START

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1315 W. 4th Avenue • Kennewick, Washington 99336-6018 • (509) 735-7581

May 8, 1995

Mr. Lief Erickson
Tank Waste Remediation System Characterization Manager
U. S. Department of Energy
P.O. Box 550
Richland, WA 99352

Dear Mr. Erickson:

This letter documents our concerns regarding a discussion we had on May 5, 1995, concerning the Washington Department of Ecology's (Ecology) displeasure that the U. S. Department of Energy (USDOE) has failed to respond to Ecology's comments on a number of Data Quality Objective (DQO) Characterization Documents.

During the months of February and March 1995, Ecology and USDOE conducted a series of meetings where Ecology's comments on various DQOs were solicited. During those meetings, Ecology verbally presented its comments on the appropriate DQO. Depending upon time constraints, Ecology also either presented a written draft version of Ecology's comments at the meeting or forwarded via electronic mail Ecology's written comments within a week after the meeting. It was Ecology's purpose to provide a timely response to USDOE on the various documents involved as requested. In addition, it was Ecology's intent to follow these comments with a formal letter which was done initially for two Safety Screening Documents (see attached letters dated March 1 and March 13, 1995). Due to time constraints, however, Ecology has not as yet formally transmitted its remaining comments. In order to resolve this matter, enclosed you will find Ecology's comments to the following documents:

1. **Data Quality Objectives for Tank Hazardous Vapor Safety Screening (WHC-SD-WM-DQO-XXX, Rev. 0)**

2. **Flammable Gas Tank Safety Program: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objectives (DQO) Process**

3. **Data Quality Objectives for Tank Farms Waste Compatibility Program**

As previously discussed during the various DQO meetings and identified during the May 5 video-teleconference, Ecology has determined there are serious deficiencies in several of the DQO documents and expects its concerns will be addressed. In the future, if the procedure of

conducting meetings where verbal comments are presented along with written draft comments is inadequate, Ecology can withhold any comments until the formal communication is completed. Ecology feels this formal process will delay the implementation of quality DQO documents and will have a serious impact upon the progress of addressing the interim safe storage and final disposal of the waste stored in the 177 underground tanks. Therefore, Ecology will continue to follow the above described procedure for deficiency and/or comment transmittal. If USDOE deems the procedures unacceptable, a formal response is requested.

Finally, Ecology places great importance upon the DQO process. The Hanford Federal Facility Agreement and Consent Order (better known as the Tri-Party Agreement or TPA) clearly states in Milestone M-44 that the DQO process will be used to determine what information is necessary to adequately characterize the waste stored in the 177 underground storage tanks. Change Control Form M-44-93-01 explicitly imposes a dependence on the DQO process for the characterization of the waste stored in the Hanford tanks. In addition, an agreement has been reached between Ecology and USDOE that the Safety Screening and Compatibility DQO's would be used as the basis for parameter selection in the Waste Analysis Plan of the Double Shell Tank, Part B Permit Application. Failure to adequately address Ecology's comments concerning the current DQO documents would both place Milestone M-44 in serious jeopardy and have a profound negative impact upon the Part B Permit Application.

Ecology is willing to work with USDOE to resolve this matter and produce DQO documents which fulfill the requirements of all stakeholders involved. If you have any questions, please call me at (509) 736-3018.

Sincerely,

Dr. Alex Stone
Tank Waste Remediation System Characterization and Safety Teams Leader
Nuclear Waste Program

AS:mf
Enclosures

cc: Jackson Kinzer, USDOE
Casey Ruud, USDOE
Lenoard Ermold, WHC
Michael Payne, WHC
James Sloughter, WHC
Richard Tontodonato, DNFSB
Wen-Shou Liou, USDOE
James Thompson, USDOE
Jerry Osborne, WHC
Robert Popeilarczyk, WHC
Paul Gubanc, DNFSB
Administrative Record

Washington State Dept. of Ecology Comments on:
Data Quality Objectives for Tank Farms Waste Compatibility Program

General Comments:

- Scope of Document: After reviewing this document, it appears the emphasis has been placed more directly upon operational considerations than waste compatibility concerns. Although it is important to assure the transfer of waste both within the DST system and into the DST system from external generators occurs safely, it is also vital to assure the waste, once transferred, does not generate either additional or new safety concerns. It is important for this document to evaluate what issues have been identified as the causal agent for the various watch list tanks and assure waste combinations do not occur which will lead to similar waste configurations. Ecology does not recognize from this document that these issues were addressed. The easiest method for the compatibility DQO to address this issue is to interact with other DQOs which address individual issues. For example, DQOs exist for such issues as safety, organic vapor, flammability, etc. Within each of these DQOs, data requirements are identified which provide boundary conditions for each individual safety issue. In order for the compatibility DQO to be complete, it is necessary that these data needs also be addressed by transfers into the DST system. For example, the Safety DQO addresses a number of organic compounds which are important for safety concerns. In addition, the flammable gas DQO must consider other chemical species such as aluminum, nitrite, total organics, etc., in addition to specific gravity which quantify the flammable gas safety problem. The compatibility DQO does not identify the same safety concerns and, therefore, does not require any of these analyses to address the same issues which are of prime importance for continued long-term safe storage of the waste in the tanks systems. Therefore, Ecology requires the issues identified within each of the specific safety oriented DQOs be addressed within this document.

- DST Waste Analysis Plan (WAP): A number of very fundamental decisions are being made within the DST WAP workshops which are contradicted in this document. For example, the DST WAP is centering upon safe storage of the waste in the tank system and has deferred data requirements to the compatibility and safety screening DQOs. Therefore, it is not appropriate for the Compatibility DQO to reference the DST WAP with such comments as "Criteria addressing regulatory requirements for waste handling are addressed in the DST WAP"' as stated in the second paragraph of Section 2.1. Another example concerns the use of historical data in lieu of sampling results (page 19, footnote number 3 which states a "decision can be based upon process knowledge and page 25, second paragraph which states "There is abundant historical data for the routine transfers."). This issue is being addressed in detail during the DST WAP workshops. The Compatibility DQO cannot contradict the DST WAP. It is necessary, therefore, that the individuals involved with the Compatibility DQO work closely with and receive input from the individuals involved in the DST WAP.

- Tank Farm Waste Transfer Compatibility Program: This document is provided in addition to the main DQO document. Ecology questions the need for this document particularly when, upon review, it contains decisions which are not made in the main DQO document. The primary example is on page 3, Section 1.2, Exemptions, which lists a number of instances where the decisions provided in the main DQO document do not apply. Ancillary documents intended for use on site cannot provide information which were neither included in nor defended in the main DQO document. The only point where exemptions are mentioned in the DQO document are on page 5, Section 2.4, where the comment is made that "Some waste transfers are exempt from waste compatibility assessments . . ." but . . . are subject to waste compatibility criteria." These statements include references. However, the justification for these comments along with a clear explanation of what they entail and the technical basis for the exemptions are not included in the DQO document. Without this information, no exemptions from this process are justified. Therefore, Ecology not only does not endorse this document for use, but requires it be either brought into strict agreement with the DQO or eliminated.

- Incomplete explanations: Statements are made throughout this document for which no explanation has been provided. Examples include page 3, Section 2.1, Item number 2 under General Criteria, where the statement is made that "Transfers to a Watch List tank shall have been reviewed prior to acceptance . . ." This statement requires clarification and a description of exactly how this review will be conducted and by whom. Further examples include page 4, Section 2.3 item number 1, which states "assurance that no safety problems are created . . ." and page 10, Section 4.1.3, which states "Data needs . . . augment, when necessary, . . ." Both statements need to be further explained in order to define exactly which actions are required to fulfill the statements or conditions described. General comments exist throughout the document which need to be made more explicit.

- Noxious Gases: The statement is made on page 8, Safety Considerations, that "Noxious gas formation as a result of waste transfers is not considered here." The section continues with a justification for elimination of this problem as a function of the physical waste transfer. It fails to consider, however, the issue of noxious gas formation once the waste is stored within the DST system. Although there may be sufficient justification for ignoring the noxious gas issue during transfers, there is no justification provided for failing to consider the noxious gas issue once storage conditions have been established. This is a further example of the earlier comment where this DQO centers upon the physical transfer of the waste while minimizing the long-term storage safety concerns. Ecology, therefore, requires the noxious gas issue be included in order to prevent the commingling of wastes which lead to the emission of noxious gases

- Evaporator Inputs: One very important issue which was not addressed was the unique case of transfers into the DST system from the 242-A Evaporator. Historically, most if not all of the Watch List tanks in the DST system were produced by either incorrect commingling of evaporator transfers or the evaporatory exceeding waste condition limits.

As the evaporatory has, historically, been the main weak point in the compatibility issue, it warrants special attention. As stated earlier, this is an area where the Compatibility DQO should interact closely with another group and evaluate input from their DQO document to assure the unique conditions represented by this generator are considered. The evaporator was not addressed within this document and it warrants special attention.

- Statistics: Table 6-1, page 25: In this table, confidence limits are provided without justification. In addition, the issue needs to be addressed throughout this document concerning the validity of using statistical confidence limits for what will be in essence a single discrete sample. Since a discrete sample can not be statistically proven to be representative of the waste stored in the DST system within any confidence limit, Ecology questions the justification for these numbers and suggests the proper use of statistics be evaluated before inclusion into this document.

Other Concerns:

- Waste Composition: Section 4.1.3, second paragraph: During this section the waste within the DST system is described as " . . an aqueous alkaline mixture of water-soluble sodium salts . . ." The section states the tank waste can be classified as 98 wt% of this mixture. These statements, however, fail to consider separable solids and sludge. Is the document suggesting the material returning from the evaporatory is not seriously concentrated to the point that substantial solids are not included? This information contradicts what is known concerning the evaporator returns. In addition, the intent of the evaporator is to concentrate the dilute aqueous waste, thereby providing additional tank capacity. This section needs to be rewritten to better reflect the range of materials stored in the DST system and how the evaporator affects various safety issues including the energetics issues described in this section.

- Heat Generation Levels: Section 4.2.2 addresses the issue of heat generation. However, no information is provided on what heat generation levels exist currently within the DST system, what heat generation levels are important, and how waste with heat generating levels should be handled. This is particularly important, as it is expected that one of the high heat watch list tanks (C-103) will be retrieved and sent to the DST system within the near future. Therefore, this issue needs to be addressed in further detail with information on how these transfers are to be addressed along with what information is required to handle them appropriately.

- Routine versus Non-Routine Transfers: In Section 5.0, page 3, the distinction is made between routine and non-routine transfers. The definition of these terms needs to be made extremely clear and it must be clearly listed what type of transfers are considered routine and non-routine. Without this explanation, Ecology cannot determine if it is in agreement with the comments made and reserves further comment until the definitions are provided.

- Sampling for Non-Routine Transfers: In Section 5.0, first paragraph, the statement is made that "For non-routine transfers, the source, and in some cases the receiver tank(s) is sampled . . ." What criteria are to be used to determine if the receiver tank(s) are to be sampled in addition to the source? This needs to be further qualified and Ecology withholds comment until the information is provided.

- Criticality Concerns: Section 6.1.1, page 16: In the last paragraph on that page the statement is made concerning the mass of ^{239}Pu and a calculation is made based upon a full DST at 1,140,000 gallons. What steps are necessary for those tanks which are not full, i.e., isn't it more appropriate to base calculations on gross amounts regardless of volume of material in the tank? This would address the issue of amount of plutonium which was allowed in each tank regardless of the liquid level. This needs to be addressed.

- Validity of Statement: Section 6.1.1, page 17: In the first paragraph under item C, the statement is made that "a 50% probability of making a false negative error . . . is acceptable." What is the justification for this percentage?

- Flammable Gas Decision Rule: Section 6.1.2, page 20: In the paragraph under item B, the statement is made that "the difference between the expected and "true" values for specific gravity are expected to be insignificant . . ." What is the justification for this statement and where can it be defended? In addition, the comment is made under Availability of Data that ". . . measurement error is believed to be low, however laboratory quality control (QC) date . . . will also be examined." These two statements are somewhat contradictory, i.e., either the differences are insignificant or they will be evaluated. This issue needs to be addressed.

- Separable Organic Layers: Section 6.1.3, page 22: In the second paragraph under item B, the issue of the creation of separable organic layers in the DST system is mentioned. It is Ecology's understanding that separable organic layers may already exist within the DST system. This is an issue which has not been addressed anywhere within this document but needs to be considered. In addition, if organic layers already exist within the DST system, the possibility of sending additional organic material to these tanks should be discussed along with potential safety problems caused by this material.

- Separable Organic Layers: Section 6.1.3, page 22: In the third paragraph under item B, the statement is made since the site no longer processes radionuclides using organic solvents, the possibility of sending separable organics to the DST system "is minimal." What this statement fails to consider is that organics exist within the SST system and there will be transfers to the DST system once SST waste is retrieved. This eventuality needs to be addressed.

- Aging Wastes: Section 6.1.4, page 22: In the second paragraph the statement is made that ". . . aging wastes are no longer generated . . " and therefore a corrosion rule does

not need to be generated for aging waste tanks. The question arises, however, does aging waste exist in SSTs and, if so, is it not important to address this issue as retrieval of SST waste will occur at some point in the future?

- Specific Gravity: Section 7.2, page 31: In the first paragraph, values of specific gravity are discussed and ranges are set. There seems to be some confusion concerning what are high and low values of specific gravity. The specific gravity of pure water, by definition, is 1.0. Therefore, the larger the number, the greater the specific gravity. This section declares that "the smallest SpG, 1.43" and the largest SpG . . . 1.40." These numbers are contrary to the definition of specific gravity and need to be corrected.

- Specific Gravity: Section 7.2, page 31: The following statement comprises the second paragraph in this section:

  > "An experimental study, designed specifically to address the relationship between tank specific gravity and flammable gas accumulation, may be necessary to provide satisfactory evidence that a specific gravity of 1.41 is an acceptable threshold."

  This statement reinforces a concern Ecology has regarding the use of specific gravity as the sole indicator for resolution of the flammable gas issue. As this statement declares, there is no justifiable technical basis for specific gravity as a sole indicator and this document must not depend upon specific gravity to resolve the issue. Further work is needed in this area to produce a more defensible list of indicators which can be used to address any compatibility issues which may give rise to flammable gas watch list tanks. (See the general comments for more details on this topic.)

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Washington State Dept. of Ecology Comments on Data Quality Objectives for Tank Hazardous Vapor Safety Screening

(WHC-SD-WM-DQO-XXX, Rev. 0)

- **Vapor Characterization vs. Industrial Hygiene**: This DQO concerns itself solely with the Industrial Hygiene/Worker Safety aspects of vapor sampling. Although this is an important issue for the vapor sampling program, it is not the only issue which needs to be addressed. Milestone M-44 of the TPA requires vapor characterization as one of the sources of data. This DQO does not address this issue at all. If it is USDOE's intent to produce a separate DQO to address vapor characterization, this DQO can stand as one of the two missions for the vapor program. Vapor characterization, however, must be addressed in one form or another. In addition, the term "characterization" used in this document does not conform to the term as intended in Milestone M-44. In the section, 1.0 Introduction, the last sentence in the second paragraph ("The methods developed and validated for the characterization of Suspect List tanks . . .") refers to characterization only within the scope of Industrial Hygiene/Worker Safety aspects and does not fulfill the M-44 definition. Either a new term should be used in this instance and elsewhere throughout this document or it must be clearly stated that the characterization requirements as outlined in M-44 are outside the scope of this document.

- **Temporal Variations**: In the Executive Summary (Step 4. Boundaries of the Study), the statement is made "Sampling events may be scheduled in the future to address diurnal, seasonal, and long-term changes in the vapor and gas concentrations." Ecology objects to even the indication that temporal changes will not be addressed at some point in the future. Ecology has stated several times the vapor program is only providing, for the most part, an indication of the status of a tank at the particular time it was sampled. The program does not address any temporal variations and this is an issue which must be addressed at some point in the future. Therefore, this issue must be included in the DQO as one which will be evaluated.

- **TCPs, SAPs and the DQO**: Ecology and EPA are currently undergoing discussions with USDOE to redirect the use of the TCPs to make them into the planning tool as defined in TPA Milestone M-44. Therefore, the TCPs will be separated from any day-to-day direction of sampling events and will be used as a scheduling/planning tool to provide information for the Tank Characterization Reports (TCRs). A SAP should be constructed based upon the input from the appropriate DQO and the DQO should contain sufficient information on number of samples, types of samples, analytical methods, etc., which can direct the writing of a SAP. Rather than write a TCP for every sampling event, Ecology hopes to see a SAP written based upon the DQOs. Changes to the standard SAP can occur to address any tank to tank variation. This document does not reflect this new strategy (e.g., 1.0 Introduction, third

paragraph, fifth sentence which begins ' These DQOs will be considered . . .") and should be changed throughout the document to reflect the discussions currently on-going between the regulators and USDOE. In addition, future revisions of the DQO should address sampling concerns and provide a sufficient basis upon which a SAP can be written.

- **Statistical Confirmation**: Considerable information is provided in this document concerning what statistical information can be obtained from the sampling event (Type I & II errors, power analysis, t-tests, etc.). Unfortunately, insufficient information is provided to indicate statistics are being used appropriately. In order to address the issue of whether Type I or II errors exist for that unique sampling event, information must be provided on the number of samples taken and analyzed for the species of interest, and an indication provided that the number of samples taken are sufficient to provide an adequate level of confidence in the results. This information is lacking and therefore, an inadequate basis for the statistical presentation is provided. At no point in the DQO are the number of samples taken for the unique sampling event addressed. Secondly, although it is potentially possible to discuss variation in results for the unique sampling event, it is inappropriate to assume this unique sampling event is truly representative of the tank conditions (see the comment on temporal considerations above). Ecology has seen in many DQOs from USDOE that statistics are used incorrectly to provide a confidence in calculations which have no statistical basis. The vapor program is different from many Hanford programs in that it has, in past sampling events, taken sufficient samples to address statistically the confidence in the analytical numbers for the unique sampling event. The past practise, however, is neither mentioned in this DQO nor provided as an indication of the level of sampling needed for future events. This document needs to be made very clear what is being statistically validated, how the procedure is justified, and what is outside the scope of the vapor sampling events as envisioned within this DQO.

- **Flammability Decision Error Limits**: In section 6.1, Development of Flammability Decision Error Limits, there exists some confusion in the definition of the two error types. In the second paragraph, the greater than (>) symbol has been omitted after the observed LFL_{mix}. In the third paragraph, the symbol for the "true" LFL_{mix} is incorrect and should be greater than (>) and not less than (<) as it appears. If Ecology's interpretation of the information provided is incorrect, this section should be checked to determine what is correct for these two paragraphs.

- **Vapor Sampling System**: In section 7.6 Vapor Sample Acquisition Methods, the Vapor Sampling System (VSS) is described. What is lacking, however, is a clear determination of when the VSS would be preferred over the in-situ vapor system (ISVS.) From the discussion, it appears the VSS would be preferred in warm, moist tanks. In any case, it should be made clear under what circumstances the VSS provides an advantage over the ISVS and how this decision would be made. In addition, no reference was made to SUMMA canisters for the VSS system. Is one to assume that SUMMA canisters are not to be used during those few instances that the VSS is the preferred sampling method? These issues need to be addressed.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1315 W. 4th Avenue • Kennewick, Washington 99336-6018 • (509) 735-7581

March 1, 1995

Mr. Ron Gerton
Tank Waste Remediation System Safety Manager
U. S. Department of Energy
P.O. Box 550
Richland, WA 99352

Dear Mr. Gerton:

The enclosed pages present the Washington State Department of Ecology's (Ecology) comments to the U. S. Department of Energy (USDOE) document, **Approach for Tank Safety Characterization** (WHC-EP-0843, Draft). Although Ecology in general understands the approached being proposed, there are a number of issues which still need to be addressed before the plan can be implemented.

If you have any questions concerning these comments, please give me a call at (509) 736-3018. Ecology looks forward to hearing your response to our concerns.

Sincerely,

Dr. Alex Stone
Ecology Tank Waste Remediation System Safety Team Leader

AS:mf
Enclosure

bcc: G. Thomas Tebb
Toby Michelena

Washington State Dept. of Ecology Comments on:
Flammable Gas Tank Safety Program: Data Requirements for Core Sample Analysis Developed Through the Data Quality Objectives (DQO) Process

General Comments:

- Intent of Document: After reviewing this document, it is still difficult to determine what exactly is its intent. Was it to acknowledge the flammable gas problem is not understood and, therefore, what is required in essence is a research effort to quantify the problem? Or was it to take what is known, or at least what is theorized, about the chemical dynamics which lead to the flammable gas issue and determine exactly what information is needed to address those parameters? If the intent was a research effort, then the DQO process has very little to contribute to the problem. If, however, it was the second, then it was not implemented in this document. Is it really the case that nothing is known about the chemical dynamics in flammable gas watch list tanks? Can no theories be generated from all the data collected on tank SY-101? Is it not possible to use this information to formulate theories on the chemical dynamics which can then be used to prioritize and select optimal data parameters to evaluate the flammable gas problem? Ecology suspects the answers to many of these questions have not been included in this document. Theories on chemical dynamics have been proposed (Don Alexander, for example) which could provide some basis for parameter selection. In any event, the first question which should have been asked prior to generating this document is what do we know about the flammable gas problem and do we know enough to conduct a DQO? One gets the impression after reading this document that the producers feel the answer to the previous question is no and, therefore, a DQO should not have been attempted. This impression is augmented when one evaluates Section 2.11 on page 10, when questions for resolving the problem are offered. Question number 6 "What conditions are responsible for producing the flammable gas species?" is a fundamental issue for which some theory needs to be offered or the DQO process cannot proceed. Ecology recommends this whole issue of extent of knowledge for problem identification be evaluated to determine if the DQO process can be used to resolve these issues.

- Structure: Ecology found this document very difficult to follow. The previous comment addresses whether or not this document should have been attempted. Once attempted, however, the DQO process was not used clearly. One finds it difficult to determine exactly what question is being asked. In other words, is it to determine everything which needs to be characterized before an understanding of the problem can be identified? Or is it to compile what is both known and unknown concerning the flammable gas issue and identify what data needs to be obtained in order to answer these questions for all Watch List (WL) tanks? If the intent was the latter, it is difficult to identify the current status of knowledge. Without the current status, it is impossible to clearly determine what

questions need to be asked and what data needs to be obtained in order to arrive at a safety evaluation of the different WL tanks Although the attempt was made to addresse the various steps of the DQO process, without this firm basis the subsequent questions can not be clearly addressed. In essence. Ecology feels the problem was not clearly defined and the current status of knowledge not definitively described. The whole document suffers from a lack of focus and logic (see the following comment on Decision Logic for more details on this issue) Ecology's recommendation would be to redo this DQO if it is determined the DQO can provide some useful information. The participants, however, need to understand that unless there is willingness to assume some risk concerning theories of chemical dynamics within flammable gas WL tanks, the DQO process will not provide any benefit. The DQO needs a clear problem statement in order to provide any useful information.

- Assumptions: The DQO document makes two very fundamental assumptions, those being: 1) core sampling is required and 2) it is aware of data requirements from other DQOs and is factoring this information into its decision process. Both assumptions are contrary to the intent of the DQO process. This document should center on only the data requirements to resolve/define the Flammable Gas Tank Safety problem. It should determine what data needs are required, the technical basis for these analyses, and how the information is best obtained. Once this process has been completed, the information will be provided to justify whatever types of analyses are needed, whether they be core samples, auger samples, "bottle on a string," etc. On page 12, Section 3.0, the comment is made that "core sample data are needed to understand the chemical and physical processes occurring within the tank waste." No information has been provided which evaluates all the sampling techniques possible. Without this unbiased evaluation, it is impossible to determine why core sampling is the only method which will provide the information needed. Secondly, the knowledge of other DQO determined data requirements have no impact on any of the decisions described above. The importance of this DQO is to determine what is needed for the flammable gas problem regardless of what other programs decide. (See the above comment on structure which affects this comment.)

- Use of non-existing equipment or on-going studies in DQO process: In Section 2.12, detail is provided on directing the development of "a retained gas sampling device and procedure for its use." Similarly in Section 5.1, page 16, considerable emphasis is placed on describing studies and sampling devices which will affect the data requirements. Inclusion of such information is inappropriate at this time. DQOs are living documents and can change as input improves. However, the intent of this document is to evaluate the present status of sampling techniques and knowledge concerning the flammable gas problem. It is inappropriate to include proposed equipment or studies as input to the decisions being made. If this DQO is to better characterize the tank waste with the intent of understanding the gas generation process, it should center upon those objectives. Once

the understanding has improved either through further studies or new theories, the DQO can be updated to reflect this new knowledge. However, these sections which deal with planned activities are outside the scope of the DQO.

- Decision Logic: In Section 5.1, page 14, an attempt is made to produce a decision logic for the DQO document. There exist serious deficiencies in this decision logic which need to be addressed. For example, in the third paragraph the statement is made if the hydrogen concentration remains below "0.63 vol %," core sampling is not needed. No information is provided on how this value will be determined. In addition, the issue of episodic releases is not addressed. Is one to assume the hydrogen concentration must always be below 0.63 vol %? If so, how can any decision be made on this variable if one must monitor the tank for long periods of time in order to determine this value is not exceeded during episodic events? Without further explanation, one questions whether this is both an appropriate and attainable decision variable. In addition, the hydrogen concentration is only species considered where earlier in the document the issue of ammonia and nitrous oxide flammability was identified (Table I, page 6). How is the flammability of these species to be addressed? (One final note on paragraph 3. It needs to be rewritten, as there are problems with the grammar. Is it the "dome space" that "never exceeds 0.63" or is it the concentration of hydrogen in the dome space? In addition, what is meant by "then there is no flammability concern is minimized"?)

  In the fourth paragraph on page 14, the comment is made if it is determined that the pressure does not exceed 25% of the Hopkins criteria, core sampling will not be needed. The questions arise 1) what are the Hopkins criteria and, more importantly, 2) what process will be used to verify that 25% of the Hopkins criteria will not be met? Further questions arise on the decision variable of volume of stored gas which is not allowed to reach 25% of the pressure needed to produce a serious release (Table 1). How is the storage capacity of the waste to be determined? What process will be used to evaluate the waste to determine if it meets this criteria and, more importantly, what justification exists for making such an important decision based upon a single, discrete sample? In summary, the decision logic provided is seriously flawed and cannot be justified for making the important decisions necessary to address the flammable gas tank issue. Ecology recommends another attempt be made to better determine what decisions need to be made, the relative importance of each decision, and what scientific basis and process can be identified for each decision variable.

- Decision Inputs: In Section 4.0, the inputs to the decision process are discussed. Insufficient information is provided, however, on how some of these inputs will be determined and what questions they will be used to address. Specific examples are: 1) under chemical composition of the waste the comment is made that "Total organic carbon, organic chelating agents . . . (on selected samples only) . . ." will be determined. No information is provided on how the selection process will be made for this decision. 2) Under the heading of "Other supporting data," the statement is made that "bulk enthalpy

characteristics" will be needed. No justification or explanation for the statement is provided and it is therefore difficult to determine the technical basis for this decision. In addition, the point arises of exactly what question will be addressed by this data. The inputs to the decision process need to be more clearly defined and a sound technical basis for their inclusion provided.

- Core Sample Requirements: In Section 5.3, a definition for facies is provided which states it must have a "visually uniform appearance." The issue of non-uniformity of sample strata was not addressed. The potential exists that the sampling process could disturb and alter the various layers. For example, the sample could be serious disturbed when it pierces the non-convective layer by the potential release of retained gas. Issues such as sample non-uniformity need to be addressed and a more clear definition of what criteria the lab is to use to determine each layer needs to be provided.

- Decision Rules: The statement is made in the very first sentence of Section 6.0 that "There are no decision rules for waste samples at this time." How can a DQO be considered successful if it cannot provide any decisions based upon the information provided? This question relates directly to the fundamental issue of whether the DQO process provides any benefit for a poorly defined problem like the flammable gas issue? In any case, a DQO document cannot be considered useful without having decisions produced from the data requirements provided.

- Data Definition: In section 8.2, page 23, the comment is made "For the AN tanks, the last analyses were done as part of the evaporator campaign when the tanks received the last addition of waste." Does this refer to sampling of the tank or sampling of the material from the Evaporator which was subsequently mixed with material in the tank? If it is the former, the information may be useful. If the latter, the information has only marginal usefulness. The origin of this data needs to be made clear.

- Statistical Evaluation: In Tables II and III on pages 24 and 25, respectively, a column is added for the desired accuracy and precision. No information was provided on how the values listed within were obtained. In addition, the issue of precision and accuracy were not addressed relative to a single, discrete sample. In other words, how can any statistical evaluation be done on a single sample which is only representative of the time and location it was taken and probably not representative of the waste stored throughout the tank? Statistical evaluation of data under such conditions is impossible and the information provided needs to be clearly explained and defined.

Washington State Dept. of Ecology Comments on:
Approach for Tank Safety Characterization (WHC-EP-0843, Draft)

Ecology has reviewed the above referenced document and, although Ecology in general agrees with the approach presented, some reservations remain. The following is an attempt to formalize these concerns. Comments on the document falls into two categories, 1) general comments on the approach/information provided, and 2) more detailed comments on portions of the document itself.

General:

- Core Sampling Program: The document implies that the only reason for taking core samples is to validate safety decisions concerning the safe storage of the waste within the tank farms. Ecology does not agree with this comment. The core sampling program also provides important data to a number of other TWRS programs including retrieval, pretreatment, vitrification, etc., and is a useful tool toward fulfilling the requirements of TPA Milestone M-44. The safety program made use of the same samples to resolve its own issues. Therefore, if core sampling to resolve safety issues can be proven no longer necessary, it does not negate the need for core samples to resolve other issues. As stated on page 1-1, the information included is meant to respond only to safety needs and does not encompass other programmatic requirements. Agreement with this approach should not be misconstrued as support for the elimination of the core sampling program.

- Historical data: The document states several times that historical data based upon "process flowsheets, waste transfer records" will be used to resolve various safety issues. It needs to be made clear exactly what types of information will be used for which purposes and what is not allowed. Ecology is opposed to using any models based upon historical data which have not been verified. The verification process includes the review of existing sampling information but, more importantly, should undergo blind verification using sample results taken after the model was promulgated. In Chapter 6.0, the statement was made that "Refinements have included incorporation of a number of models and assumptions regarding tank waste behavior. These models and assumptions must be shown to be sound, in order to provide a firm technical basis for implementing the approach." Ecology concurs with this statement. This document, however, has not made an attempt to address the validity of the models used and, in those cases where model verification is known to be absent (e.g., the Agnew historical model), no attempt was made to define what is needed before they can be used to make safety decisions. Ecology is against the use of any models based upon historical information to resolve safety issues without a clearly defined verification process.

- Assumptions: Assumptions made in Chapter 3.0 and elsewhere throughout the document are not made clear. Without an explicit understanding of the assumptions

made, no confidence can be placed in their results. The document does not make clear what results are based upon calculations, tests with simulants, and/or tests with real tank waste. Without this information, no clear confidence can be place in the information provided. Ecology can not endorse any decisions made based on this information without a clear understanding of the assumptions, methods, and limitations involved.

- Episodic releases: Insufficient information has been provided on how tanks will be "monitored." Of particular concern is the ability of any monitoring program to adequately capture any unexpected event, such as an episodic gas release. Information needs to be provided on exactly what type of monitoring will be provided for each safety issue. Specific information should be provided to delineate the capabilities of the monitoring program and what issues/problems it is designed to address.

- Long-term Responsibilities: One aspect of tank safety not addressed by this document is the question of long-term screening of the tank waste. A long-term screening strategy for all tanks is lacking from the procedure described in this document. A program needs to be formulated which provides a schedule for periodic evaluation of the information obtained from these safety screenings. Ecology would not consider the safety screening plan complete without considering this aspect.

Specific Comments:

- Page iii, 2nd paragraph: The statement is made that "The requirement (of core sampling to resolve safety issues) . . . resulted in a demand for impractically large numbers of core samples . . . ." Where is this statement made and what justification has been provided? Include a reference and a short description at some point within the document (here is probably not the best place.)

- Page 1-1, first paragraph: This paragraph is confusing when it discusses radioisotope concentrations. The values of curies per gallon were used at one point, which was to be compared with "a few million curies of radionuclides." Use consistent units, better explain what tanks are being discussed, and what concentrations can be expected where.

- Page 1-3, final paragraph: The statement is made that "analyses to close the criticality Unreviewed Safety Question (USQ) . . . ." Include a reference which supports this statement.

- Page 2-3, 2nd paragraph: What are "flammability controls" and which tanks will get them? Is this an administrative or engineered control?

- Page 2-4, Step 2B: The consensus exposure standard (CES) levels are mentioned without a reference. In addition, it would support this document if the compounds and limits involved were listed in a table.

- Page 2-4, Step 2C: This section deals with organic vapor analysis. The question arises though of how unexpected compounds will be addressed. For reference, a procedure needs to be implemented which looks for unexpected compounds (such as those found in U-106 that have a large impact on human health and safety at very low concentrations) and addresses these concerns, should it become an issue.

- Page 2-4, Step 3C: The statement "If fuel is measured in the surface material, but fuel content is below 10 cm, safe storage . . . " is confusing and needs to be rewritten to better explain what is meant.

- Page 2-5, Step 4: This statement is made that if a tank has a supernatant, "no immediate sampling will be required." What is meant by "immediate sampling" and what sampling will occur? In addition, given the history of SY-101, is it valid not to address these issues immediately? If the tank has an organic layer, will this address the problem?

- Page 2-5, Step 5: The statement "If the moisture level measured in the top 1 cm is less than 20% . . ." is missing in some units. The assumption is that it is 20 weight %, but it needs to be made clear.

- page 2-5, Step 6: The statement is made that "moisture levels will be increased" without providing an explanation of how it will be done. Does this mean adding water to tanks? How will this affect USDOE orders preventing additions to the SSTs, and what impact will it have upon the stabilization program? It is counterproductive to interim stabilize tanks only to have safety come and add water. What about the issue of leakers/potential leakers and how will this affect those tanks? Basically, although in this step all components of the triangle are present, it is necessary to evaluate all alternatives to mitigate the unsafe conditions. If tanks have been interim stabilized or are leakers/potential leakers, the very last choice should be to add water. There are several, very important issues here which need to be addressed.

- Page 3-1, first paragraph: The statement is made that "Additional characterization of the waste may be needed to guide process control during retrieval and disposal operations; however, the need to minimize cost and assure the prevention of serious accidental release . . . requires a focus on interim safe storage." This statement contradicts the 4th paragraph on page 1-1 which stated this document would address only the safe storage requirements and not any of the other programmatic needs. The issue of cost and prioritization of needs is outside the scope of this document and this section should be deleted.

- Section 3.1, pages 3-1 & 3-2: See the second general comment.

- Page 3-1, 4th bullet: The statement is made that "Tanks which may have received organic complexants were identified from a study of historical sampling data and waste transfer records . . . ." This statement is contrary to the statement made on page 1-1st paragraph, where it states, "Historical information was only partially successful in identifying organic tanks." In addition, see the general comment dealing with historical information.

- Page 3-3, 4th paragraph: The statement is made that "Sampling of 30 SSTs to date has verified the model . . . ." Include a table listing this information.

- Page 3-3, 5th paragraph: The statement is made that "Standard Hydrogen Monitoring Systems have been . . . installed on some of the Watch List Tanks." Include a table delineating exactly which tanks are involved.

- Page 3-4, 1st paragraph How effective have the void meter and retained gas sampling system been on measuring retained gases in tank wastes? Is the retained gas sampling system expected to be less costly and more effective than core sampling?

- Page 3-4, 1st paragraph: The statement is made that "Two techniques are being developed to directly characterize waste for retained gas . . . ." It is impossible to base current decisions on programs which have neither been finalized nor proven.

- Page 3-4, 3rd paragraph: Consensus exposure standards (CES) are introduced in this section without a complete explanation. Include a table of examples which demonstrates the points being raised in this section.

- Page 3-4, 5th paragraph: The statement is made that "Vapor sampling will be conducted on **most** of the 177 tanks . . . " A commitment has been made by USDOE during the Double Shell Tank Waste Analysis Plan meetings to conduct safety screening on **all** 177 SSTs and DSTs. This will be made a condition of the Part B permit and USDOE will be held to this commitment. Change the statement to reflect this agreement.

- Page 3-9, 2nd paragraph: The statement is made that "The values of ΔH_r, C_w and C_p . . . ." How applicable are these to the wastes found in the tanks and what assumptions were made in order for them to be used in this instance? See the general comment on assumptions.

- Page 3-9, 2nd paragraph: A reference is made to the "Reactive System Screening Tool." Include a description of what this is and how it is used in this instance.

- Page 3-10, 2nd paragraph: It is not clear how a maximum bulk temperature of 90°C will prevent bulk dryout. Surely if this temperature is maintained for long, the waste will begin to dry. Please expand this section.

- Page 3-11, 2nd paragraph: Previous reports suggest if tank C-106 were allowed to dry, temperatures could eventually exceed 200°C. Is this no longer true?

- Page 3-12, 1st paragraph: Does the rotary core driller measure waste or core bit temperatures? How else does the driller limit temperatures rise?

- Page 3-12, last paragraph: What is the basis (reference) for the upper bound thermal diffusivity?

- Page 3-15, 4th paragraph: Do we understand what is exceptional about the "few exceptional, potentially dry sludge tanks?" These tanks and abundant examples in natural systems suggest that sludge drying is common.

- Page 3-17, 2nd paragraph: Has the expectation that saltcake "would exhibit little radial variability" been verified?

- Page 3-17, 4th paragraph: Ecology has long encouraged the sampling of saltcake interstitial liquid as an economical means of sampling the liquid portion of single-shell tanks. Why does the document read "saltcake interstitial liquid (if available)?" These samples are available.

- Page 3-18, 3rd paragraph: The Value of Information system is introduced at this point with insufficient detail on how it was produced. This information needs to be provided and reviewed by our technical staff before Ecology could agree with the validity of the information provided.

- Page 3-19, 2nd paragraph: The statement is made that "Tank 241-U-101 had the highest VOI." Additional information needs to be provided on the reasons for this high VOI as a demonstration of the procedure.

- Page 3-19, 2nd paragraph: Is USDOE proposing to sample only 50 tanks? Is the VOI model based on historical data? How will the historical data and VOI be verified?

- Page 4-1, 1st bullet: At the end of the section, the statement is made that "If this model is confirmed, additional core sampling of all ferrocyanide tanks will no longer be required." This sentence has to be amended to add "for safety reasons" at the end of the sentence. The elimination of core sampling for safety reasons does not preclude the need in other programs. See the first general comment for additional details.

- Page 4-1, Ferrocyanide Tanks: What are the conditions "least conducive to aging?" Which tanks will be sampled?

- Page 4-1, Organic Tanks. Will the organic tanks be core sampled? How will moi e levels be controlled?

- Page 4-1, Flammable Gas Tanks: Are the installed hydrogen monitoring cabine working? Is there any data yet?

- Page B6, 1st paragraph: A reference is made to "TNMOC," which needs to be explained.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1315 W. 4th Avenue • Kennewick, Washington 99336-6018 • (509) 735-7581

March 13, 1995

Mr. Ron Gerton
Tank Waste Remediation System Safety Manager
U. S. Department of Energy
P.O. Box 550
Richland, WA 99352

Dear Mr Gerton:

The enclosed pages present the Washington State Department of Ecology's (Ecology) comments to the U. S. Department of Energy (USDOE) document, **Data Requirements for the Safety Screening Issue Developed through the Data Quality Objectives Process (Draft)**. Ecology would like to commend USDOE on producing a document which directly addresses the issues involved without a lot of unnecessary verbiage. This, however, does not mean there are not places where the document needs to be expanded, but the attempt to minimize the size of a document and focus on just the issues important for the problem is something Ecology would like to endorse. In addition, although Ecology in general understands the approached being proposed, there are a number of issues which still need to be addressed before the plan can be implemented.

If you have any questions concerning these comments, please give me a call at (509) 736-3018. Ecology looks forward to hearing your response to our concerns.

Sincerely,

Dr. Alex Stone
Tank Waste Remediation System Safety Team Leader
Nuclear Waste Program

AS:mf
Enclosures

cc: Susan Eberlein, WHC
Mike Payne, WHC
Todd Brown, WHC
Administrative Record

Ecology Comments on:

Data Requirements for the Safety Screening Issue Developed through the Data Quality Objectives Process

The comments which follow are divided into two sections. The first, Major Concerns, deals with more broad scope issues which are of primary concern. The second section, Other Concerns, are more specific examples of wording or content issues. The comments in the second section occasionally provide more detailed information on the points raised in the first section and are included for clarity.

Major Concerns:

- Control/Mitigation Definition: The document is too vague when it comes to dealing with how control and/or mitigation is to be effected. Statements are made throughout the document such as "implement appropriate controls AND/OR mitigate to reduce safe level" (page 3, 3.2 Decision Logic, 1A, final sentence) without clearly defining what actions are to take place. This information needs to be provided and each currently known safety hazard needs to be addressed.

- Long-term Screening: The document fails to include what actions are to be taken in the long term to continue safety screening. This document encompasses only what safety screening is to be done initially for all 177 tanks. It does not consider how it will address such issues as episodic releases and the potential manufacture of new safety issues. The sampling suggested in this document only provides a single value to determine the tank waste condition at a single point. It does not address the possibility the sample will be taken at a time (or place?) which is not representative of the true condition of the tank. A particular example would be the episodic release of gases. If the sample is taken on a day for which little gas was released, it may provide an unrealistic evaluation of the tank waste condition. Another example is some tanks will be screened and deemed not to present a hazard (i.e., no control and/or mitigation will be done on these tanks.) If this is the case, it is imperative that a screening schedule be established to confirm the status of these tanks on a regular basis. This document must address continued sampling on some periodic basis which resolves these issues.

- Interaction with the Interim Stabilization Program: This document fails to consider how the Interim Stabilization (IS) program will affect the safe storage of tank waste. One major premise of this document is the determination of water content. If sufficient moisture is available to prevent a reaction from occurring, the tank waste is stored safely. The IS program, however, removes moisture from the tanks in order to prevent leakage of waste into the surrounding environment. It would be necessary, therefore, 1) to work closely with the IS program to assure that sufficient moisture remains to prevent a safety

problem from occurring while minimizing potential leakage to the environment, and 2) to screen the tanks on some frequent basis to affirm the moisture content remains constant. This issue needs to be addressed in the DQO document.

- Unexpected Chemical Species: The document addresses a list of chemical species which have been identified as being potential safety hazards. What is not addressed is what effort is being made to evaluate the sampling results for unknown or unrealized hazards. A perfect example is the current problem with tank U-106. The vapor sample was analyzed for tentatively identified compounds (TICs) and values were obtained for compounds such as methyl isocyanate, which were both at a level of serious concern and completely unexpected. Although the compounds in U-106 may be either artifacts of the sampling effort or due to some chemical reaction in the sampling media, the important point is unexpected compounds were discovered and their potential presence addressed. The DQO document does not include information on what actions are to be taken to identify unexpected chemical species and how this information will affect the statusing of the various tanks.

- Monitoring Information: At several points in this document, the issue of monitoring is raised without presenting detailing information on what type of monitoring will be used for each potential safety problem. Information needs to be included on what type of monitoring will occur for each expected safety issue and how this information will be used to assure continued safe storage of the tank waste.

- Compatibility with other DQOs: There exists a vagueness in the document when other DQOs are reference. It is not clear from this document that, if a potential problem is identified, what responsibility is transferred from this document to other DQOs produced to address specific safety issues. For example, on page 3, 3.2 Decision Logic (sentence after 1C), the statement is made ". . . if step 1C is answered "yes" then go to the organic DQO . . . as well as proceeding with the safety screening DQO." It is unclear from this comment what the results of this statement are. What are the responsibilities of the Organic DQO and what are the responsibilities of the Safety Screening DQO? These issues need to be clearly defined.

- Confidence Limits: In Section 7.0 Acceptable Confidence Limits for Decision Errors, Table 7.1 provides information on what decision is being made, the decision threshold, and the confidence requirement for the sampling data. Ecology questions whether the confidence limits listed in this table and described through this section have any meaning for the sampling program provided in this DQO. In order to assign any confidence limits to a decision variable, multiple sampling is required to determine whether the data fall within the required confidence limit. The sampling described in this document only addresses a single data value taken at a specific sampling event. This comment relates somewhat to the earlier comment on long termed sampling to obtain a true representation of waste condition. The discrete sampling event provides information only on a specific

date. This limited information cannot be used to produce any defensible confidence limit. Therefore, if multiple sampling is not planned for each tank, then the use of any confidence requirements is inappropriate and a new method for evaluating the discrete samples needs to be established.

- DSTs: The issue has been raised that it may be unnecessary to subject the DST system to the Safety Screening DQO. The comment was made that due to both the level of knowledge concerning the waste in the DSTs and the high level of transfers which lead to tanks with frequently changing waste content, the Safety Screening DQO would not provide useful information. Ecology agrees some tanks within the DST system may not require a safety screening analysis (tanks which act as feed for the evaporator, for example, in which the waste fluctuates as the evaporator runs is a good example). However it has been proposed that many of the current safety problems were caused by both the inappropriate mixing of condensed waste from the evaporator and/or potentially over concentrating the waste by the evaporator. Therefore, Ecology feels many of the tanks in the DST system require safety screening on a regular basis to validate many of the assumptions used for the evaporator (level of concentration, appropriate mixing of waste types, etc.) and to provide proof that current actions are not leading to any potentially new safety problem. This issue needs to be addressed either in this DQO or in a DQO which addresses specifically the unique problems faced by the DST system.

- Non-sampling Data: At several points within this document, statements are made that sources of non-sampling data will be used as a basis for various decisions. These comments are extremely vague and details need to be provided on what type of non-sampling data will be used and how this data will provide a basis for the decision involved. Without such clear delineation of use and "appropriateness" of non-sampling data, use of it for decisional purposes cannot be justified. (See the following comment for a specific example.)

- Historical Data: One potential source of information from a non-sampling source is historical data as represented by the model produced by Steve Agnew at Los Alamos National Laboratories. Historical data as represented by the Agnew model, has very valuable uses such as directing sampling efforts and for other such general concerns at the TWRS EIS. Historical models, however, cannot be used to replacing sampling data without a detailed verification of the quality of the information the model provides. To date, there has been no verification of the Agnew model (although a Historical DQO is in process which addresses some of these concerns). Until this verification procedure has been completed, the Agnew model and any other historical sources cannot be used in lieu of sampling results. This document must reflect this limitation and users directed that historical information cannot be used in place of sampling results at this time.

- Referencing other documents: Throughout this DQO, references are made to external documents which are used for basis of several of the decisions made within. It is

important if one is to concur with these decision points that a summary of the important information be provided. Ecology does not want to see this document include all the information of the referenced item, but a very brief summary of the salient points is important.

- General Format: The draft would be more readable if a good technical writer proof read it. Some of the confusion is due to inconsistency and lack of order. Detailed information is addressed in the following comments.

Other Concerns:

- Executive Summary: Questionable statements are made in the first and second sentences under the Executive Summary. The Tank Safety Program has been working on tank safety issues for years. How could they claim that the potential for combustion of all tanks and the concentration of noxious vapors in all tank are unknown? It might be more reasonable to claim "unknown" for most, but not all tanks. The same statements are also made on the page 2 of this report.

- Executive Summary: The first sentence of the second paragraph under the Executive Summary states: ". . . bring the tank to safe operating conditions" should be changed to " . . bring the tank to safe storage conditions."

- Page 3, 3.2 Decision Logic, 1C: The comment is made concerning a "miscible organic phase." Does the logic include the possibility of discovering a tank with an immiscible or partially miscible phase? Tank C-103, for example, has a floating organic layer and the possibility exists that other tanks which have not been identified may also have this problem.

- Page 3, 3.2 Decision Logic, Item 2: The comment is made" . . . monitor waste to ensure continued safe interim storage and the decision process ends here." What exactly is meant by "monitor," and how will each safety problem be monitored? See the comment in Major Concerns for more details.

- Page 4, 3.2 Decision Logic, final sentence: The comment is made that "The decision logic is given in a logic diagram on page 4." No logic diagram was found and, therefore, no comments could be provided on its content.

- Page 4, 4.0 Decision Inputs, second paragraph: The comments are made that "Decision inputs may consist of any piece of information or data that can help answer the decision. It does not necessarily need to be from sampling and analysis." These comments are vague and need to be clarified. What process will be used for evaluating the appropriateness of information used as a decision input and what information other than sampling and analysis can be used? See the comment in Major Concerns for more details.

- Page 4, Table 4.1 Summary of Decision Inputs: CO_2 is not an air pollutant under state and federal regulations, but it appears in Table 4.1 as one of the decision inputs for Decision 1B. The other decision inputs for Decision 1B are all air pollutants. Therefore, it is questionable that CO_2 should be listed in Table 4.1. Provide justification on why it was included.

- Page 4, Table 4.1 Summary of Decision Inputs: For the "Decision Input" butanal, no "Reason for Requesting Decision Input" given. This information should be provided.

- Page 6, Table 4.1 Summary of Decision Inputs: For the "Decision Inputs" [n-dodecane] and [n-tridecane], the "Reason for Requesting Decision Input" given was "Same as [n-undecane] justification." No species of [n-undecane] was found. Is this either an error or an abbreviation which needs to be described? Please clarify.

- Page 8, paragraph below Table 4.1: The statement is made that "Decision inputs . . . are referenced in (Meacham 1994)." In addition to any grammatical considerations, it is necessary to provide a short summary here of the major decision inputs in the referenced document. (See the Major Concerns for more details.)

- Page 9, 5.0 Study Boundaries: The bulleted items in the third paragraph include the statement "Tank layer (or specified thickness)." Where does this information come from, how is it determined, and how is its presence (or absence) verified?

- Page 9, 5.0 Study Boundaries: The bulleted items in the third paragraph which list the six physical boundaries are different from the physical boundaries listed on Table 5.1 in numbers and terms. This inconsistency needs to be addressed.

- Page 9, 5.0 Study Boundaries, fifth paragraph: The statement is made "To date, no time constraints have been specified for determining decisions and decision inputs." When will these very important inputs be determined and how will the decision be made?

- Page 9, 5.0 Study Boundaries, Table 5-1. Under the "Input" for [Hydrogen], the only "Physical Boundary" mentioned is "Vapor space." Does this completely exclude the waste itself which generates the hydrogen gas? What is the responsibility of other DQOs to address the waste issue? (See Major Concerns for more information.)

- Page 9, 5.0 Study Boundaries, Table 5-1. Under the "Input" for "Temperature," the only "Physical Boundary" mentioned is "Vapor Space." Does this completely exclude the issue of high heat tank waste and is this appropriate? What is the responsibility of other DQOs to address the high heat issue? (See Major Concerns for more information.)

- Page 11, Summary of Decision Rule, second paragraph: The comment is made that "inputs may be acquired from existing information and data sources . . . ." This point needs to be clarified. See Major Concerns for a more detailed discussion of this issue.

- Page 11, Summary of Decision Rule, Table 6.1 Decision Rule: In Step #2, no decision threshold was provided for [Tributyl Phosphate] at the end of the column. Please provide this information.

- Page 14, 6.2 Justification of Decision Thresholds, third paragraph: The comment is made at the end of the paragraph that ". . . it will not characterize any type of transient behavior." This issue needs to be addressed. See Major Concerns for a more detailed discussion of this issue.

- Page 14, 6.2 Justification of Decision Thresholds, third paragraph: The statement is made that "Other flammable gases such as ammonia and methane are generated by the waste in some Hanford double-shell tanks." Why are ammonia and methane not listed with hydrogen on Decision 1A? This inconsistency needs to be addressed.

- Page 15, 6.2 Justification of Decision Thresholds, fourth paragraph: The statement is made that two sources were utilized to identify the CES concentration limits. A source which needs to be referenced and included is acceptable source impact levels as defined by WAC 173-460. The information included in this reference needs to be addressed.

- Page 19, Optimization of the DQO Process, second paragraph: The comment is made that "The characterization program has access to other sources of characterization information." This statement needs to be clarified. See Major Concerns for a more detailed discussion of this issue.

- Page 19, Optimization of the DQO Process, Table 8.1: Under the "Decision Inputs" of "% Water" and [Fuel], the comment is made in both for "Possible Input Sources" that "2 Tank grouping models" can be used. It needs to made clear what type of models are to be used and how they can be used. Historical models without verification cannot be used in lieu of sampling data. See Major Concerns for a more detailed discussion of this issue.

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