

*Revised Draft*

# **WORK PLAN**

## **ENGINEERING EVALUATION/COST ANALYSIS ARKEMA REMOVAL ACTION**

**PORTLAND, OREGON**

### **APPENDIX I DRAFT EE/CA WORK PLAN COMMENT AND RESPONSE SUMMARY**

*Prepared for*

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DO NOT QUOTE OR CITE

This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

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Draft EE/CA Work Plan Comment and Response Summary.

No.	Document	Section	Comment	Date	LSS Response
382	EE/CA	General	The proposed sampling approach appears to be insufficient to gather data adequate for selecting a final response action for the EE/CA. The approach should ensure that sufficient data are gathered to enable accurate mapping of the actual aerial extent and depth of contaminated sediments. NOAA is concerned that inadequate spatial resolution will negatively impact the generation of accurate cost estimates for removal alternatives in the EE/CA, thus reducing the likelihood of an effective cleanup. Along these lines, NOAA notes that Section 5.0 mainly specifies data for a qualitative assessment of sediment contamination. NOAA recommends adding the following language as a 4th data gap to this section:	10/21/2005	LSS has planned a comprehensive sampling and testing program to supplement existing site data and to provide enough information to conduct the EE/CA. LSS disagrees with the reviewer that Section 5.0 of the draft work plan mainly specifies data for a "qualitative assessment". The investigation was designed to collect and analyze samples and to complete a comprehensive evaluation of the nature and extent of contamination within and outside the preliminary RAA boundary including an evaluation of potential water quality impacts, among other evaluations, for individual remedial alternatives and technologies. However, LSS has evaluated the data further in light of this comment, general comment 383, and other specific comments, and proposed additional borings, samples and analytical tests as needed. For borings added to the field program, samples will be collected from multiple depths, and selected samples will be analyzed depending on field observations. The remaining samples from each boring will be archived for possible analysis as necessary. Additional borings may be drilled with samples collected, archived, and possibly analyzed (continued)
383	EE/CA	General	Quantitative Distribution of Contaminants - Additional samples are required to enable mapping the distribution of contamination (particularly DDT) both in plan view, and by depth, with volumes of high concentration delineated. Accurate mapping of the mass of DDT and other contaminants is needed to evaluate the spatial distribution of contaminants and to assess how much mass removal may be appropriate in order to evaluate containment options. It would be particularly useful if the work plan could show a three dimensional map of the contaminant body, color shaded to indicate variations in contamination compared to chronic and acute screening levels such as TEC-PEC (for example, below TEC, between TEC and PEC, 1 to 10 times the PEC, 10 to 100 times the PEC, 100 to 1000 times the PEC, and 1000 to 10,000 times the PEC). The drawing should also show the relationship of the body of contamination to the overlying sediment-water interface. Other maps should be prepared to show contour lines inside which 25 %, 50%, 75%, and 100 % of the mass of the contaminant is contained. (continued)	10/21/2005	pending the results of samples from adjacent borings. The results, which will be described in the required Site Characterization Report, will be adequate to evaluate the feasibility of the remedial alternatives in the EE/CA as specified in the draft work plan and required in the AOC SOW. This and many other comments requiring additional characterization is, in the opinion of LSS, on the level of a remedial investigation of the site, not an EE/CA which addresses a principal threat area. LSS has agreed to provide an expanded evaluation and screening approach in this revised work plan which addresses many of the comments on data presentation. Maps showing COIs at different concentration ranges and depth zones have been added to the work plan. Contour lines are provided for chemicals where contoured data interpretation is warranted. The final RAA boundary may be delineated based on mass of DDT and/or other chemicals. Mass removal of chemicals such as DDT will be evaluated in the Site Characterization Report and carried over in the EE/CA as appropriate, once Arkema has completed the additional data collection.
383		(continued)	The EE/CA should also quantify the extent of dredging required to remove, for example, 25 %, 50 %, 75 %, and 100 % of the mass of the contaminant. It may be helpful and necessary to extend this approach to additional contaminants known to be present at levels of concern on the site.		
1	EECA	General	Round 2a toxicity testing should be depicted on a figure for use in determining the extent of the hotspot and RAA delineation	9/27/2005	Portland Harbor Round 2A toxicity data are presented in Figure 3-5 of the revised work plan. These and other data were used to evaluate data gaps and the need for additional toxicity testing. Toxicity tests and other available site data will be used to identify principal threat areas and the final RAA boundary
2	EECA	General	Risk assessment activities should be avoided in favor of identification of a complete site CSM and alternatives that cut off all possible exposure pathways. The Ptd Harbor ROD will develop final acceptable exposure levels and action triggers. Post removal action, data will need to be generated to show post cleanup conditions and performance of the cleanup alternative to be compared to final remedial action cleanup standards..	9/27/2005	The preliminary CSM has been updated (Section 4) to include additional information on known sources, transport pathways, and potential receptors. The revised CSM is more comprehensive, including pathways and receptors provided in the PH CSM. The CSM will be refined after the collection of additional data.
6	EECA	General	The SOW requires that upland source control take place on the early action schedule to ensure RAOs can be met. The workplan shall be revised and resubmitted to include chromium and perchlorate contaminant issues (upland and inwater) and how these will be dealt with to ensure RAOs are met in water.	9/27/2005	LSS is committed to completing upland source control measures in a timely manner. The revised work plan does address both chromium and perchlorate issues as requested (refer to CSM in Section 4 and Project Schedule, Section 9).
10	EECA	General	Please ensure we have a QA review for consistency with PH RI/F/S sampling methods--and a Parametrix QA contact for the QA plan.	9/27/2005	Comment acknowledged. Sampling and analytical methods for site COIs will be consistent with the Portland Harbor RI/F/S.
13	EECA	General	Future electronic deliverables should include bookmarks and cross link documents (save them in the same folder). This would save approximately 4 hours of o/s cost from EPA in posting the documents to the web site. See the T4 EE/CA on the Portland harbor website as an example of how a document with dozens of files is bookmarked and cross linked for easier web viewing. <a href="http://yosemite.epa.gov/r10/cleanup.nsf/sites/ptldharbor">http://yosemite.epa.gov/r10/cleanup.nsf/sites/ptldharbor</a>	9/27/2005	The electronic deliverable for the revised work plan includes the format requested. Future EE/CA documents will also include this format.
16	EECA	General	Additional surface water baseline data should be collected to establish existing values for all COCs. These will be useful in determining which alternative to select, and later to serve as a measure of baseline conditions pre-dredging, etc	9/27/2005	Surface water has been collected from three stations in the vicinity of the Arkema site (refer to Section 3.1.23 of the revised work plan). Samples were collected by standard peristaltic and high volume methods. Surface water will also be collected from these locations as part of the proposed Round 3 Portland Harbor work (refer to Section 3.1.24) . Samples will be collected using the high volume method and analyzed for COIs. The combination of data provides an adequate baseline of surface water quality conditions at the Arkema site.

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37	EECA	General	The Work Plan does not provide for an approach to be used to evaluate the effectiveness of upland source control actions, and whether upland sources are sufficiently controlled so that the RAOs can be met. Additionally, the work plan needs to be clear as to when the evaluation will be conducted in order to include hydraulic controls in the EE/CA if needed.	10/3/2005	Section 8.1.9 of the revised work plan presents information providing baseline information on recontamination and source control for the Arkema site. Additional monitoring has been proposed for transition-zone water and groundwater as detailed in Section 8.2.1.2. The integration and timing of upland source control measures is discussed in Section 9.2.
66	EECA	General	Stormwater was identified as a transport pathway; however no stormwater or catch basin findings were presented or discussed.	10/5/2005	Comment acknowledged. An evaluation of stormwater data and potential data gaps has been added to the revised work plan in Section 8.1.4.4.
161	EECA	General	There should be some soil and sediment contaminant maps similar to Figure 4-4, but maybe more detailed to cover smaller contaminations areas which were sources to these plumes or continue to exist at the site.	10/7/2005	Comment acknowledged. A series of sediment and riverbank soil maps for COIs has been included in the revised work plan. The map folio contains cross-sections and criteria comparison maps at several depth ranges to support the evaluation of nature and extent of contamination at the site.
162	EECA	General	The report would be improved if some historical aerial photographs of the facility, similar to that shown in Figure 1-1, were included. Some of the photographs should be from the time period when the DDT production occurred, and some should include the salt piles.	10/7/2005	Historical aerials of the site are included in Appendix B of the Upland RI Report (ERM 2006) which is attached to this revised work plan (Appendix E).
163	EECA	General	The final work plan needs to provide more context for the contaminants and their continued presence at the site in the soil, ground water and sediments. The following statement raises the question of the necessary size of the sources that would be needed for the contamination concentrations still present in 2005. In page 1-2, the draft plan states - "Other chemical manufacturing processes were limited during the site operational history, but included dichlorodiphenyltrichloroethane (DDT) from 1947 to 1954, and ammonium perchlorate from 1958 to 1962." Overall the plan must give a clearer perspective to magnitude of the contamination, and must avoid the recurring themes of "limited", "discharge during a portion of the first year of DDT production", or "salts of common compounds that are mildly toxic". Such statements do not represent the impact that this site has had on the local and river environments, or the results of sampling and analyses done to date, and should be removed from the document.	10/7/2005	Comment acknowledged. Changes have been made to the revised work plan in response to this comment. The revised work plan includes data tables and a map folio with data presentations of all media with comparisons to criteria. The CSM (Section 4) goes into more detail regarding sources and transport pathways for the Arkema site.
164	EECA	General	The plan proposes investigations and plans for the sediment related contamination, and it discusses the upland remedial work being done for the chromium and chlorobenzene/DDT contamination, but the perchlorate contaminated ground water plume seems to be ignored for the moment. As mentioned above, given the period when that plume originated (1958 to 1962) it seems that Arkema should not wait any longer to attempt to control and remediate it. It is unlikely that it will be gone by the 2008 Arkema stated goal for the in-sediment work.	10/7/2005	Comment acknowledged. Additional discussion has been provided in the revised work plan to address this and other similar comments (e.g., comment 163). The perchlorate plume is now specifically addressed in the CSM (Section 4.1.5) and in the Integration and Timing of Upland Source Control Measures (Section 9.2.4) parts of the revised work plan.
215	EECA	General	Throughout the removal action data collection and analysis, EPA must be able to determine how the removal furthered remedial work that is part of the Harbor-wide RI/FS. Arkema is directed to collect data during the removal action that supports the harbor-wide RI/FS and its analysis of pre- and post-removal risks to human and ecological receptors.	10/13/2005	LSS agrees that post remedy sample collection activities will be an element of any removal action selected for the site. The post-remedy sampling will be documented in the Removal Action work plan. LSS will share any data collected as part of the EE/CA process with the LWG Portland Harbor RI/FS.
228	EECA	General	The workplan does not appear to reference RAOs stated in the SOW - Section 1 should be enhanced to discuss RAOs and set the rationale for specific sections of the document.	10/12/2005	Comment acknowledged. Section 1.2 of the revised work plan contains the RAOs for the EE/CA. Additional information on what data will be collected in support of the RAOs is presented in Section 8.
239	EECA	General	Relative to Section II of SOW, the EE/CA does not adequately summarize existing information on upstream contaminant sources, the environmental investigations and potential to contaminate the RAA.	10/12/2005	Section 2.2.2 of the revised work plan presents descriptions and associated COIs with adjacent (including upstream) property owners. Additional details on the adjacent properties can be found in DEQ's ECS1 database. This information will be used in evaluating the potential to recontaminate the RAA in the EE/CA.
253	EECA	General	Data collection. Arkema is directed to collect data in support of risk assessment /risk analysis for whatever area is determined to be the removal action area for consistency with the harborwide analysis. This may include concentration and toxicity data for baseline as well as post removal action and long term monitoring data. If extensive risk analysis is not conducted for the Arkema early action, this data would nevertheless be collected and shared with the Harborwide assessment for consistency and to ensure that RAOs for the removal action area are developed and met and that harborwide cleanup feasibility analysis proceeds with an accurate depiction of baseline and post cleanup levels for the Arkema RAA. Please revise the workplan accordingly.	10/15/2005	LSS agrees that risk assessment activities are not usually appropriate for an EE/CA. The need for, types, and locations of post-remedy sampling will be evaluated once a remedy is selected. The post-remedy sample collection activities would be documented in the Removal Action work plan. LSS will share any data collected as part of the EE/CA process with the LWG Portland Harbor RI/FS.

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259	EECA	General	Arkema shall consider use restrictions associated with each alternative. As an issue for Arkema to work out directly with DSL (separate from the EE/CA analysis) is the issue of any economic impacts selection of any particular remedy may have	10/17/2005	Comment acknowledged. Use restrictions will be considered for each remedial alternative considered in the EE/CA.
314	EECA	General	EPA cannot comment on the adequacy of the proposed sampling discussed in Section 6.0 and in the field sampling plan (FSP) without better presentation of the data and additional screening to lower criteria to fully understand the nature of the contamination. The proposed sample locations in Section 6.0 and the FSP presume that EPA and its partners agree with Arkema's decisions to limit screening of existing chemistry data to acute and other non-conservative criteria, and that these would fill certain data gaps within the initial removal action area. However, with the limited presentation that Arkema chose to include in this draft EECA, we cannot agree that the sampling proposal will be sufficient to fill data gaps and meet the remedial action objectives that are required by the early action. In fact, we know that this sampling proposal is not adequate as it does not include dioxin. We reserve the right to comment again on the sampling proposal once an appropriate data evaluation and presentation occurs. Details of an appropriate data evaluation are addressed in specific comments to the EECA sections.	10/21/2005	Comment acknowledged. The revised work plan contains a more detailed evaluation of COIs in water, tissue, and solids media for the site. The data gaps evaluation has also been expanded and additional data collection is proposed in support of the EE/CA.
315	EECA	General	To date, the highest concentration of dioxin in sediment and biota was found between Docks 1 and 2 during Round 1 sampling by the Lower Willamette Group (LWG). The available information leads one to conclude reasonably that dioxin contamination is present in the sediment and may be a result of activities at Arkema. There are studies indicating that dioxin may be an impurity created during the manufacture of chlorobenzene, which was brought on site as a raw material, and that dioxins are created in several chemical processes. During the project kickoff meeting attended by Arkema's entire technical team and attorney, the tribes explicitly raised concerns about dioxin and requested that it be addressed in the EECA. Mr. Patterson acknowledged the concern. As a result, the tribes were extremely disappointed that Arkema did not include evaluation of dioxin in the EECA work plan and propose sampling and analysis to determine the extent of the problem. The EE/CA plan should be revised to reflect that sampling and analysis of dioxin will be included.	10/21/2005	Comment acknowledged. Dioxins/furans are considered COIs for the site and potential sources of dioxins/furans are discussed in Section 4.1.3. Dioxins/furans have also been added to the analyte list for the analysis of proposed solids, tissue, and waters samples.
316	EECA	General	Fundamental to the success of this early action is integration with upland source control as there is a clear connection between plumes originating in the upland and contamination flowing to the Willamette. As a result, the tribes were surprised that Arkema did not fully describe the upland source control actions and propose how these interim remedial measures would integrate with the EPA removal action. Arkema needs to present the schedule for its source control actions, particularly for the monitoring of the source control actions and its plans for perchlorate treatment.	10/21/2005	Comment acknowledged. The integration and timing of upland source control measures is presented in Section 9.2 of the revised work plan.
395	EECA	General	The screening levels proposed in the EE/CA Work Plan should be similar to screening levels used in the Portland Harbor in-water RI/FS and the screening levels values (SLVs) used in the Joint Source Control strategy (JSCS). Screening levels should be identified & used in screening all pertinent exposure pathways & environmental media (i.e., sediment, transition zone water (TZW), & surface water). Toxicity & bioaccumulation screening levels should be considered for both human & eco receptors.		JSCS values were used to screen sediments for identification of COIs. These values include both direct and indirect exposure assumptions. Areas considered to be a principal threat were identified by screening sediment data against risk-based screening levels presented in the PH HHRA, assuming a target cancer risk of 1E-05 and noncancer HQ of 1. Refer to Section 6 of the revised work plan for a discussion of the human health risk-based screening process.
484	EECA	General	We also need to consider some dioxin/furan analysis as the highest dioxin/furan sediment value from the Round 1 sampling was off of Arkema. It also had one of the highest concentrations in sculpin concentrations. Dioxin/furans are not a "standard" requirement in the harbor-wide analysis but are only required at selected locations.		Comment acknowledged. Dioxins/furans are considered COIs for the site and have been added to the analyte list for the analysis of proposed solids, tissue, and waters samples.
494	EECA	General	<u>Identification of RAA:</u> The work plan should describe the process, methodology or criteria that will be used for identifying the removal action area. Contaminants should be screened against a variety of screening criteria (including criteria that consider bioaccumulation). The RAA identification process should also consider contaminant mass. Because the Arkema site appears to be a significant source of DDT contamination throughout Portland Harbor, optimizing contaminant mass removal will likely have the greatest benefit for Portland Harbor as a whole.		Comment acknowledged. The revised work plan contains a more detailed evaluation of COIs in water and solids media for the site including data comparison to a variety of screening criteria. The data gaps evaluation has also been expanded and additional data collection is proposed in support of the EE/CA. The RAA evaluation has and will consider the nature and extent of contamination (including mass of Ddx in sediments) in support of the EE/CA.
495	EECA	General	<u>Evaluation Process:</u> The work plan should describe the EECA evaluation process. In particular, the work plan should describe how it will be determined that the removal action objectives (RAOs) have been achieved and what data is required to make this determination.		The revised work plan (refer to Sections 7 and 8) provides the evaluation process to address this and other comments.

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496	EECA	General	<u>Assessment of Contaminant Mobility</u> : The EECA should discuss the data necessary to evaluate contaminant mobility either during implementation of the removal action or post removal action. Given the high levels of contamination present in offshore sediments, short term impacts are likely. Sufficient data collection should take place to properly design and implement a removal action that minimizes these impacts. In addition, high levels of contamination are likely to remain in place following implementation of the removal action. The work plan should identify the characterization techniques necessary to evaluate the impacts of the Arkema site on Portland Harbor as a whole following implementation of the removal action.		The revised work plan (refer to Sections 7 and 8) provides the evaluation process to address contaminant mobility during removal action implementation and post-removal action.
14	EECA	General	Additional figures are needed to delineate perchlorate in groundwater offshore, chromium in groundwater offshore above chronic values.	9/27/2005	Comment acknowledged. Additional maps of these and other COIs are provided in the revised work plan.
396	EECA	General	DEQ believes that it is critical to have a conceptual three dimensional understanding of sediment and groundwater contamination upland and in river in order to assure appropriate placement and density of additional sampling locations. Groundwater grab samples should be collected from selected and additional borings added to the program to define the extent offshore groundwater plumes.		Additional transition-zone water and groundwater sampling are proposed in the revised work plan (section 8.2) to provide information on baseline conditions, the nature and extent of groundwater contamination, and evaluation recontamination and source control in support of the EE/CA.
5	EECA	General	Title: Delete "in water" from title of document. Some activities will pertain to upland source control and how they impact in water receptors.	9/27/2005	Comment acknowledged. Change has been made to the revised work plan.
21	EECA	General	Beach areas within the final RAA shall be subject to cleanup. Alternatively, risk analysis can be performed on the beach and sediment areas separately (as they are clearly separate exposure units) which may be duplicative of the Harborwide RI/FS process.	10/3/2005	Comment acknowledged. No additional response required.
22	EECA	General	In general, there is no acknowledgement in the work plan of the Removal Action Objectives contained in the SOW. The work plan should list them specifically, and discuss the screening levels they are using to compare data and how they relate to one or more of the RAOs.	10/3/2005	Comment acknowledged. Section 1 of the revised work plan contains the RAOs for the EE/CA. Additional information on what data will be collected in support of the RAOs is presented in Section 8.
224	EECA	1	Please reference EE/CA Guidance document	10/12/2005	A reference to the EE/CA guidance document was added.
443	EECA	1.1	Section 1.1 - Much of the language in the document tends to minimize the problem and the potential risks. All of the language should be neutral. For example, eliminate words such as "limited" (page 1-2), "low concentrations" (page 4-2), "very low concentrations" (page 4-4), "at low levels" (page 4-5) unless data are presented to justify this language. There should be adequate data and good documentation in the document such that the the readers can make their own judgments.		The language in these sections has been modified as requested.
225	EECA	1.1	Sec 1.1, page 1-3, top paragraph: please discuss ongoing upland source control actions. Specifically, discuss the IRMs and the stormwater system.	10/12/2005	A description of the IRMs has been provided along with a reference to more detailed discussions in other portions of the work plan.
226	EECA	1.1	Please describe adjacent site activities that may warrant assessment of contaminant characteristics within the Arkema RAA.	10/12/2005	A description of adjacent site activities has been added along with a reference to Section 2.2.2 which provides more detail on neighboring properties that may influence the Arkema site RAA.
260	EECA	1.1	The RI/FS investigations have extended above and below the original ISA. This paragraph should be revised to reflect this in the next draft.	10/21/2005	The paragraph has been revised as requested.
261	EECA	1.1	Please remove the word "residual" and indicate that chlorobenzene is present in the subsurface as a non-aqueous phase liquid (NAPL) in the sentence: "Arkema is conducting vapor extraction and air sparging activities in the upland portion of the site to address residual chlorobenzene in groundwater."	10/21/2005	The sentence has been revised as requested.
358	EECA	1.1	The project background should accurately reflect the Portland Harbor Superfund site and its study area. This section should reflect updates that have occurred to the "initial study area" of 5.7 river miles.	10/21/2005	The description of the ISA has been modified as requested.
23	EECA	1.2	Typo - CERCLA citation is 42 USC	10/3/2005	The CERCLA citation has been corrected.

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434	EECA	1.2	Section 1.2 -In addition to adding the potential ARARs that are missing (e.g., MCLs and ODEQ WQC and EPA WQC for the protection of human health), it should be clear that risk based concentrations will be used for screening and/or decision making when ARARs are not available or are not considered protective. These include the EPA Region 9 PRGs for tap water and industrial soil exposures (for in-water sediments); Oak Ridge National Labs Tier II SCVs; and the ODEQ 2001 Bioaccumulative Sediment SLVs. Risk based values will need to be developed for some chemicals (e.g., perchlorate).		The potential ARARs list has been reviewed and expanded as requested.
391	EECA	1.2	A more detailed potential ARARs list must be developed in the revised Work Plan, which includes applicable or relevant and appropriate requirements of the ODEQ hazardous waste cleanup laws and regulations, as well as other state and federal laws.		A more detailed potential ARARs list has been provided.
392	EECA	1.2	Page 1-3, Section 1.2. If surface water is considered a drinking water source, then the Safe Drinking Water Act (42 USC 300f et seq.) may be considered a relevant and appropriate ARAR.	10/18/2005	A more detailed potential ARARs list has been provided; however, LSS does not consider the Safe Drinking water Act and ARAR but has included it as a TBC.
394	EECA	1.2	The following State regs should be evaluated as potential ARARs: 1) Lower Willamette River Management Plan (ORS 273.045 and OAR 141-080); 2) Hazardous Waste Regulations (ORS 466.005-225); 3) State Removal Fill Laws & Regulations (ORS 196.795 through .990 and OAR 141-085); 4) State Submerged and Submersible Land Management Laws and Regulations (ORS 274 and OAR 141-014 and OAR 141-082); 5) Certification of Compliance with Water Quality Requirements & Standards (ORS 468.035); and 6) State Water Quality Standards (ORS 468B.048).		The State regulations listed in the comment were evaluated and added to the ARARs table.
229	EECA	Figure 1-1	Please identify property that is unmarked, bounded by Starlink, Gould, Arkema and railroad tracks.	10/12/2005	The unmarked property has been identified on the figure.
230	EECA	Figure 1-1	Please identify flow direction of the river.	10/12/2005	The river flow direction has been added to the figure.
435	EECA	2	This section needs to be rewritten with more information on <u>all</u> of the processes and chemicals used at Arkema so that all potential COCs at the upland and in-water portions of the site can be identified and developed as a part of the CSM. For example, some of the highest levels of PCBs and chlorinated dioxins/furans found in sediment and biota in the PH RI sampling have been found off of the Arkema facility. There are also high levels of PAHs in some sediment samples. In fact, the the screening done for sediment in this EE/CA show that some PAHs as well as hexachlorocyclohexane exceed the PEC in several samples (there is an exceedance of 86 fold above the PEC for hexachlorocyclohexane in one sample and smaller exceedances in others). The sampling of transition zone water (TZW) (Round 2 Groundwater Pathway Assessment Sampling and Analysis Plan; Appendix B: Groundwater Pathway Assessment Pilot Study Data Report dated draft, July 8, 2005 by Integral) shows levels above appropriate screening levels for many volatiles, manganese, and other chemicals in the TZW which are (continued below)		The site operational history section (2.2.3) has been updated to include all known processes and chemicals used at the site. Additional processes and operational history added to Section 2.2.3 include solid sodium hydroxide, a grass defoliant, sodium orthosilicate, chlorine, boiler room operation, asbestos ponds and trenches, former brine mud pond, old caustic tank farm, ammonia plant, transformer pads, BPA substation, and stormwater drain system. Additional details were added to some of the processes described in the draft EE/CA work plan including DDT manufacturing, hydrochloric acid manufacturing, and salt pad operational history.
		(continued)	never mentioned here. Where are these chemicals coming from and are some of these acting to facilitate transfer of other chemicals, such as DDT? Examples of some of the higher values in TZW include 520,000 ug/l methylene chloride, 1,600 ug/l benzene, 1,400 ug/l tetrachloroethylene, 2,300 ug/l of trichloroethylene, and 11,300 ug/l manganese. These are in addition to the the COCs mentioned in the EE/CA, like DDT/DDE/DDD, chlorobenzene, chromium and perchlorate.		
436	EECA	2	Lots 1 and 2 should be included on the maps and included in the CSM for the site. Our understanding from discussions with ODEQ is that there is information on these 2 parcels. These data should be in the EE/CA. Also, there is limited sampling in sediments off of these 2 parcels and only the data for DDT/DDD/DDE and chromium are shown in the EE/CA (Figure 3-7). The screening shown in Figure 3-7 for these sediments shows levels of DDT/DDD/DDE above the PEC in surface samples. Also, it is not clear if contaminants found north of the Arkema site are from Rhone Poulenc or Arkema. For example, the highest levels of 2,3,7,8 -TCDD TEQ found in the PH site in the Round 2 sediment sampling are adjacent to and slightly north of the Arkema boundary. High levels are also found off of Arkema itself. Rhone-Poulenc has presented date (now being evaluated by EPA) that these contaminants may not all be from R-P but from Arkema.		Lots 1 and 2 were added to the maps and the available data on and adjacent to these lots were included in the data screen in Sections 5 and 6.

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231	EECA	2.1	Sec 2.1 page 2-1 - based on Figure 1-1 it appears the Arkema Facility is on the SW bank, not the NW bank; please verify.	10/12/2005	Text changed: 'The Arkema facility is located in Portland, Oregon on the southwest bank of the lower Willamette River...'
232	EECA	2.1	This section should identify the status of upstream/upgradient facilities relative to EPA or ODEQ remedial programs. The EECA should consider available data from upstream/upgradient facilities and identify the schedule for any upstream/upgradient remedial actions.	10/12/2005	Table 2-2 added to section 2.2.2 to address adjacent facilities and associated processes and COIs.
233	EECA	2.1	Paragraph 2: A figure showing the initial RAA should be provided.	10/12/2005	Section 6.4.4 and Figure 6-1 present the initial RAA boundary.
234	EECA	2.1	This section should have more discussion of physical and ecological characteristics. A brief overview of groundwater, surface water species, human occupation, soil type, surface features, etc., would benefit the document. It is needed to support later discussions of SCM & Fate/Transp.	10/12/2005	Section 4, Preliminary Conceptual Site Model presents descriptions of media and other characteristics (i.e., species, human occupation) present at site. Within this section, the Upland RI Report (ERM 2005) is referenced in several instances.
263	EECA	2.1	Please delete either "heavy" or "sanctuary" from the sentence: "The Arkema facility is located within the heavy industrial sanctuary of northwest Portland." We understand that the City of Portland uses the terms "industrial sanctuary" or "heavy industrial" but not combined.	10/21/2005	Text changed to: "The Arkema facility is located within the industrial sanctuary of northwest Portland."
264	EECA	2.1	This section includes in its title, "ecological setting." This section needs to indicate that the Portland Harbor Work Plan from April 2004 shows the entire Arkema shoreline and in-water areas as optimum habitat for Pacific lamprey, juvenile chinook salmon, smallmouth bass, common carp, large-scale suckers, sculpin, crayfish, hooded mergansers, spotted sandpipers and mink (Appendix B, Figures 2-6 through 2-10). In addition, part of the Arkema facility includes optimum amphibian habitat (Appendix B, Figure 2-11).	10/21/2005	A 4th sentence was added to paragraph 4: "The Willamette River is a diverse ecological system and the shoreline and in-water portions of the site represent habitat for several species of fish, as well as aquatic birds, mammals, and amphibians (see Section 3.4 Habitat Characteristics)."
265	EECA	2.1	This section should indicate that people access the site through the road leading to the Siltronic facility on the north end of the beach for recreational purposes; also please indicate that the Portland Harbor Work Plan from April 2004 shows the entire Arkema shoreline as used by transients (Appendix C, Figure 1b).	10/21/2005	Text added to mention limited access to site by transients and lack of recreational users except in-water fishers. See also Section 4, which discusses potential human receptors in the preliminary conceptual site model (also Figure 4-1).
398	EECA	2.1	Page 2.1. Based on a 7/9/03 DEQ memo, mean high water in Portland Harbor was "defined" as 8 feet CRD = 10.9 feet COP = 9.5 feet MSL and represents the boundary between upland and in-water activities. The EE/CA work plan states that the mean high water is at 18.1 feet COP. Please clarify the basis for the selected MHW and discuss the project implications of using different datums. As mentioned previously, riverbank work is likely to be part of the EE/CA because of the need to evaluate upland source control and recontamination (RAO #7).	10/19/2005	The text has been changed to reflect NAVD88 datum and to provide references to other common datums for the area. The text now reads: "The in-water portion of the site is defined as the land below mean high water (approximately 12 ft NAVD88)." The definition of MHW is provided in Section 2.1.2
437	EECA	2.2	Considering the long term history of the site, EPA would expect more information regarding construction and maintenance dredging activities at the site. Based on the information presented, there is no conclusive information to assess potential contaminant migration/relocation from dredging activities. More information is needed on these 2 dredging events, including the placement of the dredged materials. This lack of dredging also seems to contradict statements that the plant area is generally a depositional area. EPA considers additional research necessary to adequately evaluate impacts on contaminant distribution from dredging activities.		The Dredge and Fill History section (Section 2.2.4) was updated with dredging permit file records dating back to 1971 that were obtained from the USACOE. Figure 2-4 was updated to show the areas assumed to be dredged in 1956, 1977, 1984, and 1993.
235	EECA	2.2.2	Figure 2-1 needs to include information regarding the name and boundaries of adjacent sites. Include information relevant to documented on-going remedial actions.	10/12/2005	Comment acknowledged. Figure 1-1 shows the location and names of adjacent sites. Figure 2-4 is a detailed map of the Arkema site that shows the historical uses of the site. Remedial actions at the Arkema site shown on figures in the Upland RI report (ERM 2005) attached to the EE/CA WP.

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498	EECA	2.2.3	<u>Operational History</u> : In general, additional detail should be provided regarding specific operations at specific locations at the Arkema facility. EPA recently received information suggesting that the electrolytic process used at the Arkema facility may have resulted in the production of chlorinated dibenzo-dioxins and furans. Because the Portland Harbor RI/FS has detected elevated levels of chlorinated dibenzo-dioxins and furans in sediments and fish tissue off-shore of the Arkema facility, this production process should be discussed more fully and the location of the electrolytic cells should be highlighted on applicable maps and figures.		The site operational history section (2.2.3) has been updated to include all known processes and chemicals used at the site. Additional processes and operational history added to Section 2.2.3 include solid sodium hydroxide, a grass defoliant, sodium orthosilicate, chlorine, boiler room operation, asbestos ponds and trenches, former brine mud pond, old caustic tank farm, ammonia plant, transformer pads, BPA substation, and stormwater drain system. Additional details were added to some of the processes described in the draft EE/CA work plan including DDT manufacturing, hydrochloric acid manufacturing, and salt pad operational history.
236	EECA	2.2.3.1	Please reference figure depicting features described in this section eg. Acid Plant	10/12/2005	Added a reference in to Figure 2-4 in Section 2.2.3.1 that shows the Acid Plant features.
237	EECA	2.2.3.1	Page 2-3, first paragraph: The description of features described in this paragraph are not clearly identified on figure 2-1. The discharge pipe to the river does not appear to be connected to source areas. The MCB recovery facility is not shown.	10/12/2005	Added a reference in to Figure 1-4 of the Upland RI report that shows the detailed DDT manufacturing operation. Also added label for the former DDT process building to Figure 2-4.
25	EECA	2.2.3.2	This section lacks detail about the manufacturing processes, waste handling practices, and disposal practices that resulted in the soil and groundwater contamination. The Acid Plant/DDT section is much more detailed about how the hazardous substance was released into the environment.	10/3/2005	The site operational history section (2.2.3) has been updated to include all known processes and chemicals used at the site. Additional processes and operational history added to Section 2.2.3 include solid sodium hydroxide, a grass defoliant, sodium orthosilicate, chlorine, boiler room operation, asbestos ponds and trenches, former brine mud pond, old caustic tank farm, ammonia plant, transformer pads, BPA substation, and stormwater drain system. Additional details were added to some of the processes described in the draft EE/CA work plan including DDT manufacturing, hydrochloric acid manufacturing, and salt pad operational history.
238	EECA	2.2.3.2	Sodium Chlorate Manufacturing - last paragraph: [please clarify whether a pipeline system was used to transfer Sodium Chlorate from Chlorate Area to Dock #2 for barge loading. If so, figure 2-1 should show pipeline system and potential areas within River that pipeline loading may have impacted. If not, please specify transport methods for moving sodium chlorate and other materials across the site.	10/12/2005	Added the following sentence to the end of the Sodium Chlorate Manufacturing section: "An above ground pipeline was used to transport sodium chlorate from the Chlorate Plant area to Dock 2. There were no known releases from this pipeline". The pipeline was added to Figure 2-4.
282	EECA	2.2.4	Indicate on a figure where dredged material was placed on site, especially for the dredging events in 1956, 1977 and 1984. A comparison of historical shorelines should be completed to indicate the sequence of filling at the site.	10/21/2005	Figure 2-4 shows the estimated location of where the dredged material from 1956 was placed on the site. No documentation was found to confirm that the proposed 1977 and 1984 dredging activities occurred. The approximate location of fill placement along the riverbank is shown on Figure 2-4.
499	EECA	2.2.4	<u>Dredge and Fill History</u> : It is unclear whether any of the dredge projects identified resulted in the generation of sediment chemistry data. Any data collected in support of these projects should be incorporated into the summary of existing data.		See response to comment 437. No sediment data related to the dredging activities was found.
266	EECA	2.3	This section should reflect that the EECA work needs to also be coordinated with the upland source control work and potentially the Portland Harbor Remedial Investigation/ Feasibility Study (RI/FS).	10/21/2005	Text added to 3rd paragraph of Section 2.3: "Currently, the site activities are limited to upland IRMs. The EE/CA activities will be coordinated with the upland IRMs and the activities associated with the LWG Portland Harbor RI/FS, including data collection exercises. LWG Round 3 activities are currently being negotiated, and LSS believes that it is important for appropriate LWG data (e.g., data collected from samples offshore and adjacent to the site) to be used for the EE/CA as the data become available. Round 3 activities and approximate timelines are presented below."
55	EECA	2.3	Stormwater conveyance system infrastructure still remains at the site. Operational constraints may include decommissioning the existing conveyance system prior to implementing a cap or installation of a new conveyance system.	10/4/2005	Text added to Section 4.2.3 (last paragraph) referencing ERM's stormwater figure in Upland RI Report. "Refer to Sections 5.9 and 6.2.8 and Figure 1-6 of the upland RI report (ERM 2005a) for a detailed description of site stormwater." Additional information regarding stormwater is included in Section 4.2 and 3.1.
267	EECA	2.4	EECA 2.4 At least half of the tribal governments have indicated that the cultural survey completed for the LWG is too general and insufficient for the Arkema facility. Arkema needs to indicate in the EECA work plan their approach to complete a comprehensive cultural resource analysis for the Arkema facility. This comment needs to be incorporated to Section 5.2 also.		A follow-up cultural resource study has been proposed for the Arkema site as summarized in Section 8.1.2.
120	EECA	Fig 2-1	There needs to be some more research to document what became of the "Former Discharge Pipe" and its exact location, or have more field work done to locate it, and to determine whether it was cleaned out or should still be removed.	10/7/2005	As part of the EE/CA, the locations of old and existing discharge pipes will be evaluated within the RAA.

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No.	Document	Section	Comment	Date	LSS Response
121	EECA	3	It is unclear how this facility has been in operation from 1941 to 1996 and only has monitoring data since 1996. This should be explained, or the table revised to include all the other references for data available for the site.	10/7/2005	Monitoring data were first collected at the site in 1996. The work plan text was modified to reflect this.
64	EECA	3	Stormwater outfalls should be labeled on Figures 3-1 through 3-3. Catch basins should also be called out.	10/5/2005	Stormwater outfalls are labeled on Figures 3-1a and 2-4.
126	EECA	3	Table 3-7: Water Quality Criteria, Oregon DEQ Tables 33A and 33B. The table should be modified to include the values from the Joint Source Control Strategy for comparison.	10/7/2005	JSCS values have been added to the screening that is presented in Section 5. Data comparison tables in Appendix C provide a comprehensive list of the JSCS values for each chemical.
317	EECA	3	Figures 3.6: There is an absence of data to delineate DDT <sub>r</sub> at depth, particularly in the downstream of dock 2. This indicates a data need that should be discussed in Section 5.0	10/21/2005	Additional deep boreholes are proposed for this area in the data gap section (Section 8.2).
318	EECA	3	Figures 3.6: There is an absence of chromium data in the vicinity of dock 1 (WB6, 9, 10, 11). This indicates a data need that should be discussed in Section 5.	10/21/2005	Comment acknowledged. Samples from additional deep boreholes in the vicinity of Dock 1 will be analyzed for total metals, including chromium. In addition, boreholes WB-08, -09, and -11 will be reoccupied and composite sediment samples from these and one additional borehole will be analyzed for metals.
439	EECA	3.1	The presentation of existing information does not provide the reader with a clear depiction of site conditions. Arkema shall restructure this section of the document to include all available data, both upland and in water, and present it in a detailed summary in this section. Both upland and in-water data are needed to develop the CSM, that shall address (1) what are the potential COCs and what are their sources. (2) How have these COCs moved from their original place of use/manufacture through the environment (including movement from one media to another and chemical/physical/biological transformations and co-solvency with MCB and other solvents) and what media are now contaminated, and (3) What are the levels of all of these COCs in all of the environmental media, and (4) Who is being exposed and how are they being exposed. These data must be presented in figures that justify the proposed CSM. Figures should show contaminant levels (e.g. using isopleths and/or bar graphs) both spatially and vertically. These figures should include isoconcentration contours based on appropriate screening level values (continued below)		The Summary of Previous Investigations section (3.1) was left in chronological order to avoid redundancy because multiple media have been investigated in some of the investigations. Section 3.1 has been updated with new LWG investigations. The revised CSM (Section 4) includes a summary discussion of the data, by media. This description is supplemented by more than 300 maps provided in the new map folio. The revised screening approach results are presented in Sections 5 and 6.
439	EECA	Continued	presented in the Joint Source Control Strategy (DEQ/EPA September 2005). It is suggested that multipliers of SLVs (i.e., 10x, 100x) be shown to help the regulatory team determine appropriate the appropriate boundary of the early action. Maps and figures from existing reports should be included (not referenced) in the EE/CA. For example, the maps from the LWGs Round 1 Site Characterization Summary Report (showing sediment and biota results; see as an example Figure 4-20 b, 2, 3, 7, 8 - TCDD concentrations in sediment, sculpin and crayfish) and the LWGs Round 2A Sediment Site Characterization Report (maps showing sediment concentrations at the surface and at depth) would greatly benefit this section of the work plan. Also, there are many groundwater figures and isopleths that could have been included from other reports, including those from Arkema. The only groundwater data presented here is the isopleth map for groundwater contaminants after screening is done (Figure 4-4) (but it isn't clear what the depth even is); and borehole/cross section maps for chlorobenzene (Figures 1 - 7A). When one reviews some of the maps and figures from reports other than the EE/CA, the true extent of the DDT/DDE/DDD is r		
451	EECA	3.1	Section 3.1 - The discussions for each environmental medium should be in one section instead of presenting studies done in chronological order. This would allow for a summary of all of the data for groundwater and TZW, for example, in one section, allow for a logical flow into a discussion of all of the results and of the accompanying three dimensional figures. Likewise, all of the relevant upland soil, beach sediment and in-water sediment should be in one section so that it can be summarized, discussed and shown on three-dimensional figures. These figures should include all of the available data, not just samples from one study or a few studies and should be discussed separately from the screening so they flow into a discussion of the CSM (which should be in this section). For example, although there are Figures (Figures 3-5 through 3-9) that include sediment data, both surface and depth, for total 4,4' DDTs, the text never makes it clear if all available sediment data are plotted on these figures. It also isn't clear why some sediment samples labeled as "soil" are not screened and (continued below)		The Summary of Previous Investigations section (3.1) was left in chronological order to avoid redundancy because multiple media have been investigated in some of the investigations. Section 3.1 has been updated with new LWG investigations. The revised CSM (Section 4) includes a summary discussion of the data, by media. This description is supplemented by more than 300 maps provided in the new map folio. The revised screening approach results are presented in Sections 5 and 6.
			presented in Figures 3-5 through 3-10 even though they are at the same elevations as other sediment samples that are screened. Why are no sediments at depth shown? Also, a much larger suite of contaminants need to be included in the data summaries, data discussion and the figures. This includes, for example, PCBs and chlorinated dioxins/furans, (as TEQs and total concentration), HCH, PAH and total DDTs (the sum of all 4,4' and 2,4' DDTs, DDEs, and DDDs) for sediments. VOCs and manganese should be included for groundwater. The discussion should also include samples to the north of the site as these sediment contaminants may be from Arkema, not Rhone Poulenc.		

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No.	Document	Section	Comment	Date	LSS Response
450	EECA	3.1	Section 3.1 - The second sentence in this section concludes that "the principal COIs" at the site are "4,4' DDT and its metabolites, chlorobenzene, perchlorate, chromium, and chloride". As a result, the list of studies and the list of chemicals that are evaluated in this section are limited. The data review and summary should include all chemicals detected in environmental media before they are screened. Only after all of the data are presented and the CSM developed can they be screened to determine the COIs for the site. For example, PCBs, chlorinated dioxins and furans, PAHs and HCH should be included for sediments as well as VOCs and manganese for groundwater/ TZW. Also, data for the 4,4 as well as the 2,4 DDTs, DDDs, and DDEs should be presented.		The process for identifying COIs has been modified to address this comment. COIs for the site were determined through the screening process in Sections 5 and 6. Screening data are presented in Appendix C. Dot maps based on screening criteria were constructed for each COI and general descriptions of the extent of selected COIs are presented in Section 6.3.
240	EECA	3.1	Page 3-1, first paragraph: The presentation of COI at this point is premature. A table of chemical uses, summarized from Section 2.0, data from Lots 1 and 2, and upstream/upgradient contaminant sources (still to be determined) should be presented to show list of process chemicals and resultant contaminants in the environment at the site.	10/12/2005	The chemical screening and COI selection process has been modified to address the comment (see response to comment 450). Section 2.2.3 was updated with all known chemical processes that have occurred at the site.
268	EECA	3.1	The review of existing data in the subsequent sections can "focus[es] on the principal constituents of interest (COIs) at the site (4,4'-DDT and its metabolites, chlorobenzene, perchlorate, chromium, pH, and chloride)"; however, the discussion in the subsequent sections should not be limited to only these contaminants. Other contaminants such as dioxin, lead, etc. that exceed screening levels need to be discussed, especially in previous investigations that included more analytes than the "principal COIs."	10/21/2005	Please see the response to comment 450 and 240.
269	EECA	3.1	The review of existing data should include the three rounds of surface water sampling that has been completed by the LWG.	10/21/2005	The review of existing data section was updated to include four rounds of LWG surface water sampling, including the January 2006 high flow surface water sampling event.
401	EECA	3.1	Arkema has performed numerous upland investigations in addition to those referenced in Table 3-1. For example, additional investigations have been performed prior to and during implementation of various upland interim remedial measures (IRMs). These investigations/IRMs should be listed in the table and references provided. If possible, it would be beneficial to the regulatory team if the upland RI report was submitted concurrent with or prior to resubmittal of the revised EE/CA work plan.		The upland IRMs were added to Table 3-1 and references were provided. The upland RI report was submitted to DEQ in December 2005 and is provided as Appendix E to this work plan.
56	EECA	3.1	Dioxin should be considered a COIs (chemical of interest)	10/4/2005	The COI selection process has been revised. Dioxin has been included as a COI.
67	EECA	3.1.1	This investigation report discuss the collection and analysis of soil samples for COIs during monitoring well installation. No discussion of COI distribution (lateral or vertical extent) is presented. This discussion should also include findings from other soil investigation reports.	10/5/2005	The Upland RI report (Appendix E) includes a discussion of the upland COI distribution and is included with this work plan.
68	EECA	3.1.1	This investigation report discuss the collection and analysis of groundwater samples for COIs. No discussion of COI distribution (lateral or vertical extent) is presented or trends in COI concentrations over time. Report references tables presented in the RI (remedial investigation).	10/5/2005	Detailed cross-sections extending from the upland source areas to the in-water portion of the site including selected COI data are now provided in the work plan. A summary discussion of COI distribution is presented in the CSM section (Section 4.1). Additional details on COI distribution and data tables are provided in the Upland RI report (Appendix E).
242	EECA	3.1.1	Page 3-3, last paragraph of Section 3.1.1: Please provide a definition for "transition zone".	10/12/2005	The groundwater/surface water transition zone (transition zone) is the interval where both groundwater and surface water comprise some percentage of the water occupying pore space in the sediments. The physical and biochemical properties of water within the transition zone reflect the effects of mixing between groundwater and surface water that occurs within the sediments. This definition has been added as a footnote in this section.

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No.	Document	Section	Comment	Date	LSS Response
243	EECA	3.1.1	Page 3-5, first complete paragraph: previous paragraph stated 6 surface samples, however only 5 surface samples described in this paragraph. Please clarify.	10/12/2005	There are six soil samples. Based on responses to other EPA comments, the second paragraph was deleted from Section 3.1.5. Analytical results are screened in Sections 5 and 6.
452	EECA	3.1.1	Section 3.1.1 - The monitoring well data should be included in a table; figures showing groundwater concentrations upland and in river in 3 dimensions should be shown when the data are available. This should include VOCs as they may be important in the movement of DDT/DDE/DDD. All of the data should be included in the table so that it is clear that, when these data are screened (surface and at depth) against appropriate screening levels, it is clear which contaminants were screened out. There is no explanation in Section 2 as to why samples were chosen to be analyzed for volatiles and why they have been detected at high levels in groundwater and TZW.		The monitoring well data are provided in data tables in the Upland RI report (Appendix E). Detailed cross-sections extending from the upland source area to the in-water portion of the site including selected COI data are provided in the revised work plan.
360	EECA	3.1.2	Some of the highest DDT and metabolite concentrations were detected upstream of Dock 1 (e.g. DDE). These areas should be considered in the early action boundaries.	10/23/2005	Comment acknowledged. A data gap for DDT and metabolites in the vicinity of Dock 1 was addressed in Section 8.
286	EECA	3.1.2	Include a discussion of all the other contaminants in the Weston study, such as lead, that were detected above screening levels at the Arkema facility.	10/21/2005	COI discussions have been added. Please see response to comment 450.
453	EECA	3.1.2	Section 3.1.2 -Sediment Toxicity Data - were the co-located sediment data collected when the toxicity tests were done included in the data summary and the figures.		Yes, the co-located sediment data are included in the EE/CA work plan maps and screening tables.
454	EECA	3.1.2	Section 3.1.2 -Footnote 4 - Although sediment samples include porewater they are dried before analysis so the results do not provide data on contaminants that would volatilize. Please clarify this footnote.		The footnote was clarified. Sediment samples described in this section and throughout the document are bulk samples that include porewater. Standard laboratory procedures for sediment samples is to analyze the samples as received with porewater and to analyze a separate aliquot for percent solids. The percent solids measurement is used to calculate the sediment results on a dry weight basis.
122	EECA	3.1.5	Page 3-5: Riverbank soil sampling. The statement "Additionally, for all paired sample locations, the concentration of 4,4'-DDT in the sample collected near the top of the slope was higher than that in the down-slope sample" gives a somewhat misleading impression that DDT decreases in the direction of the river. That type of statement needs to be presented in the context of the entire site, not just the beach area. Compare those concentrations to concentrations in the sediments off-shore and to deeper sediment concentrations.	10/7/2005	The statement "Additionally, for all paired sample locations, the concentration of 4,4'-DDT in the sample collected near the top of the slope was higher than that in the down-slope sample" was deleted from Section 3.1.5. Analytical results are presented in the screening sections (Sections 5 and 6).
361	EECA	3.1.5	Defining the riverbank is necessary here. Based on figure 3-1 and 3-2 they look like they are in water (below mean high water), and area they are titled "bank samples". It looks like sample data are lacking around and just below mean high water.	10/23/2005	A footnote was added to the work plan to define the riverbank. The riverbank (i.e., considered soil) is defined in this work plan as the area between the mean high water and ordinary high water.
71	EECA	3.1.5	A discussion linking COIs observed in riverbank soils and upland soils is needed. River bank samples were only collected in the Dock 1 - Dock 2 area.	10/5/2005	The link between the upland and riverbank soils is presented in Section 4.1.2.
72	EECA	3.1.5	What is the distinction between a soil and sediment sample. Example: a soil and sediment sample are co-located at RB-3 and RB-10. Please clarify the criteria. Also, RB-10 is a composite sample from the top of the slope and down slope, where RB-3 is from the beach. I believe that RB stands for river bank - so the nomenclature is confusing.	10/5/2005	A footnote was added to the work plan to define the riverbank. The riverbank (i.e., considered soil) is defined in this work plan as the area between the mean high water and ordinary high water. The beach (i.e., considered sediment) is defined as the area between mean low and mean high water.
73	EECA	3.1.5	A discussion linking COIs observed in riverbank soils and sediments is needed. River bank samples were only collected in the dock area.	10/5/2005	The link between riverbank soils and sediments is presented in the Secondary and Tertiary sources section (4.1.2).

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No.	Document	Section	Comment	Date	LSS Response
26	EECA	3.1.6	Please clarify the difference between sediment groundwater and any other groundwater.	10/3/2005	Sediment groundwater is groundwater that is located in-river below the mean high water line. The clarification was added to the work plan text.
74	EECA	3.1.6	A steep lateral hydraulic gradient is observed from the uplands area to the river bank, with the vertical component of flow being generally upward. The conceptual hydrologic model presented suggests that groundwater seep(s) would likely be present.	10/5/2005	Comment acknowledged. The following text was added to Section 3.1.6: "Although seeps were not observed during the October 2002 (seep) reconnaissance survey, they may be present at certain times of the year due to the steep hydraulic gradient between the river and the uplands portion of the site near the top of the bank.
245	EECA	3.1.6	Seeps will need to be assessed as part of the EE/CA	10/12/2005	A riverbank seep survey was conducted for the Portland Harbor study and included the Arkema waterfront (refer to Section 3.1 in the revised work plan). Seeps were not observed along the Arkema shoreline. However, seep reconnaissances will be conducted during any future proposed field activities in support of the RA characterization. If active seeps are observed, sampling may be required in support of the EE/CA.
362	EE/CA	3.1.7	The co-located sediment and tissue results collected from ARKEMA as a part of the in-water RI/FS should be presented and interpreted here. This should include clam, crayfish and sculpin samples collected immediately off the ARKEMA site. Interpretation of these samples can only help in determining site specific clean up levels.	10/23/2005	A summary of tissue data has been added in Section 6. Please also see response to comment 287.
287	EECA	3.1.7	This section needs to include discussions of all the other contaminants in the Portland Harbor Round 1 data in sediment and biota (including sculpin and crayfish). These contaminants include, but may not be limited to, copper, lead, zinc, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and dioxin. In fact, the highest concentration of the dioxin toxicity equivalent (TEQ) in sediment is 16.6 parts per trillion (ppt) between Docks 1 and 2 and this has not been included in this section. This section needs to be revised.	10/21/2005	Additional information on the collection of tissue samples during the LWG's Round 1 sampling activities was added to Section 3.1.7. Summary discussions of COIs in sediment and biota are included in Section 6 of the revised work plan.
288	EECA	3.1.8	This discussion of sediment accretion should also include all rounds of the bathymetry that have been completed for the Portland Harbor RI/FS, not just two. There are also bathymetry events from Winter 2001-2, Summer 2002, and Winter 2004. All these results should be evaluated to determine if there is overall accretion at the site, and the significance of the less than one foot accretion noted over approximately eight months of time.	10/21/2005	A discussion of the bathymetric survey data collected from 2002 to 2004, including the three bathymetric difference maps that were produced from the data, were added to Section 3.2.1.2
76	EECA	3.1.9	Investigation did not include all COIs for sediment or groundwater	10/5/2005	Comment acknowledged. Data gaps are addressed in Section 8.
77	EECA	3.1.9	A discussion linking riverbank and sediment groundwater COIs is needed.	10/5/2005	The link between riverbank soils and sediments is presented in the Secondary and Tertiary sources section (4.1.2).
289	EECA	3.1.9	Please clarify which chemical(s) are in the NAPL referred to in the second paragraph.	10/21/2005	The constituent that was targeted for the NAPL screening was monochlorobenzene. This revision was made in the work plan text.
403	EECA	3.1.9	Page 3-8, Groundwater analytical detection limits for perchlorate at stations between docks 1 and 2 were elevated due to "interferences". As a result it is uncertain if the smaller perchlorate groundwater plume originating in the vicinity of the former DDT process building extends into the river.	10/19/2005	Transition zone water samples in the vicinity of Docks 1 and 2 have been collected by the LWG and additional stations are proposed in the EE/CA work plan that will delineate perchlorate in the sediment water interface. In addition, ten upland riverbank wells will be sampled for a number of analytes, including perchlorate.

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No.	Document	Section	Comment	Date	LSS Response
385	EECA	3.1.10	Page 3-8: This section describes several sediment samples that detected hexavalent chromium but does not compare the detected levels to any human health or ecological risk screening level, nor does it map the locations of the samples analyzed for hexavalent chromium. The work plan should show the location of all samples analyzed for hexavalent chromium, should propose a screening value, and should map the locations of all hexavalent chromium samples, showing which, if any, exceeded the screening values.	10/21/2005	Please see response to comment 450. Maps for both chromium and hexavalent chromium have been added to the presentation. Screening levels that were used for each of these constituents are shown on the maps, if available. A full set of screening values for each of these constituents are provided in Appendices C and D of the revised work plan.
283	EECA	3.1.10	This section needs to discuss all contaminants found in beach and surface sediment from the Portland Harbor Round 2 data. These contaminants include, but are not necessarily limited to, PCBs, PAHs and dioxin TEQ.	10/21/2005	The process for identifying COIs has been modified to address this comment. COIs for the site were determined through the screening process in Sections 5 and 6. Screening data are presented in Appendix C. Dot maps based on screening criteria were constructed for each COI and general descriptions of the extent of selected COIs are presented in Section 6.3.
284	EECA	3.1.11	This section should discuss of all contaminants in subsurface sediment from the Portland Harbor Round 2 data. These contaminants include, but are not necessarily limited to, PCBs, PAHs, and dioxin TEQ.	10/21/2005	The process for identifying COIs has been modified to address this comment. COIs for the site were determined through the screening process in Sections 5 and 6. Screening data are presented in Appendix C. Dot maps based on screening criteria were constructed for each COI and general descriptions of the extent of selected COIs are presented in Section 6.3.
82	EECA	3.1.14	The title infers a round 1 groundwater pathway. Please clarify.	10/5/2005	Comment acknowledged. The title of Section 3.1.14 was changed to "Groundwater Pathway Assessment Pilot Study".
285	EECA	3.1.14	This section states that pilot study results are in Section 3.2 and there is no discussion of the groundwater chemistry in either of these sections. One of these sections must present the chemistry results from the pilot study.	10/21/2005	Please see response to comment 450.
290	EECA	3.2.1	Please include cross-sections or other figures that present the "two apparent troughs in the basalt surface."	10/21/2005	A basalt surface contour map from the Stage 1 and 2 report (Integral 2003) was added to Appendix A.
404	EECA	3.2.1	A figure illustrating the top of the basalt surface would be useful in developing the conceptual model of the site and for screening/evaluating potential remedial technologies for the early action.		A basalt surface contour map from the Stage 1 and 2 report (Integral 2003) was added to Appendix A.
500	EECA	3.2.1	<u>Geologic cross sections</u> (Appendix A) should extend further into the uplands (i.e., cross sections D, E, L and M). This information will facilitate understanding of the relationship between upland and in-water sources, contaminant migrations pathways, etc. In addition, there should be some discussion of the filling that has occurred at the site resulting in extending the site shoreline into the river. This filling significantly impacts the location of contaminants relative to the river and the migration of contaminants towards the river.		Detailed cross-sections that link the upland source areas to the in-water portion of the site were constructed for the revised work plan. A discussion of the fill activities at the site, including the extension of the site shoreline into the river, is presented in Section 2.2.4.
84	EECA	3.2.1.1	Figure numbers appear to be out of order in Appendix A: 1, 4a, 5a, 6a, and 7a. Should this be A1, A2, A3, A4 and A5.	10/5/2005	Figure numbers from previous reports were not changed so the reader could refer back to the original source reports and quickly identify the figures. All figures from previous reports are presented in Appendix A and are grouped by report.

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246	EECA	3.2.1.2	Sedimentation rates - Bathymetric surveys: this section references bathymetric difference maps, but does not present this information in the work plan. Discussion: The evidence does not support that accretion is occurring. As previously stated (table 2-1), there is no evidence that dredging occurred. Also, dredging could be required to accommodate greater ship draft, not necessarily to remove accredited sediment. The conclusive statement that sedimentation accretion is occurring is premature based on the evidence. Also, Map 4-5f from the Harbor-wide RI Round 2 sediment sampling suggests that erosion is occurring downstream of dock 2. The draft Work Plan has not presented enough data presented to make the statement: "the preponderance of data indicates there is a net long-term sediment accretion in these areas." Please clarify statements regarding sediment accumulation/erosion near the site.	10/12/2005	Comment acknowledged. The statement "the preponderance of data indicates there is a net long-term sediment accretion in these areas" was removed from the section and a statement indicating that the data <i>appear</i> to indicate there is net long-term sediment accretion in the vicinity of Dock 1 and the Salt Dock was added. In addition, it was noted that there is no documentation to confirm the dredging around the docks actually occurred. Additional discussion of the three bathymetric difference maps was presented in Section 3.2.1.2 (see comment 291).
291	EECA	3.2.1.2	Please include the referenced bathymetry maps. Also be more specific regarding the observed differences between the various bathymetry studies at the described Arkema subareas. Does sediment appear to be accreting and/or eroding throughout the study period? Are there differences in these rates by location?		The three bathymetry difference maps are presented in Appendix A. A discussion of all three difference maps is presented in Section 3.2.1.2.
292	EECA	3.2.1.2	Modify the last sentence of the last paragraph. There has not been enough data presented to make the statement: "the preponderance of data indicates there is a net long-term sediment accretion in these areas." Please change to "the data appear to indicate."		Comment acknowledged. The statement "the preponderance of data indicates there is a net long-term sediment accretion in these areas" was removed from the section and a statement indicating that the data appear to indicate there is net long-term sediment accretion in the vicinity of Dock 1 and the Salt Dock was added.
247	EECA	3.2.1.2	Page 3-16 - Trident Probe Survey, 3rd paragraph: "A strong conductivity signal was observed at the site." Please clarify the significance of this physical condition.	10/12/2005	The high conductivities readings may be associated with groundwater discharge. This statement was in the draft EE/CA work plan.
248	EECA	3.2.1.2	Page 3-17, 4th paragraph: Data needed to validate seepage. This discussion is inconclusive re: impact of seepage.	10/12/2005	Additional information on seepage was presented in the EE/CA work plan from the R2 groundwater pathway assessment.
86	EECA	3.2.1.3	Cross sections do not include upland hydro geo. Link sediment, riverbank, and uplands stratigraphy	10/5/2005	Detailed cross-sections that link the upland source areas to the in-water portion of the site were constructed for the revised work plan. A discussion of the fill activities at the site, including the extension of the site shoreline into the river, is presented in Section 2.2.4.
87	EECA	3.2.1.3	Figures 2a, 2b, and 2c were not provided in Appendix A. Cross section locations not provided on Figure 1	10/5/2005	Figures 2a, 2b, and 2c were inadvertently omitted from the draft EE/CA. These figures are superseded by the cross-sections in the Upland RI report which are provided in Appendix E.
88	EECA	3.2.1.3	The fill history should be superimposed on the figures.	10/5/2005	The approximate extent of shoreline fill adjacent to the site was added to Figure 2-4.
455	EECA	3.2.2	Section 3.2.2 - All of the groundwater and TZW (surface and depth) need to be summarized in tables, put into three dimensional figures/isopleths, and discussed as part of a CSM. This should include all of the chemicals detected.		Groundwater and TZW analytical results are presented in Sections 5 and 6. Detailed cross-sections with selected COIs plotted on them are provided in the map folio.
90	EECA	3.2.2.1	Ultra Seep Survey, paragraph 2: "A clear negative correlation between tidal stage and seepage rate was not observed ..." intent of the sentence is unclear to me. Interpretation of these graphs are not straight forward and needs clarification.	10/5/2005	Comment acknowledged and clarification was added. A negative correlation between tidal stage and seepage rate is generally expected due to tidal influences (i.e., fluctuations in the river water column height [head]) on seepage rates.

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91	EECA	3.2.2.1	Ultra Seep Survey: Diurnal fluctuations are observed in both river stage and upland groundwater (intermediate zone). This suggests a hydraulic connection between the intermediate water bearing zone and river (Appendix B). However no explanation is given to: why the crest and troughs of the groundwater levels proceed those of the river stage, why their is asymmetry of the groundwater response curve, why the legs of groundwater response curve is so much steeper than the river stage response; why groundwater head values are greater than the river stage at the beginning of the test, and then fall below them at the end of the test.	10/5/2005	The following clarification text was added to the Pilot Study portion of Section 3.2.2.1: "Note that the groundwater response preceding the river stage response is likely a result of the river stage data being collected at the USGS station at the Morrison Bridge several miles upstream of the Arkema site". A similar groundwater response has been observed in other discharge studies, "and has been attributed to the boundary condition along the sloping beach face that acts as a nonlinear filter (Paulsen et al 2004; Integral 2005b). It is not known why the groundwater response curves are steeper than the river stage response curves".
92	EECA	3.2.2.1	Unclear where the seep was deployed? In the water column, at the base of the river bottom, at depth in a screened section?	10/5/2005	The UltraSeep unit rests on the sediment surface, requiring diver deployment and retrieval.
93	EECA	3.2.2.1	Discussion of the seepage rates is vague and does not tie in well with the discussion of groundwater and river stage measurements. Conceptually, one would expect an increase in seepage rates where the difference in head potential between groundwater and surface water is the greatest. Positive seepage rates where groundwater head is greater than the river stage. Please clarify how the existing data supports the understanding of seepage of groundwater into the river.	10/5/2005	Clarification was added to section 3.2.2.1: "In general, the nearshore sand and silty-sand sediments were found to have higher relative discharge rates than the sediments farther from the shore. This might be a result of steeper hydraulic gradients that are close to the shore". Detailed interpretation of UltraSeep data is not appropriate due to the small data set, particularly since only the three pilot study stations have associated water level data from nearshore wells.
94	EECA	3.2.2.1	The investigation findings are not conclusive. An adequate understanding of groundwater-surface water interaction appear to be limited. Additional discussion or data collection is needed.	10/5/2005	New data from LWG's Round 2 groundwater pathway assessment was presented and discussed in Section 3.2.2.1.
95	EECA	3.2.2.1	Stable isotope measurements (fractionation) have been used to help delineate surface water and groundwater interaction at the Port of Vancouver and may be considered applicable to the Arkema site.	10/5/2005	Comment acknowledged.
293	EECA	3.2.2.1	This section, Appendix B or Section 3.1.14 should include all facility groundwater chemistry results from the data tables in the Portland Harbor groundwater pilot study.	10/21/2005	Analytical results that were deemed acceptable from the LWG groundwater pilot study stations adjacent to the Arkema site are presented in Appendix C.
124	EECA	3.2.2.1	Transition-Zone Water. The summary presented seems to again minimize the discharge from the site. The fact that water does discharge is the issue, not that the monitoring is not exact or cover every seasonal difference. Please indicate that the area does discharge to the river and that the water quality from the monitoring done at that time indicated high concentrations of contaminants in the transition zone water. In addition, this section should include a summary and/or reference to the Table 3-9 values and how those relate to water quality criteria/screening values.	10/7/2005	Comment acknowledged. The following text was added to the discussion portion of Section 3.2.2.1: "Groundwater has, however, been shown to discharge from the site. Transition-zone water quality has elevated concentrations of COIs". Data screening is presented in Sections 5 and 6.
249	EECA	3.2.2.2	Deep sediment groundwater potential needs to be understood and presented in the summary of existing information or defined as a data gap.	10/12/2005	Detailed cross-sections that show selected COIs in deep sediment groundwater are provided in the map folio.
96	EECA	3.2.2.3	Figures a depicting conceptual hydrostratigraph model for the site (uplands to in-water) should be provided.	10/5/2005	Conceptual models of groundwater in the Acid Plant and Chlorate Plant areas are shown in Figures 4-1 and 4-2, respectively, of the Upland RI report (Appendix E). Detailed cross-sections that show selected COIs in groundwater are provided in the map folio.
97	EECA	3.2.2.3	Figures depicting water elevation contours or potentiometric surface for the shallow and intermediate zone should be provided.	10/5/2005	Potentiometric surface maps for the shallow and intermediate groundwater zones are provided in the Upland RI report (Attachment E)
98	EECA	3.2.2.3	Paragraph 3: Clarify whether the intermediate and deep aquifer (or water bearing zone) truly confined or are they semi-confined or leaky confined The silt layer(s) are only a few inches thick in some locations, and are not laterally continuous. This is important in regards to transport pathways and conceptual understanding of the hydrogeologic system.	10/5/2005	The intermediate groundwater zone aquifer is confined or semi-confined beneath the four uppermost alternating sand and silt layers. The deep groundwater zone aquifer is confined.

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125	EECA	3.2.2.3	The information should also include the descriptions based on the plumes of contaminants, which are the critical element to this site, rather than just the more physical description of the aquifers.	10/7/2005	Groundwater plumes and the migration of contaminants at the site are presented in the CSM section.
250	EECA	3.2.2.3	Upland groundwater - this section indicates groundwater is flowing from site to river. This condition should be discussed further relative to the migration of contaminants.	10/12/2005	Groundwater plumes and the migration of contaminants at the site are presented in the CSM section.
251	EECA	3.2.2.3	Page 3-19 - First written paragraph: It would seem that the shallow unconfined aquifer is a "flood plain" aquifer that, in addition to local recharge, is receiving inflow from upstream sites and recharge areas. Should this be the case, additional discussion of contaminant transport and fate is needed. It would be appropriate to research any I/I studies performed by City of Portland that may discuss how upgradient groundwater is influenced by storm pipes and other utility corridors.	10/12/2005	Comment acknowledged. The text in Section 3.2.2.3 was updated with information on how the City of Portland's Outfall 22B storm sewer pipe influences groundwater upgradient of the site.
295	EECA	3.2.2.3	Present upland groundwater chemistry results.	10/21/2005	The upland groundwater chemistry results are presented in the Upland RI report provided in Attachment E.
405	EECA	3.3	Available information on the presence of DNAPL and its physical properties should be summarized.		There is no information available on the physical properties of the residual MCB DNAPL observed in the Acid Plant area of the site.
69	EECA	3.3.1	Beach sediments were not collected or analyzed for metals. This is a data gap.	10/5/2005	A few beach sediment samples and a number of nearshore sediment samples have been analyzed for metals. In addition, proposed Riverbank Soil Sampling for the Upland Tier II Ecological Risk Assessment will include analysis of metals in riverbank soils. Metal concentrations in beach sediment samples are expected to be similar to the nearshore sediment and riverbank samples.
252	EECA	3.3.3	Sediment Physical Properties - Table 3-5: Physical data is from sediment within 4.5 feet of mudline. Deeper sediment info is needed to adequately assess removal areas and dredging depths.	10/12/2005	The proposed EE/CA sediment borings will provide data on the physical properties of deeper sediment.
270	EECA	3.4	This section must acknowledge that the Portland Harbor Work Plan from April 2004 shows the entire Arkema shoreline and in-water areas as optimum habitat for Pacific lamprey, juvenile chinook salmon, smallmouth bass, common carp, large-scale suckers, sculpin, crayfish, hooded mergansers, spotted sandpipers and mink (Appendix B, Figures 2-6 through 2-10). In addition, part of the Arkema facility includes optimum amphibian habitat (Appendix B, Figure 2-11).	10/21/2005	Text added: The in-water areas (< 20 ft deep) adjacent to the site were characterized in the Programmatic Work Plan (Figures 2-6 through 2-10 in Integral et al. [2004]) as being optimum fish habitat for species including common carp, juvenile Chinook, largescale sucker, Pacific lamprey, and smallmouth bass. These areas were also determined to be habitat for crayfish, sculpin, and hooded mergansers.
363	EE/CA	3.4	Table 3.6: Data in habitat areas 20 ft. deep to mean high water are absent from this site. This ecologically important area should be characterized.	10/23/2005	Text added: The in-water areas (< 20 ft deep) adjacent to the site were characterized in the Programmatic Work Plan (Figures 2-6 through 2-10 in Integral et al. [2004]) as being optimum fish habitat for species including common carp, juvenile Chinook, largescale sucker, Pacific lamprey, and smallmouth bass. These areas were also determined to be habitat for crayfish, sculpin, and hooded mergansers.
406	EECA	3.5	Page 3-30. In the equation for HQ <sub>i</sub> , the summation should be from i=1 to Ni.	10/18/2005	The equation on page 3-30 of the draft document has been removed from the work plan.
407	EECA	3.5	Page 3-31, Section 3.5.3.3. The first bullet should refer to contact with soil or sediment, because it includes dermal contact in addition to incidental ingestion.	10/18/2005	The bullet does refer to contact with soil and sediment and does not need to be revised.
408	EECA	3.5	Page 3-32, second paragraph. Screening levels based on both incidental ingestion and dermal contact are not overly conservative because both routes of exposure are reasonably likely, and will occur concurrently. The selection of exposure scenarios is very important, and needs to be discussed in more detail than a footnote.	10/18/2005	The text in Section 3.5 has been revised to remove the "conservative" or implications of being overly conservative. Additional detail and clarification concerning selection of exposure scenarios is also provided as requested.
410	EECA	3.5	Page 3-33, indirect exposure. Sediment screening values developed for consumption of water and of aquatic organisms will likely be more restrictive than the screening values for sediment contact developed in this workplan. If the lower screening levels are not considered now, it could mean that sediment concentrations remaining after early action remediation may exceed acceptable sediment levels.	10/18/2005	This comment is addressed in the new Section 5.0 of the work plan in which the JSCS criteria are now compared to site data for the purposes of COI identification.

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502	EECA	3.5	<u>Screening Level Criteria:</u> The criteria identified are for the "evaluating historical data and the RAA boundary." However the criteria do not consider bioaccumulation potential. Despite the difficulty associated with developing sediment criteria that consider bioaccumulation potential, some acknowledgement bioaccumulation is warranted considering that DDT is the primary contaminant of interest at the site and that chlorinated dioxins and furans have been detected in sediment and tissue offshore of the site. Some bioaccumulation criteria that are available include Oregon DEQ SLVs and AWQC for the protection of human health (fish consumption). Some effort at developing sediment screening values that consider bioaccumulation should also be considered. For example, using equilibrium partitioning theory and human health AWQC or using literature BSAFs and fish tissue screening levels. Sediment levels could then be screened against a range of risk levels (e.g., 10-2, 10-4).		The identified bioaccumulation criteria are elements of the JSCS which have now been incorporated into the COI identification process (see Section 5.0). Also, criteria for DDT, DDD, and DDE calculated by Poulsen and Peterson (2006) and provided by EPA have also been incorporated into the data comparison process.
458	EECA	3.5.1	Section 3.5.1 and 3.5.2 - For human health, the following values should be used for screening of groundwater, TZW, and surface water: (1) EPA's WQC and ODEQ WQC for fish consumption assuming consumption rates of both 17.5 and 175 grams per day and (2) EPA's MCLs and Region 9 tapwater PRGs. This includes the use of a tapwater PRG of 3.6 ug/l for perchlorate. For impacts to ecological receptors for screening of groundwater, TZW and surface water, the following values should be used: (1) EPA's and ODEQ's 2004 chronic WQC and Oak Ridge National Laboratory's Tier II SCVs. Language referring to principal threats should be deleted.		This comment is now addressed in the new section 5.0 of the revised work plan. The criteria identified are elements of the JSCS or have been added to the JSCS data comparison approach. Note that the DWEL for perchlorate was revised by EPA in January 2006 and therefore a drinking water value of 24.5 ug/L was used for perchlorate.
254	EECA	3.5.1	Page 3-234, 3rd paragraph. The calculation of hardness to support chronic and acute values should be based on statistical sample, not a single sample. Variability in River Water Chemistry should be recognized and accounted for.	10/15/2005	The hardness calculation was revised as requested and is based on a statistical sample of two sample stations at the Arkema site over three sample events to account for variations in river water chemistry.
296	EECA	3.5.1	Surface water data should also be screened against the more conservative of either EPA's or DEQ's chronic water quality criteria.	10/21/2005	Surface water data are compared to these and other JSCS criteria in Section 5.0 of the revised work plan.
297	EECA	3.5.2	Transition zone water and groundwater data should be screened against the more conservative of EPA's or DEQ's chronic water quality criteria.	10/21/2005	Transition-zone water and groundwater data are compared to these and other JSCS criteria in Section 5.0 of the revised work plan.
298	EECA	3.5.3	Sediment data should also be screened against DEQ's 2001 bioaccumulative sediment screening level values.	10/21/2005	These criteria are included in the JSCS which the sediment data are compared to in Section 5.0 of the revised work plan.
459	EECA	3.5.3	Arkema shall include SVLs for Aroclors, DDD/DDT/DDE, and 2,3,7,8-TCDD.		These chemicals are included in the JSCS data comparison in Section 5.0 of the revised work plan.
365	EE/CA	3.5.3.2.	Wildlife SLVs: The PRE has been submitted as a part of the in-water RI and should be referenced.	10/23/2005	Where appropriate, the PRE is now cited in the text as "Windward (2005)" and is listed in the references as "Windward. 2005c. Portland Harbor RI/FS: Ecological Preliminary Risk Evaluation. Prepared for Lower Willamette Group, Portland, OR. Windward Environmental, LLC, Seattle, WA."
491	EECA	3.5.3.2	Delete 3.5.3.2 Wildlife Sediment Quality Values "Early resolution of site-related assumptions that affect these parameters will facilitate development of wildlife sediment screening values that are generally consistent with the current harbor-wide approach (in progress). It is therefore recommended that calculation of screening values protective of wildlife exposure via consumption of aquatic organisms be completed upon final publication and approval by EPA of the harbor-wide approach, if it becomes available before completion of the EE/CA report." The Portland Harbor PRE is a preliminary risk assessment that is not intended to derive sediment screening values. Arkema should present alternative screening levels that are appropriate for the removal action.		LSS understands that the wildlife model and BSAF values needed to estimate PRGs in support the Round 2 Report are still in the developmental stages. Consequently, the quoted text has been deleted and replaced with new text that describes the selection of alternative values to facilitate definition of the RAA.

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No.	Document	Section	Comment	Date	LSS Response
460	EECA	3.5.3.3	Section 3.5.3.3 - Human Health Screening Values for Direct Contact with Sediments - (1) For the Portland Harbor (PH) Human Health Risk Assessment (RA), direct contact to beach sediments and in water sediments are being evaluated separately. For beach sediments, the methods and the exposure assumptions are those that have been agreed upon and are in the PH RA Workplan. For in-water sediments for PH, a decision has not been made as to which receptors to evaluate nor which methods and exposure parameters should be used. As the Arkema EE/CA is now written, the PH RA beach scenarios and exposure assumptions are being used to calculate screening levels for both beach sediments and in-water sediments. This should be changed. Upland beach sediment data should be presented separately and evaluated separately using the PH beach scenarios and exposure assumptions. Since the receptors, methods, and parameters have not been agreed upon for in-water receptors in the PH RA, the in water sediment concentrations in this EE/CA should be screened using the Region 9 Industrial PRGs. These values are the agreed to screening values for the in-water sediments for the PH site. (continued below)		JSCS values will be used to screen sediments for identification of COIs. Areas considered to be a principal threat will be identified by screening sediment data against risk-based screening levels presented in the PH HHRA for the dockside worker and transient; the exposure assumptions used to develop the EPA Region 9 PRGs for soil at industrial sites are not relevant for in-water sediments. The latter screening exercise is a principal threats analysis and is not intended to constitute a complete human health risk assessment. The objective of the screening is to identify contaminated areas of greatest concern that will be the focus of the removal action. For this reason, screening levels will be based on a target cancer risk level of 1E-05 and noncancer hazard quotient of 1. Indirect exposures to in-water sediment via ingestion of biota will be evaluated quantitatively as these pathways are being evaluated in the PH in-water risk assessment. Refer to Section 6 for a discussion of the human health risk-based screening process.
460		(continued)	(2) Beach sediment screening - For the beach sediments, the screening values that were developed for workers and transients using the PH RA are acceptable except for the following: (a) The EE/CA does not include the exposure factors that were used to calculate the PRGs for beach sediment - these need to be added. screening (b) The screening values for beach sediment were calculated assuming a cancer risk of 10-5 and an HI of 1. For screening purposes, EPA Region 10 requires the use of 10-6 and an HI of 0.1. A value of 10-6 should also be used since this is ODEQ's remedial risk level for individual chemicals and it also within the range of risks considered by EPA in making remedial decisions (10-4 to 10-6).		
366	EE/CA	3.5.3.3	Co-located tissue (crayfish, sculpin and clams) are available from the site, and should be used to make inferences about BSAFS and implications for sources at the ARKEMA site. These can and should be site specific in many cases (bioavailability may vary harbor-wide).	10/23/2005	The data cited in the comment have been used to characterize the site, support identification of data gaps, and provide a foundation for additional site characterization and evaluation of the RAA as described in Section 8 of the revised EE/CA work plan.
42	EECA	3.5.3.3	Page 3-32: Regarding sediment screening values. Please provide a table describing the exact numerical assumptions utilized for each of the seven scenarios.	10/6/2005	Exposure assumptions used in calculating risk-based screening levels are discussed in Section 6 and Appendix C.
43	EECA	3.5.3.3	Page 3-32: Regarding the assumed cancer risk level (RLC). A value of 10-6 should be used to be consistent US EPA Region 9 PRGs and ODEQ risk assessment guidance	10/6/2005	Refer to the revised screening methodology provided in Sections 5 and 6. Initial screening of media for selection of COIs includes JSCS values that are based on a target cancer risk of 1E-06 and noncancer HQ of 0.1. The additional screening exercise in the EE/CA is essentially a principal threats analysis and is not intended to constitute a complete human health risk assessment. The objective of the screening is to identify contaminated areas of greatest concern that will be the focus of the removal action. For this reason, screening levels are based on a target cancer risk level of 1E-05 and hazard quotient of 1.
256	EECA	3.6	Additional Surface Water Data should be drawn from other previous reports, to identify potential variability either temporal or flow. Use of one (1) sample for surface water conclusions is not sufficient.	10/15/2005	Data from the Portland Harbor RI have been added to the surface water data set and have been included in the data comparisons. The surface water data are from three stations along the Arkema riverfront and were collected temporally during three different periods of the year.
412	EECA	3.6	Page 3-34, transition-zone water. The screening of transition-zone water in Table 3-9 is conducted using only acute criteria. Screening on chronic criteria is also important.	10/18/2005	Table 6-1 includes acute and chronic criteria. Section 5.2.1 and 5.2.2 also reference chronic criteria.
413	EECA	3.6	Page 3-37, Section 3.6.3.2. Appendix C includes screening values for many scenarios, including recreational beach users and various fishers. This portion of the report limits the screening values to dockside worker or transient. The fisher scenarios are still relevant offshore of the site, so the information presented in Appendix C should be evaluated in the report.	10/18/2005	Appendix B (formerly Appendix C) has been revised to include information specific to calculation of human health risk-based screening levels which assume direct contact with sediments, not ingestion of aquatic biota. Consumption of fish and shellfish will be evaluated in the PH HHRA.
461	EECA	3.6	For any screening of environmental media in this document, the complete data set used for the screening should be in a table either in the document or on a CD included with the EECA. This will make it possible for EPA and its partners to decide if all of the data used for screening were included to verify that the screening was done accurately.		The complete set of data used in the screening process is presented in Appendix C.

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45	EECA	3.6	Page 3-34 - Data Screening. There is no discussion of screening of groundwater contaminants (hexavalent chromium, perchlorate, etc) for potable use of groundwater by current/future site workers. Please provide a discussion of the potential current/future use of groundwater and whether it is a complete exposure pathway for human receptors.	10/6/2005	The revised CSM in Section 4 reports the results of the beneficial use survey completed for the Arkema site, the findings of which are that groundwater is not currently used nor is it likely to be used in the future as a drinking water source. Although groundwater is not considered a source of drinking water, data were screened against JSCS values in Section 5 which include values based on water consumption by humans.
46	EECA	3.6	Page 3-34 - Data Screening. There is no discussion of screening of chemicals found in aquatic biota that are consumed by human receptors. Is the Site in an area of cultural importance to local Tribes? If so, then fish consumption should be evaluated. Please provide a discussion of why fish consumption (even at a minimal level) is not considered for human receptors.	10/6/2005	SLVs based on human consumption of aquatic biota have now been incorporated by way of the JSCS data comparison in Section 5 of the revised work plan.
462	EECA	3.6.1	Sections 3.6.1 and 3.6.2 -For surface water, groundwater, and TZW, as previously discussed, screening must be done against chronic WQC fo aquatic life, WQC for human health for fish consumption (175 g/day), MCLs, and Region 10 tap water PRGs. For surface water, all available data should be used including the recent sampling done for the LWG for the RI/FS. There is no section for screening of groundwater at depth, either upland or in-water. The rationale given for not screening groundwater is that " they represent the deeper groundwater and that is not in contact with eco or human receptors". All groundwater and TZW data should be summarized and discussed, as well as mapped (e.g., isopleths), as a part of the CSM. These data then should be screened to show the extent of exceedances throughout the plumes and into TZW. This screening is important for several reasons: (1) It is important for fully developing the CSM for the site (2) The PH TZW sampling was a pilot effort and may not represent actual TZW data for the site, both in the shallow waters and at depth where (continued below)  deeper plumes may be emerging. (3) In theory, silty sediments at the surface would reduce the flux of contaminated groundwater into surface water. For the purposes of remedial design, it would be important to know the depths at which ARARs and other risk based criteria are exceeded. This could help in the decisions on removal and on cap materials.		The revised CSM in Section 4 includes both upland and in-water sources, chemical transport mechanisms, and exposure media. All media are screened against JSCS values to identify COIs, as described in Section 5. Further screening using risk-based values protective of direct contact exposure pathways is discussed in Section 6.
368	EE/CA	3.6.1	Surface water data should also be screened using chronic values, since the organism exposure in the area is also chronic in nature. If acute values add value to the project, the document should present a range using both type of screening values.	10/23/2005	Surface water samples were screened against both acute and chronic values.
299	EECA	3.6.1	There are three rounds of Portland Harbor surface water sampling that need to be screened. The locations of these samples and any exceedances should be presented on a figure.	10/21/2005	The three rounds of Portland Harbor surface water samples collected adjacent to the Arkema site were included in the data screen. The surface water station locations are presented on Figure 3-1a. Screening results are presented in the map folio.
367	EE/CA	3.6.2	Appropriate screening numbers should be conducive to organism exposure. Longer term exposures (more in line with organism life span) should be assessed using chronic exposure values. Acute screening is more appropriate for assessing potential effects from short-term, limited duration exposure such as pulsed discharges (acute numbers are based on 96 hour exposure in the lab; the only endpoint measured is mortality).	10/23/2005	Surface water, groundwater, and sediment samples were screened against both acute and chronic values (Table 6-1).
3	EECA	3.6.2	No data for chromium or perchlorate in groundwater is evident. The workplan should describe how these data gaps will be filled.	9/27/2005	Riverbank monitoring well data and all in-water groundwater data were screened for perchlorate and chromium against appropriate screening criteria. Additional transition zone water samples and selected riverbank monitoring well samples are proposed to be analyzed for perchlorate and chromium as part of the EE/CA work plan.
30	EECA	3.6.2	Deeper groundwater should be evaluated in the EE/CA as it pertains to river influx.	10/3/2005	Detailed cross-sections extending from the upland source areas to the in-water portion of the site are presented in the map folio. The cross-sections show groundwater elevations from the upland source areas to the in-water portion of the site. COIs are also presented for selected chemicals on cross-section that extend from the uplands to the river.

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257	EECA	3.6.2	A definition of transitional water is needed to support conclusive statements such as WB sampling points are representative of deeper ground water. A definition is also needed to accurately assess fate/transport & exposure concerns. A definition of acute exceedances for the Transition Zone would be helpful.	10/15/2005	Please see comment 242 for a definition of transition zone water. All of the samples collected as part of the LWG Round 2 groundwater pathway assessment and groundwater pilot study are considered transition zone water samples.
300	EECA	3.6.2	Groundwater needs to be screened against chronic water quality criteria to determine the severity of the subsurface contamination. At this point in the process, it is not appropriate to limit the evaluation of groundwater to transition zone water without some type of fate and transport analysis to understand what risk deeper groundwater may pose to ecological or human receptors. There is no presentation of contaminant flux in this EECA, which has been identified as a remedial action objective (RAO). In addition, there should be figures in plan and cross-sectional view indicating the locations of the exceedances and the areal extents of the plumes that exceed each chronic chemical criterion and each acute chemical criterion.	10/21/2005	Groundwater data were screened against appropriate chronic and acute screening criteria. Plan view and cross-sections with chronic and acute screening value exceedances are presented in the map folio. A discussion on groundwater flux is presented in Section 3.2.2.1 and will be evaluated further as part of each potential EE/CA remedy for the site (in particular capping).
492	EECA	3.6.2	Incorporate 3.6.2 Transition-Zone Water "Data from a total of 45 transition-zone water samples collected adjacent to the Arkema site were screened against the Oregon DEQ acute screening criteria (Table 3-7). These samples represent data from a total of ten sample stations. Concentrations above screening criteria were found for one analyte (chloride) and one analyte group (DDTr). Table 3-9 presents a complete list of chemicals above screening criteria, including C/S -Fs, in transition-zone water samples collected adjacent to the Arkema site. Groundwater samples collected during the Stage 1 and 2 Investigation (i.e., WB stations) were not screened because they represent deeper groundwater that is not in contact with ecological or human receptors." Although deeper transition zone water may not be in contact with ecological receptors at this time, it should be screened 1) as a source, 2) as potential levels that will exist after dredging, and 3) to represent areas that groundwater may be discharging preferentially.		The WB station groundwater data were screened against appropriate chronic and acute screening criteria (Sections 5 and 6).
301	EECA	3.6.3	This section should include figures in plan and cross-sectional view that indicate the locations of surface and subsurface riverbank and sediment samples that exceed screening criteria. The areas that exceed each chronic chemical criterion and each acute chemical criterion should be shown on these figures.	10/21/2005	Plan view maps and cross-sections with data screening plotted on them are presented in the EE/CA work plan map folio.
369	EE/CA	3.6.3.1	Benthic Community Screening: We should be screening on more than just direct toxic effects.	10/23/2005	The JSCS data comparison in Section 5 now incorporates SLVs related to bioaccumulation and effects other than direct toxicity.
302	EECA	3.6.3.2	Recreational users of the beach at the north end of the property have been observed during boat trips on the Willamette River. The EECA work plan needs to evaluate the potential risks of exposure to the contamination by using the full range of human health screening values (including Native American fishers and child recreational beach users).	10/21/2005	The revised CSM in Section 4 provides a discussion of all potential human receptors for the Arkema site. However, screening to identify the area of principal threat is based on direct contact with contaminated sediment by transients and dockside workers only (see Section 6.1.2.1).
463	EECA	3.6.3.2	Section 3.6.3.2 - Sediments and beaches have been lumped together and screened. As described above, these data must be kept separate. The screening for the beach sediments is appropriate except as noted above (cancer risk level must be at 10 <sup>-6</sup> and HI at 0.1 and exposure parameters and assumptions used much be included in the EE/CA). For in water sediments, screening should be done using the Region 9 EPA industrial PRGs for soil since the receptors, methods and exposure assumptions have not been developed in the PH RA for the in-water risk assessment.		In-water and riverbank sediments will be screened against PH HHRA risk-based values for the dockside worker and transient. The exposure assumptions used to develop the EPA Region 9 PRGs for soil at industrial sites are not relevant for in-water sediments. The latter screening exercise is a principal threats analysis and is not intended to constitute a complete human health risk assessment. The objective of the screening is to identify contaminated areas of greatest concern that will be the focus of the removal action. For this reason, screening levels will be based on a target cancer risk level of 1E-05 and noncancer hazard quotient of 1.
127	EECA	Fig 3-4	The presentation of the bioassays seems to bias the information to make most of the toxicity appear in the chloride plume area and not in the DDT/chlorobenzene areas. However, it is not clear that the criteria used are acceptable to EPA and the values should be adjusted to make values compatible with Portland Harbor project final criteria. Please clarify.	10/7/2005	Figure 3-4 was generated by the LWG and was included in the LWG Round 2A Data Report, Sediment Toxicity Testing. The EE/CA work plan proposes additional surface sediment sampling using a tiered approach of sediment chemistry and bioassay testing in the vicinity of Docks 1 and 2 where DDTr concentrations are the highest.

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386	EECA	4	Figure 4-4: The figure shows several orange crosses labeled as CP-##-___ or AP-##-___, but these symbols are not defined in the legend	10/21/2005	Transition zone water sample stations will be added to the figure legend.
271	EECA	4	Figures 4-1 and 4-2 that are referenced in this section do not show a connection between the manufacturing chemicals and the NAPL in the subsurface. NAPL needs to be presented as either a primary or secondary source of contamination. In addition, the word "incidental" in front of ingestion should be removed from the surface water boxes in the exposure route column for both figures. Incidental ingestion of water does not make sense for an ecological receptor. For humans, there is the potential application of drinking water standards as an applicable or relevant and appropriate regulation (ARAR).	10/21/2005	The manufacturing process residue chemicals identified in Figures 4-1 and 4-2 include the residual DNAPL that has been observed in the subsurface. In section 4.1.2.3 (Groundwater) of the CSM, the text states that the residual DNAPL that has been observed in the subsurface is an ongoing source of chemicals to groundwater. LSS disagrees with the reviewers statement regarding incidental ingestion of surface water, beach sediments, or in-water sediments for ecological receptors. The exposure route is appropriate for ingestion of sediment and surface water while an organism feeds. LSS agrees that biotic uptake should not include "incidental". The AOC SOW states that for human health, incidental ingestion of and dermal contact with surface water are within the scope of this action. MCLs and tapwater PRGs assume a lifetime of drinking water ingestion exposure, which is not consistent with the SOW.
417	EECA	4	Figure 4-2. Ingestion of surface water, as distinct from incidental ingestion of surface water, should be included as a relevant pathway for mammals and birds. Dermal contact with sediment is also relevant for mammals and birds.	10/18/2005	The word "incidental" was deleted from the figure to acknowledge the relevance of surface water ingestion as a potential pathway and route of exposure. Dermal contact is also a potential route of exposure for birds and mammals. However, pursuant to EPA direction in past projects, dermal contact is not included in exposure calculations for birds and mammals. The dermal route of exposure would be difficult to quantify even for well known mammalian wildlife species that could be studied in controlled laboratory settings and to our knowledge is almost never conducted in ecological risk assessments.
418	EECA	4	Figure 4.4. The groundwater chloride plume should be shown on the figure.		The chloride plume has been added to the figure (now Figure 4-3)
419	EECA	4	Figure 4-4. The elevated pH/arsenic plume in the Chlorate Plant area should be shown in the figure. Elevated pH/arsenic levels are present in the riverbank wells MWA-34I and MWA-52I. The riverward extent of this plume is unknown.		The pH/arsenic plume has been added to the figure (now Figure 4-3).
420	EECA	4	Figure 4-4. The ammonium perchlorate plume in the Acid Plant Area should be shown on the figure. The riverward extent is uncertain and can be qualified with question marks.		Perchlorate in Acid Plant area groundwater did not exceed the groundwater concentration of 20 mg/L that was used as the definition of the perchlorate boundary. To provide additional information on upland groundwater plumes that are being addressed by IRMs, LSS has included the revised upland RI report as Appendix E to the revised EE/CA work plan.
421	EECA	4	Figure 4-4. From the sampling locations shown on the figure, it is not clear if the extent of the hexavalent chromium, perchlorate, and DDT plumes have been bounded beneath the river.	10/18/2005	Sample locations have been added to the figure.
414		4	This section should be expanded to include a site hydrogeologic conceptual site model. This section should be supported by appropriate figures (i.e., block diagrams, cross-sections, isoconcentration contour maps) to clearly illustrate the nature and extent of known contamination at the facility.		LSS has included the draft final upland RI report as Appendix E to the EE/CA work plan. Maps and figures that identify the nature and extent of contamination are included and referenced. The introduction to Section 4 references the Upland RI Report which contains additional text and figures that can be reviewed to develop an understanding of the site's hydrogeology.
99	EECA	4.1	Volatization should be considered a release mechanism	10/5/2005	Comment noted. Section 4.2.7 added to discuss Airborne Transport of COIs at the site.
272	EECA	4.1	This section may need to include dioxin, PCBs and PAHs. There are concerns that these chemicals may have been released with the processing waste.	10/21/2005	Comment noted. Section 4.1.3 (Additional Site COIs) was added to address COIs identified during data screening activities.
128	EECA	4.1	Sources: The sources should include chloride and maybe pH unless that is determined by the EPA not to be a potential problem when the uplands data is presented in the next version of this document.	10/7/2005	Comment acknowledged. Via the data screening process outlined in Section 3.6, pH was not considered to be a source. The chloride plume has been added to Figure 4-3. Chloride is discussed as a site COI in the CSM.
129	EECA	4.1	Sodium Chlorate Manufacturing: Unclear why this section has a USEPA 2005 reference and the other sources do not. Please include references for the other sources or delete this one.	10/7/2005	Comment noted. This reference has been deleted from this section.

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336	EECA	4.1	Figure: Please clarify the dockside worker exposure to surface water.	10/21/2005	Figure has been revised based on EPA's comments and models provided. Dockside workers could potentially be exposed to surface water during work activities.
303	EECA	4.1.1	Figure 4-3 needs to include: the locations of the former storm sewer outfall, the Lot No. 1 former DDT trench, the areal extent of the contaminated riverbank soil, and known impacted areas from historical spills; the locations and areal extents of filling activities, particularly those with suspected contaminated sediments; and the locations and areal extents of excavations completed to remove contamination.	10/21/2005	The former storm sewer outfall and the location of dredge and filling activities along the riverbank were added to the historical site features map (Figure 2-4 in the revised EE/CA work plan). IRM removal areas are presented in Figure 7-1 of the Upland RI report (ERM 2005a; Appendix E). Riverbank soil data are presented in the map folio. All available information on historical spills is presented in Section 4.
320	EECA	4.1.1	Is there information regarding the storm sewer discharge to ground water through Inflow/Outflow? Has there been storm sewer surveys that would indicate whether the storm sewer released directly to groundwater in addition to the river? The extent of the storm water system should be shown, not solely the outfall.	10/21/2005	The full extent of the storm sewer system is displayed in the background of nearly all the plan view figures in the work plan. There is no information available regarding the potential for system leakage to groundwater. A reference to the upland RI report has been added that documents that the groundwater elevation in the Chlorate Plant area and the Acid Plant area is consistently below the invert elevations of the storm sewer system.
321	EECA	4.1.1	Former DDT trench on Lot 1 should be shown on the figures.	10/21/2005	The former DDT trench on Lots 3 and 4 was added to the figures. There was no DDT trench on Lot 1.
322	EECA	4.1.1	The transport of materials across the site has been referenced in several sections of the EECA, however, there is no discussion of potential loss of chemical to the environment as a result of moving materials across the site. Overland transport would tend to concentrate chemicals in loading and discharge areas and along traffic patterns. Pipe transport of materials would be subject to leaks at flanges, unions, and welds. The EECA should look at transport methods for sodium chlorate to the process building and other materials to and from the barge and ship loading facilities.	10/21/2005	Comment acknowledged. The full discussion of loss of chemicals to the site can be found in the Upland RI. Specific discussion of chloride impact to the site is dealt with in response to comments 128 & 418. Furthermore, throughout history of the plant, all hazardous material piping was constructed and maintained as overhead piping. Overhead piperacks were located throughout the plant where any leaks could be readily detected and repaired.
323	EECA	4.1.1	The CSM should discuss the release mechanisms for the COI to enter the environment and the environmental media directly impacted from the release of COIs. Only after defining the release mechanisms can the EECA clearly evaluate secondary sources.	10/21/2005	The revised CSM presented in Section 4 provides a discussion and depiction of COI release and transport mechanisms.
324	EECA	4.1.1	The EECA does not identify contaminated groundwater from upgradient locations as a primary source of contamination at the site. Considering contaminated groundwater and contaminated river water are flowing from off-site to on-site, they should be identified as a primary source.	10/21/2005	Comment acknowledged. This type of discussion goes beyond the principal threat evaluation of an EE/CA. The Upland RI contains some of this information, and is referenced in the first paragraph of Section 4.1. The EPA CSM figure does not address upgradient groundwater as an exposure medium at all. Therefore, to remain consistent with EPA's model, we did not evaluate this source in the in-water EE/CA conceptual site model. The revised CSM presented in Section 4 lists groundwater and upriver water as sources of contamination. Upgradient groundwater sources are being evaluated under the upland RI/FS process.
503	EECA	4.1.1	<u>Primary Sources</u> : As stated earlier, the electrolytic reduction process may be a source of chlorinated dioxins and furans. This should be identified as a potential source in this section.		Comment noted. Information regarding the potential for dioxin/furan production from chlorine cells is discussed in Section 4.1.3 (Additional Site COIs).
422		4.1.1 & Figure 4-3	The location of the Lot No. 1 Former DDT Trench should be presented in Figure 4-3		The former DDT trench on Lots 3 and 4 was added to the figures. There was no DDT trench on Lot 1.
100	EECA	4.1.2	Groundwater: Is groundwater a drinking water source or not-thought to interact with river sediments; if so should deep groundwater be separated from shallow groundwater	10/5/2005	Drinking water is not an applicable beneficial use of groundwater in the vicinity of the Arkema site. The remainder of this comment is not clear. Section 4.3 (Exposure Pathways and Potential Receptor Populations) text has been expanded to indicate that groundwater has not nor will it be a drinking water source at the site.
101	EECA	4.1.2	Groundwater to soil volatilization be a secondary release mechanism	10/5/2005	The revised CSM in Section 4 includes volatilization of COIs from soil and groundwater as potential transport mechanisms.
102	EECA	4.1.2	Stormwater runoff (overland flow) and discharge (outfalls) be separated? Similar to section 4.2.	10/5/2005	Stormwater 'overland flow' and 'discharge' have been separated in the Conceptual Site Model. See Section 4.2 (Transport Pathways).

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103	EECA	4.1.2	Soil should be considered a secondary source, where process residue is leached to soil. Soil could leach to groundwater or have a direct exposure route to receptors	10/5/2005	Potential for COI leaching from soil is considered in the conceptual model (see Figures 4-1 and 4-2 and Section 4.2.2, Leaching from Soil to Groundwater).
104	EECA	4.1.2	Potential receptors on the soil exposure route would be construction workers and excavation workers (incidental ingestion, inhalation (dust), and ingestion).	10/5/2005	The revised CSM in Section 4 discusses upland workers who may be considered receptors at the site, including construction, indoor, outdoor, and excavation workers. These exposures are being evaluated in the upland RI/FS process.
105	EECA	4.1.2	If soil is a secondary source, it may be helpful to separate shallow soil (<3 feet) from deeper soil. (e.g. excavation workers would only be identified with deeper soil).	10/5/2005	Detailed evaluation of surface and subsurface soils for construction, excavation, and other outdoor workers will be conducted in the upland RI/FS process, as discussed in the revised CSM, Section 4.
423		4.1.2	Figures 4-1 & 4-2 don't include "stormwater & waste water" unless they are assumed to be included in "surface water".		Figures 4-1 and 4-2 have been revised to include storm water and waste water.
304	EECA	4.1.2.1	There needs to be a figure, either in an earlier section or in this one that shows groundwater elevations and flow directions.	10/21/2005	References to ERM's Upland RI report groundwater figures: Fig. 4-6 (Acid Plant Area Shallow-Zone Groundwater Elevation Map); Fig. 4-7 (Acid Plant Area Intermediate-Zone GW Elev. Map); Fig. 4-14 (Chlorate Plant Area Shallow-Zone GW Elev. Map); Fig. 4-15 (Chlorate Plant Area Int-Zone GW Elev. Map); Fig. 4-17 (Deep-Zone Potentiometric Surface Map) have been added to the work plan.
305	EECA	4.1.2.1	Figure 4-4 needs to show the location and extent of the chlorobenzene NAPL. In addition, the plumes also need to be mapped using chronic ambient water quality criteria or EPA Region 9 tap water preliminary remediation goals (PRGs), which appear to be 50 ug/L for chlorobenzene, 0.001 ug/L for DDT, 110 ug/L for hexavalent chromium, 3.6 ug/L for perchlorate and 230,000 ug/L for chloride. The text should list what the values of the highest chloride concentrations at the site are.	10/21/2005	Comment acknowledged. The extent of chlorobenzene NAPL has been added to Figure 4-3. Chloride concentrations as compared to acute criteria are presented in Appendix C of the revised work plan. Screening figures in Section 6 present site COIs plotted with various screening level values. Highest detections of select COIs are presented in Table 4-1 and some are listed in the text such as for chloride.
306	EECA	4.1.2.1	Cross-sections showing the groundwater plumes need to be added to this section. In addition, a specific discussion of the contaminant migration needs to be included in this section, including which plumes are in which groundwater zones. In accordance with the RAOs, an evaluation of the contamination flux must be conducted, which may need to include fate and transport modeling.		Cross-sections from Upland RI Report (ERM 2005) are referenced in Section 4 for groundwater plumes. Discussion of contaminant migration is also included in Section 4.
467	EECA	4.1.2.1	Section 4.1.2.1 -All major contaminants in groundwater should be discussed, including volatiles and manganese. The groundwater data should be presented both laterally and vertically with concentration isopleths. Plumes and isopleths should not be defined at this point by screening levels as was done for Figure 4-4, but rather all data should be presented. (The Region 9 PRG for screening of perchlorate is 3.6 ug/l and should be used when screening is done - not the 20 mg/L value used here.) Why is there no discussion of VOCs in groundwater (even though they are proposed to be analyzed in both sediments and water in the FSP)? Are they important to consider in the movement of DDT/DDE/DDD from upland into groundwater and TZW?	10/21/2005	LSS has provided discussion and presented new maps and cross-section for COIs, including VOCs, in the revised work plan.
307	EECA	4.1.2.1	The extent of any other groundwater plumes that are identified through the screening process will need to be indicated on additional figures.	10/19/2005	Data screening did not identify additional groundwater plumes at the site. Therefore, additional groundwater plume figures (other than what are presented in the map folio) are not required at this time.
415	EECA	4.1.2.1	Page 4-3 Given the large variation between the DEQ chronic value, the literature value (Dean et al. 2004), and PRGs additional regulatory review concerning the acute value is warranted. Also, mortality may not be the only end point of significant concern for perchlorate. Amphibian development is reported to be significantly impaired at sub mg/L levels.		The CMC value from Dean et al. (2004) was used because it is a more relevant indicator of the potential principal threat area that is being addressed by the EE/CA. Use of this acute number for purposes of defining the RAA does not imply it is a cleanup number.
425	EECA	4.1.2.1	Page 4-4, The high chloride concentrations in groundwater beneath the Salt Dock Area may account for the high sediment bioassay mortality observed in this area.	10/7/2005	LSS agrees. Please refer to response to comment 418.
130	EECA	4.1.2.1	Groundwater: The perchlorate plume is define at the 20 mg/L (ppm) concentration. Arkema should map this plume to the low ppb concentrations (PRGs of 3.6 ug/L) to reflect the risk values presently being used by regulatory agencies.	10/7/2005	The 3.6 ug/L level for perchlorate was a provisional value based on drinking water consumption by humans. A revised DWEL of 24.5 ug/L was recommended by EPA in January 2006. LSS's screening included screening perchlorate to the 24.5 ug/L DWEL.

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131	EECA	4.1.2.1	The chlorobenzene plume in text and Figure 4-4 should be mapped to a lower concentration than 1.1 mg/L unless there is no data to allow such contouring. If there is no data to less than 1.1 mg/L then that fact should be included in the report and maybe it should be part of the data gaps identified.	10/21/2005	Use of this acute number for purposes of defining the RAA does not imply it is a cleanup number. The revised draft work plan includes both the acute value for chlorobenzene as well as new maps that show the range of SLVs and data comparisons for chlorobenzene.
308	EECA	4.1.2.2	Stormwater data need to be presented either in this section or in Section 3. There should be a figure showing locations of samples and tables showing exceedances. In addition, the stormwater reports were not provided as part of the background document set for review.	10/7/2005	Comment noted. Figures 4-1 and 4-2 have been revised to include storm water and waste water. In addition, Section 5.9 of the Upland RI is referenced in Section 4.2.3 of the revised work plan.
133	EECA	4.1.2.3	Wastewater: The text should reference the figures (Fig. 2-1 and Fig. 4-3, for example) where the outfalls are shown, and similarly reference other figures where items mentioned in the text are documented. Note that the discharge pipe is only shown in some figures. Since that pipe apparently was the main source it should be carried along to other figures and referenced in text in more detail – where was it located? Size? Was it cleaned out? Was it removed?	10/21/2005	Comment noted. The discharge pipe location shall be added to all relevant figures. In addition, description of discharge pipe use and traditional decommissioning practices are presented in Section 4.2.3.
309	EECA	4.1.2.3	Outfalls 1 through 4 need to shown on figures, particularly Figure 4-3.	10/21/2005	Outfalls 001 through 004 were added to the figures.
327	EECA	4.1.2.3	The piping systems should be considered as well as the outfalls as sources for COI.	10/21/2005	The revised draft upland RI report evaluated the elevation of the storm sewers in the Acid Plant area and in the Chlorate Plant area. The invert elevations of the storm sewer are consistently above the maximum groundwater elevations. In addition, all chemical piping was located on overhead pipe racks.
310	EECA	4.1.2.4	There should be figures showing the location and extent of sediment contamination screened by TECs, PECs or approved screening values and by DEQ's bioaccumulation sediment SLVs.	10/3/2005	Figures have been included in the work plan presenting sediment data comparisons to a range of SLVs.
32	EECA	4.1.21	EPA does not agree that the DNAPL is immobile.	10/4/2005	Several phases of the upland RI focused on investigating whether DNAPL is present and in a mobile form. There are numerous monitoring wells in the Acid Plant area screened in the DNAPL zone. DNAPL has only been detected in one well for a short period of time after well installation. DNAPL has not been found in any of the other monitoring wells. No mobile DNAPL was identified. The EE/CA work plan text (Section 4.1.2.3), however states that the residual, immobile DNAPL is still contributing to the dissolved phase MCB plume.
107	EECA	4.1.3	It is EPA's understanding that Phase I improvements were limited and that additional sediment catch basin and stormwater sampling are being proposed by Arkema prior to any additional improvements. This information will need to be considered during the EECA process.	10/4/2005	Information regarding proposed stormwater sampling is included in Section 3.1.16.
108	EECA	4.1.3	Please define Phase II removal activities	10/7/2005	Comment noted. In addition to the summary of all source control measures in section 4.1.5, the text has been revised to include a reference to the Upland RI section 7.0 'Summary of Interim Remedial Actions'
134	EECA	4.1.3	Source Control. Soil Vapor Extraction System. This section should include some more details on what was extracted, both the contaminants and the total mass of each, to help understand the upland sources that have existed and have been removed.		Approximately 2500 pounds of MCB were removed during system operation. The text was revised.

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No.	Document	Section	Comment	Date	LSS Response
469	EECA	4.1.3	Section 4.1.3 - This section supposedly summarizes source control but it is too brief to be of much value. Little information is provided to determine how these sources may have impacted the river and, if remediated, to determine that the remaining contaminants are not at levels of concern. For example, Lots 1 and 2 should be on maps and the location of the residue piles and ponds and DDT trench shown. Historical photos would be useful. What are the residual concentrations remaining after these source control measures? Was groundwater ever measured for contaminants? What concentrations in soil remain after the Phase I and II Soil Removal IRMs and what are the levels in the fill area used for the stormwater improvements? Have these areas been ruled out as existing sources to groundwater? Have they contributed to the sediment contaminants at and beyond the North end of the site (e.g. dioxins/furans)?	10/21/2005	Source control subsections have been expanded. Also, the Upland RI Report (ERM 2005) is referenced where appropriate. Details have been added to base maps.
311	EECA	4.1.3	As stated before, areas that have been excavated need to be located on a figure. Figures should be added that show the location of the full-scale soil vapor extraction system, the stormwater system improvements, the locations of the calcium polysulfide injections and the locations of the persulfate injections.	10/21/2005	A reference to ERM's Upland RI Report has been added to Section 4.1.5., including locations within that report that provide descriptions of IRMs and figures.
328	EECA	4.1.3	Asbestos-containing Residue Removal. Please clarify whether the DEQ approval resulted in a no further action determination.	10/21/2005	Comment noted. Section 4.1.5, paragraph three text has been revised to indicate final DEQ approval (Integral and GSI 2004). DEQ-approved work plan and periodic inspections were conducted including a final DEQ inspection for a project closure on February 12, 1992.
329	EECA	4.1.3	DDT source removal. The location of the removal should be shown on the figures. Please clarify whether ODEQ issued a no further action determination for this area.	10/21/2005	Comment noted. Please refer to response to comment 311. Section 4.1.5, paragraph four text has been revised to indicate final DEQ approval. Although LSS initially proposed to finalize a soil management plan for the DDT source removal project on Lot 1, it was later decided to incorporate both Lots 1 and 2 into LSS's upland risk assessment and feasibility study.
331	EECA	4.1.3	The location of the interim source control measures should be shown on figures to allow the reviewer to assess the relevance of these actions to contaminant distribution at the site.	10/7/2005	Comment noted. A reference to ERM's Upland RI Report has been added to Section 4.1.5., including locations within that report that provide descriptions of IRMs and figures. For a comprehensive description of the interim remedial measures (IRM) conducted on the upland portion of the site, Section 7 of the Upland RI Report (ERM 2005) is referenced.
132	EECA	4.1.3	Groundwater Cleanup/Source Control. The perchlorate seems to continue to be pending, and it remains a treatment study rather than a treatment and containment plan. Note that there have been several other documented sites where that work has already been implemented, and therefore, at the Arkema site what is needed are specific plans to contain and treat, not to continue to determine whether perchlorate can be treated. For example, note Demonstration of Alternative Approaches for In Situ Bioremediation of Perchlorate in Groundwater, Symposium presentation 9 June 2005, Baltimore, Maryland. Also JUNE 1, 2005 / ENVIRONMENTAL SCIENCE & TECHNOLOGY, Perchlorate Biodegradation for Water Treatment.	10/4/2005	Comment noted. Source control section (4.1.5) includes new information regarding perchlorate interim remedial measures. Perchlorate biotreatability pilot studies are being considered including 2 options: active recirculation and passive biobarrier.
110	EECA	4.2	This section shall present NPDES (national pollutant discharge elimination system) permit requirements (constituents / criteria)	10/4/2005	These NPDES Permits are included in the EE/CA (Appendix G).
112	EECA	4.2	Lacks a discussion on soil leaching to groundwater pathway	10/4/2005	The revised CSM in Section 4.2.2 includes soil as a secondary source as well as leaching of COIs from soil to groundwater as a potential transport mechanism.
113	EECA	4.2	Lacks a discussion dust or on airborne transport pathway	10/4/2005	The revised CSM in Section 4.2.7 includes volatilization of COIs from soil and groundwater to air and particulate emission from soil as potential transport mechanisms.
114	EECA	4.2	Lacks a discussion on high water flooding	10/7/2005	The revised CSM in Section 4.2.4 includes a discussion of bank soil erosion during high-water flooding and storm events as a potential transport mechanism.

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135	EECA	4.2	TRANSPORT PATHWAYS. This section should have direct erosion from the site to the river. In the beach sample results data it indicated that the highest concentrations on the beach were in the uplands, which seem to indicate that there are sources uplands and this section should include soil/sediment erosion and transport.	10/21/2005	Text in section 4.2.4 has been revised to include discussions of bank soil erosion during high-water flooding and of beach sediment overland flow.
332	EECA	4.2	The stormwater system cannot be limited to the outfalls. The discussion of sources and pathways needs to consider leaks in the systems. Also, the location of discharge points should be shown on the figures.	10/21/2005	Comment acknowledged. Figures 4-1 and 4-2 have been revised to include storm water and waste water. Stormwater discussions have been revised to include both outfalls and overland flow (Sections 4.2.3 and 4.2.4).
333	EECA	4.2	There is no discussion of leaks from process piping as a source, secondary source or transport pathway. It should fit in somewhere.	10/21/2005	Throughout the history of the plant, all hazardous material piping was constructed and maintained as overhead piping. Overhead piperacks were located throughout the plant where any leaks could be readily detected and repaired. This discussion has been added to the CSM.
334	EECA	4.2	Without topographic data, it would be premature to eliminate overland flow as a source of soil to river water along the northern portion of the site. EPA considers sloughing as a viable soil to river pathway that should be addressed in the CSM. The ERM Lot 1 and 2 report did consider this pathway.		Overland Runoff (release mechanism) from Upland Surface Soil (secondary source) to Riverbank Soil (tertiary source) is presented in the CSM figures (Figure 4-1 and 4-2). Slope Erosion (release mechanism) from Riverbank Soil to Riparian Soil (exposure media) is also included in the CSM figures. The revised CSM in Section 4 also discusses stormwater runoff and erosion of river bank soil.
470	EECA	4.2	Section 4.2 -There are additional pathways of concern: (1) Continuing movement of contaminants from soil and other upland sources into groundwater - The data presented has not shown that soil and other sources of contamination in the main part of the site and in Lots 1 and 2 have been remediated to levels such that they are no longer sources to the river (i.e., other than the groundwater treatment technologies being implemented or considered, are there other media/sources that need to be controlled to ensure that the RAA area will continue to meet the RAOs?); (2) Movement of contaminants in groundwater and from groundwater to surface water - No data has been presented to support the statements that "the discharge pipe located just north of Dock 1 is the primary sources of DDT in sediments"; that "the current dissolved-phase transport of DDT to the river is low relative to these historic deposits"; and that "the current flux of DDT in groundwater is small compared to the historic deposits. What do "low" and "small" mean? There has been no summary and (continued below)		LSS has attached the upland RI report as Appendix E to the EE/CA work plan. Additional discussions of pathways (i.e. upland surface soil) have also been included in the revised work plan. Regarding item 2) the discussion of the presence of DDT in sediment versus in the groundwater plume was to place into context the historical and ongoing sources of chemicals in the different site media (as is necessary and relevant in a CSM). As part of the Upland RI other VOCs have been monitored however, none are found at concentrations or in a broad enough extent to be considered a cosolvent for DDT. Much of the information is requested is presented in the upland RI report. The discharge of groundwater to the river and the identified groundwater plumes is discussed in Section 4.1.2.3 and shown on Figure 4-3. Regarding the screening criteria used for the data presented in the work plan, LSS adopted a revised screening approach which included a range of screening values. The distribution and potential movement of COIs along the shoreline was considered in developing the work plan, identifying data gaps, and preparing a scope of work for completion. (continued)
470		(continued)	discussion of the groundwater data to in any way support these statements. And even if they are true, they are useless as levels of DDT and other contaminants in groundwater and TZW are extremely high when compared to more appropriate criteria than those used in this document. Only co-solvency with MCB is discussed. What about co-solvency with the other volatiles in groundwater and TZW? There is also no discussion of movement of groundwater into surface water nor of the data that are available on surface water from the LWG's monitoring; (3) Movement of contaminants in sediment off of the Arkema property to areas south and east of the property - When appropriate criteria are used for screening, this screening shows that DDT/DDE/DDD are present at levels of concern for very long distances north of the Arkema along the shoreline. In addition, there is chlorinated dioxins and furans at the northern boundary that may be from Arkema and it isn't clear if these are from Lots 1 and 2 or from movement of sediments off of the main plant.	10/21/2005	As mentioned elsewhere, dioxins/furans are a COI and analyses of selected samples for dioxins/furans is included. The dioxins/furans at the north end of the site (near the railroad bridge) are at the location of a former outfall that drained from Doane Lake that received discharges from the Rhone Poulenc site.
335	EECA	4.2	The migration of contaminants via fluvial processes and the redistribution of contaminated media (sediments) from upstream via fluvial processes should be considered a primary source. Human intervention (dredging, prop wash, dock maintenance) and fluvial processes should be considered as secondary release mechanisms within the river adjacent to the site.	10/21/2005	Comment acknowledged. A list of additional COIs identified by sediment screening (Section 5) was added to Section 4.1.3 (Additional Site COIs). Historical evidence for site production and/or handling is not available for all of these chemicals. Probable sources for some of these chemicals is from fluvial deposition from upstream sources in the river. Upstream deposition (Upriver sources) have also been added to conceptual site model Figures 4-1 and 4-2.
337	EECA	4.2	Figure: Please clarify the dermal contact for mammals and birds.	10/3/2005	Dermal contact has been included as an exposure route for both birds and mammals in Figure 4-2.

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33	EECA	4.2.1	Though this may be true, upland flux of contaminants must still be controlled to avoid selection of a hydraulic control alternative in the EE/CA.	10/7/2005	Is the "this" that the commenter is referring to the statement that "Even though upland and in-river investigations indicate that upland groundwater discharges to the river, historic discharges from a former process discharge pipe located just north of Dock 1 are the primary source of DDT in sediments?" LSS generally agrees that upland groundwater needs to be "controlled" but specifically in the context of meeting the project RAOs that are outlined in the SOW. The SOW states that "The goal is for significant upland sources to be controlled to the greatest extent practicable before or during removal action implementation...". LSS plans to evaluate hydraulic control measures in the EE/CA. Text has been added to last paragraph in Section 4.2.1 (Groundwater Migration): "Hydraulic control measures will be evaluated in the EE/CA."
136	EECA	4.2.1	Groundwater. This type of statement – "the current flux of DDT in groundwater is small compared to the historic deposits"—is misleading and should be removed. The sources of DDT at Arkema have been and remain one of the highest concentrations in the Portland Harbor site, are one of the highest environmental risks, have NOT been fully characterized in detail for their transport impacts by ground water, and, therefore, this type of minimizing statements should be removed from the document.		There is an extensive, existing data set on the concentration of DDT in both groundwater and sediment. This statement refers to the bulk of the mass from the historic deposition of DDT (now mostly buried) versus the mass being transported under present day conditions in groundwater. Under this context, the statement is factual and will remain.
471	EECA	4.2.2	Section 4.2.2 -What are permit limits for the stormwater discharge outfalls? Will they prevent recontamination of a cap, if one is used?	9/27/2005	Comment noted. Permit limits are presented in Section 4.2.3 (Stormwater Discharge - Outfalls). The potential for cap recontamination will be evaluated during the EE/CA.
17	EECA	4.2.2	Please present the NPDES limits/what constituents that are being monitored.	10/21/2005	Comment acknowledged. Please refer to response to comments 110 and 408. The following information has been added to Section 3.2.3 (Stormwater Discharge - Outfalls): Benchmarks are guideline concentrations not limitations: Oil & Grease (10 mg/L); copper (0.1 mg/L); Lead (0.4 mg/L); zinc (0.6 mg/L); pH (5.5 - 0.0 S.U.); TSS (130 mg/L); floating solids (no visible discharges); and oil & grease sheen (no visible sheen). Analyses are completed quarterly, with the exception of floating solids and oil & grease sheen, which are conducted monthly.
312	EECA	4.2.2	The two referenced NPDES permits should be included as EECA appendices or background documents.	10/21/2005	Comment acknowledged. NPDES permit are provided as Appendix G.
313	EECA	4.2.3	Please explain what is meant by "a temporary cover system" on the southern two-thirds of the property.	10/18/2005	The text in section 4.2.2 (Leaching from Soil to Groundwater) paragraph one has been modified to clarify the term 'temporary cover system.' A temporary cover system refers to asphalt pavement as a surface control or temporary cover.
416	EECA	4.3	Page 4-8, Section 4.3, and Figure 4-1. The fisher scenarios presented in Appendix C are relevant for sediment offshore of the site, and should be included in the conceptual site model. Consumption of fish is not limited to workers; it is more likely that other populations (such as recreational fishers) will be consuming fish caught adjacent to the site. For the consumption-of-biota scenarios, it should be clarified that screening values will be calculated in the future as these pathways are evaluated in the Portland Harbor in-water risk assessment.		Comment noted. Text has been added to address on-water fishers in Section 4.3.1 last paragraph. "Fishers, whether they are recreational, Native American, or non-tribal, are evaluated as on-water fishers. Their access to site surface water is restricted to boat travel because access to the riverbank is not permitted. Therefore, exposure media of concern would be surface water and fish or shellfish. Fishers that gain access as pedestrians to the riverbank would be considered transients or trespassers." These scenarios were not used to calculated screening levels for the EE/CA as they will be evaluated quantitatively in the PH HHRA.
472	EECA	4.3	Section 4.3 - It makes absolutely no sense to do a risk screening before discussing the CSM for the site, especially the receptors and the pathways and media by which they are exposed. As discussed above, the CSM must be presented before the screening.		Comment noted. The CSM has been moved to Section 4 and the screening is included in Sections 5 (JSCS screening) and 6 (EE/CA screening).

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473	EECA	4.3	Section 4.3 -The CSM in Figure 4-1 should be modified and the language in the text changed accordingly: (1) There should be an arrow from run-off/ discharge to sediments/bank soils. (2) The diagram should include the movement of contaminated sediments contiguous with the the Arkema facility to sediment areas north and south of the site. (3) Exposed populations for surface water and in-water sediments include fishers, boaters and divers. These receptors should be added to the CSM (4) Exposed populations to fish and shellfish are those being assessed in the PH Risk Assessment and include recreational fishers, subsistence fishers and tribes. These receptors should be added to the CSM (5) The drinking water pathway should be added to the CSM for trespassers and for the general population. General population should be added as another receptor to the CSM. The MCL will be used for screening for the general population for surface water and for TZW.(6) Shellfish should be added as an exposure medium from groundwater (TZW) as benthic organisms, such as (continued below)		The CSM in Section 4 includes the suggested changes to transport pathways and receptors. However, drinking water was not included as an exposure pathway for trespassers, workers, or other receptors because neither surface water nor groundwater within the locality of the facility is used or will be used as a source of drinking water (ERM 2005 - Upland RI Report). In addition, inclusion of surface water as drinking water is inconsistent with the AOC SOW which states that surface water exposure pathways are limited to dermal contact and incidental ingestion. It is unclear how a member of the general population will contact site-related media via routes other than those listed in the CSM; this receptor was not included in the revised CSM. Note that groundwater transport of chemicals to TZW and subsequent uptake by fish and shellfish is already included in Figure 4-1. These figures have been revised to clarify these relationships regarding clams and crayfish as well as dockside workers' exposure to surface water. Text in CSM have also been expanded to discuss specific ecological and human health receptors.
473		(continued)	freshwater clams and crayfish, are in direct contact with TZW. (7) The words occasional and infrequent should be removed from the worker and trespassers, respectively and the footnotes deleted.(The exposure frequencies and durations for these two groups are those defined in the PH Workplan.) Dockside worker exposure to surface water should be added. As discussed in comments on Section 3, screening levels appropriate for these pathways and populations must be included in the EE/CA.		
474	EECA	4.3	Section 4.3 -Remove the sentences discussing dockside worker and transient exposures via biota. Change all of the language in the section to be consistent with the changes in the CSM suggested for Figure 4-1 above (comments on Section 4.3).	10/6/2005	The revised CSM in Section 4.3.1 includes consumption of fish and shellfish by fishers and transients only; workers are not listed as consumers of aquatic biota.
47	EECA	4.3	Page 4-8: It is stated that Dockside worker ingestion of groundwater is considered negligible. This pathway should be evaluated for future workers given the hexavalent chromium and perchlorate groundwater plumes on the site. Please provide further discussion as to why the ingestion of groundwater pathway is not addressed.	10/6/2005	Groundwater within the locality of the facility is not used nor will be used in the future as a source of drinking water; therefore, ingestion of groundwater as drinking water is an incomplete exposure pathway (ERM 2005 - Upland RI Report). Ingestion of groundwater as drinking water is discussed in the revised CSM, Section 4.3
48	EECA	4.3	Page 4-8: Ecological receptors. Please provide information on the proposed indicator species (e.g., invertebrate, fish, mammal, bird) Please provide information on the proposed species and include the exposure parameters that will be used in the screening values.	10/6/2005	Comment noted. Information regarding individual ecological receptors presented in Section 4.3.2 (Ecological Receptors) and 4.3.2.1 (Departures from EPA Ecological Conceptual Site Model).
49	EECA	4.3	Page 4-8: Ecological receptors. Why are surface water and ingestion of food items considered negligible for these receptors? Depending on the species selected for evaluation, exposure to localized surface water and food items may be important. Please clarify why these are not considered.	10/23/2005	Comment noted. Surface water ingestion included in Conceptual Site Model for ecological receptors.
380	EECA	Figure 4-2	Please clarify how the EECA will define beach sediment. Numbers should be developed to assess risk to fish and shellfish themselves (SLVs) as well as to mammals and birds. Also, site specific data on tissue (clams, crayfish, sculpin) should be used to assess risk to the mammals and birds. The relevance of SLVs can be informed by site specific data. The birds and mammals should be described as "aquatic" and not "semi aquatic". The diets of the birds and mammals should be 100% aquatic. Biotic uptake should be from "fish, shellfish and invertebrates", not just fish and shellfish. Surface water SLVs should include potential for effects on birds and mammals from bioaccumulation. An exposure media of TRANSITION ZONE WATER should be added.	10/11/2005	Comment noted. Changes made to Conceptual Site Model text and figures to address these issues.
205	EECA	5	Page 5-7, Table 5.2. Chemical analysis for Subtitle C/D disposal should be required in the EE/CA. This should include an evaluation of the leachability of contaminants (SBLT, TCLP, etc.) to determine if dewatering is necessary prior to transportation to the disposal facility.	10/21/2005	Comment acknowledged. SBLT and TCLP testing is specifically proposed in Table 8-1. The following note will be added to Table 8-2: "Chemical analyses that include the evaluation of the leachabilities will be conducted on representative composite samples prior to disposal".

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338	EECA	5	Arkema should not infer that the preliminary RAA boundary represents a limit for investigations. The preliminary boundary was established as a 'place holder' for the extent of a removal action. The EECA will need to consider data and data gaps that extend beyond the preliminary RAA boundary.	10/21/2005	Comment acknowledged. LSS has not inferred that the preliminary RAA represents a limit for investigations. The data that are screened in the EE/CA work plan included the area adjacent to the entire site. Additional boreholes are proposed outside the preliminary RAA as shown in the AOC (see Figure 6-2). The following sentence has been added to the end of the first paragraph of Section 8.0: "This supercedes the preliminary RAA boundary as shown in the AOC".
339	EECA	5	Arkema shall gather additional geologic data to evaluate depth to basalt along the shoreward RAA boundary from the salt pads to north of dock 2. Considering upland source control actions may include hydraulic control of groundwater and sheet pile may be considered, depth to basalt should be delineated more rigorously than shown in the Phase II document. Arkema shall propose sediment cores and borings that penetrate to, and potentially into the basalt bedrock.		LSS has proposed to extend many of the borings during the site characterization phase of work to basalt.
427	EECA	5	It is recommended that surface water sampling be performed as part of the EE/CA investigation to evaluate baseline conditions prior to implementation of the EA and to aid in the evaluation of potential early action alternatives. This data will also be applicable for monitoring requirements established in the 401 Certification. DEQ recommends Arkema implement a surface water monitoring program using both semi-permeable membrane devices (SMPDs), to collect time-integrated samples for DDT (and break down products), dioxin/furans, PCBs, SVOCs, etc., and grab samples.		Data collected in support of the Portland Harbor RI is adequate to evaluate baseline conditions for the EE/CA. Surface water samples have been collected during the Round 2 sampling effort. Low-flow and high-flow samples were collected at stations located at the site between Docks 1 and 2 (W016), upstream of the site (W017), and downstream of the site (W015). Additional low- and high-flow sampling is planned for these stations during Round 3A in the fall 2006 and spring 2007, respectively. In addition, surface water collection is planned for evaluating water quality impacts during dredging (i.e., DRET, Column Settling tests).
428	EECA	5	The following data gaps should be included in the EE/CA Work Plan: 1) physical characteristics (e.g., information regarding bankline & nearshore slope stability); 2) human health & ecological risk characteristics (i.e., screening levels to determine RA area & removal action goals); 3) hydrogeologic characteristics; 4) recontamination source characteristics; & 5) hydraulics & sedimentation characteristics.		(1) LSS has provided geotechnical data from the IRM evaluations is summarized and referenced in the revised work plan. (2) as mentioned in other comments, the data screening process has been fully revised. (3) LSS has provided additional information on relevant hydrogeologic data for the site in the revised work plan. (4) Groundwater monitoring has continued to verify the effectiveness of upland treatments. In addition to upland monitoring, LSS plans to conduct an in-water monitoring program, the scope and timing of which is presented in the revised EE/CA work plan. (5) LSS has provided additional information on tools used to evaluate sedimentation, hydraulic conditions, and the potential for recontamination on and adjacent to the project site. Hydraulic characteristics of the waterway have been studied as part of the river-wide RI. Additional evaluation is ongoing. In the coming year, sediment traps will be deployed at many locations within the lower Willamette, including in the vicinity of the Arkema site, as part of the Portland Harbor RI/FS effort. LSS has concluded this information is adequate and is not proposing additional evaluation
429	EECA	5	Proposed sediment quality cores and geotech cores should be advanced to basalt. This information may be needed to define the extent of groundwater and/or sediment contamination and may be needed to evaluate potential dredging alternatives, barrier wall installation, or coffer dam construction.		LSS has proposed to extend borings during the site characterization phase of work to basalt.
475	EECA	5	The EE/CA should not be focusing on and screening for principal threats only; chronic long term impacts for ecological and human receptors must be considered as well as the potential for bioaccumulation. In addition, all of the relevant data must be considered, including sediments and groundwater at depth. This needs to be done to properly evaluate and compare the removal action technologies and alternatives. For example, several of the alternatives are unlikely to be possible given the contaminant levels at depth and the current levels of groundwater/TZW contamination. These include MNR and In Situ Capping (without significant dredging). Also, it is not clear if lateral movement of contaminants will result in recontamination of a cap above the RAOs, since screening of sediments against appropriate screening levels was not done. Also, given the paucity of information in the EE/CA on groundwater treatment (when it will be completed and what levels may remain), current groundwater and sediment at depth, it is difficult to see how Arkema will determine the (continued below)		Comment acknowledged. LSS has made changes in the revised EE/CA work plan in response to this comment.
475		(continued)	depth needed for dredging to ensure that RAOs are met, including those in sediment, TZW, and surface water.		

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476	EECA	5	Table 5-1 - It is not clear what the "checks" and "X"s mean. Does a "check" mean that there are sufficient data available and that no additional data are needed for this EE/CA or that more data will be collected and the method is readily available? Also to reiterate Rene Fuentes' comment, based upon the GASCO experience, there is a lot of concern about the methods that will be used to determine what impacts the remedial measures will have on the environment and how to design accordingly. This is a major issue of concern at Arkema because of the extremely high levels of DDT/DDE/DDE in sediments and the possibility of mobilizing this contaminant during remediation, making it bioavailable to biota, and increasing the levels in biota consumed by eco receptors and humans.		Concern about the methods that will be used to determine the impacts the remedial measures will have on the environment and how to design accordingly is acknowledged and is addressed in the EE/CA report. The following has been added after the second sentence on the last paragraph of Section 8.1.1: "A check mark indicates sufficient data are available and no additional data are needed for the sampling or analysis tool. An "X" indicates that insufficient data are available and additional data are needed for the sampling or analysis tool". The same clarifications have been added to the notes on Table 8-1.
477	EECA	5	Section 5.4- The presentation and summary of data and the development of the CSM does not allow EPA to determine if the samples and bioassays selected in the bullets are appropriate. However, there are some obvious holes. Why are there no sediment data being collected off Lots 1 and 2 (existing data show levels above PECs for DDD/DDT/DDE in these areas)? Also, PCBs, chlorinated dioxins and furans, HCH and PAHs, are above appropriate screening levels in the sediment contiguous to the Arkema site as well as in the northern portion of the site (at and slightly south of the site boundary). Why are no sediments being collected here? There are volatiles and manganese in TZW at levels well above appropriate screening levels. Why are these not being investigated further? Will these volatiles enhance the movement of other contaminants (e.g. DDT) through the groundwater? (Although not mentioned here, VOCs are included in the FSP and in the QAPP.)		Sediment cores will be collected off Lots 1 and 2 as suggested in this comment and others. A total of 6 additional borings are proposed for this area and information on location and depth has been provided in the revised work plan. LSS is also proposing additional collection of surface water, TZW, groundwater and tissue to address EPA's comment.
478	EECA	5	Section 5.5.3.1 - Some other methods must be used to evaluate contaminant mobility during dredging in addition to or instead of the DRET test. This test and the subsequent modeling have not been successful in predicting water quality impacts at other dredging sites within the Portland Harbor.		LSS has reviewed the DRET results used in evaluating and predicting water quality during the GASCO removal action and incorporated lessons learned into the evaluation approach in the revised EE/CA work plan. Water quality tests such as the DRET and EET are useful indicators of potential water quality impacts during dredging and disposal activities, respectively. The tests alone may not be adequate to completely evaluate these impacts, but computer modeling (e.g., DREDGE and SSFATE for dredging and STFATE for disposal) can also be used to predict the transport of suspended solids and contaminant release. A far-field suspended sediment transport model developed by Kuo et al. (1985) may also be used to evaluate the use of hydraulic cutterhead dredges for the site. LSS has provided more information on the approach for evaluating water quality impacts in the revised work plan.
479	EECA	5	Section 5.7 - EPA should consider the use of biological monitoring or a surrogate of biological monitoring (e.g. SPMDS) to evaluate the effectiveness of both source control and of the actions taken under the EE/CA. Limited site specific body burden data are available for the Arkema site. These data are (1) two samples of both sculpin and crayfish collected for the PH R1 (2). Bass samples collected for river mile 7, but these were composites of fish collected on both sides of the river. It is important that some biological indicator be used to show that the loading of bioaccumulative contaminants are being reduced through source control and remediation under the EE/CA. Analyses of environmental media do not provide information on loading unless coupled with modeling. This monitoring should start well before the EE/CA actions are implemented (to provide a baseline), and continue after they are completed and into the future.	10/6/2005	Agreed. LSS has evaluated the co-located tissue (crayfish, sculpin and clams) samples, bass, and chinook samples collected previously from the site to make inferences about BSAFs and implications for sources at the Arkema site. Additional tissue sampling is planned for the PH investigation (Refer to comment response 366.) LSS has proposed approaches for developing a baseline for a post-removal action monitoring program including the collection of additional tissue samples along the Arkema waterfront.
52	EECA	5	Regarding hydraulic dredging data gaps--we need a sidescan sonar run of the area to be dredged and a mechanical removal of the area to prep. for hydraulic dredging (maybe Arkema can include more specifics on preparatory work /data needs from their Hylebos project). Also, please identify the geotechnical tests proposed to adequately evaluate the use of a hydraulic cutting head.	10/6/2005	Data collection proposed in Section 8 is adequate to evaluate the feasibility of dredging either with mechanical or hydraulic methods, including information on debris. Once a remedy is selected, additional data may be required in support of the design. The geotechnical properties (i.e., plasticity, density, shear strength, and consolidation characteristics) of the project area sediment will assist in the evaluation of dredgeability (either mechanical or hydraulic), stability of dredge cut slopes, and estimate of settlement in areas of cap placement.
53	EECA	5	The T4 CDF, other possible CDFs in the area of contamination, if selected will not accept Arkema material without treatment. Possible use of the T4 CDF should only be considered in tandem with sediment pre-treatment.	10/6/2005	The following has been added after the bullets in Section 7.3.3: Sediments may require treatment before disposal at a CDF. If required, the treatment will be considered when assessing disposal at a CDF.

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No.	Document	Section	Comment	Date	LSS Response
54	EECA	5	Hydraulic containment. Given the source control evaluation schedule proposed by Arkema in the September 28 meeting (no complete s/c evaluation until post ee/ca), hydraulic control measures shall be evaluated in the ee/ca for the plumes across the site (ddt, mcb, chromium, perchlorate). Please discuss the data gaps for this effort related to engineering.	10/3/2005	Comment acknowledged. Information addressing this comment has been added to the revised work plan in Section 7.5.
35	EECA	5	Neither the SOW or the AOC indicates that the RAA is only defined by sediment chemistry. EPA will use several factors including, but not limited to constructability, short-term impact, recontamination potential, permanence of the removal action, and proposed institutional controls to assess the RAA boundary. Please describe how the sediment quality will be integrated with other RAA boundary criteria		Comment acknowledged. As stated in Section 8.2.2.5, the "multiple lines of evidence" approach includes both chemistry, bioaccumulation, and bioassay data to define the final boundary of the principal threat area. The following has been added to the footnote of Tables 8-1 and 8-2: "Once the principal threat boundary is established, several factors pertaining to the area will be examined in the EE/CA report including constructability, short-term impact, recontamination potential, permanence of the removal action, and proposed institutional controls to assess the RAA boundary".
504	EECA	5.1	<u>Evaluation Process</u> : Section 5.1.1. Identifies the removal action objectives as established in the AOC. Section 5.1 should describe how the various removal action objectives will be evaluated through the EECA. For example, the first five RAOs are associated with reducing various risks to acceptable levels within the RAA. How will this be determined? The last two RAOs consider the potential for migration of contaminants at unacceptable levels from the RAA to the Willamette River and the potential for recontamination. What data and assessment is necessary to make this determination? How will recontamination potential be assessed? The data gap identification process should consider the data necessary to perform assessments and make determinations relative to the RAOs.	10/21/2005	Neither the SOV An expanded data gap evaluation is presented in Section of 8.1 followed with proposed additional RA characterization in Section 8.2.
341	EECA	5.1 Table	Consolidation should be considered for the sediment dredging and disposal characterization alternative.	10/21/2005	Comment acknowledged. An "X" has been placed in the consolidation row of the Sediment Dredging/Disposal Characterization column in Table 8-1.
342	EECA	5.1 Table	Please clarify why water quality testing, specifically DRET would not be considered for the Isolation Cap. Some water quality testing would need to be performed to assess the impact of column settling effects on the contaminated surface sediments.	10/21/2005	Comment acknowledged. An "X" has been placed in the DRET row of the Isolation or Amended Cap column in Table 8-1.
388	EE/CA	5.1.2	Section 5.1.2, first paragraph, page 5-4: This paragraph states that sheet pile walls "may be evaluated". The work plan should commit to evaluating sheet pile containment given the problems with erosion, bioturbation, etc. that could impact the effectiveness of capping.	10/7/2005	Comment acknowledged. Section 7 has been changed to read "Construction of a sheet pile wall along the shoreline or in-water or other hydraulic or <i>in situ</i> source control measure <b>will</b> be evaluated in the EE/CA".
137	EECA	5.1.2	Removal Action Technologies and Alternatives. This section needs to have not only the technology, but the related support technology for the options provided. For example, the dredging technology needs to cover the containment methods that will need to be used to do the work to avoid additional spreading of contamination from that work (silt curtains, cofferdam, etc.) In addition, there should be a section which proposes monitoring techniques which will be able to conservatively predict the contamination which will be resuspended from the sediments (fine material, sandy material, NAPL, dissolved, etc.). The section should also have sub-section which includes field treatment and control for suspended solids, NAPL, and dissolved contaminants during the field event.	10/11/2005	The RA Technologies and Alternatives has been moved to Section 7. Summary information addressing the comment is provided in the work plan and will be expanded in the EE/CA.
203	EECA	5.1.2	Page 5-4, Section 5.1.2, second paragraph. The construction of hydraulic containment shall be evaluated in the EE/CA. Not completing this evaluation during the EE/CA would leave a data gap should upland source control not be effective. This could effect overall project schedule.	10/21/2005	Comment acknowledged. Section 7 has been changed to read "Construction of a sheet pile wall along the shoreline or in-water or other hydraulic or in situ source control measure will be evaluated in the EE/CA".
340	EECA	5.1.2	The removal action technologies and alternatives should include discussion of upland source control technologies and alternatives for implementing source control as part of the EE/CA. Some technology/alternative is needed to meet RAO #6 if upland IRMs are not complete for all contaminants, including perchlorate.	10/21/2005	Comment acknowledged. Information addressing this comment has been added to the revised work plan in Section 7.5.

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No.	Document	Section	Comment	Date	LSS Response
387		5.1.2	Section 5.1.2, bullets in first paragraph: The section proposes several removal action technologies including capping with clean sediment or sand. However, Section 3.1.13, page 3-11 states that radioisotope dating indicated that bioturbation appears to be causing mixing of the sediments over the entire depth of the core sample examined (3.1 feet). This indicates that any sediment or sand cap of this thickness and perhaps more, would be ineffective in preventing the DDT from being brought to the surface. Also, bathymetric surveys discussed in section 3.2.1.2 suggest that erosion of up to 2 feet has occurred in places over a period of just 2 years. The EE/CA must propose capping designs that can resist bioturbation and erosion. Also, additional core samples should be collected to determine more accurately the actual depth of bioturbation in the contaminant sediments.	10/21/2005	The following statement has been added Sections 8.2.1.1 and 8.2.3.2: "All sediment borings that are logged for lithology will also be examined for bioturbation. The core that is referenced in the comment (Section 3.1.13, P. 3-11) was collected from the Willbridge terminal where "the sediment mixing could be due to active ship movements and propeller wash in the area". Although Section 3.1.13 states that "Berrillium-7 has a relatively short half-life of 53 days and is useful in measuring the biological mixing zone in sediments", the sediment mixing in the Willbridge area was most likely from ships. This sediment mixing is not anticipated at the Arkema site since the docks are no longer used and will likely be decommissioned. Comment acknowledged. Potential erosion of the cap will be evaluated in the EE/CA.
343	EECA	5.2 - Table	There will need to be chemical sampling to meet disposal requirements for a Subtitle D/C landfill. Please add these to data gaps.	10/21/2005	Comment acknowledged. An "X" has been placed in the chemical analyses (COIs, TOC) row of the Subtitle C/D Landfill column in Table 8-2.
274	EECA	5.2	At least half the tribal governments have indicated that the cultural survey completed for the LWG is too general and not sufficient for the Arkema facility. This section needs to be revised to indicate that this is a data gap.	10/21/2005	Comment acknowledged. The text in Section 8.1.2 has been modified to include a follow-up study including a site reconnaissance to determine if there are any native soil exposures or physical evidence of archaeological or historical resources.
273	EECA	5.2	It appears that more research into the dredging and the filling at the site is warranted. Please indicate all avenues Arkema has taken to research this information. Have representatives viewed a series of historical aerial photographs or viewed historical maps? If this cannot be done prior to the next EECA draft, then it is likely a data gap.		Comment acknowledged. LSS has reviewed historical maps and permits/applications submitted to dredge at the site. This additional information is provided in Section 2.2.4 of the revised work plan.
344	EECA	5.2	1st Paragraph. The conclusion that there are no data gaps with regard to historical use may be premature. The dredging history described in Section 2 of the EECA work plan is inconclusive regarding dredge activities. Also the spill history may be considered incomplete.	10/7/2005	Comment acknowledged. LSS has reviewed historical maps and permits/applications submitted to dredge at the site. This additional information is provided in Section 2.2.4 of the revised work plan. See comment No. 273 regarding dredging and filling history of the site.
138	EECA	5.3	HYDRODYNAMIC CHARACTERISTICS OF THE RIVER. The sedimentation rates have not been well characterized yet in the Portland Harbor study. The period during which that work has taken place has not had major flood events, and the modeling is not developed to the point that it is reliable yet. In addition, the sediment stake work is at best weak due to the design itself and the period of record. In summary, the draft work plan should not indicate that the sedimentation has been determined with any level of certainty. That concept must not be carried forward until data of acceptable quality to EPA is presented and accepted.	10/11/2005	Within the next year, sediment traps will be deployed at many locations within the lower Willamette, including in the vicinity of the LSS site, as part of the Portland Harbor RI/FS effort. LSS has concluded this information is adequate and is not proposing additional evaluations. The revised workplan presents methods and approaches to assess sedimentation impacts to possible removal technologies, including both short-term impacts and maintenance requirements.
206	EECA	5.3	Page 5-8, Section 5.3. LSS shall evaluate the construction of hydraulic containment in the EE/CA. The evaluation is necessary to address uncertainty with on-going and proposed upland source controls.	10/21/2005	Comment acknowledged. Information addressing this comment has been added to the revised work plan in Section 7.5
275	EECA	5.3	Without a better presentation of the bathymetry and sediment stake data, it is not clear whether there is a data gap and a need to collect more site-specific information regarding sediment transport.	10/21/2005	Comment acknowledged. Additional discussion (and LWG Figures on bathymetry and the sediment stake survey) has been added to Sections 3.1.8, 3.2.1.2, and 8.1.3 based on data collected to date.
346	EECA	5.3	The data presented in Section 3.2 appears inconclusive regarding sediment accretion/erosion within the RAA. Considering the potential short term design life (several years) for the removal action, there is a need to gather more specific sedimentation data to evaluate the thin layer and isolation cap alternatives. The data referenced for downstream from Dock 2 should be reevaluated considering that Dock 2 may be removed.	10/21/2005	Sediment traps have been proposed in the vicinity of the LSS site as part of the Round 3 field work in support of the Portland Harbor RI/FS. Sediment traps are planned for deployment by the LWG in later summer or early fall 2006. The actual locations of sediment traps have not been determined as of this writing. LSS has recommended sediment traps be positioned at locations upstream of the Salt Dock, between Dock 1 and 2, and downstream of Dock 2 near the railroad bridge but upstream of the Rhone Poulenc outfalls. The sediment trap data will be used to provide additional information on sedimentation rates in the area of the site and baseline information on source control. LSS has reviewed the actual locations and timing of placement, sampling, and testing and included this information in the data gap analysis for the revised work plan.

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347	EECA	5.3	The EECA needs to (maybe in Section 2) better discuss the fluvial conditions (flow rate, river stage fluctuation) or identify data that will be collected to ascertain flow regime impacts on the EECA.	10/7/2005	Comment acknowledged. Discussion on fluvial conditions has been added to Section 2.1.3 including historical flow rates and flow volumes/river stage fluctuations. The material is presented so that it is relevant to caps and other potential RAs that are part of the EE/CA.
139	EECA	5.4	SEDIMENT QUALITY CHARACTERISTICS. There must be more detail in the discussions of toxicity which the human health and ecological risk assessors will probably cover in more detail. The point of this comment is to highlight the need to cover not only "toxicity", but the problems of bioaccumulation from DDT contaminated soil, sediments, and ground water. This issue increases the concern even if toxicity is not obvious from the data presented.	10/7/2005	Additional information has been added to the text. LSS has compared water and solids concentrations to the JSCS levels, including those related to bioaccumulation. The weight-of-evidence approach now incorporates bioaccumulation in the evaluation.
140	EECA	5.4	The perchlorate contamination may not be a high risk in the sediment, since the perchlorate probably does not bind to sediments. However, it must be accounted in the more complex framework of sediment and ground water discharge into surface water.	10/21/2005	Comment acknowledged. Text has been added to evaluate this chemical in the weight-of-evidence approach in Section 8.2.2.
276	EECA	5.4	Without additional screening at lower values and better presentation of the chemistry data, the extent of the data gaps cannot be fully identified at this time. That said, there needs to be sampling and analysis for dioxin, particularly near the LWG's Round 1 sample location that had a dioxin TEQ concentration of 16.6 ppt. There is a need to be sampling for other chemicals including PCBs and PAHs.	10/21/2005	Dioxin and other chemicals have been evaluated in the revised screening for the site and additional analyses (including dioxins) of media have been considered in the data gap analysis and proposed sampling plan.
348	EECA	5.4	The EECA should discuss the data gaps that exist relative to the extent (vertical and areal) of COI in sediment. Regardless of the extent of a removal action, the limits of the action cannot be adequately evaluated without a clear understanding of associations between a removal and the material adjacent to the removal.		Comment acknowledged. The proposed sampling and testing (data gaps) includes areas within and outside the preliminary RAA boundary delineated in the AOC/SOW. The EE/CA addresses a "principal threat" area for the site, for which we think will be delineated with the additional sampling and testing recognized in Section 8.1 and proposed in Section 8.2. If the sampling proposed in Section 8.2 is insufficient to delineate the RAA boundary, additional sampling may be proposed.
430	EECA	5.4	It is unclear from the data presentation that additional data gaps do not exist. By presenting available data in both map and cross-sectional view and contouring the data using multipliers (e.g., 10x, 100x) of SLVs it will be more apparent where additional surface and subsurface sediment data is needed, as well as additional groundwater or transition zone water data.		Comment acknowledged. Available data have been screened and presented as requested.
505	EECA	5.4	<u>Sediment Quality Characteristics</u> : This section states that "A multiple lines of evidence approach will be used to define the final RAA sediment boundary." The lines of evidence should be described and data gaps for each line of evidence identified. This could be easily presented in a table or matrix.	10/7/2005	Comment acknowledged. This information has been expanded in Section 8.2 as requested.
141	EECA	5.5	SEDIMENT PHYSICAL AND ENGINEERING CHARACTERISTICS. Based on recent experience within the Harbor the testing proposed does not appear to be sufficient to predict the contaminants fate and transport during any dredging or removal work. While the use of the tests proposed -- Elutriate Testing, Column Settling Test, sequential batch leaching test (SBLT), toxicity characteristics leaching procedures (TCLP), and Aquatic Toxicity Test (ATT) are appropriate, how the data will be used and modelled should be included in the document. More testing shall be proposed to deal with the more active disturbance of contaminated sediments and leaching from freshly cut sediment faces.	10/21/2005	LSS has reviewed the DRET results used in evaluating and predicting water quality during the GASCO removal action and incorporated lessons learned into the evaluation approach in the revised EE/CA work plan. Water quality tests such as the DRET and EET are useful indicators of potential water quality impacts during dredging and disposal activities, respectively. The tests alone, however, may not be adequate to completely evaluate these impacts, but computer modeling (e.g., DREDGE and SSFATE for dredging and STFATE for disposal) can be used to predict the transport of suspended solids and contaminant release. A far-field suspended sediment transport model developed by Kuo et al. (1991) may also be used to evaluate the use of hydraulic cutterhead dredges for the site. LSS has provided more information on the approach for evaluating water quality impacts in the revised work plan.
349	EECA	5.5	It is premature to consider that the upland IRMs will be complete in sufficient time to assess the permanence of their performance and their adequacy to prevent recontamination of the removal action area. Perchlorate IRMs are not yet initiated and may not be complete. An upland source control alternative will need to be considered and data collected to assess it's feasibility (i.e., sheet pile penetration; dock removal and disposal).	10/7/2005	Comment acknowledged. Information addressing this comment has been added to the revised work plan in Section 7.5

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No.	Document	Section	Comment	Date	LSS Response
116	EECA	5.6	A conceptual hydrogeologic model shall be presented prior to modeling efforts to estimate long term contaminant releases or loss associated with a cap.	10/7/2005	Agreed. This will be included in the Site Characterization Report. The results of analytical modeling will be required in the EE/CA in the evaluation of remedy selection.
277	EECA	5.6	Without a better presentation of the existing groundwater data, it is not clear whether there is a data gap, particularly to evaluate contaminant migration. More sampling, or potentially modeling, may be required.		Comment acknowledged. The upland RI report (ERM 2005a) is attached to the electronic version of the revised EE/CA work plan (in Acrobat pdf format) with links to relevant figures and text. Section 6 presents figures showing the extent of groundwater contamination for the site. Additional TZW and groundwater sampling is proposed in Section 8.1.
431	EECA	5.6	It is not clear that additional groundwater or transition zone water is not needed as part of the EE/CA investigation without a clear presentation of the available data. Available data should be reviewed and appropriated presented in map and cross-section view to define potential data gaps and to demonstrate the groundwater pathway is adequately understood for the purposes of the EE/CA.	9/27/2005	Comment acknowledged. The upland RI report (ERM 2005a) is attached to the revised EE/CA work plan (in Acrobat pdf format) with links to relevant figures and text. Section 6 presents figures showing the extent of groundwater contamination for the site. Additional TZW and groundwater sampling is proposed in Section 8.1.
40	EECA	5.6	Engineering data is necessary within and outside the preliminary RAA boundary, as it is preliminary and may be expanded.	10/23/2005	Comment acknowledged. Additional engineering data will be collected if the preliminary RAA boundary is expanded and additional engineering data are warranted.
373	EE/CA	5.6	Peepers, especially the large volume peeper, should also be considered for monitoring at this site. Based on what was presented in Table 3-9, this methodology may be better for detecting and monitoring DDT.	10/7/2005	LSS has considered the use of large volume peepers for additional site characterization. Based on the results and recommendations of the PH groundwater study, large volume peepers are not appropriate tools for measuring TZW in sediments. The sediments are manually disturbed during placement and may not represent insitu conditions. PH recommends the UltraSeep, small peepers, and Trident sampling for future monitoring. LSS agrees with this approach. EPA's letter to the LWG dated 8-19-05 recommends the use of small volume peepers or the Trident Probe. LSS is proposing the Trident Probe for collection of TZW samples in the RA characterization.
142	EECA	5.6	HYDROGEOLOGIC CHARACTERISTICS. The transition zone water rates that have been obtained at the site may need to be refined since one of the problems is the DDT, and the very low detection which is needed to predict whether or not there are problems with the ground water to surface water fate and transport. The characterization shall be done across a longer transect and multiple depths to account for all the ground water contamination plumes and parameters in the uplands. That level of characterization has not been done for the ground water to surface water transition zone, and is necessary for the long term containment and to prevent recontamination of any proposed capping.	10/21/2005	LSS plans to collect additional TZW data during the RAA characterization as presented in the data gaps analysis. This data will be used, along with recent PH groundwater study results, to evaluate upland source controls such as hydraulic containment and to assess recontamination potential.
143	EECA	5.7	RECONTAMINATION SOURCE CHARACTERIZATION. The transition zone water rates that have been obtained at the site may need to be refined since one of the problems is the DDT, and the very low detection which is needed to predict whether or not there are problems with the ground water to surface water fate and transport. The characterization is needed to be done across a longer transect and multiple depths to account for all the ground water contamination plumes and parameters in the uplands. That level of characterization has not been done for the ground water to surface water transition zone, and is necessary for the long term containment and to prevent recontamination of any proposed capping. (Same comment as section 5.6)	10/21/2005	LSS plans to collect additional TZW data during the RAA characterization as presented in the data gaps analysis. This data will be used, along with recent PH groundwater study results, to evaluate upland source controls such as hydraulic containment and to assess recontamination potential.
508	EECA	5.7	EPA does not concur that no additional data are needed for the recontamination source characterization. More information is warranted for stormwater and bank erosion. Additionally, data are needed to adequately assess impacts from Lots 1 and 2. Please revise this section to reflect additional data needs.		LSS has revised this section to address stormwater, bank erosion, and impacts from Lots 1 and 2. Sediment cores will be collected off Lots 1 and 2 as suggested in this comment and others. A total of 6 additional borings are proposed for this area and information on location and depth is provided in the revised work plan.
278	EECA	5.7	We are pleased to see that Arkema is proposing in-water monitoring to evaluate the source control actions. However, the Trident Probe and the UltraSeep may not be adequate to complete the in-water monitoring. Both of these tools are limited to shallow groundwater and deeper samples will likely be required. However, this cannot be determined without better presentation of the groundwater data.		LSS plans to collect additional TZW data during the RAA characterization as presented in the data gaps analysis. This data will be used, along with recent PH groundwater study results, to evaluate upland source controls such as hydraulic containment and to assess recontamination potential.

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No.	Document	Section	Comment	Date	LSS Response
432	EECA	5.7	Expand the section discussion to include the stormwater pathway, river bank erosion and deposition of contaminated sediment and what steps/monitoring ARKEMA plans for these sources.		Comment acknowledged. Section 8.1.9 has been expanded to include a discussion on the stormwater pathway, river bank erosion, and deposition of contaminated sediment. Preliminary data gaps that are identified relative to the EE/CA are noted. The next steps or monitoring of these recontamination sources will be presented in the EE/CA report.
506	EECA	5.7	<u>Recontamination Source Characterization</u> : Further elaboration on the recontamination potential evaluation is required. Although significant upland data has been collected at the Arkema facility and will continue to be collected during the implementation of various source control measures, the recontamination evaluation should described more fully for the purpose of identifying additional data needs relative to the evaluation process.	10/21/2005	Comment acknowledged. Section 8.1.9 has been expanded to include a discussion on the stormwater pathway, river bank erosion, and deposition of contaminated sediment. Preliminary data gaps that are identified relative to the EE/CA are noted. The next steps or monitoring of these recontamination sources will be presented in the EE/CA report.
389	EE/CA	5.5.2	Section 5.5.2: This section discusses how cap integrity will be evaluated. Section 3.2.1.2 states that several areas in the RAA are net depositional zones. If the shoreline is to continue to be used to dock vessels, dredging will likely be required in the future. Therefore, the capping options should also consider how dredging can be conducted over a capped area without harming the cap	10/11/2005	Comment acknowledged. The following text has been added to the end of Section 7.1: "The capping technology screening will also include an assessment of how future dredging may affect the cap if the docks are not removed".
209	EECA	6	Tables 6-1, 6-2, and 6-5. Revise per comments to Field Sampling Plan	10/21/2005	Comment acknowledged. Changes have been made to the tables in the revised work plan.
279	EECA	6	We cannot comment on the adequacy of this section and the FSP without better presentation of the data and additional screening to lower criteria to fully understand the nature of the contamination. These proposed sample locations presume that EPA and its partners agree with Arkema's decisions to limit screening of existing chemistry data to acute and other non-conservative criteria, and that these would fill certain data gaps within this general area. However, with the limited presentation that Arkema chose to include in this draft EECA, we cannot agree that the sampling proposal will be sufficient to fill data gaps and meet the remedial action objectives that are required by the early action. In fact, we know that this sampling proposal is insufficient as it does not include dioxin sampling and analysis. We will comment again on this section once an appropriate data evaluation and presentation occurs.		As requested, dioxin and other chemicals have been evaluated in the revised screening for the site and additional analyses (including dioxins) of media have been proposed in the revised work plan.
433	EECA	6	The up and down stream extent of DDT impacts in the riverbank fill have not been determined out side of the Dock 1 and Dock 2 areas. This is an existing data gap that is on DEQ's list to have Arkema address as part of the uplands source control work. It is not clear at this time whether Arkema will deal with the river bank as part of the EE/CA or upland FS. DEQ normally views this as an upland responsibility. However, it is suggested that this data need be identified in EPA's comments. This will ensure that an early dialog occurs about when this data is obtained and whether Arkema conducts the bank characterization and source control under DEQ or EPA lead.		Comment acknowledged. Existing riverbank data outside of the area between Docks 1 and 2 will be provided to address EPA's comment. Decisions will be made based on these data regarding the evaluation of the riverbank fill, ultimately whether this is an in-water or upland issue (DEQ- or EPA-led).
481	EECA	6	Section 6.1.1.3 and 6.1.2.3 -- For the risk evaluations, it will be assumed that total chromium is equal to hexavalent chromium unless hex chromium is analyzed for. PCBs and dioxins/furans need to be added (and possibly other chemicals after an adequate screening is done in this EE/CA). Sediment samples and bioassays may need to be done off Lots 1 and 2 and north of the site boundary. discuss how the impacts of VOCs on benthos in groundwater will be evaluated.		Comment acknowledged. Evaluations requested have been included in the revised work plan (refer to Section 8).
482	EECA	6	Section 6.1.2.1 - This section focuses only on eco risks and only on direct impacts on benthos. How will the evaluation of bioaccumulatives be done to ensure that both eco receptors and humans will be protected from contaminants (such as DDT/DDD/DDE, PCBs, and dioxins and furans) in the food chain following remediation within the RAA? What will be done to ensure that all of the RAOs are met in the RAA, including those for groundwater/TZW (e.g., MCLs, human health WQC for fish consumption).	10/18/2005	The revised EE/CA work plan provides methods to evaluate bioaccumulative effects (both ecological and human health) to define limits of removal area.

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No.	Document	Section	Comment	Date	LSS Response
436	EECA	6.1	Page 6-9, geo-spatial evaluation. DEQ has not agreed that three or more adjacent stations showing toxicity are required to identify remediation zones.	10/18/2005	The "three station" phrase has been removed from the revised work plan. The geo-spatial characterization should be viewed in context with the other sections on statistical significance, biological effects (toxicity and bioaccumulation), and co-occurrence with chemicals of concern in our proposed multiple-lines-of-evidence approach. Our intent is to align bioassay and bioaccumulation testing results with sediment chemistry to achieve a reduction in both concentration (sediment and tissue) and toxicity that is protective of the environment.
435	EECA	6.1	Page 6-6, last paragraph. The purging of sediment bioassay samples may be relevant to account for toxicity related to soluble chemicals such as chloride in order to characterize toxicity due to chemicals sorbed to sediment. However, the toxicity of soluble chemicals (such as perchlorate, chlorobenzene, and hexavalent chromium) also needs to be evaluated. It is not clear if static sediment bioassay tests (without purging) will adequately characterize toxicity due to discharges of chemicals in groundwater.	10/21/2005	Purging will only be conducted on samples that are previously or concurrently tested using the standard bulk sediment bioassays. Consequently, the situation envisioned in the governments comments will not occur. Porewater testing has been included in the revised Work Plan to eliminate uncertainties in the data. Bulk sediment bioassays will also be conducted with survival and growth endpoints as stated in the revised draft work plan.
384	EE/CA	6.1.1.2	page 6-1: From Figures #-5, 3-6, And 3-7, it can be seen that much of the RAA is not adequately characterized in terms of where DDT exceeds the PEC. In particular, the downstream end of the RAA has several boring samples exceeding the PEC, but only the surface 1 foot or less was sampled. For example, SD84 is the only boring collected in the area from which sediments were analyzed at a depth greater than 1 foot. The interval analyzed from this boring at a depth of 0 to .33 feet contained .89 mg/kg DDT (the PEC for DDT is .572 mg/kg). However, the interval analyzed at a depth of 0 to 2.95 feet was found to contain 5.06 to 8.01 mg/kg DDT. It is apparent that DDT contamination is increasing with depth at this location, but there is no deeper sample to verify whether the DDT levels continue to increase with depth greater than 3 feet, or how deep contamination exceeding the PEC goes. The work plan does not propose to collect more core samples in this area, but should. Whether DDT concentrations decrease or increase cannot be known without (continued below)		LSS believes the number of additional borings requested by this reviewer is more than needed to delineate the RAA boundary. LSS has evaluated the data further in light of this comment, and has proposed 6 additional borings. For borings added to the field program, samples will be collected from multiple depths and selected samples will be analyzed depending on field observations. The remaining samples from each boring will be archived for possible analysis as necessary. Additional borings may be drilled with samples collected, archived, and possibly analyzed pending the results of samples from adjacent borings. LSS has planned a comprehensive sampling and testing program to supplement the existing data and provide enough information to conduct the EE/CA.
384		(continued)	the collection and analysis of more and deeper core samples. The following samples should be added to those proposed in order to better define the area of contamination and allow the generation of a quantitative map of the contaminant body: A transect of 4 sediment characterization borings in line with SD80 at depths of 30, 20, 0 feet, and in the intertidal zone; A transect of 4 sediment characterization borings in line with SD83 at depths of 30, 20, 0 feet, and in the intertidal zone.; A transect of 4 sediment characterization borings in line with SD84 at depths of 30, 20, 0 feet, and in the intertidal zone;		
384		(continued)	Add 2 additional sediment characterization borings in line with proposed samples WS-51 and WS 52, at depths of 30, feet, and in the intertidal zone. Add 1 additional sediment characterization boring in line with proposed samples WS-48, WS-49 and WS 50, at a depth of 30, feet.; Add 1 additional sediment characterization boring in line with proposed samples WS-45, WS-46 and WS 47, at a depth of 30, feet.; Add 1 additional sediment characterization borings in line with proposed samples WS-37, WS-38, and WS 39, in the intertidal zone.; Add 3 additional sediment characterization borings in line with proposed sample WS-41 at depths of 30, 20, 0 feet, and in the intertidal zone.; Add 1 additional sediment characterization boring in line with proposed sample WS-36, at a depth of 30, feet.; Add 1 additional sediment characterization boring in line with proposed sample WS-33, at a depth of 30, feet. Propose those borings that will be extended to bedrock.	10/7/2005	
144	EECA	6.1.1.2	Sampling Strategy. Having the perchlorate sampling as part of the sediment cores, but not necessarily as part of ground water may present a potential problem with low detections in the sediments. Should include perchlorate for ground water in the sediments. The sampling should also include chloride sampling for sediments and ground water under the sediments. This may require more sampling points upstream towards the salt dock.		Perchlorate and chloride will be tested in selected sediment samples as described in Section 8. Since bulk sediment samples include porewater and groundwater influences, these compounds should be detected in the chemical analysis as planned. In addition, proposed bioassays (standard tests and purging) will aid in the interpretation of the results to possible causes of toxicity from these more soluble chemicals.

Draft EE/CA Work Plan Comment and Response Summary.

No.	Document	Section	Comment	Date	LSS Response
434	EECA	6.1.1.2	Page 6-2, Storm water monitoring data shows elevated levels of hexavalent chromium in Outfall #004. Existing sediment data should be reviewed to determine if there is adequate data to determine if chromium has accumulated to levels of concern near the outfall. Additional sediment samples should be located in this area for chromium as existing sediment data is inadequate.	10/7/2005	The existing sediment data were reviewed and additional surface and subsurface sediment samples have been proposed in the vicinity of Outfall 004.
145	EECA	6.1.1.3	Analytical Strategy. The plan states – "Sediment samples will be collected continuously in each boring at 2-ft intervals...". The cores should be continuous, and then the samples can be taken from selected locations in the continuous cores as needed. Unclear now if the plan is to take multiple 2-ft samples.	10/7/2005	Comment acknowledged. The text has been revised in Section 8.2: "Sediment samples will be collected continuously at 2-ft intervals for the entire length of each boring. Field observations will guide the preliminary selection of individual samples for the following analyses."
146	EECA	6.1.1.3	Draft plan states –"Up to three samples will be selected initially for analysis from each boring...". Explain the criteria for selecting the samples for analysis. Contamination? Visual characteristics? Grain size?		Comment acknowledged. The selection of samples in a core will initially be based on field observations including visual contamination (e.g., sheen), odor, and volatiles (e.g., PID/FID), etc. A portion of all samples will be archived for possible future analysis following the initial analyses. This will allow flexibility in the testing program with additional analysis (if necessary) to confirm the nature and extent of contamination at a specific location.
493	EECA	6.1.2.2	Sampling Strategy: Incorporate -"Reference sediments from EPA-approved ambient upstream locations on the Willamette River22 (number and location to be determined based on physical characteristics of site sediments)" EPA has not approved locations for reference toxicity tests for Portland Harbor. Further discussion will be needed. "Toxicity testing will follow procedures recommended for the harbor-wide investigation of risks to benthic organisms (Windward et al. 2005) and described in the accompanying QAPP. These solid-phase growth and survival tests were selected as measurement endpoints to help predict the potential for benthic community effects and to define principal threats associated with COIs for the site. However, some of the COIs are total dissolved solids or salts of common compounds that are mildly toxic, highly soluble, have a low affinity for the solid phase sediment matrix, and are not routinely managed pursuant to CERCLA. Consequently, additional sediment toxicity testing is proposed to segregate the effects of these (continued below)		Comment acknowledged. The text in section 8.2.2.1 (Solid Phase Bulk Sediment) Toxicity Tests 1st paragraph (after all bullets), last sentence has been revised: "Consequently, additional sediment toxicity testing is proposed to segregate the effects of these COIs and identify their relative importance as they contribute to principal threats at the site."
493		(continued)	substances and identify their relative importance as principal threats at the site." It is fine to segregate the effects of these substances to determine the cause of bioassay toxicity, but EPA will still consider them COIs.	10/23/2005	
374	EECA	6.1.2.2.	The samples collected as a part of the RI (LW2U1C through SW1-U6C) between RM 15 and RM26 are cited here as "EPA approved reference stations" This is not completely accurate. These stations were not selected for use as reference stations. Please clarify.	10/23/2005	Comment acknowledged. Text has been revised in section 8.2.2.1: Bullet reads "Ambient upstream locations on the Willamette River <sup>31</sup> (number and location to be determined based on physical characteristics of site sediments." In addition, footnote 22 reads: "Ambient upstream stations LW2-U1C ..."
375	EECA	6.1.2.3	Dioxin and furan analysis shall be added to this list given the high detected concentrations off the ARKEMA site.	10/7/2005	Comment acknowledged. Dioxins/furans has been added to the analysis list.
147	EECA	6.1.2.3	Analytical Strategy. Statement are – "Therefore, toxicity test methods conducted on selected sediment samples in the vicinity of the Salt Dock will be modified in order to reduce the effects of these chemicals found in the porewater". And in another section – "The process will continue until total dissolved solids (TDS) concentration, conductivity, or pH in the porewater is reduced to ambient or tolerant levels <sup>24</sup> ,as defined in the QAPP". It makes no sense to do toxicity testing but at the same time modify the test to reduce the toxicity from the chemicals in the porewater. The testing needs to be done so that the comprehensive impact of the contaminants at the site is determined, not to minimize or avoid the media that is a problem.		Comment acknowledged. This section has been updated to include purging and porewater analysis in support of interpreting groundwater impacts to toxicity testing.

Draft EE/CA Work Plan Comment and Response Summary.

No.	Document	Section	Comment	Date	LSS Response
438	EECA	6.1.2.3	Without appropriate concentration maps and cross-sectional depictions of the known contamination at the site and within the sediments, it is very difficult to determine if the proposed analytical strategy is adequate. Selected samples should also be analyzed for PCBs, dioxins/furans, and SVOCs to supplement the existing Arkema and LWG data.	10/23/2005	Comment acknowledged. Changes have been made to the revised document in response to this comment.
376	EECA	6.1.2.3, page 6-6	All of the "purging" (up to 5-10 times before test initiation) may reduce the effects of partitioning and availability of other chemicals bound to the sediment, leading to misleading toxicity test results for even evaluating "sediment bound" toxicity. Alterations of pH and other parameters to what we think is "ambient" will also confuse any comparisons to reference. If this kind of evaluation is done, ALL toxicity tests shall be run concurrently without modification.	10/23/2005	Comment acknowledged. This section has been updated to include purging and porewater analysis in support of interpreting groundwater impacts to toxicity testing.
377	EECA	6.1.2.4	Any comparison to reference using an upstream station should be statistically rigorous, and should be done in conjunction with government team. If the primary hypothesis here is that site and reference toxicity and growth results are the same (see footnote 26), then the an alpha level of 0.1 should be used in order to minimize Type II errors (failure to reject Ho when false). Statistical analysis on a limited data set could lead to erroneous conclusions with an alpha set at 0.05.	10/23/2005	LSS has proposed an alpha level of 0.1 pursuant to the original comment. Selection of an appropriate alpha level, statistical power, and the important of Type I and Type II errors will also be discussed in an evaluation of uncertainty. Selection of upstream ambient locations that can be used for reference comparisons will be done in consultation with the government team.
378	EECA	6.1.2.4	The exceedence of one minor effects threshold should be enough of a trigger to include for further investigation. Growth effects need to be closely considered here given the mode of action of the primary contaminant of interest (DDT and metabolites). Endpoints should be pooled and should consider the combined results of growth and survival for each test species (a sample should be considered toxic if the results for either survival or growth are determined to be toxic) as well as the results of both tests combined. Control-normalized responses for growth and survival endpoints should be calculated as test response / control response (T/C). Using a control-normalized approach provides for more consistency in comparisons among batches and does not give additional slack to tests with poor control performance. Hit / no hit toxicity thresholds. The hit / no hit toxicity thresholds should be 90% control-normalized survival OR <90% control normalized growth; ;75% control-normalized survival OR <75% control-normalized growth.	10/7/2005	Toxicity testing is not proposed as a trigger for further investigation, but is designed to identify areas of concern for pre-emptive sediment remediation. These results could also be used as "triggers for further investigation" in subsequent analysis of the nature and extent of contamination that may exist following implementation of the EE/CA work plan. We are not aware that DDT has been specifically linked to impaired growth in amphipods or midges. Nevertheless, growth effects will be carefully considered pursuant to the guidance available for these test methods. Each endpoint will be considered as an independent line of evidence in our evaluation. Consequently, results of either survival or growth can influence the overall weight of evidence. The proposed EPA and ASTM methods do not specify normalization of toxicity to controls for the survival endpoint. However, we agree that this is a useful way to understand the data for the growth endpoint and will present it in that context. Control tests will be evaluated pursuant to the performance criteria specified by EPA and ASTM. The revised work plan has been revised to address
148	EECA	6.1.2.4	Multiple-Lines-of-Evidence Approach and Figure 3-4. Note the sparse failures of bioassays in the figure as presented. Is there something missing on those tests or their interpretation that would bias the multiple lines of evidence approach? There should be non-exclusive criteria for toxicity, chemistry, contaminants, bioaccumulative compounds, and bioassays, which would prevent leaving problem areas out of the picture by masking it with "non-problem data".	10/7/2005	Comment acknowledged. The multiple-lines-of-evidence approach has been modified to address this and other EPA comments on purging, bioaccumulation and porewater.
149	EECA	6.2.2	Sampling Strategy. Statement is – "Nineteen borings will be drilled to a depth of up to 15 feet below mudline (or refusal) to evaluate geotechnical properties and conditions within the preliminary RAA boundary." Arkema shall extend a number of borings to the full depth to bedrock. This is necessary given there may be a need to design a cofferdam or sheet pile. Arkema shall propose a number of the borings to be drilled into the bedrock.	10/11/2005	LSS has proposed to extend site characterization borings to basalt.
207	EECA	6.2.3	Page 6-11, Section 6.2.3, first paragraph, first sentence. States that test will be performed on the 0- to 2-ft. etc. samples. Add this information to Section 2.2 of the Field Sampling Plan.	10/7/2005	Comment acknowledged. Text in section 2.2 of the FSP will be revised: "The following tests will be performed on the 0- to 2-ft, 4- to 6-ft, and 8- to 10-ft samples from borings within the preliminary RAA boundary." <sup>5</sup>

Draft EE/CA Work Plan Comment and Response Summary.

No.	Document	Section	Comment	Date	LSS Response
150	EECA	6.3.2	Sampling Strategy. The former discharge outfall seems to be a key item in the conceptual model of the contamination, but it needs much more detail. There should be engineering drawings documenting this outfall, and documents that show it has been abandoned, cleaned, plugged, etc. In addition, the sentence—"... the former outfall through which DDT manufacturing process residue was discharged during a portion of the first year of DDT production."-- includes the same type of bias as the perchlorate statements mentioned above and should be rewritten to avoid minimizing the impact of DDT discharge issue.	10/7/2005	LSS has provided as much detail as is known about the former outfall. Please note that engineering drawings of the former discharge outfall are not available. The exact location is unknown but an approximate location (as shown in selected figures) has been determined based on review of historical aerial photographs, field observations and testing results during the Phase 2 characterization. LSS will collect data during RAA characterization to better define the physical and chemical character of this outfall. Refer to reply to comment responses #467 and #141.
151	EECA	6.3.3	Analytical Strategy. The same issue of the need for additional tests to better characterize what will be mobilized in the process of doing remedial work.	10/7/2005	Comment acknowledged.
152	EECA	6.4	DEBRIS SURVEY (DREDGING) AND DOCK ENCUMBRANCES. Again the issue of the old industrial discharge and any other undocumented discharges in the area. There should be a more detailed description of what has been built in that area and what is known of the locations, removals, and clean outs.	10/11/2005	Comment acknowledged. Text has been added to Section 8.2.5; a final sentence has been added to the second paragraph: "A historical review will be conducted to determine the extent of building and demolition in the area currently occupied by the docks and outfalls. This information may assist in further characterizing the sediments in this area."
208	EECA	6.4	Page 6-13, Section 6.4, second paragraph. Structures outside the proposed RAA boundary at the Arkema should also be surveyed since the final RAA footprint has not been determined.		Comment noted. Text has been added to Section 8.2.5 paragraph two, after 'catalogue the type and quantity of construction materials.' "Surveying may expand to include additional structures once RAA has been established."
507	EECA	6.4	Debris Survey: The presence of debris may significantly hinder implementation of the removal action and influence the type of dredging selected for sediment removal (e.g., hydraulic dredging vs. clamshell). It is critical that a robust debris survey be performed. A range of non-invasive techniques should be considered especially given the difficulty in identifying debris using divers due to low light conditions and other hazards.	10/7/2005	Comment acknowledged. Text has been revised in Section 8.2.5 to include this statement as the 2nd to last sentence in paragraph 2: "If dredging becomes a viable option for the site, additional investigation of debris may be warranted during design or as part or condition of the construction specifications."
153	EECA	Fig 6-3	Sample locations will need to be re-evaluated once the report is resubmitted with the additional information requested.	10/11/2005	Comment acknowledged.
210	EECA	7	Page 7-1, Section 7.0, second paragraph. The construction of hydraulic containment shall be evaluated in the EE/CA. Not completing this evaluation during the EE/CA would leave a data gap should upland source control not be effective. This could effect overall project schedule.	10/17/2005	Comment acknowledged. Text in section 7 second paragraph has been revised: "Construction of a sheet pile wall along the shoreline or in-water or other hydraulic or <i>in situ</i> source control measures will be evaluated in the EE/CA." Also, a new section 7.5 describing information required to evaluate hydraulic containment has been added.
258	EECA	7	Arkema shall consider land use restrictions and potential land use as part of the remedy selection process. Outside of the EE/CA, Arkema will need to address potential future economic impacts directly with the Department of State Lands (DSL).	10/21/2005	Comment acknowledged. Text in section 7.0 has been amended (introductory paragraph): "The consideration and selection of remedial alternatives will also be dependent upon mandated land use restrictions and potential land use activities."
352	EECA	7	The introduction refers to primary goals. The primary goal is to achieve RAOs. Inferring some RAOs are primary is inconsistent with the AOC. Please revise.	10/21/2005	Comment acknowledged. Text in section 7.0 has been revised (introductory sentence): "The purpose of the NTCRA for the Arkema site in-water site is to conduct an early..."
353	EECA	7	The preliminary list of qualified technologies should include possible upland hydraulic controls that may be necessary to evaluate recontamination concerns.		Comment acknowledged. Text in section 7.0 under the preliminary list states that hydraulic controls will be evaluated for source control and recontamination concerns.
439	EECA	7	This section should also identify possible engineer controls to limit the implementation risk of the remedial technologies. For example silt curtains, coffer dam, etc.	10/11/2005	Comment acknowledged. Text in section 7.0 has been expanded to address this comment. The following sections expand on the need for engineering controls for various technologies.
211	EECA	7.1	Page 7-3, Section 7.1, second paragraph, last sentence. If capping is evaluated as a viable remedial option, Arkema will need to evaluate contaminant migration through the cap in the EE/CA.	10/21/2005	Comment acknowledged. Text in section 7.1, second paragraph, last sentence has been revised: "The modeling of contaminant transport through a cap will be conducted in preparation of the EE/CA if capping presents itself as a viable remedial technology."

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No.	Document	Section	Comment	Date	LSS Response
354	EECA	7.1	To establish effectiveness, capping technologies need to be evaluated against a specified design life. Based on the permanence of the remedy, there may be different removal criteria. For instance, an interim cap that would be enhanced under the Harbor Wide remedial action may require a different removal area than a cap intended to meet the final remedy requirements for the site.		Comment acknowledged. Statement has been added to last paragraph in section 7.1: "Sediment removal and capping design will be guided by temporal considerations such as whether the remedial action is temporary or permanent."
440	EECA	7.1	This section mentions various cap materials in the introductory paragraph (e.g., carbon-activated material) but does not indicate that an amended cap will be carried further in the EE/CA. Both granular activated carbon and organoclay should be screened for potential use in the early action.	10/7/2005	Comment acknowledged. Text has been revised to address this concern in Section 7.1, paragraph 1, sentence 2: "The cap may be constructed of clean sediments, sand, gravel, or may involve a more complex design with geotextiles, liners, organoclay, carbon-activated material (e.g. granular activated carbon), or other materials in multiple layers."
154	EECA	7.2	DREDGING TECHNOLOGIES. There should be another section which specifically addresses options to control contaminants which are mobilized during the field work. What may be mobilized by the dredging needs to be anticipated, contained and treated.	10/21/2005	Comment acknowledged. First bullet point under first paragraph of Section 7.2 has been amended: "- resuspension of sediment and water quality impacts during dredging (e.g., contaminant release control and containment)."
355	EECA	7.2	This section proposes modeling. Specific models that Arkema anticipates using should be presented.	10/21/2005	Comment acknowledged. Section 7.2 has been amended to include examples of models for consideration. Details of possible models are described in Section 8.
356	EECA	7.2	The evaluation of dredging technologies shall consider water quality impacts. Containment strategies and engineering controls shall be presented and analyzed as part of the EECA.		Comment acknowledged. Text has been added to the second paragraph after sentence 1 (below the bullets) in Section 7.2: "Possible water quality impacts will be considered during dredging activities and appropriate containment and engineering controls will be evaluated in the EE/CA."
441	EECA	7.2	It is unclear from the data presentation in this report that additional subsurface data gaps do not exist. By presenting available data in both map and cross-sectional view and contouring the data using multipliers (e.g., 10x, 100x) of SLVs it will be more apparent where additional subsurface sediment data is needed to evaluate potential dredging alternatives or dredge prism configurations.	10/11/2005	Comment acknowledged. LSS has included these figures in the revised work plan as requested.
212	EECA	7.3.1	Page 7-4, Section 7.3.1, bullet list. Should include chemical characterization and leaching potential. This may affect sediment handling such as the need to dewater prior to transportation.	10/11/2005	Comment acknowledged. Bullet has been added after 'sediment physical properties...' bullet: "- Sediment chemical properties and leaching potential"
213	EECA	7.3.2	Page 7-4, Section 7.3.2, bullet list. Type of chemicals present in the sediment could drive the selection of treatment technology.	9/27/2005	Comment acknowledged. An initial bullet has been added to the list in Section 7.3.2: "- Chemical characterization of proposed dredged sediments (integral to choice of treatment technology)."
7	EECA	8	Revise section 8 to incorporate language discussing overall s/c measures to be taken in order to ensure all in water RAOs can be met before EE/CA publication. Revise section 8 to clarify s/c measures will be required to meet RAOs, if needed, as well as limit in water recontamination potential.	10/7/2005	Section 9 (formerly Section 8) has been modified to provide a general discussion of the timing of upland source control measures that are being conducted and the intent to meet the RAO requirements in the AOC SOW. LSS agrees that upland groundwater source control actions must be effective in the context of meeting the project RAOs that are outlined in the SOW. The AOC/SOW states that "The goal is for significant upland sources to be controlled to the greatest extent practicable before or during removal action implementation...". An updated schedule for upland source control is also included in the work plan.
155	EECA	8	PROJECT SCHEDULE. Statement in draft work plan – "Arkema's upland source control activities are targeted for substantial completion by October 2007." It is unclear how to expect source control for all the upland contaminant plumes when the perchlorate has not been even fully characterized yet and there is no containment plan in place. In addition, the other upland plumes are still in the process of being controlled or treated, but the final results are not predictable at this time. It is further a problem that the proposed controls are several years away, as indicated by the sentence "If it is determined that upland source control efforts are not on track to prevent unacceptable recontamination of sediment, the time period for implementation of hydraulic containment measures is during 2008." The dates for control of the plumes should be moved up to make them fit into the overall EECA field work schedule.	10/21/2005	An updated schedule for the implementation of source control actions, including a schedule for perchlorate, has been included in the work plan. The upland source control actions must be effective in the context of meeting the project RAOs that are outlined in the SOW. The AOC/SOW states that "The goal is for significant upland sources to be controlled to the greatest extent practicable before or during removal action implementation...". As a contingency, LSS has also included hydraulic control measures evaluation in the EE/CA work plan.

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No.	Document	Section	Comment	Date	LSS Response
280	EECA	8	Arkema needs to present the schedule for its source control actions, particularly for the monitoring of the source control actions and for perchlorate, which Arkema is only presently in the phase of assessing treatment options.	10/21/2005	An updated schedule for the implementation of source control actions, including a schedule for perchlorate, has been included in the work plan. The upland source control actions must be effective in the context of meeting the project RAOs that are outlined in the SOW. The AOC/SOW states that "The goal is for significant upland sources to be controlled to the greatest extent practicable before or during removal action implementation...". As a contingency, LSS has also included hydraulic control measures evaluation in the EE/CA work plan.
281	EECA	8	Arkema shall include hydraulic control as a treatment option as part of the EECA. Include the analysis of hydraulic controls in this section of the Work Plan.	10/21/2005	The evaluation of hydraulic control has been added to the work plan (see Section 7.5 of the revised work plan).
357	EECA	8	The EECA schedule relies on two assumptions that if not correct, could significantly jeopardize the RA schedule. 1) The Additional Site Characterization will result in sufficient data to make all necessary decisions regarding the RA. This assumption seems based on a 60 day field season that will complete all data gaps. 2) The upland interim actions are substantially complete by October 2007. This assumption, while consistent with published schedules, is supported only by the pilot test data and a work plan for implementing the upland remedies. Delay, poor performance, or changes in conditions for the IRM could significantly impact the EECA schedule as proposed. Arkema shall provide more clear schedule discussions on the IRM and EECA relationship.		A new section has been added (Section 9.2) that describes the timing and linkage between the IRM source control actions and the EE/CA. Source control evaluation reports are an important element of the process as presented in Section 9.2 and Figure 9-1.
483	EECA	8	page 8-5 - The goal of the upland groundwater source control should also be to control DDT/DDE/DDD as well as possibly other contaminants (e.g., volatiles). The values given in the PH Joint Source Control Strategy should be used to assess the source control efforts. These include ARARS such as MCLS and WQC for the protection of human health.	10/3/2005	The in-situ sodium persulfate source control action is designed to address DDT/DDD/DDE source control and would also address other VOCs. Comparison of source control evaluation data to the Portland Harbor JSCS criteria is included as an element of the source control evaluation approach (Section 9.2).
38	EECA	8	Page 4: Correct the third paragraph to indicate that the final BA will be contemporaneous with the removal action design. If impacts to E&T species are minimal and no biological opinion is needed from the resource agencies, then maybe the final BA could be done with the EE/CA. However, that is not likely. If a biological opinion is needed, design level information is generally needed.	10/3/2005	The requested correction has been made. This comment is also addressed in new section 9.3.3. The clarification requested has also been included in this section.
39	EECA	8	Page 5: Second paragraph should be revised at a minimum as follows: Appropriate upland source control should be completed before or soon after the final EE/CA, which represents another major milestone in the project. A condition of the statement of work (SOW) to the AOC requires Arkema to continue to work under DEQ supervision on upland source control actions. The SOW states that the goal is for significant upland sources to be controlled to the greatest extent practicable before or during RA implementation such that significant post RA recontamination is not predicted. An evaluation of upland source control actions on all chemicals of interest will be undertaken during preparation of the EE/CA in order to determine whether source control will be accomplished prior to the removal action implementation. If in the evaluation, it is determined that source control will not be sufficient to ensure insignificant post-RA recontamination, the EE/CA will include hydraulic control measures.		The additional wording has been added to new Section 9.2.6 of the revised work plan along with a description of the upland source control evaluation. Note that the added text includes a more aggressive schedule for source control evaluation ("will be accomplished prior to the removal action implementation") than the text in the AOC SOW ("be controlled to the greatest extent practicable before or during removal action implementation") and is therefore a more stringent requirement than the SOW. LSS has also added the evaluation of hydraulic control measures in the EE/CA work plan.
39		(continued)	The work plan should provide more detail elsewhere as to how upland source control measures will be evaluated and when.	10/21/2005	
390	EECA	Appendix A	Appendix A) Figure 5a: This figure shows groundwater concentrations of Chlorobenzene measured in the monitoring wells near the illustrated cross section. The groundwater concentrations of the other contaminants, particularly DDT should also be shown. Also, the locations of known sources, such as the DDT MPR pond and trench should be depicted on the section.	10/7/2005	The detailed cross-sections generated for the EE/CA work plan include the DDT pond/trench (where applicable) and groundwater chemistry posted for a number of constituents, including DDT.
156	EECA	Appendix A	The figures should be supplemented with more detailed work from the uplands RI. I am also attaching comments that EPA provided on the sediment characterization and presentation in March 2004. Note that many of these issues are still missing on this present draft plan.	10/18/2005	The cross-sections in Appendix A were supplemented by detailed cross-sections generated for the EE/CA work plan. These new cross-sections include additional details presented on cross-sections in the Upland RI report.
397	EECA	Appendix C	Page 1-5. Appendix C includes calculations for human health in addition to wildlife.	10/6/2005	In response to other EPA comments, references to ecological calculations have been removed from this appendix; therefore, the title page of Appendix B (formerly Appendix C) was not changed.

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No.	Document	Section	Comment	Date	LSS Response
50	EECA	Appendix C	Screening values for human health. There is no value for perchlorate in this table, yet you propose sampling for perchlorate in Section 6.0 - what will these new data be screened against?. Please add a screening value for perchlorate.	10/6/2005	A screening level for perchlorate was evaluated in Sections 5 and 6 of the revised work plan.
51	EECA	Appendix C	Please provide a footnote to Table C-2 identifying the source for toxicity values. Assume it is the IRIS database, please confirm.	10/23/2005	Table B-1 (formerly Table C-2) was revised to include the source for toxicity values.
381	EE/CA	Appendix C	Table C-1: This table has a lot of exposure parameters needed to develop wildlife screening criteria for chemicals in sediments. This table does not include bioaccumulation (which it ultimately should), but just direct exposure to sediment. Some of the factors here are likely to be controversial (e.g. absorbed fractions, area use, exposure area, soil to food uptake factor, etc.) and need to be developed and reviewed in conjunction with the government team. The use of some may not be appropriate for screening level development. Suggest completing this and having it approved by the team before development of screening numbers.	10/18/2005	Comment acknowledged. This table has been removed from the work plan. See response to comment 397.
442	EECA	Appendix C	Appendix C. The title for this appendix should include a reference to human health values. The parameter values for all of the human health exposure scenarios should be explicitly included in a table(s). It appears that draft values for the Portland Harbor inwater risk assessment are being used. Some of these values may be revised.	10/7/2005	The title page for Appendix B (formerly Appendix C) was revised to reference only human health calculations (see response to comment 397). All exposure assumptions are included in the revised tables.
123	EECA	Maps, Cross Sections	All the maps and cross-sections should have the elevations referenced (or some cross-datum reference table provided in the cross-sections) to account for Mean Sea Level, City of Portland Datum, National Geodetic Vertical Datum, Ordinary High Water (for river mile at Arkema site), Ordinary Low Water (for river mile at Arkema site), and any other datum that may be used for the remedial work. I suggest that a small cross reference figure or table, similar what was done for the Terminal 4 EECA figures, be included in each figure developed for this EECA and future Arkema work.	3/12/2004	The datum used for data presentation including cross-sections is NAVD88 and illustrated on each figure as requested. In addition, a schematic of the Willamette River bank cross-section for the Arkema site is presented in Figure 2-1.

Directed Changes.

Directed Change Number	EPA Directed Change	LSS Response
1	Because of the lack of sufficient data presentation, data evaluation, figures and CSM development in the EE/CA Work Plan (WP), EPA is not able to adequately evaluate the Field Sampling Plan (FSP). Therefore, before the next version of the FSP is submitted, Arkema must resolve Work Plan comments prior to completing a revised FSP.	All comments have been addressed and resolved in the revised work plan. A complete list of the comments and associated responses is provided with this deliverable. The amount of data presentation, evaluation, and figures has been expanded significantly. The CSM was also expanded and developed further for a more descriptive presentation of the site using EPA's CSM model of the Portland Harbor as a guide. Per LSS's agreement with EPA, the FSP will be submitted as an addendum to the work plan at a later date not yet determined.
2	EPA considers the Summary of Previous Investigations inadequate. Arkema shall revise the summary of data needs in order to adequately assess: (1) the nature and extent of contamination; (2) the COIs that are known to exist at the site, including all contaminants from boundary to boundary; and (3) the mechanisms that move contaminants through the environment. Additional data for both upland and in-water conditions are needed to develop the CSM at a level that will allow for informed analysis and decision-making for this response action.	The summary of previous investigations has been expanded in Section 2. This information combined with screening data has enabled LSS to determine the general nature and extent of contamination in support of identifying data gaps and further evaluations for the site. The COI list has been expanded based upon the JSCS and EE/CA data screening procedures and activities. The CSM presents the release mechanisms for upland COIs, which include subsequent transport to the in-water portion of the site for some chemicals. The figures (Figures 4-1 and 4-2) and text within the CSM Section (Section 4.0) provide this information.
3	Throughout the removal action data collection and analysis, EPA must be able to determine how the removal furthered remedial work that is part of the Harbor-wide RI/FS since a full risk assessment will not be conducted as part of this early action. Arkema is directed to collect data during the removal action for use in the harbor-wide RI/FS and its analysis of pre and post-removal risks to human and ecological receptors.	Data will be collected prior to and during the in-water work. These data will be shared with the LWG as part of the ongoing characterization of the Portland Harbor. Evaluations will be conducted to estimate the ecological and human health risks for pre- and post-removal scenarios. The potential for recontamination of sediments following dredging or capping will be evaluated (Sections 7.0 and 8.0). This analysis will include the assessment of upland source control measures for preventing releases to the river.
4	The document does not adequately delineate the areal or vertical extent of contamination identified in the previous investigations. The EE/CA work plan should include a map for each COI showing extent and estimated thickness of each COI in sediment over the entire river area between thalweg and shoreline and the Arkema south and north property lines.	The revised work plan includes maps for COIs in each matrix, as well as cross-sections presenting concentrations of selected COIs with depth from four transects across the site. These figures provide a comprehensive visual presentation of the extent of contamination at the site from the uplands to the river.
5	Based on information from the Portland Harbor Phase 2A sampling, the data presented in Appendix D of the draft Work Plan and the findings of the upland investigations being performed at the site by ERM and others, additional COIs need to be further investigated. At a minimum, Arkema shall add PCBs, chlorinated dioxins/furans, PAHs, hexachlorocyclohexane, and VOC to the list of COI. Other COI should be added as determined by Arkema through their continued review of background documents and existing data sets.	The site COI list has been expanded significantly based on the JSCS and EE/CA data screening, which now includes but is not limited to the analytes listed in the Directed Change. The EE/CA data screening was developed as a hierarchical approach employing screening level values from multiple sources. Site COIs are discussed in the CSM (Section 4.0), which includes possible sources and the screening information is contained in Sections 5.0 (JSCS Screening) and 6.0 (EE/CA Data Screening).
6	The Work Plan does not include sufficient information for EPA to evaluate potential releases from Lots 1 and 2, or what the sediment quality is adjacent to Lots 1 and 2. Existing data shall be assessed and new data collected as necessary to ensure there is no significant contamination beyond the DDT area. Arkema shall include data from Lots 1 and 2 and show the distribution of data from upland and in water environs. Arkema shall also propose methods to complete data gaps identified for Lots 1 and 2.	The Work Plan provides sediment data along the entire shoreline of the site, including areas adjacent to Lots 1 and 2. Additional borings have been proposed at six in-water locations offshore of Lots 1 and 2 to address potential data gaps. Riverbank surface soil samples are also planned for this area in support of the upland ecological risk assessment.
7	Arkema shall provide a more comprehensive presentation of potential ARARs given the known circumstances at the site and likely removal action alternatives.	A more comprehensive preliminary list of statutes and regulations that may be considered ARARs and TBCs is provided in Section 1.3 of the revised draft EE/CA work plan. The ARARs and TBCs will be finalized and selected in consultation with EPA during preparation of the EE/CA.

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8	<p>Within the Work Plan, Arkema shall present a methodology that will be used or a set of criteria for how the RAA boundary will be delineated. Several criteria that may be used are, but are not be limited to: dredging restrictions generated from material stability, water depth, limiting factors on containment options; dredge methods; recontamination impacts; hydraulic containment alternatives; cost and schedule limitations; institutional controls; and technology limitations.</p>	<p>A revised preliminary RAA boundary is delineated in Section 6.5 of the revised draft EE/CA work plan. The proposed upstream boundary was delineated based on chemical exceedances of PECx10 for DDx in sediments. The proposed offshore boundary is the navigation channel line, a physical demarcation from the Arkema site based on water depth, sediment type, and chemical exceedances of PECx10 for DDx in sediments and acute water quality SLVs for several COIs. The proposed downstream boundary is represented by the PECx10 contour line delineated for DDD and DDT in surface sediments. The designated onshore boundary is the MHW line at an elevation of 12 ft NAVD88, as described in the AOC. Where appropriate, the preliminary RAA may extend to the top of the bank, such as in the area between Docks 1 and 2. In addition to the physical factors (some limiting) referenced by EPA, the final boundary will be determined based on a weight-of-evidence approach described in Section 8.2 of the revised work plan. The final RAA boundary will be delineated in EE/CA.</p>
9	<p>Given the source control evaluation schedule proposed by Arkema in the September 28 meeting (no complete source control evaluation until post EECA), Arkema shall evaluate hydraulic control measures in the EECA for the plumes across the site (DDT, MCB, chromium, perchlorate). Please discuss the data gaps for this effort related to engineering analyses and controls.</p>	<p>The integration and timing of upland source control measures are presented in Section 9.2 of the revised draft EE/CA work plan. A number of upland source control measures are proposed or are in the process of being implemented including an in situ sodium persulfate IRM, DNAPL remediation IRM, hexavalent chromium reduction IRM, perchlorate IRM, and a stormwater IRM. LSS is currently preparing a work plan for the isolation and treatment of the MCB DNAPL in the Acid Plant area (i.e., with a sheet pile wall). As stated in Section 9.2.6 of the revised draft work plan, if it is determined that upland source control efforts are not on track to prevent unacceptable recontamination of sediment, the time period for implementation of hydraulic containment measures would be the first order of business of the removal action implementation in 2010.</p>
10	<p>Arkema shall perform characterization activities that assess contaminant conditions at the entire site in order to determine the RAA boundaries for the EECA.</p>	<p>The RAA boundary is discussed in Section 6.5 of the revised draft EE/CA work plan. The preliminary RAA boundary was presented in the AOC and was modified based on the results of the EE/CA screening and distribution of COIs in media of the site. In general, the revised RAA boundary follows the PECx10 contour line for DDx in sediments (see the response to Directed Comment 8 for more details). Additional RA characterization will be conducted outside and inside of the preliminary RAA boundary before the completion of the EE/CA to address data gaps (Section 8). A final RAA boundary will be delineated once the RA characterization is completed in support of the EE/CA.</p>
11	<p>Arkema shall include in the work plan the process to be used and the performance standards to be applied in evaluating upland source control effectiveness. Also the work plan needs to provide a schedule for when EPA will receive the upland source control evaluation effectiveness and recontamination potential.</p>	<p>The upland source control evaluation and schedule are presented in Section 9.2 of the revised draft EE/CA work plan. For the groundwater IRMs, monitoring data from the riverbank wells downgradient from each of the source control measures will be used in the source control evaluation. For the stormwater IRM, monitoring data from outfalls to the Willamette River will be used in source control evaluation. To determine source control effectiveness for groundwater, time series plots of groundwater chemical concentrations will be prepared to evaluate contaminant reduction trends. In addition, groundwater and stormwater monitoring data will also be compared to JSCS criteria to determine whether there is a reduction in the priority level of the site (i.e., medium- or low-priority).</p>