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Naval Facilities Engineering Command
Contracts Department
1220 Pacific Highway, Building 127, Room 112
San Diego, California 92132-5190

CONTRACT NO. N68711-98-D-5713
CTO NO. 0048

FINAL
SAMPLING AND ANALYSIS PLAN
Revision 0
June 12, 2003

WEST-SIDE AQUIFERS TREATMENT SYSTEM DIVERSION
FORMER NAS MOFFETT FIELD
MOFFETT FIELD, CALIFORNIA

DCN: FWSD-RAC-03-2931

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PRE-DRAFT
WEST-SIDE AQUIFERS TREATMENT SYSTEM
DIVERSION WORK PLAN

DATED 10 APRIL 2003

THIS REPORT WAS NOT SUBMITTED TO THE ADMINISTRATIVE RECORD FILE.

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
%R	percent recovery
µg/kg	micrograms per kilogram
BHC	benzene hexachloride
CARB	California Air Resources Board
CCV	continuing calibration verification
COC	chain-of-custody
CTO	Contract Task Order
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DoD	Department of Defense
DON	Department of the Navy
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EWI	Environmental Work Instruction
FWENC	Foster Wheeler Environmental Corporation
FSP	Field Sampling Plan
GC/MS	gas chromatograph/mass spectrometer
ICAL	initial calibration
ICP-AES	inductively coupled plasma-atomic emission spectrometer
LCS	laboratory control sample
mg/kg	milligrams per kilogram
Moffett	Former NAS Moffett Field
MS	matrix spike
MSD	matrix spike duplicate
NAS	Naval Air Station
N/A	not applicable
NFESC	Naval Facilities Engineering Service Center

ABBREVIATIONS AND ACRONYMS
(Continued)

PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goal
QA	quality assurance
QC	quality control
QAPP	Quality Assurance Project Plan
RAC	Remedial Action Contract
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SIM	selective ion monitoring
SOP	standard operating procedure
SVOC	semivolatile organic compound
SWDIV	Southwest Division Naval Facilities Engineering Command
TPH-extractable	total extractable petroleum hydrocarbons
TPH-purgeable	total purgeable petroleum hydrocarbons
VOC	volatile organic compound
WATS	West-Side Aquifers Treatment System

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) was prepared by Foster Wheeler Environmental Corporation (FWENC) to support field sampling activities for import fill material for the West-Side Aquifers Treatment System (WATS) effluent diversion field activities, at Former Naval Air Station (NAS) Moffett Field (Moffett), Moffett Field, California. The SAP was prepared on behalf of the Department of the Navy (DON), Southwest Division Naval Facilities Engineering Command (SWDIV) under Remedial Action Contract (RAC) No. N68711-98-D-5713, Contract Task Order (CTO) No. 0048. This project-specific SAP includes the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP) required for this project.

This SAP has been abbreviated to include only those elements which are directly related to field sampling procedures for import backfill material. The SAP will be used by field and laboratory personnel as a reference document during sampling and analysis.

The quality assurance (QA) elements of this SAP are in accordance with the *EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, QAMS* [U.S. Environmental Protection Agency (EPA), 2001] to ensure that all data collected are precise, accurate, representative, complete, and comparable to meet their intended use. Since this SAP discusses only import fill material sampling, data quality objectives are not applicable and will not be included.

1.1 OBJECTIVE

The project objective is to install an approximate 8,300-foot-long effluent diversion line that will serve to reroute the existing WATS discharge into Stevens Creek at the National Aeronautics and Space Administration Ames Research Center, located within Moffett. Currently the WATS effluent discharges directly to the stormwater drainage system, which carries it to the Eastern Diked Marsh. Eventually the effluent flows to the Stormwater Retention Basin. The purpose of the effluent diversion is to return the capacity of the stormwater system to its originally designed level by routing the WATS effluent directly to Stevens Creek through a dedicated conveyance system. Current plans are being considered that would increase the effluent production at WATS. These plans would further compromise the capacity of the stormwater drainage system without the effluent diversion. This SAP is an attachment to the *Pre-Draft West-Side Aquifers Treatment System Diversion Work Plan,* DCN: FWSD-RAC-03-0439 (FWENC, 2003).

The sampling and analysis objective is to collect samples of import material which will be used as backfill during the WATS diversion, to ensure that the import material meets residential Preliminary Remediation Goals (PRGs) (EPA, 2002) before material is brought on site for use as backfill.

2.0 SAMPLING STRATEGY AND REQUEST FOR ANALYSIS

This section describes the collection and analysis of samples for import backfill material.

2.1 IMPORT BACKFILL MATERIAL SAMPLING

Backfill material will be imported to the site for use as fill. The Department of Toxic Substances Control (DTSC) *Information Advisory for Clean Imported Fill Material* (DTSC, 2001) will be used as guidance document for sampling analysis and frequency.

The anticipated volume of import material is 500 cubic yards. Two samples will be collected from each imported material source prior to use. If anticipated volume of material exceeds 1,000 cubic yards, then four total samples will be collected from each imported material source prior to use. All samples will be analyzed for the following: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), total purgeable petroleum hydrocarbons (TPH-purgeable), total extractable petroleum hydrocarbons (TPH-extractable), Title 22 metals, and pH. In addition to these analyses, a current certificate should be obtained from the facility providing the material to ensure that the material does not contain asbestos. If the facility cannot provide a current certificate, then asbestos analysis will be required, unless the material has been sampled for asbestos by FWENC within the last year and is below the required limit for asbestos.

2.2 ANALYTICAL METHODS

The following EPA analytical methods [*Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW-846,* Third Edition and final updates (EPA, 1986)] will be used to analyze import backfill samples during this project:

- VOCs by EPA Method 5035/8260B for soil; if En Core™ samplers for EPA Method 5035 are not able to be used due to the type of media, then EPA Method 5030B will be used
- SVOCs by EPA Method 8270C
- Pesticides by EPA Method 8081A
- PCBs by EPA Method 8082
- TPH-purgeable by EPA Method 5035/8015B; if En Core samplers for EPA Method 5035 are not able to be used due to the type of media, then EPA Method 5030B will be used
- TPH-extractable by EPA Method 8015B
- Title 22 metals by EPA Method 6010B/7000

- pH by SW-846, Chapter 7
- Asbestos by California Air Resources Board (CARB) Method 435 (if required)

Table 2-1 lists the sample containers, preservatives, and holding time requirements for samples. Detailed information on methods, calibration criteria, project-required reporting limits (RLs), and QC acceptance criteria are presented in Section 4.0.

3.0 FIELD METHODS AND SAMPLING PROCEDURES

The following sections present sampling procedures and sample handling procedures to be used for this project.

3.1 BACKFILL MATERIAL SAMPLING PROCEDURES

Sampling of import materials will be conducted as follows. If the site where the backfill is being imported from is accessible, then samples will be collected from the site; if the site is not accessible, then a sample of the material will be sent to the FWENC project site, and samples will be collected.

- A hand auger or similar device will be used to access and collect each sample.
- Four En Core samplers will be collected for each VOC and TPH-purgeable sample as follows:
    1. Holding the coring body, the plunger rod will be pushed down until the small o-ring rests against the tabs. This will assure that the plunger will move easily.
    2. 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.
    3. 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.
    4. 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.
    5. 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.
    6. The En Core sampler will be placed in its aluminum sealed bag.
    7. This procedure will be performed until the appropriate amount of En Core samplers are collected for each sample. All four En Core samplers for one sample may be placed in one aluminum bag for consolidation purposes.
    8. The sample label on the outside of the aluminum bag will be completed as described below. The aluminum bag will be placed in a resealable bag, a custody seal placed over the bag, that bag placed in another resealable bag, and then put on ice immediately.

- In addition to En Core samplers, grab samples will be collected into a sample jar. Sample jars will be filled completely.
- Sample labels will be filled out with indelible black ink and affixed to sample containers at the time of sample collection. Labels will include the sample identification number, sample collection date (month/day/year), time of collection (24-hour clock), sampler's initials, analyses required, and preservative (if any). Sample identification numbers will be identified as 0048-WATSDIV-YYY where YYY is a sequential number for this project. Each sample label will be covered with clear tape.
- Samples will be packaged according to Section 3.2.
- The sample number, date, time, and description of the sample will be recorded on the chain-of-custody (COC) record and in a permanently bound field logbook, with consecutively numbered pages. All entries will be written in indelible black ink. Changes or corrections on any project documentation will be made by crossing out the erroneous item with a single line and initialing (by the person performing the correction) and dating the correction. The original item, although erroneous, must remain legible beneath the cross-out line. The new information should be written clearly above the crossed-out item.

3.2 SAMPLE PACKAGING AND SHIPMENT

Immediately after sample labeling, custody seals will be affixed to each sample container. 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 be protected with bubble wrap if transported by a commercial carrier.

Each cooler will be shipped with a temperature blank. A temperature blank is a container 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 to keep the samples cooled. 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(s) 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 commercial carrier will be packed in a sample cooler lined with a plastic bag. Double-bagged ice will be added inside the plastic bag at the bottom of the cooler,

one layer of sample containers will be placed on the ice, more double-bagged ice will be placed on top of the containers, and 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 the commercial courier's name. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to 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, then 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 the commercial courier.

4.0 QUALITY CONTROL OBJECTIVES

The overall quality objectives of this SAP are to outline procedures for the collection and assessment of data. QA oversight for this project may include system audits of field activities and of the laboratory subcontracted by the DON to perform the analysis.

The project reporting limits and quality control (QC) acceptance criteria for each method are presented in Tables 4-1 and 4-2. Field QC samples will not be collected for this project.

This section describes laboratory qualification, QC procedures, QC samples, data review, deliverables, and data validation.

4.1 LABORATORY QUALIFICATION

The analytical laboratory selected to analyze samples for this project will be certified by the California Department of Health Services through the Environmental Laboratory Accreditation Program for all of the analytical methods required for the project. In addition, the laboratory must successfully complete the Naval Facilities Engineering Service Center (NFESC) Laboratory Evaluation Program prior to sampling activities and maintain current status throughout the duration of the project.

4.2 LABORATORY QUALITY CONTROL PROCEDURES

The analytical laboratory must have written standard operating procedures (SOPs) defining the instrumentation, instrumentation maintenance, tuning, calibration, method detection and RLs, QC requirements, blank requirements, and step-by-step procedures for each analytical method. The SOPs must be available to the analysts performing the work. The SOPs must meet or exceed the requirements of the analytical methods cited in this SAP and in the *Quality Systems Manual for Environmental Laboratories* [Department of Defense (DoD), 2000]. The laboratory must maintain logs of all activities that have an impact on the quality of the laboratory results.

Any portion of the method that is subcontracted by the laboratory to another laboratory or sent to another facility of the same network of laboratories must have the prior approval of the FWENC Project Chemist. Method substitution because of instrumental failure will not be permitted without approval from the FWENC Project Chemist.

4.3 LABORATORY QUALITY CONTROL SAMPLES

Laboratory QC samples required for this project are as follows.

Calibration

Each instrument must be calibrated in accordance with the specific methods and with the standard solutions appropriate to the type of instrument and the calibration range established for the method. Initial calibrations (ICAL) are performed when the method is first used and again whenever the continuing calibrations fail to meet their respective acceptance criteria. The frequency of continuing calibrations is specified in referenced methods.

Instrument/Calibration Blanks

Instrument blanks must be run following calibration runs, before sample analyses are performed, and after samples containing high concentrations of potentially interfering materials are found. Target analytes must not appear in the instrument blanks at concentrations greater than half the required RLs.

Method Blanks

The method blank must be prepared and analyzed for each batch of 20 project samples or less per matrix (aqueous and solid) type. The method blank must not exhibit analytes at concentrations greater than half the required RLs. Contamination in the method blank above half the RLs will require that the entire associated batch of extracts or digestates be reprepared and reanalyzed.

Laboratory Control Samples

The laboratory control sample (LCS) is prepared and run at a frequency of one per 20 project samples per matrix with the associated samples, using the same reagents and volumes. If insufficient quantity of sample is available for the matrix spike/matrix spike duplicate (MS/MSD), the LCS will be prepared and analyzed in duplicates. All analytes in the LCS must meet recovery criteria. If the criteria are not met, the entire batch of samples must be reprepared, together with a new LCS, and reanalyzed.

4.4 PREVENTIVE MAINTENANCE

All instruments must be maintained in accordance with the manufacturers' recommended procedures. The laboratory must define in its QA plan the frequency and type of maintenance for each instrument. The laboratory must also record all maintenance activities in an instrument logbook.

4.5 DATA REVIEW

All data reported by the laboratory must be reviewed in accordance with the SOPs and as follows.

Analyst Review

Each analyst that generates a data set is responsible for ensuring that 100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.

Peer Review

One hundred percent of all data sets must be reviewed by an independent peer analyst. Peer reviews must be performed by an analyst that is qualified to perform the subject analytical method.

Technical Review

Technical reviews by the responsible supervisor or designated alternate must be performed on 100 percent of reported data. The same individual may not perform peer and technical reviews on the same data set. If the responsible supervisor is the only qualified peer reviewer for a method, the requirement for the technical review is waived.

Management Review

One hundred percent of all data must receive management approval prior to release. The scope and content of management's review is at the laboratory's discretion. Authority to release data may be delegated to a technical supervisor or other party, if the term of the delegated authority is documented in the QA program file.

Quality Assurance Review

QA reviews of data from each section of the laboratory must be conducted on a routine basis. Annually, at least 10 percent of data reports generated using each analytical method must be reviewed by a member of the QA staff. QA data reviews may be conducted after the subject data have been reported to FWENC.

4.6 DELIVERABLES

The following describes the deliverable documents that will be submitted to FWENC by the analytical laboratory.

4.6.1 Hard-copy Deliverables

Two copies of the hard-copy data will be submitted to FWENC by the laboratory. The report pages will be sequentially numbered. The report will contain a table of contents referencing individual sections in the data package, 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 FWENC samples will be cross-referenced to the associated QC samples.

When revisions to data reports are required, the revised pages will be stamped with the notation "amended or revised report."

All relevant raw data and documentation, including, but not limited to, logbooks, data sheets, electronic files, and final reports, will be maintained by the laboratory for at least 7 years. FWENC will be notified 30 days before disposal of any relevant laboratory records.

To allow third-party validation, two types of data packages will be required. They will be referred to as EPA Level III-equivalent or IV-equivalent data packages. For this project, FWENC will request that 80 percent of the import backfill data be submitted in an EPA Level III-equivalent data package and 20 percent submitted in an EPA Level IV-equivalent data package. All data packages will be assembled in the following sequence:

- Cover page (with laboratory service identification number, FWENC project name, and FWENC project number)
- Original COC records (including cooler temperature and sample condition)
- Sample receipt forms
- Cross-reference table
- Case narrative
- Organic raw data sequence (by test):
  - Sample result forms, including method blanks
  - Sample raw data after each result form (EPA Level IV only)
  - Surrogate summaries (surrogate results may appear on the sample result forms)
  - QC summaries
  - Tune data [gas chromatograph/mass spectrometer (GC/MS) only]
  - ICAL
  - Daily calibration checks, including related continuing calibration verifications (CCVs)
  - Resolution check standards (GC/MS and pesticides) (if applicable)
  - QC (LCS, MS/MSD) raw data (EPA Level IV only)
  - Instrument run log
  - Sample preparation log
- Inorganic raw data sequence:
  - Sample results forms, including method blanks
  - Sample raw data (EPA Level IV only)
  - QC summaries
  - ICAL
  - Daily calibration checks, including all related CCVs

- Calibration blanks, including all related continuing calibration blanks
- Interference check standards A and B for inductively coupled plasma-atomic emission spectrometer (ICP-AES) only
- QC raw data (EPA Level IV only)
- Post-digestion spike results
- Analytical spike results
- Method of standard additions
- ICP-AES serial dilutions
- Instrument run log
- Sample preparation log

4.6.2 Electronic Deliverables

The electronic data deliverable (EDD) will be in ASCII format. This will be compatible with the Navy Environmental Data Transfer Standard. The laboratory will verify that the EDD and the hard-copy reports are identical. Both the EDD 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. The EDD for each sample delivery group is due at the same time as the hard-copy report, 21 calendar days after the last sample of the sample delivery group has been delivered to the laboratory.

4.7 DATA VALIDATION

All import backfill results will be validated by an independent data validation company. Data will be validated at 80 percent EPA Level III and 20 percent EPA Level IV. The validation will be in accordance with the 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-94/013* (EPA, 1994), *Environmental Work Instruction (EWI) #1, 3EN2.1, Chemical Data Validation* (SWDIV, 2001a), and the QC criteria specified in the referenced methods and in this SAP. Data not meeting method and/or SAP specifications will be flagged as estimated ("J") or rejected ("R").

The data validation company will have a minimum of 5 years of experience in the environmental data validation business, prior experience on DON RAC or Comprehensive Long-term Environmental Action projects, and an active peer review program.

Data reviewers must have the following qualifications: bachelor of science degree or higher in chemistry or a physical science and 5 years of combined experience with approximately 2 years

in data validation and 3 years conducting laboratory analysis in an environmental laboratory using the EPA-approved methods being validated.

4.8 DATA EVALUATION

Following third-party validation, data will be further evaluated by the FWENC Project Chemist. During this process, the Project Chemist will determine which of the advisory data qualifiers provided by the independent data validator will be retained or removed. The evaluation of data will be based on method requirements and the results of the QC samples, the level of contamination of samples indicated by the method blanks analysis, and the overall indication of interference due to contamination. The following data qualifiers will be used in the report:

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

Data qualifying will be used to alert end users to uncertainties associated with the data. The evaluation flags will be entered into a special field in the electronic database. Thus, when data processing is complete, the data for each analyte will have the flag designated by the laboratory and the flag designated by the evaluator, as appropriate.

5.0 SAP REVISION OR AMENDMENT

When circumstances arise that impact the original project scope, this SAP will be revised or amended. The modification process will be based on EPA guidelines, direction from the DON and QA Officer, and will be in conjunction with *Environmental Work Instruction (EWI) #2, 3EN2.2, Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs)* (SWDIV, 2001b).

6.0 REFERENCES

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TABLES

TABLE 2-1

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIME REQUIREMENTS

Analyte	Analytical Method	Container	Preservative	Holding Time
Import Backfill Material				
VOCs	EPA Method 5035/8260B[1]	Four En Core™ samplers	Cool, 4±2°C	48 hours for analysis or laboratory preservation for En Core samplers; analysis within 14 days of preservation
TPH-purgeable	EPA Method 5035/8015B[1]	Four En Core samplers	Cool, 4±2°C	48 hours for analysis or laboratory preservation for En Core samplers; analysis within 14 days of preservation
TPH-extractable	EPA Method 8015B	Two 9-ounce glass jars	Cool, 4±2°C	14 days to extraction and 40 days to analyze
SVOCs	EPA Method 8270C			14 days to extraction and 40 days to analyze
Pesticides	EPA Method 8081A			14 days to extraction and 40 days to analyze
PCBs	EPA Method 8082			14 days to extraction and 40 days to analyze
Title 22 Metals	EPA Method 6010B/7000			6 months, except for mercury which is 28 days
pH	SW-846, Ch. 7			24 hours
Asbestos	CARB 435			N/A

Notes:

[1] If solid samples cannot be collected with the En Core™ samplers, then EPA Method 5035 will be replaced with EPA Method 5030B, and the 9-ounce jars will be used for volatile analysis.

°C – degrees Celsius
CARB – California Air Resources Board
EPA – U.S. Environmental Protection Agency
N/A – not applicable
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
VOC – volatile organic compound

TABLE 4-1

PROJECT REPORTING LIMITS

Parameter/Method	Analyte	RL	Unit	Residential PRGs [a]
VOCs	1,1,1-Trichloroethane	5	µg/kg	1,200,000
EPA Method	1,1,2,2-Tetrachloroethane	5	µg/kg	410
5035/8260B	1,1,2-Trichloroethane	5	µg/kg	730
	1,1-Dichloroethane	5	µg/kg	2,800
	1,1-Dichloroethene	5	µg/kg	120,000
	1,2-Dichloroethane	5	µg/kg	280
	1,2-Dichloropropane	5	µg/kg	340
	2-butanone (methyl ethyl ketone)	50	µg/kg	7,300,000
	2-Hexanone	50	µg/kg	N/A
	4-methyl-2-pentanone (methyl isobutyl ketone)	50	µg/kg	790,000
	Acetone	50	µg/kg	1,600,000
	Benzene	5	µg/kg	600
	Bromodichloromethane	5	µg/kg	820
	Bromoform	5	µg/kg	62,000
	Bromomethane	5	µg/kg	3,900
	Carbon disulfide	5	µg/kg	360,000
	Carbon tetrachloride	5	µg/kg	250
	Chlorobenzene	5	µg/kg	150,000
	Chloroethane	5	µg/kg	3,000
	Chloroform	5	µg/kg	940
	Chloromethane	5	µg/kg	1,200
	cis-1,2-Dichloroethene	5	µg/kg	43,000
	cis-1,3-Dichloropropene	5	µg/kg	780 [b]
	Dibromochloromethane	5	µg/kg	1,100
	Ethylbenzene	5	µg/kg	8,900
	Methylene chloride	5	µg/kg	9,100
	Styrene	5	µg/kg	1,700,000
	Tetrachloroethene	5	µg/kg	1,500
	Toluene	5	µg/kg	520,000
	trans-1,2-Dichloroethene	5	µg/kg	69,000
	trans-1,3-Dichloropropene	5	µg/kg	780 [b]
	Trichloroethene	5	µg/kg	53
	Vinyl acetate	50	µg/kg	430,000

TABLE 4-1

PROJECT REPORTING LIMITS

Parameter/Method	Analyte	RL	Unit	Residential PRGs [a]
	Vinyl chloride	5	µg/kg	79
	Xylenes (Total)	15	µg/kg	270,000
SVOCs	1,2,4-Trichlorobenzene	330	µg/kg	650,000
EPA Method 8270C	1,2-Dichlorobenzene	330	µg/kg	370,000
	1,3-Dichlorobenzene	330	µg/kg	16,000
	1,4-Dichlorobenzene	330	µg/kg	3,400
	2,4,5-Trichlorophenol	1600	µg/kg	6,100,000
	2,4,6-Trichlorophenol	330	µg/kg	6,900
	2,4-Dichlorophenol	330	µg/kg	180,000
	2,4-Dimethylphenol	330	µg/kg	1,200,000
	2,4-Dinitrophenol	1600	µg/kg	120,000
	2,4-Dinitrotoluene	330	µg/kg	120,000
	2,6-Dinitrotoluene	330	µg/kg	61,000
	2-Chloronaphthalene	330	µg/kg	4,900,000
	2-Chlorophenol	330	µg/kg	63,000
	2-Methylphenol	330	µg/kg	3,100,000
	2-Nitroaniline	1600	µg/kg	1,700
	2-Nitrophenol	330	µg/kg	N/A
	3,3'-Dichlorobenzidine	330	µg/kg	1,100
	3-Nitroaniline	1600	µg/kg	N/A
	3-Methylphenol [c]	330	µg/kg	3,100,000
	4,6-Dinitro-2-methylphenol	1600	µg/kg	N/A
	4-Bromophenyl phenyl ether	330	µg/kg	N/A
	4-Chloro-3-methylphenol	330	µg/kg	N/A
	4-Chloroaniline	330	µg/kg	240,000
	4-Chlorophenyl phenyl ether	330	µg/kg	N/A
	4-Methylphenol [c]	330	µg/kg	310,000
	4-Nitroaniline	1600	µg/kg	N/A
	4-Nitrophenol	1600	µg/kg	N/A
	bis(2-chloroethoxy)methane	330	µg/kg	N/A
	bis(2-chloroisopropyl)ether	330	µg/kg	2,900
	bis(2-ethylhexyl)phthalate	330	µg/kg	35,000

TABLE 4-1

PROJECT REPORTING LIMITS

Parameter/Method	Analyte	RL	Unit	Residential PRGs [a]
	Butyl benzylphthalate	330	µg/kg	12,000,000
	Di-n-butylphthalate	330	µg/kg	6,100,000
	Di-n-octylphthalate	330	µg/kg	2,400,000
	Dibenzofuran	330	µg/kg	290,000
	Diethyl phthalate	330	µg/kg	49,000,000
	Dimethyl phthalate	330	µg/kg	100,000,000
	Hexachlorobutadiene	330	µg/kg	6,200
	Hexachlorocyclopentadiene	330	µg/kg	370,000
	Hexachloroethane	330	µg/kg	35,000
	N-Nitrosodiphenylamine	330	µg/kg	99,000
	Nitrobenzene	330	µg/kg	20,000
	Pentachlorophenol	330	µg/kg	3,000
	Phenol	330	µg/kg	37,000,000
SVOCs	Acenapthene	20	µg/kg	3,700,000
EPA Method	Acenaphthylene	25	µg/kg	N/A
8270C/SIM	Anthracene	20	µg/kg	22,000,000
	Benzo[a]anthracene	25	µg/kg	620
	Benzo[a]pyrene	20	µg/kg	62
	Benzo[b]fluoranthene	25	µg/kg	620
	Benzo[k]fluoranthene	20	µg/kg	380
	Benzo[g,h,i]perylene	20	µg/kg	N/A
	bis(2-chloroethyl)ether	30	µg/kg	210
	Chrysene	20	µg/kg	3,800
	Dibenzo[a,h]anthracene	20	µg/kg	62
	Fluoranthene	20	µg/kg	2,300,000
	Fluorene	20	µg/kg	2,700,000
	Hexachlorobenzene	20	µg/kg	300
	Indeno[1,2,3-cd]pyrene	20	µg/kg	620
	N-Nitrosodi-n-propylamine	20	µg/kg	69
	Naphthalene	20	µg/kg	56,000
	Phenanthrene	20	µg/kg	N/A
	Pyrene	20	µg/kg	2,300,000

TABLE 4-1

PROJECT REPORTING LIMITS

Parameter/Method	Analyte	RL	Unit	Residential PRGs [a]
Pesticides	α-BHC	2	µg/kg	90
EPA Method 8081A	β-BHC	2	µg/kg	320
	δ-BHC	2	µg/kg	N/A
	γ-BHC (Lindane)	2	µg/kg	440
	4,4'-DDD	4	µg/kg	2,400
	4,4'-DDE	4	µg/kg	1,700
	4,4'-DDT	4	µg/kg	1,700
	Aldrin	2	µg/kg	29
	alpha-chlordane	2	µg/kg	1,600 [d]
	gamma-chlordane	2	µg/kg	1,600 [d]
	Dieldrin	4	µg/kg	30
	Endosulfan I	2	µg/kg	370,000 [e]
	Endosulfan II	4	µg/kg	370,000 [e]
	Endosulfan Sulfate	4	µg/kg	370,000 [e]
	Endrin	4	µg/kg	18,000
	Endrin Aldehyde	4	µg/kg	N/A
	Endrin Ketone	4	µg/kg	N/A
	Heptachlor	2	µg/kg	110
	Heptachlor Epoxide	2	µg/kg	53
	Methoxychlor	20	µg/kg	310,000
	Toxaphene	100	µg/kg	440
PCBs	Aroclor 1016	50	µg/kg	3,900
EPA Method 8082	Aroclor 1221	100	µg/kg	220
	Aroclor 1232	50	µg/kg	220
	Aroclor 1242	50	µg/kg	220
	Aroclor 1248	50	µg/kg	220
	Aroclor 1254	50	µg/kg	220
	Aroclor 1260	50	µg/kg	220
TPH-purgeable	Gasoline (C_6-C_{10})	1	mg/kg	N/A
EPA Method 5035/8015B				

TABLE 4-1

PROJECT REPORTING LIMITS

Parameter/Method	Analyte	RL	Unit	Residential PRGs [a]
TPH-extractable EPA Method 8015B	Diesel (C_{10}-C_{24})	10	mg/kg	N/A
Title 22 Metals EPA Method 6010B/7000	Antimony	5	mg/kg	31
	Arsenic	1	mg/kg	22
	Barium	1	mg/kg	5,400
	Beryllium	0.2	mg/kg	150
	Cadmium	1	mg/kg	37
	Chromium, Total	2	mg/kg	210
	Cobalt	2	mg/kg	900
	Copper	2	mg/kg	3,100
	Lead	1	mg/kg	150
	Mercury	0.2	mg/kg	23
	Molybdenum	10	mg/kg	390
	Nickel	2	mg/kg	1,600
	Selenium	1	mg/kg	390
	Silver	2	mg/kg	390
	Thallium	1	mg/kg	5.2
	Vanadium	1	mg/kg	550
	Zinc	1	mg/kg	23,000
SW-846, Chapter 7	pH	N/A	N/A	N/A
CARB 435	Asbestos	0.25	%	0.25 [f]

Notes:

a Action levels are based on Preliminary Remediation Goals (PRGs) established for residential soils (10/01/02).

b PRG listed is for total 1,3-dichloropropene; however, laboratories report individual isomers: cis and trans 1,3-dichloropropene.

c 3- and 4-methylphenol cannot be separated by the laboratory; however, PRGs listed are for each analyte.

d PRG listed is for chlordane; however, laboratories report individual isomers: alpha and gamma-chlordane.

e PRG listed is for endosulfan; however, laboratories report the individual isomers: endosulfan I, endosulfan II, and endosulfan sulfate.

f Action level listed is from the Bay Area Air Quality Management District.

µg/kg – micrograms per kilogram
CARB – California Air Resources Board
BHC – benzene hexachloride
DDD – dichlorodiphenyldichloroethane
DDE – dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane

TABLE 4-1

PROJECT REPORTING LIMITS

EPA – U.S. Environmental Protection Agency
mg/kg – milligrams per kilogram
N/A – not applicable
PCB – polychlorinated biphenyl
PRG – Preliminary Remediation Goal
RL – reporting limit
SIM – selective ion monitoring
SVOC – semivolatile organic compound
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons
VOC – volatile organic compound

TABLE 4-2

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	Accuracy Soil (%R)	Precision Soil (RPD)
EPA Method 5035/8260B	1,1-Dichloroethene	65-135	≤ 30
	Benzene	65-135	≤ 30
	Chlorobenzene	65-135	≤ 30
	Toluene	65-135	≤ 30
	Trichloroethene	65-135	≤ 30
	Surrogates:		
	1,2-Dichloroethane-d_4	65-135	N/A
	Bromofluorobenzene	65-135	N/A
	Toluene-d_8	65-135	N/A
EPA Method 8270C	1,2,4-Trichlorobenzene	34-152	≤ 30
	1,4-Dichlorobenzene	25-135	≤ 30
	2,4-Dinitrotoluene	29-149	≤ 30
	2-Chlorophenol	31-135	≤ 30
	4-Chloro-3-methylphenol	34-135	≤ 30
	4-Nitrophenol	25-141	≤ 30
	Pentachlorophenol	38-146	≤ 30
	Phenol	25-135	≤ 30
	Surrogates:		
	2,4,6-Tribromophenol	25-144	N/A
	2-Fluorbiphenyl	34-135	N/A
	2-Fluorophenol	25-135	N/A
	Nitrobenzene-d_5	25-135	N/A
	Phenol-d_5	25-135	N/A
	Terphenyl-d_{14}	32-136	N/A
EPA Method 8270C/SIM	Acenaphthene	39-135	≤ 30
	n-Nitrosodi-n-propylamine	27-135	≤ 30
	Pyrene	37-146	≤ 30
	Surrogates:		
	Terphenyl-d_{14}	32-136	N/A

TABLE 4-2

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	Accuracy Soil (%R)	Precision Soil (RPD)
EPA Method 8081A	γ-BHC (Lindane)	63–130	≤ 50
	Heptachlor	35–138	≤ 50
	Aldrin	37–126	≤ 50
	Dieldrin	32–142	≤ 50
	Endrin	33–144	≤ 50
	4,4-DDT	25–153	≤ 50
	Surrogates:		
	Decachlorobiphenyl	30-140	N/A
	Tetrachloro-m-xylene	30-140	N/A
EPA Method 8082	Aroclor 1016	40-150	≤ 40
	Aroclor 1260	40-150	≤ 40
	Surrogates:		
	Decachlorobiphenyl	30-140	N/A
	Tetrachloro-m-xylene	30-140	N/A
EPA Method 5035/8015B	TPH-purgeable	65-135	≤ 50
	Surrogate:		
	Bromofluorobenzene	65-135	N/A
EPA Method 8015B	TPH-extractable	65-135	≤ 50
	Surrogates:		
	Octacosane, Hexacosane, or Bromofluorobenzene	65-135	N/A
EPA Method 6010B/7000	Antimony	75-125	≤ 30
	Arsenic	75-125	≤ 30
	Barium	75-125	≤ 30
	Beryllium	75-125	≤ 30
	Cadmium	75-125	≤ 30
	Chromium, Total	75-125	≤ 30
	Cobalt	75-125	≤ 30
	Copper	75-125	≤ 30
	Lead	75-125	≤ 30

TABLE 4-2

QUALITY CONTROL ACCEPTANCE CRITERIA

Method	Analyte	Accuracy Soil (%R)	Precision Soil (RPD)
EPA Method	Mercury	75-125	≤ 30
6010B/7000 (Continued)	Molybdenum	75-125	≤ 30
	Nickel	75-125	≤ 30
	Selenium	75-125	≤ 30
	Silver	75-125	≤ 30
	Thallium	75-125	≤ 30
	Vanadium	75-125	≤ 30
	Zinc	75-125	≤ 30

Notes:

%R – percent recovery
BHC – benzene hexachloride
DDT – dichlorodiphenyltrichloroethane
EPA – U.S. Environmental Protection Agency
N/A – not applicable
RPD – relative percent difference
SIM – selective ion monitoring
TPH-extractable – total extractable petroleum hydrocarbons
TPH-purgeable – total purgeable petroleum hydrocarbons