Summary Notes from 5 - 7 May 2009 Office of River Protection Waste Management Area C Tank Farm Performance Assessment Input Meeting

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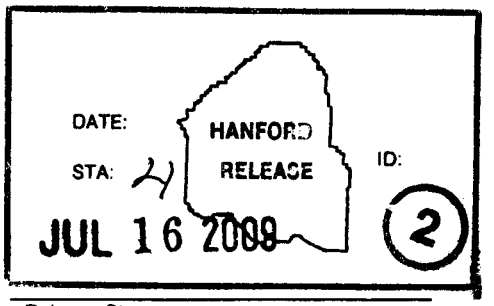
Summary of meeting between DOE-ORP and Hanford Site regulators/stakeholders regarding Waste Management Area C performance assessment



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SUMMARY NOTES FROM 5 - 7 MAY 2009 OFFICE OF RIVER PROTECTION WASTE MANAGEMENT AREA C TANK FARM PERFORMANCE ASSESSMENT INPUT MEETING

LIST OF TERMS

BBI	Best Basis Inventory
COI	constituent of interest
DOE-HQ	DOE-Headquarters
DOE ORP	Department of Energy-Office of River Protection
DOE-RL	DOE Richland Operations Office
DQO	data quality objective
Ecology	Washington State Department of Ecology
HDW	Hanford Defined Waste Model
HTWOS	Hanford Tank Waste Operations Simulator
NRC	U.S. Nuclear Regulatory Commission
PA	Performance Assessment
SAP	Sampling and Analysis Plan
SSTs	single-shell tanks
TC&WM EIS	Tank Closure and Waste Management Environmental Impact Statement
WMA-C	Waste Management Area C
WRPS	Washington River Protection Solutions
TWINS	Tank Waste Information Network Systems
WTP	Waste Treatment Plant

Attendees: Representatives from Department of Energy-Office of River Protection (DOE-ORP), DOE Richland Operations Office (DOE-RL), DOE-Headquarters (DOE-HQ), the Washington State Department of Ecology (Ecology), the U.S. Nuclear Regulatory Commission (NRC), State of Oregon, representatives of the Yakama Tribe, Nez Perce Tribe and Confederated Tribes of the Umatilla, Washington River Protection Solutions (WRPS) staff, and other stakeholders met at the Ecology offices in Richland, Washington on 5 through 7 May 2009. EPA Region X staff participated by Conference call.

Discussion: DOE is pursuing closure of Waste Management Area C (WMA-C) located at the Hanford Site. At some point in the future, DOE and NRC will consult on waste determinations for these tank closures; additionally these tanks will be closed in coordination with EPA and Ecology in accordance with the Tri-Party Agreement and State-approved closure plans. The DOE, NRC, EPA, Ecology, representatives of Tribes and stakeholders met for the first of a series of technical exchanges on the proposed inputs for a WMA-C Performance Assessment (PA). The technical exchanges are intended to capitalize on early interactions between the agencies with a goal of developing DOE's WMA-C PA. Technical discussions during the meeting are intended to allow for the clarification of general modeling approaches and for the identification of other specific questions.

Topics: The following specific topical areas were discussed during the meeting:

1. Review of Planning Session and Process
2. Proposed Glossary
3. Introduction to Residual Inventory
4. Scope, Contaminants of Interest, and Assumptions
5. Current Inventory: Best Basis Inventory (Tanks), Catch Tanks and Pipelines and Uncertainties
6. Residual Inventory Estimates – HTWOS and Uncertainties
7. Retrieval and Residual Volume Estimates and Uncertainties
8. Tank Residuals Sampling and Analysis and Uncertainties
9. Residual Inventory Estimates
10. Performance Assessment Case Definitions
11. Future Sessions

Summary: The following summarizes the discussion during the meeting, by topical area. Notes captured by the Facilitator are provided in Attachment 1.

1. Review of Planning Session and Process

- The meeting facilitator provided an overview of the process and the intent that the PA being discussed would meet the needs of all regulators and parties. The focus of this meeting was on residual inventory with an emphasis on uncertainty and how to deal with that uncertainty in the PA.
- WRPS staff provided an overview of the meeting purpose to discuss input parameters for a C Tank Farm PA, with a goal of addressing questions of all regulators and interested parties.
- WRPS staff noted that PA has many different uses and regulatory requirements, and the goal of these working sessions is to address all regulatory requirements.
- This effort is to develop information that will be a tool to decision making. This effort is not itself decision-making. Participation in this process does not limit any parties' regulatory or decision-making authority. The goal of these meetings is ensure that the information provided addresses the needs of regulators and stakeholders. This process provides an opportunity for the PA developers to hear questions and address them.
- WRPS staff presented a summary of the process developed for these meetings in February.

- WRPS staff discussed the glossary of terms that was initially developed in February (see attached), and the use of the glossary as a living document throughout this process. The glossary will be updated to reflect different parties' definitions of commonly used terms.
- These will be a series of technical working sessions. The topical area for this session is the inventory for residual material that would be left behind in tanks and ancillary equipment.
- Data packages prepared for these working sessions will be sent out four weeks before meetings and will be cleared for public release.
- WRPS staff encouraged participants to share comments on the data packages before the working sessions and agreed to disseminate any comments to all participants.
- The goal of the working sessions is to define the inputs, approaches, and assumptions that will go into the PA. At the end of the sessions, DOE will begin to run the risk assessment model.
- WRPS staff clarified that the input packages from these meetings may not ever become final documents, but may be included as sections of the PA/risk assessment documents.
- Notes from these meetings will be kept to try to capture the main issues from the discussions. Notes will be reviewed at the end of the working session, and then posted for public availability.

2. Proposed Glossary

- WRPS staff presented the current version of the glossary of terms for discussion. Meeting participants discussed various definitions presented in the glossary and clarified some definitions as presented. Suggestions were also made for additional definitions to be added to the glossary.

3. Introduction to Residual Inventory

- WRPS staff presented an introduction to the Hanford C-Farm Tank and Ancillary Equipment Residual Waste Inventory Data Package, including an overview of the topics that would be covered during the balance of the working session.
- WRPS staff presented an overview of WMA-C and the current status of retrieval activities.
- WRPS staff presented an overview of how residual waste samples are taken and analyzed to establish information used in the Hanford Tank Waste Operations Simulator (HTWOS) and included in the Best Basis Inventory (BBI) process, and ultimately used to establish an estimate of the residual waste inventories.

4. Scope, Contaminants of Interest, and Assumptions

- WRPS staff presented an overview of the scope, contaminants of interest, and assumptions that are proposed to be used in the C Tank Farm PA, including residual in tanks, catch tanks, pipelines, and other ancillary equipment. Soil inventories, PA modeling, conceptual modal, waste transport, recharge rates, and solubility factors will be addressed in future working sessions.
- WRPS staff presented the assumptions used in the Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS) versus the assumptions proposed to be applied to this PA.
- WRPS staff presented the tables listing constituents of interest proposed to be used in this PA and the references which support their inclusion.
- Meeting participants discussed how the proposed constituents of interest list was developed and how screening rules might be applied to develop the final list of constituents that would be analyzed in the PA. Ecology Staff indicated that they would ultimately like the opportunity to review and approve the final list.
- Meeting participants agreed that DOE-ORP would revise the description of how the proposed constituents of interest list was develop to better tell the story.

5. Current Inventory: Best Basis Inventory (Tanks), Catch Tanks, and Pipelines and Uncertainties

- WRPS staff presented an overview of the BBI and the process by which it is developed. The BBI presents current tank inventory estimates that are considered the best information available, however, that does not mean that there is sampling data available to support all the estimates. Some estimates are based on process knowledge and other methods.
- Meeting participants asked for clarification concerning some of the analytes on the list of standard BBI analytes.
- WRPS staff discussed how a BBI is developed for tanks for which there is not sample data. Where sample data is not available, a waste-type template is used from a tank that is expected to have similar residuals and characteristics for which sample data is available.
- WRPS staff presented an example of BBI source data, how it was derived, and the relevant concentration and density information. Meeting participants discussed how the example data was developed and the uncertainties associated with it.
- WRPS staff presented some of the limitations and uncertainties associated with the C-Farm single-shell tanks (SSTs). Waste samples have been obtained for all the C-Farm SSTs; however some samples were limited in the number and/or types of analytes that were analyzed. Many BBI inventories are still based on process knowledge or model estimates.

- Meeting participants discussed the uncertainties associated with the C-Farm SST sample results.
- WRPS staff presented how waste type templates are developed. Templates are used in the BBI for tanks for which there is not sample data. Each template can contain three types of information: sample data, process knowledge (e.g., ORIGEN2), and waste model data (e.g., Hanford Defined Waste Model [HDW]).
- WRPS staff presented an overview of the HDW, which is composed of four parts: (1) waste transfer transaction records from up to January 1994; (2) solid waste histories for each tank; (3) supernatant blending calculations; and (4) combined process and transaction information to estimate saltcake, sludge, and supernatant layers. The HDW also includes ORIGEN2 calculations. The latest revision of the HDW (rev. 5) includes updated ORIGEN2 fuel activity estimates, inclusion of tritium losses to the soil column, updated distributions of radionuclides to separation plant waste streams, and updates to the waste solubility assumptions based on sample data in the Tank Waste Information Network Systems (TWINS).
- WRPS staff presented an overview of the uncertainties associated with the residual inventory processes, which includes uncertainties associated with inventory information, concentration information, density information, and volume information. Uncertainties can also be associated with sample-based uncertainties and waste templates.

6. Residual Inventory Estimates – Hanford Tank Waste Operations Simulator and Uncertainties

- WRPS Staff presented an overview of the HTWOS, which is used to generate, among other items, residual inventory estimates in tanks after tank waste retrieval. The HTWOS applies an assumed retrieval process to estimate the composition of retrieved and residual waste. HTWOS generates residual inventory estimates by accounting for the retrieval technology being applied, waste type and phase, wash factors, and removal efficiencies. Comparisons of the HTWOS to actual removals show that the modeling is generally conservative and actual removals have exceeded the modeling predictions. However, for some contaminants, HTWOS estimated values are lower than measured.
- WRPS staff reported that one of the HTWOS primary uses is to provide feed information to the Waste Treatment Plant (WTP). Therefore, some of the conservatism in the model with respect to residual inventories is driven by the needs of the WTP. For tanks that have not yet been retrieved, HTWOS will be used to generate post-retrieval inventory information that will be used in the PA. Once waste from a tank is retrieved, actual samples will be taken of the post-retrieval residuals and the sample data will replace the modeled data in the PA.
- WRPS staff reported on the retrieval status of the WMA-C tanks. Six tanks are considered to have had retrieval completed.

- NRC staff noted that the data input package would benefit from greater transparency. For instance, too much information is presented in references and requires the reader to dig into other sources to understand the story. If the data package include more explanation, then it would be easier for the reader to understand the whole picture.
- NRC staff questioned how the assumptions are developed for the assumed concentrations in the ancillary equipment. WRPS staff clarified that the average concentration assumptions for ancillary equipment are based on the pre-retrieved assumed tank inventories, not the post-retrieval actual samples.

7. Retrieval and Residual Volume Estimates and Uncertainties

- WRPS staff presented an overview of the issues associated with sampling and estimating residual (post-retrieval) inventories in the tanks. Different waste retrieval methods (sluicing, vacuum retrieval, modified sluicing) are used to retrieve different types of waste and the efficiency of each removal technology is a function of both the removal method and the waste type.
- WRPS staff reported that other waste removing technologies that are being looked at include: enhanced caustic retrieval of gibbsite waste heels; the Mobile Arm Retrieval System, a telescoping retrieval arm; and the FoldTrack Mobile Retrieval Tool.
- NRC staff questioned how equipment and perturbances in tanks affected waste removal technologies.
- WRPS staff reported on how residual inventory estimates are calculated using video and still pictures during and after tank retrieval and in tank features such as equipment and steel plates to provide reference points for the estimates.
- NRC staff asked for more explanation on how the operators estimate the residual in the tank based on the viewing of pictures and video.
- WRPS staff reported how Autodesk Land Desktop software is used to model interior of the tanks and the contour map of residuals left in the tanks after retrieval. Operators initially sketch a map of the residual left in a tank, and then the information is plotted into the software to develop the contour maps.
- WRPS staff reported that uncertainty estimates for the residual estimating methods were developed from results of mock-up tests at the Cold Test Facility. Mock-ups of residual were placed in the Cold Test Facility, filmed, and operators used these to practice and refine estimating techniques. Three different exercises of this type were executed between 2003 and 2006, and the data and videos were re-evaluated in 2008. Resulting regression equation will be applied to future estimates.
- NRC staff requested that more discussion be included in the documentation to tell the story about this process for developing and refining the residual estimating techniques because of its importance to determining source term in the PA.

- WRPS staff noted that uncertainties for waste on tank walls and stiffener rings and in equipment are best estimate values and do not require the determination of a confidence interval; however, past estimates have attempted to estimate confidences for these estimates.
- WRPS staff reported that a general liquid displacement method is being evaluated for use of estimating residuals. Liquid is added to the tank to cover all residuals and the volume below the liquid level is calculated. The difference between the volume measured in the tank and the volume of liquid added to the tank represents the volume of water displaced by the residual in the tank. A report has just been issued evaluating this estimating method and a proposal has been made to Ecology to use this estimating method, however, no decisions have been made concerning its application.
- WRPS staff reported that uncertainty associated with the liquid displacement measurement technique include ENRAF liquid level measurement precision, ENRAF displacer immersion depth, tank dimensions, and flow meter totalizer uncertainties. Uncertainties are expected to be uncorrelated and are combined using root mean squared averaging. Other sources of uncertainty that must be considered on a case-by-case basis include: changes in liquid hold up in transfer lines, effects of liquid draining back through transfer lines, water evaporation via tank ventilation systems, and equipment in the receiving tank and waste dissolution during liquid displacement.

8. Tank Residuals Sampling and Analysis and Uncertainties

- WRPS staff presented a general overview of the process and capabilities associated with sampling and analysis of post-retrieval tank residuals, and the associated uncertainties.
- WRPS staff noted that the data quality objective (DQO) process is used to establish data requirements before retrieval is started. Data requirements are specified and summarized in the SST Component Closure Sampling and Analysis Plan (SAP), which is approved by Ecology. Detailed instructions for field and laboratory work are provided in tank-specific sampling and analysis plans that must meet the SAP requirements.
- WRPS staff summarized the process that was used for identifying what constituents would be analyzed in the tank residual samples. This includes anything driven by regulatory requirements, known risk drivers, and constituents previously identified as present in the tank farms. Twenty analytical methods were identified that when applied were expected to cover all these constituents. This is expected to be consistent with the tables 3.1 through 3.8 listing of constituents of interest in the data package prepared for this meeting.
- WRPS staff indicated that sampling capability for tank residuals has evolved over the years; however, there still is not a method for sampling very thin layers. Multiple sampling technologies have been and are being developed and evaluated for different situations that may be encountered in tanks.

- Tank residual samples are analyzed at the 222-S Laboratory at the Hanford Site. As required by the DQO (RPP-23403, 2006, *Single-Shell Tank Component Closure Data Quality Objectives*, Rev. 3, CH2M HILL Hanford Group, Inc., Richland, Washington), the 222-S Laboratory performs 21 analysis methods that generate data for about 150 constituents. Residual solids are also sent to PNNL for leach and release testing.
- WRPS staff provided an example of the sampling steps that would be associated with sampling one of the SSTs. Once retrieval of a tank is completed the tank is triple-rinsed with water. Samples taken to date at that point are analyzed.
- NRC staff questioned what the basis was for having confidence that the samples taken and the sample locations chosen capture the potential heterogeneity in the tank residuals. WRPS staff agreed to provide more discussion and documentation on supporting the assumptions and decisions about the sampling approach.
- WRPS staff reported on the uncertainty in sampling and analysis.

9. Residual Inventory Estimates – Open Discussion

- WRPS staff introduced this discussion on how information about uncertainty should be incorporated by summarizing the sources of inventory and residual data and the uncertainties associated with each.
- Meeting participants shared thoughts and ideas about uncertainty and how to address and present uncertainties in the PA process, including issues that they would like to see addressed in the PA.

10. Performance Assessment Case Definitions

- WRPS staff led a discussion among the meeting participants about what cases should be addressed in the PA. Further discussion addressed what analytes of interest should be addressed in the PA.

11. Future Sessions

- WRPS staff moderated a discussion about future working sessions. It was suggested that the originally planned session for the Week of July 7, 2009 be postponed to allow the PA team to better reflect lessons learned from this session into the input packages. It was proposed that the next meeting be the planned September meeting, but that it addresses the assessment context. Subsequent meetings would be shifted out on the schedule.
- WRPS staff moderated an introductory discussion about the future discussion on assessment context. The intent of the discussion was to familiarize meeting participants with what the assessment context topic would include and to gain their input about what things might need to be addressed.

ATTACHMENT 1

WORKING SESSION FLIP CHART NOTES

Waste Management Area C First Working Session flipcharts

May 5-7, 2009
Washington State Department of Ecology Building
Richland, WA

Following are the bulleted items from the flipcharts collected during the first working session for WMA C. They are grouped generally by topic.

Glossary additions

- Pipelines, vault tanks, diversion boxes and catch tanks should be added to the glossary.
- Add 'EPA Closure.'
- Brenda will forward edits on WAC closure to Fred.
- Add MTCA and RCRA definitions for 'facility' and 'tank system.' Jeannie will help Fred clarify.
- Add 'Hydraulic lift.'
- Add 'vadose zone' and 'groundwater' and interface between them.
- Add definition of 'intruder' and relationship to 15-foot issue.
- Add 'Dangerous waste' directly from WAC 040.
- Brenda will suggest language for RCRA Corrective Action definition.
- Under 'Regulatory Agency' insert 'State of Washington' and insert Health and Ecology as sub-bullets.
- Add waste type definitions for high-level waste and Waste Incidental to Reprocessing.

Residual Inventory Data Package

- In the PA, be very clear about what is real data and what are modeled estimates.
- Ability to detect leak has great deal of uncertainty.
- Clarify assumptions—which are data package assumptions and which are EIS assumptions.
- Clarify residual waste table text given the numbers are volumes and not mass. Also, be clear about what is incorporated in the numbers.
- Add Jim's slide 8 (residual inventory estimate) to executive summary of data package. Also, show only 1 significant figure instead of 2 to reflect uncertainty.

- Better clarify the scope of the data package.
- Best Basis Inventory
    - Ancillary equipment is not currently in the BBI but could be added.
    - Consider a figure that shows which tanks were cascaded and which tanks received which wastes.
    - BBI includes both modeled estimates and actuals (where available).
- Templates
    - Table 6-5 should not compare numbers that are not comparable.
    - Consider putting radionuclides on the X-axis, the above/below based on results and color code to correct for small numbers and non-detects.
- Residual Volume Estimate
    - Consider more discussion in the data package of the video estimating expert process (CCMS). It appears to be difficult.
    - Number of significant figures will have to be determined based on uncertainty.
    - Inputs should ensure you could obtain an upper bound.
- HTWOS
    - How will HTWOS be used to support initial PA runs?
        - It will generate numbers for approx. 170 chemicals of interest.
        - It will estimate the concentration of residual liquids.
    - Consider adding the complete Contaminants of Interest list to HTWOS.
    - Ancillary equipment a hole in the BBI since they are generally not sampling ancillary equipment.
    - Before closure, Ecology will require samples.

Tanks Discussion

- Performance Assessment should be clear about what is uncertainty and what is sensitivity. For example, waste that could be under the liner (from leaks) is a ‘true’ uncertainty.
- There are several different kinds of uncertainty. Today we are talking about data uncertainty but there is also model uncertainty and conceptualization uncertainty.
- Tanks that have been retrieved should be compared to the model and utilized to calibrate the model. To date, such comparisons are in the retrieval data reports and they have found they are overestimating solubles and underestimating insolubles in the model.
- Highlight different types of waste (e.g., hard sludge, salt cake, sludge), expected inventories and where those inventories are expected to be found (e.g., bottom, walls, stiffener rings, etc.)
- How do you know if you’ve captured the heterogeneity in residual waste when sampling?

Ancillary Equipment Discussion

- Savannah River Site developed methods to estimate ancillary equipment residuals.
- General discomfort with lack of data for catch tanks.
- Pipelines at Savannah River had a bounding estimate and could be the largest source term.
- Risk drivers in pipes may differ from tank waste.
- A case should be run for pipes that retrieves, treats and disposes of all pipes and surrounding contaminated soil.
- A case should be run for pipes that retrieves, treats and disposes of all ancillary equipment and soil (including leaked contamination).
- A case should be run for pipes that analyzes a best estimate of what may be in the pipes based on process history.
- A case should be run for pipes that assumes a high inventory of intruder impact contaminants in the pipes.
- A case should be run for pipes that assumes a high inventory of groundwater impacting contaminants in the pipes.
- Characterization of the pipes (even limited, rudimentary characterization) could provide helpful information.
- Modeling effort could be utilized to feed future characterization and remediation needs.
- A case should be run for pipes in which the pipes contain a 'skin' of contamination on their walls.
- Savannah River Site had to use a bounding estimate for its pipelines.
- Are there other DOE sites with experience dealing with pipes that could be useful?
- The pipeline cases should maintain the knowledge that one pipe in WMA C is plugged.
- Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS) case that was included in the data package: assumes 120 gallons of waste in pipelines; one pipe is plugged and that plugged pipe is 25% full; concentration is the average concentration of waste in C tank farm.
- WMA C case included in data package: assumes all pipelines in C farm are 25% full; concentration is average of waste in C farm.
- Newer study included in the data package: similar to the above mentioned TC&WM EIS except the estimate was 7 gallons of waste in pipelines and it is the average concentration of waste in C farm.
- Should assume that all the pipelines may have leaked (this will be covered in the manmade systems working session).
- If you know where the pipes have leaked, you could analyze the soil and back out an estimate of the pipe contents.

Contaminants of Interest Discussion

- Organics may have detection limit issues.
- Could you model classes of contaminants as a group?
- Take care that chelants and complexants do not fall off the list of COIs.

- Contaminants should not be screened out based on mobility.
- The limits of modeling should be considered when developing the list of COIs.
- May end up with two lists: (1) risk drivers; and (2) contaminants that impact risk drivers.
- Sodium or other big contributors that affect other analytes should be maintained on the list.
- Very short half-life radionuclides could be removed from the list.
- Take care to consider ecological risk components (bin related chemicals to model).
- Whole universe of contaminants is somewhere between 300 and 1,000 chemicals.
- Any regulatory or risk drivers from the Single Shell Tank DQO will be maintained for this risk assessment.
- Question is what to do with those on the 'detected at least once', TIC method, soil DQO and EIS lists.
- Take care with changes driven by waste moving through the soil.
- There is a big difference between measured assumptions and modeled assumptions.
- Look for exposure pathway specific risk contributors.
- Ecological risk should be considered. This also brings up questions of threshold for keeping these contaminants on or off the list.
- 'Unit approach' allows binning to deal with a much larger list of contaminants. Or we could choose to model fewer contaminants. This decision will require trade-offs.
- Be clear about all constituents expected to be in tanks.

Summary of consensus flipcharts

- Clarity, transparency and traceability are critical
  - 'Telling story'
  - More credit = more documentation
  - Data versus modeling
- Performance Assessment management
  - PA management plan a place for uncertainty reduction and management.
  - Data should feed back to models.
  - Interactions are important (e.g., interactions between waste in tanks and leaked waste; interactions between pipes and soils).
- Contaminants of Interest
  - DQO process.
  - Data package.
- Cases
  - Flexibility to highlight sensitivities.
  - Bounding cases and best estimates for pipelines.
  - Case of 100% removal for clean closure should be run.
  - Case of No Action should be run
  - Upper bound should include the life of the hazard.

Next Steps/Session Discussion

- Assessment context should be delayed until September.
- The schedule will be updated with a new placeholder meeting at the end of the schedule.
- How will outcome responses be communicated back to participants? A brief update will occur at the following session. Additionally, anytime a 'decision' is made to pursue a certain course of action, the participants will be updated.

Assessment Context Session Expectations

- Demonstrate how the project will model doses, scenarios, etc. to be compared to each regulatory agency's performance objectives.
- Session should really be focused on the question, what answers do you need? The answers then roll into a conceptual model diagram.
- Some requirements: CERCLA, RCRA, 435.1-1, MTCA, Tribal values, stakeholder values.
- Session should include 'big picture' processes (eliminate unrealistic processes).
- Some processes that should be covered: floods, reservoirs, land use, geology, cascadia.
- Outcomes of next session:
    - Understand and agree to where and how Performance Assessment will be used to meet requirements.
    - Understand and agree to general conceptual models including events, features and processes.
- CERCLA requires a dose to the Maximally Exposed Individual.
- Once endpoints identified, they lead to conceptual models.
- Session should include a high-level overview of the conceptual models and alternative models.
- This may be too much to cover in one session.