Draft

Monterey Peninsula Water Management District Aquifer Storage and Recovery Project Environmental Impact Report/ Environmental Assessment

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Acronyms

AAQS	ambient air quality standards
ACHP	Advisory Council on Historic Preservation
AF	acre-feet
AFA	acre-feet per annum
AQ 3	Aquifer Subunit 3
ASR	aquifer storage and recovery
AWT	advanced wastewater treatment plant
BA	biological assessment
BAR	Board of Architectural Review
BIRP	Begonia Iron Removal Plant
BLM	Bureau of Land Management
BMI	macrobenthic invertebrates
BO	biological opinion
BOCA	Building Officials and Code Administrators International, Inc.
BRAC	Base Realignment and Closure
BSC	Building Standards Commission
BTU	British thermal units
CAAA	Clean Air Act Amendments
Cal/OSHA	California Occupational Safety and Health Administration
Cal-Am	California American Water Company
Cal-EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CAWD	Carmel Area Wastewater District
CBC	California Building Code
CCR	California Code of Regulations
CDMG	California Division of Mines and Geology
CDPR	California Department of Parks and Recreation

CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CGS	California Geological Survey
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CRHR	California Register of Historic Resources
CRSA	Carmel River Steelhead Association
CSUMB	California State University, Monterey Bay
CVSIM	Carmel Valley Simulation Model
CWA	Clean Water Act
dB	decibels
dBA	decibels above reference noise, adjusted
DBPs	Disinfection By Products
DHS	California Department of Health Services
DOD	U.S. Department of Defense
DPM	Diesel Particulate Matter
DPR	California Department of Parks and Recreation
DTSC	Department of Toxic Substances Control
EA/IS	environmental assessment/initial study
EC	Electrical conductivity
EIR/EA	environmental impact report/environmental assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESUs	Evolutionarily Significant Units
FHWA	Federal Highway Administration
FR	Federal Register
GIS	Geographic Information Systems
gpd/ft	gallons per day per foot
gpm	gallons per minute
GRP	Groundwater Replenishment Project
H2S	hydrogen sulfide gas

HCP	Habitat Conservation Plan
HDD	horizontal directionally drilled
HDPE	high-density polyethylene
HI	Hazard Index
HMP	Habitat Management Plan
HSP	Health and Safety Plan
ICBO	International Conference of Building Officials
ICC	International Code Council
ITP	incidental take permit
kW	kilowatt
kWh	kilowatt hours
LCP	local coastal plan
Leq	noise level equivalent
LOS	level-of-service
MBEST	Monterey Bay Education, Science, and Technology
MBTA	Migratory Bird Treaty Act
MBUAPCD	Monterey Bay Unified Air Pollution Control District
MCPWD	Monterey County Public Works Department
MCWD	Marina Coast Water District
mgd	million gallons per day
MMP	monitoring and reporting plan
Mn	manganese
MOAs	Memorandum of Agreements
MPWMD	Monterey Peninsula Water Management District
MPWRS	Monterey Peninsula Water Resources System
MRF	Materials Recovery Facility
MRWMD	Monterey Regional Waste Management District
MRWPCA	Monterey Regional Water Pollution Control Agency
MSL	mean sea level
MST	Monterey-Salinas Transit
mw	megawatts
NAHC	Native American Heritage Commission
NCCAB	North Central Coast Air Basin
NEPA	National Environmental Policy Act

NMRA	Natural Resources Management Area
NO2	nitrogen dioxide
NOAA Fisheries	National Marine Fisheries Service
NOP	notice of preparation
Nox	oxides of nitrogen
NPDES	National Pollution Discharge Elimination System
NPL	National Priority List Site
NRHP	National Register of Historic Places
OEHHA	California Office of Environmental Health Hazard Assessment
PA	programmatic agreement
PAHs	polycyclic aromatic hydrocarbons
PBCSD	Pebble Beach Community Services District
PG&E	Pacific Gas and Electric Company
Ppm	part per million
Proposed Project	ASR project
REL	reference exposure level
RM	River Mile
RMP	risk management plan
RO	reverse osmosis
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SBCCI	Southern Building Code Congress International, Inc.
SCADA	supervisory control and data acquisition
SCSD	Seaside County Sanitation District
SGB	Seaside Groundwater Basin
SHPO	California State Historic Preservation Officer
SIPs	state implementation plans
SO2	sulfur dioxide
SR	State Route
State Water Board	State Water Resources Control Board
SVRP	Salinas Valley Reclamation Plant
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TACs	toxic air contaminants

UIC	EPA's Underground Injection Control
USGS	U.S. Geological Survey
UXO	Unexploded ordnance

Executive Summary

Introduction

The Monterey Peninsula Water Management District (MPWMD) manages and regulates the use, reuse, reclamation, and conservation of water within its boundaries on the Monterey Peninsula. About 80% of the water collected, stored, and distributed within the MPWMD boundaries is done so by California American Water (Cal-Am), which serves approximately 95% of Monterey Peninsula residents and businesses. Approximately 70% of the water delivered by Cal-Am is diverted from the Carmel River Basin.

The MPWMD is proposing to construct and operate an aquifer storage and recovery (ASR) project that would benefit the natural resources of the Carmel River and improve the reliability of the local water supplies. A joint draft environmental impact report/environmental assessment (EIR/EA) has been prepared in compliance with the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), respectively. The EIR/EA discloses the environmental impacts of the proposed ASR project, identifies ways to reduce or avoid adverse environmental impacts resulting from the project, identifies and assesses alternatives to the proposed project, and assesses cumulative impacts.

Cal-Am is also proposing to construct a temporary, aboveground water pipeline on former Fort Ord to connect the existing and new MPWMD ASR wells to the existing Cal-Am water delivery system. Although the City of Seaside has completed CEQA compliance for the temporary pipeline, there is no NEPA compliance documentation. Therefore, the U.S. Army at Fort Ord has requested that this EIR/EA also disclose the effects of the temporary pipeline so that it can consider issuing a right of entry for constructing and operating the new pipeline. This temporary pipeline is needed to improve the reliability of Cal-Am's distribution system in the Seaside area and will proceed whether or not the MPWMD ASR project is eventually constructed.

Proposed Project

MPWMD is proposing to construct and operate an ASR project that would allow diversion of a limited amount of excess flow from the Carmel River for storage in, and later recovery from, the Seaside Groundwater Basin. The ASR project would divert up to 2,426 acre-feet per year from the Carmel River. Diversions would occur between December and May.

The ASR would utilize new and existing water collection and conveyance facilities. New facilities include an MPWMD-owned injection/extraction well located on land currently owned and managed by the U.S. Army on the former Fort Ord and an MPWMD-owned pipeline connecting the injection/extraction well with the Cal-Am temporary pipeline located west of General Jim Moore Boulevard. No other new facilities would be constructed because the project would utilize the existing Cal-Am wells, pipelines, and pumping facilities that currently divert and transport water from the Carmel River.

The objective of the Proposed Project is to allow for changes in water supply operations in the Carmel River and Seaside Groundwater Basins that will:

- benefit the natural resources of the Carmel River and the groundwater resources of the Seaside Groundwater Basin and
- improve the short-term reliability of the domestic water supply system in the Seaside area.

An element of the Proposed Project, the Seaside Groundwater Basin injection/extraction well and pipeline, will be constructed on a portion of the former Fort Ord that is currently under federal ownership. The purpose and need of the EA is to allow the U.S. Army to:

- grant an easement for the construction and operation of the injection/extraction well on property currently under federal ownership and
- ensure that the injection/extraction well is compatible with the planned reuse of the area in which the well will be sited.

Alternatives to the Proposed Project

Alternative 1—No Action/No Project

No change in Cal-Am's water supply management of the Carmel River and Seaside Groundwater Basins would occur. No new ASR facilities would be constructed. MPWMD operation of the existing ASR test well would continue until such time as the temporary authority to divert water from the Carmel River for testing purposes was ended by the State Water Resources Control Board. The trend in extractions from the Carmel River basin would continue to affect the availability of surface and subsurface flows in the lower Camel River, especially in dry periods. Extractions from the Seaside Groundwater Basin may continue to cause a gradual decline in the basin's water levels. Future extractions from the Seaside Groundwater Basin will be monitored and managed by the Seaside Basin Watermaster, which will be comprised of nine entities including MPWMD and Cal-Am. The Watermaster governing body, which is in the process of being formed as a result of the Seaside Basin Adjudication, will regulate extractions from the basin to comply with "operating yield" limits specified in the adjudication decision of the Monterey County Superior Court. A Tentative Decision was issued in January 2006; a Final Decision is anticipated in March 2006.

Alternative 2—Non-Contiguous New Injection/Extraction Well

Alternative 2 includes constructing and operating an ASR similar to the Proposed Project with the exception of the location of the Seaside Groundwater Basin injection/extraction well which would be constructed adjacent to Fitch Middle School on the west side of General Jim Moore Boulevard. The well would be constructed to the same depth as the existing Santa Margarita well. A new pipeline, approximately 500-feet long, would be constructed to connect the well to the existing water distribution system. New onsite facilities would include a backflush percolation pit and an enclosure for electrical equipment, chemical equipment, and chemical storage. The amount of water produced by Alternative 2 would be the same as the Proposed Project.

Alternative 3—Local Desalination Plant

Alternative 3 would include construction and operation of a desalination plant located in Sand City. Seawater would be collected from wells drilled at Monterey State Beach and conveyed through underground pipes to the desalination plant for treatment. Brine would be disposed through wells on Fort Ord or through the Monterey Regional Water Pollution Control Agency outfall. Potable water would be distributed through the Cal-Am water supply system. The project would produce up to 8,400 AFA or 7.5 million-gallons/day.

Alternative 4—Wastewater Reclamation

Alternative 4 includes three elements:

(1) Monterey Regional Water Pollution Control Agency/Marina Coast Water District regional urban water augmentation project – This project would produce up to 3,000 AFA by expanding MCWD's existing desalination plant and recycling treated wastewater. Expanding MCWD's existing desalination

plant would produce approximately 1,500 AFA of potable water. Recycling treated wastewater for landscape irrigation would yield approximately 1,500 AFA.

(2) Monterey Regional Water Pollution Control Agency groundwater replenishment project – The project would deliver recycled water to the Seaside groundwater basin for recharge and would increase the amount of water available from the basin for pumping. Water injected into the groundwater basin would be purified by the use of an advanced wastewater treatment plant. The project would produce up to 4,000 AFA.

(3) Carmel Area Wastewater District/Pebble Beach Community Services District reclaimed wastewater system extension – This project would offset the use of potable water currently used to irrigate a gold course and cemetery in Pacific Grove by applying reclaimed wastewater. The project would require the construction of 15,000-foot pipeline. The project would produce approximately 95 AFA.

Alternative 5—Off-stream Storage

Off-stream storage involves capturing and storing excess winter flows from the Carmel River. Water would be either stored in surface reservoirs or in groundwater basins. Potential off-stream surface water storage sites include Chupines Creek, Cachagua Creek, San Clemente Creek and on the former For Ord. The potential groundwater storage site is the Tularcitos aquifer in the Carmel River watershed. Both off-stream storage surface reservoirs and groundwater basins would require new pipelines and pumps. The water yield from off-stream storage is estimated to range from 400 to 1,000 AFA.

Alternative 6 - Stormwater Reuse

Stormwater reuse is the collection, storage, and later use of water collected during storm events. Alternative 6 assumes stormwater would be collected in cisterns at individual residences. Water stored in cisterns would off set potable water used for irrigation. Alternative 6 is estimated to yield 10 to 120 AFA.

Temporary Pipeline

The distribution of water from the MPWMD's existing Santa Margarita well, in addition to the proposed new ASR well, would be improved by transporting the water south to the distribution main on the eastern end of Hilby Avenue, where it can be pumped more efficiently to the Cal-Am transmission pipelines in the City of Seaside. Therefore, separate from the Proposed Project, Cal-Am is proposing to construct a temporary aboveground pipeline that would connect the Santa Margarita well (and potentially the new ASR well) to the Hilby distribution main. This pipeline would be temporary (1 to 4 years) until a more permanent solution for water management and distribution in the eastern portion of Seaside is developed. When a permanent solution is developed, Cal-Am will remove the temporary pipeline.

The temporary pipeline would be installed parallel and to the west of the existing General Jim Moore Boulevard alignment, between the road and the fence line. Three segments of the pipeline, totaling 160 feet, would be placed underground where the line crosses the existing roadways (Hilby Avenue, Broadway Avenue, and San Pablo Street). An additional 60-foot segment would be underground where the line intersects with the City of Seaside well site, which is south and adjacent to San Pablo Street. The total line length would be approximately 6,700 feet.

The environmental effects of constructing, operating and removing this temporary pipeline are discussed in this EIR/EA separately from the effects of the MPWMD Proposed Project.

Summary of Potential Environmental Impacts and Mitigation Measures for the Proposed Project

Environmental impacts of the Proposed Project and the mitigation measures required to reduce the significant impacts to a less-than-significant level are listed by issue area in Table ES-1 at the end of this Executive Summary. Following is a brief discussion of the impacts for each issue area (presented in the order they appear in the EIR/EA).

Air Quality

Constructing the injection/extraction well and pipeline would result in short-term increases in PM10 and exposure of sensitive receptors to diesel particulate matter and acrolein. The impact on air quality resulting from the short-term increases in PM10 emissions was considered less-than-significant. The short-term impact of diesel particulate matter and acrolein emissions was considered significant because of the close proximity of sensitive receptors to the construction site. These impacts would be mitigated to a less-than-significant level by implementing emission-reducing construction practices.

Vegetation and Wildlife

Constructing the proposed project could directly affect special-status plant and wildlife species and habitat. Special-status plant species that could be adversely affected include Monterey spineflower, sandmat manzanita, Eastwood's Goldenbush, and Kelloggs' horkelia. Special-status wildlife species that could be adversely affected include California tiger salamander, California horned lizard, black legless lizard, Monterey dusky-footed woodrat, and American badger. Impacts on maritime chaparral were considered less than significant. Construction-related impacts on black legless lizards and Monterey dusky-footed woodrats were considered potentially significant. However, ongoing implementation of mitigation actions contained in the Fort Ord Multispecies Habitat Management Plan (U.S. Army Corps of Engineers, Sacramento District 1997) and terms and conditions contained in more recent biological opinions issued by the U.S. Fish and Wildlife Service (1999, 2002a and 2005) is considered adequate to offset potential impacts to these species. Impacts on other wildlife species were considered less than significant. The project could also conflict with the portion of the Fort Ord Natural Resource Management Area (NRMA) located adjacent to the injection/extraction well site. Impacts on the NRMA would be avoided by implementing BMPs to avoid offsite movement of soil and invasive species and potential for wildfire.

Aquatic Resources

Operating the project would change flows in the Carmel River during periods of steelhead upstream migration, spring, emigration, fall and winder downstream migration. The project is expected to result in an increase in river flows during these periods resulting in a beneficial impact on steelhead.

Changes in river flows could also affect other aquatic species, included California red-legged frog, Pacific tree frog, California newt, western toad, western pond turtle, and a variety of aquatic invertebrates. The change in river flow is expected to benefit these species as a result of the expected increase in flow below the Narrows during the dry portion of the year.

There would be no construction-related impacts on aquatic resources.

Cultural Resources

During the construction phase, the project would result in the potential for discovery of buried cultural deposits and human remains. This impact would be mitigated by "stop work" orders if buried cultural deposits or human remains were encountered during construction activities and appropriate recovery or avoidance procedures were implemented.

There would be no operational impacts on cultural resources.

Geology, Soils, and Seismicity

Construction of the project would disturb the ground and expose soil to rain and wind, potentially causing accelerated erosion and release of sediment into drainages. Development of a stormwater pollution prevention plan (SWPPP) and implementation of its recommendations would protect receiving waters and ensure this impact would be less than significant. Operation-related impacts include potential structural damage from seismic activity and rupture of pipelines from soil expansion, both of which could threaten public safety. These impacts are considered less than significant because all structures would be designed to meet the Uniform Building Code and California Building Standards.

Groundwater Hydrology and Water Quality

Constructing the injection/extraction could result in short-term affects on groundwater quality and quantity as a result of discharge of drilling fluids and testing well production. These impacts are considered less than significant because non-toxic drilling fluids would be used and water pumped from the basin during well testing would be percolated back into the basin.

Operating the injection/extraction well could result in changes in the quantity and quality of groundwater stored in the Seaside Groundwater Basin, hydrofracturing, and change water levels in overlying units. Impacts on groundwater quantity, represented as groundwater storage, are considered less than significant because the project would not substantially change the current net storage in the basin. Operating the project is expected to beneficially change groundwater levels. The quality of water stored in the basin would be maintained because the project would comply with State Water Resources Control Board and California Department of Health Services standards regarding mixing surface water with groundwater.

Operating the Proposed Project is expected to have no significant effects on flows in the Carmel River, and benefit aquatic resources.

Land Use

Construction activities occurring at the injection/extraction well site could disrupt adjacent land uses. These impacts would be less than significant because construction would be completed in approximately 8 months and measures would be taken to insure noise and air emissions are minimized. Constructing the project would not result in physical division or substantial disruption of an established community.

Operating the injection/extraction well is not expected to result in disruption of adjacent land uses because noise generated by above ground equipment would meet local noise standards. The injection/extraction well would be compatible with the designation of the site in the Fort Ord Reuse Plan as low density residential.

Noise

Constructing the injection/extraction well and pipeline would expose adjacent sensitive land uses to noise and vibration in excess of applicable standards. These potentially significant impacts would occur as a result of using heavy equipment at the construction site and the necessity to drill at 24-hours-per-day until the well is completed. Noise and vibration impacts could be reduced to a less than significant level by limiting the use of equipment ancillary to the drilling rig to daylight hours and employing noise-reducing construction practices. Operating the injection/extraction well could result in a significant impact on adjacent noise-sensitive land uses. This impact would be reduced to a less than significant level by designing an enclosure that adequately attenuates noise to meet local standards.

Hazardous Materials

Constructing the injection/extraction well could result in the exposure of workers to hazardous materials and the use of hazardous materials near a school. Workers could be exposed to lubricants and fuels used during construction. These potential impacts could be minimized by implementing the SWPPP. Workers could also be exposed to unexploded ordnance. Information provided by the Army BRAC Office at former Fort Ord (Fisbeck pers. comm.) indicates that the Proposed Project facilities would overlie portions of Army parcels E34 and E23.1. These parcels, which are scheduled for eventual transfer to the City of Seaside for residential development, are also considered munitions response sites (MRS) Seaside 2 and 3 (MRS-SEA.2 and MRS-SEA.3) in the Army's UXO cleanup plans. They are located within the former Fort Ord firing range/impact area. Surface and subsurface removal of munitions and explosives of concern (MEC) was recently conducted on the majority of the parcels; multiple MECs were removed. This impact is considered less than significant because the area has been subject to both surface and sub-surface ordnance clearance activities and additional clearance and coordination activities would be necessary with the Army prior to and during construction.

Operating the well would require the routine use of hazardous materials, including carbon dioxide, lime, and sodium hypochlorite. Compliance with regulations and requirements concerning the use and storage of hazardous materials would minimize the proposed project's potential to threaten public safety and the environment.

Public Services and Utilities

Construction of the injection/extraction well and pipeline would result in the generation of solid waste and potentially disrupt utility service. The local landfill has the capacity to accept waste generated during project construction. Disruption of utility service would be minimized by notifying and coordinating with utility providers.

Operating the injection/extraction well would increase the regional use of electricity. This increase would be small compared to regional use and the capacity of the existing system will be able to meet the additional demand.

Transportation and Circulation

Constructing the injection/extraction well and pipeline could temporarily increase traffic, conflict with public transit, and result in hazards to pedestrians and bicyclists. These impacts were considered less than significant because construction activities would only result in 10 additional round trips per day and the use of General Jim Moore Boulevard would not be restricted

Operation and maintenance of the injection/extraction well would not affect traffic or circulation or parking capacity because worker trips to the site are not expected to exceed two trips per day and parking would be provided on site.

Visual Resources

Constructing the injection/extraction well and pipeline could alter scenic views, degrade existing visual character of the site, and create light and glare. These impacts are considered less than significant because construction activities would be temporary and most construction would occur during daylight hours.

Operating the project could alter the visual character of the well site and create new light and glare. The impact on the existing visual character of the site is considered less than significant because the well would be located adjacent to the existing well. The creation of light and glare is considered a significant impact, but would be reduced to a less than significant level by incorporating light-reduction measures into the design of the well building.

Cumulative Impacts

The project's construction-related impacts that could result in a considerable contribution to a cumulative impact include air emissions and noise. To minimize the cumulative impacts on air quality and noise, construction projects planned for the same timeframe should be phased so NO_x and PM10 emissions remain below

Monterey Bay Unified Air Pollution Control District (MBUAPCD) thresholds, dust control measures should be required of contractors, and noise reduction measures should be implemented for all projects. With implementation of these mitigation measures, the cumulative effects on air emissions and noise are considered less than significant. Constructing the project could also result in cumulative impacts on special-status plants and wildlife or their habitat and traffic and transportation. The cumulative impact on special-status plants and wildlife is considered less than significant because impacts were previously considered when developing the Fort Ord Multi-species Habitat Management Plan (U.S. Army Corps of Engineers, Sacramento District 1997), and subsequent terms and conditions have been placed on development by biological opinions issued by the U.S. Fish and Wildlife Service (1999, 2002b and 2005). Cumulative impacts on traffic and transportation were considered less than significant because of the small number of additional trips generated during construction and because construction would be completed in 8 weeks.

Operating the project would require additional use of electricity. The increased cumulative demand is considered less than significant because the Monterey Peninsula has an ample supply of energy.

Impacts of Project Alternatives

Chapter 16, "Alternatives," provides the results of the comparative evaluation of the environmental effects of Proposed Project with the alternatives, including the No Action/No Project (No Project) Alternative. The environmental impacts (both beneficial and adverse) associated with constructing and operating the action-oriented alternatives are generally greater than the Proposed Project. With the No Project Alternative, however, the adverse effects would be less than the Proposed Project, but the beneficial effects would also be less .

Alternative 1 – No Action/No Project

The No Project Alternative would not result in construction-related effects because no new water supply facilities would be built. The trend in extractions from the Carmel River basin would continue to affect the availability of surface and subsurface flows in the lower Camel River, especially in dry periods. Extractions from the Seaside Groundwater Basin could continue to cause a gradual decline in the basin's water levels. However, these extractions will be monitored and managed by the Seaside Basin Watermaster, which will regulate extractions to comply with the "operating yield" limits specified in the adjudication decision issued by the Monterey County Superior Court.

Alternative 2—Non-Contiguous New Injection/Extraction Well

Many of the effects of Alternative 2 would be the same or nearly the same as the Proposed Project because each is composed of the same primary elements (e.g. injection/extraction wells and pipelines) and would be operated in the same manner. Similar impacts include air emissions, seismic risk, exposure to hazardous materials, public services, and transportation and circulation. Alternative 2 would lessen the potential loss of special-status vegetation and wildlife on the former Fort Ord and change in the visual character of the well site.

Construction-related impacts with the potential to be greater than the Proposed Project include cultural resources, land use, and noise. These impacts, with the exception of cultural resources, are expected to be greater because of the proximity of the school to the site of the injection/extraction well and pipeline. Cultural resource impacts may be greater because more ground disturbing activity would occur with the resulting greater potential to unearth buried resources.

Operations would also be the same resulting in identical impacts on the aquatic resources found in and along the Carmel River.

Alternative 3—Local Desalination Plant

Nearly all of the construction-related effects of Alternative 3 would be greater when compared to the Proposed Project because a much larger area would be disturbed and construction would last much longer. These impacts include air quality, noise, traffic and circulation, land use compatibility, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife. Construction-related impacts would be much greater because elements of the project would be constructed over a wider geographic area including the coastal zone, urban areas, and the portions of the former Fort Ord.

Operation of Alternative 3 is expected to have a greater beneficial effect on Carmel River aquatic resources, including steelhead and riparian vegetation, because the potable water produced by the desalination plant would offset reduced diversions from the Carmel River basin because much less water would be diverted from the basin. Other operation-related effects expected to occur under Alternative 3, including noise, release of hazardous materials, transportation, and energy use would be greater than the Proposed Project because facilities would be larger.

Alternative 4—Wastewater Reclamation

Nearly all of the construction-related effects of Alternative 4 would be greater when compared to the Proposed Project because a much larger area would be disturbed and construction is expected to last over a longer period. These adverse impacts include air quality, noise, traffic and circulation, land use compatibility, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife.

Operating Alternative 4 is expected to have a greater benefit on Carmel River aquatic resources compared to the Proposed Project because much less water would be diverted from the basin. Other operation-related effects expected to occur under Alternative 4, including noise, release of hazardous materials, transportation, and energy use would be greater than the Proposed Project because facilities would be larger.

Alternative 5—Off-stream Storage

Most of the construction-related effects of Alternative 5 would be greater when compared to the Proposed Project because a larger area would be disturbed during construction of the storage facilities, pipelines, and pumps. These impacts include air quality, noise, traffic and circulation, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife.

Operating Alternative 5 is expected to result in a smaller beneficial impact on Carmel River aquatic resources compared to the Proposed Project because less water would be diverted during times of high flow. Other operation-related effects expected to occur under Alternative 5, including damage to cultural resources, noise, release of hazardous materials, transportation, and energy use would be greater than the Proposed Project.

Alternative 6 - Stormwater Reuse

All of the construction-related effects of the Proposed Project would be avoided or reduced under Alternative 6. These impacts would be avoided or reduced because the stormwater collection and storage systems would be located adjacent to existing structures and would utilize roofs or other surfaces already constructed as a means to collect water. Construction of the storage systems would be of short-duration and is not expected to adversely affect native vegetation or wildlife and would avoid affects on special-status species.

Operation of Alternative 6 would benefit Carmel River aquatic resources, because water collected reused would offset diversions made from the Carmel River. However, these benefits would be less than the Proposed Project because when combined, the systems are only expected to provide from 10 to 120 AFA.

Summary of Potential Environmental Impacts and Mitigation Measures for the Proposed Temporary Pipeline

Cal-Am's proposed temporary aboveground pipeline would not result in significant short-term, long-term or cumulative effects on the environment. Construction and removal of the pipeline would result in short-term effects on local air quality, noise and traffic, but the short construction period and the small number of vehicles and equipment involved would not create substantial effects. Mitigation measures are available to minimize the impacts. Construction and removal would also have a small effect on vegetation and wildlife resources between the General Jim Moore Boulevard corridor and the developed eastern edge of the City of Seaside. However, mitigation measures identified in the Army's Multi-species Habitat Management Plan and three biological opinions issued by the U.S. Fish and Wildlife Service will be implemented as part of the proposed project to reduce and minimize impacts to sensitive plant and animal species, including the California tiger salamander.

Identification of the Environmentally Superior Alternative

The State CEQA Guidelines require identification of an environmentally superior alternative that would minimize adverse impacts on the project site and surrounding environment, while achieving the project's basic objectives. The goal of identifying the environmentally superior alternative is to assist decision makers in considering project approval, although an agency is not required to select the environmentally superior alternative (*Laurel Hills Homeowners Association v. City Council [1978] Cal. App. 3d 515, State CEQA Guidelines Sec. 15042-15043*). A discussion of the comparative environmental impacts of the Proposed Project and the alternatives is included in Chapter 16, "Alternatives." The MPWMD has identified the Proposed Project as the environmentally superior alternative. The Proposed Project includes an injection/extraction well located on the former Fort Ord approximately 250 feet from the existing Santa Margarita test ASR well.

Compared to the Proposed Project, Alternative 2 would result in greater construction-related and operation-related environmental impacts. Noise and vibration impacts are expected to be greater because of the close proximity of a public school. Constructing and operating Alternative 2 would be less compatible with existing or proposed land uses also because of the closer proximity of the school. The Proposed Project's impacts on biological resources would be greater; however, these impacts would eventually occur as part of the proposed reuse for the portion of the former Fort Ord on which the well would be located. The beneficial impacts on Carmel River aquatic resources would be the same because operation of the ASR element of the project would be identical.

Other alternatives evaluated include Alternative 3 - Local Desalination Plant, Alternative 4 - Wastewater Reclamation, Alternative 5 - Offstream Storage, and Alternative 6 - Stormwater Reuse. Alternatives 3, 4, and 5 would result in greater environmental impacts because they would take longer to construct and would result in greater land disturbance with the potential to adversely affect a greater number of sensitive resources.

Areas of Known Controversy

During the scoping process for the EIR/EA, the major areas of environmental concern identified included:

- impacts on the quality of groundwater in the Seaside Groundwater Basin as a result of injection and extraction of Carmel River water;
- hydrologic impacts on the Seaside Groundwater Basin; and
- changes in Carmel River flow and resulting effects on the aquatic resources and watershed ecosystem of the river.

Table ES-1. Summary of Impacts and Mitigation Measures for the Proposed Project[1]

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
Air Quality	AQ-1: Short-Term Increase in PM10 Emissions from Well Drilling	Less than Significant	None required	Less than Significant
	AQ-2: Short-Term Increase in PM10 Emissions from Pipeline Construction	Less than Significant	None required	Less than Significant
	AQ-3: Short-Term Increase in PM10 Emissions from Building Construction	Less than Significant	None required	Less than Significant
	AQ-4: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Diesel Particulate Matter from Construction Activities	Less than Significant	Mitigation Measure AQ-1. Use Newer, Cleaner-Burning Engines. Mitigation Measure AQ-2. Limit Construction Duration.	Less than Significant
	AQ-5: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Acrolein Emissions from Diesel Exhaust from Construction Activities	Significant	Mitigation Measure AQ-1. Use Newer, Cleaner-Burning Engines. Mitigation Measure AQ-2. Limit Construction Duration.	Less than Significant
Vegetation and Wildlife	BIO-1: Removal of Maritime Chaparral	Less than significant	None required	Less than significant
	BIO-2: Disturbance of the Fort Ord NRMA	Significant	Mitigation Measure BIO-1: Minimize or Prevent Disturbance to Adjacent NRMA	Less than significant
	BIO-3: Destruction of Monterey Spineflower, Sandmat Manzanita, Eastwood's Goldenbush, and Kellogg's Horkelia	Less than significant	None required	Less than significant
	BIO-4: Potential Direct Mortality or Disturbance of California Horned Lizards and Potential Permanent and Temporary Loss of California Horned Lizard Habitat	Less than significant	None required	Less than significant

[1] This table summarizes impacts of the ASR well project and not the effects of the temporary pipeline project.

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
	BIO-5: Potential Direct Mortality or Disturbance of Black Legless Lizards and Potential Permanent and Temporary Loss of Black Legless Lizard Habitat	Significant	None required; mitigation is included in the Fort Ord Multispecies Habitat Management Plan	Less than significant
	BIO-6: Potential Direct Mortality or Disturbance of Monterey Dusky-Footed Woodrat and Potential Permanent and Temporary Loss of Monterey Dusky-Footed Woodrat Habitat	Significant	None required; mitigation is included in the Fort Ord Multispecies Habitat Management Plan	Less than significant
	BIO-7: Potential Direct Mortality or Disturbance of American Badger and Potential Permanent and Temporary Loss of American Badger Habitat	Less than significant	None required	Less than significant
	BIO-8: Potential Loss of Nest Trees and Disturbance or Mortality of Migratory Birds	Less than significant	Mitigation Measure BIO-4: Remove Trees and Shrubs during the Nonbreeding Season for Most Birds (September 1 To February 15).	Less than significant
Aquatic Resources	AR-1: Change in Flows for Adult Steelhead Upstream Migration	Beneficial	None required	Beneficial
	AR-2: Change in Juvenile Steelhead Rearing Habitat	Beneficial	Mitigation Measure AR 5-2: Cooperate to help develop a Project to Maintain, Recover, or Increase Storage in Los Padres Reservoir and If Needed, Continue Funding Program to Rescue and Rear Isolated Juveniles	Beneficial
	AR-3: Improved Flows for Fall/Winter Downstream Migration	Beneficial	None required	Beneficial
	AR-4: Maintenance of Flows for Spring Emigration	Beneficial	None required	Beneficial
	AR-5: Changes in California Red-legged Frog Habitat Due to Changes in River Flows	Beneficial	None required	Beneficial
	AR-6: Changes in Habitat for Other Aquatic Species Due to Changes in River Flows	Beneficial	None required	Beneficial

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
Cultural Resources	CR-1: Potential for Discovery of Buried Cultural Deposits and Human Remains during Construction of the Well and Pipelines	Significant	Mitigation Measure CR-1: Stop Work If Buried Cultural Deposits Are Encountered during Construction Activities. Mitigation Measure CR-2: Stop Work If Human Remains Are Encountered during Construction Activities.	Less than significant
Geology, Soils, and Seismicity	GS-1: Potential Short-Term Increase in Erosion Resulting from Project Construction	Less than significant	None required	Less than significant
	GS-2: Potential Structural Damage and Threat to Public Safety from Fault Displacement and Ground Shaking during a Seismic Event	Less than significant	None required	Less than significant
	GS-3: Potential Structural Damage and Threat to Public Safety from Earthquake-Induced Liquefaction and Lateral Spread	Less than significant	None required	Less than significant
	GS-4: Potential Rupture of Pipelines and Threat to Public Safety Caused by Expansive Soils and Pipeline Corrosion	Less than significant	None required	Less than significant
Surface and Groundwater Hydrology and Water Quality	GWH-1: Changes in Seaside Basin Groundwater Storage	Beneficial	None required	Beneficial
	GWH-2: Short-Term Changes in Seaside Basin Groundwater Quantity	Less than significant	None required	Less than significant
	GWH-3: Long-Term Changes in Seaside Basin Groundwater Levels	Beneficial	None required	Beneficial
	GWH-4: Changes in Seaside Basin Groundwater Levels in Overlying Units	Less than significant	None required	Less than significant
	GWH-5: Potential for Seaside Basin Hydrofracturing	Less than significant	None required	Less than significant
	GWH-6: Short-Term Change in Seaside Basin Groundwater Quality	Less than signficant	Mitigation Measure GWH-1: Comply with Performance Standards in NPDES Permits	Less than significant

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
	GWH-7: Long-Term Change in Seaside Basin Groundwater Quality From Mixing Groundwater with Injected Water	Less than significant	Mitigation Measure GWH-2: Operate Project in Compliance with SWRCB and DHS Policies Mitigation Measure GWH-3: Modify Project Operations as Required by Results of Monitoring	Less than significant
	GWH-8: Changes in Seaside Basin Groundwater Quality Caused by ASR Well Operation Discharges	Less than signficant	None required	Less than significant
	GWH-9: Changes in Seaside Basin Recovered Water Quality	Less than significant	None required	Less than significant
	GWH-10: Effects on Other Seaside Basin Groundwater Users	Beneficial	None required	Beneficial
	GWH-11: Changes in Carmel River Streamflow During High Flow Periods	Less than significant	Mitigation Measure GWH-4: Operate Project in Compliance with NOAA Fisheries Recommendations, and Reduce Unlawful Diversions	Less than significant
	GWH-12: Changes in Carmel Valley Alluvial Aquifer Storage During High Flow Periods	Beneficial	None required	Beneficial
	GWH-13: Changes in Carmel River Streamflow During Low Flow Periods	Less than significant	Mitigation Measure GWH-4: Operate Project in Compliance with NOAA Fisheries Recommendations, and Reduce Unlawful Diversions	Less than significant
	GWH-14: Changes in Carmel Valley Alluvial Aquifer Storage During Low Flow Periods	Beneficial	None required	Beneficial
Land Use	LU-1: Disruption of Existing Land Uses or Neighborhoods during Construction of the Well Site	Less than significant	None required	Less than significant

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
	LU-2: Disruption of Existing Land Uses or Neighborhoods during Construction of the Santa Margarita Well Pipeline and New Well Pipeline	Less than significant	None required	Less than significant
	LU-3: Incompatibility with Existing Adjacent Land Uses from Operation of the Proposed Pipelines and Well	Less than significant	None required	Less than significant
	LU-4: Potential Inconsistencies with Relevant Land Use Plans and Policies from Operation of the Proposed Well and Pipelines	Less than significant	None required	Less than significant
Noise	NZ-1: Exposure of Noise-Sensitive Land Uses to Construction Noise in Excess of Applicable Standards	Significant	Mitigation Measure NZ-1a: Prohibit Ancillary and Unnecessary Equipment During Nighttime Well Drilling Activities. Mitigation Measure NZ-1b: Employ Noise-Reducing Construction Practices to Meet Nighttime Standards. Mitigation Measure NZ-1c: Prepare a Noise Control Plan. Mitigation Measure NZ-1d: Disseminate Essential Information to Residences and Implement a Complaint/Response Tracking Program.	Less than significant
	NZ-2: Exposure of Sensitive Land Uses to Construction-Related Vibration Levels in Excess of Applicable Standards	Significant	Mitigation Measure NZ-1a Mitigation Measure NZ-1b Mitigation Measure NZ-1c Mitigation Measure NZ-1d	Less than significant
	NZ-3: Exposure of Sensitive Land Uses to Operational Noise in Excess of City Standards	Significant	Mitigation Measure NZ-2: Design Pump Stations to Meet Local Noise Standards.	Less than significant

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
Hazardous Materials	HAZ-1: Exposure of Employees and Public to Hazardous Materials during Construction of a Well and Pipelines at the Former Fort Ord	Significant	Mitigation Measure HAZ-1: Implement UXO Safety Precautions during Grading and Construction Activities at the Project Site.	Less than significant
	HAZ-2: Handling and Use of Hazardous Materials during construction within 0.25 Mile of a School	Less than significant	None required	Less than significant
	HAZ-3: Potential Creation of a Hazard to the Public and Environment from Routine Use of Hazardous Materials or Accidental Release of Hazardous Materials during Operation of the Well Site	Less than significant	None required	Less than significant
	HAZ-4: Handling of Hazardous Materials during operation within 0.25 Mile of a School	Less than significant	None required	Less than significant
	HAZ-5: Public Exposure to Contaminated Drinking Water	Less than significant	None required	Less than significant
Public Services and Utilities	PS-1: Increase in Solid Waste Generation and Construction Debris during Construction of Well and Pipelines	Less than significant	None required	Less than significant
	PS-2: Temporary Disruption of Existing Underground Utilities and Utility Service during Construction of Well and Pipelines	Significant	Mitigation Measure PS-2: Coordinate Relocation and Interruptions of Service with Utility Providers during Construction Mitigation Measure PS-3: Protect All Existing UtilitiesSlated to Remain	Less than significant
	PS-3: Increased Demand for Electricity from Operation of ASR Facilities	Less than significant	None required	Less than significant
Transportation and Circulation	TR-1: Temporary Traffic Increase and Potential for Level of Service Degradation during Construction of Wells and Pipelines	Less than significant	None required	Less than significant
	TR-2: Potential Conflict with Fixed-Route Monterey-Salinas Transit Service during Construction of Wells and Pipelines	Less than significant	None required	Less than significant

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
	TR-3: Potential Pedestrian and Bicycle Hazards from Pathway and Bikeway Closures or Disruption during Construction of Well and Pipelines	Less than significant	None required	Less than significant
	TR-4: Potential for Increased Traffic and Level of Service Degradation from Operation and Maintenance of the Well Site	Less than significant	None required	Less than significant
	TR-5: Increased Parking Demand Attributable to Operations and Maintenance of the Well	Less than significant	None required	Less than significant
Visual Resources	VIS-1: Temporary Alteration of Scenic Views during Construction of Well and Pipelines	Less than significant	None required	Less than significant
	VIS-2: Degrade Existing Visual Character during Construction of Well and Pipelines	Less than significant	None required	Less than significant
	VIS-3: Creation of Light and Glare during Construction of Well and Pipelines	Less than significant	None required	Less than significant
	VIS-4: Alteration of Existing Visual Character at Well Site	Less than significant	None required	Less than significant
	VIS-5: Creation of New Light and Glare at Well Site	Significant	Mitigation Measure VIS-3: Incorporate Light-Reduction Measures into the Plan and Design of Exterior Lighting at Well Site.	Less than significant
Cumulative Impacts	The Proposed Project could result in cumulative impacts on traffic and transportation	Less than significant	None required	Less than significant
	The Proposed Project could result in a considerable contribution to NOx and PM10 emissions when considered together with other projects that could be constructed in the same timeframe.	Significant	Mitigation Measure Cume-1: Coordinate with Relevant Local Agencies to Develop and Implement a Phased Construction Plan to Reduce Cumulative Traffic, Air Quality, and Noise Impacts	Less than significant

Issue Area	Potential Impact	Significance Determination without Mitigation	Mitigation	Significance Determination with Mitigation
	The Proposed Project could contribute considerably to construction noise and vibration, affecting sensitive receptors when considered together with other projects that could be constructed in the same timeframe in the same area and affecting the same sensitive noise receptors.	Significant	Mitigation Measure Cume-1	Less than significant
	Construction of the well and associated pipelines could result in the loss or disturbance to special-status plant and wildlife species or their habitat.	Less than significant	None required	Less than significant
	There would be a cumulative energy effect from the Proposed Project because operation of the new ASR well would require 10,000 killowat hours of electricity daily.	Less than significant	None required	Less than significant

Chapter 1
Introduction

Purpose of This Environmental Impact Report/ Environmental Assessment

This environmental impact report/environmental assessment (EIR/EA) has been prepared to comply with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Monterey Peninsula Water Management District (MPWMD) is proposing to construct and operate an aquifer storage and recovery (ASR) project that would allow diversion of a limited amount of excess flow from the Carmel River for storage in, and later recovery from, the Seaside Groundwater Basin. The ASR project would divert up to 2,426 acre-feet (AF) per year from the Carmel River between December and May. Because the ASR project would include construction of an injection/extraction well and underground permanent pipeline on a portion of the former Fort Ord that is still under federal ownership, the U.S. Army has requested that an EA be prepared to disclose the environmental effects of the ASR project.

California American Water (Cal-Am) is also proposing to construct a temporary, aboveground water pipeline on former Fort Ord to connect the existing and new MPWMD ASR wells to the existing Cal-Am water delivery system. Although the City of Seaside has completed CEQA compliance for the temporary pipeline, there is no NEPA compliance documentation. Therefore, the Army has requested that this EIR/EA also disclose the effects of the temporary pipeline.

Therefore, this EIR/EA serves two functions: (1) it serves as CEQA and NEPA compliance for MPWMD and the U.S. Army (Army) respectively, for the ASR project and its alternatives, including a No Action/No Project (No Project) Alternative; and (2) it serves as NEPA compliance to support the Army's decision on the construction and removal of Cal-Am's temporary aboveground pipeline. The lead agency for CEQA compliance in this document is MPWMD; the lead agency for NEPA compliance is the Army.Proposed Project

The ASR project would utilize new and existing water delivery facilities. New MPWMD facilities would include:

- an injection/extraction well located on land owned and managed by the Army on the former Ford Ord military base or on land owned by the City of Seaside, and
- an enlarged pipeline connecting both the existing and proposed injection/extraction wells with theCal-Am temporary pipeline that would be located west of General Jim Moore Boulevard.

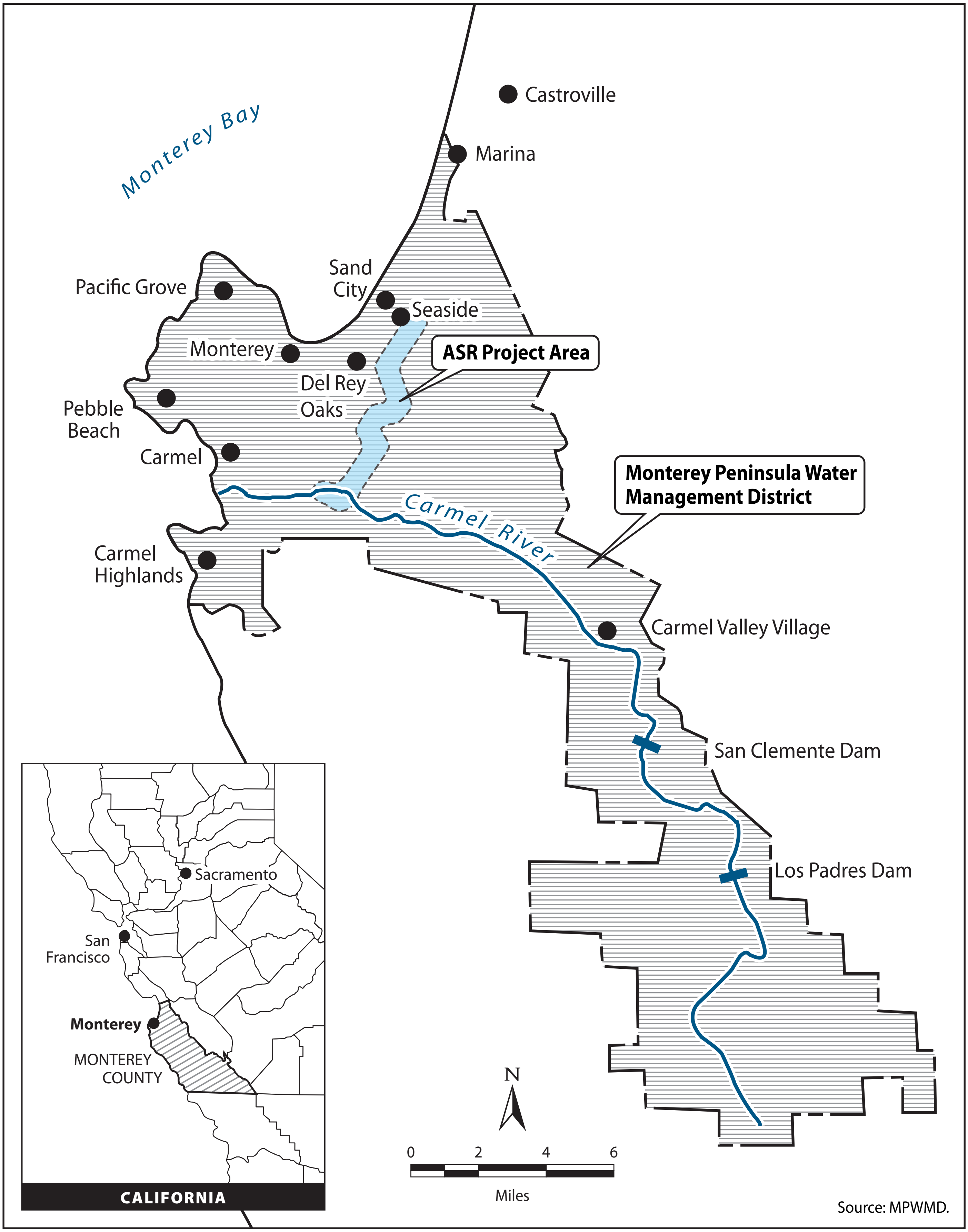
The Proposed Project would allow MPWMD to divert water from the Carmel River during times of high flows and store it in aquifers during drier times of the year. More detail about the specific components, construction, and operation is provided in Chapter 2.

Temporary Pipeline

Cal-Am's proposed temporary pipeline west of General Jim Moore Boulevard is needed to ensure uninterrupted deliveries of water into its Seaside area domestic distribution system, pumped from the Seaside Groundwater Basin by MPWMD's existing Santa Margarita Test Well. Cal-Am has been using deliveries of water from the Santa Margarita Test Well to ensure adequate delivery of water to Seaside when its Paralta well is not fully operational. This project will proceed whether or not MPWMD authorizes construction of a second ASR well (MPWMD's Proposed Project). Therefore, the temporary pipeline project is analyzed separately from the Proposed Project in this EIR/EA. The details of the temporary pipeline project are described in Chapter 2; a complete NEPA analysis is provided in Chapter 17.

Project Location

The Proposed Project and the temporary pipeline are located in Monterey County, California, and are within the boundaries of MPWMD (Figure 1-1). The Proposed Project would use existing and new infrastructure. Existing infrastructure includes groundwater extraction wells in the Carmel River basin; a pipeline extending from Carmel Valley north to Seaside (i.e., the Cañada Segunda pipeline); water pumping, storage, and treatment facilities located along the pipelines; and one injection/extraction well located on the former Fort Ord. New infrastructure includes a new injection/extraction well located on the former Fort Ord in the vicinity of the existing injection/extraction well and a short pipeline to connect the two injection/extraction wells to the proposed temporary Cal-Am water supply pipeline located west of General Jim Moore Boulevard. The temporary aboveground pipeline would be located along General Jim Moore Boulevard from Hilby Avenue to the Santa Margarita Test Well site.



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Jones & Stokes

Figure 1-1
Monterey Peninsula Water Management District Service Boundary and ASR Project Area

Project Background

The MPWMD manages and regulates the use, reuse, reclamation, and conservation of water within its boundaries. MPWMD conserves and augments water supplies by the integrated management of ground and surface water resources. About 80% of water within the MPWMD boundaries is collected, stored, and distributed by Cal-Am, which serves about 95% of peninsula residents and businesses. More than 70% of the water delivered by Cal-Am is diverted from the Carmel River Basin. Cal-Am owns two dams and a series of wells along the Carmel River. For many years it has been recognized that the current level of pumping from the Carmel River Basin has adverse effects on lower Carmel River natural resources, particularly in dry years. Cal-Am, MPWMD, and the State of California have sought alternative water sources and alternative water management actions to reduce pumping in the lower river and allow natural habitats to recover. To support a lowered level of pumping in the Carmel River basin, pumping of water from the Seaside groundwater basin has increased, especially in dry periods. This increased groundwater pumping has, in turn, led to a gradual lowering of water levels in the Seaside basin, threatening its long-term reliability as a local source of domestic water supply.

Since 1996, MPWMD has evaluated the feasibility of an ASR project. Efforts have included hydrogeologic testing and construction of pilot and full-scale test ASR wells in the coastal area of the Seaside basin. The testing results indicate that the basin can be successfully used to store water for future use in the Cal-Am system. In 2004, MPWMD's Santa Margarita test ASR well was used to provide a back-up supply because of a well failure elsewhere in the Cal-Am system. An ASR project is viewed by MPWMD as one way to improve water management capabilities to the benefit of Carmel River natural resources and Seaside groundwater basin long-term reliability.

Water Rights

The State Water Resources Control Board (State Water Board or SWRCB) is the entity that administers appropriative water rights in the Carmel Valley alluvial aquifer area. Previous decisions by the State Water Board have identified water rights held (or permits that need to be obtained) by various entities in Carmel Valley. The State Water Board has determined that the Carmel River is fully appropriated in the drier season of the year (May 1 to December 31). MPWMD was issued water rights associated with a mainstem reservoir on the Carmel River (State Water Board Permits 20808 and 7130B). As part of the existing ASR project testing, the State Water Board issued annual temporary urgency permits to MPWMD to divert Carmel River water for injection well testing. In October 2001, MPWMD submitted a petition for change based on the 1995 water rights permits associated with the New Los Padres Reservoir Project. The petition requests use of the Seaside basin as a place of storage for some of the Carmel River water, rather than using a dam and reservoir on the Carmel River. The petition was revised in September 2003. Approval of this petition would provide a water source (up to 7,300 afa) for the ASR project (Proposed Project) that is the subject of this EIR/EA. The State Water Board will use the information in this EIR/EA to help determine whether the petition should be granted.

Project Objectives and Purpose and Need

The objective of the Proposed Project is to allow for changes in water supply operations in the Carmel River and Seaside Groundwater Basins that will:

- benefit the natural resources of the Carmel River and the groundwater resources of the Seaside Groundwater Basin and
- improve the short-term reliability of the domestic water supply system in the Seaside area.

An element of the Proposed Project (Seaside Groundwater Basin injection/extraction well and pipeline) will be constructed on a portion of the former Fort Ord that is currently under federal ownership. The purpose and need of the EA is to allow the U.S. Army to:

- consider permitting the construction and operation of the injection/extraction well and its associated pipelines on property currently under federal ownership, and
- ensure that the injection/extraction well is compatible with the planned reuse of the area in which the well will be sited.

The objective of Cal Am's proposed temporary pipeline is to:

- ensure efficient delivery of water from the MPWMD ASR wells into Cal-Am's water distribution system in the Seaside area when the Paralta Well is not fully operational.

The purpose and need for the EA on the temporary pipeline project is to:

- allow the Army to consider issuing a right-of-entry for the installation and removal of the temporary aboveground pipeline that would be located on property currently under federal ownership.

Purpose and Content of the EIR/EA

CEQA Compliance

CEQA applies to all discretionary activities proposed, implemented, or approved by California public agencies. The MPWMD is the lead agency for the Proposed Project because it has the principal responsibility for approving and implementing the project and, therefore, the principal responsibility for ensuring CEQA compliance. The State CEQA Guidelines provide detailed procedures that the lead agency must follow to implement the law (Public Resources Code Section 21000 et seq.). According to the State CEQA Guidelines, if there is "substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment", the agency is required to prepare an EIR (State CEQA Guidelines Sec. 15064[a][1]).

The primary purposes of an EIR are to: inform decision-makers and the public about a project's significant environmental effects; identify ways to mitigate or minimize those effects; and describe reasonable alternatives to the project that would avoid or reduce the project's significant effects (State CEQA Guidelines Sec. 15121[1]). This EIR also provides the information necessary to obtain additional permits and approvals required for constructing and operating the ASR.

NEPA Compliance

The ASR injection/extraction well and associated pipelines, and the temporary aboveground pipeline would be located on a portion of the former Fort Ord that is currently under federal ownership. The well site and surrounding lands will eventually be transferred to the City of Seaside. The US Army will issue an Easement to construct and operate the injection/extraction well and associated pipelines; it will issue a Right-of-Entry and an Easement to allow construction and eventual removal of the temporary aboveground pipeline with the condition that the applicable mitigation measures described in the U.S. Fish and Wildlife Service's (2005) biological opinion are implemented. This EIR/EA serves as the US Army's NEPA compliance document for the federal action of issuing the Easements and Right-of-Entry.

Scope of the Environmental Impact Report/ Environmental Assessment

The focus and content of this EIR/EA were determined based on input received from the public and agencies, as well as studies MPWMD conducted previously to address water supply issues on the Monterey Peninsula. Potential environmental effects were evaluated for the following resources or issue areas.

- air quality,
- vegetation and wildlife,
- aquatic resources,
- cultural resources,
- geology and soils,
- hydrology and water quality,
- land use,

- noise,
- hazards and hazardous materials,
- public services and utilities,
- transportation and circulation, and
- visual resources.

The EIR/EA addresses potential direct and indirect impacts resulting from construction and operation of the Proposed Project. The EIR/EA also addresses potential cumulative and growth-inducing effects. The effects of installing and removing the temporary pipeline are described in Chapter 17, separately from the Proposed Project and alternatives.

Alternatives

An EIR must describe a range of alternatives to the project or to the project location that would feasibly attain the basic project objectives while avoiding or lessening significant environmental effects of the project. Alternatives may be eliminated from detailed consideration in the EIR if they fail to meet the basic project objectives, are determined to be infeasible, or cannot be demonstrated to avoid or lessen significant environmental effects.

The EIR/EA includes an evaluation of five alternatives to the proposed project. The alternatives evaluated in the EIR/EA are:

- Alternative 1- No Project: This alternative assumes that no additional water is diverted from the Carmel River for injection and eventual recovery for Seaside Groundwater Basin
- Alternative 2 - Alternative Well Site
- Alternative 3 - Local Desalination Plant
- Alternative 4 - Wastewater Reclamation
- Alternative 5 - Offstream Storage
- Alternative 6 – Stormwater Runoff

Environmental Impact Report/Environmental Assessment Process

Notice of Preparation

CEQA requires a notice of preparation (NOP). MPWMD prepared an NOP for this EIR/EA, which was filed with the State Clearinghouse on December 14, 2004. The NOP indicated a 30-day review period. The NOP was mailed to local, state, and federal agencies. The NOP provided a general description of the Proposed Project, alternatives to the Proposed Project, and the major environmental issues that would be addressed in the EIR/EA. At the time the NOP was issued, an ASR project was considered the most likely way to meet the project objectives.

The NOP described a three-phase ASR program. The NOP anticipated the EIR would include a project-level evaluation of Phase 1, and a program-level evaluation of Phases 2 and 3. At its February 24, 2005 meeting, the MPWMD Board received a Scoping Report that summarized written and oral comments on the NOP. At its March 21, 2005 meeting, the Board received an update on the ASR Project, based on meetings with federal and local agencies, consultation with the State Water Resources Control Board, and new information about potential road relocation and widening that was not available when the NOP was prepared.

Based on the NOP comments and new information, the MPWMD Board determined that this EIR/EA should focus only on the Phase 1 ASR Project. This determination was based on MPWMD's commitment to pursue a second ASR well at the existing test site, and the uncertainties about regional water projects, infrastructure, and development projects on Fort Ord that would affect whether Phases 2 or 3 would be pursued, or the timing of such projects. Once more concrete information is known, future ASR phases can be defined and environmental impacts can be addressed at the project level in a separate environmental document.

Thus, for the purpose of this EIR/EA, the Proposed Project may be viewed as equivalent to the "Phase 1 ASR Project" that was described in the December 2004 NOP, as amended by technical refinements that have occurred in 2005.

Public and Agency Scoping

In addition to the formal 30-day scoping period, the MPWMD conducted two scoping meetings to explain the environmental review process and to receive public and agency comments on the EIR. These meetings were held on January 12, 2005 in the City of Monterey.

Comments were received on a broad range of issues, including relationship of the proposed project to other local and regional water supply project, growth, drinking water quality, groundwater quality, air quality, vegetation, cultural resources, and aquatic resources.

Draft Environmental Impact Report/ Environmental Assessment

This document is the Draft EIR/EA for the MPWMD's ASR project. It contains a description of the Proposed Project, alternatives, and environmental setting and identifies direct and indirect impacts and mitigation measures for impacts found to be significant. The EIR/EA also includes a comparative analysis of the impacts associated with the project alternatives. This document also serves as NEPA compliance for the Army's action of allowing the installation and removal of the temporary pipeline on Army property.

Final Environmental Impact Report/ Environmental Assessment

Written and oral comments received in response to the Draft EIR will be addressed in a response to comments document that together with the Draft EIR will constitute the Final EIR and EA.

Mitigation Monitoring and Reporting Plan

CEQA requires agencies to "adopt a reporting and mitigation monitoring program for changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment". Although a final mitigation monitoring and reporting plan (MMP) is not required to be included in the EIR, mitigation measures have been clearly identified in a manner that will facilitate preparation of the MMP. Measures adopted by the MPWMD will be included in the MMP.

Alternatives Screening Process

An EIR must describe a range of reasonable alternatives to the project or to the project location that would feasibly attain the basic project objectives while avoiding or substantially lessening significant environmental effects of the project. Alternatives may be eliminated from detailed consideration in the EIR if they fail to meet the basic project objectives, are determined to be infeasible, or cannot be demonstrated to avoid or lessen significant environmental impacts. The EIR analyzes six alternatives to the Proposed Project. A discussion of the alternatives screening process is included in Chapter 16, "Alternatives."

Report Organization

This EIR contains the following chapters and sections in addition to this introduction.

Chapter 2: Project Description. This chapter describes the facilities required for the Proposed Project, including options being considered for those facilities. This chapter also describes the installation and removal of the temporary pipeline proposed by Cal-Am.

Chapters 3–14: Environmental Setting and Impacts. These chapters contain the environmental evaluation for each environmental issue area listed above. Each chapter describes the environmental setting and the environmental impacts and mitigation measures for the topic area. The Environmental Setting sections describe the existing environmental conditions in and around the project sites as they relate to the individual resource or issue areas. These descriptions constitute the baseline for the evaluation of potential effects of the project. The Environmental Impacts and Mitigation Measures sections identify potential direct and indirect environmental impacts that could result from implementation of the Proposed Project.

Chapter 15: Other CEQA Analyses. This chapter presents a qualitative description of potential cumulative impacts resulting from the incremental implementation of the project in combination with implementation of other closely related past, present, and future projects in the project area. This chapter also addresses growth-inducing impacts and irreversible or irretrievable commitments of resources.

Chapter 16: Alternatives. This chapter evaluates the following alternatives to the Proposed Project: No Project, Contiguous New Injection/Extraction Well, Local Desalination Plant, Wastewater Reclamation, Offstream Storage, and Stormwater Runoff.

Chapter 17: Temporary Pipeline Analysis. This chapter contains the environmental analysis for the installation and removal of the temporary pipeline.

Chapter 18: References. This chapter lists printed references and personal communications used in the preparation of this EIR.

The EIR also includes a list of preparers, appendices, and abbreviations and acronyms (an 11x17 foldout following the Table of Contents).

Chapter 2

Project Description/Proposed Action and Alternatives

Introduction

Chapter 2 describes all aspects of MPWMD's proposed ASR project (the Proposed Project) and alternative projects that could meet some or all of the objectives of the Proposed Project. The chapter also describes the construction and removal of a temporary aboveground pipeline that is being proposed by Cal-Am immediately adjacent to the Proposed Project. The Proposed Project would connect to this temporary pipeline rather than to the existing Cal-Am delivery system. This temporary pipeline is described here so that NEPA analysis can be completed. This analysis is presented in Chapter 17, separate from the analysis of the Proposed Project and alternatives. The background information that provides the basis for the Proposed Project and the temporary pipeline is contained in Chapter 1.

Proposed Aquifer Storage and Recovery Project

Carmel River Diversions

Seasons and Amounts of Diversions

The water needed to support the Proposed Project would be extracted from the Carmel River basin during the wet season (December to May). The anticipated maximum annual extraction would be 2,426 AF and the maximum instantaneous diversion rate would not exceed 6.7 cubic feet per second (cfs). The timing of these extractions would have to be consistent with National Marine Fisheries Service (NOAA Fisheries) recommendations for maintenance of flows in the river to protect steelhead, a native fish in the Carmel River. Extractions would occur only when flow in the Carmel River below River Mile (RM) 5.5 exceeds the recommended bypass flow. The recommended bypass flow ranges from 40 to 200 cfs depending on the season, current flow condition, and expected water-year type. Annual extractions would vary from year to year, based on the levels of precipitation and subsequent runoff in the Carmel River watershed.

Facilities Used for Diversions

All of the facilities used to divert, treat, and transport Carmel River water to the Fort Ord area for this project are already in place. Cal-Am wells that are located along the Carmel River would be used to extract the water for this project. Existing pipelines would carry the water from the wells to the Begonia Iron Removal Plant (BIRP) for treatment, and then through the Cañada Segunda pipeline to the Seaside area. This infrastructure would deliver Carmel River water to the Cal-Am system that connects to the two project wells overlying the Seaside basin (Figure 2-1).

Carmel River Pumping

Current Cal-Am Pumping Regime

Cal-Am currently operates a series of wells located along the Carmel River to collect water for its domestic supply system. The State Water Board has set Cal-Am's maximum annual production from the Carmel River basin at 11,285 AF. Cal-Am alters the location and volume of pumping from this system to meet the fluctuating demand and to ensure the lowest possible effect on Carmel River flows. In dry periods, Cal-Am alters its extraction pattern to emphasize use of water in the lower sections of the river. This action allows flows in the river to traverse as much of the river course as possible before being affected by pumping. It also results, however, in periodic elimination of surface flows in the lower river. This reduction in flow has adverse effects on native fish and on all plants and animals that use the lower river as essential habitat.

Pumping Regime as Modified by the Project

At times when Carmel River flows exceed minimum flow requirements, additional production from Cal-Am's Carmel Valley wells would be diverted for injection into the Seaside basin. The Cal-Am wells would be operated such that the additional production for ASR diversion would occur from as far downstream in the Carmel Valley aquifer as possible. The maximum rate of additional production for ASR diversion is anticipated to be 3,000 gallons per minute (gpm), or 6.7 cfs. Presently, Cal-Am production well capacity below RM 5.5 is 8.4 cfs and is sufficient to supply the proposed maximum ASR diversion rate.

Existing Santa Margarita Injection/Extraction Well Location

MPWMD's existing injection/extraction well is located on land owned and managed by the U.S. Army on the former Fort Ord military base (Figure 2-2).

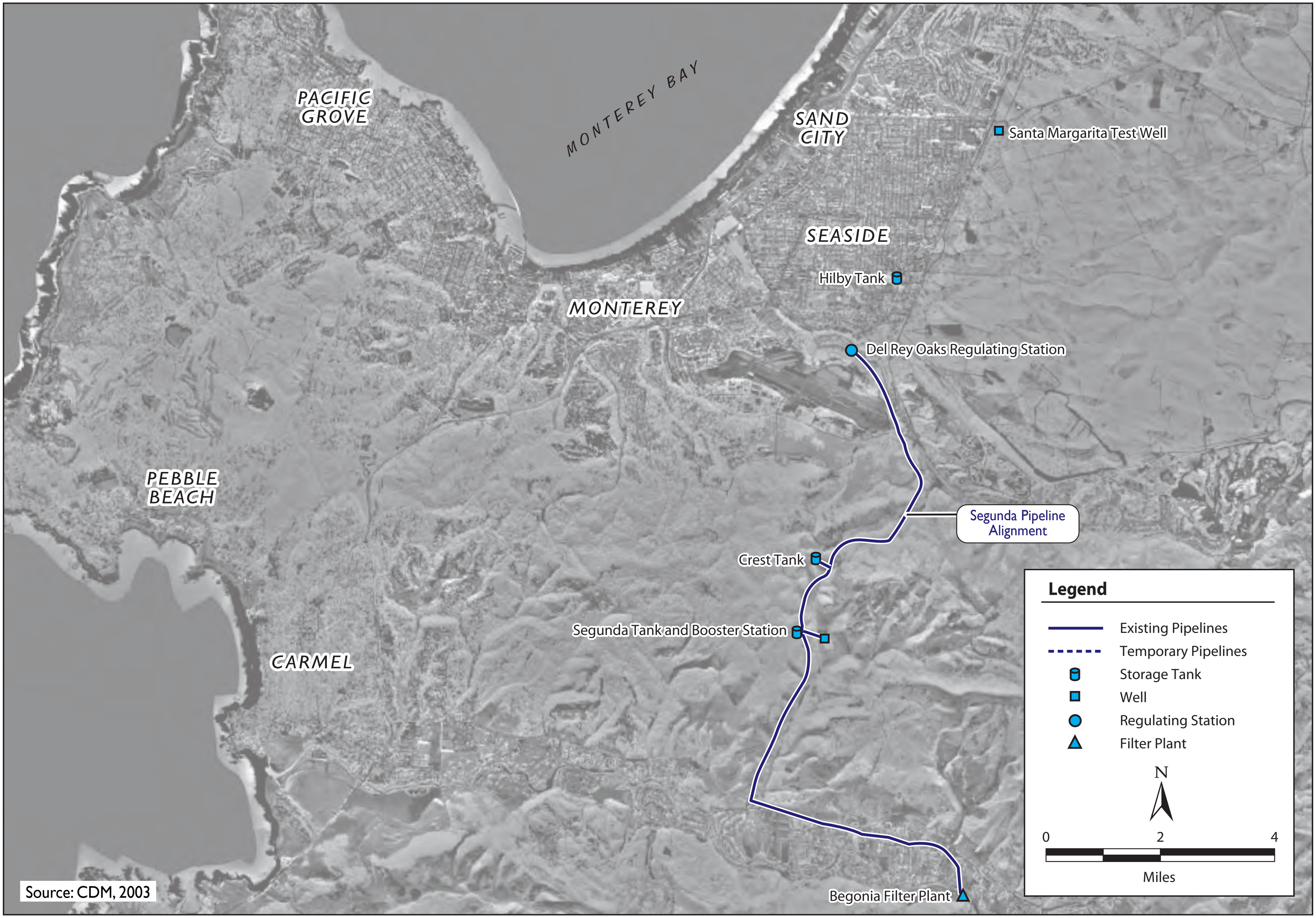

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Figure 2-1
General Location of Existing Pipeline and Well Facilities

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Figure 2-2
Santa Margarita Injection/Extraction Well

The site is immediately east of General Jim Moore Boulevard and approximately 300 feet south of Eucalyptus Road. Access to the site is by an unpaved road from General Jim Moore Boulevard. This site was selected by MPWMD in 1999 for its ASR test well. The cleared site includes approximately 0.25 acre and houses an 18-inch-diameter well drilled to approximately 720 feet below surface elevation. The perforated portion of the well is within the Santa Margarita sandstone aquifer between depths of 480 and 700 feet below the surface. The well is operated by a 400-horsepower pump and is capable of injecting 1,000 to 1,300 gpm and extracting 2,000 to 2,400 gpm. MPWMD estimates that the well is capable of injecting up to 1,050 AFA of Carmel River water and recovering up to 1,620 AFA for use in the Cal-Am water supply system.

From 2001 to the present, the well has functioned as a test facility to determine the feasibility of diverting water from the Carmel River and injecting and then extracting water from the Seaside basin in the vicinity of Seaside, California. In 2004 the well was used as a backup source of water for the Cal-Am domestic water supply system, as Cal-Am experienced maintenance problems with its Paralta well. The MPWMD Santa Margarita well is connected to the Cal-Am delivery system through a pipe that extends from the well to a Cal-Am line west of General Jim Moore Boulevard.

Operation and Maintenance

Under the Proposed Project, the existing Santa Margarita test well typically would be operated in injection mode during the December–May period (up to 183 days), subject to sufficient excess Carmel River flow conditions. The well would be idle during the intervening storage period, likely at least 30 days and typically during the month of June. Well pumping for recovery would typically occur during the July through November period (up to 153 days). When the well is operated in injection mode, injection operations would be halted periodically to backflush the well. This shutdown would occur for approximately 2 to 3 hours on a weekly basis, during which a small volume (approximately 0.75 AF) would be discharged to an on-site backflush pit. This water would then percolate into the ground and eventually back into the Seaside basin aquifer system. Upon recovery, water would be pumped from the well, treated on site for disinfection and transported through the Cal-Am system for delivery to customers. Periodically (i.e., approximately every 2 to 5 years), the well would be serviced for pump, motor, and casing inspection; maintenance; and cleaning.

Connection to Cal-Am Infrastructure

The Santa Margarita test ASR well is presently connected to the Cal-Am system via a buried 12-inch high-density polyethylene (HDPE) pipeline, crossing under General Jim Moore Boulevard through a 24-inch culvert. This pipeline currently provides water to a distribution system west of General Jim Moore Boulevard. The 12-inch pipeline (Figure 2-2) would be replaced with a new 16-inch pipeline through the culvert as part of the project. This construction would not require surface excavation of the road. The new 16-inch pipeline would connect to the proposed Cal-Am temporary aboveground pipeline on the west side of General Jim Moore Boulevard. (This temporary aboveground pipeline is described later in this Chapter and a NEPA analysis is presented in Chapter 17.)

New Injection/Extraction Well

Location

The new injection/extraction well would be located up to 250 feet from the existing Santa Margarita test ASR well and anywhere within the semicircular area shown in Figure 2-3. The EIR/EA has evaluated the impacts of constructing the injection/extraction well anywhere within the semicircular area. This site overlies the Seaside basin on former Fort Ord military base land currently owned and managed by the U.S. Army. Access to the Fort Ord well site would be via an unpaved road from the existing Santa Margarita well site. The final location of the injection/extraction well will be based on consultation with the City of Seaside and the U.S. Army to ensure the well will be constructed in site that will be compatible with the proposed reuse of that portion of Fort Ord.

The pipeline that would connect this new well to the Cal-Am water supply system would extend approximately 500 feet to the new 16-inch line described above for the existing well. This connection would occur east of General Jim Moore Boulevard. Approximately 0.7 acre of land would be cleared to accommodate the new well and its associated facilities.

Construction Methods

Construction of the new well and the connecting pipelines would employ standard land-clearing, well-drilling and pipeline-trenching equipment. This equipment would include one drill rig and one water tank; a pipe truck and several service vehicles also would be needed. Construction activity would normally extend from 7 a.m. to 7 p.m., 5 days a week; however, brief periods of 24-hour operation would be associated with well completion and initial well testing. Approximately 10 vehicle trips per day would be generated to and from the construction site, including workers and construction-related material deliveries. All waste material generated by land clearing and drilling that needs to be disposed of off site would be transported to an approved facility. These materials may include bentonite-based drilling fluids.

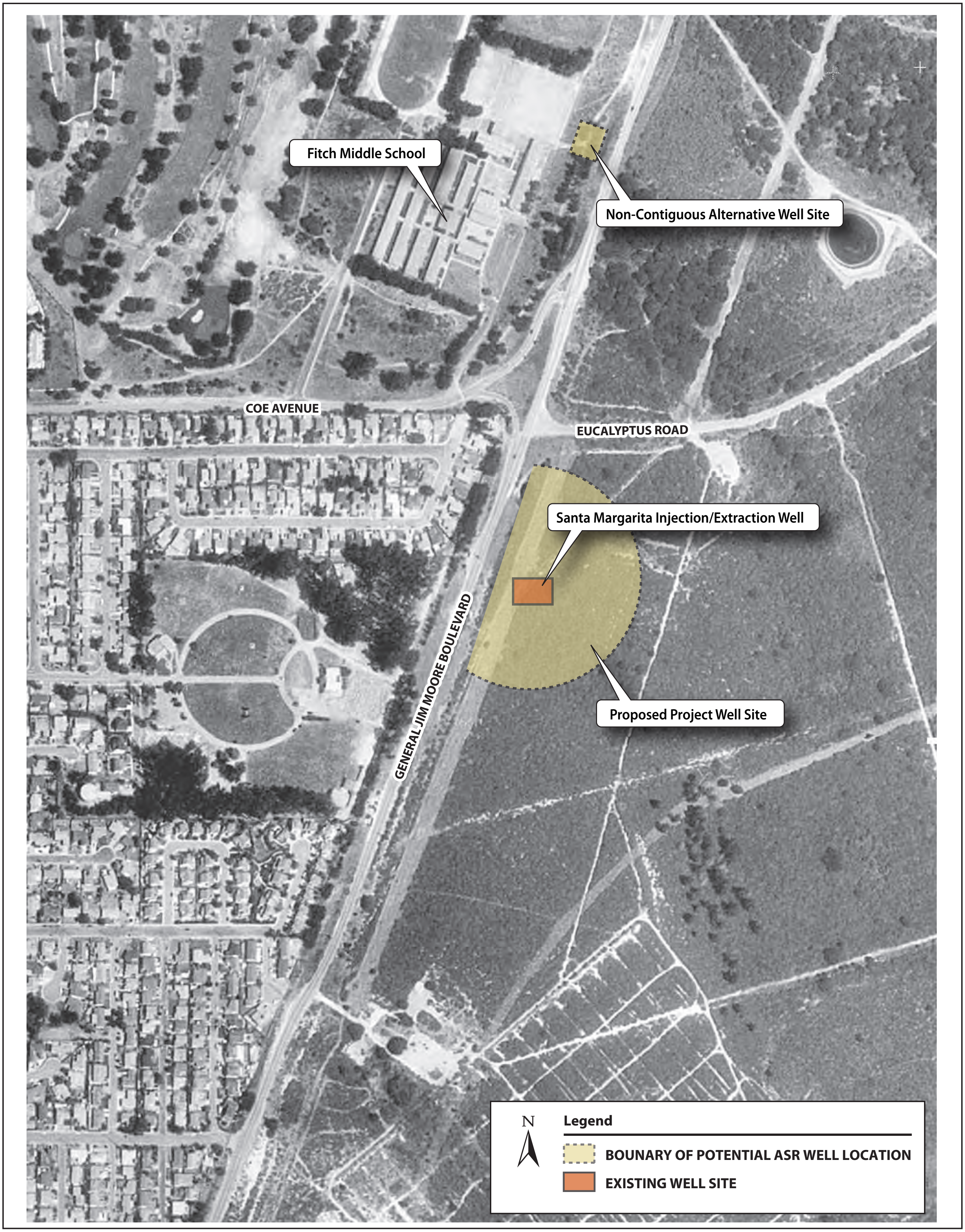

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Figure 2-3
Existing and Potential New ASR Well Location

Operations and Maintenance

Daily and annual operations and maintenance activities associated with the new ASR well would be similar to those described for the existing Santa Margarita test well above.

Water Treatment Following Extraction

As discussed in the Hydrology and Water Quality chapter (Chapter 8, under Environmental Setting), the water quality of the extracted water would be similar to that of the originally injected water. The primary difference would be that the chlorine residual in the injected water would have dissipated after several weeks of aquifer storage.

As soon as the water is extracted from the well, it would be re-chlorinated to restore the chlorine disinfectant residual before it reenters the Cal-Am distribution system. The chlorination system would be on site and consist of a 3,000- to 5,000-gallon bulk storage tank, dual/redundant chemical metering pumps, and a chlorine residual analyzer. All equipment would be located indoors in the chemical/electrical building to be constructed on site (see description below). Safety features for the system would include double containment for all chemical storage and dispensing equipment, protective vent fume neutralizers, safety showers for operating personnel, and a forced-air ventilation system.

Sodium hypochlorite solution (12.5% NaOCl) would be delivered by tanker truck as needed to replenish the system. Anticipated chemical use would be less than 100 gallons per day of hypochlorite, and bulk deliveries would be limited to one trip per month. The system would function automatically based on the well flow and analyzer outputs; status signals and emergency shutdown indicators would be relayed to Cal-Am via supervisory control and data acquisition (SCADA).

Other Site Facilities

In addition to the two ASR wells and 240,000-gallon backflush percolation pit, a single-story concrete block building, 24 feet by 45 feet (1,080 sq. ft.), would be located in the southwest corner of the site. The building would house all of the electrical switchgear, instruments, and SCADA equipment, as well as the chemical storage and dispensing systems for disinfection of the water.

The building would be of conventional design, with two regular doors and one 12-foot rollup door for equipment removal. Because the system would be unstaffed, no restroom facilities would be included in the building.

Energy Requirements

The primary energy source for operation of the Proposed Project would be electricity from the local Monterey Peninsula grid. Electricity would be needed to operate the Carmel Valley wells and water treatment plant, the pumps that move water through the Cañada Segunda pipeline, and the wells and water treatment facilities at the Santa Margarita ASR well site. Based on the anticipated injection and extraction scheme described above, the project would require approximately 2 million kilowatt hours (kWh) of electricity annually. Daily demand for electricity would vary, as the system would be operated with significant seasonal variation. Under maximum daily operation, the demand would be approximately 10,000 kWh per day. The peak demands would occur during high-flow events on the Carmel River and during extended dry periods when Cal-Am would be trying to minimize pumping along the Carmel River.

Costs

The overall costs of the Proposed Project would include one-time design and permitting costs, one-time construction costs, and ongoing operation and maintenance costs. The initial costs would include final design and engineering for the new well, on-site facilities, and connecting pipelines and permits from the U.S. Army, the City of Seaside, and Monterey County Department of Health Services. Construction costs would include land clearing, well and on-site facilities construction, connecting pipeline construction, and construction management. Total project capital costs are estimated to be $3.3 million. Operation costs would include the energy costs associated with the Cal-Am diversion wells in Carmel Valley, water treatment in the Carmel Valley, pumps needed to move the water from Carmel Valley to the Seaside area, operation of the ASR wells, and water treatment needed prior to introducing extracted water back into the Cal-Am water distribution system. Maintenance costs would include periodic servicing of the associated pumps, pipelines, wells, and water treatment facilities. Annual total operation and maintenance costs are estimated to be $300,000.

Project Environmental Commitments

As part of the project planning and impact assessment process, MPWMD will incorporate the following environmental commitments into the project to avoid or minimize impacts.

Traffic Control Plan

The construction contractor will coordinate with local public works or planning departments, including the City of Seaside, to prepare a traffic control plan during the final stage of project design. The purpose of the traffic control plan will be to:

- reduce, to the extent feasible, the number of vehicles (construction and other) on the roadways adjacent to the project;
- reduce, to the extent feasible, the interaction between construction equipment and other vehicles;
- promote public safety through actions aimed at driver and road safety; and
- ensure safety for bicyclists and pedestrians throughout the project study.

The traffic control plan will include the following measures:

- Through access for emergency vehicles will be provided at all times.
- Access will be maintained for driveways and private roads.
- Adequate off-street parking will be provided for construction-related vehicles through the construction period.
- Pedestrian and bicycle access and circulation will be maintained during construction. If construction encroaches onto a sidewalk, a safe detour will be provided for pedestrians at the nearest painted crosswalk. If construction encroaches on a bike lane, warning signs will be posted that indicate that bicycles and vehicles are sharing the roadway.
- Lane closures (partial or entire), traffic controls, and construction materials delivery will be restricted to between 9:00 a.m. and 4:00 p.m. on weekdays to avoid more congested morning and evening hours.
- Roadway segments or intersections that are at or approaching LOS that exceed local standards will be identified. A plan will be provided for construction-generated traffic to avoid these locations at the peak periods, either by traveling different routes or by traveling at nonpeak times.
- Traffic controls on arterials and collectors should include flag persons wearing bright orange or red vests and using a “stop/slow” paddle to warn drivers.
- Access to public transit should be maintained, and movement of public transit vehicles will not be impeded as a result of construction activities. Coordination with Monterey-Salinas Transit (MST) will be required regarding lane closures (partial or entire) that occur on bus routes and to provide notice of construction that could affect transit service routes so that MST can adjust routes or schedules. Adequate lead-time will need to be afforded to MST for developing temporary service changes due to construction and providing notice of changes to the public.
- Construction warning signs will be posted, in accordance with local standards or those set forth in the Manual on Uniform Traffic Control Devices in advance of the construction area and at any intersection that provides access to the construction area.

- If lane closures occur, local fire and police departments will be notified of construction locations and alternative evacuation and emergency routes will be designed to maintain response times during construction periods, if necessary.
- Written notification will be provided to appropriate contractors regarding appropriate routes to and from construction sites, and weight and speed limits for local roads used to access construction sites.
- A sign will be posted at all active construction sites. This sign will give the name and telephone number or electronic mail address of the MPWMD staff member to contact with complaints regarding construction traffic. The area of the sign should be at least 1 square yard.

The traffic control plan will be included in the construction specifications, implemented by construction contractor throughout the construction period, and monitored by MPWMD.

Heath and Safety Plan and Risk Management Plan

As required by Cal/OSHA standards, the construction contractor will prepare and implement a hazardous operations site-specific Health and Safety Plan (HSP) and Resource Management Plan (RMP) for construction activities that occur on designated DOD and NPL sites (former Fort Ord). A site-specific HSP will be developed, as necessary, by an environmental contractor before any investigation or cleanup activities or construction activities begin in the area. Workers who could directly contact soil, vapors, or groundwater containing hazardous levels of constituents will perform all activities in accordance with the HSP. The RMP for construction in this portion of the project study area would identify specific measures to reduce potential risks to human and ecological populations during construction of the Proposed Project. The RMP will be submitted to the Regional Water Quality Control Board (RWQCB) for review and approval. Preparation of the RMPs and subsequent RWQCB staff approval will occur independent of the CEQA process under the administrative jurisdiction of the RWQCB.

Alternatives

No Action/No Project

The No Project Alternative would leave Cal-Am's water supply management of the Carmel River and Seaside groundwater basins as it exists. MPWMD operation of its ASR test well would continue until its temporary authority to divert water from the Carmel River for this testing purpose was ended by the State Water Board. . No new ASR facilities would be constructed. The trend in extractions from the Carmel River groundwater basin would continue to affect the availability of surface and subsurface flows in the lower Carmel River, especially in dry periods. The cumulative extractions from the Seaside Groundwater Basin could continue to cause a gradual decline in the basin's water levels. However, due to recent court action, future extractions from the Seaside Groundwater Basin will be monitored and managed by the Seaside Basin Watermaster, which will be comprised of nine entities including MPWMD and Cal-Am. The Watermaster governing body, which is in the process of being formed as a result of the Seaside Basin adjudication, will regulate extractions from the basin to comply with "operating yield" limits specified in the adjudication decision of the Monterey County Superior Court. A Tentative Decision (Randall 2006) was issued in January 2006; a Final Decision is anticipated in March 2006.

Non-Contiguous New Injection/Extraction Well Location

The non-contiguous Seaside well site is located adjacent to Fitch Middle School on the west of General Jim Moore Boulevard (Figure 2-3). Access to the Seaside well site would be via existing paved areas at Fitch Middle School. The well would be constructed to the same depth as proposed for the second well at the Santa Margarita well site described above. The pipeline that would connect this new well to the Cal-Am water supply system would extend approximately 500 feet to the new 16-inch line described above for the existing well. This connection would occur west of General Jim Moore Boulevard. Approximately 0.7 acre of land would be cleared to accommodate the new well and its associated facilities.

Construction, Operation, and Maintenance Activities and Energy Requirements

The construction, operation, and maintenance activities and the energy requirements of the Seaside well would be similar to the proposed new well at the Santa Margarita site described above.

Other Site Facilities

Because the Seaside well would be constructed some distance from the existing Santa Margarita well, duplicate on-site facilities would be needed. The new site would have to include a backflush percolation pit and an enclosure for electrical equipment, chemical equipment, and chemical storage. Water treatment facilities would be needed on site.

Local Desalination Plant

From 2002 to 2004, MPWMD conducted engineering and environmental studies related to construction and operation of a desalination facility that would include seawater collection wells located at Monterey State Beach, a desalination plant located in Sand City, brine disposal wells located on the former Fort Ord, and new pipelines to convey seawater, brine, and potable water. Depending on the seawater collection and brine disposal methods used, the proposed desalination plant could produce up to 8,400 AFY. This would help Cal-Am meet the provisions of State Water Board Order WR 95-10, maintain its existing total system production of 15,285 AFA (maximum dry-year demand), and continue to provide a reliable supply of water to the Monterey Peninsula customers. While preliminary engineering studies were completed for this project (Camp Dresser & McKee, Inc. 2003a, 2003b), an environmental study was never completed. The project was suspended by the MPWMD Board of Directors in spring 2004. This project could provide an alternate water source that would support the Proposed Project's goals related to improved management of the Carmel River and Seaside groundwater basins.

The desalination plant would use the reverse osmosis (RO) process to remove salts from seawater. This process would be about 50% efficient; therefore, the desalination plant would require 15 mgd of feedwater to produce 7.5 mgd of potable water. At the same time, the plant would produce about 7.5 mgd of brine concentrate that would be returned to the ocean. The project elements include the following:

- Desalination plant located at one of three sites in Sand City (Figure 2-5). Desalination Plant Site 1 is located on a parcel currently occupied by the Graniterock aggregate processing and distribution yard. Desalination Plant Site 2 is the Salvation Army building located between California Street and Scott Street. Desalination Plant Site 3 is on a parcel west of and adjacent to State Route (SR) 1 near the intersection of SR 1 and Del Monte Boulevard.
- Seawater collection through horizontal directionally drilled (HDD) wells and/or radial beach wells located along the beach in Sand City and the former Fort Ord.
- Brine disposed of through HDD wells located in the coastal section of former Fort Ord or through the Monterey Regional Water Pollution Control Agency (MRWPCA) treated-wastewater outfall pipeline, which discharges to Monterey Bay south of the mouth of the Salinas River. If the MRWPCA brine discharge option were selected, brine would be disposed of in the outfall year-round.
- Brine disposal pipelines to HDD wells or to the MRWPCA wastewater outfall constructed in surface streets or railroad rights-of-way.

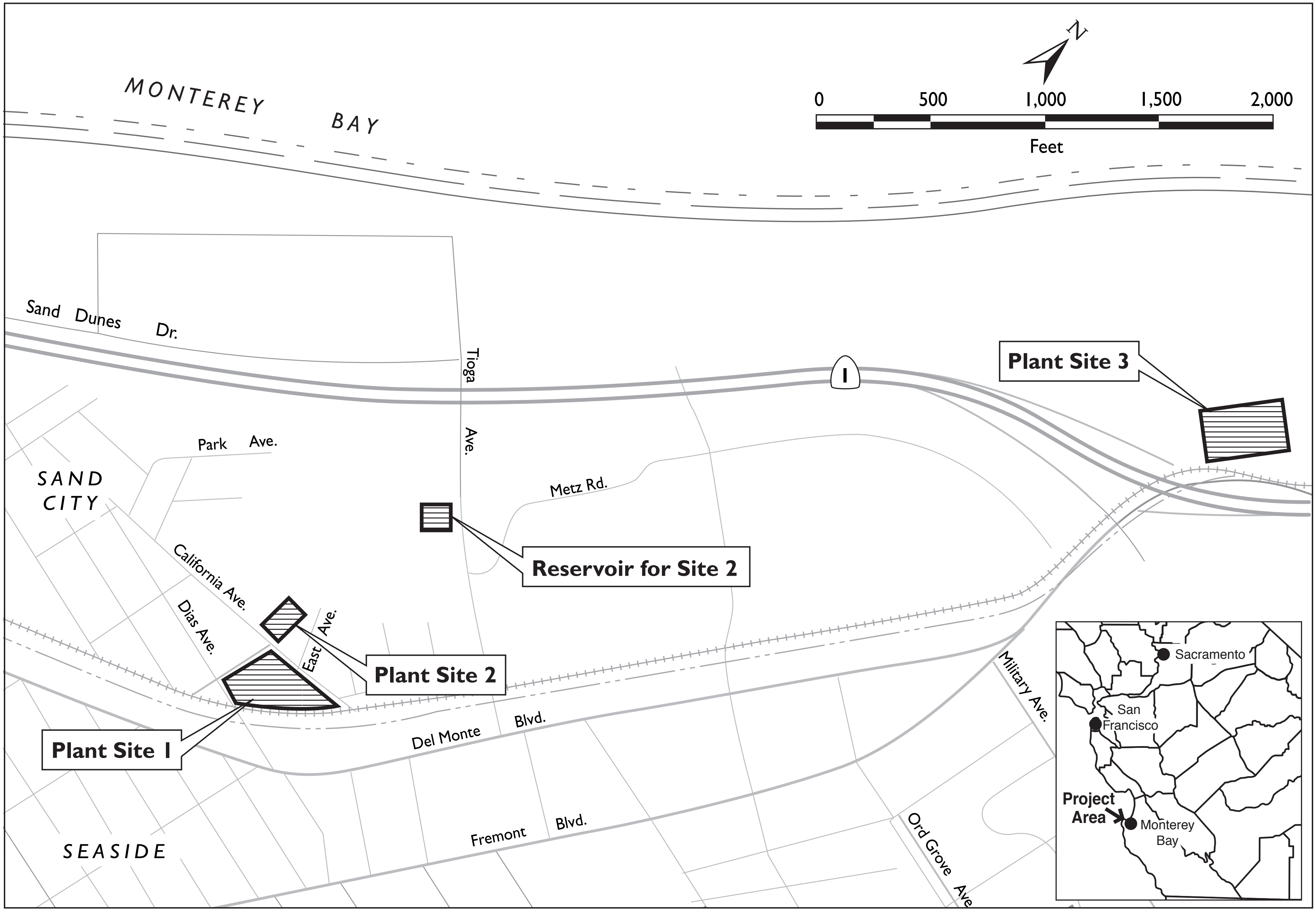

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Figure 2-5
Desalination Plant Sites 1, 2, and 3

Wastewater Reclamation

Reclaiming wastewater could supplement water supplies in the Cal-Am service area by replacing potable water used for irrigation or by recharging one of the groundwater basins used by Cal-Am. Three projects have been identified that would provide this water source. One is the Regional Urban Water Augmentation Project (RUWAP) being pursued jointly by the MRWPCA and the Marina Coast Water District (MCWD). A second is the Groundwater Replenishment Project (GRP) being pursued by the MRWPCA. The third is the expansion of the existing Carmel Area Wastewater District (CAWD)/Pebble Beach Community Services District (PBCSD) reclamation project.

Monterey Regional Water Pollution Control Agency/Marina Coast Water District Regional Urban Water Augmentation Project

The RUWAP involves two major water augmentation supply projects: seawater desalination and recycled water. The RUWAP project goal is to provide 2,400 AFY of water to the former Fort Ord area to meet redevelopment requirements described in the Fort Ord Reuse Plan. In addition, 300 AFY of water is being considered to supply the Monterey Peninsula (defined as California-American Water Company's Monterey Division service area) and 300 AFY of water is being considered to supply MCWD's other service areas. An EIR for this project was certified in October 2004; the "Hybrid Alternative" was endorsed by the MCWD and FORA boards of directors in 2005. The EIR identified and evaluated several alternatives, including:

- "Seawater Desalination Alternative" -- a new 3,000 AFY desalination facility in the area currently occupied by the MCWD's existing desalination plant. The proposed replacement desalination project meets the project objective of 2,400 AFY, replaces the District's existing 300 AFY desalination plant, and also provides 300 AFY for use within or outside of the District service areas, e.g., on the Monterey Peninsula.
- "Recycled Water Alternative" -- provides 3,000 AFY of recycled water, which meets the project objective of 2,400 AFY, but would also provide 300 AFY of recycled water to the Monterey Peninsula and an additional 300 AFY for use within or outside District service areas.
- "Hybrid Alternative" -- includes a water supply of up to 1,500 AFY from an expansion of MCWD's seawater desalination plant (including replacement of the existing 300 AFY capacity plant) and the production and distribution of up to 1,500 AFY of recycled water for landscape irrigation. The EIR concluded that depending upon the recycled water needs at the former Fort Ord, the remainder would be used for MCWD's other service areas and potentially, the Monterey Peninsula, via a new recycled water distribution system.

According to MCWD, project-level scoping for the “Hybrid Alternative” project and its two components (desalination and recycled water) was to begin August 2005. The ultimate size and design of the desalination component project and the recycled water component project will depend on many factors. Scoping will help determine how much potable and non-potable water from these two projects may be designated to the Monterey Peninsula (www.mpwmd.dst.ca.us/asd/board/boardpacket/2005/20050908/item4.htm).

Monterey Regional Water Pollution Control Agency Groundwater Replenishment Project

The following description of the GRP was provided by staff of the MRWPCA (Jacques pers. com).

The GRP would deliver recycled water from the SVRP, located at the regional wastewater treatment facility, to the Seaside groundwater basin for recharge. This would increase the amount of water available from this basin for pumping by existing or new domestic wells.

Groundwater replenishment water would consist of purified recycled water, blended with domestic water. During the summer, the SVRP produces tertiary treated water from the effluent of the regional wastewater treatment plant. This recycled water meets all state and federal standards for irrigating golf courses, parks, schools, and agricultural crops, including non-processed food crops that may be eaten raw. Currently, only agricultural applications are made, as a conveyance and distribution system for urban uses does not exist. However, construction of an urban water supply system to provide irrigation water for the southern Monterey Bay area has been in the planning stages for many years. A water-demand analysis shows that even with the development of the urban project, the combined agricultural and urban demands for irrigation water in the winter would be minimal. Thus, the SVRP would not be operated in the winter unless a project is constructed to use the winter volumes. It is estimated that after the construction of the proposed urban system, about 4,000 AF of SVRP water still could be produced in excess of the existing agricultural and potential urban demands. This quantity could be available for purification and groundwater recharge.

Recycled water from the SVRP would be purified by an advanced wastewater treatment plant (AWT). The AWT would most likely be constructed adjacent to the SVRP, although alternate locations will be considered during preliminary design. The AWT would process water to meet all state and federal drinking water standards and the California Department of Health Services (DHS) requirements for groundwater recharge. The treatment processes would most likely include RO for the removal of dissolved salts, microorganisms, and other constituents. An ultraviolet disinfection system would be provided to meet bacterial requirements and to destroy organic compounds. The ultraviolet system might be coupled with the addition of hydrogen peroxide, if necessary to improve its effectiveness.

The SVRP should provide adequate pretreatment for the RO process. However, it may be desirable to include pretreatment with microfiltration to reduce biofouling of the RO membranes. The product water would meet all drinking water standards prior to groundwater recharge.

State guidelines for groundwater recharge of purified recycled water require that the water be blended with water from non-wastewater sources. The blend water could come from the Seaside basin or from the Carmel River.

The purified water would be recharged either through surface recharge basins or by injection wells. In either case, the recharge facilities would be constructed on the former Fort Ord, east of General Jim Moore Boulevard. The selected recharge method would depend on the findings of surface recharge pilot testing. The two groundwater recharge concepts are described below.

Direct Injection into the Aquifers

MPWMD's pilot demonstration project has shown that direct injection of potable water into the Santa Margarita aquifer is feasible. This aquifer is the primary groundwater supply in the Seaside basin. The pilot project is part of a proposed project, known as the Seaside Basin Storage and Recovery Project, that proposes to inject surplus Carmel River water into the aquifer with subsequent extraction by dual-purpose wells.

Purified recycled water could also be injected into the Santa Margarita aquifer. However, the underground retention period required by DHS dictates that the extracted water could not be withdrawn for a period of 12 months and must not be extracted within 2,000 feet from the point of injection. Thus, the groundwater replenishment injection well locations would need to be sited to ensure compliance with the DHS guidelines.

Surface Recharge

In 1977, the U.S. Geological Survey investigated the feasibility of surface recharge in the Seaside basin. While its investigation was not exhaustive, the study indicated that surface recharge was possible and concluded that most of the natural recharge to the basin was from surface recharge of rain. The investigation estimated that 75% of the recharge to the basin occurs from rainfall.

The former Fort Ord area east of General Jim Moore Boulevard would be used for surface recharge. The 1978 U.S. Department of Agriculture soil survey for Monterey County describes the soils in this area, which consist of stabilized sand dunes, as exhibiting infiltration rates of 6–20 inches/hour. Further, there exist a number of surface depressions on this former Fort Ord site that may be used as recharge basins.

Recharge water would travel downward through the Aromas Sand into the Paso Robles Formation and then probably into the Santa Margarita. (The percolation pathways into this confined Santa Margarita aquifer are not currently well defined.) The percolation of the AWT water through the Aromas Sand would further purify the percolating waters.

While the upper layers of soil are conducive to surface recharge, subsurface clay lenses within the underlying aquifers possibly could serve to inhibit or retard the downward percolation of water. Therefore, if this recharge method is selected for further consideration it would be necessary to perform a pilot recharge test to determine the degree of retardation provided by these restricting layers.

The purified water would be transported to the groundwater recharge or injection site via a pipeline during the winter period when agricultural and urban irrigation demands are minimal.

The RO process usually rejects about 10% of the influent as a brine stream. The brine stream would most likely be discharged into the brine disposal facility at MRWPCA's regional wastewater treatment plant, although alternate disposal methods will be considered during preliminary design.

Carmel Area Wastewater District/ Pebble Beach Community Services District Reclaimed Wastewater System Extension

The extension of the CAWD/PBCSD system would offset use of potable water by replacing irrigation of a golf course and cemetery located in Pacific Grove with reclaimed wastewater. The project would require construction of a 15,000-foot, 14-inch-diameter pipeline running from the northern terminus of the existing reclaimed water system at Spanish Bay Golf Course north to the Pacific Grove Golf Links and El Carmelo Cemetery. The project would provide an estimated 95 AFA (Camp, Dresser & McKee 2003).

All three of these wastewater reclamation projects would allow Cal-Am to reduce its water extractions from the lower Carmel River and the Seaside groundwater basin and therefore meet two of the proposed ASR project objectives.

Off-stream Storage

Off-stream storage involves capturing and storing excess winter flows from the Carmel River at a surface water storage reservoir or groundwater basin for subsequent delivery to Cal-Am customers during summer months, or during drought years. Potential off-stream storage sites include surface water storage sites on Chupines Creek, Cachagua Creek, San Clemente Creek, and on the former Fort Ord. The potential groundwater storage site is the Tularcitos aquifer in the Carmel River watershed.

Surface water storage includes capturing excess flows from the Carmel River and transporting this water to an off-stream storage reservoir. The use of groundwater storage in the Tularcitos Aquifer would require dual-purpose injection/extraction wells for storage and subsequent recovery of water. Water stored in an off-stream storage reservoir or groundwater basin in the Carmel River watershed would be conveyed by pump stations and pipelines to the Carmel Valley filter plant, or to a new water treatment plant located in the Carmel Valley, for treatment and delivery to Cal-Am customers. Storing water at the former Fort Ord would require a treatment plant and conveyance pipelines, probably located on the former Fort Ord property.

The firm water supply yield from off-stream storage is estimated to range from 400 to 1,000 AFA, depending on storage capacity and water availability (Camp, Dresser & McKee 2003). The additional yield from these off-stream storage projects would allow Cal-Am to reduce its water extractions from the lower Carmel River and the Seaside groundwater basin, and therefore meet two of the proposed ASR project objectives.

Stormwater Runoff

Stormwater reuse is the capture of runoff during storm events and the use of this runoff for irrigation or groundwater recharge. Required facilities for large-scale reuse projects would include collection and conveyance pipelines, storage reservoirs, treatment facilities, and distribution pipelines. Small-scale reuse options include cisterns at individual residences. Because of the large capital costs associated with large-scale facilities and the variability of storm events, this option is not being considered.

Cisterns are storage containers designed to hold stormwater at individual sites. Stormwater would be collected from roofs or other impermeable surfaces and conveyed to cisterns for storage. The stored water later would be used for on-site irrigation. Similar to wastewater reclamation, use of water stored in cisterns would supplement use of potable water for irrigation.

The storage capacity of a cistern would range from 75 to 2,000 gallons. The size of the cistern, frequency of storm events, and the number of individual participants would limit the firm yield from on-site stormwater reuse. It is anticipated that use of cisterns in the Monterey area would yield approximately 60 to 120 AFA, assuming a 25% to 50% participation rate among customers (Camp, Dresser & McKee 2003).

The relatively small yield from stormwater capture would not allow Cal-Am to significantly modify its extractions from the Carmel River and Seaside groundwater basins.

Proposed Temporary Pipeline

MPWMD and Cal-Am currently operate the Santa Margarita Test Well, which is located on former Fort Ord, just east of General Jim Moore Boulevard (Figure 2-2). This well currently connects to the Cal-Am system through a 12-inch pipe that extends west under General Jim Moore Boulevard through a 24-inch culvert, which then connects to existing infrastructure that distributes the water to the west. The distribution of water from the Santa Margarita well, as well as the proposed ASR project, would be improved by transporting the water south to the distribution main on the eastern end of Hilby Avenue, where it can be pumped more efficiently to the Cal-Am transmission pipelines in the City of Seaside.

Therefore, separate from the Proposed Project, Cal-Am is proposing to construct a temporary aboveground pipeline that would connect the Santa Margarita well (and potentially the new ASR well) to the Hilby distribution main (Figure 2-4). This pipeline would be temporary (in place no more than five years from the completion of construction). Therefore, Cal-Am is proposing to install piping that would result in minimal ground disturbing activities while a more permanent solution for water management and distribution is developed. When a permanent solution is developed, Cal-Am will remove the temporary pipeline. Implementing the permanent solution will require Cal-Am to complete additional environmental compliance. This document addresses only the effects of the installation, operation, and removal of the temporary pipeline.

Location

The temporary pipeline would be installed parallel and to the west of the existing General Jim Moore Boulevard alignment, between the road and the fence line (Figure 2-4). The pipeline would extend from where it connects to the new 16-inch Santa Margarita well pipeline south to the Hilby distribution main in the City of Seaside. Two segments of the pipeline, totaling approximately 100 feet, would be placed underground where the line crosses the existing roadways. These are intersections of General Jim Moore Boulevard with Broadway Avenue and San Pablo Street. An additional 60-foot segment will be underground where the line intersects with the City of Seaside well site, which is south and adjacent to San Pablo Street. The total line length will be approximately 6,700 feet.

04637.04 (02/06)

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Figure 2-4
CAL-AM Temporary Pipeline Route & Staging Areas
Sheet 1 of 2

04637.04 (02/06)

Jones & Stokes

Figure 2-4
CAL-AM Temporary Pipeline Route & Staging Areas
Sheet 2 of 2

Specifications

The pipeline would be approximately 6,700 feet in length, extending from its connection to the Santa Margarita Test Well to an existing pipeline connected to the Hilby distribution main (Figure 2-4). The pipeline would be 16 inches in diameter and mostly aboveground, except for where it crosses roads. Cal-Am is proposing this aboveground pipeline because the project is both temporary and critically time-dependent. This aboveground route would minimize environmental effects and costs, and the proposed route minimizes both visual and direct exposure to the community, as it would be located in the area between the Army fence line and General Jim Moore Boulevard.

The pipeline would be a high density polyethylene (HDPE) pipe, 16 inches in diameter. The pipe material contains special inhibitors to prevent UV (sunlight) degradation from the aboveground installation. HDPE is the preferred pipeline material because it can be easily installed aboveground by staging the pipe assembly equipment in several locations and pulling the line as it is assembled into place. At the two locations where the line would be underground, the pipe would be buried and paved.

Construction Methods

Construction activity would normally occur from 7 a.m. to 7 p.m., 5 days a week. Approximately 10 vehicle trips per day would be generated to and from the entire construction area, including workers and construction-related material deliveries. The only work that is expected to occur concurrently is the Broadway crossing and portions of the aboveground pipeline. This would occur for over a period of 2 days. It is estimated that installation of the total temporary pipeline would take approximately 6 weeks. Construction methods for both the aboveground and underground pipe installation and removal are described below.

Aboveground Installation and Removal

Approximately 6,600 feet of the 6,700-foot long line would be installed aboveground. The pipe would be staged and assembled in lengths of approximately 2,000 feet. An excavator, located at a designated staging area, would pull the pipe into place along a steel cable. Several workers would walk along the pipeline route as the pipe is pulled to guide and secure the pipeline. Based on pipe assembly rates, approximately 800 to 1,000 feet/day of pipe can be installed in the aboveground areas. Potential staging areas are shown in Figure 2-4. Flanged couplings would be required at both ends and other areas where line segments are to be joined without the use of fusion welding equipment. The air-vac and blow-off assemblies would be installed after the line is in place and connected. The taps into the line would be made via full circle clamp fittings. All valves would be installed within tamper-proof enclosures at the request of the California Department of Health Services.

Workers would walk along the alignment to install the various fittings. Besides the excavator, construction equipment would include a fusion welder machine and a crane or boom truck with a 20-foot bed that would be used to unload the piping and haul the fusion welder machine to each staging area. There would be up to 10 staging areas along the pipeline alignment. Each staging area would be approximately 60 feet in length. Staging areas, like the pipeline alignment, have been selected to avoid impacts on vegetation and to better facilitate construction activity. These staging areas are shown in Figure 2-4.

The line would be secured with minimal anchoring to allow for any thermal expansion. For areas where the slope is greater than 10 percent, posts would be set into the ground to limit pipe movement. The aboveground segments of the pipeline would take approximately 4 .5 weeks to install, including mobilizing and demobilizing periods.

Underground Installation and Removal

Where the pipeline crosses Broadway Avenue and San Pablo Street, the line would be installed underground. These underground segments would be constructed using a conventional trenching system because there is no regular traffic in the area as it is fenced off by the Army, or in the case of Broadway Avenue, there are multiple traffic lanes in each direction, which would allow single-lane closures during trenching/installation, and repaving stages. It is estimated that each pipeline crossing would be placed approximately 3.5 feet below the existing pavement level to avoid existing utilities. Each crossing would take up to two days and the equipment required to do this may include an excavator, roller, backhoe, water truck, and dump truck. However, because these areas would be relatively small, it is likely that at least some of the repaving work would be done by hand. The underground segments of the pipeline would take approximately 1.5 weeks to install, including mobilizing and demobilizing periods.

Operations and Maintenance

A Cal-Am employee would drive along General Jim Moore Boulevard daily and approximately once a month a Cal-Am employee would walk along the alignment to inspect for leaks or other problems. It is not expected that any additional maintenance would be required.

Chapter 3
Air Quality

Introduction

This chapter describes the setting and impacts of the Proposed Project with regard to air quality. Specifically, this section focuses on the relationship between topography and climate, discusses federal and state ambient air quality standards (AAQS) and existing air quality conditions in the project study area, identifies land uses that could be sensitive to decreased air quality, and describes the overall regulatory framework for air quality management in California and the region. This section then identifies the potential air quality impacts of the Proposed Project and proposes mitigation measures to reduce any significant impacts to less-than-significant levels.

Setting

Climate and Topography

The project study area is located in the County of Monterey. The County of Monterey is in the North Central Coast Air Basin (NCCAB), where the Monterey Bay Unified Air Pollution Control District (MBUAPCD) is charged with maintaining air quality within the county.

The NCCAB comprises 5,159 square miles along the central coast and includes Monterey, Santa Cruz, and San Benito Counties. The northwest sector of the basin is dominated by the Santa Cruz Mountains. The Diablo Range marks the northeastern boundary and, together with the southern extent of the Santa Cruz Mountains, forms the Santa Clara Valley, which extends into the northeastern tip of the basin. Farther south, the Santa Clara Valley evolves into the San Benito Valley, which extends northwest–southeast and has the Gabilan Range as its western boundary. To the west of the Gabilan Range is the Salinas Valley, which extends from Salinas at the northwest end to King City at the southeast end. The western side of the Salinas Valley is formed by the Sierra de Salinas, which also form the eastern side of the smaller Carmel Valley; the coastal Santa Lucia Range defines the western side of the valley.

The semi-permanent high-pressure cell in the eastern Pacific is the basic controlling factor in the climate of the air basin. In the summer, the high-pressure cell is dominant and causes persistent west and northwest winds over the entire California coast. Air descends in the Pacific High forming a stable temperature inversion of hot air over a cool coastal layer of air. The onshore air currents pass over cool ocean waters to bring fog and relatively cool air into the coastal valleys. The warmer air aloft acts as a lid to inhibit vertical air movement.

The generally northwest–southeast orientation of the mountain ridges tends to restrict and channel the summer onshore air currents. Surface heating in the interior portion of the Salinas and San Benito Valleys creates a weak low pressure, which intensifies the onshore airflow during the afternoon and evening.

In the fall, the surface winds become weak, and the marine layer grows shallow, dissipating altogether on some days. The airflow is occasionally reversed in a weak offshore movement, and the relatively stationary air mass is held in place by the Pacific high-pressure cell, which allows pollutants to build up over a period of a few days. It is most often during this season that the north or east winds develop to transport pollutants from either the San Francisco Bay area or the Central Valley into the NCCAB.

During the winter, the Pacific High migrates southward and has less influence on the air basin. Air frequently flows in a southeasterly direction out of the Salinas and San Benito Valleys, especially during night and morning hours. Northwest winds are nevertheless still dominant in winter, but easterly flow is more frequent. The general absence of deep, persistent inversions and the occasional storm systems usually result in good air quality for the basin as a whole in winter and early spring.

Air Quality Pollutants

The federal and state governments have established AAQS for six criteria pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter smaller than or equal to 10 microns in diameter (PM10), and lead. Ozone and PM10 are generally considered to be regional pollutants, as these pollutants or their precursors affect air quality on a regional scale. Pollutants such as CO, NO_2, SO_2, and lead are considered to be local pollutants that tend to accumulate in the air locally. PM10 is considered to be a localized pollutant as well as a regional pollutant. In the project study area, CO, PM10, and ozone (and the ozone precursors, oxides of nitrogen [NO_x] and reactive organic gases [ROG]) are of particular concern. A complete summary of state and national AAQS is provided in Table 3-1.

Table 3-1. Ambient Air Quality Standards Applicable in California

Pollutant	Symbol	Average Time	Standard (parts per million)		Standard (micrograms per cubic meter)		Violation Criteria	
			California	National	California	National	California	National
Ozone*	O_3	1 hour	0.09	NA	180	NA	If exceeded	NA
		8 hours	0.070	0.08	137	157	If exceeded	If fourth highest 8-hour concentration in a year, averaged over 3 years, is exceeded at each monitor within an area
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
		1 hour	20.0	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
(Lake Tahoe only)		8 hours	6	NA	7,000	NA	If equaled or exceeded	NA
Nitrogen dioxide	NO_2	Annual average	NA	0.053	NA	100	NA	If exceeded on more than 1 day per year
		1 hour	0.25	NA	470	NA	If exceeded	NA
Sulfur dioxide	SO_2	Annual average	NA	0.03	NA	80	NA	If exceeded
		24 hours	0.04	0.14	105	365	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.25	NA	655	NA	If exceeded	NA
Hydrogen sulfide	H_2S	1 hour	0.03	NA	42	NA	If equaled or exceeded	NA
Vinyl chloride	C_2H_3Cl	24 hours	0.01	NA	26	NA	If equaled or exceeded	NA
Inhalable particulate matter	PM10	Annual geometric mean	NA	NA	20	NA	If exceeded	NA
		Annual arithmetic mean	NA	NA	NA	50	NA	If exceeded at each monitor within area
		24 hours	NA	NA	50	150	If exceeded	If exceeded on more than 1 day per year
	PM2.5	Annual geometric mean	NA	NA	NA	NA	If exceeded	NA
		Annual arithmetic mean	NA	NA	12	15	NA	If 3-year average from single or multiple community-oriented monitors is exceeded
		24 hours	NA	NA	NA	65	NA	If 3-year average of 98th percentile at each population-oriented monitor within an area is exceeded
Sulfate particles	SO_4	24 hours	NA	NA	25	NA	If equaled or exceeded	NA
Lead particles	Pb	Calendar quarter	NA	NA	NA	1.5	NA	If exceeded no more than 1 day per year
		30-day average	NA	NA	1.5	NA	If equaled or exceeded	NA

Notes: All standards are based on measurements at 25ºC and 1 atmosphere pressure.
National standards shown are the primary (health effects) standards.
NA = not applicable.

* The U.S. Environmental Protection Agency recently replaced the 1-hour ozone standard with an 8-hour standard of 0.08 part per million. EPA issued a final rule that will revoke the 1-hour standard on June 15, 2005. However, the California 1-hour ozone standard will remain in effect.

Source: California Air Resources Board 2003

Ozone

Ozone is an irritant to the respiratory tract and sensitive tissues in the eyes. As an oxidant, it increases susceptibility to respiratory infections. Ozone also attacks synthetic rubber, textiles, plants, and other materials and can cause substantial damage. Effects on plants, through leaf discoloration and cell damage, can be extensive.

State and federal standards for ozone have been set for a 1-hour averaging time. The state requires that a 1-hour ozone standard of 0.09 part per million (ppm) not be exceeded. The federal 1-hour ozone standard is 0.12 ppm, not to be exceeded more than three times in any 3-year period. The EPA recently replaced the 1-hour ozone standard with an 8-hour standard of 0.08 ppm, with the exception of areas classified as nonattainment for ozone, which must also attain the 1-hour ozone standard.

Ozone is not emitted directly into the air but is formed by a photochemical reaction in the atmosphere. Ozone precursors, which include ROG and NO_x, react in the atmosphere in the presence of sunlight to form ozone. Because photochemical reaction rates increase when the intensity of ultraviolet light and air temperature increase, ozone is primarily a summer air pollution problem. ROG and NO_x are emitted by internal combustion engines.

Carbon Monoxide

CO is a public health concern because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death.

State and federal CO standards have been set for both 1-hour and 8-hour averaging times. The state 1-hour standard is 20 ppm by volume, and the federal 1-hour standard is 35 ppm. Both state and federal standards are 9 ppm for the 8-hour averaging period.

Motor vehicles are the dominant source of CO emissions in most areas, with electric utilities, fires, and other mobile and miscellaneous sources contributing. High CO levels develop primarily during winter, when periods of light winds combine with the formation of ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

Inhalable Particulates

Particulates can damage human health and retard plant growth. Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled. Particulates also reduce visibility and corrode materials.

The federal and state AAQS for particulate matter apply to two classes of particulates: particulate matter 2.5 microns or less in diameter (PM2.5) and PM10.

The state PM10 standards are 50 micrograms per cubic meter (μ/m^3) as a 24-hour average and 20 μ/m^3 as an annual geometric mean. The federal PM10 standards are 150 μ/m^3 as a 24-hour average and 50 μ/m^3 as an annual arithmetic mean. The federal PM2.5 standards are 15 μ/m^3 for the annual average and 65 μ/m^3 for the 24-hour average. On May 14, 1999, a three-judge panel of the U.S. Court of Appeals for the District of Columbia put a hold on implementing the PM2.5 standard and asked for further comments. On February 27, 2001, the U.S. Supreme Court unanimously upheld the constitutionality of the Clean Air Act as the EPA had interpreted it in setting health-protective air quality standards for PM2.5. On June 20, 2002, the California Air Resources Board (CARB) adopted a new annual PM2.5 standard of 12 μ/m^3.

Particulates are generated from a wide variety of sources, including agricultural activities, industrial emissions, dust suspended by vehicle traffic and construction equipment, and secondary aerosols formed by reactions in the atmosphere.

Toxic Air Contaminants

Although AAQS exist for criteria pollutants, no ambient standards exist for toxic air contaminants (TACs). Many pollutants are identified as TACs because of their potential to increase the risk of developing cancer or because of their acute or chronic health risks. For TACs that are known or suspected carcinogens, the CARB consistently has found that there are no levels or thresholds below which exposure is risk-free. Individual TACs vary greatly in the risk they present. At a given level of exposure, one TAC may pose a hazard that is many times greater than another. For certain TACs, a unit risk factor can be developed to evaluate cancer risk. For acute and chronic health risks, a similar factor called a Hazard Index is used to evaluate risk. In the early 1980s, the CARB established a statewide comprehensive air toxics program to reduce exposure to air toxics. The Toxic Air Contaminant Identification and Control Act (AB 1807) (Tanner 1983) created California's program to reduce exposure to air toxics. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) (Connelly 1987) supplements the AB 1807 program by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks.

Chlorine, which is often used to disinfect product water, is considered a TAC. It is a greenish-yellow gas, liquid, or rhombic crystal; and the odor is suffocating and very irritating when inhaled. Because of the well site's proximity to residences and a school, product water disinfection would be accomplished by using a sodium hypochlorite solution, which does not generate a significant gas by-product.

Regulatory Setting

Federal

The primary legislation that governs federal air quality regulations is the Clean Air Act Amendments (CAAA). The CAAA delegates primary responsibility for clean air to the U.S. Environmental Protection Agency (EPA). The EPA develops rules and regulations to preserve and improve air quality and delegates specific responsibilities to state and local agencies.

The EPA has established national AAQS for criteria pollutants (see Table 3-1). Criteria pollutants include CO, NO_2, SO_2, ozone, PM10, and lead.

If an area does not meet the federal AAQS shown in Table 3-1, federal clean air planning requirements specify that states develop and adopt state implementation plans (SIPs), which are air quality plans showing how air quality standards will be attained. In California, the EPA has delegated authority to prepare SIPs to the CARB, which, in turn, has delegated that authority to individual air districts.

State

The CARB, which is part of the California Environmental Protection Agency (Cal-EPA), develops air quality regulations at the state level. The state regulations mirror federal regulations by establishing industry-specific pollution controls for criteria, toxic, and nuisance pollutants. California also requires areas to develop plans and strategies for attaining state AAQS as set forth in the California CAA of 1988 (Table 3-1). The CARB is also responsible for developing emission standards for California vehicles.

Local

At the local level, the MBUAPCD is responsible for establishing and enforcing local air quality rules and regulations that address the requirements of federal and state air quality laws. Air quality is also managed through land use and development planning practices.

Existing Air Quality Conditions and Ambient Air Quality Standards

The State of California has designated the NCCAB as being in moderate nonattainment for ozone. The California Clean Air Act states that an ozone nonattainment area becomes nonattainment transitional if the state AAQS are not exceeded more than three times at any monitoring station in the air basin. The

NCCAB is designated nonattainment for PM10 and unclassified/attainment for CO.

The EPA has designated the NCCAB as being a moderate maintenance area for ozone. The NCCAB was redesignated from a moderate nonattainment area to a maintenance area in 1997 after meeting the federal 1-hour ozone standard in 1990. The NCCAB is designated unclassified for PM10 and unclassified/attainment for CO.

The existing air quality conditions in the project study area can be characterized by monitoring data collected in the region. PM10, CO, and ozone concentrations are the pollutants of greatest concentration in the MBUAPCD and, therefore, are the pollutants of most concern from the Proposed Project. Air quality monitoring data for the last 3 years are presented in Table 3-2. The closest monitoring stations in the vicinity of the Proposed Project are:

- Monterey Silver Cloud Court (ozone)
- Salinas High School (ozone, CO, and PM10)
- Moss Landing—Sandholt School (PM10)

As shown in Table 3-2, monitoring stations closest to the project study area have shown one violation of the state 1-hour ozone standard and occasional violations of the state PM10 standard during the three most recent years for which data are available. In addition, there have been no violations of the state or federal CO standard for this time period.

Table 3-2. Ambient Air Quality Monitoring Data in Project Study Area

Pollutant Standards	2001	2001	2002
Ozone (O_3)- Monterey: Silver Cloud Court			
Maximum 1-hour concentration (ppm)	0.095	0.084	0.082
Number of Days Standard Exceeded[a]			
CAAQS 1-hour (>0.09 ppm)	1	0	0
NAAQS 1-hour (>0.12 ppm)	0	0	0
Ozone (O_3)- Salinas: High School			
Maximum 1-hour concentration (ppm)	0.075	0.076	0.075
Number of Days Standard Exceeded[a]			
CAAQS 1-hour (>0.09 ppm)	0	0	0
NAAQS 1-hour (>0.12 ppm)	0	0	0
Carbon Monoxide (CO) - Salinas: High School			
Maximum 8-hour concentration (ppm)	1.40	1.64	1.38
Maximum 1-hour concentration (ppm)	3.5	3.3	2.3
Number of Days Standard Exceeded[a]			
CAAQS 8-hour (≥9.0 ppm)	0	0	0
NAAQS 8-hour (≥9.0 ppm)	0	0	0
CAAQS 1-hour (≥20 ppm)	0	0	0
NAAQS 1-hour (≥35 ppm)	0	0	0
Particulate Matter (PM10) - Salinas: High School			
Maximum 24-hour concentration ($\mu g/m^3$)	36.0	50.0	44.0
Second highest 24-hour concentration ($\mu g/m^3$)	34.0	46.0	37.0
Average geometric mean concentration ($\mu g/m^3$)	15.0	17.0	15.0
Average arithmetic mean concentration ($\mu g/m^3$)	15.0	20.0	18.0
Number of Days Standard Exceeded[a]			
CAAQS 24-hour (>50 $\mu g/m^3$)[b]	0	0	0
NAAQS 24-hour (>150 $\mu g/m^3$)[b]	NA[c]	0	0
Particulate Matter (PM10) – Moss Landing: Sandholt School			
Maximum 24-hour concentration ($\mu g/m^3$)	74.0	68.0	58.0
Second highest 24-hour concentration ($\mu g/m^3$)	70.0	59.0	57.0
Average geometric mean concentration ($\mu g/m^3$)	27.0	26.0	25.0
Average arithmetic mean concentration ($\mu g/m^3$)	29.0	29.0	27.0

Pollutant Standards	2001	2001	2002
Number of Days Standard Exceeded[a]			
CAAQS 24-hour (>50 µg/m^3)[b]	4	5	2
NAAQS 24-hour (>150 µg/m^3)[b]	0	0	0
Particulate Matter (PM2.5) – Salinas: High School			
Maximum 24-hour concentration (µg/m^3)	26.4	25.6	23.5
Second highest 24-hour concentration (µg/m^3)	21.5	21.7	22.8
Average arithmetic mean concentration (µg/m^3)	7.9	8.6	9.1
Number of Days Standard Exceeded[a]			
NAAQS 24-hour (>65 µg/m^3)[d]	0	0	0

Notes: CAAQS = California Ambient Air Quality Standards.

NAAQS = National Ambient Air Quality Standards.

[a] The number of days above the standard is not necessarily the number of violations of the standard for the year.

[b] Calculated exceedances based on measurements taken every 6 days.

[c] Data not available.

[d] Calculated exceedances based on measurements taken every 3 or 6 days, depending on the time of year and the site's monitoring schedule.

Sources: California Air Resources Board 2003; Environmental Protection Agency 2003

Sensitive Receptors

Sensitive receptors include land uses such as residences, schools, and hospitals where building occupants are considered to be sensitive to air pollution, such as residents, recreationists, school children, hospital patients, and the elderly. The only sensitive receptors in the project vicinity are the Fitch Middle School and the residences on the west side of General Jim Moore Boulevard.

Impacts and Mitigation Measures

Methods and Significance Criteria

Approach

Construction-Related Impacts

Sources of construction-related emissions include construction equipment exhaust (ROG, NO_x, CO) and fugitive dust (PM10) entrained into the air from construction activities. Construction-related emissions could result from site grading, trenching, construction worker commute trips, mobile and stationary construction equipment exhaust, architectural coatings, and asphalt paving. Table 3-3 presents a list of construction equipment anticipated to be used for various phases of construction for the Proposed Project.

Table 3-3. Equipment Used During Project Construction

Phase and Equipment
Wells
Air Compressor
Auger Drill Rig[1]
Rotary Drill Rig[1]
Backhoe
Pump
Truck
Building Construction
Air Compressor
Backhoe
Concrete Mixer
Truck
Pipelines
Backhoe
Concrete Mixer
Truck

Note:
[1] The auger drill rig and rotary drill rigs will not be operated simultaneously.

Construction-related emissions were estimated and analyzed using the anticipated construction equipment inventory from Table 3-3, guidelines provided by the MBUAPCD, and the URBEMIS2002 model (version 8.7.0). It was assumed that construction activities would occur for 12 hours per day, with each phase of construction occurring separately. Construction activities were divided into separate phases and analyzed separately. Table 3-4 summarizes the anticipated construction schedule for the proposed project.

Table 3-4. Estimated Construction Schedule

Week	Construction Activity	Duration (days)	Work Hours	Equipment Types[1]
1	Installation of Sound Barrier and Conductor	5	Daylight	Installed with Auger Rig
2	Mobilization of Drilling Equipment	5	Daylight	
3	Pilot Hole Drilling and Logging	2	24-hrs	Mud-Rotary Drilling Rig
3	Borehole Reaming, Casing Installation, Gravel Placement, and Cement Sealing	5	24-hrs	Mud-Rotary Drilling Rig
4	Well Development with Drilling Rig	2	24-hrs	Mud-Rotary Drilling Rig
5	Demobilize Rig, Install Test Pump	5	Daylight	
6	Well Development with Test Pump	5	Daylight	Engine-Driven Pump
7	Production Testing	3	24-hrs	Engine-Driven Pump
7	Disinfection	1	Daylight	Engine-Driven Pump
8	Demobilization and Site Cleanup	2	Daylight	

Note:
[1] Equipment types will also include ancillary equipment listed in Table 3-3.

Operation-Related Impacts

Facility operations are not anticipated to use equipment that would generate pollutant emissions. Operation of the project wells and pipelines would include the use of electric pumps to convey diverted water and treated water. These electric pumps are not considered sources of pollutant emissions, as they do not include any internal combustion engines or motors.

Significance Thresholds

Appendix G of the State CEQA Guidelines states that a project would normally have a significant effect on the environment if it would:

- conflict with or obstruct implementation of the applicable air quality plan,
- violate any air quality standard or contribute substantially to an existing or projected air quality violation,
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state AAQS,
- expose sensitive receptors to substantial pollutant concentrations, or

- create objectionable odors affecting a substantial number of people.

The State CEQA Guidelines further state that the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the determinations above. The MBUAPCD has specified significance thresholds within its CEQA Air Quality Guidelines (2002) to determine whether project-related air quality impacts need mitigation. Based on consultation with MBUAPCD staff (Brennan pers. comm.) and the MBUAPCD's CEQA air quality guidelines, Table 3-5 summarizes applicable thresholds that are used in the analysis of significant air quality impacts.

Table 3-5. Monterey Bay Unified Air Pollution Control District Thresholds of Significance

Pollutant	Construction	Operation[1]
ROG	NA[2]	137 pounds per day
NO_x	NA[2]	137 pounds per day
CO	NA	550 pounds per day
PM10	82 pounds per day	82 pounds per day
SO_x	NA	150 pounds per day
Diesel Particulate Matter (DPM)	Cancer incidence > 10 in 1 million	NA
Acrolein	Hazard Index > 1	NA

Notes:

Projects that emit other criteria pollutant emissions would have a significant impact if emissions would cause or substantially contribute to the violation of State or national AAQS. Criteria pollutant emissions could also have a significant impact if they would alter air movement, moisture, temperature, climate, or create objectionable odors in substantial concentrations.

[1] The MBUAPCD does not have significance thresholds for construction-related ozone precursors from typical construction equipment because they are accommodated in the emission inventories of State- and federally required air plans and would not have a significant impact on the attainment and maintenance of ozone AAQS.

[2] Based on the construction threshold of 82 pounds per day of PM10, the MBUAPCD has identified levels of construction activity that could result in a significant impact. For construction activities with minimal earthmoving, the MBUAPCD has identified construction sites that disturb more than 8.1 acres per day as having the potential to exceed the District's 82 pounds per day threshold. For construction activities involving grading, excavation, and other earthmoving activities, the MBUAPCD has identified construction sites that disturb more than 2.2 acres per day as having the potential to exceed the District's 82 pounds per day threshold.

Source: Monterey Bay Unified Air Pollution Control District 2004.

Construction Impacts

Impact AQ-1: Short-Term Increase in PM10 Emissions from Well Drilling

Modeling conducted using the URBEMIS2002 model indicates that PM10 associated with well drilling would be approximately 3.4 pounds per day, well below the MBUAPCD's threshold of 82 pounds per day. In addition, well drilling does not involve substantial ground disturbance, which is a primary source of fugitive dust. Unlike open trenching, where ground disturbance occurs horizontally across the surface, ground disturbance associated with well drilling is limited to the launching point, where the drilling bore enters the ground. Because emissions associated with well drilling are below MBUAPCD's threshold, and because of the limited ground disturbance associated with well drilling, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact AQ-2: Short-Term Increase in PM10 Emissions from Pipeline Construction

Modeling conducted using the URBEMIS2002 model indicates that PM10 associated with pipeline construction would be approximately 2.7 pounds per day, well below the MBUAPCD's threshold of 82 pounds per day. In addition, the MBUAPCD has established a construction-related PM10 threshold of 82 pounds per day. Based on this threshold, the MBUAPCD has identified levels of construction activity that could result in a significant PM10 impact. For construction involving grading, excavation, and other earthmoving activities, the MBUAPCD has identified construction sites that disturb more than 2.2 acres per day as having the potential to exceed the 82-pounds-per-day threshold (Table 3-5). Construction of the Proposed Project would not result in ground disturbance exceeding 2.2 acres per day. Consequently, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact AQ-3: Short-Term Increase in PM10 Emissions from Building Construction

Modeling conducted using the URBEMIS2002 model indicates that PM10 associated with building construction would be approximately 2.7 pounds per day, well below the MBUAPCD's threshold of 82 pounds per day. The primary source of PM10 from construction of the building facilities would be ground disturbance associated with earthmoving activities, such as grading. As indicated above, the MBUAPCD has identified construction sites that disturb more than 2.2 acres per day as having the potential to exceed the 82-pounds-per-day threshold (Table 3-5). Construction of building facilities is not anticipated to result in ground disturbance exceeding 2.2 acres per day. Because emissions associated with construction of the building facilities are below MBUAPCD's threshold and the limited ground disturbance associated with well drilling, this impact is considered **less than significant.**

Mitigation: No mitigation is required.

Impact AQ-4: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Diesel Particulate Matter from Construction Activities

TACs are pollutants that may be expected to result in an increase in mortality or serious illness or that may pose a present or potential hazard to human health. Health effects of TACs include cancer, birth defects, neurological damage, damage to the body's natural defense system, and diseases that lead to death. In August 1998, the CARB identified diesel exhaust as a TAC (California Air Resources Board 1998). In the identification report, the California Office of Environmental Health Hazard Assessment (OEHHA) provided an inhalation noncancer chronic reference exposure level (REL) of 5 micrograms per cubic meter ($\mu g/m^3$) and a range of inhalation cancer potency factors of 1.3×10^{-4} to 2.4×10^{-3} $(\mu g/m^3)^{-1}$. The Scientific Review Panel on Toxic Air Contaminants recommended a "reasonable estimate" inhalation unit risk factor of 3.0×10^{-4} $(\mu g/m^3)^{-1}$. From the unit risk factor an inhalation cancer potency factor of 1.1 $(mg/kg\text{-}day)^{-1}$ may be calculated. These noncancer and cancer health factors were developed based on whole (gas and particulate matter) diesel exhaust. The surrogate for whole diesel exhaust is diesel PM. PM10 is the basis for the potential risk calculations. (California Air Resources Board 1998)

When evaluating health risks from diesel exhaust exposure, the potential cancer risk from inhalation exposure to diesel PM will outweigh the potential noncancer health impacts. Therefore, inhalation cancer risk is the primary consideration for health effects according to OEHHA and CARB guidelines. When comparing whole diesel exhaust to speciated diesel exhaust (e.g., polycyclic aromatic hydrocarbons [PAHs], metals), potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multipathway cancer risk from the speciated components. For this reason, an analysis of multipathway risk is not necessary.

Emissions of diesel particulate matter have the potential to result in elevated health risks. The assessment of cancer risk is typically based on a 70-year exposure period. Construction activities are sporadic, transitory, and short-term in nature, and once construction activities cease, so too will emissions from construction. Conversation with MBUAPCD staff indicates that construction activities that occur for less than 1 year will generally not result in any adverse health impacts. As indicated in Table 3-4, construction activities are anticipated to occur for a period of 2 months. Because construction activities are less than 1 year in duration, this impact is considered **less than significant**. However, to further reduce emissions of DPM and associated health risks, Mitigation Measures AQ-1 and AQ-2 are recommended.

Mitigation Measure AQ-1: Use Newer, Cleaner-Burning Engines.
The project applicant will encourage all construction contractors that use equipment with diesel engines to use as much equipment as possible that meets EPA Tier II engine standards. The project applicant will also encourage construction contractors to install diesel particulate matter filters and lean-NOx or diesel oxidation catalysts in all equipment, especially equipment that doesn't meet Tier II engine standards. .

Mitigation Measure AQ-2: Limit Construction Duration.
To minimize potential exposure of students at the nearby Roger S. Fitch Middle School (Figure 2-3) to TACs associated with diesel exhaust from construction activities, construction activities should occur as much as possible when prevailing winds are away from the school and when students are away from the school site.

Impact AQ-5: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Acrolein Emissions from Diesel Exhaust from Construction Activities

Construction equipment and the test well pump may be diesel and could therefore emit diesel exhaust. Acrolein is emitted as a product of diesel combustion, where the concentration in diesel exhaust is currently understood to be 0.0035 grams acrolein per gram of ROG emissions. An acute one-hour reference exposure level (REL) of 0.19 $\mu g/m^3$ has been determined. Using methods developed by the MBUAPCD, a screening analysis conducted for project construction indicates that the hazard index for acrolein exposure may exceed 1 at nearby sensitive receptors at the two potential locations for the well sites. Consequently, this impact is considered **significant**. **Implementation of Mitigation Measures AQ-1 and AQ-2 would reduce these impacts to a less-than-significant level.**

Mitigation Measure AQ-1: Use Newer, Cleaner-Burning Engines.

Mitigation Measure AQ-2: Limit Construction Duration.

Operational Impacts

The well pump would be electric and would therefore not emit any diesel or other exhaust. In addition, the use of sodium hypochlorite solution rather than chlorine gas for product water disinfection eliminates the risk of release of toxic gases during well operation.

Chapter 4
Vegetation and Wildlife

Introduction

This chapter presents an analysis of construction- and operation-related effects of the project on vegetation and terrestrial wildlife. Effects on fish and other aquatic biota are discussed in Chapter 5, "Aquatic Resources." Measures are included to avoid, reduce, and compensate for significant impacts on vegetation and wildlife.

Setting

Monterey Bay is located on California's central coast, a biologically diverse and unique region. The Monterey Bay coastline varies from sandy beaches, rocky outcrops, and sandstone cliffs to sand bluffs and wind-swept dunes and beaches. The area inland from the coast is composed primarily of Pleistocene dune formations that are weakly consolidated silts and sands. The area has a moderate maritime climate with a pattern of wet winters and relatively dry summers. Both annual and diurnal temperature ranges are small because of the moderating influence of the ocean. The area is within the Coast Ranges Geomorphic Province, a region consisting of northwest-trending mountain ranges, broad basins, and elongated valleys generally paralleling the major geologic structures. The coastal chaparral ecosystems prevalent in the area are home to several endemic plant species.

Methods

A Jones & Stokes wildlife biologist and botanist reviewed existing information from local, state, and federal agencies, and Jones & Stokes file information. Information from these sources was used to compile lists of special-status species that had the potential to occur in the project area. The wildlife biologist and botanist conducted a field survey of the project area to evaluate the biological resources in the Fort Ord well project area on July 21, 2005. For the purpose of this document, the *project area* includes a 320–foot arc around the north, east, and south side of the existing well site as shown in Figure 2-4. The Fort Ord well site and associated facilities would be constructed within this area; however the exact location of the well site and associated facilities has not been determined. A field survey was also conducted at the Seaside well site (Alternative). A field survey was conducted of the temporary pipeline on January 28, 2006. For the purpose of this document, the *surveyt area* includes the temporary pipeline alignment, proposed staging areas, temporary access roads, and a 30-foot-wide area around these sites.

The sources of information listed below were used to prepare the existing conditions and impact analysis portions of this section:

- a records search of the California Natural Diversity Database (CNDDB) for the Marina, Seaside, Monterey, Spreckels, and Salinas U.S. Geological Survey (USGS) 7.5-minute quadrangles (CNDDB 2005a);
- the California Native Plant Society (CNPS) Inventory of Rare and Endangered Vascular Plants of California (CNPS 2001);
- Flora and Fauna Baseline Study of Fort Ord, California (U.S. Army Corps of Engineers 1992)
- Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (U.S. Army Corps of Engineers 1997)
- Jones & Stokes file information on biological resources in the Monterey Bay area, and
- other biological references cited below in the text and included in the reference list in Chapter 17.

Sensitive Natural Communities and Environmentally Sensitive Habitat Areas

Sensitive natural communities are those communities that are especially diverse, regionally uncommon, considered sensitive natural communities (as defined by Holland 1986), or regulated by federal or state agencies. Several state and federal laws regulate the management of these areas, such as Section 404 of the Clean Water Act (CWA) and California Fish and Game Code Section 1601. Most sensitive natural communities are given special consideration because they provide important ecological functions. Some communities support a unique or diverse assemblage of plant or wildlife species and therefore are considered sensitive from an ecological standpoint.

Biological Communities

Maritime Chaparral

The plant community at the Fort Ord well site consists primarily of maritime chaparral. Maritime chaparral is a shrub community dominated by moderate to low-growing evergreen and drought-deciduous shrubs adapted to shallow soils and periodic fires. The characteristic shrub species on the project site include woollyleaf manzanita (*Arctostaphylos tomentosa*), chamise (*Adenostoma fasciculata*), deer broom (*Lotus scoparius*), bush monkeyflower (*Mimulus aurantiacus*), black sage (*Salvia mellifera*), and Monterey ceanothus (*Ceanothus cuneatus* var. *rigidus*). The vegetation was cleared for unexploded ordinance removal but is recovering rapidly.

Several bird species feed and nest in chaparral habitat including orange-crowned warbler (*Vermivora celata*), spotted towee (*Pipilo maculatus*), California thrasher (*Toxostoma redivivum*), and California quail (*Callipepla californica*) (Zeiner et al. 1990a). Mammals such as brush rabbit (*Sylvilagus bachmani*), California mouse (*Peromyscus californicus*) and brush mouse (*P. boylii*) will forage and find cover in dense chaparral, whereas narrow-faced kangaroo rat (*Dipodomys venustus*) and Heerman's kangaroo rat (*D. heermanni*) will use sparsely vegetated openings within thick vegetation (Zeiner et al. 1990b). These small mammals are preyed upon by gray fox (*Urocyon cinereoargenteus*), bobcat (*Felis rufus*), spotted skunk (*Spilogale gracilis*), and western rattlesnake (*Crotalis viridis*) (Zeiner et al. 1988, 1990b). Chaparral also provides important foraging habitat and cover for black-tailed deer (*Odocoileus hemionus*). Species observed during the field survey in this community type include western scrub jay (*Aphelocoma californica*), black phoebe (*Sayornis nigricans*), dark-eyed junco (*Junco hyemalis*), mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicanus*), red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes aura*), broad-footed mole (*Scapanus latimanus*) (observed mole trails), and black-tailed deer (scat). Many small mammal burrows were observed in the project area during the field survey. All trees in the survey area were examined for bird nests; only one small nest was observed in one tree.

The maritime chaparral that occurs at Fort Ord is classified as Central Maritime Chaparral (Holland 1986) or Woollyleaf Chaparral (Sawyer and Keeler-Wolf 1995). The CNDDB (1999) lists Central Maritime Chaparral as a sensitive natural community.

Ruderal Vegetation

A second plant community, ruderal vegetation, occurs between the fenced boundary between the former USA Fort Ord lands and residential area of Seaside and General Jim Moore Boulevard along the alignment of the temporary pipeline and associated staging areas and temporary access roads. The ruderal community is disturbed and dominated by dense common Hottentot fig (*Carpobrotus edulis*). Landscape trees, mainly Monterey cypress (*Cupressus macrocarpa*), eucalyptus species (mostly blue gum, *Eucalyptus globosus*), and myoporum, have been planted along the fenceline, and provide cover and potential nesting sites for migratory birds.

Special-Status Species

Special-status species are plants and animals that are legally protected under the California Endangered Species Act (CESA) the federal Endangered Species Act (ESA), or other regulations, as well as species considered sufficiently rare by the scientific community to qualify for such listing. Special-status species are defined as:

- species listed or proposed for listing as threatened or endangered under the ESA (Title 50, Code of Federal Regulations [CFR], Section 17.12 for listed plants, 50 CFR 17.11 for listed animals, and various notices in the Federal Register [FR] for proposed species);
- species that are candidates for possible future listing as threatened or endangered under ESA (67 FR 40657, June 13, 2002);
- species that are federal species of concern;
- species that are listed or proposed for listing by the State of California as threatened or endangered under CESA (Title 14, California Code of Regulations [CCR], Section 670.5);
- plants listed as rare under the California Native Plant Protection Act of 1977 (California Fish and Game Code, Section 1900 *et seq*.);
- plants considered by CNPS to be "rare, threatened, or endangered in California and elsewhere" (List 1B, 2, and 3) (List 4 species were included and evaluated in the impact analysis to determine whether they should be considered special-status species for the purposes of this EIR);
- species that meet the definition of *rare* or *endangered* under the State CEQA Guidelines, Section 15380;
- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); or
- animal species of special concern to DFG (Remsen 1978 [birds]; Williams 1986 [mammals]; and Jennings and Hayes 1994 [amphibians and reptiles]).

Special-Status Plants

Based on a review of existing information and the botanical survey of the project site, 27 special-status plants were identified as having the potential to occur in the project area and surrounding region (Table 4-1).

Table 4-1. Special-Status Plants Occurring in the Vicinity of the MPWMD ASR Project

Name	Status* Federal/State/ CNPS	Distribution	Habitat	Occurrence in Project Area
Hickman's onion *Allium hickmanii*	–/–/1B	Central coast; Monterey County (Monterey Peninsula) and San Luis Obispo County (Arroyo de la Cruz).	Closed-cone coniferous forest, maritime chaparral, coastal prairie, coastal scrub, valley and foothill grassland, generally +/- 150'; blooms April-May.	Fort Ord; not present on project site
Hooker's manzanita *Arctostaphylos hookeri* ssp. *hookeri*	–/–/1B	Central coast, western San Francisco Bay region, Santa Cruz mountains and south to Carmel.	Closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub on sandy substrate; blooms February-May	Fort Ord; not present on project site
Monterey manzanita *Arctostaphylos montereyensis*	–/–/1B	Central coast, northern outer south Coast Range, Toro Mountain, northwestern Monterey County	Chaparral, cismontane woodland, coastal scrub, sandy soils; blooms February-March	Fort Ord; not present on project site
Pajaro manzanita *Arctostaphylos pajaroensis*	–/–/1B	Pajaro Hills, Monterey County	Chaparral, on sandy soils; blooms December-March.	Fort Ord; not present on project site
Sandmat manzanita *Arctostaphylos pumila*	–/–/1B	Central coast, especially Monterey Bay, Monterey County	Openings in closed-cone coniferous forest, maritime chaparral, cismontane woodland, coastal dunes, and coastal scrub, in sandy areas; blooms February-May	Present on project site
Alkali milk-vetch *Astragalus tener* var. *tener*	–/–/1B	Southern Sacramento Valley, northern San Joaquin Valley, east San Francisco Bay Area	Grassy flats and vernal pool margins, on alkali soils; blooms March-June	Near Salinas; not present on project site

Name	Status* Federal/State/ CNPS	Distribution	Habitat	Occurrence in Project Area
Congdon's spikeweed *Centromadia parryi* subsp. *congdonii*	–/–/1B	East San Francisco Bay Area, Salinas Valley, Los Osos Valley	Annual grassland, on lower slopes, flats, and swales, sometimes on alkaline or saline soils, below 560 feet; blooms June-November	Fort Ord; not present on project site
Monterey spineflower *Chorizanthe pungens*	T/–/1B	Monterey and Santa Cruz Counties	Coastal dunes; blooms April-June	Present on project site
Robust spineflower *Chorizanthe robusta* var. *robusta*	E/–/1B	Coastal central California, from San Mateo to Monterey County	Coastal dunes, coastal scrub, on sandy soil; blooms May-September	Fort Ord; not present on project site
Jolon clarkia *Clarkia jolonensis*	–/–/1B	Northern outer south coast ranges, Monterey County	Cismontane woodland; blooms June	Seaside, Laguna Seca; not present on project site
Seaside bird's-beak *Cordylanthus rigidus* ssp. *littoralis*	–/E/1B	Central and southern central coast, Monterey and Santa Barbara Counties	Closed-cone coniferous forest, maritime chaparral, cismontane woodland, coastal dunes, coastal scrub; on sandy soils, often disturbed sites; blooms May-October	Fort Ord; not present on project site
Hutchinson's larkspur *Delphinium hutchinsoniae*	–/–/1B	Monterey County	Broad-leaved upland forest, chaparral, coastal prairie, coastal scrub; blooms March-June	Spreckels; not present on project site

Name	Status* Federal/State/ CNPS	Distribution	Habitat	Occurrence in Project Area
Eastwood's goldenbush *Ericameria fasciculata*	–/–/1B	Monterey County	Sandy soils and openings in closed-cone coniferous forest, maritime chaparral, coastal dunes, coastal scrub; blooms July-October	Present on project site
Coast wallflower *Erysimum ammophilum*	–/–/1B	Coastal San Mateo, Santa Cruz, and Monterey Counties	Coastal dunes and sandy openings in Maritime Chaparral, Coastal Scrub; blooms February-June	Fort Ord; not present on project site
Yadon's wallflower *Erysimum menziesii* ssp. *yadonii*	E/E/1B	Monterey County	Coastal dunes; blooms June-August	North of Marina; not present on project site
Sand Gilia *Gilia tenuiflora* ssp. *arenaria*	E/T/1B	Monterey County	Sandy soils in maritime chaparral, cismontane woodland, coastal dunes, coastal scrub; blooms April-June	Fort Ord; not present on project site
Kellogg's horkelia *Horkelia cuneata* subsp. *sericea*	–/–/1B	Coastal California from Marin to Santa Barbara County	Coastal scrub, maritime chaparral, in sandy and gravelly places; blooms April-September	Present on project site
Contra Costa goldfields *Lasthenia conjugens*	E/–/1B	Scattered occurrences in Coast Range valleys and southwest edge of Sacramento Valley	Alkaline or saline vernal pools and swales, below 700 feet; blooms March-June	Fort Ord; not present on project site
Carmel Valley bush mallow *Malacothamnus palmeri* var. *involucratus*	–/–/1B	Monterey and San Luis Obispo counties	Oak woodland, chaparral; talus hilltops and slopes, between 1,200-2,200 feet; blooms May-August	Carmel Valley; not present on project site

Name	Status* Federal/State/ CNPS	Distribution	Habitat	Occurrence in Project Area
Santa Lucia bush mallow *Malacothamnus palmeri* var. *palmeri*	–/–/1B	San Luis Obispo and possibly Monterey Counties	Rocky places in chaparral; blooms May-July	Carmel Valley; not present on project site
Carmel Valley cliff-aster *Malacothrix saxatilis* var. *arachnoidea*	–/–/1B	Monterey and Santa Barbara Counties	Rocky areas in chaparral; blooms June-December	Carmel Valley; not present on project site
Marsh Microseris *Microseris paludosa*	–/–/1B	Coastal California from Mendocino County to San Luis Obispo County	Grassland, coastal scrub, closed-cone-coniferous forest, cismontane woodland	East of Monterey; not present on project site
Monterey pine *Pinus radiata*	–/–/1B	Monterey, Santa Cruz, San Luis Obispo, and San Mateo Counties,; Baja California (Guadalupe Island)	Closed-cone coniferous forest, cismontane woodland	Monterey; trees present on project site are not native
Yadon's rein orchid *Piperia yadonii*	E/–/1B	Monterey County	Coastal bluff scrub, closed-cone coniferous forest, maritime chaparral, on sandy soils; blooms May-August	Fort Ord; not present on project site
Santa Cruz microseris *Stebbinsoseris decipiens*	–/–/1B	Coastal California: scattered occurrences from Marin County to Monterey County	Grasslands, coastal prairie, and open grassy areas in other habitat types	East of Monterey; not present on project site
Santa Cruz clover *Trifolium buckwestiorum*	–/–/1B	Known from Santa Cruz and Sonoma Counties	Coastal prairie, broadleaved upland forest, and cismontane woodland; blooms May-October	Fort Ord; not present on project site

Name	Status* Federal/State/ CNPS	Distribution	Habitat	Occurrence in Project Area
Pacific Grove clover *Trifolium polyodon*	–/R/1B	Monterey County	Closed-cone coniferous forest, coastal prairie, meadows, valley and foothill grassland, in mesic areas; blooms April-June	Carmel Valley, Laguna Seca; not present on project site

[a] Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
– = no listing.

State

E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
R = listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation. .

California Native Plant Society

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.

Of the species listed in Table 4-1, four were documented on the Fort Ord well site. The locations are shown in Figure 4-1. The remaining 23 species were not observed on the project site and are not addressed further in this document. A brief description of the occurrence of each special-status plant that has been documented on the project site is provided below.

Monterey Spineflower

Monterey spineflower was listed as endangered under the federal Endangered Species Act on February 4, 1994 (59 FR 5499). It has a very limited distribution and is threatened in portions of that distribution (California Natural Diversity Data Base 2005a, California Native Plant Society 2001). Monterey spineflower is restricted to a narrow band along and adjacent to the coast of southern Santa Cruz and northern Monterey Counties and inland to the coastal plain of the Salinas River Valley (Reveal and Hardham 1989). It is abundant at the former Fort Ord, which likely supports the largest known populations of the species (U.S. Army Corps of Engineers 1992). Monterey spineflower colonizes recently disturbed sandy soils within coastal dune, coastal scrub, grassland, and maritime chaparral communities. In the project area, Monterey spineflower occurs at low density, primarily in openings in the chaparral (U.S. Army Corps of Engineers 1992). At the Fort Ord well site, it was found in three areas (Figure 4-1). The project site appears to be outside of the area designated as critical habitat for Monterey spineflower. USFWS published a recovery plan for Monterey spineflower and seven other coastal plants in 1998.

Sandmat Manzanita

Sandmat manzanita has no state or federal listing status but is considered by the California Native Plant Society to be rare and endangered in California (List 1B) (California Native Plant Society 2001). It has a very limited distribution and is threatened in portions of its distribution (California Natural Diversity Database 2005a, CNPS 2001). Sandmat manzanita is found in openings in maritime chaparral and coast live oak woodland on sand hills near Monterey Bay (Griffin 1976). It is known to occur at the former Fort Ord, the Monterey Airport, in very small populations on the Monterey Peninsula, and two sites south of Point Lobos (California Natural Diversity Database 2005a). It is well adapted to shifting sand habitat, forming large circular mats and mounds. It appears to be an early to middle successional species in maritime chaparral following burn events or ground disturbance, eventually yielding to taller chamise and woollyleaf manzanita in older stands. In the project area, it occurs at medium density within the chaparral (U.S. Army Corps of Engineers 1992). At the Fort Ord well site, sandmat manzanita occurs in two areas along the west edge of the site and in the cleared area under the power lines (Figure 4-1).

Eastwood's goldenbush

Eastwood's goldenbush has no state or federal listing status but is considered by the California Native Plant Society to be rare and endangered in California (List 1B) (CNPS 2001). It has a very limited distribution and appears to be threatened throughout that distribution (CNDDB 2005a, CNPS 2001). The species is only known from the Monterey Bay area (CNDDB 2005a). Fort Ord supports more than half the known range of Eastwood's goldenbush (U.S. Army Corps of Engineers 1992). Eastwood's goldenbush in maritime chaparral, coastal scrub, and closed-cone coniferous forest. Although most early collections of the species were made on coastal dunes near Monterey, no populations have survived in coastal dune habitat (Griffin 1976). Eastwood's goldenbush is apparently an early to middle successional species, regenerating from seed following burn events in maritime chaparral. In the project area, it occurs at medium densities in the maritime chaparral (U.S. Army Corps of Engineers 1992). On the Fort Ord well site, Eastwood's goldenbush is scattered across the site at low density (Figure 4-1).

Kellogg's Horkelia

Kellogg's horkelia has no state or federal listing status but is considered by the California Native Plant Society to be rare and endangered in California (List 1B) (CNPS 2001). It occurs in sandy and gravelly openings in coastal scrub, maritime chaparral, and closed-cone coniferous forest. Although its historical range extended from Marin to Santa Barbara Counties, it currently has a very limited distribution and appears to be threatened throughout that distribution (CNDDB 2005a, CNPS 2001). Kellogg's horkelia occurs at the former Fort Ord, scattered throughout the maritime chaparral and coastal scrub and occasionally in grassland. In the project area, it is mapped at low densities (U.S. Army Corps of Engineers 1992). On the Fort Ord well site, is scattered along the west edge of the site and in the cleared area under the power lines, generally in association with sandmat manzanita (Figure 4-1).

Special-Status Wildlife

A list of all special-status wildlife species evaluated (32 species) for this project is included in Table 4-2. This list was comprised mainly from a search of the CNDDB (2005a) for the Marina, Seaside, Monterey, Spreckels, and Salinas quadrangles, and from the Threatened and Endangered Species List from the Ventura Fish and Wildlife Office for Monterey County. Based on a review of these sources as well as information obtained from previous reports for the project area and vicinity, species distribution and habitat requirements data, and information from the field survey, five special-status wildlife species were identified as occurring or potentially occurring in the project area. These four species include California horned lizard (*Phrynosoma coronatum frontale*), black legless lizard (*Anniella pulchra*), California tiger salamander (*Ambystoma*

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
Longhorn fairy shrimp *Branchinecta longiantenna*	E/--	Eastern margin of central Coast Ranges from Contra Costa County to San Luis Obispo County; disjunct population in Madera County.	Small, clear pools in sandstone rock outcrops of clear to moderately turbid clay- or grass-bottomed pools.	Suitable habitat not present
Conservancy fairy shrimp *Branchinecta conservatio*	E/--	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties.	Large, deep vernal pools in annual grasslands.	Suitable habitat not present
Vernal pool fairy shrimp *Branchinecta lynchi*	T/--	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County. Isolated populations also in Riverside County.	Common in vernal pools; also found in sandstone rock outcrop pools.	Suitable habitat not present
California linderiella *Linderiella occidentalis*	SC/--	Central Valley, central and south Coast Ranges from Mendocino County to Santa Barbara County.	Vernal pools.	Suitable habitat not present
Globose dune beetle *Coelus globosus*	SC/--	Sporadically distributed from central and southern California and the Channel Islands; from Bodega Bay, Sonoma County, south to Ensenada, Baja California.	Foredunes and sand hummocks, burrows beneath sand surface under shrubs or herbaceous plants.	Suitable habitat not present
Smith's blue *Euphilotes enoptes smithi*	E/--	Localized populations along the immediate coast and in coastal canyons of Monterey County; single populations reported in Santa Cruz and San Mateo Counties.	Coastal dunes and hillsides that support seacliff buckwheat (Eriogonum parvifolium) or coast buck-wheat (Eriogonum latifolium); these plants used as a nectar source for adults and host plant for larvae.	Host plants not present at project site

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
Monarch butterfly (overwintering habitat) *Danaus plexippus*		Adults migrate from August-October, and winter along the California coast and in central Mexico.	Open habitats including fields, meadows, weedy areas, marshes, and roadsides. Monarch butterflies roost in wind-protected tree groves (such as eucalyptus) with nectar and water sources nearby. Caterpillar host plants are milkweeds.	Eucalyptus grove is present nearby; may feed on plants in project area
California tiger salamander *Ambystoma californiense*	T/SSC	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to northeastern San Luis Obispo County.	Small ponds, lakes, or vernal pools in grass-lands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy.	Nearest breeding habitat is more than 2.5 miles from site; marginal upland habitat because of dense vegetation
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	E/E	Three metapopulations and breeding sites in coastal areas of southern Santa Cruz County and northern Monterey County.	Lifetime spent mostly underground in willow groves, coastal scrub, coast live oak, or riparian habitats; migrates to breeding ponds in early to late winter, and juveniles disperse from the pond in September.	Suitable upland habitat is present; potential breeding ponds are located less than 2 km from the project area
California red-legged frog *Rana aurora draytoni*	T/SSC	Found along the coast and coastal mountain ranges of California from Marin County to San Diego County and in the Sierra Nevada from Tehema County to Fresno County.	Permanent and semipermanent aquatic habitats, such as creeks and cold-water ponds, with emergent and submergent vegetation. May estivate in rodent burrows or cracks during dry periods.	Nearest breeding habitat is 2.5 miles from site; marginal upland habitat because of dense vegetation

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
Southwestern pond turtle *Clemmys marmorata pallida*	SC/SSC	Occurs along the central coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley.	Occupies aquatic habitats, such as ponds, marshes, or streams, with rocky or muddy bottoms in woodlands, grasslands, and open forests. Also requires aquatic vegetation for cover and food. Nests in upland adjacent to aquatic habitat.	Nearest breeding habitat is 2.5 miles from site; marginal upland habitat because of dense vegetation
California horned lizard *Phrynosoma coronatum frontale*	SC/SSC	Sacramento Valley, including foothills, south to southern California; Coast Ranges south of Sonoma County; below 4,000 feet in northern California.	Grasslands, brushlands, woodlands, and open coniferous forest with sandy or loose soil; requires abundant ant colonies for foraging.	Suitable habitat present
Black legless lizard Anniella pulchra nigra	SC/SSC	Monterey Bay region.	Coastal dunes with native vegetation or chaparral, pine-oak woodland, or riparian areas with loose soil for burrowing.	Suitable habitat present
Two-striped garter snake *Thamnophis hammondii*	SC/SSC	Known range extends through the south coast and peninsular ranges west of the San Joaquin valley from the Salinas Valley and the southeastern slopes of the Diablo range, south to the Mexican border.	Perrenial and intermittent streams having rocky beds bordered by willow thickets or other dense vegetation. Also inhabits large sandy riverbeds, such as the Santa Clara river, if a strip of riparian vegetation is present, and stock ponds if riparian vegetation and fish and amphibian prey are present.	Suitable habitat not present
California brown pelican (nesting colony) *Pelecanus occidentalis californicus*	E/E	Along the entire California coast; rare to uncommon on the Salton Sea; breeds on the Channel Islands.	Estuarine, marine, subtidal, and marine pelagic waters along the coast. Rests on water, inaccessible rocks, mudflats, sandy beaches, wharfs, and jetties.	Suitable habitat not present

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
California condor *Gymnogyps californianus*	E/E, FP	Historically, rugged mountain ranges surrounding the southern San Joaquin Valley; currently, most individuals are in captive populations, but a few birds were recently released in the rugged portions of the Los Padres National Forest.	Requires large blocks of open savanna, grasslands, and foothill chaparral with large trees, cliffs, and snags for roosting and nesting.	Project area is outside of species known range; no suitable roosting or nesting habitat in project area
Ferruginous hawk *Buteo regalis*	SC/SSC	Does not nest in California; winter visitor along the coast from Sonoma County to San Diego County, east-ward to the Sierra Nevada foothills and south-eastern deserts, the Inyo-White Mountains, the plains east of the Cascade Range, and Siskiyou County.	Open terrain in plains and foothills where ground squirrels and other prey are available.	May occasionally forage in or migrate through project area
Bald eagle *Haliaeetus leucocephalus*	T/E	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin. Reintroduced into central coast. Winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierra Nevada, and east of the Sierra Nevada south of Mono County.	In western North America, nests and roosts in coniferous forests within 1 mile of a lake, reservoir, stream, or the ocean.	May occasionally migrate through project area
Prairie falcon *Falco mexicanus*	--/SSC	Permanent resident in the south Coast, Transverse, Peninsular, and northern Cascade Ranges, the southeastern deserts, Inyo-White Mountains, foothills surrounding the Central Valley, and in the Sierra Nevada in Modoc, Lassen, and Plumas Counties. Winters in the Central Valley, along the coast from Santa Barbara County to San Diego County, and in Marin, Sonoma, Humboldt, Del Norte, and Inyo Counties.	Nests on cliffs or escarpments, usually overlooking dry, open terrain or uplands.	May occasionally forage in or migrate through project area

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
California clapper rail *Rallus longirostris obsoletus*	E/E	Marshes around the San Francisco Bay and east through the Delta to Suisun Marsh.	Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickle-weed; feeds on mollusks removed from the mud in sloughs.	Suitable habitat not present
Western snowy plover (coastal populations) *Charadrius alexandrinus nivosus* (nesting)	T/SSC	Population defined as those birds that nest adjacent to or near tidal waters, including all nests along the mainland coast, peninsulas, offshore islands, and adjacent bays and estuaries. Twenty breeding sites are known in California from Del Norte to Diego County.	Coastal beaches above the normal high tide limit in flat, open areas with sandy or saline substrates; vegetation and driftwood are usually sparse or absent.	Suitable habitat not present
California least tern *Sterna antillarum (=albifrons) browni* (nesting colony)	E/E	Nests on beaches along the San Francisco Bay and along the southern California coast from southern San Luis Obispo County south to San Diego County.	Nests on sandy, upper ocean beaches, and occasionally uses mudflats; forages on adjacent surf line, estuaries, or the open ocean.	Suitable habitat not present
Marbled murrelet *Brachyramphus marmoratus*	T/E	Nesting sites from the Oregon border to Eureka and between Santa Cruz and Half Moon Bay; winters in nearshore and offshore waters along the entire California coastline.	Mature, coastal coniferous forests for nesting; nearby coastal water for foraging; nests in conifer stands greater than 150 years old and may be found up to 35 miles inland; winters on subtidal and pelagic waters often well offshore.	Suitable habitat not present
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	--/E	Nests along the upper Sacramento, lower Feather, south fork of the Kern, Amargosa, Santa Ana, and Colorado Rivers.	Wide, dense riparian forests with a thick understory of willows for nesting; sites with a dominant cottonwood overstory are preferred for foraging; may avoid valley-oak riparian habitats where scrub jays are abundant.	Suitable habitat not present

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
Western burrowing owl *Athene cunicularia hypugea*	SC/SSC	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas. Rare along south coast.	Level, open, dry, heavily grazed or low stature grassland or desert vegetation with available burrows.	Suitable habitat not present; vegetation too dense
Black swift *Cypseloides niger* (nesting)	--/SSC	Breeds very locally in the Sierra Nevada and Cascade Range, the San Gabriel, San Bernardino, and San Jacinto mountains, and in coastal bluffs from San Mateo county south to near San Luis Obispo county.	Nests in moist crevice or cave on sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons.	Suitable nesting habitat not present
California horned lark *Eremophila alpestris actia*	--/SSC	Found throughout much of the state, less common in mountainous areas of the north coast and in coniferous or chapparal habitats.	Common to abundant resident in a variety of open habitats, usually where large trees and shrubs are absent. Grasslands and deserts to dwarf shrub habitats above tree line.	Suitable habitat not present; vegetation too dense
Tricolored blackbird *Agelaius tricolor*	SC/SSC	Permanent resident in the Central Valley from Butte County to Kern County. Breeds at scattered coastal locations from Marin County south to San Diego County; and at scattered locations in Lake, Sonoma, and Solano Counties. Rare nester in Siskiyou, Modoc, and Lassen Counties.	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grainfields. Habitat must be large enough to support 50 pairs. Probably requires water at or near the nesting colony.	Suitable habitat not present
Monterey dusky-footed woodrat *Neotoma fuscipes luciana*	--/SSC	Occurs throughout Monterey and northern San Luis Obispo Counties where appropriate habitat is available.	Coast live oak woodland and chaparral habitats with moderate canopy cover and moderate to dense understory and abundant deadwood for nest construction	Suitable habitat present

Common and Scientific Name	Status Federal/State	California Distribution	Habitats	Occurrence in Project Area
San Joaquin kit fox *Vulpes macrotis mutica*	E/T	Principally occurs in the San Joaquin Valley and adjacent open foothills to the west; recent records from 17 counties extending from Kern County north to Contra Costa County.	Saltbush scrub, grassland, oak, savanna, and freshwater scrub.	Project area is outside of species known range
Southern sea otter *Enhydra lutris nereis*	T/--, FP	Occurs approximately from the vicinity of Half Moon Bay south to Gaviota, California. Approximately 20 otters, including pups, are at San Nicolas Island as a result of translocation efforts to establish an experimental population.	Coastal waters, typically within 1 km of shoreline. Often associated with kelp beds.	Suitable habitat not present
American badger *Taxidea taxus*	--/SSC	Throughout California, except for the humid coastal forests of northwestern California in Del Norte and the northwestern Humboldt Counties.	Requires sufficient food, friable soils, and relatively open uncultivated ground; preferred habitat includes grasslands, savannas, and mountain meadows near timberline.	Suitable habitat is present

[a] Status explanations:

Federal

E = listed as endangered under the federal Endangered Species Act.
T = listed as threatened under the federal Endangered Species Act.
SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.
-- = no listing.

State

E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
SSC = species of special concern in California.
FP = fully protected under the California Fish and Game Code.
-- = no listing.

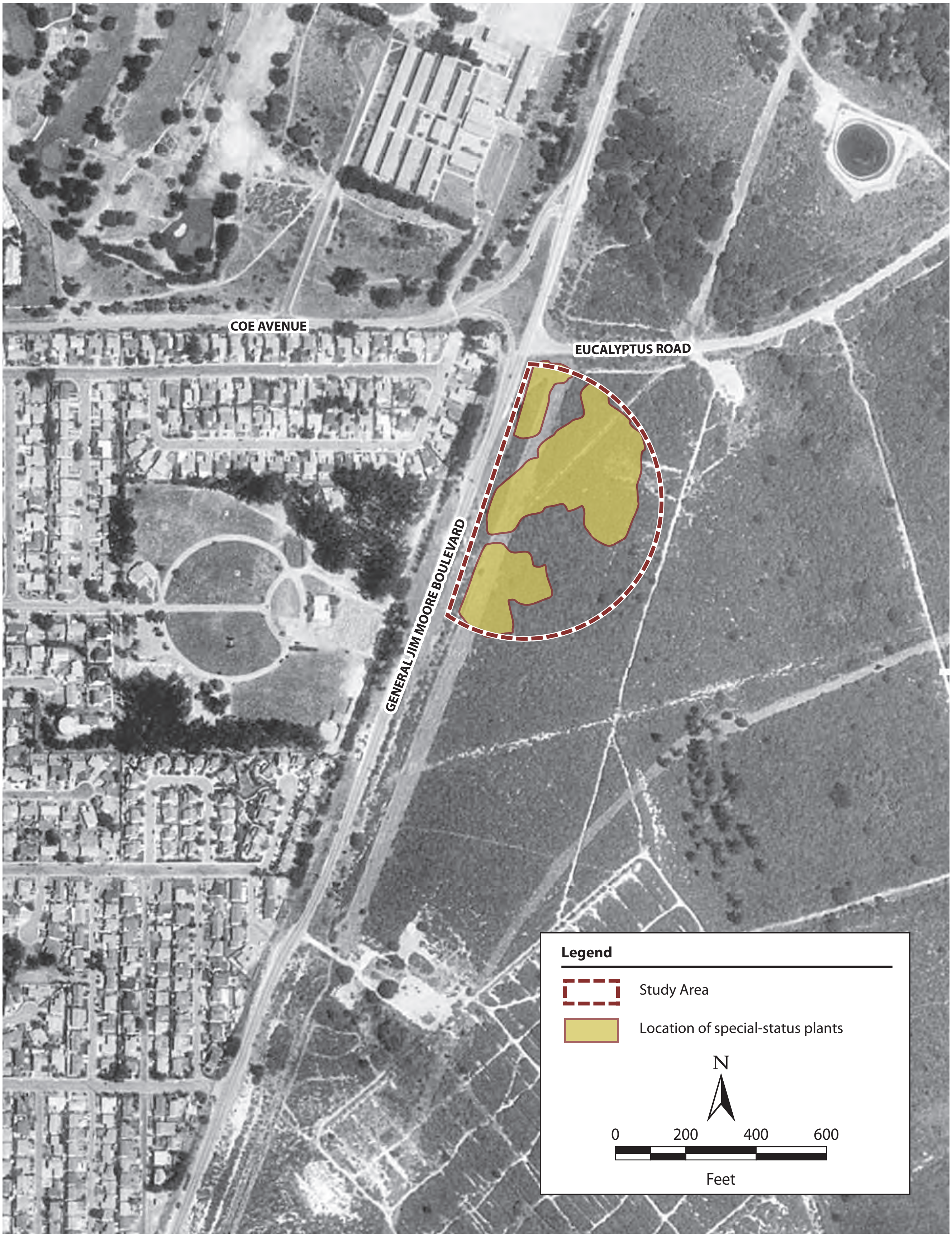

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Figure 4-1
Location of Monterey Spineflower, Sandmat Manzanita, Eastwood's Goldenbush and Kellogg's Horkelia at the Fort Ord Well Site

californiense), Monterey dusky-footed woodrat (*Neotoma fuscipes luciana*), and American badger (*Taxidea taxus*).

Monarch butterfly (*Danaus plexippus*) could also occur in the project area. Although this species is not special-status, overwintering habitat for monarch butterflies is considered a sensitive resource and is protected by the state. No overwintering habitat is present in the project area but a eucalyptus grove is located across the street from the project area. Monarch butterflies could occasionally feed in the project area. The removal of a small amount of potential feeding habitat in the project area is not likely to impact monarch butterfly feeding, if they occur in the project vicinity, as there will be an abundance of feeding area still available. Therefore, no impacts to Monarch butterfly overwintering habitat or feeding areas would occur; this species is not discussed further.

Three additional species–bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), and prairie falcon (*Falco mexicanus*)– could occasionally migrate through or forage in the project area but would not be impacted by the proposed project because of their brief occurrence at the site. These three species are not discussed further.

Many of the 32 species identified as potentially occurring in the general vicinity of the project area occur in habitats that are not present in the project area, such as vernal pools, riparian, coastal beaches, marsh or oak woodlands. Species were assumed to have a potential to occur in the project area if there was a known occurrence of the species in or near the project area, or if the species could potentially occur in a specific habitat that was present in or adjacent to the project area. Because none of the special-status species that may occur in the project area are federally listed, there are no recovery plans or critical habitat designated for these wildlife species. A brief description of the four special-status animals, their habitats, and their locations in the project vicinity is provided below.

California Horned-Lizard

The California horned lizard has a spotty distribution; it occurs from Shasta County south along the edges of the Sacramento Valley into much of the South Coast Ranges, San Joaquin Valley, and Sierra Nevada foothills to northern Los Angeles, Santa Barbara, and Ventura Counties (Jennings and Hayes 1994). The species occurs between near sea level and an elevation of 8,000 feet (Stebbins 2003).

California horned lizards occupy a variety of habitats, including scrubland, grassland, coniferous forest, and broadleaf woodland (Stebbins 2003). They occur in areas with an exposed gravelly-sandy substrate (Jennings and Hayes 1994), such as sandy washes, where scattered low shrubs provide cover (Stebbins 2003). For extended periods of inactivity or hibernation, they occupy small mammal burrows or burrow into loose soils under surface objects (Zeiner et al. 1988). The project area provides suitable habitat for California horned lizards because of the brushy habitat present, soil type, and presence of small mammal burrows.

Black Legless Lizard

The distribution of the black legless lizard is restricted to the vicinity of Monterey Bay and the Monterey Peninsula within coastal and interior dunes and other areas with sandy soils (63 FR 43129-43135). Black legless lizards are considered a subspecies of the Silvery legless lizard (*Anniella pulchra*).

Legless lizards occur in sparse vegetation of beaches, chaparral, pine-oak woodland, and along streams with sycamores, cottonwoods, and oaks. They require loose soil, such as sand, loam, or humus for burrowing, as well as moisture, warmth, and plant cover. Legless lizards burrow into washes, dune sand of beaches, loose soil nears bases of slopes, and near permanent and intermittent streams. They use leaf litter, overhangs of trees and bushes, rocks, logs, and boards for cover (Stebbins 2003.) They forage for insects and spiders in leaf litter or at the base of shrubs or other vegetation (Zeiner et al. 1988). The project area is located within an area that was identified as suitable black legless lizard habitat in the Flora and Fauna Baseline Study of Fort Ord (U.S. Army Corps of Engineers 1992) and the Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (U.S. Army Corps of Engineers 1997). Habitat suitability in the project area is diminished by the presence of a fair amount of nonnative ice plant.

California Tiger Salamander

The California tiger salamander is listed as threatened under ESA and is a state species of special concern. California tiger salamanders are terrestrial and spend most of their time underground in small burrows, emerging for only brief periods to breed in aquatic habitats. California tiger salamander breeding and estivation habitat includes vernal pools, seasonal and perennial ponds, and surrounding upland areas in grassland and oak savannah plant communities from sea level to about 3,600 feet (U.S. Fish and Wildlife Service 2005). The historical range of the California tiger salamander extends from Butte County in the north to Santa Barbara County in the south (Stebbins 1985). Populations of the California tiger salamander have declined in much of their former range in the Central Valley because of the conversion of valley and foothill grassland habitats to agricultural and urban uses (Stebbins 1985). There are confirmed California tiger salamander sites on Fort Ord, the nearest being 3.87 km from the proposed temporary pipeline (Froke 2005), outside the dispersal range. However, three potential breeding sites have been identified within 2 km of the temporary pipeline (Froke 2005) and therefore the project area could provide upland habitat for California tiger salamanders. Habitat suitability in the project area is diminished by the high levels of disturbance, the presence of a significant movement barrier (General Jim Moore Boulevard), and the presence of large areas of nonnative ice plant. However, "take" is authorized for this project, but requires implementation of several terms and conditions described in the U.S. Fish and

Wildlife Service's 2005 biological opinion issued for infrastructure projects at former Fort Ord.

Monterey Dusky-Footed Woodrat

Monterey dusky-footed woodrat is a subspecies of the dusky-footed woodrat (*Neotoma fuscipes*). The Monterey dusky-footed woodrat occurs throughout Monterey and northern San Luis Obispo Counties where appropriate habitat is available. Dusky –footed woodrats can be found in chaparral, streamside thickets, and deciduous or mixed woodland habitats (Burt and Grossenheider 1980). In forest habitats, they are generally found where these is a moderate canopy with a dense to moderate understory. Dusky-footed woodrats construct nests out of sticks, grass, leaves, and other debris and the availability of these nest-building items may limit abundance of woodrats (Zeiner et al. 1990b). Monterey dusky-footed woodrats were captured in maritime chaparral habitat at Fort Ord during small mammal trapping in 1992 (U.S. Army Corps of Engineers 1992). The maritime chaparral habitat in the project area provides suitable habitat for Monterey dusky-footed woodrats. No woodrat nests were observed during the field survey, however all vegetation in the project area was not searched for nests.

American Badger

American badgers occur throughout California, except for the humid coastal forests in Del Norte County and the northwestern portion of Humboldt County (Williams 1986). They occupy open stages of most shrub, forest, and herbaceous habitats with friable soils (Zeiner et al. 1990b). Badgers dig burrows for cover and reproduction. Badgers are carnivores that prey on burrowing rodents, such as gophers (*Thomomys* sp.), California ground squirrels (*Spermaphilus beecheyi*) and kangaroo rats (*Dipodomys* sp.) (Williams 1986). The maritime chaparral habitat in the project area provides moderate quality habitat for badgers. One badger-size burrow was observed in the project area.

Regulatory Setting

Federal Regulations

Federal Endangered Species Act

The ESA is administered by USFWS and National Marine Fisheries Service (NOAA Fisheries). In general, NOAA Fisheries is responsible for protection of ESA-listed marine species and anadromous fishes, whereas other listed species are under USFWS jurisdiction. *Endangered* refers to species, subspecies, or distinct population segments that are in danger of extinction through all or a significant portion of their range; *threatened* refers to species, subspecies, or distinct population segments that are likely to become endangered in the near future.

USFWS will use this EIR/EA to review the environmental consequences of the proposed action on botanical and wildlife resources, including threatened and endangered species. Provisions of Sections 7 and 9 of ESA could be relevant to the proposed project and are summarized below.

Endangered Species Act Prohibitions (Section 9)

Section 9 of ESA prohibits the take of any fish or wildlife species listed under ESA as endangered. Take of threatened species is also prohibited under Section 9, unless otherwise authorized by federal regulations. *Take*, as defined by ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." *Harm* is defined as "any act that kills or injures the species, including significant habitat modification." In addition, Section 9 prohibits removing, digging up, cutting, and maliciously damaging or destroying federally listed plants on sites under federal jurisdiction. Section 9 does not prohibit take of federally listed plants on sites not under federal jurisdiction.

Endangered Species Act Authorization Process (Section 7 and 10)

Take of listed species is authorized through the Section 7 consultation process for actions by federal agencies. Federal agency actions include activities that are:

- on federal land,
- conducted by a federal agency,
- funded by a federal agency, or
- authorized by a federal agency (including issuance of federal permits and licenses).

Under Section 7, the federal agency conducting, funding, or permitting an action (the federal lead agency) must consult USFWS or NOAA Fisheries, as appropriate, to ensure that the proposed action will not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a biological assessment (BA) evaluating the nature and severity of the expected effect. The BA is prepared for the proposed action and alternatives, and is submitted to USFWS and/or NOAA Fisheries to initiate consultation. In response, USFWS and/or NOAA Fisheries issues a biological opinion (BO), with a determination that the proposed action either:

- may jeopardize the continued existence of one or more listed species (jeopardy finding) or result in the destruction or adverse modification of critical habitat (adverse modification finding) or

- will not jeopardize the continued existence of any listed species (no jeopardy finding) or result in adverse modification of critical habitat (no adverse modification finding).

The BO issued by USFWS and/or NOAA Fisheries may stipulate discretionary "reasonable and prudent" conservation measures. If the proposed action would not jeopardize a listed species, USFWS and/or NOAA Fisheries will issue an incidental take statement to authorize the proposed activity.

In cases where a nonfederal entity is undertaking an action that does not require federal authorization, the take of listed species must be permitted by USFWS through the Section 10 process. If the Proposed Project would result in the incidental take of a listed species, the project proponent must first obtain a Section 10(a)(1)(B) incidental take permit (ITP). Incidental take under Section 10 is defined as the take of federally listed fish and wildlife species "that is incidental to, but not the purposes of, otherwise lawful activities." To receive an ITP, the nonfederal entity is required to prepare a Habitat Conservation Plan (HCP). The HCP must include conservation measures that avoid, minimize, and mitigate the project's impact on listed species and their habitat.

Installation-Wide Multispecies Habitat Conservation Plan for Former Fort Ord

An Installation-Wide Multispecies Habitat Conservation Plan (HCP) is currently being prepared for the former Fort Ord. The HCP will cover all species that are covered in the Installation-Wide Multispecies Habitat Management Plan (HMP) for former Fort Ord (described below) (covered species) and will integrate the key components of the HMP with additional elements required in an HCP. The purpose of the HCP is to provide the framework for ensuring the conservation, recovery, and enhancement of covered species upon transfer of former Fort Ord lands to public and private recipients. As the former base is redeveloped, incidental take of covered species would be consistent with the HCP.

Applicability to Project

The ESA could apply to the project area in two ways. First, one federally listed plant (Monterey spineflower) has been found in the project area and may be affected by the Proposed Project; consequently, the Proposed Project has the potential to result in destruction of part of a population of a federally listed species. Second, it is assumed that the project will be constructed prior to the transfer of former Fort Ord lands from the federal government. Therefore, the Proposed Project must comply with conditions developed to protect listed species contained in the three biological opinions developed by the U.S. Fish and Wildlife Service (1999, 2002a and 2005) through Section 7 consultations for projects on former Fort Ord.

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) (16 USC 703) enacts the provisions of treaties between the United States, Great Britain, Mexico, Japan, and the Soviet Union and authorizes the U.S. Secretary of the Interior to protect and regulate the taking of migratory birds. It establishes seasons and bag limits for hunted species and protects migratory birds, their occupied nests, and their eggs (16 USC 703, 50 CFR 21, 50 CFR 10). Most actions that result in taking or in permanent or temporary possession of a protected species constitute violations of MBTA. Examples of permitted actions that do not violate MBTA are the possession of a hunting license to pursue specific gamebirds, legitimate research activities, display in zoological gardens, banding, and other similar activities. USFWS is responsible for overseeing compliance with MBTA, and the U.S. Department of Agriculture's Animal Damage Control Officer makes recommendations on related animal protection issues.

Executive Order 13186 (January 10, 2001) directs each federal agency taking actions having or likely to have a negative impact on migratory bird populations to work with USFWS to develop an MOU to promote the conservation of migratory bird populations. Protocols developed under the MOU must include the following agency responsibilities:

- avoid and minimize, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;
- restore and enhance habitat of migratory birds, as practicable; and
- prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable.

The executive order is designed to assist federal agencies in their efforts to comply with MBTA, and does not constitute any legal authorization to take migratory birds.

State Regulations

California Environmental Quality Act

A project normally has a significant environmental impact on biological resources if it substantially affects a rare or endangered species or the habitat of that species; substantially interferes with the movement of resident or migratory fish or wildlife; or substantially diminishes habitat for fish, wildlife, or plants. (Specific significance criteria for this project are described in a separate section below.) The State CEQA Guidelines define rare, threatened, or endangered species as those listed under CESA and ESA, as well as other species that meet the criteria of the resource agencies or local agencies—for example, DFG–designated species of special concern and some CNPS–listed species. The State CEQA Guidelines state that the lead agency preparing an EIR must consult with and receive written findings from DFG concerning project impacts on species listed as endangered or threatened. The effects of a project on these resources are important in determining whether project activities would have significant environmental impacts under CEQA. However, because the Proposed Project in this case is located on federal land, CESA requirements do not apply. Nonetheless, the Army's Multispecies Habitat Management Plan (U.S. Army Corps of Engineers, Sacramento District, 1997) includes consideration of all state-listed endangered or threatened species.

California Endangered Species Act

California implemented CESA in 1984. The act prohibits the take of endangered and threatened species; however, habitat destruction is not included in the state's definition of *take*. Section 2090 of CESA requires state agencies to comply with endangered species protection and recovery and to promote conservation of these species. DFG administers the act and authorizes take through Section 2081 agreements (except for species designated as fully protected). DFG can adopt a federal biological opinion as a state biological opinion under California Fish and Game Code, Section 2095. In addition, DFG can write a consistency determination for species that are both federally and state listed if DFG determines that the avoidance, minimization, and compensation measures will ensure no take of species.

Regarding rare plant species, CESA defers to the California Native Plant Protection Act of 1977, which prohibits importing rare and endangered plants into California, taking rare and endangered plants, and selling rare and endangered plants. State-listed plants are protected mainly in cases where state agencies are involved in projects under the California Environmental Quality Act (CEQA). In these cases, plants listed as rare under the California Native Plant Protection Act of 1977 are not protected under CESA but can be protected under CEQA.

California Fish and Game Code

Section 3503 of the California Fish and Game Code prohibits the killing, possession, or destruction of bird eggs or of bird nests. Sections 3503.5 and 3513 prohibit the killing, possession, or destruction of all nesting birds (including raptors and passerines). Section 3513 prohibits the take or possession of any migratory non-game birds designated under the federal MBTA. Section 3800 prohibits take of non-game birds. Some mammals are protected under Section 4700.

Local Regulations

Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord

The Installation-Wide Multispecies Habitat Management Plan (HMP) for the closure and reuse of the former Fort Ord was prepared to comply with the requirements of the ESA. The goals of the HMP are being accomplished by transferring the larger contiguous and biologically diverse habitat parcels to natural resource management agencies such as the California Department of Parks and Recreation (CDPR) and the Bureau of Land Management (BLM). The protected parcels would constitute the Natural Resources Management Area (NMRA). Other parcels would be disposed of for development or other purposes. The parcels in which the proposed Fort Ord well site are located are among the parcels designated as "Borderland Development Areas Along NRMA Interface". Use of the project site by MPWMD would be consistent with the HMP. However, these borderland parcels remain subject to pre-transfer and post-transfer management requirements developed in conjunction with FORA. Development of the parcels would also be subject to compliance with the ESA and other state and federal regulations.

Impacts and Mitigation Measures

Methodology and Significance Criteria

Approach

The methods used to determine potential impacts on vegetation and wildlife resources in the project area are described below. A detailed impact analysis for each resource in the project area is also included in this section.

Impact Assumptions

The proposed project could result in temporary and permanent impacts on biological resources in the project area. In assessing the magnitude of possible impacts, the following assumptions were made regarding construction, resource management, and operation and maintenance activities.

- Impacts from the construction of the pipeline would be considered short-term temporary impacts because topography and topsoil would be restored to preproject conditions following construction. Approximately 0.3 acre would be temporarily disturbed during pipeline construction.
- Approximately 0.7 acre of habitat would be permanently removed by the construction of the proposed well, back flush percolation pit, and the 24 foot by 45 foot (1,080 sq. ft.) building. The entire 0.7 acre area would be

developed, and no additional areas would be affected by construction equipment.

- No waters of the United States (including wetlands) will be affected by the Proposed Project.
- Permanent facilities placed underground with no aboveground structures outside developed areas are considered "temporary" impacts.
- Access to the well site would be via an unpaved road from the existing well site.
- The provisions, terms, and conditions outlined in the Fort Ord Habitat Management Plan will be complied with fully.

Impact Mechanisms

Vegetation and wildlife resources could be directly or indirectly affected by proposed project activities. The following types of activities could cause varying degrees of impacts on biological resources:

- Fragmentation of a sensitive biological community and special-status plant and wildlife populations by development in the project area;
- grading and paving activities during construction and building activities;
- temporary stockpiling and side casting of soil, construction materials, or other construction wastes;
- soil compaction, dust, and water runoff from the construction and development site;
- construction-related noise (from equipment) and increased human presence;
- development of soil-stockpiling areas to contain material from excavation;
- introduction of invasive nonnative species in the project area that could displace native plant species in open space areas; and
- ongoing operational activities (maintenance) that result in increased human presence/activity and ground disturbance.

Criteria for Determining Significance

Based on the State CEQA Guidelines and a review of applicable local management plans, and the *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord* (U.S. Army Corps of Engineers 1997), impacts on vegetation and wildlife resources were considered significant if the Proposed Project would:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS, including reducing the number or restricting the range of an endangered, rare, or threatened species;

- have a substantial adverse effect on any sensitive natural community identified in local, state, or federal regional plans, policies, or regulations, including long-term degradation of a sensitive plant community because of substantial alteration of a landform or site conditions;
- substantially reduce the habitat of a wildlife species, cause a wildlife population to drop below self-sustaining levels, or threaten to eliminate a plant or animal community;
- interfere substantially with the movement of any native resident or migratory wildlife species; or
- impede the use of native wildlife nursery sites or directly harm nesting species protected under the provisions of the MBTA;
- conflict substantially with an approved land management plan such as the *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord*;
- conflict substantially with goals set forth in an approved USFWS recovery plan for a federally-listed species; or
- result in any direct or indirect disturbance of habitat designated as an ESHA (as defined by the California Coastal Act and or LUP) that results in disruption of protected resources and habitat values.

Impact Analysis

This biological resources impact analysis is based on the most current project description, existing biological resource information (sources are listed in the Existing Conditions section), and current baseline conditions. The mitigation measures for impacts on biological resources were developed through review of prior environmental impact studies, land and resource management plans, the Fort Ord HMP, and professional judgment.

The methods used to determine potential impacts are briefly described below.

Special-Status Plants and Wildlife

The impact analysis for each special-status plant or wildlife species documented or with potential to occur in the project area is based on the species' presence, presence of suitable habitat, and the extent of the population that occurs within and outside of the project area. The analysis recognizes that occurrences of special-status plants or wildlife may fluctuate annually depending on environmental conditions, survey methods, and other factors that may result in the presence or absence of species. The impact analysis for special-status plants and wildlife evaluated the following factors to determine whether an impact on a special-status species or its habitat would be considered “substantial.”

- Level of impact compared to the distribution of the species in California, Monterey County, and the project area.
- The known range/distribution of a species. For the purpose of this EIR, an impact is considered substantial if it would “restrict the range or reduce the number” of a special-status plant or wildlife species.
- Fragmentation of special-status wildlife habitat.

Sensitive Biological Communities and Environmentally Sensitive Habitat Areas

The impact analysis for sensitive biological communities and ESHAs is based on the information described above in the Setting section. Impacts are qualitatively and quantitatively described for the sensitive biological communities and ESHAs in the project area.

Construction Impacts

This section describes impacts that could occur during construction of the proposed project prior to the adoption of mitigation measures. This impact analysis recognizes that exact location of ASR well, backflush percolation pit, building, and pipeline have not yet been determined; however, these elements will be constructed within one habitat type (maritime chaparral). In addition, a larger area (project area) was surveyed that the project would actually encompass. For each potentially significant impact on a specific resource, a detailed mitigation measure or measures is included that would reduce the impact to a less-than-significant level or would reduce the impact to the degree feasible.

Impact BIO-1: Removal of Maritime Chaparral.

Construction of the well facilities would result in permanent loss of up to 0.7 acre of maritime chaparral, and construction of the pipeline from the well site to the existing pipeline would result in temporary disturbance of 0.3 acre of habitat. The project site is within the area designated for development under the Fort Ord HMP, which mitigates for the loss of maritime chaparral habitat through implementation of the NRMA. Therefore, this impact is considered **less than significant**.

Mitigation: No further mitigation is required.

Impact BIO-2: Disturbance of the Fort Ord NRMA.

The project site is within a Borderland Development area that is adjacent to the NRMA. The HMP states that these areas will be managed or developed in a manner that protects the adjacent NRMA. The proposed project has the potential to disturb the NRMA by the sidecasting of soil or by the spread of dust and water runoff during project construction, by the introduction of invasive nonnative species in the project area that could spread to the NMRA, or by increasing the potential for fires. Disturbance of the NMRA would be considered a **significant** impact because it would conflict substantially with the HMP. However, with implementation of the mitigation described below (required in the HMP), the impact would be **less than significant**.

Mitigation Measure BIO-1: Minimize or Prevent Disturbance to Adjacent NRMA

To prevent disturbance of the adjacent NRMA, management measures will be carried out during project construction and operation to minimize construction effects and the potential for introducing invasive nonnative species. The construction contractor will implement BMPs to prevent the spread outside the construction area of construction materials, oil and fuel, sidecast soil, dust, or water runoff. All invasive nonnative plants, such as iceplant or pampas grass, will be removed from the construction area prior to site disturbance to avoid the spread of plant fragments or seeds. A firebreak consistent with the requirements of the local fire district and acceptable to the City of Seaside will be located and maintained by MPWMD between the well site and the adjacent NRMA.

Impact BIO-3: Destruction of Monterey Spineflower, Sandmat Manzanita, Eastwood's Goldenbush, and Kellogg's Horkelia

Construction of the well facilities would result in permanent loss of up to 0.7 acre of habitat containing Monterey spineflower, Sandmat manzanita, Eastwood's goldenbush, and Kellogg's horkelia. Because these species are scattered across the project area and because the exact location of the well facilities has not yet been determined, the actual area of plant disturbance cannot be determined. However, the plants are not distributed uniformly across the project area, so the impact would probably be less than 0.7 acre. Construction of the pipeline from the well site to the existing pipeline would result in destruction of plants on 0.3 acre of habitat. The 0.3-acre impact is considered to be temporary, as the species are likely to become re-established in the disturbed area following project completion. These impacts are considered **less than significant,** because the USFWS has determined that development of the borderland development areas would not have a substantial adverse effect on the populations at Fort Ord, if the HMP is implemented.

Mitigation: No further mitigation is required.

Impact BIO-4: Potential Direct Mortality or Disturbance of California Horned Lizards and Potential Permanent and Temporary Loss of California Horned Lizard Habitat

Construction of the well, backflush percolation pit, and building has the potential to result in direct mortality or disturbance of California horned lizard and would result in permanent loss of approximately 0.7 acre of habitat capable of supporting California horned lizard. Construction of the pipeline from the well site to the existing pipeline would result in a temporary loss of 0.3 acre of habitat capable of supporting California horned lizard. Although this species is known to occur on the former Fort Ord in small numbers (U.S. Army Corps of Engineers 1992), it is common throughout the southern portion of the Central Coast Range and occurs in fair numbers throughout the rest of its range in California (Jennings and Hayes 1994). Because the status of the California horned lizard in the region is relatively abundant, and because a very small area of habitat will be affected and the species is unlikely to occur in significant numbers in this small area, this impact is considered **less than signific**ant.

Mitigation: No mitigation is required.

Impact BIO-5: Potential Direct Mortality or Disturbance of Black Legless Lizards and Potential Permanent and Temporary Loss of Black Legless Lizard Habitat

Construction of the well, backflush percolation pit, and building has the potential to result in direct mortality or disturbance of black legless lizard and would result in permanent loss of approximately 0.7 acre of habitat capable of supporting black legless lizard. Construction of the pipeline from the well site to the existing pipeline would result in the temporary loss of 0.3 acre of suitable habitat for black-legless lizard. Direct mortality of black legless lizards and the permanent and temporary loss of habitat would be considered a **significant** impact because the subspecies is rare in California, with a distribution that is restricted to coastal areas in the Monterey Bay region (Stebbins 2003). However, development and implementation of the HMP has provided adequate mitigation for potential impacts to the black legless lizard. Therefore**, this impact is less than significant.**

Mitigation: No further mitigation is required.

Impact BIO-6: Potential Direct Mortality or Disturbance of Monterey Dusky-Footed Woodrat and Potential Permanent and Temporary Loss of Monterey Dusky-Footed Woodrat Habitat

Construction of the well, backflush percolation pit, and building has the potential to result in direct mortality or disturbance of Monterey dusky-footed woodrat and would result in permanent loss of approximately 0.7 acre of habitat capable of supporting Monterey dusky-footed woodrat. Construction of the pipeline from the well site to the existing pipeline would result in the temporary loss of 0.3 acres of suitable habitat for Monterey dusky-footed woodrat. Direct mortality of Monterey dusky-footed woodrat and the permanent and temporary loss of habitat would be considered a **significant** impact because the species is rare in California, with a distribution that is restricted to appropriate habitat in two California counties (CNDDB 2005b). However, development and implementation of the HMP has provided adequate mitigation for potential impacts to the dusky-footed woodrat. Therefore**, this impact is less than significant**

Mitigation: No further mitigation is required.

Impact BIO-7: Potential Direct Mortality or Disturbance of American Badger and Potential Permanent and Temporary Loss of American Badger Habitat

Construction of the well, backflush percolation pit, and building has the potential to result in direct mortality or disturbance of American badger and would result in permanent loss of approximately 0.7 acre of habitat capable of supporting badgers. Construction of the pipeline from the well site to the existing pipeline would result in the temporary loss of 0.3 acre of suitable habitat for American badgers. This species is known to occur on the former Fort Ord in a number of locations (U.S. Army Corps of Engineers 1992). Badgers are relatively uncommon in Monterey County (CNDDB 2005c) and have been drastically reduced in coastal areas south of Mendocino County (Williams 1986). Although badger populations have declined in California, this impact is considered **less than significant** because a very small area of habitat will be affected and the species is unlikely to occur in significant numbers in this small area (only one burrow that was badger size was located in the project area).

Mitigation: No mitigation is required.

Impact BIO-8: Potential Loss of Nest Trees and Disturbance or Mortality of Migratory Birds

Several oak trees and abundant shrubby vegetation are present in the project area that provide suitable nesting habitat for migratory birds. Construction or removal of nest trees and shrubs during the nesting period for migratory birds could result in nest abandonment and death of young or loss of reproductive potential at active nests located in the project area. Impacts on migratory birds would be considered adverse if the subsequent population decline was large and affected the viability of the local population. Disturbance that results in nest abandonment and death of young or loss of reproductive potential at active nests would also violate California Fish and Game Code Sections 3503 (active bird nests) and the MBTA. Because only a small area of habitat (shrubs and trees within approximately 1 acre) will be impacted by the project, impacts on migratory birds are considered **less than significant**. However, in order to avoid violation of California Fish and Game Code Sections 3503 (active bird nests) and the MBTA, the following mitigation measure would be implemented.

Mitigation Measure BIO-4: Remove Trees and Shrubs during the Nonbreeding Season for Most Birds (September 1 To February 15)
Clearing of the site for construction of the well and associated facilities and the pipeline will result in the removal of trees and shrubs that provide suitable nesting habitat for migratory birds. To avoid the loss of active migratory bird nests, tree and shrub removal will be conducted only during the nonbreeding season for migratory birds (generally September 1 to February 15). Removing woody vegetation during the nonbreeding season will ensure that active nests will not be destroyed by removal of trees supporting or adjacent to active nests.

Operational Impacts

Operation of the well site is **not expected to have any impacts** on special-status plant or wildlife species described above. Maintenance of the well site would involve servicing (inspection, maintenance, and cleaning) the pump, motor, and casing approximately every 2 to 5 years. This very infrequent and noninvasive human disturbance is not expected to result in any impacts on special-status wildlife or nesting migratory birds that may occur in the project area.

Chapter 5

Aquatic Resources

Introduction

This chapter describes the aquatic resources of the Carmel River and predicts the potential effects of the Proposed Project on these resources. Aquatic resources include fish, aquatic invertebrates, reptiles, amphibians and the riparian plant community that occupies the river corridor.

Setting

Aquatic Invertebrates of the Carmel River

In general, the Carmel River supports a low diversity of aquatic invertebrates. The local distribution and abundance of invertebrate populations is limited by the annual reduction in streamflows; two dams, which block recruitment of gravel and cobbles into reaches below the dams; drying of the river (which usually extends approximately 7 miles upstream) from the lagoon to Robinson Canyon; high flows during winter and spring; and the transport and deposition of coarse sand, which prevents organisms from colonizing lower portions of the river. In 1982, a study of the benthic (i.e., bottom-dwelling) invertebrate fauna found six orders of aquatic insects, represented by 59 species, and eight noninsect orders, represented by 15 species. Of the noninsect species, the introduced crayfish (*Pacifasticus leniusculus*) is the largest (Fields 1984). In 2000, MPWMD began sampling macrobenthic invertebrates (BMI) at several sites to establish a baseline metrics for future comparisons and to assess the existing health of BMI assemblages. In three years of sampling, this work yielded results that highlight the importance of three limiting factors, including: 1) the annual summer drying up of the lower river by groundwater pumping, 2) shifting of fine-grained bed material and the lack of habitable surface area for colonization during high-flow events, and 3) the entrapment of gravel and cobble substrate within Los Padres and San Clemente Reservoirs, which has created habitats without enough interstitial space for many species of BMI (MPWMD 2004).[1]

Fish Resources of the Carmel River

The Carmel River supports populations of steelhead (*Oncorhynchus mykiss)*, Pacific lamprey (*Entosphenus tridentatus*), river lamprey (*Lampetra ayresi*), Coast Range sculpin (*Cottus aleuticus*), prickly sculpin (*Cottus asper*), riffle sculpin (*Cottus gulosus*), Sacramento hitch (*Lavinia exilicauda*), threespine stickleback (*Gasterosteus aculeatus*), Sacramento blackfish (*Orthodon microlepidotus*), starry flounder (*Platichthys stellatus*), shiner perch (*Cymatogaster aggregata*), Pacific staghorn sculpin (*Leptocottus armatus*) (in the lagoon and lower river), brown trout (*Salmo trutta*), goldfish (*Carassius auratus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), black bullhead (*Ictalunus melas*), and large-mouth bass (*Micropterus salmoides*). A single sighting of striped bass (*Moroni saxitillus*) in the Carmel River Lagoon indicates that this species is an infrequent visitor.

California state law and California Fish and Game Commission policies stipulate that healthy steelhead populations shall be protected or restored by controlling the harvest of adults, providing suitable spawning grounds, and maintaining rearing habitat for juvenile steelhead. The ongoing survival of the Carmel River population, however, is jeopardized by the historical development of water resources within the Carmel River Basin, the recent periods of drought, and other environmental problems. In 1986, DFG expressed concern that the steelhead population in the Carmel River was threatened with becoming a remnant run and adopted statewide policies and a management goal to maintain it as a self-sustaining resource and to restore it as much as possible to its historic level of productivity (Snider 1983; McEwan D. and T. A. Jackson 1986).[2] For this goal to be accomplished, environmental problems that limit habitat and reduce opportunities for adult migration and juvenile emigration will have to be corrected. Recently, the Monterey Peninsula Water Management District completed an environmental and biological assessment of portions of the Carmel

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1 Monterey Peninsula Water Management District. 2004. Environmental and Biological Assessment of Portions of the Carmel River Watershed. Part of a Watershed Assessment prepared for the Carmel River Watershed Conservancy, under contract to the California State Water Resources Control Board.

2 For the purposes of this EIR, remnant run is defined as population levels that are substantially reduced from historical levels and severely limited by man-induced environmental changes, which prevent the population from reproducing and expanding over several generations. Remnant populations may persist, but only at a fraction of potential population number, compared to natural conditions, or may further decline to threatened and endangered levels.

River Basin, which included an inventory of the historical environmental problems that limited the steelhead population.[3] This inventory included:

- Inadequate passage facilities for adults and juveniles at Los Padres Dam,
- Dry season surface diversions at San Clemente Dam,
- Subsurface diversion of percolating streamflow and groundwater,
- Reduction in the extent and diversity of streamside vegetation,
- Reduction of the number of trees and the canopy in the riparian forest, and reduced amounts of large wood in the active channel downstream of Robles del Rio,
- Retention in main stem reservoirs of sediment that is beneficial to steelhead and macrobenthic invertebrates (insects in the river bottom),
- Chronic and episodic bank erosion in tributaries and the main stem that introduces fine sediments into spawning and rearing habitats,
- Prior to 1997, the temporary or seasonal blockage of smolt emigration at San Clemente Dam in some years when flashboards were raised in the spring,
- Sand deposition in the Lagoon that reduces habitats for adults during the winter, for smolts during the spring, and for juveniles during the summer and fall months,
- Changes in dry season (late spring to fall) water quality, including increased water temperature, reduced oxygen levels, and higher salinity levels (Lagoon only),
- Loss of surface storage in Los Padres Reservoir due to sedimentation, and
- The release and deposition of fine-grained sand and silt from San Clemente Dam

Steelhead Life Cycle

Steelhead are anadromous fish, meaning they migrate to the ocean as juveniles, live in the ocean as adults and migrate back into freshwater to reproduce (Figure 5-1). As indicated by adult counts at San Clemente Dam, the historical migration of adults started with the beginning of major storms in late fall or early winter and continued through March or, in some years, April. Following upstream migration, the female steelhead establishes a territory, dig nests in the bottom of the stream, and deposit eggs that are then fertilized by one or more males. In the Carmel River, adults have been observed spawning from February through March, but they probably spawn from as early as mid-January to as late as early April (Dettman and Kelley 1986).

[3] Monterey Peninsula Water Management District. 2004. Environmental and Biological Assessment of Portions of the Carmel River Watershed. Part of a Watershed Assessment prepared for the Carmel River Watershed Conservancy, under contract the California State Water Resources Control Board.

Eggs buried in nests incubate 3-8 weeks, depending on water temperature, and hatch in late winter or early spring. The newly hatched fry reside in the gravel for as long as 2 weeks, emerge from the nest, and disperse into quiet areas along the stream margin, where they begin to feed.

Steelhead fry grow rapidly during spring and soon move into swifter, deeper water in riffles, runs, and the upstream and downstream ends of pools. Throughout late spring, summer, and fall, the juveniles feed predominately on drifting, immature aquatic insects or adult terrestrial insects that fall into the river.

Beginning with the first rains of the fall, some juveniles move downstream. During the following spring, many juveniles change into smolts (juvenile steelhead that have adapted to seawater), if they have attained sufficient size, and emigrate to the ocean. Other juveniles remain in fresh water for 1-2 more years before they enter the ocean, depending on their growth rates.

Steelhead from the Carmel River spend one to four years in the ocean before returning to spawn. Unlike other Pacific salmon, not all steelhead die after spawning. Many migrate back downstream as kelts and reenter the ocean. Some of the larger and older adults reenter the ocean as kelts and migrate upstream again; these are called repeat spawners. Occasionally, juvenile steelhead mature in fresh water and spawn without migrating to the ocean. This occurs most frequently during droughts when juveniles are trapped in the river and cannot emigrate to the ocean.

Extent of Spawning Habitat

Figure 5-2 illustrates the extent of steelhead spawning habitat in the Carmel River Basin. In most years, adult steelhead spawn in 62.5 miles of stream habitat: 24.5 miles of the mainstem, 30 miles of primary tributaries, and 7.5 miles of secondary tributaries. Spawning habitat in the mainstem upstream of the Narrows totals approximately 120,000 square feet: 50,000 square feet in the reach from the Narrows to San Clemente Dam (41% of total), 10,000 square feet from San Clemente Reservoir to Los Padres Dam (9% of total), and 60,000 square feet upstream of Los Padres Reservoir (50% of total). The quantity of spawning habitat in the mainstem below San Clemente Dam and between San Clemente Reservoir and Los Padres Dam is limited by the entrapment of spawning gravels in the existing reservoirs.

Extent and Characterization of Rearing Habitat

Figure 5-3 illustrates the extent of juvenile rearing habitat in the Carmel River Basin. In most years, 49 miles of rearing habitat are available, with 20 miles on the mainstem, 24 miles on primary tributaries, and 5 miles on secondary tributaries. Based on the Rearing Index (RI, a measure related to the square feet and quality of habitat for age 0+ steelhead), 28% of the total rearing habitat is in the reach from the Narrows to San Clemente Dam, 33% is from San Clemente Reservoir to Los Padres Dam, and 39% is upstream of Los Padres Reservoir. For yearling steelhead, 23% of the total rearing habitat is in the reach from the Narrows to San Clemente Dam, 20% is from San Clemente Reservoir to Los Padres Dam, and 57% is upstream of Los Padres Reservoir. Basin wide, rearing habitat totals 12.9 million RI units for age 0+ steelhead and 5.9 million units for yearling steelhead. These totals do not include habitat in Pine Creek, Robinson Canyon, Garzas Creek, or Hitchcock Canyon.

The rearing habitat in the mainstem of the Carmel River can be divided into three broad reaches based on the physical character of the channel and summer flow regimes:

- **Upper Mainstem** – Most habitat upstream of Los Padres Dam is within the Ventana Wilderness area, where river flow is unregulated, roads have not caused erosion, the stream gradient is steep (320 feet per mile), and bedrock outcrops control the course of the channel. Deep pools separated by short, shallow glides and long, cobble/boulder riffles and runs are common.
- **Middle Mainstem** – In the reach between the dams, the channel configuration is controlled by bedrock outcrops and large boulders. The substrate is a mixture of cobbles and boulders and lacks a natural source of gravel because most of it is trapped behind Los Padres Dam. During summer, water stored in Los Padres Reservoir is released into the channel and diverted or released at San Clemente Dam. By agreement with DFG and under a water right permit from the SWRCB, Cal-Am maintains a minimum flow of 5 cfs below Los Padres Dam. Because of variation in natural accretion, the augmented dry-season flow ranges from 5 cfs in critical years to 15 cfs in wet years.
- **Lower Mainstem** – Below San Clemente Dam downstream to near Paso Hondo Road (Powell's Hole), the river is controlled primarily by bedrock outcrops. Below Powell's Hole, the channel is primarily alluvial, where the river's course and configuration periodically shifts due to the interaction of alluvial deposits with flood flows that rearrange, scour, and deposit bedload along the course of the river. In spring 2003, the DWR-DSOD required Cal-Am to lower the water surface elevation in SCD by drilling six ports in the dam and drawing off the upper 10 feet of water. This interim project was implemented to partially reduce the risks to life and property, if SCD should fail due to a maximum credible earthquake. In October 2003, DWR-DSOD further ordered Cal-Am to hold the reservoir at this reduced elevation year round, whenever feasible, and to develop and implement additional measures to lower the reservoir another nine feet by November 2004. To date, Cal-Am has not implemented any measures to lower the water level in the reservoir to elevation 505 feet, and currently maintains the reservoir at elevation 515 feet during the low-flow season (e.g., April through November). As a result of these changes, it highly probable that large volumes of fine-grained sediment will be flushed out of SCR and damage the quality of rearing habitat and reduce the population of steelhead in the reach below SCD.

Status of Steelhead in The Carmel River

Before 1983, the steelhead run was primarily supported by habitat in the river and tributaries upstream of Robles del Rio where permanent, year-round streamflow and substrate conditions are suitable for juveniles throughout the summer. Some adults spawned in the river below Robles del Rio, but in most years the progeny died when the river dried up during the summer. In 1983, DFG, Cal-Am, and MPWMD began negotiating annual Memorandum of Agreements (MOAs) that specify minimum streamflow releases from San Clemente Dam. Since 1988, the scope of this agreement has been extended to include the following elements:

- Specifications for the maximum diversion that is allowed through Cal-Am's Carmel Valley Filter Plant during summer months[4];
- A schedule for apportioning the spring inflows to fill San Clemente Reservoir, minimize diversions from the reservoir, and maximize releases to the river[5];
- A schedule of releases and diversions for the late fall/winter period;
- A maintenance pumping schedule for Cal-Am wells upstream of the Narrows (river mile 9.5); and
- A provision to pump Cal-Am wells in the lower Carmel Valley (Aquifer Subunits 3 and 4) beginning with the well farthest downstream and progressing upstream as water demand increases.

The goal of the MOA is to provide the maximum amount of juvenile habitat in the reach upstream of the Narrows, consistent with the limited amount of surface storage available in Los Padres Reservoir and Cal-Am's goal to divert water at San Clemente Dam for its municipal system during the high flow season.

Historical Decline in Adult Steelhead

The most recent estimate of the total steelhead run in the Carmel River was 860 adults during 1984 (Dettman 1986). Of the total, an estimated 480 fish (56% of

[4] Since 2002, the maximum diversion rate from San Clemente Dam through the CVFP has been set to zero during the summer low-flow season, in accordance with the September 2001 Conservation Agreement (CA) between NOAA Fisheries and Cal-Am. For purposes of the CA, the low flow season begins when streamflow is below 20 cfs for five consecutive days at the MPWMD Don Juan gaging station and ends when the streamflow is greater than 20 cfs for five consecutive days.

[5] Beginning in 1997 the flashboards at San Clemente Dam were held down in an effort to reduce the temperature of water released from San Clemente Reservoir and to improve downstream passage for juvenile steelhead. Beginning in summer 2003 the flashboards were permanently decommissioned with implementation of the Interim Drawdown Project at San Clemente Dam. The goal of the IDP is to reduce the risk to downstream lives, if the dam failed during an earthquake. This is accomplished by draining water off the reservoir surface between elevation 525 (spillway height) and 514.5 (elevation of six regulating ports drilled through the dam in 2003) from May 15 of one year to February 7 of the following year.

the run) were harvested in the lower river, and about 380 fish migrated past San Clemente Dam. During 1984, only 51 adults were trapped at the base of Los Padres Dam and transported upstream, and an unknown (but probably small) number of adults spawned in the river downstream of San Clemente Dam. Previous estimates of the run at San Clemente Dam were 395 fish in 1974 and 1,287 fish in 1975 (Snider 1983) (Figure 5-4). A 1987 estimate was that the Carmel River could support a total run of about 3,500 adults upstream of San Clemente Dam (Kelley et al. 1987). Comparing this estimate to the actual run of 860 fish in 1984 indicates that the river produced only 25% of its full potential that year. A DFG report from 1983 arrived at a similar estimate of the percentage of decline in the run, but concluded that the basin had the potential to produce twice as many steelhead as were estimated in the 1987 report (Snider 1983). Regardless of the absolute number of adults that can be supported in the river, general agreement exists that the run had declined substantially during the 20-year period from 1974 to 1993.

Impact of the 1987-1992 Drought Period

The 1987-1991 drought and its subsequent effects, combined with diversions totaling more than inflow, affected natural opportunities for upstream migration of adults and downstream emigration of juveniles during the period from 1987 through 1992. Opportunities for upstream migration were limited in 1987 and 1991, and no outflow through the river mouth occurred in 1988, 1989, and 1990. Thus, sea-run adults were unable to migrate upstream from the ocean to spawn during those years. However, some adults from the 1987 sea run were landlocked and spawned during spring 1988 and 1989. Wild, emigrant smolts were landlocked in the mainstem and given supplemental food by members of the Carmel River Steelhead Association (CRSA) between Rosie's Bridge and the Tularcitos Creek confluence. Some of these wild fish reached sufficient size to spawn and were detected during spawning season at San Clemente Dam during the drought years without flow to the ocean.

The lack of sea-run adults during 1988-1991, critically low flows during summer and spring months combined to reduce the population of emigrating smolts to remnant levels. During late winter and spring of 1989, 1990, and 1991, the CRSA and MPWMD operated smolt migration traps and captured emigrating smolts in the river below the Narrows. Fish were then transported to the lagoon or Carmel Bay and released. During spring 1989, a total of approximately 200 smolt-sized juveniles were trapped or captured in the lower river. During spring 1990, a total of 162 smolts were captured, with most of the population emigrating during March. During spring 1991, MPWMD staff rescued or trapped a total of 700 smolt-sized steelhead. During 1989-1991, some smolts were placed in the lagoon, most were released into the ocean, and some were used by the CRSA in its wild brood stock program. Annual production of only 150-700 smolt-sized fish during 1989, 1990, and 1991 was the result of insufficient numbers of adult sea-run fish spawning in the river during 1987, 1988, 1989, and 1990.

Recovery of Steelhead Population since 1993

More recently, the steelhead population has been recovering from the effects of the 1987-1992 drought. Since 1991, MPWMD has monitored the number of adult steelhead passing San Clemente Dam and surveyed the population density of juvenile steelhead at several reference stations in the mainstem below Los Padres Reservoir.

Adult Steelhead Run at San Clemente Dam

The 1997, 1998, and 2001 totals were the highest counts at San Clemente Dam since 1975 (Figure 5-4). During the period from 1962 through 1975, visual counts of adult steelhead at San Clemente Dam averaged 780 fish and ranged from a low of 94 fish in 1972 to 1,350 fish in 1965. The index from the 1962-1975 period was six times the average count for the 1988-1996 period, indicating that adult returns had not reached levels commonly counted before the 1976-1977 drought or recovered from reductions caused by the 1987-1991 drought. During the past nine years (1997-2005), the number of adults averaged 573, or about 74 percent of the historical average during the 1962 to 1975 period. The number of adults has not reached historical levels, but has recovered partially from the effects of the 1987-91 and earlier drought. Since 2001, the annual number of adults has trended downward with counts ranging from 328 to 388 (Figure 5-4). This trend indicates that environmental factors continue to severely limit the recruitment of adults.

Juvenile Population Surveys

Since fall 1990, MPWMD has surveyed the juvenile steelhead population in the Carmel River below Los Padres Dam. This information is crucial in assessing the success of adult reproduction and in determining whether freshwater habitats are fully seeded with juvenile steelhead. The population is surveyed at eight stations in the 15-mile-long reach between Robinson Canyon Road Bridge and Los Padres Dam. In this reach, the population density has increased from near zero in 1989 to recent annual averages ranging from 70 to 195 fish per 100 lineal feet of stream (Figure 5-5). The recent densities are similar, or slightly higher, than densities in other coastal streams in Central and Northern California.

Listing of Steelhead under Federal ESA

In August 1996, the National Marine Fisheries Service (NOAA Fisheries) published a notice in the Federal Register summarizing its status review of steelhead (*Oncorhynchus mykiss*) populations in Washington, Oregon, Idaho and California. NOAA-Fisheries identified 15 geographic Evolutionarily Significant Units (ESUs) within the species' range, six of which are in California. The 15 steelhead groups of populations were categorized on the basis of genetic similarity and similarity in life history patterns correlated to rainfall patterns and topography. As a result of its initial review, NOAA Fisheries proposed five ESUs for listing as threatened and five more for listing as endangered under the federal ESA. Endangered status means that steelhead within the listed ESUs were believed likely to become extinct without protective action. A threatened listing means that steelhead within the designated ESUs were believed likely to warrant listing as endangered in the foreseeable future unless conditions for the ESUs were improved.

On August 18, 1997, NOAA Fisheries listed steelhead in four ESUs as threatened species and steelhead in two ESUs as endangered species. Listing decisions affecting steelhead in other ESUs were deferred while NOAA-Fisheries evaluated additional scientific information. On March 19, 1998, NOAA Fisheries listed two additional ESUs as threatened (Lower Columbia River and Central Valley, California) and determined that listing was not warranted in two ESUs (Klamath Mountains Province and Northern California). On March 25, 1999, NOAA Fisheries issued another final rule listing steelhead in the Middle Columbia and Upper Willamette River ESUs as threatened. Following additional review of conservation measures that were initially described but never implemented by the state of California, NOAA Fisheries published a reevaluation and final rule on June 7, 2000, listing the Northern California Province ESU as threatened. Following a U.S. District Court decision, which determined that NOAA Fisheries decision to not list steelhead in the KMP was capricious, NOAA Fisheries reconsidered future conservation actions and new information on the status of steelhead in KMP, and again decided not to list KMP steelhead. As of September 2003, steelhead populations in ten ESUs have been listed as threatened or endangered. The 15 ESUs identified by NOAA-Fisheries and the current listing status, including date of action when appropriate, is as follows:

- Puget Sound: not presently at risk (August 8, 1996)
- Olympic Peninsula: not presently at risk (August 8, 1996)
- Southwest Washington: not presently at risk (August 8, 1996)
- Lower Columbia River: listed as threatened (March 19, 1998)
- Upper Willamette River: listed as threatened (March 25, 1999)
- Oregon Coast: Species of Concern (March 19, 1998)
- Klamath Mountains Province: not presently at risk (April 4, 2001)
- Northern California: listed as threatened (June 7, 2000)
- Central California Coast: listed as threatened (August 18, 1997)
- South Central California Coast: listed as threatened (August 18, 1997)
- Southern California: listed as endangered (August 18, 1997)
- Central Valley: listed as threatened (March 19, 1998)
- Middle Columbia River: listed as threatened (March 25, 1999)
- Upper Columbia River: listed as endangered (August 18, 1997)

- Snake River Basin: listed as threatened (August 18, 1997)

NOAA Fisheries assigned steelhead in the Carmel River to the South Central California Coast ESU, which includes all naturally spawned populations (and their progeny) in streams from the Pajaro River (inclusive), in Santa Cruz County, southward to (but not including) the Santa Maria River, in San Luis Obispo and Santa Barbara Counties. It includes rivers such as the Salinas, Carmel, Big Sur, Little Sur, and Arroyo Seco, as well as significant coastal creeks such as Willow Creek near Pigeon Point, Arroyo de la Cruz near San Simeon, and Santa Rosa Creek near Cambria.

As part of the listing process for "threatened" species under Section 4 (d) of the federal ESA, NOAA Fisheries is required to review and adopt a specific set of regulations prohibiting "take" of the species. Under this Section, NOAA Fisheries has the legal flexibility to work with state agencies and local governments in developing rules to permit or exempt activities that represent incidental (i.e., minimal, minor or inadvertent) take of the protected species, an option not available for a species with endangered status. On July 10, 2000, following extensive review and public comment, NOAA-Fisheries adopted a final set of regulations extending specific protection to salmon and steelhead ESU along the Pacific Coast. The Section 4(d) rule allows NOAA Fisheries to grant its authority to manage the listed species to state and local agencies as responsible parties. As part of the 4d regulations, NOAA Fisheries decided to exempt thirteen specific activities from the take prohibitions of the ESA. For example, take associated with sport angling and programs to rescue steelhead are exempted, subject to certain conditions.[6]

According to NOAA Fisheries, the abundance of steelhead in the South Central California Coast ESU has declined from a historic maximum of 25,000 returning adults to fewer than 500 currently.

Amphibians and Reptiles of the Carmel River

The Carmel River contains a diverse assemblage of amphibious and reptilian species, including the threatened California red-legged frog (*Rana aurora*

[6] Under the 4d rules for salmon and steelhead, NOAA Fisheries defined 16 specific activities that are most likely result in unauthorized take by injuring and harming steelhead. At the same time NOAA Fisheries identified thirteen programs and activities where minor take occurs, but for which NOAA Fisheries decided the take provisions of the ESA were not necessary because the programs and activities contribute to conserving the ESU. These programs include: (1) activities conducted in accord with ESA incidental take authorization; (2) ongoing scientific research activities for a period of 6 months from the publication of this final rule; (3) emergency actions related to injured, stranded, or dead salmonids; (4) fishery management activities; (5) hatchery and genetic management programs; (6) activities in compliance with joint tribal/state plans developed within United States (U.S.) v. Washington or U.S. v. Oregon; (7) scientific research activities permitted or conducted by the states; (8) state, local, and private habitat restoration activities; (9) properly screened water diversion devices; (10) routine road maintenance activities; (11) certain park pest management activities; (12) certain municipal, residential, commercial, and industrial (MRCI) development and redevelopment activities; and (13) forest management activities on state and private lands within the State of Washington.

draytonii), California newt (*Triturus torosus*), Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), western toad (*Bufo boreas*), western pond turtle (*Clemmys marmorata*), and possibly the foothill yellow-legged frog (*Rana boylei*).

The range of the threatened California tiger salamander (*Ambystoma californiense*), includes the Carmel Valley; however, the area potentially affected by the Proposed Project includes only the river corridor and does not contain suitable habitat (e.g. deep seasonal wetlands and stock ponds) for salamanders.

California Red-Legged Frog (CRLF)

The CRLF is listed as threatened under the ESA. It has been extirpated from 70% of its former range and now is found primarily in coastal drainages of central California, from Marin County, California, south to northern Baja California, Mexico. CRLF has been reported from several relatively isolated, although widely distributed, locations along the Carmel River. This Carmel River population of CRLF has been identified as a core population by the USFWS, targeted for development and implementation of a management plan. (U.S. Fish and Wildlife Service 2002b).

CRLF breed from November through April (Storer 1925), although most egg masses are typically laid in March. Males appear at breeding sites approximately 2 to 4 weeks before females (Storer 1925) and begin calling to attract females. A mated pair will then move to the location where eggs are laid, and the eggs will be fertilized while being attached to a brace. Braces include emergent vegetation such as bulrushes (*Scirpus* spp.) and cattails (*Typha* spp.) or roots and twigs. Egg masses typically float on the surface of the water but may occur at depths of up to 1 meter (3.3 feet) (EcoSystems West Consulting Group 2001).

CRLF habitat consists of permanent or ephemeral water sources with emergent and or submerged aquatic vegetation. They are known to occupy and breed in marshes, springs, ponds (both natural and artificial), and backwater pools of rivers and streams (Stebbins 1985). CRLF also occur and reproduce in tidally influenced coastal marshes that have low salinity levels during the reproductive season (EcoSystems West Consulting Group 2001). The types of habitat occupied by CRLF tend to vary with life stage; in general, eggs and tadpoles have narrower habitat tolerances than subadults or adults (EcoSystems West Consulting Group 2001).

EcoSystems West Consulting Group (2001) identified a total of 100 potential reproductive sites along the Carmel River floodplain. Twenty-two of these occurred in the mainstem of the river, and 78 occurred in off-channel sites. Numerous additional non-reproductive habitats were also identified. Incidental observations of CRLF in the Carmel River floodplain made during the habitat characterization and critical habitat mapping efforts included observations of adults at 69 sites, sub-adults at 22 sites, young of the year at 15 sites, and tadpoles at 13 sites (EcoSystems West Consulting Group 2001). The majority of potential reproductive sites tend to cluster in two general locations: behind the two storage reservoirs and below river mile (RM) 1 in the Carmel River lagoon.

Riparian Habitat in the Carmel River Corridor

Riparian vegetation in the Carmel Valley downstream of San Clemente Dam conforms generally to Holland's (1986) central coast arroyo willow riparian forest. It is dominated by arroyo willow (*Salix lasiolepis*), with red willow (*S. laevigata*), shining willow (*S. lucida* ssp. *lasiandra*), narrow-leaved willow (*S. exigua*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) as an important component of the overstory, and with western sycamore (*Platanus racemosa*), box elder (*Acer negundo*), and other riparian species. In the drier outer floodplains of this region, coast live oak (*Quercus agrifolia*) may dominate, and the riparian vegetation conforms generally to central coast live oak riparian forest (Holland 1986). Recent Geographical Information Systems (GIS) mapping, using 2001 ortho-imagery, revealed 438 acres of riparian woodlands and 105 acres of non-wooded area along the river corridor from the Carmel River lagoon to San Clemente Dam (Christensen pers comm.)

The riparian forest along the Carmel River has been affected by natural and human-induced events. The most important natural events that have affected the riparian forest and channel conditions in recent years have been the floods of 1995 and 1998. The river is still adjusting to the effects of the floods. The sharp peaks of the 1995 flood scoured deep pools, caused bank erosion, and deposited large amounts of sand in the lower Carmel River, while the longer, sustained high flows of the 1998 flood redistributed the sand, filling up many pools. (MPWMD 2003).

Human-induced events include encroachment on the riparian vegetation as the result of farming, housing development, golf course construction, construction of San Clemente and Los Padres Dams, and groundwater pumping. In addition, installation of bank protection has reduced lateral movement of the river. The dams have relatively small reservoirs that have little effect on flood peaks. Diversions and groundwater pumping have caused the once-perennial river to become characteristically dry in summer. However, reservoir releases also periodically increase flows in reaches below the dams that otherwise would have been dry. The dams also trap sediment, which has led to downstream channel incision. Groundwater pumping has been identified as a major impact on riparian vegetation. Several studies have demonstrated that groundwater pumping has led to local riparian vegetation mortality. This mortality has been associated with local bank erosion. (McNiesh 1989)

MPWMD has implemented an extensive riparian restoration and management program, the Riparian Corridor Management Program. This program is part of the MPWMD Water Allocation Program EIR Mitigation Program (MPWMD 1990). Approximately 20,000 lineal feet of river restoration has been implemented between 1986 and 1999. Since 1998 streambank restoration designs have utilized active floodplains that inundate every 1-2 years and natural recruitment, in addition to planting (MPWMD 2003). The MPWMD has operated irrigation systems since 1985 to mitigate the effect of groundwater pumping on riparian vegetation, covering more than 6.4 miles of riverbank (MPWMD 1996). Between 1988 and 2003, annual irrigation volume varied from 2.64 AF in 1998 to 195.53 AF in 1988 (Christensen pers comm.)

Regulatory Setting

The state and federal regulations that affect the aquatic resources of the Carmel River are similar to those described for vegetation and wildlife in Chapter 3. Therefore, the only regulations described below are those that apply to the Carmel River riparian corridor and not the portion of the project located on former Fort Ord lands, or that apply to the Carmel River because of the presence of other species.

Federal Endangered Species Act

The federal ESA could apply to project effects in the Carmel River because of the presence of the threatened California red-legged frog. Changes in river hydrology created by the project-related changes in water withdrawals from the river basin could modify habitat occupied by the frog.

California Coastal Act

The California Coastal Act (California Public Resources Code section 30000 et seq.) requires preparation of an LCP by local municipalities. The LCP consists of a land use plan and its implementing measures (e.g., zoning ordinances). The Coastal Act requires the incorporation of Coastal Act policies into local LCPs. Several Coastal Act policies relevant to the biological resources of the lower Carmel River are noted below.

Coastal Act Section 30107.5 defines an environmentally sensitive area as: any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities.

Coastal Act Section 30240 states that: environmentally sensitive habitat areas [ESHAs] shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas. This section also states that: development in areas adjacent to environmentally sensitive habitat areas and areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Impacts and Mitigation Measures

Significance Criteria

Criteria and Thresholds of Significance for Fish

Maintenance of a large, vigorous steelhead population in the Carmel River depends on the existence of sufficient spawning and rearing habitat; suitability of flows for the upstream migration and spawning of adults, successful incubation of eggs, rearing of juveniles, and the emigration of smolts from fresh water into the ocean; and passage of adults upstream and juveniles downstream over San Clemente and Los Padres Dams. In previous EIRs on water supply alternatives the significance of potential impacts to the steelhead population was based on several criteria including streamflow needed to complete four life cycle phases of steelhead, inundation impacts, and effects on water quality. For this EIR, the criteria have been modified to include only criteria based on changes to streamflow in the Carmel River. Table 5-1 identifies the criteria and standards of significance used in this EIR. The following four sections describe the criteria and significance thresholds for evaluating how flow changes impact four key phases of the steelhead life cycle including: upstream migration of adults, rearing of juveniles, downstream migration of juveniles during late fall and winter, and seaward emigration of smolts during spring. It is important to note that existing conditions in the Carmel River do not meet most of the criteria and the current conditions have significant adverse effects on the steelhead population in the river.

Upstream Migration

The flows needed for upstream migration of adult steelhead have been studied extensively, and are discussed in MPWMD Technical Memorandum 89-05, previous reports and water supply EIRs and most recently in a NOAA-Fisheries report (all hereby incorporated by reference).[7] There are three basic elements: pulses of high flows to attract adults into the river in winter (January, February, March and April); adequate river flows to transport adults upstream to spawning sites; and adequate outflows to keep the river mouth open between storms.

A key element in determining adequate transportation flows is the role of "critical riffles" - areas of the river bottom that may act as barriers for migrating fish. CDFG staff had recommended a minimum transportation flow of 40 cfs at Highway One during January, February, and March. During the early 1980s,

7 D. H. Dettman, Evaluation of Instream Flow Recommendations for Adult Steelhead Migration in the Lower Carmel River, Technical Memorandum 89-05, Monterey Peninsula Water Management District, Oct. 1989; W. M. Snider 1983, op. cit.; D. H. Dettman and D. W. Kelley, 1986, op. cit.; NOAA-Fisheries, Instream Flow Needs for Steelhead in the Carmel River, Bypass flow recommendations for water supply projects using Carmel River waters, Southwest Region-Santa Rosa Office, June 2002.

Table 5-1. Fisheries Resources Biological Significance Thresholds

Measure	Significance Threshold
Threatened or endangered, candidate, sensitive, or special-status species	Likely to harm or harass any federally listed as threatened or endangered species, or any identified as candidate, sensitive or special-status species in local or regional plans, policies, or regulations, or by the DFG, USFWS or NOAA Fisheries.
Critical Habitat for Steelhead	Measurable negative alteration in the physical habitat of threatened or endangered, candidate, sensitive or special status species: For steelhead in the Carmel River this includes changes in physical habitats for rearing juvenile steelhead in two reaches (Downstream of the Narrows and between the Narrows and San Clemente Dam) during the summer months and for smolts during spring months.
Impact on Seasonal Migration Pathways	Measurable negative alteration in streamflow that supports migratory phases of the steelhead lifecycle including: 1) changes in the duration and frequency of flows for adult migration from the ocean into freshwater during winter months; 2) changes in duration and frequency of flows needed for downstream migration of juveniles during fall months; 3) changes in the duration and frequency of flows required for the emigration of smolts from freshwater into the ocean during spring months.

D.W. Kelley determined that a 75 cfs minimum would be needed for fish to pass over critical riffles in the lower Carmel River. During the period from March through early May 1991, the District measured conditions at five critical riffles in the reach below Schulte Road. The results of these measurements indicated that a minimum flow of 60 cfs is needed with existing substrate conditions.

For this EIR, the impact of flow patterns on upstream migration was assessed on a daily basis using simulated daily flows from the Carmel Valley Simulation Model (CVSIM) for each alternative.[8] The minimum daily flows recommended by CDFG and D. W. Kelley for attracting steelhead were used to compare project impacts on a daily basis.[9] The basic CDFG recommendation of 200 cfs for attracting adults was used in below and above normal years. D.W. Kelley and Associates' recommendation of using attraction flows of 100 cfs in February and 75 cfs March was applied in dry and critical years.

Based on a review of historical information on the relationships between water depth and streamflow over critical riffles and NOAA Fisheries recent recommendations, a minimum transportation flow of 60 cfs is used to evaluate transportation flows in the reach below Schulte Road. This threshold was applied to daily flows during the period from December 15 through April 15 of all year types.

To rate opportunities for upstream migration, duration of the migration season and the number of days with attraction flows were tallied for each alternative during the 1958-2002 period. An impact of project operations was considered significant if the duration of the migration season (stratified by year type) or the number of attraction days was reduced below a threshold based on level that would have occurred with the No Project Alternative or if the percentage of years without attraction flows exceeded seven percent (which corresponds to performance with No Project conditions).

Flows for Rearing Juvenile Steelhead

The quality and quantity of rearing habitat for juvenile steelhead is directly influenced by streamflow. The results of several studies indicate summer habitat is a crucial factor that limits the juvenile steelhead population.[10] For this EIR, the impact of water supply project operations on juvenile rearing habitat was examined in two reaches of the Carmel River: the 8.6-mile reach from Highway One to the Narrows and the 9.0-mile reach from the Narrows to San Clemente Dam.

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8 Daily flows for a 45-year period of historical record from Water Years 1958 to 2002 were used for evaluations in this EIR, although flows can be modeled for a 100-year reconstructed record using the Carmel Valley Simulation Model.

9 McEwan and Jackson, 1986, op. cit.; D. H. Dettman and D. W. Kelley, 1986, op. cit.
10 W. M. Snider, 1983, op. cit.; D. H. Dettman and D. W. Kelley, 1986 op. cit

Criteria and Thresholds of Significance for Rearing Juveniles Downstream of the Narrows

Under existing conditions, streamflow downstream of the Narrows often recedes rapidly during late spring and early summer due to reduced inflow from the upper watershed and increased groundwater pumping in the lower Carmel Valley. Streamflow usually ceases by early summer at the MPWMD Highway One gage and by mid- to late summer at the USGS Near Carmel gage. Juvenile habitat in the lower river is reduced to critical levels at flows of about one cfs; pools become separated by long, shallow glides and riffles. Below one cfs, the continuity of the river is broken, and by the end of summer the riverbed is dry. This situation impacts juvenile steelhead by restricting their movement, by isolating them in discontinuous pools, and finally by suffocation as the pools dry up.

To assess the tendency of each alternative to result in a discontinuous river, the daily CVSIM results were used to determine how often summer flows would recede below a threshold of one cfs at the Near Carmel gage. For this EIR, a significant adverse impact is defined as an increase in the number of days with flow less than 1 cfs at the Near Carmel gage, as compared to the existing No Project condition. The District record of simulated No Project flow indicates that the summer flow would drop below one cfs during 82 percent of the 1958-2002 period. This percentage accounts for estimated inflow to the lower Carmel Valley, corrected for evapotranspiration from existing vegetation.

Criteria and Thresholds of Significance for Rearing Juveniles in the Reach from the Narrows to San Clemente Dam

The MPWMD developed methods to estimate the quality and quantity of rearing habitat for young-of-the-year and yearling steelhead in the reach between the Narrows and San Clemente Dam at flows ranging from 5 to 50 cfs.[11] Figure 5-6 illustrates the relationship between rearing habitat and streamflow in this reach. For this EIR, the relationship in Figure 5-6 was applied to the minimum mean monthly flow at the Narrows for each dry season in the 45-year hydrologic record.[12] A significant impact was defined on the basis of a paired t-test of minimum annual rearing habitats available with each alternative versus No Project conditions.

Fall Downstream Migration

In the Carmel River, the initial flows of the water year spill over San Clemente Dam and percolate into the aquifer downstream of it. At the same time, many

11 D. H. Dettman and D. W. Kelley, 1986, op. cit.

12 The minimum mean monthly flow for each year was calculated from the sequence of monthly flows for the summer dry season, extending from June through December.

juvenile steelhead that have reared upstream or in the vicinity of San Clemente Dam begin to move downstream and occupy habitats in the lower Carmel River. Thus, a portion of the juvenile steelhead that migrate into the reach downstream of the Narrows face a risk of being isolated and stranded as flows decline following the peak of each storm in late fall and winter. The problem is exacerbated during years when the Carmel Valley aquifer is drawn down during the preceding summer or during years when rain and runoff is insufficient to fill the lower aquifer subunits.

For this EIR, the risk of stranding steelhead was defined as a "high level" whenever simulated daily streamflow at the Near Carmel gage or at the Narrows declined to less than one cfs following storms that were likely to stimulate downstream migration. The date of migration was determined by examining simulated daily inflows to Los Padres and San Clemente Reservoirs and flow at the Narrows.

Tallying the simulated number of days with a “high risk” during the period from 1958 through 2002 compared the severity of the isolation risk with each water supply alterative. For this EIR, the impact was assessed by tallying the number of days with “high risk” and making a comparison to the number of days under No Project conditions. As with most perennial streams in central California, the record of natural flows shows that once the first storms of the year saturate the aquifer and produce a pulse of flow in the lower valley, the Carmel River would continuously flow to the ocean for the remainder of the wet season. The fact that flows no longer respond in this way is a major constraint to the steelhead population because a high percentage of larger, older juveniles naturally migrate downstream, without knowing that the river will dry-up underneath them.

Spring Seaward Emigration

Adequate April and May streamflow are needed for rearing steelhead smolts below San Clemente Dam and for their emigration from the lower river into the ocean. Previous studies indicate that the quality and quantity of habitat and the survival of emigrating juveniles is related to the magnitude of spring runoff.[13]

Prior to 1960, the diversion of spring flows at San Clemente Dam was a minor problem for emigrating steelhead because no major diversions occurred downstream of the surface diversion at the dam. Following 1959, when Cal-Am began to consistently pump wells in the Carmel Valley alluvial aquifer, there was a gradual, but steady increase in water demand that was met with extractions from the aquifer. As groundwater production increased, spring flows in the lower river declined. The decline was further exacerbated by the raising of flashboards at San Clemente Dam each spring, which caused reductions in streamflow and drying of the river below the Narrows.

The impact of these operations on steelhead was documented as early as 1975, when Snider (1983) observed, "A sudden reduction in flow from the lower river

13 D. H. Dettman and D. W. Kelley, 1986, op. cit.; W. M. Snyder, 1983, op. cit.

in June 1975 resulted in the stranding and eventual loss of numerous downstream migrants, demonstrating that migrants were in the lower river at that time, and that abrupt reductions in flow in June are harmful."[14] Such flow reductions during April and May were even more harmful because recent studies of smolt emigration at Los Padres Dam show that many from the upper Carmel River emigrate downstream during April and May.[15]

Smolt Emigration

Monthly Criteria

Kelley and Dettman developed criteria for mean April through May flows to assess rearing habitat for yearling steelhead and the success of smolt emigration into the ocean.[16] The criteria are based on a correlation between historical adult counts at San Clemente Dam and spring flows at the Near Carmel gage, rearing habitat versus flow relationships for yearling-sized steelhead in the reach upstream of the Narrows, and observations of the flows needed to keep the river mouth open during the spring.

To compare impacts of water supply alternatives on steelhead emigration, these monthly criteria were applied to the simulated April-May flows for the period from 1958 to 2002. The frequency of years in each category and the number of years with "zero", "critical" or "poor" conditions were tallied for each alternative. Project impacts were defined as significant if operations increased the percentage of the April-May periods with "zero," "critical" or "poor" emigration conditions as compared to simulated No Project flows. . The District's simulated record of natural (unimpaired) flows indicates that 13 percent of April-May periods would have been rated as "zero," "critical" or "poor."

Daily Criteria

To supplement the analysis based on bimonthly criteria, the number of days with a high risk of stranding in April and May was assessed for each alternative. The severity of the isolation and stranding risk was indexed by tallying the annual number of days with flows less than 10 cfs during the April-May period from 1958 to 2002. A significant impact was defined as more than fourteen days with flows less than 10 cfs during the April-May period.[17] This is based on the simulated No Project flow record, which indicates that steelhead smolts are subject to isolation risk for an average of fourteen days per year under existing conditions

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14 W. M. Snyder, 1983, op. cit.

15 MPWMD conducted smolt emigration studies at Los Padres Dam in 1992, 1996, and 1999. Daily counts of steelhead smolts trapped during these years showed large numbers of smolts emigrating during April and May of 1996 and 1999.

16 D. H. Dettman and D. W. Kelley, 1986, op. cit.

17 This analysis was supplemented by making paired comparisons amongst years stratified by water year type.

Criteria and Thresholds of Significance for Other Aquatic Resources

Approach

The methods used to determine potential impacts on vegetation and wildlife resources along the Carmel River are described below. An impact analysis for each resource in the project area is also included in this section.

Impact Assumptions

The proposed project could result in temporary and permanent impacts on aquatic resources along the Carmel River. In assessing the magnitude of possible impacts, the following assumptions were made regarding construction, resource management, and operation and maintenance activities.

- Construction activities necessary to develop a second ASR well on former Fort Ord would not directly or indirectly affect Carmel River resources.
- Operation of the new ASR project would result in small changes in seasonal water extractions from the Carmel River Basin.

Impact Mechanisms

Carmel River aquatic resources could be directly or indirectly affected by Proposed Project activities. The following activity could cause varying degrees of impacts on river resources:

- The proposed project would result in reductions in river flows during high water periods and would reduce pumping along the lower Carmel River during dry periods, potentially increasing river flows in those dry periods.

Criteria for Determining Significance

Based on the State CEQA Guidelines, impacts on vegetation and wildlife resources were considered significant if the Proposed Project would:

- have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG or USFWS, including reducing the number or restricting the range of an endangered, rare, or threatened species;
- have a substantial adverse effect on any sensitive natural community identified in local, state, or federal regional plans, policies, or regulations, including long-term degradation of a sensitive plant community because of substantial alteration of a landform or site conditions;

- substantially reduce the habitat of a wildlife species, cause a wildlife population to drop below self-sustaining levels, or threaten to eliminate a plant or animal community;
- interfere substantially with the movement of any native resident or migratory wildlife species;
- impede the use of native wildlife nursery sites or directly harm nesting species protected under the provisions of the MBTA;
- conflict substantially with goals set forth in an approved USFWS recovery plan for a federally-listed species; or
- result in any direct or indirect disturbance of habitat designated as an ESHA (as defined by the California Coastal Act and or LUP) that results in disruption of protected resources and habitat values.

Impact Analysis

This aquatic resources impact analysis is based on the most current project description, existing biological resource information (sources are listed in the Chapter 17), and current baseline conditions. The mitigation measures for impacts on biological resources were developed through review of prior environmental impact studies, land and resource management plans, and professional judgment.

Impacts and Mitigation Measures for Fish

This impact assessment addresses how the operation of MPWMD's ASR project would affect streamflow patterns during four key phases of the steelhead life cycle. All assessments of operations are compared with the simulated flow regime for existing No Project conditions in the Carmel River Basin over the 45-year long historical period from 1958-2002. Using a 45-year period for comparison encompasses both dry and wet years with the San Clemente and Los Padres Dams in place. Existing conditions also recognize that the current run of 500-1,000 fish has been maintained by implementing efforts to reconfigure Cal-Am's diversions, rescuing juvenile fish, carrying out a brood stock program during the last drought, and constraining water production in the Carmel River Basin. For this draft EIR, an assumption was made that existing maximum annual Cal-Am production would be 15,285 AF per year with the average production in the Seaside Basin ranging from 3,670 AF/year to 4,720 AF/year with the Proposed Project. As a consequence of increasing production from the Seaside Basin during the summer and a diversion schedule that allows increased diversions from the Carmel River Basin during winter months, Cal-Am production from the Carmel Valley Aquifers is reduced during summer months, but increased during winter months. In general, the net effect of these operational changes is to increase summer streamflow and potentially improve environmental conditions in the Carmel River.

MPWMD staff has also conducted a comparison of Proposed Project effects on the Carmel River with a simulated flow regimen for unimpaired or natural conditions (flows that would have been present without human-made facilities or development of groundwater and surface water supplies for beneficial uses) Refer to Appendix A for this assessment. This second assessment accounts for the fact that even under unimpaired conditions, flows are not always ideal or optimum. In addition, the use of unimpaired flows as a standard for comparison recognizes that flows during the last 30 years have not been adequate to support a self-sustaining steelhead population, and the Proposed Project would not restore the river to a natural flow regime capable of supporting a much larger steelhead population.

All of the analyses first identify impacts and then address mitigation measures that may reduce the damage to a less-than-significant level; the overall impact with mitigations is then identified.

Impact AR-1: Reduced Flows for Adult Upstream Migration

Compared to existing No Project conditions, operation of the ASR Project would improve opportunities for upstream migration by slightly increasing the duration of attraction flows and lengthening the duration of the migration season. On average, the Proposed Project would provide 38 days of attraction flows (the minimum flows, ranging from 75 cfs to 200 cfs depending on year type, that induce steelhead to enter the river from the ocean) and would provide at least two weeks (14 days) of attraction flows during the average dry, below-normal, above-normal, and wet years (Figures 5-6 and 5-7). Although the average number of attraction days and the duration is increased by only one day, in dry years the attraction days are increased by two days and the duration of the migration season increases by three days. Although small, these differences are considered a significant beneficial impact because steelhead migrate over a short time period of three to six-week long period in dry years, so increases of a few days in years with naturally overwhelming constraints will increase the probability that a larger portion of the potential run will successfully migrate and spawn in the upper river. For this reason, the overall impact on upstream migration is considered a **beneficial impact**.

Mitigation: No mitigation is required.

Impact AR-2: Effects on Flows for Juvenile Rearing Habitat

Although the Proposed Project has no direct impact on the ability to release water from Los Padres Reservoir, it influences streamflow via increased direct diversion during winter months when excess flow is available and reduced groundwater pumping during summer months when the stream is fully appropriated. The influence varies depending on generalized location, upstream or downstream of the Narrows. Below the Narrows, the production of ASR Project water stored in Seaside offsets Cal-Am production that would otherwise occur, thereby reducing Cal-Am groundwater production in the lower Carmel Valley and potentially increasing the magnitude, extent and persistence of streamflow below the Narrows. Upstream of the Narrows, streamflow during the dry season is affected directly by the amount of water stored in Los Padres Reservoir, by the relative wetness of the water year, and by the absolute level of base-flow from the upper drainage. The ASR Project would have little, or no effect on these factors, so dry season streamflow at the Narrows would be essentially equal under the Proposed Project and the existing operations.

Near Carmel to the Narrows

The Proposed Project would reduce the risk of stranding juvenile steelhead in the lower river during summer months, as compared to existing conditions, reducing it from 108 to 53 days in above normal years and from 211 to 202 days during critically-dry years (Figure 5-8). **This impact is beneficial.**

While the duration of risk remains high with the Proposed Project, the extent of viable habitat in this reach may be improved during the first 15-20 years of project operation, depending on surface storage capacity in Los Padres Reservoir. The persistence and extent of habitat in this reach is a function of streamflow at the Narrows and the rate/distribution of groundwater pumping in Carmel River Basin Aquifer Subunit 3 (AQ 3). During the early years of operation, sufficient flow will pass the Narrows to provide several miles of habitat downstream of the Narrows. However, with time the storage capacity in Los Padres Reservoir will be depleted as it fills with sediment, and in 2-3 decades the flow at the Narrows will decline below the level of groundwater pumping associated with daily groundwater production in the upper region of AQ 3. At that juncture, the persistence and extent of aquatic habitats downstream of the Narrows will fade with brief periods of early summer flow over a mile or so of stream.

Narrows to San Clemente Dam

Compared to existing conditions flows, the operation of the ASR Project would maintain equal degrees of risk that fish would be stranded in this reach. During the first 15-20 years of operation, streamflow at the Narrows would be maintained at viable levels. After this initial period the flows at the Narrows would decline if storage capacity is not improved in Los Padres Reservoir, frequently approaching or persisting at lethal levels (Figures 5-9a & 5-9b). As indexed by habitat values, the Proposed Project provides an average of 1.2 million RI units of habitat for age 0+ juveniles and 0.4 million units for yearlings. Following the initial 20-year period, the juvenile habitat is reduced to essentially zero as reservoir capacity is lost and streamflow drops to lethal levels, especially in below normal, dry and critically dry years (Figures 5-10a & 5-10b). This loss of flow is not related to the Proposed Project; **the Proposed Project would have no adverse effect on flows or juvenile rearing habitat above the Narrows.** However, without some improvement in Los Padres Reservoir storage capacity, a significantly reduced habitat condition would occur 20 years in the future with both the Proposed Project and No Project condition, as a consequence of the filling of Los Padres Reservoir with sediment.

Mitigation Measure AR-2: Cooperate to Help Develop a Project to Maintain, Recover, or Increase Storage in Los Padres Reservoir and If Needed, Continue Funding Program to Rescue and Rear Isolated Juveniles

MPWMD will encourage and work with Cal-Am, DFG, and NOAA Fisheries to investigate and develop a project to improve summer flows and the quality of releases by maintaining, recovering, or increasing surface storage capacity in existing Los Padres Reservoir. MPWMD will provide staff expertise and data, but does not control the reservoir. In the meantime, MPWMD will continue operation and funding of the program to rescue and rear juveniles that are isolated downstream of the Robles del Rio gaging station. Without significant progress in recovering storage capacity and obtaining an alternate source of water, this program will be needed in most years, especially as Los Padres Reservoir continues to fill with sediment and the ability to maintain flow releases continues to diminish.

Impact AR-3: Improved Flows for Fall/Winter Downstream Migration

During the late-fall and early winter period, the Proposed Project would reduce the risk that steelhead are stranded, as compared to existing conditions. Compared to existing conditions, the duration of risk would be reduced by three to thirteen days, depending on water year type (Figure 5-11). This is a **beneficial impact**.

Mitigation: No mitigation is required.

Impact AR-4: Maintenance of Flows for Spring Emigration

Compared to existing conditions, the Proposed Project would slightly reduce flows for smolt habitats during wet, above normal, and below normal years, but improve flows during dry and critically-dry years. (Figure 5-12) This is a direct consequence of changing Cal-Am's existing production system to inject surplus water into the Seaside Basin during wet periods and to restrain production from the Carmel River Basin during the spring of dry and critically-dry years. Opportunities for successful smolt emigration would be most improved during selected dry and critically-dry years, when flows into the Lagoon would be significantly increased as a direct result of Project operations. (Figure 5-13). In addition to improving opportunities for smolt emigration, the Project would slightly reduce the risk of isolating and stranding steelhead smolts in the lower Carmel River (Figure 5-14). Overall, these changes are considered a **beneficial impact**.

Mitigation: No mitigation is required.

Impacts and Mitigation Measures for Other Aquatic Resources

The conclusions presented in Chapter 8, "Surface and Groundwater Hydrology and Water Quality," were used as the basis to evaluate potential effects on other aquatic resources in the Carmel River. In particular, the effects of periodic surface water flow changes in the Carmel River resulting from operation of the ASR Project were considered.

Impact AR-5: Changes in California Red-legged Frog Habitat Due to Changes in River Flows

As indicated in Chapter 8, the ASR project would have no effect on river flows upstream of the Narrows, and would have minimal effect on flows below the Narrows to the Carmel River Lagoon during high-flow periods (December through May) when water would be extracted for transport to the ASR wells. This minimal effect on flows would occur for all water-year types (above normal, normal, dry and critically dry). With only minimal change in stream flow, there would be a less than significant effect on red-legged frog habitat and breeding activity.

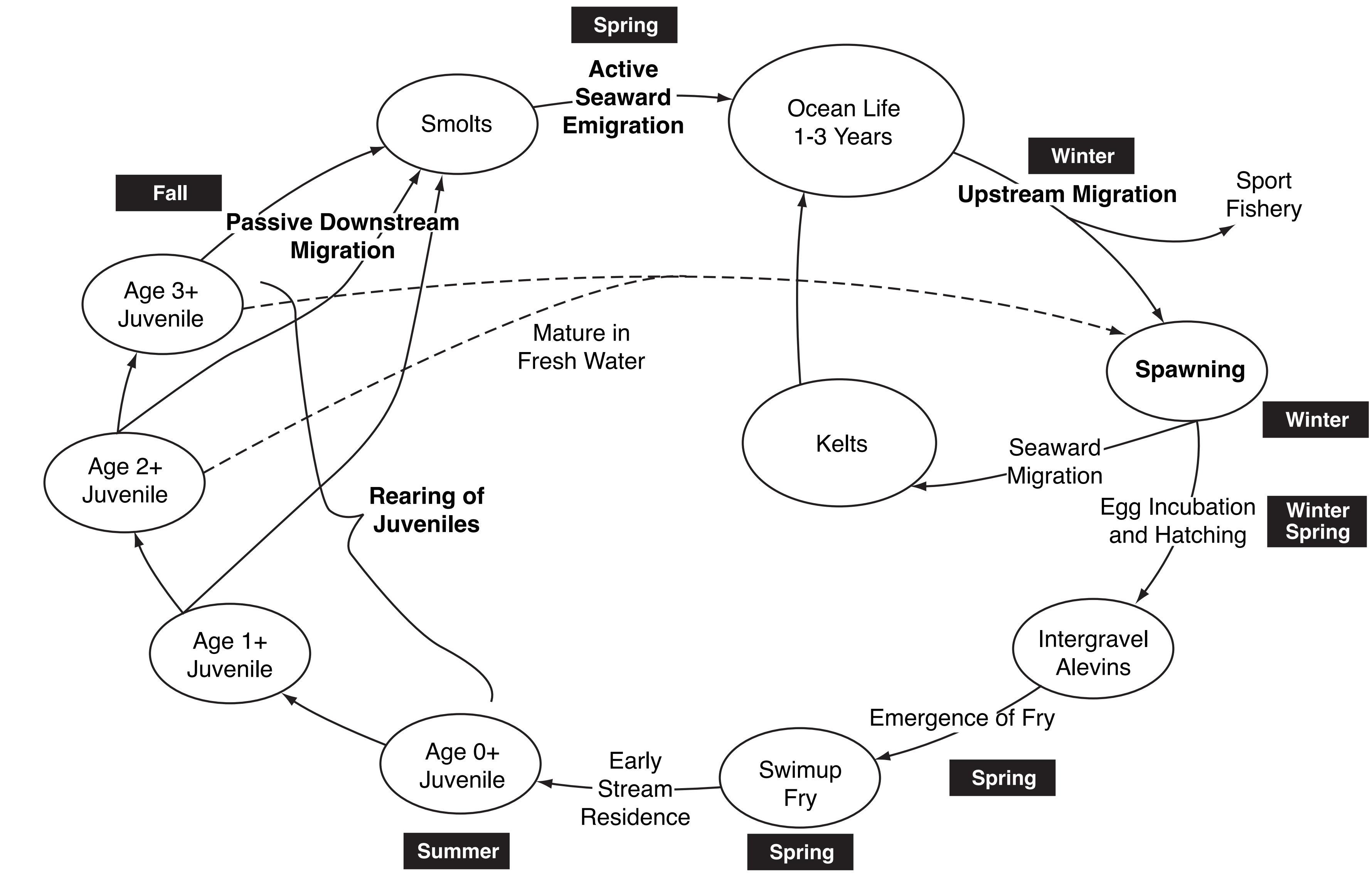
During low-flow conditions (June to November), the reduced pumping from the Carmel River alluvial aquifer that could occur with the Proposed Project would have minimal effect on the river's flow. The only changes that might be observed would be an extended area of flow below the Narrows because of higher groundwater levels at the beginning of the dry season. There would be essentially no change in flow above the Narrows and at the Lagoon in all water-year types. The small increase in surface flow below the Narrows would provide improved habitat conditions for red-legged frog. This flow increase would be a **beneficial impact**.

Mitigation: No mitigation is required.

Impact AR-6: Changes in Habitat for Other Aquatic Species Due to Changes in River Flows

Other aquatic species present in the Carmel River below the Narrows include Pacific tree frog, California newt, western toad, western pond turtle, and a variety of aquatic invertebrates. The river channel also supports a wide array of riparian plant species. As indicated above, the proposed ASR project would have minimal or no changes in surface flow in the Carmel River. A small beneficial increase in flow may occur below the Narrows in the dry portion of the year (June through November). The improved conditions below the Narrows could support an expansion of riparian vegetation in that stretch of the river. Therefore, the Proposed Project impacts on these aquatic species would be **beneficial**.

Mitigation: No mitigation is required.

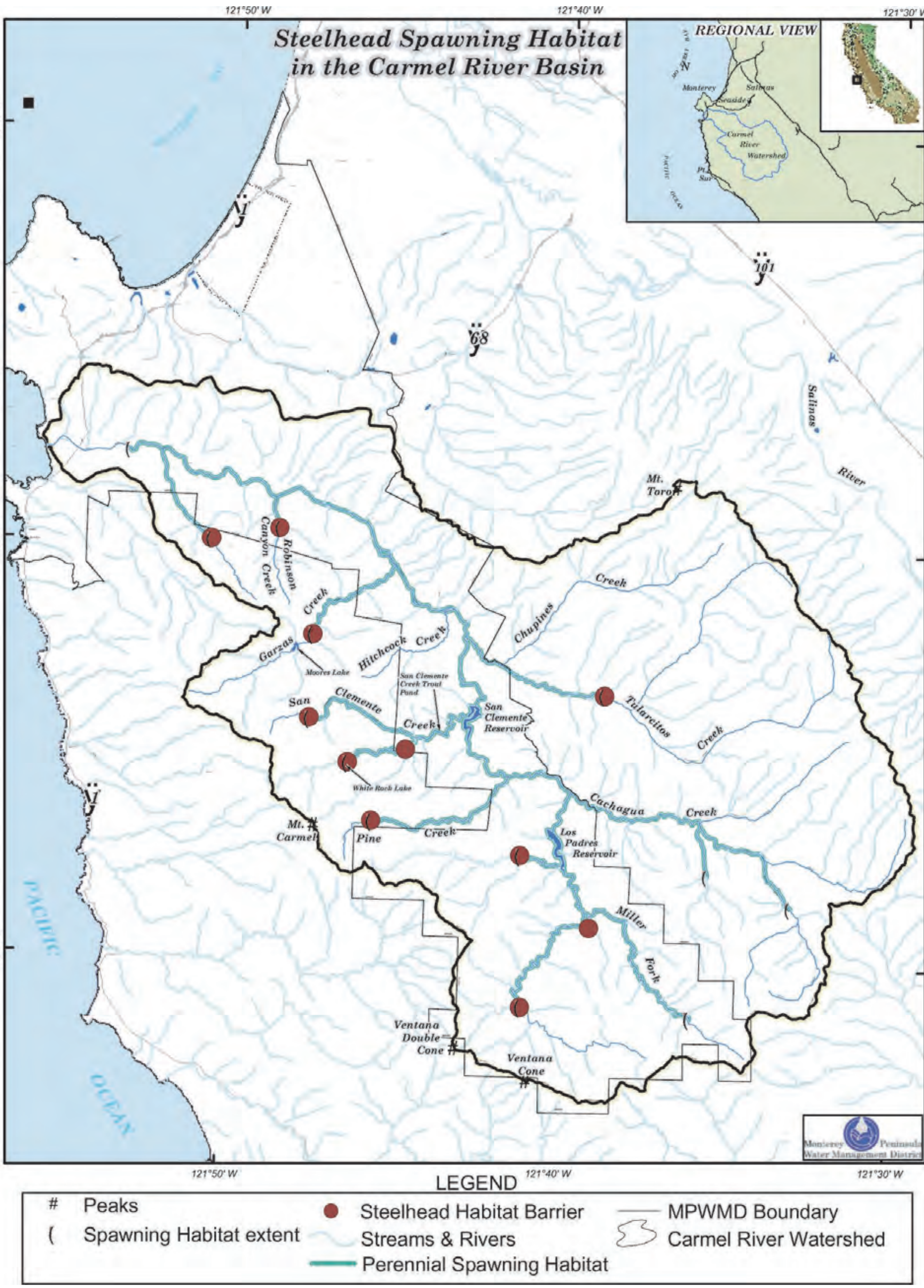


Source: MPWMD 1994a.

04637.04 EIR (11-05)

Jones & Stokes

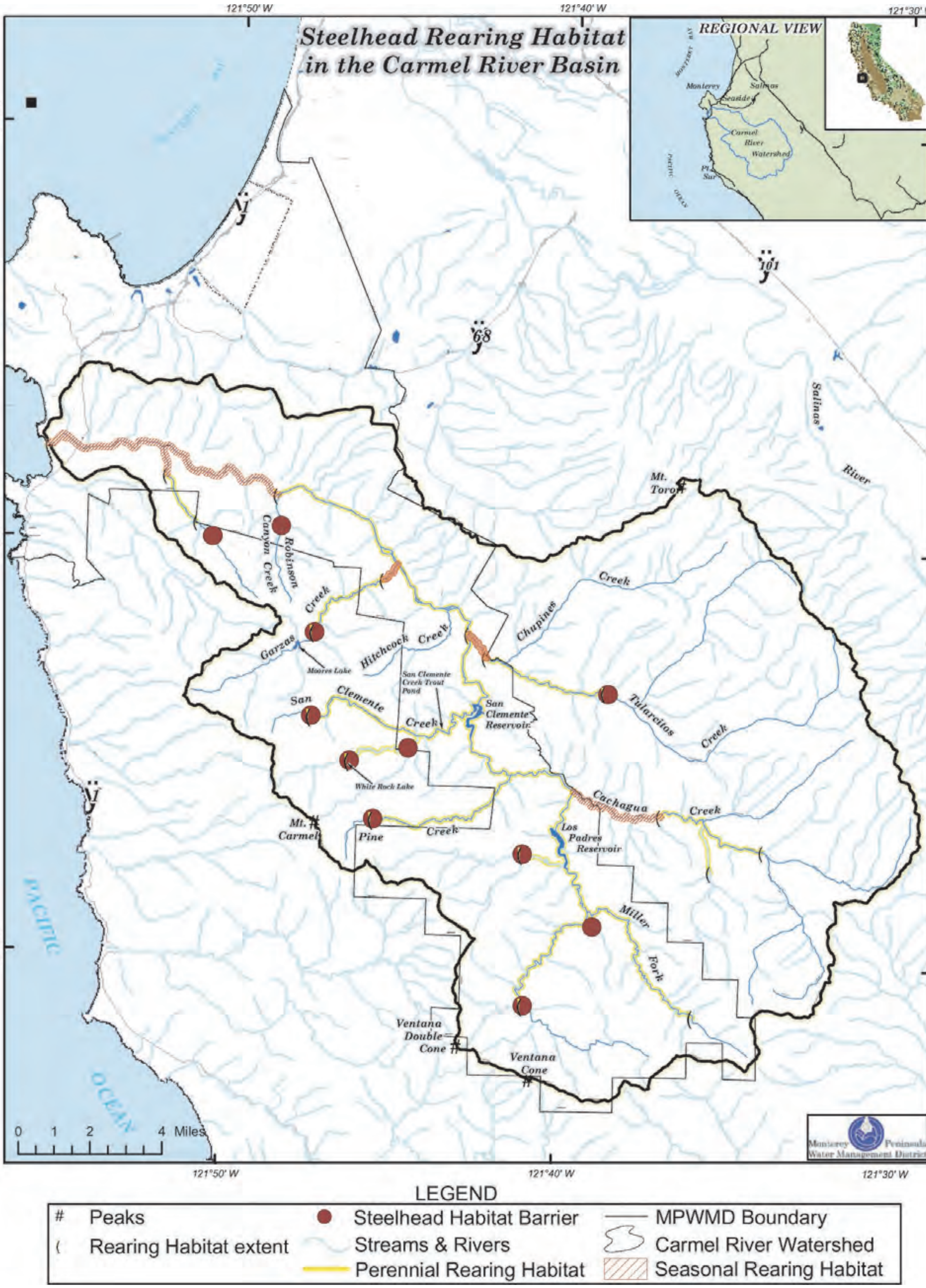
Figure 5-1
Life Cycle of Steelhead in the Carmel River Basin



Source: MPWMD.

Jones & Stokes

Figure 5-2
Steelhead Spawning Habitat in the Carmel River Basin



Source: MPWMD.

04637.04 EIR (11-05)

Jones & Stokes

Figure 5-3
Steelhead Rearing Habitat in the Carmel River Basin

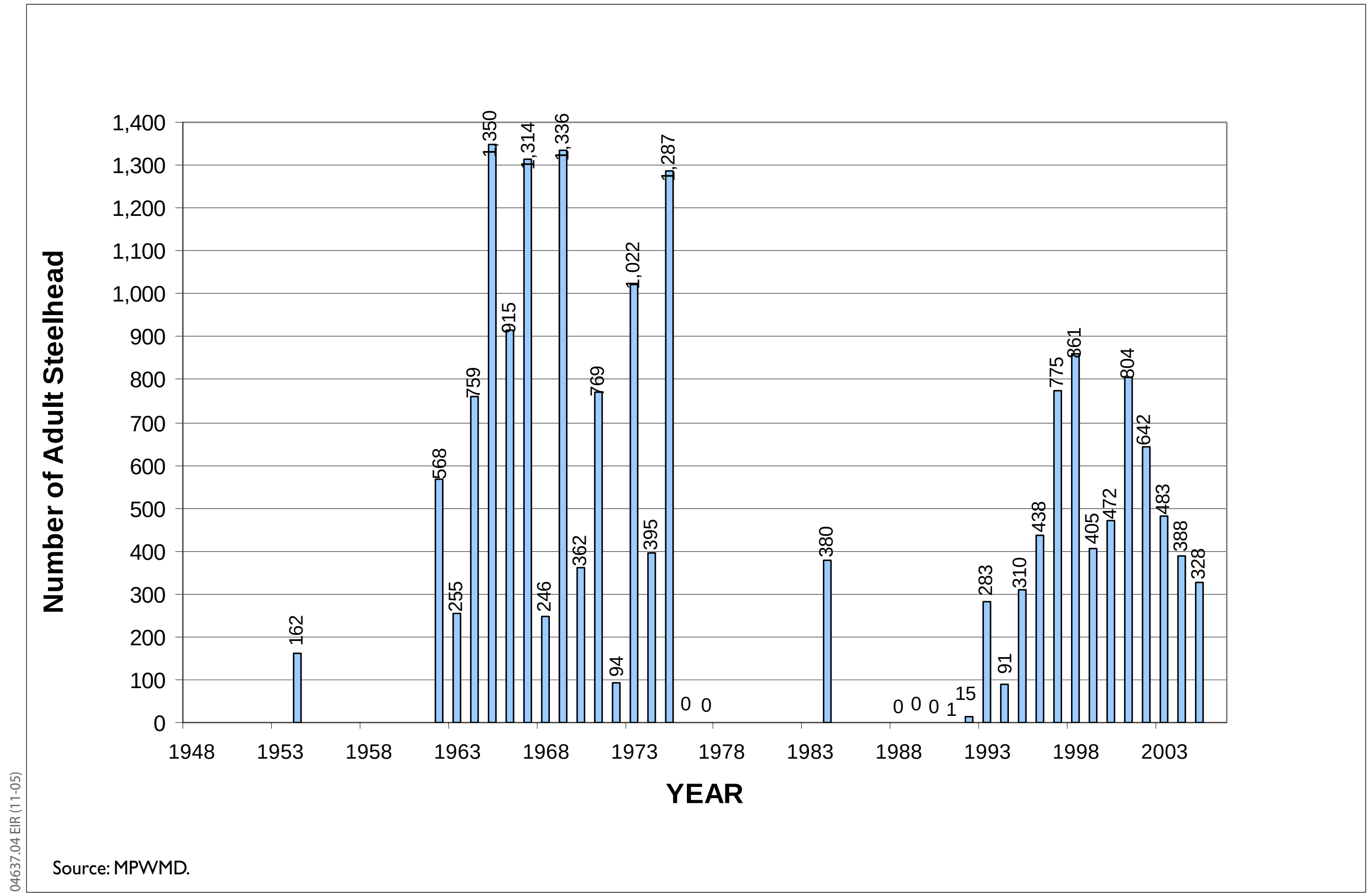
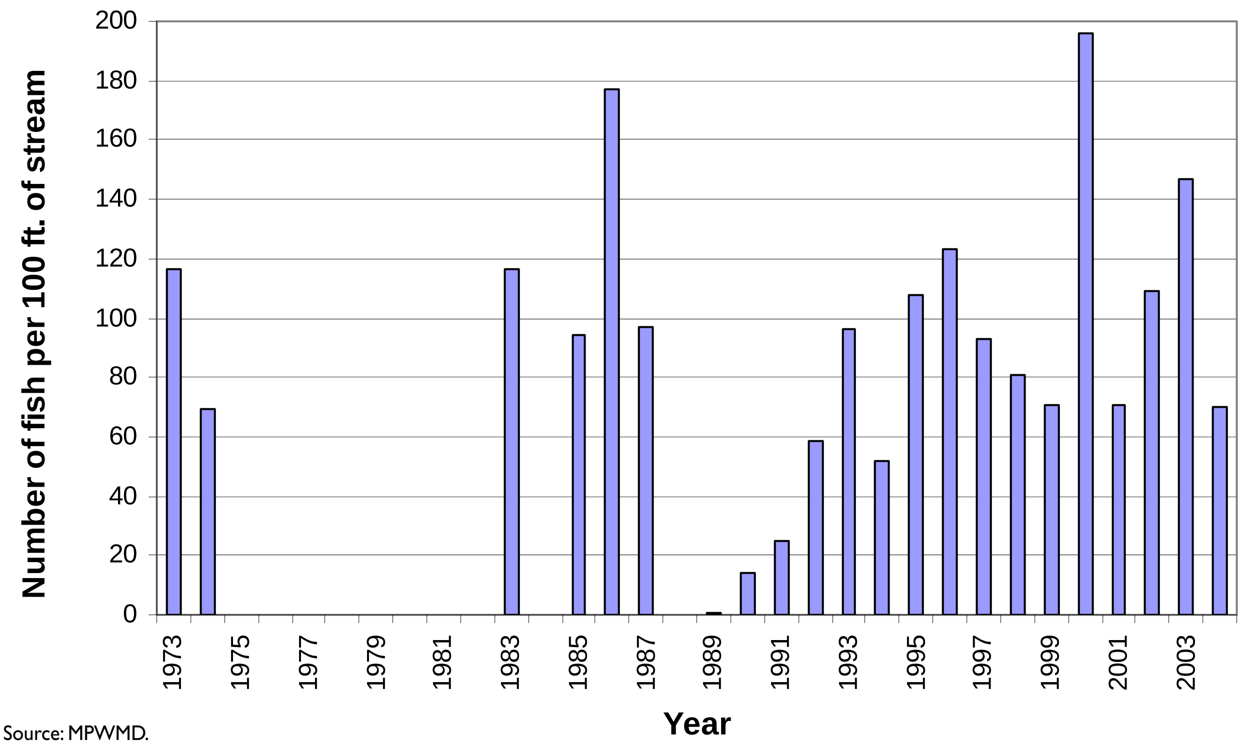


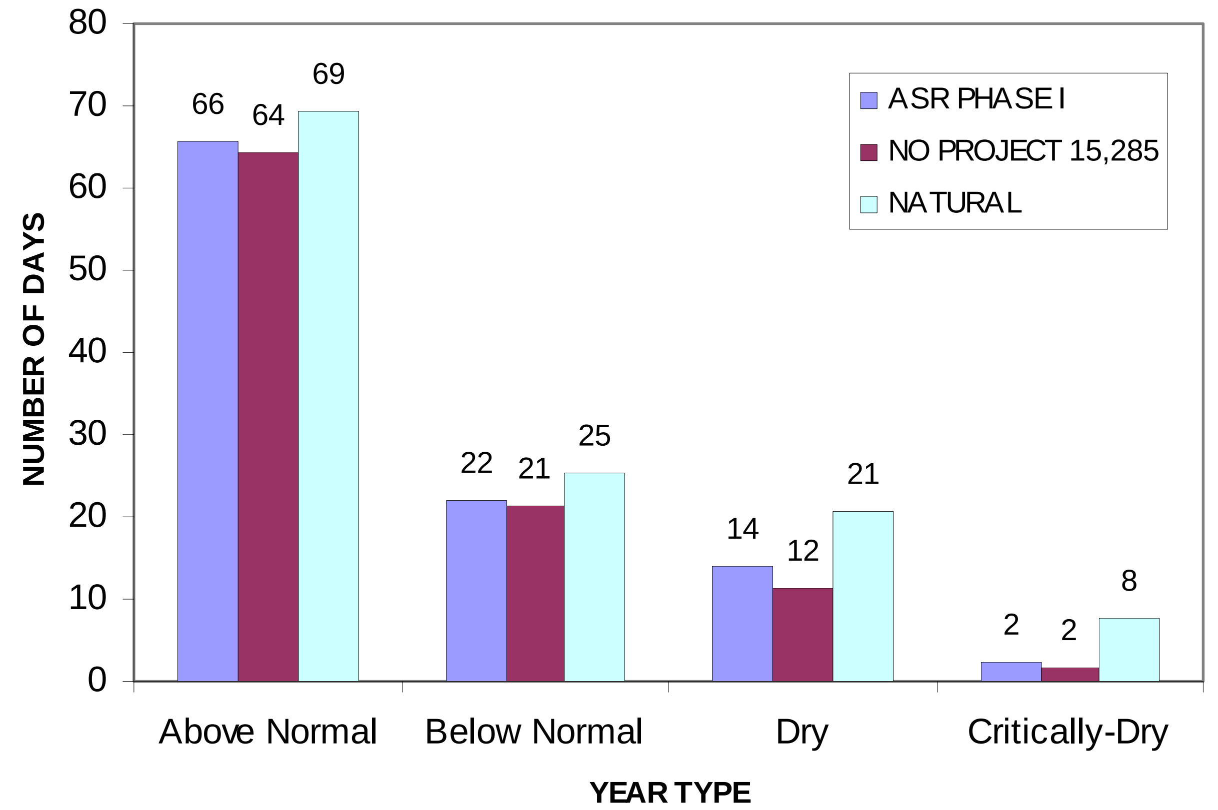
Figure 5-4
Number of Adult Steelhead at San Clemente Dam (1954-2005)



Source: MPWMD.

04637.04 EIR (11-05)

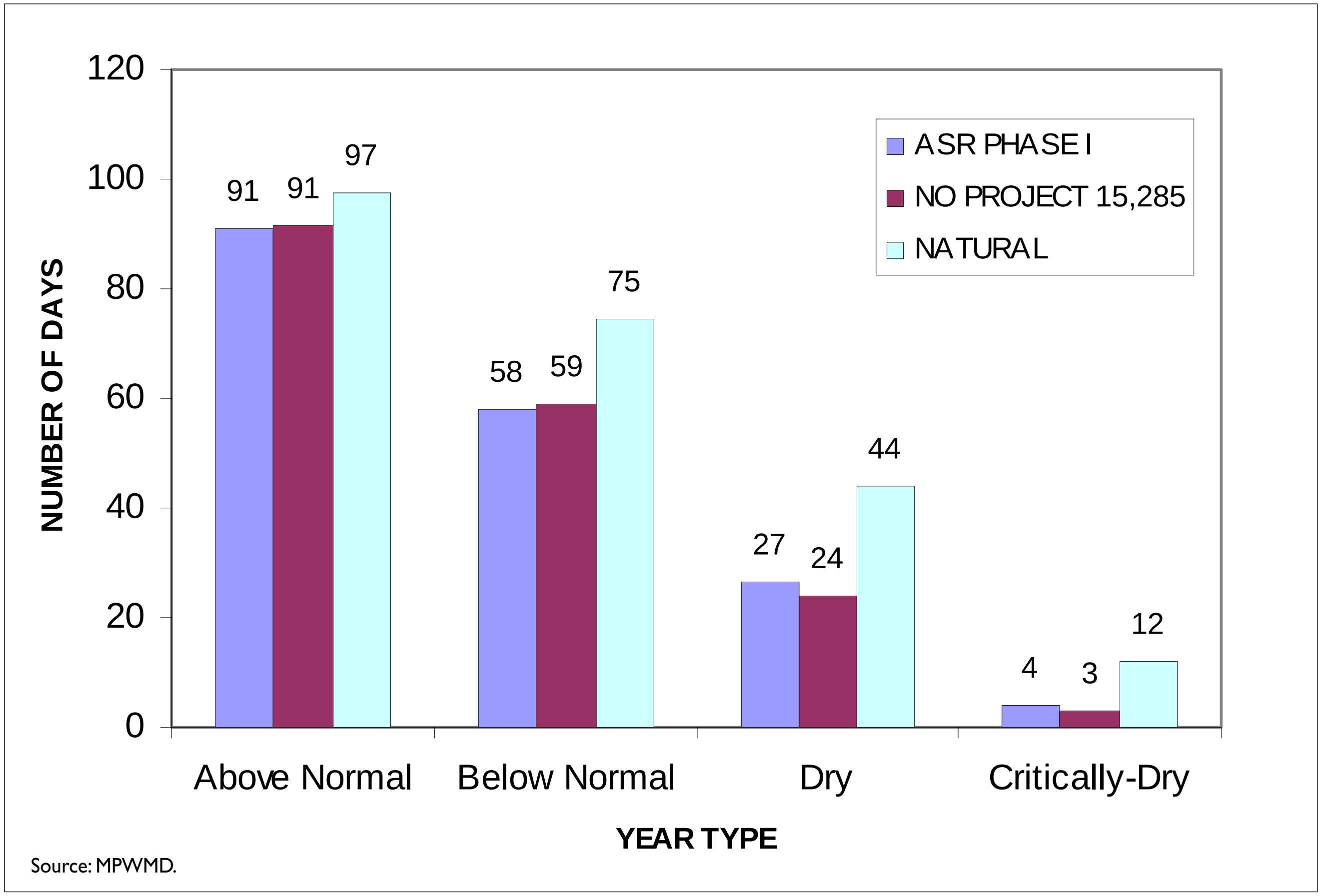
Figure 5-5
Average Carmel River Juvenile Steelhead Population Density (1973-2004)



Source: MPWMD.

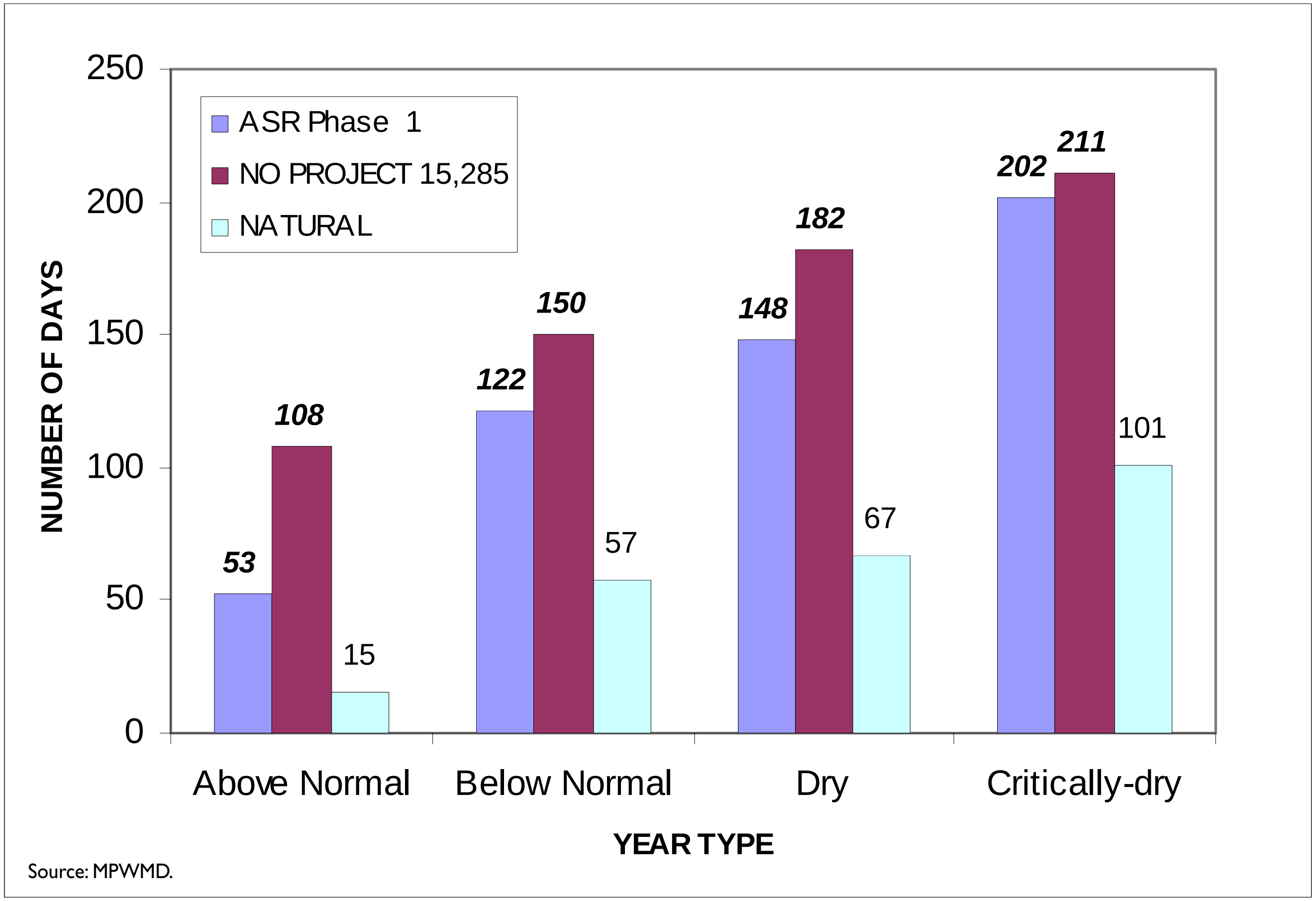
04637.04 EIR (11-05)

Figure 5-6
Average Days per Year That Recommended Flows for Attraction of Adult Steelhead Would Be Equaled or Exceeded, by Type of Water Year



04637.04 EIR (11-05)

Figure 5-7
Average Days per Year That Recommended Flows for Transportation of Adult Steelhead Would Be Equaled or Exceeded, by Type of Water Year



04637.04 EIR (11-05)

Figure 5-8
Number of Days in June-December Period during Which Juvenile Steelhead Would Be at High Risk of Stranding in Reach between Via Mallorca Road and the Narrows with Alternative Water Supply Projects, by type of water year, 1958-2002

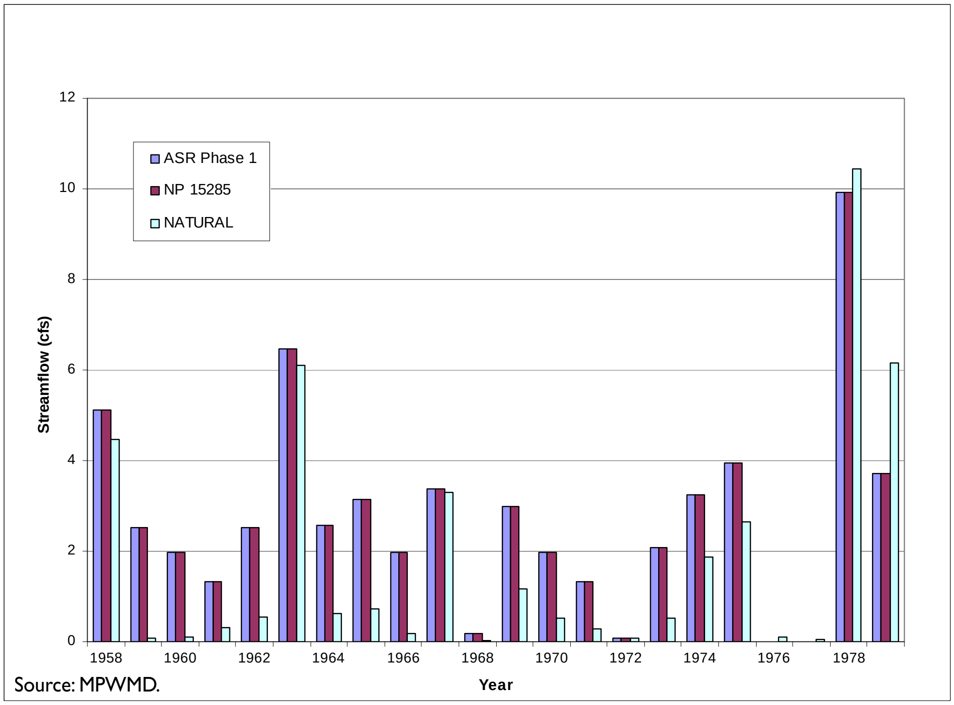
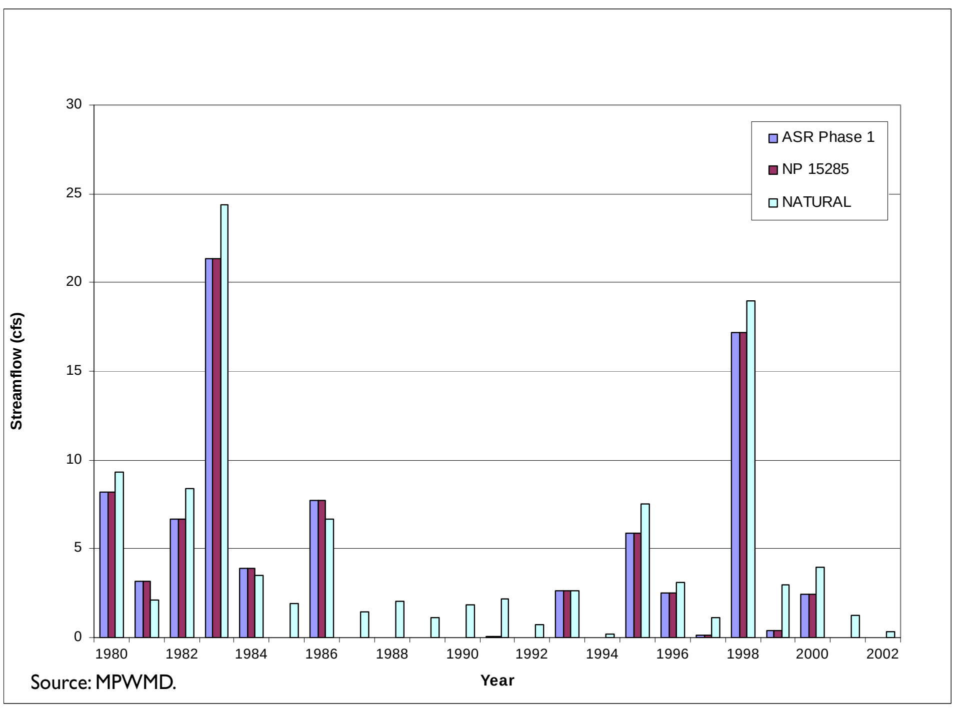


Figure 5-9a
Seasonal Minimum Monthly Streamflow in the Carmel River at the Narrows with Alternative Water Supply Projects, 1958-1979



04637.04 EIR (11-05)

Figure 5-9b
Seasonal Minimum Monthly Streamflow in the Carmel River at the Narrows with Alternative Water Supply Projects, 1980-2002

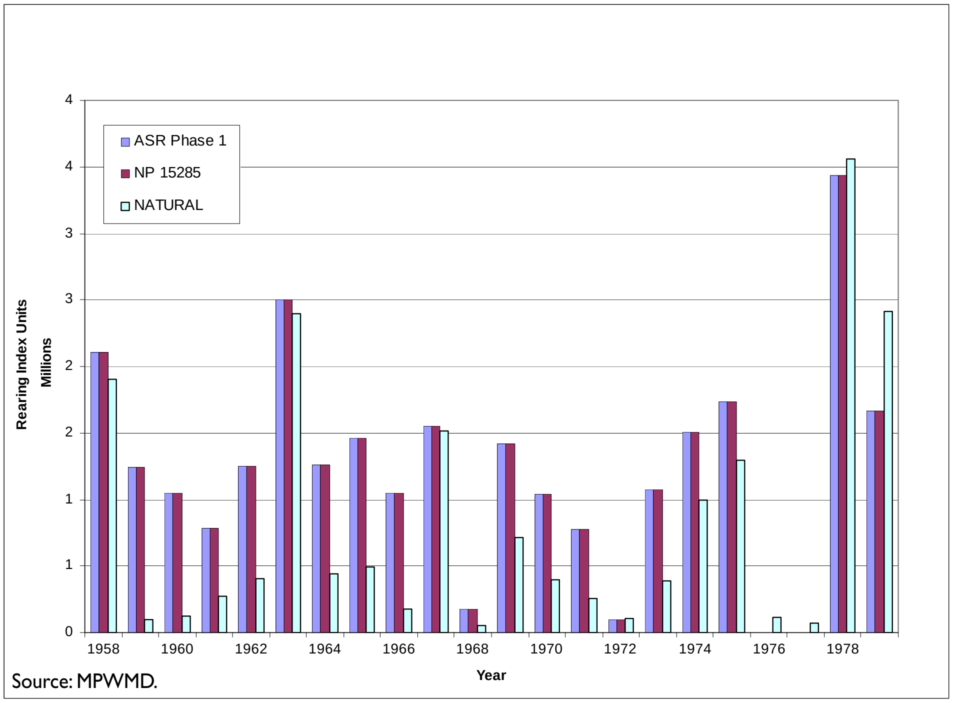
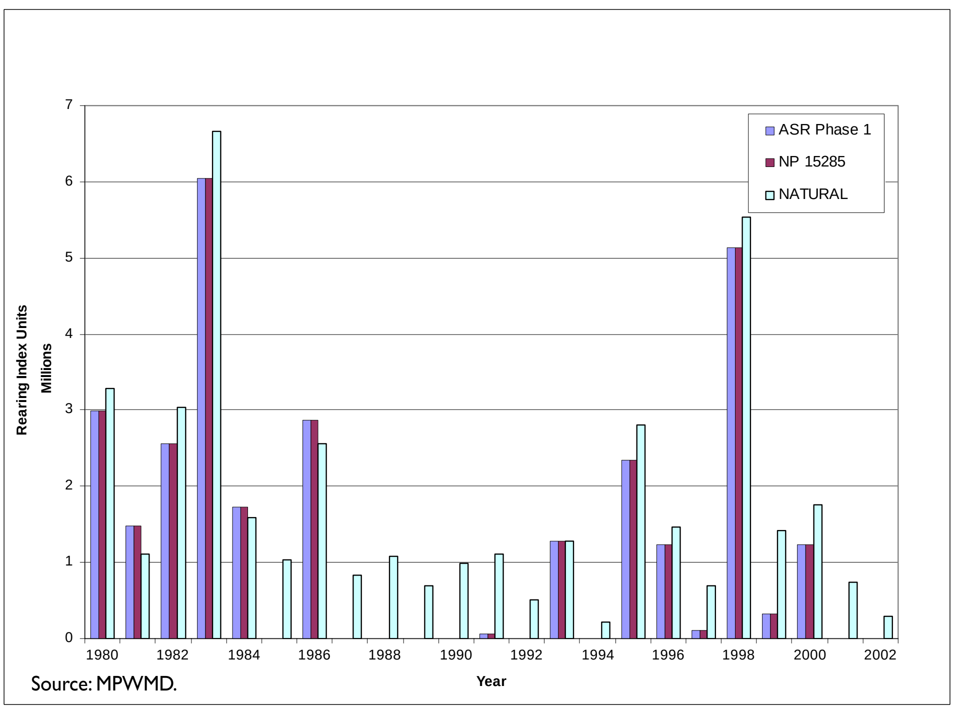


Figure 5-10a
Minimum Seasonal Rearing Habitat for Age 0+ Juvenile Steelhead in the Carmel River between the Narrows and San Clemente Dam with Alternative Water Supply Projects, 1958-1979



04637.04 EIR (11-05)

Figure 5-10b
Minimum Seasonal Rearing Habitat for Age 0+ Juvenile Steelhead in the Carmel River between the Narrows and San Clemente Dam with Alternative Water Supply Projects, 1980-2002

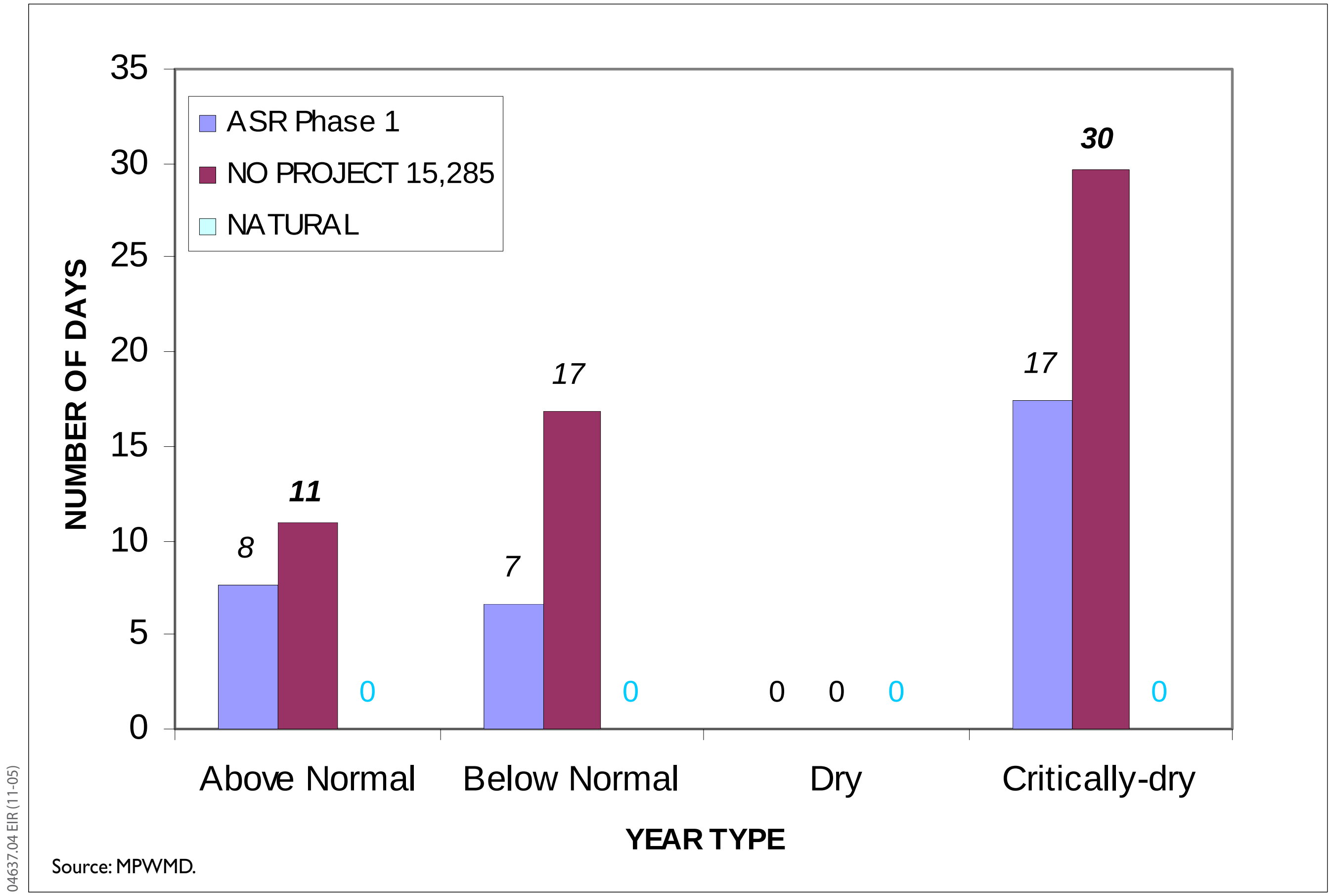


Figure 5-11
Average Number of Days in October-March Period during Which Juvenile Steelhead Would Be at High Risk of Stranding in Reach between Via Mallorca Road and the Narrows with Alternative Water Supply Projects, by Type of Water Year, 1958-2002

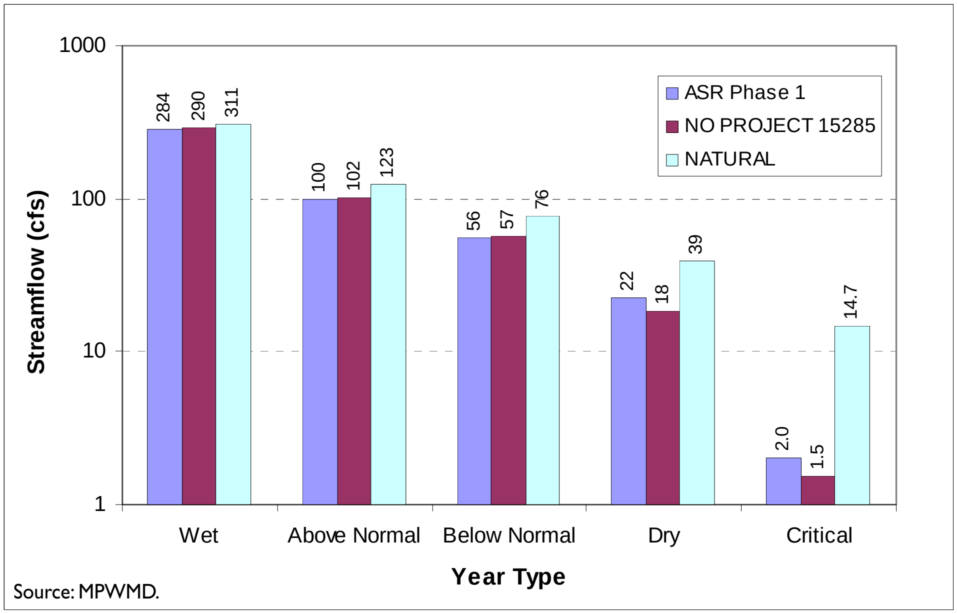


Figure 5-12
Average streamflow (Apr-May) into Carmel River Lagoon for Emigration of Smolt Steelhead, 1958-2002, by type of water year

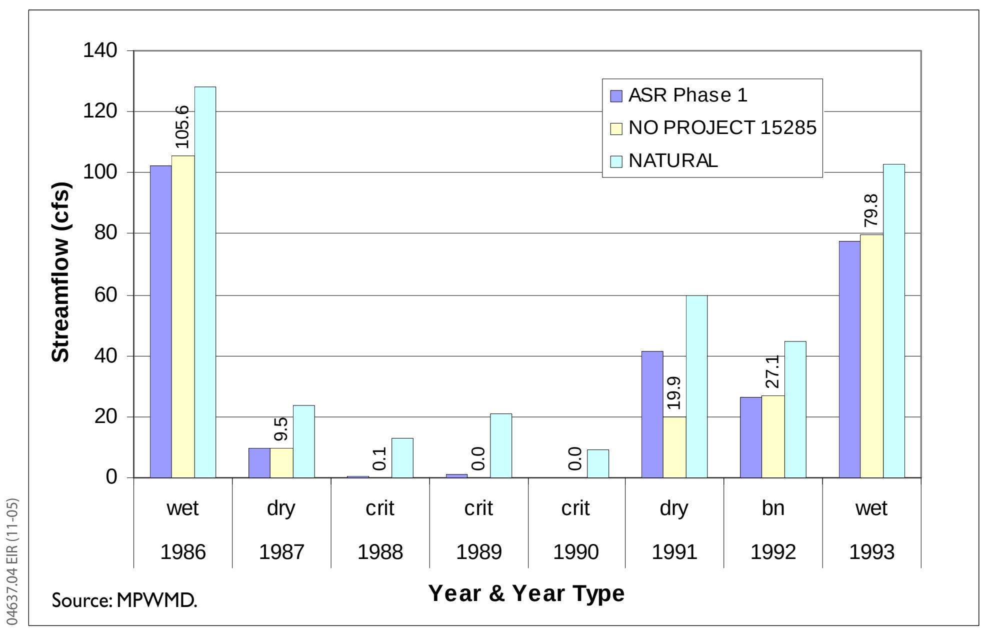
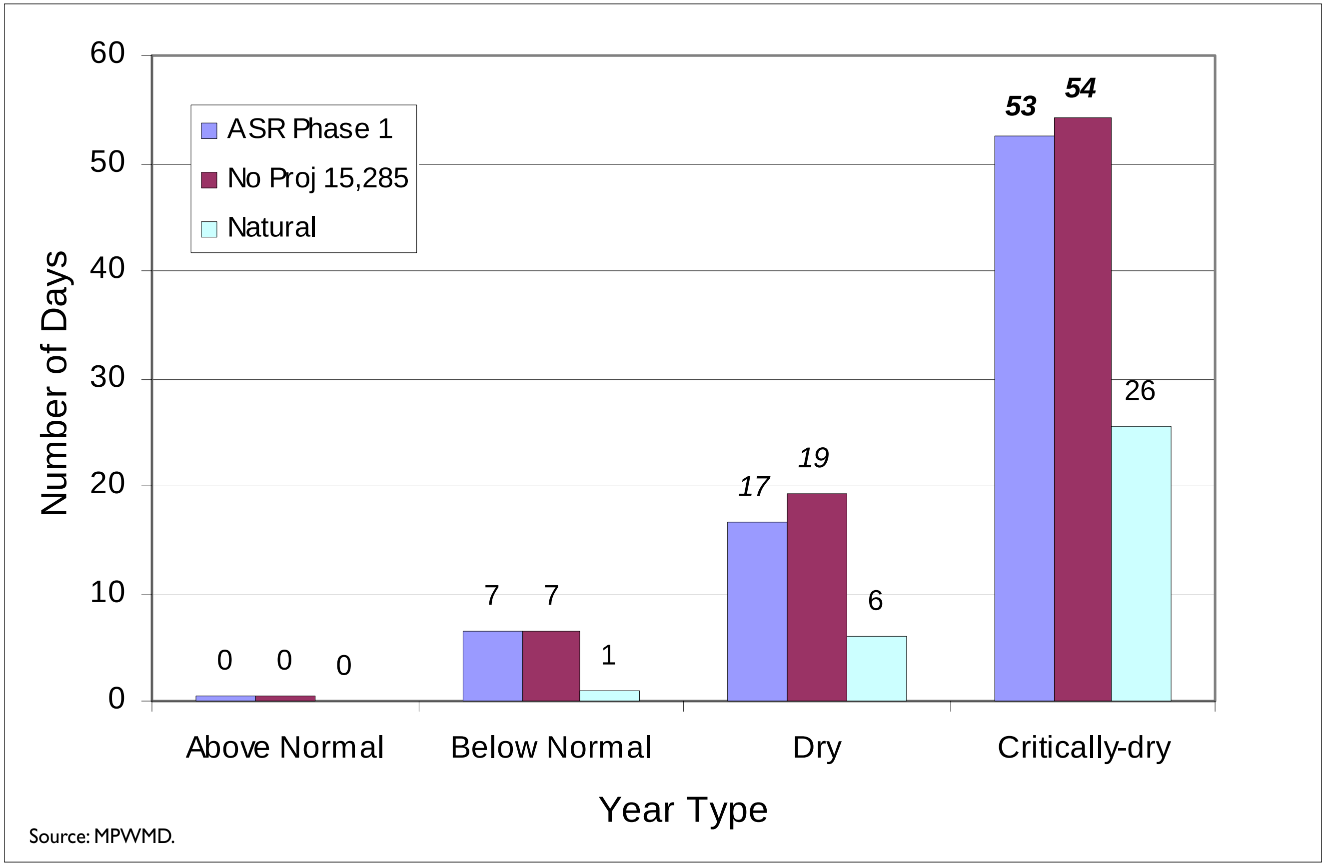


Figure 5-13
Average streamflow (Apr-May) into Carmel River Lagoon for Emigration of smolt steelhead, 1986-1993, with ASR Phase 1, No Project, and Natural Flows
Note: Type of water year shown above Year



04637.04 EIR (11-05)

Figure 5-14
Number of days in April-May period during which steelhead smolts would be at high risk of stranding and isolation in the reach from Via Mallorca Road to the Narrows, 1958-2002, by type of water year

Note: Bold Italic Print for data labels above bars indicates significant difference in number of risk days compared to natural flows. Based on paired t-test of means at <= .01 probability level. Data labels in *Italic print* indicate significant difference at <= .05 probability

Chapter 6
Cultural Resources

Setting

Cultural resources encompass several different types of properties, including prehistoric and historic archaeological sites; architectural features such as buildings, bridges and other structures; and places and resources of importance to the Native Americans who identify with the area.

A resource may be eligible for inclusion in the California Register of Historic Resources (CRHR) if it:

- is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
- is associated with the lives of important historical figures;
- embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic value; or
- has yielded, or may be likely to yield, important prehistoric or historic information.

Prehistoric Background

Archaeological evidence and radiocarbon dates establish human occupation of the California coast dating back at least 10,000 years. Evidence from coastal areas of Monterey County suggests settlement of this area by at least 7,000 years ago and possibly earlier. Breschini and Haversat have identified early, middle, and late cultural components on the Monterey Peninsula (Breschini and Haversat 1980 *et seq.*). The early component dates to approximately 5,000 to 2,200 years ago (or 3000 B.C. to 200 B.C.) and is characterized by hunters and gatherers (Binford 1980, cited in http://www.calforniaprehistory.com/reports01/rep0023.html.). Population and habitation sites were small, and the sites are reflected as small village sites in the archaeological record. Sites that date to this era reveal that the populations were mobile and moved to reach food resources. As the middle period approached, these sites were abandoned (Breschini and Haversat 1993).

According to Breschini and Haversat (1993), the sites that are dated to the end of the middle period show a distinct shift to larger residential centers, such as the Rancho San Carlos area south of Carmel. As technological advances occurred over the last 2,000 years, the shift in the settlement patterns of the population reveals that the inhabitants of the Monterey Peninsula developed methods of specialized food collection as a result of their new technology (http://www.californiaprehistory.com/reports01/rep0023.html). During this period, there were many special-purpose sites for various resources, including shellfish-processing sites such as CA-Mnt-149, which is located in Spanish Bay approximately 6 miles south of Sand City. Many of these specialized sites are in the same locations as the early period village sites (Breschini and Haversat 1993). The resources gathered at the specialized processing sites were then transported back to the residential sites, revealing a greater diversity of site types in the archaeological record. This pattern of large residential sites and dispersed special food processing sites persisted until the historic period (Breschini and Haversat 1993).

There is a significant amount of archaeological evidence of these settlements in the hills, on the coast, and along the coastal bluff. The toolkits used by the population tend to include large projectile points, milling stones, domed scrapers, large used flake stones, and many bone and shell tools. The artifacts found in the numerous sites on the Monterey Peninsula reveal that the subsistence patterns of the people who lived in the area were based on the exploitation of marine resources; evidence exists of marine mammals, net fishing, fishing, intensive shellfish-processing, and the use of terrestrial resources (Breschini and Haversat 1993).

Ethnographic Background

The project study area is located within the ancestral territory of the Ohlone. Historically, the Ohlone were called the *Costanoan Indians*. *Costanoan* is the name assigned to the group by the Spaniards and is derived from the word *costaños*, meaning "people of the coast." The term *Ohlone* is preferred by the group themselves.

The Ohlone are believed to have inhabited the area 1,500 years ago. Their territory extended along the coast from San Francisco Bay in the north to just beyond Carmel in the south, and as much as 60 miles inland. The Ohlone are a linguistically defined group speaking eight different yet related languages and composed of several autonomous tribelets. The Ohlone languages, together with Miwok, make up the Utian language family of the Penutian stock (Levy 1978).

The Monterey Peninsula and the current location of the former Fort Ord were inhabited by the Rumsen group of Ohlone Indians at the time of contact. According to Milliken's maps (Milliken 1992), the Rumsen territory encompassed the Carmel River Valley and the Monterey Peninsula. Much of the information that has been gathered regarding the Rumsen population has been derived from baptismal records from the Carmel Mission (Milliken 1992). The closest Rumsen village to the Monterey Peninsula was likely named Achasta (Milliken 1992).

During the summer months, the Ohlone would spend much of their time camped at the beach to enjoy the abundance of resources such as sea birds and fish (Milliken 1992). In the fall months, they would spend their time more dispersed in search of acorns and various other resources that could be stored for the winter months ahead (Milliken 1992). During the winter, the Ohlone would return to a more sedentary lifestyle and reside in the villages. In the spring, particularly May and June, they focused on a period of intense gathering of edible and medicinal plant resources such as clover, goosefoot, wild peas, and lupine.

The Ohlone were hunter-gatherers, using only the native flora and fauna. Acorns and various seafoods were heavily relied upon as a means of subsistence. However, a wide range of other foods was used, including assorted seeds, buckeye, berries, roots, land and sea mammals, waterfowl, reptiles, and insects. The Ohlone practiced some forms of resource management similar to agriculture practices. For example, some plants were pruned and re-seeded seasonally for optimum production. Acorns were among several foods stored for months at a time. Controlled burning of vast areas of land was implemented to promote the growth of seed-bearing annuals and to increase the available grazing areas for deer, elk, and antelope (Levy 1978).

Historic Background

Spanish

After Juan Cabrillo discovered Monterey Bay in 1542, it became the focus of several Spanish exploratory expeditions. Sebastian Vizcaino, who sailed into Monterey Bay in 1602, named it for Conde de Monterrey, Viceroy of Spain. The Franciscans founded three missions (San Carlos Borromeo, San Antonio de Padua, and Nuestra Sonora de Soledad) in what is now Monterey County. The missions, along with the presidio established in the late 1700s and eight large ranchos that formed from land concessions to Spanish army veterans, became focal points of activity.

Mexican

When the Mexican Republic formed in 1822, the missions were secularized, and new ranchos developed on 68 Mexican land grants. An agrarian economy emerged, based on cattle ranching on large ranchos. This economy received a boost when the Mexican regime opened Monterey harbor to foreign trade, enabling rancheros to trade their hides and tallow for products from the outside world. The Custom House in Monterey became the site for collection of duties, providing the main source of income for Alta California’s government. This commercial vitality, supported by Monterey Bay’s ideal harbor, led to Monterey’s role as the Mexican capital of Alta California.

American

Monterey continued to play a key role after the Americans took control of California in the late 1840s. For example, the convention to draft and sign California's new constitution convened at Colton Hall in Monterey. This period coincided with the California gold rush and economic growth in the region.

Economy

During the first half of the nineteenth century, fruits and vegetables dominated the market. During the 1850s, the market for beef and grain increased to feed the gold prospectors, and dairy farming was introduced in the area around the communities of Gonzales and Soledad. Dairy farming spurred alfalfa production in Monterey County to feed the cattle, and alfalfa production required irrigation. During the 1870s, the Southern Pacific Railroad extended its rail line from Pajaro in Monterey County southeast to the Salinas Valley, which enabled crops to be shipped more efficiently. The combination of improved irrigation systems and additional railroad connections spurred the economic growth of Monterey County.

The fishing industry started in the Monterey Peninsula as early as the late nineteenth century when Portuguese and Chinese fisherman fished the region for salmon. In the early twentieth century, Frank Booth converted his salmon cannery and packing plant to sardine production because he was impressed with the large schools of sardines around the Monterey Wharf. By 1913, three other canneries were established in the area. Sardine production exploded during World War I when the U.S. sardine supply from Europe was stopped, and by the late 1930s, Monterey became the third-largest fish tonnage port in the world. By 1948, the waters were depleted by over-fishing, and the last cannery closed. Although the community initially suffered from the economic loss, the region revived as a tourist destination in the late twentieth century (Fink 1972; Kyle 1990.)

Military

There has been a military presence in Monterey County since Americans took control of the Presidio of Monterey in the 1840s. In 1917, Fort Ord was created from land designated as City of Monterey Tract No. 1 and several ranches. The installation was originally called Gigling Reservation and was a subinstallation of the Presidio of Monterey. The reservation was renamed Camp Ord in 1933 after Major General Edward Ord, an important figure in California military history (U.S. Army Corps of Engineers 1996).

During the early years, the reservation was used to drill the 11th Cavalry, which was stationed at the Presidio of Monterey. Before 1938, the only improvements at Camp Ord were a caretaker's house and a few bivouac sites. Beginning in 1940, many facilities were built at Camp Ord using funds from the Work

Progress Administration, including the East Garrison complex of buildings and Stilwell Hall. In the same year the camp was renamed Fort Ord, and the 7th Infantry Division was reactivated and stationed there. After the attack on Pearl Harbor, Fort Ord was expanded and construction increased dramatically. In addition to artillery training, Fort Ord was an important staging area for units deployed to the Pacific during World War II and was used as a processing center for deactivated personnel when the war ended. During the Korean War, Fort Ord was again used as a basic and advanced training facility for artillery and ground troops. In 1953, the areas of Camp Roberts and Hunter Liggett, also in Monterey County, were placed under the command of Fort Ord as subinstallations (U.S. Army Corps of Engineers 1996). In 1994, Fort Ord became the 72nd stateside Army post to close in accordance with Base Realignment and Closure (BRAC) Commission recommendations. The land of the former Fort Ord is being disposed of to various federal, state, local, and private entities. The coastal area west of SR 1 is being transferred to California Department of Parks and Recreation (DPR) for use as a state park. This area encompasses a component of the project study area.

Former Fort Ord

Three archaeological surveys have been conducted within the boundaries of the former Fort Ord, all of them more than 20 years old (A. S. Peak and Associates 1978; Johnson 1975; Swernoff 1982). The Swernoff survey covered the largest total area and made recommendations regarding high-, medium-, and low-sensitivity areas for the presence of cultural resources. The project study area is located in the low-sensitivity area, according to Swernoff. Also, only two archaeological sites have been located within the former Fort Ord, CA-Mnt-416 and CA-Mnt-933H, and both sites are located outside the project study area and away from the Coastal Zone (Swernoff 1982).

At present, the Army has a programmatic agreement (PA) with the California State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) concerning the management of cultural resources. The *Programmatic Agreement among the Department of the Army, the Advisory Council on Historic Preservation and the California State Historic Preservation Officer Regarding Base Closure and Realignment Actions at Fort Ord, California* was established in 1993 (Jones & Stokes Associates 1992). The PA states that all but the few properties within the former Fort Ord that are eligible for the National Register of Historic Places (NRHP) have been determined not significant cultural resources. Zahnier and Roberts conducted a cultural resource overview for Fort Ord in 1980. Several historic properties were recommended for eligibility for listing in the NRHP. Those properties include Whitcher Cemetery, Stilwell Hall, Martinez Hall, and the Mess Hall Complex in the East Garrison. None of these properties is located in the project study area.

Impacts and Mitigation Measures

Methodology and Significance Criteria

Records Search

On July 13, 2005, a Jones & Stokes archaeologist conducted a records search at the Northwest Information Center of the California Historical Resources Information System at the Sonoma State University. A review of all of the archaeological sites and surveys within 0.5 mile of the project study area, historical maps, and the Historic Resources Index was performed. Additionally, historic maps for the project study area, the NRHP, and the CRHR were consulted.

The records search at the Northwest Information Center did not result in the identification of any previously recorded prehistoric or historic resources within .5 mile of the project study area. One previous study has been conducted in surrounding vicinity (PMC 2004) but none in the project area. The closest prehistoric archaeological site, CA-Mnt-699, is located approximately 1.5 miles west of the project area in the coastal dunes (Weber and Peak 1976).

Field Survey

No field survey was conducted for the Fort Ord well site because of the extensive surveying that was completed in the past for the entire former Fort Ord, as described above.

Native American Consultation

On August 3, 2005, a Jones & Stokes archaeologist faxed a letter to the Native American Heritage Commission (NAHC) requesting that they consult their sacred lands database as well as send a list of the interested Native American groups and individuals for the project area. Letters were sent to all interested Native American groups or individuals describing the nature of the project and requesting that they contact Jones & Stokes with concerns or comments regarding cultural resources in the project area.

The NAHC identifies any important cultural sites in the project study area in their sacred lands database. No responses have been received from the letters sent to the interested Native American individuals.

Approach

The potential for the presence of archaeological or historical resources in the project study area is based on the field survey, records search, and Native American consultation described above. According to CEQA, a historical resource is considered significant if it is identified as a "resource listed or eligible for listing on the California Register of Historical Resources" (Public Resources Code Section 21084.1). For a historical resource to be eligible for listing in the CRHR, it must be significant at the local, state, or national level under one or more of the following four criteria.

- It is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States.
- It is associated with the lives of persons important to local, California, or national history.
- It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values.
- It has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Those properties listed in, or formally determined eligible for listing in, the NRHP are automatically listed in the CRHR.

Significance Criteria

The project would have a significant impact on cultural resources if it would potentially:

- disrupt or adversely affect a prehistoric or historic archaeological site or property of historic or cultural significance to a community or ethnic or social group, except as a part of a scientific study, or
- conflict with an established recreational, educational, religious, or scientific use of an area.

Construction Impacts

Impact CR-1: Potential for Discovery of Buried Cultural Deposits and Human Remains during Construction of the Well and Pipelines

There are no known archeological sites, nor cultural resources meeting the four criteria for listing on the CRHR, and no structures more than 45 years old at or adjacent to the Proposed Project area. Although there are no known cultural resources in the project study area, there is always the potential for inadvertent discovery of buried cultural deposits and/or human remains at any location in which ground-disturbing activities will be taking place. **This impact is considered significant, but would be reduced to a less-than-significant level by implementing Mitigation Measures CR-1 and CR-2.**

Mitigation Measure CR-1: Stop Work If Buried Cultural Deposits Are Encountered during Construction Activities.

If buried cultural resources such as chipped stone or groundstone, historic debris, building foundations, or human bone are inadvertently discovered during ground-disturbing activities, the construction contractor will stop work in that area and within a 100-foot radius of the find until a qualified archaeologist can assess the significance of the find and, if necessary, develop appropriate treatment measures. Treatment measures typically include avoidance strategies or mitigation of impacts through data recovery programs such as excavation or detailed documentation.

Mitigation Measure CR-2: Stop Work If Human Remains Are Encountered during Construction Activities.

If human skeletal remains are encountered, the construction contractor will notify MPWMD and the county coroner immediately. MPWMD will ensure the construction specifications include this order.

If the county coroner determines that the remains are Native American, the coroner will be required to contact the NAHC (pursuant to Section 7050.5 [c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs. A qualified Jones & Stokes archaeologist will also be contacted immediately.

If human remains are discovered in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

- the coroner of the county has been informed and has determined that no investigation of the cause of death is required; and
- if the remains are of Native American origin:
  - the descendants from the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of with appropriate dignity the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98; or
  - the NAHC was unable to identify a descendent or the descendent failed to make a recommendation within 24 hours after being notified by the commission.

According to the California Health and Safety Code, six or more human burials at one location constitute a cemetery (Section 8100), and disturbance of Native American cemeteries is a felony (Section 7052). Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If the remains are determined to be Native American, the coroner must contact the NAHC.

Operation Impacts

There are no known archaeological sites, no cultural resources meeting the four criteria listed above, and no structures more than 45 years old in the project study area. In addition, operation of the project would not require ground-disturbing activities.

Operation of the project would not result in flows in the Carmel River outside of existing flow variations. This would not affect cultural resources located along the Carmel River because enhanced flows would remain within the existing river channel. **No operational impacts on cultural resources would occur.**

Chapter 7
Geology, Seismicity, and Soils

Introduction

This chapter describes the geologic, seismic, and soil conditions in the vicinity of the proposed new well and in the region. It does not include a description of the Carmel River Valley, as the project does not include construction of new facilities in this area. The chapter also identifies potential construction- and operation-related impacts associated with the project and mitigation measures to reduce the severity of those impacts.

Setting

Regional Geology and Stratigraphy

The Monterey area is a tectonically active region. It is part of the Salinian block, a complexly deformed block that is bounded by the San Andreas Fault to the northeast and the San Gregorio fault zone to the southwest. At the San Andreas fault, the Pacific Plate, which is moving northwest, meets the North American Plate, causing extensive seismic activity. The geology of the Monterey area is characterized by compressional tectonics, and high-angle faults trend northwest across it. Most of these faults are less than 1 mile long, but the Tularcitos/Navy fault zone extends for many miles. (Clark, Dupré, and Rosenberg 1997.) Figure 7-1 shows the location of faults in the project area.

The regional topography of the Monterey area has been shaped by tectonic uplifting (mountain-building) and coastal erosion and deposition.

The predominant rock types mapped in the Monterey area are described below.

- Quaternary deposits associated with marine environments (e.g., dune, beach, alluvial, and coastal terrace deposits) are widespread throughout the area, becoming less abundant with distance from the coast.
- The Tertiary Monterey Formation, a thick (up to almost 3,000 feet) series of siliceous and diatomaceous beds, is a ridge-forming unit that underlies the Quaternary deposits. It outcrops extensively in the steeper inland areas.

- The Cretaceous porphyritic granodiorite of Monterey is a granitic unit that underlies the Monterey Formation. It outcrops offshore, at the edges of the peninsula, and in the southern and eastern portions of the peninsula.

Project Area Topography

Elevation in the project area is approximately 340 feet above mean sea level (MSL). The area is generally flat with a gentle rise in elevation in an easterly direction from General Jim Moore Boulevard.

Project Area Geology

The surficial geology of the project area is made up of Pleistocene dune deposits that are composed of weakly consolidated, moderately well-sorted to well-sorted silt and sand (the Aromas formation). These dune deposits occur in a wide band along the coast (Clark, Dupré, and Rosenberg 1997).

This formation overlies 100–200 feet of the Paso Robles formation (which is part of the continental deposits of Clark, Dupré, and Rosenberg 1997) and the Santa Margarita Sandstone, which overlies the Monterey Shale (Camp, Dresser & McKee 2003a).

Several roughly parallel, northwest-trending faults exist in the vicinity of the project area (Clark, Dupré, and Rosenberg 1997; Camp, Dresser & McKee 2003a; California Division of Mines and Geology 2000). Active faults are those faults that show evidence of Holocene movement (e.g., offset Holocene strata). Potentially active faults are those faults that show evidence of Pleistocene movement (Hart and Bryant 1997).

- Navy fault—an active strike-slip fault approximately 3.3 miles the south of the project area. Two large earthquakes with a magnitude of 6.1 may have been associated with the Navy fault. Because of its alignment with the Tularcitos fault and its similar trend, the Navy fault may be an extension of the active Tularcitos fault. (Clark, Dupré, and Rosenberg 1997.)
- Chupines fault—an active strike-slip/reverse fault approximately 2.2 miles south of the project area. Four epicenters have been plotted within 1 km of the Chupines fault. (Clark, Dupré, and Rosenberg 1997.) This fault is shown on the Monterey County map of major fault lines (2001).
- Seaside fault—an inactive reverse fault approximately 2 miles south of the project area (Clark, Dupré, and Rosenberg 1997). This fault is shown on the Seaside General Plan map of major fault lines (City of Seaside 2003a).
- Ord Terrace fault—a potentially active or active reverse fault approximately .6 mile south of the project area (Clark, Dupré, and Rosenberg 1997). This fault is not shown on the Monterey County map of major fault lines but is

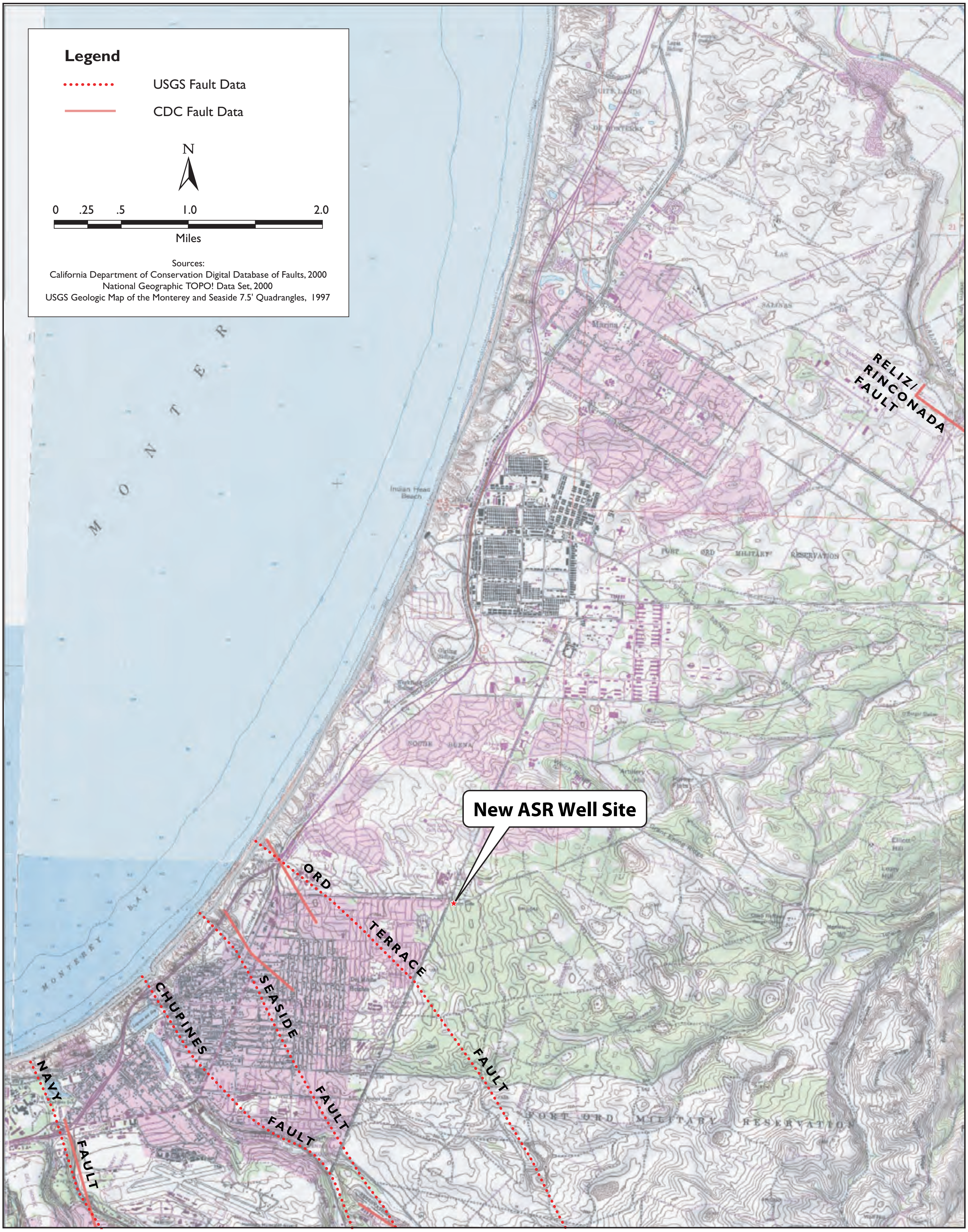


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Figure 7-1
Faults near the Proposed Project Site

shown in the Seaside General Plan (Monterey County 2001; City of Seaside 2005).

- Reliz/Rinconada fault—an active strike-slip fault approximately 5 miles northeast of the project study area (Jenning 1994; Southern California Earthquake Data Center 2003). This fault is specifically mentioned in the Monterey County General Plan. Areas within 300 feet of this fault are considered to be in a geologic hazard zone (Monterey County 2001).

Project Area Soils

Soils in the project area have been mapped and described by the U.S. Soil Conservation Service (Cook 1978). Baywood sand (2-15% slopes) covers the entire project area. This soil is an excessively drained soil that formed in stabilized sand dunes. It is a gently sloping to rolling soil made up of sand. It is usually less than 20 inches thick, runoff is slow to medium, and the erosion hazard is slight to moderate (Cook 1978).

Potential Geologic Hazards

Seismic Conditions

The project area is in a seismically active region (Clark, Dupré, and Rosenberg 1997; Petersen et al. 1999; California Division of Mines and Geology 2000). Potential hazards associated with seismic activity are described below.

Seismic Ground Shaking

Because the project study area is in a tectonically active region, it could be subject to seismic ground shaking during an earthquake (Camp, Dresser & McKee 2003a). California Division of Mines and Geology (CDMG) (now called the California Geological Survey [CGS]) has classified the probabilistic seismic hazards for the state (Peterson et al. 1999) using a measure called peak ground acceleration. This measure is used to estimate the likelihood of peak horizontal ground acceleration (i.e., maximum acceleration parallel to the earth's surface, where 1 gravity [g] is the force of gravity) values that might be exceeded in a given region of California at a 10% probability in 50 years (i.e., a 0.2% probability in 1 year). This measure can be used to assess the relative seismic ground-shaking hazard for a given region. The probabilistic peak horizontal ground acceleration value, and thus the seismic ground-shaking hazard, for the project area is 45 %g (Petersen et al. 1999; Monterey County 2001), which is in the low range for seismic hazard.

All project components are in an area prone to ground shaking.

Liquefaction

Liquefaction is a process in which soils and sediments lose shear strength and fail during prolonged, intense seismic ground shaking. The susceptibility of an area to liquefaction is determined largely by the depth to groundwater and the properties (e.g., texture and density) of the soil and sediment above the groundwater. The sediments most susceptible to liquefaction are saturated, unconsolidated sand and silt within 50 feet of the ground surface. During ground shaking, saturated soils and sediments lose cohesion and "liquefy." (California Division of Mines and Geology 1997.)

Lateral spreading is a failure of soil/sediment within a nearly horizontal zone (possibly due to liquefaction), which causes the soil to move toward a free face (such as a streambank) or down a gentle slope. Lateral spreading can occur on slopes as gentle as one half a degree percent. Even a relatively thin seam of liquefiable sediment can create planes of weakness that could cause continuous lateral spread over large areas. (California Division of Mines and Geology 1997.)

The liquefaction potential in the project area is low (Monterey County 2001).

Accelerated Erosion

Erosion is the process by which soil material is detached and transported from one location to another by wind or water. Erosion occurs naturally in most systems, but is often accelerated by human activities that disturb soil and vegetation. The rate at which natural erosion and accelerated erosion occur is largely a function of climate, soil cover, slope conditions, and inherent soil properties such as texture and structure. (Johnson undated.)

The project study area is in a zone designated by the county (Monterey County 2001) as low erosion hazard. This designation is a result of the low slope in the project area. Also, the Baywood soils of the project area have a low erosion potential.

Slope Stability

Slope stability is the resistance of a slope to failure by landsliding. For the entire project area, topography is gently sloping (i.e., 0–10%); therefore, slope stability is not a concern (rated low in the Monterey County General Plan [Monterey County 2001]).

Expansive Soil

Most fine-textured and moderately fine-textured soils and sediments expand and contract to some degree in response to fluctuations in water content. In certain instances, expansive soils and sediments can cause substantial damage to surface and near-surface structures such as roads, building foundations, and buried utilities.

The tendency of a given soil to expand when wetted is referred to as its "expansion potential" and is measured by determining its expansion index . According to Cook (1978), the expansion potential of Baywood sand is low.

Corrosive Soil

It is worthwhile to note the corrosive properties of the soil mapping unit in the project area.. According to Cook (1978), Baywood sand is highly corrosive to uncoated steel and moderately corrosive to concrete.

Tsunami

A tsunami is a great sea wave produced by submarine earth movement or volcanic eruption. Tsunamis can cause severe flooding and erosion in coastal areas, which can result in loss of life and destruction of property. Because of the project area's elevation of 340 feet above mean sea level, there is no tsunami threat.

Regulatory Setting

Federal Regulations

Clean Water Act

Section 402 of the CWA mandates that construction activity disturbing 1 or more total acres comply with the requirements of the NPDES stormwater permit for general construction activity. The ASR project construction activities would not disturb more than 1 acre and therefore would not be subject to NPDES requirements. The Central Coast RWQCB administers the stormwater permit program in the Monterey area.

State Regulations

California Building Code Commission

Established in 1953 by the California Building Standards Law, the California Building Standards Commission (BSC) is an independent commission within the State and Consumer Services Agency. The BSC's mission is to produce sensible and usable state building standards and administrative regulations that implement or enforce those standards. As provided in established laws and rules, the BSC is charged with:

- Assisting state agencies in producing high-quality amendments.
- Working to repeal unnecessary building regulations and see that ambiguous regulations are more clearly written.
- Assisting various constituents and special interest groups in making their needs known to various code-writing departments.
- Administering a public appeal process.
- Educating the public about the state's building code, and helps them to understand and comply with it.
- Ensuring a high-quality California Code of Regulations, Title 24, with minimal errors.

The California Building Code (CBC) contains general construction building standards of state adopting agencies.

Uniform Building Code (International Building Code)

The design and construction of engineered facilities in the state of California must comply with the requirements of the Uniform Building Code. The International Code Council (ICC) was established in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes, or Uniform Building Codes. The founders of the ICC are Building Officials and Code Administrators International, Inc. (BOCA), International Conference of Building Officials (ICBO, and Southern Building Code Congress International, Inc. (SBCCI). Since the early twentieth century, these nonprofit organizations developed the three separate sets of model codes used throughout the United States. Although regional code development has been effective and responsive in the past, a single set of codes was developed. The nation's three model code groups responded by creating the ICC and by developing codes without regional limitations, the International Codes.

Impacts and Mitigation Measures

Methods and Assumptions

Impacts related to geology, seismicity, and soils that could result from construction activities were qualitatively evaluated based on the aforementioned geologic hazards, on the construction practices and materials to be used, and the location and duration of the activities. It is assumed that erosion and sediment control measures will be implemented as part of the project design.

Impacts related to geology, seismicity, and soils that could result from operation activities were evaluated based on the assumption that the design and construction materials will be adequately evaluated by a licensed geotechnical engineer prior to construction and will meet or exceed Uniform Building Code standards for seismic stability and liquefaction.

Significance Criteria

Criteria for determining the significance of impacts related to geology, seismicity, and soils were developed based on the environmental checklist form in Appendix G of the State CEQA Guidelines. Impacts were considered significant if the project alternatives would:

- expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides;
- be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project;
- be located on expansive soil that could cause significant damage to or disruption of engineered utilities or structures; or
- result in substantial soil erosion or the loss of topsoil.

Construction Impacts

Impact GS-1: Potential Short-Term Increase in Erosion Resulting from Project Construction

As ground is disturbed and vegetation is removed during construction of the new ASR well and related pipelines, soil would be exposed to rain and wind, potentially causing accelerated erosion and deposition of sediment into nearby drainages. Erosion and sedimentation could result in a short-term increase in turbidity in waterways receiving runoff, potentially causing water quality degradation. While the small size of ground disturbance (0.7 acre) does not warrant preparation of a stormwater pollution prevention plan (SWPP), local government grading ordinances will require the construction contractor adopt BMPs that will prevent all construction pollutants from contacting stormwater and has the intent of keeping all products of erosion from moving off site into receiving waters. These ordinances state the procedures, standards, and enforcement measures that shall be used to manage soil erosion and subsequent sedimentation in order to sustain the goal of clean water.

The implementation of BMPs would prevent the increase in turbidity in receiving waters as a result of project construction. The employment of grading ordinances would prevent substantial soil erosion or the loss of topsoil. Therefore, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Operation Impacts

Impact GS-2: Potential Structural Damage and Threat to Public Safety from Fault Displacement and Ground Shaking during a Seismic Event

Local seismic activity is not expected to cause fault rupture in the project area, as it is approximately 0.6 mile north of the nearest known fault. However, ground shaking caused by regional earthquakes could result in severe damage to structures and utilities and pose a significant risk to public safety. Unless constructed to withstand the potential shaking caused by an earthquake, structures could collapse or be shifted off their foundations and pipelines and wells could fail. Before constructing the Proposed Project facilities, the engineering design or construction drawings must be approved by adhering to the California Building Standards Law. The California Building Standards Commission (BSC) is an independent commission within the State and Consumer Services Agency. The BSC is authorized by California Building Standards Law (Health and Safety Code Sections 18901 through 18949.6) to administer the processes related to the adoption, approval, publication, and implementation of California's building codes. These building codes serve as the basis for the design and construction of buildings and other structures in California. The purpose of the codes is to ensure public safety and ascertaining the suitability of materials, methods or systems of construction.

All of the proposed ASR facilities would be constructed in an area with low ground shaking potential, and would be constructed to withstand the potential shaking caused by an earthquake, consistent with state building codes. Thus, because of the implementation of these building codes, **this impact is less than significant**.

Mitigation: No mitigation is required.

Impact GS-3: Potential Structural Damage and Threat to Public Safety from Earthquake-Induced Liquefaction and Lateral Spread

All project facilities would be constructed in an area with low potential for earthquake-induced liquefaction. Therefore impactsfrom construction of the new well and associated pipelines are expected to be **less than significant**.

Mitigation: No mitigation is required.

Impact GS-4: Potential Rupture of Pipelines and Threat to Public Safety Caused by Expansive Soils and Pipeline Corrosion

The project area does not contain expansive soils, so the threat of damage to project facilities from soil expansion is less than significant. However, the soils of the area are highly corrosive to uncoated steel and moderately corrosive to concrete. This corrosivity poses a threat to the long-term viability of the new well and its associated facilities.

The project pipelines, well and other facilities would be constructed to reduce the potential for corrosion and eventual failure to the extent feasible. Construction measures could include:

- Construct pipelines and other project facilities to withstand the effects of soil corrosion using standard and tested methods of pipeline protection such as pipeline coating.
- Conduct regular inspections of the pipelines and well during operation at an interval that is in accordance with safe and standard operating practices. The inspections may be conducted by visual inspection or with specialized equipment used to detect potential damage and leaks.

Because the project facilities would be constructed to minimize damage to pipelines from corrosion, the impact on public safety is considered **less than significant**.

Mitigation: No mitigation is required.

Chapter 8

Surface and Groundwater Hydrology and Water Quality

Seaside Groundwater Basin

Setting

The project area is located over the Seaside Groundwater Basin (SGB), which underlies an approximately 19-square mile area at the northwest corner of the Salinas Valley, adjacent to the Monterey Bay. The general location of the SGB and its four subareas are shown in Plate 1. The basin has been studied extensively by numerous investigators since 1974, when a report on the SGB was prepared by the California Department of Water Resources. The SGB has been subsequently studied in detail in reports prepared for the MPWMD and others. The more significant of these studies include:

- Staal, Gardner and Dunne, Inc. (1987), Hydrogeologic Investigation, Seaside Coastal Ground Water Basin
- Staal, Gardner and Dunne, Inc. (1990), Hydrogeologic Update, Seaside Coastal Ground Water Basins
- Fugro West, Inc. (1997), Hydrogeologic Assessment, Seaside Coastal Groundwater Subareas, Phase III Update

The above studies have focused on defining the regional hydrogeology and delineating the hydrostratigraphy of the basin. Additionally, these reports have summarized components of the regional water balance and developed estimates of operational yield of the Seaside Basin. Taken together, these studies represent the incremental advancement of the understanding of the hydrogeology of the SGB.

Most recently, an update on water resource conditions in the basin was prepared for the MPWMD by Yates and others, entitled: *Seaside Groundwater Basin: Update on Water Resource Conditions*, dated April 14, 2005. This document presents the most recent understanding of the hydrogeologic setting and current conditions of the basin, and is the principal source for the following description of the environmental setting of the basin.

Physiography

The SGB underlies a hilly coastal plain that slopes northward toward the Salinas Valley and westward toward Monterey Bay. The basin area includes Sand City, and much of the cities of Seaside and Del Rey Oaks, as well as small portions of the City of Monterey. In addition, the basin underlies most of the land formerly occupied by Fort Ord. The physiography is characterized by young, active dunes near the coast and mature dunes to the east of Seaside on former Fort Ord. Land surface elevations range from sea level at the beach to approximately 900 feet near the eastern boundary of the basin.

Geology

The geologic structure of the SGB is characterized by structural deformation that has resulted in varying thickness and depths of the various stratigraphic units across the basin. Basin structure is relatively well understood in the Laguna Seca and coastal subareas, where wells are numerous. Subsurface information in those areas reveals a complex arrangement of faults, anticlines and synclines. Basin structure is poorly understood in the northern and interior parts of the basin occupied by the former Fort Ord military base. Subsurface information is entirely absent throughout the Northern Inland subarea and the adjacent part of the Salinas Valley Basin.

The boundaries of the SGB and its subareas are shown in Figure 8-1 and surficial geology is shown in Figure 8-2.

The southern boundary of the SGB is the trace of the Chupines Fault, where non-water bearing Monterey Shale is uplifted to near or above sea level.

The western boundary of the SGB has typically been designated as the interface between the aquifer system and Monterey Bay. This designation has been one of convenience, because little or no information is available regarding the offshore extent of the onshore aquifers or the nature of their connection with the ocean. The coastline is an adequate surrogate for the purpose of estimating groundwater recharge, but the hydrogeology of the offshore area determines the risk of seawater intrusion and the feasibility of dynamically utilizing offshore storage by shifting the saltwater/freshwater interface seaward and landward.

The eastern and northern boundaries of the SGB are less clearly defined. The present understanding is that the northern and eastern basin boundaries follow a groundwater flow divide that separates groundwater flowing toward the Salinas Valley from groundwater flowing toward the coastal subareas of the SGB (Yates, and others, 2005).

Subdivisions of the Basin

The SGB has traditionally been subdivided into several subbasins or subareas for hydrologic analysis. These divisions reflect a combination of hydrogeologic and jurisdictional boundaries, and the configuration of the subarea boundaries has evolved slightly over time. The current subarea names and locations are shown in Figure 8-1.

A hydrogeologic boundary created by the Laguna Seca anticline divides the basin into Northern and Southern Subbasins. The anticline lifts the relatively impermeable Monterey Shale above the regional water table along its length, including the segment where the shale is offset by the Ord Terrace fault.

Each of the two subbasins is further divided into Coastal and Inland Subareas. The dividing line follows General Jim Moore Boulevard (previously North-South Road), which was formerly the jurisdictional boundary between the Fort Ord military base and the communities of Seaside and Del Rey Oaks. In the Southern Subbasin, the inland part is the Laguna Seca Subarea, and in the Northern Subbasin it is the Northern Inland Subarea. The coastal subareas are simply referred to as the Southern and Northern Coastal Subareas, respectively.

As shown on Plate 1, the MPWMD ASR project is located in the Northern Subbasin, just east of the boundary between the Coastal and Inland Subareas (i.e., General Jim Moore Blvd.).

Hydrogeologic Units

The SGB consists of a sedimentary sequence of water-bearing materials that overlie the low permeability Monterey Shale. Although the Monterey Shale is capable of yielding small quantities of water in many locations, the Monterey Shale has been traditionally considered non-water-bearing and forms the ”effective base of freshwater” in the SGB. The formation directly overlying the Monterey Shale is the Santa Margarita Sandstone as mapped by Clark and others (1997, 2000), and it corresponds to the Santa Margarita aquifer. This sedimentary unit is a loose to weakly cemented sandstone with a stratigraphic thickness of approximately 200 feet. The upper portion of this deposit is medium-grained clean sand. With increasing depth and proximity to the underlying Monterey Shale, the clay content of the formation increases. The Santa Margarita aquifer is the target aquifer for the proposed ASR project.

Overlying the Santa Margarita aquifer is a formation referred to as Tertiary and Quaternary “continental deposits” (Dupré 1990; Clark and others, 1997, 2000). This formation consists of a complex sequence of interbedded sand, gravel and clay deposits. These deposits are more than 600 feet thick in some portions of the SGB. Because of the fluvial depositional environment, gravel deposits encountered in wells are not easily correlated between wells for great distances. The water bearing portions of this formation are thick lenses of sand and gravel of limited areal extent and as a group are commonly referred to as the Paso Robles aquifer by hydrogeologists.

The uppermost formations in the SGB are the Aromas Sand and Older Dunes. These surficial deposits are of minor importance to groundwater resources in the basin as they are unconfined, in direct hydraulic communication with the ocean and are only saturated in the extreme coastal portion of the basin. These characteristics make them susceptible to water quality degradation, either from seawater intrusion or surface-derived contaminants.

Hydrogeologic cross-sections depicting the geologic stratigraphy and structural characterization of aquifer units in the SGB were prepared by Yates and others (2005). The section locations are shown in Figure 8-2 and the cross-sections are shown in Figures 8-3 and 8-4.

Hydrogeologic Properties

The primary aquifer properties important to groundwater flow and storage capacity are transmissivity and storativity. Transmissivity characterizes the permeability of aquifers and aquitards. Storativity (dimensionless) is a measure of the aquifer's ability to take and release water into/from storage. Estimates of these parameters from aquifer tests were first summarized by Staal, Gardner & Dunne (1987), to which data from analysis of pumping of the Paralta well (located in the Northern Coastal Subarea) was added by Fugro West, Inc.(1997).

The Fugro (1997) study presented a transmissivity value of 85,100 gallons per day per foot (gpd/ft) and an estimated storativity value of 0.0018 (dimensionlees) for the Santa Margarita aquifer. These aquifer parameter values were based on analysis of water level and water quality data collected during four separate periods of continuous operation of the Paralta well, and are considered the most representative values available for the regional aquifer system in the vicinity of the proposed ASR project.

Ground Water Budget

A groundwater budget consists of an itemization of inflows, outflows, and storage change within a groundwater basin. Groundwater levels within a basin fluctuate in response to recharge and discharge sources and changes in storage. When recharge exceeds discharge, groundwater levels will rise, on average, across a basin; the reverse will occur when discharge exceeds recharge. Each of the components of the SGB groundwater budget is discussed below.

Within the SGB, the single largest source of recharge to the basin is infiltration of rainfall, which occurs throughout the basin and is facilitated by the generally sandy soils that dominate the land surface overlying the basin. Relatively minor amounts of water from pipe leaks and irrigation return flows also contribute recharge. With a few minor exceptions, the Santa Margarita aquifer is not exposed at the land surface anywhere within the SGB. The nearest outcrops are east of the SGB in the El Toro Creek watershed, where groundwater is thought to flow northward to the Salinas Valley. Consequently, all sustainable groundwater production ultimately derives from rainfall that percolates into the basin at the land surface, and all sustainable pumping from the Santa Margarita Aquifer consists of leakage through the overlying Paso Robles Aquifer (Yates and others 2005). Increased extractions from the Santa Margarita aquifer since 1995 have created downward gradients that support this leakage. Although the Paso Robles contains numerous clay layers, none of these are thick or extensive enough to prevent groundwater flow between the aquifers.

Within the SGB, subsurface inflow occurs between subareas, and can account for a large percentage of the inflow for a particular subarea. For example, inflow from the Northern Inland Subarea into the Northern Coastal Subarea accounts for approximately 40 percent of the recharge in the Northern Coastal Subarea. However, there is no significant subsurface inflow into the SGB as whole from outside areas (with the exception of inflow from offshore areas, i.e., the landward advancement of the seawater/freshwater interface).

Primary discharge/outflow from the basin is from groundwater production from wells, with relatively minor offshore outflow from limited areas of the basin. Currently, average extraction from the basin is approximately 5,580 AF per annum (AFA), approximately 80 percent of which is extracted from the Northern Coastal Subarea.

Under current conditions, the sustainable yield of the Northern Subbasin is estimated to be approximately 1,840 AFA. Current extractions from the Northern Subbasin total approximately 4,420 AFA (Yates and others 2005)

As discussed above, total outflows from the Northern Subbasin currently exceed total inflows. The principal effects of this deficit in the water balance are the depletion of groundwater in storage (and associated water level declines) and inflow into the basin from offshore areas. The currently estimated average rate of storage depletion in the Northern Subbasin is approximately 1,020 AFA and the estimated rate of inflow to the Subbasin from offshore areas (i.e., the landward advancement of the seawater/freshwater interface) is approximately 1,080 AFA (Yates and others 2005). These ongoing deficits in the overall water balance of the aquifer system in recent years have created ample available storage space in the SGB that the proposed dynamic storage of excess Carmel River water via ASR wells would utilize.

Groundwater Levels

Water level data from wells in the SGB have been collected for more than 30 years. Water level data are available from most Cal-Am production wells since the 1970’s as well as from more recently installed dedicated, aquifer specific monitoring wells installed by MPWMD. Water level hydrographs for selected monitoring wells for the Northern Subbasin are presented in Figure 8-5 and the well locations are shown on Figure 8-6.

As presented above, most groundwater extraction in the SGB is from the Northern Coastal Subarea, and the hydrographs for the area show steady declines in water levels in most wells since 1995 due to increased pumping from the Santa Margarita aquifer. As shown, in most wells water levels were above sea level prior to 1995 and are now consistently below sea level. The net decline in water levels between 1995 and 2002 was 10 to 15 feet in most wells, reflecting the depletion of groundwater storage.

The hydrographs of several monitoring well clusters that have wells screened in both the Paso Robles and Santa Margarita aquifers indicate a general, vertically downward gradient in groundwater levels. For example, at wells FO-7 and PCA-East groundwater levels in the Paso Robles are 15 to 25 feet higher than groundwater levels in the Santa Margarita.

A local-scale contour map of groundwater elevations in the Santa Margarita aquifer in fall 2004 is shown on Figure 8-6. As shown, a prominent pumping depression exists that coincides with the distribution/concentration of Cal-Am's production wells. The trough of the pumping depression extends to elevations lower than 40 feet below sea level. The MPWMD ASR well site is located within the depression, approximately 1,500 feet north-northeast of trough center.

Groundwater Quality

The groundwater aquifer targeted for receiving injected waters for the project is limited to the Santa Margarita aquifer of the SGB. In general, water quality in the aquifer is qualitatively considered as moderate to good in salinity and mineral content. Waters in the Santa Margarita aquifer are typified as calcium-carbonate to sodium-chloride in character; showing slight geographic variability in mineralogy and salinity. Electrical conductivity (EC) of these waters range from 400 to slightly over 1,000 microsiemens/cm. From a general mineral standpoint, Santa Margarita aquifer water quality is suitable for domestic and agricultural use; however, it often exceeds State Drinking Water Standards due to elevated levels of manganese (Mn) and hydrogen sulfide gas (H_2S). It should be noted that these constituents are regulated as Secondary (i.e., aesthetic) Standards and are not associated with health risks to consumers. Municipal wells producing from the Santa Margarita aquifer either utilize treatment or blending to meet State standards when MCL's are exceeded. Because the Santa Margarita is a deep, confined aquifer, water quality is not influenced by constituents of man-made pollution such as nitrates, synthetic or volatile organics, or pesticides/herbicides.

The Paso Robles aquifer, although similar in chemical character (sodium-chloride/calcium bicarbonate), has lower salinity and mineral saturation levels than the Santa Margarita. Paso Robles waters have typical EC values of 300 to 600 microsiemens/cm, and generally do not contain H_2S or Mn. It is generally considered of superior water quality to the Santa Margarita aquifer.

Water quality within the Santa Margarita aquifer at the project site trends towards the lower (i.e., more mineralized) end of the range of quality typical for the zone.

EC levels are at or above 1,000 microsiemens/cm, and H_2S is present at approximately 2 mg/L. The results of sampling performed upon initial construction of the Santa Margarita Test Injection Well (SMTIW) in March 2001 are presented below (Table 8-1). Typical water quality data for the Carmel Valley injection source water are also presented below for comparison.

Table 8-1. Summary of SMTIW and Injection Source Water Quality

Constituent	Unit	Native Groundwater from SMTIW (3/22/01)	Carmel Valley Injection Source Water (3/19/04)	State MCL (mg/L)
Ammonia (N)	mg/L	0.33	ND	NS
Arsenic	Ug/L	ND	ND	10
Calcium	mg/L	85	42	NS
Chloride	mg/L	120	36	500
Color Determination	Color Units	5.0	--	15
Conductivity (EC)	Umhos at 25 C	1015	546	1,000 / 1,600
Fluoride	mg/L	0.35	--	2
Hardness as CaC03	mg/L	290	159	NS
Iron (Fe)	mg/L	0.12	ND	0.3
Magnesium (Mg)	mg/L	19	13	NS
Manganese (Mn)	mg/L	0.04	0.02	0.05
Nitrate (N03)	mg/L	ND	ND	45
Orthophosphate (as P)	mg/L	0.46	0.40	NS
PH	Unit	7.1	7.2	NS
Potassium (K)	mg/L	5.3	2.9	NS
Sodium (Na)	mg/L	88	45	NS
Sulfate (S04)	mg/L	95	78	500
Total Alkalinity (as CaC03)	mg/L	224	140	NS
Total Dissolved Solids (TDS)	mg/L	618	338[1]	1,000
Turbidity	NTU	0.15	0.10	5

ND – Not Detected
NS – No MCL Standard

[1] Calculated based on TDS/EC ratio of 0.71 for Cal-Am Lower Carmel Valley Wells (Monterey Peninsula Water Management District 2005).

The native groundwater quality can be characterized as moderately reducing in nature, anaerobic, and likely populated with sulfate-reducing bacteria (non-pathogenic), which is the cause of H_2S in the aquifer. Evaluation of chemical stability using geochemical modeling software (discussed further in Water Quality Interactions) indicates that the water is at or near equilibrium with respect to the primary mineralogy of the Santa Margarita Sandstone, i.e., silica quartz, plagioclase, and orthoclase.

Injection Source Waters and Quality

The injection source waters originate in the Carmel Valley watershed approximately 7 miles south of the project site. The specific source point of injection waters will vary depending upon the current operational condition of the Cal-Am system, although all sources lie within the Carmel Valley watershed. Potential source points for the injection water include (in order of likelihood); (1) groundwater in the lower Carmel Valley that is treated at the Begonia Iron Removal Plant (BIRP); (2) groundwater in the lower Carmel Valley that is not treated at the BIRP; (3) groundwater in the upper Carmel Valley; and (4) surface water in the Carmel River that is treated at the Carmel Valley Filter Plant.

It is important to note that although Cal-Am will preferentially utilize lower Carmel Valley sources to withdraw the 'excess' waters utilized for injection, the actual molecules of water injected may be a mixture of any sources within the Cal-Am system since the sources are all of potable quality and will become intermixed once inside the municipal storage and distribution system.

Typical quality of the injection source waters is similar, but of superior quality, when compared to the native Santa Margarita aquifer groundwater. For purposes of this analysis, we have considered BIRP treated product water as typical in quality of the Carmel Valley sources.

The injection source water is also of calcium bicarbonate character, but of lower hardness and salinity than the Santa Margarita groundwater. The primary anions and cations are present at similar ratios, with the injection source water being approximately 50 to 60 percent lower in concentration. These aqueous chemistry conditions are considered excellent for ASR operations, as it minimizes the possibility of adverse geochemical reactions during aquifer storage, and improves the salinity and salt-balance issues in the groundwater basin.

Because the injected water is taken directly from the potable water distribution system, it does contain a residual (1 to 2 mg/l) of chlorine disinfectant and trace levels of disinfection byproducts (DBPs), both trihalomethanes (THMs) and haloacetic acids (HAAs). However, these constituent concentrations are well below (50 percent) the allowable levels for potable drinking water. The presence of disinfectant residual is beneficial in that it protects against pathogenic organism proliferation in the well bore.

Regulatory Setting

Federal Regulations

Underground injection of water supplies is regulated by EPA's Underground Injection Control (UIC) program as part of the Safe Drinking Water Act. The UIC program regulations prohibit any underground injection except as authorized by rule or permit. Injection wells are currently authorized by rule until further regulations become applicable. This rule exempts injection wells from permitting procedures, although EPA may require a permit on a case-by-case basis. However, all owners of injection wells authorized by rule must submit inventory information to EPA.

State of California Regulations

Several state agencies and policies can affect injection programs. The State Water Resources Control Board (SWRCB) has broad authority over discharges to waters of the State. California has adopted a "nondegradation policy" *(Statement of Policy with Respect to Maintaining High Quality of Waters in California*; Resolution No. 68-16; October, 1968) for State waters, whereby actions that tend to degrade the quality of groundwaters is prohibited. Oversight of this policy is done through the Regional Water Quality Control Board (RWQCB), although the RWQCB does not have permit authority over injection/extraction activities, which do not constitute a discharge of waste. However, the RWQCB would review injection/extraction activities to ensure groundwater quality standards are met. The California Department of Health Services (DHS) regulates drinking water quality, hazardous waste, use of reclaimed water, and may advise individual RWQCBs on discharge requirements.

Impacts and Mitigation Measures

Background

This section describes potential impacts and mitigation for groundwater hydrology and quality related to the Proposed Project. Existing regional groundwater conditions within the Seaside Groundwater Basin (SGB), including groundwater quantity and groundwater quality, are described above. The following discussion of impacts within the Proposed Project area contains information from the following sources: *Plan B Project Report,* prepared by Raines, Melton, & Carella, Inc. (2002) .; *Summary of Operations, Well Construction and Testing, Santa Margarita Test Injection Well,* prepared by Padre Associates, Inc. (2002) ; and a series of reports prepared by Padre Associates, Inc. documenting several years of testing operations at the Santa Margarita Test Injection Well entitled *Summary of Operations, Water Year 2002 (and 2003 and 2004) Injection Testing, Santa Margarita Test Injection Well* (Padre Associates, Inc. 2003, 2004, 2005, respectively).

Approach and Significance Criteria

Based upon the CEQA Guidelines, a project is determined to result in a significant impact if the project would 1) substantially degrade groundwater quality, 2) contaminate a public water supply, 3) substantially deplete groundwater resources or 4) substantially interfere with groundwater recharge. Therefore, potential impacts associated with project implementation are considered significant if operation of the proposed project would result in any of these conditions.

Impacts and Mitigation Measures

Impact GWH-1: Changes in Seaside Basin Groundwater Storage

Construction and operation of the proposed project would occur under conditions as described in the Background and Approach section of the Carmel Valley Groundwater Basin discussion on following pages. During project operation, MPWMD would extract, on an annual average basis, the same amount of groundwater that has been previously injected. During wet years, storage of water supplies within the SGB by MPWMD would not exceed 2,426 AF. In a confined coastal aquifer such as the SGB, storage of injected water is achieved by two primary mechanisms: 1) elastic expansion of the aquifer matrix and associated increased pressure (i.e., potentiometric head/water level), and, 2) lateral displacement of the seawater/freshwater interface. The proposed maximum amount of injection and temporary storage for the Proposed Project is significantly less than the currently available storage volume within the basin, based on the estimated amount of storage depletion and landward advancement of the seawater/freshwater interface that has occurred in the aquifer since 1995. Under current conditions the amount of annual imbalance in the Northern Subbasin’s water budget is estimated to be over 2,500 AFA. The fact that this imbalance in the water budget has occurred for the past 8 to 10 years indicates there is ample storage space in the aquifer for the proposed volumes of injection. Therefore, project implementation would not adversely affect the current net storage within the SGB. Rather, during wet periods, the project would increase the amount usable storage within the SGB, and thus have a **beneficial effect**.

As modeled, injection would only occur during the December through May high-flow period and extractions would generally occur during the June through November low-flow period. With the Proposed Project, it was assumed that a maximum of 14,700 AF of usable storage would be available in the coastal subareas. With No Project, it was assumed that a maximum of 7,500 AF of usable storage would be available.

Figures 8-7 through 8-10 show the simulated end-of-month usable storage values for the coastal area of the SGB with and without the Proposed Project for four types of water year: wet, normal, dry, and critically-dry.

During wet years, simulated end-of-month usable storage in the coastal area of the SGB would be significantly greater with the Proposed Project. Specifically, simulated usable storage would be between 3,350 and 4,780 AF greater with the Proposed Project. During normal years, the increases in usable storage with the Proposed Project would range from 1,950 to 3,510 AF. During dry years, when storage would be used, simulated storage would be between 500 and 1,920 AF greater with the Proposed Project. During critically-dry years, simulated usable storage would be similar for both projects during the October through December period and greater with the Proposed Project during the January through September period. During the later part of the year, simulated usable storage would be between 300 and 1,520 AF greater with the Proposed Project. Therefore, the Proposed Project would have **a beneficial effect** on SGB storage.

As indicated earlier, increased groundwater storage in the coastal area of the SGB would result in increased outflow to the offshore portions of the aquifers in the basin. For the 45-year period of analysis, simulated subsurface outflow from the coastal area with No Project would average 410 AF per year and range from 32 AF in Water Year 1991 to 830 AF in Water Year 1958. The median or typical subsurface outflow with No Project would be approximately 420 AF per year. With the Proposed Project and elevated water levels due to increased storage, simulated subsurface outflow would average 910 AF per year and range from 90 AF in Water Year 1991 to 1,960 AF in Water Year 1984. The median or typical subsurface outflow with the Proposed Project would be approximately 850 AF per year.

Mitigation: No mitigation is required.

Impact GWH-2: Short-Term Changes in Seaside Basin Groundwater Quantity

During construction of the new SMTIW well, development and initial well production testing flows would be discharged from the well to nearby surface depressions. Average discharge volumes would be on the order of 3,000 gallons per minute (gpm), and would result in a discharge of approximately 45 AF over an approximate 80-hour development and testing period. Because these discharges would be percolated back into the SGB, they would not significantly affect net groundwater quantities within the SGB.

Discharge would be conveyed to adjacent depressions via temporary above ground conveyance piping. If required, prior to any such discharge, MPWMD would obtain a National Pollution Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board (RWQCB). This permit would establish discharge quality and quantity parameters, and would require implementation of a Monitoring and Reporting Program for discharge monitoring. Discharge water associated with well development is anticipated to have high sediment levels and may require sediment removal prior to discharge. Discharge would be in compliance with water quality parameters and reporting requirements established by the RWQCB. Therefore, potential impacts associated with discharge to surface depressions associated with well development would be reduced to **less than significant**.

Mitigation: No mitigation is required

Impact GWH-3: Long-Term Changes in Seaside Basin Groundwater Levels

Effects on groundwater levels from operation of the ASR wells were evaluated using a groundwater flow simulation model of the Santa Margarita aquifer in the SGB. This groundwater model was developed utilizing the WinFlow software program (Environmental Simulations, Inc., 2003). WinFlow is an analytic modeling program that simulates two-dimensional steady-state and transient groundwater flow. The transient module uses equations developed by Theis (1935) for confined aquifers.

The model uses the principal of superposition to evaluate the effects from multiple analytical functions (e.g., wells) in a uniform regional flow field. As discussed previously, there currently exists a prominent depression in water levels in the basin, which results in a non-uniform flow field. For purposes of this analysis, a flat starting water surface was assumed in the model. This was considered a reasonably conservative assumption, as the model results likely overstate the amount of drawup in areas upgradient of the ASR site, and understate the amount of drawup in areas downgradient (i.e., towards the trough of the depression).

Published aquifer parameters for the Santa Margarita aquifer were utilized in the model:

- Transmissivity – 85,100 gpd/ft
- Storativity – 0.0018 (dimensionless)

Comparison of theoretical responses based on these parameters to actual water level responses in various monitoring wells to injection testing operations at the SMTIW over the past several years has shown these aquifer parameters to be reasonably representative of the regional Santa Margarita aquifer system (Padre, 2003, 2004).

The simulations assumed 2 ASR wells would be operational at the proposed site as described in the Background and Approach section of the Carmel River Basin Surface and Groundwater Hydrology and Water Quality discussion on following pages. The wells were assigned combined rates of injection/extraction of 3,000 gpm. For the injection scenario, the wells were assumed to be operating continuously for 183 days, for a total volume of approximately 2,426 AF. For the extraction (recovery) scenario, the wells were assumed to be operating continuously for 153 days, for a total volume of 2,002 AF. These scenarios represent the range of likely "extreme" injection and extraction conditions that could be encountered over the life of the project. Actual injection/extraction operations would be less on average than the extreme assumptions utilized, and would be determined according to supply and demand relationships, and storage goals.

Simulated increases in groundwater levels (drawup) due to injection are shown on Figure 8-11. As shown, injection creates a water level 'cone of impression' (or mound) centered around the injection wells, similar to a 'cone of depression' associated with pumping wells. The model predicted increases in water levels at the end of the simulated injection period range between approximately 15 feet at the coastline to 40 feet near the edge of the Proposed Project site. The maximum drawup in the aquifer would be approximately 72 feet, directly adjacent to the injecting wells (i.e., 1-foot radius from the wells).

Figure 8-6 shows current (fall 2004) groundwater levels in the Santa Margarita aquifer in the project area. Comparison of the simulated water level increases with the existing water levels in the aquifer reveals that water levels would remain below sea level in most of the aquifer at the end of the simulated maximum injection season. Most notably, water levels would remain below sea level at the coast, where current water levels are approximately 17 to 18 feet below sea level (e.g., wells PCA West and MSC), compared with the model predicted water level increase of approximately 15 feet. Water levels would be raised above sea level in an limited area of about a 500 feet radius of the ASR site, ranging from approximately 10 to 40 feet above sea level.

Simulated decreases in groundwater levels (drawdown) due to recovery/extraction pumping are shown on Figure 8-12. As shown, model predicted decreases in water levels at the end of the simulated recovery are similar to, but slightly less than, the injection related increases, and range between approximately 14 feet at the coastline to 40 feet near the edge of the Phase 1 site.

A summary of the model predicted water level changes at existing water supply wells in the Santa Margarita aquifer in the Subbasin is presented in Table 8-2 below.

Table 8-2. Model Predicted Water Level Impacts at Existing Santa Margarita Aquifer Production Wells

State Well No.	Well Name	Distance from ASR Site (feet)	Current Water Level (ft msl)	Model Predicted Maximum Water Level Changes (feet)[1]	
				Injection	Recovery
15S/1E-14Rb	Paralta	500	-29	+38	-36
15S/1E-23B03	Ord Grove	1,700	-55	+27	-26
15S/1E-23G01	City of Seaside No.3	3,100	-24	+23	-22
15S/1E-23D03	Luzern	3,700	-31	+21	-20
15S/1E-23H05	La Salle No.2	5,200	-23	+18	-17
15S/1E-22B04	Playa No.4	6,500	-19	+17	-16

Notes:

[1] rounded to nearest foot

As shown, predicted maximum water level increases due to injection at existing production wells pumping from the Santa Margarita aquifer range between approximately 17 to 38 feet. Predicted water level decreases due to recovery pumping similarly range between approximately 16 to 36 feet.

During the long-term operation of the Proposed Project, average annual extractions would approximate the average annual amount of water injected into the SGB. As simulated, the Proposed Project would be operated so that water levels in the coastal portion of the SGB would exceed water levels without the Proposed Project during non-drought periods. During drought periods, e.g., Water Years 1960-1961, 1976-1977, and 1987-1991, the Proposed Project would be operated so that water levels in the coastal subareas would approach the water levels expected without the Proposed Project. Therefore, no net reduction of supplies/levels would occur. Thus, the anticipated main effect of the proposed ASR operations would be to transiently increase water levels, which will lessen the magnitude of the existing water level depression in the aquifer during injection. On average, owners of the existing wells are anticipated to experience higher groundwater levels and thus lower pumping costs with the proposed project. This reduction in pumping costs is considered to be a beneficial impact within the SGB. Therefore, impacts to water levels in terms of well production would be **beneficial**.

Mitigation: No mitigation is required.

Impact GWH-4: Changes in Seaside Basin Groundwater Levels in Overlying Units

Groundwater levels in overlying units (i.e., the Paso Robles aquifer) are typically 10 to 25 feet higher than groundwater levels in the Santa Margarita aquifer as described in the setting section above; therefore, groundwater movement is from the overlying units toward the Santa Margarita aquifer. Under Proposed Project conditions, groundwater levels in the Santa Margarita aquifer will be transiently increased during injection periods, as indicated by the groundwater flow simulations described above. The magnitude of water level increases in most of the basin at the end of the maximum injection period will be less than the existing difference between levels in the two aquifers. In addition, the temporary water level increases during injection will be subsequently reversed on a seasonal basis during recovery operations. Therefore, the direction of the hydraulic gradient between the Santa Margarita aquifer and overlying units is not expected to change substantially over most of the basin by implementing the Proposed Project. Therefore, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact GWH-5: Potential for Seaside Basin Hydrofracturing

As discussed previously, the target aquifer for injection is the Santa Margarita Sandstone, which is considered a semi-confined to confined aquifer (although there is believed to be limited hydraulic communication with the overlying units). Pressurization during injection has the potential to result in hydrofracturing of the aquitard if the pressures are sufficient. Hydrofracturing is a common practice used in the oil industry to increase the production of oil from low permeability units. In general, the pressure in the confined aquifer must not exceed vertical grain pressures of the materials overlying the confining layer to avoid hydraulic fracturing. Based on soil mechanics, Huisman and Olsthoorn[1] (1983) suggest that the maximum allowable drawup to avoid hydraulic fracturing can be calculated using the equation:

$$s < 0.22 (A+B)$$

Where: s = total drawup (ft)

A = depth from ground surface to the top of the confining layer (ft)

B = depth from ground surface to static water level (ft).

The depth to the Santa Margarita aquifer confining layer in the area of the proposed ASR well sites is approximately 460 feet, and the static water level is approximately 350 feet. Based on these values, the maximum allowable drawup to avoid hydraulic fracturing of the confining layer is approximately 178 feet. As described previously, the maximum drawup in the aquifer directly adjacent to the

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[1] L. Huisman and T N Olsthoorn, Artificial Groundwater Recharge, 1983

ASR wells is anticipated to be approximately 72 feet – more than 100 feet less than the maximum allowable drawup to avoid hydrofracturing.

Based on the above, the potential for aquitard fracturing during project implementation is considered very low. This is not unexpected, as the proposed project would be injecting water into an overdrafted basin. Therefore, potential impacts associated with aquitard fracture would be **less than significant**.

Mitigation: No mitigation is required.

Impact GWH-6: Short-Term Change in Seaside Basin Groundwater Quality

Construction activities associated with drilling and installation of the second SMTIW well would not alter groundwater quality within the SGB. As previously discussed, non-hazardous bentonite- or polymer-based drilling fluids would be used during well drilling. These fluids would be stored onsite and circulated through the well using Baker tanks and a vacuum truck. Expended fluids that would not meet NPDES discharge standards would be removed from the site using vacuum trucks, and would not be exposed or discharged. Therefore, potential impacts to groundwater quality would be **less than significant.**

Mitigation Measure GWH-1: Comply with Performance Standards in NPDES Permits

All construction activities, vehicle storage and discharges associated with project construction and operation, including well discharges, shall be accomplished in accordance with NPDES permits from the RWQCB to ensure no degradation of surface or groundwater quality. All performance standards contained in the permit will be met.

Impact GWH-7: Long-Term Change in Seaside Basin Groundwater Quality From Mixing Groundwater with Injected Water

Water quality stability and interaction potential are important factors for ASR operations. Ideally, the seasonally available potable water supply can be injected, stored, and recovered without the need for additional treatment except for disinfection prior to delivery into the potable water system.

For the proposed ASR project, treated Carmel Valley source waters such as treated potable water from the Cal-Am Begonia Iron Removal Plant (BIRP) or the Carmel Valley Filter Plant would be stored in the Santa Margarita aquifer for months or years at a time before recovery, with the goal of retrieving water of potable quality upon pumping. Because the ASR wells are located upgradient of the center/trough of the existing water level depression, it is expected that the actual particles of injected water will tend to migrate away from the ASR wells towards the pumping trough during storage. Given the current basin conditions, the MPWMD has no expectation that the ASR wells themselves will achieve 'molecule-for-molecule' recovery of injected waters, and the extracted/recovered water is expected to consist of varying mixtures of injected and native groundwaters. During project implementation, varying percentages of injected water will be captured by either the ASR wells or existing proximate downgradient production wells (e.g., Cal-Am's Paralta and Ord Grove wells), and/or will remain in groundwater storage.

To determine the effects of ASR operations on water quality in the SGB, a series of geochemical modeling tasks were performed using historical data from Cal-Am's treated water distribution system and recent aquifer test results from the SMTIW. Data analysis included the evaluation of chemical stability in both the injected water and native ground water, as well as chemical interaction and stability modeling of the two waters mixed together in varying proportions, as might be expected during a completed cycle of injection, storage, and recovery. These analyses are also modeled within the mineral environment of the Santa Margarita Sandstone aquifer, resulting in a 3-component reactivity analysis between the injected water, native ground water, and geologic sediments.

All analyses were performed using the USGS geochemical model code PHREEQ-C 2.3 (Parkhust et al.) and the extensive chemical speciation database developed by Lawrence Livermore National Laboratory. The results of the analyses indicated no adverse chemical reactions were likely to occur during injection, storage, or intermixing within the Santa Margarita Sandstone aquifer.

For typical ASR operations in the western coastal zone, the injected water is (relatively) cold, low salinity, oxygenated, and chlorinated; and is injected into a (relatively) warmer, moderate salinity, oxygen depleted aquifer system. Thus, the main effect is to "dilute" the moderately saline groundwater with a higher quality, low salinity treated water. The groundwater, which is often near its mineral saturation limit, becomes undersaturated and therefore less susceptible to mineral precipitation, which could cause well plugging.

The main kinetic process occurring during aquifer storage is an oxidation-reduction reaction as the native groundwater (and aquifer minerals) is oxidized by the injected water. In this case, the reaction is beneficial, as it converts reduced sulfide to sulfate and manganese to manganese oxide (or possibly manganese smectite). After several years and/or repeated ASR cycles, these deleterious native groundwater constituents will become oxidized, and the population of sulfate reducing bacteria within the aquifer will be largely eliminated. As a result, Cal-Am's Paralta and Ord Grove wells may no longer require supplemental treatment for hydrogen sulfide due to their proximity to the storage area.

In summary, the analysis of geochemical interaction during ASR operations suggests that the Santa Margarita Sandstone aquifer is a suitable zone for storage of treated Carmel Valley water sources, and that the observed redox reactions will benefit native ground water quality through the oxidation of reduced species.

This applies to both Carmel Valley filter plant water and Carmel Valley well source waters.

In support of the findings of the geochemical modeling efforts, there have been no adverse water quality impacts observed at the SMTIW or in nearby Cal-Am municipal wells during the last three years of injection demonstration testing. Based on the empirical results of the testing and the results of modeling analysis with Carmel Valley source water and Santa Margarita groundwater, there appears to be no adverse impacts to aquifer water quality; and measurable improvements in water quality with respect to the natural aquifer contaminants manganese and hydrogen sulfide.

ASR testing at the SMTIW has included a detailed investigation of the fate of Disinfection By Products (DBPs) during aquifer storage. The studies showed that DBPs degraded to below detectable levels over a period of approximately four months. The concurrent monitoring of other water quality parameters showed simultaneous changes in other constituents (P, CO_2, ORP) indicated that the DBP degradation was caused by the bioactive metabolism of existing subsurface anaerobes that are naturally present in most aquifers. It is important to note that these organisms are not pathogenic.

The presence of disinfectant residual in the injection water did allow a temporary ingrowth (increase) in DBP levels during the initial stages of aquifer storage, however complete degradation of DBPs still occurred after disinfectant residuals were depleted. Recent testing at the SMTIW with no disinfectant residual in the injection water showed the following:

- THM’s and HAA’s were present during initial aquifer storage, however no ingrowth occurred (in THM’s or HAA’s).
- HAA degradation was complete, and occurred within one week of the commencement of aquifer storage.
- THM’s remained relatively stable for the first nine weeks of aquifer storage.
- Although disinfectant removal did control DBP ingrowth, it did not substantially accelerate the THM degradation process.

Given the results of geochemical reactions observed during the ASR demonstration project, the potential for water quality degradation or aquifer alteration associated with project implementation is considered low. In addition, the proposed project would be operated in compliance with the SWRCB's anti-degradation policy (Resolution 68-16), and applicable regulations regarding drinking water quality. Therefore, potential impacts to ground water quality due to geochemical reactions associated with project implementation would be **less than significant.**

Mitigation Measure GWH-2: Operate Project in Compliance with SWRCB and DHS Policies
MPWMD shall operate the proposed project in compliance with the SWRCB's Anti-Degradation Policy (Resolution 68-16), and applicable DHS regulations regarding drinking water quality.

Mitigation Measure GWH-3: Modify Project Operations as Required by Results of Monitoring
Groundwater conditions shall be tracked via the MPWMD's existing monthly monitoring program. In the event that any adverse impacts to groundwater conditions occur, MPWMD shall halt operations and consult with the RWQCB to determine appropriate operational changes.

Impact GWH-8: Changes in Seaside Basin Groundwater Quality Caused by ASR Well Operation Discharges

In order to maintain adequate injection rates, injection operations will be temporarily suspended for two to three hours per week to backflush the well, which removes particulates that accumulate in the well bore. These particulates are present in minute quantities in the injection water, and will over time plug off the porous portions of the well. Backflushing of the well is similar to backwashing a media filter at a conventional water treatment plant; the waste discharge is demerited due to its particulate load, but does not contain soluble or ionized pollutants. Water quality from well backflush operations has the same dissolved mineral character as the injected water, which is of potable quality.

Discharge and disposal of the well backflush water will be to an on-site percolation pit with a volume of approximately 240,000 gallons. There will therefore be no discharge to live streams or aquatic habitat. The percolated water will eventually recharge the groundwater basin's upper aquifer, having been purified through natural percolation and filtration of the soil mantle. Because the backflush water is nonhazardous and is not discharged to a live stream, no RWQCB or DFG permits are required for the percolation pit. Discharge of backflush waters from ASR operations is therefore considered to have **a less than significant** impact on the environment.

Mitigation: No mitigation is required.

Impact GWH-9: Changes in Seaside Basin Recovered Water Quality

The physical/chemical water quality of the recovered water after aquifer storage has been monitored during the last three years of testing at the SMTIW, and modeled with respect to mixing/interaction with native groundwater and equilibration with the mineralogy of the Santa Margarita aquifer. In general, both the empirical observations of the demonstration test program and the geochemical model results indicate that the recovered water quality remains fully potable, and of essentially identical mineral character except for the effects of direct blending/ intermixing with native groundwater.

Specific trends observed in recovered water quality include the following:

- No ion exchange reactions with the formation minerals were observed (or anticipated).
- Free chlorine residual in the injected water dissipated within two to three weeks of aquifer storage.
- Dissolved oxygen was lower in the recovered water (due to chemical and/or biological oxidation processes).
- There were no disinfection byproducts (i.e., THM's or HAA's) present in the water after four to six months of aquifer storage.
- DBP formation of the recovered water was less than or equal to that of the injected water; thus the potability of the recovered water will not be compromised upon rechlorination.
- Chemical compatibility of the recovered water with Cal-Am distribution system water is excellent and shows no adverse reactivity upon reconveyance into the potable system. There is no observable increase in water corrosivity or scale potential of the water as compared to existing Cal-Am source waters from the Carmel Valley (i.e., Carmel River filter plant and CR well sources).

Based on the above evidence, this impact is **less than significant**.

Mitigation: No mitigation is required.

Impact GWH-10: Effects on Other Seaside Basin Groundwater Users

It is anticipated that long-term injection of supplies would benefit existing groundwater users within the SGB through reduced pumping lifts and associated costs. Therefore, project implementation would result in a **beneficial** residual impact.

Mitigation: No mitigation is required.

Carmel River Basin

Background and Approach

The following pages describe the modeling undertaken to predict the hydrologic and water quality effects of the proposed ASR project within the Carmel River Basin. The logic and assumptions made in the modeling effort are also described.

Project Operations

For this EIR, the unimpaired, No Project, and Proposed Project streamflow values in the Carmel River were simulated by MPWMD using a computerized operations model of the Monterey Peninsula Water Resources System (MPWRS). This system includes surface water in the Carmel River and its tributaries and groundwater in the Carmel Valley alluvial aquifer and coastal subareas of the SGB (Figure 8-13). The model, i.e., Carmel Valley Simulation Model (CVSIM), was designed by the District to simulate the performance of the water resources system under varying physical, structural, and managerial conditions. CVSIM operates on a daily time-step and incorporates both surface and groundwater responses and interactions. The model is a dynamic accounting model based on the continuity equation, i.e., inflow - outflow = change in storage. CVSIM accounts for inflows, outflows, and storage changes in two surface reservoirs and five groundwater subunits and subareas. A schematic of the MPWRS, as modeled for the No Project Alternative, is shown in Figure 8-14.

Please note that, although there is no hydrologic connection between the Carmel River Basin and SGB, the two basins are connected hydraulically by the Cal-Am distribution system. In addition to simulating the basic hydrologic processes within the MPWRS, CVSIM includes options for simulating the effects of various facilities, operations, demand management programs, and instream flow requirements.

As a "lumped parameter" model, CVSIM aggregates the effects of the different simulations in the Carmel River and underlying alluvial aquifer by river reach. Each of the four designated river reaches – (1) San Clemente Dam to the USGS gaging station at Robles del Rio (Esquiline Road Bridge), (2) USGS gaging station at Robles del Rio to the Narrows (Scarlett Road), (3) Narrows to the USGS gaging station near Carmel (Via Mallorca Bridge), and (4) USGS gaging station near Carmel to Carmel Lagoon – corresponds to a subunit of the alluvial aquifer. As an example, subunit three of the Carmel Valley alluvial aquifer (AQ3) refers to the Carmel River and associated alluvial area between river miles[2] 3.6 and 9.7.

The 45-year period of analysis selected for this EIR, i.e., water years 1958-2002, is based on the measured mean daily flows at the USGS gaging station at Robles del Rio. This record is considered representative of the range of hydrologic extremes expected over the life of the proposed project. Specifically, the 45-year period includes a short-duration, severe drought period (Water Years 1976-1977) and a longer duration, less severe drought period (Water Years 1987-1991). It also includes extremely wet years such as Water Years 1983, 1995, and 1998. In this context, it is believed that the selected period of analysis is sufficient to assess the water supply and environmental performance of the proposed water supply alternatives.

[2] River miles are referenced from the river mouth, i.e., 0.0 mile, and increase as you move upstream.

For this EIR, a new version of CVSIM3[3] (Version 6.3) was developed to assess the impacts of the proposed Proposed Project. Version 6.3 is based on a previous version of CVSIM3 that was used for the impact analyses for the District's proposed Sand City Seawater Desalination Plant and is described in a *Board Review Draft EIR* dated December 2003. For this EIR, the principal change to CVSIM3 centered on Cal-Am's production sequence. In earlier CVSIM versions, the production needed to meet Cal-Am's simulated daily demand in their main system[4] was met by first operating Cal-Am's production wells in the coastal area of the Seaside Groundwater Basin and then operating Cal-Am's production sources – surface water diversions and groundwater extractions – in the Carmel River Basin. For this EIR, Cal-Am's production sequence was reordered so that the daily demand in Cal-Am's main system was first met by sources in the Carmel River Basin, and then from sources in the coastal area of the SGB. The reordering was done to reflect the increased regulatory constraints on diversions from the Carmel River Basin and allow a determination of whether or not there was excess flow in the Carmel River available for diversion and injection into the SGB. The specific operating logic and assumptions for the Proposed Project are described below.

Other changes to CVSIM3 included a 139-acre increase in the amount of riparian areas and a 5-acre decrease in non-wooded areas between San Clemente Dam and the Carmel River Lagoon. The net affect of these changes in riparian and non-wooded areas was a 500 acre-foot increase in annual water use by riparian vegetation between San Clemente Dam and the Carmel River Lagoon, compared to previous simulations. This change in riparian area and associated evapotranspiration was calculated by District staff (Christensen 2003) based on 2001 orthoimagery from San Clemente Dam to the Carmel River Lagoon. Previous estimates of riparian area along the Carmel River were based on 1986 aerial photographs.

ASR Project Operating Logic

For the ASR simulation, it was assumed that diversions from the Carmel River Basin for injection into the coastal area of the SGB would only occur between December 1 and May 31, when flow in the Carmel River was in excess of the bypass flows recommended by the National Marine Fisheries Service (NOAA Fisheries) in their June 3, 2002, report, *Instream flow Needs for Steelhead in the Carmel River, Bypass Flow Recommendations for Water Supply Projects Using Carmel River Waters*. Similarly, it was assumed that diversions from the coastal

[3] CVSIM refers to a family of simulation models. CVSIM1 is used to assess the performance of Carmel River mainstem dam alternatives, CVSIM2 is used to simulate unimpaired flow conditions, and CVSIM3 is used to simulate the performance of No-Project and non-dam water supply alternatives.

[4] Cal-Am owns and operates a "main" water distribution system in its Monterey Division. This main system serves approximately 37,000 connections and derives its source of supply from the MPWRS. Cal-Am also owns and operates three smaller and separate water distribution systems in its Monterey Division, i.e., Ryan Ranch, Hidden Hills, and Bishop Units, that are within the District. These units are served from sources of supply outside the MPWRS and are not included in this analysis.

area of the SGB by Cal-Am for customer use in its main system would occur primarily between June 1 and November 30. Accordingly, the usual high-flow period (December through May) was considered the "injection" season and the usual low-flow period (June through November) was considered the "recovery" season. No exceptions to the operating logic were made during the injection season. Three exceptions to the logic were made for diversions from the coastal area of the SGB during the recovery season. First, consistent with SWRCB Order 98-04, during November when flow in the Carmel River at the Highway 1 Bridge exceeded 40 cubic feet per second (cfs), Cal-Am's daily diversions from the Seaside Basin were curtailed. Second, during critically-dry water years when usable storage in subunit three of the Carmel Valley alluvial aquifer (AQ3) was less than 11,000 AF, Cal-Am's daily diversions from the SGB were maximized to preserve groundwater storage in Carmel Valley. Third, during April and May when flow in the Carmel River at the Highway 1 Bridge was less than 40 cfs, Cal-Am's daily diversions from the SGB were maximized to provide increased flow in the Carmel River for steelhead smolt emigration. Based on this logic, Cal-Am production from the coastal area of the SGB was distributed uniformly during the six-month recovery season.

This operating logic was chosen to facilitate comparisons between the No Project and Proposed Project simulation results. Actual operations may differ depending on future project objectives. For example, more water could be extracted from the SGB in April and May and less in October and November to provide increased flows for steelhead smolt emigration in the spring and less flow for juvenile rearing in the fall. Similarly, more storage in the SGB could be held in reserve for municipal use during extended dry periods. The magnitude and range of Cal-Am's production from the coastal area of the SGB due to operation of the proposed Proposed Project is explained further in the "Project Yield" section.

Modeling Assumptions

For the Proposed Project simulation, it was assumed that 7,200 AF of additional usable storage capacity would be available in the coastal subarea of the SGB for injection purposes. This usable storage capacity is in addition to the 7,500 AF of usable capacity assumed for the No Project Alternative. Therefore, the total usable storage capacity in the coastal area of the SGB with the Proposed Project was assumed to be 14,700 AF. For both simulations, initial usable storage in the coastal area of the basin was assumed to be approximately 5,000 AF.

It was also assumed that two ASR wells would be available with a combined injection capacity of 3,000 gallons per minute (gpm) or 13.3 AF per day. Specifically, it was assumed that the existing Santa Margarita Test Injection Well (SMTIW or ASR #1) would be able to inject up to 1,250 gpm and a new larger ASR well at the existing site (ASR #2) would be capable of injecting up to 1,750 gpm. It was assumed that both wells would operate at the same time during the injection season.

Similarly, it was assumed that ASR #1 well would be able to recover up to 2,500 gpm and ASR #2 well would be able to recover up to 3,500 gpm. For this analysis, it was assumed that only one well would operate at a time during the recovery season to avoid interference effects. Accordingly, the maximum recovery or production capacity with ASR #2 would be 3,500 gpm or 15.5 AF per day. Cal-Am's total production capacity from the coastal area of the SGB with ASR #2 in maximum recovery mode would be almost 35 AF per day.

In addition, it was assumed that Cal-Am would be able to transmit 3,000 gpm or 13.3 AF per day to and from the proposed Proposed Project site, while meeting customer water demand throughout their main water distribution system. The 13.3 AF per day transmission capacity is based on the proposed 16-inch, above-ground, 6,800-foot pipeline that is planned to connect the existing ASR site with the existing Cal-Am distribution system at the east end of Hilby Avenue in Seaside. The maximum transmission capacity of this pipeline is estimated to be 3,000 gpm or 13.3 AF per day.

In the ASR simulation, outflow from the coastal area of the SGB to the offshore area was increased to reflect the increased gradient that would result from increased storage in the coastal area. The increases were calculated based on Darcy's Law. As an example, when simulated usable storage in the coastal area is between 5,880 and 7,350 AF, simulated outflow is estimated to be 2.86 AF per day. However, when usable storage is between 13,320 and 14,700 AF, simulated outflow is estimated to be 6.43 AF per day.

For the Proposed Project simulations, it was assumed that annual inflow into the coastal area from upgradient, inland areas would be 4,955 AF and that this inflow would be uniformly distributed throughout the year, i.e., 413 AF per month. This assumption is the same as used in previous simulations, but differs from inflow estimates recently developed for the District. In their April 2005 report, *Seaside Groundwater Basin: Update on Water Resource Conditions*, Yates and others estimated that the amount of inflow from inland areas to the coastal area was 2,330 AF per year. In their water budget analysis, Yates and others also estimated that an additional 1,670 AF per year would recharge the coastal area from rainfall, irrigation and pipe leaks. Altogether, Yates and others estimated that an average of 4,000 AF per year would recharge the coastal area of the SGB.

In a separate calculation, Yates and others (2005) estimated a range of average annual inflow values into the coastal area using Darcy's Law. Yates and others' "best" estimates for inflows into the northern and southern coastal subareas were 5,060 AF and 680 AF, respectively. Therefore, based on Darcy's Law and available hydraulic conductivity values, the average annual inflow into the coastal area of the SGB is estimated to be approximately 5,740 AF. Given the uncertainty associated with these inflow estimates and the fact that the new inflow estimates bracket the previous estimate, it was decided to retain the previous subsurface inflow estimate in the Proposed Project simulations.

Project Yield

For this EIR, the annual yield for the Proposed Project was determined by comparing Cal-Am's average annual production from the coastal area of the SGB with the Proposed Project and Cal-Am's average annual production from the SGB without the Proposed Project, i.e., the No-Project Alternative. Based on this comparison, the average annual increase in yield from the coastal area of the SGB due to the ASR project is 1,050 AF per year. Specifically, Cal-Am's simulated average annual yield from the coastal area of the SGB for the 45-year period of analysis with the Proposed Project is 4,720 AF per year, compared to 3,670 AF per year without the project. The difference is 1,050 AF per year and is attributable to the excess water diverted from the Carmel River system during the December through May period and injected into the coastal area of the SGB for recovery during the June through November period.

The increased yield in the coastal area of the SGB was determined heuristically through a series of CVSIM3 simulations. The reference simulation was the No-Project alternative, in which an annual production target of 3,500 AF was specified for Cal-Am's diversions from the coastal area of the SGB. This target equates to an average diversion of 480 to 530 AF per month during the six-month recovery season. For the Proposed Project, the annual production target from the coastal area of the SGB was incrementally increased to 4,300 AF. At this production level, simulated monthly diversions would average between 650 and 720 AF during the six-month recovery period.

The 4,300 acre-foot production target was selected based on maintenance and recovery of usable groundwater storage in the coastal area of the SGB. Figure 8-15 shows the simulated end-of-year usable groundwater storage values for the coastal area of the SGB with and without the Proposed Project. As shown, end-of-year usable storage in the coastal area would be significantly greater with the Proposed Project and would range from a low of 1,595 AF in Water Year 1961 to a high of 10,920 AF at the end of Water Year 1983. The 4,300 acre-foot production target was chosen so that end-of-year usable storage with the Proposed Project approximates the end-of-year usable storage values without the Proposed Project during extended drought periods, e.g., Water Years 1959-1961 and Water Years 1987-1991. Note that, with the Proposed Project, the SGB can be operated more aggressively because of the ability to artificially recharge the basin in future wet years.

Figure 8-16 shows a comparison of the simulated annual amount of water injected and stored in the coastal area of the SGB and the annual amount of water recovered that would be attributable to the Proposed Project. As shown, the amount of water stored during a year would not necessarily match the amount of water recovered. For example, in simulated Water Year 1961, no water would be stored and 1,140 AF would be recovered. Conversely, in simulated Water Year 1983, 2,370 AF would be stored and 870 AF would be recovered. Over time, however, the average amount of stored water would approximate the average amount of recovered water.

Figure 8-17 shows a comparison of the simulated average monthly amounts of water that Cal-Am would divert from the coastal area of the SGB with and without the Proposed Project. As shown, the diversions amounts during the injection season, i.e., December through May, are essentially the same with the No-Project and Proposed Project. These diversions during the injection season reflect the exceptions to the operating logic and were made to provide increased municipal supply during drought periods and increased streamflows in the lower reaches of the Carmel River for steelhead smolt emigration. Diversions during the recovery season, i.e., June through November, are significantly greater with the Proposed Project. Specifically, diversions during the recovery season would be between 130 and 200 AF greater each month with the Proposed Project.

The Proposed Project, by increasing Cal-Am's reliable yield from the coastal area of the SGB during the June through November period, would allow Cal-Am to decrease its diversions from the Carmel River Basin during this low-flow season. Figure 8-18 shows a comparison of Cal-Am's simulated mean monthly diversions from the Carmel Valley alluvial aquifer with and without the Proposed Project. As shown, Cal-Am's monthly diversions from the Carmel Valley alluvial aquifer would be reduced by 90 to 240 AF per month during the June through November period. The total average reduction in diversions during this period would be 1,120 AF.

Lastly, it should be noted that the incremental firm yield associated with the Proposed Project is part of Cal-Am's overall yield from the MPWRS. For both simulations, i.e., No-Project and Proposed Project, overall annual production from the MPWRS to serve Cal-Am's main system was set at a maximum of 15,285 AF. Therefore, any increase in Cal-Am's ability to reliably divert from the coastal area of the SGB due to the Proposed Project would result in a corresponding decrease in Cal-Am's need to continue to divert from the Carmel River alluvial aquifer. None of the increased yield from the SGB due to the Proposed Project will be provided to new connections or intensified existing uses.

Setting

Carmel River Basin

Carmel River Streamflow

Streamflow in the Carmel River occurs in direct response to rainfall. Annual rainfall in the upper watershed at San Clemente Dam averages 20.4 inches, with more than 90 percent of this average occurring between November and April. Typically, the first winter rains replenish soils that have dried out during summer. Consequently, there is little runoff before December. Early runoff from the upper watershed refills Los Padres and San Clemente Reservoirs, which have been drawn down during the preceding months. After the reservoirs have filled, usually by mid-December, water overflows into the lower reaches of the river. By this time of year, groundwater pumping has lowered the water level in the alluvial aquifer subunits that lie below the lower river. Most of the early runoff percolates into the ground, and early runoff therefore adds little flow to the river. As groundwater levels rise, the period of highest streamflow begins, usually from January through April. Average monthly flows in the lower Carmel River during this time are between 180-380 cfs. When the first of the large flows reaches the lagoon at the river mouth, streamflow crosses the sand barrier that separates the lagoon from the ocean and the flow to the ocean begins. In anticipation of the high flows, the Monterey County Public Works Department (MCPWD) bulldozes a channel through the sand barrier to reduce the risk of flooding in adjacent low-lying residential areas.

After the rains stop, the river typically recedes. Ocean waves then close the channel through the beach, and the lagoon forms again. Usually, the river dries up in its lower reaches (e.g., below Schulte Road Bridge) by July. From July until the rains begin again, the only water remaining in the lower Carmel River is in isolated pools that gradually dry up as the water table declines in response to pumping. Streamflow in the river is measured continuously at two locations by the U.S. Geological Survey (USGS): (1) at River Mile (RM) 3.6 at the "Near Carmel" gaging station (one-third mile upstream of Via Mallorca Bridge), and (2) at RM 14.4 at the Robles del Rio gaging station (adjacent to Esquiline Road Bridge near Carmel Valley Village). Additionally, the District maintains continuous gaging stations at four locations on the Carmel River: (1) at RM 1.1 at the Highway 1 Bridge, (2) RM 10.8 at the Don Juan Bridge (at Garland Ranch Regional Park), (3) RM 17.6 at Sleepy Hollow Near San Clemente Dam, and (4) RM 24.8 below Los Padres Dam. Table 8-3 shows the average monthly flows in the river at the USGS Near Carmel and Robles del Rio gaging stations under unimpaired and existing conditions. "Unimpaired conditions" are the natural flow conditions that existed in the basin prior to water supply development or that it is estimated would have existed in the absence of such development. "Unimpaired flows" are the flows that would have occurred over time without any surface water diversion, groundwater pumping, or reservoir effects (i.e., flow regulation and evaporation). The unimpaired flows for the Carmel River mainstem sites were calculated by adding the reconstructed mainstem flows and estimated tributary flows in a downstream order and include evapotranspirative losses for riparian vegetation. Streamflow in the Carmel River is considered "flashy", i.e., it responds rapidly to rainfall over the watershed.

Table 8-4 shows monthly unimpaired streamflow at San Clemente Dam for selected exceedence frequencies for the 1958-2002 period of analysis. "Exceedence frequency" is the percentage of times that a particular value will be equaled or exceeded during a specific series of events. The 87.5% exceedence frequency is the streamflow value that is equaled or exceeded by 87.5% of the simulated streamflow values. For example, the 87.5% exceedence frequency for unimpaired streamflow in January at San Clemente Dam is 1,200 AF. This means that, for the period of analysis, the flow in January is equal to or greater than 1,200 AF 87.5% of the time.

In general, there is an inverse relationship between exceedence frequencies and streamflow. That is, high exceedence frequencies are associated with low flows and low exceedence frequencies are associated with high flows. This relationship follows from the fact that low flows are frequently exceeded and high flows are infrequently exceeded. Commonly, the observed frequencies are fitted to a theoretical probability distribution and used to assign probabilities of occurrence for specific streamflows. In this analysis, the exceedence frequencies were calculated based on the values simulated for the 1958-2002 period. These simulated frequencies were used to indicate the likelihood that certain flows would occur with the specified projects and associated operations. It was assumed that future inflows would be statistically similar to those in the historical record.

Water years were classified based on selected exceedence frequencies. In general, six classes – extremely-wet, wet, above normal, below normal, dry, and critically-dry -- were defined based on the 12.5%, 25.0%, 50.0%, 75.0%, and 87.5% exceedence frequencies. Table 8-5 shows a breakdown of the annual unimpaired flows at San Clemente Dam by water-year type based on these thresholds. The statistically derived water-year classes were used in the hydrology analysis to represent typical: “wet”, “normal”, and “dry” conditions, rather than specific years. This approach was taken to minimize the bias that would be introduced by analyzing single years and to clearly discern long-term differences in project performance and impacts.

Carmel River Alluvial Aquifer

The Carmel River from below San Clemente Dam to the ocean is an alluvial river, i.e., a river that flows over an accumulation of sediment deposited and reworked by the river in an earlier time. The underlying and reworked sediment is referred to as alluvium and consists of poorly consolidated boulders, gravel, sand, and silt deposited by the Carmel River in the last 10,000 years or so. The thickness of the alluvium increases in a downstream direction from zero feet above the Carmel Valley Filter Plant to more than 200 feet west of Highway 1 near the river mouth, with a typical thickness of 50 to 100 feet. The Carmel Valley alluvial aquifer is unconfined and is highly permeable, recharging rapidly after extended dry periods. The aquifer is underlain by much less permeable bedrock formations consisting of pre-Tertiary Period igneous and metamorphic rocks, and Tertiary Period sedimentary rocks. Only a few wells on the valley floor have been drilled through the alluvial sediments into underlying bedrock. Because the permeability of these rocks is considerably less than that of the alluvial sediments, groundwater exchange between the alluvium and the bedrock is thought to be limited and, therefore, has not been studied extensively or definitively quantified.

The Carmel Valley Alluvial Aquifer has been divided into four subunits for descriptive and computer modeling purposes: Aquifer Subunits 1 and 2 are collectively referred to as the upper aquifer, and Aquifer Subunits 3 and 4 are referred to as the lower aquifer. The terms “upper” and “lower” refer to upstream and downstream regions; the terms do not refer to shallow versus deep aquifer zones. A map and profile of the Carmel Valley Alluvial Aquifer is shown in Figure 8-19. This figure shows the location of Cal-Am’s production wells in the Carmel Valley, including four production wells (Panetta Nos. 1 and 2

Table 8-3. Average Monthly Flows in the Carmel River (Acre-feet)

	Robles del Rio Site		Near Carmel Site	
	Unimpaired Conditions[a]	Recorded Conditions[b]	Unimpaired Conditions[a]	Recorded Conditions[c]
October	430	202	424	82
November	1,614	832	1,703	550
December	4,664	3,636	5,031	3,786
January	13,312	12,510	14, 588	14,760
February	19,135	18,440	21,124	21,327
March	17,501	16,837	19,048	20,218
April	10,382	9,739	11,274	10,714
May	4,184	3,555	4,468	4,332
June	1,812	1,242	1,888	1,319
July	785	468	786	363
August	324	187	309	79
September	236	157	219	40
Total	74,379	67,805	80,862	77,570

Notes:

Estimated unimpaired runoff assuming no surface or groundwater development as simulated by MPWMD. Based on water years 1958-2002.

[b] Average of USGS gage records at Robles del Rio, water years 1957–2002.

[c] Average of USGS gage records at the Near Carmel site, water years 1962–2002.

Source: Monterey Peninsula Water Management District.

Table 8-4. Monthly Unimpaired Streamflow Values for Selected Exceedance Frequencies for the Carmel River at San Clemente Dam (All Flow Values Are in Acre-feet)

	Frequency				
Month	12.5	25.0	50.0	75.0	87.5
October	720	440	240	100	50
November	4, 100	1,810	670	300	230
December	8,910	5,060	2,430	1,020	600
January	34,430	16,770	6,410	2,190	1,200
February	41,250	25,490	9,580	3,860	1,770
March	35,130	22,570	10,230	3,240	1,870
April	22,220	11,780	4,630	1,850	1,150
May	8,750	5,020	2,430	1,130	570
June	3,350	2,240	1,130	490	190
July	1,920	970	380	60	10
August	760	360	90	40	0
September	510	210	70	20	10

Note:

Percent values refer to exceedance frequencies. For example, monthly flow in January is equal to or greater than 1,200 acre-feet 87.5% of the time.

Exceedance frequencies were calculated based on the unimpaired monthly record for the Carmel River at San Clemente Dam that was simulated by MPWMD for water years 1958–2002.

All numbers are rounded to the nearest 10.

Source: Monterey Peninsula Water Management District.

Table 8-5. Breakdown of Annual Unimpaired Flows at San Clemente Dam by Water-year Type Based on Selected Exceedance Frequencies

Water-year Type	Exceedance Frequency (%)	Streamflow (acre-feet)
Extremely wet	> 12.5	> 131,000
Wet	12.5–25.0	105,800–131,000
Above normal	25.0–50.0	50,700–105,800
Below normal	50.0–75.0	27,400–50,700
Dry	75.0–87.5	14,900–27,400
Critically dry	< 87.5	< 14,900

Note: Percentiles are based on exceedance frequencies. For example, a dry year would occur when flows at San Clemente Dam were exceeded between 75.0% and 87.5% of the time (i.e., between 14,900 and 27,400 acre-feet). Exceedance frequencies were calculated based on the unimpaired monthly record for the Carmel River at San Clemente Dam that was simulated by MPWMD for water years 1902–1996.

Source: Monterey Peninsula Water Management District and Garzas Nos. 3 and 4) that were formerly owned and operated by the Water West Corporation. These wells are now owned by Cal-Am, and their operation has been integrated into the Cal-Am system.

It is estimated that about 85% of the water entering the aquifer percolates through the bed of the Carmel River (Kapple and others 1984). Additional recharge comes from the tributary drainages, direct infiltration of precipitation, inflow from subsurface bedrock formations, and return flow from irrigation and septic systems. Water in the aquifer is primarily lost by groundwater pumping; minor sources of loss include discharge into the river, seepage into the ocean, evapotranspiration by riparian vegetation, and deep percolation into underlying bedrock formations.

Although riparian vegetation was much more abundant before the valley was developed and, consequently, evapotranspiration was greater, the water level in the aquifer in summer and fall was generally high enough to provide base flow to the river and sustain year-round flow. Upstream diversion of water and large-scale groundwater pumping now dry up the river in the Lower Carmel Valley during the summer months.

Since SWRCB Order 95-10 went into effect in July 1995, Cal-Am has produced about 74% of its annual water supply from sources in the Carmel River Basin. Specifically, for Water Years 1996-2002, Cal-Am diverted an average of 1,394 AF per year of surface water from San Clemente Reservoir, 9,827 AF per year from the Carmel River Alluvial Aquifer, and 3,851 AF per year from the coastal subareas of the Seaside Groundwater Basin. During this same seven-year period, non Cal-Am pumpers withdrew an average of 1,965 AF per year from wells in the Carmel Valley Alluvial Aquifer. A portion of the non-Cal-Am pumpage is assumed to return to the aquifer as recharge from irrigation and septic system return flow.

It should also be noted that, since September 2001 when Cal-Am signed a Conservation Agreement with the National Marine Fisheries Service (NOAA Fisheries) regarding actions to minimize Cal-Am's "take" of the federally listed steelhead in the Carmel River, Cal-Am has significantly modified its facilities and operations. Specifically, under the Conservation Agreement, Cal-Am has ceased diversion of water from San Clemente Reservoir during low-flow periods except during emergencies. Low-flows periods are defined as the times when streamflow in the Carmel River at the District's Don Juan Bridge (RM 10.8) gaging station is less than 20 cfs for five consecutive days. In addition, during the low-flow period, Cal-Am has ceased pumping water from its wells in the upper Carmel Valley, i.e., subunits 1 and 2, with two exceptions. These exceptions allow Cal-Am to pump its two Russell wells for a combined instantaneous diversion rate of no more than 0.5 cfs and conduct maintenance pumping of its other wells in the upper Carmel Valley during the low-flow period. As a result of this agreement, Cal-Am's surface water diversions from San Clemente Reservoir have averaged less than 200 AF per year over the last three years.

The volume of groundwater storage in the Carmel Valley Alluvial Aquifer is a function of the geometry of the basin and the porosity of the alluvial sediments.

Based on available information from logs of existing wells in the basin, the District has estimated that the total groundwater storage capacity of the aquifer is approximately 48,000 AF. Groundwater storage capacity estimates have been made by other investigators based on varying amounts of information, and have generally been in the range of 36,000-52,000 af. Not all of the total storage volume is considered usable, however, as this would result in complete dewatering of the aquifer. This would not be desirable or even possible, given the present configuration of production wells.

For CVSIM modeling purposes, the total groundwater storage capacity of the aquifer has been adjusted to exclude non-usable storage below the bottom of the perforations of the Cal-Am wells and in the coastal area of the aquifer that provides subsurface outflow to the ocean for prevention of seawater intrusion and freshwater inflow to the lagoon to minimize adverse impacts on the lagoon and wetland environment. The volume of usable groundwater storage in the aquifer is estimated at 28,500 AF.

Impacts and Mitigation Measures

Impact GWH-11: Changes in Carmel River Streamflow During High Flow Periods

Potential changes in Carmel River streamflow from increased diversions associated with the Proposed Project during high flow periods are **less than significant**. As modeled, increases in Cal-Am's diversions from the Carmel Valley alluvial aquifer for injection into the coastal area of the SGB for the Proposed Project would be limited to the December through May high-flow season. Further, new diversions for the ASR project would only be allowed when streamflow in the Carmel River during the high-flow season exceeded the bypass flows recommended by the NOAA Fisheries in June 2002. These bypass flows, which are intended to reflect the minimum instream flow needs of the Carmel River steelhead population, vary daily based on season, location, water year type, and current flow conditions. For example, at the beginning of the high-flow season before an attraction event has occurred, the bypass flow requirement is 40 cfs at the Carmel River Lagoon. During an attraction event, the bypass flow requirement is 200 cfs at the Carmel River Lagoon followed by five days of reduced flows – 175, 150, 125, 100, and 80 cfs – for migration purposes. Once an attraction event and the five-day migration flows have occurred, the minimum bypass flow requirement is 60 cfs at the Carmel River Lagoon for the remainder of the high-flow season, unless a new attraction event occurs that resets the bypass flow requirements. For the period of analysis, the annual bypass flow requirements at the Carmel River Lagoon averaged 34,870 AF and ranged from a minimum of 19,900 AF in simulated Water Year 1961 to a maximum of 52,730 AF in simulated Water Year 1983. The median or typical annual bypass flow requirement at the Carmel River Lagoon was 33,880 AF.

The average annual amount of simulated Carmel River streamflow in the reach between Cal-Am's Cypress production well (River Mile 5.5) and the Carmel

River Lagoon during the high-flow season that was in excess of the minimum bypass flows recommended by NOAA Fisheries was 42,890 AF. This excess flow volume ranged from zero AF in a number of dry years, e.g., Water Years 1961, 1976 and 1977, and 1989, to 271,180 AF in Water Year 1983. The median or typical amount of excess flow based on NOAA Fisheries' minimum bypass flow requirements during the high-flow season in the lower reach of the Carmel River Lagoon was 16,230 AF.

In addition to the minimum bypass flow requirements for the Carmel River, NOAA Fisheries specified a "cumulative maximum" diversion rate. This rate, which included all Cal-Am and non Cal-Am diversions from the Carmel River and Carmel Valley alluvial aquifer, was set at 80 cfs or approximately 160 AF per day. As recommended, the 80 cfs diversion rate would be the maximum amount of water that could be diverted by existing and future Cal-Am and non Cal-Am water users from the Carmel River and underlying alluvial aquifer. For this analysis, the maximum mean daily diversion rates for Cal-Am and non Cal-Am diverters were estimated to be approximately 25 cfs and 3 cfs, respectively.

The cumulative maximum diversion rate was set by NOAA Fisheries to provide "flushing flows" for channel maintenance. Specifically, the 80-cfs maximum was selected so that the two-year peak recurrence event (Q_2) would not be reduced by more than five percent. In their discussion, NOAA Fisheries indicated that additional field study of the Carmel River geomorphology and sediment characteristics "may demonstrate that somewhat higher levels of diversion can be accommodated without undue adverse environmental impact". After applying NOAA Fisheries' "cumulative maximum diversions rate" limit, the average amount of excess water in the lower reach of the Carmel River during the high-flow season was reduced to 6,190 AF and ranged from zero AF to 18,720 AF. The median or typical amount of excess flow based on NOAA Fisheries' minimum bypass flow requirements and maximum cumulative diversion rate during the high-flow season in the lower reach of the Carmel River Lagoon was 5,640 AF.

As discussed above, Cal-Am's ability to deliver water to and transmit water from the Proposed Project site is a limiting factor. As proposed, the temporary, above-ground pipeline that would connect the Proposed Project site with Cal-Am's existing distribution system at the east end of Hilby Avenue in Seaside would be limited to 3,000 gpm or 13.3 AF per day. This limit will constrain the amount of excess water in the Carmel River Basin that could be diverted for injection and storage in the coastal area of the SGB. Specifically, the average simulated amount of excess water in the Carmel River during the high-flow season that would be diverted for injection as part of the Proposed Project is 960 AF and would range from zero AF to 2,370 AF per year. The median or typical amount of excess flow that would be diverted for injection based on available transmission capacity during the high-flow season is 1,150 AF per year. During the high-flow season, monthly diversions for injection would average between 80 and 240 AF per month. The maximum monthly diversion for injection would be approximately 410 AF.

Figures 8-20 through 8-31 show the monthly impact of the Proposed Project on Carmel River streamflow at the Narrows, Near Carmel, and Lagoon sites for four types of water year: wet, normal, dry, and critically-dry. Each figure also includes the estimated monthly unimpaired flows for site for reference.

Carmel River at the Narrows

This site reflects streamflow conditions in the Upper Carmel Valley (Figures 8-20 to 8-23). Because the same operations were used for the Cal-Am facilities in the Upper Carmel Valley aquifer subunits for the No-Project and Proposed Project simulations, the simulated streamflow at the Narrows is identical for both simulations for all water year types. As shown, the project flows are generally less than the unimpaired or natural flows. However, during dry and critically-dry years, streamflow at the Narrows with the No-Project and Proposed Project is greater than the unimpaired flow in July and August because of the release of stored water in Los Padres and San Clemente reservoirs.

Carmel River near Carmel

This site reflects streamflow conditions in the reach between the Narrows and the near Carmel gaging station and is associated with subunit 3 of the Carmel Valley alluvial aquifer (AQ3) (Figures 8-24 to 8-27). The bulk of Cal-Am's groundwater production capacity in the Carmel Valley is in AQ3 with seven wells comprising 65 percent of Cal-Am's total groundwater production capacity in the Carmel Valley.

During wet years, the simulated monthly flows are essentially the same for the No-Project and Proposed Project. In the November through February period, monthly streamflows are slightly greater with the Proposed Project. During the March through April period, monthly streamflows are slightly greater with the No-Project. During normal years, the simulated streamflow are also similar, with flows during December and January greater with the Proposed Project and flows during February and March greater with the No-Project. During dry years, the simulated streamflows are similar, with flows during the December through February period greater with the Proposed Project. During critically-dry years, the simulated streamflows are dissimilar during the February through April period, with flows greater with the Proposed Project.

Given that the surface water inflow to the reach is the same for both simulations, the increase in streamflow in the early winter months with the Proposed Project is due to increased storage in the alluvial aquifer. This increased storage is, in turn, due to the decreased pumping in AQ3 during the preceding low-flow season with the Proposed Project. By starting the high-flow season with greater groundwater storage and higher water levels, less streamflow is “lost” to percolation and more surface flow would occur in AQ3. The decrease in streamflow during the spring months is due to increased diversions for injection and is relatively minor.

Carmel River at the Lagoon

This site reflects streamflow conditions in the reach between the near Carmel gaging station and the Lagoon and is associated with subunit 4 of the Carmel Valley alluvial aquifer (AQ4) (Figures 8-28 to 8-31). Impacts to streamflow at the Lagoon are similar to those simulated at the near Carmel site. During wet years, the simulated monthly flows are essentially the same for the No-Project and Proposed Project. In the November through February period, monthly streamflows are slightly greater with the Proposed Project. During the March through April period, monthly streamflows are slightly greater with the No-Project. During normal years, the simulated streamflows are also similar, with flows during the December through February period greater with the Proposed Project and flows during March greater with the No-Project. During dry years, the simulated streamflows are similar, with flows during the January through February period greater with the Proposed Project. During critically-dry years, the simulated streamflows are dissimilar during the February through April period, with flows greater with the Proposed Project.

In summary, the Proposed Project would have a **less than significant effect** on Carmel River streamflow during high flow periods. However, to insure that flows remain in compliance with NOAA Fisheries recommendations, the following mitigation is proposed.

Mitigation Measure GWH-4: Operate Project in Compliance With NOAA Fisheries Recommendations and to Reduce Unlawful Diversions

MPWMD shall operate the Proposed Project in accordance with all of the bypass terms recommended by NOAA Fisheries in its 2002 report, "Instream Flow Needs for Steelhead in the Carmel River, Bypass Flow Recommendations for Water Supply Projects Using Carmel River Waters." In addition, Cal-Am should be required to utilize water that is available from the Seaside Basin to help reduce unlawful diversions from the Carmel River.

Impact GWH-12: Changes in Carmel Valley Alluvial Aquifer Storage During High Flow Periods

During high flow periods of wet and normal years in the Carmel River Basin, the Proposed Project would not cause substantial changes in Carmel Valley alluvial aquifer storage. During high flow periods of dry years in the Carmel River basin, the Proposed Project would result in increased storage in Carmel Valley alluvial aquifer storage during the first three months of the high-flow season (December through February). This increased storage during these months would be due to the reduced pumping from the Carmel Valley alluvial aquifer during the preceding low-flow season and is considered **a beneficial change.** During high flow periods of critically-dry years in the Carmel River basin, the Proposed Project would result in increased storage in Carmel Valley alluvial aquifer for the entire high-flow season (December through May). Similar to conditions during the high-flow season for dry years, this increased storage would be due to the reduced pumping from the Carmel Valley alluvial aquifer during the preceding low-flow season and is considered a beneficial change.

As discussed above, groundwater storage in the Lower Carmel alluvial aquifer (AQ3 and AQ4) is increased due to the decreased pumping from the Lower

Carmel alluvial aquifer during the low-flow season with the Phase 1 ASR Project. Figures 8-32 through 8-35 show the simulated end-of month amounts of usable storage in the Lower Carmel Valley alluvial aquifer for four types of water year: wet, normal, dry, and critically-dry. Each figure also includes the simulated end-of-month storage value for each water year type for reference.

During wet years, simulated end-of-month usable storage in the Lower Carmel Valley alluvial aquifer is essentially the same during the high-flow season with the No-Project and Proposed Project. Usable storage in December is approximately 500 AF greater with the Proposed Project. This similarity is due to the relatively large amount of streamflow and recharge available during wet years and the limited amount of storage capacity available in the Carmel Valley alluvial aquifer. During normal years, the same pattern is apparent. Usable storage is slightly greater in December with the ASR Project and similar to the No-Project for the remainder of the high-flow season. During dry years, when there is less streamflow and recharge and the Lower Carmel Valley alluvial aquifer takes longer to fill, the effects of the Proposed Project are more apparent. Usable storage in December, January and February is greater with the Proposed Project. During critically-dry years, when there is insufficient streamflow and recharge to fill the Lower Carmel Valley alluvial aquifer, usable storage is greater for the entire high-flow period with the Proposed Project. This is a **beneficial change**.

Mitigation: No mitigation is required.

Impact GWH-13: Changes in Carmel River Streamflow During Low Flow Periods

During low flow periods in the Carmel River Basin, the Proposed Project would cause beneficial or **less than significant** adverse changes in Carmel River streamflow at the locations simulated by CVSIM. As modeled, decreases in Cal-Am's diversions from the Carmel Valley alluvial aquifer as a result of the Proposed Project would occur during the June through November low-flow period.

Figures 8-20 to 8-31 show the monthly impact of the Proposed Project on Carmel River streamflow at the Narrows, Near Carmel, and Lagoon sites for four types of water year: wet, normal, dry, and critically-dry. Each figure also includes the estimated monthly unimpaired flows at each site for reference.

Carmel River at the Narrows

This site reflects streamflow conditions in the Upper Carmel Valley aquifer subunit (AQ1 and AQ2) (Figures 8-20 to 8-23). Because the same operations were used for the Cal-Am facilities in the Upper Carmel Valley for the No-Project and Proposed Project simulations, the simulated streamflow at the Narrows is identical for both simulations for all water year types. As shown, the project flows are generally less than the unimpaired or natural flows. However, during dry and critically-dry years, streamflow at the Narrows with the No-Project and Proposed Project is greater than the unimpaired flow during the low-flow months of July and August because of the release of stored water in Los Padres and San Clemente reservoirs.

Carmel River near Carmel

This site reflects streamflow condition in the reach between the Narrows and the near Carmel gaging station and is associated with subunit 3 of the Carmel Valley alluvial aquifer (AQ3) (Figures 8-24 to 8-27). The bulk of Cal-Am's groundwater production capacity in the Carmel Valley is in AQ3 with seven wells comprising 65 percent of Cal-Am's total groundwater production capacity in the Carmel Valley.

During wet years, the simulated monthly flows would be essentially the same for the No-Project and Proposed Project. During the June through October period, monthly streamflows would be essentially the same with the No-Project and the Proposed Project. In November, monthly streamflow would be slightly greater with the Proposed Project. During normal years, the simulated streamflow would also be similar. During dry years, the simulated streamflows would be similar and dry at the near Carmel site. During critically-dry years, the simulated streamflows would be similar with zero AF during the low-flow period with both the No-Project and Proposed Project.

It should be noted that, although increased streamflow at the near Carmel gaging station would not occur with the Proposed Project, it is likely that streamflow in the 6.4-mile reach between the Narrows (River Mile 9.6) and the near Carmel site (3.2) would flow farther and persist longer with the Proposed Project. This expectation is based on the fact that, with the Proposed Project, more groundwater would be in storage in AQ3 and this increased storage would be in the upstream portion of the aquifer subunit. Accordingly, given the same amount of surface water flow into AQ3 as the No-Project and greater storage and less groundwater pumping with the Proposed Project, it follows that streamflow would flow farther and persist longer before it would percolate into the underlying alluvial aquifer. With a larger Proposed Project (additional phases), it is possible that increases in Cal-Am's production from the coastal area of the SGB during the low-flow season would lead to sufficient decreases in Cal-Am's diversions from the Lower Carmel Valley alluvial aquifer that would result in increased streamflow in the lower reaches of the river

Carmel River at the Lagoon

This site reflects streamflow condition in the reach between the near Carmel gaging station and the Lagoon and is associated with subunit 4 of the Carmel Valley alluvial aquifer (AQ4) (Figures 8-28 to 8-31). Impacts to streamflow at the Lagoon are similar to those simulated at the near Carmel site. During wet years, the simulated monthly flows would be essentially the same for the No-Project and Proposed Project, with a slight increase in simulated monthly streamflow in November with the Proposed Project. During normal years, the simulated monthly streamflows would also be similar, with essentially no flows available during the July through November period. During dry and critically-dry years, the simulated streamflows would be the same, with no flows available during the June through November low-flow period.

In summary, the Proposed Project would have a **less than significant effect** on Carmel River streamflow during low flow periods. However, to insure that flows remain in compliance with NOAA Fisheries recommendations, the following mitigation is proposed.

Mitigation: See mitigation measure GWH-4 above. .

Impact GWH-14: Changes in Carmel Valley Alluvial Aquifer Storage During Low Flow Periods

During low flow periods in the Carmel River Basin, the Proposed Project and corresponding decreased diversions from the Carmel Valley alluvial aquifer would provide significant **beneficial changes** in Carmel Valley alluvial aquifer storage. During low flow periods of wet years in the Carmel River basin, the Proposed Project would result in increased storage in Carmel Valley alluvial aquifer storage during most of the low-flow season (July through November). This increased storage during these months would be due to the reduced pumping from the Carmel Valley alluvial aquifer during the preceding low-flow season and is considered a beneficial change. During low flow periods of normal, dry, and critically-dry years in the Carmel River basin, the Proposed Project would result in increased storage in Carmel Valley alluvial aquifer storage for the entire low-flow season (June through November). Similar to conditions during the low-flow season for wet years, this increased storage would be due to the reduced pumping from the Carmel Valley alluvial aquifer during the preceding low-flow season and is considered a **beneficial change**.

As discussed above, groundwater storage in the Lower Carmel Valley alluvial aquifer (AQ3 and AQ4) would be increased due to the decreased pumping from the Lower Carmel Valley alluvial aquifer during the low-flow season with the Proposed Project. Figures 8-32 through 8-35 show the simulated end-of month amounts of usable storage in the Lower Carmel Valley alluvial aquifer for four types of water year: wet, normal, dry, and critically-dry. Each figure also includes the simulated end-of-month storage value for each water year type for reference.

During wet years, simulated end-of-month usable storage in the Lower Carmel Valley alluvial aquifer shows a progressive increase in storage with the Proposed Project during the low-flow period. Between July and November, simulated groundwater storage would be between 240 and 860 AF greater with the Proposed Project. During normal years, the increases in usable storage would be greater. Between June and November, simulated groundwater storage in the Lower Carmel Valley alluvial aquifer would be between 130 and 1,170 AF greater with the Proposed Project.

During dry years, usable simulated storage would be greater in all months with the Proposed Project. During the June and November low flow period, usable storage would be between 210 and 1,200 AF greater with the Proposed Project. During critically-dry years, usable simulated storage would be greater in all months with the Proposed Project. During the June and November low-flow period, usable storage would be between 1,110 and 2,040 AF greater with the Proposed Project. This is a **beneficial change**.

Mitigation: No mitigation is required.

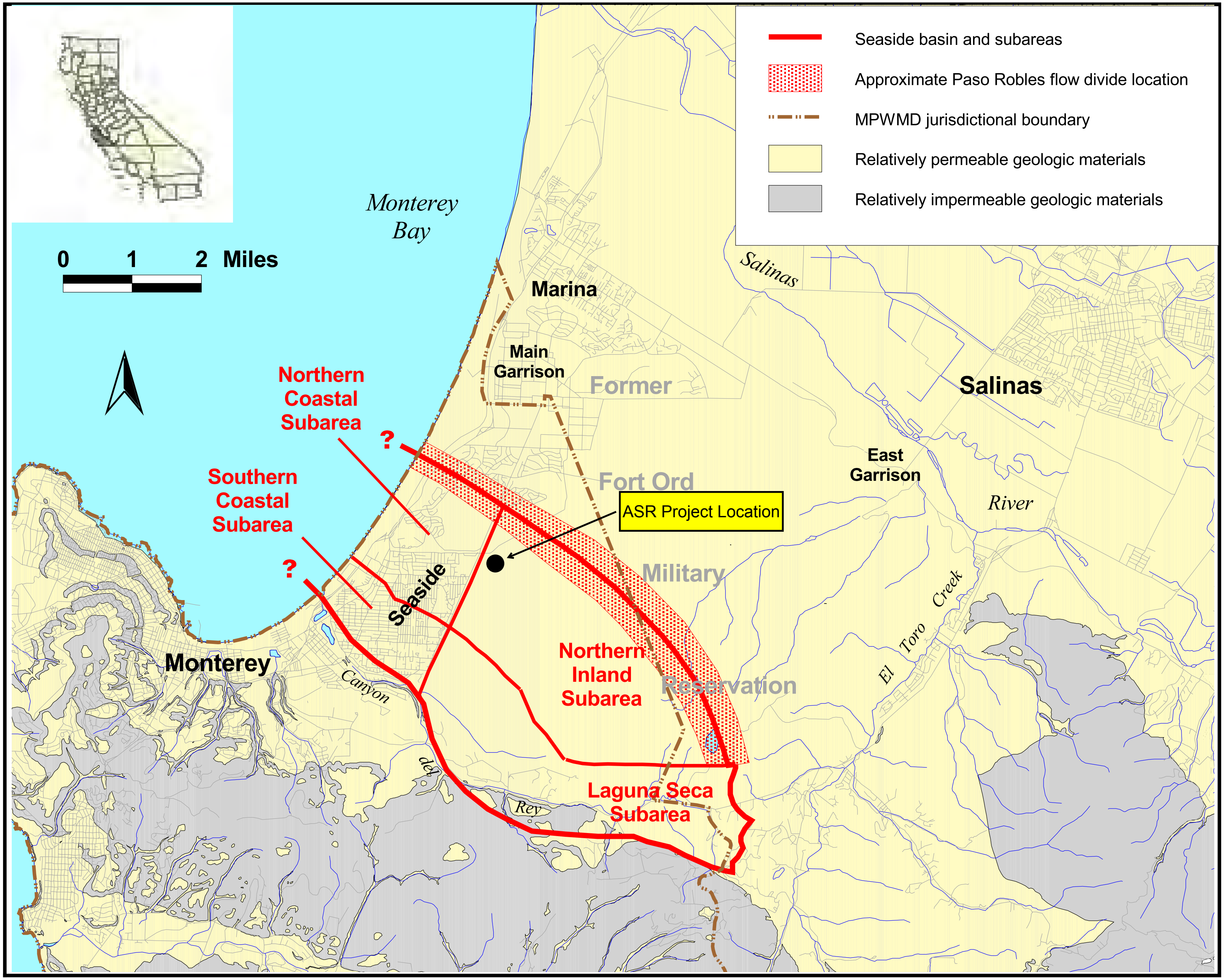
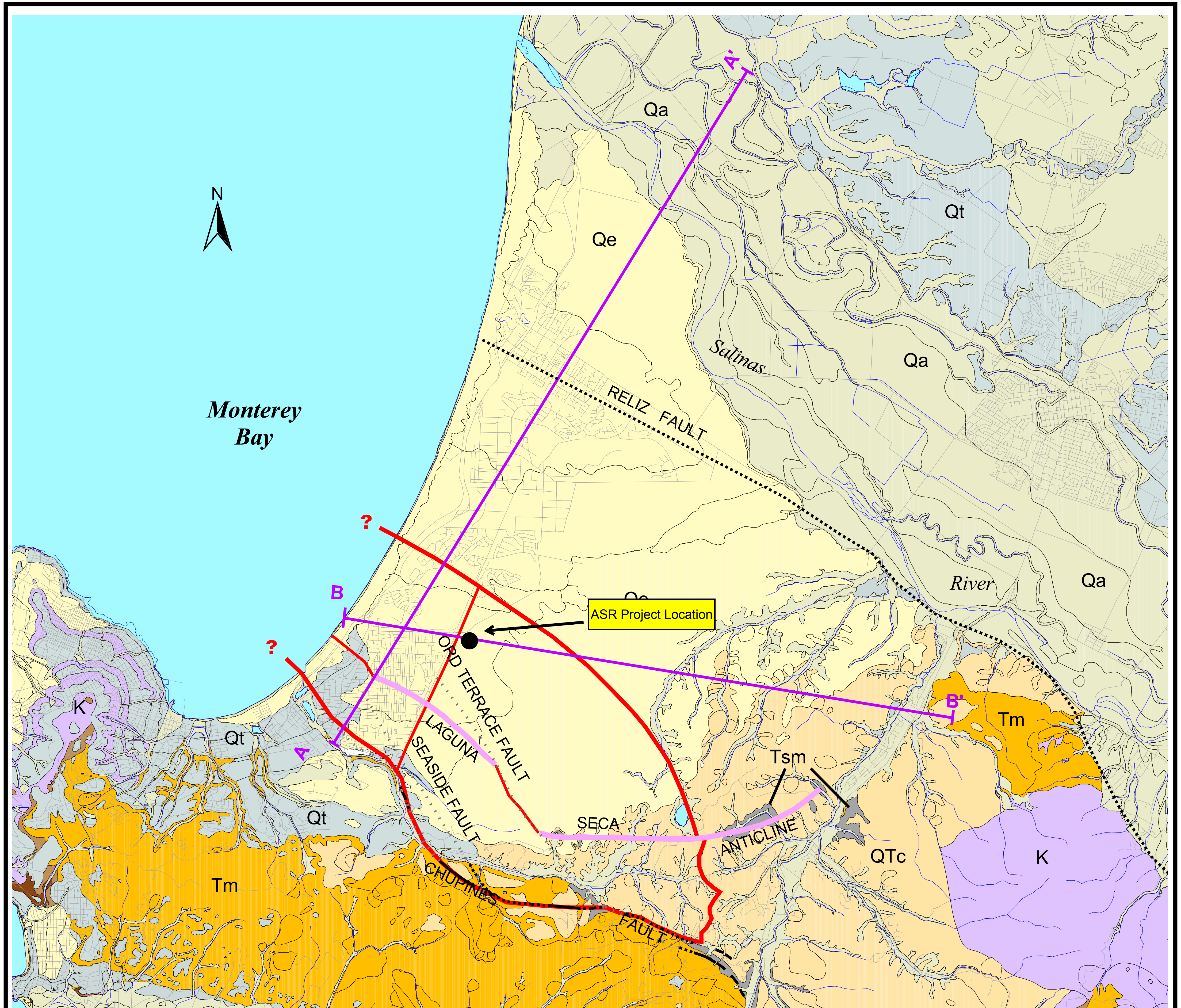


Figure 8-1. Location of the Seaside Groundwater Basin

Figure 8-2. Regional Location Map



DESCRIPTION OF MAP UNITS

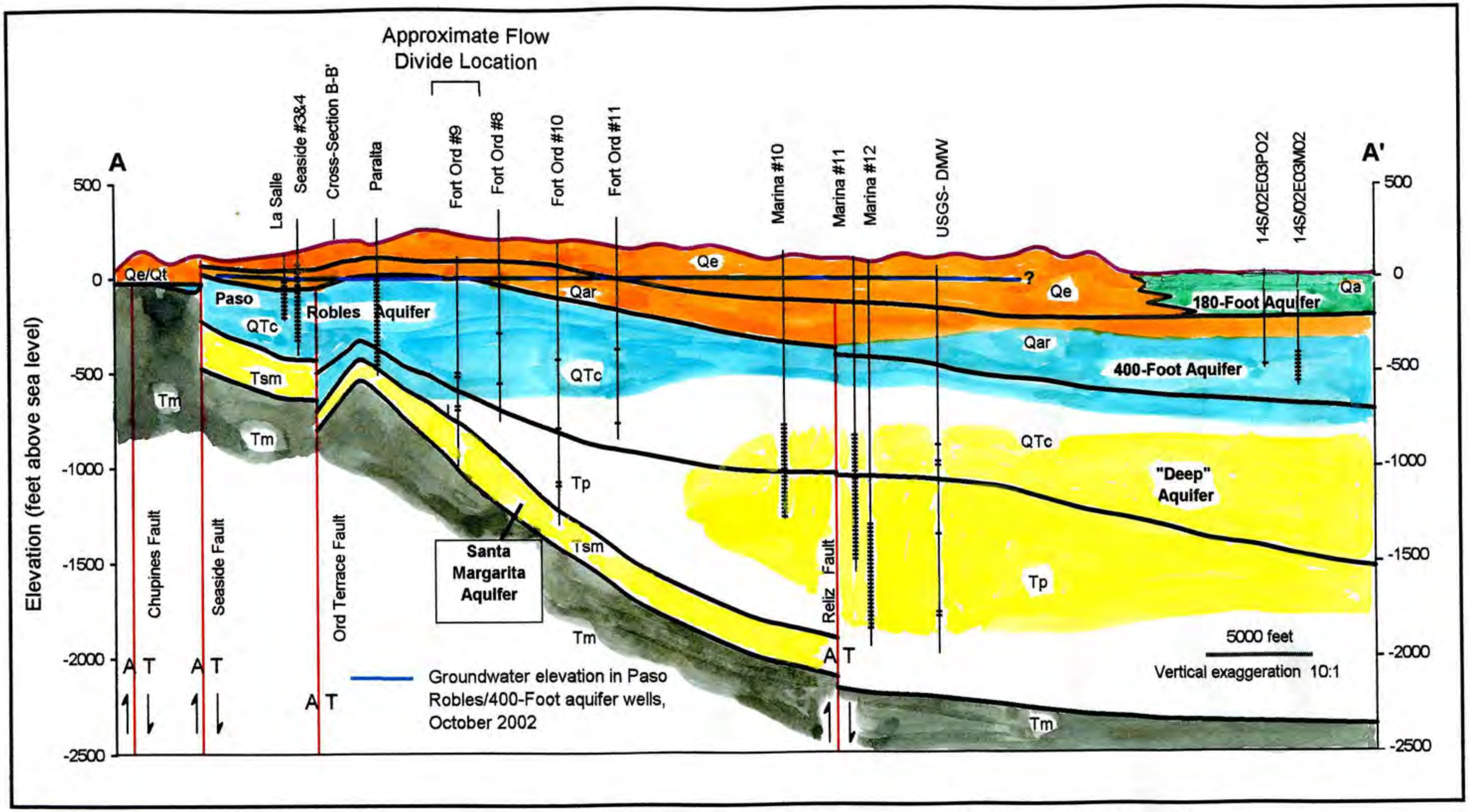
Qa	**Alluvial deposits, undivided (Holocene and Pleistocene)** Includes alluvium, colluvium, and river-channel, floodplain, basin and hillslope deposits.
Qe	**Eolian deposits (Pleistocene and Holocene).** Dunes and older dune deposits.
Qt	**Coastal and fluvial terrace deposits (Pleistocene)**
QTc	**Continental deposits, undivided (Pleistocene-Pliocene?)** Includes Paso Robles aquifer.
Tsm	**Santa Margarita Sandstone (Miocene)**
Tm	**Monterey Formation (Miocene)** Includes other Miocene clastic sediments.
K	**Intrusive igneous rocks (Late Cretaceous)**

DESCRIPTION OF MAP SYMBOLS

- **Seaside Basin boundary**
- **Basin subarea boundaries**
- **Laguna Seca Anticline**
- **Fault, certain**
- **Fault, approximately located**
- **Fault, concealed**
- **Fault, inferred**
- A A' **Geologic cross-section**

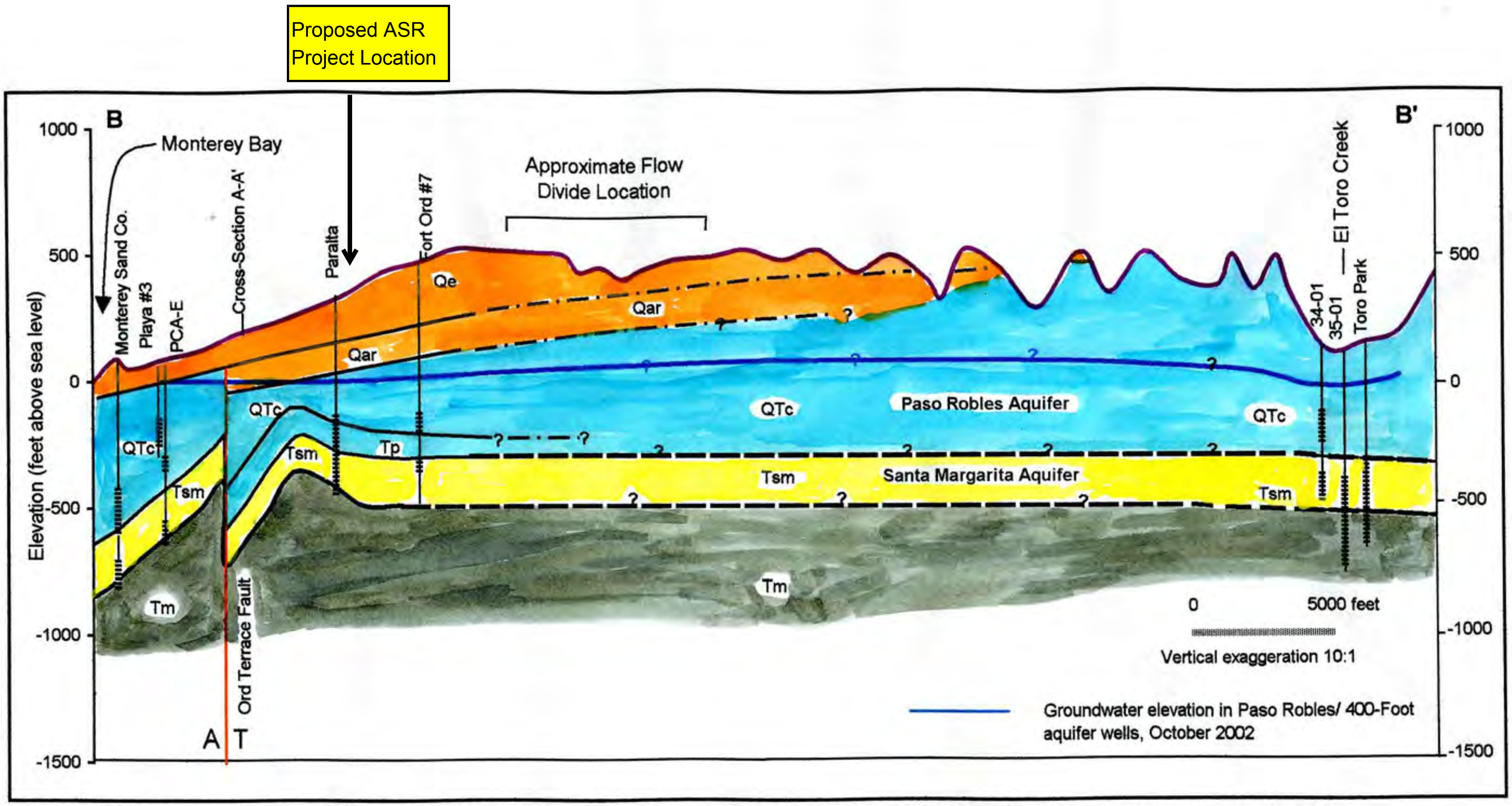
0 1 2 **Miles**

Geology simplified from Rosenberg (2001). Mapped landslides are grouped with the surrounding or source-area geologic unit.



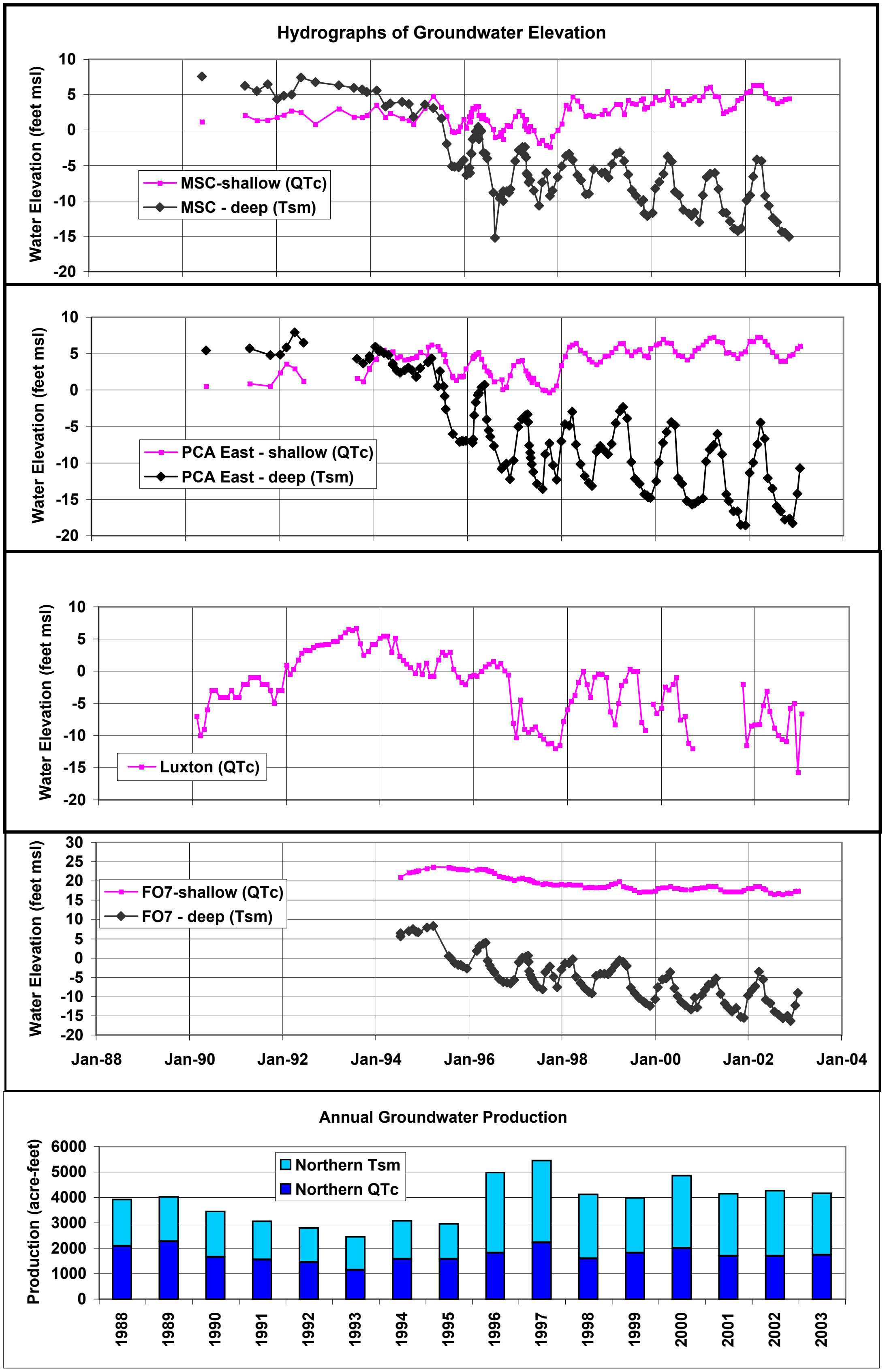
Location of cross-section is shown on Figure 3. Geology from Clark and others, 1997; Fugro West, Inc., 1997b: and WRIME, Inc., 2003. Formations: Tm = Monterey Formation; Tsm = Santa Margarita Sandstone; Tp = Purisima Formation; QTc = continental deposits; Qar = Aromas Sand; Qe = eolian deposits (dunes); Qt = terrace deposits; Qa = undifferentiated alluvial deposits. See text and Figure 3 for descriptions. Fault movement: arrows indicate vertical movement; A = horizontal movement away from the viewer; T = toward viewer.

Figure 8-3. Hydrogeologic Cross-Section A-A'



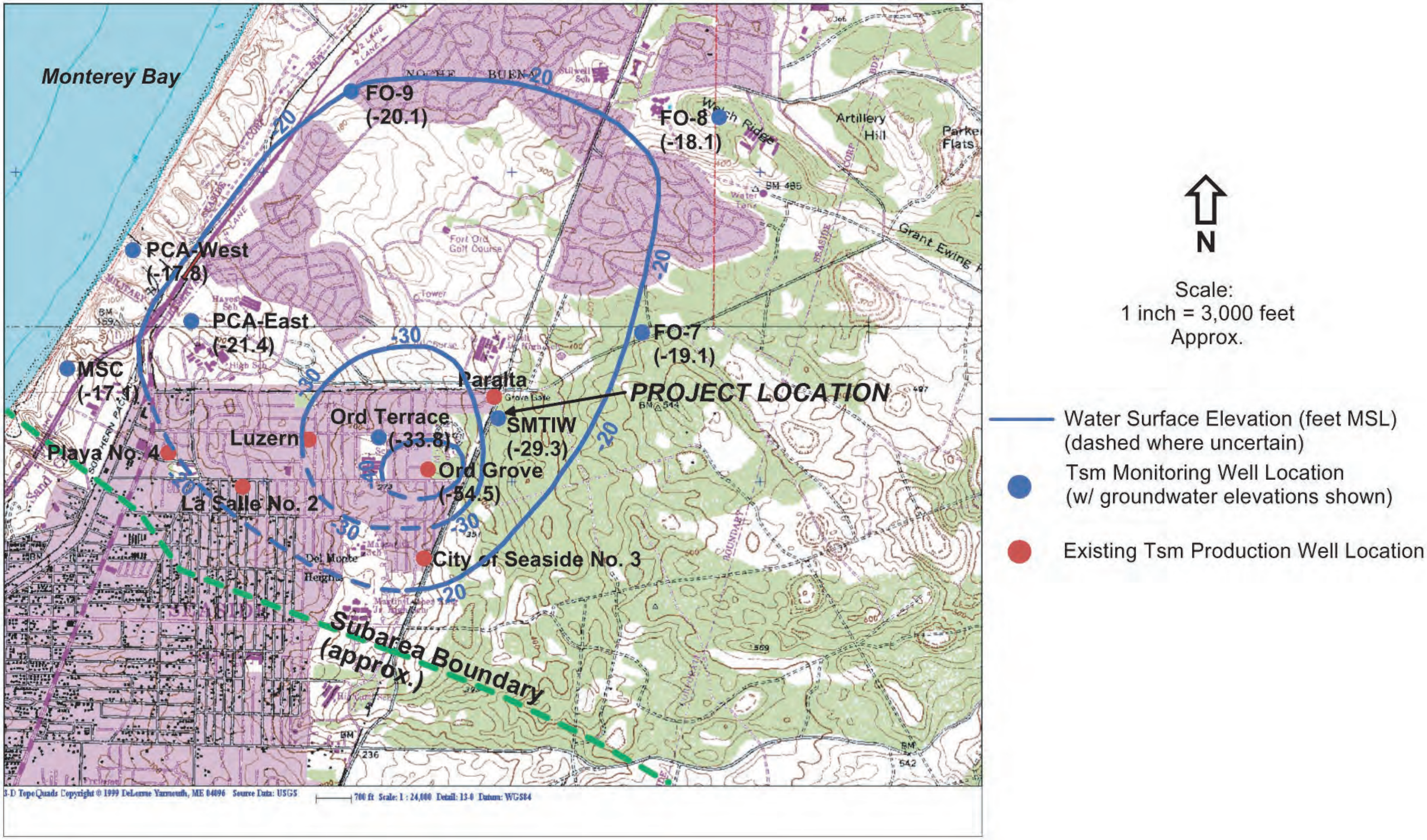
Location of cross-section is shown on Figure 3. Geology from Clark and others, 1997; Fugro West, Inc., 1997b: and WRIME, Inc., 2003. Formations: Tm = Monterey Formation; Tsm = Santa Margarita Sandstone; Tp = Purisima Formation; QTc = continental deposits; Qar = Aromas Sand; Qe = eolian deposits (dunes); Qt = terrace deposits; Qa = undifferentiated alluvial deposits. See text and Figure 3 for descriptions. Fault movement: arrows indicate vertical movement; A = horizontal movement away from the viewer; T = toward viewer.

Figure 8-4. Hydrogeologic Cross-Section B-B'



Source: MPWMD.

Figure 8-5. Groundwater Levels and Production in the Northern Coastal Subarea



Source: Padre Associates, Inc.

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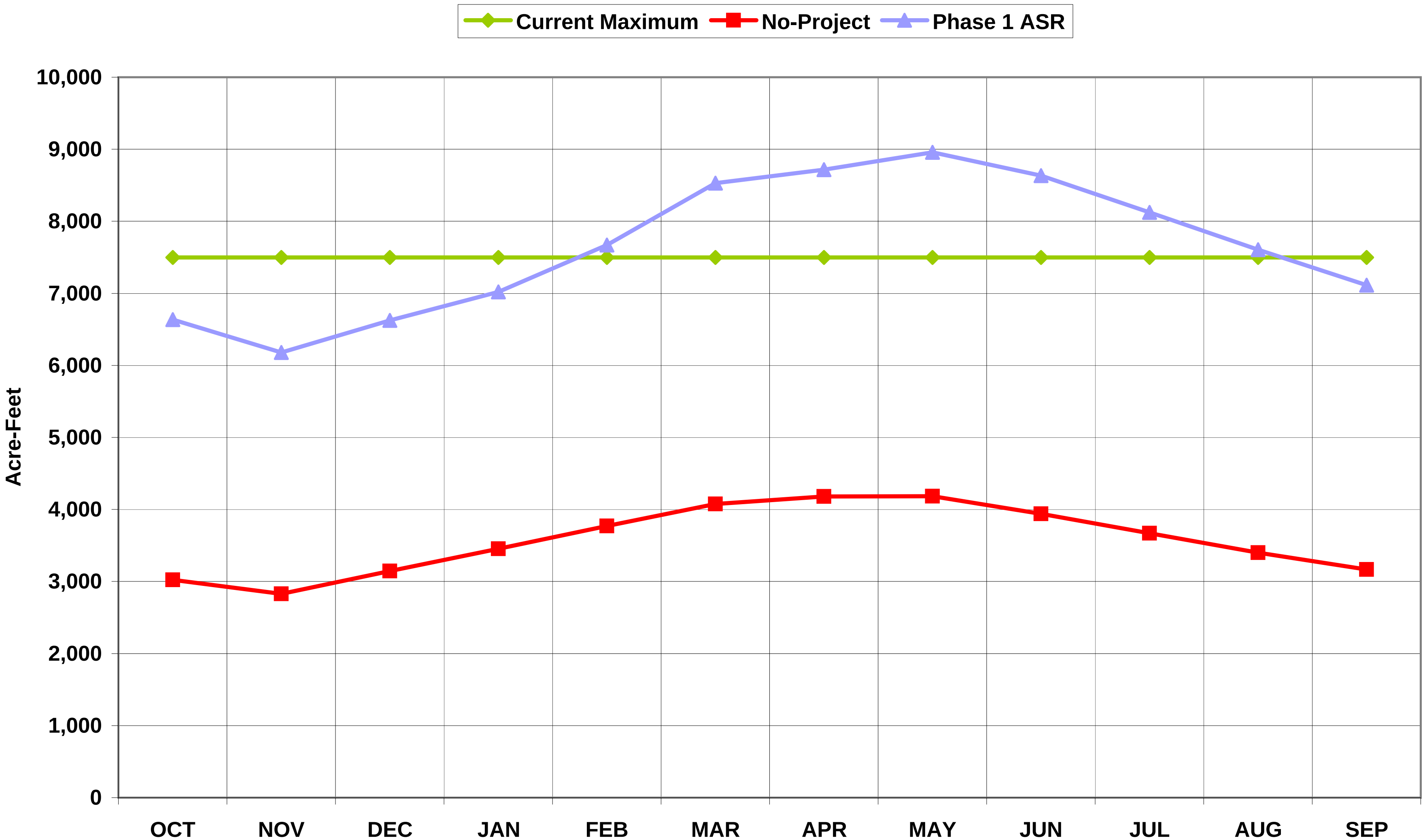
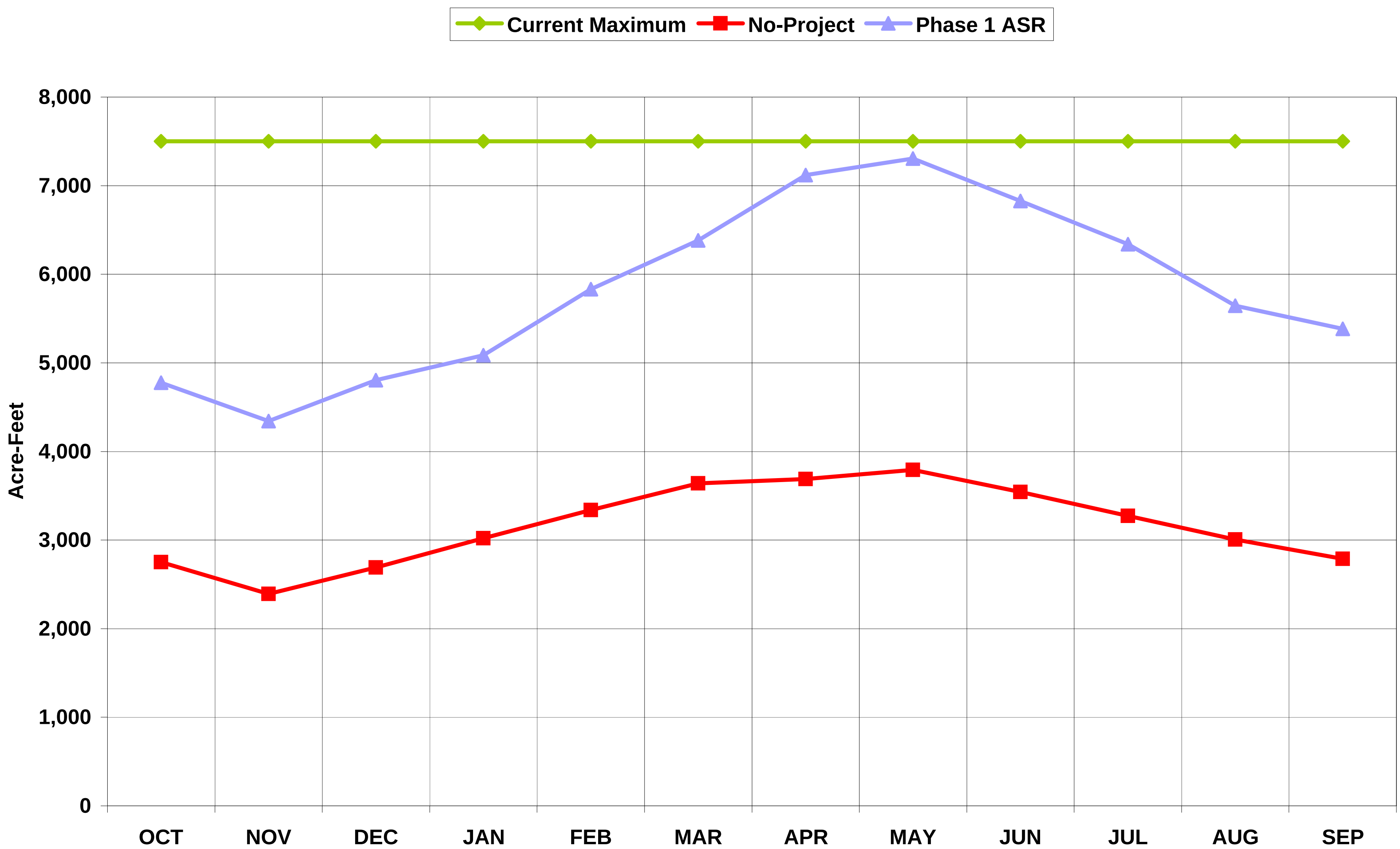
Figure 8-6
Water Surface Contours in Santa Margarita Aquifer, Fall 2004

Figure 8-7. Simulated End-of-Month Usable Groundwater Storage in the Coastal Subareas of the Seaside Groundwater Basin During Wet Years



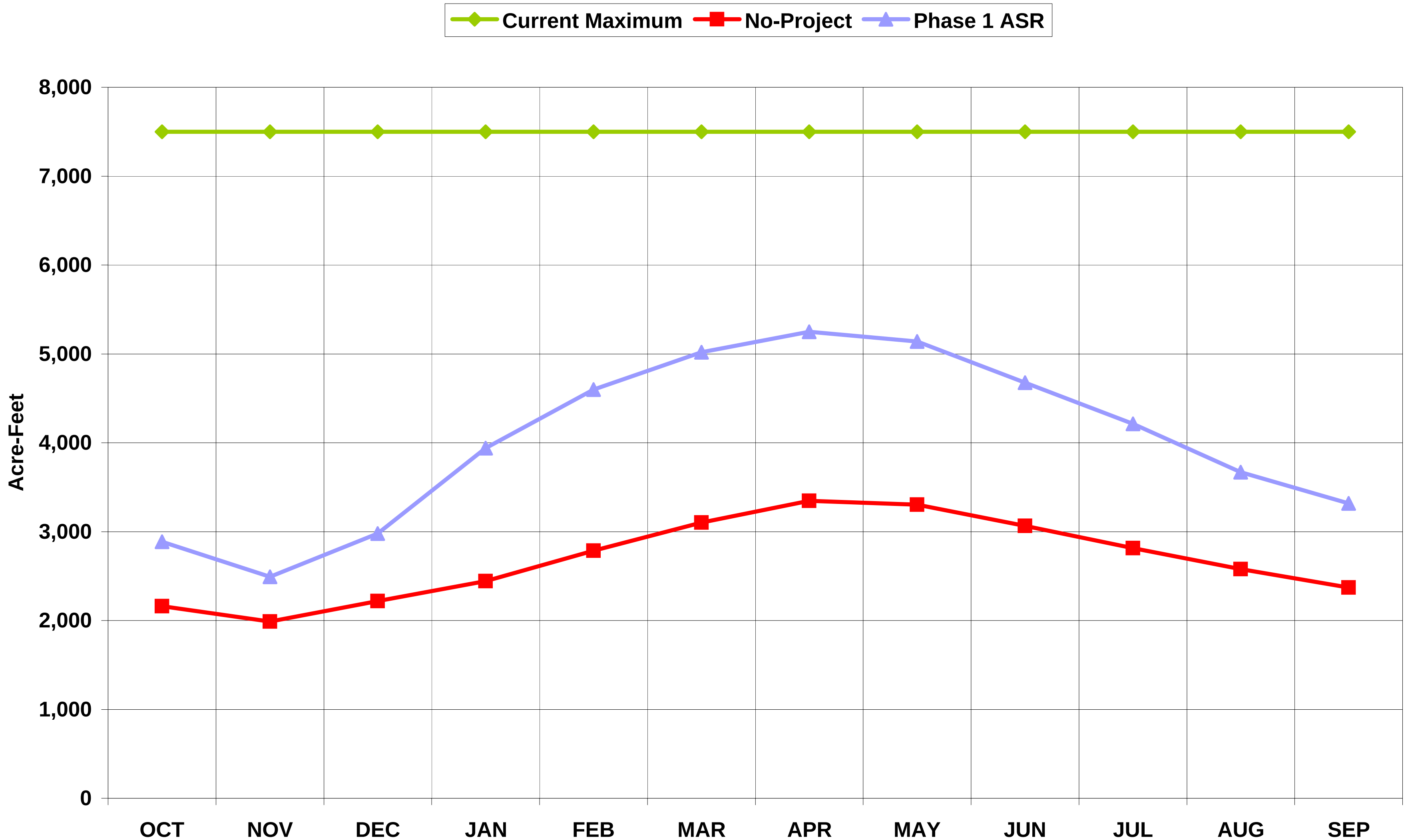
Source: MPWMD.

Figure 8-8. Simulated End-of-Month Usable Groundwater Storage in the Coastal Subareas of the Seaside Groundwater Basin During Normal Years



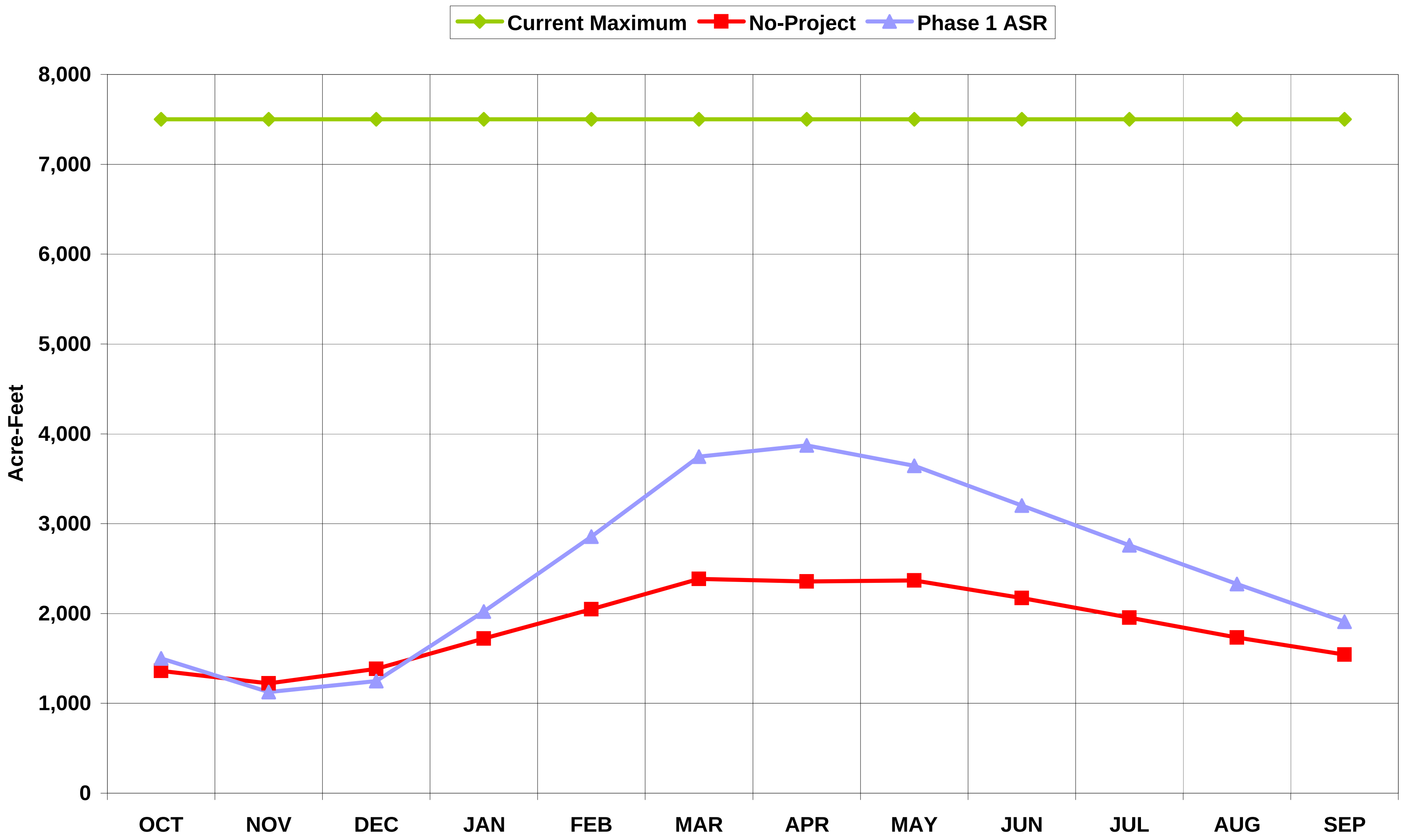
Source: MPWMD.

Figure 8-9. Simulated End-of-Month Usable Groundwater Storage in the Coastal Subareas of the Seaside Groundwater Basin During Dry Years

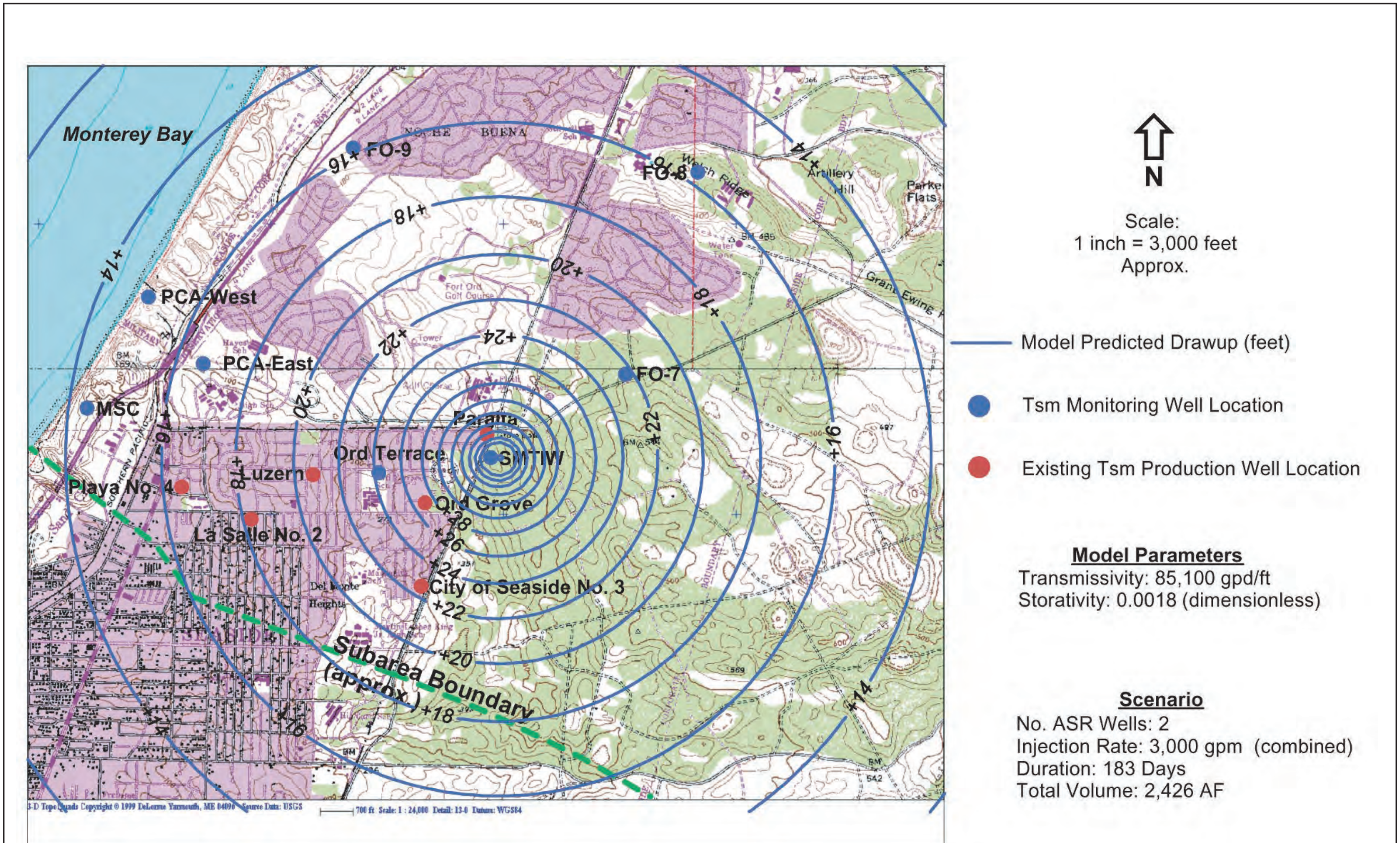


Source: MPWMD.

Figure 8-10. Simulated End-of Month Usable Groundwater Storage in the Coastal Subareas of the Seaside Groundwater Basin During Critically-Dry Years



Source: MPWMD.



Source: Padre Associates, Inc.

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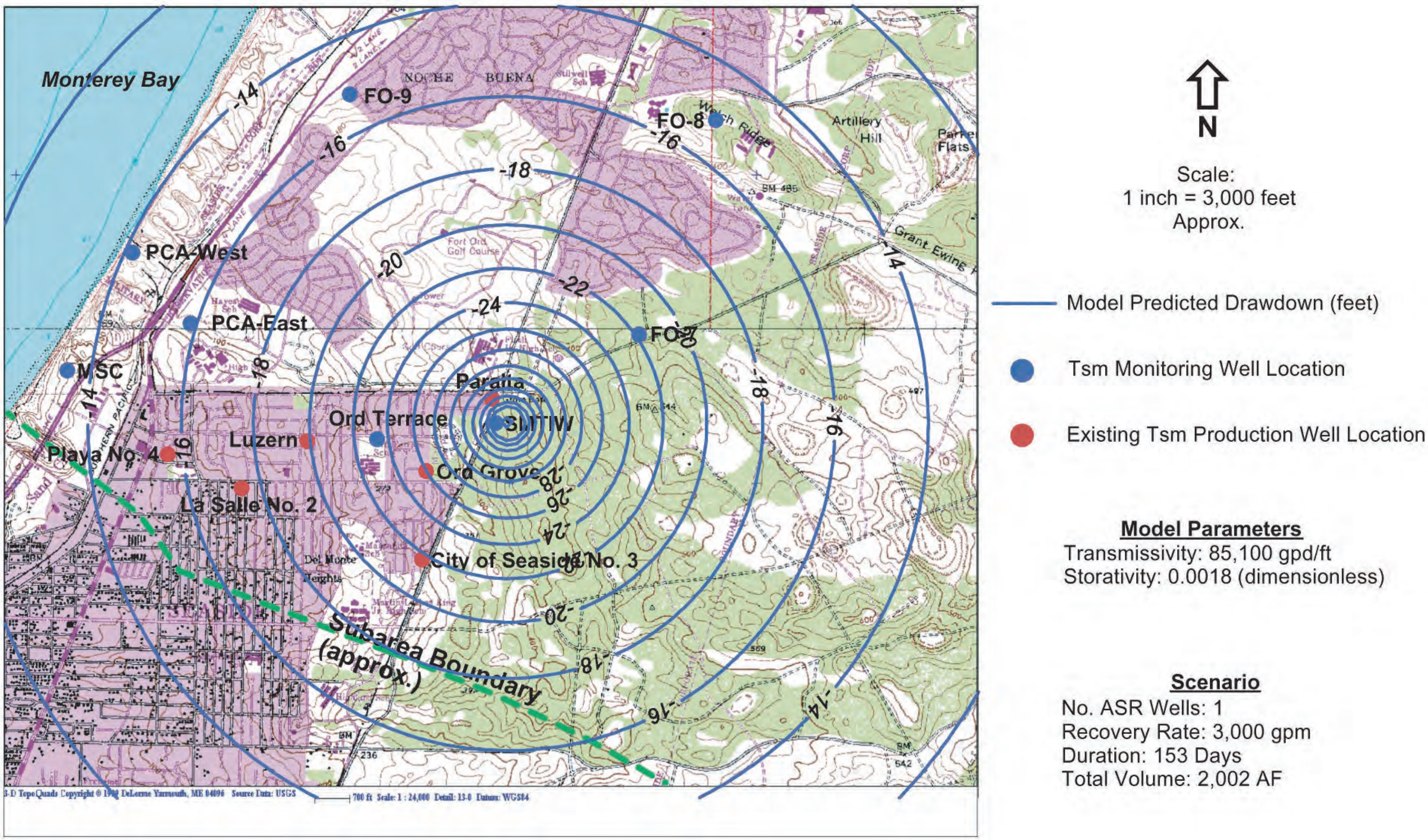
Figure 8-11
Model Predicted Water Level Drawup, Maximum Injection Year



Source: Padre Associates, Inc.

04637.04 EIR (11-05)

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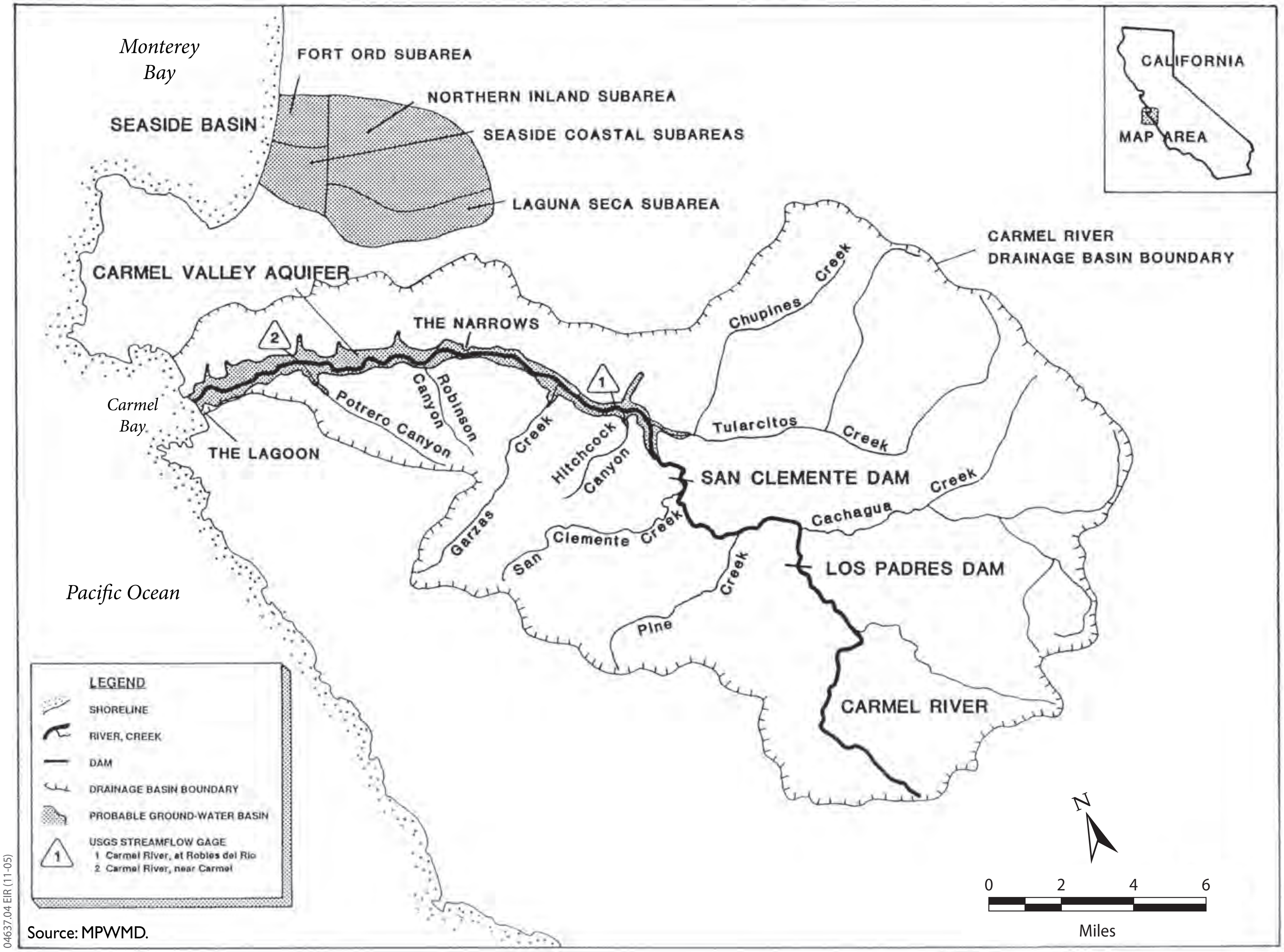
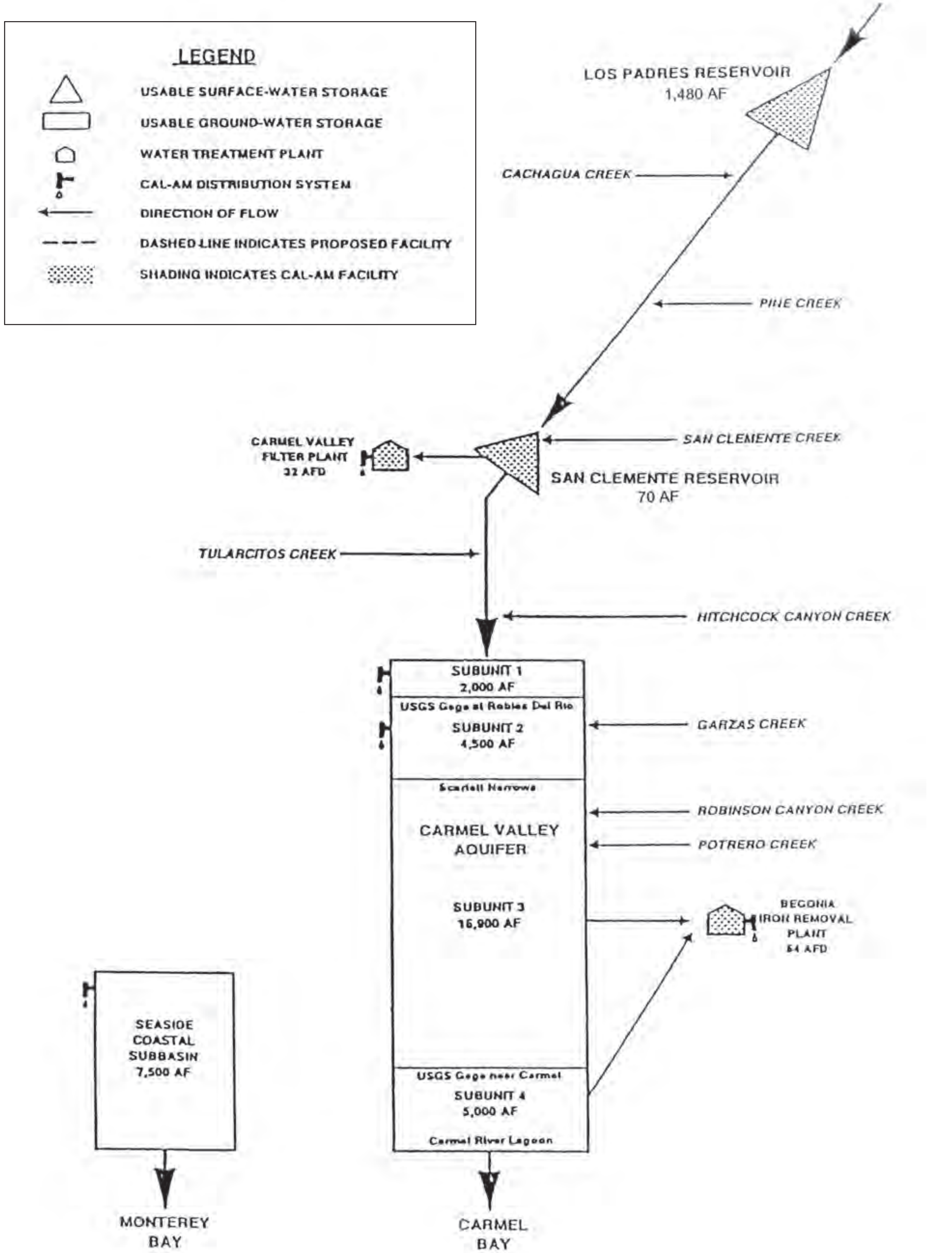
Figure 8-12
Model Predicted Water Level Drawdown, Maximum Recovery Year



Jones & Stokes

Figure 8-13
Water Resources System for the Monterey Peninsula Area, Including Carmel River, Carmel Valley Alluvial Aquifer, and Seaside Groundwater Basin



Source: MPWMD, 2003.

04637.04 EIR (11-05)

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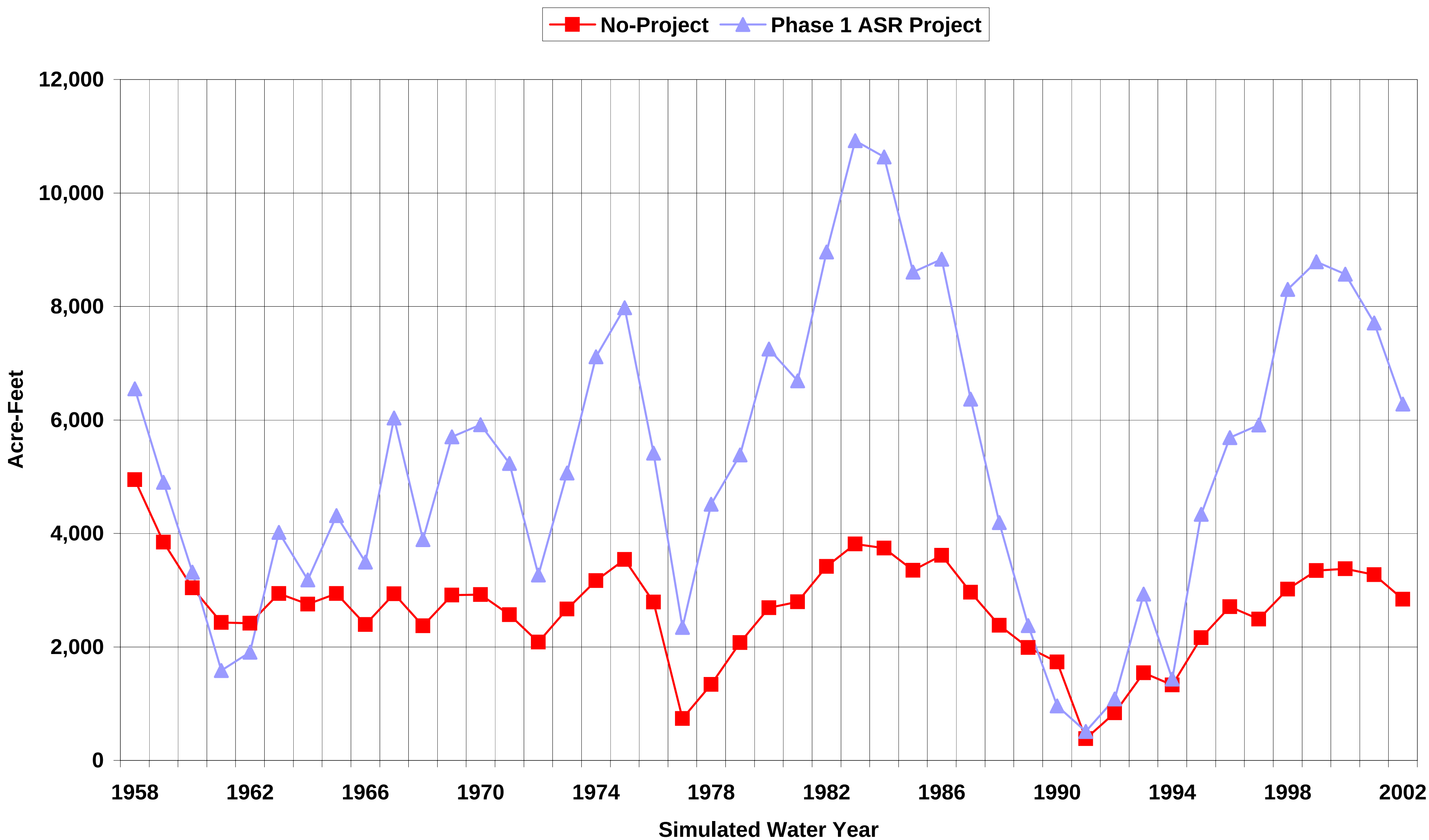
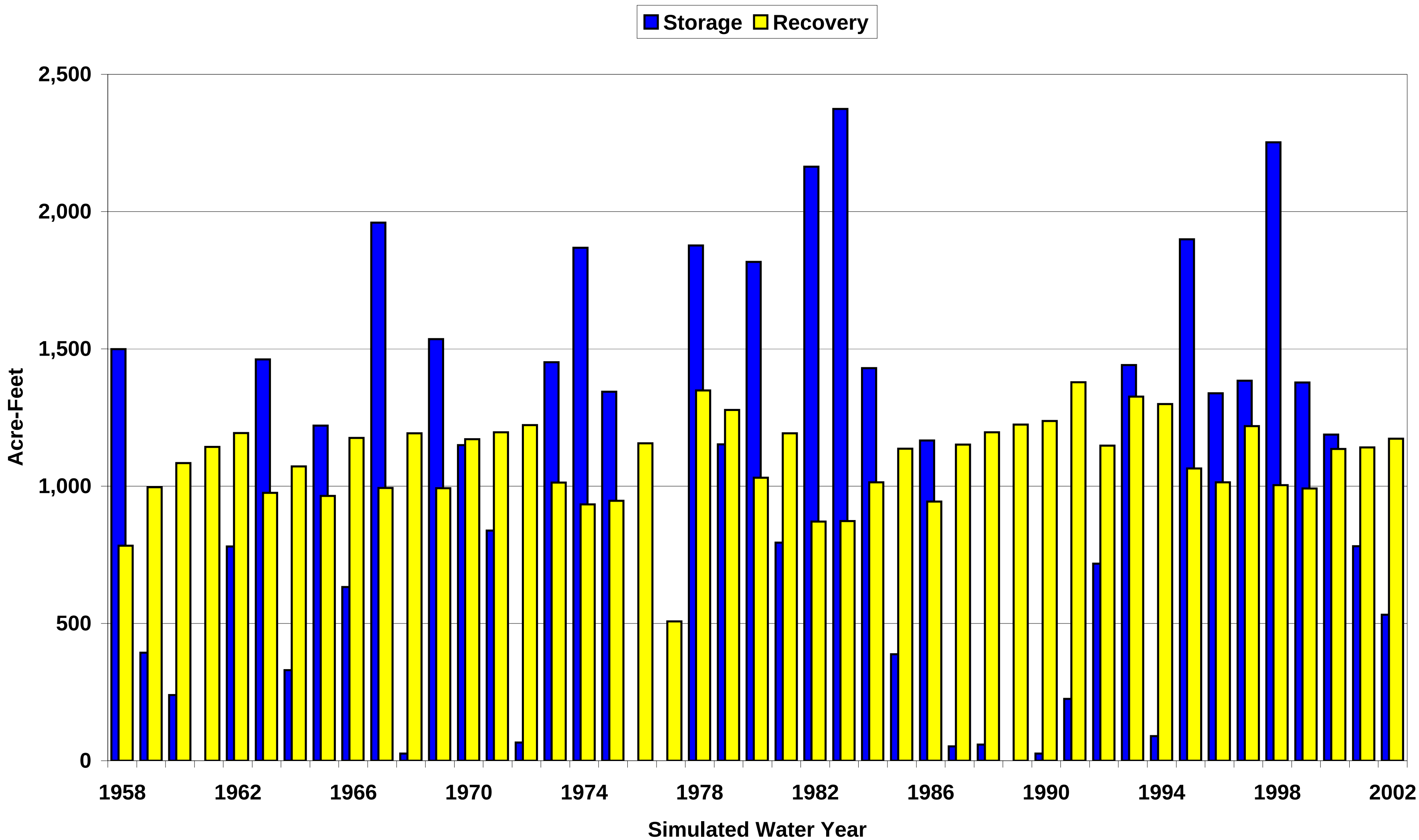
Figure 8-14
Operational Schematic of the Monterey Peninsula Water Resources System — Existing Conditions: 2003

Figure 8-15. Simulated End-of-Year Usable Storage in Coastal Area of Seaside Groundwater Basin



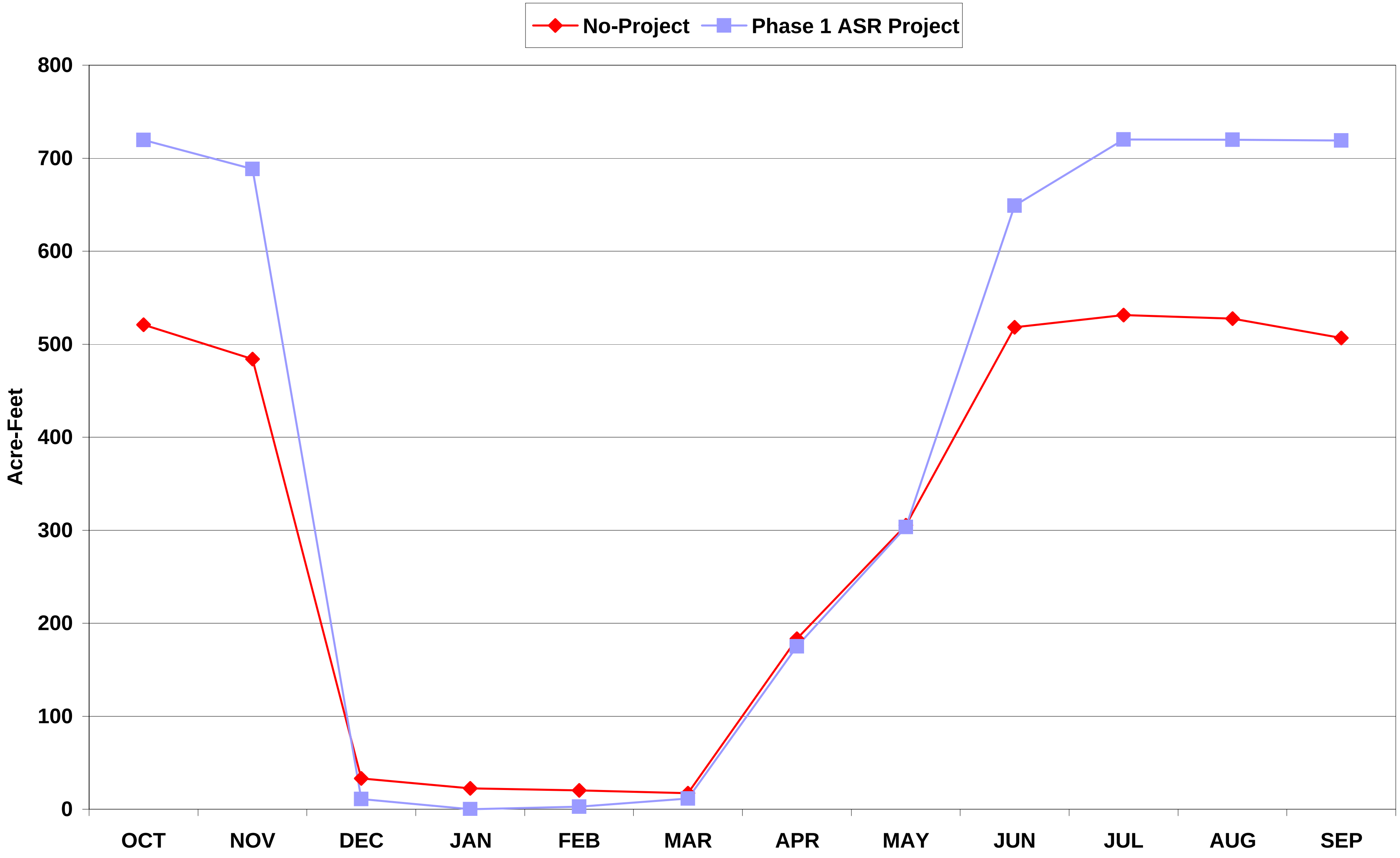
Source: MPWMD.

Figure 8-16. Simulated Annual Amounts of Water Stored and Recovered with the Phase 1 ASR Project: Water Years 1958 - 2002



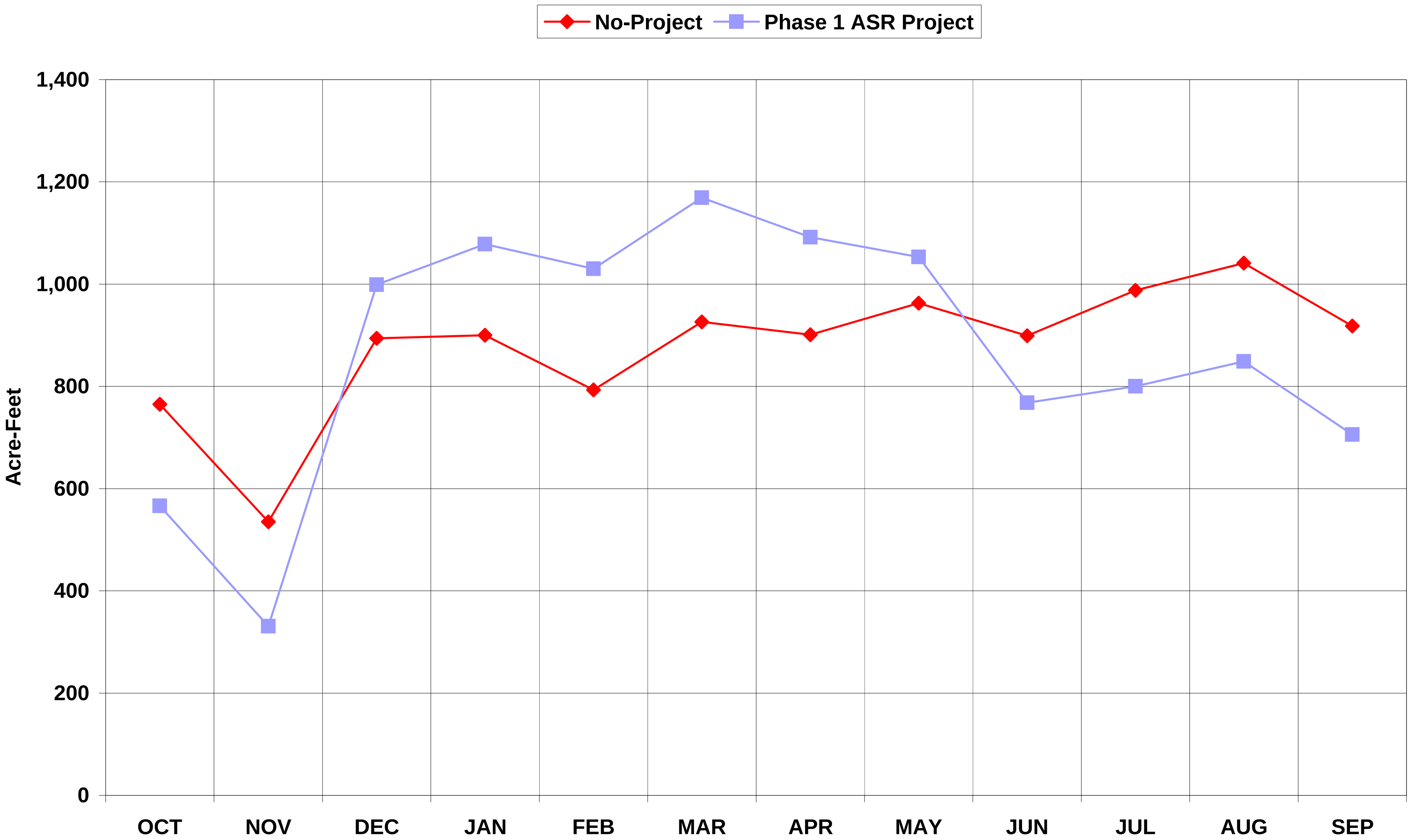
Source: MPWMD.

Figure 8-17. Average Simulated Monthly Cal-Am Diversions from Coastal Area of the Seaside Groundwater Basin With and Without the Phase 1 ASR Project

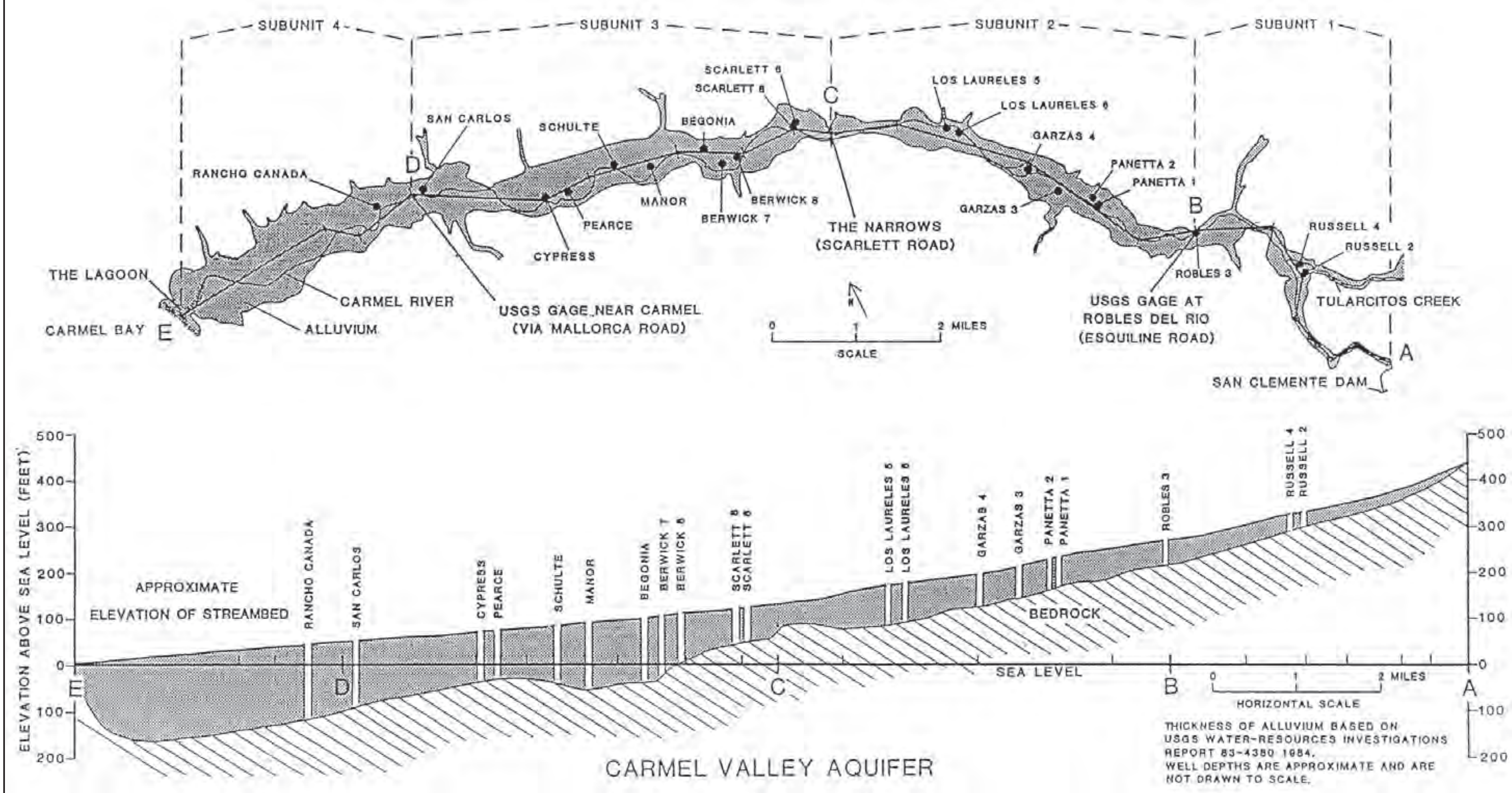


Source: MPWMD.

Figure 8-18. Average Simulated Monthly Cal-Am Diversions from Carmel Valley Alluvial Aquifer With and Without Phase 1 ASR Project



Source: MPWMD.



Source: MPWMD.

04637.04 EIR (11-05)

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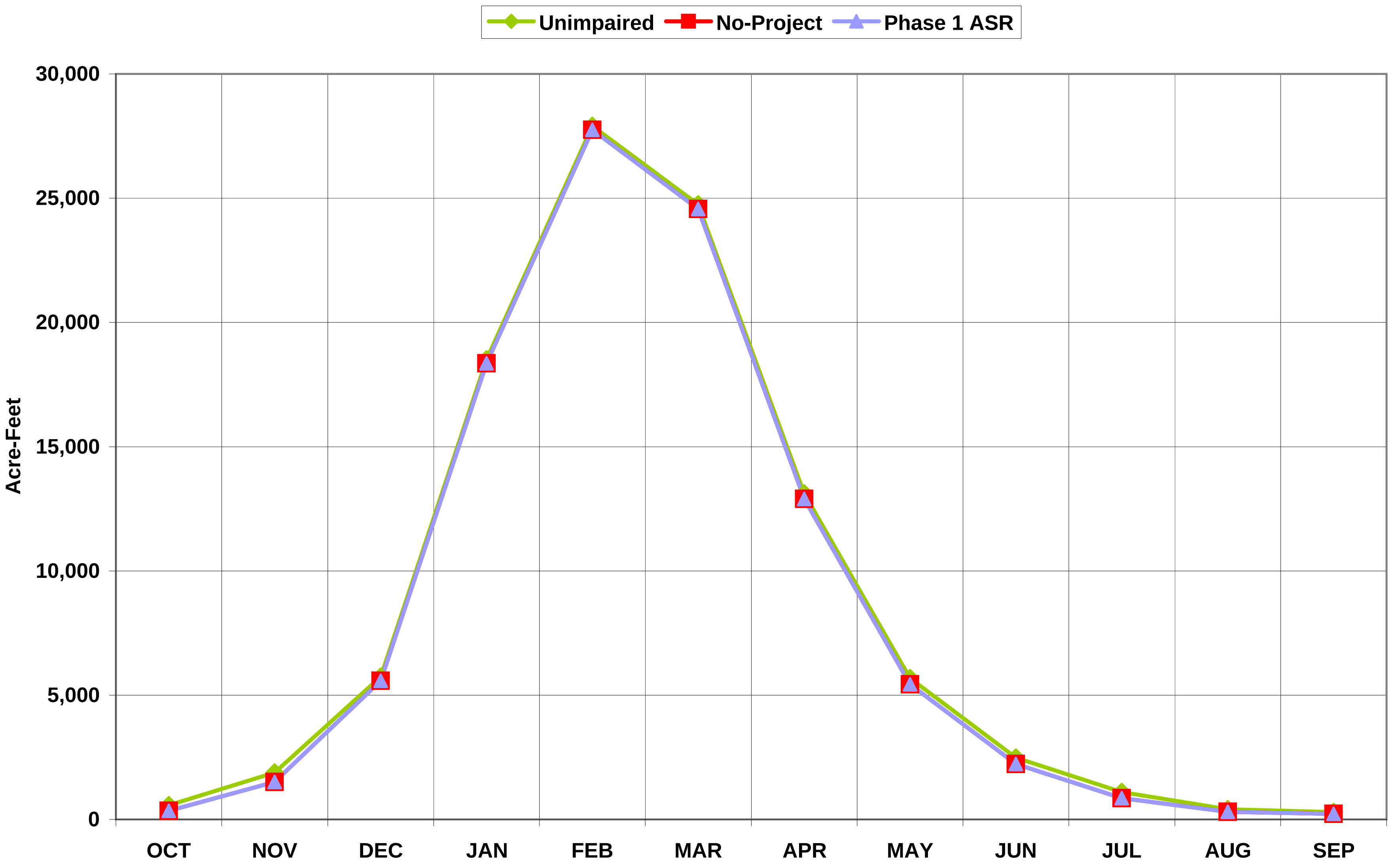
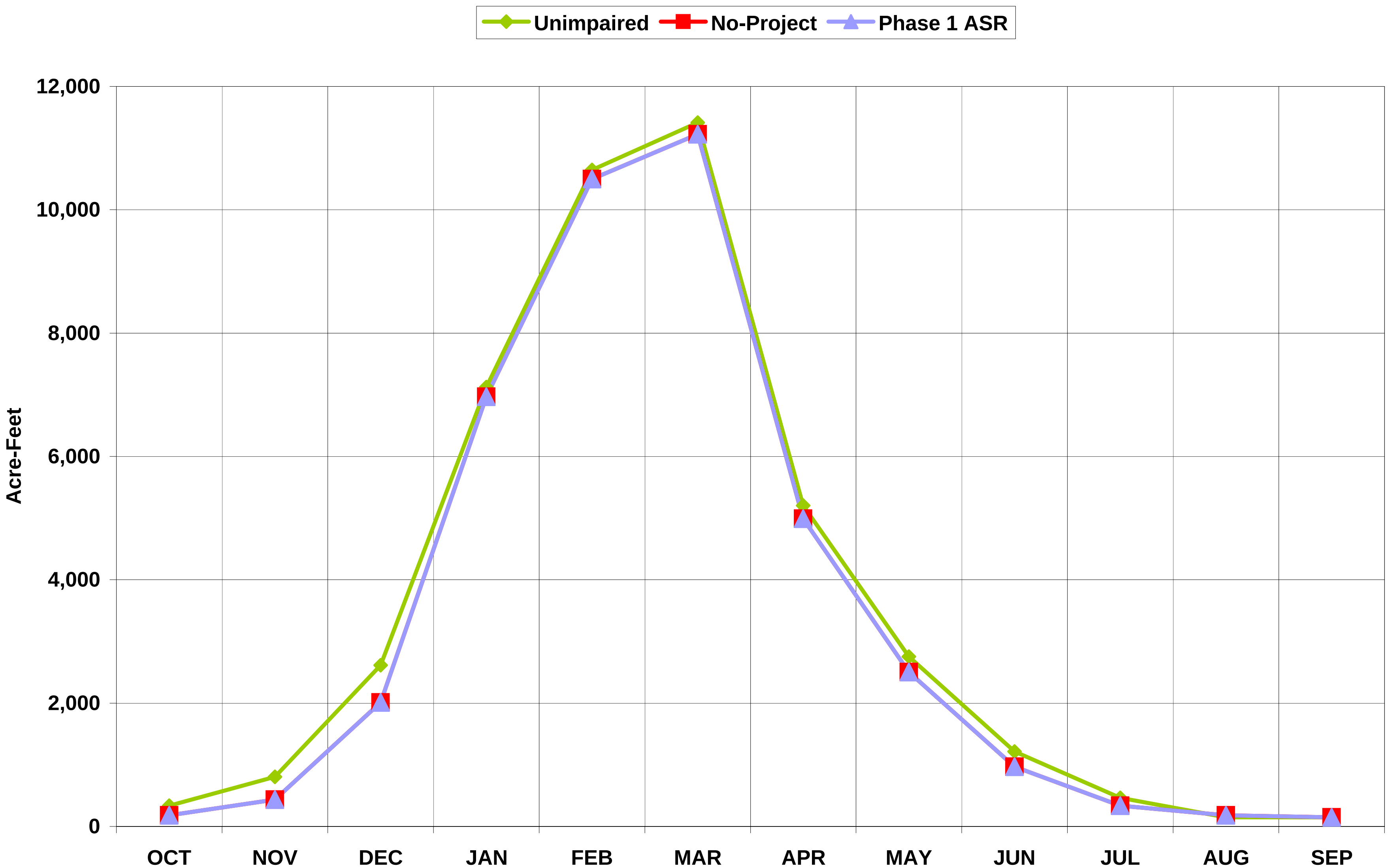
Figure 8-19
Profile of Carmel Valley Aquifer Showing Cal-Am Production Wells

Figure 8-20. Simulated Monthly Carmel River Flow at the Narrows Site During Wet Years



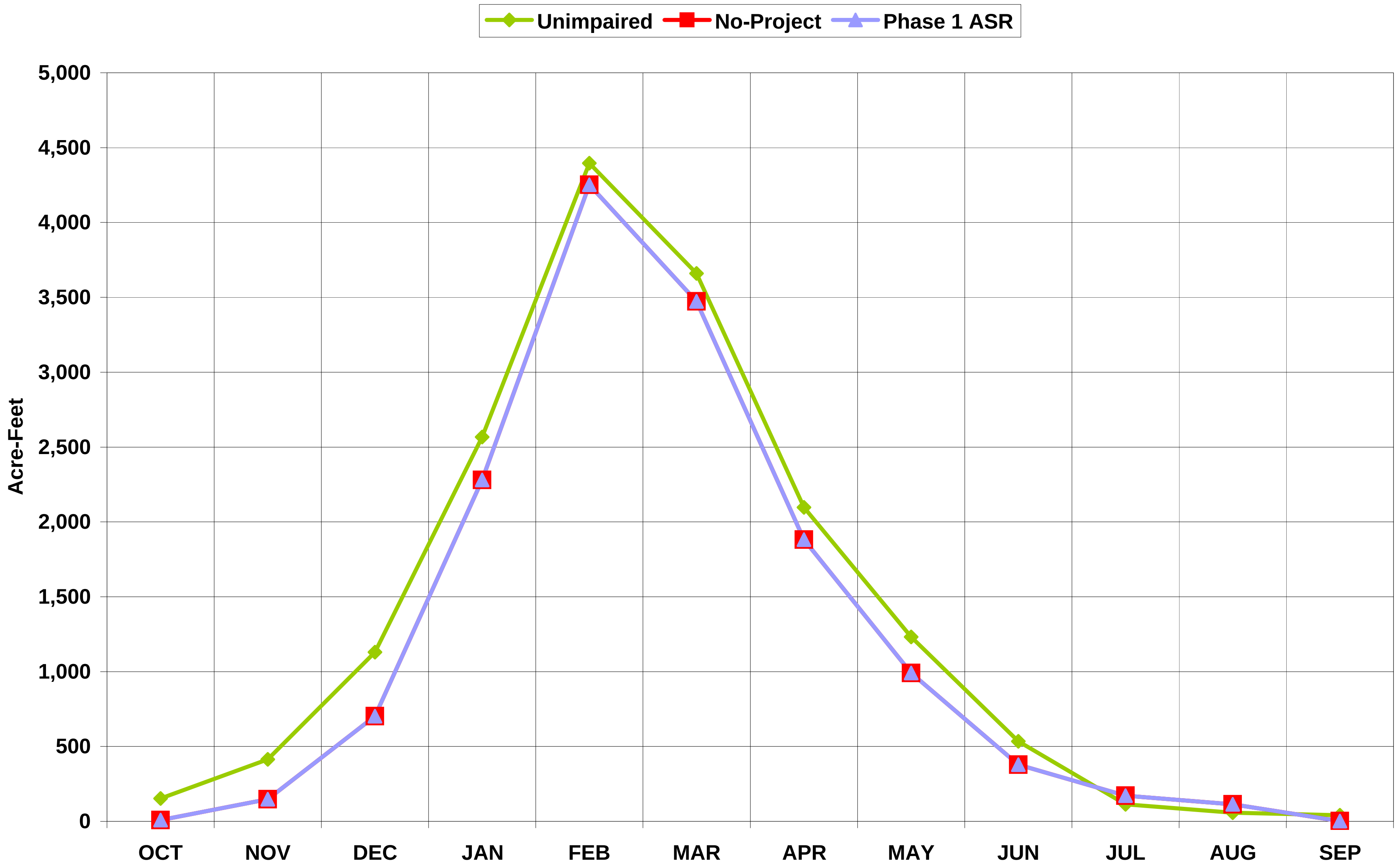
Source: MPWMD.

Figure 8-21. Simulated Monthly Carmel River Flow at the Narrows Site During Normal Years



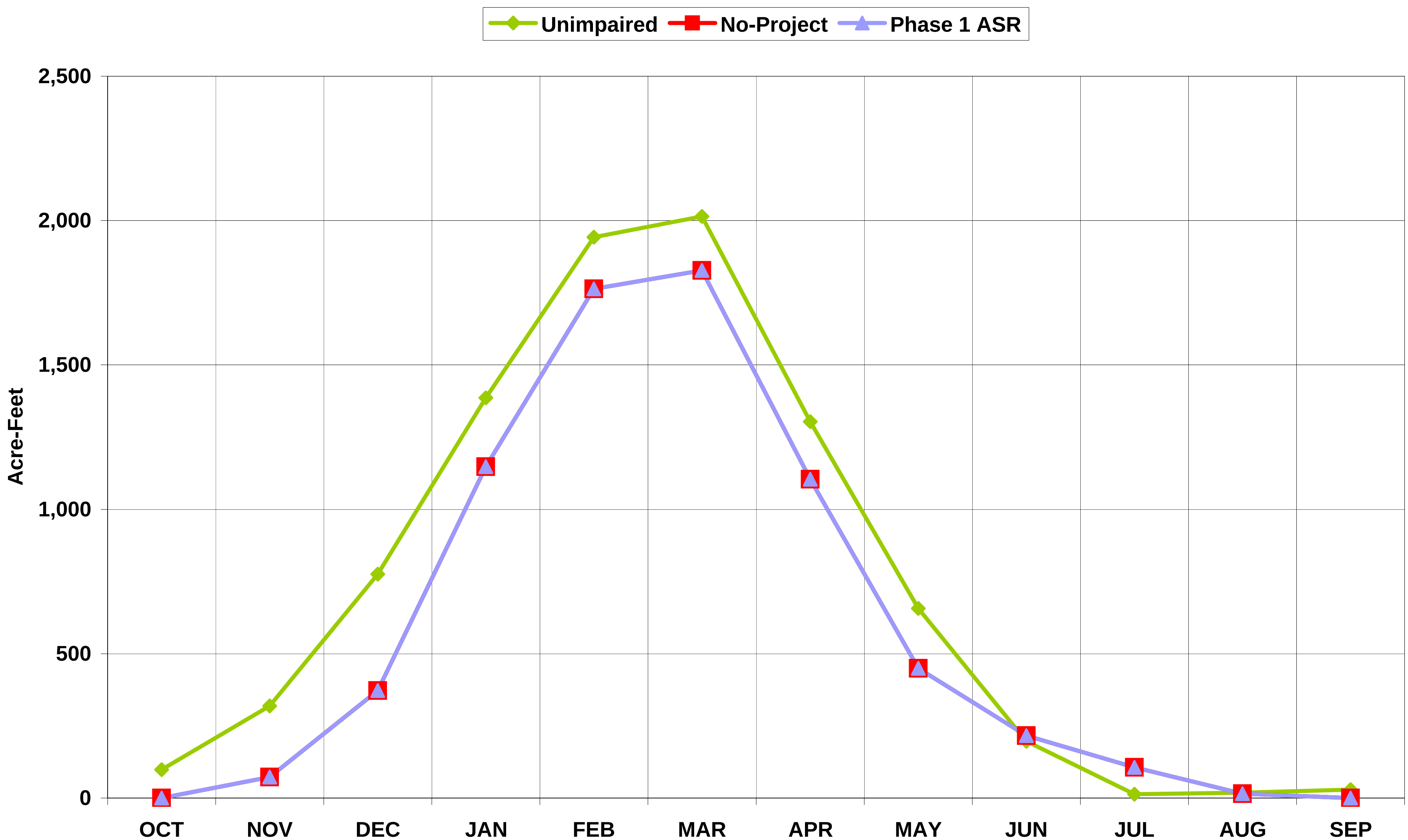
Source: MPWMD.

Figure 8-22. Simulated Monthly Carmel River Flow at the Narrows Site During Dry Years



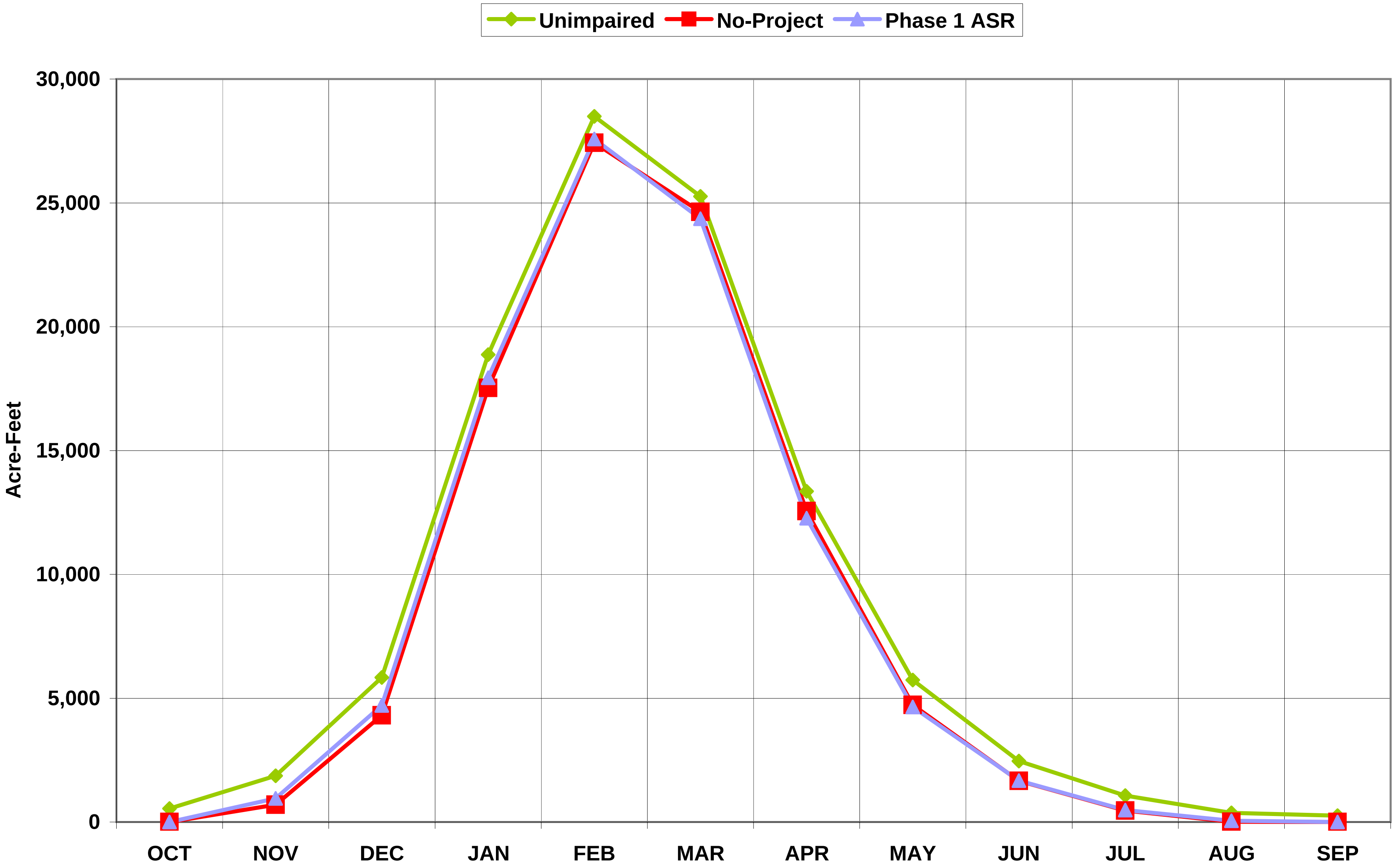
Source: MPWMD.

Figure 8-23. Simulated Monthly Carmel River Flow at the Narrows Site During Critically-Dry Years



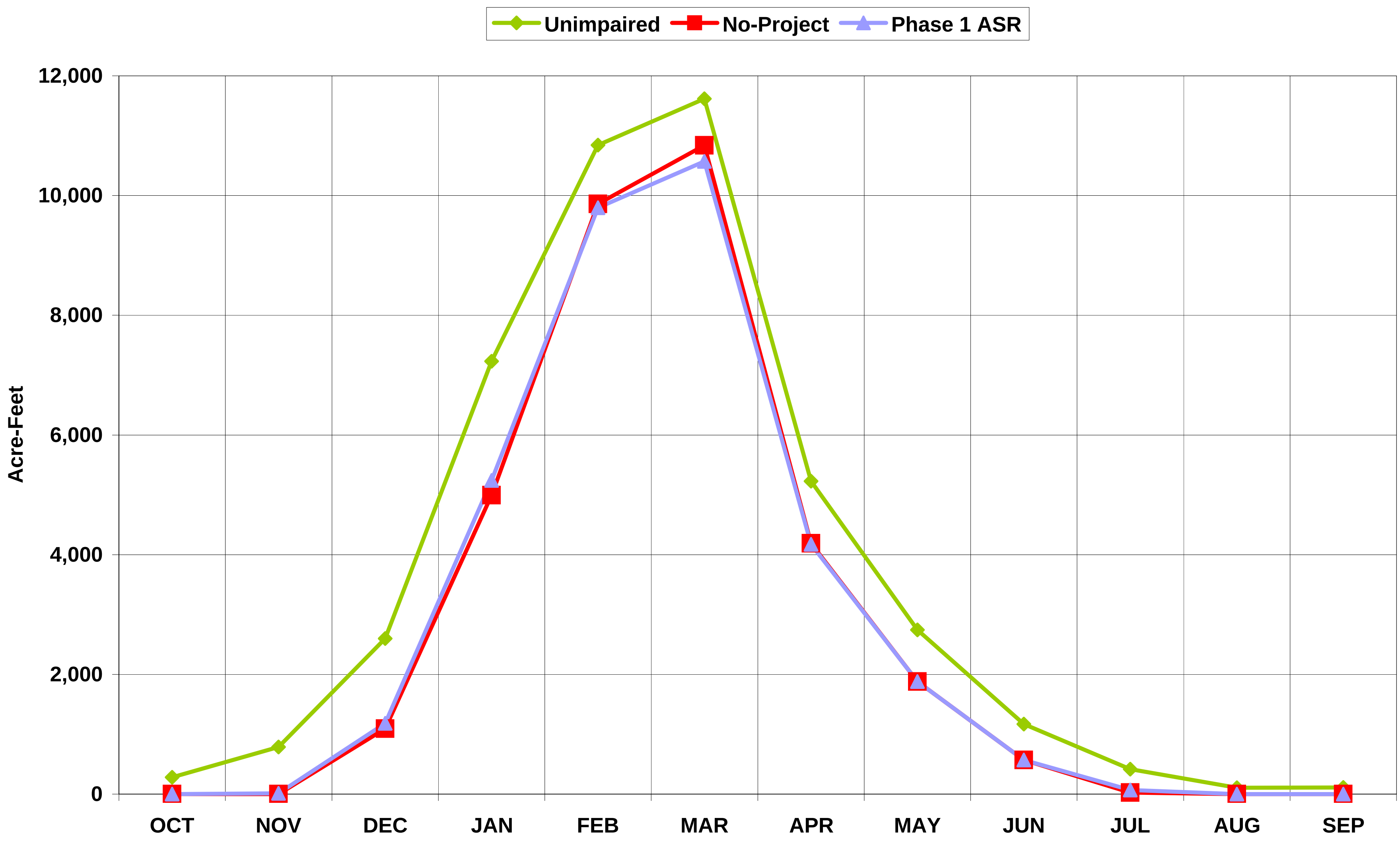
Source: MPWMD.

Figure 8-24. Simulated Monthly Flow at the Near Carmel Site During Wet Years



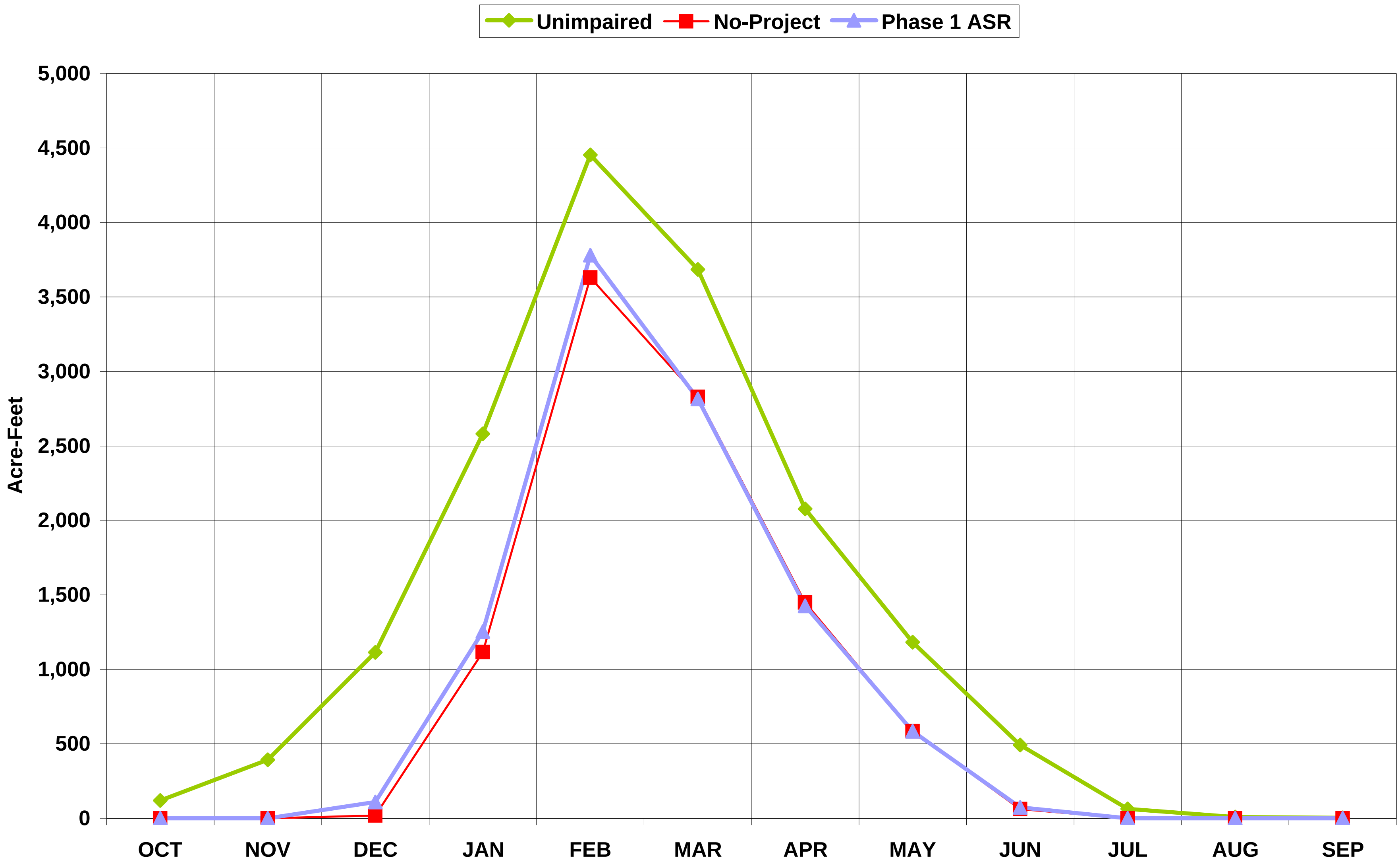
Source: MPWMD.

Figure 8-25. Simulated Monthly Carmel River Flow at the Near Carmel Site During Normal Years



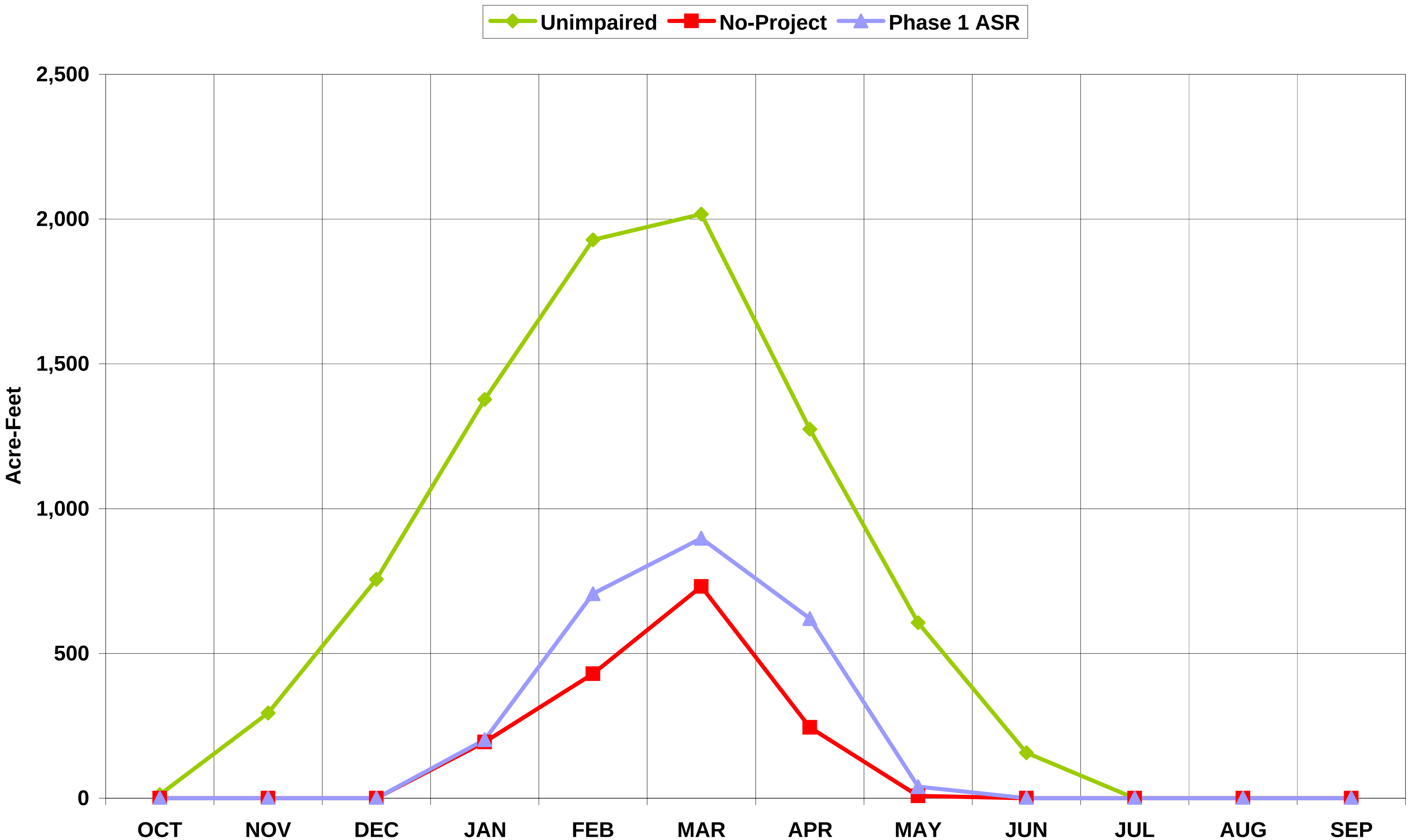
Source: MPWMD.

Figure 8-26. Simulated Monthly Carmel River Flows at the Near Carmel Site During Dry Years



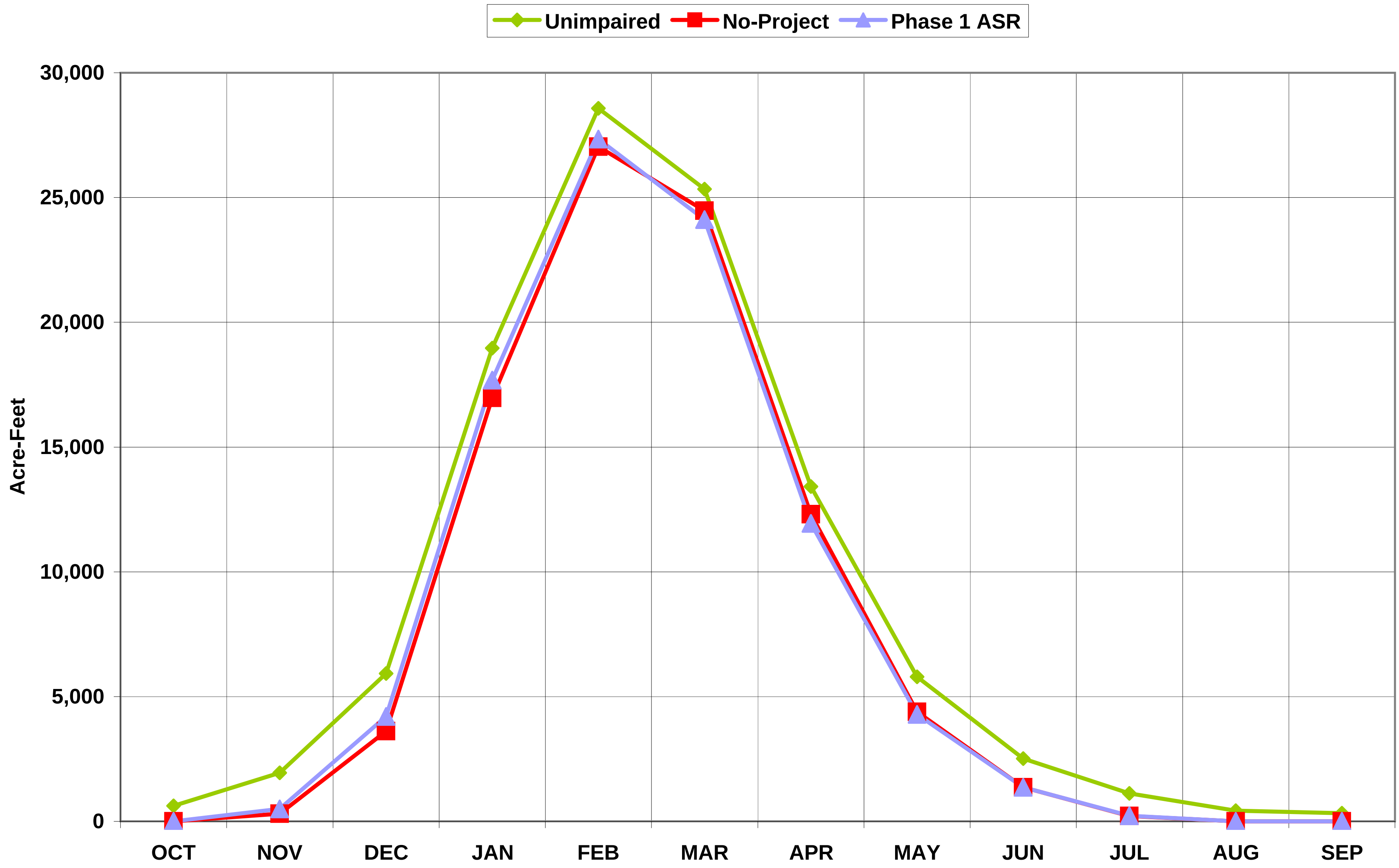
Source: MPWMD.

Figure 8-27. Simulated Monthly Carmel River Flow at the Near Carmel Site During Critically-Dry Years



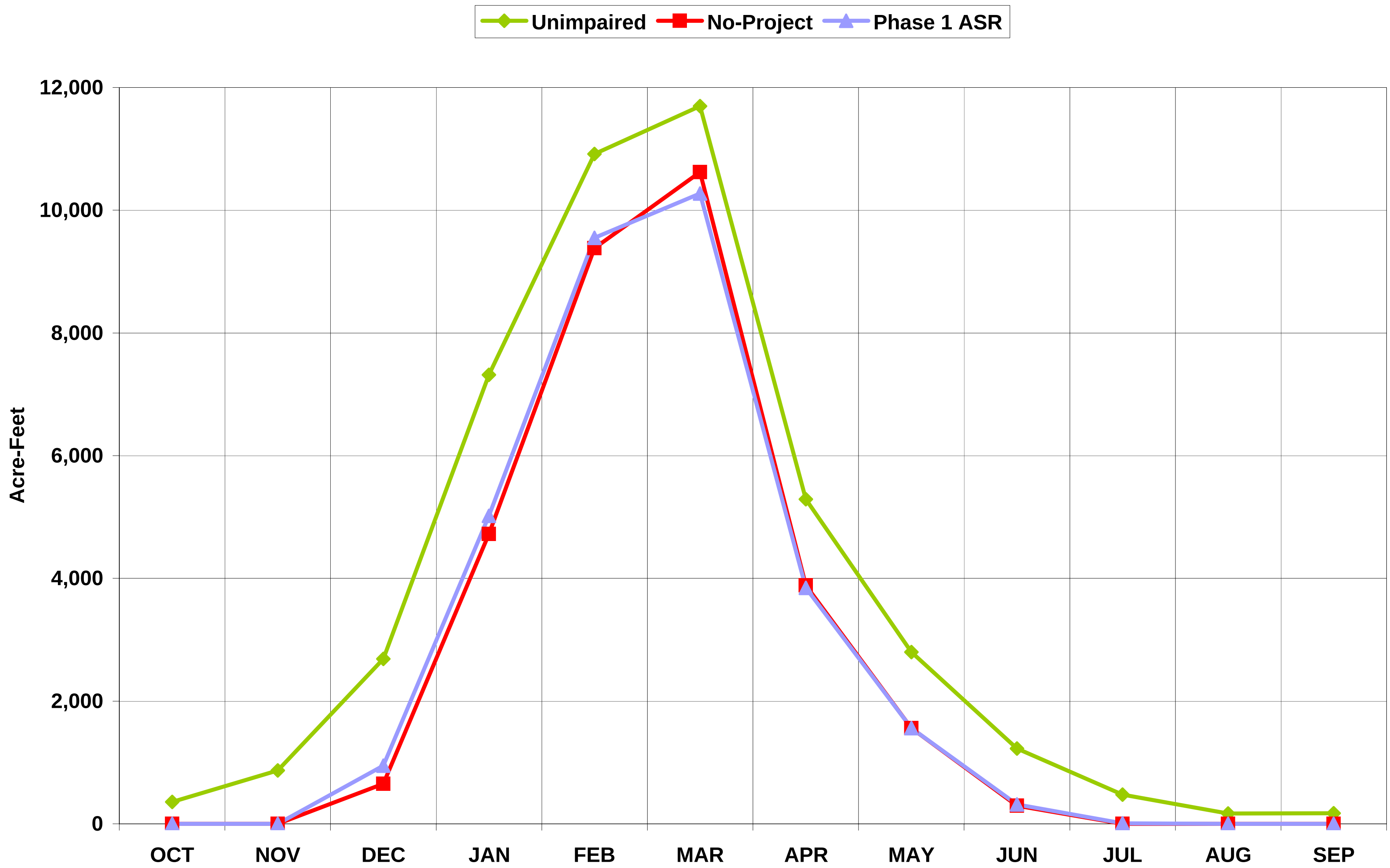
Source: MPWMD.

Figure 8-28. Simulated Monthly Carmel River Flow at the Lagoon Site During Wet Years



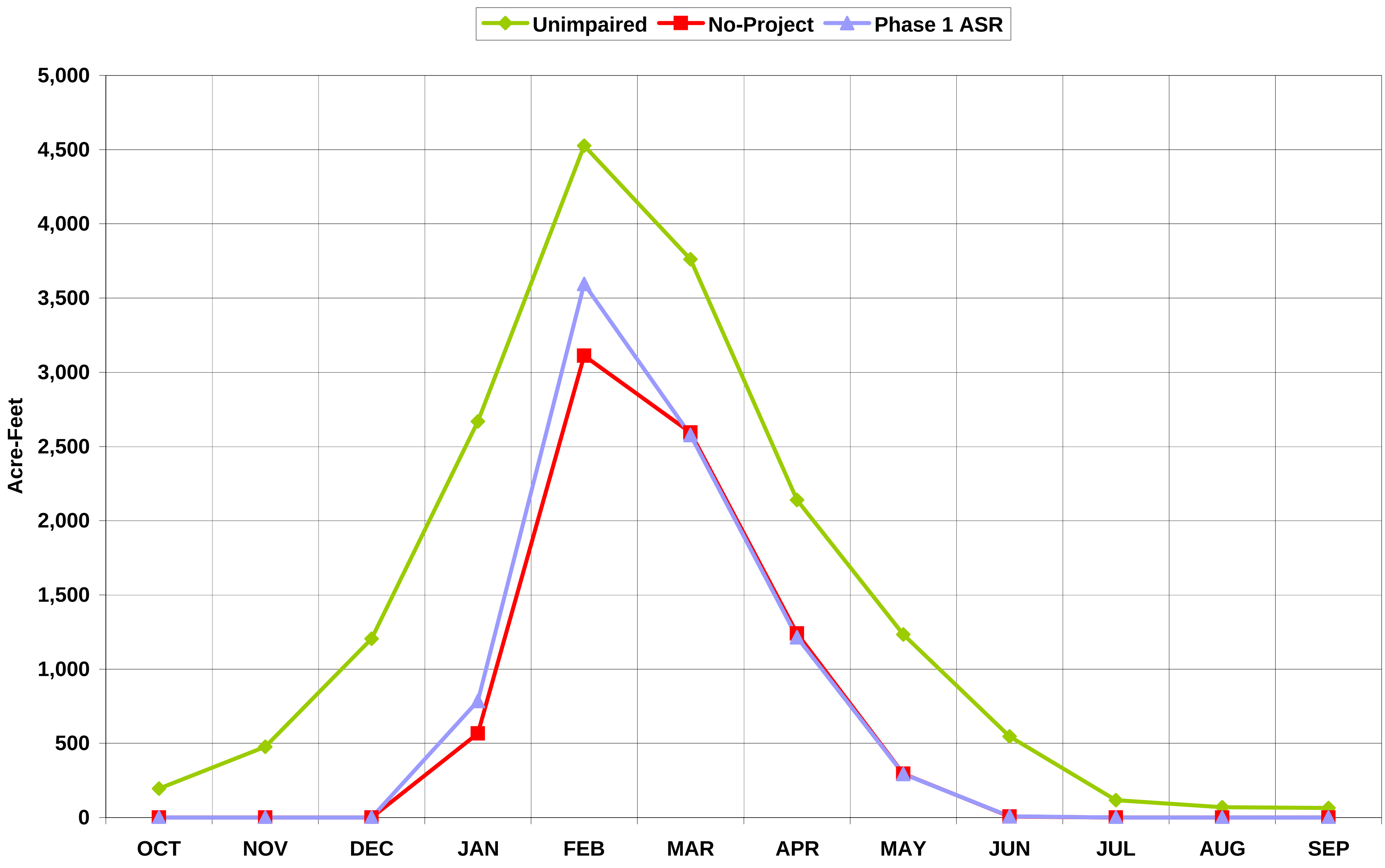
Source: MPWMD.

Figure 8-29. Simulated Monthly Carmel River Flow at the Lagoon Site During Normal Years



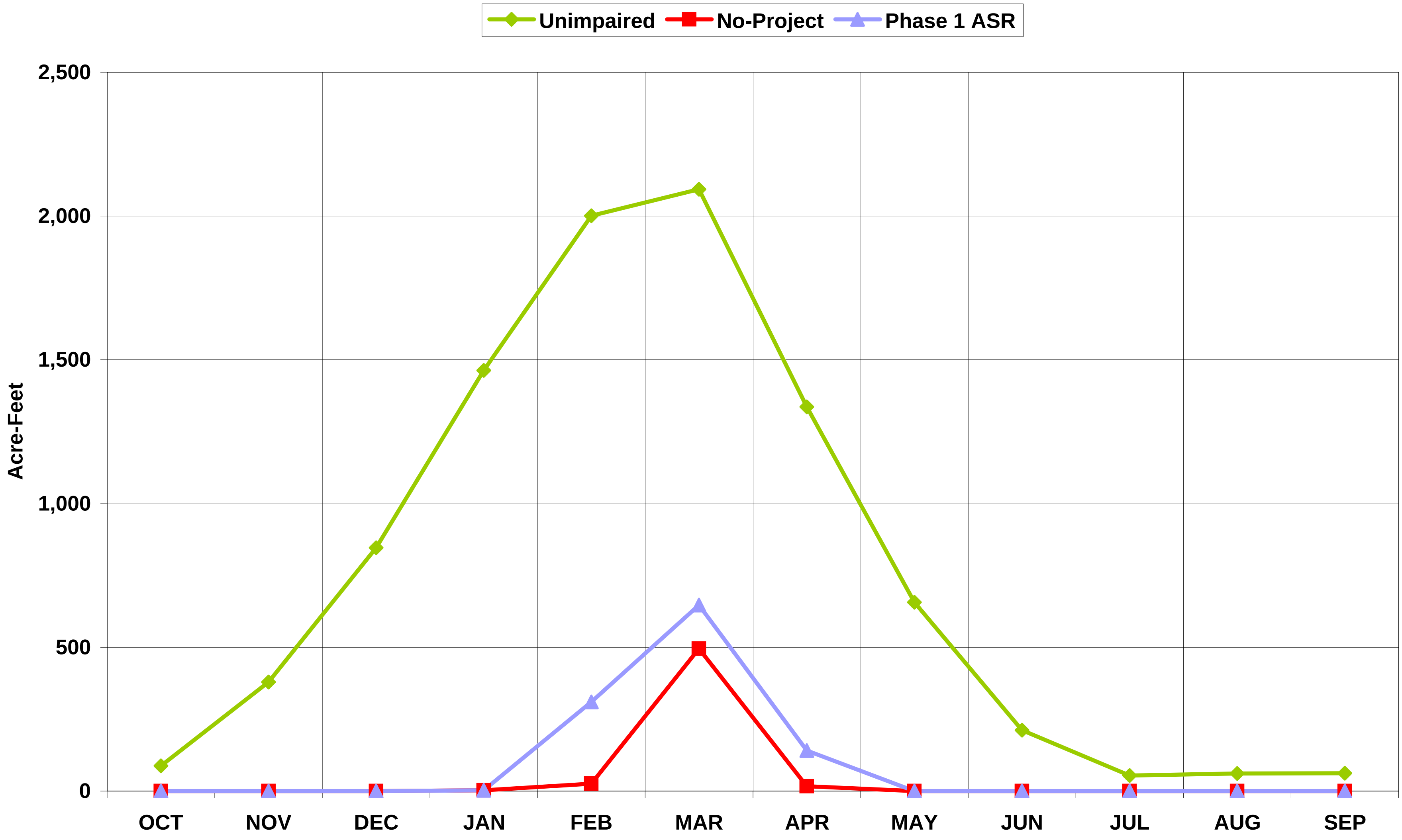
Source: MPWMD.

Figure 8-30. Simulated Monthly Carmel River Flow at the Lagoon Site During Dry Years



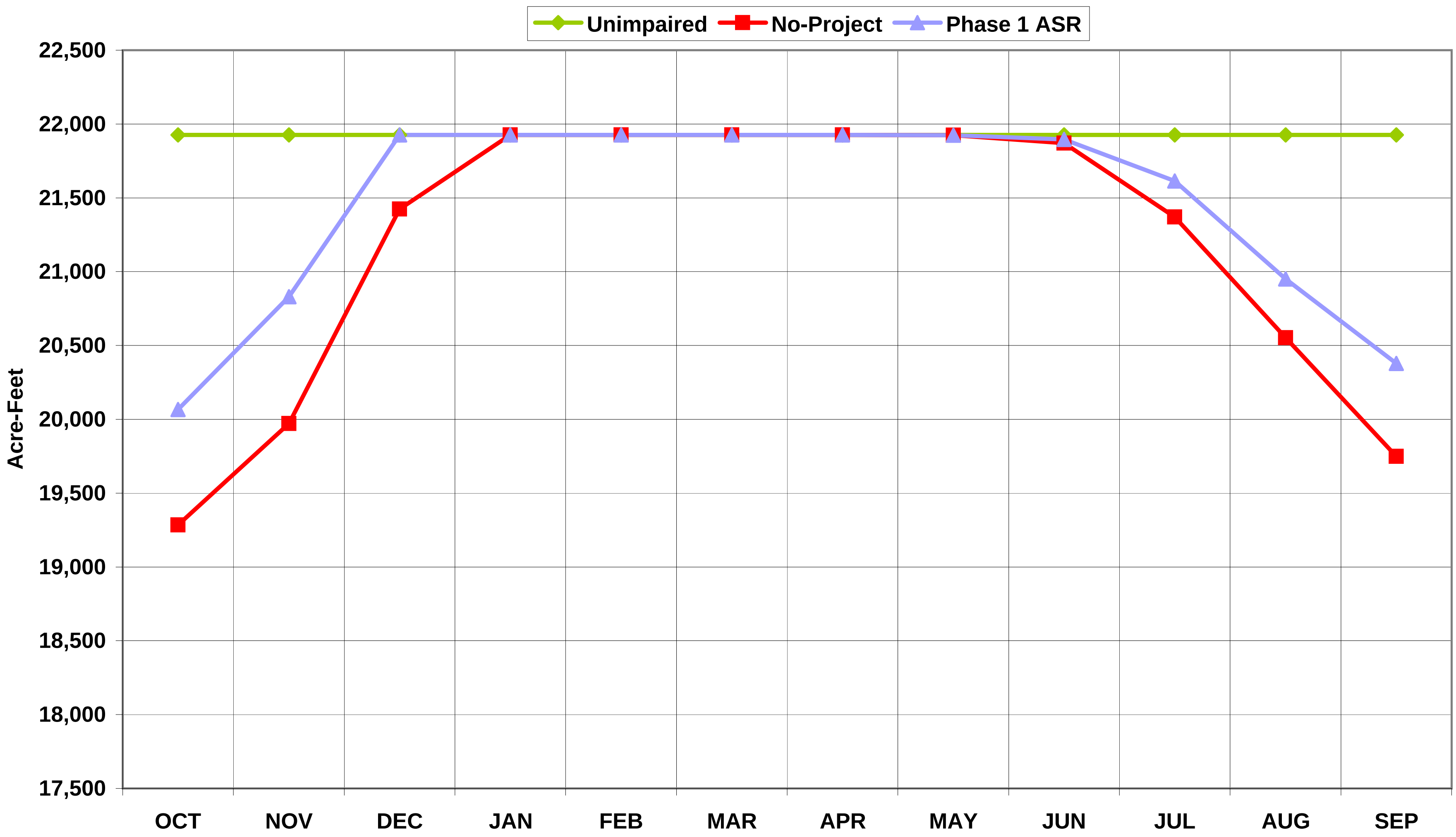
Source: MPWMD.

Figure 8-31. Simulated Monthly Carmel River Flow at the Lagoon Site During Critically-Dry Years



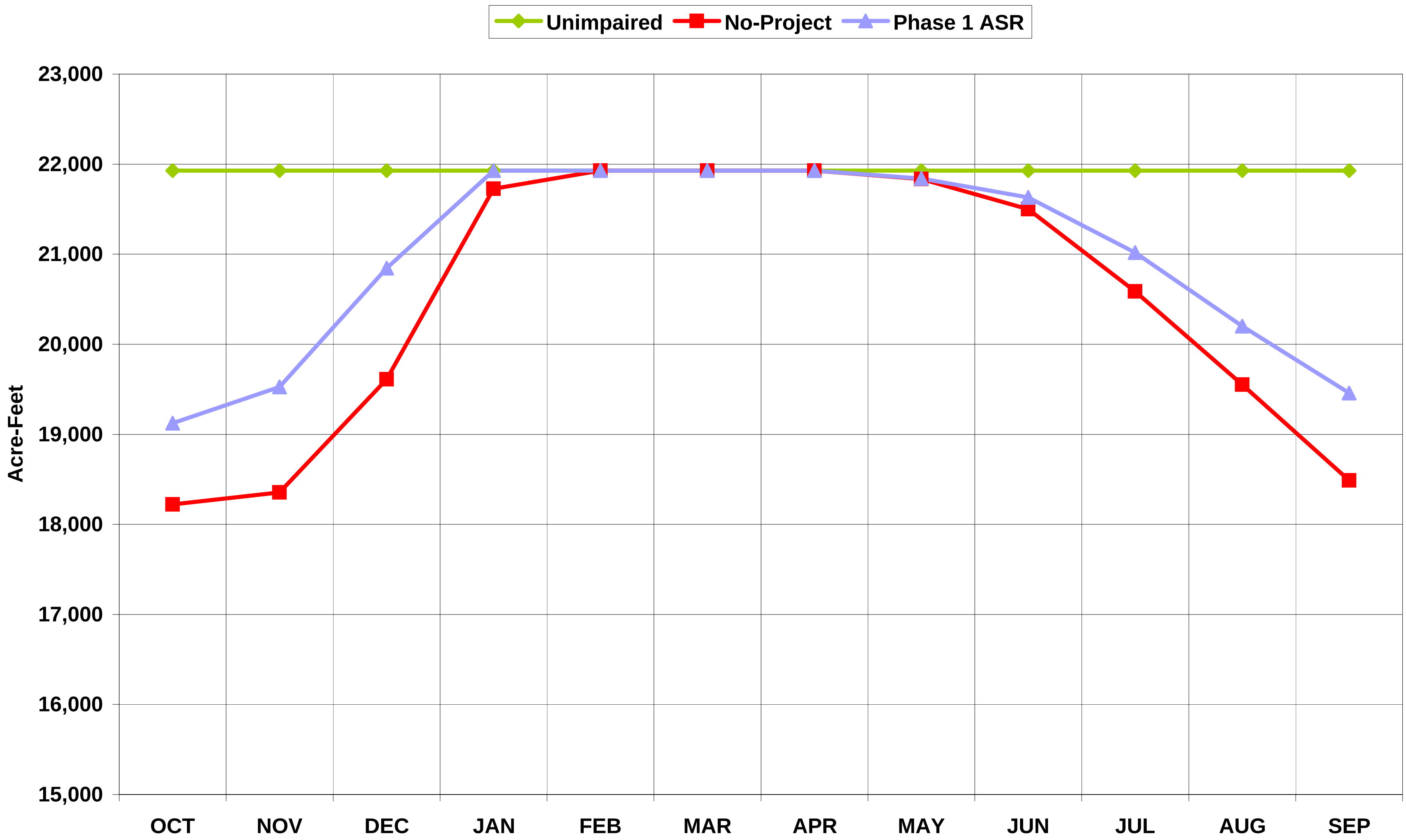
Source: MPWMD.

Figure 8-32. Simulated End-of-Month Usable Groundwater Storage in the Lower Carmel Valley Alluvial Aquifer During Wet Years



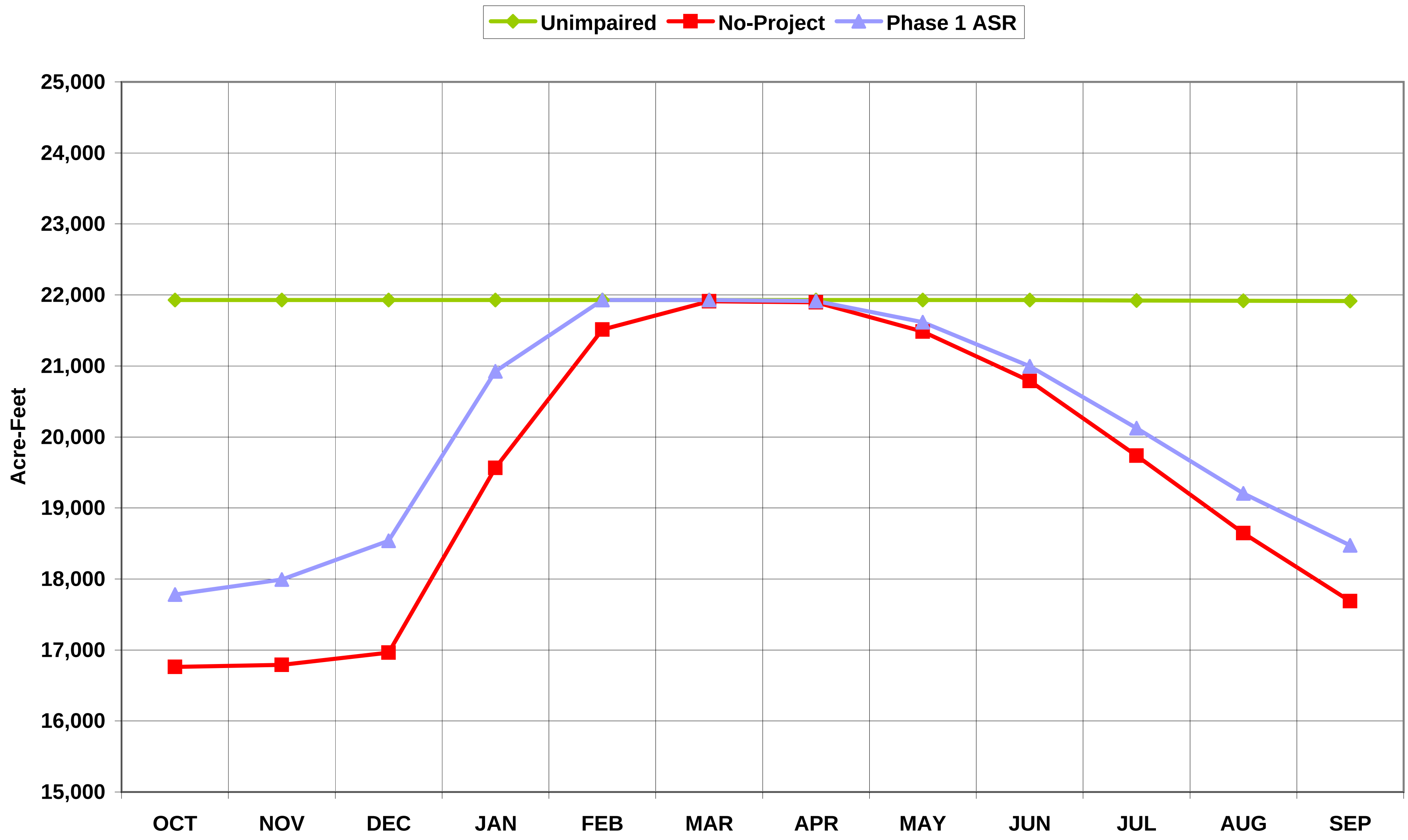
Source: MPWMD.

Figure 8-33. Simulated End-of-Month Usable Groundwater Storage in the Lower Carmel Valley Alluvial Aquifer During Normal Years



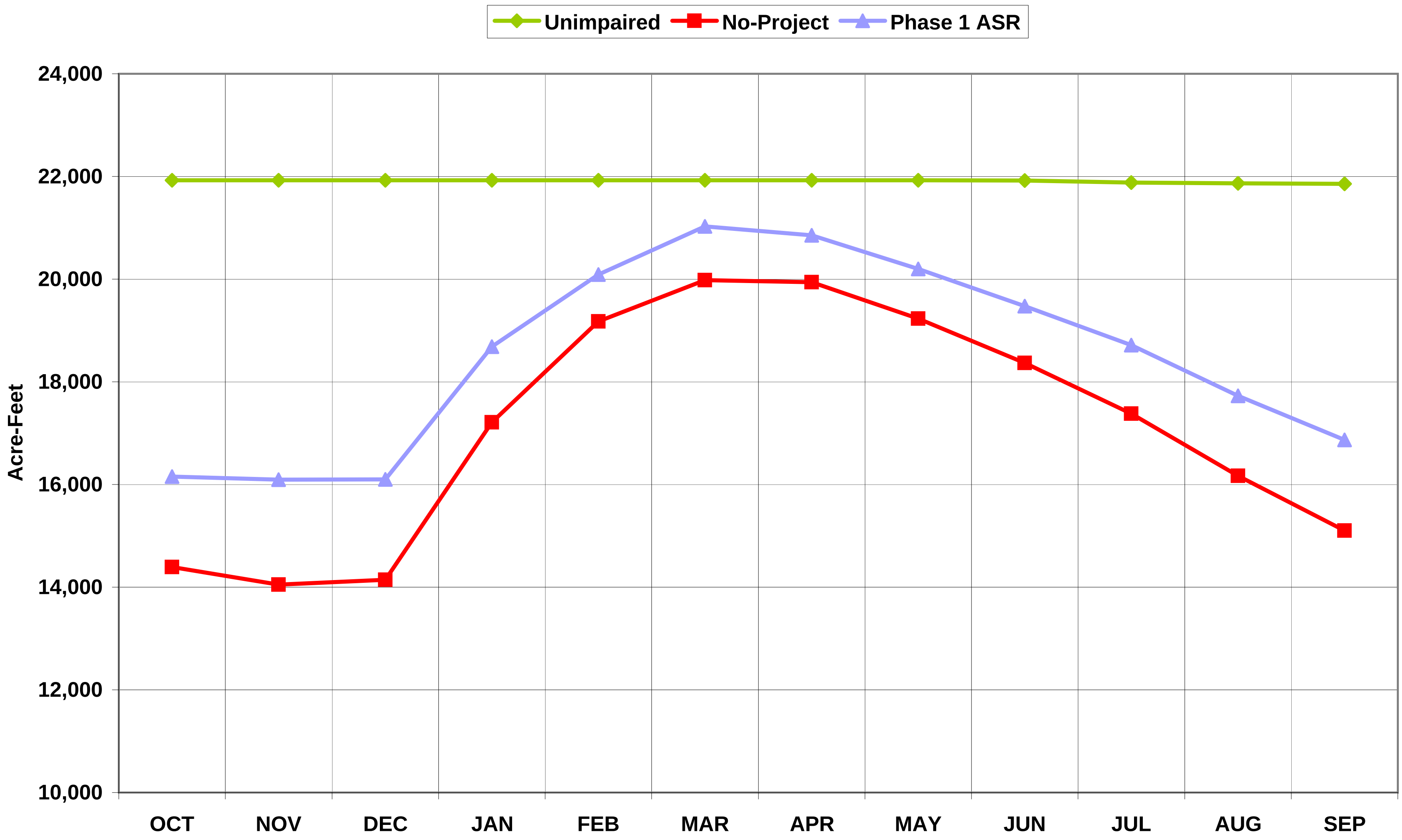
Source: MPWMD.

Figure 8-34. Simulated End-of-Month Usable Groundwater Storage in the Lower Carmel Valley Alluvial Aquifer During Dry Years



Source: MPWMD.

Figure 8-35. Simulated End-of-Month Usable Groundwater Storage in the Lower Carmel Valley Alluvial Aquifer During Critically-Dry Years



Source: MPWMD.

Chapter 9
Land Use

Introduction

The setting section describes existing land uses in the project study area for each of the project components (well sites and associated pipelines). Existing land use and zoning designations are provided for the well sites and associated pipeline sites. The setting section also describes applicable regulations, including the local plans and policies.

Setting

The project is in Monterey County, which is situated on the southern end of Monterey Bay, a National Marine Sanctuary. The project is located within the City of Seaside. However, the U.S. Army still owns the land on which project components would be located. The Proposed Project lands overlap portions of Army parcels E34 and E23.1. These two parcels are scheduled for early transfer from the Army to FORA and eventually to the City of Seaside, potentially in 2006 (Fisbeck pers. comm.).

Well Sites

Fort Ord Well Site

The Fort Ord well site would be located near the MPWMD Santa Margarita injection/extraction well on the western side of Fort Ord (just east of General Jim Moore Boulevard). Although the area has not been developed since its use by the Army, the area is designated as low-density residential and habitat management by the Fort Ord Reuse Plan (FORA 1997). Figure 2-3 shows the location of this well.

Pipelines

Santa Margarita Pipeline

A 12-inch underground pipeline currently connects the Santa Margarita well site to the Cal-Am system pipeline. The 12-inch Santa Margarita pipeline is entirely within the former Fort Ord property and extends approximately 100 feet from the well to the Cal-Am system pipeline. The project would involve the replacement of this pipe with a new 16-inch-diameter pipeline from the Santa Margarita well site, through a culvert under General Jim Moore Boulevard to avoid surface excavation, to the Cal-Am system pipeline. This area is not currently developed, but the Fort Ord Reuse Plan designates it as low-density residential and habitat management (FORA 1997).

Pipeline from Fort Ord Well to Santa Margarita Pipeline

If the Fort Ord Well site is selected, a new pipeline connecting this well to the Santa Margarita pipeline alignment would be constructed underground. It is expected that this pipeline would be approximately 500 feet long. It would connect to the new 16-inch Santa Margarita pipeline at a location east of General Jim Moore Boulevard. The entire pipeline would be located within the former Fort Ord, specifically in the land designated as low-density residential and habitat management as described above.

Regulatory Setting

Greater Monterey Peninsula Area Plan

The County of Monterey identifies the following goals in the Greater Monterey Peninsula Area Plan:

- Land Use—Goal #1: Provide a land supply to meet the long-range (20-year) and short-range (5-year) population growth targets for Monterey County, while ensuring that these growth targets do not exceed the county's fair share of state and regional housing growth, and that new growth in the unincorporated portions of Monterey County does not exceed the capacity of available infrastructure or damage the environment.
- Land Use—Goal #4: Ensure that new development outside designated community areas protects the environment and achieves good planning goals.
- Land Use—Goal #5: Preserve rural lands for rural residential uses on existing legal lots of record, small-scale farming and grazing, natural resources and watershed protection, passive recreation, existing small-scale neighborhoods serving commercial uses, and existing industrial uses.

Fort Ord Reuse Plan

The following objectives are identified by the Fort Ord Reuse Plan (Fort Ord Reuse Authority 1997, page 263) to be used as a basis for development:

- Objective A: Encourage land uses that respect, preserve and enhance the natural resources of Fort Ord.
- Objective C: Reserve sufficient lands for regional, community, and neighborhood parks and recreation facilities in the Fort Ord area and adjacent communities.
- Objective F: Preserve and protect the Habitat Management Area set aside at the former Fort Ord.

Seaside General Plan

The City of Seaside General Plan (2005) identifies the following policies for the implementation plan:

- Implementation Plan LU-1.6.1: Adequate Public Services. Provide adequate public services to serve the newly developed areas, including a circulation system and transit facilities that provide convenient travel between the two areas.
- Implementation Plan LU-5.2.1: MPWMD Water Supply Project. Continue to work with the MPWMD, other water agencies, and other entities to legalize the existing deficit that has been determined by the California Water Resources Control Board Order 95-10 and to augment the water supply to accommodate current and future water need reflected in this General Plan.

Impacts and Mitigation Measures

Methods and Significance Criteria

Approach

General plan and zoning designations were reviewed to determine anticipated future land uses on vacant parcels.

The Proposed Project was evaluated for compatibility with existing and planned land uses in the project study area, based on professional experience and consultation with local planning agencies. Additionally, the proposed well site and pipeline alignment were evaluated for consistency with the relevant local plans.

Potential direct and indirect impacts on land uses from construction-related or operational air emissions, noise, public safety hazards, and traffic (i.e., access) are addressed in Chapters 3, 10, 11, and 13, respectively.

Significance Thresholds

The Proposed Project would have a significant environmental impact related to land use and planning if it would:

- disrupt or divide the physical arrangement of established land uses, neighborhoods, or communities in the project vicinity;
- disrupt existing recreation facilities;
- create land uses substantially incompatible with existing land uses in or adjacent to the project study area;
- create substantial conflicts or incompatibility with planned future land uses in or adjacent to the project study area; or
- conflict with applicable policies in the relevant local planning documents (including a general plan or local coastal plan (LCP).

California Government Code Sections 53091 and 53096 exempt the "location or construction of facilities for the production, generation, storage, treatment, or transmission of water" from regulation under local zoning ordinances. Therefore, inconsistencies between most project facilities and zoning would not be considered, in and of themselves, potential significant impacts in this assessment. MPWMD nevertheless wishes to disclose the extent to which the Proposed Project is consistent with adopted plans and land use goals.

Construction Impacts

Impact LU-1: Disruption of Existing Land Uses or Neighborhoods during Construction of the Well Site

Construction of the proposed ASR well at the former Fort Ord would not physically divide an established neighborhood or community but could temporarily disrupt existing adjacent land uses during construction. Land uses in the well site area are primarily open space. Pedestrian movement along and across streets such as Coe Avenue and General Jim Moore Boulevard would continue to occur at intersections and along sidewalks. Delays on Coe Avenue and General Jim Moore Boulevard may occur as a result of trucks and construction equipment entering and leaving the construction areas; however, pedestrian movement would not be blocked for long periods. This impact would be temporary (8 weeks would be required to prepare the well sites, drill the well, and install piping and control equipment) and would not result in substantial physical division or disruption of an established community. This impact is considered **less than significant.**

Mitigation: No mitigation is required.

Impact LU-2: Disruption of Existing Land Uses or Neighborhoods during Construction of the Santa Margarita Well Pipeline and New Well Pipeline

Construction of a new 16-inch-diameter pipeline between the Santa Margarita well site and the existing Cal-Am pipeline would not physically divide an established neighborhood or community because it is located primarily on undeveloped former Fort Ord land, which is still owned and managed by the Army. It would cross under General Jim Moore Boulevard. In addition, the pipeline would replace the existing 12-inch-diameter pipeline, would be located in the same alignment, and would be underground.

A pipeline from the proposed well site at the former Fort Ord would be in currently undeveloped open space. No established residential areas exist along this alignment. Therefore, construction of the pipeline alignments would not result in substantial disruption to existing land uses or physical division of established neighborhoods or communities. This impact is considered **less than significant.**

Mitigation: No mitigation is required.

Operational Impacts

Impact LU-3: Incompatibility with Existing Adjacent Land Uses from Operation of the Proposed Pipelines and Well

No sensitive land uses currently exist in the vicinity of the proposed Fort Ord well site and related pipelines. As such, no land use–compatibility impacts would result from operation of the Fort Ord well and its pipelines. This impact is considered **less than significant.**

Mitigation: No mitigation is required.

Impact LU-4: Potential Inconsistencies with Relevant Land Use Plans and Policies from Operation of the Proposed Well and Pipelines

The project components would be consistent with the goals, policies, and objectives described in the Regulatory Setting section above. The Fort Ord Reuse Plan identified this area as low density residential. The Seaside General

Plan calls for adequate water supply and the development of adequate public services. The construction of the ASR project would be consistent with these plans as the well would be located within low-density residential and would help Seaside in meeting its goal of providing adequate public services. This impact is considered **less than significant.**

Mitigation: No mitigation is required.

Chapter 10
Noise

Introduction

This chapter describes the environmental and regulatory setting for noise, identifies potential noise impacts associated with construction and operation of the Proposed Project, and when applicable, identifies appropriate mitigation measures to reduce potentially significant impacts. Background information on environmental acoustics and additional information on the terms used in noise analysis are provided in Appendix C.

Setting

General Noise Levels in Project Study Area

The existing noise environment in the project study area is governed primarily by vehicular traffic along General Jim Moore Boulevard (adjacent to the project sites) and aircraft overflights from the Monterey Peninsula Airport (located approximately 2.5 miles from the project site). Local noise levels vary with the time of day and depend mainly on the amount of traffic along General Jim Moore Boulevard. (Fort Ord Reuse Authority 2005.)

An environmental assessment/initial study (EA/IS) for the realignment of General Jim Moore Boulevard was published in March 2005 that included background noise information. According to modeling results published in that document, ambient noise in the project area during peak a.m. and p.m. hours is generally between 58 and 65 noise level equivalent (L_{eq}) decibels above reference noise, adjusted (dBA). (FORA 2005.)

Sensitive Receptors

Sensitive receptors include land uses where people reside or locations where the presence of unwanted sound could adversely affect the use of the land. Noise-sensitive land uses typically include residences, hospitals, schools, libraries, and certain types of recreational uses. Noise-sensitive land uses, including residences and a junior high school, occur near or adjacent to most project elements. A list of these land uses is provided in Appendix C.

Regulatory Setting

Federal, state and local noise regulations and ordinances applicable to the Proposed Project are summarized below.

Federal

Federal Highway Administration (FHWA) guidelines identify a significant noise increase when exterior traffic noise levels approach or exceed 67 decibels (dB) L_{eq} for sensitive noise receptors in noise-sensitive land uses. The project area is located entirely within property that is owned by the U.S. Army. Federal regulations (24 CFR 51.101) require that ambient noise levels be no more than 65 L_{dn}.

State

California requires each local government entity to implement a noise element as part of its general plan. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. Table 10-1 lists the state land use compatibility guidelines.

Local

City of Seaside

The City of Seaside General Plan Noise Element establishes maximum acceptable noise levels for various types of land uses within the city. This information is summarized in Table 10-2 (City of Seaside 2005).

Table 10-1. State Land Use Compatibility Standards for Community Noise Environment

Normally Acceptable	Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
Normally Unacceptable	New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.
Clearly Unacceptable	New construction or development generally should not be undertaken.

Source: California Governor's Office of Planning and Research, November 1998.

Table 10-2. City of Seaside General Plan Noise Element Maximum Acceptable Interior and Exterior Noise Levels

Land Uses	Noise Standards (CNEL)	
	Exterior	Interior
Residential	65 dB(A)	45 dB(A)
Mixed-Use Residential	70 dB(A)	45 dB(A)
Commercial	70 dB(A)	–
Office	70 dB(A)	50 dB(A)
Industrial	75 dB(A)	55 dB(A)
Public Facilities	70 dB(A)	50 dB(A)
Schools	50 dB(A)	50 dB(A)

Source: City of Seaside 2005 (Table N-1 from the City of Seaside General Plan Noise Element).

The city's noise ordinance does not establish explicit noise standards, but Chapter 9.12 from the city's municipal code prohibits any excessive or unusually loud noise that annoys or disturbs the peace or safety of any individual within the city's limits. The city's code prohibits construction activities between the hours 7:00 p.m. and 7:00 a.m. on weekdays and 7:00 p.m. and 9:00 a.m. on Saturdays, Sundays, and holidays. However, activities on or in public property and facilities, or by public employees or their franchises, are exempt from the City's noise ordinance.

Other Relevant Criteria

Construction Noise

There are no commonly accepted thresholds for acceptable levels of noise from construction activities. The U.S. Department of Transportation has established recommended guidelines for the assessment of noise from construction activities. These guidelines state that there may be an adverse community reaction if the eight-hour L_{eq} value from construction noise would exceed values presented in Table 10-3.

Table 10-3. Federal Transit Administration Recommended Construction Noise Guidelines

	Eight-hour L_{eq} (dBA)	
Land Use	Daytime	Nighttime
Residential	80	70
Commercial	85	85
Industrial	90	90

Source: Federal Transit Administration 1995

Federal Transit Administration Ground-Borne Vibration Criteria

There are no commonly accepted thresholds for acceptable levels of ground vibration. However, the U.S. Department of Transportation suggests a vibration damage threshold of 0.20 inch/second for fragile buildings and 0.12 inch/second for extremely fragile historic buildings and vibration annoyance thresholds, indicated in Table 10-4 (Federal Transit Administration 1995).

Table 10-4. Federal Transit Administration Ground-Borne Vibration Criteria

Land Use Category	Description of Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) Frequent Events[1]	Infrequent Events[2]
1	Buildings where low ambient vibration is essential to the operations within the building, which vibrations may be well below levels associated with human annoyance. Concert halls, TV studios and recording studios are included in this category only for the purpose of applying these screening distances. Always included are vibration-sensitive research and manufacturing, hospitals with vibration-sensitive equipment, certain university research operations, and computer-chip manufacturing facilities where electron microscopes and photolithographic equipment are used.	65 VdB[3]	65 VdB[3]
2	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels. Theaters and auditoriums are included in this category for the purpose of applying screening distances only.	72 VdB	80 VdB
3	Institutional land uses such as schools, libraries, and churches. Buildings with interior spaces where vibration-sensitive equipment is not present but where excessive vibration could cause activity interference through human annoyance are included (e.g., certain offices).	75 VdB	83 VdB

Notes:

[1] Frequent Events is defined as more than 70 vibration events per day. Most transit projects fall into this category.

[2] Infrequent Events is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.

[3] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Source: Federal Transit Administration 1995.

Impacts and Mitigation Measures

Methods and Significance Criteria

Approach

Construction noise impacts were assessed using an analysis method recommended by the U.S. Department of Transportation (Federal Transit Administration 1995). Potential noise impacts resulting from constructing the project elements were evaluated by estimating the amount of noise generated on the theoretical worst-case day of construction activity. The City's noise ordinance establishes hours in which construction activities may occur, and construction activities may not legally occur outside of these hours, unless a variance is obtained. Construction activities that would occur within these hours are considered less than significant, and are not addressed further in this analysis. Consequently, this analysis addresses construction activities that would occur outside of these hours. Based on information provided by the project engineer, construction activities associated with well drilling would be required to occur on a 24-hours -per- day basis for approximately 12 days (not concurrently) to maintain borehole stability and avoid damage to the aquifer formation. A list of the types of equipment that may be used to construct the project and noise typically generated by this equipment is shown in Table 10-5. To assess noise associated with well drilling, the simultaneous and continuous operation of drilling equipment (i.e., bucket auger rig and rotary drill rig), a backhoe, truck, air compressor, and pump over at least a 1-hour period was assumed.

It should be noted that the magnitude of construction noise impacts is a result of the type of construction activity, the noise level generated by various pieces of construction equipment, the distance between the activity and noise-sensitive receivers, and the presence of local noise barriers including topography and buildings.

Operational noise impacts have been assessed qualitatively because of the acoustic properties of the ASR project electric pumps attributable to the noise-attenuation properties of the pump enclosures and pump-house buildings.

Significance Thresholds

Criteria for determining the significance of noise impacts were developed based on questions contained in the environmental checklist form in Appendix G of the State CEQA Guidelines, consideration of applicable state and local regulations, and professional judgment. The Proposed Project would have a significant noise impact if it would:

- generate construction-related noise above the levels identified in Table 10-3 outside of the construction hours specified in the City of Seaside's noise ordinance;
- generate construction-related ground vibration levels above 0.20 inch/second at fragile or historic building structures, above 0.12 inch/second at extremely fragile historic buildings, or above the thresholds indicated in Table 10-4 or;
- generate operational noise in excess of the City of Seaside standards indicated in Table 10-2.

Proposed Project

Construction Impacts

Impact NZ-1: Exposure of Noise-Sensitive Land Uses to Construction Noise in Excess of Applicable Standards

Construction associated with the Proposed Project would temporarily increase noise in the vicinity of project components. Project components that would be built include wells, buildings, and transport pipelines. Noise increases would result both from on-site construction activities, especially during site preparation, grading, and other earthmoving activities, and from construction-related vehicle traffic delivering materials to and from the construction site.

The City's noise ordinance establishes hours in which construction activities may occur, and construction activities may not legally occur outside of these hours, unless a variance is obtained. Construction activities that would occur within these hours are considered less than significant. As previously noted, construction activities associated with well drilling would be required to occur on a 24-hour-per-day basis for approximately 12 days (not concurrently) to maintain borehole stability and avoid damage to the aquifer formation.

Table 10-5 summarizes the equipment anticipated to be used to construct each project element, as well as associated noise levels. Actual inventories of construction equipment that will be used for drilling the well pilot holes and installing the wells were not provided and were estimated based on previous experiences with similar projects. To assess noise associated with well drilling, the simultaneous and continuous operation of drilling equipment (i.e., bucket auger rig and rotary drill rig), a backhoe, truck, air compressor, and pump over at least a 1-hour period was assumed.

Table 10-5. Construction Equipment Noise Emission Levels

Phase and Equipment	Typical Noise Level 50 feet from Source (dBA)
Wells	
Air Compressor	81
Auger Drill Rig[1]	85
Rotary Drill Rig[1]	88[2]
Backhoe	80
Pump	76
Truck	88
Building Construction	
Air Compressor	81
Backhoe	80
Concrete Mixer	85
Truck	88
Pipelines	
Backhoe	80
Concrete Mixer	85
Truck	88

Notes:

[1] Operation of the auger drill rig and rotary drill rigs will not occur simultaneously.

[2] Boring Machine noise level is estimated for a unit with a 300 hp bore machine and 450 hp drilling fluid system.

Source: Federal Transit Administration 1995 and Jones & Stokes calculations for a bore machine.

Based on the noise levels summarized in Table 10-5, it is anticipated that combined-source construction noise levels would be 92 dBA, L_{eq} for drilling the wells The calculation of noise levels are measured at a distance of 50 feet from construction activities, where soft site attenuation is assumed. Based on the noise levels presented in Table 10-5, Table 10-6 presents predicted construction noise levels at various distances from well drilling activities.

Table 10-6. Estimated Construction Noise in the Vicinity of Well Drilling Activities

Entered Data:			
Construction Condition: Site leveling			
Source 1: Air compressor - Sound level (dBA) at 50 feet =		81	
Source 2: Rotary drill rig - Sound level (dBA) at 50 feet =		88	
Source 3: Backhoe - Sound level (dBA) at 50 feet =		80	
Source 4: Pump - Sound level (dBA) at 50 feet =		76	
Source 5: Truck - Sound level (dBA) at 50 feet =		88	
Average Height of Sources - Hs (ft) =		10	
Average Height of Receiver - Hr (ft.) =		5	
Ground Type (soft or hard) =		soft	
Calculated Data:			
All Sources Combined - Sound level (dBA) at 50 feet =		92	
Effective Height $(H_S+H_R)/2$ =		7.5	
Ground factor (G) =		0.62	
Distance Between Source and Receiver (ft.)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)
50	0	0	92
100	-6	-2	84
200	-12	-4	76
300	-16	-5	71
400	-18	-6	68
500	-20	-6	66
600	-22	-7	64
700	-23	-7	62
800	-24	-7	60
900	-25	-8	59
1,000	-26	-8	58
1,200	-28	-9	56
1,400	-29	-9	54
1,600	-30	-9	52

Entered Data:			
1,800	-31	-10	51
2,000	-32	-10	50
2,500	-34	-10	47
3,000	-36	-11	45

Calculations based on Federal Transit Administration 1995.

This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

The magnitude of construction noise impacts is assumed to depend on the type of construction activity, the noise level generated by various pieces of construction equipment, and the distance between the activity and noise-sensitive land uses. As sensitive receptors (residences and Fitch Middle School; Figure 2-3) may be located close enough to construction activities to exceed the noise levels indicated in Table 10-3, this impact is considered **potentially significant. Implementation of Mitigation Measures NZ-1a through NZ-1d would reduce this impact to a less-than-significant level.**

Mitigation Measure NZ-1a: Prohibit Ancillary and Unnecessary Equipment During Nighttime Well Drilling Activities.

The project applicant shall ensure that the construction contractor prohibit the use of all ancillary equipment (i.e., backhoe, truck, air compressor, and pump, etc.) during nighttime hours. The only equipment that will be allowed to operate during nighttime activities would be the drilling equipment; cleanup and other activities will occur only during daytime activities.

Mitigation Measure NZ-1b: Employ Noise-Reducing Construction Practices to Meet Nighttime Standards.

The construction contractor will employ noise-reducing construction practices such that nighttime standards (Table 10-3) are not exceeded. Measures that will be used to limit noise include, but are not limited to:

- using noise-reducing enclosures around noise-generating equipment;
- constructing barriers between noise sources and noise-sensitive land uses or taking advantage of existing barrier features (terrain, structures) to block sound transmission; and
- enclosing equipment.

Mitigation Measure NZ-1c: Prepare a Noise Control Plan.
The construction contractor will prepare a detailed noise control plan based on the construction methods proposed. This plan will identify specific measurement that will be taken to ensure compliance with the noise limits specified above. The noise control plan will be reviewed and approved by City staff before any noise-generating construction activity begins.

Mitigation Measure NZ-1d: Disseminate Essential Information to Residences and Implement a Complaint/Response Tracking Program.
The construction contractor will notify residences within 500 feet of the construction areas of the construction schedule in writing prior to construction. The construction contractor will designate a noise disturbance coordinator who will be responsible for responding to complaints regarding construction noise. The coordinator will determine the cause of the complaint and will ensure that reasonable measures are implemented to correct the problem. A contact telephone number for the noise disturbance coordinator will be conspicuously posted on construction site fences and will be included in the written notification of the construction schedule sent to nearby residents.

Impact NZ-2: Exposure of Sensitive Land Uses to Construction-Related Vibration Levels in Excess of Applicable Standards

Constructing the wells and transmission pipelines is anticipated to generate ground vibration. Drilling wells would require a large drilling rig, and installing the transmission pipelines would require a backhoe or other trenching equipment. Ground vibration is of concern because it can result in two adverse affects: physical damage to buildings and structures and annoyance of sensitive receptors. Table 10-7 presents vibration source levels generated from typical drilling activities in terms of both damage potential and annoyance. The table is based on Federal Transit Administration methodology (Federal Transit Administration 1995) and is used in this analysis to estimate vibration from construction activities.

Table 10-7. Vibration Source Levels from Typical Drilling Activities[1]

Distance to Receptor (feet)	Vibration Level at Receptor: Damage Potential PPV (in/sec)	Vibration Level at Receptor: Annoyance VdB re 1 micro-inch/sec
25	0.089	87.0
50	0.031	81.0
100	0.011	75.0
150	0.006	71.4
200	0.004	68.9
250	0.003	67.0
300	0.002	65.4
500	0.0010	61.0
750	0.0005	57.5
1,000	0.0004	55.0

[1] Drilling activities based on the use of a drilling rig/backhoe.

Source: Federal Transit Administration 1995 and Jones & Stokes calculations.

Damage Potential

Table 10-7 indicates that well drilling and pipeline trenching would not generate vibration levels above the damage threshold of 0.20 inch/second. The impact of vibration on structures is considered **less than significant**.

Mitigation: No mitigation is required.

Annoyance

Table 10-7 indicates that Category 1 land uses within about 300 feet of a well drilling or pipeline trenching site would be exposed to vibration levels in excess of the 65 VdB threshold; Category 2 land uses within about 150 feet would be exposed to vibration levels in excess of the 72 VdB threshold; and Category 3 land uses within about 40 feet would be exposed to vibration levels in excess of the 83 VdB threshold. The impact of vibration on sensitive land uses is considered **significant**. **Implementing Mitigation Measures NZ-1a through NZ-1d would reduce this impact to a less-than-significant level**. These measures are described under Impact NZ-1, above.

Operational Impacts

Impact NZ-3: Exposure of Sensitive Land Uses to Operational Noise in Excess of City Standards

Noise-generating operations include mainly the use of electric pumps used to inject, extract, and transport water and equipment used to treat the extracted water. It is anticipated that the electric pumps will be located within an enclosure in a pump-house building, and the equipment used to treat the water will be enclosed in the chemical/electrical building to be constructed on site. Noise attenuation resulting from the enclosures and building surrounding the pumps and distance to the nearest noise-sensitive land uses are expected to limit noise at the nearest noise-sensitive land uses. However, without proper design, some nearby noise-sensitive land uses could be exposed to a significant increase in noise. This impact is considered **significant. Implementation of Mitigation Measure NZ-2 would mitigate this impact to a less-than-significant level.**

Mitigation Measure NZ-2: Design Pump Stations to Meet Local Noise Standards.

MPWMD will design the new pump station and chemical/electrical building so that noise levels do not exceed applicable City of Seaside noise standards and ordinances. Prior to field acceptance, MPWMD will retain an acoustical consultant to measure noise levels from the operating facility. If project-generated noise exceeds the noise ordinance performance standards, additional noise attenuation measures will be implemented to meet the standards. The proposed facility will not receive final acceptance until the required noise standards are met. This measure will be made a condition of the final design review.

Chapter 11
Hazards and Hazardous Materials

This chapter addresses potential environmental impacts associated with hazards or hazardous materials that could be encountered during construction or operation of the Proposed Project.

Setting

Hazardous Sites

The entire former Fort Ord area, which includes a portion of the project study area, is currently designated by the Environmental Protection Agency (EPA) as a National Priority List site (NPL), which means that there is known contamination on the property. NPL sites are slated for priority cleanup under the federal Superfund program. The same area is also designated by the U.S. Department of Defense (DOD) as a DOD site, a designation intended to indicate that, because of the area's history of use as a military facility, various hazardous materials are likely to be present on site and that the site therefore will probably require hazardous remediation in the future. Unexploded ordnance (UXO) on an 8,000-acre firing range/impact area and at limited on-site areas may pose safety hazards. Types of ordnance found at Fort Ord include artillery projectiles, rockets, hand grenades, land mines, pyrotechnics, bombs and other demolition materials. The Army has ensured that known munitions sites are fenced, posted with warning signs and are off-limits to unauthorized people. The entire project study area is located on this NPL/DOD property.

Information provided by the Army BRAC Office at former Fort Ord (Fisbeck pers. comm.) indicates that the Proposed Project facilities would overlie portions of Army parcels E34 and E23.1. These parcels, which are scheduled for eventual transfer to the City of Seaside for residential development, are also considered munitions response sites (MRS) Seaside 2 and 3 (MRS-SEA.2 and MRS-SEA.3) in the Army's UXO cleanup plans. They are located within the former Fort Ord firing range/impact area. Surface and subsurface removal of munitions and explosives of concern (MEC) was recently conducted on the majority of the parcels. The history of munitions response investigations at these sites is provided below.

MRS-SEA.2. The boundary of MRS-SEA.2 was developed to support the transfer of Parcel E34 and not on evidence of munitions use. MRS-SEA.2 included the firing points and some of the targets associated with two small arms ranges. Several munitions responses to MEC were conducted on MRS-SEA.2 including grid sampling, the clearance of fuel breaks, a removal within the small arms ranges, a surface time-critical removal action (TCRA), a subsurface non-time critical removal action (NTCRA), and a 100% digital geophysical survey on all remaining portions of MRS-SEA.2 not covered by the NTCRA. Twelve MEC items have been found and removed from within the site. Munitions debris was also removed. All accessible areas within MRS-SEA.2 have been investigated to depth. Subsurface removal of MEC has not been completed in inaccessible areas (e.g. fencelines and asphalt pads); these areas were delineated as Special Case Areas and will be addressed in a follow-up investigation. MRS-SEA.2 will undergo additional evaluation in the ongoing former Fort Ord Military Munitions Response Program.

MRS-SEA.3. The boundary of MRS-SEA.3 was developed to support the transfer of Parcel E23.1 and not on evidence of munitions use. MRS-SEA.3 includes a portion of Range 18, a former small arms range. Features associated with Range 18 that lie within Parcel E23.1 include some of the firing points and some of the targets. Several munitions responses to MEC were conducted on MRS-SEA.3 including road clearances, grid sampling, the clearance of fuel breaks, a removal within the small arms range, a surface TCRA, a subsurface NTCRA, and a 100% digital geophysical survey on all remaining portions of MRS-SEA.3 not covered by the NTCRA. One hundred, twenty-four MEC items were removed from the site. Munitions debris was also removed. All accessible areas within MRS-SEA.3 have been investigated to a depth. Subsurface removal of MEC has not been completed in inaccessible areas (e.g. fencelines and asphalt pads); these areas were delineated as Special Case Areas and will be addressed in a follow-up investigation. MRS-SEA.3 will undergo additional evaluation in the ongoing former Fort Ord Military Munitions Response Program.

A summary of previous munitions response investigations, as well as a detailed report of most recently conducted surface TCRA, subsurface NTCRA and 100% digital geophysical investigation of these sites, are documented in *Draft Final Technical Information Paper MRS-SEA.1-4, Time Critical Removal Action, Non-Time Critical Removal Action, and 100% Digital Geophysical Survey*, dated June 23, 2005 (Administrative Record #OE-0495F). This document is available at the Fort Ord Administrative Record and online at www.fortordcleanup.com. This report also described the types and locations of SCAs where subsurface MEC removal is yet to be completed (Fisbeck pers. comm.).

In addition to the potential contamination due to UXO, groundwater contamination is also present in the aquifers located in former Fort Ord. This contamination is a result of a combination of saltwater intrusion from the nearby Monterey Bay, pumping for agricultural purposes, and the presence of organic compounds. This has created a groundwater plume located north of Light Fighter Drive, and approximately 1.5 miles north of the Proposed Project site.

Sensitive Receptors

Schools are considered sensitive receptors for hazardous material issues because children are more susceptible than adults to the effects of many hazardous materials. Fitch Middle School is approximately 240 feet west of General Jim Moore Boulevard, and 650 feet northwest of the Proposed Project area (Figure 2-3). A residential area is also located on the west side of General Jim Moore Boulevard. The closest homes are approximately 250 feet from the Proposed Project site.

Regulatory Setting

A hazardous material is defined by the California Department of Toxic Substances Control (DTSC) as a material that poses a significant present or potential hazard to human health and safety or the environment if released because of its quantity, concentration, or physical or chemical characteristics (26 CCR 25501). For the purposes of this analysis, hazardous materials include raw materials, and hazardous waste includes waste generated by facilities and businesses or waste material remaining on site as a result of past activities. Hazardous materials that would be stored on site as part of the operation of the Proposed Project include carbon dioxide, lime, and chlorine gas. Applicable regulations and policies considered relevant to the Proposed Project are summarized below.

Federal Regulations

The principal federal regulatory agency responsible for the safe use and handling of hazardous materials is EPA. Two key federal regulations pertaining to hazardous wastes are described below. Other applicable federal regulations are contained primarily in 29, 40, and 49 CFR.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act enables EPA to administer a regulatory program that extends from the manufacture of hazardous materials to their disposal, thereby regulating the generation, transport, treatment, storage, and disposal of hazardous waste at all facilities and sites in the nation.

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund, was passed to facilitate the cleanup of the nation's toxic waste sites. In 1986, Superfund was amended by the Superfund

Amendment and Reauthorization Act Title III (community right-to-know laws). Title III states that past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup even if the material was dumped illegally when the property was under different ownership. As mentioned above, portions of the former Fort Ord, including portions of the project study area, are designated NPL sites that are slated for priority cleanup under the federal Superfund program.

State Regulations

California regulations are equal to or more stringent than federal regulations. EPA has granted the state primary oversight responsibility to administer and enforce hazardous waste management programs. State regulations require planning and management to ensure that hazardous wastes are handled, stored, and disposed of properly to reduce risks to human health and the environment. Several key laws pertaining to hazardous wastes are discussed below.

Hazardous Materials Release Response Plans and Inventory Act of 1985

The Hazardous Materials Release Response Plans and Inventory Act, also known as the Business Plan Act, requires businesses using hazardous materials to prepare a hazardous materials business plan that describes their facilities, inventories, emergency response plans, and training programs. Hazardous materials are defined as raw or unused materials that are part of a process or manufacturing step. They are not considered hazardous waste. Health concerns pertaining to the release of hazardous materials, however, are similar to those relating to hazardous waste.

Hazardous Waste Control Act

The Hazardous Waste Control Act created the state hazardous waste management program, which is similar to, but more stringent than, the federal Resource Conservation and Recovery Act program. The act is implemented by regulations contained in 26 CCR, which describes the following required aspects of the proper management of hazardous waste:

- identification and classification;
- generation and transport;
- design and permitting of recycling, treatment, storage, and disposal facilities;
- treatment standards;
- operation of facilities and staff training; and
- closure of facilities and liability requirements.

These regulations list more than 800 materials that may be hazardous and establish criteria for identifying, packaging, and disposing of them. Under the Hazardous Waste Control Act and 26 CCR, the generator of hazardous waste must complete a manifest that accompanies the waste from the generator to the transporter to the ultimate disposal location. Copies of the manifest must be filed with DTSC.

Emergency Services Act

Under the Emergency Services Act, the state developed an emergency response plan to coordinate emergency services provided by federal, state, and local agencies. Rapid response to incidents involving hazardous materials or hazardous waste is an important part of the plan, which is administered by the California Office of Emergency Services. The office coordinates the responses of other agencies, including the EPA, California Highway Patrol, RWQCBs, air quality management districts, and county disaster response offices.

California Occupational Safety and Health Administration Standards

Worker exposure to contaminated soils, vapors that could be inhaled, or possibly groundwater containing hazardous levels of constituents would be subject to monitoring and personal safety equipment requirements that are established in California Occupational Safety and Health Administration (Cal/OSHA) regulations (Title 8) and specifically address airborne contaminants. Site controls pertaining to asbestos and lead exposure, which could be an issue in the former artillery range areas, during construction activities are also included in Cal/OSHA regulations. The primary intent of the Title 8 requirements is to protect workers, but compliance with some of these regulations would also reduce potential hazards to nonconstruction workers and project area occupants, because required site monitoring, reporting, and other controls would be in place.

Workers who are in direct contact with soil or groundwater containing hazardous levels of constituents would perform all activities in accordance with a hazardous operations site-specific health and safety plan (HSP), as outlined in Cal/OSHA standards. An HSP is not required for workers such as heavy equipment operators, carpenters, painters, or other construction workers who would not be performing investigation or remediation activities where direct contact with materials containing hazardous levels of constituents could occur. However, elements of an HSP protect those workers who may be adjacent to cleanup activities by establishing engineering controls, monitoring, and security measures to prevent unauthorized entry to cleanup sites and to reduce hazards outside the investigation/cleanup area.

In addition to an HSP, Cal/OSHA requires that contaminated sites listed under the NPL must have a risk management plan (RMP) reviewed and approved by the RWQCB and administered by the responsible party. The RMP identifies specific measures to reduce potential risks to human and ecological populations during construction of the Proposed Project for each site or group of sites to be developed. The RWQCB follows EPA guidelines for risk management. EPA and DTSC guidelines divide potential human health risks associated with exposure to chemicals into cancer risks and noncancer hazard indices. The calculated cancer risk characterizes health risks as a result of exposure to carcinogenic substances by using estimated or measured concentrations and risk/potency factors. The calculated cancer risk is an approximation of the probability of an individual developing cancer over the course of a lifetime as a result of exposure to a particular cumulative dose of a potential carcinogen.

Unlike cancer risk estimates, the measure used to describe the potential for noncarcinogenic toxic effects to occur is expressed in terms of a hazard index (HI), which is calculated as the ratio of the predicted acute or chronic exposure (dose) of a noncarcinogenic substance to that chemical's toxicity threshold, often referred to as the reference dose. The HI assumes that there is a level of exposure below which it is unlikely, even for sensitive populations, to experience adverse health effects. Because there are inherent uncertainties and assumptions used in the modeling, the final calculated risk value therefore should be viewed as a very conservatively estimated probability of occurrence. The HIs for the project site will be determined before construction by the lead agency in the site's cleanup process.

Local Regulations

The project study area is located in Seaside and the former Fort Ord. Policies S-2.1 and S-2.2 in the Seaside General Plan address protection of the community from public safety hazards related to human activities. Policy S-2.1 aims to reduce the risks posed by air pollution, and Policy S-2.2 deals with hazardous materials, particularly in Implementation Plan S-2.2.1, which addresses cooperation with federal, state, and county agencies; identification of roadway transportation routes for conveyance of hazardous materials; and implementation of a multihazard emergency plan and risk management plans.

Other Laws, Regulations, and Programs

Various other state regulations have been enacted that affect hazardous waste management, including:

- Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), which requires labeling of substances known or suspected by the state to cause cancer; and
- California Government Code Section 65962.5, which requires the Office of Permit Assistance to compile a list of possible contaminated sites in the state.

State and federal regulations also require that hazardous materials sites be identified and listed in public records. These lists include:

- Comprehensive Environmental Response, Compensation, and Liability Information System;
- National Priorities List for Uncontrolled Hazardous Waste Sites;
- Resource Conservation and Recovery Act;
- California Superfund List of Active Annual Workplan Sites; and
- lists of state-registered underground and leaking underground storage tanks.

Impacts and Mitigation Measures

Methods and Significance Criteria

Impacts on the public and environment that could result from hazardous materials and other hazards were evaluated based on the known potentially hazardous materials that would be used or stored on site during construction and operation, potential for accidental hazardous material release, and presence of other health-threatening factors in the project vicinity. The analysis is also based on information compiled by Padre Associates, Inc. (2005) for MPWMD. It is assumed that hazardous spill prevention and response measures would be incorporated into the construction specifications.

Criteria for determining the significance of impacts related to hazards and hazardous materials are based upon criteria contained in the State CEQA Guidelines. The Proposed Project would have a significant effect if it would:

- create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- emit hazardous emissions or involve handling hazardous materials, substances, or waste within ¼ mile of an existing or proposed school;
- be located on a site that is listed as hazardous by the California Environmental Protection Agency (Cal-EPA) and, as a result, would create a significant hazard to the public or the environment;
- result in safety hazards near a public or public-use airport;
- expose people to significant risk of injury or death from flooding; or
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

Construction Impacts

Impact HAZ-1: Exposure of Employees and Public to Hazardous Materials during Construction of a Well and Pipelines at the Former Fort Ord

Construction of a new well at the former Fort Ord and installation of pipelines that extend through the former Fort Ord could result in the exposure of employees and the public to hazardous materials. Construction of the well and pipeline would require the use of fuels and lubricants. Accidental release of these hazardous materials could result in exposure to construction workers and the public. The risk of worker and public exposure to fuels and lubricants would be substantially reduced by normal equipment operation and fueling safety measures and by implementing a Storm Water Pollution Prevention Plan (SWPPP) as described in Chapter 2.

As indicated earlier, Fort Ord is designated both an NPL site and DOD site. The entire project study area is located on this NPL/DOD property in an area that formerly contained live-firing ranges for various weapons. Therefore, soil disturbance from excavation, grading, and trenching activities at the project site could expose construction workers and the public to hazards. The principal hazard that is of concern is UXO. This potential impact is considered **significant**.

The Proposed Project is located in a portion of the former Fort Ord inland range that has been subject to both surface and limited sub-surface ordnance clearance activities. In addition, prior to the commencement of any construction, the DOD would clear the area for drilling and trenching to the appropriate depth to ensure that no UXO exist within these areas. The DOD would also require implementation of Mitigation Measure HAZ-1 below. With implementation of these measures, the risk of encountering UXO during project grading and well drilling would be low. This impact is considered **less than significant.**

Mitigation Measure HAZ-1: Implement UXO Safety Precautions during Grading and Construction Activities at the Project Site. Because of the proposed well site's location, the following safety precautions are required for onsite activities. The requirements may be modified upon completion of the Munitions Response Remedial Investigation/Feasibility Study (MR RI/FS) process for the munitions response sites.

- All personnel accessing the proposed well site will be trained in MEC recognition. This safety training is provided by the Army at no cost to the trainee. Training may be scheduled by contacting Fort Ord BRAC Office, Lyle Shurtleff at 831-242-7919.
- If an item is discovered that is or could be MEC, it shall not be disturbed. The item shall be reported immediately to the Presidio of Monterey Police Department at 831-242-7851 so that appropriate U.S. Military explosive

ordnance disposal personnel can be dispatched to address such MEC as required under applicable law and regulations at the expense of the Army.

- Ground disturbing activities, including perimeter fence installation, will be coordinated with U.S. Army Corps of Engineers Unexploded Ordnance Safety Specialist so that appropriate construction-related precautions may be provided (Fisbeck pers. comm.).

Impact HAZ-2: Handling and Use of Hazardous Materials during Construction within 0.25 Mile of a School

Construction activities that may result in the release of fuels and lubricants would occur within 0.25 mile of Fitch Middle School (Figure 2-3). As described above, accidental release of these materials during construction could result in exposure to the public at the nearby school. As described in Chapter 2, a SWPPP would be implemented that would impose performance standards on the construction activity so that the risk of release of hazardous materials during construction would be minimal. In addition, construction would last only 8 weeks. Therefore, **this impact is less than significant**.

Mitigation: No mitigation is required.

Operation Impacts

Impact HAZ-3: Potential Creation of a Hazard to the Public and Environment from Routine Use of Hazardous Materials or Accidental Release of Hazardous Materials during Operation of the Well Site

Operation of the proposed well site would involve the storage and use of hazardous materials, including carbon dioxide, lime, sodium hypochlorite solution, and other substances that may result in hazardous conditions on site. MPWMD would be required to comply with regulations for use and disposal of hazardous materials, including an operation and maintenance plan and a chemical handling and emergency response plan. If the aforementioned materials would be present above reportable quantities (as noted in the county requirements for hazardous materials management plans), a hazardous materials management plan would be implemented, as required by county regulations. This plan would address public health and safety issues by providing safety measures, including release-prevention measures; employee training, notification, and evacuation procedures; and adequate emergency response protocols and cleanup procedures. Compliance with regulations and requirements concerning the use and storage of hazardous materials will minimize the Proposed Project’s potential to threaten public safety and the environment; therefore, this impact is **less than significant.**

Mitigation: No mitigation is required.

Impact HAZ-4: Handling of Hazardous Materials during Operation within 0.25 Mile of a School

Operation of the proposed well site would involve the use of hazardous materials (i.e., carbon dioxide, lime, and sodium hypochlorite solution) within 0.25 mile of Fitch Middle School (approximately 650 feet from the proposed new well site; Figure 2-3). It is expected that compliance with the regulations and plans as described above would reduce the risk of release of hazardous materials that could affect people at the nearby school. This impact is **less than significant**.

Mitigation: No mitigation is required.

Impact HAZ-5: Public Exposure to Contaminated Drinking Water

The Proposed Project would store water in underground aquifers for extraction and use during dry periods. According to Padre Associates, Inc. (2005), water quality in the aquifer is moderate to good in salinity and mineral content and is suitable for domestic and agricultural use. Because the Proposed Project would treat water transported from the Carmel River prior to injection, the water quality would not be degraded by constituents of human-made pollution such as nitrates, synthetic or volatile organics, or pesticides/herbicides. In addition, the Proposed Project would have a positive influence on water levels in the aquifer and would therefore not draw contaminated groundwater that exists north of the project site closer to the new well. Once water was extracted from the ASR well, it would be disinfected using sodium hypochlorite before being fed into the Cal-Am water distribution system. . Therefore, the public would not be exposed to contaminated drinking water. **This impact is less than significant**.

Mitigation: No mitigation is required.

Chapter 12
Public Services and Utilities

This chapter addresses the following public services and utilities:

- fire protection,
- police service,
- schools,
- parks,
- gas and electric service,
- water supply,
- wastewater treatment, and
- solid waste.

Setting

Public Services

Schools

The Monterey Peninsula Unified School District provides public school services in the communities of Monterey, Seaside, Del Rey Oaks, Sand City, the former Fort Ord, Marina, and some unincorporated areas. Sand City has no public schools, so students attend schools in Seaside. The California State University, Monterey Bay (CSUMB), campus is situated in the northeastern portion of the City of Seaside and the southeastern portion of the City of Marina. Approximately 3,020 students were enrolled in 2001.

In the City of Seaside, public elementary schools include Ord Terrace, Manzanita, Highland, Del Rey Woods, and Marshall. In addition, Fitch Middle School, King Middle School, and Seaside High School serve the city. Fitch Middle School is on the opposite side of General Jim Moore Boulevard from the existing Santa Margarita well site. If the Seaside well site were selected, the new well would be located on the property of Fitch Middle School (Figure 2-3).

Fire Protection

The Seaside Fire Department provides emergency response and prevention services to the City of Seaside and former Fort Ord. The department maintains one station that responds to 2,000 to 2,400 calls annually (City of Seaside 2003b). Since the annexation of a portion of the former Fort Ord, the Seaside Fire Department has served three times the land area without a proportional increase in staffing. As a result, fire response times to North Seaside range from 10 to 15 minutes, whereas a 5-minute response time is desirable (City of Seaside 2003b).

The portion of former Fort Ord that was not annexed by the cities of Seaside and Marina is served by the Fort Ord Military Community Fire Department. This department maintains one station located on General Jim Moore Boulevard between Gigling Road and Lightfighter Drive. Information regarding staffing, response times, and future plans for this station is not available for public use.

Police Services

The Seaside Police Department serves the City of Seaside and the former Fort Ord. The department maintains headquarters and two substations in Seaside, with a contingent of 42 sworn officers and 12 non-sworn full-time employees (City of Seaside 2003b). As with fire protection services, the response area of the department increased from 2.69 square miles to 8.96 square miles with the closure of Fort Ord and the city's subsequent annexation of a portion of this land. Staffing levels have remained the same despite this service area increase. New facilities and sworn officers will be required in order to serve new development and improve the current ratio of officers to residents (City of Seaside 2003b).

Parks

Seaside owns and/or maintains 28 park and recreation areas totaling 50.58 acres, including mini-parks, neighborhood parks, community parks, regional parks, and open-space areas. The city uses a standard of 2 acres per 1,000 residents for mini-parks and neighborhood parks, and 1 acre per 1,000 residents for community parks (City of Seaside 2003b).

The only public parks that are in the project area are Stuart and Lincoln Cunningham Parks, which are located just north of King Middle School along San Pablo Avenue. The Bayonet & Black Horse Golf Course, a public course, is located northwest of the Proposed Project site.

Utilities

Gas and Electricity

Gas and electric service in the project study area is provided by Pacific Gas and Electric Company (PG&E), which distributes natural gas and electricity to approximately 13 million people through a 70,000-square-mile service area in northern and central California.

Natural gas is measured in British thermal units (BTU), which is the quantity of heat necessary to raise the temperature of 1 pound of water 1 degree Fahrenheit. Electricity is measured in kilowatt hours (kWh). A kilowatt (kW) is a measure of power produced through sources of generation at 3,413 BTU/kWh. Most electricity is produced by consuming other resources. After these primary energy sources are converted to electricity, PG&E operates a grid distribution system that transmits electricity with a vast network of transmission and distribution lines throughout the service area to the users.

Major electric service infrastructure in or near the project study area includes the Del Monte Substation located on English Avenue and Fremont Street near the Sand City/Seaside city limits, the Fort Ord Substation located on Gigling Road on former Fort Ord, the Manzanita Substation on San Pablo and Flores Streets in Seaside, and various aerial and underground transmission lines. Gas service infrastructure includes underground pipelines.

Water Supply

The cities of Monterey, Seaside, and Sand City are within the MPWMD, which is responsible for issuing water connection permits for development within the district's boundaries. Cal-Am operates and maintains the physical water supply system for approximately 95% of MPWMD residents and businesses. Water supplied by Cal-Am is obtained from the Los Padres and San Clemente Reservoirs located on the Carmel River, and from wells in the Carmel Valley and Seaside aquifers. A detailed description of the role of MPWMD and water service provided by Cal-Am is included in Chapter 1, "Introduction."

The former Fort Ord has received a separate allocation from the Monterey County Water Resources Agency, of which 1,175 AFA have been allocated by the Fort Ord Reuse Authority to the City of Marina (excluding the Monterey Bay Education, Science, and Technology [MBEST] Center) and 230 AFA to the MBEST Center.

Wastewater Treatment

The provision of sanitary sewer or wastewater service in the Monterey area is organized at two levels. Local cities and sanitation districts are responsible for maintenance and extension of sewer lines, and the Monterey Regional Water Pollution Control Agency (MRWPCA) is responsible for development and operation of treatment facilities.

The wastewater systems in Sand City and Seaside are maintained and operated by the Seaside County Sanitation District (SCSD). Wastewater is carried by the SCSD's sanitary collection system to the MRWPCA pump stations. There are currently two pump stations; one serves Seaside and Sand City proper (located at the end of Bay Street in Seaside), and the other serves the former Fort Ord military base, including North Seaside. From these pump stations, the wastewater is pumped to the MRWPCA treatment plant. The plant was constructed with a permitted capacity of 29 million gallons per day (mgd) (City of Seaside 2003b). Several mgd of capacity are still available to meet future demand, and expansion of the treatment plant is not anticipated to be necessary in the near future. Future infrastructure improvements will focus on the collection system (City of Seaside 2003b).

Stormwater

There is no stormwater collection and transport system in the project area. Runoff from the undeveloped lands in this portion of former Fort Ord generally drains westward toward General Jim Moore Boulevard and the City of Seaside residential areas.

Solid Waste

The entire project study area is within the jurisdiction of the Monterey Regional Waste Management District (MRWMD). Seaside Waste Management provides solid waste collection for the City of Seaside, and the Monterey Bay Disposal Corporation serves the former Fort Ord. Solid waste collection trucks travel frequently on roadways throughout the project study area. The solid waste is transported to the Monterey Peninsula Landfill and Recycling Facility in the City of Marina, which is operated by the MRWMD and serves western Monterey County. This facility serves the solid waste and recycling needs of an estimated 170,000 residents on the Monterey Peninsula. Among other things, the facility accepts basic solid waste, liquid waste and sewage sludge (biosolids), wood waste, yard waste, concrete, brick, rock, asphalt, tires, appliances, furniture, plastics, and boats. The Materials Recovery Facility (MRF) targets materials brought in from self-haul loads and commercial wastes, construction and demolition debris, wood waste, and yard waste and diverts 64% of incoming material. The facility has off-site local recycling centers that collect household recyclables (glass, aluminum, paper, and plastics). The MRWMD estimates that the landfill has adequate capacity for projected development on the Monterey Peninsula through 2076 (City of Sand City 2002).

Regulations

Relevant policies for public service and utilities from the local general plans are shown in Table 12-1.

Table 12-1. City of Seaside General Plan Policies for Public Services and Utilities

City of Seaside General Plan
Land Use Goal LU-5: Collaborate with local and regional water suppliers to continue to provide quality water supply and treatment capacity to meet community needs.
Land Use Policy LU-5.2: Work cooperatively with local and regional water suppliers to ensure adequate water reserves.
Land Use Implementation Plan LU-5.2.1: Support the MPWMD in its plans for a water supply project that will: 1. Supply water to meet the existing level of Cal-Am system production of 15,285 AFA as a short-term goal. 2. Augment the community water supply as a long-term goal. The project specifically includes aquifer storage and recovery components. MPWMD will also be evaluating other water supply options including local desalination and the Carmel Dam and Reservoir Project.
Land Use Goal LU-6: Ensure that sewer service and facilities are provided and maintained to adequately meet the community's current and future need for sewer collection and treatment.
Land Use Goal LU-7: Collaborate effectively with local providers of solid waste collection and disposal to provide a sufficient level of solid waste disposal.
Land Use Goal LU-9: Provide a sufficient level of fire protection, public education, and emergency response service (with a response time of 5 minutes) for all portions of the community.
Land Use Goal LU-10: Provide an effective and responsive level of police protection (including facilities, personnel, and equipment) through the Seaside Police Department.

Impacts and Mitigation Measures

Methods and Significance Criteria

Potential impacts on public services and utilities were analyzed based on the Proposed Project's potential to affect the service or facilities of the public services and utilities described in the Setting section during construction and operation.

The Proposed Project would have a significant impact on public services and utilities if it would:

- result in disturbance to existing public services and utility infrastructure from construction activities;
- create a need for new or altered fire, police, school, or park service or facilities;

- require new or altered gas, electric, water, stormwater, or solid waste service or facilities; or
- require energy or water supplies in excess of existing capacity.

Construction Impacts

Construction activities associated with the ASR project would not increase the need for new water supply, or water or wastewater treatment facilities and would not require substantial amounts of water. Impacts related to traffic, including roadway circulation, access to parks and schools, and emergency response, are addressed in Chapter 13, *Transportation and Circulation*.

Impact PS-1: Increase in Solid Waste Generation and Construction Debris during Construction of Well and Pipelines

Construction of the well and pipelines would create construction debris and increased need for solid waste disposal. Waste materials generated would include excavated materials (soils and sediment), demolition waste, and roadbed fragments. The Monterey Peninsula Landfill and Recycling Facility accepts this type of waste and has adequate capacity to serve projected development, including the proposed project, on the Monterey Peninsula through 2076 (Griffith pers. comm.). This impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact PS-2: Temporary Disruption of Existing Underground Utilities and Utility Service during Construction of Well and Pipelines

Construction of the well and pipelines could conflict with existing utilities, particularly underground utility lines in roadways but possibly aerial lines as well. Construction of the underground pipelines could result in the temporary disruption of utilities, (i.e., electricity, water, gas, sewers, and stormwater conveyance) or the need to relocate utility infrastructure. **This impact is considered significant but would be reduced to a less-than-significant level with implementation of the following mitigation measures.**

Mitigation Measure PS-1: Coordinate Relocation and Interruptions of Service with Utility Providers during Construction

The construction contractor will contact Underground Service Alert (800/642-2444) at least 48 hours before excavation work begins in order to verify the nature and location of underground utilities. In addition, the contractor will notify and coordinate with public and private utility providers at least 48 hours before the commencement of work adjacent to any utility, unless the excavation permit specifies otherwise. In addition, the service provider will be notified in advance of all service interruptions and will be given sufficient time to notify customers. The timing of interruptions will be coordinated with the providers to ensure that the frequency and duration of interruptions are minimized.

Mitigation Measure PS-2: Protect All Existing Utilities Slated to Remain

The construction contractor will be responsible for ensuring protection of all utilities slated to remain. All buried lines will be tape-coated in accordance with the requirements of American Water Works Association C214. All new water services, fire services, and water mains will be cathodically protected, in accordance with contract documents. In addition, the contractor will be required to comply with State Department of Health Services criteria for the separation of water mains and sanitary sewers, as set forth in Section 64630, Title 22, of the California Administrative Code. MPWMD will ensure this measure is included in the contract specifications.

Operational Impacts

Project operation would not increase water supply capacity. The Proposed Project would help Cal-Am comply with Order WR 95-10, but is not large enough to facilitate full compliance (refer to Chapter 1, "Introduction"). The Proposed Project would not result in a new allocation of water. Project operation is not considered to be growth-inducing because it is replacing a previous water source, rather than generating additional water yield (see Chapter 15, "Other CEQA Analyses—Growth-Inducing Impacts"). Because the proposed project is not considered growth-inducing, no impacts on schools, parks, or police and fire services are anticipated. The new ASR well and pipelines are not expected to generate a need for police service or fire protection above the existing level of service.

Potential impacts include increased demand for energy beyond existing capacity, increased solid waste, and alteration of existing wastewater facilities.

Impact PS-3: Increased Demand for Electricity from Operation of ASR Facilities

The operation of the new well and pipelines would not result in a substantial demand for energy above what is currently required. Maximum new energy demand as a result of operating the project is estimated to total 10,000 kWh per day.

The impact is considered **less than significant** because PG&E has the capacity to meet the additional demands.

Mitigation: No mitigation is required.

Chapter 13
Transportation and Circulation

Setting

Existing Roadway Network

Access to the project area is provided by State Routes 1, 68, and 218; General Jim Moore Boulevard; and Broadway Avenue. In the project vicinity, SR 1 is a restricted-access freeway, four to six lanes wide. Another state highway serving the area is SR 218 (Canyon Del Rey Boulevard), which extends northwest to southeast between SR 1 and SR 68. SR 218 is four lanes wide in the vicinity of Sand City, but decreases to two lanes as it passes through Del Rey Oaks. General Jim Moore Boulevard and Broadway Avenue are arterial roads serving the local area (Figure 13-1).

Parking

On- and off-street parking is provided throughout Seaside and the former Fort Ord, but none is available along General Jim Moore Boulevard adjacent to the project study area. The Seaside General Plan specifies that proposed land uses should provide adequate on-site parking.

Transit

Monterey-Salinas Transit (MST) provides local fixed-route transit service in the project vicinity, including three MST transit centers. In the project vicinity, Route 17 extends along General Jim Moore Boulevard between Military and Inter-Garrison Roads. (Monterey-Salinas Transit 2003)

Bicycle and Pedestrian Traffic

Bicycle and pedestrian travel for commute and recreational purposes is prominent throughout the Monterey Peninsula. Nonmotorized travel along the coast is anchored by the Monterey Bay Coastal Trail, an approximately 29-mile-long bicycle and pedestrian pathway extending from Castroville on the north to the Monterey Peninsula and parts of Pebble Beach on the south. The Monterey Bay Coastal Trail is not located near the project site.

Other bicycle lanes and routes are present near the project site. However, the City of Seaside General Plan Traffic Study (Cotton/Bridges/Associates 2003) does not explicitly address bicycle and pedestrian facilities.

Pedestrian generators in the vicinity of the project are listed below:

- Fitch Middle School (Figure 2-3), located on the west side of General Jim Moore Boulevard north of Coe Avenue in Seaside; and
- California State University, Monterey Bay, located on the east side of General Jim Moore Boulevard between Gigling and Inter-Garrison Roads in Seaside (the university's stadium is located on the west side of General Jim Moore Boulevard north of Light Fighter Drive).

Impacts and Mitigation Measures

Methodology and Significance Criteria

Approach

This chapter addresses short-term construction impacts and long-term operation impacts of the project on the surrounding transportation system. Potential impacts were assessed by conducting a field survey, reviewing the local standards and general plans, and contacting local agencies. To estimate construction-related traffic increases, the number of anticipated round trips per day for construction vehicles was considered (Table 13-1).

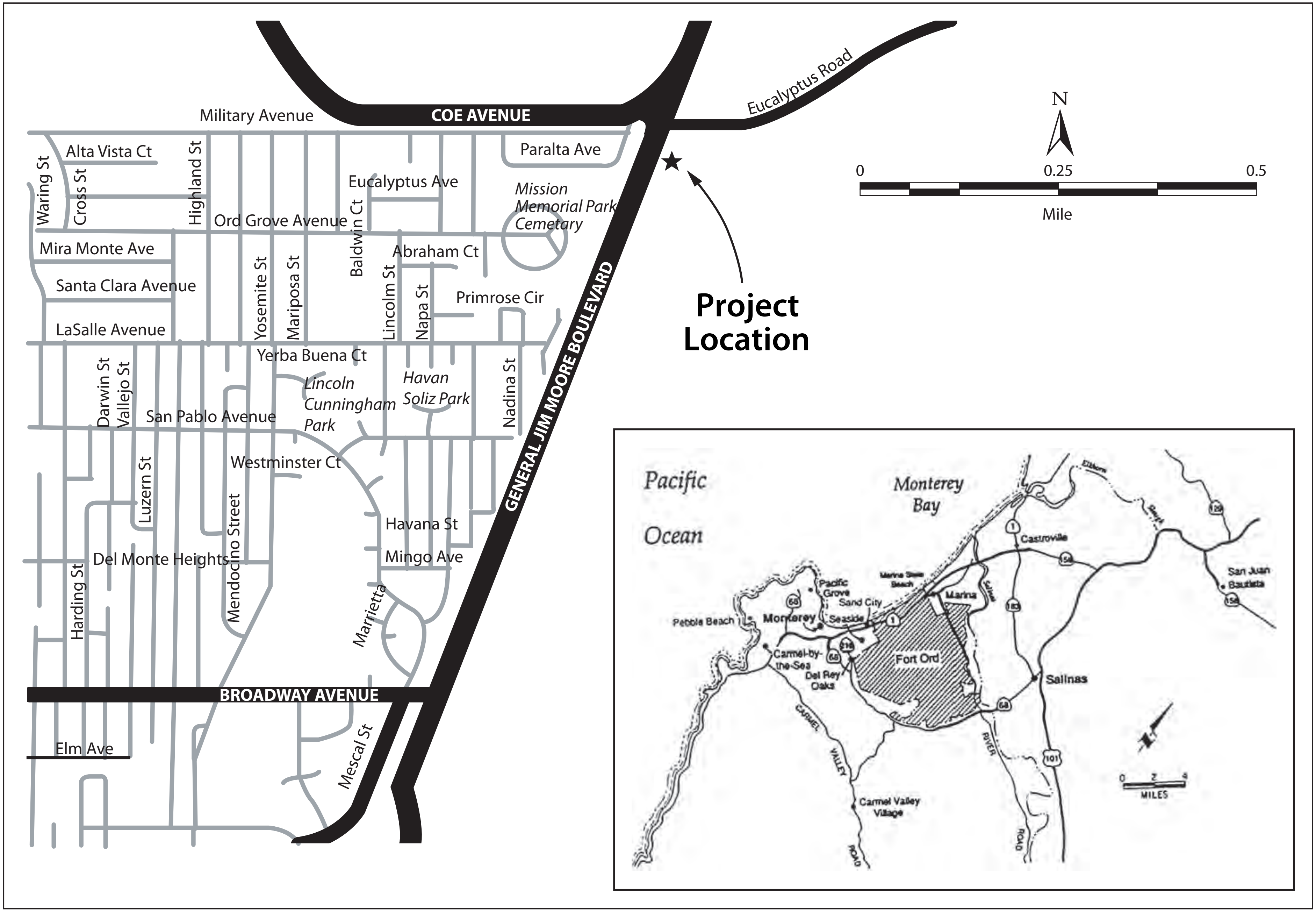
Table 13-1. Anticipated Construction Vehicle Roundtrips per Day

Type of Construction Vehicles	Anticipated Round Trips per Day during Construction
Heavy trucks (dump trucks, cement mixers, earth movers)	2
Light trucks (employees, inspectors, deliveries)	8

Significance Criteria

Based on the State CEQA Guidelines, transportation impacts were considered significant if the Proposed Project would result in:

- a substantial increase in traffic compared to the existing traffic volumes and the capacity of the roadway system;



Jones & Stokes

Figure 13-1
Roadways in Project Area

- safety hazards due to a design features or incompatible uses, including hazards to vehicular, pedestrian, and bicycle transit;
- inadequate emergency access;
- inadequate parking capacity; or
- conflicts with existing MST system or UPRR track.

The project study area is located within 3 miles of the Monterey Peninsula Airport and would not result in a change in air traffic patterns, including an increase in traffic levels and a change in allocation that results in substantial safety risks. Therefore, this issue is not discussed further in this section. Also, qualitative assessment of policies defined in the Seaside General Plan indicates that the Proposed Project would not conflict with adopted policies, plans, or programs supporting alternative transportation.

Construction Impacts

Impact TR-1: Temporary Traffic Increase and Potential for Level of Service Degradation during Construction of Wells and Pipelines

A slight increase in localized traffic would be associated with installation of the well and associated pipelines. Construction equipment and workers would access the site from General Jim Moore Boulevard. It is anticipated that construction activities required for well construction and pipe installation would require approximately 10 round trips per day (Table 13-1). Because only 10 additional round trips per day are expected to be generated from the Proposed Project, minimal disruption to the affected roadways would occur. There would be no noticeable changes in traffic in areas outside the immediate vicinity of the project area. In addition, the slight increase in localized traffic would occur only during construction, which is expected to last for no more than 8 weeks. This impact is considered **less than significant** due to the small number of additional roundtrips generated in the project area, the temporary duration for which the slight increase would occur, and because a Traffic Control Plan, as described in Chapter 2, would be implemented.

Mitigation: No mitigation is required.

Impact TR-2: Potential Conflict with Fixed-Route Monterey-Salinas Transit Service during Construction of Wells and Pipelines

Construction activities associated with the construction of wells and the installation of pipelines would occur only within the former Fort Ord, just east of General Jim Moore Boulevard. The new pipeline would be connected to the existing pipeline parallel to General Jim Moore Boulevard through an existing culvert. As a result, there would be no disruption to the roadway during construction of the wells and pipelines and no substantial conflict with fixed-route MST. In addition, coordination between MPWMD and MST described in the Traffic Control Plan (Chapter 2) would ensure that there would be no conflicts with the MST. This impact is **less than significant.**

Mitigation: No mitigation is required.

Impact TR-3: Potential Pedestrian and Bicycle Hazards from Pathway and Bikeway Closures or Disruption during Construction of Well and Pipelines

Construction activities associated with construction of the well and pipelines could result in closing or narrowing pedestrian or bicycle pathways to accommodate truck traffic in and out of the project area, which could present a hazard to pedestrians or bicyclists. The Traffic Control Plan, described in Chapter 2, would require proper signage to direct bicyclists and pedestrians around the affected project area and the disruption would occur only during construction, which would last 8 weeks. Therefore, this impact is **less than significant.**

Mitigation: No mitigation is required.

Operational Impacts

Impact TR-4: Potential for Increased Traffic and Level of Service Degradation from Operation and Maintenance of the Well Site

There would be only intermittent traffic on the roadways in the vicinity of the project well as a result of well operation and maintenance. In most situations, there would only be two employees traveling to the well site to check well operation and to conduct maintenance. Therefore, operation and maintenance would not generate sufficient additional travel to result in significant degradation of traffic levels on streets adjacent to the project site. This impact would be **less than significant**.

Mitigation: No mitigation is required.

Impact TR-5: Increased Parking Demand Attributable to Operations and Maintenance of the Well

Operation and maintenance of the well would not require additional parking facilities; maintenance workers would be able to park off of public roads, in the graded areas adjacent to the well. This impact would be **less than significant**.

Mitigation: No mitigation is required.

Chapter 14
Visual Resources

Introduction

This chapter describes the regional visual character and existing visual resources of the project study area. The impacts and mitigation section identifies potential impacts on visual resources, including changes in the views that would result from constructing the project elements.

Identification of an area's existing visual resources and conditions involves:

- objective identification of the visual features (visual resources) of the landscape;
- assessment of the character and quality of those resources relative to overall regional visual character; and
- determination of the importance to people, or sensitivity, of views of visual resources in the landscape.

The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area (Federal Highway Administration 1983). The scenic quality component can best be described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area (U.S. Bureau of Land Management 1980). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, the number of views seen, the distance of the viewers, and the viewing duration. Viewer sensitivity relates to the extent of the public's concern for a particular viewshed. A more detailed description of these variables is provided in Appendix D.

Setting

Well Sites

Fort Ord Well Site

The Fort Ord well site is located in the western area of former Fort Ord, east of General Jim Moore Boulevard (Figure 2-3). The project area is predominantly open space and has been used as a firing range while occupied by the U.S. Army. The Fort Ord Reuse Plan (Fort Ord Reuse Authority 1997) indicates that this area is zoned for low-density residential and habitat management.

Vehicle access is provided primarily by a dirt road that exists for access to the Santa Margarita well. A new dirt road connecting the Fort Ord well site to the existing dirt road would be constructed.

Pipelines

Santa Margarita Pipeline

A 12-inch-diameter underground pipeline currently connects the Santa Margarita well site to the Cal-Am system pipeline (Figure 2-2)_. The 12-inch-diameter Santa Margarita pipeline is entirely within the former Fort Ord property and extends approximately 200 feet from the well to the Cal-Am system pipeline. The project would involve the replacement of this pipe with a new 16-inch-diameter pipeline from the Santa Margarita well site, through a culvert under General Jim Moore Boulevard to avoid surface excavation, to the Cal-Am system pipeline. This area is not currently developed, but the Fort Ord Reuse Plan designates it as low-density residential and habitat management (Fort Ord Reuse Authority 1997).

Pipeline from Fort Ord Well to Santa Margarita Pipeline

If the Fort Ord well site is selected, a new pipeline connecting this well to the Santa Margarita pipeline alignment would be constructed underground. It is expected that this pipeline would be approximately 500 feet long. It would connect to the new 16-inch-diameter Santa Margarita pipeline at a location east of General Jim Moore Boulevard. The entire pipeline would be located in the former Fort Ord, specifically in the land designated as low-density residential and habitat management as described above. The areas surrounding the collection pipeline are low to moderate in unity and intactness because of structural development, roadways, utility lines, and other artificial intrusions along the majority of the alignment.

Existing Viewer Groups and Viewer Response

Travelers on General Jim Moore Boulevard

The well site corridor is within the viewshed of travelers on General Jim Moore Boulevard. As one of the major roadways in Seaside, General Jim Moore Boulevard carries mainly residents and non-recreational travelers. As such, travelers along the portion of General Jim Moore Boulevard in the project area would be considered to have moderate visual sensitivity.

Regulatory Context

The Proposed Project is subject to the specific federal, state, and local laws, ordinances, regulations, and standards for visual resources, described below. There are no specific federal regulations that apply to the visual resources associated with this project. However, the project study area east of General Jim Moore Boulevard is within the federal jurisdiction of the former Fort Ord, but the land is in the process of being transferred to Seaside.

State Regulations

The segment of State Route (SR) 1 from U.S. 101 near San Luis Obispo to SR 35 near Daly City (which includes the project area) is an officially designated scenic highway by state of California legislation. As such, its scenic corridor (defined as the area of land generally adjacent to and visible from the highway) is subject to protection, including regulation of land use, site planning, advertising, earthmoving, landscaping, and design and appearance of structures and equipment. Examples of visual intrusions that would degrade scenic corridors as stipulated by Caltrans and are applicable to this project include dense and continuous development, highly reflective surfaces, development along ridge lines, extensive cut and fill, scarred hillsides and landscape, exposed and unvegetated earth, and dominance of exotic vegetation. Unsightly land uses would include those actions that result in these conditions.

Local Regulations

City of Seaside

The City of Seaside General Plan identifies the following policies for the implementation plan:

- **Policy UD-3.1.** Protect private views of significant natural features, such as the Monterey Bay, Roberts Lake, the Pacific Ocean, the surrounding mountains, and other important viewsheds.

- **Implementation Plan UD-3.1.1 View Protection and the BAR.** Continue to require all additions that increase building heights and new developments to stake and flag development at least 10 days prior to consideration by the Board of Architectural Review (BAR) for design approval. When feasible, require project site redesign, modified landscaping, or reduced building heights to avoid obstruction of private views.

Former Fort Ord

The Fort Ord Reuse Plan does not include a separate visual resources element; however, it does include a recreation and open space objective that discusses visual quality and scenic views. Additionally, the former Fort Ord is subject to visual resource protection policies in the Monterey County LCP (North County Land Use Plan). Table 14-1 includes the relevant policies of both the Fort Ord Reuse Plan and Monterey County LCP (North County Land Use Plan).

Table 14-1. Local Visual Resources Policies

Local Document	Visual Resources Policies
Seaside General Plan (Urban Design Element)	**Goal UD-1:** Create and maintain a positive image that also provides a clear identity for the community within the region.
	Policy UD-1.1: Enhance the City's image and identity within the region's natural setting.
	Policy UD-3.1: Protect private views of significant natural features, such as the Monterey Bay, Roberts Lake, the Pacific Ocean, the surrounding mountains, and other important viewsheds.
	Policy UD-3.2: Preserve the unique public views visible from the Highway 1 Corridor between Fremont Boulevard and the northern boundary of the city as identified in the Fort Ord Reuse Authority (FOR A) Plan.
	Implementation Plan UD-3.2.1: Establish and enforce design guidelines in the Seaside Zoning Ordinance to preserve and protect the public viewsheds.
Fort Ord Reuse Plan	**Objective B:** Protect scenic views, and preserve and enhance visual quality.
	An integral part of the reuse planning strategy for the economic redevelopment of the former Fort Ord is to provide a visually attractive environment that will be a draw for businesses and residents alike. Another goal of the reuse planning effort is to integrate the former Fort Ord into the greater Monterey Peninsula, both functionally and visually. Due to its location straddling Highway One, the main access route to the Monterey Peninsula, the former Fort Ord provides a major gateway image to the Peninsula itself. This image should be attractive and in harmony with that of the overall image of the Peninsula itself.

Local Document	Visual Resources Policies
Monterey County LCP (North County Land Use Plan).	**Policy 2.2.1:** In order to protect the visual resources of North County, development should be prohibited to the fullest extent possible in beach, dune, estuary, and wetland areas. Only low intensity development that can be sited, screened, or designed to minimize visual impacts, shall be allowed on scenic hills, slopes, and ridgelines. **Policy 2.2.2.1:** Views to and along the ocean shoreline from Highway One, Molera Road, Struve Road, and public beaches, and to and along the shoreline of Elkhorn Slough from public vantage points shall be protected. **Policy 2.2.2.2:** The coastal dunes and beaches, estuaries, and wetlands should be designated for recreation or environmental conservation land uses that are compatible with protection of scenic resources. Facilities that are provided to accompany such uses shall be designed and sited to be unobtrusive and compatible with the visual character of the area. **Policy 2.2.2.4:** The least visually obtrusive portion of a parcel should be considered the most desirable site for the location of new structures. Structures should be located where existing topography and vegetation provide natural screening. **Policy 2.2.2.5:** Structures should be located to minimize tree removal, and grading for the building site and access road. Disturbed slopes should be returned to their previous visual quality. Landscape screening and restoration should consist of plant and tree species complementing the native growth of the area. **Policy 2.2.3.3**: Structures shall generally be sited so as not to block public views of the shoreline; development proposals shall be revised if necessary to accomplish this goal. Necessary structures in public view between the road and the shoreline (such as agricultural buildings) shall be functionally designed, and sited so as to protect the maximum possible open views. Other development in public view between the road and the shoreline (such as residential or commercial structures) shall be designed with materials, colors, landscaping, and fencing appropriate to the rural setting. **Policy 2.2.3.5:** New overhead utility and high voltage transmission lines that cannot be placed underground should be routed to minimize environmental and scenic impacts.

Impacts and Mitigation Measures

Methods and Significance Criteria

The analysis of the visual effects of the project are based on photographic documentation of key views of and from the project site, as well as regional visual context; review of project construction drawings included in Chapter 2; and review of the project in regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality.

Based on professional standards and Appendix G of the State CEQA Guidelines, the Proposed Project would have a significant impact if it would:

- conflict with adopted visual resource policies;
- substantially reduce the vividness, intactness, or unity of high-quality views;
- introduce a substantial source of light and glare into the viewshed;

- conflict with local guidelines or goals related to visual quality;
- alter the existing natural viewsheds, including changes in natural terrain;
- alter the existing visual quality of the region or eliminate visual resources;
- increase light and glare in the project vicinity;
- result in backscatter light into the nighttime sky;
- result in a reduction of sunlight or introduction of shadows in community areas;
- obstruct or permanently reduce visually important features; or
- result in long-term (that is, persisting for 2 years or more) adverse visual changes or contrasts to the existing landscape as viewed from areas with high visual sensitivity.

Construction Impacts

Impact VIS-1: Temporary Alteration of Scenic Views during Construction of Well and Pipelines

Construction activities associated with the Proposed Project would temporarily alter scenic views along General Jim Moore Boulevard, because construction equipment associated with the well and pipelines would use this road to access the construction site and would be visible to vehicles traveling in both directions on General Jim Moore Boulevard. However, construction activities are considered temporary, and the existing visual character of areas surrounding the project sites would be restored after the completion of the project (approximately 8 weeks). This impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact VIS-2: Degrade Existing Visual Character during Construction of Well and Pipelines

Construction activities associated with the well site and pipelines would include the use of heavy equipment and associated vehicles (e.g., bulldozers, graders, cranes, and various trucks). Construction equipment would be present in the viewshed of nearby roadways and adjacent residences. Construction activities are considered temporary (lasting approximately 8 weeks), and the existing visual character of areas surrounding the project sites would be restored after the completion of the project**.** This impact is considered **less than significant.**

Mitigation: No mitigation is required.

Impact VIS-3: Creation of Light and Glare during Construction of Well and Pipelines

Most of the construction activities associated with the well site and pipelines would occur during weekdays between the hours of 6:30 a.m. and 3:00 p.m. Nighttime construction would occur at various times throughout the construction period, necessitating temporary lighting. Reflective surfaces of construction equipment at the well site and portions of the pipeline would create a glare that could affect travelers on General Jim Moore Boulevard, and residents to the west of General Jim Moore Boulevard in Seaside. Sources of nighttime lighting during the construction period would, however, be controlled by being focused onsite.. This impact is considered **less than significant** because of the short duration of construction.

Mitigation: No mitigation is required.

Operational Impacts

Impact VIS-4: Alteration of Existing Visual Character at Well Site

No operational visual impacts would result from operation of the ASR project. The pipelines would be underground and not visible for the entire length of the alignments. The existing visual character along the pipeline alignments would be unaffected by the pipelines. In addition, trenching scars from the construction of the pipelines would not be significant, as they would be in previously disturbed corridors. Operation of the proposed well site would not substantially alter scenic vistas or scenic resources but would create new visual features at the well site. Because the well site would not result in substantial changes in the aesthetic character of the area and the pipelines would be underground, the impact on existing visual resources is considered **less than significant.**

Mitigation: No mitigation is required.

Impact VIS-5: Creation of New Light and Glare at Well Site

The project would not be constructed of reflective material and would, therefore, not create a source of glare. The baseline condition for light and glare at the well site is moderate because it is along General Jim Moore Boulevard, and there are a number of sources of nighttime light and developed structures that are sources of daytime glare. The control facility buildings associated with the well would include minimal nighttime lighting for security purposes. This would represent a new source of light and glare. Motorists traveling on General Jim Moore Boulevard and residents west of General Jim Moore Boulevard in Seaside could be affected by potential light and glare.

This impact is considered significant, but implementation of the following mitigation measure would reduce project-related light and glare impacts to a less-than-significant level.

Mitigation Measure VIS-1: Incorporate Light-Reduction Measures into the Plan and Design of Exterior Lighting at Well Site.
Where lighting is required or proposed, the MPWMD will incorporate the following light-reduction measures into the lighting design specifications to reduce light and glare. The lighting design will also meet minimum safety and security standards.

- Luminaires will be the minimum required for property security to minimize incidental light.
- Luminaires will be cutoff-type fixtures that cast low-angle illumination to minimize incidental spillover of light onto adjacent properties and open space. Fixtures that project light upward or horizontally will not be used.
- Luminaires will be focused only where needed (such as building entrances) and should not provide a general "wash" of light on building surfaces.
- Luminaires will be directed away from habitat and open space areas adjacent to the project site.
- Luminaires will provide good color rendering and natural light qualities. Low-pressure sodium and high-pressure sodium fixtures that are not color-corrected will not be used.
- Luminaire mountings will be downcast and the height of poles minimized to reduce potential for backscatter into the nighttime sky and incidental spillover of light onto adjacent properties and open space. Light poles will be no higher than 20 feet. Luminaire mountings will have non-glare finishes.

Chapter 15

Other Analyses Required by CEQA

This chapter addresses the following analyses required by CEQA:

- cumulative effects,
- growth inducement, and
- significant irreversible changes.

Cumulative Effects

CEQA Requirements

Section 15130 of the State CEQA Guidelines requires an EIR to discuss cumulative impacts of a Proposed Project when the project's incremental effect is cumulatively considerable. As defined by Section 15355 of the State CEQA Guidelines, a cumulative impact is an impact that is created as a result of the combination of the Proposed Project and related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

CEQA requires that the discussion describe the severity of the cumulative impacts and their likelihood of occurrence but does not require as much detail as that provided for the Proposed Project alone. Lead agencies may use a "list" approach to identify related projects producing related impacts or may base the cumulative analysis on a summary of projections in an adopted general plan or related planning document. (State CEQA Guidelines Section 15130[b])

NEPA Requirements

NEPA and its implementing regulations also require consideration of cumulative effects when preparing EAs or EISs. The CEQ NEPA Regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action." (40 CFR 1508.7)

Approach

This EIR/EA uses the list approach for determining potential cumulative impacts. As required by CEQA and NEPA, the cumulative effects analysis presented in this chapter identifies the impacts of the Proposed Project that could contribute considerably, when considered together with effects of other past, present, and reasonably foreseeable related projects, to a potentially significant cumulative impact.

Construction-related impacts of the Proposed Project are typically short-term and therefore have a relatively narrow window of time related to those past, present and reasonably foreseeable projects that could contribute to a potentially significant cumulative impact. It was determined that the project could contribute to cumulative short-term local construction-related traffic, air quality, and noise impacts. Additionally, construction activities on undeveloped former Fort Ord land would contribute to the long-term loss of vegetation and wildlife habitat. For construction-related cumulative impacts, MPWMD has identified *other related projects* as urban development and infrastructure projects with construction schedules that could overlap with that of the Proposed Project or construction footprints that could affect sensitive biological resources found on former Fort Ord. This includes projects that could begin before but are completed during construction of the Proposed Project, are constructed simultaneously with the Proposed Project, or begin during but are completed after construction of the Proposed Project. Construction of the Proposed Project is planned to occur between late 2006 and late 2007. The geographic area considered includes the cities of Marina, Seaside, Sand City, Del Rey Oaks, and Monterey because these are areas that could be affected by or could contribute to construction-related impacts.

Operation-related impacts of the Proposed Project are long-term and therefore have a broader window of time, starting with project completion, related to those past, present, and probable future projects that could contribute to a potentially significant cumulative impact. It was determined that operation of the Proposed Project would not contribute to cumulative impacts on resources or the public, either in the vicinity of the new ASR well or in the Carmel River Basin.

For construction-related impacts, the analysis considers all elements of the Proposed Project, including well, and pipelines. Even if a significant impact of the Proposed Project was mitigated to a less-than-significant level, the project could still contribute to a significant cumulative impact.

Evaluation of Project Contribution to Cumulative Effects

The project's construction-related impacts that could contribute to a cumulative effect in the immediate vicinity of the project include increased traffic, noise, and loss of vegetation and wildlife habitat. Increased air emissions could contribute to considerable cumulative effects in the air basin. Table 15-1 includes a list of specific planned or reasonably foreseeable projects in Seaside and surrounding communities considered in the cumulative effects analysis, based on input from planning and public works departments and several project proponents. In addition to these specific projects, it was assumed that other infrastructure improvements and other projects that could contribute to cumulative impacts on air quality would occur in the cities of Monterey, Marina, Sand City, and Del Rey Oaks. Although it is highly unlikely that all these projects would be constructed in the same timeframe (or constructed at all), it is possible that some of the projects could be constructed during the same timeframe as the Proposed Project. The schedules for the major large construction projects in the immediate vicinity of the Proposed Project are not set at this time, and are likely to proceed after the construction phase for the ASR project. Several of the projects would be constructed on undeveloped land within the former Fort Ord.

Traffic

Cumulative traffic-related impacts include temporary traffic increase and level-of-service (LOS) degradation, conflict with fixed-route transit service, creation of pedestrian and bicycle hazards, and impedance of emergency vehicle access.

- Constructing multiple projects that would affect traffic on General Jim Moore Boulevard south of Eucalyptus Avenue could result in temporary traffic increases from additional construction traffic and from delays caused by construction activities. This effect would be most likely to occur and be most severe at the time General Jim Moore Boulevard is being widened. However, the traffic generated by the Proposed Project is expected to include only 10 vehicle trips per day, and the construction period would last only 8 weeks. Because of the temporary nature of this increase, the small number of added trips, and the small likelihood that the Proposed Project would be constructed simultaneously with other large projects in the vicinity, **the project would not result in a considerable contribution to cumulative impacts on traffic, transit or pedestrian and bicycle traffic.**

Mitigation: No mitigation is required.

Air Quality

Cumulative air quality impacts include short-term increases in NO_x emissions from construction equipment exhaust and PM10 emissions from fugitive dust of ground-disturbing activities.

The MBUAPCD has identified a threshold of 137 pounds per day for NO_x emissions (MBUAPCD 2000). The analysis in Chapter 3 of this EIR/EA indicated that simultaneous construction of all project elements (well, building, and pipelines) would result in a temporary increase in NO_x emissions; however, these emissions would be below the MBUAPCD threshold. The MBUAPCD has identified a threshold of 82 pounds per day (or disturbance of more than 2.2 acres per day) for PM10 emissions (MBUAPCD 2000). The analysis in Chapter 3 of this EIR/EA indicated that this impact would be less than significant because fugitive dust from ground-disturbing activities would be well below the threshold. However, the Proposed Project could still result in increased PM10 emissions.

- The Proposed Project could result in a **considerable contribution** to NO_x and PM10 emissions when considered together with other projects that could be constructed in the same timeframe. To minimize this cumulative effect, construction projects planned for the same timeframe should be phased so the cumulative contribution of all the projects occurring in the same timeframe would remain below MBUAPCD thresholds for NO_x and PM10 emissions. With implementation of Mitigation Measure Cume-1, and a low likelihood that the ASR project would be constructed simultaneously with other projects planned for the General Jim Moore Boulevard corridor, **the project would not result in a considerable contribution to cumulative impacts on air quality.** If other construction projects planned in the vicinity of the Proposed Project were not implemented at the same time as the Proposed Project, the mitigation would not be needed.

- From a NEPA perspective, the MPUAPCD has already included construction-related emissions of ozone precursors (ROG and NO_x) in the emission inventories of state and federally required air plans and would not have a significant impact on the attainment and maintenance of ozone ambient air quality standards. **For CO and PM10, the region is in attainment of federal standards for these pollutants, so no assessment is necessary.**

Mitigation Measure Cume-1: Coordinate with Relevant Local Agencies to Develop and Implement a Phased Construction Plan to Reduce Cumulative Traffic, Air Quality, and Noise Impacts

The MPWMD will contact local agencies that have projects planned in the same area (i.e., project sites within 1 mile or projects that affect the same roadways) and that have construction schedules that overlap with construction of the Proposed Project. The MPWMD (or their contractor) will coordinate with local agencies responsible for said projects to develop a phased construction plan that includes the following components.

- Evaluate roadways affected by construction activities and minimize roadway and traffic disturbance (e.g., lane closures and detours) and the number of construction vehicles using the roadways. This may involve scheduling some construction activities simultaneously or phasing.
- Prepare compatible traffic control plans for construction projects. If one traffic control plan cannot be prepared, the construction contractor for the Proposed Project and the relevant local agencies (or their construction contractors) will ensure that the traffic control plans for projects affecting the same roadways are compatible. The traffic control plan can be modeled after that required for the Proposed Project in Chapter 2.

Table 15-1. List of Planned Local Construction Projects with Potential to Contribute to Cumulative Impacts of Proposed Project

Jurisdiction and Project Location (presented by City through which project study area extends, in alphabetical order)	**Planned Project**	**Project Status**	**Estimated Construction Timeframe**
Marina[1]			
West of California Avenue–Third Avenue	Cypress Knolls project. A senior residential community with 406 remodeled duplex units, 72 apartment units, 60 assisted living units, and up to 125,000 sf community facilities.	Tentative plans. Awaiting draft final development agreement	2006
North of Imjin Parkway and east of California Avenue	Marina Heights. 1,050 residential units (mix of detached and attached units)	Awaiting completion of environmental review.	2005–2010
North and west of the CSUMB campus	West and North University Village. Mix of commercial and residential use. 840 residential units and 1.5 million sf of commercial and nonresidential uses.	Selected development team	2006–2016
California Ave and Imjin Parkway	27-acre park with equestrian center and MARS.	In Fort Ord Reuse Plan. Awaiting initial submittals	Unknown
East of Second Ave (Del Monte Blvd) and south of Ninth Street	20-acre park with sports complex, MYSAC, etc	In Fort Ord Reuse Plan. Awaiting initial submittals	Unknown
199 Paddon Place	15-unit planned unit development	Awaiting submission for preliminary staff review	Unknown
Imjin Parkway	Imjin Parkway Police Substation	City's 2003–2004 Capital Improvement Program list	2005–2006
Throughout city	Street rehabilitation—resurfacing streets throughout city (specific streets not yet known)	City's 2005–2006 Capital Improvement Program list	2006–2007
Monterey[2]			
Throughout city	Annual street resurfacing program—each year during late summer and early fall, several streets are resurfaced. Specific streets that would be affected in future years are not yet known.	Ongoing	Annually, late summer to early fall
Sand City[3]			
Shasta Ave/Elder	Sand City Desalination Plant (300–400 AFA). Treatment facility located at Shasta Ave/Elder.	Obtaining permits.	2006-2007
Tioga Ave/California Ave	South of Tioga redevelopment project. Approximately 120,000 sf home improvement business	Application pending.	Unknown
Ortiz Ave near Hickory Street	Robinette mixed use project. 34 apartments over 2 stories (34,000 sf) of office/retail development	Completed planning review. Building plan review in progress	2006

Jurisdiction and Project Location (presented by City through which project study area extends, in alphabetical order)	**Planned Project**	**Project Status**	**Estimated Construction Timeframe**
Seaside[4]			
West of General Jim Moore Blvd. from Eucalyptus Road to Hilby Avenue	Cal-Am aboveground, temporary water line	Received encroachment agreement from City of Seaside; pending approval from Army	2006
General Jim Moore Blvd. from South Boundary Road to Gigling Road; Eucalyptus Road from General Jim Moore Blvd. to Parker Flats Cut-off	Road improvements and widening, including bike lanes and curbs and gutters	First phase, north of Eucalyptus Road, completed; other phases pending	2005-2008
Del Monte Blvd, between Contra Costa and La Salle Ave	Seaside Auto Center expansion: Create new circulation system with extension of Tioga into and through existing center to loop back to Del Monte Blvd; 3 new multistory garages	In design and project approval stage	2007-2008
Kenneth Ave (325 feet south of Wanda Ave) Noche Buena (325 feet south of Wanda Ave)	Butlong Development. Phase 1: 8 new single family residences Phase 2: demolition/reconstruction of neighborhood grocer, 2 new retail spaces, covered/uncovered parking, and 10 condominiums	Application submitted.	2006
Blackhorse and Bayonet Golf Courses	Seaside Resort. Mixed use project with 330 hotel rooms, 170 timeshare units, 125 single-family lots, reconstruction of golf clubhouse. Development of 84 acres within the existing 375-acre golf course area.	Application approved.	2006-2007
Broadway Avenue from Del Monte Blvd to General Jim Moore Blvd	Broadway Avenue street improvements, including undergrounding of existing utilities, street resurfacing, installation of various streetscape and landscape improvements.	In design stage.	2007
Multiple Jurisdictions			
General Jim Moore Blvd. corridor through Marina and Seaside[5]	MRWPCA/MCWD Regional Urban Water Augmentation Project recycled water delivery pipeline.	In design and project approval stage.	2007

Jurisdiction and Project Location (presented by City through which project study area extends, in alphabetical order)	**Planned Project**	**Project Status**	**Estimated Construction Timeframe**
General Jim Moore Blvd. corridor through Marina and Seaside and various locations on undeveloped lands of former Fort Ord	MRWPCA Groundwater Replenishment Project pipelines and recharge areas.	In feasibility stage.	2008

Note: This table includes a list of planned or reasonably foreseeable projects in Marina, Seaside, Sand City and Monterey that could be constructed during the same time frame (late 2006–late 2007) as the Proposed Project or within 1 year of the Proposed Project, and that have the potential to contribute to cumulative construction impacts (traffic, dust, noise). Some of these projects could also contribute to permanent operation impacts (energy use, traffic generation).

The City of Del Rey Oaks, situated between Seaside and Monterey, was also considered. The only foreseeable project (360-acre Fort Ord development) is too speculative at this point. Del Rey Oaks hopes to inherit 360 acres of former Fort Ord. If they receive the property and if they secure an adequate water source, they plan to develop the land with a 350–400 room hotel, 100 timeshare units, 40,000–50,000 sf office space, and an 18-hole golf course. (per a 9-15-03 telephone conversation with the City's redevelopment manager Dick Goblirsch).

Cal-Am's Coastal Water Project, which currently includes plans for aquifer storage and recovery facilities in the General Jim Moore Boulevard corridor, has not been considered in this analysis because the time period for construction is unknown at this time; delays in processing the project are currently affecting schedules.

Information Sources:

[1] City of Marina. Paterson pers. comm. Felton pers. com.

[2] City of Monterey. Deal pers. comm. Fell pers. comm. Reeves pers. comm.

[3] City of Sand City. Pooler pers. comm.

[4] City of Seaside. Ebbs pers. comm.

[5] Marina Coast Water District. Lucca pers. comm.

- Phase construction activities so NO_x and PM10 emissions remain below MPUAPCD thresholds. For medium and large projects (defined as projects that involve construction on a 1-acre site or larger because there is a reasonable likelihood it could contribute to exceeding the MBUAPCD NO_x and PM10 emissions thresholds) that will be constructed during the same timeframe, MPWMD and the agencies will develop a phased construction plan so the cumulative NO_x emissions remain below 137 pounds per day and the cumulative PM10 emissions remain below 82 pounds per day (or less than 2.2 acres per day is disturbed). The phased construction plan will identify planned construction activities and equipment, anticipated emissions, and a schedule that can be used to estimate daily emissions. The phased construction plan will be reviewed and approved by the MPUAPCD. It will likely be necessary for proponents of other projects to implement NO_x-reducing construction practices, as well as dust reduction measures, to ensure NO_x and PM10 emissions are at acceptable levels. The dust reduction measures should include all feasible measures contained in Table 8-2 of MBUAPCD's CEQA Air Quality Guidelines (Getchell pers. comm.), which include:
  - Limit grading to 8.1 acres per day, and grading and excavation to 2.2 acres per day.
  - Water graded / excavated areas at least twice daily. Frequency should be based on the type of operations, soil and wind exposure.
  - Prohibit all grading activities during periods of high wind (over 15 mph)
  - Apply chemical soil stabilizers on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days)
  - Apply non-toxic binders (e.g., latex acrylic copolymer) to exposed areas after cut and fill operations, and hydro-seed area.
  - Haul trucks shall maintain at least 2'0" of freeboard.
  - Cover all trucks hauling dirt, sand, or loose materials.
  - Plant tree windbreaks on the windward perimeter of construction projects if adjacent to open land.
  - Plant vegetative ground cover in disturbed areas as soon as possible.
  - Cover inactive storage piles.
  - Install wheel washers at the entrance to construction sites for all exiting trucks.
  - Pave all roads at construction sites.

Noise

Cumulative noise impacts include exposure of sensitive land uses to high levels of noise and vibration during construction. Noise generated by the Proposed Project during construction would exceed the 60-dB threshold and the vibration threshold (Table 10-9), but the noise would be reduced with implementation of mitigation measures NZ-1a: Limit Hours of Construction Activities, NZ-1b: Employ Noise-Control Construction Practices, and NZ-1c: Implement a Noise Control Plan.

The Proposed Project **could contribute considerably** to construction noise and vibration, affecting sensitive receptors when considered together with other projects that could be constructed in the same timeframe in the same area and affecting the same sensitive noise receptors. Road widening activities along General Jim Moore Boulevard in the vicinity of the Proposed Project would be of greatest concern.

- To minimize this cumulative effect, construction projects planned for the same timeframe will be phased, and noise reducing mitigation measures will be implemented for all the projects. With implementation of Mitigation Measure Cume-1, and a low likelihood that the ASR project would be constructed simultaneously with other large projects planned for the General Jim Moore Boulevard corridor, **the project would not result in a considerable contribution to cumulative noise impacts.**

Mitigation Measure Cume-1: Coordinate with Relevant Local Agencies to Develop and Implement a Phased Construction Plan to Reduce Cumulative Traffic, Air Quality, and Noise Impacts

This mitigation measure is described under Air Quality above.

Vegetation and Wildlife

Construction of the Proposed Project's well and associated pipelines could result in the loss or disturbance to special-status plant and wildlife species or their habitat. Other construction projects in the area, including widening of General Jim Moore Boulevard, constructing a temporary above-ground water line along the west side of General Jim Moore Boulevard, and construction of a recycled water delivery line along the same alignment, could also contribute to a cumulative loss of special-status plant and animal species. The species that are known to exist or may exist in the area are listed in Table 4-1. However, the effects of development on most special status species in the project area and in the corridor along General Jim Moore Boulevard have already been considered in development of the Fort Ord Multispecies Habitat Management Plan (HMP). These potential adverse effects would be mitigated as long as the habitat preservation elements of the HMP were adhered to by recipients of former Fort Ord land.

The Fort Ord HMP was developed prior to the listing of the California tiger salamander as threatened under the federal ESA, so does not contain mitigation for loss of salamander upland habitat (Collins pers. comm.). Undeveloped former Fort Ord lands do include breeding and upland habitat for the salamander, and several of the projects listed in Table 15-1 may affect upland habitat. However, because the Proposed Project well and pipeline construction do not affect breeding habitat or upland habitat within 2 kilometers of breeding sites, it will not contribute to a cumulative loss of salamanders or salamander habitat.

Given the above information, the Proposed Project's **potential impact is not a considerable contribution to an adverse cumulative impact on vegetation and wildlife.**

Mitigation: No mitigation is required.

Energy (Electricity)

There would be a cumulative energy effect from the Proposed Project because operation of the new ASR well would require 10,000 killowat hours of electricity daily. However, PG&E has an ample supply of electricity. The primary source is Duke Energy Moss Landing Plant, which generates more than 1,500 megawatts (mw), which is sufficient to serve the Monterey Peninsula region. **This impact is not considered a considerable contribution to an adverse cumulative impact**.

Mitigation: No mitigation is required.

Growth Inducement

A project is considered growth-inducing if it directly or indirectly fosters economic or population growth or the construction of additional housing, removes obstacles to population growth, or encourages other activities that cause significant environmental effects (State CEQA Guidelines Sec. 151262[d]).

The Proposed Project is a water supply project, but it is not creating a new source of water that could be considered growth-inducing. As described in Chapter 1, the purpose of the Proposed Project is to reduce the amount of water diverted from the Carmel River during summer by diverting, on average, a similar amount of water during the winter when flows are greater, and storing the water in a groundwater basin. This action would address some of the goals of the pending cease and desist order (WR 95-10) that the SWRCB has placed on Cal-Am by maintaining natural flows in the Carmel River during summer. It would also enable Cal-Am to maintain its existing system total production of 15,285 AFA without increasing water production, so they can continue to provide a reliable supply of water to the existing Monterey Peninsula customers.

The entire existing system production of 15,285 AFA, including the water that would be diverted and stored in an underground aquifer, is being used by existing customers and is not being reserved for proposed or future development. The ASR project would be designed and constructed to divert and store a maximum of 2,426 AFA. This would not result in changes in overall annual diversions from the Carmel River. No allocation of new water would result from the Proposed Project. Therefore, it is not creating a new source of water and is not removing an obstacle to population growth or fostering growth. The MPWMD would provide public oversight of the water generated by the proposed ASR project and would continue to oversee water withdrawn from the Carmel River.

Significant Irreversible Environmental Changes

Section 15126[f] of the State CEQA Guidelines requires EIRs to include a discussion of significant, irreversible environmental changes that would result from project implementation.

Implementation of the Proposed Project would result in the commitment of nonrenewable natural resources, such as concrete, aggregate, steel, and sand for construction of the well, pipelines and associated structures. A relatively small amount of petroleum products would be required for employee vehicles used to operate and maintain the new pumping facilities.

Operation and maintenance of the project would also require a further commitment of energy resources because a small amount of electricity would be required to operate the project facilities. The Warren-Alquist Act (in effect since January 7, 1975) states:

> The present rapid rate of growth in demand for electric energy is in part due to wasteful, uneconomic, inefficient, and unnecessary uses of power and a continuation of this trend will result in serious depletion or irreversible commitment of energy, land and water resources, and potential threats to the state's environmental quality. It is further the policy of the state and the intent of the California Legislature to employ a range of measures to reduce wasteful, uneconomical, and unnecessary uses of energy, thereby reducing the rate of growth of energy consumption, prudently conserve energy resources, and assure statewide environmental, public safety, and land use goals.

Because the ASR project would require a small amount of electricity and PG&E has been operating with 13–20% reserve, there is adequate system capacity to accommodate the ASR project without compromising service. (ISO 2003; Pate pers. comm.).

Alternatives

Introduction

This chapter provides a comparative evaluation of the potential environmental effects of the Proposed Project to the project alternatives. A description of each alternative evaluated in this chapter is included in Chapter 2, "Description of the Proposed Project and Alternatives." The alternatives are:

- Alternative 1: No Project,
- Alternative 2: Non-Contiguous New Injection/Extraction Well,
- Alternative 3: Local Desalination Plant,
- Alternative 4: Wastewater Reclamation,
- Alternative 5: Off-Stream Storage, and
- Alternative 6: Stormwater Reuse

The following text describes the differences in the construction-related and operation-related environmental effects expected under each alternative when compared to the Proposed Project. Tables 16-1 through 16-12 provide a summary comparison of these effects for each resource evaluated in this EIR/EA.

Alternatives Screening Process

An EIR must describe a range of alternatives to the Proposed Project that would feasibly attain the basic project objectives while avoiding or substantially lessening significant environmental effects of the project. Alternatives may be eliminated from detailed consideration in the EIR if they fail to meet the basic project objectives, are determined to be infeasible, or cannot be demonstrated to avoid or lessen significant environmental impacts.

The alternatives evaluated in this EIR/EA are the result of an evaluation process to identify alternatives that would meet the project objective of allowing for changes in water supply operations in the Carmel River and Seaside

Groundwater Basin that will benefit the natural resources of the Carmel River and the groundwater resources of the Seaside Groundwater Basin.

The alternatives screening process for this EIR/EA builds on the alternatives development and screening processes conducted for earlier projects, including the 1993 Monterey Peninsula Water Supply Project, the 1998 Supplemental EIR on Cal-Am's proposed Carmel River Dam Project and the 2003 Water Supply Project. The alternatives developed during this process included offstream storage, local and regional desalination projects, dams and reservoirs on the Carmel River, large- scale ASR, wastewater reclamation, and stormwater reuse.

Selecting the alternatives for evaluation in the EIR/EA was based on institutional feasibility, environmental impacts, and the ability to be placed in operation within a time period comparable to the Proposed Project. Alternatives dropped from consideration in this EIR/EA included a regional desalination plant, a new reservoir on the Carmel River, and a large-scale ASR.

The alternatives brought forward for evaluation in the EIR/EA range from an alternative location for the new Seaside Groundwater Basin injection/extraction well to collecting and storing stormwater for later reuse by individual households.

Alternative 1—No Action/No Project

Continuing the current diversions from the Carmel River groundwater basin would avoid all adverse effects associated with constructing and operating the Proposed Project. These include construction related effects on air quality, noise, vegetation, and wildlife. The No Project Alternative would leave Cal-Am's water supply management of the Carmel River and Seaside groundwater basin as it exists. No new ASR facilities would be constructed. MPWMD would continue to operate its ASR test well until the temporary authority to divert water from the Carmel River for testing was ended by the State Water Board. The extractions for the Carmel River groundwater basin would continue to adversely affect the surface and subsurface flow in the lower Carmel River and the water levels in the Seaside Groundwater Basin could continue to decline. However, as noted in the No Project/No Action discussion in Chapter 2, recent court action has established a Watermaster for the Seaside Groundwater Basin, and that new entity will be regulating extractions from the basin to comply with "operating yield" limits. These actions will likely positively affect future conditions in the basin.

Alternative 2—Non-Contiguous New Injection/Extraction Well

Alternative 2 includes constructing and operating a new ASR well (the Seaside well) similar to the Proposed Project, except that the new well would be located adjacent to Fitch Middle School on the west side of General Jim Moore

Boulevard (Figure 2-3). The well would be constructed to the same depth as the Santa Margarita well. In addition, a new pipeline approximately 500-feet long would be constructed to connect the well to the existing water distribution system. New onsite facilities would include a backflush percolation pit and an enclosure for electrical equipment, chemical equipment, and chemical storage. Production of potable water would be the same as the Proposed Project

Many of the effects of Alternative 2 would be the same or nearly the same as the Proposed Project because each is composed of the same primary elements (e.g., injection/extraction wells and pipelines) and would be operated in the same manner. Similar impacts include air emissions, seismic risk, exposure to hazardous materials, public services, and transportation and circulation. Operations would also be the same resulting in identical impacts on the aquatic resources found in and along the Carmel River.

Construction-related impacts with the potential to be greater than the Proposed Project include cultural resources, land use, and noise. These impacts, with the exception of cultural resources, are expected to be greater because of the proximity of the school to the site of the injection/extraction well and pipeline. Cultural resource impacts may be greater because more ground disturbing activity would occur with the resulting greater potential to unearth buried resources.

In summary, Alternative 2 would lessen the potential loss of special-status vegetation and wildlife on the former Fort Ord and change in the visual character of the well site. Some effects would be greater when compared to the Proposed Project as a result of the proximity of the public school to the well site. Impacts on the Carmel River aquatic resources would be the same.

Alternative 3—Local Desalination Plant

Alternative 3 would include construction and operation of a desalination plant located in Sand City. Seawater would be collected from wells drilled along the beaches in Seaside and Sand City and conveyed through underground pipes to the plant for treatment. Brine would be disposed through injection wells on former Fort Ord or through the Monterey Regional Water Pollution Control Agency outfall. Potable water would be distributed through the Cal-Am water supply system. The project would produce up to 8,400 AFA or 7.5 mgd.

Nearly all of the construction-related effects of Alternative 3 would be greater when compared to the Proposed Project because a much larger area would be disturbed and construction would last much longer. These impacts include air quality, noise, traffic and circulation, land use compatibility, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife. Construction-related impacts would be much greater because elements of the project would be constructed over a wider geographic area including the coastal zone, urban areas, and the portions of the former Fort Ord.

Operation of Alternative 3 is expected to benefit Carmel River aquatic resources, including steelhead and riparian vegetation, because the potable water produced by the desalination plant would result in reduced diversions from the Carmel River basin. The benefit to Carmel River aquatic resources would be greater than the Proposed Project because much less water would be diverted from the Carmel River basin. Other operation-related effects expected to occur under Alternative 3, including noise, release of hazardous materials, transportation, and energy use, would be greater than the Proposed Project because facilities would be larger.

In summary, constructing and operating a local desalination project would result in greater construction- and operation-related impacts than the Proposed Project. These impacts are expected to be greater because size and location of desalination plant, wells, and pipelines. Conversely, the benefits to the Carmel River aquatic resources are expected to be much greater compared to the Proposed Project because the amount of water diverted from the Carmel River would be substantially reduced.

Alternative 4—Wastewater Reclamation

Alternative 4 includes three elements:

(1) Monterey Regional Water Pollution Control Agency/Marina Coast Water District regional urban water augmentation project – This project would produce up to 3,000 AFA by expanding MCWD's existing desalination plant and recycling treated wastewater. Expanding MCWD's existing desalination plant would produce approximately 1,500 AFA of potable water. Recycling treated wastewater for landscape irrigation would produce approximately 1,500 AFA.

(2) Monterey Regional Water Pollution Control Agency groundwater replenishment project – The project would deliver recycled water to the Seaside groundwater basin for recharge and would increase the amount of water available from the basin for pumping. Water injected or percolated into the groundwater basin would be purified by the use of an advanced wastewater treatment plant. The project would produce up to 4,000 AFA.

(3) Carmel Area Wastewater District/Pebble Beach Community Services District reclaimed wastewater system extension – This project would offset the use of potable water currently used to irrigate a golf course and cemetery in Pacific Grove by applying reclaimed wastewater. The project would require the construction of a 15,000-foot pipeline. The project would produce approximately 95 AFA.

Assuming the groundwater replenishment project or reclaimed wastewater system is extended, nearly all of the construction-related effects of Alternative 4 would be greater when compared to the Proposed Project because a much larger area would be disturbed and construction is expected to last over a longer period. These adverse impacts include air quality, noise, traffic and circulation, land use compatibility, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife.

Operating Alternative 4 is expected to benefit Carmel River aquatic resources, including steelhead and riparian vegetation, because water normally diverted from the Carmel River would be offset with reclaimed water. Production could range from a low of 95 AFA if only one reclamation project is implemented (e.g., reclaimed wastewater pipeline extension) up to approximately 4,345 AFA if the three potential projects are combined. When combined, the reclamation projects could benefit Carmel River aquatic resources to a greater degree than the Proposed Project. Other operation-related effects expected to occur under Alternative 3, including noise, release of hazardous materials, and energy use would be greater than the Proposed Project.

In summary, the three wastewater reclamation projects would result in greater construction- and operation-related impacts than the Proposed Project. These impacts are expected to be greater because size and location of facilities including pipelines and an advanced treatment plant. Conversely, if the three wastewater reclamation projects are combined, the benefits to the Carmel River aquatic species and habitat are expected to be greater compared to the Proposed Project because water diverted from the Carmel River could be substantially reduced.

Alternative 5—Off-stream Storage

Off-stream storage involves capturing and storing excess winter flows from the Carmel River. Water would be either stored in surface reservoirs or in groundwater basins. Potential off-stream surface water storage sites include Chupines Creek, Cachagua Creek, San Clemente Creek and on the former For Ord. The potential groundwater storage site is the Tularcitos aquifer in the Carmel River watershed. Both off-stream storage surface reservoirs and groundwater basins would require new pipelines and pumps. The water yield from off-stream storage is estimated to range from 400 to 1,000 AFA.

Most of the construction-related effects of Alternative 5 would be greater when compared to the Proposed Project because a larger area would be disturbed during construction of the storage facilities, pipelines, and pumps. These impacts include air quality, noise, traffic and circulation, cultural resources, soils, hazardous materials, public services, visual resources, vegetation, and wildlife.

Operation of Alternative 5 would affect Carmel River aquatic resources, including steelhead and riparian vegetation, in a fashion similar to the effects described for the Proposed Project. Alternative 5 would change the timing in which water is diverted from the river. Benefits to aquatic resources may be less than the Proposed Project because only 400 to 1,000 AFA would be diverted during high flow periods. Other operation-related effects expected to occur under Alternative 5, including damage to cultural resources, noise, release of hazardous materials, transportation, and energy use would be greater than the Proposed Project.

In summary, constructing and operating an off-stream storage project would result in construction- and operation-related impacts expected to be greater than the Proposed Project. These impacts are expected to be greater because more ground disturbing activities would occur and more land surface would be converted as a result of inundation caused by the storage reservoir(s). The benefits to the Carmel River aquatic species and habitat would be less compared to the Proposed Project because less water would be diverted from the river during high flows and made available during dry periods.

Alternative 6 - Stormwater Reuse

Stormwater reuse is the collection, storage, and later use of water collected during storm events. Alternative 6 assumes stormwater would be collected in cisterns at individual residences. Water stored in cisterns would off set potable water used for irrigation. Use of cisterns is estimated to yield approximately 10 to 120 AFA.

All of the construction-related effects of the Proposed Project would be avoided or reduced under Alternative 6. These impacts would be avoided because the stormwater storage and distributing systems would be located adjacent to existing structures and would utilize roofs or other surfaces already constructed as a means to collect water. Construction of the storage systems would be of short-duration and is not expected to adversely affect native vegetation or wildlife and would avoid affects on special-status species.

Operation of Alternative 6 would benefit Carmel River aquatic resources, because water collected and reused would offset diversions made from the Carmel River. However, these benefits would be small because when combined, the systems are only expected to provide from 10 to 120 AFA. Operating the reuse systems is not expected to result in measurable adverse impacts because they would be passive systems requiring little maintenance or use of power.

In summary, constructing and operating stormwater reuse systems would result in construction- and operation-related impacts that are less when compared to the Proposed Project. These impacts are expected to be less because the systems minimize ground disturbance and use of power to operate. Conversely, the benefits to the Carmel River aquatic species and habitat would be less compared to the Proposed Project because the offset of water diverted from the river would be less.

Table 16-1. Comparison of Air Quality Impacts

Proposed Project	Alternatives					
	Alternative 1 - No Action	Alternative 2—Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
AQ-1, AQ-2, AQ-3. PM10 emissions of 8.8 lbs/day generated during construction of well, pipeline, and buildings would not exceed the MPUAPCD threshold of 82 lbs/day. **Impact: LTS**	No construction-related effects. **Impact: < PP**	PM10 emissions are expected to be nearly the same as the Proposed Project. **Impact: = PP**	PM10 emissions (approximately 22 lbs/day) are expected to be greater than the Proposed Project because of the greater amount of land disturbing activity required to construct the seawater collection wells, brine disposal wells, desalination plant, and pipelines. **Impact: > PP**	PM10 emissions are expected to be greater than the Proposed Project because of the greater amount of land disturbing activity required to construct a desalination plant and advanced wastewater treatment plant and injection wells or recharge basin. **Impact: > PP**	PM10 emissions are expected to be greater than the Proposed Project because of the greater amount of land disturbing activity required to construct offstream storage reservoir(s), pipelines, and injection and extraction wells. **Impact: > PP**	PM 10 emissions expected to be less than the Proposed Project because land disturbance would be localized and would occur over a longer period. **Impact: < PP**
AQ-4. Exposure of sensitive receptors to elevated health risks from exposure to diesel particulate matter **Impact: LTS**	No construction-related effects. **Impact: < PP**	Exposure of sensitive receptors is expected to be nearly the same as the Proposed Project. **Impact: = PP**	Exposure of sensitive receptors to diesel particulate matter would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors to diesel particulate matter would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors to diesel particulate matter would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors to diesel particulate matter expected to be less than the Proposed Project because land disturbance would be localized and would occur over a longer period. **Impact: <PP**

Proposed Project	Alternatives					
	Alternative 1 - No Action	Alternative 2—Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
AQ-5. Exposure of sensitive receptors to elevated risks from exposure to arcolein. **Impact: S**	No construction related effects. **Impact: <PP**	Exposure of sensitive receptors is to arcolein is expected to be nearly the same as the Proposed Project. **Impact: = PP**	Exposure of sensitive receptors to aroclein would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors to aroclein would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors to aroclein would be greater because construction would last longer and cover a greater area. **Impact: >PP**	Exposure of sensitive receptors aroclein is expected to be less than the Proposed Project because land disturbance would be localized and would occur over a longer period. **Impact: <PP**

Notes:

<: Impact less adverse than Proposed Project (indicates less beneficial when used to compare to a Beneficial effect)
=: Impact the same as Proposed Project
>: Impact more adverse than the Proposed Project (indicates more beneficial when used to compare to a Beneficial effect)

PP: Proposed Project
S: Significant Impact (Prior to mitigation)
LTS: Less than Significant Impact (Prior to mitigation)
B: Beneficial effect

Table 16-2. Comparison of Vegetation and Wildlife Impacts

Proposed Project	Alternatives					
	Alternative – 1 No Action	Alternative 2 – Non Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
BIO-1. Loss of maritime chaparral **Impact: LTS**	No direct loss of special-status plant species because no construction activities would occur. **Impact: < PP**	Loss of maritime chaparral would be avoided because injection/extraction well would be constructed in a previously disturbed area. **Impact: < PP**	Desalination plant facilities would not be located within areas supporting maritime chaparral vegetation. **Impact: <PP**	The exact location of improvements required for Alternative 4 is not known, however facilities may be located in maritime chaparral habitat. **Impact: >PP**	The exact location of improvements required for Alternative 4 is not know, however facilities may be located in maritime chaparral habitat. **Impact: >PP**	Stomwater collection and distribution systems would be located on and immediately adjacent to private residences and are not expected to adversely affect maritime chaparral habitat. **Impact: <PP**
BIO-2. Disturbance to the Fort Ord Natural Resource Management Area **Impact: LTS**	No disturbance to the Fort Ord NRMA would occur because no new facilities would be constructed **Impact: <PP**	Disturbance to the Fort Ord NRMA would be avoided because facilities would not be constructed on the former Fort Ord. **Impact: <PP**	Desalination plant facilities would not be located within the Ford Ord NRMA. **Impact: <PP**	The exact location of improvements required for Alternative 4 is not know, however facilities may be constructed within the former Fort Ord NRMA, causing disturbance to natural resources **Impact: >PP**	Offstream storage facilities would not be constructed on the former Fort Ord and would not result in disturbance to the NRMA. **Impact: <PP**	Stomwater collection and distribution systems would be located on and immediately adjacent to private residences. **Impact: <PP**

	Alternatives					
Proposed Project	Alternative – 1 No Action	Alternative 2 – Non Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5— Offstream Storage	Alternative 6— Stormwater Reuse
BIO-3. Direct loss of individuals and loss of habitat for special-status vegetation (Monterey spineflower, Sandmat manzanita, Eastwood's goldenbush, and Kellogg's horkelia) **Impact: LTS**	No direct loss of special-status vegetation species because no construction activities would occur. **Impact < PP**	Direct loss of special-status vegetation would most likely be less than the Proposed Project because most construction would occur within a previously developed area. **Impact < PP**	Direct loss of special-status vegetation (Monterey spineflower and sand gilia) would most likely be greater than the proposed project because more ground disturbing activities resulting from construction of seawater collection and brine disposal wells and pipelines on the former Fort Ord would occur. **Impact: >PP**	Although the exact location of improvements required for Alternative 4 is not known, facilities may be constructed over a much wider geographic area that may result in the direct loss of additional special-status vegetation. **Impact: >PP**	Although the exact location of improvements required for Alternative 5 is not known, offstream storage and pumping facilities may be constructed over a much wider geographic area that may result in the direct loss of additional special-status vegetation. **Impact >PP**	Stormwater storage and distribution systems are not expected to result in the direct loss of special status vegetation because each would be constructed adjacent to existing residences and would not result in extensive ground disturbing activities. **Impact: > PP**
BIO-4 through BIO-7. -Potential direct mortality or loss of special status wildlife and habitat (California horned lizard [**LTS**], black legless lizard [**S**], Monterey dusky footed woodrat [**S**] and American badger [**LTS**]). **Impact: LTS & S**	No potential for direct impacts on special status wildlife and habitat because no ground disturbing activities would occur. **Impact < PP**	Direct mortality or disturbance to, or loss of, California horned lizard, black legless lizard, duskyfooted woodrat and American badger or habitat would be less than the Proposed Project because less ground disturbing activities would occur in potential habitat **Impact: < PP**	Direct mortality or loss of special status wildlife and habitat (California horned lizard, Smith's blue butterfly, black legless lizard, California horned lark, and western snowy plover) would be greater than the Proposed Project because more ground disturbing activities would occur in potential habitat. **Impact: >PP**	Direct mortality or loss of special status species is expected to be greater than the Proposed Project because more ground disturbing activities would occur in potential habitat. **Impact: >PP**	Direct mortality or disturbance to, or loss of, California horned lizards or habitat would be greater than the Proposed Project because more ground disturbing activities would occur in potential habitat **Impact: >PP**	Direct mortality or disturbance to, or loss of, special status species or habitat would much less than the Proposed Project because ground disturbing activities would most likely not occur in potential habitat. **Impact: <PP**

Proposed Project	Alternatives					
	Alternative – 1 No Action	Alternative 2 – Non Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
BIO-8. Loss of next trees and disturbance or mortality of migratory birds. **Impact: LTS**	No potential for direct impacts on migratory birds because no ground disturbing activities would occur. **Impact < PP**	Potential loss of trees and disturbance or mortality of migratory birds would be less than the Proposed Project because less ground disturbing activities would occur in potential habitat. **Impact: < PP**	Potential loss of trees and disturbance or mortality of migratory birds would be greater than the Proposed Project because more ground disturbing activities would occur in potential habitat. **Impact: >PP**	Potential loss of trees and disturbance or mortality of migratory birds would be greater than the Proposed Project because more ground disturbing activities could occur in potential habitat. **Impact: >PP**	Potential loss of trees and disturbance or mortality of migratory birds would be greater than the Proposed Project because more ground disturbing activities could occur in potential habitat. **Impact: >PP**	Potential loss of trees and disturbance or mortality of migratory birds would be much less than the Proposed Project because ground disturbing activities would most likely not occur in potential habitat. **Impact: <PP**

Notes:

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Table 16-3. Comparison of Aquatic Resources Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Operation						
AR-1. Change in Carmel River flows for adult steelhead upstream migration. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on Carmel River steelhead upstream migration would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on steelhead upstream migration would be greater because much less water (8,400 AFA) would be diverted from the Carmel River compared to the Proposed Project. **Impact >PP**	Beneficial impacts on steelhead upstream migration would possibly be greater if all water produced by Alternative 4 (estimated to total 4,200 AFA) would replace water previously diverted from the Carmel River. **Impact >PP**	Beneficial impacts on steelhead upstream migration would be less because Alternative 5 would divert and store for later use only up to 1,000 AFA from the Carmel River during high flow periods. **Impact < PP**	Beneficial impacts on steelhead upstream migration would be less because total water produced by Alternative 6 (60 to 120 AFA) would not result in substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**
AR-2. Change in Carmel River juvenile steelhead rearing habitat. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on Carmel River juvenile steelhead rearing habitat upstream migration would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on Carmel River juvenile steelhead rearing habitat would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on Carmel River juvenile steelhead rearing habitat would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on Carmel River juvenile steelhead rearing habitat would be less because Alternative 5 would divert and store only up to 1,000 AFA from the Carmel River during high flow periods. **Impact < PP**	Beneficial impacts on Carmel River juvenile steelhead rearing habitat would be less than the Proposed Project because Alternative 6 would not result in a substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
AR-3. Change in Carmel River flows for steelhead fall/winter downstream migration. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on Carmel River steelhead fall/winter downstream migration would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on Carmel River steelhead fall/winter downstream migration would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on Carmel River steelhead fall/winter downstream migration would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on steelhead fall/winter downstream migration would be less because Alternative 5 would divert and store for later use only up to 1,000 AFA during high flow periods from the Carmel River. **Impact < PP**	Beneficial impacts on steelhead fall/winter downstream migration would be less because total water produced by Alternative 6 (60 to 120 AFA) would not result in substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**
AR-4. Change in Carmel River flows for steelhead spring emigration. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on Carmel River steelhead spring emigration would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on Carmel River steelhead spring emigration would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on Carmel River steelhead spring emigration would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on Carmel River spring emigration would be less because Alternative 5 would divert and store for later use only up to 1,000 AFA during high flow periods from the Carmel River. **Impact < PP**	Beneficial impacts on Carmel River spring emigration would be less because total water produced by Alternative 6 (60 to 120 AFA) would not result in substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
AR-5. Changes in California red-legged frog habitat due to changes in Carmel River flows. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on California red-legged frog habitat due to changes river flows would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on California red-legged frog habitat would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Beneficial impacts on California red-legged frog habitat would be greater because much less water would be diverted from the river compared to the Proposed Project. **Impact >PP**	Alternative 5 would have minimal or no beneficial effects on California red-legged frog habitat, as it would have minimal effect on Carmel River flows. In addition, inundation of sections of Chupines, Cachagua and San Clemente Creeks could significantly affect frog populations. **Impact < PP**	Beneficial impacts on California red-legged frog habitat would be less because total water produced by Alternative 6 (60 to 120 AFA) would not result in substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**
AR-6. Change in habitat of other aquatic species due to changes in Carmel River flows. **Impact: B**	No change in diversion from the Carmel River would occur. **Impact < PP**	Beneficial impacts on other aquatic species due to changes in Carmel River flows would be the same as the Proposed Project because operations would be the same. **Impact = PP**	Beneficial impacts on habitat of other aquatic species would be greater because all water produced by Alternative 3 (8,400 AFA) would replace water previously diverted from the Carmel River. **Impact >PP**	Beneficial impacts on habitat of other aquatic species would be greater if all water produced by Alternative 4 (estimated to total 4,200 AFA) would replace water previously diverted from the Carmel River. **Impact >PP**	Beneficial impacts on habitat of other aquatic species would be less because Alternative 5 would divert and store for later use only up to 1,000 AFA during high flow periods from the Carmel River. Adverse effects would occur on tributary streams. **Impact < PP**	Beneficial impacts on habitat of other aquatic species would be less because total water produced by Alternative 6 (60 to 120 AFA) would not result in substantial reduction in the amount of water diverted from the Carmel River. **Impact < PP**

Table 16-3. Continued

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Table 16-4. Comparison of Cultural Resource Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
CR-1. Potential to unearth buried cultural deposits and human remains during construction of injection/extraction well and pipeline. **Impact: S**	No construction-related effects on cultural resources because no ground-disturbing activities would occur. **Impact < PP**	Slightly greater potential to unearth buried cultural deposits during construction because a greater amount of land would be disturbed as a result of constructing the pipeline. **Impact > PP**	The potential to unearth buried cultural deposits and human remains would be greater compared to the Proposed Project because more ground - disturbing activities would occur. **Impact: > PP**	The potential to unearth buried cultural deposits and human remains would be greater compared to the Proposed Project because more ground -disturbing activities would occur. **Impact: > PP**	The potential to unearth buried cultural deposits and human remains would be greater compared to the Proposed Project because more ground - disturbing activities would occur. **Impact: > PP**	The potential to unearth buried cultural deposits and human remains would be less compared to the Proposed Project because less ground - disturbing activities would occur. **Impact: < PP**

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Table 16-5. Comparison of Geology, Soils, and Seismicity Impacts

Proposed Project	Alternatives					
	Alterative 1— No Action	Alternative 2—Non-Contiguous New Injection/Extraction Well	Alternative 3— Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5 —Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
GS-1. Short-term increase in erosion resulting from project construction **Impact: LTS**	No short-term increase in erosion because no ground-disturbing activities would occur. **Impact < PP**	Short-term increase in erosion resulting from project construction would be nearly the same as the Proposed Project because the facilities constructed would also be nearly the same. **Impact = PP**	Short term increase in erosion would be greater than the Proposed Project because a much larger area would be disturbed as a result of constructing wells, pipelines, and desalination plant. **Impact > PP**	Short term increase in erosion would be greater than the Proposed Project because a much larger area would be disturbed. **Impact: > PP**	Short term increase in erosion would be greater than the Proposed Project because a much larger area would be disturbed. **Impact: > PP**	Installing the stormwater collection and storage systems is not expected to result in any appreciable increase in erosion because land disturbance would be very minimal**.** **Impact: < PP**
Operation						
GS-2, GS-3, GS-4. Potential for failure of structures as a result of fault displacement, ground shaking, liquefaction, and expansive soils and resulting threat to public safety. **Impact: = LTS**	No new facilities would be constructed. **Impact <PP**	Potential for failure of structures as a result of fault displacement, ground shaking, liquefaction, and expansive soils and resulting threat to public safety would be the same as the Proposed Project **Impact =PP**	Potential for failure of structures as a result of fault displacement, ground shaking, liquefaction, and expansive soils and resulting threat to public safety would be greater than the Proposed Project because more structures would be constructed over a wider urban area. **Impact >PP**	Potential for failure of structures as a result of fault displacement, ground shaking, liquefaction, and expansive soils and resulting threat to public safety would be greater than the Proposed Project because more structures would be constructed and operated. **Impact >PP**	Potential for failure of structures as a result of fault displacement, ground shaking, liquefaction, and expansive soils and resulting threat to public safety would be greater than the Proposed Project because more structures would be constructed and operated. **Impact > PP**	The stormwater collection and storage systems would not threaten public safety in the event of fault displacement, shaking or liquefaction. **Impact < PP**

Table 16-5. Continued

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Table 16-6. Comparison of Hydrology and Water Quality Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
GWH-2, GWH-3. Short-term change in groundwater quality and quantity during drilling of injection/extraction wells. **Impact: LTS**	No construction-related changes in groundwater quality because no new injection/extraction wells would be constructed. **Impact: <PP**	Short-term change in groundwater quality during drilling of injection/extraction wells would be the same as the Proposed Project. **Impact: = PP**	No short-term change in Seaside Groundwater Basin water quality would occur because no injection/extraction wells would be constructed. **Impact: < PP**	Short-term change in groundwater quality during drilling of injection/extraction wells could be greater than the Proposed Project because more than one injection/extraction well would be drilled. **Impact: > PP**	No short-term change in Seaside Groundwater Basin water quality because no wells would be drilled in that basin. However, short-term impacts on the water quality of the Tularcitos Aquifer could occur because injection/extraction wells would be constructed. **Impact: > PP**	No short-term change in Seaside Groundwater Basin water quality would occur because no injection/extraction wells would be constructed. **Impact: <PP**
Operation						
GWH-1. Increase in Seaside Groundwater Basin storage. **Impact: B**	The imbalance in the Seaside Groundwater Basin water budget is expected to continue. **Impact < PP**	Any change in the Seaside Groundwater Basin occurring as a result of the Proposed Project would also occur under Alternative 2 because the amount of water injected and extracted would be the same. **Impact = PP**	Operating Alternative 3 is not expected to benefit the Seaside Groundwater Basin water budget because no water would be injected into the Basin. **Impact: < PP**	Operating Alternative 4 may result in greater benefits to the Seaside Groundwater Basin water budget because the amount of water injected would be greater than estimated for the Proposed Project. **Impact: >PP**	Operating Alternative 5 would not result in a direct effect on storage in the Seaside Groundwater Basin. **Impact: < PP**	Operating Alternative 6 would not result in a direct effect on storage in the Seaside Groundwater Basin. **Impact: < PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
GWH-3. Long-term change in Seaside Groundwater Basin water levels. **Impact: B**	No increase in the long-term water levels of the Seaside Groundwater Basin is expected because no change in the amount of water injected would occur. **Impact < PP**	Any change in the Seaside Groundwater Basin water levels occurring as a result of the Proposed Project would also occur under Alternative 2 because the amount of water injected and extracted would be the same. **Impact = PP**	Operating Alternative 3 is not expected to change Seaside Groundwater Basin water levels because no water would be injected into the Basin . **Impact: < PP**	Operating Alternative 4 may result in greater benefits to the Seaside Groundwater Basin water levels because the amount of water injected or percolated would be greater than estimated for the Proposed Project. **Impact: >PP**	Operating Alternative 5 would not result in a direct effect on storage in the Seaside Groundwater Basin. **Impact: < PP**	Operating Alternative 6 would not result in a direct effect on storage in the Seaside Groundwater Basin. **Impact: < PP**
GWH-4. Potential for change in groundwater levels in the Paso Robles aquifer. **Impact: LTS**	No secondary change to the groundwater level in the Paso Robles aquifer is expected because no change in the amount of water injected or extracted from the Santa Margarita aquifer would occur. **Impact < PP**	Change in the groundwater levels in the Paso Robles aquifer as a result of the Proposed Project would be the same under Alternative 2 because operations would be identical. **Impact = PP**	Operating Alternative 3 is not expected to change Paso Robles aquifer levels because no water would be injected into the Seaside Groundwater Basin. **Impact > PP**	Change in the groundwater levels in the Paso Robles aquifer could be greater when compared to the Proposed Project because more water could be injected into the Santa Margarita aquifer. **Impact > PP**	Operating Alternative 5 would not result in a direct effect on storage in the Seaside Groundwater Basin or associated changes to the groundwater levels in the Paso Robles aquifer. **Impact: < PP**	Operating Alternative 6 would not result in a direct effect on storage in the Seaside Groundwater Basin or associated changes in the groundwater levels in the Paso Robles aquifer. **Impact: < PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
GWH-5. Potential for hydrofracturing Santa Margarita Sandstone when injecting water. **Impact: LTS**	No new injection/extraction activities would occur and the potential for hydrofracturing the Santa Margarita Sandstone would not change. **Impact < PP**	Potential for hydrofracturing Santa Margarita Sandstone when injecting water would be the same as the Proposed Project because operations would be identical. **Impact = PP**	There would be no potential for hydrofracturing Santa Margarita Sandstone because no water would be injected. **Impact < PP**	Potential for hydrofracturing Santa Margarita Sandstone when injecting water could be greater than the Proposed Project because more water would be injected. **Impact > PP**	Operating Alternative 5 would not increase the potential for hydrofracturing Santa Margarita Sandstone because no change in the amount of water injected to the Seaside Groundwater Basin would occur. **Impact: < PP**	Operating Alternative 6 would not increase the potential for hydrofracturing Santa Margarita Sandstone because no change in the amount of water injected to the Seaside Groundwater Basin would occur. **Impact: < PP**
GWH-7, GWH-8, GWH-9. Long-term change in the quality of Seaside Groundwater Basin stored or recovered water. **Impact: LTS**	No long-term change in the quality of Seaside Groundwater Basin water because the amount of water injected and extracted would not change. **Impact < PP**	Long-term change in the quality of Seaside Groundwater Basin water would be the same as the Proposed Project because the amount of water injected and extracted would be the same. **Impact: <PP**	No long-term change in the quality of Seaside Groundwater Basin water because no water would be injected and extracted. **Impact: <PP**	Long-term change in the quality of Seaside Groundwater Basin water could be greater when compared to the Proposed Project because more water would be injected and extracted. **Impact: >PP**	Operating Alternative 5 would not affect the quality of water within the Seaside Groundwater Basin because no change in the amount of water injected or extracted would occur. However, long-term change to the quality of impacts on the water quality of the Tularcitos Aquifer could occur because injection/extraction wells would be constructed. **Impact: < PP**	Alternative 6 would not affect the quality of the water within the Seaside Groundwater Basin because no change in the amount of water injected or extracted would occur. **Impact: < PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
GWH-10. Effects on other Seaside Groundwater Basin users. **Impact: B**	No beneficial effects would occur for other Seaside Groundwater Basin users. **Impact: < PP**	The effects on other users would be the same for this alternative because the same amount of water would be injected and extracted. **Impact: = PP**	No beneficial effects would occur for other Seaside Groundwater Basin users. **Impact: < PP**	Alternative 4 would add more water to the Seaside Groundwater Basin than would the Proposed Project, increasing the benefit to other Basin users. **Impact: >PP**	No beneficial effects would occur for other Seaside Groundwater Basin users. **Impact: < PP**	No beneficial effects would occur for other Seaside Groundwater Basin users. **Impact: < PP**
GWH-11, GWH-13. Change in Carmel River flows during high and low flow periods. **Impact: LTS**	No change in Carmel River flows during low- or high-flow periods because no change in diversions would occur. **Impact: < PP**	Changes in Carmel River flows would be the same and the Proposed Project changes in pumping would be the same. **Impact: = PP**	Increases in Carmel River flows would be greater compared to the Proposed Project because diversion would be substantially reduced. **Impact: <PP**	Increases in Carmel River flows would be greater compared to the Proposed Project because diversion could be substantially reduced. **Impact: <PP**	Changes in Carmel River flows could be less when compared to the Proposed Project because less water would be diverted during the high flow periods. **Impact: <PP**	Increases in Carmel River flows would be greater compared to the Proposed Project because diversion could be slightly reduced. **Impact: <PP**
GWH-12, GWH-14. Change in Carmel Valley alluvial aquifer storage. **Impact: B**	No change in Carmel Valley alluvial aquifer storage because no change in diversions would occur. **Impact < PP**	Change in the amount of water stored in the Carmel Valley alluvial aquifer would be the same as the Proposed Project because the amount and timing of water diverted from the river would be same. **Impact: = PP**	Increases in Carmel Valley alluvial aquifer storage expected to be greater than the Proposed Project because the amount of water diverted from the Carmel River would be substantially less. **Impact: >PP**	Increases in Carmel Valley alluvial aquifer storage expected to be greater than the Proposed Project because the amount of water diverted from the Carmel River would be substantially less. **Impact: >PP**	Increases in Carmel Valley alluvial aquifer storage expected to be greater than the Proposed Project because the amount of water diverted from the Carmel River would be substantially less. **Impact: >PP**	Increases in Carmel Valley alluvial aquifer storage expected to be less than estimated for the Proposed Project because diversion from the Carmel River would be reduced. **Impact: <PP**

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Table 16-7. Comparison of Land Use Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stomwater Reuse
Construction						
LU-1, LU-2. Disruption of existing land uses during construction. **Impact: LTS**	No construction-related activities would occur under this alternative. **Impact < PP**	Disruption of existing land uses would be greater compared to the Proposed Project because the well site is located adjacent to a public school **Impact > PP**	The potential to adversely affect existing land uses is greater under Alternative 3 because construction would occur over a much wider urban area geographic area. **Impact: > PP**	The potential to adversely affect existing land uses is greater under Alternative 4 because more ground disturbing activities would occur. **Impact: > PP**	The potential to adversely affect existing land uses is greater under Alternative 5 because more ground disturbing activities would occur. **Impact: > PP**	Installing small stormwater collection and storage systems is not expected to adversely affect existing land uses because construction would be localized and would be of short duration. **Impact: <PP**
Operation						
LU-3, LU-4. Incompatibility of facilities with adjacent land uses and zoning designations. **Impact: LTS**	No new facilities would be constructed. **Impact < PP**	Locating the well adjacent to a public school would be less compatible with designated land uses compared to the Proposed Project **Impact > PP**	The potential for incompatibility of project facilities with designated land uses may be greater compared to the Proposed Project because would be spread over a wider urban area. **Impact > PP**	The potential for the incompatibility of project facilities with designated land use may be greater compared to the Proposed Project because Alternative 4 would cover a wider geographic area. **Impact > PP**	The potential for the incompatibility of project facilities with designated land use may be greater compared to the Proposed Project because Alternative 4 would cover a wider geographic area. **Impact > PP**	The stormwater collection and storage systems would be a passive systems and are not expected to conflict with onsite or adjacent land uses. **Impact: <PP**

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Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
NZ-1. Exposure of sensitive land uses to noise during construction of the injection well, pipeline and facilities. **Impact: S**	No construction-related activities would occur under this alternative. **Impact < PP**	Noise impacts would be greater than the Proposed Project because the injection/extraction will would be constructed adjacent to a school. **Impact: > PP**	The potential to adversely affect noise-sensitive land uses is greater because construction activities would occur over a much wider urban area. **Impact: > PP**	The potential to adversely affect noise-sensitive land uses is greater during construction because of the greater amount of land disturbing activities and longer construction duration **Impact: > PP**	The potential to adversely affect noise-sensitive land uses is greater during construction because of the greater amount of land disturbing activities and longer construction duration **Impact: > PP**	Installing stormwater collection and storage systems would be short term and would not require the use of heavy equipment that generate high levels of noise **Impact: <PP**
NZ-2. Exposure of sensitive land uses to construction-related vibration **Impact: S**	No construction-related activities would occur under this alternative. **Impact < PP**	Vibration impacts would be greater than the Proposed Project because the injection/extraction will would be constructed adjacent to a school. **Impact: > PP**	Vibration impacts would be greater than the Proposed Project because construction activities would occur over a much wider urban area. **Impact: > PP**	Vibration impacts would be greater than the Proposed Project because of the greater amount of land disturbing activities and longer construction duration **Impact: > PP**	Vibration impacts would be greater than the Proposed Project because of the greater amount of land disturbing activities and longer construction duration **Impact: > PP**	Installing stormwater collection and storage systems would be short term and would not require the use of heavy equipment that generate measurable vibration. **Impact: <PP**

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Operation						
NZ-3. Generation of noise exceeding local standards when operating the injection/extraction well. **Impact: S**	No facilities would be constructed. **Impact < PP**	Generation of noise exceeding local standards would be the same as the Proposed Project because the same type of facilities would be operated. **Impact = PP**	Generation of noise exceeding local standards is expected to be greater than the Proposed Project because more facilities that generate noise (seawater wells, brine disposal well, and RO pumps) would be operated compared to the Proposed Project. **Impact > PP**	Generation of noise exceeding local standards is expected to be greater than the Proposed Project because more facilities that generate noise (AWT and injection wells) would be operated **Impact > PP**	Generation of noise exceeding local standards is expected to be greater than the Proposed Project because more facilities that generate noise (pumps and injection/extraction wells) would be operated. **Impact > PP**	The stormwater collection and storage system is a passive system that would not generate high levels of noise when collecting or discharging water. **Impact: < PP**

Notes:

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Table 16-9. Comparison of Hazardous Materials Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/ Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 5—Stormwater Reuse
Construction						
HAZ-1. Exposure of construction workers and public to hazardous materials during construction of pipeline and injection/extraction well **Impact: S**	No construction-related activities would occur under this alternative. **Impact < PP**	The potential to expose construction works and public to hazardous materials during construction would be similar to the Proposed Project **Impact = PP**	The potential for exposure of workers and public to hazardous materials would be slightly greater under Alternative 3 because of the greater geographic extent of the project and because an elements of this alternative (brine disposal wells and pipelines) may be located on Fort Ord. **Impact: > PP**	The potential for exposure of construction workers and public to hazardous materials would greater than the Proposed Project because constructing the AWT and injection wells would require a greater land disturbing activities compared to the Proposed Project **Impact: > PP**	The potential for exposure of construction workers and public to hazardous materials would greater than the Proposed Project because constructing offstream storage facilities would require more land disturbing activities compared to the Proposed Project. **Impact: > PP**	The potential for exposure of construction workers to hazardous materials would be less than the Proposed Project because ground disturbing activities would be limited to installing small water collection and storage systems. **Impact: <PP**
HAZ-2, HAZ-4. Handling and use of hazardous material within 0.25 mile of a school. **Impact: LTS**	No construction-related activities would occur under this alternative. **Impact < PP**	The potential to release of hazardous materials within 0.25 mile of a school would be the same as the Proposed Project. **Impact: =PP**	The potential to release hazardous materials within 0.25 mile of a school would be greater compared to the Proposed Project because five schools exist within the immediate vicinity of this alternatives constructed elements. **Impact: >PP**	The potential to release hazardous materials within 0.25 mile of a school would be less compared to the Proposed Project because no schools exist within the immediate vicinity of this alternatives constructed elements. **Impact: <PP**	The potential to release hazardous materials within 0.25 mile of a school would be less compared to the Proposed Project because no schools exist within the immediate vicinity of this alternatives constructed elements. **Impact: <PP**	Constructing small stormwater collection and storage facilities is not expected involve the use of hazardous materials. **Impact: <PP**

Table 16-9. Continued

	Alternatives					
Proposed Project	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection/ Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 5—Stormwater Reuse
Operation						
HAZ-3. Exposure of public and environment to release of hazardous materials when operating the injection/extraction wells. **Impact: LTS**	No new facilities would be constructed or operated. **Impact: < PP**	The potential to expose the public to hazardous materials when operating Alternative 2 is expected to be the same as the Proposed Project because both would treat water using the same types of chemicals. **Impact: = PP**	The potential to expose the public to hazardous materials would be greater under Alternative 3 because the operating the desalination plant would require a wider array of chemicals than the injection extraction wells. **Impact: > PP**	The potential to expose the public to hazardous materials would be greater under Alternative 4 because the AWT would include a RO system that would potentially use the same types of chemicals as Alternative 3. **Impact: > PP**	Alternative 5 includes an injection/extraction well system that would potentially require the use of the same chemicals as the Proposed Project **Impact: = PP**	Collecting and storing stormwater for irrigation purposes would not require chemical treatments and would not expose the public to environmental hazards. **Impact: <PP**
HAZ-5. Public exposure to contaminated drinking water **Impact: LTS**	No new facilities affecting groundwater quality would be constructed or operated. **Impact: < PP**	The potential to expose the public to contaminated drinking water when operating Alternative 2 is expected to be the same as the Proposed Project because both would inject and extract water from the same sources. **Impact: = PP**	The potential for public exposure to contaminated drinking water would be lower with a local desalination plant, as the water would be treated to a high degree and not stored in the groundwater before delivery to the public. **Impact: <PP**	The potential for contaminating public drinking water would be higher with a reclamation plant, as a portion of the water source would be treated wastewater percolated or injected nto the groundwater basin. **Impact: > PP**	Offstream storage would involve both surface and groundwater storage of Carmel River water prior to treatment and use by the public. The risk of drinking water contamination would be greater due the surface storage of the water prior to injection and recovery. **Impact: > PP**	Collecting and storing stormwater at individual residences for non-potable use would not affect public drinking water. **Impact: < PP**

Table 16-9. Continued

Notes:

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Table 16-10. Comparison of Public Services Impacts

Proposed Project	Alternatives					
	Alternative 1— No Action	Alternative 2—Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
PS-1. Increase in solid waste generated during construction of the injection/extraction well, pipeline, and other facilities. **Impact: LTS**	No construction-related activities would occur. **Impact < PP**	Increase in solid waste would be nearly the same as the Proposed Project because the same type of facilities would be constructed. **Impact = PP**	Construction of the desalination plant, wells, and pipelines would generate substantially more solid waste than the Proposed Project. **Impact >PP**	Construction of the wastewater reclamation facilities is expected to generate substantially more solid waste than the Proposed Project. **Impact: > PP**	Construction of the offstream storage facilities is expected to generate substantially more solid waste than the Proposed Project. **Impact: >PP**	Construction of stormwater storage and distribution systems is expected to generate less solid waste than the Proposed Project because each system is small and would be installed in a few days. **Impact: < PP**
PS-2. Disruption of utility services during construction. **Impact: S**	No construction-related activities would occur under this alternative. **Impact < PP**	Potential for disruption of utility services would be slightly greater than the Proposed Project because a longer pipeline would be constructed. **Impact > PP**	Potential for disruption of utility services would be greater than the Proposed Project because a much longer pipeline system would be constructed. **Impact >PP**	Potential for disruption of utility services would be greater than the Proposed Project because a more ground disturbing activities would occur. **Impact > PP**	Potential for disruption of utility services would be greater than the Proposed Project because a more ground disturbing activities would occur **Impact > PP**	Very small potential for disruption to utility service because each system is very small and would be located immediately adjacent to existing structures. **Impact < PP**

Proposed Project	Alternatives					
	Alternative 1— No Action	Alternative 2—Non-Contiguous New Injection/Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Operation						
PS-3. Increase demand for electric power. **Impact: LTS**	No new facilities would be constructed or operated. **Impact < PP**	Demand for electric power would be the same as the Proposed Project because operation of the injection/extraction well would be the same. **Impact = PP**	Demand for electric power would be much greater than the Proposed Project because Alternative 3 is composed of a greater number of facilities (wells, pipelines, and RO). **Impact >PP**	Demand for electric power is expected to be greater than the Proposed Project because Alternative 4 may include an advanced water treatment plant that includes RO. **Impact > PP**	Demand for electric power is expected to be greater than the Proposed Project because Alternative 5 includes more extensive water pumping requirements. **Impact > PP**	The stormwater collection and distribution systems would most likely be passive and would not require use increased use of energy. If used to an as offset to water diverted from the Carmel River or other source, these systems may result in a reduction in the system wide use of energy. **Impact < PP**

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Table 16-11. Comparison of Transportation and Circulation Impacts

Proposed Project	Alternatives					
	Alternative 1—No Action	Alternative 2—Non-Contiguous New Injection Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
TR-1: Temporary increase in construction-related traffic and associated reduction of level of service on local roadways. **Impact: LTS**	No construction-related activities would occur under this alternative. **Impact < PP**	Temporary increase in construction-related traffic and associated reduction of level of service on local roadways would the same as the Proposed Project because he same type of facilities would be constructed. **Impact = PP**	Construction of desalination plant and associated facilities would result in a greater increase in construction-related traffic and reduction in service levels because facilities are larger and will take much longer to construct. **Impact: >PP**	Construction-related traffic and potential to adversely affect level of service on local roadways would be greater under Alternative 4 because facilities are larger and will take longer to construct. **Impact: > PP**	Construction-related traffic and potential to adversely affect level of service on local roadways would be greater under Alternative 5 because facilities are larger and will take longer to construct. **Impact: > PP**	Installing small stormwater collection and storage systems is not expected to adversely affect traffic and level of service because the systems could be installed quickly with only a few workers. **Impact: <PP**
TR-2. Conflict with public transit systems **Impact: LTS**	No construction-related activities would occur under this alternative. **Impact < PP**	Potential to conflict with public transit systems would be the same as the Proposed Project because the project facilities are nearly the same as the Proposed Project **Impact = PP**	Potential to conflict with public transit systems would be greater than the Proposed Project because many of the pipelines would be constructed within city streets. **Impact: >PP**	Potential to conflict with public transit systems is expected to be greater than the Proposed Project because of more extensive construction activities would occur and the potential to locate new pipelines within roadways. **Impact >PP**	Potential to conflict with public transit systems is expected to be greater than the Proposed Project because of more extensive construction activities would occur and the potential to locate new pipelines within roadways. **Impact >PP**	Installing small stormwater collection and storage systems would have no affect on public transit systems because no work in roadways would be required. **Impact <PP**

Proposed Project	Alternatives					
	Alternative 1—No Action	Alternative 2—Non-Contiguous New Injection Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse
TR-3. Pedestrian and bicycle hazards as a during construction of injection/extraction wells and pipelines **Impact: LTS**	No construction-related activities would occur. **Impact < PP**	Hazards to pedestrians and bicyclists would be similar to the Proposed Project because the same type of facilities would be constructed. **Impact = PP**	Disruption of use of pedestrian walkways and bicycle routes would be greater than the Proposed Project because many pipelines would be constructed within roadways and the use of the pedestrian/bicycle path along Monterey State Beach would be temporarily disrupted. **Impact >PP**	Construction-related effects on pedestrians and cyclists are expected to be greater than the Proposed Project because of the greater amount of construction activities. **Impact > PP**	Construction-related effects on pedestrians and cyclists are expected to be greater than the Proposed Project because of the greater amount of construction activities. **Impact > PP**	Construction could disrupt use of pedestrian walkways and bicycle routes. This effect is not expected to be as disruptive as the Proposed Project because much of the pipeline construction would occur in rural areas. **Impact < PP**
Operation						
TR-4, TR-5. Operating the Proposed Project would not require a substantial increase in worker trips or need for parking and would not result in a change in local roadway level of service. **Impact: LTS**	No new facilities would be constructed or operated. **Impact <PP**	Additional worker trips or need for more parking to maintain and operate the injection/extraction well would be the same as the Proposed Project. **Impact =PP**	Additional worker trips and need for worker parking to operate and maintain the desalination facilities would be greater than the Proposed Project because these facilities are more extensive and require more workers to operate. **Impact: >PP**	Additional worker trips and need for worker parking to operate and maintain the wastewater reclamation facilities would be greater than the Proposed Project because these facilities are more extensive and require more workers to operate. **Impact > PP**	Additional worker trips and need for worker parking to operate and maintain the offstream storage facilities would be greater than the Proposed Project because these facilities are more extensive and require more workers to operate. **Impact > PP**	The stormwater collection and storage facilities are passive systems that do not require operators. **Impact < PP**

Proposed Project	Alternatives					
	Alternative 1—No Action	Alternative 2—Non-Contiguous New Injection Extraction Well	Alternative 3—Local Desalination Plant	Alternative 4—Wastewater Reclamation	Alternative 5—Offstream Storage	Alternative 6—Stormwater Reuse

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Table 16-12. Comparison of Visual Resources Impacts

Proposed Project	Alternatives					
	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5 – Offstream Storage	Alternative 6—Stormwater Reuse
Construction						
VIS-1., VIS-2. Temporarily alter scenic views and degrade the existing visual character during construction of injection/extraction wells and pipelines. **Impact: LTS**	No construction-related activities would occur under this alternative. **Impact < PP**	Altering scenic views would be less compared to the proposed project because the injection/extraction well would be located adjacent to an existing structure. **Impact < PP**	Altering scenic views and degrading existing views would be greater compared to the Proposed Project because drilling would occur adjacent to Monterey State Beach. **Impact: > PP**	The potential to adversely affect scenic views during construction would be greater than the Proposed Project because facilities would be constructed over a wider geographic area. **Impact: > PP**	The potential to alter scenic views during construction would be greater than the Proposed Project because of facilities would be constructed over a wider geographic area. **Impact: > PP**	Scenic views would not be affected because collection and storage infrastructure would be small a located immediately adjacent to existing structures **Impact: < PP**
VIS-3. Creation of light and glare during construction of injection/extraction well and pipelines. **Impact: LTS**	No construction-related activities would occur under this alternative **Impact < PP**	Light and glare created during construction would be similar to the Proposed Project because the same type of construction methods would be used. **Impact = PP**	Light and glare created during construction would be greater compared to the Proposed Project because the facilities are more extensive (wells, pipelines, and the desalination plant) and would be located over a wider urban area. **Impact: >PP**	Light and glare created during construction would be greater compared to the Proposed Project because more ground disturbing activities would occur. **Impact >PP**	Light and glare created during construction would be greater compared to the Proposed Project because more ground disturbing activities would occur. **Impact >PP**	Installing the stormwater collection and storage systems would not result in additional light and glare because construction would not require heavy equipment and is expected to occur during daylight hours. **Impact <PP**

Proposed Project	Alternative 1 – No Action	Alternative 2 – Non-Contiguous New Injection Extraction Well	Alternative 3 – Local Desalination Plant	Alternative 4 – Wastewater Reclamation	Alternative 5 – Offstream Storage	Alternative 6—Stormwater Reuse
	Alternatives					
Operation						
VIS-4. Creating new visual features and altering existing visual character and views. **Impact: LTS**	No new facilities would be constructed or operated. **Impact <PP**	Change in visual features and altering existing views would less than the Proposed Project because the injection/extraction well would be located adjacent to existing structures. **Impact <PP**	The seawater collection and brine disposal wells and pipelines would result in an adverse impact on visual character of Monterey State Beach. **Impact: >PP**	Potential for creating new visual features and altering existing visual character and views would be greater than the Proposed Project **Impact: > PP**	The potential to permanently alter visual features would be greater than the Proposed Project because of the constructed facilities required to store and inject/extract water would be more extensive. **Impact > PP**	The stormwater collection and storage systems would not alter visual features because the systems would be small is size and would be located adjacent to existing structures. **Impact: < PP**
VIS-5. Creating new light and glare at the injection/extraction well site. **Impact: S**	No new facilities would be constructed or operated. **Impact <PP**	Changes in light and glare would be the same as the Proposed Project because the same type of facilities would be constructed and operated **Impact =PP**	Changes in light and glare are expected to be greater than the Proposed Project because facilities would be constructed at Monterey State Beach and over a much greater urban area. **Impact >PP**	Potential for changing light and glare expected to be greater than the Proposed Project because new facilities would be constructed over a wider area. **Impact > PP**	Potential for changing light and glare expected to be greater than the Proposed Project because new facilities would be constructed over a wider area. **Impact > PP**	The stormwater collection and storage systems would not create light and glare because the systems would be small in size and would be located adjacent to existing structures. **Impact < PP**

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Chapter 17
Temporary Pipeline Analysis

Introduction

This section provides an impact analysis, in compliance with NEPA, for the installation and removal of Cal-Am's temporary water pipeline west of General Jim Moore Boulevard (see Figure 2-4). As described in Chapter 1, this analysis is necessary for the Army to issue a right of entry for pipeline construction and operation, which would be located on Army property. Although this is a separate action from the Proposed Project, the project settings and the criteria and methodology used to analyze the Proposed Project and alternatives are the same. Therefore, the setting, significance criteria, and methods are not repeated in this Chapter and the reader is referred to each applicable resource section for this background information. This chapter provides the effects and any necessary mitigation for those effects, of installing and removing the temporary pipeline.

Resources Eliminated From Detailed Discussion

Land Use

The placement and removal of the temporary pipeline would not affect land use. The pipeline would be placed on Army property between the existing General Jim Moore Boulevard and a chain link fence. During construction, staging areas would be alongside the pipeline and would not affect land uses. The pipeline is expected to be in place for up to five years after completion of construction. During this time, and after its removal, there would be no change in any land uses.

Aquatic Resources

The placement and removal of the temporary pipeline would not result in any effects on aquatic resources. There would be no significant change in diversions from the Carmel River that would affect flows. The pipeline would not be placed adjacent to or on any wetlands, including streams or rivers. Additionally, the placement of the pipeline would require minimal ground disturbance, which would not occur near a waterway, and therefore, it is not expected that there would be any degradation to aquatic habitat.

Public Services

The placement and removal of the pipeline would not result in any effects on public services such as police and fire protection, schools, hospitals, and other public services and facilities. The pipeline would be placed alongside General Jim Moore Boulevard and underneath two roadways. There would be no disturbance to access to these services or the need to build or establish new services or facilities.

Hydrology and Water Quality

The placement and removal of the temporary pipeline would not affect hydrology and water quality. The pipeline would not result in changes in flows or diversions in the Carmel River or any other water body. Additionally, the pipeline would not be near any wetlands or other waters and there would be minimal ground disturbance.

Impacts and Mitigation Measures

Vegetation and Wildlife

Impact VEG-1: Temporary Disturbance of Maritime Chaparral.

The placement and removal of the temporary pipeline would result in temporary disturbance of up to 0.56 acre of maritime chaparral. The project area is within the area designated for development under the Fort Ord HMP, which mitigates for the loss of maritime chaparral habitat through a variety of actions including establishment of natural resource management areas. Therefore, this impact is considered **less than significant**.

Mitigation: No further mitigation is required.

Impact VEG-2: Disturbance or Destruction of Sandmat Manzanita, and Potential Disturbance or Destruction of Monterey Spineflower, Eastwood's Goldenbush, and Kellogg's Horkelia

The placement and removal of the temporary pipeline would result in disturbance or destruction of sandmat manzanita, which occurs in the project area, and potential disturbance or destruction of up to 0.56 acre of habitat that could potentially contain Monterey spineflower, Eastwood's goldenbush, and Kellogg's horkelia. All of these plants have been recorded in the vicinity of MPWMD's Santa Margarita Test Well (see Chapter 4 and Figure 4-1) and the open lands east of General Jim Moore Boulevard (U.S. Army Corps of Engineers 1997), but were not blooming or evident at the date of the field survey of the temporary pipeline project area (January 28, 2006). These impacts are considered to be temporary, as the species are likely to become re-established in the disturbed area following project completion. These impacts are considered **less than significant** because of their temporary nature and because these impacts were considered in the Fort Ord disposal and reuse habitat management plan, and mitigating measures were adopted, including establishment of natural resource management areas on former Fort Ord (U.S. Army Corps of Engineers 1997). **Mitigation**: No further mitigation is required.

Impact WLD-1: Potential Direct Mortality or Disturbance of California Tiger Salamanders and Potential Temporary Disturbance of California Tiger Salamander Upland Habitat

Because a portion of the temporary pipeline project area is within two kilometers of three potential California Tiger Salamander (CTS) breeding sites, a Biological Assessment (BA) was prepared to analyze the impacts of the project on CTS (Froke 2005). The BA concluded that the project would be constructed outside of suitable CTS habitat and that construction and operation of the pipeline would not pose a significant risk to CTS (Froke 2005, pg. 4.10). The potential for CTS effects from this and other planned infrastructure improvements on former Fort Ord were addressed in a recent biological opinion (BO) issued by the USFWS. The USFWS concluded that a number of pre-disposal projects would not substantially affect the persistence of CTS populations throughout former Fort Ord. A CTS incidental take authorization was issued in this BO for pre-disposal actions being taken or permitted by the Army (U.S. Fish and Wildlife Service 2005). The temporary pipeline would qualify as one of these pre-disposal actions. Therefore, construction and operation of the temporary pipeline **would not have a significant effect** on CTS.

Even though the BA and BO conclude that the temporary pipeline project would not substantially affect the persistence of CTS on former Fort Ord, the BO requires that several "Reasonable and Prudent Measures" be undertaken by the

Army to minimize take of CTS (U.S. Fish and Wildlife Service 2005, pages 58-59). Three of the measures apply to the proposed temporary pipeline project, including:

- The Army must develop and include, in its interim use permits, additional protective measures to reduce the take of California tiger salamanders from interim uses.
- The Army must ensure that only qualified personnel handle California tiger salamanders during survey and salvage operations.
- The Army must develop standard measures to minimize take of California tiger salamanders when permitting infrastructure improvement and road construction actions by non-federal entities.

As a result of these reasonable and prudent measures, the Army must comply with or ensure that any contractors comply with specific terms and conditions associated with the measures. These terms and conditions are incorporated into the following mitigation measure. The major terms and conditions include:

- The Army must ensure that only qualified personnel handle California tiger salamanders during survey and salvage operations.
- Persons handling or moving California tiger salamanders must record the details of such activities for reporting to the USFWS.
- Site assessments and field surveys for California tiger salamanders must follow the appropriate USFWS guidelines.
- Implement other measures to protect salamanders during construction, including:
  - Do not construct storm water detention facilities that might attract salamanders during the breeding season.
  - Cover excavations sites to avoid trapping salamanders
  - To the extent practicable, conduct construction activities in the dry season.
  - Avoid construction in wetlands.
  - Control soil erosion.
  - Prohibit pets in construction areas.

Mitigation Measure WLD-1. Comply with U.S. Fish and Wildlife Service Biological Opinion Terms and Conditions. The U.S. Army will require that any contracts let to construct the proposed temporary pipeline include the U.S. Fish and Wildlife Service BO terms and conditions for Reasonable and Prudent Measures numbers 5, 6 and 7 (U.S. Fish and Wildlife Service 2005, pages 63-65).

Impact WLD-2: Potential Direct Mortality or Disturbance of California Horned Lizards and Potential Temporary Disturbance of California Horned Lizard Habitat

The placement and removal of the temporary pipeline has the potential to result in direct mortality or disturbance of California horned lizard and a temporary disturbance of up to approximately 2.5 acres of low quality habitat capable of supporting California horned lizard. The pipeline itself may be a barrier to the movement of California horned lizards, but the project area is adjacent to Seaside, an intensively developed residential area with no cover or suitable habitat for California horned lizards. The residential area west of the proposed pipeline also supports potential horned lizard predators (resident and/or feral dogs and cats); therefore the pipeline will not restrict access to suitable habitat. Although this species is known to occur on the former Fort Ord in small numbers (U.S. Army Corps of Engineers 1992), it is common throughout the southern portion of the Central Coast Range and occurs in fair numbers throughout the rest of its range in California (Jennings and Hayes 1994). Because the status of the California horned lizard in the region is relatively abundant, and because a very small area of habitat that is low in quality because of disturbance and the presence of dense vegetation will be affected and the species is unlikely to occur in significant numbers in this small area, this impact is considered **less than significant.**

Mitigation: No mitigation is required.

Impact WLD-3: Potential Direct Mortality or Disturbance of Black Legless Lizards and Potential Permanent and Temporary Disturbance of Black Legless Lizard Habitat

The placement and removal of the temporary pipeline has the potential to result in direct mortality or disturbance of black legless lizard and a temporary disturbance of up to approximately 2.5 acres of low quality habitat capable of supporting black legless lizard. The pipeline itself may be a barrier to the movement of black legless lizards if it settles into the substrate over time, but the project area is adjacent to Seaside, an intensively developed residential area with no cover and limited suitable habitat for black legless lizards. There are also potential predators (resident and/or feral dogs and cats) immediately west of the proposed pipeline; therefore the pipeline will not restrict access to suitable habitat. Direct mortality of black legless lizards and the temporary loss of habitat would be considered a **significant** impact because the subspecies is rare in California, with a distribution that is restricted to coastal areas in the Monterey Bay region (Stebbins 2003). However, development and implementation of the HMP (U.S. Army Corps of Engineers 1997) has provided adequate mitigation for potential impacts on the black legless lizard. Therefore**, this impact is less than significant.**

Mitigation: No mitigation is required.

Impact WLD-4: Potential Loss of Nest Sites and Disturbance or Mortality of Migratory Birds

Several Monterey cypress, eucalyptus, and myoporum trees and shrubby vegetation are present in the project area that provide suitable nesting habitat for migratory birds. Trimming of nest trees and shrubs during the nesting period for migratory birds could result in nest abandonment and death of young or loss of reproductive potential at active nests located in the project area. Impacts on migratory birds would be considered adverse if the subsequent population decline was large and affected the viability of the local population. Disturbance that results in nest abandonment and death of young or loss of reproductive potential at active nests would also violate California Fish and Game Code Sections 3503 (active bird nests) and the Migratory Bird Treaty Act (MBTA). Because only a small area of habitat (shrubs and trees within approximately 1 acre) would be impacted by the project, impacts on migratory birds are considered **less than significant**. However, in order to avoid violation of California Fish and Game Code Sections 3503 (active bird nests) and the MBTA, the following mitigation measure would be implemented.

Mitigation Measure WLD-1: Remove Trees and Shrubs during the Nonbreeding Season for Most Birds (September 1 To February 15)

The placement and removal of the temporary pipeline may result in the trimming of trees and shrubs that provide suitable nesting habitat for migratory birds. To avoid the loss of active migratory bird nests, tree and shrub removal, if necessary, will be conducted only during the non-breeding season for migratory birds (generally September 1 to February 15). Removing woody vegetation during the non-breeding season will ensure that active nests will not be destroyed by removal of trees supporting or adjacent to active nests.

If shrub and tree trimming cannot be accomplished before the breeding season, a qualified wildlife biologist will conduct focused nest surveys for active nests of migratory bird species. If active nests are found in the project area, and if construction activities must occur during the nesting period, an appropriate “no-disturbance” buffer around the nest sites will be implement until the young have fledged (as determined by a qualified biologist).

Impact WLD-5: Potential Disturbance of Nest Trees and Nesting Raptors

There is suitable nesting habitat for nesting non-special-status raptors (red-tailed hawk and great horned owl) in eucalyptus trees in the project area and in residential areas within 0.25 miles of the project in the northern portion of the project area. Any raptor nesting in these locations are subject to on-going disturbance from traffic on General Jim Moore Boulevard and from traffic and human activity in the residential areas. Impacts on nesting raptors are therefore considered **less than significant** because only a few potential nest trees will be impacted by the project, and the additional disturbance from the placement and removal of the temporary pipeline would not significantly increase the current level of disturbance.

Mitigation: No mitigation is required.

Cultural Resources

The proposed temporary pipeline does not appear to impact cultural resources as a result of its construction or use. Based on archival research and field studies conducted for the proposed project, there are no previously recorded archaeological sites, nor any significant architectural resources within or adjacent to the project area. The areas where the pipeline will be placed underground at the street intersections, do not appear sensitive for previously unknown archaeological resources.

Impact CUL-1: Potential for Discovery of Archaeological Resources

While there are no known archaeological resources or human remains located adjacent or within the proposed project area, there is always the possibility that archaeological materials can be found during project construction and ground disturbing activities. This impact is **potentially significant**.

Mitigation Measure CUL-1: Stop work if buried cultural deposits are encountered during construction activities.

If buried cultural resources such as chipped or ground stone, quantities of bone or shell material, or historic debris or building foundations are inadvertently discovered during ground-disturbing activities, work will be stopped within a 100-foot radius of the find until a qualified archaeologist can assess the significance of the find. If, after evaluation by a qualified archaeologist, an archaeological site or other find is identified as meeting the criteria for inclusion in the NRHP or the CRHR, Cal-Am will retain a qualified archaeologist to develop and implement an adequate program for investigation, avoidance if feasible, and data recovery for the site, with Native American consultation, if appropriate.

If human skeletal remains are inadvertently encountered during construction of the temporary pipeline, the contractor will contact the Monterey County Coroner immediately. If the County Coroner determines that the remains are Native

American, the coroner will contact the NAHC, as required by Section 7050.5[c] of the California Health and Safety Code, and the County Coordinator of Indian Affairs. A qualified archaeologist will also be contacted immediately.

Noise

Impact NZ-1: Exposure of Noise-Sensitive Land Uses to Construction Noise in Excess of Applicable Standards

Installing the pipeline would temporarily increase noise along segments of the alignment. Noise increases would result both from on-site construction activities and from construction-related vehicle traffic delivering materials to and from the construction site.

The City's noise ordinance establishes hours in which construction activities may occur, and construction activities may not legally occur outside of these hours, unless a variance is obtained. Construction activities that would occur within these hours are considered less than significant. Installation of the pipeline would occur between 7 a.m. and 7 p.m. weekdays, which is within the City's range of hours for less than significant construction-related noise. Therefore, this impact is **less than significant.**

Transportation

Impact TR-1: Temporary Increase in Traffic

A slight increase in local traffic would be associated with installation of the pipeline because construction equipment and workers would access the site from General Jim Moore Boulevard. It is anticipated that construction activities required for pipe installation would require approximately 10 round trips per day (Table 13-1). Because only 10 additional round trips per day are expected, minimal disruption from construction equipment on affected roadways would occur. Each of the crossings would result in minor effects on traffic in the vicinity of the crossing. Broadway Avenue is the only crossing that is accessible by the general public and the pipe would be installed one lane at a time to ensure minimal effects on traffic. Additionally, the entire crossing at Broadway would be completed within two days. There would be no noticeable changes in traffic in areas outside the immediate vicinity of the project area. This impact is considered **less than significant** due to the small number of additional roundtrips generated in the project area, the temporary duration for which the slight increase would occur, and because a Traffic Control Plan, as described in Chapter 2, would be implemented. Therefore, no mitigation is necessary.

Visual Resources

Impact VIS-1: Alteration of Scenic Views

Construction activities associated with the temporary pipeline would not affect any scenic views. The pipeline would be located along the alignment of General Jim Moore Boulevard and all construction equipment would be restricted to the designated staging areas. Construction would last up to six weeks at which time all construction equipment would be removed. The only remaining structure after construction ends would be the pipeline itself, which would lie on the ground for most of the alignment. The primary viewers of the pipeline would be those traveling along General Jim Moore Boulevard and property owners and occupants of residential property west General Jim Moore Boulevard. This area currently provides scenic views to occupants and property owners west of General Jim Moore Boulevard and installation of the pipeline would temporarily affect the aesthetic character of their views to the east. As the pipeline would be in place for only a maximum of five years after completion of construction, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact VIS-2: Creation of Light and Glare

All of the construction activities associated with the pipeline would occur during weekdays between the hours of 7:00 a.m. and 7:00 p.m. No nighttime construction would occur. Reflective surfaces of construction equipment could create a glare that would affect travelers on General Jim Moore Boulevard, and residents to the west of General Jim Moore Boulevard in Seaside. However, the equipment would be restricted to the immediate project area and would only be present for up to 6 weeks. This impact is considered **less than significant** because of the short duration of construction.

Mitigation: No mitigation is required.

Air Quality

Impact AQ-1: Short-Term Increase in PM10 Emissions from Pipeline Construction

Modeling conducted using the URBEMIS2002 model indicates that PM10 associated with pipeline construction would be approximately 2.7 pounds per day, well below the MBUAPCD's threshold of 82 pounds per day. In addition, the MBUAPCD has established a construction-related PM10 threshold of 82 pounds per day. Based on this threshold, the MBUAPCD has identified levels of construction activity that could result in a significant PM10 impact. For construction involving grading, excavation, and other earthmoving activities, the MBUAPCD has identified construction sites that disturb more than 2.2 acres per day as having the potential to exceed the 82-pounds-per-day threshold. Construction of the temporary pipeline would not result in ground disturbance exceeding 2.2 acres per day. Consequently, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact AQ-2: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Diesel Particulate Matter from Construction Activities

Toxic Air Contaminants (TAC) are pollutants that may be expected to result in an increase in mortality or serious illness or that may pose a present or potential hazard to human health. Health effects of TACs include cancer, birth defects, neurological damage, damage to the body's natural defense system, and diseases that lead to death. In August 1998, the CARB identified diesel exhaust as a TAC (California Air Resources Board 1998). In the identification report, the California Office of Environmental Health Hazard Assessment (OEHHA) provided an inhalation non-cancer chronic reference exposure level (REL) of 5 micrograms per cubic meter ($\mu g/m^3$) and a range of inhalation cancer potency factors of 1.3×10^{-4} to 2.4×10^{-3} $(\mu g/m^3)^{-1}$. The Scientific Review Panel on Toxic Air Contaminants recommended a "reasonable estimate" inhalation unit risk factor of 3.0×10^{-4} $(\mu g/m^3)^{-1}$. From the unit risk factor an inhalation cancer potency factor of 1.1 $(mg/kg\text{-}day)^{-1}$ may be calculated. These non-cancer and cancer health factors were developed based on whole (gas and particulate matter) diesel exhaust. The surrogate for whole diesel exhaust is diesel PM. PM10 is the basis for the potential risk calculations. (California Air Resources Board 1998)

When evaluating health risks from diesel exhaust exposure, the potential cancer risk from inhalation exposure to diesel PM will outweigh the potential non-cancer health impacts. Therefore, inhalation cancer risk is the primary consideration for health effects according to OEHHA and CARB guidelines. When comparing whole diesel exhaust to speciated diesel exhaust (e.g., polycyclic aromatic hydrocarbons [PAHs], metals), potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multi-pathway cancer risk from the speciated components. For this reason, an analysis of multi-pathway risk is not necessary.

Emissions of diesel particulate matter have the potential to result in elevated health risks. The assessment of cancer risk is typically based on a 70-year exposure period. Construction activities are sporadic, transitory, and short-term in nature, and once construction activities cease, so too will emissions from construction. Conversation with MBUAPCD staff indicates that construction activities that occur for less than 1 year will generally not result in any adverse health impacts. Because construction activities would be up to 6 weeks in duration, this impact is considered **less than significant**. However, to further reduce emissions of diesel PM and associated health risks, Mitigation Measures AQ-1 and AQ-2 are recommended (refer to Chapter 3).

Mitigation: See Mitigation Measures AQ-1 and AQ-2 in Chapter 3.

Impact AQ-3: Exposure of Sensitive Receptors to Elevated Health Risks from Exposure to Acrolein Emissions from Diesel Exhaust from Construction Activities

Construction equipment used for the pipeline may be diesel-powered and would therefore emit diesel exhaust. Acrolein is emitted as a product of diesel combustion, where the concentration in diesel exhaust is currently understood to be 0.0035 grams acrolein per gram of ROG emissions. An acute one-hour reference exposure level (REL) of 0.19 $\mu g/m^3$ has been estimated for acrolein. Using methods developed by the MBUAPCD, a screening analysis conducted for project construction indicates that the hazard index for acrolein exposure may exceed 1 at nearby sensitive receptors. Consequently, this impact is considered **significant**. Implementation of Mitigation Measures AQ-1 through AQ-2 would reduce these impacts to a **less-than-significant level**.+

Mitigation Measure AQ-1: Use Newer, Cleaner-Burning Engines.

Mitigation Measure AQ-2: Limit Construction Duration.

Hazardous Materials

Impact HAZ-1: Inadvertent Release of Hazardous Materials

Installation of the temporary pipeline could result in the exposure of employees and the public to hazardous materials. Installing the pipeline would require the use of fuels and lubricants to operate the equipment. Accidental release of these hazardous materials could result in exposure to construction workers and the public. The risk of worker and public exposure to fuels and lubricants would be substantially reduced by normal equipment operation and fueling safety measures and by implementing a Storm Water Pollution Prevention Plan (SWPPP) as described in Chapter 2.

Although the temporary pipeline would be installed on the former Fort Ord property, the majority of the pipeline would be installed aboveground and therefore would not be likely to result in disturbance to UXO. The portion of the pipeline that would be installed underground would be at each road crossing. These areas are assumed to be previously disturbed and therefore do not pose a risk for UXO. Even though the risk of encountering UXO is low, this **impact is**

potentially significant. To reduce the likelihood of harm to construction workers, the following mitigation measure should be implemented.

Mitigation Measure HAZ-1: Provide UXO Training to Construction Workers.

All construction workers that will enter the project site will receive training from qualified personnel on the identification and avoidance of UXO prior to beginning work.

Impact HAZ-2: Handling and Use of Hazardous Materials during Construction within 0.25 Mile of a School

Construction activities that may result in the release of fuels and lubricants would occur within ¼ mile of Fitch Middle School. As described above, accidental release of these materials during construction could result in exposure to the public at the nearby school. As described in Chapter 2, a SWPPP would be implemented that would impose performance standards on the construction activity so that the risk of release of hazardous materials during construction would be minimal. In addition, construction would last only 6 weeks. Therefore, **this impact is less than significant**.

Mitigation: No mitigation is required.

Geology and Soils

Impact GS-1: Potential Short-Term Increase in Erosion

Installing the aboveground portion of the pipeline would result in very minimal ground disturbance as there would be no excavation or limited vegetation removal. Installing the underground portion may result in disturbance to soils adjacent to the roadways at each crossing. The construction contractor will prepare and implement a SWPPP as described in Chapter 2 that will ensure that erosion of soils would be kept to a minimum and that no erosion or sedimentation would occur in any waterways. The SWPPP will state the procedures, standards, and enforcement measures that shall be used to manage soil erosion in order to sustain the goal of clean water.

The implementation of the SWPPP would prevent the erosion of the soils and exposure to waterways. The employment of grading ordinances would prevent substantial soil erosion or the loss of topsoil. Therefore, this impact is considered **less than significant**.

Mitigation: No mitigation is required.

Impact CUM-1: Cumulative Effects of Construction, Operation and Removal on Traffic, Air Quality, Noise and Vegetation and Wildlife Resources

The potential cumulative effects of constructing, operating and removing the proposed temporary pipeline have been considered in Chapter 15 (see text and Table 15-1). With the proposed mitigation contained in this chapter and in Chapter 15, the temporary pipeline project would not make a considerable contribution to cumulative effects on the environment. The impacts would **be less than significant.**

Mitigation: No additional mitigation is required.

Chapter 18
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Appendix A
Aquatic Resources

Appendix A – CARMEL RIVER/FRESHWATER AQUATIC LIFE

AQUATIC RESOURCES OF THE CARMEL RIVER

In general, the Carmel River supports a low diversity of aquatic invertebrates. The local distribution and abundance of invertebrate populations is limited by the annual reduction in streamflows; two dams, which block recruitment of gravel and cobbles into reaches below the dams; drying of the river (which usually extends approximately 7 miles upstream) from the lagoon to Robinson Canyon; high flows during winter and spring; and the transport and deposition of coarse sand, which prevents organisms from colonizing lower portions of the river. In 1982, a study of the benthic (i.e., bottom-dwelling) invertebrate fauna found six orders of aquatic insects, represented by 59 species, and eight noninsect orders, represented by 15 species. Of the noninsect species, the introduced crayfish (*Pacifasticus leniusculus*) is the largest (Fields 1984). In 2000, MPWMD began sampling macrobenthic invertebrates (BMI) at several sites to establish a baseline metrics for future comparisons and to assess the existing health of BMI assemblages. In three years of sampling, this work yielded results that highlight the importance of three limiting factors, including: 1) the annual summer drying up of the lower river by groundwater pumping, 2) shifting of fine-grained bed material and the lack of habitable surface area for colonization during high-flow events, and 3) the entrapment of gravel and cobble substrate within Los Padres and San Clemente Dams, which has created habitats without enough interstitial space for many species of BMI (MPWMD, 2004).[1]

The Carmel River contains a diverse assemblage of amphibious and reptilian species, including the threatened California red-legged frog (*Rana aurora draytonii*), threatened California tiger salamander (*Ambystoma californiense*), California newt (*Triturus torosus*), Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), western toad (*Bufo boreas*), western pond turtle (*Clemmys marmorata*), and possibly the foothill yellow-legged frog (*Rana boylei*).

EXISTING FISH RESOURCES

The Carmel River supports populations of steelhead (*Oncorhynchus mykiss)*, Pacific lamprey (*Entosphenus tridentatus*), river lamprey (*Lampetra ayresi*), Coast Range sculpin (*Cottus aleuticus*), prickly sculpin (*Cottus asper*), riffle sculpin (*Cottus gulosus*), Sacramento hitch (*Lavinia exilicauda*), threespine stickleback (*Gasterosteus aculeatus*), Sacramento blackfish (*Orthodon microlepidotus*), starry flounder (*Platichthys stellatus*), shiner perch (*Cymatogaster aggregata*), Pacific staghorn sculpin (*Leptocottus armatus*) (in the lagoon and lower river), brown trout (*Salmo trutta*), goldfish (*Carassius auratus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), mosquitofish (*Gambusia affinis*), carp (*Cyprinus carpio*), black bullhead (*Ictalunus melas*), and large-mouth bass (*Micropterus salmoides*). A single sighting of striped bass (*Moroni saxitillus*) in the Carmel River Lagoon indicates that this species is an infrequent visitor.

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1 Monterey Peninsula Water Management District. 2004. Environmental and Biological Assessment of Portions of the Carmel River Watershed. Part of a Watershed Assessment prepared for the Carmel River Watershed Conservancy, under contract to the California State Water Resources Control Board.

California state law and California Fish and Game Commission policies stipulate that healthy steelhead populations shall be protected or restored by controlling the harvest of adults, providing suitable spawning grounds, and maintaining rearing habitat for juvenile steelhead. The ongoing survival of the Carmel River population, however, is jeopardized by the historical development of water resources within the Carmel River Basin, the recent periods of drought, and other environmental problems. In 1986, DFG expressed concern that the steelhead population in the Carmel River was threatened with becoming a remnant run and adopted statewide policies and a management goal to maintain it as a self-sustaining resource and to restore it as much as possible to its historic level of productivity (Snider, 1983; California Department of Fish and Game, 1986).[2] For this goal to be accomplished, environmental problems that limit habitat and reduce opportunities for adult migration and juvenile emigration will have to be corrected. Recently, the Monterey Peninsula Water Management District completed an environmental and biological assessment of portions of the Carmel River Basin, which included an inventory of the historical environmental problems that limited the steelhead population.[3] This inventory included:

1) Inadequate passage facilities for adults and juveniles at Los Padres Dam,
2) Dry season surface diversions at San Clemente Dam,
3) Subsurface diversion of percolating streamflow and groundwater,
4) Reduction in the extent and diversity of streamside vegetation,
5) Reduction of the number of trees and the canopy in the riparian forest, and reduced amounts of large wood in the active channel downstream of Robles del Rio,
6) Retention in main stem reservoirs of sediment that is beneficial to steelhead and macrobenthic invertebrates (insects in the river bottom),
7) Chronic and episodic bank erosion in tributaries and the main stem that introduces fine sediments into spawning and rearing habitats,
8) Prior to 1997, the temporary or seasonal blockage of smolt emigration at San Clemente Dam in some years when flashboards were raised in the spring,
9) Sand deposition in the Lagoon that reduces habitats for adults during the winter, for smolts during the spring, and for juveniles during the summer and fall months,
10) Changes in dry season (late spring to fall) water quality, including increased water temperature, reduced oxygen levels, and higher salinity levels (Lagoon only),
11) Loss of surface storage in Los Padres Reservoir due to sedimentation, and
12) The release and deposition of fine-grained sand and silt from San Clemente Dam

[2] For the purposes of this EIR, remnant run is defined as population levels that are substantially reduced from historical levels and severely limited by man-induced environmental changes, which prevent the population from reproducing and expanding over several generations. Remnant populations may persist, but only at a fraction of potential population number, compared to natural conditions, or may further decline to threatened and endangered levels.

[3] Monterey Peninsula Water Management District. 2004. Environmental and Biological Assessment of Portions of the Carmel River Watershed. Part of a Watershed Assessment prepared for the Carmel River Watershed Conservancy, under contract the California State Water Resources Control Board.

STEELHEAD LIFE CYCLE

Steehead are anadromous fish, meaning they migrate to the ocean as juveniles, live in the ocean as adults and migrate back into freshwater to reproduce (**Figure A-1**). As indicated by adult counts at San Clemente Dam, the historical migration of adults started with the beginning of major storms in late fall or early winter and continued through March or, in some years, April. Following upstream migration, the female steelhead establishes a territory, dig nests in the bottom of the stream, and deposit eggs that are then fertilized by one or more males. In the Carmel River, adults have been observed spawning from February through March, but they probably spawn from as early as mid-January to as late as early April (Dettman and Kelley 1986).

Eggs buried in nests incubate 3-8 weeks, depending on water temperature, and hatch in late winter or early spring. The newly hatched fry reside in the gravel for as long as 2 weeks, emerge from the nest, and disperse into quiet areas along the stream margin, where they begin to feed.

Steelhead fry grow rapidly during spring and soon move into swifter, deeper water in riffles, runs, and the upstream and downstream ends of pools. Throughout late spring, summer, and fall, the juveniles feed predominately on drifting, immature aquatic insects or adult terrestrial insects that fall into the river.

Beginning with the first rains of the fall, some juveniles move downstream. During the following spring, many juveniles change into smolts (juvenile steelhead that have adapted to seawater), if they have attained sufficient size, and emigrate to the ocean. Other juveniles remain in fresh water for 1-2 more years before they enter the ocean, depending on their growth rates.

Steelhead from the Carmel River spend one to four years in the ocean before returning to spawn. Unlike other Pacific salmon, not all steelhead die after spawning. Many migrate back downstream as kelts and reenter the ocean. Some of the larger and older adults reenter the ocean as kelts and migrate upstream again; these are called repeat spawners. Occasionally, juvenile steelhead mature in fresh water and spawn without migrating to the ocean. This occurs most frequently during droughts when juveniles are trapped in the river and cannot emigrate to the ocean.

Extent of Spawning Habitat – **Figure A-2** illustrates the extent of steelhead spawning habitat in the Carmel River Basin. In most years, adult steelhead spawn in 62.5 miles of stream habitat: 24.5 miles of the mainstem, 30 miles of primary tributaries, and 7.5 miles of secondary tributaries. Spawning habitat in the mainstem upstream of the Narrows totals approximately 120,000 square feet: 50,000 square feet in the reach from the Narrows to San Clemente Dam (41% of total), 10,000 square feet from San Clemente Reservoir to Los Padres Dam (9% of total), and 60,000 square feet upstream of Los Padres Reservoir (50% of total). The quantity of spawning habitat in the mainstem below San Clemente Dam and between San Clemente Reservoir and Los Padres Dam is limited by the entrapment of spawning gravels in the existing reservoirs.

Extent and Characterization of Rearing Habitat – **Figure A-3** illustrates the extent of juvenile rearing habitat in the Carmel River Basin. In most years, 49 miles of rearing habitat are available, with 20 miles on the mainstem, 24 miles on primary tributaries, and 5 miles on secondary tributaries. Based on the Rearing Index (RI, a measure related to the square feet and quality of habitat for age 0+

steelhead), 28% of the total rearing habitat is in the reach from the Narrows to San Clemente Dam, 33% is from San Clemente Reservoir to Los Padres Dam, and 39% is upstream of Los Padres Reservoir. For yearling steelhead, 23% of the total rearing habitat is in the reach from the Narrows to San Clemente Dam, 20% is from San Clemente Reservoir to Los Padres Dam, and 57% is upstream of Los Padres Reservoir. Basin wide, rearing habitat totals 12.9 million RI units for age 0+ steelhead and 5.9 million units for yearling steelhead. These totals do not include habitat in Pine Creek, Robinson Canyon, Garzas Creek, or Hitchcock Canyon.

The rearing habitat in the mainstem of the Carmel River can be divided into three broad reaches based on the physical character of the channel and summer flow regimes:

- **Upper Mainstem** – Most habitat upstream of Los Padres Dam is within the Ventana Wilderness area, where river flow is unregulated, roads have not caused erosion, the stream gradient is steep (320 feet per mile), and bedrock outcrops control the course of the channel. Deep pools separated by short, shallow glides and long, cobble/boulder riffles and runs are common.

- **Middle Mainstem** – In the reach between the dams, the channel configuration is controlled by bedrock outcrops and large boulders. The substrate is a mixture of cobbles and boulders and lacks a natural source of gravel because most of it is trapped behind Los Padres Dam. During summer, water stored in Los Padres Dam is released into the channel and diverted or released at San Clemente Dam. By agreement with DFG and under a water right permit from the SWRCB, Cal-Am maintains a minimum flow of 5 cfs below Los Padres Dam. Because of variation in natural accretion, the augmented dry-season flow ranges from 5 cfs in critical years to 15 cfs in wet years.

- **Lower Mainstem** – Below San Clemente Dam downstream to near Paso Hondo Road (Powell's Hole), the river is controlled primarily by bedrock outcrops. Below Powell's Hole, the channel is primarily alluvial, where the river's course and configuration periodically shifts due to the interaction of alluvial deposits with flood flows that rearrange, scour, and deposit bedload along the course of the river. In spring 2003, the DWR-DSOD required Cal-Am to lower the water surface elevation in SCD by drilling six ports in the dam and drawing off the upper 10 feet of water. This interim project was implemented to partially reduce the risks to life and property, if SCD should fail due to a maximum credible earthquake. In November 2003, DWR-DSOD further ordered Cal-Am to hold the reservoir at this reduced elevation year round, whenever feasible, and to develop and implement additional measures to lower the reservoir another five feet by November 2004. As a result of these changes, it highly probable that large volumes of fine-grained sediment will be flushed out of SCR and damage the quality of rearing habitat and reduce the population of steelhead in the reach below SCD.

STATUS OF STEELHEAD IN THE CARMEL RIVER

Before 1983, the steelhead run was primarily supported by habitat in the river and tributaries upstream of Robles del Rio where permanent, year-round streamflow and substrate conditions are suitable for juveniles throughout the summer. Some adults spawned in the river below Robles del Rio, but in most years the progeny died when the river dried up during the summer. In 1983, DFG, Cal-Am, and MPWMD began negotiating annual Memorandum of Agreements (MOAs) that specify minimum streamflow releases from San Clemente Dam. Since 1988, the scope of this agreement has been extended to include the following elements:

- Specifications for the maximum diversion that is allowed through Cal-Am's Carmel Valley Filter Plant during summer months[4];
- A schedule for apportioning the spring inflows to fill San Clemente Reservoir, minimize diversions from the reservoir, and maximize releases to the river[5];
- A schedule of releases and diversions for the late fall/winter period;
- A maintenance pumping schedule for Cal-Am wells upstream of the Narrows (river mile 9.5); and
- A provision to pump Cal-Am wells in the lower Carmel Valley (Aquifer Subunits 3 and 4) beginning with the well farthest downstream and progressing upstream as water demand increases.

The goal of the MOA is to provide the maximum amount of juvenile habitat in the reach upstream of the Narrows, consistent with the limited amount of surface storage available in Los Padres Reservoir and Cal-Am's goal to divert water at San Clemente Dam for its municipal system during the high flow season.

Historical Decline in Adult Steelhead

[4] Since 2002, the maximum diversion rate from San Clemente Dam through the CVFP has been set to zero during the summer low-flow season, in accordance with the September 2001 Conservation Agreement (CA) between NOAA Fisheries and Cal-Am. For purposes of the CA, the low flow season begins when streamflow is below 20 cfs for five consecutive days at the MPMWD Don Juan gaging station and ends when the streamflow is greater than 20 cfs for five consecutive days.

[5] Beginning in 1997 the flashboards at San Clemente Dam were held down in an effort to reduce the temperature of water released from San Clemente Dam and to improve downstream passage for juvenile steelhead. Beginning in summer 2003 the flashboards were permanently decommissioned with implementation of the Interim Drawdown Project at San Clemente Dam. The goal of the IDP is to reduce the risk to downstream lives, if the dam failed during an earthquake. This is accomplished by draining water off the reservoir surface between elevation 525 (spillway height) and 514.5 (elevation of six regulating ports drilled through the dam in 2003) from May 15 of one year to February 7 of the following year.

The most recent estimate of the total steelhead run in the Carmel River was 860 adults during 1984 (Dettman, 1986). Of the total, an estimated 480 fish (56% of the run) were harvested in the lower river, and about 380 fish migrated past San Clemente Dam. During 1984, only 51 adults were trapped at the base of Los Padres Dam and transported upstream, and an unknown (but probably small) number of adults spawned in the river downstream of San Clemente Dam. Previous estimates of the run at San Clemente Dam were 395 fish in 1974 and 1,287 fish in 1975 (Snider 1983) (**Figure A-4**). A 1987 estimate was that the Carmel River could support a total run of about 3,500 adults upstream of San Clemente Dam (Kelley et al. 1987). Comparing this estimate to the actual run of 860 fish in 1984 indicates that the river produced only 25% of its full potential that year. A DFG report from 1983 arrived at a similar estimate of the percentage of decline in the run, but concluded that the basin had the potential to produce twice as many steelhead as were estimated in the 1987 report (Snider 1983). Regardless of the absolute number of adults that can be supported in the river, general agreement exists that the run had declined substantially during the 20-year period from 1974 to 1993.

Impact of the 1987-1992 Drought Period

The 1987-1991 drought and its subsequent effects, combined with diversions totaling more than inflow, affected natural opportunities for upstream migration of adults and downstream emigration of juveniles during the period from 1987 through 1992. Opportunities for upstream migration were limited in 1987 and 1991, and no outflow through the river mouth occurred in 1988, 1989, and 1990. Thus, sea-run adults were unable to migrate upstream from the ocean to spawn during those years. However, some adults from the 1987 sea run were landlocked and spawned during spring 1988 and 1989. Wild, emigrant smolts were landlocked in the mainstem and given supplemental food by members of the Carmel River Steelhead Association (CRSA) between Rosie's Bridge and the Tularcitos Creek confluence. Some of these wild fish reached sufficient size to spawn and were detected during spawning season at San Clemente Dam during the drought years without flow to the ocean.

The lack of sea-run adults during 1988-1991, critically low flows during summer and spring months combined to reduce the population of emigrating smolts to remnant levels. During late winter and spring of 1989, 1990, and 1991, the CRSA and MPWMD operated smolt migration traps and captured emigrating smolts in the river below the Narrows. Fish were then transported to the lagoon or Carmel Bay and released. During spring 1989, a total of approximately 200 smolt-sized juveniles were trapped or captured in the lower river. During spring 1990, a total of 162 smolts were captured, with most of the population emigrating during March. During spring 1991, MPWMD staff rescued or trapped a total of 700 smolt-sized steelhead. During 1989-1991, some smolts were placed in the lagoon, most were released into the ocean, and some were used by the CRSA in its wild brood stock program. Annual production of only 150-700 smolt-sized fish during 1989, 1990, and 1991 was the result of insufficient numbers of adult sea-run fish spawning in the river during 1987, 1988, 1989, and 1990.

Recovery of Steelhead Population since 1993

More recently, the steelhead population has been recovering from the effects of the 1987-1992 drought. Since 1991, MPWMD has monitored the number of adult steelhead passing San Clemente Dam and surveyed the population density of juvenile steelhead at several reference stations in the mainstem below Los Padres Reservoir.

Adult Steelhead Run at San Clemente Dam The 1997, 1998, and 2001 totals were the highest counts at San Clemente Dam since 1975 (**Figure A-4**). During the period from 1962 through 1975, visual counts of adult steelhead at San Clemente Dam averaged 780 fish and ranged from a low of 94 fish in 1972 to 1,350 fish in 1965. The index from the 1962-1975 period was six times the average count for the 1988-1996 period, indicating that adult returns had not reached levels commonly counted before the 1976-1977 drought or recovered from reductions caused by the 1987-1991 drought. During the past nine years (1997-2005), the number of adults averaged 573, or about 74 percent of the historical average during the 1962 to 1975 period. The number of adults has not reached historical levels, but has recovered partially from the effects of the 1987-91 and earlier drought. Since 2001, the annual number of adults has trended downward with counts ranging from 328 to 388 (**Figure A-4**). This trend indicates that environmental factors continue to severely limit the recruitment of adults.

Juvenile Population Surveys Since fall 1990, MPWMD has surveyed the juvenile steelhead population in the Carmel River below Los Padres Dam. This information is crucial in assessing the success of adult reproduction and in determining whether freshwater habitats are fully seeded with juvenile steelhead. The population is surveyed at eight stations in the 15-mile-long reach between Robinson Canyon Road Bridge and Los Padres Dam. In this reach, the population density has increased from near zero in 1989 to recent annual averages ranging from 70 to 195 fish per 100 lineal feet of stream (**Figure A-5**). The recent densities are similar, or slightly higher, than densities in other coastal streams in Central and Northern California.

LISTING OF STEELHEAD UNDER FEDERAL ESA

In August 1996, the National Marine Fisheries Service (NOAA Fisheries) published a notice in the Federal Register summarizing its status review of steelhead (*Oncorhynchus mykiss*) populations in Washington, Oregon, Idaho and California. NOAA-Fisheries identified 15 geographic Evolutionarily Significant Units (ESUs) within the species range, six of which are in California. The 15 steelhead groups of populations were categorized on the basis of genetic similarity and similarity in life history patterns correlated to rainfall patterns and topography. As a result of its initial review, NOAA Fisheries proposed five ESUs for listing as threatened and five more for listing as endangered under the federal ESA. Endangered status means that steelhead within the listed ESUs were believed likely to become extinct without protective action. A threatened listing means that steelhead within the designated ESUs were believed likely to warrant listing as endangered in the foreseeable future unless conditions for the ESUs were improved.

On August 18, 1997, NOAA Fisheries listed steelhead in four ESUs as threatened species and steelhead in two ESUs as endangered species. Listing decisions affecting steelhead in other ESUs were deferred while NOAA-Fisheries evaluated additional scientific information. On March 19, 1998, NOAA Fisheries listed two additional ESUs as threatened (Lower Columbia River and Central

Valley, California) and determined that listing was not warranted in two ESUs (Klamath Mountains Province and Northern California). On March 25, 1999, NOAA Fisheries issued another final rule listing steelhead in the Middle Columbia and Upper Willamette River ESUs as threatened. Following additional review of conservation measures that were initially described but never implemented by the state of California, NOAA Fisheries published a reevaluation and final rule on June 7, 2000, listing the Northern California Province ESU as threatened. Following a U.S. District Court decision, which determined that NOAA Fisheries decision to not list steelhead in the KMP was capricious, NOAA Fisheries reconsidered future conservation actions and new information on the status of steelhead in KMP, and again decided not to list KMP steelhead. As of September 2003, steelhead populations in ten ESUs have been listed as threatened or endangered. The 15 ESUs identified by NOAA-Fisheries and the current listing status, including date of action when appropriate, is as follows:

- Puget Sound: not presently at risk (August 8, 1996)
- Olympic Peninsula: not presently at risk (August 8, 1996)
- Southwest Washington: not presently at risk (August 8, 1996)
- Lower Columbia River: listed as threatened (March 19, 1998)
- Upper Willamette River: listed as threatened (March 25, 1999)
- Oregon Coast: Species of Concern (March 19, 1998)
- Klamath Mountains Province: not presently at risk (April 4, 2001)
- Northern California: listed as threatened (June 7, 2000)
- Central California Coast: listed as threatened (August 18, 1997)
- South Central California Coast: listed as threatened (August 18, 1997)
- Southern California: listed as endangered (August 18, 1997)
- Central Valley: listed as threatened (March 19, 1998)
- Middle Columbia River: listed as threatened (March 25, 1999)
- Upper Columbia River: listed as endangered (August 18, 1997)
- Snake River Basin: listed as threatened (August 18, 1997)

NOAA Fisheries assigned steelhead in the Carmel River to the South Central California Coast ESU, which includes all naturally spawned populations (and their progeny) in streams from the Pajaro River (inclusive), in Santa Cruz County, southward to (but not including) the Santa Maria River, in San Luis Obispo and Santa Barbara Counties. It includes rivers such as the Salinas, Carmel, Big Sur, Little Sur, and Arroyo Seco, as well as significant coastal creeks such as Willow Creek near Pigeon Point, Arroyo de la Cruz near San Simeon, and Santa Rosa Creek near Cambria.

As part of the listing process for "threatened" species under Section 4 (d) of the federal ESA, NOAA Fisheries is required to review and adopt a specific set of regulations prohibiting "take" of the species. Under this Section, NOAA Fisheries has the legal flexibility to work with state agencies and local governments in developing rules to permit or exempt activities that represent incidental (i.e., minimal, minor or inadvertent) take of the protected species, an option not available for a species with endangered status. On July 10, 2000, following extensive review and public comment, NOAA-Fisheries adopted a final set of regulations extending specific protection to salmon and steelhead ESU along the Pacific Coast. The Section 4(d) rule allows NOAA Fisheries to grant its authority to manage the listed species to state and local agencies as responsible parties. As part of the 4d regulations, NOAA Fisheries decided to exempt thirteen specific activities from the take prohibitions of the ESA. For example, take associated with sport angling and programs to rescue steelhead are exempted, subject to certain conditions.[6]

According to NOAA Fisheries, the abundance of steelhead in the South Central California Coast ESU has declined from a historic maximum of 25,000 returning adults to fewer than 500 currently.

FRESHWATER HABITAT NEEDS: CRITERIA AND THRESHOLDS OF SIGNIFICANCE

Maintenance of a large, vigorous steelhead population in the Carmel River depends on the existence of sufficient spawning and rearing habitat; suitability of flows for the upstream migration and spawning of adults, successful incubation of eggs, rearing of juveniles, and the emigration of smolts from fresh water into the ocean; and passage of adults upstream and juveniles downstream over San Clemente and Los Padres Dams. In previous EIRs on water supply alternatives the significance of potential impacts to the steelhead population was based on several criteria including streamflow needed to complete four lifecyle phases of steelhead, inundation impacts, and effects on water quality. For this EIR, the criteria have been modified to include only criteria based on changes to streamflow in the Carmel River. **Table A-1** identifies the criteria and standards of significance used in this EIR. The following four sections describe the criteria and significance thresholds for evaluating how flow changes impact four key phases of the steelhead life cycle including: upstream migration of adults, rearing of juveniles, downstream migration of juveniles during late fall and winter, and seaward emigration of smolts during spring.

The following four sections describe the criteria and significance thresholds for evaluating how flow changes impact four key phases of the steelhead life cycle including: upstream migration of adults, rearing of juveniles, downstream migration of juveniles during late fall and winter, and seaward emigration of smolts during spring.

[6] Under the 4d rules for salmon and steelhead, NOAA Fisheries defined 16 specific activities that are most likely result in unauthorized take by injuring and harming steelhead. At the same time NOAA Fisheries identified thirteen programs and activities where minor take occurs, but for which NOAA Fisheries decided the take provisions of the ESA were not necessary because the programs and activities contribute to conserving the ESU. These programs include: (1) activities conducted in accord with ESA incidental take authorization; (2) ongoing scientific research activities for a period of 6 months from the publication of this final rule; (3) emergency actions related to injured, stranded, or dead salmonids; (4) fishery management activities; (5) hatchery and genetic management programs; (6) activities in compliance with joint tribal/state plans developed within United States (U.S.) v. Washington or U.S. v. Oregon; (7) scientific research activities permitted or conducted by the states; (8) state, local, and private habitat restoration activities; (9) properly screened water diversion devices; (10) routine road maintenance activities; (11) certain park pest management activities; (12) certain municipal, residential, commercial, and industrial (MRCI) development and redevelopment activities; and (13) forest management activities on state and private lands within the State of Washington.

Upstream Migration

The flows needed for upstream migration of adult steelhead have been studied extensively, and are discussed in MPWMD Technical Memorandum 89-05, previous reports and water supply EIRs and most recently in a NOAA-Fisheries report (all hereby incorporated by reference).[7] There are three basic elements: pulses of high flows to attract adults into the river in winter (January, February, March and April); adequate river flows to transport adults upstream to spawning sites; and adequate outflows to keep the river mouth open between storms.

A key element in determining adequate transportation flows is the role of "critical riffles" - areas of the river bottom that may act as barriers for migrating fish. CDFG staff had recommended a minimum transportation flow of 40 cfs at Highway One during January, February, and March. During the early 1982s, D.W. Kelley determined that a 75 cfs minimum would be needed for fish to pass over critical riffles in the lower Carmel River. During the period from March through early May 1991, the District measured conditions at five critical riffles in the reach below Schulte Road. The results of these measurements indicated that a minimum flow of 60 cfs is needed with existing substrate conditions.

For this EIR, the impact of flow patterns on upstream migration was assessed on a daily basis using simulated daily flows from the Carmel Valley Simulation Model (CVSIM) for each alternative.[8] The minimum daily flows recommended by CDFG and D. W. Kelley for attracting steelhead were used to compare project impacts on a daily basis.[9] The basic CDFG recommendation of 200 cfs for attracting adults was used in below and above normal years. D.W. Kelley and Associates' recommendation of using attraction flows of 100 cfs in February and 75 cfs March was applied in dry and critical years.

Based on a review of historical information on the relationships between water depth and streamflow over critical riffles and NOAA Fisheries recent recommendations, a minimum transportation flow of 60 cfs is used to evaluate transportation flows in the reach below Schulte Road. This threshold was applied to daily flows during the period from December 15 through April 15 of all year types.

To rate opportunities for upstream migration, duration of the migration season and the number of days with attraction flows were tallied for each alternative during the 1958-2002 period. An impact of project operations was considered significant if the duration of the migration season (stratified by year type) or the number of attraction days was reduced below a threshold based on level that would have occurred under natural conditions, <u>or</u> if the percentage of years without attraction flows exceeded seven percent (which corresponds to performance under natural conditions).

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7 D. H. Dettman, <u>Evaluation of Instream Flow Recommendations for Adult Steelhead Migration in the Lower Carmel River</u>, Technical Memorandum 89-05, Monterey Peninsula Water Management District, Oct. 1989; W. M. Snider 1983, op. cit.; D. H. Dettman and D. W. Kelley, 1986, op. cit.; NOAA-Fisheries, Instream Flow Needs for Steelhead in the Carmel River, Bypass flow recommendations for water supply projects using Carmel River waters, Southwest Region-Santa Rosa Office, June 2002.

8 Daily flows for a 45-year period of historical record from Water Years 1958 to 2002 were used for evaluations in this EIR, although flows can be modeled for a 100-year reconstructed record using the Carmel Valley Simulation Model.

9 CDFG, 1986, op. cit.; D. H. Dettman and D. W. Kelley, 1986, op. cit.

Flows for Rearing Juvenile Steelhead

The quality and quantity of rearing habitat for juvenile steelhead is directly influenced by streamflow. The results of several studies indicate summer habitat is a crucial factor that limits the juvenile steelhead population.[10] For this EIR, the impact of water supply project operations on juvenile rearing habitat was examined in two reaches of the Carmel River: the 8.6-mile reach from Highway One to the Narrows and the 9.0-mile reach from the Narrows to San Clemente Dam.

Criteria and Thresholds of Significance for Rearing Juveniles Downstream of the Narrows: Under existing conditions, streamflow downstream of the Narrows often recedes rapidly during late spring and early summer due to reduced inflow from the upper watershed and increased groundwater pumping in the lower Carmel Valley. Streamflow usually ceases by early summer at the MPWMD Highway One gage and by mid- to late summer at the USGS Near Carmel gage. Juvenile habitat in the lower river is reduced to critical levels at flows of about one cfs; pools become separated by long, shallow glides and riffles. Below one cfs, the continuity of the river is broken, and by the end of summer the riverbed is dry. This situation impacts juvenile steelhead by restricting their movement, by isolating them in discontinuous pools, and finally by suffocation as the pools dry up.

To assess the tendency of each alternative to result in a discontinuous river, the daily CVSIM results were used to determine how often summer flows would recede below a threshold of one cfs at the Near Carmel gage. For this EIR, a significant adverse impact is defined as an increase in the number of days with flow less than 1 cfs at the Near Carmel gage, as compared to the simulated natural condition. The District record of historical simulated unimpaired flow indicates that the summer flow would drop below one cfs during 64 percent of the 1958-2002 period under natural conditions. This percentage accounts for estimated inflow to the lower Carmel Valley, corrected for evapotranspiration from existing vegetation.

Criteria and Thresholds of Significance for Rearing Juveniles in the Reach from the Narrows to San Clemente Dam: The MPWMD developed methods to estimate the quality and quantity of rearing habitat for young-of-the-year and yearling steelhead in the reach between the Narrows and San Clemente Dam at flows ranging from 5 to 50 cfs.[11] **Figure A-6** illustrates the relationship between rearing habitat and streamflow in this reach. For this EIR, the relationship in Figure 5-6 was applied to the minimum mean monthly flow at the Narrows for each dry season in the 45-year hydrologic record.[12] A significant impact was defined on the basis of a paired t-test of minimum annual rearing habitats available with each alternative versus natural conditions.

Fall Downstream Migration

In the Carmel River, the initial flows of the water year spill over San Clemente Dam and percolate into the aquifer downstream of it. At the same time, many juvenile steelhead that have reared upstream or in the vicinity of San Clemente Dam begin to move downstream and occupy habitats in the lower Carmel River. Thus, a portion of the juvenile steelhead that migrate into the reach downstream of the Narrows face a risk of being isolated and stranded as flows decline following the peak of each storm in late fall and winter. The problem is exacerbated during years when the Carmel Valley aquifer is drawn

10 W. M. Snider, 1983, op. cit.; D. H. Dettman and D. W. Kelley, 1986 op. cit

11 D. H. Dettman and D. W. Kelley, 1986, op. cit.

12 The minimum mean monthly flow for each year was calculated from the sequence of monthly flows for the summer dry season, extending from June through December.

down during the preceding summer or during years when rain and runoff is insufficient to fill the lower aquifer subunits.

For this EIR, the risk of stranding steelhead was defined as a "high level" whenever simulated daily streamflow at the Near Carmel gage or at the Narrows declined to less than one cfs following storms that were likely to stimulate downstream migration. The date of migration was determined by examining simulated daily inflows to Los Padres and San Clemente Reservoirs and flow at the Narrows.

Tallying the simulated number of days with a “high risk” during the period from 1958 through 2002 compared the severity of the isolation risk with each water supply alterative. For each year, the impact threshold was considered significant if more than one simulated high-risk day occurred. This threshold is based on the District's simulated record of natural flows into the lagoon. As with most perennial streams in central California, the record of natural flows shows that once the first storms of the year saturate the aquifer and produce a pulse of flow in the lower valley, the Carmel River would continuously flow to the ocean for the remainder of the wet season. The fact that flows no longer respond in this way is a major constraint to the steelhead population because a high percentage of larger, older juveniles naturally migrate downstream, without knowing that the river will dry-up underneath them.

Spring Seaward Emigration

Adequate April and May streamflow are needed for rearing steelhead smolts below San Clemente Dam and for their emigration from the lower river into the ocean. Previous studies indicate that the quality and quantity of habitat and the survival of emigrating juveniles is related to the magnitude of spring runoff.[13]

Prior to 1960, the diversion of spring flows at San Clemente Dam was a minor problem for emigrating steelhead because no major diversions occurred downstream of the surface diversion at the dam. Following 1959, when Cal-Am began to consistently pump wells in the Carmel Valley alluvial aquifer, there was a gradual, but steady increase in water demand that was met with extractions from the aquifer. As groundwater production increased, spring flows in the lower river declined. The decline was further exacerbated by the raising of flashboards at San Clemente Dam each spring, which caused reductions in streamflow and drying of the river below the Narrows.

The impact of these operations on steelhead was documented as early as 1975, when Snider (1983) observed, "A sudden reduction in flow from the lower river in June 1975 resulted in the stranding and eventual loss of numerous downstream migrants, demonstrating that migrants were in the lower river at that time, and that abrupt reductions in flow in June are harmful."[14] Such flow reductions during April and May were even more harmful because recent studies of smolt emigration at Los Padres Dam show that many from the upper Carmel River emigrate downstream during April and May.[15]

13 D. H. Dettman and D. W. Kelley, 1986, op. cit.; W. M. Snyder, 1983, op. cit.
14 W. M. Snyder, 1983, op. cit.
15 MPWMD conducted smolt emigration studies at Los Padres Dam in 1992, 1996, and 1999. Daily counts of steelhead smolts trapped during these years showed large numbers of smolts emigrating during April and May of 1996 and 1999.

Standards of Significance for Smolt Emigration

Monthly Criteria: Kelley and Dettman developed criteria for mean April through May flows to assess rearing habitat for yearling steelhead and the success of smolt emigration into the ocean.[16] The criteria are based on a correlation between historical adult counts at San Clemente Dam and spring flows at the Near Carmel gage, rearing habitat versus flow relationships for yearling-sized steelhead in the reach upstream of the Narrows, and observations of the flows needed to keep the river mouth open during the spring.

To compare impacts of water supply alternatives on steelhead emigration, these monthly criteria were applied to the simulated April-May flows for the period from 1958 to 2002. The frequency of years in each category and the number of years with "zero", "critical" or "poor" conditions were tallied for each alternative. Project impacts were defined as significant if operations increased the percentage of the April-May periods with "zero," "critical" or "poor" emigration conditions as compared to simulated natural flows. The District's simulated record of natural (unimpaired) flows indicates that 13 percent of April-May periods would have been rated as "zero," "critical" or "poor."

Daily Criteria: To supplement the analysis based on bimonthly criteria, the number of days with a high risk of stranding in April and May was assessed for each alternative. The severity of the isolation and stranding risk was indexed by tallying the annual number of days with flows less than 10 cfs during the April-May period from 1958 to 2002. A significant impact was defined as more than five days with flows less than 10 cfs during the April-May period. This is based on the simulated natural flow record, which indicates that steelhead smolts are subject to isolation risk for an average of six days per year.

IMPACTS AND MITIGATION MEASURES FOR FRESHWATER HABITATS

This impact assessment addresses how the operation of Phase 1 of MPWMD's ASR project would affect streamflow patterns during four key phases of the steelhead life cycle. All assessments of operations are compared with the simulated flow regimen for unimpaired conditions (flows that would have been present without human-made facilities or development of groundwater and surface water supplies for beneficial uses).[17] This assessment accounts for the fact that even under unimpaired conditions, flows are not always ideal or optimum. In addition, the use of unimpaired flows as a standard is preferable to using historical or existing flows because flows during the last 30 years have not been adequate to support a self-sustaining steelhead population. The current run of 500-1,000 fish has been maintained by implementing efforts to reconfigure Cal-Am's diversions, rescuing juvenile fish, carrying out a brood stock program during the last drought, and constraining water production in the Carmel River Basin. For this draft EIR, an assumption was made that existing maximum annual Cal-Am production would be15,285 AF per year with average production from the Seaside Basin ranging from 3,670 AF/year with the No Project to 4,720 AF/year with Phase 1 ASR. As a consequence of increasing production from the Seaside Basin during the summer and an diversion schedule that allows increased diversions from the Carmel River Basin during winter months, the Cal-Am production from the Carmel Valley Aquifers is reduced during summer months,

16 D. H. Dettman and D. W. Kelley, 1986, op. cit.
17 The term "natural condition" as used throughout this chapter refers to simulated unimpaired conditions.

but increased during winter months. In general, the net effect of these operational changes is to increase summer streamflow and potentially improve environmental conditions in the Carmel River.

All of the analyses first identify impacts and then address mitigation measures that may reduce the damage to a less-than-significant level; the overall impact with mitigations is then identified. A similar evaluation is performed for each alternative.

IMPACTS OF PHASE 1 ASR PROJECT

AR 5-1: Reduced Flows for Adult Upstream Migration

Compared to natural conditions, operation of the Phase1 ASR would reduce opportunities for upstream migration by limiting the duration of attraction flows and shortening the duration of the migration season. This is considered a significant impact. During above normal and dry hydrologic years, project conditions would be significantly better than conditions under the Existing No-Project.

On average, the Phase1 ASR would provide 38 days of attraction flows (the minimum flows, ranging from 75 cfs to 200 cfs depending on year type, that induce steelhead to enter the river from the ocean) and would provide at least two weeks (14 days) of attraction flows during the average dry, below-normal, above-normal, and wet years (**Figure A-6**). The Phase1 ASR would have fewer attraction events than would occur under natural conditions, with most of the shortages occurring during dry and critically dry years; on average, attraction flows occur on 14 days during dry years and two days during critically dry years, compared to an average of 21 days in dry years and 8 days in critically dry years under natural conditions. Although small, these differences are considered a significant impact because steelhead migrate over a three- to four-month period, so reductions of a few days in years with naturally overwhelming constraints will increase the probability that a significant portion of the potential run will not be attracted into the river. Ultimately, this can limit the number of adults that successfully spawn and affect the timing of the run in subsequent years. Under these conditions, the rearing habitat upstream of San Clemente Reservoir would be insufficiently seeded with juvenile steelhead. The resulting lower production of smolts would be inadequate to replace the parent adult population, and therefore adult returns in the following years would decline below self-sustaining levels.

On average, the duration of the migration season (when transportation flows are adequate to enable steelhead to travel upstream) would be 60 days, which is ten days less than under natural conditions and essentially the equal to No-Project conditions. Adverse impacts (e.g., a greater potential for unsuccessful migration) would occur primarily during dry and critically dry years, when the average duration would be reduced by seventeen and eight days, respectively (**Figure A-7**). This impact is most often manifested during severe, multiple-year droughts (e.g. 1987-1992).

In comparison to natural conditions, the performance of the Phase1 ASR in terms of attraction events and transportation flows is acceptable in all but certain dry and all critically dry years, when the project retains the significant impacts associated with historical levels of pumping that reduce winter flows. As stated above, this impact would be most often manifested during severe, multiple-year droughts. At a Cal-Am annual demand level of 15,285 AF, the impacts during dry and critically dry years might not be able to be mitigated without implementing Phases 2 and 3 of ASR, or obtaining water from an alternate source. Therefore, this impact is considered significant.

<u>Mitigation Measure AR 5-1: Implement Artificial Attraction or Broodstock Measures.</u> In previous water supply EIRs, two measures were discussed as mitigation for impacts on adult migration during drought years:

- artificially attracting adult steelhead and transporting them above the Narrows, where flows are sufficient for migration and spawning, and
- rearing a contingent of adult steelhead in a saltwater facility for release into the river if flow conditions are insufficient for attraction and transportation of adults through the lower river.

Although it may be technologically feasible to artificially attract steelhead into the lagoon, significant challenges would occur with this alternative including institutional and physical constraints on constructing the required facilities at Carmel River Beach Preserve and another pipeline between the river mouth and an unknown location downstream of the Narrows. Additional engineering studies would be required before this mitigation could be implemented. During 1987-1992, the CRSA operated a successful broodstock program. That program emphasized hatchery production and planting of steelhead fry and yearlings. Although this program appears to have been successful, DFG does not favor this approach because of the required reliance on hatchery production.

If DFG and NOAA Fisheries concurred, MPWMD might consider funding a broodstock program for emergency use during extended droughts, but for this Draft EIR, additional mitigation measures are not planned.

If either of the two proposed measures were implemented, then impacts on upstream migration would be reduced, but full mitigation would be unlikely. Thus, the impact on upstream migration is considered to be an infrequent, but unavoidable, significant impact.

Impact AR 5-2: Effects on Flows for Juvenile Rearing Habitat

Although the Phase 1 ASR has no direct impact on the ability to release water from Los Padres Dam, but it influences streamflow via increased direct diversion during winter months when excess flow is available and reduced groundwater pumping during summer months when the stream is fully appropriated. The influence varies depending on generalized location, upstream or downstream of the Narrows. Below the Narrows, the production of Phase 1 ASR water stored in Seaside offsets Cal-Am production that would otherwise occur, thereby reducing Cal-Am groundwater production in the lower Carmel Valley and potentially increasing the magnitude, extent and persistence of streamflow below the Narrows. Upstream of the Narrows, streamflow during the dry season is affected directly by the amount of water stored in Los Padres Reservoir, by the relative wetness of the water year, and by the absolute level of base-flow from the upper drainage. The Phase 1 ASR has little, or no affect on these factors, so dry season streamflow at the Narrows is essentially equal under the Phase 1 ASR and the Existing No Project operations.

Near Carmel to the Narrows Compared to natural flow conditions, the operation of the Phase 1 ASR would approximately triple the duration of risk that juvenile steelhead are stranded in the lower river during summer months. On average, the duration would increase from 47 to 135 days per year and range from 53 days in above normal years to 202 days in critically-dry years (**Figure A-8**). This is considered a significant impact. While significant compared to natural conditions, the Phase 1 ASR would reduce the risk of stranding, as compared to the Existing No Project alternative, reducing it from 108 to 53 days in above normal years and from 211 to 202 days during critically-dry years (**Figure A-8**).

While the duration of risk is high with the Phase1 ASR, the extent of viable habitat in this reach may be improved during the first 15-20 years of project operation, depending on surface storage in Los Padres Reservoir. The persistence and extent of habitat in this reach is a function of streamflow at the Narrows and the rate/distribution of groundwater pumping in Aquifer Subunit 3 (AQ 3). During the early years of operation, sufficient flow will pass the Narrows to provide several miles of habitat downstream of the Narrows. However, with time the storage in Los Padres Reservoir will be depleted as it fills with sediment, and in 2-3 decades the flow at the Narrows will decline below the level of groundwater pumping associated with daily groundwater production in the upper region of AQ 3. At that juncture, the persistence and extent of aquatic habitats downstream of the Narrows will fade with brief periods of early summer flow over a mile or so of stream.

Narrows to San Clemente Dam Compared to natural flows, the operation of the Phase1 ASR would maintain similar degrees of risk that fish would be stranded in this reach. During the first 15-20 years of operation, streamflow at the Narrows would be higher than under natural conditions, but after this initial period the flows at the Narrows will decline below natural levels (**Figures A-9a & A-9b**). As indexed by habitat values, this flow scenario provides an average of 1.2 million RI units of habitat for age 0+ juveniles and 0.4 million units for yearlings, slightly less than under natural conditions. The benefit during the initial 15-20 years is reduced to a negative impact later on, as the juvenile habitat is reduced to essentially zero when the streamflow drops to lethal levels, especially in below normal, dry and critically dry years (**Figures A-10a & A-10b**). This is considered an indirect, significant impact.

Mitigation Measure AR 5-2: Develop a Project to Maintain, Recover, or Increase Storage in Los Padres Reservoir and If Needed, Continue Funding Program to Rescue and Rear Isolated Juveniles

MPWMD will encourage and work with Cal-Am, DFG, and NOAA Fisheries to investigate and develop a project to improve summer flows and the quality of releases by maintaining, recovering, or increasing surface storage capacity in existing Los Padres Reservoir. In the meantime, MPWMD will continue operation and funding of the program to rescue and rear juveniles that are isolated downstream of Robles del Rio. Without significant progress in recovering storage capacity and obtaining an alternate source of water, this program will be needed in most years, especially as Los Padres Reservoir continues to fill with sediment and the ability to maintain flow releases continues to diminish.

Impact AR 5-3: Improved Flows for Fall/Winter Downstream Migration

During the late-fall and early winter period, the Phase 1 ASR would increase the risk that steelhead are stranded, as compared to natural conditions. But, this risk would be significantly less than under No Project conditions. Compared to No Project conditions, the duration of risk would be reduced by three to thirteen days, depending on water year type (**Figure A-11)**.

Mitigation Measure AR 5-3: Continue Existing Rescue Program

Though reduced compared to the No Project, the duration of isolation and stranding risk with Phase 1 ASR (8 to 17 days depending on year type) is sufficient to warrant continuation of the MPWMD program to rescue juvenile steelhead during the downstream migration period in fall and early winter. If ASR is developed at higher levels of diversion and storage or Los Padres storage capacity is restored, it may be possible to eliminate the fall/winter rescue program. In the meantime, MPWMD will continue to rescue fall and early winter migrants.

Impact AR 5-4: Maintenance of Flows for Spring Emigration

Compared to natural conditions, the Phase 1 ASR would reduce opportunities for smolt emigration during most below normal years and all dry and critically dry years. Opportunities for successful smolt emigration would be most affected during dry and critically-dry years with average streamflow declining by 13 to 17 cfs (**Figure A-12**). Under these conditions, the percentage of time with poor, critical, or zero conditions for emigration would be sufficient to cause substantial reduction in survival of smolts, as the fish would be either stranded in the lower river, or trapped in the Carmel River Lagoon. It would adversely affect opportunities for emigration most often in critically-dry years, when smolts would be unable to emigrate to the ocean during most of the April-May period (**Figure A-13**). Compared to Existing No Project conditions, the Phase 1 ASR would slightly improve opportunities and reduce the risk of isolating and stranding steelhead smolts (**Figure A-14**). This reduces impacts, but not to the threshold associated with natural conditions. Because of this, the impact on smolt emigration is considered a significant adverse impact.

Mitigation Measure AR 5-4: Investigate and Implement Ways to Further Improve Flows and If Needed, Continue Trapping, Transporting, and Transplanting Smolts

MPWMD will work to further investigate, develop, and implement additional phases of ASR to indirectly improve spring flows by increasing Cal-Am production capacity outside the Carmel River Basin. The most promising approach appears to be further modifications of the Cal-Am's distribution system and construction of additional ASR wells to allow additional injection of surplus Carmel River Basin water into the Seaside Basin and simultaneous use of Cal-Am's Seaside Wells and MPWMD's new Seaside Injection/Recovery Well(s). If these wells were used simultaneously during periods of low flow in the Carmel River, the reduction in pumping from Carmel Valley would indirectly boost flows in the lower river and help to reverse the impacts. Full mitigation for operational impacts may require continued implementation of the current program for trapping, transporting, and transplanting spring emigrants, when flows are insufficient for emigration, especially during critically-dry years.

With implementation of flow requirements and the transport program, the impact on downstream migrants would be mitigated to a less-than-significant level compared to natural conditions and be beneficial compared to the Existing No Project alternative. Some stress to the fish may result from trapping and handling smolts; however, the number of years and duration during which this activity is needed may be reduced by increasing production from Seaside; therefore, the impact of implementing the mitigation is considered less than significant.

SUMMARY OF PHASE 1 ASR IMPACTS ON THE STEELHEAD RESOURCE

Compared to natural conditions, the flow patterns resulting from the Phase 1 ASR would substantially reduce opportunities for upstream migration. Additional mitigation measures, such as holding a contingent of spawners at Granite Canyon Marine Laboratory or artificially attracting sea-run adult steelhead, may not be practicable or institutionally feasible. Thus, if natural conditions are considered the baseline, the mitigated impact is considered significant and potentially unavoidable.

Compared to natural conditions, the Phase 1 ASR would indirectly benefit juvenile rearing habitats during the early years of operation, but without a feasible program to maintain existing storage capacity in Los Padre Reservoir, the dry season flows would eventually be reduced to critical/lethal levels during at least one-half of the years, throughout most of the lower river. While continuing the current program to rescue and rear steelhead juveniles could partially offset the impacts, full mitigation is unlikely due to the future availability of streamflow and the potential need to rescue fish from the majority of the river channel below Robles del Rio. Flows during fall/winter downstream migration season are improved compared to Existing No Project, but insufficient compared to natural conditions. Opportunities for spring emigration are similar to the Existing No Project during above normal years, but significantly reduced during dry and critically-dry years when compared to natural conditions. Potentially, it is possible to offset this impact by indirectly increasing flows with further development of Phases 2 and 3 of ASR or seasonally increasing pumping from the Seaside Basin. Even with this mitigation in place it may be necessary to continue the existing program to trap, transport and transplant steelhead smolts into the ocean.

IMPACTS AND MITIGATION MEASURES OF THE EXISTING NO-PROJECT ALTERNATIVE

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Flows for Adult Upstream Migration

Compared to natural conditions, the operation of the No-Project Alternative would substantially reduce opportunities for upstream migration by limiting the duration of attraction flows, shortening the duration of the migration season, and increasing the number of years without attraction flows.

On average, the No-Project Alternative would provide 37 days of attraction flows (minimum flows ranging from 75 to 200 cfs). However, it would provide an average of only two days in critically-dry years and twelve days in dry years (**Figure A-6**), and in 11% of years zero or one day of attraction flows would occur. Under these circumstances, it is highly unlikely that the steelhead run could migrate past San Clemente Dam or self-reproduce itself during severe, sustained droughts.

On average, the duration of the migration season would be 59 days, which is 11 days less than under natural conditions. Most of the impact would occur in below-normal, dry, and critically dry years; the average duration would be reduced by 16 days during below-normal years, 20 days during dry years, and nine days during critically dry years (**Figure A-7**). Overall, this is considered a significant impact.

Mitigation Measure: No mitigation is available that would reduce this impact to a less-than-significant level. Thus, this remains a significant unavoidable impact. A similar finding was made as part of the Water Allocation Program Final EIR certification. (An emergency program, similar to the broodstock program conducted by the CRSA, could be implemented to shorten the time needed for the population to recover from the effects of severe droughts.)

Flows for Juvenile Rearing Habitat

As discussed under the impact section for the Phase1 ASR, the flows during the low-flow season are directly influenced by releases from Los Padres Reservoir and groundwater pumping from Carmel Valley. Flow conditions and habitat for juvenile steelhead are similar to conditions with the Phase1 ASR, except that the Existing No Project condition results in poorer flows and habitat downstream of the Narrows. Upstream of the Narrows, the Existing No Project and the Phase 1 ASR provide essentially the same conditions with enhanced flows/habitats during the first 15-20 years of operation and critical/lethal flows/habitats following the early period. As with the Phase1 ASR, this indirect effect is due to the gradual loss of surface storage in Los Padres Reservoir. In general the Existing No Project would substantially reduce habitat downstream of the Narrows and strand juveniles in the lower river more often than would conditions with natural flows.

Near Carmel to the Narrows – Compared to natural flow conditions, the No-Project Alternative would increase the percentage of years during which the lower river would dry up from 64% to 96%. This is a significant impact. The Existing No Project operation would approximately triple the duration of risk that juvenile steelhead could be stranded in the lower river. On average, the duration would increase from 47 to 135 days per year and ranges from 108 days in above normal years to 211 days in critically-dry years (**Figure A-8**). This is considered a significant impact.

Narrows to San Clemente Dam – Compared to natural flows, the Existing No Project would maintain similar degrees of risk that fish would be stranded in this reach. During the first 15-20 years of operation, streamflow at the Narrows would be higher than under natural conditions, but after this initial period the flows at the Narrows will decline below natural levels (**Figures A-9a & A-9b**). On average, this flow scenario provides approximately 1.2 million RI units of habitat for age 0+ juveniles and 0.4 million units for yearlings, slightly less than under natural conditions. The beneficial impacts of higher releases during the initial 15-20 years are reduced to negative impacts later on, as the juvenile habitat is reduced to essentially zero when the streamflow drops to lethal levels, especially in below normal, dry and critically dry years (**Figure A-9b**). This is considered a direct, significant impact associated with no program for maintaining surface storage in Los Padres Reservoir.

Mitigation Measure: Continue Programs to Rescue, Transport, Rear and Transplant Isolated Juveniles; Further Mitigation May Be Required in the Future

With the Existing No-Project Alternative, MPWMD, DFG, and Cal-Am would continue to negotiate annual MOAs for the release of streamflow below San Clemente Dam. In time, ~15-20 years depending on erosion rates and deposition of sediment in Los Padres Reservoir, the release of flow from Los Padres Reservoir will not be sufficient to maintain habitats upstream of the Narrows throughout the dry season or to provide adequate flow for operation of Sleepy Steelhead Rearing Facility. Prior to that event, further mitigation measures may be needed with the No Project alternative. To this end, MPWMD will work with Cal-Am, DFG, and NOAA-Fisheries to investigate and develop a project to improve summer flows by maintaining, recovering, or increasing surface storage capacity in the existing Los Padres Reservoir. In the meantime, MPWMD will continue funding the program to rescue and rear juveniles that are isolated downstream of Robles del Rio. Based on the operation study, this program would be needed in 96% of the 45 simulated years and for approximately five months per year.

Flows for Fall/Winter Downstream Migration

Compared to natural flows, the No-Project Alternative would substantially increase the risk that juvenile steelhead would be stranded in the Carmel River downstream of the Narrows during the late fall /early winter period. On average, a high stranding risk occurs for two weeks following the first storms of the water year, with a range of zero days in dry years to 30 days in critically-dry years (**Figure A-11**).

Mitigation Measure: Feasibility of Making Special Releases. Since 1997, Cal-Am and the District have coordinated special releases from Los Padres Dam following the first heavy rains of the year. This approach has essentially eliminated risk of stranding during the late fall/early winter period; but this operation cannot be continued if storage is insufficient for making releases. Considering this, MPWMD will continue the existing program to rescue and transplant migrants during fall months.

Reduced Flows for Spring Emigration

The No-Project Alternative would adversely affect opportunities for smolt emigration by increasing the percentage of years with poor, critical, or zero emigration ratings; reducing the percentage of years with good to excellent emigration ratings; and increasing the occurrence and duration of the risk of isolating smolts in the lower river.

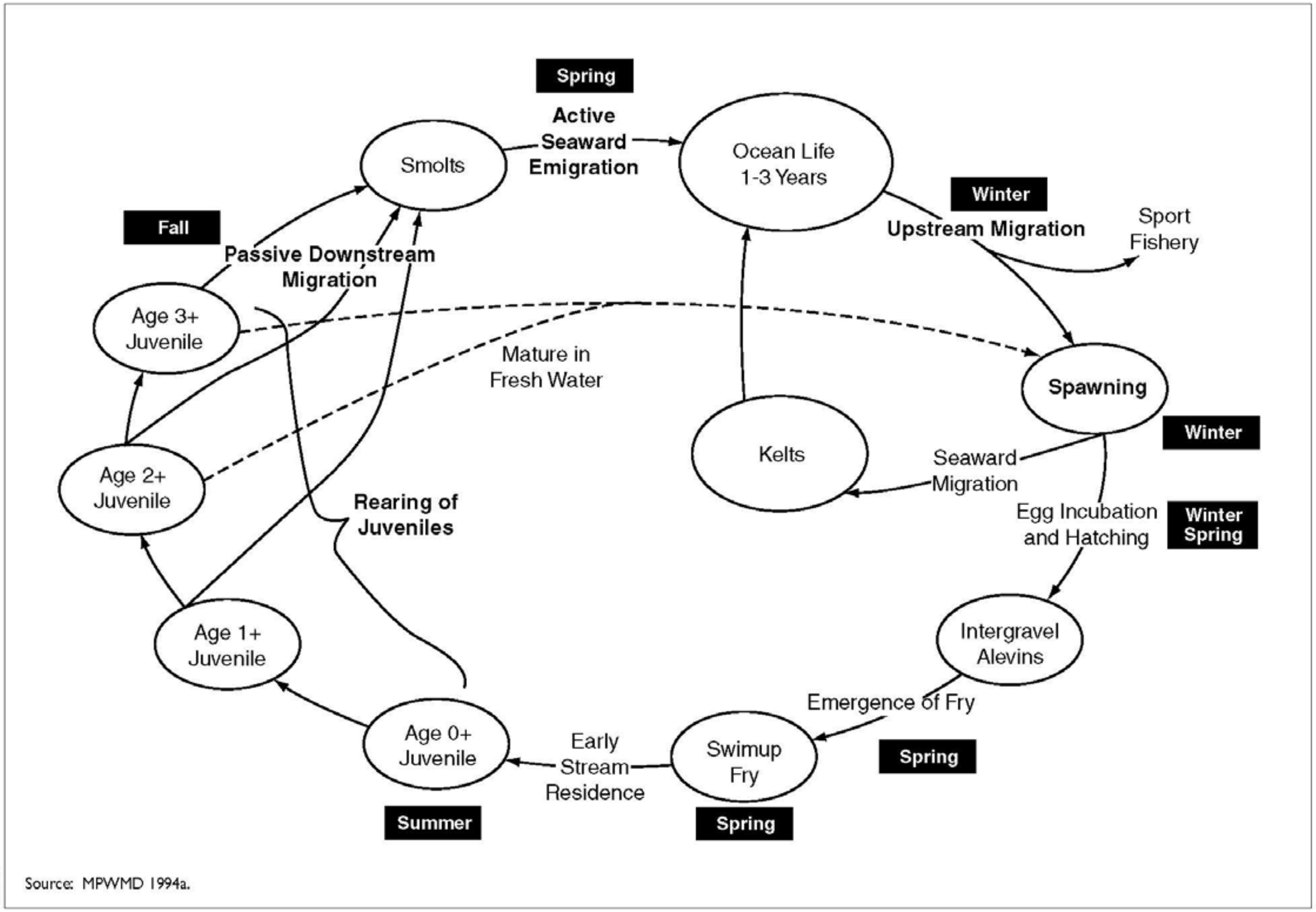
Compared to natural flow conditions, the Existing No Project would substantially reduce opportunities for smolt emigration in below-normal, dry, and critically dry years. It would increase the percentage of years with poor, critical, or zero ratings from 13% to 29% and would reduce the percentage of years with good to excellent ratings.

Compared to natural conditions, the No-Project Alternative would increase the incidence of smolts being isolated from 20% to 33% of the years in the record, and the average duration of risk in the reach between Via Mallorca and the Narrows would increase from 26 to 54 days in critically-dry years, from 6 to 19 days in dry years, and from one to seven days in below normal years (**Figure A-14**). This is considered a significant impact.

Mitigation Measure: Continue Funding Program to Trap and Transport Smolts. MPWMD will continue funding the existing MPWMD program to trap and transport smolts in below-normal, dry, and critically-dry years.

SUMMARY OF EXISTING NO-PROJECT IMPACTS ON STEELHEAD

Compared to natural conditions, the No-Project Alternative would result in significant impacts on several facets of the steelhead life cycle, including upstream migration, juvenile rearing habitats, and the risk of stranding juveniles during summer, fall/winter downstream migration, and spring smolt emigration. All of these impacts could be reduced continued implementation of the Water Allocation Mitigation Program described previously, but substantial challenges to the success of this program will occur with the gradual filling of Los Padres Reservoir. Without addressing this problem the impacts on upstream migration and juvenile rearing would be significant unavoidable impacts because streamflow under the No-Project Alternative would be insufficient to meet upstream migration and rearing habitat requirements in the lower river, particularly during dry and critically dry years. Mitigating the impacts to a less-than-significant level would require at least maintaining, and perhaps restoring the surface storage capacity in Los Padres Reservoir and carrying out a brood stock program during severe, long-term droughts. Even with these mitigations, it may be impossible to avoid intensive rescue efforts similar to those required under existing conditions, because the No-Project Alternative does not include any reduction in groundwater pumping below the Narrows.



Jones & Stokes

Figure A-1
Life Cycle of Steelhead in the Carmel River Basin

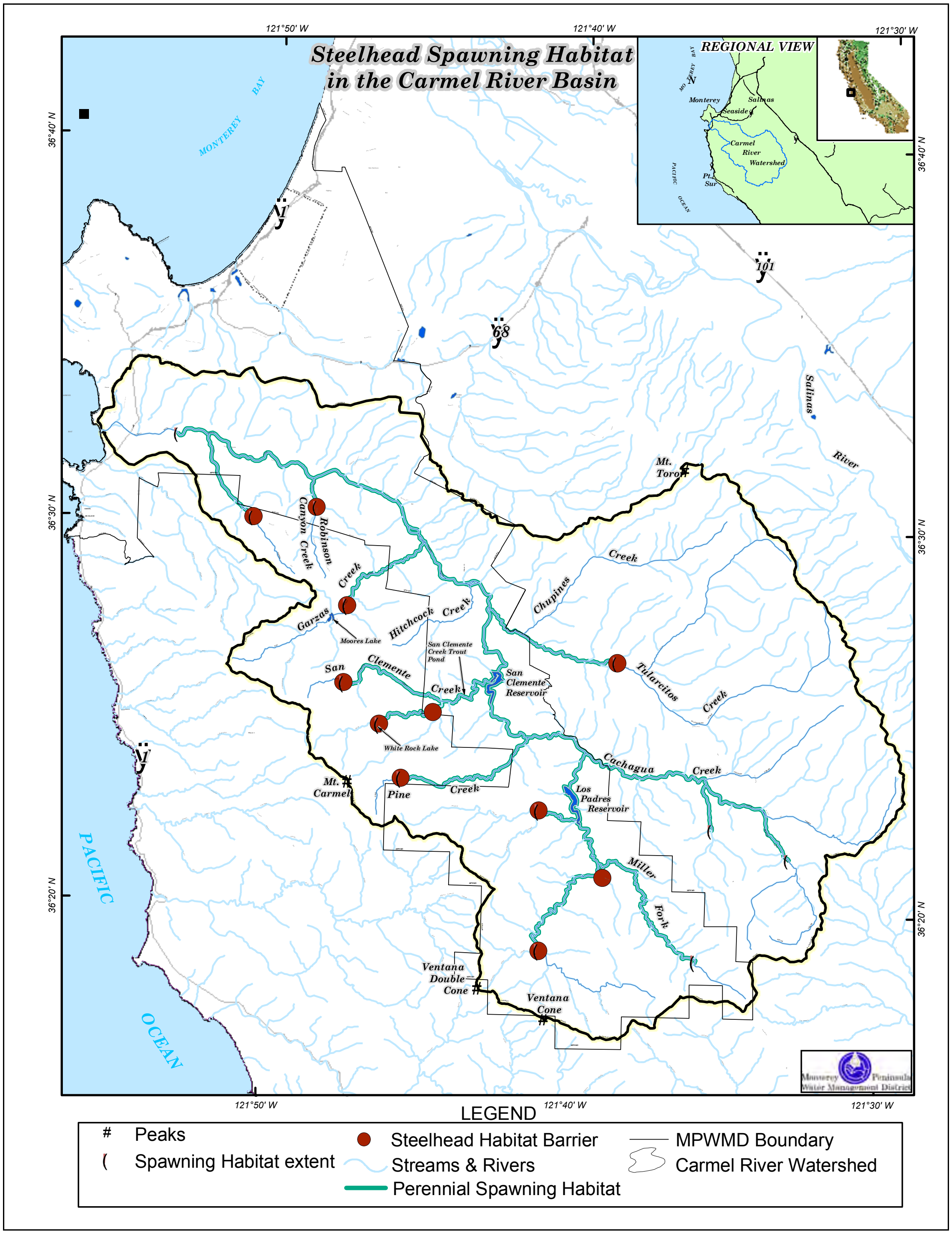


Figure A-2
Steelhead Spawning Habitat in the Carmel River Basin

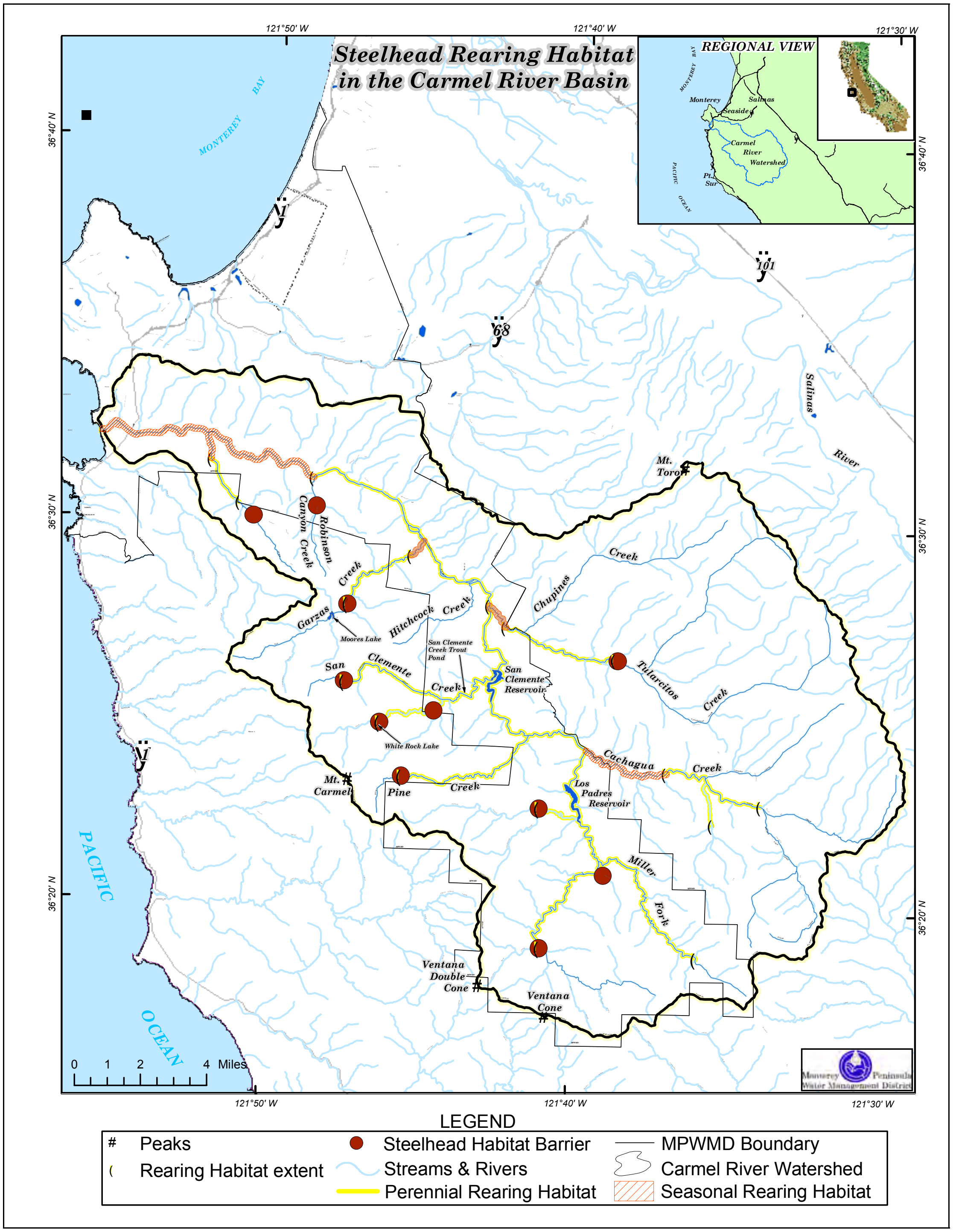


Figure A-3
Steelhead Rearing Habitat in the Carmel River Basin

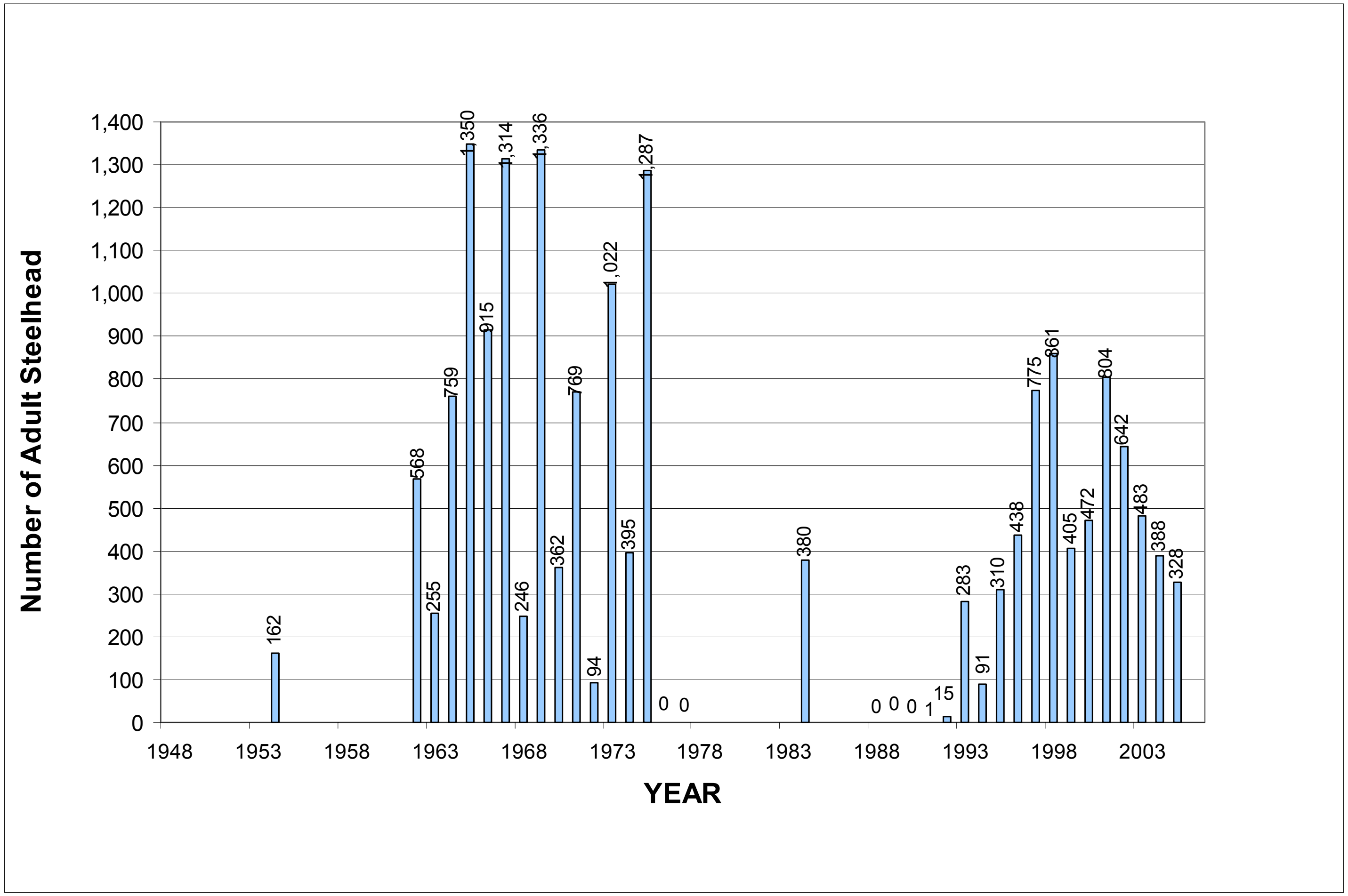


Figure A-4
Number of Adult Steelhead at San Clemente Dam (1954-2005)

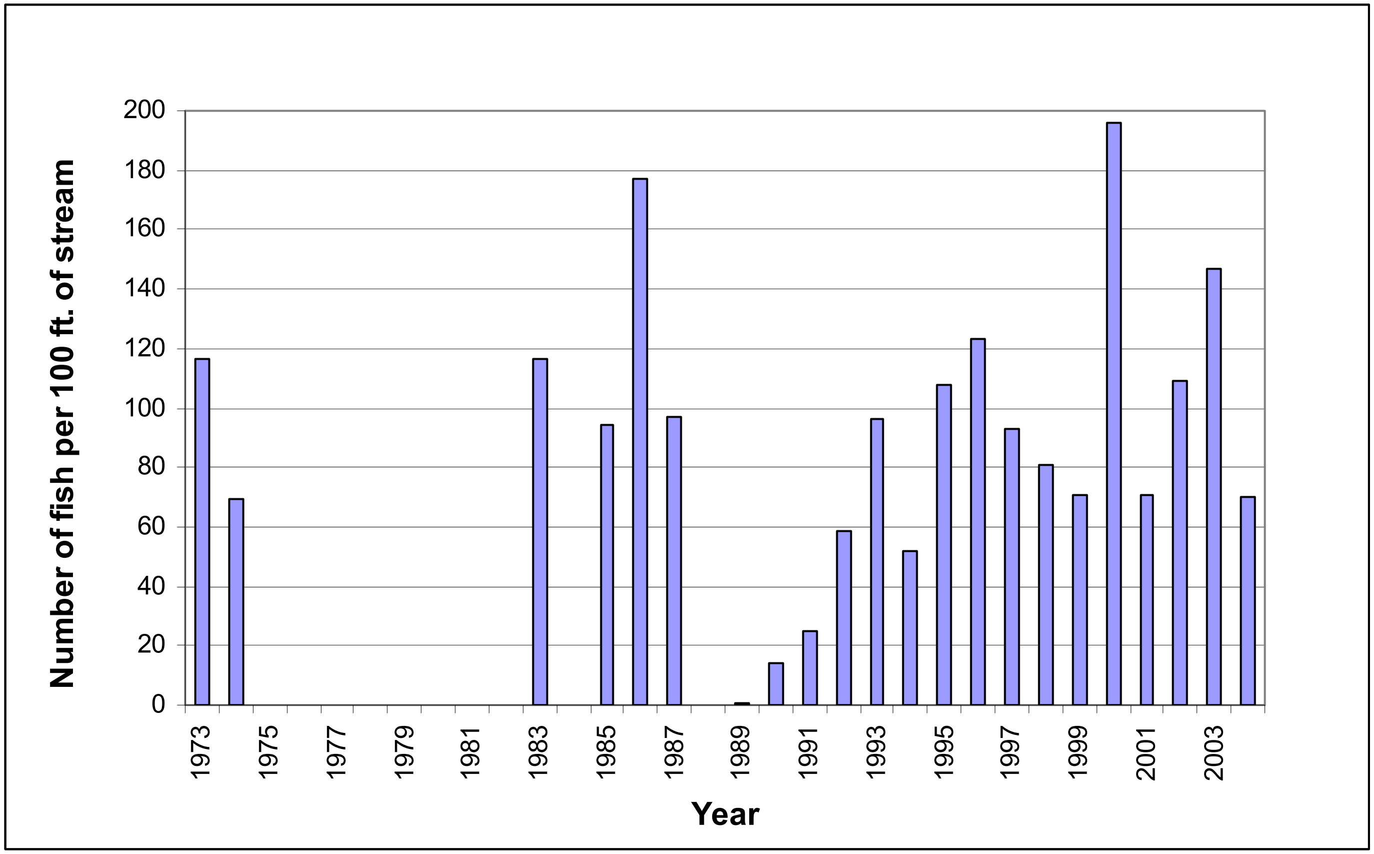


Figure A-5
Average Carmel River Juvenile Steelhead Population Density (1973-2004)

Table A-1. **Aquatic Resources Biological Significance Thresholds**

Measure	Significance Threshold
Threatened or endangered, candidate, sensitive, or special-status species	Likely to harm or harass any federally listed as threatened or endangered species, or any identified as candidate, sensitive or special-status species in local or regional plans, policies, or regulations, or by the DFG, USFWS or NOAA Fisheries.
Critical Habitat for Steelhead	Measurable alteration in the physical habitat of threatened or endangered, candidate, sensitive or special status species: For steelhead in the Carmel River this includes changes in physical habitats for rearing juvenile steelhead in two reaches (Downstream of the Narrows and between the Narrows and San Clemente Dam) during the summer months and for smolts during spring months.
Impact on Seasonal Migration Pathways	Measurable alteration in streamflow that supports migratory phases of the steelhead lifecycle including: 1) changes in the duration and frequency of flows for adult migration from the ocean into freshwater during winter months; 2) changes in duration and frequency of flows needed for downstream migration of juveniles during fall months; 3) changes in the duration and frequency of flows required for the emigration of smolts from freshwater into the ocean during spring months.

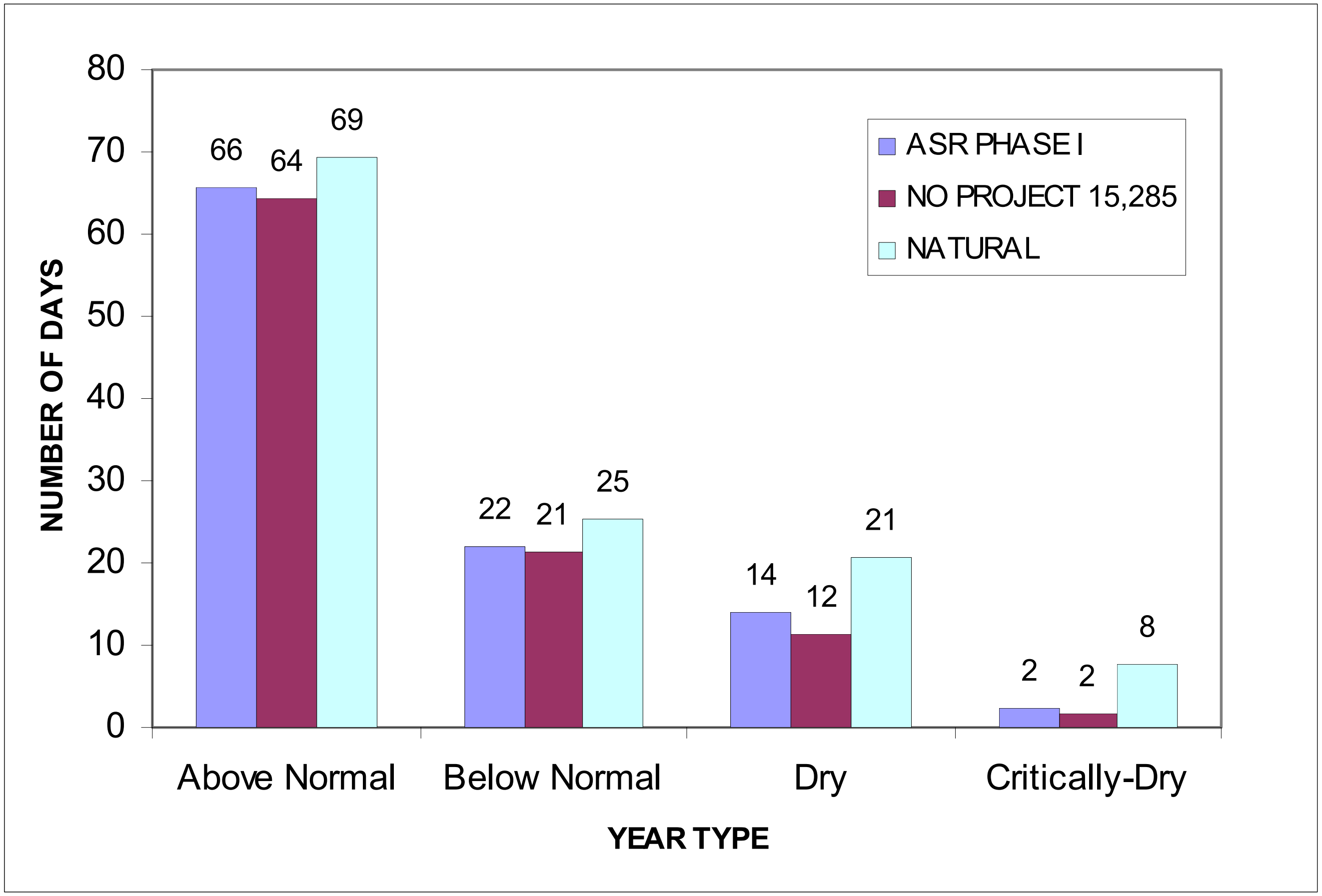


Figure A-6
Average Days per Year That Recommended Flows for Attraction of Adult Steelhead Would Be Equaled or Exceeded, by Type of Water Year

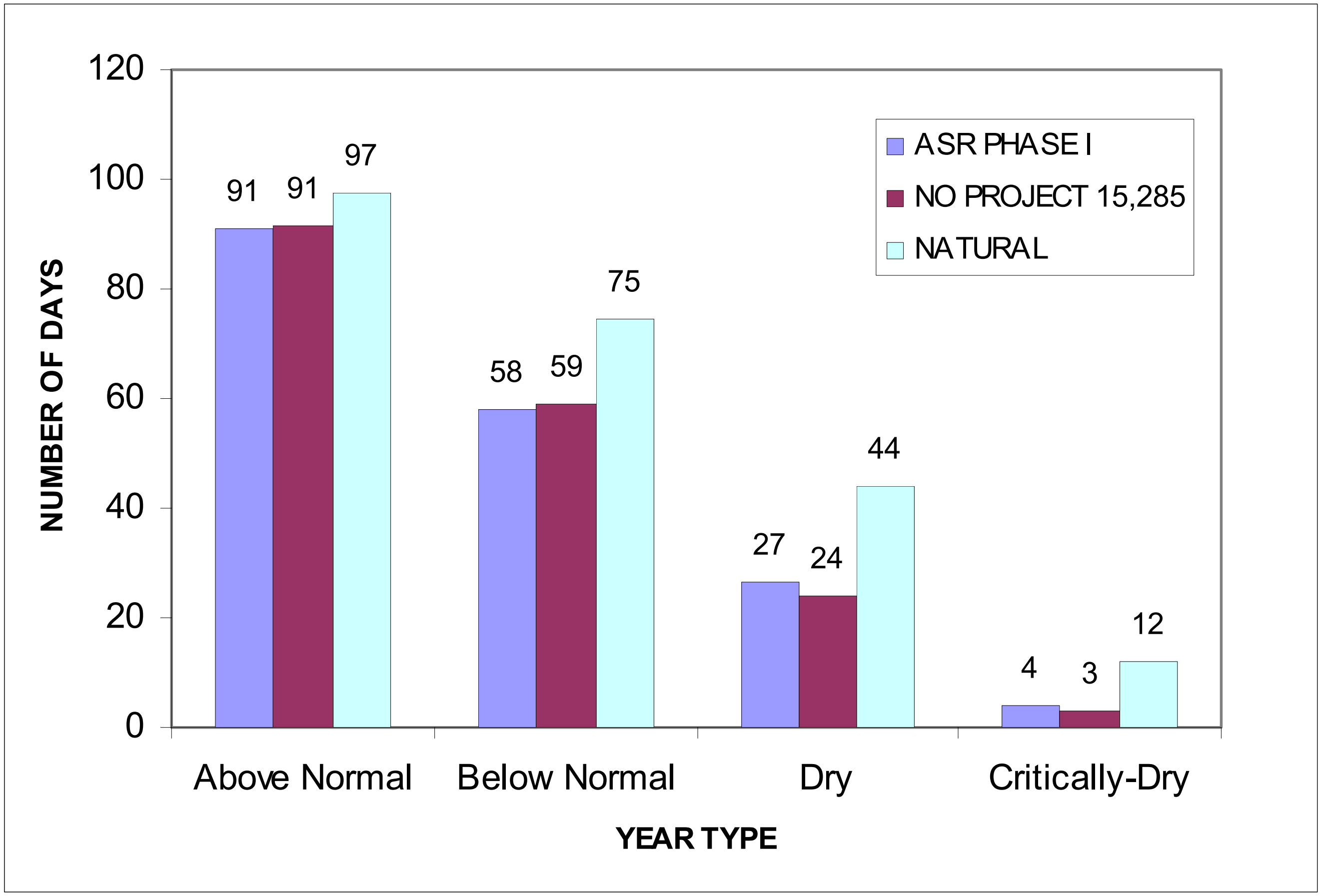


Figure A-7
Average Days per Year That Recommended Flows for Transportation of Adult Steelhead Would Be Equaled or Exceeded, by Type of Water Year

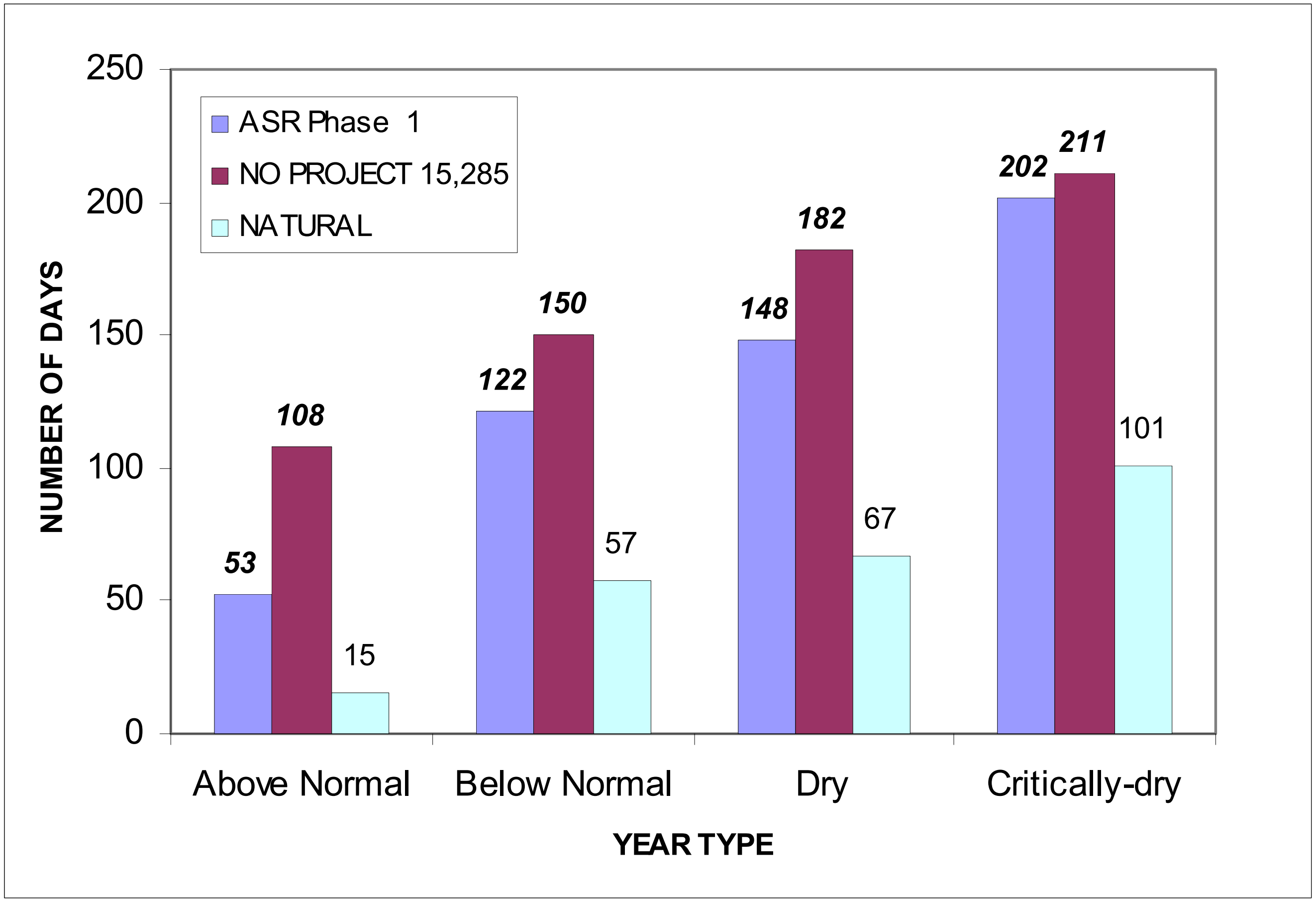


Figure A-8
Number of Days in June-December Period during Which Juvenile Steelhead Would Be at High Risk of Stranding in Reach between Via Mallorca Road and the Narrows with Alternative Water Supply Projects, by Type of Water Year, 1958-2002

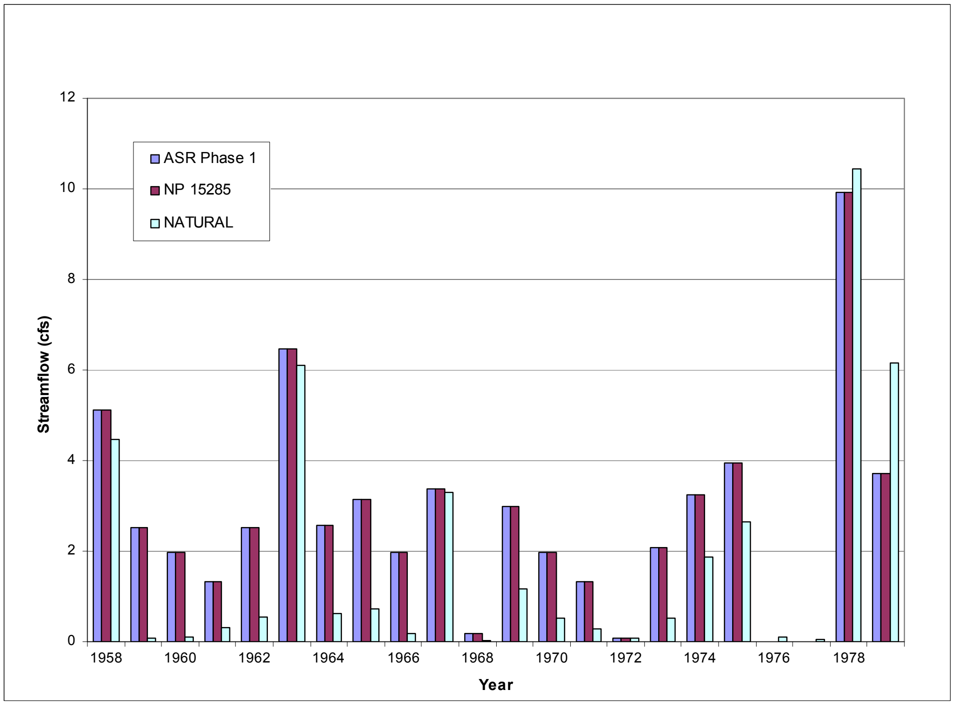


Figure A-9a
Seasonal Minimum Monthly Streamflow in the Carmel River at the Narrows with Alternative Water Supply Projects, 1958-1979

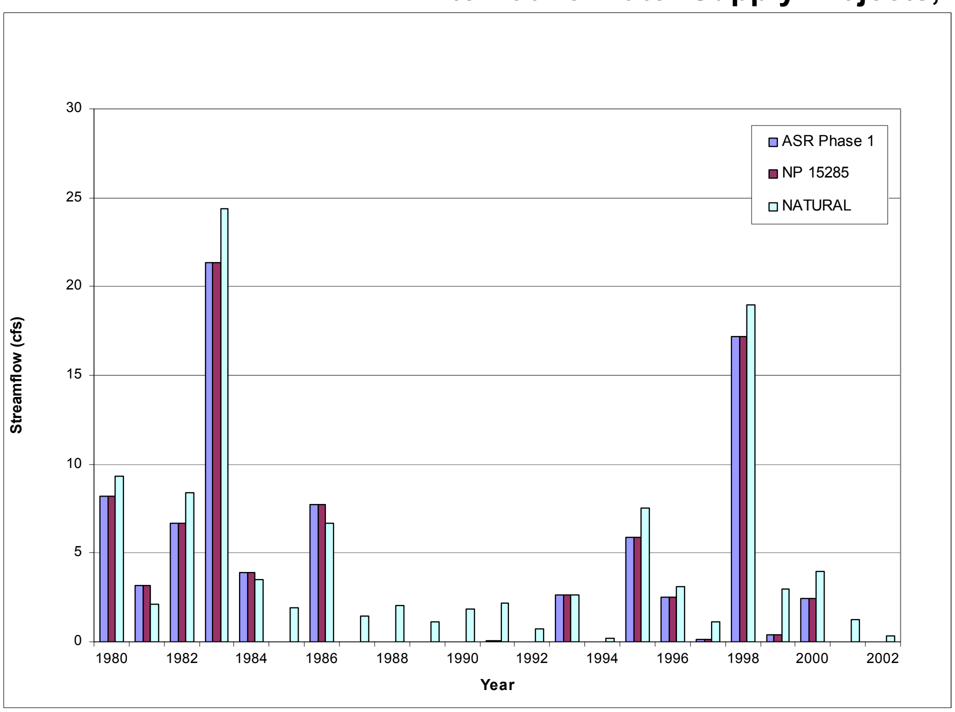


Figure A-9b
Seasonal Minimum Monthly Streamflow in the Carmel River at the Narrows with Alternative Water Supply Projects, 1980-2002

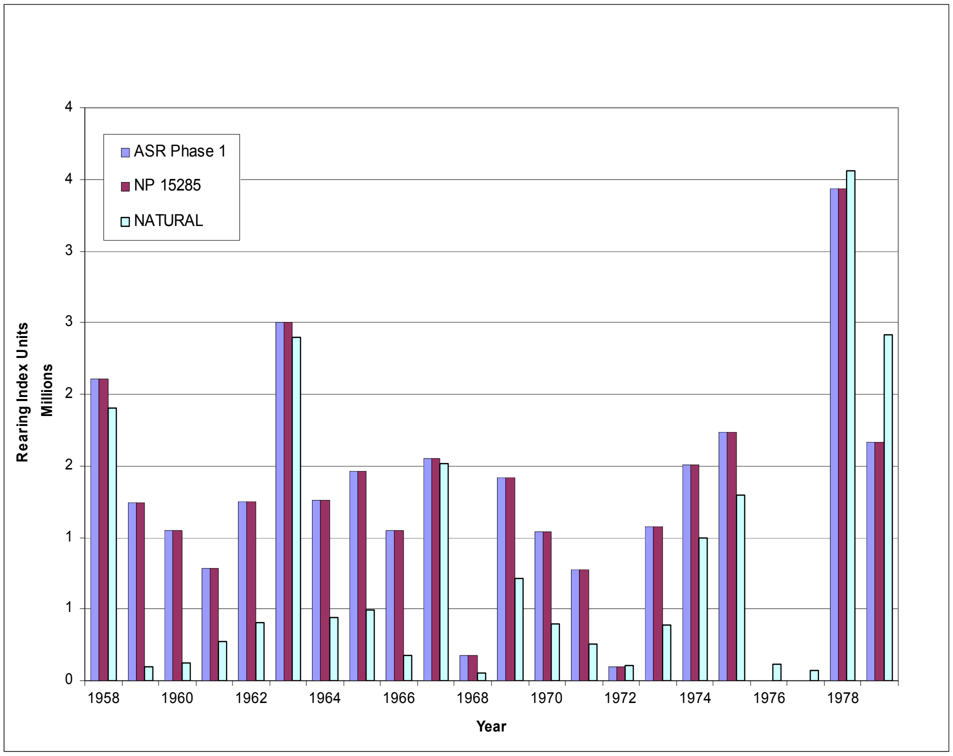


Figure A-10a

Minimum Seasonal Rearing Habitat for Age 0+ Juvenile Steelhead in the Carmel River between the Narrows and San Clemente Dam with Alternative Water Supply Projects, 1958-1979

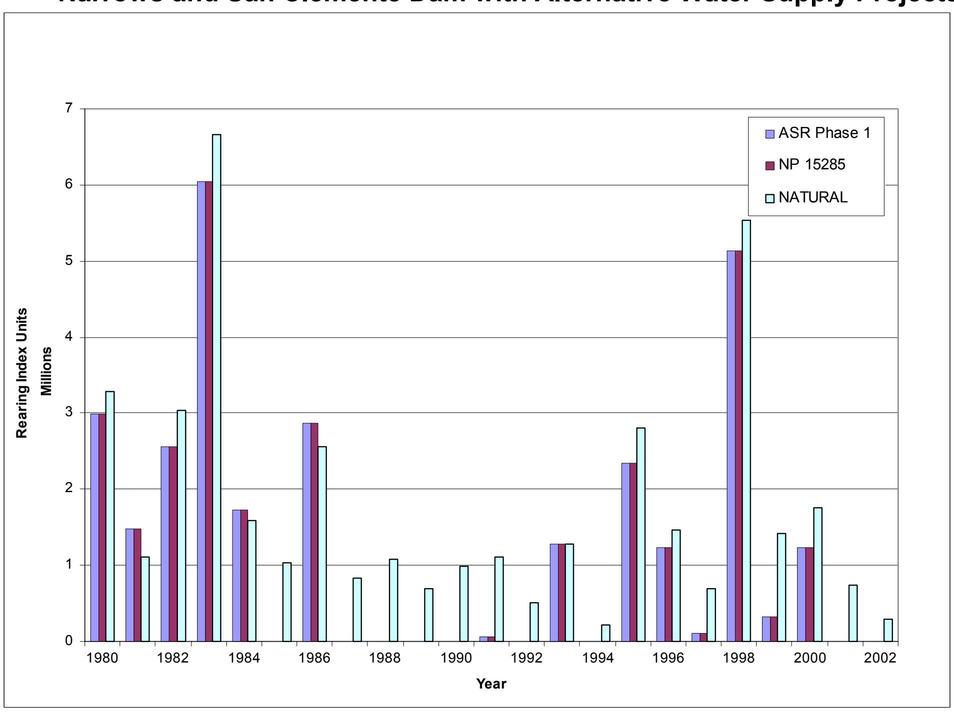


Figure A-10b

Minimum Seasonal Rearing Habitat for Age 0+ Juvenile Steelhead in the Carmel River between the Narrows and San Clemente Dam with Alternative Water Supply Projects, 1980-2002

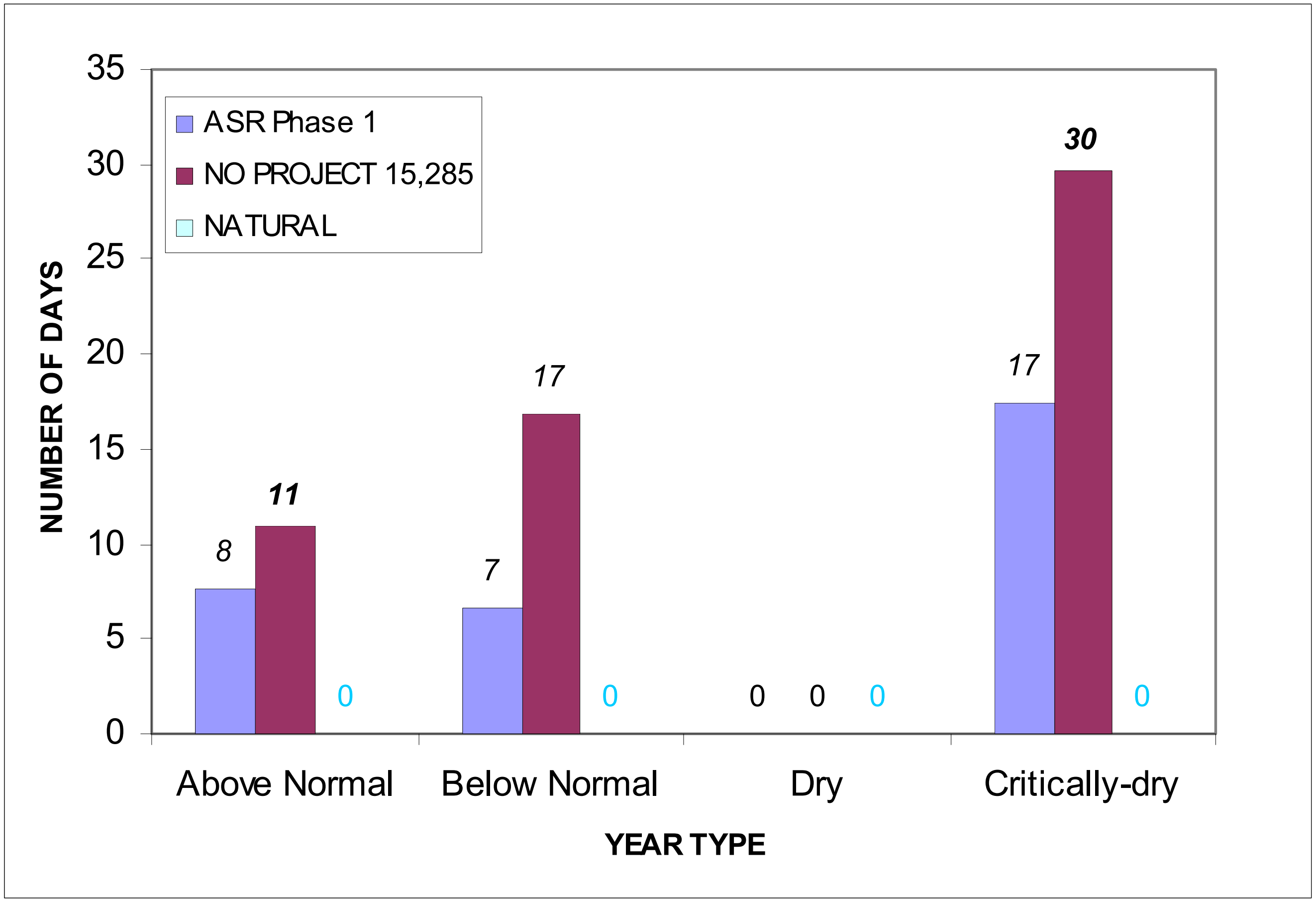


Figure A-11
Average Number of Days in October-March Period during Which Juvenile Steelhead Would Be at High Risk of Stranding in Reach between Via Mallorca Road and the Narrows with Alternative Water Supply Projects, by Type of Water Year, 1958-2002

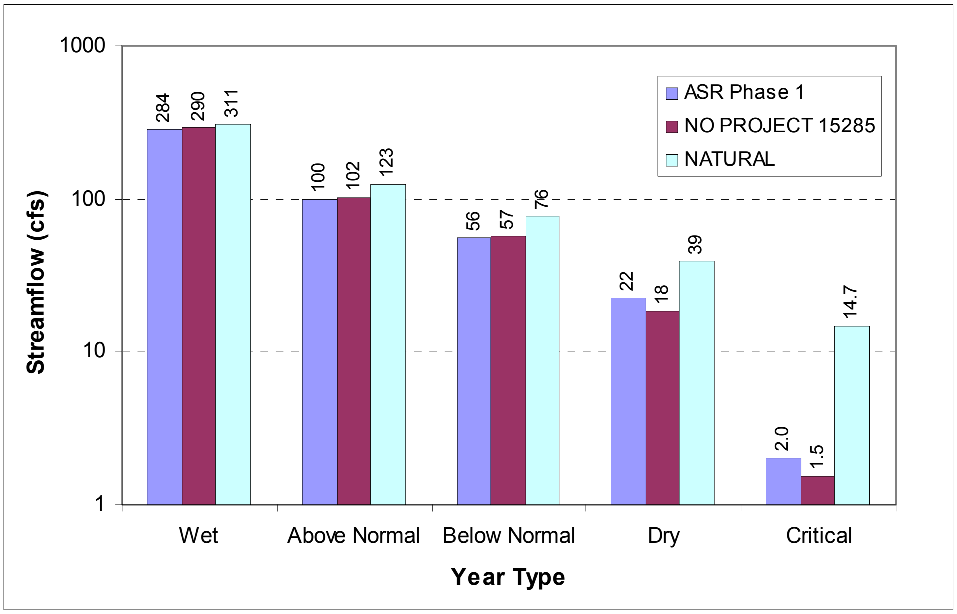


Figure A-12
Average streamflow (Apr-May) into Carmel River Lagoon for Emigration of Smolt Steelhead, 1958-2002, by Type of Water Year

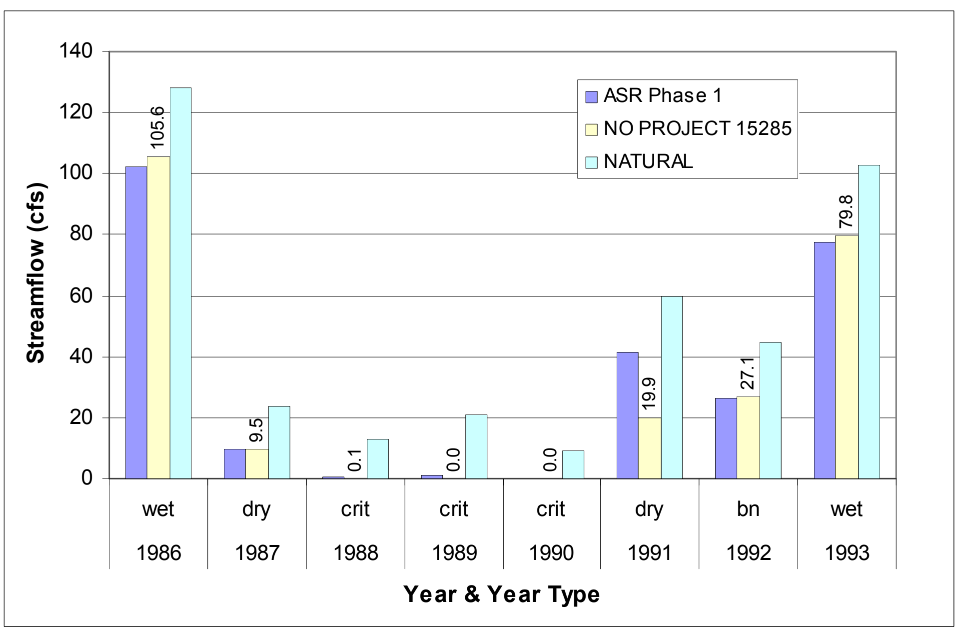


Figure A-13
Average streamflow (Apr-May) into Carmel River Lagoon for Emigration of smolt steelhead, 1986-1993, with ASR Phase 1, No Project, and Natural Flows
Note: Type of water year shown above Year

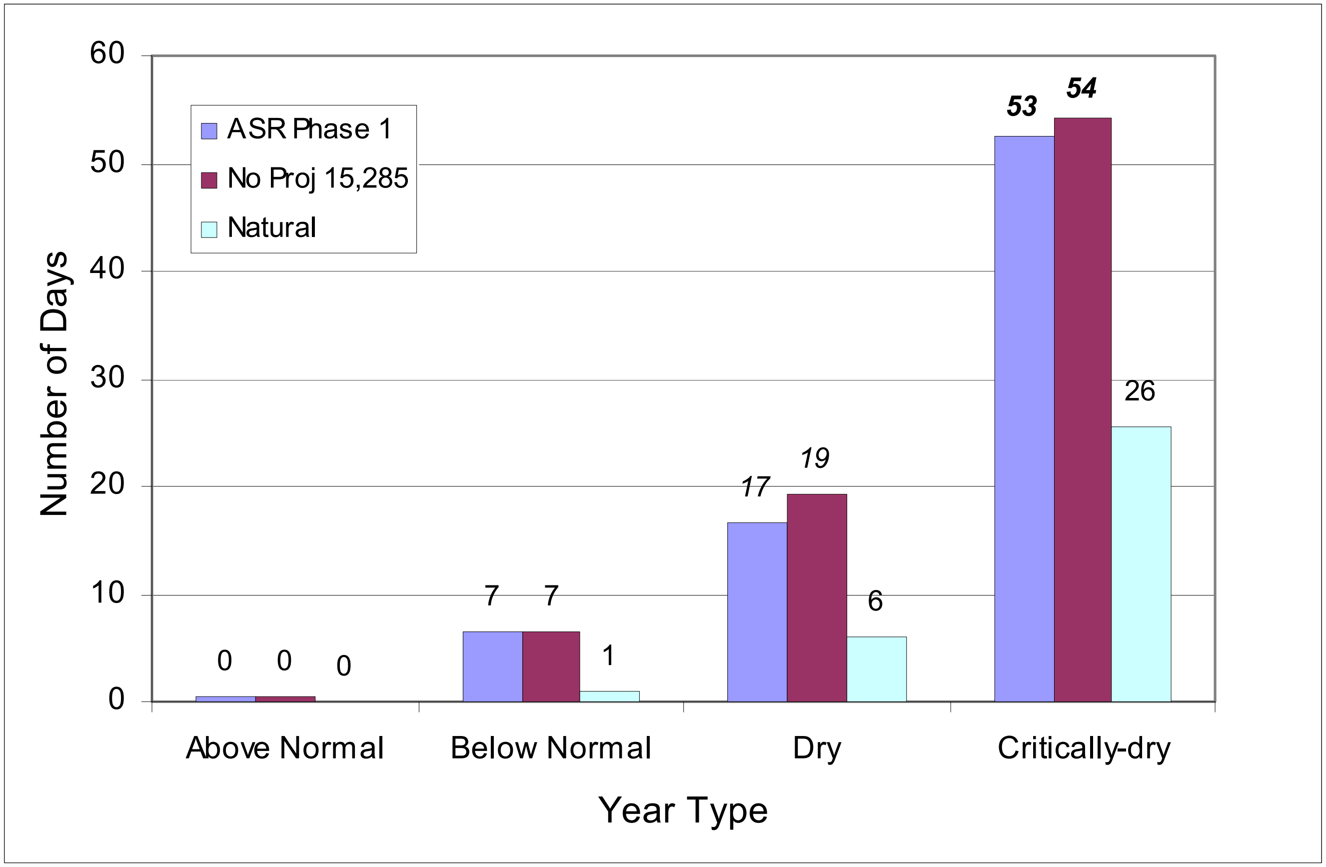


Figure A-14
Number of Days in April-May Period during which Steelhead Smolts Would be at High Risk of Stranding and Isolation in the Reach from Via Mallorca Road to the Narrows, 1958-2002, by Type of Water Year

Note**: *Bold Italic*** Print for data labels above bars indicates significant difference in number of risk days compared to natural flows. Based on paired t-test of means at <= .01 probability level. Data labels in *Italic print* indicate significant difference at <= .05 probability.

Appendix B
Noise

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Appendix B
Environmental Acoustics and State and Federal Noise Regulations

Background Information on Acoustics

Sound Terminology

Sound travels through the air as waves of minute air pressure fluctuations caused by some type of vibration. In general, sound waves travel away from the sound source as an expanding spherical surface. The energy contained in a sound wave is consequently spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the sound source. The following terms are commonly used in acoustics.

Decibel

Sound-level meters measure the pressure fluctuations caused by sound waves. Because of the ability of the human ear to respond to a wide dynamic range of sound pressure fluctuations, loudness is measured in terms of decibels (dB) on a logarithmic scale. This results in a scale that measures pressure fluctuations with a convenient range of values and corresponds to our auditory perception of increasing or decreasing loudness.

A-Weighted Decibels

Most sounds consist of a broad range of sound frequencies. Because the human ear is not equally sensitive to all frequencies, several frequency-weighting schemes have been used to develop composite decibel scales that approximate the way the human ear responds to sound levels. The "A-weighted" decibel scale (dBA) is the most widely used for this purpose. Typical A-weighted sound levels for various types of sound sources are summarized in Table B-1.

Table B-1. Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	— 110 —	Rock band
Jet fly-over at 300 meters (1000 feet)		
	— 100 —	
Gas lawn mower at 1 meter (3 feet)		
	— 90 —	
Diesel truck at 15 meters (50 feet) at 80 kph (50 mph)		Food blender at 1 meter (3 feet)
	— 80 —	Garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime		
Gas lawn mower, 30 meters (100 feet)	— 70 —	Vacuum cleaner at 3 meters (10 feet)
Commercial area		Normal speech at 1 meter (3 feet)
Heavy traffic at 90 meters (300 feet)	— 60 —	
		Large business office
Quiet urban daytime	— 50 —	Dishwasher next room
Quiet urban nighttime	— 40 —	Theater, large conference room (background)
Quiet suburban nighttime		
	— 30 —	Library
Quiet rural nighttime		Bedroom at night, concert
	— 20 —	
		Broadcast/recording studio
	— 10 —	
Lowest threshold of human hearing	— 0 —	Lowest threshold of human hearing

Source: California Department of Transportation 1998.

Equivalent Sound Level

Time-varying sound levels are often described in terms of an equivalent constant decibel level. The equivalent sound level (L_{eq}) is the average of sound energy occurring over a specified time period. In effect, L_{eq} is the steady-state sound level that in a stated time period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. Equivalent sound levels (L_{eq}) are often used to develop single-value descriptions of average sound exposure over various periods of time. Such average sound exposure values often include additional weighting factors for annoyance potential attributable to time of day or other considerations. The L_{eq} data used for these average sound exposure descriptors are generally based on A-weighted sound-level measurements.

Day-Night Average Sound Level

Average sound exposure over a 24-hour period is often presented as a day-night average sound level (Day-Night Level [L_{dn}]) values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period (10:00 p.m.–7:00 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises.

Community Noise Equivalent Level

The community noise equivalent level (CNEL) is also used to characterize average sound levels over a 24-hour period, with weighting factors included for evening and nighttime sound levels. L_{eq} values for the evening period (7:00 p.m.–10:00 p.m.) are increased by 5 dB, while L_{eq} values for the nighttime period (10:00 p.m.–7:00 a.m.) are increased by 10 dB. For given set of sound measurements, the CNEL value will usually be about 1 dB higher than the L_{dn} value. In practice, CNEL and L_{dn} are often used interchangeably.

Percentile-Exceeded, Maximum, and Minimum Sound Level

The sound level exceeded during a given percentage of a measurement period is the percentile-exceeded sound level (L_x). Examples include L_{10}, L_{50}, and L_{90}. L_{10} is the A-weighted sound level that is exceeded 10% of the measurement period, L_{50} is the level exceeded 50% of the period, and so on. L_{50} is the median sound level measured during the measurement period. $L_{90,}$ the sound level exceeded 90% of the time, excludes high localized sound levels produced by nearby sources such as single car passages or bird chirps. L_{90} is often used to represent the background sound level. L_{50} is also used to provide a less conservative assessment of the background sound level.

The maximum sound level (L_{max}) and the minimum sound level (L_{min}) are the maximum and minimum sound levels respectively, measured during the measurement period. When a sound meter is set to the slow response setting as is typical for most community noise measurements, the L_{max} and L_{min} values are the maximum and minimum levels measured over a one second period.

Ambient Sound

Ambient sound is the all-encompassing sound associated with a given community site, usually being a composite of sounds from many sources, near and far, with no particular sound being dominant.

Equivalencies between Various Sound Descriptors

The L_{dn} value at a site calculated from a set of measurements taken over a given 24-hour period will be slightly lower than the CNEL value calculated over the same period. Except in situations where unusually high evening sound levels occur, the CNEL value will be within about 1.5 dB of the L_{dn} value for the same set of sound measurements.

The relationship between peak hourly L_{eq} values and associated L_{dn} values depends on the distribution of traffic over the entire day. There is no precise way to convert a peak hourly L_{eq} value to an L_{dn} value. However, in urban areas near heavy traffic, the peak hourly L_{eq} value is typically 2–4 dB lower than the daily L_{dn} value. In less heavily developed areas, the peak hourly L_{eq} is often equal to the daily L_{dn} value. For rural areas with little nighttime traffic, the peak hourly L_{eq} value will often be 3–4 dB greater than the daily L_{dn} value.

Working with Decibel Values

The nature of the decibel scale is such that the individual sound levels for different sound sources cannot be added directly to give the combined sound level of these sources. Two sound sources producing equal sound levels at a given location will produce a composite sound level that is 3 dB greater than either sound alone. When two sound sources differ by 10 dB, the composite sound level will be only 0.4 dB greater than the louder source alone.

Most people have difficulty distinguishing the louder of two sound sources if they differ by less than 1.5–2.0 dB. Research into the human perception of changes in sound level indicates the following:

- a 3-dB change is just perceptible,
- a 5-dB change is clearly perceptible, and
- a 10-dB change is perceived as being twice or half as loud.

A doubling or halving of acoustic energy will change the resulting sound level by 3 dB, which corresponds to a change that is just perceptible. In practice, this means that a doubling of traffic volume on a roadway, doubling the number of people in a stadium, or doubling the number of wind turbines in a wind farm will, as a general rule, only result in a 3-dB, or just perceptible, increase in noise.

Outdoor Sound Propagation

There are a number of factors that affect how sound propagates outdoors. These factors, described by Hoover and Keith (1996), are summarized below.

Distance Attenuation

As a general rule, sound from localized or point sound sources spreads out as it travels away from the source and the sound level drops at a rate of 6 dB per doubling of distance. If the sound source is long in one dimension, such as traffic on a highway or a long train, the sound source is considered to be a line source. As a general rule, the sound level from a line source will drop off at a rate of 3 dB per doubling of distance. If the intervening ground between the line source and the receptor is acoustically “soft” (e.g., ground vegetation, scattered trees, clumps of bushes), an attenuation rate of 4.5 dB per doubling of distance is generally used.

Attenuation from Barriers

Any solid structure such as a berm, wall, or building that blocks the line of sight between a source and receiver serves as a sound barrier and will result in additional sound attenuation. The amount of additional attenuation is a function of the difference between the length of the sound path over the barrier and the length of the direct line of sight path. Thus, the sound attenuation of a barrier between a source and a receiver that are very far apart will be much less than the attenuation that would result if either the source or the receiver is very close to the barrier.

Molecular Absorption

Air absorbs sound energy as a function of the temperature, humidity of the air, and frequency of the sound. Additional sound attenuation on the order of 1 to 2 dB per 1,000 feet can occur.

Anomalous Excess Attenuation

Large-scale effects of wind speed, wind direction, and thermal gradients in the air can cause large differences in sound transmission over large distances. These effects when combined result in anomalous excess attenuation, which can be applied to long-term sound-level estimates. Additional sound attenuation on the order of about 1 dB per 1,000 feet can occur.

Other Atmospheric Effects

Short-term atmospheric effects relating to wind and temperature gradients can cause bending of sound waves and can influence changes in sound levels at large distances. These effects can either increase or decrease sound levels depending on the orientation of the source and receptor and the nature of the wind and temperature gradient. Because these effects are normally short-term, it is generally not practical to include them in sound propagation calculations. Understanding these effects, however, can help explain variations that occur between calculated and measured sound levels.

Guidelines for Interpreting Sound Levels

Various federal, state, and local agencies have developed guidelines for evaluating land use compatibility under different sound-level ranges. The following is a summary of federal and state guidelines.

Federal Agency Guidelines

The federal Noise Control Act of 1972 (Public Law 92-574) established a requirement that all federal agencies administer their programs to promote an environment free of noise that jeopardizes public health or welfare. The U.S. Environmental Protection Agency (EPA) was given the responsibility for:

- providing information to the public regarding identifiable effects of noise on public health or welfare,
- publishing information on the levels of environmental noise that will protect the public health and welfare with an adequate margin of safety,
- coordinating federal research and activities related to noise control, and
- establishing federal noise emission standards for selected products distributed in interstate commerce.

The federal Noise Control Act also directed that all federal agencies comply with applicable federal, state, interstate, and local noise control regulations.

Although the EPA was given major public information and federal agency coordination roles, each federal agency retains authority to adopt noise regulations pertaining to agency programs. The EPA can require other federal agencies to justify their noise regulations in terms of the federal Noise Control Act policy requirements. The Occupational Safety and Health Administration retains primary authority for setting workplace noise exposure standards. The Federal Aviation Administration retains primary jurisdiction over aircraft noise standards, and the Federal Highway Administration (FHWA) retains primary jurisdiction over highway noise standards.

In 1974, in response to the requirements of the federal Noise Control Act, the EPA identified indoor and outdoor noise limits to protect public health and welfare (communication disruption, sleep disturbance, and hearing damage). Outdoor L_{dn} limits of 55 dB and indoor L_{dn} limits of 45 dB are identified as desirable to protect against speech interference and sleep disturbance for residential, educational, and healthcare areas. Sound-level criteria to protect against hearing damage in commercial and industrial areas are identified as 24-hour L_{eq} values of 70 dB (both outdoors and indoors).

FHWA regulations (23 CFR §772) specify criteria for evaluating noise impacts associated with federally funded highway projects and for determining whether these impacts are sufficient to justify funding noise abatement actions. The FHWA noise abatement criteria are based on worst hourly L_{eq} sound levels, not L_{dn} or 24-hour L_{eq} values. The worst-hour 1-hour L_{eq} criteria for residential, educational, and healthcare facilities are 67 dB outdoors and 52 dB indoors. The worst-hour 1-hour L_{eq} criterion for commercial and industrial areas is 72 dB (outdoors).

The U.S. Department of Housing and Urban Development has established guidelines for evaluating noise impacts on residential projects seeking financial support under various grant programs (44 FR §135:40860–40866, January 23, 1979). Sites are generally considered acceptable for residential use if they are exposed to outdoor L_{dn} values of 65 dB or less. Sites are considered “normally unacceptable” if they are exposed to outdoor L_{dn} values of 65–75 dB. Sites are considered unacceptable if they are exposed to outdoor L_{dn} values above 75 dB.

State Agency Guidelines

In 1987, the California Department of Health Services published guidelines for the noise elements of local general plans. These guidelines include a sound level/land use compatibility chart that categorizes various outdoor L_{dn} ranges into up to four compatibility categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable) by land use. For many land uses, the chart shows overlapping L_{dn} ranges for two or more compatibility categories.

The noise element guidelines chart identifies the normally acceptable range for low-density residential uses as less than 60 dB and the conditionally acceptable range as 55–70 dB. The normally acceptable range for high-density residential uses is identified as L_{dn} values below 65 dB, and the conditionally acceptable range is identified as 60–70 dB. For educational and medical facilities, L_{dn} values below 70 dB are considered normally acceptable and L_{dn} values of 60–70 dB are considered conditionally acceptable. For office and commercial land uses, L_{dn} values below 70 dB are considered normally acceptable and L_{dn} values of 67.5–77.5 dB are categorized as conditionally acceptable.

These overlapping L_{dn} ranges are intended to indicate that local conditions (existing sound levels and community attitudes toward dominant sound sources) should be considered in evaluating land use compatibility at specific locations.

The California Department of Housing and Community Development has adopted noise insulation performance standards for new hotels, motels, and dwellings other than detached single-family structures (24 CCR §25–28). These standards require that "interior CNELs with windows closed, attributable to exterior sources, shall not exceed an annual CNEL of 45 dB in any habitable room".

The California Department of Transportation uses the FHWA criteria as the basis for evaluating noise impacts from highway projects.

References

California Department of Transportation. 1998. *Technical noise supplement, a technical supplement to the traffic noise analysis protocol*. Sacramento, CA.

Hoover, R.M., and R.H. Keith. 1996. *Noise control for buildings and manufacturing plants*. Hoover and Keith, Inc. Houston, TX.

Appendix C
Visual Resources

Appendix C
Visual Resources

Visual Character

Both natural and artificial landscape features comprise the character of an area or view. Character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with landscape settlements and development, including roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary significantly seasonally and even hourly, as weather, light, shadow, and the elements that comprise the viewshed change. The basic components used to describe visual character for most visual assessments are the elements of form, line, color and texture of the landscape features (U.S. Forest Service 1974; Federal Highway Administration 1983). The appearance of the landscape is described in terms of the dominance of each of these components.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by Federal Highway Administration (FHWA), employing the concepts of vividness, intactness and unity (Federal Highway Administration 1983; Jones et. al. 1975). These terms are defined below.

- Vividness is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- Intactness is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, as well as in natural settings.
- Unity is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape. (Federal Highway Administration 1983).

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as modified by its visual sensitivity. High quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Viewer Exposure and Sensitivity

The measure of the quality of a view must be tempered with the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, the proximity of viewers to the visual resource, the elevation of viewers relative to the visual resource, the frequency and duration of views, the number of viewers, and the type and expectations of individuals and viewer groups.

The importance of a view is related in part to the position of the viewer to the resource; therefore, visibility and visual dominance of landscape elements are dependent on their placement within the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (Federal Highway Administration 1983). To identify the importance of views of a resource, a viewshed must be broken into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Although distance zones in a viewshed may vary between different geographic region or types of terrain, the standard foreground zone is 0.25–0.5 mile from the viewer, the middleground zone extends from the foreground zone to 3–5 miles from the viewer, and the background zone extends from the middleground to infinity (U.S. Forest Service 1974).

Visual sensitivity is dependent on the number and type of viewers and the frequency and duration of views. Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, visual sensitivity is generally higher for views seen by people who are driving for pleasure; people engaging in recreational activities such as hiking, biking or camping; and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (U.S. Forest Service 1974; Federal Highway Administration 1983; U.S. Soil Conservation Service 1978). Commuters and non-recreational travelers have generally fleeting views and tend to focus on commute traffic and not on surrounding scenery, and therefore are generally considered to have low visual sensitivity. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes; therefore, they generally are considered to have high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic overlooks are usually assessed as having high visual sensitivity.

Judgments of visual quality and viewer response must be made based on a regional frame of reference (U.S. Soil Conservation Service 1978). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.