-Agency Management Integration Team Meeting
Thursday, February 21, 2019, 8:30 a.m.
 U.S. Department of Energy, 2440 Stevens, Conf. Room 2200, Richland, WA

Agenda

No	Time	POC / Org	Topic
1	8:00 – 8:05 am	Turner, Michael, MSA	Review IAMIT Action Tracking Table
2	8:05 – 8:10 am	Einan, Dave, EPA	TPA Paragraph 148/149 Status
3a	8:10 – 8:15 am	Lyon, Jeff, ECY Delistraty, Damon, ECY	Judgmental Samples
	8:15 – 8:20 am	Hansen, James, RL	
	8:20 – 8:30 am	IAMIT Discussion	
3b	8:30 – 8:35 am	Lyon, Jeff, ECY Delistraty, Damon, ECY	Hazard Index
	8:35 – 8:40 am	Hansen, James, RL	
	8:40 – 8:50 am	IAMIT Discussion	
3c	8:50 – 8:55 am	Lyon, Jeff, ECY Delistraty, Damon, ECY	Groundwater Ingestion
	8:55 – 9:00 am	Hansen, James, RL	
	9:00 – 9:10 am	IAMIT Discussion	
3d	9:10 – 9:15 am	Lyon, Jeff, ECY Delistraty, Damon, ECY	Food Chain Pathway
	9:15 – 9:20 am	Hansen, James, RL	
	9:20 – 9:30 am	IAMIT Discussion	
4	9:30 – 9:40 am	Hamel, Bill, RL	New Topic: Stenography services for IAMIT meetings
5	9:40 – 9:50 am	Rob Hastings, ORP	New Topic Identified for Next IAMIT: <ul style="list-style-type: none"> • Tank C-106 Dispute Status
6	9:50 – 9:55 am	Michael Turner, MSA	Topics Identified for Next IAMIT: <ul style="list-style-type: none"> • Sensitivity Analysis on Groundwater Recharge Rates/Potential IAMIT Determination • PCB method 8082 vs 1668A • Any others?
7	9:55 am	Adjourn	

Inter-Agency Management Integration Team Decision Table/Action Tracking

February 21, 2019

*New information shown in blue

Table I. Action Items

1. NONE

Table II. Status Updates

1. TPA Five-Year Review

Reference: TPA Article XXXVIII

Affected Milestones: N/A

Originated: N/A

Status: Agency Review – closed (via IAMIT Determination)/TPA update – complete

Dispute Extended: N/A

Action: Parties will meet for close-out meeting and commit to meet regularly (or semi-regularly) on remaining agreed-upon sections targeted for updating (*see below).

Comments: Ten TPA Class II Change Control Forms were signed at the August 17, 2017 IAMIT meeting. One Class I Change Control Form was signed at the ECY Director and EPA Regional Administrator level. One Class I Change Control Form was disapproved by EPA.

*Some of the TPA Change Forms initially proposed as part of the TPA update (Paragraphs 148/149, Appendices H and I, and Section 11.8) will not be implemented due to time and available resources. However, the parties have agreed to continue talks on these areas.

Notes: The TPA agencies have determined the changes to the TPA were “not significant” and thereby not subject to public comment. A reprint decision of the TPA has been postponed to late Fall pending changes to the above-mentioned sections of the TPA meeting agreement by the parties. The Parties have committed to continuing talks on other potential changes to the TPA, notably Appendices H, I, Section 11.8 and Paragraphs 148/149.

Pending the outcome of these potential changes, a decision to reprint the TPA will be made. As of December 14, 2017 IAMIT, no change in the status, however it was determined that both Ecology and EPA Legal should be involved in the 148/149 discussions and that potential changes to TPA Appendices H and I may be included in the scope of the “System Plan” negotiations, which resumed January 17, 2018. System Plan Negotiations are scheduled to conclude by February 15, 2019. A decision to reprint must be made by July 31st to complete by the end of the fiscal year.

At the October 18, 2018 IAMIT meeting, EPA agreed to take the lead in coordinating a Paragraph 148/149 meeting to discuss EPA’s legal comments with the Parties for resolution.

At the December 20, 2018 IAMIT meeting, Ecology stated they have been discussing minor changes to Appendix I with ORP.

At the January 31, 2019 IAMIT, EPA requested the latest proposed changes to TPA Paragraphs 148/149. EPA agreed to review the draft change control form (L-16-01) and provide a status at the February IAMIT.

Closed:

Inter-Agency Management Integration Team Decision Table/Action Tracking

February 21, 2019

2. Milestone M-037-10/Closure Actions for Five Specified TSDs, aka "Coordinated Closure"

Reference: TPA Milestone M-37-10: *Complete Unit-Specific Closure Requirements according to the closure plan(s) for six (6) TSD Units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, 216-B- 63 Trench, and Hexone Storage and Treatment Facility (276-S-141/142).*

Affected Milestones: M-037-10 (Due 9/30/2020); TPA Action Plan, Sections 3.3, 5.5

Originated: 1/18/18

Status: Open

Dispute Extended: N/A

Action: Parties are being asked to agree that TSD closures will be coordinated with the OUs, then determine best way to adjust the milestone.

Comments: Via RCRA Permit Rev. 9 discussions, agencies have agreed that closure of land-based TSDs can be coordinated with surrounding OUs. Should Milestone M-037-10 and TPA Sections 3.3 and 5.5 be altered, potential exists for TPA negotiations, tentative agreement and/or public comment.

Closed:

3. Modifications to TPA Section 9.4, "Administrative Record," to Eliminate Hard Copy Requirements

Reference: TPA Section 9.4

Affected Milestones: N/A

Originated: 11/15/18 (re-opened)

Status: Change Control Form P-09-18-01 has been drafted, is under review with DOE

Dispute Extended: N/A

Action: Sign Change Control Form

Comments: Change Control Form in draft, proposes eliminating the requirement to maintain hard-copy files in the Hanford Administrative Record. DOE has authorized an Administrative Record system upgrade. This upgrade will enhance search and retrieval capabilities, allow multi-field filtering, provide canned and ad hoc reporting functionality, enable electronic document submittal, and improve system response time. At the December 20, 2018 IAMIT meeting, Ecology indicated they would be ready to sign this change control form when the AR upgrade is complete. The system upgrade is planned to be completed during the second quarter of FY2019.

Closed:

Inter-Agency Management Integration Team Decision Table/Action Tracking February 21, 2019

4. Agreement in Principle for the Negotiation of HFFACO Revisions in Response to Federal Fiscal Year (FFY) 2018 Appropriation and FFY 2019 President's Budget

Reference: N/A

Affected Milestones: M-015-84, M-015-91B, M-015-92C, M-015-93B, M-015-93C, M-015-98, M-015-99, M-015-112, M-016-255, M-016-256, M-085-70, M-085-80

Originated: 12/20/18

Status: Agreement in Principle and corresponding Tentative Agreement have been drafted

Dispute Extended: N/A

Action: Sign Agreement in Principle, enter into negotiations

Comments: These negotiations are driven primarily by requirements found in HFFACO, Legal Agreement, Paragraph 148.A, which requires DOE-RL to include in its annual budget request to the DOE Office of Environmental Management (DOE-EM) estimated funding levels required to achieve full compliance with HFFACO milestones. The FFY 2018 appropriation by Congress and the FFY 2019 President's budget request to Congress, respectively, were less than the DOE-RL estimated funding levels submitted to DOE-EM. HFFACO, Legal Agreement, Paragraph 149.G allows DOE-RL to propose changes to milestones in response to congressional budget appropriations that are less than estimated funding levels required to achieve full compliance. HFFACO, Legal Agreement, Paragraph 149.D states that DOE-RL shall assess the impacts of the President's budget on DOE-RL's ability to complete milestones on time.

At the December 20, 2018 IAMIT meeting, Ecology stated they had received drafts of the AIP and TA on December 19, 2018, were scheduled to meet with their attorneys to review them, and will respond back to DOE. [At the January 31, 2019 IAMIT, Ecology stated EPA had been on furlough and needed to restart these discussions.](#)

Closed:

Table III. Recently Closed/Other Agreements

1. IAMIT Decision/Determination 2018-010: Agreement on the Pipeline Segmentation Approach

Reference: Tri-Party Agreement (TPA) Change Control Form C-17-07, Update 200-IS-1 and 200-WA-1 Operable Units in the Tri-Party Agreement (TPA) Appendix C to Reflect Pipeline Segmentation

Affected Milestones: N/A

Originated: August 2017

Status: Agency Review/Signature at IAMIT level

Dispute Extended: N/A

Action: Parties are being asked to sign the IAMIT Decision

Comments: This IAMIT decision documents agreement among Tri-Party Program Managers from the DOE-RL, DOE-ORP, Ecology, and EPA on the segmentation and interface criteria for Hanford's Central Plateau pipeline waste sites listed in Appendix C of the TPA Action Plan. The attached pages defines the pipeline segmentation designation criteria. The segmentation criteria was based off the Central Plateau Remediation Optimization Study (DOE/RL-2012-33, Rev. 0). TPA Change Control Form C-17-07 is a companion piece to this IAMIT Determination

Closed: [1/31/19 – IAMIT Determination 2018-010 and TPA Change Control Form C-17-07 were approved](#)

February 21, 2019 TPA IAMIT Meeting

Attachment 1

“Issue: Data Analysis Methods for Judgmental
Samples”

Ecology Presentation

Issue: Data Analysis Methods for Judgmental Samples

- The WMA C soil data were obtained from soil samples collected at targeted (judgmental, focused, biased, selective) locations in WMA C. The data analysis method was not consistent with this sampling. The data were pooled over judgmentally-defined areas, and analyzed using a method that assumes that the data are from random samples taken from a true population. The method: calculation of 95% UCL values.
- Ecology regulations (WAC 173-340) and guidance (ex. Ecology Publication No. 94-49) give methods for analyzing selective sampling data. The methods specify directly comparing each data point against the threshold or cleanup level that applies. The USDOE method is, instead, for area-wide sampling using a statistical sampling approach such as simple random, or gridded sampling with a random start, or other methods based on random sampling.

History of WMA C Baseline Risk Assessment (BRA)

- The BRA was a secondary document submitted to Ecology with the WMA C RFI (RPP-RPT-58339), along with roughly 195 other secondary reference documents for the RFI
- Ecology reviewed this document as a secondary document when it was submitted with the RFI
- The BRA is now part of the WMA C Appendix I PA, and was reviewed as a primary document once received with the WMA C Appendix I PA

Regulations and Guidance

- Ecology is asking for data analysis consistent with WAC 173-340-740(d)(iii) (direct comparison for selective sampling) and (e) (all data analysis methods...).
- -740(d)(iii) describes direct comparison: 'Direct comparison of soil sample concentrations with cleanup levels may be used to evaluate compliance with cleanup levels where selective sampling of soil can be reliably expected to find suspected soil contamination....'

Regulations and Guidance

- This is consistent with Ecology Publication No. 94-49, 'Guidance on Sampling and Data Analysis Methods', Section A2.0 for "focused sampling" ('the selective sampling of areas where potential or suspected soil contamination can reliably be expected to be found if a release of hazardous substance has occurred').
- 'This approach may only be used if there is reliable information that can be used to focus sampling efforts on the appropriate locations.'
- Section A2.2 (Comparing data from focused soil sampling with cleanup levels) begins with the following: "The concentrations of all hazardous substances in each soil sample should be compared directly with the cleanup levels...(The sampling points with exceedances are not the areas requiring cleanup; they are used to map the areas requiring a decision on the need for remediation.)..."

Statistical Approach Influences Outcome

- Direct comparison, consistent with WAC 173-340, indicates the following risk/hazard drivers (exceedences of WAC 173-340 Method B) not identified by the USDOE method:
 - Beta-hexachlorocyclohexane (various locations above 15 ft). Pathway: soil to gw
 - Chromium (assuming hexavalent) (various locations from 14 to 225 ft). Pathway: soil to gw (Method B value 0.2 mg/kg, based on site-specific Hanford Kd 0 mL/g (PNNL-13895) (WAC 173-340-740(1)(c))
 - Nitrate (various locations, depth 0 to 159 ft). Pathway: soil to gw
 - Arsenic at location C1, depth of 11 to 13 ft. Pathways: direct contact, soil to gw, eco (plants)
 - One radionuclide not identified using the current approach in the BRA: Pu-239/240, location P, depth 14 to 16 ft, 11 to 40 pCi/g
- Current BRA risk drivers:
 - Beta-hexachlorocyclohexane was indicated in Table 3-14

Appendices and Conclusion for Judgmental Sampling Issue

- Ecology would like to comment on proposed appendices and see the appendices revised to incorporate our comments.
- Any conclusions made for WMA C soil regarding the differences between data analysis methods are specific to WMA C. **Different locations have different waste streams, soils and subsurface geology. Therefore, WMA C should not be the basis for generalizing or extrapolating to other locations.**

February 21, 2019 TPA IAMIT Meeting

Attachment 2

“Judgmental Samples Issue”

DOE Presentation

Judgmental Samples Issue

- ORP collected samples and analyzed samples per the approved work plan and SAP
- Ecology comments on the BRA Rev 2 identified that the use of a statistics-based approach on judgmental sampling was not valid
- ORP conducted a sample-by-sample evaluation per Ecology request on a subset of the risk scenarios and found the same contaminants of concern and risk conclusions
 - The evaluation was completed for 5 of the 11 scenarios, including residential, industrial, MTCA B, MTCA C, and groundwater protection.
 - Evaluation has already been provided to Ecology.

Judgmental Samples DOE Proposal

- Add the five sample-by-sample evaluations in an appendix and short explanation in the text.
- Minimize revision of the BRA to expedite completion
- BRA summary and conclusions in RFI/CMS would not change
- Sample-by-sample evaluation would not be performed for 6 remaining scenarios

- Summary question: Is it worth the time and resources to revise the BRA to fully incorporate the sample-by-sample evaluation or to complete the sample-by-sample evaluations for the remaining 6 risk scenarios?

February 21, 2019 TPA IAMIT Meeting

Attachment 3

“IAMIT Issue: Secondary Effects of Noncancer
Chemicals for Segregation of Hazard Index (HI)”

Ecology Presentation

IAMIT Issue: Secondary Effects of Noncancer Chemicals for Segregation of Hazard Index (HI)

Damon Delistraty
Washington State Dept of Ecology
Feb 2019

Background

- Context is Baseline Risk Assessment (BRA) of WMA-C Performance Assessment (PA)
 - WMA-C is a RCRA/TSD facility
- For human health risk assessment, EPA divides the world into cancer and noncancer chemicals
 - issue here concerns noncancer chemicals and effects (e.g., liver, kidney, GI, etc)

Background (continued)

- Hazard Quotient (HQ) and Hazard Index (HI) are used to characterize hazard for noncancer chemicals
 - $HQ = [\text{exposure dose or conc}] / [\text{RfD or RfC}]$
 - Sum HQs [over multiple noncancer chemicals] = HI
- Interpretation
 - [HI < 1] indicates adverse effects are unlikely
 - [HI > 1] indicates adverse effects are possible
- If [HI > 1], EPA recommends segregating HI by similar toxic effect and recalculating separate HIs for each effect

Issue

- To segregate HI, USDOE claims to follow EPA's Risk Assessment Guidance for Superfund (RAGS)
 - RAGS is EPA's seminal document for human health risk assessment methodology
- RAGS states, "Segregation of hazard indices requires identification of the major effects of each chemical, including those seen at higher doses than the critical effect."
 - EPA's IRIS database provides toxicity values for noncancer chemicals (e.g., RfD, RfC), based on a critical effect
 - additional sources (e.g., ATSDR) may be needed to identify effects that occur at higher doses (i.e., secondary effects)
- USDOE does not identify secondary effects

Issue (continued)

- RAGS also states, “Information in IRIS supersedes all other sources. Only if information is not available in IRIS for the chemical being evaluated should the sources below be consulted.”
 - “sources below” include, e.g., ATSDR, open literature
- critical and secondary effects should be included from non-IRIS sources (but “only if information is not available in IRIS”)

Conclusion

- USDOE does not identify secondary effects of noncancer chemicals (i.e., effects beyond the critical effect)
- Re HI segregation, by excluding consultation of sources for secondary effects of noncancer chemicals (when not available in IRIS), USDOE does not follow RAGS (in entirety)
 - Ecology requests that USDOE comply with RAGS

February 21, 2019 TPA IAMIT Meeting

Attachment 4

“Hazard Index Issue”

DOE Presentation

Hazard Index Issue

- BRAs calculate cancer risk and hazards
- Hazard quotients are calculated for each contaminant with Hazard information specific to target organs.
- HQs for target organs are summed for a Hazard Index (HI)
- Where $HI > 1$ for a target organ, there is a basis for a remedial action

- DOE has used the same methods based on CERCLA guidance for the BRAs on the 300 Area, F/IU, D/H, 200 Area groundwater, and WMA C.
- Guidance is to use EPA's IRIS database
 - If no information in IRIS, get information from Tier 2 sources.
 - If no information there, go to Tier 3 sources.

- Ecology is asking to revise the BRA to another method to calculate HI based on secondary and lower-level effect
- DOE is not aware of MTCA or CERCLA guidance to support Ecology

Hazard Index DOE Proposal

- DOE would like to follow CERCLA guidance as used in 300 Area, F/IU, D/H, and 200 Area groundwater remedial investigations and WMA C BRA
- Summary question: Is it worth the time and resources to revise the BRA to incorporate Ecology's proposed methods that are inconsistent with EPA guidance, inconsistent with CERCLA decision documents at Hanford and elsewhere, and not supported by Ecology regulations or methods?

February 21, 2019 TPA IAMIT Meeting

Attachment 5

“Groundwater Ingestion Issue”

Ecology Presentation

Groundwater Ingestion Issue

- The WMA C BRA evaluates ingestion of only the water that leaches through WMA C in residential and industrial settings, while not including ingestion of the groundwater contamination that it mixes with in the aquifer.
- **TPA requirements** (App I, Section 2.4)

“However, in order to ensure that TSD units within the operable units are brought into compliance with RCRA and State of Washington hazardous waste regulations, Ecology intends..., that all response or corrective actions, ..., will be conducted in a manner which ensures compliance with the technical requirements of the HWMA (Chapter 70.105 RCW and its implementation regulations). In any case, the Parties agree that CERCLA remedial actions will comply with requirements to meet applicable or relevant and appropriate requirements.”

HWMA Implementing Regulations include WAC 173-340 (cited in WAC 173-303)

WAC 173-340-708 addresses sites with multiple contaminants and multiple exposure pathways

(5) Multiple hazardous substances.

- (a) Cleanup levels for individual hazardous substances established under Methods B and C and remediation levels shall be adjusted downward to take into account exposure to multiple hazardous substances. This adjustment needs to be made only if, without this adjustment, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}).

(6) Multiple pathways of exposure.

- (a) Estimated doses of individual hazardous substances resulting from more than one pathway of exposure are assumed to be additive unless scientific evidence is available to demonstrate otherwise.
- (b) Cleanup levels and remediation levels based on one pathway of exposure shall be adjusted downward to take into account exposures from more than one exposure pathway....

Risk Assessment at MTCA sites

- Ecology shared the DRAFT CLEANUP ACTION PLAN, WA DOC Washington State Penitentiary Site, Walla Walla, WA, FSID 779, CSID 4971, April 2016, Washington Department of Ecology, Toxics Cleanup Program, Eastern Regional Office, Spokane
- An excerpt from this document explains how soil and groundwater pathways were considered in the MTCA investigation for this example project.

DRAFT CLEANUP ACTION PLAN, WA DOC Washington State Penitentiary Site, Walla Walla, WA

- “WAC 173-340-700(5)(b) provides that, when using Method B to derive CULs, where a hazardous waste site involves multiple hazardous substances and/or multiple pathways of exposure, then standard and modified Method B CULs for individual substances must be adjusted downward for additive health effects in accordance with the procedures in WAC 173-340-708 if the total excess lifetime cancer risk for a site exceeds 1×10^{-5} or the hazard index for substances with similar non-carcinogenic toxic effects exceeds one..... Because total excess lifetime cancer risk above background exceeds 1×10^{-5} , a downward adjustment to CULs is made based on cancer risk; benzo(a)pyrene is reduced from 0.14 mg/kg to 0.014 mg/kg. Because no total hazard index above background exceeds 1, no downward adjustment to CULs is made based on non-cancer hazard.”

200-BP-5 Remedial Investigation Report

DOE's Position:

- Recent TPA agreement (IAMIT 2018-002) on the path forward for the 200-BP-5 Interim Record of Decisions already addresses how groundwater under WMA C is evaluated.
 - DOE believes this agreement provides a clear path forward that groundwater risk under WMA C is evaluated in the 200-BP-5 RI, and that evaluation addresses Ecology's concerns for drinking water and household activities.

Actual RI content:

- The RI for BP-5 specifically states that the **IROD** addresses only what is in the ground water now.

200-BP-5 Remedial Investigation Report

1 Introduction

- This report presents the results of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial investigation (RI) conducted for the 200-BP-5 Groundwater Operable Unit (OU), located at the U.S. Department of Energy (DOE) Hanford Site in Washington State (Figure 1-1). During the development of the 200-BP-5 RI/Feasibility Study (FS) Work Plan (DOE/RL-2007-18, *Remedial Investigation/Feasibility Study Work Plan for the 200-BP-5 Groundwater Operable Unit*, Rev. 1), it was recognized that source units, including tank farms, will need to be either closed/remediated or have approved mutually accepted decisions/strategies regarding closure/remediation before remedial actions are identified for the 200-BP-5 Groundwater OU, and before decisions on a record of decision (ROD) for the 200-BP-5 OU can be implemented (WMP-28945, *Data Quality Objective Summary Report in Support of the 200-BP-5 Groundwater Operable Unit Remedial Investigation/Feasibility Study Process*, Rev. 1, Page 1-4). **It was also recognized and well documented that the 200-BP-5 Groundwater OU consists of the current aquifer, and does not include the overlying vadose zone or perched water zones (DOE/RL-2007-18, Rev. 1, p. 4-2).**

Table 7 shows the addition of risk values across soil and gw pathways

Indicator Analyte	Method B Cleanup Level	Basis	Cancer Risk	Hemotoxicity	Neurotoxicity
Conventionals					
Nitrate	10,000 µg/L	MCL gw		1	
Inorganics					
Chromium (VI)	42 mg/kg	BCKR soil	not calculated - based on background		
Chromium (VI)	48 µg/L	MCL gw	no known toxicological endpoint		
Lead	250 mg/kg	A soil	not calculated - based on Method A		
Manganese	2240 µg/L	BNCAR gw			1
Volatile Organics					
Tetrachloroethene	0.05 mg/kg	BCAR soil	1.00E-06		
Tetrachloroethene	5 µg/L	MCL gw	1.00E-05		
Benzo(a)pyrene	0.14 mg/kg	BCAR soil	1.00E-05		
Totals:			1.02E-05	1	1

Indicator Analyte	Adjusted Method B Cleanup Level	Basis	Cancer Risk	Hemotoxicity	Neurotoxicity
Conventionals					
Nitrate	10,000 µg/L	MCL gw		1	
Inorganics					
Chromium (VI)	42 mg/kg	BCKR soil	not calculated - based on background		
Chromium (VI)	48 µg/L	MCL gw	no known toxicological endpoint		
Lead	250 mg/kg	A soil	not calculated - based on Method A		
Manganese	2240 µg/L	BNCAR gw			1
Volatile Organics					
Tetrachloroethene	0.005 mg/kg	BCAR soil	1.00E-07		
Tetrachloroethene	5 µg/L	MCL gw	1.00E-05		
Benzo(a)pyrene	0.014 mg/kg	BCAR soil	1.00E-07		
Totals:			1.02E-05	1	1

Ecology Position

Data Analysis Methods for Judgmental Samples

Table 7. Overall Site Risk Evaluation, Pre- and Post-Adjustment

February 21, 2019 TPA IAMIT Meeting

Attachment 6

“Groundwater Ingestion Issue”

DOE Presentation

Groundwater Ingestion Issue

- The TPA identifies that groundwater contamination would be evaluated in the CERCLA Groundwater Remedial Investigation.
- WMA C BRA Rev. 2 was updated to identify that existing groundwater contamination is evaluated in the 200-BP-5 Remedial Investigation (RI) report and not included in the WMA C BRA
- WMA C BRA includes a vadose zone evaluation for groundwater protection
- Ecology is asking for additional groundwater evaluations to be performed for WMA C, including “all groundwater pathways (e.g., drinking water, household activities, irrigation of crops, drinking water for livestock) with groundwater that contains contamination leached from contaminated soil and contamination already present in groundwater as leachate arrives be evaluated” (from Ecology summary question)

Groundwater Ingestion DOE Proposal

- Recent TPA agreement (IAMIT 2018-002) provides a clear path forward that groundwater risk under WMA C is evaluated in the 200-BP-5 RI, and that evaluation addresses Ecology's concerns for drinking water and household activities.
- Irrigation of crops and drinking water for livestock in Ecology's position are inconsistent with reasonably anticipated future land use.
- DOE believes that sufficient information has already been provided in both the WMA C BRA and the 200-BP-5 RI to support corrective measure decisions
- Summary question: Is it worth the time and resources to add Ecology's request for additional pathways or evaluations to either the WMA C BRA or the 200-BP-5 RI?

February 21, 2019 TPA IAMIT Meeting

Attachment 7

“IAMIT Issue Nonradionuclide Chemicals in
Food Pathway”

Ecology Presentation

IAMIT Issue: Nonradionuclide Chemicals in Food Pathway

Damon Delistraty
Washington State Dept of Ecology
Feb 2019

Issue

- Context is Baseline Risk Assessment (BRA) of WMA-C Performance Assessment (PA)
- USDOE has evaluated a food exposure pathway for radionuclides, but not chemicals, in residential and Native American scenarios in the BRA (Section 3.2.1.4)
- Food exposure clearly includes both radionuclides and chemicals
 - evaluation of one, but not the other, is not logical

Future Hanford Land Use/Exposure Scenarios

- TPA response to HAB Advice #132 on exposure scenarios in the 200 Area
 - “An industrial land use scenario will set CULs on the Central Plateau. Other scenarios (e.g., residential) may be used for comparison purposes to support decision making especially for the post-institutional control period (>150 yrs).”
- Therefore, a residential scenario (which includes a food pathway for chemicals) should be evaluated, as a future exposure scenario to support remedial decisions

EPA Guidance/MTCA Rule

- WMA-C is a RCRA/TSD facility, but CERCLA and MTCA risk guidance largely apply
- EPA's Risk Assessment Guidance for Superfund (RAGS) provides ingestion equations for chemicals in food for a residential exposure
 - fish, produce, meat, dairy
- MTCA allows for evaluation of chemicals in food
 - establishes soil CULs “that eliminate or reduce the potential for food chain contamination” (WAC 173-340-740[1][c])([i])

Inclusion of Chemicals in a Food Pathway at Hanford

- Precedent in numerous Hanford risk assessment reports over past 25 yrs
 - e.g., HSRAM, CRCIA, WTP, Tank Waste Scenarios, RCBRA, 100 DH RI/FS (more detailed citations in position paper memo)
 - resident, farmer, Native American receptors
- Toxicity factors available for many radionuclides and chemicals
 - e.g., risk coefficients for radionuclides, CSF and RfD for chemicals
- Many exposure factors are independent of rad/chem grouping
 - e.g., food intake rates, transfer factors (e.g., BCF, BAF)

Uncertainty

- USDOE has claimed that uncertainty is greater for evaluation of chemicals vs. radionuclides
 - consulted Bruce Napier (health physicist at PNNL and author of GENII rad dosimetry/risk code) who noted that uncertainty is approximately equal for these two analyses
- Large uncertainty is prevalent in all components of risk assessment (e.g., source term characterization, fate/transport modeling, risk estimation)
 - uncertainty in evaluation of chemicals in food pathway is arguably similar, so its omission is inconsistent
- Future land use at Hanford can be assumed, but in reality, can neither be predicted nor guaranteed

Conclusion

- Food pathway in the BRA should evaluate both radionuclides and chemicals
 - excluding chemicals would underestimate risk
- This pathway is needed for future resident, farmer, and Native American exposure scenarios
- All of these scenarios inform remedial decisions at WMA-C, a RCRA TSD facility

February 21, 2019 TPA IAMIT Meeting

Attachment 8

“Food Chain Pathway Issue”

DOE Presentation

Food Chain Pathway Issue

- WMA C BRA provides an evaluation of a residential scenario
- This evaluation includes an evaluation of risk from consuming food grown at WMA C for radionuclides only
- This evaluation is consistent with residential scenario risk assessments run for the River Corridor Baseline Risk Assessment (RCBRA) as well as remedial investigations for 300 Area, D/H, and F/IU
- This was developed per request by WA Dept. of Health for the Interim Action ROD for the River Corridor. This was continued for later recent RODs
- Ecology is asking for the residential scenario to include consumption of food grown at WMA C for chemicals
- Ecology's request is consistent with the RCBRA "Subsistence Farmer" scenario

Food Chain Pathway DOE Position

- Residential and Subsistence Farmer exposure scenarios are not consistent with current and reasonably anticipated future land use on the Central Plateau
- Ecology's request is inconsistent with the residential scenario used in River Corridor RODs, the RCBRA, and the River Corridor interim action ROD
- Including the evaluation will not change the RFI/CMS conclusions that will lead to a decision for WMA C
- Summary question: Is it worth the time and resources to conduct the food chain evaluation for chemicals or to revise the WMA C BRA?
 - The evaluation would be inconsistent with existing Central Plateau source units Work Plans and would be inconsistent with RODs along the River Corridor

February 21, 2019 TPA IAMIT Meeting

Attachment 9

“WMA-C Baseline Risk Assessment Remaining
Issues”

DOE Presentation

WMA-C Baseline Risk Assessment

Remaining issues

- The Baseline Risk Assessment (BRA) is 1 of 4 IPA documents
- Rev 0 was submitted to Ecology in 2014, Rev 2 in October 2016
- Comment resolution been ongoing since March 2015
- Multiple comments are associated with 4 remaining issues
- Resolving the issues was intended to resolve open comments

- RL became involved in meetings with Ecology in 2018 because issues could impact RL
- June 11, 2018, Ecology approved the RFI/CMS, which included results and conclusions of the BRA

- The issues are explained in the provided issue papers, and simplified here in this presentation

February 21, 2019 TPA IAMIT Meeting

Attachment 10

Ecology Backup/Position Papers

Ecology's Position Paper for the Use of Judgmental Soil / Vadose Zone Sample Data at WMA C

February 14, 2019

Issue: Data Analysis Methods for Judgmental Samples

The WMA C soil data were from soil samples collected at targeted (judgmental, focused, biased, selective) locations in WMA C. The data analysis method was not consistent with this sampling. The data were pooled over judgmentally-defined areas, called exposure areas, and were analyzed using a method that assumes that the data are from random samples taken from a true population. The method: calculation of 95% UCL values.

Ecology regulations (WAC 173-340) and guidance (ex. Ecology Publication No. 94-49, *Guidance on sampling and data analysis methods*) give methods for analyzing selective sampling data. The methods specify directly comparing each data point against the threshold or cleanup level that applies. The USDOE method is, instead, for area-wide sampling with a statistical approach such as simple random, or systematic sampling with a random start, or other methods based on random sampling.

History of WMA C Baseline Risk Assessment (BRA)

The WMA C BRA was a secondary document submitted with the WMA C RFI (RPP-RPT-58339), along with roughly 195 other secondary reference documents for the WMA C RFI. Ecology reviewed this document as a secondary document when it was submitted to Ecology with the WMA C RFI. The BRA is now part of the WMA C Appendix I Performance Assessment, and was reviewed as a primary document once received with the WMA C Appendix I PA.

Regulations and Guidance

Ecology is asking for data analysis to be consistent with WAC 173-340-740(d)(iii) (direct comparison for selective sampling) and (e) (all data analysis methods...). WAC 173-340-740(d)(iii) describes direct comparison: "Direct comparison of soil sample concentrations with cleanup levels may be used to evaluate compliance with cleanup levels where selective sampling of soil can be reliably expected to find suspected soil contamination...." This is consistent with Ecology Publication No. 94-49, Section A2.0 for "focused sampling" ("means the selective sampling of areas where potential or suspected soil contamination can reliably be expected to be found if a release of hazardous substance has occurred"). The guidance states "This approach may only be used if there is reliable information that can be used to focus sampling efforts on the appropriate locations." Section A2.2 (Comparing data from focused soil sampling with cleanup levels) begins with the following: "The concentrations of all hazardous substances in each soil sample should be compared directly with the cleanup levels...(The sampling points with exceedances are not the areas requiring cleanup; they are used to map the areas requiring a decision on the need for remediation.)..." Ecology accepted USDOE's logic for targeting specific areas in the tank farm, and recognized that the equipment within WMA C posed constraints for doing a statistically-based sampling. However, the WMA C RFI Phase 2 work plan did not specify data analysis methods.

Ecology's Position Paper for the Use of Judgmental Soil / Vadose Zone Sample Data at WMA C

Statistical Approach Influences Outcome

Using methods consistent with WAC 173-340 indicates the following risk/hazard drivers (exceeding WAC 173-340 Method B) not identified by the USDOE method:

- Beta-hexachlorocyclohexane (various locations above 15 ft). Pathway: soil to gw
- Chromium (assuming hexavalent) (various locations from 14 to 225 ft). Pathway: soil to gw (Method B gw value 0.2 mg/kg, based on site-specific Hanford Kd 0 mL/g (PNNL-13895) (WAC 173-340-740(1)(c))
- Nitrate (various locations, depth 0 to 159 ft). Pathway: soil to gw
- Arsenic at location C1, depth of 11 to 13 ft. Pathways: direct contact, soil to gw, eco (plants)
- One radionuclide not identified using the current approach in the BRA: Pu-239/240, location P, depth 14 to 16 ft, 11 to 40 pCi/g

The WMA C BRA gives beta-hexachlorocyclohexane in Table 3-14, but the others appear to be overlooked. Therefore, it should not be assumed that these two approaches give the same results. It should also not be concluded that these two approaches will give the same results at other locations with different waste streams, soils and subsurface geology.

Conclusion

Ecology would like to comment on proposed appendices for the WMA C BRA, and see the appendices revised to incorporate our comments.

We also stress that any conclusions made for WMA C soil regarding the differences between data analysis methods are specific to WMA C. Different locations have different waste streams and subsurface soils and geology. Therefore, WMA C should not be the basis for generalizing or extrapolating to other locations.

Ecology Response to selected bullets in USDOE Position Paper "Use of Judgmental Samples Issue Summary"

ORP/Ecology Discussion History:

- The WMA C RFI/CMS, Data Quality Objectives (DQO), Work Plan and SAP were developed with extensive participation/input from Ecology. The Work Plan and SAP were approved by Ecology. The DQO specified that exposure point concentrations (EPCs) would be calculated using the 95% UCL method. In the event there were insufficient data collected to allow for calculating the 95% UCL, the option was to use the maximum concentration.

Ecology response: The following was all that was stated of the data analysis approach in the Work Plan (RPP-PLAN-39114, Rev. 2) Section 5.4.2, "f. If sufficient data are available, perform statistical analyses. This step has many facets, including determining the distribution of the data and selecting the appropriate statistical tests. If available data are not sufficient for statistical analysis, maximum concentrations will be used in the data evaluation process. The combined chemical and geophysical data will be used for refining the initial conceptual contaminant-distribution models and as inputs to the risk assessment." The Work Plan for the RFI did not include sufficient information to know the data analysis method planned.

Ecology's Position Paper for the Use of Judgmental Soil / Vadose Zone Sample Data at WMA C

- The BRA was revised to a Rev. 2. Ecology provided comments (on the BRA Rev. 2) stating that calculating a 95% UCL from judgmental samples was not statistically valid. Ecology requested a sample-by-sample evaluation of the data.

Ecology response: The BRA was a secondary document submitted with the WMA C RFI, along with roughly 195 other secondary reference documents for the RFI. We had only one reviewer because the rest of the team was busy with the RFI itself and the many other secondary documents that we had to review in the process of reviewing the RFI. This document was reviewed as a primary document when it became part of the WMA C Appendix I PA.

DOE's Position:

- DOE has completed the sample-by-sample evaluation requested by Ecology for five of the 11 risk scenarios in the BRA, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) residential and industrial scenarios, the Model Toxics Control Act (MTCA) Methods B and C scenarios, and the groundwater protection evaluation using the MTCA fixed-parameter three-phase model. The conclusions are the same between the two methods (95% UCL and sample-by-sample).
- DOE is proposing to provide the comparison of the two method results for the scenarios listed above in an appendix to the BRA with a short explanation in the text of the BRA. DOE is also proposing to not complete the evaluation for the remaining six scenarios (BRA, Section 3.5), and to continue to use the 95% UCL evaluation in the BRA.

Ecology response: Note that Ecology often does not sign DQO documents and Ecology risk assessors are not consistently involved in DQO workshops. The work plan for the BRA was not specific about the data analysis methods.

DOE's Future Considerations:

- In general, judgmental samples should not be used to make statistical inferences about an underlying population. However, when a large number of samples are collected, inferences can be made about the mean value. Future characterization needs will be identified through the DQO and Work Plan process. The DQOs will identify data needs and the appropriate methods to evaluate those data sets.

Ecology response: Note that Ecology often does not sign DQO documents and Ecology risk assessors are not consistently involved in DQO workshops. The work plan for the BRA was not specific about the data analysis methods.

Future documents should use the appropriate statistics. Any inferences about the mean value should be those that can be made without violating the assumptions of the statistics in use. For instance, a 95 % UCL calculation assumes a randomly sampled population with each member of the population having an equal chance of being sampled. When this assumption is violated, the 95% UCL value is not meaningful, and therefore, misleading.

- As a future action, TPA agencies need to determine a path forward for future tank farms. It would be difficult, if not impossible, to obtain random samples within any Waste Management Area. An approach would be needed to obtain a reasonable number of samples and support the remedial action decision making process. The comparison of methods completed for WMA C shows the same conclusions are obtained with both methods. Evaluating the data by calculating a 95% UCL is more efficient and a cleaner presentation of results, and with large sample sizes, is expected to provide the same conclusions. Alternatively, evaluating judgmental samples using sample-by-sample methods is statistically more defensible.

Ecology response: Defensibility is key.

Ecology's Position Paper for the Groundwater Ingestion Pathway for WMA C

February 14, 2019

Issue: Addition of risk and hazard associated with vadose zone and groundwater sources

The WMA C BRA evaluates ingestion of only the water that leaches through WMA C in residential and industrial settings, while not including ingestion of the groundwater contamination that it mixes with in the aquifer.

Risk Assessment at MTCA sites

WAC 173-340-708

Human health risk assessment procedures.

(5) Multiple hazardous substances.

(a) Cleanup levels for individual hazardous substances established under Methods B and C and remediation levels shall be adjusted downward to take into account exposure to multiple hazardous substances. This adjustment needs to be made only if, without this adjustment, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5}).

(b) Adverse effects resulting from exposure to two or more hazardous substances with similar types of toxic response are assumed to be additive unless scientific evidence is available to demonstrate otherwise. Cancer risks resulting from exposure to two or more carcinogens are assumed to be additive unless scientific evidence is available to demonstrate otherwise....

(6) Multiple pathways of exposure.

(a) Estimated doses of individual hazardous substances resulting from more than one pathway of exposure are assumed to be additive unless scientific evidence is available to demonstrate otherwise.

(b) Cleanup levels and remediation levels based on one pathway of exposure shall be adjusted downward to take into account exposures from more than one exposure pathway. The number of exposure pathways considered at a given site shall be based on the reasonable maximum exposure scenario as defined in WAC 173-340-708(3). This adjustment needs to be made only if exposure through multiple pathways is likely to occur at a site and, without the adjustment, the hazard index would exceed one (1) or the total excess cancer risk would exceed one in one hundred thousand (1×10^{-5})....

TPA requirements

(App I, Section 2.4) "However, in order to ensure that TSD units within the operable units are brought into compliance with RCRA and State of Washington hazardous waste regulations, Ecology intends..., that all response or corrective actions, ..., will be conducted in a manner which ensures compliance with the technical requirements of the HWMA (Chapter 70.105 RCW and its implementation regulations). In any case, the Parties agree that CERCLA remedial

Ecology's Position Paper for the Groundwater Ingestion Pathway for WMA C

actions will comply with requirements to meet applicable or relevant and appropriate requirements.”

Example of how MTCA is applied

Ecology shared the Draft Cleanup Action Plan written by Ecology for the Washington Department of Corrections for the Washington State Penitentiary Site, Walla Walla, WA, in April 2016 with USDOE to help resolve this issue. An excerpt from this document shows how soil and groundwater pathways were considered in the MTCA investigation for this example site.

- “WAC 173-340-700(5)(b) provides that, when using Method B to derive CULs, where a hazardous waste site involves multiple hazardous substances and/or multiple pathways of exposure, then standard and modified Method B CULs for individual substances must be adjusted downward for additive health effects in accordance with the procedures in WAC 173-340-708 if the total excess lifetime cancer risk for a site exceeds 1×10^{-5} or the hazard index for substances with similar non-carcinogenic toxic effects exceeds one.... Because total excess lifetime cancer risk above background exceeds 1×10^{-5} , a downward adjustment to CULs is made based on cancer risk; benzo(a)pyrene is reduced from 0.14 mg/kg to 0.014 mg/kg. Because no total hazard index above background exceeds 1, no downward adjustment to CULs is made based on non-cancer hazard.”

Ecology Response to selected bullets in USDOE Position Paper “Groundwater Ingestion Issue Summary”

Ecology's Position:

- Multiple Pathways – A complete groundwater ingestion pathway from leaching of contaminated soil and back to surface should be evaluated for radiological and chemical contaminants in the vadose zone.
- Cumulative Risk – Risk characterization of current contamination in groundwater should be completed. Cleanup levels for soil contaminants should include existing groundwater contamination cleanup levels.

Ecology response: The above bullets are not in Ecology's words. Some of the sentences are unclear. Please see the question below for clarification.

- **Ecology's Summary Question:** “Should all groundwater pathways (e.g., drinking water, household activities, irrigation of crops, drinking water for livestock) with groundwater that contains contamination leached from contaminated soil and contamination already present in groundwater as leachate arrives be evaluated; or should only a groundwater ingestion pathway (human drinking water only) be evaluated, considering only contamination that has been leached from contaminated soil in residential and industrial scenarios, and assuming that an off-site water source would be used for all other groundwater uses?”

DOE's Position:

- Recent TPA agreement (IAMIT 2018-002) on the path forward for the 200-BP-5 Interim Record of Decisions already addresses how groundwater under WMA C is evaluated.
 - DOE believes this agreement provides a clear path forward that groundwater risk under WMA C is evaluated in the 200-BP-5 RI, and that evaluation addresses Ecology's concerns for drinking water and household activities.

Ecology's Position Paper for the Groundwater Ingestion Pathway for WMA C

Ecology response: This requires further discussion with Ecology, as our Environmental Restoration project staff are not convinced this is true.

- DOE is planning and engaged in the development of a Central Plateau integrated vadose zone and groundwater model called the Cumulative Impact Evaluation (CIE). The CIE will not address scenarios inconsistent with the reasonably anticipated future land use.

Ecology response: This does not address permit or regulatory needs.

- DOE has determined that sufficient information has already been provided in both the WMA C BRA and the 200-BP-5 RI to support corrective measure decisions identified for contaminated vadose zone and contaminated groundwater at WMA C.

Ecology response: BP-5 is only addressing existing contamination, through interim actions.

Ecology's Position for the Hazard Index (HI) Calculation in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for Waste Management Area-C (WMA-C)

Memo

TO: Interagency Management Integration Team (IAMIT)
CC: Beth Rochette, Cheryl Whalen, Jeff Lyon
FROM: Damon Delistraty (Ecology)
DATE: 8 Feb 2019
RE: Hazard Index (HI) Calculation in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for Waste Management Area-C (WMA-C) (RPP-RPT-58329, Rev 2)

The following are Ecology responses to the most recent USDOE position, stated in their "Hazard Indices Calculation Issue Summary" (dated 11/10/2018).

USDOE Position

The HI segregation process that DOE-RL and DOE-ORP use is from US EPA guidance (Risk Assessment Guidance for Superfund, or RAGS, part A). This guidance has been implemented in the 100-D/H, 100-F/IU, 300 Area, and all 200 Area Groundwater OU RI/FS decision documents in addition to the WMA C BRA.

Ecology Response

Ecology agrees that identification of major health effects of noncarcinogens for the purpose of segregating HI should follow EPA/RAGS (EPA/540/1-89/002). However, USDOE is not using EPA guidance (in entirety) with respect to segregation of HI by effect, as specified in RAGS (see both grey boxes on p 8-15, Section 8.2.2). RAGS (p 8-15) states,

"Segregation of hazard indices requires identification of the major effects of each chemical, including those seen at higher doses than the critical effect."

Note that IRIS typically provides only the critical effect (i.e., effect elicited by lowest dose [most sensitive endpoint]). Therefore, additional sources should be consulted to identify less sensitive effects that occur at higher doses (i.e., secondary effects). Specifically, RAGS (p 8-15) goes on to say,

"Of the available information sources, the ATSDR Toxicological Profiles are well suited in format and content to allow a rapid determination of additional health effects that may occur at exposure levels higher than those that produce the critical effect."

Therefore, RAGS recommends that other sources beyond IRIS (e.g., ATSDR) be consulted to identify secondary effects of chemicals, relative to the critical effect identified in IRIS. Hazard quotients (HQs) for multiple chemicals are additive if these chemicals adversely impact the same target organ. HQ should be calculated with the specific toxicity factor (e.g., RfD, MRL) derived for the effect described by that toxicity factor.

USDOE Position

DOE's method seemed consistent with Ecology's summary question until they provided clarification.

Ecology Response

In their issue summary paper (11/10/2018), USDOE writes the following:

Ecology's Position for the Hazard Index (HI) Calculation in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for Waste Management Area-C (WMA-C)

"On 9/17/18, Ecology clarified their position on the interpretation of EPA guidance; specifically, that even if toxicity information is available in IRIS, that other toxicity information beyond IRIS should be considered and evaluated. Toxicity information should be collected from all sources all the time for all potential contaminants."

The final sentence of this quote noticeably mischaracterizes Ecology's clarification.

USDOE Position

The same explanation can be provided in WMA C BRA as provided in CERCLA RI/FS documents elsewhere at Hanford:

- Toxicity values are determined using the following hierarchy:
 - Tier 1—The EPA Integrated Risk Information System (IRIS) database.
 - Tier 2—The EPA Provisional Peer Reviewed Toxicity Values (PPRTV).
 - Tier 3—Other Toxicity Values.
- The effect(s) and mechanism(s) of action for each chemical are obtained from the source of the toxicity value listed above. When multiple chemicals have the same effect and mechanism of action, their HQs are segregated and summed to obtain a HI for the effect. These HI values are compared to threshold criteria and is sufficient to determine if remedial action is needed.

Ecology Response

Agreed, if RAGS guidance on secondary effects of chemicals (p 8-15) is also included.

USDOE Position

According to US EPA's RAGS Part A, Section 7.4.1, "Information in IRIS supersedes all other sources. Only if information is not available in IRIS for the chemical being evaluated should the sources below be consulted." That means, chemicals for which toxicity information is available in IRIS, other toxicity information beyond IRIS need not to be evaluated.

- As stated in RAGS Part A, Section 8.2.2 "If the HI is greater than unity as a consequence of summing several HQs of similar value, it *would be* appropriate to segregate the compounds by effect and by mechanism of action to derive separate HIs for each group."
- When information is not available in IRIS, then major noncancer effects from chronic toxicity studies would be appropriate sources of information; health effects from acute and intermediate duration studies do not represent health effects from long-term exposures.

Ecology Response

The USDOE interpretation of the underlined quote above (from RAGS, Section 7.4.1) is not entirely correct. Specifically, USDOE states above, "That means, chemicals for which toxicity information is available in IRIS, other toxicity information beyond IRIS need not to be evaluated." However, in order to be consistent with RAGS text in grey boxes on p 8-15 (Section 8.2.2) which recommend inclusion of secondary effects, the RAGS quote from Section 7.4.1 clearly allows use of non-IRIS sources to identify secondary effects of chemicals (if this information is not available in IRIS).

USDOE Position

Remedial Investigation Reports for Toxic Cleanup Sites in Washington and superfund sites in Washington were reviewed to determine if multiple sources (IRIS, PPRTV, Risk Assessment Information System, Agency for Toxic Substances and Disease Registry) were consulted to identify critical effects for HI segregation.

Ecology's Position for the Hazard Index (HI) Calculation in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for Waste Management Area-C (WMA-C)

- DOE reviewed several remedial investigation reports prepared for Washington toxic cleanup sites, and these did not segregate HIs by critical effect, and were not consistent with Ecology's position. Rather, medium-specific (e.g., soil, water) contaminant concentrations were compared to preliminary cleanup levels (concentrations based on the lower of a target risk of 1E-06 or a HI of 1) to identify indicator hazardous substances. Cumulative cancer risks and noncancer hazards were not calculated or documented in these reports. One example of this is the *Final Supplemental Remedial Investigation Report, Everett Smelter Lowland Area, Everett, Washington*.
- Remedial investigation reports prepared for Superfund Sites in Washington included a baseline human health risk assessment and followed RAGS Part A guidance. The approach used by DOE-RL and DOE-ORP for HI segregation is the same as that implemented by Superfund Sites in Washington. One example is the *Lower Duwamish Waterway Remedial Investigation Report*.
- Therefore, the process used to evaluate cumulative noncancer health effects at WMA C and recent Groundwater Operable Units is consistent with EPA guidance and other EPA Superfund Sites in Washington State.

Ecology Response

HIs only need to be segregated if $HI > 1$. Segregation is performed on the basis of similar toxic response or common target organ. According to MTCA, concentrations of multiple noncarcinogens (with similar types of toxic response), exerting effects over multiple pathways, may need to be apportioned or adjusted downward to meet a total site HI limit of 1 (WAC 173-340-708[5 and 6]).

USDOE Position

DOE believes that both DOE-RL and DOE-ORP are evaluating HIs the way EPA guidance recommends.

Ecology Response

Re segregation of HIs by effect, USDOE is not following RAGS guidance, stated in grey boxes on p 8-15. This issue was the focus of Ecology's original comment (BRA3-31).

Ecology's Position for the Evaluation of Nonradionuclides in a Food Exposure Pathway in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for WMA-C

Memo

TO: Interagency Management Integration Team (IAMIT)
CC: Beth Rochette, Cheryl Whalen, Jeff Lyon
FROM: Damon Delistraty (Ecology)
DATE: 8 Feb 2019
RE: Evaluation of nonradionuclides in a food exposure pathway in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for Waste Management Area-C (WMA-C) (RPP-RPT-58329, Rev 2)

The following are Ecology responses to the most recent USDOE position, stated in their "Food Pathways Issue Summary" (dated 11/10/2018).

USDOE Position

WDOH-320/015, *Hanford Guidance for Radiological Cleanup* (1997), is the basis for inclusion of the food chain pathway in the radiological residential scenario; input parameters provided in WDOH-320/015 were developed for use with the RESRAD software tool. This scenario was used to develop the remedial action goals (RAGs) for the interim action RODs. The same exposure pathways and updated exposure assumptions were used to develop the radiological cleanup levels presented in the 100-D/H RI/FS. Note, these inputs are defined and readily available for radioisotopes in the *User's Manual for RESRAD Version 6*, Appendix D, Ingestion Pathway Factors.

Ecology Response

Ecology's basis for requesting inclusion of nonradionuclides in a food exposure pathway is the presence of a complete exposure pathway in resident, farmer, and Native American scenarios. According to the Tri Party Agreement (TPA) response to Hanford Advisory Board (HAB) Advice #132, these scenarios can be used for comparison purposes to support decision making for the post-institutional control period (>150 yrs). These receptors would clearly be exposed to both radionuclide and nonradionuclide COPCs in food. To exclude exposure to nonradionuclides in food is not logical. Omission of nonradionuclide risk via food exposure represents a data gap which potentially underestimates overall risk.

WMA-C is a RCRA treatment, storage, and disposal (TSD) facility which exploits much of CERCLA risk methodology (e.g., Risk Assessment Guidance for Superfund [RAGS]) but does not fall entirely under CERCLA purview. For a resident scenario, RAGS (EPA/540/1-89/002) provides intake equations for nonradionuclides in fish, produce, meat, and dairy. Consistent with this approach, there exists extensive Hanford site precedent. For example, the following Hanford reports include evaluation of both radionuclides and nonradionuclides via food exposure.

- USDOE. 1995. Hanford Site Risk Assessment Methodology (HSRAM). DOE/RL-91-45, Rev 3 (nonrads in food evaluated for resident, farmer, recreational scenarios)
- USDOE. 1998. Columbia River Comprehensive Impact Assessment (CRCIA). DOE/RL-96-16, Rev 1 (nonrads in food evaluated for Native American, resident, farmer, recreational scenarios)
- USDOE. 2007. Exposure Scenarios and Unit Factors for Hanford Tank Waste Performance Assessments, HNF-SD-WM-TI-707, Rev 5 (nonrads in food evaluated for resident, farmer, recreational scenarios)

Ecology's Position for the Evaluation of Nonradionuclides in a Food Exposure Pathway in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for WMA-C

- USDOE. 2011. River Corridor Baseline Risk Assessment (RCBRA). Human Health Risk Assessment. DOE/RL-2007-21, Vol 2, Part 1, Rev 0
(nonrads in food evaluated for Native American, farmer, recreational scenarios)
- USDOE. 2011. Exposure Scenarios for the WMA-C Performance Assessment. RPP-RPT-47479, Rev 1
(nonrads in food evaluated for Native American, farmer scenarios)
- USDOE. 2014. Environmental Risk Assessment Work Plan (RAWP) for the Hanford Tank Waste Treatment and Immobilization Plant (WTP). 24590-WTP-RPT-ENV-14-002, Rev 0
(nonrads in food evaluated for Native American, resident, farmer, fisher scenarios)
- USDOE. 2014. RI/FS for the 100-DR-1, 100-DR-2, 100-HR-1, 100-HR-2, and 100-HR-3 OUs. DOE/RL-2010-95, Rev 0 (cites RCBRA)

USDOE Position

WDOH did not publish guidance for evaluating chemicals. For the interim action and final action RODs, 2007 and 2013 MTCA Method B parameters were used to develop RAGs and Preliminary Remediation Goals. MTCA B parameters do not include food chain pathways for chemicals.

Ecology Response

Although food exposure is not a standard pathway in MTCA, MTCA does allow for the establishment of soil cleanup levels (CULs) for the evaluation of foodchain contamination by nonradionuclides, if warranted (WAC 173-340-740[1][c][i]). MTCA also includes evaluation of nonradionuclides via human fish consumption (WAC 173-340-730[3][b][iii]).

USDOE Position

The subsistence farmer scenario was evaluated in the RCBRA (DOE/RL-2007-21, Volume II) for information purposes and was not used to determine basis for action or develop cleanup levels. Numerous uncertainties are associated with the nonradiological food chain pathway and described in Section 5.9.2.4 of the RCBRA.

Ecology Response

EPA's RAGS provides specific intake equations for nonradionuclides in various food items for human consumption (e.g., fish, produce, meat, and dairy). Regarding uncertainty associated with the nonradiological food chain pathway, an expert was consulted. Bruce Napier (PNNL), author of the GENII code on dosimetry and rad risk, concurred that the uncertainties in evaluating radionuclides vs. nonradionuclides in food exposure are not that different. The overall uncertainty in risk estimation of radionuclides and nonradionuclides should be approximately equal. He emphasized that both of these risk estimates are order of magnitude at best.

In this regard, many radionuclides and nonradionuclides have toxicity factors (e.g., risk coefficients for radionuclides, slope factors and RfDs for nonradionuclides), and many exposure factors are independent of a radionuclide vs. nonradionuclide grouping (e.g., food intake rates, wet to dry conversion factors, exposure duration). Transfer factors (e.g., soil to plant, plant to beef) are based on empirical data and can be modeled based on structural properties, independent of radionuclide vs. nonradionuclide differences. For example, a nonradionuclide (e.g., Se-76) would have the same transfer factor as a corresponding radionuclide of the same element (e.g., Se-79). That is, all isotopes of an element are assigned the same transfer factor (e.g., RESRAD), since chemical reactivity (including transfer properties)

Ecology's Position for the Evaluation of Nonradionuclides in a Food Exposure Pathway in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for WMA-C

is determined by electron configuration (in an atom's outermost valence shell), rather than nuclear composition.

In addition, citing uncertainty as rationale for exclusion of the nonradionuclide pathway is inconsistent with a broader risk assessment perspective. That is, given the large uncertainty in upstream aspects of an assessment (e.g., source term characterization, contaminant fate transport), these components contain large uncertainty but are nevertheless evaluated.

USDOE Position

The food chain pathway is not included as a complete exposure pathway in the default resident exposure scenario (for chemicals) provided in the US EPA's Regional Screening Levels website; default exposure assumptions and chemical-specific input parameters are not defined for this pathway.

- Models to estimate chemical contaminant concentrations in plants, animals, and animal products require development; the types of plants, animals, animal products consumed, exposure assumptions and chemical-specific parameters would be based on available guidance, literature review, and professional judgement. As a result, numerous uncertainties would be associated with cancer risks and noncancer hazards produced from this exposure pathway.

Ecology Response

EPA's RAGS recommends evaluating residential exposure to nonradionuclides in food and provides clear guidance on this methodology, including intake equations for fish, produce, meat, and dairy. Although EPA models may not be readily available on the EPA/RSL website, convenience of an online calculator is not a valid reason to dismiss analysis. Notably, other Hanford reports (cited above) were able to effectively evaluate exposure to nonradionuclides in food.

USDOE Position

The *Preliminary Remediation Goals for Radionuclides* website provides equations for the consumption of fruits and vegetables but does not specifically define radionuclide-specific values in the download area or the calculator (only the hierarchy of sources are provided). Note that the food chain pathway is included in the residential scenario for radionuclides only because of the precedent set by WDOH-320/015. Similar to chemicals, numerous uncertainties are associated with the cancer risks produced from the food chain pathway for radionuclides.

Ecology Response

Limitations of EPA's PRG calculator for radionuclides highlight the need to consult additional sources of information. Uncertainty exists in all aspects of risk assessment and should be fairly and openly evaluated.

USDOE Position

Residential and Subsistence Farmer exposure scenarios are not consistent with current and reasonably anticipated future land use on the Central Plateau.

Ecology Response

Re exposure scenarios in the 200 Areas, the TPA response to HAB Advice #132 specifies, "Other scenarios (e.g., residential, recreational) may be used for comparison purposes to support decision

Ecology's Position for the Evaluation of Nonradionuclides in a Food Exposure Pathway in the Baseline Risk Assessment (BRA) for the Appendix I Performance Assessment (IPA) for WMA-C

making especially for the post-institutional controls period (>150 years)." Therefore, residential and farmer scenarios should be evaluated, at least for comparison purposes for the post-institutional control period. Also, previous Hanford work (see reports cited above) has evaluated residential and farmer scenarios. A precautionary approach is warranted, since future land use can neither be predicted nor guaranteed.

USDOE Position

Evaluation of the food chain pathway for chemicals (and radionuclides) is not consistent with current RI/FS Work Plans for source units across the Central Plateau. A subsistence farmer scenario was evaluated in the 200-PW-1/3/6 Feasibility Study (DOE/RL-2007-27) to evaluate effects from exposure 150 years in the future. However, this scenario was not used to determine basis for action or develop cleanup levels for the ROD.

Ecology Response

As noted above, residential and farmer scenarios should be evaluated for comparison purposes for the post-institutional control period. These scenarios should include a food chain pathway for both nonradionuclides and radionuclides. Omitting nonradionuclides in this context would underestimate risk. This issue was the focus of Ecology's original comment (BRA3-12).

February 21, 2019 TPA IAMIT Meeting

Attachment 11

DOE Backup/Position Papers

**TECHNICAL ISSUES – DOE Position
Waste Management Area C Baseline Risk Assessment
(RPP-RPT-58329, Rev. 2)**

RCRA-related documents have been prepared for review and approval by the Washington State Department of Ecology (Ecology) to support the closure of Waste Management Area C (WMA C). These documents include a RCRA Facility Investigation Report (RFI), which provides nature and extent information on soil contamination resulting from past waste releases at WMA C, and a Corrective Measures Study (CMS), which provides alternatives for remediation of contamination found in soil beneath WMA C.

The Baseline Risk Assessment (BRA), which supports both the RFI and CMS, presents the potential health impacts to human and ecological receptors from exposure to both nonradiological and radiological contaminants found in soil beneath WMA C. Ecology approved both the RFI and CMS on June 11, 2018 (18-NWP-088¹), which included results and conclusions of the BRA, however, the BRA included some unresolved issues which are identified in the four issue papers.

The Department of Energy (DOE), Office of River Protection (ORP) resolved most of Ecology's comments on the draft A of the BRA document, and submitted the Rev 0 of the BRA to Ecology in 2014. Between March 2015 and September 2018, DOE ORP and Ecology worked to try to resolve comments on the Rev 0 BRA. In 2018, DOE Richland Operations (RL) identified that resolution of the comments could impact remedial decision documents being prepared by RL, so RL staff attempted to assist in resolving comments. DOE and Ecology summarized numerous unresolved comments into four main topics. Details associated with the specific issues are provided in four summary issue papers. All parties have agreed that if we resolve those four issues then the remaining comments would be resolved.

Each of the issue papers has a brief discussion of the history and background of the issue, statements of Ecology's position, and statements of DOE's position. Both Ecology and DOE have identified a summary question based on their position. The issues can be discussed in the context of how resolution could impact the remedial decision.

DOE has identified minimal modifications to the document to address Ecology's concerns. Since Ecology has already approved the RFI and CMS, and because the BRA is integrated into the RFI and CMS (e.g., risk conclusions, contaminants of concern), major revisions to the BRA would require significant revisions to the RFI and CMS. These revisions could put the approval status of the RFI and CMS in jeopardy by causing an additional review and comment resolution cycle.

ORP and RL have identified a preferred path forward that would minimized the revision necessary to have a complete and approved BRA to support the already approved RFI and CMS. This preferred path forward is stated on each position paper in "DOE's Recommended Path Forward".

¹ Note: The letter approving the RFI/CMS did include a caveat regarding the Appendix I Performance Assessment, of which the Baseline Risk Assessment is a part, which states that Ecology could require "further investigative and remedial action" following their review of other documents such as the Appendix I Performance Assessment (18-NWP-088).

Use of Judgmental Samples Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

ORP/Ecology Discussion History:

- The WMA C RFI/CMS, Data Quality Objectives (DQO), Work Plan and SAP were developed with extensive participation/input from Ecology. The Work Plan and SAP were approved by Ecology. The DQO specified that exposure point concentrations (EPCs) would be calculated using the 95% UCL method. In the event there were insufficient data collected to allow for calculating the 95% UCL, the option was to use the maximum concentration.
- Judgmental sampling was used to avoid subsurface infrastructure, above ground retrieval facilities and topographic features that limit soil sample locations and to target areas of high contamination. Approximately 500 soil samples were collected from 19 locations. Approximately 24,000 analytical results (representing 13 exposure areas) were reported from these samples. The sample results were evaluated in the WMA C Baseline Risk Assessment (BRA) Rev 0. Ecology did not provide comments that expressed concerns with collecting judgmental samples.
- The BRA was revised to a Rev. 2. Ecology provided comments (on the BRA Rev. 2) stating that calculating a 95% UCL from judgmental samples was not statistically valid. Ecology requested a sample-by-sample evaluation of the data.
- Ecology's approach for judgmental samples is consistent with DOE-RL's approach for evaluating judgmental samples. However, DOE-RL evaluations typically have a relatively small number of judgmental samples that are often supplemental to random samples.

Ecology's Position:

- Ecology asserts that data collected via a judgmental sampling design should not be evaluated statistically; instead, a sample-by-sample evaluation should be performed.
- **Ecology's Summary Question:** "Should data collected via a judgmental sampling design (as opposed to a statistical design) be evaluated on a sample-by-sample direct comparison basis in accordance with WAC 173-340-740(7)(d)(iii) and (e), or should Phase 2 characterization data for WMA C vadose zone soil (collected via a judgmental sampling design) be evaluated using *ProUCL* to calculate 95% UCL values to estimate exposure point concentrations (EPCs)?"
- **Ecology's Recommended Path Forward:** Jeff Lyon email on 9/18/18 identifying that "Since you have completed the 4 (or 5) evaluations comparing the statistical method or maximal value evaluation of the judgmental samples, I would like to know more about the impacts of using the 4 (or 5) evaluations and rewriting the section using just those scenarios. Then you could carry the full 11 as an appendix, and use your caveat text that you had suggested. I remain convinced that it is important to correct the method and presentation in the document to assure that we are not misrepresenting the acceptable analysis."
- Ecology has added that they want language added to the WMA C BRA stating that future WMA BRAs will not use statistical approaches to evaluate judgmental samples.

DOE's Position:

- DOE has completed the sample-by-sample evaluation requested by Ecology for five of the 11 risk scenarios in the BRA, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) residential and industrial scenarios, the Model Toxics Control Act (MTCA) Methods B and C scenarios, and the groundwater protection evaluation using the MTCA fixed-parameter three-phase model. The conclusions are the same between the two methods (95% UCL and sample-by-sample).
- DOE is proposing to provide the comparison of the two method results for the scenarios listed above in an appendix to the BRA with a short explanation in the text of the BRA. DOE is also proposing to not complete the evaluation for the remaining six scenarios (BRA, Section 3.5), and to continue to use the 95% UCL evaluation in the BRA.
- DOE is proposing to limit the additional work to complete the BRA by keeping the current 95% UCL in the body of the BRA, and adding the sample-by-sample evaluation and method comparison to an appendix. A summary of the comparison of methods would be added to the body of the BRA.

Use of Judgmental Samples Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

- DOE's position is that the place to agree to methods of evaluation is in work plans for future WMA BRAs. The WMA C BRA should not define future actions or agreements for other WMAs.
- **DOE's Summary Questions:** (1) Is it worth the time and resources to complete the sample-by-sample evaluation for the other scenarios? (2) Is it worth the time and resources to revise the BRA to include the sample-by-sample evaluation as identified by Ecology in 9/18/18 email (see above)? (3) Should WMA C BRA include language stating what future WMAs should or should not do?

Implications to WMA C BRA Rev. 2:

- Completing the evaluation for other six scenarios, and completely rewriting most sections of the BRA will require significant time and resources to produce the same contaminants of concern, areas of elevated risks, and risk conclusions.

DOE's Recommended Path Forward:

- The BRA will be updated to provide the evaluation that uses the sample-by-sample approach for four scenarios (CERCLA residential and industrial, MTCA Methods B and C) as well as the groundwater protection evaluation using the MTCA fixed-parameter three-phase model.
 - An appendix will be added to the BRA that compares the two methods. An introduction would also be added to explain that the judgmental samples were selected in locations to maximize chances for encountering contaminated soils. The introduction would explain that any bias introduced by the sampling design will likely over-estimate site risks.
 - The BRA will add text to summarize the results of both evaluations and highlight the differences between the two methods (i.e., contaminants of potential concern, areas that exceed risk thresholds, and the risk drivers).
- Gain concurrence on comment responses for the WMA C BRA.

DOE's Future Considerations:

- In general, judgmental samples should not be used to make statistical inferences about an underlying population. However, when a large number of samples are collected, inferences can be made about the mean value. Future characterization needs will be identified through the DQO and Work Plan process. The DQOs will identify data needs and the appropriate methods to evaluate those data sets.
- As a future action, TPA agencies need to determine a path forward for future tank farms. It would be difficult, if not impossible, to obtain random samples within any Waste Management Area. An approach would be needed to obtain a reasonable number of samples and support the remedial action decision making process. The comparison of methods completed for WMA C shows the same conclusions are obtained with both methods. Evaluating the data by calculating a 95% UCL is more efficient and a cleaner presentation of results, and with large sample sizes, is expected to provide the same conclusions. Alternatively, evaluating judgmental samples using sample-by-sample methods is statistically more defensible.
- NOTE: DOE is in discussions with a statistician who is evaluating judgmental sampling data to determine if it can be evaluated statistically (e.g., 95% UCL) for future application.

Hazard Indices Calculation Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

ORP/Ecology Discussion History:

- The discussion on how Hazard Indices (HIs) are calculated and the sources of information has evolved over time. The latest clarification from Ecology is summarized below.

Ecology's Position:

- **Ecology's Summary Questions:** "Should hazard indices (multiple pathways, multiple contaminants) for WMA C sampling locations be evaluated using toxicity information beyond the Integrated Risk Information System (IRIS) database, in accordance with OSWER Directive 9285.7-53, using second and third tier references when IRIS does not have toxicity values for a contaminant or effect; or should they be calculated using EPA IRIS information only? Toxicity values for each chemical in IRIS are based on the most critical health effect on a target organ (i.e., most sensitive endpoint), although other important secondary effects may occur which merit inclusion in risk assessment. When multiple chemicals have adverse effects on the same target organ, their hazard quotients (HQs) are summed up to obtain a hazard index (HI). The calculated HI is then evaluated against a threshold criterion (i.e., HI=1) to determine if remedial action is needed."
- On 9/17/18, Ecology clarified their position on the interpretation of EPA guidance; specifically, that even if toxicity information is available in IRIS, that other toxicity information beyond IRIS should be considered and evaluated. Toxicity information should be collected from all sources all the time for all potential contaminants.

DOE's Position:

- The HI segregation process that DOE-RL and DOE-ORP use is from US EPA guidance (Risk Assessment Guidance for Superfund, or RAGS, part A). This guidance has been implemented in the 100-D/H, 100-F/II, 300 Area, and all 200 Area Groundwater OU RI/FS decision documents in addition to the WMA C BRA.
- DOE's method seemed consistent with Ecology's summary question until they provided clarification.
- The same explanation can be provided in WMA C BRA as provided in CERCLA RI/FS documents elsewhere at Hanford:
 - Toxicity values are determined using the following hierarchy:
 - Tier 1—The EPA Integrated Risk Information System (IRIS) database.
 - Tier 2—The EPA Provisional Peer Reviewed Toxicity Values (PPRTV).
 - Tier 3—Other Toxicity Values.
 - The effect(s) and mechanism(s) of action for each chemical are obtained from the source of the toxicity value listed above. When multiple chemicals have the same effect and mechanism of action, their HQs are segregated and summed to obtain a HI for the effect. These HI values are compared to threshold criteria and is sufficient to determine if remedial action is needed.
- According to US EPA's RAGS Part A, Section 7.4.1, "information in IRIS supersedes all other sources. Only if information is not available in IRIS for the chemical being evaluated should the sources below be consulted." That means, chemicals for which toxicity information is available in IRIS, other toxicity information beyond IRIS need not to be evaluated.
 - As stated in RAGS Part A, Section 8.2.2 "If the HI is greater than unity as a consequence of summing several HQs of similar value, it *would be* appropriate to segregate the compounds by effect and by mechanism of action to derive separate HIs for each group."
 - When information is not available in IRIS, then major noncancer effects from chronic toxicity studies would be appropriate sources of information; health effects from acute and intermediate duration studies do not represent health effects from long-term exposures.
- Remedial Investigation Reports for Toxic Cleanup Sites in Washington¹ and superfund sites in Washington² were reviewed to determine if multiple sources (IRIS, PPRTV, Risk Assessment Information System, Agency for Toxic Substances and Disease Registry) were consulted to identify critical effects for HI segregation.
 - DOE reviewed several remedial investigation reports prepared for Washington toxic cleanup sites, and these did not segregate HIs by critical effect, and were not consistent with Ecology's position. Rather,

¹ Available at: <https://ecology.wa.gov/Spills-Cleanup/Contamination-cleanup/Cleanup-sites/Toxic-cleanup-sites>

² Available at <https://www.epa.gov/aboutepa/epa-washington>

Hazard Indices Calculation Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

medium-specific (e.g., soil, water) contaminant concentrations were compared to preliminary cleanup levels (concentrations based on the lower of a target risk of 1E-06 or a HI of 1) to identify indicator hazardous substances. Cumulative cancer risks and noncancer hazards were not calculated or documented in these reports. One example of this is the *Final Supplemental Remedial Investigation Report, Everett Smelter Lowland Area*, Everett, Washington.

- Remedial investigation reports prepared for Superfund Sites in Washington included a baseline human health risk assessment and followed RAGS Part A guidance. The approach used by DOE-RL and DOE-ORP for HI segregation is the same as that implemented by Superfund Sites in Washington. One example is the *Lower Duwamish Waterway Remedial Investigation Report*.
- Therefore, the process used to evaluate cumulative noncancer health effects at WMA C and recent Groundwater Operable Units is consistent with EPA guidance and other EPA Superfund Sites in Washington State.
- DOE believes that both DOE-RL and DOE-ORP are evaluating HIs the way EPA guidance recommends.
- **DOE's Summary Question:** Is it worth the time and resources to revise the BRA to incorporate Ecology's methods that are inconsistent with EPA guidance, inconsistent with CERCLA decision documents at Hanford and elsewhere, and not supported by Ecology regulations or methods?

Implications to WMA C BRA Rev. 2:

- Implications are not clear.

DOE's Recommended Path Forward:

- DOE will add clarification language to the WMA C BRA paralleling the summary provided above in DOE's position.
- Resolve the path forward for calculating HI values.
- Gain concurrence on comment responses for the WMA C BRA.

Groundwater Ingestion Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

ORP/Ecology Discussion History:

- The Tri-Party Agreement (TPA) identifies that groundwater contamination would be evaluated in the Comprehensive Environmental Response, Compensation, and Liability Act Groundwater Remedial Investigation.
- Based on Ecology comments on Rev. 1, the WMA C BRA Rev. 2 was updated to identify that existing groundwater contamination is evaluated in the 200-BP-5 Remedial Investigation (RI) report and not included in the WMA C BRA

Ecology's Position:

- Multiple Pathways – A complete groundwater ingestion pathway from leaching of contaminated soil and back to surface should be evaluated for radiological and chemical contaminants in the vadose zone.
- Cumulative Risk – Risk characterization of current contamination in groundwater should be completed. Cleanup levels for soil contaminants should include existing groundwater contamination cleanup levels.
- **Ecology's Summary Question:** "Should all groundwater pathways (e.g., drinking water, household activities, irrigation of crops, drinking water for livestock) with groundwater that contains contamination leached from contaminated soil and contamination already present in groundwater as leachate arrives be evaluated; or should only a groundwater ingestion pathway (human drinking water only) be evaluated, considering only contamination that has been leached from contaminated soil in residential and industrial scenarios, and assuming that an off-site water source would be used for all other groundwater uses?"

DOE's Position:

- Recent TPA agreement (IAMIT 2018-002) on the path forward for the 200-BP-5 Interim Record of Decisions already addresses how groundwater under WMA C is evaluated.
 - DOE believes this agreement provides a clear path forward that groundwater risk under WMA C is evaluated in the 200-BP-5 RI, and that evaluation addresses Ecology's concerns for drinking water and household activities.
- Irrigation of crops and drinking water for livestock are inconsistent with reasonably anticipated future land use.
- DOE is planning and engaged in the development of a Central Plateau integrated vadose zone and groundwater model called the Cumulative Impact Evaluation (CIE). The CIE will not address scenarios inconsistent with the reasonably anticipated future land use.
- DOE has determined that sufficient information has already been provided in both the WMA C BRA and the 200-BP-5 RI to support corrective measure decisions identified for contaminated vadose zone and contaminated groundwater at WMA C.
- **DOE's Summary Question:** Is it worth the time and resources to add Ecology's request for additional pathways or evaluations to either the WMA C BRA or the 200-BP-5 RI?

Implications to WMA C BRA Rev. 2:

- Adding the pathways or evaluations as suggested in Ecology's summary question to either WMA C or 200-BP-5 will have significant cost and schedule implications to those projects.

DOE's Recommended Path Forward:

- Coordinate the WMA C BRA comment responses with the agreed-upon path forward for 200-BP-5 (IAMIT 2018-002).
- Rename the WMA C BRA as requested and add clarification language to state where groundwater is addressed.
- Gain concurrence on comment responses for the WMA C BRA.

Groundwater Ingestion Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

DOE's Future Considerations:

- As a future action, DOE is committed to providing a CIE to integrate the impacts of existing groundwater contamination and contamination associated with past and future liquid waste releases from the vadose zone in the Central Plateau, which will include WMA C. While the CIE is under preparation, the Tri Parties have agreed on a path forward to implement an interim remedial action for the 200-BP-5 and 200-PO-1 Operable Units. The Tri Parties have agreed that this interim action will include pumping and treating contaminated groundwater downgradient of WMA C (and WMA A/AX):
 - Uncertainties associated with future fluxes of contamination from the vadose zone under WMA C into the groundwater aquifer are expected to be addressed with this interim remedial action. A future (final) Record of Decision for 200-BP-5 and 200-PO-1 will consider existing contamination in groundwater as well as any potential impacts that have been identified in the CIE and approved WMA C decision documents.

Food Chain Pathway Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

ORP/Ecology Discussion History:

- The WMA C Exposure Scenario Data Package, Rev. 0 was reviewed by Ecology and it was identified that the food chain pathway would be evaluated for radiological contaminants only. Ecology comments on Rev. 0 did not identify any concern about the food chain pathway being evaluated for only radiological contaminants. Comments were dispositioned.
- The WMA C Exposure Scenario Data Package, Rev. 2, includes the methods and parameters for the evaluation of a residential scenario. The document states that in this scenario the food chain pathway is evaluated for radiological contaminants only.
- The WMA C Exposure Scenario Data Package was finalized to provide the basis for the WMA C Baseline Risk Assessment (BRA).
- Ecology commented on the WMA C BRA Rev. 0 regarding the need to evaluate the food chain pathway for chemicals. This issue was not resolved at that time, and the WMA C BRA Rev. 0 was revised which became WMA C BRA Rev. 2.
- Ecology commented again with the same issue on the WMA C BRA Rev. 2.
- The resident scenario detailed in the WMA C Exposure Scenario Data Package is consistent with the resident scenario used in the Baseline Risk Assessments across the Hanford Site River Corridor areas (this includes the River Corridor Baseline Risk Assessment [RCBRA], 100-D/H BRA, 100-F/IU BRA as examples) and the basis for cleanup levels under the River Corridor interim action Records of Decision (RODs).
- The RCBRA evaluated a subsistence farmer scenario which included evaluation of food chain pathways for chemicals. This scenario was not identified for evaluation for contaminated soils in the WMA C Exposure Scenario Data Package.

Ecology's Position:

- For the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) residential scenario, the food chain pathway should be evaluated for chemicals.
- Some past risk assessments (e.g., the RCBRA) included this food chain pathway for subsistence farmer risk.
- **Ecology's Summary Question:** "Should the food chain pathway be evaluated for both chemicals and radionuclides, or should only radionuclides be evaluated for the food chain pathway/CERCLA residential scenario?"
- **Ecology's Recommended Path Forward:** In the 9/25/18 meeting, Ecology identified that they wanted language as to why the food chain pathway was not evaluated for chemicals. Based on the response from DOE, Ecology would determine if they thought there was a need for this evaluation to be performed.

DOE's Position:

- WDOH-320/015, *Hanford Guidance for Radiological Cleanup* (1997), is the basis for inclusion of the food chain pathway in the radiological residential scenario; input parameters provided in WDOH-320/015 were developed for use with the RESRAD software tool. This scenario was used to develop the remedial action goals (RAGs) for the interim action RODs. The same exposure pathways and updated exposure assumptions were used to develop the radiological cleanup levels presented in the 100-D/H RI/FS. Note, these inputs are defined and readily available for radioisotopes in the *User's Manual for RESRAD Version 6*, Appendix D, Ingestion Pathway Factors.
- WDOH did not publish guidance for evaluating chemicals. For the interim action and final action RODs, 2007 and 2013 MTCA Method B parameters were used to develop RAGs and Preliminary Remediation Goals. MTCA B parameters do not include food chain pathways for chemicals.
- The subsistence farmer scenario was evaluated in the RCBRA (DOE/RL-2007-21, Volume II) for information purposes and was not used to determine basis for action or develop cleanup levels. Numerous uncertainties are associated with the nonradiological food chain pathway and described in Section 5.9.2.4 of the RCBRA.

Food Chain Pathway Issue Summary – DOE Position

Prepared on 11/10/18 for DOE-ORP, DOE-RL, Department of Ecology Comment Resolution Discussion

- The food chain pathway is not included as a complete exposure pathway in the default resident exposure scenario (for chemicals) provided in the US EPA's Regional Screening Levels website; default exposure assumptions and chemical-specific input parameters are not defined for this pathway.
 - Models to estimate chemical contaminant concentrations in plants, animals, and animal products require development; the types of plants, animals, animal products consumed, exposure assumptions and chemical-specific parameters would be based on available guidance, literature review, and professional judgement. As a result, numerous uncertainties would be associated with cancer risks and noncancer hazards produced from this exposure pathway.
- The *Preliminary Remediation Goals for Radionuclides* website provides equations for the consumption of fruits and vegetables but does not specifically define radionuclide-specific values in the download area or the calculator (only the hierarchy of sources are provided). Note that the food chain pathway is included in the residential scenario for radionuclides only because of the precedent set by WDOH-320/015. Similar to chemicals, numerous uncertainties are associated with the cancer risks produced from the food chain pathway for radionuclides.
- Residential and Subsistence Farmer exposure scenarios are not consistent with current and reasonably anticipated future land use on the Central Plateau.
- Evaluation of the food chain pathway for chemicals (and radionuclides) is not consistent with current RI/FS Work Plans for source units across the Central Plateau. A subsistence farmer scenario was evaluated in the 200-PW-1/3/6 Feasibility Study (DOE/RL-2007-27) to evaluate effects from exposure 150 years in the future. However, this scenario was not used to determine basis for action or develop cleanup levels for the ROD.

DOE's Summary Question:

- Is it worth the time and resources to conduct the food chain evaluation and revise the WMA C BRA when default assumptions are not readily available, and the evaluation will be inconsistent with existing Central Plateau source units Work Plans and RODs along the River Corridor?

Implications to WMA C BRA Rev. 2:

- Completing the risk evaluation and incorporating the information into the BRA will require time and resources to produce a Rev. 3 BRA. It will add significant uncertainties to the risk calculations and will not impact remediation or closure decisions since it is inconsistent with reasonably anticipated future land use on the Central Plateau.

DOE's Recommended Path Forward:

- Resolve the disagreement, or present the information to the Tri-Party Agreement managers through the IAMIT.
- Gain concurrence on comment responses for the WMA C BRA.