NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (NEPA)
VALUES ASSESSMENT FOR OPERABLE UNIT 1

CONTENTS

FIGURES

ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
ASTDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CAA	Clean Air Act
Cal-EPA	State of California, Environmental Protection Agency
Caltech	California Institute of Technology
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CCl_4	carbon tetrachloride
DCE	1,1-dichloroethene
DOJ	Department of Justice
DTSC	Department of Toxic Substances Control
FBR	fluidized bed reactor
FFA	Federal Facilities Agreement
Freon 113	1,1,2-trichloro-1,2,2-trifluoroethane
FS	Feasibility Study
FWEC	Foster Wheeler Environmental Corporation
HHRA	human health risk assessment
JPL	Jet Propulsion Laboratory
LGAC	liquid-phase granular activated carbon
MCL	maximum contaminant level
NA	no action
NAAQS	National Primary and Secondary Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NPL	National Priorities List
OU	operable unit
PTO	permit to operate

RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
SVE	soil vapor extraction
SWRCB	State Water Resources Control Board
TCE	trichloroethene
EPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1: INTRODUCTION

This National Environmental Policy Act of 1969 (NEPA) Values Assessment accompanies the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial documentation for Operable Unit 1 (OU-1) at the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL). The Council on Environmental Quality (CEQ) and the Department of Justice (DOJ) have advised that federal agencies should integrate NEPA values into the CERCLA process when feasible and appropriate (DOJ, 1995).

1.1 Purpose and Need

Under CERCLA, NASA must determine the appropriate action to remediate volatile organic compounds (VOCs) and perchlorate in source area groundwater at JPL. This document accompanies CERCLA documentation for OU-1 and serves to integrate NEPA values into the CERCLA process for the response action.

1.2 Applicable Statutes and Regulations

This section discusses the federal, state, and local environmental statutes and regulations that are applicable or relevant and appropriate requirements (ARARs) to the response action at OU-1. Section 13.2 of the Interim ROD summarizes the ARARs associated with the limited-scope interim action.

1.2.1 National Environmental Policy Act of 1969, as Amended

This document is prepared in compliance with NEPA, as amended, and the Council on Environmental Quality Regulations for Implementing NEPA (40 CFR Parts 1500-1508). It is prepared to comply with NEPA through the assessment of selected NEPA values associated with the response action for OU-1 at JPL.

1.2.2 Other Federal Regulations

A Federal Facilities Agreement (FFA) under CERCLA Section 120 was executed in 1992 by NASA, EPA Region IX, State of California, Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC), and the Regional Water Quality Control Board (RWQCB), Los Angeles Region (EPA, 1992). The FFA lists JPL as a Resource Conservation and Recovery Act (RCRA)/CERCLA site requiring further evaluation using an investigation/assessment process that integrates and combines the RCRA Facility Investigation Process with the CERCLA Remedial Investigation (RI) process to determine the actual or potential impacts.

Federal environmental regulations considered to be ARARs were identified as part of the CERCLA process. These ARARs will be used to establish standards, consistent with the National Oil Hazardous Substance and Pollution Contingency Plan (NCP), for any remedial actions at OU-1 unless waived.

1.2.3 State and Local Regulations

State and local environmental regulations that are considered ARARs have been identified and will be used to establish standards that are consistent with the NCP for any remedial actions at JPL OU-1, unless waived.

2: PROPOSED ACTION AND ALTERNATIVES

During the RI of OU-1, the following four VOCs were detected frequently at elevated concentrations in groundwater samples: carbon tetrachloride (CCl_4); tricholorethene (TCE); tetrachloroethene (PCE) and 1, 1-dichloroethene (1, 1-DCE). In addition, perchlorate was detected frequently at elevated levels. The *Final Remedial Investigation Report for Operable Unit 1 and 3 On-site and Off-site Groundwater* (Foster Wheeler Environmental Corporation [FWEC], 1999) contains detailed information and data for all of the environmental groundwater samples taken in the characterization of OU-1.

The highest concentrations of carbon tetrachloride and perchlorate at the JPL site are located in the north-central portion of the JPL facility, which is referred to as the "source area." The source area is the location where the majority of chemicals are dissolved in the groundwater, and is defined as an eight-acre by 100-ft-thick portion of the aquifer.

In the late 1990s and early 2000s, NASA conducted pilot testing of several technologies to address dissolved perchlorate in source area groundwater. The technologies tested included reverse osmosis, a fluidized bed reactor (FBR), packed bed reactors, in situ bioremediation, and ion exchange. Due to the depth and extent of the chemicals in groundwater, in situ (below ground) treatment is not cost-effective at the JPL facility; therefore, groundwater must be pumped from the ground, treated above ground, and reinjected.

NASA installed a demonstration treatment plant located on JPL in the source area in early 2005. The demonstration study consists of two extraction wells, two injec¬tion wells, liquid-phase granular activated carbon (LGAC) treatment to remove VOCs, and a FBR to remove perchlorate. This system has been successful in the demon¬stration phase and the Interim ROD documents expansion and continued opera¬tion of the demonstration system as the response action.

The source area treatment facility is located on NASA Property. The ex situ biological treatment of perchlorate and LGAC treatment of VOCs will be operated until the performance objectives are achieved (see Section 11.4 of the Interim ROD).

A groundwater monitoring program, currently in place, will be used to track VOC and perchlorate concentrations and the areal extent of VOCs and perchlorate in groundwater over time. The monitoring program will consist of the periodic collection and analysis of groundwater samples from existing monitoring wells. This program will be used evaluate the treatment system's effectiveness and progress toward achieving the remedial action objectives (RAOs) discussed in the Interim ROD.

NASA expects that the selected alternative, ex situ biological treatment of perchlorate and LGAC treatment of VOCs, will satisfy the statutory requirements in CERCLA section 121(b) that the selected alternative:

- Be protective of human health and the environment
- Comply with ARARs

- Be cost-effective

- Use permanent solutions and alternative treatment technologies to the maximum extent practicable

- Satisfy the statutory preference for treatment as a principal element, or justify not meeting the preference.

The other alternative considered for OU-1 was "no further action" (NFA). This alternative includes groundwater monitoring as part of the selected alternative, but there would be no treatment technologies to remediate VOCs and perchlorate for on-site groundwater. The No Action alternative is required by the NCP and serves as the baseline for comparison for the other alternatives.

3: AFFECTED ENVIRONMENT

The JPL site is located within the San Gabriel Valley, in the eastern part of Los Angeles County. It is located between the city of La Cañada Flintridge and the unincorporated city of Altadena, CA, northeast of the 210 Foothill Freeway near Pasadena, CA.

JPL 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 JPL. Within the Arroyo Seco is a series of surface impoundments used as surface water collection and spreading basins for groundwater recharge. Residential development, an equestrian club (Flintridge Riding Club), and a Los Angeles County Fire Department Station (Fire Camp #2) border the JPL along its southwestern and western boundaries. Residential development also is present to the east of JPL, along the eastern edge of the Arroyo Seco.

3.1 Land Use

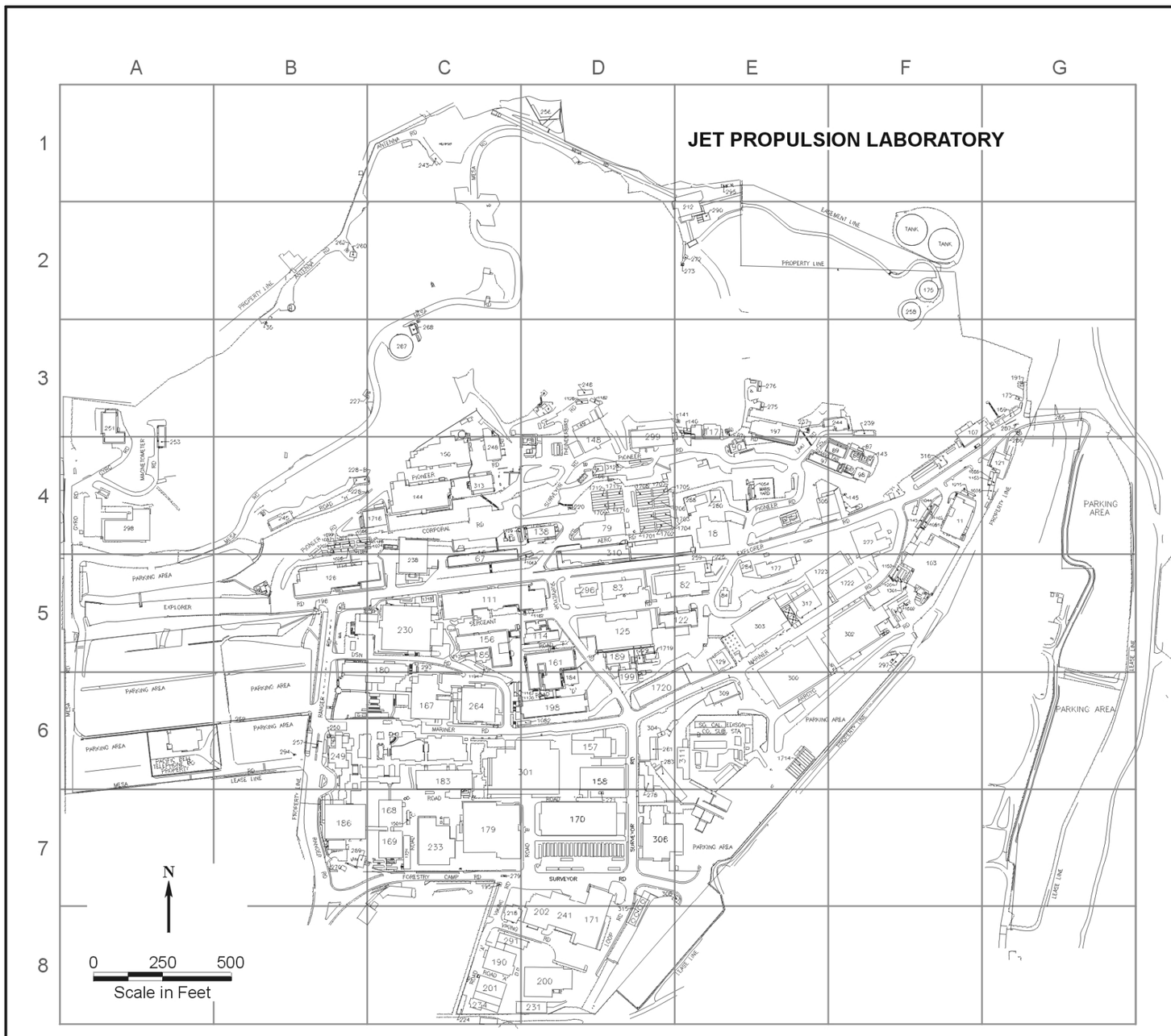
JPL comprises about 176 acres of land. Of these 176 acres, about 156 acres are federally owned. The remaining land is leased for parking from the City of Pasadena and the Flintridge Riding Club. The main developed area of JPL is the southern half, which can be divided into two general areas, the northeastern early-developed area and the southwestern later-developed area. Most of the northern half of JPL is not developed because of steeply sloping terrain.

Currently, the northeastern early-developed part of JPL is used for project support, testing, and storage. The southwestern later-developed part is used mostly for administrative, management, laboratory, and project functions. Further development of JPL is constrained because of steeply sloping terrain to the north, the Arroyo Seco to the south and east, and residential development to the west.

Located at the northern boundary of JPL is the Gould Mesa area. This area has widely separated small buildings and is used primarily for antenna testing. The distance between buildings is a result of the terrain and the need to isolate transmitting and receiving equipment. The relatively steep mountainside between Gould Mesa and the developed area at JPL is unpopulated.

Presently, more than 150 structures and buildings occupy JPL. Total usable building space is approximately 1,330,000 ft^2. Figure D-2 is a facility map for JPL.

The primary land use in the areas surrounding JPL is residential and light commercial. Industrial areas, such as manufacturing, processing, and packaging, are limited. The closest residential properties are those located along the western fence line of JPL. The nearest off-facility buildings are the Flintridge Riding Club and Fire Camp #2, both located approximately 100 yards from the southern border of JPL. The total number of buildings within two miles of JPL is about 2,500, primarily residential and community (e.g., schools, day-care centers, churches).



Facility Locations

No.	Facility Title	Location
	Mars Yard	4-E
11	Space Sciences Laboratory	4-F
18	Structural Test Laboratory	4-E
35	Radio/Repeater Complex	3-B
67	Material Research	5-C
79	Wind Tunnel (20 inch)	4-D
82	High Vacuum Laboratory	5-E
83	Quality Assurance	5-D
84	Chemical Materials Laboratory	5-E
86	Solid Oxidizer Laboratory	4-F
87	Propellant Conditioning Laboratory	4-F
88	Mixing Laboratory	4-F
89	Laser Laboratory	4-F
90	Pyrotechnics Laboratory	4-E
97	Development Laboratory and Offices	4-E
98	Solid Fuel Laboratory	4-F
103	Fabrication Shop	5-F
107	Laser Research Laboratory	3-F
111	Technical Information	5-C
114	Electronics Development	5-D
117	Liquid and Solid Propellant Laboratory	3-E
121	Analytical Instruments Laboratory	3-G
122	Energy Conservation Systems	5-E
125	Combined Engineering Support	5-D
126	Information Systems Development	5-B
129	Combustion Research Laboratory	5-E
138	Mission Operations	4-D
140	Propulsion Materials Storage	3-E
141	Propulsion Materials Storage	3-E
143	Solid Rocket Dock	4-F
144	Environmental Laboratory	4-C
145	Magazine - Propellant	4-F
148	Energy Conservation Laboratory	4-D
149	Energy Conservation Development	3-D
150	25-Foot Space Simulator	4-C
156	Computer Program Offices	5-C
157	Applied Mechanics	6-D
158	Material Research Processing Laboratory	6-D
159	Pump House (water)	3-G
161	Telecommunications Laboratory	5-D
166	Cooling Tower	4-D
167	Cafeteria	6-C
168	Instrument System Laboratory	7-C
169	Earth Space Science	7-C
170	Fabrication Shop	7-D
171	Material Services	8-D
173	Test Shelter	3-G
175	Water Reservoir	2-F
177	Transportation Garage	5-E
179	Spacecraft Assembly Facility	7-C
180	Administration	5-C
183	Physical Science Laboratory	6-C
184	Electronic Stores	6-D
185	Programming Office	5-C
186	Science Exhibits and Engineering	7-B
189	Electronics Laboratory Annex	5-D
190	Procurement Offices	8-C
191	Materials Compatability Laboratory	3-G
195	Guard Shelter	7-C
196	Guard Shelter	5-B
197	Solid Propellant Engineering Laboratory	3-E
198	Control Systems Laboratory	6-D
199	Celestial Simulator	6-D
200	Facilities Engineering and Services	8-D
201	Carpenter Shop	8-C
202	Procurement and Communications Support	8-D
212	Antenna Laboratory	2-E
218	Credit Union	8-C
220	ICS Terminal	4-D
224	Sewage Lift Station	8-C
225	Nitrogen Facility Office	5-E
226	Solvent Storage	5-D
227	Pistol Range Storage	3-B
228	Cooling Tower (A-B)	4-B
229	Shielded Room Building	5-D
230	Space Flight Operation Facility	5-C
231	Paint Shop	8-D
233	System Development	7-C
234	Lumber Storage	8-C
237	Cooling Tower	3-E
238	Telecommunications	5-C
239	Propellant Conditioning Laboratory	3-F
241	Receiving and Shipping	8-D
243	Remote Antenna Range Control	1-C
244	Chemical Engineering	3-F
245	Spectroscopy Laboratory	4-B
246	Soils Test Laboratory	3-D
248	10-Foot Space Simulator	4-C
249	Visitor Reception	6-B
250	Main Guard Shelter	6-B
251	Gyro Laboratory	3-A
252	Guard Shelter	6-B
253	Magnetic Laboratory	3-A
256	Model Range Control	1-D
257	Main Guard Island	6-B
258	Water Reservoir	2-F
259	Liquid Nitrogen Bottling Storage	5-E
260	Illuminator Equipment	2-B
761	Controlled Storage	6-D
262	Radiometer	2-B

Trailer Locations

Trlr.No.	Location
1021	4-B
1025	7-C
1028	4-B
1033	7-D
1044	4-G
1054	4-E
1057	7-D
1058	4-F
1060	7-D
1063	5-D
1065	7-C
1069	7-D
1073	7-D
1074	4-B
1076	4-G
1079	7-C
1081	4-F
1082	6-D
1085	7-C
1086	4-B
1087	4-B
1088	7-D
1089	4-B
1099	4-B
1102	4-F
1109	7-C
1110	7-C
1114	7-C
1128	3-D
1129	4-C
1132	7-D
1140	7-D
1141	7-D
1143	4-F
1147	7-D
1150	7-C
1151	7-D
1152	5-F
1153	4-G
1154	7-D
1155	7-C
1156	7-C
1162	5-D
1166	7-C
1167	6-C
1168	4-B
1169	7-D
1170	6-C
1173	7-C
1177	7-D
1180	7-D
1182	3-D
1186	7-D
1194	5-C
1197	7-D
1200	7-D
1201	5-F
1202	4-B
1203	7-D
1208	7-C
1213	5-C
1215	4-F
1300	7-D
1301	5-F
1304	7-D
1306	7-D
1307	7-D
1501	7-C
1502	5-F
1701	4-D
1702	4-D
1703	4-D
1704	4-D
1705	4-D
1706	4-D
1707	4-D
1708	4-D
1709	4-D
1710	4-D
1711	4-D
1712	4-D

No.	Facility Title	Location
264	Space Flight Support	6-C
267	Water Reservoir	3-C
268	Pump House	3-C
270	Sewage Metering Station	7-B
271	Oil Storage	6-D
272	East Illuminator	2-E
273	Antenna Tower	2-E
275	Pyrotechnic Storage	3-E
276	Propellant Storage	3-E
277	Isotope Thermoelec. Sys. Appl. Lab.	4-F
278	Robotics Laboratory	6-D
279	Guard Island	7-C
280	Static Test Tower	4-E
283	Metal Storage	6-D
284	Transportation Office	5-E
285	Arroyo Bridge	3-G
286	Guard Shelter	3-G
287	Guard Island	3-G
288	Project Equipment Storage	4-E
289	Main Sewage Lift Station	7-B
290	Antenna Inspection	2-E
291	Procurement Services	8-C
293	Instrumentation Cable Amplifier Building	6-C
294	Guard Shelter (Visitor Lot)	6-B
295	Antenna Test Facility	1-E
296	Central Cooling Tower Water System	5-D
297	Xenon Test Laboratory	5-F
298	Frequency Standard Laboratory	4-A
299	Assembly Handling & Shpg. Equip. Fac.	4-D
300	Earth and Space Science Laboratory	5-E
301	Central Engineering Building	6-D
302	Microdevices Laboratory	5-F
303	Engineering Support Building	5-E
304	Disintegrator	6-D
305	Hazardous Waste/Cryogenic Storage Facility	4-E
306	Observational Instruments Laboratory	7-D
308	Sewage Lift Station	7-E
309	Maintenance Storage Facility	6-E
310	X X X	4-D
311	Ground Maintenance Facility	6-E
312	Shelter Maintenance Facility	4-D
313	Mirror Refurbishment	4-C
315	X X	8-D
316	Hazmat Storage and Dist Facility	4-F
317	In-situ Instruments Laboratory	5-E
	MODULARS:	
1701-1712	Modular Offices	4-D
1714	Modular Offices	6-E
1716	Modular Offices	4-C
1718	Modular Offices	5-C
1719	Modular Offices	5-D
1720	Modular Offices	6-D

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Figure 1. Facility Map of JPL

3.2 Regional Demographics

Based on the United States Census 2000, the total population residing within 1 mile of JPL is 9,500 people. The population residing within 2 miles of JPL is 22,500 people, and the population residing within 3 miles is 44,000.

In 2001, the JPL workforce consisted of approximately 5,175 employees and contractors. Major sources of employment in the area surrounding JPL are office, retail, and service centers, primarily located within Pasadena. Residents of Altadena and La Cañada-Flintridge generally are employed outside their home community, except those conducting retail businesses or professional services for their respective communities.

In 2000, the population of Pasadena was approximately 133,936 and was broken down into the following demographics: 71,469 Caucasian; 19,319 Black or African-American; 952 American Indian; 13,399 Asian; 132 Pacific Islander; and 28,665 multiracial or other racial group.

In 2000, the population of Altadena was approximately 42,610 and was broken into the following demographics: 20,156 Caucasian; 13,388 Black or African-American; 247 American Indian; 1,807 Asian; 56 Pacific Islander; and 6,956 multiracial or other racial group. The population of La Cañada Flintridge in 2000 was approximately 20,318 and was broken into the following demographics: 15,142 Caucasian; 73 Black or African American; 36 American Indian; 4,180 Asian; 9 Pacific Islander; and 878 multiracial or other racial group.

According to the United States Census 2000, 33.4% of the Pasadena population identifies their ethnic group as Hispanic, while 20.4% of Altadena residents and 4.8% La Cañada Flintridge residents identify themselves as Hispanic.

3.3 Meteorology and Climatology

The San Gabriel Valley has a semiarid Mediterranean climate characterized by mild, relatively rainy winters and warm, dry summers. Rainfall in the area is variable, although it typically averages about 15 inches per year overall (Boyle Engineering, 1988). Rainfall in the vicinity of JPL is slightly higher than for the City of Los Angeles, averaging about 20 inches per year. The higher amount of rainfall near JPL results from the orographic effects generated along the southern slope of the San Gabriel Mountains. Roughly 80% of the precipitation occurs between the months of November and April.

Temperatures in the San Gabriel Valley are relatively mild, with August typically being the warmest month and January the coolest. Extremes for the area range from about 30°F in January to 105°F during the summer months. Wind patterns change seasonally in both strength and direction in response to normal seasonal variations in barometric pressure systems. Generally, winds are mild throughout the year, characterized by ocean breezes (onshore) during the day and land breezes (offshore) at night.

Occasionally during the fall, the area is affected by the Santa Ana winds. These winds occur as a result of strong high-pressure systems moving into parts of Nevada and Utah, creating strong,

hot, dry winds from the northeast. Santa Ana wind speeds through Arroyo Seco have reached more than 100 miles per hour.

3.4 Geology and Seismology

This section discusses the geology and seismology of the area surrounding JPL. Figure D-2 is a map of the regional geology and physiography. Figure D-3 is a geologic map of JPL and the surrounding area.

JPL is located immediately south of the southwestern edge of the San Gabriel Mountains (see Figure D-2). The San Gabriel Mountains, together with the San Bernadino Mountains to the east and the Santa Monica Mountains to the west, make up a major part of the east-west trending Transverse Ranges province of California. This province is dominated by north-south compressional deformation.

The San Gabriel Mountains are primarily composed of crystalline basement rocks. These rocks range in age from Precambrian to Tertiary and include various types of diorites, granites, monzonites, and granodiorites with a complex history of intrusion and metamorphism (Dibblee, 1982). The northwest part of the San Gabriel Valley, near JPL, is composed of about 1,500 to 2,000 ft of Cenozoic alluvial-fan deposits that unconformably overlie the crystalline basement complex exposed in the San Gabriel Mountains (Smith, 1986). These alluvial deposits typically consist of poorly sorted, coarse-grained sands and gravels, with some finer sand and silty material. Clasts within the alluvial deposits range from silt size to boulders more than 3 ft in diameter.

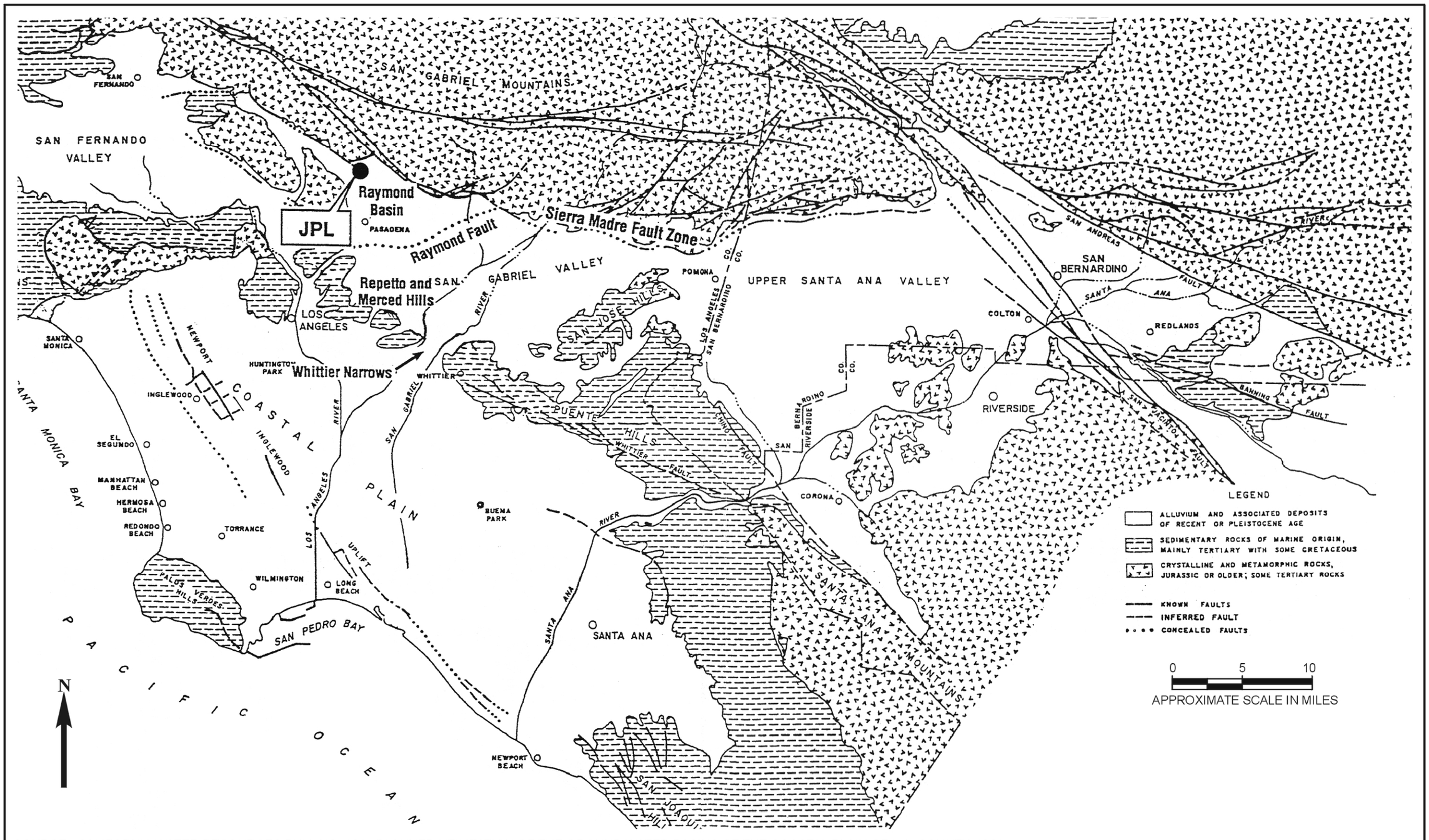
Periodic tectonic uplift of the San Gabriel Mountains has occurred during the past 1 to 2 million years. This uplift is responsible for the present topography of the area (Smith, 1986). Most of this uplift has occurred along north- to northeast-dipping reverse and thrust faults located along the south to southwest edges of the San Gabriel Mountains. This system of faults along the southern edge of the San Gabriel Mountains is 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.

3.5 Hydrology

This section discusses the hydrology of JPL and the surrounding area. JPL is located in the northwest part of the Raymond Basin watershed (see Figure D-2).

3.5.1 Surface Water

There are no permanent surface water bodies within the boundaries of JPL. The northernmost part of JPL consists of Gould Mesa, a flat-topped southern promontory of the San Gabriel Mountains that rises 300 ft above the main part of the JPL complex. The remainder of JPL is moderately sloped and has been graded extensively throughout its development. The Arroyo Seco Creek intermittently flows through the Arroyo Seco wash on the east side of JPL. Within the Arroyo Seco, a series of surface impoundments are used as surface water collection and spreading basins for groundwater recharge.



SOURCE: CALIFORNIA WATER RESOURCES BULL NO. 104. PLANNED UTILIZATION OF THE GROUND WATER BASINS OF THE COASTAL PLAIN OF L.A. COUNTY, 1961.

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Figure 2. Map of Regional Geology and Physiography

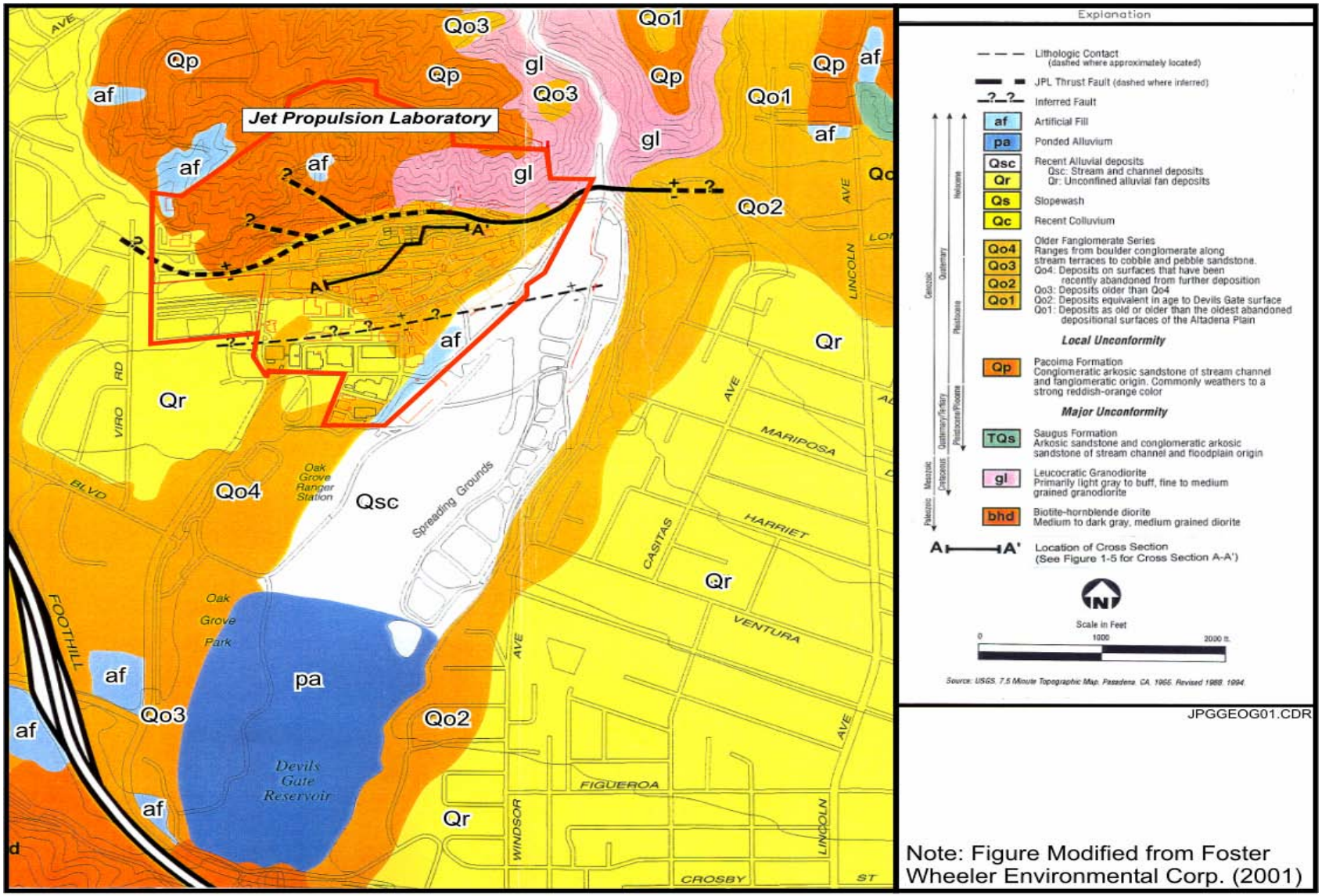

Figure 3. Geologic Map of the JPL and Surrounding Area

3.5.2 Groundwater

The San Gabriel Valley contains distinct groundwater basins, including the Raymond Basin, where JPL is located (see Figure D-2). 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 provides an important source of potable groundwater for many communities in the area around JPL, including Pasadena, La Cañada-Flintridge , San Marino, Sierra Madre, Altadena, Alhambra, and Arcadia.

North of the JPL Thrust Fault (see Figure D-3), groundwater primarily occurs in joints and fractures in the bedrock. Because the bedrock is of low porosity, it is considered non-water-bearing. South of the JPL Thrust Fault, groundwater occurs in alluvial deposits.

The aquifer below JPL consists of four layers that are separated by noncontiguous, low-permeability silt layers (see Figure D-4). Layer 1 consists of the upper 75 to 100 ft of saturated alluvium. Layer 2 underlies Layer 1 and is about 150 to 200 ft thick. Layer 3 is about 200 to 300 ft thick and generally overlies crystalline basement rock beneath JPL. Layer 4 occurs only at the far eastern end of JPL, is about 150 ft thick, and rests on crystalline basement rocks.

Depth to groundwater at JPL ranges from 22 ft bgs to 270 ft bgs. This wide range of depth to water is attributed to steep topography in the northern part of the site and to seasonal groundwater recharge. The depth to groundwater under most of the JPL complex averages approximately 200 ft.

3.6 Natural and Ecological Resources

JPL is located along the northern edge of the San Gabriel Valley in the central part of Los Angeles County. The San Gabriel Valley is bounded to the north by the San Gabriel Mountains, which consist of relatively steep, rocky ridges with numerous canyons. The northernmost part of JPL consists of Gould Mesa, a flat-topped, southern promontory of the San Gabriel Mountains that rises 300 ft above the main JPL complex. Chaparral covers the convex slopes of the mesa in this part of JPL as well as the upland banks of the Arroyo Seco, east of JPL.

The Arroyo Seco, which borders the east side of JPL, is about 1,000 ft wide. It contains mostly riparian and desert wash habitat, interspersed with chaparral. The Arroyo Seco Creek intermittently flows through the Arroyo Seco wash. The Arroyo Seco collects runoff from the north, east, and west. Several groundwater recharge ponds are located on the east side of the Arroyo Seco and west of the extended parking area (see Figure D-3). Groundwater beneath the Arroyo Seco is a current source of drinking water.

Riparian areas are located directly northeast and east of the JPL along the Arroyo Seco Creek. Riparian trees are thicker at the drain outfalls on the eastern boundary of JPL, where runoff from landscaped areas and pavement is year-round. However, there are no forest resources at JPL.

The predominant habitat type at JPL is urbanized landscape, with paved roads, parking lots, and buildings. Vegetation used in landscaping includes native and nonnative plant species.

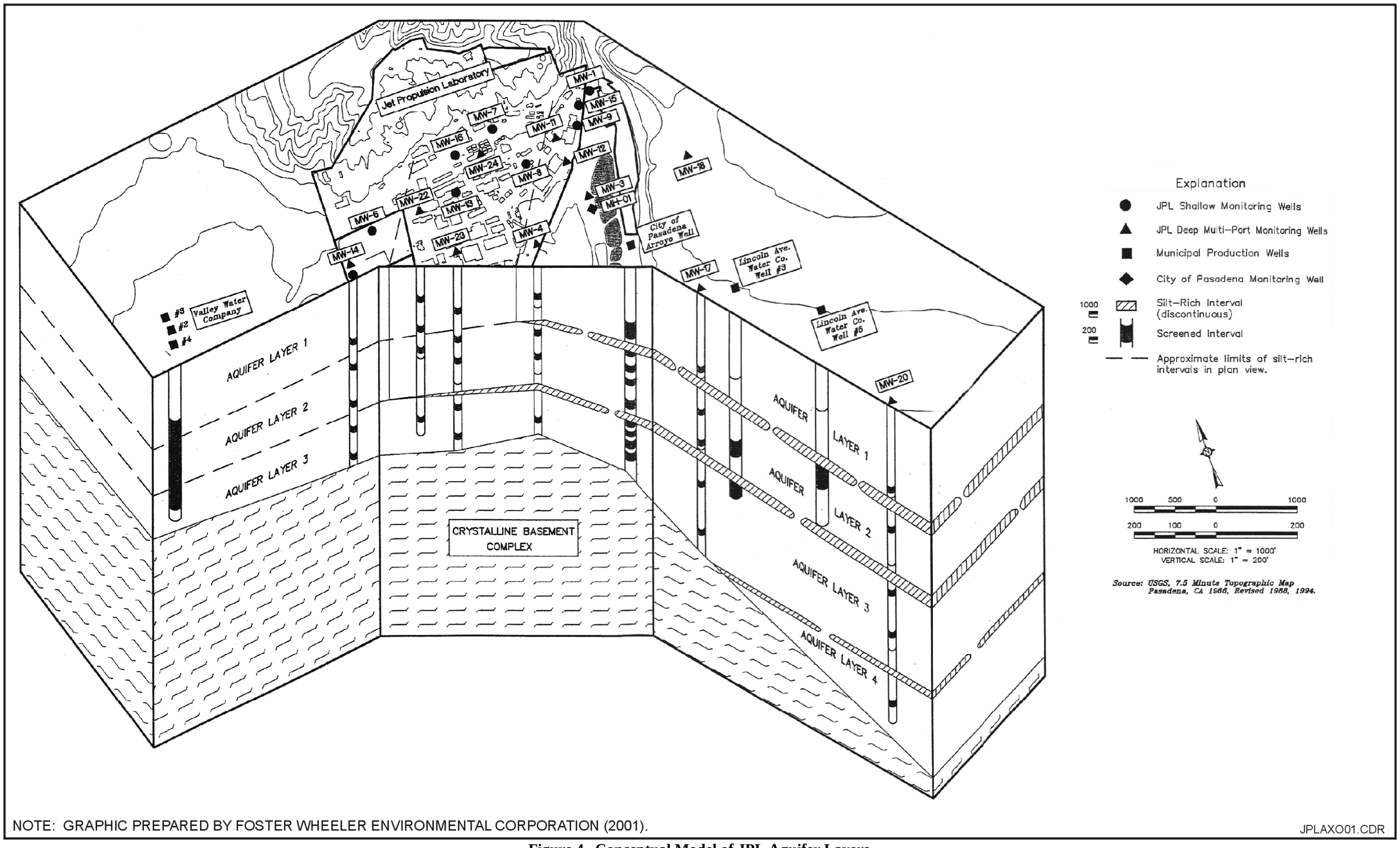

Figure 4. Conceptual Model of JPL Aquifer Layers

Species of special concern that potentially occur in the vicinity of JPL include the southwestern arroyo toad, the southwestern pond turtle, the San Diego horned lizard, the peregrine falcon, the bank swallow, the western yellow-billed cuckoo, and the least Bell's vireo. These species were identified using the California Department of Fish and Game Natural Diversity Database (California Department of Fish and Game, 1995) and the California Native Plant Society's list of rare, threatened, or endangered plant species (Skinner and Paulik, 1994). However, none of these species have been identified at the JPL site. If necessary, consultation under Section 7 of the Endangered Species Act will be conducted directly with the U.S. Fish and Wildlife Service.

3.7 Archaeological and Cultural Resources

NASA has an obligation to determine if any building, structure, or object listed or eligible to be listed on the National Register of Historic Places would be affected by the OU-1 remedial activities. It also has the obligation to determine whether any historical or archaeological data could be destroyed through alteration of terrain as a result of implementation of the selected remedial action.

It is unlikely that property with historic, architectural, archaeological, or cultural value located within the vicinity of JPL will be impacted by the selected remedial action. However, a historical, archaeological, architectural, and cultural resource review of surrounding and on-facility property will be conducted prior to implementation if remedial actions involve intrusive groundwork.

4: NEPA VALUES ASSESSMENT OF PROPOSED ACTION AND ALTERNATIVES

The results of groundwater investigations conducted at JPL revealed the presence of VOCs and perchlorate above health-based levels. These chemicals have the potential to migrate off-facility, thus impacting downgradient groundwater sources.

Under the NFA alternative, no remediation of OU-1 would be planned except that which occurs naturally due to chemical/biological degradation, dispersion, advection, and sorption. The NFA alternative would not prevent migration of perchlorate and VOCs in the groundwater to off-site drinking water sources.

Under the selected alternative, ex situ biological treatment of perchlorate and ex situ LGAC treatment of VOCs would be used to remediate the source area groundwater at OU-1. The treatment systems would operate until the performance objectives are achieved.

Air emissions from ex situ biological treatment of perchlorate and ex situ LGAC treatment of VOCs would be limited to possible dust generation during well installation and pipeline construction. The dust generation during well installation would be minimal and occur over a short duration; therefore, these emissions are expected to have negligible impacts on local air quality. The VOCs and perchlorate in the extracted groundwater will be removed by an above ground treatment system in accordance with state and local ARARs. These ARARs ensure protection of human health and the environment.

The ex situ biological treatment of perchlorate and ex situ LGAC treatment of VOCs system expansion and operation would also result in negligible impacts. Any vegetation removed or species temporarily displaced would have the potential to recolonize the area following completion of the construction. However, given the small size of the above ground system, the net impact to wildlife species would be negligible.

Solid waste, in the form of spent carbon from the LGAC treatment system and sludge from the bioreactor, would be transported and treated off site. Thus, implementation of the selected alternative would have negligible impacts and during operation would be protective of human health and the environment.

In addition, because the ex situ biological treatment of perchlorate and LGAC treatment of VOCs system permanently removes perchlorate and VOCs from the groundwater, the potential for further groundwater contamination to off-site is significantly reduced. Thus, long-term protection and reliability are provided to the environment.

4.1 Socioeconomic Impacts

Expansion and continued operation of the ex situ biological treatment of perchlorate and LGAC treatment of VOCs system at OU-1 is expected to employ a maximum of five people on a part-time, temporary basis. Operation and maintenance of the system is expected to employ one person full time. These numbers are small compared to the total present employment at JPL (approximately 5,175), as well as employment at local businesses and industries in the surrounding area.

The workforce needed to implement the selected alternative would be derived from local construction companies. No measurable impact on the local economy would be expected. Thus, direct and indirect socioeconomic impacts of the remediation of OU-1 using the selected alternative are expected to be negligible.

The NFA alternative would have no direct socioeconomic effects on JPL or the surrounding area. However, because no action would be taken under the NFA alternative to protect the beneficial uses of the groundwater at JPL, potential indirect socioeconomic effects could accrue to JPL and the surrounding area due to the degradation of groundwater quality.

4.2 Transportation Impacts

Three major freeways serve the Pasadena, Altadena, and La Cañada Flintridge communities (see Figure D-3). The Pasadena Freeway (California Route 110) connects Pasadena to Los Angeles. The Foothill Freeway (Interstate 210) links communities to the north and east of Pasadena. The Ventura Freeway (U.S. Route 134) leads to Ventura County and beyond.

OU-1 source area groundwater remediation at JPL using the selected alternative would create a very small, short-term increase in traffic flow to and from the site as a result of the movement of equipment and supplies. However, based on current traffic volume associated with the 5,175 JPL employees and various activities, the increased traffic associated with remediation efforts under the selected alternative would be negligible.

Most of the traffic on and around JPL is associated with morning and evening rush hours, 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m. Most of the traffic associated with the movement of equipment and supplies for the selected alternative would not be present at those peak periods of traffic flow. Further, all truck traffic associated with implementation of the selected alternative would be during daylight hours, which would further reduce the potential for accidents. Similarly, removal and transport of spent carbon and sludge waste during daylight, non-rush hours are expected to have a negligible impact over the entire course of treatment.

The NFA alternative would have no effects on transportation at JPL or in the surrounding area.

4.3 Natural and Ecological Resources

Groundwater beneath the JPL is a current source of drinking water. The selected alternative for OU-1, on-facility groundwater at JPL, is expected to have a beneficial effect on groundwater near JPL. No threatened or endangered species have been identified at the JPL site.

The areal extent of VOCs and perchlorate in the groundwater and the proposed area for installation and operation of the ex situ treatment system are located within the main JPL complex in previously disturbed and developed areas. These areas contain no wetlands and provide minimum wildlife habitat. The minimal land disturbance caused by installation of the ex situ treatment system is expected to have negligible impacts on vegetation and wildlife.

There is no floodplain or wetland involvement in the response action for OU-1; therefore, a floodplains/wetlands assessment is not required.

Under the NFA alternative, no action would be taken to protect the beneficial uses of the groundwater at JPL. Thus, the NFA alternative would have no effects on natural or ecological resources at JPL or in the surrounding area.

4.4 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations.

As part of the RI (FWEC, 1999), NASA conducted a human health risk assessment (HHRA) to determine the need for action to protect human health. The HHRA assessed cancer and noncancer risks associated with human exposure to untreated groundwater, which represents the only direct human exposure route at OU-1. Conservative assumptions with respect to VOCs, perchlorate, and other chemical concentrations in groundwater, exposure parameters, and toxicity ensured that the calculated risks were protective of human health. Exposure parameters included both commercial and residential land use scenarios and risks were assessed for on-facility human receptors.

The results of the HHRA showed that the risks associated with exposure to groundwater are negligible and are within regulatory thresholds. The Agency for Toxic Substances and Disease Registry (ATSDR) has determined that on-facility and off-facility groundwater at JPL does not pose a present or future public health hazard because wellhead treatment and water blending are used by local water purveyor to meet stringent drinking water standards prior to distribution of water for public use (ATSDR, 1999).

The risks from implementation of the ex situ biological treatment of perchlorate and LGAC treatment of VOCs are low. Therefore, NASA expects little to no adverse human health impacts from implementation of the selected alternative to occur in any off-facility community, including minority and low-income communities.

4.5 Irreversible and Irretrievable Commitment of Resources

The commitment of a resource is considered irreversible if primary or secondary impacts of the response action limit future options for the use of the resource. Under the selected action, LGAC would be used to remove VOCs and a biological fluidized bed reactor (FBR) would be used to remove perchlorate from groundwater at JPL. The primary objective of ex situ biological treatment of perchlorate and LGAC treatment of VOCs would be to reduce the potential for further groundwater impacts downgradient of the JPL facility. Thus, under the selected action, there would be no irreversible commitment of resources. Rather, groundwater would be recovered as a resource under this action.

The commitment of a resource is considered irretrievable if the action uses or consumes the resource during the course of implementation. Again, under the selected action, the ex situ biological treatment of perchlorate and LGAC treatment of VOCs would be conducted to remove perchlorate and VOCs from the groundwater and reduce the potential for further groundwater impacts. The treated groundwater would be re-injected. This action would lead to potential recovery of the groundwater resource. Thus, under the selected action there would be no irretrievable commitment of resources.

4.6 Cost-Benefit Analysis

Costs associated with the selected action, expansion and continued operation of the OU-1 source area demonstration system, were evaluated in the Interim ROD. Capital costs associated with the technology include installation of one extraction well and one injection well, and associated piping. In addition, LGAC vessels, one FBR unit, the substrate and nutrient feed system, a multimedia filter, and a backwash and a biomass collection is included in the existing treatment system. Operating and maintenance costs include operation and maintenance of the treatment system. Total present worth cost for the selected action is estimated to be $8,980,000.

NASA and the regulatory authorities agree that the costs associated with ex situ biological treatment of perchlorate and LGAC treatment of VOCs in groundwater are justified because the selected action reduces and removes VOCs and perchlorate from the on-site groundwater at JPL and reduces the potential for off-site groundwater impacts. Thus, the groundwater resource at JPL is recovered, and the groundwater beneath JPL is protected, as required under both the NCP (40 CFR Section 300.430(e)(2)(B)) and State of California regulations for the beneficial use of groundwater, including groundwater used as a source of drinking water.

5: CUMULATIVE IMPACTS

As described above, minimal environmental impacts are expected from the proposed implementation of the selected action. In particular, the selected action would have no adverse impacts on threatened or endangered species, cultural resources, floodplains, or wetlands. NASA expects no adverse human health impacts from the CERCLA action to occur in any off-facility community, including minority and low-income communities. Under the selected action, increases in JPL traffic would be minimal and consist of transportation of equipment and supplies to and from the JPL site, resulting in insignificant transportation impacts. There would be no measurable impact on the local economy as a result of the selected action, and, thus, no socioeconomic impacts are anticipated. Also, under the selected alternative, there would be no irreversible and irretrievable commitment of resources and the cost of remediation is justified to protect the existing source of drinking water.

NASA has examined the potential cumulative environmental impacts of the selected action in addition to other past, present, and reasonably foreseeable future actions at the site. NASA has initiated cleanup activities to address VOC- impacted soil for on-facility (OU-2) and VOC-and perchlorate-impacted groundwater for off facility (OU-3). Response actions have been and will continue to be conducted in accordance with all federal, state, and local regulations. Also, research and development related to robotic exploration of the solar system, remote sensing, astrophysics, and planetary science is performed at JPL. These activities are conducted in controlled settings in accordance with applicable regulations. NASA does not anticipate any cumulative environmental impacts from the activities conducted at JPL and remedial activities at OU-1. Rather, the remediation of OU-1, using ex situ biological treatment of perchlorate and LGAC treatment of VOCs would have a positive impact in preventing further negative impacts to the groundwater resource.

6: AGENCIES AND PERSONS CONTACTED

During the preparation of the RI (FWEC, 1999) and the Interim ROD for OU-1, NASA consulted with and received comments and recommendations from the Cal-EPA DTSC; RWQCB, Los Angeles Region; the EPA, Region IX; the U.S. Fish and Wildlife Service; and the Raymond Basin Management Board. In addition, the Naval Facilities Engineering Command (NAVFAC), the City of Pasadena, and the Lincoln Avenue Water Company are also providing technical assistance to NASA on cleanup decisions at JPL.

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