RCRA RECORDS CENTER
FACILITY
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OTHER RCMS 11110

Loureiro Engineering Associates, Inc.

May 31, 2001

**United States Environmental Protection Agency**
**New England**
One Congress Street
Suite 1100 (HBT)
Boston, MA 02114-2023

Attn.: Mr. Juan A. Perez
Ms. Kim Tisa

**RE: November 2000 Remedial Action Work Plan**
**Willow Brook and Willow Brook Pond**
**Response to March 21, 2001 EPA Comments**

Dear Mr. Perez and Ms. Tisa:

We have prepared this letter on behalf of our client, United Technologies Corporation, Pratt & Whitney Division (UTC/P&W), to provide responses to each of the comments raised by the United States Environmental Protection Agency (US EPA) in regard to the above-referenced document. This letter is formatted to provide each of the comments followed by the response to the comment in italics. Submitted with this letter is one copy of the Remedial Action Work Plan that has been revised in accordance with the response provided to each of the comments received. The Remedial Action Work Plan has also been revised to respond to written comments received from the Connecticut Department of Environmental Protection.

It should be noted, during the period of time following the original submittal of the Remedial Action Work Plan (RAWP), design activities have been performed to support the preparation of permit applications to the State of Connecticut Department of Environmental Protection Inland Water Resources Division and the United States Army Corps of Engineers. These design activities have resulted in two modifications to the project as conceived in the November 2000 Remedial Action Work Plan. These changes are as follows:

1. The use of portable dams and by-pass pumping is no longer the method for addressing wet-weather flows. The project will include the installation of a single 2,200 linear-foot by-pass channel to redirect flow within Willow Brook during the implementation of the project. The by-pass channel is designed to pass a 100-year storm event. By-pass pumping will still be required for stormwater outfalls located along the northern banks of Willow Brook Pond and Willow Brook. The methods for handling stormwater during the performance of the project have been revised in the attached Remedial Action Work Plan to address this modification.

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2. Based on comments received from the Inland Water Resources Division, the use of stone-filled gabions within the stream channel of Willow Brook has been eliminated. The revised cross-sections are included in the attached Remedial Action Work Plan and depict the use of riprap. The riprap has been sized to withstand the maximum velocity anticipated within the stream channel. The riprap channel lining is discussed in the attached Remedial Action Work Plan.

In recognition of the significant design activities that have taken place, the figures and drawings contained in the revised RAWP have been modified and/or replaced with figures and drawings that have been presented in the variety of permit applications necessary for the completion of the project. These figures and drawings are representative of the current status of the project design. It should be noted, the project is being performed as a design-build effort. As such, detailed design plans and specifications beyond that which is necessary to support the permitting efforts and to establish the performance criteria for the remediation project, are not necessary. Additional engineering design is not anticipated, other than the anticipated minor field alterations necessitated by changed conditions.

**Ernest Waterman - General Comments**

There are four key flaws in this work plan as a conceptual work plan and/or 30% design document.

1. No specific Media Cleanup standards or general clean up goals are specified for constituents of concern other than PCBs.

   *The RAWP has been revised to specifically reference the cleanup criteria applicable to this site as reflected in the Remediation Standard Regulation (RSR), 22a-133k-1 through 3 of the Regulations of Connecticut State Agencies (RCSA). The project will result in the installation of an engineered control pursuant to the RSR. As such, with the exception of PCBs, there are no numeric criteria applicable to materials to be left in place beneath an engineered control. This issue is further addressed in response to Comment No. 7, below.*

2. Plans for project aspects ancillary to the remediation itself (e.g. the management of water during the project and disposal of remediation waste from the project, controls on future development, etcetera) are unclear at this time.

   *The RAWP has been revised to address the management of water during the project, the disposal of remediation waste from the project, and the implementation of institutional controls. The regulatory framework for institutional controls is discussed in greater detail in response to Question No. 8, below.*

3. How project components will mate together is unclear (e.g. how halves of the cap will be joined, the boundary of the streambed cap with wetland remediation area, etcetera).

*The RAWP has been revised and additional details have been provided to address the specific activities associated with the proposed remediation. As noted above, the scope of the project remains unchanged, but the means and methods of achieving the objectives have been modified. Through the installation of the by-pass channel, will eliminate the need to install portable dams to manage stream flow during construction. Additional details have also been provided that set forth the limits of each particular type of cap that will be installed.*

4. How this project will integrate and be impacted by other remediation needs at the site. Most prominent of these concerns is the ground water plume of solvents and chromium that discharges into the lower reach of willow brook within the project area.

   *This project is considered a "stand alone" effort to address the PCB and related contamination within Willow Brook and Willow Brook Pond. Other remedial needs on the site would be considered separate projects and will not be impacted by this remedial effort. With regard to the solvent and chromium groundwater contamination, the implementation of the remediation of Willow Brook and Willow Brook Pond will not alter the need to evaluate the impacts associated with that plume. Furthermore, the remediation of Willow Brook and Willow Brook Pond will not alter the hydrogeologic regime within or surrounding Willow Brook or Willow Brook Pond and will not affect the evaluation of alternatives to address the plume should it be necessary to do so.*

**Ernest Waterman - Specific Comments**

5. Page 7, Paragraph 2: Specify if the statement "It should be noted that the contamination might have originated from multiple sources" indicates other candidate source areas are suspected or if this is a generic statement that one can never be completely sure all sources have been found. If there are specific other candidates, what are they?

   *No revision to the RAWP was made to address this comment. The context of the statement presented in the RAWP was of a generic nature. Based on the available historic mapping and soil analytical data, the primary source of soil contamination within the area addressed by this comment appears to be the former oil-water separator. It is suspected that a facility discharge upstream of Willow Brook may also have contained oil. This discharge originated from the Experimental Test Airport Laboratory, which has been demolished. As such, this upstream discharge may have led to contamination of sediments within the previous stream channel bed. Certain soil boring data in this area confirms a PCB contaminated strata consisting of river sediments at an elevation consistent with the floor of the adjacent ponds. Historical mapping similarly confirms the previous streambed location. The proposed soil remediation effort for this area will address the sediment as well as the former streambed through excavation and removal and/or capping. The oil-water separator and adjacent streambed are the only known sources of soil contamination in the area. Based on our investigations throughout the site, which included assessments of various drain and discharge connections, review*

*of historic mapping, as well as surface water sampling and analysis, no continuing sources of contamination are present.*

6. Page 9, Paragraph 3: Clarify if the 14-16 feet below grade in the pond area means 14 to 16 feet below the bottom of the pond or 14-16 feet below ground level on the banks of the pond.

   *The RAWP has been revised to clarify this statement as follows: The vertical extent of PCB impacts has been defined by the sampling conducted, generally achieving non-detect or concentrations < 1 ppm at depths ranging from 4 to 6 feet below grade in the off-site wetlands and 14 to 16 feet below grade in the soil between the upper and lower Willow Brook Pond.*

7. Page 10, Paragraph 2: Propose Media Cleanup Standards for the other constituents of concern found in the area of the proposed remediation. Although the SVOCs, metals, and petroleum hydrocarbons were not the trigger to the timing of this project. The levels of some of these constituents are quite high and we need to specify remediation goals for these ancillary contaminants.

   *The RAWP has been modified to reference the applicable cleanup criteria. Remediation of other constituents of concern found in the remediation areas will be completed in accordance with the Remediation Standard Regulation (RSR), 22a-133k-1 through 3 of the Regulations of Connecticut State Agencies (RCSA). The remediation goals for the ancillary constituents are presented in tabular format in Appendix A and B to 22a-133k-2, more specifically the Industrial/Commercial criteria in Appendix A, the GB Mobility Criteria in Appendix B and/or alternative criteria in accordance with those specific provisions. Institutional controls will be imposed to prohibit the residential development of the impacted areas.*

   *However, the proposed engineered control (EC) will be prepared in accordance with specific requirements through a variance provision in the RSR thereby allowing soils exceeding these tabular criteria to be left in place. As a result, the development of specific clean-up criteria for other constituents is not necessary. The criteria developed pursuant to the RSR will be used to assess the lateral extent of the engineered control. Sampling to address the lateral limits of the cap are discussed in greater detail in response to Comment No. 16, below.*

8. Page 10, Paragraph 3: Propose a framework of institutional controls to govern the flexibility of future use this paragraph seeks to maintain. The remedy currently proposed envisions a specific future use scenario which we have anticipated will be secured by an institutional control on the area. While the alternatives discussed here might be possible the institutional control itself will have to lay out what remediation steps must be added to change the use restrictions of any area included in the institutional control.

*The RAWP has not been modified to address this comment. However, further definition of the RSR as it relates to the proposed institutional controls is presented herein. The use of the areas of this project that will be remediated through the installation of an engineered control (the area of the oil/water separator, Willow Brook Pond, and the stream channel of Willow Brook) will be restricted by recording an environmental land use restriction (ELUR) in accordance with 22a-133q-1 of the RCSA. Specific provisions are included within this regulation for a release of the restriction by the Commissioner of the Department of Environmental Protection. Such release would necessitate the preparation of a detailed remediation and restoration plan, which would be consistent with the future proposed use of the subject area or part thereof.*

9. Page 13, Construction activities bullet points: 1) Clarify which oil water separator is being demolished. 2) Explain why an engineered control is needed. It was EPA's understanding that the oil/ water separator source area would be completely excavated. 3) Specify the disposal scenario for each of the waste streams itemized.

   *The RAWP has been modified to specifically identify the former oil-water separator existing between the two water bodies of Willow Brook Pond is the structure to be removed.*

   *The RAWP has been revised to specifically address the proposed activities within the subject area and to present the reason for the engineered control. Based on the available analytical data the soil material within the oil-water separator is impacted by PCBs at concentrations greater than 100 mg/kg. Consequently, remediation of this area includes excavation and complete removal of the structure and any related soil impacted by PCBs at greater than 25 mg/kg. An engineered control within this area was proposed to address the direct exposure issues associated with the residual PCBs (at < 25 mg/kg) and the presence of other constituents at concentrations in excess of the Commercial/Industrial Direct Exposure Criteria and the GB Pollutant Mobility Criteria.*

   *The RAWP has been revised to specifically identify the waste streams expected from this project. A minimum of two and a maximum of four separate waste streams are expected. The minimum two waste streams are PCB remediation waste (PCBs > 50 mg/kg) and PCB contaminated waste (PCBs < 50 mg/kg). The additional two waste streams would include the above minimum two but with the addition of other underlying hazardous constituents. Each waste stream would contain a generic profile description to allow for the combined disposal of soil, sediment, concrete, personal protective equipment, and metal. All waste streams will be disposed of at landfills that are permitted and approved to receive such waste materials. It is anticipated that the waste streams containing >50 mg/kg PCBs would be disposed of at a chemical waste landfill approved under §761.75.*

10. Provide additional information regarding the civil war marker whose relocation is proposed. There are federal statutes regarding archeological and historical resources which may have to be complied with for this marker.

*As shown on the drawings in the RAWP, the civil war marker will not be impacted by the remediation project. The relocation of the civil war marker was discussed in the RAWP in recognition of its existence within the area of proposed remediation efforts. However, the disturbance or relocation of the marker will not be required as part of the Willow Brook and Willow Brook Pond remediation project.*

11. Page 16, Paragraph 3: Expand the discussion regarding diversion of flows to explain how the restored channel halves and planned channel armoring will be mated together along the centerline of the project.

    *The RAWP has been revised to incorporate a temporary by-pass channel to facilitate the management of stream flows during construction. This approach will streamline the pond and channel remediation efforts and eliminate the need for segregating the project into halves. Details associated with the by-pass channel and related construction sequencing and logistics are presented in the revised RAWP.*

12. Page 17, Paragraph 1: Explain how water within the staging areas will be collected. No provision for a sump or other collection point has been specified. The Work Plan has been revised to present additional detail associated with the

    *The RAWP has been revised to enhance the details associated with the staging areas. All water within the staging areas will be collected in a pre-formed sump located at an intentionally defined low spot within the staging area(s). The collected water will be pumped to a settling tank within which solids will be separated. Water will be decanted from the settling tank, treated through a wet-phase carbon adsorption system then discharged to the Town of East Hartford Water Pollution Control Facility. Sampling, as necessary to comply with the terms and conditions of the general permit for discharge and the Town's discharge requirement will be performed. Prior to initiating the discharge to the sanitary sewer, the treated water will be sampled to ensure that the PCB concentration is less than 1 ug/l.*

13. Page 17, Paragraph 6: Specify the size of the stones to be used in the gabions.

    *The RAWP has been revised in response to comments made by the DEP Inland Water Resources Division. The revised plan includes a reduction to the channel side slope to control potential erosion and modifications to the character of the channel bottom to create a low flow channel with pools and eddy. The previously proposed gabions have been deleted from the project and have been replaced by the use of riprap. As noted above, the riprap has been sized to withstand the maximum anticipated velocity within the stream channel.*

14. Page 20, Project schedule bullet points: 1) Include engineering design completion as a major step. 2) Provide for interaction with EPA at each major step.

*The engineering design component of the project was completed February 14, 2001. The design revisions to the RAWP have been incorporated into this submission. It should be noted, the project is being performed as a design-build effort. As such, detailed design plans and specifications beyond that which is necessary to support the permitting efforts and to establish the performance criteria for the remediation project, is not necessary. Additional engineering design is not anticipated, other than the anticipated minor field alterations necessitated by changed conditions. Interaction with EPA has been included at each major step remaining within the project.*

15. Page 22, Paragraph 5: Justify the sample grid size proposed, specify the composite sample detection that corresponds to a 1 ppm and 25 ppm detection in a point sample assuming adjacent points are non-detect.

    *During the preparation of the RAWP, it was determined that the 20 –foot by 20-foot sample grid would result in the collection of data adequate to support verification that the remediation goals of 1 and 25 ppm, respectively, were met. The sampling was to be performed through the collection of individual aliquot samples on the nodes of this grid to form a single composite sample representative of 2,400 square foot area. This assumes the collection of six aliquot samples to form the composite sample.*

    *In consideration of the comments received in regard to the size of the area to be represented by a single composite sample, the RAWP has been revised to provide for a four point composite sample representative of a 1,600 square-foot area. The aliquots would still be collected on the same 20-foot by 20-foot grid as this will result in data that are adequate to ensure the remediation goals have been met.*

    *With regard to the composite sample detection that corresponds to 1 ppm and 25 ppm, any result for a <u>composite</u> sample below 1 ppm in a 1-ppm target area and 25 ppm in a 25-ppm target area would result in the conclusion that remediation in that area has been completed.*

16. Page 23, Paragraph 1: Provide a figure showing areal pattern of collection points for other constituents of concern and explain how sample point will be selected.

    *A graphical depiction of the areal pattern for the collection points for other constituents of concern has been included. The RAWP has also been revised to provide a more concise description of the implementation of the sampling plan to confirm the limits of areas to be capped. This comment is addressed in greater detail in the response to Question No. 17 below.*

17. Page 23, Paragraph 1: Explain the sentence which reads "...submitted for analysis for metals, VOCs, SVOCs, and cyanide as necessary to determine the lateral extent of the areas to be capped. As pointed out earlier no goals for these constituents has been proposed so it is impossible to tell how the would be used as a guide to cap design. Further it was our understanding that the width of cap was predefined by the project

scope we are setting (i.e. we are armoring the entire pond bottom and stream bed and providing a minimum thickness of clean soil over all upland areas excavated.).

*As noted in the response to Question No. 1, the remediation goals for constituents other than PCBs are those pursuant to the RSRs.*

*The project area upstream of the dam is defined in two sections, Willow Brook Pond and the area of the former oil/water separator. The lateral limit of the project area of Willow Brook Pond, inclusive of the small embayment west of the Process Water Facility and south of the lower section of Willow Brook Pond, is defined as the horizontal location of the ordinary water level. As the pond and embayment are defined structures (defined by sheet-piles along the banks), sampling to confirm the lateral extent of caps in this area of the project will not be necessary. The lateral limits of the project area in the vicinity of the former oil/water separator is currently defined as the lateral limit of soils containing PCBs at concentrations greater than 25 ppm. However, it is recognized that the potential exists that other constituents may exist in soils outside this lateral limit that would require remediation pursuant to the RSRs. As a result, sidewall sampling will be necessary to confirm the lateral limits of the area to be remediated for other constituents to comply with the RSRs. The remediation would be accomplished by locating these soils beneath the composite cap. Confirmatory grab samples would be continued until a point at which no constituent is detected in soil at concentrations requiring remediation pursuant to the RSRs.*

*The project area downstream of the dam is defined in two parts, the stream channel of Willow Brook Pond and the wetland area. The lateral limit of the project area for the stream channel cap is the 10-year flood elevation (22.0 to 24.0 feet above mean sea level). As such, sampling to confirm the lateral extent of the cap in this area of the project will not be necessary. The lateral limit of the project area for the wetland is currently defined to the south by the northern limit of the stream channel cap and to the north, east and west as the lateral limit of soils containing PCBs at concentrations greater than 1 ppm. However, as with the former oil/water separator area discussed above, it is recognized that the potential exists that other constituents may exist in soils outside this lateral limit that would require remediation pursuant to the RSRs. As a result, sidewall sampling will be necessary to confirm the lateral limits of the area to be remediated for other constituents to comply with the RSRs. The remediation would be accomplished by additional excavation and removal. Confirmatory grab samples would be continued until a point at which no constituent is detected in soil at concentrations requiring remediation pursuant to the RSRs.*

18. Page 24, Paragraph 2: Modify disposal characterization to incorporate our knowledge about the areas we are excavating from our characterization sampling and segregate our materials handling to prevent mixing of highly contaminated sediments with relatively uncontaminated sediments.

*The RAWP has been revised to explain the waste disposal and staging area details. Waste Disposal staging areas will be managed as necessary to segregate the waste streams as those containing greater than 50 ppm PCBs and less than 50 ppm PCBs. All waste disposal characterization for PCBs will be based on "as-found concentrations". A minimum of two and a maximum of four separate waste streams are expected. The minimum two waste streams are PCB remediation waste (PCBs > 50 mg/kg) and PCB contaminated waste (PCBs < 50 mg/kg). The additional two waste streams would include the above minimum two but with the addition of other underlying hazardous constituents. Supplemental analysis (for PCBs as well as other constituents of concern) will be performed for disposal vendor satisfaction and for disposal characterization of the concrete debris from demolition of the process water facility and the former oil/water separator. Supplemental analysis for disposal vendor satisfaction will be performed from stockpile grab samples using a random node sampling technique. Disposal characterization sampling of concrete debris will be performed at a rate of approximately 1 sample per 500 tons of concrete debris or at a more frequent rate as directed by the disposal vendor.*

**General Comments – Kim Tisa**

1. As noted during our meetings, the driving factor for the remediation action levels is eco-risk. Under the TSCA regulations, remediations of this caliber and with the institutional controls proposed would require public participation, normally through a public notice/comment period. This has not yet occurred. As such, it must be clear to P&W that this remediation is, in effect, source removal with interim institutional controls and that P&W is undertaking the measure at its own risk. (Albeit as discussed on several occasions, it appears that what P&W is proposing is reasonable and will most likely pass this type of assessment.) Until we have a human health/eco-risk evaluation and public process, we cannot consider the remedy permanent.

   *The remediation is being undertaken as part of the site-wide RCRA voluntary corrective action program and is being implemented as a final remedy for the project area as defined in the revised RAWP. We too are of the opinion that the remediation will withstand the human health/ecological risk evaluation and public participation process contemplated under the TSCA regulations and appreciate your support of the project as presented in the RAWP.*

   *However, we disagree that a public notice and comment period has yet occurred. To date, four forms of public notice/comment have taken place. The first was the formal notice of the application to the State of Connecticut Department of Environmental Protection for the Section 401 Water Quality Certification. The second was the public notice of the application to the Army Corps of Engineers for the Section 404 permit to perform activities impacting greater than 1 acre of jurisdictional wetlands. The third was the formal notice of a public hearing on the application submitted to the Town of East Hartford Inland Wetlands Commission. The fourth was the formal notice of the proposed use of an engineered control pursuant to the State of Connecticut RSRs. In*

*each of the formal notices, a description of the project was provided and each notice referenced availability of additional information pertaining to the proposed application. Each application contained a detailed description of the proposed remediation. To date, the public comment period has elapsed on the first three notices with no substantive comments received and the Town of East Hartford granted an Inland Wetlands approval with only one comment from the public at the hearing.*

*With regard to the ecological and human health risk evaluation, UTC has provided additional evaluations of existing data and obtained additional data to support the conclusion that no adverse risks will be posed to human health and the environment following the implementation of the remediation project. In response to these evaluations, the DEP has indicated that they are satisfied with the proposed remedy.*

Also, I can find no clear discussion on the piping and/or conduit discharging into the Willow Brook Ponds from the plant or upstream. I believe we had past discussions on these structures and that minimal to no contamination was found; however, it should be redocumented here.

*As discussed in the December 12, 1997 Work Plan for Willow Brook and Willow Brook Pond PCB Investigation, prepared by Loureiro Engineering Associates, known water discharges throughout the East Hartford Main Plant and Colt Street facilities at one point in time or another include Discharge Nos. 001 through 009. The location of these discharges is identified in Drawing No. 1 of the above-referenced report. The same report contains analytical data on PCBs for water collected from Discharge Nos. 001 through 004. The same report also provides analytical data on a former oil/water separator in the Experimental Test Airport Laboratory area.*

*The RAWP has been modified to re-document the previously provided information. The information is presented in Section 1.3.*

2. I would suggest that P&W provide an analysis of the costs associated with the proposed remedy and its alternatives, including complete source removal.

   *Remediation alternatives that have been considered include the alternative currently documented in the RAWP and the complete source removal. A detailed cost evaluation of both alternatives has been prepared as part of the documentation necessary to support a request to implement an engineered control pursuant to the RSRs. The request was submitted in January 2001 and was revised in May 2001 in response to DEP comments. The revised document has been provided under separate cover.*

3. EPA has developed Quality Assurance Guidelines for submission of Quality Assurance Project Plans (QAPP). For future sites and projects, I suggest this format be used in that it helps simplify and clarify analytical requirements, sampling methodologies, QA/QC specifications and laboratory requirements. I have enclosed a summary outline of this guidance document which may be obtained from EPA's OEME Quality Assurance office.

*The RAWP includes all main components of the guidance document "EPA-NE Compendium of Quality Assurance Project Plan Requirements and Guidance Document" (EPA-NE QAPP Manual). The following components of the EPA QAPP guidance document are included in the RAWP as specified below:*

*1.0 Project Management and Objectives is addressed in Section 5.2 – "Project Organization and Responsibilities"*
*2.0 Measurement / Data Acquisition is addressed in Section 5.4 "Sampling Procedures", Section 5.5 "Sample and Document Custody, Section 5.7 "Analytical Procedures, Section 5.9 "field and Laboratory Quality Control Checks: and Appendix B 'Standard Operating Procedures (SOPs)*
*3.0 Assessment / Oversight is addressed in Section 5.10 "Performance and System Audits" and Section 5.12 "Reports to Management."*
*4.0 Data Validation is addressed in section 5.11.6 "Data Validation."*

**Specific Comments – Kim Tisa**

4. Page 7, 2nd complete paragraph - The text indicates that "free oil" was observed at WT-SB-88 at a depth of 10-12 feet. It is not clear if any sample of this product was collected and analyzed. If so, what were the results?

   *The RAWP has been revised to explain that the soil sample from this location and depth interval was collected and analyzed, and the data has been provided. The separate-phase oil that was observed in the sample was not analyzed independently.*

5. Page 9, Subsection 1.4.1 - The last sentence states that "SVOCs and select metals are co-located with the elevated PCB concentrations". It is unclear how P&W is making this determination. Drawings 1-3 show the constituents of concern and sampling points along Willow Brook and in Willow Pond; however, it appears that much of the analytical determinations were only for PCBs, not for these other constituents. Therefore, it is unclear how P&W can make this assertion. Further, at least one sampling location (e.g. WT-SD-47) shows relatively low levels of PCBs, but much higher levels of SVOCs.

   *The original statement in the RAWP was a generalization based on an overview of the analytical data. The RAWP has been revised to clarify the general distribution of other constituents in recognition of the fact that the vast majority of samples were collected for the purposes of the delineation of PCB-contaminated soil and sediment.*

6. Page 9, Subsection 1.4.2 - The text indicates that groundwater contamination will be monitored post-excavation and that new monitoring wells will be installed. There is no indication on the frequency and duration of this monitoring. (RAWP addresses. See Page 19, Subsection 2.4.2.)

*The comment appears to indicate that a response is addressed in Section 2.4.2. A post-remediation groundwater monitoring plan has been developed as part of a request to implement an engineered control pursuant to the RSRs. The request was submitted in January 2001 and was revised in May 2001 response to DEP comments. The May 2001 revision to the January 2001 request has been provided under separate cover.*

7. Page 10, Subsection 2.0, 3rd paragraph

   a. The text refers to the "PCB action level". This appears to be the driver for cleanup; however, from a cumulative standpoint the other constituents may also be problematic. (See Comment 5, above). Based on the information provided in subsequent sections, it appears that confirmation sampling will include the other constituents of concern; however, the target action levels for cleanup have not been provided.

      *This comment is addressed in detail in the response to comment Nos. 1, 7, 8, and 17 from Ernest Waterman. The RAWP has been revised to specifically reference the cleanup criteria applicable to this site as reflected in the Remediation Standard Regulation (RSR), 22a-133k-1 through 3 of the Regulations of Connecticut State Agencies (RCSA). The project will result in the installation of an engineered control pursuant to the RSR. As such, with the exception of PCBs, there are no numeric criteria applicable to materials to be left in place beneath an engineered control.*

   b. The 1st sentence states that the PCB action level assumes future use of the area as open pond flanked by parking and green space. This is slightly misleading as in the previous paragraph P&W indicates that a fence will be installed around the remediated area to preclude access to the area. In this event, the affected area will not be "open" to the public, but actually be a restricted area.

      *The RAWP has been revised to reiterate that the area will be restricted and not open to the public. The term "green" was selected in deference to the ultimate visual appearance of the project area following remediation. It was not intended to infer that the project area was to be available for open public use.*

   c. The 2nd sentence states that if redevelopment involves a bike path or roadway, the area will be remediated so the PCBs are less than 1ppm. In our most recent meeting with P&W, I believe it was indicated that these redevelopment scenarios were no longer under consideration. If so, the RAWP should be amended and these options deleted. It should also be noted that any future change in the property use would require re-evaluation of the exposure risks and potentially additional remediation.

      *The potential redevelopment scenarios are still a consideration. The use of the areas of this project that will be remediated through the installation of an*

*engineered control pursuant to the RSRs (the area of the oil/water separator, Willow Brook Pond, and the stream channel of Willow Brook) will be restricted by recording an environmental land use restriction (ELUR) in accordance with 22a-133q-1 of the RCSA. Specific provisions are included within this regulation for a release of the restriction by the Commissioner of the Department of Environmental Protection. Such release would necessitate the preparation of a detailed remediation and restoration plan, which would be consistent with the future proposed use of the subject area or part thereof.*

8. Page 14, Subsection 2.3.1, Decontamination

   a. 1st paragraph - The text indicates that pressure washing will be used for equipment decontamination. The PCB regulations at §761.79(b) and (c) specify decontamination allowances for sampling equipment. The proposed decontamination procedures do not meet any of the specified allowances.

      *The RAWP has been revised to indicate that construction equipment will be decontaminated via a double wash/rinse.*

      *The SOP for Soil Sampling has been revised to detail the decontamination process for durable sampling equipment. This procedure will be accomplished via swabbing the surfaces with a solvent More specifically, the order of decontamination is as follows:*

      - *detergent swab*
      - *DI water rinse*
      - *hexane rinse (to be used only if separate-phase petroleum product, other than gasoline, is present)*
      - *DI water rinse*
      - *10 percent nitric acid rinse (to be used only when metals are suspected as potential contaminants)*
      - *DI water rinse*
      - *methanol rinse (less than 10 percent solution)*
      - *air dry*

   b. 2nd paragraph - This text refers to the Appendix B SOPs. In reviewing these SOPs, I note that many are very general in nature and are not specifically written for this project. EPA recommends that SOPs be written site specifically as this insures consistency throughout the project.

      *The SOPs provided in Appendix B are the same SOPs that have been presented and approved by EPA during the performance of investigation activities pursuant*

*to the voluntary RCRA corrective action program at P&W Connecticut Facilities. The SOPs are written to provide staff members with appropriate guidelines to ensure activities are conducted in a consistent manner under a variety of conditions. When necessary and appropriate (see response to Comment Nos. 8a and 22) the SOPs are revised to reflect standard procedures that could be implemented under a variety of conditions.*

c. 3rd paragraph - The text indicates that liquids generated during decontamination will be disposed of via the sanitary system. This is not sufficient. These liquids could contain COCs that exceed the allowable discharge limits under either or both the federal and state regulations. For example, decontamination waters generated during a PCB remediation must be disposed of as a TSCA-regulated material unless the waters are decontaminated in accord with §761.79(b). The discussion needs to be revised to discuss not only state requirements under the discharge permit, but also federal PCB requirements.

   *Under the cited TSCA regulations, decontamination of the waters must result in a total PCB concentration of less than 3 µg/l. Under the terms and conditions of the cited General Permit for discharge to the sanitary sewer, the maximum allowable PCB concentration is 1 µg/l, more stringent than the aforementioned TSCA regulations. The paragraph has been modified to more clearly state that wastewater will be treated to comply with the maximum allowable concentrations stipulated in the General Permit prior to discharge to the sanitary sewer. The General Permit is issued by the State of Connecticut under statutory authority detailed in Section 22a-430 of the Connecticut General Statutes.*

9. Page 15, Process Water Buildings - The last sentence refers to the abandonment of pipes and utilities. It any of these pipes/utilities are in contact with contaminated material, decontamination would be required. There is no discussion of this included in the text.

   *The RAWP has been revised to reflect the options available to address buried pipes and utilities in contact with contaminated materials. Those materials clearly within the limits of an area designated for remedial excavation, will be either removed and disposed of as bulk PCB remediation waste, will be sampled and decontaminated, or abandoned in place, as appropriate. Those materials outside of these remediation areas would be sampled and removed for disposal or decontaminated and abandoned in place, as appropriate.*

10. Page 15, 3rd and 4th paragraphs - These subsections refer to characterization for disposal of the oil/water separator the demolition debris. It any of the material in question contains PCBs and meets the definition of PCB remediation waste as defined at §761.3, the disposal requirements are specified under §761.61(b), unless otherwise requested under §761.(a) or (c). P&W must specify how these wastes will be managed.

*The RAWP has been revised to define specifically that PCB remediation wastes will be managed and disposed of using the performance based disposal provisions in §761.61(b)(2)(i) at a chemical waste landfill approved under §761.75.*

11. Page 15, Subsection 2.3.3.

    a. 1st paragraph - The last sentence refers to a lime stabilization procedure to eliminate free-draining water. As discussed with P&W in previous meetings, the PCB regulations specifically prohibit solidification of liquids into non-liquids for purposes of avoiding disposal requirements. Given the types of impacted materials, namely sediments, there is likelihood that the excavated materials will be low in % solids. Some type of dewatering step will be necessary, such as gravity filtration, to remove as much excess water from these sediments as reasonably feasible prior to solidification. (I believe this comment in addressed on Page 17 of the RAWP; however, P&W should provide more detail on its implementation., such as how the water will be collected and stored, etc.)

    *The RAWP has been revised to clearly define the sediment and soil dewatering procedures. The proposed by-pass channel was incorporated into this project primarily to facilitate in-situ gravity dewatering and to mitigate potential logistical complications associated with the previous proposal. Based on the available historic stream channel bathymetry and utility invert data, the by-pass channel is expected to effectively relieve the groundwater table to an elevation below 21.00 in the pond areas. A field determination will be made based on the % solids observed in the in-situ material, to excavate the material and direct-load the vehicles for off-site disposal with or without the addition of lime, or to excavate the material and stage it in a temporary staging area for further gravity dewatering. Additional details have been provided regarding the operation of the temporary staging areas. The staged material would again be evaluated after a 24-hour period to assess the % solids. If the % solids are unacceptable for over-the-road transport, the material would be stabilized with lime to further reduce the water content and render the subject material compliant for transportation. The addition of lime is proposed as an additional measure to ensure no free-draining liquids will be formed during transportation and will only be used once adequate time has elapsed to allow for gravity dewatering.*

    b. 2nd paragraph - The text indicates that excavated areas will be restored with a geotextile, soil and stone cap. Since remediation will be performed in a phased approach, P&W should clarify how these institutional controls will be integrated to achieve an effective barrier to contamination.

    *The RAWP has been revised to reflect that a by-pass channel for flow diversion will be provided during construction. This revised approach will facilitate remedial activities throughout the impacted areas in a top-down/bottom up sequence (east to west or west to east). Additional details have been provided in*

*the revised RAWP to address how each of the institutional controls will be integrated to form a continuous barrier over the entirety of the project area.*

c. 2nd paragraph - The text indicates that dewatering pumps will be used to pump water from the side of the dam that will be remediated. How will this water be handled? If P&W plans on "discharging" to the open side, it should clarify how it can insure that contaminated sediments will not be suspended into the water column during the dewatering.

*The RAWP has been revised to include a by-pass channel. The pumping of water from one side of a dam to another will no longer be necessary.*

12. Page 16, Dewatering - See Comment 8.c., above.

*The RAWP has been revised to indicate that all dewatering wastewater will be containerized, treated as necessary, sampled, then discharged to the Town of East Hartford Water Pollution Control Facility through a sanitary sewer under the General Permit for the Discharge of Groundwater Remediation Wastewater to a Sanitary Sewer. As noted, this General Permit is issued by the DEP. The collected water will be pumped to a settling tank within which solids will be separated. Water will be decanted from the settling tank, treated through a wet-phase carbon adsorption system then discharged. All related monitoring and record keeping shall be implemented in accordance with the terms and conditions of the General Permit.*

13. Page 16, Excavation Methods, 2nd paragraph - The last sentence should state "Excavation will continue...in excess of 25ppm within the pond and brook and 1ppm within the wetland are removed."

*The RAWP has been modified to specifically note that "Excavation will continue...in excess of 25 ppm with the pond and brook and 1 ppm within the wetland are removed."*

14. Page 17 - A map showing the staging, decontamination and waste storage areas should be provided.

*The RAWP has been revised to include the requested details.*

15. Page 17,1st paragraph - See comment 8.c, above.

*The RAWP has been revised to reiterate that the General Permit for the Discharge of Groundwater Remediation Wastewater to a Sanitary Sewer issued by the DEP will address this. All related monitoring and record keeping shall be implemented in accordance wit the terms and conditions of the general permit.*

16. Page 17, Off-Site Disposal - Why is P&W proposing to dispose of this material at a solid waste landfill? Much of this material contains high concentrations of PCBs and other

COCs. Disposal requirements for PCB remediation waste are found at §761.61(a), (b), and (c).

*The RAWP has been revised to clarify that bulk PCB remediation wastes will be managed and disposed of using the performance based disposal provisions in §761.61(b)(2)(i) at a chemical waste landfill approved under §761.75. Waste containing less than 50 ppm PCBs will be managed in accordance with applicable local, state and federal regulations and will be landfilled at a facility permitted to receive such waste.*

17. Page 18, Subsection 2.3.5, 4th paragraph - See comment 7.c, above.

    *The RAWP has been revised to present the details associated with the Engineered Control variance provisions of the RSR. The use of the areas of this project that will be restored through the installation of an engineered control (all areas except the wetland) will be restricted by recording an environmental land use restriction (ELUR) in accordance with 22a-133q-1 of the RCSA. Specific provisions are included within this regulation for a release of the restriction by the Commissioner of the Department of Environmental Protection. Such release would necessitate the preparation of a detailed remediation and restoration plan, which would be consistent with the future proposed use of the subject area or part thereof.*

18. Page 21, Subsection 4.1.2

    a. The text states that "The sampling program will be implemented in accordance with 40 CFR Part 761 Section 761.61(c) and in general compliance with Subpart O. I have received no request for a risk-based sampling procedure under §761.61(c). If P&W is requesting a variation from the Subpart O requirements, a formal request must be made and an approval issued.

       *The RAWP has been revised to more clearly state the basis for the design and implementation of the sampling program. The sampling program has been developed in consultation with the requirements presented in 40 CFR Part 761 Section 761.61 (c), 40 CFR Part 761 Subpart O, and the documents entitled Verification of PCB Spill Cleanup By Sampling and Analysis, EPA August 1985 and Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup, EPA May 1986. The field sampling program, as revised, will provide those data necessary to confirm that PCB concentrations remaining in soil/sediment at the limits of the excavation are consistent with the remedial action objectives.*

19. Page 22 - Remedial Action Field Sampling

    a. The SOP associated with Soil Sampling for VOCs is of concern. The proposed SOP for soil VOC sampling indicates only that the sample must completely fill the sample container. EPA recommends that SW-846 Method 5035 be used for

field collection of VOC samples. This minimizes the potential loss of contaminants prior to sample analysis.

*The RAWP has been revised to include the SW-846 Method 5035 field collection method for VOC samples in the site specific SOP for Soil Sampling.*

20. Page 22, Subsection 4.2.2. - Given the heterogeneity of the contamination, the proposed grid interval for confirmatory sampling appears too large, especially given that P&W also proposes compositing up to 6 grab samples. Further P&W proposes an even larger area (1 per 2,400 ft2 ) for confirmatory sampling of other COCs. P&W should provide a justification as to why it believes this sampling scheme is sufficient to ensure target action levels are met for all COCs.

    *This comment is addressed in detail in the response to comment Nos. 15, 16, and 17 from Ernest Waterman.*

21. Page 23, 1st sentence - The text indicates that additional confirmatory samples for metals, VOCs, SVOCs, and cyanide will be collected. In its investigatory phase, P&W identified several areas where elevated Total Petroleum Hydrocarbons were found. Will confirmatory analysis also include TPH? If so, it should be added and also included in Table 4-1.

    *The RAWP has been revised to include TPH analysis on confirmatory soil samples. Table 4-1 has also been updated to reflect the addition of TPH analysis.*

22. Page 23, 2nd paragraph, sample collection procedures - EPA recommends that compositing be performed in the laboratory. Further, the PCB regulations require that analytical determinations be performed on, not reported on, a dry-weight analysis. Therefore, given the characteristics of the samples (wet sediments), I would recommend that aliquots of the individual grab samples be dried either at low temperature or at ambient temperature in a desiccator, prior to compositing. P&W may also wish to confirm with CTDEP that compositing of samples for confirmatory analysis will be allowed under the state regulations. The compositing discussion should also include a discussion on how the composite sample results will be interpreted.

    *The RAWP has been revised to explain that the analytical determinations will be performed on a dry-weight basis in accordance with the appropriate PCB extraction procedure. However, rather than utilizing the laboratory to composite samples and run the risk of laboratory error during the compositing, a revision to the SOP for soil sample collection has been made to provide for the collection of aliquot samples using disposable syringes. This will allow for the collection of a predetermined amount of soil from a given location and the placement of that aliquot directly into the laboratory-supplied glassware. The four aliquot samples comprising a composite will be thoroughly mixed and provided to the laboratory for drying and analysis. As the aliquots comprising a given composite sample will be collected from within 20 feet of one another and consist*

*of previously saturated sediments, it is anticipated that variability of moisture content from one aliquot to another within a composite will be minimal. As a result, the SOP has not been revised to provide for the desiccation of aliquot samples prior to forming the composite.*

23. Page 23, 4th paragraph - The text indicates that the sampling device will be decontaminated or replaced with new sampling equipment prior to sample collection. What criteria will be used to make this determination?

    *The RAWP has been revised to specifically note the criteria for decontaminating a device or replacing with new sampling equipment. All disposable components of a sampling device will be disposed of prior to sample collection and all fixed components of a sampling device will be decontaminated in accordance with the procedures outlined in the revised SOP for Soil Sampling.*

24. Page 23, 5th paragraph

    a. The 2nd sentence makes no sense. The text appears to indicate that field screening using test kits will be performed on those samples exceeding 25ppm. Please clarify.

       *The RAWP has been revised to clarify that field screening using immunoassay test kits will be performed to determine if PCB concentrations are above or below the RA objective of 25 ppm prior to implementing the final, more costly and time consuming confirmatory sampling at a fixed analytical laboratory. The intent of the immunoassay test kits is to direct the excavation efforts prior to embarking on the final confirmatory sampling effort.*

    b. The 3rd sentence is misleading. The test kits don't identify the Aroclor present. Rather, the test kits quantify total PCBs, based on calibration with a specified Aroclor.

       *The RAWP has been revised to indicate that the PCB field test kits are a semi-quantitative screening method that determines whether the total PCB concentration is above or below the specified threshold values by comparison with a standard. The immunoassay test kits will not be used to document completion of remediation activities but rather as a means to direct excavation efforts and the timing of final confirmatory sampling.*

25. Page 24, Subsection 4.2.3

    a. The 1st paragraph indicates that disposal characterization samples will determine the appropriate method for handling and disposal. This is not allowed by the PCB regulations for PCB remediation waste. Specifically, the regulations require disposal based on the insitu PCB concentration, not the PCB concentration of the

generated stockpile. The generator must select a PCB disposer based on the insitu characterization sampling; however, the disposer may require additional analytical based on its permit conditions and/or requirements.

*The RAWP has been revised to indicate that waste disposal characterization shall be based upon the as-found concentrations of the in-situ material. Additional analysis will be performed on stockpile grab samples as needed to satisfy the disposal vendor. The waste will be disposed of based upon the more restrictive analytical data regardless of the as-found concentrations (e.g. if in-situ characterization documents < 50 ppm PCBs and the stockpile data suggests > 50 ppm, the waste disposal profile used for this particular load would be based on the stockpile data). Stockpile analytical data would not be used to reduce any disposal restrictions on the material.*

b. It is unclear based on the information presented if sufficient characterization samples exist that would allow segregation of lower-contaminated material from higher-contaminated material for off-site disposal. It would be helpful if P&W could specify what it proposes to do with the excavated-contaminated waste. This would enable us to better determine how much additional sampling, if any, would be needed.

*The RAWP has been revised to specifically identify the waste streams expected from this project. A minimum of two and a maximum of four separate waste streams are expected. The minimum two waste streams are PCB remediation waste (PCBs > 50 mg/kg) and PCB contaminated waste (PCBs < 50 mg/kg). The additional two waste streams would include the above minimum two but with the addition of other underlying hazardous constituents. Each waste stream would contain a generic profile description to allow for the combined disposal of soil, sediment, concrete, personal protective equipment, and metal. All waste streams will be disposed of at landfills that are permitted and approved to receive such waste materials. It is anticipated that the waste streams containing >50 mg/kg PCBs would be disposed of at a chemical waste landfill approved under §761.75.*

c. 2nd paragraph - Field screening may not be used for segregation purposes unless the field screening methodology has gone through comparison testing as specified under Subpart Q of 40 CFR Part 761. Unless the field screening method is validated, the methods specified in Subparts N and O are required.

*The RAWP has been revised to eliminate the use of immunoassay kits for waste disposal characterization.*

26. Page 26, Subsection 4.5.1

a. What is the disposition of the wastes described in this section?

*The RAWP has been revised to explain that disposable equipment and debris would be disposed of as bulk PCB remediation waste in conjunction with other PCB remediation waste generated during the project. The disposable equipment and debris would be addressed through the use of a miscellaneous health and safety waste provisions permitted under a standard disposal profile.*

27. Page 40, Subsection 5.7.4

    a. As discussed in comment 22, above, the PCB regulations require that PCB concentrations be determined on a dry-weight analysis, not reported on dry-weight.

    *The RAWP has been revised to reflect that the PCB concentrations will be determined on a dry-weight analysis (not reported on dry-weight) as indicated in the appropriate PCB extraction methods SW 846 Method 3540C or 3541 Soxhlet Extraction.*

28. Table 4-1

    a. The Table should specify the extraction method associated with each analytical method, if applicable.

    *The RAWP has been revised to include extraction methods associated with each analytical method on Table 4-1.*

    b. The method citation for PCBs is incorrect. The method number is 8082, but the Revision Date is January, 1998 not January 1988.

    *Table 4-1 in the RAWP has been revised to specify the December 1996 revision for method number 8082. The method has not been updated to 8082A Rev. January 1998 as stated in the comments because the January 1998 revision has not- yet been promulgated. Other method citation and dates have also been updated to reflect most current promulgated methods.*

    c. At a minimum, any wastewater generated during this remedial process must be tested for PCBs. See comment 8.c., above. This should be noted in the Table.

    *The RAWP has been revised to reflect this. This comment has also been addressed in greater detail in response to comment Nos. 8c, 12, and 15, above.*

    d. See Comment 21, above.

    *The RAWP has been revised to include TPH analysis on confirmatory soil samples. Table 4-1 has also been updated to reflect the addition of TPH analysis.*

e. It is unclear what the "Anticipated Number of Samples" column is based upon. For example, the Table indicates that 65 soil/sediment samples will be collected for confirmatory samples. Note 1 indicates that bottom samples will be collected at 1/400ft2. Further, on Page 22, Subsection 4.2.2. P&W indicates that up to 6 grab samples will be composited for purposes of confirmatory analysis. Therefore, clarification is needed on how these samples numbers were derived.

*In consideration of the comments received regarding the clarity of the confirmatory sampling and the size of the area to be represented by a single composite sample, the RAWP has been revised to clarify the confirmatory sampling to be implemented on for the project. The revision also provides for a four-point composite representative of a 1,600 square-foot area rather than the initially proposed six-point composite representative of a 2,400 square-foot area. The RAWP has also been revised to clarify the derivation of the revised number of post-excavation confirmatory samples to be collected based on this revised sampling approach and a map has been included to provide for the proposed location of anticipated confirmatory sampling locations.*

f. EPA recommends that some bias sampling, based on visual observations, should be added to this list.

*The RAWP has been revised to explain that bias sampling will be performed, based on visual observations. This will supplement the confirmatory sampling described in the RAWP.*

29. Table 4-2

a. The Table indicates that aqueous PE samples will be submitted to the laboratory. EPA recommends that in addition to aqueous PE samples, non-aqueous (e.g. solid) PE samples should also be submitted since the major portion of this project deals with soils/sediments.

*The RAWP has not been revised to include the use of soil PE samples because the vendor that we are currently using (Environmental Resource Associates, Arvada, Colorado) is unable to certify the results of a non-aqueous PE sample. In addition, a non-aqueous PE sample would not be double blind unless clean soil is provided which is similar to the one encountered at the site. The soil would then need to be tested by the vendor to ensure that it is clean prior to being spiked. Mixing of the soil to achieve homogeneity may lead to loss of volatile constituents invalidating the results obtained. It should also be noted, this issue was discussed at length with EPA as part of the implementation of the Voluntary Corrective Action Program at Pratt & Whitney Connecticut facilities. The outcome of those discussions was EPA approval to allow the use of aqueous PE samples as part of the validation of laboratory analysis of solid matrix samples.*

30. Table 5-1

    a. Methods specified in Table 5-1 do not correspond to those listed in Table 4-1.

       *The methods specified in Tables 4-1 and 5-1 have been updated to reflect the most recent promulgated revisions. Method numbers correspond in Tables 4-1 and 5-1.*

    b. The PCB PQLs for aqueous matrices is too high given that the decontamination standard for water is 0.5 µg/L (see 40 CFR §761.79(b)).

       *The RAWP has been revised to clearly state that all water derived from this project will be treated prior to discharge in accordance with the terms and conditions of the General Permit for the Discharge of Groundwater Remediation Wastewater to a Sanitary Sewer issued by the DEP. As such, the PQL for aqueous matrices would need to be less than 1 µg/L. Unrestricted use of the discharge (reference to the cited 0.5 µg/L standard 40 CFR §761.79(b)) was never contemplated for the resultant discharge and in will not be permitted as a part of this project.*

    c. P&W should also confirm with its selected laboratory that it is capable of achieving the stated PQLs.

       *The PQLs stated will be one of many of the selection criteria used to select the laboratories qualified to participate in the project.*

    d. The selected laboratory's SOP numbers for the cited methods should also be included in this section. Also the laboratory's internal QA/QC requirements should be included.

       *The laboratory or laboratories have not been selected yet. Upon completion of our selections, the SOPs and QA/QC requirements will be secured for project documentation.*

31. Table 5-6

    a. Duplicative of Table 4-3.

       *The RAWP was revised and Table 5-6 was eliminated. The text was edited to refer to Table 4-3 wherever table 5-6 was previously referenced.*

32. SOPs - See comment 8.b., above.

    *This comment is addressed in our response to comment No. 8b above.*

We hope that the above responses and the attached revised RAWP adequately address your comments and meets with your satisfaction. As we have indicated on numerous occasions, UTC is fully committed to the implementation of this project during the 2001 construction season. Your concurrence with the approach set forth in the attached RAWP is an essential element to the recognition of this goal. Should you have any further questions or comments, please do not hesitate to contact Lauren Levine of UTC at (860) 728-6520 or me.

Sincerely

**LOUREIRO ENGINEERING ASSOCIATES, INC.**

Jeffrey Loureiro, P.E., L.E.P.
President

Attachments

cc: Lauren Levine, UTC
Elsie Patton, DEP, w/o enclosure and attachments
Richard Hathaway, DEP, w/o enclosure and attachments
Lori Saliby, DEP, w/o enclosure and attachments
Melissa Toni, DEP, w/o enclosure and attachments
Cori Rose, ACOE, w/o enclosure and attachments
Ernest Waterman, U.S. EPA, w/o enclosure and attachments