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FEASIBILITY STUDY REPORT
FOR
OPERABLE UNITS 1 AND 3:
ON-SITE AND OFF-SITE GROUNDWATER

FOR THE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JET PROPULSION LABORATORY

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TABLE OF CONTENTS

PAGE

LIST OF TABLES vii

LIST OF FIGURES ix

LIST OF ACRONYMS AND CHEMICAL SYMBOLS xiv

EXECUTIVE SUMMARY xviii

1.0 INTRODUCTION 1-1
1.1 PURPOSE AND ORGANIZATION 1-2
1.2 BACKGROUND INFORMATION 1-2
1.2.1 Site Description 1-2
1.2.2 Site History 1-3
1.2.3 Geology 1-4
1.2.3.1 Stratigraphy 1-5
1.2.3.2 Structure 1-6
1.2.4 Hydrogeology 1-6
1.2.4.1 Hydraulic Characteristics 1-7
1.2.4.2 Groundwater Chemistry 1-8
1.2.4.3 Groundwater Flow System 1-9
1.2.5 Nature and Extent of Contamination 1-10
1.2.5.1 Estimated Volume of Impacted Groundwater 1-13
1.2.5.2 Summary of Nature and Extent of Contamination 1-14
1.2.6 Current Remedial Activities 1-14
1.2.7 Contaminant Fate and Transport 1-15
1.2.7.1 Selected Chemical and Physical Properties 1-15
1.2.7.2 Fate and Transport Modeling 1-16
1.2.8 Risk Assessment 1-17
1.2.8.1 Carcinogens 1-17
1.2.8.2 Non-Carcinogens 1-17
1.2.8.3 Scoping Assessment of Ecological Risks 1-18
1.2.9 Summary of RI Findings 1-19
1.3 SUMMARY OF JPL RI/FS PROCESS 1-19

2.0 IDENTIFICATION OF POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS 2-1
2.1 DEFINITION OF ARARS AND OTHER CRITERIA OR GUIDELINES TO BE CONSIDERED (TBCs) 2-1
2.2 CLASSIFICATION OF ARARS 2-2

TABLE OF CONTENTS
(Continued)

PAGE

2.3 IDENTIFICATION OF POTENTIAL ARARS 2-2
2.3.1 Potential Chemical-Specific ARARs 2-2
2.3.1.1 Safe Drinking Water Act 2-3
2.3.1.2 California Safe Drinking Water Act 2-3
2.3.1.3 Federal Water Pollution Control Act 2-4
2.3.1.4 State Water Resources Control Board, Resolution 88-63 2-4
2.3.1.5 State Water Resources Control Board, Resolution 92-49 2-4
2.3.1.6 Los Angeles Regional Water Quality Control Board, Los Angeles River Basin Plan 2-5
2.3.2 Potential Location-Specific ARARs 2-5
2.3.2.1 Federal Facilities Compliance Act (FFCA) 2-5
2.3.2.2 National Historic Preservation Act 2-6
2.3.2.3 Archaeological and Historic Preservation Act 2-6
2.3.2.4 Endangered Species Act 2-6
2.3.2.5 Executive Order 11988 – Protection of Floodplains 2-6
2.3.2.6 Executive Order 11990 – Protection of Wetlands 2-7
2.3.2.7 California Fish and Game Code 2-7
2.3.3 Potential Action-Specific ARARs 2-7
2.3.3.1 Clean Air Act - Local Air Quality Management 2-8
2.3.3.2 Federal Water Pollution Control 2-8
2.3.3.3 California Porter-Cologne Water Quality Act 2-9
2.3.3.4 State Water Resources Control Board, Resolution 68-16 2-10
2.3.3.5 Resource Conservation and Recovery Act and the California Hazardous Waste Management Program 2-10
2.3.3.6 Clean Water Act and County Sanitation District of Los Angeles County (CSDLAC) Wastewater Ordinance 2-11
2.3.3.7 Toxic Injection Well Control Act 2-11
2.3.3.8 California Water Well Standards 2-11
2.3.3.9 Public Water Supply Regulations 2-11
2.4 IDENTIFICATION OF GUIDANCE AND CRITERIA TO BE CONSIDERED (TBCs) 2-11
2.4.1 State Action Levels (ALs) 2-12
2.4.2 Federal Guidance Documents 2-12
2.4.3 Health Effects Advisories: Chemical-Specific TBCs 2-12
2.4.3.1 Policies, Guidance, and Local Requirements 2-13
2.5 RAYMOND BASIN REPORT OF REFEREE 2-14

3.0 IDENTIFICATION, SCREENING, AND EVALUATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS 3-1
3.1 DEVELOPMENT OF REMEDIAL ACTION OBJECTIVES 3-1
3.1.1 Constituents of Interest 3-1
3.1.1.1 Organic Constituents 3-2
3.1.1.2 Inorganic Constituents 3-2

TABLE OF CONTENTS
(Continued)

PAGE

3.1.2 Exposure Pathways 3-3
3.1.3 Remediation Goals 3-3
3.1.4 Remedial Action Objectives (RAOs) 3-4
3.2 GENERAL RESPONSE ACTIONS 3-4
3.3 IDENTIFICATION AND PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS 3-5
3.3.1 No Further Action 3-6
3.3.2 Limited Action 3-6
3.3.2.1 Monitored Natural Attenuation 3-6
3.3.2.2 Groundwater Monitoring 3-6
3.3.3 Institutional Controls 3-6
3.3.3.1 Use Restrictions 3-6
3.3.3.2 Alternate Water Supplies 3-6
3.3.4 Containment Technologies 3-7
3.3.4.1 Capping 3-7
3.3.4.2 Vertical Barriers 3-7
3.3.4.3 Hydraulic Control 3-7
3.3.5 Collection Technologies 3-8
3.3.5.1 Extraction Wells 3-8
3.3.5.2 Subsurface Drains 3-8
3.3.6 Treatment Technologies (*In-situ*) 3-8
3.3.6.1 Physical Treatment 3-9
3.3.6.2 Chemical Treatment 3-10
3.3.6.3 Biological Treatment 3-10
3.3.7 Treatment Technologies (*Ex-situ*) 3-12
3.3.7.1 Physical Treatment 3-12
3.3.7.2 Chemical Treatment 3-13
3.3.7.3 Biological 3-14
3.3.8 Disposition of Treated Water 3-14
3.3.8.1 Re-use as a Drinking Water Source 3-15
3.3.8.2 Discharge to Surface Water Bodies 3-15
3.3.8.3 Use as Irrigation Water 3-15
3.3.8.4 Discharge to Publicly-Owned Treatment Works (Sewer) 3-15
3.3.8.5 Re-Introduction to the Aquifer 3-15
3.4 EVALUATION OF RETAINED TECHNOLOGIES AND PROCESS OPTIONS 3-16
3.4.1 No Further Action 3-17
3.4.2 Limited Action 3-17
3.4.2.1 Monitored Natural Attenuation 3-17
3.4.2.2 Groundwater Monitoring 3-17
3.4.3 Institutional Controls 3-18
3.4.3.1 Alternate Water Supplies 3-18
3.4.3.2 Use Restrictions 3-18

TABLE OF CONTENTS
(Continued)

PAGE

3.4.4 Containment Technologies 3-18
3.4.4.1 Hydraulic Control 3-18
3.4.5 Collection Technologies 3-19
3.4.5.1 Extraction Wells 3-19
3.4.6 Treatment Technologies (*Ex-situ*) 3-19
3.4.6.1 Physical Treatment 3-19
3.4.6.2 Biological 3-28
3.4.7 Disposition of Treated Water 3-29
3.4.7.1 Re-Use as a Drinking Water Source 3-29
3.4.7.2 Discharge to Surface Water Bodies 3-29
3.4.7.3 Use as Irrigation Water 3-29
3.4.7.4 Discharge to Publicly Owned Treatment Works (Sewer) 3-30
3.4.7.5 Re-Introduction to the Aquifer 3-30
3.5 RETAINED TECHNOLOGIES 3-30

4.0 DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES 4-1
4.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES 4-1
4.1.1 Summary of Retained Technologies and Process Options 4-2
4.1.1.1 Collection Options 4-2
4.1.1.2 Treatment Options 4-2
4.1.1.3 Disposition of Treated Water 4-3
4.1.1.4 Groundwater Monitoring 4-4
4.1.1.5 Institutional Controls 4-4
4.1.1.6 Monitored Natural Attenuation (MNA) 4-5
4.2 DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES 4-5
4.2.1 Groundwater Modeling 4-6
4.2.2 Current Remedial Activities/Proposed Pilot Study 4-7
4.2.2.1 Current Remedial Activities 4-7
4.2.2.2 Proposed Additional Pilot Study 4-8
4.2.3 Description and Screening of Alternatives 4-10
4.2.3.1 Alternative 1: No Further Action 4-11
4.2.3.2 Alternative 2: On-Site Contaminant Source Reduction 4-12
4.2.3.3 Alternative 3: Plume Remediation with On-Site Pump-and-Treat Activities 4-14
4.2.3.4 Alternative 4: Plume Remediation with Off-Site Pump-and-Treat Activities 4-16
4.2.3.5 Alternative 5: Plume Remediation with Off-Site Pump-and-Treat Activities Plus On-site Source Reduction 4-18
4.2.3.6 Alternative 6: Containment of ClO_4^- Only with Off-Site Pumping 4-20
4.2.3.7 Summary of Screening 4-22
4.3 RETAINED ALTERNATIVES 4-23

TABLE OF CONTENTS
(Continued)

PAGE

5.0 DETAILED ANALYSIS OF ALTERNATIVES 5-1
5.1 ANALYSIS OF ALTERNATIVES 5-2
5.1.1 Overall Protection of Human Health and the Environment 5-3
5.1.1.1 Overall Protection of Human Health and the Environment: Detailed Analysis of Alternatives 5-3
5.1.1.2 Overall Protection of Human Health and the Environment: Comparative Analysis of Alternatives 5-4
5.1.2 Compliance with ARARs 5-5
5.1.2.1 Compliance with ARARs: Detailed Analysis of Alternatives 5-5
5.1.2.2 Compliance with ARARs: Comparative Analysis of Alternatives 5-7
5.1.3 Long-Term Effectiveness and Permanence 5-7
5.1.3.1 Long-Term Effectiveness and Permanence: Detailed Analysis of Alternatives 5-7
5.1.3.2 Long-Term Effectiveness and Permanence: Comparative Analysis of Alternatives 5-8
5.1.4 Reduction of Toxicity, Mobility, and Volume through Treatment 5-9
5.1.4.1 Reduction of Toxicity, Mobility, and Volume: Detailed Analysis of Alternatives 5-9
5.1.4.2 Reduction of Toxicity, Mobility, and Volume: Comparative Analysis of Alternatives 5-10
5.1.5 Short-Term Effectiveness 5-10
5.1.5.1 Short-Term Effectiveness: Detailed Analysis of Alternatives 5-11
5.1.5.2 Short-Term Effectiveness: Comparative Analysis of Alternatives 5-12
5.1.6 Implementability 5-12
5.1.6.1 Implementability: Detailed Analysis of Alternatives 5-13
5.1.6.2 Implementability: Comparative Analysis of Alternatives 5-14
5.1.7 Cost 5-14
5.1.7.1 Cost: Detailed Analyis of Alternatives 5-15
5.1.7.2 Cost: Comparative Analysis of Alternatives 5-16
5.1.8 State Acceptance 5-16
5.1.9 Community Acceptance 5-16

6.0 REFERENCES 6-1

TABLE OF CONTENTS
(Continued)

APPENDIX A: Monitored Natural Attenuation of VOCs

APPENDIX B: B-1 Geochemical Properties of Perchlorate, Regulatory Issues, and Potential Removal Technologies for Treating Perchlorate-Impacted Groundwater

B-2 Investigation and Bench-Scale Treatability Studies to Evaluate Removal of Perchlorate from JPL Groundwater

APPENDIX C: Calgon Carbon Corporation Final Report on a Pilot Study for Removal of Perchlorate from JPL Groundwater

APPENDIX D: Removal of Perchlorate from Groundwater Using Reverse Osmosis and Biological Treatment

APPENDIX E: Perchlorate Biotreatability Studies: Use of *Perclase* in a Packed Bed Bioreactor to Treat JPL Groundwater and RO Rejectates

APPENDIX F: Report on Biodegradation of Perchlorate in RO Water (Applied Research Associates)

APPENDIX G: Report on the JPL Groundwater Model

APPENDIX H: Results of Groundwater Model Simulations

APPENDIX I: Remedial Alternative Cost Estimates

LIST OF TABLES

TABLE NUMBER		FOLLOWING SECTION
1-1	Results of Aquifer Tests in Shallow JPL Monitoring Wells	1
1-2	Results of Aquifer Tests in Deep JPL Multi-Port Monitoring Wells	1
1-3	Summary of Water Chemistry Results from JPL Monitoring Wells, Nearby Production Wells and Colorado River Water	1
1-4	Summary of VOCs and Perchlorate Detected During the OU-1/OU-3 RI	1
1-5	Summary of Semi-Volatile Organic Compounds Detected During the OU-1/OU-3 RI	1
1-6	Summary of Metals and Cyanide Detected During the OU-1/OU-3 RI Prior to the Long-Term Quarterly Monitoring Program (1994-1995)	1
1-7	Summary of Metals of Potential Concern [As, Pb, Cr, Cr(VI)] Detected During the OU-1/OU-3 RI	1
1-8	Estimated Volumes of Constituents of Interest in Groundwater	1
1-9	Chemical and Physical Properties for Primary Constituents of Concern in Groundwater	1
1-10	Summary of Input Parameters for Fate and Transport Modeling	1
1-11	Summary of Results of Fate and Transport Modeling	1
2-1	Summary of Chemical Specific ARARs for Constituents of Potential Concern	2
2-2	Los Angeles River Basin Plan Discharge Limits	2
3-1	Summary of Constituents of Potential Concern	3
3-2	Summary of Remediation Goals for Constituents of Interest	3
3-3	Summary of General Response Actions	3
3-4	Summary of Identification and Preliminary Screening Results of Remedial Technologies and Process Options	3
3-5	Summary of Final Screening of Retained Technologies and Process Options for Groundwater	3

LIST OF TABLES
(Continued)

TABLE NUMBER		FOLLOWING SECTION
3-6	Summary of Retained Technologies and Process Options for Groundwater	3
4-1	Summary of Municipal Production Well Pumping Schedules Used During Groundwater Model Simulations	4
4-2	Summary of Remedial Alternatives	4
5-1	Factors for Detailed Evaluation of Alternatives	5
5-2	Summary of Detailed Analysis of Alternatives	5
5-3	Ranking of Alternatives	5
5-4	Summary of Cost Estimates	5

LIST OF FIGURES

FIGURE NUMBER		FOLLOWING SECTION
1-1	Site Location Map	1
1-2	Site Facility Map	1
1-3	Locations of JPL Groundwater Monitoring Wells and Nearby Municipal Production Wells	1
1-4	Geologic Map of Study Area with Lines of Cross Sections	1
1-5	Geologic Cross Section A-A'	1
1-6	Geologic Cross Section B-B'	1
1-7	Geologic Cross Section C-C'	1
1-8	Geologic Cross Section D-D'	1
1-9	Geologic Cross Section E-E'	1
1-10	Groundwater Elevation of the Raymond Basin, Fall 1997	1
1-11	General Water Types, Aquifer Layers 1, 2, and 3: January/February 1998	1
1-12	Conceptual Model of JPL Aquifer Layers	1
1-13	Groundwater Elevation Contour Maps for Aquifer Layers 2 and 3 When Nearby Municipal Production Wells are Not Operating	1
1-14	Groundwater Elevation Contour Maps for Aquifer Layers 1, 2 and 3 When Nearby Municipal Production Wells are Operating, September 1996	1
1-15	Municipal Well Pumping Volumes, Precipitation Data, Spreading Basin Recharge Data, and Water-Level Elevations from Multi-Port Wells in Aquifer Layer 1	1
1-16	Municipal Well Pumping Volumes, Precipitation Data, Spreading Basin Recharge Data, and Water-Level Elevations from Multi-Port Wells in Aquifer Layer 2	1
1-17	Municipal Well Pumping Volumes, Precipitation Data, Spreading Basin Recharge Data, and Water-Level Elevations from Multi-Port Wells in Aquifer Layer 3	1

LIST OF FIGURES
(Continued)

FIGURE NUMBER		FOLLOWING SECTION
1-18	Carbon Tetrachloride, Aquifer Layer 1, January-February 1998	1
1-19	Carbon Tetrachloride, Aquifer Layer 2, January-February 1998	1
1-20	Carbon Tetrachloride, Aquifer Layer 3, January-February 1998	1
1-21	Graphs of Concentrations of Carbon Tetrachloride in JPL Aquifer Layers, March 1990-January 1998	1
1-22	Trichloroethene, Aquifer Layer 1, January-February 1998	1
1-23	Trichloroethene, Aquifer Layer 2, January-February 1998	1
1-24	Trichloroethene, Aquifer Layer 3, January-February 1998	1
1-25	Graphs of Concentrations of Trichloroethene in JPL Aquifer Layers, March 1990-January 1998	1
1-26	1,2-DCA, Aquifer Layer 1, January-February 1998	1
1-27	Graphs of Concentrations of 1,2-DCA in JPL Aquifer Layers, March 1990-January 1998	1
1-28	Perchlorate, Aquifer Layer 1, January-February 1998	1
1-29	Perchlorate, Aquifer Layer 2, January-February 1998	1
1-30	Perchlorate, Aquifer Layer 3, January-February 1998	1
1-31	Areal Extent of VOCs Above Maximum Contaminant Levels in Aquifer Layer 1 (January-February 1998)	1
1-32	Areal Extent of VOCs Above Maximum Contaminant Levels in Aquifer Layer 2 (January-February 1998)	1
1-33	Areal Extent of VOCs Above Maximum Contaminant Levels in Aquifer Layer 3 (January-February 1998)	1
1-34	Isopleth Map of Total Hypothetical Carcinogenic Risks	1
1-35	Isopleth Map of Total Hypothetical Non-Carcinogenic Risks	1
1-36	Flow Chart Summarizing RI/FS Process	1

LIST OF FIGURES
(Continued)

FIGURE NUMBER		FOLLOWING SECTION
4-1	Locations of Proposed Groundwater Extraction and Infiltration Wells	4
4-2	Conceptual Schematic Diagram for the Proposed Pilot Study	4
4-3	Schematic Diagrams of Remedial Alternatives	4
4-4	Proposed Layout for Alternative 2: On-Site Source Reduction	4
4-5	Capture Zone for Groundwater Model Simulation of Alternative 2: On-Site Source Reduction (Aquifer Layer 1, September)	4
4-6	Capture Zone for Groundwater Model Simulation of Alternative 2: On-Site Source Reduction (Aquifer Layer 2, September)	4
4-7	Capture Zone for Groundwater Model Simulation of Alternative 2: On-Site Source Reduction (Aquifer Layer 1, March)	4
4-8	Capture Zone for Groundwater Model Simulation of Alternative 2: On-Site Source Reduction (Aquifer Layer 2, March)	4
4-9	Proposed Layout for Alternative 3: Plume Remediation with On-Site Pumping	4
4-10	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 1, September)	4
4-11	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 2, September)	4
4-12	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 3, September)	4
4-13	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 1, March)	4
4-14	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 2, March)	4

LIST OF FIGURES
(Continued)

FIGURE NUMBER		FOLLOWING SECTION
4-15	Capture Zone for Groundwater Model Simulation of Alternative 3: Perchlorate Plume Remediation with On-Site Pumping (Aquifer Layer 3, March)	4
4-16	Proposed Layout for Alternative 4: Plume Remediation with Off-Site Pumping	4
4-17	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 1, September)	4
4-18	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 2, September)	4
4-19	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 3, September)	4
4-20	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 1, March)	4
4-21	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 2, March)	4
4-22	Capture Zone for Groundwater Model Simulation of Alternative 4: Perchlorate Plume Remediation with Off-Site Pumping (Aquifer Layer 3, March)	4
4-23	Proposed Layout for Alternative 5: Plume Remediation with Off-Site Pumping and On-Site Source Reduction	4
4-24	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 1, September)	4
4-25	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 2, September)	4

LIST OF FIGURES
(Continued)

FIGURE NUMBER		FOLLOWING SECTION
4-26	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 3, September)	4
4-27	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 1, March)	4
4-28	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 2, March)	4
4-29	Capture Zone for Groundwater Model Simulation of Alternative 5: Perchlorate Plume Remediation with Off-Site Pumping and On-Site Source Reduction (Aquifer Layer 3, March)	4

LIST OF ACRONYMS AND CHEMICAL SYMBOLS

1,1-DCA	1,1-Dichloroethane
1,2-DCA	1,2-Dichloroethane
1,1-DCE	1,1-Dichloroethene
AL	Action Level
ARARs	Applicable or Relevant and Appropriate Requirements
As	Arsenic
ASTM	American Society for Testing Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BOD	Biological Oxidation Demand
C	Carbon
CAA	Clean Air Act
CADHS	California Department of Health Services
$CaCO_3$	Calcium carbonate
CalTech	California Institute of Technology
Calgon	Calgon Carbon Corporation
CCl_4	Carbon Tetrachloride
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Cl^-	Chloride
ClO_4^-	Perchlorate
COD	Chemical Oxygen Demand
COPC	Constituent of Potential Concern
Cr	Chromium
Cr(III)	Trivalent Chromium
Cr(VI)	Hexavalent Chromium
CrO_4^{-2}	Chromate
CSDLAC	County Sanitation District of Los Angeles County
CSTR	Continuously Stirred Tank Reactor
CWA	Clean Water Act
Cu	Copper
DTSC	California State Department of Toxic Substances Control
ED	Electrodialysis
EPA	United States Environmental Protection Agency
FBR	Fluidized Bed Reactor
FFCA	Federal Facilities Compliance Act
FS	Feasibility Study

LIST OF ACRONYMS AND CHEMICAL SYMBOLS
(Continued)

FSAP	Field Sampling and Analysis Plan
ft	feet
ft/day	feet per day
GAC	Granular-Activated Carbon
gal/min	gallons per minute
GALCIT	Gugenheim Aeronautical Laboratory, California Institute of Technology
gpd/ft^2	gallons per day per square foot
gpm	gallons per minute
GRA	General Response Action
HCO_3^-	Bicarbonate
HEA	Health Effect Advisory
HI	Hazard Index
H_2O_2	Hydrogen Peroxide
HQ	Hazard Quotient
HRS	Hazard fRanking System
IAL	Interim Action Level
IE	Ion Exchange
ISEP	Ionic SEParation
ISEP+	Ionic SEParation Plus (with PNDM)
JPL	Jet Propulsion Laboratory
LARWQCB	Los Angeles Regional Water Quality Control Board
lbs	pounds
LPGAC	Liquid-Phase Granular-Activated Carbon
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MFBR	Matrix Film Biological Reactor
mg/L	Milligrams per liter
mg/kg	Milligrams per kilogram
MNA	Monitored Natural Attenuation
MW	Monitoring Well
MWD	Metropolitan Water District
Na	Sodium
NASA	National Aeronautics and Space Administration
NCP	National Contingency Plan
ND	Not Detected
NF	Nanofiltration
NO_3^-	Nitrate
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List

LIST OF ACRONYMS AND CHEMICAL SYMBOLS
(Continued)

O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU-1	Operable Unit - 1 (On-site Groundwater Investigation)
OU-2	Operable Unit - 2 (On-site Contaminant Source Investigation)
OU-3	Operable Unit - 3 (Off-site Groundwater Investigation)
Pb	Lead
PBR	Packed Bed Reactor
PCE	Perchloroethene (Tetrachloroethene)
PNDM	Perchlorate and Nitrate Destruction Module
POTW	Publically-Owned Treatment Works
ppmv	Parts per million by volume
PRG	Preliminary Remediation Goal
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Program Plan
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RO	Reverse Osmosis
ROD	Record of Decision
ROI	Radius of Influence
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SCAQMD	South Coast Air Quality Management District
SDWA	Safe Drinking Water Act
SO_4^{-2}	Sulfate
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
SWRCB	State Water Resources Control Board
TBC	To Be Considered
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
µg/L	Micrograms per liter
µmhos	Micromhos
UV	Ultraviolet
USGS	United States Geological Survey
VOC	Volatile Organic Compound

LIST OF ACRONYMS AND CHEMICAL SYMBOLS
(Continued)

VPGAC	Vapor Phase Granulated-Activated Carbon
WDR	Waste Discharge Requirements
°C	Degrees Celsius

EXECUTIVE SUMMARY

This report contains the results of the Feasibility Study (FS) completed as part of a Remedial Investigation/Feasibility Study (RI/FS) for the National Aeronautics and Space Administration (NASA)-Jet Propulsion Laboratory (JPL) located at 4800 Oak Grove Drive, Pasadena, California. In October, 1992, JPL was placed on the National Priorities List (NPL) and, therefore, is subject to the provisions of the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (hereafter jointly referred to as CERCLA). Pursuant to CERCLA requirements, this FS was completed to evaluate potential remedial options for groundwater beneath and downgradient of JPL.

The overall purpose of the JPL groundwater FS is to identify and evaluate remedial alternatives that are consistent with the goals of CERCLA, which include being protective of human health and the environment. This FS is based primarily on information and data developed during the JPL groundwater Remedial Investigation (RI) as well as pertinent data from previous investigations of the site. The format of this FS report follows the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (EPA, 1988a).

The groundwater beneath and off-site JPL has been divided into two Operable Units (OUs), including OU-1 (on-site groundwater) and OU-3 (off-site groundwater), respectively. OU-2 pertains to on-site soils. The results of the RIs completed to characterize the nature and extent of contamination in the on-site and off-site groundwater at JPL were combined into one RI Report (Foster Wheeler, 1999). During the groundwater investigations, a total of twenty-three groundwater monitoring wells were installed and routinely sampled within the study area. Eighteen of the wells are located on the JPL site (OU-1) and another five wells are located off-site (OU-3). Ten of the twenty-three JPL wells are shallow standpipe wells that have a single screened interval at the groundwater table. All of the shallow wells are on-site. The remaining thirteen wells are deep (up to 1,000 feet), multi-port wells that contain five screened intervals each and a Westbay® multi-port casing system to allow for the simultaneous compliance monitoring of each screened interval.

From 1994 to 1998, groundwater beneath and off-site JPL was sampled through the JPL monitoring well network. The samples from these wells were analyzed for a comprehensive suite of analytes including sixty volatile organic compounds (VOCs), sixty-five semi-volatile organic compounds (SVOCs), nineteen metals, and perchlorate (ClO_4^-). Natural groundwater flow patterns around JPL are predominantly to the east and south, but water-level data show that flow patterns are strongly influenced by pumping of nearby municipal production wells.

During the RI, five constituents were detected at concentrations exceeding their respective maximum contaminant levels (MCLs) or action levels for drinking water. These included three VOCs [carbon tetrachloride (CCl_4), trichloroethene (TCE), 1,2-dichloroethane (1,2-DCA)], one chloro-oxyanion (ClO_4^-), and one metal [chromium (Cr)]. A CCl_4 plume appears to have originated on-site and migrated downward and eastward towards nearby municipal production wells. TCE and ClO_4^- plumes appear to have both on-site and off-site sources, and have also migrated eastward into the vicinity of nearby production wells. Further extensive down-gradient migration of these three constituents appears to have been inhibited by nearby City of Pasadena and Lincoln Avenue Water Company municipal production wells. 1,2-DCA and Cr were detected on-site and have not impacted nearby municipal production wells.

The primary objective of this FS is to develop, evaluate, and compare remedial alternatives to address contaminated groundwater at JPL, as identified during the groundwater RI (Foster Wheeler, 1999). The general steps involved in this process are listed below:

1. Identification of applicable or relevant and appropriate requirements (ARARs).
2. Establishment of Remedial Action Objectives (RAOs), based on the constituents of interest, ARARs, potential exposure pathways, and target treatment goals established to protect human health and the environment.
3. Identification of General Response Actions (GRAs) to meet the RAOs.
4. Preliminary identification and screening of technology types and process options appropriate for each response action.
5. Assembly of retained technology types and process options into remedial alternatives.
6. Initial screening followed by detailed analysis of retained remedial alternatives.

The identification of ARARs is a key component of the planning, evaluation, and selection of remedial alternatives. An ARAR may be either "applicable," or "relevant and appropriate," but not both. ARARs can be divided into three categories: chemical-, location- and action-specific requirements. Many regulations can fall into more than one category. Each potential remedial alternative is evaluated to determine compliance with identified ARARs.

Based on nature, extent, potential migration of contamination, and potential for human and environmental exposure, the RAOs for JPL groundwater are:

1. Continue current activities designed to prevent exposure of the public to untreated impacted groundwater;
2. Minimize contaminant migration from more highly contaminated portions of the aquifer to less contaminated areas of the aquifer (both horizontally and vertically);
3. Reduce the potential impact of contaminant migration on down-gradient water-supply wells; and
4. Initiate efforts to meet remediation goals for the constituents of interest in impacted groundwater.

GRAs were identified to address the RAOs. The GRAs were selected from a comprehensive list typically considered for the remediation of hazardous waste sites (EPA, 1993). The GRAs that were identified for the site can be included in the following general categories: institutional controls, containment options, collection methods, treatment technologies, and disposal options.

Remedial alternatives are combinations of technology types and process options identified as GRAs. The technologies and process options are assembled into remedial alternatives, which are then initially screened on the basis of effectiveness, implementability and cost.

Based on the screening of the treatment technologies and process options identified for JPL, it became apparent that groundwater extraction and *ex-situ* treatment (pump-and-treat) is the only option with merit. This FS, therefore, focuses on comparing various pump-and-treat strategies as to their potential effectiveness in meeting RAOs.

It is important to note that remedial activities are currently ongoing at the City of Pasadena (Pasadena) and Lincoln Avenue Water Company (Lincoln) municipal production wells, which are located down-gradient to the east from JPL. Air-stripping and liquid phase granular activated carbon (LPGAC) are used to treat the extracted water for VOCs. Blending of water is being used to meet the California interim action level (IAL) for ClO_4^-.

Because the current on-going remedial activities were designed to effectively treat VOCs, it was not necessary to consider pump-and-treat alternatives with respect to the VOC plumes only. However, due to relatively high levels of ClO_4^- on-site (Foster Wheeler, 1999), ClO_4^- concentrations may rise in downgradient production wells (which could render current blending practices non-feasible) and may also migrate toward unprotected, non-impacted production wells. Therefore, ClO_4^- impacted groundwater requires additional remedial action. Outlined in the following list are general pump-and-treat approaches that were initially considered in developing the final remedial alternatives for the remediation of groundwater at JPL. Importantly, the current remedial activities are included and considered an integral component of each approach:

1. No Further Action.
2. On-site source reduction.
3. ClO_4^- plume remediation via on-site pump and treat activities.
4. ClO_4^- plume remediation via off-site pump and treat activities.
5. ClO_4^- plume remediation via a combination of on- and off-site pump and treat activities.
6. ClO_4^- plume control only (not remediation) via off-site pumping
   (because ClO_4^- treatments are relatively new, this assumes ClO_4^- treatment(s) not currently sufficiently developed for large-scale implementation).

The No Further Action alternative (Alternative 1) is evaluated for this FS in accordance with CERCLA protocol (EPA, 1988a) as a basis to compare all other alternatives. The No Further Action alternative stipulates that no additional remedial activities would be implemented by NASA. Under this alternative, the current remedial activities at the Pasadena and Lincoln wells would continue.

Under Alternative 2, on-site contaminant source reduction would be conducted via pump-and-treat activities. This alternative is expected to result in significant on-site contaminant removal, and limitation of further off-site contaminant migration through hydraulic control. This alternative has the potential to remove over 70% of the total ClO_4^- estimated to be present in the JPL-impacted groundwater, and thereby significantly inhibit ClO_4^- migration from the source area towards down-gradient production wells. Removal of VOCs from the source area would also be accomplished.

Alternative 3 consists of extracting water from wells on JPL property to capture the on- and off-site ClO_4^- and VOC plumes (in conjunction with the current remedial activities). These extraction wells would have to be pumped at a rate that causes reversal of flow towards JPL and away from Pasadena production wells, as opposed to the current flow towards the Pasadena wells.

Alternative 4 consists of pump-and-treat activities conducted solely off-site. This alternative is expected to result in ClO_4^- and VOC contaminant removal and limitation of further off-site contaminant migration through hydraulic control.

Under Alternative 5, remediation of the ClO_4^- and VOC plumes would be carried out through pump-and-treat activities conducted both on- and off-site. This alternative is expected to result in significant contaminant removal (mainly through the on-site activities) and limitation of further off-site contaminant migration through hydraulic control.

Alternative 6 is a scenario where ClO_4^- treatment is assumed to be not feasible at the flow rates required. This scenario must be considered because of the potential technical uncertainties associated with current technologies for long-term removal of ClO_4^- from groundwater. Alternative 6, therefore, involves treatment of VOCs, but only containment of the ClO_4^- plume through hydraulic control. This would be accomplished using off-site extraction wells, and on-site re-introduction of water into the aquifer without ClO_4^- treatment (back into the ClO_4^- plume) in an effort to create a containment loop.

Four of the above remedial alternatives passed the initial screening where effectiveness, implementability, and related cost were evaluated, and were retained for further detailed analysis. The remedial alternatives retained for detailed evaluation are as follows:

Alternative 1: No Further Action
(retained due to CERCLA protocol for comparison purposes)

Alternative 2: On-Site Source Reduction

Alternative 4: Plume Remediation with Off-Site Pump-and-Treat Activities

Alternative 5: Plume Remediation with Off-Site Pump-and-Treat Activities Plus On-Site Source Reduction

The detailed evaluation of each retained remedial alternative includes the following:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Long-term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

Pursuant to CERCLA, the alternatives must also be evaluated in terms of state and community acceptance. These criteria will be addressed in a later phase of the project.

The retained alternatives were screened against the above criteria based largely to the degree to which ClO_4^- is addressed. Since these alternatives do have significant beneficial effects on the VOC plumes, these effects are recognized, but not primarily used to compare alternatives.

For this FS, an alternative is considered protective of human health with regard to ClO_4^- to the extent that it provides protection of nearby down-gradient municipal production wells (Pasadena, Lincoln, etc.), which are the only potential exposure points. Protection from VOCs is afforded through the current remedial activities, which were determined to meet RAOs. It should be noted that exposure to untreated JPL groundwater does not occur due to the current remedial activities. Protection of the environment is assumed to refer to the inhibition of further down-gradient contaminant migration. The assessment of overall protection also draws on the assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

All retained alternatives currently protect human health and the environment for VOCs and ClO_4^- (based on the current remedial activities). Alternative 1, however, provides the least amount of overall protection, and therefore is ranked last among the four retained alternatives. Alternative 2 removes large amounts of ClO_4^- from the source area, but fails to address migration of the off-site portion of the ClO_4^- plume and is, therefore, ranked 3rd among the four alternatives. Alternative 4 results in control and remediation of the off-site portion of the ClO_4^- plume, whereas

Alternative 5 results in control and remediation of the off-site portion of the plume and on-site source reduction. Therefore, Alternative 4 is ranked 2nd, and Alternative 5 is ranked 1st.

The compliance with ARARs criterion was used to determine if each alternative is consistent with federal and state ARARs. Alternative 1 is assigned a low ranking to reflect the conclusion that it does not aggressively meet ARARs with respect to protecting the environment (aquifer) from further migration of ClO_4^-. Alternatives 2, 4 and 5 are assigned a high ranking because these alternatives achieve this criterion. There are no significant differences between Alternatives 2, 4 and 5 in consideration of and compliance with ARARs.

The long-term effectiveness evaluation criterion is used mainly to assess each remedial alternative in terms of the risk remaining at the site after the remedial action objectives are met. In this FS, the performance of the alternatives with respect to the long-term effectiveness criterion is evaluated by estimating the extent to which each alternative removes contaminant mass and prevents the migration of contamination into less contaminated areas of the aquifer. Alternative 1 is assigned the lowest ranking in terms of long-term effectiveness because the migration of off-site ClO_4^- is not inhibited, which may lead to shutdown of production wells in the future if ClO_4^- levels rise. Alternative 2 is ranked 2nd because it has the potential for removing a large percentage of the ClO_4^- relatively quickly, thereby reducing the time needed for treatment. Alternative 4 is ranked 3rd because it treats only the off-site portion of the plume, which means an exceedingly long time to treat the plume, considering the fact that most of the ClO_4^- contamination is on-site. Alternative 5 allows for maximum contaminant removal and inhibition of migration, and is therefore the most effective (ranked 1st) among the alternatives in terms of long-term efficiency.

Each alternative was assessed to determine its propensity to significantly reduce toxicity, mobility and volume of ClO_4^- as a principal element of the action. This criterion is assessed by estimating the reduction in contaminant volume (mass) and mobility for each alternative. Alternative 1 is ranked last (4th) because migration of ClO_4^- toward currently operating production wells is not reduced, and no direct ClO_4^- treatment techniques are implemented. Alternative 2 removes large amounts of ClO_4^-, but does reduce migration of the off-site portion of the ClO_4^- plume toward currently operating production wells, and is, therefore, ranked 3rd among the four alternatives. Alternative 4 results in reduction in contaminant volume, as well as in mobility of the off-site portion of the plume, thereby protecting non-impacted down-gradient production wells from ClO_4^-, and is ranked 2nd. Alternative 5 allows for maximum reduction of contaminant volume (mass) and in reduction of contaminant migration through addressing the on- and off-site portions of the plume, and is, therefore, the most effective (ranked 1st) among the alternatives.

The short-term effectiveness criterion is used to evaluate the effects of each remedial alternative on human health and the environment during the construction and implementation phase. All alternatives provide adequate short-term protection of human health and the environment from VOCs based on the current remedial activities. Since Alternative 1 does not require any

construction, it provides the greatest degree of short-term effectiveness, hence, it is ranked 1st. Alternative 2 does not require any off-site construction, hence, it is ranked 2nd. Both Alternatives 4 and 5 require similar off-site construction, hence, they are both ranked 3rd.

The implementability criterion addresses the technical and administrative feasibility associated with implementing an alternative, as well as the availability of various services and materials required during its implementation. Alternative 1 has already been successfully implemented, and since no additional implementation is thus required, Alternative 1 is ranked 1st among the alternatives. Alternative 4 requires larger equipment than is required for Alternative 2, but due to the fact that Alternative 2 requires more extensive on-site construction, which is much more difficult due to the presence of significant underground utilities, Alternatives 2 and 4 are considered to be essentially equal in terms of implementability, and are both ranked 2nd. Alternative 5 involves the most extensive equipment, and significant on-site construction as well, and is, therefore, ranked 4th.

The cost criterion addresses the total estimated cost of each alternative, which includes short- and long-term costs, capital and operation and maintenance (O&M) costs. With respect to cost, Alternative 1 is ranked 1st, Alternative 2 is ranked 2nd, Alternative 4 is ranked 3rd, and Alternative 5 is ranked 4th.

The state acceptance criterion evaluates the technical and administrative issues and concerns the state may have regarding each alternative. This criterion will be addressed in the ROD and responsiveness summary.

The community acceptance criterion evaluates the issues and concerns the public may have regarding each alternative. As with state acceptance, this criterion will be evaluated in the ROD and responsiveness summary, once public comments on this FS and the proposed plan have been received.

1.0 INTRODUCTION

This report contains the results of the Feasibility Study (FS) for Operable Units 1 (on-site groundwater) and 3 (off-site groundwater) at the Jet Propulsion Laboratory (JPL). The Jet Propulsion Laboratory is a National Aeronautics and Space Administration (NASA) owned facility, managed by the California Institute of Technology (CalTech). The term "JPL" is used throughout this document to refer to facilities located at 4800 Oak Grove Drive, Pasadena, California.

In October, 1992, JPL was placed on the National Priorities List (NPL) and, therefore, is subject to the provisions of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (hereafter jointly referred to as CERCLA). Pursuant to CERCLA requirements, this FS was completed to evaluate potential remedial options for groundwater beneath and downgradient of JPL.

Remedial Investigation (RI) activities were performed to characterize the nature and extent of contamination in the groundwater at JPL (Foster Wheeler, 1999). During the preparation of a Remedial Investigation Work Plan for JPL, (Ebasco, 1993a; Foster Wheeler, 1996a, 1996b, 1998), the groundwater beneath and downgradient of JPL was divided into two operable units (OUs). These two OUs consisted of on-site groundwater (OU-1), which was defined as groundwater underlying the land within the JPL boundaries and the land immediately to the east across the Arroyo Seco, and off-site groundwater (OU-3), which referred to the groundwater underlying land off-site JPL to the south and east of OU-1.

It was initially believed that an RI/FS for OU-1 could be completed before an RI/FS for OU-3, since several groundwater-monitoring wells already existed on-site when JPL became a CERCLA site. However, after the RI for OU-1 began, additional monitoring wells were required to be installed on-site. This sufficiently delayed the completion of the RI for the on-site groundwater to coincide with the completion of the RI for the off-site groundwater. For this reason the data collected from both the on-site and off-site JPL groundwater monitoring wells were combined into a single OU-1/OU-3 RI Report (Foster Wheeler, 1999). This FS report also encompasses both OU-1 and OU-3 groundwater. The term "study area" used in this report is defined as the area encompassing both on- and off-site groundwater (OU-1/OU-3).

This FS report is one of two to be produced for JPL. There is an FS report associated with the "groundwater" operable units (OU-1 and OU-3) and an FS report associated with the "soil" operable unit (OU-2), as agreed upon by the EPA, the California Department of Toxic Substances Control (DTSC), the California Regional Water Quality Control Board (RWQCB), and NASA. The FS for JPL "soils" (OU-2) will pertain to potential on-site contaminant-source remedial alternatives.

1.1 PURPOSE AND ORGANIZATION

The overall purpose of the JPL groundwater FS is to identify and evaluate remedial alternatives that are consistent with the goals of CERCLA, which include being protective of human health and the environment. During the RI program, the horizontal and vertical extent of contamination was well characterized. This characterization provides a starting point for developing Remedial Action Objectives (RAOs) for the FS based on Applicable or Relevant and Appropriate Requirements (ARARs). The extent of contamination (vertical and horizontal distribution) also serves as a basis for estimating the volume of impacted groundwater. This information is used to screen out impractical remediation technologies in terms of effectiveness, implementability, and relative cost. Specific chemical data, including water-quality data, and the hydrological characteristics of the aquifer, also play major roles in the remedial alternative screening process.

The format of this FS report follows the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (EPA, 1988a). This report consists of six sections. The Introduction, Section 1.0 outlines the purpose and organization of the report, and provides a summary of the groundwater RI, including a discussion of the nature and extent of contamination, contaminant fate and transport, and baseline risk assessment.

Section 2.0 presents local, state, and Federal ARARs that may govern the type and extent of remediation. The ARARs will be considered during development of all remedial alternatives. Section 3.0 identifies Remedial Action Objectives and describes the identification, development and screening of potential groundwater treatment technologies and process options. Section 4.0 develops a comprehensive list of groundwater treatment alternatives from the technologies identified in Section 3.0, and Section 5.0 presents a detailed analysis of preferred alternatives. Section 6.0 is a list of references.

1.2 BACKGROUND INFORMATION

This section provides background information relevant to the FS including: a site description, a summary of site history, a description of site geology and hydrogeology, a discussion of the nature and extent of contamination, an assessment of contaminant fate and transport, and the estimated risks associated with impacted groundwater.

1.2.1 Site Description

JPL is located between the city of La Canada-Flintridge and the unincorporated city of Altadena, California, northeast of the 210 Foothill Freeway. A site location map is included as Figure 1-1. The site is situated on a south facing slope along the base of the southern edge of the east-west trending San Gabriel Mountains at the northern edge of the metropolitan Los Angeles area. The Arroyo Seco, an intermittent streambed, lies immediately to the east and southeast of the site. Within the Arroyo Seco just east of JPL is a series of surface impoundments used to collect surface water run-off during the rainy season for groundwater recharge (Figure 1-1). Residential development, an equestrian club (Flintridge Riding Club), and a Los Angeles County Fire

Department Station border the site along its southwestern and western boundaries. Residential development is also present to the east of JPL, along the eastern edge of the Arroyo Seco.

The JPL site is comprised of approximately 176 acres. Of this, approximately 156 acres are Federally owned, with the remaining land leased from the City of Pasadena and the Flintridge Riding Club for parking. The main developed area of JPL is located on the southern half of the site, which can be divided into two general areas. These include: the northeastern early-developed area, which is currently used for project support, testing, and storage facilities, and the southwestern later-developed area, which houses most of the personnel, administrative, management, laboratory, and project functions of JPL. Further development of JPL is constrained because of steeply sloping terrain to the north, the Arroyo Seco wash to the east and south, and residential development to the west. A site facility map is included as Figure 1-2.

The FS "study area" includes the area primarily around the on-site and off-site JPL groundwater monitoring wells shown in Figure 1-3. As shown in Figure 1-3, a number of municipal production wells are present, both down-gradient of JPL (City of Pasadena, Lincoln Avenue Water Company, Rubio Cañon Land and Water Company, Las Flores Water Company) and up-gradient of JPL (La Canada Irrigation District and Valley Water Company). Water produced from these municipal wells is treated, when necessary, to meet strict drinking water standards before being supplied to local residents for domestic use. The pumping of the City of Pasadena municipal production wells has been shown to significantly influence groundwater flow patterns beneath the study area.

1.2.2 Site History

In 1936, Professor Theodore Von Karmen of the California Institute of Technology (CalTech) and a group of students began testing liquid propellant rockets in the Arroyo Seco. Later, the testing became part of the activities of the Gugenheim Aeronautical Laboratory at the California Institute of Technology (GALCIT). In 1940, the Army Air Corps provided funding for the first permanent structures built near the present day site. By 1944, the site continued to grow and changed its name to the Jet Propulsion Laboratory-GALCIT. In the 1940's the United States began purchasing the property. Ultimately, the site became known as the Jet Propulsion Laboratory, or JPL, and became a fully owned Federal facility. In 1958, NASA took over control of JPL. Today, under a prime contract, CalTech performs research and development tasks at facilities provided by NASA which are located at the current site of JPL. CalTech also maintains the facilities as part of its contractual agreement with NASA.

Various chemicals and materials have been utilized during the operational history of the site. The general types of materials used and produced include a variety of solvents, solid and liquid rocket propellants, cooling-tower chemicals, and analytical laboratory chemicals. During the 1940s and 1950s, many buildings at JPL maintained a cesspool to dispose of liquid and solid sanitary wastes collected from drains and sinks within the building. These cesspools were designed to allow liquid wastes to seep into the surrounding soil. Present-day terminology for

these subsurface disposal areas is "seepage pits". Some of the seepage pits may have received volatile organic compounds (VOCs) and other waste materials that are currently found in the groundwater. In the 1950s, a sewer system was installed and the use of the cesspools for waste disposal was discontinued.

In the early 1980s, analyses of groundwater from City of Pasadena (Pasadena) water-supply wells located in the Arroyo Seco, near JPL, revealed the presence of VOCs. Around the same time, VOCs were also detected in two Lincoln Avenue Water Company (Lincoln) water supply wells. As a result of continued monitoring, the Pasadena wells and Lincoln wells were shutdown in the mid to late 1980s by the California Department of Health Services (CADHS). In 1990, NASA funded the installation of a water-treatment plant in the Arroyo Seco so that the Pasadena wells could resume supplying water. By 1992, the Lincoln Avenue Water Company had installed a water-treatment plant and had similarly restarted production.

In 1988, as part of the CERCLA process, a Preliminary Assessment/Site Inspection was completed at JPL (Ebasco, 1988) indicating further site characterization work was warranted. In 1990, an Expanded Site Investigation was performed at JPL during which several groundwater monitoring wells were installed on-site (Ebasco, 1990). VOCs were subsequently detected in on-site groundwater above drinking water standards and the site was ranked using the CERCLA Hazard Ranking System. In October 1992, the site was placed on the National Priorities List (NPL). Since that time, a Remedial Investigation was completed characterizing the nature and extent of groundwater contamination (Foster Wheeler, 1999).

During the groundwater investigation at JPL, a total of twenty-three groundwater monitoring wells were installed and routinely sampled within the study area pursuant to a regulatory agency-approved Field Sampling and Analysis Plan (Ebasco, 1993b, 1994; Foster Wheeler, 1996c, 1996d) and Quality Assurance Program Plan (Ebasco, 1993c; Foster Wheeler, 1996e). Eighteen (18) of the wells are located on the JPL site (OU-1) and another five (5) wells are located off-site (OU-3) (see Figure 1-3). Of the twenty-three wells, ten (10) are relatively shallow standpipe wells that have a single screened interval at the groundwater table. All of the shallow standpipe wells are located on the JPL site. The other thirteen (13) wells, including all of the off-site monitoring wells, are relatively deep, multi-port wells that contain five (5) screened intervals each and a Westbay® multi-port casing system to allow for the simultaneous monitoring of each zone. The multi-port wells extend down to approximately 1,000 feet below grade and are used to identify the vertical extent of groundwater contamination and to evaluate the hydrogeological characteristics of the greater than 700 foot thick aquifer.

1.2.3 Geology

The geology, including stratigraphy and structure, in the study area is summarized in this section. A more detailed discussion is included in the OU-1/OU-3 RI report (Foster Wheeler, 1999).

1.2.3.1 Stratigraphy

The stratigraphy in the study area was evaluated by reviewing a published surface geologic map (Figure 1-4) and by constructing five geologic cross sections (Figures 1-5 through 1-9). The cross sections were constructed by correlating lithologic logs, geophysical logs, and water-level and hydraulic-head data from the deep JPL multi-port monitoring wells (see below).

The surface geologic map of the study area was produced by the California Division of Mines and Geology (Smith, 1986). The geologic formations present within the subject area are included on the geologic map in Figure 1-4. Also shown on Figure 1-4 are the locations of the geologic cross sections.

The lithologic columns and geophysical logs depicted on the cross sections accurately represent the boring logs and geophysical logs obtained during the OU-1/OU-3 RI (Foster Wheeler, 1999). As anticipated, correlation between wells was, in most cases, difficult due to the variable nature of alluvial fan-type deposits present at JPL. Correlations of generally similar lithologic sequences at similar depths were made whenever possible as opposed to attempting to correlate individual sand and silt layers. Correlations were also made between sections of the aquifer that had similar responses to pumping of nearby municipal production wells (similar amounts of "drawdown"). Historical hydrographs from JPL monitoring wells are included on the cross sections for reference. Throughout the aquifer, silt-rich intervals are present that appear to inhibit the vertical migration of groundwater during periods of pumping of the nearby production wells. Well screens located between silt-rich intervals that are similarly affected, or show similar amounts of drawdown during periods of pumping, were correlated with each other.

Based on the above criteria, four primary "hydrogeologic zones" within the aquifer, or "aquifer layers", were delineated in the study area above the crystalline basement complex. The geophysical log that can be considered a "type log" for the study area is from well MW-19 (Figure 1-7). Three of the four "aquifer layers" in the study area are present in this well. After evaluating descriptions of geologic formations in the study area published by the California Division of Mines and Geology (Smith, 1986) and the USGS (Crook, et al., 1981), the primary aquifer layers present in the study area were identified with geological formations (Figures 1-5 through 1-9).

The four aquifer layers in the study area include the upper and lower sections of the Older Fanglomerate Series (Aquifer Layers 1 and 2, respectively), the Pacoima Formation (Aquifer Layer 3) and the Saugus Formation (Aquifer Layer 4). The fourth aquifer layer is represented by only one JPL well screen, the deepest screened interval in the well furthest downgradient of JPL (MW-20, screen 5). Further discussion and detailed descriptions of the formations beneath JPL are included in the OU1/OU-3 RI report (Foster Wheeler, 1999).

1.2.3.2 Structure

As previously described, JPL lies immediately south of the southern edge of the San Gabriel Mountains, which, together with the San Bernardino Mountains to the east and the Santa Monica Mountains to the west, make up a major portion of the east-west trending Transverse Range geologic province of California. This province is dominated by east-west trending folds, reverse faults and thrust faults, indicating a history of extensive north-south compressional deformation.

The San Gabriel Mountains are primarily composed of Cretaceous to Tertiary crystalline rocks, including diorites, granites, monzonites, and granodiorites, with a complex history of intrusion and metamorphism. Episodic pulses of tectonic uplift of the San Gabriel Mountains has produced the present topography of the area (Smith, 1986). Most of this uplift has occurred along a system of north- to northeast-dipping reverse faults and thrust faults located along the southern edge of the San Gabriel Mountains referred to as the Sierra Madre Fault system. The Sierra Madre Fault system separates the San Gabriel Mountains to the north from the San Gabriel Valley to the south.

A significant component of the Sierra Madre Fault system crosses the JPL site in the form of the JPL Thrust Fault. This fault is the only positively identified geologic structural feature present on the JPL site. The known and inferred locations of the JPL Thrust Fault are shown on Figure 1-4.

Several previous investigations at JPL have provided information on the actual and inferred location of the JPL Thrust Fault. During these studies, as summarized in the OU-1/OU-3 RI Report (Foster Wheeler, 1999), boreholes were drilled and trenches were excavated indicating the fault dips approximately 40 degrees to the north and has over 800 feet of vertical displacement on the JPL site. Data on the depth to the crystalline basement complex from deep JPL monitoring wells and nearby municipal production wells show that the crystalline basement complex south of the fault generally dips to the north and east beneath JPL.

1.2.4 Hydrogeology

The San Gabriel Valley has been divided into distinct groundwater basins, including the Raymond Basin where JPL is located. The Raymond Basin is bordered on the north by the San Gabriel Mountains, on the west by the San Rafael Hills, and on the south and east by the Raymond Fault. The Raymond Basin is further divided into three subbasins, the Pasadena Subarea, the Santa Anita Subarea, and the Monk Hill Subbasin. JPL is located in the Monk Hill Subbasin. The Monk Hill Subbasin provides an important source of potable groundwater for many communities in the area including Pasadena, La Canada-Flintridge, and Altadena.

In the Raymond Basin, groundwater flows in somewhat different directions depending on where one is located. JPL lies within the Monk Hill Subbasin where, on a regional scale, a confluence of groundwater flow regimes occurs. At the western end of the Monk Hill Subbasin, west of JPL, the groundwater flow is predominantly to the southeast, and at the eastern end of the Monk Hill Subbasin, east of JPL, the groundwater flow is predominantly to the south (Figure 1-10).

However, the presence of groundwater recharge basins (spreading grounds) near JPL in the Arroyo Seco, and the presence of municipal groundwater production wells near JPL, significantly influence local groundwater flow directions.

The aquifer below the site is generally considered to be an unconfined, or water-table aquifer. However, vertical hydraulic head differences with depth are observed between screens in deep JPL multi-port monitoring wells located near production wells when the production wells are pumping, which indicates the presence of other than completely unconfined conditions. This is due to the presence of relatively thin, silt-rich layers located throughout the alluvial aquifer that inhibit vertical flow of groundwater. As previously discussed, the aquifer has been divided into four "hydrogeologic" layers based to a large extent on how these silt-rich intervals influence the hydraulic heads in the aquifer during periods of pumping of the nearby municipal wells (see Section 1.2.3.1). The upper three aquifer layers are present beneath JPL, and the fourth layer is represented by the bottom screen in the easternmost off-site JPL multi-port well (MW-20, screen 5).

During the OU-1/OU-3 RI, groundwater elevation measurements were recorded routinely to characterize aquifer conditions. Water-table elevations in monitoring wells located at the mouth of the Arroyo Seco (MW-1, MW-9 and MW-15) have always been consistently higher than the water-table elevations in the other JPL wells, indicating a significant groundwater mound is present in this area. This mound is typically between 80 and 120 feet higher than the surrounding water table and is a result of recharge from the mouth of the Arroyo Seco. The mound is present year-round and is one of the most significant features of the water-table at JPL.

The groundwater surface has been measured in the JPL monitoring wells at depths ranging from approximately 22 feet (on the groundwater mound) to 270 feet below ground surface. This wide range of depth to groundwater can primarily be related to the relatively steep topography present at JPL and the local groundwater mounding, but can also be related to effects from seasonal groundwater recharge at the nearby spreading grounds and affects from groundwater production from the nearby municipal production wells. Throughout the OU-1/OU-3 RI, groundwater elevations fluctuated up to approximately 75 feet each year beneath JPL primarily as a result of these influences.

1.2.4.1 Hydraulic Characteristics

The hydraulic characteristics of the aquifer were evaluated by performing simple aquifer tests at each shallow monitoring well at JPL and at each screen interval in the deep multi-port monitoring wells. The goal was to collect data for estimating the hydraulic conductivity of the aquifer material surrounding each monitoring well casing. Two different types of aquifer tests were performed, "slug/bail" tests in the shallow wells and "rising-head" tests in the deep wells, to accommodate the construction design differences between the well types. Results from the aquifer tests for the shallow and deep wells are summarized in Tables 1-1 and 1-2, respectively. The hydraulic conductivity values calculated from the "slug" test data ranged from 2.0 ft/day

(15 gpd/ft^2) to 8.0 ft/day (60 gpd/ft^2) . The conductivity values estimated from the "bail" test data ranged from 2.0 ft/day (15 gpd/ft^2) to 16.5 ft/day (123 gpd/ft^2). For the deep wells, five conductivity values were estimated representing the formation characteristics at the five different screen intervals. The hydraulic conductivity values ranged from 0.1 ft/day (0.7 gpd/ft^2) to 20.8 ft/day (156 gpd/ft^2). In general, no trend or consistent change (increase or decrease) in conductivity values with depth was observed. Overall, the hydraulic conductivity values estimated indicate moderate to high soil permeabilities.

1.2.4.2 Groundwater Chemistry

During the OU-1/OU-3 RI, groundwater samples from all the JPL monitoring wells were submitted for analysis of major anions (including chloride, sulfate, nitrate and alkalinity), major cations (including calcium, magnesium, sodium, potassium, and iron), and total dissolved solids (TDS). The results of these analyses were used to evaluate the general chemistry of the groundwater beneath JPL. The data were compiled as Stiff diagrams, which allowed for visual categorization of each water sample. A review of the Stiff diagrams suggested that the majority of groundwater at JPL can, in general, be divided into three general types:

Type 1: Calcium-bicarbonate groundwater. Groundwater with calcium (Ca) as the dominant cation and bicarbonate (HCO_3) as the dominant anion.

Type 2: Sodium-bicarbonate groundwater. Groundwater with sodium (Na) as the dominant cation and HCO_3 as the dominant anion.

Type 3: Calcium-bicarbonate/chloride/sulfate groundwater. Groundwater with Ca as the dominant cation and HCO_3 the dominant anion, but with relatively elevated chloride (Cl) and sulfate (SO_4) concentrations. This water type consistently had higher levels of TDS than the other two general types

In addition to the general water types listed above, the analytical data suggested occasional mixing, or blending of water types occurs, creating occasional "intermediate" water types.

A summary of the locations of the different water types within the JPL study area at the completion of the RI sampling period (January/February, 1998) are illustrated in Figure 1-11. Overall, the types of water identified at each screen did not change significantly throughout the RI. Those screens where the water type did change were typically located in areas where two of the general water types coincided. A summary of the general groundwater chemistry data collected during the RI, along with water chemistry data from nearby municipal production wells and Colorado River water used for injection at the Valley Water Company wells, is presented in Table 1-3.

In general, water Type 1, the calcium-bicarbonate water type, was primarily found in monitoring and production wells in and near the Arroyo Seco (Figure 1-11). This is the most common water type at JPL. It appears that this water type, with its relatively low concentrations of major ions (low TDS), originates as rainwater runoff from the San Gabriel Mountains and enters the study area through the Arroyo Seco and the spreading grounds within the Arroyo Seco.

Water Type 2, the sodium-bicarbonate water type, along with associated blends, is typically found in the deeper well screens of both the on-site and off-site JPL multi-port wells (Figure 1-11). This water type (Type 2), although found deep in the aquifer, is similar to water Type 1 in that both have relatively low TDS. The only significant difference between these water types is that sodium makes up the predominant cation in Type 2, whereas calcium is the predominant cation in Type 1.

Water Type 3, the calcium-bicarbonate/chloride/sulfate water type, is most prevalent in wells located "upgradient" and along the western edge of JPL (Figure 1-11). Some Type 3 water is also found downgradient and to the south of JPL. This water type differs from Type 1 in that it contains relatively elevated levels of chloride, sulfate, and TDS.

As indicated on Table 1-3, Colorado River water, which is obtained from the Metropolitan Water District Weymouth Plant and is used for injection into the aquifer upgradient of JPL at the Valley Water Company wells, has high Cl, SO_4, and TDS similar to levels used to define Type 3 water in the study area. The fact that water with relatively low TDS, Cl, and SO_4 is present in the La Cañada Irrigation District well No. 1, located immediately upgradient of the Valley Water Company (Valley) wells (Figure 1-3), suggests the presence of high Cl, SO_4, and TDS in the Valley wells, and wells located downgradient of the Valley wells, is the result of historical injection of Colorado River water into the Valley wells.

Based on the general water chemistry results, most groundwater within the JPL study area can be classified in two ways. First, as "upgradient" (Type 3) water, likely the result of injection of Colorado River water into the aquifer at the Valley Water Company wells, or second, as "Arroyo Seco" (Type 1) water, primarily originating at the mouth of the Arroyo Seco.

1.2.4.3 Groundwater Flow System

The direction of groundwater flow and the magnitude of the groundwater gradient beneath the study area, and particularly beneath the JPL site, are dynamic. In general, natural groundwater flow across the site is in the southeasterly direction. However, the aquifer is significantly affected by various natural and anthropogenic influences which include: 1) pumping from nearby municipal production wells; 2) groundwater recharge from the Arroyo Seco spreading basins; 3) seasonal regional groundwater recharge from precipitation; and 4) regional groundwater flow.

Pumping of the nearby City of Pasadena municipal production wells is clearly the most significant. The reason for this is twofold: first, the Pasadena wells are located very close to, and immediately down-gradient of the JPL site (see Figure 1-3), and secondly, the volumes of water extracted by the Pasadena wells are much greater than those of the other nearby production wells (Lincoln Avenue Water Company, Valley Water Company, La Cañada Irrigation District, Rubio Cañon Land and Water Company, and Las Flores Water Company).

As discussed in Section 1.2.3, the aquifer underlying the study area was divided into four layers. The layers are defined by depth, lithology, and on the response of screened intervals in the multi-port wells to pumping of nearby municipal production wells. Silt-rich intervals in the aquifer that appear to inhibit the vertical flow of groundwater during periods of pumping were used to define the layers (Foster Wheeler, 1999). A conceptual model of the aquifer layers and associated silt-rich intervals is included in Figure 1-12.

A detailed analysis of flow directions and gradients observed in each aquifer layer during various pumping and non-pumping scenarios was conducted as part of the OU-1/OU-3 RI (Foster Wheeler, 1999) in an effort to study the effects nearby production wells have on groundwater flow patterns. Potentiometric surface maps from the RI Report representing times when all the nearby production wells are operating and when none of them are operating are included in Figures 1-13 and 1-14. This analysis indicated that the Pasadena wells, by far, have the most significant effect on groundwater levels and associated groundwater flow patterns beneath the study area. The effects on groundwater elevations in the upper three aquifer layers are illustrated in Figures 1-15, 1-16, and 1-17, which show the correlation of changes in the water table or potentiometric surface elevations measured in the JPL multi-port monitoring wells during periods of operation and non-operation of the Pasadena and other nearby municipal production wells.

During most of each year the Pasadena wells are pumping and groundwater flows across JPL to the southeast towards the wells. However, during the "wet" season of the year, typically when the Arroyo Seco spreading basins are full of rainwater runoff and significant groundwater recharge is occurring, and the Pasadena wells are shut down for a relatively short period of time, flow directions can change. At this time, the groundwater mound at the mouth of the Arroyo Seco can significantly expand, and the groundwater gradient can reverse to the west across all or parts of JPL. During the RI, groundwater gradient (water table) reversals were observed each year with durations ranging from approximately 9 days up to approximately 16 weeks. These shallow aquifer gradient reversals are complex in nature. The duration of the reversal primarily depends on the pumping schedule of the Pasadena wells and on the rate of groundwater recharge from the Arroyo Seco spreading basins.

1.2.5 Nature and Extent of Contamination

The nature and extent of groundwater contamination in the study area are discussed thoroughly in the OU-1/OU-3 RI Report (Foster Wheeler, 1999). Summary information is presented here to support the evaluation of remedial technologies (Section 3.0) and development of remedial alternatives (Section 4.0).

During the initial phases of the RI, comprehensive suites of analyses were performed to identify potential constituents of concern. These included VOCs, semi-volatile organic compounds (SVOCs), Title 26 metals, additional metals analyses for strontium, aluminum, and hexavalent chromium [Cr(VI)], cyanide, gross alpha/gross beta radiation, and total petroleum hydrocarbons.

In later sampling events, various analyses were added or dropped based on previous results or new information. Analyses in later events primarily included VOCs, metals [arsenic (As), lead (Pb), chromium (Cr) and Cr(VI)], tributyltin, 1,4-dioxane, n-nitrosodimethylamine, and perchlorate. Results of the RI sampling are summarized on Table 1-4 (VOCs and perchlorate), Table 1-5 (SVOCs), Table 1-6 (metals and cyanide), and Table 1-7 [select metals (As, Pb, Cr, Cr(VI))]. During the RI, five constituents were detected at concentrations exceeding their respective maximum contaminant levels (MCLs) or action levels for drinking water. These included three VOCs [carbon tetrachloride (CCl_4), trichloroethene (TCE), 1,2-dichloroethane (1,2-DCA)], perchlorate (ClO_4^-) and one metal [chromium (Cr)].

Following is a summary of the RI findings regarding the concentrations and the areal extent of these five constituents in the upper three groundwater aquifer layers. Because Aquifer Layer 4 is located only at the eastern edge of the study area (Figure 1-12), only one screen is located in Aquifer Layer 4 (MW-20, Screen 5), and no contaminants were detected in samples from this screen, Aquifer Layer 4 is excluded from this discussion.

Carbon Tetrachloride (CCl_4)

Shown in Figures 1-18 through 1-20 are plume maps for CCl_4 in Aquifer Layers 1, 2 and 3, respectively. Figure 1-21 depicts CCl_4 concentrations in JPL monitoring wells over time.

From Figure 1-18, it appears that Layer 1 wells downgradient of JPL have not become contaminated with CCl_4. This may be as a result of pumping of the Pasadena municipal production wells "pulling" CCl_4 into the lower aquifer layers. The Aquifer Layer 2 CCl_4 plume (Figure 1-19) is more extensive than the Layer 1 plume, but contains lower concentrations than the Layer 1 plume. The Layer 2 plume appears to be an extension of the Layer 1 plume. Due to pumping of the Pasadena wells, it appears CCl_4 was first pulled down and to the southeast from Layer 1 into Layer 2. The Layer 3 CCl_4 plume (Figure 1-20) similarly appears to have been influenced by the Pasadena wells. As shown in Figure 1-21, CCl_4 concentrations in most JPL monitoring wells are generally stable or decreasing. The RI data suggests that the off-site portion of the CCl_4 plume is inhibited from migrating downgradient when the nearby production wells are pumping.

Trichloroethene (TCE)

Figures 1-22 through 1-24 illustrate the TCE plumes in Aquifer Layers 1, 2 and 3, respectively. The TCE concentrations in JPL monitoring wells over time are presented in Figure 1-25.

The data, as depicted in Figure 1-22, suggests that there is a plume comprised of TCE from on-site sources and a plume comprised of off-site sources. These merge near or south of the southern portion of JPL. Further horizontal migration in Layer 1 of TCE appears to be inhibited due to the enhanced downward flow induced by pumping of the Pasadena production wells. Due to pumping of the Pasadena wells, the Layer 2 TCE plume (Figure 1-23) appears to be a downward and southeasterly extension of the two plumes identified in Layer 1. This is similar to the Layer 2 CCl_4 plume, but the Layer 2 TCE plume extends further south. This southern extension is

possibly due to upgradient off-site source(s). The Layer 3 TCE plume (Figure 1-24) is located mostly off-site, consistent with flow patterns induced by pumping of the Pasadena production wells. The data presented in Figure 1-25 suggests that the Layer 1, 2, and 3 TCE plumes are generally stable, and are not increasing in size.

1,2-Dichloroethane (1,2-DCA)

Shown in Figure 1-26 is the plume map for 1,2-DCA in Aquifer Layer 1. 1,2-DCA was not detected in Layer 2 well screens during the January/February 1998 sampling event or in any Layer 3 well screens during the RI period. Figure 1-27 shows the 1,2-DCA concentrations in JPL monitoring wells over time.

As shown (Figure 1-26), 1,2-DCA contamination in Layer 1 occurs only on-site, and concentrations have generally remained constant or decreased during the RI period (Figure 1-27). The location of the 1,2-DCA plume in Layer 1 is generally coincident with the elevated levels of the on-site CCl_4 and the TCE plumes in Layer 1. It is unlikely that the 1,2-DCA plume will migrate further downgradient to any extent in Layer 1 due to nearby municipal well pumping. As shown in Figure 1-27, 1,2-DCA had been detected at concentrations slightly above the detection limit (0.5 µg/L) in one Layer 2 well/screen (MW-4 Screen 2) as recently as February, 1997. However, Figure 1-27 shows that the concentration of 1,2-DCA in MW-4 Screen 2 decreased and has been below detection limits since that time.

1,2-DCA was not commonly used in industrial applications, however, it is one of several breakdown products of biological reduction of TCE. This potentially explains its presence in the JPL groundwater. However, this mechanism has not been confirmed at JPL.

Perchlorate (ClO_4^-)

Perchlorate (ClO_4^-), which is a non-volatile oxyanion of chlorine (Cl), has been detected in JPL groundwater monitoring wells at levels above the California Department of Health Services (CADHS) Interim Action Level (IAL) of 18 micrograms/liter (µg/L). No state or Federal MCLs for ClO_4^- currently exist. Analyses for ClO_4^- in JPL groundwater were performed during the June/July 1997, September/October 1997, and January/February 1998 RI sampling events following a request from the CADHS. The current analytical technique, with its detection limit of 4 µg/L, has only been available since mid 1997. Previously used techniques could not quantify ClO_4^- concentrations in groundwater below 100 µg/L. Because ClO_4^- analysis has only been conducted since the June/July, 1997 RI event, chronological trends could not be reliably inferred. The plume maps for ClO_4^- in Aquifer Layers 1, 2 and 3 are presented in Figures 1-28 through 1-30, respectively.

As with TCE, there appears to be more than one source of ClO_4^-, one on-site and one off-site to the west. These sources form plumes which appear to merge near or below the southern portion of JPL (Figure 1-28). The portion of the Layer 1 ClO_4^- plume exceeding the CA IAL is localized on-site, and is upgradient from the Pasadena production wells. The Pasadena production wells appear to inhibit significant downgradient migration in Layer 1.

The Layer 2 plume appears to be a convergence of the two plumes identified in Layer 1, extending downward in response to pumping by the Pasadena and other production wells (Figure 1-29). The portion of the plume that exceeds the IAL extends from on-site to the Pasadena Arroyo Well. The plume appears to have been inhibited from further significant downgradient migration by the Pasadena Arroyo well. The shape of the southern and eastern boundaries of the Layer 2 ClO_4^- plume, where levels are close to the analytical reporting limit, are not well defined. This is possibly due to the dynamic nature of groundwater flow in the vicinity of JPL. The nature of the apparent upgradient ClO_4^- source is not clear at this time. However, it is believed to have resulted at least partially from injection of Colorado River water containing ClO_4^- into the Valley Water Company production wells located upgradient of JPL for groundwater recharge purposes.

The Layer 3 ClO_4^- plume (Figure 1-30) is smaller in size than the Layer 2 ClO_4^- plume, and the concentrations of ClO_4^- are lower in the Layer 3 plume. The Layer 3 plume centers around the Pasadena Arroyo Well, again suggesting a strong influence by the well.

Chromium (Cr)

Groundwater samples were analyzed for both total Cr and Cr(VI). Total chromium was detected in two on-site wells during the RI (in 6 of 506 samples) above its MCL. Hexavalent chromium was detected at low levels in the north-central portion of the site in monitoring wells MW-7 and MW-13, and extremely rarely (only twice during the RI period of 1995-1998) in off-site monitoring wells at very low levels. No MCLs are promulgated for Cr(VI). Concentrations have decreased or remained relatively stable. No direct evidence of significant Cr migration was found during the RI.

1.2.5.1 Estimated Volume of Impacted Groundwater

As described above, CCl_4, TCE, 1,2-DCA, ClO_4^- and Cr were the only constituents detected in JPL impacted groundwater above MCLs or action levels. To estimate the volume of impacted groundwater, the area of each contoured interval on each plume map generated for the most recent RI sampling event (January/February, 1998) was calculated by the AutoCAD drafting software used to generate the maps. The area of impacted groundwater above MCLs or action levels was determined and is summarized in Table 1-8. For Cr, the volume of Cr(VI) was estimated. Cr(VI) was detected in only one on-site well (MW-13). Estimating the volume of Cr(VI) impacted groundwater was completed by conservatively assuming the Cr(VI) plume extended approximately 350 feet in all directions from MW-13. Based on the geologic cross sections constructed for the study area, Aquifer Layer 1 is estimated to be 100 feet thick, Layer 2 is estimated to be 150 feet thick, and Layer 3 is up to 300 feet thick. Using a porosity value of 20%, the volume of impacted groundwater for each constituent of interest was calculated. The estimated volumes are summarized on Table 1-8. It is important to note that the plumes of the constituents of interest are co-mingled, and the total volume of impacted groundwater is not the sum of the estimated volume for each constituent.

Using the detected concentrations of the constituents and the estimated volumes of impacted groundwater, the total mass of each constituent was also estimated. It is estimated that approximately 102 pounds (lbs), or 7.7 gallons, of CCl_4; 143 lbs, or 11.7 gallons, of TCE; 0.1 lb, or 0.01 gallons, of 1,2-DCA; 1300 lbs of ClO_4^- and 0.01 lb of Cr(VI) are present in the groundwater beneath and near JPL (Table 1-8).

To evaluate the estimated volume of impacted groundwater on-site, a circle with a radius of approximately 600 feet at the north-central portion of the site where the highest levels of contaminants were found (between MW-7, MW-16, and MW-13) was used to define the area of impact. Using the same estimated aquifer properties as before, it was estimated there are approximately 40 lbs of CCl_4, 11 lbs of TCE, 0.1 lb of 1,2-DCA, 950 lbs of ClO_4^- and 0.01 lbs Cr(IV) at the north-central portion of JPL (Table 1-8).

1.2.5.2 Summary of Nature and Extent of Contamination

From 1994 to 1998, groundwater from the areas beneath and adjacent to JPL was sampled through a series of monitoring wells and analyzed for a comprehensive suite of analytes including 60 VOCs, 65 SVOCs, 19 metals, and ClO_4^-. Through this extensive investigation, only three VOCs (CCl_4, TCE and 1,2-DCA), one metal (Cr), and ClO_4^- were detected at levels exceeding state and Federal MCLs or IALs. The 1,2-DCA plume, which is present only on-site, is possibly a degradation product from the reduction dechlorination of TCE. However, this mechanism has not been confirmed at JPL.

Groundwater elevations were also routinely monitored. Natural groundwater flow patterns around JPL are predominantly to the east and the south. However, the Pasadena municipal production wells, located to the east of the site, typically operate up to 11 months per year, and were shown to strongly affect local groundwater flow patterns by inhibiting downgradient migration beyond the Pasadena municipal wells.

1.2.6 Current Remedial Activities

Remedial activities were initiated several years ago in response to the detection of VOCs in the Pasadena and Lincoln municipal production wells. This was carried out to ensure that water extracted from these wells, and used for domestic consumption, met California Department of Health Services (CADHS) drinking water standards. These remedial activities are on-going.

Pasadena maintains four production wells near JPL which are used to supply water to Pasadena residents for domestic consumption. Three of the Pasadena wells (Well #52, the Ventura Well, and the Windsor Well) are currently operating, while one well (the Arroyo Well) has been shut down due to the presence of elevated levels of ClO_4^-. Lincoln maintains two production wells located to the east of the Pasadena wells, which are used to supply water for domestic consumption. One Lincoln well (No. 3) is currently in operation, and the other (No. 5) has not

been producing for several years. Well No. 5 is apparently functional and the reason it has not been pumping is not known (R. Palmer, personal communication, December 6, 1999).

The three city of Pasadena wells are pumped at a combined flow of approximately 4,600 gallons per minute (gpm) and extracted water is treated with an air-stripping system to remove VOCs prior to distribution. In addition to VOCs, water extracted from Well #52 contains ClO_4^- at levels above the current CADHS Interim Action Level (IAL) of 18 μg/L. ClO_4^- levels in Well #52 are low enough, however, that water extracted from this well can be blended with water extracted from the two other currently operating Pasadena wells to insure that the total stream meets CADHS requirements for drinking water prior to distribution. The Lincoln Avenue well (#3) is pumped at approximately 950 gpm and the extracted water is treated by liquid-phase granular-activated carbon (LPGAC) for VOCs prior to distribution. ClO_4^- has been detected in the Lincoln well, but at levels below the CADHS IAL.

It is clear from the data collected during the JPL OU-1/OU-3 Remedial Investigation (RI) that pumping by the Pasadena wells exerts considerable influence on local groundwater flow patterns (Foster Wheeler, 1999). When pumping at their average rates the Pasadena wells create a zone of depression that induces flow toward the production wells from all directions. This appears to effectively capture the VOC contaminant plumes (Section 3.4.3 in the RI Report, Foster Wheeler, 1999). Figures 1-31, 1-32, and 1-33 show the effect pumping the Pasadena wells have on groundwater elevations in Aquifer Layers 1, 2, and 3, respectively. In addition, Figures 1-31, 1-32, and 1-33 show the areal extent of VOC plumes above MCLs and how the pumping of the Pasadena wells impacts groundwater flow around the plumes. The Pasadena wells extract groundwater approximately 11 months per year. Other wells in the area do not pump groundwater as continuously or at as high flow rates. These other wells do not affect the groundwater flow conditions around JPL as significantly (Foster Wheeler, 1999).

1.2.7 Contaminant Fate and Transport

The fate and transport characteristics and the potential for downgradient migration of contaminants were described in detail in the JPL RI Report (Foster Wheeler, 1999). The evaluation of contaminant fate and transport focused on three VOCs (CCl_4, TCE, 1,2-DCA), a non-volatile oxyanion, ClO_4^-, and a metal, Cr [both total Cr and Cr(VI)]. An additional VOC, tetrachloroethene (PCE), which was detected in groundwater samples from JPL monitoring wells at levels below state and federal MCLs, was included in the fate and transport assessment pursuant to the request of the regulatory agencies.

1.2.7.1 Selected Chemical and Physical Properties

Selected chemical and physical properties of the constituents detected above MCLs or IALs at JPL are presented in Table 1-9. The VOCs were generally characterized as being volatile, moderately soluble in water, moderately adsorbing to soil organic carbon, and possibly subject to natural attenuation mechanisms (Appendix A). Detailed data regarding the behavior of ClO_4^- in the environment is currently lacking, but preliminary assessment indicates that ClO_4^- is highly

stable and mobile in soil/water systems. Cr occurs in nature in two oxidation states: trivalent Cr [Cr(III)], which is generally stable, forms highly insoluble precipitates, and is generally considered to be immobile; and hexavalent Cr, which is less stable due to biotic or abiotic reduction to Cr(III), is more soluble and generally more mobile than the trivalent form.

1.2.7.2 Fate and Transport Modeling

With the RI data collected over the last 5 years, the fate and transport of the groundwater contaminants at JPL are generally well known. Fate and transport modeling during the RI was, however, performed as a preliminary evaluation of a scenario where it was assumed that CCl_4, TCE and ClO_4^- migrate further downgradient, beyond their currently known limits of extent, with natural groundwater gradients present only during periods when the Pasadena and other nearby municipal wells are not operating and inhibiting further downgradient migration. The point source location for contaminant migration modeling was chosen as MW-17, Aquifer layer 2, because CCl_4, TCE and ClO_4^- were consistently detected above drinking water standards at this location. If the Pasadena and other nearby production wells were to be shut down for an extended period of time, contaminant migration from MW-17, Aquifer layer 2, would be of potential concern. The contaminant path from MW-17 to MW-20 was selected for the model simulations because MW-20 is downgradient from MW-17 under natural flow conditions and there are no known physical barriers between these two points. Therefore, it was assumed to provide an appropriate estimate of off-site migration.

The modeling runs were carried out using SOLUTE, Version 4.04 for each of the three constituents listed above (Foster Wheeler, 1999). In these runs, source concentrations and several input parameters were based on actual site information or on literature values which were considered to be representative of site conditions. All input parameters were the same for all simulations with the exception of the initial contaminant concentrations for each contaminant, which reflected actual detected values. The input parameters used are listed in Table 1-10.

Results of the simulations are presented in Table 1-11. The simulations predicted that with an initial CCl_4 concentration of 6.6 μg/L (maximum detected in MW-17 during the RI), under the defined conditions (no pumping), and with general input parameters based on conservative assumptions, the MCL for CCl_4 (0.5 μg/L) would be exceeded in 20 years in MW-20. As with CCl_4, TCE at an initial concentration of 23 μg/L (maximum detected in MW-17 during the RI), and under conservative input assumptions, levels in MW-20 would increase to the MCL (5.0 μg/L) in 31 years. With regard to ClO_4^-, at an initial concentration of 55 μg/L (maximum detected in MW-17 during the RI), and with conservative input parameter assumptions, the IAL (18 μg/L) would be exceeded in MW-20 in 40 years.

Results of the fate and transport modeling, using actual observed maximum concentrations for CCl_4, TCE and ClO_4^- during the RI, indicate that even under conservative assumptions, it will take very long periods of time (from 20 to 40 years) for these contaminants to migrate

downgradient of non-pumping Pasadena and other nearby municipal production wells at concentrations above MCLs.

1.2.8 Risk Assessment

At the request of EPA and DTSC, a baseline risk assessment was completed to evaluate the potential risks to human health associated with hypothetical exposure to untreated JPL impacted groundwater. It is important to note that because groundwater is in a deep aquifer, and, thus, it does not recharge surface water within the area of concern, and water purveyors treat impacted groundwater before use, that there is no complete pathway for exposure to untreated JPL groundwater. Thus, the risk is negligible. Nonetheless, at the request of EPA and DTSC risk assessors, a conservative hypothetical current and future residential use scenario was evaluated using EPA risk assessment guidance. It is assumed in the risk assessment humans could be exposed to untreated groundwater. Detailed results and methodologies used are presented in the JPL groundwater RI report (Foster Wheeler, 1999). To ensure that human health is adequately protected, conservative exposure point concentrations and toxicity assumptions were used in estimating potential risks. Theoretical risks to human health predicted by this assessment are likely to be an overestimation of actual risk.

1.2.8.1 Carcinogens

The total cancer risk from hypothetical exposure to untreated groundwater at each of the JPL monitoring wells and at each of the nearby municipal production wells was determined by adding the risks calculated for ingestion, inhalation and dermal contact pathways for each contaminant. Results, using conservative assumptions, showed five on-site monitoring wells, two off-site monitoring wells, and one municipal production well had total cancer risk values outside EPA's range for acceptable risk. The JPL monitoring wells with hypothetical elevated risk extended from the north-central portion of the site towards the City of Pasadena Arroyo well. The only municipal production well with hypothetical elevated cancer risk, based on hypothetical exposure to untreated groundwater is the Valley Water Company Well No. 1, located approximately ½ mile to the west of JPL. This well is outside the observed known influence of JPL impacted groundwater and appears to be impacted from commercial activities not associated with JPL. Even if the well was impacted by activities at JPL, the health risks were calculated assuming exposure to untreated groundwater, which does not occur. The Valley Water Company, like all purveyors, is required to monitor water quality and treat groundwater when necessary to meet strict drinking water standards prior to distribution. The total cancer risk values for each monitoring well and each nearby production well are plotted and contoured on Figure 1-34 to present spacial trends in the risk data.

1.2.8.2 Non-Carcinogens

The total risk from non-carcinogenic materials, expressed as a hazard index (HI), was also determined for hypothetical exposure to untreated groundwater at each of the JPL monitoring wells and at each of the nearby municipal production wells. Results showed that 10 JPL

monitoring wells and three nearby municipal production wells had hypothetical HI values that exceeded EPA's benchmark value of 1.0 (Foster Wheeler, 1999). The monitoring wells with hypothetical elevated HI values were primarily located between the north-central portion of the site and Lincoln Avenue Well No. 3, located off-site to the southeast of JPL. The three municipal production wells with hypothetical elevated HI values included the City of Pasadena Arroyo well, the City of Pasadena Well 52, and the Lincoln Avenue Well No. 3. The total non-cancer risk values for each monitoring well and each nearby production well are plotted and contoured on Figure 1-35 to present spatial trends in the risk data.

It is important to note that the Agency for Toxic Substances and Disease Registry (ATSDR) recently issued a final version of the *Public Health Assessment for the JPL site* (ATSDR, 1999), and concluded that on-site and off-site groundwater do not pose a present or future public health hazard since wellhead treatment and water blending are used by local water purveyors to meet stringent drinking water standards prior to distribution of the water for public use. Unlike state and Federal guidance that require exposures to untreated groundwater be evaluated in baseline risk assessments, the ATSDR evaluated whether or not residents are actually being exposed, or may in the future actually be exposed, to hazardous substances.

1.2.8.3 Scoping Assessment of Ecological Risks

An initial scoping assessment of ecological risks was completed (Foster Wheeler, 1996f) to determine if a quantitative ecological assessment of the potential risks to plants and animals associated with the contamination was required. The scoping assessment qualitatively evaluated potential ecological receptors, constituents of concern, and potentially complete exposure pathways. An evaluation of ecological risk was required because ecological receptors are frequently more sensitive to contaminant-induced effects than humans.

The scoping assessment used a habitat approach as the basis for identifying potentially complete pathways between areas of contamination and specific plant and animal species that may occupy the site. Potentially affected habitats within or adjacent to the JPL site were found to include: urban landscape, chaparral, riparian, wetlands, southern oak woodland, and desert wash. A wide variety of plant and animal species were catalogued during field surveys by Foster Wheeler personnel and from reported observations from JPL personnel. The constituents of concern evaluated for groundwater are the metals and VOCs that had been detected in the groundwater during the RI.

The chaparral and southern oak woodland habitats are found only in the San Gabriel Mountains to the north of the JPL site. Because no contamination was known or suspected within the chaparral and southern oak woodland habitats, no potential exposure pathways were identified for these habitats. The riparian, desert wash and wetland habitats occur off-site only, and contaminated groundwater typically underlies these habitats at depths of approximately 100 feet or more. For this reason, there are no plausible groundwater exposure pathways to plants and animals within the riparian, desert wash, and wetland habitats. The urban landscape habitat is the

predominant on-site JPL habitat. As with the off-site habitats, contamination of groundwater is found at depths between approximately 100 to 250 feet. Therefore, no groundwater exposure pathways to plants and animals are possible.

It was, therefore, concluded no further characterization of ecological risks to plants and animals due to groundwater contamination was warranted since there were no complete exposure pathways from groundwater to site biota.

1.2.9 Summary of RI Findings

The four major objectives of the JPL OU-1/OU-3 RI were to: 1) characterize the nature and extent of contaminants in the groundwater beneath and near the JPL site; 2) assess the fate and transport of contaminants in the groundwater beneath the JPL site; 3) provide an evaluation of potential risk from contaminants in the groundwater to human health and the environment; and 4) provide sufficient information for the OU-1/OU-3 FS to evaluate potential technologies for remediation of groundwater. These objectives were met during the RI as summarized below:

- Five constituents were detected above state or Federal drinking water standards including three VOCs (CCl_4, TCE, 1,2-DCA); ClO_4^- and Cr.
- The Pasadena municipal production wells were shown to exert considerable influence on groundwater flow beneath the site and surrounding area, which apparently inhibits significant off-site migration of these contaminants.
- Risks to human receptors is unlikely because the only potentially complete exposure pathway is through domestic consumption of untreated water. This possibility should never occur because water is treated and meets strict drinking water standards prior to being distributed. There are no risks to ecological receptors because there are no complete potential exposure pathways.

1.3 SUMMARY OF JPL RI/FS PROCESS

The RI/FS process is used by the Superfund program to characterize the nature and extent of risks posed by hazardous constitutents at a site and for evaluating potential remedial options. During the JPL groundwater RI, the nature and extent of impacted groundwater was well characterized. Large amounts of groundwater quality and groundwater flow data were collected and evaluated to understand the dynamic nature of the aquifer beneath the site. This data was compiled in the OU-1/OU-3 RI Report, which became final in September, 1999 (Foster Wheeler, 1999).

During the RI, a baseline risk assessment was developed to identify existing or potential risks that may be posed to human health or the environment as a result of exposure to untreated JPL-impacted groundwater. Because this assessment was designed to identify potential primary health and environmental threats at the site, it also provided important input into whether or not groundwater remediation was required at the site.

As summarized in the groundwater RI Report, three VOCs (CCl_4, TCE, and 1,2-DCA), ClO_4^- and Cr were detected in the groundwater beneath and, in some cases, downgradient of JPL at levels above state and Federal drinking water standards. It was determined in the baseline risk assessment that there was a hypothetical elevated health risk from non-carcinogenic constituents in the groundwater extending from the north-central portion of JPL towards the Pasadena Arroyo Well (Figure 1-35), and a hypothetical elevated health risk from carcinogenic constituents in the groundwater at the north-central portion of the site extending offsite to the east, just north of the Pasadena Arroyo Well (Figure 1-34). Because results of the risk assessment indicate groundwater beneath and immediately to the east of JPL pose a potential threat to human health in the absence of remedial action, remedial alternatives will be evaluated for the site.

The FS report is designed to methodically develop a list of appropriate remedial alternatives for a given site. The FS can be viewed as occurring in three general phases: the development of alternatives, the screening of alternatives, and the detailed analysis of alternatives. To develop alternatives, a list of local, state, and Federal environmental standards, requirements, criteria, etc. that are determined to be legally Applicable or Relevant and Appropriate Requirements (ARARs) is compiled as a basis for planning, evaluating, and selecting remedial alternatives. For the JPL site, the list of ARARs is included in Section 2.0. Based on the ARARs, remediation goals are then identified to provide a framework for adequate protection of human health and the environment. Next, groundwater collection, treatment, and disposal/re-use technologies are identified that will potentially satisfy ARARs and remediation goals. The various identified technologies are then screened based on their effectiveness, implementability, and cost to determine their appropriateness for the site (Section 3.0).

After appropriate collection, treatment, and disposal/reuse options are selected, they are assembled into remedial alternatives. Each alternative represents a "complete" remedial action, consisting of a specific combination of the retained technologies and process options to address all aspects of collection, treatment and disposal/reuse. A range of alternatives is developed, which vary in the nature and degree of collection, treatment, and associated containment and disposal options, as appropriate. An alternative involving little or no treatment is also developed as a basis to compare all other alternatives. Once the alternatives are developed, they are preliminary screened to reduce the number of alternatives that will be analyzed in detail. The screening process involves evaluating the alternatives with respect to their potential for meeting remediation goals by assessing their effectiveness, implementability and cost. For JPL, the assembling and screening of remedial alternatives is included in Section 4.0.

The remedial alternatives that make it through the preliminary screening are further analyzed in detail with respect to nine separate criteria identified by the EPA. The detailed analysis is conducted so that the regulatory agencies are provided with sufficient information to compare alternatives and select an appropriate site remedy. This detailed analysis is completed in Section 5.0.

After the RI/FS is completed, CERCLA requires a Proposed Plan be prepared as a part of the site remediation process. The Proposed Plan highlights key aspects of the RI/FS, provides a brief analysis of the alternatives being considered, identifies the preferred alternative, and provides the public with information on how they can participate in the final remedy selection process.

After public review and comment on the Proposed Plan, EPA will issue a Record of Decision (ROD) for JPL as the final remedial action plan. The ROD summarizes the alternatives considered and the rationale for selecting the final remedy. The overall RI/FS process is summarized on Figure 1-36.

TABLES

TABLE 1-1

RESULTS OF AQUIFER TESTS IN SHALLOW JPL MONITORING WELLS

Well No.	Representative Depth Interval (ft)	Date of Test	Estimated Hydraulic Conductivity					
			Slug Test		Bail Test		Geometric Mean	
			(ft/day)	(gpd/ft²)	(ft/day)	(gpd/ft²)	(ft/day)	(gpd/ft²)
MW-1	70-110	12/94	7.0	52	--	--		
			8.0	60	5.4	40	6.7	50.1
MW-5	85-135	12/94	6.9	52	--	--		
			7.9	59	15.8	118	9.5	71.1
MW-6	195-245	12/94	2.1	16	5.4	40		
			2.2	16	5.5	41	3.4	25.4
MW-7	225-275	12/94	7.1	53	12.3	92		
			4.4	33	9.8	74	7.8	58.3
MW-8	155-205	12/94	2.7	20	--	--		
			3.7	27	5.1	38	3.7	27.7
MW-9	18-68	12/94	2.1	16	--	--		
			2.3	17	2.0	15	2.1	15.7
MW-10	105-155	12/94	7.7	58	--	--		
			5.7	43	16.5	123	9.0	67.3
MW-13	180-230	12/94	2.0	15	--	--		
			2.9	22	10.3	77	3.9	29.2
MW-15	20.5-70.5	12/94	3.2	24	5.7	43		
			2.9	21	6.0	45	4.2	31.4

--: denotes data was distorted and could not be analyzed.

TABLE 1-2

RESULTS OF AQUIFER TESTS IN DEEP JPL MULTI-PORT MONITORING WELLS

Multi-Port Well Number	Screen Number	Date of Test	Well Screen Depth Interval (ft)	Estimated Hydraulic Conductivity (ft/day)	Estimated Hydraulic Conductivity (gpd/ft^2)
MW-3	1	2/16/90	170-180	7.6	56.8
	2	2/15/90	250-260	7.3	54.6
	3	2/15/90	344-354	0.6	4.5
	4	2/13/90	555-565	6.6	49.4
	5	2/12/90	650-660	1.8	13.5
MW-4	1	2/26/90	146.8-156.8	7.7	57.6
	2	2/24/90	237.2-247.2	4.0	29.9
	3	2/24/90	319.6-329.6	4.6	34.4
	4	2/23/90	388.9-398.9	4.1	30.7
	5	2/22/90	509.4-519.4	3.1	23.2
MW-11	1	12/15/92	140-150	0.5	3.7
	2	12/12/92	250-260	0.1	0.7
	3	12/8/92	420-430	0.1	0.7
	4	12/1/92	515-525	0.1	0.7
	5	12/1/92	630-640	0.1	0.7
MW-12	1	8/16/94	135-145	—(1)	—(1)
	2	8/16/94	240-250	4.1	30.7
	3	8/16/94	315-325	3.4	25.4
	4	8/16/94	430-440	1.5	11.2
	5	8/16/94	546-556	4.7	35.2
MW-14	1	8/17/94	205-215	2.6	19.4
	2	8/17/94	275-285	19.6	146.6
	3	8/17/94	380-390	20.8	155.6
	4	8/17/94	453-463	7.0	52.4
	5	8/17/94	538-548	5.8	43.4
MW-17	1	8/18/95	246-256	9.3	69.7
	2	8/18/95	366-376	16.8	125.7
	3	8/18/95	466-476	0.8	6.0
	4	8/18/95	578-588	0.4	3.0
	5	8/18/95	723-733	6.1	45.6
MW-18	1	8/17/95	266-276	3.1	23.2
	2	8/17/95	326-336	5.6	41.9
	3	8/17/95	421-431	10.8	80.8
	4	8/17/95	561-571	9.9	74.1
	5	8/21/95	681-691	2.0	15.0

TABLE 1-2

RESULTS OF AQUIFER TESTS IN DEEP JPL MULTI-PORT MONITORING WELLS

Multi-Port Well Number	Screen Number	Date of Test	Well Screen Depth Interval (ft)	Estimated Hydraulic Conductivity (ft/day)	Estimated Hydraulic Conductivity (gpd/ft²)
MW-19	1	8/19/95	240-250	4.3	32.2
	2	8/19/95	310-320	12.2	91.2
	3	8/19/95	390-400	1.1	8.2
	4	8/18/95	442-452	9.2	68.8
	5	8/17/95	492-502	2.9	21.7
MW-20	1	8/18/95	228-238	11.1	83.0
	2	8/18/95	388-398	10.1	75.5
	3	8/18/95	558-568	17.2	128.7
	4	8/18/95	698-708	1.9	14.2
	5	8/18/95	898-908	2.5	18.7
MW-21	1	8/17/95	86-96	3.5	26.2
	2	8/17/95	156-166	3.9	29.2
	3	8/17/95	236-246	4.2	31.4
	4	8/17/95	306-316	12.0	89.8
	5	8/17/95	366-376	6.2	46.4
MW-22	1	9/5/97	239-249	1.2	9.0
	2	9/5/97	324-334	6.7	50.1
	3	9/5/97	384-394	12.3	92.0
	4	9/5/97	464-474	7.0	52.4
	5	9/5/97	584-594	15.9	118.9
MW-23	1	8/29/97	170-180	2.4	17.9
	2	8/29/97	250-260	7.7	57.6
	3	8/29/97	315-325	2.4	17.9
	4	8/29/97	440-450	2.2	16.5
	5	8/29/97	540-550	0.2	1.5
MW-24	1	9/4/97	275-285	2.2	16.5
	2	9/4/97	370-380	11.4	85.3
	3	9/4/97	430-440	1.5	11.2
	4	8/22/97	550-560	11.6	86.8
	5	8/22/97	675-685	2.6	19.4

(1): Piezometric head too close to measurement port, test data not analyzed.

TABLE 1-3

SUMMARY OF WATER CHEMISTRY RESULTS FROM JPL MONITORING WELLS, NEARBY PRODUCTION WELLS AND COLORADO RIVER WATER JET PROPULSION LABORATORY

(concentrations in mg/L)

Well Number	Number of Samples		MAJOR ANIONS					MAJOR CATIONS					Measured TDS	Measured pH
			Cl	CO_3	HCO_3	NO_3-N	SO_4	Na	Mg	K	Ca	Fe		
MW-1	8	Average	14.3	0.8	210.1	1.3	37.4	26.9	15.1	4.6	47.4	0.1	276.3	7.7
		STDEV[1]	2.8	0.2	10.3	0.2	5.0	1.4	1.4	2.2	5.2	0.0	19.2	0.2
MW-3														
Screen 1	8	Average	9.7	0.7	191.9	0.8	31.5	17.9	15.0	2.7	43.1	0.7	250.0	7.6
		STDEV	3.9	0.6	21.5	0.4	6.5	1.5	1.9	0.2	5.4	0.5	30.7	0.3
Screen 2	8	Average	11.5	1.9	205.8	0.9	34.9	19.0	16.8	2.7	47.5	0.3	267.5	7.7
		STDEV	1.7	3.3	14.3	0.1	2.6	0.8	1.0	0.2	4.1	0.3	14.9	0.5
Screen 3	8	Average	21.6	5.2	154.8	0.1	15.7	39.0	9.6	6.2	21.3	0.6	207.5	8.6
		STDEV	4.0	2.1	11.3	0.1	5.0	2.2	1.9	8.8	1.0	0.4	15.8	0.2
Screen 4	8	Average	9.7	4.8	174.3	0.3	16.6	48.3	8.5	2.3	16.9	0.6	206.3	8.6
		STDEV	0.6	1.2	7.7	0.1	1.4	1.8	0.6	0.2	1.6	0.4	9.2	0.1
Screen 5	8	Average	9.6	7.9	146.5	0.1	15.2	67.3	1.1	1.2	6.7	0.1	203.8	9.0
		STDEV	0.4	6.0	8.1	0.0	8.4	2.6	0.1	0.2	2.5	0.0	21.3	0.2
MW-4														
Screen 1	8	Average	15.5	0.2	172.3	1.5	35.9	19.0	14.1	3.0	38.1	0.4	253.8	7.2
		STDEV	11.5	0.1	21.7	1.4	10.7	2.7	3.3	0.4	17.0	0.5	61.9	0.2
Screen 2	8	Average	55.9	0.3	189.0	7.8	66.9	27.3	24.8	2.5	65.9	0.9	432.5	7.2
		STDEV	14.2	0.1	8.5	0.8	10.4	2.5	2.0	0.2	8.4	1.4	74.8	0.2
Screen 3	8	Average	21.0	1.3	184.1	7.3	10.1	31.8	13.0	2.0	40.8	0.1	262.5	7.9
		STDEV	1.3	0.4	7.8	0.4	0.9	1.5	0.9	0.2	4.2	0.0	10.4	0.3
Screen 4	8	Average	14.6	1.6	188.4	4.2	7.7	38.3	10.4	2.0	31.6	0.5	235.0	8.0
		STDEV	0.7	0.3	7.4	1.4	0.5	2.4	0.7	0.2	4.0	0.4	12.0	0.2
Screen 5	8	Average	8.7	1.8	195.3	0.9	16.9	36.9	9.5	2.1	33.9	0.7	230.0	8.0
		STDEV	0.4	0.8	12.3	0.3	1.1	1.1	0.3	0.2	5.6	0.4	15.1	0.1
MW-5	8	Average	8.7	1.8	195.3	0.9	16.9	36.9	9.5	2.1	33.9	0.7	230.0	8.0
		STDEV	0.4	0.8	12.3	0.3	1.1	1.1	0.3	0.2	5.6	0.4	15.1	0.1
MW-6	8	Average	70.4	0.2	185.5	7.9	71.6	25.4	25.6	2.0	70.9	0.5	428.8	7.1
		STDEV	15.9	0.0	29.0	2.2	19.8	2.3	5.0	0.2	9.7	0.9	55.4	0.1
MW-7	8	Average	20.8	0.5	168.3	6.0	41.6	18.4	16.6	2.7	49.5	0.2	281.3	7.5
		STDEV	1.6	0.1	11.3	0.4	4.5	0.9	0.9	0.2	6.0	0.1	21.7	0.2
MW-8	8	Average	13.3	0.3	166.0	2.3	35.3	14.2	14.0	2.6	43.5	0.2	242.5	7.2
		STDEV	2.1	0.2	16.4	0.7	7.4	4.9	1.5	0.2	4.8	0.1	22.5	0.2
MW-9	8	Average	16.9	0.4	249.5	1.4	44.3	23.9	19.4	3.6	60.4	0.1	328.8	7.3
		STDEV	5.2	0.4	29.0	1.9	19.5	2.4	3.3	0.4	8.3	0.1	50.0	0.4
MW-10	8	Average	67.4	0.2	237.0	12.4	115.3	23.6	34.5	3.1	101.0	0.1	535.0	7.0
		STDEV	31.4	0.1	24.5	5.1	40.8	6.0	9.7	0.4	33.8	0.1	143.4	0.1
MW-11														
Screen 1	8	Average	15.8	1.8	246.3	0.5	39.4	28.4	19.0	3.6	52.6	0.3	308.8	8.0
		STDEV	1.6	0.6	16.0	0.3	2.6	6.4	1.4	0.3	4.3	0.2	29.0	0.2
Screen 2	8	Average	14.4	2.4	206.6	0.4	36.0	24.0	17.4	3.3	43.5	0.7	273.8	8.1
		STDEV	0.7	1.6	8.1	0.2	1.9	3.3	0.5	0.3	3.8	0.6	24.5	0.1
Screen 3	8	Average	11.8	3.1	211.6	0.2	26.1	28.9	13.4	2.5	43.4	0.3	253.8	8.2
		STDEV	0.7	0.9	11.5	0.1	2.5	3.6	1.2	0.2	4.6	0.1	16.9	0.2
Screen 4	8	Average	10.5	3.0	195.4	0.1	20.5	25.8	12.8	2.6	37.3	0.7	241.3	8.3
		STDEV	0.5	1.1	6.3	0.0	3.5	1.9	1.0	0.3	4.4	0.4	36.4	0.1
Screen 5	8	Average	10.4	2.3	159.4	0.1	17.6	47.5	2.2	1.3	24.4	0.2	200.0	8.2
		STDEV	0.9	0.7	5.5	0.0	1.1	1.3	0.2	0.2	3.1	0.1	27.3	0.2

TABLE 1-3

SUMMARY OF WATER CHEMISTRY RESULTS FROM JPL MONITORING WELLS, NEARBY PRODUCTION WELLS AND COLORADO RIVER WATER JET PROPULSION LABORATORY

(concentrations in mg/L)

Well Number	Number of Samples		MAJOR ANIONS					MAJOR CATIONS					Measured TDS	Measured pH
			Cl	CO_3	HCO_3	NO_3-N	SO_4	Na	Mg	K	Ca	Fe		
MW-12														
Screen 1	8	Average	12.7	0.4	199.0	1.1	37.2	26.0	15.3	3.5	41.3	0.7	266.7	7.4
		STDEV	2.9	0.1	6.2	0.6	1.3	8.8	1.8	0.5	7.3	0.6	35.6	0.3
Screen 2	8	Average	15.0	1.1	225.9	1.7	39.0	27.1	18.1	3.6	49.1	0.5	293.8	7.7
		STDEV	1.7	1.3	11.8	0.5	2.0	4.5	1.1	0.6	10.1	0.4	30.7	0.4
Screen 3	8	Average	15.6	1.6	222.0	1.1	33.5	24.8	15.8	3.1	50.0	0.5	283.8	7.9
		STDEV	1.5	0.5	9.6	0.2	2.4	1.3	1.0	0.2	8.4	0.4	19.2	0.2
Screen 4	8	Average	13.8	1.4	227.3	1.1	30.5	24.6	13.9	2.5	51.3	0.4	280.0	7.8
		STDEV	0.7	0.3	7.1	0.3	2.1	1.9	0.8	0.3	8.9	0.3	20.7	0.2
Screen 5	8	Average	12.1	2.2	213.4	0.8	19.3	41.5	10.2	2.5	37.6	0.2	261.3	8.0
		STDEV	0.8	1.5	5.9	0.3	3.8	9.7	2.3	0.4	8.7	0.2	18.9	0.1
MW-13	8	Average	29.6	0.3	177.8	8.5	62.6	23.4	20.1	2.9	58.6	0.2	352.5	7.3
		STDEV	12.2	0.1	24.5	2.5	6.3	2.4	2.7	0.3	8.7	0.2	39.9	0.2
MW-14														
Screen 1	8	Average	121.3	0.3	256.9	17.6	195.6	43.3	48.4	3.0	141.3	0.9	782.5	7.0
		STDEV	9.9	0.2	23.8	2.3	26.2	2.8	2.4	0.3	9.9	0.7	52.3	0.3
Screen 2	8	Average	115.6	0.7	307.1	14.8	174.4	35.4	53.6	2.9	143.8	1.1	773.8	98.1
		STDEV	6.8	0.5	47.5	0.9	8.6	1.1	4.2	0.2	17.3	0.7	92.4	256.6
Screen 3	8	Average	81.9	2.3	200.4	11.4	100.1	44.9	38.1	3.7	70.9	0.2	512.5	8.0
		STDEV	4.9	2.5	38.0	3.5	7.6	13.5	5.3	0.6	27.8	0.2	71.3	0.3
Screen 4	8	Average	27.3	1.5	181.1	9.8	17.1	29.1	17.3	2.3	46.5	0.3	298.8	8.0
		STDEV	3.5	0.8	12.3	0.5	3.4	3.2	1.3	0.3	10.5	0.2	27.5	0.1
Screen 5	8	Average	8.0	7.0	175.6	0.2	16.3	41.9	11.5	2.6	17.3	0.3	231.3	8.7
		STDEV	1.2	2.6	7.5	0.1	3.6	8.4	1.4	0.3	3.2	0.3	74.1	0.1
MW-15	8	Average	18.0	0.4	234.5	1.9	44.5	23.1	18.9	3.2	56.9	0.1	311.3	7.3
		STDEV	5.6	0.2	25.2	1.5	20.9	1.7	2.9	0.3	8.8	0.0	57.7	0.3
MW-16	8	Average	24.2	0.3	155.2	14.3	26.6	22.7	19.0	2.5	49.8	0.1	318.3	7.4
		STDEV	7.4	0.1	21.8	5.6	14.0	1.6	1.9	0.1	6.3	0.0	32.5	0.2
MW-17														
Screen 1	8	Average	5.9	0.4	159.8	0.6	25.6	13.9	12.0	2.2	36.4	0.1	190.0	7.6
		STDEV	0.7	0.2	14.9	0.2	3.4	1.0	1.1	0.2	3.7	0.1	15.1	0.2
Screen 2	8	Average	7.7	3.4	156.8	0.5	26.0	16.1	15.4	2.5	28.5	0.5	197.5	8.2
		STDEV	0.9	4.3	21.0	0.3	2.3	1.6	1.7	0.4	10.0	0.3	26.6	0.6
Screen 3	8	Average	12.0	1.1	184.4	1.3	30.0	25.3	15.2	1.9	36.0	0.7	232.5	7.9
		STDEV	2.2	0.6	9.2	0.7	1.7	13.3	3.2	0.2	9.7	0.4	21.2	0.2
Screen 4	8	Average	11.8	1.2	225.9	2.1	27.5	33.8	13.8	1.7	45.3	0.4	260.0	8.0
		STDEV	0.5	0.7	21.1	0.3	2.9	7.6	1.8	0.1	6.8	0.4	15.1	0.2
Screen 5	8	Average	12.4	1.7	212.6	2.1	28.6	37.5	12.6	1.8	42.3	1.8	263.3	8.1
		STDEV	0.7	0.8	12.2	0.3	3.2	5.1	1.1	0.1	4.2	1.6	22.1	0.2
MW-18														
Screen 1	8	Average	20.1	0.5	161.0	2.7	39.2	15.4	14.6	2.4	43.6	0.2	244.0	7.5
		STDEV	22.6	0.5	16.7	1.9	15.7	1.1	2.5	0.3	10.3	0.1	54.1	0.3
Screen 2	8	Average	11.7	0.7	203.0	1.3	36.9	18.4	16.1	2.7	49.8	0.2	260.3	7.6
		STDEV	1.8	0.4	11.9	0.4	3.0	0.9	1.4	0.3	6.6	0.1	22.4	0.3
Screen 3	8	Average	13.8	1.4	230.8	0.9	34.0	22.5	19.1	3.1	51.0	0.4	276.9	8.0
		STDEV	1.3	0.5	20.9	0.6	6.0	1.5	1.2	0.2	6.1	0.2	14.9	0.2
Screen 4	8	Average	9.4	2.1	195.4	0.7	27.1	33.8	11.3	1.7	38.1	0.2	235.6	8.2
		STDEV	1.9	1.0	16.7	0.2	9.7	3.7	2.2	0.5	6.5	0.1	27.7	0.2

TABLE 1-3

SUMMARY OF WATER CHEMISTRY RESULTS FROM JPL MONITORING WELLS, NEARBY PRODUCTION WELLS AND COLORADO RIVER WATER JET PROPULSION LABORATORY

(concentrations in mg/L)

Well Number	Number of Samples		MAJOR ANIONS					MAJOR CATIONS					Measured TDS	Measured pH
			Cl	CO_3	HCO_3	NO_3-N	SO_4	Na	Mg	K	Ca	Fe		
Screen 5	8	Average	11.3	8.0	170.3	0.2	12.3	52.3	6.7	1.9	14.5	0.2	202.5	8.8
		STDEV	1.7	4.9	10.3	0.3	16.5	3.7	3.1	0.4	7.4	0.2	34.5	0.4
MW-19														
Screen 1	8	Average	6.1	0.4	151.3	0.7	24.1	12.6	12.2	2.5	35.1	0.6	210.0	7.6
		STDEV	0.6	0.1	6.8	0.2	2.0	1.1	1.1	0.4	4.8	0.9	45.7	0.1
Screen 2	8	Average	41.4	0.2	193.6	4.7	64.6	15.9	25.1	2.1	63.3	2.2	373.8	7.1
		STDEV	12.4	0.1	14.9	1.2	12.7	1.7	4.5	0.5	16.4	2.8	77.4	0.2
Screen 3	8	Average	70.5	0.5	248.5	9.8	65.1	30.3	32.0	2.6	85.0	0.6	471.3	7.4
		STDEV	5.7	0.2	9.5	0.6	5.3	1.4	1.9	0.3	8.9	0.5	28.0	0.2
Screen 4	8	Average	34.3	0.9	232.9	4.6	45.0	27.0	23.8	2.2	61.4	1.0	356.3	7.8
		STDEV	5.7	0.4	15.0	0.5	6.4	1.1	2.4	0.3	10.9	0.6	38.9	0.2
Screen 5	8	Average	62.4	1.1	250.5	7.8	56.8	32.9	29.3	2.5	79.4	0.5	450.0	7.8
		STDEV	7.4	0.5	25.7	1.6	5.8	1.8	2.1	0.2	13.8	0.3	46.0	0.2
MW-20														
Screen 1	8	Average	57.0	0.9	187.7	13.8	132.5	26.2	33.7	3.8	93.5	0.7	506.7	7.8
		STDEV	4.6	0.4	17.3	5.9	22.5	4.8	3.4	0.2	15.9	0.6	65.0	0.2
Screen 2	8	Average	14.8	12.6	159.8	1.3	33.1	40.3	14.0	2.2	22.3	0.3	235.0	8.8
		STDEV	2.8	13.9	20.6	1.4	5.6	19.0	3.7	0.1	15.7	0.1	22.7	0.6
Screen 3	8	Average	26.3	7.1	208.3	1.6	21.9	55.3	14.8	2.6	25.3	0.4	266.3	8.6
		STDEV	3.2	7.9	19.4	1.0	7.5	8.5	3.8	0.3	10.2	0.6	33.4	0.4
Screen 4	8	Average	11.4	4.3	167.5	0.1	30.1	72.1	3.1	1.1	10.4	0.2	208.8	8.6
		STDEV	2.7	2.1	12.3	0.0	25.9	20.2	1.1	0.5	2.0	0.0	12.5	0.2
Screen 5	8	Average	8.5	14.2	179.8	0.1	23.0	74.8	2.1	1.6	10.5	0.1	230.3	9.0
		STDEV	0.4	6.5	5.4	0.0	2.4	5.6	0.5	0.1	3.6	0.1	10.7	0.2
MW-21														
Screen 1	8	Average	72.7	0.2	197.5	13.4	100.7	29.3	31.5	2.2	85.5	0.2	523.3	7.1
		STDEV	8.3	0.1	11.8	6.7	10.4	2.0	1.0	0.1	10.3	0.1	50.9	0.3
Screen 2	8	Average	126.9	0.6	318.8	7.4	154.4	55.4	46.0	3.3	131.9	0.2	758.8	7.4
		STDEV	7.5	0.3	16.7	1.3	12.1	4.2	2.9	0.3	10.7	0.2	40.9	0.2
Screen 3	8	Average	93.5	0.8	300.1	9.2	89.8	38.5	37.4	3.2	113.5	0.9	586.3	7.6
		STDEV	5.2	0.4	16.5	0.7	3.8	2.9	2.9	0.2	10.7	0.4	25.0	0.2
Screen 4	8	Average	54.3	0.8	239.4	9.1	53.4	29.1	25.6	2.4	79.3	0.3	425.0	7.6
		STDEV	10.9	0.8	18.9	1.1	16.4	2.9	4.4	0.3	12.9	0.3	60.9	0.3
Screen 5	8	Average	58.8	1.0	242.0	9.8	68.1	33.1	28.9	2.9	79.3	2.2	461.3	7.8
		STDEV	3.4	0.6	11.8	0.8	5.5	2.9	1.4	0.2	12.7	1.0	41.2	0.2
MW-22														
Screen 1	2	Average	106.0	0.6	262.0	9.9	140.0	32.0	43.0	3.5	109.0	1.8	685.0	7.5
		STDEV	19.8	0.2	25.5	1.6	28.3	2.8	8.5	0.1	15.6	0.3	134.4	0.1
Screen 2	2	Average	52.0	1.1	207.0	9.4	50.5	32.0	25.0	2.9	60.5	1.0	390.0	7.9
		STDEV	7.1	0.8	8.5	0.4	10.6	0.0	0.0	0.3	12.0	0.4	14.1	0.4
Screen 3	2	Average	27.5	1.2	186.0	8.3	18.5	34.0	14.5	2.3	44.0	0.6	295.0	8.0
		STDEV	0.7	0.0	4.2	0.6	0.7	1.4	0.7	0.1	2.8	0.1	7.1	0.0
Screen 4	2	Average	11.5	0.9	170.0	4.3	8.1	28.5	9.8	1.9	34.0	0.4	230.0	7.9
		STDEV	0.7	0.0	0.0	0.1	0.1	0.7	0.3	0.0	1.4	0.1	0.0	0.0
Screen 5	2	Average	10.5	6.0	159.0	0.2	44.0	67.0	5.3	1.9	12.5	0.9	245.0	8.8
		STDEV	0.8	2.4	38.2	0.1	18.4	8.5	3.2	0.1	2.1	0.9	21.2	0.1

TABLE 1-3

SUMMARY OF WATER CHEMISTRY RESULTS FROM JPL MONITORING WELLS, NEARBY PRODUCTION WELLS AND COLORADO RIVER WATER JET PROPULSION LABORATORY

(concentrations in mg/L)

Well Number	Number of Samples		MAJOR ANIONS					MAJOR CATIONS					Measured TDS	Measured pH
			Cl	CO_3	HCO_3	NO_3-N	SO_4	Na	Mg	K	Ca	Fe		
MW-23														
Screen 1	2	Average	115.0	0.3	311.0	13.5	165.0	35.0	49.5	3.6	155.0	1.1	520.0	7.2
		STDEV	7.1	0.1	8.5	0.7	7.1	1.4	6.4	0.1	35.4	0.9	410.1	0.1
Screen 2	2	Average	99.0	0.3	241.0	14.5	135.0	36.5	39.5	3.5	87.0	0.4	640.0	7.3
		STDEV	1.4	0.0	12.7	0.7	7.1	2.1	4.9	0.2	25.5	0.4	56.6	0.0
Screen 3	2	Average	24.0	0.7	174.0	9.2	14.5	28.0	14.5	2.1	42.5	2.3	285.0	7.8
		STDEV	0.0	0.3	4.2	0.1	0.7	1.4	0.7	0.0	3.5	3.0	7.1	0.1
Screen 4	2	Average	12.5	2.9	160.0	4.4	7.6	29.0	13.5	2.3	28.5	0.6	220.0	8.2
		STDEV	0.7	3.4	2.8	1.1	0.4	2.8	4.9	0.1	6.4	0.0	0.0	0.7
Screen 5	2	Average	39.0	19.8	193.0	0.1	56.5	106.0	4.7	4.0	14.3	0.4	355.0	9.1
		STDEV	1.4	16.9	1.4	0.0	19.1	15.6	2.0	0.1	10.9	0.1	7.1	0.4
MW-24														
Screen 1	2	Average	17.0	2.0	170.0	4.1	38.0	26.0	17.5	3.6	34.5	0.4	275.0	8.3
		STDEV	4.2	0.2	8.5	2.2	1.4	4.2	2.1	0.4	6.4	0.2	35.4	0.1
Screen 2	2	Average	38.5	4.9	162.5	2.1	20.5	41.5	15.5	3.4	26.0	0.8	300.0	8.6
		STDEV	0.7	4.4	10.6	0.2	2.1	3.5	3.5	0.0	17.0	0.3	28.3	0.5
Screen 3	2	Average	21.5	6.3	186.5	1.4	14.0	45.0	11.5	2.6	29.0	1.2	265.0	8.4
		STDEV	6.4	8.0	3.5	0.5	2.8	5.7	0.7	0.2	14.1	0.8	21.2	0.9
Screen 4	2	Average	11.5	3.5	182.0	2.5	10.4	41.5	10.3	2.5	26.5	0.4	220.0	8.4
		STDEV	0.7	3.2	9.9	0.1	0.9	3.5	1.1	0.1	9.2	0.1	56.6	0.5
Screen 5	2	Average	9.1	1.1	210.0	1.0	23.0	41.5	8.9	2.2	40.0	2.5	245.0	7.9
		STDEV	0.1	0.0	4.2	0.1	0.0	2.1	0.0	0.2	4.2	2.6	49.5	0.0
City of Pasadena														
Arroyo	1	Average	14	<1	136	--	30	21	15	--	45	<0.1	250	7.4
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Well 52	1	Average	26	<1	178	--	37	34	16	--	47	<0.1	302	7.5
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Ventura	1	Average	54	<1	197	--	72	28	28	--	81	<0.1	424	7.5
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Windsor	1	Average	35	<1	218	--	41	35	19	--	60	<0.1	347	7.4
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Lincoln Avenue														
Well 3	1	Average	9	<1	195	--	29	17	16	--	48	<0.1	225	7.6
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Well 5	1	Average	12	<1	209	--	32	24	16	--	49	<0.1	253	7.7
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Valley Water Company														
Well 1	4	Average	105	0.23	250	--	184	46	42	--	130	0.12	680	7.1
		STDEV	4.1	0.10	31.8	--	17.0	4.1	1.5	--	10	0.04	24	0.3
Well 2	5	Average	98	0.74	253	--	173	68	38	--	106	0.07	656	7.5
		STDEV	9.9	0.60	26	--	6.7	11	4.8	--	22	0.05	36	0.4
Well 3	3	Average	88	0.34	234	--	145	48	36	--	101	0.29	620	7.3
		STDEV	5.3	0.10	19	--	13	7.0	5.3	--	11	0.22	20	0.1
Well 4	5	Average	93	0.34	241	--	160	59	34	--	109	0.06	632	7.3
		STDEV	9.0	0.15	86	--	54	13	5.4	--	17	0.03	74	0.3

TABLE 1-3

SUMMARY OF WATER CHEMISTRY RESULTS FROM JPL MONITORING WELLS, NEARBY PRODUCTION WELLS AND COLORADO RIVER WATER JET PROPULSION LABORATORY

(concentrations in mg/L)

Well Number	Number of Samples		MAJOR ANIONS					MAJOR CATIONS					Measured TDS	Measured pH
			Cl	CO_3	HCO_3	NO_3-N	SO_4	Na	Mg	K	Ca	Fe		
La Canada Irrigation District														
Well 1	2	Average	38	--	202	--	52	38	21	--	55	0.51	341	7.6
		STDEV	11.3	--	9.9	--	12.7	7.8	1.0	--	21	0.5	28	0.2
Rubio Cañon														
Well 4	1	Average	22	<1	220	--	61	25	25	--	50	<0.1	321	7.8
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Well 7	1	Average	18	<1	233	--	20	48	11	--	36	<0.1	259	7.9
		STDEV	--	--	--	--	--	--	--	--	--	--	--	--
Las Flores Water Company														
Well 2	3	Average	38	<1	223	--	65	23	25	--	78	<0.1	383	7.4
		STDEV	3.5	--	10.5	--	11.5	2.3	0.0	--	9.7	--	24	0.2
Colorado River Water														
Weymouth Plant[2]	2	Average	92	0.20	113	0.22	247	97	29	4.5	68	<0.1	6.5	8.04
		STDEV	1.0	0.1	2.1	0.1	4.2	1.0	0.5	0.0	0.0	--	4.9	0.01

Note:

(1): Standard Deviation.

(2): Colorado River water used for injection in the JPL study area comes from the Weymouth Plant, where it is blended with 15% California Water Project water before distribution. "Samples" represent annual averages of discharge water from Weymouth Plant as reported by the Metropolitan Water District for 1995 and 1996.

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-1	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.9(TB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	1.9(EP) Acetone	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	1.3 m, p-Xylenes 1.2 Toluene	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-3												
Screen 1	Jun/Jul 1994	X	–	–	–	–	–	–	–[UJ]	–	0.9 Toluene	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	1.2(TB)	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	8.3	0.7(B) Naphthalene	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	2.6(EP) Carbon Disulfide	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 2	Jun/Jul 1994	X	–	–	–	–	–	–	–	2.6	–	NA
	Nov/Dec 1994		–	0.6	–	–	–	–	–	1.1	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	5.5(TB)	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	4.8	1.9(B) Naphthalene	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	4.4	8.0(EP) Carbon Disulfide	NA
	Jun/Jul 1997		–	–	–	–	–	–	1.0	1.2	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	0.8(EB)	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 3	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		**0.6**	0.8	–	–	–	–	–	1.6(TB)	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	0.7	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	0.8	–	NA
	Jun/Jul 1997		**1.2**	0.8	0.6	–	–	–	2.8	1.8	–	**21**
	Sep/Oct 1997	X	**1.2**	0.5	–	–	–	–	–	1.6	–	13
	Jan/Feb 1998	X	**1.2**	–	–	–	–	–	–	2.7	–	6.5

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 4	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.2(TB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	1.0(EP) Hexane	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	4.7(EP) Carbon Disulfide[4]	–
Screen 5	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	0.7(EP) Carbon Disulfide	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	0.5 Ethylbenzene 2.2(EP) Carbon Disulfide	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.1 Dichloromethane	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	2.1(TB, EP) Acetone 1.2(EP) Carbon Disulfide	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	1.5(EP) Carbon Disulfide 2.7(EP) Sulfur Dioxide 1.3(EP) Unknown (RT=2.51)	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	4.5(EP) Carbon Disulfide	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-4												
Screen 1	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.9(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	7.4
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	9.6
Screen 2	Jun/Jul 1994	X	**1.9**	**7.9**	–	–	**0.8**	–	–	3.6	–	NA
	Nov/Dec 1994	X	**1.3(EB)**	2.5(EB)	–	–	–	–	–	1.7(EB)	1.6(EP) 2-Methylpropane	NA
	Aug/Sep 1996		**5.5**	**19**	–	–	**0.9**	0.7	–	6.7	3.2(B,EP) Acetone	NA
	Oct/Nov 1996		**5.3**	**15**	–	–	**0.6**	0.8	–	5.4	1.8(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		**7.9**	**19**	–	–	**0.8**	0.8	–	7.8	–	NA
	Jun/Jul 1997		**4.0**	**5.7**	–	–	–	0.5	–	3.4	–	**51**
	Sep/Oct 1997	X	**4.0**	**8.0**	0.5	0.6	–	0.5	–	3.5(EB)	–	**34**
	Jan/Feb 1998	X	**1.9**	2.7	0.6	–	–	–	–	1.8	–	**30**

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 3	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	3.0(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.5(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 4	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	3.9(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.6(EB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 5	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.9(EB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	7.4(EP) Hexane	–
MW-5	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	1.1	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	4.2

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-6	Jun/Jul 1994	X	–	–	–	–	–	–[UJ]	–	–	–	NA
	Nov/Dec 1994		–	0.7	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	1.3(TB)	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	0.8	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	5.5
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	2.0	1.0	–	–	–	–	–	–
MW-7	Jun/Jul 1994	X	**180,190(DUP)**	**33,34(DUP)**	1.5,1.6(DUP)	–	**1.0,1.0(DUP)**	1.5,1.6(DUP)	3.9[J],3.8[J](DUP)	–	–	NA
	Nov/Dec 1994	X	**310,280(DUP)**	**29,26(DUP)**	2.6,2.6(DUP)	–	--	2.3,2.2(DUP)	8.2,8.3(DUP)	–	–	NA
	Aug/Sep 1996		**90**	**39**	0.8	–	**1.2**	1.1	8.8	13(TB)	–	NA
	Oct/Nov 1996		**170**	**27**	1.3	–	**0.8**	2.3	7.7	14	4.3(B,EP) 1,1-Difluoroethane 2.8(B,EP) Acetone	NA
	Feb/Mar 1997		**45**	**27**	0.6	–	**0.8**	0.9	5.1	9.9	–	NA
	Jun/Jul 1997		**39**	**23**	0.7	–	**0.8**	1.0	4.1	11	10(EP) Unknown	**285**
	Sep/Oct 1997	X	**93[J]**	**22[J]**	1.1	–	**0.9**	1.3	4.7	13	–	**550**
	Jan/Feb 1998	X	**150[J]**	**24[J]**	3.7	–	**0.8**	2.1[J]	6.4	13	–	**720**
MW-8	Jun/Jul 1994	X	–	–	–	–	–	–	–	2.3	–	NA
	Nov/Dec 1994	X	**5.3**	3.5	–	–	–	–	0.9	2.3	–	NA
	Aug/Sep 1996		**4.0**	4.6	–	–	–	–	–	1.3	–	NA
	Oct/Nov 1996		**2.8**	2.2	–	–	–	–	0.6	0.6	1.7(TB, EP) Acetone	NA
	Feb/Mar 1997		**1.5**	4.5	–	–	–	–	–	1.3	1.1 Freon 11 1.9(EP) Carbon Disulfide	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	6.4
	Sep/Oct 1997	X	**3.2[J]**	3.6[J]	–	–	–	–	–	1.2[J]	1.0 Freon 11[J]	**29**
	Jan/Feb 1998	X	**1.8**	1.3[J]	–	–	–	–[UJ]	–	0.8	0.8 Freon 11	11
MW-9	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	3.9(EP) Unknown RT=6.21	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-10	Jun/Jul 1994	X	**0.5**	**24**	0.7	–	–	–	1.8	1.7	1.2 1,1,1-TCA 0.8 Toluene[5]	NA
	Nov/Dec 1994	X	–	**14**	1.2	1.5	–	–	0.9	1.9	–	NA
	Aug/Sep 1996		**0.7**	**18**	0.5	–	–	–	1.2	1.4(TB)	–	NA
	Oct/Nov 1996		**0.6**	**6.6**	1.0	1.9	–	–	0.8	1.1	3.0(B,EP) Acetone 1.1(EP) Unknown scan #350	NA
	Feb/Mar 1997		–	**5.2**	–	–	–	–	–	0.6	–	NA
	Jun/Jul 1997		–	2.2	–	–	–	–	–	–	–	11
	Sep/Oct 1997	X	–	4.3	1.3	1.2	–	–	–	1.0	–	16
	Jan/Feb 1998	X	–	1.1	2.2	1.6	–	–	–	1.4	–	4.7
MW-11												
Screen 1	Jun/Jul 1994	X	**0.6**	–	–	–	–	–	–[UJ]	0.7	–	NA
	Nov/Dec 1994		–	0.6	–	–	–	–	–	5.3	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.6(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	7.1 MTBE 1.8(TB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		**1.4**	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–[UJ]	–	–	–	–
Screen 2	Jun/Jul 1994	X	–	–	–	–	–	–[UJ]	–[UJ]	0.6	0.7(EP) MTBE 0.5(EP) Carbon Disulfide	NA
	Nov/Dec 1994	X	**0.6,1.0(DUP)**	–	–	–	–	–	–	1.9	–	NA
	Aug/Sep 1996		**2.4**	–	–	–	–	–	–	1.0	–	NA
	Oct/Nov 1996		**1.1**	–	–	–	–	–	–	1.2	–	NA
	Feb/Mar 1997		**1.7**	–	–	–	–	–	–	1.0	–	NA
	Jun/Jul 1997		**1.2**	–	–	–	–	–	–	1.0	–	–
	Sep/Oct 1997	X	**0.6**	–	–	–	–	–	–	0.6(EB)	–	–
	Jan/Feb 1998	X	**0.7**	–	–	–	–	–[UJ]	–	0.7	–	–
Screen 3	Jun/Jul 1994	X	–	–	–	–	–	–	–[UJ]	0.6	0.5(EP) Carbon Disulfide	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	0.5	–	NA
	Aug/Sep 1996		**0.9**	–	–	–	–	–	–	1.3	2.9(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	1.4	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	1.1	–	NA
	Jun/Jul 1997		**0.7**	–	–	–	–	–	–	1.4	–	–
	Sep/Oct 1997	X	**0.6**	–	–	–	–	–	–	1.3(EB)	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–[UJ]	–	1.4	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 4	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	0.5(EP) Carbon Disulfide	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	0.5	2.4(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	1.5(EP) 2-Methyl-1-Propene	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	0.5	–	–
Screen 5	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.4(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.1(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	44(TB, EP) Carbon Disulfide[4]	–
MW-12												
Screen 1	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	4.1	–	NA
	Oct/Nov 1996		Not Sampled*									
	Feb/Mar 1997		–	–	–	–	–	–	–	5.8	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	0.5	–	–
	Sep/Oct 1997		Not Sampled*									
	Jan/Feb 1998	X	–	–	–	–	–	–[UJ]	–	0.8	–	–
Screen 2	Jun/Jul 1994	X	**0.8,0.7(DUP)**	3.0,2.8(DUP)	1.2,1.1(DUP)	–	–	–	–	1.6(TB),1.5(TB)(DUP)	–	NA
	Nov/Dec 1994	X	**2.3**	1.4	0.6	–	–	–	–	2.1	–	NA
	Aug/Sep 1996		**0.9**	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		**1.5**	0.6	–	–	–	–	0.5	–	–	NA
	Feb/Mar 1997		**1.1**	0.5	–	–	–	–	–	–	1.1(B,EB,EP) Acetone	NA
	Jun/Jul 1997		**1.0**	–	–	–	–	–	–	0.8	–	6.9
	Sep/Oct 1997	X	**0.8**	–	–	–	–	–	–	0.8(EB)	–	5.8
	Jan/Feb 1998	X	**1.1**	–	–	–	–	–[UJ]	–	0.6	–	6.3

TABLE 1-4

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JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 3	Jun/Jul 1994	X	3.5	–	–	–	–	–	–	1.5(TB)	0.5(EP) Carbon Disulfide	NA
	Nov/Dec 1994	X	7.1	0.6	–	–	–	–	–	5.1	–	NA
	Aug/Sep 1996		4.5	–	–	–	–	–	–	1.3	–	NA
	Oct/Nov 1996		3.8	–	–	–	–	–	–	1.3	1.6(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		6.4	–	–	–	–	–	–	1.4	1.3(B,EP) Acetone	NA
	Jun/Jul 1997		20	–	–	–	–	–	–	1.6	–	5.7
	Sep/Oct 1997	X	14	–	–	–	–	–	–	1.7(EB)	–	6.2
	Jan/Feb 1998	X	23[J]	–	–	–	–	–[UJ]	–	2.3[J]	–	5.9
Screen 4	Jun/Jul 1994	X	2.7	–	–	–	–	–	–	1.1(TB)	1.1 Dichloromethane[5]	NA
	Nov/Dec 1994	X	2.1	–	–	–	–	–	–	1.5(TB)	–	NA
	Aug/Sep 1996		6.3	–	–	–	–	–	–	1.4	–	NA
	Oct/Nov 1996		5.1	–	–	–	–	–	–	1.4	2.5(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		4.9	–	–	–	–	–	–	1.3	–	NA
	Jun/Jul 1997		4.9	–	–	–	–	–	–	1.3	–	7.3
	Sep/Oct 1997	X	3.8	–	–	–	–	–	–	1.0(EB)	–	7.6
	Jan/Feb 1998	X	4.0	–	–	–	–	–[UJ]	–	1.1	–	8.0
Screen 5	Jun/Jul 1994	X	0.7	–	–	–	–	–	–	0.7(TB)	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		3.4	–	–	–	–	–	–	0.7	–	NA
	Oct/Nov 1996		1.3	–	–	–	–	–	–	–	1.5(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		1.7	–	–	–	–	–	–	0.5	–	NA
	Jun/Jul 1997		1.9	–	–	–	–	–	–	0.5	–	4.1
	Sep/Oct 1997	X	1.3	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	1.3	–	–	–	–	–[UJ]	–	–	–	–
MW-13	Jun/Jul 1994	X	15,18(DUP)	71,73(DUP)	0.7,0.8(DUP)	–	8.4,8.9(DUP)	1.6,1.7(DUP)	–	38,37(DUP)	0.7 Toluene[5],(0.9DUP)[5]	NA
	Nov/Dec 1994	X	69,70(DUP)	66,50(DUP)	0.9,0.9(DUP)	–	5.6,5.4(DUP)	2.4,2.3(DUP)	–,1.3(DUP)	30,31(DUP)	–	NA
	Aug/Sep 1996		21	47	0.6	–	2.5	1.5	0.7	21(TB)	–	NA
	Oct/Nov 1996		27	27	–	–	1.9	1.5	0.6	14	–	NA
	Feb/Mar 1997		18	28	–	–	0.9	1.1	0.6	9.2	–	NA
	Jun/Jul 1997		6.4	24 E	–	–	0.9	0.5	–	11	–	130
	Sep/Oct 1997	X	8.2	19	–	–	1.1	0.5	–	10	–	210
	Jan/Feb 1998	X	12	5.2	0.5	–	–	0.5 (DUP)[3]	–	2.9	1.8 Freon 11	99

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JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-14												
Screen 1	Jun/Jul 1994	X	–	–	0.5	2.0	–	–	–	0.9	–	NA
	Nov/Dec 1994		–	–	–	3.9	–	–	–	0.5	–	NA
	Aug/Sep 1996		–	–	–	2.4	–	–	–	0.6	–	NA
	Oct/Nov 1996		–	–	–	2.9	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	0.7	1.5	–	–	–	0.7	–	NA
	Jun/Jul 1997		–	–	–	2.0	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	1.9	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	2.1	–	–	–	0.5	–	–
Screen 2	Jun/Jul 1994	X	–	–	0.6	0.6	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	0.7	0.6	–	–	–	–	–	NA
	Aug/Sep 1996		–	2.8	1.6	1.4	–	–	–	1.5	–	NA
	Oct/Nov 1996		–	1.5	1.6	1.0	–	–	–	0.9	0.6 1,2,3-Trichlorobenzene 1.1(EB, EP) Acetone	NA
	Feb/Mar 1997		–	0.9	1.9	1.3	–	–	–	0.8	0.8 1,2,3-Trichlorobenzene 1.1(EP) Acetone	NA
	Jun/Jul 1997		–	1.1	1.7	1.5	–	–	–	0.9	0.5 1,2,3-Trichlorobenzene	–
	Sep/Oct 1997	X	–	1.2	1.9	1.6	–	–	–	0.8(EB)	–	–
	Jan/Feb 1998	X	–	–	1.2	0.7	–	–	–	–	8.9(EB,TB,EP) Carbon Disulfide[4]	9.0
Screen 3	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	4.3
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	5.6
Screen 4	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 5	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.1(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.6(EB,TB,EP) Acetone 1.3(EP) Carbon Disulfide	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	4.6(EB,TB,EP) Carbon Disulfide[4]	–
MW-15	Jun/Jul 1994	X	–	–	–	–	–	–	–	–	–	NA
	Nov/Dec 1994		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	2.6(TB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-16	Jun/Jul 1994	X	**150**	**43**	1.5	–	**4.0**	2.3	1.0	58	–	NA
	Nov/Dec 1994	X	**200**	**29**	3.0	–	**3.0**	4.7	2.0	41	–	NA
	Aug/Sep 1996		**125**	**33**	1.3	–	**2.4**	2.2	2.0	40(TB)	–	NA
	Oct/Nov 1996		Not Sampled*									
	Feb/Mar 1997		**91**	**23**	1.3	–	**1.7**	2.6	1.6	29	–	NA
	Jun/Jul 1997		**68**	**25**	1.1	–	**2.1**	1.7	0.6	43	–	**615**
	Sep/Oct 1997		Not Sampled*									
	Jan/Feb 1998	X	**30[J]**	3.5	1.0	–	–	1.3[J]	–	14	–	**1230**
MW-17												
Screen 1	July 1995		–	–	–	–	–	–	–	–	–	NA
	Dec 1995		–	–	–	–	–	–	–	0.7	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	4.3(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.4(EB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	2.9	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 2	July 1995		–	–	–	–	–	–	–	5.6,7.1(DUP)	–	NA
	Dec 1995		–	–	–	–	–	–	–	6.4	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	3.8	4.5(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	6.0	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	5.2	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	4.1	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	6.1	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	5.4	–	–
Screen 3	July 1995		–	–	–	–	–	–	–	4.5	–	NA
	Dec 1995	X	–	–	–	–	–	–	–	9.4	–	NA
	Aug/Sep 1996		**2.0**	**7.9**	–	–	–	–	–	7.5	–	NA
	Oct/Nov 1996		**3.3**	**18**	0.8	–	–	–	–	8.7	–	NA
	Feb/Mar 1997		**5.1**	**23**	1.1	–	–	–	–	6.2	–	NA
	Jun/Jul 1997		**1.3**	**5.9**	–	–	–	–	–	8.2	–	12
	Sep/Oct 1997	X	**6.6**	**22**	1.4	–	–	–	–	9.2(EB)	–	**55**
	Jan/Feb 1998	X	**3.3**	**8.7**	–	–	–	–	–	6.8	–	**25**
Screen 4	July 1995		–	1.5	–	–	–	–	–	3.0	2.2(EB,TB,EP) Acetone	NA
	Dec 1995	X	–	**8.4**	0.5	–	–	–	–	1.2	–	NA
	Aug/Sep 1996		–	**9.5**	0.5	–	–	–	–	1.1	–	NA
	Oct/Nov 1996		–	**8.9**	–	–	–	–	–	1.5	–	NA
	Feb/Mar 1997		–	**5.8**	–	–	–	–	–	0.7	–	NA
	Jun/Jul 1997		–	4.5	–	–	–	–	–	0.6	–	13
	Sep/Oct 1997	X	–	**6.8**	0.5	–	–	–	–	1.0(EB)	–	16
	Jan/Feb 1998	X	–	**7.3**	0.6	–	–	–	–	1.2	–	16
Screen 5	July 1995	X	–	1.3	–	–	–	–	–	3.5	–	NA
	Dec 1995	X	–	**12**	–	–	–	–	–	2.1	–	NA
	Aug/Sep 1996		–	**13**	0.6	–	–	–	–	1.7	3.4(B,EP) Acetone	NA
	Oct/Nov 1996		–	**16**	0.7	–	–	–	–	1.7	–	NA
	Feb/Mar 1997		–	**14**	0.7	–	–	–	–	1.3	–	NA
	Jun/Jul 1997		–	**11**	0.7	–	–	–	–	1.3	–	12
	Sep/Oct 1997	X	–	**8.6**	0.6	–	–	–	–	1.4(EB)	–	15
	Jan/Feb 1998	X	–	**7.9**	–	–	–	–	–	1.5	–	15

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-18												
Screen 1	July 1995		–	–	–	–	–	–	–	–	2.8(EP) Acetone	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	1.6	–	NA
	Oct/Nov 1996		Not Sampled*									
	Feb/Mar 1997		–	–	–	–	–	–	–	3.0	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	0.8	–	–
	Sep/Oct 1997		Not Sampled*									
	Jan/Feb 1998		Not Sampled*									
Screen 2	July 1995		–	–	–	–	–	–	–	–	5.0(EB, EP) Acetone	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	7.3	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	8.2(EB)	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	1.9	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	4.5	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	2.5(EB)	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	3.7	–	–
Screen 3	July 1995		–	–	–	–	–	–	–	1.5	5.5(EB, EP) Acetone	NA
	Dec 1995	X	**0.5**	–	–	–	–	–	–	4.3	1.9(EB,TB,EP) Acetone	NA
	Aug/Sep 1996		**0.7**	4.7	2.8	–	–	–	–	5.1	–	NA
	Oct/Nov 1996		**0.7**	**6.4**	3.2	–	–	–	–	5.6	–	NA
	Feb/Mar 1997		**0.8**	**6.6**	2.9	–	–	–	–	5.1	–	NA
	Jun/Jul 1997		**0.6**	2.4	1.8	–	–	–	–	4.4	–	–
	Sep/Oct 1997	X	–	3.0	1.9	–	–	–	–	6.2(EB)	–	–
	Jan/Feb 1998	X	–	1.9	1.7	–	–	–	–	6.6	4.1(EP) Unknown RT=4.33	–
Screen 4	July 1995		–	–	–	–	–	–	–	0.9	1.9(EB, EP) Acetone	NA
	Dec 1995	X	**1.8**	–	0.5	–	–	–	–	0.6	–	NA
	Aug/Sep 1996		**2.2**	–	0.7	–	–	–	–	0.5	–	NA
	Oct/Nov 1996		**2.2**	–	0.7	–	–	–	–	0.5	1.4(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		**2.2**	–	1.5	–	–	–	–	0.6	–	NA
	Jun/Jul 1997		**1.9**	–	0.7	–	–	–	–	–	–	11
	Sep/Oct 1997	X	**2.4**	–	0.7	–	–	–	–	–	1.5(EP) Carbon Disulfide	12
	Jan/Feb 1998	X	**2.6**	–	1.0	–	–	–	–	0.5	–	11

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 5	July 1995	X	–	–	–	–	–	–	–	0.8	2.4(EB,TB,EP) Acetone	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	1.6(EB,TB,EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	1.1(EP) Carbon Disulfide	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-19												
Screen 1	July 1995		–	–	–	–	–	–	–	–	0.7 Dichloromethane 0.5(EP) Carbon Disulfide 5.1(EP) Acetic Acid	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	0.9	3.7(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	0.6	2.9(EB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	0.8	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	2.5	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	1.4(EB)	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	0.8	–	–
Screen 2	July 1995	X	–	–	–	–	–	–	–	–	1.0(EP) Carbon Disulfide 2.0(EP) Acetic Acid	NA
	Dec 1995		–	–	0.7	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	0.8	–	–	–	–	–	3.0(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	1.1	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	0.6	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	0.6	0.9	–	–	–	–	–	–	–
Screen 3	July 1995		–	–	1.3	–	–	–	–	–	–	NA
	Dec 1995	X	–	–	1.8	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	3.1	–	–	–	–	–	2.6(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	2.5	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	2.1	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	2.0	–	–	–	–	–	–	4.1
	Sep/Oct 1997	X	–	–	1.5	–	–	–	–	–	0.6 Toluene	–
	Jan/Feb 1998	X	–	–	2.1	–	–	–	–	–	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 4	July 1995	X	**0.6,0.6(DUP)**	2.3,2.4(DUP)	–	–	–	–	–	1.5,1.8(DUP)	1.8(EP) Acetone	NA
	Dec 1995	X	–	1.3	–	–	–	–	–	1.3	–	NA
	Aug/Sep 1996		**0.5**	1.5	–	–	–	–	–	2.1	–	NA
	Oct/Nov 1996		–	1.5	–	–	–	–	–	1.9	–	NA
	Feb/Mar 1997		–	1.1	0.6	–	–	–	–	1.5	–	NA
	Jun/Jul 1997		–	0.7	–	–	–	–	–	1.3	–	–
	Sep/Oct 1997	X	–	0.7	0.6	–	–	–	–	1.7(EB)	–	4.9
	Jan/Feb 1998	X	–	0.5	0.6	–	–	–	–	1.3	–	–
Screen 5	July 1995		–	–	1.3	–	–	–	–	–	2.2(EB, EP) Acetone	NA
	Dec 1995		–	–	1.5	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	3.0	–	–	–	–	0.6	1.6(B,EP) Unknown scan #940	NA
	Oct/Nov 1996		–	–	2.4	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	1.7	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	1.5	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	2.2	–	–	–	–	0.8(EB)	–	–
	Jan/Feb 1998	X	–	–	1.4	–	–	–	–	–	–	–
MW-20												
Screen 1	July 1995		–	–	–	–	–	–	–	–	2.1(EB,TB,EP) Acetone	NA
	Dec 1995		–	–	–	–	–	–	–	–	1.6(EP) Unknown Scan #1047	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	0.7	3.4(B,EP) Acetone	NA
	Oct/Nov 1996		Not Sampled*	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	1.4	2.4(EB, EP) Acetone	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	0.8	–	5.7
	Sep/Oct 1997		Not Sampled*									
	Jan/Feb 1998	X	–	–	–	–	–	–	–	1.4	–	6.3
Screen 2	July 1995		–	–	–	–	–	–	–	0.5	–	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	7.7	4.0(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	4.4	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	3.2	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	3.3	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	5.7(EB)	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	2.7	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI
JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 3	July 1995		–	–	–	–	–	–	–	–	–	NA
	Dec 1995		–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	2.7(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	0.6	2.3(EB, EP) Acetone	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	3.4(EP) Unknown RT=6.2	–
Screen 4	July 1995		–	–	–	–	–	–	–	–	–	NA
	Dec 1995		–	–	–	–	–	–	–	–	2.2(EP) Unknown Scan #1596	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	3.8(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 5	July 1995	X	–[UJ]	–	–	–	–	–	–	–	–	NA
	Dec 1995	X	–	–	–	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	–	–	–	–	–	–	–	4.8(B,EP) Acetone	NA
	Oct/Nov 1996		–	–	–	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	–	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	–	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-21												
Screen 1	July 1995	X	–	**29[J]**	0.5	–	–	–	–	1.9	–	NA
	Dec 1995	X	–	**35[J]**	–	–	–	–	–	1.7	2.8(EB,TB,EP) Acetone	NA
	Aug/Sep 1996		–	**33**	0.7	–	–	–	–	1.8	2.3(B,EP) Acetone	NA
	Oct/Nov 1996		Not Sampled*									
	Feb/Mar 1997		–	**29**	–	–	–	–	–	2.2	–	NA
	Jun/Jul 1997		–	**20**	–	–	–	–	–	1.6	–	**19**
	Sept/Oct 1997		Not Sampled*									
	Jan/Feb 1998	X	–	**16[J]**	–	–	–	–[UJ]	–	1.8	–	14

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Screen 2	July 1995	X	–	–	0.8	–	–	–	–	–	0.6(DUP) 1,1,2,2-Tetrachloroethane	NA
	Dec 1995		–	0.5	2.1	–	–	–	–	–	– –	NA
	Aug/Sep 1996		–	–	0.9	–	–	–	–	0.5	–	NA
	Oct/Nov 1996		–	0.6	2.3	–	–	–	–	0.6	1.4(TB, EP) Acetone	NA
	Feb/Mar 1997		–	–	1.1	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	0.7	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	1.1	–	–	–	–	–	–	–
Screen 3	July 1995		–	–	0.7	–	–	–	–	–	–	NA
	Dec 1995		–	–	1.0	–	–	–	–	–	–	NA
	Aug/Sep 1996		–	0.7	1.5	–	–	–	–	0.5	–	NA
	Oct/Nov 1996		–	0.9	1.6	–	–	–	–	–	1.2(EP) Acetone	NA
	Feb/Mar 1997		–	0.8	1.6	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	1.2	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	0.6	1.3	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	0.5	1.4	–	–	–	–	–	–	–
Screen 4	July 1995		–	–	1.7	–	–	–	–	–	–	NA
	Dec 1995		–	–	1.4	–	–	–	–	–	3.0(EB,TB,EP) Acetone	NA
	Aug/Sep 1996		–	0.8	4.2	–	–	–	–	–	–	NA
	Oct/Nov 1996		–	–	2.5	–	–	–	–	–	1.6(EP) Acetone	NA
	Feb/Mar 1997		–	–	1.8	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	2.8	–	–	–	–	–	–	4.6
	Sep/Oct 1997	X	–	0.6	4.4	–	–	–	–	–	–	5.0
	Jan/Feb 1998	X	–	–	2.4	–	–	–	–	–	–	–
Screen 5	July 1995	X	–	–	0.9	–	–	–	–	–	–	NA
	Dec 1995	X	–	–	1.2	–	–	–	–	–	3.6(EB,TB,EP) Acetone	NA
	Aug/Sep 1996		–	–	4.5	–	–	–	–	0.6	–	NA
	Oct/Nov 1996		–	–	3.1	–	–	–	–	–	–	NA
	Feb/Mar 1997		–	–	3.0	–	–	–	–	–	–	NA
	Jun/Jul 1997		–	–	3.0	–	–	–	–	–	–	–
	Sep/Oct 1997	X	–	–	2.9	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	4.1	–	–	–	–	–	0.6 cis-1,2-Dichloroethene 5.0(TB, EP) Carbon Disulfide[4]	5.2

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
MW-22 [1]												
Screen 1	Sep/Oct 1997	X	–	–	2.0	0.7	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	2.3	0.8	–	–	0.5(EB)	–	–	–
Screen 2	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	0.8 Dichloromethane	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 3	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	15
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 4	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 5	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-23 [1]												
Screen 1	Sep/Oct 1997	X	–	3.1	0.6	0.8	–	–	–	–	–	4.4
	Jan/Feb 1998	X	–	4.2	1.6	1.2	–	–	–	0.9	0.6 1,2,3 Trichlorobenzene	5.2
Screen 2	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	7.6
	Jan/Feb 1998	X	–	–	–	–	–	–	–	0.7	–	6.7
Screen 3	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 4	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 5	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
MW-24 [1]												
Screen 1	Sep/Oct 1997	X	**5.0**	**5.0**	–	–	–	–	0.6	3.1	–	**92[J]**
	Jan/Feb 1998	X	**30(E)**	**15**	0.5	–	**0.8**	–	0.6	15(EB)	–	**330**
Screen 2	Sep/Oct 1997	X	**13[J]**	1.3[J]	–	–	–	–	–	3.8[J]	–	**200**
	Jan/Feb 1998	X	**6.9[J]**	0.7	–	–	–	–	–	2.4(EB)	–	**110**
Screen 3	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 4	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–	–	–	–	–
Screen 5	Sep/Oct 1997	X	–	–	–	–	–	–	–	–	–	–
	Jan/Feb 1998	X	–	–	–	–	–	–[UJ]	–	–	–	–

TABLE 1-4

SUMMARY OF VOCs AND PERCHLORATE DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(Values equal to or above state or Federal MCLs are in bold and shaded)

Sampling Location	Sampling Event	Data Validation	Carbon Tetrachloride	TCE	PCE	1,1-DCA	1,2-DCA	1,1-DCE	Freon 113	Total Trihalomethanes (Primarily Chloroform)	Other Volatile Organic Compounds	Perchlorate
Practical Quantitation Limit			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	4.0
California Maximum Contaminant Level			0.5	5.0	5.0	5.0	0.5	6.0	1,200	100	150 Freon 11 [a]	18 [2]
EPA Region IX Maximum Contaminant Level			5.0	5.0	5.0	NE	5.0	7.0	NE	100	5.0 Dichloromethane [a]	NE

–: Not detected.
*: Not sampled, no water over screen.
a: Only VOCs for which MCLs have been established are listed.
NA: Not analyzed.
NE: Not established.
(EP): Extraneous peak.
(EB): Compound detected in associated equipment blank.
(TB): Compound detected in associated trip blank.
(B): Compound detected in the laboratory method blank.
(E): Estimated concentration; result exceeded calibration range.
[J]: Validation qualifier for estimated result.
[U]: Validation qualifier for non-detect.
[UJ]: Validation qualifier for estimated non-detect.
[R]: Validation qualifier for rejected data.
1: Wells installed June-August 1997.
2: California Department of Health Services Interim Action Level.
3: DUP – Results from duplicate analysis; original sample was non-detect, or as noted.
4: Suspected by the laboratory to be carry over in analysis.
5: Although not detected in associated blanks result may be an artifact of cross-contamination from laboratory activities (based on review of data validation packages).

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1[1] as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
MW-1	MW-3	June 1994	X	70-110	11	9.3(B,EP)	–	–	–
	MW-203	Nov. 1994		70-110	–	–	–	–	8.4(B,EP) Unknown Alkyl Subs. Propanoic Acid 2100(B,EP) Unknown Scan #191
MW-3									
Screen 1	MW-56	June 1994	X	170-180	–	–	–	–	–
	MW-258	Nov. 1994		170-180	10	16(B,EP)	–	–	2900(B,EP) Unknown
Screen 2	MW-54	June 1994	X	250-260	–	–	–	–	–
	MW-254	Nov. 1994		250-260	–	–	–	–	1200(B,EP) Unknown
Screen 2 DUP	MW-258	Nov. 1994		250-260	11	15(B,EP)	–	–	3000(B,EP) Unknown
Screen 3	MW-52	June 1994	X	344-354	–	–	–	–	–
	MW-252	Nov. 1994		344-354	–	12(B,EP)	–	–	2900(B,EP) Unknown
Screen 4	MW-50	June 1994	X	555-565	–	–	–	–	–
	MW-250	Nov. 1994		555-565	–	9(B,EP)	–	–	2300(B,EP) Unknown
Screen 5	MW-48	June 1994	X	650-660	–	–	–	–	12(EP) Unknown Scan #1390
	MW-248	Nov. 1994		650-660	–	16(B,EP)	1.4(EB)	8.9(EP) n-butyl-benzenesulfonamide	2600(B,EP) Unknown
MW-4									
Screen 1	MW-46	June 1994	X	147-157	–	–	–	–	–
	MW-246	Nov. 1994		147-157	–	9(B,EP)	–	–	2100(B,EP) Unknown
Screen 2	MW-44	June 1994	X	237-247	–	–	–	–	–
	MW-244	Nov. 1994	X	237-247	–	– [U]	–	–	–
Screen 3	MW-42	June 1994	X	319-329	–	–	–	–	–
	MW-242	Nov. 1994		319-329	–	14(B,EP)	–	–	3000(B,EP) Unknown
Screen 4	MW-40	June 1994	X	389-399	–	–	–	–	–
	MW-240	Nov. 1994		389-399	–	11(B,EP)	–	–	9(EP) Unknown Scan #252 2600(B,EP) Unknown Scan #191
Screen 5	MW-38	June 1994	X	510-520	–	–	–	–	–
	MW-238	Nov. 1994		510-520	–	13(B,EP)	–	–	2900(B,EP) Unknown
MW-5	MW-9	June 1994	X	85-135	–	– [U]	–	–	6.0(EP) Unknown Scan #432
	MW-209	Nov. 1994		85-135	–	8.3(B,EP)	–	–	11(B,EP) Unknown Alkyl Subs. Propanoic Acid 1900(B,EP) Unknown Scan #188
MW-6	MW-1	June 1994	X	195-245	–	–	–	–	–
	MW-201	Nov. 1994		195-245	–	–	–	–	1800(B,EP) Unknown Scan #190

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1[1] as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
MW-7	MW-23	June 1994	X	225-275	–	–	–	–	–
	MW-223	Nov. 1994	X	225-275	–	– [U]	–	–	–
MW-7 DUP	MW-25	June 1994	X	225-275	–	–	–	–	–
	MW-225	Nov. 1994	X	225-275	–	– [U]	–	–	–
MW-8	MW-11	June 1994	X	155-205	–	– [U]	–	–	7.1(EP) Unknown Scan #433
	MW-211	Nov. 1994	X	155-205	12	– [U]	–	–	–
MW-9	MW-7	June 1994	X	18-68	–	– [U]	–	–	7.9(EP) Unknown Scan #433
	MW-207	Nov. 1994		18-68	11	10(B,EP)	–	–	12(B,EP) Unknown Alkyl Subs. Propanoic Acid 2300(B,EP) Unknown Scan #189
MW-10	MW-14	June 1994	X	105-155	–	–	–	–	–
	MW-214	Nov. 1994	X	105-155	–	– [U]	–	–	–
MW-11									
Screen 1	MW-78	June 1994	X	140-150	–	–	–	–	–
	MW-278	Nov. 1994		140-150	16(EB)	12(B,EP)	–	–	14(B,EP) Unknown Alkyl Subs. Propanoic Acid 2700(B,EP) Unknown Scan #192
Screen 2	MW-76	June 1994	X	250-260	–	–	–	–	–
	MW-276	Nov. 1994	X	250-260	–	– [U]	–	–	–
Screen 3	MW-74	June 1994	X	420-430	–	–	–	–	–
	MW-274	Nov. 1994		420-430	10(EB)	11(B,EP)	–	–	12(B,EP) Unknown Subs. Propanoic Acid 2500(B,EP) Unknown Scan #190
Screen 4	MW-72	June 1994	X	515-525	–	–	–	–	15(EP) Unknown Scan #1226 8.5(EP) Unknown Scan #1237
	MW-272	Nov. 1994		515-525	–	10(B,EP)	–	–	8.3(EP) Unknown Scan #1239 10(B,EP) Unknown Alkyl Subs. Propanoic Acid 2200(B,EP) Unknown Scan #190
Screen 5	MW-70	June 1994	X	630-640	–	–	–	32(EB,EP) 2,4-bis(1,1-dimethylethyl)phenol	–
	MW-270	Nov. 1994		630-640	–	–	–	–	8.6(EP) Unknown Scan #1240 540(B,EP) Subs. Alkyl Hexanedioic Acid Ester 2300(B,EP) Unknown Scan #190

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1[1] as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
MW-12									
Screen 1	MW-68	June 1994	X	135-145	–	–	–	–	–
	MW-268	Nov. 1994		135-145	–	10(B,EP)	–	–	2200(B,EP) Unknown Scan #191 560(B,EP) Unknown Subs. Alkyl Hexanedioic Acid Ester
Screen 2	MW-64	June 1994	X	240-250	–	–	–	12 Benz(a)anthracene 16 Benzo(a)pyrene 28 Benzo(b)fluoranthene 10 Benzo(g,h,i)perylene 11 Benzo(k)fluoranthene 21 Chrysene 39 Fluoranthene 10 Indeno(1,2,3-c,d)pyrene 29 Phenanthrene 33 Pyrene	13(EP) Unknown Polynuclear Aromatic Hydrocarbon
	MW-266	Nov. 1994	X	240-250	–	– [U]	–	–	–
	MW-961-53	Aug. 1996		240-250	NA	NA	NA	–[2]	NA
Screen 2 DUP	MW-66	June 1994	X	240-250	–	–	–	–	–
	MW-961-54	Aug. 1996		240-250	NA	NA	NA	–[2]	NA
Screen 3	MW-62	June 1994	X	315-325	–	–	–	–	–
	MW-264	Nov. 1994	X	315-325	–	– [U]	–	–	10(EP) Unknown Scan #1239
Screen 4	MW-60	June 1994	X	430-440	–	–	–	–	–
	MW-262	Nov. 1994	X	430-440	– [U]	– [U]	–	–	–
Screen 5	MW-58	June 1994	X	546-556	–	–	–	–	–
	MW-260	Nov. 1994		656-556	–	12(B,EP)	–	–	2600(B,EP) Unknown
MW-13	MW-17	June 1994	X	180-230	–	–	–	–	36(EP) Unknown Scan #533
	MW-217	Nov. 1994	X	180-230	–	– [U]	–	–	–
MW-13 DUP	MW-19	June 1994	X	180-230	–	–	–	–	–
	MW-219	Nov. 1994	X	180-230	–	– [U]	–	–	–
MW-14									
Screen 1	MW-36	June 1994	X	205-215	–	– [U]	–	–	7.8(EP) Unknown Scan #432
	MW-236	Nov. 1994		205-215	–	27(B,EP)	–	–	17(EB,EP) Unknown 17(B,EP) Unknown 2600(B,EP) Unknown 14(B,EP) Unknown Alcohol

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1[1] as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
Screen 2	MW-34	June 1994	X	275-285	–	– [U]	–	–	–
	MW-234	Nov. 1994		275-285	–	12(B,EP)	–	–	2700 (B,EP) Unknown
Screen 3	MW-32	June 1994	X	380-390	–	–	–	–	–
	MW-232	Nov. 1994		380-290	–	14(B,EP)	–	–	3400(B,EP) Unknown
Screen 4	MW-30	June 1994	X	453-463	–	– [U]	–	–	57(EP) Unknown Scan #548 7.4(EP) Unknown Scan #611 7.4(EP) Unknown Scan #669
	MW-230	Nov. 1994		453-453	–	23(B,EP)	–	–	13(B,EP) Unknown 2800(B,EP) Unknown 15(B,EP) Unknown Alcohol
Screen 5	MW-28	June 1994	X	538-548	–	– [U]	–	–	–
	MW-228	Nov. 1994		538-548	–	30(B,EP)	–	–	16(B,EP) Unknown 2900(B,EP) Unknown 17(B,EP) Unknown Alcohol
MW-15	MW-5	June 1994	X	20-70	–	–	–	–	–
	MW-205	Nov. 1994		20-70	15	12(B,EP)	–	–	12(B,EP) Unknown Alkyl Subs. Propanoic Acid 2800(B,EP) Unknown Scan #190
MW-16	MW-21	June 1994	X	230-280	–	–	–	–	–
	MW-221	Nov. 1994	X	230-280	–	– [U]	–	–	–
MW-17									
Screen 1	MW-556-01	July 1995		246-256	–	–	–	–	–
	MW-567-01	Dec. 1995		246-256	–	9.5(B,EP)	1.1	–	–
Screen 2	MW-555-01	July 1995		366-376	–	–	–	9.2(EP) 4,4-Butylidenebis-2-(1,1-dimethylethyl)5-methylphenol	–
	MW-568-01	Dec. 1995		366-376	–	9.8(B,EP)	–	–	–
Screen 2 DUP	MW-555-04	July 1995		366-376	–	8.5(B,EB,EP)	1.2	–	–
Screen 3	MW-554-01	July 1995		466-476	–	–	0.6	–	–
	MW-569-01	Dec. 1995	X	466-476	– [R]	– [U]	– [UJ]	–	–
Screen 4	MW-553-01	July 1995		578-588	–	–	–	–	–
	MW-570-01	Dec. 1995	X	578-588	– [R]	– [U]	–	–	–
Screen 5	MW-552-01	July 1995	X	723-733	–	–	–	–	–
	MW-571-01	Dec. 1995	X	723-733	– [UJ]	– [U]	–	–	–

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1[1] as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
MW-18									
Screen 1	MW-551-01	July 1995		266-276	–	–	0.7(EB)	–	–
	MW-566-01	Dec. 1995		266-276	–	9.4(B,EP)	–	–	–
Screen 2	MW-550-01	July 1995		326-336	–	–	2.7	–	–
	MW-565-01	Dec. 1995		326-336	–	13(B,EP)	–	–	–
Screen 3	MW-549-01	July 1995		421-431	–	–	3.0	–	–
	MW-564-01	Dec. 1995	X	421-431	– [UJ]	– [U]	–	–	–
Screen 4	MW-548-01	July 1995		561-571	–	21(B,EB,EP)	4.2	–	–
	MW-563-01	Dec. 1995	X	561-571	– [UJ]	– [U]	– [UJ]	–	–
Screen 5	MW-547-01	July 1995	X	681-691	–	– [U]	1.4(EB)	–	–
	MW-562-01	Dec. 1995		681-691	–	12(B,EP)	–	–	–
MW-19									
Screen 1	MW-541-01	July 1995		240-250	–	–	–	–	–
	MW-581-01	Dec. 1995		240-250	–	–	–	–	–
Screen 2	MW-540-01	July 1995	X	310-320	–	–	–	–	–
	MW-580-01	Dec. 1995		310-320	–	–	0.7	–	11(B,EP) Unknown Scan #92
Screen 3	MW-539-01	July 1995	X	390-400	–	– [U]	–	–	–
	MW-579-01	Dec. 1995	X	390-400	– [UJ]	–	–	–	8.2(B,EP) Unknown Scan #92
Screen 4	MW-538-01	July 1995	X	442-452	–	– [U]	–	–	–
	MW-578-01	Dec. 1995	X	442-452	– [UJ]	–	–	–	11(B,EP) Unknown Scan #92
Screen 4 DUP	MW-578-04	Dec. 1995	X	442-452	– [UJ]	–	–	–	–
Screen 5	MW-537-01	July 1995		492-502	–	11(B,EB,EP)	–	–	8.8(B,EB,EP) Unknown Dimethylbenzene Isomer
	MW-577-01	Dec. 1995		492-502	–	–	–	–	–
MW-20									
Screen 1	MW-546-01	July 1995		228-238	–	–	–	–	–
	MW-576-01	Dec. 1995		228-238	–	–	–	–	–
Screen 2	MW-545-01	July 1995		388-398	–	–	–	–	–
	MW-575-01	Dec. 1995		388-398	–	–	–	–	48(EP) Unknown Scan #1268 21(EP) Unknown Scan #1608 11(EP) Unknown Scan #835
Screen 3	MW-544-01	July 1995		558-568	–	–	–	–	11(EP) Unknown Scan #1311
	MW-574-01	Dec. 1995		558-568	–	14(B,EP)	–	–	–

TABLE 1-5

SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

Concentrations in µg/L

(EPA Methods 8270 or 525.1(1) as indicated)

Sample Location	Sample Number	Sample Event	Data Validation	Screened Interval (feet)	Di-n-butylphthalate (8270)	Ethylbenzene (8270)	Di(2-ethylhexyl)phthalate (525.1)	Other SVOCs (8270)	Unknown Semi-Volatile Organic Compounds (8270)
Screen 4	MW-543-01	July 1995		698-708	–	–	–	–	11(EP) Unknown Scan #1451
	MW-573-01	Dec. 1995		698-708	–	14(B,EP)	–	–	–
Screen 5	MW-542-01	July 1995	X	898-908	–	–	–	–	–
	MW-572-01	Dec. 1995	X	898-908	– [UJ]	– [U]	–	–	–
MW-21									
Screen 1	MW-561-01	July 1995	X	86-96	–	–	–	–	–
	MW-588-01	Dec. 1995	X	86-96	–	– [U]	–	–	–
Screen 2	MW-560-01	July 1995	X	156-166	–	–	–	–	–
	MW-587-01	Dec. 1995		156-166	–	–	–	–	–
Screen 2 DUP	MW-560-04	July 1995	X	156-166	–	–	0.5	–	–
Screen 3	MW-559-01	July 1995		236-246	–	–	–	–	–
	MW-584-01	Dec. 1995	X	236-246	– [UJ]	–	–	–	–
Screen 4	MW-558-01	July 1995		306-316	–	9.3(EP)	0.8(EB)	–	–
	MW-583-01	Dec. 1995		306-316	–	–	–	–	–
Screen 5	MW-557-01	July 1995		366-376	–	–	2.1	–	–
	MW-582-01	Dec. 1995	X	366-376	– [UJ]	–	–	–	–

Notes (1): EPA Method 525.1 includes analyses for hexachlorobenzene, pentachlorophenol, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene and di(2-ethylhexyl)phthalate only.
(2): Analyses completed for the 10 SVOCs detected in MW-12 Screen 2 during the June, 1994 event only.
(B): Indicates constituent also detected in laboratory method blank.
(EB): Indicates constituent also detected in equipment blank collected in the field.
(EP): Indicates constituent is not on method target analyte list and was identified as an extraneous peak by the laboratory.
[U]: Validation qualifier for nondetect.
[UJ]: Validation qualifier for estimated nondetect.
[R]: Validation qualifier for rejected data.

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-1	June 1994	MW-3	X	Unfiltered	NA	–	0.039	–	–	–	–	–	0.29	0.022	–	–	1.7
	June 1994	MW-4	X	Filtered	NA	–	0.040	–	–	–	–	–	0.29	0.021	NA	–	NA
	Nov 1994	MW-203		Unfiltered	–	–	0.040	–	–	–	–	–	0.31	–	–	–	2.0
	Nov 1994	MW-204		Filtered	–	–	0.038	NA	–	–	–	0.002	0.29	0.025	NA	–	NA
	Aug 1996 (1)	MW-961-01		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	0.8
MW-3																	
Screen 1	June 1994	MW-56	X	Unfiltered	NA	–	0.020	–	–	–	–	–	0.29[J]	– [UJ]	–	–	3.4
	June 1994	MW-57	X	Filtered	NA	–	0.032	–	–	–	–	–	0.29[J]	0.020(EB)[J]	NA	–	NA
	Nov 1994	MW-258		Unfiltered	–	–	0.038	–	–	–	–	–	0.34	–	–	–	3.5
	Nov 1994	MW-259		Filtered	–	–	0.037	NA	–	–	–	–	0.33	–	NA	–	NA
	Aug 1996	MW-961-03		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	7.2
Screen 2	June 1994	MW-54	X	Unfiltered	NA	–	0.044	–	–	–	–	– [UJ]	0.31[J]	0.023(EB)[J]	–	–	0.8
	June 1994	MW-55	X	Filtered	NA	–	0.044	–	–	–	–	– [UJ]	0.31[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-256		Unfiltered	–	–	0.043	–	–	–	–	–	0.37	–	–	–	2.9
	Nov 1994	MW-257		Filtered	–	–	0.042	NA	–	–	–	–	0.37	0.037	NA	–	NA
	Aug 1996	MW-961-05		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	1.7
Screen 3	June 1994	MW-52	X	Unfiltered	NA	–	0.024	–	–	–	–	– [UJ]	0.24	0.023(EB)	–	–	15.3
	June 1994	MW-53	X	Filtered	NA	–	0.023	–	–	–	–	– [UJ]	0.23	–	NA	–	NA
	Nov 1994	MW-252		Unfiltered	–	–	0.023	–	–	–	–	–	0.26	–	–	–	4.2
	Nov 1994	MW-253		Filtered	–	–	0.023	NA	–	–	–	–	0.27	–	NA	–	NA
	Aug 1996	MW-961-07		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	5.2
Screen 4	June 1994	MW-50	X	Unfiltered	NA	–	0.025	–	–	–	–	– [UJ]	0.26	–	–	–	6.4
	June 1994	MW-51	X	Filtered	NA	–	0.023	–	–	–	–	– [UJ]	0.26	–	NA	–	NA
	Nov 1994	MW-250		Unfiltered	0.081	–	0.027	–	–	–	–	–	0.20	0.025	–	–	3.9
	Nov 1994	MW-251		Filtered	–	–	0.022	NA	–	–	–	–	0.29	–	NA	–	NA
	Aug 1996	MW-961-09		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	4.3
Screen 5	June 1994	MW-48	X	Unfiltered	NA	0.014	–	–	–	–	–	– [UJ]	0.10	0.026(EB)	–	–	3.4
	June 1994	MW-49	X	Filtered	NA	0.017	–	–	–	–	–	–[UJ]	0.10	–	NA	–	NA
	Nov 1994	MW-248		Unfiltered	0.063(EB)	0.006	–	–	–	–	–	–	0.076	–	–	–	2.0
	Nov 1994	MW-249		Filtered	0.063(EB)	0.006	–	NA	–	–	–	–	0.080	–	NA	–	NA
	Aug 1996	MW-961-11		Unfiltered	0.055	0.011	NA	–	–	NA	NA	–	NA	NA	NA	NA	1.5

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-4																	
Screen 1	June 1994	MW-46	X	Unfiltered	NA	–	0.043	–	–	–	–	– [uJ]	0.28	–	–	–	2.5
	June 1994	MW-47	X	Filtered	NA	–	0.043	–	–	–	–	– [uJ]	0.29	–	NA	–	NA
	Nov 1994	MW-246		Unfiltered	–	–	0.042	–	–	–	–	–	0.33	0.027	–	–	7.2
	Nov 1994	MW-247		Filtered	–	–	0.047	NA	–	–	–	–	0.32	–	NA	–	NA
	Aug 1996	MW-961-13		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	2.6
Screen 2	June 1994	MW-44	X	Unfiltered	NA	–	0.068	–	–	–	–	– [uJ]	0.48	–	–	–	2.3
	June 1994	MW-45	X	Filtered	NA	–	0.067	–	–	–	–	– [uJ]	0.48	0.052	NA	–	NA
	Nov 1994	MW-244		Unfiltered	–	–	0.083	–	0.017	–	0.019	–	0.56	–	–	–	5.0
	Nov 1994	MW-245		Filtered	–	–	0.077	NA	–	–	0.036	–	0.53	–	NA	–	NA
	Aug 1996	MW-961-15		Unfiltered	–	–	NA	–	0.023	NA	NA	—	NA	NA	NA	NA	3.8
Screen 3	June 1994	MW-42	X	Unfiltered	NA	–	0.053	–	–	–	–	–	0.28	0.048(EB)	–	–	2.6
	June 1994	MW-43	X	Filtered	NA	–	0.052	–	–	–	–	–	0.28	0.026(EB)	NA	–	NA
	Nov 1994	MW-242		Unfiltered	0.066	–	0.058	–	–	–	–	–	0.32	0.021	–	–	2.2
	Nov 1994	MW-243		Filtered	–	–	0.057	NA	–	–	–	–	0.32	–	NA	–	NA
	Aug 1996	MW-961-19		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	0.6
Screen 4	June 1994	MW-40	X	Unfiltered	NA	–	0.033	–	0.018	–	0.014	–	0.26	0.031(EB)	–	–	3.3
	June 1994	MW-41	X	Filtered	NA	–	0.031	–	–	–	–	–	0.26	0.022(EB)	NA	–	NA
	Nov 1994	MW-240		Unfiltered	–	–	0.032	–	–	–	–	–	0.26	–	–	–	2.1
	Nov 1994	MW-241		Filtered	–	–	0.032	NA	–	–	–	–	0.26	–	NA	–	NA
	Aug 1996	MW-961-21		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	3.0
Screen 5	June 1994	MW-38	X	Unfiltered	NA	–	0.050	–	0.011	–	–	–	0.30	0.027(EB)	–	–	18.0
	June 1994	MW-39	X	Filtered	NA	–	0.045	–	–	–	–	–	0.29	0.033(EB)	NA	–	NA
	Nov 1994	MW-238		Unfiltered	–	–	0.037	–	–	–	–	–	0.28	–	–	–	15.7
	Nov 1994	MW-239		Filtered	–	–	0.037	NA	–	–	–	0.003	0.29	–	NA	–	NA
	Aug 1996	MW-961-23		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	4.5
MW-5	June 1994	MW-9	X	Unfiltered	NA	– [uJ]	0.052	–	–	–	–	–	0.32	0.061	–	–	1.7
	June 1994	MW-10	X	Filtered	NA	–	0.057	–	–	0.015	–	–	0.34	0.025	NA	–	NA
	Nov 1994	MW-209		Unfiltered	–	–	0.054	–	0.011	–	–	–	0.36	–	–	–	1.3
	Nov 1994	MW-210		Filtered	–	–	0.052	NA	–	–	–	–	0.36	–	NA	–	NA
	Aug 1996	MW-961-25		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	2.7

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-6	June 1994	MW-1	X	Unfiltered	NA	–	0.055	–	**0.075**	0.012	0.036	–	0.40	0.028	–	–	2.2
	June 1994	MW-2	X	Filtered	NA	–	0.054	–	–	–	0.034	–	0.41	0.034	NA	–	NA
	Nov 1994	MW-201	X	Unfiltered	0.096	–	0.092	–	**0.24**	–	0.035	–	0.73	0.050	–	–	4.8
	Nov 1994	MW-202		Filtered	–	–	0.086	NA	–	–	0.019	–	0.72	–	NA	–	NA
	Aug 1996	MW-961-27		Unfiltered	–	–	NA	–	**0.050**	NA	NA	–	NA	NA	NA	NA	4.5
MW-7	June 1994	MW-23	X	Unfiltered	NA	–	0.049	–	–	–	–	–	0.34[J]	– [UJ]	–	–	4.6
	June 1994	MW-24	X	Filtered	NA	–	0.048	–	–	–	–	–	0.34[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-223	X	Unfiltered	–	–	0.048	–	0.012	–	–	–	0.34	–	–	–	3.2
	Nov 1994	MW-224		Filtered	–	–	0.047	NA	0.011	–	–	–	0.33	–	NA	–	NA
	Aug 1996	MW-961-29		Unfiltered	–	–	NA	0.007	0.013	NA	NA	–	NA	NA	NA	NA	4.8
MW-7 DUP	June 1994	MW-25	X	Unfiltered	NA	–	0.048	–	–	–	–	–	0.34[J]	– [UJ]	–	–	4.6
	June 1994	MW-26	X	Filtered	NA	–	0.049	–	–	–	–	–	0.34[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-225		Unfiltered	–	–	0.055	–	0.013	–	–	–	0.34	0.038	–	–	3.2
	Nov 1994	MW-226		Filtered	–	–	0.048	NA	0.012	–	–	–	0.33	–	NA	–	NA
	Aug 1996	MW-961-31		Unfiltered	–	–	NA	0.011	0.012	NA	NA	–	NA	NA	NA	NA	4.8
MW-8	June 1994	MW-11	X	Unfiltered	NA	– [UJ]	0.039	–	–	0.024	–	–	0.26	0.029	–	–	4.2
	June 1994	MW-12	X	Filtered	NA	–	0.039	–	–	–	–	0.002	0.27	0.028	NA	–	NA
	Nov 1994	MW-211		Unfiltered	0.13	–	0.040	–	–	–	–	–	0.27	–	–	–	4.3
	Nov 1994	MW-212		Filtered	–	–	0.035	NA	–	–	–	–	0.26	–	NA	–	NA
	Aug 1996	MW-961-33		Unfiltered	0.160	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	4.0
MW-9	June 1994	MW-7	X	Unfiltered	NA	–	0.058	–	–	–	–	–	0.33	0.030	–	–	5.6
	June 1994	MW-8	X	Filtered	NA	–	0.055	–	–	–	–	–	0.32	0.022	NA	–	NA
	Nov 1994	MW-207		Unfiltered	0.16	–	0.092	–	–	–	–	–	0.55	–	–	–	3.9
	Nov 1994	MW-208		Filtered	–	–	0.094	NA	–	–	–	–	0.56	–	NA	–	NA
	Aug 1996	MW-961-35		Unfiltered	0.110	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	2.1
MW-10	June 1994	MW-14	X	Unfiltered	NA	–	0.096	–	0.012	–	–	– [UJ]	0.61[J]	– [UJ]	–	–	3.8
	June 1994	MW-15	X	Filtered	NA	–	0.095	–	–	–	–	–	0.61[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-214		Unfiltered	0.11	–	0.14	–	0.017	–	0.012	–	0.95	–	–	–	4.0
	Nov 1994	MW-215		Filtered	–	–	0.13	NA	0.010	–	–	–	0.89	–	NA	–	NA
	Aug 1996	MW-961-37		Unfiltered	0.190	–	NA	0.010	0.011	NA	NA	–	NA	NA	NA	NA	4.5

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-11																	
Screen 1	June 1994	MW-78	X	Unfiltered	NA	–	0.038	–	0.021	–	0.022	–	0.49	0.021(EB)	0.006	–	6.8
	June 1994	MW-79	X	Filtered	NA	–	0.038	–	–	–	–	0.002	0.50	–	NA	–	NA
	Nov 1994	MW-278		Unfiltered	–	–	0.033	–	–	–	0.012	–	0.49	–	–	–	1.9
	Nov 1994	MW-279		Filtered	–	–	0.030	NA	–	–	–	–	0.48	–	NA	–	NA
	Aug 1996	MW-961-41		Unfiltered	0.052	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	4.0
Screen 2	June 1994	MW-76	X	Unfiltered	NA	–	0.047	–	–	–	–	–	0.40	0.030(EB)	–	–	11.4
	June 1994	MW-77	X	Filtered	NA	–	0.037	–	–	–	–	–	0.41	–	NA	–	NA
	Nov 1994	MW-276		Unfiltered	–	–	0.048	–	–	–	–	–	0.47	–	–	–	0.5
	Nov 1994	MW-277		Filtered	–	–	0.043	NA	–	–	–	–	0.47	–	NA	–	NA
	Aug 1996	MW-961-43		Unfiltered	0.055	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	4.5
Screen 3	June 1994	MW-74	X	Unfiltered	NA	–	0.041	–	–	–	0.011	0.013	0.39	0.023(EB)	–	–	2.9
	June 1994	MW-75	X	Filtered	NA	–	0.047	–	–	–	–	**0.025**	0.40	–	NA	–	NA
	Nov 1994	MW-274		Unfiltered	–	–	0.15	–	–	–	–	–	0.43	0.020	–	–	3.2
	Nov 1994	MW-275		Filtered	–	–	0.048	NA	–	–	–	–	0.44	–	NA	–	NA
	Aug 1996	MW-961-45		Unfiltered	0.077	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	0.5
Screen 4	June 1994	MW-72	X	Unfiltered	NA	– [ω]	0.031	–	–	–	–	– [ω]	0.40[J]	0.024	–	–	4.4
	June 1994	MW-73	X	Filtered	NA	– [ω]	0.030	–	–	–	–	– [ω]	0.41[J]	–	NA	–	NA
	Nov 1994	MW-272		Unfiltered	–	–	0.029	–	–	–	–	–	0.40	–	–	–	2.7
	Nov 1994	MW-273		Filtered	–	–	0.028	NA	–	–	–	–	0.39	–	NA	–	NA
	Aug 1996	MW-961-48		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	3.9
Screen 5	June 1994	MW-70	X	Unfiltered	NA	– [ω]	0.026	–	0.012	–	0.010	– [ω]	0.26[J]	0.041	0.006	–	2.5
	June 1994	MW-71	X	Filtered	NA	–	0.027	–	–	–	–	– [ω]	0.26[J]	0.028	NA	–	NA
	Nov 1994	MW-270		Unfiltered	–	–	0.097	–	–	–	–	–	0.26	0.053	–	–	2.6
	Nov 1994	MW-271		Filtered	–	–	0.028	NA	–	–	–	0.002	0.26	–	NA	–	NA
	Aug 1996	MW-961-49		Unfiltered	0.055	0.007	NA	–	–	NA	NA	–	NA	NA	NA	NA	0.6

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-12																	
Screen 1	June 1994	MW-68	X	Unfiltered	NA	–	0.048	–	–	–	–	– [UJ]	0.34[J]	–	–	–	1.9
	June 1994	MW-69	X	Filtered	NA	–	0.048	–	–	0.010(EB)	–	– [UJ]	0.34[J]	–	NA	–	NA
	Nov 1994	MW-268		Unfiltered	–	–	0.046	–	–	–	–	–	0.36	–	–	–	4.4
	Nov 1994	MW-269		Filtered	–	–	0.046	NA	–	–	–	**0.020**	0.35	–	NA	–	NA
	Aug 1996	MW-961-51		Unfiltered	**1.10**	–	NA	–	–	NA	NA	0.004	NA	NA	NA	NA	50.4
Screen 2	June 1994	MW-64	X	Unfiltered	NA	–	0.042	–	0.016	–	–	–	0.39[J]	–	–	–	12.3
	June 1994	MW-65	X	Filtered	NA	–	0.042	–	–	–	–	– [UJ]	0.39[J]	–	NA	–	NA
	Nov 1994	MW-266		Unfiltered	–	–	0.027	–	–	–	–	–	0.35	–	–	–	13.8
	Nov 1994	MW-267		Filtered	–	–	0.027	NA	–	–	–	–	0.37	–	NA	–	NA
	Aug 1996	MW-961-53		Unfiltered	–	–	NA	–	–	NA	NA	**0.024**	NA	NA	NA	NA	4.0
Screen 2 DUP	June 1994	MW-66	X	Unfiltered	NA	–	0.044	–	–	–	–	– [UJ]	0.44[J]	–	–	–	12.3
	June 1994	MW-67	X	Filtered	NA	–	0.40	–	0.014	–	–	– [UJ]	0.38[J]	–	NA	–	NA
Screen 3	June 1994	MW-62	X	Unfiltered	NA	–	0.034	–	–	–	–	–	0.37[J]	0.028	–	–	16.3
	June 1994	MW-63	X	Filtered	NA	–	0.031	–	–	–	–	– [UJ]	0.38[J]	–	NA	–	NA
	Nov 1994	MW-264		Unfiltered	–	–	0.033	–	–	–	–	–	0.43	0.024	–	–	15.2
	Nov 1994	MW-265		Filtered	–	–	0.029	NA	–	–	–	0.005	0.41	–	NA	–	NA
	Aug 1996	MW-961-55		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	2.5
Screen 4	June 1994	MW-60	X	Unfiltered	NA	–	0.050	–	–	–	–	–	0.40[J]	0.022(EB)	–	–	3.2
	June 1994	MW-61	X	Filtered	NA	–	0.053	–	–	–	–	–	0.42[J]	0.029(EB)	NA	–	NA
	Nov 1994	MW-262		Unfiltered	–	–	0.049	–	–	–	–	–	0.42	–	–	–	2.8
	Nov 1994	MW-263		Filtered	–	–	0.049	NA	–	–	–	–	0.43	–	NA	–	NA
	Aug 1996	MW-961-57		Unfiltered	0.086	–	NA	–	–	NA	NA	0.005	NA	NA	NA	NA	1.8
Screen 5	June 1994	MW-58	X	Unfiltered	NA	–	0.030	–	–	0.020(EB)	0.011	–	0.33[J]	0.020(EB)	–	–	3.3
	June 1994	MW-59	X	Filtered	NA	–	0.030	–	–	–	–	–	0.34[J]	0.031(EB)	NA	–	NA
	Nov 1994	MW-260	X	Unfiltered	–	–[R]	0.025	–	–	–	–	– [R]	0.18	–	–	–	3.9
	Nov 1994	MW-261		Filtered	–	–	0.023	NA	–	–	–	–	0.18	–	NA	–	NA
	Aug 1996	MW-961-59		Unfiltered	0.060	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	2.0
MW-13	June 1994	MW-17	X	Unfiltered	NA	–	0.063	–	**0.062**	–	–	– [UJ]	0.51[J]	– [UJ]	–	–	4.7
	June 1994	MW-18	X	Filtered	NA	–	0.061	–	**0.054**	–	–	–	0.52[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-217	X	Unfiltered	0.14	–	0.043	0.019	0.033	–	–	–	0.40	–	–	–	3.6
	Nov 1994	MW-218	X	Filtered	–	–	0.042	NA	0.024	–	–	–	0.39	–	NA	–	NA
	Aug 1996	MW-961-61		Unfiltered	0.092	–	NA	0.047	0.046	NA	NA	–	NA	NA	NA	NA	4.1

TABLE 1-6

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JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-13 DUP	June 1994	MW-19	X	Unfiltered	NA	–	0.063	–	**0.061**	–	–	–	0.51[J]	– [UJ]	–	–	4.7
	June 1994	MW-20	X	Filtered	NA	–	0.058	–	**0.054**	–	–	–	0.49[J]	– [UJ]	NA	–	NA
	Nov 1994	MW-219	X	Unfiltered	0.10	–	0.043	0.026	0.026	–	–	–	0.40	–	–	–	3.6
	Nov 1994	MW-220		Filtered	–	–	0.043	NA	0.024	–	–	–	0.40	–	NA	–	NA
MW-14																	
Screen 1	June 1994	MW-36	X	Unfiltered	NA	–	0.15	–	–	0.017	–	–	1.2	0.029	–	–	3.4
	June 1994	MW-37	X	Filtered	NA	–	0.15	–	–	0.012(EB)	–	–	1.2	0.024(EB)	NA	–	NA
	Nov 1994	MW-236		Unfiltered	–	–	0.15	–	–	–	–	–	1.2	–	–	–	6.9
	Nov 1994	MW-237		Filtered	–	–	0.15	NA	–	–	–	–	1.2	–	NA	–	NA
	Aug 1996	MW-961-63		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	3.3
Screen 2	June 1994	MW-34	X	Unfiltered	NA	–	0.089	–	0.012	–	–	– [UJ]	0.93	0.037(EB)	–	–	7.9
	June 1994	MW-35	X	Filtered	NA	–	0.091	–	–	–	–	– [UJ]	0.96	0.047(EB)	NA	–	NA
	Nov 1994	MW-234		Unfiltered	–	–	0.095	–	–	–	–	–	1.1	–	–	–	4.2
	Nov 1994	MW-235		Filtered	–	–	0.092	NA	–	–	–	–	1.1	–	NA	–	NA
	Aug 1996	MW-961-65		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	4.4
Screen 3	June 1994	MW-32	X	Unfiltered	NA	–	0.047	–	–	–	–	– [UJ]	0.38	0.031(EB)	–	–	4.4
	June 1994	MW-33	X	Filtered	NA	–	0.040	–	0.012	–	–	– [UJ]	0.38	0.088(EB)	NA	–	NA
	Nov 1994	MW-232		Unfiltered	–	–	0.060	–	–	–	–	–	0.46	–	–	–	2.8
	Nov 1994	MW-233		Filtered	–	–	0.060	NA	–	–	–	–	0.46	0.071(EB)	NA	–	NA
	Aug 1996	MW-961-67		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	1.7
Screen 4	June 1994	MW-30	X	Unfiltered	NA	–	0.044	–	–	–	–	– [UJ]	0.27	0.028(EB)	–	–	4.8
	June 1994	MW-31	X	Filtered	NA	–	0.045	–	–	–	–	– [UJ]	0.27	0.030(EB)	NA	–	NA
	Nov 1994	MW-230		Unfiltered	–	–	0.063	–	–	–	–	–	0.33	–	–	–	13.7
	Nov 1994	MW-231		Filtered	–	–	0.065	NA	–	–	–	–	0.34	–	NA	–	NA
	Aug 1996	MW-961-69		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	3.1
Screen 5	June 1994	MW-28	X	Unfiltered	NA	–	0.034	–	–	–	–	– [UJ]	0.23	0.030(EB)	–	–	2.0
	June 1994	MW-29	X	Filtered	NA	–	0.028	–	–	–	–	– [UJ]	0.23	0.028(EB)	NA	–	NA
	Nov 1994	MW-228	X	Unfiltered	–	– [R]	0.032	–	–	–	–	– [R]	0.24	–	–	–	4.1
	Nov 1994	MW-229		Filtered	–	–	0.031	NA	–	–	–	–	0.24	–	NA	–	NA
	Aug 1996	MW-961-71		Unfiltered	–	–	NA	–	–	NA	NA	—	NA	NA	NA	NA	1.5

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JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
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Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-15	June 1994	MW-5	X	Unfiltered	NA	–	0.056	–	–	–	–	–	0.33	0.037	–	–	3.9
	June 1994	MW-6	X	Filtered	NA	–	0.051	–	–	–	–	–	0.31	0.21	NA	–	NA
	Nov 1994	MW-205		Unfiltered	–	–	0.085	–	–	–	–	–	0.53	–	–	–	1.4
	Nov 1994	MW-206		Filtered	–	–	0.085	NA	–	–	–	–	0.54	–	NA	–	NA
	Aug 1996	MW-961-73		Unfiltered	–	–	NA	–	–	NA	NA	–	NA	NA	NA	NA	1.3
MW-16	June 1994	MW-21	X	Unfiltered	NA	–	0.073	–	–	–	–	– [UJ]	0.37[J]	– [UJ]	–	–	2.3
	June 1994	MW-22	X	Filtered	NA	–	0.077	–	–	–	–	–	0.38[J]	0.022[J]	NA	–	NA
	Nov 1994	MW-221		Unfiltered	–	–	0.056	–	–	–	–	–	0.33	0.031	–	–	2.5
	Nov 1994	MW-222		Filtered	–	–	0.055	NA	–	–	–	–	0.32	–	NA	–	NA
	Aug 1996	MW-961-75		Unfiltered	0.11	–	NA	–	0.018	NA	NA	–	NA	NA	NA	NA	3.4
MW-17																	
Screen 1	July 1995	MW-556-01		Unfiltered	–	–	0.023	NA	–	–	–	–	0.25	–	–	–	0.2
	July 1995	MW-556-02		Filtered	–	–	0.025	NA	–	–	–	–	0.23	–	–	–	0.2
	Dec. 1995	MW-567-01		Unfiltered	–	–	0.025	NA	–	–	–	–	0.27	–	–	–	2.0
	Dec. 1995	MW-567-02		Filtered	–	–	0.024	NA	–	–	–	–	0.26	–	–	–	2.0
	Aug 1996	MW-961-77		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	1.0
Screen 2	July 1995	MW-555-01		Unfiltered	–	–	0.029	NA	–	–	–	–	0.32	0.033	–	–	2.0
	July 1995	MW-555-02		Filtered	0.066	–	0.029	NA	–	–	–	–	0.34	–	–	–	2.0
	Dec. 1995	MW-568-01		Unfiltered	0.13	–	0.034	NA	–	–	–	–	0.31	0.033	–	–	5.0
	Dec. 1995	MW-568-02		Filtered	–	–	0.029	NA	–	–	–	–	0.27	–	–	–	5.0
	Aug 1996	MW-961-78		Unfiltered	**0.33**	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	4.5
Screen 2 DUP	July 1995	MW-555-04		Unfiltered	0.089	–	0.028	NA	–	–	–	–	0.32	0.030	–	–	2.0
	July 1995	MW-555-05		Filtered	0.057	–	0.028	NA	–	–	–	–	0.34	0.051	–	–	2.0
Screen 3	July 1995	MW-554-01		Unfiltered	0.19	–	0.027	NA	–	–	–	–	0.23	0.048	–	–	3.5
	July 1995	MW-554-02		Filtered	0.16	–	0.025	NA	–	–	–	–	0.22	–	–	–	3.5
	Dec. 1995	MW-569-01	X	Unfiltered	**0.20**	–	0.036	NA	–	–	–	–	0.33	–	–	–	11.3
	Dec. 1995	MW-569-02		Filtered	–	–	0.032	NA	–	–	–	–	0.32	–	–	–	11.3
	Aug 1996	MW-961-79		Unfiltered	0.12	–	NA	NA	NA	NA	NA	0.002	NA	NA	NA	NA	4.9
Screen 4	July 1995	MW-553-01		Unfiltered	0.147	–	0.034	NA	–	–	–	–	0.28	0.061(EB)	–	–	4.7
	July 1995	MW-553-02		Filtered	–	–	0.036	NA	–	–	–	–	0.34	0.022(EB)	–	–	4.7
	Dec. 1995	MW-570-01	X	Unfiltered	–	–	0.046	NA	–	–	–	–	0.55	–	–	–	4.5
	Dec. 1995	MW-570-02		Filtered	–	–	0.047	NA	–	–	–	–	0.52	–	–	–	4.5
	Aug 1996	MW-961-80		Unfiltered	**0.26**	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	2.8

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JET PROPULSION LABORATORY

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Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
Screen 5	July 1995	MW-552-01	X	Unfiltered	**0.510**	–	0.053	NA	–	–	–	–	0.40	0.035(EB)[J]	–	–	5.0
	July 1995	MW-552-02	X	Filtered	0.055	–	0.049	NA	–	–	–	–	0.37	0.024(EB)[J]	–	–	5.0
	Dec. 1995	MW-571-01	X	Unfiltered	0.056	–	0.056	NA	–	–	–	–	0.42	–	–	–	4.9
	Dec. 1995	MW-571-02		Filtered	–	–	0.055	NA	–	–	–	–	0.51	–	–	0.017 Sb 0.012 Se	4.9
	Aug 1996	MW-961-81		Unfiltered	**0.21**	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	5.0
MW-18																	
Screen 1	July 1995	MW-551-01		Unfiltered	–	–	0.029	NA	–	–	–	–	0.32	–	–	–	1.3
	July 1995	MW-551-02		Filtered	–	–	0.027	NA	–	–	–	–	0.31	0.021(EB)	–	–	1.3
	Dec. 1995	MW-566-01		Unfiltered	–	–	0.023	NA	–	–	–	–	0.27	–	–	–	3.3
	Dec. 1995	MW-566-02		Filtered	–	–	0.023	NA	–	–	–	–	0.28	–	–	–	3.3
	Aug 1996	MW-961-82		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	0.9
Screen 2	July 1995	MW-550-01		Unfiltered	–	–	0.037	NA	–	–	0.018	–	0.31	–	–	–	3.45
	July 1995	MW-550-02		Filtered	–	–	0.034	NA	–	–	–	–	0.39	0.024	–	–	3.45
	Dec. 1995	MW-565-01		Unfiltered	–	–	0.031	NA	–	–	–	–	0.34	–	–	–	2.8
	Dec. 1995	MW-565-02		Filtered	–	–	0.030	NA	–	–	–	–	0.32	–	–	–	2.8
	Aug 1996	MW-961-83		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	3.5
Screen 3	July 1995	MW-549-01		Unfiltered	–	–	0.031	NA	–	–	–	–	0.37	–	–	–	4.57
	July 1995	MW-549-02		Filtered	–	–	0.029	NA	–	–	–	–	0.35	–	–	–	4.57
	Dec. 1995	MW-564-01	X	Unfiltered	–	–	0.029	NA	–	–	–	–	0.39	0.030[J]	–	–	4.1
	Dec. 1995	MW-564-02		Filtered	–	–	0.027	NA	–	–	–	–	0.39	0.030	–	–	4.1
	Aug 1996	MW-961-84		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	4.2
Screen 4	July 1995	MW-548-01		Unfiltered	–	–	0.033	NA	–	0.044	0.044	–	0.32	0.034(EB)	–	–	1.1
	July 1995	MW-548-02		Filtered	–	–	0.034	NA	–	–	–	–	0.32	–	–	–	1.1
	Dec. 1995	MW-563-01	X	Unfiltered	–	–	0.021	NA	–	–	–	–	0.34	–	–	–	2.1
	Dec. 1995	MW-563-02		Filtered	–	–	0.021	NA	–	–	–	–	0.33	–	–	–	2.1
	Aug 1996	MW-961-86		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	2.0
Screen 5	July 1995	MW-547-01	X	Unfiltered	**0.29**	– [UJ]	0.031	NA	–	–	–	–	0.34	– [UJ]	–	–	5.0
	July 1995	MW-547-02	X	Filtered	–	– [UJ]	0.028	NA	–	–	–	–	0.32	– [UJ]	–	0.0003 Hg	5.0
	Dec. 1995	MW-562-01		Unfiltered	0.17	–	0.032	NA	–	–	–	–	0.22	0.065	–	–	6.7
	Dec. 1995	MW-562-02		Filtered	0.05	–	0.032	NA	–	–	–	–	0.22	–	–	–	6.7
	Aug 1996	MW-961-87		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	2.8

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Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
MW-19																	
Screen 1	July 1995	MW-541-01		Unfiltered	–	–	0.029	NA	–	–	–	–	0.24	–	–	–	0.6
	July 1995	MW-541-02		Filtered	–	–	0.028	NA	–	–	–	–	0.25	0.032(EB)	–	–	0.6
	Dec. 1995	MW-581-01		Unfiltered	–	–	0.040	NA	–	–	–	–	0.29	–	–	–	3.0
	Dec. 1995	MW-581-02		Filtered	–	–	0.037	NA	–	–	–	–	0.28	–	–	–	3.0
	Aug 1996	MW-961-88		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	5.0
Screen 2	July 1995	MW-540-01	X	Unfiltered	–	–	0.11	NA	–	–	–	–	0.48	0.031	–	–	1.0
	July1995	MW-540-02		Filtered	–	–	0.11	NA	–	–	–	–	0.46	0.027	–	–	1.0
	Dec. 1995	MW-580-01		Unfiltered	–	–	0.12	NA	–	–	–	–	0.45	–	–	–	5.7
	Dec. 1995	MW-580-02		Filtered	–	–	0.12	NA	–	–	–	–	0.52	0.024	–	–	5.7
	Aug 1996	MW-961-89		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	4.5
Screen 3	July 1995	MW-539-01		Unfiltered	–	–	0.13	NA	–	–	–	–	0.68	0.032	–	–	4.3
	July 1995	MW-539-02		Filtered	–	–	0.13	NA	–	–	–	–	0.67	0.031	–	–	4.3
	Dec. 1995	MW-579-01	X	Unfiltered	–	– [UJ]	0.12	NA	–	–	–	0.002	0.61	0.020[J]	–	–	3.8
	Dec. 1995	MW-579-02		Filtered	–	–	0.11	NA	–	–	–	–	0.55	0.032	–	–	3.8
	Aug 1996	MW-961-90		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	3.0
Screen 4	July 1995	MW-538-01	X	Unfiltered	–	– [UJ]	0.057	NA	–	–	–	–	0.44	0.029	–	–	4.2
	July 1995	MW-538-02		Filtered	–	–	0.056	NA	–	–	–	–	0.47	0.022	–	–	4.2
	Dec. 1995	MW-578-01	X	Unfiltered	–	– [UJ]	0.059	NA	–	–	–	–	0.48	0.031[J]	–	–	19.7
	Dec. 1995	MW-578-02		Filtered	–	–	0.058	NA	–	–	–	–	0.46	–	–	–	19.7
	Aug 1996	MW-961-91		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	4.2
Screen 4 DUP	Dec. 1995	MW-578-04	X	Unfiltered	–	– [UJ]	0.063	NA	–	–	–	–	0.43	0.032[J]	–	–	19.7
	Dec. 1995	MW-578-05		Filtered	–	–	0.057	NA	–	–	–	–	0.46	–	–	–	19.7
Screen 5	July 1995	MW-537-01		Unfiltered	–	–	0.079	NA	–	–	–	–	0.66	0.028(EB)	–	–	4.6
	July 1995	MW-537-02		Filtered	–	–	0.075	NA	–	–	–	–	0.63	0.039(EB)	–	–	4.6
	Dec. 1995	MW-577-01		Unfiltered	–	–	0.089	NA	–	–	–	–	0.78	0.040	–	–	3.2
	Dec. 1995	MW-577-02		Filtered	–	–	0.083	NA	–	–	–	–	0.76	0.52	–	–	3.2
	Aug 1996	MW-961-92		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	4.9
MW-20																	
Screen 1	July 1995	MW-546-01		Unfiltered	–	–	0.063	NA	–	–	–	–	0.68	0.043(EB)	–	–	2.5
	July 1995	MW-546-02		Filtered	–	–	0.060	NA	–	–	–	–	0.74	0.020(EB)	–	–	2.5
	Dec. 1995	MW-576-01		Unfiltered	–	–	0.042	NA	–	–	–	–	0.72	–	–	–	6.5
	Dec. 1995	MW-576-02		Filtered	–	–	0.041	NA	–	–	–	–	0.66	–	–	–	6.5
	Aug 1996	MW-961-93		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	3.5

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
Screen 2	July 1995	MW-545-01		Unfiltered	–	–	0.051	NA	–	–	–	–	0.34	–	–	–	2.7
	July 1995	MW-545-02		Filtered	–	–	0.032	NA	–	–	–	–	0.34	0.025(EB)	–	–	2.7
	Dec. 1995	MW-575-01		Unfiltered	–	–	–	NA	–	–	–	–	0.18	–	–	–	3.0
	Dec. 1995	MW-575-02		Filtered	–	–	–	NA	–	–	–	–	0.20	–	–	–	3.0
	Aug 1996	MW-961-94		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	3.9
Screen 3	July 1995	MW-544-01		Unfiltered	0.092	–	0.028	NA	–	–	–	–	0.36	–	–	–	4.7
	July 1995	MW-544-02		Filtered	–	–	0.026	NA	–	–	–	–	–	–	–	–	4.7
	Dec. 1995	MW-574-01		Unfiltered	–	–	0.034	NA	–	–	–	–	0.39	–	–	–	3.0
	Dec. 1995	MW-574-02		Filtered	–	–	0.038	NA	–	–	–	–	0.38	0.049	–	–	3.0
	Aug 1996	MW-961-95		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	1.7
Screen 4	July 1995	MW-543-01		Unfiltered	–	–	–	NA	–	–	–	–	0.10	0.031(EB)	–	–	1.8
	July 1995	MW-543-02		Filtered	–	–	–	NA	–	–	–	–	0.11	0.028(EB)	–	–	1.8
	Dec. 1995	MW-573-01		Unfiltered	–	–	0.022	NA	–	–	–	–	0.09	–	–	0.025 Mo	2.7
	Dec. 1995	MW-573-02		Filtered	–	–	0.022	NA	–	–	–	–	0.09	–	–	0.025 Mo	2.7
	Aug 1996	MW-961-96		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	1.0
Screen 5	July 1995	MW-542-01	X	Unfiltered	**0.230[J]**	–	0.032	NA	–	–	–	–	0.17	–	–	–	3.2
	July 1995	MW-542-02	X	Filtered	0.082[J]	–	0.030	NA	–	–	–	–	0.16	–	–	–	3.2
	Dec. 1995	MW-572-01	X	Unfiltered	0.100	–	0.037	NA	–	–	–	–	0.21	–	–	–	3.2
	Dec. 1995	MW-572-02		Filtered	–	–	0.036	NA	–	–	–	–	0.19	–	–	–	3.2
	Aug 1996	MW-961-97		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	1.8
MW-21																	
Screen 1	July 1995	MW-561-01	X	Unfiltered	–	–	0.079	NA	–	–	–	0.007[J]	0.88	0.024	–	–	1.7
	July 1995	MW-561-02		Filtered	–	–	0.076	NA	–	–	–	–	0.98	–	–	–	1.7
	Dec. 1995	MW-588-01		Unfiltered	–	–	0.100	NA	–	–	–	–	1.00	–	–	–	2.4
	Dec. 1995	MW-588-02		Filtered	–	–	0.100	NA	–	–	–	–	1.10	–	–	–	2.4
	Aug 1996	MW-961-98		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	0.9
Screen 2	July 1995	MW-560-01	X	Unfiltered	–	–	0.083	NA	–	–	0.014	– [R]	1.30	0.023	–	–	3.5
	July 1995	MW-560-02		Filtered	–	–	0.080	NA	–	–	–	–	1.10	0.024	–	–	3.5
	Dec. 1995	MW-587-01		Unfiltered	0.10	–	0.120	NA	–	–	–	–	1.30	0.020	–	0.0002 Hg	4.8
	Dec. 1995	MW-587-02		Filtered	–	–	0.110	NA	–	–	–	–	1.20	–	–	–	4.8
	Aug 1996	MW-961-99		Unfiltered	–	–	NA	NA	NA	NA	NA	—	NA	NA	NA	NA	2.1

TABLE 1-6

SUMMARY OF METALS AND CYANIDE DETECTED DURING THE OU-1/OU-3 RI PRIOR TO THE LONG-TERM QUARTERLY MONITORING PROGRAM (1994-1995)

JET PROPULSION LABORATORY

Concentrations in mg/L unless otherwise noted
(Values equal to or above state or Federal MCLs are in bold and shaded)

Sample Location	Sample Event	Sample Number	Data Validation	Sample Filtered	Al (6010)	As (206.2)	Ba (6010)	Cr^{+6} (7196)	Cr Total (6010)	Cu (6010)	Ni (6010)	Pb (239.2)	Sr (6010)	Zn (6010)	Cyanide (335.3)	Other Metals	Turbidity (NTUs)
Screen 2 DUP	July 1995	MW-560-04	X	Unfiltered	–	–	0.084	NA	–	–	0.012	– [R]	1.20	0.026	–	–	3.5
	July 1995	MW-560-05		Filtered	–	–	0.079	NA	–	–	–	–	1.30	0.027	–	–	3.5
Screen 3	July 1995	MW-559-01		Unfiltered	–	–	0.11	NA	–	–	–	–	0.88	–	–	–	9.5
	July 1995	MW-559-02		Filtered	–	–	0.11	NA	–	–	–	0.002	0.92	–	–	–	9.5
	Dec. 1995	MW-586-01	X	Unfiltered	–	–	0.15	NA	–	–	–	–	0.80	0.27	–	–	12.6
	Dec. 1995	MW-586-02		Filtered	–	–	0.13	NA	–	–	–	–	0.81	–	–	–	12.6
	Aug 1996	MW-961-10		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	4.6
Screen 4	July 1995	MW-558-01		Unfiltered	–	–	0.091	NA	–	–	–	–	0.67	–	–	–	3.8
	July 1995	MW-558-02		Filtered	–	–	0.089	NA	–	–	–	–	0.66	0.028	–	–	3.8
	Dec. 1995	MW-583-01		Unfiltered	–	–	0.084	NA	–	–	–	–	0.51	–	–	–	4.1
	Dec. 1995	MW-583-02		Filtered	–	–	0.083	NA	–	–	–	–	0.47	–	–	–	4.1
	Aug 1996	MW-961-10		Unfiltered	–	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	2.5
Screen 5	July 1995	MW-557-01		Unfiltered	0.190	–	0.059	NA	–	–	–	–	0.63	–	–	–	11.4
	July 1995	MW-557-02		Filtered	0.068	–	0.054	NA	–	–	–	–	0.63	–	–	–	11.4
	Dec. 1995	MW-582-01	X	Unfiltered	**0.230**	–	0.079	NA	–	–	–	–	0.74	–	–	–	
	Dec. 1995	MW-582-02		Filtered	–	–	0.072	NA	–	–	–	–	0.72	–	–	–	
	Aug 1996	MW-961-10		Unfiltered	0.012	–	NA	NA	NA	NA	NA	–	NA	NA	NA	NA	4.9
Detection Limits					0.05	0.005	0.02	0.01	0.01	0.01	0.01	0.002	0.01	0.02	0.005	–	–
California Maximum Contaminant Level					1.0	0.05	1.0	–	0.05	–	–	0.015(3)	–	–	–	–	–
EPA Maximum Contaminant Level					0.05-0.2(2)	0.05	2.0	–	0.1	1.0(2)	0.1	0.015(3)	–	5.0(2)	0.2	–	–

Notes
(1): Results of aluminum analysis conducted during the first long-term quarterly sampling event (August, 1996) are included here with previous aluminum results. Results for As, Cr, Cr^{+6} and Pb are also included on Table 4-9.
(2): Secondary standard. Maximum value used for shading purposes.
(3): Treatment technique and public notification triggered at Action Level of 0.015 mg/L.
—: Not detected.
NA: Not analyzed.
EB: Metal also detected in associated equipment blank.
[U]: Validation qualifier for nondetect.
[R]: Validation qualifier for rejected data.
[J]: Validation qualifier for estimated value.
[UJ]: Validation qualifier for estimated non-detect.

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-1	Jun/Jul 1994	X	--/--[2]	--/--[2]	--/--[2]	--/--[2]	1.7
	Nov/Dec 1994		--/--	--/0.002	--/--	--/--	2.0
	Aug/Sep 1996		--	--	--	--	0.8
	Oct/Nov 1996		--	--	--	--	0.5
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		--	--	--	--	1.92
	Sep/Oct 1997	X	--	--	--	--	0.73
	Jan/Feb 1998	X	--	--	--	--	1.64
MW-3							
Screen 1	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	3.4
	Nov/Dec 1994		--/--	--/--	--/--	--/--	3.5
	Aug/Sep 1996		--	--	--	--	7.2
	Oct/Nov 1996		--	--	--	--	3.1
	Feb/Mar 1997		--	--	--	--	6.1
	Jun/Jul 1997		--	--	--	--	2.61
	Sep/Oct 1997	X	--	--	--	--	2.12
	Jan/Feb 1998	X	--[UJ]	--	--	--	2.87
Screen 2	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	0.8
	Nov/Dec 1994		--/--	--/--	--/--	--/--	2.9
	Aug/Sep 1996		--	--	--	--	1.7
	Oct/Nov 1996		--	--	--	--	2.7
	Feb/Mar 1997		--	--	--	--	3.8
	Jun/Jul 1997		--	--	--	--	1.13
	Sep/Oct 1997	X	--	--	--	--	2.11
	Jan/Feb 1998	X	--[UJ]	--	--	--	2.25
Screen 3	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	15.3
	Nov/Dec 1994		--/--	--/--	--/--	--/--	4.2
	Aug/Sep 1996		--	--	--	--	5.2
	Oct/Nov 1996		--	--	--	--	2.7
	Feb/Mar 1997		--	--	--	--	1.7
	Jun/Jul 1997		--	--	--	--	3.41
	Sep/Oct 1997	X	--	--	--	--	4.97
	Jan/Feb 1998	X	--	--	--	--	4.89
Screen 4	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	6.4
	Nov/Dec 1994		--/--	--/--	--/--	--/--	3.9
	Aug/Sep 1996		--	--	--	--	4.3
	Oct/Nov 1996		--	--	--	--	2.6
	Feb/Mar 1997		--	--	--	--	4.5
	Jun/Jul 1997		--	--	--	--	2.71
	Sep/Oct 1997	X	--	--	--	--	2.45
	Jan/Feb 1998	X	--	--	--	--	2.96
Screen 5	Jun/Jul 1994	X	0.014/0.017	--[UJ]/--[UJ]	--/--	--/--	3.4
	Nov/Dec 1994		0.006/0.006	--/--	--/--	--/NA	2.0
	Aug/Sep 1996		0.011	--	--	--	1.5
	Oct/Nov 1996		0.007	--	--	--	1.9
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		0.007	--	--	--	0.83
	Sep/Oct 1997	X	0.010	--	--	--	0.96
	Jan/Feb 1998	X	0.009	0.008	--	--	2.28
MW-4							
Screen 1	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	2.5
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	7.2
	Aug/Sep 1996		--	--	--	--	2.6
	Oct/Nov 1996		--	--	--	--	1.7
	Feb/Mar 1997		--	--	--	--	4.6
	Jun/Jul 1997		--	--	--	--	2.79
	Sep/Oct 1997	X	--	--	--	--	4.76
	Jan/Feb 1998	X	--[R]	--	--	--	3.35

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
Screen 2	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	2.3
	Nov/Dec 1994		--/--	--/--	0.017/--	--/NA	5.0
	Aug/Sep 1996		--	--	0.023	--	3.8
	Oct/Nov 1996		--	--	0.014	--	4.2
	Feb/Mar 1997		--	--	0.011	--	4.5
	Jun/Jul 1997		--	--	0.013	--	2.69
	Sep/Oct 1997	X	--	--	0.012	--	3.51
	Jan/Feb 1998	X	--[R]	--	--	--	4.84
Screen 3	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	2.6
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.2
	Aug/Sep 1996		--	--	--	--	0.6
	Oct/Nov 1996		--	--	--	--	1.5
	Feb/Mar 1997		--	--	--	--	2.8
	Jun/Jul 1997		--	--	--	--	1.98
	Sep/Oct 1997	X	--	--	--	--	1.42
	Jan/Feb 1998	X	--[UJ][R]	--	--	--	4.55
Screen 4	Jun/Jul 1994	X	--/--	--/--	0.018/--	--/--	3.3
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.1
	Aug/Sep 1996		--	--	--	--	3.0
	Oct/Nov 1996		--	--	--	--	1.4
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		--	--	--	--	4.62
	Sep/Oct 1997	X	--	--	--	--	3.28
	Jan/Feb 1998	X	--[UJ]	--	--	--	4.73
Screen 5	Jun/Jul 1994	X	--/--	--/--	0.011/--	--/--	18.0
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	15.7
	Aug/Sep 1996		--	--	--	--	4.5
	Oct/Nov 1996		--	--	--	--	4.1
	Feb/Mar 1997		--	--	--	--	4.4
	Jun/Jul 1997		--	--	--	--	3.98
	Sep/Oct 1997	X	--	--	--	--	3.92
	Jan/Feb 1998	X	--	--	--	--	4.47
MW-5	Jun/Jul 1994	X	--[UJ]/--	--/--	--/--	--/--	1.7
	Nov/Dec 1994		--/--	--/--	0.011/--	--/NA	1.3
	Aug/Sep 1996		--	--	--	--	2.7
	Oct/Nov 1996		--	0.003	--	--	2.7
	Feb/Mar 1997		--	--	--	--	1.5
	Jun/Jul 1997		--	--	--	--	4.50
	Sep/Oct 1997	X	--	--	--	--	1.00
	Jan/Feb 1998	X	--	--	--	--	0.86
MW-6	Jun/Jul 1994	X	--/--	--/--	**0.075/--**	--/--	2.2
	Nov/Dec 1994	X	--/--	--/--	**0.24/--**	--/NA	4.8
	Aug/Sep 1996		--	--	**0.050**	--	4.5
	Oct/Nov 1996		--	--	0.011	--	1.1
	Feb/Mar 1997		--	--	0.014	--	4.3
	Jun/Jul 1997		--	--	0.019	--	2.50
	Sep/Oct 1997	X	--	--	--	--	1.78
	Jan/Feb 1998	X	--	--	--	--	0.42
MW-7	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	4.6
	Nov/Dec 1994	X	--/--	--/--	.013/.012	--/NA	3.2
	Aug/Sep 1996		--	--	0.013	0.007	4.8
	Oct/Nov 1996		--	--	0.019	0.019	3.5
	Feb/Mar 1997		--	--	--	0.010	2.2
	Jun/Jul 1997		--	--	--	--	0.98
	Sep/Oct 1997	X	--	--	0.018	--[UJ]	0.77
	Jan/Feb 1998	X	--	--	0.012	--	1.21

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-8	Jun/Jul 1994	X	--[UJ]/--	--/0.002	--/--	--/--	4.2
	Nov/Dec 1994	X	--/--	--/--	--/--	--/NA	4.3
	Aug/Sep 1996		--	--	--	--	4.0
	Oct/Nov 1996		--	0.003	--	--	4.7
	Feb/Mar 1997		--	--	--	--	3.1
	Jun/Jul 1997		--	0.002	--	--	4.61
	Sep/Oct 1997	X	--	--	--	--	4.20
	Jan/Feb 1998	X	--	--	--	--	3.39
MW-9	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	5.6
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	3.9
	Aug/Sep 1996		--	--	--	--	2.1
	Oct/Nov 1996		--	--	--	--	2.5
	Feb/Mar 1997		--	--	--	--	4.2
	Jun/Jul 1997		--	--	--	--	3.22
	Sep/Oct 1997	X	--	--	--	--	1.03
	Jan/Feb 1998	X	--	--	--	--	2.43
MW-10	Jun/Jul 1994	X	--/--	--[UJ]/--	0.012/--	--/--	3.8
	Nov/Dec 1994		--/--	--/--	0.017/0.010	--/NA	4.0
	Aug/Sep 1996		--	--	0.011	0.010	4.5
	Oct/Nov 1996		--	0.003	0.011	--	4.9
	Feb/Mar 1997		--	--	--	--	2.2
	Jun/Jul 1997		--	--	0.014	--	2.92
	Sep/Oct 1997	X	--	--	--	--	3.23
	Jan/Feb 1998	X	--	--	--	--	2.11
MW-11							
Screen 1	Jun/Jul 1994	X	--/--	--/--	0.021/--	--/--	6.8
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	1.9
	Aug/Sep 1996		--	--	--	--	4.0
	Oct/Nov 1996		--	--	--	--	2.5
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		--	--	--	--	1.53
	Sep/Oct 1997	X	--[UJ]	--	--	--	4.64
	Jan/Feb 1998	X	--[UJ]	--	--	--	1.03
Screen 2	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	11.4
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	0.5
	Aug/Sep 1996		--	--	--	--	4.5
	Oct/Nov 1996		--	--	--	--	4.7
	Feb/Mar 1997		--	--	--	--	3.1
	Jun/Jul 1997		--	--	--	--	4.67
	Sep/Oct 1997	X	--[UJ]	--	--	--	3.00
	Jan/Feb 1998	X	--[UJ]	--	--	--	2.37
Screen 3	Jun/Jul 1994	X	--/--	0.013/**0.025**	--/--	--/--	2.9
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	3.2
	Aug/Sep 1996		--	--	--	--	0.5
	Oct/Nov 1996		--	--	--	--	2.3
	Feb/Mar 1997		--	--	--	--	1.7
	Jun/Jul 1997		--	--	--	--	1.88
	Sep/Oct 1997	X	--[UJ]	--	--	--	3.02
	Jan/Feb 1998	X	--	--	--	--	1.39
Screen 4	Jun/Jul 1994	X	--[UJ]/--[UJ]	--[UJ]/--[UJ]	--/--	--/--	4.4
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.7
	Aug/Sep 1996		--	--	--	--	3.9
	Oct/Nov 1996		--	--	--	--	3.3
	Feb/Mar 1997		--	0.009	--	--	5.2
	Jun/Jul 1997		--	--	--	--	4.80
	Sep/Oct 1997	X	--[UJ]	--	--	--	4.95
	Jan/Feb 1998	X	--[R]	--	--	--	3.43

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect
a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank
[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
Screen 5	Jun/Jul 1994	X	--[UJ]/--	--[UJ]/--[UJ]	0.012/--	--/--	2.5
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.6
	Aug/Sep 1996		0.007	--	--	--	0.6
	Oct/Nov 1996		0.005	--	--	--	1.9
	Feb/Mar 1997		--	0.002	--	--	1.6
	Jun/Jul 1997		--	--	--	--	0.69
	Sep/Oct 1997	X	--[UJ]	--	--	--	2.55
	Jan/Feb 1998	X	--[R]	--	--	--	1.23
MW-12							
Screen 1	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	1.9
	Nov/Dec 1994		--/--	--/0.020	--/--	--/NA	4.4
	Aug/Sep 1996		--	0.004	--	--	50.4
	Oct/Nov 1996		Not Sampled*				
	Feb/Mar 1997		--	0.003(EB)	--	--	3.8
	Jun/Jul 1997		--	--	--	--	4.80
	Sep/Oct 1997		Not Sampled*				
	Jan/Feb 1998	X	--	--	--	--	2.63
Screen 2	Jun/Jul 1994	X	--/--	--/--[UJ]	0.016/--	--/--	12.3
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	13.8
	Aug/Sep 1996		--	0.024	--	--	4.0
	Oct/Nov 1996		--	--	--	--	4.0
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		--	--	--	--	3.16
	Sep/Oct 1997	X	--[UJ]	--	--	--	3.37
	Jan/Feb 1998	X	--[UJ]	--	--	--	4.41
Screen 3	Jun/Jul 1994	X	--/--	--/--[UJ]	--/--	--/--	16.3
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	15.2
	Aug/Sep 1996		--	--	--	--	2.5
	Oct/Nov 1996		--	--	--	--	3.1
	Feb/Mar 1997		--	--	--	--	5.0
	Jun/Jul 1997		--	--	--	--	4.79
	Sep/Oct 1997	X	--[UJ]	--	--	--	4.18
	Jan/Feb 1998	X	--	--	--	--	2.79
Screen 4	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	3.2
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.8
	Aug/Sep 1996		--	0.005	--	--	1.8
	Oct/Nov 1996		--	--	--	--	0.7
	Feb/Mar 1997		--	--	--	--	2.4
	Jun/Jul 1997		--	--	--	--	2.49
	Sep/Oct 1997	X	--[UJ]	--	--	--	1.58
	Jan/Feb 1998	X	--	--	--	--	3.39
Screen 5	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	3.3
	Nov/Dec 1994	X	--[R]/--	--[R]/--	--/--	--/NA	3.9
	Aug/Sep 1996		--	--	--	--	2.0
	Oct/Nov 1996		--	--	--	--	2.0
	Feb/Mar 1997		--	--	--	--	1.5
	Jun/Jul 1997		--	--	--	--	4.97
	Sep/Oct 1997	X	--[UJ]	--	--	--	0.99
	Jan/Feb 1998	X	--[UJ]	--	--	--	2.17

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-13	Jun/Jul 1994	X	--/--	--[UJ]/--	**0.062,0.061(DUP)/ 0.054,0.054(DUP)**	--/--	4.7
	Nov/Dec 1994	X	--/--	--/--	0.033,0.026(DUP) 0.024,0.024(DUP)	0.019/NA	3.6
	Aug/Sep 1996		--	--	0.046	0.047	4.1
	Oct/Nov 1996		--	0.005	0.031	0.028	3.0
	Feb/Mar 1997		--	--	0.032	0.035	0.5
	Jun/Jul 1997		--	--	0.038	0.037	1.21
	Sep/Oct 1997	X	--	--	**0.050**	0.045	2.36
	Jan/Feb 1998	X	--	0.003	0.040	0.036	1.0
MW-14							
Screen 1	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	3.4
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	6.9
	Aug/Sep 1996		--	--	--	--	3.3
	Oct/Nov 1996		--	--	--	--	4.5
	Feb/Mar 1997		--	--	--	--	4.3
	Jun/Jul 1997		--	--	--	--	2.21
	Sep/Oct 1997	X	--	--	--	--	3.89
	Jan/Feb 1998	X	--	0.004(EB)	--	--	4.96
Screen 2	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	0.012/--	--/--	7.9
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	4.2
	Aug/Sep 1996		--	--	--	--	4.4
	Oct/Nov 1996		--	--	--	--	3.8
	Feb/Mar 1997		--	--	--	--	4.8
	Jun/Jul 1997		--	--	--	--	4.97
	Sep/Oct 1997	X	--	--	--	--	3.22
	Jan/Feb 1998	X	--	0.003(EB)	--	--	4.80
Screen 3	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	4.4
	Nov/Dec 1994		--/--	--/--	0.012/--	--/NA	2.8
	Aug/Sep 1996		--	--	--	--	1.7
	Oct/Nov 1996		--	--	--	--	2.0
	Feb/Mar 1997		--	--	--	--	2.5
	Jun/Jul 1997		--	--	--	--	0.70
	Sep/Oct 1997	X	--	--	--	--	2.94
	Jan/Feb 1998	X	--	0.003(EB)	0.026	--	2.14
Screen 4	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	4.8
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	13.7
	Aug/Sep 1996		--	--	--	--	3.1
	Oct/Nov 1996		--	--	--	--	2.5
	Feb/Mar 1997		--	--	--	--	4.1
	Jun/Jul 1997		--	--	--	--	2.31
	Sep/Oct 1997	X	--	--	--	--	1.73
	Jan/Feb 1998	X	--	0.002(EB)	--	--	2.69
Screen 5	Jun/Jul 1994	X	--/--	--[UJ]/--[UJ]	--/--	--/--	2.0
	Nov/Dec 1994	X	--[R]/--	--[R]/--	--/--	--/NA	4.1
	Aug/Sep 1996		--	--	--	--	1.5
	Oct/Nov 1996		--	--	--	--	4.1
	Feb/Mar 1997		--	**0.028**	--	--	2.3
	Jun/Jul 1997		--	--	--	--	1.90
	Sep/Oct 1997	X	--	--	--	--	3.80
	Jan/Feb 1998	X	--	--	--	--	4.65

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)
Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-15	Jun/Jul 1994	X	--/--	--/--	--/--	--/--	3.9
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	1.4
	Aug/Sep 1996		--	--	--	--	1.3
	Oct/Nov 1996		--	--	--	--	0.5
	Feb/Mar 1997		--	--	--	--	2.6
	Jun/Jul 1997		--	--	--	--	0.21
	Sep/Oct 1997	X	--	--	--	--	0.94
	Jan/Feb 1998	X	--	--	--	--	1.40
MW-16	Jun/Jul 1994	X	--/--	--[UJ]/--	--/--	--/--	2.3
	Nov/Dec 1994		--/--	--/--	--/--	--/NA	2.5
	Aug/Sep 1996		--	--	0.018	--	3.4
	Oct/Nov 1996		Not Sampled*				
	Feb/Mar 1997		--	--	--	0.007	0.2
	Jun/Jul 1997		--	--	--	--	0.12
	Sep/Oct 1997		Not Sampled*				
	Jan/Feb 1998	X	--	--	--	--	1.12
MW-17							
Screen 1	July 1995		--/--	--/--	--/--	NA	0.2
	Dec 1995		--/--	--/--	--/--	NA	2.0
	Aug/Sep 1996		--	--	NA	NA	1.0
	Oct/Nov 1996		--	--	--	--	2.9
	Feb/Mar 1997		--	--	--	--	2.0
	Jun/Jul 1997		--	--	--	--	2.23
	Sep/Oct 1997	X	--	--	--	--	1.30
	Jan/Feb 1998	X	--	--	--	--	4.98
Screen 2	July 1995		--/--	--/--	--/--	NA	2.0
	Dec 1995		--/--	--/--	--/--	NA	5.0
	Aug/Sep 1996		--	--	NA	NA	4.5
	Oct/Nov 1996		--	--	--	--	2.5
	Feb/Mar 1997		--	--	--	--	2.7
	Jun/Jul 1997		--	--	--	--	4.49
	Sep/Oct 1997	X	--	--	--	--	1.23
	Jan/Feb 1998	X	--	--	--	--	0.79
Screen 3	July 1995		--/--	--/--	--/--	NA	3.5
	Dec 1995	X	--/--	--/--	--/--	NA	11.3
	Aug/Sep 1996		--	0.002	NA	NA	4.9
	Oct/Nov 1996		--	--	--	--	4.8
	Feb/Mar 1997		--	--	--	--	6.0
	Jun/Jul 1997		--	--	--	--	4.83
	Sep/Oct 1997	X	--	--	--	0.006	2.54
	Jan/Feb 1998	X	--	--	--	--	3.24
Screen 4	July 1995		--/--	--/--	--/--	NA	4.7
	Dec 1995	X	--/--	--/--	--/--	NA	4.5
	Aug/Sep 1996		--	--	NA	NA	2.8
	Oct/Nov 1996		--	--	--	--	2.6
	Feb/Mar 1997		--	--	--	--	5.6
	Jun/Jul 1997		--	--	--	--	4.09
	Sep/Oct 1997	X	--	--	--	--	3.57
	Jan/Feb 1998	X	--	--	--	--	3.94
Screen 5	July 1995	X	--/--	--/--	--/--	NA	5.0
	Dec 1995	X	--/--	--/--	--/--	NA	4.9
	Aug/Sep 1996		--	--	NA	NA	5.0
	Oct/Nov 1996		--	0.005	--	--	5.2
	Feb/Mar 1997		--	0.003	--	--	24.5
	Jun/Jul 1997		--	--	--	--	34.0
	Sep/Oct 1997	X	--	--	--	--	4.83
	Jan/Feb 1998	X	--	--	--	--	4.75

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-18							
Screen 1	July 1995		--/--	--/--	--/--	NA	1.3
	Dec 1995		--/--	--/--	--/--	NA	3.1
	Aug/Sep 1996		--	--	NA	NA	0.9
	Oct/Nov 1996		Not Sampled*				
	Feb/Mar 1997		--	--	--	--	1.9
	Jun/Jul 1997		--	--	--	--	0.42
	Sep/Oct 1997		Not Sampled*				
	Jan/Feb 1998		Not Sampled*				
Screen 2	July 1995		--/--	--/--	--/--	NA	3.45
	Dec 1995		--/--	--/--	--/--	NA	2.8
	Aug/Sep 1996		--	--	NA	NA	3.5
	Oct/Nov 1996		--	0.003(EB)	--	--	3.4
	Feb/Mar 1997		--	--	--	--	2.8
	Jun/Jul 1997		--	--	--	--	1.53
	Sep/Oct 1997	X	--	--	--	--	1.43
	Jan/Feb 1998	X	--	--	--	--	3.60
Screen 3	July 1995		--/--	--/--	--/--	NA	4.57
	Dec 1995	X	--/--	--/--	--/--	NA	4.1
	Aug/Sep 1996		--	--	NA	NA	4.2
	Oct/Nov 1996		--	0.002(EB)	--	--	4.0
	Feb/Mar 1997		--	--	0.015	0.007	3.3
	Jun/Jul 1997		--	--	--	--	3.88
	Sep/Oct 1997	X	--	--	--	--	2.05
	Jan/Feb 1998	X	--	--	--	--	0.58
Screen 4	July 1995		--/--	--/--	--/--	NA	1.1
	Dec 1995	X	--/--	--/--	--/--	NA	2.1
	Aug/Sep 1996		--	--	NA	NA	2.0
	Oct/Nov 1996		--	0.003(EB)	--	--	1.9
	Feb/Mar 1997		--	--	--	--	2.8
	Jun/Jul 1997		0.005	--	--	--	3.58
	Sep/Oct 1997	X	--	--	--	--	1.12
	Jan/Feb 1998	X	--	--	--	--	2.23
Screen 5	July 1995	X	--[UJ]/--[UJ]	--/--	--/--	NA	5.0
	Dec 1995		--/--	--/--	--/--	NA	6.7
	Aug/Sep 1996		--	--	NA	NA	2.8
	Oct/Nov 1996		--	0.002(EB)	--	--	3.6
	Feb/Mar 1997		--	--	--	--	2.9
	Jun/Jul 1997		--	--	--	--	3.97
	Sep/Oct 1997	X	--	--	--	--	1.65
	Jan/Feb 1998	X	--	--	--	--	1.63
MW-19							
Screen 1	July 1995		--/--	--/--	--/--	NA	0.6
	Dec 1995		--/--	--/--	--/--	NA	3.0
	Aug/Sep 1996		--	--	NA	NA	5.0
	Oct/Nov 1996		--	--	--	--	3.4
	Feb/Mar 1997		--	--	--	--	6.6
	Jun/Jul 1997		--	--	--	--	0.78
	Sep/Oct 1997	X	--	--	--	--	4.63
	Jan/Feb 1998	X	--[UJ]	--	--	--	4.70
Screen 2	July 1995	X	--/--	--/--	--/--	NA	1.0
	Dec 1995		--/--	--/--	--/--	NA	5.7
	Aug/Sep 1996		--	--	NA	NA	4.5
	Oct/Nov 1996		--	--	--	--	3.6
	Feb/Mar 1997		--	--	--	--	21.9
	Jun/Jul 1997		--	--	--	--	2.80
	Sep/Oct 1997	X	--	--	--	--	4.57
	Jan/Feb 1998	X	--[UJ]	--	--	--	4.72

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: *Validation qualifier for estimated non-detect*

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)
Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
Screen 3	July 1995		--/--	--/--	--/--	NA	4.3
	Dec 1995	X	--[UJ]/--	0.002/--	--/--	NA	3.8
	Aug/Sep 1996		--	--	NA	NA	3.0
	Oct/Nov 1996		--	--	--	--	5.0
	Feb/Mar 1997		--	--	--	--	4.9
	Jun/Jul 1997		--	--	--	--	4.88
	Sep/Oct 1997	X	--	--	--	--	2.02
	Jan/Feb 1998	X	--	--	--	--	4.10
Screen 4	July 1995	X	--[UJ]/--	--/--	--/--	NA	4.2
	Dec 1995	X	--[UJ]/--	--/--	--/--	NA	19.7
	Aug/Sep 1996		--	--	NA	NA	4.2
	Oct/Nov 1996		--	--	--	--	8.0
	Feb/Mar 1997		--	0.003	--	--	15.8
	Jun/Jul 1997		--	--	--	--	4.88
	Sep/Oct 1997	X	--	--	--	--	4.82
	Jan/Feb 1998	X	--	--	--	--	4.75
Screen 5	July 1995		--/--	--/--	--/--	NA	4.6
	Dec 1995		--/--	--/--	--/--	NA	3.2
	Aug/Sep 1996		--	--	NA	NA	4.9
	Oct/Nov 1996		--	--	--	--	4.6
	Feb/Mar 1997		--	--	--	--	3.8
	Jun/Jul 1997		--	--	--	--	2.15
	Sep/Oct 1997	X	--	--	--	--	4.98
	Jan/Feb 1998	X	--[UJ]	--	--	--	3.98
MW-20							
Screen 1	July 1995		--/--	--/--	--/--	NA	2.5
	Dec 1995		--/--	--/--	--/--	NA	6.5
	Aug/Sep 1996		--	--	NA	NA	3.5
	Oct/Nov 1996		Not Sampled*				
	Feb/Mar 1997		--	--	--	--	2.3
	Jun/Jul 1997		--	--	--	--	0.16
	Sep/Oct 1997		Not Sampled*				
	Jan/Feb 1998	X	--	--	--	--	3.17
Screen 2	July 1995		--/--	--/--	--/--	NA	2.7
	Dec 1995		--/--	--/--	--/--	NA	3.0
	Aug/Sep 1996		--	--	NA	NA	3.9
	Oct/Nov 1996		--	--	--	--	1.1
	Feb/Mar 1997		--	--	--	--	2.1
	Jun/Jul 1997		--	--	--	--	2.54
	Sep/Oct 1997	X	--	--	--	--	3.57
	Jan/Feb 1998	X	--	--	--	--	0.44
Screen 3	July 1995		--/--	--/--	--/--	NA	4.7
	Dec 1995		--/--	--/--	--/--	NA	3.0
	Aug/Sep 1996		--	--	NA	NA	1.7
	Oct/Nov 1996		--	--	--	--	1.6
	Feb/Mar 1997		--	--	--	--	1.9
	Jun/Jul 1997		--	--	--	--	2.14
	Sep/Oct 1997	X	--	--	--	--	4.56
	Jan/Feb 1998	X	--	--	--	--	2.16
Screen 4	July 1995		--/--	--/--	--/--	NA	1.8
	Dec 1995		--/--	--/--	--/--	NA	2.7
	Aug/Sep 1996		--	--	NA	NA	1.0
	Oct/Nov 1996		--	--	--	--	1.3
	Feb/Mar 1997		--	--	--	--	3.3
	Jun/Jul 1997		--	--	--	--	1.29
	Sep/Oct 1997	X	--	--	--	--	1.35
	Jan/Feb 1998	X	--	--	--	--	0.58

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
Screen 5	July 1995	X	--/--	--/--	--/--	NA	3.4
	Dec 1995	X	--/--	--/--	--/--	NA	3.2
	Aug/Sep 1996		--	--	NA	NA	1.8
	Oct/Nov 1996		--	--	--	--	1.3
	Feb/Mar 1997		--	0.004	--	--	1.6
	Jun/Jul 1997		0.006	--	--	--	1.94
	Sep/Oct 1997	X	--	--	--	--	3.50
	Jan/Feb 1998	X	--	--	--	--	0.13
MW-21							
Screen 1	July 1995	X	--/--	0.007[J]/--	--/--	NA	1.7
	Dec 1995		--/--	--/--	--/--	NA	2.4
	Aug/Sep 1996		--	--	NA	NA	0.9
	Oct/Nov 1996		Not Sampled*				
	Feb/Mar 1997		--	--	--	--	1.1
	Jun/Jul 1997		--	--	--	--	2.76
	Sep/Oct 1997		Not Sampled*				
	Jan/Feb 1998	X	--	--	--	--	0.79
Screen 2	July 1995	X	--/--	--[R]/--	--/--	NA	3.5
	Dec 1995		--/--	--/--	--/--	NA	6.8
	Aug/Sep 1996		--	--	NA	NA	2.1
	Oct/Nov 1996		--	--	--	--	1.2
	Feb/Mar 1997		--	--	--	--	3.9
	Jun/Jul 1997		--	--	--	--	1.68
	Sep/Oct 1997	X	--	--	--	--	0.75
	Jan/Feb 1998	X	--	--	--	--	0.60
Screen 3	July 1995		--/--	--/0.002	--/--	NA	9.5
	Dec 1995	X	--/--	--/--	--/--	NA	12.6
	Aug/Sep 1996		--	--	NA	NA	4.6
	Oct/Nov 1996		--	--	--	--	4.9
	Feb/Mar 1997		--	0.003	--	--	4.6
	Jun/Jul 1997		--	--	--	--	1.40
	Sep/Oct 1997	X	--[UJ]	--	--	--	3.16
	Jan/Feb 1998	X	--	0.003	--	--	4.79
Screen 4	July 1995		--/--	--/--	--/--	NA	3.8
	Dec 1995		--/--	--/--	--/--	NA	4.1
	Aug/Sep 1996		--	--	NA	NA	2.5
	Oct/Nov 1996		--	--	--	--	3.3
	Feb/Mar 1997		--	0.004	--	--	4.4
	Jun/Jul 1997		--	--	--	--	2.46
	Sep/Oct 1997	X	--	--	--	--	4.51
	Jan/Feb 1998	X	--	--	--	--	1.10
Screen 5	July 1995		--/--	--/--	--/--	NA	11.4
	Dec 1995	X	--/--	--/--	--/--	NA	NA
	Aug/Sep 1996		--	--	NA	NA	4.9
	Oct/Nov 1996		--	--	--	--	5.0
	Feb/Mar 1997		--	--	--	--	28.0
	Jun/Jul 1997		--	--	--	--	26.4
	Sep/Oct 1997	X	--[UJ]	--	--	--	12.19
	Jan/Feb 1998	X	--	--	--	--	4.94

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-7

SUMMARY OF METALS OF POTENTIAL CONCERN [As, Pb, Cr, Cr(VI)] DETECTED DURING THE OU-1/OU-3 RI JET PROPULSION LABORATORY

(Concentrations in mg/L)

Values equal to or above MCLs or action levels are in bold and outlined

Sample Location	Sampling Date	Data Validation	Arsenic	Lead	Total Chromium	Hexavalent Chromium	Field Turbidity (NTUs)
MW-22 [1]							
Screen 1	Sep/Oct 1997	X	--	--	--	--	33.8
	Jan/Feb 1998	X	--	--	--	--	4.50
Screen 2	Sep/Oct 1997	X	--	--	--	--	4.90
	Jan/Feb 1998	X	--	--	--	--	4.15
Screen 3	Sep/Oct 1997	X	--	--	--	--	2.96
	Jan/Feb 1998	X	--	--	--	--	3.75
Screen 4	Sep/Oct 1997	X	--	--	--	--[UJ]	2.79
	Jan/Feb 1998	X	--	--	--	--	3.69
Screen 5	Sep/Oct 1997	X	--	--	--	--[UJ]	4.41
	Jan/Feb 1998	X	--[UJ]	--	--	--	2.81
MW-23 [1]							
Screen 1	Sep/Oct 1997	X	--	--	--	--	3.44
	Jan/Feb 1998	X	--	--	--	--	4.11
Screen 2	Sep/Oct 1997	X	--	--	--	--	4.92
	Jan/Feb 1998	X	--	--	--	--	4.89
Screen 3	Sep/Oct 1997	X	--	--	--	--	3.04
	Jan/Feb 1998	X	--	--	--	--	4.60
Screen 4	Sep/Oct 1997	X	--	--	--	--	4.88
	Jan/Feb 1998	X	--	--	--	--	4.51
Screen 5	Sep/Oct 1997	X	--	--	--	--	1.76
	Jan/Feb 1998	X	--	--	--	--	1.78
MW-24 [1]							
Screen 1	Sep/Oct 1997	X	--	--	--	--	1.56
	Jan/Feb 1998	X	--	--	--	--	3.82
Screen 2	Sep/Oct 1997	X	--	--	--	--	4.36
	Jan/Feb 1998	X	--	--	--	--	4.87
Screen 3	Sep/Oct 1997	X	--	--	--	--	4.63
	Jan/Feb 1998	X	0.006	--	--	--	4.71
Screen 4	Sep/Oct 1997	X	--	--	--	--	4.03
	Jan/Feb 1998	X	--	--	--	--	4.87
Screen 5	Sep/Oct 1997	X	--	--	--	--	4.79
	Jan/Feb 1998	X	--	--	--	--	4.76
Practical Quantitation Limit			0.005	0.002	0.01	0.005	
Calif. Maximum Contaminant Level			0.05	(a)	0.05	Not Established	
EPA Maximum Contaminant Level			0.05	(a)	0.10	Not Established	

NA: Not analyzed
--: Not detected
*: Not sampled, no water over screen
[UJ]: Validation qualifier for estimated non-detect

a: Treatment technique and public notification triggered at 0.015 mg/l
1: Wells installed June-August 1997
2: For the first two events, unfiltered/filtered sample data is included
(EB): Constituent also detected in equipment blank

[U]: Validation qualifier for non-detect
[J]: Validation qualifier for estimated result
[R]: Validation qualifier for rejected data

TABLE 1-8

ESTIMATED VOLUMES OF CONSTITUENTS OF INTEREST IN GROUNDWATER
JET PROPULSION LABORATORY

Constituent	Aquifer Layer	Layer Thickness	Contour Interval [1] (µg/L)	Ave. Concentration (µg/L)	Plume Area [2] (ft^2)	Volume Impacted H_2O (ft^3) [3]	Mass of Constituent (lbs)	Total Mass of Constituent (lbs)	Total Mass at North-Central Part of Site (lbs)
Carbon Tetrachloride	1	100	0.5-5.0	1.8	395,918	7,918,360	33.4	101.7 lbs (7.7 gallons)	40 lbs (3 gallons)
			5.0-20	12	832,804	16,656,080			
			20-100	30	429,727	8,594,540			
			100+	150	20,511	410,220			
	2	150	0.5-5.0	0.9	2,200,366	66,010,980	31.7		
			5.0-20	3.5	2,236,755	67,102,650			
			20+	28	255,371	7,661,130			
	3	300	0.5-5.0	1.3	7,500,350	450,021,000	36.6		
Trichloroethene	1	100	5-20	12	1,581,552	31,631,040	33.9	142.9 lbs (11.7 gallons)	11 lbs (1 gallon)
			20+	24	34,580	691,600			
	2	150	5-20	4.4	4,172,837	125,185,110	34.1		
	3	300	5-20	5.1	4,384,231	263,053,860	83.9		
1,2-Dichloro-athene	1	100	0.5-5.0	0.8	88,315	1,766,300	0.1	0.1 lb (0.01 gallons)	0.1 lb (0.01 gallons)
Perchlorate	1	100	18-100	99	400,900	8,018,000	316.9	1,298.8 lbs	948 lbs
			100-500	330	337,598	6,751,960			
			500+	975	104,748	2,094,960			
	2	150	18-100	22	3,894,931	116,847,930	492.6		
			100-500	93	1,900,789	57,023,670			
	3	300	18-100	41	1,573,215	117,991,125	489.3		
			100-500	130	306,122	22,959,150			
Hexavalent Chromium	1	100	--	0.036	400,000	8,000,000	0.01	0.01 lbs	0.01 lbs

Notes:

(1): As depicted on contaminant plume maps.

(2): Calculated with AutoCAD software used to generate plume maps.

(3): Assuming aquifer has 20% porosity.

TABLE 1-9

CHEMICAL AND PHYSICAL PROPERTIES FOR PRIMARY CONSTITUENTS OF INTEREST IN GROUNDWATER AT THE JET PROPULSION LABORATORY

Group	Analyte	CAS Number	Empirical Formula	Molecular Weight (g/mol)	Physical State (at 25 degrees C)	Density (g/ml)	Aqueous Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m^3/mol)	Octanol-Water Partition Coefficient (Log[K_{ow}])
VOCs	Carbon Tetrachloride	56-23-5	CCl_4	153.82	Liquid	1.594	800	113	0.0293	2.73
	1,2-Dichloroethane	107-06-2	$C_2H_4Cl_2$	98.96	Liquid	1.235	8,500	79	9.77×10^{-4}	1.48
	Tetrachloroethene	127-18-4	C_2Cl_4	165.8	Liquid	1.63	150	19	0.0685	2.53
	Trichloroethene	79-01-6	C_2HCl_3	131.39	Liquid	1.46	1,100	77	0.0117	2.53
Metals	Chromium(1)	7440-47-3	Cr	51.996	Solid	7.2	Insoluble	NA	NA	NA
Anions	Perchlorate	NA	ClO_4^-	99.5	Solid (2)	2.02 (2)	Soluble	NA	NA	NA

Notes:

NA: Not available.

(1): Properties are presented for metallic chromium. Values are not available for the hexavalent state of chromium.

(2): Properties are presented for sodium perchlorate. Values are not available for perchlorate as an anion.

References for chemical and physical properties include the following: (Micromedex, 1997), (ATSDR, 1997), (Burkhard and Kuehl, 1986), and (Howard, 1990).

TABLE 1-10

SUMMARY OF INPUT PARAMETERS FOR FATE AND TRANSPORT MODELING (SOLUTE VERSION 4.04) JET PROPULSION LABORATORY

Parameter(1)	Site-Specific Data Available?	Known/Measured/ Estimated Value (2)
Hydrogeologic Information		
Groundwater velocity (ft/d)	Yes	0.15
Porosity (%)	No	20*
Hydraulic gradient (ft/ft)	Yes	0.005
Longitudinal dispersivity (ft)	No	500*
Retardation factor	No	1.0
Hydraulic Conductivity (ft/d)	Yes	6.0
Contaminant Point Source Information		
Number of contaminant sources	Yes	1 (MW-17)
Initial aquifer concentration (μg/l)	Yes	0
Contaminant source concentration (3)	Yes	CCl_4: 6.6 μg/L TCE: 23 μg/L ClO_4^-: 55 μg/L
Duration of solute pulse (yrs)	No	20*
Aquifer half-life (yrs)	No	0*

Notes:

(1): Data for aquifer Layer 2 downgradient of JPL (near MW-17).

(2): Where site specific data was not available, assumptions were made based on conservative literature values (see RI, Foster Wheeler, 1999).

(3): Highest concentration of analyte detected in MW-17 during RI.

*: Estimated value.

TABLE 1-11

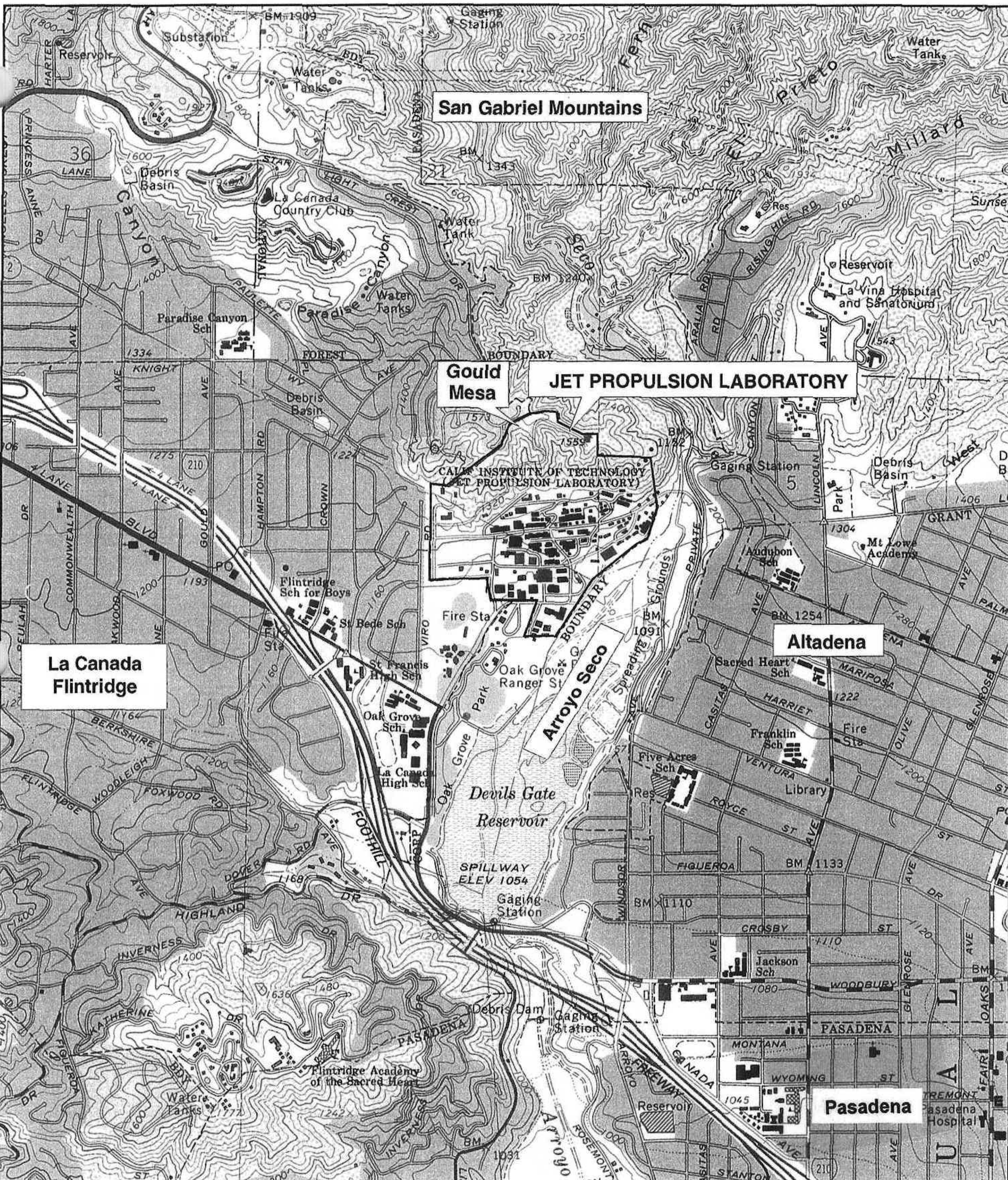
SUMMARY OF RESULTS OF FATE AND TRANSPORT MODELING JET PROPULSION LABORATORY

Analyte	MCL/IAL	Initial Concentration at MW-17	Time at Which Analyte Concentration is Predicted to Exceed MCL/IAL at MW-20
CCl_4	0.5 µg/l	6.6 µg/l (1)	22 years
TCE	5.0 µg/l	23 µg/l (1)	31 years
ClO_4^-	18 µg/l	55 µg/l (1)	40 years

Notes:

(1): Highest concentration of analyte detected in MW-17 during RI; input assumptions considered to be very conservative.

FIGURES



Source: USGS 7.5 Minute Topographic Quadrangle, 1966, Revised 1994

Scale
1:24,000

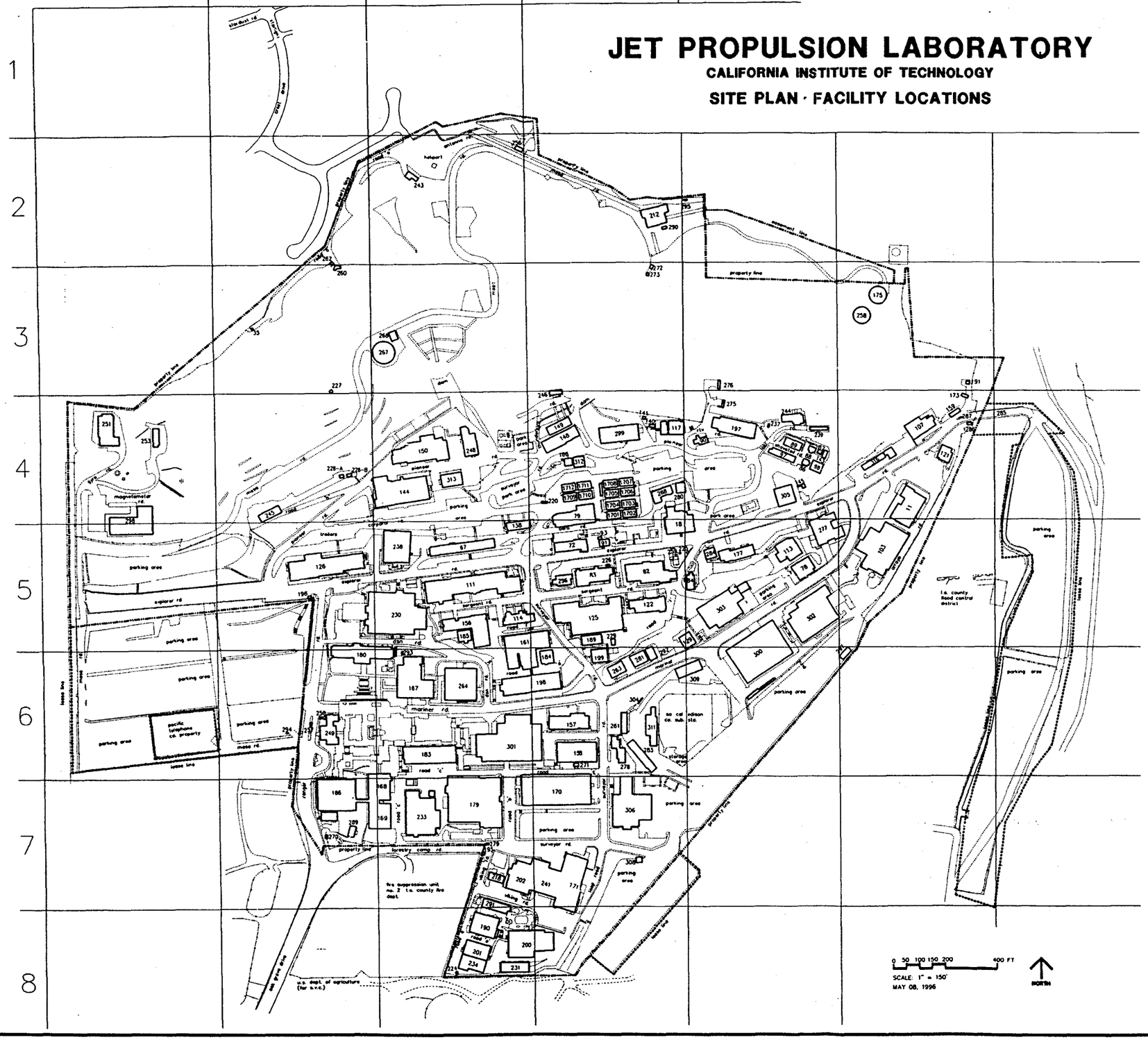
Figure 1-1

Site Location Map
Jet Propulsion Laboratory

JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY

SITE PLAN · FACILITY LOCATIONS



Facility Locations

No.	Facility Title	Location	No	Facility Title	Location
11	Space Sciences Laboratory	4-F	227	Pistol Range Storage	3-B
18	Structural Test Laboratory	5-D	228	Cooling Tower (A-B)	4-B
35	Radio/Repeater Complex	3-B	229	Shielded Room Building	5-D
67	Material Research	5-C	230	Space Flight Operation Facility	5-C
72	Engineering Offices	5-D	231	Paint Shop	8-C
78	Hydraulics Laboratory	5-E	233	System Development	7-C
79	Wind Tunnel (20 inch)	4-D	234	Lumber Storage	8-C
82	High Vacuum Laboratory	5-D	237	Cooling Tower	4-E
83	Quality Assurance	5-D	238	Telecommunications	5-C
84	Chemical Materials Laboratory	5-E	239	Propellant Conditioning Laboratory	4-E
86	Solid Oxidizer Laboratory	4-E	241	Receiving and Shipping	7-D
87	Propellant Conditioning Laboratory	4-E	243	Remote Antenna Range Control	2-C
88	Mixing Laboratory	4-E	244	Chemical Engineering	4-E
89	Laser Laboratory	4-E	245	Spectroscopy Laboratory	4-B
90	Pyrotechnics Laboratory	4-E	246	Soils Test Laboratory	4-D
91	Air Dryer	5-D	248	10-Foot Space Simulator	4-C
93	Vaporizer	5-D	249	Visitor Reception	6-B
97	Development Laboratory and Offices	4-E	250	Main Guard Shelter	6-B
98	Solid Fuel Laboratory	4-E	251	Gyro Laboratory	4-A
103	Fabrication Shop	5-F	252	Guard Shelter	6-B
107	Laser Research Laboratory	4-F	253	Magnetic Laboratory	4-A
111	Technical Information	5-C	256	Model Range Control	2-C
113	Pneumatics Laboratory	5-E	257	Main Guard Island	6-B
114	Electronics Development	5-C	258	Water Reservoir	3-F
117	Liquid and Solid Propellant Laboratory	4-D	259	Liquid Nitrogen Bottling Storage	5-D
121	Analytical Instruments Laboratory	4-F	260	Illuminator Equipment	3-B
122	Energy Conservation Systems	5-D	261	Controlled Storage	6-D
125	Combined Engineering Support	5-D	262	Radiometer	2-B
126	Information Systems Development	5-B	263	First Aid	6-D
129	Combustion Research Laboratory	5-E	264	Space Flight Support	6-C
138	Mission Operations	5-C	267	Water Reservoir	3-C
140	Propulsion Materials Storage	4-D	268	Pump House	3-C
141	Propulsion Materials Storage	4-D	270	Sewage Metering Station	7-B
143	Solid Rocket Dock	4-E	271	Oil Storage	6-D
144	Environmental Laboratory	4-C	272	East Illuminator	3-D
145	Magazine - Propellant	4-E	273	Antenna Tower	3-D
148	Energy Conservation Laboratory	4-D	275	Pyrotechnic Storage	4-E
149	Energy Conservation Development	4-D	276	Propellant Storage	3-E
150	25-Foot Space Simulator	4-C	277	Isotope Thermoelec. Sys. Appl. Lab.	5-E
156	Computer Program Offices	5-C	278	Robotics Laboratory	6-D
157	Applied Mechanics	6-D	279	Guard Island	7-C
158	Material Research Processing Laboratory	6-D	280	Static Test Tower	4-D
159	Pump House (water)	4-F	281	Fire and Guard Headquarters	6-D
161	Telecommunications Laboratory	5-C	283	Metal Storage	6-D
166	Cooling Tower	4-D	284	Transportation Office	5-E
167	Cafeteria	6-C	285	Arroyo Bridge	4-C
168	Instrument System Laboratory	7-C	286	Guard Shelter	4-F
169	Earth Space Science	7-C	287	Guard Island	4-F
170	Fabrication Shop	7-D	288	Project Equipment Storage	4-D
171	Material Services	7-D	289	Main Sewage Lift Station	7-B
173	Test Shelter	4-F	290	Antenna Inspection	2-D
175	Water Reservoir	3-F	291	Procurement Services	8-C
177	Transportation Garage	5-E	292	Fire Station	6-D
179	Spacecraft Assembly Facility	7-C	293	Instrumentation Cable Amplifier Building	6-C
180	Administration	6-B	294	Guard Shelter (Visitor Lot)	6-B
183	Physical Science Laboratory	6-C	295	Antenna Test Facility	2-E
184	Electronic Stores	6-D	296	Central Cooling Tower Water System	5-D
185	Programming Office	5-C	297	Xenon Test Laboratory	6-F
186	Science Exhibits and Engineering	7-B	298	Frequency Standard Laboratory	4-A
189	Electronics Laboratory Annex	5-D	299	Assembly Handling & Shpg. Equip. Fac.	4-D
190	Procurement Offices	8-C	300	Earth and Space Science Laboratory	6-E
191	Materials Compatability Laboratory	3-F	301	Central Engineering Building	6-C
195	Guard Shelter	7-C	302	Microdevices Laboratory	5-E
196	Guard Shelter	5-B	303	Engineering Support Building	5-E
197	Solid Propellant Engineering Laboratory	4-E	304	Disintegrator	6-D
198	Control Systems Laboratory	6-D	305	Hazardous Waste/Cryogenic Storage Facility	4-E
199	Celestial Simulator	6-D	306	Observational Instruments Laboratory	7-D
200	Facilities Engineering and Services	8-C	308	Sewage Lift Station	7-D
201	Carpenter Shop	8-C	309	Maintenance Storage Facility	6-D
202	Procurement and Communications Support	7-C	311	Ground Maintenance Facility	6-D
212	Antenna Laboratory	2-D	312	Shelter Maintenance Facility	4-D
218	Credit Union	7-C	313	Mirror Refurbishment	4-C
220	ICS Terminal	4-D	316	Hazmat Storage and Dist Facility	4-F
224	Sewage Lift Station	8-C			
225	Nitrogen Facility Office	5-D		MODULARS:	
226	Solvent Storage	5-D	1701-1712	Modular Offices	4-D

Figure 1-2

Site Facility Map
Jet Propulsion Laboratory

Jet Propulsion Laboratory
Pasadena, California

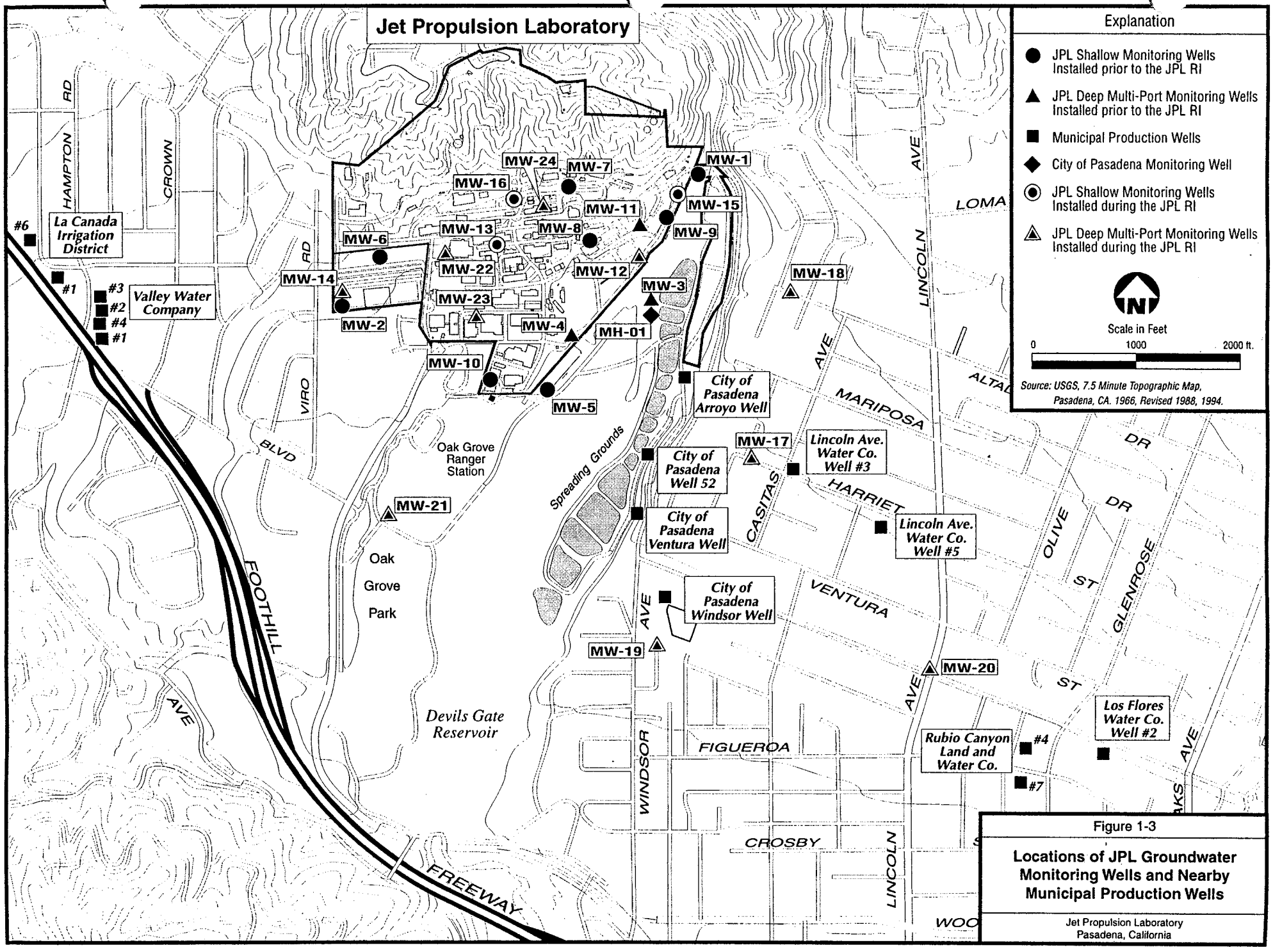


Figure 1-3

Locations of JPL Groundwater Monitoring Wells and Nearby Municipal Production Wells

Jet Propulsion Laboratory
Pasadena, California

Continue

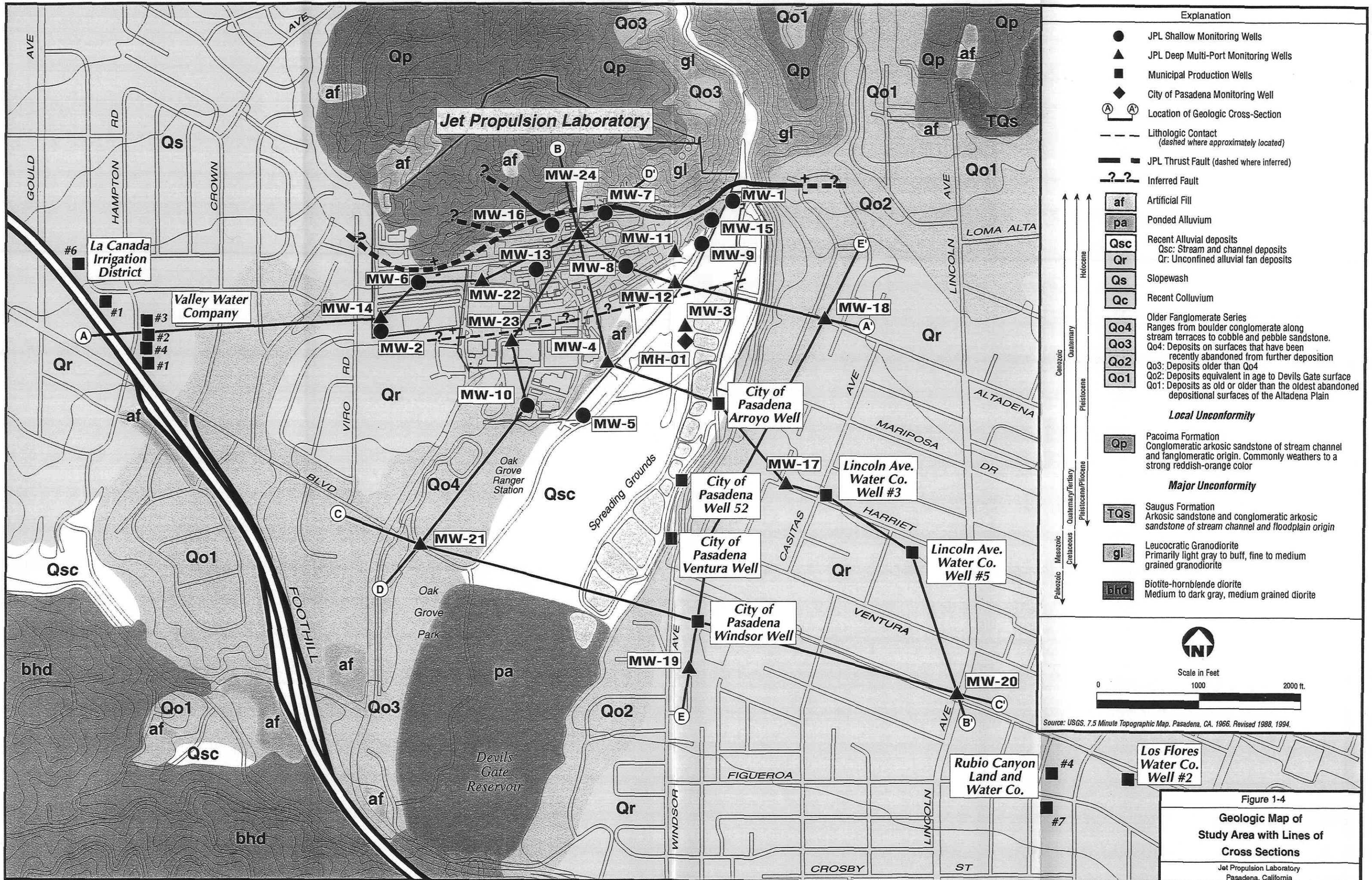


Figure 1-4

Geologic Map of Study Area with Lines of Cross Sections

Jet Propulsion Laboratory
Pasadena, California

1572.0245