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06-AMRC-0255

JUN 6 2006

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Addressees:

TRANSMITTAL OF THE APPROVED "100 AREA AND 300 AREA COMPONENT OF THE RCBRA SAMPLING AND ANALYSIS PLAN" (DOE/RL-2005-42, REVISION 0) AND COMMENT RESPONSE MATRIX FOR THE "100 AREA AND 300 AREA COMPONENT OF THE RCBRA SAMPLING AND ANALYSIS PLAN" (DOE/RL-2005-42, DRAFT A)

Attached for your use and information is the approved *100 Area and 300 Area Component of the RCBRA Sampling and Analysis Plan* (DOE/RL-2005-42, Revision 0). Revision 0 will be posted to the End State and Final Closure web site (<http://www.washingtonclosure.com/Projects/endstate>) and a notification will be sent electronically to announce availability of the document online.

Also attached are comment response matrices, which include comments from August 2005 on the *100 Area and 300 Area Component of the RCBRA Sampling and Analysis Plan* (DOE/RL-2005-42, Draft A), plus additional comments from the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) received in November 2005 on the *100 Area and 300 Area Component of the RCBRA Sampling and Analysis Plan* (DOE/RL-2005-42, Revision 0 DRAFT). The sampling and analysis plan has been revised based on these comments as well as additional discussions held with the EPA and Ecology in December 2005 and January 2006 to resolve questions concerning the comments and responses.

Addressees
06-AMRC-0255

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If you have questions, please contact me or your staff may contact John Sands, of my staff, on (509) 372-2282.

Sincerely,



David T. Evans, Acting Assistant Manager
for the River Corridor

AMRC:JPS

Attachments

cc w/attachs:

M. Baker, NOAA
G. Bohnee, Nez Perce
L. Cusack, Ecology
D. Delistraty, Ecology
D. Fault, EPA
L. Gadbois, EPA
L. Goldstein, Ecology
D. Goswami, Ecology
B. Harper, CTUIR
S. Harris, CTUIR
L. Hayes, USFWS
S. Hughs, ODOE
R. Jim, Yakama Nation
D. Landeen, Nez Perce
J. McConnaughey, Yakama Nation
K. Niles, ODOE
M. Plahuta, HAB
J. Price, Ecology
B. Rochette, Ecology
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D. Steffeck, USFWS
T. Stoops, ODOE
L. Vigue, WDFW
Administrative Record H6-08

**Comments 100 Area and 300 Area Component of the RCBRA Sampling and Analysis Plan
(DOE/RL-2005-42, Draft A)**

Index	Commenter	Location (in SAP unless otherwise stated)	Comment	Response
1.	Larry Goldstein, HNRTC	General	Many types of studies listed in the DQO Summary Report have been eliminated in the draft SAP without explanation. For example, field work on plants in the upland zone on plants, and a study on growth and survival of soil macroinvertebrates.	Four measures (lines of evidence) proposed in the DQO were not carried forward in the SAP; Table 1-10 lists and describes each one. Table 1-10 also lists one spatial domain that will not be sampled. Regarding the examples given, field work on upland plants is described in the SAP Executive Summary, Table 1-3, Section 3.3.1.2 and elsewhere. Similarly, details on assessing soil macroinvertebrates are provided in Section 2.2.6.1.
2.	Larry Goldstein, HNRTC	General	We have heard from DOE staff and contractors over the past two years that the chromium breakthrough in the 100-D area is poorly understood in terms of source and extent of the plume. The situation appears to be evolving with the potential that chromium concentrations in groundwater and concentrations being discharged to the river would increase with time. The proposed sampling for chromium in the riparian and near-shore zone needs to be significantly enhanced. Specifically, more data are needed on the exposure and potential sub-lethal effects on fish and aquatic invertebrates from chromium. There has been disagreement among experts regarding the conclusions reached in previous studies on salmonids.	The sampling design has been augmented to enhance characterization of chromium plumes. More data will be collected on fish and invertebrates. In particular, tissue contaminant levels and histopathology will be performed on whole fish and on fish organs (e.g., liver) expected to be affected through exposure to heavy metals like chromium. Targeting resident fish species with limited home ranges (sculpin) will provide for protective estimates of tissue contamination levels in fish that can be used to estimate risk to transient species such as salmon. In recognition of the differing interpretations of Hanford Site salmonid/chromium studies, Appendix B has been removed from the SAP.

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3.	Larry Goldstein, HNRTC	General	The hyporheic zone in the 100 and 300 Areas is poorly understood and inadequately addressed in the draft SAP. To accurately characterize existing and potential risk to biota more data are needed across the food web in the hyporheic zone. Sampling should be at locations with levels of contaminants. It is important to understand potential impacts on the aquatic system as contaminated groundwater will continue to discharge to the river over many years.	Several lines of evidence will assess the potential for ecological effects in the hyporheic zone. For example, biota colonizing the rock baskets (mesh cages of gravel substrate sunk into the riverbed) are expected to be representative of hyporheic organisms in multiple parts of the food web. Organisms colonizing the rock baskets will be evaluated for diversity and abundance and contaminant body burdens relative to reference locations. In addition, toxicity testing with <i>Hyalella</i> will model exposure for hyporheic organisms and test for effects using sediments from the site.
4.	Larry Goldstein, HNRTC	General	Consultation with WDFW staff and the current PNNL inventory of amphibians suggest data can be collected on these sensitive organisms. The draft SAP (page 1-20) provides rationale for not looking at amphibians that requires further discussion. For example, there appear to be many locations where organisms such as the bullfrog (<i>Rana catesbeiana</i>) can be found. Great Basin spadefoot and woodhouse's toad are locally common along the Hanford Reach (L. Hallock pers. comm.).	Based on the suggestions from numerous participants and the recent amphibian surveys in the 100 Area and 300 Area, tissue concentrations of tadpoles for key contaminants will be added as another measure for this group. In addition, qualitative information on abundance and biological condition (e.g., deformities) will be recorded.

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5.	Larry Goldstein, HNRTC	General	The SAP proposes very little work in riparian and aquatic areas of the 300 Area. Uranium being discharged to the river in the 300 Area is a significant concern of the Council	The SAP has been revised to expand sampling efforts in the 300 Area. The multi-increment soil sampling performance assessment will determine the number of multi-increment samples per riparian investigation area. The strategy for sampling in the near-shore environment has been enhanced to a stratified sampling design based on the three major contaminant plumes (Sr-90, U, Cr+6). Thus, the number of aquatic near-shore sampling locations in the 300 Area has been increased to 10 (and also adding additional reference sites) to characterize uranium input to the river and the potential for effects on resident biota.
6.	Larry Goldstein, HNRTC	General	In concept we support the type of study submitted by USGS in November 2003, "The Health Status of Fish in the Hanford Reach of the Columbia River, Washington." This study on resident fish will analyze tissue residue accumulation, DNA damage, histology, lipid peroxidation and necropsies. The Council believes it is appropriate the USGS conduct this study given their experience (DeLonay 2001, Farag 2000, 2003), expertise and independence.	Several of the desired endpoints (fish tissue concentration and histopathology) will be pursued in the 100 Area and 300 Area risk assessment as requested. Data collection will be performed by qualified subcontractors per the specifications listed in the SAP. Additional studies beyond those outlined in the DQO and SAP are not within the scope of the risk assessment.

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7.	Mary Baker, NOAA	General	<p>Summary data tables should be included (summaries of tables that appear in the document appendix) to support the assumptions underlying the sampling and analysis plan. For example, maximum concentrations of metals in groundwater, soil, sediment, fish and other biota should be described in the body of the plan document to help interpret selection of contaminants of potential concern, assessment, measurement endpoints, hypotheses, and specific analyses. As requested in our December 2004 review of the DQO workbook, data tables to include listings of the detection limits that were above screening values, and locations of maximum concentrations for each COPEC that exceeded a screening value would help us evaluate the relative uncertainty for each COPEC and whether COPECs are co-located with each other.</p>	<p>The plan now includes graphical summaries of COPEC concentrations for locations included in the investigation (Appendix D). In addition, information is presented in the ecological screening assessment for the 100 Area and 300 Area (Appendix C of the DQO). Information relating to the ecological effects of these COPECs was included in the DQO and SAP and some clarification of the role of key contaminants has been added to the SAP. It should be emphasized that uncertainty about COPEC selection is obviated by the decision to characterize biotic and abiotic media with full suite analyses at virtually every sampling location.</p>
8.	Mary Baker, NOAA	General	<p>The conceptual site model in the work plan is missing a discussion of the expected modes of action of effects of the contaminants discussed in the exposure models. This discussion is necessary to justify the assessment endpoints, measurement endpoints, and risk hypotheses presented in the document.</p> <p>It does not seem an advantage to present two separate site models, one for upland and one for the river. There is a connection between the two, since the riparian and near-shore zones includes soil and groundwater. Having one site model would identify how (for example) groundwater can migrate from areas distant from the river.</p>	<p>Consideration of contaminant modes of action was incorporated into selection of measurement and assessment endpoints and risk hypotheses. Specifically, given the preponderance of heavy metal and radionuclide risk drivers, attention was focused on the lower and middle trophic levels because these organisms are likely to represent the most highly exposed receptors considering the limited trophic of inorganic contaminants. This information has been clarified in the SAP and some additional information provided.</p> <p>Although there are connections between all environments and sites types, the species selected for measures of exposure, effect, and ecosystem/receptor characteristics tend to belong primarily to one of these environments. We have added a discussion regarding the potential connection of these environments to the SAP and it will be considered in the risk assessment uncertainty analysis.</p>

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9.	Mary Baker, NOAA	General	Appendix B of the sampling and analysis plan is inappropriate to include as part of the work plan documents. Because groundwater is highly contaminated with substances that can adversely affect salmon, groundwater is discharging to the river at or near areas used by spawning salmon, and literature and past studies indicate that low levels of these contaminants can affect survival and health of early life stages of salmon, early life stage survival and health of salmon is an appropriate assessment endpoint for the site. It is not appropriate to include risk conclusions in the sampling and analysis plan.	Agree that it is not appropriate to include risk conclusions in the sampling and analysis plan; Appendix B was removed from the SAP.
10.	Mary Baker, NOAA	General	Further, NOAA disagrees with the conclusions presented in Appendix B and suggests that additional analysis for salmon should be conducted. Some of the data collected in this sampling and analysis plan will be useful for interpreting risk to salmon (for example, horizontal aquifer tubes can provide additional information on magnitude and extent of releases that might affect salmon). Uptake of Cr by clams indicates that Cr released into the river is not completely diluted. This data indicates that Cr is clearly bio-available to organisms in the river, including salmon fry. This sampling and analysis plan should indicate what lines of evidence will be evaluated to determine whether salmon are at risk. Specific comments below provide additional information on this issue. Section 4.3 of the work plan states that the WAS 173-340-730(6) establishes the point of compliance for groundwater at the point of entry into surface water and prohibits the use of a mixing zone to attain AWQC values. Appendix B reads as though dilution in the river provides a mixing zone, thus mitigating the need to reach these criteria.	As indicated in the previous response, Appendix B has been removed from the SAP. The sampling and analysis plan will employ several lines of evidence to determine whether biota such as salmon are at risk. However, salmon themselves are not selected for direct measurement. It is believed that collecting aquatic contaminant data under worst-case conditions (e.g., horizontal aquifer tubes placed in known Cr plumes and sampled when groundwater input to the river is proportionally greatest) and tissue concentrations for highly exposed aquatic biota (e.g., clams, resident sculpin and others) will provide an adequate basis for a conservative estimate of risk to salmonids.

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11.	Mary Baker, NOAA	General	The sampling and analysis plan should provide additional details on how risk will be interpreted. NOAA strongly disagrees with the approach described in the 100-B/C Pilot Project Risk Assessment Report that the maximum acceptable adverse effect level for a community and population level assessment is a 20% reduction in growth, reproduction, or survival. We also disagree that this level is consistent with current EPA regulatory practice. For example, ambient water quality criteria are intended to protect 95% of species, not 80%. Study designs should be sufficiently powerful and robust to be able to statistically detect a 20% difference between site and reference conditions, but this is not the same thing as saying that a 20% reduction in any endpoint is acceptable. Depending on the endpoint and species considered, a minimum effect level of 5-10% would be more appropriate. One of the more important discussions that should occur is to generate some consensus around how risk will be interpreted.	Additional details have been added to the SAP regarding determination of risk, and the comment regarding the 20% effect level has been noted. However, comments regarding the 100-B/C Pilot Project Risk Assessment are addressed in comment responses for that document.
12.	Mary Baker, NOAA	General	Many of the hypotheses refer to gradients, however, if no gradient in response is found, it does not mean there is not a problem. For example, all the site conditions tested could kill 100% of the toxicity test organisms. This would not be acceptable even though no gradient in response might be observed. Further, how would the significance of gradients be tested? Environmental data is highly variable, and this seems to be too high a standard to meet to define unacceptable risk. It is also not clear how "gradient units" would be defined when there are likely to be varying mixtures of contaminants in each sample.	Hypotheses are paired to assess contaminant gradients and reference sites for the very reason stated. We also use comparison to no effect levels for some hypotheses. Additional clarification on risk characterization has been included in the SAP so that these data analysis methods and the limitations of various measures is more transparent.

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13.	Mary Baker, NOAA	General	Numbers of samples and stations for evaluating contaminants and receptors in the river are insufficient. A power analysis should be conducted for each endpoint, and we need to significantly increase numbers of samples in the near-shore areas.	The number of aquatic near-shore samples has been increased from 15 to 37 locations. The design is now to target the three major contaminant plumes as follows: 10 sites across a chromium gradient (most at 100-D, with some at 100-K), 10 sites across a strontium-90 gradient at 100-N, and 10 sites across a uranium gradient at the 300 Area. The SAP also includes a discussion of statistical power (now Appendix B of the revised SAP) and how the study design and the achieved number and variability of sample results will be used to characterize ecological risks.
14.	Mary Baker, NOAA	General	NOAA supports the type of study submitted by USGS in November 2003, "The Health Status of Fish in the Hanford Reach of the Columbia River, Washington." Resident fish should be examined to analyze accumulation in specific tissues, DNA damage, histology, and lipid peroxidation. NOAA believes it is appropriate for USGS researchers to evaluate fish for these effects given their specific experience and expertise with these endpoints and their independence from other Department of Energy contractors and past Department of Energy projects.	Please see response to Comment #6
15.	Mary Baker, NOAA	General	NOAA supports the evaluation of concentrations and tissue-specific abnormalities in resident amphibians using the extensive knowledge and involvement of staff from the State of Washington, and also, an appropriate evaluation of the potential for past air releases of particulates to result in upland ecological risk.	See response to Comment #4 regarding amphibians. In addition to the white paper on the potential for air depositional effects for the Hanford Site (http://www.washingtonclosure.com/Projects/endstate/), further evaluation of potential air deposition will be evaluated in this assessment through the planned surface soil sampling in 45 hectare-sized investigation areas spread across the 100 Area and 300 Area; this includes 15 reference sites that are outside of Hanford-Site operational-area boundaries.

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16.	Mary Baker, NOAA	General	NOAA's additional general concerns with the risk assessment for the River include: selection of appropriate reference locations, identification of additional areas of sediment deposition and erosion within and downstream of the Hanford Reach, evaluation of "reasonable worst-case" scenarios in addition to "average" scenarios, including evaluation of sensitive aquatic receptors and endpoints considering the contaminants of concern, and coordinating sampling in the river with the 100NR2 risk assessment.	NOAA's concerns are congruent with DOE priorities in this risk assessment. For example, the number of aquatic sampling sites has been greatly expanded and the sampling locations will be clustered around known contaminant plumes entering the Columbia River. In addition, porewater will be sampled when dilutional effects from the river are expected to be the least in an effort to characterize worst-case (maximum exposure) conditions. Considering endpoint sensitivity, for example, the amphipod, <i>Hyaella azteca</i> , was chosen for sediment toxicity bioassays because of its extreme sensitivity to heavy metals. The sampling and analyses planned for this risk assessment are being integrated with similar efforts performed in the 100-NR-2 risk assessment.

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17.	Mary Baker, NOAA	Page 1-5, section 1.3.1.	Clarify how contaminant modes of effect were used to select assessment endpoints and risk hypotheses.	The primary Hanford Site contaminants are heavy metals and radionuclides that have limited potential for trophic transfer. Organisms such as soil and aquatic invertebrates that are intimately associated with contaminated media are judged to be the most highly exposed receptors. Consequently, these organisms are assessment endpoints and also serve as measures of exposure and effect. Considering dietary exposure, invertebrates have a greater potential for metal and radionuclide uptake relative to plants so this assessment focuses on these lower trophic level receptors as well as on the middle trophic level that preys on invertebrates (e.g., deer mice, kingbirds and sculpin). Because heavy metals accumulate in organs such as the liver, these tissues will be targeted for contaminant analysis and, in the case of fish, organs will be subjected to histopathological analyses.
18.	Mary Baker, NOAA	Page 1-6, section 1.3.1.	Add salmon and forage fish as assessment endpoint species	Salmon are assessment endpoint species. See Figure 5-3, DQO. Forage fish (sculpin) will be collected as measures of exposure and effect.

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19.	Mary Baker, NOAA	Page 1-13, section 1.2.3.1	Field measures should not be given greater weight than other measures, especially given the low power expected by the sample sizes considered.	The proposed weights are based on obtaining the number of samples in the SAP for each measure. Discussion about the potential power for detecting difference has been added (now Appendix B of the revised SAP). However, we disagree that field measures should be given less weight than all other measures. Field measures are given less weight than laboratory toxicity tests, but greater weight than comparison to literature-based benchmarks. The greater ecological relevance of Hanford Site-specific measures corresponds to a relatively (e.g., compared to literature values) higher weighting for field data.
20.	Mary Baker, NOAA	Section 1.3.2.3, hypothesis 1.	Hypothesis 1b will only be considered if there is a significant elevation over reference sites. This will not provide information that will allow us to determine whether the reference site is appropriate, or whether reference conditions also pose risk. Hypothesis 1b should be considered even if 1a is accepted.	Comparisons to toxicity thresholds are a logical step if contamination exceeds background conditions. Reference sites were chosen by balancing the desire for pristine conditions while sharing a similarity to investigation areas. Fifteen hectare-sized plots across the Hanford Site will be used for terrestrial (upland and riparian) reference investigation areas. In the 7 river reference areas, samples will be taken <u>intaken</u> in substrate classes 1 and 2 (total of 14 aquatic reference sites). This will provide a robust data set for reference conditions. With that said, all collected data will be evaluated in terms of threshold exceedances. While some constituents at reference locations may exceed applicable toxicity thresholds, this does not invalidate the use of a particular reference site(s).

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21.	Mary Baker, NOAA	Page 1-18, section 1.3.3.	In addition to evaluating average and “realistic” exposures, also evaluate reasonable worst-case scenarios for ecological exposure.	Worst-case exposure was considered in the ecological screening assessment; it is appropriate to consider average exposure in the more ecologically realistic and focused terrestrial component of the baseline risk assessment. However, worst-case exposure will also be evaluated for the terrestrial environment by collecting discrete rooting zone samples in habitat suitable for threatened and endangered plants. In addition, the entire aquatic sampling plan is structured around capturing worst-case conditions.
22.	Mary Baker, NOAA	Page 1-20, section 1.3.5.	Additional detail and analysis is needed to justify why the number of samples is not insufficient. Statistical power calculations would help. The justification for appendix B is insufficient. Explanations of why evaluations of resident amphibians are inappropriate are not convincing.	Additional detail on data analysis and the statistical power of the proposed measures is provided in the revised SAP. See response to Comment #2 regarding Appendix B. See response to Comment #4 regarding amphibians.
23.	Mary Baker, NOAA	Page 1-27, figure 1-6.	These graphics do not indicate how (over what area) aquatic samples will be collected.	Agree, the figure does not indicate the area over which aquatic sampling will occur; that was not its intended purpose. Please see Figures 3-1, 3-2, 3-3, 3-4, 3-6 and 3-8 for sample location information.

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24.	Mary Baker, NOAA	Page 1-32, table 1-3 (and page 1-37, table 1-4	Please indicate the relative sensitivity of the plant species to site contaminants. Are these species known to be sensitive to metals and radionuclides? Evaluation of specific organs for abnormalities in small mammals would be of greater relevance in risk assessment than would gross deformities.	Plant species were chosen based on ecological relevance (e.g., Sandberg's bluegrass, yellow nutsedge) and/or endorsement from environmental regulatory institutions (e.g., Ecology recommends using perennial ryegrass for the alkaline soils of Hanford). These species are desirable test candidates because of their cataloged response to contaminants and relevance to the site. The response of these species to radionuclide exposure is not known. There are no plans to evaluate small mammal organ-specific abnormalities, but we will measure concentrations in tissues and can compare those concentrations to effect levels. Existing data would not suggest that small mammal organs have greater levels of exposure than at reference sites and tissue specific histopathology studies on small mammals are not warranted.
25.	Mary Baker, NOAA	Page 1-38, table 1-5.	Horizontal aquifer tubes are likely to provide very useful information on exposure to aquatic species if they do adequately capture and represent maximum and biologically relevant releases of groundwater to surface water. Therefore, it is important to document that the placement and design of aquifer tubes represents biologically relevant locations and unimpeded release of groundwater (demonstrate that digging trenches and placing tubes does not affect groundwater flow). Because this appears to be a new technique, I would suggest placing more aquifer tubes at multiple water depths, and co-locating shallow vertical aquifer tubes with them.	Horizontal aquifer tubes will be placed at multiple locations around major contaminant plumes at a depth designed to characterize the biologically active zone in sediments (10 cm below the riverbed). A factor in the location of horizontal aquifer tubes is based on contaminant data from the existing vertical aquifer tube array. Horizontal aquifer tube installation is not expected to affect water quality because the tubes will not be sampled for at least a week following installation. Horizontal aquifer tube performance will be assessed by comparison with the existing aquifer tube array through side-by-side measures of the vertical and the horizontal aquifer tubes.

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26.	Mary Baker, NOAA	Page 1-40, table 1-5.	Both sculpin and suckers should be collected. They should be evaluated for effects to fish, not just human health. Individual tissues should be analyzed for uptake and abnormalities.	Sculpin will be collected and evaluated for effects on fish as determined by histopathological analyses of liver tissues. Suckers have been dropped because 1) of their larger home range, 2) it is believed sufficient mass of sculpin will be available, and 3) evaluating only one species will minimize confounding factors.
27.	Mary Baker, NOAA	Page 1-41, table 1-5.	Clam survival is an insensitive endpoint.	Given their limited mobility and intimate association with the river substrate, clams are excellent monitors of contaminant uptake in biota. By virtue of the experimental design employing clams in tubes at areas of greatest contamination, additional data on clam survival can be obtained. Although clam survival is not the most sensitive endpoint, it is a measurement obtained at small additional cost and is therefore included as one of many lines of evidence to characterize the potential for aquatic effects.

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28.	Mary Baker, NOAA	Page 1-46, Table 1-8.	Many of the endpoints given higher weight in the assessment are likely to be less sensitive than laboratory and literature endpoints. For example, plant toxicity tests results, diversity and abundance from rock baskets, and clam survival. I would give more weight to literature values for benthic invertebrate and plant endpoints. Clarify that benthic invertebrate accumulation will be compared to available literature to evaluate effects and consider giving this endpoint a high weight. Site-specific toxicity testing of benthic invertebrates and amphibians should be given high weight. Analysis of specific tissues in fish should be given high weight.	In many cases, literature values for toxicity thresholds are based on conditions that are atypical of field settings. For example, toxicity tests with heavy metals frequently employ soluble metal salts for test organism exposure. These salts are highly bioavailable and not characteristic of the weathered media of the Hanford Site in which bioavailability is expected to be lower. The purpose of this assessment is to move from protective estimates of risk based largely on literature values to more ecologically realistic estimates by focusing on effects under more site-specific conditions. Comparisons will be made to literature values but the uncertainty associated with these does not warrant high weight for literature-based lines of evidence. Additional measures will be added to Table 1-8 for amphibians and survival and growth of amphibians based on FETAX will be given a high weight.
29.	Mary Baker, NOAA	Page 2-7, section 2.2.6.2.	Labs to conduct aquatic and sediment toxicity testing should demonstrate that they have acceptable quality control, that they can minimize variability, that they can achieve target positive and negative control results. NOAA would like to review lab quality control data for the last year before tests are conducted. Expand the amphipod toxicity testing to the 28 day standard test, which we consider to be more sensitive.	The amphipod aquatic toxicity test has been extended to 28 days. The toxicity testing laboratory will provide as much QA/QC material as is available for appropriate reviews.
30.	Mary Baker, NOAA	Page 3-2, section 3.2.	Sampling methods for surface and aquifer tube water and sediment should be described in more detail. Consider sampling aquifer tubes monthly over dry season. NOAA would like to participate in surface water and sediment sampling.	Additional detail on aquatic sampling has been added to the revised SAP. Aquifer tubes will be sampled during the fall/winter (low flow) in an attempt to capture worst-case conditions. NOAA is welcome to participate in the sampling effort.

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31.	Mary Baker, NOAA	Page 3-3, section 3.2.	Based on data presented as part of the 100 B/C Pilot risk assessment, the Vernita Bridge reference sites may be substantially different in sediment and flow character than the 100/300 area of the river. If there are no suitable reference sites upstream of the site boundary, the most upstream areas of the site should be evaluated as possible reference locations, in addition to other locations.	Additional aquatic reference areas have been added to augment the design.
32.	Mary Baker, NOAA	Page 3-5, section 3.2.2.	Rock baskets are not likely to produce density and structure data that can be compared between stations. Biota tissue sampling should be composited only among similar taxa (if necessary based on biomass limitations).	The basis is unclear for the judgment that organisms colonizing rock baskets are unlikely to be comparable between sampling stations. They are a standardized matrix that will be left in aquatic locations for the same amount of time, which increases the likelihood that they are comparable. It is not expected, however, that the biomass collected would be sufficient to allow for compositing among similar taxa.
33.	Mary Baker, NOAA	Page 3-22, figure 3-2.	Consider adding additional near-shore samples in the 100D shoreline areas to evaluate potential release and effects of Cr and other contaminants on fish. Add additional samples in the 100H area (upstream end) and downstream of 100H area near salmon redds.	Additional sampling locations have been added around the 100-D shoreline because of the elevated levels of chromium in the groundwater there, compared to the 100-H area shoreline.. Additional aquatic sample locations have also been added to 100-N Area and the 300 Area.
34.	Mary Baker, NOAA	Page 3-23, figure 3-3.	Consider adding samples in the fine-grained sediments at the downstream end of the island at the top of the figure. Consider adding samples in the slough areas downstream of 100F.	See response to Comments #13 and #33.
35.	Mary Baker, NOAA	Page 3-24, figure 3-4.	Ensure that aquatic samples taken in the 100N area are consistent with the aquatic samples taken under this sampling plan, otherwise, add additional 100N area samples for this effort. Consider moving the elevated #3 sample down to the downstream end of the fine-grained sediment patch.	The samples taken at the 100-N Area are consistent with those planned for this effort except for horizontal aquifer tubes and toxicity tests. Consequently, these measures will be collected for the 100-N Area. The suggestion to move the sampling point will be considered in the expanded sampling effort at 100-N.
36.	Mary Baker, NOAA	Page 3-26, figure 3-6.	Add a sample downstream of Low-Moderate #6.	The aquatic sampling effort at the 300 Area has been greatly expanded. See Comment #13 for additional details.

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37.	Mary Baker, NOAA	DQO, Page 3-1, section 3.1.	The conceptual site model should address expected effects of the contaminants at the site.	Modes of action of contaminants were considered in the conceptual model of the potential for contaminant effects. See Comment #17 for additional details.
38.	Mary Baker, NOAA	DQO, Page 3-7, section 3.2.	Groundwater migration should be mentioned as a specific release mechanism and transport media. The contribution of groundwater originating in the 200 area should be specifically addressed here.	Groundwater migration is considered to the extent that ecological receptors are exposed to groundwater. The contribution of groundwater originating in the 200 Area is addressed by the relevant groundwater operable units.
39.	Mary Baker, NOAA	DQO, Page 3-11, section 3.1.4.2.	Groundwater and river bank seeps are used by biota as habitat, for drinking, forage, refuge, and nursery.	Comment noted.
40.	Mary Baker, NOAA	, Page 3- 25, section 3.2.5.	This section states that groundwater contributions will be modeled over time for their future interactions with the Columbia River. The work plan should describe how risk of these interactions will be identified, evaluated, and described.	Discussion of how groundwater interactions will be identified, evaluated, and described are in the scope of the Hanford Sitewide Assessment Program. As stated in the Work Plan, "if available, groundwater modeling and risk calculations from the Hanford Sitewide Assessment Program will be included in the risk assessment report, with an evaluation of their significance to the 100 and 300 Areas and Columbia River."
41.	Mary Baker, NOAA	DQO, Page 3-31, section 3.6.3.	If site related contaminants are also present at the reference site, that does not obviate the need to describe risk of these contaminants for the site. Contaminants of concern should not be excluded because of their presence at the reference site. Similarly, if a toxicity reference value is not available, but a contaminant is known to have adverse effects, it should not be excluded as a COPEC.	Sample results will be compared to relevant and available background concentrations and also compared to reference site levels. Effects at reference sites will be assessed through toxicity testing with soil, sediment, and water. All available effects and exposure information will be used to assess ecological risks.

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42.	Mary Baker, NOAA	DQO, Page 3-42, section 3.6.5.3, first full paragraph.	It is not clear to me how the population size, home range size, and habitat suitability are lines of evidence to characterize ecological significance of risk.	Population size, home range, and habitat suitability are not lines of evidence in and of themselves. Rather, this information was used to aid in the selection of investigation area boundaries. The 1-hectare sized plots are considered to be representative of assessment population boundaries for the middle trophic level and encompass boundaries for the lower trophic level as well.
43.	Ken Niles, Oregon DOE	8/10 workshop comments	<ol style="list-style-type: none"> 1. adjusting sampling to reduce the number of sample sites in upland, remediated backfill areas, and increasing numbers of samples in riparian and near-shore aquatic areas; 2. focusing sampling in riparian and aquatic areas to optimize sampling of source areas and plumes for uranium, chromium, and strontium; 3. including analyses of specific organs and histopathology analyses for fish; 4. sampling fewer plant species on upland sites; and 5. reviewing data from the Vernita Bridge area to better understand why this "reference" site frequently has higher concentrations of metals than sites in operating areas. 	The number of sample sites in upland, remediated backfill areas were not reduced but the number of samples in riparian areas as well as the number of near-shore aquatic sample sites were increased. Points 2-5 are accepted.

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44.	Ken Niles, Oregon DOE	Sample Design, Data Analysis	Because changes to the SAP reflect a reallocation of sampling effort rather than an increase in the overall level of effort, sample sizes remain smaller than would be desirable. The increased numbers of samples in riparian and aquatic areas, and the focus on sampling near source areas to better sample for effects of specific contaminants (uranium, chromium, and strontium), will substantially improve the likelihood of drawing defensible conclusions regarding effects (or lack of effects) for these contaminants. Until data are in hand and the variability of data can be considered, however, it remains possible that data analyses will be ambiguous and that additional sampling may be necessary to reach defensible conclusions about risk for some pairs of contaminants and receptors. For some analyses, the potential for Type II error will likely remain high.	<p>The sampling effort in near-shore areas has been almost tripled. Further information on how the various measures will be evaluated has been added to the SAP, which includes a consideration of statistical power.</p> <p>Please see responses to Comment #13 for additional details.</p>
45.	Ken Niles, Oregon DOE	Sample Design, Data Analysis	Section 1.3.2 lists a number of risk questions and poses hypotheses describing the possible fate and effects of residual contaminants, and Tables 1-6 to 1-8 provide a cross walk relating data sources and analyses to hypotheses for various endpoints. Under plans in the draft SAP, it is unclear whether sampling would have provided sufficient data to effectively test some of the hypotheses (e.g., for population abundance, reproductive rates, gender ratios); modifications to the sampling plans may make some of these analyses impossible. We suggest that the list of hypotheses and Tables 1-6 to 1-8 be carefully reviewed and pruned to be certain you don't over-promise what can be delivered by work defined by the revised SAP.	The revised SAP provides the general framework used for ecological risk assessment as well as the data analysis plan for these data. One element considered in evaluating the strength of evidence for ecological risk is the underlying uncertainty and variability in the data obtained. As noted in this comment, some measures will provide stronger evidence and some weaker evidence for ecological risk. This has already been taken into account in specifying the weights for the measures. The basis for these weights has been clarified in the SAP and it is also clarified that the weights will be reassessed in light of the completeness and variability of the results obtained for each measure during the risk assessment process. A key aspect of this evaluation is the concordance or discordance of various measures and contaminant results.

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46.	Ken Niles, Oregon DOE	Sample Design, Data Analysis	<p>We remain opposed to the planned use of composite samples (multi-increment samples, or MIS) for soils, plants, and small mammals. Compositing to the extent proposed in the SAP (one sample per area) would lead to severe loss of information characterizing the occurrence and distribution of contaminants in these components of an ecosystem, and would seriously degrade the ability to quantify residual contamination. Compositing to a single sample results in loss of any information about heterogeneity of the sampled material, including loss of information about possible hot spots within the sampled area. If most sub-samples in an MIS sample were well below the maximum contaminant level (MCL), one could have a few grossly contaminated sub-samples, yet the average value would be below the standard (e.g., if 95 sub-samples had contaminant concentrations that were half the MCL, the remaining five samples could have an average concentration 10 times the MCL, but the concentration of the composite sample would not exceed the MCL). If all that mattered were an average value, or if all plants and animals obtained nutrients randomly from a large plot, use of composite samples might be a valid approach to estimating contaminant exposure and uptake. In reality, however, the distribution of contaminants in soil is stochastic, plants are sessile and draw nutrients from a very small area, and small mammals often spend most of their time in a very restricted area. An average concentration does not identify hot spots and does not accurately describe actual exposure for those organisms.</p>	<p>Under Superfund, the goal of ecological risk assessments is to protect and maintain healthy populations of biota. While it is agreed that an average concentration would not describe actual exposure to hot spots for sessile organisms such as plants, average exposure is the most meaningful exposure parameter for the population (e.g., dietary intake over a specified area). The scale of a hectare was chosen to reflect the assessment population boundaries for the middle trophic level; specifically for small mammals (see response to Comment #74 for more on population boundaries). MIS soil sample results are not planned for any compliance monitoring decisions where the results from discrete samples are more appropriate. In cases where the health of individual organisms is of importance (e.g., threatened and endangered plants in riparian areas) individual discrete samples will be collected in the rooting zone to characterize exposure.</p>

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47.	Ken Niles, Oregon DOE	Sample Design, Data Analysis	The combination of the Hanford “background” concentrations for soil contaminants, coupled with use of MIS sampling for soils, establishes an unrealistically high standard for identifying a site as having contaminant concentrations above background values. The background value is the estimate of the upper confidence limit of the 95th percentile of the distribution of contaminant concentrations in discrete soil samples from the Hanford Site. This value is defined by the upper tail of the distribution of values, and is likely to be influenced by “nuggets,” atypical soils (e.g. those with unusual chemistry, organic matter context, texture, etc.) and potentially by contamination from Hanford operations. The “background” value becomes the benchmark for comparison to the value of MIS samples. In the MIS samples, however, the effects of nuggets, atypical samples, and residual contaminants have been diluted by compositing with other, “typical” soil sub-samples. The likelihood of an MIS sample having contaminant concentrations significantly above those of baseline values is diminishingly small; the approach is statistically and technically unsound.	The goal of sampling soil is to characterize average contaminant concentrations across investigation areas. MIS is an efficient way to characterize large upland and riparian locations for the potential for ecological risk to populations. The multi-increment sampling technique has also been shown to be a robust indicator of the mean site concentration, because, as noted, the influence of “nuggets” or otherwise atypical soils is better characterized. The mean results from the multi-increment sampling will be compared to the mean concentrations for Hanford Site background, as stated in Hypothesis 1a, page 1-8 of the SAP. The concern regarding the “nugget effect” will be evaluated at 20% of the investigation areas during the MIS performance assessment during the fall sampling event. Based on the results of the MIS performance assessment the MIS will be developed for the remaining investigation areas.
48.	Ken Niles, Oregon DOE	General	Workshop discussion partially addressed concerns about chromium and uranium as described below; issues are listed here to insure their consideration in revision of the SAP. There is a need for significantly increased effort to characterize releases (present and future) of chromium into riparian and nearshore aquatic areas along the Columbia River, and to assess potential environmental effects of those releases. Available data and recent comments from DOE staff suggest that the number and/or size of groundwater plumes, and perhaps concentrations of chromium in those plumes, is increasing in some parts of the 100 Area. Accordingly, improved forecasts of chromium releases to the river are necessary for reliably forecasting potential environmental effects of chromium.	There has been a significantly increased effort to characterize releases of chromium and environmental effects of those releases into riparian and nearshore aquatic areas along the Columbia River. However, the risk assessment is designed to estimate current day risk and requests for forecasts of chromium releases to the river are beyond the scope of this project.

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49.	Ken Niles, Oregon DOE	General	<p>Additional studies of possible ecological risks are also needed, including: exposure of fish and invertebrates via both water and through food webs; better characterization of the effects of chromium on eggs and juvenile salmonids living in gravels of the hyporheic zone (including accumulation and sub-lethal effects on sensitive organ systems, especially kidneys); accumulation and effects of chromium on invertebrates other than the Asiatic clam (a non-native species that is relatively insensitive to chromium), including exposure and uptake via multiple pathways of water and food webs. We note also there is not consensus regarding conclusions of Appendix B of the SAP, which suggests there are not adverse effects on fish in the Columbia River. The lack of consensus, together with possible increases in chromium releases to the river from groundwater, and the need to include food webs as a source of chromium contamination, all point to the need for additional exposure and effects studies. The U.S. Geological Survey (USGS) has previously proposed additional studies of juvenile salmon and invertebrates; we suggest that funding of the USGS proposal be pursued.</p>	<p>Exposure to fish and aquatic invertebrates will be assessed with tissue analyses of these organisms. In particular, analyses of resident fish that tend to have relatively limited ranges (e.g., sculpin) will provide protective estimates of risk to salmonids. The Asiatic clam may be one of the best sentinel organisms along the Hanford Reach of the Columbia River for assessing biotic contaminant uptake. The sensitivity of clams to toxicants was considered of secondary importance to use of clams for studying contaminant uptake but still a useful measure - basically maximizing data extraction from proposed measures. Sensitivity to contaminants was a criterion in the selection of test organisms employed in the battery of bioassays conducted in the risk assessment (see, e.g., response to Comment #16).</p> <p>Appendix B has been removed from the SAP as requested. Many of the study elements proposed by the USGS are reflected in this risk assessment. Data collection training requirements are specified in the SAP.</p>

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50.	Ken Niles, Oregon DOE	General	The draft SAP described efforts that would be insufficient to define exposure and to assess effects of uranium releases in the 300 area. The acknowledged failure of monitored natural attenuation, together with uncertainty regarding future plans to manage uranium releases, demonstrate the need to better understand effects of continuing uranium releases. Plans in the draft SAP (one riparian/aquatic sample point and two terrestrial samples) should be substantially increased in the revised plan, and we support an expanded effort in the 300 Area to provide an adequate assessment of residual uranium concentrations, transport in groundwater, and a reliable assessment of the environmental risks of those releases.	The revised SAP has a greatly expanded effort in the 300 Area to provide an assessment of residual uranium concentrations, exposure to upwelling groundwater, and an assessment of the environmental risks of those releases. This will supplement existing studies of the 300 Area, such as Patton et al. (2003), which did an extensive evaluation of uranium in the riparian and near-shore zones of the 300 Area.
51.	Ken Niles, Oregon DOE	General	We remain concerned by the lack of effort to assess exposure and effects of contaminant releases on amphibians. The lack of effort as described in the SAP, and reiterated at the review workshop, leaves a significant gap in project efforts. Information recently provided by Janelle Downs of PNNL, including draft language from a recent Hanford environmental monitoring report, suggest there is likely more habitat, and larger populations of amphibians in the 100 Area than was previously believed. The report further noted that the Columbia River at Hanford may be an especially important habitat for some amphibian species, most notably for Woodhouse's toad (a Washington state monitor species). Amphibians lay eggs and spend a significant portion of their life cycle in the most contaminated portions of the river corridor area (riparian and near-shore aquatic areas). As such, a significantly expanded effort to evaluate exposure and effects, especially of chromium, on adults, eggs, and larval stages of amphibians should be undertaken to better characterize exposure and ecological risk.	Please see response to Comment #4.

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52.	Larry Goldstein, Ecology	General	The DQO Summary Report did an excellent job at demonstrating the links between selected receptors and sampling design, linking proposed measures to risk hypothesis. There appear to be significant discrepancies between the DQO Summary report and this SAP. Within the SAP it is unclear if these links are still maintained since several elements of the sampling design were omitted in the SAP. There is no explanation in the transmittal letter or the SAP about these changes.	See Response to Comment # 1.
53.	Larry Goldstein, Ecology	General	We have concerns that the limited sampling will generate sufficient data for statistical analysis and defensible conclusions. We have confidence in those who developed this plan and therefore assume the budget was a constraining factor in the final draft of this planned risk assessment. However, when the budget was briefly discussed at an August 10 meeting we heard that the "guesstimate" from last year is adequate. We respectfully disagree. If in fact available funding is a serious impediment to conducting a robust ecological risk assessment, we request that a second phase sampling occur. Ideally, adequate money is available now and only one phase of sampling and one risk assessment report will need to be written.	The sampling efforts associated with this risk assessment have been considerably expanded as a result of Trustee input from the August 10 th meeting. The resultant design will use a single-phase sampling approach for one year and is expected to yield adequate data for a current assessment of present day risk in the 100 Area and 300 Area.
54.	Larry Goldstein, Ecology	General	Stakeholder concerns that contamination that may have come to reside between reactor areas because of undocumented past activities or air releases will not be addressed by this risk assessment. Some of the contamination may be in the upland as well as near the river.	Please see response to Comment #15.
55.	Larry Goldstein, Ecology	General	Important data gaps identified by trustees have been dismissed based on weak rationale or questionable assumptions. The dialogue on this topic at the August 10 meeting was helpful.	Please see response to Comment #1. Regarding amphibians, please see response to Comment #4.
56.	Larry Goldstein, Ecology	General	The document does not cover data interpretation procedures. Section 7.2 of Ecological Risk Assessment Guidance for Superfund (ERAGS), Step 4, indicates that data interpretation procedures should be included in the Sampling and Analysis Plan or Work Plan.	Discussion of data interpretation procedures has been augmented in the revised SAP.

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57.	Larry Goldstein, Ecology	General	Integration of the human and ecological risk assessment objectives, questions, data gaps, data gathering and interpretation need improvement. As written the document is fragmented and difficult to follow.	Risk assessment objectives, data gaps, data collection needs, and interpretation objectives were stated in the DQO process and subsequently documented in the DQO summary report. The risk hypotheses are re-stated in the SAP document. Human health data needs have been clarified in revisions to the SAP document.
58.	Larry Goldstein, Ecology	General	Sampling should be concentrated across the food web for chromium and uranium at elevated discharge points. For higher trophic level organisms the data should be analyzed for sub-lethal and chronic effects in sensitive organs, not whole body. Much more sampling needs to occur, particularly in the 100-D and 300 Areas.	The SAP has been revised to increase the number of samples collected at elevated discharge points for chromium and uranium as well as strontium-90. This includes sub-lethal and chronic effects in sensitive organs, not just whole body analyses.
59.	Larry Goldstein, Ecology	General	<p>In concept Ecology supports the type of study submitted by USGS in November 2003, "The Health Status of Fish in the Hanford Reach of the Columbia River, Washington." This study on resident fish will analyze tissue residue accumulation, DNA damage, histology, lipid peroxidation and necropsies. We believe it is appropriate the USGS conduct this study given their experience (DeLonay 2001, Farag 2000, 2003), expertise and independence.</p> <p>Blanton (pers.comm.) found that sculpins (<i>Cottus spp.</i>) collected near N-Springs had higher mean concentrations of Sr-90 than sculpins from the Vernita area. Compared to migratory or more mobile fish species, sculpins with limited home-ranges may be exposed to higher radiation levels than more mobile fish species. Maximum tissue concentration of Sr-90 in bass and whitefish were typically found near the 100 Area (Poston 1994).</p> <p>Further, this study was recommended in the Hanford Site 100 Area Assessment Plan Volume 1: Columbia River Aquatic Resources (USFWS 1999).</p>	Many of the study elements proposed by the USGS are reflected in this risk assessment. In particular the 100-N Area is targeted with an expansion of data collection efforts. Training requirements for data collection are addressed in the SAP.

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60.	Larry Goldstein, Ecology	Section 1.1, Page 1-2	Please provide more detail on the term "alternative land use."	Text will be clarified to indicate that additional exposure scenarios will be evaluated such as monument worker, avid hunter, avid angler, and tribal use to evaluate alternative land uses.
61.	Larry Goldstein, Ecology	Section 1.3.1, Page 1-5	Contrary to the title of the section, it doesn't appear the problem is stated. Consider reference to the Hanford Past Practice Strategy and the decision for interim actions with no ecological sampling. Ecological risk assessments are needed to write final ROD's.	The text has been revised and clarified as suggested.
62.	Larry Goldstein, Ecology	Section 1.3.2.1, Page 1-8	Please give the reference for contaminant soil benchmarks.	References have been provided.
63.	Larry Goldstein, Ecology	Section 1.3.2.1, Pages 1-9 to 1-12	Given the lack of habitat in remediated sites, the large variability in faunal communities and populations, and the limited sample size both spatially and temporally, we have serious concerns about the validity of results from testing hypotheses 3, 4, 5, 6, 7, and 10.	Given inherent uncertainty in any single proposed measure, hypotheses will be evaluated with multiple measures in a weight of evidence approach to improve confidence in conclusions or estimates of risk. The framework for data evaluation has been expanded to clarify how data will be used. In addition, we have clarified how variability in measures and concordance or discordance are used to characterize ecological risks.
64.	Larry Goldstein, Ecology	Section 1.3.2.3, Page 1-15	The concerns raised in comment #4 [63] also apply to the hypotheses in this section.	See response to Comment #63

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65.	Larry Goldstein, Ecology	Section 1.3.3, Page 1-18	The last paragraph in this section contains terms and concepts that raise concerns. While the general environmental design certainly can benefit from Hanford experts, there is the possibility of introducing bias with a "judgmental" approach. The text notes data will be evaluated on probabilities of 0.05 or less "if there are sufficient data." The number of samples and their location should ensure sufficient data for defensible results. Finally, we question the logic for only evaluating "average values" in calculating exposure and dose. By definition the process can mask any "hot spots" and certainly does not evaluate worst-case scenarios.	We have clarified what aspects of the design are based on science and statistical concepts and which are based on judgment. Please see the response to Comment #46 regarding use of average values in the terrestrial component of the assessment. Based on input from Hanford environmental professionals and on existing site data, the entire aquatic component of the assessment is biased towards capturing worst-case exposure conditions. Please see response to Comments #10, #16, #21 and #30 for more on this topic.
66.	Larry Goldstein, Ecology	Section 1.3.5, Page 1-20	If indeed five values can yield sufficient data for statistical analysis, the method for this assumption should be defined.	It is assumed that five values are enough to provide the necessary sample size for meaningful exploratory data analyses (e.g., box plots). We have also provided an analysis of the expected power of the design (now Appendix B of the revised SAP). The discussion of data analysis has been expanded in the revised SAP.
67.	Larry Goldstein, Ecology	Section 1.3.5, Page 1-20	Reliance on multi-increment soil sampling has great potential for results that do not accurately describe realistic exposures due to averaging. Please provide more information, e.g., how will variability be determined?	The SAP includes a performance assessment of MIS in a fall sampling event. This information will be used to develop the MIS design for the remaining sites to be sampled in the spring.
68.	Larry Goldstein, Ecology	Section 1.3.5, Page 1-20	Appendix B is a fine summary of the fish studies but does not mention the controversy regarding data interpretation. Professionals have disagreed and the data are equivocal. We believe more data on the potential chronic effects of chromium on resident salmon are needed.	More data will be collected to assess the potential for adverse effects on salmon. Please see response to Comment #2 with regard to Appendix B.

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69.	Larry Goldstein, Ecology	Section 1.3.5, Page 1-20	<p>More discussion is needed prior to dismissing studies on amphibians. A PNNL project in 2004 found permanent pools with three species, one of which is the bullfrog (<i>Rana catesbeiana</i>), which is invasive. We believe the potential difficulty in attributing the source of contamination is spurious reasoning to categorically eliminate sensitive species.</p> <p>Wetlands were mapped as part of the Biological Resources Management Plan (BRMAP), Figure D.21, and should be included on Figures 3-2 through 3-6. This will help identify good places for locating amphibians.</p> <p>Amphibian studies were identified as a critical data gap during the June 29th Ecological Workshop. Specifically the SAP should include groundwater seep exposure studies for amphibians for both technetium and tributyl phosphate. In the Herpetofauna of the Hanford Nuclear Reservation, Grant, Franklin and Benton Counties, Washington (Hallock 1998), Hallock identified several locations of woodhouse's toad, Great Basin spadefoot, and bullfrog. Many of these sighting were located between Boat Launch Slough and Hanford Slough. Hallock further indicated that adults could be found during nighttime surveys during early spring through the fall.</p>	Please see response to Comment #4 regarding amphibians.
70.	Larry Goldstein, Ecology	Section 1.3.5, Page 1-21	In dismissing proposed additional radiation surveys it isn't clear from the text that existing radiation surveys were used to inform the environmental design.	The use of existing data has been clarified in the site selection process discussion. The radiological survey maps were provided in the DQO and the results were used for site selection as discussed in Appendix C of the revised SAP.
71.	Larry Goldstein, Ecology	Table 1-5, Page 1-41	Please provide information from the literature to support clam survival, abundance and diversity over 6 months to a year as measurable and sensitive endpoints.	Asiatic clams are primarily used to measure contaminant uptake. Please see response to Comment #49 regarding clam survival. Abundance and diversity of clams are not endpoints targeted in this assessment.

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72.	Larry Goldstein, Ecology	Tables 1-6, 1-7 and 1-8, Pages 1-42	Several elements in the DQO summary report were omitted in the SAP. For example: terrestrial plant survival and growth; soil macroinvertebrates; riparian aerial insectivores survival, growth and reproduction and carnivorous birds and mammals survival, growth and reproduction. Why were these elements of the proposed field study omitted?	As stated in the SAP, bioassays will be conducted for terrestrial plant survival and soil macroinvertebrates (among other tests); kingbird nesting success and sampling of juveniles is also included. On page 4-21 of the DQO summary report, Table 4-12 (footnote c,) note that for carnivorous birds and mammals (e.g., red-tailed hawk, loggerhead shrike, bald eagles, badger, and coyote), the exposure estimate would be modeled based on COPEC concentrations in prey. This is due to the very large home ranges of the higher trophic levels and extreme difficulty in sampling these animals.
73.	Larry Goldstein, Ecology	Section 2.6.1, Page 2-13	The footnote suggests Phase 2 sampling may be required. Is there any other place in the SAP where this contingency is addressed? What are the criteria for making a decision for more sampling? Will there be an adequate budget?	It is assumed that the recent efforts to improve the sample design with more data collection, this assessment will provide adequate data to assess risk based on data collected in FY06.

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74.	Larry Goldstein, Ecology	Section 3.2, Page 3-2	<p>Please explain the rationale for the proposed one hectare size sample plots, whether square or rectangle. Upland sampling sites should be selected based on the home range and dispersal distance of middle trophic level receptors. For example, loggerhead shrikes (<i>Lanius ludovicianus</i>) home range average between 7.5 to 34 ha (Vander Haegen 2003); and sage sparrows (<i>Amphispiza belli</i>) average between 0.8 and 4.4 ha (Petersen et al 1987) (Rich 1980). Black-tailed jack rabbit (<i>Lepus californicus</i>), average home range is 20 ha (Ballenger 2005).</p> <p>Black-tailed jackrabbits were encountered on the Hanford site during the Nature Conservancy surveys (Soll et al 1999). We appreciate these organisms are not planned for study, but they serve to illustrate the huge variability in home range.</p>	<p>The rationale for targeting one hectare sample plots is based on the home range and dispersal distance of middle trophic level receptors. Briefly, operationally defining an assessment population boundary as a circle with species-characteristic (median) dispersal distance as the circle's radius, it can be shown that the assessment population area is a linear multiplier of a species home range (Ryti et al., 2004). Assessment population boundaries for small mammals, the primary focus of the terrestrial component of this assessment, are based on Hanford Site home range data for small mammals (deer mice and pocket mice) and are roughly 1 hectare. It is recognized that many middle trophic-level receptors, particularly birds, have home ranges greater than the 1 ha investigation areas. But because the investigation areas were selected based on known levels of contamination, small mammals, with more limited home ranges, will have a proportionately greater exposure to contamination than far-ranging species such as birds or larger mammals (e.g., black-tailed jackrabbit). Focusing on the most highly exposed component of the middle trophic level will consequently result in protective estimates of risk to this general trophic class.</p>
75.	Larry Goldstein, Ecology	Section 3.2.2, Page 3-5	<p>It can be inferred that Vernita Bridge will be a reference site. At the B/C Pilot meeting on August 9 trustees learned there are significant differences in sediment and flow between this area and the 100/300 Areas, and there are unexplained elevated levels of metals. Given these facts we question the suitability and reliance on Vernita Bridge as a reference site.</p>	<p>The suitability of the Vernita area as a reference site will be evaluated with the data collected in this investigation. Additional reference sites are included.</p>

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76.	Larry Goldstein, Ecology	Section 3.3.1.3, Page 3-7	If surrogate species are considered to estimate risk to threatened, endangered and sensitive species, USFWS, NOAA and WDFW should be involved in this process of species selection.	USFWS, NOAA and WDFW were involved during the DQO in the process of surrogate species selection for threatened, endangered and sensitive species.
77.	Larry Goldstein, Ecology	Section 3.3.3.4, Page 3-12	Please provide more information describing the value of the litterbag decomposition bioassay, particularly given the significant variable of moisture. How will the data be interpreted and correlated with other data?	While aspects of the design have either remained unchanged or have been expanded, it was decided to omit litterbags from the study design due to the confounding effects of soil moisture and soil texture.
78.	Larry Goldstein, Ecology	Section 3.4.3.4, Page 3-15	<p>Why was the aerial insectivorous survey limited to nesting eastern and western kingbird? It is unclear what information the nesting success survey will provide for the risk assessment. Is there any background information on nesting kingbirds at either the reference site or the study sites along the Hanford Reach? How can nesting success be determined by only one years worth of data? Why weren't bats or bank swallows considered?</p> <p>Data on exposure to water-dependent or riparian bird species is limited. As part of the riparian zone studies for the SAP, we recommend eggshell analysis conducted on great blue heron, osprey and egret. This analysis would provide more reliable information on determining radiological and chemical exposure to ecological receptors.</p>	The decision to study kingbirds is based on their role as aerial insectivores and on their previous use at the Hanford Site as monitors of environmental contamination. Similar background and/or developed investigation methods were not available for bats or swallows. It is expected that kingbirds will be feeding on insects emerging from the river. If the insects are contaminated, this should be reflected in analyses of avian tissues (carcass and crop). Because effort will be expended in visiting nests to collect fledgling tissue (the adults may have picked up contamination off site), it was deemed prudent to maximize the data collection and include nest success. Because eggshells may reflect contamination picked up offsite, the avian measure selected was deemed to have the least uncertainty around Hanford Site exposure. Also see Blus et al (1985).

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79.	Larry Goldstein, Ecology	Section 3.5.3, Page 3-17	<p>The hyporheic zone has been recognized as a critical component of many streams and rivers. Hyporheic habitats contain a diverse and abundant fauna (Williams and Hynes 1974) often dominating the biological productivity of rivers (Smock et al. 1992). Salmon utilize the hyporheic zone during egg development and after hatching (Vaux 1968). As a result, spawning behavior of some salmon populations is influenced by subsurface ground water and hyporheic flows.</p> <p>The SAP does not include a discussion on how this complex ecological component of the river system is going to be analyzed as part of the ecological risk assessment process. The hyporheic zone was identified as a data gap in the Ecological Workshop in June. There is a need to include a mapping study in the river that shows the groundwater discharge areas and relationships of populations of organism in those areas.</p>	Please see response to Comment #3.
80.	Larry Goldstein, Ecology	Section 3.5.3.2, Page 3-18	Analysis of aquatic contaminants in fish by whole body seems inappropriate and potentially misleading given some contaminants are lipophilic, e.g., PCB's, or organ sensitive, e.g., metals in kidneys.	Chemical and histopathological analyses will be performed on fish organs.
81.	Larry Goldstein, Ecology	Figure 3-7, Page 3-27	The native soils reference site in the Arid Lands Ecology Reserve (ALE) would not serve as a good reference site since it cannot be considered "undisturbed" since it was impacted by the fire in 2000. The 24 Command fire severely impacted vegetation on those areas burned (PNNL 2003).	Degree of disturbance is one of many considerations in selecting reference sites. However, this reference site area was not impacted by the fire.
82.	Larry Goldstein, Ecology	Page B-5	The last sentence in the conclusion reads, "If it is found that contaminants are bioaccumulating in fish tissues at levels that warrant concern, further studies on salmonids may be recommended." We believe this very conditional statement is contrary to the express intent of CERCLA § 107 and MTCA 173-340-7493 as an ARAR	Comment noted. This appendix has been deleted from the SAP.

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83.	Larry Gadbois, USEPA Region 10	Technical and editorial	<p>Gradient Analysis. The upfront description of the statistical approaches planned for in the sampling and analysis design, i.e. the hypotheses and gradient analysis design, is appreciated. Common recommendations of minimum sample number to conduct a gradient analysis are on the order of 20-30, with more strongly encouraged. This number is with respect to the one particular gradient of interest, and the design has the greatest potential for detecting a signal if all other factors are held to a minimum. The current plan proposes a gradient analysis that will attempt to span a gradient of contamination, while also blocking on four different habitat types. This effectively reduces the number of sites available to span a contamination gradient in a given habitat type, to 7 (or maybe 10 if the total site number is increased to 40 as has been speculated). If habitat differences are subtle or not particularly important, then the design might be suitable. However, it runs <u>the very real risk</u> of “learning what you already know,” that the block effect is driving the response because the gradient is too weak to be detected. (i.e. that different habitat types have different populations and/or communities regardless of contaminant level). It is recommended that if the gradient design is to be pursued, then either: a) more sites are added to each block, or b) the number of blocks be reduced to just those two that are likely the most different (remediated vs. native soils, or barren ground vs. vegetated). This later option would result in 20 sites per block (assuming total site number was 40). A separate set of reference sites is <u>not</u> explicitly needed. in a gradient design, rather they only need to be included as the “low end” of the gradient of interest. If the proposed reference sites constitute a third habitat type clearly different from the two treatment groups, they should not be used in the gradient design</p>	<p>The SAP includes more information on the proposed data analysis and interpretation, which includes comparison to reference sites, gradients, and comparison to literature values. Although gradient analysis is one component of the study design, it is not the only line of evidence evaluated for ecological risks. Based on the existing data and process knowledge regarding residual contamination at remediated waste sites, it is unlikely that there will be a steep gradient in either surface soil or biota concentrations at upland sites. Thus, the data could be pooled across sites types to improve the power of detecting small difference in average contaminant concentrations between these upland sites. This point has been clarified in the SAP. The situation is different at the riparian and near-shore locations. We have used the existing radiological survey data to target riparian locations for investigation areas. We have also increased the number of near-shore locations and stratified their locations to provide coverage of the key contaminant plumes (hexavalent chromium, uranium, and strontium-90). These points have also been clarified in the revised SAP.</p>

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84.	Larry Gadbois, USEPA Region 10	Technical and editorial	The co-location of aquifer tubes, rock baskets, and clam tubes at the sites of highest likely exposure to radionuclides is an appropriately conservative approach. The 6-month exposure period for the rock baskets and the clam tubes also seems appropriately long. However, the temporal component of the aquifer tube sampling appears less useful, i.e. one water sample retrieved over the course of a 6-month exposure of fluctuating river stage is insufficient to describe exposure. Either addition aquifer tube samples could be collected over the exposure period or co-location of a time-integrating surrogate sampling device should be considered.	One sampling event under worst-case conditions (proportionately greatest groundwater representation in porewater) is considered to be adequate to characterize porewater exposure. There are data to provide information on the temporal variability of seep concentrations, and these data will be considered in risk characterization and uncertainty analysis.
85.	Larry Gadbois, USEPA Region 10	Technical and editorial	Use of all available data, including older poorly documented data, should be done with caution. There is bad data. There is also data that was collected for specific purposes in an unusual manner that should be handled as unique data. Combining and using add available data as discussed in this document may very well result in inappropriate conclusions. Data from other and previous projects and monitoring should be used, but should be used in a way consistent with the original context.	Employment of existing data will be made with appropriate caveats and in recognition of the circumstances in which existing data were generated. However, some of these existing data were collected by the same project teams at several locations and thus should be internally consistent and provide relative measures of exposure and variability in exposure.

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86.	Larry Gadbois, USEPA Region 10	Technical and editorial	Tissue sampling. The projected number of tissue samples in the upland and riparian areas appears sufficient, while the number in the near-shore zone (i.e. the zone with the highest potential exposure) seems insufficient. Additional fish samples are recommended. (This reviewer is not aware of the value of analysis of hard-tissue [i.e. shells?] and that analysis could be considered for re-appropriation.) Additionally, when sampling biota tissue, there is an opportunity to evaluate the target of the expected contaminant in-vitro rather than relying on tissue-based effects from the literature. Given the likely mechanism of action, target organs could be sub-sampled for sub-lethal effects. It is acknowledged that these types of endpoints are difficult to interpret and may seem less useful. However, an investigation that evaluates the most sensitive endpoint (in this case the target organ) gives additional confidence in a conclusion where "no effect was observed" is a likely outcome. Livers and other susceptible organs should be evaluated for abnormal histopathology in birds, mammals, and fish. As some level of abnormal histopathology is expected in any given population, such an investigation is most valuable with a large sample size. As cost of histopathology is likely less than or equivalent to sampling cost, these organisms should be sampled opportunistically with a goal of 'as many as available.' (Co-characterization of other parameters [sediments, aqueous concentrations, etc.] is not needed at all collection locations for histopathology.)	Please see response to Comment #13 regarding expansion of aquatic sampling. Target organs will be sampled in mammals (carcass for contaminant suites, liver/kidney for metals and isotopic uranium), birds (carcass and crop for contaminant suites) and fish (carcass for contaminant suites, kidney for metals and isotopic uranium and histopathology).
87.	Larry Gadbois, USEPA Region 10	Technical and editorial	One of the mistakes in the 100-BC Pilot risk assessment was that soil samples were processed using a hydrofluoric acid digestion. That should not be done in the 100/300 Area risk assessment.	Agreed: In Draft A of the SAP Table 2-2 footnote 'n' specifies the extraction method 3050B.

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88.	Larry Gadbois, USEPA Region 10	Page ES- 2, 1 st para	The document states “analytical suites are basically the same between media with a few exceptions.” EPA supports that strategy. Something that occurs later relates to which analytes to run (and drop) if there is insufficient volume of material to fulfill all analytical requirements. A predetermined order is presented for each media. It may be better to have a predetermined order that varies from place to place. There are areas where residual organics like pesticides are a chief concern (such as Hanford/White Bluffs townsites and construction camps in the 100-IU-2 and 100-IU-6 operable units). In those cases, pesticides should be at the beginning of the list. There are other areas where residual uranium, or other areas where residual strontium-90 is the key interest. The priority for analytics should be established accordingly.	The priority for analyses will be established for samples having mass limitations (e.g., internal organs) according to the primary risk drivers characteristic of a sampling area.
89.	Larry Gadbois, USEPA Region 10	Page ES- 3, 1 st paragraph	The document states “the soil with the highest biological activity...0- to 15cm will be sampled along with site biota to assess whether plants and animals are potentially taking up contaminants from the top 6 inches or from deeper soils.” EPA has brought this issue up many times before and it is worth doing so again. Some of the plants have significant rooting mass below 6 inches in the soil. That soil is not going to be sampled. Without that deeper soil information, we will not be able to calculate biological uptake factors for any deeper-rooted plants. Presumably, subsequent risk assessment calculations with this data will calculate soil-to-plant-to-herbivore transport of contaminants. We won’t have the data to do this for deeper-rooted plants.	This is a large-scale assessment. The 100 Area and 300 Area combined represent over 25 square miles of land and approximately 18 linear miles of the Columbia River; information will be collected on these Areas by using 45 hectare-sized plots to assess risk. It is true that deep soil sampling at the investigation areas is necessary to calculate biological uptake factors for deeper-rooted plants. However, the resources associated with deep soil sampling at the scale under consideration was not justified considering the more likely exposure routes of soil to surface invertebrates and invertebrate-eating wildlife.
90.	Larry Gadbois, USEPA Region 10	Page ES- 3, 2 nd paragraph	Here and elsewhere in the document the use of horizontal aquifer tubes is discussed. A brief description of these tubes within the executive summary would be helpful. For a decade, the site has used vertical aquifer tubes both on-shore and in the river bottom. Horizontal tubes are new at Hanford and should be described.	Horizontal aquifer tubes are more thoroughly described in the revised SAP.

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91.	Larry Gadbois, USEPA Region 10	General comment.	During the workshop on August 10, there was considerable discussion about the small number of samples being collected. There were questions about the statistical power that would be available in the resultant data. The draft SAP contains little discussion about variability in the environmental media and how many samples would need to be collected to have a given level of confidence in the data. More information on which data would be handled statistically, which would not, and the anticipated alpha and beta errors with the final sampling plan would be very helpful to the reader.	Please see response to Comment #13 regarding expanded sampling efforts. Additional discussion of planned data analyses has been incorporated in the revised SAP.
92.	Larry Gadbois, USEPA Region 10	General comment.	The results of the litterbag technique in this arid climate will be extremely dependent on soil moisture. In the various sections that discuss this, there is no mention of moisture control or monitoring ambient moisture levels. It is hard to imagine how a toxicant effect from a post remediated or background site would be identified against a strong moisture-induced effect if moisture is not measured or controlled. Nutrients in the soil should also be measured, as this will be important to assess the degradation rates.	Please see response to Comment #77.

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93.	Larry Gadbois, USEPA Region 10	Page 3-2, aquatic sites, 2 nd paragraph	<p>Vertical aquifer tubes have been used at Hanford for a decade, and most people interested in such things understand those tubes. Horizontal aquifer tubes are new to this audience. A descriptive picture was provided in the August 10th workshop. It would be good to add this to the document. Also, normal practice when adopting a new technique is do some side-by-side comparison of the old and new technique. This would be good to do at some of the aquifer tube sites.</p> <p>An explanation of the volume of water contained in the hyporheic zone compared to the volume of water needed for analytical work (and any system purging) should be provided. There is a danger that river water will be drawn down into the hyporheic area and into the aquifer tube, causing dilution. The percent of the bottom substrate believed to be water and the volume of that water over and immediately adjacent to the sampling tube should be presented.</p>	A figure of a horizontal aquifer tube has been added to the SAP (Figure 3-11). An assessment of the purging and extraction methodology is being made and additional details will be included (e.g., evaluating conductivity during sample extraction).
94.	Larry Gadbois, USEPA Region 10	Page 3-6, section 3.2.4	The document states "Water sampling will follow the ERC groundwater sampling procedures." This could be problematic. If the 100 BC pilot project used the ERC groundwater sampling procedures when it filtered the groundwater to be used for the human health risk assessment, then we should not use the ERC groundwater sampling procedures.	Collection of groundwater samples from the 100 and 300 Areas will be coordinated with appropriate contractors; samples are collected using established site procedures. Text will be clarified to indicate that "Water sampling will be conducted during routine monitoring and unfiltered samples will be analyzed for additional analytical suites as listed in Table 1-2."
95.	Larry Gadbois, USEPA Region 10	Page 3-7, section 3.3	The document states "Available vegetation in the remediated waste site areas is typically...or those species that were planted as part of a restorative revegetation effort." Should species which are rapid recruiters to the area also be mentioned since they may be a dominant vegetation at some sites?	The suggested edit has been made.

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96.	Larry Gadbois, USEPA Region 10	Page 3-7, section 3.3.1.2, 1 st paragraph	The document states "presence of cryptogams, canopy cover, frequency, and composition by canopy cover." Frequency of what?	Frequency is in reference to the occurrence of various plant species encountered (e.g. "ambrosia was detected in all 32 plots and the mariposa lily was only detected in 1 out of 32 plots.") The SAP will be revised to note, "presence of cryptogams, aerial extent and species composition of canopy cover."
97.	Larry Gadbois, USEPA Region 10	Page 3-7, section 3.3.1.2, 2 nd paragraph	This paragraph contains a description establishing investigative plots, and the number of plots would be 4 to 10 based on site conditions and the decision by the biologist. That makes sense. But usually Hanford plans with this sort of subjectivity end up being the minimum, a justification for why the minimum was appropriate, but budget was the real driver. I hope that the biologist is not encumbered by budget limits so (s)he can make a habitat-based decision	Comment noted and text revised to be 32 per hectare. In actuality, the standard practice of number of Daubenmire plots measured (in Central Plateau EcoDQO site characterization) in investigation area quarters has been closer to 30 than the 4-10 quoted in the SAP.

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98.	Larry Gadbois, USEPA Region 10	Page 3-8, section 3.3.1.3, last paragraph	<p>This paragraph discusses identifying T&E species that could potentially inhabit the site as a first step. Exposure would then be estimated using surrogate species and some guidance for selection of a surrogate species. The document then states “Exposure determined or estimated in surrogate species”...“Exposure estimates for contaminants detected in surrogate...”</p> <p>The work plan (DOE/RL-2004-37) for this project states this is a one year sampling effort. When will the T&E presence or potentially present activity be conducted? (Note that a species if present might not be present until some period later in the sampling year.) How long after that period would be needed to determine an appropriate surrogate species to study? Then a mini-SAP would need to be created for that species. Perhaps that surrogate species is not a permanent resident and it wouldn't be until the following year until it could be sampled. Note also that this document discusses contaminants detected in the surrogate, so this is not just a modeling activity.</p> <p>In short, EPA doesn't believe all these sequential activities would happen within a year. Therefore, either the project would be delayed to do this work, or it won't happen.</p>	<p>The process for evaluation of threatened and endangered species for this risk assessment used methodology developed for the 100-NR-2 risk assessment, including drafting a robust database of Hanford Site species with involvement from the Tri-Parties. Information from this database was used in the selection of assessment endpoints and measurement endpoints in the 100 Area and 300 Area risk assessment; e.g., Chinook salmon, Figure 5-3, DQO (BHI-01757 [BHI 2005]). Sculpin are being employed as surrogate fish species (histopathology measures and full-suite tissue contaminant analyses) for salmon. Assessment of T&E plants (e.g., lowland toothcup) will involve habitat assessment. Once the suitability of the plots as habitat for T&E species is assessed, a search will be made for those plants, taking into account as much as possible the seasons of occurrence. If a T&E plant is found, soil will be collected around it and analyzed for the suites of contaminants and a bioassay (for up to 15 samples). If 15 T&E plants are not found, or it is out of their season of occurrence, the remainder of the samples will be collected from areas shown to have elevated radiation readings from the 2004 surveys. The discrete samples will also be analyzed for the suites of contaminants and bioassays.</p>
99.	Larry Gadbois, USEPA Region 10	Page 3-10, section 3.3.2.2	<p>The document states “Groundwater samples will be analyzed for the same parameters as those identified for the groundwater monitoring program.” This should be changed to match the analytical suites for the other media. See for example section 3.3.3 for analytical suites.</p>	<p>Change made.</p>

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100.	Larry Gadbois, USEPA Region 10	Page 3-10, section 3.3.3.1	For plant collection, the document states “the top three dominant plant species will be noted... Plant samples will be combined into separate bags for each species, resulting in up to three composite samples for each investigation area.” It is hard for the reader to understand why exactly three dominant species will be noted. (For example if there are five dominant plant species, why wouldn’t all five be noted?) It is also hard for the reader to understand why up to three composite samples. If there are 3, 4, or 5 dominant plant species, why wouldn’t 3, 4, or 5 species-specific composites be collected? Footnote “b” to table 3-8 is also affected by this comment.	Plant samples were limited to dominant plants to represent most of the potentially contaminated flora at an investigation area. In the revision to the SAP, the plant sampling was modified to collect the top two dominant plants. Given the relative homogeneity in many of the vegetational communities to be sampled (e.g., remediated waste sites planted with sagebrush and Sandberg’s bluegrass, among other species), it is expected that tissue concentrations of the two most dominant plants will represent the majority of vegetation at a given investigation area. Ideally the plants selected from the vegetation abundance results will be consistently located across all sites and, if possible, at least one species will be representative of deep rooted species. This will be clarified in the revised SAP.
101.	Larry Gadbois, USEPA Region 10	Page 3-14, section 3.4.2	The soil samples analytical suites includes both “total organic carbon” and “organic matter.” A couple words to explain the difference between these two measures would be helpful.	Text was clarified
102.	Larry Gadbois, USEPA Region 10	Page 3-15, section 3.4.3.5	This section describes placing the litterbag so that it is not below the high-water zone. This suggests soil above the riparian moist area. If so, it is not clear how that data will be relevant to the adjacent riparian zone.	Please see response to Comment #77.
103.	Larry Gadbois, USEPA Region 10	Page 3-15, section 3.4.4	The document states “If there is insufficient avian tissue obtained, a nest box study may be employed.” In a one year study (as per the work plan, DOE/RL-2004-37, Rev 2) it is not clear how the project will respond sufficiently quickly to the lack of avian tissue to plan, prepare, and conduct the nest box study.	It is anticipated that the original and recently expanded data-collection efforts outlined in the SAP will provide the requisite information to conclude sampling in one year. The contingency for nest box sampling has been removed from the revised SAP.
104.	Larry Gadbois, USEPA Region 10	Page 3-17, section 3.5.2.2	The document should state if the pore water is filtered or unfiltered.	Change will be made to indicate that unfiltered pore water will be used.

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105.	Larry Gadbois, USEPA Region 10	Page 3-17, section 3.5.2.2	The document states "Samples are collected using a peristaltic pump." Please see the previous comment regarding drawing down river water. Peristaltic pumps can pump much faster than the groundwater discharge rate at that small area.	Please see response to Comment #93.
106.	Larry Gadbois, USEPA Region 10	Page 3-17, section 3.5.2.3	Regarding surface water sampling, the document should indicate the depth in the water column at which the samples would be collected. Previous studies looking at vertical distances in the water column vs concentration consistently show that where groundwater upwells and is detected at the very bottom of the water column, within a few inches from the bottom the concentrations are at background levels. So depth of sample is extremely important. And interpretation of the data must consider depth in the water column.	Agreed. The SAP has been clarified to state that surface water samples are to be collected ~6 cm above the river bed.
107.	Larry Gadbois, USEPA Region 10	Page 3-17, section 3.5.2.3	Second sentence. As written, this could be interpreted several different ways. Based on more information from table 3-10, I think this is what is meant: "Surface water samples will be collected from all locations used for aquifer tubes, and also for all locations used for sediment samples." If that is true, consider writing the document something like that.	That interpretation is correct. The text has been revised accordingly.
108.	Larry Gadbois, USEPA Region 10	Page 3-18, section 3.5.3.1	Regarding installing clam tubes, the document states the tubes will be "left for a period of 90 days to encompass the low-flow conditions in late summer and winter." Should this really be "late autumn and winter?" I believe the project plans to begin field work in October 2005, which is already autumn.	Change made.
109.	Larry Gadbois, USEPA Region 10	Page 3-19, section 3.5.4	For the order of analytes, consider having a site-specific order to respond to limited sampling media. But for the default order, pesticides will likely be of more interest than TPHs.	Change made.
110.	Larry Gadbois, USEPA Region 10	Page 3-20, section 3.9	The document states that waste will be managed "consistent with an established waste management plan." Two points. Waste management should be in accord with (not just consistent with) the waste management plan. Also, to which waste management plan does this document refer? A specific reference should be provided.	Waste management is in accord with the waste control plan. This plan is being developed in September before sampling begins, now that the sampling design is more completely defined.

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111.	Larry Gadbois, USEPA Region 10	Page 3-32, table 3-5.	Footnote "a" states that these upland "sites will be selected during initial reconnaissance activities." "Will be" is a future tense, but table A-1 already lists the upland sites. This is confusing.	Agree. Change will be made to reflect past tense.
112.	Stuart Harris, CTUIR	Statistical Design & Sampling	We have some concerns about the 100-300 SAP regarding the statistical design of this fall's sampling campaign. Most of the concerns are due to the fact that baseline risk assessments are intended to be performed before remediation. The 100/300 SAP includes both remediated upland sites and unremediated riparian and near-shore aquatic sites. Because the guidance for doing baseline risk assessments was developed for pre-remediation conditions, a number of problems arise when they are applied post-remediation. As we have commented previously, we believe that a clarification of the study goals and data requirements would result in more useful information.	Clarification of the project objectives have been made in the revised SAP.
113.	Stuart Harris, CTUIR	Statistical Design & Sampling	Were the numerical remedial goals chosen correctly for ecological receptors, based on laboratory data?	This risk assessment has not employed numerical remedial action goals for ecological receptors. A screening-level ecological risk assessment served as the basis for the DQO and is included as Appendix C to the DQO Summary Report.
114.	Stuart Harris, CTUIR	Statistical Design & Sampling	Have the remediated sites in the 100 Area resulted in conditions where biota are/are not exposed (as confirmed by exposure determinations)? Is this different for sites remediated to industrial and residential standards? Can the protectiveness of the numerical remedial goals be verified by carefully selected field studies based on knowing the mode of action of the major contaminants and the sensitive species and endpoints?	The purpose of this SAP is to provide the information needed for a risk assessment. The need to develop remedial action goals is a risk management decision and is therefore outside the scope of this risk assessment.
115.	Stuart Harris, CTUIR	Statistical Design & Sampling	Are different kinds of data needed for unremediated riparian and near-shore aquatic areas in order to prospectively develop numerical remedial goals?	Different kinds of data have been proposed for the riparian and near-shore environments. As noted above, the purpose of this SAP is to provide the information needed for a risk assessment. The need to develop remedial action goals is a risk management decision and is therefore outside the scope of this risk assessment.

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116.	Stuart Harris, CTUIR	Specific	The laboratory toxicity tests may provide the most useful information, and we recommend that these be retained.	Agree
117.	Stuart Harris, CTUIR	Specific	We remain concerned that the comparison site, Vernita, is contaminated (according to DOE's data), and therefore will not be able to tell us much. We also disagree that borrow pits are the appropriate reference sites for remediated sites. In fact, there is no real "habitat" at remediated sites, especially since revegetation success is so low. We request a discussion of the proper selection of reference sites (prior to remediation) and comparison sites (after remediation) with the Trustees.	The Trustees have been involved with numerous discussions on reference sites, and DOE has included several additional specific reference sites based on input from USFWS and Ecology. While the revegetation at remediated sites will take many years to resemble undisturbed areas, the risk assessment will evaluate the soil, insects, mice, and vegetation that have come back. Areas in and near borrow sites that have revegetated are the only practical areas to sample with similar soils to the remediated waste sites. The data quality assessment will include an evaluation of the suitability of the reference sites for assessing ecological risks.

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118.	Stuart Harris, CTUIR	Specific	<p>The utility of testing some of the hypotheses is unclear with respect to the overall goal, which seems to be to determine whether the original remedial goals were adequate.</p> <p>The exact species, tissues, and locations are not clear. The riparian and near-shore sampling locations seem to be targeted appropriately, but the rationale for upland remediated sites is not as clear, or is directed at a different scientific question.</p> <p>For example, doing plant surveys at remediated sites will only tell us something about revegetation success, but this is related to the quality of restoration work, not to the original numerical remediation goals. It is true that biodiversity is important to monitor as revegetation and regrowth continues over the next few decades. However, a snapshot at poorly restored sites may not be too informative.</p> <p>Similarly, it is not clear what data litter bags will tell us, especially in these arid soils.</p> <p>We believe that soil sieving is needed, since the data will be used for human as well as ecological risk assessment.</p>	<p>The primary objective of this SAP is to provide information for risk assessment. The hypotheses are structured accordingly. We welcome any suggestions on alternate formulations of the hypotheses.</p> <p>The rationale for selecting upland sites is discussed in Appendix C of the revised SAP.</p> <p>Please see response to Comment #77 regarding litterbags.</p> <p>Soil will be sieved to less than 2 mm as noted in SAP Section 3.3.2.1, bullet 2.</p>
119.	Stuart Harris, CTUIR	Specific	<p>Most of the questions about appropriate remedial goals can be answered with good literature reviews combined with laboratory studies</p>	<p>The design includes literature, field, laboratory, and modeled measures, which are all used as lines of evidence to assess ecological risks.</p>

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120.	Stuart Harris, CTUIR	Specific	No literature review has been done for the COPECs that looks at new published data, modes of action, sensitive species, and so on. This should have been done before the study design was done, so that carefully targeted field experiments could be designed with an adequate sample size and dose responses could be designed. As it is, a wide scattershot of sample collection will be made, and we won't know until much later whether the selected locations actually provide the concentration gradients that are hoped for.	<p>An extensive toxicological literature survey has been performed and is being used in this assessment. The information is compiled in a database that is regularly updated with information from new studies. For example, the information that went into the ecological screening assessment (DQO Appendix C) represents the current state of the science for toxicological thresholds of hundreds of chemicals and radionuclides. Some additional information on the ecological effects of indicator contaminants has been included in the revised SAP.</p> <p>Site selection was determined on the basis of concentration gradients as described in Appendix C of the revised SAP.</p>
121.	Stuart Harris, CTUIR	Specific	There is no real discussion of how many individuals constitutes a population, how are various endpoints rolled up to organismal or population levels, or how stressor identification and other sublethal effects are considered in risk conclusions. We disagree with the DOE rule that 20% reduction in growth, reproduction, or survival is acceptable. A 5% rule <i>may</i> be appropriate for species that are not of tribal importance (essentially a LOAEL), while a 0% rule (or NOAEL) is appropriate for species of tribal importance, ecological keystone species, and T&E species. This discussion is also relevant to the common scientific standard of requiring $p < 0.05$ for rejecting each null hypothesis. No discussion of alpha and beta error was included in the discussion of sample size or in data interpretation.	<p>Please see response to Comments #46 and #74 regarding populations.</p> <p>Please see response to the "20% rule" in Comment #11. However, please note that 20% is not a "DOE rule."</p> <p>The SAP has been revised to clarify how data analyses/interpretation and lines of evidence will be used in making risk conclusions.</p>

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122.	Gabe Bohnnee, Nez Perce	General	The ERWM comments are broken down into two general areas: 1) sample design, and 2) recommendations for conducting other studies as part of the ecological risk assessment process. The Nez Perce Tribe is a participating member of Hanford Natural Resource Trustee Council and has been encouraged by DOE to utilize this document as an opportunity to submit comments regarding other potential pathway studies that could be conducted in the 100 and 300 Areas	Comment noted.
123.	Gabe Bohnnee, Nez Perce	Study Design	Whether or not amphibians should be a part of the overall design needs to be, reconsidered. If habitat is a limiting factor and the population numbers are very low, this needs to be documented. The rationale given on page 1-20, that it would be difficult to assess where that animal picked up the contaminant load, is weak. Home ranges of amphibians are probably smaller than small mammals that are being assessed as part of this study. Making any assessment of where an amphibian picked up a load of contaminants would be no more difficult than in doing that same assessment on a small mammal.	Agree. Please see response to Comment #4.
124.	Gabe Bohnnee, Nez Perce	Study Design Page 1-20	The fourth paragraph provides a rationale for eliminating fish studies as part of this SAP, ERWM does not agree with this rationale. The information provided in Appendix B does a good job of summarizing the past fish/chromium studies at Hanford. However, those studies also raised as many questions as they answered, and there is major disagreement between Hanford and USGS scientists on what the results of those studies really mean. More fish studies at Hanford with species such as salmon and sculpins need to be completed with respect to contaminant effects and uptake.	Fish studies are being conducted as part of the risk assessment; specifically, resident species with limited home ranges are being targeted for tissue concentration analyses (carcass and liver) and histopathology analyses (organs). Please see response to Comment #2 regarding Appendix B.

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125.	Gabe Bohnee, Nez Perce	Study Design, Section 1-49	"Based on the information provided in the <i>RCBRA Stack Air Emissions Deposition Scoping Document</i> (DOE-RL 2005b, in preparation), the upland study will not include a specific set of investigations to address air dispersion because of the present-day low risk potential associated with past air releases." When will this document be available for review?	The <i>RCBRA Stack Air Emissions Deposition Scoping Document</i> is available for downloading at http://www.washingtonclosure.com/Projects/enstate/docs/RL-2005-49_Rev0.pdf . Printed copies have recently been distributed.
126.	Gabe Bohnee, Nez Perce	Study Design Section 3-9	What procedures are being used for soil sample mixing and splitting to obtain an "average" or "uniform" sample?	Multi-increment sampling will provide for a robust estimate of mean contaminant exposure concentrations. This sampling technique is described in more detail in a newly added appendix to the SAP (see Appendix B). In addition, the MIS is being evaluated during performance assessment sampling in fall 2005.
127.	Gabe Bohnee Nez Perce	Study Design, Section 3-16	In the Near-Shore Zone, what is the basis for expecting deposits of fine-grained sediments in this zone to be areas of highest concentrations of contaminants?	There may be a misunderstanding on what was intended by this text. Fine-grained sediments are not necessarily found where there are greater concentrations of contaminants. Page 3-2, the second paragraph under the Aquatic Sites section, notes that fine-grained sediment has the highest surface area relative to other sediment types (e.g., sands, gravels). This high surface area allows for more contaminants to adsorb on to the fine particles relative to sands, which have a smaller surface area for a given mass.
128.	Gabe Bohnee, Nez Perce	General	In June ERWM staff met with the trustees and several Hanford scientists to discuss ecological data gaps at the Hanford Site in general. One of the issues discussed was the need to concentrate on chromium, strontium, and uranium in the aquatic environment. Subsequent discussions and meetings have led ERWM to believe that chromium is a priority in identifying potential impacts of contaminants at Hanford. It is not the intent of ERWM that uranium and strontium studies be neglected, but chromium in the opinion of most scientists appears to be a priority.	Please see response to Comment #13 for more information on increased efforts to characterize chromium, strontium, and uranium in the aquatic environment.

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129.	Gabe Bohnee, Nez Perce	Specific	PNNL scientists have indicated that the spatial extent of the chromium plume in the Columbia River is not complete and more mapping work needs to be done. This mapping is especially important so that sampling sites in any future studies can be located in areas that will provide the best data.	The location of existing chromium plumes have been sufficiently delineated to guide ongoing remedial actions, and to locate sampling sites for this risk assessment. Ongoing remedial actions include monitoring the plumes to assess the effectiveness of the remedial actions to contain the plumes and identify any plume movement. Plume maps are provided each year in the sitewide groundwater report (see http://groundwater.pnl.gov/ for monitoring and modeling information).
130.	Gabe Bohnee, Nez Perce	Specific	They also indicated that development of a summary document detailing the complete chromium story at Hanford, starting with the inception of the Manhattan Project to present day conditions, would be very useful. This would also include documenting the fate of chromium throughout the food chain.	This type of document is outside the scope of the risk assessment.
131.	Gabe Bohnee, Nez Perce	Specific	In addition, Hanford scientists have indicated that a laboratory study utilizing snails to determine synergistic effects of multiple contaminants could be useful.	Laboratory studies are currently planned to evaluate potentially synergistic effects of multiple Hanford-Site contaminants. Studies with snails may be useful but are less standardized than the ASTM-endorsed aquatic bioassays selected. In addition, snails are likely to be less sensitive than the amphipods, cladocerans and amphibians targeted for toxicity testing.
132.	Gabe Bohnee, Nez Perce	Specific	ERWM supports in concept the study proposed by USGS entitled: <i>The Health Status of Fish in The Hanford Reach of the Columbia River, Washington</i> . ERWM is aware that this has been received by your office and will be an attachment with the USFWS comments on this document. The study design proposed by USGS could certainly be modified or changed but the overall concept of looking at fish health is important.	Many of the study elements proposed by the USGS are reflected in this risk assessment. Data collection will be performed by qualified personnel as required by the SAP.

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133.	Gabe Bohnnee, Nez Perce	Specific comments	A study is needed that focuses on sculpin accumulation of chromium in kidney tissue. This would focus on locations in the river where high chromium concentrations in aquifer tubes are observed. Compositing whole bodies as currently presented in the SAP may underestimate the uptake of chromium by sculpin.	The SAP was revised to focus on accumulation of contaminants in sculpin liver tissue in areas where high levels of chromium, strontium-90 and uranium are observed. See response to Comment #13.
134.	Gabe Bohnnee, Nez Perce	Specific	Analyze concentrations of chromium in aquifer tubes, water collected at the sediment/water interface, benthic invertebrates from rock basket, and clams from the same locations where sculpin are collected.	The SAP calls for the analysis of chromium in aquifer tubes, water collected at the sediment/water interface, benthic invertebrates from rock basket, and clams from the same locations where sculpin are collected.
135.	Gabe Bohnnee, Nez Perce	Specific	Recent mussel surveys on the Hanford Reach have shown that some naive mussels are 100 years old. It might be beneficial to sample mussel shells in discreet units of time when large quantities of contaminants were entering the river many years ago to look for evidence of growth effects.	The aquatic measures currently selected are considered adequate for characterizing present-day ecological risk in the aquatic near-shore environment.
136.	Washington State Department of Ecology Comments	General	The document does not cover data interpretation procedures. Section 7.2 of Ecological Risk Assessment Guidance for Superfund, Step 4, indicates that data interpretation procedures should be included in the Sampling and Analysis Plan (SAP) or Work Plan (WP). It does not appear that they are provided in either document. Provide a subheading to highlight them in the SAP (if they are in the SAP), include a statement in the SAP pointing to them in the WP, or add them to the SAP in their own subsection.	The types of data interpretation methods has been added to the SAP and cross-referenced to the measures (see Appendix D of the revised SAP).

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137.	Washington State Department of Ecology Comments	General	<p>Ecology is concerned that there is a consistent write-up for the RI/FS scoping process, specifically stakeholder concerns that contamination that may have come to reside between reactor areas as a result of undocumented past activities or air releases will not be addressed by this risk assessment. Some of the contamination may be in the upland as well as near the river. Although a number of historical efforts have been done to identify waste sites, those activities are rarely referred to. The elements that USDOE could address in a consistent write-up might include:</p> <ul style="list-style-type: none"> • Regulatory basis, i.e., 40 CFR 300.430(b) (1) requirements to “Assemble and evaluate existing data on the site, including the results of any removal actions, remedial preliminary assessment and <u>site inspections, and the NPL listing process.</u>” [underline added for emphasis] • Regulatory compliance, i.e., Section 3.0 of the TPA Action Plan and 40 CFR 300.405 <i>Discovery or notification.</i> • Air deposition white paper • Discovery site process (plug-in approach) • Orphan sites evaluations <p>(JP, BR)</p>	<p>A discussion of the scope of the SAP and the purpose of the risk assessment – “make decisions on the waste sites in the 100 Area and 300 Area” has been clarified in the revised SAP. Also, text has been prepared to summarize the historical and current efforts on searching for and identifying potential waste sites across the Hanford Site.</p>
138.	Washington State Department of Ecology Comments	General	<p>Ecology’s policy for groundwater protection is that there shall be minimal further degradation of groundwater quality relative to the current condition at the site. See Chapter 3, P.2, Hanford Site Groundwater Strategy (DOE/RL-2002-59). “Minimize further degradation of groundwater consistent with state and federal anti-degradation policies, during remedial and closure activities (for example, tank waste retrieval), including the reduction of preferential pathways such as abandoned wells.”</p> <p>The SAP should discuss this policy and indicate that the risk goals for groundwater protection are consistent with this policy.</p>	<p>Ecology’s understanding is correct: The risk assessment will evaluate migration of contaminants in shallow and deep zone soils to groundwater. The most appropriate model to evaluate soil to groundwater transport has not yet been determined for all contaminants; however, the intent is to use the RESRAD model as a preliminary screening step and a technically-defensible, recognized method (e.g., the STOMP model) will be used, if necessary, in the feasibility study or proposed plan phase of the River Corridor Closure Contract to identify those</p>

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				contaminants that could further degrade the groundwater. The "100 times" rule established in the 1996 version of WAC 173-340 will not be used for the 100/300 Area risk assessment. A statement will be added to the SAP clarifying that an appropriate soil-to-groundwater model will be used to evaluate impacts to groundwater from residual soil contamination.
139.	Washington State Department of Ecology Comments	Section 1.2, page 1-5, First full sentence of page	Elaborate on the statement "Contaminants eliminated in the screening evaluation will be further reviewed in the risk assessment to determine whether elimination is appropriate." When will this review take place and what will be the process and criteria used for determining whether elimination is appropriate or not?	All detected soil, sediment, and water analytical results will be compared to benchmarks based on hypothesis 1 for terrestrial and aquatic media. The detection limits will be compared to the screening benchmarks to verify that they are sufficiently low. Thus, all contaminants are evaluated in the risk assessment. The text has been revised accordingly.
140.	Washington State Department of Ecology Comments	Section 1.3.1, page 1-5, general	This section does not clearly state the problem and only mentions ecological risk assessment. The statement of the problem should include that final RODs will require revisiting the issue of protectiveness for human health in light of revised regulations and will require ecological risk assessment, which was not addressed in cleanups that satisfied the interim RODs. Revise this section to clearly point to the problem. It may be useful to include some of the text from the introduction to the work plan.	Clarifications have been made.
141.	Washington State Department of Ecology Comments	Section 1.3.3, page 1-18, Last paragraph of section	Please consult Risk Assessment Guidance for Superfund (RAGS) Volume 1, Human Health Evaluation Manual (Part A), EPA/540/1-89/002, Section 4.6.2, regarding purposeful (judgmental) sampling. RAGS states, "the sampling locations within areas of concern generally should not be sampled purposively if the data are to be used to provide defensible information for a risk assessment." Ecology requests that the human health portion of the risk assessment be consistent with EPA's guidance so that the results are defensible.	Clarifying text has been added to Section 1.3.3 to indicate that soil sampling is "representative" and not simply judgmental. The SAP provides more information on the basis for investigation area selection and clarify how these data are representative in human health exposure calculations. The SAP indicates that number of samples used to characterize each investigation area will be developed based on the results from the MIS performance assessment sampling.

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142.	Washington State Department of Ecology Comments	Section 1.3.4, page 1-18, First paragraph of section	Contaminants that exceed final cleanup levels for both soil and water based on existing regulations must be examined in the human health portion of the risk assessment. Therefore, the approach of using interim cleanup levels for screening contaminants of potential concern should be replaced with one that screens against detection limits and background. In some cases, a screening approach that considers cleanup levels based on current state and federal regulations may be considered.	Clarifying text has been added to the SAP to indicate that interim cleanup levels were used to identify "indicator contaminants" for the purpose of identifying analytical suites for each environmental medium type. However, interim cleanup levels will not be used as screening criteria for identification of contaminants of potential concern in the human health risk assessment.
143.	Washington State Department of Ecology Comments	Section 1.3.4, page 1-18, 2 nd paragraph of section	Please reference in the text the documents, letter, or other correspondence that resulted in the conclusion that there are only 2 data gaps for human health risk assessment. There is no apparent document or paper trail that identified fish tissue concentration and unfiltered groundwater contaminant concentrations as the only data gaps for human health risk assessment.	Tables will be added to Section 1 of the SAP to identify the data needs of the human health risk assessment.
144.	Washington State Department of Ecology Comments	Section 1.3.5, page 1-20, 1 st paragraph of page	Discuss the confidence that will be associated with the mean value from the sites that have been sampled using multi-increment sampling. Ecology requires that the mean be estimated based on an upper confidence limit of 95%. The work plan listed the 95% UCL and range in concentration as data assessment elements. The use of only 1 multi-increment soil sample from each waste site will not address a key requirement of compliance monitoring according to WAC 173-340. Ecology would like each site to be sampled by the multi-increment approach at least 5 times.	The variability of the MIS results will be evaluated in the fall performance assessment sampling event. This will provide the information needed to determine the number of increments and number of samples to characterize contaminant concentrations.
145.	Washington State Department of Ecology Comments	Section 1.3.5, page 1-20, 2 nd paragraph of page	The statement, "The number of biota samples is sufficient ..." requires explanation. Please add text or a reference to justify this statement.	Text has been revised to state "The mean and standard deviation of contaminant concentrations will be calculated from the desired number of biota samples."

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146.	Washington State Department of Ecology Comments	Section 1.3.5, page 1-20, 2 nd paragraph of page	Provide in the document the data interpretation techniques that will be used and demonstrate how the use of 5 sites will provide adequate statistical power to detect differences between sites.	Data evaluation methods have been included in the SAP (Appendix D).
147.	Washington State Department of Ecology Comments	Table 1-1 and 1-2, page 1-28	Replace the contaminants listed with the analytical method that will be used to analyze the samples for each analyte group. The contaminants of concern are all of the contaminants listed for each analytical method to be used.	A column has been added to Tables 1-1 and 1-2 to indicate the analytical method and the last column header will be revised to note specific analytes listed are "indicator contaminants." A footnote has been added to each of these tables to indicate these contaminants were used to identify analytical suites of analyses for the risk assessment and will be the contaminants that are focused upon during the multi-increment performance evaluation. A footnote has been added to indicate that "all analytes obtained with these methods."
148.	Washington State Department of Ecology Comments	Table 1-1 and 1-2, page 1-28	The two tables should be merged into one. The soil, sediments, and water should be analyzed for the same constituents.	The use of two separate tables is a logical outcome of the way that DQO and conceptual models (upland and riparian/nearshore aquatic) were structured. Also, based on the analysis of the existing CVP data, some minor differences in the analytical suites are justified between terrestrial and aquatic environments.
149.	Washington State Department of Ecology Comments	Table 1-3, page 1-29, 2 nd row, last column	For the regression models planned for surface soils, the regression r^2 values should have a lower limit for drawing conclusions. A value of less than 0.8 would not be adequate for drawing conclusions, except to state that there is not a clear relationship. Please explain in the document the use of the regression analyses and how the data will be interpreted.	A discussion of regression analysis will be added to the SAP. It will discuss that statistical significance will be judged based on $\alpha < 0.05$. Biological significance is interpreted in conjunction with literature relationships and the other measures being evaluated.

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150.	Washington State Department of Ecology Comments	Table 1-9, page 1-48, 3 rd column	Include how many contaminants will be used to define "elevated" and "low-medium" contamination sites, and provide text to justify the planned approach. Only if the 10 (5+5) sites have low - medium to elevated concentrations of the same contaminants will there be any observable trends to interpret.	All COPECs were evaluated to determine the site categories. "Elevated" sites have greater concentrations of at least one COPEC (indicator contaminant). The "low-medium" category sites have lesser concentrations of all COPECs. Additional clarification has been added to Appendix C of the revised SAP.
151.	Washington State Department of Ecology Comments	Table 2-2, page 2-14 - 2-16	Include the references for each of the target minimum quantitation limits in the table. Footnote c indicates that WAC 173-340-747 is the calculation method for human health; however, the values in this table have not all come from the same source.	References have been added to Table 2-2.
152.	Washington State Department of Ecology Comments	Table 2-2, page 2-14 -2-16	Include the equations for calculating the soil target minimum quantitation limits for ecological receptors.	Sources of reference values for ecological receptors have been footnoted in Table 2-2.

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153.	Washington State Department of Ecology Comments	Table 2-2, page 2-14 – 2-16	<p>The following target minimum quantitation limits for human health need revision:</p> <ul style="list-style-type: none"> • Change chrysene to 1.4E-01 mg/kg for direct contact and 95.6 mg/kg for soil for protection of groundwater. • Change lead to 270 mg/kg for groundwater protection (see Table 2-3). • Change zinc to 5970 mg/kg for groundwater protection (see Table 2-3). • Change Cr (VI) to 2 mg/kg for direct contact (inhalation of resuspended dust) and 0.19 mg/kg for protection of groundwater. <p>The Tri-Parties have agreed to use the value of 2 mg/kg for Cr (VI) direct contact in the 100 area. For protection of groundwater, Ecology is using the WAC 173-340 (2001) 3-phase model and a traditional site-specific Kd value of 0 L/kg for Cr (VI) at Hanford. Also, on the basis of the amended WAC 173-340-740(1)(c), which states that “the department may require more stringent soil cleanup standards than required by this section where, based on a site-specific evaluation, the department determines that this is necessary to protect human health and the environment”, Ecology finds the lower values for Cr (VI) to be necessary to protect human health and the environment in the 100 Areas where there has been a significant history of Cr (VI) release to the environment.</p>	<p>Sources of Target minimum quantitation limits for human health presented in Table 2-2 have been footnoted.</p> <p>The purpose of these target minimum quantitation limits in this table is to evaluate the adequacy of analytical detection limits for risk characterization (comparison to protective levels).</p>
154.	Washington State Department of Ecology Comments	Table 2-2 and 2-3, page 2-14 – 2-19	Please revise the two tables by making Table 2-2 specific to human health and Table 2-3 specific to ecological receptors.	The tables were structured to be media specific and the most restrictive of ecological or human health thresholds are listed for each medium. This will obviate the need to flip between tables to determine the lowest detection limits for a particular contaminant/media concentration.

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155.	Washington State Department of Ecology Comments	Section 3.1, page 3-1	The bulleted text should be included in the introduction of the document, as these bullets provide the objectives of the 100 and 300 Areas component of the RCBRA.	Change made.
156.	Washington State Department of Ecology Comments	Section 3.2, page 3-2, Upland sites	In this section, please include a few paragraphs explaining the logic that drove selection of the upland sites, and explain how these sites can address objectives of the risk assessment. The logic behind the rationale cited in Appendix A is generally missing.	The site selection appendix (now Appendix C of the revised SAP) was revised to make the site selection process more transparent. Explanatory text has been added along with a graphical presentation of the considerations going into site selection.
157.	Washington State Department of Ecology Comments	Section 3.2, page 3-3, 1 st paragraph after the text in quotes	Please modify the second sentence of this paragraph as follows: "For example, soil particle size determines <u>is one of the factors in determining</u> the adherence and retention of chemicals in the soil." Several other factors have significant influences on sorption reactions in soil, including soil mineralogy and associated points of zero charge, soil pH and acid neutralizing capacity, soil electrolytic conductivity, soil cation and anion exchange capacities, major cations and anions associated with exchange sites, and soil organic matter type and quantity.	Change made.
158.	Washington State Department of Ecology Comments	Section 3.3.2.1 page 3-9	Replicates should be taken as described in step 5 at all sites where 50 samples are taken as a decision unit. Enough replicates need to be taken so the variance can be calculated to defend this sampling approach. Please see comment 8 above. Step 8 expects the laboratory to analyze the entire sample. With the metals acid digestion this could create a laboratory hazard by using a large amount of acid. Has the laboratory tried performing an acid digestion on a 5 to 10 gram soil sample?	Performance assessment criteria were recently developed to evaluate the number of multi-increment samples necessary to characterize the mean contaminant concentrations. This information is included in the revised SAP. Per recent discussion with Chuck Ramsey on this methodology, a sample size of at least 20-25 grams is required. Step 8 will be changed to reflect this amount.

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159.	Washington State Department of Ecology Comments	Table A-1, page A-1 – A-15	The table generally does not list the contaminants (or how many contaminants) present at low-medium or elevated concentrations. Exceptions to this are on page A-1, A-2, A-14, and A-15. Please provide in the table the contaminants that are known to be present at the sites.	Appendix C of the revised SAP describes the site selection process in much greater detail. Appendix A includes graphical summaries of soil COPEC concentrations for various groups of selected and not selected waste sites and graphical summaries of water COPEC concentrations and other information that support the selection of the near-shore aquatic sampling locations.
160.	Washington State Department of Ecology	General Comment	The SAP is primarily concerned with ecological risk. However, there is some text interspersed on human health risk (e.g., Section 1.3.4; Tables 2-2 and 2-3 MTCA soil concentrations for direct exposure and protection of groundwater). This makes the document somewhat fragmented and confusing. It would make more sense to either have entirely separate documents for ecological risk and human risk or to have one document where ecological and human risk are largely integrated.	The SAP has been revised to provide a more cohesive plan for incorporating the needs of human health and ecological sampling needs.
161.	Washington State Department of Ecology	Page 1-1, paragraph 1	Given that the purpose of the SAP is “to define data collection methods that fill data gaps associated with completing a baseline risk assessment report for 100 Area and 300 Area,” please provide a brief summary of data which are considered complete. In this way, “data gaps” can be viewed in perspective.	Existing data were described in the Work Plan (DOE/RL-2004-37 [DOE/RL 2004]) and DQO Summary Report (BHI-01757 [BHI 2005]) documents. Data collected under the SAP are specifically designed to answer the uncertainties raised by existing data, particularly as identified in Appendices C and D of the DQO summary report. Section 1 will be clarified to add a brief discussion on completed sets of data, if any.
162.	Washington State Department of Ecology	Page 1-2, paragraph 1	Re the final sentence, please provide more detail on “alternative land use.” Does this refer to alternative exposure scenarios (e.g., residential, Native American)?	Text has been clarified to indicate that additional exposure scenarios will be evaluated such as monument worker, avid hunter, avid angler, and tribal use to evaluate alternative land use.
163.	Washington State Department of Ecology	Page 1-3, paragraph 1	Please provide rationale for claiming there are only two data gaps (i.e., fish tissue contaminant concentration and unfiltered groundwater contaminant concentrations), identified relative to human health risk assessment calculations.	Additional tables will be added to Section 1 to describe the types of analytical data currently existing and the data needs that will be filled through this SAP.

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164.	Washington State Department of Ecology	1-4, paragraph 4	When comparing media contaminant concentrations with various benchmark concentrations, use of the 95% UCL is more appropriate than the maximum concentration. This is required for nonradionuclides and MTCA cleanup levels.	We recognize that guidance recommends that the 95% UCL should be used instead of the maximum concentration. This is particularly important when environmental data are skewed. Use of a maximum concentration in a screening-level ecological risk assessment is consistent with EPA guidance (i.e., <i>ERAGS</i> , EPA 1997); the screening-level risk assessment is not intended to satisfy compliance monitoring requirements in the WAC.
165.	Washington State Department of Ecology	Page 1-6, paragraph 2	Although inorganic contaminants may not readily bioaccumulate, complexation with organics may increase bioaccumulation (e.g., methyl-Hg), resulting in increased risk to higher trophic levels.	Organics are not usually a significant contaminant at these sites; however, the samples of mice will help determine if there is bioaccumulation occurring at a mid-trophic level, and soil bioassays will help to answer uncertainty about risks from complexation.
166.	Washington State Department of Ecology	Page 1-7, paragraph 2	In the "weight of evidence" approach, please explain how weighting will be assigned to various metrics (e.g., how will conflicting data be resolved/interpreted?).	The SAP has been revised to clarify the data interpretation and analysis through the weight of evidence approach.
167.	Washington State Department of Ecology	Page 1-8, paragraph 1	Please provide references for contaminant soil benchmarks and background concentrations which will be used. Are soil benchmarks based on NOEC, LOEC, ECx, or other statistical summaries?	References will be added to the text to clarify the sources of the soil benchmarks. Soil benchmark values used in the initial screening-level ecological risk assessment as part of the DQO were documented in Table 2 of Appendix C of the DQO Summary Report (BHI-01757 [BHI 2005]). Background soil concentrations for metals and radionuclides are documented in DOE/RL-92-24 (DOE/RL 2001) and DOE/RL-96-12, (DOE/RL-1996) respectively.

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168.	Washington State Department of Ecology	Page 1-8, paragraph 4	Please provide more detail (e.g., potential limitations/problems) on reference site comparison (e.g., criteria for reference site selection) and on gradient analysis (e.g., non-monotonic data).	Information on the data analysis approaches and the limitations of various statistical comparisons (e.g., reference site comparison and gradient analysis) has been added to the SAP.
169.	Washington State Department of Ecology	Page 1-11	Note uncertainties associated with “no effect” levels (e.g., extrapolation across species, endpoint, route, or duration of exposure).	Uncertainties will be noted in the risk assessment.
170.	Washington State Department of Ecology	Page 1-13, paragraph 6	Re near-shore aquatic receptors, it is suggested that phytoplankton be evaluated, along with aquatic macrophytes, in order to assess the primary trophic level more completely.	Relative to plants, metals have a greater propensity to be taken up by invertebrates. Consequently, more effort was targeted at characterizing tissue concentrations of invertebrates and their predators; e.g., invertebrate-eating receptors such as kingbirds. In addition, phytoplankton would receive exposure primarily through the relatively unimpacted water column and thus would not capture worst-case aquatic exposure conditions. Collection of rooted aquatic macrophytes was considered but sediments are patchily distributed and the uncertainty in correlating sediment exposure to plants detracted from the utility of this measure.
171.	Washington State Department of Ecology	Page 1-18, paragraph 2	It is stated that “average values will be used in calculating exposure and doses.” Please note that this is due to multi-increment sampling (if this is the case).	This text has been deleted.
172.	Washington State Department of Ecology	Page 1-18, paragraph 4	In addition to fish tissue contaminant concentrations and unfiltered groundwater contaminant concentrations, why are plant and game contaminant concentrations also not identified as data gaps for human health risk assessment?	Human health risk assessment data needs have been clarified in Tables added to Section 1; data needs include model estimates of exposure for the wild game ingestion pathway.

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173.	Washington State Department of Ecology	Page 1-20, paragraph 2	Although it yields a good estimate of central tendency, it should be noted that multi-increment sampling yields little information on variability.	A performance assessment endorsed by the Tri-Parties will be performed to assess the variability around the mean through multi-increment sampling. The assessment will determine the number of multi-increment samples to be collected per investigation area that are necessary to adequately characterize sample variability.
174.	Washington State Department of Ecology	Page 1-20, paragraph 3	Provide rationale for five replicates yielding sufficient statistical power to detect differences among sites.	Please see response to Comment #66.
175.	Washington State Department of Ecology	Page 1-28, Tables 1-1 and 1-2	Please provide the basis for the statement in footnote "a." For example, nitrate has been shown to produce methemoglobinemia in mammals.	The constituents designated with footnote "a" were reported at concentrations greater than the human health cleanup levels; they did not fail screening criteria for ecological receptors. However, nitrate concentrations will be compared to applicable ecotoxicity thresholds if available.
176.	Washington State Department of Ecology	Page 1-48, Table 1-9	Footnotes in table need to be superscripted.	The footnotes have been superscripted.

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177.	Washington State Department of Ecology	Page 1-49, Table 1-10	The decision to omit several measures proposed in the DQO appears weak. Re amphibians, because their sensitivity to contamination outweighs the uncertainty in matching contaminant body burden with habitat contaminant concentration, it would appear worthwhile to sample amphibians. Re aquatic macrophytes, although sediments may be patchily distributed, non-mobility of rooted aquatic macrophytes may yield useful correlation with contaminants in abiotic media. In addition, contaminant concentration data in aquatic macrophyte tissue would be useful for assessing exposure and effects in the field. Finally, re salmonids, although studies cited in Appendix B are useful, additional data collection is warranted due to the relevance of salmonids to human exposure (e.g., Native Americans) and piscivorous wildlife (e.g., bald eagle).	Please response to Comment #4 regarding amphibians. Please see response to Comment #170 regarding aquatic macrophytes. Please see response to Comment #2 regarding fish studies and removal of Appendix B.
178.	Washington State Department of Ecology	Page 2-12, paragraph 3	Please describe statistical analyses in more detail. For example, make a table listing comparisons to be made, statistical test employed, assumptions underlying the test (e.g., normality, homogeneity of variances), P-level for significance, and so on. Assumptions should indicate whether parametric or nonparametric procedures are justified.	Statistical analyses are described in more detail in the revised SAP (see Appendices B and D in revised SAP).
179.	Washington State Department of Ecology	Page 2-14 to 2-16, Table 2-2	Please indicate the source of "Soil" data in column 6. For rads, these data look like soil BCGs and for nonrads these data look like eco soil MTCA Table 749-3 values (but not in all cases, e.g., acenaphthene). Also, for MTCA soil direct contact (column 4) and MTCA soil for protection of groundwater (column 5), please check all values against the CLARC on-line web tool (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx).	Target values for soil for ecological receptors have been footnoted. Target minimum quantitation limits for direct contact and protection of groundwater have been verified against CLARC.

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180.	Washington State Department of Ecology	Page 2-17 to 2-19, Table 2-3	<p>Please indicate the source of "Water" and "Sediment" data in columns 6 and 7, respectively. For rads, these data look like water and sediment BCGs.</p> <p>Also, for MTCA soil direct contact (column 4) and MTCA soil for protection of groundwater (column 5) please check all values against the CLARC on-line web tool (https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx).</p> <p>Re Cd, the direct exposure soil concentration should be 80 mg/kg (same as in Table 2-2). Also, re Nitrate, the direct exposure soil concentration should be 1.28E5 mg/kg (not "No Limit").</p> <p>I noticed that footnote "h" mentions As, but As is not listed in Table 2-3. Also, column 11 indicates units are either pCi/g or mg/kg, which appears incorrect for "Water" data in column 6. Please correct/clarify.</p>	<p>Target values for soil for ecological receptors have been footnoted.</p> <p>Target minimum quantitation limits for direct contact and protection of groundwater have been verified against CLARC.</p> <p>Table 2-3 human health values have been corrected and are for water only.</p> <p>The units in Table 2-3 have been corrected.</p>
181.	Washington State Department of Ecology	Page 3-2, bullet 1	<p>Briefly provide rationale for size (1 ha) of investigation areas for terrestrial ecological risk assessment. Since selection of 1 ha is based on the home range and dispersal distance of middle trophic level receptors, note a potential lack of fit with non-middle trophic level species with home ranges and dispersal distances that do not conform to 1 ha.</p>	<p>Please see response to Comment # 74 regarding rationale behind the hectare-sized investigation area. Potential lack of fit with other species, including plants, has been noted.</p>
182.	Washington State Department of Ecology	Page 3-2, bullet 3, paragraph 2	<p>Please provide a reference for the linkage between fine-grained sediment and maximum contaminant concentrations.</p>	<p>This statement was not entirely clear; maximum contaminant concentrations are assumed to be associated with fine-grained sediment given their higher surface area relative to other sediment types (e.g., sands, gravels). This high surface area allows for more contaminants to adsorb on to the fine particles relative to sands, which have a smaller surface area for a given mass. One reference for this relationship is Reneau et al (2004).</p>

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183.	Washington State Department of Ecology	Page 3-3, paragraph 2	In addition to the description provided on reference site selection (EPA, 1994b), Suter et al (2000) mention two potentially conflicting goals: (1) close resemblance to the contaminated site (except for the presence of contaminants) and (2) independence from the contaminated site (e.g., no migration of biota between sites). Suter, GW et al. 2000. Ecological risk assessment for contaminated sites. Lewis Pub, Boca Raton, FL.	Comment noted.
184.	Washington State Department of Ecology	Page 3-4, paragraph 2	Please clarify that each of 5 aquatic/riparian reference sites (Figure 3-8) includes both substrate categories 1 and 2 (if this is the case).	This is the case and the number of aquatic/riparian reference sites have been considerably increased in the revised SAP.
185.	Washington State Department of Ecology	Page 3-4, paragraph 3	Please provide a reference for Daubenmire plots.	Daubenmire, R., 1959, "A Canopy-Covered Method of Vegetation Analysis," Northwest Science 33:43-64.
186.	Washington State Department of Ecology	Page 3-4, paragraph 4	Note that systematic random sampling may yield inaccuracies when unrecognized trends occur in a population. (http://www.epa.gov/epaoswer/hazwaste/test/pdfs/chap9.pdf). Please clarify if the multi-increment sampling method covers the entire 1 ha investigation area or only part of the area. If the method covers the entire area and sample locations are pre-set, a random start location would not appear to influence results.	Multi-increment sampling method covers the entire 1 ha investigation area, and there is a random start for each multi-increment sample collected from an investigation. Because there are more grid points than subsample increments (over the 1 ha), multiple random starts will yield distinct multi-increment samples.
187.	Washington State Department of Ecology	Page 3-4, paragraph 5	Note that when samples are selected without randomization (e.g., opportunistic sampling), the validity of the data (e.g., representativeness) is totally dependent on the knowledge of the sampler. (http://www.epa.gov/epaoswer/hazwaste/test/pdfs/chap9.pdf).	Comment noted. A random start location will be used for each mutli-increment sample.

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188.	Washington State Department of Ecology	Page 3-5, paragraph 2	Re the last sentence of this paragraph, I assume the sentence is trying to say that each of 50 subsamples (from 50 locations in one investigation area) will be combined into one primary multi-increment sample in order to represent the average concentration in each investigation area (e.g., see Tables 3-4 and 3-7). Otherwise, it sounds like multi-increment samples are being combined across investigation areas. Please clarify.	The assumption is correct: 50 subsamples comprise 1 multi-increment sample. Text will be revised for clarification.
189.	Washington State Department of Ecology	Page 3-6, paragraph 4	Please provide a reference for "horizontal aquifer tubes."	A reference for horizontal aquifer tubes is Buske 2005.
190.	Washington State Department of Ecology	Page 3-7, paragraph 4	The text indicates that canopy cover, bare ground, and cryptogam cover will be estimated, but then appears to indicate later (in this same paragraph) that only canopy cover will be estimated. Please clarify.	Text will be clarified that canopy cover, bare ground, and cryptogam cover will be estimated.
191.	Washington State Department of Ecology	Page 3-7, paragraph 5	Provide rationale for employing 4 to 10 Daubenmire plots per 0.25 ha section.	Based on past practice, 4-10 plots per quarter-hectare were judged to be adequate to characterize the vegetational community in investigation areas. Please see response to Comment #97 for more details on this topic.
192.	Washington State Department of Ecology	Page 3-8, paragraph 1	Provide rationale as to why surrogate species will be used to estimate risk to T&E species, and explain how these surrogates will be identified.	Please see response to Comment #98.
193.	Washington State Department of Ecology	Page 3-8, paragraph 3	The relevant spatial scales for Hanford site operational impacts depend on source terms, transport mechanisms/pathways (e.g., via air, groundwater, soil), and exposure scenarios. These factors do not all conform to a 1 ha spatial scale. Thus, use of 1 ha may fit middle trophic level receptors, but its application should not be extrapolated casually, without expressing limitations and associated uncertainties.	Uncertainties associated with the investigation area scale is noted in the revised SAP.

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194.	Washington State Department of Ecology	Page 3-9, step #4	It appears that the constant in the equation (22.5) incorporates soil density (g/cm ³), so as to yield sample mass (M) in grams. What is the difference between this assumed density and measured density in Hanford soils, and how might this influence the value of M?	This constant is derived from a formula employing soil parameters that are general enough to be applicable to many soil types, including the Hanford Site.
195.	Washington State Department of Ecology	Page 3-12, paragraph 4	Re litterbag statistics, can you really assess a normal distribution with 5 data points? Why not just use nonparametric tests to avoid distributional requirements here and in other statistical analyses, as well? Also, in this section (Section 3.3 on the Upland Zone), it appears that statistical analysis is only described for litterbags. Other metrics will also be compared against a reference site and evaluated via gradient analysis (e.g., Section 1.3.2.1). In order to consolidate description of statistical analyses, please provide text or a table in one place which summarizes all statistical analyses for all dependent variables in upland, riparian, and near-shore aquatic zones (see comment for page 2-12, paragraph 3).	Please see response to Comment #77 regarding litterbags. Please see Comment #83 regarding gradient analyses. An expanded discussion of statistical analyses has been incorporated in the revised SAP.
196.	Washington State Department of Ecology	Page 3-16, paragraph 2	Although low flow of the river (late summer through winter) may correspond to maximum availability and minimal dilution of groundwater, this may not correspond to maximum availability of aquatic biota (e.g., invertebrates, fish), due to seasonal fluctuation in their patterns of distribution and abundance. Might this be problematic with the proposed sampling schedule for aquatic biota?	Biota integrate exposure over time and do not need to be sampled concurrently with abiotic media. Aquatic biota will not be collected until a sufficient period has allowed for contaminant uptake (e.g., resident fish and 6-month old rock basket fauna). Porewater will be sampled under worst-case conditions. This approach maximizes the potential to capture the greatest levels of contamination in the environment.
197.	Washington State Department of Ecology	Page 3-18, paragraph 1	The TPH concern should refer to Table 1-2 (not Table 1-3).	Change made

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198.	Washington State Department of Ecology	Page 3-30, Table 3-3	Why is Detection Limit "N/A?"	This column has been deleted from this table.
199.	Washington State Department of Ecology	Page 3-32, Table 3-5	Re Small Mammals in the Remediated Native Soil sites, please clarify (via footnote) why 20 samples will be collected. Are there 10 Remediated Native Soil sites?	This is an artifact of formatting the Table. Remediated native soil sites are collapsed into one category (for a total of 20 samples) whereas remediated backfill sites are differentiated by two categories: low-med and elevated concentration sites (for 10 samples each, respectively, or 20 total).
200.	Washington State Department of Ecology	Page 3-32, Table 3-5, footnote "e"	Footnote "e" notes there are 10 litterbags/investigation area, whereas text on page 3-12 (paragraph 4) notes 16 litterbags/investigation area. Please reconcile.	Please see response to Comment #77 regarding litterbags.
201.	Washington State Department of Ecology	Appendix B, General Comment	Although this appendix is a good review of chromium exposure and effects to salmonids at the Hanford site (and to a more limited extent, radiological exposure and effects to salmonids at Hanford), it does not review a broad range of contaminants in fish tissue nor a comprehensive set of fish species consumed by humans throughout the Hanford Reach. Therefore, in the context of the SAP (i.e., collection of fish tissue data in order to model human and wildlife contaminant exposure), this literature review appears inadequate relative to additional field data collection (i.e., beyond sculpin and sucker benthic species).	Please see response to Comment #2 regarding Appendix B.

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202.	Washington State Department of Ecology	Page B-1, paragraph 1	EPA (1998) states that “ecological risk assessment (ERA) is a process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors.” Therefore, the definition of ERA (as expressed here in Appendix B) is too narrow, since it includes only “legacy contaminants” (especially considering that ecological receptors are blind to contaminant source). Teasing out the Hanford component of ecological risk is a separate objective within the ERA paradigm. EPA, 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F.	Comment noted. Please see response to Comment #2 regarding Appendix B.
203.	Russell Jim, Yakama Nation	Approach	U.S. Department of Energy is attempting to perform a baseline risk assessment post-remediation. The USDOE, U.S. EPA and Washington Department of Ecology implemented a bias for remedial action approach for known waste sites in the 100 and 300 Areas. This approach involved excavating to fifteen feet and hauling contaminated soil to the Environmental Restoration Disposal Facility. USDOE was to chase plumes that spread laterally if they exceeded established cleanup levels or ARARs. Yet EPA has stated some remediated contaminant levels exceed these requirements. The fifteen-foot depth was selected based on being protective of human health as well as being below the active biological zone of plants or animals. The sites have been backfilled with soils from nearby geologic sources.	Comment noted. Determinations of requirements for cleanup verification of waste sites and acceptable risk, including compliance with ARARs, have been determined by the Tri-Parties. Residual concentrations of contaminants left in the excavation floors and sidewalls of remediated waste sites are compliant with the cleanup requirements stated in the Interim Action RODs.

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204.	Russell Jim, Yakama Nation	General	The Yakama Nation ERWM Program has been raising issues throughout the risk assessment planning process for the 100 Area and 300 Area component of the RCBRA. Unfortunately, many of these issues have either been ignored, or remain unresolved.	Input for risk assessment objectives, data gaps, data collection needs, and interpretation objectives were solicited during the DQO interview process. Results of the interview process as well as the approaches selected to address risk assessment data needs were subsequently documented in the DQO Summary Report (BHI-01757 [BHI 2005]). The Yakama Nation was not able to arrange a DQO issues interview despite the numerous scheduling attempts by the contractors. Some issues were raised verbally during the DQO workshops, such as their concerns for air deposition of contaminants, which were also voiced by other participants. Additional work has been done to respond to these concerns (e.g., DOE/RL 2005) The issues of the Yakama Nation have not been ignored, but it is recognized that the resolution of the issues may not have always been to their satisfaction. All players in a collaborative process will not be 100% satisfied with the resolution of all issues.
205.	Russell Jim, Yakama Nation	General	Issues previously raised in the process include: need for a Yakama Nation Human Health risk scenario (i.e. Yakama people being the most sensitive subpopulation), consideration of new information (e.g. 2002 U.S. EPA study which found a 1 in 50 cancer risk among tribal people consuming fish from the Hanford Reach) assessment of cumulative risk including from non-Hanford stressors, need for an independent assessment, involvement from EPA and scientists from the U.S. Geological Service (<i>sic</i>) which is the scientific branch of the United States government, assessment of risk from past stack emissions from facilities in the 100, 200 and 300 areas, need for a confidentiality agreement to protect Yakama Nation proprietary information, limited scope e.g. ignoring transport	All human health exposure scenarios submitted to date have been reviewed by the EPA and will be used in the human health risk evaluation. Invitations have been extended for Yakama Nation tribal representatives to participate in the confidential identification and collection of resources (foods, medicines, and resources for other purposes) for laboratory analysis and subsequent data use in developing a human-health exposure scenario specific to the Nation's lifeways. This invitation has yet to be accepted and we encourage the Yakama Nation to consult with project risk assessors on how they might

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			<p>of past hazardous substance releases, injury assessment studies (i.e. toxicity tests), defining the nature and extent of contamination of the vadose zone in the 300 Area, commingling of ground water plumes from 100, 200 and 300 areas, additive and synergistic effects of contaminants, and studies to demonstrate the health and protectiveness of resources identified in the Presidential Proclamation establishing the Hanford Reach National Monument.</p>	<p>contribute to the evaluation.</p> <p>Air emissions are generally considered to be a lesser contributor to contaminant exposure than the millions of gallons of liquid effluent and solid wastes disposed to the 100 and 300 Areas of the Hanford Site. Resources have been allocated to the sources and pathways most likely to demonstrate risk to increase conservatism. A separate study (DOE/RL-2005-49), <i>RCBRA Stack Air Emissions Deposition Scoping Document</i> was drafted and distributed at the December 2004 DQO meeting, documents the negligible present-day risk associated historical air deposition. In addition to this study, further evaluation of potential air deposition will be evaluated in this assessment through the planned surface soil sampling in 45 hectare-sized investigation areas spread across the 100 Area and 300 Area; this includes 15 reference sites that are outside of Hanford-Site operational-area boundaries.</p> <p>An assessment of the health of the environment will be achieved through the approach outlined in the 100 Area and 300 Area risk assessment. Ecological effects of past releases, and specifically additive and synergistic effects of contaminants in Hanford Site media, will be performed through a battery of toxicity bioassays as described in the SAP. Data collection and analysis will be performed by qualified subcontractors per the specifications listed in the Request for Proposal.</p>

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206.	Russell Jim, Yakama Nation	General	<p>Budget constraints for this project are impacting risk management decisions and discussions. This constraint is hindering the development of a scientifically defensible risk assessment and is preventing significant issues raised by the technical staff of the Yakama Nation and others from being satisfactorily resolved. This must be corrected for a successful outcome.</p> <p>The related milestone driving the schedule for this risk assessment needs to be adjusted outward to allow scientists sufficient time in the field (i.e., 2 full field seasons) to gather pertinent data and ensure a better outcome. USDOE needs to initiate discussions with the other Tri-Party members on this issue as soon as possible. The unrealistic schedule is creating poor decisions just to get through the process and leaving huge large areas of the site affected by releases with out any risk assessment coverage.</p>	<p>RL is committed to resolving tribal, stakeholder, and trustee issues in a timely manner, while meeting project schedules agreed upon by the Tri-Parties with budgets approved by the Federal Government. It is RL's intention to perform a scientifically defensible risk assessment. Any variation in schedule or budget for the risk assessment project will require discussion with the Tri-Parties.</p> <p>Please see response to Comments #204 and #205 regarding the Yakama Nation's participation in this process.</p>

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207.	Russell Jim, Yakama Nation	General	<p>Because of limited budget, the sampling and analysis plan has many significant deficiencies that include sampling limited to a few selectively remediated waste sites leaving the surrounding without a baseline risk assessment, limited sample sizes and poor statistical power, selection of insensitive endpoints and measurement endpoints, emission of fate-and-transport of air emissions and factoring these releases into selection of appropriate reference sites, poor study design which prevents discovery of unknown waste sites, extent of ground water plumes, or hot spots. It has not been illustrated how this work will assess cumulative effects or feed results into a cumulative risk assessment for the entire area where the contaminants have come to be located and pose a threat to humans and the environment.</p>	<p>The risk assessment study design is adequate to satisfy the risk hypotheses identified in the DQO summary report. The scope of the 100 Area and 300 Area Component of the RCBRA is limited to assessing potential risks from post-remediation conditions to evaluate the adequacy of interim action cleanup levels. Hanford Site waste streams and disposal sites are well documented and it is presumed that all currently unremediated waste sites will be cleaned up to the same standards identified in the interim action RODs, thus the risk assessment results would be applicable to the entire River Corridor. Site-specific multi-contaminant media (soil, sediment, water) are being used in toxicity bioassays to account for the risks to ecological receptors from chemical/radiological contaminant mixtures. While natural resource injury evaluation is not within the scope of the risk assessment, efforts have been made to evaluate risk-based endpoints that may also be useful for injury assessment. Because toxicity test are being performed with media directly from the Hanford Site, any potential effects observed would be the result of a contaminant combinations and thus highly representative of Hanford Site exposures.</p>
208.	Russell Jim, Yakama Nation	General	<p>The Yakama Nation has not seen a conceptual model presented in this planning process that addresses a Yakama human health risk scenario, and therefore, it is undetermined at this time what information needs to be collected to aid in calculating risk to the Yakama people. In all likelihood, it will require more than the two data gaps mentioned in the document on page 1-3. An assessment of risk to the Yakama people must be done before any final records of decisions are signed.</p>	<p>Please see response to Comments #204 and #205 regarding the Yakama Nation's participation in this process. The Yakama Nation continues to be invited to consult with project risk assessors on the fulfillment of data needs for a tribal-specific exposure scenario.</p>

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209.	Russell Jim, Yakama Nation	General	In light of the poor study design which is in need of major modifications, it would be best to revise the risk assessment schedule so that an experienced EPA risk assessor (acting as lead manager) and scientists from the USGS can be brought in to develop a more scientifically credible risk assessment that addresses our issues and deficiencies raised in this letter.	<p>Timely participation is essential to ensuring an agreeable, successful, and defensible risk assessment effort. We encourage the Yakama Nation to submit comments, questions, or other issues in the timeframes indicated in document transmittal letters to prevent missed opportunities for input.</p> <p>The data collection approach for the risk assessment is based on the numerous comments received from participants (including agencies, trustees, and Tribes) during the DQO interview process and discussed during the DQO workshops.</p>

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210.	Russell Jim, Yakama Nation	General	Results from previous fishery studies support the need for more investigations of the Hanford Reach fisheries. We support the proposal that USGA has put together and shared with USDOE and other parties on sculpin and whitefish. In addition we believe that proposal should be expanded to include lamprey, suckers, salmonids and sturgeon. Furthermore, that proposal should be expanded to contain a component to determine the extent of ground water uprising in the riverbed to aid in selection of biota sampling locations. USGS staff from their various labs and water programs should conduct this work.	<p>Assessment endpoints and measures included in the risk assessment were determined during the DQO process. Sculpin were identified as the fish species most spatially constrained to areas potentially affected by Hanford Site contaminant releases, thus serving as the best species for substantiating contaminant exposure pathways. Farther ranging and anadromous species, such as those mentioned, are difficult to link directly to Hanford Site exposure. For this reason, sculpin have been identified as assessment endpoints, with specific measures of tissue analysis and histopathology collected as part of the risk assessment. Conductivity surveys are currently being employed to evaluate the emergence of groundwater into the Columbia River and will be used to supplement sample location selection.</p> <p>Data collection will be performed by qualified subcontractors per the specifications listed in the Request for Proposal. Additional studies beyond those outlined in the DQO and SAP are not within the scope of the risk assessment.</p>

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211.	Russell Jim, Yakama Nation	General	In previous communications on this River Corridor Baseline Risk Assessment Project, the Yakama Nation has consistently raised the need for independent oversight of the effort given the conflict of interest that USDOE and its contractors have. The Yakama Nation staff and other natural resource trustees developed a cost account plan (Task 2) that contained eight proposed studies (Task 2A-H), and which was transmitted to USDOE on February 7, 2005 from the chairman of the Hanford Natural Resource Trustee Council. We believe these are all valid and applicable studies needed to determine risk in the River Corridor Baseline Risk Assessment Project that includes the three current components, i.e. the 100-N Area, 100 Area and 300 Area, and the river corridor. It makes sense that these be incorporated into the current risk effort and performed by the natural resource trustee governments and agencies. Why haven't these studies been incorporated? Parties attending the risk assessment workshops have proposed nearly all of these projects at some point or another.	<p>In response to the perceived conflict of interest, nationally recognized and highly qualified sub-contractors from outside the Hanford community were brought on to help design and conduct the risk assessments. The scope of the 100 Area and 300 Area Component of the RCBRA is limited to assessing potential risks from post-remediation conditions to evaluate the adequacy of interim action cleanup levels. Additional studies beyond those outlined in the DQO and SAP are not within the scope of the risk assessment.</p> <p>The participation of regulatory agencies (EPA and Ecology) as decision makers is the independent oversight the Yakamas are requesting.</p>
212.	Lindsey Hayes/Greg ory Hughes, USFWS	General	Comments submitted on August 25, 2005 pertained to multi-increment sampling, sampling locations, reference sites, vegetation collection.	Thank you for your input. The USFWS comments were received after the submission deadline of August 15, 2005. Due to the delayed receipt of your input, disposition and incorporation of specific comments could not be performed for this revision SAP. However, several of your concerns have been dispositioned in response to other comments, and outstanding concerns have been noted for further consideration.
213.	Donald Steffeck, USFWS	General	Comments submitted on September 2, 2005 pertained to biological sampling, study design, groundwater/Columbia River pathway, analytical suites, salmonids, and <i>Migratory Bird Treaty Act</i> concerns.	See response to Comment #212.

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References Cited

- BHI, 2005, *DQO Summary Report for the 100 Area and 300 Area Component of the River Corridor Baseline Risk Assessment*, BHI-01757, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.
- Blus, L. J., C. J. Henny, A. Anderson, and R. E. Fitzner, 1985., *Reproduction, Mortality, and Heavy Metal Concentrations in Great Blue Herons from Three Colonies in Washington and Idaho*, *Colonial Waterbirds* 8(2): 110-116.
- Buske, N. 2005, *Radioactive Bioaccumulation in Clams Along the Hanford Reach*. Produced by the Radioactivist Campaign (www.radioactivist.org)
- DOE/RL, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, DOE/RL-96-12, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-34, Rev. 4, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL, 2004, *Risk Assessment Work Plan for the 100 Area and 300 Area Component of the RCBRA*, DOE/RL-2004-37, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE/RL 2005, *RCBRA Stack Air Emissions Deposition Scoping Document*, DOE/RL-2005-49, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- Daubenmire, R., 1959, "A Canopy-Covered Method of Vegetation Analysis," *Northwest Science* 33:43-64.
- EPA, 1997, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final)*, EPA/540/R-97/006, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.
- Patton, G.W. et al. Survey of Radiological and Chemical Contaminants in the Near-Shore Environment at the Hanford Site 300 Area. PNNL-13692, Rev 1
- Reneau, S.L., P.G. Drakos, D. Katzman, D.V. Malmom, E.V. McDonald, and R.T. Rytí. 2004, Plutonium in Pueblo Canyon, New Mexico: Geomorphic Controls on Contaminant Distribution along an Ephemeral Stream. *Earth Surface Processes and Landforms* 29:1209-1223.
- Rytí RT, Markwiese JT, Mirenda R, Soholt L., 2004, Preliminary Remediation Goals for Terrestrial Ecological Receptors. *Journal of Human and Ecological Risk Assessment* 10:437-450.

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Comment Number	Section/Page	Comment	Response
1.	General	The executive summary should include a paragraph listing the changes in the document that resulted from stakeholder input, or it should include a crosswalk in an appendix. If the latter option is taken, a statement should be added to the executive summary that references the crosswalk in the appendix.	A summary list of the most significant changes will be included in Rev 0, beginning on page ES-2.
2.	Exec. Summary, page ES-2, last paragraph	The last sentence states that the investigation areas will be approximately square shaped in the upland; however, the latest designs generally deviate from this. Rephrase this statement to describe how the sampling will be done.	As stated in the first sentence of the last paragraph on page ES-2, "The terrestrial investigation areas for the risk study will be approximately 1 ha in size, with <i>dimensions adjusted as appropriate to characterize biologically relevant and consistent habitats of mid-trophic level receptors.</i> " The text will be amended also to indicate that the grid size for sampling is adjusted on a site-specific basis to allow for characterization of the entire investigation area.
3.	Exec. Summary, page ES-3, end of first (partial) paragraph	The last sentence of the paragraph refers to a performance assessment. This will be new to stakeholders. Provide a sentence in the executive summary that summarizes the purpose of the performance assessment (note that in other applications at Hanford, performance assessments are basically risk assessments).	The following explanation of the performance assessment has been added to the executive summary text as recommended, "The fall sampling event, which will assess 20% of the investigation areas, representing all nine environment and site type combinations, will be conducted as a performance assessment. The purpose of the performance assessment is to provide information on the 'between-sample' and 'between-investigation-area' variability in contaminant concentrations. The results of the performance assessment will be used to evaluate the adequacy of the number of samples and increments per investigation area. The criteria that will be used in the performance assessment are provided in Figure 2-2."
4.	Section 1.0, page 1-1, 1 st paragraph	As the 3 rd sentence of the 1 st paragraph, add text from section 3.1: "The purpose of the 100 Area and 300 Area Component of the RCBRA is two-fold: Fill data gaps ..., and use results to support risk management decision making ..."	The following text has been added to Section 1, "The purpose of the 100 Area and 300 Area Component of the RCBRA is two-fold: 1) to fill data gaps associated with completing baseline human health and ecological risk assessments that represent the conditions subsequent to the implementation of the interim remedial actions; and, 2) to use results to support risk management decision making for developing final records of decision."

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5.	Section 1.3.1, page 1-7 – 1-9	The statement of the problem still does not clearly state the problem. A solid statement of the problem should be provided as the first sentence of this section.	The following problem statement has been added to the text, “In order to assess potential risks from exposure to post-remediation contaminant concentrations in the environment, contaminant concentrations in the upland, riparian, and near-shore aquatic soils, water, sediment, and biota must be evaluated.”
6.	Section 1.3.4, page 1-25, last paragraph of section	<p>Ecology previously made the following comment:</p> <p>“Please consult Risk Assessment Guidance for Superfund (RAGS) Volume 1, Human Health Evaluation Manual (Part A), EPA/540/1-89/002, Section 4.6.2, regarding purposeful (judgmental) sampling. RAGS states, ‘the sampling locations within areas of concern generally should not be sampled purposively if the data are to be used to provide defensible information for a risk assessment.’ Ecology requests that the human health portion of the risk assessment be consistent with EPA’s guidance so that the results are defensible.”</p> <p>This comment does not seem to be resolved. Multi-increment sampling is fine, but it should be done for the proper decision unit for human health, the edges of the former waste site – the entire “donut”. The 1-hectare areas only apply to ecological aspects. If the data from this study are to be utilized for human health risk assessment, the study needs to be designed to address that objective.</p>	<p>The relevancy of the MIS approach for estimating human exposure to onsite contaminants is discussed in Section 1.4 instead of Section 1.3.4. This section was revised to explain how the MIS data will be used and how the current study design is adequate for evaluating exposure to humans within the surface expression of waste sites, non-operational areas, the riparian zone, and reference areas.</p> <p>It should be noted that the sample design will not be augmented to collect samples around the “entire donut” to assess human exposure. Based on the preliminary screening discussed in the DQO, all post remediation soil concentrations were either below HH CULs or less than naturally-occurring levels. The portion of the “donut” where soil samples will be collected is considered representative of the entire donut. Although humans would not occupy a 1-hectare area over a lifetime, it is expected to provide a good estimate of the true mean concentrations present within that portion of the donut and presumed representative of the entire donut.</p>
7.	Section 1.3.4, page 1-27, 1 st paragraph	The statement “Although the placement of upland and riparian zone investigation areas was based on ecological risk assessment considerations, these multi-increment soil data are also useful for evaluating human health risk” is another case of stating that the 1-ha plots will be used for human health risk assessment. This is not the proper decision unit for human health risk assessment. The SAP should describe sampling of the entire “donut” for human health purposes.	See response to Comment 6.

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Comment Number	Section/Page	Comment	Response
8.	Section 1.4, page 1-27, Last paragraph	Describe in the SAP how samples of unfiltered groundwater will be obtained (section 3.2.4 gives some information but "routine monitoring" is not explained). Also, indicate how the groundwater sampling addresses the groundwater strategy for the Hanford site. The response to Ecology's comment 138 indicates that the groundwater issues will be postponed until a feasibility study. However, this SAP, in Section 1.4, mentions that unfiltered groundwater samples are needed for risk assessment, so the sampling plans for groundwater should be given in this document.	<p>Text has been expanded in Section 3.2.4 to identify that the groundwater samples are being collected in concurrence with routine groundwater monitoring being conducted by PNNL as part of the sitewide groundwater monitoring program. Unfiltered groundwater samples are being collected in approximately 10 wells from each of the 100 Area reactor sites and the 300 Area. The wells selected were evaluated based construction and location to ensure spatial distribution of the wells provided adequate coverage to represent the current groundwater conditions in each of the respective areas.</p> <p>Sampling plans for the groundwater collection activities are not included in this SAP since these samples are being collected in concurrence with the sitewide groundwater monitoring program, which already has approved documents and plans. Applicable documents and plans, such as PNNL's Integrated Monitoring Plan for the Hanford Groundwater Performance Assessment Project (Reiger and Hartman 2005), will be referenced in Section 3.2.4.</p> <p>The sampling conducted as part of the SAP will represent only the current groundwater conditions and the associated risks. Future groundwater conditions and risks should be determined through the CERCLA process for groundwater Operable Units.</p>

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9.	Section 1.4, page 1-28, last paragraph of section	Cite the document(s) produced by the annual surveillance program containing data for filtered groundwater samples.	<p>Groundwater monitoring reports are produced annually by the Pacific Northwest National Laboratory. PNNL groundwater monitoring results published between 1994 and 2004 were evaluated in the risk assessment. The following example document citations have been included in the revised document:</p> <p>“e.g., PNNL 2004, PNNL 2003, PNNL 2002”</p> <p><i>Hanford Site Groundwater Monitoring for Fiscal Year 2003</i>, PNNL-14548, March 2004</p> <p><i>Hanford Site Groundwater Monitoring for Fiscal Year 2002</i>, PNNL-14187, September 2003.</p> <p><i>Hanford Site Groundwater Monitoring for Fiscal Year 2001</i>, PNNL-13788, September 2002.</p>
10.	Table 1-1, page 1-35	It appears that Cr (VI) will not be analyzed in tissue samples. This appears to be a change relative to the previous Table 1-1. On p. 1-9, 2 nd full paragraph, the toxicity of Cr (VI) to ecological receptors is discussed. Table A-1 indicates that Cr (VI) is reduced to Cr (III) in invertebrate tissue, and indicates that it may be reduced to Cr (III) in plant tissue. Table A-1 does not mention mammals, and Cr (VI) is not necessarily completely oxidized in mammals. Without Cr (VI) data the chromium data may be ambiguous, and some will argue that the Cr concentrations may be the result of natural Cr (III). Plant and mammal tissues should be analyzed for Cr (VI), or it should be assumed that Cr in the samples was derived from Cr (VI).	Chromium (VI) is unstable in biotic tissues. In mammals, for example, Cr(VI) readily enters cells, where it becomes reduced to Cr(III) by NADPH (ATSDR, 1998; Petrilli et al., 1986). Considering that reduction is a primary detoxification mechanism for mammals and many other phyla, measurement of Cr(VI) in tissues did not seem justified. While it may be reasonable to assume that chromium exposure in some environmental pathways involve Cr(VI) (e.g., exposure to soluble Cr(VI) in water), dietary chromium exposure will largely consist of Cr(III) for this reason.
11.	Table 1-1, page 1-35	Method 8081A is only for organochlorines, which are mainly insecticides. Some of the plots are sprayed with herbicides. Herbicides could impact the biota, introducing a source of variability that will complicate data interpretation. Analyze tissue samples for the herbicides that are used on the plots so that this source of variability can be accounted for.	Application of herbicides at the Hanford Site is consistent with laws and regulations of their use, and therefore does not qualify as a CERCLA release. In addition, herbicide application is limited to areas requiring weed control for fire suppression or for minimization of contaminant transport on active waste sites. The investigation areas addressed in the 100 Area and 300 Area Component of the RCBRA are not affected by herbicide application.

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12.	Table 1-2, page 1-36	Add nitrite for groundwater since it is a common co-contaminant with nitrate and is more toxic than nitrate.	Nitrite has not been added as an "indicator contaminant" as it was not evaluated as part of the screening evaluation for humans. However, it is included in the "anion suite" for Method 300.0 and will be evaluated in the risk assessment. In addition, the footnote "e" text in Table 1-2 was incorrect [states "a" in the footnote text but should be "e"] and has been corrected.
13.	Table 1-2, page 1-36	Add SVOCs for water, soil, and sediment samples.	SVOCs were not identified as indicator contaminants, however they are analyzed in water, soil, and sediment in the riparian and aquatic zones using method 8270A (Table 1-2).
14.	Table 1-4, page 1-44	Include more detail in the study design for the surface soil sampling, row 1. If these are to be multi-increment, add this to the table.	The following text has been added to the study design column for surface soil sampling for T&E plants in Table 1-4: "If T&E plants are encountered, soil samples representative of the habitat type and rooting zone (0 to 15 cm) will be collected for analysis and performance of bioassays (see Tables 3-7 and 3-9)."
15.	Table 1-11, page 1-61	Add a tribal use scenario for the shallow zone. A tribal use scenario will be applied for groundwater according to the table. Also, a tribal scenario is listed on p. 1-2 in the last sentence before Section 1.1.1.	A tribal use scenario has been added to list of scenarios evaluated using shallow zone soil.
16.	Table 1-11, page 1-61	Modify the first cell in the second row as follows: Existing deep zone <u>(0 ft bgs to groundwater)</u> soil data	Text was modified as recommended.
17.	Table 1-11, page 1-61	Add the year 2001 after WAC 173-340-747 in the last cell of the second row.	Text was modified as recommended.
18.	Table 1-11, page 1-62	Add a tribal use scenario in the first row, second column.	Text was modified as recommended.
19.	Table 1-11, page 1-62	In the 4 th column, first row, multi-increment sampling is listed. As stated in an earlier comment, for human health the samples need to represent the decision unit, which is the entire periphery of the site (the entire "donut"); the 1-ha plots will not represent the proper decision unit for human health. Change the first sentence in this cell to: Multi-increment samples <u>obtained from representing surface soil (0 to 15 cm) from the entire border of the waste site,</u> to be collected....	The MIS sample design was not modified to collect samples around the entire surface expression of the waste site. The investigation areas selected for MIS are considered representative for estimating exposure to both ecological and human receptors. Existing data were used to design a stratified sampling approach which includes several different waste site types, presence/absence of vegetative cover, and accounts for a range of indicator contaminant concentrations.
20.	Table 1-11, page 1-63	Add the year 2001 after WAC 173-340-747 in the last cell of the row.	Text was modified as recommended.

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Comment Number	Section/Page	Comment	Response
21.	Table 1-13, page 1-65	Add SVOCs to the analyte list for surface water and sediment.	See response to Comment 13.
22.	Section 2.1.3, page 2-2	Add the year 2001 after WAC 173-340 in the 5 th sentence.	Text was modified as recommended.
23.	Section 2.1.3, page 2-2	The last 2 sentences state that most of the detection levels are above cleanup levels, but that in some cases they are above; when detection levels are above cleanup levels other lines of evidence will be used. According to Tables 2-2 and 2-3, the detection levels are high for a number of important metals. Describe in the document the lines of evidence that will be used to address metals that are below the detection levels.	For analytes with ecological screening benchmarks less than laboratory detection limits, lines of evidence used to evaluate risk may include comparison to background concentrations, comparison to reference site concentrations, comparison of media concentrations to a range of literature values for survival, growth or reproduction, results of diversity and abundance surveys, measured tissue concentrations, and results from toxicity testing. The assessment endpoints and attributes evaluated are listed in Tables 2-9 and 2-10.
24.	Section 2.2.2, page 2-3	Provide the priorities for analytes when sample volume is limited.	Sample volume limitations should pertain only to biological samples. The priority of analysis is described under "Contingencies" in Section 3.3.4. Similar text will be inserted at the end of Section 2.2.2 to describe priority of analyses.
25.	Section 2.3.1, page 2-9	The document seems to give conflicting information regarding field duplicates for MIS sampling. The first sentence of the field duplicate section says that no field dup will be collected for MIS, while the next paragraph says that 2 field duplicates will be collected for MIS. Please revise the document to make the field duplicate collection clear; also, define field duplicate, because this terminology is used in various ways by different labs and field operations.	The first sentence of the second paragraph has been deleted as field duplicates will not be collected for the MIS approach.
26.	Section 2.6.1, page 2-13, 2 nd paragraph of section	Describe in the document what is meant by "outlier".	The following footnote will be added to the text in Section 2.6.1: "An outlier is an observation that lies an abnormal distance from other values in a random sample from a population. Outliers will be investigated to determine potential reason for occurrence or the likelihood that such values will continue to occur."
27.	Section 2.6.2, page 2-14	Provide the goal of the performance assessment. The document does not clearly tell the reader why a performance assessment is being conducted.	See response to Comment 3.

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Comment Number	Section/Page	Comment	Response
28.	Section 2.2.3, page 2-4, 1 st paragraph	The statement "Radiological samples are unaffected by container type ..." is probably not true (this would not be a true statement for metals). Consult the laboratory quality assurance plans and use the containers recommended by the laboratory; modify the text to reflect this.	This statement was included in the SAP in agreement with sampling and analytical staff. When container type is not specified by the laboratory, plastic containers are preferred to reduce the handling weight of samples. However, since the phrase mentioned in the comments is not necessary, it will be removed.
29.	Table 2-2, page 2-19	Change the direct contact value for chrysene to 14 mg/kg to be consistent with the CalEPA TEF method (1/100 potency of benzo(a) pyrene); this is described in CLARC (see hard copy, Assessing the Carcinogenic Risk of Mixtures using Toxicity Equivalence Factors, at the end of the document).	The direct contact value for chrysene has been revised to 14 mg/kg.
30.	Table 2-2, page 2-21	For uranium, change the ecological protection value from 25 to 5 mg/kg to be consistent with WAC 173-340, Table 749-3.	This value will be corrected to 5 for consistency with WAC 173-340.
31.	Table 2-2, page 2-21	For uranium, provide the detection level for the "trace" analytical method.	The detection limit requirement has been revised to 5 mg/kg.
32.	Table 2-2, page 2-21	For nitrate give its human health direct contact (1.28E05) and groundwater protection value for soil (40 mg/kg). For ecological receptors this can be treated as a nutrient.	The recommended values for direct contact and groundwater protection have been included in Table 2-2.
33.	Table 2-3, page 2-26	Include the groundwater value for fluoride: 9.6E2; also, remove the footnote that this is a general chemistry parameter – it is a COC.	The recommended groundwater value has been included in Table 2-2; the footnote was not removed as it is referring to the class of contaminant. Fluoride was not identified as an "indicator contaminant" in the preliminary screening evaluation.
34.	Section 3.2.1, page 3-5, 2 nd paragraph	Describe the performance assessment in this paragraph.	The performance assessment is defined in Section 2.6.2 and Figure 2-2; this will be referenced in Section 3.2.1.
35.	Section 3.2.2, page 3-5, Last paragraph of section	Define "contaminant mixtures". Are these arochlors, or other mixtures?	The toxicity tests will use site-specific media which contain a variety of contaminants at varying concentrations. Test results will be representative of exposures to site-specific media concentrations. For clarification, the sentence has been modified to include the word 'environmental': "Toxicity testing will also be performed on soil, sediment, and porewater to provide Hanford Site-specific information on the effects of <i>environmental</i> contaminant mixtures and contaminant bioavailability."
36.	Section 3.3.1.3, page 3-8	There is no longer a section 3.3.1.3 for special status species. Add this section back to the document.	Subsections for T&E species have been included in the revised document.

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Comment Number	Section/Page	Comment	Response
1.	Introduction	What criteria were used to define parameters to measure and detection limits?	Investigative measures and quality assurance requirements were established using the Data Quality Objectives process. These findings are documented in the DQO summary report (BHI-01757).
2.	Introduction	A decision tree and map of the site would help to understand the different units of work.	It is unclear what is entailed with the suggested decision tree. Figures are placed at the end of each section; while generic maps of the Hanford Site are on pages 1-29 and 1-30, detailed maps of the sampling locations are on pages 3-22 through 3-32.
3.	Introduction	How were the initial remediation boundaries defined?	Most of the waste sites were engineered structures. Remediation was conducted based on the observational approach; excavation continued until the cleanup criteria specified in the interim RODs were attained.
4.	Introduction	Was the EIS for Hanford (1999) considered equivalent to an RI/FS?	The <i>Final Hanford Comprehensive Land Use Plan Environmental Impact Statement</i> (DOE/EIS-022-F) is a requirement of the National Environmental Policy Act for evaluating land use alternatives for the Hanford Site. The intent and purpose of this document is in no way considered equivalent to an RI/FS. Section 2 and Appendix C of the project Work Plan (DOE/RL-2004-37) discuss the CERCLA approach for the 100 and 300 Areas, and lists the Limited Field Investigation reports (e.g., see page C-2)
5.	Introduction	In many cases terms like relatively minor, low, medium, or high are used. These need to be defined.	In most cases, these terms are used in relation to each other. For example, 'high' sites have higher levels of some residual contaminants than 'low' sites, even if they all have met the cleanup criteria. Section 3.2 (page 3-2) describes this in more detail.
6.	Introduction	Human health is mentioned sporadically throughout the document. Please clarify on the DQO's for human health. Define: monument and refuge worker; avid recreational user.	The scenarios for human health are described in the Work Plan (DOE/RL-2004-37).

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Comment Number	Section/Page	Comment	Response
7.	Introduction	Define orphan sites.	The term will be clarified in the text on page 1-4.
8.	Introduction	The sample location decision process is not clear. It is difficult to determine why random samples were not chosen within a grid or specific unit.	The sample location decision process depends on sample type. Generally, investigation areas were chosen based on the availability of vegetation at remediated waste sites and previous analytical and field sampling results; riparian and aquatic sites were generally chosen based on known groundwater plumes (see Appendix C). Within the investigation areas, soil samples are collected using a systematic random design (except for discrete samples co-located with T&E plants). Biota sample collection depends on the occurrence of the plants and animals, limiting the opportunities for randomness.
9.	Introduction	The shallow soil zone was 0 to 15 feet. Describe the rationale for this depth. A "screening" level assessment was apparently completed to eliminate analytical suites that are clear not risk contributors. Explain the rationale in this decision making process. How were the "benchmarks" derived? Where are the data? What about the uncertainty in this screening assessment?	This depth was chosen for the remedial actions based on the average maximum depth that a basement would be constructed at a remediated waste site; shallow zone cleanup criteria were based on direct exposure to the soil; deep zone criteria were based on protection of groundwater. The definition of the shallow zone will be added to the text on page 1-2 to improve the connection to the defining text on page 1-6. The rationale behind the screening process is described in the DQO summary report (BHI-01757).
10.	Introduction	A conceptual model and decision tree would be very helpful.	Again, it is unclear what the suggested decision tree entails. The conceptual models are presented in the DQO report (e.g., BHI-01757, pages 4-2, 4-3, 4-8, 4-9).
11.	Introduction	There should be a complete inventory of plants, animals, fish, and birds included with the sampling plan.	The inventories of the biota are in Poston et al (2004) (PNNL-SA-41467). "Literature Review of Environmental Documents in Support of the 100 and 300 Area River Corridor Baseline Risk Assessment."

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12.	Introduction	A diagram of possible exposure routes need to be included with rationales for eliminating or retaining different pathways.	The conceptual models are presented in the DQO report (e.g., BHI-01757, page 4-2).
13.	Introduction	This statement could confuse the reader: "and although there are examples of residual contamination exceeding applicable benchmarks in remediated waste sites... in general the environmental media under consideration in this investigation should be relatively low in contaminant levels compared to unremediated conditions." The reader might wonder why a remediated site would still exceed applicable benchmarks. This should be explained.	Interim remedial actions were performed to human health standards, in accordance with records of decision at the time. Protection of ecological receptors is being evaluated though this risk assessment process.
14.	Introduction	Delete weight of evidence approach. It is based on a judgment that is flawed. Keep all lines of evidence until all work is completed. At that time each line of evidence should be carefully reviewed to determine if the DQO's were met and how each line contributes to a definitive statement regarding the likelihood of ecological or human health effects.	All relevant Federal and Washington state guidance on ecological risk assessment advocates a weight (or strength) of evidence approach for risk characterization. All lines of evidence will be retained, and each will be reviewed during the risk assessment. At the request of the stakeholders, the relative emphasis (weight) that each line of evidence will receive was estimated a priori.

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Comment Number	Section/Page	Comment	Response
15.	Introduction	The risk hypotheses are set to examine comparison to soil "benchmarks". Is background considered a "benchmark?" Is the dataset of background samples adequate for making comparisons with potentially impacted areas? It is not clear how they will be compared. Will all sites be compared to one background concentration? The term "reference" site is included in some sentences. Is reference site equivalent to background?	<p>Benchmarks consist of single chemical toxicity-based media concentrations for abiotic media (e.g., soil, water, sediment). These values originate from regulatory requirements (e.g., NAWQC), risk assessment screening level guidance, and toxicity-based exposure limits from the scientific literature.</p> <p>Hanford Site background values for metals and radionuclides are documented in two reports (DOE/RL-96-24, Rev. 0, and DOE/RL-92-24, Rev. 4). Hanford Site background values for soil may be used as a point of comparison for analytical results, but they are not considered benchmarks because these values do not relate to toxicity.</p> <p>Reference sites are areas of habitat and biota similar to the on-site investigation areas that have not been influenced by Hanford Site releases of hazardous substances. Reference sites are not equivalent to "background," but are evaluated as a measure of comparison between sites affected by contamination and unaffected sites.</p>
16.	Introduction	The null hypotheses are not readily testable given the construct of the sampling plan. Explain how you propose to test the hypothesis of changes along a "gradient".	We must respectfully disagree that the null hypotheses cannot be tested; please be more specific with regard to this. Regarding a gradient, we are interested in inferring causality between COPEC exposure and effects. For example, a greater incidence or magnitude of effects (e.g., toxicity testing) associated with higher COPEC concentrations would provide a stronger basis for linking COPECs to ecological risk.
17.	Introduction	Under hypothesis 6: Is the hypothesis test a deviation from equality and/or a comparison to the reference site? This is not clear.	It is testing a deviation from equality relative to that observed in the reference sites.

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18.	Introduction	Explain with specific evidence how sculpin are similar in habitat and life history compared to other species that may be present at the site.	The rationale for selecting sculpin is more fully described in Sections 1.3.4 and 3.5.3.2; it is not based on similar life history but because sculpin are resident fish in areas potentially affected by Hanford Site contamination and thereby represent highly exposed receptors as compared to transient species.
19.	Introduction	Show number of samples on a map of the site. It is not clear where there are replicates or single samples.	Because of the size of the area involved and the number of samples and media to be collected, such detail would be hard to show on maps. However, Section three has tables listing all the samples to be collected, and the general locations where they will be collected.
20.	Introduction	Delete weight of evidence procedures. They are not appropriate. All evidence should be considered. If the results are not consistent, you must explain the discrepancy.	See response to comment 14.
21.	Introduction	"Professional judgment" was used. This statement appears throughout the document. Whose professional judgment? Is there a defined logic tree for this professional judgment?	In this case, professional judgment represents field personnel with many years experience sampling the River Corridor as well as experts in ecological risk assessment. In addition, the SAP reflects the professional judgment of stakeholders as gleaned through a series of public workshops.
22.	Introduction	Define "multi-increment performance assessment".	This will be better defined in the next revision.
23.	Introduction	Define the site ecosystem. Terms like "remediated/backfill" and "remediated/native soil" are not clear.	The site ecosystem is defined in Poston et al (2004) (PNNL-SA-41467). "Literature Review of Environmental Documents in Support of the 100 and 300 Area River Corridor Baseline Risk Assessment" and the project work plan (DOE/RL-2004-37). Terminology for the types of investigations areas (i.e., remediated/backfill, remediated/native soil) are defined in Section 1.1.4 of the SAP.

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24.	Introduction	What about effects of endocrine disruptors on amphibians? There seems to be a predilection for selecting organisms or life stages based on exposure. What about effects?	The extent of exposure must be determined first, which the sampling of tadpoles will help document (being the most conservative life stage to evaluate). The FETAX studies will help evaluate potential effects as another line of evidence.
25.	Introduction	Concentration of contaminants in whole sculpin may also be used? How and when will this decision be made?	"May be used" will be changed to "will be used" on page 1-24.
26.	Introduction	The SAP "will employ" several lines of evidence to determine whether salmon are adversely affected by contaminants. How can a SAP employ? Was does this mean?	On page 1-24 the text will be revised to say "The risk assessment will use several lines..."
27.	Introduction	What is the basis for the assumption that analytical measurement error is typically 30%?	This is based on common experience in running samples through commercial analytical laboratories
28.	Introduction	"Each upland and riparian investigation areas represents a decision unit". What does this mean? Define with a decision tree and a map!	The "investigation area" is the geographical unit of evaluation (typically 1 hectare), and "decision unit" refers to the general type of site that a group of investigation areas (e.g., remediated/backfill) is meant to represent.
29.	Introduction	"... present day low risk potential associated with past air releases" Provide the data or references for this statement?	The reference is included earlier in the sentence (<i>RCBRA Stack Emissions Deposition Scoping Document</i> (DOE-RL 2005b))
30.	Introduction	Rooted macrophytes will be associated with sediments. Why is it difficult to correlate aquatic plants with abiotic substrate?	Extreme variations in flow velocity and volume and the dominance of cobble substrate limit the occurrence of rooted macrophytes in the Hanford Reach of the Columbia River, limit the availability of aquatic plants. In addition, many aquatic plants use the roots only for anchoring, and absorb directly from the water column. Text will be added to page 1-26 to help clarify this.

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31.	Introduction	Why is there a change in the DQO's with respect to sample area? This is very confusing. Some places use 1 hectare, whereas in others there is a discussion of different sample size areas.	The sizes of the terrestrial investigation areas are intended to be comparable and each is targeted at 1 hectare in size, although a few are less than this (minimum of ½ ha) to make the sample area more homogeneous. The shape of the investigation area is less important and it can vary to best represent the waste site being characterized.
32.	Introduction	"...a performance assessment will be conducted on the nine site types..." Explain in plain language. At Hanford the term "performance assessment" typically has a very different meaning.	An improved definition of "performance assessment" has been included in the revised SAP.
33.	Introduction	The fish consumption exposure pathway is important for mammals (including humans) and birds. Much more detail is needed to connect the sampling plan with the proposal for estimating exposure for these various groups.	Exposure modeling will be conducted for piscivorous birds and mammals.
34.	Introduction	Table 1-1 "indicator contaminants" were used. What are these?	Indicator contaminants are described in Section 1.2, pages 1-6 and 1-7.
35.	Introduction	Table 1-5 "Results from toxicity tests can be applied to other water or sediment samples." Does this mean that the results from some samples will be used to estimate risk across a large geographic area?	Yes—Because of the very large size of the overall study area, we are investigating risks along a gradient of contaminant concentrations, and using that to evaluate a larger area with similar contaminant values.
36.	Introduction	There needs to be a chapter describing how the data will be used. Right now it is in different places and it is not clear how the linkages will be made between different sampling and analysis methods and the site remedial decisions.	Appendices have been added to present higher levels of statistical detail for specific subjects while simplifying the document presentation for the reader. This is a post-remediation risk assessment which will evaluate the effectiveness of past remedial actions implemented under current records of decision. Regarding linkages between this SAP and remedial decisions, requirements for any additional actions would occur as part of a risk management decision, separate from the risk assessment.
37.	Introduction	Delete weighting on Table 1-6, it is irrelevant.	The weighting has been added at the request of the stakeholders.

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38.	Introduction	The null hypotheses do not appear to be testable. Explain exactly how the results of different sampling rounds will be compared and what type of statistical tests will be used for these comparisons. This needs to be in one chapter not in separate appendices.	See response to comment 36
39.	Introduction	The air deposition section is particularly weak. How can the remediated and reference native soil areas provide a measure of potential effects?	Because the remediated native soil and the reference areas will have mainly undisturbed soils, and because they are placed far apart (North Slope, ALE, McGee ranch, NW of 200 area, Midway, and all over the 100 and 300 areas), potential differences in air deposition from past stack releases would be evident (e.g., if the site NW of the 200 areas shows higher levels of 'background' than the Midway or ALE sites.)
40.	QAPP	Where did the sediment criteria come from?	The sources of sediment criteria have been footnoted for each analyte in the revised SAP.
41.	QAPP	The Data analysis section includes statements about "statistically increased tissue concentrations." How is this determined? What test will be used? What test will be used to define outliers?	See response to comment 36
42.	QAPP	How will non-detects be treated in estimating concentrations?	The standard practice of 1/2 the MDL/PQL will be used. This will be clarified in the text.
43.	QAPP	The data analysis flow chart is completely inadequate.	It is difficult to remedy this issue without more specific on what is inadequate or deficient.
44.	QAPP	"... investigation areas were selected based on known contaminant levels and in some case (elevated contaminants sites? How and where are these defined? A map and decision tree would help.	The DQO summary report contains a screening level evaluation of available analytical data for remediated waste sites. These data were used to identify potential investigation areas. Please see the DQO summary report (BHI-01757) for site selection rationale. Please also explain what is meant by decision tree.

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45.	Field Sampling Plan	It is not clear how many samples will be taken, whether there are composites, and whether there are replicates	The tables in the back of Section 3 list the number of samples proposed for each media. In general, many of the individual biota media will have to be composited to have sufficient biomass for the analyses proposed. This is mentioned in Section 3.5.4.
46.	Field Sampling Plan	How many reference or background sites are there for each media? How will they be compared to the areas potentially affected by pollutants?	The number and type of reference sites are documented in Section 3 of the SAP. On-site and reference site sampling locations will be assessed for significant differences in contaminant concentrations to evaluate potential exposures in each area.
47.	Field Sampling Plan	The figures and tables should be more self explanatory. Currently they do not stand alone. There needs to be more information in legends and titles.	The tables presented in the SAP are intended to supplement the explanatory text and are not intended to stand alone.
48.	Field Sampling Plan	What about observations prior to remediation? Since there was no baseline risk assessment it is difficult to understand what the habitat could support. There is no discussion of what alterations the remediation did to the ecosystem.	This discussion was presented in the work plan, Section 2.2. The habitat at many of the waste sites was kept to a minimum for decades before remediation because of concerns about release to the environment by plant uptake and animal access.
49.	Page 3-2	Why are Asiatic clams included in this study? They are not native to the area and possibly highly tolerant since they are opportunistic species.	While Asiatic clams may be more tolerant of polluted environments than native species, they have become so numerous that they are the dominant bivalve species. They are also valuable in being able to demonstrate uptake of contaminants, and thus exposure. In addition, bioassays, using standardized species, will be used to demonstrate the toxicity of the groundwater/river interface. The information on clam survival will provide one of many line of evidence for the aquatic portion of the study.
50.	Page 3-2	What is a "slight" gradient in the concentrations? This is a value judgment without substantiation. How do you know there is a gradient? Was sampling completed prior to remediation, during remediation, after remediation?	See response to Comment 44.

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Comment Number	Section/Page	Comment	Response
51.	Page 3-2	How do you define "moderate to low contaminant concentrations?"	See response to Comment 44.
52.	Page 3-2	The term COPC and COPEC are used in different places in the document. Do they refer to the same list of contaminants? Where are these lists?	COPCs pertain to humans, whereas COPECs pertain to ecological receptors. Complete suite analyses are being performed to identify both contaminant types, but final contaminants of concern (as determined in the risk assessment) may vary between human and ecological receptors.
53.	Page 3-3	Define "relatively elevated" contaminant concentrations.	See response to Comment 44.
54.	Page 3-3	"... these locations are comparable ecologically to the riparian corridor upstream of Vernita Bridge." Provide evidence to support this statement (page 3-3)	Vernita Bridge has been historically used as a reference area because it is similar in habitat to the Hanford Reach but far enough upstream to be uninfluenced from Hanford operations.
55.	Page 3-3	Explain how a borrow pit can be a reference or background site. It is an extremely disturbed system. This is a problem with doing a baseline risk assessment after remediation. The site has already been disturbed. How do you determine ecological impacts from physical vs chemical stressors?	We are interested in assessing effects from COPECs. These potential effects must be separated from effects such as physical stressors. Assessing extremely disturbed (i.e., previously remediated) systems relative to native undisturbed soil would be inappropriate in this respect and comparable references must be employed. The two types of upland reference locations were chosen based on the conditions of the waste sites before remediation. When the liquid waste sites (e.g., cribs, trenches, retention basins) were constructed, they were backfilled with borrow-pit materials, and kept free of vegetation. Backfill from the borrow pits was also used during the remediation of these waste site, but they were planted with vegetation and are now beginning to resemble the old borrow pits more. This approach will minimize the ecological impact differences from physical stressors.

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Comment Number	Section/Page	Comment	Response
56.	Page 3-4	"multi-increment sampling is employed to characterize... experienced by human and ecological ..." It is not clear what samples will be used for human health exposure and effects and what are ecologically relevant samples.	With the exception of groundwater samples from wells, all abiotic data will be used for both the human health and ecological risk evaluations. Exposure to well water will only be used for human health risk modeling.
57.	Page 3-6	Fish ...will be collected in near shore environment to address human health..." How will this be done? There is very little explanation in this sampling plan about human health exposure or effects.	Fish tissue concentrations will be used in human health exposure modeling for the fish consumption pathway.
58.	Page 3-6	Why was the "kingbird" chosen as the bird species for ecorisk?	Kingbirds, both eastern and western, are fairly common along the river, nesters, native species, do not range far when seeking food, and consume local insects that would be most likely to show contamination transfer in the area.
59.	Page 3-6	How will the toxicity testing results be used?	Toxicity testing results will be used as a line of evidence to evaluate risk to ecological receptors from environmental exposures of contaminants; specifically, potentially showing effects with site-specific media.
60.	Page 3-6	How will the samples from pebble and gravel size substrate be collected? How will they be used?	Samples from pebble and gravel-sized substrate area will be collected using a shovel to access the finer-grained material from between and beneath the rocks, and then with a pre-cleaned Teflon or stainless steel scoop. The substrate will be used for toxicity testing and analyzed for contaminants.
61.	Page 3-7	The number of investigation areas and sizes is very difficult to follow. Please put these on a map.	Maps showing the investigation areas are shown on Figures 3-1 through 3-10, and listed in Appendix C, Table C-1.
62.	Page 3-8	The Daubenmire plots will be place at random. There are random and biased sampling events included in this sampling plan. However, the rationale for the choices is not clear. Delineate on a map random and biased points.	As stated in Section 3.3.1.2 (first paragraph), "Line transects will be used in areas that are dominated by shrubs.... whereas modified Daubenmire plots will be used for early successional landscapes..."
63.	Page 3-8	PCB congeners must be sampled. Ecological risk is based on an understanding of the specific congeners.	Analysis for PCBs is a planned component of this SAP.

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64.	Page 3-8	What about current use pesticides? Is there any evidence that pesticide application or disposal is occurring now?	The application of herbicides on the Hanford Site is conducted by Washington State Department of Agriculture licensed applicators and is consistent with the laws and regulations regulated by Washington Administrative Codes and in strict compliance with manufacture product labels.
65.	Page 3-9	The formula for sample mass does not make sense. Please explain all the unit conversions.	The factor of 22.5 represents soil density (g/cm ³). This will be added to the list of factors below the equation
66.	Page 3-10	It is not clear how filtered and non-filtered samples will be used. A diagram showing exposure via all routes of exposure for people and organisms is needed.	Unfiltered groundwater results will be used in the human health exposure model for the drinking water consumption pathway.
67.	Page 3-10	How were the "buffer areas" determined?	The buffer areas are the perimeters of the remediated waste sites. Remedial activities stopped when sampling showed that the remedial action objectives were attained.
68.	Page 3-10	Are the plants all naturally occurring or are they planted? It is not clear. Again a site diagram showing vegetation across the landscape will help to clarify the various groupings of plant and soils.	Poston et al (2004) "Literature Review of Environmental Documents in Support of the 100 and 300 Area River Corridor Baseline Risk Assessment" shows the vegetation maps. The plants are both naturally occurring and planted, depending on the site.
69.	Page 3-10	Why are the plants composited? Describe the rationale for compositing samples (this applies to all media).	For the same reason we are collecting a measure of average soil COPEC concentrations, plants are composited (by species) because we are interested in what plant eaters would be exposed to on average throughout the investigation area.
70.	Page 3-11	Why were the invertebrates not deperated? Explain the pros and cons of deperations on exposure estimates and risk assessment	We are interested in assessing COPEC uptake in invertebrates from soil and deperating the insects would prohibit this measure. Also, invertebrates will not be deperated because the predators would be exposed to the internal COPEC burden.

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71.	Page 3-12	Rinsing is not necessarily appropriate. If the "whole" organism is eaten then the predator is exposed to contaminants in soil as well as those that adhere to the organism or in the gut of the prey.	Washing of biota samples will be performed because exposure modeling already takes soil consumption into account as a fixed percentage of an organism's diet. Also, COPEC uptake into an organism from soil will be assessed and external contamination would confound this estimate.
72.	Page 3-13	Are the persistent seeps identified? Can they be shown on a map?	Poston et al (2004) "Literature Review of Environmental Documents in Support of the 100 and 300 Area River Corridor Baseline Risk Assessment" shows the seep locations.
73.	Page 3-13	"lower levels of contamination" Who is deciding what is "lower"?	See response to Comment 44.
74.	Page 3-13	Will plant species be defined according to their origin (native, endemic, invasive)?	Plants will be identified by species. Their origin does not need to be specifically defined for risk assessment purposes, but this information is available in "Vascular Plants of the Hanford Site" (PNNL-13688)
75.	Page 3-14	"...to support dose..." I think plant material is being collected to establish exposure point concentrations not dose (unless you are speaking to administered dose for predators)?	The text is referring to dietary dose.
76.	Page 3-14	What about bird eggs and the associated effects like egg shell thinning?	These were not measurement endpoints identified in the DQO process and are not particularly relevant effects of known Hanford Site contaminants.
77.	Page 3-15	Why are metals the only contaminants that will be measured in amphibians? What about endocrine disruptors (PCBs, pesticides)?	The use of PCBs has not historically been widespread on the Hanford Site. Pesticides are applied in accordance with the Washington State Department of Agriculture. Metals are the most prevalent contaminants that may be traced back to Hanford Site releases. For these reasons and because the availability of sample mass is limited, amphibians will be measured for metals only.
78.	Page 3-16	Abiotic sampling is based on a report published in 1998. Has the habitat changed?	This habitat has not changed significantly since 1998.

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79.	Page 3-18	How are the measurements related to ecological exposure and effects? E.g. fish reproduction, growth, or survival?	Please refer to the introductory paragraph of Section 3.5.3.1 which discusses the measures evaluated by each biomonitoring effort.
80.	Page 3-18	"they are a standardized matrix..." What is a standardized?	Please see the description for "rock baskets" under Section 3.5.3.1.
81.	Page 3-19	Sculpin aren't sentinel species in the Columbia River. There needs to be a clear description of the rationale for selecting sculpin. There needs to be a complete species list to define the ecological community that the sculpin are an indicator for.	The species lists are in Poston et al (2004) "Literature Review of Environmental Documents in Support of the 100 and 300 Area River Corridor Baseline Risk Assessment." Section 3.5.3.2 of the SAP describes the rationale for choosing the sculpin (i.e., their limited home range, benthic habitat, and ability to show exposure to contaminants. They are a conservative indicator for salmon, the main species of concern.
82.	Page 3-19	The discussion of the plumes needs to include a description of the possible fate and transport routes. There needs to be a description of how the measurement data will be used to fill the data gaps in this model of fate and transport.	The evaluation of fate and transport of groundwater contamination is not within the scope of this assessment. This assessment identifies exposure and risks from currently emergent contaminant concentrations.
83.	Page 3-20	Carbon 14 is missing from table 1-1.	Carbon-14 is not an indicator contaminant for the upland investigation areas.
84.	Appendix A	Why is the comprehensive review based on secondary sources? If this is comprehensive it should include primary and secondary literature.	Primary sources have been utilized to the extent possible. The review is comprehensive in the breadth of relevant secondary literature on the Hanford Site that is being utilized.
85.	Appendix A	Table A-1. It is not clear what effect is being defined. Are the effects summarized in the reference at the end of each line? There are no benchmarks in the Table. The description in the text does not appear to match the table.	Appendix A summarizes common effects from indicator contaminants in the column labeled "effects." Benchmarks exceeded were presented in the screening level assessment produced as Appendix A of the DQO summary report.
86.	Appendix B	Which tests are supposed to be covered with these statistical considerations. This appendix does not have any relationship to specific elements of the sampling plan.	See response to Comment 36

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87.	Appendix C	How were the values attached to reference concentrations eg elevated, medium- low?	Please see the DQO summary report.
88.	Appendix C	How did you define "plume" from ground water to surface water?	Groundwater plumes have historically been identified and monitored by the Hanford Site Groundwater Monitoring Program. The plume maps presented in Section 3 of the SAP were obtained with data provided by the Hanford Site Groundwater Monitoring Program.
89.	Appendix C	The graphs are quite mystifying? I cannot decipher their purpose or relationship to sample locations	The graphs depict contaminant concentrations relative to various sampling locations. Sampling location selection was based on a gradient of contaminant concentrations. Please see the DQO summary report for a more detailed explanation.
90.	Appendix D	How are the statistics being distributed across samples, across investigation areas? What area does a "mean" represent? How many samples will be used to determine the mean and upper confidence limit for exposure? Is the 95% UCL only for human health exposures or will this be used for ecorisk?	See response to Comment 36
91.	Appendix D	How is background defined – pristine?	Hanford Site background values for metals and radionuclides are documented in two reports (DOE/RL-96-24, Rev. 0, and DOE/RL-92-24, Rev. 4).
92.	Appendix D	How is reference area defined? Is it the same as background?	Reference areas are those that are similar in habitat characteristics of the investigation area, but do not share the history of contaminant release as the affected site.

ATTACHMENT 4

Ghost Letter