UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 9
75 Hawthorne Street
San Francisco, CA 94105-3901

July 24, 2000

Mike Bertrand
Cherokee
5445 DTC Parkway, Suite 900
Englewood, CA 80111

Re: Corrective Measures Implementation Workplan for the Former O'Brien Facility in South San Francisco (EPA ID: CAD005130455)

Dear Mr. Bertrand:

EPA has reviewed the Corrective Measures Implementation Workplan (or CMI Workplan), dated May 18, 2000, and Addendum to the Corrective Measures Implementation, Workplan dated June 2, 2000, submitted to EPA by your contractor, Henshaw Associates. The CMI Workplan is approved with the following conditions and clarifications.

- Even though cap repair requirements were discussed during a meeting between Tom Kelly, of my staff, and Mike Harrison, with Henshaw Associates, on May 28, 2000, we are still concerned about the adaquacy of you proposal. The CMI Plan would require repair whenever 5% of a 10 foot by 10 foot area has been degraded to the extent that vegetation or precipitation can easily pass through. However, cracks in asphalt or concrete, represent only a small fraction of a given surface area unless the number of cracks are large. EPA suggests an approach that considers crack length, width and possibly depth. Additionally, we have begun to examine approaches taken at other facilities and will inform you of our progress. Please note that cracks need not be immediately repaired, but a repair schedule should be provided if significant cracks are noted in the annual inspection report. EPA is also willing to consider alternative approaches suggested by Cherokee or it's consultant. In summary, further discussion of this requirement will be necessary to resolve our concern.

- EPA did not receive a copy of the POTW discharge limits with the Addendum to the CMI Workplan. These limits should be provided as soon as possible after receipt of this letter.

- The CMI Workplan did not specify a date for the CMI report. Although we are aware of Cherokee's desire to submit this report as soon as possible, EPA nonetheless requests that it be provided within 60 (calendar) days of completion of all CMI fieldwork.

- The CMI Workplan does not identify the elements of the CMI Report. General guidance on the elements of the Report can be found in Section E of the Scope of Work for Corrective Measures Implementation, from EPA's April 26, 2000 letter. Although the

report will be submitted in draft for EPA approval, I wanted you to know that we expect the CMI Report to also include: manifests of all hazardous waste sent off-site, documentation of any non-hazardous soils sent off-site, a total estimate of the soil removed, surveyed locations of the excavations, an explanation of and location for the wastes encountered (clay pots, yellow-resin like material, dark stained soils etc.), an explanation of runoff controls to ensure that lead containing soils will not impact nearby sediments (e.g. a topographic map that demonstrates surface water will not leave the site), the locations where oxygen release compounds were placed and an explanation of how the material was mixed with the backfill soil, a description of the backfill soil, measures taken to assure adequate backfill compaction, a cross-section of the asphalt cap (asphalt and base material) and a copy of all analytical results.

- I would also like to confirm a conversation between Tom Kelly, of my staff, and Mike Harrison with your consultant Henshaw Associates. Tom and Mike agreed that only the excavation near SWB-9 (or eastern property) needed to be analyzed for semi-volatile contamination. However, EPA did reserve the right to request that Cherokee collect a semi-volatile sample at locations of EPA's choosing in other excavations.

- Although we consider it separate from the CMI Workplan, we wanted to remind Cherokee that EPA has not yet received draft "deed restrictions" for the site.

If you have further questions on this matter, please contact Tom Kelly of my staff at (415) 744-2070.

Sincerely,

Larry Bowerman

Larry Bowerman, Chief
RCRA Corrective Action Office (WST-5)

cc: Daisey Lee, DTSC
Michelle Rembaum-Fox, RWQCB
Michael Harrison, Henshaw Associates
Jerome Crowley, O'Brien Corporation
Jolynn Hardiman, Genentech
John Gibbs, City of South San Francisco
Richard Haskins, Transiterra Corp.

Henshaw Associates, Inc.
Environmental Engineering Services

FAX COVER SHEET

DATE:06/04/00 4:42 PM

TOTAL NUMBER OF PAGES (including this page):

VIII. B.

TO:	Tom Kelly
COMPANY:	US EPA
PHONE:	(415) 744-2070
FAX:	(415) 744-1044

FROM:	Michael Harrison, P.E.
EMAIL:	MHarrison@HenshawAssoc.com
COMPANY:	Henshaw Associates, Inc.
PHONE:	(925) 551-7272
FAX:	(925) 551-7464

COMMENTS:

Dear Tom:

Attached please find the text of the Addendum. The attachments (SSF discharge requirements, and field XRF and lab SOPs) to follow by mail.

Also attached are the VOC analytical reports for the samples collected on June 1, 2000 from the Genentech

The documents accompanying this cover sheet contain information from Henshaw Associates which is confidential or privileged. The information is intended for the use of the individual or entity named on this facsimile transmission cover sheet. If you are not the intended recipient, be aware that any disclosure, copying, distribution, or use of the contents of this facsimiled information is prohibited. If you received this facsimile in error, please notify us by telephone immediately, so we can arrange for the return of the original document to us.

11875 Dublin Blvd., St. A-200 • Dublin, California 94568 • T: 925/551-7272 F: 925/551-7464

Henshaw Associates, Inc.
Environmental Engineering Services

June 2, 2000

Thomas Kelly
United States Environmental Protection Agency Region 9
75 Hawthorne Street
San Francisco, CA 94105

RE: Addendum to the *Corrective Measures Implementation Workplan*
450 E. Grand Avenue
South San Francisco, California

Dear Mr. Kelly:

The following addendum to the *Corrective Measures Implementation Workplan* (Workplan, Henshaw Associates, Inc. [Henshaw], May 18, 2000) has been prepared to augment the scope of work presented in the Workplan and to respond to questions raised during the meeting between Henshaw and the United States Environmental Protection Agency (USEPA) on May 25, 2000. The Workplan and this addendum have been prepared by Henshaw on behalf of Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C. (herein collectively referred to as Cherokee), the current owners of 450 E. Grand Avenue, South San Francisco, California (Property).

ADDITIONAL INVESTIGATIONS

During performance of the Corrective Measures (CMs), Henshaw will perform additional sampling for lead in the areas of EB-28, EB-19, and the Southeastern portion of the former hazardous waste storage area. The additional sampling will be conducted to fill data gaps associated with the aforementioned areas where elevated concentrations of lead have historically been detected. Henshaw will use a hand auger to collect four samples from each area at a maximum depth of 1.5 feet below ground surface (bgs) for analysis with field x-ray fluorescence (XRF) equipment. If samples are found to exceed the lead media cleanup standard established for the CMs, excavation will be conducted in the areas of exceedences according to the procedures established in the Workplan. If elevated levels of lead are not encountered during the additional sampling, it will be assumed that the lead found in the aforementioned locations is not indicative of larger areas with uniformly high concentrations of lead, and therefore do not require remediation.

Henshaw will also perform one day of sampling on the Genentech beachfront in order to relocate the area of volatile organic compound (VOC) soil contamination on the Genentech Beachfront previously detected within sample G-2 (July 1996) as reported in the *Final Phase II RCRA Facility Investigation* (Harza, May 31, 1996). Although no responsible party has been established for the contamination, Cherokee has volunteered to incorporate removal of the VOC hotspot from the Genentech Beachfront during the planned CMs. The sampling activity will consist of one day of sampling utilizing a direct-push sampling rig. A split spoon sampler will be driven to five feet bgs and samples will be collected and field screened with an organic vapor

11875 Dublin Blvd., Suit A-200 • Dublin, California 94568 • T: 925/551-7272 F: 925/551-7464

meter. A representative of Genentech will be present during the sampling to assist in directing sampling locations. Field staking will be completed in areas where elevated concentrations of organic vapor are observed in soil samples. Although high concentrations of VOCs were found in sample G-2 at 5 feet below ground surface, VOCs were not detected in several samples collected within approximately 30 feet of sample G-2. The technique of collecting split spoon samples from shallow depth (5-feet bgs) is very fast and will allow for a maximum of 20-samples to be collected from the area of concern during the Genentech Beachfront sampling event. Therefore, if elevated levels of VOCs are not encountered during the one-day sampling event, it will be assumed that the VOCs found in sample G-2 are not indicative of a larger area with uniformly high concentrations of VOCs, and therefore do not require remediation.

WORKPLAN CLARIFICATIONS

Section 5.1 CAP Maintenance

The last two sentences of Section 5.1, CAP Maintenance, is amended to specify a minimum inspection area for which cap maintenance will be conducted and require that an inspection form be submitted annually to the lead agency:

> *Walking inspections shall take note of cracks, vegetative intrusion, and other defects or normal wear and tear that effect the permeability of the cap for inclusion on an annual cap inspection form. Inspection forms shall be submitted annually to the lead public agency with a discussion of proposed and/or completed repairs. Repair work shall be conducted when more than 5% of the cap in any 10-foot by 10-foot area has been degraded to the extent that vegetation or precipitation can easily pass through.*

Discharge limits for the South San Francisco Publicly Owned Treatment Works (POTW)

As described in Section 4.0, Scope of Work, of the Workplan, "dewatering fluids, if any, will be pumped to temporary storage tanks for treatment and then discharged to the local Publicly Owned Treatment Works (POTW) under a special discharge permit". Per request by the USEPA, the discharge limits for the City of South San Francisco POTW are included as Attachment A.

Excavation Slope Stability

The second paragraph of Section 4.0, Scope of Work, is modified as follows:

> *Excavation activities will comply with the OSHA guidelines in Title 29 of the Code of Federal Regulations (CFR), Part 1926.651-652. Excavation sidewalls will be sloped or benched in accordance with CFR Part 1926.651-652, and as dictated by the nature of the soils encountered.*

Pavement Design Standard

The following sentences are added after the first sentence of paragraph 3 of Section 4.3, Backfill and Paving:

> *The pavement design is based upon the Caltrans flexible pavement design procedure. For the main area of new pavement to be installed outside of the fenced area leased by ICI (low traffic area), a traffic index (T.I.) of 4.5 has been used. For the new pavement to be installed within the area leased by ICI where truck traffic may be heavier (heavier traffic area), a T.I. of 5.5 has been used. An R-value of 5 has been assumed for this design.*

Excavation-Derived Residual Plan

The first sentence of Section 1.0, Introduction, of the Excavation-Derived Residual Plan (Appendix D of the Workplan) is modified to include reference to the *Management of Remediation Waste Under RCRA*, USEPA, October 1998 as follows:

> *This Excavation-Derived Residuals Plan (EDR Plan) was prepared according to the "Management of Remediation Waste Under RCRA" (USEPA, October 1998), and the "Guide to Management of Investigation-Derived Wastes" (USEPA 1992) to establish procedures for the handling, storage, testing, characterization, and disposal of Excavation-Derived Residuals (EDR) generated during implementation of the Corrective Measures Implementation Workplan (Workplan) at 450 E. Grand Avenue, South San Francisco, California (Property).*

The first paragraph of Section 2.1.1, Waste Storage, of the EDR Plan is modified as follows:

> *As specified in Section 4.0, Scope of Work, of the Workplan, "The excavation spoils will be temporarily consolidated on plastic within the areas of excavation from which they were derived prior to hauling them to an appropriate waste disposal facility as dictated by State and Federal Law". Alternatively, wastes may be stored in drop boxes, lined and covered roll-off bins, 55-gallon drums or other alternative containers appropriate for hazardous or non-hazardous wastes. If waste containers are utilized, a label will be affixed to each container that will provide the following information:*

Disposal Facilities

The following waste disposal facilities are being considered for wastes generated during performance of the CMs: Safety Kleen in Buttonwillow, California; ChemWaste Management in Kettleman Hills, California; and Altamont Landfill in Livermore California.

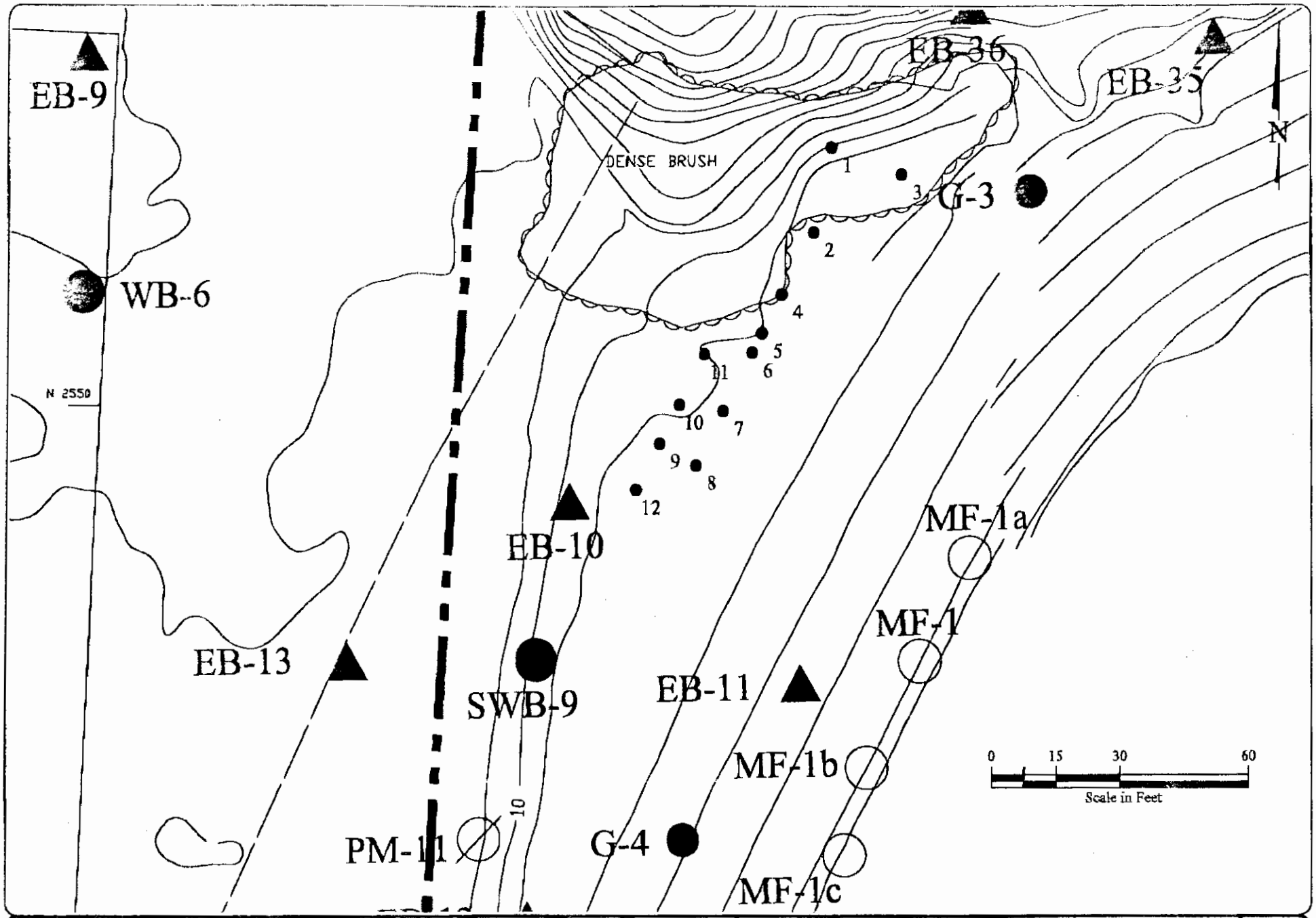
Analytical Standard Operating Procedures

Per request by USEPA, the standard operating procedures (SOPs) for use of the field XRF, and fixed laboratory methods for lead, arsenic, semi-volatile organic compounds and VOCs are included in attachments B and C, respectively.

Thank you for discussing the CMI Workplan on May 25, 2000 and the opportunity to submit this addendum to the CMI Workplan. Please do not hesitate to contact the undersigned for further clarifications of the CMI Workplan or other questions or comments.

Respectfully submitted,

Michael Harrison, P.E.
Environmental Engineer
Project Manager



No.	Date	Revision	Approved

Henshaw Associates, Inc.
Environmental Engineering Services
11875 Dublin Blvd., Suite A-200 • Dublin, California 94568

Date:	XX
Designed:	XX
Drawn:	XX
Checked:	XX
DWG file:	9001-00

APPROXIMATE LOCATION OF GENENETECH VOC SCREENING SAMPLES
Genenetech Beachfront
Cherokee Environmental Risk Management
South San Francisco, CA

Figure: 1
Project: 233.C.01

16/04/2008 16:59 9255517464 HENSHAW ASSOCIATES PAGE

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

June 2, 2000

Mike Harrison
Henshaw Assoc., Inc
11875 Dublin Blvd. A-200
Dublin, CA 94568

RE: 1/L006004

Dear Mike Harrison

Enclosed are the results of analyses for sample(s) received by the laboratory on June 1, 2000. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Wayne Stevenson
Project Manager

CA ELAP Certificate Number 12360

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

ANALYTICAL REPORT FOR L006004

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
S-12-6	L006004-01	Soil	6/1/00
S-3+6-5	L006004-02	Soil	6/1/00

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A
Sequoia Analytical - San Carlos

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
S-12-6			L006004-01				Soil	
Benzene	0060005	6/1/00	6/2/00		2000	ND	ug/kg	
Bromobenzene	"	"	"		2000	ND	"	
Bromochloromethane	"	"	"		2000	ND	"	
Bromodichloromethane	"	"	"		2000	ND	"	
Bromoform	"	"	"		2000	ND	"	
Bromomethane	"	"	"		10000	ND	"	
n-Butylbenzene	"	"	"		2000	ND	"	
sec-Butylbenzene	"	"	"		2000	**3590**	"	
tert-Butylbenzene	"	"	"		2000	ND	"	
Carbon tetrachloride	"	"	"		2000	ND	"	
Chlorobenzene	"	"	"		2000	ND	"	
Chloroethane	"	"	"		10000	ND	"	
Chloroform	"	"	"		2000	ND	"	
Chloromethane	"	"	"		10000	ND	"	
2-Chlorotoluene	"	"	"		2000	ND	"	
4-Chlorotoluene	"	"	"		2000	ND	"	
Dibromochloromethane	"	"	"		2000	ND	"	
1,2-Dibromoethane	"	"	"		2000	ND	"	
Dibromomethane	"	"	"		2000	ND	"	
1,2-Dibromo-3-chloropropane	"	"	"		10000	ND	"	
1,2-Dichlorobenzene	"	"	"		2000	ND	"	
1,3-Dichlorobenzene	"	"	"		2000	ND	"	
1,4-Dichlorobenzene	"	"	"		2000	ND	"	
Dichlorodifluoromethane	"	"	"		10000	ND	"	
1,1-Dichloroethane	"	"	"		2000	ND	"	
1,2-Dichloroethane	"	"	"		2000	ND	"	
1,1-Dichloroethene	"	"	"		2000	ND	"	
cis-1,2-Dichloroethene	"	"	"		2000	ND	"	
trans-1,2-Dichloroethene	"	"	"		2000	ND	"	
1,2-Dichloropropane	"	"	"		2000	ND	"	
1,3-Dichloropropane	"	"	"		2000	ND	"	
2,2-Dichloropropane	"	"	"		2000	ND	"	
1,1-Dichloropropene	"	"	"		2000	ND	"	
Ethylbenzene	"	"	"		2000	**3030**	"	
Hexachlorobutadiene	"	"	"		2000	ND	"	
Isopropylbenzene	"	"	"		2000	**3220**	"	
p-Isopropyltoluene	"	"	"		2000	**16800**	"	
Methylene chloride	"	"	"		10000	ND	"	
Naphthalene	"	"	"		10000	**8820**	"	
n-Propylbenzene	"	"	"		2000	**5120**	"	
Styrene	"	"	"		2000	ND	"	

*Refer to end of report for text of notes and definitions.

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A

Sequoia Analytical - San Carlos

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
S-12-6 (continued)			**L006084-01**				**Soil**	
1,1,1,2-Tetrachloroethane	0060005	6/1/00	6/2/00		2000	ND	ug/kg	
1,1,2,2-Tetrachloroethane	"	"	"		2000	ND	"	
Tetrachloroethene	"	"	"		2000	ND	"	
Toluene	"	"	"		2000	ND	"	
1,2,3-Trichlorobenzene	"	"	"		2000	ND	"	
1,2,4-Trichlorobenzene	"	"	"		2000	ND	"	
1,1,1-Trichloroethane	"	"	"		2000	ND	"	
1,1,2-Trichloroethane	"	"	"		2000	ND	"	
Trichloroethene	"	"	"		2000	ND	"	
Trichlorofluoromethane	"	"	"		10000	ND	"	
1,2,3-Trichloropropane	"	"	"		2000	ND	"	
1,2,4-Trimethylbenzene	"	"	"		2000	**25400**	"	
1,3,5-Trimethylbenzene	"	"	"		2000	**7610**	"	
Vinyl chloride	"	"	"		10000	ND	"	
Total Xylenes	"	"	"		2000	**13740**	"	
Surrogate: 1,2-Dichloroethane-d4	"	"	"	*70.0-121*		*NR*	%	1
Surrogate: Toluene-d8	"	"	"	*81.0-117*		*NR*	"	1
Surrogate: 4-BFB	"	"	"	*74.0-121*		*NR*	"	1

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9500
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A
Sequoia Analytical - San Carlos

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
S-3+6-S			L006004-02				Soil	2
Benzene	0060005	6/1/00	6/2/00		333	ND	ug/kg	
Bromobenzene	"	"	"		333	ND	"	
Bromochloromethane	"	"	"		333	ND	"	
Bromodichloromethane	"	"	"		333	ND	"	
Bromoform	"	"	"		333	ND	"	
Bromomethane	"	"	"		1670	ND	"	
n-Butylbenzene	"	"	"		333	ND	"	
sec-Butylbenzene	"	"	"		333	ND	"	
tert-Butylbenzene	"	"	"		333	ND	"	
Carbon tetrachloride	"	"	"		333	ND	"	
Chlorobenzene	"	"	"		333	ND	"	
Chloroethane	"	"	"		1670	ND	"	
Chloroform	"	"	"		333	ND	"	
Chloromethane	"	"	"		1670	ND	"	
2-Chlorotoluene	"	"	"		333	ND	"	
4-Chlorotoluene	"	"	"		333	ND	"	
Dibromochloromethane	"	"	"		333	ND	"	
1,2-Dibromoethane	"	"	"		333	ND	"	
Dibromomethane	"	"	"		333	ND	"	
1,2-Dibromo-3-chloropropane	"	"	"		1670	ND	"	
1,2-Dichlorobenzene	"	"	"		333	ND	"	
1,3-Dichlorobenzene	"	"	"		333	ND	"	
1,4-Dichlorobenzene	"	"	"		333	ND	"	
Dichlorodifluoromethane	"	"	"		1670	ND	"	
1,1-Dichloroethane	"	"	"		333	ND	"	
1,2-Dichloroethane	"	"	"		333	ND	"	
1,1-Dichloroethene	"	"	"		333	ND	"	
cis-1,2-Dichloroethene	"	"	"		333	ND	"	
trans-1,2-Dichloroethene	"	"	"		333	ND	"	
1,2-Dichloropropane	"	"	"		333	ND	"	
1,3-Dichloropropane	"	"	"		333	ND	"	
2,2-Dichloropropane	"	"	"		333	ND	"	
1,1-Dichloropropene	"	"	"		333	ND	"	
Ethylbenzene	"	"	"		333	ND	"	
Hexachlorobutadiene	"	"	"		333	ND	"	
Isopropylbenzene	"	"	"		333	ND	"	
p-Isopropyltoluene	"	"	"		333	ND	"	
Methylene chloride	"	"	"		1670	ND	"	
Naphthalene	"	"	"		1670	ND	"	
n-Propylbenzene	"	"	"		333	ND	"	
Styrene	"	"	"		333	ND	"	

*Refer to end of report for text of notes and definitions.

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd, A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A
Sequoia Analytical - San Carlos

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
S-3+6-5 (continued)			**L006004-02**				**Soil**	
1,1,1,2-Tetrachloroethane	0060005	6/1/00	6/2/00		333	ND	ug/kg	
1,1,2,2-Tetrachloroethane	"	"	"		333	ND	"	
Tetrachloroethene	"	"	"		333	ND	"	
Toluene	"	"	"		333	ND	"	
1,2,3-Trichlorobenzene	"	"	"		333	ND	"	
1,2,4-Trichlorobenzene	"	"	"		333	ND	"	
1,1,1-Trichloroethane	"	"	"		333	ND	"	
1,1,2-Trichloroethane	"	"	"		333	ND	"	
Trichloroethene	"	"	"		333	ND	"	
Trichlorofluoromethane	"	"	"		1670	ND	"	
1,2,3-Trichloropropane	"	"	"		333	ND	"	
1,2,4-Trimethylbenzene	"	"	"		333	ND	"	
1,3,5-Trimethylbenzene	"	"	"		333	ND	"	
Vinyl chloride	"	"	"		1670	ND	"	
Total Xylenes	"	"	"		333	ND	"	
Surrogate: 1,2-Dichloroethane-d4	"	"	"	*70.0-121*		*97.2*	*%*	
Surrogate: Toluene-d8	"	"	"	*81.0-117*		*90.0*	"	
Surrogate: 4-BFB	"	"	"	*74.0-121*		*115*	"	

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	I	Sampled: 6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received: 6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported: 6/2/00

Volatile Organic Compounds by EPA Method 8260A Quality Control
Sequoia Analytical - San Carlos

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0060005	**Date Prepared: 5/31/00**				**Extraction Method: EPA 5030B [P/T]**					
Blank	0060005-BLK1									
Benzene	5/31/00			ND	ug/kg	100				
Bromobenzene	"			ND	"	100				
Bromochloromethane	"			ND	"	100				
Bromodichloromethane	"			ND	"	100				
Bromoform	"			ND	"	100				
Bromomethane	"			ND	"	500				
n-Butylbenzene	"			ND	"	100				
sec-Butylbenzene	"			ND	"	100				
tert-Butylbenzene	"			ND	"	100				
Carbon tetrachloride	"			ND	"	100				
Chlorobenzene	"			ND	"	100				
Chloroethane	"			ND	"	500				
Chloroform	"			ND	"	100				
Chloromethane	"			ND	"	500				
2-Chlorotoluene	"			ND	"	100				
4-Chlorotoluene	"			ND	"	100				
Dibromochloromethane	"			ND	"	100				
1,2-Dibromoethane	"			ND	"	100				
Dibromomethane	"			ND	"	100				
1,2-Dibromo-3-chloropropane	"			ND	"	500				
1,2-Dichlorobenzene	"			ND	"	100				
1,3-Dichlorobenzene	"			ND	"	100				
1,4-Dichlorobenzene	"			ND	"	100				
Dichlorodifluoromethane	"			ND	"	500				
1,1-Dichloroethane	"			ND	"	100				
1,2-Dichloroethane	"			ND	"	100				
1,1-Dichloroethene	"			ND	"	100				
cis-1,2-Dichloroethene	"			ND	"	100				
trans-1,2-Dichloroethene	"			ND	"	100				
1,2-Dichloropropane	"			ND	"	100				
1,3-Dichloropropane	"			ND	"	100				
2,2-Dichloropropane	"			ND	"	100				
1,1-Dichloropropene	"			ND	"	100				
Ethylbenzene	"			ND	"	100				
Hexachlorobutadiene	"			ND	"	100				
Isopropylbenzene	"			ND	"	100				
p-Isopropyltoluene	"			ND	"	100				
Methylene chloride	"			ND	"	500				
Naphthalene	"			ND	"	500				
n-Propylbenzene	"			ND	"	100				

*Refer to end of report for list of notes and definitions.

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project: 1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number: Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager: Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A/Quality Control
Sequoia Analytical - San Carlos

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	**0060005-BL31**									
Styrene	5/31/00			ND	ug/kg	100				
1,1,1,2-Tetrachloroethane	"			ND	"	100				
1,1,2,2-Tetrachloroethane	"			ND	"	100				
Tetrachloroethene	"			ND	"	100				
Toluene	"			ND	"	100				
1,2,3-Trichlorobenzene	"			ND	"	100				
1,2,4-Trichlorobenzene	"			ND	"	100				
1,1,1-Trichloroethane	"			ND	"	100				
1,1,2-Trichloroethane	"			ND	"	100				
Trichloroethene	"			ND	"	100				
Trichlorofluoromethane	"			ND	"	500				
1,2,3-Trichloropropane	"			ND	"	100				
1,2,4-Trimethylbenzene	"			ND	"	100				
1,3,5-Trimethylbenzene	"			ND	"	100				
Vinyl chloride	"			ND	"	500				
Total Xylenes	"			ND	"	100				
Surrogate: 1,2-Dichloroethane-d4	"	*2500*		*2680*	"	*70.0-121*	*107*			
Surrogate: Toluene-d8	"	*2500*		*2540*	"	*81.0-117*	*102*			
Surrogate: 4-BFB	"	*2500*		*2420*	"	*74.0-121*	*119*			

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Volatile Organic Compounds by EPA Method 8260A/Quality Control
Sequoia Analytical - San Carlos

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
LCS	0060005-BS1									
Benzene	5/31/00	2500		2550	ug/kg	70.0-130	102			
Chlorobenzene	"	2500		2430	"	70.0-130	97.2			
1,1-Dichloroethene	"	2500		2550	"	70.0-130	102			
Toluene	"	2500		2340	"	70.0-130	93.6			
Trichloroethene	"	2500		2420	"	70.0-130	96.8			
Surrogate: 1,2-Dichloroethane-d4	"	2500		2600	"	*70.0-121*	*104*			
Surrogate: Toluene-d8	"	2500		2460	"	*81.0-117*	*98.4*			
Surrogate: 4-BFB	"	2500		2870	"	*74.0-121*	*115*			

SEQUOIA ANALYTICAL CHAIN OF CUSTODY

L006004

☐ 885 Jarvis Drive • Morgan Hill, CA 95037 • (408) 776-9600 • FAX (408) 782-6308
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☐ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (925) 988-9600 FAX (925) 988-9673
☐ 1455 McDowell Blvd. North, Suite D • Petaluma, CA 94954 • (707) 792-1865 FAX (707) 792-0342
☐ 1551 Industrial Road • San Carlos, CA 94070 • (650) 232-9600 FAX (650) 232-9612

Company Name: Henshaw Associates, Inc	Project Name: Cherokee / Beachfront
Mailing Address: 11875 Dublin Blvd., Suite A-205	Billing Address (if different):
City: Dublin State: CA Zip Code: 94568	
Telephone: 925 551-7272 FAX #: 925 551 7464	P.O. #:
Report To: M. Harrison Sampler: M. Harrison	QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☐ 10-15 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☒ 24 Hours

☐ Drinking Water ☐ Waste Water ☐ Other

Analyses Requested

Client Sample I.D	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	8260	TPH-D & M	~~TPH-M~~							Comments
1. S-12-6	6/1/00 00:00	S	1			X	X	X							8260 on 24hr
2. S-3+6-5	6/1/00 14:03	S	1			X	X	X							8260 on 24hr
3.															
4.															
5.															
6.															
7.															
8.															
9.															
10.															

Note * talk to M Harrison for TPH turn around

Relinquished By: [signature]	Date: 6/1/00	Time: 4:00 PM	Received By: [signature]	Date: 6/1/00	Time: 16:00
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:

Pink - Client
Yellow - Sequoia
White - Sequoia

Sequoia Analytical

1551 Industrial Road
San Carlos, CA 94070-4111
(650) 232-9600
FAX (650) 232-9612
www.sequoialabs.com

Henshaw Assoc., Inc	Project:	1	Sampled:	6/1/00
11875 Dublin Blvd. A-200	Project Number:	Cherokee/Beachfront	Received:	6/1/00
Dublin, CA 94568	Project Manager:	Mike Harrison	Reported:	6/2/00

Notes and Definitions

#	Note
1	Due to the high concentration of target analytes, the sample had to be diluted and the surrogate recoveries could not be determined.
2	Sample was diluted due to high concentration of non-target compounds.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

Corrective Measures Implementation Workplan

Cherokee San Francisco, L.L.C. &
Cherokee Grand Avenue, L.L.C.

South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C.
Cherokee Grand Avenue, L.L.C.

Prepared by:

Henshaw Associates, Inc.
Environmental Engineering Services

Corrective Measures Implementation Workplan

Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared For:

Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.

Prepared By:

Henshaw Associates, Incorporated
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

REGISTERED PROFESSIONAL ENGINEER
MICHAEL E. HARRISON
NO. C57319
12/31/01
CIVIL
STATE OF CALIFORNIA

Michael Harrison, P.E.
Environmental Engineer
Senior Project Manager

Kenneth C. Ames, C.P.H., M.S.
Senior Project Manager

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Purpose and Scope 1
2.0 BACKGROUND AND SETTING 2
2.1 Property Setting 2
2.2 Property History 2
2.3 Geology and Soils 2
2.4 Geohydrology 3
3.1 Conceptual Model 4
3.2 Media Cleanup Standards 4
3.3 Required Permits 4
3.4 Data Sufficiency 4
3.5 Project Management 5
4.0 SCOPE OF WORK 6
4.1 Excavation of Contaminated Soils 6
4.1.1 Confirmation Sampling 6
4.2 Removal, Transport, and Disposal of Soils 7
4.3 Backfill and Paving 7
4.4 Coordination of Operations 8
4.5 Project Schedule 8
5.0 INSTITUTIONAL CONTROLS 9
5.1 Deed Restriction 9
5.1 CAP Maintenance 9

FIGURES

Figure 1 Property Vicinity Map
Figure 2 Areas of Proposed Excavations & Areas of Proposed Low permeability Caps
Figure 3 Geologic Unit Plan View
Figure 4 Analytical Results Over Media Cleanup Standards

APPENDICES

Appendix A Final Decision and Response to Comment for Soil Remediation at the Former O'Brien Facility
Appendix B Access Plan
Appendix C Sampling and Analysis Plan
Appendix D Excavation-Derived Residual Plan
Appendix E Health and Safety Plan
Appendix F Well Logs

1.0 INTRODUCTION

On behalf of Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C. (Cherokee), Henshaw Associates, Inc. (Henshaw) has prepared this Corrective Measures Implementation Workplan (Workplan) for the property at 450 E. Grand Avenue, South San Francisco, California (Property). The Property location is shown on Figure 1. This Workplan outlines the work to be performed as part of Corrective Measures (CMs) at the Property. The CMs are based on guidance presented by the U.S. Environmental Protection Agency in *Final Decision and Response to Comment for Soil Remediation at the Former O'Brien Facility*, April 26, 2000 (Appendix A). This Workplan describes and summarizes the history and geology of the Property and presents the scope of work designed to remediate soils affected by past uses at the Property.

1.1 Purpose and Scope

The purpose of the CMs are to protect human health and the environment by minimizing exposure to and removing contaminated soils that that have been impacted by historical hazardous waste management practices at the Property. During implementation of the CMs, impacted soils will be removed from the Eastern and former Solvent Still Areas and replaced with clean fill (Figure 2). During excavation, samples will be collected and analyzed using field test methods (i.e. field portable X-ray fluorescence (XRF) analyzers) to verify the progress of the excavation and the nature and extent of the contamination. Excavated soils will be characterized and segregated to allow proper disposal, and excavated areas will be backfilled with clean fill material and compacted. The Property's existing low permeability cap will be extended to areas of impacted soils adjacent to the existing warehouse Property and existing concrete pavement (Figure 2). An inspection and maintenance plan (Section 5) for the low permeability cap at the Property will be implemented as an institutional control. Deed restrictions will also be implemented at the Property as an institutional control to manage potential exposure to contamination left in place and restrict the future uses of the Property to commercial or industrial purposes. The CMs described within this workplan are designed to ameliorate soil contamination. Groundwater issues at the property will be addressed separately.

2.0 BACKGROUND AND SETTING

The following section presents a summary of the Property setting, geology and hydrology. A more complete description of these elements is contained in a series of environmental reports completed for the Property as summarized in the *Final Phase II - RCRA Facility Investigation* report (Harza, May 31, 1996).

2.1 Property Setting

The Property consists of 27-acres in South San Francisco, California, and lies approximately one mile east of Highway 101 at the eastern edge of Grand Avenue (Figure 1). The Property is located in an industrialized area on the western shore of San Francisco Bay, within an area zoned for commercial and light industrial uses, and has housed paint manufacturing operations for over 100 years. The Property is located on Point San Bruno, and is bordered by the San Francisco Bay to the east, the former San Bruno Channel to the south, by an air-freight forwarding company to the west, and by Genentech and the former Marine Magnesium facility to the North and Northwest.

2.2 Property History

Paint manufacturing began at the Property in 1898 under the ownership of W.P. Fuller. In 1968, The O'Brien Corporation purchased the Property. ICI Glidden then purchased a 7-acre portion of the Property from The O'Brien Corporation. The entire 27-acre parcel (including the 7-acre ICI Glidden portion) was purchased by Cherokee (effective June 30, 1999), the current and sole owner of the Property.

2.3 Geology and Soils

The Property lies within the Santa Cruz Mountains region of the Coast Ranges geomorphic province of California. The geology of the Property, consists of Franciscan Complex bedrock overlain by estuarine bay deposits, colluvium, and artificial fill. The estuarine bay deposits consist primarily of a blue-gray to black, highly plastic, silty clay commonly referred to as "Bay Mud". The colluvium generally consists of loose to firm, silty, sandy clay, gravel, and rock debris in varying proportions. Figure 3 presents a generalized surficial geologic map of the Property and selected boring logs are presented in Appendix F. The artificial fill consists of a variable mix of sand, silt, clay, and rock, primarily derived from local sources, and although it varies in thickness, it generally increases in a southerly direction across the Property.

2.4 Geohydrology

Groundwater has been observed within the shallow subsurface at depths ranging from six to ten feet below ground surface (bgs). The average permeability of the fill material as determined by pump testing is 2.9E-4 cm/sec, and the average permeabilities of the Bay Mud and the colluvium, as reported by the Mark Group (1989), are less than 2.0E-8 cm/sec and 3.9E-4 cm/sec, respectively.

3.0 CONCEPTUAL MODEL AND MEDIA CLEANUP STANDARDS

The following section presents an abbreviated conceptual model of the soil contamination at the Property. A more complete discussion is presented in the *Final Phase II - RCRA Facility Investigation.* A description of the media cleanup standards selected by the U.S. EPA is also included.

3.1 Conceptual Model of Contaminant Migration

Various environmental investigations (see the administrative record included in Appendix A) have documented the existence of inorganic (mainly lead and arsenic) and semivolatile organic compounds (SVOCs) in Property shallow soils. These contaminants of concern at the Property, are assumed to have been introduced into the environment by historical waste management practices or fill practices, and are relatively immobile in the subsurface. Potential migration of these relatively immobile constituents in groundwater will be addressed separately by Cherokee and the U.S. EPA, and is not addressed in these CMs. This CMI Workplan addresses potential migration of contaminants by providing for removal or isolation of contaminated soils. Figure 4 presents analytical data from the locations described in the U.S. EPA *Final Decision and Response to Comments* where concentrations of metals and SVOCs above media cleanup standards were found in soil samples collected at the Property.

3.2 Media Cleanup Standards

Media cleanup standards adopted by the U.S. EPA are based on U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for industrial land use, which "correspond to a one in a million cancer risk, under a conservative set of assumptions" (U.S. EPA, 2000). Due to the ubiquitous levels of arsenic in Bay Area soils (background concentrations) and the industrial history of the Point San Bruno area, the U.S. EPA has adopted a 30 milligram per kilogram (mg/Kg) cleanup standard for arsenic. These standards are appropriate due to the industrial nature of the Property and the surrounding area, the institutional controls included as part of the CMs, and the economic impracticality of creating a pristine environment in an area industrialized since the turn of the century and built on industrial fill.

3.3 Required Permits

Cherokee has obtained a permit from the Bay Conservation and Development Commission (BCDC) to conduct work within the 100-foot area proximate to San Francisco Bay that is under BCDC's jurisdiction. No other permits are required to perform the CMs

3.4 Data Sufficiency

As discussed previously, a significant body of environmental investigatory work has been performed at the Property (Appendix A). Based on this body of environmental information, the on-site lateral and vertical extent of impacted soil has been "functionally delineated" (Harza, 1996). Additional information concerning the extent of contamination in the areas of excavation

will be collected during confirmation sampling efforts of the CMs. During performance of the CMs, the confirmation sampling will augment existing information regarding the actual extent of soil contamination at the property.

3.5 Project Management

The following section describes the responsibilities of key personnel for the CMs.

Project Manager: Michael Harrison, P.E., of Henshaw will serve as Project Manager for the CMs. As Project Manager, Mr. Harrison is responsible for ensuring that the CMs meet their objectives and regulatory commitments. The Project Manager manages the design and implementation of the CMs including data management and quality assurance/quality control (QA/QC).

Supervisory Geologist: Dana Brown of Henshaw will serve as the Supervisory Geologist for Henshaw. The Supervisory Geologist will provide field oversight to assure day-to-day monitoring of project QA/QC activities to verify compliance with the project Sampling and Analysis Plan (SAP, Appendix C). The SAP is composed of the Field Sampling Plan and the Quality Assurance Project Plan. The Supervisory Geologist shall also be responsible for ensuring that all subcontractor activities are performed in accordance with Workplan requirements. Duties of the Supervisory Geologist will include directing or performing confirmatory sampling, and maintaining project status logs that include daily mass removal subtotals and accurate confirmatory sample locations and sampling results.

Health and Safety Manager: Dana Brown of Henshaw will serve as Health and Safety Manager. The Health and Safety Manager is responsible for implementing and monitoring conformance with procedures described in the Health and Safety Plan (HASP) which is included as Appendix E of this Workplan. The Health and Safety Manager shall have the authority to stop work in the field at any time. Responsibilities are further defined in the site-specific HASP.

Vendors and Contractors: Various vendors and contractors will be performing work during implementation of the Workplan. Vendors shall provide equipment, materials, and services, e.g., surveying, and laboratory analytical services, health and safety supplies, and waste disposal services, among others. Vendor and contractors approved by Henshaw and Cherokee.

4.0 SCOPE OF WORK

The project involves excavating contaminated soils from three areas within the Property, as shown on Figure 2. Excavated soils will be segregated as directed by Henshaw, manifested, transported, and disposed of according to applicable law. Clean fill, defined as uncontaminated, nonwater-soluble, and nondecomposable inert solid material, will be used to backfill excavations to original grade and shall be inspected prior to use for odor, staining, and other indications of debris or contamination. Additionally, two non-contiguous low permeability caps shall be constructed in the areas shown on Figure 2 in order to "eliminate exposure to contaminated soil" (EPA, 2000).

Excavation work will be coordinated with confirmation sampling activities, which are further detailed in the SAP (Appendix C). The lateral extent of remedial excavations will be determined when the concentrations of contaminants of concern in confirmation samples collected from excavation sidewalls are below the cleanup criteria established by the EPA, or the excavation approaches the maximum expected high tide limits of San Francisco Bay.

Confirmation samples will be collected from the base of the excavation during CM activities. The depth of the excavations will be extended until confirmation samples are below media cleanup standards, or a depth of six inches into the Bay Mud underlying fill materials (estimated maximum depth from 10-12 feet) is reached. If excavations extend into the Bay Mud, any remaining contamination will be assumed to exist within low permeability materials and be immobile and functionally encapsulated. Further details regarding confirmation sampling are presented in Section 4.1.1.

The excavation spoils will be temporarily consolidated on plastic within the areas of excavation from which they were derived prior to hauling them to an appropriate waste disposal facility as dictated by State and Federal Law. Dewatering fluids, if any, will be pumped to temporary storage tanks for treatment and then discharged to the local Publicly Owned Treatment Works (POTW) under a special discharge permit.

These CMs are based on established environmental methodology and are simple to implement. Consequently, their ability to meet the corrective measure objectives is high.

4.1 Excavation of Contaminated Soils

The excavation of designated areas (Figure 2) will be to the depth specified by Henshaw, as a result of the confirmation sampling (estimated maximum depth 10-12 feet bgs). If required by groundwater conditions or proximity to San Francisco Bay, shoring and cut-off or diaphragm walls (curtain wall) may be used to reduce infiltration.

4.1.1 Confirmation Sampling

Lead is the primary contaminant of concern in the areas proposed for excavation. Previous investigations have indicated that other contaminants of concern are collocated with elevated

lead concentrations. During excavation activities, confirmation samples will be collected as deemed appropriate for analysis of total lead content with a field XRF to ascertain if CM goals have been met. The location and results of the XRF sampling will be recorded and included in a report documenting the completion of the CMs. Additional field screening for volatile organic compounds (VOCs) with an organic vapor meter (OVM) may be conducted in areas where VOCs have been detected in groundwater. When XRF samples indicate that CM goals have been met, soil samples will be collected at 25-foot spacing along excavation sidewalls and at grid centers of a 25-foot grid along the excavation bottom for analysis at a certified laboratory for lead, arsenic and semivolatile organic compounds (SVOCs). Soil samples will not be collected from the bottom of the excavations if the static groundwater level is above the excavation bottom. Rather, samples will be collected from the side walls above the local groundwater elevation to confirm the extent to which excavation of the EA will be required. Further details regarding CM sampling activities are presented in the SAP (Appendix C).

4.2 Removal, Transport, and Disposal of Soils

Subsequent to applicable testing, excavated soils that exceed Federal or State Land Disposal Restrictions (LDRs) or U.S. EPA selected media cleanup standards will be removed, transported, and disposed of at a RCRA Class I or Class II facility, as appropriate. If confirmation sampling and waste characterization sampling indicate that excavated soils are non-hazardous and below U.S. EPA media cleanup standards, those soils will be placed back in the excavation from where they were derived.

4.3 Backfill and Paving

Clean fill material will be predominantly granular, non-expansive soil, and free from organic or other deleterious matter. If placed on Bay Mud, the first (bottom) 12-inches layer of the backfill material will not contain rock material greater than 1-inch in diameter. The placement and compaction of the fill material will be in equal continuous layers, and the fill materials will be compacted to 90 percent of relative compaction, as specified under ASTM D1557.

Where groundwater contamination is indicated by field screening or laboratory confirmation, Cherokee may augment clean fill with approximately 0.2% to 0.4% by weight of oxygen release compound (ORC) supplied by Regenesis in the backfill material. The total mass of backfill to be augmented would be defined by the surface area of the excavation where VOCs have been identified, multiplied by a treatment depth of 2 to 4 feet, depending on the depth of the excavation and the severity of the observed VOC impairment. ORC would be applied at the indicated ratio in a dry form from 30 pound buckets into each scoop of back-fill material. If high winds prevent this dry application method from being effective, a 63% solids slurry of ORC and water will be added to buckets of backfill prior to addition to the excavation.

Two non-contiguous areas of pavement will be constructed in the areas shown on Figure 2 (extending approximately 47,500 square feet and 4,600 square feet for the two areas). The pavement will be constructed on 8-inches of aggregate base with 2.5-inches of asphalt paving in areas of low traffic. Four inches of asphalt paving will be completed in areas within the perimeter

of the warehouse facility where heavier traffic is expected. Compaction testing will follow ASTM D1557. Areas the fail the testing will be re-compacted and retested, until all areas exceed the specified relative density. The finished work will be protected from vehicle traffic until it has properly set.

4.4 Coordination of Operations

All operations will be conducted in a manner that causes the least possible obstruction and inconvenience to neighboring businesses. At the end of each working day, all open pits will be secured by barriers, tape and warning lights. The consolidation of excavated soils will occur adjacent to the excavation that soils are derived from, prior to removal. Uniform hazardous waste manifests for wastes will be completed and submitted to the U.S. EPA. All California-hazardous or non-hazardous waste will be transported to an appropriately licensed facility for appropriate treatment or disposal under a uniform waste manifest and/or bill of lading. Copies of the destination landfill weight tickets for excavation spoils removed from the Property will be retained and all local transportation permits will be prepared and/or obtained.

4.5 Project Schedule

The project schedule is expected to involve approximately five to seven days of excavation and backfilling and three days of paving. Actual fieldwork will depend on availability of equipment and waste disposal capacity at selected disposal facilities. All fieldwork should be completed and all equipment removed from the Property within one month of the initiation of fieldwork. A Corrective Measures Completion report will be completed for submission to the U.S. EPA within six weeks of fieldwork completion.

5.0 INSTITUTIONAL CONTROLS

Institutional controls for the CMs include deed restrictions and inspection and maintenance of the low permeability cap.

5.1 Deed Restriction

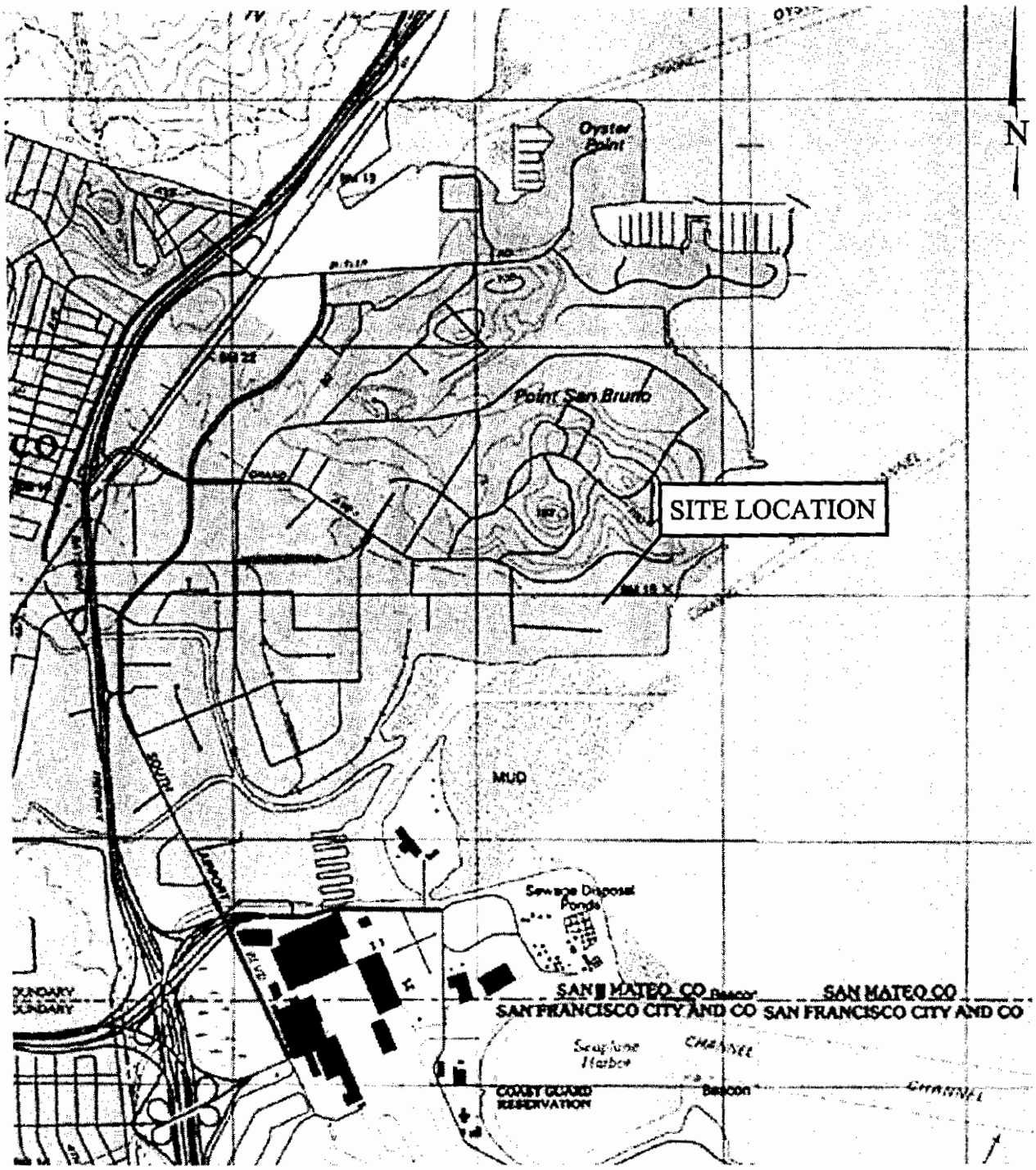
As detailed within the *Final Decision and Response to Comment for Soil Remediation,* a deed restriction shall be submitted with the Corrective Measures Completion report to restrict the future use of the Property to commercial and industrial use and manage soils on the property. The specific objectives of the deed restrictions sought by the U.S. EPA are contained within the *Final Decision and Response to Comment for Soil Remediation,* Appendix A.

5.1 CAP Maintenance

In order to ensure that the low permeability cover at the Property continues to serve the function of minimizing exposure to contaminated soil, a walking inspection shall be completed at yearly intervals following the rainy season. Walking inspections shall take note of cracks, vegetative intrusion, and other defects or normal wear and tear that effect the permeability of the cap. Repair work shall be conducted when more than 5% of the cap in any area has been degraded to the extent that vegetation or precipitation can pass through.

FIGURES

Figures



Scale 1:24,000

1 1/2 0 1 Mile

1000 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 .5 0 1 Kilometer

Source: TOPO!, Wildflower Productions, 1999

No.	Date	Revision	Approved

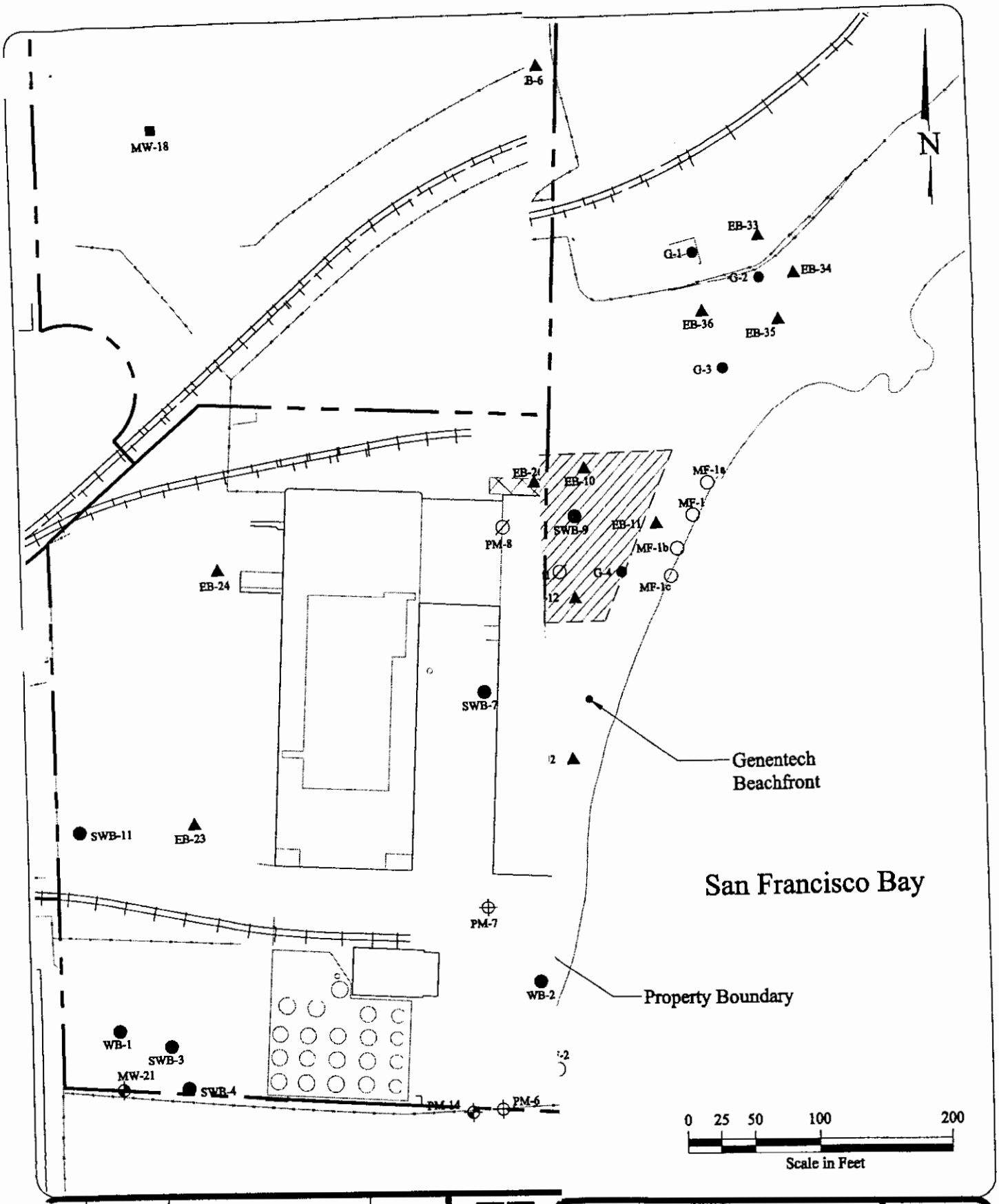
Henshaw Associates, Inc.
Environmental Engineering Services
11875 Dublin Blvd., Suite A-200 • Dublin, California 94568

Date:	05/18/00
Designed:	OS
Drawn:	OS
Checked:	MH
DWG file:	7037-99

PROPERTY VICINITY MAP
The Cherokee Environmental Risk Management Property
450 East Grand Avenue
South San Francisco, California

Figure 1

Project 233.C.01



No.	Date	Revision	Approved

Environm

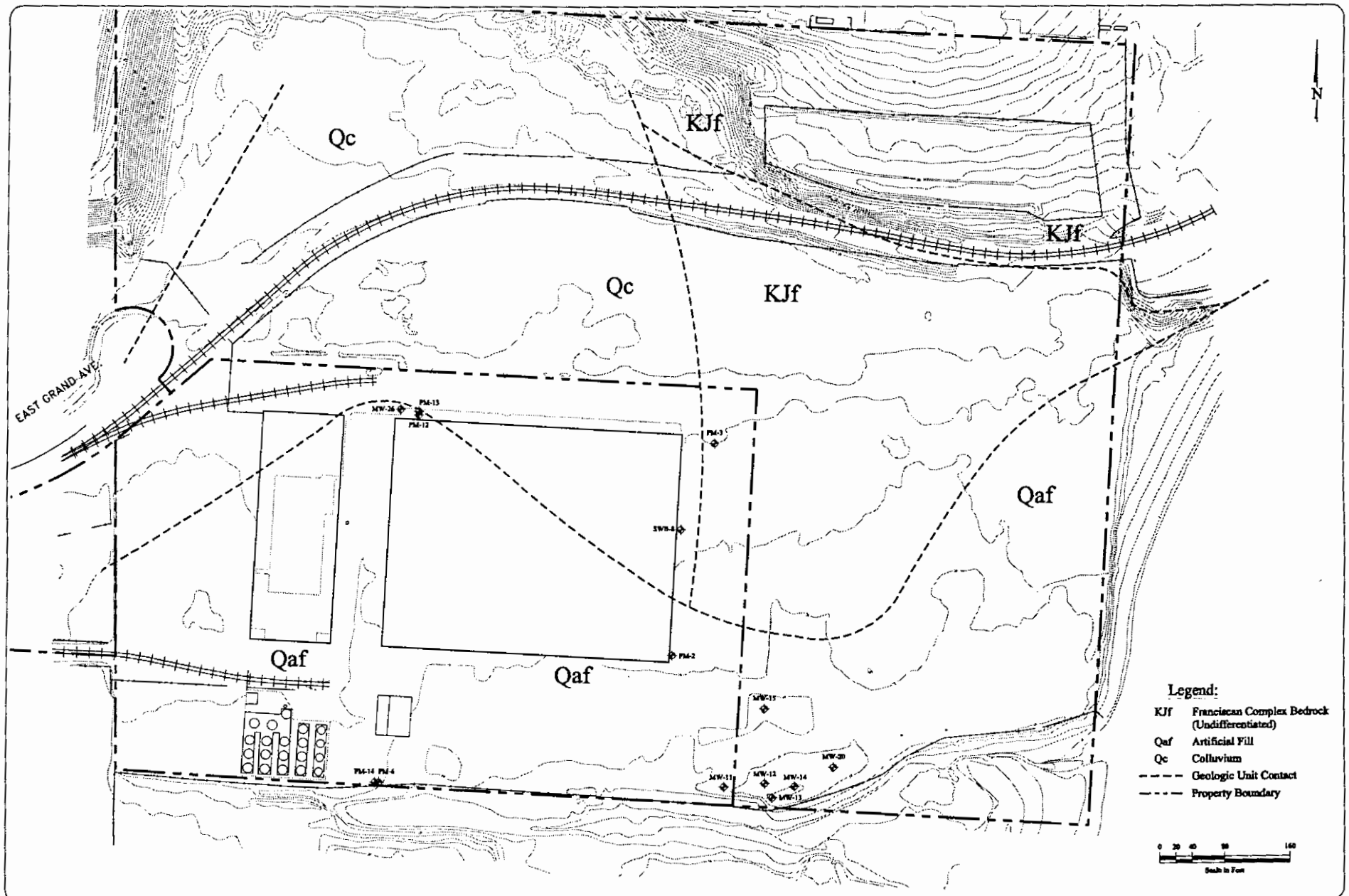
11875 Dublin B

VATIONS AND
MEABILITY CAPS

Property

Figure
2

Project
233.C.01



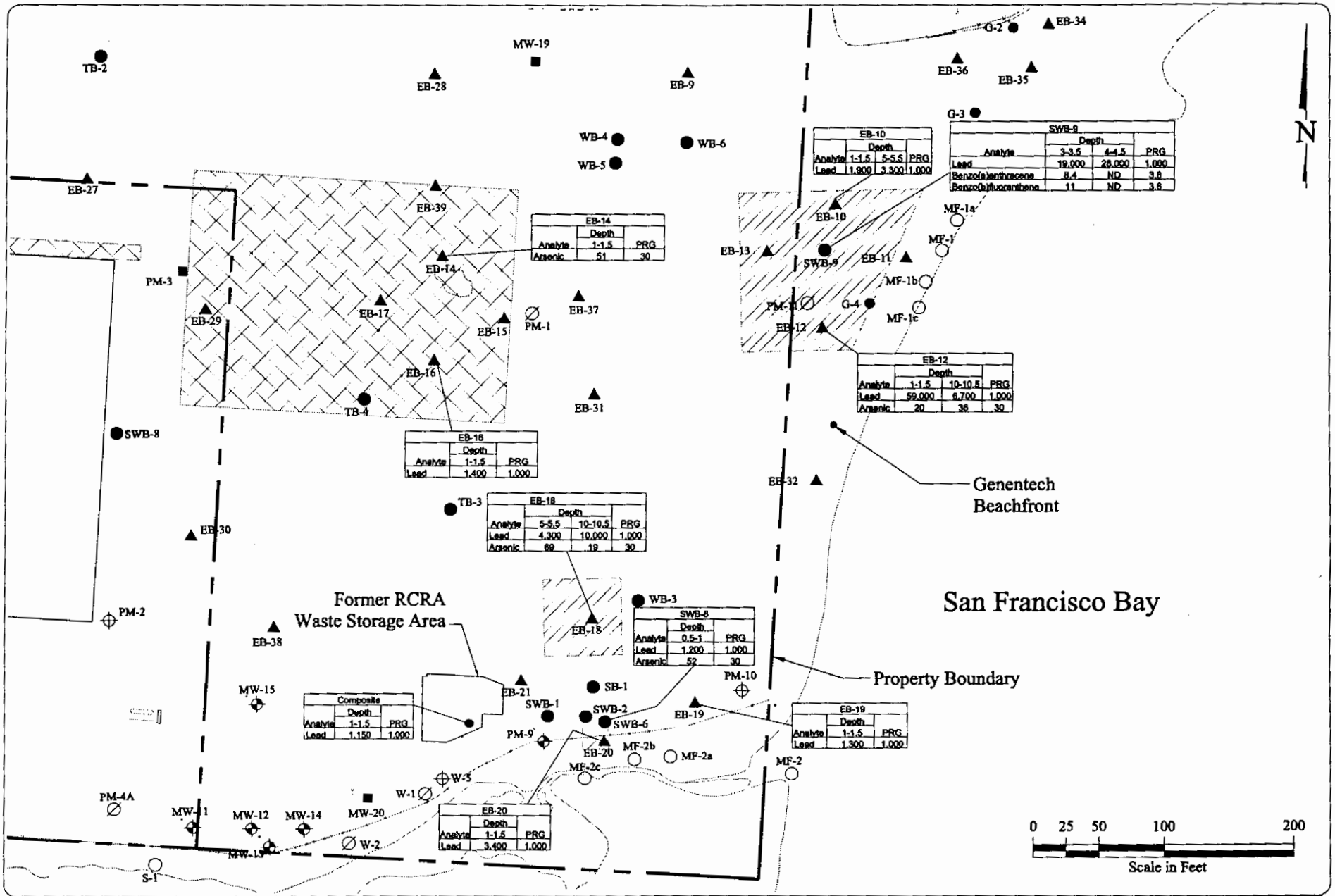
No.	Date	Revision	Approved

Henshaw Associates, Inc.
Environmental Engineering Services
11875 Dublin Blvd., Suite A-200 • Dublin, California 94568

Date:	05/18/00
Designed:	OS
Drawn:	OS
Checked:	MH
DWG file:	7035-99

GEOLOGIC UNIT PLAN VIEW
Corrective Measures
450 East Grand Avenue
South San Francisco, California

Figure 3
Project 233.C.01



EB-10			
	Depth		
Analyte	1-1.5	5-5.5	PRG
Lead	1,900	3,300	1,000

SWB-9			
	Depth		
Analyte	3-3.5	4-4.5	PRG
Lead	19,000	28,000	1,000
Benzo(a)anthracene	8.4	ND	3.8
Benzo(b)fluoranthene	11	ND	3.6

EB-14		
	Depth	
Analyte	1-1.5	PRG
Arsenic	51	30

EB-12			
	Depth		
Analyte	1-1.5	10-10.5	PRG
Lead	59,000	6,700	1,000
Arsenic	20	36	30

EB-16		
	Depth	
Analyte	1-1.5	PRG
Lead	1,400	1,000

EB-18			
	Depth		
Analyte	5-5.5	10-10.5	PRG
Lead	4,300	10,000	1,000
Arsenic	69	19	30

SWB-6		
	Depth	
Analyte	0.5-1	PRG
Lead	1,200	1,000
Arsenic	52	30

Composite		
	Depth	
Analyte	1-1.5	PRG
Lead	1,150	1,000

EB-19		
	Depth	
Analyte	1-1.5	PRG
Lead	1,300	1,000

EB-20		
	Depth	
Analyte	1-1.5	PRG
Lead	3,400	1,000

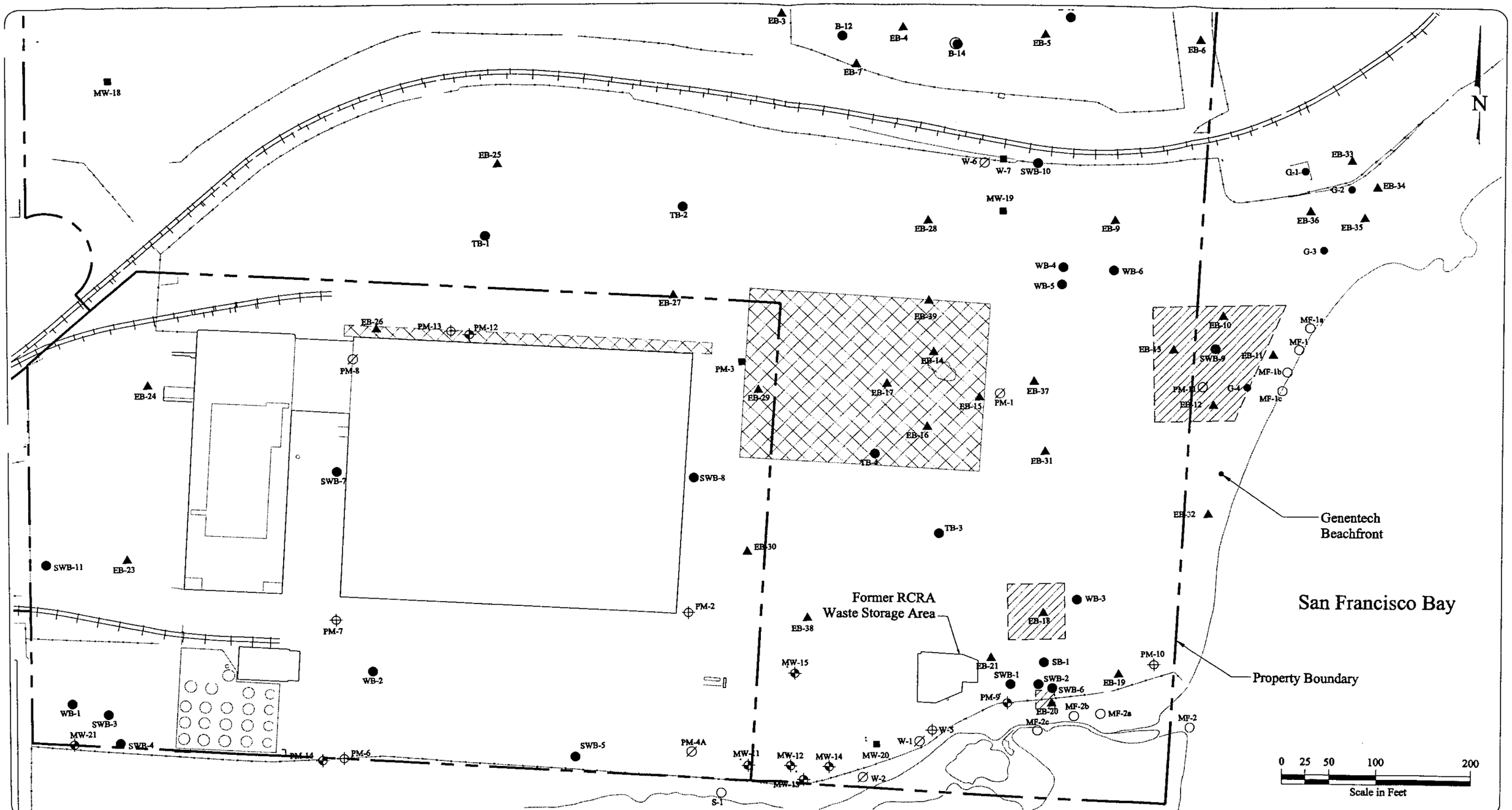
No.	Date	Revision	Approved

Henshaw Associates, Inc.
Environmental Engineering Services
11875 Dublin Blvd., Suite A-200 • Dublin, California 94568

Date:	05/18/00
Designed:	MH
Drawn:	OS
Checked:	MH
DWG file:	9126-00

ANALYTICAL RESULTS OVER MEDIA STANDARDS
Corrective Measures
Cherokee South San Francisco Property
South San Francisco, CA

Figure 4
Project 233.C.01



No.	Date	Revision	Approved

Henshaw Associates, Inc.
Environmental Engineering Services
11875 Dublin Blvd., Suite A-200 • Dublin, California 94568

Date:	05/18/00
Designed:	MH
Drawn:	OS
Checked:	MH
DWG file:	9141-00

AREAS OF PROPOSED EXCAVATIONS AND
AREAS OF PROPOSED LOW PERMEABILITY CAPS
Corrective Measures
Cherokee South San Francisco Property
South San Francisco, CA

Figure
2
Project
233.C.01

APPENDIX A

Appendix A
Final Decision and Response to Comment for Soil Remediation at the Former O'Brien Facility

Final Decision and Response to Comments for Soil Remediation at the Former O'Brien Facility located at 450 East Grand Avenue, South San Francisco, CA (EPA ID CAD005130455)

Table of Comments

1.0 Introduction 1

2.0 Goals and Intent of the Selected Remedy 1

3.0 Selected Remedy 2

3.1 Warehouse Area 2

3.2 Eastern Property and Former Solvent Still Areas 3

4.0 Public Participation Activities 4

5.0 Comments Raised and the Agency's Response 4

6.0 Declarations 12

List of Tables

Table 1: Soil Cleanup Standards

List of Figures

Figure 1: Site Location Map

Figure 2: Actions to Address Soil Contamination at the Former O'Brien Site in South San Francisco

Attachments

Attachment 1: Errata to EPA's Statement of Basis for Soil Remediation at the O'Brien Corporation's facility located at 450 East Grand Avenue, South San Francisco, CA (EPA ID CAD005130450) July 1999

1. Introduction

The purpose of this document is to describe the remedy for soil contamination selected by the U.S. Environmental Protection Agency (EPA or the Agency) at the O'Brien facility, located in South San Francisco, California. The Statement of Basis, dated July 1999, explains the remedy proposed by EPA and provides an evaluation of alternative remedies considered.

The agency selected this remedy pursuant to Section VIII of the 3008(h) Administrative Order on Consent, dated April 16, 1991. All of the comments received were carefully reviewed during the final selection of the remedy, and have been answered in this response to comments.

In making its remedy decision, the Agency responded to and considered all comments received from the community. In the following sections, EPA describes and justifies the remedy for the O'Brien site and provides a preliminary schedule for remedy implementation.

The facility is located in South San Francisco, one mile east of Highway 101 at the eastern end of Grand Avenue. It is located on Point San Bruno adjacent to the San Francisco Bay. To the south lies the former San Bruno Channel, which was used for shipping. It was filled in with soil from the late-1960s to the mid-1970s. The southwestern portion of the site was previously occupied by Steiger Pottery Works. A trucking company is located west of the site. To the north lies undeveloped land owned by Genentech. Northeast of the site, Marine Magnesium previously operated a plant that recovered magnesium and other salts from bay-water.

The O'Brien Corporation, the company named in EPA's 3008(h) Corrective Action Order, purchased the site in 1967. The site itself has been used to manufacture paints and coatings since 1898. Approximately two years ago, ICI Glidden purchased a portion of the site that included most of the warehouse area. As explained in the Response to Comments section, the site has again changed owners since EPA's proposed remedy on July 28, 1999. Cherokee South San Francisco LLC and Cherokee Grand Avenue LLC have purchased both portions of the facility.

2.0 Goals and Intent of the Selected Remedy

The general goals of this remedy are to protect human health and the environment. For the Warehouse Area, the remedy is intended to eliminate exposure to contaminated soil. Institutional controls will run with the land to ensure the long term effectiveness of the remedy, particularly during periods of subsurface maintenance (on sewer lines for example) or construction.

For the Eastern Property and Solvent Still Area, the remedy is intended to remove soil contamination in excess of the level allowable for industrial or commercial exposure. Institutional controls will also be necessary on this portion of the property to ensure that the future land use remains commercial or industrial.

3.0 Selected Remedy

The initial evaluation of the alternative remedies contained in EPA's Statement of Basis for Soil Remediation at the O'Brien Corporation's facility. For the Warehouse Area, the remedy remains the same as proposed in the Statement of Basis. For the Solvent Still Area and Eastern Property, the remedy has been slightly revised (as described below). All changes made were in response to written comments received during the comment period.

3.1 Warehouse Area

The proposed remedy is asphalt and concrete capping of contaminated soil near the warehouse and the surrounding paint manufacturing facility, see Figure 1. The cap consists of asphalt paving around the warehouse and administrative building as well as the buildings themselves and the concrete foundation of the tank storage area.

The cap will cover all areas where soil concentrations are known to exceed the Soil Cleanup Standards, listed in Table 1 (further discussion of these standards is contained in Section 3.2). The cap is intended to prevent direct human contact with these contaminated soils. Additionally, it will minimize the infiltration of surface water through these soils, thereby reducing contaminant migration. EPA or DTSC will include groundwater monitoring for the capped area at a later date, when the groundwater remedy is selected. The need for groundwater remediation in the warehouse area is still under evaluation.

As part of this remedy, the facility must submit a plan to maintain the asphalt and concrete cap in good condition. For this portion of the property, the current land owner and the current operator will need to enter into institutional controls (deed restrictions) that accomplish the following objectives:

- restrict the future use of the property to commercial and industrial use, unless approved by the lead regulatory agency (EPA or DTSC)
- minimize excavations in the capped area
- if excavations are necessary, notify the lead agency (EPA or DTSC) at least 14 days in advance of any planned activities and explain how contaminated soils will be managed
- characterize any soil that is excavated beneath the cap, but not replaced (soil excavated for the repair of underground utilities may be removed without characterization, provided the soil is replaced in the original excavation)
- remove existing buildings (and structures) or construct new buildings, provided that (1) the lead agency (EPA or DTSC) approves the activity, (2) the area remains capped after construction is complete and (3) soils are properly managed during construction or demolition activities.

The institutional controls must run with the land and remain in perpetuity unless the lead agency (EPA or DTSC) agrees that no further remediation is necessary.

Normally, EPA establishes specific groundwater monitoring requirements where contaminated soils are left in place. In this case EPA is still evaluating releases from the site to groundwater, and therefore EPA prefers to delay this decision until a comprehensive remedy decision can be made for groundwater. Currently O'Brien is monitoring two wells on the southern border of the Warehouse area in addition to other wells at the site. Until a groundwater remedy is selected, these wells must continue to be monitored on a quarterly basis. No wells are currently located upgradient of the Warehouse, where a different geologic unit is located. This limits the value of statistical comparisons between upgradient and downgradient water quality. Consequently, EPA is not requiring the facility to monitor water quality upgradient of the Warehouse area.

This remedy selection does not restrict the facility from proposing further characterization or remediation of soils under the direction of EPA or DTSC. However, if proposed, EPA or DTSC will provide public notice of significant changes to this remedy, such as excavation and treatment of contaminated soils in the Warehouse area.

3.2 Eastern Property and Former Solvent Still Areas

The remedy consists of (1) excavating contaminated soil (approximately shown in Figure 2) that exceeds EPA's Soil Contamination Standards (listed in Table 1); (2) transporting all excavated soils off-site for treatment and disposal in accordance with applicable state and federal standards for transportation, treatment and disposal; (3) backfilling excavated areas with clean soil and (4) capping an additional portion of the site discussed below. The remedy has been changed from that proposed in the Statement of Basis in that the facility will no longer have the option to treat and dispose of soil on-site. Please review the response to comments for EPA's rationale for this change.

The media (in this case soil) cleanup standards proposed for this site are based on Region 9's Preliminary Remediation Goals (PRGs) for industrial land use. PRGs correspond to a one in a million cancer risk, under a conservative set of assumptions. The PRGs consider three pathways of exposure: ingestion, inhalation and dermal adsorption. The PRGs do not consider the potential risk to groundwater from soil leachate. Additionally, the PRGs do not address ecological impacts. Given the industrial nature of the past, current and expected land use, and the institutional controls to ensure that future land use is industrial or commercial, the PRG for lead, benzo (a) anthracene and benzo (b) fluoranthene (respectively 1000 mg/kg, 3.6 mg/kg and 3.6 mg/kg) are appropriate for this facility.

For arsenic, EPA is setting the media cleanup standard at 30 mg/kg, which represents a 10^{-5} risk level (1 in 100,000 cancer risk). The industrial PRG for arsenic is 3 mg/kg. The 30 mg/kg media cleanup standard would require little cleanup beyond that proposed for lead contamination, since high arsenic is often located at borings that also contained high lead levels, like EB-12, EB-18, SWB-6 and SWB-9. EPA believes that the 10^{-5} risk level is warranted considering (1) the industrial nature of the site, (2) the difficulty in distinguishing between background and site-related arsenic, and (3) the similarly high levels of arsenic that can be found throughout California and San Francisco Bay Peninsula.

For the eastern property and the solvent still area, the facility proposed to remediate the areas shown in Figure 2, with the exception of a dot representing the southeast portion of the RCRA waste storage area. EPA added this location because the composite lead concentration was 1,150 mg/kg. One change from the remedy proposed in the Statement of Basis is that EPA will not require the facility to sample near S-4, unless additional information is provided by the landowner, Genentech. In the Statement of Basis, EPA requested additional sampling near EB-14 and EB-16 to determine if excavation was necessary for the area. However, based on comments received, EPA will require capping of the area near EB-14 and EB-16. Figure 2 also shows an approximate extent of the cap. This area will also require institutional controls consistent with the warehouse portion of the site. All remaining uncapped areas of the site are below industrial PRGs, except arsenic as noted above.

The facility estimated that it will excavate 3,500 cubic yards of contaminated soil. This determination is based on limited data. As part of the remedy, the facility must submit a Corrective Measures Implementation Plan (CMIP) for EPA approval. It will explain, in a more detailed manner than the Revised Remedial Alternatives Evaluation and the Statement of Basis, how the facility will implement the approved remedy. As discussed in Section 4 (Response to Comments), EPA will make this Corrective Measures Implementation Plan available for review to anyone that has expressed an interest in reviewing it.

4.0 Public Participation Activities

A public comment period was held from July 28, 1999 to September 10, 1999. EPA held a Public Hearing/Meeting on the proposed remedy on August 26 at the City of South San Francisco's Municipal Services Building, at 33 Arroyo Drive. Excluding EPA representatives and contractors, the Public Meeting/Hearing was attended by only one person, a representative for Cherokee LLC. He did not make any comments for the record at that meeting.

EPA provided direct notice of the comment period and public meeting, in the form of a fact sheet, to landowners and occupants near the facility as well as people that had previously expressed interest in the facility's remediation. EPA also published a notice of the comment period and Public Meeting/Hearing that appeared in the San Francisco Chronicle on July 28, 1999 and La Mensajero, a Spanish language newspaper, on July 28, 1999. EPA's fact sheet, which was prepared in both English and Spanish, explained the proposed remedy, notified people of the availability of EPA's Statement of Basis, and notified people abut the August 26th Public Hearing/Meeting.

5.0 Comments Raised and the Agency's Response

EPA received no comments at the Public Hearing/Meeting. However, EPA subsequently received three sets of written comments on the proposed remedy. To assist the reader in understanding and cross-referencing of comments, EPA has identified the source of each comment and assigned a comment number. Comments by Henshaw Associates for Cherokee South San Francisco LLC and Cherokee Grand Avenue LLC are identified as Cherokee. Comments by Morrison and Foerster on behalf of Genentech Inc. are identified as Genentech.

Comments from the City of South San Francisco have been identified as CSSF. Please note that comments from Cherokee were direct quotes from their letters to EPA. In the case of Genentech and CSSF, EPA has briefly summarized their comments.

Cherokee Comment 1: Section 3.1, Facility Background, Page 2. During the time that EPA was finalizing the Statement of Basis, the portion of the property containing the ICI manufacturing facility was purchased by Cherokee Grand Ave, L.L.C. and the rest of the Property was purchased by Cherokee South San Francisco, L.L.C. Cherokee's ownership became effective as of June 30, 1999. This change should be reflected in future communications.

Response: This comment is addressed and the ownership changes acknowledged in EPA's Errata to the Statement of Basis, attached to this document.

Cherokee Comment 2: Section 3.2, Resource Conservation and Recovery Act (RCRA) Status, Page 2. As of August 25, 1999, the Department of Toxic Substances Control (DTSC) has approved the Class 3 modification to the approved closure plan thus granting closure of the former RCRA surface impoundments. The pond closure should be reflected in future status summaries.

Response: EPA acknowledges that DTSC now considers the surface impoundments at the former O'Brien facility to be clean closed.

Cherokee Comment 3: Section 5.2, Eastern Property and Former Solvent Still Area Page 5. In the second paragraph of this section, EPA proposes additional sampling as follows: "EPA is also proposing further sampling near sample locations EB-16 and S-4 (a minimum of four samples at each location)." The sample collected from EB-16 on November 30, 1995 at 1.5 feet below ground surface was found to contain 1,400 mg/kg of lead. Samples collected from locations encircling EB-16 (EB-17, EB-15 ,EB-31 and TB-3 and TB-4) did not contain elevated lead concentrations. Cherokee is willing to extend an impermeable cap from the warehouse asphalt apron to the approximate eastern extent of sample EB-15 (approximately 75-feet east of EB-16) and include a cap in the institutional controls (i.e. Deed restrictions) proposed for the Property. Cherokee requests that this option be reflected in the final remedy.

Response: EPA does not believe that soil from locations as far away as 75 feet should be averaged together to obtain an estimate of the concentration near sample EB-16. Further, averaging these widely separated samples is not justification for avoiding cleanup. However, EPA is willing to accept the extended cap to EB-15. The northern boundary of the cap should be at EB-39 for the reasons discussed in Cherokee comment 5. The southern boundary would be at sample TB-15. These are the closest locations with samples below the Soil Cleanup Standards (listed in Table 3 of the Statement of Basis).

Cherokee Comment 4: Section 5.2, Eastern Property and Former Still Area, Page 5. In the second paragraph of this section, EPA proposes additional sampling as follows: "EPA is also proposing further sampling near sample locations EB-16 and S-4 (a minimum of four samples at each location)." Several samples were collected at or proximate to location S-4 for Genentech on

October 11, 1993 and reported in the Phase I/II Environmental Site Assessment, Marine Magnesium Company Merck Site, Wookward-Clyde, April 20, 1994. These samples include S-3 (0.5-feet below ground [bgs] surface), S-4(0.5 and 3.0-feet bgs) and S-5 (0.5-feet bgs). Harza performed follow-up sampling on the Genentech property on July 26, 1994 for the O'Brien Corporation. Harza collected six samples in the vicinity of S-4 (G-1, G-2 and G-3 at two and five feet bgs). Only the sample collected at S-4 at 3 feet bgs was found to have lead concentrations over California Preliminary Remediation Goals or Total Threshold Limit Concentrations. In fact, the average lead concentration of the samples discussed in this comment (including the two samples collected from S-4) is 416.1 mg/kg. The average arsenic concentration of the samples is anomalous and that sufficient characterization has been completed in the proximity of S-4. Therefore, Cherokee requests that the requirement to complete sampling and remediation in the vicinity of S-4 be removed from the final remedy selection.

Response: EPA will not require further sampling at sample location S-4. Therefore, no cleanup will be required. However, EPA is including a contingency to the remedy that would require remediation at S-4 if the property owner, Genentech, provides additional compelling data.

Based on the additional samples at G-1, G-2 and G-3, EPA agrees that further sampling at S-4 is not necessary. EPA is not confident that the location of samples S-3 and S-5 are close enough to S-4 to consider them in this decision. According to the Figure 10 of the Statement of Basis (from the PhaseI/II Environmental Site Assessment, Marine Magnesium Company/Merck Site, April 20, 1994), the samples are 50 feet apart. EPA realizes that unsurveyed sampling locations may be inaccurate, but samples taken northeast from sample S-4 could easily be 50 feet away from S-5. So, we will not consider S-3 and S-5 close enough to further characterize the area near S-4.

While the same is true for the locations of samples G-1, G-2 and G-3, according to Figure 7 of the Statement of Basis, EPA believes the G-1, G-2 and G-3 samples were specifically intended to determine the extent of contamination near Sample S-4. EPA bases this opinion on a verbal statement by the consultant for O'Brien, Mike Harrison with Harza Associates and on the timing of the samples. Sample S-4 was taken on October 11, 1993, but was not reported until April 20, 1994. Samples G-1, G-2 and G-3 were taken on July 26, 1994. Based on the narrowness of the beachfront, EPA believes that G-1, G-2 and G-3 are in close proximity to S-4 and therefore indicate that the area does not contain uniformly high concentrations of lead or arsenic.

EPA is aware that the exact location of all of these samples is uncertain today. Because of their scale, the maps only provide a general idea of the sample locations. EPA has included a contingency in the remedy that would require cleanup for treatment near Sample S-4. This contingency would take effect only if Genentech can provide additional environmental sampling results of sufficient quality to demonstrate that lead and/or arsenic levels are present at levels above the soil cleanup standard on its property. The area should be, at a minimum, 50 square feet. EPA is not concerned that a single sample may contain lead above the cleanup standard.

Rather, we are concerned that a larger area could potentially cause people to be exposed to high levels of lead.

Cherokee Comment 5: Section 6.3, Surface Water, Page 6. This section states that "O'Brien currently manages storm water on the site in impoundments as specified in their stormwater management plan." The O'Brien Corporation filed and was granted a Notice of Termination for General Permit activities following the 1997 -1998 wet season. The Notice of Termination was filed on the advice of the Regional Water Quality Control Board following it's review of 1997-1998 stormwater monitoring data. Therefore, stormwater is not currently managed on the unpaved portion of the Property. This modification to the current stormwater management program should be reflected in future project status summaries.

Response: The Statement of Basis will be changed to reflect this fact. However, EPA remains concerned about the potential migration of contaminated soils to off-site sediments of the former San Bruno Channel. Therefore, EPA will also amend the Statement of Basis to require continued compliance with portions of the stormwater management plan. Specifically, the site topography shall remain intact so that contaminated soils will not migrate with stormwater runoff, but sampling of stormwater will not be necessary. Cherokee may submit an alternative stormwater management plan to EPA for consideration.

Even after remediation, lead levels up 1,000 mg/kg may be left on-site. So, soil (or sediment) runoff control must be maintained in perpetuity. EPA believes that redevelopment of the site will likely minimize future soil/sediment runoff if buildings, landscaping, facilities etc. are properly maintained. EPA will include an institutional control that requires the facility to provide EPA with copies of redevelopment plans. EPA's review will focus on the potential for the migration of soil with run off.

Cherokee Comment 6: Section 7, Scope of RCRA Facility Investigation, Page 7. Paragraph 5 on page 7 states "EPA requests that O'Brien verify that the area near EB-14 has an average concentration of less than 30 mg/kg of arsenic. Otherwise, the area near EB-14 should also be remediated along with lead contaminated soils." Cherokee is willing to extend the impermeable cap discussed in Cherokee Comment 3 to the area around EB-14. The sample collected at EB-14 found to have 51 mg/kg of arsenic was collected at 1.5 feet bgs. The sample collected from 5.5 feet bgs from EB-14 had 7.6 mg/kg of arsenic. Samples collected near EB-14 (EB-15, EB-16 and EB-17) had less than 20 mg/kg of arsenic. Therefore, we suggest that the sample collected from EB-14 with 51 mg/kg of arsenic is anomalous and not an indicator of an 'areally extensive problem.' Therefore, extending the impermeable cap described in Cherokee Comment 3 northward to the area of EB-14 would be a conservative mitigation strategy. Cherokee requests that the option be reflected in the final remedy.

Response: EPA does not believe that these widely separated samples indicate that the EB-14 sample is anomalous. EPA has no indication that contamination near EB-14 does not extend northward. While EPA is willing to accept the cap proposal, the cap must extend northward to sample location EB-39 and eastward to EB-15. These are the closest locations with samples below the Soil Cleanup Standards (listed in Table 3 of the Statement of Basis).

Cherokee Comment 7: Section 8.1.2. Former Solvent Still Area and Eastern Property. Section 8.1.2 discusses the proposed alternatives for the Former Solvent Still Area and Eastern Property. As discussed in Section 7, the land disposal restrictions and universal treatment standards were modified after the submissions of the Revised Remedial Alternatives Evaluation Report and prior to the initiation of the public comment period by the EPA. Because of the regulatory changes, on-site treatment of excavated soils is no longer feasible. In lieu of on-site treatment, contaminated soils will be excavated, profiled and disposed of per State and Federal regulations. This comment is in agreement with Section 8.2.2.1, General Standards, Compliance with Waste Management Standards, on page 13 of the Statement of Basis. This modification should be reflected in the proposed remedy.

Response: EPA is unclear of the meaning of "no longer feasible" in this comment. EPA guidance on remedy selection discusses technical feasibility of remedies, but that does not seem to be at issue here. Cherokee could mean no longer financially feasible. EPA will grant that it's cost analysis of a combined Alternative 1 and 2 was only an estimate, or possibly, that "no longer feasible" has some other meaning. However, EPA proposed Alternative 1 (off-site treatment and disposal) alone or in combination with Alternative 2 (on-site treatment and off-site disposal) for contaminated soils in the Solvent Still Area and Eastern Property. Cherokee's comment clearly expresses their preference for Alternative 1. Since the Statement of Basis offered O'Brien the opportunity to choose their preferred Alternative, EPA does not see a need to revise it. However, for the purposes of clarity in this Final Decision and Response to Comments, EPA will only identify Alternative 1 as the Selected remedy.

Cherokee Comment 8: Section 8.1.2, Former Solvent Still Area and Eastern Property. Section 8.1.2 discusses the proposed alternatives for the Former Solvent Still Area and Eastern Property. Following issuance of the Revised Remedial Alternatives Evaluation, groundwater sampling was conducted along the Eastern Property boundary. Groundwater samples collected during the Eastern Property sampling contained volatile and semi-volatile organic compounds during corrective action confirmatory sampling activities in the effected area. In areas impractical for excavation where residual concentrations of organic compounds exist, Cherokee proposes to add oxygen release compounds to excavation backfill to facilitate the biological or chemical removal of residual concentrations of organic chemicals.

Response: While this is a soil remedy, EPA has no concern, beyond clarification of the work to be performed, with the proposed addition of oxygen release compounds to speed biologic and chemical destruction of organic contaminants. EPA requests that the facility identify, in the Corrective Measures Implementation Plan (CMIP) the specific oxygen release compound, the ratio (of oxygen release compound to soil), the method of mixing and any other relevant implementation issues.

General Comment 1: EPA received a comment from both Genentech and the City of South San Francisco asking for copies of future correspondence about site remediation activities.

Response: EPA agrees to provide copies of it's correspondence to the CSSF and Genentech.

Genentech Comment 1: EPA should clarify whether the Statement of Basis requires O'Brien to perform work on the Genentech Property.

Response: The remedy may require the facility to perform work on Genentech Property. As described in the Statement of Basis, Cherokee will continue to sample until it has fully delineated the extent of contamination. If evidence suggests that sampling or excavation of contaminated soils on Genentech property is necessary, EPA will require the facility to seek permission from Genentech. EPA hopes that Genentech and the facility can reach an agreement in advance of the sampling and remediation that allows it to proceed without delay regardless of whether the contamination crosses the property line. If an agreement cannot be reached between the facility and Genentech, EPA will consider legal remedies to allow access to Genentech property, so that the facility may implement the approved remedy.

EPA does not have a map that shows the site's eastern property line relative to the current sampling results or the proposed excavation areas. So, EPA is uncertain whether the area of contamination near SWB-9, for example, extends onto Genentech property. EPA will request that future maps from Cherokee clearly delineate the property line with Genentech.

Genentech Comment 2: In the discussion of the proposed samples near S-4, Genentech requests the Statement of Basis be amended to require that each of the samples be analyzed for lead and arsenic.

Response: As explained in EPA's response to Cherokee Comment 4, no additional samples will be taken. However, EPA does expect that if samples are collected, they will be analyzed for lead, arsenic and semi-volatile organic compounds.

Genentech Comment 3: The Statement of Basis should be amended to more clearly describe the purpose of the Characterization Plan.

Response: In discussing this comment, Genentech states, "...the responsible party is not being required to fully investigate the vertical and horizontal extent of contamination at the site, but rather is excavating first and investigating later through confirmation sampling."

EPA has not concluded that O'Brien has completely characterized the contamination at the site, rather we have concluded that O'Brien has investigated the site sufficiently to allow EPA to select the appropriate remedy. The existing investigation data leaves EPA , O'Brien and now Cherokee the confidence to excavate first and confirm later. The purpose of further sampling is to delineate the extent of soil excavation and at the same time, confirm that the contamination in the area has been removed. In most instances, the data suggest a limit of contamination. In some cases, like SWB-9, the deepest sample taken, at 4 to 4.5 feet, contained high levels of lead. So, at some locations, the estimated depth for excavation is not known. From current data, we know that contamination in some areas extends downward to ten feet. The limit of contamination will likely be the clay layers found 10 to 15 feet below the surface. If the facility cannot completely excavate all contamination, it must request a modification to the remedy from EPA.

Genentech Comment 4: The Statement of Basis should be amended to discuss how the responsible party plans to characterize and manage any groundwater accumulated in the excavation pits.

Response: The facility's management and characterization of groundwater, removed from the site during excavation activities, will be a key aspect of the cleanup. This is a detail that the facility must include in their CMIP. As indicated in the response to General Comment 1, EPA is willing to share documents, like the CMIP, with Genentech.

Genentech Comment 5: The Statement of Basis should be changed to reflect changed circumstances. Cherokee Environmental (has) apparently purchased from O'Brien the portion of O'Brien's property that remained after O'Brien sold the warehouse area to ICI Glidden. Also, due to changes in EPA's land disposal regulations, onsite stabilization of metals contaminants in soil excavated at the site is no longer feasible.

Response: EPA has modified the Statement of Basis to reflect the ownership changes. The feasibility of on-site stabilization is addressed in EPA's response to Cherokee comment 7.

CSSF Comment 1: Will soil and groundwater remedial actions conducted on the O'Brien site preclude future migration of contaminants off-site to the channel and other areas?

Response: No. EPA recognizes the unacceptably high levels of contaminants in the former San Bruno Channel. This contamination may be addressed by a variety of agencies and orders. At this time, the Former San Bruno Channel is not specified as a Solid Waste Management Unit or Area of Concern in EPA's 3008(h) order. However, EPA may issue a new 3008(h) order to address this area, if it cannot be addressed satisfactorily by another agency or voluntarily by the parties involved. EPA would like to clarify that the former channel is not owned by O'Brien, but O'Brien at one time held a 99-year lease to the property.

CSSF Comment 2: What is the schedule for development of a plan to address off-site contamination?

Response: The remedy being selected today is a soils remedy; it does not directly address groundwater, except as explained in the response to Cherokee Comment 8.

Other than the Former San Bruno Channel and the areas addressed by this remedy on the Genentech property, EPA is not aware of any (site-related) off-site contamination. While EPA is concerned that groundwater could impact the San Francisco Bay, EPA does not expect that Bay water would require cleanup. Rather the source of contamination would need to be controlled. Either EPA or the State will issue a public notice of a proposed groundwater remedy in the near future, even if the determination is made that groundwater remediation is unnecessary.

CSSF Comment 3: Who will be responsible for contamination left in the former San Bruno Channel, even if remediaton of the channel is completed to the satisfaction of the EPA and other regulatory agencies.

Response: EPA may or may not be the agency that approves a remedial action for the former San Bruno Channel. Therefore, this question can best be answered by the regulatory agency in charge at the time they make the decision. The other agency currently involved with investigation and remediation of the former San Bruno Channel is the Regional Water Quality Control Board, San Francisco Bay Region.

CSSF Comment 4: What criteria will be used to establish clean-up levels for contaminants in the former San Bruno Channel?

Response: At the present time, EPA has not established remediation levels for sediments in the Former San Bruno Channel. However, EPA has stated repeatedly, in correspondence with O'Brien, it's concern about the levels of contaminants in the Former San Bruno Channel. Also, see response to CSSF Comment 3.

CSSF Comment 5: Who will be responsible for "the operation and maintenance of any mitigation activities that leave/stabilize off-site soil contamination in-place (including deed restrictions)."

Response: First, EPA would like to clarify that only on-site soils were (potentially) to be solidified on-site. However, as Cherokee Comment 7 clarifies, that is no longer a remediation option.

Second, off-site soil may be brought in as backfill, but Cherokee must demonstrate that the soil is free from contaminants that could pose a risk to human health or the environment. This demonstration may be in the form of testing or through knowledge of the soil source.
Third, EPA will ensure that institutional controls (deed restrictions) are recorded in the appropriate county recorder's office. EPA envisions the institutional controls as a combination of notifications and requirements. The notifications are intended for any person interested in obtaining more information about the property. The restrictions would apply to present and future property owners. EPA recognizes the City of South San Francisco's key role as the entity that controls land use for the Cherokee property. Consequently, EPA would welcome any suggestions from CSSF that would ensure the effectiveness of the proposed institutional controls.

CSSF Comment 6: Does EPA have (or will EPA require O'Brien to develop) a contingency plan in event that the former channel is further contaminated by the O'Brien site.

Response: As stated in the Statement of Basis, EPA is still reviewing groundwater data to determine whether contamination is migrating from the site to the Bay or the Former San Bruno Channel. Either EPA or the State will propose a groundwater remedy at a later date. With regard to soil contamination, a portion of the site will be capped. For the remainder of the site, although excavation will remove any soil that could be of concern to human health (based on an

industrial exposure), lead levels could still potentially be of concern to ecological receptors, like birds. Therefore, on-site soils must either be capped by asphalt or concrete paving, covered by the site's Stormwater Pollution Prevention Plan and Monitoring Program, dated June 18, 1997, or O'Brien must submit an alternative plan to ensure that contaminated soil does not migrate with rainfall run off. The stormwater discharge plan prevents current soil at the site from migrating (with stormwater) to the bay or Former San Bruno Channel. The Statement of Basis also specifies conditions for temporary soil excavation, to ensure that it does not migrate to the Bay or Former San Bruno Channel. Therefore, at this time, EPA does not believe that soil contamination from the former O'Brien site will migrate to the former San Bruno Channel. If this conclusion proves to be incorrect and site related contaminants migrate to the former channel in the future, EPA will consider all necessary actions to stop the migration, including a revision to the current remedy.

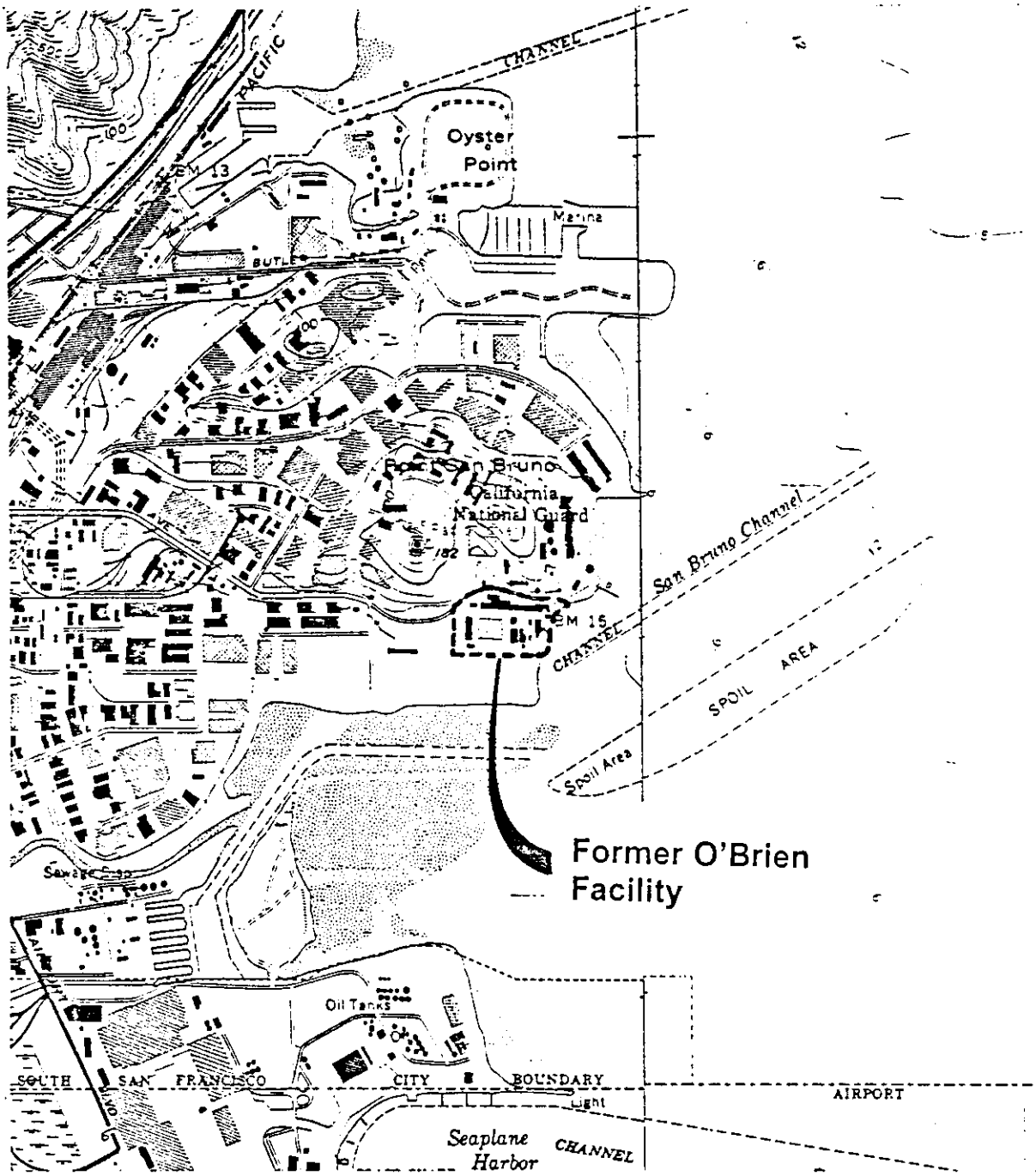
6.0 Declarations

Based on the administrative record compiled for this action, I have determined that the selected soil remedy to for this site is appropriate, consistent with the remedial approach taken at similar hazardous waste sites and will be protective of human health and the environment.

Julie Anderson, Director
Waste Management Division
U.S. EPA Region 9

Date 4/25/00

Table 1: Soil Cleanup Standards	
Contaminant	Concentration
arsenic	30 mg/kg
lead	1000 mg/kg
benzo (a) anthracene	3.6 mg/kg
benzo (b) fluoranthene	3.6 mg/kg



APPROXIMATE SCALE IN FEET

0 2000 4000

BASE: U.S.G.S., SOUTH SAN FRANCISCO QUADRANGLE, 7.5 MINUTE SERIES, DATED 1980

HARZA

Consulting Engineers and Scientists

FULLER-O'BRIEN PAINTS
450 East Grand Avenue
South San Francisco, California

SITE LOCATION MAP

PROJECT NO.	DATE
K615	April 1994

Final Decision and
Response to Commer
Figure 1

Actions to Address Soil Contamination at the Former O'Brien Site in South San Francisco

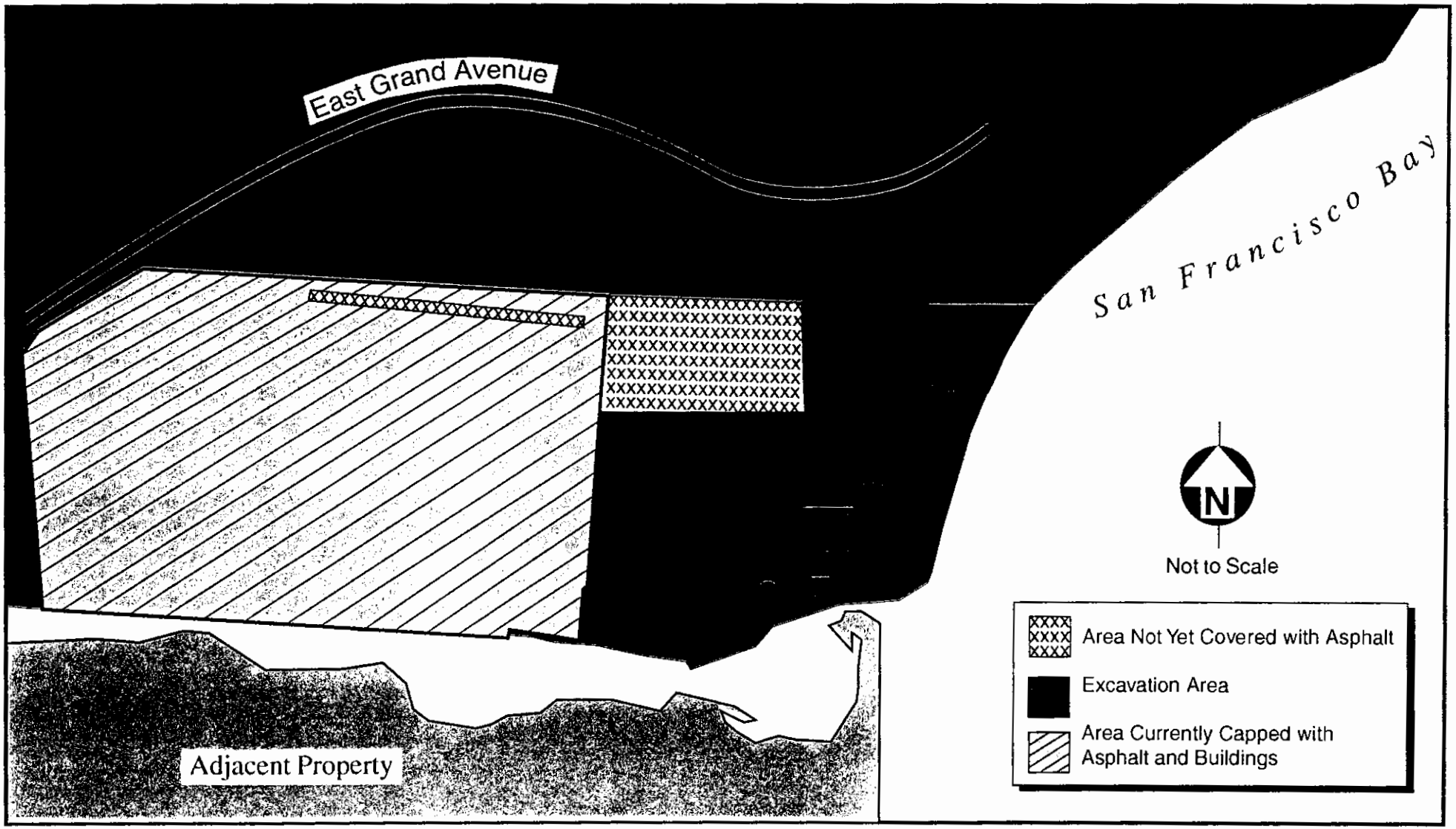


Figure 2

Attachment 1

Errata to EPA's
Statement of Basis for Soil Remediation at the O'Brien Corporation's facility
located at 450 East Grand Avenue South San Francisco, CA
(EPA ID CAD005130450)
July 1999

The Statement of Basis is revised to read as follows:

3.1. Facility Background

The facility is located in South San Francisco, one mile east of Highway 101 at the eastern end of Grand Avenue, as shown in Figure 2. Figure 3 is a more detailed facility map of the 26-acre facility, prepared by AT Kearney in December 1987 as part of the RCRA Facility Assessment for the site. The plant, originally owned by W.P. Fuller, has been in operation since 1898. The O'Brien Corporation purchased the facility in 1968. In 1994, O'Brien employed 85 people at the site. ICI Glidden recently purchased the remaining paint manufacturing operations, an area of seven acres. **Effective June 30, 1999, Cherokee Grand Avenue L.L.C. purchased the portion of the property owned by ICI Glidden. The rest of the property has been purchased by Cherokee South San Francisco, L.L.C.** Except for the portion **formerly** owned by ICI Glidden (the warehouse, administrative building west of the warehouse), all structures have been removed from the facility.

The O'Brien site is located on Point San Bruno adjacent to the San Francisco Bay. To the south lies the former San Bruno Channel, which was used for shipping. It was filled in with soil from the late-1960s to the mid-1970s. The southwestern portion of the site was previously occupied by Steiger Pottery Works. A trucking company is located west of the site. To the north lies undeveloped land owned by Genentech. Northeast of the site, Marine Magnesium previously operated a plant that recovered magnesium and other salts from bay-water. The entire area around the site is zoned for commercial and light industrial uses.

3.2. Resource Conservation and Recovery Act (RCRA) Status

The site operated one RCRA regulated storage area, two RCRA regulated storage tanks and three RCRA regulated surface impoundments. All of the units were operated under RCRA interim status. In a September 23, 1987 letter, DTSC and EPA approved a closure plan for three surface impoundments and two waste storage tanks as a closure with waste in-place. However, the facility submitted and followed a post-closure plan that included a seven year post-closure monitoring period, not the thirty year period described in state and federal regulations. During closure, O'Brien removed soil contaminated with lead above a concentration of 200 mg/kg from the impoundments and the area that surrounded the impoundments, shown in Figure 4. DTSC approved the certification of closure in July 18, 1988. Recently, O'Brien has requested that

DTSC re-evaluate the closure to determine if it meets clean closure standards.

On May 27, 1994 , DTSC similarly approved the closure plan and provided oversight on the closure of the storage area. Although the soils at one location (a composite of four samples) contained lead at concentrations well above the previously approved level (see Figure 5) the facility demonstrated that the contamination beneath the pad came from operations previous to the use of the drum storage pad. Therefore, DTSC indicated that further work may be required under EPA's 3008(h) order.

EPA issued an administrative 3008(h) order to O'Brien on February 24, 1989. O'Brien filed a request for a hearing on April 7, 1989. After negotiations with O'Brien, EPA issued a revised administrative 3008(h) order on April 16, 1991. O'Brien did not request a hearing for the revised order, which became effective thirty days after issuance. EPA's order, both the original and revised, were based on the RCRA Facility Assessment, completed by A.T. Kearney Inc. for EPA. Figure 3 includes numbers that identify the Solid Waste Management Units and Areas of Concern identified in the RCRA Facility Assessment. The numbers correspond with the named areas in Table 1. Although, over time, some of the areas have broadened from the original designation.

As explained in Section 3.1, the site has changed owners effective June 30, 1999. This may potentially change the responsible party or mechanism that EPA uses to enforce this remedy. EPA is willing to work with Cherokee, the new landowner. However, at this time, the O'Brien Corporation remains the owner and operator identified in EPA's 3008(h) corrective action order. Consequently, EPA will continue hold the O'Brien Corporation ultimately responsible for the site's remediation.

Addendum to the Administrative Record for the O'Brien Corporation

Date	Author / Affiliation	Recipient / Affiliation	Subject
Undated	None Specified	None Specified	Facility Mailing List
Various	None Specified	None Specified	Title 40 of the Code of Federal Regulations, Part 268
7/27/1990	EPA	None Specified	Corrective Action from Releases at Solid Waste Management Units at Hazardous Waste Management Facilities (also refered to as "Subpart S") 55FR30798
11/1991	EPA	None Specified	A Guide to Principal Threat and Low Level Threat Wastes, (Superfund Publication 9380.3-06FS)
5/1994	EPA	None Specified	RCRA Corrective Action Plan (OSWER Directive 9902.3-2A)
7/1995	EPA	None Specified	Contaminants and Remedial Options at Selected Metal-Contaminated Sites, EPA/540/R-95/512
3/25/1996	Michael Shapiro EPA	Norman Nosenchuck N.Y. Department of Environmental Conservation	Use of the Area of Contamination (AOC) Concept
5/1/1996	Timothy Fields EPA	Regional Administrators EPA Regions I-X	Corrective Action from Releases at Solid Waste Management Units at Hazardous Waste Management Facilities, Proposed Rule (also referred to as "Advance Notice of Proposed Rule Making") 61 FR 19432
6/6/1996	EPA	None Specified	RCRA Public Participation Manual

APR 26 2000

9/1997	EPA	None Specified	Engineering Bulletin, Technology Alternatives for the Remediation of Soils Contaminated with As, Cd, Cr, Hg and Pb (EPA/540/S-97/500
4/13/1998	George Wyeth EPA	Institutional Controls Workgroup	Transmittal of Draft Reference Manual on Institutional Controls
8/1998	EPA	None Specified	Clarification to the 1994 Revise Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action (OSWER Directive 9200.4-27)
2/8/1999	Michael Harrison Henshaw Associates	Wei Wei Chui DTSC	Agenda Items, The O'Brien Corporation Former Surface Impoundment Meeting
3/23/1999	Michael Harrison Henshaw Associates	Thomas Kelly EPA	Southern Property Boundary Groundwater Sampling, QM4-1998
5/1999	The O'Brien Corporation	None Specified	Fact Sheet: Former Solar Evaporation Ponds/Former Surface Impoundments
5/13/1999	Michael Harrison Henshaw Associates	Wei Wei Chui DTSC	Request for Modification of Former Surface Impoundment Closure Plan
7/1999	US EPA	None Specified	Statement of Basis for Soil Remediation at the O'Brien Corporation's facility at 450 East Grand Avenue, South San Francisco, CA
7/1999	US EPA	None Specified	Fact Sheet: Soil Cleanup at The O'Brien Corporation
7/6/1999	Michael Harrison Henshaw Associates	Thomas Kelly EPA	Southern Property Boundary Groundwater Sampling, QM4-1998
7/28/1999	US EPA	None Specified	Newspaper Advertisement: Public Comment Period and Public Meeting on Proposed Remedy for Soil Contamination at the O'Brien Corporation's Facility at 450 East Grand Avenue, South San Francisco, (San Francisco Chronicle)

7/28/1999	US EPA	None Specified	Newspaper Advertisement: La EPA Anuncia un Periodo de Comentario publica del Remedio Propuesto Para la Contaminacion La Facilidad de O'Brien Corporation (El Mensajero [Newspaper])
8/25/1999	DTSC	O'Brien Corporation	Approval of the Modification to the Closure Plan
8/26/1999	None Specified	None Specified	Proposed Remedy for Soil Contamination at the O'Brien facility located at 450 East Grand Avenue, South San Francisco, CA (Pesentation Overheads)
8/26/1999	California Shorthand Reporting	None Specified	Transcript: Public Meeting on the Proposed Remedy for the O'Brien Corporation Site
9/3/1999	John Gibbs City of South San Francisco	Tom Kelly	Comments to Statement of Basis for Soil Remediation at the O'Brien Corporation's Facility located at 450 East Grand Avenue, South San Francisco (EPA ID CAD005130455)
9/10/1999	Michael Harrison Henshaw Associates	Thomas Kelly EPA	Southern Property Boundary Groundwater Sampling, QM2-1998
9/10/1999	Michael Harrison, P.E. Henshaw Associates, Inc	Thomas P. Kelly U.S. EPA	Comments on Proposed Remedy for Soil Contamiation, Former O'Brien Corporation Property, 450 E. Grand Avenue, South San Francisco
9/10/1999	Brooks M. Beard Morrison & Foerster LLP	Thomas P. Kelly U.S. EPA	O'Brien Corp. Site, South San Francisco - Proposed Remedy for Soil Contamination
10/1/1999	Stanford Smucker, Ph.D., EPA	PRG Table Mailing List	Region 9 Preliminary Remediation Goals (PRGs) 1999
10/7/1999	EPA	None Specified	Corrective Action from Releases at Solid Waste Management Units at Hazardous Waste Management Facilities: Partial Withdrawal of Rulemaking Proposal 64 FR 54604

2/24/2000	Michael Harrison Henshaw Associates	Thomas Kelly EPA	Southern Property Boundary Groundwater Sampling 1999
APR 26 2000	US EPA	None Specified	Notice to the mailing list: Selection of Final Remedy for Soil Contamination at the Former O'Brien Corporation's Facility
APR 25 2000	US EPA	None Specified	Final Decision and Response to Comments for Soil Remediation at the Former O'Brien Facility
APR 26 2000	Julie Anderson US EPA	Alen Seeling Cherokee Environmental Risk Management	Voluntary Implementation of the Soil Remedy at the Former O'Brien Corporation Facility in South San Francisco
APR 26 2000	Julie Anderson US EPA	Jerome Crowley, President, The O'Brien Corporation	Final Decision and Response to Comments for the Former O'Brien Facility in South San Francisco

The O'Brien Corporation
Administrative Record Index - Sorted by Date

Date	Author Affiliation	Recipient Affiliation	Subject/Title
2/24/99	Tom Kelly US EPA R9	Larry Bowerman US EPA R9	Cost of a Multi-Layer Low Permeability Cap for O'Brien
7/7/98	Michael Harrison Henshaw Associates, Inc.	Thomas Kelly US EPA R9	Meeting to Discuss The O'Brien Corporation Property
6/5/98	Michael Harrison Henshaw Associates, Inc.	Thomas Kelly US EPA R9	Eastern Property and Southern Property Boundary Groundwater Sampling
4/27/98	Michael Harrison Henshaw Associates, Inc.	Michael Lozeau San Francisco BayKeeper	Stormwater Management Update for the O'Brien Corporation Property
4/27/98	None Specified Henshaw Associates, Inc.	Michael Lozeau San Francisco BayKeeper	Stormwater Management Update
3/17/98	Michael Harrison Henshaw Associates, Inc.	Thomas Kelly US EPA R9	Eastern Property Discrete Sampling Completion
2/25/98	Michael Harrison Henshaw Associates, Inc.	Thomas Kelly US EPA R9	Update on Schedule and Procedures Proposed for Discrete and Quarterly Groundwater Monitoring
10/23/97	Larry Bowerman US EPA R9	Jerome J. Crowley, Jr. The O'Brien Corporation	Approval of Groundwater Monitoring Plan - Subject to Conditions
10/20/97	Patricia Houle Applied Environmental Strategies	Thomas Kelly US EPA R9	Revised Remedial Alternatives Evaluation
10/20/97	None Specified Applied Environmental Strategies	None Specified The O'Brien Corporation	Revised Remedial Alternatives Evaluation

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
9/22/97	Patricia Houle Applied Environmental Strategies	Thomas Kelly US EPA R9	Transmittal Letter for Groundwater Monitoring Plan
7/24/97	None Specified Applied Environmental Strategies	Thomas Kelly US EPA R9	EPA Comments to Remedial Alternatives Evaluation
6/16/97	Thomas Kelly US EPA R9	Jerome J. Crowley, Jr. The O'Brien Corporation	Remedial Alternatives Evaluation, Dated 6/7/96
2/27/97	Jerome J. Crowley, Jr. The O'Brien Corporation	James M. Pappas Department of Toxic Substances Control	Modification to Closure Plan for Surface Impoundments at The O'Brien Corporation
2/19/97	James M. Pappas Cal/EPA	Jerome J. Crowley, Jr. The O'Brien Corporation	Modification to Closure Plan for Surface Impoundments at The O'Brien Corporation
10/17/96	Wei-Wei Chui DTSC	Jerome J. Crowley, Jr. The O'Brien Corporation	Corrective Action at The O'Brien Corporation
10/15/96	Loretta Barsamian and Steve Morse CRWQCB	Jerome J. Crowley, Jr. The O'Brien Corporation	Spill, Leaks, Investigations and Clean-ups (SLIC) Program for Oversight Costs at O'Brien Corporation Site
10/4/96	Loretta Barsamian and Steve Morse CRWQCB	Patricia Houle Applied Environmental Strategies	Spill, Leaks, Investigations and Clean-ups (SLIC) Program for Oversight Costs at O'Brien Corporation Site
9/24/96	Patricia Houle The O'Brien Corporation	Thomas Kelly and Wei-Wei Chui US EPA R9 and DTSC	ENFORCEMENT CONFIDENTIAL - Lead Agency in Facility Oversight
6/6/96	Thomas Kelly US EPA R9	Jerome J. Crowley, Jr. The O'Brien Corporation	Comments on Remedial Alternatives Evaluation, Dated 6/7/96, for Fuller-O'Brien Paints Facility
5/31/96	None Specified Harza	None Specified US EPA	Final Phase II - RCRA Facility Investigation Fuller-O'Brien Paints Facility

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
5/31/96	None Specified	None Specified	Final Phase II - RCRA Facility Investigation Fuller-O'Brien Paints Facility, Volume 2
	Harza	Fuller-O'Brien Paints	
3/21/96	Patricia Houle	Thomas Kelly	Most Recent Laboratory Data - Soil Samples
	The O'Brien Corporation	US EPA R9	
2/1/96	Ray Kaminsky	Patricia Houle	Annual Report: 1995 Post-Closure Monitoring
	EMCON Associates	Applied Environmental Strategies	
1/25/96	Stephen R. Henshaw	Patricia Houle	Former Fuller-O'Brien Paint Facility RCRA Phase III Site Investigation - Draft
	Harza Kaldveer	The O'Brien Corporation	
1/9/96	Tacia Miller	Patricia Houle	Fuller-O'Brien Data
	Harza Kaldveer	Applied Environmental Strategies	
1/1/96	E.P. Daly	None Specified	Hazardous Waste Permit Application (Last page is missing)
	The O'Brien Corporation	US EPA	
12/15/95	Patricia Houle	Thomas Kelly	1995 4th Quarter ISD/ Post-Closure Monitoring Report: The O'Brien Corporation - CAD 005130455
	Applied Environmental Strategies	US EPA R9	
11/22/95	Larry Bowerman	Patricia Houle	Approval of Workplan for Additional Characterization and Completion of RCRA Facility Investigation
	US EPA R9	The O'Brien Corporation	
11/3/95	Patricia Houle	Vern Christianson	Confidential Business Information
	The O'Brien Corporation	US EPA R9	
11/1/95	None Specified	None Specified	Total Petroleum Hydrocarbons (TPH)
	None Specified	None Specified	
11/1/95	Patricia Houle	Thomas Kelly	1995 3rd Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
	The O'Brien Corporation	US EPA R9	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
10/28/95	None Specified National Safety Council	None Specified None Specified	Forklift Truck Operators Training Course - Written Test
10/23/95	Timothy B. Tyler Environmental Control Associates, Inc.	Thomas Kelly US EPA R9	Technical Discussion of Soil Core/Groundwater Sampling Techniques, O'Brien Paints, South San Francisco, CA
8/16/95	Trisha Blau The O'Brien Corporation	Thomas Kelly US EPA R9	1995 2nd Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
7/28/95	Patricia Houle The O'Brien Corporation	Thomas Kelly US EPA R9	O'Brien's Strategy for Completing RCRA Order
6/13/95	None Specified Jenkins, Sanders & Associates	None Specified The O'Brien Corporation	Biological Evaluation of Fuller-O'Brien Paints Facility - Draft
6/13/95	None Specified Jenkins, Sanders & Associates	None Specified The O'Brien Corporation	Biological Evaluation of Fuller-O'Brien Paint Facility
5/1/95	Thomas Kelly US EPA R9	Patricia Houle The O'Brien Corporation	Review of O'Brien's Phase I Health Risk Assessment
4/20/95	Trisha Blau The O'Brien Corporation	Thomas Kelly US EPA R9	1995 1st Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
3/23/95	Larry Bowerman US EPA R9	Diane Mims Oakland RWQCB	ENFORCEMENT CONFIDENTIAL - Copy of O'Brien Memo of Understanding
3/23/95	Alisa Greene, Wei Wei Chui, and John Kaiser US EPA R9, DTSC, CRWQCB	None Specified None Specified	ENFORCEMENT CONFIDENTIAL - Memorandum of Understanding Among USEPA, DTSC and RWQCB for Regulatory Oversight of Investigation and Remediation of Contamination at The O'Brien Corporation Site
3/21/95	John E. Kaiser RWQCB (SF Bay Region)	Michael Pixlon DTSC	ENFORCEMENT CONFIDENTIAL - Submittal for Signature of Memorandum of Understanding for The O'Brien Corporation Site in South San Francisco, CA

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
3/14/95	Larry Bowerman US EPA R9	John Kaiser RWQCB (SF Bay Region)	ENFORCEMENT CONFIDENTIAL - Revised Copy of Memorandum of Understanding, Sign and Forward If Acceptable
2/13/95	Trisha Blau Fuller-O'Brien Paints	Thomas Kelly US EPA R9	1994 Annual Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
2/2/95	Stephen R. Henshaw Harza Consulting Engineers and Scientists	Patricia Houle The O'Brien Corporation	Transmittal Letter for Soil Quality Report for Additional Soil Characterization Activities
2/2/95	None Specified Harza Consulting Engineers and Scientists	None Specified The O'Brien Corporation	Soil Quality Report for Additional Soil Characterization Activities
1/11/95	Katherine J. Baylor US EPA R9	Thomas Kelly US EPA R9	Estimate of Lead Discharge to San Francisco Bay from O'Brien Site
1/10/95	Ray Kaminsky EMCON Associates	Trisha Blau The O'Brien Corporation	Data Evaluation: 4th Quarter 1994
11/23/94	Jean M. Christensen and Daniel E. Madsen SECOR International Incorporated	None Specified Genentech, Inc.	Report of Phase IIB Soil Investigation, 330 Point San Bruno Boulevard, South San Francisco, California
11/9/94	Patricia Houle The O'Brien Corporation	Thomas Kelly US EPA R9	Draft RFI - Phase II - Response to EPA Comments and Meeting Summary
10/21/94	None Specified Jenkins, Sanders & Associates	None Specified None Specified	Response to Agency Comments - Draft Report for Phase II RCRA Facility Investigation for The O'Brien Corporation
10/12/94	Gillian I. Marks Ratech Resources	Josephine Chien US EPA R9	Transmittal Letter for Heath Risk Assessment - Phase I
10/11/94	Trisha Blau Fuller-O'Brien Paints	Josephine Chien US EPA R9	1994 3rd Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455

Date	Author Affiliation	Recipient Affiliation	Subject/Title
10/3/94	John E. Kaiser	Josephine Chien	ENFORCEMENT CONFIDENTIAL - Draft Proposed Interagency Memorandum of Understanding for O'Brien Project
	RWQCB (SF Bay Region)	US EPA R9	
10/1/94	None Specified	None Specified	Heath Risk Assessment - Phase I
	Ratech Resources	The O'Brien Corporation	
9/2/94	Stephen R. Henshaw	James L. Jaffe, Esq.	Transmittal Letter re: Submittal of Soil Quality Results for Due Diligence Report
	HARZA Consulting Engineers and Scientists	Jaffe, Trutanich, Scatena & Blum	
9/2/94	Stephen R. Henshaw	None Specified	Soil Quality Report for Due Diligence Evaluation of Genentech Property, South San Francisco, CA, with Appendices A, B, and C (Dated 9/2/94), Prepared for Fuller-O'Brien Paints
	HARZA Consulting Engineers and Scientists	Fuller-O'Brien Paints	
8/25/94	Alisa Greene, Wei Wei Chui, and John Kaiser	None Specified	ENFORCEMENT CONFIDENTIAL - Draft Interagency Memorandum of Understanding Regarding The O'Brien Corporation
	USEPA, DTSC, CRWQCB	None Specified	
8/25/94	Josephine Chien	Patricia Houle	Transmittal Letter of EPA's Split Sampling Groundwater Data
	US EPA R9	The O'Brien Corporation	
8/25/94	Josephine Chien	Patricia Houle	Draft Report for Phase II RCRA Facility Investigation, Summary of 8/19/94 Meeting between O'Brien, EPA and RWQCB (Report Attached)
	US EPA R9	The O'Brien Corporation	
8/10/94	Alisa Greene	Patricia Houle	EPA's Comments on Draft Report for Phase II RCRA Facility Investigation (Report Attached)
	US EPA R9	The O'Brien Corporation	
8/5/94	Stephen Morse	Josephine Chien	Comments on Report for Phase II RCRA Facility Investigation - Fuller-O'Brien Paints Facility
	RWQCB (SF Bay Region)	US EPA R9	
7/22/94	Jean M. Christensen	None Specified	Sample Plan For Phase IIB Investigation, 330 Point San Bruno Boulevard, South San Francisco, California
	Science & Engineering Analysis Corporation (SEACOR)	Genentech, Inc.	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
7/15/94	Katherine J. Baylor US EPA R9	Josephine Chien US EPA R9	Errors in O'Brien RFI Report
7/3/94	Larry Bowerman US EPA R9	Paula Bisson None Specified	Request for Hydrogeologic Technical Support Assistance
6/30/94	Lester Kaufman Cal/EPA	Patricia Houle The O'Brien Corporation	Drum Storage Pad Closure Certification
6/29/94	Trisha Blau Fuller-O'Brien Paints	Josephine Chien US EPA R9	1994 2nd Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD 005130455
5/27/94	Lester Kaufman Cal/EPA	Patricia Houle The O'Brien Corporation	Drum Storage Pad - Closure Plan Approval
5/19/94	Santiago M. Lee PRC Environmental Management, Inc.	Josephine Chien US EPA R9	The O'Brien Corporation Review Comments for Phase II - RCRA Facility Investigation Report by Harza
5/13/94	None Specified PRC Environmental Management, Inc.	None Specified US EPA	RCRA Corrective Action Technical Support and Oversight Support
4/25/94	None Specified Harza	None Specified The O'Brien Corporation	Draft Report for Phase II - RCRA Facility Investigation, 2 Volumes
4/24/94	Stephen R. Henshaw Harza	Josephine Chien US EPA R9	Transmittal Letter for Draft Report for Phase II - RCRA Facility Investigation Fuller-O'Brien Paints Facility (Draft Report attached)
4/20/94	None Specified Woodward-Clyde Consultants	None Specified Genentech, Inc.	Phase I/II Environmental Site Assessment Marine Magnesium Company/Merck Site, Volumes I and II
4/8/94	Gillian I. Marks Ratech Resources	Josephine Chien US EPA R9	Clarification on 3 Health Risk Assessment Issues

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
3/22/94	Chris West Fuller-O'Brien Paints	Josephine Chien US EPA R9	1994 1st Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
3/12/94	Gillian I. Marks Ratech Resources	Josephine Chien US EPA R9	Response to USEPA Letter Dated 2/16/94 - Statement of Understanding of Current Status of Health Risk Assessment
3/4/94	Daniel Stralka US EPA	Josephine Chien US EPA R9	Meeting Notes on Fuller-O'Brien Paints
2/23/94	Chris West Fuller-O'Brien Paints	Josephine Chien US EPA R9	1993 Annual ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455
2/22/94	Larry Bowerman US EPA R9	Patricia Houle The O'Brien Corporation	Inclusion of RCRA Hazardous Waste Container Storage Area Within Perimeter of Solvent Still Area, Solid Waste Management Unit
2/16/94	Larry Bowerman US EPA R9	Patricia Houle The O'Brien Corporation	EPA's Comments on Health Risk Assessment Workplan for The O'Brien Corporation
2/15/94	Gillian I. Marks Ratech Resources	Oscar Portocarrero Cal/EPA	Impacts Beneath Former Storage Area
2/7/94	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	Approval of Phase II - RCRA Facility Investigation Workplan
1/26/94	Stephen R. Henshaw Harza Kaldveer	Josephine Chien US EPA R9	RFI Workplan: The O'Brien Corporation
1/25/94	Stephen R. Hehshaw Harza Kaldveer	Josephine Chien US EPA R9	Response to EPA Comments on Amended Phase II - RCRA Facility Investigation Workplan
1/19/94	Chris West The O'Brien Corporation	Oscar Portocarrero Cal/EPA	Closure of The O'Brien Corporation Container Storage Area

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
1/14/94	Santiago M. Lee PRC Environmental Management, Inc.	Josephine Chien US EPA R9	Field Audit of Phase II RCRA Facility Investigation (RFI) at Fuller-O'Brien Corporation with Photograph Attachments
1/5/94	Chris West The O'Brien Corporation	Oscar Portocarrero Cal/EPA	Closure of The O'Brien Corporation Container Storage Area
1/5/94	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	Amended Phase II - RCRA Facility Investigation Workplan
1/1/94	None Specified The O'Brien Corporation	None Specified None Specified	Response to EPA Comments of 8/10/94
12/28/93	None Specified Harza	None Specified The O'Brien Corporation	Phase II - RCRA Facility Investigation Workplan
12/15/93	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	EPA's Comments on O'Brien's Draft Phase II RFI Workplan
12/6/93	Santiago M. Lee PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Transmittal Letter re: Submittal of Analytical Data Packages for Split Samples from Fuller-O'Brien Corporation Collected on 11/1/93 and 11/3/93
12/2/93	Santiago M. Lee PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Fuller-O'Brien Field Audit of Groundwater Sampling Activities
11/30/93	Michael Galvin Versar Laboratories, Inc.	Santiago M. Lee PRC Environmental Management, Inc.	Transmittal Letter re: Submittal of Analytical Data Packages
11/29/93	Janet Jaufmann Versar Laboratories, Inc.	Michael Galvin Versar Laboratories, Inc.	Transmittal of Laboratory Data Package
11/24/93	None Specified Versar Laboratories, Inc.	Michael Galvin Versar Laboratories, Inc.	GC/MS Semivolatile Analysis - Analytical Data Package

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
11/24/93	None Specified Versar Laboratories, Inc.	Michael Galvin Versar Laboratories, Inc.	GC/MS Volatile Analysis - Analytical Data Package
11/24/93	None Specified Versar Laboratories, Inc.	Michael Galvin Versar Laboratories, Inc.	Metals Section - Analytical Data Package
11/20/93	Chris Prokop US EPA R9	Steve Henshaw Harza Kaldveer	Draft Letter of EPA's Comments on 11/17/93 Draft Phase II RFI Workplan
11/17/93	Stephen R. Henshaw Harza	Chris Prokop US EPA R9	Transmittal Letter for Phase II - RCRA Facility Investigation Workplan
11/17/93	None Specified Harza	None Specified The O'Brien Corporation	Phase II - RCRA Facility Investigation Workplan
11/16/93	Charlene F. Williams Cal/EPA	Chris West The O'Brien Corporation	Extension of Deadline to Submit New Closure Plan for Drum Storage Area
11/16/93	Patricia Houle The O'Brien Corporation	Alisa Greene US EPA R9	Response to EPA Comments - Data Needs Letter
11/4/93	None Specified Versar Laboratories, Inc.	None Specified None Specified	Chain of Custody Record
11/2/93	None Specified Versar Laboratories, Inc.	None Specified None Specified	Chain of Custody Record
10/27/93	Stephen R. Henshaw Harza Kaldveer	Chris Prokop US EPA R9	Sampling Procedures for The O'Brien Corporation RFI
10/26/93	Stephen R. Henshaw Harza Kaldveer	Chris Prokop US EPA R9	Masterflex Pump Head, Pump Drives (Drawings)
10/15/93	Kenneth D. Jenkins Jenkins, Sanders & Associates	Chris Prokop US EPA R9	Draft Workplan for Phase I of Ecological Evaluation/Ecological Assessment of Fuller-O'Brien Paints Site

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
10/15/93	Charlene F. Williams Cal/EPA	Chris West The O'Brien Corporation	Request for Closure Documentation or New Closure Plan for Drum Storage Pad
10/12/93	Gillian I. Marks Ratech Resources	Chris Prokop US EPA R9	O'Brien Workplan Outline
10/12/93	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	1993 3rd Quarter ISD/Post-Closure Monitoring Report: The O'Brien Corporation
10/8/93	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Sampling Points for Groundwater Monitoring
10/1/93	Martha G. Prothro US EPA	Water Mgmt Div Directors & Env Svcs Div Directors US EPA	Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria (PB94-118 544)
10/1/93	None Specified Ratech Resources	None Specified The O'Brien Corporation	Health Risk Assessment Workplan: October 1993
9/24/93	Orrin Childs EMCON Associates	Chris West The O'Brien Corporation	Data Evaluation: 3rd Quarter 1993
9/14/93	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	O'Brien's 5/27/93 Data Needs Letter (Includes EPA Comments on 5/28/93 Data Needs Letter)
8/27/93	None Specified US EPA R9	None Specified None Specified	Form: USEPA Region 9 Corrective Action Data Entry Re-Submittal Sheet - The O'Brien Corporation (CA data entry forms for June 1993)
7/20/93	Orrin Childs EMCON Associates	Patrick Kuefler US EPA R9	Groundwater Contour Maps from 2/93 and 5/93
7/16/93	Patricia Houle The O'Brien Corporation	Patricia Barni DTSC	Operation and Maintenance Inspection
7/15/93	Orrin Childs EMCON Associates	Patricia Houle The O'Brien Corporation	Response to Violations

Date	Author Affiliation	Recipient Affiliation	Subject/Title
5/28/93	None Specified Ratech Resources	None Specified The O'Brien Corporation	Data Needs Letter for Risk Assessment/Ecological Evaluation
4/28/93	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	Risk Assessment/Ecological Evaluation - Acceptance of O'Brien's Response
4/23/93	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Transmittal Letter re: Submittal of Bulkhead Remediation Project Final Report, Fuller-O'Brien Paints
4/12/93	Michael Pixton and Asha Arora Cal/EPA	None Specified None Specified	O'Brien Inspection Report
4/1/93	None Specified EMCON Associates	None Specified The O'Brien Corporation	Bulkhead Remediation Project - The O'Brien Corporation
3/31/93	Patricia Barni Cal/EPA	Don Mazzone The O'Brien Corporation	Report of Violation
3/31/93	Patricia Barni Cal/EPA	Don Mazzone The O'Brien Corporation	Report of Violation: 10/15/91 - 10/16/91 Cal/EPA DTSC Operation and Maintenance Inspection
3/30/93	Gillian I. Marks Ratech Resources	Chris Prokop US EPA R9	Response to EPA's 2/8/93 Comments
3/17/93	Patricia Barni Cal/EPA	Greg Czajkowski US EPA R9	Transmittal Letter for Operation and Maintenance Report for Former RCRA Surface Impoundments at The O'Brien Corporation
3/17/93	Patricia Barni Cal/EPA	Don Mazzone The O'Brien Corporation	Transmittal Letter for Operation and Maintenance Inspection Report
3/17/93	Patricia Barni Cal/EPA	Don Mazzone The O'Brien Corporation	Transmittal Letter for Operation and Maintenance Inspection Report
3/12/93	Chris West Fuller-O'Brien Paints	Chris Prokop US EPA R9	1992 Annual ISD/Post-Closure Monitoring Report: The O'Brien Corporation - CAD005130455

Date	Author Affiliation	Recipient Affiliation	Subject/Title
3/9/93	Patricia Houle	Chris Prokop	O'Brien Unable to Respond to EPA Comments on Risk Assessment/Ecological Evaluation Within 30 Days
	The O'Brien Corporation	US EPA R9	
2/26/93	None Specified	None Specified	Operation and Maintenance Report for Former RCRA Surface Impoundments at The O'Brien Corporation
	Cal/EPA	None Specified	
2/8/93	Alisa Greene	Patricia Houle	Risk Assessment/Ecological Evaluation Phase I - Site History and Data Evaluation
	US EPA R9	The O'Brien Corporation	
2/8/93	Alisa Greene	Patricia Houle	EPA's Concern re: O'Brien's Risk Assessment/Ecological Evaluation Is Incomplete
	US EPA R9	The O'Brien Corporation	
2/1/93	None Specified	None Specified	Groundwater Contours - Artificial Fill, Figure 1
	EMCON Associates	None Specified	
1/13/93	Patricia Houle	Chris Prokop	New Office Address for The O'Brien Corporation
	The O'Brien Corporation	US EPA R9	
11/10/92	Martha J. Watson	Chris Prokop	Replacement Pages for Final RCRA Facility Investigation Report, The O'Brien Corporation (Pages 20/21, 24/25, Boring Logs b-12, b-13, and b-14 for Appendix A)
	EMCON Associates	US EPA R9	
11/5/92	Alisa Greene	Patricia Houle	EPA's Conditional Approval of O'Brien's Revised RFI Phase I Report
	US EPA R9	The O'Brien Corporation	
9/25/92	Gillian I. Marks	Patricia Houle	Risk Assessment/Ecological Evaluation Phase I - Site-Wide History and Data Evaluation - In Response to EPA Letter Dated 7/22/92 and Includes Review of 11/19/91 Risk Assessment Workplan
	Ratech Resources	The O'Brien Corporation	
9/9/92	Patricia Houle	Chris Prokop	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, September 1992
	The O'Brien Corporation	US EPA R9	
9/1/92	None Specified	None Specified	RCRA Facility Investigation
	EMCON Associates	The O'Brien Corporation	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
8/20/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	O'Brien Requests EPA Review of Response to EPA Comments on RFI Report for Discussion at Meeting 8/21/92
8/19/92	Martha J. Watson EMCON Associates	Patricia Houle The O'Brien Corporation	Responses to EPA Comments on Draft RFI Report
8/19/92	Martha J. Watson EMCON Associates	Chris Prokop US EPA R9	Responses to EPA Comments on Draft RFI Report
8/17/92	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	Submittal Date for The O'Brien Corporation's Revised RCRA Facility Investigation Report and Discussion of Future Corrective Action Activities at O'Brien Facility
8/7/92	Martha J. Watson EMCON Associates	Patricia Houle The O'Brien Corporation	Response to EPA Comments on RFI Report
8/7/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, August 1992
8/5/92	Roxy Barnett US EPA	Chris Prokop US EPA R9	Review of Ecological Assessment Workplan for O'Brien
7/22/92	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	Risk Assessment Workplan for The O'Brien Corporation Warehouse Area
7/21/92	Alisa Greene US EPA R9	Patricia Houle The O'Brien Corporation	EPA Review of the RCRA Facility Investigation Report for The O'Brien Corporation
7/7/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, July 1992, Section VI, Part 17
7/7/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	Transmittal Letter re: EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, July 1992

Date	Author Affiliation	Recipient Affiliation	Subject/Title
6/23/92	Santiago M. Lee PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Transmittal Letter for Data Validation Report for Samples Collected at O'Brien Corporation Site (Report attached)
6/3/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, June 1992, Section VI, Part 17
6/3/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	Transmittal Letter re: EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, June 1992
5/13/92	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Metals Section - Analytical Data Package
5/13/92	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Semivolatile Analysis - Analytical Data Package
5/12/92	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	GC/MS Volatile Analysis - Analytical Data Package
5/8/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, May 1992, Section VI, Part 17
5/8/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	Transmittal Letter re: EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, May 1992
5/7/92	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Breakwater Corrective Measures Implementation - Field Audit Trip Report
5/1/92	None Specified S.R. Hansen & Associates	None Specified RWQCB (SF Bay Region)	Development of Site-Specific Criteria for Copper for San Francisco Bay
4/30/92	Chris West The O'Brien Corporation	Chris Prokop US EPA R9	Request Copies of All Photographs and Slides Taken by EPA for O'Brien Breakwater Remediation Project

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/17/92	Patricia Houle The O'Brien Corporation	Patricia Barni Cal/EPA	Drum Storage Area Closure and Bulkhead Remediation Project: The O'Brien Corporation
4/9/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, April 1992
3/31/92	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Review Comments for Evaluation of Quality Control Results (Tier III QA/QC Package) Appendix F, Part 2 of the RCRA Facility Investigation Report, Dated 2/92, Prepared by EMCON Associates for The O'Brien Corporation
3/31/92	Alan R. Pendleton San Francisco Bay Conservation and Development Commission	Patricia Houle The O'Brien Corporation	Permit No. M92-9
3/31/92	Derek D. Armentrout EMCON Associates	Patricia Houle The O'Brien Corporation	1991 Post-Closure Monitoring Data Evaluation
3/30/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Barrier Wall Remediation Project Schedule
3/30/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Transmittal Letter for Barrier Wall Remediation Project Schedule
3/6/92	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	O'Brien Corporation Review Comments for RCRA Facility Investigation Report by EMCON Associates
3/3/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, March 1992
2/20/92	Patricia Houle The O'Brien Corporation	Robert Feathers Toxic Substances Control Division	Request for Extension to 3/1 Due Date - Annual Groundwater Monitoring Report

Date	Author Affiliation	Recipient Affiliation	Subject/Title
2/7/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, February 1992
2/1/92	None Specified EMCON Associates	None Specified US EPA	Evaluation of Quality Control Results (Tier III QA/QC Validation Package) for RCRA Facility Investigation, 2 Volumes, Appendix F
2/1/92	None Specified EMCON Associates	None Specified US EPA R9	The O'Brien Corporation: RCRA Facility Investigation, September 1992
2/1/92	None Specified EMCON Associates	None Specified US EPA R9	The O'Brien Corporation: RCRA Facility Investigation, February 1992
1/31/92	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Data Validation Report for Samples Collected at The O'Brien Corporation Site - 11/91
1/23/92	James W. Stettler Cal/EPA	Patricia Houle The O'Brien Corporation	No Violations Found During 11/21/91 Inspection
1/21/92	Josephine Chien US EPA R9	None Specified None Specified	RCRA Prioritization System Scoring Summary for The O'Brien Corporation
1/12/92	John D. Wolfenden and Michael P. Carlin RWQCB (SF Bay Region)	None Specified None Specified	Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse
1/9/92	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Results from Split Sampling Field Activities Which Occurred in November (Handwritten Cover Letter with Data)
1/9/92	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, December 1991
1/1/92	K. Johnson EMCON Associates	None Specified None Specified	Sampling and Monitoring Well Locations, Drawing No. 2-1

Date	Author Affiliation	Recipient Affiliation	Subject/Title
1/1/92	K. Johnson EMCON Associates	None Specified The O'Brien Corporation	RFI Investigation Groundwater Contours - Bedrock, November 1991
1/1/92	K. Johnson EMCON Associates	None Specified The O'Brien Corporation	RFI Investigation Groundwater Contours - Artificial Fill, November 1991
12/31/91	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Applied Chromatography Section - Analytical Data Package
12/30/91	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Metals Section - Analytical Data Package
12/27/91	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Semivolatile Analysis - Analytical Data Package
12/24/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	Response to Letter Dated 12/2/91 - Approval of O'Brien's Breakwater Corrective Measures Study (CMS) Report
12/18/91	Daniel Stralka US EPA	Chris Prokop US EPA R9	Comments on O'Brien Risk Assessment Workplan
12/13/91	Chris Prokop US EPA R9	Ratna Jain PRC Environmental Management, Inc.	Quality Assurance Project Plan for O'Brien Facility
12/12/91	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	Volatile Analysis - Analytical Data Package
12/12/91	Janice M. Sedlak Columbia Analytical Services	Vivian Hsiong EMCON Associates	Transmittal Letter for Analysis of O'Brien Water Samples
12/11/91	None Specified Versar Laboratories, Inc.	None Specified The O'Brien Corporation	BTEX Analysis - Water Analytical Data Package
12/10/91	David R. Taylor ICF Technology Inc.	Chris Prokop US EPA R9	Review of Quality Assurance Project Plan for The O'Brien Corporation, Dated 11/8/91

Date	Author Affiliation	Recipient Affiliation	Subject/Title
12/6/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, November 1991
12/2/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Response to EPA's Letter of 10/18/91
11/21/91	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Field Oversight Activities at Fuller-O'Brien
11/20/91	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Soil and Groundwater Sampling Activities on 11/11/91 and 11/12/91
11/14/91	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	RCRA Corrective Action Technical Support and Oversight Support: Photo Log for Remedial Field Investigation Split Sampling Field Activities, 11/11/91 - 11/14/91
11/8/91	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	Final Split Sampling and Analysis Plan, Draft Quality Assurance Project Plan, and Health and Safety Plan Cover Letter
11/8/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, November 1991
11/8/91	Barbara Gordon ESAT/ICF Technology, Inc.	None Specified US EPA	Water Samples for RAS Dissolved Metals - Analytical Results
11/6/91	Gillian I. Marks Mittelhauser Corporation	Chris Prokop US EPA R9	O'Brien Request to EPA for Extension of Date for Submission of Revised RAWP to 11/25/91
11/5/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Sampling Schedule RFI Project
11/5/91	Gillian I. Marks Mittelhauser Corporation	Chris Prokop US EPA R9	Uptake Biokinetic Model for The O'Brien Corporation

Date	Author Affiliation	Recipient Affiliation	Subject/Title
11/4/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	RFI Project Start-up
11/1/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	Transmittal of Revised O'Brien's Corrective Measures Study (CMS) Report and Risk Assessment Workplan Dated 7/12/91 and 10/18/91 - Draft (Includes handwritten note that letter was not sent)
11/1/91	None Specified Mittelhauser Corporation	None Specified The O'Brien Corporation	Risk Assessment Workplan
10/18/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	O'Brien Risk Assessment Workplan and Corrective Measures Study (CMS) Report
10/14/91	Gerald P. Manuell ICF Technology Inc.	Chris Prokop US EPA R9	Draft Split Sampling and Analysis Plan for The O'Brien Corporation Paint Production Facility, Dated 10/1/91 and Prepared by PRC Environmental Management, Inc.
10/9/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, October 1991
10/2/91	Patricia Houle The O'Brien Corporation	Salvatore Cirielo and Lester Kaufman Department of Toxic Substances Control and USEPA	Post-Closure Permit Application Call-in
9/30/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	EPA Approval of The O'Brien Corporation RFI Workplan
9/27/91	None Specified (Illegible) EMCON Associates	None Specified None Specified	Proposed Sampling Locations - The O'Brien Corporation RFI Workplan, Figure 2
9/27/91	Jack C. Hardin EMCON Associates	Patricia Houle The O'Brien Corporation	RFI Workplan
9/25/91	Victoria Taylor ICF Technology Inc.	Chris Prokop US EPA R9	Review of Responses to Comments on QAPjP for O'Brien RCRA Facility Investigation - Draft

Date	Author Affiliation	Recipient Affiliation	Subject/Title
9/24/91	Salvatore Ciriello and Lester Kaufman Cal/EPA and US EPA R9	Raymond Elliot The O'Brien Corporation	Closure Plan Notice of Deficiency (NOD) for Drum Storage Area
9/19/91	Mark C. Wheeler EMCON Associates	Patricia Houle The O'Brien Corporation	Response to EPA Review of RFI Workplan
9/16/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Request for Extension for Final RFI Workplan
9/13/91	Mark C. Wheeler EMCON Associates	Patricia Houle The O'Brien Corporation	Preparing Final Draft - RFI Workplan
9/12/91	Margie Weiner ESAT/ICF Technology, Inc.	None Specified US EPA	Soil Samples for RAS Metals Analyses - Analytical Results
9/11/91	Patricia Houle The O'Brien Corporation	Karen Schwinn US EPA R9	Comments to EPA Conditions for Approval of Breakwater Corrective Measures Study (CMS) Report
9/10/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, September 1991
9/5/91	Karen Schwinn US EPA	Patricia Houle The O'Brien Corporation	Conditions for EPA Approval of Breakwater Corrective Measures Study (CMS) Report
8/29/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	EPA Review of The O'Brien Corporation's RFI Workplan Dated 7/17/91 - In Response to Unilateral Corrective Action Order Dated 4/18/91
8/26/91	Salvatore Ciriello and Lester Kaufman Cal/EPA and US EPA R9	Don Mazzone The O'Brien Corporation	Post-Closure Permit Application Call-in
8/20/91	Ratna Jain PRC Environmental Management, Inc.	Chris Prokop US EPA R9	RCRA Field Investigation Workplan Comments

Date	Author Affiliation	Recipient Affiliation	Subject/Title
8/9/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, August 1991
8/8/91	Victoria Taylor ICF Technology Inc.	Chris Prokop US EPA R9	Review of QAPjP for O'Brien RCRA Facility Investigation
8/6/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Final Corrective Measures Study (CMS) Report for Breakwater
8/2/91	Martha J. Watson EMCON Associates	Patricia Houle The O'Brien Corporation	Response to EPA Comments on Breakwater Corrective Measures Study (CMS)
8/1/91	None Specified Mittelhauser Corporation	None Specified The O'Brien Corporation	Response to Comments for Risk Assessment Workplan
8/1/91	None Specified Mittelhauser Corporation	None Specified The O'Brien Corporation	Draft Response to Comments for Risk Assessment Workplan, August 1991
7/31/91	Chris Wong ESAT/ICF Technology, Inc.	None Specified US EPA	Low Concentration Water Samples - Unvalidated Data
7/17/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	RFI Workplan for The O'Brien Corporation
7/16/91	Jack C. Hardin EMCON Associates	Patricia Houle The O'Brien Corporation	RFI Workplan - Draft Report
7/12/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	EPA Comments on The O'Brien Corporation's Risk Assessment Workplan
7/12/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	Submittal of Final Breakwater Corrective Measures Study (CMS)
7/9/91	Josephine Chien US EPA R9	Chris Prokop US EPA R9	O'Brien Risk Analysis

Date	Author Affiliation	Recipient Affiliation	Subject/Title
7/9/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, July 1991
6/7/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	EPA RCRA Section 3008(h) Unilateral Order, Monthly Progress Report, June 1991
6/5/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Dissolved Lead Sample Results EPA Method 7421
5/31/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Submittal of Tank Farm Soil Sampling Results Dated 2/11/91
5/31/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Project Coordinator EPA Unilateral Order
5/29/91	Nancy Lindsay US EPA R9	Patricia Houle The O'Brien Corporation	O'Brien's Request for Extension of RFI Workplan Submittal Date
5/21/91	Raymond Elliott The O'Brien Corporation	Chris Prokop US EPA R9	Sampling and Analysis Plan Modification for ISD/Post-Closure Groundwater Monitoring Program - Unilateral Order
5/21/91	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	RFI Workplan - Request for Extension
5/9/91	Jeannie Cervera Risberg US EPA R9	James Jaffe, Esq. Jaffe, Trutanich, Scatena & Blum	Copy of Executed Stipulation Filed with Presiding Officer on 5/1/91
5/1/91	James L. Jaffe, Esq. Jaffe, Trutanich, Scatena & Blum	Jeannie Risberg US EPA R9	Final Section 3008(h) Unilateral Order for The O'Brien Corporation RCRA Facility
4/22/91	Richard K. McMurtry RWQCB (SF Bay Region)	Patricia Houle The O'Brien Corporation	O'Brien's Former Solar Evaporation Ponds and Compliance with TPCA Regulations - Request for Additional Groundwater Monitoring

Date	Author Affiliation	Recipient Affiliation	Subject/Title
4/18/91	Jeff Zelikson US EPA R9	Jerome J. Crowley, Jr. The O'Brien Corporation	Final Section 3008(h) Unilateral Order for The O'Brien Corporation RCRA Facility
4/9/91	Richard K. McMurtry RWQCB (SF Bay Region)	Patricia Houle The O'Brien Corporation	Staff Review of O'Brien's Submittal "San Bruno Channel Fill Investigation" March 1989, in Response to Comprehensive Monitoring Evaluation (CME), and Follow-up of Site Visit on 1/22/91
4/1/91	Tom Huetteman US EPA R9	Chris Prokop US EPA R9	Field Audit of Sampling at O'Brien Facility
3/26/91	James L. Jaffe, Esq. Jaffe, Trutanich, Scatena & Blum	Nancy Lindsay US EPA R9	Section 3008(h) Interim Status Corrective Action Order, RCRA 0989-00168
3/20/91	Sharon Seidel US EPA R9	Chris Prokop US EPA R9	O'Brien Risk Assessment Workplan
3/19/91	James Johnson US EPA R9	Kent Kitchingman US EPA R9	Analysis of Case LV1R03 for Volatile Organics
3/5/91	Raymond Elliott US EPA	Patricia Houle The O'Brien Corporation	Review of Water Quality Assessment Report - 1985
2/22/91	Katherine J. Baylor US EPA R9	None Specified None Specified	Resource Conservation and Recovery Act Sampling Plan, February 19-22, 1991
2/19/91	Katherine J. Baylor US EPA R9	None Specified None Specified	RCRA Sampling Plan - The O'Brien Corporation
2/11/91	Suzanne Veaudry International Technology Corporation	Chris Prokop US EPA R9	Certificate of Analysis re: Soil Sampling in Former Resins Tank Farm Area on North Side of Facility in January 1991
2/11/91	None Specified Cal/EPA	None Specified None Specified	Operation and Maintenance Report of Former RCRA Surface Impoundments

Date	Author Affiliation	Recipient Affiliation	Subject/Title
2/8/91	Nancy Lindsay US EPA R9	Doug Steele US EPA	Review of Draft Risk Assessment Workplan for The O'Brien Corporation
2/1/91	None Specified The O'Brien Corporation	None Specified US EPA R9	San Bruno Channel Fill Area Defense Support Documentation
1/22/91	Katherine J. Baylor US EPA R9	None Specified None Specified	Resource Conservation and Recovery Act Sampling Plan, February 19 - 22, 1991 - Final
1/7/91	None Specified None Specified	None Specified None Specified	Journal with Handwritten Entries, First Entry Dated 1/7/91, Some re: BKK, some re: Tosco
1/1/91	None Specified Mittelhauser Corporation	None Specified The O'Brien Corporation	Risk Assessment Workplan
12/7/90	Chris Prokop US EPA R9	Patricia Houle The O'Brien Corporation	Comments on Breakwater CMS Report and Confirmation of Future Meeting of EPA's Corrective Action Order for O'Brien Facility
11/16/90	Chris Prokop US EPA R9	Nancy Lindsay US EPA R9	Review of Corrective Measures Study (CMS) for O'Brien Breakwater
8/10/90	None Specified EMCON Associates	None Specified The O'Brien Corporation	Breakwater Alternatives Analysis
8/1/90	None Specified EMCON Associates	None Specified The O'Brien Corporation	Breakwater Alternatives Analysis: The O'Brien Corporation
7/25/90	Hernan E. Gomez Cal/EPA	Raymond Elliot The O'Brien Corporation	Transmittal Letter for Corrective Action Order from Department of Health Services' Toxic Substances Control Program (Corrective Action Order attached)
6/20/90	None Specified DHS	None Specified The O'Brien Corporation	Stipulation and Order, Docket HWCA 88/89-049
6/5/90	Patricia Houle The O'Brien Corporation	Chris Prokop US EPA R9	Workplan: RCRA Facility Investigation (RFI)

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/30/90	Patricia Houle The O'Brien Corporation	Director Toxic Substances Control Division, Department of Health Services	Documentation Demonstrating Financial Assurance
2/1/90	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified None Specified	Site Assessment Report: Fuller-O'Brien Corporation, Volume I of III, Text and Drawings
2/1/90	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified None Specified	Site Assessment Report: Fuller-O'Brien Corporation, Volume II of III, Appendices
2/1/90	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified None Specified	Site Assessment Report: Fuller-O'Brien Corporation, Volume III of III, Appendices
1/11/90	Richard A. Wheeler DHS	Don Mazzone The O'Brien Corporation	No Violations Found During 9/20/89 Inspection
11/17/89	N. Dean Marachi The MARK Group Engineers & Geologists, Inc.	Patricia Houle The O'Brien Corporation	Addendum to Hydrogeologic Assessment Report: The O'Brien Corporation, Volume II of II - Appendices, November 1989
11/17/89	N. Dean Marachi The MARK Group Engineers & Geologists, Inc.	Patricia Houle The O'Brien Corporation	Addendum to Hydrogeologic Assessment Report: The O'Brien Corporation, Volume I of II - Text and Drawings, November 1989
11/17/89	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified None Specified	Cross-Section Index Map - Addendum to Hydrogeological Assessment Report, Drawing No. 4-4
11/17/89	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified None Specified	Site Geologic Map - Addendum to Hydrogeological Assessment Report, Drawing No. 4-3

Date	Author Affiliation	Recipient Affiliation	Subject/Title
11/17/89	None Specified	None Specified	Regional Geologic Map - Addendum to Hydrogeological Assessment Report, Drawing No. 4-2
	The MARK Group Engineers & Geologists, Inc.	None Specified	
11/17/89	None Specified	None Specified	Historical Shorelines and Known Fill Areas - Addendum to Hydrogeological Assessment Report, Drawing No. 4-1
	The MARK Group Engineers & Geologists, Inc.	None Specified	
11/17/89	None Specified	None Specified	Cross-Sections A-A' and B-B' - Addendum to Hydrogeological Assessment Report, Drawing No. 4-5
	The MARK Group Engineers & Geologists, Inc.	None Specified	
11/17/89	None Specified	None Specified	Cross-Sections C-C', D-D', and E-E' - Addendum to Hydrogeological Assessment Report, Drawing No. 4-6
	The MARK Group Engineers & Geologists, Inc.	None Specified	
11/1/89	None Specified	None Specified	1988 ISD/Post-Closure Groundwater Monitoring Report Former RCRA Surface Impoundments: The O'Brien Corporation, Volume I of II - Text and Drawings, November 1989
	The MARK Group Engineers & Geologists, Inc.	None Specified	
10/17/89	Richard Wheeler	None Specified	O'Brien Inspection Report
	DHS	None Specified	
6/14/89	Chris Prokop	Patricia Houle	Summary of EPA Position on Corrective Action Requirements for O'Brien Facility Presented at 5/19/89 Technical Meeting
	US EPA R9	The O'Brien Corporation	
5/2/89	Eric J. Garcia	Don Mazzone	Notification - The O'Brien Corporation Has Satisfactorily Completed Required Corrections in Response to Reports of Violation
	DHS	The O'Brien Corporation	
4/16/89	None Specified	None Specified	Administrative Order USEPA Docket No. RCRA-09-89-0016, Proceeding Under Section 3008(h) of the Resource Conservation and Recovery Act, as Amended, 42 USC Section 6928(h)
	None Specified	None Specified	

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/7/89	None Specified	None Specified	Request for Hearing USEPA Docket No. RCRA-09-89-0016, Proceeding Under Section 3008(h) of the Resource Conservation and Recovery Act, as Amended, 42 USC Section 6928(h)
	None Specified	None Specified	
3/31/89	Ted N. Rauh	None Specified	Corrective Action Order and Complaint for Penalty
	DHS	The O'Brien Corporation	
3/8/89	Jeff Zelikson	E.P. Daly	Transmittal Letter for RCRA Facility Assessment
	US EPA	The O'Brien Corporation	
3/8/89	None Specified	None Specified	Administrative Order USEPA Docket No. RCRA-09-89-0016, Proceeding Under Section 3008(h) of the Resource Conservation and Recovery Act, as Amended, 42 USC Section 6928(h)
	None Specified	None Specified	
3/3/89	Patricia Houle	Richard K. McMurtry	Transmittal Letter re: Submittal of Final Report for San Bruno Channel Fill Investigation
	The O'Brien Corporation	CRWQCB	
3/1/89	None Specified	None Specified	San Bruno Channel Fill Investigation, Volume I of II, Text and Drawings
	The MARK Group Engineers & Geologists, Inc.	None Specified	
3/1/89	None Specified	None Specified	San Bruno Channel Fill Investigation, Volume II of II, Appendices
	The MARK Group Engineers & Geologists, Inc.	None Specified	
1/5/89	Don Mazzone	Edgar H. Refsell	Response to 9/16/88 Letter from Department of Health Services - Report of Violation
	The O'Brien Corporation	DHS	
12/20/88	Patricia Houle	Rubia Bertrum	Transmittal Letter for Revised Financial Test for Fiscal Year 1987-88 (Test attached)
	The O'Brien Corporation	DHS	
11/18/88	Patricia Houle	Frank Lee	Transmittal Letter for Revised Financial Test for Post-Closure (Test attached)
	The O'Brien Corporation	DHS	
10/31/88	Richard K. McMurtry	Patricia Houle	9/19/88 Response to March Workplan
	CRWQCB	The O'Brien Corporation	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
10/17/88	Patricia Houle	Steven R. Ritchie	Transmittal Letter for Submittal of Workplan Addressing Deficiencies as Outlined in RWQCB 8/18/88 Transmittal and Corrective Measures Evaluation (CME)
	The O'Brien Corporation	RWQCB	
10/15/88	N. Dean Marachi	Patricia Houle	Workplan Comprehensive Groundwater Monitoring Evaluation: The O'Brien Corporation
	The MARK Group Engineers & Geologists, Inc.	The O'Brien Corporation	
10/14/88	Robert J. Kamauskas	Patricia Houle	Workplan Addendum - Tidal Marsh Sediment Quality Investigation
	The MARK Group Engineers & Geologists, Inc.	The O'Brien Corporation	
9/28/88	Caroline Cabias	Philip T. Newton	Report of Violation
	DHS	The O'Brien Corporation	
9/16/88	Edgar H. Refsell	Don Mazzone	Report of Violations Found During 4/12/88, 4/13/88 and 4/14/88 Inspections
	DHS	The O'Brien Corporation	
8/18/88	Steven R. Ritchie	Don Mazzone	Transmittal Letter for Comprehensive Groundwater Monitoring Evaluation - Request for Workplans and Completion Schedules
	CRWQCB	The O'Brien Corporation	
8/8/88	Allen K. Wolfenden	Lori Lewis	Transmittal Letter for Comprehensive Groundwater Monitoring Evaluation
	DHS	US EPA	
7/18/88	Dwight R. Hoenig	Don Mazzone	Acceptance of Closure Certification
	DHS	The O'Brien Corporation	
7/18/88	Dwight R. Hoenig	Don Mazzone	Acceptance of Closure Certification for The O'Brien Corporation Hazardous Waste Facility
	DHS	The O'Brien Corporation	
7/11/88	None Specified	None Specified	RCRA ISD Comprehensive Groundwater Monitoring Evaluation: The O'Brien Corporation
	CRWQCB	None Specified	
7/1/88	None Specified	None Specified	1988 ISD/Post-Closure Groundwater Monitoring Program - Data Print-Outs for 3rd Quarter 1988 (Ending in July)
	None Specified	None Specified	

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/11/88	Don Mazzone The O'Brien Corporation	Roger R. James RWQCB	Transmittal Letter for Addendum to Hydrogeological Assessment Report and Report of Waste Discharge (Addendum attached)
4/11/88	Don Mazzone The O'Brien Corporation	Roger R. James RWQCB	Addendum to Hydrogeological Assessment and Report of Waste Discharge
2/2/88	Roger B. James CRWQCB	Don Mazzone The O'Brien Corporation	Confirmation of RWQCB's Intent to Evaluate O'Brien Facility
1/28/88	Don Mazzone The O'Brien Corporation	Dwight R. Hoenig DHS	Confirmation of Planting of Vegetative Cover Over Entire Closed Area
1/1/88	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified The O'Brien Corporation	1988 ISD/Post-Closure Groundwater Monitoring Report - Former RCRA Surface Impoundments, Volume II
1/1/88	R.C. Swartz, P.F. Kemp, D.W. Schults, and J.O. Lamberson US EPA	None Specified Environmental Toxicology and Chemistry	Effects of Mixtures of Sediment Contaminants on Marine Infaunal Amphipod, Rhepoxynius Abronius
12/23/87	Don Mazzone The O'Brien Corporation	Roger P. James CRWQCB	Transmittal Letter for Hydrogeological Assessment Report
12/1/87	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified The O'Brien Corporation	Hydrogeological Assessment Report - Report of Waste Discharge - Former Surface Impoundment Area, Volume I of II, Text
12/1/87	None Specified The MARK Group Engineers & Geologists, Inc.	None Specified The O'Brien Corporation	Hydrogeological Assessment Report - Report of Waste Discharge - Former Surface Impoundment Area, Volume II of II
12/1/87	None Specified AT Kearney, Inc. and SAIC	None Specified US EPA R9	CONFIDENTIAL BUSINESS INFORMATION - RCRA Facility Assessment Report (document control #PS0000217)

Date	Author Affiliation	Recipient Affiliation	Subject/Title
11/24/87	None Specified	None Specified	Boring, Sampling, and Cross-Section Locations - Hydrogeological Assessment, Drawing No. 8-3
	The MARK Group Engineers & Geologists, Inc.	None Specified	
11/5/87	Karen Schwinn	Don Mazzone	Follow-up to Conversation of 11/4/87
	US EPA	The O'Brien Corporation	
10/21/87	N. Dean Marachi	Don Mazzone	Soil Sampling and Analysis - Former Waste Water Treatment Tank Area
	The MARK Group Engineers & Geologists, Inc.	The O'Brien Corporation	
9/30/87	Christiane Camp	The O'Brien Corporation File	O'Brien Corporation Closure Plan Approval
	US EPA	None Specified	
9/25/87	Seena N. Hoose	Don Mazzone	Response to Letter of 9/11/87
	CRWQCB	The O'Brien Corporation	
9/24/87	Michael R. James	Jim Breitlow	Final Closure Plan Package for Paint Manufacturing Waste Surface Impoundments and Tank Treatment Units
	DHS	US EPA	
9/24/87	Lee A. Deets and Don R. Beasley	Mark Flachsbart	Transmittal Letter for RCRA Facility Assessment Preliminary Review (Review attached)
	A.T. Kearney	US EPA	
9/23/87	Dwight R. Hoenig	Don Mazzone	Closure Plan Approval for Paint Manufacturing Waste Surface Impoundments and Waste Water Treatment Tanks
	DHS	The O'Brien Corporation	
9/4/87	Don Mazzone	Paris Greenlee	Transmittal Letter for Information Requested Regarding Removal of Dewatering Tanks (Information attached)
	The O'Brien Corporation	DHS	
8/10/87	None Specified	None Specified	Invoice No. Q 12819 - Oakland Tribune
	California Newspaper Service Bureau, Inc.	None Specified	
7/31/87	None Specified	None Specified	Affidavit of Publication
	None Specified	None Specified	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
7/31/87	None Specified None Specified	None Specified None Specified	The O'Brien Corporation Public Notice 7/31/87 - San Francisco Examiner
7/30/87	Don Mazzone The O'Brien Corporation	None Specified USEPA	Transmittal Letter for Information Requested Regarding Potential Releases from Solid Waste Management Units (Information attached)
7/27/87	None Specified DHS	None Specified None Specified	Environmental Checklist Form - Appendix A
7/27/87	Michael R. James DHS	Diane Webb California Newspaper Service Bureau	Please Publish Attached Legal Notice in Oakland Tribune and San Francisco Chronicle
7/20/87	Don Mazzone The O'Brien Corporation	Patricia Barni DHS	4/17/87 Report of Violation
7/16/87	Wil Bruhns RWQCB (SF Bay Region)	Dwight R. Hoenig DHS	Documentation of RWQCB's Involvement in O'Brien Closure Process
6/19/87	Roger B. James CRWQCB	Don Mazzone The O'Brien Corporation	Discussion of Problems with New Monitoring Wells
6/1/87	None Specified Office of the Attorney General - Sacramento	Paul Blais DHS	$12,500 Check to Settle O'Brien Administrative Order
5/11/87	Ronald Leach US EPA R9	The O'Brien Corporation File None Specified	Violations at O'Brien
4/27/87	Christopher L. Vais Woodward-Clyde Consultants	None Specified Toxic Substances Control Division	Closure Report: Solar Evaporation Ponds Impoundment Closure Area Fuller-O'Brien Paint Plant, November 1986
4/17/87	Patricia Bami DHS	Don Mazzone The O'Brien Corporation	Report of Violation from 3/19/87 Inspection

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/9/87	Christopher L. Vais	Beth Levine	The O'Brien Corporation: January Groundwater Monitoring Results (Results attached)
	Woodward-Clyde Consultants	RWQCB (SF Bay Region)	
3/19/87	None Specified	None Specified	Interim Status Document Compliance Inspection
	DHS	None Specified	
3/18/87	Michael R. James	Don Mazzone	Request for Removal of Inactive Waste Treatment Tanks and Request for Variance from Operation Plan Requirements
	DHS	The O'Brien Corporation	
3/6/87	Reed Sato	Paul Blais	Transmittal Letter for Stipulation to Entry of Order and Schedule of Compliance, and Order (Order attached)
	Office of the Attorney General	DHS	
2/6/87	Jonh K. Van De Kamp	James L. Jaffe, Esq.	Transmittal Letter for Proposed Stipulated Administrative Order (Order attached)
	Office of the Attorney General	None Specified	
1/19/87	Don Mazzone	Dwight R. Hoenig	Plans to Seal and Abandon Existing Monitoring Wells
	The O'Brien Corporation	DHS	
1/1/87	M.E. Staradub, P.T.S. Wong, C.I. Mayfield, and Y.K. Chau	None Specified	Influence of Complexation and pH on Individual and Combined Heavy Metal Toxicity to Freshwater Green Algae
	Canada Centre for Inand Waters, University of Waterloo	Canadian Journal of Fisheries and Aquatic Science	
11/4/86	Michael R. James	Don Mazzone	Backfilling Excavated Surface Impoundments E, W, M and Surrounding Area
	DHS	The O'Brien Corporation	
10/17/86	Don Mazzone	Dwight R. Hoenig	Aquatic Toxicity Tests
	The O'Brien Corporation	DHS	
8/18/86	Jean Daniel	Donn Zuroski	Technical Data Needed to Complete Investigators' Report
	None Specified	None Specified	

Date	Author Affiliation	Recipient Affiliation	Subject/Title
8/15/86	Kathleen G. Shimmin US EPA	Michael Burdine The O'Brien Corporation	12/12/85 Hazardous Waste Investigation
8/14/86	Douglas Krause DHS	Bill Soo Hoo Office of Legal Services	Support of 8/14/86 Addendum to 3/24/86 Statement-of-Facts Prepared for The O'Brien Corporation
7/21/86	Don Mazzone The O'Brien Corporation	Dwight R. Hoenig DHS	Analytic Results for 5/1/86 Soil Sampling (for TOC Analysis) and Backfilling Plans for Closed Area
6/27/86	Dwight R. Hoenig DHS	Don Mazzone The O'Brien Corporation	Notice of Violation and Schedule for Compliance
6/17/86	None Specified Waste Management, Inc.	None Specified The O'Brien Corporation	Re-certification of Generator's Waste Material Profile Sheet
6/12/86	None Specified DHS	None Specified The O'Brien Corporation	Stipulation to Order Specifying Schedule for Compliance or Correction
6/6/86	Donn Zuroski None Specified	Philip Bobel US EPA	Transmittal Letter for RCRA Inspection Report
6/6/86	None Specified US EPA	None Specified None Specified	RCRA Report Preparation Request Form
6/6/86	Donn Zuroski None Specified	Philip Bobel US EPA	RCRA Investigation of Fuller-O'Brien Paints
6/3/86	Dwight R. Hoenig DHS	Don Mazzone The O'Brien Corporation	Notice of Violation Found During 5/26/85 Inspection
5/30/86	Harold J. Singer CRWQCB	Don Mazzone The O'Brien Corporation	Transmittal Letter for Compliance Evaluation Inspection Report (Report attached)
5/28/86	None Specified DHS	None Specified The O'Brien Corporation	Interim Status Document Inspection

Date	Author Affiliation	Recipient Affiliation	Subject/Title
4/29/86	Don Mazzone The O'Brien Corporation	Dwight R. Hoenig DHS	Summary of 4/25/86 Meeting
4/28/86	C. David Willis DHS	Philip T. Newton The O'Brien Corporation	Proposed Remedial Action Order
3/26/86	Don Mazzone The O'Brien Corporation	Dwight R. Hoenig DHS	Response to Notice of Violations
3/24/86	Dwight R. Hoenig DHS	James P. Fox The O'Brien Corporation	Transmittal Letter for Statement-of-Facts Describing Potential Violations
3/17/86	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Notice of Violation
3/3/86	None Specified State of California	None Specified None Specified	Items to Copy for EPA Region
2/19/86	Michael D. Burdine The O'Brien Corporation	Donn Zuroski US EPA	Transmittal Letter for Requested Sump Water Lab Reports (Reports attached)
1/27/86	Rafeal Gomez The O'Brien Corporation	None Specified None Specified	Employee HMIS Quiz
1/21/86	Norma Corea The O'Brien Corporation	None Specified None Specified	Employee HMIS Quiz
1/14/86	Michael D. Burdine The O'Brien Corporation	Donn Zuroski US EPA	Transmittal Letter - Four Requested Documents
1/1/86	Ijaz Jamall Risk-Based Decisions, Inc.	Thomas Kelly US EPA R9	Transmission of Previously Discussed Reference (Chromium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review)

Date	Author Affiliation	Recipient Affiliation	Subject/Title
1/1/86	Timothy E. Lewis and Alan W. McIntosh Rutgers University	None Specified Archives of Environmental Contamination and Toxicology	Uptake of Sediment-Bound Lead and Zinc by Freshwater Isopod Asellus Communis at 3 Different pH Levels
12/18/85	None Specified None Specified	None Specified None Specified	16 Photos at O'Brien
12/18/85	Donn Zuroski US EPA	None Specified US EPA	RCRA Inspection Report - The O'Brien Corporation
12/18/85	Donn Zuroski US EPA	None Specified US EPA	RCRA Inspection Report
12/16/85	Michael D. Burdine The O'Brien Corporation	Michael T. Feeley US EPA	Response to Harry Seraydarian's Letter Dated 12/13/85
12/13/85	Paul Smith DHS	Phil Bobel US EPA	Case Summary of O'Brien Corporation
12/2/85	Norma Corea None Specified	None Specified None Specified	Inspection Checklist
12/1/85	None Specified Woodward-Clyde Consultants	None Specified The O'Brien Corporation	Impoundment Closure Report - Former Solar Evaporation Ponds
11/12/85	None Specified DHS	E.P. Daly The O'Brien Corporation	Interim Status Document Inspection
11/8/85	Harry Seraydarian US EPA R9	None Specified The O'Brien Corporation	Loss of Interim Status
11/5/85	None Specified McIntosh Laboratories	Michael Burdine The O'Brien Corporation	Untreated Waste Wash Water

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
11/5/85	E.P. Daly The O'Brien Corporation	Philip Bobel US EPA	Acknowledgment of Undated Letter Received on 10/22/85
10/29/85	N. Corea The O'Brien Corporation	All Factory and Dept Mgrs The O'Brien Corporation	Procedures for Transferring Discontinued Material or Hazardous Waste
10/29/85	None Specified None Specified	None Specified None Specified	Sign-Off Sheet for Spill Control Cart Instructions
10/29/85	None Specified None Specified	None Specified None Specified	Spill Control Cart Instructions
10/29/85	None Specified The O'Brien Corporation	None Specified None Specified	Safety - Foreman's Checklist for Employees
10/28/85	None Specified National Safety Council	None Specified None Specified	Forklift Truck Operator's Training Course - Trainee Workbook
10/28/85	J. Farris The O'Brien Corporation	E.P. Daly The O'Brien Corporation	Forklift Operator Training
10/28/85	None Specified None Specified	None Specified None Specified	Uniform Hazardous Waste Manifest
10/18/85	M.B. Bennedsen Woodward-Clyde Consultants	Howard Hatayama DHS	Results of Analysis of Soil and Liquid Samples for Fence Line Pits at Fuller-O'Brien Paints Plant
10/14/85	Michael D. Burdine The O'Brien Corporation	None Specified None Specified	Report of Success of 10/11/85 Fire Drill
10/10/85	None Specified The O'Brien Corporation	None Specified None Specified	List of Attendees at 10/10/85 O'Brien Volunteer Fire Brigade Meeting
9/27/85	None Specified Clement Associates, Inc.	None Specified US EPA	Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Sites

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
8/29/85	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Additional Sampling Requirements
8/27/85	Wil Bruhns DHS	E.P. Daly The O'Brien Corporation	Denial of Request for Exemption from Interim Status
8/21/85	Steven R. Ritchie CRWQCB	E.P. Daly The O'Brien Corporation	Transmittal Letter for Compliance Monitoring Report from 8/18/85 Regional Board Inspection
7/25/85	None Specified McIntosh Laboratories	Michael Burdine The O'Brien Corporation	Wastewater Treatment Sludge
7/22/85	None Specified Woodward-Clyde Consultants	None Specified The O'Brien Corporation	Water Quality Assessment Report: Fuller-O'Brien Paint Plant
7/11/85	None Specified The O'Brien Corporation	None Specified None Specified	Sign-Off Sheet for Viewing of Film Titled "You Bet Your Eyes"
7/5/85	E.P. Daly The O'Brien Corporation	William Bruhns DHS	Request to Remove Fuller-O'Brien Plant from Interim Status
6/28/85	Harold J. Singer RWQCB (SF Bay Region)	E.P. Daly The O'Brien Corporation	Transmittal Letter for RCRA Groundwater Monitoring Program Evaluation Report (Report attached)
6/28/85	Melita Elmore RWQCB (SF Bay Region)	Harold J. Singer None Specified	ISD Inspection for Fuller-O'Brien on 5/26/85
6/25/85	None Specified DHS	None Specified The O'Brien Corporation	Perform Generator and ISD Inspection - Draft (Handwritten Report)
6/19/85	Harry Seraydarian US EPA R9	Richard Wilcoxon DHS	EPA Goal re: Appropriate Action on RCRA Groundwater Monitoring Facilities Not in Compliance with ISD and 40 CFR 265 Subpart F and Notice Pursuant to Section 3008(a)(2) of RCRA

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
5/2/85	E.P. Daly The O'Brien Corporation	Harold J. Singer RWQCB	Transmittal Letter for Groundwater Sampling Report
5/1/85	None Specified None Specified	None Specified None Specified	O'Brien Status (Handwritten)
3/1/85	E.P. Daly The O'Brien Corporation	Philip Bobel US EPA	Transmittal Letter for Copies of Letters Sent to Harold Singer and Dwight Hoenig and Final Plan of Correction and Closure Plans
2/25/85	E.P. Daly The O'Brien Corporation	Dwight R. Hoenig DHS	Transmittal Letter for Final Plan of Correction and Closure Plan
2/25/85	E.P. Daly The O'Brien Corporation	Harold J. Singer RWQCB	Transmittal Letter for Final Plan of Correction and Closure Plan
1/18/85	None Specified Woodward-Clyde Consultants	None Specified The O'Brien Corporation	Closure Plan for Waste Water Treatment Tanks and Container Storage Area
1/18/85	None Specified Woodward-Clyde Consultants	None Specified The O'Brien Corporation	Proposed Plan of Correction and Closure Plans
11/29/84	Harold J. Singer CRWQCB	E.P. Daly The O'Brien Corporation	Approval of O'Brien Request for Extention of Closure Deadline for Out-of-Service Waste Ponds
8/7/84	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Denial of Request for Extension for Submission of Amended Pond Closure Plan
8/1/84	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Denial of Request for Extension for Submittal of Some Information to Be Included in ISD
6/4/84	Harold J. Singer CRWQCB	E.P. Daly The O'Brien Corporation	Comments on Groundwater Assessment Report
5/18/84	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Reminder of Overdue Plan of Corrections - Reminder of $25,000 Per Day Penalty

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
4/13/84	None Specified Tribune Films, Inc.	Audrey Murray The O'Brien Corporation	Confirmation of Bookings
4/9/84	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Reminder of Overdue Plan of Correction
3/28/84	Dwight R. Hoenig DHS	E.P. Daly The O'Brien Corporation	Response to O'Brien's Documentation of Compliance
2/17/84	Harold J. Singer CRWQCB	E.P. Daly The O'Brien Corporation	Response to Letter of 2/7/84
1/20/84	Harold J. Singer CRWQCB	Edward Daly The O'Brien Corporation	Comments on O'Brien's Soil and Groundwater Quality Assessment
12/6/83	Charles A. White DHS	E.P. Daly The O'Brien Corporation	Unanswered Questions from 6/29/83 Letter
10/31/83	Charles A. White DHS	E.P. Daly The O'Brien Corporation	Four Alternatives to Resolve Contamination Problem
6/13/83	Charles A. White DHS	Michael Burdine The O'Brien Corporation	Notification of Conditions Alleged To Be Violations of California Hazardous Waste Control Act Found During 2/17/83 Inspection
4/20/83	Michael Pixton Cal/EPA	Don Mazzone The O'Brien Corporation	Report of Violation
9/28/82	Charles A. White DHS	Michael Burdine The O'Brien Corporation	Notification of Conditions Alleged To Be Violations of California Hazardous Waste Control Act Found During 4/21/82 Inspection
9/8/82	Marcia Pukach US EPA	Michael Burdine The O'Brien Corporation	RCRA Verification Call Sheet
1/6/82	Industrial Relations Department The O'Brien Corporation	All Factory and Office Employees The O'Brien Corporation	Agreement Not To Stuff Rags or Other Objects Into Fire Alarm Horns To Muffle Noise

Date	Author Affiliation	Recipient Affiliation	Subject/Title
3/19/81	J. Steenhoven None Specified	None Specified US EPA	Part A Rating Sheet
2/25/81	Michael D. Burdine The O'Brien Corporation	William D. Wilson US EPA R9	Transmittal Letter for RCRA Form 3 with Corrections to Part IV
12/8/80	None Specified US EPA	None Specified The O'Brien Corporation	Acknowledgment of Notification of Hazardous Waste Activity
11/19/80	None Specified US EPA	None Specified None Specified	Part A Permit Process - Internal Checklist
11/19/80	Michael D. Burdine The O'Brien Corporation	None Specified US EPA	EPA General Information Consolidated Permits Program
9/16/80	None Specified The O'Brien Corporation	None Specified None Specified	The O'Brien Corporation
1/1/75	None Specified None Specified	None Specified None Specified	Aerial Photo of O'Brien
1/1/73	None Specified None Specified	None Specified None Specified	South San Francisco, CA
No Date	None Specified None Specified	None Specified None Specified	Addendum to EPA Technical Closure Checklist Outline for The O'Brien Corporation
No Date	None Specified Applied Environmental Associates	None Specified US EPA	Groundwater Monitoring Plan
No Date	Patricia Barni DHS	None Specified None Specified	Surveillance and Compliance Report - Hazardous Waste Generator
No Date	None Specified The O'Brien Corporation	None Specified None Specified	General Work Rules

Date	*Author Affiliation*	*Recipient Affiliation*	*Subject/Title*
No Date	None Specified The O'Brien Corporation	None Specified None Specified	The O'Brien Fire Brigade
No Date	None Specified None Specified	None Specified None Specified	Fuller-O'Brien Location Map
No Date	None Specified None Specified	None Specified None Specified	Waste Analysis Plan
No Date	None Specified The O'Brien Corporation	None Specified None Specified	The O'Brien Spill Control Plan
No Date	None Specified None Specified	None Specified None Specified	Groundwater Monitoring Facility Information Form
No Date	None Specified None Specified	None Specified None Specified	Former Solvent Still Area - 3.1.1.3 (One-page photocopy)
No Date	None Specified None Specified	None Specified None Specified	Negative Declaration
No Date	None Specified Waste Management, Inc.	None Specified The O'Brien Corporation	Generator's Waste Material Profile Sheet
No Date	None Specified None Specified	None Specified None Specified	Map of O'Brien Property
No Date	None Specified None Specified	None Specified None Specified	5 Photos at O'Brien
No Date	None Specified None Specified	None Specified None Specified	Former Solvent Still Area - 1.2.2 (One-page photocopy)
No Date	None Specified None Specified	None Specified None Specified	Closure Plan Documents - Attachment A

Date	Author Affiliation	Recipient Affiliation	Subject/Title
No Date	None Specified	None Specified	Closure Plan Modifications - Attachment B
	None Specified	None Specified	
No Date	None Specified	None Specified	O'Brien Photos
	PRC Environmental Management, Inc.	None Specified	
No Date	None Specified	None Specified	Contingency Plan for Waste Treatment Area
	Woodward-Clyde Consultants	None Specified	
No Date	Thomas Kelly	None Specified	O'Brien Meeting re: O'Brien's Response to EPA Comments on RFI, Risk Assessment, Eco-Assessment, Former San Bruno Channel
	US EPA R9	None Specified	
No Date	None Specified	None Specified	O'Brien Worksheet
	US EPA	None Specified	
No Date	None Specified	None Specified	Hazardous Wastes Scheduled for June Promulgation
	None Specified	None Specified	
No Date	None Specified	None Specified	Summary of Well Construction Data
	None Specified	None Specified	
No Date	None Specified	None Specified	Journal with Handwritten Entries, Some re: O'Brien
	None Specified	None Specified	
No Date	None Specified	None Specified	General Information (1st page is missing)
	None Specified	None Specified	
No Date	None Specified	None Specified	Calculations for Comparison to Disprove Any Release of Lead Pigment (One-page chart)
	None Specified	None Specified	
No Date	None Specified	None Specified	Interim Status Checklist
	None Specified	None Specified	
No Date	None Specified	None Specified	Initial Environmental Study for Proposed Closure of Hazardous Waste Surface Impoundments and Tank Treatment Units
	None Specified	None Specified	

APPENDIX B

Appendix B
Access Plan

Appendix B

Access Plan
Corrective Measures Implementation Workplan
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

Prepared by:
Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

TABLE OF CONTENTS

1.0 INTRODUCTION 3

2.0 CHEROKEE PROPERTY ACCESS 4

2.1 Physical Restrictions to Access 4
2.2 Pre-approved Access 4
2.3 Access Approval 4
2.4 Access Restrictions 4

3.0 ACCESS TO OTHER PROPERTIES 5

3.1 City and County Easements 5
3.2 Business Properties 5

4.0 COORDINATION OF FIELDWORK 6

5.0 PREVENTION AND REPAIR OF DAMAGE 8

Appendix

Genentech Access Agreement
Bay Conservation and Development Commission Permit

1.0 INTRODUCTION

This Access Plan was developed for the Corrective Measures Implementation Workplan (Workplan) at the Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C. (Cherokee), property located at 450 E. Grand Avenue in South San Francisco, California (Property). This Access Plan was prepared in order to establish protocols and procedures for physical access to the Property as well as to surrounding properties in the vicinity.

A Site Plan, which shows the Property layout is included as Figure 2 to the Workplan. The Property consists of 27-acres in South San Francisco, California, and lies approximately one mile east of Highway 101 at the eastern edge of Grand Avenue (Workplan, Figure 1). The property is located in an industrialized area on the western shore of San Francisco Bay, within an area zoned for commercial and light industrial uses, and has housed paint manufacturing operations for over 100 years. Environmental conditions at the Property have been deemed by the United States Environmental Protection Agency (U.S. EPA) to merit Corrective Action.

This Access Plan describes procedures that will be followed to obtain any necessary permits, approvals, easements, licenses, and rights-of-entry before performing fieldwork. In addition, this Access Plan describes how various individuals and entities will be notified of the schedule for performing fieldwork, how those parties might coordinate their activities with fieldwork conducted Henshaw Associates and subcontractors, and how the repair of areas damaged, if any, during fieldwork will be performed. Field procedures are described in the *Field Sampling Plan (FSP* - Appendix C, Part I). The procedures for storage and disposal of materials generated during fieldwork are provided in the *Excavation Derived Residuals Plan* (*EDR Plan* - Appendix D).

2.0 CHEROKEE PROPERTY ACCESS

2.1 Physical Restrictions to Access

The Property is surrounded by a chain-link fence approximately 8 feet high. The main entrance to the property is through a gate in the fence, located in the northwestern corner of the property. The gate is kept locked with a padlock. During performance of CMs, if required, temporary fencing will be installed to maintain site security.

2.2 Pre-approved Access

Access to the Property is pre-approved to members of Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C. (Cherokee) and Henshaw Associates (Henshaw). Henshaw may temporarily provide keys to subcontractors in order to expedite safe and efficient fieldwork.

2.3 Access Approval

Any individual or group desiring access to the Property must request it in writing. Inquiries shall be made to:

Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin CA 94568

The purpose of the requested access must be clearly stated, as well as the names of individuals requesting access. Access may be authorized or denied, depending upon the reasonable and legitimate needs and rights of the group or individuals requesting access.

2.4 Access Restrictions

Access to the Property is strictly forbidden to any groups or individuals without the express written permission of Cherokee or Henshaw.

3.0 ACCESS TO OTHER PROPERTIES

Access to private and public property might be required to fulfill the goals of the Workplan. The sections below describe the various entities from which access permission may be sought. A standard access agreement will be utilized to obtain permission for access to perform fieldwork. Access agreements may deviate from the standard format, depending upon the final terms of agreement with the respective persons or entities from which access is sought.

3.1 City and County Easements

If required, before performing fieldwork on or beneath a City of South San Francisco or San Mateo County right-of-way, Henshaw will obtain necessary permits from appropriate regulatory agencies.

3.2 Business Properties

Activities conducted off the Property will be conducted at times acceptable to the surrounding residents and businesses that may be impacted by such activities. Notification and performance of any fieldwork conducted off Cherokee's property will be made in accordance with the requirements set forth in each separate Access Agreement.

Genentech, the owner of the strip of land bordering the Property to the east and lying between the Property and San Francisco Bay (the Genentech Beachfront), has granted access to Cherokee for the purposes of the CMs. Accordingly, Cherokee will follow the notification The Genentech access agreement is included as an Appendix to this Access Plan. The Bay Conservation and Development Commission (BCDC) permit required to conduct CMs on the Genentech property is also included in the appendix.

4.0 COORDINATION OF FIELDWORK

The Project Manager will attempt to provide business property owners with written notice of request for property access and an access agreement for authorization at least seven (7) days before scheduled fieldwork is to commence, unless otherwise agreed with the property owner. The notice will include appropriate traffic control plans, if necessary. If the fieldwork is delayed after the notification and access authorization has been executed the Project Manager will utilize reasonable efforts to notify property owners at least three (3) days before the originally scheduled commencement of fieldwork. Rescheduling of fieldwork will be performed within a time frame that is mutually agreed upon by the Henshaw and the party from whom access is being requested.

Fieldwork will be conducted according to the project scheduling process described in the *Field Sampling Plan.* Fieldwork will be conducted in a manner in which to minimize disruption of traffic on nearby streets, and to minimize the impact of noise to nearby business and residents. Technical consultants and subcontractors shall coordinate and cooperate with Henshaw so that the fieldwork does not unreasonably interfere with the operation at the Property, with the operation of nearby businesses, or with the use and enjoyment of nearby residents of their property.

Subcontractors retained by Henshaw will perform fieldwork according to the following guidelines, where applicable:

On the evening or morning before commencing fieldwork on a specified property, parking barricades will be placed, where appropriate, to prevent vehicles from parking in the vicinity of fieldwork.

An area equivalent to an exclusion zone will be delineated, as further described in the *Health and Safety Plan (HASP)*, to protect the safety of any member of the public that might be present during performance of the work.

Traffic control measures will be implemented for the public safety and to minimize disruption of traffic flow, which may include placing equipment outside traffic paths wherever possible and using traffic cones to ease merging traffic around potential obstructions. A traffic control plan may be prepared for review by property owners that specifies the dimensions of the impacted area, traffic control measures where appropriate, and agreed to by the parties.

Immediately following completion of fieldwork at a particular area, the area will be cleared of equipment and of any debris that accumulated during the work, and any damage will be repaired as described in Section 5.0 below.

5.0 PREVENTION AND REPAIR OF DAMAGE

Henshaw and subcontractors shall not unnecessarily damage any third-party property located within or proximate to the Property while CMs are performed, and shall, in a timely manner, repair all damage to such property caused by Henshaw or subcontractors while performing that work. Contractors retained by Henshaw will take the following precautions to minimize the likelihood of damage to property, as necessary and appropriate:

An underground utility-locating service may be retained to check the location of underground utilities before initiating invasive subsurface investigation. Subsurface investigation locations will be adjusted to avoid known or suspected locations of underground utilities and other subsurface structures. Underground Service Alert will be notified 48 hours in advance of all excavation work, where required.

Traffic-control measures will be implemented as required to provide for safe passage of vehicles and pedestrians during fieldwork.

Photographs of the investigation areas will be taken before and after fieldwork.

Any damage caused by contractors retained by Henshaw will be reported to the Project Manager within twenty four (24) hours, at which time the scope and scheduling of any repairs will be discussed, and agreed to with the parties whose property was damaged.

RIGHT OF ENTRY AND LICENSE AGREEMENT

THIS RIGHT OF ENTRY AND LICENSE AGREEMENT ("Agreement") is made this 4th day of February, 2000, by and between Cherokee Environmental Risk Management, ~~LLC~~, L.P. BCA 2/4/00 5445 DTC Parkway, Englewood, Colorado 80111 attn: Dwight Stenseth ("Cherokee") and Genentech, Inc., a Delaware corporation, 1 DNA Way, South San Francisco, California 94080-4990, Attention: Elona Baum, Esq. ("Genentech").

WITNESSETH:

WHEREAS, Genentech owns the real property described on Exhibit A hereto (the "Beach Property"); and

WHEREAS, Cherokee desires to enter upon the Beach Property to undertake certain environmental remediation work on the Beach Property.

NOW, THEREFORE, in consideration of the mutual premises and covenants contained herein, Genentech and Cherokee agree as follows:

1. License. Subject to the terms and conditions of this Agreement, Genentech hereby grants to Cherokee a non-exclusive license ("the License") and right of entry to undertake various environmental remediation work including the removal of contaminated soils (the "Work").

2. Term. The term of this Agreement shall commence on the date the condition in Section 3.B (i) is satisfied and end on the earlier of the completion of the Work or August 31, 2000 ("Term") and shall automatically terminate thereafter. Genentech shall have the right to terminate this Agreement for cause at any time.

3. Work.

   A. The cost of the Work shall be borne solely by Cherokee.

   B. Cherokee shall:

      i. prior to entering the Property, obtain Genentech's prior written approval of the Work plan with a time line and any amendments or revisions thereto, which approval shall not be unreasonably withheld. In this regard, Genentech shall give its approval/disapproval within three (3) business days after receipt by Mark Henderson at 1 DNA Way Mail Stop 71, South San Francisco, California, 94080 with a copy to Tim Bishop at 1 DNA Way Mail Stop 71, South San Francisco, California, 94080 of a copy of the written Work plan;

ii. perform all Work pursuant to a detailed written plan for the environmental remediation approved by the public agencies having governmental authority for such activities;

iii. cause all Work to be in a safe and workmanlike manner consistent with generally accepted construction standards and in compliance with applicable environmental laws;

iv. perform all Work in such a way as to minimize or avoid any interference with the operations of the Genentech business campus;

v. obtain, prior to the commencement of any Work, the necessary federal, state and municipal permits, licenses and approvals required for such Work;

vi. promptly provide to Genentech copies of any and all results of sampling and analytical tests and any reports and site closure letters or denials thereof which arise from or relate to the Work; and

vii. promptly remove from the Property any excavated soils under a hazardous waste manifest naming Cherokee as generator.

4. Performance of Work. Cherokee may contract or subcontract any portion of the Work to be performed pursuant to this Agreement with reputable, licensed contractors. Cherokee shall be responsible for any environmental contamination brought by it or its contractors to the Property or any environmental damage caused by it or its contractors in conducting the Work. Cherokee shall not be relieved of liability for any of its obligations under this Agreement as a result of subcontracting the Work.

5. Completion. Upon completion of the Work, Cherokee shall cause the surface of the Beach Property to be properly graded. Soil or fill shall not be deposited on the Property unless provided for in a Work plan approved by Genentech or under conditions approved by Genentech.

6. Indemnification. Cherokee shall indemnify and hold Genentech harmless from and against:

A. any and all claims, losses, demands, judgments, damages and/or expenses (including reasonable attorneys' fees) for losses or injuries arising out of or relating to the negligent or willful act or omission of Cherokee or its agents, servants, employees, contractors or representatives, arising from or related to the conduct of the Work and/or the access provided herein; and

B. any liens against Genentech or the Beach Property as a result of the Work performed.

The provisions of this paragraph shall survive the termination of this Agreement.

7. Notices. Notification to either party to this Agreement will be sufficient when deposited in the United States mail, first class mail, certified letter or return receipt requested, postage prepaid, or by recognized overnight courier at the address set forth on the first page of this Agreement.

8. Successors and Assigns. The benefits and obligations of this Agreement shall be binding upon and inure to the benefit of the parties hereto and then the successors and assigns, provided that except as set forth in paragraph 4 above, Cherokee shall not assign its interest in or rights and obligations under this Agreement without Genentech's prior written consent.

9. Insurance. Cherokee shall maintain comprehensive general liability insurance during the Work with a minimum combined limit of not less than $5,000,000 per occurrence. Such policy shall name Genentech as an additional insured for the purposes of the Work to be performed on the Property. Within ten (10) days of execution, Cherokee shall provide Genentech with certificates of insurance evidencing the coverage required hereunder. Cherokee's contractors who are performing the Work shall provide and maintain in force worker's compensation insurance. Cherokee shall also provide and maintain professional liability and errors and omissions insurance which covers environmental damage and any other forms of insurance which may be required by law.

10. Governing Law. This Agreement shall be construed and enforced in accordance with, and the validity and performance hereof shall be governed by the laws of the State of California.

11. Survival. The following provisions shall survive the termination of this agreement: 3A, 3B (iii), 4, 5, 6A, 6B, 8, 10 and 11.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their duly authorized representatives on the day and year first above written.

GENENTECH, INC.

By: Cynthia J. Jean (a)

CHEROKEE ENVIRONMENTAL RISK MANAGEMENT, ~~LLC~~ L.P. BLA 2/4/00

By: [signature]

Name: _____ Name: Brent C. Anderson

Its: _____ Its: Vice President

EXHIBIT A
Property Description

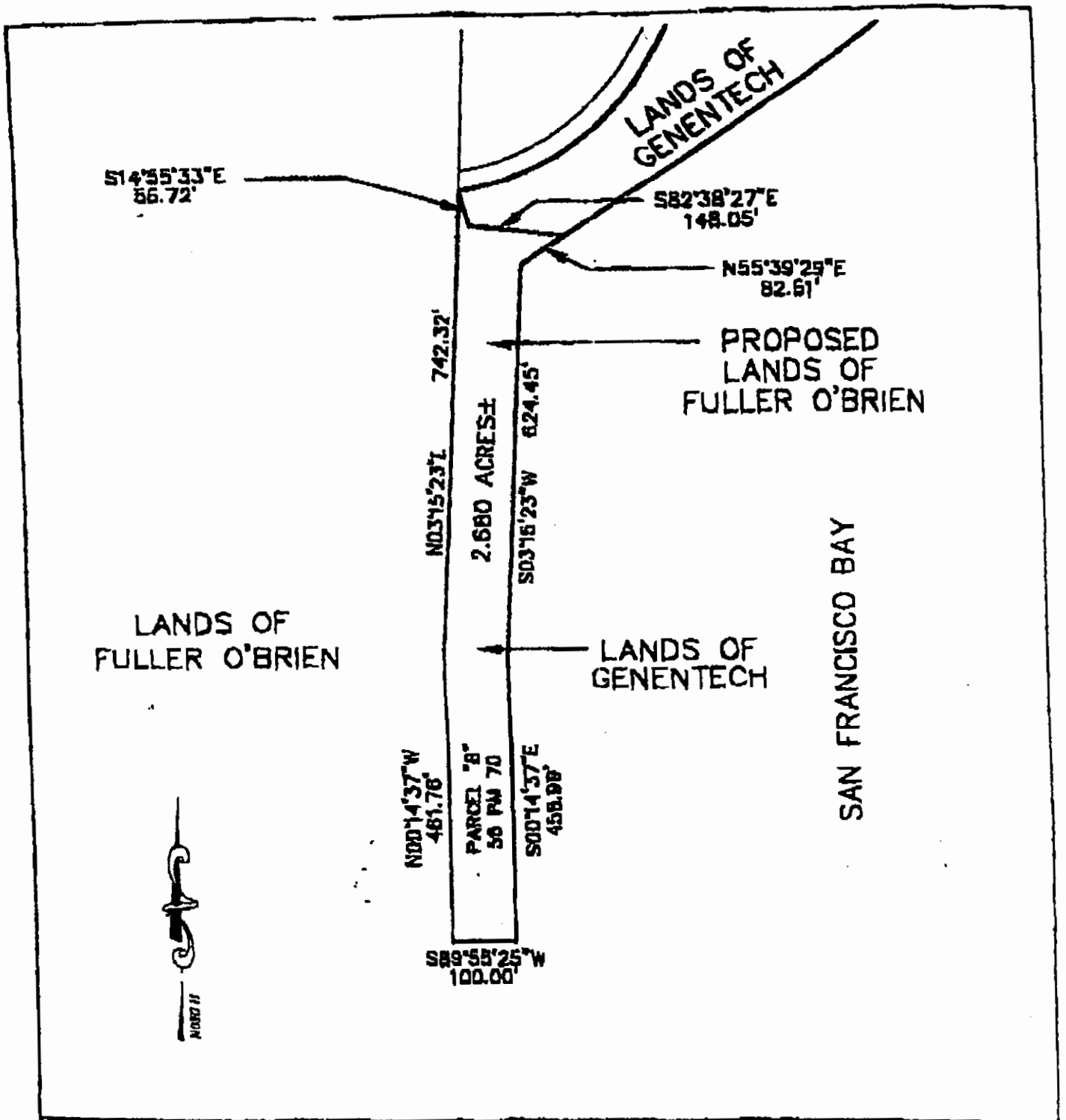
All that certain Real Property situate in the City of South San Francisco, County of San Mateo State of California, being a portion of Parcel B, a 5 84 Acre Parcel, shown on that certain Parcel Map recorded in Volume 56 of Parcel Maps at Page 71, of the Official Records of the County of San Mateo, State of California, more particularly described as follows:

Beginning at the South West corner of said parcel, thence along the Westerly line of said parcel through the following courses, North 00° 14' 37" West for a distance of 461 76 feet to a point, Thence North 03° 15' 23" East for a distance of 742 32 feet to a point, Thence leaving said Westerly line South 14°55' 33" East for a distance of 56 72 feet to a point, Thence South 82 38' 27"East a distance of 148 05 feet to a point on the Easterly side of said parcel, Thence along said Easterly line, South 55 39' 29" West for a distance of 82 51 feet to a point, Thence continuing along said Easterly Line South 03° 15' 23" West for a distance of 624 45 feet to a point; Thence continuing along said line South 00° 14' 37" East for a distance of 458 99 feet to a point on the Southerly line of said parcel; Thence along said Southerly line South 89° 55' 25" West a distance of 100 00 feet to the Point of Beginning and containing 2.68 Acres more or less

Prepared by

Kenneth P. Moore L.S. 4918
Expire date 12/30/00

LICENSED LAND SURVEYOR
KENNETH P MOORE
No. 4918
Exp. 12/30/05
STATE OF CALIFORNIA



Surv.			WILSEY HAM 331 LAKESIDE DRIVE SUITE B, FOSTER CITY, CALIFORNIA 94404 (650)349-2151
Dwn.			
Ck.			
Approved:			GENENTECH – FULLER O'BRIEN PROPERTY AGREEMENT

DWG. NO.
GENFULX2.DWG
SCALE: 1" = 200'
DATE: 4-17-98
BK NO.

STATE OF CALIFORNIA GRAY DAVIS, Governor

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
THIRTY VAN NESS AVENUE, SUITE 2011
SAN FRANCISCO, CALIFORNIA 94102-6080
PHONE: (415) 557-3686
http://ceres.ca.gov/bcdc/

bcdc
Celebrating 35 Years

Permittees' Copy

PERMIT NO. M92-9
(Issued on March 31, 1992, As
Amended Through March 20, 2000)
AMENDMENT NO. TWO

Dwight Stenseth, President
Cherokee San Francisco, LLC.
5445 DTC Parkway, Suite 900
Englewood, Colorado 80111

Dear Mr. Stenseth:

I. Authorization

A. Subject to the conditions stated below, the permittee, ~~The Obrien Corporation~~ Cherokee San Francisco, LLC., is hereby authorized to do the following:

Location: In the Bay and within the 100-foot shoreline band, on the northern bank of the San Bruno Channel, at 450 East Grand Avenue, in the City of South San Francisco, San Mateo County.

Description: Conduct remediation of hazardous waste by: (1) excavating and removing approximately 720 cubic yards of contaminated soils including removal of a concrete bulkhead and steel drums to an approved upland disposal site and replacing the excavated material with clean fill; (2) revegetating and restoring upland and wetland habitat in accordance with an approved restoration plan, creating 510 square feet of new Bay; ~~and~~ (3) pursuant to requirements of the U.S. Environmental Protection Agency, constructing an approximately 750-square-foot earthen berm and portions of an approximately 800-square-foot V-ditch to collect and prevent the discharge of contaminated runoff into San Francisco Bay. ~~The permittee is carrying out the remediation work under the requirements of the U.S. Environmental Protection Agency~~ (Amendment No. One)~~.~~; and (4) pursuant to requirements of the U.S. Environmental Protection Agency and within the 100-foot shoreline band, excavating and removing approximately 2,000 cubic yards of contaminated soil from three locations (Exhibit A) to an approved upland disposal site, replacing the excavated material with clean fill, and restoring the original topography of the area (Amendment No. Two).

B. This amended authority is generally pursuant to and limited by your application dated February 20, 1992, ~~and~~ your letter of November 8, 1996, requesting Amendment No. One, and your submittal dated February 4, 2000 requesting Amendment No. Two, including all accompanying and subsequent exhibits and all conditions of this amended permit.

C. The excavation, filling, and grading originally authorized herein must commence prior to July 1, 1992, or this amended permit will lapse and become null and void. Such work must also be diligently pursued to completion and must be completed within one year of commencement, or by July 1, 1993, whichever is earlier, unless an extension of time is granted by amendment of the permit.

The marsh planting authorized herein must occur during the period between March 1, 1993, and May 31, 1993. Replanting will be allowed if necessary in order to establish a stable shoreline. Work authorized under Amendment No. One must commence by March 31, 1998, or this permit will lapse and become null and void. Such work must also be diligently pursued to completion and must be completed within one year of commencement, or by March 31, 1999, whichever is earlier, unless an extension of time is granted by further amendment of this amended permit. Work authorized under Amendment No. Two must commence by March 31, 2001, or this permit will lapse and become null and void. Such work must also be diligently pursued to completion and must be completed within one year of commencement, or by March 31, 2002, whichever is earlier, unless an extension of time is granted by further amendment of this amended permit.

II. Special Conditions

The authorization made herein shall be subject to the following special conditions, in addition to the standard conditions in Part IV:

A. Specific Plans and Plan Review

1. **Plan Review.** No work whatsoever, except that authorized under Amendment No. One, shall be commenced pursuant to this authorization until final precise site, and grading, ~~and marsh restoration~~ plans and any other relevant criteria, specifications, and plan information for that portion of the work have been submitted to, reviewed, and approved in writing by or on behalf of the Commission. The specific drawings and information required will be determined by the staff. To save time, preliminary drawings should be submitted and approved prior to final drawings.

   a. **Site and ~~Restoration~~ Grading Plans.** Site and ~~restoration~~ grading plans shall include and clearly label the ~~6~~ 5-foot contour line above Mean Sea Level (the line of highest tidal action), the line 100 feet inland of the line of highest tidal action, property lines, grading, details showing the location, ~~types~~, dimensions, and materials to be ~~used for all structures, irrigation, landscaping, drainage, fences, and other proposed improvements.~~ excavated and the original topography, to which the site will be restored.

      (1) Evidence that the design complies with all applicable codes; and

      (2) Evidence that a thorough and independent review of the design details, calculations, and construction drawings has been made.

   Plans submitted shall be accompanied by a letter requesting plan approval, identifying the type of plans submitted, the portion of the project involved, and indicating whether the plans are final or preliminary. Approval or disapproval shall be based upon:

   (a) completeness and accuracy of the plans in showing the features required above, particularly the line of highest tidal action, property lines, and the line 100-feet inland of the line of highest tidal action, and any other criteria required by this authorization;

   (b) consistency of the plans with the terms and conditions of this authorization;

   (c) assuring that any fill in the Bay does not exceed this authorization and will consist of appropriate shoreline protection materials as determined by or on behalf of the Commission;

Plan review shall be completed by or on behalf of the Commission within 45 days after receipt of the plans to be reviewed.

2. **Conformity with Final Approved Plans.** All work, improvements, and uses shall conform to the final approved plans. The appropriate design professional(s) of record shall certify in writing that, through personal knowledge, the Work covered by the amended authorization has been performed in accordance with the approved design criteria and in substantial conformance with the approved plans. No noticeable changes shall be made thereafter to any final plans or to landscaping or shoreline protection work without first obtaining written approval of the change(s) by or on behalf of the Commission.

3. **Discrepancies Between Approved Plans and Special Conditions.** In case of any discrepancy between final approved plans and Special Conditions of this amended authorization, the Special Condition shall prevail. The applicant is responsible for assuring that all plans accurately and fully reflect the Special Conditions of this amended authorization.

B. **Debris Removal.** The permittee shall remove all construction debris to a location outside the jurisdiction of the Commission. In the event that any such material is placed in any area within the Commission's jurisdiction, the permittee, its assigns, or successors in interest, or the owner of the improvements, shall remove such material, at its expense, within ten days after it has been notified by the Executive Director of such placement.

C. **Contaminated Soils.** The permittee shall remove all soils determined to be contaminated according to U.S. Environmental Protection Agency standards to a location outside the Commission's jurisdiction.

~~D. Coffer Dam. The permittee shall remove the sheet piling coffer dam upon completion of excavation and fill work.~~

~~E. Marsh Restoration. Within one year of the initial planting, the permittee shall submit photographs to BCDC that clearly show the extent of revegetation. Planting consistent with the approved marsh restoration plan shall be repeated if the area does not revegetate within one year of the initial planting.~~

~~F. Storm Water Management Plan. The permittee shall construct all stormwater collection improvements authorized in Amendment No. One as generally shown on the plan entitled, "Project Site Plan," prepared by the O'Brien Corporation and dated February 4, 1997. The permittee shall not place any construction equipment, construction debris, excavated materials or any other fill within the Bay (Bayward of the mean high tide line) for the construction of the earthen berm and V-ditch authorized in Amendment No. One.~~

D. ~~G.~~ **Collection and Discharge of Contaminated Runoff.** The permitee shall not discharge any collected or ponded runoff into the San Francisco Bay or other off-site areas. All collected runoff shall be properly discharged into the sanitary sewer system or disposed of in another approved manner that is consistent with local, state, and federal hazardous waste disposal requirements. ~~The permitee shall periodically monitor and inspect the berms, V-ditch and pumping equipment to ensure that they are functioning properly and are adequate to collect and discharge any expected runoff.~~

E. **Notice to Contractor.** The permittee shall provide a copy of this amended permit to any contractor or person working in concert with the permittee to carry out the activities authorized herein and shall point out the special conditions contained herein.

F. **Marsh Protection.** The work authorized by this amended permit shall be performed in a manner that will prevent any significant adverse impact on any tidal marsh or other sensitive wetland resources. If any unforeseen adverse impacts occur to any such areas as a result of the activities authorized herein, the permittee shall restore the area to its previous condition, including returning the disturbed area to its original elevation and soil composition and, if the area does not revegetate to its former condition within one year, the permittee shall seed all disturbed areas with appropriate marsh vegetation.

G. **Construction Operations.** All construction operations shall be performed to prevent construction materials from falling into the Bay. In the event that such material escapes or is placed in an area subject to tidal action of the Bay, the permittee shall immediately retrieve and remove such material at its expense.

H. **Hold Harmless Agreement.** The permittee agrees to indemnify, defend and save harmless the State of California, its agencies, departments, officers, agents and employees from any and all claims, demands, losses or judgments accruing or resulting to any person, firm, corporation or entity who may be injured or damaged by work performed in accordance with the terms and conditions of this permit.

I. **Eastern Property Excavation.** In the event that it is determined that excavation of the eastern property area will extend onto the neighboring Genentech Beachfront, the permittee shall submit a restoration plan for that area for review and approval by or on behalf of the Commission prior to any work in that area. The restoration shall include restoring the area to its original topography and vegetation and the plan shall conform to the requirements of Special Condition II.A. herein.

III. Findings and Declarations

On behalf of the Commission, I find and declare that:

A. The project authorized by this amended permit involves the excavation and removal of approximately 720 cubic yards of contaminated soils including a concrete bulkhead and steel drums and the replacement of the excavated materials with clean fill, and the construction of a surface water collection system to prevent the discharge of contaminated runoff into San Francisco Bay. These activities may be described as the placement of small amounts of inorganic fill and the extraction of small amounts of material which do not have a significant adverse effect on present or possible future maximum feasible public access to the Bay consistent with the project, which, pursuant to Regulation Section 10601(b) (1), constitute a "minor repair or improvement" for which the Executive Director may issue a permit. Additionally, this amended permit authorizes grading and landscaping in accordance with approved plans in order to establish marsh and transitional upland vegetation for shoreline protection, resulting in the creation of approximately 510 square feet of new Bay. Such activities may be described as the installation of new protective work which constitutes the minimum amount necessary to stabilize the bank and to provide improved wildlife habitat, and will cover less than 10,000 square feet of the horizontal projection of the work below the line of highest tidal action as defined in Regulation Section 10601(a)(5) as a "minor repair or improvement". Therefore, the amended project authorized herein is a "minor repair or improvement" for which the Executive Director may issue a permit, pursuant to Government Code Section 66632(f) and Regulation Section 10622(a).

The project authorized by Amendment No. Two involves excavating and removing approximately 2,000 cubic yards of contaminated soil to an approved upland disposal site, replacing the excavated material with clean fill, and restoring the original topography of the area. These activities constitute the extraction of small amounts of material which do not have a significant adverse effect on present or possible future

maximum feasible public access to the Bay consistent with the project, which, pursuant to Regulation Section 10601(b)(1), constitute a "minor repair or improvement" for which the Executive Director may issue a permit. Furthermore, pursuant to Regulation Section 10810, this is a nonmaterial amendment to an administrative permit for a "minor repair or improvement" for which the Executive Director may issue a permit, pursuant to Government Code Section 66632(f) and Regulation Section 10622(a).

B. Special Conditions II-A through II-~~G~~ I are necessary to ensure that the any remediation work required by this amended permit is carried out in a manner that will not adversely impact the San Francisco Bay. Therefore, as conditioned, the amended project authorized by this permit is consistent with the McAteer-Petris Act and with the San Francisco Bay Plan in that it will not adversely affect the Bay nor public access to and enjoyment of the Bay.

C. The Commission further finds, declares, and certifies that the activity or activities authorized herein are consistent with the Commission's Amended Management Program for San Francisco Bay, as approved by the Department of Commerce under the Federal Coastal Zone Management Act of 1972, as amended.

D. The City Engineer for the City of South San Francisco adopted a Negative Declaration for this project on February 28, 1992. Moreover, pursuant to Commission Regulation Section 11501, the work authorized under Amendment ~~No~~. Nos. One and Two is categorically exempt from the requirement to prepare an environmental impact report. The Commission finds that, as conditioned herein, the amended project will not have a significant adverse environmental impact.

E. Pursuant to Regulation Section 10620, ~~this~~ the original project was listed with the Commission on March 19, 1992.

IV. Standard Conditions

A. All required permissions from governmental bodies must be obtained before the commencement of work; these bodies include, but are not limited to, the U. S. Army Corps of Engineers, the State Lands Commission, the Regional Water Quality Control Board, and the city and/or county in which the work is to be performed, whenever any of these may be required. This amended permit does not relieve the permittee of any obligations imposed by State or Federal law, either statutory or otherwise.

B. The attached Notice of Completion shall be returned to the Commission within 30 days following completion of the work.

C. Work must be performed in the precise manner and at the precise locations indicated in your application and amendment request, as such may have been modified by the terms of the amended permit and any plans approved in writing by or on behalf of the Commission.

D. Work must be performed in a manner so as to minimize muddying of waters, and if diking is involved, dikes shall be waterproof. If any seepage returns to the Bay, the permittee will be subject to the regulations of the Regional Water Quality Control Board in that region.

E. ~~The rights derived from this amended permit are assignable as provided herein. An assignment shall not be effective until the assignee shall have executed and the Commission shall have received an acknowledgment that the assignee has read and understood the application for this amended permit and the amended permit itself and agrees to be bound by the terms and conditions of the amended permit, and the assignee is accepted by the Executive Director as being reasonably capable of complying with the terms of the permit.~~

The rights, duties, and obligations contained in this amended permit are assignable. When the permittee transfers any interest in any property either on which the authorized activity will occur or which is necessary to the full compliance of one or more conditions to this amended permit, the permittee/transferor and the transferee shall execute and submit to the Commission a permit assignment form acceptable to the Executive Director. An assignment shall not be effective until the assignee executes and the Executive Director receives an acknowledgment that the assignee has read and understands the amended permit and agrees to be bound by the terms and conditions of the amended permit, and the assignee is accepted by the Executive Director as being reasonably capable of complying with the terms and conditions of the amended permit.

F. Unless otherwise provided in this amended permit, all the terms and conditions of this amended permit shall remain effective for so long as the amended permit remains in effect or for so long as any use or construction authorized by this amended permit exists, whichever is longer.

G. Unless otherwise provided in this amended permit, the terms and conditions of this amended permit shall bind all future owners and future possessors of any legal interest in the land and shall run with the land.

H. Unless otherwise provided in this amended permit, any work authorized herein shall be completed within the time limits specified in this amended permit, or, if no time limits are specified in the amended permit, within three years. If the work is not completed by the date specified in the amended permit, or, if no date is specified, within three years from the date of the amended permit, the amended permit shall become null and void. If a permit becomes null and void for a failure to comply with these time limitations, any fill placed in reliance on this permit shall be removed by the permittee or its assignee upon receiving written notification by or on behalf of the Commission to remove the fill.

I. Except as otherwise noted, violation of any of the terms of this amended permit shall be grounds for revocation. The Commission may revoke any permit for such violation after a public hearing held on reasonable notice to the permittee or its assignee if the permit has been effectively assigned. If the amended permit is revoked, the Commission may determine, if it deems appropriate, that all or part of any fill or structure placed pursuant to this amended permit shall be removed by the permittee or its assignee if the amended permit has been assigned.

J. This amended permit shall not take effect unless the permittee executes the original of this amended permit and returns it to the Commission within ten days after the date of the issuance of the amended permit. No work shall be done until the acknowledgment is duly executed and returned to the Commission.

K. Any area subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission under either the McAteer-Petris Act or the Suisun Marsh Preservation Act at the time the amended permit is granted or thereafter shall remain subject to that jurisdiction notwithstanding the placement of any fill or the implementation of any substantial change in use authorized by this amended permit.

L. Any area not subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission that becomes, as a result of any work or project authorized in this amended permit, subject to tidal action shall become subject to the Commission's "bay" jurisdiction up to the line of highest tidal action.

M. Unless the Commission directs otherwise, this amended permit shall become null and void, if any term, standard condition, or special condition of this amended permit shall be found illegal or unenforceable through the application of statute, administrative ruling, or court determination. If this amended permit becomes null and void, any fill or structures placed in reliance on this amended permit

shall be subject to removal by the permittee or its assignee if the amended permit has been assigned to the extent that the Commission determines that such removal is appropriate. Any uses authorized shall be terminated to the extent that the Commission determines that such uses should be terminated.

Executed at San Francisco, California, on behalf of the San Francisco Bay Conservation and Development Commission on the date first above written.

WILL TRAVIS
Executive Director
San Francisco Bay Conservation and
Development Commission

HI/LL/gg

cc: U. S. Army Corps of Engineers, Attn.: Regulatory Functions Branch
San Francisco Bay Regional Water Quality Control Board,
Attn.: Certification Section
Environmental Protection Agency, Attn.: Mike Monroe, W-3-3
State Lands Commission

* *

Receipt acknowledged, contents understood and agreed to:

Executed at _____ Cherokee San Francisco, LLC
Applicant

On _____ By: _____

_____
Title

APPENDIX C

Appendix C
Sampling and Analysis Plan

Appendix C

Sampling and Analysis Plan
Part I
Field Sampling Plan
Corrective Measures Implementation Workplan
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

Prepared by:
Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SITE DESCRIPTION AND HISTORY 1

3.0 FIELD ACTIVITIES AND SAMPLING OBJECTIVES 1
- 3.I Fieldwork Support 1
  - 3.1.1 Field Team 2
  - 3.1.2 Permits 2
  - 3.1.3 Site Access 2
  - 3.1.4 Project Coordination 2
- 3.2 Excavation Confirmation Sampling 3

4.0 SAMPLING EQUIPMENT AND PROCEDURES 3
- 4.1 Soil Sampling 3
- 4.2 Quality Control Sampling 4

5.0 SAMPLE HANDLING AND ANALYSIS 4
- 5.1 Sample Preparation 4
  - 5.1.1 Sample Containers, Preservation, and Holding Times 5
  - 5.1.2 Sample Labels 5
  - 5.1.3 Sample Collection Data Forms 5
  - 5.1.4 Field Activities Log Book 6
- 5.2 Sample Designation 6
  - 5.2.1 Primary, Duplicate, or Split Samples 6
- 5.3 Chain of Custody 7
- 5.4 Sample Shipping Procedures 7
- 5.5 Interaction with Laboratory 8

6.0 SAMPLE EQUIPMENT DECONTAMINATION 8

7.0 WASTE DISPOSAL 8

1.0 INTRODUCTION

This Field Sampling Plan (FSP) is intended to provide the methodology to collect and analyze field data during the performance of the Corrective Measures Implementation Workplan (Workplan) at the Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C. (Cherokee), property located at 450 E. Grand Avenue in South San Francisco, California (Property). This FSP was prepared by Henshaw Associates, Inc. (Henshaw).

This FSP provides detailed descriptions of objectives, methods and procedures to be used during the implementation of field activities at the Site. The Site Location Map and Site Plan are respectively shown on Figures 1 and 2 of the Workplan. The FSP is intended for use by the field investigation team.

Section 3.0 (Proposed Scope of Work) of the Workplan describes the specific field activities to be performed at the Site. This FSP will be implemented in conjunction with the entire Workplan. This FSP (Part I) and the Quality Assurance Project Plan (QAPP - Part II) together comprise the Sampling and Analysis Plan (SAP - Appendix C of the Workplan).

2.0 SITE DESCRIPTION AND HISTORY

The Property consists of 27-acres in South San Francisco, California, and lies approximately one mile east of Highway 101 at the eastern edge of Grand Avenue (Figure 1). The property is located in an industrialized area on the western shore of San Francisco Bay, within an area zoned for commercial and light industrial uses, and has housed paint manufacturing operations for over 100 years. Environmental conditions at the Property have been deemed by the United States Environmental Protection Agency (U.S. EPA) to merit Corrective Action.

The Property was originally owned by W.P. Fuller and was purchased in 1968 by the O'Brien Corporation. Recently, ICI Glidden purchased a portion of the Property from O'Brien, which was later purchased by Cherokee along with the remaining O'Brien property. Hence, Cherokee is the current and sole owner of the Property.

3.0 FIELD ACTIVITIES AND SMAPLING OBJECTIVES

3.1 Fieldwork Support

The *Project Manager,* or an assigned designee, is responsible for the coordination of all the activities described in Section 3.0 of the Workplan. The fieldwork support will provide the

necessary tools, scheduling, access, and support communications for all field efforts. These will include providing a field office as necessary, mobilizing to the Site, and demobilizing from the Site after the completion of field activities. Fieldwork support also includes obtaining sample support items such as sample packaging materials and express delivery services for shipping samples, as well as providing the necessary equipment and communications to conduct the fieldwork in compliance with the *Health and Safety Plan* (HSP). This support function also includes providing a secure storage for investigation derived residuals (IDR). IDR will be containerized, tested and disposed of in accordance with the *IDR Management Plan* as well as local, state, and federal requirements.

3.1.1 Field Team

The Field Team's organization, communication, and experience is the primary fieldwork support mechanism necessary to accomplish the field activities and sampling objectives. The *Project Manager* will oversee the subcontractor who will perform the tasks described in this FSP. Each member of the field team shall have appropriate background and experience in performing the assigned tasks. Project quality assurance authority is described in the *Quality Assurance Project Plan* (QAPP).

3.1.2 Permits

In order to perform the fieldwork in a manner consistent with applicable local, state, and federal regulations, one fieldwork support objective is to perform the work under applicable permits which may be required for a particular activity. All necessary permits, such as confined space entry and special discharge permits, will be obtained through the appropriate regulatory agencies.

3.1.3 Site Access

On-Site and off-Site access will be controlled according to procedures described in the *Access Plan*. The project team will provide the fieldwork support necessary to coordinate activities according to the *Access Plan*.

3.1.4 Project Coordination

Project coordination is an essential element of fieldwork support for accomplishment of safe and efficient fieldwork and attainment of sampling objectives. The *Project Manager* will maintain primary responsibility for project coordination among the City of South San Francisco, U.S. EPA, subcontractors, and the public.

3.2 Excavation Confirmation Sampling

The lateral extent of remedial excavations will be determined when the concentrations of contaminants of concern in confirmation samples collected from excavation sidewalls are below the cleanup criteria established by the EPA, or the excavation approaches the maximum expected high tide limits of San Francisco Bay. Confirmation samples will be collected from the base of the excavation during CM activities. The depth of the excavations will be extended until confirmation samples are below media cleanup standards or a depth of six inches into the bay mud underlying fill materials (estimated maximum depth from 10-12 feet) is reached. If excavations extend into the bay mud, any remaining contamination will be assumed to exist within impermeable materials and be immobile and functionally encapsulated.

Lead is the primary contaminant of concern in the areas proposed for excavation. During excavation activities, confirmation samples will be collected at the end of each day for analysis of total lead content with a field XRF to ascertain if CM goals have been met. The location and results of the XRF sampling will be recorded and included in a report documenting the completion of the CM. Additional field screening for volatile organic compounds (VOCs) with an organic vapor meter (OVM) may be conducted in areas where VOCs have been detected in groundwater. When XRF samples indicate that CM goals have been met, soil samples will be collected at 25-foot spacing along excavation sidewalls and at grid centers of a 25-foot spaced grid for analysis at a certified laboratory for lead, arsenic and semivolatile organic compounds (SVOCs). Soil samples will not be collected from the bottom of the EAs if the static groundwater level is above the excavation bottom. Rather, samples will be collected from the side-walls above the local groundwater elevation to confirm the extent to which excavation of the EA will be required.

4.0 SAMPLING EQUIPMENT AND PROCEDURES

4.1 Soil Sampling

Samples of soils will be collected as described in Section 3.2. To minimize human entry into the excavations, samples will be collected by the Supervisory Geologists from excavator buckets whenever possible. Sample containers will consist of glass jars.

4.2 Quality Control Sampling

Field quality assurance/quality control (QA/QC) samples for this Workplan may include replicate samples, trip blanks, split samples, and laboratory quality control samples. QA/QC samples will be collected and analyzed to establish quality control of laboratory analytical results.

One field replicate sample will be collected for every 10 soil samples collected. A field replicate sample consists of a single sample divided into two equal parts for analysis. When volatile organic analysis (VOA) replicate soil samples are collected, they will be sampled from adjacent locations (i.e., collocated) to reduce volatile losses resulting from sample handling. The non-VOC samples will be first combined into a stainless steel mix bowl. The soil will be mixed until homogenous. The samples will then be divided equally into two samples.

If VOC sampling is attempted, trip blanks will be collected to indicate any potential field contamination associated with volatile organic sampling. Trip blanks will be included at a frequency of one per shipment of soil and water samples during the course of volatile organic sampling. A trip blank is a volatile organic compound (VOC) sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the site, handled like a sample, and returned to the laboratory for analysis. The trip blank for soils is the same samples the one used for water.

5.0 SAMPLE HANDLING AND ANALYSIS

Sample handling and analysis procedures consists of sample preparation, sample designation, sample chain of custody, sample shipping procedures, and interaction with the analytical laboratory. With the assistance of the fieldwork support function, the sampling team will be responsible for collecting samples, preparing samples for shipment, completing all necessary paperwork, decontaminating sampling equipment, properly labeling samples, and completing sample collection data forms and COC forms. These forms will be completed using indelible ink. Any correction to a form will be made by drawing a line through the error and reentering the correct information, without obliterating the original entry. Anyone correcting an original form will initial and date all changes. Field documentation is described in detail below.

5.1 Sample Preparation

5.1.1 Sample Containers, Preservation, and Holding Times

Sample containers, preservation methods, and holding times for the various analyses are presented in the QAPP. All samples prepared in the field will follow these protocols. All sample vials and bottles containing preservatives must be so labeled by the laboratory before samples are collected. With the exception of samples that require special handling and preservation, all samples will be stored in coolers chilled to 4 degrees Celsius for shipment to the appropriate analytical laboratory. Sample containers will not be reused. Samples will be shipped to the laboratory within a time frame to allow for extraction and analysis to be performed within the holding times described in the QAPP.

5.1.2 Sample Labels

A sample label will be completed and attached to each sample container for every sample collected. Labels are made of a waterproof material backed with a water-resistant adhesive. Labels are to be filled out using waterproof ink, and are to contain at least the following information:

I. sampling date and time
II. sample identification number
III. investigation location
IV. sampler's initials
V. analyses to be conducted

5.1.3 Sample Collection Data Forms

During soil sampling field activities, appropriate field log forms will be completed by the individual collecting the data. These forms will contain pertinent project, excavation, and sample station location information.

The following information will be entered on sample collection data forms at the time of sampling:

I. project name and number
II. investigation location
III. sample identification number
IV. sampler's initials
V. time and date of sampling
VI. sampling method
VII. sample identification number

VIII. volume of each sample container
IX. laboratory analyses requested
X. observable conditions (e.g., color, odor, clarity)
XI. field conditions (e.g., recent precipitation, ambient temperature)
XII. equipment used

5.1.4 Field Activities Log Book

A field log book will be used to record daily field activities. This field log book will provide a general chronology of each day's field activities, and a record of personnel present at the Site. In addition, a description of all samples obtained will be included. This description may reference other documents prepared during the sampling day such as filed sampling logs, and other sample collection forms. Information will be recorded according to EPA protocols.

5.2 Sample Designation

5.2.1 Primary, Duplicate, or Split Samples

Each primary, duplicate, or split soil sample collected will be identified with an alphanumeric code. The first sequence of characters will be letters, and will identify the sample source:

Sample Source Code	Sample Source
EXB	Excavation Bottom
EXS	Excavation Side
RIN	Equipment Blank
TRA	Trip Blank

The next sequence of characters will be numbers, and will identify location number. All samples collected during the filed activities will begin with a series numerical system followed by a designation denoting the excavation area from which the sample was collected.
The next sequence of characters will also be numbers, and will identify the depth from which the sample was collected. For example, a soil sample collected from the bottom surface of excavation area 01 at a depth of 5 feet will be EXB-01-05.

The next sequence of characters for samples will identify the type of sample, as described below:

Sample Type Code	Sample Type
A	field sample
B	replicate sample

The next sequence of characters will be numbers, and will identify the order of sample collected from a particular depth within an excavation area. For example, EB-01-05-C-01 would denote the first confirmation soil sample at 5 feet. All information necessary to identify each sample, and the corresponding sample code, will be recorded on the appropriate field forms. Field replicate samples will be submitted blind to the laboratory.

5.3 Chain of Custody

COC will be prepared each day for each cooler for samples being shipped to analytical laboratories. Each COC will be prepared in triplicate and will accompany every shipment of samples to the laboratory.

One of the three copies will accompany the samples to the laboratory. One copy will be kept in the QA/QC file, and the one copy will be retained in the project file. The COC form makes provision for documenting sample integrity and the identity of any persons involved in sample transfer. Information entered on the COC will consist of the following:

I. project name and number
II. COC serial number
III. project location
IV. sample numbers
V. sampler/recorder's signature
VI. date and time of collection of each sample
VII. collection location
VIII. sample type
IX. analyses requested
X. inclusive dates of possession
XI. name of person receiving the sample
XII. date of receipt of sample
XIII. name, address, and telephone number of laboratory

A custody seal will be used when the samples are shipped through a common carrier (ie. Federal Express). As no chain-of-custody signature will document the shipment, a custody seal will be used on the outside of each cooler.

5.4 Sample Shipping Procedures

The method of shipment may be hand delivery by field personnel, laboratory courier, or commercial shipping services (such as UPS or Federal Express). The method of sample

shipment will be noted on the COC. If samples to be kept cool are to be held for longer than 24 hours, the samples will be placed in a refrigerator or similar insulated cooling container and maintained at approximately 4 degrees Celsius.

5.5 Interaction with the Laboratory

The *Project Manager* will interact with the laboratory for sampling schedules and to coordinate adequate laboratory availability. Field sampling activities will not start until the necessary laboratory equipment and personnel availability has been arranged. Once a shipment has been made, the laboratory will be contacted to provide specific information about the sample shipment, including the number of samples, types of samples, destination of samples, and analysis to be performed.

6.0 SAMPLING EQUIPMENT DECONTAMINATION

All equipment used during field activities that could possibly come into contact with potentially chemically affected materials will be thoroughly cleaned, before and after each use, with a three stage process by washing with Alconox (a laboratory-grade detergent) and water, potable water, and rinsing with deionized or distilled water. Decontamination procedures may be modified and/or revised based upon the data obtained, at the discretion of the *Project Manager.*

7.0 WASTE DISPOSAL

Methods and procedures regarding the management of investigation derived residuals (IDR) such as soil spoils, used personal protective equipment, used disposable sampling equipment, and other waste solids and liquids are discussed in the *IDR Management Plan.*

Appendix C

Sampling and Analysis Plan
Part II
Quality Assurance Project Plan
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

Prepared by:
Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

TABLE OF CONTENTS

1.0 INTRODUCTION 1
- 1.1 Purpose and Scope 1
- 1.2 Site Background 1

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 2
- 2.1 Project Organization 2
- 2.2 Responsibilities 2
  - 2.2.1 Project Manager 2
  - 2.2.2 Supervisory Geologist 2
  - 2.2.3 Quality Assurance Managers 3

2.3 Training 3

3.0 SAMPLE ANALYTICAL PROGRAM 3
- 3.1 Soil Sampling 3

4.0 DATA QUALITY OBJECTIVES 4
- 4.1 Accuracy 4
- 4.2 Precision 4
- 4.3 Completeness 5
- 4.4 Representativeness 5
- 4.5 Comparability 5
- 4.6 Method Reporting Limit 5

5.0 SAMPLING PROCEDURES 5
- 5.1 Sample Protocols 6
- 5.2 Sample Handling 6
  - 5.2.1 Sample Containers and Preservatives 6
  - 5.2.2 Labeling 6
  - 5.2.3 Sample Documentation 7
  - 5.2.4 Data Management 7
  - 5.2.5 Chain of Custody Documentation 8

6.0 SAMPLE CUSTODY PROCEDURES 8
- 6.1 Field Custody Procedures 8
- 6.2 Laboratory Custody Procedures 9

7.0 ANALYTICAL AND QUALITY CONTROL PROCEDURES 11
- 7.1 Analytical Procedures and Detection Quantitation Limits 11
  - 7.1.1 Analytical Methods 11

7.1.2 Method Detection Limits 11
7.1.3 Practical Detection Limits 12
7.1.4 Method Calibration 12
7.2 Calibration Procedures and Frequency 13
7.3 Preventative Maintenance 13
7.4 Internal Quality Control Checks and Frequency 14
7.4.1 Field Quality Control Samples 14
7.4.2 Field Measurements 15
7.4.3 Off Site Laboratory 15
7.5 Data Reduction 16
7.5.1 Field Data Reduction 17
7.5.2 Off-Site Laboratory Data Reduction 17
7.5.3 Field Data Reporting 18
7.5.4 Off-Site Laboratory Data Reporting 18

8.0 DATA QUALITY MANAGEMENT 19
8.1 Project Data Management Scheme 19
8.2 Data Validation 19
8.2.1 Field Data Validation 19
8.2.2 Laboratory Data Validation 20
8.3 Statistical Assessment of Data Quality 22
8.3.1 Precision 22
8.3.2 Accuracy 23
8.3.3 Data Completeness 24

9.0 QUALITY ASSURANCE OVERSIGHT 25
9.1 Performance and System Audits 25
9.2 Corrective Action Procedures 26
9.3 Quality Assurance Reports to Management 27

10.0 REFERENCES 27

1.0 INTRODUCTION

The Property is located at 450 East Grand Avenue in South San Francisco, California (Figure 1).

1.1 Purpose and Scope

This Quality Assurance Project Plan (QAPP) describes the policy, organization, functional activities for quality assurance and quality control. Quality assurance (QA) refers to the overall system of activities providing assurance that reliable data have been generated during sampling and analysis. Quality control (QC) is defined as the specific actions taken to ensure that system performance is consistent with established limits. Quality control actions ensure the precision, accuracy, and completeness of analytical data.

The primary objectives of this QAPP are to describe the overall QC measures that will be implemented to ensure that field and laboratory activities will generate reliable data, to recognize deficiencies that may affect the quality of data, and to provide corrective actions where necessary. The QAPP will be used to ensure that proper quality assurance and quality control procedures are implemented during all phases of data acquisition, analysis, and evaluation for the Site and vicinity. The QAPP contains the following sections:

- Section 1.0 - Introduction
- Section 2.0 - Project Organization and Responsibilities
- Section 3.0 - Data Quality Objectives (DQOs) For Measurement Data
- Section 4.0 - Sampling Procedures
- Section 5.0 - Sample Custody
- Section 6.0 - Analytical and Quality Control Procedures
- Section 7.0 - Data Quality Management
- Section 8.0 - Quality Assurance Oversight
- Section 9.0 - References

1.2 Site Background

The Property consists of 27-acres in South San Francisco, California, and lies approximately one mile east of Highway 101 at the eastern edge of Grand Avenue (Figure 1). The property is located in an industrialized area on the western shore of San Francisco Bay, within an area zoned for commercial and light industrial uses, and has housed paint manufacturing operations for over 100 years. Environmental conditions at

the Property have been deemed by the United States Environmental Protection Agency (U.S. EPA) to merit Corrective Action.

The Property was originally owned by W.P. Fuller and was purchased in 1968 by the O'Brien Corporation. Recently, ICI Glidden purchased a portion of the Property from O'Brien, which was later purchased by Cherokee along with the remaining O'Brien property. Hence, Cherokee is the current and sole owner of the Property.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section describes the organizational structure, levels of authority among key personnel, and lines of communication for activities affecting QA/QC.

2.1 Project Organization

The specific responsibilities of the key staff are presented below:

Project Manager:	Michael Harrison, P.E.
Supervisory Geologist:	Dana Brown
Quality Assurance Manager:	Michael Harrison, P.E.

2.2 Responsibilities

The following subsections describe the responsibilities of key personnel for this QAPP.

2.2.1 Project Manager

Project Manager - Michael Harrison, P.E. is the *Project Manager* and is responsible for overall QA/QC program direction. Mr. Harrison ensures that the Workplan program meets its objectives and contractual commitments. Mr. Harrison will review QA reports, approve final project QC needs, and authorize necessary actions and adjustments to accomplish program QA objectives.

2.2.2 Supervisory Geologist

Supervisory Geologist - Mr. Dana Brown, CEA is the *Supervisory Geologist.* He reports to the *Project Manager* and is responsible for providing technical direction to the other Leaders and Managers, and assisting the *Project Manager* by managing the technical project activities. Mr. Brown has direct management responsibility and authority for cost, schedule, quality, and technical performance of activities performed in support of this program and is responsible for implementing this QAPP. The *Supervisory Geologist*

is the primary point of contact with the *Project Manager* for all project communication and correspondence.

2.2.3 Quality Assurance Manager

Quality Assurance (QA) Managers - Mr. Michael Harrison, P.E. is the *QA Manager.* He report to the *Project Manager* and *Supervisory Geologist,* and provides direction and assistance to the *Team Leaders* in establishing, implementing, and verifying compliance with the QAPP. The *QA Manager* shall approve QA and technical procedures and contract QA deliverables. *QA Manager* shall be responsible for auditing project activities to verify conformance with QA objectives and for informing the *Project Manager* and *Supervisory Geologist* of audit results, including QA deficiencies. The *QA Manager* has the authority and organizational freedom to identify problems, initiate or provide solutions, verify implementation of solutions, and order work stoppage, if necessary.

2.3 Training

The *Supervisory Geologist* and *Project Manager* will review the capabilities and qualifications of the consultants' and contractors' personnel to perform the assigned task. If personnel qualifications, including education, experience, and training, do not meet project needs, appropriate training will be performed or other appropriately qualified individuals will be assigned to perform the task. Personnel qualifications shall be reviewed by the *Supervisory Geologist* and *Project Manager* for approval to work on a given task.

3.0 SAMPLE ANALYTICAL PROGRAM

3.1 Soil Sampling

Soil samples will be collected and analyzed for chemical specific compounds as outlined in Section 4 of the Workplan, in accordance with the methodology set forth in EPA, *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods,* (SW-846), Third Edition of SW-846 with Update I (pages dated September 1992), Update IIA (pages dated August 1993), Update II (pages dated September 1994), Update IIB (pages dated January 1995), and Update III (pages dated December 1996). Soil samples will be analyzed for SVOCs using EPA Method 8270B, and for lead and arsenic using EPA Methods 6000/7000 series. Analytes and reporting limits (RLs) are in accordance with the EPA's laboratory standards.

4.0 DATA QUALITY OBJECTIVES (DQOs) FOR MEASUREMENT DATA

Data Quality Objectives (DQOs) are qualitative and quantitative statements developed by data users to specify the quality of data needed from a particular data collection activity to support specific decisions or regulatory actions. The process for developing DQOs is described in *Data Quality Objectives for Remedial Activities*, EPA 1987.

Data will be gathered during the Workplan activities that will be used to decide whether Corrective Measures have been successfully completed. To support this decision, data must be provided that is scientifically sound, defensible, and of known, acceptable and documented quality. To provide data of this quality, the following will take place:

- Use standard operating procedures for sampling, chain-of-custody, calibration, preventive maintenance, laboratory analysis, reporting, validation, internal QC, audits, and corrective action.

- Set quantitative goals and units of expression for precision, accuracy, and completeness for each measurement parameter.

- Set quantitative goals for representativeness and comparability.

The specific operating procedures to be used during the Workplan activities are described in detail in the Field Sampling Plan. A qualitative description of precision, accuracy, representativeness, completeness, and comparability parameters are discussed below. The quantitative description of precision, accuracy, representativeness, completeness, and comparability parameters are discussed in Section 8.3.

4.1 Accuracy

A measurement of the bias in a system. Accuracy will be assessed through the evaluation of the percent recoveries associated with laboratory control samples, and matrix spikes.

4.2 Precision

A measurement of the reproducibility of data under a specified set of conditions. Precision is a quantitative measure that will assess the variability of a data set in reference to the calculated average value. Precision will be assessed by the evaluation of the day-to-day variances in the laboratory control samples. Control charts will be used to monitor the variations in the precision.

4.3 Completeness

The percentage of measurements evaluated and judged to be valid. For this project, the QA objectives for completeness are 95 and 90 percent for each analyte by matrix by analytical method, for water and soil, respectively.

4.4 Representativeness

A qualitative measure used to determine the degree to which obtained data correlate to the population sampled. The evaluation of this parameter will be measured through the precision of the analysis of field replicate samples. If the precision of field replicates is high, it can be determined that the samples collected were representative of the site. However, if the media sampled is naturally heterogeneous, then the precision of field replicates may be poor, but the data may still be representative of the sites condition. Generally though, when precision is poor, additional samples may need to be collected.

4.5 Comparability

A qualitative measure assessing the confidence with which data sets obtained for similar samples and sample conditions can be correlated. Comparability is determined by the adherence of different laboratories and different sampling teams, to standard sampling protocols and analytical methods, as well as the use of traceable calibration standards, and the same reporting units. By having the various laboratories participate in a performance evaluation program, comparability **can be determined.**

4.6 Method Reporting Limits

Method reporting limits for the media and analysis methods proposed will follow EPA laboratory guidelines.

5.0 SAMPLING PROCEDURES

Proposed field activities to be conducted in support of the Workplan at the Site include: collection/analysis of soil samples and waste characterization sampling. Detailed descriptions of sampling procedures are included in the FSP. Drum and investigation derived residuals (IDR) sampling procedures are described in the IDR Plan.

5.1 Sampling Protocols

Field activities shall be conducted in accordance with the methods specified in the FSP. Sampling locations, and analytical parameters for the Workplan will be determined based on field observations, background documentation, and/or field screening results. A detailed discussion of the environmental media, sampling procedures, and specific sampling locations is fully documented in the Work Plan and FSP. The FSP outlines the general methodologies to be followed for each activity on a project-wide basis.

5.2 Sample Handling

5.2.1 Sample Containers and Preservation

Containers will be cleaned by the selected project laboratory in accordance with procedures dictated by the specific method of analysis to be performed. Appropriate preservatives will be added to samples that require preservation to inhibit degradation of sample constituents during transport and storage. Coolants will also be used to maintain internal cooler temperatures required for preservation during transport. The clean sample containers will be accompanied by a chain of custody form, and the receptacle used to ship the containers will be custody-sealed.

5.2.2 Labeling

Each sample will be assigned a unique sequential number at the time of sampling as discussed in the FSP. The number will be affixed to the sample container with an adhesive label. The labels will be covered with clear tape to help prevent damage to the label during shipment and will include the following information when applicable:

- Sample number
- Sampling date
- Preservative
- Filtered or unfiltered
- Analyte(s)
- Sampler's name
- Project name

5.2.3 Sample Documentation

Bound logbooks with sequentially numbered pages will be used for all record keeping in the field and laboratory. The use of the bound logbook will result in a chronological sequence of data entries. Entries will be recorded using indelible ink. Correction to entries will be made by drawing a single line through the incorrect entry, recording the correct information, and initialing and dating the corrected entry. If computerized information is used or original field forms, a hard copy, which has been permanently affixed to the logbook, will be acceptable as an original record of sampling and laboratory logging.

The following information shall be recorded for field activities:

- Location
- Date and time
- Identity of persons performing the activity
- Weather conditions

The following information shall be recorded for field measurements:

- The numerical value and units of each measurement
- The calibration results for each field instrument

The following information shall be recorded for sampling activities:

- Sample type and method
- Sample identification number and depth(s) of sample, if applicable
- Time of measurement
- The quantity/volume of each sample
- Sample description (e.g., color, odor, and texture)
- Type of sampling device used
- Discussion of conditions that may affect the representativeness of a sample (e.g., damaged casing)

5.2.4 Data Management

A relational database computer system will be designed to store data in a readily retrievable manner. To ensure that the data collection and field documentation procedures for this investigation meet the data management requirements, the information provided below will be included in the field logbook or appropriate data entry forms. Field personnel will familiarize themselves with the data management

requirements before initiating any field activities. Copies of each of the following forms will be supplied upon request.

Field data pertaining to environmental sampling events shall include:

- Location identification
- Date and time
- Field Personnel
- Sample matrix
- Sample designation
- Sample method
- Beginning depth
- Ending depth
- Sample type
- Remarks

5.2.5 Chain of Custody Documentation

Evidence of sample custody will be traceable from the time the sample is collected until the filled sample bottles are in the possession of the laboratory and the requested analysis has been performed. To achieve this accountability, field personnel will complete chain of custody (COC) forms (triplicate copies) and affix COC seals to each sample shipment container. Field personnel will not leave samples unattended and will relinquish samples only to the laboratory sample custodian or an authorized shipping agent. A custody seal on the sample cooler will be used when the samples are shipped through a common carrier (ie. Federal Express). As no chain-of-custody signature documents this shipment, a custody seal will be used on the outside of each cooler.

6.0 SAMPLE CUSTODY PROCEDURES

6.1 Field Custody Procedures

Sample custody will begin, in all cases, at the time of sample collection. Samples will be placed into an iced cooler, or appropriate container, in the possession of the field leader or appropriate designee. A line item on the field COC form will be completed immediately after sample collection and initialed by the designated field sample custodian.

Upon completing the line items, or after sample pickup, the samplers will sign, date, list the time, and confirm the completeness of all descriptive information contained on the COC form. Each individual who subsequently assumes responsibility for the samples

will sign and date the COC form, and will record the reason for assuming custody. The field COC form terminates upon laboratory receipt of samples.

One copy of the COC forms will be given to the laboratory sample custodian when samples are submitted to the laboratory. One copy will be retained by the Team Leader. The original copy will be transmitted by the laboratory once the laboratory has received the samples. The field personnel will retain the original with the project files and will submit the information as a deliverable at the completion of the project.

When samples are shipped to the laboratory, a COC form must accompany each shipment. When shipping chilled samples in coolers, the sample containers will be packed securely, sample documentation (i.e., COC forms) will be placed in a sealed plastic bag, coolers will have COC seals affixed and be well sealed, and the cooler containing the COC papers will be marked (e.g., the master air bill will be affixed to the cooler containing the COC forms).

6.2 Laboratory Custody Procedures

Samples delivered to the approved laboratory will be accepted by the laboratory sample custodian or an appropriate designee during laboratory operating hours. The laboratory sample custodian will be responsible for maintaining custody of the samples and all associated paperwork documenting custody. Laboratory sample management will be initiated using the following sequence of events:

1. The carrier and the time of arrival will be documented in the daily receipt log. The number of items on the air bill will be checked with the actual number received to ensure that all coolers arrived.

2. Notation will be made as to whether the sample cooler was sealed.

3. The cooler will be opened, the internal ambient temperature of the cooler taken and noted on the COC, and the samples itemized. All deviations from the COC form will be noted and reported to the *Laboratory QA Manager.*

4. Samples will be assigned a unique sample laboratory identification number. The laboratory identification number and corresponding field identification number will be logged into a laboratory custody log.

5. Once the samples have been transmitted into the laboratory, the following sequence of events will occur:

a. The samples will be recorded on the Sample Log-in Form to summarize all the information pertaining to the sample/order and to instruct the laboratory on the proper analysis and reporting of samples.

b. After the samples are logged in, they will be assigned to the appropriate storage refrigerator.

c. The laboratory sample custodian will be responsible for ensuring that all transfers of samples into and out of storage will be documented in the sample custody log. The laboratory project coordinator, or appropriate designee, will be responsible for reviewing the sample custody log at the end of each day to ensure that appropriate sample custody procedures have been maintained.

d. Samples will remain in secured storage until removed for analysis. Whenever samples are removed for analysis, the names of the individuals who receive the samples will be entered in the sample custody log by the laboratory sample custodian, including the date and time the transfer occurred.

e. To ensure refrigerators are operating at the appropriate temperature, a refrigeration log will be maintained. Refrigerator temperature will be checked daily, seven days per week. The log will indicate the ambient internal temperatures as well as the initials of the person recording the reading and the date. Should the temperature fluctuate outside of the specified temperature range, corrective action will be taken immediately.

After the sample has been analyzed, a laboratory lot control number will be assigned to the sample. All samples within a given laboratory analysis group (i.e., samples sharing the same QC samples) will have the same laboratory lot control number.

7.0 ANALYTICAL AND QUALITY CONTROL PROCEDURES

Collection of representative field samples require strict adherence to established procedures. The following subsections discusses analytical and quality control procedures to ensure high quality data.

7.1 Analytical Procedures and Detection Quantitation Limits

During the activities conducted for this Site, chemical analysis and physical characteristics will be measured by on-Site field sampling teams and off-Site analytical chemistry. Off-Site analytical chemistry and geotechnical laboratories will be appropriately certified and will be approved by the *Project Manager*.

Personnel conducting field screening analysis will follow all field screening protocols outlined within Section 4 of the FSP. Parameters for which the FSP has not established procedure will be analyzed with a method that meets the objectives of this project.

7.1.1 Analytical Methods

Analytical procedures will generally be conducted in accordance with the methodology set forth in EPA, *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods,* (SW-846), Third Edition of SW-846 with Update I (pages dated September 1992), Update IIA (pages dated August 1993), Update II (pages dated September 1994), Update IIB (pages dated January 1995), and Update III (pages dated December 1996); unless otherwise approved by Henshaw. In some instances, the analytical methods contained in SW-846 may not meet the project-specific DQOs (e.g., detection limits may be greater than applicable or relevant and appropriate requirements). If the use of alternate analytical methods is deemed necessary, the modified method(s) will be included in the site-specific SAP. Table 2 provides a summary of the analytical methods that will typically be used for analyses of concern.

7.1.2 Method Detection Limits

The method detection limit (MDL) is the lowest concentration at which a particular analyte can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero. The MDL should be determined by multiplying the appropriate one-sided 99 percent t-statistic by the standard deviation obtained from a minimum of seven analyses of a matrix spike containing the analyte of interest at a concentration of three to five times the estimated MDL. MDLs for each target analyte will be determined by the analytical laboratory using the applicable SW-846 protocol or the method specified in *40 Code of Federal Regulations (CFR) Part 136, Appendix B*. The laboratory then develops individual Reporting Limits (RLs) which represent concentration levels that can be consistently obtained by the specified method, and are generally two to five time the applicable MDLs. RLs specific to the selected project laboratory and analytical methods are in accordance with EPA guidelines.

7.1.3 Practical Quantitation Limits

As specified in SW-846, practical quantitation limits (PQLs), also referred to as the estimated quantitation limits (EQLs), are defined as the lowest level of quantitation that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The PQL or EQL is generally five to ten times the MDL, but may be nominally selected within these guidelines to simplify data reporting. The laboratories must demonstrate that PQLs are routinely and reliably achieved by analyzing a calibration standard that is below the PQL for each analyte. Certified laboratories are expected to routinely achieve PQLs for SW-846 analytical methods.

7.1.4 Method Calibration

At a minimum of once daily or if the instrument exceeds calibration limits, chemical calibration of each target analyte will be performed to ensure that the analytical instrumentation is functioning within the established sensitivity range. All analytes specified in the FSP must be present in the initial and continuing calibrations, and these calibrations must meet the acceptance criteria specified by the respective method. The laboratories must demonstrate that PQLs are routinely and reliably achieved by analyzing a calibration standard that is below the PQL for each analyte. An accepted variance will allow the lowest standard to be equal to the PQL for SW846 Methods 8260B. Calibration standards and solutions will be of known concentration and purity to achieve the criteria necessary for validation of the analytical results. Inorganic standards must conform to the National Institute of Standards and Technology (NIST) Central QA Laboratory. Organic standards must conform to materials certified by the Cooperative Research and Development Agreement (CRADA), NIST, or Contract Laboratory Program-Standard Reference Material.

Standards used in this program will be prepared and maintained under the normal laboratory standards tracking system, which ensures preparation, checking, documentation, storage, and disposal of standards according to method specified procedures and schedules.

7.2 Calibration Procedures And Frequency

Calibration procedures establish the relationship between a calibration standard(s) and the measurement of that standard by an instrument or analytical procedure.

All field equipment will be calibrated according to the manufacturer's schedule or, at a minimum, prior to use in the field. If a schedule is not provided by the manufacturer, the calibration group servicing the equipment will provide a written calibration and maintenance frequency. Calibrations will follow the manufacturer's instructions for equipment calibration and maintenance. A record of the instrument calibration will be

maintained by the Team Leader. Calibration procedures and frequency for field equipment will be supplied upon request. Procedures for calibrating any additional or different field equipment will be included in the FSP.

7.3 Preventative Maintenance

A preventive maintenance plan allows for periodic instrument checks for problems that occur frequently. The objective of a preventive maintenance plan is to rectify equipment problems before they become serious. Preventive maintenance also brings attention to those areas of the instrument susceptible to degradation from aging, toxic/corrosive effects, and clogging due to environmental factors.

Procedures for preventive maintenance are contained in each instrument's manual under the maintenance/troubleshooting sections. Each piece of equipment will have an associated SOP detailing the calibration/maintenance instructions. Equipment failing calibration specifications will be identified with a red warning label and will not be used for sample analysis.

Equipment requiring calibration will have an assigned record number that is permanently affixed to the instrument. A label will be affixed to each instrument containing the following information:

- Description
- Manufacturer
- Model number
- Serial number
- Date of last calibration or maintenance
- Name of person who performed calibration or maintenance
- Date of next servicing

Should the selected contract laboratory have a more stringent preventive maintenance plan, then the *Laboratory QA Manager or the Project Manager* may approve the laboratories plan.

7.4 Internal Quality Control Checks and Frequency

Field and Laboratory QC data are necessary to determine precision and accuracy of the analyses. At least 10 percent of each data set generated will be composed of field and laboratory QC data. Field QC samples for this project will consist of trip blanks, ambient condition blanks, equipment blanks, duplicates/splits, replicates, and laboratory quality

control samples. Laboratory QC samples will consist of method blanks, standards, laboratory control samples, matrix spikes, and surrogate spikes.

A discussion of field and laboratory control samples including frequency of analysis is provided in the following sections. A summary of laboratory internal quality control procedures including acceptance criteria and corrective action is available upon request.

7.4.1 Field Quality Control Samples

Quality control samples ensure that the sampling and analytical systems used in support of project activities are in control, and verify the quality of the data generated from these activities. Quality control samples for this project will consist of trip blanks, ambient condition blanks, equipment blanks, duplicates/splits, replicates, and laboratory quality control samples.

- One field replicate sample will be collected for every 10 soil samples collected. A field replicate sample consists of a single sample divided into two equal parts for analysis. When volatile organic analysis (VOA) replicate soil samples are collected, they will be sampled from adjacent locations (i.e., collocated) to reduce volatile losses resulting from sample handling. Field duplicate relative percent difference (RPD) will be calculated as detailed in section 8.3. Field duplicate RPD goals are defined as within 25% for detections of chemicals in both samples of the duplicate set at concentrations greater then the lowest standard used to define the laboratory calibration curve. The lowest standard on the laboratory calibration curve shall be run at the method detection limits determined by EPA guidelines.

- Trip blanks will be collected to indicate any potential field contamination associated with volatile organic sampling. Trip blanks will be included at a frequency of one per container (cooler) of soil samples during the course of volatile organic sampling. A trip blank is a volatile organic compound (VOC) sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the site, handled like a sample, and returned to the laboratory for analysis. The trip blank for soils is identical to the one used for water.

- Equipment blanks will be used to provide information on the extent of potential cross-contamination at the Site. Equipment blanks will be collected at a frequency of one per day, per team, per matrix or a minimum of 10% of the samples collected. Additional equipment blanks may be collected after decontamination of suspected highly contaminated samples. An equipment blank consists of ASTM Type II reagent grade water that is poured through or over the

purging or sampling device, transferred to a sample bottle, and transported to the laboratory for analysis. The equipment blank should be poured immediately after the equipment has been decontaminated.

7.4.2 Field Measurements

Numerous field measurements will be performed as part of the Workplan activities. These field measurements and associated QC checks are listed below.

- Field measurements of lead by XRF. Ten percent will be measured in duplicate.

- Total organic vapor screening (headspace using a PID) - Ten percent will be measured in duplicate.

7.4.3 Off Site Laboratory

Laboratory QC samples will consist of method blanks, standards, laboratory control samples, matrix spikes, matrix spike duplicate, and surrogate spikes.

- Method blanks are used to detect laboratory-related contamination. These blanks identify and minimize interferences caused by solvents, reagents, glassware, or other equipment used in the laboratory's sample preparation and analytical measurement process. A method blank consists of a volume of deionized or distilled laboratory water for organic water samples and inorganic soil samples, or a purified solid matrix for organic soil/sediment samples, which is carried through the entire analytical process. The method blank volume or weight must be approximately equal to that of the samples being processed. Method blanks will be analyzed at a minimum frequency of one per batch. The concentration of target compounds in the blank must be less than the PQL. If the blank exceeds the above criteria, the source of the contamination must be identified and appropriate corrective action taken, including reanalysis of the sample group.

- Laboratory control samples (LCSs) consist of blank spikes. Blank spikes are used to determine the accuracy of the analytical procedure by measuring a known concentration of an analyte of interest. LCSs will be analyzed at a minimum frequency of one per batch.

- Surrogate spike analyses are used to determine the efficiency of analyte recovery in organic sample preparation and analyses. Surrogate standard determinations are performed for all organic standards, samples, and blanks. Each organic

standard, sample, matrix spike, matrix spike duplicate, LCS, and blank, is spiked with surrogate compounds prior to purging or extraction. The surrogate spiking compounds are used to fortify the sample(s) with the proper concentrations. Surrogate spike recoveries must fall within the limits established by the laboratory QA plan and the analytical method. If a surrogate spike recovery is outside of acceptable ranges, corrective action must be taken.

- MS/MSD analyses are conducted to evaluate the matrix effect of the sample on the analytical method. The MS/MSD consists of a pair of samples with a known amount of analyte added in the laboratory. MS/MSD analyses must be performed at a minimum frequency of one per each group of 20 samples of the same matrix. To perform MS/MSD analyses, it is necessary to collect triplicate sample volume in the field for one sample out of every 20. Two volumes of the sample will be spiked with a standard solution containing all the target analytes; the third sample volume will be analyzed normally, without spiking. The samples are analyzed and the concentrations found in the spiked samples are used to determine the precision as measured by the percent difference. If the relative percent difference is greater than 20 percent, appropriate corrective action should be taken, including reanalysis, if necessary. Accuracy is also measured by determining the percent recovery of the spiked compound compared to the actual level that was spiked. The percent recovery must fall within the range established by the laboratory.

7.5 Data Reduction and Reporting

In order to ensure proper data management activities and provide an accurate and controlled flow of data, it is important that data is handled and reported in a concise and useable format. Data management procedures are applicable to field- and laboratory-generated data.

7.5.1 Field Data Reduction

Data generated in the field will be recorded in task-specific field notebook or on customized field data sheets. Should separate data sheets be used, then the sheets shall be attached to the field notebook. Should calculations be performed in the field, then they shall be clearly recorded. The respective *Team Leader* will be responsible for the review of all field documentation to ensure completeness and legibility.

7.5.2 *Off-Site Laboratory Data Reduction*

The analytical data are initially collected, converted to standard reporting units, and recorded in standard formats by the project analysts. These project analysts conduct preliminary data analysis using a variety of methods and procedures. Because many analytical instruments are microprocessor controlled, some of the requisite analyses can be performed directly in the instrument's operating or outputting mode. Those instruments interfaced to stand-alone computers or microprocessors often permit data analysis programs to be written and modified to produce data formats specifically suited to end user requirements.

Data requiring manual recording, integration, and/or analysis may be converted to a more appropriate format prior to subsequent analyses. Through all stages and aspects of data processing, the data are double checked for translation or transcription errors and are initialed by both the recorder and the checker. The *QA Manager*, or other designated individual not directly involved in the analysis, will review the data for acceptability.

Data reduction frequently includes computation of analytical results from raw instrument data and summary statistics, including standard errors, confidence intervals, test of hypothesis relative to the parameters, and model validation.

Data reduction procedures used by the laboratory will address the reliability of computations and the overall correctness of the data reduction. The numerical transformation algorithms used for data reduction will be verified against a known problem set to ensure that the reduction methods are correct.

The equations and the typical calculation sequence that is followed to reduce the data to the acceptable format is instrument- and method-specific. Where standard methods are modified, data reduction techniques will be described in a report accompanying the data.

Auxiliary data produced for internal records and not reported as part of the analytical data include the following: laboratory worksheets, laboratory notebooks, sample tracking system forms, instrument logs, standard records, maintenance records, calibration records, and associated quality control records. These sources will document data reduction and will be available for inspection during audits and to determine the validity of data.

Outliers will be identified according to laboratory control charts, and the rationale used for data acceptance or rejection will be described and documented.

7.5.3 *Field Data Reporting*

Field data will be reported in the appropriate formats including field logbooks, sample tags, chain-of-custody forms, and field data sheets. As a general guideline the following minimum standards should be maintained:

- Documentation will be completed in permanent black ink.
- Enteries will be legible.
- Errors will be corrected by crossing out with a single line, dating, and initialing.
- Any serialized documents will be maintained on-site and referenced in the Site Logbook.
- Final field data will be reviewed by the *Team Leader* prior to database entry.

7.5.4 *Off-Site Laboratory Data Reporting*

All analytical results will be reported in the laboratories' approved format. In addition to the reported data, the laboratory data report will, at a minimum, include a narrative that will discuss any problems or discrepancies, and sufficient calibration and QC information to determine that the method was in control at the time that the samples were analyzed. In addition to the hard-copy report requirements the laboratory will provide electronic deliverables conforming to an ASCII comma-delimited format.

Laboratory data will be reported in the appropriate unit of concentration depending upon the matrix and type of analysis. Generally, concentrations in solids will be reported in milligrams per kilogram (mg/kg). Premature rounding of intermediate results can significantly affect the final result. Therefore, the reported results will be rounded to the correct number of significant figures only after all calculations and manipulations are completed. As many significant figures as are warranted by the analytical method will be used in pre-reporting calculations.

Before being released by the laboratory, all analytical data and quality control data generated by the laboratory will be reviewed by the analyst. The data are checked for the following: transcription errors, calculation accuracy and dilution factors, and compliance with QC requirements. Failure to meet method performance QC criteria will result in the reanalysis of the sample or lot. After the data have been reviewed, they are assembled

into a data package. The final laboratory data package will be reviewed by the Laboratory QA Manager before delivery.

8.0 DATA QUALITY MANAGEMENT

This section discusses the data management scheme, data validation, and procedures for statistical evaluation of the data quality.

8.1 Project Data Management Scheme

The project data management scheme to be adopted for this QAPP conforms to the guidelines set for the QAPP data management as indicated in the *Guidance for Conducting RI/FS under CERLCA* (EPA 1988). Specific aspects of the data management scheme are discussed below.

8.2 Data Validation

The data validation process is used to screen data and accept, reject, or qualify data on the basis of sound criteria. Data will be validated, as appropriate, based on holding times, initial calibration, continuing calibration, blank results, and other QC sample results.

8.2.1 Field Data Validation

To ensure the validity of data gathered in conjunction with the Site field activities, all situations need to be in control for all aspects of the project. Periodic audits will be conducted to monitor adherence to SOPs, QC protocols, and general program policies and protocols.

Factors affecting out-of-control conditions can usually be traced to sampling or laboratory activities. The following sections are examples of specific conditions that result in out-of-control situations. Corrective action requirements are discussed in Section 8.2.

Areas in which out-of-control situations have the potential to occur include:

- Improper sampling techniques
- Inappropriate sample identification
- Improper sample storage and preservation
- Nonconformance to appropriate COC protocols

8.2.2 Laboratory Data Validation

Data validation is the process of reviewing data and accepting, qualifying, or rejecting data on the basis of sound criteria using established EPA guidelines. An analyst at the laboratory, other than the original data processor, will be responsible for reviewing all steps of data processing. All input parameters, calibrations, calculations, and transcriptions will be carefully checked prior to the laboratory reporting the results. The analyst's supervisor at the laboratory will check a minimum of 10 percent of all calculations from the raw to final data prior to releasing the analytical report.

The QC sample results (e.g., laboratory control standards, surrogates, initial calibration standards, continuing calibration standards, etc.) will be compared against project specific accuracy and precision criteria. The QC data must meet acceptance levels prior to processing the analytical data. If QC standards are not met, the cause must be ascertained and appropriate corrective action must be taken. If the noncompliant situation can be rectified without affecting the integrity of the data, data processing will proceed. If resolution of the problem will jeopardize the integrity of the data, the sample in question must be reanalyzed. If reanalysis fails to correct the problem, the data will be flagged to indicate that the data are out of control. The internal review checks will be documented in the batch report and data review form in each data package.

A minimum of 25% of the data generated during the Workplan activities will be validated by an independent data validator, designated by the Project Manager. The data validation approach will consist of a systematic review of the analytical results, associated QC methods and results, and all of the supporting data. Best professional judgement in any area not specifically addressed by EPA guidelines will be utilized as necessary.

The following items may be reviewed by the *Laboratory Data Validator* to validate the data:

- Sample holding times
- Documentation that the analytical results are in control and within the certified range
- Documentation that data and calculations were checked by a reviewer who was not involved in the performance of sampling, analysis, or data reduction
- Calibration of methods and instruments
- Routine instrument checks (e.g., calibration, control samples, etc.)
- Documentation on traceability of instrument standards, samples, and data
- Documentation on analytical methodology and QC methodology
- The potential presence of interferences in analytical methods (check of reference blanks and spike recoveries)

- Documentation of routine maintenance activity to ensure analytical reliability
- Documentation of sample preservation and transport

All data generated will be assessed for accuracy, precision, and completeness. Data assessment techniques will include routine quality control checks and system audits. Precision will be assessed from analysis of duplicates and/or replicates of the same parameter at different times. Control charts will be maintained to provide a timely assessment of precision for measurement function. Accuracy will be assessed from analysis of samples spiked with known concentrations of reference materials. The assessment for accuracy will be independent of the routine calibration process (i.e., reference materials will be obtained from independent sources and will be prepared independently).

If an analyte is detected above the PQL in a method blank, that analyte will be flagged with a "B" for every sample in that batch. The batch will then be assessed to determine if that analyte data is usable or not, taking into consideration the type of contaminant (i.e., known lab contaminant) and its level.

The tables in SW-846, ASTM, and EPA methods will be used to validate the definitive data. Professional judgment will be applied in accordance with these guidelines. A data validation summary that describes all validated data will be prepared and submitted to the *Laboratory QA Manager* for each set of validated analytical data.

8.3 Statistical Assessment of Data Quality

The routine procedures used to assess data are precision, accuracy, and completeness. Specific formulas used to quantitatively define these parameters are presented in the following sections.

8.3.1 Precision

Precision is a measurement of the reproducibility of data under a specified set of conditions. For this project, precision will be evaluated in conjunction with accuracy for the LCS samples. If the accuracy is good, the precision is good. Precision will be determined for matrix effects using the MS/MSD samples. Precision will be expressed as relative percent difference (RPD) or relative standard deviation (RSD).

RPD is defined as:

$$RPD = \frac{(C_1 - C_2) \times 100\ \%}{}$$

$(C_1 + C_2)/2$

where C_1 and C_2 are the larger and smaller of the two duplicate values, respectively.

RSD is defined as:

$$RSD = \frac{s}{y_{mean}} \times 100\%$$

where s = standard deviation and y_{mean} = mean of replicate analyses.

Acceptable levels of precision vary with the sample matrix, analytical method, and sample concentration. EPA precision data will be used as a basis for developing acceptance criteria for assessing precision; however, laboratory control charts must be developed and used to determine acceptance criteria for the LCS samples. The acceptance criteria for precision are available upon request.

8.3.2 Accuracy

Accuracy is a measurement of the bias in a system. The accuracy of sampling data for this project will be determined through the use of laboratory control samples. Accuracy is generally expressed as percent recovery (%R), which is defined as:

$$\%R = 100\% \times \left(\frac{s - U}{C_{sa}} \right)$$

where,
s = measured concentration of spiked aliquot
U = measured concentration of unspiked aliquot
C_{sa} = actual concentration of spike added.

If a standard reference material (SRM) is used instead of or in addition to laboratory control samples, accuracy is defined as:

$$\%R = 100\% \times \left(\frac{C_m}{C_{sm}} \right)$$

where, C_m = measured concentration of SRM in the spiked sample and C_{srm} = actual concentration of SRM.

The degree of accuracy and the recovery of the analyte is dependent on the matrix, method of analysis, and compound being measured. The objective for accuracy is to equal or exceed the accuracy demonstrated for the analytical method for samples of similar matrix and contaminant concentration. Accuracy will be controlled by comparing percent recoveries to the acceptable tables in this QAPP to make sure it falls within the control limits. Control charts will be maintained for all surrogates. Also, all analytes of interest shall be charted for each method for percent recovery and RSD. The charts shall be used to help show any adverse trends or drifts in the QC data, so corrections can be made.

8.3.3 Data Completeness

Data completeness represents the percentage of measurements evaluated and judged to be valid measurements. In order to meet the completeness objective for this project, valid results will be defined as all results not qualified with an "R" flag. Data completeness is expressed as percent completeness (%C) and is defined as:

$$\%C = 100\% \times \left(\frac{V}{n} \right)$$

where, V = number of measurements judged valid
n = total number of measurements

The quality assurance objective for completeness is 95 percent for water and 90 percent for soil analyses.

9.0 QUALITY ASSURANCE OVERSIGHT

Audits are tools used to evaluate the effectiveness of the QA program with respect to the QA requirements of the sampling and analysis activities. Two types of audits may be performed, performance audits and system audits.

9.1 Performance and System Audits

Performance audits are normally conducted after the data production systems are operational and are generating data. These audits consist of the collection of measurement data by using performance evaluation samples to determine the accuracy of the total measurement system or portions thereof.

All laboratories participating in this projects may be audited by the *Laboratory QA Manager*, or individual designated by the *Laboratory QA Manager* or *Project Manager*. Additionally, the *Laboratory QA Manager* will be responsible for verifying that standards, procedures, records, and charts are properly maintained and that QA records are adequately filed and maintained in a retrievable fashion.

System audits are on-site qualitative inspections and reviews of the QA system, and encompass all aspects of the project. These audits are concerned with evaluations of all components of the applicable measurement systems to determine if they have been properly selected and implemented. System audits typically consist of on-site reviews of both field and laboratory systems and facilities for sampling, calibration, and measurement protocols.

The *Laboratory QA Manager* or designated personnel may audit all of the laboratories regularly. In addition to the lab's internal auditing and auditing by *Laboratory QA Manager*, audits may be performed by the *Project Manager*, and other applicable governmental and private agencies. These audits are performed to verify the following conditions:

- Standards, procedures, records, charts, software, etc., have been properly maintained.
- QA records have been adequately filed and maintained, and documents are protected and retrievable.
- Results of QC sample analyses have been assessed.

Formal audit reports will be distributed to the *Project Manager, Laboratory QA Manager*. Results of the audit will be documented in a bound logbook, or permanently attached and maintained as part of the QA documentation.

A *QA Manager* will conduct an internal field audit, during approximately 5 % of all field activities, in conjunction with field sampling events at the Site. The audits' objectives are to ensure that the work plan is followed, that QC measures have been implemented and maintained, and that sample integrity has not been compromised.

Upon completion of the audit, a report documenting the findings will be given to the *Project Manager,* the *Laboratory QA Manager*. Deficiencies encountered will be listed in the report. Corrective action will be initiated as appropriate.

9.2 Corrective Action Procedures

Corrective action will be initiated through the development and implementation of routine internal QC checks. Corrective action requirements will be implemented in response to deficiencies encountered during system audits or failure to adhere to the QAPP.

To enhance the timeliness of corrective action and thereby reduce the generation of unacceptable measurement data, problems identified by assessment procedures will be resolved by the laboratory at the lowest possible management level. All problems requiring corrective action will be documented on a corrective action documentation form and will be included in the appropriate data package. The *Laboratory QA Manager* will be immediately notified of any major collective problems, such as the need to resample. Otherwise, progress reports to the *Laboratory QA Manager* will detail all problems and subsequent resolutions.

Steps comprising a closed-loop corrective action system include:

- Defining the problem
- Assigning responsibility for problem investigation
- Investigating and determining the cause of the problem
- Assigning responsibility for problem resolution
- Verifying that the resolution has corrected the problem

9.3 Quality Assurance Reports to Management

The *Laboratory QA Manager* will be responsible for reporting any laboratory QA/QC issues to the *Quality Assurance Officer* and/or *Project Manager*. For those issues that may adversely impact the quality of the project or require immediate corrective action, the *Laboratory QA Manager* will provide the *QA Managers* with a verbal report. In all cases, a written summary in the form of a memorandum, letter, or report of the laboratory QA/QC issues will be forwarded to the *QA Managers*. Laboratory QA/QC issues may include, but are not limited to: responses to findings of internal or external audits; missed holding times or problems with laboratory acceptance criteria; situations arising causing a deviation from the procedures specified in the QAPP; and out-of-control conditions and associated corrective actions.

It is the responsibility of the *Team Leader* or appropriate designee to notify the *QA Managers* or *Project Manager* of out-of-control events encountered in the field and corrective action taken, and conditions that require a modification of the procedures set forth in the QAPP.

The following QA/QC documents and deliverables will be submitted to Cherokee in support of the project work conducted at the Site:

- Audit reports
- Laboratory data package (including QC data)
- Logbooks
- Final QA report.

10.0 REFERENCES

EPA (United States Environmental Protection Agency). 1983. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans.*

EPA. 1986. *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods (SW-846).* Third Edition of SW-846 with Update I (pages dated September 1992), Update IIA (pages dated August 1993), Update II (pages dated September 1994), Update IIB (pages dated January 1995), and Update III (pages dated December 1996)

EPA 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* Interim Final.

EPA. 1992. *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods (SW-846).* Final Update I.

EPA. 1993. *Data Quality Objectives Process for Superfund: Interim Final Guidance.* EPA 540-R-93-071.

EPA. 1993a. *EPA Presumptive Remedy for CERCLA Municipal Landfill Sites.* Directive No. 9355.0-49FS.

EPA. 1994. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.*

EPA. 1994a. *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods (SW-846).* Final Update II.

EPA. 1994b. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.*

Office of the Federal Register National Archives and Records Administration.1994. *40 Code of Federal Regulations (CFR) Part 136, Appendix B.*

APPENDIX D

Appendix D
Excavation-Derived Residual Plan

Appendix D

Excavation-Derived Residual Plan
Corrective Measures Implementation Workplan
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

Prepared by:
Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

TABLE OF CONTENTS

1.0 INTRODUCTION 3

2.0 EXCAVATION-DERIVED SOLID WASTES 4

2.1 Investigation-Derived Soils 4

2.1.1 Waste Storage 4

2.1.2 Waste Characterization 5

2.1.3 Soil Management 6

2.1.4 Non-Hazardous Soil Management 6

2.2 Disposable Sampling Equipment, Personal Protective Equipment (PPE), and Other Discarded Solids 7

2.2.1 Contact Wastes 7

2.2.2 Non-Contact Wastes (Trash) 8

2.2.3 Management of Empty Containers 8

3.0 REPORTING REQUIREMENTS 9

3.1 Hazardous Materials Manifest 9

3.2 Non-Hazardous Materials 9

1.0 INTRODUCTION

This Excavation-Derived Residuals Plan (EDR Plan) was prepared according to the "Guide to Management of Investigation-Derived Wastes" (EPA 1992) to establish procedures for the handling, storage, testing, characterization, and disposal of Excavation-Derived Residuals (EDR) generated during implementation of the Corrective Measures Implementation Workplan (Workplan) the property at 450 E. Grand Avenue, South San Francisco, California (Property). A description of the project background, scope of work, and regulatory authority is presented in Section 1.0 (Introduction) of the Workplan.

Waste management procedures included in this EDR Plan will be conducted in a manner to be protective of human health and the environment in accordance with applicable laws and regulations adopted by both the Federal Government and State of California. EDR Plan procedures will remain in effect throughout the course of the Workplan field activities and associated or subsequent CMs.

2.0 EXCAVATION-DERIVED SOLID WASTES

2.1 Investigation-Derived Soils

Soil excavation and sampling are anticipated to generate excavation-derived waste soils. Additional sources of soil wastes may also be generated from currently unforeseen sources. Soil wastes generated will be stored, characterized, and managed according to the soil characterization and management procedures discussed in this section.

2.1.1 Waste Storage

Soil wastes will be stored in drop boxes or lined and covered roll-off bins appropriate for Hazardous Waste. Alternative storage containers might be utilized if conditions require such use. A label will be affixed to each container which will provide the following information:

- drum/container number
- media of waste (soil, purge water, drill cuttings, etc.)
- sampling locations from which the waste was derived
- date of collection
- name of the generator
- contact information in the event of an emergency

The label to be used for containerized soils is included in Attachment 1.

In addition, pertinent information will be documented for each container on a Waste Log Sheet (see Attachment 1). The following information will be recorded on the Waste Log Sheet.

- sampling location(s)
- approximate volume of waste
- date collected
- characterization sample designation and date collected
- name of person filling the container
- comments (relevant observations)
- characterization results

All EDR will be properly disposed within 90 days.

2.1.2 *Waste Characterization*

Chemical characterization will determine whether or not the waste soils are Hazardous Wastes. Soil piles will be segregated during excavation so that excavation confirmation samples can be used to provide initial information regarding the excavated soil. Composite verification samples will be collected for submission to a certified laboratory for lead analysis. No other compound has been observed to violate land disposal restrictions in the areas of excavation. Composite samples will be placed into coolers as specified in the Quality Assurance Project Plan (QAPP) and appropriately labeled. The characterization samples will then be transported using chain-of-custody procedures to the analytical laboratory for analysis as described below.

Characterization samples will be analyzed for lead. Additional analysis for semivolatile organic compounds (SVOCs) or volatile organic compounds (VOCs) may be conducted if warrented by conditions observed in the field. Soil containing detectable concentrations of Hazardous Substances at concentrations above the applicable limits established by the Federal Government or the State of California will be classified as either RCRA or California Hazardous Waste as appropriate:

Parameter	Analytical Method	Regulatory Threshold
Total Metals	EPA Method 6010	TTLC[1],TCLP[2]
Soluble fraction Metals	TCLP[2], WET[3], EPA Method 6010	TC[4], STLC[5]
Soluble fraction SVOCs	TCLP[2], WET[3], EPA Method 8270	TCLP[2], STLC[6]
Soluble fraction VOCs	TCLP[2], WET[3], EPA Method 8260	TCLP[2], STLC[6]

Notes:

1. TTLC for Inorganic Persistent and Bioaccumulative Toxic Substances specified in 22 CCR 66261.24(a)(2)(A)
2. Toxicity Characteristic Leaching Procedure (TCLP), EPA Method 1311, specified in 22 CCR, Division 4.5, Chapter 18, Appendix VIII and 40 CFR 261.24(a). Note: Section 1.2 of the TCLP does allow for a total constituent analysis in lieu of the TCLP extraction
3. California Waste Extraction Test (WET) specified in 22 CCR, Division 4.5, Chapter 11, Appendix II
4. Toxicity Characteristic (TC) level specified in 22 CCR 66261.24(a)(1)(B) and 40 CFR 261.24(a)
5. Soluble Threshold Limit Concentration (STLC) for Inorganic Persistent and Bioaccumulative Toxic Substances specified in 22 CCR 66261.24(a)(2)(A)
6. STLC for Organic Persistent and Bioaccumulative Toxic Substances specified in 22 CCR 66261.24(a)(2)(B)

If soil not otherwise classified as Hazardous Waste based on the analyses described above is suspected of containing petroleum constituents based on odor, discoloration, or elevated PID readings, samples may be analyzed for total petroleum hydrocarbons (TPH) by EPA Method 8015M. Although TPH values are not directly applicable to Hazardous Waste classification they are useful in selecting an appropriate disposal facility.

2.1.3 Soil Management

During performance of the CMs, certain wastes or portions of wastes exhibiting potential indicators of significant contamination (e.g., field screening methods, discoloration, odor) will be segregated from the remaining soil under the direction of supervising field personnel to minimize the amount of soil that must be disposed of as Hazardous Waste.

Upon classification of the waste material, the waste will be manifested accordingly, and transported for off-Site treatment and/or disposal within 90 days of generation in accordance with applicable regulations including, but not limited to: RCRA, California HWCL, CERCLA, and Department of Transportation (DOT) regulations. Waste manifests will be accompanied by a land disposal restriction (LDR) notification of certification, to the extent that LDR requirements are applicable. The container will be appropriately labeled and the Waste Log Sheet will be updated. An example of the label to be placed on containers with Hazardous Waste is included in Attachment 1. Hazardous Waste will be manifested under the name "Cherokee Grand Avenue". An authorized representative of Cherokee will sign all manifests on behalf of and as agent for Cherokee, which will be the sole generator of EDR during the field activities. The transporter of this material will be a fully licensed Hazardous Waste transporter having adequate insurance policies in effect for environmental impairment liability, workers compensation and comprehensive general liability. Each vehicle will carry the required documentation and display the appropriate material placards. Hazardous Waste solids will be treated or disposed at an appropriately permitted Hazardous Waste facility.

Soil that has been determined to be Hazardous Waste will be sent for off-Site treatment and/or disposal at a permitted RCRA Subtitle C or State-permitted facility, as appropriate, depending on the waste classification. A record of pertinent information for handling and management of each waste container shall be completed on a Waste Log Sheet.

2.1.4 Non-Hazardous Soil Management

Soil that has been determined not to be Hazardous Waste may be classified and managed as non-hazardous and/or solid waste. These wastes will be sent for off-Site management at a permitted RCRA Subtitle D or Class III waste facility. Alternatively, pending the soil volume, logistics,

and cost, the Project Manager may decide to manage the non-hazardous waste as a Hazardous Waste (e.g., where minimal quantities are involved) where it is clearly shown to be more cost effective, for example when the cost of classification exceeds the cost of off-Site Hazardous Waste management. A record of pertinent information for handling and management of each waste container shall be completed on a Waste Log Sheet.

2.2 Disposable Sampling Equipment, Personal Protective Equipment (PPE), and Other Discarded Solids

Other solids which require appropriate waste handling and off-Site management include disposable sampling equipment and disposable PPE.

Disposable sampling equipment and PPE which do not meet the criteria of a Hazardous Waste will be sent for off-Site management at a permitted RCRA Subtitle D or Class III waste facility. Contact wastes described herein include material and equipment which are exposed to environmental contaminants and have the potential to become contaminated during the field work. Such contact wastes may require decontamination to meet the requirements of a non-hazardous classification. Non-contact wastes described herein include discarded materials and trash which is not exposed to environmental contaminants.

2.2.1 Contact Wastes

Contact wastes described in this EDR Plan include disposable equipment and materials which come into direct or indirect contact with contaminated EDR materials. The following subsections describe storage, characterization, and management of solid Contact Wastes.

2.2.1.1 Storage

Contact wastes will be stored in either DOT-type 55-gallon drums or equivalent watertight containers such as drop boxes or lined and covered roll-off bins. These wastes will be stored for a period not exceeding 90 days.

2.2.1.2 *Waste Characterization*

Contact wastes will be classified using the procedure described in Section 2.1.2 of this EDR Plan, with the exception of any PPE and disposable sampling equipment that are classified as "hazardous debris" pursuant to 22 CCR 66260.10 or 40 CFR 268.2(g). These excepted materials may be rendered non-hazardous by treatment using a technology specified in 22 CCR 66268.45 or 40 CFR 268.45, pursuant to 22 CCR 66261.3(e)(1) or 40 CFR 261.3(f)(1). Hazardous debris treated in this manner may then be classified as non-hazardous waste, placed in appropriate containers, and transported to a permitted RCRA Subtitle D or Class III waste management facility.

2.2.1.3 *Waste Management*

At the end of each field work day, Contact Wastes will be transported to the EDR Storage Area. Any PPE and disposable sampling equipment that are determined to be Hazardous Waste or that are classified as hazardous debris, and that are not treated in accordance with the procedures described above, will be temporarily stored in 55-gallon drums and managed in accordance with applicable federal and state Hazardous Waste regulations until transported to an appropriately permitted Hazardous Waste treatment or disposal facility within 90 days. A record of pertinent information for handling and off-Site management of each waste container shall be completed on a Waste Log Sheet.

2.2.2 ***Non-Contact Wastes (Trash)***

Non-Contact Wastes such as normal refuse which does not directly or indirectly contact contaminated media generated during the field activities will be properly contained, stored, and disposed of at a permitted RCRA Subtitle D or Class III waste management facility. The waste will be placed in a dumpster or other appropriate receptacle for solid waste and picked up as part of the regular trash service for the Site.

2.2.3 ***Management of Empty Containers***

Any drums or drum liners used for interim storage of EDR will be managed according to procedures set forth in 40 CFR 261.7 and 22 CCR 66261.7. The drums will then either be sent to a drum reconditioner or will be disposed at a permitted RCRA Subtitle D or Class III waste management facility. Empty containers that have been utilized to store Hazardous Wastes will be stored in the EDR Storage Area for no longer than 90 days.

3.0 REPORTING REQUIREMENTS

3.1 Hazardous Materials Manifest

EPA Hazardous Waste Manifests will be properly completed and signed by authorized representatives/agents of the generator, hauler, and appropriately permitted treatment, storage or disposal (TSD) facility. Manifests will be maintained and handled in strict compliance with all requirements of RCRA. Waste logs completed during field activities will be maintained by the Cherokee for a minimum period of three (3) years or through the duration of project activities following treatment or disposal of all Hazardous Wastes.

3.2 Non-Hazardous Materials

Non-hazardous Waste Manifests will be properly completed and signed by authorized representatives/agents of the generator, hauler, and appropriately permitted treatment, storage or disposal (TSD) facility. Non-hazardous Waste Manifests and Waste logs completed during field activities will be maintained by the Cherokee for a minimum period of three (3) years or through the duration of project activities following treatment or disposal of all Hazardous Wastes.

APPENDIX E

Appendix E
Health and Safety Plan

Appendix E

Health and Safety Plan
Corrective Measures Implementation Plan
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

May 18, 2000

Prepared for:
Cherokee San Francisco, L.L.C. and Cherokee Grand Avenue, L.L.C.
South San Francisco, California Property

Prepared by:
Henshaw Associates, Inc.
11875 Dublin Boulevard, Suite A-200
Dublin, California 94568

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 General 1
1.2 Property Background 2
1.3 Scope of HASP 2
1.4 Human Exposure Pathways 3
2.0 PROJECT SAFETY AUTHORITY 4
2.1 Project Manager 4
2.2 Supervisory Geologist 4
2.3 Project Safety Coordinator 4
3.0 HAZARD ASSESSMENT AND CONTROL MEASURES 6
3.1 Chemical Hazards 6
3.1.1 Metals 6
3.12 Semivolatile Organic Compounds (SVOCs) 7
3.1.3 Volatile Organic Compounds (VOCs) 7
3.2 Physical and Biological Hazards 7
3.2.1 Head Trauma 8
3.2.2 Foot Trauma 8
3.2.3 Eye Trauma 8
3.2.4 Noise Exposure 8
3.2.5 Heavy Equipment Limitations 9
3.2.6 Buried Utilities and Overhead Power Lines 9
3.2.7 Excavations 9
3.2.8 Thermal Stress 9
3.2.9 Traffic 10
3.2.10 Electric Shock 11
3.2.11 Confined Space 11
3.2.12 Hazardous Weather Conditions 11
3.2.13 Slip, Trip and Fall 11
3.2.14 Biological Hazards 12
4.0 AIR MONITORING 13
5.0 PERSONAL PROTECTIVE EQUIPMENT 14
6.0 PROPERTY ACCESS 15
7.0 WORK AREAS 16
7.1 Exclusion Area 16
7.2 Contaminant Reduction Area 16

7.3 Support Area 16
8.0 DECONTAMINATION PROCEDURES 17
9.0 GENERAL SAFE WORK PRACTICES 18
9.1 Safe Work Practices 18
9.2 Safe Workplace Conditions 19
10.0 EMERGENCY RESPONSE PLAN 20
11.0 TRAINING 22
12.0 MEDICAL MONITORING 23
13.0 PROPERTY HEALTH AND SAFETY PLAN SIGNATURES 24

Attachments

Accident Report
Emergency Medical Facility Location

1.0 INTRODUCTION

1.1 General

This Health and Safety Plan (HASP) was developed to provide information on the potential hazards associated with implementing the Corrective Measures Workplan (Workplan),) for the property at 450 E. Grand Avenue, South San Francisco, California (Property), and to provide general health and safety guidance for personnel conducting the field activities at the immediate vicinity of the Property.

The following regulatory, guidance, and background documents were used in developing this HASP:

- *Occupational Safety and Health Guidance Manual for Hazardous Waste Property Activities* (National Institute for Occupational Safety and Health [NIOSH], Occupational Safety and Health Administration [OSHA], United States Coast Guard [USCG], U.S. Environmental Protection Agency [USEPA], 1985)
- *Standard Operating Safety Guides* (USEPA, 1988)
- 29 Code of Federal Regulations (CFR) Part 1910 and 1926
- Title 8, California Code of Regulations (CCR)
- *Property Safety Plan Guidance Document for Property Assessment and Property Mitigation Projects* (California Department of Health Services [DHS], 1988)
- *Documentation of Threshold Limit Values and Biological Exposure Indices* (American Conference of Governmental Industrial Hygienists [ACGIH], 1989)
- *NIOSH Pocket Guide to Chemical Hazards* (U.S. Department of Health and Human Services, Center for Disease Control, National Institute for Occupational Safety and Health, 1996)

The Property characterization data presented in previous investigation reports and the results of interviews with individuals familiar with the Property were used to complete the chemical hazard assessment described in this HASP.

The following constituents of concern have either been detected in soil or ground water samples collected at the Property, or are suspected based on reports of chemicals historically used at the Property:

- Metals, including lead and arsenic
- Semi-volatile organic compounds (SVOCs)
- Volatile organic compounds (VOCs)

1.2 Property Background

The Property consists of 27-acres in South San Francisco, California, and lies approximately one mile east of Highway 101 at the eastern edge of Grand Avenue (Figure 1). Environmental conditions at the Property have been deemed by the United States Environmental Protection Agency (U.S. EPA) to merit Corrective Action.

The property is located in an industrialized area on the western shore of San Francisco Bay, within an area zoned for commercial and light industrial uses, and has housed paint manufacturing operations for over 100 years. Metals, VOCs, and SVOCs have been detected in soil and groundwater at the Property.

The Property was originally owned by W.P. Fuller and was purchased in 1968 by the O'Brien Corporation. Recently, ICI Glidden purchased a portion of the Property from O'Brien, which was later purchased by Cherokee along with the remaining O'Brien property. Hence, Cherokee is the current and sole owner of the Property.

1.3 Scope of HASP

The HASP has been prepared to address the hazards associated with implementation of Corrective Measures (CMs) at the Property. The CMs involve: 1) excavating contaminated soils from three areas within the Property (Figure 2); 2) segregating excavated soils; 3) transporting the soils to the appropriate waste disposal facility; 4) backfilling and compacting the excavated areas with clean fill material; and 5) constructing non-continuous low permeability caps in two areas (Workplan, Figure 2). This HASP provides standard operating safety procedures for personnel conducting the CM activities.

Supplements to this HASP will be prepared, as necessary, to address special hazards associated with all other activities. Soil sampling will be performed by Henshaw Associates, Incorporated (Henshaw) personnel. Soil excavation, transporting, backfilling, and construction of low permeability caps will be performed by Henshaw subcontractors. Henshaw and subcontractor personnel are required to adhere to all

provisions of this HASP. Subcontractors can choose to prepare their own plan using these provisions as minimum requirements. The subcontractors are also responsible for following all federal, state, and local requirements applicable to their operations that are not specifically addressed in this HASP. Upon request, the subcontractors shall provide Henshaw documentation of safety training and medical surveillance program participation, and the applicable respirator fit-test records for all personnel conducting field activities.

1.4 Human Exposure Pathways

Impacted soil at the Property is the primary potential exposure media for personnel implementing field activities. The potential exposure pathways for constituents in Property soil include dermal contact, incidental ingestion, and inhalation of windblown dust or vapors during the field activities. The overall potential for inhalation of dust or vapors is expected to be relatively high because the entire Property is neither paved nor covered by buildings. Dermal contact and incidental ingestion pathways will be minimized through a vigilant personal hygiene program and the use of personal protective equipment.

Inhalation of contaminated fugitive dust is considered to pose the greatest potential threat for chemical exposure. Consequently, dust control measure will be implemented during construction activities. Water is available at the Property, and water trucks will be available at all times during CM activities to moisten construction areas. A rigorous air monitoring program will be used to ensure that conditions at the Property are within required parameters during performance of the CMs (Section 4).

2.0 PROJECT SAFETY AUTHORITY

The following Henshaw personnel are responsible for project health and safety during implementation of the Workplan:

Project Manager	Michael Harrison, P.E.
Supervisory Geologist	Dana Brown
Property Safety Coordinator	Dana Brown
Property Safety Coordinator	Daniel W. Hernandes, MPH, CIH

Each individual working at the Property will be responsible for compliance with the safety procedures established herein as well as general safe work practice.

2.1 Project Manager

The Project Manager has the authority to direct all activities at the Property and is responsible for ensuring proper training of all Henshaw employees.

2.2 Supervisory Geologist

The Supervisory Geologist is responsible for disseminating the information contained in this HASP to all Henshaw personnel assigned to the project, and to the responsible representative of each subcontractor firm working under Henshaw on the project. The Supervisory Geologist will provide subcontractors with copies of the HASP prior to start of work.

2.3 Project Safety Coordinator

The Project Safety Coordinator is also responsible for disseminating the information contained in this HASP to all Henshaw personnel assigned to the project, and to the responsible representative of each subcontractor firm working under Henshaw on the project. The Project Safety Coordinator is responsible for enforcement of all policies and practices of the HASP, and for on-Property safety and loss-prevention functions. During performance of the CMs, Daniel W. Hernandez, MPH, CIH of Pacific States will also serve as Project Safety Coordinator.

The Property Safety Coordinator is directly responsible for the following items during implementation of the project:

- Ensuring that HASP sampling is implemented properly
- Conducting inventory of safety supplies and equipment
- Conducting safety briefings
- Reporting accidents and incidents
- Enforcing safe work practices
- Coordinating waste containment or storage

The Property Safety Coordinator shall review the requirements of this HASP during a meeting with all project personnel (Henshaw and subcontractor personnel) before each phase of the field activities begin. Safe work practices, control of potentially impacted materials, and protection of personnel and property as described in this HASP shall be emphasized during the safety meeting. Field personnel will be required to sign a certification indicating that they will comply with the plan provisions (see Section14).

Subcontractors shall identify their responsible representatives for project safety by name before the field activities begin. Telephone numbers of these individuals for emergency contact shall also be provided.

3.0 HAZARD ASSESSMENT AND CONTROL MEASURES

The constituents of potential occupational exposure concern at the Property are metals, VOCs, and SVOCs. A brief description of these constituents, relevant toxicological data, and an exposure hazard assessment are presented below.

Field personnel are required to control exposure primarily through the use of safe work practices, including dust suppression, and personal protective equipment (PPE). The working conditions will be assessed using air monitoring instruments and visual observations. Air monitoring will be conducted during field activities to assess airborne levels of dust and potential contaminants. Action levels are specified in Section 4.

3.1 Chemical Hazards

Chemicals detected in soil samples from the Property include metals, semivolatile and volatile organic compounds. OSHA standards applicable to the CMs include: PELs defined as the time-weighted average concentrations for a nominal 8-hour work day and a 40-hour work week, to which nearly all workers may be repeatedly exposed without adverse effect (Title 8, CCR, Section 5155), STEL values that represent short term exposures (15 minutes) without adverse effect, and IDLH values that represent a maximum level from which a person could escape within 30 minutes without escape-impairing symptoms or irreversible health effects (*NIOSH Pocket Guide to Chemical Hazards,* U.S. Department of Health and Human Services, 1996). However, the concentrations of constituents reported in the soil samples (which are reported on a weight-to-weight or weight-to-volume in water ratio) are not directly comparable to the airborne exposure criteria (PELs and IDLHs, which are reported on a weight-to-volume ratio in air or volume-to-volume ratio).

3.1.1 Metals

Metals, including arsenic, cadmium, copper, chromium, lead, mercury, selenium, silver, and zinc have been detected in Property soil. Arsenic, cadmium, and nickel are considered carcinogenic. Lead is considered the primary COC for the Property due to levels detected in soil samples collected from the Property. Exposure to lead dusts can cause weakness, lassitude (weakness, exhaustion), insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis wrist, ankles, encephalopathy, kidney disease, irritation eyes, or hypotension.

The primary potential route of exposure to lead during field activities is inhalation. Inhalation is expected to occur exclusively via airborne dust, if present. Occupationally significant levels of lead dust may be encountered during field activities as high levels of lead have been detected in Property soil. Safe work practices and PPE will be required when contact with lead-impacted media is possible.

3.12 Semivolatile Organic Compounds (SVOCs)

Low levels of semivolatile organic compounds (SVOCs) have been identified in soil at the Property including acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, dibenzofuran, fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, benzoic Acid, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, nitrobenzene, 2,4-dimethylphenol, butylbenzyl phthalate, and di-n-octylphthalate. Exposure to occupationally significant levels of SVOCs is not anticipated during performance of the Workplan activities.

3.1.3 Volatile Organic Compounds (VOCs)

Previous investigations have identified the following VOCs in the soil and groundwater at the Property: acetone, benzene, toluene, ethylbenzene, and total xylenes.

Benzene is the only VOC considered carcinogenic. VOCs are generally moderately toxic through inhalation and ingestion exposure pathways. Several are strong irritants to the eyes and skin. Inhalation of high concentrations causes narcosis and anesthesia. Chronic exposure can lead to liver damage.

The primary potential exposure pathways during the field activities is expected to be through inhalation. Occupationally significant airborne concentrations of VOCs (above the PELs) are not anticipated during the field activities because of the relatively low concentrations detected in the soil and groundwater. Dermal contact will be minimized by practicing contamination avoidance and using the assigned level of PPE. Air monitoring in the breathing zone will be performed with chemical specific Draeger tubes to confirm that ambient VOC concentrations are below prescribed action levels. Respiratory protection will be available for use as necessary.

3.2 Physical and Biological Hazards

The physical hazards associated with the field activities may present a greater risk of injury than the chemical constituents in soil and groundwater at the Property. Activities

within the scope of this project shall comply with California and federal OSHA construction safety standards.

3.2.1 Head Trauma

To minimize the potential for head injuries field personnel will be required to wear NIOSH approved hard hats while operating around heavy equipment and sampling activities are being performed. Hats must be worn properly and not altered in any way that would decrease the degree of protection provided.

3.2.2 Foot Trauma

To avoid foot injuries, field personnel will be required to wear steel-toed safety shoes while drilling and sampling activities are being performed. To afford maximum protection, all safety shoes must meet American National Standards Institute (ANSI) standards. Drums or other heavy containers used at the Property should be moved only with a drum dolly or by an appropriate lifting mechanism. When drums are moved, all personnel should stand clear of the drum or container to avoid foot injury.

3.2.3 Eye Trauma

Field personnel will be required to wear eye protection (safety glasses) while field activities are being performed to prevent eye injuries caused by contact with chemical or physical agents. Care should be taken to prevent splashing when working with containers with hazardous materials. Any movement of containers with liquids will be done only with the appropriate lid secured.

3.2.4 Noise Exposure

Field personnel will be required to wear hearing protection (ear plugs or muffs) in high noise areas (e.g., around heavy equipment) while field activities are being performed. Local noise ordinances will be observed during execution of the project. Given the close proximity of the Property to residential areas to the north, elevated noise levels periods should be minimized and limited to normal working hours. The threshold for wearing noise protection shall be to don protection if a conversation cannot be conducted at normal voice levels between two individuals standing approximately three feet apart.

3.2.5 Heavy Equipment Limitations

Vehicles and heavy equipment shall not exceed a speed limit of 10 miles per hour in the project area. Drivers and equipment operators will wear seat belts at all times. No riders will be allowed on heavy equipment or in vehicles unless seats and seat belts are available for their use.

3.2.6 Buried Utilities and Overhead Power Lines

Excavation and well installation or destruction locations will be examined by Property personnel or an underground utility locator service. Utilities will be protected during excavation activities. Underground Services Alert will be provided notice at least two days before beginning excavation or well installation activities. Protection from overhead power lines will be accomplished by maintaining safe distances of at least 15 feet at all times.

3.2.7 Excavations

Field personnel are prohibited from entering into excavations deeper than 5 feet below ground surface unless a Cal-OSHA excavation permit is obtained and Cal-OSHA excavation regulations are observed. The subcontractor shall obtain a Cal-OSHA excavation permit if entry is required. Excavations will be protected from inadvertent or unauthorized entry through the use of temporary fencing, barriers, and/or taping when the excavation is unattended.

3.2.8 Thermal Stress

Adverse climate conditions are an important consideration in planing and conducting Property operations. The effects of ambient temperature can cause physical discomfort, personal injury, and increase the probability of accidents. In addition, heat stress due to lack of body ventilation caused by protective clothing is an important consideration. Heat-related illnesses commonly consist of heat exhaustion and heat stroke.

The symptoms of heat exhaustion include:

- Weak pulse
- General weakness and fatigue
- Rapid shallow breathing
- Cold, pale, clammy skin
- Nausea or headache

- Profuse perspiration
- Unconsciousness
- Appearance of having fainted

The symptoms of heat stroke include:

- Sudden onset
- Change in behavior
- Confusion
- Dry, hot and flushed skin
- Dilated pupils
- Fast pulse rate
- Body temperature reaching 105□ or more
- Deep breathing later followed by shallow breathing

One or more of the following precautions will reduce the risk of heat stress on the Property:

- Provide plenty of liquids to replace lost body fluids. Water, electrolytic drinks, or both will be made available to minimize the risk of dehydration and heat stress.
- Establish a work schedule that will provide appropriate rest periods.
- Establish work regimens consistent with the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines.
- Provide adequate employee training on the causes of heat stress and preventive measures.

In the event of extreme low temperatures, reasonable precautions will be made to avoid risks associated with low temperature exposure (hypothermia).

3.2.9 Traffic

Some of the field activities will occur near East Grand Avenue or on the adjacent streets. Vehicular traffic will be a potential hazard during these activities. Control of these areas will be established using barricades or traffic cones. Personnel will be required to wear high-visibility traffic vests while working in streets and near the highway. Local requirements for lane closure will be observed as necessary.

3.2.10 Electric Shock

All electrical equipment to be used during field activities will be suitably grounded and insulated. Ground fault circuit interrupters (GFCI) will be utilized with all heavy electrical equipment to reduce the potential for electrical shock.

3.2.11 Confined Space

A confined space has limited or restricted means of entry or exit, is large enough for an employee to enter and perform assigned work, and is not designed for continuous occupancy by the employee. These spaces may include, but are not limited to, underground vaults, tanks, storage bins, pits and diked areas, vessels, trenches, and silos.

A permit-required confined space is one that meets the definition of a confined space and has one or more of these characteristics: (1) contains or has the potential to contain a hazardous atmosphere, (2) contains a material that has the potential for engulfing an entrant, (3) has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section, and/or (4) contains any other recognized serious safety or health hazards.

It is not anticipated that field activities involving confined space entry or permit-required confined space entry will be encountered during the implementation of the Workplan. However, should field activities involving confined space entry be encountered, supplements to this HASP will be prepared, as necessary, to address special hazards associated with confined space entry or permit-required confined space entry.

3.2.12 Hazardous Weather Conditions

All Property workers will be made aware of hazardous weather conditions including extreme heat or cold, and take the precautions described herein to avoid adverse health risks. All workers are encouraged to take reasonable, common sense precautions to avoid potential injury associated with possible rain, sleet, snow, or high wind.

3.2.13 Slip, Trip and Fall

Several indentations exist in the ground surface such as sumps and trenches. Great care should be taken by all Property workers to avoid slip, trip and fall hazards. Additional portable lighting will be provided at the discretion of the Property Safety Coordinator if

necessary. Workers shall not pass through or work in areas of inadequate lighting in order to prevent physical injury.

3.2.14 Biological Hazards

Drugs and alcohol are prohibited from the Property. Any worker or oversight personnel suspected of being in an impaired condition due to drugs or alcohol will be immediately expelled from the Property.

Any worker or oversight personnel with a relevant medical condition which may require attention should inform the Property Safety Coordinator of such condition, and describe appropriate measures to be taken if the individual should become symptomatic.

All Property personnel should be aware that poisonous snakes, spiders, plants, and insects may possibly be encountered and should be avoided. Care should be taken in lifting objects under which a poisonous insect or reptile may be residing. Large and aggressive dogs may be present at private residences at or near the Property. Private property should not be entered without the permission of the property owner.

4.0 AIR MONITORING

The total dust monitoring will be conducted both up and down wind of CM activities and compared against the threshold limit value (TLV) for dust of 15 mg/M^3. Dust measurements will be conducted in real time with portable dust monitors ("Miniram"). Results of dust monitoring will be used to evaluate the effecacy of dust suppression activities.

Lead concentrations will be measured using personal exposure monitoring pumps worn by CM workers in construction zones, and at perimeter locations east of active CM areas. Selected samples will also be collected for SVOCs. The samples will be conducted over 8-hour periods during which work is occurring and compared against Permissible Exposure Level (PEL) standards. During the first two days of CM activities, which will be conducted in the most impacted area of the Eastern Property, samples will be submitted to an accredited laboratory for expedited turn around. During the first two days of CM activities, workers will be in level C PPE (Section 8). The samples submitted for expedited turn around will be used to reevaluate the level of PPE appropriate during continuing CMs.

Monitoring for VOCs in the breathing zone will be conducted with chemical specific Draeger tubes (benzene and xylene) and an organic vapor meter (OVM). Draeger tubes shall be used in areas where VOCs are know to exist at one hour intervals. If three successive non-detections have been measured and OVM levels are consistently below 10 ppm, the use of Draeger tubes may be discontinued. If OVM levels rise above 10 ppm, the use of Draeger tubes will be reinstituted.

All monitoring instruments will be calibrated daily before use, consistent with the manufacturers' recommendations. All calibration data and monitoring results shall be recorded in a field logbook.

5.0 PERSONAL PROTECTIVE EQUIPMENT

As described in Section 4.0, the potential hazards from exposure to metals, SVOCs and VOCs will be minimized by using the appropriate PPE. Initial CM activities will be conducted in Level C PPE, as defined by the USEPA (July1988). If air monitoring activities so indicate, the required PPE level may be decreased to Level D. Level D is the minimum level of PPE required during field activities at the Property.

Level C

- Half- or full-facepiece respirators with organic vapor cartridges and high efficiency particulate filters (see Section 4.0 for use requirements)
- Chemical-resistant (Nitrile) gloves
- Chemical-resistant boots
- Tyvek® or Saranex® outer garment

Level D

- Safety glasses or goggles
- Hardhat
- Steel-toed boots

In addition, chemical resistant (Nitrile) gloves are recommended when handling soil or water samples.

The following PPE will be readily available, for use as necessary, based on monitoring results outlined in Section 4.0:

-

All field personnel assigned to work in the project area where respiratory protection may be necessary will be required to have been fit-tested for and trained in the use, limitations, care, and maintenance of air-purifying respirators.

All personnel will be required to were Level C PPE until quantitative analytical results prove that safe levels of metals in the dust are present during working conditions.

6.0 PROPERTY ACCESS

Access to the Property during field activities will be controlled through a locked Property gate. Unauthorized personnel and visitors shall not be allowed access to the facility. Only personnel with specific operational duties should be present on the Property when field operations are being conducted. Property control at work locations shall be established using barricades, cones, and flagging tape as necessary to prevent unauthorized access during work. The Property gate will be locked during off-hours for security. Note that Property ownership may change and that new access arrangements and approval may be required.

At the beginning of each work day, during the health and safety meeting, each exit from the Property will be described and shown to each Property worker as described in Section 11.0 - Emergency Response Plan.

7.0 WORK AREAS

This section provides a brief description of the work areas that will be established for the activities described in this HASP. In addition to the areas described below, an evacuation meeting place will be designated before operation begins, based on the field activity planned. Work-zone boundaries will be delineated in the field, as necessary, using safety cones, barricades, and flagging tape.

7.1 Exclusion Area

An exclusion area will be established to control access to the work areas. The exclusion area will extend from a distance of at least 10 feet from the area where potentially-impacted media is being sampled or tested when sampling monitoring wells or creek sediments, and to at least 25 feet in areas where drill rigs or heavy equipment is in use. Level D protection will be required at a minimum for all personnel within the exclusion area.

7.2 Contaminant Reduction Area

A contaminant reduction area will be placed in an area adjacent to and upwind from the exclusion area, if practical. In this area, personnel and equipment will be decontaminated, as appropriate, after work has been completed.

7.3 Support Area

The support area covers all areas outside the exclusion and contamination reduction areas. This support area provides for all administrative and support functions (command post, first-aid station, rest area, etc.) necessary to keep the field activities running smoothly. Potable water and wash facilities for the field personnel shall be provided at this location. The entire project area will be considered the support area when no field activities are being conducted. Restrooms are available at the facility, and the location will be made known to all individuals working at the Property.

8.0 DECONTAMINATION PROCEDURES

Decontamination procedures will be performed before leaving the work areas as part of the system for preventing or reducing the physical transfer of impacted materials from the project area. Wash tubs with soap and water and rinse tubs will be provided for cleaning of personnel and reusable equipment. A portable handwashing facility will be provided in the support area. All personnel will be required to wash their hands before eating and after work. Solid waste (disposable sampling equipment and used PPE) and liquid waste (decontamination and purged groundwater) will be placed in labeled containers as these wastes are generated.

The wastes will be managed following the procedures described in the Investigation Derived Residuals (IDR) Plan and in accord with applicable law.

Specific procedures for decontamination of reusable equipment will be provided in the *Field Sampling and Analysis Plan.* Personnel decontamination procedures should be performed in the following sequence:

- If gross contamination is obvious, remove contamination with water prior to leaving the exclusion zone. Contain water in a bucket or tub;
- Remove equipment used in the exclusion zone to the contamination reduction zone for subsequent decontamination or disposal;
- Scrub chemical-resistant boot and gloves (if worn) with detergent and later followed by water rinse. Contain water in bucket or tub;
- Remove respirator (if worn); avoid touching face with fingers;
- Thoroughly wash hands and face.

9.0 GENERAL SAFE WORK PRACTICES

The field activities will be conducted following the minimum safety practices described below.

9.1 Safe Work Practices

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in any area where the potential of contamination exists.

- Hands must be thoroughly washed when leaving a contaminated, or suspected contaminated area, before eating, drinking, or any other activities.

- Impacted PPE will not be removed from the contaminant reduction zone until it has been properly containerized.

- Removal of materials from PPE by blowing, shaking, or any means that may disperse materials into the air is prohibited.

- Personnel on Property must use the "buddy" system when wearing respiratory protective devices. Emergency communications will be prearranged in case unexpected situations arise. Visual contact must be maintained between "pairs" on Property, and each individual should remain close enough to assist the other in an emergency.

- Personnel will be cautioned to inform each other of subjective symptoms of chemical exposure, such as headache, dizziness, nausea, and irritation of the respiratory tract.

- No excessive facial hair that interferes with a satisfactory fit of the facepiece-to-face seal will be allowed on personnel required to wear respiratory protective equipment.

- On-Property personnel will be thoroughly briefed about the anticipated hazards, equipment requirements, safety practices, personal hygiene, emergency procedures, and communications methods, initially and in briefings.

- All field personnel will, whenever possible, locate themselves so that they work upwind from any excavation area.

- Field personnel are prohibited from entering confined spaces, trenches, or excavations deeper than 4 feet unless the entry provisions of Title 8 CCR are addressed. Open trenches or excavations that are unattended will be guarded covered, or marked by the subcontractor as described in Section 7 to restrict entry.

9.2 Safe Workplace Conditions

- A multipurpose (A, B, C) portable fire extinguisher and other emergency response equipment shall be located in the immediate vicinity of the work area. The Property Safety Coordinator will be responsible for maintaining fire extinguishers.

- Field equipment shall be kept in good condition.

- First-aid supplies shall be available in the project area.

- Appropriate work areas designated for support, contamination reduction, and exclusion will be maintained.

10.0 EMERGENCY RESPONSE PLAN

Illnesses, injuries, or accidents occurring during the field activities shall be reported to the Project Safety Coordinator, and attended to immediately.

The following emergency equipment shall be kept in each work area:

- A copy of this Health and Safety Plan
- First aid kit
- 20-pound ABC dry chemical extinguisher
- Portable eyewash unit
- Supply of clean water
- Hand-held horn

A first-aid kit will be available in the vehicle of the Property Safety Coordinator for treatment of minor injuries such as cuts or bruises that may result from an accident. The first-aid kit will contain but not be limited to clean gauze, bandages, tape, and disinfectant. The use of the first-aid kit will be limited to treatment of only minor injuries such as shallow cuts and scratches. Tweezers will be available for removal of splinters.

In an emergency or hazardous situation involving explosions, fires, or major physical injuries, the individual who observes this condition will immediately give a verbal alarm or sound a hand held horn. Upon hearing the alarm, field personnel will safely de-energize nonessential equipment and evacuate to the parking lot, outside of the gate on the eastern part of the property on South Main Street. The injured personnel must be attended to immediately and medical attention must be obtained. If required, the injured personnel will be transported to the hospital by ambulance. The field activities will be suspended until the cause of the injury has been investigated and the work procedures modified accordingly. An accident/loss report will be completed for any illness, injury, or accident that occurs during the field activities. A copy of the report is presented in Attachment 1. The Property Safety Coordinator shall report to the Project Safety Coordinator or Project Geologist for instructions.

Prior to beginning the field work, the local Hospital Emergency Department will be notified of the work taking place at the Property. The Property conditions and scope of

work will be described, so as to allow emergency staff to be prepared for any potential chemical or physical injury or contamination which may be encountered and require a hospital emergency room visit.
The telephone numbers of local emergency services are given in Table 2. A map with directions to the hospital is shown for reference in Figure1.

The only hazardous materials which are to be handled are investigation-derived soil, groundwater or excavation spoils. In the event that hazardous materials are spilled at the Property, the Property Project Manager or the Property Technical Coordinator, and the Property Safety Coordinator should be immediately informed. Measures to contain and clean up any hazardous material spills should be taken immediately. Any contaminated surfaces from a hazardous material spill should be appropriately decontaminated.

A portable eye-wash will be available in the work area, and an eye wash and shower is located in the former chrome plating area.

11.0 TRAINING

All personnel performing the field activities described in this HASP will have received the initial safety training required by OSHA in 29 CFR Part 1910.120 and Title 8, CCR Section 5192. Current refresher training status will also be required for all personnel engaged in the field activities. Documentation that this training has been completed will be provided to Henshaw upon request. During the field activities, daily safety meetings will be held by the Property Safety Coordinator to review specific health and safety aspects of the scheduled work.

Henshaw field personnel responsible for air monitoring will be adequately trained in the use, calibration, and limitations of the field monitoring equipment.

12.0 MEDICAL MONITORING

All personnel scheduled for field activities will have completed medical examinations meeting the minimum medical surveillance requirements described in 29 CFR, Part1910.120, and Title 8, CCR, Section5192.

13.0 PROPERTY HEALTH AND SAFETY PLAN SIGNATURES

I have reviewed Henshaw's HASP for implementation of the Workplan at the Property and immediate vicinity. I understand its purpose and consent to adhere to its policies, procedures, and guidelines for this project while an employee of Henshaw or Henshaw contractor (subcontractor).

Name (please print)	Date	Signature

Cherokee Property
450 East Grand Avenue
South San Francisco, California

Party	Number
Local Fire/Police Department/Ambulance	911
Kaiser Permanente Medical Center - South San Francisco	(650) 742-2000
Hazmat: National Control Center Poison Control Center	 (800) 424-8802 (800) 962-1253
Henshaw Associates, Inc. Property Project Manager: Michael Harrison Property Safety Coordinator: Dana Brown	 (925) 551-7272 (925) 570-7610

ATTACHMENT 1

Name of injured person:

_____

Company Name and Address:

_____

Age: _____ Sex: _____ SSN:

_____

Summary of incident: (provide detail and parts of body affected.)

_____

_____

_____

_____

_____

_____

Type of incident: Possible chemical exposure _____ Physical incident _____
Other_____

Chemical name and form (liquid, solid, gas, fume, mist)

_____

Date of Incident: _____ Time of incident:

_____

Weather conditions at time of incident: (temperature, precipitation, wind speed, and direction)

_____

_____

_____

_____

Was medical care provided on-Property? Yes _____ No _____

If yes, when and where was care provided

_____

_____

_____

By whom:

_____

If "off-Property" care was provided, provided name and location of health-care facility:

_____

_____

Nature of care at the health-care facility:

Was the Property Health and Safety Coordinator contacted? Yes_____ No _____
If no, who was contacted?

Has the employee returned to work? Yes _____ No _____
If yes, on what date?

Provide names of persons who witnessed the exposure/injury incident.

Was the activity being performed under a Health and Safety Plan?
Yes ____ No ____ If yes, attach a copy of the plan.
Provide a list of any personal protective clothing and equipment used by the employee at the time of the exposure/injury incident.

Did any aspect of personal protective clothing and equipment contribute to the exposure/injury incident? Yes _____ No _____ If yes, please explain.

Are measures available that may help prevent a repeat of a similar exposure/injury incident?
Yes _____ No _____ If yes, please explain.

Describe property damage, if applicable.

Name, job position, office location of individual(s) completing this exposure/injury incident report.

_____ Date: _____
Project Manager Signature

_____ Date: _____

Employee Signature

_____ Date: _____

Property Safety Coordinator Signature

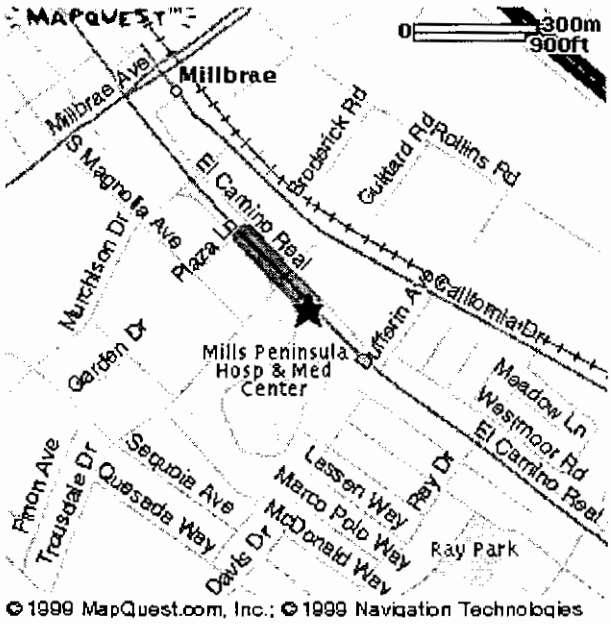
_____ Date: _____

Property Technical Coordinator Signature

Directions to the Nearest Hospital

Starting From:	Arriving At:	Dist.:	Approximate Travel Time:
450 E grand avenue South San Francisco, CA	Mills-Peninsula Health Svc 1783 El Camino Real Burlingame, CA 94010 (650) 696-5400	6.3 miles	13 mins

	Directions	Miles
1.	Start out going West on E GRAND AVE towards HASKINS WAY by turning left.	1.2
2.	Turn LEFT onto GATEWAY BLVD.	0.4
3.	Turn RIGHT onto S AIRPORT BLVD.	0.1
4.	Turn LEFT onto PRODUCE AVE.	0.3
5.	Take the US-101 SOUTH ramp towards SAN JOSE.	0.1
6.	Merge onto US-101 S.	3.1
7.	Take the MILLBRAE AVE exit towards MILBRAE.	0.1
8.	Keep RIGHT at the fork in the ramp.	0.2
9.	Merge onto E MILLBRAE AVE.	0.3
10.	Turn LEFT onto EL CAMINO REAL/CA-82.	0.4
11.	Turn RIGHT.	0.0



APENDIX F

Appendix F
Well Logs

LOG OF BORING No.PM-9

DATE DRILLED: 8/28/87 EQUIPMENT: B-56

DESCRIPTION: auger ELEVATION: 2.62 feet

DRILLING CONTRACTOR Exploration Geoservices

DRILLER Dave Yaeger

BY KLH DATE 12/11/87 CHK'D BY IWC

SAMPLE NO / SAMPLE TYPE	BLOWS PER 6 INCHES	SPT N	INCHES DRIVEN / INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	DESCRIPTION	HNu TESTS
S-1	25-20-16		18/12					Fill (hf) - gravel, sand, silty clay, hard, dry, brick, glass	0
	13-22-9		18/12						
					2.5			Becoming moist, more clayey.	
	4-5-7		18/18						
	5		2		5			Strong paint thinner odor at 4.5 feet, dark gray.	5
S-2	5-6-8		18/12					▽ Wet at 5 feet, oily, clay pot bits.	
	9-12-15		18/14						
					7.5			Very strong vapors coming out of auger, doesn't register much on HNu	40
	10-6-4		18/18						
	5		NR		10				
	3-3-5		18/3					SILTY SAND - with little clay, black, wet, loose, very fine, did not fill liner, solvent odor.	10
								Becoming dusky green (5G 3/2), less odor at 12 feet	
S-3	2-3-3		18/12						
sieve analysis					12.5				
	4-4-6		18/12						
S-4	4-4-5		18/13		15			Bay Mud (OL) - silty clay with some very fine sand soft, very plastic, occasional shell fragments, dark olive gray	0
	2-2-2-4		24/18					PEAT (Pt) - with little silty clay, strong H_2S odor.	
					17.5			SILTY CLAY (OL) - with little peat, very soft, very plastic, greenish black (5GY 2/1).	
	9-14-23		18/13					SILTY SAND (SM) - with little clay, medium grained, wet, shell fragments, well rounded, well sorted.	

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED

PROJECT NO 87-01105.18

THE MARK GROUP ENGINEERS & GEOLOGISTS, INC

Hydrogeological Assessment
The O'Brien Corporation
South San Francisco, CA

DRAWING NO

LOG OF BORING No.PM-9

DATE DRILLED: 8/28/87 EQUIPMENT: B-56

DESCRIPTION: auger ELEVATION: 2.62 feet

SAMPLE NO / SAMPLE TYPE	BLOWS PER 6 INCHES	SPT N	INCHES DRIVEN / INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG		HNu TESTS
S-5	4-17-32		18/15					As above - Silty ~~Clay~~. SAND	
	4-8-16		18/13						
					22.5			Layer of well rounded pebbles, gravel and shell fragments, with coarse quartzic sand.	
	38-50		9"					SANDSTONE & MUDSTONE - layers (convaluted), hard, heavily weathered, friable, dark yellowish orange (10YR 6/6), veins of white mineralization.	
	39-50		3"						
	50		6						
	50		6						
					25				
								TD Boring at 25 feet.	
								Installed 2 inch monitoring well, see Well Construction Log for details.	
					27.5				

DRILLING CONTRACTOR Exploration Geoservices

DRILLER Dave Yaeger

BY XLH DATE 12/11/87 CHK'D BY TWC

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED

PROJECT NO 87-01105.18

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Hydrogeological Assessment
The O'Brien Corporation
South San Francisco, CA

DRAWING NO

DRILL RIG	CME 75	SURFACE ELEVATION		LOGGED BY	TCM
DEPTH TO GROUNDWATER	4 Feet	BORING DIAMETER	8-inch	DATE DRILLED	12/7/93

DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	PID READING	REMARKS	WELL CONSTRUCTION
FILL: CLAYEY SAND (SC), brown and orange mottled, damp, trace silt, very fine-grained.					9		
(As above, no clay, with debris [wood and brick fragments])					9		
FILL: Rock, gray and multicolored, dry, some silt.					9		
(As above, wet, with clay binder)		5			0		
(As above)					0		
(As above, saturated, with clay and sand [fine-grained])					0		
FILL: SANDY CLAY (CL), grayish-black, saturated, (fine-grained), strong organic odor.					0	No recovery between 7.5 and 10 feet.	
FILL: Rock, gray and black, saturated, moderate organic odor.		10			207	30% recovery for 10 to 15 foot interval.	
SILTY CLAY (CH), gray with black staining, saturated, moderate organic odor, (Bay Mud).					0		
					0		
					0		
		15			65		

Bottom of Boring = 15.5 Feet

Notes:

1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. Boring backfilled with cement grout to grade.
3. Ground water level measured at 4 feet at time of drilling.

HARZA

Consulting Engineers & Scientists

EXPLORATORY BORING LOG

FULLER-O'BRIEN PAINTS
South San Francisco, California

PROJECT NO.	DATE	BORING NO	SWB-6
K615I	April 1994		

DRILL RIG	CME 75	SURFACE ELEVATION		LOGGED BY	TCM
DEPTH TO GROUNDWATER	17 Feet	BORING DIAMETER	8-inch	DATE DRILLED	12/7/93

DESCRIPTION AND CLASSIFICATION DESCRIPTION AND REMARKS	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	PID READING	REMARKS	WELL CONSTRUCTION
FILL: SANDY CLAY (CL), mottled brown, tan, and orange, wet, trace organic odor.					210		
FILL: SANDY GRAVEL (GM), brown, dry/damp, trace organics.					254		
FILL: GRAVEL (GM), gray, dry, trace sand (coarse-grained).					1218		
FILL: Debris, (glass and very fine-grained sand), black and multicolored, damp, strong solvent odor.		5			573		
FILL: CLAYEY SAND (SC), gray and black, damp, fine-grained.					132		
(As above, with slight green discoloration, with brick debris)					37		
(As above, with rock fragments and cobbles)		10			50		
(As above, damp, with silt)					177		
(As above, with weathered rock and fine-grained sand)					202		
FILL: Serpentine Rock, green, damp, weathered, with clay and sand (fine-grained).		15			1332	<10% recovery for 15 to 20 foot interval. Rock blocked sampler.	
FILL: SAND (SM), black and gray, wet, fine-grained.					83		
(As above, color change to tannish-brown)					891		
					110		
					50		
Bottom of Boring = 20 Feet		20					

Notes:
1. The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.
2. Boring backfilled with cement grout to grade.
3. Ground water level measured at 16.5 feet at time of drilling.

HARZA
Consulting Engineers & Scientists

EXPLORATORY BORING LOG

FULLER-O'BRIEN PAINTS
South San Francisco, California

PROJECT NO.	DATE	BORING NO	SWB-9
K615I	April 1994		

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

EPA METHOD 8270B SEMIVOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY / MASS SPECTROSCOPY (GC/MS)

Applicable matrix or matrices: Solid Waste, Water, Wastewater
Standard Compound List and Reporting Limits: approximately 1 mg/Kg (wet weight) for soil/sediment samples, 1-200 mg/Kg for wastes (dependent on matrix and method of preparation), and approximately 10 ug/L for water samples

Approvals and Signatures

Laboratory Manager: _____ **Date:** _____

QA Manager: _____ **Date:** _____

Department Manager: _____ **Date:** _____

" This document has been prepared by Algen Technical Services for Sequoia Analytical and for the use of Sequoia Analytical's customers in evaluating laboratory qualifications and capabilities. The user of this document agrees by its acceptance or use to return it to Sequoia Analytical upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use it for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT PRIOR WRITTEN AUTHORIZATION IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK IS PROTECTED BY STATE AND FEDERAL LAWS OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

COPYRIGHT 1999 SEQUOIA ANALYTICAL, ALL RIGHTS RESERVED."

1.0 SCOPE AND APPLICATION

1.1 Method 8270 is a GC/MS method used to determine the concentration of semivolatile organic compounds in organic extracts prepared from all types of solid waste matrices, soils, and ground water. Direct injection of a sample may be used in limited applications. The following compounds are routinely reported by this method.

ANALYTE	CAS #
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Aniline	62-53-3
Anthracene	120-12-7
Azobenzene	103-33-3
Benzidine	92-87-5

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

ANALYTE	CAS #
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Benzo(g,h,i)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Benzoic acid	65-85-0
Benzyl alcohol	100-51-6
bis (2-Chloroethoxy)methane	111-91-1
bis(2-Chloroethyl)ether	111-44-4
bis(2-Chloroisopropyl) ether	108-60-1
bis(2-Ethylhexyl)phthalate	117-81-7
4-Bromophenyl-phenylether	101-55-3
Butylbenzylphthalate	85-68-7
4-Chloro-3-methylphenol	59-50-7
4-Chloroaniline	106-47-8
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
4-Chlorophenyl-phenyl ether	7005-72-3
Chrysene	218-01-9
Dibenz(a,h)anthracene	53-70-3
Dibenzofuran	132-64-9
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
3,3'-Dichlorobenzidine	91-94-1
2,4-Dichlorophenol	120-83-2
Diethylphthalate	84-66-2
2,4-Dimethylphenol	105-67-9
Dimethylphthalate	131-11-3
Di-n-butylphthalate	84-74-2
4,6-Dinitro-2-methylphenol	534-52-1
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Di-n-octylphthalate	117-84-0
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Indeno(1,2,3-cd)pyrene	193-39-5
Isophorone	78-59-1
2-Methylnaphthalene	91-57-6
2-Methylphenol	95-48-7
4-Methylphenol	106-44-5

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

ANALYTE	CAS #
Naphthalene	91-20-3
2-Nitroaniline	88-74-4
3-Nitroaniline	99-09-2
4-Nitroaniline	100-01-6
Nitrobenzene	98-95-3
2-Nitrophenol	88-75-5
4-Nitrophenol	100-02-7
N-Nitrosodimethylamine	62-75-9
N-Nitrosodi-n-propylamine	621-64-7
N-Nitrosodiphenylamine	86-30-6
2,2'-oxybis (1-Chloropropane)	108-60-1
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Phenol	108-95-2
Pyrene	129-00-0
1,2,4-Trichlorobenzene	120-82-1
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2

1.2 Method 8270C can be used to quantitate most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols. See Table 1 for a list of compounds and their characteristic ions that have been evaluated on the specified GC/MS system.

1.3 The following compounds may require special treatment when being determined by this method. Benzidine can be subject to oxidative losses during solvent concentration. Also, chromatography is poor. Under the alkaline conditions of the extraction step, a-BHC, g-BHC, endosulfan I and II, and endrin are subject to decomposition. Neutral extraction should be performed if these compounds are expected. Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph, chemical reaction in acetone solution, and photochemical decomposition. N-nitrosodimethylamine is difficult to separate from the solvent under the chromatographic conditions described. N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol,4,6-dinitro-2-methylphenol,4-chloro-3-methylphenol,benzoicacid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

1.4 The reporting limit of Method 8270 for determining an individual compound is approximately 1 mg/Kg (wet weight) for soil/sediment samples, 1-200 mg/Kg for wastes (dependent on matrix and method of preparation), and 10 ug/L for ground water samples (see Table 2). QLs will be proportionately higher for sample extracts that require dilution to avoid saturation of the detector.

1.5 This method is restricted to use by or under the supervision of analysts experienced in the use of gas chromatograph/mass spectrometers and skilled in the interpretation of mass spectra. Each analyst must demonstrate the ability to generate acceptable results with this method.

Note: The quality control limits specified in this Standard Operating Procedure are applicable to all analyses which specify this method and are not governed by a project or program specific QAPP. In cases where a separate QAPP is provided, the QAPP will supersede the limits specified herein.

2.0 SUMMARY OF METHOD

2.1 Prior to using this method, the samples should be prepared for chromatography using the appropriate sample preparation and cleanup methods. This method describes chromatographic conditions that will allow for the separation of the compounds in the extract and for their qualitative and quantitative analysis by mass spectrometry.

2.2 A 500 mL aliquot of a liquid sample or a 30 g aliquot of a soil sample is spiked with a surrogate compound mixture and then extracted with methylene chloride. The final extract is concentrated to 1000 uL. A 1.0 uL aliquot of the concentrated final extract is injected into the gas chromatograph, where it is volatilized in the injection port and swept onto the chromatographic column. A temperature program is used to separate the semivolatile compounds, and they are carried on the gas stream into the ion source of a mass spectrometer. The end of the column is positioned so the eluting compounds are ionized immediately. The ionized molecules are focused and separated according to their mass/charge ratio (m/z) by the quadrupole analyzer. The signal is amplified by an electron multiplier and interpreted by the mass spectrometer data system to produce a total ion chromatogram and mass spectrum for every data point on the chromatogram.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

Identification of target analytes is accomplished by comparing the mass spectrum with the spectrum of authentic standards. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard with a five point calibration curve, for each analyte.

2.3 The scanning range for the mass spectrometer is 35-500 AMU. Instrument performance is verified by the injection of Decafluorotriphenylphosphine (DFTPP). The ion relative abundances must meet the specified criteria before analyses can proceed. If the criteria are met, the instrument then must demonstrate acceptable chemical calibration and linearity by the injection of a minimum of 5 concentrations of a standard mix containing the analytes of interest, as well as the internal standards. If the sensitivity (relative response factor, RRF) and linearity (relative standard deviation, %RSD) criteria are met the analysis may proceed. All analyses must occur within 12 hours of the injection of the passing DFTPP. Another analytical sequence may be started by analysis of a passing DFTPP followed by a continuing calibration standard. This standard must meet the sensitivity (RRF) and linearity (difference from the initial calibration , %D) criteria before analysis of samples may proceed.

2.4 The method includes specific calibration and quality control steps that supersede the general requirements provided in Method 8000.

3.0 DEFINITIONS

3.1 Tuning window – The period of time in which the GC/MS is considered 'in tune'. The tuning window for 8270 is twelve hours. This is defined as injection to injection. That is to say the timing window clock starts at the moment of injection and ends 12 hours later. The next tuning at the end of that 12 hour period is also measured from the start of injection of the next tune.

4.0 INTERFERENCES

4.1 Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation and/or cleanup of the samples and take corrective action to eliminate the problem.

4.2 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed with solvent between samples. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross contamination.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

4.3 In most cases, Method 8270 is not appropriate for the quantitation of multicomponent analytes, e.g., Aroclors, Toxaphene, Chlordane, etc., because of limited sensitivity for those analytes. When these analytes have been identified by another technique, Method 8270 is appropriate for confirmation of the presence of these analytes when concentration in the extract permits. Refer to Methods 8081 and 8082 for guidance on calibration and quantitation of multicomponent analytes such as the Aroclors, Toxaphene, and Chlordane.

4.4 The following compounds may require special treatment when being determined by this method:

4.4.1 Benzidine may be subject to oxidative losses during solvent concentration and its chromatographic behavior is poor.

4.4.2 Under the alkaline conditions of the extraction step from aqueous matrices, BHC, Endosulfan I and II, and Endrin are subject to decomposition. Neutral extraction should be performed if these compounds are expected.

4.4.3 Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph, chemical reaction in acetone solution, and photochemical decomposition.

4.4.4 N-nitrosodimethylamine is difficult to separate from the solvent under the chromatographic conditions described in the method.

4.4.5 N-nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine.

4.4.6 Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, benzoic acid, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

4.4.7 Pyridine may perform poorly at the GC injection port temperatures listed in the method. Lowering the injection port temperature may reduce the amount of degradation. The analyst needs to use caution if modifying the injection port temperature as the performance of other analytes may be adversely affected.

4.4.8 Toluene diisocyanate rapidly hydrolyses in water (half-life of less then 30 min.). Therefore, recoveries of this compound from aqueous matrices should not be expected. In addition, in solid matrices, toluene diisocyanate often reacts with alcohols and amines to produce urethane and ureas and consequently cannot usually coexist in a solution containing these materials.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

4.4.9 In addition, analytes in the list provided above should be flagged when there are limitations caused by sample preparation and/or chromatographic problems.

4.4.10 The estimated quantitation limit (EQL) of Method 8270 for determining an individual compound is approximately 660 µg/kg (wet weight) for soil/sediment samples, 1-200 mg/kg for wastes (dependent on matrix and method of preparation), and 10 µg/L for ground water samples (see Table 2). EQLs will be proportionately higher for sample extracts that require dilution to avoid saturation of the detector.

4.4.11 It is recommended that nitrosamine compounds be placed together in a separate calibration mix and not combined with other calibration mixes. When using a premixed certified standard, consult the manufacturer's instructions for additional guidance.

4.4.12 Mixes with hydrochloride salts may contain hydrochloric acid, which can cause analytical difficulties. When using a premixed certified standard, consult the manufacturer's instructions for additional guidance.

5.0 SAFETY

5.1 During the execution of the procedures outlined in this SOP, potentially hazardous compounds may be encountered. Preparation personnel should observe all appropriate safety rules as outlined in the Chemical Hygiene Plan.

5.2 Samples handled under this SOP may originate from unknown sites, which could contain a variety of hazardous materials. Appropriate safety rules as outlined in the Chemical Hygiene Plan should be observed while handling samples of unknown content and/or origin.

6.0 EQUIPMENT AND SUPPLIES

6.1 Gas Chromatograph – Hewlett-Packard 5890

6.1.1 Column - DB-5 625 30 meter, 0.32 mm i.d., 0.5 um thickness coating

6.2 Mass spectrometer - Hewlett Packard 5971A and 5972 MSD (Mass Selective Detectors) capable of scanning from 35-500 m/z every second, using 70 volts (nominal) electron energy in the electron impact mode.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

6.2.1 Column – RTX5 (Restek) 30 meter, 0.25 i.d., 0.5 um thickness coating

6.3 Data systems – The Hewlett Packard 5890's use a network version of Chemstation to set up run sequences, control the purge and trap device and control the GC and MSD. UNIX based programs, Target and Chemserver, are used to integrate files and produce reports for each system. This computer system allows the continuous acquisition and storage on machine readable media of all mass spectra obtained throughout the duration of the chromatographic program. This system allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). This software also allows integrating the abundances in any EICP between specified time or scan number limits. The most recent version of the EPA/NIST Mass Spectral Library which contains 75,000 entries is loaded on the system.

6.4 Syringe - 10 uL.

6.5 Sample Bottles - glass with Teflon-lined screw caps or crimp tops.

7.0 REAGENTS AND STANDARDS

7.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 **Reagent water** – Use the 18 megohm deionized water supply. The conductivity of the water must be monitored daily and recorded in a conductivity logbook. Reagent water shall have a conductivity of less than 1.0 µS/cm. If the conductivity limits are exceeded, replace the resin beds in the nanopure DI unit.

7.3 Working Standards

7.3.1 Tuning Solution - Contains 50 µg/mL each of DFTPP, Decafluoro-triphenylphosphine, pentachlorophenol, benzidine and 4,4-DDT.

7.3.2 Daily Working Standards - Concentration 50 µg/mL. (Each Target Parameter Contained)

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

7.3.3 Matrix Spike, Laboratory Control Samples - The final concentration will be 100 µg/L (liquid) or 3333 µg/Kg (soil). For detailed instructions please refer to the applicable sample preparation SOP.

7.3.4 Internal Standard - Spiked into every standard, sample and quality control sample. Concentration 40 µg/mL of the following compounds:

Acenaphthene-d10
Chrysene-d12
Naphthalene-d8
1,4-Dichlorobenzene-d4
Perylene-d12
Phenanthrene-d10

7.3.5 Surrogate Standard - For detailed instructions please refer to the applicable sample preparation SOP. Compounds listed below.

2-Fluorophenol	Acid
Phenol-d6	Acid
2,4,6-Tribromophenol	Acid
2-Fluorobiphenyl	Base/Neutral
Nitrobenzene-d5	Base/Neutral
p-Terphenyl-d14	Base/Neutral

7.4 All standard solutions are made from Certified Stock mixtures supplied by Supelco, Chem. Service, Ultra Scientific, or Restek. Pure assayed compounds supplied by Aldrich, Mallinckrodt and other suppliers can also be used to make standard solutions.

7.5 Methylene Chloride

7.6 The table below is an example of how to prepare the calibration curve. Please note, different suppliers may have different stock concentrations, therefore, amounts may need to be revised in order to achieve the final concentrations (5, 20, 50, 80, 120, 160 ng/µL).

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

µLs of 200 µg/mL Stock Standard	µLs of Methylene Chloride	µLs of Internal Std. Solution	Final Concentration ng/µL
25	975	20	10
100	900	20	20
250	750	20	50
400	600	20	80
600	400	20	120
800	200	20	160

Note – Each new lot of solvent must be checked for contamination by using an solvent or method blank. These blanks must pass below the reporting limit for each new lot. If a new lot of solvent is found to be contaminated it shall not be used. It is recommended that the vendor set aside a number of bottles of solvent of the same lot to minimize the number of blanks analyzed.

8.0 SAMPLE COLLECTION, PRESERVATION, SHIPMENT AND STORAGE

8.1 All samples must be collected following a sampling plan addressing the considerations of Chapter nine of SW846, and must have complete chains of custody.

8.2 All sample containers must be prewashed with detergents, acids, and water. Alternately a supply of prewashed and certified plastic or glass containers may be used.

8.3 Sample Collection.

8.3.1 Liquids: A minimum of 500 mLs is required for extraction. Additional sample volume is required for the Matrix Spike and Matrix Spike Duplicate.

8.3.2 Solids: A minimum of 30 grams of sample is required. Additional sample volume is required for the Matrix Spike and Matrix Spike Duplicate.

8.4 Shipment - Samples should be sent to the laboratory packed in a cooler or other suitable container and maintained at 4 ±2°C. Samples should be sent to the laboratory as soon after collection as possible.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

8.5 Laboratory Storage - Samples should be stored under refrigeration at the laboratory at 4 ± 2°C. Samples that are identified as high concentration may be segregated from other samples during the storage period. The holding time for aqueous samples is 7 days from collection to extraction. The holding time for solid samples is 14 days from collection before extraction. Once samples have been extracted analysis must be performed within 40 days.

9.0 QUALITY CONTROL REQUIREMENTS

9.1 For each analytical batch of no more than 20 samples processed, or one per day of extractions – whichever is more frequent, a Prep blank (method or reagent blank) must be carried throughout the entire sample-preparation and analytical process. The quantity of the reagent blank extracted should be approximately equal to the sample aliquots being processed. This blank will be useful in determining if samples are being contaminated during extraction.

9.2 A Laboratory Control Sample (LCS) must be processed with each analytical batch of no more than 20 samples. An LCS is a blank spike brought through the whole preparation and analytical process.

9.3 Matrix spike (MS) and matrix spike duplicate (MSD) samples should be prepared with each analytical batch of no more than 20 samples. Spiked samples should be included whenever a new sample matrix is being analyzed. If there is insufficient sample for a matrix spike duplicate, a Laboratory Control Sample duplicate may be substituted.

9.3.1 Once analysis is complete, the percent recoveries and the relative percent difference are calculated and compared to the required limits.

Accuracy (Percent Recovery)

$$\%\text{Recovery} = \frac{(\text{Concentration of Matrix Spike} - \text{Concentration of Sample})}{\text{Spike Concentration Added}} \times 100$$

Precision (Relative Percent Difference)

$$\text{RPD} = \frac{(\text{Concentration of Matrix Spike} - \text{Concentration of MSD})}{(\text{Concentration of Matrix Spike} + \text{Concentration of MSD})/2} \times 100$$

9.3.2 The following compounds are routinely controlled in the LCS and MS samples:

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

Phenol	2-Chlorophenol
1,4,-Dichlorobenzene	N-Nitroso-di-n-propylamine
1,2,4-Trichlorobenzene	4-Chloro-3-methylphenol
Acenaphthene	4-Nitrophenol
2,4-Dinitrotoluene	Pentachlorophenol
Pyrene	

9.4 A sample duplicate should also be performed with each analytical batch of no more than 20 samples. A sample duplicate is a sample brought through the whole sample preparation and analytical process.

9.5 Surrogates. Each sample, blank and QC sample is spiked with surrogate prior to extraction.

10.0 CALIBRATION AND STANDARDIZATION

10.1 **Tuning** - Before analysis begins each GC/MS must meet tuning criteria specified in EPA Method 8270C (SW-846). These criteria must be met once for every 12 hours of analysis time.

DFTPP KEY ION ABUNDANCE CRITERIA	
MASS	**ION ABUNDANCE CRITERIA**
51	30 to 60% of mass 198
68	less than 2% of mass 69
70	less than 2% of mass 69
127	40 to 60% of mass 198
197	less than 1% of mass 198
198	base peak, 100% relative abundance
199	5 to 9% of mass 198
275	10 to 30% of mass 198
365	greater than 1% of mass 198

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

DFTPP KEY ION ABUNDANCE CRITERIA	
441	present but less than mass 443
442	greater than 40% of mass 198
443	17 to 23% of mass 442

10.1.1 **Column performance test for base/neutrals** - At the beginning of each day the benzidine tailing factor must be checked visually for tailing. Inject 50 ng of benzidine as a part of a standard mixture that contains DFTPP. If the tailing is excessice, perform corrective maintenance or replace the column as necessary.

10.1.2 **Column performance test for acids** - At the beginning of each day, inject 50 ng of pentachlorophenol as a part of a standard mix that contains DFTPP. Visually check the chromatogram for tailing, if the tailing is excessive perform corrective maintenance or replace the column as necessary.

10.1.3 **DDT degradation test** - The GC/MS tuning standard solution should also be used to assess GC performance and injection port inertness. Degradation of DDT to DDE and DDD should not exceed 20%.

10.2 5 point Calibration

10.2.1 DFTPP tuning criteria must be satisfied before the **5 POINT** calibration can be analyzed.

10.2.2 Prepare a calibration curve with at least 5 points from certified multi-component stock mixes.

10.2.3 The following acceptance criteria for initial calibration **must** be satisfied before analysis of samples begin.

10.2.3.1 The percent relative standard deviation (%RSD) should be less than 15% for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) must be less than 30%. The relative retention times of each compound in each calibration run should agree within 0.06 relative retention time units. Late-eluting compounds usually have much better agreement.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

$$\%RSD = \frac{SD}{RF} * 100$$

where:
SD = standard deviation (n-1) of the RFs for a compound.
RF = mean of the 5 initial RFs for a compound.

10.2.3.2 If the %RSD of any CCC is 30% or greater, then the chromatographic system is too reactive for analysis to begin. Clean or replace the injector liner and/or capillary column, then repeat the calibration procedure.

10.2.3.3 Linearity - If the %RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

10.2.3.4 If the %RSD of any compound is greater than 15%, construct calibration curves of area ratio (A/Ais) versus concentration using first or second order regression fit of the five calibration points. The analyst should select the regression order which introduces the least calibration error into the quantitation. Use of calibration curves is a recommended alternative to average response factor calibration, and a useful diagnostic of standard preparation accuracy and absorption activity in the chromatographic system.

10.2.4 **Calibration Check Compounds** (CCC's) must be less than 30% RSD for each compound.

Calibration Check Compounds

Base/Neutral Fractions	Acid Fraction
Acenapthalene	4-Chloro-3-methylphenol
1,4-Dichlorobenzene	2,4-Dichlorophenol
Hexachlorobutadiene	2-Nitrophenol
N-Nitrosodiphenylamine	Phenol
Di-n-octyl phthalate	Pentachlorophenol
Fluoranthene	2,4,6-Trichlorophenol
Benzo(a)pyrene	

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

If the %RSD of any compound is 30% or greater, than the chromatographic system is too reactive for analysis to begin. Clean or replace the injector liner and/or capillary column, then repeat the calibration procedure.

10.2.5 **System Performance Check Compounds** (SPCC's) must have an (RF) of 0.05 or greater.

System Performance Check Compounds:

N-Nitroso-di-n-propylamine
Hexachlorocyclopentadiene
2,4-Dinitrophenol
4-Nitrophenol

10.3 **Continuing Calibration** - Prior to the analysis of samples, the GC/MS tuning standard must be analyzed using a 50 ng injection of DFTPP.

10.4 If the instrument has been previously calibrated then a continuing calibration is required. Analyze a mid-level standard, 50 µg/L, and compare to the initial five point calibration every 12 hours. **CCC's** and **SPCC's** must meet the specified criteria. Calibration check compounds are allowed no greater than20 % difference from the initial calibration. System performance check compounds are required to maintain the relative response factors (Rf) of 0.050. If the CCCs are not analytes required for the analysis, than all required analytes must meet the 20% drift criterion. If the drift is >20% for any one CCC, corrective action is required.

10.5 The retention time for any internal standard may not vary by more than 30 seconds from the last calibration check (12 hours). If it does vary then the chromatographic system must be inspected for malfunctions and corrective actions should be taken.

10.6 The **E**xtracted **I**on **C**urrent **P**rofile area for any internal standard must not deviate by more than a factor of two (- 50% to + 100%).

11.0 PROCEDURE

11.1 Samples are normally prepared by one of the following methods prior to GC/MS analysis.

Matrix	Methods

Air	3542
Water	3510, 3520, 3535
Soil/sediment	3540,3541, 3545, 3550, 3560, 3561
Waste	3540, 3541, 3545, 3550, 3560, 3561, 3580

11.2 In very limited applications, direct injection of the sample into the GC/MS system with a 10-µL syringe may be appropriate. The detection limit is very high (approximately 10,000 µg/L). Therefore, it is only permitted where concentrations in excess of 10,000 µg/L are expected.

11.3 Extract cleanup - Extracts may be cleaned up by any of the following methods prior to GC/MS analysis.

Analytes of interest	Methods
Aniline & aniline derivatives	3620
Phenols	3630, 3640 (sm5225F), 8041
Phthalate esters	3610, 3620, 3640 (sm5225F)
Nitrosamines	3610, 3620, 3640 (sm5225F)
Organochlorine pesticides & PCBs	3610, 3620, 3630, 3660, 3665
Nitroaromatics and cyclic ketones	3620, 3640 (sm5225F)
Polynuclear aromatic hydrocarbons	3611, 3630, 3640 (sm5225F)
Haloethers	3620, 3640 (sm5225F)
Chlorinated hydrocarbons	3620, 3640 (sm5225F)
Organophosphorus pesticides	3620
Petroleum waste	3611, 3650
All base, neutral, and acid priority pollutants	3640 (sm5225F)
Organophosphorus pesticides	3620

* Method 8041 includes a derivatization technique followed by GC/ECD analysis, if interferences are encountered on GC/FID.

11.4 **Operating Conditions**

GC/MS OPERATING CONDITIONS	**RECOMMENDED**	**HP 5890**
Mass range:	35-500 amu	35-500 amu
Scan time:	1 sec/scan	0.625 sec/scan

Prepared for Sequoia Analytical by Algen Technical Services. ©1999

GC/MS OPERATING CONDITIONS	RECOMMENDED	HP 5890
Initial temperature:	40° C, hold for 4 minutes	39°
Temperature program:	40-270° C at 10° C/min	39-300 at 10° /min
Final temperature:	270° C, hold until benzo[g,h,i]perylene elutes	300-320°
Injector temperature:	250-300° C	250°
Transfer line temperature:	250-300° C	250°
Source temperature:	According to manufacturer's specifications	200°
Injector:	Grob-type, splitless*	splitless*
Injection volume:	1-2 µL	1 µL
Carrier gas:	Hydrogen at 50 cm/sec or helium at 30 cm/sec	15 psi helium

* Split injection is allowed if the sensitivity of the mass spectrometer is sufficient.

11.5 Analytical Sequence – example of a routine analytical sequence follows: (Actual sequencing may vary beyond the LCS).

1. DFTPP Injection
2. Cal. Std. (Assuming 5-pt. calibrated)
3. Blank
4. LCS
5. Matrix Spike
6. Matrix Spike Duplicate
7. Sample #1
8. Sample #2
9. Sample #3
10. Sample #4
11. Sample #5
12. Sample #6

12.0 CALCULATIONS

12.1 Target components identified shall be quantified by the internal standard method. The internal standard used shall be the one nearest the retention time to that of a

Prepared for Sequoia Analytical by Algen Technical Services. ©1999

given analyte. The extracted ion current profile (EICP) area of primary characteristic ions of analytes listed in Table IV and V are used. The average response factors from the initial calibration curve are used to calculate the concentration of target analytes present in each sample. Secondary ions may be used if interferences are present. The area of a secondary ion cannot be substituted for the area of a primary ion unless a response factor is calculated using the secondary ion.

12.2 Calculate the concentration in the sample using the response factor (Equation 1) and the equations (2-7) given below.

12.3 An estimated concentration for non-target components tentatively identified shall be calculated by the internal standard method. For quantification, the nearest internal standard free of interferences shall be used. When calculating concentration, total area counts from the total ion chromatograms are to be used for both the compound to be measured and the internal standard. A response factor of one (1.0) is to be assumed. The value from this quantitation shall be qualified as estimated. This estimated concentration should be calculated for all tentatively identified compounds as well as those identified as unknowns.

12.4 Response Factors (RF)

Calculate response factors (RFs) for each compound as follows:

$$RF = (A_x C_{is})/(A_{is} C_x) \qquad \text{----Equation 1}$$

Where:

A_x	=	Area of the characteristic ion for the compound being measured.
A_{is}	=	Area of the characteristic ion for the specific internal standard.
C_{is}	=	Concentration of the specific internal standard (ng/µL).
C_x	=	Concentration of the compound being measured (ng/µL).

12.5 PERCENT RELATIVE STANDARD DEVIATION (%RSD)

The percent relative standard deviation (%RSD) is calculated as follows:

$$\%RSD = 100(SD/RF) \qquad \text{----Equation 2}$$

Where:

Prepared for Sequoia Analytical by Alpen Technical Services, ©1999

RF = Mean of the Response Factors from the initial calibration curve.

SD = Standard Deviation of initial response.

12.6 PERCENT DIFFERENCE (%D)

The Percent Difference (%D) is calculated as follows:

$$\% \text{ Difference} = \frac{(RF_i - RF_c)}{RF_i} (100) \qquad \text{---- Equation 3}$$

Where:

RF_i = Average response factor from initial calibration.

RF_c = Response factor from current verification check standard.

12.7 Concentration Calculations

12.7.1 Concentration in extract

$$C_{(ex)} \text{ (mg/L)} = \frac{A_{(x)} \times C_{(is)}}{A_{(is)} \times RF} \qquad \text{----- Equation 4}$$

where:

$C_{(ex)}$ is the concentration of the compound in the extract

$A_{(x)}$ = Area of the characteristic ion for the compound being measured.

$A_{(is)}$ = Area of the characteristic ion for the specific internal standard.

$C_{(is)}$ = Concentration of the specific internal standard (ng/µL).

$C_{(x)}$ = Concentration of the compound being measured (ng/µL).

12.7.2 Concentration in aqueous samples

$$\text{Conc. in sample } (\mu g/L) = \frac{(C_{(ex)} \times V_{(ex)})}{V_{(o)}} \qquad \text{----- Equation 5}$$

where:

$C_{(ex)}$ is the concentration of the compound in the extract

$V_{(ex)}$ = extract volume, in mL

$V_{(o)}$ = volume of liquid extracted, in L.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

12.7.2 **Concentration in soil samples**

$$\text{Conc. in solid } (\mu g/Kg) = \frac{(C_{(ex)} \times V_{(ex)})}{W_{(s)}} \qquad \text{-----Equation 6}$$

where:
$C_{(ex)}$ is the concentration of the compound in the extract
$V_{(ex)}$ = extract volume, in mL
$W_{(s)}$ = sample weight, in Kg.

12.8 MATRIX SPIKE PERCENT RECOVERY

Calculate the Matrix Spike Percent Recovery as follows:

$$\text{Matrix Spike Percent Recovery} = \frac{(SSR - SR)}{SA}(100) \qquad \text{---- Equation 7}$$

Where:

SSR	=	Spike Sample Results
SR	=	Sample Result
SA	=	Spike Added from spiking mix

12.9 RELATIVE PERCENT DIFFERENCE (RPD)

The laboratory should calculate the relative percent difference between the matrix spike and matrix spike duplicate. The relative percent differences (RPD) for each component are calculated using the following equation:

$$RPD = \frac{(A - B)}{(A + B)/2} \times 100 \text{---- Equation 8}$$

Where:

RPD	=	Relative Percent Difference
A	=	First Sample Value
B	=	Second Sample Value (duplicate)

13.0 METHOD PERFORMANCE

13.1 Method Detection Limit Studies are performed for this method on each instrument per matrix on an annual basis.

14.0 POLLUTION PREVENTION

14.1 All wastes from this procedure shall be disposed following the recommendations of the chemical hygiene plan.

15.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES

15.1 **Method Blank** - If any target analyte is found in the method blank at or above the PQL, the blank must be reanalyzed. Method blanks must meet the same requirements that the samples do. Surrogate spikes must meet the specified control limits or the batch must be re-extracted.

15.2 **Laboratory Control Sample, Matrix Spike and Matrix Spike Duplicate -**

15.2.1 The following compounds are routinely controlled in the LCS and MS samples:

Phenol	2-Chlorophenol
1,4,-Dichlorobenzene	N-Nitroso-di-n-propylamine
1,2,4-Trichlorobenzene	4-Chloro-3-methylphenol
Acenaphthene	4-Nitrophenol
2,4-Dinitrotoluene	Pentachlorophenol
Pyrene	

15.2.2 Please refer to Section 20 for compound specific QC limits.

15.2.3 Corrective action for failed QC

LCS	All analytes must pass control limits. If criteria is not met upon reanalysis of the LCS, a re-extraction of the batch occurs. Surrogates must be within the stated control limits listed in Appendix A or the batch must be re-extracted.
MS/MSD	Evaluate the LCS. If LCS is within the control limits then MS/MSD failures are assumed to be matrix related.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

15.3 **Surrogates** - One acid surrogate and one B/N surrogate is allowed to fail in the sample. All surrogates must be within the control limits in the method blank and the LCS.

15.4 **Qualitative Analysis** – The target compounds shall be identified by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound. Two criteria must be satisfied to verify the identifications:

15.4.1 Elution of the sample component at the same GC relative retention time as the standard component.

15.4.2 Correspondence of the sample component and standard component mass spectra.

15.4.3 For establishing correspondence of the GC relative retention time (RRT), the sample component RRT must compare within ± 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run on the same twelve hour shift as the sample. The RRT should be assigned by using extracted ion current profiles for ions unique to the component of interest. Standard component RRT values are updated with each continuing calibration standard.

15.5 The requirements for qualitative verification by comparison of mass spectra are as follows:

15.5.1 All ions present in the standard mass spectra at a relative intensity greater than 10% (the most abundant ion in the spectrum is assigned a value of 100%) must be present in the sample spectrum.

15.5.2 The relative intensities of all the major qualifying ions must agree within plus or minus 20% between the standard and sample spectra.

15.5.3 Ions greater than 10% in the sample spectrum must be considered and accounted for by the analyst making the comparison.

15.5.4 When using GC/MS computer data processing programs to obtain sample spectra, the processed and the raw spectra must be evaluated.

15.5.5 A library search shall be executed for non-target sample components for the purpose of tentative identification if so requested by the client as "TIC" analysis. For this purpose, the EPA Mass Spectral Library should be used.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

15.5.6 If a TIC analysis is requested, up to 20 substances of greatest apparent concentration for the combined base/neutral/acid fraction shall be tentatively identified via a forward spectral library search. Substances with responses less than 10% of the nearest internal standard are not required to be searched in this fashion. Only after visual comparison of sample spectra with the nearest library searches will a GC/MS chemist assign a tentative identification.

15.5.7 Guidelines for Making Tentative Identification

15.5.7.1 Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

15.5.7.2 The relative intensities of the major ions should agree within ± 20%.

15.5.7.3 Molecular ions present in reference spectrum should be present in sample spectrum.

15.5.7.4 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

15.5.7.5 Ions present in the reference spectrum but not in the sample spectrum should be accounted for with respect to: (a) automatic background subtraction by the data system spectral reduction program or, (b) absence due to low concentration of the compound.

15.5.7.6 If in the opinion of the analyst no valid tentative identification can be made, the compound should be reported as unknown. The analyst should give additional classification of the unknown compound if possible (i.e. unknown phthalate, unknown hydrocarbon, unknown carboxylic acid, unknown chlorinated compound). If probable molecular weights can be determined, include them.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY
16.0 CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

16.1 Follow the corrective actions outlined in the following table.

Quality Control and Corrective Actions

Semi-Volatile Organics Method 8270			
Quality Control Criteria	**Frequency**	**Acceptance**	**Corrective Action**
DFTPP 50 ng on column	12 hour	Per Method	Re Tune Re Shoot
5 point initial calibration	As Required	Must meet all minimum RF and maximum %RSD criteria for CCC's and SPCC's	Recalibrate, mix new standards, reanalyze
CCAL	As required; beginning of each 12 hour window	Must meet all minimum RF and maximum %D criteria for CCC's and SPCC's	Re-shoot, check integrations, mix new std. Reanalyze ICAL
Method Blank	1 per extraction batch of 20 samples or fewer.	Targets < Reporting Limit **(With the exception of phthalate esters which can be up to 5 times the Reporting Limit)**	Reanalyze, check for contamination, correct as required
Matrix Spike/Matrix Spike Duplicate	1 per extraction batch of 20 samples or fewer.	Comparable results for spike and duplicate	Reanalyze if analytical problem. Evaluate LCS.
Samples	As Required	Results below the highest calibration standard	Dilute and re-analyze the samples.
Surrogates	Each Blank, Sample and QC sample	1 BN and 1 Acid surrogate may be outside the control limits for the samples. LCS and method blank surrogates must be within control limits.	If Blank and/or LCS has surrogates outside the control limit re-analyze. If they confirm re-extract the batch. If surrogates out in sample re-analyze. Narrative note.
LCS	1 per extraction batch of 20 samples or fewer.	Limited List evaluated	Check Std., Check Quantitation, Evaluate MS/MSD. If compounds outside the control limits, re-extract analytical batch.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

17.0 CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

17.1 Data that fails quality control requirements but cannot be repeated (i.e., insufficient sample volume, or severe matrix effects) should be brought to the immediate attention of the Analytical Department or the Client Services Representative so that the results may be discussed with the client. A narrative should accompany the analytical results explaining the analytical difficulties the laboratory encountered.

18.0 WASTE MANAGEMENT

18.1 All extracts produced by this procedure must be disposed following the procedures outlined in the Chemical Hygiene Plan.

19.0 REFERENCES

19.1 SW846, Method 8270B, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrophotometry (GC/MS): Capillary Column Technique, Revision 1, December 1992.

19.2 SW846, Method 8000, Determinative Chromatographic Separations, Revision 1, December 1992.

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

20.0 TABLES, DIAGRAMS, FLOWCHARTS AND VALIDATION DATA

20.1 Appendix A – (GEN047) Control Limits for Matrix Spikes and Laboratory Control Samples, Solid Waste, Wastewater, and Drinking Water Methods Using GC/MS

Network Control Limits (8270, 625)[1]									
GC/MS Semivolatiles	LCS (Sol.)	MS (Sol.)	LCS (Liq.)	MS (Liq.)	LCS (HW)	MS (HW)	RPD (Sol.)	RPD (Liq.)	RPD (HW)
Acenaphthene	31-137	31-137	46-118	46-118	31-137	31-137	0-40	0-30	0-40
4-Nitrophenol	11-114	11-114	10-80	10-80	11-114	11-114	0-40	0-30	0-40
2,4-Dinitrotoluene	28-89	28-89	24-96	24-96	28-100	28-100	0-40	0-30	0-40
Pentachlorophenol	17-109	17-109	9-103	9-103	17-117	17-117	0-40	0-30	0-40
Pyrene	35-142	35-142	26-127	26-127	35-142	35-142	0-40	0-30	0-40
Phenol	26-90	26-90	12-110	12-110	26-107	26-107	0-40	0-30	0-40
2-Chlorophenol	25-102	25-102	27-123	27-123	25-102	25-102	0-40	0-30	0-40
1,4-Dichlorobenzene	28-104	28-104	36-97	36-97	28-104	28-104	0-40	0-30	0-40
N-Nitroso-Di-N-propylamine	41-126	41-126	41-116	41-116	41-126	41-126	0-40	0-30	0-40
1,2,4-Trichlorobenzene	38-107	38-107	39-98	39-98	38-142	38-142	0-40	0-30	0-40
4-Chloro-3-Methylphenol	26-103	26-103	23-97	23-97	26-103	26-103	0-40	0-30	0-40

1 – LIMS Control Limits Revision 5 3/23/98

Prepared for Sequoia Analytical by Algen Technical Services. ©1999

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Appendix B: CHARACTERISTIC IONS

Compound	Primary Ion	Secondary Ion
N-Nitrosodimethylamine	74	43,42
Pyridine	79	52
Fluorophenol (SS)	112	64
Phenol-d6 (SS)	99	71,42
Aniline	93	66,65
Phenol	94	66,65
Bis(2-chloroethyl)ether	93	63,95
2-Chlorophenol	128	130,64
1,3-Dichlorobenzene	146	148,113
1,4-Dichlorobenzene-d4	152	154,115
1,4-Dichlorobenzene	146	148,113
Benzyl alcohol	108	77,79
1,2-Dichlorobenzene	146	148,113
2-Methylphenol	108	107
Bis(2-chloroisopropyl)ether	45	77,79
N-Nitroso-di-n-propylamine	70	42,130
4-Methylphenol	108	107
Hexachloroethane	117	201,199
Nitrobenzene-d5	82	54,128
Nitrobenzene	77	123,65
Isophorone	82	138,95
2-Nitrophenol	139	65,109
2,4-Dimethylphenol	107	122,77
m,p-Cresol	108	107
Bis(2-chloroethoxy)methane	93	63,95
Benzoic acid	105	105,77

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Compound	Primary Ion	Secondary Ion
2,4-Dichlorophenol	162	164,98
1,2,4-Trichlorobenzene	180	182,145
Naphthalene-d8	136	68
Naphthalene	128	129,102
4-Chloroaniline	127	129
Hexachlorobutadiene	225	223,227
4-Chloro-3-methylphenol	107	142,144
2-Methylnaphthalene	142	141
Hexachlorocyclopentadiene	237	235,272
2,4,6-Trichlorophenol	196	198,200
2,4,5-Trichlorophenol	196	198,200
2-Fluorobiphenyl (SS)	172	171
2-Chloronaphthalene	162	164,127
2-Nitroaniline	65	138,92
Dimethyl phthalate	163	194,164
2,6-Dinitrotoluene	165	89
Acenaphthylene	152	151,153
3-Nitroaniline	138	92,108
Acenaphthene-d10	164	162,160
Acenaphthene	153	152,154
2,4-Dinitrophenol	184	79,107
4-Nitrophenol	109	139,65
Dibenzofuran	168	169
2,4-Dinitrotoluene	165	63,182
Diethyl phthalate	149	177,150
Fluorene	166	165,163

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Compound	Primary Ion	Secondary Ion
4-Chlorophenyl phenyl ether	204	206,141
4-Nitroaniline	138	92,108
4,6-Dinitro-2-methylphenol	198	106,121
N-Nitrosodiphenylamine	169	168,167
1,2-Diphenylhydrazine	77	51,182
2,4,6-Tribromophenol (SS)	332	332,141
4-Bromophenyl phenyl ether	248	250,141
Hexachlorobenzene	284	142,249
Pentachlorophenol	266	264, 268
Phenanthrene-d10	188	94,80
Phenanthrene	178	176,179
Anthracene	178	176,179
Carbazole	167	166,139
Di-n-butylphthalate	149	150,104
Fluoranthene	202	101,100
Benzidine	184	92,185
Pyrene	202	101,100
Terphenyl-d14 (SS)	244	122,212
Butyl benzyl phthalate	149	91,206
3,3'-Dichlorobenzidine	252	254,126
Benzo(a)anthracene	228	229,226
Chrysene-d12	240	236,120
Chrysene	228	226,229
Bis(2-ethylhexyl)phthalate	149	167,279
Di-n-octylphthalate	149	
Benzo(b)fluoranthene	252	253
Benzo(k)fluoranthene	252	253

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Compound	Primary Ion	Secondary Ion
Benzo(a)pyrene	252	253
Perylene-d12	264	260,265
Indeno (1,2,3-cd)pyrene	276	138,277
Dibenz(a,h)anthracene	278	279,139
Benzo(g,h,i)perylene	276	138,277

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

ORGANIC ANALYSIS

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Appendix C: Semivolatile Internal Standards with Corresponding Target Compounds and Surrogates Assigned for Quantitation

1,4 Dichlorobenzene-d4	Naphthalene-d8	Acenaphthene-d10	Phenanthrene-d10	Chrysene-d12	Perylene-d12
N-Nitrosodimethylamine	Nitrobenzene	Hexachlorocyclo-pentadiene	4,6-Dinitro-2-methylphenol	Benzidine	Di-n-octylphthalate
Pyridine	Isophorone	2,4,6-Trichlorophenol	N-Nitrosodiphenylamine	Pyrene	Benzo(b)fluoranthene
2-Fluorophenol (SS)	2-Nitrophenol	2,4,5-Trichlorophenol	1,2-Diphenylhydrazine	Terphenyl-d14 (SS)	Benzo(k)fluoranthene
Phenol-d6 (SS)	2,4-Dimethylphenol	2-Fluorobiphenyl(SS)	2,4,6-Tribromophenol (SS)	Butyl benzyl phthalate	Benzo(a)pyrene
Aniline	m,p-Cresol	2-Chloronaphthalene	4-Bromophenyl phenyl ether	3,3'-Dichlorobenzidine	Indeno(1,2,3-cd)pyrene
Phenol	Bis(2-chloroethoxy)methane	2-Nitroaniline	Hexachlorobenzene	Benzo(a)anthracene	Dibenz(a,h)anthracene
Bis(2-chloroethyl)ether	Benzoic acid	Dimethyl phthalate	Pentachlorophenol	Chrysene	Benzo(g,h,i)perylene
2-Chlorophenol	2,4-Dichlorophenol	2,6-Dinitrotoluene	Phenanthrene	Bis(2-ethylhexyl)phthalate	(2-ethylhexyl)phthalate
1,3-Dichlorobenzene	1,2,4-Trichlorobenzene	Acenaphthylene	Anthracene		
1,4-Dichlorobenzene	Naphthalene	3-Nitroaniline	Carbazole		
Benzyl alcohol	4-Chloroaniline	Acenaphthene	Di-n-butylphthalate		
1,2-Dichlorobenzene	Hexachlorobutadiene	2,4-Dinitrophenol	Fluoranthene		
2-Methylphenol	4-Chloro-3-methylphenol	4-Nitrophenol			
Bis(2-chloroisopropyl)ether	2-Methylnaphthalene	Dibenzofuran			
N-Nitrosodi-n-propylamine	Nitrobenzene-d5 (SS)	2,4-Dinitrotoluene			
4-Methylphenol		Diethyl phthalate			
Hexachloroethane		Fluorene			
		4-Chlorophenyl phenyl ether			
		4-Nitroaniline			
		2,4,6-Tribromo-			

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

1,4 Dichlorobenzene-d4	Naphthalene-d8	Acenaphthene-d10	Phenanthrene-d10	Chrysene-d12	Perylene-d12
		phenol (SS)			

Prepared for Sequoia Analytical by Algen Technical Services, ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

EPA METHOD 6010B – INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY

Applicable matrix or matrices: Ground water, aqueous samples, TCLP extracts, industrial and organic wastes, soils, sludges, sediments and other solid wastes
Standard Compound List and Reporting Limits: See Table 1

Approvals and Signatures

Laboratory Manager: _____ **Date:** _____

QA Manager: _____ **Date:** _____

Department Manager: _____ **Date:** _____

" This document has been prepared by Algen Technical Services for Sequoia Analytical and for the use of Sequoia Analytical's customers in evaluating laboratory qualifications and capabilities. The user of this document agrees by its acceptance or use to return it to Sequoia Analytical upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use it for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT PRIOR WRITTEN AUTHORIZATION IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK IS PROTECTED BY STATE AND FEDERAL LAWS OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

COPYRIGHT 1999 SEQUOIA ANALYTICAL, ALL RIGHTS RESERVED."

1.0 SCOPE AND APPLICATION

1.1 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.2 Inductively coupled plasma-atomic emission spectroscopy determines trace elements in solution. The method is applicable to all of the elements listed in Table 1. All matrices, including ground water, aqueous samples, TCLP extracts, industrial and organic wastes, soils, sludges, sediments and other solid wastes, require digestion prior to analysis (California WET extracts and samples for dissolved metals which have been preserved and filtered do not require digestion).

NOTE: Dissolved elements are determined in filtered and acidified samples. Appropriate steps must be taken in all analyses to ensure that potential interferences

are taken into account. This is especially true when dissolved solids exceed 1500 mg/L. Total elements are determined after appropriate digestion procedures are performed. Since digestion techniques increase the dissolved solids content of the samples, appropriate steps must be taken to correct for potential interference effects.

1.3 This method may be applicable to elements other than those listed in Table 1 providing interelement correction factors, method detection limits, and linear ranges have been determined for each element prior to any sample analysis.

1.4 Method Detection limits, sensitivity and optimum ranges of the metals will vary with the matrices and model of the spectrometer. Method detection limits studies for this method are matrix, prep, and wavelength dependent. The concentrations of analytes in the MDL studies are to be set at approximately ½ the low standards concentration. This is accomplished by providing the metals preparation department with the ICP Initial Calibration Verification solution. The metals preparation department will spike 0.5 mL of the ICV solution into seven blank matrices for digestates with final volumes of 100 mL. This ratio of spike solution to final digestate (1/200) is to be used for all MDL studies. The matrix spiked in the MDL study must be high purity water for aqueous studies and glass beads or Ottawa Sand for soil matrices. MDL Studies are to be performed yearly.

1.5 Use of this method is restricted to analyst who have been trained and who are knowledgeable in the correction of spectral, chemical, and physical interferences.

1.6 Typical compounds and reporting limits used for this method are listed in Table 1 below:

Table 1: Typical Compound List and CAS#.

Analyte	**CAS #**
Aluminum	7429-90-5
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Boron	7440-42-8

Sequoia Analytical ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Analyte	CAS #
Cadmium	7440-43-9
Calcium	7440-70-2
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Iron	7439-89-6
Lead	7439-92-1
Magnesium	7439-95-4
Manganese	7439-96-5
Molybdenum	7439-98-7
Nickel	7440-02-0
Potassium	7440-09-7
Selenium	7782-49-2
Silver	7440-22-4
Sodium	7440-23-5
Strontium	7440-24-6
Thallium	7440-28-0
Tin	7440-31-5
Vanadium	7440-62-2
Zinc	7440-66-6

Note: The quality control limits specified in this Standard Operating Procedure are applicable to all analyses which specify this method and are not governed by a project or program specific QAPP. In cases where a separate QAPP is provided, the QAPP will supersede the limits specified herein.

Sequoia Analytical ©1999

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, samples must be solubilized or digested using appropriate sample preparation methods. When analyzing for dissolved metals, acid digestion is not necessary if the samples are filtered and acid preserved prior to analysis.

2.2 The method describes a technique for the simultaneous multielement determination of trace elements in solution. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Samples are nebulized and the aerosol that is produced is transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio frequency inductively coupled plasma (ICP). The spectra are dispersed by a grating spectrometer and the intensities of the line are monitored by photomultiplier tubes. The photocurrents form the photomultiplier tubes are processed and controlled by a computer system. A background correction technique is applied to compensate for variable background contribution to the determination of trace elements. Background is measured adjacent to analyte line on samples during analyses. The position selected for the background intensity measurement, on either or both sides of the analytical line, is determined by the complexity of the spectrum adjacent to the analyte line. This setting is associated with the method used and should not be changed except by skilled analysts under direction of the laboratory manager. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences named in Section 4 should also be recognized and appropriate corrections made.

Table 2 - Recommended Wavelengths and Estimated Instrumental Detection Limits

ELEMENT	WAVELENGTH[a] (nm)	ESTIMATED DETECTION LIMIT[b] (µg/L)
Aluminum	308.215	45
Antimony	206.833	32
Arsenic	193.696	53
Barium	455.403	2
Beryllium	313.042	0.3
Cadmium	226.502	4
Calcium	317.933	10
Chromium	267.716	7

Sequoia Analytical ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

ELEMENT	WAVELENGTH[a] (nm)	ESTIMATED DETECTION LIMIT[b] (µg/L)
Cobalt	228.616	7
Copper	324.754	6
Iron	259.940	7
Lead	220.353	42
Lithium	670.784	5
Magnesium	279.079	30
Manganese	257.610	2
Molybdenum	202.030	8
Nickel	231.604	15
Phosphorus	213.618	51
Potassium	766.491	See note c
Selenium	196.026	75
Silver	328.068	7
Sodium	588.995	29
Strontium	407.771	0.3
Thallium	190.864	40
Vanadium	292.402	8
Zinc	213.856	2

[a] The wavelengths listed are recommended because of their sensitivity and overall acceptance. Other wavelengths may be substituted if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference (see Step 3.1). In time, other elements may be added as more information becomes available and as required.

[b] The estimated instrumental detection limits shown are taken from Reference 1 in Section 9.0 below. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

[c] Highly dependent on operating conditions and plasma position.

3.0 DEFINITIONS

3.1 None

4.0 INTERFERENCES

4.1 Several types of interference effects may contribute to inaccuracies in the determination of trace elements. They can be summarized as follows:

4.1.1 Overlap of a spectral line from another element.

Sequoia Analytical ©1999

4.1.2 Unresolved overlap of molecular band spectra.

4.1.3 Background contribution from continuous or recombination phenomena.

4.1.4 Background contribution from stray light from the line emission of high concentration elements.

4.2 The first of these effects is compensated for by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The interfering element correction factor is calculated by measuring the signal due to an interfering element (typically at the highest linear range for that element) at the wavelength of the analyte of interest, and is expressed as concentration of analyte per concentration of interfering element.

4.3

4.3 The second effect may require selection of an alternate wavelength.

4.4 The third and fourth effects can usually be compensated by a background correction adjacent to the analyte line. In addition, users of simultaneous, multi-element instrumentation must assume the responsibility of verifying the absence of spectral interference from an element that could occur in a sample for which there is no channel in the instrument array.

4.5 Listed in Table 3 are some interference effects for the recommended wavelengths given in Table 1. The data in Table 3 are intended for use only as a rudimentary guide for the indication of potential spectral interferences, as actual interferences are often machine specific. For this purpose, linear relations between concentration and intensity for the analytes and the interferents can be assumed. The information is expressed as analyte concentration equivalents (i.e., false analyte concentrations) arising from 100 mg/L of the interferent element. Interferences for the ICP are calculated annually and the correction factor tables are updated and stored in the computer controlling the ICP.

4.6 Physical interferences are generally considered to be effects associated with the sample nebulization and transport processes. Such properties as change in viscosity and surface tension can cause significant inaccuracies especially in samples, which may contain high dissolved solids and/or acid concentrations. The use of a peristaltic pump lessens these interferences, and both of the ICP used at ITS use peristaltic pumps. However, caution should be exercised to make sure that the peristaltic tubing is not crimped, worn or clogged, all connections are snug, and that the pump is set for the proper uptake. If viscosity or surface tension interferences are occurring, they must be reduced by dilution of the sample and/or utilization of the method of standard addition.

Sequoia Analytical ©1999

4.7 Another problem which may occur is salt buildup from high dissolved solids at the tip of the nebulizer. This affects aerosol flow rate causing instrumental drift. The tip of the sample introduction tube and the tip of the nebulizer on the ICP may be cleaned with cleaning wires or moistened Q-tip should salt buildup occur (Nebulizer tip cleaning should be done at the beginning of the shift or be bracketed by CCV/CCBs).

4.8 Chemical interferences are characterized by molecular compound formation, ionization effects and solute vaporization effects. Normally these affects are not pronounced with the ICP technique, however, if observed they can be minimized by careful selection of operating conditions (that is, incident power, observation position, and so forth.), by buffering of the sample, by matrix matching, and by standard addition procedures. These types of interferences can be highly dependent on matrix type and the specific analyte element.

Table 3 – Possible Analyte Concentration Equivalents Arising from Interferences at the 100 mg/L Level

Elem.	λ (nm)	Al	Ca	Cr	Cu	Fe	Mg	Mn	Ni	Tl	V
Al	308.215	--	--	--	--	--	--	0.21	--	--	1.4
Sb	206.833	0.47	--	2.9	--	0.08	--	--	--	0.25	0.45
As	193.696	1.3	--	0.44	--	--	--	--	--	--	1.1
Ba	455.403	--	--	--	--	--	--	--	--	--	--
Be	313.042	--	--	--	--	--	--	--	--	0.04	0.05
Cd	226.502	--	--	--	--	0.03	--	--	0.02	--	--
Ca	317.933	--	--	0.08	--	0.01	0.01	0.04	--	0.03	0.03
Cr	267.716	--	--	--	--	0.003	--	0.04	--	--	0.004
Co	228.616	--	--	0.03	00	0.005	--	--	0.03	0.15	--
Cu	324.754	--	--	--	--	0.003	--	--	--	0.05	0.02
Fe	259.940	--	--	--	--	--	--	0.12	--	--	--
Pb	220.353	0.17	--	--	--	--	--	--	--	--	--
Mg	279.079	--	0.02	0.11	--	0.13	--	0.25	--	0.07	0.12
Mn	257.610	0.005	--	0.01	--	0.002	0.002	--	--	--	--
Mo	202.030	0.05	--	--	--	0.03	--	--	--	--	--
Ni	231.604	--	--	--	--	--	--	--	--	--	--
Se	196.026	0.23	--	--	--	0.09	--	--	--	--	--
Na	588.995	--	--	--	--	--	--	--	--	0.08	--
Tl	190.864	0.03	--	--	--	--	--	--	--	--	--
V	292.402	--	--	0.05	--	0.005	--	--	--	0.02	--
Zn	213.856	--	--	--	0.14	--	--	--	0.29	--	--

Sequoia Analytical ©1999

[a] Dashes indicate that no interference was observed even when interferents were introduced at the following levels: Al - 1000 mg/L; Mg - 1000 mg/L; Ca - 1000 mg/L; Mn - 200 mg/L; Cr - 200 mg/L; Tl - 200 mg/L; Cu - 200 mg/L; V - 200 mg/L; Fe - 1000 mg/L

[b] The figures recorded as analyte concentrations are not the actual observed concentrations, to obtain those figures, add the listed concentration to the interferent figure.

4.9 Sensitivity, instrumental detection limit precision, linear dynamic range, and interference effects, have been investigated and established for each individual analyte line on the TJA-61. All analytical measurements must be within the instrument linear range where correction factors are valid. *It is the responsibility of the analyst to verify that the instrument configuration and operating conditions used satisfy the analytical requirements and to maintain quality control data confirming instrument performance and analytical results.*

4.10 Linear Range Studies and Interelement Correction Factors must be calculated at a minimum annually, and whenever a significant change in operating conditions or equipment occurs.

4.11 Titanium as an interfering element may occur in samples analyzed in Petaluma, it is recommended to add titanium to the IEC list of interfering elements.

5.0 SAFETY

5.1 During the execution of the procedures outlined in this SOP, potentially hazardous compounds may be encountered. Preparation personnel should observe all appropriate safety rules as outlined in the Chemical Hygiene Plan.

5.2 Samples handled under this SOP may originate from unknown sites, which could contain a variety of hazardous materials. Appropriate safety rules as outlined in the Chemical Hygiene Plan should be observed while handling samples of unknown content and/or origin.

5.0 EQUIPMENT AND SUPPLIES

5.1 Inductively Coupled Plasma-Atomic Emission Spectrometer: Computer controlled atomic emission spectrometer with background correction.

5.1.1 Thermo Jarrell Ash, Model 61e, Simultaneous Inductively Coupled Plasma-Atomic Emission Spectrometer.

Sequoia Analytical ©1999

5.2 Radio frequency generators (included in each instrument).

5.3 Data system: IBM compatible with appropriate software.

5.4 Argon gas supply, welding grade or better.

5.5 Class A Volumetric Flasks of different sizes (50, 100, 250, 500 and 1000 mL).

5.6 Class A volumetric pipettes in various sizes (1, 2, 5, 10 and 20 mL).

5.7 Eppendorf or similar pipettor, 10 to 100 and 100 to 1000 µL capability, with appropriate disposable tips.

7.0 REAGENTS AND STANDARDS

7.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 **Reagent water** – Use the 18 megohm deionized water supply. The conductivity of the water must be monitored daily and recorded in a conductivity logbook. Reagent water shall have a conductivity of less than 1.0 µS/cm. If the conductivity limits are exceeded replace the resin beds in the nanopure DI unit.

7.3 **Nitric Acid**, high purity grade.

7.4 **Hydrochloric Acid**, high purity grade.

7.5 Stock standard solutions of 1000 mg/L and 10000 mg/L, ultrapure plasma grade, NIST traceable.

7.6 Multi-element stock standard solutions, ultrapure plasma grade, NIST traceable.

7.7 Mixed calibration standard solutions are prepared by combining appropriate volumes of two stock standard solutions with nitric and hydrochloric acid (6% HNO3/ 4% HCl). The standards must include all of the required target elements. Mixed standard solutions are transferred to brown plastic bottles for storage. The calibration standards used and the analyte levels are listed Table 2. Standards 1,

Sequoia Analytical ©1999

2, 3, and 4 are made by taking 12.5 uL, 25 uL, 250 uL, and 5.0 mL of stock standards to 500 mL of 6% HNO3/ 4% HCl. The standards are labeled with an expiration date of two weeks from the date made. The Army Corp. of Engineers requires that standards 1, 2, and 3 be made fresh daily for analysis of their samples. A stability study has shown the standards to be stable for at least 4 weeks. Other final volumes of the standards can be made as long as the ratios of stock volumes to final volumes do not change.

7.9 The ICV and CCV solutions are prepared in the same manner as the calibration standards. The multielement stock standards must be from a different vendor than the calibration standards. The concentrations of analytes in the ICV are at the midrange of the highest calibration standard and are made by taking 2.5 mL of the stocks to 500 mL of blank matrix. This standard labeled with an expiration date two weeks from the date made.

7.10 The ICB/CCB is prepared by adding 60 mL of concentrated nitric acid and 40 mL of concentrated hydrochloric acid to DI water and diluting to 1 L with DI The resulting solution is 6% HNO3/4%HCl, larger volumes than 1 L may be prepared as long as the acid concentrations do not vary.

7.11 The ICSA is prepared from premixed solutions from Inorganic Ventures, CPI, or other reputable vendor. The ICSAB is prepared from the same purchased multielement stock standards with the addition of analytes of interest. See Table 3 for the levels of analytes and interferences in the ICSA and ICSAB solutions. The expiration date for this standard is two weeks from the date that it was made.

7.12 Record all standard preparations in a Standards Logbook. The combination of books should yield or include all of the information listed below :

Standard name or Stock solution No.
Date prepared or Date received (Purchased Stock Standard).
Expiration date.
Name of analyst who prepared standard.
Matrix.
Acid lot number.
Analyte name (unless multiblend).
Name of stock standard.
Concentration of stock standard (May need to refer back to original stock solution information.
Lot number of stock standard (not recorded if using Stock No.)
Volume of stock standard used.

Sequoia Analytical ©1999

Final volume of standard solution.
Final concentration of standard solution (unless multi-concentrations.
Source of stock standard solution (get from tracing back to Stock Standard Notebook).

Table 4 – ICP Calibration Standards

Standard	Components
Standard 1	Ba, Be, Cd, Co, Cu, Mn, Pb, Sr, Zn, Fe, Li, Mo, Ni, Sb, Ti, Tl, As, B, Cr, Ge, P, Se, Si, Ga, Sc, Au, Pt, Sn
Standard 2	Al, Ca, K, Mg, Na
Standard 3	Ag, Si

* These concentrations may vary for specific ICP methods. Please check the analytical method before running.

Note – Each new lot of acid or solvent must be checked for contamination by using a method blank. These blanks must pass below the reporting limit for each new lot. If a new lot of is found to be contaminated it shall not be used. It is recommended that the vendor set aside a number of bottles of the same lot to minimize the number of blanks analyzed.

8.0 SAMPLE COLLECTION, PRESERVATION, SHIPMENT AND STORAGE

8.1 All samples must be collected following a sampling plan addressing the considerations of Chapter nine of SW846, and must have complete chains of custody.

8.2 All sample containers must be prewashed with detergents, acids, and water. Alternately a supply of prewashed and certified plastic or glass containers may be used.

8.3 Nonaqueous samples shall be refrigerated at $4^{o} \pm 2^{o}$ C upon receipt and analyzed as quickly as possible. Maximum holding time must not exceed six months from the date of collection.

8.1 Preserve aqueous sample with HNO_3 to a pH of < 2.

8.2 Soils are not preserved with acid. Keep the sample cooled in a refrigerator set to maintain 4°C until ready for digestion.

Sequoia Analytical ©1999

8.3 Collect a minimum of 500 mLs of aqueous sample in a glass or plastic container. Collect a minimum of 50 grams of soil sample. Extra sample volume may be required for matrix spike/spike duplicate samples.

9.0 QUALITY CONTROL REQUIREMENTS

9.1 For each analytical batch of no more than 20 samples processed, a Prep blank (method blank) must be carried throughout the entire sample-preparation and analytical process. This blank will be useful in determining if samples are being contaminated during digestion. The blank must be carried through the complete procedure and contain the same acid concentrations in the final solution as the sample solution used for analysis.

9.2 A Laboratory Control Sample (LCS) must be processed with each analytical batch of no more than 20 samples. An LCS is a blank spike brought through the whole preparation and analytical process. All preparation methods will include an LCS (Lab Control Samples) at a frequency of 1 per batch of 20 or less. The LCS may be made from the same standard used to make the calibration standards or it may be made from an independent source. The concentrations are to be at or below one half of the high standard of the instrument. A separate LCS for water (LCSW) and soil (LCSS) is recommended. If matrix matching is required by a client the LCSS matrix should be glass beads or Ottawa Sand depending on the list of analytes. If Al, Ca, Fe, Mg, or Zn are required, the solid matrix recommended is glass beads. Ottawa sand has high levels of the above elements which elevates the LCS recoveries above the acceptance limits.

9.3 Matrix spike (MS) and matrix spike duplicate (MSD) samples should be prepared with each analytical batch of no more than 20 samples. Spiked samples should be included whenever a new sample matrix is being analyzed. If there is insufficient sample for a matrix spike duplicate a Laboratory Control Sample duplicate may be substituted. A matrix spike and matrix spike duplicate are required for each batch of samples. Two aliquots of a sample are spiked with the analytes of interest to give a demonstration of the accuracy of the measurement in the sample matrix. Spike concentrations should be approximately one half the calibration range of the instrument. The matrix spike sample analysis is designed to provide information about possible interference due to sample matrix and/or problems associated with the sample digestion.

9.4 Post Digestion Spike - An analyte spike added to a portion of a prepared sample. A post digestion spike analysis should be performed by client request and may be

Sequoia Analytical ©1999

performed when the MS and MSD analyses both fail. The sample used for the post digestion spike should be the same as the sample that was originally used for the matrix spike analysis.

9.5 A sample duplicate should also be performed with each analytical batch of no more than 20 samples. A sample duplicate is a sample brought through the whole sample preparation and analytical process. Calculation of the RPD between the sample and sample duplicate serves as a measure of precision for the analysis if the results of the sample and sample duplicate are greater than 10 times the reporting limit.

9.6 Interference check samples (ICS) are used to verify the interelement correction and background correction factors. They must be analyzed at the beginning and at the end of every analytical run or every 8 hours, whichever is more frequent. There are two types of ICS samples that are analyzed. The ICSA solution contains the major interferents Al, Fe, Ca and Mg as well as any minor interfering elements such as Cr, Cu, Mn, Ni, Ti, or V. The ICSAB contains the same interferents and analytes of interest at very low levels. These solutions must be analyzed consecutively beginning with the ICSA.

9.7 The Initial Calibration Verification (ICV) is used to verify the calibration and is analyzed immediately after the standards are reanalyzed after calibration. The ICV must be made from a standard source other than that used to calibrate the instrument.

9.8 The Continuing Calibration Verification (CCV) check standard is used to measure instrument drift and is run at a frequency of 10% (every 10 samples) or every two hours, whichever is more frequent. The CCV must also be analyzed after the last analytical sample. The CCV can be from the same source as the instrument calibration standards or from a different source than the instrument calibration standards.

9.9 Initial Calibration Blank (ICB) and Continuing Calibration Blanks (CCB) are required to be analyzed after every ICV and CCV, at a frequency of 10 percent, or every two hours, whichever is more frequent. A CCB must also be analyzed after the last CCV on the analytical run. The ICB and CCB must contain the same mix of the reagents contained in the standards used for calibration. The calibration blank solution is used to flush the system between each standard and sample analysis.

Sequoia Analytical ©1999

9.10 The highest calibration standard must be analyzed immediately after calibration before the ICV.

9.11 A linear range verification standard should be analyzed annually for each element reported. The standard should be analyzed during a routine analytical run.

9.12 Interelement correction factors (IEC) are determined annually. Correction factors for spectral interference due to major interferents Al, Ca, Fe, Mg as well as any required minor interferents such as Co, Cr, Cu, Mn, Mo, Ni, Ti, and V shall be determined for all ICP instruments at the wavelengths used for each analyte. The IEC's are measured on a separate analytical run with all correction factors "turned off". For the TJA 61E, the interelement correction factors are calculated by dividing the apparent analyte concentration by the measured interferent concentration. The constant is entered into the method. The constant is verified by reanalyzing the interferent solutions with the IEC's "turned on", the resulting measured analyte concentrations should be less than the reporting limits. The IEC's are then checked by running the ICSA solution, again the results for non-spiked analytes should be less than the absolute value of the lowest reporting limit for each analyte.

9.13 Serial Dilution - If the analyte concentration is sufficiently high (minimally a factor of 10 above the instrument detection limit after dilution), an analysis of a 1:5 dilution should agree within 10% of the undiluted result.

10.0 CALIBRATION AND STANDARDIZATION

10.1 Instrument or Daily Calibration

Instrument calibration is performed at least once every 24 hours and each time the instrument is set up. The instrument calibration date and time are included in the raw data.

10.2 Set up the instrument with the operating parameters recommended by the manufacturer. Allow the instrument to become thermally stable before beginning calibration (30-60 min.).

10.3 Profile using the mercury lamp attached to the TJA 61E then calibrate the instrument according to the manufacturer's instructions

Sequoia Analytical ©1999

10.4 The ICP is calibrated using single point calibration. Multipoint calibrations may be requested by specific clients or for particular programs, however, 6010B specifies a single point calibration.

10.5 A minimum of two exposures for each standard, sample, and blank is required. The average of the exposures should be reported.

10.6 Prior to calibration and between each standard/sample the system should be flushed with the calibration blank.

10.7 Reanalyze High Standard the highest mixed analyte standard used. In the single point calibration scheme this is the single standard used. The concentrations of each element obtained from the analysis of the high standard should not vary from their true values by more than 5%.

11.0 PROCEDURE

11.1 Initial Calibration Verification (ICV) - Once the calibration is complete it must be verified by analyzing a calibration verification standard (ICV). The ICV must be within 10% of the true value.

11.2 Initial Calibration Blank (ICB) - The initial calibration blank must be analyzed immediately following the ICV. The concentration of each target element in the ICB must be less than the reporting limit in order for the analysis to proceed.

11.3 Continuing Calibration Verification (CCV) - CCV will be run at a frequency of 10% or every two hours, whichever is more frequent. All results must be within ± 10% for each analyte of interest.The CCV must be analyzed for every wavelength used for analysis at the beginning of the run and after the last analytical sample.

11.4 Continuing Calibration Blank (CCB) - The continuing calibration blank will be run immediately following each CCV. The initial calibration blank solution will be used for the continuing calibration blank (6% HNO3/4% HCl). The concentration of each target element in the CCB must be less than the reporting limit in order for the analysis to proceed.

11.5 Low level check sample (CRI) - A low level check sample is analyzed after the CCB solution, the concentration of this standard are at two times the CLP SOW reporting limits for select elements. The warning limits are + or - 40%. Elements with concentrations outside of these limits should be evaluated for possible problems and corrected.

Sequoia Analytical ©1999

11.6 Interference Check Sample (ICSA and ICSAB) - The interference check sample is run at the beginning of the run immediately following the ICB and every 8 hours and/or at the end of the run. All results must within 80-120% of the true value for each interferent and analyte of interest. The warning limits for analytes not spiked into the ICSA solution is the absolute value of the reporting limit, if results fall outside of two times the reporting limit, the analysis should be evaluated with management. Results are acceptable if there is no significant effect measured on reportable analytes.

11.7 Sample Analysis - Ten samples or fewer can be analyzed between CCV/CCB pairs. ICSA, ICSAB, and CRI solutions count as samples. All analyte concentrations must be less than the quarterly determined linear range for the wavelength analyzed. Samples higher than the linear range should be diluted and reanalyzed for the elements which were higher than the linear range.

12.0 CALCULATIONS

$$MS\ \ Recovery\ (\%) = \frac{SSR\ -\ SR}{SA} * 100$$

12.1 Individual component recoveries are calculated with the following equation:
where:
SSR = Spike Sample Results
SR = Sample Results
SA = Spike Added (concentration)

12.2 The Relative Percent Difference (%RPD) between matrix spike and matrix spike

$$\%\ RPD = \frac{|D_1\ -\ D_2|}{\frac{D_1\ +\ D_2}{2}} * 100$$

duplicate analysis is calculated with the following equation:
where:
RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second Sample Value (duplicate)

12.3 Individual LCS recoveries are calculated with the following equation:

Sequoia Analytical ©1999

$$LCS\ \ Recovery\ (\%) = \frac{SR}{SA} * 100$$

where:
SR = Spike Result
SA = Spike Added (concentration)

12.4 To calculate results, use the following formulas:

$$C_{(ug/L)} = \frac{ug}{L_{dig}} * \frac{V_{dig}}{V_{samp}}$$

Liquids

Where:
ug/L_{dig} = ICP result including all dilution factors
V_{dig} = final digestate volume in mLs
V_{samp} = sample volume in mLs

For Example: For Total Liquids (TL): the normal procedure is to take 100 mL original volume to 100 mL final volume. The result is:

$$C_{(ug/L)} = \frac{ug}{L_{dig}} * \frac{100\ mL}{100\ mL}$$

$$C_{(mg/Kg)} = \frac{ug}{L_{dig}} * \frac{V_{dig}}{g_{samp}}$$

Solids
Where:
ug/L_{dig} = ICP result including all dilution factors
V_{dig} = final distillate volume in Liters
g_{samp} = sample weight in grams

For example: For Soil samples if the preparation takes 2 g of original sample to a final volume of 100 mL, then:

Sequoia Analytical ©1999

$$C_{(mg/Kg)} = \frac{ug}{L_{dig}} * \frac{0.1\,L}{0.2\,g}$$

13.0 METHOD PERFORMANCE

13.1 Method Detection Limit Studies are performed for this method on each instrument per matrix on an annual basis.

14.0 POLLUTION PREVENTION

14.1 All wastes from this procedure shall be disposed following the recommendations of the chemical hygiene plan.

15.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES

15.1 If the preparation blank result is greater than the reporting limit, contamination is suspected. All associated samples must be redigested unless the sample result is lower than the reporting limit or greater than ten times the level of contamination in the blank. Blank subtraction (from sample results) is only permissible if reagents have been proven to be the source of contamination and supervisor approval has been given.

15.2 Acceptance limits for LCS recoveries are nominally 80-120%. The LCS limits may be calculated by the laboratory based on analytical results. If the LCS is outside of the recovery limits, the batch is redigested and reanalyzed for the failed element(s). Exceptions are made when an LCS fails with high recoveries and there is no reportable analyte in the affected samples.

15.3 If the MS and MSD do not recover within the limits specified (nominally 75-125%), and the concentration of the analyte in the unspiked sample is less than four times the spike added concentration, then a post digestion spike may be performed on the sample (see below).

15.4 Post Digestion Spike Addition – if performed, the PDS should be recovered to within 75-125% of the known value. If the post digestion spike analysis fails (limits are 75-125 percent), a spectral interference should be suspected. If the post digestion spike passes, and the MS/MSD recoveries are low, the digestion procedure is most likely inappropriate. In this case, please report to the metals

Sequoia Analytical ©1999

section head for further action. Possible solutions are to redigest the sample using a different digestion procedure or decreasing the amount of sample prepared. Finally, if the MS/MSD, LCS/LCSD or duplicate precision is poor (> 25% RPD) this should be noted in the report to the client. Soils are more likely to produce RPD failures due to lack of sample homogeneity and complex matrix. Poor MS/MSD or duplicate precision on waters is less likely. However, aqueous samples with appreciable solids may also suffer from homogeneity problems.

15.6 The ICSA and ICSAB must recover 80-120% (exception for sodium and potassium) of the true value for all wavelengths used for each analyte reported. Sodium and potassium recoveries should be within 35% of there true values, there is a larger difference for these elements due to ionization effects on these elements. The analytes not included in the ICSA solution must be with-in + or - the reporting limit of the analyte. If the samples fail the interelement correction factors should be checked or remeasured and the samples reanalyzed. If the ICSA analytes start to show concentrations that are greater than the absolute value of the reporting limit, this is a warning that there are problems with the measured interelement correction factors (IEC) and that the analyst should remeasure and update them.

15.7 The ICV must recover within ± 10% of the true value, or the calibration is out of control. If the ICV is out of control, terminate the analysis, correct the problem, and recalibrate.

15.8 The CCV has a control limit of ± 10% of the true value. The CCV can be from the same source as the instrument calibration standards or from a different source than the instrument calibration standards for most programs. Some clients require that the CCV standard be from a different source than the calibration standards (must be from a different Vendor), although as the method is written only the ICV needs to be from a second vendor. Standards from the same source are used for the CCV unless the client specifies otherwise. If a CCV is out of control for any analyte, the analysis must be terminated, the problem corrected and the instrument recalibrated. All samples analyzed since the last compliant CCV must be reanalyzed for the analytes affected.

15.9 If the magnitude (absolute value) of the calibration blank result (ICB/CCB) exceeds the reporting limit, then terminate the analysis, correct the problem, recalibrate, verify the calibration, and reanalyze the preceding 10 samples or all samples analyzed since the last compliant calibration blank.

Sequoia Analytical ©1999

15.10 The calibration standard (highest calibration standard in multipoint calibration schemes) must be analyzed immediately after calibration and before the ICV. Results for each analyte must be within 95-105% of the true value. If not, terminate the analysis, correct the problem and recalibrate.

15.11 The analytically determined concentration of the linear range verification standard shall be within ± 5% of the true value. This concentration is the upper limit of the ICP linear range beyond which results cannot be reported without dilution of the sample.

15.12 Serial Dilution - If the analyte concentration is sufficiently high (minimally a factor of 10 above the instrument detection limit after dilution), an analysis of a 1:5 dilution should agree within 10% of the undiluted result. If not, a chemical or physical effect should be suspected

16.0 CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

16.1 Follow the corrective actions outlined in the following table.

Table 5 - Quality Control and Corrective Actions

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method Detection Limit (MDL) Study	Annually for water and soil.	Minimum of 7 replicates. Spike level must be at a concentration between the calculated MDL and 10 x MDL.	Reprepare study at adjusted spiking levels for MDLs falling outside of acceptable range.
Initial Demonstration of Proficiency	Prior to use of method for client samples.	Four replicates of a spiked sample must be prepared and/or analyzed by the chemist. The mean concentration of all compounds must fall within 30% of the expected value. Method-specific. Coefficient of variation for the four replicates must be less than 20%.	Investigate failure. Verify solution integrity and instrument performance. Reprepare and reanalyze.
Ongoing Demonstration of Proficiency	Annually.	Single- or double-blind PE sample within study acceptance range or acceptable MDL	Investigate failure. Verify solution integrity and instrument performance.

Sequoia Analytical ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		study.	Reprepare and reanalyze.
Initial Calibration.	Daily.	Single point. If a multipoint calibration is requested the correlation coefficient ≥ 0.995.	Check instrument performance. Verify solution integrity. Recalibrate instrument.
Instrument Performance Check	Daily, following initial calibration.	Reanalyze high standard. All compounds must be within 5% of the expected value.	Check instrument performance. Verify solution integrity. Recalibrate instrument.
Initial Calibration Verification (ICV).	Following instrument performance check.	Secondary source at a concentration other than that used in initial calibration. Must be within +/- 10%.	Check instrument performance and perform necessary maintenance. Verify solution integrity. Recalibrate instrument.
Initial Calibration Blank (ICB)	Following ICV.	Must be less than 3x the standard deviation (s) of the mean blank value.	Repeat analysis two more times and average results. If the average is not within 3s of the background mean, terminate analysis, correct the problem, and recalibrate.
Continuing Calibration Verification (CCV)	Following ICV, after every 10 analyses, and at end of analytical sequence.	At a concentration other than ICV. Must be within +/- 10%.	Check instrument performance and perform necessary maintenance. Verify solution integrity. Recalibrate instrument and reanalyze all samples from last acceptable CCV.
Continuing Calibration Blank (CCB)	Following each CCV, after every ten analyses, and at the end of the analytical sequence.	Must be less than 3x the standard deviation (s) of the mean blank value.	Repeat analysis two more times and average results. If the average is not within 3 s of the background mean, terminate analysis, correct the problem, and recalibrate.
Interference Check Sample (ICS)	Following ICV, but prior to sample	All analytes present must be within 20 % of expected value.	Check instrument performance and perform necessary maintenance. Verify solution integrity. Recalibrate and

Sequoia Analytical ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
	analysis, and optionally following the analysis of last sample..		reanalyze all samples since last acceptable ICS.
Preparation Blank	One per preparation batch.	All analytes must be less than 1/2 reporting limit or MDL, whichever is greater.	If analyte concentration in associated samples exceeds blank value by greater than 10 x, then no further action is necessary. If concentration of analyte is less than reporting limit, no further action is necessary. If concentration of analyte in samples is between reporting limit and 10x the blank value, samples must be reprepared and reanalyzed for that analyte(s).
Laboratory Control Sample (LCS).	One per preparation batch.	All spiked elements must be +/- 20% of true value.	Reanalyze once. Verify solution integrity and instrument performance. Reprepare and reanalyze all associated samples for failed analyte(s).
Matrix Spike (MS)	One per 20 field samples of a similar matrix.	All spiked elements must be within 75-125% of expected value..	Reanalyze once. Verify solution integrity and instrument performance.
Sample Duplicate (D) or Matrix Spike Duplicate (MSD)	One per 20 field samples of a similar matrix.	All elements at concentrations greater than 10x MDL must be <20% RPD for water and <35% RPD for soil.	Reanalyze sample and duplicate. Reprepare sample and duplicate, if still out, flag data and narrate.
Serial Dilution	One per analytical sequence.	If the analyte conc. >10x MDL after dilution, the concentration in the diluted aliquot should be ±10% of the original analysis.	Reanalyze once. Narrate as a possible chemical or physical interference.
Post-Digestion Spike	If the MS fails.	Analyte should be recovered within 75 - 125% of the	Reanalyze once. Narrate as a possible matrix effect.

Sequoia Analytical ©1999

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
		expected value.	

17.0 CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

17.1 Data that fails quality control requirements but cannot be repeated (i.e., insufficient sample volume, or severe matrix effects) should be brought to the immediate attention of the Department or Project Manager so that the results may be discussed with the client. A narrative should accompany the analytical results explaining the analytical difficulties the laboratory encountered.

18.0 WASTE MANAGEMENT

18.1 All digests produced by this procedure must be disposed following the procedures outlined in the Chemical Hygiene Plan.

19.0 REFERENCES

19.1 SW-846, Third Edition, Method Number 6010B, Inductively Coupled Plasma-Atomic Emission Spectroscopy, December 1996.

19.2 Winge, R.K.; Peterson, V.J.; Fassel, V.A. Inductively Coupled Plasma-Atomic Emission Spectroscopy: Prominent Lines (final report, March 1977 - February 1978); EPA-600/4-79-017, Environmental Research Laboratory, Athens, GA, March 1979; Ames Laboratory, Ames, IA.

19.3 Test Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater; U.S. Environmental Protection Agency. Office of Research and Development. Environmental Monitoring and Support Laboratory. ORD Publication Offices of Center for Environmental Research Information: Cincinnati, OH 1982: EPA-600/4-82-057.

19.4 Patel, B.K.; Raab, G.A.; et al. Report on a Single Laboratory Evaluation of Inductively Coupled Optical Emission Method 6010; EPA Contract No. 68-03-3050, December 1984.

Sequoia Analytical ©1999

19.5 Sampling and Analysis Methods for Hazardous Waste Combustion; U.S. Environmental Protection Agency; Air and Energy Engineering Research Laboratory, Office of Research and Development: Research Triangle Park, NC, 1986; Prepared by Arthur D. Little, Inc.

19.6 Bowmand, P.W.J.M. Line Coincidence Tables for Inductively Coupled Plasma Atomic Emission Spectrometry. 2nd ed. ; Pergamon, 1984.

19.7 Rohrbough, W.G.; et al. Reagent Chemicals. American Chemical Society Specifications, 7th ed.; American Chemical Society; Washington, DC, 1986.

19.8 1985 Annual Book of ASTM Standards, Vol. 11.01, "Standard Specification for Reagent Water"; ASTM: Philadelphia, PA, 1985: D1193-77.

20.0 TABLES, DIAGRAMS, FLOWCHARTS AND VALIDATION DATA

Table 5 - ICV Standard

Concentration (mg/L)	Element(s)
0.5	Cr
1.0	Ba, Be, Cd, Co, Mn, V, Zn
2.0	Al, As, B, Ca, Cu, Fe, Li, Mg, Mo, Ni, Pb, Se, Sr, Tl
5.0	K, P, Si
8.1	Na

Table 6 - CRI Standard (μg/L)

ICP-1			ICP-3		
Al - 200	Sb - 120	As - 80	Al - 100	Sb - 12	As - 20
Ba - 200	Be - 10	Cd - 10	Ba - 400	Be - 8	Cd - 10
Cr - 20	Co - 100	Cu - 50	Cr - 20	Co - 50	Cu - 50
Fe - 200	Pb - 80	Mo - 20	Fe - 100	Pb - 6	Mo - 20
Mn - 30	Ni - 80	Se - 160	Mn - 30	Ni - 80	Se - 10
Ag - 20	Tl - 20	V - 100	Ag - 20	Tl - 20	V - 100
Zn - 40			Zn - 40		

The CRI standard is prepared by the analyst by combining compatible elements at twice (2x) the reporting limit.

Table 7 - ICSA and ICSAB Standards (mg/L)

Sequoia Analytical ©1999

DEPARTMENT

SEQUOIA ANALYTICAL, REDWOOD CITY LABORATORY

ICSA (Interfering Elements)

Al - 500	Ca - 500	Fe - 200	Mg - 500

ICSAB (Interferents Plus Analytes)

Al - 500	Ca - 500	Fe - 200	Mg - 500
As - 0.5	Ba - 0.5	Be - 0.5	Cd - 1.0
Co - 0.5	Cr - 0.5	Cu - 0.5	Mn - 0.5
Ni - 1.0	Pb - 1.0	Se - 0.5	Ag - 1.0
Tl - 0.5	V - 0.5	Zn - 1.0	Mo - 1.0
Sb - 1.0			

Table 8 - Spike Levels LCSW (µg/L)

Al - 50000	Sb - 500	As - 2000	Ba - 2000	Be - 50
Ca - 50000	Cd - 50	Co - 500	Cu - 250	Fe - 1000
K - 50000	Mg - 50000	Mn - 500	Mo - 2000	Ni - 500
Pb - 500	Se - 2000	Ag - 50	Na - 50000	Tl - 100
V - 500	Zn - 500			

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

EPA METHOD Method 8260A - Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry (GC/MS)

Applicable matrix or matrices: Water, wastewater, and waste
Standard Compound List and Reporting Limits: Approximately 5 µg/Kg (wet weight) for soil/sediment samples, approximately 0.5 mg/Kg (wet weight) for wastes, and approximately 5 µg/L for ground water.

Approvals and Signatures

Laboratory Manager: _____ **Date:** _____

QA Manager: _____ **Date:** _____

Department Manager: _____ **Date:** _____

" This document has been prepared by Algen Technical Services for Sequoia Analytical and for the use of Sequoia Analytical's customers in evaluating laboratory qualifications and capabilities.The user of this document agrees by its acceptance or use to return it to Sequoia Analytical upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use it for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT PRIOR WRITTEN AUTHORIZATION IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK IS PROTECTED BY STATE AND FEDERAL LAWS OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

COPYRIGHT 1999 SEQUOIA ANALYTICAL, ALL RIGHTS RESERVED."

1.0 SCOPE AND APPLICATION

1.1 Method 8260 is used to determine volatile organic compounds in a variety of solid waste matrices. This method is applicable to nearly all types of samples, regardless of water content, including ground water, aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, mousses, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments. The following compounds may be determined by this method:

Table 1 – Analytes and CAS numbers

ANALYTE	CAS #
Acetone	67-64-1
Benzene	71-43-2
Bromobenzene	108-86-1

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

ANALYTE	CAS #
Bromochloromethane	74-97-5
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
2-Butanone	78-93-3
n-Butylbenzene	104-51-8
sec-Butylbenzene	135-98-8
tert-Butylbenzene	98-06-6
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chlorodibromomethane	124-48-1
Chloroethane	75-00-3
Chloroform	67-66-3
1-Chlorohexane	544-10-5
Chloromethane	74-87-3
2-Chlorotoluene	95-49-8
4-Chlorotoluene	106-43-4
1,2-Dibromo-3-chloropropane	96-12-8
1,2-Dibromoethane	106-93-4
Dibromomethane	74-95-3
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-2
trans-1,2-Dichloroethene	156-60-5
1,2-Dichloropropane	78-87-5
1,3-Dichloropropane	142-28-9
2,2-Dichloropropane	594-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
Hexachlorobutadiene	87-68-3
2-Hexanone	591-78-6
Isopropylbenzene	98-82-8
p-Isopropyltoluene	99-87-6
Methylene chloride	75-09-2
4-Methyl-2-pentanone	108-10-1
Naphthalene	91-20-3
n-Propylbenzene	103-65-1
Styrene	100-42-5

Sequoia Analytical ©1999

ANALYTE	CAS #
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-3
1,2,3-Trichlorobenzene	87-61-6
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
Trichlorotrifluoroethane	76-13-1
1,2,3-Trichloropropane	96-18-4
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Vinyl acetate	108-05-4
Vinyl chloride	75-01-4
Total Xylenes	1330-20-7
o-Xylene	95-47-6
m-Xylene	108-38-3
p-Xylene	106-42-3

1.2 Method 8260 can be used to quantitate most volatile organic compounds that have boiling points below 200°C and that are insoluble or slightly soluble in water. Volatile water-soluble compounds can be included in this analytical technique. However, for the more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency. Such compounds include low-molecular-weight halogenated hydrocarbons, aromatics, ketones, nitriles, acetates, acrylates, ethers, and sulfides.

1.3 The estimated quantitation limit (PQL) of Method 8260 for an individual compound is approximately 5 µg/Kg (wet weight) for soil/sediment samples, 0.5 mg/Kg (wet weight) for wastes, and 5 µg/L for ground water. PQLs will be proportionately higher for sample extracts and samples that require dilution or reduced sample size to avoid saturation of the detector. The PQL is considered to be equivalent to the lowest non-zero standard in the calibration curve.

1.4 Method 8260 is based upon a purge-and-trap, gas chromatographic/mass spectrometric (GC/MS) procedure. This method is restricted to use by or under the supervision of trained analysts experienced in the use of purge-and-trap systems and gas chromatograph/mass spectrometers, and skilled in the

Sequoia Analytical ©1999

interpretation of mass spectra and their use as a quantitative tool. Each analyst must demonstrate the ability to generate acceptable results with this method.

Note: The quality control limits specified in this Standard Operating Procedure are applicable to all analyses which specify this method and are not governed by a project or program specific QAPP. In cases where a separate QAPP is provided, the QAPP will supersede the limits specified herein.

2.0 SUMMARY OF METHOD

2.1 The volatile compounds are introduced into the gas chromatograph by the purge-and-trap method. Purged sample components are trapped in a tube containing suitable sorbent materials. When purging is complete, the sorbent tube is heated and backflushed with helium to desorb trapped sample components. The analytes are desorbed directly to a large bore capillary or cryofocussed on a capillary precolumn before being flash evaporated to a narrow bore capillary for analysis. The column is temperature programmed to separate the analytes which are then detected with a mass spectrometer (MS) interfaced to the gas chromatograph. Wide bore capillary columns require a jet separator, whereas narrow bore capillary columns can be directly interfaced to the ion source.

2.2 If the above sample introduction techniques are not applicable, a portion of the sample is dispersed in a solvent (e.g. methanol) to dissolve the volatile organic constituents. A portion of the solution is combined with organic-free reagent water in the purge chamber. It is then analyzed by purge-and-trap GC/MS following the normal water method.

2.3 Analytes eluted from the capillary column are introduced into the mass spectrometer via a jet separator or a direct connection. Identification of target analytes is accomplished by comparing their mass spectra with the electron impact spectra of authentic standards. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard with a five-point calibration curve.

2.4 The method includes specific calibration and quality control steps that replace the general requirements in SW-846 Method 8000.

3.0 DEFINITIONS

3.1 None

4.0 INTERFERENCES

4.1 Major contaminant sources are volatile materials in the laboratory and impurities in the inert purging gas and in the sorbent trap. The use of non-polytetrafluoroethylene (PTFE) thread sealants, plastic tubing, or flow controllers with rubber components should be avoided since such materials out-gas organic compounds which will be concentrated in the trap during the purge operation. Analyses of calibration and reagent blanks provide information about the presence of contaminants. When potential interfering peaks are noted in blanks, the analyst should change the purge gas source and regenerate the molecular sieve purge gas filter, subtracting blank values from sample results **is not** permitted. If reporting values not corrected for blanks result in what the laboratory feels is a false positive for a sample, this should be explained in text accompanying the uncorrected data.

4.2 Interfering contamination may occur when a sample containing low concentrations of volatile organic compounds is analyzed immediately after a sample containing high concentrations of volatile organic compounds (carry over). The preventive technique is rinsing of the purging apparatus and sample syringes with two portions of organic-free reagent water between samples. After analysis of a sample containing high concentrations of volatile organic compounds, one or more calibration blanks should be analyzed to check for cross contamination. For samples containing appreciable amounts of water soluble materials, suspended solids, high boiling compounds or high concentrations of compounds being determined, it may be necessary to wash the purging device with a soap solution, rinse it with organic-free reagent water, and then dry the purging device in an oven at approximately 105°C. In extreme situations, the whole purge and trap device may require dismantling and cleaning. Automated headspace screening of the samples prior to purge and trap GC/MS analysis may help prevent contamination of the system. This is especially true for soil and waste samples.

4.2.1 The low purging efficiency of many analytes from a 25 mL sample often results in significant concentrations remaining in the sample purge vessel after analysis. In cases where carryover is suspected rinse the purge vessel with analyte-free water. It may be necessary to confirm the absence of carryover by running an instrument blank(s).

4.3 The analytical and sample storage area should be isolated from all atmospheric sources of contaminants such as methylene chloride. Otherwise random

Sequoia Analytical ©1999

background levels will result. Since many contaminants will permeate through PTFE tubing, all gas chromatography carrier gas lines and purge gas plumbing should be constructed from stainless steel or copper tubing. Laboratory clothing worn by the analyst should be clean since clothing previously exposed to methylene chloride fumes during liquid/liquid extraction procedures can contribute to sample contamination. Clothing worn during extraction procedures should not be worn in the analytical laboratory.

4.4 Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) through the septum seal into the sample during shipment and storage. A trip blank prepared from organic-free reagent water and carried through the sampling and handling protocol can serve as a check on such contamination. Storage blanks prepared from organic-free water should be stored in the sample storage areas and analyzed on a periodic basis.

4.5 If hexadecane is added to samples or petroleum samples are analyzed, some chromatographic peaks will elute after the target analytes. The oven temperature program must include a post-analysis bake out period to ensure that semivolatile hydrocarbons are volatilized.

5.0 SAFETY

5.1 During the execution of the procedures outlined in this SOP, potentially hazardous compounds may be encountered. Preparation personnel should observe all appropriate safety rules as outlined in the Chemical Hygiene Plan.

5.2 Samples handled under this SOP may originate from unknown sites, which could contain a variety of hazardous materials. Appropriate safety rules as outlined in the Chemical Hygiene Plan should be observed while handling samples of unknown content and/or origin.

6.0 EQUIPMENT AND SUPPLIES

6.1 **Purge-and-trap devices** - The purge-and-trap device consists of two separate pieces of equipment: the sample purger and concentrator.

6.1.1 Two purge and trap devices are used.

6.1.1.1 Tekmar LCS 2000 concentrator and ALS 2016 Autosampler.

6.1.1.2 OI 4460 Concentrator and MPM-16 Autosampler.

Sequoia Analytical ©1999

6.1.2 The trap must be at least 25 cm long and have an inside diameter of at least 0.105 in. Two types of trap are used at the laboratory. Starting from the inlet, the first analytical trap used is composed of 16 cm Tenax polymer and 7.7 cm activated charcoal (Supelco part no. 2-1061). The second trap used is the Supelco VOCARB 3000 composed of Carbopack B/ Caboxen 1000 and 1001 (Part #2-1066). Before initial use, the trap should be conditioned at 270°C for 60 minutes followed by an extended desorb and bake cycle.

6.2 **Gas chromatograph/mass spectrometer system.**

6.2.1 Gas chromatograph – 3 Varian 3400 gas chromatographs.

6.2.2 Column - DB-624, 75 meter, 0.53 mm i.d., 0.5 µm thickness coating.

6.2.3 Mass spectrometer – Finnegan INCOS mass spectrometer capable of scanning from 35-280 m/z every second, using 70 volts (nominal) electron energy in the electron impact mode and producing a mass spectrum that meets all the BFB criteria.

6.2.4 GC/MS interface - Because megabore columns are used for analysis (0.53 mm i.d.) jet separators are used on all MS systems. The jet separators are used to reduce the total He_2 carrier gas flow being introduced into the mass spec detector. The column eluant is transfered from the jet separator to the MSD via a heated, deactivated transfer line.

6.3 **Data acquisition and quantitation systems** - A UNIX based PC program supplied by Finnegan is used for instrument control and data aquisition. A network version of Chemserver (Hewlett Packard) is used to set up run sequences, control the purge and trap device and control the GC and MSD. Target Thru-Put® and Envisions® is used to process and report mass spectral data. This computer system allows the continuous acquisition and storage on machine readable media of all mass spectra obtained throughout the duration of the chromatographic program, searching any GC/MS data file for ions of a specified mass and plotting the ion abundances versus time or scan number. This type of plot is defined as an **Extracted Ion Current Profile** (EICP). This software also allows integrating the abundances in any EICP between specified time or scan number limits. A recent version of the EPA/NIST Mass Spectral Library which contains 75,000 entries is loaded on the system.

Sequoia Analytical ©1999

6.4 Microsyringes - 10, 25, 100, 250, 500 and 1000 µL.

6.5 Syringe valve - Two-way with Luer ends.

6.6 Syringes - 5, 10 or 25 mL, gas-tight with shut off valve.

6.7 Balance - top-loading, 0.1 g.

6.8 Glass vials - 40 mL with Teflon-lined scew caps.

6.9 Volumetric flasks, Class A - 10 and 100 mL, with ground glass stoppers.

6.10 Spatula - Stainless steel.

7.0 REAGENTS AND STANDARDS

7.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. The check sample must be free of all target compounds, and TIC compounds should be at a minimum.

6.1 **Organic Free Reagent water** – Organic free water must be used for this method. Prepare by boiling for 15 minutes and then purging the water with a fine stream of helium. The water must be continuously sparged with helium through its entire use and should be prepared fresh daily.

7.3 Stock solutions - Stock solutions are prepared from certified solutions purchased from reputable vendors, such as Restek, Ultratech, Absolute, or Accustandard, with certificates of analysis and documentation of each set of standards. When stock solutions are to be used to prepare standards, allow the ampule or sealed vial of stock solution to warm to room temperature before opening. Perform all calculations and assemble the necessary Hamilton microliter syringes, volumetric flasks, and methanol before opening the stock solution.

7.3.1 If volumetric flasks are used to prepare stock solutions, rinse the volumetric flask with methanol and discard the rinsate methanol. Fill the volumetric flasks with methanol leaving space for the standard stock.

Sequoia Analytical ©1999

7.3.2 For preparation of stock solutions using microliter syringes, pick microliter syringes that have a total volume close to the volume you wish to measure. Example: If 20 uL is required, use a 25 uL syringe, not a 50 uL syringe. Rinse all microliter syringes 3 times with clean methanol and discard the methanol. Confirm that the syringes are clean, have no burrs on the needles, and do not trap bubbles when inverted.

7.3.3 Open the stock solution vial or ampule. Note: Go through the following steps completely, one vial or ampule at a time. Draw a small amount of the stock standard into the syringe and then discard. Fill the syringe beyond the volume required, then pull in a small bubble of air. Invert the syringe, tap lightly to force all bubbles to the needle end of the syringe. Slowly adjust the syringe to the appropriate volume while holding a lab wipe to the needle orifice, this allows the bubble and a small amount of liquid to be purged from the syringe. Wipe the needle of excess solution and place the needle into the volumetric flask below the level of methanol and expel the stock solution into the flask. Watch for bubbles and do not "pump" the syringe.

7.3.4 Bring the volumetric flask to volume with methanol and stopper. Invert the flask and rotate several times so that the bubble of air circles the bottom of the upended flask. Right the flask. Repeat the last two steps twice. Transfer the freshly prepared stock solution into a Teflon-capped container, which has little headspace. Discard the original vial or ampule and its remaining contents. **Under no circumstances are stock solutions to be kept and used at a later time after they have been opened.**

7.4 All prepared dilute solutions in methanol must be discarded after three months. Gasses and other reactive components such as 2-chloroethylvinyl ether will degrade more quickly if allowed to warm often. Monitor these components and replace more frequently if required.

7.5 Surrogate standards - The following may be used as surrogates: toluene-d8, 4-bromofluorobenzene, 1,2-dichloroethane-d4 and dibromofluoromethane. These are purchased as a mix. A stock surrogate solution in methanol should be prepared as described below, and a surrogate standard spiking solution should be prepared in methanol from the stock at a concentration of 25 µg/mL. Each sample undergoing GC/MS analysis must be spiked with 10 µL of the surrogate spiking solution prior to analysis.

Sequoia Analytical ©1999

7.6 Internal standards - The internal standards used are pentafluorobenzene, 1,4-difluorobenzene, 1,4-dichlorobenzene-d4 and chlorobenzene-d5. These are purchased as a mix. Prepare internal standard stock and secondary dilution standards in methanol using the procedures described below. It is recommended that the secondary dilution standard should be prepared at a concentration of 25 µg/mL for soil analyses and 250 µg/mL for waters of each internal standard compound. Addition of 10 µL of this standard to 5.0 mL of sample or calibration standard would be the equivalent of 50 µg/L.

7.7 **Bromofluorobenzene** (BFB) standard - A stock solution of BFB is purchased. A standard solution containing 25 ng/µL of BFB in methanol should be prepared.

7.8 **Calibration standards** - Calibration standards usually six but at a minimum of five concentrations should be prepared from the secondary dilution of stock standards. Prepare these solutions in organic-free reagent water. Routinely, the concentrations prepared are 10, 20, 50, 100 and 200 µg/L for water or µg/Kg for soil. These levels may have to be adjusted to meet requirements for lower reporting limits. The low level standard is at a concentration equivalent to the reporting limit. The remaining concentrations should correspond to the expected range of concentrations found in real samples, but should not exceed the working range of the GC/MS system. Each standard should contain each target analyte. Calibration standards in reagent water must be disposed of within 24 hours of preparation.

7.9 **Matrix spiking standards** - Matrix spiking standards should be prepared from volatile organic compounds which will be representative of the compounds being investigated. The compounds are 1,1-dichloroethene, trichloroethene, chlorobenzene, toluene, and benzene. The standard is purchased as a mix and is prepared in methanol, with each compound present at a concentration of 25 µg/mL.

7.10 Great care must be taken to maintain the integrity of all standard solutions. It is recommended that all standards in methanol be stored in freezers at -10°C to -20°C in screw-cap amber bottles with Teflon liners.

7.11 Methanol, Purge-and-trap quality. All lots of methanol must be tested as described above.

Note – Each new lot of acid or solvent must be checked for contamination by using a method blank. These blanks must pass below the reporting limit for

Sequoia Analytical ©1999

each new lot. If a new lot is found to be contaminated it shall not be used. It is recommended that the vendor set aside a number of bottles of tbe same lot to minimize the number of blanks analyzed.

8.0 SAMPLE COLLECTION, PRESERVATION, SHIPMENT AND STORAGE

8.1 All samples must be collected following a sampling plan addressing the considerations of Chapter nine of SW846, and must have complete chains of custody.

8.2 All VOA vials must be prewashed, a supply of prewashed and certified glass VOA vials may be used.

8.3 Samples should be analyzed as soon as possible after receipt. Samples should be stored in an area free from contamination and at a temperature of 4±2°C. Maximum holding times for water and soil samples are 14 days from the time of sampling. Water samples should be preserved with hydrochloric acid to a pH of less than 2. Upon client request, sample preservation should be checked at the time of analysis and documented.

NOTE: Do not open the VOA vial to be analyzed prior to analysis. The pH of the VOA vial to be analyzed should not be checked until the time of analysis. If a separate VOA vial is supplied for pH checking it should be checked at the time of sample receipt in the laboratory.

9.0 QUALITY CONTROL REQUIREMENTS

9.1 Each laboratory that uses these methods is required to operate a formal quality control program. The minimum requirements of this program consist of an intitial demonstration of laboratory capability and an ongoing analysis of spiked samples to evaluate and document quality data. The laboratory should maintain records to document the qualtiy of data generated. Ongoing data quality checks are compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a quality control check sample should be analyzed to confirm that the measurements were performed in an in-control mode of operation.

9.2 Before processing any samples, the analyst should demonstrate, through the analysis of a calibration blank, that interferences from the analytical system, glassware, and reagents are under control. Each time a set of samples is extracted

Sequoia Analytical ©1999

or there is a change in reagents, a reagent blank should be processed as a safeguard against chronic laboratory contamination. The blank sample should be carried through all stages of sample preparation and measurement.

9.3 The experience of the analyst performing GC/MS analyses is invaluable to the success of the methods. Each day that analysis is performed, the daily calibration standard should be evaluated to determine if the chromatographic system is operating properly. Question that should be asked here are: Do the peaks look normal?; Is the response obtained comparable to the response from previous calibrations? Careful examination of the standard chromatogram can indicate whether the column is still useable, the injector is leaking, the injector septum needs replacing, etc. If any changes are made to the system (e.g. column changed), recalibration of the system should take place.

9.4 Required instrument QC

9.4.1 The GC/MS system must be tuned to meet the BFB specifications.

9.4.2 There must be an initial calibration of the GC/MS system.

9.4.3 The GC/MS system must meet the SPCC and CCC criteria every 12 hours.

9.4.4 To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations.

9.4.4.1 A quality control (QC) reference sample concentrate is required containing a representative selection of analytes. Prepare a QC reference sample to contain 20 µg/L of each analyte. For low level 25 mL sample, spike at 5 µg/L.

9.4.4.2 Four 5 mL aliquots (or 25 mL for low level) of the well-mixed QC reference sample are analyzed according to the method.

9.4.4.3 Calculate the average recovery (x) and the standard deviation of the recovery (s), for the results.

9.4.5 Single laboratory recovery and precision data obtained for the method analytes from water are presented below (Section 20). Similar results from dosed water should be expected by any experienced laboratory. Compare results obtained above to the single laboratory recovery and precision data. If the results are not comparable, review potential problem area and repeat

Sequoia Analytical ©1999

the test. Results are comparable if the calculated standard deviation of the recovery does not exceed 2.6 times the single laboratory RSD or 20%, whichever is greater, and the mean recovery lies within the interval x ± 3s or x ± 30%, whichever is greater.

9.5 When one or more of the analytes tested fail at least one of the acceptance criteria, the analyst must proceed according to the procedure below.

9.5.1 Locate and correct the source of the problem and repeat the test for all analytes.

9.5.2 Repeat the test only for those analytes that are not comparable. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest.

9.5.3 For each analytical batch (up to 20 samples), a reagent blank, a matrix spike, duplicate or matrix spike duplicate, and a blank spike (LCS) should be analyzed (the frequency of the spikes may be different for different programs). The blank and spiked samples should be carried through all stages of the sample preparation and measurement steps.

9.6 The usual concentrations of the matrix spike in the samples are listed in the following table:

Table 2 – Matrix Spiking Levels

Matrix and Level	Recommended Concentration
Water 5mL purge	50 µg/L
Water 25 mL purge	10 µg/L
Soil, low level	50 µg/Kg
Soil, medium level	2500 µg/Kg

9.6.1 If recovery is not within limits, the following procedures are required.

9.6.1.1 Check to be sure there are no errors in calculations, matrix spike solution and internals standards. Also, check instrument performance.

9.6.1.2 Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.

Sequoia Analytical ©1999

9.6.1.3 If the checks reveal no errors, the recovery problem encountered with the dosed sample is judged to be matrix-related, not system-related. The result for that analyte in the unspiked sample is labeled to inform the user that the results are suspect due to matrix effects and the department manager should be notified.

9.7 **MTBE AND OXYGENATES MODIFICATION -** For MTBE analyses, since there is modified reporting list, only the first surrogate and the first internal standard are required to pass.

9.8 To determine acceptable accuracy and precision limits for surrogate standards the following procedure is recommended to be performed annually. In lieu of derived limits use the nominal limits for surrogates of 50-150%.

9.8.1 For each sample analyzed, calculate the percent recovery of each surrogate in the sample.

9.8.2 Once a minimum of thiry samples of the same matrix have been analyzed, calculate the average percent recovery (the average of p) and standard deviation of the percent recovery (sp) for each of the surrogates.

9.8.3 For a given matrix, calculate the upper and lower control limit for method performance for each surrogate standard. This should be done as follows:

Upper Control Limit(UCL)= p + 3sp
Lower Control Limit(LCL) = p - 3sp

9.8.4 For aqueous and soil matrices, laboratory established surrogate control limits should, if applicable, be compared with the control limits listed below.

9.8.5 If recovery is not within the 50-150% or the derived limits, the following procedures should be followed.

9.8.5.1 Check to be sure there are no errors, in calculations, surrogates solution and internal standards. Also, check instrument performance.

9.8.5.2 Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.

Sequoia Analytical ©1999

9.8.5.3 Reextract and reanalyze the sample if none of the above are a problem or flag the data as "estimated concentration".

9.9 When doubt exists over the identification of a peak on the chromatogram, confirmatory techniques such as second column confirmation or a different ionization mode using a mass spectrometer should be used.

9.10 In recognition of the rapid advances occurring chromatography, the analyst is permitted to modify GC columns, GC conditions, or detectors to improve the separations or lower the cost of the measurements. Such modifications should be included in the next version of the SOP.

10.0 CALIBRATION AND STANDARDIZATION

10.1 The only time direct injection is to be used is in the injection of the tuning compound, BFB, at the start of the calibration period.

10.2 Initial calibration for purge-and-trap procedure. Recommended GC/MS operating condition.

Table 3 – GC/MS Operating Conditions.

Electron energy	70 volts (nominal)
Mass range	35-280 amu
Scan time	1 scan/ sec
Initial column temperature	35°C
Initial column holding time	2 minutes
Column temperature program	6°C/minute to 100°C, hold for 2 min.
Final column temperature	10°C/min to180°C.
Final column holding time	1.5 minutes
Injector temperature	200-225°C
Source temperature	The source temperature is kept at 200°C.
Transfer line temperature	250-300°C
Carrier gas	Helium at total column flow of 30 mL/min.

Sequoia Analytical ©1999

10.3 Each GC/MS system must be hardware tuned to meet the criteria for a 50 ng injection or purging of 4-bromofluorobenzene (1 uL injection of the BFB standard). Analyses must not begin until these criteria are met.

10.4 Assemble a purge-and-trap device. Condition the K traps at 230°C for 30 to 60 minutes in the bake mode with an inert gas flow of at least 20 mL/min. Prior to use, condition the trap daily by performing one or more blank purge and desorb/bake cycles.

10.5 Connect the purge-and-trap device to a gas chromatograph.

10.6 Prepare the final solutions containing the required concentrations of calibration standards, including surrogate standards, directly in the purge vessels. Use freshly prepared stock solutions when preparing the calibration standards for the initial calibration. Add 5.0 mL of organic-free reagent water to the sample syringe. Then, using a 10 µL or 25 µL microsyringe, take up a volume of the secondary dilution solution containing the appropriate concentrations of the calibration standards. Add this aliquot of calibration solution directly to the organic-free reagent water in the syringe by inserting the needle through the Luer-lock tip. When discharging the contents of the microsyringe, be sure that the end of the syringe needle is well beneath the surface of the organic-free reagent water. Similarly, add 10 µL of the internal standard solution. Close the 2 way syringe valve at the sample inlet.

10.6.1 Another method of preparing the standards for purging is to perform tertiary dilutions of stock calibration standards in volumetric flasks. Once the dilution has been performed, a 5 mL aliquot of the working standard can be decanted into a sample syringe and loaded into the purge vessel after the addition of internal standards.

10.7 Carry out the purge-and-trap analysis.

10.8 Tabulate the area response of the characteristic ions against concentration for each compound and each internal standard. Calculate response factors (RF) for each compound relative to one of the internal standards. The internal standard selected for the calculation of the RF for a compound should be the internal standard that has a retention time closest to the compound being measured. The RF is calculated as follows:

$$RF = (A_{(x)}C_{(is)})/(A_{(is)}C_{(x)})$$

Sequoia Analytical ©1999

where:

$A_{(x)}$ = Area of the characteristic ion for the compound being measured.
$A_{(is)}$ = Area of the characteristic ion for the specific internal standard.
$C_{(is)}$ = Concentration of the specific internal standard.
$C_{(x)}$ = Concentration of the compound being measured.

10.8.1 The average RF must be calculated and recorded for each compound using the five or six RF values calculated for each compound from the initial calibration curve. A system performance check should be made before this calibration curve is used. Five compounds (the System Performance Check Compounds, or SPCCs) are checked for a minimum average response factor.

Table 4 – SPCC Response Factors

Chloromethane	0.10
1,1-Dichloroethane	0.10
Bromoform	>0.10
Chlorobenzene	0.30
1,1,2,2-Tetrachloroethane	0.30

10.8.2 These compounds are used to check compound instability and to check for degradation caused by contaminated lines or active sites in the system. Examples of these occurrences are:

10.8.2.1 **Chloromethane** - This compound is the most likely compound to be lost if the purge flow is too fast.

10.8.2.2 **Bromoform** - This compound is one of the compounds most likely to be purged very poorly if the purge flow is too slow. Cold spots and/or active sites in the transfer lines may adversely affect response. Response of the quantitation ion (m/z 173) is directly affected by the tuning of BFB at ions m/z 174/176. Increasing the m/z 174/176 ratio may improve bromoform response.

10.8.2.3 **1,1,2,2-Tetrachloroethane** and **1,1-dichloroethane** - These compounds are degraded by contaminated transfer lines in purge-and-trap systems and/or active sites in trapping materials.

Sequoia Analytical ©1999

10.8.3 Using the RFs from the initial calibration, calculate the percent relative standard deviation (%RSD) for all compounds. The percent RSD is calculated as follows:

$$\%RSD = (SD/\overline{RF_x}) \times 100$$

where:

%RSD = relative standard deviation.
$\overline{RF_x}$ = mean of 5 or 6 initial RFs for a compound.
SD = standard deviation of the 5 or 6 initial RFs for a compound.

10.8.4 The %RSD should be less than 15 percent for each compound. However, the %RSD for each individual Calibration Check Compound (CCC) must be less than 30%. The CCCs are:

Table 5 – CCC's

1,1-Dichloroethene
Chloroform
1,2-Dichloropropane
Toluene
Ethyl benzene
Vinyl chloride

10.8.5 If a %RSD greater than 30% is measured for any CCC, then corrective action to eliminate a system leak and/or column reactive sites is required before reattempting calibration.

10.8.6 Linearity - If the %RSD of any compound is greater than 15%, construct calibration curves of area ratio (A/A_{is}) versus concentration using first or higher order regression fit of the five calibration points. The analyst should select the regression order which introduces the least calibration error into the quantitation. Please note that this may be limited to first order by contract or project requirements. The use of calibration curves is a recommended alternative to average response factor calibration, and a useful diagnostic of standard preparation accuracy and absorption activity in the chromatographic system.

Sequoia Analytical ©1999

10.8.7 These curves are verified every 12 hours by purging a performance standard. Recalibration is required only if calibration and ongoing performance criteria cannot be met.

10.9 GC/MS Calibration Verification - Prior to the analysis of samples, inject or purge 50 ng of the 4-bromofluorobenzene standard. The resultant mass spectra for the BFB must meet all of the criteria given in Table 4 before sample analysis begins. These criteria must be demonstrated each 12 hour shift.

10.10 The initial calibration curve for each compound of interest must be checked and verified once every 12 hours during analysis with the introduction technique used for samples. This is accomplished by analyzing a calibration standard that is at a concentration near the midpoint concentration for the working range of the GC/MS by checking the SPCC and CCC.

10.11 System Performance Check Compounds (SPCCs) - A system performance check must be made each 12 hours. If the SPCC criteria are met, a comparison of relative response factors is made for all compounds. This is the same check that is applied during the initial calibration. If the minimum response factors are not met, the system must be evaluated, and corrective action must be taken before sample analysis begins. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system.The minimum relative response factors (RRF) for volatile SPCCs are as follows:

Table 6 – SPCC minimum RRF's

Compound	Min. RRF
Chloromethane	0.10
1,1-Dichloroethane	0.10
Bromoform	>0.10
Chlorobenzene	0.30
1,1,2,2-Tetrachloroethane	0.30

10.12 Calibration Check Compounds (CCCs) - After the system performance check is met, CCCs are used to check the validity of the initial calibration. Calculate the percent drift using the following equation:

$$\%Drift = (C_{(I)} - C_{(C)}) / C_{(I)} \times 100$$

where:

Sequoia Analytical ©1999

$C_{(I)}$ = Calibration Check Compound standard concentration.
$C_{(C)}$ = Measured concentration using selected quantitation method.

If the percent drift for each CCC is less than 20%, the initial calibration is assumed to be valid. If the criterion is not met for any one CCC, corrective action must be taken. All other compounds of interest should have a % Drift of less than 50%. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five point calibration must be generated. This criterion must be met before quantitative sample analysis begins. If the CCCs are not required analytes by the permit, then all required analytes must meet the 20% Drift criterion.

10.13 The internal standard responses and retention times in the check calibration standard must be evaluated immediately after or during data acquisition. If the retention time for any internal standard changes by more than 30 seconds from the last calibration check (12 hrs), the chromatographic system must be inspected for malfunctions and corrections must be made, as required. If the EICP area for any of the internal standards changes by a factor of two (-50 to +100%) from the last daily calibration check standard, the mass spectrometer must be inspected for malfunctions and corrections must be made, as appropriate. When corrections are made, reanalysis of samples analyzed while the system was malfunctioning is necessary.

11.0 PROCEDURE

11.1 Water samples

11.1.1 Screening of the sample prior to purge-and-trap analysis will provide guidance on whether sample dilution is necessary and will prevent contamination of the purge-and-trap system. Screening is performed at the laboratory by automated headspace analysis using a gas chromatograph (GC) equipped with an FID.

11.1.2 All samples and standard solutions must be allowed to warm to ambient temperature before analysis.

11.1.3 Set up the GC/MS.

11.1.4 Confirm that the BFB tuning criteria, GC/MS calibration verification criteria, and LCS criteria were met before analyzing samples.

Sequoia Analytical ©1999

11.1.5 Adjust the purge gas (helium) flow rate to 40 mL/min on the purge-and-trap device. Optimize the flow rate to provide the best response for chloromethane and bromoform, if these compounds are target compounds. Excessive flow rate reduces chloromethane response, whereas insufficient flow reduces bromoform response.

11.1.6 Under normal circumstances, water samples are manually loaded directly into the purging chamber. To do this, remove the plunger from a 5 mL syringe and attach a closed syringe valve. Open the sample or standard bottle, which has been allowed to come to ambient temperature, and carefully pour the sample into the syringe barrel to just short of overflowing. Replace the syringe plunger and compress the sample. Open the syringe valve and vent any residual air while adjusting the sample volume to 5.0 mL. This process of taking an aliquot destroys the validity of the liquid sample for future analysis; therefore, if there is only one VOA vial, the analyst should fill a second syringe at this time to protect against possible loss of sample integrity. This second sample is maintained only until such time when the analyst has determined that the first sample has been analyzed properly. Filling one 20 mL syringe would allow the use of only one syringe. If a second analysis is needed from a syringe, it must be analyzed within 24 hours. Care must be taken to prevent air from leaking into the syringe.

11.1.7 The following procedure is appropriate for diluting purgeable samples. All steps must be performed without delays until the diluted sample is in a gas-tight syringe.

11.1.7.1 Dilutions may be made in volumetric flasks (10 to 100 mL). Select the volumetric flask that will allow for the necessary dilution. Intermediate dilutions may be necessary for extremely large dilutions.

11.1.7.2 Calculate the approximate volume of organic-free reagent water to be added to the volumetric flask selected and add slightly less than this quantity of organic-free reagent water to the flask.

11.1.7.3 Inject the proper aliquot of sample from the syringe into the flask. Aliquot of less than 1 mL are not recommended. Dilute the sample to the mark with organic-free reagent

Sequoia Analytical ©1999

water. Cap the flask, invert, and shake three times. Repeat above procedure for additional dilutions.

11.1.7.4 Fill a 5 mL syringe with the diluted sample.

11.1.7.5 Add 10.0 µL of surrogate spiking solution and 10 µL of internal standard spiking solution through the valve bore of the syringe; then close the valve. The surrogate and internal standards may be mixed and added as a single spiking solution. The addition of 10 µL of the surrogate spiking solution to 5 mL of sample is equivalent to a concentration of 50 µg/L of each surrogate standard.

11.1.7.6 Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valves and inject the sample into the purging chamber.

11.1.7.7 Close both valves and purge the sample for 11.0 ± 0.1 minutes at ambient temperature.

11.1.7.8 At the conclusion of the purge time, attach the trap to the chromatograph, adjust the device to the desorb mode, and begin the gas chromatographic temperature program and GC/MS data acquisition. Concurrently, introduce the trapped materials to the gas chromatographic column by rapidly heating the trap to 230°C while backflushing the trap with inert gas between 20 and 60 mL/min for 4 minutes. If this rapid heating requirement cannot be met, the gas chromatographic column must be used as a secondary trap by cooling it to 30°C (or subambient, if problems persist).

11.1.7.9 While the trap is being desorbed into the gas chromatograph, empty the purging chamber. Wash the chamber with a minimum of two 5 mL flushes of organic-free reagent water (or methanol followed by organic-free reagent water) to avoid carryover of pollutant compounds into subsequent analyses.

11.1.7.10 After desorbing the sample for 4 minutes, recondition the trap by returning the purge-and-trap device to the bake

Sequoia Analytical ©1999

mode. The trap temperature should be maintained at 230°C. Higher temperatures will shorten the useful life of the trap. After approximately 11 minutes, turn off the trap heater and open the syringe valve to stop the gas flow through the trap. When cool, the trap is ready for the next sample.

11.1.7.11 If the initial analysis of a sample or a dilution of the sample has a concentration of analytes that exceeds the initial calibration range, the sample must be reanalyzed at a higher dilution. Secondary ion quantitation is allowed only when there are sample interferences with the primary ion. When a sample is analyzed that has saturated ions from a compound, this analysis must be followed by a blank organic-free reagent water analysis. If the blank analysis is not free of interferences, the system must be decontaminated. Sample analysis may not resume until a blank can be analyzed that is free of interferences.

11.1.7.12 For matrix spike analysis, add 10 µL of the matrix spike solution to the 5 mL of sample to be purged. Disregarding any dilutions, this is equivalent to a concentration of 50 µg/L of each matrix spike standard.

11.1.7.13 All dilutions should keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve. Proceed to qualitative or quantitative analysis.

11.1.8 Compositing aqueous samples prior to GC/MS analysis.

11.1.8.1 Add 5 mL or equal larger amounts of each sample (up to 5 samples are allowed) to a 25 mL glass syringe. Special precautions must be made to maintain zero headspace in the syringe.

11.1.8.2 The samples must be cooled at 4°C during this step to minimize volatilization losses.

11.1.8.3 Mix well and draw out a 5 mL aliquot for analysis.

11.1.8.4 Follow the sample analysis results above.

Sequoia Analytical ©1999

11.1.8.5 If less than 5 samples are used for compositing, a proportionately smaller syringe should be used unless a 25 mL sample is to be purged.

11.1.9 Water-miscible liquids

11.1.9.1 Water-miscible liquids are analyzed as water samples after first diluting them at least 50-fold with organic-free reagent water.

11.1.9.2 Initial and serial dilutions can be prepared by pipetting 2 mL of the sample to a 100 mL volumetric flask and diluting to volume with organic-free reagent water. Transfer immediately to a 5 mL gas tight syringe.

11.1.9.3 Alternatively, prepare dilutions directly in a 5 mL syringe filled with organic-free reagent water by adding at least 20 µL, but not more than 100 µL of liquid sample. The sample is ready for addition of internal and surrogate standards.

11.2 Sediment/soil and waste samples - It is highly recommended that all samples of this type be screened prior to the purge-and-trap GC/MS analysis by the headspace GC/FID method. These samples may contain percent quantities of purgeable organics that will contaminate the purge-and-trap system, and require extensive cleanup and instrument downtime. Use the screening data to determine whether to use the low-concentration method (0.005-1 mg/Kg) or the high-concentration method (> 1 mg/Kg).

11.3 Optional Low-concentration Method - This is designed for samples containing individual purgeable compounds of < 1 mg/Kg. It is limited to sediment/soil samples and waste that is of a similar consistency (granular and porous). The low-concentration method is based on purging a heated sediment/soil sample mixed with organic-free reagent water containing the surrogate and internal standards. Analyze all reagent blanks and standards under the same conditions as the samples.

11.4 Use a 5 g sample if the expected concentration is < 0.1 mg/Kg or a 1 g sample for expected concentrations between 0.1 and 1 mg/Kg.

Sequoia Analytical ©1999

11.5 The GC/MS system should be set up prior to the preparation of the sample to avoid loss of volatiles from standards and samples. A heated purge calibration curve must be prepared and used for the quantitation of all samples analyzed with the low-concentration method. Follow the initial and daily calibration instructions, except for the addition of a 40°C purge temperature.

11.6 Remove the plunger from a 5 mL Luerlock type syringe equipped with a syringe valve and fill until overflowing with water. Replace the plunger and compress the water to vent trapped air. Adjust the volume to 5.0 mL. Add 10 µL each of surrogate spiking solution and internal standard solution to the syringe through the valve (Surrogate spiking solution and internal standard solution may be mixed together.). The addition of 10 µL of the surrogate spiking solution to 5 g of sediment/soil is equivalent to 50 µg/Kg of each surrogate standard.

11.7 The sample (for volatile organics) consists of the entire contents of the sample container. Do not discard any supernatant liquids. Mix the contents of the sample container with a narrow metal spatula. Weigh the amount determined into a tared purge device. Note and record the actual weight to the nearest 0.1 g.

11.8 Determination of sample % dry weight - In certain cases, sample results are desired based on dry weight basis. Percent dry weight may be determined by the following formula:

$$\%\ \text{dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$

11.9 Add the spiked water to the purge device, which contains the weighed amount of sample, and connect the device to the purge-and-trap system.

11.9.1 Heat the sample to 40 ± 1°C and purge the sample for 10.0 ± 0.1 minute.

11.9.2 Proceed with the analysis. Use 5 mL of the same organic-free reagent water as in the reagent blank. If saturated peaks occurred or would occur if a 1 g sample were analyzed, the high-concentration method must be followed.

11.9.3 For low-concentration sediment/soils add 10 µL of the matrix spike solution to the 5 mL of organic-free reagent water. The concentration for

Sequoia Analytical ©1999

a 5 g sample would be equivalent to 50 µg/Kg of each matrix spike standard.

11.10 High-concentration method - The method is based on extracting the sediment/ soil with methanol. A waste sample is either extracted or diluted, depending on its solubility in methanol. An aliqout of the extract is added to organic-free reagent water containing surrogates, internal standards and, if applicable, matrix spike compounds. This is purged at ambient temperature. All samples with an expected concentration of > 1.0 mg/Kg should be analyzed by this method.

11.11 The sample (for volatile organics) consists of the entire contents of the sample container. Do not discard any supernatant liquids. .Mix the contents of the sample container with a narrow metal spatula. For sediment/ soil and solid wastes that are insoluble in methanol, weigh 5 g (wet weight) of sample into a tared 20 mL vial. Use a top-loading balance. Note and record the actual weight to 0.1 gram and, if required, determine the percent dry weight of the sample.

11.12 For sediment/ soil or solid waste, quickly add 9.0 mL of appropriate solvent; then add 10 µL of the surrogate spiking solution to the vial. For a solvent miscible sample, dilute the sample to 10 mL with the appropriate solvent after adding the surrogate spiking solution. If a 5.0 mL solution is desired, add 4.5 mL solvent, 5 µL of surrogate spiking solution, and dilute the sample to 5 mL. Cap and shake for 2 minutes.

[**NOTE:** The above procedures must be performed rapidly and without interruption to avoid loss of volatile organics. These steps must be performed in a laboratory free from solvent fumes.]

11.13 Pipet approximately 1 mL of the extract to a GC vial for storage, using a disposable pipet. The remainder may be disposed of properly. Transfer approximately 1 mL of appropriate solvent to a separate GC vial for use as the method blank for each set of samples. These extracts may be stored at 4°C in the dark, prior to analysis.

11.14 The GC/MS system should be set up prior to the addition of the solvent extract to organic-free reagent water.

11.15 A volume of solvent extract is added to the 5 mL of organic-free reagent water for analysis. If a screening procedure was followed use the estimated concentration to determine the appropriate volume. Otherwise, estimate the concentration range of the sample from the low-concentration analysis to determine the appropriate

Sequoia Analytical ©1999

volume. If the sample was submitted as a high-concentration sample, start with 100 µL. All dilutions must keep the response of the major constituents (previously saturated peaks) in the upper half of the linear range of the curve.

11.16 Remove the plunger from a 5.0 mL Luer-lock type syringe equipped with a syringe valve and fill until overflowing with water. Replace the plunger and compress the water to vent trapped air. Adjust the volume to 4.9 mL. Pull the plunger back to 5.0 mL to allow volume for the addition of the sample extract and of standards. Add 10 µL of internal standard solution. Also add the solvent extract and a volume of extraction or dissolution solvent to total 100 µL (excluding methanol in standards).

11.17 Attach the syringe-syringe valve assembly to the syringe valve on the purging device. Open the syringe valve and inject the organic-free reagent water/methanol sample into the purging chamber.

11.18 It is good practice to analyze all reagent blanks on the same instrument as that used for the samples. If two instruments are used for the analysis run the reagent blanks on one instrument and the water blanks on the other instrument to verify blank performance. The standards and blanks should also contain 100 µL of solvent to simulate the sample conditions.

11.19 For a matrix spike in the high-concentration sediment/soil samples, add 8.0 mL of methanol, 1.0 mL of surrogate spike solution, and 1.0 mL of matrix spike solution. Add a 100 µL aliquot of this extract to 5 mL of organic-free reagent water for purging .

12.0 CALCULATIONS

12.1 Response Factor

$$RF = (A_{(x)}C_{(is)})/(A_{(is)}C_{(x)})$$

where:

$A_{(x)}$ = Area of the characteristic ion for the compound being measured.
$A_{(is)}$ = Area of the characteristic ion for the specific internal standard.
$C_{(is)}$ = Concentration of the specific internal standard.
$C_{(x)}$ = Concentration of the compound being measured.

12.2 Percent RSD

Sequoia Analytical ©1999

$$\%RSD = (SD/\overline{RF_x}) \times 100$$

where:

%RSD = relative standard deviation.
$\overline{RF_x}$ = mean of 5 initial RFs for a compound.
SD = standard deviation of the 5 initial RFs for a compound.

12.3 Calibration Check Percent Drift

$$\%Drift = (C_{(I)} - C_{(C)})/ C_{(I)} \times 100$$

where:
$C_{(I)}$ = Calibration Check Compound standard concentration.
$C_{(C)}$ = Measured concentration using selected quantitation method.

12.4 Percent Dry Weight

$$\%\ \text{dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$

12.5 Water and Water miscible waste concentration calculations

$$\text{Concentration } (\mu g/L) = \frac{(A_{(x)})(I_{(s)})}{(A_{(is)})(RF)(V_{(o)})}$$

where:
$A_{(x)}$ = Area of characteristic ion for compound being measured.
$I_{(s)}$ = Amount of internal standard injected (ng).
$A_{(is)}$ = Area of characteristic ion for the internal standard.
RF = Mean relative response factor for compound being measured
$V_{(o)}$ = Volume of water purged (mL), taking into consideration any dilutions made.

12.6 Sediment, sludge, and soil

Sequoia Analytical ©1999

12.6.1 High-concentration:

$$\text{Concentration (ug/Kg)} = \frac{(A_{(x)})(I_{(s)})\,(V_{(t)})}{(A_{(is)})(RF)(V_{(i)})(W_{(s)})}$$

12.6.2 Low-concentration:

$$\text{Concentration (µg/Kg)} = \frac{(A_{(x)})(I_{(s)})}{(A_{(is)})(RF)(W_{(s)})}$$

where:
$A_{(x)}$) $I_{(s)}$) $A_{(is)}$) RF = Same as in water and water-miscible waste above.
$V_{(t)}$ = Volume of total extract (µL) (use 10,000 uL or a factor of this when dilutions are made).
$V_{(i)}$ = Volume of extract added (µL) for purging.
$W_{(s)}$ = Weight of sample extracted or purged (g). The wet weight or dry weight may be used, depending upon the specific applications of the data.

13.0 METHOD PERFORMANCE

13.1 Method Detection Limit Studies are performed for this method on each instrument per matrix on an annual basis.

14.0 POLLUTION PREVENTION

14.1 All wastes from this procedure shall be disposed following the recommendations of the chemical hygiene plan.

15.0 DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES

15.1 See Table 7, Section 16.

16.0 CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

16.1 Follow the corrective actions outlined in the following table.

Sequoia Analytical ©1999

Table 7 – Quality Control and Corrective Actions for Method 8260

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Method Detection Limit (MDL) Study	Annually for water and soil.	Minimum of 7 replicates. Spike level must be at a concentration between the calculated MDL and 10 x MDL.	Reprepare study at adjusted spiking levels for MDLs falling outside of acceptable range.
Initial Demonstration of Proficiency	Prior to use of method for client samples.	Every analyst must demonstrate proficiency	Investigate failure. Verify solution integrity and instrument performance. Reprepare and reanalyze.
Tuning	Every 12 hr, prior to analysis.	See Section 20.	Inspect instrument and perform necessary maintenance. Retune instrument and reanalyze any samples since last acceptable tune.
Initial Calibration	As necessary.	Minimum of five points. Low standard must not exceed method reporting limit. Minimum RRF for each SPCC and maximum %RSD for each CCC.	Verify solution integrity and check instrument performance. Perform necessary maintenance and recalibrate instrument. Reanalyze all affected samples.
Secondary Source Calibration Verification	Following every initial calibration.	Secondary source check - all target compounds +/- 20% of expected value and 90% of compounds passing.	Verify solution integrity and instrument performance. Reanalyze, if still out, then recalibrate.
Continuing Calibration Verification	Every 12 hr.	All CCCs must be less than 20% drift from expected value.	Verify solution integrity and instrument performance. Reanalyze standard once, if still out remix and reshoot affected samples.
Method Blanks	One every 12 hr.	Target compounds < reporting limit.	Investigate source of contamination. Reprepare and reanalyze all associated samples. If acetone or methylene chloride is found near detection limits, the limits may be raised, refer these cases to the departmental manager.

Sequoia Analytical ©1999

Surrogate Spike	Every sample, blank and standard.	50-150% or in-house generated limits.	Check calculations. If still out, verify instrument performance and correct, if necessary. Reanalyze sample, if still out reextract and reanalyze.
Laboratory Control Sample	One per analytical batch.	80-120% or control limits generated from in-house data.	Reanalyze once, if still out verify solution integrity and instrument performance. Make new spike standard and reanalyze. If still out, reprepare and reanalyze all associated samples.
Matrix Spike (MS) and Matrix Spike Duplicate (MSD)	One set per 20 samples of a similar matrix.	75-125% or control limits generated from in-house data.	Reanalyze once, if still out verify solution integrity and instrument performance. If LCS acceptable, narrate as possible matrix effect.

17.0 CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

17.1 Data that fails quality control requirements but cannot be repeated (i.e., insufficient sample volume, or severe matrix effects) should be brought to the immediate attention of the Department or the Client Services Representative so that the results may be discussed with the client. A narrative should accompany the analytical results explaining the analytical difficulties the laboratory encountered.

18.0 WASTE MANAGEMENT

18.1 All digests produced by this procedure must be disposed following the procedures outlined in the Chemical Hygiene Plan.

19.0 REFERENCES

19.1 "EPA SW-846", Method 8260A, Revision 1, September, 1994.

19.2 Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water Method 524.2; U.S. Environmental Protection Agency. Office of Research Development. Environmental Monitoring and Support Laboratory: Cincinnati, OH 1986.

Sequoia Analytical ©1999

19.3 Bellar, T.A.; Lichtenberg, J.J.J. Amer. Water Works Assoc. 1974, 66(12), 739-744.

19.4 Bellar, T.A.; Lichtenberg, J.J. "Semi-Automated Headspace Analysis of Drinking Waters and Industrial Waters for Purgeable Volatile Organic Compounds", in Van Hall, Ed.; Measurement of Organic Pollutants in Water and Wastewater, ASTM STP 686, pp 108-129, 1979.

19.5 Budde, W.L.; Eichelberger, J.W. "Performance Tests for the Evaluation of Computerized Gas Chromatography/Mass Spectrometry Equipment and Laboratories"; U.S. Environmental Protection Agency. Environmental Monitoring and Support Laboratory. Cincinnati, OH 45268, April 1980; EPA600/4-79-020.

19.6 Eichelberger, J.W.; Harris, L.E.; Budde, W.L. "Reference Compound to Calibrate Ion Abundance Measurement in Gas Chromatography-Mass Spectrometry Systems"; Analytical Chemistry 1975, 47, 995-1000.

19.7 Olynyk, P.; Budde, W.L.; Eichelberger, J.W. "Method Detection Limit for Methods 624 and 625"; Unpublished report, October 1980.

20.0 TABLES, DIAGRAMS, FLOWCHARTS AND VALIDATION DATA

TABLE 8. REPRESENTATIVE CHROMATOGRAPHIC RETENTION TIMES FOR VOLATILE ORGANIC COMPOUNDS ON WIDE BORE CAPILLARY COLUMNS

		Retention Time (min)	
Analyte	**Column 1(a)**	**Column 2(b)**	**Column 2(c)**
Dichlorodifluoromethane	1.55	0.70	3.13
Chloromethane	1.63	0.73	3.40
Vinyl Chloride	1.71	0.79	3.93
Bromomethane	2.01	0.96	4.80
Chloroethane	2.09	1.02	--
Trichlorofluoromethane	2.27	1.19	6.20
1,1-Dichloroethene	2.89	1.57	7.83
Methylene chloride	3.60	2.06	9.27
trans-1,2-Dichloroethene	3.98	2.36	9.90
1,1-Dichloroethane	4.85	2.93	10.80
2,2-Dichloropropane	6.01	3.80	11.87
cis-1,2-Dichloroethene	6.19	3.90	11.93

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

		Retention Time (min)	
Analyte	**Column 1(a)**	**Column 2(b)**	**Column 2(c)**
Chloroform	6.40	4.80	12.60
Bromochloromethane	6.74	4.38	12.37
1,1,1-Trichloroethane	7.27	4.84	12.83
Carbon tetrachloride	7.61	5.26	13.17
1,1-Dichloropropene	7.68	5.29	13.10
Benzene	8.23	5.67	13.50
1,2-Dichloroethane	8.40	5.83	13.63
Trichloroethene	9.59	7.27	14.80
1,2-Dichloropropane	10.09	7.66	15.20
Bromodichloromethane	10.59	8.49	15.80
Dibromomethane	10.65	7.93	15.43
trans-1,3-Dichloropropene	--	--	16.70
Toluene	12.43	10.00	17.40
cis-1,3-Dichloropropene	--	--	17.90
1,1,2-Trichloroethane	13.41	11.05	18.30
Tetrachloroethene	13.74	11.15	18.60
1,3-Dichloropropane	14.04	11.31	18.70
Dibromochloromethane	14.39	11.85	19.20
1,2-Dibromoethane	14.73	11.83	19.40
1-Chlorohexane	15.46	13.29	--
Chlorobenzene	15.76	13.01	20.67
1,1,1,2-Tetrachloroethane	15.94	13.33	20.87
Ethylbenzene	15.99	13.39	21.00
p-Xylene	16.12	13.69	21.30
m-Xylene	16.17	13.68	21.37
o-Xylene	17.11	14.52	22.27
Styrene	17.31	14.60	22.40
Bromoform	17.93	14.88	22.77
Isopropylbenzene	18.06	15.46	23.30
1,1,2,2-Tetrachloroethane	18.72	16.35	24.07
Bromobenzene	18.95	15.86	24.00
1,2,3-Trichloropropane	19.02	16.23	24.13
n-Propylbenzene	19.06	16.41	24.33
2-Chlorotoluene	19.34	16.42	24.53
1,3,5-Trimethylbenzene	19.47	16.90	24.83

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

		Retention Time (min)	
Analyte	**Column 1(a)**	**Column 2(b)**	**Column 2(c)**
4-Chlorotoluene	19.50	16.72	24.77
tert-Butylbenzene	20.28	17.57	26.60
1,2,4-Trimethylbenzene	20.34	17.70	31.50
sec-Butylbenzene	20.79	18.09	26.13
p-Isopropyltoluene	21.20	18.52	26.50
1,3-Dichlorobenzene	21.22	18.14	26.37
1,4-Dichlorobenzene	21.55	18.39	26.60
n-Butylbenzene	22.22	19.49	27.32
1,2-Dichlorobenzene	22.52	19.17	27.43
1,2-Dibromo-3-chloropropane	24.53	21.08	--
1,2,4-Trichlorobenzene	26.55	23.08	31.50
Hexachlorobutadiene	26.99	23.68	32.07
Naphthalene	27.17	23.52	32.20
1,2,3-Trichlorobenzene	27.78	24.18	32.97
4-Bromofluorobenzene (Surr)	18.63	15.71	23.63

(a) = Column 1 - 60 meter x 0.75 mm ID VOCOL capillary. Hold at 10°C for 5 minutes, then program to 160°C at 6°C/min.
(b) = Column 2 - 30 meter x 0.53 mm ID DB-624 wide-bore capillary using cryogenic oven. Hold at 10°C for 5 minutes, then program to 160°C at 6°C/min.
(c) = Column 2' - 30 meter x 0.53 mm ID DB-624 wide-bore capillary, cooling GC oven to ambient temperatures. Hold at 10°C for 6 minutes, program to 70°C at 10°C/min, program to 120°C at 5°C/min, then program to 180°C at 8°C/min.
(d) = MDL based on a 25 mL sample volume.

Sequoia Analytical ©1999

TABLE 9. PRACTICAL QUANTITATION LIMITS FOR VOLATILE ANALYTES(a)

	Groundwater ug/L	Low Soil/Sediment(b) ug/Kg
5 mLof Water Purged	5	
25 mL of Water Purged	1	
Soil/ Sediment		5

(a) = Practical Quantitation Limit (PQL) - The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The EQL is generally 5 to 10 times the MDL. However, it may be nominally chosen within these guidelines to simplify data reporting. For many analytes the PQL analyte concentration is selected for the lowest non-zero standard in the calibration curve. Sample PQLs are highly matrix-dependent. The EQLs listed herein are provided for guidance and may not always be achievable. See the following information for further guidance on matrix-dependent PQLs.
(b) = PQLs listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis; therefore, PQLs will be higher, based on the percent dry weight in each sample.

Sequoia Analytical ©1999

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY
TABLE 10. BFB MASS - INTENSITY SPECIFICATIONS (4-BROMO-FLUOROBENZENE)

Mass	Intensity Required (relative abundance)
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

TABLE 11. CHARACTERISTIC MASSES (M/Z) FOR PURGEABLE ORGANIC COMPOUNDS

Analyte	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Acetone	43	58
Benzene	78	--
Bromobenzene	156	77, 158
Bromochloromethane	128	49, 130
Bromodichloromethane	83	85, 127
Bromoform	173	175, 254
Bromomethane	94	96
2-Butanone	43	72
n-Butylbenzene	91	92, 134
sec-Butylbenzene	105	134
tert-Butylbenzene	119	91,134
Carbon disulfide	76	78
Carbon tetrachloride	117	119
Chlorobenzene	112	77,114
Chlorodibromomethane	129	127
Chloroethane	64	66
Chloroform	83	85
1,Chlorohexane	91	--
Chloromethane	50	52
2-Chlorotoluene	91	126
4-Chlorotoluene	91	126
1,2-Dibromo-3-chloropropane	157	75, 155
1,2-Dibromoethane	107	109, 188
Dibromomethane	93	95, 174
1,2-Dichlorobenzene	146	111, 148
1,3-Dichlorobenzene	146	111, 148
1,4-Dichlorobenzene	146	111, 148
Dichlorodifluoromethane	85	87
1,1-Dichloroethane	63	65, 83
1,2-Dichloroethane	62	98
1,1-Dichloroethene	96	61, 63
cis-1,2-Dichloroethene	96	61, 98
trans-1,2-Dichloroethene	96	61, 98
1,2-Dichloropropane	63	112

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

Analyte	Primary Characteristic Ion	Secondary Characteristic Ion(s)
1,3-Dichloropropane	76	78
2,2-Dichloropropane	77	97
1,1-Dichloropropene	75	110, 77
cis-1,3-Dichloropropene	75	77, 39
trans-1,3-Dichloropropene	75	77, 39
Ethylbenzene	106	91
Hexachlorobutadiene	225	223, 227
2-Hexanone	43	58, 57, 100
Isopropylbenzene	105	120
p-Isopropyltoluene	119	134, 91
Methylene chloride	84	86, 49
4-Methyl-2-pentanone	43	100, 58, 85
Naphthalene	128	--
n-Propylbenzene	91	120
Styrene	104	78
1,1,1,2-Tetrachloroethane	133	131, 119
1,1,2,2-Tetrachloroethane	83	131, 85
Tetrachloroethene	164	131, 166, 168, 129
Toluene	92	91
1,2,3-Trichlorobenzene	180	182, 145
1,2,4-Trichlorobenzene	180	182, 145
1,1,1-Trichloroethane	97	99, 61
1,1,2-Trichloroethane	83	97, 85
Trichloroethene	130	95, 132
Trichlorofluoromethane	101	103
1,2,3-Trichloropropane	75	77
Trichlorotrifluoroethane	151	--
1,2,4-Trimethylbenzene	105	120
1,3,5-Trimethylbenzene	105	120
Vinyl acetate	43	86
Vinyl chloride	62	64
o-Xylene	106	91
m-Xylene	106	91
p-Xylene	106	91
INTERNAL STANDARDS/SURROGATES		
4-Bromofluorobenzene (Surr)	95	174, 176

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

Analyte	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Dibromofluoromethane (Surr)	113	-
Toluene-d(8) (Surr)	98	-
Pentafluorobenzene (IS)	**168**	**-**
1,4-Difluorobenzene (IS)	**114**	**-**
Chlorobenzene-d(5) (IS)	**117**	**-**
1,2-Dichloroethane-d(4) (Surr)	65	-
1,4-Dichlorobenzene-d(4) (IS)	**152**	**115, 150**

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY
TABLE 12. VOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

Pentafluoro-benzene	**1,4-Difluoro-benzene**	**Chlorobenzene-d5**	**1,4-Dichloro-benzene-d4**
Acetone	Benzene	Bromofluoro-benzene (Surr)	Bromobenzene
Bromochloro-methane	Bromodichloro-methane	1,2-Dibromoethane	n-Butylbenzene
Carbon tetrachloride	Dibromomethane	1-Chlorohexane	sec-Butylbenzene
Bromomethane	1,2-Dichloroethane	trans-1,3-Dichloropropene	tert-Butylbenzene
2-Butanone	1,2-Dichloropropane	Toluene	2-Chlorotoluene
Carbon disulfide	cis-1,3-Dichloropropene	Toluene-d(8)(Surr)	4-Chlorotoluene
Chloroethane	4-Methyl-2-pentanone	1,1,2-Trichloroethane	1,2-Dibromo-3-chloropropane
Chloroform	Trichloroethene	m/p-Xylene	1,2-Dichlorobenzene
1,2-Dichloro-ethane-d(4)(Surr)		o-Xylene	1,3-Dichlorobenzene
Chloromethane		Bromoform	1,4-Dichlorobenzene
Dibromofluoro-methane (Surr.)		Chlorodibromo-methane	Hexachloro-butadiene
Dichlorodifluoro-methane		Chlorobenzene	p-Isopropyltoluene
1,1-Dichloropropene		1,3-Dichloropropane	Naphthalene
1,1-Dichloroethane		Ethylbenzene	n-Propylbenzene
1,1-Dichloroethene		2-Hexanone	1,1,2,2-Tetrachloroethane
cis-1,2-Dichloroethene		Styrene	1,2,3-Trichlorobenzene
trans-1,2-Dichloroethene		1,1,1,2-Tetrachloroethane	1,2,4-Trichlorobenzene
2,2-Dichloropropane		Isopropyl benzene	1,2,3-Trichloropropane
Iodomethane		Tetrachloroethene	1,2,4-Trimethylbenzene
Methylene chloride		Xylene	1,3,5-Trimethylbenzene
1,1,1-Trichloroethane			
Trichlorofluoro-methane			
Trichlorotri-fluoroethane			
Vinyl acetate			

Sequoia Analytical ©1999

Vinyl chloride			

TABLE 13. SINGLE LABORATORY ACCURACY AND PRECISION DATA FOR VOLATILE ORGANIC COMPOUNDS IN WATER DETERMINED WITH A WIDE BORE CAPILLARY COLUMN

Analyte	Conc. Range ug/L	No. of Samples	% Rec	Std Dev of Recovery(b)	%RSD
Benzene	0.1 - 10	31	97	6.5	5.7
Bromobenzene	0.1 - 10	30	100	5.5	5.5
Bromochloromethane	0.5 - 10	24	90	5.7	6.4
Bromodichloromethane	0.1 - 10	30	95	5.7	6.1
Bromoform	0.5 - 10	18	101	6.4	6.3
Bromomethane	0.5 - 10	18	95	7.8	8.2
n-Butylbenzene	0.5 - 10	18	100	7.6	7.6
sec-Butylbenzene	0.5 - 10	16	100	7.6	7.6
tert-Butylbenzene	0.5 - 10	18	102	7.4	7.3
Carbon tetrachloride	0.5 - 10	24	84	7.4	8.8
Chlorobenzene	0.1 - 10	31	98	5.8	5.9
Chloroethane	0.5 - 10	24	89	8.0	9.0
Chloroform	0.5 - 10	24	90	5.5	6.1
Chloromethane	0.5 - 10	23	93	8.3	8.9
2-Chlorotoluene	0.1 - 10	31	90	5.6	6.2
4-Chlorotoluene	0.1 - 10	31	98	8.2	8.3
1,2-Dibromo-3-Chloropropane	0.5 - 10	24	83	16.6	19.9
Dibromochloromethane	0.1 - 10	31	92	6.5	7.0
1,2-Dibromoethane	0.5 - 10	24	102	4.0	3.9
Dibromomethane	0.5 - 10	24	100	5.6	5.6
1,2-Dichlorobenzene	0.1 - 10	31	93	5.8	6.2
1,3-Dichlorobenzene	0.5 - 10	24	99	6.8	6.9
1,4-Dichlorobenzene	0.2 - 20	31	103	6.6	6.4
Dichlorodifluoromethane	0.5 - 10	18	90	6.9	7.7
1,1-Dichlorobenzene	0.5 - 10	24	96	5.1	5.3
1,2-Dichlorobenzene	0.1 - 10	31	95	5.1	5.4
1,1-Dichloroethene	0.1 - 10	34	94	6.3	6.7
cis-1,2-Dichloroethene	0.5 - 10	18	101	6.7	6.7
trans-1,2-Dichloroethene	0.1 - 10	30	93	5.2	5.6
1,2-Dichloropropane	0.1 - 10	30	97	5.6	6.1
1D,3-Dichloropropane	0.1 - 10	31	96	5.7	6.0

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

Analyte	Conc. Range ug/L	No. of Samples	% Rec	Std Dev of Recovery(b)	%RSD
2,2-Dichloropropane	0.5 - 10	12	86	14.6	16.9
1,1-Dichloropropene	0.5 - 10	18	98	8.7	8.9
Ethylbenzene	0.1 - 10	31	99	8.4	8.6
Hexachlorobutadiene	0.5 - 10	18	100	6.8	6.8
Isopropylbenzene	0.5 - 10	16	101	7.7	7.6
p-Isopropyltoluene	0.1 - 10	23	99	6.7	6.7
Methylene chloride	0.1 - 10	30	95	5.0	5.3
Naphthalene	0.1 -100	31	104	8.6	8.2
n-Propylbenzene	0.1 - 10	31	100	5.8	5.8
Styrene	0.1 -100	39	102	7.3	7.2
1,1,1,2-Tetrachloroethane	0.5 - 10	24	90	6.1	6.8
1,1,2,2-Tetrachloroethane	0.1 - 10	30	91	5.7	6.3
Tetrachloroethene	0.5 - 10	24	89	6.0	6.8
Toluene	0.5 - 10	18	102	8.	8.0
1,2,3-Trichlorobenzene	0.5 - 10	18	109	9.4	8.6
1,2,4-Trichlorobenzene	0.5 - 10	18	108	9.0	8.3
1,1,1-Trichloroethane	0.5 - 10	18	98	7.9	8.1
1,1,2-Trichloroethane	0.5 - 10	18	104	7.6	7.3
Trichloroethene	0.5 - 10	24	90	6.5	7.3
Trichlorofluoromethane	0.5 - 10	24	89	7.2	8.1
1,2,3-Trichloropropane	0.5 - 10	16	108	15.6	14.4
1,2,4-Trimethylbenzene	0.5 - 10	18	99	8.0	8.1
1,3,5-Trimethylbenzene	0.5 - 10	23	92	6.8	7.4
Vinyl chloride	0.5 - 10	18	98	6.5	6.7
o-Xylene	0.1 - 31	18	103	7.4	7.2
m-Xylene	0.1 - 10	31	97	6.3	6.5
p-Xylene	0.5 - 10	18	104	8.0	7.7

(a) = Recoveries were calculated using internal standard method. Internal standard was fluorobenzene.
(b) = Standard deviation was calculated by pooling data form three concentrations.

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

TABLE 14. SINGLE LABORATORY ACCURACY AND PRECISION DATA FOR VOLATILE ORGANIC COMPOUNDS IN WATER DETERMINED WITH A NARROW BORE CAPILLARY COLUMN

Analyte	Conc. ug/L	Number of Samples	%Reco-very (a)	Std. Dev. of Recovery	%RSD
Benzene	0.1	7	99	6.2	6.3
Bromobenzene	0.5	7	97	7.4	7.6
Bromochloromethane	0.5	7	97	5.8	6.0
Bromodichloromethane	0.1	7	100	4.6	4.6
Bromoform	0.5	7	101	5.4	5.3
Bromomethane	0.5	7	99	7.1	7.2
n-Butylbenzene	0.5	7	94	6.0	6.4
sec-Butylbenzene	0.5	7	110	7.1	6.5
tert-Butylbenzene	0.5	7	110	2.5	2.3
Carbon tetrachloride	0.1	7	108	6.8	6.3
Chlorobenzene	0.1	7	91	5.8	6.4
Chloroethane	0.1	7	100	5.8	5.8
Chloroform	0.1	7	105	3.2	3.0
Chloromethane	0.5	7	101	4.7	4.7
2-Chlorotoluene	0.5	7	99	4.6	4.6
4-Chlorotoluene	0.5	7	96	7.0	7.3
1,2-Dibromo-3-chloropropane	0.5	7	92	10.0	10.9
Dibromochloromethane	0.1	7	99	5.6	5.7
1,2-Dibromoethane	0.5	7	97	5.6	5.8
Dibromomethane	0.5	7	93	5.6	6.0
1,2-Dichlorobenzene	0.1	7	97	3.5	3.6
1,3-Dichlorobenzene	0.1	7	101	6.0	5.9
1,4-Dichlorobenzene	0.1	7	106	6.5	6.1
Dichlorodifluoromethane	0.1	7	99	8.8	8.9
1,1-Dichloroethane	0.5	7	98	6.2	6.3
1,2-Dichloroethane	0.1	7	100	6.3	6.3
1,1-Dichloroethene	0.1	7	95	9.0	9.5
cis-1,2-Dichloroethene	0.1	7	100	3.7	3.7
trans-1,2-Dichloroethene	0.1	7	98	7.2	7.3
1,2-Dichloropropane	0.5	7	96	6.0	6.3
1,3-Dichloropropane	0.5	7	99	4.9	4.9
1,1-Dichloropropene	0.5	7	102	7.4	7.3
Ethylbenzene	0.5	7	99	5.2	5.3

Sequoia Analytical ©1999

GC/MS VOLATILE DEPARTMENT

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY

Analyte	Conc. ug/L	Number of Samples	%Reco-very (a)	Std. Dev. of Recovery	%RSD
Hexachlorobutadiene	0.5	7	100	6.7	6.7
Isopropylbenzene	0.5	7	102	6.4	6.3
p-Isopropyltoluene	0.5	7	113	13.0	11.5
Methylene chloride	0.5	7	97	13.0	13.4
Naphthalene	0.5	7	98	7.2	7.3
n-Propylbenzene	0.5	7	99	6.6	6.7
Styrene	0.5	7	96	19.0	19.8
1,1,1,2-Tetrachloroethane	0.5	7	100	4.7	4.7
1,1,2,2-Tetrachloroethane	0.5	7	100	12.0	12.0
Tetrachloroethene	0.1	7	96	5.0	5.2
Toluene	0.5	7	100	5.9	5.9
1,2,3-Trichlorobenzene	0.5	7	102	8.9	8.7
1,2,4-Trichlorobenzene	0.5	7	91	16.0	17.6
1,1,1-Trichloroethane	0.5	7	100	4.0	4.0
1,1,2-Trichloroethane	0.5	7	102	4.9	4.8
Trichloroethene	0.1	7	104	2.0	1.9
Trichlorofluoromethane	0.1	7	97	4.6	4.7
1,2,3-Trichloropropane	0.5	7	96	6.5	6.8
1,2,4-Trimethylbenzene	0.5	7	96	6.5	6.8
1,3,5-Trimethylbenzene	0.5	7	101	4.2	4.2
Vinyl chloride	0.1	7	104	0.2	0.2
o-Xylene	0.5	7	106	7.5	7.1
m-Xylene	0.5	7	106	4.6	4.3
p-Xylene	0.5	7	97	6.1	6.3

(a) = Recoveries were calculated using internal standard method. Internal standard was fluorobenzene.

Sequoia Analytical ©1999

SEQUOIA ANALYTICAL, SAN CARLOS LABORATORY
TABLE 15. SURROGATE SPIKE RECOVERY LIMITS FOR WATER AND SOIL/SEDIMENT SAMPLES

Surrogate Compound	Low/High Water	Low/High Soil/Sediment
4-Bromofluorobenzene(a)	86-115	74-121
Optional Dibromofluoromethane(a)	86-118	80-120
Toluene-d8(a)	88-110	81-117
1,2-Dichloroethane-d4(a)	80-120	80-120

(a) = Single laboratory data for guidance only.

TABLE 16. QUANTITY OF EXTRACT REQUIRED FOR ANALYSIS OF HIGH-CONCENTRATION SAMPLES

Approximate Concentration Range	Volume of Extract(a)
500 - 10,000 ug/Kg	100 uL
1,000 - 20,000 ug/Kg	50 uL
5,000 – 100,000 ug/Kg	10 uL
25,000 - 500,000 ug/Kg	100 uL of 1/50 dilution(b)

Calculate appropriate dilution factor for concentrations exceeding this table.

(a) The volume of solvent added to 5 mL of water being purged should be kept constant. Therefore, add to the 5 mL syringe whatever volume of solvent is necessary to maintain a volume of 100 uL added to the syringe.

(b) Dilute an aliquot of the solvent extract and then take 100 uL for analysis.

Sequoia Analytical ©1999

NOTICE OF PENDING FIELD ACTIVITIES

As part of the City of Lodi's Initial Site Investigation (ISI) field activities, we will be conducting soil gas and/or groundwater sampling in the vicinity of your property. These sample locations have been previously identified and marked in the field with white paint within City of Lodi right-of-ways. Each location has been checked for underground utilities, prior to the initiation of sampling. The City has retained Henshaw Associates, Inc. to conduct this phase of the investigation which will include the collection of soil gas samples and/or groundwater samples from approximately 450 locations across the City.

The sampling will be conducted at the following location:

_____

_____.

We anticipate the sampling will be conducted on the following date: _____

to begin at approximately _____

and should be concluded at _____.

The City will make every attempt to conduct this work with a minimal disturbance to you. If you have any questions or if any problems arise from this activity, please contact Mr. John C. Bird of Henshaw Associates, Inc. at (925) 551-7272.

114.C.09 City of Lodi Utility Locations Data

USA #	Boring ID	Address	West/North Cross St	East/South Cross St	Surface Type	Estimated Date	Comments
	A-01	Alley behind 18 North Hutchins St.	Hutchins St.	Lee Ave.	Asp.	06/08/2000	80' east of Hutchins St.
149572	A-02	Alley behind 220 West Elm St.	Lee Ave.	Church St.	Asp.	06/08/2000	Reserved parking spaces at East end of alley
	A-03	East side of Church St.	Elm St.	Pine St.	Asp.	06/08/2000	Across from F&M Bank 24hr Teller Kiosk
	A-04	Alley behind 12 North School St.	Elm St.	Pine St.	Asp.	06/08/2000	Behind Tuxedos of Lodi
149591	A-05	23 North Sacramento St.	Elm St.	Pine St.	Asp.	06/08/2000	Parking area in front of Salvation Army
	A-06	SE Corner of Elm St. and Main St.	SP RR Tracks	Stockton St.	Asp.	06/09/2000	East side shoulder 15' south of intersection
	A-07	Alley behind 420 Pine St.	Hutchins St.	Lee Ave.	Asp.	06/09/2000	120' east of Hutchins St.
149600	A-08	Alley behind 314 west Pine St.	Lee Ave.	Pleasant Ave.	Asp.	06/09/2000	150' west of Pleasant Ave.
	A-09	17 South Church St.	Pine St.	Oak St.	Asp.	06/09/2000	West side of shoulder, 10' south of alley
	A-10	Alley beside 14A South School St.	Pine St.	Oak St.	Asp.	06/12/2000	Alley beside business at 14A S. School St.
	A-11	15 South Sacramento Ave.	Pine St.	Oak St.	Asp.	06/12/2000	Parking area in front of Adult Pleasure World
149608	A-12	SE Corner Oak and Main, 20' east on Oak	Pine St.	Oak St.	Asp.	06/12/2000	East side shoulder 20' south of intersection
	A-13	Across from 428 West Oak St.	Oak St.	Walnut St.	Asp.	06/12/2000	Parking area
	A-14	Alley behind 214 West Oak St.	Oak St.	Walnut St.	Asp.	06/12/2000	20' west of Pleasant Ave.
149612	A-15	West side of Church St.@ 215 Walnut Ave.	Oak St.	Walnut St.	Asp.	06/13/2000	East of St. Anne's parking lot
	A-16	Alley behind 111 South School St.	Oak St.	Walnut St.	Asp.	06/13/2000	Behind Classic Lighting
	A-17	105 South Sacramento Street	Oak St.	Walnut St.	Asp.	06/08/2000	Parking area in front of New Life Ministry
149631	A-18	100 East Oak St.	SP RR Tracks	Stockton St.	Asp.	06/13/2000	20' east of SE corner Oak St. & Main St.
	A-19	Alley behind 214 S Hutchins St.	Hutchins St.	Lee Ave.	Asp.	06/13/2000	125' east of Hutchins St., at Int in alley
	A-20	Alley behind 308 W Walnut St.	Walnut St.	Lodi Ave.	Asp.	06/13/2000	110' west of Pleasant Ave.
149640	A-21	Alley behind 200 Pleasant Ave.	Walnut St.	Lodi Ave.	Asp.	06/14/2000	Bend in alley behind St Anne's Academy
	A-22	Alley behind 215 S School St.	Walnut St.	Lodi Ave.	Asp.	06/14/2000	Behind Rochas Mortuary
	A-23	Alley behind 217 S Sacramento Ave.	Walnut St.	Lodi Ave.	Asp.	06/14/2000	5' west of Sacramento Ave.
149651	A-24	Shoulder of 100 E Walnut St.	SP RR Tracks	Stockton St.	Asp.	06/14/2000	SW corner Main St. & Walnut St.
	A-25	316 S Lee Ave	Lodi Ave.	Chestnut St.	Asp.	06/14/2000	Parking area in front of home
	A-26	Alley behind 200 W Lodi Ave.	Pleasant Ave.	Church St.	Asp.	06/14/2000	Alley intersection by McDonalds parking lot
149659	A-27	NOT MARKED-CONFLICT					
	A-28	Alley behind 310 S School St.	Lodi Ave.	Chestnut St.	Asp.	06/15/2000	Alley behind Chatfield Investments
149669	A-29	Alley behind 4 W Lodi Ave.	Lodi Ave.	Chestnut St.	Asp.	06/15/2000	Alley behind Daniger Furniture
	A-30	100 E Lodi Ave.	SP RR Tracks	Main St.	Asp.	06/15/2000	Street in front of Reillys Express Car Wash, possible land closure required.
	A-31	Shoulder in front of 507 Sturla St.	Hutchins St.	Rose St.	Asp.	06/15/2000	Street in front of residence, can use sidewalk
	A-32	Shoulder in front of 419 South Lee Ave.	Chestnut St.	Tokay St.	Asp.	06/15/2000	Street in front of residence, can use sidewalk
	A-33	Shoulder in front of 420 South Pleasant	Chestnut St.	Tokay St.	Asp.	06/16/2000	Street in front of Needham School
	A-34	Shoulder in front of 410 South Church St.	Chestnut St.	Tokay St.	Asp.	06/16/2000	Street in front of residence
	A-35	Street in front of 410 South School St.	Chestnut St.	Tokay St.	Asp.	06/16/2000	Thin street in front of vacant lot-possible lane closure required
	A-36	Across from 415 South Sacramento St.	Chestnut St.	Tokay St.	Asp.	06/16/2000	Thin street in front of Lodi Community Service Center, lane closure required
	A-37	Street in front of 425 S. Main St., NW cor.	Lodi Ave.	Tokay St.	Asp.	06/16/2000	NW corner S. Main & E. Flora St. Adjacent ot SP Spur by Methyl Bromide sign