RESPONSE TO COMMENTS
DRAFT WORK PLAN FOR SIX-PHASE HEATING PILOT TEST (December 3, 1999)
NON-TIME-CRITICAL REMOVAL ACTION
AT INSTALLATION RESTORATION SITE 14
FORMER NAVAL STATION LONG BEACH
LONG BEACH, CALIFORNIA

DCN: FWSD-RAC-00-0697

May 12, 2000

Ms. Sue Hakin, DTSC-RPM California Environmental Protection Agency Department of Toxic Substances Control Office of Military Facilities Southern California Region 5796 Corporate Avenue Cypress, CA 90630	Responses by: Mr. Michael Toy Foster Wheeler Environmental Corporation 611 Anton Blvd., Suite 800 Costa Mesa, CA 92626 Date: May 12, 2000
Comments from Department of Toxic Substances Control (DTSC), Jennifer M. Rich, Remedial Project Manager, April 13, 2000	
Comment 1. Table of Contents, Page v, 8.3.2 Testing Laboratory Qualifications: Please change page 8-3 to 8-2.	Response 1. Comment noted. Table of Contents will be revised.
Comment 2. List of Acronyms, Page viii: There are several acronyms used in the document that are not listed here (e.g., CFR, DPM, kV, TSDF, QAPP, SHSO). Please make sure all acronyms used in the document are listed here in the List of Acronyms. Also, please be sure to spell out acronyms the first time they are used in the document.	Response 2. Comment noted. Text will be revised.
Comment 3. List of Acronyms, Page ix: Please change "WPM" to "WMP" for Waste Management Plan. Please change "Remedial Action Objectives" to "Removal Action Objectives."	Response 3. Comment noted. Text will be revised.
Comment 4. Pages 9-2 and 9-3, Chart: Please update the chart with the appropriate names, addresses and phone numbers. Please change "Ms. Jennifer Rich" to "Ms. Sue Hakim" and the phone number to "(714) 484-5381."	Response 4. Comment noted. Table will be revised.
Comment 5. Page 10-1, Sentence 1: Please outline the specific community relations activities to be conducted.	Response 5. Comment noted. Community relations activities will be conducted on a quarterly basis throughout the project, but none are currently scheduled. More details will be provided in the full-scale design report.

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Comment 6. Table 1: In the Note at the bottom of the table, please explain what "No data" means. There should be a brief explanation as to why there is "no data" for certain chemicals at certain depths.	Response 6. Comment noted. All data in this table are from the EE/CA (Battelle, 1999) and incorporate results from the Site Inspection and Expanded Site Inspection (Bechtel, 1997 and 1998). An explanation will be added to the table.
Comment 7. Table 2: In the title, please change "Remedial" to "Removal."	Response 7. Comment noted. Title will be revised.
Comment 8. Table 4: 25 mg/kg is listed as the performance objective for PCE in soil. Table 2 lists the proposed risk-based remedial action objective for PCE in soil at 45 mg/kg. Why the discrepancy?	Response 8. Comment noted. The PCE performance objective is 45 mg/kg, and will be corrected.
Comment 9. Table 7: Page 7-2 listed "construction debris" as one of the waste streams. Why isn't construction debris listed in this table?	Response 9. Comment noted. Table will be revised to include construction debris.
Comment 10. Appendix A – Please be sure this appendix accurately reflects information presented in the Work plan.	Response 10. Comment noted. Information in Appendix A will be corrected.
Comment 11. Appendix A, Table of Contents: Please be sure to include "A." before each of the page numbers listed for various sections.	Response 11. Comment noted. All pages will be corrected.
Comment 12. Appendix A, Page A.iii, List of Figures, Figure A.8: Please change "Steam" to "Stream."	Response 12. Comment noted. Figure A.8 will be revised.
Comment 13. Appendix A, Page A.iv, List of Acronyms: DTSC – please make "Substance" plural. PA – please change "Primary" to "Preliminary." There are several acronyms used in the Appendix that are not listed here (e.g., QA/QC, MEK, PRG, SCE, VOCs, TCE). Please make sure all acronyms used in the Appendix are listed here in the List of Acronyms. Also, please be sure to spell out acronyms the first time they are used in the document.	Response 13. Comment noted. The document will be revised accordingly.
Comment 14. Appendix A, Page A.2-3, Table: TCE for soil is listed at "0.70." Table 2 in the Work Plan lists TCE for soil at "70.0." Please make the appropriate correction.	Response 14. Comment noted. TCE concentration will be corrected to "70 mg/kg".

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Comment 15. Appendix A, Page A.4-2, Section 4.5 Waste Sampling: The waste streams listed here should be identical to those listed in Section 7.0 of the Work Plan. In the last line, please change "Section 5.0" to "Section 7.0."	Response 15. Comment noted. Section 4.5 will be revised accordingly.
Comment 16. Appendix B, Page B.i, Table of Contents: For Sections 6.3 and 6.3.1, please change the page numbers to "B.6-1." For Section 6.3.4, please change the page number to "B.6-2.	Response 16. Comment noted. Table of Contents will be revised.
Comment 17. Appendix B, List of Acronyms, Page B.iv: Please include "VOCs" in the list. Also, please be sure to spell out acronyms the first time they are used in the document.	Response 17. Comment noted. Appendix B will be revised accordingly.
Comment 18. Appendix B, Page B.2-2: Please change "Ms. Jennifer Rich" to "Ms. Sue Hakim" and replace the phone number with "(714) 484-5381."	Response 18. Comment noted. Section 2.1 will be revised.
Comment 19. Appendix D: Please update the project schedule.	Response 19. The project schedule will be updated.
Comments from DTSC, Jesus I. Sotelo, P.E., Hazardous Substances Engineer, March 20, 2000	
GENERAL COMMENTS	
Comment 1. I recommend that the soil vapor analysis be updated to include TO-14A rather than TO-14. Also, I recommend the volatile organic compound analysis using USEPA Method 8260 be updated to USEPA Method 8260B using USEPA Method 5035 for collecting the soil sample and USEPA Method 5030 for collecting the aqueous samples. Finally, I recommend the semi-volatile organic compound analysis using USEPA Method 8270 be updated to USEPA Method 8270C.	Response 1. Comment noted. All analytical methods will be updated in Appendix A. Semi-volatile organic compounds will not be required since it is not a contaminant of concern for this project.
Comment 2. I recommend that at the interface of the sandy and clay len/layer soils, where the pool of product is believed to be, that some samples and analysis of the soil should include semi-volatiles, i.e. USEPA Method 8270C. I also recommend that USEPA Method 8270C analysis be done when the confirmation/performance monitoring is completed, especially after the test.	Response 2. Comment noted. Semi-volatile organic compounds are not considered a contaminant of concern for this project.

Comment 3. I am concerned that the system will be remotely monitored after installation of the wells. From a safety perspective, have our IH folks reviewed and agree with the Health and Safety Plan particularly with regard to the site work/treatment area (after installation of the grid of wells and electrical system) being unsupervised?	Response 3. Access to the project site is controlled via a perimeter fence. In addition, the specific area of the pilot study will be delineated to restrict access. Despite inherent danger of high voltage system, a subject can walk over the electrical field without any danger due to grounding system. There will be on-site supervision of the system during normal business hours and an on-call after-hours response team. During construction and operation of the system (approximately a 3-month period), three Foster Wheeler Environmental employees will be present: the Site Manager, the Health and Safety Officer, and the Construction Quality Control Engineer.
Comment 4. I am aware that this is a federal lead site, from our perspective, how do we go and visit the site, see the monitoring reports (before the final report is issued, after the operations of the pilot)? How will the performance/progress data/reports be utilized and performance/ system adjustment be done/performed? These items need further consideration and thought in regard to field implementation and performance evaluation of the pilot test.	Response 4. The following types of data will be used in evaluating the performance of the SPH process: • Applied voltage and amperage readings – adjusted to achieve optimum power input • Subsurface temperatures – to determine if changes to power input are needed • Vacuum flow readings – to check if flow is sufficient to capture steam from the subsurface • Steam recovery rates – used to track efficiency of subsurface heating • Concentration of VOCs in recovered soil vapors – used to measure VOC recovery rates and total mass of VOCs removed • Groundwater quality – to measure effectiveness of remediation action

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SPECIFIC COMMENTS	
Comment 1. Page iii of Executive Summary, first bullet item. There appears to be no RI work for this site.	Response 1. Comment noted. This project follows the Removal Action Process not the Remedial Action Process. Removal Action requirements are: PA, SI/ESI, EE/CA, AM, Removal Action, Cleanup Complete. Whereas, the Remedial Action Process follows the following path: PA, SI, RI/FS, PP/ROD, RD/RA, Cleanup Complete. To date, the AM for this site has not been signed. Page iii of Executive Summary, first bullet item will be reworded to read: "Performance of an additional baseline soil and groundwater investigation consisting of soil sampling in the pilot study area and the installation of 11 groundwater monitoring wells distributed throughout IR Site 14. This additional soil sampling effort will be performed to increase the integrity of the pilot test." Previously, PA, SI/ESI, EE/CA, and AM have been completed for this site.
Comment 2. Page iii of Executive Summary, second bullet item. Reference is made to temperature probes. Please elaborate further upon why only three temperature probes is sufficient for monitoring the performance particularly on an area of approximately 790 square feet.	Response 2. Three temperature probes are sufficient because there is limited horizontal variability in permeability. Also the critical junctions at which to measure temperature are located medially between electrodes. It is at these junctions where current flux is lowest, and hence temperature is at a minimum.
Comment 3. Page 1-1, Section 1.0, Introduction. Reference is made to pilot test as pilot study for the non-time critical removal action. Please elaborate further as to when a Remedial Investigation of the site will be completed.	Response 3. No RI will be performed at this site. Refer to Comment 1 above.
Comment 4. Page 1-3, Subsection 1.2, Scope of Work, Second Paragraph. Reference is made to a Station-Wide Health and Safety Plan. I recommend the review by Department's IH and will need to incorporate the H&SP changes with regard to the pilot test into this document.	Response 4. Comment noted. Foster Wheeler Environmental will submit the Site-Specific Health and Safety Plan to DTSC. A Technology-Specific Health and Safety Plan is being prepared and will be submitted to DTSC at a later date.

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Comment 5. Page 2-1, Subsection 2.2, Overview of Previous Investigations. Please elaborate further in this section whether there was any drain in the building, clarifiers, etc. before the building was razed.	Response 5. Comment noted. Based on the EE/CA (Battelle, June 1999), a utility survey was performed and indicates the presence of a drainpipe along the west side of the building foundation. The drainpipe extends north beyond the foundation and possibly through the area of soil contaminated with DNAPL.
Comment 6. Page 2-2, Subsection 2.2, Overview of Previous Investigations, last paragraph of this subsection. Please include in the text or as a table what the predetermined preliminary screening-level risk assessment exposure criteria for groundwater found between 10 and 20 feet bgs for the contaminants of concern are. Please elaborate further in the text upon how and what criteria was used to arrive at these screening levels.	Response 6. Comment noted. Tables 2-9 through 2-14 of the EE/CA (Battelle, June 1999) is attached for reference and a text description of screening levels will be added to the Work Plan.
Comment 7. Page 3-1, Section 3.0, Description of the SPH Process, figure on page. Please describe further on this drawing what types of soil matrix would provide the proposed flux. I am concerned that this depiction does not accurately represent the site because of the proximity to the Building 46 foundations.	Response 7. It is just a schematic, not a modeling simulation. Conductive interval is from 8 to 16 feet (and moves about 3 feet up and 3 feet down), so electric field will not be affected by foundation (foundation does not extend beyond 2-3 feet below ground surface (bgs) since Building 46 was a one-story building).
Comment 8. Page 3-2, Section 3.0, Description of the SPH Process, last bullet item. The boiling point of PCE is 124°C and not at 89°C as presented in the text. Please include the boiling point of all Contaminants of Concern (TCE, DCE, DCA, TCA, VC, etc.) This information is needed to further evaluate the effectiveness of this proposal to remove contaminants from the soil and water particularly because the water and soil will be heated theorically to 100° Celsius.	Response 8. Yes, boiling point (BP) was cited incorrectly. BP does not have to be exceeded to volatilize compound since physical properties of pure substances can be different from a mixture. Volatilization is dependent on vapor pressures, which increases with temperature. A table of vapor pressures and boiling points will be added to this section. Numbers will show that volatilization will be greatly accelerated at 100 degrees Celsius.
Comment 9. Page 4-1, Subsection 4.1, Performance Levels and Objectives. Reference is made to Table 5 for the PSRGs. Upon review of Table 5 for TCE, VC, and DCE, the level for the criteria are currently met without treatment. These PSRG could not be used as a criteria for evaluating the performance of SPH. Please correct this table to be consistent with the text as regards to a 99% reduction of the maximum initial VOC concentration as shown in this table.	Response 9. Comment noted. Table 5 has been modified. TCE and cis-1,2-DCE will not have a PSRG because RAOs are currently met and, therefore, will not be used as a performance indicator compound. Should pilot study baseline results indicate otherwise, PSRG will be established. Likewise, for compounds not previously detected in the field (VC and 1,1-DCE), PSRG will be considered if baseline results show levels exceeding RAOs.

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Comment 10. Page 4-2, Subsection SPH Electrodes. Reference is made to the construction of the electrodes for SPH. I foresee a problem with this probe construction as possibly becoming a conduit for downward migration of contaminants.	Response 10. Bentonite seals or conductor casing will be placed across competent clay layers in SPH electrode boreholes in which DNAPL is encountered. If the pilot test fails, all SPH electrodes and other specialty materials will be withdrawn from the subsurface and backfilled to prevent residual contaminant migration.
Comment 11. Please elaborate further upon the duration of time expected or anticipated for the soils to cool back down. Operation of the SVE system will be required due to the high potential of the VOCs to migrate out of the soils and into the atmosphere during this cooling off period.	Response 11. Comment noted. Section 6.4 will include the following text: "At the conclusion of the pilot test, power flow to the site will be terminated and groundwater boiling stops almost immediately and the site temperature will drop dramatically at an exponential rate. The SVE system will continue to be operated until soil temperatures return to 30±3 degrees Celsius, as measured by 3 temperature probes."
Comment 12. Page 6-2, Subsection 6.2, Installation of Groundwater Monitoring Wells and Groundwater Sampling, second paragraph. Reference is made to sampling every four weeks. The proposed sampling schedule would allow, at most, two sampling events due to the proposed 9-week operation. This may not be sufficient to evaluate the performance of the system/technology.	Response 12. Comment noted. Two sample episodes during the pilot system operation will be sufficient. Sampling and analysis of high-temperature groundwater during system operation will show favorable results due to favorable partitioning conditions in the subsurface and volatilization losses during sample collection. The true test of this technology's success will be analytical results of groundwater at ambient temperatures several weeks after completion of pilot operations. Thus, 2 groundwater sampling episodes during operations and overall quarterly groundwater monitoring at the site will be adequate.
Comment 13. Page 6-3, Section 6.2, Installation of Groundwater Monitoring Wells and Groundwater Sampling, last paragraph of page. Reference is made to development of the well, using less than 10 parts per million (ppm) settleable soils. Please provide details as to how these settleable solids will be measured. What method to be used in the field?	Response 13. Comment noted. This sentence will be removed from the Work Plan. In Section 5.2 of the Field Sampling Plan, the groundwater sampling procedure is described and turbidity will be measured after each well volume removed using field test meters until a value of less than 5 NTU is achieved.

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Comment 14. Page 6-3, Subsection 6.2, Installation of Groundwater Monitoring Wells and Groundwater Sampling, last paragraph of page. Reference is made to approval of drums stored on site or a suitable location as approved by DON. Approval of the storage area will be required by State, if not on-site and must be properly disposed of within the regulatory 90 days.	Response 14. Comment noted. Detailed information is provided in Table 7 of the Work Plan.
Comments from DTSC, Aaron Yue, March 14, 2000	
GENERAL COMMENTS	
Comment 1. DTSC notes that this Work Plan is prepared specifically for the "Pilot Study" of the six-phase in-situ soil resistive heating technology to be utilized at the Installation Restoration Site 14. Please be aware that by conducting a "Pilot Study," DTSC would require the Navy to submit a pilot study report at the end of the pilot test and a full remedial type document for review and approval prior to the full-scale implementation of the technology at Site 14. Although DTSC is pleased that the Navy is conducting a pilot test, DTSC recalls that the Navy was not interested in a pilot study and would like to pursue a phased implementation of the technology. If that were the case, the Navy would be required to provide substantially more information up-front for review, evaluation, and approval. This information would include all the detail design parameters, operational procedures and contingency plans for the remediation at Site 14.	Response 1. This work plan outlines a pilot study for the application of this innovative technology. A report documenting the results of the pilot study will be submitted to the agencies. Subsequently, a full-scale design report will be submitted to the agencies.
SPECIFIC COMMENTS	
Comment 1. Page 1-3, Second Paragraph. Although a "Station-Wide" Health and Safety Plan had been prepared for work performed at the Station, this pilot test is unique in its hazards. A detailed "Site-Specific" Health and Safety Plan should be prepared and incorporated into the Work Plan. Please submit a Site-Specific Health and Safety Plan for review.	Response 1. A Site-Specific Health and Safety Plan has been prepared and will be submitted. A Technology-Specific Health and Safety Plan will be submitted at a later date.

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Comment 2. Page 3-2. This section discussed the design parameters of the remedial technology. However, the only physical property provided in this section is the boiling point of PCE. In order for this remedial technology to work properly, all the physical properties of all target compounds must be evaluated (e.g., boiling points, dew points, and vapor pressures of PCE, TCE, DCE, vinyl chlorine, etc.). It is critical that this Work Plan provide these parameters as well as all design calculations based on these parameters for all target compounds. Please ensure that these critical points are specified and are taken into consideration in the Work Plan.	Response 2. A table has been constructed to compare physical property values of the contaminants at different temperatures.
Comment 3. Page 4-3, Second Paragraph. This paragraph states that the applied voltage will be varied according to the resistance and temperature of the subsurface. This paragraph, however, neither specified the operational parameters that requires monitoring, nor the decision tree to be followed for the voltage adjustment (i.e., specify whether the applied voltage would be increased or decreased when the resistance reaches a specified threshold, and the rationale for that change. Also state clearly whether the resistance is assumed to be directly proportional to temperature.)	Response 3. Comment noted. The governing equation is: V=IR. The control system for the SPH transformer monitors voltage and amperes being applied to the subsurface. These two parameters will be regulated to achieve optimum heating by trial in the field. Resistance will not be explicitly calculated during start-up procedures. Though not explicitly calculated, resistance will indeed change (directly proportional with temperature) according to the above relationship as heating progresses.
Comment 4. Page 4-4, Section 4.6, Condenser. The first paragraph references Table 6 for the designed capacity of the condenser based on site-specific requirements. However, Table 6 does not provide any details of the derivation of the site-specific requirements. An appendix should be provided with the Work Plan, which shows the calculations and the assumptions made for the site-specific requirements. These calculations should also include information on the theoretical efficiency and the type of condenser to be used.	Response 4. The purpose of the pilot study is to obtain design parameter information for the site in order to determine full-scale operation parameters and equipment sizing. Proposed pilot system contains more than sufficient capacity for the single-heating array configuration based on previous pilot study experience of subcontractor. Therefore, pilot system sizing calculations were not performed. All calculations for the full-scale system will be presented in a separate design report.
Comment 5. Page 4-5, Sections 4.7 and 4.8. Similar to the comment on the condenser. Please provide the calculations and assumptions made in deriving the site-specific needs.	Response 5. See Response to Comment 4.

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Comment 6. Page 4-7, Section 4.13, Mobile Office Trailer. This section states that a portable computer will be set up in the mobile office trailer to allow remote operations of the power supply. Please clarify if it is the Navy's intention to allow the treatment to be operated from outside the LBNC or just the immediate treatment area of IR Site 14. DTSC is uncomfortable with the operation of a hazardous waste treatment system with a specified exclusion zone at the site without any on-site supervision given the minimal security described in Section 4.15.	Response 6. See General Comment 3 from Jesus I. Sotelo.
Comment 7. Page 4-8. This paragraph and Figure 9 depicts the 20,000-gallon baker tank for the recovered water, and the transformer to be co-located at the equipment compound at approximately less than 50 feet apart. Figure 9, however, neither provides any elevation information of the equipment compound nor any secondary containment system for the baker tank to reduce electro-shock hazards from a water tank failure or rapture. Please provide a design layout that would minimize this hazard.	Response 7. The entire SPH system will be properly grounded and all elements of the system are rated for outdoor use. These systems have been employed and operated in tropical rainstorms and with a snow cover of several feet. Secondary containment is not required. Due to favorable partitioning conditions in the condenser and the placement of a carbon polish bed upstream of the tank, the condensate in the tank will not be contaminated. Furthermore, a failure in the tank integrity will not present an electrical hazard because spilled water will rapidly dissipate out through the treatment compound fence enclosure.
Comment 8. Page 6-1, First Paragraph, Baseline Soil Sampling. In accordance with the EPA SW846, Revision 3 requirements, soil samples for VOCs should be prepared and collected pursuant to Method 5035 by the use of either the Encore sampler or field preservation methods. Please revise the Work Plan accordingly.	Response 8. Comment noted. Appendix A will be revised. All sampling and analysis details will be removed from the Work Plan and described in the Field Sampling Plan.

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Comment 9. Page 6-4, Confirmation Soil and Groundwater Sampling. Whenever contaminants are mobilized and desorbed, there is a potential for rebound effects while the contaminants equilibrate in the environment. Rebound confirmation samples should be conducted over a specified period of time to ensure that the contaminant levels have indeed been reduced to the remedial action objectives. Furthermore, aside from the five soil borings proposed DTSC requests that soil gas should also be collected and analyzed as an additional measurement that the remedial action objectives have been attained.	Response 9. Section will be changed to include the following: "Confirmation sampling is as follows: 1) at conclusion of active heating, soil gas and groundwater will be sampled, 2) soil gas will be sampled at 3 months and 6 months after cessation of SVE operation (this schedule is subject to change depending on temperature decay profile of the site soils), and 3) soil will be sampled at 6 months after cessation of SVE operation (this schedule is subject to change depending on temperature decay profile of the site soils)."
Comment 10. Page 7-1, Section 7.1, Regulatory Requirements. 22 CCR does not need to be referenced twice. If the intent is to separate waste identification from waste management, proper sections of the 22 CCR should be cited. Please also check with the California Regional Water Quality Control Board for applicable regulations for potential water discharge. Furthermore, the operation of a Soil Vapor Extraction System may require a permit from the South Coast Air Quality Management District for emission control.	Response 10. 22 CCR double references will be removed. A NPDES permit has been requested to regulate pilot-system water discharge. There are no permit requirements, but the project must and will comply with applicable SCAQMD rules and regulations.
Comment 11. Page 7-2, Section 7.2, Waste Minimization. A simple statement was made in this section with respect to volume reduction techniques. However, these techniques are not specified. Please provide examples of these techniques.	Response 11. The following are examples of possible volume-reduction techniques: 1) minimize feed water to the condenser, and 2) size augurs to the application to minimize soil cuttings.
Comment 12. Page 7-5, Section 7.5, Reporting Spills and Releases. Since this is a Work Plan, all necessary policies and procedures should be clearly stated. Please include the procedure for spill and release reporting and the spill response procedure as appropriate. If this information is provided in other sections of the Work Plan, a clear reference should be included in this section.	Response 12. Spill response plan is included in the Station-Wide Health and Safety Plan.

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Comment 13. Figure 3, Plot Plan of Pilot Study Array. This figure is overly simplistic. It lacks details to identify the location and size of the array in relation to the contaminated area of Site 14. DTSC would prefer to see this figure in relation to the details of Figure 2. Please note, the caption for the extent of DNAPL should be changed to "extent of DNAPL in soil".	Response 13. Relational location of Figure 3 to Figure 2 will be shown. Caption will be changed to "extent of DNAPL in soil."
Comment 14. Figure 5, Temperature Monitoring Point Design. Please note that DTSC remains concerned that the advancement of temperature monitoring probes through the clay layer would provide a preferential pathway for the DNAPL to reach the groundwater in the event that the Six Phase Soil Resistive Heating technology fails at the site. Please provide and explain any contingencies for this possible scenario.	Response 14. Bentonite seals will be placed across clay layers in the borehole to prevent contaminant migration through conduit.
Comment 15. Figure 6, Vapor Recovery Well Design. Please note that page 4-4 specified a twelve-inch (12") diameter borehole, not eight inches as depicted in this figure.	Response 15. Text will be changed to reflect an 8-inch-diameter boring.
Comment 16. Figure 8, Process Flow Diagram. Please explain the rationale for considering the 200-pound GAC as optional from the condenser when the water may be used as makeup water and potentially opened to the water storage tank?	Response 16. GAC bed will be incorporated into the system. Optional tag will be removed.
Comment 17. Table 2, Proposed Risk-Based Remedial Action Objectives. Although these numbers were derived from the screening risk assessment for the determination of no further action, the RAOs for 1,1-DCE and Vinyl Chloride should not be "Not Applicable" simply because it was not detected in the soil during previous sampling. Please remember that VOC could potentially degrade during remediation from the heat to form these daughter products. Therefore, a risk-based RAO should be proposed for 1,1-DCE and VC as well. In addition, this table should specify that the derived RAOs are for an industrial future use only.	Response 17. Comment noted. Results will be published in the full-scale design report.

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Comment 18. Table 5, Pilot Study Remediation Goals (PSRGS). Please review the Maximum Initial Levels in this table. They do not correspond to the findings in the final EE/CA of June 1, 1999. For example, PCE was found in the shallow soil sample SB-05-18 (at 1.75 feet) at a concentration of 5,200,000 µg/kg, not 70,000 µg/kg as indicated in this table. TCE was found at 6.5 – 7.0 feet in sample SB-05-16 at 67,000 µg/kg. As presented, this table is misleading because the maximum initial level is neither indicative of true site conditions, nor does it indicate the location and depth at which these concentrations were found. Even at the higher concentrations stated, they represent a small sample of a larger contaminated area with uncertain contaminant levels. If the Navy's hypothesis is correct, and that there is a clay layer at the capillary fringe, which is retaining the DNAPL, the contaminant concentration at that fringe could be much higher than the concentrations cited. Because of these uncertainties, DTSC requests that a qualifier be added to the table that these are "potential" maximum levels only.	Response 18. Comment noted. Table has been revised to accurately reflect maximum concentrations in the pilot study area based on EE/CA report and a qualifier will be added.
Comment 19. Table 6, Steam/Air Flowrates. See comment number 4 above.	Response 19. Previously addressed in Comment 4.
Comment 20. Table 7, Page 3 of 5. Reinjection of Process Condensate Water in the disposal requirement column may also require additional sampling and analysis for waste characterization as well as permits from other local, state, or federal agencies aside from DTSC and the RWQCB.	Response 20. Reinjection of process condensate will not be performed during pilot test. Table 7 will be revised to reflect this.
Comment 21. Page A.4-2, Section 4.4, Pilot Test. Rebound study over time should be included as part of the proposed treatment system shutdown. Also, soil gas samples should also be conducted in addition to soil samples to ensure that the RAOs have been achieved. See comment number 9 above.	Response 21. Comment noted. More sampling was previously proposed. Refer to Comment 9.
Comment 22. Page A.4-2, Section 4.4, Pilot Test. The pilot study should evaluate the possibility of volatilization from incomplete vapor capture. What safeguards are in place to ensure that the mobilized VOCs are completely captured by the SVE instead of volatilization as fugitive emissions from cracks in the soil since much of the VOCs are found at a relatively shallow soil depth?	Response 22. Observation of escaping steam and radius of influence calculations will indicate incomplete capture. Additional vapor recovery wells would be installed.
Comment 23. Page A.4-3, Section 4.6. Please specify the use of EPA Method 5035 for sample preparation for VOCs.	Response 23. Comment noted. Text will be revised accordingly.

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Comment 24. Page A.4-3, Section 4.6.1, Analytical Methods. DTSC requests the use of EPA 352 for Nitrate and EPA 354 for Nitrite.	Response 24. Comment noted. EPA Method 352.1 and 354.1 will be used to analyze for nitrate and nitrite, respectively.
Comment 25. Page A.4-3, Section 4.7. Typographical error. Table A.5 should be changed to Table A.3.	Response 25. Comment noted. Text will be revised accordingly.
Comment 26. Page A.4.8.2, Equipment Rinsate Samples. Please specify the frequency of rinse samples to be collected for analysis.	Response 26. Comment noted. Equipment rinsate samples will be collected at a frequency of one per sampling event.
Comment 27. Page A.5-1, Section 5.1, Soil Sampling Procedure. Please specify the use of EPA Method 5035 for VOC samples.	Response 27. Comment noted. Text will be revised accordingly.
Comment 28. Table A.3, Sample Container, Preservatives, and Holding Time. For VOCs, please ensure that EPA Method 5035 is followed and revise this table accordingly. Also, please revise the EPA Analytical Method for Nitrate and Nitrite as requested in comment number 24 above.	Response 28. Comment noted. Text will be revised accordingly.
Comment 29. Page B.3-3, Section 3.2.2.2, Analytical Methods. Please revise this section in accordance with comment number 24 above.	Response 29. Comment noted. Text will be revised accordingly.
Comment 30. Table B.3, Project Reporting Limits. Please also provide the Practical Quantitative Limit (PQL) of the proposed laboratory for the proposed analytical method. Note, if the PQL is above the proposed reporting limit, another analytical method or laboratory should be chosen for the work.	Response 30. Comment noted. One criterion for selection of a laboratory is the ability to meet the proposed reporting limit required for the project.

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Comments from DTSC, Ron Okuda, Hazardous Substances Engineering Geologist, Geological Services Unit, April 5, 2000	
Comment 1. Section 4.5, Vapor Recovery Wells, Page 4-4.	Response 1.
a. The Work Plan states that the Six-Phase Heating (SPH) vapor recovery wells intercepts the steam flow of volatile organic compounds (VOCs) to prevent steam from venting to the surface and to prevent steam from migrating out of the treatment volume. It is not clear how only two vapor. recovery wells can "intercept" all the VOCs, particularly when the Work Plan estimates that the actual heated area will extend beyond the electrode hexagonal array. The Navy should consider installing additional well locations along the perimeter of the electrode array to use in the event that the radius of influence is less than expected.	Previously addressed. Refer to Response 22 to Aaron Yue's Specific Comments. A contingency plan to install additional wells is in place and will be executed if ROI calculations show incomplete capture.
b. The Work Plan states that each vapor recovery well be constructed in a 12-inch diameter borehole. However, Figure 6 shows an 8-inch borehole.	Previously addressed. Refer to Response 15 to Aaron Yue's Specific Comments.
Comment 2. Section 6.1, Baseline Soil Sampling, Page 6-1.	Response 2.
a. This section states that soil borings will be drilled with a hollow stem auger and soil samples collected with a split-spoon sampler. For borings exceeding 5 feet total depth, boring logs should be prepared. The Work Plan should include a statement that all soil and rock materials will be logged by a Registered Geologist, Registered Civil Engineer, or Certified Engineering Geologist, who is registered in the State of California. A trained and experienced technician working under the direct supervision and review of one of the aforementioned professionals shall be deemed qualified. In addition, all work and reports, which require geologic or engineering evaluations and/or judgments must be performed under the direction of an appropriately registered or certified professional. All reports containing such information must be signed by the registered professional.	Comment noted. Text will be revised according to recommendations.

b. On June 13, 1997, test method 5035 was promulgated by U.S. EPA, as Update III of SW-846. Test method 5035 was introduced to reduce the losses of volatile organic compounds (VOCs) in soil samples. In method 5035, U.S. EPA recommends a sealed purge-and-trap vial be collected in the field or, as alternatives, the En Core-type sampler or field methanol preservation. On May 6, 1998, the California Department of Health Services issued Technical Bulletin 98-01: Status of SW 846, Update III, which states that the Department of Toxic Substances Control recognizes SW 846 Update III methods for regulatory compliance testing. Soil samples collected for VOC analysis must follow the field preservation methods described in EPA Method 5035 and analyzed using EPA Method 8260B.	Comment noted. Text will be revised accordingly.
c. The Work Plan states that soil borings not converted into a well, electrode, or probe will be backfilled with hydrated bentonite chips. GSU strongly recommends that the boreholes be backfilled with a neat cement or shrinkage-compensated cement grout via a tremie pipe from the bottom of the borehole up. Bentonite is not recommended as an annular sealant in the unsaturated zone because the moisture available is insufficient to fully saturate bentonite. Even if bentonite and water are mixed at the surface and poured down the borehole, the bentonite chips may not fully hydrate and seal the borehole, creating a pathway for air to migrate to the surface.	Hydrated bentonite chips are commonly used to effectively seal boreholes and is considered standard industry practice.
Comment 3. Section 6.2, Installation of Groundwater Monitoring Wells and Groundwater Sampling, Pages 6-2 and 6-3.	Response 3.
a. Groundwater monitoring well MW-05-05 is located within the electrode array. VOCs may accumulate in the well borehole during the pilot study. We recommend that during the pilot study, the well cap on MW-05-05 be sealed to prevent VOCs from migrating to the surface up the well borehole. The Field Sampling Plan and Health and Safety Plan should specify that each monitoring well in the vicinity of the electrode array will be monitored for toxic gasses during sampling events.	Comment noted. Toxic gases will be monitored during sampling events. Details are provided in the Site-Specific Health and Safety Plan.
b. The last paragraph on page 6-2 fails to mention the grout seal and surface completion that must be placed over the bentonite seal. A figure showing the monitoring well design should be included in the Work Plan.	A figure showing the well construction design is included in Appendix C of the Work Plan.

c. Page 6-3, second paragraph from the bottom. The Work Plan should state that the groundwater parameters will be monitored using calibrated field test meters. Three consecutive measurements, which display consistent values of all parameters, should be taken prior to sampling. Samples should be collected after three well casing volumes if parameters have stabilized. The temperature should not vary by more than +/- 1°C, pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading, Turbidity should be less then 5 NTUs.	Comment noted. Text will be revised accordingly.
d. The last paragraph on page 6-3 states that wells will be developed until the water has less than 10 parts per million settleable solids. This is not the normal method of measuring groundwater turbidity. A turbidity value of less than 5 Nephelometric Turbidity Units (NTUs) is the criteria used to determine whether the well has been adequately developed and purged of fine-grained material in the groundwater. Groundwater should be collected and measured for turbidity periodically during well development and at the completion of well development The measured groundwater parameters and volume of water purged during well development must be recorded on well development logs and submitted with groundwater monitoring reports.	Comment noted. Text will be revised accordingly.
e. Information on the design, construction, and development of each well should be compiled. Such information should include: 1) a boring log that documents well drilling and associated sampling, and 2) a well construction log and well construction diagram (i.e., as-built). All documents pertaining to the design, construction, and development of monitoring wells should be submitted with the groundwater monitoring data collected during the pilot study.	Comment noted. Pertinent information to well construction and development will be compiled and submitted with the groundwater monitoring data.
Comment 4. Section 6.4, Confirmation Soil and Groundwater Sampling, Page 6-4. GSU recommends that soil gas analysis be included in the confirmation sampling. Vapor probes can be installed so that soil gas samples can be collected before, during, and after the pilot study. Soil gas measurements should provide a better indication of changes in VOC concentrations in the vadose zone. Vapor probes installed around the perimeter of the electrode array could also be used to determine verify the estimated radius of influence from the vapor recovery wells.	Response 4. Previously addressed. Refer to Response 9 to Aaron Yue's Specific Comments. A soil gas survey will be performed at vapor recovery well and temperature monitoring probe locations prior to, during, and after pilot operations.

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Figures Comment 5. A diagram showing the proposed well construction should be included in the Work Plan.	Response 5. Refer to Response 3b.
Appendix A, Field Sampling Plan Several of these comments also apply to the Quality Assurance Project Plan in Appendix B.	
Comment 6. Section 4.1, Groundwater Monitoring Wells, Page A.4-1. See comment number 3.e. on documenting the well design, construction, and development.	Response 6. Comment noted. Detailed description of well design, construction and development are presented in Section 6.2 of the Work Plan.
Comment 7. Section 4.3, Vapor Recovery Wells, Page A.4-1. GSU recommends that vadose zone monitoring probes or additional vapor recovery wells be installed around the perimeter of the electrode array to measure and verify the radius of influence of the vapor recovery system. In the event of incomplete capture, the perimeter vapor recovery wells could be used to prevent migration of VOCs outside the pilot study area.	Response 7. Comment noted. Refer to Response 1. Additional vapor recovery wells (beyond the 2 to be installed) will not be installed in accordance with the contingency plan.
Comment 8. Section 4.6.1, Analytical Methods, Page A.4-3. Soil samples collected for VOC analysis should be listed as EPA Methods 5035/8260. Soil samples should be collected from the different lithologic units analyzed for moisture content, air permeability, porosity, organic carbon content, and particle size distribution. These soil parameter data will be useful when evaluating the pilot study results and estimating electrode and recovery well spacing if the size of the electrode array is increased.	Response 8. Comment noted. Section 4.6.1 will be revised. Moisture content and organic carbon content will be measured from select soil samples (one sample at each electrode location and each confirmation soil sampling location).
Comment 9. Section 5.1, Soil Sampling Procedure, Page A.5-1. This section should include EPA Method 5035, the field preservation method, for collecting soil samples for VOC analysis using EPA Method 8260B.	Response 9. Comment noted. Section 5.1 will be revised.

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Comment 10. Section 5.2, Groundwater Sampling Procedures, Page A.5-2. This section should include the following activities in the field sampling plan for collecting groundwater samples: a. All field test meters will be calibrated according to manufacturers guidelines and specifications before and after each day of field use. Field meter probes will be decontaminated before and after use at each well. The name, model, and serial number of the field meters will be recorded in the field logbook. The calibration standards used and expiration dates will also be recorded in the field logbook. Any deviations noted during the day (e.g., meter drift) must also be recorded. If the meter drift requires an adjustment to nay final values for field parameters, the results must be flagged in the database. b. Water temperature, pH, specific conductance, and turbidity will be measured using field test meters and the measurements will be recorded in field logs. Groundwater samples will be collected after these parameters have stabilized; indicating representative formation water is entering the well. Three consecutive measurements, which display consistent values of all parameters, will be taken prior to sampling. Samples will be collected after three well casing volumes if parameters have stabilized. The temperature should not vary by more than +/- 1°C, pH by more than 0.2 pH units, and specific conductance by more than 10 percent from reading to reading. Turbidity should be less then 5 NTUs. No water that has been tested with a field meter probe will be collected for chemical analysis. If these parameters have not stabilized after five casing volumes have been purged (30 minutes if the purge volume is not known), purging will cease, a notation will be recorded in the field logbook and samples will be collected. If a well dewaters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80 percent of the static water column, and dewatered once more. After water levels have recharged to 80 percent of the static water column, groundwater samples will be collected. Depth to water measurements, field measurements of parameters, and purge volumes will be recorded in the field logbook and sheets.	Responses 10a-10c. Comments noted. Section 5.2 will be revised.

c. Vials for VOC analysis will be filled first to minimize aeration of water in the well. A test vial will be preserved with HCl to determine the amount of preservative needed to lower the pH to less than 2. The appropriate amount of HCl will then be added to the sample vials prior to the addition of the sample. The laboratory will provide vials containing sufficient HCl preservative to lower the pH to less than 2. The vials will be filled directly from the tap of the bailer. The vial will be inverted and checked for bubbles to insure zero headspace. If an air bubble appears, the vial contents will be emptied into the measured container, the vial discarded, and a new sample will be collected.	
Comment 11. Section 5.3, Vapor Sampling Procedures, Page A.5-2. As stated in previous comments, GSU recommends collecting soil gas samples before, during, and after the pilot study to help determine the effectiveness of the technology.	Response 11. Comment noted. Refer to Response 9 to Aaron Yue's Specific Comments.
Comment 12. Table A.3, Sample Containers, Preservatives, and Holding Times Requirements. Soil samples collected for VOC analysis should be collected and analyzed using EPA Methods 5035 and 8260B, respectively. The holding time for soil samples should be revised to be match the type of field preservation used. For example, samples collected using an En Core-type sampler has a holding time of 48 hours.	Response 12. Comment noted. Table A.3 will be revised.
Comments from California Regional Water Quality Control Board (CRWQCB), Ana M. Townsend, Sanitary Engineer Associate, April 4, 2000	
Comment 1. Table 2, *Proposed Risk-Based Remedial Action Objectives*, does not provide an objective for 1,1-DCE and vinyl chloride. The footnote on this page indicates that these compounds were not detected in soils at this site. However, page 2-3 and Table 1, contradict this information. A remedial objective must be developed, and these compounds must be analyzed for, during the baseline soil investigation, since 1,1-DCE and vinyl chloride may exist due to bio-degradation.	Response 1. Comment noted. Refer to Response 17 to Aaron Yue's Specific Comments.

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Comment 2. The report indicates that a tar-like substance, which contains solvents, is located at approximately 0.5 to 2 feet below ground surface (bgs). It is not clear whether this area will be remediated. The Regional Board believes that this tar-like substance, which contains very high VOC concentrations, will be a continuing source of soil and groundwater contamination unless it is remediated or removed. Please revise the draft work plan to address this tar-like substance accordingly.	Response 2. Comment noted. Page 4-1 and 6-1 will be revised to clarify remediation of the tar-like substance in the near surface soil. The pilot test will show that the tar-like substance can be remediated.
Comment 3. The report indicates that the DNAPL near the capillary fringe is estimated to be approximately 25 by 25 feet and underlain by an approximate 12-inch-thick silt/clay layer, which apparently retains the DNAPL liquid from migrating deeper. Prior to implementing the six-phase heating pilot testing activities, the actual thickness of the DNAPL and silt/clay layer must be verified during the baseline investigations and results submitted to the agencies for review and approval. Please revise the draft work plan to incorporate the above.	Response 3. Comment noted. Page 6-1 will be revised.
Comment 4. EPA's industrial preliminary remediation goal (PRG) for PCE is 19 mg/kg not 25.4 mg/kg as indicated throughout the draft work plan, including the field sampling plan. Please revise the entire document with the correct value accordingly.	Response 4. Comment noted. The industrial PRG for PCE in this section refers to a previous document, the Preliminary Assessment (Bechtel, 1996), in which the industrial PRG for PCE at that time was 25.4 mg/kg. The text will be changed to more clearly reflect this.

Comment 5. The work plan indicates that the boiling of soil moisture and groundwater in clay lenses will form steam that will sweep out VOCs and this steam stripping process effectively increases the permeability of clay soils. This Regional Board is concerned that this effect may also cause the DNAPL located on the silt/clay lenses to migrate vertically through the lenses and into the underlying groundwater. Please modify the draft work plan to clarify how this will be prevented.	Response 5. The above sentence does not mean to imply that the clay layer will actually increase in permeability as a result of steam stripping. The word "effectively" is used to convey the idea that steam stripping will remediate clay layers to an extent comparable to that achieved when remediating sand layers. In other words, clay layers will behave like sand layers in the sense that they will both be amenable to remediation. Steam stripping will not cause DNAPL to leak out of clay layers and migrate downward. The electrical current will generate heat which will cause the DNAPL and contaminated soil moisture in the clay to vaporize. The generated gases, in their thermally excited states, will be forced out of the clay. Because the subsurface will be under vacuum, the gaseous DNAPL and soil moisture will be swept out of the subsurface toward the vapor recovery wells. The text in the Work Plan will be revised to more clearly explain this.
Comment 6. The work plan indicates that vapor extraction wells will be installed down to 7 feet bgs and that a vacuum will be applied to the vapor recovery wells, which will pull steam, air, and VOC vapor to the surface. The silt/clay layer is located at approximately 10 feet bgs. This Regional Board is concerned that the vapors from the groundwater may not penetrate this silt/clay layer and may cause the PCE groundwater plume to spread further laterally. A well-defined groundwater monitoring grid, around the pilot testing area, must be established prior to conducting any testing activities. Please modify the draft work plan to reflect the above accordingly.	Response 6. Vapor and steam generated below the silt/clay layer (at 10 feet bgs) are able to travel to the vapor recovery wells (installed to 7 feet bgs) via the boreholes of the electrodes (installed down to 16 feet bgs). The backfill material of the electrode boreholes is permeable, and when under vacuum, the electrode boreholes serve as an effective conduit for vapor flow through the clay/silt layer. A well-defined groundwater monitoring grid consisting of 4 existing and 5 proposed monitoring wells is detailed in Figure 2.
Comment 7. The radius of influence of the vapor recovery wells is estimated to be approximately 40 feet. As discussed with the Navy and its consultants at a meeting on March 23, 2000, this information will be verified by vapor monitoring points that will be installed with each temperature monitoring point. Please revise the draft work plan to reflect the above accordingly.	Response 7. Comment noted. Section 6.0 will be revised to include collection of vacuum response data and radius of influence calculations.
Comment 8. Page 3-2 indicates that PCE boils at 89 degrees Celsius. The boiling point of PCE is 121.2 degrees Celsius. Please revise the draft work plan accordingly.	Response 8. Comment Noted. Refer to Response 8 to Jesus I. Sotelo's Specific Comments.

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Comment 9. The work plan proposes to treat soil and groundwater contamination to approximately 19 feet bgs. Electrodes will be installed to a depth of 16 feet bgs and insulated from the soil, from grade surface to approximately 8 feet bgs, creating an active heating zone between 5 and 19 feet bgs. The top 5 feet of soil, which contains elevated VOC concentrations, does not appear to be remediated by this active heating zone. The Regional Board believes that the elevated VOC concentrations detected, in the upper 5 feet of soil, will be a continuing source of groundwater contamination unless they are remediated. Update the draft work plan to address the soil in this area, as appropriate.	Response 9. Although the upper 5 feet of soil is not in the active heating zone, it will be passively heated and effectively remediated. Confirmation sampling will verify effective remediation in this zone. Section 4.2 will be revised to more clearly describe this.
Comment 10. The draft work plan does not indicate when the vapor recovery system will be shut off. As discussed, the vapor recovery system shut off will occur when the temperature in all the temperature monitoring probes reach approximately 30 degrees Celsius. Please revise the draft work plan to reflect the above.	Response 10. Comment noted. Section 6.4 will be revised accordingly.
Comment 11. EPA Method 5035 must be used for soil sample preparation and preservation in the field in order to minimize volatile organic losses. Please revise the draft work plan, including the field sampling plan, accordingly.	Response 11. Comment noted. Text will be revised accordingly.
Comment 12. The work plan indicates that 10 groundwater monitoring wells will be installed in locations distributed across the zone of contaminated groundwater. Additional groundwater monitoring wells must be installed or proposed groundwater monitoring wells relocated into areas outside the zone of contaminated groundwater. These groundwater monitoring wells will be used as control wells and must be monitored during the pilot testing activities to ensure that the VOC contaminated groundwater does not migrate further from the site. Update Figure 2, in the draft work plan with these new well locations accordingly.	Response 12. Comment noted. Due to obstruction by oil/gas production lines south of the plume, only one additional monitoring well (MW-05-16) is proposed to the east of the plume. The proposed locations of the new monitoring wells will be re-defined to cover a larger area. Figure 2 will be revised accordingly.
Comment 13. Please revise Figure 3, *Plot Plan of Pilot Study Array*, to also include the groundwater monitoring wells that will be sampled during the pilot study testing activities.	Response 13. Comment noted. Figure 3 will be revised according to recommendations.
Comment 14. Task C involves post-operation soil and groundwater sampling after the completion of the pilot testing activities. Please revise the draft work plan to reflect the following post-operation sampling activities which were discussed at the meeting on March 23, 2000:	Response 14. Section 6.4 has been revised to better define the post-operation sampling activities. A sampling analysis plan for quarterly groundwater monitoring will be presented as part of the full-scale design report.

a. Groundwater; in addition to the groundwater sampling activities proposed in the work plan, a quarterly groundwater monitoring and sampling analysis plan must be developed for the groundwater monitoring wells located at this site. Upon completion of the groundwater monitoring well installation and baseline sampling activities, please submit a quarterly groundwater monitoring and sampling analysis plan for review and approval. b. Soil; the post-operation soil sampling activities will be collected 6 months after the vapor recovery system has been shut off. Prior to conducting these sampling activities a sampling grid with these locations must be submitted to all appropriate agencies for review and approval. c. Soil vapor; in addition to the soil and groundwater post-operation sampling activities proposed in the draft work plan, soil vapor samples must also be collected as discussed. The soil vapor samples must be collected 3 and 6 months after the vapor recovery system has been shut off. Prior to conducting these sampling activities, a sampling grid with these locations must be submitted to all appropriate agencies for review and approval.	
Comment 15. The work plan indicates that approximately 70,000 gallons of condensate will be produced during the pilot study, however, it is unclear where this water will be disposed of. If the condenser water is disposed of to surface water or groundwater, an NPDES permit needs to be obtained from this Regional Board prior to disposal. Please revise the draft work plan clarifying the above.	Response 15. Comment noted. Page 4-5 of the Work Plan will be revised to clarify disposal of condensate. Also, an NPDES application has been submitted and is currently under review. The condensate will be treated via carbon on-site and disposed of to surface water.
Comment 16. A Site-Specific Health and Safety Plan has not been submitted as indicated in the report. The Health and Safety Plan must be submitted to all appropriate agencies for review and approval prior to implementing any site activities.	Response 16. Comment noted. Foster Wheeler Environmental will submit a Site-Specific Health and Safety Plan.
Comment 17. The site should be secure 24 hours a day and security fences visually inspected periodically to ensure the fences remain in-place throughout the pilot testing activities. Please revise the draft work plan accordingly.	Response 17. Comment noted. Refer to Response 3 to Jesus I. Sotelo's General Comments.
Comment 18. As discussed, status reports must be submitted throughout the pilot testing activities to all the appropriate agencies for their review. Subsequently, follow-up meetings may be required. Update the draft work plan to reflect the above.	Response 18. Comment noted. Section 8 Contractor Quality Control Plan has been revised to include an "over-the-shoulder" review by DTSC and the California Regional Water Quality Control Board of pilot test operations.

Table 2-9. Physical Parameters for RBC Calculations

Physical Exposure Parameter	Definition	Units	Utility Maintenance Worker lagoon model	Utility Maintenance Worker box model	Outdoor Construction Worker with dermal groundwater exposure	Indoor Industrial Worker
ATc	Averaging time for carcinogens	years	70 (l)	70 (i)	70 (i)	70 (i)
ATn	Averaging time for noncarcinogens	years	25 (l)	25 (i)	1 (e)	25 (i)
BW	Body weight	kg	70 (h)	70 (h)	70 (h)	70 (h)
ED	Exposure duration	years	25 (l)	25 (i)	1 (e)	25 (i)
EF	Exposure frequency	days/year	10 (f)	10 (f)	113 (e)	250 (i)
IRs	Soil ingestion rate	mg/day	480 (i)	480 (i)	50 (i)	--
IRa.I	Indoor inhalation rate	m^3/day	--	--	--	20 (i)
IRa.O	Outdoor inhalation rate	m^3/day	20 (l)	20 (i)	20 (i)	20 (i)
SA	Skin surface area (soil dermal)	cm^2	4,300 (j)	4,300 (j)	4,300 (i)	--
M	Soil to skin adherence factor	unitless	0.2 (j)	0.2 (j)	0.2 (i)	--
SA.GWd	Skin surface area (groundwater dermal)	cm^2	6,200 (a)	6,200 (a)	6,200 (a)	--
ET.GWd	Duration of groundwater dermal exposure	hours/day	4 (a)	4 (a)	4 (a)	--

Table 2-10. Environmental Parameters for RBC Calculations

Environmental Exposure Parameter	Definition	Units	Utility Maintenance Worker (lagoon model)	Utility Maintenance Worker (box model)	Outdoor Construction Worker (without dermal groundwater exposure)	Outdoor Construction Worker (with dermal groundwater exposure)	Indoor Industrial Worker
Surface Parameters							
A	Contaminated soil area	m^2	2 (b)	2 (b)	6,600 (b)	6,600 (b)	6,600 (b)
W	Width of affected soil perpendicular to wind	m	1 (b)	1 (b)	320 (b)	320 (b)	320 (b)
W.gw	Length of affected soil parallel to groundwater flow	m	—	—	—	—	—
Uair	Ambient air velocity in mixing zone	m/s	1.5 (b)	1.5 (b)	2.8 (b)	2.8 (b)	2.8 (b)
delta	Air mixing zone height	m	2 (i)	2 (i)	2 (i)	2 (i)	2 (i)
Pe	Particulate areal emission rate	g/cm^2-s	3.90E-12 (c)	3.90E-12 (c)	3.90E-12 (c)	3.90E-12 (c)	3.90E-12 (c)
Soil Parameters							
hc	Capillary zone thickness	cm	5 (b)	0.10 (l)	5 (b)	5 (b)	5 (b)
hv	Vadose zone thickness	cm	115 (b)	0.10 (l)	295 (b)	295 (b)	295 (b)
Lgw	Depth to groundwater	cm	120 (b)	0.20 (l)	300 (b)	300 (b)	300 (b)
Ls	Depth to top of affected soil	cm	-- (b)	0.10 (l)	45 (b)	45 (b)	45 (b)
ds	Thickness of affected soil zone	cm	120 (b)	0.10 (l)	250 (b)	250 (b)	250 (b)
rho	Soil density	g/cm^3	1.6 (b)	1.6 (b)	1.6 (b)	1.6 (b)	1.6 (b)
phi	Soil porosity in vadose zone	unitless	0.35 (b)	0.35 (b)	0.35 (b)	0.35 (b)	0.35 (b)
foc	Fraction of organic carbon in vadose zone	unitless	0.05 (b)	0.05 (b)	0.05 (b)	0.05 (b)	0.05 (b)
pH	Soil/groundwater pH	unitless	7.3 (b)	7.3 (b)	7.3 (b)	7.3 (b)	7.3 (b)
Building Parameters							
Lb	Building volume/area ratio	cm	—	200 (a) [1]	—	—	300 (a)
ER	Building air exchange rate	L/s	—	1.40E-01 (b) [1]	—	—	0.00023 (g)
Lcrk	Foundation crack thickness	cm	—	15 (b) [1]	—	—	15 (b)
eta	Foundation crack fraction	unitless	—	1 (g) [1]	—	—	0.01 (a)

1 Indoor air inhalation calculations were used to simulate the enclosed trench space for the utility maintenance worker.

Table 2-11. RBC References

	Citation	Reference
a	ASTM, 1995	Value is a default found within: Groundwater Services, Inc. 1995. *ASTM, RBCA Spreadsheet System and Modeling Guidelines Version 1.0* (software package).
b	BNI, 1998 ESI	Bechtel National, Inc. 1998. *Expanded Site Investigation for Site 14 — Naval Station Long Beach, Long Beach, California.*
c	calc ASTM	Value is calculated within: Groundwater Services, Inc. 1995. *ASTM, RBCA Spreadsheet System and Modeling Guidelines Version 1.0* (software package).
d	Cal-EPA, 1994	Cal-EPA. 1994. *California Office of Environmental Health Hazard Assessment, California Environmental Protection Agency, Criteria for Carcinogens.*
e	client	Values were provided by the client
f	DON, 1994	U.S. Department of the Navy (DON). 1994. George Coleman personal communication to Bechtel regarding site-specific assumptions.
g	mod ASTM	Value is modified to fit the model from a default found within: Groundwater Services, Inc. 1995. *ASTM, RBCA Spreadsheet System and Modeling Guidelines Version 1.0* (software package).
h	U.S. EPA, 1989a	United States Environmental Protection Agency. 1989a. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual.* Office of Emergency and Remedial Response. EPA/540/1-89 002.
i	U.S. EPA, 1991a	United States Environmental Protection Agency. 1991. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors.* Office of Solid Waste and Emergency Response Directive 9285.6-03.
j	U.S. EPA, 1992	United States Environmental Protection Agency. 1992. *Dermal Exposure Assessment: Principles and Applications.* Office of Research and Development. EPA/600/8-91/011B. January.
k	U.S. EPA, 1998	United States Environmental Protection Agency. 1996. *Region IX Preliminary Remediation Goals 1996.* August.
l	Battelle	Conservative values used to calculate a volatilization factor for utility maintenance worker exposure to groundwater.

Table 2-12. COC Toxicity Parameters

COC	Reference Dose (RfD) (mg/kg-day)			Cancer Slope Factor (CSF) (kg-day/mg)			Relative Dermal Absorption Factor	Water Dermal Skin Permeability (cm/hr)
	Oral	Calculated Dermal [1]	Inhalation	Oral	Calculated Dermal [2]	Inhalation		
PCE	1.0E-02 (a)	1.00E-03	1.00E-02 (a)	5.2E-02 (a) 5.1E-02 (b)	5.2E-01 5.1E-01	2.03E03 (a) 2.10E-02 (b)	0.1	4.80E-02
TCE	6.0E-03	6.00E-04	6.00E-03 (a)	1.1E-02 (a) 1.5E-02 (b)	1.1E-01 1.5E-01	6.00E03 1.00E-02 (b)	0.1	1.60E-02
1,1-DCE	9.0E-03 (a)	9.00E-04	9.00E-03 (a)	6.0E-01 (a,b)	6.0E+00	1.75E01 (a) 1.80E-01 (b)	0.1	1.60E-02
VC	—	—	—	1.9E+00 (a) 2.7E-01 (b)	1.9E+01 2.7E+00	3.00E-01 (a) 2.70E-01 (b)	0.1	7.30E-03
c-DCE	1.0E-02 (a)	1.00E-03	1.00E-02 (a)	—	—	—	0.1	1.00E-02
t-DCE	2.0E-02 (a)	2.00E-03	2.00E-02 (a)	—	—	—	0.1	1.00E-02

[1] Calculated dermal RfD = (Oral RfD)·(Relative Dermal Absorption Factor)

[2] Calculated dermal CSF = (Oral CSF)/(Relative Dermal Absorption Factor)

(a) U.S. EPA Region IX PRG Document (U.S. EPA, 1998)

(b) California Criteria for Carcinogens (Cal-EPA, 1994)

Table 2-13. COC Chemical and Physical Parameters

COC	Molecular Weight (MW) (g/mole)		Diffusion Coefficients (cm^2/s) Air		Diffusion Coefficients (cm^2/s) Water		Log Octanol-Water Partition Coefficient (@ 20-25°C) (log L/kg)		Henry's Law Constant (@ 20-25°C) ($atm\text{-}m^3/mol$)		Vapor Pressure (@ 20-25°C) (mm Hg)		Solubility (@ 20-25°C) (mg/L)	
PCE	165.83	(a)	0.076	(b)	1.02E-05	(b)	2.29	(b)	1.44E-2	(b)	19.2	(b)	287	(b)
TCE	131.4	(h)	0.0788	(b)	1.05E-04	(b)	1.93	(b)	8.75E-3	(b)	72.5	(b)	1,450	(b)
1,1-DCE	96.94	(a)	0.09	(b)	1.18E-05	(b)	0.61	(b)	2.23E-2	(b)	580	(b)	2,700	(b)
VC	62.5	(a)	0.106	(b)	1.40E-05	(b)	1.47	(b)	2.53E-2	(b)	2,750	(b)	2,460	(b)
c-DCE	96.936	(a)	0.0736	(b)	1.19E-05	(b)	1.38	(d)	4.04E-3	(b)	178	(b)	5,260	(b)
t-DCE	96.936	(a)	0.0707	(b)	1.19E-05	(b)	1.46	(a)	9.46E-3	(b)	354	(b)	8,890	(b)

(a) U.S. EPA, 1989b.

(b) DataCal.xls, a library of chemical-specific values intended for use with Cal/TOX, a multimedia fate and transport model. All files related to Cal/TOX are available from the website: http://www.cwo.com/~herd1/downset.htm

(c) NIOSH, 1990.

(d) Calculated using Kenaga and Goring K_{ow}/solubility regression equation and K_{ow} data.

Table 2-14. Risk-Based Concentrations (RBCs), Industrial PRGs, and COP Criteria for Soil and Groundwater Contaminants at IR Site 14

Contaminants	Soil Concentrations (mg/kg)			Groundwater Concentrations (µg/L)	
	Soil RBC	Industrial PRG	Groundwater Protection	Groundwater RBC	COP WQC
RBCs calculated with ELCR = 10^{-6}					
PCE	48	17	4.5	2.2	99
TCE	52	7	7	24	27
1,1-DCE	NA	NA	NA	0.7	7,100
VC	NA	NA	NA	0.5	36
c-1,2-DCE[a]	118	100	120	908	—
t-1,2-DCE[a]	464	270	240	1,600	—
RBCs calculated with ELCR = 10^{-5}					
PCE	480	17	45	22	99
TCE	520	7	70	240	27
1,1-DCE	NA	NA	NA	7	7,100
VC	NA	NA	NA	5	36
c-1,2-DCE[a]	118	100	120	910	—
t-1,2-DCE[a]	464	270	240	1,600	—
RBCs calculated with ELCR = 10^{-4}					
PCE	4,800	17	450	220	99
TCE	5,200	7	700	2,400	27
1,1-DCE	NA	NA	NA	70	7,100
VC	NA	NA	NA	50	36
c-1,2-DCE[a]	118	100	120	910	—
t-1,2-DCE[a]	464	270	240	1,600	—

(a) Hazard index = 1.0.
NA = Not applicable — 1,1-DCE and VC were not detected in soils.
— = Not available.

The RBCs shown in Table 2-14 are the minimum RBC values from the two exposure scenarios analyzed for this risk assessment (i.e., the utility maintenance worker box model and the outdoor construction worker with dermal exposure [see Section 2.5.3]), for the 10^{-4}, 10^{-5}, and 10^{-6} ELCRs. Groundwater and soil RBCs from the indoor-industrial worker were not included because this scenario does not meet the designated use of the port facilities. RAOs, based on the RBCs, are presented in Section 3.5. RBCs based on noncarcinogenic effects were calculated based on a cumulative hazard index (HI) of 1.0.

FOSTER WHEELER

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NTC - IR Site 14 - 5/12/00

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