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MARE ISLAND
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Naval Facilities Engineering Command Southwest
Contracts Department
1220 Pacific Highway
San Diego, California 92132-5190

NAVFAC Contract No.: N62473-12-C-4801
DCN: NRS-4801-0000-0001.A1/F
PRIOR SAP DCN: ECSD-3211-0004-0016

FINAL

ADDENDUM 1

FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)

SOIL EXCAVATION AND GROUNDWATER TREATMENT BUILDING 742 FORMER DEGREASING PLANT INVESTIGATION AREA C2 AT THE FORMER MARE ISLAND NAVAL SHIPYARD VALLEJO, CALIFORNIA

April 2013

Prepared by:

Environmental Engineering and Science
16501 Scientific Way
Irvine, California 92618

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SAP Worksheet #1 – Title and Approval Page

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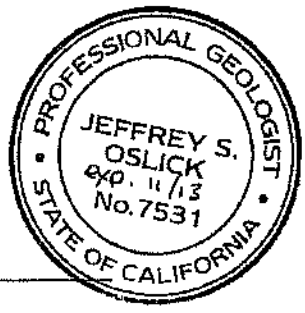

Jeff Oslick, PhD, PG
Program Quality Control Manager, NOREAS, Inc.

Date: 4/15/13

Joseph Michalowski
Acting Quality Assurance Officer
U.S. Naval Facilities Engineering Command Southwest

Date: May 1, 2013

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EXECUTIVE SUMMARY

This Addendum 1 to the *Final Sampling and Analysis Plan for Soil Excavation and Groundwater Treatment, Building 742 Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo, California,* (Tetra Tech EC, Inc [TtEC] 2010a) has been prepared by NOREAS, Inc. (NOREAS) on behalf of the Department of Navy (DON), Naval Facilities Engineering Command Southwest (NAVFACSW), in accordance with Contract No. N62473-12-C-4801. The original Sampling and Analysis Plan (SAP) is included as Attachment 1 for reference.

The original SAP was prepared to support a number of tasks related to the remediation of soil, groundwater and soil gas at the Navy Retained-Condition (NRC) Building 742 Investigation Area C2 at the Former Mare Island Naval Shipyard (MINS), including groundwater, soil and soil vapor sampling. Results from soil confirmation samples collected at the time of the previous excavation at the site in June 2010 (Final Removal Action Summary Report, TtEC 2011) indicate residual tetrachloroethene (PCE) concentrations above the Project Screening Levels (PSLs) remain at the site. PCE concentrations in soil above PSLs were reported both beneath utility lines, which were not removed during the prior excavation (sample numbers 4-045, 4-048, 4-049) and in the vicinity of one excavation-floor confirmation sample (sample number 4-046, collected from 9 to 9.5 feet below ground surface [bgs]). Additionally, one previous soil investigation boring result, D1C85GB002 at 5 feet bgs, reported a laboratory-estimated concentration of PCE at the PSL for PCE (2,700 micrograms per kilogram (µg/kg). Figure 1 shows the previous excavation area, previous soil sample results at or exceeding PSLs, and groundwater monitoring well and soil gas probe locations.

Soil gas and groundwater monitoring data collected in 2011 indicate that remediation of groundwater and soil gas at the NRC Building 742 to below PSLs is incomplete. Results from soil gas probe D1C85SG06 in November 2011 (TtEC 2012), located in the vicinity of PCE-impacted soil remaining below shallow utility lines, reported PCE and trichloroethene (TCE) exceeding PSLs. Groundwater monitoring well D1C85W02R, located less than 10 feet northwest of excavation floor confirmation sample 4-046, reported vinyl chloride exceeding the PSL in November 2011.

Based on these remaining of soil, groundwater and soil gas concentrations above PSLs, the DON has contracted NOREAS to perform additional excavation at the NRC at Building 742 to remove remaining soils impacted with volatile organic compounds (VOCs) above PSLs. NOREAS is also contracted to perform a minimum of one post-excavation groundwater and soil gas monitoring event for VOCs. Abandonment and replacement of one groundwater monitoring well, D1C85W02R, and one soil gas monitoring probe, D1C85SG06, are anticipated to be needed to complete the soil excavation activities. The proposed extent of additional excavation is shown on Figure 1.

Although the original SAP included elements of active groundwater treatment via Oxygen Release Compound®, no active groundwater treatment is proposed related to the additional excavation and monitoring activities discussed in this SAP Addendum 1.

This Addendum will be used in conjunction with the original SAP. All policies and procedures set forth in the original SAP that were not modified in this Addendum will remain in effect for continuation of groundwater monitoring activities.

The following worksheets (WS) have been updated for the current work and are included in this Addendum:

- WS #1 – Title and Approval Page
- WS #3 – Distribution List
- WS #4 – Project Personnel Sign-Off Sheet
- WS #5 – Project Organizational Chart
- WS #6 – Communication Pathways
- WS #7 – Personnel Responsibilities and Qualifications Table
- WS #10 – Problem Definition
- WS #13 – Secondary Data Criteria and Limitations Table
- WS #14 – Summary of Project Tasks
- WS #16 – Project Schedule/Timeline Table
- WS #18 – Sampling Locations and Methods/SOP Requirements Table
- WS #19 – Analytical Standard Operating Procedures (SOP) Requirements Table
- WS #20 – Field Quality Control Sample Summary Table

It is noted that since NOREAS had not performed the prior field work, all project management and field personnel have changed for this project, including the Program Quality Control Manager (QCM). Further, there are a several cases (Worksheets #26, 29, 31, 32, 33, 34, 35 and 37) where the only change to a worksheet would be to substitute "NOREAS" for the name of the prior contractor (TtEC). These worksheets are not reproduced here – only worksheets where substantive changes to protocols or lines of communication (etc.) were made are included.

FINAL
WORK PLAN
SOIL EXCAVATION AND GROUNDWATER TREATMENT BUILDING 742
FORMER DEGREASING PLANT
INVESTIGATION AERA C2

DATED 28 MAY 2010

IS RECORD NO. N00221_001507

SAP Worksheets

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LIST OF FIGURES

LIST OF ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
bgs	below ground surface
BRAC	Base Realignment and Closure
CO	Contracting Officer
COC	chain-of-custody
DTSC	Department of Toxic Substances Control
DON	U.S. Department of the Navy
EMAX	EMAX Laboratories, Inc.
EPA	U.S. Environmental Protection Agency
FCR	field change request
LDC	Laboratory Data Consultants, Inc.
mL	milliliter
MINS	Mare Island Naval Shipyard
NAVFACSW	Naval Facilities Engineering Command Southwest
NOREAS	NOREAS, Inc.
NRC	Navy Retained-Condition
PCE	tetrachloroethene
PID	photoionization detector
PMO	Project Management Office
PSL	project screening level
PQCM	Project Quality Control Manager
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
QCM	Program Quality Control Manager
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SOP	standard operating procedure
TCE	trichloroethene
TtEC	TetraTech EC, Inc.
VOA	volatile organic analysis
VOC	volatile organic compound
Water Board	California Regional Water Quality Control Board, San Francisco Region
WS	worksheet

SAP Worksheet #3 – Distribution List

Name of SAP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address
Heather Wochnick	Lead Remedial Project Manager (LRPM and RPM)	Base Realignment and Closure Project Management Office (BRAC PMO) West	(619) 532-0763	Heather.Wochnick@navy.mil
Brooks Pauly	Contracted Support Project Manager	BRAC PMO West	(619) 532-0789	Brooks.Pauly.ctr@navy.mil
Janet Lear	BRAC Environmental Coordinator	BRAC PMO West	(619) 532-0976	Janet.Lear@navy.mil
Joseph Michalowski	Acting Quality Assurance Officer (QAO)	NAVFACSW	(619) 532-4125	Joseph.Michalowski@navy.mil
Diane Silva	Administrative Records Manager	NAVFACSW	(619) 532-3676	Diane.Silva@navy.mil
Mr. Izzat Amadea	Resident Officer in Charge of Construction (ROICC)	BRAC Program Navy	(510) 749-5945	Izzat.Amadea@navy.mil
Melecio Asuncion	Caretaker's Site Office	BRAC Program Navy	(415) 743-4721	Melecio.Asuncion@navy.mil
Elizabeth Wells	RPM	Regional Water Quality Control Board (Water Board), San Francisco Bay Region	(510) 622-2440	ewells@waterboards.ca.gov
Janet Naito	RPM	California Department of Toxic Substances Control (DTSC)	(510) 540-3833	jnaito@dtsc.ca.gov
Carolyn d'Almeida	RPM	U.S. Environmental Protection Agency (EPA)	(415) 972-3105	dAlmeida.Carolyn@epamail.epa.gov
Jeff Oslick	Project Manager/QCM	NOREAS	(949) 467-9105	Jeff.Oslick @noreasinc.com

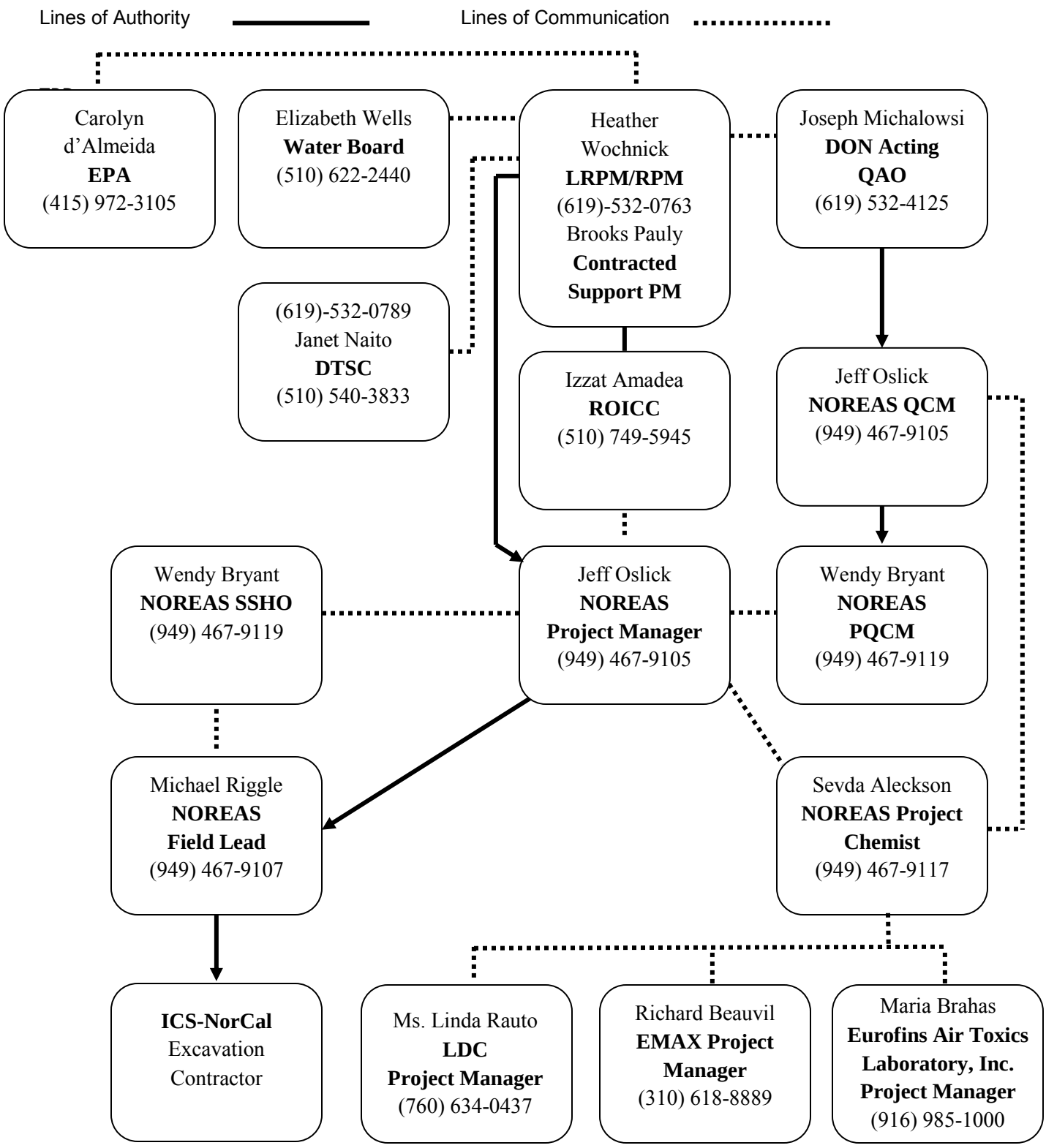
Name of SAP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address
Wendy Bryant	Project Quality Control Manager (PQCM)/Site Safety and Health Officer (SSHO)	NOREAS	(949) 467-9119	Wendy.Bryant@noreasinc.com
Michael Riggle	Project Field Lead	NOREAS	(949) 467-9107	Michael.Riggle@noreasinc.com
Sevda Aleckson	Project Chemist	NOREAS	(949) 467-9117	Sevda.Aleckson@noreasinc.com
Richard Beauvil	Project Manager (analytical services)	EMAX Laboratories, Inc. (EMAX)	(310) 618-8889	rbeauvil@emaxlabs.com
Maria Brahas	Project Manager (analytical services)	Eurofins Air Toxics Laboratories, Inc.	(916) 985-1000	m.brahas@airtoxics.com
Erlinda Rauto	Project Manager (data validation)	Laboratory Data Consultants (LDC)	(760) 634-0437	lrauto@lab-data.com

SAP Worksheet #4 – Project Personnel Sign-Off Sheet

Prior to start of the project, the SAP will be provided to the following individuals for review. The undersigned acknowledge receipt and will implement the plan and requirements of this Sampling and Analysis Plan. If only a portion of the SAP was reviewed, note the section(s) that was reviewed. This sign-off sheet (with appropriate signatures) will be scanned and filed in the project file.

Name	Organization/Title/Role	Telephone Number (optional)	Signature/e-mail receipt	SAP Addendum 1 Section Reviewed	Date SAP Read
Sevda Aleckson	NOREAS Project Chemist	(949) 467-9117		All	
Wendy Bryant	NOREAS PQCM	(949) 467-9119		All	
Michael Riggle	NOREAS Project Geologist, Field Team Lead	(949) 467-9107		All	
Richard Beauvil	EMAX Project Manager	(310) 618-8889		All	
Maria Brahas	Eurofins Air Toxics Laboratory, Inc. Project Manager	(916) 985-1000		All	
Erlinda Rauto	LDC Project Manager (data validation)	(760) 634-0437		All	

SAP Worksheet #5 – Project Organizational Chart



SAP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Point of contact for DON quality issues	NAVFACSW Acting QAO	Joseph Michalowski	(619) 532-4125	SAP Addendum 1 will be approved by the QAO prior to start of sampling. If during sampling, a change in sampling procedures or strategy is required, the QAO will be notified via email and give concurrence to issue a field change request (FCR).
Project management	NOREAS Project Manager	Jeff Oslick	(949) 467-9105	If changes are necessary, the Project Manager is responsible for communicating the changes via phone and/or e-mail to the project staff and is authorized to stop work if necessary.
SAP review	NOREAS QCM	Jeff Oslick	(949) 467-9105	SAP will be reviewed by the QCM prior to submittal to the NAVFACSW QAO.
Coordination and communication of fieldwork activities related to sampling	NOREAS PQCM	Wendy Bryant	(949) 467-9119	PQCM is responsible for communicating to the Project Manager any site condition changes.
Coordination of laboratory supplies for field activities	NOREAS Project Chemist	Sevda Aleckson	(949) 467-9117	Project Chemist will contact the laboratory to provide all necessary sample containers and appropriate shipping materials (such as coolers and bubble wrap) to be delivered on site prior to commencement of field sampling activities and throughout the course of the project.
Submittal of samples to the laboratory	NOREAS Sampler	Michael Riggle	(949) 467-9107	Sampling personnel will package and ship samples in accordance with this SAP.
Daily chain-of-custody (COC) reports and shipping documentation	NOREAS Sampler	Michael Riggle	(949) 467-9107	COC and shipping documentation will be submitted via fax or e-mail to the Project Chemist at the end of each day that samples are collected.

SAP Worksheet #6 – Communication Pathways – (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Reporting laboratory data quality issues	EMAX Project Manager	Richard Beauvil	(310) 618-8889	All quality assurance (QA)/quality control (QC) issues will be reported by the Laboratory Project Manager to the Project Chemist in writing within 2 business days.
Reporting laboratory data quality issues	Eurofins Air Toxics Project Manager	Maria Brahas	(916) 985-1000	All quality assurance (QA)/quality control (QC) issues will be reported by the Laboratory Project Manager to the Project Chemist in writing within 2 business days.
Field and analytical corrective actions	NOREAS Project Chemist	Sevda Aleckson	(949) 467-9117	The Project Chemist will immediately notify the PQCM and the QCM of any field or analytical procedures that were not performed in accordance with this SAP. The Project Chemist, in coordination with the PQCM, will ensure that the nonconformance and corrective actions to be taken are documented. The Project Chemist or PQCM will verify that the corrective actions have been implemented.
Notification of Non-Useable Analytical Data	NOREAS Project Chemist	Sevda Aleckson	(949) 467-9117	"If significant problems are identified by the laboratory or the project team that impact the usability of the data (i.e. the data is rejected or the data quality objectives are not met), the Program Chemist will notify the NAVFACSW RPM and the NAVFACSW QAO within 24 hours or the next business day
Release of analytical data	NOREAS Project Chemist	Sevda Aleckson	(949) 467-9117	The Project Chemist will review faxed/e-mailed data to verify that data quality is met as described in this SAP prior to releasing the data. Analytical data will be released to the Project Manager (or designee) after the Project Chemist has verified the data are in accordance with the SAP.
SAP procedure revision during field activities	NOREAS Project Chemist	Sevda Aleckson	(949) 467-9117	The Project Chemist or designee will prepare an FCR for any changes in sampling procedures that occur due to conditions in the field.

SAP Worksheet #6 – Communication Pathways – (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
SAP amendments	NOREAS QCM	Jeff Oslick	(949) 467-9105	Any changes to the SAP will require the QCM to prepare an addendum, which will be approved by NAVFACSW QAO prior to any field activities.
Stop work	NAVFAC SW QAO	Joseph Michalowski	(619) 532-4156	If an issue warranting a stop work order is identified, the NAVFAC SW QAO will immediately call the NOREAS QC Manager to order the cessation of all project work.
Stop work	NAVFAC SW	Heather Wochnick	619-532-0763	If an issue warranting a stop work order is identified, the RPM will alert the Contracted Support PM, the Navy Contracting Officer (CO) and the NOREAS Project Manager. The RPM or CO may order the cessation of all project work
Stop work	NAVFAC Headquarters – Contracted Support PM	Brooks Pauly	(619) 532-0789	If an issue warranting a stop work order is identified, the Contracted Support PM will alert the RPM. The RPM will alert the Navy Contracting Officer and the NOREAS Project Manager. The RPM or CO may order the cessation of all project work.
Stop Work	NOREAS QCM	Jeff Oslick	(949) 467-9105	If an issue warranting a stop work order is identified, the NOREAS QCM will immediately call the NAVFAC SW QAO and NOREAS Project Manager to order the cessation of all project work.
Stop Work	NOREAS SSHO	Wendy Bryant	(949) 467-9119	If an issue warranting a stop work order is identified, the NOREAS SSHO will immediately call the NOREAS Project Manager to order the cessation of all project work.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Joseph Michalowski	Acting QAO	NAVFACSW	Reviewing and approving this SAP Providing DON oversight of NOREAS' QA Program Providing technical and administrative oversight of NOREAS' surveillance audit activities Acting as point of contact for matters concerning quality assurance and the DON's Laboratory QA Program Coordinating training on matters pertaining to generation and maintenance of quality of data Authorizing the suspension of project execution if QA requirements are not adequately followed
Heather Wochnick Brooks Pauly	LRPM/RPM Contracted Support PM	NAVFAC SW NAVFAC Headquarters	Performing project management for the DON Ensuring that the project scope of work requirements are fulfilled Overseeing the project cost and schedule Providing formal technical direction to the NOREAS project team, as needed Acting as lead interface with agencies
Jeff Oslick	Project Manager	NOREAS	Coordinating work activities of subcontractors and NOREAS personnel, and ensuring that all personnel adhere to the administrative and technical requirements of the project Monitoring and reporting the progress of work, and ensuring that the project deliverables are completed on time and within project budget Monitoring the budget and schedule, and notifying the client and the RPM of any changes that may require administrative actions Ensuring adherence to the quality requirements of the contract, project scope of work, and the QC Plans Ensuring that all work meets the requirements of the technical specifications and complies with applicable codes and regulations

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table – (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Jeff Oslick	Project Manager	NOREAS	Ensuring that all work activities are conducted in a safe manner in accordance with the Site-Specific Health and Safety Plan, United States Army Corps of Engineers' Safety and Health Requirements (EM-385-1-1), and all applicable OSHA regulations Serving as the primary contact between the DON and NOREAS for actions and information related to the work and including appropriate NOREAS technical personnel in the decision-making Coordinating satisfactory resolution and completion of evaluation and acceptance report for nonconformance reports
Jeff Oslick	QCM	NOREAS	Establishing and maintaining the Quality Program Overseeing program QC, including construction and chemical data acquisition Working directly with the Project Manager and the DON to ensure implementation of the Program QC Plans Acting as a focal point for coordination for quality matters across all projects and resolving quality issues Suspending project activities if quality standards are not maintained Interfacing with the DON, including NAVFACSW QAO, on quality-related items Conducting field QC audits to ensure that project plans are being followed Performing reviews of audit and surveillance reports conducted by others Implementing the DON technical direction letters related to quality topics Approving any FCRs or Addendums to the SAP

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table – (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Jeff Oslick	QCM	NOREAS	Implementing contract requirements for chemical data collection Supporting projects as the technical lead for chemical data collection and analysis Ensuring that the Project Chemist has adequate training in sample collection and analytical methods Ensuring that sampling personnel have documented training on sampling procedures for specific project requirements Monitoring performance of subcontract laboratory and data validator
Sevda Aleckson	Project Chemist	NOREAS	Developing the SAP Evaluating and selecting a qualified subcontract laboratory Reviewing laboratory data prior to use against requirements in this SAP Evaluating and selecting a qualified data validation subcontractor Reviewing data validation reports Preparing data quality assessment report to ensure that the quality of the data meets the intended use of the data
Richard Beauvil	Project Manager	EMAX	Interfacing with NOREAS Project Chemist on project-specific requirements Reviewing sample login receipt to ensure that all analyses and samples are accounted for Reviewing laboratory data to ensure that requirements of this SAP have been met
Ms. Linda Rauto	Project Manager	LDC	Interfacing with NOREAS Project Chemist on project-specific requirements Validating laboratory data to ensure requirements of this SAP have been met

SAP Worksheet #10 – Problem Definition

Results from soil confirmation samples collected at the time of the previous excavation at the site in June 2010 (TtEC 2010) indicate residual PCE concentrations, above the PSL of 2,700 µg/kg, remain at the site. PCE concentrations in soil above PSL were reported both beneath utility lines which were not removed during the prior excavation (sample numbers 4-045, 4-048, 4-049 and in the vicinity of one excavation-floor confirmation sample (sample number 4-046, collected from 9 to 9.5 feet bgs). Additionally, one previous soil investigation boring result, D1C85GB002 at 5 feet bgs, reported a laboratory-estimated concentration of PCE at the PSL for PCE (2,700 µg/kg). Figure 1 shows the previous excavation area, previous soil sample results at or exceeding PSLs, and select groundwater monitoring well and soil gas probe locations.

Soil gas and groundwater monitoring data collected in 2011 indicate that remediation of groundwater and soil gas at the NRC Building 742 to below PSLs is incomplete. Results from soil gas probe D1C85SG06 in November 2011 (TtEC 2012), located in the vicinity of PCE-impacted soil remaining below shallow utility lines, reported PCE and TCE at respective concentrations of 16,000 micrograms per cubic meter (µg/m^3) and 6,700 µg/m^3, exceeding the respective PSLs of 2,000 µg/m^3 and 5,530 µg/m^3.

Groundwater monitoring well D1C85W02R, located less than 10 feet northwest of excavation floor confirmation sample 4-046, reported vinyl chloride at a concentration of 120 micrograms per liter (µg/L), exceeding the PSL of 4.04 µg/L, in November 2011 (Figure 1) (TtEC 2012).

Based on these remaining soil, groundwater and soil gas concentrations above PSLs, additional excavation at the NRC Building 742 is required to remove remaining soils above PSLs. A minimum of one post-excavation groundwater and soil gas monitoring event will be performed. Abandonment and replacement of one groundwater monitoring well, D1C85W02R, and one soil gas monitoring probe, D1C85SG06, are anticipated to be needed to complete the soil excavation activities. The proposed extent of additional excavation is shown on Figure 1. The placement of the sheet pile walls is principally designed to minimize intrusion of groundwater into the excavation from surrounding areas.

SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (Originating organization, data types, data generation/collection dates)	How Data Will Be Used	Limitations on Data Use
Previous excavation area soil confirmation sample results.	TetraTech EC (TtEC). 2011. *Final Removal Action Summary Report, Soil Excavation and Groundwater Treatment, Building 742 Former Degreasing Plant Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo California.*August.	*TtEC*. Soil confirmation data from previous excavation performed in 2010.	Data will be used to determine areas requiring additional excavation for completion of the Removal Action.	None known

SAP Worksheet #14 – Summary of Project Tasks

PROJECT TASKS

Project sampling and analysis tasks related to the planned work are briefly summarized below. Except where noted, the details of task implementation will be as presented in the Final SAP (TtEC 2010a), included as Attachment 1.

- QC sampling and analyses protocols shall be performed in accordance with all applicable elements of all Worksheets of the Final SAP (Attachment 1) not otherwise explicitly modified by this SAP Addenum 1.

- One groundwater monitoring well (D1C85W02R) and one soil gas probe (D1C85SG06) located within or immediately adjacent to the excavation boundary (Figure 1) will likely require destruction prior to excavation. Replacements will be installed in alternate, nearby locations following backfilling of the excavations (see Figure 1) approximately one week following completion of excavation backfilling operations. The work will be performed by a drilling contractor licensed in the state of California and under the supervision of NOREAS.

    - Paved surfaces located within the excavation boundary will be removed for disposal prior to excavation.

    - The proposed area of excavation is shown on Figure 1. The depth to the bottom of the proposed excavation is at least approximately 10 feet, based on the need to remove soils reported as containing PCE above the PSL, as shown on Figure 1. The groundwater table is approximately 5 feet bgs. Sheet pile walls, shown on Figure 1, will be driven (to an approximate depth of 25 feet bgs) at the maximum proposed lateral extent of the excavation area to reduce groundwater intrusion into the excavation area and prevent undermining of previously placed gravel fills below groundwater. Excavation sidewalls not adjoining sheet pile walls will be sloped as described in the Final Work Plan (TtEC 2010b)

    - Soil confirmation samples will be collected during excavation activities. A minimum of one bottom excavation soil sample will be collected for every 25 linear feet of excavation, including below the previously-reported elevated PCE concentrations at confirmation sample locations 4-045 and 4-046. See Figure 1 and WS#18 for proposed sampling locations and depths. Buried utility lines that cross the excavation limits will be cut off and capped.

- If soil staining is present and/or elevated photoionization detector (PID) recordings are noted, then the sample locations will be biased toward the area that is stained. A minimum of one sample beneath each utility line is required, which may also serve as the required excavation bottom sample in areas with multiple utility lines (see Figure 1). Based on the anticipated excavation dimensions, we anticipate a minimum total of 6 bottom/utility line samples, and 10 sidewall samples. All soil samples from excavation activities will be analyzed for parameters listed in WS #18 of the Final SAP (Attachment 1). The excavation limits were established based on historical sampling locations to be

inclusive of PCE reported in bottom and sidewall (adjacent to remaining utility lines) samples exceeding the PSL. Post-excavation soil samples will be documented and evaluated in a Completion Report.

- Excavation areas will be backfilled with clean imported material, which will be sampled prior to use, in accordance with the Final SAP (Attachment 1) and DTSC Guidance on Clean Imported Fill Material (DTSC, 2001). In addition, backfill soils from the previous excavation performed at Building 742 (TtEC, 2011) placed above groundwater may be reused, following testing in accordance with the requirements for imported fill soils.
-
- Five groundwater monitoring wells located at the site (D1C85W01R, D1C85W02R-A, D1C85W03, D1C85W04, and D1C85W05) and six soil gas probes (D1C85SG01, D1C85SG02, D1C85SG03, D1C85SG04, D1C85SG05 and D1C85SG06-A) will be sampled a minimum of 30 days after completion of excavation activities, including the replacement monitoring well/soil gas probe locations. Both groundwater and soil gas samples will be analyzed by EMAX Laboratories in Torrance, California, and Eurofins Air Toxics in Folsom, California for VOCs only. Groundwater monitoring for field-measured parameters described in the Final SAP (Attachment 1) will also be performed. Additional post-excavation sampling groundwater and/or soil gas monitoring events may be performed under this SAP Addendum 1, if determined to be necessary by the Navy in consultation with the regulatory agencies.

DETAILS ON SAMPLING TASKS

Soil sampling procedures shall follow those described in the Final SAP (Attachment 1), with the following exception, which provides an alternate method for sampling and field preservation of soil samples for VOC analyses, in accordance with EPA Method 5035.

Below are the required steps for TerraCore® (or similar 5035-compliant field sampling and preservation method), in lieu of the EnCore® sampling method, for each soil VOC sample collected.

- Step 1: Have ready a pre-weighed 40-milliliter (ml) glass volatile organic analysis (VOA) vial containing the appropriate preservative. With the plunger seated in the handle, push the Terra Core® into freshly exposed soil until the sample chamber is filled. A filled chamber will deliver approximately 5 grams of soil.
- Step 2: Wipe all soil or debris from the outside of the TerraCore® sampler. The soil plug should be flush with the mouth of the sampler. Remove any excess soil that extends beyond the mouth of the sampler.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

- Step 3: Rotate the plunger that was seated in the handle top 90° until it is aligned with the slots in the body. Place the mouth of the sampler into the 40-ml VOA vial containing the appropriate preservative and extrude the sample by pushing the plunger down. Quickly place the lid back on the 40-ml VOA vial. **Note:** When capping the 40-ml VOA vial, be sure to remove any soil or debris from the top and/or threads of the vial.
- Fill an additional sample jar of at least 2-ounce volume for use in sample dry-weight determination.

Sample labeling, handling and shipping instructions are described in the Final SAP (Attachment 1). Also see SAP Addendum 1, supplement to WS #19.

SAP Worksheet #16 – Project Schedule / Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable
		Anticipated Date of Initiation	Anticipated Date of Completion	
Draft SAP Addendum	NOREAS	10/01/12	12/5/12	Draft SAP
Final SAP Addendum	NOREAS	12/18/12	4/30/13	Final SAP
Field Investigation	NOREAS	5/28/13	11/28/13	Report of Results

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Excavation Sampling					
Excavation Floor	Soil	See Figure 1 [b,c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	See Figure 1 and Attachment 3	Worksheet #14
Excavation Sidewall	Soil	See Figure 1 [d]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	See Figure 1 and Attachment 3[d]	Worksheet #14
Groundwater Monitoring					
D1C85W01R	Water	5–15	VOCs	2 events	Worksheet #14
D1C85W02R	Water	5–15	VOCs	2 events	Worksheet #14
D1C85W03	Water	5–15	VOCs	2 events	Worksheet #14
D1C85W04	Water	5–15	VOCs	2 events	Worksheet #14
D1C85W05	Water	5–15	VOCs	2 events	Worksheet #14
D1C85SG01	Soil Gas	3–5	VOCs	2 events	Worksheet #14
D1C85SG02	Soil Gas	3–5	VOCs	2 events	Worksheet #14
D1C85SG03	Soil Gas	3–5	VOCs	2 events	Worksheet #14

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
D1C85SG04	Soil Gas	3–5	VOCs	2 events	Worksheet #14
D1C85SG05	Soil Gas	3–5	VOCs	2 events	Worksheet #14
D1C85SG06	Soil Gas	3–5	VOCs	2 events	Worksheet #14
Miscellaneous					
Import Material	Soil	Random	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals [e]	4 per borrow source	Worksheet #14
Waste	Soil and Water	N/A	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals [e,f]	[f]	Worksheet #14

Notes:

[a] Specific sampling IDs for each sample location are identified in Attachment 3 of this SAP Addendum (Field Sampling Matrix).

[b] Select soil samples will be collected at designated locations and depths shown on Figure 1, based on prior confirmation soil sample results (TtEC, 2011). Sample locations indicated as "approximate" on Figure 1 will be collected either at biased locations based on field observations (visual and/or PID evidence of contamination), or in the absence of field evidence of contamination, at floor or sidewall locations selected via a random-number generated grid location in the excavation area consistent with the requirement for a maximum spacing of 25 linear feet between respective excavation floor or sidewall samples. The location and sample ID of the sample collected will be noted in the field logbook.

[c] Along the former stormwater pipeline, **one bottom excavation soil sample will be collected every linear 25 feet** except in areas where the pipeline overlaps the utility line excavation areas.

[d] Once utilities are identified, **one sample beneath each utility line** will be collected. Sample depths are unknown until the pipeline and surrounding soils are removed and the utilities are uncovered. Utility line confirmation samples may be counted toward the required amount of excavation sidewall and bottom confirmation samples. Depths for each sample will be recorded in the field logbook.

[e] Additional analyses may be required by the DON or disposal facility. If additional analyses are requested that are not detailed in this SAP, standard laboratory quantitation limits and QC criteria will be used in accordance with the DOD QSM.

[f] Frequency of waste sampling will be determined in the field based on the disposal facility requirements.

SAP Worksheet #19 – Analytical SOP Requirements

Supplement to Final SAP (Attachment 1)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil	VOCs	(Field-preservation method) EPA Method 5035A/8260B EMAX-8260	Three 40-ml VOA vials: (1) Methanol preserved, (2) Sodium bisulfate preserved, and; (1) 2-ounce or larger container for sample dry weight determination	15 grams	4±2°C	14 days

SAP Worksheet #20 – Field Quality Control Sample Summary Table

Field QC samples are listed below for the soil, groundwater and soil gas samples. (Field QC samples are not applicable to waste characterization samples, and therefore are not discussed below.)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA or Summa Trip Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	VOCs	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Soil	TPH-purgeable	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Soil	SVOCs	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Soil	TPH-extractable	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Soil	PCBs	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Soil	Metals	16 [a]	Not applicable [b]	1	1 [c]	3 [d]	Not applicable	Not applicable	16 [e]
Water	VOCs	5	1 [b]	1	1 [c]	1 [d]	1 per cooler with VOCs	Not applicable	10 [e]
Soil Gas	VOCs	6	Not applicable	Not applicable	Not applicable	Not applicable	1	Not applicable	7 [e]

Notes:

[a] The number of soil samples is estimated based on samples listed in Worksheet #18/Attachment 3, the estimated linear length of excavation and number of utility lines expected to be encountered. Number of soil samples assumes a single borrow site source.

[b] Field duplicates are collected only for water samples from groundwater monitoring wells.

[c] Field blanks (or source blanks) are only required if the laboratory does not provide certification that the water used for equipment blanks is below quantitation limits for all analyses listed.

[d] Equipment blanks are collected at a frequency of one per day per piece of equipment. For this project, it is estimated that three equipment blanks will be collected for soil samples and one for water samples. This number may increase/decrease depending on the number of sampling days. Equipment blanks will not be required if new, disposable sampling equipment is used for collection of each sample (per day).

[e] Total number of samples may vary depending on items in notes a through d listed above.

REFERENCES

California Department of Toxic Substances Control (DTSC). 2001. *Information Advisory for Clean Imported Fill Material.* October.

TtEC (Tetra Tech EC, Inc.). 2010a. *Final Sampling and Analysis Plan, Soil Excavation and Groundwater Treatment, Building 742 Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo, California*. May 28.

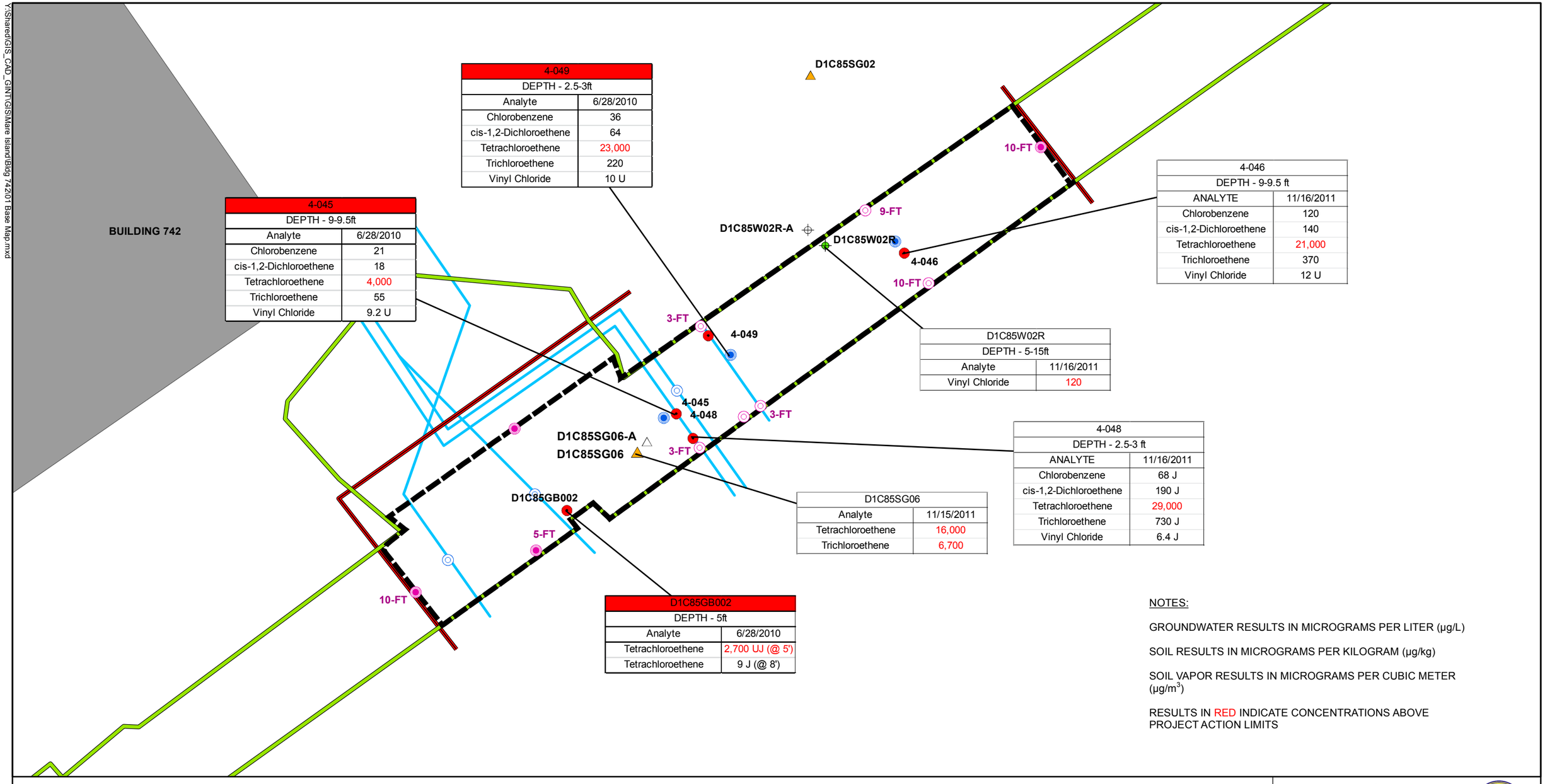
———————. 2010b. *Final Work Plan, Soil Excavation and Groundwater Treatment, Building 742 Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo, California*. May 28.

———————. 2011. *Final Removal Action Summary Report, Former Mare Island Naval Shipyard, Vallejo, California*. August 15.

———————. 2012. *Final Post-Excavation Soil, Soil Gas, and Groundwater Sampling Report, Former Mare Island Naval Shipyard, Vallejo, California*. March.

FIGURES

Y:\Shared\GIS_CAD_GIN\TGIS\Mare Island\Bldg 742\01 Base Map.mxd



4-049	
DEPTH - 2.5-3ft	
Analyte	6/28/2010
Chlorobenzene	36
cis-1,2-Dichloroethene	64
Tetrachloroethene	23,000
Trichloroethene	220
Vinyl Chloride	10 U

4-045	
DEPTH - 9-9.5ft	
Analyte	6/28/2010
Chlorobenzene	21
cis-1,2-Dichloroethene	18
Tetrachloroethene	4,000
Trichloroethene	55
Vinyl Chloride	9.2 U

4-046	
DEPTH - 9-9.5 ft	
ANALYTE	11/16/2011
Chlorobenzene	120
cis-1,2-Dichloroethene	140
Tetrachloroethene	21,000
Trichloroethene	370
Vinyl Chloride	12 U

D1C85W02R	
DEPTH - 5-15ft	
Analyte	11/16/2011
Vinyl Chloride	120

4-048	
DEPTH - 2.5-3 ft	
ANALYTE	11/16/2011
Chlorobenzene	68 J
cis-1,2-Dichloroethene	190 J
Tetrachloroethene	29,000
Trichloroethene	730 J
Vinyl Chloride	6.4 J

D1C85SG06	
Analyte	11/15/2011
Tetrachloroethene	16,000
Trichloroethene	6,700

D1C85GB002	
DEPTH - 5ft	
Analyte	6/28/2010
Tetrachloroethene	2,700 UJ (@ 5')
Tetrachloroethene	9 J (@ 8')

NOTES:

GROUNDWATER RESULTS IN MICROGRAMS PER LITER (µg/L)

SOIL RESULTS IN MICROGRAMS PER KILOGRAM (µg/kg)

SOIL VAPOR RESULTS IN MICROGRAMS PER CUBIC METER ($\mu g/m^3$)

RESULTS IN RED INDICATE CONCENTRATIONS ABOVE PROJECT ACTION LIMITS

LEGEND

- GROUNDWATER MONITORING WELL LOCATION
- SOIL GAS PROBE LOCATION
- PROPOSED REPLACEMENT SOIL GAS MONITORING PROBE
- PROPOED REPLACEMENT GROUNDWATER MONITORING WELL
- SAMPLE LOCATION WITH RESULTS ABOVE PROJECT ACTION LIMITS
- PROPOSED BOTTOM SAMPLE (APPROXIMATE)
- PROPOSED BOTTOM SAMPLE (FIXED)
- PROPOSED SIDEWALL SAMPLE (APPROXIMATE)
- PROPOSED SIDEWALL SAMPLE (FIXED)
- FOR SELECT SIDEWALL SAMPLES
- 5-FT (PROPOSED SAMPLE DEPTH IN FEET)
- PROPOSED EXCAVATION AREA
- 2010 EXCAVATION BOUNDARY
- PROPOSED SHEET PILE LOCATION
- UTILITY LINE (SHOWN TO PROPOSED WORK AREA ONLY)
- BUILDING

SIDEWALL SAMPLE DEPTHS ARE SPECIFIED WHERE NEARBY PREVIOUS EXCAVATION SAMPLE CONFIRMATION RESULTS EXCEEDED PROJECT ACTION LIMITS. DEPTHS FOR OTHER SIDEWALL SAMPLES WILL BE DETERMINED IN THE FIELD IN ACCORDANCE WITH THE SAMPLING AND ANALYSIS PLAN."

N

0 5 10 20 Feet

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE

FORMER MARE ISLAND NAVAL SHIPYARD
VALLEJO, CALIFORNIA
SAMPLING AND ANALYSIS PLAN

FIGURE 1
EXCAVATION AREA

NOREAS Environmental Engineering and Science

DATE: APRIL 2013
CONTRACT NO.: N62473-12-C-4801
DCN: NRS-4801-0000-0001.A1/F

ATTACHMENT 1

Final SAP (TtEC 2010)

SAP Worksheet #1 – Title and Approval Page

APPENDIX A

FINAL

SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
May 28, 2010

SOIL EXCAVATION AND GROUNDWATER TREATMENT
BUILDING 742 FORMER DEGREASING PLANT
INVESTIGATION AREA C2 AT THE
FORMER MARE ISLAND NAVAL SHIPYARD
VALLEJO, CALIFORNIA

Prepared for:
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
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Prepared by:
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1230 Columbia Street, Suite 750
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(619) 234-8696

Prepared under:
Contract No. N62473-07-D-3211
DCN: ECSD-3211-0004-0016
CTO No. 0004

Review Signature: Lisa A. Bienkowski for — 05/18/10
Gregory Joyce — Date
TtEC Quality Control Program Manager

Approval Signature: Narciso Adban Ancog — 5/26/2010
Narciso A. Ancog — Date
NAVFAC SW Quality Assurance Officer

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EXECUTIVE SUMMARY

This Sampling and Analysis Plan describes the sampling activities to be performed during the removal action at the Building 742 Former Degreasing Plant (FDP), Mare Island Naval Shipyard (now referred to as Mare Island), Vallejo, California. This removal action is being conducted to eliminate volatile organic compounds (VOCs) that may be present in the groundwater and soil gas within the Building 742 FDP footprint, in the vicinity of Manhole D1-C85, and along the crushed stormwater pipeline. The crushed stormwater pipeline is approximately 320 feet long. It starts from approximately 55 feet west of the FDP and extends through the south side of the FDP, through manholes D1-C85 and D1-C86. Total petroleum hydrocarbons (TPH) are also present in the vadose zone soil and groundwater in the Building 742 FDP footprint and adjacent areas. The presence of TPH in soil and groundwater is a result of leaks from the fuel oil pipelines that ran parallel to the stormwater pipeline. Although TPH is not a risk driver for this removal action, TPH that commingled with VOCs in soil and groundwater within the excavation limits will be addressed as a result of this removal action. Also, polychlorinated biphenyls (PCBs) have been reported near Manhole D1-C85, and the proposed removal action will address soil with PCB concentrations greater than 1 milligram per kilogram in the vicinity of that manhole.

This removal action will be conducted pursuant to the Action Memorandum for the Building 742 FDP (DON 2010). This document substantiates the Department of the Navy's (DON's) decision to undertake a non-time-crtitical removal action at this site due to elevated levels of VOCs in groundwater and soil gas.

Field activities include site preparation, pre-excavation sampling, existing well abandonment, and excavation and removal of soil and debris (including any potential remnants of former grease sumps and sump lines) from within the Building 742 FDP footprint, in the vicinity of Manhole D1-C85, and along the crushed stormwater pipeline. These activities will minimize the threat to industrial receptors from exposure to soil gas. The excavated materials will be disposed of off-site at an appropriate permitted disposal facility. Contaminated groundwater will be remediated through in situ bioremediation. In situ bioremediation will lower contaminant levels within the treatment areas. The site will be restored by backfilling the excavated area with soil brought in from a clean source, and soil gas probes and groundwater monitoring wells will be installed. Site activities will be complete after the excavation has been backfilled, groundwater and soil gas monitoring have been completed, and all equipment and personnel have been demobilized.

Site closeout activities will be performed at the completion of the remediation activities. These activities include technical closeout for the project, which entails the preparation of a Completion Report to document the fieldwork performed at the sites during the removal action. The DON comments will be incorporated into a draft Completion Report that will be submitted to the regulatory agencies and the Base Closure Team for review and comment. A final Completion Report will be issued after the regulatory and Base Closure Team comments have been addressed.

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SAP Worksheets

Page

FIGURES

ATTACHMENTS

Abbreviations and Acronyms

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
%R	percent recovery
°C	degrees Celsius
AES	atomic emission spectrometer
bgs	below ground surface
BRAC	Base Realignment and Closure
CA	corrective action
CAS	Chemical Abstracts Service
CCB	continuing calibration blank
CCC	calibration check compounds
CCV	continuing calibration verification
COC	chain of custody
CSM	conceptual site model
CTO	Contract Task Order
CV	calibration verification
DCC	daily calibration check
DCN	Document Control Number
DO	dissolved oxygen
DoD	Department of Defense
DON	Department of the Navy
DPT	direct push technology
DQA	data quality assessment
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
EB	equipment blank
EDD	electronic data deliverable
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ESI	extended site inspection
ESL	Environmental Screening Level

Abbreviations and Acronyms
(Continued)

EWI	Environmental Work Instruction
FCR	Field Change Request
FDP	Former Degreasing Plant
FID	flame ionization detector
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GSDS	Groundwater Sampling Data Sheet
HCl	hydrochloric acid
HNO_3	nitric acid
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively coupled plasma
ICS	interference check sample
ICV	initial calibration verification
IDL	instrument detection limit
IRAW	Interim Removal Action Work Plan
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LDC	Laboratory Data Consultants
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
min	minute
mL	milliliter
mL/min	milliliters per minute
MS	matrix spike
MSD	matrix spike duplicate
NAVFAC SW	Naval Facilities Engineering Command Southwest
NEDD	Navy Electronic Data Deliverable
NTU	nephelometric turbidity unit
ORC	oxygen release compound

Abbreviations and Acronyms
(Continued)

ORP	oxidation/reduction potential
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PID	photoionization detector
PjM	Project Manager
PLFA	phospholipid fatty acid
PMO	Program Management Office
PQCM	Project Quality Control Manager
PT	proficiency testing
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual
RF	response factor
RML	removal monitoring level
ROICC	Resident Officer in Charge of Construction
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SDG	sample delivery group
SI	site inspection
SLHHRA	screening-level human health risk assessment
SOP	Standard Operating Procedure
SPCC	system performance check compounds
SSHO	Site Safety and Health Officer
SVOC	semivolatile organic compound

Abbreviations and Acronyms
(Continued)

SW	sidewall
TCD	thermal conductivity detector
TKN	total Kjeldahl nitrogen
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-extractable	total extractable petroleum hydrocarbons
TPH-purgeable	total purgeable petroleum hydrocarbons
TSCA	Toxic Substances Control Act
TtEC	Tetra Tech EC, Inc.
UFP	Uniform Federal Policy
VFA	volatile fatty acid
VOA	volatile organic analysis
VOC	volatile organic compound
Water Board	Regional Water Quality Control Board

SAP Worksheet #2 – SAP Identifying Information

Site Name/Number: **Soil Excavation and Groundwater Treatment, Building 742 Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Mare Island, California**
Contractor Name: **Tetra Tech EC, Inc. (TtEC)**
Contract Number: **N62473-07-D-3211**
Contract Title: **Environmental Remedial Action Contract V**

1. This Sampling and Analysis Plan (SAP) was prepared in accordance with the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005) and U.S. Environmental Protection Agency (EPA) Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS (EPA 2002).

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held.

Scoping Session	Date
Kick-off meeting to discuss scope of project with the Department of the Navy (DON).	08/28/09

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.

Title	Date
Not applicable	

6. List organizational partners (stakeholders) and connection with lead organization: The California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (Water Board), San Francisco Bay Region, provide state oversight. The EPA provides federal oversight.

7. Lead organization: The DON, with state regulatory oversight, is the lead agency for the removal action.

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:

    - Worksheet #8 (Special Personnel Training Requirements) is not applicable for this project as the sampling involved does not require any specialized training.

SAP Worksheet #2 – SAP Identifying Information (Continued)

- Worksheet #13 (Secondary Data Sources) is not applicable for this project as secondary data evaluation is not required.
- Worksheet #21 (Project Sampling SOPs Reference Table) is not included in this SAP since the sampling procedures are described in detail in Worksheet #14, making use of sampling standard operating procedures (SOPs) unnecessary.

SAP elements and required information that are not applicable to the project are noted below. An explanation is provided on the previous page and in the appropriate SAP worksheet(s), as necessary.

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	Not applicable
Project Planning/ Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table	
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	Not applicable
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/ SOP Requirements Table Sampling Location Map(s)	

SAP Worksheet #2 – SAP Identifying Information (Continued)

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table	Not applicable
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

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SAP Worksheet #3 – Distribution List

The following distribution list represents the recipients of the final version of this SAP.

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing & E-mail Address
Ms. Heather Wochnick, PE	Lead Remedial Project Manager	BRAC PMO West	(619) 532-0763	1455 Frazee Road, Suite 900 San Diego, CA 92108-4310 heather.wochnick@navy.mil
Ms. Brooks Pauly	Remedial Project Manager	BRAC PMO West	(619) 532-0789	1455 Frazee Road, Suite 900 San Diego, CA 92108-4310 brooks.pauly.ctr@navy.mil
Mr. Michael Bloom	BRAC Environmental Coordinator	BRAC PMO West	(619) 532-0923	1455 Frazee Road, Suite 900 San Diego, CA 92108-4310 michael.bloom@navy.mil
Mr. Narciso Ancog	Quality Assurance Officer	NAVFAC SW	(619) 532-3046	1220 Pacific Coast Highway San Diego, CA 92132 narciso.ancog@navy.mil
Ms. Diane Silva	Administrative Record Manager	NAVFAC SW	(619) 532-3676	937 N. Harbor Drive Building 1, 3rd Floor San Diego, CA 92132 diane.silva@navy.mil
Mr. Izzat Amadea	ROICC	BRAC Program Navy	(510) 749-5945 (phone) (510) 755-5876 (cell)	2450 Saratoga Street, Suite 200 Alameda, CA 94501 izzat.amadea@navy.mil
Mr. Melecio Asuncion	Caretakers Site Office	BRAC Program Navy	(415) 743-4721	1 Avenue of the Palms, Suite 161 San Francisco, CA 94130-1806 melecio.asuncion@navy.mil
Ms. Janet Naito	RPM	DTSC	(510) 540-3833	700 Heintz Avenue, Suite 200 Berkeley, California 94710-2721 jnaito@dtsc.ca.gov

SAP Worksheet #3 – Distribution List (Continued)

Name of SAP Recipients	Title/Role	Organization	Telephone Number	Mailing & E-mail Address
Ms. Elizabeth Wells, PE	RPM	California Water Board, San Francisco Bay Region	(510) 622-2440	1515 Clay Street, Suite 1400 Oakland, California 94612 ewells@waterboards.ca.gov
Ms. Carolyn d'Almeida	RPM	U.S. EPA	(415) 972-3105	75 Hawthorne Street (SFD-7-3) San Francisco, CA 94105 dAlmeida.Carolyn@epamail.epa.gov
Mr. Hamlet Hamparsumian	Project Manager	TtEC	(949) 809-5017	17885 Von Karman Ave, Suite 500 Irvine, CA 92614 hamlet.hamparsumian@tetratech.com
Wilmer Solorzano	Project Quality Control Manager	TtEC	(415) 860-7345	1230 Columbia St., Suite 750 San Diego, CA 92101 wilmer.solorzano@tetratech.com
Mr. Gregory Joyce	Quality Control Program Manager	TtEC	(360) 780-0371	1230 Columbia St., Suite 750 San Diego, CA 92101 greg.joyce@tetratech.com
Ms. Lisa Bienkowski	Program Chemist	TtEC	(949) 809-5028	17885 Von Karman Ave, Suite 500 Irvine, CA 92614 lisa.bienkowski@tetratech.com
Ms. Rina Kato	Project Manager	EMAX	(310) 618-8889	1835 W. 205th Street Torrance, CA 90501 rkato@emaxlabs.com
Ms. Linda Rauto	Project Manager	LDC	(760) 634-0437	7750 El Camino Real Suite 2L Carlsbad, CA 92009 lrauto@lab-data.com

SAP Worksheet #4 – Project Personnel Sign-Off Sheet

The key personnel listed below will read the final version of this SAP. Their signature and date will be filled in below and included in the project file.

Name	Organization/Title/Role	Signature/Email Receipt	SAP Section Reviewed	Date SAP Read
Mr. Hamlet Hamparsumian	TtEC/Project Manager		Entire document	
Ms. Sabina Sudoko	TtEC/Project Chemist		Entire document	
Mr. Wilmer Solorzano	TtEC/Project Quality Control Manager		Entire document	
Mr. Diego Almanza-Gutierez	TtEC/Technical Lead and Sampler		Entire document	
Ms. Rina Kato	EMAX /Laboratory Project Manager		Entire document	
Ms. Linda Rauto	LDC /Data Validator Project Manager		Entire document	

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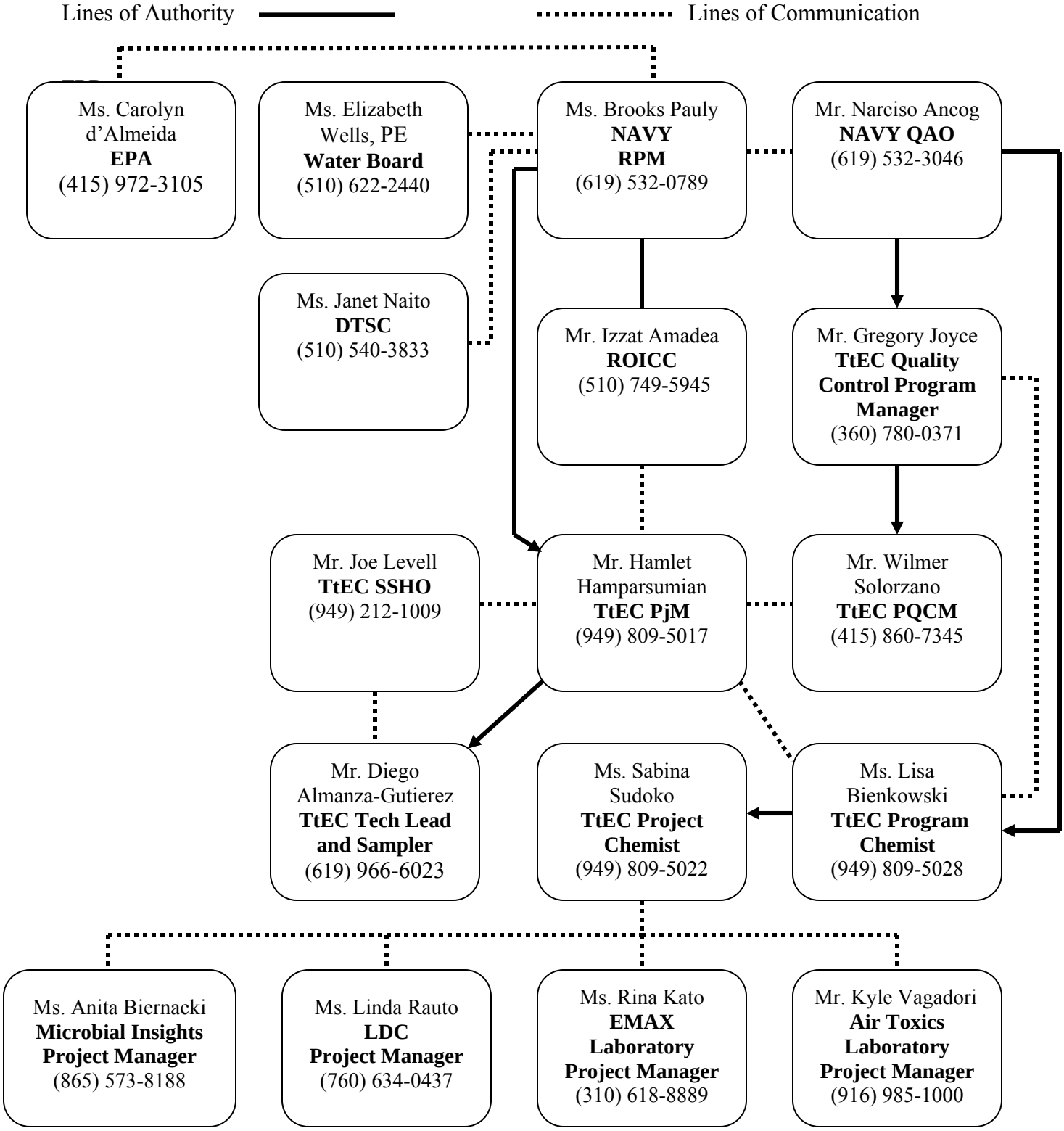
SAP Worksheet #5 – Project Organizational Chart



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SAP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Point of contact for Navy quality issues	NAVFAC SW QAO	Mr. Narciso Ancog	(619) 532-3046	SAP and its addendum (if applicable) will be approved by the QAO prior to start of sampling. If during sampling, a change in sampling procedures or strategy is required, QAO will be notified via email and give concurrence to issue a field change request.
Project management	TtEC Project Manager	Mr. Hamlet Hamparsumian	(949) 809-5017	If changes are necessary, the Project Manager is responsible for communicating the changes via phone and/or e-mail to the project staff and is authorized to stop work if necessary.
SAP review	TtEC Program Chemist or Quality Control Program Manager	Ms. Lisa Bienkowski or Mr. Gregory Joyce	(949) 809-5028 (360) 780-0371	SAP will be reviewed by the Program Chemist and Quality Control Program Manager prior to submittal to the NAVFAC SW QAO.
Coordination and communication of fieldwork activities related to sampling	TtEC PQCM	Mr. Wilmer Solorzano	(415) 860-7345	PQCM is responsible for communicating to the Project Manager any site condition changes.
Coordination of laboratory supplies for field activities	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	Project Chemist will contact the laboratory to provide all necessary sample containers and appropriate shipping materials (such as coolers and bubble wrap) to be delivered on site prior to commencement of field sampling activities and throughout the course of the project.
Submittal of samples to the laboratory	TtEC Sampler	Mr. Diego Almanza-Gutierez	(619) 966-6023	Sampling personnel will package and ship samples in accordance with this SAP.
Daily COC reports and shipping documentation	TtEC Sampler	Mr. Diego Almanza-Gutierez	(619) 966-6023	Chain-of-custody and shipping documentation will be submitted via fax or e-mail to the Project Chemist at the end of each day that samples are collected.

SAP Worksheet #6 – Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Reporting laboratory data quality issues	EMAX Laboratory Project Manager	Ms. Rina Kato	(310) 618-8889	All QA/QC issues will be reported by the Laboratory Project Manager to the Project Chemist in writing within 2 business days.
Field and analytical corrective actions	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	The Project Chemist will immediately notify the PQCM, Quality Control Program Manager, and Program Chemist of any field or analytical procedures that were not performed in accordance with this SAP. The Project Chemist, in coordination with the PQCM, will ensure that the nonconformance and corrective actions to be taken are documented. The Project Chemist or PQCM will verify the corrective actions have been implemented.
Release of analytical data	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	The Project Chemist will review faxed/e-mailed data to verify that data quality is met as described in this SAP prior to releasing the data. Analytical data will be released to the Project Manager (or designee) after the Project Chemist has verified the data are in accordance with the SAP.
SAP procedure revision during field activities	TtEC Project Chemist	Ms. Sabina Sudoko	(949) 809-5022	The Project Chemist or designee will prepare an FCR for any changes in sampling procedures that occur due to conditions in the field.
SAP amendments	TtEC Program Chemist	Ms. Lisa Bienkowski	(949) 809-5028	Any changes to the SAP will require the Program Chemist to prepare an addendum, which will be reviewed by the Quality Control Program Manager and approved by NAVFAC SW QAO prior to any field activities.

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Narciso Ancog	QAO	NAVFAC SW	Reviewing and approving this SAP Providing Navy oversight of TtEC's Quality Assurance Program Providing technical and administrative oversight of TtEC's surveillance audit activities Acting as point of contact for matters concerning quality assurance and the Navy's Laboratory Quality Assurance Program Coordinating training on matters pertaining to generation and maintenance of quality of data Authorizing the suspension of project execution if quality assurance requirements are not adequately followed
Ms. Brooks Pauly	RPM	NAVFAC SW	Performing project management for the DON Ensuring that the project scope of work requirements are fulfilled Overseeing the project cost and schedule Providing formal technical direction to the TtEC project team, as needed Acting as lead interface with agencies
Mr. Hamlet Hamparsumian	PjM	TtEC	Coordinating work activities of subcontractors and TtEC personnel, and ensuring that all personnel adhere to the administrative and technical requirements of the project Monitoring and reporting the progress of work, and ensuring that the project deliverables are completed on time and within project budget Monitoring the budget and schedule, and notifying the client and the RPM of any changes that may require administrative actions Ensuring adherence to the quality requirements of the contract, project scope of work, and the QC Plans Ensuring that all work meets the requirements of the technical specifications and complies with applicable codes and regulations

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Mr. Hamlet Hamparsumian	PjM	TtEC	Ensuring that all work activities are conducted in a safe manner in accordance with the Site-Specific Health and Safety Plan, United States Army Corps of Engineers' Safety and Health Requirements (EM-385-1-1), and all applicable OSHA regulations Serving as the primary contact between the DON and TtEC for actions and information related to the work and including appropriate TtEC technical personnel in the decision-making Coordinating satisfactory resolution and completion of evaluation and acceptance report for nonconformance reports
Mr. Gregory Joyce	Quality Control Program Manager	TtEC	Establishing and maintaining the Quality Program Overseeing program QC, including construction and chemical data acquisition Working directly with the PjM and the DON to ensure implementation of the Program QC Plans Acting as a focal point for coordination for quality matters across all projects and resolving quality issues Suspending project activities if quality standards are not maintained Interfacing with the DON, including NAVFAC SW QAO, on quality-related items Conducting field QC audits to ensure project plans are being followed Performing reviews of audit and surveillance reports conducted by others Implementing the DON technical direction letters related to quality topics Approving any Field Change Requests or Addendums to the SAP

SAP Worksheet #7 – Personnel Responsibilities and Qualifications Table (Continued)

Name	Title/Role	Organizational Affiliation	Responsibilities
Ms. Lisa Bienkowski	Program Chemist	TtEC	Implementing contract requirements for chemical data collection Supporting projects as the technical lead for chemical data collection and analysis Ensuring Project Chemist has adequate training in sample collection and analytical methods Ensuring that sampling personnel have documented training on sampling procedures for specific project requirements Monitoring performance of subcontract laboratory and data validator
Ms. Sabina Sudoko	Project Chemist	TtEC	Developing the SAP Evaluating and selecting a qualified subcontract laboratory Reviewing laboratory data prior to use against requirements in this SAP Evaluating and selecting a qualified data validation subcontractor Reviewing data validation reports Preparing data quality assessment report to ensure the quality of the data meets the intended use of the data
Ms. Rina Kato	Project Manager	EMAX	Interfacing with TtEC Project Chemist on project-specific requirements Reviewing sample login receipt to ensure all analyses and samples are accounted for Reviewing laboratory data to ensure requirements of this SAP have been met
Ms. Linda Rauto	Project Manager	LDC	Interfacing with TtEC Project Chemist on project-specific requirements Validating laboratory data to ensure requirements of this SAP have been met

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SAP Worksheet #8 – Special Personnel Training Requirements Table

For this project, there are no specialized training requirements. However, field personnel will have been trained in sampling procedures and have current 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response training.

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SAP Worksheet #9 – Project Scoping Session Participants Sheet

Project Name: Soil Excavation and Groundwater Treatment at Building 742 Former Degreasing Plant **Projected Date(s) of Sampling:** 2010 **Project Manager:** Mr. Hamlet Hamparsumian	**Site Name:** Former Mare Island Naval Shipyard **Site Location:** Vallejo, CA
Date of Session: August 28, 2009 **Scoping Session Purpose:** Kick-off meeting to discuss scope of project with Navy. The purpose of this meeting was to develop a mutual understanding of the work to be performed, administration of on-site work, and coordination of construction management.	

Name	Title	Affiliation	Phone #	E-mail Address
Ms. Heather Wochnick, PE	RPM (at time of this scoping meeting)	NAVFAC SW	(619) 532-0763	heather.wochnick@navy.mil
Mr. Hamlet Hamparsumian	Project Manager	TtEC	(949) 809-5017	hamlet.hamparsumian@tetratech.com
Mr. Bryce Bartelma, PG	Technical Lead (at the time of this meeting)	TtEC	(619) 471-3523	bryce.bartelma@tetratech.com

Discussion:

The scope of work, including the sampling locations, removal action, and in situ bioremediation, was discussed for inclusion into the draft Work Plan.

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SAP Worksheet #10 – Problem Definition

The main problem defined for this project is as follows: Previously contaminated groundwater associated with all potential sources at the Building 742 Former Degreasing Plant (FDP) and any secondary sources of contamination is generating soil gas. This soil gas, if not treated, could become a threat to industrial receptors from exposure via vapor intrusion and inhalation of volatile organic compounds (VOCs) released from groundwater. A secondary problem defined for this project is as follows: Soil contamination may be a potential source of groundwater contamination and thereby could contribute to the threat to industrial receptors from soil gas.

BACKGROUND

Investigation Area C2 is located in the central eastern portion of Mare Island, which was previously used by the DON for industrial activities. The FDP was located adjacent to Building 742 on the eastern side of Mare Island, approximately 300 feet west of Mare Island Strait. A site inspection (SI) (SCG and TtEMI 2003) and an expanded SI (ESI) (SulTech 2007) conducted at the site identified the FDP at Building 742 as a potential source of contamination. The SI concluded that the most likely primary source of VOC contamination in groundwater is the historical degreasing operations at the FDP. Manhole D1-C85 was identified as a secondary source of groundwater contamination.

Following the SI, an ESI was conducted in 2004 and 2005 to evaluate potential sources of VOCs, including the FDP, to assess whether the stormwater pipeline is acting as a preferential migration pathway at the site and to confirm the presence of compounds (particularly metals and polychlorinated biphenyls [PCBs]) previously reported in grab groundwater samples at the site. The ESI concluded that VOCs, including vinyl chloride (VC) and chlorobenzene, are present within the footprint of the FDP and along the stormwater pipeline. Many buildings upgradient of the site also discharged to this stormwater pipeline.

As part of the ESI, a Screening-Level Human Health Risk Assessment (SLHHRA) was conducted to evaluate the potential risk to current and future receptors at the site. The SLHHRA concluded that VC is the primary contributor to the soil gas and groundwater vapor intrusion-related cancer risks. VC and cis-1,2-dichloroethene are the primary contributors to the soil gas noncancer health risk, and chlorobenzene is the primary contributor to the groundwater vapor intrusion-related noncancer health risk.

This removal action is being conducted to reduce VOCs that may be present within the Building 742 FDP footprint, in the vicinity of Manhole D1-C85, and along the crushed stormwater pipeline that are contributing to the VOC contamination of the soil vapor. Total petroleum hydrocarbons (TPH) are also present in the vadose zone soil and groundwater in the Building 742 FDP footprint and adjacent areas. TPH is present in soil and groundwater as a result of leaks from the fuel oil pipelines that ran parallel to the stormwater pipeline. Although TPH is not a risk driver for this removal action, TPH that commingled with VOCs in soil and groundwater within the excavation limits will be addressed as a result of this removal action. Also, PCBs have been reported near Manhole D1-C85, and the proposed removal action will address soil with PCB concentrations greater than 1 milligram per kilogram (mg/kg) in the vicinity of that

SAP Worksheet #10 – Problem Definition (Continued)

manhole. Finally, metals reported in groundwater were not attributed to the FDP; however, installation of a well upgradient of the FDP may provide information on whether the presence of metals is likely a result of any upgradient sources.

Information on sources of chemicals of potential concern, the affected environmental media, chemicals of potential concern release and transport mechanisms that may occur at the site, potentially exposed receptors, and potential routes of exposure is summarized in a conceptual site model (CSM) presented in the Engineering Evaluation/Cost Analysis (EE/CA)/Interim Removal Action Work Plan (IRAW) (TtEC 2009) as Figure 2-15. In the CSM, potentially complete exposure pathways are designated with a "C." Quantitative risk evaluation (i.e., calculation of numerical cancer and noncancer risk estimates) is a possibility for potentially complete exposure pathways. As shown in the CSM, the potentially complete exposure pathways identified for the risk assessment for each exposure scenario were consistent with those evaluated within the screening-level framework.

This removal action is being conducted pursuant to the Action Memorandum for the Building 742 FDP (DON 2010). The document substantiates the DON's decision to undertake a non-time-critical removal action at this site due to elevated levels of VOCs in groundwater and soil gas at the site.

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements

The data quality objectives (DQOs) specify the project objectives, the data collection boundaries and limitations, the most appropriate type of data to collect, and the level of acceptable decision error. The quality and quantity of data required to implement an environmental remedial action are also defined.

The project-specific DQOs, as defined through the seven-step process (EPA 2006), are as follows:

1. State the problem

The main problem defined for this project is as follows: Previously contaminated groundwater associated with all potential sources at the Building 742 FDP and any secondary sources of contamination is generating soil gas. This soil gas, if not treated, could become a threat to industrial receptors from exposures via vapor intrusion and inhalation of VOCs released from groundwater. A secondary problem defined for this project is as follows: Soil contamination may be a potential source of groundwater contamination and thereby could contribute to the threat to industrial receptors from soil gas.

2. Identify the goal of the study

a. Are the analytical results for the excavation soil samples above the screening levels listed in Worksheet #15.1?

b. Are the analytical results for the groundwater and soil gas samples after four quarters of monitoring above the screening levels listed in Worksheets #15.2 and 15.3?

3. Identify information inputs

Information inputs required to achieve the goal for this project are:

- Previous investigation information
- Analytical results from soil, groundwater, and soil gas samples collected during this project

4. Define the boundaries of the study

Temporal boundaries are not applicable to this project.

Spatial boundaries include the sampling locations and excavation boundaries illustrated on Figures A-1 through A-3.

5. Develop the analytic approach

If the analytical results are above the screening levels listed in Worksheets #15.1 through 15.3, then the DON and regulators will determine any further course of action. If the analytical results are below the screening levels, then no further action is warranted.

SAP Worksheet #11 – Project Quality Objectives/Systematic Planning Process Statements (Continued)

6. Specify performance or acceptance criteria

Field crews will review the final version of this SAP prior to collection of samples and sign off on Worksheet #4. In addition, the laboratory will be provided the final version of this SAP to ensure that all specified requirements are met.

Sampling and analytical performance or acceptance criteria are specified in Worksheets #12, 15, and 28. Third-party data validation will be performed on samples as described in Worksheets #29 and 36.

7. Develop the plan for obtaining data

Samples will be collected prior to and after removal action activities and analyzed for one or more of the following: VOCs, SVOCs, total purgeable petroleum hydrocarbons (TPH-purgeable), total extractable petroleum hydrocarbons (TPH-extractable), PCBs, metals (total or dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), total organic carbon (TOC), total Kjeldahl nitrogen (TKN), ammonia, and microbial testing. Details on sampling strategy and analysis are provided in Worksheets #17 and #18.

SAP Worksheet #12.1 – Measurement Performance Criteria Table for Soil Samples

Measurement Performance Criteria Table – Field QC Samples

QC Sample [a]	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Equipment blank	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1 per day of sampling equipment	Accuracy	No analyte > QL	S&A
Source blank [b]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1 per source	Accuracy	No analyte > QL	S&A

Notes:

[a] QC samples only include equipment blanks and a source blank sample for this project for soil samples collected during pre- and post-excavation activities. Due to the heterogeneity of the soil matrices, field duplicates will not be required.

[b] A source blank is only required if the laboratory does not provide certification that the water used for collecting the equipment blanks is below QLs for the analyses listed.

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SAP Worksheet #12.2 – Measurement Performance Criteria Table for Groundwater Samples

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group [a]	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Equipment blank	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals	1 per day of sampling equipment	Accuracy	No analyte > QL	S&A
Source blank [b]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals	1 per source	Accuracy	No analyte > QL	S&A
Field duplicate [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved)	1 per 10 groundwater samples	Precision	RPD < 25%	S
Trip blank	VOCs, TPH-purgeable	1 per cooler with VOC analysis	Accuracy	No analyte > QL	S&A

Notes:

[a] Field QC samples only include analyses for contaminants of concern for this project.
[b] A source blank is only required if the laboratory does not provide certification that the water used for collecting the equipment blanks is below QLs for the analyses listed.
[c] Field duplicates are applicable only to the collection of water samples from groundwater monitoring wells.

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SAP Worksheet #12.3 – Measurement Performance Criteria Table for Soil Gas Samples

Measurement Performance Criteria Table – Field QC Samples

QC Sample	Analytical Group	Frequency	Data Quality Indicators	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Ambient blank	VOCs	1 per day of sampling	Accuracy	No analyte > QL	S&A

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SAP Worksheet #13 – Secondary Data Criteria and Limitations Table

For this project, secondary data are not applicable.

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SAP Worksheet #14 – Summary of Project Tasks

PROJECT TASKS

- Prior to intrusive activities, Underground Service Alert will be notified to obtain utility clearance. All pertinent as-built and utility drawings will be reviewed prior to starting any work; however, utility drawings will not be relied on for exact location of utilities, services, laterals, etc. Therefore, a subcontractor will conduct a geophysical survey to identify all utilities in close proximity to the soil boring locations and also determine the exact location of existing pipelines, where applicable.
- Prior to excavation activities at the site, direct-push technology (DPT) will be used for vertical lithologic logging and collection of soil and groundwater samples. One DPT boring will be advanced to a maximum depth of 30 feet within the source area (FDP) to delineate vertical contamination. Since most data for the site have been collected near ground surface and to a depth of 12 feet bgs, the intention of this boring is to collect soil and groundwater samples from a deeper interval (between 12 and 30 feet bgs), as requested by the Water Board. The proposed DPT location (D1C85GB017) is shown on Figure A-2. Soil and groundwater samples will be collected from this boring as described in the sampling procedures below and analyzed for parameters in Worksheet #18.
- After sampling is completed, all down-hole equipment and polyvinyl chloride (PVC) temporary well casing will be removed and the borehole will be backfilled with cement grout. Up to 5 percent of bentonite clay may be added to the cement grout mixture. The surface will be completed to pre-investigation conditions with like material (such as asphalt, concrete, or soil).
- The existing monitoring wells located within the site (D1C85W01, D1C85W02, and D1C85W03; see Figure A-1) will be sampled prior to excavation activities, and the samples analyzed for parameters listed in Worksheet #18. If additional existing groundwater monitoring wells are nearby and accessible, they will be sounded to help determine the depth to water in order to help guide the soil gas probe depth and be utilized for determining groundwater flow direction.
- Five temporary soil gas probes will be installed at the site, and soil gas samples will be collected from these five locations (depicted on Figure A-1). Soil gas probes will be placed in the vadose zone (12 inches above the water table) to a depth of approximately 4 feet bgs. To allow for subsurface conditions to equilibrate, soil gas sampling will not occur for at least 20 to 30 minutes after probe installation. The soil gas probes will be purged prior to sampling, and a leak test compound will be used during sampling to ensure that atmospheric air is not impacting the soil gas sample collection. Soil gas samples will be analyzed for the parameters listed in Worksheet #18.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

- Two wells (D1C85W01 and D1C85W02) located within the excavation boundary (Figure A-1) will be destroyed prior to excavation and their replacements installed in alternate locations following backfilling of the excavations. The work will be performed by a drilling contractor licensed in the state of California and under the supervision of TtEC.
- Paved surfaces located within the excavation boundary will be removed for disposal prior to excavation.
- The proposed areas of excavation are within the FDP footprint (approximately 40 feet wide by 60 feet long), around Manhole D1-C85 (approximately 30 feet wide by 35 feet long), and along the crushed stormwater pipeline (approximately 5 feet wide by 215 feet long). An additional spot excavation is planned for the grinder foundation sump (approximately 5 feet wide by 10 feet long). The limits of the excavation around the FDP and Manhole D1-C85 were defined by analytical results from past site investigations, whereas the limits of the excavation for the grinder foundation sump are defined by the approximate sump footprint and recommendations in the ESI (SulTech 2007). The FDP footprint and manhole areas will be excavated to approximately 8 feet bgs, the grinder foundation sump will be excavated to approximately 5 to 8 feet bgs, and the area along the crushed stormwater pipeline will be excavated to approximately 9 feet bgs for complete removal of the crushed pipe and pipe bedding material. Depth to the bottom of the crushed stormwater pipeline is approximately 9 feet based on measurements to the bottom of manholes D1-C85 and D1-C86 taken by TtEC during plugging of those manholes in April 2008. The groundwater table is approximately 5 feet bgs; thus, excavation will expose the groundwater table for subsequent groundwater remediation.
- Soil samples will be collected during excavation activities. One bottom and four sidewall excavation samples will be collected from the Building 742 FDP excavation area, the Manhole D1-C85 excavation area, and the grinder sump foundation excavation area for a total of three bottom excavation samples and twelve sidewall excavation samples. Along the crushed stormwater pipeline, one bottom excavation soil sample will be collected every 25 feet except in areas where the pipeline overlaps the Building 742 FDP and Manhole D1-C85 excavation areas. In addition, several buried utility lines cross the excavation boundaries. To investigate whether the utility lines are serving as potential contaminant migration pathways, one soil sample per utility line will be collected from the bedding material. Since groundwater is shallow, every effort will be made to collect soil samples prior to encountering groundwater in the excavations so that an unsaturated soil sample may be collected. A random number generated will be used to identify sample locations on each excavation sidewall and for the location in the bottom of each excavation. If staining is present, then the sample locations will be biased toward the area that is stained. All soil samples from excavation activities will be analyzed for parameters listed in Worksheet #18. The excavation limits were established based on historical sampling locations to be inclusive of potential chemicals of concern. In addition, to maintain the structural integrity of the building along the excavation areas adjacent to the

SAP Worksheet #14 – Summary of Project Tasks (Continued)

footing and foundation, no additional soil removal is planned at this time regardless of excavation sidewall sample results. Residual chemicals of concern (those that are risk drivers) detected in samples collected from the sidewalls are expected to be treated with the application of the oxygen release compound (ORC) in the excavation areas. Post-excavation soil samples will be collected, documented, and evaluated in a Completion Report.

- After excavation activities, groundwater will be treated by in situ aerobic bioremediation using an ORC. In areas that are being excavated, ORC will be applied directly to the bottom of the excavation. In areas where soil excavation will not be performed due to site features (e.g., along Building 742), ORC will be applied by injection. Details on the ORC application are in Section 4.8 of the Work Plan.
- Excavation areas will be backfilled with clean imported material, which will be sampled prior to use.
- Four new monitoring wells (D1C85W01R, D1C85W02R, D1C85W04, and D1C85W05) will be installed at the site using hollow-stem auger drilling methods. Proposed groundwater monitoring well locations are shown on Figure A-3. Wells will be installed upgradient of the site, within the excavation area, and downgradient of the site. In addition, a total of five soil gas monitoring probes (D1C85SG01, D1C85SG02, D1C85SG03, D1C85SG04, and D1C85SG05) will be installed at the site. Proposed soil gas monitoring probes locations are shown on Figure A-3. The probes will be installed adjacent to groundwater monitoring wells upgradient of the site, within the excavation/source area, and downgradient of the site. Soil gas probes will be advanced to the vadose zone (12 inches above the water table at approximately 3.5 to 5 feet bgs). Groundwater from the four new and one existing well (D1C85W03) and soil gas from the five new probes will be collected for a minimum of four quarters and analyzed for the parameters listed in Worksheet #18.
- After four quarters of monitoring, groundwater and soil gas monitoring results will be reviewed to determine if further sampling and/or ORC application is necessary.
- Data will be managed as described below.
- After completion of the proposed work, all sampling locations will be restored to pre-investigation conditions. Boring locations will be surveyed for horizontal location and vertical elevation. All investigation-derived waste will be characterized and properly disposed of. (Waste management procedures are detailed in Section 5.0 of the Work Plan.) Upon completion, a final walk-through will be conducted to ensure that all aspects of the proposed project have been satisfactorily completed, and a completion report will be prepared.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

DETAILS ON SAMPLING TASKS

The following sections provide the sampling procedures for this project. Attachment 1 is provided for use in the field as a sampling matrix illustrating sampling locations, sample identification numbers, field quality control (QC) samples to be collected, analyses required, container collection, etc.

Pre-Excavation Soil and Groundwater Sampling Procedures

Prior to advancing the DPT boring, the location will be hand augered to 5 feet bgs to avoid any potential contact with buried utilities. Hand-auger cuttings will be collected in 1-foot increments and will be field screened and logged for lithology. Soil cores from beyond 5 feet bgs will be collected using a DPT rig. The DPT rig will push dual-tube continuous soil sampling equipment (Geoprobe® DT325 Dual Tube Sampling System or equivalent) into the ground by percussive hammering, hydraulic pushing, static pushing, or vibration. An outer tube and inner soil-coring barrel are simultaneously advanced. The outer tube serves to hold back formation material, while the inner core barrel is retrieved and soil samples are extracted. The outer tube typically consists of nominal 3¼-inch diameter, steel, flush-threaded rods typically 3 to 5 feet in length. The inner core barrel is typically stainless steel, nominally 1½ inches in diameter, and 1½ to 3 feet long. Soil cores will be retrieved in 4-foot acetate sampling sleeves (or equivalent) that line the inner core barrel. Soil cores will be field screened in accordance with the following procedures:

- The acetate sleeves (or equivalent) will be retrieved and sliced open to expose the soil core.
- The soil in each core interval will be visually inspected for staining. For intervals between 12 and 30 feet bgs, up to three samples will be collected if visible staining is observed or a permeable or sandy interval is identified.
- If visual staining or no permeable or sandy interval is identified between 12 and 30 feet bgs, the first sample will be collected near 18 feet bgs and an additional sample will be collected from approximately 24 and 30 feet bgs.

Samples with visual staining (or identified permeable/sandy layer) will be analyzed first. Then the next deepest sample taken that does not have visible staining will be analyzed. Deeper samples will be sent to the laboratory and held pending the results of the shallower samples. If no contaminants are detected above screening levels, the deeper samples will be discarded. It is anticipated that bedrock will be encountered at 30 feet bgs, and therefore the DPT will not be advanced deeper than 30 feet bgs. If no visual staining or permeable/sandy layer is identified, then the samples collected at 18 feet bgs and between 24 and 30 feet bgs will be analyzed.

Once samples are collected (as described below), the core lithology will be logged by a field geologist in accordance with the Unified Soil Classification System visual-manual procedure and Munsell® soil chart. In addition, photoionization detector (PID) readings will be recorded in the field logbook for each soil core.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

All soil samples sent to the laboratory will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.

2. Sample containers for each location will be stored in a cooler and will not be brought out before sample collection.

3. Once the soil core is sliced open and the sample interval is identified as described above, soil samples will first be collected into En Core® samplers to minimize loss of volatile components. Instructions for the collection of En Core samplers are as follows:

    a. Holding the coring body, the plunger rod will be pushed down until the small o-ring rests against the tabs. This will ensure that the plunger will move easily.

    b. The locking lever on the En Core T-handle will be depressed. The coring body, with the plunger end first, will be placed into the open end of the T-handle, aligning the slots of the coring body with the locking pins in the T-handle. The coring body will be twisted clockwise to lock the pins in the slots. The sampler will be checked to ensure that it is locked in place. The sampler will now be ready for use.

    c. By holding the T-handle, the coring body will be pushed into the soil until the coring body is full. When full, the small o-ring will be centered in the T-handle viewing hole. The sampler will then be removed from the soil, and any excess soil will be wiped from the coring body exterior.

    d. The coring body will be capped while it is still on the T-handle. The cap should be pushed over the flat area of the ridge. To lock the cap in place, the cap will be pushed and twisted so that it seals the sampler.

    e. The capped sampler will be removed by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.

    f. The En Core sampler will be placed in its En Core sampler bag.

    g. This procedure will be performed two more times for a total collection of three En Core samplers. Three En Cores samplers will be placed in one En Core sampler bag for VOC analysis. If TPH-purgeable analysis is also required for a site, then an additional three En Core samplers will be collected for each.

    h. If the matrix is such that En Core samplers are not able to be collected (i.e., saturated), the volatile analysis will be performed by the laboratory directly from the sample jar collected for non-VOC analysis as described in Step 4 below. This is a viable alternative to meet the project objectives.

4. Once the En Core samplers are collected, soil will also be placed into an 8-ounce glass jar filled with minimal headspace for nonvolatile analyses as required for each site.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

5. Five percent of locations will require the collection of an MS/MSD. In order to collect an MS/MSD, two additional sets of En Core samplers and containers will be collected in the same location after the collection of the original sample. One set will be labeled with the same sample number (as the original sample) and "MS," and the other set will be labeled with the same sample number and "MSD." "MS/MSD" will be noted on the COC in the comments column.

6. Each En Core sampler bag and container will be labeled, and clear packing tape will be placed over the label to secure it.

7. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.

8. After packaging, samples will be stored in a cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers).

9. Field documentation (including field logbooks and COCs) will be filled out during sample collection in accordance with Worksheet #29.

10. Nondisposable sampling equipment will be decontaminated as described below between each sample acquisition, and an equipment blank sample will be collected from the sampling equipment at a frequency of one per day. Laboratory reagent-grade water will be used as an additional rinse after Step 3 of the decontamination procedure. Water that is falling off of the equipment will be collected for the same organic and inorganic analyses required by the samples collected for that day. "EB" will be noted on the COC in the QC column for that sample.

A groundwater sample will also be collected from the same DPT boring at the same depth interval as the soil sample. Once the desired depth has been reached, the inner core barrel will be extracted from the borehole and a nominal 1-inch diameter PVC temporary well casing with 5 feet of 0.010 slotted PVC screen will be lowered inside of the outer core barrel. Once the temporary well is placed to the desired depth, the outer core barrel will be extracted 5 feet to expose the PVC screen to the formation and allow groundwater to fill within the temporary well. Groundwater samples will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.

2. Sample containers for each location will be stored in a cooler and will not be brought out before sample collection.

3. The temporary well will be developed using a low-flow bladder pump until the following conditions have been met or a maximum of 1 hour of pumping time has elapsed:

SAP Worksheet #14 – Summary of Project Tasks (Continued)

- Turbidity has stabilized to less than 50 nephelometric turbidity units (NTUs)
- Consecutive readings are within ± 5 percent for conductivity, within ± 0.2 units for pH, and ± 1 degree Celsius (°C) for temperature

If the temporary well does not produce sufficient water for purging and/or sampling, then the temporary well will be allowed to recover and water will be collected when laminar flow in the tubing is achieved, without meeting stabilization conditions.

In the event the low-flow bladder pump does not perform due to field conditions, a peristaltic pump may be used. In the event a peristaltic pump cannot be used due to field conditions, a disposable Teflon bailer will be used. The use of a peristaltic pump or bailer will be noted in the field logbook.

4. Development parameters and approximate water volumes will be recorded on the Groundwater Sampling Data Sheet (GSDS) every 3 to 5 minutes. Field instruments for measurement of water parameters including temperature, pH, turbidity, and conductivity will be calibrated prior to use. If the temporary well cannot maintain a sufficient volume of water during development (i.e., runs dry), then the temporary well will be allowed to recharge and sample collection will begin.

5. Gloves worn during purging activities will be discarded, a new pair of nitrile gloves will be donned, the sample containers will be brought out, and the caps will be loosened and placed on plastic sheeting. Solar warming of the sample bottles will be avoided as much as possible. The pharmaceutical-grade tubing connecting the low-flow bladder pump discharge to the water-quality meter flow-through cell will be disconnected from the flow-through cell. The samples will be collected directly from the end of the pharmaceutical-grade tubing. The pump will not be turned off, and the tubing will not be removed from the well between purging and sampling. Filling of sample bottles will be conducted over a 5-gallon bucket on plastic sheeting to contain any spills. Groundwater sampling and preservation procedures will be conducted as follows:

   - The pump tubing will be completely full of groundwater (no bubbles) to prevent the groundwater from being aerated as it flows through the tubing. Tubing will not touch vials during sampling.
   - Prior to collecting samples for VOCs, the pump flow rate will be reduced to between 100 and 200 milliliters per minute (mL/min) such that a steady stream of water exists. The sampling rate will be recorded on the GSDS.
   - Volatile organic analysis (VOA) vials will be filled by initially tilting the vials, allowing the pump discharge to flow gently down the inside of the vial with minimal turbulence. Each vial will be filled until a positive meniscus is formed at the top of the VOA vial. After the vial is full, it will be capped immediately, inverted, tapped lightly, and checked for the presence of air

SAP Worksheet #14 – Summary of Project Tasks (Continued)

bubbles. If air bubbles are present, the sample will be discarded and resampled using a new vial.

- Subsequently, samples for other organic and inorganic analyses will be collected, as required. The pump flow rate may be increased up to 500 mL/min to collect these containers. A field filter will be used as required for dissolved metals analysis.

6. Five percent of locations will require the collection of an matrix spike (MS)/matrix spike duplicate (MSD) if there is sufficient water present, which will be documented in the field logbook. To collect an MS/MSD, two additional sets of sample containers will be used to collect samples in the same location as the original sample. One set will be labeled with the same sample number (as the original sample) and "MS," and the other set will be labeled with the same sample number and "MSD." "MS/MSD" will be noted on the chain of custody (COC) in the QC column for that sample.

7. Each container will be labeled, and clear packing tape will be placed over the label to secure it.

8. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.

9. After packaging, samples will be stored in a cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers).

10. Field documentation (including field logbooks and COCs) will be filled out during sample collection in accordance with Worksheet #29.

11. A new length of PVC screen and new tubing for the low-flow bladder pump will be used between each sampling location.

12. Nondisposable sampling equipment will be decontaminated between each sample acquisition as described below, and an equipment blank sample will be collected from the low-flow bladder pump at a frequency of one per day. Laboratory reagent-grade water (that is certified to be analyte-free by the supplier) will be used as an additional rinse after Step 3 of the decontamination procedure. Water that is falling off of the equipment will be collected for the same organic and inorganic analyses required by the samples collected for that day. EB will be noted on the COC in the QC column for that sample.

After completing groundwater sampling at each location, the temporary well will be properly decommissioned. Boring abandonment will occur in this order to eliminate the possibility of bentonite-cement grout migrating from the soil core boring and impacting groundwater sample quality. The ground surface will be restored to pre-boring conditions.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

Post-Excavation Soil Sampling Procedure

Grab soil samples will be collected from the excavation bottom and sidewalls, along the pipeline, and from excavated utility lines. Since groundwater is shallow, every effort will be made to collect soil samples prior to encountering groundwater in the excavations so that an unsaturated soil sample may be collected. A random number generated will be used to identify sample locations on each excavation sidewall and for two locations in the bottom of each excavation. If there is staining present, then the sample locations will be biased toward the area that is stained. Samples from the excavation areas will be collected from the backhoe bucket, and a disposable scoop will be used as needed. Soil samples will be collected into En Core samplers first as described above and then into containers listed in Worksheet #19 for nonvolatile analysis as required. Samples will be packaged as described above.

Soil Gas Sampling Procedure

A sampling probe typically consists of 3-foot sections of 1½-inch-diameter, hollow, tubular steel rods connected by threads. The tip section contains a smaller section of rod that is slotted to allow soil gas to enter through it. A bulkhead union at the top of the slotted rod accommodates the connection of Tygon tubing that runs from the tip section through the steel rods to the ground surface, where the soil gas samples will be collected. During the advancement of the probe, the slotted-rod section will be covered by the outer drive casing and protected by a pointed metal drive tip. The probe will be advanced to the vadose zone (3.5 to 6 feet bgs). Once the vadose zone is reached, the metal rod will be pulled back approximately 18 inches to allow for collection of the soil gas sample.

Soil gas testing and sampling will be conducted following probe placement. The following procedure will be followed to collect the samples using 6-liter SUMMA® canisters:

1. Calculate probe volume. For example, if the dimensions of the probe are 0.5 inch in radius (1-inch diameter) and 5 feet in length, then the volume calculation is "pi x radius^2 x length of probe." So, the volume would equal 0.0273 cubic feet, which is equal to 0.77 liter or approximately 770 milliliters.
2. Attach a short piece of new Tygon^R tubing to the soil gas probe.
3. Attach a new “Y” valve to the end of the Tygon tubing.
4. Connect a vacuum sampling pump (Cole-Parmer U-07056-61 or equivalent) to one of the two remaining ends of the “Y” valve using a short piece of new Tygon tubing. The pump will have a flow meter which calculates milliliters per minute.
5. Connect the SUMMA canister to the other end of the “Y” valve.
6. With the “Y” valve positioned to allow flow to the pump, turn on the pump and purge three probe volumes using the flow meter and a timer.
7. Turn the pump off, and then switch the “Y” valve to allow flow to the SUMMA canister.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

8. Spray a compressed air canister containing 1,1-difluoroethane (or an equivalent volatile compound that is not a volatile contaminant of concern for this project) around the sample collection train of tubing and the SUMMA canister.
9. Open the SUMMA canister valve to pull a sample from the soil gas probe. A hissing sound will occur as canister is being filled.
10. When the hissing sound is no longer heard, close valve on the SUMMA canister as sampling is complete.
11. Label the SUMMA canister with the appropriate sample identification.
12. Pack the SUMMA canister and ship to the laboratory for analysis.

Monitoring Well Sampling Procedure

Groundwater sampling procedures are as follows:

1. After removing the well cap and allowing the well to equilibrate, the headspace of the well at the rim of each well casing and above the well casing in the breathing zone will be measured for VOCs using a calibrated PID. All readings will be recorded on the GSDS. The PID will be calibrated daily according to the manufacturer's specifications, using current (unexpired) standards.

2. The well will be measured (to nearest 0.01 foot) relative to a known surveyed reference point.

3. To ensure accuracy, the well will be measured three times. The probe will be lowered slowly into the well until the light or sound alarm is activated, indicating that the probe has touched the water surface. The static depth-to-water will be read directly from the tape by holding the tape to the surveyed reference point on the well casing. Water level measurements should be within 0.01 foot of each other. If they are not, the process will be repeated until measurements are within 0.01 foot of each other, thus allowing the well to stabilize. For consistency, depth-to-water measurements will be recorded to two decimal places. The three measurements, time, and final measurement for each well will be recorded on the GSDS. The depth to the bottom of the well will not be measured at this time (to avoid disturbing any sediment that may have accumulated).

4. The condition of the well will be checked for any damage or evidence of tampering. Information will be recorded on the GSDS.

5. Groundwater sampling at monitoring wells will be conducted using the low-flow purge and sampling method. (In the event the low-flow bladder pump does not perform due to field conditions, a peristaltic pump may be used. In the event a peristaltic pump cannot be used due to field conditions, a disposable Teflon bailer will be used. The use of a peristaltic pump or bailer will be noted in the field logbook and on the GSDS.) Disposable nitrile gloves will be worn during all purging and

SAP Worksheet #14 – Summary of Project Tasks (Continued)

sampling activities. Nitrile gloves will be disposed of after purging activities, and a new pair will be donned before sampling each well to avoid possible contamination. All monitoring, purging, and sampling equipment will be placed on polyethylene sheeting on the ground around the well. Sample collection bottles for each well will be left in a closed dry cooler (without ice) and will not be brought out before sample collection. The cooler containing sample bottles will be kept in the shade (if possible) or in the cab of the sampling vehicle with the windows down.

6. The screen interval will be determined from the construction logs. High-density polyethylene tubing will be measured with a cloth measuring tape, marked, and cut prior to being attached to the bladder pump. Care will be taken not to allow the tubing to touch the ground surface during measurement. The pump intake will be lowered into the well to the midpoint of the screen interval. The depth of the pump intake will be recorded on the GSDS. Care will be taken to place the pump intake more than 2 feet above the bottom of the well to avoid mobilization of any sediment present in the bottom.

7. The depth-to-water will be measured (to nearest 0.01 foot) again after lowering the pump into the well. The information will be recorded on the GSDS. The water level indicator probe will be left in the monitoring well above the water level.

8. The top end of the pump discharge tubing will be attached to the bottom end of a water-quality meter flow-through cell. The discharge tubing (if required) from the top end of the flow-through cell will be directed into a 5-gallon bucket to collect the groundwater during purging activities.

9. Personnel will start pumping the well at 200 to 500 mL/min. The water level in the well will be checked, and the discharge rate of the pump will be measured by using a graduated cylinder and stopwatch every minute for the first 5 minutes. All readings will be recorded in the field notebook. Ideally, the pumping rate should be equal to the recharge rate with little or no water level drawdown (drawdown should be less than 0.33 foot). The water level, discharge rate, and water quality indicator parameters will be measured and recorded on the GSDS every 3 to 5 minutes during purging.

10. There should be at least 1 foot of water over the tubing intake so that there is no risk of the suction being broken. Breaking the suction could entrap air in the sample. If necessary, pumping rates will be reduced to the minimum capability of the pump (100 to 200 mL/min) to avoid purging the well dry. Under no circumstances will the well be pumped dry. If a stabilized drawdown in the well cannot be maintained at less than 0.33 foot, and the water level is approaching the pump intake, the flow rate will be reduced. If drawdown cannot be maintained at less than 0.33 foot, the well will be allowed to recover. The depth to water and the time for well recovery will be measured and recorded in a field notebook. Once groundwater in the well has recovered, groundwater sampling will begin.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

11. During purging activities, the tubing will be checked for air bubbles.

12. Once the flow-rate has been established, water quality parameters will be recorded. Temperature, pH, turbidity, specific conductance, oxidation/reduction potential (ORP), and dissolved oxygen (DO) will be monitored during purging approximately every 3 to 5 minutes with a water-quality meter calibrated to the manufacturer's specifications using current (unexpired) standards. A 2-point calibration procedure will be conducted on each water-quality meter, if appropriate, twice a day (morning and afternoon) to account for temperature variance. Calibration results will be documented on the Field Calibration Form. A flow-through cell will be used to monitor the water-quality indicator parameters. If the flow cell does not measure turbidity, it will be monitored using a LaMotte 2020 turbidity meter.

13. Groundwater will be purged until indicator parameters have stabilized (or the well has recovered from drawdown). The well will be considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:

    - Consecutive readings within ± 0.1 standard units for pH
    - Consecutive readings within ± 1 °C for temperature
    - Consecutive readings within ± 10 percent for turbidity (when turbidity is greater than 10 NTUs)
    - Consecutive readings within ± 3 percent microohms per centimeter for specific conductance
    - Consecutive readings within ± 10 millivolts for ORP
    - Consecutive readings within ± 0.3 for DO (in units of milligrams per liter)

14. Bottles for the specific well to be sampled will be prelabeled as much as possible during purging activities. To ensure accuracy, the date and time of sampling will not be filled out prior to sampling. If the team consists of two people, one teammate will label while the other teammate monitors the indicator parameters.

15. Once the field parameters have stabilized, gloves worn during purging activities will be discarded, a new pair of nitrile gloves will be donned, the collection bottles for the specific well will be brought out, the caps will be loosened, and the bottles will be placed on plastic sheeting. Solar warming of the sample bottles will be avoided as much as possible. The tubing connecting the bladder pump discharge to the water-quality meter flow-through cell will be disconnected from the flow-through cell. The samples will be collected directly from the end of the tubing. The pump will not be turned off or removed from the well between purging and sampling. Filling of sample bottles will be conducted over the plastic sheeting to contain any spills. Groundwater sampling and preservation procedures will be conducted as follows:

SAP Worksheet #14 – Summary of Project Tasks (Continued)

- The pump tubing will be completely full of groundwater (no bubbles) to prevent the groundwater from being aerated as it flows through the tubing. Tubing will not touch vials during sampling.
- Prior to collecting samples for VOCs, the pump flow rate will be reduced to between 100 to 200 mL/min such that a steady stream of water exists. The sampling rate will be recorded on the GSDS.
- VOA vials will be filled by initially tilting the vials, allowing the pump discharge to flow gently down the inside of the vial with minimal turbulence. Each vial will be filled until a positive meniscus is formed at the top of the VOA vial. After the vial is full, it will be capped immediately, inverted, tapped lightly, and checked for the presence of air bubbles. If air bubbles are present, the sample will be discarded and resampled using a new vial.
- Subsequently, other organic and inorganic analytes will be collected as required. The pump flow rate may be increased up to 500 mL/min to collect these containers. A field filter will be used as required for dissolved metals analysis.
- Finally, an aliquot of water will be used to test for ferrous iron using a field test kit. The result will be recorded on the GSDS.

16. Ten percent of locations will require the collection of a field duplicate if there is sufficient water present, which will be documented in the field logbook. In order to collect a field duplicate, one additional set of containers will be used to collect a sample in the same location as the original sample. The field duplicate will be identified with a unique sample number, and "FD" will be noted on TtEC's copy of the COC in the QC column for that sample but will be blind to the laboratory.

17. Five percent of locations will require the collection of an MS/MSD if there is sufficient water present, which will be documented in the field logbook. In order to collect an MS/MSD, two additional sets of sample containers will be used to collect a sample in the same location as the original sample. One set will be labeled with the same sample number (as the original sample) and "MS," and the other set will be labeled with the same sample number and "MSD." "MS/MSD" will be noted on the COC in the QC column for that sample.

18. Each container will be labeled, and clear packing tape will be placed over the label to secure it.

19. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.

20. Immediately after collection, the samples will be stored in a cooler with sufficient ice (the cooler will be approximately half full of wet ice placed below and above sample containers).

SAP Worksheet #14 – Summary of Project Tasks (Continued)

21. Field documentation (including field logbooks and COCs) will be filled out during sample collection in accordance with Worksheet #29.

22. The pump and water level indicator probe will be removed and decontaminated. All equipment will be disassembled, and the used tubing will be placed in a large plastic garbage bag for disposal.

23. Before locking the well, the total well depth (to 0.01 foot) will be measured and recorded on the GSDS. The well will be closed and locked.

24. Nondisposable sampling equipment will be decontaminated as described below between each sample acquisition, and an equipment blank sample will be collected daily from the low-flow bladder pump. Laboratory reagent-grade water (that is certified to be analyte-free by the supplier) will be used as an additional rinse after Step 3 of the decontamination procedure. Water that is falling off of the equipment will be collected for the same organic and inorganic analyses required by the samples collected for that day. "EB" will be noted on the COC in the QC column for that sample.

Import Material Sampling Procedure

Four grab soil samples will be collected from each soil import material source. The samples will be collected using a disposable scoop as needed. Soil samples will be collected into En Core samplers first as described above and then into containers listed in Worksheet #19 for non-volatile analysis as required. Samples will be packaged as described above. Field QC samples are not required for import material samples.

Waste Characterization Sampling Procedure

Soil and water wastes will be generated during field activities and will require proper disposal. Samples will be collected as follows:

1. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting samples at each location.

2. Using a new disposable plastic scoop (or equivalent), grab soil samples will be collected into containers. En Core samplers will be collected as described above.

3. Using disposable bailers (or equivalent), wastewater samples will be collected into containers listed in Worksheet #19.

4. Each container will be labeled, and clear packing tape will be placed over the label to secure it.

5. Sample containers will be custody sealed and packaged in accordance with Worksheet #27.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

6. After packaging, samples will be stored in a cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers).

7. Field documentation including field logbooks and COCs will be filled out during sample collection in accordance with Worksheet #29. (Field QC samples are not applicable to waste characterization samples.)

Decontamination Procedure

Decontamination of nondisposable sampling equipment that comes in contact with samples (such as the bladder pump for groundwater sampling) will be performed to prevent the introduction of extraneous material into samples, and to prevent cross-contamination between samples. All sampling equipment will be decontaminated by washing with a nonphosphate detergent such as Liquinox™ (or equivalent) as follows:

1. Dilute the nonphosphate detergent with potable water in a bucket (or equivalent) as directed by the manufacturer. Wash the equipment with the nonphosphate detergent and potable water solution.

2. Use second bucket with potable water to rinse the equipment.

3. Use third bucket with deionized/distilled water to rinse the equipment again.

An equipment blank will be collected from a piece of equipment at a frequency of once per day. Laboratory reagent-grade water will be used as an additional rinse after Step 3 of the decontamination procedure described above. Water that is falling from the sampling equipment as it is being rinsed will be collected in appropriate sample bottles for analysis of the same parameters as the field samples.

DATA MANAGEMENT TASKS

The following section discusses the data management tasks for this project's field and laboratory data.

Field sampling data, including field logbooks and field forms, will be maintained. The logbooks will be numbered sequentially on the cover by the Project Quality Control Manager (PQCM) and that number will be entered into a logsheet maintained by the PQCM. A copy of all field forms will be maintained in the project file.

A copy of the COCs will be faxed/emailed to the Project Chemist on a daily basis for review and communication with the laboratory. The manila copy of the COC form will be mailed to the Project Chemist. The Project Chemist will maintain the manila copy of the COC form until submitted to the Navy Administrative Record along with the hard-copy packages as described in Worksheet #29.

SAP Worksheet #14 – Summary of Project Tasks (Continued)

The laboratory will submit data at the turnaround time to TtEC via email. This submittal will include results and basic QC results (method blanks, laboratory control sample [LCS], surrogates, and MS/MSDs). Following this submittal, the laboratory will be required to submit a Level III- or Level IV-equivalent data package within 20 business days of the sample collection date. For this project, 80 percent of the data will be submitted in an EPA Level III-equivalent data package and 20 percent will be submitted in an EPA Level IV-equivalent data package as listed on the COC and described in Worksheet #29.

Field data from the COCs (date and time collected, sample identification, etc.) will be entered into the TtEC database by the Project Chemist. Survey data will be recorded and also entered into the database. All sampling locations, except for waste characterization samples, will be surveyed in accordance with Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005). Horizontal control information will be captured in the State Plane Coordinate System (North American Datum 83) in feet, and vertical control standards will be in mean sea level (North American Vertical Datum 88) in feet. All manual entries into the database will be 100 percent verified by the Project Chemist by checking the manual entry against the hard copy information.

The laboratory will provide an electronic data deliverable (EDD) that will be compatible with TtEC requirements, and the EDD will be uploaded into the TtEC database. The data will be checked for required values and project-specific requirements by the database. Any discrepancies in the EDD will be corrected by TtEC or the laboratory will be notified to make corrections.

All analytical data generated from laboratories, except waste characterization data, will be validated by an independent data validation company. The validation report will include the data validation findings worksheets as described in Worksheet #29, and the validation qualifiers will be entered electronically in the laboratory EDD.

Within 30 calendar days of receipt of the validated data, the validation qualifiers will be uploaded into the TtEC database and the electronic data will be submitted to the Naval Installation Restoration Information Solution website in Navy Electronic Data Deliverable format in accordance with EWI EVR.6, Environmental Data Management and Required Electronic Delivery Standards (SWDIV 2005).

Hard-copy data will be stored until subsequent submittal to the Navy Administrative Record as described in Worksheet #29. The TtEC database will be electronically backed up on data storage tapes, and the backup will be stored as an archive file.

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples

Matrix: Soil [a]
Analytical Group: VOCs

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
1,1,2,2-Tetrachloroethane	79-34-5	2,900	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,1,2-Trichloroethane	79-00-5	5,500	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,2,4-Trichlorobenzene	120-82-1	400,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,2,4-Trimethylbenzene	95-63-6	280,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,1-Dichloroethene	75-35-4	1,100,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,2-Dichlorobenzene	95-50-1	10,000,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,3-Dichlorobenzene	541-73-1	None established	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,4-Dichlorobenzene	106-46-7	13,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
1,4-Dioxane	123-91-1	160,000	EPA Region 9 Industrial RSL (April 2009)	200	200	80
Benzene	71-43-2	5,600	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Chlorobenzene	108-90-7	1,500,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Chloroform	67-66-3	1,500	EPA Region 9 Industrial RSL (April 2009)	5	5	2
cis-1,2-Dichloroethene	156-59-2	10,000,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
cis-1,3-Dichloropropene	10061-01-5	8,400	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Ethylbenzene	100-41-4	29,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Hexachlorobutadiene	87-68-3	22,000	EPA Region 9 Industrial RSL (April 2009)	10	10	2
Naphthalene	91-20-3	20,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Tetrachloroethene	127-18-4	2,700	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Toluene	108-88-3	46,000,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
trans-1,2-Dichloroethene	156-60-5	500,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
trans-1,3-Dichloropropene	10061-02-6	8,400	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Trichloroethene	79-01-6	14,000	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Vinyl chloride	75-01-4	1,700	EPA Region 9 Industrial RSL (April 2009)	5	5	2
Xylenes (Total)	1330-20-7	2,600,000	EPA Region 9 Industrial RSL (April 2009)	10	10	2

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil [a]
Analytical Group: SVOCs

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
Hexachlorobenzene	118-74-1	1,100	EPA Region 9 Industrial RSL (April 2009)	330	330	167

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil [a]
Analytical Group: TPH-purgeable (gasoline) and TPH-extractable (diesel and motor oil)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific	
					QLs (mg/kg)	MDLs (mg/kg)
TPH-gasoline (C_6-C_{10})	8006-61-9	1,500	[c]	1	1	0.5
TPH-diesel (C_{10}-C_{24})	-3527 [b]	2,100	[c]	10	10	5
TPH-motor oil (C_{24}-C_{36})	68476-77-7	5,000	[c]	20	20	5

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil [a]
Analytical Group: PCBs

Analyte	CAS Number	Project Action Limit (µg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/kg)	Laboratory-specific	
					QLs (µg/kg)	MDLs (µg/kg)
Aroclor 1016	12674-11-2	1,000	[d]	50	50	20
Aroclor 1221	11104-28-2	1,000	[d]	50	50	20
Aroclor 1232	11141-16-5	1,000	[d]	50	50	20
Aroclor 1242	53469-21-9	1,000	[d]	50	50	20
Aroclor 1248	12672-29-6	1,000	[d]	50	50	20
Aroclor 1254	11097-69-1	1,000	[d]	50	50	20
Aroclor 1260	11096-82-5	1,000	[d]	50	50	20

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Matrix: Soil [a]
Analytical Group: Metals

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific	
					QLs (mg/kg)	MDLs (mg/kg)
Aluminum	7429-90-5	990,000	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Antimony	7440-36-0	410	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Arsenic	7440-38-2	36	[e]	0.5	0.5	0.1
Barium	7440-39-3	190,000	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Beryllium	7440-41-7	2,000	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Cadmium	7440-43-9	800	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Calcium	7440-70-2	None established	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Chromium	7440-47-3	1,400	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Cobalt	7440-48-4	300	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Copper	7440-50-8	41,000	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.2
Iron	7439-89-6	720,000	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Lead	7439-92-1	800	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Magnesium	7439-95-4	None established	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Manganese	7439-96-5	None established	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Mercury	7439-97-6	24	EPA Region 9 Industrial RSL (April 2009)	0.1	0.1	0.033
Molybdenum	7439-98-7	5,100	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Nickel	7440-02-0	20,000	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Potassium	7440-09-7	None established	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Selenium	7782-49-2	5,100	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Silver	7440-22-4	5,100	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1

SAP Worksheet #15.1 – Reference Limits and Evaluation Table for Soil Samples (Continued)

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/kg)	Laboratory-specific	
					QLs (mg/kg)	MDLs (mg/kg)
Sodium	7440-23-5	None established	EPA Region 9 Industrial RSL (April 2009)	100	100	20
Thallium	7440-28-0	66	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Vanadium	7440-62-2	5,200	EPA Region 9 Industrial RSL (April 2009)	0.5	0.5	0.1
Zinc	7440-66-6	310,000	EPA Region 9 Industrial RSL (April 2009)	1	1	0.5

Notes:

[a] Soil samples include excavation, import material, and waste. The project action limits listed herein apply to excavation and import material samples only.
[b] Value listed is from the valid value list from the Navy Electronic Data Deliverable (NEDD) for analytes that do not have CAS numbers.
[c] CH2M Hill. 2009. Technical Memorandum: Tier 2 Risk Assessment Approach for Water Board Sites in the Eastern Early Transfer Parcel, Lennar Mare Island, Vallejo, California. April 9. (Table 3).
[d] The TSCA soil concentration for residential/unrestricted use is 1 mg/kg (or 1,000 µg/kg). Furthermore, EPA Headquarters has accepted the 1 mg/kg soil standard as being protective for residential use under CERCLA based on an excess cancer risk of 1 x 10^{-5}. See page 28 of EPA's Guidance on Remedial Actions for Superfund Sites with PCB Contamination (OSWER Directive No. 9355.4-01 [August 1990]).
[e] TtEMI. 2002. Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, Vallejo, California. April 26.

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SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples

Matrix: Water [a]
Analytical Group: VOCs

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
1,1,2,2-Tetrachloroethane	79-34-5	261	RML [b]	1	1	0.2
1,1,2-Trichloroethane	79-00-5	527	RML [b]	1	1	0.2
1,2,4-Trichlorobenzene	120-82-1	1,690	RML [b]	1	1	0.2
1,2,4-Trimethylbenzene	95-63-6	616	RML [b]	1	1	0.2
1,1-Dichloroethene	75-35-4	2,800	RML [b]	1	1	0.2
1,2-Dichlorobenzene	95-50-1	42,100	RML [b]	1	1	0.2
1,3-Dichlorobenzene	541-73-1	42,100	RML [b]	1	1	0.2
1,4-Dichlorobenzene	106-46-7	445	RML [b]	1	1	0.2
1,4-Dioxane	123-91-1	5,090	RML [b]	80	80	40
Benzene	71-43-2	62.1	RML [b]	1	1	0.2
Chlorobenzene	108-90-7	113,000	RML [b]	1	1	0.2
Chloroform	67-66-3	419	RML [b]	1	1	0.2
cis-1,2-Dichloroethene	156-59-2	3,360	RML [b]	1	1	0.2
cis-1,3-Dichloropropene	10061-01-5	53.0	RML [b]	1	1	0.2
Ethylbenzene	100-41-4	300	[c]	1	1	0.2
Hexachlorobutadiene	87-68-3	96.7	RML [b]	1	1	0.2
Naphthalene	91-20-3	439	RML [b]	2	2	0.5
Tetrachloroethene	127-18-4	123	RML [b]	1	1	0.2
Toluene	108-88-3	400	[c]	1	1	0.2
trans-1,2-Dichloroethene	156-60-5	2,820	RML [b]	1	1	0.2

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
trans-1,3-Dichloropropene	10061-02-6	53.0	RML [b]	1	1	0.2
Trichloroethene	79-01-6	567	RML [b]	1	1	0.2
Vinyl chloride	75-01-4	4.04	RML [b]	1	1	0.2
Xylenes (Total)	1330-20-7	5,300	[c]	2	2	0.2

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: SVOCs

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Hexachlorobenzene	118-74-1	21.3	RML [b]	10	10	5

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: TPH-purgeable (gasoline) and TPH-extractable (diesel and motor oil)

Analyte	CAS Number	Project Action Limit (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Laboratory-specific	
					QLs (mg/L)	MDLs (mg/L)
TPH-gasoline (C_6-C_{10})	8006-61-9	5	[c]	0.1	0.1	0.02
TPH-diesel (C_{10}-C_{24})	-3527 [d]	2.5	[c]	0.5	0.5	0.1
TPH-motor oil (C_{24}-C_{36})	68476-77-7	2.5	[c]	1	1	0.1

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: PCBs

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Aroclor 1016	12674-11-2	16	[c]	1	1	0.5
Aroclor 1221	11104-28-2	16	[c]	1	1	0.5
Aroclor 1232	11141-16-5	16	[c]	1	1	0.5
Aroclor 1242	53469-21-9	16	[c]	1	1	0.5
Aroclor 1248	12672-29-6	16	[c]	1	1	0.5
Aroclor 1254	11097-69-1	16	[c]	1	1	0.5
Aroclor 1260	11096-82-5	16	[c]	1	1	0.5

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: Metals

Analyte	CAS Number	Project Action Limit [a] (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Aluminum	7429-90-5	480	[e]	100	100	50
Antimony	7440-36-0	5.6	[e]	1	1	0.5
Arsenic	7440-38-2	78	[ef]	1	1	0.5
Barium	7440-39-3	1,200	[e]	1	1	0.5
Beryllium	7440-41-7	1.6	[e]	1	1	0.5
Cadmium	7440-43-9	16	[e]	1	1	0.5
Calcium	7440-70-2	680,000	[e]	100	100	50
Chromium	7440-47-3	180	[f]	1	1	0.5
Cobalt	7440-48-4	100	[e]	1	1	0.5
Copper	7440-50-8	33	[e]	1	1	0.5
Iron	7439-89-6	140,000	[e]	100	100	50
Lead	7439-92-1	10	[e]	1	1	0.5
Magnesium	7439-95-4	1,500,000	[e]	100	100	50
Manganese	7439-96-5	5,400	[e]	1	1	0.5
Mercury	7439-97-6	0.22	[e]	0.5	0.5	0.1
Molybdenum	7439-98-7	240	[e]	2	2	1
Nickel	7440-02-0	8.2	[f]	1	1	0.5
Potassium	7440-09-7	210,000	[e]	100	100	50
Selenium	7782-49-2	12	[e]	1	1	0.5
Silver	7440-22-4	15	[e]	1	1	0.5
Sodium	7440-23-5	7,400,000	[e]	100	100	50

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Analyte	CAS Number	Project Action Limit [a] (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Thallium	7440-28-0	None established	[e]	1	1	0.5
Vanadium	7440-62-2	140	[e]	1	1	0.5
Zinc	7440-66-6	260	[e]	10	10	5

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: Dissolved gases

Analyte	CAS Number	Project Action Limit [a] (µg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (µg/L)	Laboratory-specific	
					QLs (µg/L)	MDLs (µg/L)
Carbon dioxide	124-38-9	None established	Not applicable [g]	1,200	1,200	600
Ethane	74-84-0	None established	Not applicable [g]	2	2	0.6
Ethene	74-85-1	None established	Not applicable [g]	2	2	0.6
Methane	74-86-2	None established	Not applicable [g]	2	2	0.6

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: Anions (chloride, nitrate, nitrite, ortho-phosphate, and sulfate), TOC, TKN, and Ammonia

Analyte	CAS Number	Project Action Limit [a] (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Laboratory-specific	
					QLs (mg/L)	MDLs (mg/L)
Chloride	16887-00-6	None established	Not applicable [g]	0.2	0.2	0.1
Nitrate	14797-55-8	None established	Not applicable [g]	0.1	0.1	0.05
Nitrite	14797-65-0	None established	Not applicable [g]	0.1	0.1	0.05
Ortho-phosphate	-15 [d]	None established	Not applicable [g]	0.5	0.5	0.25
Sulfate	14808-79-8	None established	Not applicable [g]	0.5	0.5	0.25
Total Organic Carbon (TOC)	-28 [d]	None established	Not applicable [g]	1	1	0.5
Total Kjeldahl Nitrogen (TKN)	-20 [d]	None established	Not applicable [g]	0.1	0.1	0.05
Ammonia	7664-41-7	None established	Not applicable [g]	0.1	0.1	0.05

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: Microbial testing – volatile fatty acids

Analyte	CAS Number	Project Action Limit [a] (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (mg/L)	Laboratory-specific	
					QLs (mg/L)	MDLs (mg/L)
Acetic Acid	64-19-7	None established	Not applicable [g]	1	1	Not applicable [h]
Butyric Acid	107-92-6	None established	Not applicable [g]	1	1	Not applicable [h]
Lactic Acid	50-21-5	None established	Not applicable [g]	1	1	Not applicable [h]
Propionic Acid	79-09-4	None established	Not applicable [g]	1	1	Not applicable [h]
Pyruvic Acid	127-17-3	None established	Not applicable [g]	4	4	Not applicable [h]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water
Analytical Group: Microbial testing – phospholipid fatty acids

Analyte	CAS Number	Project Action Limit [a]	Project Action Limit Reference	Project Quantitation Limit Goal	Laboratory-specific	
					QLs	MDLs
Anaerobic metal reducers (BrMonos)	-125 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]
Cells	-126 [d]	None established	Not applicable [g]	Result reported in cells/mL	Not applicable [h]	Not applicable [h]
Decreased Permeability	-130 [d]	None established	Not applicable [g]	Result reported as a ratio	Not applicable [h]	Not applicable [h]
Eukaryotes (polyenoics)	-131 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]
Firmicutes (TerBrSats)	-132 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]
General (Nsats)	-121 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]
Proteobacteria (Monos)	-140 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]
Slowed Growth	-141 [d]	None established	Not applicable [g]	Result reported as a ratio	Not applicable [h]	Not applicable [h]
SRB/Actinomycetes (MidBrSats)	-142 [d]	None established	Not applicable [g]	Result reported in percent	Not applicable [h]	Not applicable [h]

SAP Worksheet #15.2 – Reference Limits and Evaluation Table for Groundwater Samples (Continued)

Matrix: Water [a]
Analytical Group: Microbial testing - qPCR

Analyte	CAS Number	Project Action Limit [a] (mg/L)	Project Action Limit Reference	Project Quantitation Limit Goal (cells/mL)	Laboratory-specific	
					QLs (cells/mL)	MDLs (cells/mL)
Phenol hydroxylase (qPHE)	[i]	None established	Not applicable [g]	Not applicable	Not applicable [h]	Not applicable [h]
Biphenyl dioxygenase (qBPH)	[i]	None established	Not applicable [g]	Not applicable	Not applicable [h]	Not applicable [h]
Toluene dioxygenase (qTOD)	[i]	None established	Not applicable [g]	Not applicable	Not applicable [h]	Not applicable [h]
Dehalococcoides (qDHC)	-123 [d]	None established	Not applicable [g]	Not applicable	Not applicable [h]	Not applicable [h]
DHC functional genes (qTCE, qVC-Reductase, and qBVC)	[i]	None established	Not applicable [g]	Not applicable	Not applicable [h]	Not applicable [h]

Notes:

[a] Water samples include groundwater samples from the borings and monitoring wells and wastewater. Project action limits listed are applicable to groundwater samples only. The remainder of the analytical tests that do no have established action limits are being performed at the request of the DON to gather data for the in situ bioremediation.
[b] Removal monitoring levels (RMLs) are from Table 3-3 in the Work Plan.
[c] Water Board. 2008. California Regional Water Quality Control Board, San Francisco Bay Region. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final (Tables E-2, Shallow Soil Gas Levels for Evaluation of Potential Vapor Intrusion Concerns, Commercial/Industrial Land Use). November 2007 (Revised May 2008).
[d] Value listed is from the valid value list from the Navy Electronic Data Deliverable (NEDD) for analytes that do not have CAS numbers.
[e] TtEMI. 2002. Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, Vallejo, California. April 26.
[f] Water Board. 2008. California Regional Water Quality Control Board, San Francisco Bay Region. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final (Table F-1b, taking the Final Groundwater Screening Level) November 2007 (Revised May 2008).
[g] These analyses are being conducted to evaluate the application and/or effectiveness of the ORC remedial treatment option. Therefore, project action limits are not applicable.
[h] These analyses are specialty microbiological testing wherein quantitation limits and method detection limits may not be applicable.
[i] This analyte does not have a NEDD valid value for the CAS number. This value will have to be requested.

SAP Worksheet #15.3 – Reference Limits and Evaluation Table for Soil Gas Samples

Matrix: Soil Gas
Analytical Group: VOCs

Analyte	CAS Number	Project Action Limit ($\mu g/m^3$)	Project Action Limit Reference	Project Quantitation Limit Goal ($\mu g/m^3$)	Laboratory-specific	
					QLs ($\mu g/m^3$)	MDLs ($\mu g/m^3$)
1,1,2,2-Tetrachloroethane	79-34-5	205	[a]	35.0	35.0	8.5
1,1,2-Trichloroethane	79-00-5	696	[a]	28.0	28.0	2.9
1,2,4-Trichlorobenzene	120-82-1	3,380	[a]	25.0	25.0	16.1
1,2,4-Trimethylbenzene	95-63-6	3,350	[a]	25.0	25.0	8.2
1,1-Dichloroethene	75-35-4	72,200	[a]	20.0	20.0	2.9
1,2-Dichlorobenzene	95-50-1	86,900	[a]	30.0	30.0	12.0
1,3-Butadiene	106-99-0	33.9	[a]	11.0	11.0	1.9
1,3-Dichlorobenzene	541-73-1	86,900	[a]	30.0	30.0	12.0
1,4-Dichlorobenzene	106-46-7	1,110	[a]	30.0	30.0	12.3
1,4-Dioxane	123-91-1	751	[a]	73.0	73.0	2.6
Benzene	71-43-2	353	[a]	16.0	16.0	1.1
Chlorobenzene	108-90-7	417,000	[a]	23.0	23.0	2.5
Chloroform	67-66-3	1,730	[a]	25.0	25.0	2.2
cis-1,2-Dichloroethene	156-59-2	14,500	[a]	20.0	20.0	2.1
cis-1,3-Dichloropropene	10061-01-5	817	[a]	23.0	23.0	1.1
Ethylbenzene	100-41-4	3,300	[a]	22.0	22.0	3.2
Hexachlorobutadiene	87-68-3	645	[a]	220.0	220.0	24.2
Naphthalene	91-20-3	401	[a]	100	100	13.1
Tetrachloroethene	127-18-4	2,000	[a]	34.0	34.0	3.9
Toluene	108-88-3	180,000	[a]	19.0	19.0	0.8
trans-1,2-Dichloroethene	156-60-5	25,600	[a]	20.0	20.0	2.5
trans-1,3-Dichloropropene	10061-02-6	817	[a]	23.0	23.0	2.8
Trichloroethene	79-01-6	5,530	[a]	27.0	27.0	2.7
Vinyl chloride	75-01-4	116	[a]	13.0	13.0	1.9

SAP Worksheet #15.3 – Reference Limits and Evaluation Table for Soil Gas Samples (Continued)

Analyte	CAS Number	Project Action Limit ($\mu g/m^3$)	Project Action Limit Reference	Project Quantitation Limit Goal ($\mu g/m^3$)	Laboratory-specific	
					QLs ($\mu g/m^3$)	MDLs ($\mu g/m^3$)
Xylenes (Total)	1330-20-7	58,000	[a]	22.0	22.0	5.0
1,1,-difluoroethane	75-37-6	10,000	Leak Test Compound	10,000	54.3	5

Notes:

[a] Screening criteria are from Table 3-3 in the Work Plan.

SAP Worksheet #16 – Project Schedule / Timeline Table

The project schedule is provided in the Work Plan as Figure 7-1.

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SAP Worksheet #17 – Sampling Design and Rationale

The sampling design described below is based on the recommendations in the EE/CA/IRAW (TtEC 2009). The rationale behind the sampling design is to confirm the existing site conditions prior to the removal action, evaluate the application of ORC at the site as a remedial action, and then monitor the effectiveness of the ORC application at reducing contamination.

Prior to excavation activities at the site, DPT will be used for vertical lithologic logging and collection of soil and groundwater samples. One DPT boring will be advanced to a maximum depth of 30 feet within the source area (FDP) to delineate vertical contamination. Since most data for the site have been collected near ground surface and to a depth of 12 feet bgs, the intention of this boring is to collect soil and groundwater samples from a deeper interval (between 12 and 30 feet bgs), as requested by the Water Board. The proposed DPT location (D1C85GB017) is shown on Figure A-2. Soil and groundwater samples will be collected from this boring as described in the sampling procedures below and analyzed for parameters in Worksheet #18.

The existing monitoring wells located within the site (D1C85W01, D1C85W02, and D1C85W03; see Figure A-1) will be sampled prior to excavation activities, and the samples analyzed for the parameters listed in Worksheet #18.

Soil gas samples will be collected from five locations (depicted on Figure A-1) using direct push technology to install a sampling probe with a slotted screen-point sampling tip. Soil gas samples will be analyzed for the parameters listed in Worksheet #18.

Two wells (D1C85W01 and D1C85W02) located within the excavation boundary (Figure A-1) will be destroyed prior to excavation and their replacements installed in alternate locations following backfilling of the excavations. The work will be performed by a drilling contractor licensed in the state of California and under the supervision of TtEC.

Soil samples will be collected during excavation activities. One bottom and four sidewall excavation samples will be collected from the Building 742 FDP excavation area, the Manhole D1-C85 excavation area, and the grinder sump foundation excavation area for a total of three bottom excavation samples and twelve sidewall excavation samples. Along the crushed stormwater pipeline, one bottom excavation soil sample will be collected every 25 feet except in areas where the pipeline overlaps the Building 742 FDP and Manhole D1-C85 excavation areas. In addition, several buried utility lines cross the excavation boundaries. To investigate whether the utility lines are serving as potential contaminant migration pathways, one soil sample per utility line will be collected from the bedding material. Since groundwater is shallow, every effort will be made to collect soil samples prior to encountering groundwater in the excavations so that an unsaturated soil sample may be collected. If staining is present, then the sample locations will be biased toward the area that is stained. All soil samples from excavation activities will be analyzed for parameters listed in Worksheet #18.

Four new monitoring wells (D1C85W01R, D1C85W02R, D1C85W04, and D1C85W05) will be installed at the site using hollow-stem auger drilling methods. Proposed groundwater monitoring well locations are shown on Figure A-3. The rationale for selecting the location of the proposed new wells is to monitor groundwater upgradient (as a check for potential unknown sources),

SAP Worksheet #17 – Sampling Design and Rationale (Continued)

within the known source areas (and as replacement wells for those that will be destroyed by excavation activities), and downgradient of the excavation footprint (and closer to the Mare Island Straight as requested by the Water Board). In addition, a total of five soil gas monitoring probes (D1C85SG01, D1C85SG02, D1C85SG03, D1C85SG04, and D1C85SG05) will be installed at the site and will be placed in close proximity to the groundwater monitoring well locations. Proposed soil gas monitoring probes locations are shown on Figure A-3. The probes will be installed adjacent to wells upgradient of the site, within the excavation/source area, and downgradient of the site. Groundwater from the four new and one existing well (D1C85W03) and soil gas from the five new probes will be collected for a minimum of four quarters and analyzed for the parameters listed in Worksheet #18.

After four quarters of monitoring, groundwater and soil gas monitoring results will be reviewed to determine if further sampling and/or ORC application is necessary.

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Pre-excavation Sampling					
D1C85GB017	Soil	TBD [b]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	TBD [b]	Worksheet #14
D1C85GB017	Water	TBD [b]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved)	TBD [b]	Worksheet #14
D1C85TSG01	Soil Gas	3–5	VOCs	1	Worksheet #14
D1C85TSG02	Soil Gas	3–5	VOCs	1	Worksheet #14
D1C85TSG03	Soil Gas	3–5	VOCs	1	Worksheet #14
D1C85TSG04	Soil Gas	3–5	VOCs	1	Worksheet #14
D1C85TSG05	Soil Gas	3–5	VOCs	1	Worksheet #14
D1C85W01	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing	1	Worksheet #14
D1C85W02	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing	1	Worksheet #14
D1C85W03	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing	1	Worksheet #14

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Excavation Sampling					
FDP North SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
FDP South SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
FDP East SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
FDP West SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
FDP Bottom	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Manhole North SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Manhole South SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Manhole East SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Manhole West SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Manhole Bottom	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Grinder Sump North SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Grinder Sump South SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Grinder Sump East SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Grinder Sump West SW	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
Grinder Sump Bottom	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	1	Worksheet #14
Pipeline X	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	[d]	Worksheet #14
Utility X	Soil	Random [c]	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	[e]	Worksheet #14
Quarterly Monitoring					
D1C85W01R	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing [f]	4 (once per quarter)	Worksheet #14
D1C85W02R	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing [f]	4 (once per quarter)	Worksheet #14
D1C85W03	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing [f]	4 (once per quarter)	Worksheet #14
D1C85W04	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing [f]	4 (once per quarter)	Worksheet #14
D1C85W05	Water	5–15	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate), TOC, TKN, ammonia, and microbial testing [f]	4 (once per quarter)	Worksheet #14

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location / ID Number [a]	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
D1C85SG01	Soil Gas	3–5	VOCs	4 (once per quarter)	Worksheet #14
D1C85SG02	Soil Gas	3–5	VOCs	4 (once per quarter)	Worksheet #14
D1C85SG03	Soil Gas	3–5	VOCs	4 (once per quarter)	Worksheet #14
D1C85SG04	Soil Gas	3–5	VOCs	4 (once per quarter)	Worksheet #14
D1C85SG05	Soil Gas	3–5	VOCs	4 (once per quarter)	Worksheet #14
Miscellaneous					
Import Material	Soil	Random	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals [f]	4	Worksheet #14
Waste	Soil and Water	N/A	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals [f]	[h]	Worksheet #14

SAP Worksheet #18 – Sampling Locations and Methods/SOP Requirements Table (Continued)

Notes:

[a] Specific sampling IDs for each sample location are identified in Attachment 1 of this SAP (Field Sampling Matrix).

[b] The boring depths for soil and groundwater will be determined in the field based on visual observation and the determination of the most permeable layer using field logging as described in Worksheet #14. More than one sample may also be collected for soil and water in this boring based on criteria described in Worksheet #14. Number of samples and final depths for each of the samples will be recorded in the field logbook.

[c] Soil samples will be collected at random locations in the excavation area. If staining is present, then the sample locations will be biased toward the area that is stained. The location of the sample collected will be noted in the field logbook.

[d] Along the crushed stormwater pipeline, one bottom excavation soil sample will be collected every 25 feet except in areas where the pipeline overlaps the Building 742 FDP and Manhole D1-C85 excavation areas.

[e] Once utilities are identified, one sample per utility will be collected. Sample depths are unknown until the pipeline and surrounding soils are removed and the utilities are uncovered. Depths for each sample will be recorded in the field logbook.

[f] Sample analysis frequency for parameters such as microbial testing may be reduced during the quarterly events based on review of data.

[g] Additional analyses may be required by the DON or disposal facility. If additional analyses are requested that are not detailed in this SAP, standard laboratory quantitation limits and QC criteria will be used in accordance with the DOD QSM.

[h] Frequency of waste sampling will be determined in the field based on the disposal facility requirements.

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SAP Worksheet #19 – Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Soil [a]	VOCs	EPA Method 5035A/8260B EMAX-8260	Three 5-gram En Core samplers [b]	15 grams	4±2°C	48 hours/14 days [c]
Soil [a]	TPH-purgeable	EPA Method 5035A/8015B EMAX-8015G	Three 5-gram En Core samplers [b]	15 grams	4±2°C	48 hours/14 days [c]
Soil [a]	SVOCs	EPA Method 3550B/8270C EMAX-8270	One 8-ounce glass jar	8 ounces	4±2°C	14 days/40 days [c]
Soil [a]	TPH-extractable	EPA Method 3550B/8015B EMAX-8015D			4±2°C	14 days/40 days [c]
Soil [a]	PCBs	EPA Method 3550B/8082 EMAX-8082			4±2°C	14 days/40 days [c]
Soil [a]	Metals	EPA Method 3050B/6020A/7471A EMAX-6020 and EMAX-7471			4±2°C	180 days [d]

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Water [e]	VOCs	EPA Method 5030B/8260B EMAX-8260	Three 40-mL VOA vials	120 mL	pH ≤ 2 w/HCl, 4±2°C	14 days [d]
Water [e]	TPH-purgeable	EPA Method 5030B/8015B EMAX-8015G	Three 40-mL VOA vials	120 mL	pH ≤ 2 w/HCl, 4±2°C	14 days [d]
Water [e]	SVOCs	EPA Method 3520C/8270C EMAX-8270C	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days [c]
Water [e]	TPH-extractable	EPA Method 3520C/8015B EMAX-8015D	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days [c]
Water [e]	PCBs	EPA Method 3520C/8082 EMAX-8082	Two 1-L amber bottles	2 L	4±2°C	7 days/40 days [c]
Water [e]	Metals (dissolved)	EPA Method 3010A/6020A/7470A EMAX-6020 and EMAX-7470	One 250-mL poly bottle	500 mL	pH ≤ 2 w/HNO_3 [f]	180 days [d]
Water [e]	Dissolved Gases	RSK 175 EMAX-RSK 175	Three 40-mL VOA vials	120 mL	4±2°C	14 days [d]
Water [e]	Anions (chloride, nitrate, nitrite, ortho-phosphate, sulfate)	EPA Method 300.0 EMAX-300.0	One 125-mL poly bottle	125 mL	4±2°C	48 hours (nitrate, nitrite, ortho-phosphate) 28 days (chloride, sulfate)

SAP Worksheet #19 – Analytical SOP Requirements Table (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Water [e]	TOC	SM 5310B EMAX-5310B	One 125-mL poly bottle	125 mL	pH ≤ 2 w/ HCL, 4±2°C	28 days
Water [e]	TKN	SM 4500-N EMAX-4500-NorgC	One 250-mL poly bottle	250 mL	pH ≤ 2 w/ H2SO4 4±2°C	28 days
Water [e]	Ammonia	SM 4500-NH3C EMAX-4500-NH3C	One 125-mL poly bottle	125 mL	pH ≤ 2 w/ H2SO4 4±2°C	28 days
Water [e]	Volatile Fatty Acids	Microbial Insights SOP for VFA	Three 40-mL VOA vials	120 mL	4±2°C	14 days
Water [e]	Phospholipid Fatty Acids	Microbial Insights SOP for PLFA	Two 1-L bottles	2 L	4±2°C	48 hours
Water [e]	qPCR	Microbial Insights for qPCR	Two 1-L bottles	2 L	4±2°C	48 hours
Soil Gas	VOCs	EPA Method TO-15 Modified	One 6-L SUMMA canister	6 L	None	30 days

Notes:

[a] Soil includes excavation samples, soil waste samples, and import material samples.
[b] If En Core samplers cannot be used due to saturated soil, then only the 8-ounce jar will be used, and VOC analysis will be conducted from the jar sample. This is a viable alternative to meet the project objectives.
[c] The time listed is the maximum holding time for the preparation/analysis.
[d] The time listed is the maximum holding time for the analysis. Preparation time is included in the analytical method holding time.
[e] Water includes groundwater and associated field QC samples (equipment blank, source blank, and field duplicate samples).
[f] Sample for dissolved metals is prefiltered in the field with a 0.45-micron filter prior to dispensing into container with HNO_3.

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SAP Worksheet #20 – Field Quality Control Sample Summary Table

Field QC samples are listed below for the soil boring and groundwater samples. (Field QC samples are not applicable to waste characterization samples, and therefore are not discussed below.)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA Trip Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	VOCs	16 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	23 [e]
Soil	TPH-purgeable	16 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	23 [e]
Soil	SVOCs	16 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	23 [e]
Soil	TPH-extractable	16 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	23 [e]
Soil	PCBs	16 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	23 [e]
Soil	Metals	4 [a]	Not applicable [b]	1	1 [c]	5 [d]	Not applicable	Not applicable	11 [e]

SAP Worksheet #20 – Field Quality Control Sample Summary Table (Continued)

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates	No. of MS/MSDs	No. of Field Blanks	No. of Equipment Blanks	No. of VOA Trip Blanks	No. of PT Samples	Total No. of Samples to Lab
Water	VOCs	24	2 [b]	2	1 [c]	5 [d]	1 per cooler with VOCs	Not applicable	34 [e]
Water	TPH-purgeable	24	2 [b]	2	1 [c]	5 [d]	1 per cooler with VOCs	Not applicable	34 [e]
Water	SVOCs	24	2 [b]	2	1 [c]	5 [d]	Not applicable	Not applicable	34 [e]
Water	TPH-extractable	24	2 [b]	2	1 [c]	5 [d]	Not applicable	Not applicable	34 [e]
Water	PCBs	24	2 [b]	2	1 [c]	5 [d]	Not applicable	Not applicable	34 [e]
Water	Metals	24	2 [b]	2	1 [c]	5 [d]	Not applicable	Not applicable	34 [e]
Water	Dissolved Gases	23	2 [b]	2	1 [c]	5 [d]	Not applicable	Not applicable	33 [e]
Water	Anions, TOC, TKN, Ammonia	23	Not applicable	2	Not applicable	Not applicable	Not applicable	Not applicable	25 [e]
Water	Microbial testing	23	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	23 [e]
Soil Gas	VOCs	25	Not applicable	Not applicable	1 (ambient)	Not applicable	Not applicable	Not applicable	26 [e]

Notes:

[a] The number of soil samples is based on samples listed in Worksheet #18.
[b] Field duplicates are collected only for water samples from groundwater monitoring wells.
[c] Field blanks (or source blanks) are only required if the laboratory does not provide certification that the water used for equipment blanks is below quantitation limits for all analyses listed.
[d] Equipment blanks are collected at a frequency of one per day per piece of equipment. For this project, it is estimated that five equipment blanks will be collected. This number may increase/decrease depending on the number of sampling days.
[e] Total number of samples may vary depending on items in notes a through d listed above.

SAP Worksheet #21 – Project Sampling SOP References Table

Sampling SOPs are not used for this project. Instead, the details of the sampling procedures associated with this project are included in Worksheet #14.

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SAP Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference	Comments
PID	Calibrate using isobutylene standard	Daily	Pass/fail	If test fails, PID will be inspected and recalibrated. If recalibration fails, then return PID to the vendor until PID passes.	Site Health and Safety Officer	Not applicable [a]	None
Water quality meter	Calibration standards for pH, specific conductance, oxidation/reduction potential, and dissolved oxygen per manufacturer's recommendation	Daily	Within manufacturer's recommended value	According to manufacturer's instructions	Sampling personnel	Not applicable [a]	None

Notes:

[a] The manufacturer's instructions will be used as a standard operating procedure for the calibration and operation of the photoionization detector.

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SAP Worksheet #23 – Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
EMAX-8260	Volatile Organics by GCMS Rev.4	Definitive	Soil/water VOCs	GC/MS	EMAX	N
EMAX-8015G	Gasoline Range Organics, Rev. 2	Definitive	Soil/water TPH-purgeable	GC/PID	EMAX	N
EMAX-8015D	Diesel Range Organics, Rev. 3	Definitive	Soil/water TPH-extractable	GC/FID	EMAX	N
EMAX-8082	PCBs by GC Rev.2	Definitive	Soil/water PCBs	GC/MS	EMAX	N
EMAX-6020	Trace Metals by ICP, Rev. 5	Definitive	Soil/water Metals	ICP	EMAX	N
EMAX-7471	Mercury in Solid or Semisolid Waste Rev.4	Definitive	Soil Mercury	Cold Vapor	EMAX	N
EMAX-7470	Mercury in Liquid Waste Rev.4	Definitive	Water Mercury	Cold Vapor	EMAX	N
EMAX-RSK 175	Dissolved Gases, Rev. 1	Definitive	Water Dissolved gases	GC/Thermal Conductivity Detector	EMAX	N
EMAX-300.0	Ion Chromatography Analysis, Rev. 5	Definitive	Water Anions	IC/Conductivity	EMAX	N
EMAX-5310B	Total Organic Carbon, Rev. 1	Definitive	Water TOC	Combustion-IR	EMAX	N
EMAX-4500-NorgC	Total Kjeldahl Nitrogen, Rev. 0	Definitive	Water TKN	Spectrometer	EMAX	N

SAP Worksheet #23 – Analytical SOP References Table (Continued)

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
EMAX-4500-NH3C	Ammonia-N, Rev. 0	Definitive	Water Ammonia	Colorimetric	EMAX	N
MI SOP VFA [a]	Microbial Insights SOP for VFAs, Revision 1.1, 5/22/09	Definitive	Water Volatile Fatty Acids	Not applicable	Microbial Insights	N
MI SOP PLFA [a]	Microbial Insights SOP for PLFAs, Revision 1.2, 5/22/09	Definitive	Water Phospholipid Fatty Acids	Not applicable	Microbial Insights	N
MI SOP qPCR [a]	Microbial Insights SOP for qPCR, Revision1.0, 5/22/09	Definitive	Water qPCR	Not applicable	Microbial Insights	N
ATL SOP #91	Analysis of Volatile Organic Compounds in SUMMA Polished Canisters; Modified EPA Methods TO-14A/TO-15 (5&20 ppbv)	Definitive	Soil Gas VOCs	GC/MS	Air Toxics	N

Notes:

[a] The methods listed for Microbial Insights are for microbiological testing and do not employ the use of analytical instruments. Therefore, these methods will not be referenced in the worksheets that follow regarding analytical instrumentation: #24, 25, 28, 34, and 35.

SAP Worksheet #24 – Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	1. Average response factor (RF) for SPCCs: VOCs ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, and ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethene. 2. RSD for RFs for CCCs: VOCs ≤ 30% and one option below: a. Option 1: RSD for each analyte ≤ 15% b. Option 2: linear least squares regression r ≥ 0.995 c. Option 3: non-linear regression – coefficient of determination $r^2 \geq 0.99$ (6 points will be used for second order, 7 points shall be used for third order)	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet #25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-8260
GC/MS	Second source calibration verification	Once after each initial calibration	Value of second source for all analytes within ±25% of expected value (initial source) except for the following compounds due to erratic chromatographic behavior: bromomethane, chloroethane, chloromethane, dichlorodifluoromethane within +/- 35% of expected value.	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8260

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	1. Average RF for SPCCs: VOCs ≥ 0.30 for chlorobenzene and 1,1,2,2-tetrachloroethane, and ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethene. 2. %Difference/Drift for CCCs: VOCs ≤ 20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed. Samples will be reanalyzed once the calibration verification sample is within acceptance criteria.	Analyst	EMAX-8260
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Linear-mean RSD ≤ 20%	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet #25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-8015G

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8015G
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: Every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8015G

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	1. Average response factor (RF) for SPCCs: SVOCs ≥ 0.050. 2. RSD for RFs for CCCs: SVOCs ≤ 30% and one option below: • Option 1: RSD for each analyte ≤ 15% • Option 2: linear least squares regression r ≥ 0.995 • Option 3: non-linear regression – coefficient of determination r2 ≥ 0.99 (6 points will be used for second order, 7 points shall be used for third order)	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet # 25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-8270
GC/MS	Second source calibration verification	Once after each initial calibration	Value of second source for all analytes within ±25% of expected value (initial source)	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8270

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	Average RF for SPCCs: SVOCs ≥ 0.050. %Difference/Drift for CCCs: SVOCs ≤ 20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed. Samples will be reanalyzed once the calibration verification sample is within acceptance criteria.	Analyst	EMAX-8270
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Linear mean RSD ≤ 20%	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet #25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-8015D

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8015D
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: Every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8015D
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	Mean RSD for each PCB ≤ 20%	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet # 25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-8082

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 15% of expected value (initial source)	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-8082
GC	Calibration Verification (Initial [ICV] and continuing [CCV])	ICV: Daily, before sample analysis CCV: After every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed. Samples will be reanalyzed once the ICV and CCV are within acceptance criteria.	Analyst	EMAX-8082

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP	Initial Calibration (ICAL) – minimum one high standard and a calibration blank	Daily initial calibration prior to sample analysis	Acceptable ICV (all analytes within + 10% of expected value and RSD of replicate integrations: < 5%)	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet # 25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-6020
ICP	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected value (second source) and RSD of replicate integrations: < 5%	If RSDs <5%, prepare fresh standard and reanalyze CCV to rule out standard degradation or inaccurate injection. If RSD >5%, perform instrument maintenance to correct the problem and repeat ICAL.	Analyst	EMAX-6020
ICP	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence.	All analytes within + 10% of expected value and RSD of replicate integrations < 5%.	If RSDs <5%, prepare fresh standard and reanalyze CCV to rule out standard degradation or inaccurate injection. If RSD >5%, perform instrument maintenance to correct the problem and repeat ICAL. Samples will be reanalyzed once the continuing calibration check sample is within acceptance criteria.	Analyst	EMAX-6020

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Cold Vapor	Initial Calibration (ICAL)	Daily initial calibration prior to sample analysis	Correlation coefficient R>=0.995 for linear regression	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet # 25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-7470 EMAX-7471
Cold Vapor	Second Source Calibration Verification (ICV)	Once after each initial calibration, prior to sample analysis	Value of second source for all analyte(s) within ± 10% of expected value (second source)	Prepare fresh standard and reanalyze CCV to rule out standard degradation or inaccurate injection. Perform instrument maintenance to correct the problem and repeat ICAL.	Analyst	EMAX-7470 EMAX-7471
Cold Vapor	Continuing Calibration Verification (CCV)	After every 10 samples and at the end of the analysis sequence.	All analytes within + 20% of expected value	Prepare fresh standard and reanalyze CCV to rule out standard degradation or inaccurate injection. Perform instrument maintenance to correct the problem and repeat ICAL. Samples will be reanalyzed once the continuing calibration check sample is within acceptance criteria.	Analyst	EMAX-7470 EMAX-7471

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	RSD for all analytes ≤ 20%	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet #25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	EMAX-RSK 175
GC	Second Source Calibration Verification	Once after each initial calibration	Value of second source for all analytes within ± 25% of expected value (initial source)	Prepare fresh standard and reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	EMAX-RSK 175

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC	Continuing Calibration Verification (CCV)	CCV:Daily, before sample analysis, every 12 hours of analysis time and at the end of the analysis sequence	All analytes within ± 15% of expected value from the ICAL	Prepare fresh standard and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed. Samples will be reanalyzed once the ICV and CCVare within acceptance criteria.	Analyst	EMAX-RSK 175
IC	Linear Calibration Range (LCR) (Min 3 pts + Calibration Blank)	Every 6 months or when IPC fails to meet the acceptance criteria	Correlation coefficient ≥0.995 for linear regression	Locate the source of the problem. Check for standard degradation or perform instrument adjustment and/or maintenance to correct the problem then repeat initial calibration.	Analyst	EMAX-300.0
IC	Second Source Calibration Verification (ICV)	After every ICAL and quarterly thereafter	All analytes within ± 10% of expected value from the ICAL	Prepare fresh standard and reanalyze ICV to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance to correct the problem and repeat ICAL.	Analyst	EMAX-300.0
IC	Instrument Performance Check (CCV)	Bracket every 10 field samples with IPC	CCV: all analytes within ± 10% of expected value.	Reanalyze IPC. If reanalysis is still outside acceptance limits, discontinue the analysis. Resolve the cause of the failure and recalibrate prior to resuming analysis.	Analyst	EMAX-300.0

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
TOC	ICAL	Prior to sample analysis	Correlation coefficient (r^2) $\geq$0.995	Locate the source of the problem. If outliers exist, prepare fresh calibration standards and repeat ICAL.	Analyst	EMAX-5310B
TOC	ICV	After every ICAL	± 10% of expected value	Reanalyze ICV to rule out bad injection and/or standard degradation. Otherwise repeat ICAL.	Analyst	EMAX-5310B
TOC	CCV	Every 15 samples and at the end of the analysis sequence	± 10% of expected value	Reanalyze CCV to rule out bad injection and/or standard degradation. Otherwise repeat calibration and reanalyze all samples since last successful calibration verification.	Analyst	EMAX-5310B
TKN	Multipoint calibration curve	Initial daily calibration prior to sample analysis	Correlation coefficient (r^2) $\geq$0.995 for linear regression	Locate the source of the problem. If outliers exist, prepare fresh calibration standards and repeat ICAL.	Analyst	EMAX-4500-NorgC
TKN	ICV	After initial calibration	± 15% of expected value	Locate the source of the problem and verify second source standard. Repeat ICAL.	Analyst	EMAX-4500-NorgC
Ammonia	Multipoint calibration curve	Initial daily calibration prior to sample analysis	Correlation coefficient (r^2) $\geq$0.995 for linear regression	Locate the source of the problem. If outliers exist, prepare fresh calibration standards and repeat ICAL.	Analyst	EMAX-4500-NH3C
Ammonia	ICV	After initial calibration	± 15% of expected value	Locate the source of the problem and verify second source standard. Repeat ICAL.	Analyst	EMAX-4500-NH3C

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Initial Calibration (ICAL) – five-point ICAL	Initial calibration prior to sample analysis	% RSD ≤ 30 with two compounds allowed out to ≤ 40% RSD	Prepare fresh standards and reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance (as described in Worksheet # 25), and rerun initial calibration. If problem continues, new standards may need to be purchased, prepared, and analyzed, or instrument may need manufacturer servicing to diagnose problem.	Analyst	ATL SOP #91
GC/MS	Second source calibration verification	After each initial calibration curve, and daily, prior to sample analysis	Value of second source for all analytes within ±30% of expected value (initial source).	Reanalyze second source to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and second source verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed.	Analyst	ATL SOP #91

SAP Worksheet #24 – Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC/MS	Calibration Verification (CV)	Daily before sample analysis and every 12 hours of analysis time	All analytes within ± 40% of expected value from the ICAL	Reanalyze to rule out standard degradation or inaccurate injection. If problem persists, perform instrument adjustment and/or maintenance, and rerun initial calibration and calibration verification standard. If problem continues, new standards may need to be purchased, prepared, and analyzed. Samples will be reanalyzed once the calibration verification sample is within acceptance criteria.	Analyst	ATL SOP #91

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GCMS GC ICP Cold Vapor IC	Parameter Setup	Physical check	Physical check	Initially; prior to DCC	Predetermined optimum parameter settings	Reset if incorrect	Analyst	EMAX-8260 EMAX-8015G EMAX-8015D EMAX-8082 EMAX-6020 EMAX-7470/7471 EMAX- RSK 175 ATL SOP #91
GC/MS	Tune Check	Instrument Performance	Conformance to instrument tuning.	Initially; prior to DCC	Compliance to ion abundance criteria	Repeat tune check to rule out standard degradation or inaccurate injection. If problem persist perform retune the instrument and repeat tune check.	Analyst	EMAX-8260 ATL SOP #91
ICP	ICS	Instrument Performance	Conformance to interference check	Prior to sample analysis	Within + 20% of expected value	Terminate analysis, reanalyze ICS to rule out standard degradation or inaccurate injection. If problem persist, perform instrument maintenance, repeat calibrations and reanalyze all associated samples.	Analyst	EMAX-6020

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification.	No analytes detected > 3X IDL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	Analyst	EMAX-6020
Cold Vapor	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification.	No analytes detected > 3X IDL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	Analyst	EMAX-7470 EMAX-7471
IC	Parameter Setup	Physical Check	Check that the autosampler is functioning as expected.	Initially, prior to each use.	Autosampler must move to the expected position when activated.	Reset autosampler. If problem persists, perform autosampler troubleshooting prior to instrument use.	Analyst	EMAX-300.0

SAP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Continued)

Instrument Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Spectrometer Conductivity Meter Colorimeter Combustion IR	ICB/CCB	Instrument Performance	Instrument contamination check	After every calibration verification.	No analytes detected > 3X IDL	Determine possible source of contamination and apply appropriate measure to correct the problem. Reanalyze calibration blank and all associated samples.	Analyst	EMAX-300.0 EMAX-5310B EMAX-4500-NorgC EMAX-4500-NH3C

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SAP Worksheet #26 – Sample Handling System

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Sampler / TtEC
Sample Packaging (Personnel/Organization): Sampler / TtEC
Coordination of Shipment (Personnel/Organization): Sampler / TtEC
Type of Shipment/Carrier: Courier or FedEx®
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Custodian / EMAX, Air Toxics (soil gas laboratory), Microbial Insights
Sample Custody and Storage (Personnel/Organization): Sample Custodian / EMAX, Air Toxics (soil gas laboratory), Microbial Insights
Sample Preparation (Personnel/Organization): Sample preparation personnel / EMAX, Air Toxics (soil gas laboratory), Microbial Insights
Sample Determinative Analysis (Personnel/Organization): Analyst / EMAX, Air Toxics (soil gas laboratory), Microbial Insights
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 90 calendar days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): up to 40 calendar days depending on method holding times
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization: Sample Custodian / EMAX, Air Toxics (soil gas laboratory), Microbial Insights
Number of Days from Analysis: N/A (Samples may be disposed of 90 calendar days after collection.)

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SAP Worksheet #27 – Sample Custody Requirements Table

An overriding consideration for data resulting from laboratory analyses is the ability to demonstrate that the data are legally defensible, i.e., that the samples were obtained from the locations stated and that they reached the laboratory without alteration. To accomplish this, evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal will be documented through the COC record. A sample is considered to be in custody if the following conditions have been observed:

- In actual possession or in view of the person who collected the samples
- Locked in a secure area
- Placed in an area restricted to authorized personnel
- Placed in a container and secured with an official seal, so that the sample cannot be reached without breaking the seal

Attachment 2 presents an example of the COC record. The COC record lists each sample and the individuals performing the sample collection, shipment, and receipt. Attachment 2 presents an example of a custody seal that will seal samples and the cooler during transportation to the laboratory.

The COC record will be the controlling document to ensure that the sample custody is maintained. Upon collecting a sample, sampling personnel will initiate the COC record in the field. Each time the sample custody is transferred, the former custodian will sign the COC on the _Relinquished By_ line, and the new custodian will sign the COC on the _Received By_ line. The date, time, and project or company affiliation will accompany each signature. The waybill number and courier name will be recorded on the COC when FedEx is used. The shipping container will be secured with two custody seals, thereby allowing for custody to be maintained by the shipping personnel until receipt by the laboratory.

Sample custody will be the responsibility of sampling personnel from the time of sample collection until the samples are accepted by the laboratory via courier or FedEx. Thereafter, the laboratory performing the analysis will maintain custody. The sample custodian will sign the COC from the courier or FedEx, inventory each shipment, and note on the original COC record any discrepancy in the sample custody, temperature of the cooler, or broken sample containers. The laboratory will note discrepancies on the sample receipt form. The laboratory project manager will immediately notify the Project Chemist. The Project Chemist, in consultation with the project team, will provide instructions in writing to the laboratory. The laboratory will have a system for tracking samples consistent with Section 5.8 of the Quality Systems Manual (QSM) (DoD 2006). The laboratory will archive the samples and maintain their custody up to 90 calendar days after sample collection, at which time the samples will be disposed of by the laboratory.

In addition to providing a custody exchange record for the samples, the COC record serves as a formal request for sample analyses. The COC records will be completed, signed, and distributed as follows:

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

- White and pink copies sent to the analytical laboratory with the sample shipment
- Yellow copy retained on site for inclusion in the project files
- A copy faxed/e-mailed to the Project Chemist on a daily basis to allow tracking of samples during shipment and confirm laboratory receipt of samples
- Manila copy sent to the Project Chemist

Samples will be uniquely designated using a numbering system that identifies the Contract Task Order number and a sequential number (e.g., 4-001). Sample designation/numbering is described in Worksheets #14, 18, and Attachment 1.

The sample number will be recorded in the field logbook, on the labels, and on the COC record at the time of sample collection. A complete description of the sample and sampling conditions will be recorded in the field logbook and referenced using the unique sample identification number.

Sample packaging and shipment procedures for this project will conform to Department of Transportation/International Air Transport Association procedures as applicable for packaging. Immediately after sample labeling, custody seals will be affixed to each sample container, except for En Core aluminum bags, which will be placed in a plastic bag first, then a custody seal will be placed over the bag. En Core aluminum bags will then be placed in another plastic bag, and other sample containers will be placed in double-resealable plastic bags to protect the sample from moisture and to prevent breakage and potential cross-contamination during transportation to the laboratory. All glass sample containers will first be protected with bubble wrap if transported by FedEx.

Each cooler will be shipped with a temperature blank. A temperature blank is a vial filled with tap water and stored in the cooler during sample collection and transportation. The temperature of the cooler will be recorded by the laboratory on the COC record immediately upon receipt of the samples. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

Samples transported by a laboratory-assigned courier will be packed in a sample cooler with sufficient ice (cooler will be approximately half full of wet ice that is below and above sample containers). Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. The COC record will be completed and signed by the courier. The cooler and the top two copies (white and pink) of the COC record will then be released to the courier for transportation to the laboratory.

Samples to be shipped by FedEx will be packed in a sample cooler lined with a plastic bag. Ice will be double-bagged and placed at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This will be repeated until the cooler is filled with ice as the top layer in the cooler. The COC record will include the airbill number, and the "Received By" box will be labeled with FedEx. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the airbill will be placed on the cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, the original airbill will be placed on the cooler with the COC record, and copies of the airbill will be placed on the other coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by FedEx.

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SAP Worksheet #28 – Laboratory QC Samples Table

Matrix: Soil
Analytical Group: VOCs
Analytical Method/SOP Reference: EPA 8260B / EMAX-8260

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	1,1-Dichloroethene: 60–130% Benzene: 70–130% Chlorobenzene: 70–130% Toluene: 70–130% Trichloroethene: 70–130%	[b]	Analyst	Accuracy	1,1-Dichloroethene: 60–130% Benzene: 70–130% Chlorobenzene: 70–130% Toluene: 70–130% Trichloroethene: 70–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	1,1-Dichloroethene: 50–140% Benzene: 60–150% Chlorobenzene: 70–130% Toluene: 70–140% Trichloroethene: 60–140% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	1,1-Dichloroethene: 50–140% Benzene: 60–150% Chlorobenzene: 70–130% Toluene: 70–140% Trichloroethene: 60–140% RPD ≤ 50
Surrogate	Per all field and QC samples	1,2-Dichloroethane-d_4: 60–160% 4-Bromofluorobenzene: 70–150% Toluene-d_8: 70–140%	[d]	Analyst	Accuracy	1,2-Dichloroethane-d_4: 60–160% 4-Bromofluorobenzene: 70–150% Toluene-d_8: 70–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil
Analytical Group: TPH-purgeable
Analytical Method/SOP Reference: EPA 8015B / EMAX-8015G

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	TPH-gasoline: 60–130%	[b]	Analyst	Accuracy	TPH-gasoline: 60–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	TPH-gasoline: 50–130% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	TPH-gasoline: 50–130% RPD ≤ 50
Surrogate	Per all field and QC samples	4-Bromofluorobenzene: 70–140%	[d]	Analyst	Accuracy	4-Bromofluorobenzene: 70–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil
Analytical Group: SVOCs
Analytical Method/SOP Reference: EPA 8270C / EMAX-8270

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	1,4-dioxane: 30–130% or Hexachlorobenzene: 30–130%	[b]	Analyst	Accuracy	1,4-dioxane: 30–130% or Hexachlorobenzene: 30–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	1,4-dioxane: 30–130% RPD ≤ 30 or Hexachlorobenzene: 30–130% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	1,4-dioxane: 30–130% RPD ≤ 30 or Hexachlorobenzene: 30–130% RPD ≤ 50
Surrogate	Per all field and QC samples	Bromobenzene: 30–130% or 2-Fluorobiphenyl: 30–130% Nitrobenzene-d5: 30–130% Terphenyl-d14: 30–130%	[d]	Analyst	Accuracy	Bromobenzene: 30–130% or 2-Fluorobiphenyl: 30–130% Nitrobenzene-d5: 30–130% Terphenyl-d14: 30–130%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil
Analytical Group: TPH-extractable
Analytical Method/SOP Reference: EPA 8015B / EMAX-8015D

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	TPH-diesel: 60–140%	[b]	Analyst	Accuracy	TPH-diesel: 60–140%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	TPH-diesel: 40–150% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	TPH-diesel: 40–150% RPD ≤ 50
Surrogate	Per all field and QC samples	Bromobenzene: 40–160% Hexacoasane: 70–160%	[d]	Analyst	Accuracy	Bromobenzene: 40–160% Hexacoasane: 70–160%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil
Analytical Group: PCBs
Analytical Method/SOP Reference: EPA 8082 / EMAX-8082

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	Aroclor 1016: 50–130% Aroclor 1260: 70–150%	[b]	Analyst	Accuracy	Aroclor 1016: 50–130% Aroclor 1260: 70–150%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	Aroclor 1016: 20–160% Aroclor 1260: 20–160% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	Aroclor 1016: 20–160% Aroclor 1260: 20–160% RPD ≤ 50
Surrogate	Per all field and QC samples	Decachlorobiphenyl: 30–150% Tetrachloro-m-xylene: 10–160%	[d]	Analyst	Accuracy	Decachlorobiphenyl: 30–150% Tetrachloro-m-xylene: 10–160%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil
Analytical Group: Metals (total)
Analytical Method/SOP Reference: EPA 6020A / EMAX-6020 and EPA 7471A / EMAX-7471

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[a]	Analyst	Accuracy	No analytes detected > 2 × MDL
LCS	1 per preparatory batch (not to exceed 20 samples)	80–120%	[b]	Analyst	Accuracy	80–120%
MS/MSD (lab duplicate)	1 per preparatory batch per matrix (not to exceed 20 samples)	75–125% RPD ≤ 20	[c]	Analyst	Accuracy/ Precision	75–125% RPD ≤ 20
Serial dilution	Each new sample matrix	1:5 dilution must agree within ±10% of original determination.	[e]	Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination.
Post-digestion spike	When serial dilution or matrix spike fails	75–125%	[f]	Analyst	Accuracy	75–125%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: VOCs
Analytical Method/SOP Reference: EPA 8260B / EMAX-8260

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	1,1-Dichloroethene: 60–130% Benzene: 70–130% Chlorobenzene: 70–130% Toluene: 70–130% Trichloroethene: 70–130%	[b]	Analyst	Accuracy	1,1-Dichloroethene: 60–130% Benzene: 70–130% Chlorobenzene: 70–130% Toluene: 70–130% Trichloroethene: 70–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	1,1-Dichloroethene: 60–140% Benzene: 60–140% Chlorobenzene: 70–130% Toluene: 70–140% Trichloroethene: 60–140% RPD ≤ 30	[c]	Analyst	Accuracy/ Precision	1,1-Dichloroethene: 60–140% Benzene: 60–140% Chlorobenzene: 70–130% Toluene: 70–140% Trichloroethene: 60–140% RPD ≤ 30
Surrogate	Per all field and QC samples	1,2-Dichloroethane-d_4: 70–140% 4-Bromofluorobenzene: 70–130% Toluene-d_8: 70–140%	[d]	Analyst	Accuracy	1,2-Dichloroethane-d_4: 70–140% 4-Bromofluorobenzene: 70–130% Toluene-d_8: 70–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: TPH-purgeable
Analytical Method/SOP Reference: EPA 8015B / EMAX-8015G

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	a	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	TPH-gasoline: 60–130%	b	Analyst	Accuracy	TPH-gasoline: 60–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	TPH-gasoline: 50–130% RPD ≤ 30	c	Analyst	Accuracy/ Precision	TPH-gasoline: 50–130% RPD ≤ 30
Surrogate	Per all field and QC samples	4-Bromofluorobenzene: 60–140%	d	Analyst	Accuracy	4-Bromofluorobenzene: 60–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: SVOCs
Analytical Method/SOP Reference: EPA 8270C / EMAX-8270

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	1,4-dioxane: 30–130% or Hexachlorobenzene: 30–130%	[b]	Analyst	Accuracy	1,4-dioxane: 30–130% or Hexachlorobenzene: 30–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	1,4-dioxane: 30–130% RPD ≤ 30 or Hexachlorobenzene: 30–130% RPD ≤ 50	[c]	Analyst	Accuracy/ Precision	1,4-dioxane: 30–130% RPD ≤ 30 or Hexachlorobenzene: 30–130% RPD ≤ 50
Surrogate	Per all field and QC samples	Bromobenzene: 30–130% or 2-Fluorobiphenyl: 30–130% Nitrobenzene-d5: 30–130% Terphenyl-d14: 30–130%	[d]	Analyst	Accuracy	Bromobenzene: 30–130% or 2-Fluorobiphenyl: 30–130% Nitrobenzene-d5: 30–130% Terphenyl-d14: 30–130%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: TPH-extractable
Analytical Method/SOP Reference: EPA 8015B / EMAX-8015D

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	a	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	TPH-diesel: 70–140%	b	Analyst	Accuracy	TPH-diesel: 70–140%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	TPH-diesel: 60–140% RPD ≤ 30	c	Analyst	Accuracy/ Precision	TPH-diesel: 60–140% RPD ≤ 30
Surrogate	Per all field and QC samples	Bromobenzene: 50–130% Hexacosane: 70–140%	d	Analyst	Accuracy	Bromobenzene: 50–130% Hexacosane: 70–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: PCBs
Analytical Method/SOP Reference: EPA 8082 / EMAX-8082

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	Aroclor 1016: 50–130% Aroclor 1260: 70–150%	[b]	Analyst	Accuracy	Aroclor 1016: 50–130% Aroclor 1260: 70–150%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	Aroclor 1016: 50–130% Aroclor 1260: 70–160% RPD ≤ 30	[c]	Analyst	Accuracy/ Precision	Aroclor 1016: 50–130% Aroclor 1260: 70–160% RPD ≤ 30
Surrogate	Per all field and QC samples	Decachlorobiphenyl: 40–150% Tetrachloro-m-xylene: 30–140%	[d]	Analyst	Accuracy	Decachlorobiphenyl: 40–150% Tetrachloro-m-xylene: 30–140%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: Metals (dissolved)
Analytical Method/SOP Reference: EPA 6020A / EMAX-6020 and EPA 7470A/EMAX-7470

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
Calibration Blank	Before beginning a sample run, after every 10 samples, and at end of the analysis sequence	No analytes detected > 2 × MDL	[a]	Analyst	Accuracy	No analytes detected > 2 × MDL
LCS	1 per preparatory batch (not to exceed 20 samples)	80–120%	[b]	Analyst	Accuracy	80–120%
MS/MSD (lab duplicate)	1 per preparatory batch per matrix (not to exceed 20 samples)	75–125% RPD ≤ 20	[c]	Analyst	Accuracy/ Precision	75–125% RPD ≤ 20
Serial dilutions	Each new sample matrix	1:5 dilution must agree within ±10% of original determination.	[e]	Analyst	Accuracy	1:5 dilution must agree within ±10% of original determination.
Post-digestion spike	When serial dilution or matrix spike fails	75–125%	[f]	Analyst	Accuracy	75–125%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: Dissolved Gases
Analytical Method/SOP Reference: RSK 175/EMAX-RSK 175

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	Ethane 70–140% Ethene 70–140% Methane 70–130%	[b]	Analyst	Accuracy	Ethane 70–140% Ethene 70–140% Methane 70–130%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	Ethane 60–140% Ethene 20–160% Methane 10–160% RPD ≤ 30	[c]	Analyst	Accuracy/ Precision	Ethane 60–140% Ethene 20–160% Methane 10–160% RPD ≤ 30

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: Anions
Analytical Method/SOP Reference: EPA 300.0 / EMAX-300

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	90–110%	[b]	Analyst	Accuracy	90–110%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	80–120% RPD ≤ 20	[c]	Analyst	Accuracy/ Precision	80–120% RPD ≤ 20

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: TOC
Analytical Method/SOP Reference: SM 5310B / EMAX-5310B

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	80–120%	[b]	Analyst	Accuracy	80–120%
MS/MSD	1 per preparatory batch per matrix (not to exceed 20 samples)	80–120% RPD ≤ 20	[c]	Analyst	Accuracy/ Precision	80–120% RPD ≤ 20

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: TKN
Analytical Method/SOP Reference: SM 4500-N / EMAX-4500-NorgC

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	80–120%	[b]	Analyst	Accuracy	80–120%
DUP	1 per preparatory batch (not to exceed 20 samples)	RPD ≤ 20	[c]	Analyst	Accuracy	RPD ≤ 20
MS	1 per preparatory batch per matrix (not to exceed 20 samples)	75–125%	[c]	Analyst	Accuracy/ Precision	75–125%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Water
Analytical Group: Ammonia
Analytical Method/SOP Reference: SM 4500-NH3C / EMAX-4500-NH3C

QC Sample	Frequency / Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < ½ QL	[a]	Analyst	Accuracy	Analytes < ½ QL
LCS	1 per preparatory batch (not to exceed 20 samples)	80–120%	[b]	Analyst	Accuracy	80–120%
DUP	1 per preparatory batch (not to exceed 20 samples)	RPD ≤ 20	[c]	Analyst	Accuracy	RPD ≤ 20
MS	1 per preparatory batch per matrix (not to exceed 20 samples)	75–125%	[c]	Analyst	Accuracy/ Precision	75–125%

SAP Worksheet #28 – Laboratory QC Samples Table (Continued)

Matrix: Soil Gas
Analytical Group: VOCs
Analytical Method/SOP Reference: EPA TO-15 / ATL SOP #91

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per preparatory batch (not to exceed 20 samples)	Analytes < QL	[a]	Analyst	Accuracy	Analytes < QL
LCS	1 per preparatory batch (not to exceed 20 samples)	50–150%	[b]	Analyst	Accuracy	50–150%
Surrogate	Per all field and QC samples	1,2-Dichloroethane-d_4: 70–130% 4-Bromofluorobenzene: 70–130% Toluene-d_8: 70–130%	[d]	Analyst	Accuracy	1,2-Dichloroethane-d_4: 70–130% 4-Bromofluorobenzene: 70–130% Toluene-d_8: 70–130%

Notes:

[a] Any sample associated with a blank that fails the criteria checks will be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results will be reported with appropriate data qualifying codes.
[b] Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.
[c] The data will be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. Perform post-digestion spike addition if matrix spike does not meet criteria.
[d] Reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available.
[e] Perform post-digestion spike addition if serial dilution does not meet criteria.
[f] Reanalyze post-digestion spike.
[g] Soil gas laboratory is to be determined. The laboratory will be determined prior to finalization of this SAP. Once detemined, the laboratory-specific information will be added.

SAP Worksheet #29 – Project Documents and Records Table

Document	Where Maintained
Field logbook	TtEC Project file
Sample labels	EMAX Laboratory
COC	EMAX Laboratory; NAVFAC SW Administrative Record will receive original copy
Shipping records	TtEC Project file
Field surveillance reports	TtEC Project file
Field Change Requests	TtEC Project file
Corrective action forms/reports	TtEC Project file
Laboratory data package including: Sample receipt and login Laboratory internal COC Instrument calibration logs Sample preparation logs Sample analysis/run logs Nonconformance reports including corrective actions Sample disposal records	EMAX Laboratory; NAVFAC SW Administrative Record will receive original copy
Data validation report	LDC Validator; NAVFAC SW Administrative Record will receive original copy

Field documentation associated with sampling activities includes logbooks, sample labels, COCs, sample shipping records, field surveillance reports, and Field Change Request (FCR) forms. In addition, laboratory and validator documentation will be generated during this project. These types are described in the following sections.

Field Logbook

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. All entries will be recorded in indelible black or blue ink. At the end of each work day, the logbook pages will be signed by the responsible sampler, and any unused portions of the logbook pages will be crossed out, signed, and dated. If it is necessary to transfer the logbook to another person, the person relinquishing the logbook will sign and date the last page used, and the person receiving the logbook will sign and date the next page to be used. At a minimum, the logbook will contain the following information:

- Project name and site location
- Date and time

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Personnel in attendance
- General weather information
- Work performed
- Field observations
- Sampling performed, including specifics such as location, type of sample, type of analyses, and sample identification
- Field analyses performed, including results, instrument checks, problems, and calibration records for field instruments
- Descriptions of deviations from this SAP
- Problems encountered and corrective action taken
- Identification of field QC samples
- QC activities
- Verbal or written instructions
- Any other events that may affect the samples

Sample Labels

Sample labels will be filled out in indelible black or blue ink and affixed to sample containers at the time of sample collection. An example sample label is provided in Attachment 2. Each sample label will be covered with clear tape. Each sample container will be labeled with the following, at a minimum:

- Sample identification number
- Sample collection date (month/day/year)
- Time of collection (24-hour clock) from the start of sampling
- Sampler's initials
- Analyses required
- Preservative (if any)

Chain-of-Custody

COC information is described in Worksheet #27.

Sample Shipping Records

Samples will be transported to the laboratory via courier or FedEx. The courier who receives samples will sign the COC and accept the samples. For samples shipped via FedEx, the COC will be packaged within the cooler, and the sender's copy of the airbill will serve as custody

SAP Worksheet #29 – Project Documents and Records Table (Continued)

documentation and will be maintained on site in the project file. Sample shipping procedures are detailed in Worksheet #27.

Field Surveillance Reports

Field Surveillances will be performed in accordance with the three phases of inspection as required by the Remedial Action Contract QC Program. A Preparatory Inspection will be performed by the PQCM prior to the first sampling activities. This will include a general orientation for health and safety. An Initial Inspection will be conducted at the beginning of field sampling activities for project. Daily field inspections and subsequent surveillances will be performed at the discretion of the PQCM or the Quality Control Program Manager throughout the duration of the project. The PQCM will use the Initial Inspection Checklist during inspection.

Field Change Request

An FCR will be prepared by the Project Chemist, or a designee, if a change to the SAP occurs during sampling activities. These changes will be minor and not result in a change in scope and/or DQOs for this project. The FCR must be approved prior to field implementation. The FCR will include the revised worksheets from this SAP. Examples of worksheets that may be revised due to minor changes such as personnel changes would be Worksheets #3 (Distribution List), #4 (Project Personnel Sign-Off Sheet), #5 (Project Organizational Chart), #6 (Communication Pathways), and #7 (Personnel Responsibilities and Qualifications Table).

Major changes to work scope affecting the original DQOs or meeting criteria described in EWI #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs) (NAVFAC SW 2006) will require preparation of a SAP Addendum. The SAP Addendum must be approved by the Naval Facilities Engineering Command Southwest (NAVFAC SW) Quality Assurance Officer (QAO) prior to conducting sampling and analysis.

Laboratory Documentation

Laboratory records associated with project samples analyzed include the following at a minimum:

- Sample receipt and login
- Laboratory internal COC
- Instrument calibration logs
- Sample preparation logs
- Sample analysis/run logs
- Sample results case narrative

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Sample disposal records
- Nonconformance reports including corrective actions

The laboratory will prepare analytical data packages comprising the above documentation for each sample delivery group (SDG) and provide them to TtEC. Laboratory deliverables will include two copies of the hard copy data package, submitted as either EPA Level III- or IV-equivalent packages as specified on the COC. Detailed information on the requirement of hard copy data packages is provided below. The report pages will be sequentially numbered. The report will contain a table of contents referencing individual sections in the data package, the original, white copy of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and nonconformances. All samples will be cross-referenced to the associated QC samples. The packages will be assembled in the following sequence:

- Cover page (with laboratory name, address, phone number, contact person, and SDG number, as well as the project name and project number)
- Table of contents
- Case narrative
- Sample management records, including the original, white copy of COC records (including cooler temperature and sample condition), shipping documents, and laboratory sample receipt forms
- Cross-reference table
- Analytical results and quality assurance (QA)/QC information by test as follows:
  - Organic raw data sequence
    a. Sample result forms, including method blanks
    b. Sample raw data after each result form (EPA Level IV only)
    c. Surrogate summaries (surrogate results may appear on the sample result forms)
    d. QC summaries
    e. Tune data (gas chromatograph/mass spectrometer [GC/MS] only)
    f. Initial calibration (ICAL)
    g. Daily calibration checks, including related continuing calibration verifications (CCVs)
    h. Resolution check standards (GC/MS and pesticides), if applicable
    i. QC LCS, MS/MSD raw data (EPA Level IV only)
    j. Instrument run log
    k. Sample preparation log

SAP Worksheet #29 – Project Documents and Records Table (Continued)

– Inorganic raw data sequence

a. Sample results forms, including method blanks
b. Sample raw data (EPA Level IV only)
c. QC summaries
d. ICAL
e. Daily calibration checks, including all related CCVs
f. Calibration blanks, including all related continuing calibration blanks
g. Interference check standards A and B for inductively coupled plasma (ICP)-atomic emission spectrometer (AES) only
h. QC raw data (EPA Level IV only)
i. Post-digestion spike results
j. Analytical spike results
k. Method of standard additions
l. ICP-AES serial dilutions
m. Instrument run log
n. Sample preparation log

All relevant laboratory raw data and documentation including, but not limited to, logbook, data sheets, electronic files, and reports, will be maintained by the laboratory for at least 5 years. TtEC must be notified 30 days before disposal of any relevant records.

In addition to the hard copy data, an EDD will be submitted in American Standard Code for Information Interchange format. Both the EDDs and the hard copy report will present results to two or three significant figures. For organic results, two significant figures will be used for all results. For inorganic results, two significant figures will be used for results less than 10, and three significant figures will be used for results greater than 10. Results for QC analyses (method blanks, MS/MSD, LCS, and duplicates) will be reported up to three significant figures.

When revisions to data reports are required, the revised pages (an original and copy) will be stamped with the notation "amended or revised report." If revisions affect the EDDs, the revised EDD will then be sent along with the revised hard copy pages. In addition, a hard copy or electronic copy of items submitted to the validator by the laboratory will also be submitted to the Project Chemist.

Data Validation Reports

All analytical data generated from laboratories except waste characterization data will be validated by an independent data validation company. The validation report will include the data validation findings worksheets. The reports will be arranged in increasing SDG numbers and grouped by the type of analysis; i.e., a group of reports will consist of SDGs with the same analysis arranged in increasing numerical order. Each SDG will be submitted as a separate data validation report. Reports covering multiple SDGs are not acceptable.

SAP Worksheet #29 – Project Documents and Records Table (Continued)

The validation reports will contain the following information:

- Title page that contains project name, sample collection date, validator subcontractor name, report date, type of analysis, laboratory, SDG, sample identifications (including MS/MSD, duplicate, reanalysis, or dilution samples), sample matrix (e.g., soil, water), and validation level (EPA Level III or IV)
- Introduction page that includes the number of samples per matrix, analytical method reference, validation guideline reference, and section references to summary qualification flags, and denotes QC samples. Statements regarding flag classification (protocol/ advisory) and whether raw data check was performed will also be included.
- Section headings for each analytical method will include the following:
  - Technical holding times
  - GC/MS instrument performance check (tune) if applicable
  - Calibration
    a. ICAL
    b. Initial calibration verification (second source standard)
    c. CCV
  - Laboratory blanks
  - Accuracy and precision data
    a. Surrogate spike recoveries
    b. MS/MSD
    c. LCSs/LCS duplicates (LCSDs)
    d. Internal standards
  - Target compound identification
  - System performance checks
  - Analyte quantitation and quantitation limit (QL)
  - Field QC samples (if not applicable, report will note)
  - Overall assessment of data
  - Assessment of compliance with statement of work requirements
- QC deviation summaries, which will include in a tabular format the following:
  - Unique identification of QC run (e.g., date/time)
  - Associated project and sample numbers (not the laboratory internal sample IDs)
  - Associated constituents
  - Actual value for noted deviation
  - Applicable QC criteria
  - Applicable qualifiers
  - Qualifier classifications (advisory or protocol)

SAP Worksheet #29 – Project Documents and Records Table (Continued)

- Validation findings worksheets
- Qualifier classification

The following format will be used when preparing and submitting revised data validation reports and analytical result pages:

- The cover letter and revised text pages will clearly identify the revision number (e.g., **Revision 1**) typed in the upper right-hand corner of the page.
- A statement in the cover letter will be included indicating that an asterisk will be placed in the margin to the left of any revised item in the text.
- Every revised page in the text will have the following statement placed at the bottom of the page:

  ***Indicates revision based on report review.**

- The summary table will have an asterisk placed to the left of every revised item and a statement at the bottom of the page as follows:

  ***Indicates change as a result of report review.**

Revisions will be submitted within 1 week of receiving the review comments from the Project Chemist. Report revision submittal packages will include an original and copy of the cover page and revised pages.

In addition to a hard-copy report, the validator will receive the EDD and populate the final validation qualifiers in the EDD. The validated EDD will be returned to TtEC for upload into the database.

The data validation subcontractor will maintain validation records for at least 5 years. TtEC will be notified 30 days before disposal of any records.

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SAP Worksheet #30 – Analytical Services Table

The laboratory that will provide chemical analytical services for this project will be certified by the Department of Health Services Environmental Laboratory Accreditation Program. (California National Environmental Laboratory Accreditation Program certification is also acceptable.) The laboratory will have successfully completed the Naval Facilities Engineering Service Center or DoD Environmental Laboratory Accreditation Program. The exception to these requirements is the microbiological laboratory which will perform specialty testing for this project. The microbiological laboratory listed below is the only laboratory that performs the specialty tests required for this project. Any deviations from these requirements will require prior approval by the NAVFAC SW QAO.

The laboratory must be capable of meeting all the requirements listed in this SAP including turnaround time, QLs, QC criteria, data deliverables (as described in Worksheet #29), and requirements in the Navy Installation Restoration Chemical Data Quality Manual (NFESC 1999) and the QSM for Environmental Laboratories (DoD 2006).

Information regarding the laboratory (and backup laboratory) is provided in the table below.

Matrix	Analytical Group	Sampling Locations/ ID Number [a]	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization (contact information)	Backup Laboratory/ Organization (contact information)
Soil	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	D1C85GB017	EPA 8260B, 8015B, 8082	20 business days	**Soil/Water analysis:** EMAX Rina Kato (310) 618-8889	**Soil/Water analysis:** APPL Cynthia Clark (559) 275-2175
Water	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals	D1C85GB017	EPA 8260B, 8270C, 8015B, 8082, 6020A/7470A			
Soil Gas	VOCs	D1C85TSG01, D1C85TSG02, D1C85TSG03, D1C85TSG04, D1C85TSG05	EPA TO-15		**Air analysis:** Air Toxics Kyle Vagadori (916) 985-1000	**Air analysis:** Environmental Analytical Service Steve Hoyt (805) 781-3585

SAP Worksheet #30 – Analytical Services Table (Continued)

Matrix	Analytical Group	Sampling Locations/ ID Number [a]	Analytical Method	Data Package Turnaround Time	Laboratory/ Organization (contact information)	Backup Laboratory/ Organization (contact information)
Water	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions, TOC, TKN, ammonia, microbial testing	D1C85W01, D1C85W02, D1C85W03	EPA 8260B, 8270C, 8015B, 8082, 6020A/7470A, 300.0, SM-5310B, SM-4500N, SM-4500NH3C, microbes		**Microbial analysis:** Microbial Insights Anita Biernacki (865) 573-8188	**Microbial Analysis[b]**
Soil	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs	FDP North SW, FDP South SW, FDP East SW, FDP West SW, FDP Bottom, MH North SW, MH South SW, MH East SW, MH West SW, MH Bottom, GS North SW, GS South SW, GS East SW GS West SW, GS Bottom, Pipeline X, Utility X	EPA 8260B, 8270C, 8015B, 8082			
Water	VOCs, SVOCs, TPH-purgeable, TPH-extractable, PCBs, Metals (dissolved), dissolved gases, anions, TOC, TKN, ammonia, microbial testing	D1C85W01R, D1C85W02R, D1C85W03, D1C85W04, D1C85W05	EPA 8260B, 8270C, 8015B, 8082, 6020A/7470A, 300.0, SM-5310B, SM-4500N, SM-4500NH3C, microbes			
Soil Gas	VOCs	D1C85SG01, D1C85SG02, D1C85SG03, D1C85SG04, D1C85SG05	EPA TO-15			

Notes:

[a] Sample IDs are listed in Attachment 1 of this SAP.
[b] Microbial testing is a specialty analysis and can only be performed by Microbial Insights laboratory.

SAP Worksheet #31 – Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
Operational Readiness Review	Prior to mobilization of the project and prior to initiating major phases of work	Internal	TtEC	Project Manager, TtEC	Project Manager, TtEC	Project Manager, TtEC	PQCM, TtEC
Field Sampling Surveillance	Once	Internal	TtEC	PQCM, TtEC	Project Manager, TtEC	Project Manager, TtEC	PQCM, TtEC
Data Review Surveillance	Once	Internal	TtEC	Program Chemist, TtEC	Project Chemist, TtEC	Program Chemist, TtEC	Quality Control Program Manager, TtEC

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SAP Worksheet #32 – Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Title and Organizational Affiliation)	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Title and Organizational Affiliation)	Time Frame for Response
Field Sampling Surveillance	Surveillance Report	Project Manager, TtEC	24 hours after completion of the inspection	Corrective Action Report	Project Manager and Quality Control Program Manager, TtEC	24 hours after notification
Data Review Surveillance	Surveillance Report	Project Manager, TtEC	24 hours after completion of the inspection	Corrective Action Report	Project Manager and Quality Control Program Manager, TtEC	24 hours after notification

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SAP Worksheet #33 – QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Surveillance Report	Once	5 days after completion of surveillance	PQCM, TtEC	Project Manager, Program Chemist, Quality Control Program Manager, TtEC
Data Review Surveillance Report	Once	5 days after completion of surveillance	Program Chemist, TtEC	Project Manager, Program Chemist, Quality Control Program Manager, TtEC
Final Report	Once	5 days after completion	PQCM, TtEC	Project Manager, Program Chemist, Quality Control Program Manager, TtEC

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SAP Worksheet #34 – Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Field logbook	Field logbooks will be reviewed weekly and verified for information accuracy and completeness. The inspection will be documented in daily QC reports.	I	PQCM, TtEC
COC forms	COC forms will be reviewed daily upon their completion and verified for completeness.	I	PQCM, TtEC
Sample receipt	For samples shipped via courier or FedEx, the Project Chemist will verify receipt of samples by the laboratory the day following shipment.	I	Project Chemist, TtEC
Sample logins	Sample login information will be reviewed and verified for accuracy and completeness in accordance with the requirements in this SAP.	I E	Project Chemist, TtEC Laboratory Project Manager, EMAX
Laboratory data prior to release	Laboratory data will be reviewed to verify that the requirements in this SAP have been met. Prior to release, data will be verified as follows:	E	Laboratory Project Manager, EMAX
	All data (100 percent) comply with the method- and project-specific requirements and any deviations or failure to meet criteria is documented for the project file.	E	Analyst, EMAX
	All manual entries (100 percent) are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliant with method- and project-specific QC requirements; raw data and supporting materials are complete; spectral assignments are confirmed; descriptions of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable.	E	Peer Analyst, EMAX
	Data reported are compliant with method- and project-specific QC requirements; the reported information is complete; the information in the report narrative is complete and accurate; and results are reasonable.	E	Supervisor, EMAX
	Data reported are compliant with method- and project-specific QC; analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since reviews are done only on 10 percent of the data.	E	Quality Assurance Manager, EMAX

SAP Worksheet #34 – Verification (Step I) Process Table (Continued)

Verification Input	Description	Internal/ External	Responsible for Verification (Title and Organizational Affiliation)
Laboratory data due at turnaround time listed on COC	Laboratory data will be verified for having been obtained following the protocols in this SAP and being of sufficient quality to satisfy DQOs.	I	Project Chemist, TtEC
Laboratory data packages	All laboratory data packages will be verified by the laboratory performing the work for completeness and technical accuracy prior to submittal. Data packages will then be reviewed by the Project Chemist for accuracy against faxed/e-mailed data and for completeness in accordance with the data package requirements described in Worksheet #29. Subsequently, data packages will be evaluated externally by undergoing third-party data validation as described in Worksheet #36.	E I E	Laboratory, EMAX Project Chemist, TtEC Data validator, LDC

SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Title and Organizational Affiliation)
IIa	Field logbook	Field logbooks will be reviewed weekly for accuracy associated with each sampling event. The inspection will be documented in daily QC reports.	PQCM, TtEC
IIa	COC forms	COC forms will be reviewed daily to ensure that project information, sample analyses requested, number of field QC samples collected, and percent level III or IV validation chosen are accurate and in accordance with the requirements in this SAP.	Project Chemist, TtEC
IIa	Sample receipt	The sample cooler will be checked for compliance with temperature and packaging requirements listed in Worksheet #27 of this SAP.	Laboratory sample custodian, EMAX
IIa	Sample logins	Sample login will be reviewed for accuracy against the COC form.	Project Chemist, TtEC Laboratory Project Manager, EMAX
IIa	Laboratory data prior to release	Laboratory data will be reviewed to ensure that the data are accurate and meet the requirements in this SAP. Prior to release, data will be validated as follows:	Laboratory Project Manager, EMAX
		All data (100 percent) comply with the method- and project-specific requirements and any deviations or failure to meet criteria is documented for the project file.	Laboratory Analyst, EMAX
		All manual entries (100 percent) are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliant with method- and project-specific QC requirements; raw data and supporting materials are complete; spectral assignments are confirmed; descriptions of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable.	Laboratory Peer Analyst, EMAX
		Data reported are compliant with method- and project-specific QC requirements; the reported information is complete; the information in the report narrative is complete and accurate; and results are reasonable.	Laboratory Supervisor, EMAX
		Data reported are compliant with method- and project-specific QC; analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since only 10 percent of the data is reviewed.	Laboratory Quality Assurance Manager, EMAX

SAP Worksheet #35 – Validation (Steps IIa and IIb) Process Table (Continued)

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Title and Organizational Affiliation)
IIa	Laboratory data due at turnaround time listed on COC	Laboratory data will be reviewed to ensure that the data reported met the analyte list and limits listed in this SAP.	Project Chemist, TtEC
IIa	Laboratory data packages	All laboratory data packages will be validated by the laboratory performing the work for technical accuracy prior to submittal.	Laboratory Project Manager, EMAX
		Data packages will then be reviewed for accuracy against the laboratory data that was faxed/e-mailed at the turnaround time listed on the COC.	Project Chemist, TtEC
		Data packages will be evaluated externally by undergoing data validation as described in Worksheet #36.	Third-party data validator, LDC
IIb	Data validation reports	Data validation reports will be reviewed in conjunction with the project DQOs and data usability assessment (Worksheet #37).	Project Chemist, TtEC

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIa	Soil	VOCs	In accordance with SOP EMAX-8260, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil	TPH-purgeable	In accordance with SOP EMAX-8015G, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil	SVOCs	In accordance with SOP EMAX-8270, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil	TPH-extractable	In accordance with SOP EMAX-8015D, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil	PCBs	In accordance with SOP EMAX-8082, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil	Metals (total)	In accordance with SOPs EMAX-6020 and EMAX-7471, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	VOCs	In accordance with SOP EMAX-8260, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	TPH-purgeable	In accordance with SOP EMAX-8015G, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	SVOCs	In accordance with SOP EMAX-8270, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	TPH-extractable	In accordance with SOP EMAX-8015D, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	PCBs	In accordance with SOP EMAX-8082, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	Metals (dissolved)	In accordance with SOPs EMAX-6020 and EMAX-7470, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	Dissolved Gases	In accordance with SOP EMAX-RSK 175, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table (Continued)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIa	Water	Anions	In accordance with SOP EMAX-300, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	TOC	In accordance with SOP EMAX-5310B, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	TKN	In accordance with SOP EMAX-4500-NorgC, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Water	Ammonia	In accordance with SOP EMAX-4500-NH3C, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIa	Soil Gas	VOCs	In accordance with SOP ATL SOP #91, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Laboratory Project Manager/ EMAX
IIb	Soil	VOCs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil	TPH-purgeable	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil	SVOCs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil	TPH-extractable	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil	PCBs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil	Metals (total)	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	VOCs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	TPH-purgeable	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table (Continued)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (Title and Organizational Affiliation)
IIb	Water	SVOCs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	TPH-extractable	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	PCBs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	Metals (dissolved)	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	Dissolved Gases	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	Anions	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	TOC	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	TKN	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Water	Ammonia	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC
IIb	Soil Gas	VOCs	In accordance with LDC's SOPs, NAVFAC SW EWI #1, and EPA Level III and IV guidelines	Third-party data validator / LDC

The following documents will be used as guidance for validating all data: Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA 540/R-99-008 (EPA 1999); Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540-R-04-004 (EPA 2004); EWI #1, 3EN2.1, Chemical Data Validation (SWDIV 2001); Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846, Third Edition and final updates (EPA 1986); and the QC criteria specified in this SAP.

SAP Worksheet #36 – Analytical Data Validation (Steps IIa and IIb) Summary Table (Continued)

Data validation will be performed by an independent data validation company. For this project, 80 percent of the data will require EPA Level III-equivalent data validation and 20 percent EPA Level IV-equivalent data validation. Data may be qualified as protocol or advisory. Protocol violations are when the laboratory deviates from the referenced analytical methods or the project-specific QLs, QC limits, or QC criteria. Advisory violations are when technical validation criteria have not been met.

Field QC samples will be discussed in the validation reports as follows:

- **Field Duplicates** – Field duplicate identifications will be provided on TtEC's copy of the COC form for each SDG if collected. (Field duplicates will be blind to the laboratory.) A section showing relative percentage difference (RPD) values will be included to demonstrate field duplicate precision. If the results cannot be calculated, this will be noted in the report.
- **Field Blanks** – Identifications for field blanks, including trip blanks, equipment blanks, and source blanks, will be provided on the COC forms by TtEC. Any analyte detected above the QL in field blanks will be discussed in this section of the report.

SAP Worksheet #37 – Usability Assessment

After the analytical data have been reviewed, verified, and validated in accordance with Worksheets #34 to 36, the TtEC Project Chemist will prepare a data quality assessment (DQA) report to assess data quality and usability. The DQA will include review of the following:

- Sample collection and analytical methods to verify that these were performed as discussed in Worksheets #14 and #17
- Field QC samples to verify that these were collected in accordance with Worksheet #12
- Project-specific QLs as listed in Worksheet #15 to verify that project-specific remedial goals were met
- DQOs to determine whether they have been achieved by the data collected
- Project-specific data quality indicators for precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters as discussed below

Analytical DQOs as assessed through the PARCC parameters are as follows.

Precision

Precision is the measure of the reproducibility of a set of replicate results or the agreement among repeat observations made under the same conditions. Analytical precision is the measurement of the variability associated with duplicate or replicate analyses. Field duplicate, laboratory duplicate, MSD, and LCSD (if analyzed) samples will be used to assess field and analytical precision. The precision measurement will be determined using the RPD between the duplicate sample results as follows:

$$RPD = 100 \times 2 \times (\text{result} - \text{duplicate result})/(\text{result} + \text{duplicate result})$$

The RPD limits for laboratory duplicates, MSDs, and LCSDs are presented in Worksheet #28, and the RPD limits for field duplicates are listed in Worksheet #12. Associated samples that do not meet the criteria will be discussed in the DQA by the TtEC Project Chemist.

Accuracy

Accuracy is defined as the nearness of a result or the mean of a set of results to the true or accepted value. Analytical accuracy is measured by comparing the percent recovery (%R) of analytes spiked into a sample against a control limit. Spiked samples include an MS, MSD, and LCS analyzed for every batch of up to 20 samples. Surrogate standards that are added to all samples, blanks, MSs, MSDs, and LCSs are analyzed for organic contaminants to evaluate the method's accuracy and help to determine matrix interferences. The calculation of %R is as follows:

$$\%R = 100 \times (\text{spiked sample result} - \text{unspiked sample result})/\text{amount of spike added}$$

SAP Worksheet #37 – Usability Assessment (Continued)

The TtEC Project Chemist will review the associated QC samples and surrogate standard recoveries for each analysis to ensure that the %R lies within the control limits listed in Worksheet #28. Otherwise, data will be flagged as follows in the DQA to indicate uncertainties associated with the data:

J – Result is estimated
U – Analyte is not detected at or above the stated quantitation limit
R – Data are rejected
UJ – Analyte is not detected, but there is an uncertainty about the quantitation limit

Representativeness

Unlike precision and accuracy, which can be expressed in quantitative terms, representativeness is a qualitative parameter. Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Field personnel will be responsible for ensuring that samples are representative of field conditions by collecting and handling samples according to the procedures in this SAP. Errors in sample collection, packaging, preservation, or COC procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

The TtEC Project Chemist will annotate any errors in sample collection in the DQA.

Completeness

Completeness is the percentage of measurements made that is judged to be valid. The completeness goal is to generate a sufficient amount of valid data to meet project needs. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not qualified with a rejected ("R") flag. The requirement of completeness is 95 percent for samples and is determined using the following equation:

$$\% \text{ completeness} = 100 \times (\text{number of valid analyte results/number of possible results})$$

The completeness goal will be determined by the TtEC Project Chemist and discussed in the DQA.

SAP Worksheet #37 – Usability Assessment (Continued)

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during interlaboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data.

Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements. Any deviations from field or analytical procedures will be discussed in the DQA.

After review of the PARCC parameters, the TtEC Project Chemist will summarize in the DQA any impact on and limitations of the data usability based on the above review parameters. The DQA will be part of a larger report that discusses the findings of the data and any subsequent recommendations for the project.

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REFERENCES

DoD (Department of Defense). 2006. Quality Systems Manual for Environmental Laboratories. January.

DON (Department of the Navy). 2009. Preliminary Draft Action Memorandum, Building 742, Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo, California. August 20.

EPA (U.S. Environmental Protection Agency). 1986. Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846. Third Edition and final updates.

————————. 1999. National Functional Guidelines for Organic Data Review, EPA 540/ R-99/008. Contract Laboratory Program. October.

————————. 2002. EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS. December.

————————. 2004. National Functional Guidelines for Inorganic Data Review, EPA 540/ R-04/004. Contract Laboratory Program. October.

————————. 2005. Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP). March.

————————. 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4, QAMS. February.

NAVFAC SW (Naval Facilities Engineering Command Southwest). 2006. Environmental Work Instruction (EWI) #2, 3EVR.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs). April.

NFESC (Naval Facilities Engineering Service Center). 1999. Navy Installation Restoration Chemical Data Quality (IR CDQM) Manual. October.

SCG and TtEMI (Sullivan Consulting Group and Tetra Tech EM, Inc.). 2003. Draft Final Site Inspection Report Manhole D1-C85 and Outfalls 22, 23, 25, and 26, Investigation Area C2, Mare Island, Vallejo, California. June 2.

SulTech (Sullivan Consulting Group and Tetra Tech EM, Inc.). 2007. Final Expanded Site Inspection Report, Building 742, Former Degreasing Plant, Investigation Area C2, Mare Island, Vallejo, California. December 7.

SWDIV (Southwest Division Naval Facilities Engineering Command). 2001. Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation. November.

————————. 2005. Environmental Work Instruction (EWI) EVR.6, Environmental Data Management and Required Electronic Delivery Standards. April.

TtEC (Tetra Tech EC, Inc.). 2009. Draft Final Engineering Evaluation/Cost Analysis/Interim Removal Action Work Plan, Building 742, Former Degreasing Plant, Investigation Area C2 at the Former Mare Island Naval Shipyard, Vallejo, California. August 14.

Weston (Roy F. Weston, Inc.) 2000. Draft Removal Summary Report for Fuel Oil Lines, Former Mare Island Naval Shipyard, Vallejo, California. January 7.

FIGURES

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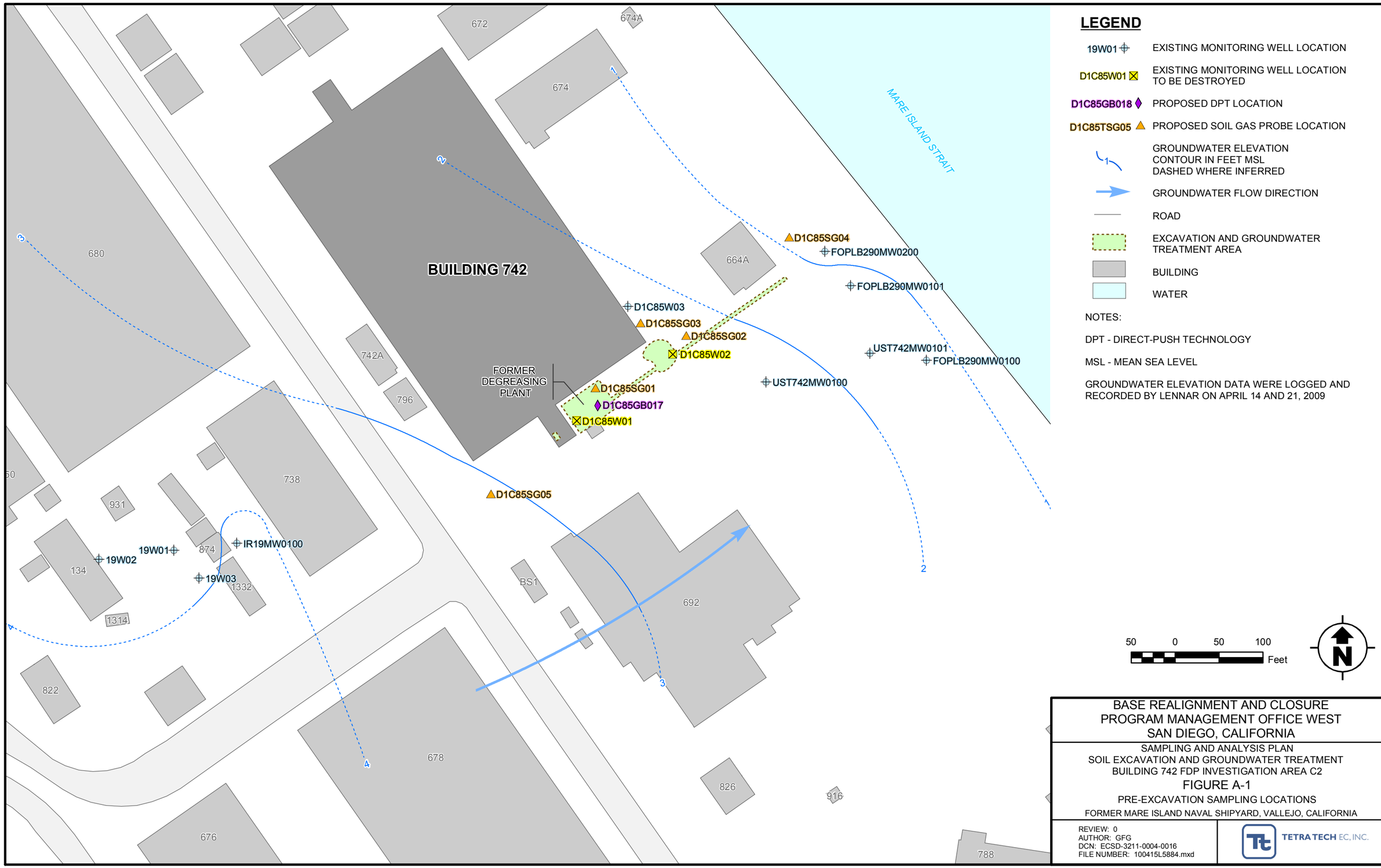


LEGEND

- 19W01 — EXISTING MONITORING WELL LOCATION
- D1C85W01 — EXISTING MONITORING WELL LOCATION TO BE DESTROYED
- D1C85GB018 — PROPOSED DPT LOCATION
- D1C85TSG05 — PROPOSED SOIL GAS PROBE LOCATION
- GROUNDWATER ELEVATION CONTOUR IN FEET MSL DASHED WHERE INFERRED
- GROUNDWATER FLOW DIRECTION
- ROAD
- EXCAVATION AND GROUNDWATER TREATMENT AREA
- BUILDING
- WATER

NOTES:

DPT - DIRECT-PUSH TECHNOLOGY

MSL - MEAN SEA LEVEL

GROUNDWATER ELEVATION DATA WERE LOGGED AND RECORDED BY LENNAR ON APRIL 14 AND 21, 2009

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SAMPLING AND ANALYSIS PLAN
SOIL EXCAVATION AND GROUNDWATER TREATMENT
BUILDING 742 FDP INVESTIGATION AREA C2

FIGURE A-1

PRE-EXCAVATION SAMPLING LOCATIONS

FORMER MARE ISLAND NAVAL SHIPYARD, VALLEJO, CALIFORNIA

REVIEW: 0
AUTHOR: GFG
DCN: ECSD-3211-0004-0016
FILE NUMBER: 100415L5884.mxd

TETRA TECH EC, INC.

BUILDING 742

D1-C87

D1-M15

STEAM SYSTEM UNIT

D1C85W03

8" VCP

APPROXIMATE LIMITS OF PROPOSED EXCAVATION AREA AROUND MANHOLE D1-C85

TOP OF EXCAVATION SLOPE

TOE OF EXCAVATION SLOPE

24" ACCMP

MARE ISLAND STRAIT (APPROXIMATELY 300 FEET FROM BUILDING 742)

APPROXIMATE LIMITS OF CRUSHED STORMWATER PIPELINE PROPOSED FOR EXCAVATION

D1C85W02

TOE OF EXCAVATION SLOPE

APPROXIMATE LIMITS OF PROPOSED EXCAVATION AREA ASSOCIATED WITH THE FORMER DEGREASING PLANT

DRYING RACKS

D1-C89

D1-C85

D1-C88

4" GREASE TRAP

RAMP

D1/4/B290W

D1/4/B290E

D1-C84

GRINDER FOUNDATION SUMP

D1C85W01

D1-C91

D1-C90

GARAGE BAY

STORAGE SHED

ELECTRICAL SUBSTATION

STORMDRAIN PIPE CONCRETE CAP

TOP OF EXCAVATION SLOPE

GREASE SUMP

D1-C81

D1-M9

D1-C80

12" VCP

LEGEND

- ORC INJECTION LOCATION
- MONITORING WELL
- STORMWATER MANHOLE
- MANHOLE D1-C85
- STORMWATER CATCH BASIN
- CATCH BASIN OR MANHOLE (NOT VISIBLE)
- APPROXIMATE EXTENT OF CRUSHED STORMWATER PIPELINE
- ELECTRIC LINE
- FUEL OIL PIPELINE D1/4/B290W (WESTON 2000)
- FUEL OIL PIPELINE D1/4/B290E (WESTON 2000)
- INDUSTRIAL WASTEWATER PIPELINE
- SANITARY SEWER
- STEAM LINE
- STORMWATER PIPELINE
- UNKNOWN UTILITY LINE
- GARAGE ROLL-UP DOOR
- DRYING RACK
- FLOW DIRECTION OF STORMWATER SYSTEM BASED ON SYSTEM DESIGN (IT 2002)
- PROPOSED EXCAVATION/GROUNDWATER TREATMENT AREA
- EXTENT OF GPR ANOMALIES
- CONCRETE PAD
- BUILDING

NOTES:

GPR - GROUND PENETRATING RADAR

ORC - OXYGEN RELEASE COMPOUND

15 0 15 30 Feet

N

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SAMPLING AND ANALYSIS PLAN
SOIL EXCAVATION AND GROUNDWATER TREATMENT
BUILDING 742 FDP INVESTIGATION AREA C2

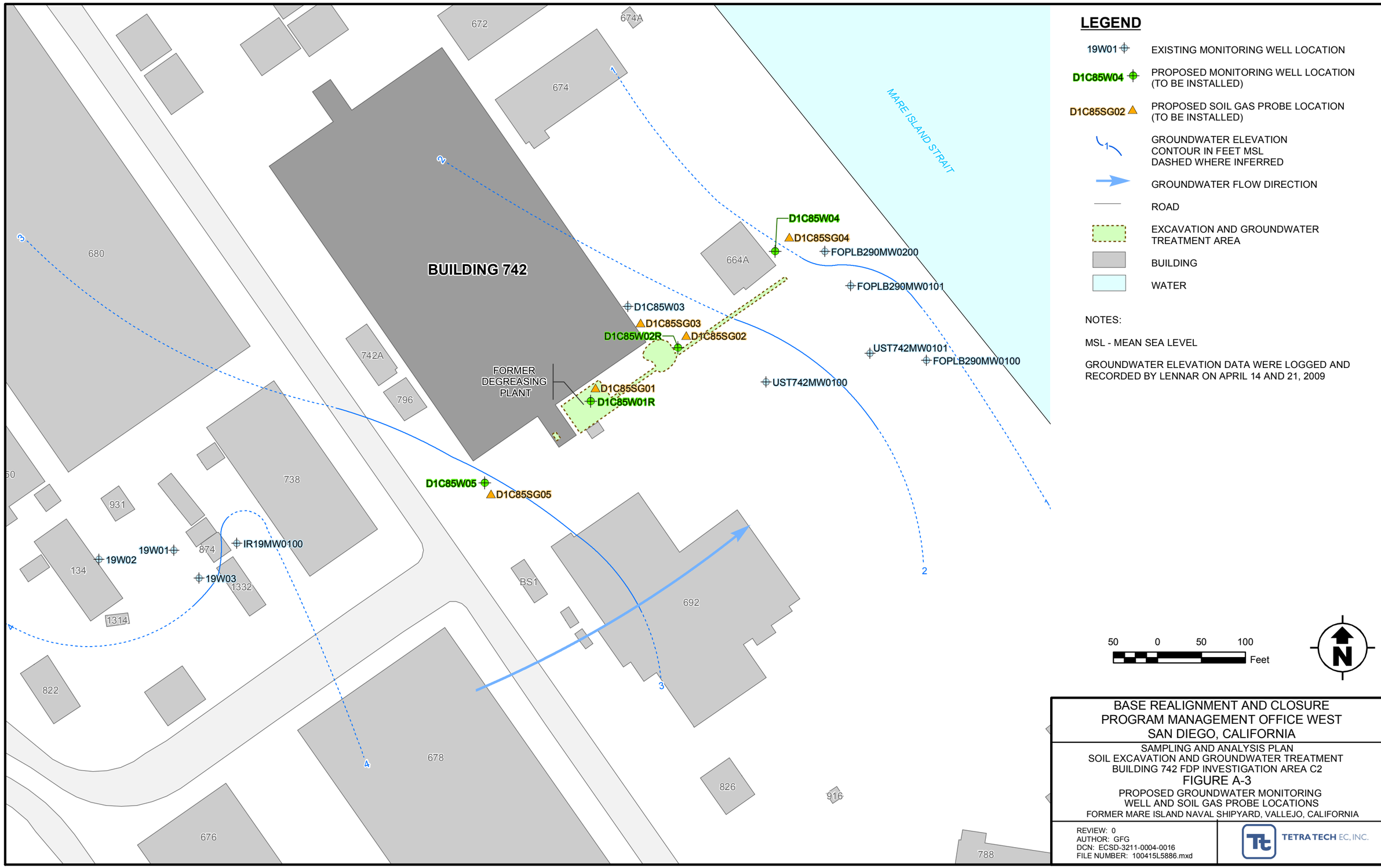
FIGURE A-2

PROPOSED SOIL EXCAVATION/GROUNDWATER TREATMENT PLAN

FORMER MARE ISLAND NAVAL SHIPYARD, VALLEJO, CALIFORNIA

REVIEW: 0
AUTHOR: GFG
DCN: ECSD-3211-0004-0016
FILE NUMBER: 100415L5885.mxd

TETRA TECH EC, INC.



LEGEND

- 19W01 — EXISTING MONITORING WELL LOCATION
- D1C85W04 — PROPOSED MONITORING WELL LOCATION (TO BE INSTALLED)
- D1C85SG02 — PROPOSED SOIL GAS PROBE LOCATION (TO BE INSTALLED)
- GROUNDWATER ELEVATION CONTOUR IN FEET MSL DASHED WHERE INFERRED
- GROUNDWATER FLOW DIRECTION
- ROAD
- EXCAVATION AND GROUNDWATER TREATMENT AREA
- BUILDING
- WATER

NOTES:

MSL - MEAN SEA LEVEL

GROUNDWATER ELEVATION DATA WERE LOGGED AND RECORDED BY LENNAR ON APRIL 14 AND 21, 2009

BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
SAN DIEGO, CALIFORNIA

SAMPLING AND ANALYSIS PLAN
SOIL EXCAVATION AND GROUNDWATER TREATMENT
BUILDING 742 FDP INVESTIGATION AREA C2

FIGURE A-3

PROPOSED GROUNDWATER MONITORING
WELL AND SOIL GAS PROBE LOCATIONS
FORMER MARE ISLAND NAVAL SHIPYARD, VALLEJO, CALIFORNIA

REVIEW: 0
AUTHOR: GFG
DCN: ECSD-3211-0004-0016
FILE NUMBER: 100415L5886.mxd

TETRA TECH EC, INC.

ATTACHMENT 1

FIELD SAMPLING MATRIX

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FIELD SAMPLING MATRIX

TEST METHODS TO LIST ON COC						SOIL					WATER										SOIL GAS
						8260B/ VOCs	TPH-P	8270C/S VOCs	TPH-E	8082/ PCBs	8260B/ VOCs	8270C/ SVOCs	TPH-P	TPH-E	8082/ PCBs	6020A/7470A (Dissolved Metals)	RSK175/ Dissolved Gases	Anions (Cl, NO3, NO2, PO4, SO4)	TOC/TKN/Ammonia	Microbial Testing	TO-15/ VOCs
Location ID	Sample ID	Matrix	Start Depth-End Depth (feet)	QC	Level 3 or 4	Three 5-gram En Cores in one aluminum bag	Three 5-gram En Cores in one aluminum bag	One 8-ounce glass jar in double ziplock bag			Three 40-mL VOA vials with HCl in double ziplock bag	Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag	Three 40-mL VOA vials with HCl in double ziplock bag	Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag	Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag	FIELD FILTER during collection through a 0.45 micron filter into one 250-mL Poly bottle with HNO3 in double ziplock bag; write FILTERED on sample label	Three 40-mL VOA vials in double ziplock bag	One 125-mL plastic with no preservative	One 500-mL plastic bottle with H2SO4	Three 40-mL vials and four 1-L bottles	One 6-L SUMMA
D1C85GB017	4-001	Soil	TBD	N	3	X	X		X	X											
D1C85GB017	4-002	Water	TBD	N	3						X	X	X	X	X	X					
D1C85TSG01	4-003	Soil Gas	3-5	N	3																X
D1C85TSG02	4-004	Soil Gas	3-5	N	3																X
D1C85TSG03	4-005	Soil Gas	3-5	N	4																X
D1C85TSG04	4-006	Soil Gas	3-5	N	3																X
D1C85TSG05	4-007	Soil Gas	3-5	N	3																X
D1C85W01	4-008	Water	5-15	N	3						X	X	X	X	X	X	X	X	X	X	
D1C85W02	4-009	Water	5-15	N	3						X	X	X	X	X	X	X	X	X	X	
D1C85W03	4-010	Water	5-15	N	3						X	X	X	X	X	X	X	X	X	X	
D1C85W03	4-011	Water	5-15	FD	4						X	X	X	X	X	X	X	X	X	X	
FDP North SW	4-012	Soil	TBD	N	3	X	X		X	X											
FDP South SW	4-013	Soil	TBD	N	3	X	X		X	X											
FDP East SW	4-014	Soil	TBD	N	3	X	X		X	X											
FDP West SW	4-015	Soil	TBD	N	4	X	X		X	X											
FDP Bottom	4-016	Soil	TBD	MS/MSD	3	XXX	XXX		XXX	XXX											
Manhole North SW	4-017	Soil	TBD	N	3	X	X		X	X											
Manhole South SW	4-018	Soil	TBD	N	3	X	X		X	X											
Manhole East SW	4-019	Soil	TBD	N	3	X	X		X	X											
Manhole West SW	4-020	Soil	TBD	N	4	X	X		X	X											
Manhole Bottom	4-021	Soil	TBD	N	3	X	X		X	X											
Grinder Sump North SW	4-022	Soil	TBD	N	3	X	X		X	X											
Grinder Sump South SW	4-023	Soil	TBD	N	3	X	X		X	X											
Grinder Sump East SW	4-024	Soil	TBD	N	3	X	X		X	X											
Grinder Sump West SW	4-025	Soil	TBD	N	3	X	X		X	X											
Grinder Sump Bottom	4-026	Soil	TBD	N	3	X	X		X	X											
Pipeline X	4-XXX	Soil	TBD	N	3/4	X	X		X	X											
Utility X	4-XXX	Soil	TBD	N	3/4	X	X		X	X											
TRIP BLANK (1/day)	4-TB1, 4-TB2, 4-TB3, etc.	Water	--	TB	3						X		X								
EQUIPMENT BLANK (1/day)	4-EB1, 4-EB2, 4-EB3, etc.	Water	--	EB	3						X	X	X	X	X	X					

Abbreviations and Acronyms:

COC – chain of custody
FDP – Former Degreasing Plant
HCl – hydrochloric acid
HNO^3 – nitric acid
ID – identification
L – liter
mL – milliliter
MS – matrix spike
MSD – matrix spike duplicate
N – normal
PCB – polychlorinated biphenyl
QC – quality control
SW – sidewall
TB – trip blank
TBD – to be determined
TKN – total Kjeldahl nitrogen
TOC – total organic carbon
TPH-E – total extractable petroleum hydrocarbons
TPH-P – total purgeable petroleum
VOA – volatile organic analysis
VOC – volatile organic compound

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QUARTERLY MONITORING MATRIX

TEST METHODS TO LIST ON COC						WATER										SOIL GAS
						8260B/VOCs	8270C/SVOCs	TPH-P	TPH-E	8082/PCBs	METALS	RSK 175M	Anions (Cl, NO3, NO2, PO4, SO4)	TOC/TKN/Ammonia	Microbial Testing	TO-15/VOCs
Location ID	**Sample ID**	**Matrix**	**Start Depth-End Depth (feet)**	**QC**	**Level 3 or 4**	**Three 40-mL VOA vials with HCl in double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**	**Three 40-mL VOA vials with HCl in double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**	**FIELD FILTER during collection through a 0.45 micron filter into one 250-mL Poly bottle with HNO3 in double ziplock bag**	**Three 40-mL VOA vials in double ziplock bag**	**One 125-mL plastic with no preservative**	**One 500-mL plastic bottle with H2SO4**	**Three 40-mL vials and four 1-L bottles**	**One 6-L SUMMA**
D1C85W01R	4-Q1-001 4-Q2-001 4-Q3-001 4-Q4-001	Water	5-15	N	3	X	X	X	X	X	X	X	X	X	X	
D1C85W02R	4-Q1-002 4-Q2-002 4-Q3-002 4-Q4-002	Water	5-15	N	3	X	X	X	X	X	X	X	X	X	X	
D1C85W03	4-Q1-003 4-Q2-003 4-Q3-003 4-Q4-003	Water	5-15	N	3	X	X	X	X	X	X	X	X	X	X	
D1C85W04	4-Q1-004 4-Q2-004 4-Q3-004 4-Q4-004	Water	5-15	N	3	X	X	X	X	X	X	X	X	X	X	
D1C85W05	4-Q1-005 4-Q2-005 4-Q3-005 4-Q4-005	Water	5-15	N	3	X	X	X	X	X	X	X	X	X	X	
D1C85SG01	4-Q1-006 4-Q2-006 4-Q3-006 4-Q4-006	Soil Gas	3-5	N	3											X
D1C85SG02	4-Q1-007 4-Q2-007 4-Q3-007 4-Q4-007	Soil Gas	3-5	N	3											X
D1C85SG03	4-Q1-008 4-Q2-008 4-Q3-008 4-Q4-008	Soil Gas	3-5	N	3											X
D1C85SG04	4-Q1-009 4-Q2-009 4-Q3-009 4-Q4-009	Soil Gas	3-5	N	3											X
D1C85SG05	4-Q1-010 4-Q2-010 4-Q3-010 4-Q4-010	Soil Gas	3-5	N	3											X
TRIP BLANK (1/day)	4-TB1, 4-TB2, 4-TB3, etc.	Water	--	TB	3	X		X								
EQUIPMENT BLANK (1/day)	4-EB1, 4-EB2, 4-EB3, etc.	Water	--	EB	3	X		X	X	X	X					

Notes:

For groundwater samples, one field duplicate and one MS/MSD should be performed for each quarterly event. FDs and MS/MSDs should be Level 4.

Abbreviations and Acronyns:

COC – chain of custody
EB – equipment blank
FDP – Former Degreasing Plant
HCl – hydrochloric acid
HNO^3 – nitric acid
ID – identification
L – liter
mL – milliliter
MS – matrix spike
MSD – matrix spike duplicate
N – normal
PCB – polychlorinated
QC – quality
SW – sidewall
TB – trip
TBD – to be determined
TPH-E – total extractable petroleum hydrocarbons
TPH-P – total purgeable petroleum hydrocarbons
VOA – volatile organic
VOC – volatile organic compound

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ATTACHMENT 2

EXAMPLE OF CHAIN OF CUSTODY, SAMPLE LABEL, CUSTODY SEAL, AND FIELD FORMS

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TETRA TECH
1230 Columbia Street, Suite 500
San Diego, CA 92101 (619) 234-8696

NUMBER 21700

CHAIN-OF-CUSTODY RECORD

PROJECT NAME	PURCHASE ORDER NO.	ANALYSES REQUIRED	LABORATORY NAME	Project Information Section Do not submit to Laboratory
PROJECT LOCATION	PROJECT NO.			
SAMPLER NAME	AIRBILL NUMBER		LABORATORY ID (FOR LABORATORY)	
PROJECT CONTACT	PROJECT CONTACT PHONE NUMBER			

SAMPLE ID	DATE COLLECTED	TIME COLLECTED	NO. OF CONTAINER	LEVEL 3	LEVEL 4	TYPE	TAT	COMMENTS	LOCATION	DEPTH START	DEPTH END	QC

RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	LABORATORY INSTRUCTIONS/COMMENTS	SAMPLING COMMENT:
COMPANY	TIME	COMPANY		
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	COMPOSITE DESCRIPTION	
COMPANY	TIME	COMPANY		
RELINQUISHED BY (Signature)	DATE	RECEIVED BY (Signature)	SAMPLE CONDITION UPON RECEIPT (FOR LABORATORY)	
COMPANY	TIME	COMPANY	TEMPERATURE: _____ SAMPLE CONDITION: ☐ INTACT ☐ BROKEN COOLER SEAL: ☐ INTACT ☐ BROKEN	

White - Laboratory; Pink - Laboratory; Canary - Project File; Manila - Data Management

SAMPLE LABEL (EXAMPLE)

SAMPLE NO.:_____
PROJECT:_____
DATE:_____/_____/_____ **TIME:**_____**HRS**_____
MEDIUM: WATER_____ **SOIL**_____ **SEDIMENT**_____
OTHER_____**(Specify)**
TYPE: GRAB_____ **COMPOSITE**_____ **OTHER**_____
PRESERVATION:_____
ANALYSIS:_____
SAMPLED BY:_____
REMARKS:_____
_____

CUSTODY SEAL (EXAMPLE)

CUSTODY SEAL

Person Collecting Sample**:**_____ Sample No**.:**_____
(Signature)
Date Collected:_____ Time_____
_____

TETRA TECH EC, INC.

LOW-FLOW GROUNDWATER SAMPLING DATA SHEET

Well Name _____
Project _____
Project No. _____
Well Location _____
Sample Date _____
Sampling Personnel _____
_____
_____
Sample ID _____
Duplicate ID _____

Screen Interval _____
Water Level (from TOC) _____
Depth of Bottom of Tubing/Pump Inlet _____
Depth to Water (w/ Tubing/Pump in Well) _____
Immiscible Phases Present_____ ☐ Yes ☐ No

PURGING

Time	Discharge Rate[1] (ml/min)	Dissolved Oxygen (mg/L)	pH	Eh/ORP (mV)	Temp. (°C)	Specific Conductivity (mS/cm)	Turbidity (NTU)	Cumulative Volume of Water Removed/Purged (Gallons)	Depth to Water[2] (ft)	Comments
Stabilization Criteria		**± 0.3**	**± 0.1**	**± 10**	**± 1°**	**± 3 percent**	**± 10% if NTU>10**			

Notes:
1. Purge rate = 200 - 500 ml/minute
2. Drawdown shall be <0.33 foot
3. Sample rate for VOCs analysis = 100 - 200 ml/minute
4. Sample rate for non-VOCs analysis = purge rate = 200 - 500 ml/minute

Condition of Well: _____
Remarks: _____

ATTACHMENT 2

NOREAS Field Forms

NOREAS
Environmental Engineering and Science

CHAIN-OF-CUSTODY RECORD

COC No. _____

PAGE of

Project Name/No:	Purchase Order No.
Project Location:	Laboratory Name:
Company Name: NOREAS, Inc.	Laboratory Contact:
Address:	Laboratory Address:
Project Manager:	Laboratory Phone:
Phone/Fax No.	
Project Contact:	Airbill No.
Contact Phone:	

Laboratory SDG No:

ANALYSES REQUIRED

Sample ID	Sampling Location	Date	Time	Matrix	QC Level (3/4)	Unpreserved	Preserved	# of Containers

Special Instructions:

Turnaround Time: ☐ *24 HR* ☐ *48 HR* ☐ *72 HR*

☐ *STANDARD* *OR* ☐ _____

Sampler(s) Name(s):

Matrix: W: Groundwater or Drinking water; S: Soil; W: Waste

Relinquished By (signature):	Date	Received By (signature)	Date
Company	Time	Company	Time
Relinquished By (signature):	Date	Received By (signature)	Date
Company	Time	Company	Time

Sample Condition Upon Receipt (For Laboratory Use)

Cooler Temp (°C):

Sample Condition: ☐ **Intact** ☐ **Broken**

Cooler Seal: ☐ **Intact** ☐ **Broken**

DISTRIBUTION: White - Laboratory; Blue - Project File

NOREAS
Environmental Engineering and Science

GROUNDWATER LEVEL MEASUREMENTS

Project:_____ Date: _____

Personnel:_____ Equip.: _____

Time	Location/Well I.D.	Measuring / Reference Point	DTW (feet below measuring point)

NOREAS
Environmental Engineering and Science

LOW-FLOW SAMPLING LOG

Project Name: _____ Well Number: _____
Project Number: _____ Equipment: _____
Date: _____ Sample ID: _____
Site Engineer(s): _____ Contractor: _____

Reference Point: _____

Depth to Water (ft) _____ h - Length of discharge tubing (feet) _____
Depth to Sediment (ft) _____ ID - Inner Dia. discharge tubing (inches) _____
Water Column Height (ft) _____ TV - Volume of Tubing (ml) _____
Casing Diameter (inches) _____ [TV (in ml) = $3.01*D^2h$]

Pump Controller Settings: BV - Bladder volume (ml) _____
Cycles per minute (CPM) _____
Refill Time (seconds) _____ SSV - Sampling System Volume (ml) _____
Discharge Time (seconds) _____ [SSV = TV + BV]
Low Flow Sampling Rate (ml/min) _____

Time Required to Purged SSV _____ (minutes) Total Volume Purged (ml) _____

Time	pH	Temp. (^oC)	Conductivity (umhos)	Dissolved Oxygen (mg/L)	ORP (mv)	DTW (ft bgs)	Comments

Notes Sampling Procedures:

ATTACHMENT 3

Field Sampling Matrices

FIELD SAMPLING MATRIX

TEST METHODS TO LIST ON COC				SOIL					WATER				
				8260B/ VOCs	TPH-P	8270C/S VOCs	TPH-E	8082/ PCBs	8260B/ VOCs	8270C/ SVOCs	TPH-P	TPH-E	8082/ PCBs
Location ID	**Sample ID**	**Matrix**	**Start Depth-End Depth (feet)**	**Three 40-ml VOAs filled via 5-gram TerraCore**	**Two 40-ml VOAs filled via 5-gram TerraCore**	**One 8-ounce glass jar in double ziplock bag**			**Three 40-mL VOA vials with HCl in double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**	**Three 40-mL VOA vials with HCl in double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**	**Two 1-L amber glass bottles unpreserved, each in bubble bag and double ziplock bag**
Excavation Floor	4-XXX	Soil	See Figure[1]	X	X	X	X	X					
Excavation Sidewall	4-XXX	Soil	See Figure[1]	X	X	X	X	X					
TRIP BLANK (1/day)	4-TB1, 4-TB2, 4-TB3, etc.	Water	--						X		X		
EQUIPMENT BLANK (1/day)	4-EB1, 4-EB2, 4-EB3, etc.	Water	--						X	X	X	X	X

Abbreviations and Acronyns:
COC – chain of custody
HCl – hydrochloric acid
HNO^3 – nitric acid
ID – identification
L – liter
mL – milliliter
MS – matrix spike
MSD – matrix spike duplicate
N – normal
PCB – polychlorinated biphenyl
QC – quality control
SW – sidewall
TB – trip blank
TBD – to be determined
TKN – total Kjeldahl nitrogen
TOC – total organic carbon
TPH-E – total extractable petroleum hydrocarbons
TPH-P – total purgeable petroleum hydrocarbons
VOA – volatile organic analysis
VOC – volatile organic compound
XXX – sequential sample identification number, beginning at 4-059

TEST METHODS TO LIST ON COC				WATER	SOIL GAS
				8260B/VOCs	TO-15/VOCs
Location ID	**Sample ID**	**Matrix**	**Start Depth-End Depth (feet)**	**Three 40-mL VOA vials with HCl in double ziplock bag**	**One 6-L SUMMA**
D1C85W01R	4-Q6-001	Water	5-15	X	
D1C85W02R	4-Q6-002	Water	5-15	X	
D1C85W03	4-Q6-003	Water	5-15	X	
D1C85W04	4-Q6-004	Water	5-15	X	
D1C85W05	4-Q6-005	Water	5-15	X	
D1C85SG01	4-Q6-006	Soil Gas	3-5		X
D1C85SG02	4-Q6-007	Soil Gas	3-5		X
D1C85SG03	4-Q6-008	Soil Gas	3-5		X
D1C85SG04	4-Q6-009	Soil Gas	3-5		X
D1C85SG05	4-Q6-010	Soil Gas	3-5		X
D1C85SG06	4-Q6-011	Soil Gas	3-5		X
TRIP BLANK (1/day)	4-TB1, 4-TB2, 4-TB3, etc.	Water	--	X	X
EQUIPMENT BLANK (1/day)	4-EB1, 4-EB2, 4-EB3, etc.	Water	--	X	

Notes:
For groundwater samples, one field duplicate and one MS/MSD should be performed for each quarterly event.
FDs and MS/MSDs should be Level 4 data packages.

Abbreviations and Acronyns:

COC – chain of custody
EB – equipment blank
HCl – hydrochloric acid
L – liter
mL – milliliter
MS – matrix spike
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VOA – volatile organic analysis
VOC – volatile organic compound