Artesian Slough

Valley Water

SANTA CLARA COUNTY
SEAWATER DESALINATION PROJECT

Environmental Feasibility and Planning Study

JULY 2023

PREPARED BY

GEI Consultants

Santa Clara County
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Acronyms and Abbreviations

2005 Shoreline Study	South San Francisco Bay Shoreline Interim Feasibility Study
2040 WSMP	Regional Water System. Valley Water's Water Supply Master Plan 2040
AAPI	Asian American Pacific Islander
AB	Assembly Bill
Addendum	Addendum to the Proposed Framework for Regulating Direct Potable Reuse in California, Second Edition
APN	assessor's parcel number
ART	Adapting to Rising Tides
BARDP	Bay Area Regional Desalination Project
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
Bay Plan	San Francisco Bay Conservation and Development Commission's San Francisco Bay Plan
BCDC	San Francisco Bay Conservation and Development Commission
°C	degrees Celsius
CalEPA	California Environmental Protection Agency
CalVeg	California Aquatic Science Center and Vegetation Classification, and Mapping
CARB	California Air and Resource Board
Cargill	Cargill, Inc.
CARI	California Aquatic Resources Inventory
CCAP	Climate Change Action Plan
CCP	Comprehensive Conservation Plan
CCR	California Code of Regulations
CCWD	Contra Costa Water District
cd3 Database	Contaminant Data Display and Download
CDEC	California Data Exchange Center
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CEDEN	California Environmental Data Exchange Network
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CIWQS	California Integrated Water Quality System Project
cm	centimeter

CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
CO2	carbon dioxide
Comprehensive Plan	City of Palo Alto Comprehensive Plan
CPAU	City of Palo Alto Utilities
CRHR	California Register of Historical Resources
criteria	environmental criteria
CSLC	California State Lands Commission
CT	census tract
CWA	Clean Water Act
DAC	Disadvantaged Community
DAC Map	Disadvantaged Communities Map
DBP	disinfection byproduct
DDW	Division of Drinking Water
desalination project	seawater desalination project
DFA	Distribution Facility Agreement
Diesel PM	Diesel Particulate Matter
Doheny Project	Doheny Ocean Desalination Project
DPR	direct potable reuse
DPS	distinct population segment
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EBDA	East Bay Dischargers Authority
EC	electrical conductivity
EIA	Economic Impact Area
EIR	Environmental Impact Report
EJ	Environmental Justice
Enclosed Bays and Estuaries Plan	Water Quality Control Plan for Enclosed Bays and Estuaries
EPA	Environmental Protection Agency
ERD	energy recovery devices
ESA	Endangered Species Act
°F	degrees Fahrenheit
Flood Control Basin	Palo Alto Flood Control Basin
Framework	Proposed Framework for Regulating Direct Potable Reuse in California, Second Edition
GHG	Greenhouse Gas
GWh	gigawatt-hours

HCD	Department of Housing and Community Development
HHE	Heat Health Events
Improvement Act	National Wildlife System Improvement Act of 1997
Intake	seawater intake
ISP	Initial Stewardship Plan
ISWEBE Plan	Inland Surface Waters, Enclosed Bays, and Estuaries of California
kWh	kilowatt-hours
LULUs	locally unwanted land uses
m3	cubic meter
MCL	Maximum Contaminant Level
MG	million gallons
MGD	million gallons per day
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MUN	municipal
MW	megawatts
MWh	megawatt-hours
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Agency
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRCS SSURGO	NRCS Soil Survey Geographic database
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
OEHHA	California Office of Environmental Health Hazard Assessment
OPR	California Office of Planning and Research
PG&E	Pacific Gas and Electric
Plant Master Plan	San Jose/Santa Clara Water Pollution Control Plant's Master Plan
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
psi	pounds per square inch
PSPS	Public Safety Power Shutoff
PWRPA	Power and Water Resources Pooling Authority
Reclamation	U.S. Bureau of Reclamation

Refuge	Don Edwards San Francisco Bay National Wildlife Refuge
RMP	Regional Monitoring Program
RO	reverse osmosis
ROW	right-of-way
RPA	Registered Professional Archaeologist
RWF	Regional Wastewater Facility
RWQCB	Regional Water Quality Control Board
RWQCP	Regional Water Quality Control Plant
SAFER	Strategy to Advance Flood Protection, Ecosystems, and Recreation
SB	Senate Bill
SBSP Restoration Project	South Bay Salt Pond Restoration Project
SFEI	San Francisco Estuary Institute
SFCJPA	San Francisquito Creek Joint Powers Authority
SFPUC	San Francisco Public Utilities
Shoreline Study	South San Francisco Bay Shoreline Study
SHPO	State Historic Preservation Office
SLF	Sacred Lands Files
SMCL	Secondary Maximum Contaminant Level
South Bay	South San Francisco Bay
SR	California State Route
SSURGO	Soil Survey Geographic database
Staff Report	BCDC's Staff Report Desalination and the San Francisco Bay
SVCU	Silicon Valley Clean Energy
SVI	Shoreline Vulnerability Index
SWRCB	State Water Resource Control Board
TDS	Total Dissolved Solids
TFPA	Treatment Facility Planning Areas
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Valley Water	Santa Clara Valley Water District

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Executive Summary

ES.1 Introduction

The Santa Clara Valley Water District (Valley Water) is evaluating the environmental feasibility of a seawater desalination project (desalination project) in Santa Clara County with intake of seawater from the South San Francisco Bay (South Bay). A desalination project would augment potable water supply and serve the primary purpose of providing a new reliable water supply for current and future populations in the Santa Clara County. This study was prepared as a first step in project planning to evaluate environmental, land use, regulatory, and stakeholder issues, as well as to aid in the selection of project alternatives and identification of critical issues that could render an alternative or even the overall desalination project infeasible. This study was conducted in four phases with the results of each phase informing subsequent phases (see text box).

Study Phases

Phase 1 - Screened potential desalination project locations to identify project options and alternatives.

Phase 2 - Evaluated existing information on environmental conditions and applicable plans and regulations to identify issues and constraints.

Phase 3 - Identified regulatory requirements and key issues to provide a guide for obtaining regulatory approvals and public acceptance.

Phase 4 - Developed scoring of project options and alternatives, evaluated feasibility-level issues, and developed recommendations and next steps.

As a starting point, the desalination project evaluated for this study is based on a production capacity of 10 million gallons per day (MGD) – up to 11,208 acre-feet per year. In this study, typical reverse osmosis (RO) and water treatment processes for seawater desalination facilities were assumed. As a result, a recovery rate of approximately 50 percent was identified, which requires a seawater intake (intake) capacity of 20 MGD for this desalination project. After screening several options, seven intake and three brine management options were selected for evaluation (see **Figure ES-1** below and **Figure ES-5** at the end of this section). Additionally, three Treatment Facility Planning Areas (TFPAs) were identified, which consist of general areas where a treatment facility could be located. Two TFPAs in San Jose and one covering areas in both Mountain View and Palo Alto were evaluated and some TFPAs are composed of several discrete areas, as shown in the Figures ES-1 and ES-5. Figure ES-1 also includes the reference identification used for each project option in this study.

A total of 13 different desalination project alternatives were then assembled – each consisting of a unique combination of an intake option and a brine management option, as shown in **Figure ES-2**. These project alternatives included three in San Jose, four in Mountain View, and six in Palo Alto. The remainder of this section discusses the key findings of this study.

Figure ES-1. Project Options Evaluated

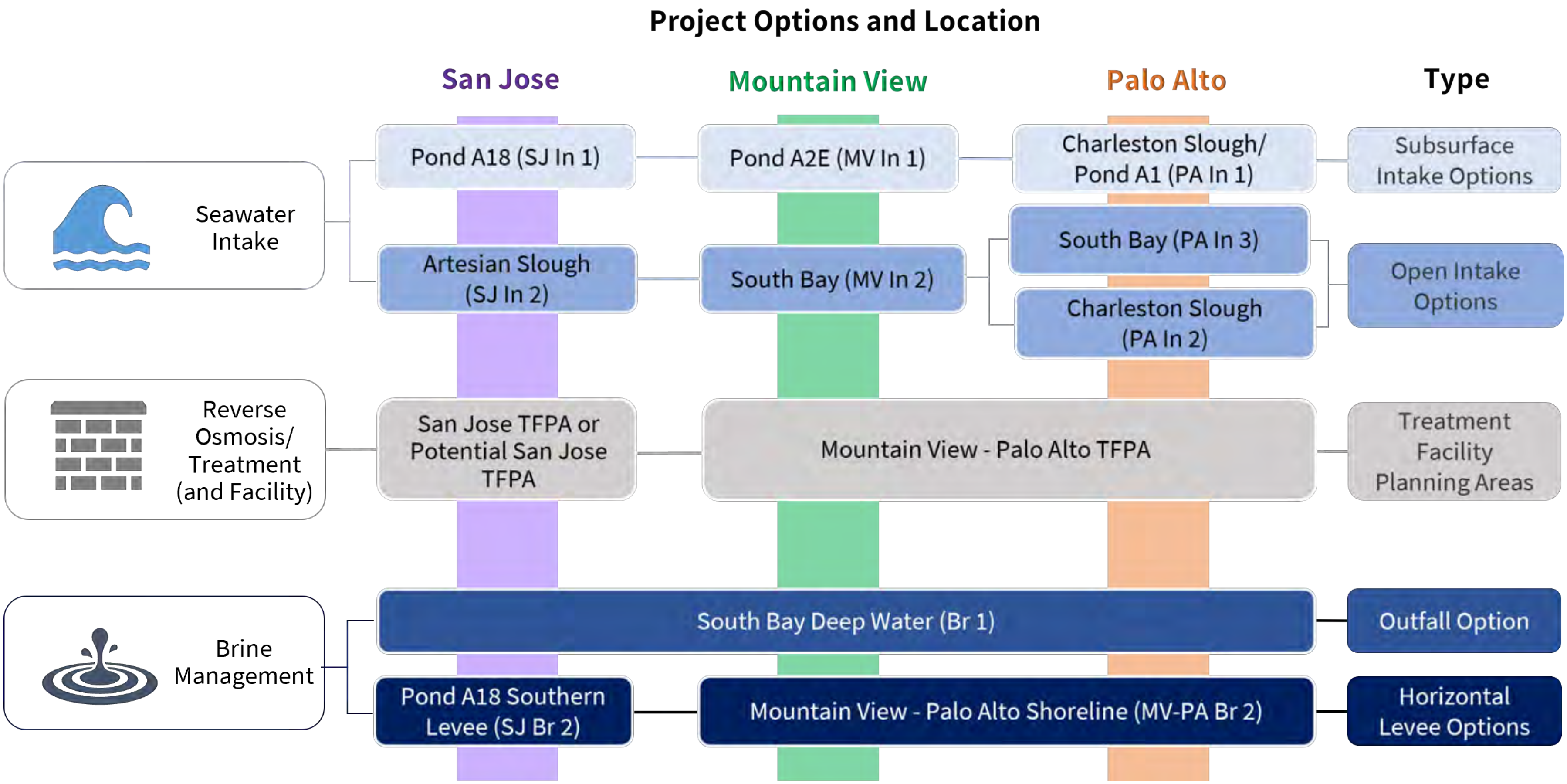

Figure ES-2. Desalination Project Alternatives and Associated Project Options

San Jose

Alternative SJ-S1
- Pond A18 Subsurface Intake (SJ In 1)
- South Bay Deep Water Outfall (Br 1)

Alternative SJ-O1
- Artesian Slough Open Intake (SJ In 2)
- South Bay Deep Water Outfall (Br 1)

Alternative SJ O2
- Artesian Slough Open Intake (SJ In 2)
- Pond A18 Horizontal Levee (SJ Br 2)

All San Jose Alternatives
- San Jose TFPA
- Future San Jose TFPA

Mountain View

Alternative MV-S1
- Pond A2E Subsurface Intake (MV In 1)
- South Bay Deep Water Outfall (Br 1)

Alternative MV-S2
- Pond A2E Subsurface Intake (MV In 1)
- MV-PA Horizontal Levee (MV-PA Br 2)

Alternative MV-O1
- South Bay Open Intake (MV In 2)
- South Bay Deep Water Outfall (Br 1)

Alternative MV-O2
- South Bay Open Intake (MV In 2)
- MV-PA Horizontal Levee (MV-PA Br 2)

All Mountain View Alternatives
- Mountain View-Palo Alto TFPA

Palo Alto

Alternative PA-S1
- Charleston Slough/Pond A1 Subsurface Intake (PA In 1)
- South Bay Deep Water Outfall (Br 1)

Alternative PA-S2
- Charleston Slough/Pond A1 Subsurface Intake (PA In 1)
- MV-PA Horizontal Levee (MV-PA Br 2)

Alternative PA-O1
- Charleston Slough Open Intake (PA In 2)
- South Bay Deep Water Outfall (Br 1)

Alternative PA-O2
- Charleston Slough Open Intake (PA In 2)
- MV-PA Horizontal Levee (MV-PA Br 2)

Alternative PA-O3
- South Bay Open Intake (PA In 3)
- South Bay Deep Water Outfall (Br 1)

Alternative PA-O4
- South Bay Open Intake (PA In 3)
- MV-PA Horizontal Levee (MV-PA Br 2)

All Palo Alto Alternatives
- Mountain View-Palo Alto TFPA

ES.2 Environmental and Planning Considerations Evaluated

Environmental Considerations

Table ES-1 provides a summary of issues that are critical to feasibility of the desalination project, such that if these issues are not resolved, then they will pose challenges to development of the desalination project. **Table ES-2** provides a summary of other important considerations identified in this study. The general types of project options (i.e., intake, treatment/facility, and brine management) that are applicable to each issue are also identified in these tables.

Table ES-1. Feasibility Level Environmental Considerations

Feasibility Level Issue Summary	Applicable Project Options		
Marine Organisms – Impacts to marine organisms must be minimized. Regulations for intake of seawater require evaluating the feasibility of subsurface intakes first, and open intakes can only be considered if subsurface intakes are infeasible.			
Refuge Compatible Use – Infrastructure within the Don Edwards San Francisco Bay National Wildlife Refuge must be determined to be a compatible use (based largely on environmental impacts) or Valley Water would be denied right-of-way. Significant changes to the scope of project options may be needed to obtain/avoid right-of-way.			
Direct Potable Reuse – Should the desalination project draw in wastewater effluent, it could be considered as a direct potable reuse project, potentially resulting in significant additional treatment requirements.			
Municipal Drinking Water Designation – Source water from the South Bay needs to be designated as municipal for drinking purposes through a regulatory hearing process to amend the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan).			
Water Supply Availability – 20 MGD of source water supply may not be available for intake options in sloughs and salt marsh habitats.			
Planned Land Uses and Projects – Conflicts with flood protection and habitat restoration projects planned along the South Bay shoreline could preclude development or significantly change the scope of some project options.			
Brine Discharge Requirements – To comply with brine discharge requirements in the Basin Plan, Valley Water needs to consider achieving proper dilution of brine discharged to open water and/or blending brine with wastewater effluents to reduce salinity levels.			

Table ES-2. Other Important Environmental Considerations

Issue Summary	Applicable Project Options		
Source Water Quality – Intake options that do not draw seawater in directly from the South Bay, including subsurface intakes and intakes in sloughs, may have lower salinity levels. Additionally, constituents that may impact treatment effectiveness or the potable water distribution system were evaluated.			
Sensitive Habitats – Sensitive habitats including salt marshes, wetlands, and other waters of the U.S./State could be impacted by construction activities, operation of intakes in sloughs and salt ponds, and/or discharge of brine with elevated levels of salinity.			
Special-Status and Listed Species – A total of 22 special-status species including 10 species listed per the Endangered Species Act and/or California Endangered Species Act could be impacted by the project options to various degrees.			
Energy Use – Energy use from conveyance and treatment (including RO) was estimated to be similar among all project options/alternatives, and it is largely dependent on salinity levels during treatment.			[1]
Greenhouse Gas (GHG) Emissions – GHG emissions from purchase of electricity for conveyance and treatment (including RO) were estimated to be similar among all project options/alternatives and are largely dependent on energy use during treatment. However, if energy is purchased from pooling or renewable energy sources, then GHG emissions would not typically be generated.			[1]
Climate Change Hazards – Based on a high-level assessment of flooding and non-flooding climate change hazards, the desalination project would be vulnerable to various flood hazards and compound flood events, increases in groundwater salinity, increases in water temperature, and power outages.			

Notes: [1] This study preliminarily determined that brine management does not require pumping for conveyance to disposal location, and therefore would not require energy or generate GHG emissions from operations. Refer to Chapter 7, "Energy Use," for more information.

Planning Considerations

The following considerations are necessary to support regulatory approvals and public acceptance.

CEQA and NEPA Compliance

Valley Water would be the California Environmental Quality Act (CEQA) lead agency for preparation of an Environmental Impact Report (EIR).

Several regulatory permitting authorities would use the EIR, acting as CEQA responsible agencies, to issue permits/approvals for the desalination project.

The EIR would evaluate the comprehensive actions of the desalination project including design, construction activities, operations and maintenance activities, and relocation or construction of energy sources and electrical lines.

National Environmental Policy Act (NEPA) documentation would be required for federal permits and federal funding.

Environmental Justice

The desalination project could potentially be a moderate to high contributor to impacts related to traffic, air quality (including diesel particulate matter), hazardous chemicals, and impaired water bodies affecting nearby environmental justice (EJ) communities.

An environmental justice analysis is required for NEPA compliance and by the San Francisco Bay Conservation and Development Commission for projects proposed within environmental justice communities.

Permitting

Approximately 14 permits/approvals from federal agencies, 8 permits/approvals from state agencies, and several from local agencies may be required to obtain approvals for issues related to water, biological and cultural resources, and land use issues.

Permitting the desalination project is anticipated to be a long and complicated process.

A detailed permitting work plan, including permit triggers, requirements, key issues, timelines, and agency contacts is provided in **Appendix D**.

Public Acceptance

A review of other seawater desalination studies and projects in California revealed issues that may be similarly perceived by the public for this project as follows: brine discharge and disposal, general environmental impacts, intake structures, pipeline construction, construction and long-term noise, treated water quality, energy use and GHG emissions, and growth-inducing impacts.

Stakeholder messaging is pivotal to success of Valley Water's desalination project and should be conducted in an iterative and cyclical process as follows:

1. Collaboration with Valley Water Board of Directors.
2. Outreach to key elected officials so that they are apprised of the project.
3. Engagement with partner agencies and key stakeholders on strategic key issues.
4. Outreach to the public for education and input.

ES.3 Scoring, Recommendations, and Next Steps

Scoring

Each intake and brine management option was scored based on a set of criteria that were determined from the environmental evaluations summarized above. Each criteria score was multiplied by a corresponding criteria weight. Higher weighting was assigned to feasibility-level issues (discussed above) compared to other significant issues. Desalination project alternative scores were then compiled by adding the scores of the applicable intake and brine management options. The remainder of this section summarizes scoring, recommendations, and next steps.

Selection of Project Options and Alternatives

The scoring and ranking for the seven intake options and three brine management options, based on the evaluation presented in this study, is summarized in **Figure ES-3**. Note that subsurface intakes are preferred before open intakes regardless of option scoring due to regulations that require evaluation of subsurface intakes first. Scoring and ranking were not conducted for the TFPAs. However, the study conclusions for these areas are summarized below.

- **San Jose TFPA and Potential San Jose TFPA –** The TFPAs in San Jose could provide a larger area for development of a treatment facility than the other TFPA but pose potential challenges with compatibility of existing and future planned land uses. These issues should continue to be evaluated.

- **Mountain View-Palo Alto TFPA –** This is a much smaller area due to lack of available sites north of U.S. Highway 101 and the San Francisco Bay Conservation and Development Commission's requirement to be located more than 100 feet from the shoreline.

The scoring and ranking of the 13 different desalination project alternatives, based on the evaluation presented in this study, is summarized in **Figure ES-4**. Similar to the ranking for intake and brine management options above, alternatives with subsurface intakes are preferred before open intakes regardless of option scoring due to regulations that require evaluation of subsurface intakes first. The options that compose each alternative were shown in Figure ES-2. The ranking of desalination project alternatives does not consider constraints of the TFPAs.

Additional Data Collection and Verification

This study was conducted at a desktop level using publicly available information and was based on general concepts of the project options. As a result, some data gaps and limitations were identified, and several assumptions were made to conduct the evaluations in this study. Additional information and data should be collected to confirm and update the environmental evaluations conducted. Additional information that should be collected includes source water quality data, environmental conditions based on field surveys, treatment requirements, use of energy recovery devices, pipeline lengths and elevation changes, and other key assumptions for evaluation energy use. Additionally, coordination should be conducted with regulatory agencies and other stakeholders to verify and update the understanding of feasibility level and other significant issues identified in this study.

Future Phases of Project Development

As project options are selected and designed, information in this study should be used to avoid and minimize environmental impacts and regulatory requirements to the extent possible. The next step is to conduct an engineering feasibility evaluation, which should be organized around the preferred project options and desalination project alternatives identified in this study. Subsurface intakes should be evaluated first and environmental information in this study should be supplemented with additional information necessary to complete the feasibility analysis required by the Ocean Plan (per the Water Code section 13142.5[b]). Several additional considerations for the next phase of project development are provide in Chapter 14, "Recommendations and Next Steps."

Figure ES-3. Intake and Brine Management Option Scoring and Recommendations

Preferred Intake and Brine Management Options

1) Charleston Slough/Pond A1 Subsurface Intake (Pa In 1) and **Pond A2E Subsurface Intake (MV In 1) -** *Preferred options because these are the highest scoring subsurface intake options.* Next steps should include a site-specific study to evaluate groundwater supplies and quality, determining if sufficient water is available to provide 20 MGD for the desalination project (or if not, what quantity of water is available), and potential impacts to salt marsh habitats from intake of this water. If further study indicates significant impacts to salt marsh habitats, then these subsurface intake options are likely not feasible. PA In 1 scored slightly higher.

55

53

2) Pond A18 Subsurface Intake (SJ In 1) - This subsurface intake is likely very difficult to implement due to other projects planned at Pond A18 and proximity to the San Jose/Santa Clara Regional Wastewater Facility discharge**.** However, it is preferred over open intake options due to permitting agency regulations.

47

3) South Bay Open Intake Options (PA In 3 and **MV In 2) –** The open intakes drawing in source water directly from the Bay in Palo Alto and Mountain View may present good intake options if all subsurface intakes are determined not to be feasible. PA In 3 scored slightly higher.

56

54

4) Charleston Slough Open Intake (PA In 2) and **Artesian Slough Open Intake (SJ In 2) -** The open intake options in sloughs appear to have many constraints. However, site-specific conditions of the option in Artesian Slough in San Jose should be studied further to see if this location has advantages that were not captured in this study. PA In 2 scored slightly higher.

38.5

38

1) Mountain View–Palo Alto Horizontal Levee (MV-PA Br 2) - *Preferred brine management option if brine can be blended with wastewater.* It is recommended that this option be developed in the Palo Alto Flood Control Basin (i.e., outside of the Refuge) and that brine be blended with wastewater effluent to reduce salinity levels, which will avoid/minimize impacts to salt marsh habitat and help achieve compliance with discharge requirements.

43

2) South Bay Deep Water Outfall (Br 1) - This may also present a good option for discharging brine if significant dilution credit can be obtained immediately upon discharge to the Bay and/or brine can be blended with wastewater effluent and impacts to marine organisms can be minimized.

42

3) Pond A18 Horizontal Levee (SJ Br 2) – This option has many constraints related to planned projects at Pond A18 and additional information on the status of these projects should be collected.

34

Legend:

= project option total score

Green shading = top scored/ranked
Yellow shading = high scored/ranked
Red shading = low scored/ranked
Purple shading = lowest scored/ranked

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Figure ES-4. Desalination Project Alternative Scoring and Recommendations

Alternative Tiers

Preferred Alternatives

1) Alternatives PA-S2 and **MV-S2 –** Alternatives with subsurface intake options in Mountain View and Palo Alto, and the Mountain View and Palo Alto horizontal levee brine management option, combine the preferred intake and brine management options. PA-S2 scored slightly higher.

98 96

2) Alternatives PA-S1 and **MV-S1 –** Alternatives with subsurface intake options in Mountain View and Palo Alto and the outfall brine management option combine the preferred intake options and the second brine management option available in Mountain View and Palo Alto. PA-S1 scored slightly higher.

97 95

3) Alternative SJ-S1 – This alternative combines the subsurface intake in San Jose and the outfall brine management option. It is preferred over alternatives with open intake options that scored higher because it includes a subsurface intake which is preferred by regulations. However, the subsurface intake option in San Jose may be difficult to implement, as discussed.

89

4) Alternatives PA-O4 and **MV-O2 –** Alternatives with open intakes in the South Bay and the Mountain View and Palo Alto horizontal levee brine management option combine the second ranked intake options and preferred brine management option. PA-04 scored slightly higher.

99 96

5) Alternatives PA-O3 and **MV-O1 –** Alternatives with open intake in the South Bay and the outfall brine management option combine the second ranked intake options and the other brine management option for these locations. PA-04 scored slightly higher.

98 97

6) Alternative SJ-O1 – The alternative with the open intake in Artesian Slough and the San Jose horizontal levee brine management option combines the open intake option ranked lower than open intakes in the South Bay and the lowest ranked brine management option. If the horizontal levee is not compatible with the ecotone planned at Pond A18, then this alternative is not feasible.

80

7) Alternatives PA-O2, PA-O1, and **SJ-O2 –** Alternatives with open intakes in sloughs and either brine management option have no advantages compared to other alternatives due to constraints associated with these intake options. PA-O2 scored the highest followed by PA-O1.

81.5 80.5 72

Legend:

= alternative total score

Green shading = top scored/ranked
Yellow shading = high scored/ranked
Red shading = low scored/ranked
Purple shading = lowest scored/ranked

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Figure ES-5. Overview of Project Option Locations

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Chapter 1. Introduction

1.1 Desalination Project Overview

The Santa Clara Valley Water District (Valley Water) is investigating the development of a seawater desalination project (desalination project) in Santa Clara County with intake of seawater from the South San Francisco Bay (South Bay). A desalination project would augment Valley Water's potable water supply and serve the primary purpose of obtaining a reliable water supply for current and future populations in Santa Clara County. Valley Water is considering developing a desalination facility in the South Bay, the size of which would be dependent on numerous factors such as location, available water supply, consistency with the Ocean Plan, etc. For this study, Valley Water is considering a 10 million gallon per day (MGD) (up to up to 11,208 acre-feet per year) desalination project with a 15 cubic feet per second (cfs) production rate with a focus on locating infrastructure in the geographical area encompassing the cities of Palo Alto, Mountain View, Sunnyvale, and San Jose, in Santa Clara County. The desalination project would operate year-round but could potentially ramp down in months when water conditions are wetter than normal and ramp up in months when water conditions are drier than normal.

1.2 Study Purpose

The intent of this study is to evaluate the environmental, land use, regulatory, and stakeholder issues associated with the desalination project. As a part of this study, Valley Water has identified eight conceptual options for seawater intakes and three options for brine management and identified Treatment Facility Planning Areas (TFPAs) – generalized areas where a treatment facility could be located. Overall, a total of 13 conceptual desalination project alternatives have also been identified, each consisting of a unique combination of intake and brine management options and the associated TFPA for the location.

This study provides an evaluation of environmental and land use conditions and applicable regulations to identify constraints for each intake and brine management option and TFPAs. Scoring is developed for each intake and brine management option and each of the 13 desalination project alternatives. Feasibility level issues are also identified based on the environmental constraints and are further evaluated. Additionally, the environmental permitting, California Environmental Quality Act (CEQA), and National Environmental Policy Act (NEPA) requirements of the desalination project and key issues are also evaluated along with stakeholders and public acceptance of the project to provide a guide for future phases of project planning. Lastly, this study provides recommendations and next steps for further evaluating intake and brine management options/desalination project alternatives and for environmental planning.

In this study, typical reverse osmosis (RO) and water treatment processes for seawater desalination facilities are assumed for the conceptual project, and as such, particular treatment processes are not part of this evaluation. Should the project be pursued further, the evaluation of engineering, constructability, cost, or other non-environmentally related constraints would occur in future phases of planning.

1.3 Desalination Project Purpose and Need

The need to identify and evaluate new reliable sources of water is increasing as the availability of existing water supplies is constrained by a multitude of factors, such as drought, population growth, and increasing water demands. A desalination project would increase the diversity of Valley Water's water supply portfolio by providing a new drought-proof water supply and allow for more certainty and reliability. The remainder of this section discusses the purpose and need in more detail.

1.3.1 Uncertainty in Existing Water Supply Availability

Valley Water's water supplies currently include:

- local surface water diversions
- groundwater sources
- recycled/reused water
- imported water from the Central Valley Project and State Water Project

The San Francisco Public Utilities Commission (SFPUC) also provides water supplies to the northern portions of Valley Water's service area through the Regional Water System. Valley Water's Water Supply Master Plan 2040 (2040 WSMP) identifies several future challenges and uncertainties for existing water supplies. Future droughts are identified as Valley Water's primary water supply challenge, which are exacerbated by the following circumstances (Valley Water 2019):

- Uncertainties in reliability of imported water supplies due to climate change, including impacts from warming temperatures, shrinking snowpack, increasing weather extremes, and prolonged droughts

- Uncertainty in availability of local surface water supplies due to climate change and likely future changes in regulatory requirements for appropriative water rights, including from:

    - The Settlement Agreement produced by the Fisheries and Aquatic Habitat Collaborative Effort in 2003

    - Increased restrictions on Sacramento-San Joaquin River Delta pumping required by biological opinions issued by the U.S. Fish and Wildlife Service in 2008 and National Marine Fisheries Service in 2009

    - Amendments to the Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary in December 2018, which resulted in increased restrictions on water users within the San Joaquin Basin

- Uncertainty in SFPUC supply reliability due to climate change and San Francisco Bay (Bay)-Sacramento-San Joaquin River Delta regulations

The 2040 WSMP estimates that by 2040, water shortages could occur without the augmentation of new supplies or conservation savings. Based on modeling, water shortages are estimated to occur in approximately 40 percent of years and water supplies would only be able to meet about 60 percent of normal demand (Valley Water 2019). Water supply planning analyses indicate future shortages that exceed Valley Water's level of service goal by mid-century are anticipated if no new water supply projects are completed (S. Green, personal communication, March 20, 2023).

1.3.2 Water Supply Planning and Desalination

The California Governor issued Executive Order N-10-19 in April 2019 directing state agencies to develop recommendations and to enable water security for all Californians to meet the challenges of more extreme droughts and floods, rising temperatures, depleted groundwater basins, aging infrastructure and other challenges magnified by climate change. The California Natural Resources Agency, California Environmental Protection Agency and Department of Food and Agriculture released the 2020 Water Resilience Portfolio in response to Executive Order N-10-19. This document highlighted the importance of diversifying water supplies through the introduction of new water sources and preparing for new threats. The report states that depending upon local circumstances, desalination can be a viable supply source, and desalting brackish groundwater can provide a safe supply and capacity for additional groundwater storage (California Natural Resources Agency [CNRA], California Environmental Protection Agency [CalEPA], and California Department of Food and Agriculture [CDFA] 2020).

Valley Water is a participant of the Bay Area Regional Desalination Project (BARDP), a collaborative desalination project among several Bay Area water agencies. In 2003, Valley Water in coordination with the Contra Costa Water District (CCWD), the East Bay Municipal Utility District, and SFPUC entered into a Memorandum of Understanding (MOU) to explore the initial viability of the BARDP through a pre-feasibility analysis (as such, Valley Water does not have sole decision-making authority for the BARDP). In October 2003, a Phase I Pre-Feasibility Study resulted in the short-listing of three potential sites, all of which are beyond the South Bay and Valley Water's service area. In June 2004, the agencies entered into a second MOU to conduct preliminary environmental screening and an evaluation of conveyance options for the three short-listed sites. The agencies conducted a feasibility study in 2005 which found that a desalination plant near Pittsburg would be the most cost-effective and technically feasible option. A pilot test was conducted at CCWD's Mallard Slough Pump Station site located in the eastern part of Contra Costa County and collected data suggested that a full-scale facility is viable in this location, and potentially other locations in the Bay Area as well. In 2014, a site-specific analysis was conducted, and it was determined that the BARDP is technically feasible.

The 2040 WSMP identifies a potable water reuse program goal of 24,000 acre-feet per year and projects that could help meet this goal, including the BARDP (Valley Water 2019). A Santa Clara County desalination project, beyond the scope of the BARDP (as is evaluated in this study), is not identified in the 2040 WSMP but would help satisfy the same goal as the BARDP and other goals related to future reliability of water supplies, including those circumstances discussed in Section 1.2.1, above. Additionally, Valley Water's 2020 Urban Water Management

Plan discusses Valley Water's participation in the BARDP; however, it does not include desalination in its projected water supplies (Valley Water 2021).

Valley Water is evaluating its own desalination project in this study, in part, because the current BARDP project product water would likely be approximately 10 MGD and shared among three agencies, and therefore would not provide sufficient supply to Valley Water. Additionally, since the BARDP did not short-list sites in the South Bay, much of the BARDP and conducted studies are not directly applicable to Valley Water's own desalination project. A Santa Clara County desalination project, outside the scope of the BARDP (as is evaluated in this study), could support goals related to future water supply reliability, including mitigating the risks discussed in Section 1.2.1, above. A local desalination facility could be under the second strategy of the WSMP, which recommends increasing purified water, conservation, and stormwater capture.

1.4 Study Area

Valley Water is focusing this study on a potential desalination project located along the lower San Francisco Bay (Bay) south of the Dumbarton Bridge (referred to as the Lower South Bay in this study) in Santa Clara County due to the proximity to its existing potable water systems. Thirteen conceptual desalination project alternatives are evaluated in this analysis, situated within three general locations – in the cities of San Jose, Mountain View, and Palo Alto, as shown in **Figure 1-1**. Additionally, unincorporated areas of Santa Clara County are evaluated in the study as part of the desalination project alternatives in Mountain View and Palo Alto. In addition, the City of Sunnyvale was also evaluated for a desalination project, but no intake or brine management options were selected for this study at this location. The selection of options is discussed further in Chapter 2, "Study Methodology."

1.5 Desalination Project Planning Process

An overview of what the desalination project development process could look like, beginning with this study and extending through beginning of construction, is shown in **Figure 1-2**. This process emphasizes development of the project around the environmental, land use, and regulatory constraints identified in this study. Additionally, this process includes further data collection, coordination with agencies and stakeholders to obtain input on critical issues, and critical milestones. Critical milestones are identified when additional information is obtained, and data is developed which can then be used to determine if the project should continue moving forward.

As a first step in project planning, this study identifies and evaluates environmental and land use conditions, applicable regulations and permitting requirements, stakeholder concerns, and potential environmental impacts associated with the eight intake options, three brine management options, and TFPAs evaluated in this study and referred to collectively as project options. To conduct this study, applicable planning documents, studies, CEQA and NEPA documentation, other publicly available resources for other seawater desalination projects, and publicly available information on environmental conditions and regulations were compiled and reviewed.

Figure 1-1. Study Locations and Regional Setting

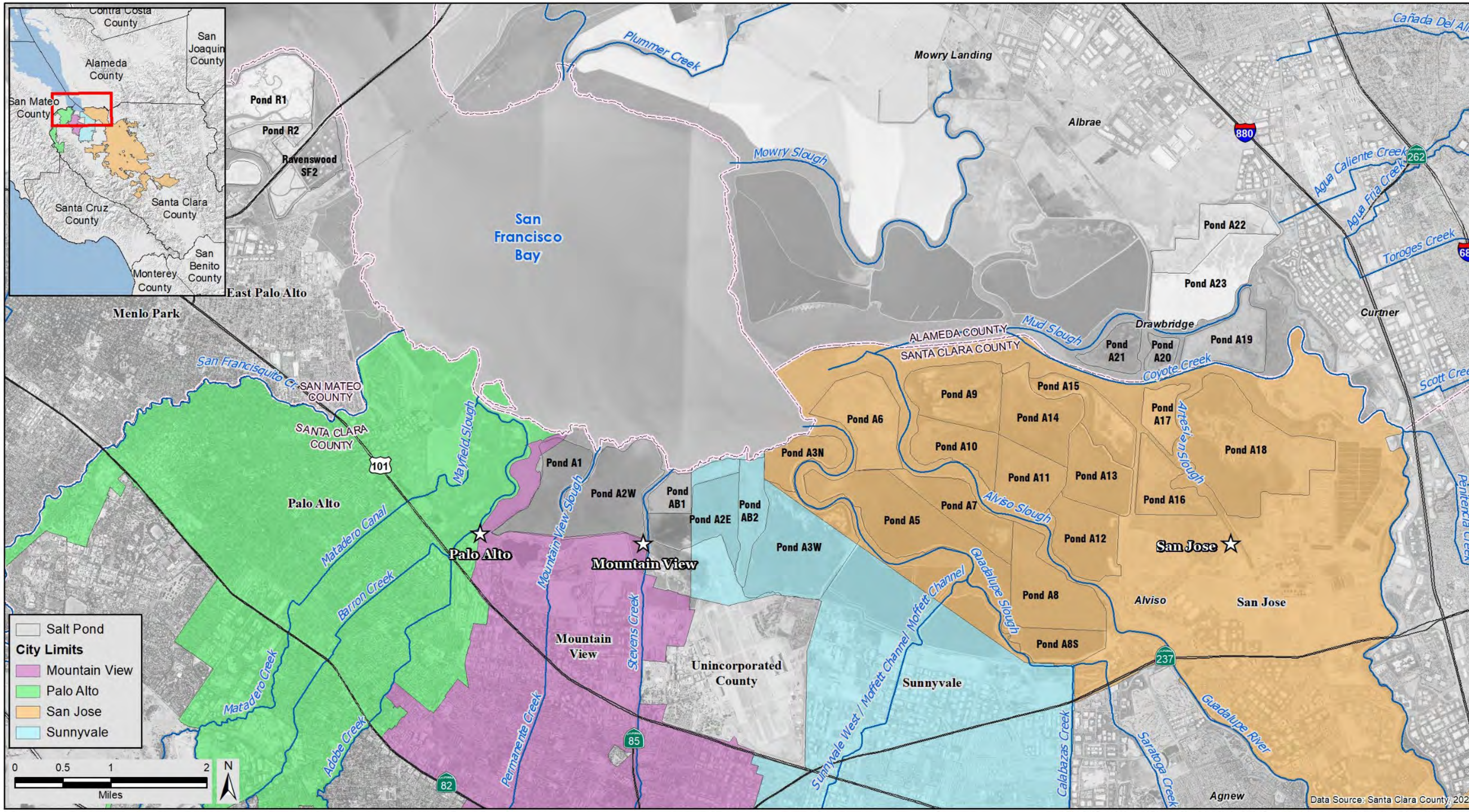

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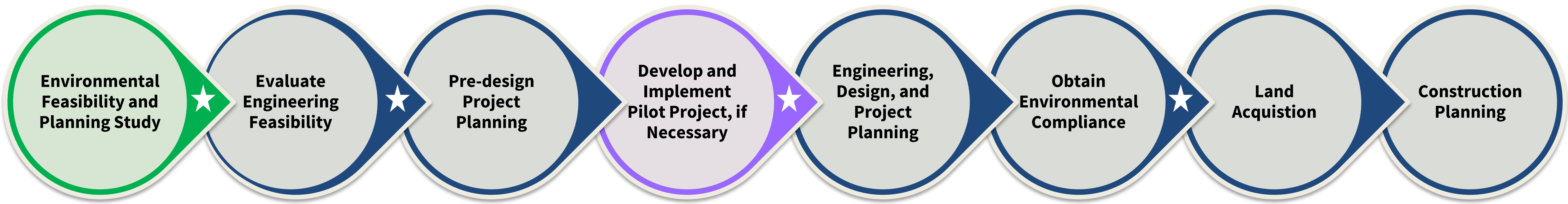
Figure source: GEI 2022

Figure 1-2. Desalination Project Development Process



Environmental Feasibility and Planning Study

- Identify Environmental, Land Use, Statetholder, and Regulatory Constraints
- Evaluate Environmental Feasibility
- Score and Rank Alterantives and Identify Preferred Alterantives
- Develop Recommendations and Next Steps for Environmental Planning During Future Phases of Project Development

Evaluate Engineering Feasibility

- Identify Complete Intake, Brine Management, Treatment Facility, and Conveyance Alternatives
- Identify Feasibility Criteria and Collect Field Data
- Develop Costs Estimates and Identify Funding Opportunities
- Score and Rank Alternatives and Identify Peferred Project

Pre-design Project Planning

- Collect Additional Data to Support Environmental and Engineering Studies
- Develop CEQA,NEPA, and Permitting Strategy
- Begin Outreach to Stakeholders including Landowners and Regulatory Agencies (ongoing)

Develop and Implement Pilot Project, if Necessary

- Collect Additional Data to Support Environmental and Engineering Studies

Engineering, Design, and Project Planning

- Prepare Project Specific Techincal Studies
- Develop 30/60/90/100% Design Using Site-specific Data
- Begin High-level Construction Planning
- Prepare CEQA/NEPA Documentation and Permit Applications

Obtain Environmental Compliance

- Certify CEQA Document
- Negotiate Permits with Regulaotry Agencies

Land Acquistion

- Obtain Easements, Rights-of-way, and Property, as Necessary

Construction Planning

- Finalize Construction Plans
- Integrate CEQA Mitigation and Permit Conditions
- Obtain Construciton Bids

☆ *Key point in deciding on moving forward with a desalination project*

Technical issues evaluated in this study include the following:

- source, treated, and brine discharge water quality
- land use planning and conflicts with other regional projects
- energy use and consumption
- greenhouse gas emissions and climate change hazards
- environmental justice
- CEQA and NEPA requirements and critical issues
- applicable regulations and environmental permitting requirements
- stakeholders and public acceptance

Using the environmental constraints evaluation, the intake and brine management options were scored, and feasibility level criteria were compared to identify key differences and preferences. The scores of the 13 desalination project alternatives were then assembled and compared to identify preferred alternatives for the next stages of project planning.

1.6 Study Organization

This study was completed in four phases with information from each phase informing subsequent phases. The study consists of the following chapters and phases:

Study Introduction

- **Chapter 1, Introduction.** Identifies study purpose and need, project location, desalination project planning process, study organization, and study terminology.

- **Chapter 2, Study Approach.** Describes the approach to key aspects of each phase of this study, including development of project options and alternatives, the environmental and planning evaluations, and the scoring and feasibility evaluation.

Phase 1 – Development of Project Options and Alternatives

- **Chapter 3, Project Description, Options, and Alternatives.** Provides an overview of the desalination process; describes project components and characteristics and construction, operations, and maintenance activities; identifies and describes intake and brine management options, TFPAs, and desalination alternatives evaluated in the study.

Phase 2 – Environmental Evaluations

- **Chapter 4, Water Quality.** Identifies source water quality, develops estimates of treated and brine concentrate water quality, discusses existing Valley Water studies and applicable regulations, and provides an evaluation of source and receiving water quality constraints.

- **Chapter 5, Environmental Conditions.** Identifies environmental conditions and provides a siting evaluation of site-specific environmental constraints.

- **Chapter 6, Land Use and Planning.** Identifies land use conditions and applicable planning regulations and provides a planning evaluation of land use and planning issues.

- **Chapter 7, Energy.** Discusses energy demands, provides estimates and an evaluation of energy use, and identifies potential energy sources.

- **Chapter 8, Climate Change.** Identifies sources of greenhouse gas emissions, provides estimates of greenhouse gas emissions for electricity purchases, evaluates greenhouse gas emissions, identifies and discusses flood-related and non-flood related climate change hazards, evaluates vulnerability to climate hazards, and evaluates applicability of Valley Water's Climate Change Action Plan.

Phase 3 – Planning Evaluations

- **Chapter 9, Environmental Justice.** Identifies Environmental Justice communities and provides an evaluation of key pollution indicators of these communities.

- **Chapter 10, CEQA and NEPA.** Identifies CEQA and NEPA requirements for the desalination project and provides a screening analysis of resource topics and issues.

- **Chapter 11, Permitting.** Identifies permitting requirements for the desalination project and the associated steps and processes.

- **Chapter 12, Public Acceptance.** Identifies stakeholders and evaluates key stakeholder issues, key messaging, community engagement, and outreach strategy.

Phase 4 – Study Conclusions

- **Chapter 13, Scoring and Feasibility.** Identifies scoring categories and criteria, develops, and evaluates scoring for intake and brine management options, provides an assessment of feasibility level criteria, and assembles and evaluates scoring for desalination project alternatives.

- **Chapter 14, Recommendations and Next Steps.** Provides a summary of recommendations and next steps for the development of the desalination project.

References

- **Chapter 15, References.** Provides references for citations provided in each chapter of this study.

Appendices

- **Appendix A, Intake and Brine Management Options Screening.** Provides a screening matrix of all project components' options considered for the study including benefits and limitations of each option site.

- **Appendix B, Description of Seawater Desalination Intake Types.** Provides technical descriptions of the different types of intake and brine management designs typically used in desalination projects.

- **Appendix C, Energy Use Calculations.** Provides calculations of energy use with detailed inputs and assumptions.
- **Appendix D, Santa Clara County Seawater Desalination Project Permitting Work Plan.** Provides an in-depth description of requirements for permits from Federal, State, and local agencies.
- **Appendix E, Environmental Justice Evaluation Detailed Results.** Provides detailed evaluation tool results for the environmental justice evaluation.

1.7 Study Terminology

The following terminology is used throughout this study. Terminology referring to a specific place or thing is capitalized.

- **study.** This document and all the evaluations conducted referred to collectively.
- **study area.** The general area evaluated in this study consisting of San Jose, Mountain View, and Palo Alto in Santa Clara County.
- **desalination project.** The conceptual 10 MGD (up to up to 11,208 acre-feet per year) desalination project with a 15 cubic feet per second (cfs) production rate evaluated by Valley Water in this study.
- **project options.** The eight intake options, three brine management options, and TFPAs evaluated in this study referred to collectively.
- **desalination project alternative(s)/alternative(s).** Either one of the desalination project alternatives or all 13 desalination project alternatives collectively assembled from a unique combination of intake, brine management, and TFPAs or all of these alternatives referred to collectively.
- **reverse osmosis.** Purification process where salt and contaminants are removed from water by pushing it under pressure through semi-permeable membranes.
- **brine.** highly concentrated water with high salt concentrations generated by RO.
- **permeate.** Water that passes through membranes by RO and has contaminants and salt removed.
- **pre-treatment.** Treatment of water prior to RO.
- **post-treatment.** Treatment of water after RO.
- **product water** or **treated water.** Drinking water produced from RO and treatment.
- **seawater intake** or **intake.** Infrastructure used to draw in seawater or brackish water as source water for the desalination project.
- **brine management.** Infrastructure and other means of disposing and managing brine generated from RO.

- **treatment facility.** The building or collection of buildings, structures, and equipment where RO, treatment, and other maintenance activities occur.
- **Treatment Facility Planning Areas.** Refers collectively to the San Jose, Potential San Jose, and Mountain View-Palo Alto TFPAs. Each of these areas is defined as follows:
    - **San Jose Treatment Facility Planning Area.** Existing San Jose/Santa Clara Regional Wastewater Facility buffer lands which are evaluated in this study for location of a treatment facility for desalination project alternatives in San Jose.
    - **Potential San Jose Treatment Facility Planning Area.** Existing San Jose/Santa Clara Regional Wastewater Facility biosolids lagoon and residual solids management areas that are planned for retirement and where a treatment facility could be located if retirement of these areas occurs as planned.
    - **Mountain View-Palo Alto Treatment Facility Planning Area.** The general area in Mountain View and Palo Alto evaluated in this study for location of a treatment facility for desalination project alternatives in Mountain View or Palo Alto.
- **Environmental Study Areas.** Refers collectively to the Deep Bay Brine Outfall, San Jose, and Mountain View-Palo Alto Environmental Study Areas. Each of these areas is defined as follows:
    - **Deep Bay Brine Outfall Environmental Study Area.** The area where site-specific environmental conditions are identified for the South Bay deep water outfall project option.
    - **San Jose Environmental Study Area.** The area where site-specific environmental conditions are identified for intake and brine management options in San Jose.
    - **Mountain View-Palo Alto Environmental Study Area.** The area where site-specific environmental conditions are identified for the intake and brine management options in Mountain View and Palo Alto. These areas are connected and referred to collectively.
- **Lower South Bay.** The lower San Francisco Bay south of the Dumbarton Bridge.
- **environmental justice study area.** The study area consisting of census tracts developed for identification of environmental justice communities.

Chapter 2. Study Approach

The methodology and approach to each of the four study phases – Phase 1 – Development of Project Options and Alternatives, Phase 2 - Environmental Evaluations, Phase 3 - Planning Evaluations, and Phase 4 – Scoring and Conclusions – are addressed below.

2.1 Phase 1 – Development of Project Options and Alternatives

The seawater desalination project (desalination project) alternatives development process began by identifying potential desalination project locations, then identifying seawater intake (intake) and brine management options at each location, and finally organizing unique combinations of intake and brine management options into desalination project alternatives, as shown in **Figure 2-1**. A screening analysis was conducted to identify the intake and brine management options for the study as discussed below. The intake and brine management options, Treatment Facility Planning Areas (TFPAs), and desalination project alternatives are described in Chapter 3, "Desalination Project Description, Options, and Alternatives."

2.1.1 Screening Analysis

Valley Water initially identified four potential desalination project locations in the cities of San Jose, Sunnyvale, Mountain View, and Palo Alto. At each location, multiple unique intake and brine management project options were identified. The project options were identified based on the proximity to the South San Francisco Bay (South Bay); geographic, land use, and environmental conditions at each location; and critical regulations applicable to siting of desalination projects, including the State Water Resource Control Board's Water Quality Control Plan for Ocean Waters of California and the San Francisco Bay Conservation and Development Commission's San Francisco Bay Plan (Bay Plan). The benefits and limitations of each option were screened to identify alternatives evaluated in this study. **Appendix A** provides a matrix of intake and brine management options considered in the screening analysis and highlights those selected. Based on this screening, no options were carried forward into the study for the Sunnyvale location.

Next, TFPAs were developed based on the location of selected intake and brine management options for the study. The TFPAs were identified based on review of aerial photography and input from Valley Water staff. Due to the close proximity of project options in Mountain View and Palo Alto, it was determined a treatment facility could be located in either area, and therefore, a joint Mountain View–Palo Alto TFPA was identified. In San Jose, a TFPA was identified based on current land uses and a second potential TFPA was also identified on lands currently used for operations of the San Jose-Santa Clara Regional Wastewater Facility that may become available as the Mechanical Drying/Dewatering of the Digested Sludge progresses. This will free many acres of the ponds currently used for further digested sludge processing in the

Residual Solids Management area. Since no project options were selected in Sunnyvale, no TFPA was developed at this location.

2.2 Phase 2 – Environmental Evaluations

This section provides background on the approach used to conduct environmental and planning evaluations.

2.2.1 Reference Desalination Projects

Publicly available information on the following desalination projects recently or currently being planned in California was reviewed in preparation of evaluations in this study.

- Bay Area Regional Desalination Project (Various counties and locations)
- Marin Municipal Water District Desalination Project (Marin County and North Bay)
- California American Water Company Monterey Peninsula Water Supply Project (Monterey County and Pacific Ocean)
- City of Antioch Brackish Water Desalination Project (Contra Costa County and San Joaquin River)
- City of Santa Cruz and Soquel Creek Water District Regional Seawater Desalination Project (Santa Cruz County and Pacific Ocean)
- City of Huntington Beach Seawater Desalination Project (Orange County and Pacific Ocean)
- City of Carlsbad Desalination Plant Project (San Diego County and Pacific Ocean)

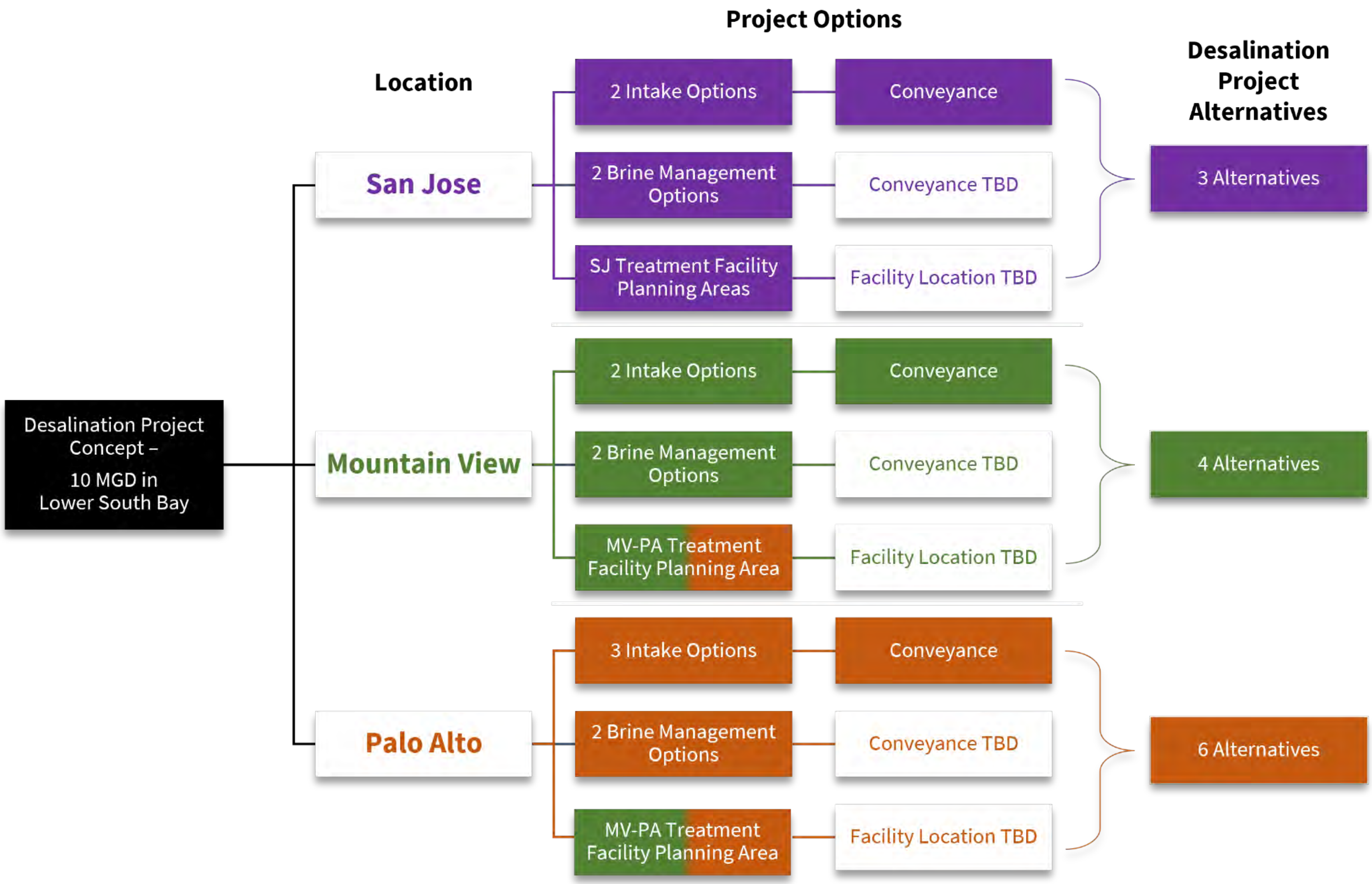
2.2.2 Approach

The environmental evaluations were conducted to identify the potential environmental impacts and constraints of the project options and desalination project overall and allows for comparison of constraints among project options where there are differences. An overview of topics evaluated in each of the environmental evaluations is shown in **Figure 2-2**. For each topic, a qualitative evaluation of constraints was conducted. The remainder of this section highlights key aspects of the approach used for specific environmental evaluations.

Water Quality

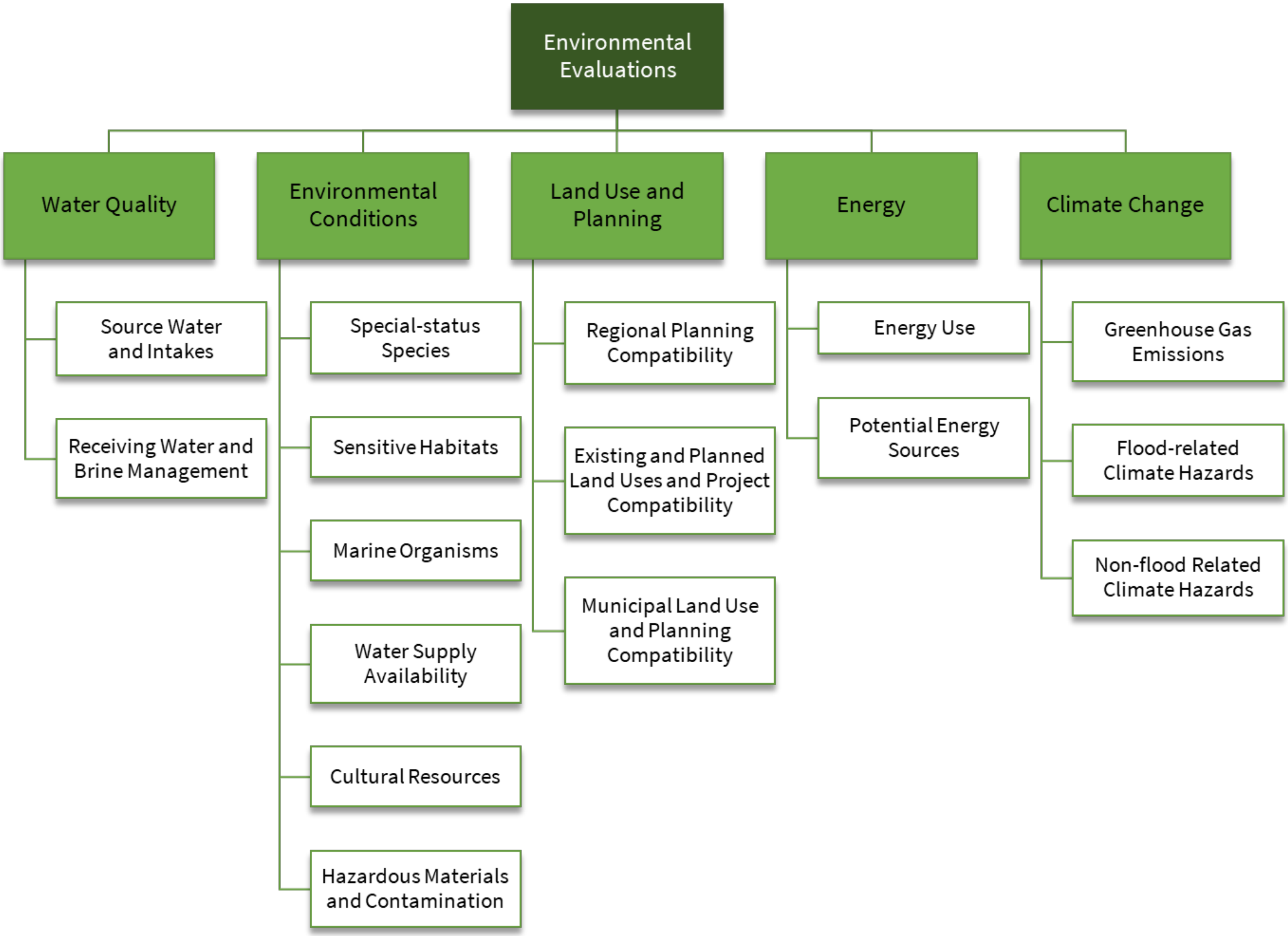
- Evaluates water quality associated with source water for each intake option and potential impacts to water quality for receiving water pertinent to each brine management options
- Limited to surface water and does not consider potential pumping of groundwater as part of the source water for subsurface intake options
- Collected and evaluated source water quality data from existing data sources for the Lower South Bay (surface water only)

Figure 2-1. Project Options and Desalination Project Alternatives by Study Area Location



Notes: MGD = millions of gallons per day; TBD = to be determined

Figure 2-2. Environmental Evaluations Overview



- Using source water quality data and assuming on typical treatment requirements for seawater desalination facilities, developed estimates of treated and brine concentrate water quality and evaluated results. Does not consider additional constituents that could be in groundwater for subsurface intake options
- Collected information on applicable regulations and information in existing Valley Water studies related to dilution in the Lower South Bay and horizontal levee water quality

Environmental Conditions

- Identifies environmental conditions related to each intake and brine management option location and provides an evaluation of potential impacts related to siting these options
- Site-specific environmental conditions are documented and evaluated within the Environmental Study Areas developed for this study
- Does not identify or evaluate site-specific conditions within TFPAs
- Collected information on existing environmental conditions from publicly available planning documents, studies, California Environmental Quality Act (CEQA) documents for other projects in the area, and databases (e.g., biological resources and hazardous materials)
- Conducted a cultural resources records search for the Environmental Study Areas

Land Use and Planning

- Identifies land use and planning issues related to each intake and brine management option location and TFPA and provides an evaluation of potential conflicts and compatibility related to siting these options
- Documents applicable land use conditions, plans, and regulations within the Environmental Study Areas and TFPAs
- Collected information on existing land use conditions, plans, and planned projects from publicly available planning documents, studies, CEQA documents for other projects in the area, and databases and websites (e.g., recreation trails and facilities, flood protection levees, etc.)

Energy

- Identifies energy use for pumping, conveyance, and treatment and provides and evaluation of energy use related to intake, brine management options, and salinity levels in source water
- Researched energy use for seawater desalination projects and other water supplies and evaluated energy demands and use for a recently approved desalination project, the Doheny Ocean Desalination Project

- Collected information on energy providers and sources in the study area. Energy transmission to the treatment facility or pump station would be evaluated in an Engineering Feasibility Study in the future phases of project planning
- Using assumptions on source water quality treatment from the water quality evaluation and pipeline conveyance assumptions, estimated energy use of project options and treatment for a variety of salinity scenarios. Quantification of energy reductions from treatment technologies could be evaluated in an Engineering Feasibility Study in the future phases of the study

Climate Change

- Identifies greenhouse gas (GHG) emissions sources from the desalination project and provides and evaluation of project options and salinity levels in source water.
- Identifies climate change hazards and provides an evaluation of project options vulnerability of to these hazards.
- Identifies applicability of Valley Water's climate change planning activities and provides an evaluation of project options.
- Using energy use estimates and published GHG emissions factor for Pacific Gas and Electric Company, estimated GHG emissions for all project options and treatment including for a variety of salinity scenarios. Quantifying greenhouse gas reductions from treatment technologies that would reduce energy use would be evaluated after completion of an Engineering Feasibility Study in the future.
- Collected information on climate change hazards from publicly available studies and databases.

2.3 Phase 3 – Planning Evaluations

The planning evaluations were conducted as a guide for obtaining regulatory approvals required for the desalination project and public acceptance. The remainder of this section highlights key aspects of the approach used for specific planning evaluations.

2.3.1 Approach

Environmental Justice

- Identifies environmental justice communities within an Environmental Justice study area developed for the project options and provides an evaluation of project options contribution to pollution indicators in environmental justice communities
- Also, provides an evaluation of regulations applicable to the environmental justice and the desalination project

- Uses existing publicly available evaluation tools and maps to identify environmental justice communities, including disadvantaged communities and low-income areas, and pollution indicators that are addressed in the evaluation

California Environmental Quality Act and National Environmental Policy Act

- Identifies key requirements for CEQA and National Environmental Policy Act (NEPA) compliance and document preparation
- Provides a screening analysis of key issues that will need to be addressed in CEQA/NEPA documentation and recommendations for future phases of project planning to address these issues
- Refers back to environmental evaluations where information is already provided and provides evaluation of new issues that are not previously discussed

Permitting

- Identifies federal, state, and local regulations applicable to the desalination project and evaluates anticipated level of complication to obtain permits related to regulations for each intake and brine management option
- Summarizes permit triggers, key issues, and recommendations for each applicable federal and state regulations. A detailed work plan for each regulation is provided in **Appendix D**
- Outlines permitting process for key federal and state regulations

Public Acceptance

- Identifies stakeholder issues and evaluates applicability to the desalination project
- Reviewed public comments on several desalination project CEQA documents to identify likely stakeholder issues
- Identifies specific stakeholders for the desalination project and key messaging
- Provides a strategy for community engagement and outreach if Valley Water moves forward with the project

2.4 Phase 4 – Study Conclusions

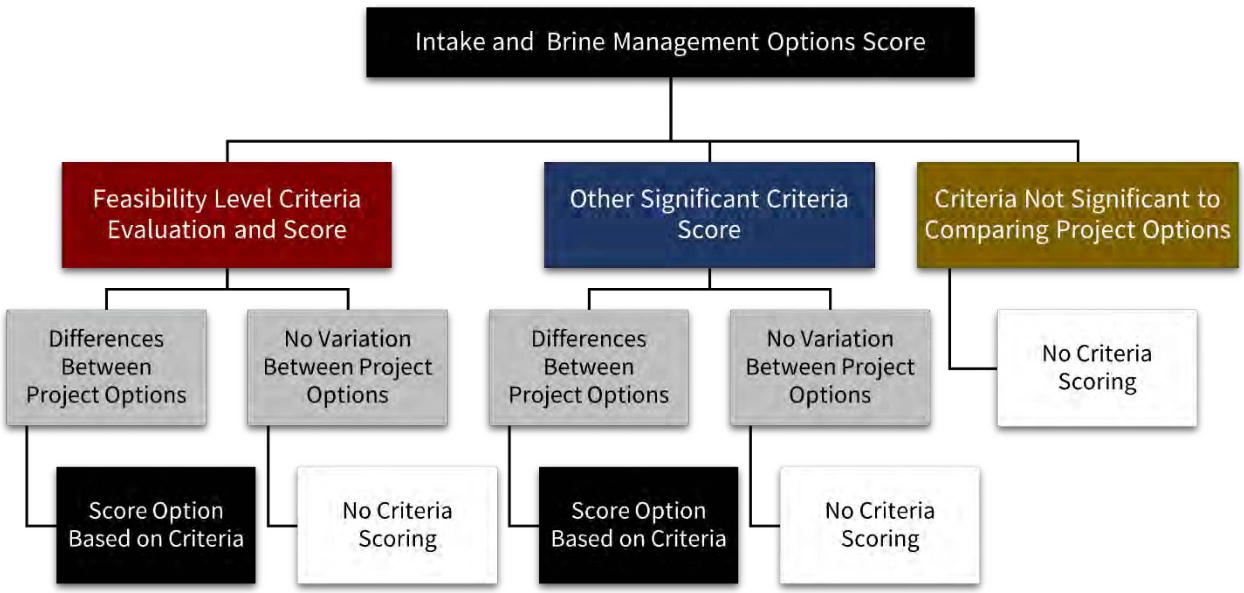
The environmental evaluations portion of the study culminates in the development and comparison of scoring and a feasibility level issues evaluation. The TFPAs are not included in the scoring or feasibility evaluation because they are broadly defined, there is flexibility in locating the treatment facility based on the constraints identified in this study, site-specific analysis was not conducted within these areas, and most feasibility level criteria do not apply to these areas. Therefore, the remainder of this section focuses on intake and brine management.

2.4.1 Scoring

An overview of the process used to select criteria for scoring is provided in **Figure 2-3**. Criteria refers to the specific issues identified during the environmental evaluations. Some criteria apply to both intake and brine management options, and some apply to only intake options or only brine management options. Each criteria identified is categorized as one of the following.

- **Feasibility Level Criteria.** Issues that have implications for determining if a project option can be developed or could be eliminated from consideration. These issues could represent potentially substantial environmental impacts and/or compatibility with plans, regulations, and land uses.
- **Other Significant Criteria.** Issues that could result in substantial impacts or conflicts and potentially modify the design, construction, operations, or other requirements of project options. These criteria have lower weighting than feasibility level criteria.
- **Criteria Not Significant to Project Planning.** Issues that were not determined have substantial impacts or conflicts for project options and are anticipated to be managed during project planning using typical approaches and measures.

Figure 2-3. Intake and Brine Management Scoring Criteria Selection



The environmental evaluations found that some feasibility level criteria and other significant criteria did not have any variation or significant enough variation in constraints between project options to warrant different scoring.

Each project option is assigned a score from 1 to 5 (higher being a better score) for each criterion. Each criterion was weighted based on its overall importance to project planning. Feasibility-level criteria have higher weights than other significant criteria. Specific issues within each criterion are also weighted differently based on their overall level of importance to planning. Specific criteria and weighting are discussed further in Chapter 13, “Scoring and Feasibility.”

The score for each desalination project alternative identified in this study is compiled after scoring of project options and simply consists of the total score of the intake and brine management option associated with the alternative.

2.4.2 Feasibility-Level Criteria Evaluation

After scoring, an evaluation of feasibility level criteria is provided for each project option because of its importance to identifying the preferred desalination project for Valley Water. The purpose of this evaluation is to further clarify which project options have the fewest barriers to implementation. This evaluation considers the following for each project option:

- Aggregate score for feasibility level criteria
- Number of feasibility level criteria that apply
- Specific feasibility level factors that apply and are influencing the score

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Chapter 3. Project Description, Options, and Alternatives

3.1 Introduction

This section first provides an overview of the desalination process and then conceptually discusses seawater desalination project (desalination project) components and operations and maintenance activities, including general parameters used for the evaluations in this study. Then, intake and brine management options, Treatment Facility Planning Areas (TFPAs), and the 13 desalination project alternatives evaluated in this study area are identified and described.

3.2 Desalination Overview

The desalination process begins with an intake facility to collect seawater. Intake facilities can be subsurface by collecting seawater water and possibly groundwater at shallow depths below the ground surface or open water by directly drawing seawater into a pipe/conduit. Water is then pumped and conveyed from the intake to a facility for reverse osmosis (RO) and treatment. At the facility, treatment and RO generates treated water and brine. Treated water is pumped and conveyed to the water system for end uses. Brine is pumped and conveyed to a new location for management. Brine management has traditionally occurred as disposal via outfalls where it can be diluted into a large receiving water body. Alternative solutions, such as ecotones or horizontal levees, are also emerging and being studied for management of brine from a variety of facility types that use RO. The desalination process can be summarized in the following six steps.

1.) **Seawater Intake.** Salt water or brackish water (raw water or source water) is obtained. Pumping is required to convey water to the desalination treatment facility (treatment facility).

2.) **Source Water Treatment.** The raw/source water is pre-treated to remove larger debris and particles through flocculation, dissolved air flotation, and filtration. The pretreated water is pumped into cartridge filters, and it is then conveyed through the RO system in two passes. A portion of the first pass RO water is bypassed and blended with the second pass RO water. The RO process generates two water streams: brine (water with high salinity concentrations) and treated (or product) water. Once treated by RO, the permeate flow must be re-mineralized and disinfected. This water is then conveyed to the distribution system. A pump station is likely required as the treatment facility will be located at or close to sea level. The spent wash water and solids accumulated from the pre-treatment are sent to a wash water recovery system. The solids are dewatered and off hauled to a landfill or appropriate disposal site.

3.) **Desalination Treatment Facility.** The treatment facility houses the main project components including the pre-treatment, RO, post-treatment, and solids recovery components. The treatment facility also requires space for operation and maintenance, electrical, and stormwater retention.

4.) **Brine Management.** Based on the efficiency of the RO treatment, the high salinity water that is reject water from the first and second pass of the RO treatment becomes brine. This water is high salinity water (e.g., 65,000 to 67,000 milligrams per liter) and is pumped and discharged to an outfall but can also be managed through nature-based solutions which use natural features or processes in the built environment to promote adaptation and resilience.

5.) **Conveyance and Infrastructure.** Pipelines are needed to convey seawater from the intake pump to the treatment facility, brine from the treatment facility to any of the brine management options, and produce water from the treatment facility to an existing Valley Water treated water distribution line. Additionally, an intake pump station would be required to help convey raw water to the treatment facility.

Figure 3-1. Desalination Process

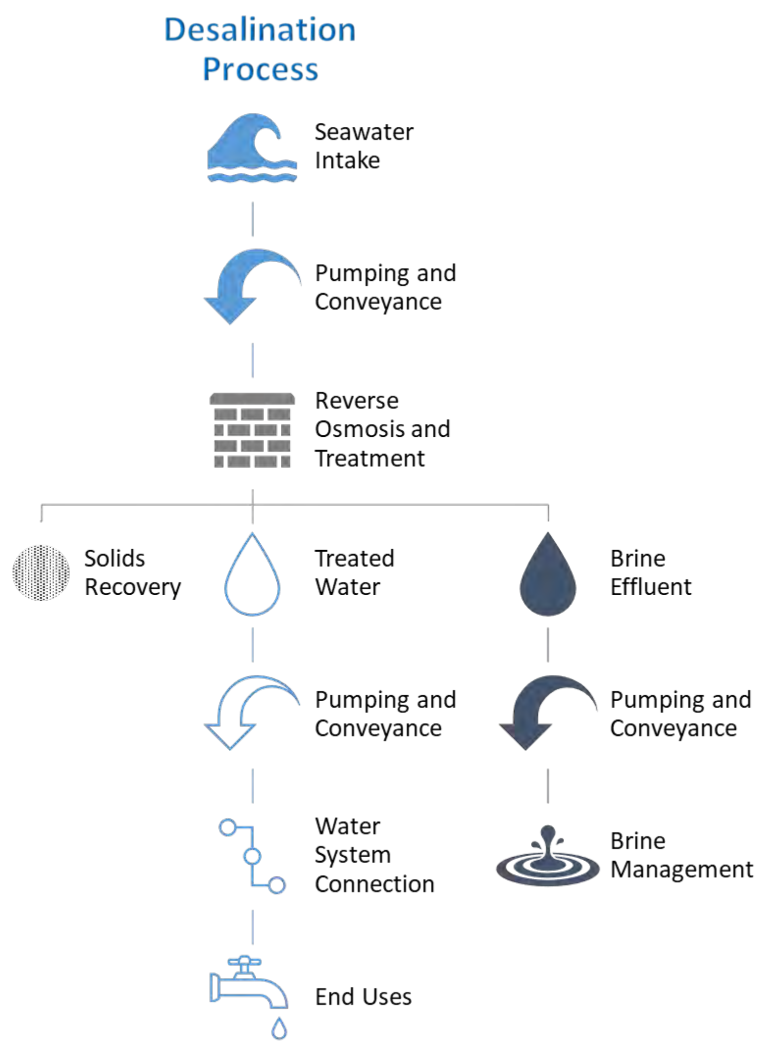
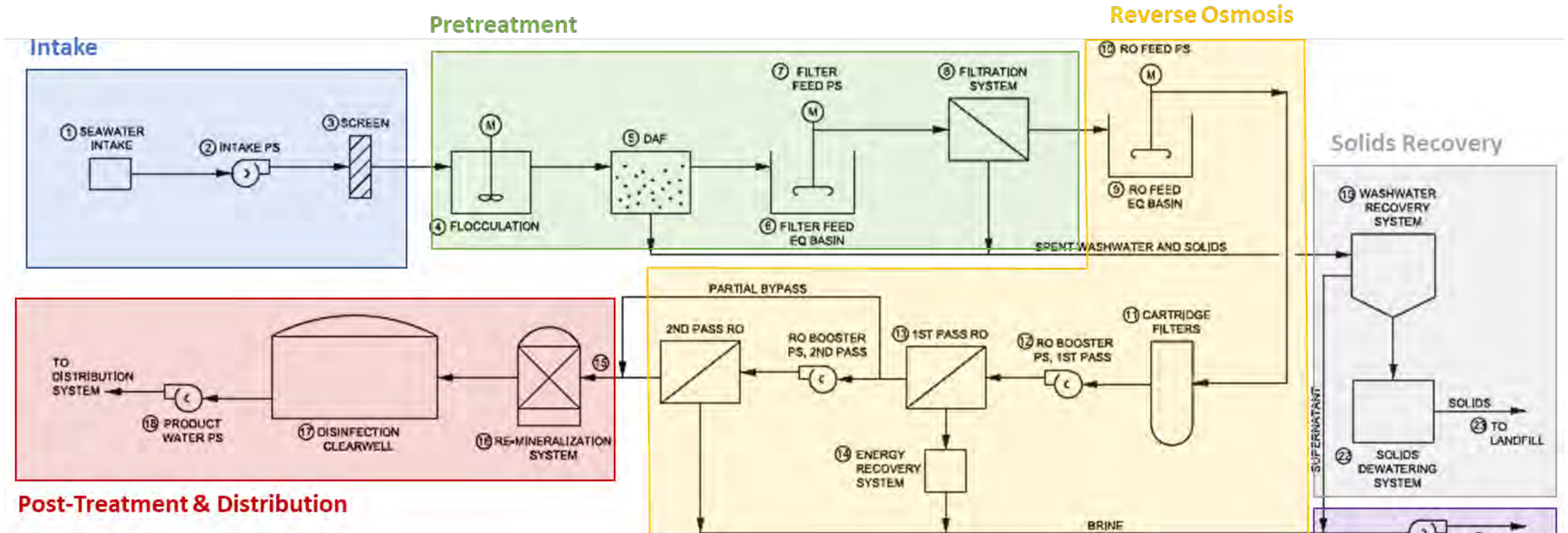


Figure 3-2. Process Flow Diagram for Desalination from Intake to Distribution/Discharge



ABBREVIATIONS

CFS	CUBIC FEED PER SECOND
DAF	DISSOLVED AIR FLOTATION
EQ	EQUALIZATION
MF	MEMBRANE FILTRATION
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
PS	PUMP STATION
RO	REVERSE OSMOSIS
UF	ULTRAFILTRATION

Figure Source: Kennedy Jenks 2022

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3.3 Project Components and Characteristics

This section provides a brief discussion of the main desalination project components evaluated in this study.

3.3.1 Seawater Intake

Seawater intakes that have previously been considered for supplying water to other desalination plants typically fall into the following two categories: 1) subsurface intakes, or 2) surface water intakes (open intakes). Most desalination intakes are subject to requirements of the Water Quality Control Plan for Ocean Waters of California (Ocean Plan), which requires that a subsurface intake first be evaluated (SWRCB 2019). The requirements of the Ocean Plan for siting the intake are discussed in Chapter 6, "Land Use and Planning."

This study considers both subsurface and open intake options. The type/design of each subsurface and open intake option has not been determined and conceptual information on the available intake options is discussed below and was used to prepare this study. In addition, the site-specific feasibility of engineering and operating a subsurface intake at a specific location has not yet been evaluated and is outside the scope of this study.

Subsurface intakes take advantage of the natural seabed and/or aquifer geology to provide a filter for the water prior to collection. All subsurface intake designs operate under the same fundamental principle; they allow water from the ocean, or ocean-influenced aquifers, to infiltrate through subsurface materials into a collection system. Through that process, some level of particulates and colloidal material is removed. The options differ in configuration and location relative to the shoreline. Types of subsurface intakes include the following:

- Vertical wells
- Slant wells
- Horizontal directionally drilled collector wells
- Radial collector (Ranney) wells
- Infiltration gallery

The location of subsurface intake options considered in this study are general and are not specific to any one design type. In the case that a subsurface intake is not feasible, an open intake may be used. Open intakes currently constitute most intakes for seawater desalination projects globally. To reduce the impact on marine organisms and the potential entrainment of unwanted suspended material and debris, open intakes can be screened or have velocity caps installed to reduce velocity in the vicinity of the intake opening.

Appendix B includes a more detailed description of intake types used for desalination and factors considered for feasibility. The details in Appendix B were not used to conduct this evaluation but clarify how intakes are designed, operate, and sited. This information is informative for future phases of project planning.

3.3.2 Source Water Treatment

This study assumes a standard treatment train for desalination of seawater. A treatment process diagram for a typical treatment facility is shown in **Figure 3-3** and discussed below.

Figure 3-3. Process Diagram for Reverse Osmosis

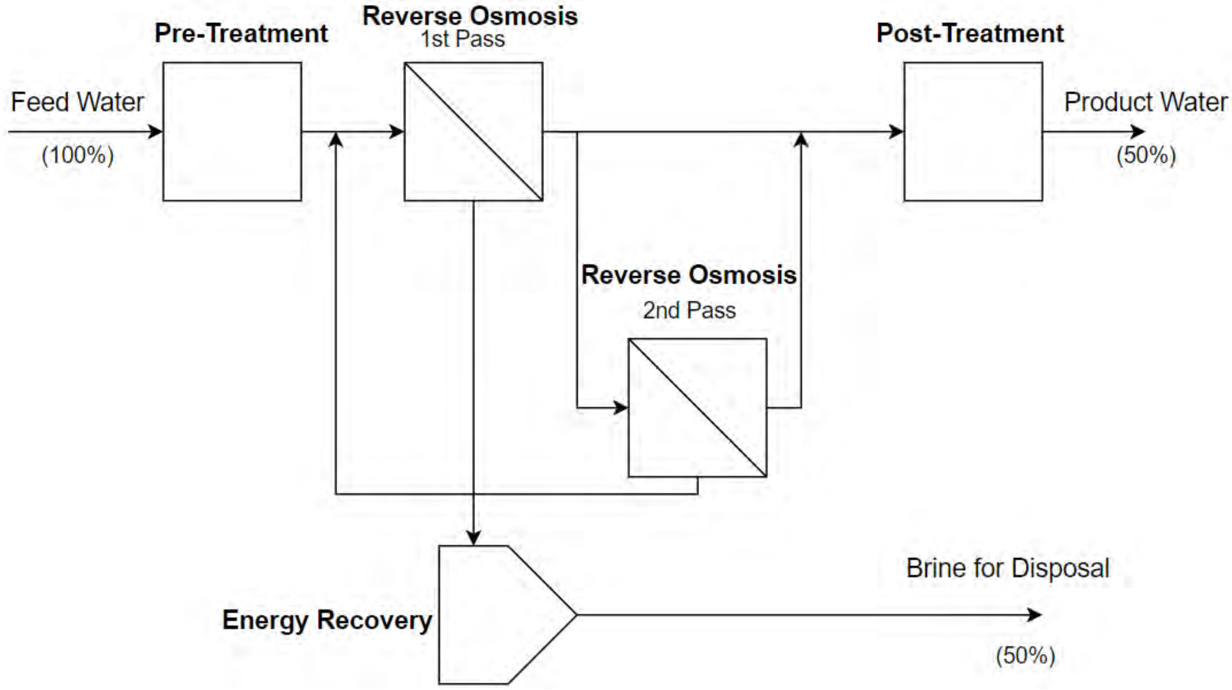


Figure source: Kennedy Jenks 2022

Pre-treatment is critical for preserving the membrane during the RO stage of treatment. Pre-treatment is required to remove foulant and scale-producing constituents. Without proper pre-treatment, fouling of the membranes during RO can occur more quickly, reducing the efficiency of the system and requiring earlier replacement of membranes. Two key considerations that impact facility requirements are the water quality treatment goals and the type of intake. The selection of an intake and the method for collecting and conveying the seawater may affect the pre-treatment requirements.

RO is a pressurized, energy-intensive, membrane filtration process. Water is pushed through a membrane using a pressure differential which causes salts to pass through the membrane due to the concentration differential. RO membranes can remove more than 99 percent of dissolved minerals, organic compounds, and biological constituents from the source water. The RO system creates two streams: a permeate and concentrate stream. The concentrate is a high salinity water that is discharged as brine. A portion of the RO product water is then sent to a second pass RO for additional desalting, while a portion of the product water bypasses the second system. The second pass RO treatment system typically operates at a lower pressure than the first pass. The second pass also creates a permeate and brine stream. The second pass RO permeate water and bypassed permeate water from the first pass are blended.

After the Seawater RO process, the product water (permeate) requires post-treatment conditioning to provide a stable product water that is compatible with water quality currently in the potable water distribution system. This water is then conveyed to the distribution system. The spent wash water and solids accumulated from the pre-treatment are sent to a wash water recovery system and the solids are dewatered and off hauled to a landfill or appropriate disposal site.

The recovery ratio, or recovery rate, of the system is defined by the amount of product water that is produced from the feed water (the source water). Higher recovery rates are typical for brackish groundwater that is lower in salinity. Higher recovery rates can be achieved through multiple stage processes. However, as more stages are added, additional energy is expended. It is anticipated that the potential seawater desalination plant would have a recovery rate of approximately 50 percent, which is typical of facilities desalinating seawater. Therefore, for every gallon of potable water produced, an intake of 2 gallons of seawater is required, with 1 gallon being brine with a higher salt concentration. The proposed 10 million gallons per day (MGD) product water facilities would require 20 MGD of seawater and produce 10 MGD of brine. A production rate of 15 cubic feet per second (cfs) of product water is also anticipated, which is estimated to also produce 15 cfs of brine.

3.3.3 Desalination Treatment Facility

The desalination treatment facility (treatment facility) is comprised of the pre-treatment, RO, post-treatment, and solids recovery components. In addition to the main components, additional facilities that are required include an operation and maintenance building, a stormwater retention area, and an electrical substation. The operation and maintenance building contains the control room for the facility, a maintenance workshop space, a laboratory, and other required facilities. For a developed site of this size, stormwater management is required.

A conceptual site layout for this project with the major components for a treatment facility is shown in **Figure 3-4**. The approximate acreage needed for a 15 cfs (10 MGD) treatment facility is estimated to be 5.3 acres, as summarized in **Table 3-1**. The site acreage requirements could be increased or reduced as the project elements become more defined in the preliminary planning stages. It is assumed that the source water intake, feed pumping and screening facilities, and brine management would be located offsite. The footprint for additional power is also not included and an allocation of space for additional power (i.e., power co-generation system) should also be considered in future planning efforts.

Figure 3-4. Conceptual Layout for a 10 MGD Product Water Treatment facility

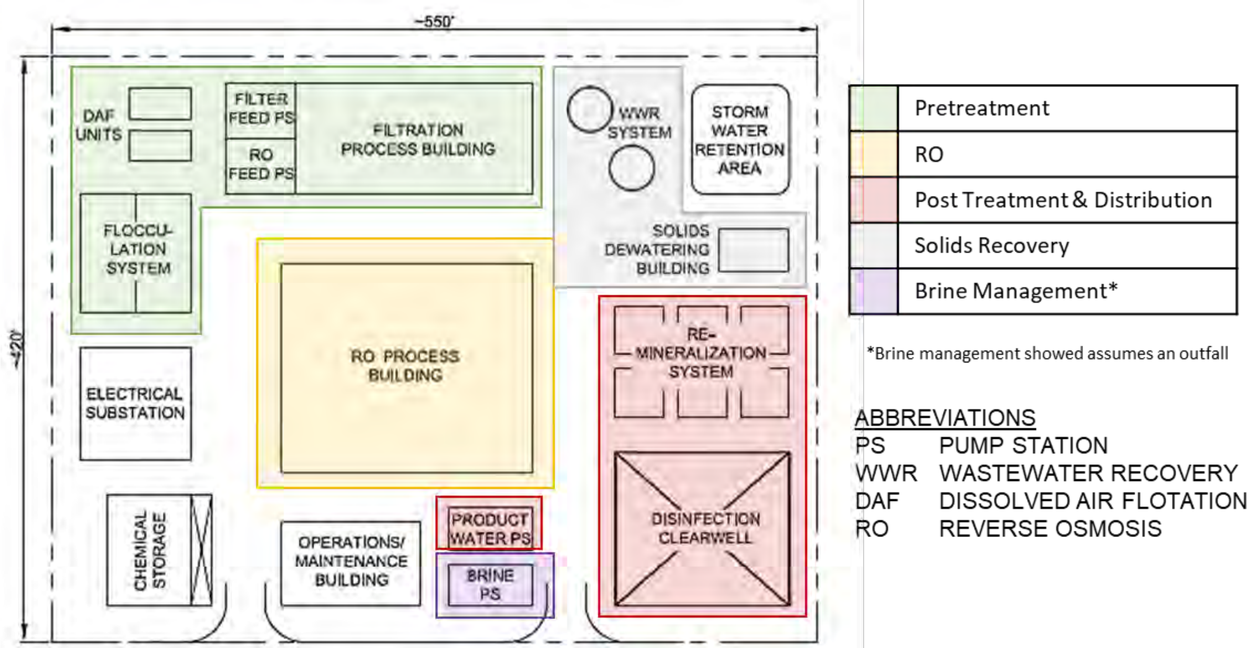


Figure source: Kennedy Jenks 2022

Table 3-1. Treatment facility Footprint Requirements

Treatment Capacity		Unit Area Requirements (MGD / Acre)			Approximate Footprint Requirements (Acres)		
Cubic Feet per Second	MGD	Minimum	Maximum	Average	Minimum	Maximum	Average
15	10	1.7	6.0	3.6	1.6	5.6	2.8

Source: Kennedy Jenks 2022

Treatment facility locations have not been identified for this study. Instead, TFPAs have been identified as larger, general areas where a treatment facility could be located. The layout and footprint of the facility would depend on the site(s) available and would be reconfigured and designed based on site-specific conditions. The treatment facility and buildings are typically up to 20 feet in height and can be designed as needed to accommodate site conditions.

3.3.4 Brine Management

Brine from desalination projects has typically been managed by conveying brine from the treatment facility via a pipeline to an outfall for disposal and dilution with the receiving water. Nature-based solutions or treatment wetlands are also being studied extensively and are starting to be implemented. Existing treatment wetlands in the region include Mountain View Sanitary District’s Moorhen Marsh in Martinez, Ellis Creek Water Recycling Facility’s polishing wetlands in Petaluma, and Arcata Marsh in Humboldt Bay. Wetland treatment for wastewater effluent is more established than for RO concentrate, including brine from desalination projects (San Francisco Estuary Institute [SFEI] 2022).

Valley Water has conducted rigorous evaluations and studies for the past 5 years to investigate viable alternatives, including nature-based solutions, for proper RO concentrate management from the Silicon Valley Advanced Water Purification Center. Similar opportunities exist for management of brine from a desalination project, and brine management alternatives studied by Valley Water were considered in the preparation of this study. Valley Water has previously studied deep water outfalls, discharge to sloughs in the South San Francisco Bay (South Bay) for shallow zone dilution, and nature-based solutions including open water treatment cells, floating wetlands, and horizontal levees. Another option to reduce contaminant concentrations is dilution through blending with wastewater effluent. This approach may be valuable in the short term as other strategies are developed. However, in the long term, its viability as a standalone option could be challenged by regulatory requirements as demand for recycled water increases and wastewater effluent volumes available for mixing decrease accordingly (SFEI 2022). Existing wastewater infrastructure was not analyzed for discharge of brine as part of this study because existing wastewater discharges in San Jose, Sunnyvale, and Palo Alto are near the shoreline in shallower South Bay waters that aren't known to experience dilution very quickly and Valley Water has not spoken to the owners of these facilities at this early stage of project planning. This study considers an outfall in the deep water of the Lower South Bay and horizontal levees for brine management options.

Deep Water Brine Outfall

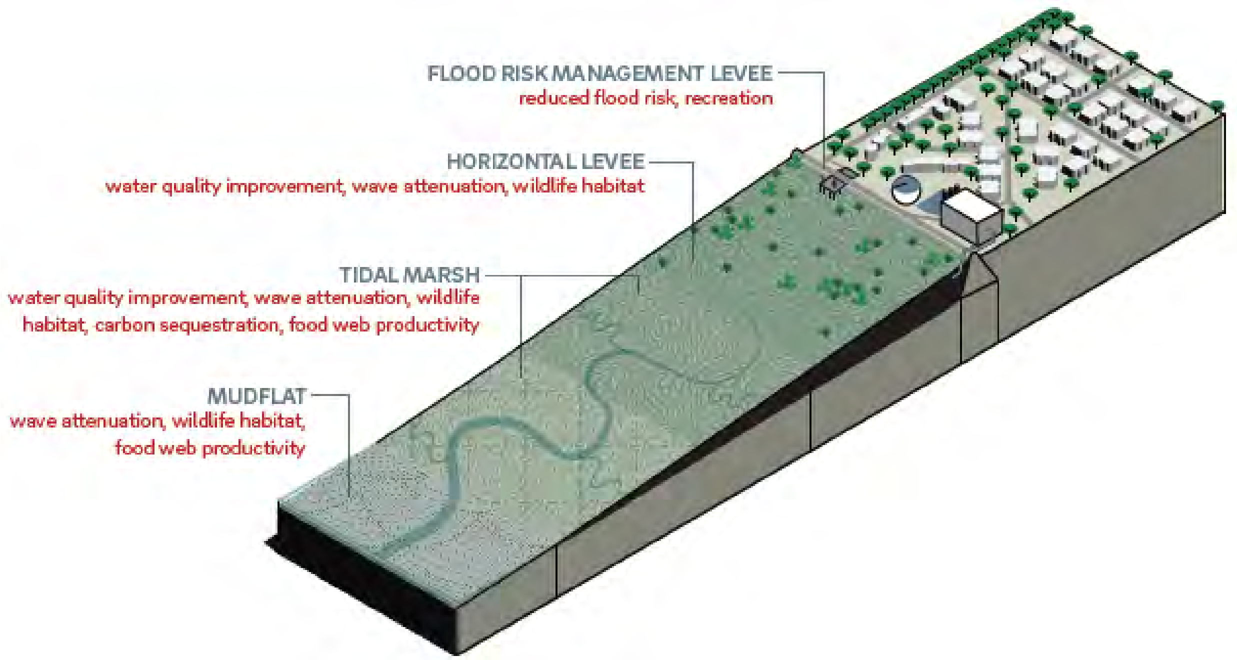
The most common brine management solution for this size desalination project is to construct an outfall where brine can be discharged and diluted with the receiving water. An outfall would need to be constructed in the deeper portions of the Lower South Bay (beyond the shallow mudflats), where dilution can be more easily achieved and located away from the intake source water. Brine would be conveyed via a pipeline from the treatment facility to the outfall in the Lower South Bay, starting onshore and extending into the deeper portion of the Lower South Bay. The length of the pipe would depend on the site location and the bathymetry of the Bay bottom along the pipeline alignment.

At the outfall discharge point into the South Bay, an engineered diffuser system and/or wastewater dilution is typically required to diffuse and dilute concentrated brine (SWRCB 2019). An engineered diffuser system consists of a long pipeline with discharge ports spaced evenly along the pipe, sized to achieve certain dilution within a specified distance from the diffusers. Options for diffuser configuration include linear or "Y" configurations. A diffuser that allows the discharge to be spread over a large area can achieve more efficient diffusion of the brine into the seawater.

Horizontal Levees

Horizontal levees are shallow sloped subsurface treatment wetlands built between a coastal/flood protection levee and tidal marsh. **Figure 3-5** provides an illustration of the horizontal levee concept. An example horizontal levee design for the Palo Alto Horizontal Levee Pilot Project, located adjacent to the study area, is shown in **Figure 3-6**.

Figure 3-5. Horizontal Levee Concept



Source: SFEI 2021

Figure 3-6. Example Palo Alto Horizontal Levee Pilot Project Embarcadero Road Phase Preliminary Design

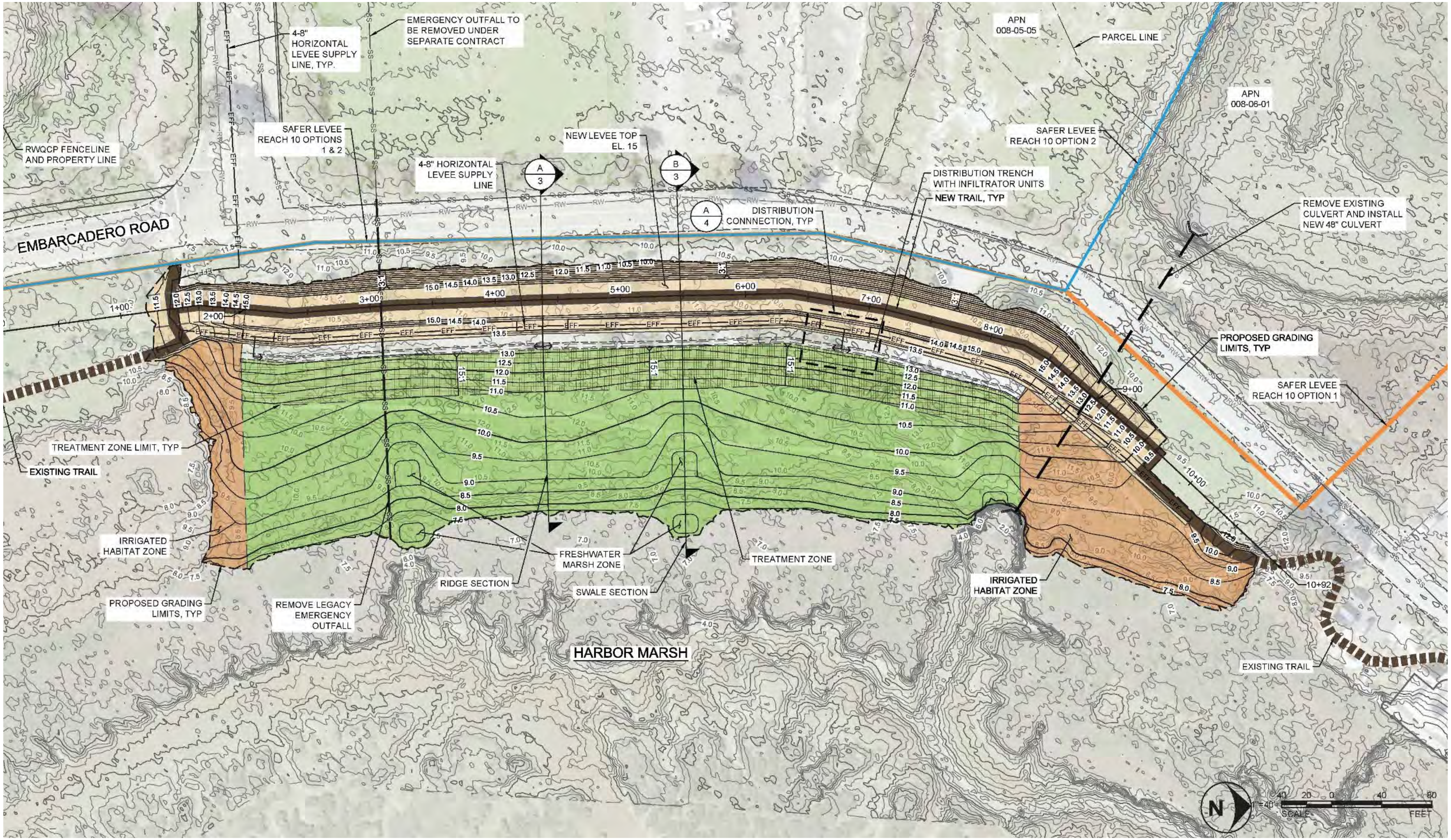


Figure source: Environmental Science Associates 2019

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The horizontal levee provides transitional wetland habitat consisting of native vegetation that protects existing levees from erosion and reduces the threat of coastal flooding by attenuating storm waves. Effluent is discharged to the subsurface of these wetlands through a perforated pipe to provide water for plants. Contaminants are attenuated as the water flows though the subsurface. To accommodate greater applied flows, the subsurface consists of multiple layers. A surficial layer of low permeability soil (i.e., clay or loam) that is suitable for cultivating wetland plants, is underlain by coarse layers (i.e., sand and gravel) with higher hydraulic conductivities to achieve greater subsurface flows. (Cecchetti et al. 2020). Most of the treatment occurs in the first 10 meters of the slope, so the design could be adjusted to include more discharge points while maintaining the same slope. More inflow and outflow pipes along the horizontal levee slope could allow for better optimization of space, allowing greater volumes of wastewater effluent or RO concentrate to be treated in the same total area (SFEI 2022).

In addition to treatment of water, horizontal levees have the potential to provide co-benefits, such as wave attenuation to reduce levee erosion, transition zone and high tide refuge habitat for tidal marsh species, and marsh migration space as sea levels rise. When vegetated with appropriate native plants, they can also emulate the natural freshwater to saltwater marsh habitat gradient that once existed around the edges of the South Bay. (SFEI 2022).

The SFEI has identified suitable sites for horizontal levees around the South Bay which were used to identify horizonal levee alternatives for this study (SFEI 2021). Typical salinity levels for seawater range from 30 to 35 parts per million (ppm) and salt-tolerant plants such as pickleweed can survive in salinities up to 25 ppm and kelps while seaweeds can survive in salinity ranging from 30 to 35 ppm. As a result, the salinity of brine needs to be managed to levels similar to or less than seawater depending on how salt-tolerant vegetation is at the horizontal levee location. Dilution of brine with wastewater would likely be necessary to satisfy this requirement.

3.3.5 Conveyance Infrastructure

Pipelines are needed to convey water to and from the following project components:

- Seawater from the intake to the intake pump station and from intake pump station to the treatment facility
- Brine from the treatment facility for brine management
- Product water from the treatment facility to an existing Valley Water treated water distribution line

Seawater Intake Pump Station and Pipelines

A pump station is required nearby the intake to pump and convey water to the treatment facility. Intake pump stations are typically located as close to the intake as possible. This study identifies possible pump station locations for intake options at each location – San Jose, Mountain View, and Palo Alto – and conceptual pipeline alignments from the intake to the pump station. The pump station can be enclosed or designed as needed to accommodate site conditions, such as to reduce or prevent noise.

This study does not identify tunnelling routes which could avoid many constraints. Tunnelling options require further evaluation of geotechnical constraints to determine potential routes and feasibility.

The intake is sized to convey the total maximum flow based on the desired product water and RO treatment efficiency. RO treatment efficiencies are approximately 50 percent efficient for saltwater; however, this is variable based on several factors such as product water quality, treatment technology, and pre-treatment methodologies. Assuming the product water is 10 MGD, an influent pipe with the conveyance capacity of approximately 24 MGD would be required. A pipe diameter of up to 60 inches would be required to convey the flow to the treatment facility.

Brine Pipelines

Pipeline alignments have not been identified for conveyance of brine since these pipelines would need to connect to treatment facilities and this study does not provide site-specific analysis of treatment facilities. Instead, potential pipeline distances are assumed for this study. Enough pressure should be sustained within the brine management system to ensure that brine can be discharged through the bring management options with no additional pumping beyond that required to provide adequate pressure for the desalination treatment process. The required diameter of the pipeline is based on maintaining a minimum velocity of 3 feet per second to minimize sediment deposition in the pipeline. For a 10 MGD/15 cfs treatment facility, it is estimated that up to a 42-inch-diameter pipeline would be required to convey brine.

Product Water Pipelines and Valley Water System Connection

Product water from the treatment facility could be conveyed to either Valley Water’s raw or treated water pipelines or for other uses such as groundwater recharge, similar to Valley Water’s proposed Purified Water Project which supplements groundwater recharge. This study assumes product water is treated to drinking water standards and conveyed to Valley Water’s treated water pipelines.

Valley Water’s system contains treated water pipelines in three separate locations in southern Santa Clara County – near San Jose/Milpitas, Cupertino/Loyola, and Campbell/West San Jose. This study assumes the treatment facility would connect to one of these segments. The connection point has not been evaluated for engineering and operational constraints and is used in this study as a concept to estimate and evaluate energy emissions from conveyance of treated water.

For a 10 MGD/15 cfs treatment facility, it is estimated that up to a 42-inch-diameter pipeline would be required to convey brine.

3.4 Project Operations and Maintenance Activities

Most details on project operations and maintenance activities have not been determined at this early phase in project planning. Therefore, this section provides a generalized overview of typical activities that can be expected to inform the environmental and planning evaluations in this study.

3.4.1 Seawater Intake

The intake structure would require periodic cleaning of marine accumulations such as sand, mud, and aquatic vegetation. Seawater intake cleaning would occur approximately every 2-3 months and would consist of removing fouling from the intake screens by hand or with brushes. If the screens have a large amount of fouling, they may need to be removed and cleaned at the treatment facility site; however, this would occur infrequently. There are two methods available for cleaning the intake pipeline, the first would consist of using a process called “pigging,” where a pipe cleaner or pipeline pig would be inserted into the pipeline to clean any obstructions. The second method involves introducing sodium hypochlorite (a low hazard chemical) into the intake to prevent biological growth and aid in removal of existing growths.

3.4.2 Treatment Facility/Treatment

The treatment facility would be operated 24-hours per day and require several employees onsite daily for operations and regular maintenance activities. Operation of the treatment facility would mainly be conducted from the control room in the operation and maintenance building. Within the operation and maintenance building, control staff would monitor treatment processes, log operating data and events, and regulate operations. Additionally, onsite staff would regularly inspect equipment and conduct analytical procedures to check water quality and verify instrument readings.

Periodic backwashing of the RO membrane would be required to ensure efficient performance of the RO process and limit membrane fouling. Membrane backwashing would be required every 2 to 3 months and membranes would likely need to be replaced approximately every 5 years. Regular inspection of the treatment facility would be required, and servicing of equipment would occur as needed. The treatment facility would generate sludge that forms solids and would require periodic removal and disposal at a nearby landfill. Removal of sludge could occur every 1 to 6 days.

Vehicle/truck trips would be generated daily from worker commutes, truck deliveries, and hauling of waste, sludge, and other materials.

3.4.3 Brine Management

Deep Water Brine Outfall

Minimal maintenance of the deep water brine outfall would be required. Annual visual inspections would likely be warranted. Infrequent cleaning may occur, as described for the intake above.

Horizontal Levees

Maintenance on horizontal levee systems includes management of vegetation and habitat (e.g., management of invasive species) and ensuring consistent performance in the subsurface layer by preventing or managing gradual clogging of the subsurface treatment zone after 4 to 5 years of flow (SFEI 2022). Maintenance on systems where endangered species are found would be more expensive and is a major consideration for the feasibility of horizontal levee systems.

There is a need to develop clear expectations about how maintenance will occur in multi-benefit nature-based solutions that double as habitat areas (streamlining necessary permits, etc.). More discussion on permitting challenges is included in the following section. Prior to implementation of a horizontal levee system, a long-term operations and maintenance plan should be developed designating expected and possible maintenance activities (e.g., invasive species removal) and the agencies responsible for completing these activities. (SFEI 2022).

3.4.4 Pump Stations and Conveyance Pipelines

The pump stations would operate 24 hours per day and would likely be operated remotely. Control staff would conduct routine visits to the pump station to monitor operations, conduct maintenance activities, and service the pumps as necessary. The conveyance pipelines would require annual inspection and servicing as necessary, such as for minor leaks, testing/replacement of valves, and maintenance of vegetation. Infrequent cleaning may occur, as described for the intake above.

3.5 Project Options Evaluated

Figure 3-7 provides a conceptual illustration of the seawater desalination process, intake, and brine management options, and TFPAs at each location that are evaluated in this study. The general location of intake and brine management options and TFPAs is presented in **Figures 3-8** through **3-10**. Following the figures, an outline of intake and brine management options, including identifications used in tables and figures throughout this study, and TFPAs is provided.

Figure 3-7. Project Options Evaluated

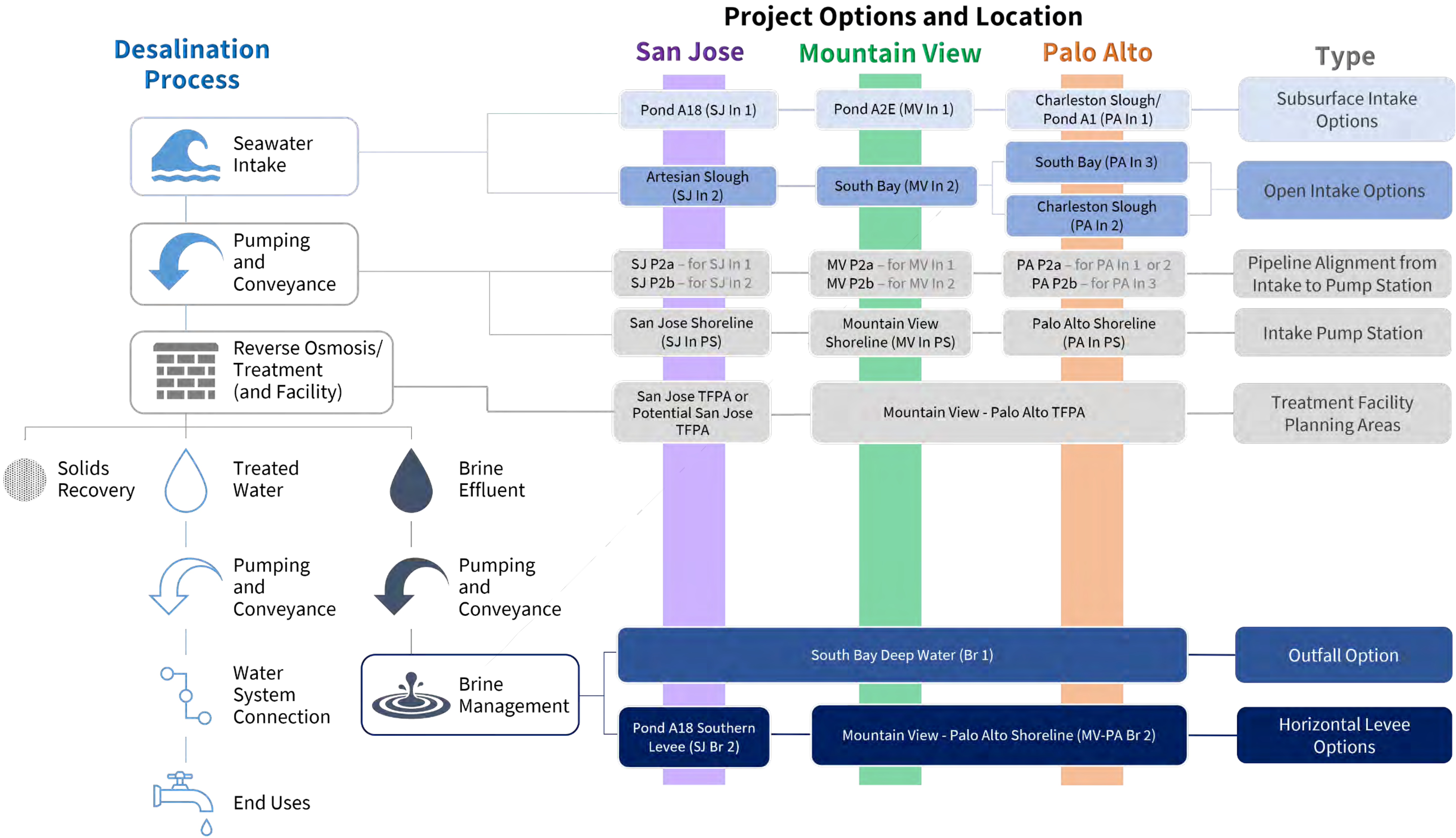

Figure 3-8. Overview of Project Options

Figure source: GEI 2022 (horizontal levee data is from SFEI 2019).

Figure 3-9. San Jose Project Options

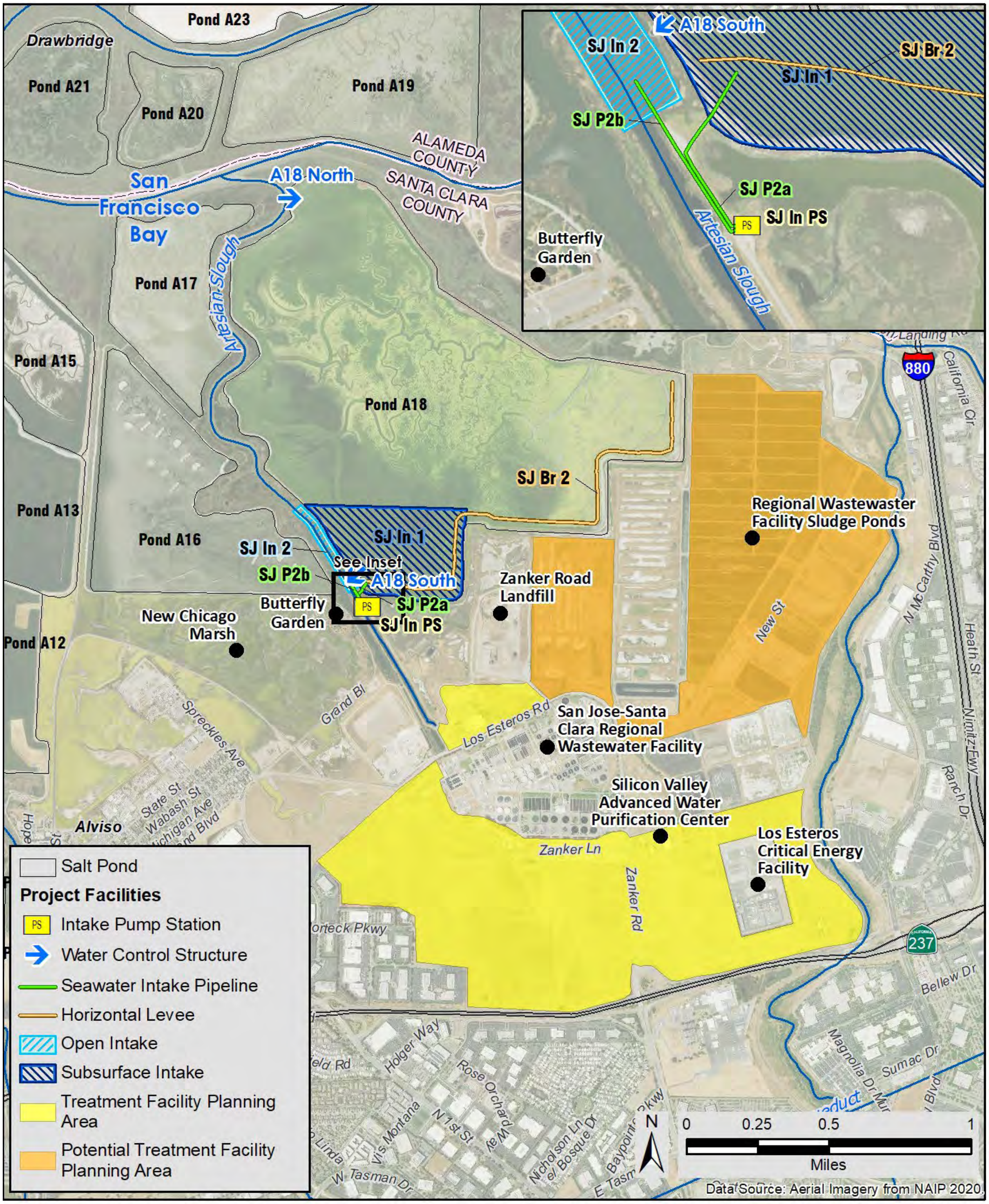

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Figure source: GEI 2022 (horizontal levee data is from SFEI 2019).

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Figure 3-10. Mountain View and Palo Alto Project Options

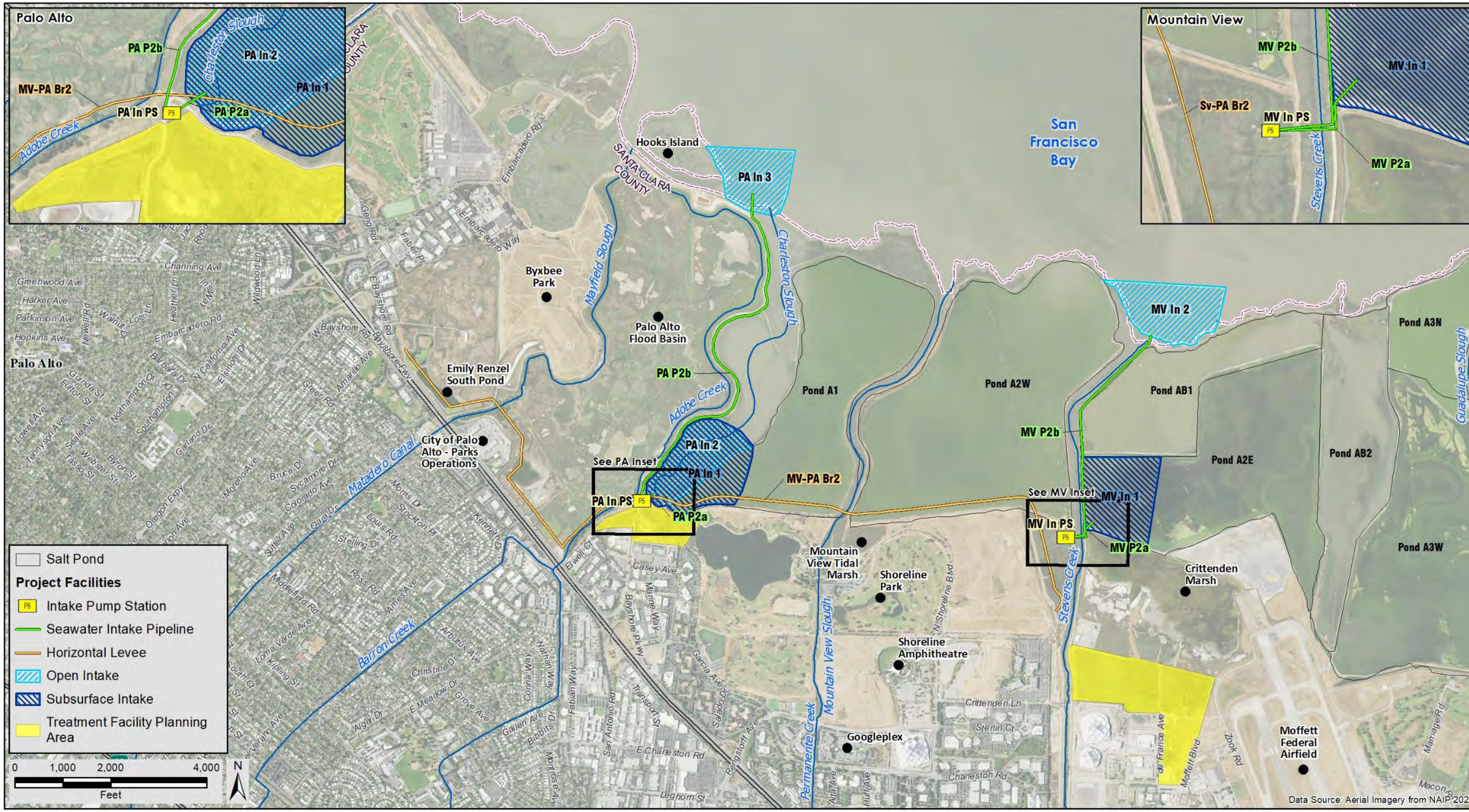

Figure source: GEI 2022 (horizontal levee data is from SFEI 2019).

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3.5.1 San Jose Project Options

Intake Options and Associated Conveyance

- **SJ In PS** – *San Jose Shoreline Intake Pump Station* – Station to pump source water from intake options in San Jose to the treatment facility. Located between Artesian Slough and Pond A18 next to the San Jose/Santa Clara Regional Wastewater Facility (RWF) outfall bridge
- **SJ In 1** – *Pond A18 Subsurface Intake Option* – Intake beneath Pond A18 drawing in source water consisting of seawater from Pond A18 and groundwater. Infrastructure would connect to a new pipeline to the southwest
  - **SJ P2a** – *Pipeline from SJ In 1 to SJ In PS* – A 0.1 mile or longer pipeline conveying source water from the subsurface intake beneath Pond A18 to the San Jose pump station.
- **SJ In 2** – *Artesian Slough Open Intake Option* – Intake extending into Artesian Slough to the north of the San Jose/Santa Clara RWF outfall bridge and between Ponds A18 and A16; drawing in source water from seawater and wastewater effluent from the San Jose/Santa Clara RWF in Artesian Slough. Infrastructure would connect to a new pipeline to the south
  - **SJ P2b** – *Pipeline from SJ In 2 to SJ In PS* – A 0.1 mile or longer pipeline conveying source water from the open intake in Artesian Slough to the San Jose pump station.

Brine Management Options

- **Brine (Br) 1** –*South Bay Deep Water Outfall Option* – Outfall extending into deep water of the Lower South Bay. Assumes pump station is in treatment facility. A pipeline route has not been identified for this study and would likely need to be a constructed below ground by tunneling. Same option used for San Jose, Mountain View, and Palo Alto
- **SJ Br 2** – *Pond A18 Horizontal Levee Option* – Treatment wetland located along up to 1.8 miles of the interior slope of the southern levee of Pond A18. Alignment identified in SFEI 2019. Corresponds to the same location as a treatment wetland proposed for the San Jose/Santa Clara RWF

Treatment Facility Planning Areas

- **San Jose TFPA** – *San Jose Options for Treatment Facility* – Existing San Jose/Santa Clara RWF buffer lands where the treatment facility could be located.
- **Potential San Jose TFPA** – *Potential San Jose Options for Treatment Facility* – Existing San Jose/Santa Clara RWF biosolids lagoon and residual solids management areas that are planned for retirement and where a treatment facility could be located if retirement of these areas occurs as planned.

3.5.2 Mountain View Project Options

Intake Options and Associated Conveyance

- **MV In PS** – *Mountain View Shoreline Intake Pump Station* – Station to pump source water from intake options in Mountain View to the treatment facility. Located south of Pond A2W and immediately west of Stevens Creek

- **MV In 1** – *Pond A2E Subsurface Intake Option* – Intake beneath Pond A2E drawing in source water consisting of seawater from Pond A2E and groundwater. Infrastructure would connect to a new pipeline to the southwest

    - **MV P2a** – *Pipeline from MV In 1 to MV In PS* – A 0.1 mile or longer pipeline crossing Stevens Creek to convey source water from the subsurface intake beneath Pond A2E to the Mountain View pump station.

- **MV In 2** – *South Bay Open Intake Option* – Intake extending into the Lower South Bay to the north of Ponds A2W and AB1:AB2 and Stevens Creek; drawing in source water consisting of seawater from the Lower South Bay. Infrastructure would connect to a new pipeline to the south

    - **MV P2b** – *Pipeline from MV In 2 to MV In PS* – A 1 mile or longer pipeline routed along the levee on the east or west bank of Stevens Creek (east bank shown in figures) and crossing Stevens Creek to convey source water from the open intake in the Lower South Bay to the Mountain View pump station.

Brine Management Options

- **Br 1** – *South Bay Deep Water Outfall Option* – Refer to description in Section 3.5.1, "San Jose Project Options." Same option used for San Jose, Mountain View, and Palo Alto

- **Mountain View-Palo Alto (MV-PA) Br 2** – *Mountain View-Palo Alto Shoreline Horizontal Levee Option* – Treatment wetland located along up to 3.4 miles of the side slope of levees associated with the Palo Alto Flood Control Basin, Charleston Slough, Pond A1, and Pond A2W. Alignment identified by SFEI (SFEI 2019). Same option used for Mountain View and Palo Alto

Treatment Facility Planning Areas

- **Mountain View-Palo Alto TFPA** – *Mountain View and Palo Alto Options for Treatment Facility* – Undeveloped areas in Mountain View and Palo Alto to the north of State Route 101 where a treatment facility could be located. Same option used for Mountain View and Palo Alto

3.5.3 Palo Alto Project Options

Intake Options and Associated Conveyance

- **PA In PS** – *Palo Alto Shoreline Intake Pump Station* – Station to pump source water from intake options in Palo Alto to the treatment facility. Located immediately south of Charleston Slough

- **PA In 1** – *Charleston Slough/Pond A1 Subsurface Intake* – Intake beneath Charleston Slough and Pond A1 drawing in source water consisting of seawater from Charleston Slough and Pond A1 and groundwater. Infrastructure would connect to a new pipeline to the southwest

  - **PA P2a** – *Pipeline from PA In 1 or PA In 2 to PA In PS* – A 0.05 mile or longer pipeline conveying source water from the subsurface intake beneath Charleston Slough and Pond A1 to the Palo Alto pump station.

- **PA In 2** – *Charleston Slough Open Intake Option* – Intake extending into Charleston Slough drawing in source water consisting of sweater from Charleston Slough. Infrastructure would connect to a new pipeline to the south

  - **PA P2a** – *Pipeline from PA In 1 or PA In 2 to PA In PS* – A 0.05 mile or longer pipeline conveying source water from the open intake in Charleston Slough to the Palo Alto pump station.

- **PA In 3** – *South Bay Open Intake Option* – Intake extending into the Lower South Bay to the north of the Palo Alto Flood Control Basin; drawing in source water consisting of seawater from the Lower South Bay. Infrastructure would connect to a new pipeline to the south

  - **PA P2b** – *Pipeline from PA In 3 to PA In PS* – A 1.5-mile or longer pipeline routed along the levee on the east bank of Adobe Creek to convey source water from the open intake in the Lower South Bay to the Palo Alto pump station.

Brine Management Options

- **Br 1** – *South Bay Deep Water Outfall Option* – Refer to description in Section 3.5.1, "San Jose Project Options." Same option used for San Jose, Mountain View, and Palo Alto

- **MV-PA Br 2** – *Mountain View-Palo Alto Shoreline Horizontal Levee Option* – Refer to description in Section 3.5.2, "Mountain View Project Options." Same option used for Mountain View and Palo Alto

Treatment Facility Planning Areas

- **Mountain View-Palo Alto TFPA** – *Mountain View and Palo Alto Options for Treatment Facility* – Refer to description in Section 3.5.2, "Mountain View Project Options." Same option used for Mountain View and Palo Alto

3.6 Seawater Desalination Project Alternatives Evaluated

A total of 13 different alternative desalination projects are possible, as shown in **Table 3-2**. Each alternative consists of a unique combination of intake and brine management options.

Alternatives were not identified where there was a conflict in the location of the intake and brine management option. This occurs for the Pond A18 Subsurface Intake Option (SJ In 1) and Pond A18 Horizontal Levee Option (SJ Br 2). This was not identified as an alternative because both the intake and brine management option are at Pond A18 and could not operate concurrently without conflicts.

Table 3-2. Desalination Project Alternatives Evaluated

Alternative	Intake Option and Associated Conveyance	Brine Management Option	Treatment Facility Planning Area
San Jose (SJ)			
Alternative SJ-S1	Pond A18 Subsurface Intake (SJ In 1, SJ P1, SJ P2a)	South Bay Deep Water Outfall (Br 1)	San Jose or Potential San Jose
Alternative SJ-O1	Artesian Slough Open Intake (SJ In 2, SJ P1, SJ P2b)	South Bay Deep Water Outfall (Br 1)	
Alternative SJ-O2	Artesian Slough Open Intake (SJ In 2, SJ P1, SJ P2b)	Pond A18 Horizonal Levee (SJ Br 2)	
Mountain View (MV)			
Alternative MV-S1	Pond A2E Subsurface Intake (MV In 1, MV P1, MV P2a)	South Bay Deep Water Outfall (Br 1)	Mountain View-Palo Alto
Alternative MV-S2	Pond A2E Subsurface Intake (MV In 1, MV P1, MV P2a)	MV-PA Horizontal Levee (MV-PA Br 2)	
Alternative MV-O1	South Bay Open Intake (MV In 2, MV P1, MV P2b)	South Bay Deep Water Outfall (Br 1)	
Alternative MV-O2	South Bay Open Intake (MV In 2, MV P1, MV P2b)	MV-PA Horizontal Levee (MV-PA Br 2)	
Palo Alto (PA)			
Alternative PA-S1	Charleston Slough/Pond A1 Subsurface Intake (PA In 1, PA P1, PA P2a)	South Bay Deep Water Outfall (Br 1)	Mountain View-Palo Alto
Alternative PA-S2	Charleston Slough/Pond A1 Subsurface Intake (PA In 1, PA P1, PA P2a)	MV-PA Horizontal Levee (MV-PA Br 2)	
Alternative PA-O1	Charleston Slough Open Intake (PA In 2, PA P1, PA P2a)	South Bay Deep Water Outfall (Br 1)	
Alternative PA-O2	Charleston Slough Open Intake (PA In 2, PA P1, PA P2a)	MV-PA Horizontal Levee (MV-PA Br 2)	
Alternative PA-O3	South Bay Open Intake (PA In 3, PA P1, PA P2b)	South Bay Deep Water Outfall (Br 1)	
Alternative PA-O4	South Bay Open Intake (PA In 3, PA P1, PA P2b)	MV-PA Horizontal Levee (MV-PA Br 2)	

Chapter 4. Water Quality

4.1 Introduction

This chapter provides an evaluation of water quality issues related to the operation of a seawater desalination project (desalination project), including review of applicable regulations, the intake source water quality, identification of treatment standards, estimated brine water quality, applicable information from previous studies conducted by Valley Water, and identification and discussion of water quality constraints including evaluation of applicable discharge requirements for waters receiving brine.

In the summer of 2022, source water quality data was collected from publicly available documents and databases and from National Pollutant Discharge Elimination System (NPDES) permits for wastewater facility discharges in the Lower South San Francisco Bay (South Bay). This evaluation is limited to surface water and does not consider potential pumping of groundwater for source water at subsurface intake locations–SJ In 1, MV In 2, and PA In 1. Since intake options for a future desalination project are near municipal wastewater treatment plant discharges, discharge effluent data was used in the water quality evaluation. Variations in source water quality data and data gaps and limitations are also discussed. Water quality scenarios were identified based on source water quality data. Treatment standards were identified based on constituents of concern in source water quality, including from the State Water Resources Control Board's (SWRCB) Division of Drinking Water's (DDW's) Title 22 regulations. Kennedy Jenks estimated permeate (i.e., treated water) and brine water quality using source water quality data, scenarios, and treatment standards.

Existing Valley Water studies were reviewed and information pertinent to the water quality evaluation is summarized, including studies on the dilution of existing effluent discharges from wastewater treatment plants and water quality treatment by experimental horizontal levees. Federal and state regulations related to water quality were reviewed and plans, policies, regulations, and laws that are applicable to this water quality evaluation are summarized, including Clean Water Act (CWA) requirements, receiving water quality objectives, treatment standards, and other important elements of water quality control plans. Other regulations related to water quality, such as CWA Sections 404 and 401, are not discussed in this chapter. This chapter also does not discuss detailed permitting requirements. A comprehensive overview of permits and approvals and requirements is outlined in **Appendix D**. *See* Chapter 5, "Environmental Conditions," for a complete list of permits and approvals related to environmental conditions including water resources and water quality.

Constraints and recommendations related to the project options evaluated are based on source water quality data, water quality estimates, information from existing Valley Water studies, and applicable regulations. Since discharge requirements are not known for the project, this evaluation identifies existing requirements for similar discharges in the Lower South Bay and discusses discharge requirements of similar desalination projects elsewhere in California.

Changes in water quality from brine management with horizonal levees are not quantified but information from existing reports and studies is used to provide a discussion of natural treatment of water quality. This chapter does not discuss potential impacts to biological resources from brine management options (*see* Chapter 5, “Environmental Conditions”).

4.2 Source Water Quality Data

4.2.1 Data Sources

Various public databases were utilized to determine the water quality of intake options, including:

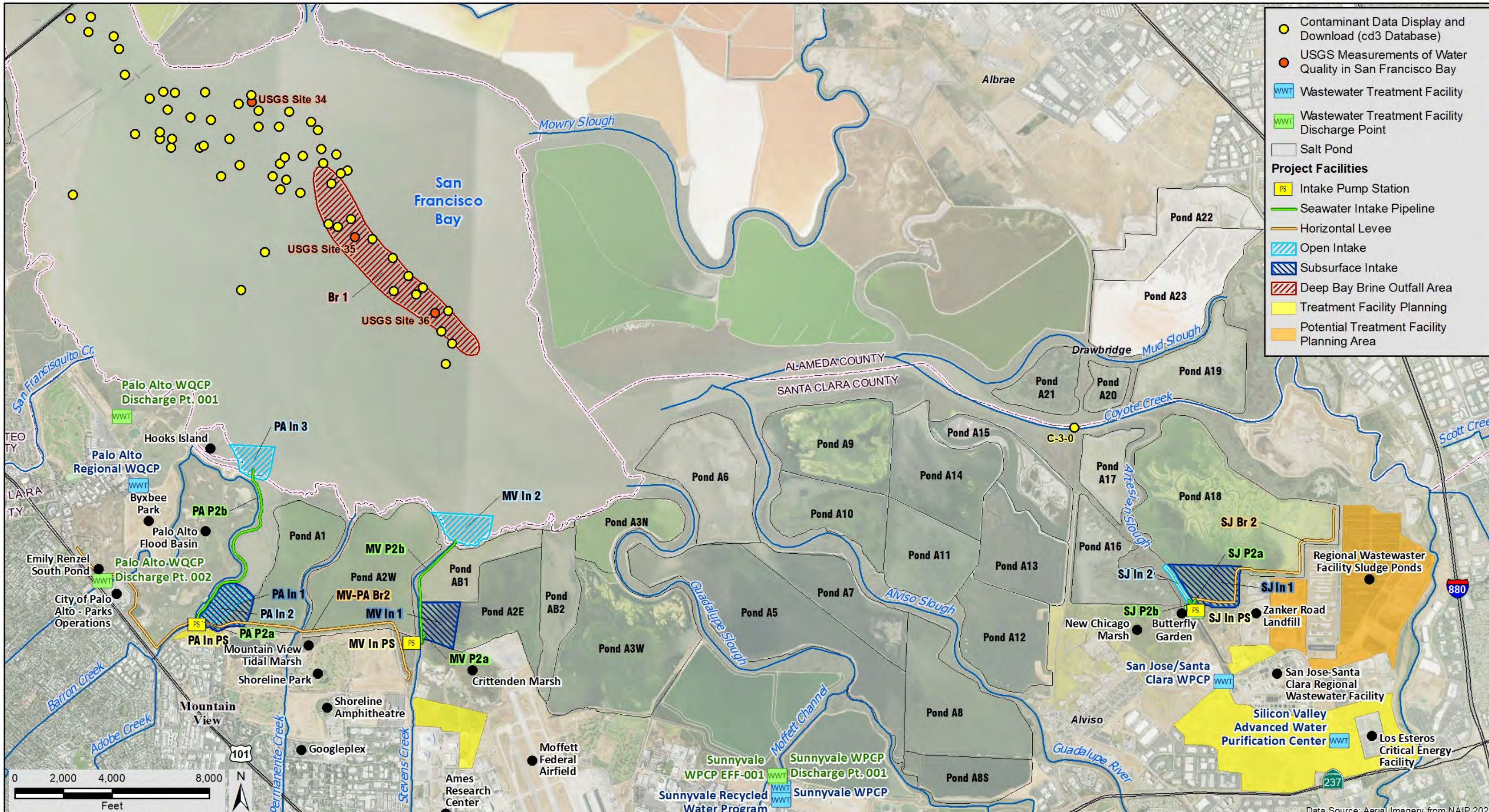
- U.S. Geological Survey (USGS) Measurements of Water Quality in the Lower South Bay
- Contaminant Data Display and Download (cd3 Database)
- California Environmental Data Exchange Network (CEDEN)
- California Department of Water Resources (DWR) – California Data Exchange Center (CDEC)
- SWRCB’s California Integrated Water Quality System Project (CIWQS)

Other databases, such as the SWRCB’s Surface Water Ambient Monitoring Program Data Dashboard and USGS’s National Water Information System, were reviewed but no relevant data was found for the intake option locations in the Lower South Bay. **Figure 4-1** shows information and data points relevant to the water quality analysis. Relevant information reviewed from each database listed above is discussed below.

U.S. Geological Survey’s Measurements of Water Quality in San Francisco Bay

USGS has maintained a program of water quality studies in the San Francisco Bay (Bay) since 1969 (USGS 2017). Annually since 2016, a data file is available for specific water quality constituent measurements from 37 fixed sampling locations along a 145-kilometer transect from Lower South Bay to the lower Sacramento River. Sampling is conducted at least monthly at these fixed locations. Locations south of the Dumbarton Bridge (Sites 34-36) are within the vicinity of the project area. These locations along with data from 2014 through 2019 were evaluated. Water quality data included salinity, temperature, light attenuation coefficient, concentrations of chlorophyll-a, dissolved oxygen, suspended particulate matter, and dissolved inorganic nutrients (nitrate, nitrite, ammonium, phosphate, and silicate) (USGS 2017).

Figure 4-1. Relevant Water Quality Information



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Contaminant Data Display and Download

The cd3 Database (SFEI 2022a) predominately houses data from various monitoring programs within the Lower South Bay to Sacramento-San Joaquin River Delta. Of the various monitoring programs within the Bay, the Regional Monitoring Program (RMP) for Water Quality in the Lower South Bay provided the most relevant data for the project. The RMP is an innovative collaboration of the Bay's Regional Water Quality Control Board (RWQCB), regulated discharger community, and the San Francisco Estuary Institute. This monitoring program provides water quality regulators with information needed to manage the Bay effectively. Constituents in the Bay predominately monitored for the RMP are regulated Total Maximum Daily Loads (TMDL). Data south of the Dumbarton Bridge, more specifically locations identified as Lower South Bay are relevant data evaluated. Although there are water quality data, most available data are sediment, ecological habitats, and fish tissue results. Available data evaluated includes conductivity, dissolved oxygen, pH, temperature, total ammonium, total salinity, and total sulfide.

California Environmental Data Exchange Network

Various monitoring groups within the state record water quality, aquatic habitat, and wildlife health of ecological resources. The CEDEN is a centralized database used to find and share information about California's water bodies, including streams, lakes, rivers, and the coastal ocean. To determine the sample locations within CEDEN (SWRCB 2022a) that are relevant to the project area, the National Water Quality Monitoring Council database map was utilized. Once Station IDs within the vicinity of the project area were identified from the map, they were queried in CEDEN for data evaluation. Relevant Station IDs are San Jose (C-3-0) near San Jose and several stations in deeper water of the Lower South Bay near Mountain View and Palo Alto. Upon review of the data, locations matched the cd3 Database and therefore data from cd3 Database were utilized in the water quality evaluation.

California Department of Water Resources' California Data Exchange Center

Water quality data from the Water Data Library are now housed in the CDEC. The Water Data Library publishes three separate datasets: discrete water quality, discrete groundwater measurements, and continuous data. Of these three datasets, only discrete water quality data points were within the vicinity of the project area. Available water quality data may include total ammonia, dissolved nitrate, total organic nitrogen, total phosphorus, total Kjeldahl nitrogen, turbidity, dissolved ortho-phosphate. In addition, available field measurements may include conductivity, dissolved oxygen, temperature, and pH. An evaluation of this database indicated there were some potential good locations with available water quality data, however the data was from a single point in time, in June 1975. Although there were a handful of potential good sample locations, data from CDEC was not utilized in the water quality evaluation due to a limited dataset and the existing data being too old to use.

California Integrated Water Quality System Project

The CIWQS (SWRCB 2022b) is a system used by the SWRCB and RWQCB to track information about places of environmental interest, manage permits and other orders, track inspections, and manage violations and enforcement activities. Permitted dischargers for certain programs are also able to upload their online submittal of monitoring reports to this database. The CIWQS database was utilized to evaluate the water quality data from wastewater treatment facilities within proximity to the intake options. A review of the water quality monitoring data and discharge effluent limitations for each facility provided additional water quality data near source water intake options. Although the Waste Discharge Orders typically allow dischargers to obtain dilution credits for certain constituents, the evaluation utilized wastewater treatment plant effluent data provided from each wastewater treatment plants' electronic self-monitoring reports without assuming any dilution credits. This provides a conservative understanding of the water quality. An understanding of discharge effluent limitations will help other aspects of this desalination project on the water quality concentrations likely allowed in receiving waters.

Municipal wastewater treatments plants reviewed for this desalination project included:

- **San Jose/Santa Clara Regional Wastewater Facility (RWF) (San Jose/Santa Clara RWF Order No. R2-2020-0001 / NPDES No. CA0037842 –** The San Jose/Santa Clara RWF is jointly owned by the cities of San Jose and Santa Clara. The facility treats wastewater to national standards and produces an average of 110 million gallons per day (MGD) with a capacity of up to 167 MGD. Approximately 90 percent of the treated water produced as the wastewater facility is piped to the outfall channel located near Artesian Slough; downstream from where the Artesian Slough open intake project option is proposed. From there it flows to Artesian Slough, through Coyote Slough, and eventually into the wetlands of the 30,000-acre Don Edwards Refuge, specifically pond A18.
- **Sunnyvale WPCP, Order No. R2-2020-0002 / NPDES No. CA0037621 –** The Donald M. Somers WPCP, owned and operated by the city of Sunnyvale, is an advanced wastewater facility that maintains 440 acres of treatment ponds. The plant produces an average of 0.8 MGD of recycled water. This plant discharges to the Moffett Channel, a tributary to Guadalupe Slough, thence the South Bay. This facility is located off Borregas Avenue, south of Mountain View.
- **Palo Alto RWQCP, Order No. R2-2019-0015 / NPDES No. CA0037834 –** This wastewater treatment facility, owned and operated by the city of Palo Alto, has the capacity to produce 39 MGD of recycled water. This plant discharges to the Matadero Creek and South Bay. This facility is located off Embarcadero Road, near Palo Alto.

4.2.2 Data Gaps and Limitations

Although multiple public databases and monitoring programs were evaluated, there were apparent data gaps when conducting an evaluation of the source water quality for the intake options. Since the water bodies associated with this project are considered impaired waters and are listed in CWA Section 303(d), much of the available data for the Lower South Bay and Coyote Creek/Artesian Slough were for other constituents and sample media type relevant to the ecological habitats of the enclosed bay. For example, there are more sediment and fish tissue data from these water bodies than water quality constituents. In addition, if there was available water quality data, it was for limited constituents and data that were either too old to use (more than 10 years ago) or only a few data sets were available. For these reasons, water quality data from wastewater treatment facilities were utilized to supplement data from public databases. These datasets were more consistent and in close vicinity of intake options.

4.2.3 Results

Initially data from the cd3 Database and USGS study on the Lower South Bay were evaluated; however, there was not much overlap between the constituents monitored from both databases. Between these two data sources, both had ammonium, salinity, and temperature data available for comparison. Data from the cd3 Database are the oldest datasets – from 1995 through 2002. Since there were not many constituents available to determine the source water quality, efforts were made to evaluate and utilize discharge effluent data from the San Jose/Santa Clara RWF and the Palo Alto RWQCP (SWRCB, 2022c). Discharge effluent data were extracted from each facility's electronic self-monitoring reports. To be conservative, effluent data were not altered to account for any dilution credits. Data from the Sunnyvale WPCP was not utilized as its discharge location was not in proximity to the intake options. **Table 4-1** identifies intake options and the associated water quality data sources used. **Table 4-2** identifies the constituents available from each water quality data source.

Table 4-1. Water Quality Data Source Locations

Intake Options	Water Quality Evaluation Designation	Data Source		
		cd3 Database	USGS	Wastewater Treatment Facility
SJ In 1 and SJ In 2	San Jose	C-3-0	Site 36	San Jose/Santa Clara Water Pollution Control Plant
MV In 1, MV In 2, PA In 1, PA In 2, PA In 3	Mountain View and Palo Alto	LSB (Lower South Bay – various locations)	Sites 34 and 35	Palo Alto Regional Water Quality Control Plant

Table 4-2. List of Constituents from Each Water Quality Data Source

Constituent	Data Source Locations		
	cd3 Database	USGS	Wastewater Treatment Facility
Ammonium	●	●	
Total Ammonia as N			●
EC	●		
pH	●		●
Salinity	●	●	
Sulfide	●		
Temperature	●	●	●
Metals1			●
Nutrients2		●	●

Notes: [1] Metals includes: antimony, arsenic, beryllium, cadmium, total chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. [2] Nutrients includes: nitrate + nitrite as N, nitrogen, phosphorus as P, orthophosphate as P.

Although the available data often had other constituents monitored, the following constituents were deemed most relevant to the desalination project and were evaluated: ammonium, Electrical Conductivity (EC), nitrate+nitrite as N, pH, and temperature. Salinity data was converted into EC as the water quality evaluation for drinking water regulations is for EC. **Table 4-3** provides a summary of the focused water quality data amongst the various data sources identified earlier.

Table 4-3. Source Water Quality Data

Water Quality Evaluation Designation		Ammonium (ppm)	Electrical Conductivity (µS/cm)	Nitrate + Nitrite as N (ppm)	pH (Standard Units)	Temperature (°C)
San Jose	Range	0.01 – 7.74	3,500 – 50,670	1.35 – 20.31	6.9 – 8.7	10 – 26.4
	Average	1.23	26,080	10.1	7.6	17.9
Mountain View and Palo Alto	Range	0.01 – 11.62	13,000 – 51,680	0.73 - 46	6.4 – 8.6	9.9 – 27.9
	Average	1.45	41,247	18.61	7.45	21.5

Notes: ppm = parts per million; µS/cm=micro-Siemens per centimeter; C=Celsius

While available data came from various sources and timeframes, there were some notable high-level differences. Conductivity readings predominately available from USGS shows that levels are more elevated at Sites 34 and 35 near Mountain View and Palo Alto as they are closer to the ocean compared to Site 36 near San Jose, which is located further inland. Available nitrite+nitrate as N data is also higher from the wastewater treatment facility discharge effluent locations compared to sample sites further in the Lower South Bay. pH and temperature levels appear to be similar between the data. Although there was available data to conduct a high-level water quality evaluation, there are notable data gaps. Recommendations to close these data gaps are further discussed in Section 4.6.

4.2.4 Drought and Seasonal Data Variability

Since the available USGS data is consistent, it was further evaluated to determine if there are drought and seasonal variations observed. Constituents evaluated were salinity, taken at 2 meters below surface, and temperature as these are factors that may impact the project with respect to treatment effectiveness. Water years 2015, 2016, and 2017 were evaluated as these water years cover the most recent drought and wet years – water year 2015 was the most recent driest water year on record, water year 2017 was the most recent wettest year on record, and water year 2016 was also included to observe the changes between the driest and wettest water years. The following variations in data were identified and are shown in the referenced figures.

- **Drought Salinity Variation** – During the drought in water year 2015, salinity levels from all three USGS sites had elevated salinity levels compared to water year 2017, as shown in **Figure 4-2**.
- **Drought Temperature Variation –** Temperature readings at the same depth interval and during the same timeframes did not show variation between the two water year types. At all three USGS sites, temperature readings were about the same for each water year, as shown in **Figure 4-3**.
- **Seasonal Salinity Variation –** Since water years 2015 through 2017 were evaluated for drought variations, the same data was used to evaluate seasonal variations. Data from

USGS Site 36 was selected for this exercise as it is in proximity to the project area. Amongst the water years evaluated, each shows a similar trend. Salinity levels dropped during the winter months, most likely due to precipitation, and began to increase in the spring months, as shown in **Figure 4-4**. As seen in the drought variation analysis, salinity levels were overall higher during the drought in water year 2015, as compared to the wet water year 2017, with water year 2016 data fell between the two extremes.

- **Seasonal Temperature Variation** – When looking at the seasonal variation with respect to temperature, each water year showed a similar trend as well. **Figure 4-5** shows temperature levels dropped during the winter months and increased in the spring and into summer months. The temperature trend was similar across all water years regardless of a wet or dry water year.

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Figure 4-2. Comparison of Salinity Levels Between Wet and Dry Water Years

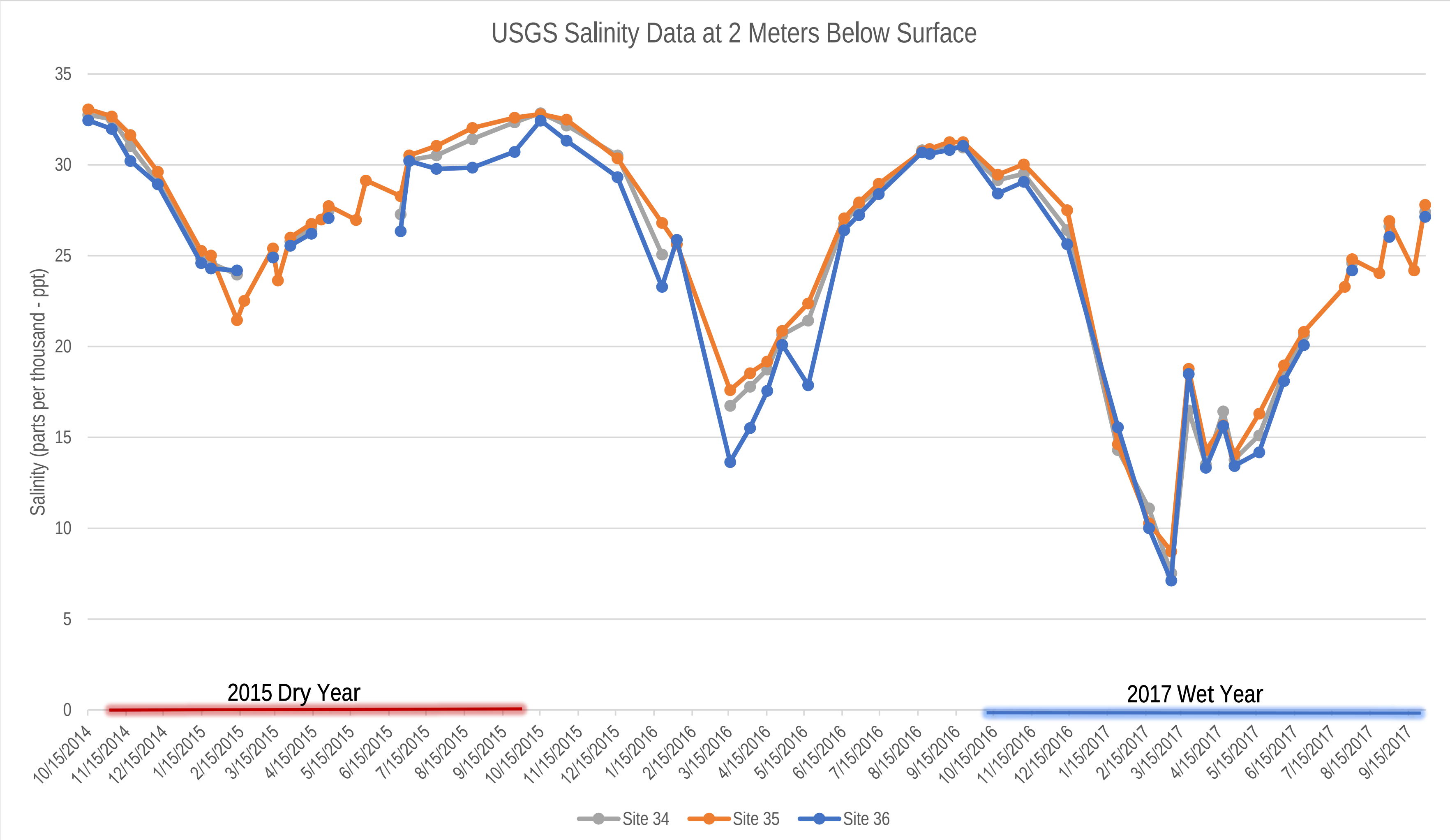


Figure 4-3. Comparison of Temperature Between Wet and Dry Water Years

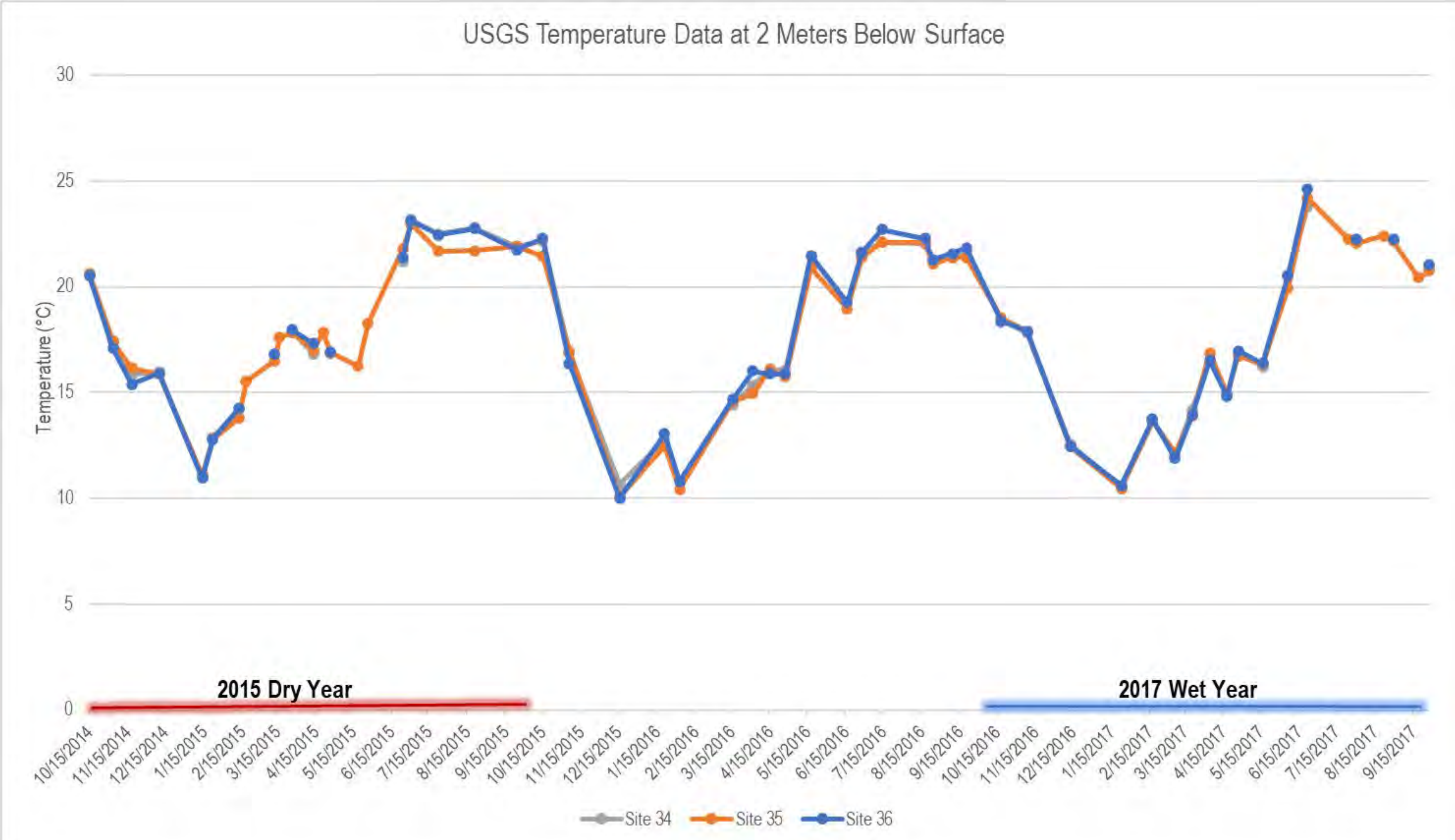


Figure 4-4. Salinity Seasonal Variation

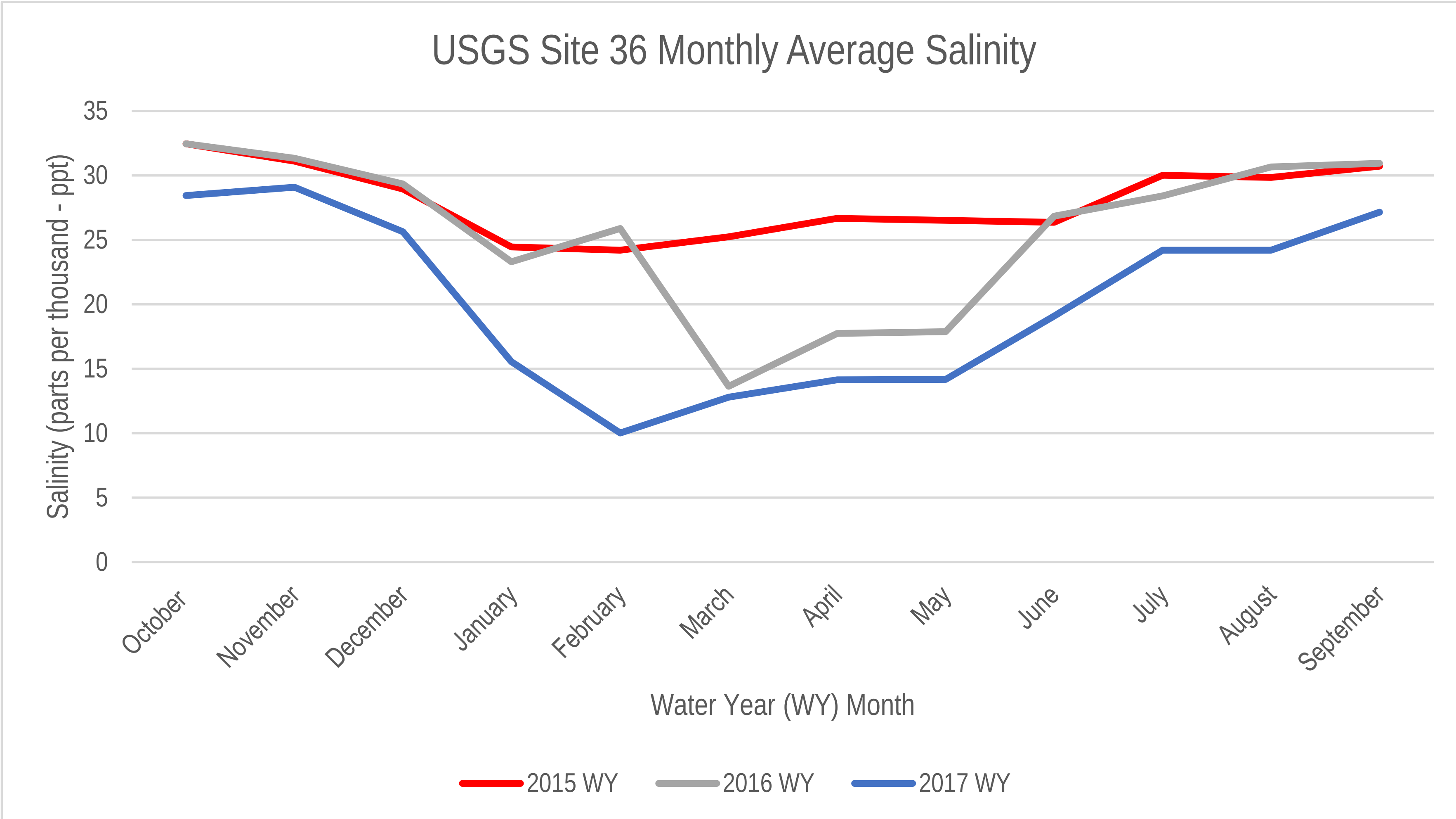
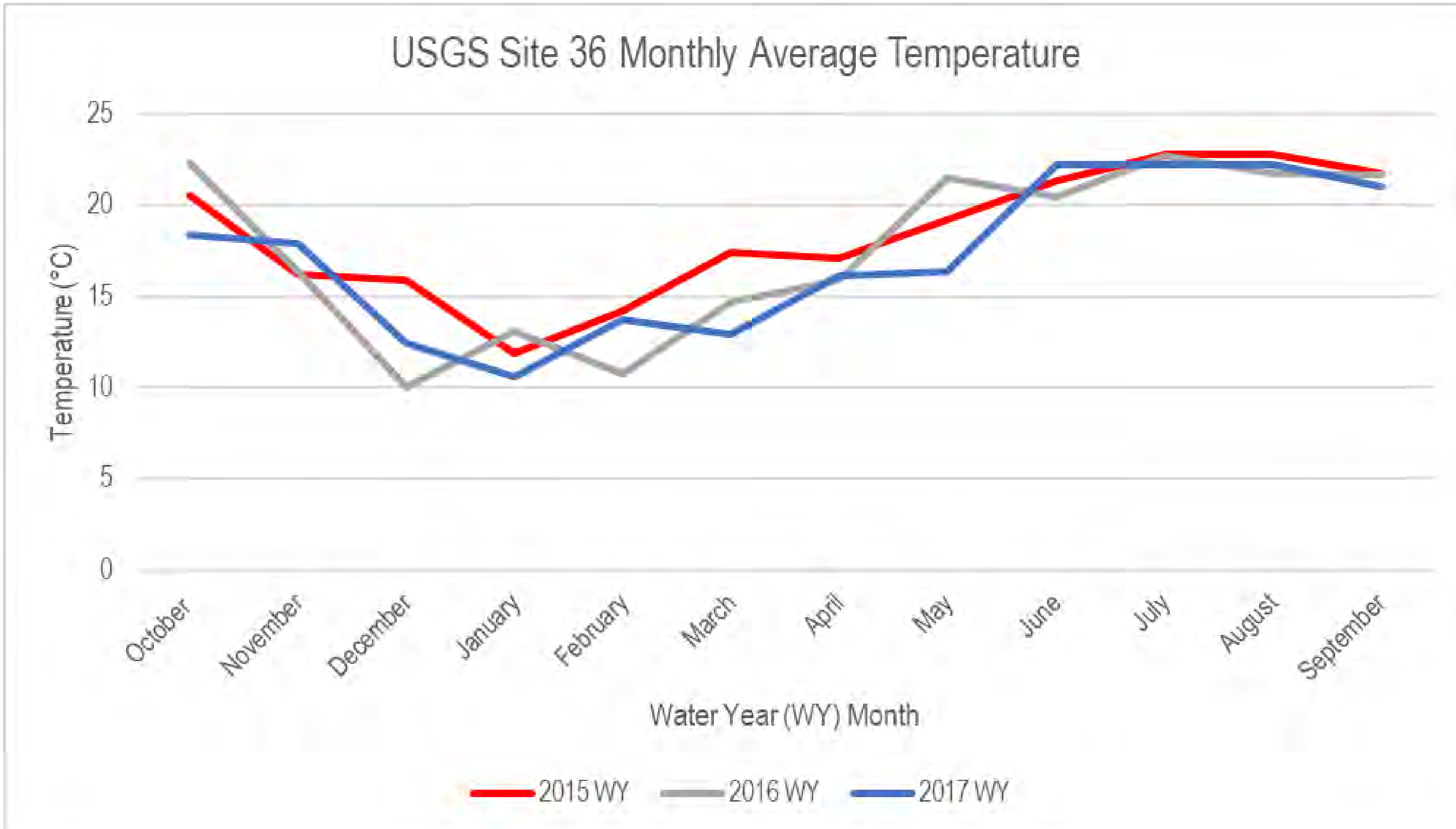


Figure 4-5. Temperature Seasonal Variation



4.2.5 Standards for Treatment

Since the desalination project's purpose is to expand Valley Water's water supply portfolio as an additional source of supply for drinking water, SWRCB DDW's Title 22 drinking water standards must be followed. In addition, if DDW determines an intake option is considered a Direct Potable Reuse (DPR) project, regulations applicable to a DPR project are also to be followed. There are other constituents that are not part of Title 22 drinking water standards that should be considered since these constituents either have water quality objectives identified in Chapter 3 of the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) or have the potential to impact constituents with drinking water standards or water quality objectives in the Basin Plan. Drinking water standards are discussed further in Section 4.5.2. Other constituents that should be considered are discussed below.

Ammonia

For ammonia, currently there is no regulatory drinking water standard, but if there is naturally occurring ammonia in the source water and chloramination is the primary disinfectant for Valley Water's local retailers, there may be nitrification problems in the distribution system especially if there are elevated ammonia levels typically above 0.1 parts per million (ppm).

Sulfide

Reverse Osmosis (RO) membranes are not effective in removing sulfide and pre-treatment will be necessary upstream of the membranes. Since there is not a drinking water limit for sulfide, the aesthetic (e.g., odor) Secondary Maximum Contaminant Level (SMCL) is deferred to since the human nose can detect very small amounts of sulfide. Therefore, treatment efficacy is based on consumer acceptance limits. When referring to the analytical method, a sulfide result of non-detect is recommended. Levels above non-detect can also lead to disinfection problems and possible disinfection byproduct (DBP) formation, which leads to potentially exceeding DBP MCLs. Hydrogen sulfide (rotten egg odor) does make up a large component of sulfide, but it is pH dependent. It has been observed when pH is above 9.0 in water, hydrogen sulfide is generally not present.

Bromide

While there is not a limit for bromide, there is a MCL for bromate at 0.01 ppm. Studies have shown that high levels of natural bromide (> 50 parts per billion [ppb]) can produce bromate when ozone is used as a disinfectant. If ozone will be the primary disinfectant for this desalination project, then elevated bromide levels will be a concern. Valley Water's other drinking water treatment plants (Santa Teresa and Penitencia) utilize ozone treatment as the primary disinfectant.

4.3 Water Quality Estimates

4.3.1 Methodology

The objective of the brine water quality analysis is to characterize the RO permeate and brine water qualities based on available representative source water quality data collected for the evaluation, as discussed in Section 4.2. As such, this characterization can be used to roughly estimate treatment and power requirements; however, more detailed characterization of the source water quality is required to better define pretreatment and post-treatment requirements.

The following methodology was used to estimate brine water quality.

1) **Identify Source Water Quality –** Identified available source water quality data (categorized by average, maximum, and minimum as indicated in Section 2.3) is summarized below in this section.

2) **Identify Water Quality Scenarios –** Five potential water quality scenarios were identified (below in this section) using maximum, average, and minimum conditions for primary water quality constituents

3) **Identify Treatment Requirements and Calculate Treated Water Quality –** Evaluated water quality using Hydranautics' IMSDesign®[1] to define treatment requirements based on source water quality. Identified primary water quality constituents including Total Dissolved Solids (TDS) and pH for permeate and brine water. The calculated RO permeate water quality was compared to drinking water quality objectives (per Title 22 requirements) against calculated water quality scenarios (*see* Section 4.3.2, below).

4) **Identify Additional Water Quality Constituents –** Evaluated additional water quality constituents with reasonable assumptions on treatment removal efficiencies with additional water quality data. The calculated RO permeate water quality was compared to drinking water quality objectives (per Title 22 requirements) against calculated water quality scenarios (*see* Section 4.3.2).

Temperature, pH, and EC were the primary water quality constituents evaluated. Nitrite (as nitrogen) and nitrate/nitrite water quality data was also evaluated where(?) available.

[1] Hydranautics IMSDesign® is used to create designs for a water treatment plant that uses the reverse osmosis process. It is designed to calculate the throughput of a reverse osmosis plant and allows water data to move through a series of stages.

4.3.2 Source Water Quality Data

Source water quality data utilized for input into the Hydranautics' IMSDesign® are provided in **Table 4-4** for the Lower South Bay.

Table 4-4. Source Water Quality Data Input

Constituent	Minimum	Maximum	Average
Temperature (ºC)	20	23.8	21.9
pH	7.4	8.55	8.0
EC (µS/cm)	23,750	51,680	42,721

Notes: EC=electrical conductivity; C=Celsius; µS/cm=micro-Siemens per centimeter
Source: Kennedy Jenks 2022

4.3.3 Water Quality Scenarios

Five water quality scenarios were developed to evaluate water quality under various conditions. Scenario 1 represents an average water condition based on temperature, pH and EC. Scenarios 2 and 3 evaluate an average EC under the maximum and minimum pH and temperature conditions. Scenarios 4 and 5 evaluate the maximum and minimum EC conditions under average temperature and pH conditions. These scenarios are summarized in **Table 4-5.**

Table 4-5. Water Quality Scenarios

	Scenario	Temperature (ºC)	pH	EC (µS/cm)
1	Average Temperature, Average pH, Average EC	21.9	8.0	42,721
2	Maximum Temperature, Minimum pH, Average EC	23.8	7.4	42,721
3	Minimum Temperature, Maximum pH, Average EC	20.0	8.55	42,721
4	Maximum EC, Average Temperature, Average pH	21.9	8.0	51,680
5	Minimum EC, Average Temperature, Average pH	21.9	8.0	23,750

Notes: EC=electrical conductivity; ºC= degrees Celsius; µs/cm=micro-Siemens per centimeter
Source: Jenks 2022

4.3.4 Treatment Requirements

The water quality scenarios were evaluated using Hydranautics' IMSDesign® to identify the requirements for treatment and resulting water quality. IMSDesign® is a membrane projection software that is used to support RO system sizing, membrane selection, and estimate water quality. The following assumptions were made for the analysis.

- Source water was a surface water with conventional pretreatment.
- Sodium, chloride, hardness, and alkalinity concentrations were estimated based on the typical ocean water and adjusted to meet the specific EC as defined by the range of measured water quality and the specified concentration as defined in the five scenarios evaluated.
- Cations and anions were balanced based on the assumed cation ratio and typical ocean water properties.
- 50 percent permeate recovery was used for the evaluation, based on a conservative estimate of anticipated single pass seawater RO recovery rates.

- A single pass system with a total permeate flow of 10 MGD was selected. Single pass was selected as it is a more conservative assumption for the energy analysis compared to double pass RO, as double pass RO can reduce energy consumption.

The membrane identified for the analysis was the SWC5-LD. This membrane has a nominal production of 9,000 gallons per day with a salt rejection of 99.8 percent and is a low differential pressure membrane. The size of the membrane is 8 by 40 inches, with a total area of 400 square feet and has a spacer size of 34 millimeters. This has the benefit of minimizing the constituents that get stuck within the feed spacers, reducing the overall fouling. When spacers are less than 30 millimeters the fouling can occur faster. Six element per vessel were used with 525 total vessels.

4.3.5 Estimated Permeate and Brine Water Quality Calculated TDS

TDS is based on the EC of the water, as this was the available data in the proposed location area, and TDS was calculated based on the assumed anions and cations, as shown in **Table 4-6**. While EC and TDS are two distinct parameters, there is a close relationship between the parameters.

Table 4-6. Calculated TDS Based on Electrical Conductivity

	Scenario	Temperature (ºC)	pH	EC (µS/cm)	TDS (ppm)
1)	Average Temperature, Average pH, Average EC	21.9	8.0	42,721	26,869
2)	Maximum Temperature, Minimum pH, Average EC	23.8	7.4	42,721	26,855
3)	Minimum Temperature, Maximum pH, Average EC	20.0	8.55	42,721	26,911
4)	Maximum EC, Average Temperature, Average pH	21.9	8.0	51,680	32,918
5)	Minimum EC, Average Temperature, Average pH	21.9	8.0	23,750	14,434

Notes: EC=electrical conductivity; C=Celsius;µs/cm=micro-Siemens per centimeter; TDS=total dissolved solids; ppm=parts per million
Source: Kennedy Jenks 2022

Estimated Treated Water Quality

The resulting RO permeate and brine TDS are summarized in **Table 4-7**. At the modeled recovery of 50 percent, the brine is approximately double the TDS in the source water. For drinking water, TDS has a SMCL which includes a recommended, upper, and short-term threshold. The recommended TDS level is 500 ppm with the upper and short term at 1,000 ppm and 1,500 ppm, respectively. For the modeled RO system, the RO permeate TDS is approximately half of the recommended level, meeting the SMCL.

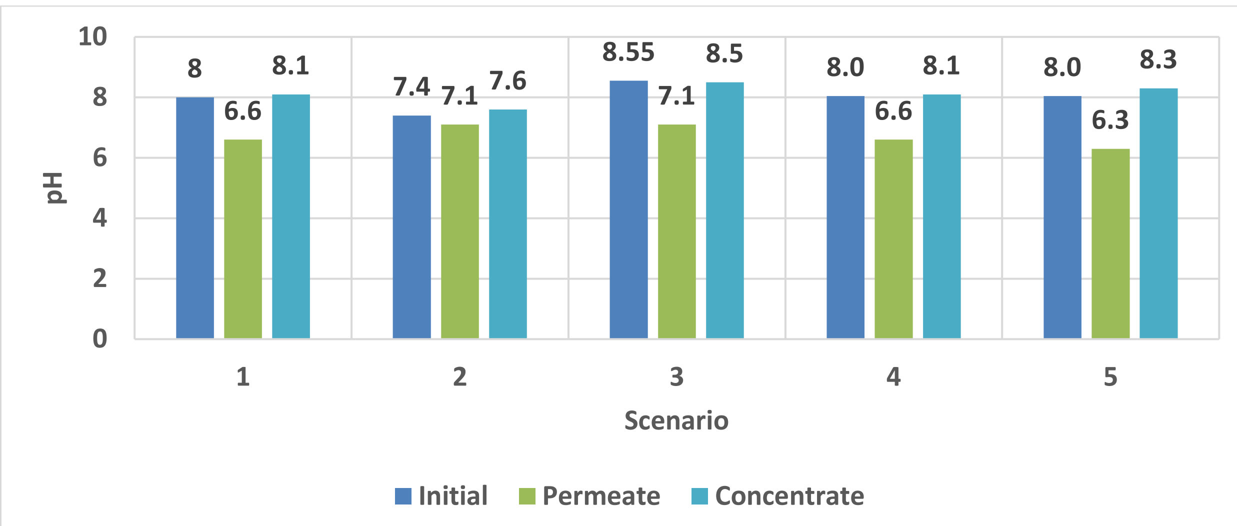
Table 4-7. Comparison of TDS in Source Water, Permeate and Brine (parts per million)

	Scenario	Source Water	Permeate	Brine
1)	Average Temperature, Average pH, Average EC	26,869	225	53,461
2)	Maximum Temperature, Minimum pH, Average EC	26,855	239	53,434
3)	Minimum Temperature, Maximum pH, Average EC	26,911	210	53,519
4)	Maximum EC, Average Temperature, Average pH	32,918	279	65,473
5)	Minimum EC, Average Temperature, Average pH	14,434	117	28,730

Notes: EC=electrical conductivity
Source: Kennedy Jenks 2022

The pH for the feed, permeate, and brine water is shown in **Figure 4-6.** This demonstrates that the permeate water pH level is anticipated to be between 6.3 and 7.1. The brine pH is higher, with a pH range of 7.6 to 8.5. pH has a federal SMCL with a range of 6.5 to 8.5. Scenario 5 does not meet the recommended pH range, however, following RO treatment, further post-treatment conditioning will be required and will bring the pH into the desired range.

Figure 4-6. Comparison of pH for Water Quality Scenarios



Source: Kennedy Jenks 2022

RO membranes can typically reject 93 to 97 percent of nitrate. The maximum, average, and minimum existing water quality conditions for the Lower South Bay, and at 93 and 97 percent rejection, are summarized in **Table 4-8**. Nitrite and nitrate+nitrite have MCL regulations of 1 ppm and 10 ppm, respectively. The MCL is met post treatment at both the 93 and 97 percent rejection of maximum observed constituents.

Table 4-8. Nitrite and Nitrate (ppm)

Constituent	Lower South Bay			93 Percent Rejection		97 Percent Rejection	
	Maximum	Minimum	Average	Maximum	Average	Maximum	Average
Nitrite	8.4	0.3	2.8	0.6	0.2	0.3	0.3
Nitrate + Nitrite	132.8	6.8	60.6	9.3	4.2	4.0	4.0

Source: Kennedy Jenks 2022

In addition to the available Lower South Bay water quality data, wastewater discharge data was also available for the Palo Alto and Santa Clara point discharges. The average and maximum measured levels of each constituent is summarized in **Tables 4-9** and **4-10**. For estimating these constituents in the permeate water, a 90 percent rejection was assumed; the anticipated treated water quality is summarized in **Tables 4-9** and **4-10**. This does not account for the fact that there would be dilution at the point of discharge of the wastewater treatment point discharges as well as the potential for the source water to already contain a concentration of these constituents. Additional water quality testing would be required to further understand the potential constituents and their concentrations.

The brine water quality was also estimated based on the available wastewater discharge water quality and is presented in **Tables 4-9** and **4-10**. Similarly, this water quality is not fully representative of the anticipated brine discharge as it assumes the source water quality to be the wastewater discharge and does not account for any existing concentrations of constituents in the Lower South Bay nor the potential for dilution of the constituents from the point discharge.

Table 4-9. San Jose/Santa Clara RWF Point Discharge Water Quality

Constituent	Measured (ppb)		90 Percent Rejection (ppb)		Drinking Water Standard (ppb)	Brine (ppb)	
	Maximum	Average	Maximum	Average		Maximum	Average
Total Antimony	ND	ND	ND	ND	6	ND	ND
Total Arsenic	1.79	0.99	0.18	0.10	10	3.40	1.88
Total Beryllium	0.01	ND	ND	ND	4	0.02	ND
Total Cadmium	0.04	ND	ND	ND	5	0.07	ND
Total Chromium	0.77	0.49	0.08	0.05	50	1.46	0.93
Total Copper	4.63	2.85	0.46	0.29	1,000	8.80	5.41
Total Cyanide	2.30	0.78	0.23	0.08	150	4.37	1.48
Total Mercury	ND	ND	ND	ND	2	ND	ND
Total Nickel	6.40	4.68	0.64	0.47	100	12.16	8.89
Total Selenium	1.17	0.49	0.12	0.05	50	2.22	0.93
Total Silver	0.01	ND	ND	ND	100	0.03	ND
Total Thallium	1.54	0.08	0.15	0.01	2	2.93	0.15
Total Zinc	31.10	19.73	3.11	1.97	5,000	59.09	37.49

Notes: ND: Non-detect; ppb: part per billion
Source: Kennedy Jenks 2022

Table 4-10. Palo Alto RWQCP Point Discharge Water Quality

Constituent	Measured (ppb)		90 Percent Rejection (ppb)		Drinking Water Standard (ppb)	Brine (ppb)	
	Maximum	Average	Maximum	Average		Maximum	Average
Total Antimony	0.42	0.31	0.04	0.03	6	0.80	0.58
Total Arsenic	1.17	0.79	0.12	0.08	10	2.22	1.46
Total Cadmium	0.69	0.06	0.07	0.01	5	1.31	0.05
Total Chromium	0.60	0.33	0.06	0.03	50	1.14	0.60
Total Copper	14.80	8.50	1.48	0.85	1,000	28.12	15.52
Total Mercury	ND	ND	ND	ND	2	ND	ND
Total Nickel	5.91	4.16	0.59	0.42	100	11.23	7.73
Total Selenium	2.12	0.93	0.21	0.09	50	4.03	1.65
Total Silver	0.23	0.01	0.02	ND	100	0.44	ND
Total Thallium	ND	ND	ND	ND	2	ND	ND
Total Zinc	92.00	46.64	9.20	4.66	5,000	174.80	84.08

Source: Kennedy Jenks 2022

4.4 Applicable Valley Water Studies

4.4.1 Hydrodynamic Modeling and Analysis of ROC Discharge Options: Outfall Location and Dilution Modeling Analysis

In 2019, Valley Water prepared the study titled, *Hydrodynamic Modeling and Analysis of ROC Discharge Options: Outfall Location and Dilution Modeling Analysis*, to evaluate RO concentrate discharge at current publicly owned treatment works outfall locations and potential new locations with more favorable dilution characteristics. A numerical model for hydrodynamics and water quality of the Lower South Bay was applied to support the evaluation process, and to characterize and better understand dilution and mixing occurring in the Lower South Bay. The model used for the dilution analysis is based upon the San Francisco Estuary Institute's (SFEI)- Delft3D-FM model for 3D flow, salinity, and water quality. The following summarizes findings of the study at each wastewater facility discharged evaluated in this chapter. (Valley Water 2019).

- **San Jose/Santa Clara RWF Outfall –** *Discharges to Artesian Slough at the upstream end of the channel (adjacent to SJ In 1), which flows into Coyote Creek and then the open waters of the Lower South Bay*. Transport and mixing of the effluent in Artesian Slough is enhanced by the one-way tide gates drawing water from Coyote Creek through Ponds A17 and A16 out to Artesian Slough. The A16 gate outflow augments the flow down Artesian Slough on ebb tide and dilutes the effluent concentrations below the gate outlet. The one-way gates do, however, recirculate some effluent back into ponds A17 and A16. To a lesser degree, the Pond A18 outflow to Artesian Slough at the south gate similarly reduces the tracer concentration downstream of the gate outlet. The waters leaving Artesian Slough are further mixed by tidal flow from Coyote Creek. At the highest effluent discharge levels, dilution was 3:1 or more past the end of Artesian Slough. The breached ponds and channels of the Coyote Creek system provide considerable tidal flow and mixing of the waters leaving Artesian Slough though some effluent water can accumulate in the system over time at the higher discharge levels and when upstream inflows from Coyote Creek are low. (Valley Water 2019).

- **Sunnyvale WPCP Outfall –** *Discharges into Moffett Channel, which flows into Guadalupe Slough and then to the open waters of the Lower South Bay.* The effluent leaving Moffett Channel is mixed by the tidal flow in Guadalupe Slough and any inflow from San Tomas Aquino Creek. Modeled dilution was 3:1 or greater, past the end of Moffett Channel into Guadalupe Slough.
- **Palo Alto RWQCP Outfall –** *Discharges into a comparatively short channel before entering the open waters of the Lower South Bay.* Once in the Lower South Bay, the effluent is diluted by tidal mixing. Tidal mixing is least effective during the neap tide period. Dilution values are generally 3:1 or greater, past the end of the discharge channel. Overall, the model results indicate the Palo Alto location provides the best dilution and smallest mixing zone.
- **Transport from Lower South Bay –** *Discharge flow out of the Lower South Bay/past the Dumbarton Bridge.* Where the model showed lower remaining RO concentrate mass in the Lower South Bay over time series plots of the simulation period, the brine has been more effectively transported past the Dumbarton Bridge by tidal mixing processes and, to a much lesser extent, by net flows. Alternative outfall locations (located closer to the Lower South Bay along Coyote Creek and Guadalupe Slough than existing outfalls for the San Jose and Sunnyvale WPCPs, respectively) lead to a reduced mass of RO concentrate in the Lower South Bay. Results also suggested that RO concentrate discharge at Palo Alto RWQCP is transported more quickly from the Lower South Bay.

The results of this study are useful for understating 1) dilution and transport of effluent from existing wastewater discharges that could affect source of water quality and 2) dilution and mixing of discharges from brine management options being considered for the desalination project; and are used in the constraints analysis in Section 4.6.

4.4.2 Nature-based Solutions for Reverse Osmosis Concentrate Management Compilation Report

SFEI prepared the study titled, *Nature-Based Solutions for Reverse Osmosis Concentrate Management Compilation Report,* for Valley Water in 2022, to evaluate options, technical and logistical limitations, permitting challenges, and impacts from nature-based solutions for RO concentrate management including horizontal levees.

Oro Loma Sanitary District Experimental Horizontal Levee

An experimental horizontal levee at the Oro Loma Sanitary District treats nitrified effluent via seepage through a gravel and woodchip-amended subsurface layer. The Oro Loma horizontal levee is highly effective in removing nitrate (greater than 97 percent removed), trace organic contaminants (greater than 97 percent removed), and viruses (up to 99 percent removed) from wastewater effluent. Removal efficiencies are dependent on the proportion of subsurface flow; with greater subsurface flow, contaminant removal is enhanced. Overall, the horizontal levee demonstrated a high capacity to remove various contaminants from wastewater effluent (Cecchetti et al., 2020).

The experiment indicates that plantings in the first few meters of the levee could be optimized for nitrogen uptake, while plantings elsewhere can be targeted for habitat or other objectives. Other design adjustments to optimize treatment efficiency could include changing the slope, length, thickness, and materials of the treatment zone. Changing the design from a 30:1 to 15:1 slope would increase flow-through capacity while still maintaining stability. Given high removal efficiency from wastewater in the first 10 meters of the slope, the length of the subsurface treatment zone could be limited. Increasing the thickness of the subsurface zone, where most of the treatment occurred, could improve performance. Given the success of the wastewater effluent trial at the Oro Loma horizontal levee, including the ability to remove contaminants in just a fraction of the built capacity of the levee, it was hypothesized that the levee could be effective in treating higher mass loads of contaminants (e.g., RO concentrate). (SFEI 2022b).

Since 2019, one of the coarse substrate cells of the experimental Oro Loma horizontal levee has been dedicated to the testing of RO concentrate. Initial results are encouraging and show rapid nitrate removal from RO concentrate in the horizontal levee subsurface. Despite higher contaminant loads in RO concentrate, similar removal rates between RO concentrate and wastewater effluent were observed. Initial results show extensive removal of trace organic contaminants, including acyclovir, atenolol, metoprolol, and trimethoprim, with fractions remaining comparable to wastewater effluent. (SFEI 2022b).

4.5 Applicable Regulations

4.5.1 Federal Plans, Policies, Regulations, and Laws

Federal Clean Water Act

CWA (33 USC § 1251 et seq.), formerly the federal Water Pollution Control Act of 1972, was enacted with the intent of restoring and maintaining the chemical, physical, and biological integrity of the waters of the U.S.

Clean Water Act Section 303(d)

Section 303(d) authorizes the U.S. Environmental Protection Agency (EPA) to assist states, territories, and authorized tribes in listing impaired waters and developing TMDLs for these types of waterbodies. The list of impaired waters are waters for which technology-based regulations and other required controls are not stringent enough to meet water quality standards set by states. A TMDL establishes the maximum amount of a pollutant allowed in a waterbody, while still meeting water quality standards, and serves as starting point or planning tool for restoring water quality. Within a TMDL, the state allocates a loading capacity among various point sources and non-point sources. Permits for point sources are issued through EPA's NPDES Program. States are required to update and resubmit their impaired waters list every 2 years to ensure polluted waters continue to be monitored and assessed until water quality standards are met.

The Lower South Bay was first listed on CWA 303(d) list starting in 1990 and is considered an impaired waterbody for aquatic life and fish and shellfish consumption (SWRCB, 2022d). Once a body of water is on the CWA 303(d) list, the state is required to develop a TMDL. This resulted in the San Francisco Estuary RMP, which is administered and managed by the SFEI, an independent nonprofit organization under a Memorandum of Understanding with the SWRCB. The RMP produces an Annual Monitoring Report summarizing the current state of the Estuary regarding pollution, a summary report (Pulse of the Estuary), a quarterly newsletter, technical reports from diverse sources, and journal publications that utilize RMP results. With respect to water quality only, it also monitors the development of TMDLs for chlordane, DDT, dieldrin, dioxin compounds, furan compounds, and selenium and monitoring of mercury, polychlorinated biphenyls (PCBs) and dioxin-like PCBs for the Lower South Bay.

Clean Water Act Section 402 (National Pollutant Discharge Elimination System)

The objective of the NPDES program is to control and reduce discharges of pollutants to water bodies in surface water discharges. Under CWA Section 402, the SWRCB and RWQCBs have been delegated authority by EPA to implement and enforce the NPDES program within California. The Bay RWQCB adopted the Waste Discharge Requirements for Nutrients from Municipal Wastewater Discharges to San Francisco Bay Order R2-2019-0017 (NPDES No. CA0038873) on May 8, 2019, and it became effective on July 1, 2019 (RWQCB 2019b). Order R2-2019-0017 regulates dischargers that own and operate wastewater treatment plants providing secondary or advanced secondary treatment of wastewater collected from their service areas. After treatment, the dischargers discharge to the Bay and its tributaries, which are waters of the U.S. within the Bay watershed. Dischargers are authorized to discharge nutrients subject to waste discharge requirements (WDRs) in this Order and are considered Co-Permittees. This Order established requirements since municipal wastewater treatment plants are a significant source of nutrients to the Bay; therefore, posing a potential threat to the Bay's beneficial uses. Due to the nutrient-enriched Bay and municipal wastewater treatment plants accounting for about 62 percent of the annual average total inorganic nitrogen load to the Bay[2], it is necessary to understand the following:

- Current and future nutrient loads from municipal dischargers.
- The fate and cycling of these nutrients.
- The potential for current or future adverse impacts (ex. Low dissolved oxygen or harmful algal blooms) from these nutrients.
- Indicators of potential changes in the Bay's ability to assimilate nutrients and maintain its resilience to potential adverse nutrient-related impacts.

The Order is the second phase of a multiple-permit-term effort needed to determine an appropriate level of nutrient control and to identify necessary management actions to protect the Bay's beneficial uses. This continues to implement the regional assessment framework established from the previous order to facilitate collaboration on studies that will inform future

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[2] San Francisco Estuary Institute, External Nutrient Loads to San Francisco Bay, January 2014, Table 6, page 27.

nutrient management decisions and regulatory strategies. The purpose of the second phase of this Order is to:

- Track and evaluate treatment plant performance.
- Fund nutrient monitoring programs.
- Support load response modeling.
- Evaluate, on an individual and subembayment scale, nutrient removal approaches using natural systems, and wastewater recycling.

In 2024, RWQCB anticipates considering whether to establish nutrient effluent limitations for municipal wastewater treatment plants, which could require treatment plant optimization or upgrades to reduce nutrient loads to the Bay. To comply with the requirements of Order R2-2019-0017, dischargers must follow the monitoring and reporting requirements specific to their individual NPDES permit conditions, evaluate, by themselves or in collaboration with others: (1) nutrient reduction opportunities through natural systems, (2) evaluate nutrient reduction opportunities through wastewater recycling, and (3) studies to address the potential impacts of nutrients on the Bay's beneficial uses. From the previous order term, dischargers have participated with regional stakeholders to develop the San Francisco Bay Nutrient Management Strategy, a science plan and governance structure.

In addition to Order R2-2019-0017, each discharger identified within the Order also holds their own individual NPDES Permit. These individual NPDES Permits contains specific sampling, monitoring, and reporting requirements and additional standard provisions that supplement the federal standard provisions. Municipal wastewater treatments plants reviewed for this desalination project included:

- San Jose/Santa Clara RWF Order No. R2-2020-0001 / NPDES No. CA0037842
- Sunnyvale WPCP Order No. R2-2020-0002 / NPDES No. CA0037621
- Palo Alto RWQCP Order No. R2-2019-0015 / NPDES No. CA0037834

These orders were effective on April 1, 2020 and expire on March 31, 2025, except for the Palo Alto facility, which went into effect on June 1, 2019 and expires on May 31, 2024. Since the desalination project looks at intake options near the municipal wastewater treatment plants mentioned above, discharge effluent results were used in the water quality assessment for source water quality.

Another entity, the East Bay Dischargers Authority (EBDA) also discharges a similar type of discharge as this project into the Bay (RWQCB 2022). The EBDA and its member agencies are a Joint Powers Agency. Member agencies separately own and operate their treatment plants and wastewater collection systems. Under Order R2-2022-0023 / NPDES No. CA0037869, EBDA discharges secondary treated municipal wastewater, Zone 7 RO reject water, and Cargill brine through the EBDA Common Outfall to the Lower San Francisco Bay. The EBDA Common Outfall is between the San Francisco-Oakland Bay Bridge and the San Mateo-Hayward Bridge. The outfall diffuser meets the requirements to be considered as a deepwater discharge per Basin Plan Section 4.6.1 as it is located 37,000 feet (about 7 miles) offshore and is submerged 23.5 feet under the water surface. It consists of 251 6-inch bell mouth riser ports that each split into two

3-inch perpendicular discharge points. This Order went into effect on September 1,2022 and expires August 31, 2027. Since this project is evaluating a deepwater discharge, effluent limits outlined in Order R2-2022-0023 are used in the water quality assessment for brine WDRs. This project will need to obtain its own Order and NPDES permit to allow for discharge of the brine waste.

Clean Water Act Section 403

Effluent limitations established under CWA Section 403 are included in the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) by reference. Refer to the Ocean Plan in Section 4.5.2 below and *see* Chapter 6, "Land Use and Planning," for discussion of the applicability of this plan to Valley Water's desalination project.

4.5.2 State Plans, Policies, Regulations and Laws

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act defines waters of the state as, "…any surface water or ground water, including saline waters, within the boundaries of the state" and water quality objectives as, "…the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area" (Water Code Section 13050[e and h, respectively]). It also requires the RWQCB to establish water quality objectives, while acknowledging that it is possible for water quality to be changed to some degree without unreasonably affecting beneficial uses.

SWRCB establishes statewide water quality control policy and regulation. SWRCB also coordinates and reviews RWQCB actions for consistency with statewide policy and regulation. RWQCBs develop Water Quality Control Plans to provide reasonable protection and enhancement of the quality of both surface and groundwater in their respective regions.

SWRCB Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality Waters in California (Antidegradation Policy) requires the SWRCB and RWQCBs issue WDRs to ensure that projects that may discharge pollutants to land or water conform to water quality objectives and policies and procedures of the applicable water quality control plans.

San Francisco Bay Basin Water Quality Control Plan

Water Quality Control Plans must be updated every 3 years in compliance with the Porter-Cologne Act. The Basin Plan designates beneficial uses of groundwater, inland surface water, and wetland areas in the Project area (Santa Clara Hydrologic Unit, Hydrologic Unit Code #18070103), as shown in **Table 4-11**. Designated beneficial uses for specific surface water and groundwater resources and the enforceable water quality objectives necessary to protect those beneficial uses are defined in the Basin Plan. The Basin Plan includes numerical and narrative water quality objectives for microbiological, physical, and chemical water quality constituents. In the Bay region, regional objectives are set for inland surface waters, surface waters, wetlands, groundwaters, and the Bay. Since the inland surface waters, wetlands, and the Bay are identified as potential discharge locations for brine water, regional objectives for inland surface waters, wetlands, and the Bay and wetlands as outlined in Chapter 3 of the Basin Plan are considered as there are several identified existing beneficial uses.

As indicated in **Table 4-11**, none of the surface source waters at the intake options are considered for human consumption. The salt pond source water intake options (SJ In 1, MV In 1, and PA In 1) would be considered salt-type wetlands and are classified as part of the South San Francisco Bay and Redwood City Area water bodies.

Ocean Standards

SWRCB, Ocean Standards Unit is responsible for developing and updating statewide plans and policies involving marine waters, providing scientific support, and inter-agency coordination regarding marine pollution and resource management. Ocean standards are in place to protect the beneficial use of California's marine waters through established water quality objectives and implementation provisions in statewide water quality control plans and policies. Although there are three plans and policies applicable to Ocean Standards, the ones applicable to this desalination project are the Ocean Plan and the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan).

Water Quality Control Plan for Ocean Waters of California *(Revised 2019)*

See Chapter 6, "Land Use and Planning," for discussion of the applicability of this plan to Valley Water's desalination project. The Lower South Bay, where discharge of brine would occur for all brine management options, is a long way from ocean waters and it is not anticipated that discharges under the brine management options considered would affect ocean waters. These regulations are not discussed but can be found in the Ocean Plan (SWRCB 2019).

Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California

The Thermal Plan (SWRCB 1975) regulates the discharge of elevated temperature waste to the coastal and interstate waters and enclosed bays. Although it is not expected that brine from the desalination project would be at an elevated temperature when it is discharged, this Thermal Plan is acknowledged for awareness. Since proposed receiving waters for the brine wastewater would be considered discharging into an enclosed bay, the maximum temperature of the water discharge is not to exceed the natural temperature of the receiving waters by more than 20°F.

Water Quality Control Plan for Enclosed Bays and Estuaries: Part 1 Sediment Quality Objectives

The Water Quality Control Policy for the Enclosed Bays and Estuaries of California was initially adopted in 1974 and amended in 1995 through Resolutions No. 74 to 43 and 95 to 84, respectively. This policy provides water quality principles and guidelines for prevention of water quality degradation and the protection of beneficial uses of waters. The Water Quality Control Plan for Enclosed Bays and Estuaries (Enclosed Bays and Estuaries Plan) complies with the legislative directive in Water Code Section 13393 to adopt sediment quality objectives. These provisions integrate chemical and biological measures to determine if sediment-dependent biota are protected or degraded as a result of exposure to toxic pollutants in sediment. Low dissolved oxygen, pathogens, or nutrients including ammonia are not addressed in these provisions. The Enclosed Bays and Estuaries Plan may be applicable to this project since the brine wastewater discharge may be considered a point source discharge. Resolution No. 2018-0028, effective March 11, 2019, states in Item 6 that proposed amendments and adopted provisions relevant to the Enclosed Bays and Estuaries Plan are intended for future incorporation into the new Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries Plan, when it is adopted.

Draft Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California

The Draft Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (ISWEBE Plan) is considered in draft form and has not been adopted by SWRCB or approved by the Office of Administrative Law per the SWRCB's website (SWRCB 2018). The ISWEBE Plan establishes provisions for water quality and sediment quality that apply to all inland surface waters, enclosed bays, and coastal waters of the state, including both waters of the U.S. and surface waters of the state. This plan does not apply to ocean waters. There are three parts (adopted amendments) that will be incorporated into to the ISWEBE Plan that include: (Part 1) Trash Provisions, (Part 2) Tribal Subsistence Beneficial Uses and Mercury Provisions, and (Part 3) Bacteria Provisions and Variance Policy. Because the Bay is considered an enclosed bay, this plan is applicable to this project.

California Drinking Water Related Laws

Drinking Water Related Regulations

The DDW regulates the drinking water standards. Drinking water related statutes are from the Corporations Code, Education Code, Food and Agricultural Code, Government Code, Health and Safety Code, Public Resources Code, and Water Code. Drinking water regulations are from Title 17 and Tile 22 of the California Code of Regulations (CCR). Title 17 Standards provides the regulations for the protection of drinking water supplies such as protection of a drinking water system. Title 22 Standards provides the regulations for the monitoring and reporting requirements for drinking water.

There are primary standards for bacteriological, inorganic, and organic chemicals known as MCLs. Primary standards are set to protect public health by limiting the levels of certain constituents in drinking water. Secondary standards are set for constituents that do not impact health, but could affect the water's taste, odor, or appearance. **Table 4-12** identifies the sections of Title 22 Drinking Water Regulations where water quality constituents and their respective MCLs and SMCLs are referenced.

Table 4-11. Designated Beneficial Uses within Project Area

Waterbody	Human Consumptive Uses					Aquatic Life Uses					Wildlife Use	Recreational Use		
	MUN	IND	PROC	AGR	COMM	SHELL	EST	MIGR	RARE	SPWN	WILD	REC-1	REC-2	NAV
Inland Surface Water – Santa Clara Basin[1]														
San Francisco Bay South		●			●	●	●	●	●	●	●	●	●	●
Charleston Slough							●	●	●	●	●	●	●	
Mallard (Artesian) Slough							●		●		●	●	●	
Groundwater – Santa Clara Valley (DWR Basin No. 2-009)[2]														
Santa Clara (2-9.02)	●	●	●	●										
Wetlands – Salt Type[3]														
South San Francisco Bay					●		●	●	●	●	●	●	●	
Redwood City Area							●	●	●		●	●	●	

Notes: [1] Basin Plan – Table 2-1; [2] Basin Plan – Table 2-2 / Figure 2-10D; [3] Basin Plan – Table 2-4 / Figure 2-11

MUN Municipal and Domestic Supply
IND Industrial Service Supply
PROC Industrial Process Supply
AGR Agricultural Supply
COMM Commercial and Sport Fishing
SHELL Shellfish Harvesting
EST Estuarine Habitat
MIGR Fish Migration
RARE Preservation of Rare and Endangered Species
SPWN Fish Spawning
WILD Wildlife Habitat
REC-1 Water Contact Recreation
REC-2 Noncontact Water Recreation
NAV Navigation

Source: RWQCB 2019a

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Table 4-12. Drinking Water Standards Reference

Constituents	Reference
Total Coliform / E. Coli	Title 22[1], §644261.1, Chapter 15
Inorganic Chemicals	Title 22, Table 64431-A, Chapter 15
Radionuclide Chemicals	Title 22, Tables 64442 and 64443, Chapter 15
Organic Chemicals	Title 22, Table 64444-A, Chapter 15
Secondary Drinking Water Standards	Title 22, Tables 64449-A and 67779-B, Chapter 15
Lead and Copper	Title 22, Chapter 17.5
Disinfection Byproducts	Title 22, Table 64533-A, Chapter 15.5
Chemicals with Notification Levels	DDW: Drinking Water Notification Levels and Response Levels: An Overview, Table 1[2]
Enteric Virus, Cryptosporidium oocysts, Giardia cysts*	Addendum to DPR Framework, §64669.45
Priority Toxic Pollutants*	40 CFR Section 131.38[3]
Solvents*	Addendum to DPR Framework, §64669.65
Safe Drinking Water and Toxic Enforcement Act of 1986, listed as known to state of CA to cause Cancer and Reproductive Toxicity*	CCR §27001, Title 27, Division 4, Chapter 1, Article 9[4]

Note: *Constituents are applicable for Direct Potable Reuse Regulations
Sources: [1, 2] SWRCB 2022e; SWRCB 2022f; [3] Cornell Law School 2022; [4] California Office of Environmental Health Hazard Assessment 2022.

Direct Potable Reuse Regulations

If the intake source water includes permitted discharge from a wastewater treatment facility, then DDW considers it a DPR project. On October 1, 2018, SWRCB updated their regulations related to recycled water. As a result of Assembly Bill 574 (AB 574), recycled water terminology related to the various types of potable reuse projects were updated. The SWRCB's Proposed Framework for Regulating Direct Potable Reuse in California, Second Edition released on August 2019 (Framework) incorporated language from AB 574. However, SWRCB's recycled water regulations have not yet been updated. More recently the SWRCB released an Addendum to the Proposed Framework on March 22, 2021 (Addendum). This Addendum provides an early draft of anticipated criteria for DPR projects. It will be added to Title 22, Division 4, Chapter 17, Surface Water Treatment, as new Article 10, Direct Potable Reuse, starting at §64669.00 following review and adoption of the regulations. The Framework and Addendum was used in understanding what the potential regulations may entail as the feasibility of this desalination project is reviewed. It is anticipated the SWRCB will adopt uniform water recycling criteria for DPR on or before December 31, 2023.

The Framework and Addendum are used to understand what the potential regulations as a DPR may entail, including the following.

- § 60320.312 of Title 22 Recycled Water Regulations states that in addition to constituents in **Table 4-12**, DBP in Table 64533-A, Chapter 15.5 of Title 22 Drinking Water Regulations also need to be analyzed.

- The Addendum provides proposed sampling criteria regarding monitoring related to a DPR project. §64669.60 of the Addendum references all sampling in **Table 4-12** to be monitored at the influent and effluent of an advanced treatment plant. In addition, §64669.65 states to also include monitoring for Priority Toxic Pollutants for chemicals listed in 40 CFR Section 131.38, "Establishment of numeric criteria for priority toxic pollutants for the State of California", Notification Levels, solvents, treatment byproducts and their precursors. To understand potential chemicals entering the sewershed, §64669.65 also states to identify and monitor for chemicals known to the state of California to cause cancer and reproductive toxicity. To further understand what is entering the sewershed from industrial and nonindustrial sources, a wastewater source control program would need to be conducted and reviewed. Once this is performed, additional constituents may be added for monitoring.

Additionally, Notification Levels, which are nonregulatory and health-based, were recently established for perfluorinated compounds. Although MCLs have not been set yet, sampling for perfluorinated compounds is recommended as they are commonly found in wastewater and likely to be regulated in the foreseeable future.

Other Treatment Standards

Other constituents that are not part of Title 22 drinking water standards, such as ammonia, biochemical oxygen demand, chlorophyll-a, ortho-phosphate, phosphorus, total Kjeldahl nitrogen, total nitrogen, and total suspended solids should be monitored as these constituents either have water quality objectives, as identified in Chapter 3 of the Basin Plan, or have the potential to impact constituents with drinking water standards or water quality objectives in the Basin Plan. Section 3.3 of the Basin Plan mentions the objectives for all surface waters within the region, except for the Pacific Ocean (**Table 4-13**). This would apply to the project area, particularly where the brine will be discharged.

Table 4-13. Basin Plan Water Quality Objectives for Surface Waters

Constituents	Basin Plan Water Quality Objective
Bacteria[1]	
Enterococcus	Geometric mean < 30 CFU/100 mL; STV < 110 CFU/100 mL
E. coli	Geometric mean < 100 CFU/100 mL; STV < 320 CFU/100 mL
Fecal Coliform	Median < 14 MPN/100 mL; 90^{th} percentile < 43 MPN/100 mL
Total Coliform	Median < 70 MPN/100 mL; 90^{th} percentile < 230 MPN/100 mL
Bioaccumulation	Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent such growths cause nuisance or adversely affect beneficial uses. Irregular and extreme levels of chlorophyll a or phytoplankton blooms may indicate exceedance of this objective and require investigation.
Color	Water shall be free of coloration that cause nuisance or adversely affect beneficial uses.
Copper	Acute (1-hr. average): 10.8 ppb; Chronic (4-day average): 6.9 ppb
Cyanide	Acute (1-hr. average): 9.4 ppb; Chronic (4-day average): 2.9 ppb

Constituents	Basin Plan Water Quality Objective
Dissolved Oxygen	5.0 ppm minimum
Floating Material	Water shall not contain floating material, including solids, liquids, foam, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
Mercury	Protection of Human Health: 0.2 mg/kg fish tissue; Protection of Aquatic Organisms and Wildlife: 0.3 mg/kg fish
Nickel	Acute (1-hr. average): 62.4 ppb; Chronic (4-day average): 11.9 ppb
Oil and Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water that cause nuisance, or adversely affect beneficial uses.
Polychlorinated Biphenyls	10kg/year. Individual wasteload allocations are assigned for municipal wastewater dischargers and industrial wastewater dischargers.
Population and Community Ecology	Water shall be free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. Health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.
pH	Shall not be depressed below 6.5 nor raised above 8.5. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.
Radioactivity	Shall not be present in concentrations that result in accumulation of radionuclides in the food web to extent that presents a hazard to human, plant, animal, or aquatic life.
Salinity	Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state to adversely affect beneficial uses, particularly fish migration and estuarine habitat.
Sediment	Suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in a manner to cause nuisance or adversely affect beneficial uses. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic pollutants in sediment or aquatic life.
Settleable Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Sulfide	Water shall be free from dissolved sulfide concentrations above natural background levels. Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objective as sulfides cannot exist to a significant degree in an oxygenated environment.
Tastes and Odors	Waters shall not contain taste or odor producing substances in concentrations that impart undesirable tastes or odor to fish flesh or other edible products of aquatic origin, that cause nuisance, or adversely affect beneficial uses.
Temperature	This objective defers to the Thermal Plan. The maximum temperature of the water discharge is not to exceed the natural temperature of the receiving waters by more than 20°F.
Toxicity	Waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test. There shall be no chronic toxicity in ambient waters.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or

Constituents	Basin Plan Water Quality Objective
	turbidity relatable to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.
Un-ionized Ammonia	Annual median = 0.025 ppm as N. Maximum for Lower South Bay = 0.4 ppm as N.

Note: CFU/100 mL = colony forming units/100 milliliters; STV = statistical threshold value; mg/kg = milligram per kilogram; ppm = parts per million; ppb = parts per billion; NTU = nephelometric turbidity units
Source: RWQCB 2019. Chapter 3.3

4.6 Source Water and Intake Evaluation

A summary of water quality constraints relevant to source water and associated intake options is provided in **Table 4-14.** Critical constraints and recommended next steps are discussed below in this section.

Table 4-14. Summary of Source Water Constraints

Source Water and Associated Intake Options		Source Water Quality Data	Anticipated Source Water Salinity Levels	Designated MUN for Potable Water Supply in Basin Plan	Applicable Drinking Water Standards	
					Other Constituents of Concerns	Direct Potable Reuse
SJ	Pond A18 Subsurface (SJ In 1)	Monitoring program recommended	Likely less than LSB due to natural filtering and intake of groundwater	No MUN designation	Ammonia, sulfide, bromide	Likely
SJ	Artesian Slough Open (SJ In 2)	Monitoring program recommended	Less than LSB due to high flow of treated wastewater effluent	No MUN designation	Ammonia, sulfide, bromide	Possibly
MV	Pond A2E Subsurface (MV In 1)	Monitoring program recommended	Likely less than LSB due to natural filtering and intake of groundwater	No MUN designation	Ammonia, sulfide, bromide	Not Likely
MV	South Bay Open (MV In 2)	Monitoring program recommended	Similar to estimated	No MUN designation	Ammonia, sulfide, bromide	Possibly
PA	Charleston Slough/Pond A1 Subsurface (PA In 1)	Monitoring program recommended	Likely less than LSB due to natural filtering and intake of groundwater	No MUN designation	Ammonia, sulfide, bromide	Not Likely
PA	Charleston Slough Open (PA In 2)	Monitoring program recommended	Similar to LSB	No MUN designation	Ammonia, sulfide, bromide	Possibly
PA	South Bay Open (PA In 3)	Monitoring program recommended	Similar to LSB	No MUN designation	Ammonia, sulfide, bromide	Possibly

Notes: DPR=Direct Potable Reuse; LSB=Lower South Bay; MUN=municipal

4.6.1 Source Water Quality Data Monitoring Program

There is limited site-specific data on salinity and other constituents for all intake options. Development of a monitoring program is recommended to close the data gaps and gain more information on the source water quality as it relates to drinking water standards. It is recommended for the monitoring program to be conducted for a minimum of 5 years to streamline the monitoring efforts, close the data gaps, and have data available for designating the source water as municipal (MUN) beneficial use. It would be ideal for the monitoring to occur at locations where the potential source water intake would be constructed. The first year of monitoring would be considered as a baseline and should include constituents listed in **Table 4--12**. To capture seasonal variations in water quality, bi-annual sampling should occur with samples being collected during one high and one low flow condition/potential runoff. Certain constituents that may impact treatment effectiveness, such as conductivity, TDS, pH, temperature, ammonia, sulfide, and bromide would be recommended for more frequent quarterly monitoring to understand if there may be variations in water quality. After the first year of baseline monitoring, water quality data would be evaluated to determine if sampling frequencies for various constituents should be adjusted.

As subsurface intake options would be evaluated in subsequent phases of this project, it is also recommended that baseline sampling is conducted in locations where groundwater may be extracted. Recommended monitoring would be similar to surface water quality monitoring discussed above and also include constituents listed in **Table 4-12**, except those constituents identified as only applicable to DPR would not need to be sampled unless the location where groundwater may be utilized is in vicinity to a discharge point from a wastewater treatment facility.

Additional water quality data collected from this monitoring program will also support a more accurate characterization of permeate and brine water quality, which was limited for this study. It is recommended the following additional data is collected and considered in the following subsequent water quality analyses for the permeate water.

- **Post-treatment Requirements –** After RO treatment, the product water requires post-treatment to provide a stable product water that is compatible with water quality that is in the current distribution system. This includes the addition of minerals to the RO permeate to mitigate the corrosive nature of the permeate and ensure compatibility with current water supplies. Post-treatment processes include lime addition via chemical conditioning or calcite beds/contactors, carbon dioxide addition, pH adjustment with caustic soda (sodium hydroxide) or with decarbonation, fluoridation, and disinfection.
- **Additional Water Quality Constituents –** The water quality that was available for constituents other than temperature, pH and EC was from wastewater data. Additional characterization of water quality of the Lower South Bay at/near intake options may be required to identify pre-treatment requirements.

It is recommended additional data is collected and considered in the following subsequent water quality analyses for characterizing the brine.

- **Pre-treatment Impacts** – If it is identified that additional pre-treatment is required to reduce membrane fouling, additional chemicals may be added as part of this process. This would impact the overall brine water quality.

- **Discharge Water Profile** – Ambient temperature and salinity stratifications are major factors affecting near-field dilution. Currents drive plume migration and affect dilution by causing mixing. Because of this, it is essential to characterize ambient current data in any potential outfall locations, considering the depth of the discharge and the water quality at that depth.

4.6.2 Anticipated Source Water Salinity Levels

The salinity level of source water is important because it has implications for RO and treatment process requirements, energy use, and composition of brine. A range of salinity levels were estimated in **Table 4-4** based on the limited source water quality data available. Since available water quality data was from the open waters of the Lower South Bay it's anticipated salinity levels for open intakes in open water – MV In 2 and PA In 3 – would be similar. Since there is no additional data available, it is also assumed salinity for the open intake in Charleston Slough – PA In 2 – is similar but more study is required at this location. Based on the proximity to the San Jose/Santa Clara RWF Discharge Point and existing dilution study prepared by Valley Water (discussed in Section 4.4.1), it is anticipated that SJ In 2 would divert wastewater in high concentrations as it mixes with water in Artesian Slough; and as a result, salinity in source water for this intake is anticipated to be less than estimated. Salinity levels in subsurface intake options – SJ In 1, MV In 1, and PA In 1 – are also anticipated to be less than estimated due to natural filtration of source water through the ground and potential intake of groundwater with Bay water.

4.6.3 Designated MUN for Potable Water Supply in Basin Plan

As discussed in Section 4.5.2, none of the intake options are currently designated MUN for beneficial uses, which would allow these water bodies to be used for potable water purposes. As a result, the source water body under any alternative may need to be designated as MUN for source water drinking purposes through a regulatory hearing process. The initial process would require scheduling a meeting with the Bay's RWQCB to discuss the process to include MUN designation for the water body during a Basin Plan Amendment, which are conducted triennially. To change the beneficial use designation to MUN with the SWRCB, DDW would first need to approve the water body as a drinking water supply. A water quality monitoring plan should be developed and submitted with a DDW Application for Domestic Water Supply Permit Amendment to demonstrate that water body water quality achieves water quality objectives or criteria designed to protect the beneficial uses (e.g., MUN) and whether additional treatment would be feasible to meet drinking water standards in accordance with Title 22.

4.6.4 Other Constituents of Concern

As mentioned in Section 4.2.5, in addition to meeting drinking water standards, there are other constituents of concern that may impact treatment effectiveness or impact the potable water distribution system. Constituents such as ammonia, sulfide, and bromide are not regulated under Title 22 drinking water standards but are considered other constituents of concern due to their potential to impact constituents with drinking water standards. These constituents should be included with the recommended monitoring program to understand if it is a concern to be addressed during treatment plant design.

4.6.5 Direct Potable Reuse Regulations

Mountain View and Palo Alto Intake Options

Intake options in Mountain View and Palo Alto are more than 1.5 miles (PA In 3), 3 miles (MV In 2, PA In 1, and PA In2), and 4 miles (MV In 1) from Palo Alto RWQCP Discharge Point 1; and further from outfalls for the Sunnyvale WPCP and San Jose/Santa Clara RWF. As discussed in Section 4.4.1, Valley Water has conducted previous studies evaluating mixing of RO concentrate including a study in 2019 modeling dilution and transport in the Lower South Bay (Valley Water 2019). The results of this study indicate that effluent discharged from existing wastewater outfalls experiences dilution of 3:1 or greater once flows enter open water of the Lower South Bay.

Based on these results, intake options in the Lower South Bay – MV In 2 and PA In 3 – could intake source water with wastewater effluent diluted at 3:1 or greater. Intakes close to the shoreline – MV In 1, PA In 1, PA In 2 – could also intake wastewater effluent diluted at 3:1 or greater if the ponds containing these intakes divert water from the Lower South Bay. Since MV In 1 and PA In 1 are subsurface intakes, any wastewater that is mixed with Bay water would be naturally filtered by percolation through the ground surface.

San Jose Intake Options

The intake option in Artesian Slough – SJ In 2 – is immediately downstream of the San Jose/Santa Clara RWF Discharge Point. As discussed in the RO concentrate study and summarized in Section 4.4.1, effluent from this discharge point does not experience dilution of 3:1 or more until entering Coyote Creek – past the end of Artesian Slough. Therefore, it is anticipated that SJ In 2 would divert wastewater in high concentrations as it mixes with water in Artesian Slough.

SJ In 1 at Pond A18 is adjacent to the San Jose/Santa Clara RWF Discharge Point but separated by the levees forming the perimeter of Pond A18 and is a subsurface intake. Water control gates along the Pond A18 levees allow flows to enter the pond from Artesian Slough approximately 1.7 miles downstream from this discharge point and release flows back into Artesian Slough adjacent to the discharge point. Wastewater flowing down Artesian Slough could flow into Pond A18 through the entrance gate. Wastewater would be naturally filtered during percolation through the ground surface but could still be a source of water in the subsurface intake at Pond A18.

Recommendations

Further study is recommended to evaluate the wastewater effluent as component of source water and dilution in the ponds and/or groundwater for intake options SJ In 1, MV In 1, PA In 1, and PA In 2 and in the Lower South Bay for MV In 2 and PA In 3. The project should be discussed with regulators from DDW and RWQCB to understand the feasibility of utilizing proposed intake options. Regulators from DDW and RWQCB have recognized every project is unique and highly recommend engaging regulators early on in a project. Additionally, if Valley Water were to move forward with a DPR intake option, Valley Water would need to work closely with the wastewater facility owners, and a formal partnership/agreement would likely be necessary.

4.7 Receiving Water Quality and Brine Management Evaluation

A summary of water quality constraints relevant to receiving water and associated brine management options is provided in **Table 4-15.** Critical constraints and recommended next steps are discussed below in this section.

Table 4-15. Summary of Receiving Water Constraints

Receiving Water and Associated Brine Management Option		Subject to Ocean Plan Discharge Requirements	Compliance with Discharge Requirements	Ability to be Implemented
All	South Bay Deep Water Outfall (Br 1)	Not anticipated but possible	▪ Considered difficult ▪ Further modeling and dilution study required	▪ Proven approach ▪ Co-location with wastewater discharges may be preferred by SWRCB and RWQCB
SJ	Pond A18 Horizontal Levee (SJ Br 2)	Not likely	▪ Considered difficult ▪ Further modeling and study of effects to biological resources required	▪ Experimental phase ▪ Blending with other discharges should be considered to reduce salinity levels and may be preferred by SWRCB and RWQCB
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	Not likely	▪ Considered difficult ▪ Further modeling and study of effects to biological resources required	▪ Experimental phase ▪ Blending with other discharges should be considered to reduce salinity levels and may be preferred by SWRCB and RWQCB

Notes: RWQCB=Regional Water Quality Control Board; SWRCB=State Water Resources Control Board

The discharge of brine would need to comply with discharge permits and specified TMDLs for the Bay, and the Basin Plan. All water quality standards prescribed in the permits and TMDLs are included in the Basin Plan.

4.7.1 Subject to Ocean Plan Discharge Requirements

As discussed in Section 4.5.2, the brine management options would result in discharges a long way from ocean waters and it is not anticipated that discharges would affect ocean waters. However, the RWQCB and SWRCB would ultimately make this determination, and could regulate the discharge to assure no violation of the Ocean Plan will occur in ocean waters. It's not likely horizontal levee options – SJ Br 2 and MV-PA Br 2 – would be subject to the Ocean Plan and not anticipated but possible Br 1 would be subject to the Ocean Plan. It is recommended that early in project planning Valley Water discussions with regulators the proposed brine management option being pursued. If the regulators consider that the proposed brine discharge may affect the ocean waters, then the project would be subject to Chapters III.M.3 (Receiving Water Limitation for Salinity) and III.M.4 (Monitoring and Reporting Programs) of the Ocean Plan.

4.7.2 Compliance with Brine Discharge Requirements

Although brine water quality was estimated (*refer to* Section 4.3), insufficient relevant source water quality data was available for comparison to anticipated discharge requirements. To gain an understanding of potential discharge requirements for the brine, **Table 4-16** provides the effluent limitations per Order R2-2022-0023/ NPDES No. CA0037869 for EBDA, which discharges a similar type of brine as Valley Water's desalination project, discharges into the Lower South Bay, and is classified as a deepwater discharge. Per Basin Plan Section 4.6.1, to be classified as a deepwater discharge, wastewater is to be discharged through an outfall with a diffuser and must receive an initial dilution of 10:1, with generally much greater dilution.

As discussed in Section 4.4.1, based on the review of previous dilution studies conducted by Valley Water, discharge of brine at Br 1 would achieve initial dilution of 3:1 or greater and be quickly transported from the Lower South Bay. However, since Br 1 is in deeper water of the Lower South Bay than wastewater discharges evaluated in previous Valley Water studies, initial dilution of 10:1 may occur and should be studied further.

Table 4-16. Potential Discharge Effluent Limitations

Parameter	Units	Average Monthly	Maximum Daily	Average Weekly
Enterococcus Bacteria	CFU/100 mL	1,100[a]	n/a	280[b]
Fecal Coliform Bacteria	MPN/100 mL	500[c]	1,100[d]	
Acute Toxicity	Percent Survival	90[e]	70[f]	
Total Chlorine Residual	ppm	n/a	n/a	n/a
Total Ammonia as Nitrogen	ppm	86	110	n/a
Total Copper	ppb	53	69	n/a
Total Cyanide	ppb	20	40	n/a
Dioxin-Toxin Equivalent	ppb	1.4×10^{-8}	2.8×10^{-8}	n/a
Total Mercury	ppb	0.066	n/a	0.072
Polychlorinated Biphenyls	ppb	0.012	0.017	n/a

Note: CFU/100 mL = colony forming units per 100 milliliters; MPB/100 mL = most probable number per 100 milliliters; ppm = parts per million; ppb = parts per billion
a = no more than 10 percent of samples collected in a calendar month shall exceed this
b = 6-week rolling geometric mean
c = geometric mean of all samples collected in a calendar month

d = 11-sample 90th percentile value
e = three-sample median shall not exhibit less than
f = single sample value shall not exhibit less than
Source: RWQCB 2022

As part of the documentation and studies to obtain WDRs and a NPDES permit for the brine discharge, a mixing zone study or modeling of the discharge and receiving water needs to be conducted to calculate the dilution ratio required to meet the water quality-based effluent limitations and remains protective of water quality. In addition to the discharge effluent limitations identified in **Table 4-16**, the receiving water limitations provided in **Table 4-17**, which are based on Order R2-2022-0023, are also to be complied with the order. Since TMDLs for mercury and PCBs were approved by EPA for the Bay, the project would need to demonstrate meeting these TMDLs. Receiving water limitations identified from Order R2-2022-0023 in **Table 4-17** aligns with the Basin Plan Water Quality Objectives for Surface Waters identified in **Table 4-13**.

Regarding temperature limits, the desalination project is not expected to be a concern as treatment through RO membranes is not expected to elevate temperature. Temperature requirements in the Thermal Plan are more relevant to discharges from cooling plants and industrial process water used for the purpose of transporting waste where there is the possibility of elevated temperature being discharged to receiving waters.

pH is not expected to be an issue for brine from the desalination project. Based on the modeled scenarios from Section 4.3.5, estimates of pH in the concentrate ranges from 7.6 to 8.5 (*refer to* **Figure 4-6)**, which is within the receiving water limitations in **Table 4-17** and Basin Plan Water Quality Objectives in **Table 4-13**.

To understand how this desalination project compares to other existing desalination projects within the state, three other desalination projects with more current NPDES Permits effective dates were reviewed. Although these projects are in Southern California, discharge effluent and receiving water requirements are similar. A major difference is that these other projects discharge directly into the Pacific Ocean, while this desalination project will be discharging into an enclosed bay. The other desalination projects NPDES Permits reviewed were:

- Pebbly Beach Desalination Plant: Order R4-2019-0145 / NPDES No. CA0061191
- Carlsbad Desalination Plant: Order R9-2020-0004 / NPDES No. CA0109223
- Doheny Desalination Project: Order R9-2022-0005 / NPDES No. CA0107417

Similar to EBDA Order R2-2022-0023, receiving water limitations followed their respective regional water quality control plans. Discharge effluent limits were also similar, except these three NPDES Permits also added salinity as a parameter with a limit. Defined salinity effluent limits are:

- Pebbly Beach Desalination Plant: maximum daily of 96.94 parts per thousand (ppt)
- Carlsbad Desalination Plant: average daily of 42 ppt
- Doheny Desalination Plant: instantaneous max of 232.4 ppt

Table 4-17. Potential Receiving Water Limitations

Parameter	Receive Water Limitation
At Any Place in Receiving Waters	
Floating Material	Water shall not contain floating material, including solids, liquids, foam, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
Sediment	Alteration of suspended sediment in a manner to cause nuisance or adversely affect beneficial uses or detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.
Settleable Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Bioaccumulation and Biostimulatory Substances	Bottom deposits or aquatic growths to the extent that such deposits or growths cause nuisance or adversely affect beneficial uses.
Temperature	Alteration of temperature beyond present natural background levels unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
Turbidity	Changes in turbidity that cause nuisance or adversely affect beneficial uses or increases from normal background light penetration or turbidity greater than 10 percent in areas where natural turbidity is greater than 50 NTU or above 55 NTU in areas where natural turbidity is less than or equal to 50 NTU.
Color	Coloration that causes nuisance or adversely affects beneficial uses.
Oil and Grease	Visible, floating, suspended, or deposited oil or other products of petroleum origin
Population and Community Ecology	Toxic or other deleterious substances in concentrations or quantities that cause deleterious effects on wildlife, waterfowl, or other aquatic biota, or render any of these unfit for human consumption, either at levels created in the receiving waters or as a result of biological concentration.
Limit within 1-foot of the Water Surface	
Dissolved Oxygen	5.0 ppm minimum
Dissolved Sulfide	Natural background levels
pH	6.5 to 8.5. Discharge shall not cause changes greater than 0.5 pH units in normal ambient pH levels
Nutrients	Water shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses

Source: RWQCB 2022

Since these facilities discharge to the Pacific Ocean, the Ocean Plan applies. Discharges may not exceed a daily maximum of 2 ppt above natural background salinity in the brine mixing zone in the receiving water and throughout the water column. As these facilities have various discharge locations in the Pacific Ocean, this may be the reason of the variable salinity limits.

Another proposed desalination project closer to the project area, Antioch Brackish Water Desalination Project located in Contra Costa County, will utilize their source water from the San Joaquin River. Since the brine from the brackish water desalination plant will be routed to the Delta Diablo Wastewater Treatment Plant, discharge requirements are prescribed for Delta Diablo under Order R2-2019-0035 / NPDES No. CA0038547. When construction of the brackish water desalination plant is completed, the brine (at a rate of 2 MGD) will blend with Delta Diablo’s treated wastewater effluent prior to discharging into the New York Slough. The existing discharge into the New York Slough is through a deep-water diffuser about 500 feet offshore. It is a 42-inch-diameter iron pipe about 400 feet in length at a depth of about 26 feet below the mean water level. The diffuser consists of 50 ports spaced 8 feet apart in alternating directions, with diffuser port openings at three inches in diameter.

Since this desalination project is not fully constructed yet, Order R2-2019-0035 provides provisions prior to discharge of the brine. Order R2-2019-0035 states that specific conditions must be met before Delta Diablo accepts the brine from the Antioch Brackish Water Desalination Project and that RWQCB needs to be informed prior to discharge as the brine will trigger different Water Quality Based Effluent Limitations and monitoring requirements. In addition to treated wastewater effluent from the Delta Diablo Wastewater Treatment Plant, it also receives cooling tower blowdown and industrial brine. Estimated pollutant concentrations in the brine from the Antioch Brackish Water Desalination Project is expected to be four times those in treated drinking water from city of Antioch’s water treatment plant. It is recommended to monitor the regulatory permitting of the Antioch Brackish Water Desalination Project as the Bay RWQCB is issuing the NPDES Permit and there are some similarities to this desalination project as both dischargers are required to follow the Basin Plan for this region.

Compliance with discharge requirements is considered difficult and requires further study. Further data collection of source water quality and modeling of brine water quality is required for all brine management options. Dilution modeling should also be conducted for the outfall – Br 1. As discussed in Section 4.4.2, the experimental Oro Loma horizontal levee has been used to identify design adjustments to optimize treatment efficiency and one section has been dedicated to the testing of RO concentrate with results indicating similar rates for removing contaminates between RO concentrate and wastewater effluent despite higher contaminant loads in brine. These results suggest that more mass removal could be possible in more concentrated brine. As a result, horizontal levees options – SJ Br 2 and MV-PA Br 2 – are anticipated to significantly reduce discharge of contaminants to the Lower South Bay compared to an outfall, which is anticipated to make it easier to satisfy discharge requirements for many constituents. Since horizontal levees would be in tidal marsh habitat with sensitive biological species, changes in water quality also need to be analyzed for effects to these habitats and species. Additional study of effects to biological resources from changes in water quality should be conducted for the horizontal levee options – SJ Br 2 and MV-PA Br 2.

Ability to be Implemented

Outfalls have been permitted for several desalination projects. One potential method to meet brine discharge requirements would be to blend the brine with another less saline source, such as wastewater effluent. This would dilute the brine to meet discharge requirements. Order R2-2022-0023 did this same approach by blending the Cargill Brine discharge with treated wastewater effluent from municipal wastewater facilities within the Order. As the brine water quality has elevated salt concentrations, a requirement of obtaining the NPDES Permit would be to conduct a model of the mixing zone and to calculate the dilution ratio required to meet the water quality-based effluent limitations and remains protective of water quality. As discussed for the Ocean Plan in Chapter 6, “Land Use and Planning,” the SWRCB and RWQCB prefer co-locating brine discharges for desalination facilities and this option should be explored further. Coordination with the SWRCB and RWQCB is required to understand discharge requirements further.

Experimental horizontal levees are being used in the Bay Area for treatment of wastewater effluent and brine. Further study and evaluation are required to confirm their ability to manage RO concentrate from desalination projects. Due to the sensitivity of tidal marsh habitats to high levels of salinity, blending of brine with other less-saline sources for discharge on horizontal levees is also likely to make horizontal levees a more viable option. The SWRCB and RWQCB may also prefer blending with other less-saline sources of effluent for horizontal levee options.

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Chapter 5. Environmental Conditions

5.1 Introduction

This chapter provides an evaluation of site-specific environmental constraints related to the site/location of project options for a future desalination facility. Environmental conditions evaluated in this chapter include water resources, biological resources, cultural resources, and known hazardous materials and contaminants. This evaluation covers the eight intake options and associated conveyance to the pump stations and the three brine management options. The Treatment Facility Planning Areas are not evaluated in this chapter.

The Environmental Study Areas developed for the seawater desalination project (desalination project) encompass the intake and brine management options evaluated in this chapter. The Environmental Study Areas are intentionally broad and intended to cover areas where these project options could generally be located or result in direct or indirect effects including within the cities of San Jose, Palo Alto, and Mountain View. The Environmental Study Areas do not include the following pipeline alignments, as they are not identified in this study: 1) from intake pump stations to treatment facilities; 2) from the treatment facility to brine management options; and 3) from the treatment facility to Valley Water's treated water system.

This chapter identifies environmental conditions within the Environmental Study Areas using information obtained from publicly available databases and reports. No field surveys or data collection was conducted for this study. After relevant environmental conditions are discussed, this chapter provides a site-specific analysis for the purpose of evaluating siting of intake and brine management options.

5.2 Historical Conditions

Historically, lands surrounding the San Francisco Bay (Bay), including those in the Environmental Study Areas, were composed of a mosaic of wetland habitat types dominated by tidal salt marsh with sinuous channel networks and pockets of salt pannes, sausals (willow groves), lagoons, and emergent marsh ponds, transitioning to large expanses of seasonal wet meadow to upland habitat including grassland and oak savannah in the surrounding rolling hills (U.S. Fish and Wildlife Service [USFWS] 2012). These areas provided extensive habitat for millions of waterfowl, bear, elk and deer herds, as well as supporting the foodweb dynamics of anadromous salmonid populations and small fishes such as gobes and sticklebacks. The tremendous level of ecological life supported numerous indigenous tribes who hunted, fished, and lived throughout the region. The South San Francisco Bay (South Bay) salt pond landscape was formerly made up of natural or semi-natural salt ponds developed by Native Americans by using low berms and weirs to control inundation duration.

With the discovery of gold in 1848 near Sacramento, California, populations in the area surged, resulting in rapid urban development and control and manipulation of freshwater sources necessary to support the farms and ranches. Land reclamation activities such as levees and drainage ditches were pursued intensively, further diminishing overall Bayland areas. Today, 80 percent of the estuary's historic marshes have been heavily impacted reducing the ecological functionality for the region's plant and animal life. This is due to both direct impacts, through agriculture, industrialization, and urbanization, as well as indirect impacts through intensive water operations during dam and pump operations miles upstream. This has changed the dynamics of freshwater entering the system as well as sediment transport into the region which has had adverse impacts on sensitive habitats such as pickleweed plains and salt ponds. Water quality has also diminished from historic levels due to surface runoff from urban development, farms, and historic mining operations. Historic gold mining operations are of particular concern due to mercury contamination that has entered many of the rivers and tributaries that flow into the Bay. When soils and sediment are disturbed through construction or earth-disturbing activities, especially in aquatic environments, this mercury is released as methylated mercury into the atmosphere.

Despite these challenges, the Bay continues to support a significant number of ecologically important habitats for numerous federally and state threatened and endangered species. The fresh and tidal wetlands also continue to provide flood resiliency, and water quality benefits to human communities and the region supports a vibrant food web which supports anadromous fish and other economically significant wildlife for California.

5.3 Water Resources Conditions

The section provides information on the South Bay and other water resources in the Environmental Study Areas including hydrology and biological habitats. These water resources are shown on Figures 5-1 through 5-3, below in Section 5.4, "Biological Resources Conditions." The discussion of the South Bay also applies generally to water resources within the salt ponds. Site-specific information was not found for Pond A2E.

Climate in the Environmental Study Areas is considered Mediterranean in nature with annual wet winters and dry summers, interspersed with longer multi-year drought and/or wet conditions. Hydrology in the Environmental Study Areas is influenced by direct precipitation, groundwater, overland flow from creek channels, and the tidal prism within tidal marshes and sloughs. In some cases, creek channels from upland areas terminate in sloughs that discharge to the South Bay. Many of the salt ponds within and adjacent to the San Jose and Mountain View-Palo Alto Environmental Study Areas have restricted tidal action due to levees and/or water control structures.

5.3.1 South San Francisco Bay

The South Bay is a large, shallow basin, with a relatively deep relict river channel surrounded by broad shoals and mudflats, 70 percent of the area south of Dumbarton Narrows (located right around the Dumbarton Bridge) occupied by intertidal mudflats. The shallows and mudflat areas are collectively referred to as the "sweep zone." Seaward of the sweep zone, the main channel of South Bay drops to depths of up to 50 feet below Mean Lower Low Water (MLLW). Tides propagate through the narrow opening at the Golden Gate as shallow water waves. The enclosed nature of the South Bay creates a mix of progressive wave and standing wave behavior, which leads to tidal amplification southward. The tidal range is 9 feet at Coyote Creek near the Alviso Unit of the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge). Currents in the South Bay are a product of tidally-driven residual currents and wind-driven circulation. The South Bay receives significant inputs of sediment from local watersheds and from the Central Bay. However, the major source of sediment in circulation within the South Bay is the wave-induced erosion of consolidated mud on the surface of the sweep zone north of the Dumbarton Narrows. (USFWS 2012).

Over the last 150 years, most of the tidal marshes of the South Bay were diked to create ponds for salt production. These ponds form a large part of the Refuge. Other areas were converted for agricultural, hunting clubs, or development purposes. Reclamation activities removed vegetated tidal marsh functions and associated habitats, specifically marsh plain, perimeter salt pans, and the tidal channels within the marsh. Diking of the marshes also affected physical and sedimentary processes. The tidal prism was reduced, causing tidal sloughs to fill with sediment as fringing marsh outboard of the levees expanded. Several outboard levees of former salt ponds have been breached to reintroduce tidal action and move toward restoration of tidal marsh habitat (USFWS 2012).

Mercury enters the South Bay in runoff from legacy mercury contamination in creek sediments accumulated from abandoned mercury mining sites in the watershed, as well as from the contemporary urban landscape. Surface sediments in the South Bay generally contain total mercury concentrations either similar to or slightly greater than the ambient mercury criteria established by the San Francisco Bay Regional Water Quality Control Board (RWQCB). The Guadalupe River/Alviso Slough system is one of the principal sources of mercury to the South Bay. Polychlorinated biphenyls (commonly known as PCBs) and selenium are also water quality concerns in the Bay (USFWS 2012).

The Quaternary sediments of the South bay comprise of unconsolidated layers of gravel, sand, silt, and clay. The clays are relatively impervious to water, whereas the sand and gravel layers store and transmit water, forming important groundwater aquifers. Groundwater and surface water are often hydraulically connected to some degree. Surface water may infiltrate and become groundwater, or groundwater may discharge to the surface and become surface water. Groundwater levels in the South Bay fluctuate seasonally with no apparent tidal influence. Under natural conditions, precipitation infiltrates the alluvial deposits, and groundwater in the South Bay flows toward discharge areas in the Bay. In recent years, groundwater pumping in the area has significantly decreased. As a result, groundwater levels in the region have recovered, which has halted local saltwater intrusion problems. While a zone of saltwater intrusion can still be found in the South Bay, the zone appears to be stable and is not migrating further inland. Groundwater in the South Bay currently flows toward the Bay, and if this continues, saltwater intrusion should not be as significant of a problem as it has been in the past (USFWS 2012).

The Bay serves as open water habitat for resident and migratory fish. The area functions as a spawning habitat for fish and macroinvertebrates, a foraging and juvenile rearing area, and a migratory corridor for a variety of anadromous fish species including chinook salmon, steelhead, striped bass, sturgeon, and American shad (MMWD 2008). Marshes and mudflats are present along the shoreline of the Bay and provide food and shelter to a variety of fish and wildlife. This includes the San Francisco Bay-Delta Distinct Population of the longfin smelt (*Spirinchus thaleichthys*), which is currently under consideration for listing as a federally endangered species. Additionally, the South Bay serves as a critical staging and wintering ground on the Pacific Flyway for numerous migratory birds. A full listing of these species and potential for occurrence is provided in **Table 5-2**.

5.3.2 Artesian Slough and Coyote Creek

Artesian Slough is a 2.5-mile-long tidal slough that begins at Los Esteros Road and terminates at Coyote Creek. Artesian Slough is made up of open water habitat with tidal freshwater marsh found along the eastern boundary of the slough. The San Jose/Santa Clara Regional Wastewater Facility (RWF) discharges into Artesian Slough near the shoreline. Coyote Creek drains a 322-square-mile watershed and provides a substantial amount of freshwater during winter and spring, particularly during wet years.

5.3.3 Pond A18

Pond A18 is open water habitat separated from tidal flows of the Bay by a levee and two tide gates, one on the north and one on the south. Pond A18 was originally created for salt production and harvesting. It is currently inactive as a salt pond but is managed to achieve specific salinity and hydrologic circulation regimes. Salinity data indicate that the range of brackish salinities in the pond vary by season, from less than 10 parts per thousand (ppt) in the wet season to 25 ppt in the dry season (Environmental Science Associates and Jones and Stokes 2013). Open water is predominantly inundated by direct rainfall and run-off from surrounding areas, but the salt content of the soil results in brackish or saline inundation within these features. The city of San Jose owns and maintains pond A18.

5.3.4 Stevens Creek

Stevens Creek consists of approximately 20 miles of channel that enters the San Francisco Estuary near Long Point, north of Moffett Field Naval Air Station, at Whisman Slough. Stevens Creek is an important corridor for federally threatened distinct population segment (DPS) steelhead (*Oncorhynchus mykiss irideus*) and other aquatic species (City of Cupertino 2011). Steelhead occur and spawn within the Stevens Creek watershed. Juvenile steelhead were captured in surveys conducted downstream of Stevens Creek Reservoir between 2013 and 2020 (Smith 2019). Designated critical habitat for Central California Coastal steelhead occurs in Stevens Creek (Santa Clara County 2019).

5.3.5 Charleston Slough and Pond A1

Charleston Slough and Pond A1 were originally created for salt production and harvesting; however, both are currently inactive and are now part of the South Bay Salt Pond Restoration Project Phase II Action Area, which aims to restore approximately 15,000 acres of former salt ponds located around the edge of the South Bay. Pond A1 is bordered on the west by Charleston Slough, a 115-acre muted tidal mudflat that is separated from the Bay’s full tidal flows by a levee and a large tide gate structure owned and operated by the city of Mountain View. The intertidal mudflats around the channel draw large numbers of foraging shorebirds, ducks, and other species, particularly at low tide. The southern and western levees around Charleston

Slough support popular public access/recreation trails and ruderal and other vegetation (USFWS and SCC 2016).

5.3.6 Palo Alto Flood Control Basin

The 618-acre Palo Alto Flood Control Basin (Flood Control Basin) collects flows from Adobe, Matadero, and Baron creeks, includes Mayfield Slough, and consist of diked salt marsh or muted tidal marsh habitat. The Flood Control Basin was built in 1956 to prevent floods in the city of Palo Alto. The water level in the Flood Control Basin is typically between -2.2 and -2.0 feet. A two-way tidal gate located at the north end of the Flood Control Basin allows tidal inflow and freshwater outflow under controlled conditions. The tide gates are operated to allow for adequate space within the Flood Control Basin for rain flow from the creeks, managing muted tidal marsh habitat, and controlling vectors. The northern area of the Flood Control Basin closest to the tide gate experiences more saline conditions than the southern area (City of Palo Alto 2017).

The southern portion of the basin is mostly dry but includes marsh panne formations present throughout this area which indicate seasonal ponding occurs. A large open area in the northeastern corner of the Flood Control Basin is denuded of vegetation and supports roosting by numerous seabirds throughout the day. Matadero Creek and Adobe Creek empty into the Flood Control Basin and are characterized as riparian corridor habitat. The far west portion of the Environmental Study Area, west of Byxbee Park and contiguous to the Flood Control Basin, contains the Emily Renzel Wetlands, which overall contains similar habitat composition to the Flood Control Basin (City of Palo Alto 2017).

5.4 Biological Resources Conditions

5.4.1 Soils

Native soils within the project area are primarily a mix of Novato and Campbell complexes. Novato complexes are generally clay to silty loams that originate from granite and sedimentary and/or volcanic rock alluvium. Historically, soil in this grouping has a low slope, is often subject to tidal influence and supported native vegetation such as pickleweed and cordgrass. As such, where intact, these areas may continue to support associated sensitive species such as salt marsh harvest mice and rail species (NRCS 2022). Campbell complexes also tend to have low slope profiles and are generally found in floodplains and alluvial fans. However, they are not frequently subjected to flooding or emersion and prior to European settlement, these areas had a mix of oak and grassland vegetation. These soils are also comprised of more rocky alluvium sources than the Novato series, allowing them to be more well drained and very deep. Because of this combination of factors, Campbell complexes have often been developed into urban landscapes and/or high intensity agriculture such as row cropping or orchards (NRCS 2022).

5.4.2 Land and Vegetation Cover Types

Land and vegetation cover types were obtained from the California Aquatic Resources Inventory (CARI) published by the San Francisco Estuary Institute (SFEI), and the California Aquatic Science Center and Vegetation Classification, and Mapping (CalVeg) published by the U.S. Department of Agriculture (SFEI ASC 2017, USDA 2018). The CARI dataset was used to capture all Bayland and Wetland types due to being a peer reviewed statewide standardized dataset. CalVeg was used to fill in upland habitat not captured in the CARI dataset. Due to the use of two distinct datasets, a few data gaps are present as seen on **Figures 5-1** to **5-4**. Future field surveys would be required to map these habitat types and confirm habitats captured by CARI and CalVeg. However, due to similarities between mapped and unmapped upland habitat, the unmapped habitat types are likely to be annual grassland or urban lands. The land and vegetation cover types within the Environmental Study Area consist of: Bay Flat, Deep Bay, Lagoon, Marsh, Marsh Flat, Panne, Shallow Bay, Tidal Unnatural, Depressional, Playa; Annual Grassland, and Urban, and are shown in **Figures 5-1** to **5-4**. A description of each land and vegetation cover type is provided below. **Table 5-1** shows habitat acreage within the Environmental Study Areas.

Table 5-1. Land Cover/Vegetation Acreage within the Environmental Study Areas

Desalination Project Environmental Study Area	Approximate Land Cover/Vegetation Acreage											
	Annual Grassland	Urban	Depressional Wetlands	Playa	Lagoon	Bay Flat	Tidal Unnatural	Marsh Flat	Panne	Marsh	Deep Bay	Shallow Bay
San Jose	17	32	30	<1	819	-	<1	5	0.03	16	-	5
Mountain View–Palo Alto	5	35	140	-	1,152	216	8	114.73	62.73	406	-	-
South Bay Deep Water Outfall	-	-	-	-	-	-	-	-	-	-	110	168

Notes: < = less than

Source: SFEI ASC 2017, USDA 2018

Bayland and Wetland Types

- **Deep Bay –** The Deep Bay consists of estuarine open water habitat (including the greater Bay and other estuarine channels) deeper than 18 feet below MLLW, including the deepest portions of the Bay and the largest tidal channels. Deep bay/channel habitat accounts for approximately one-third of the area within the Bay. Deep bay environments in the southern part of the Bay tend to have higher salinities that are distributed more uniformly throughout the water column as compared to the northern Bay due to reduced freshwater inputs. Aquatic life in this part of the Bay includes northern anchovies (*Engraulis mordax*), Pacific sardine (*Sardinops sagax caerulea*), and Pacific mackerel (*Scomber japonicus*). These species form an important base for foodweb dynamics, providing food for migratory and resident bird populations as well as seals and sea lions.

Figure 5-1. Land Cover and Vegetation within the Environmental Study Areas

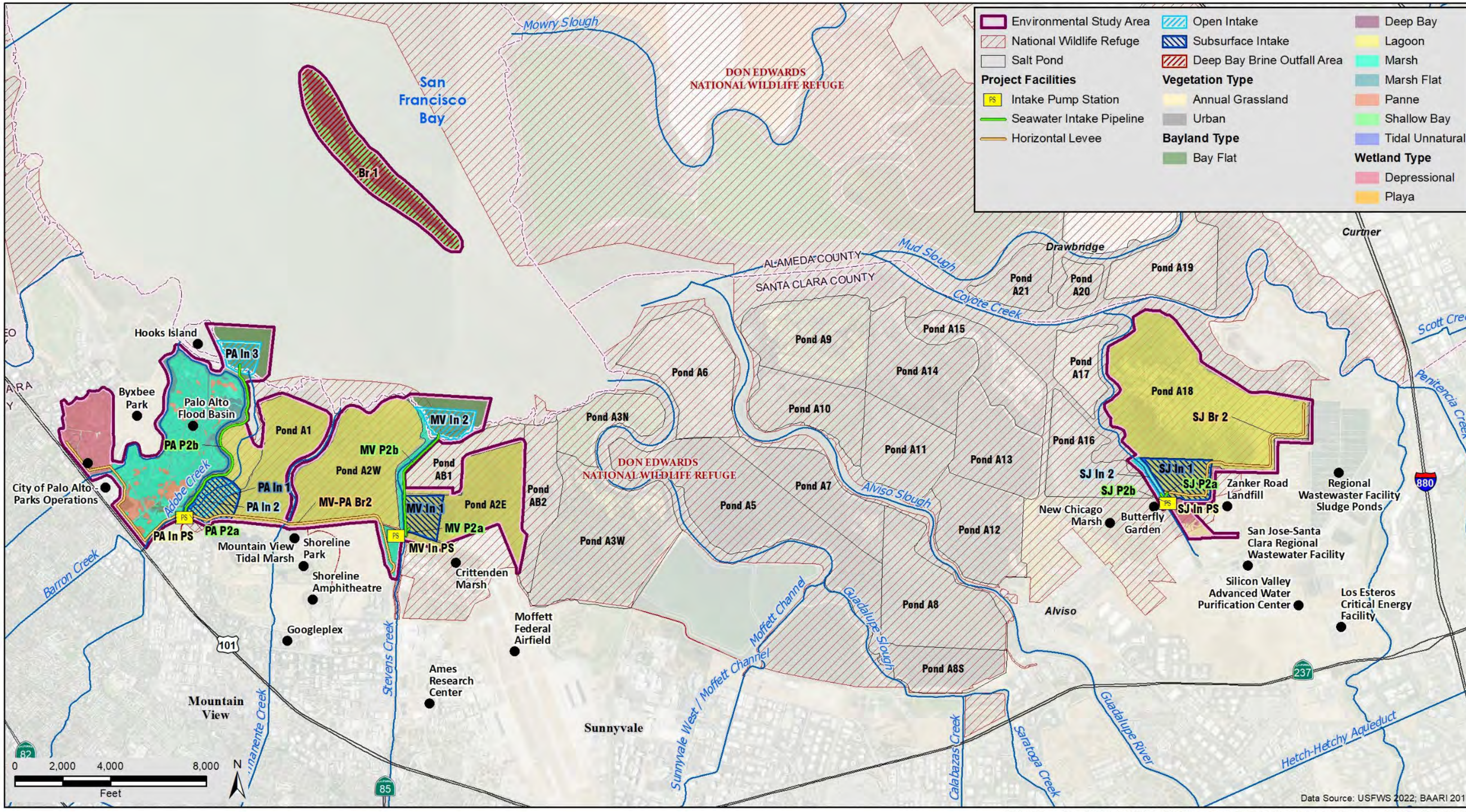

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Figure 5-2. Land Cover and Vegetation within the San Jose Environmental Study Area

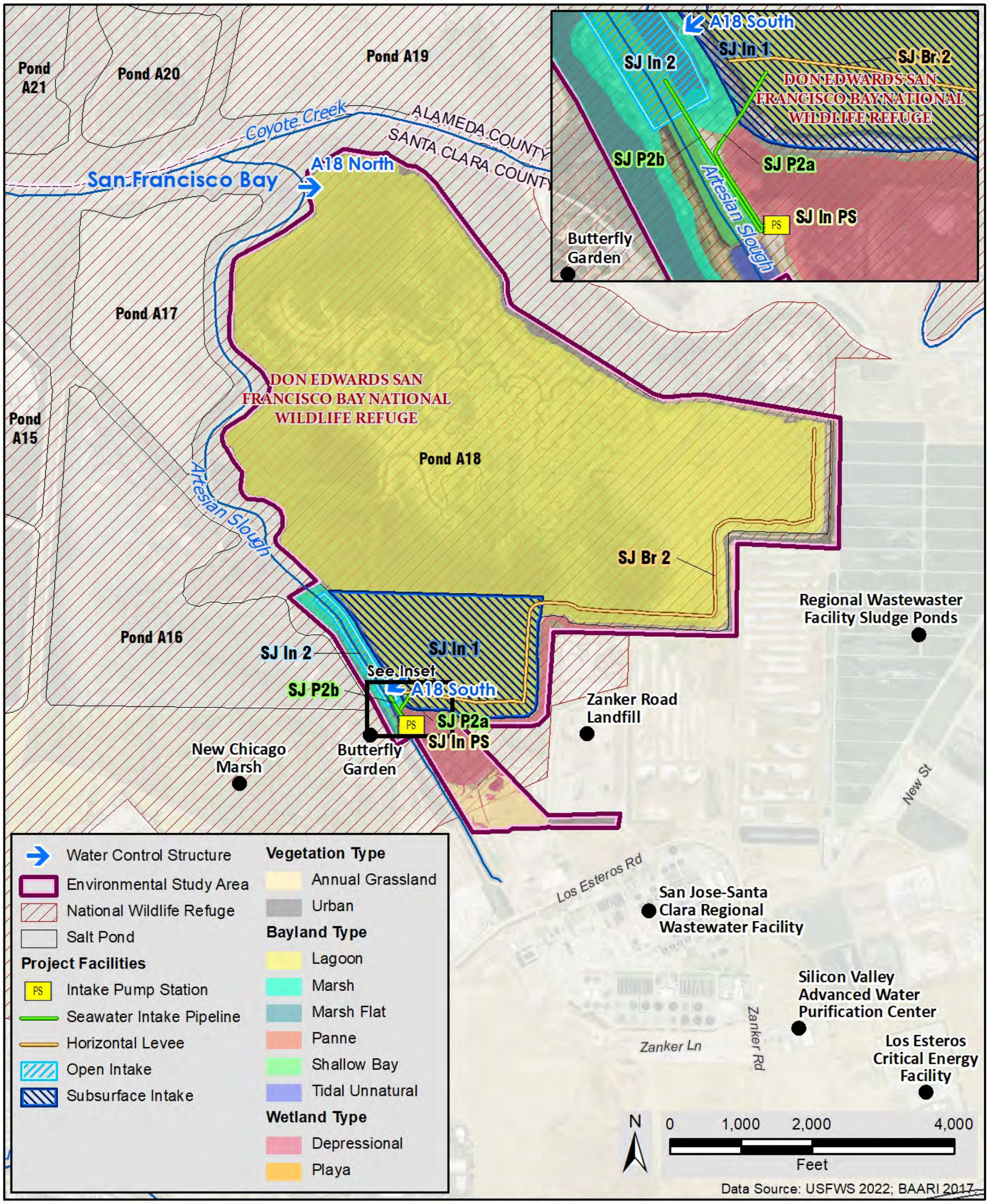

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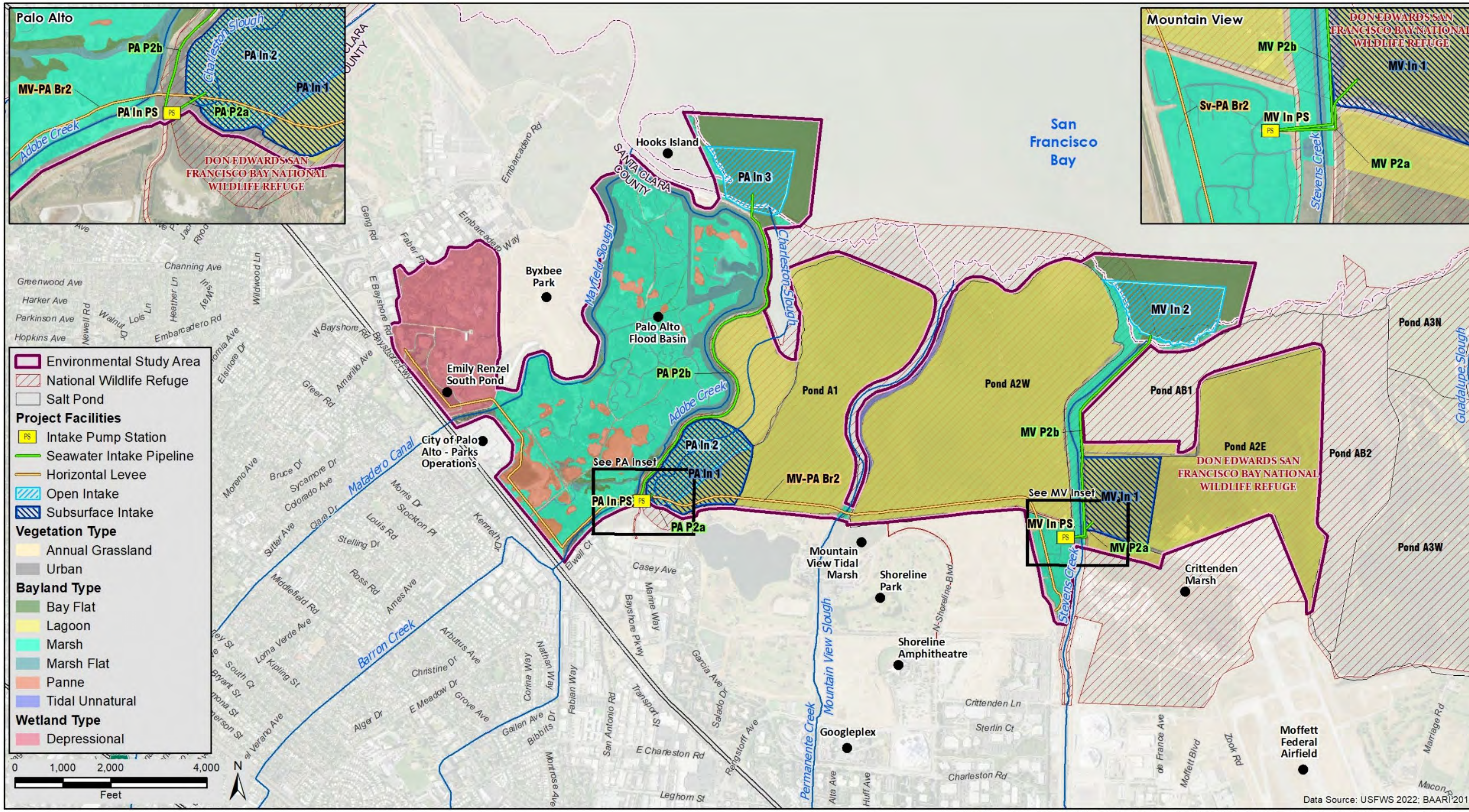
Figure 5-3. Land Cover and Vegetation within the Mountain View-Palo Alto Environmental Study Area



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- **Shallow Bay –** Shallow Bay communities consist of estuarine areas (including the greater Bay and other estuarine channels) entirely between 18 feet below MLLW. Substrates are generally comprised of fine silts and clays, sand, shell hash and bedrock. Salinity in the Shallow Bay can vary throughout the greater Bay ecosystem, but during dry years salinities in the South Bay can reach up to 35 ppt. This transitional area between deep bay and tidal marsh zones are exposed to wave action and daily tidal influence, allowing organic matter to be transported to these areas and providing key feeding grounds for invertebrate species. Shallow bay ecotones also support microalgae, and eelgrass as its primary plant communities that provide food, shelter and breeding for many fish and migratory birds who feed on the diversity of macroinvertebrates in shallow bay locations (Goals Project 2000) Wildlife in these zones includes the Bay ray (*Myliobatus californica*), Pacific Herring (*Clupea harengus*), and California least tern (*Sterna albifrons browni*).

- **Lagoon –** Lagoons are impoundments of water subject to at least occasional or sporadic connection to full or muted tidal action. Millions of years ago, barrier lagoons were likely the building blocks of the current estuary but are now submerged and/or eroded. Some of these ancient lagoons became blocked by tidal sands, and formed natural, highly saline salt ponds, allowing for the formation of highly localized endemic life. Modern lagoons receive tidal action seasonally or perennially depending on management or natural cycles and can consist of three habitat areas: open water, unvegetated mudflat, and emergent marsh vegetation. Unnatural lagoon features in the South Bay were developed within man-made levees and are managed with tide gates. Vegetative species within lagoons are generally highly salt-tolerant and display a stunted growth pattern. Wildlife in this area include the arrow goby (*Eucyclogobius newberryi*) and numerous shore and game birds. Maintaining or increasing the acreage of the limited number of natural lagoons remaining in the South Bay has been identified as a priority to improve waterfowl loafing and feeding habitats by the RWQCB (Goals Project 2000).

- **Mudflat –** Mudflats typically occur between Mean Tide Level and the MLLW tide. Tidal mudflats are non-channelized features that typically support less than 10 percent cover of vascular emergent vegetation, except for eelgrass (*Zostera marina*). Mudflats tend to change in extent and location depending on sediment deposition and erosional forces. These lands are covered by shallow water during high tide. Tidal flats support non-vascular micro- and macro-algae, that in turn support invertebrate populations providing a valuable food source for waterfowl, fish, and crustaceans during high tides in turn supporting wading shorebirds.

- **Tidal Marsh –** Marshes are areas with greater than 10 percent vascular vegetation cover that exist below the high tide line. Tidal marsh habitat occurs throughout much of the Bay from the lowest extent of vascular vegetation to the top of the intertidal zone. South Bay tidal marshes typically consist of three zones: low marsh dominated by cordgrass (Spartina sp.), middle marsh dominated by pickleweed (*Salicornia*), and high marsh with a mixture of pickleweed and other moderately halophytic (salt tolerant) species that are adapted to occasional high tides (USFWS and CDFG 2007). Tidal marsh habitat supports a variety of special-status species including the federally and state-listed salt marsh harvest mouse (*Reithrodontomys raviventris*), which requires healthy stands of pickleweed for its survival and the California Ridgway's rail (*Rallus obsoletus obsoletus*). The area also supports habitat for numerous special-status plant species and migratory birds protected under the federal Migratory Bird Treaty Act.

- **Tidal Flat –** Tidal flats are generally low energy areas within the tidal zone, comprised of channels that completely empty at MLLW. However, these areas generally experience more disturbance from waves, wind, and tidal influence than tidal marsh; hence, the amount of established vegetation is reduced. Tidal flats are typically surrounded by tidal marsh or emerging tidal marsh in recently restored areas. They provide protection to banks and upland shoreline from wave energy and sediment. While wading birds will nest within the adjoining tidal marshes, tidal flat areas are vital for wading birds where they have a longer feeding period than in other parts of the tidal zone (Kleinhans, et.al., 2021). This includes the western sandpiper (*Calidris mauri*) and the long-billed Dowitcher (*Limnodromus scolopaceus*).

- **Panne –** Pannes are natural saline ponds that form in the marsh plain. Pannes are found in poorly drained flats, depressions, and barrier-impounded areas of the tidal marsh. Generally, pannes lack emergent vascular vegetation and store surface water in tidal wetlands during low tide. Marsh pannes are typical features of extensive, well-developed tidal marshes. These ponds, usually less than one foot in depth, fill with tidal water only during very high tides. They usually support less than 10 percent cover of vascular plant growth due to the high salinities. Pannes may be hypersaline in late summer, but they do not develop thick deposits of salts as do natural or commercial salt ponds. Limited vegetation that may be found includes wigeon grass (*Ruppia cirrhosa*) and green macroalgae (*Chlorophyta*). Franciscan Brine shrimp (*Artemia franciscana Kellogg),* several types of Bay tiger beetles including *Cicindela senilis*, *C. oregona*, and *C. haemorrhagica* and the western tanarthrus beetle (*Tanarthrus occidentalis*), which is endemic to the crystallizer ponds and salt pannes of the South Bay, are examples of animals that may persist in this environment (Goals Project 2000).

- **Tidal Unnatural –** Unnatural tidal areas include man-made water ways that were established to facilitate drainage and development. These channels are easily identified on maps and aerial images by long, straight stretches of waterways or bends in waterways at right or near right angles. Unnatural tidal areas also include man-made salt ponds that were primarily established in former tidal marsh replacing the natural salt-crystallizing ponds that once existed in the Bay area. Wildlife within unnatural tidal locations typically include species that use human structures for habitat including the double-crested cormorant (*Phalacrocorax auratus*); who often use. Sensitive species that once thrived in the marsh such as the California Ridgway's rail have been expelled from these areas due to their sensitivity to human presence and disturbance.

- **Depressional Wetlands –** Depressional wetlands exist in topographic lows that may or may not have outgoing surface drainage. Precipitation and overland flow are the primary water source. Dependence on precipitation inputs differentiates this wetland type from springs and seeps that depend mainly on groundwater. Depressional wetlands can be differentiated from lacustrine wetlands by depths of less than 6 feet and covering areas of less than 20 acres. Depressional wetlands can have prominent areas of shallow or seasonally open water and areas of adjacent vegetation. They differ from playas within the Bay area by not being strongly alkaline or saline.

- **Playa –** Playas are nearly level, shallow, ephemeral (seasonal) or perennial, sodic (i.e., strongly alkaline) or saline water bodies with very fine-grain sediments of clays and silts. Unlike vernal pools, playas have little or no vascular vegetation within the limits of the water body, though they support sparse peripheral vegetation. Playas can consist of open water, associated vegetation and unvegetated areas without standing water. These features can be either natural or modified. Unlike lacustrine wetlands, playas are less than 6 feet deep during the dry season, although they can be hundreds of acres in size.

Upland Types

Prior to significant European settlement in the South Bay, the study area was comprised nearly entirely of subtidal open water, tidal mudflat and tidal emergent marsh ecosystems, with a small portion of the area consisting of alkali or wet meadow ecotones (Beller, et. al. 2010). In the approximately 200 years since that time, upland areas have expanded due to human activity such as draining, diverting and filling landscapes throughout the Bay region. As a result, the following upland types now exist within the Environmental Study Areas:

- **Annual Grassland –** Annual grasslands within the Environmental Study Areas are comprised primarily of a variety of non-native annual grass species including brome species (Bromus spp.), wild oats (*Avena fatua*), and perennial ryegrass (*Lolium perenne*) are found in a variety of areas, especially along the edges of roads and uncultivated areas that have been drained and cleared for development and/or are subject to other disturbance. Broadleaf weed species within these grasslands may include black mustard (Brassica nigra), fennel (*Foeniculum vulgare*), and cutleaf geranium (*Geranium dissectum*), among others. Some limited native species remain scattered throughout these areas such as purple needlegrass (*Nassella pulchra*), however healthy and persistent stands of these species can be challenged to persist. Small mammals, such as rabbits (Sylvilagus spp.), mice (Peromyscus spp.), and voles (Microtus spp.), tend to use annual grasslands as foraging habitat, along with the associated predators such as red fox (*Vulpes vulpes*), coyotes (*Canis latrans*), and common raptors.

- **Urban –** Urban areas are dominated by developed land use including urban structures, residential units, or other elements such as highways, city parks, cemeteries, and similar infrastructure. These areas can also apply to wastewater treatment settling ponds, golf courses, regional trails, access roads and other areas that are found throughout the Environmental Study Areas. Primary vegetation in these locations generally consists of ruderal weed species, and/or cultivated turf grass. Additionally, water runoff and sedimentation tend to increase in urban environments due to persistent soil disturbance paired with hardened surfaces such as cement and asphalt can impact local hydrology and salinity. This change impacts ecological communities both in the immediate vicinity of urban landscapes and downstream.

Sensitive Habitats

Sensitive habitats include those that are of special concern to resource agencies or are afforded specific consideration under state or federal regulations including those that are considered waters of the U.S. subject to regulation by U.S. Army Corps of Engineers (USACE) and RWQCB under Sections 404 and 401 of the Clean Water Act, respectively. Sensitive habitats may be of special concern for a variety of reasons, including their locally or regionally declining status or because they provide important habitat for special-status species. The following land and cover vegetation cover types within the project area are considered sensitive habitats: Deep Bay, Bay Flat, Lagoon, Marsh (Salt Marsh and Freshwater Emergent Marsh) and Marsh Flat, Panne, Shallow Bay, Tidal Unnatural, Depressional, Playa.

5.4.3 Special-Status Species

The California Natural Diversity Database (CNDDB; CDFW 2022), California Native Plant Society (CNPS) electronic database (CNPS 2022), USFWS species lists (USFWS 2022), and National Marine Fisheries Service (NMFS) interactive online mapper (NMFS 2022) were reviewed to determine the potential for occurrence of special-status plant or wildlife species. CNDDB occurrences within 3 miles of the Environmental Study Areas are shown on **Figures 5-4** to **5-6**. Results are shown in **Table 5-2**. Potential for occurrence is defined as follows in the table:

- **No potential to occur –** Suitable habitat is not present in the project area and/or the project area is not within the historical or current range of the species.
- **Unlikely to occur –** Potential habitat present, but species unlikely to be present in the project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.
- **Could occur –** Suitable habitat is available in the project area; however, few or no other indicators show that the species may be present.
- **Likely to occur –** Habitat conditions, behavior of the species, known occurrences in the project area, or other factors indicate a relatively high likelihood that the species would occur in the project area.
- **Known to occur –** The species, or evidence of its presence, was observed in the project area during reconnaissance-level surveys or was reported by others.

A total of 50 special-status plant and wildlife species were identified during database queries (CDFW 2022, CNPS 2022, USFWS 2022, NMFS 2022). Of the 18 plant species identified, there are no known occurrences and only one Congdon's tarplant (*Centromadia parryi* ssp.*Congdonii*) that is "Likely to Occur." Two other species "Could Occur" due to presence of suitable habitat but are unlikely due to probable extirpation. Of the 32 special-status wildlife species identified, 10 are "Known to Occur" within or directly adjacent to the Environmental Study Areas including western pond turtle (*Emys marmorata*), steelhead - central California coast DPS (*Oncorhynchus mykiss irideus*), Salt marsh harvest mouse, and nine different bird species described in **Table 5-2**.

Figure 5-4. CNDDB Occurrences within 3 Miles of the San Jose Environmental Study Area

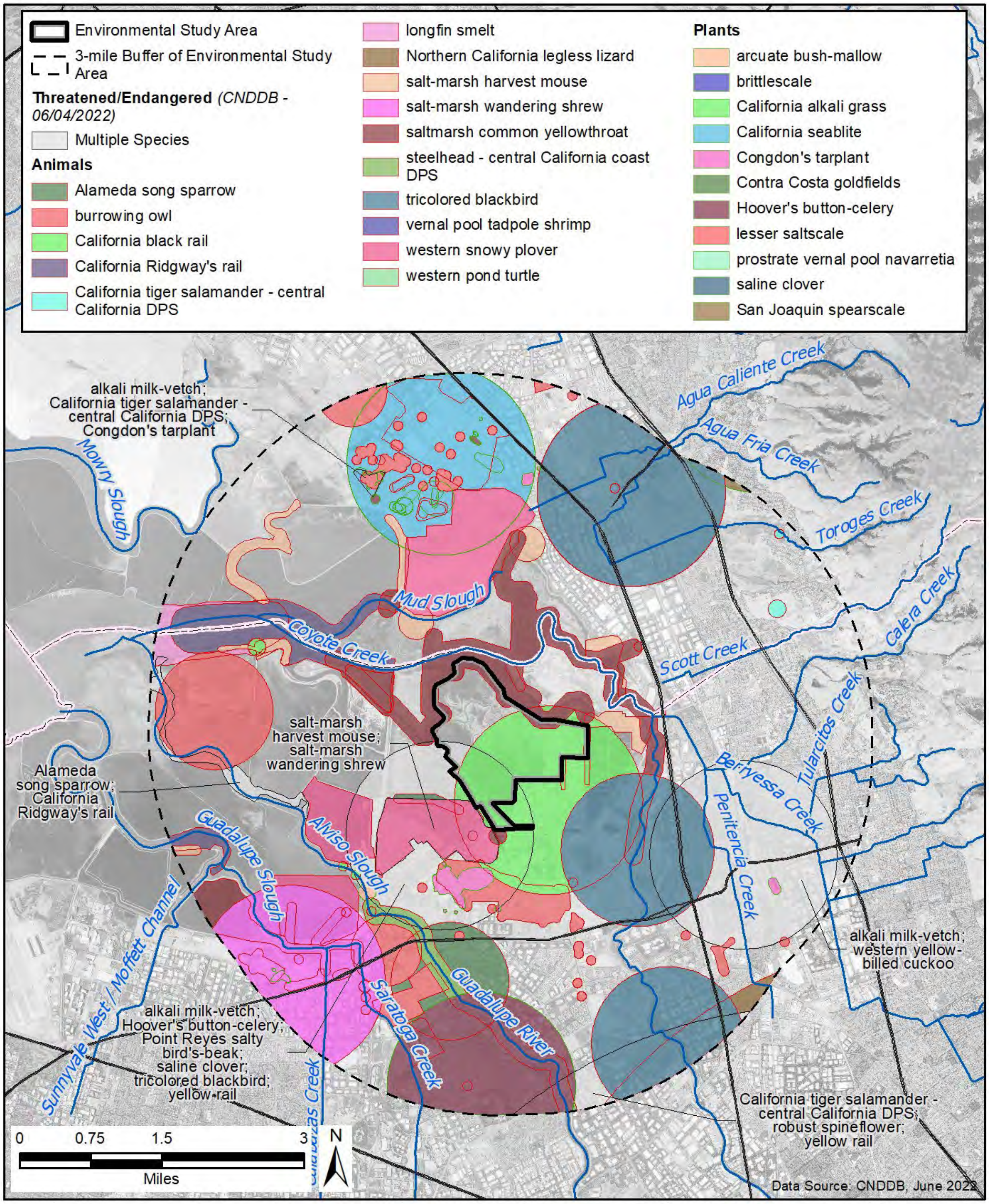

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Figure 5-5. CNDDB Occurrences within 3 Miles of the Mountain View–Palo Alto Environmental Study Area

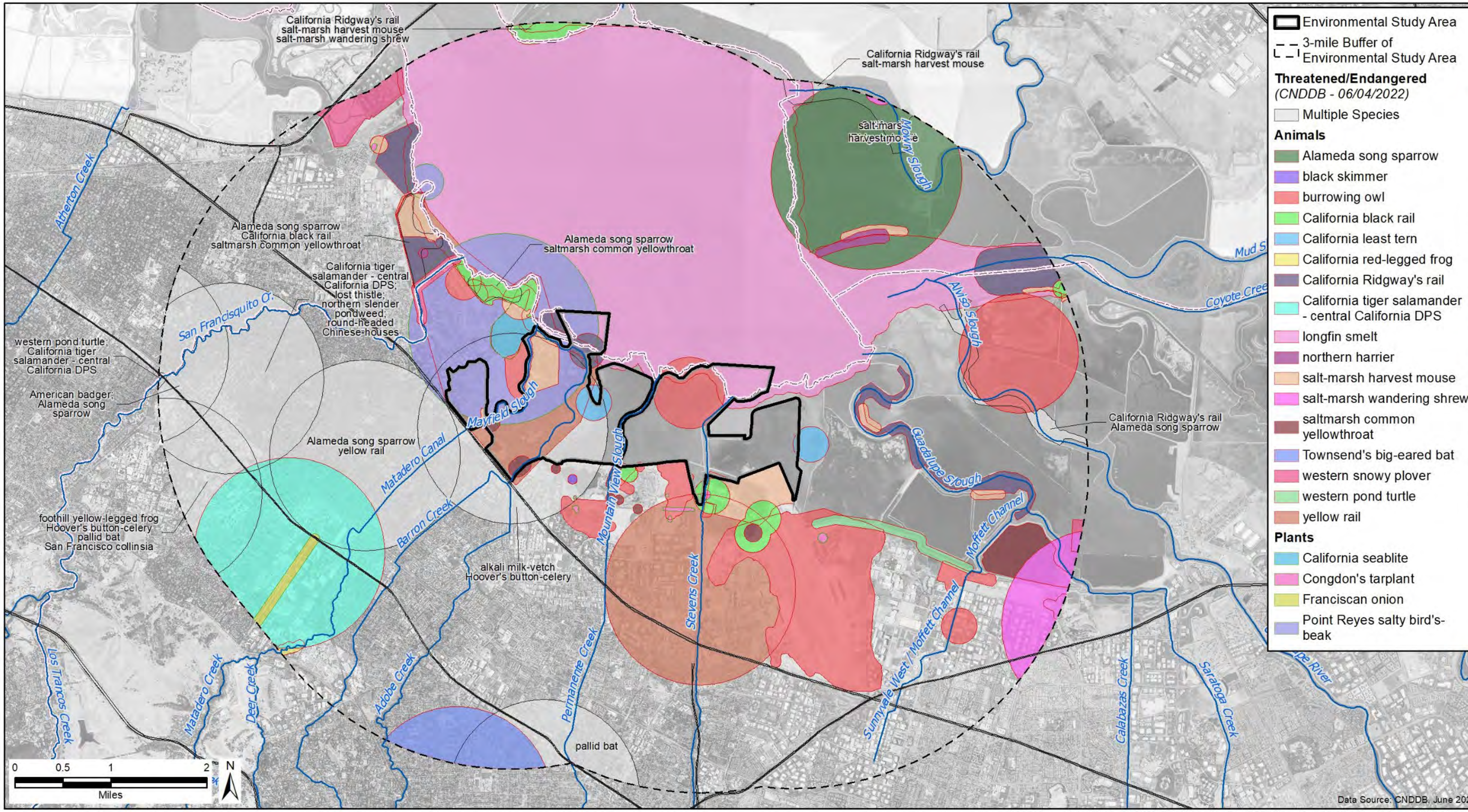

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Table 5-2. Potentially Occurring Special-Status Species within the Environmental Study Areas

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
Plants				
California Androsace *elongata* ssp.Acuta	--/--/4.2	Northern coastal scrub, coastal sage scrub, foothill woodland, chaparral. Elevation: (El.) 490-4280 feet. Blooms: Mar-Jun	**No potential to occur**. Suitable habitat is not present in the ESAs, and outside of typical elevation.	N/A
Franciscan onion *Allium peninsulare var. franciscanum*	--/--/1B.2	Clay, volcanic and often serpentine soils. Oak woodland, serpentine grassland and woodland, valley and foothill grassland. El.: 560-3220 feet. Blooms: May-Jun	**No potential to occur**. Suitable habitat is not present in the ESAs, and outside of typical elevation.	N/A
alkali milk-vetch *Astragalus tener var.Tener*	--/--/1B.2	Alkaline soils in playas, valley & foothill grassland (adobe clay), and vernal pools. El.: 3-197 feet (1-60 meters). Blooms: Mar-Jun	**Unlikely to occur**. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland and freshwater emergent wetland.
Brittlescale *Atriplex depressa*	--/--/1B.2	Chenopod scrub, Meadows and seeps, Playas, Valley and foothill grassland, Vernal pools. El.: 5-1050 feet. Blooms: Apr-Oct	**Unlikely to occur**. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland and freshwater emergent wetland.
Lesser saltscale *Atriplex minuscula*	--/--/1B.1	Chenopod scrub, Playas, Valley, and foothill grassland. Sandy, alkaline soils. El.: <330 feet Blooms: April-Oct	**Unlikely to occur**. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland and freshwater emergent wetland.
Congdon's tarplant *Centromadia parryi* ssp.Congdonii	--/--/1B.1	Alkaline valley and foothill grasslands. El.: 0-755 feet (0-230 meters). Blooms: May-Nov	**Likely to occur.** Multiple CNDDB occurrences within 1 mile of the ESAs. Large population documented as recent as 2016 near Alviso. Other populations recently documented in Baylands Park, NASA golf course, Shoreline Golf Course, and Stevens Creek Nature Preserve.	Grasslands.

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
Point Reyes salty bird's-beak *Chloropyron maritimum ssp. Palustre*	--/--/1B.2	Marshes and swamps. El.: 0-35 feet. Blooms: Jun-Oct	**Could occur.** Suitable habitat is present in both ESAs, but CNDDB occurrences are all historical and presumed extirpated	Saline emergent wetland (salt marsh).
Robust spineflower *Chorizanthe robusta var. robusta*	FE/--/1B.1	Coastal Strand, Northern Coastal Scrub, Foothill Woodland. El.: 30-985 feet. Blooms: May-Sep	**No potential to occur**. Suitable habitat is not present in the ESAs. Project area outside of typical elevation.	N/A
Santa Clara red ribbons *Clarkia concinna ssp. Automixa*	--/--/4.3	Chaparral, Cismontane woodland. El.: 295-4920 feet. Blooms: Apr-July	**No potential to occur**. Suitable habitat is not present in the ESAs. ESAs are outside of typical elevation.	N/A
Round-headed Chinese houses *Collinsia corymbose*	--/--/1B.2	Coastal dunes. El.: 0-65 feet. Bloom Apr-June	**No potential to occur.** Suitable habitat is not present in the ESAs.	N/A
Hoover's button-celery *Eryngium aristulatum var. hooveri*	--/--1B.1	Vernal pools. El.: 10-150 feet. Bloom: June-Aug	**No potential to occur**. Suitable habitat is not present in the ESAs.	N/A
San Joaquin spearscale *Extriplex joaquinana*	--/--/1B.2	Chenopod scrub, Meadows and seeps, Playas, valley, and foothill grassland. El.: 5-2740 feet. Blooms: Apr-Oct	**Unlikely to occur**. No vernal pool habitat present in the ESAs. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland (salt marsh) and freshwater emergent wetland.
Contra Costa goldfields *Lasthenia conjugens*	FE/--/1B.1	Cismontane woodland, Playas, Valley and foothill grassland, Vernal pools. El.: 0-1540 feet. Blooms: Mar-Jun	**Unlikely to occur**. No vernal pool habitat present in the ESAs. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland (salt marsh) and freshwater emergent wetland.
arcuate bush-mallow *Malacothamnus arcuatus*	--/--/1B.2	Chaparral, Cismontane woodland. El.: 50-1165 feet. Blooms: Apr-Sep	**No potential to occur**. Suitable habitat is not present in ESAs. ESAs are outside of typical elevation.	N/A
prostrate vernal pool navarretia *Navarretia prostrata*	--/--/1B.2	Coastal scrub, Meadows and seeps, Valley and foothill grassland, Vernal pools. El.: 10-3970 feet. Blooms: Apr-Jul	**No potential to occur**. Suitable habitat is not present in the ESAs. ESAs are outside of typical elevation.	N/A

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
California seablite *Suaeda californica*	FE/--/1B.1	Marshes and swamps. El.: 0-50. Blooms: Jul-Oct	**Could occur**. Suitable habitat is present in both ESAs. However, all occurrences are presumed extirpated.	Saline emergent wetland (salt marsh)
saline clover *Trifolium hydrophilum*	--/--/1B.2	Marshes and swamps, Valley and foothill grassland, Vernal pools. El.: 0-985. Blooms: Apr-Jun	**Unlikely to occur**. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs.	Transition between saline emergent wetland and freshwater emergent wetland.
California alkali grass *Puccinellia simplex*	--/--/1B.2	Valley Grassland, wetland-riparian El.: 7-2905 Blooms: Mar-May	**Unlikely to occur**. Wet meadow habitat was present historically, however, the level of disturbance and the extent of alkaline soils at the historic margin of wet meadow and tidal marsh is extremely limited within the ESAs. No CNDDB occurrences.	Transition between saline emergent wetland and freshwater emergent wetland
Invertebrates				
Conservancy fairy shrimp *Branchinecta conservatio*	FE/--/--	Found in vernal pools in California's Central Valley from Tehama County into north Merced County.	**Unlikely to occur**. Suitable habitat is not present in the ESAs.	N/A
vernal pool tadpole shrimp *Lepidurus packardi*	FE/--/--	Found in ephemeral freshwater habitats, including alkaline pools, clay flats, vernal pools, vernal lakes, vernal swales, and other types of seasonal wetlands, which range in size from small, clear, well-vegetated vernal pools to highly turbid, alkali scald pools to large winter lakes.	**Unlikely to occur**. Suitable habitat is not present in the ESAs.	N/A
Amphibians				
California tiger salamander – central California DPS *Ambystoma californiense* pop. 1	FT/ST/--	Annual grassland and grassy understory of valley-foothill hardwood habitats in central and northern California. Needs underground refuges and vernal pools or other seasonal water sources.	**Unlikely to occur.** Suitable habitat is not present in the ESAs.	N/A

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
foothill yellow-legged frog *Rana boylii*	--/SE/SSC	Frequents rocky streams and rivers with rocky substrate and open, sunny banks, in forests, chaparral, and woodlands. Sometimes found in isolated pools, vegetated backwaters, and deep, shaded, spring-fed pools.	**Unlikely to occur.** Suitable habitat is not present in the ESAs.	N/A
California red-legged frog *Rana draytonii*	FT/--/SSC	Breeds in slow moving streams, ponds, and marshes with emergent vegetation; forages in nearby uplands within about 200 feet. Extant records in the Sierra Nevada range are over 800 feet. Below this elevation, aquatic habitat supports stronger populations of non-native predators associated with warm water habitats such as bullfrogs and Centrarchid fish. Believed extirpated from the floor of the Central Valley prior to the 1960s.	**Could occur**. Historically known occur within drainages to the South Bay. Currently known to occur in San Francisquito Creek on Stanford Campus.	Fresh Emergent Wetland (Freshwater Marsh), Open Water (creeks and drainage channels), and lacustrine ponds.
Reptiles				
Northern California legless lizard *Anniella pulchra*	--/--/SSC	Occurs in moist warm loose soil with plant cover within sparsely vegetated areas of beach dunes, chaparral, pine-oak woodlands, desert scrub, sandy washes, and shaded stream terraces. Occurs from the southern edge of the San Joaquin River in northern Contra Costa County south to the Ventura County.	**No potential to occur.** Suitable habitat is not present within ESAs.	N/A
Green sea turtle *Chelonia mydas*	FE/--/--	Typically found in shallow waters of lagoons, bays, estuaries, mangroves, eelgrass and seaweed beds. Prefers areas with aquatic vegetation, such as pastures of sea grasses and algae, in shallow, protected water.	**Unlikely to occur**. Migrating turtles have been observed along the California coast and very rarely in San Francisco Bay.	N/A

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
western pond turtle *Emys marmorata*	--/--SSC	Ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. Requires basking sites and suitable upland habitat for egg-laying. Nest sites most often characterized as having gentle slopes (<15 percent) with little vegetation or sandy banks.	**Known to occur**. Known to in channels adjacent to Sunnyale Water Pollution Control Plant, in San Tomas Aquino Creek between both ESAs. Known in upstream reaches of San Francisquito Creek on Stanford campus upstream of MV-PA ESA.	Fresh Emergent Wetland (Freshwater Marsh), Open Water (creeks and drainage channels), and lacustrine ponds.
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/ST/--	Commonly found in chaparral or coastal scrub vegetation in Contra Costa County, most of Alameda County and portions of northern Santa Clara and western San Joaquin counties.	**No potential to occur.** No suitable habitat within the ESAs.	N/A
Fish				
Green sturgeon – southern DPS *Acipenser medirostris*	FT/--/--	Anadromous. Enter the San Francisco Bay between mid-February and early May and migrate rapidly up the Sacramento River. Spawning occurs in cool sections of the upper Sacramento River. In the autumn, adults move back down the river and re-enter the ocean. After hatching, larvae and juveniles migrate downstream toward the Sacramento-San Joaquin Delta and estuary. After rearing in the delta and estuary for a few years, they move out to the ocean.	**Could Occur.** Environmental Study Areas include critical habitat for this species as the fish is known to utilize the San Francisco Bay.	Open Water.
steelhead - central California coast DPS *Oncorhynchus mykiss irideus* pop. 8	FT/--/--	Anadromous. Occur below natural and manmade impassable barriers from the Russian River to and including Aptos Creek, and all drainages of San Francisco and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers. Steelhead require similar freshwater spawning and rearing sites.	**Known to occur**. Known to be present in the ESAs. Known to occur in Coyote, Stevens, and San Francisquito creeks, and the Guadalupe River. The nearest CNDDB occurrence is from 2017 and is approximately 1.5 miles west of the MV-PA ESA, within the Guadalupe River.	Open Water.

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
longfin smelt *Spirinchus thaleichthys*	FC/ST/--	Anadromous. Live primarily in bays, estuaries, and nearshore coastal areas. Habitat includes waterways upstream from Rio Vista and downstream through Suisun Bay and Suisun Marsh. Adult migration to upstream spawning areas occurs January–March. Waters in the proposed project area have the potential to be used by this species during migration and spawning. The USFWS has issued a preliminary rule to list the population of the San Francisco Bay-Delta Distinct Population (DPS as threatened). A final rule on this listing is expected in early 2023.	**Could occur**. CNDDB occurrence documented in South Bay from 1995 and prior near the Dumbarton Bridge.	Open water of estuaries.
Coho salmon – central California Coast ESU Oncorhynchus kisutch	FE/SE/--	Anadromous. Typically inhabit small coastal streams, as well as larger rivers. Coho salmon in northern California coastal streams are typically associated with low gradient reaches of tributary streams, which provide suitable spawning areas and good juvenile rearing habitat.	**Unlikely to occur.** Coho have been extirpated from all tributaries of San Francisco Bay. CDFW still considers this area part of this species range.	N/A
Birds				
Tricolored blackbird *Agelaius tricolor*	--/ST/SSC	Largely endemic to California, most numerous in the Central Valley and nearby vicinity. Typically requires open water, protected nesting substrate, and foraging grounds within vicinity of the nesting colony. Nests in dense thickets of cattails, tules, willow, blackberry, wild rose, and other tall herbs near fresh water. Also nests in agricultural crops (e.g., silage), where colonies are threatened during harvest.	**Could occur.** Several records within 3 miles of the San Jose ESA. However, all are from the mid- to late-90s.	Freshwater emergent wetland.

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
Golden eagle *Aquila chrysaetos*	--/--/FP	Favor partially or completely open country, and are usually found around mountains, hills, and cliffs. Habitats include arctic to desert, including tundra, shrublands, grasslands, coniferous forests, farmland, and areas along rivers and streams.	**Unlikely to occur.** No known records; could occur as rare forager.	N/A
Burrowing owl *Athene cunicularia*	--/--/SSC	Found in open grasslands with low vegetation, golf courses, and disturbed/ruderal habitat in urban areas.	**Known to occur** Within or adjacent to the ESAs. There are several CNDDB occurrences from 1989-2017 located within 3 miles of the ESAs and one within the Mountain View-Palo Alto ESA. These occurrences include single sightings, nest observations, and sightings of several pairs of adults together.	Non-native annual grassland/disturbed/ruderal habitat.
western snowy plover *Charadrius nivosus nivosus*	FT/--/SSC	Sparsely vegetated sandy beaches and dry salt flats.	**Known to occur**. Single occurrence within 3 miles of the Palo Alto ESA. Nesting documented in at the Refuge at Eden Landing, Ravenswood, and West Bay complexes (USFWS 2012). Additionally documented nesting in Ponds A3N, A6, A8, A8S, A12, and A22 (USFWS and SCC 2016).	Open mudflats.
western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FT/SE/--	Uses a variety of riparian habitat. Cottonwood and willow trees are an important foraging habitat. Require large blocks of riparian habitat for nesting.	**Unlikely to occur**. Project does not align with species range.	N/A
yellow rail *Coturnicops noveboracensis*	--/--/SSC	Typically found nesting in shallow freshwater sedge marshes; winters in wet meadows and marshes with cordgrass, saltgrass, sedges, and other low vegetation	**Likely to occur**. There are a few CNDDB occurrences located within 3 miles of the ESAs. However, almost all occurrences are over 20 years old. One occurrence located within the Palo Alto ESA was updated in 2013 and observed 1 yellow rail foraging and calling.	Marsh
white-tailed kite *Elanus leucurus*	--/--/FP	Grasslands, open woodlands, savannas, marshes, and cultivated fields.	**Known to occur.** No CNDDB occurrences but known from the South Bay Salt Ponds and the Refuge.	Saline emergent and freshwater emergent wetlands

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	--/--/SSC	Found in open areas with thick, low vegetation, ranging from marsh to grassland to open pine forest	**Known to occur**. There are several CNDDB occurrences from 1985 to 2016 located within 3 miles of the ESAs. More recent occurrences are in the vicinity of the MV-PA ESA and within the San Jose ESA and consists of adult males heard singing.	Saline emergent and freshwater emergent wetlands
California black rail *Laterallus jamaicensis coturniculus*	FT/--/FP	Yearlong resident of saline, brackish, and fresh emergent wetlands (CDFW 2021b).	**Known to occur**. There are occurrences from 2008 to 2016 that are located within 3 miles of the ESAs; one within the MV-PA ESA. These occurrences include sighting and audio detections.	Saline emergent and freshwater emergent wetlands
Alameda song sparrow *Melospiza melodia pusillula*	--/--/SSC	Tidal salt marsh habitat	**Likely to occur**. There are a few CNDDB occurrences located within 3 miles of the ESAs. However, most all occurrences are historical. The most recent occurrence is from 2004 and is located adjacent to the MV-PA ESA. This occurrence includes several sightings.	Saline emergent and freshwater emergent wetlands.
California Ridgway's rail *Rallus obsoletus obsoletus* (formerly California clapper rail)	FE/SE/FP	Tidal and brackish marshes	**Known to occur**. There are a number of CNDDB occurrences located within 3 miles of the ESAs. The most recent occurrence is from 2018 and is located approximately 1 mile northwest of the MV-PA ESA. This occurrence includes sightings of up to 85 individuals.	Saline emergent and freshwater emergent wetlands.
northern harrier *Circus hudsonius*	--/--/SSC	Breed in wide-open habitats ranging from Arctic tundra to prairie grasslands to fields and marshes. Their nests are concealed on the ground in grasses or wetland vegetation.	**Likely to occur**. Breeds in marsh habitats within the Refuge (USFWS 2012), and likely to occur within all ESAs.	Saline emergent and freshwater emergent wetlands, grasslands, and open ruderal habitat.
black skimmer *Rynchops niger*	--/--/SSC	Coastal beaches and islands.	**Could occur**. A few pairs are known to breed and forage within the Refuge on islands within ponds (USFWS 2012).	Open water, ponded habitat.
California least tern *Sternula antillarum browni*	FE/SE/FP	Found along rivers, estuaries, bays, and ocean coastlines.	**Could occur.** Forages and roosts in South Bay Salt Ponds, especially near Alviso.	Open water, ponded habitat.

Species[1]	Fed/ State/ CRPR Status[2] or CDFW	General Habitat	Potential to Occur in the ESA	Suitable Habitat within the **ESAs**
Mammals				
pallid bat *Antrozous pallidus*	--/--/SSC	Mostly found in desert habitats. They roost in various places but favor rocky outcrops. They also occur in oak and forested areas and open farmland.	**Unlikely to occur**. ESAs do not align with species range.	N/A
Townsend's big-eared bat *Corynorhinus townsendii*	--/--/SSC	Found in coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Requires caves, mines, tunnels, buildings, or other human-made structures for roosting	**Unlikely to occur**. ESAs do not align with species range.	
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE/SE/FP	Restricted to saline or subsaline marsh habitats around the San Francisco Bay Area and mixed saline/brackish areas in the Suisun Bay area (USFWS 2013).	**Known to occur.** There are several CNDDB occurrences located within 3 miles of the ESAs, and at least one known occurrence within 1 mile of both ESAs. Many are older occurrence records between 1975 and early 2000s, except for one updated in 2016. The occurrence from 2016 is located approximately 0.75 mile east of the San Jose ESA.	Saline emergent wetland (tidal salt marsh)
San Joaquin kit fox *Vulpes macrotis mutica*	FE/ST/--	Valley floor and foothills of the San Joaquin Valley, from San Joaquin County to Kern County.	**No potential to occur.** No suitable habitat within the ESAs.	N/A
salt-marsh wandering shrew *Sorex vagrans halicoetes*	--/--/SSC	Found in middle and high salt marsh zones bordering the San Francisco Bay.	**Could occur.** Only one record within 3 miles of San Jose ESA from 1980.	Saline emergent wetland (tidal salt marsh)

Notes: CNDDB = California Natural Diversity Database; CRPR = California Rare Plant Rank; DCH = designated critical habitat; DPS = distinct population segment; EFH = Essential Fish Habitat; EL=elevation; ESA=Environmental Study Areas; ESU = evolutionary significant unit; Mountain View-Palo Alto = MV-PA, N/A = not applicable, < = less than

1 – Species that are bolded may occur (i.e., could occur, are likely to occur, or are known to occur) within the ESAs.

2 – Legal Status Definitions:

Federal

FC – Species identified as a candidate species for listing as threatened or endangered under the federal Endangered Species Act (federal ESA).

FDL – Species delisted from the federal ESA.

FE – Species listed as Endangered under the federal ESA.

FT – Species listed as Threatened under the federal ESA.

SSC – Species listed as Species of Special Concern by the NMFS.

– – No listing under the federal ESA.

State

SC – Species identified as a candidate species for listing as threatened or endangered under the California Endangered Species Act (CESA).
SDL – Species delisted from the CESA.
SE – Species listed as Endangered under the CESA.
SFP – Species listed as Fully Protected under the California Fish and Game Code.
SSC – Species listed as Species of Special Concern by the California Department of Fish and Wildlife.
ST – Species listed as Threatened under the CESA.
– – No listing under the CESA.
<u>CRPR / California Rare Plant Rank</u>
1B – Plant species considered Rare, Threatened, or Endangered in California and elsewhere.
2B – Plant species considered Rare or Endangered in California but more common elsewhere.
– – No California Rare Plant Rank listing or not applicable.
California Rare Plant Rank Extensions:
1 – Seriously threatened in California (greater than 80 percent of occurrences are threatened and/or have a high degree and immediacy of threat).
2 – Moderately threatened in California (20-80 percent of occurrences are threatened and/or have a moderate degree and immediacy of threat).
3 – Potential for Occurrence Definitions:
No potential to occur: Suitable habitat is not present in the project area and/or the project area is not within the historical or current range of the species.
Unlikely to occur: Potential habitat present, but species unlikely to be present in the project area because of current status of the species, a very restricted distribution, and/or essential habitat components are not present.
Could occur: Suitable habitat is available in the project area; however, few or no other indicators show that the species may be present.
Likely to occur: Habitat conditions, behavior of the species, known occurrences in the project area, or other factors indicate a relatively high likelihood that the species would occur in the project area.
Known to occur: The species, or evidence of its presence, was observed in the project area during reconnaissance-level surveys or was reported by others.

Sources: CDFW 2022; CNPS 2022; USFWS 2022; NMFS 2022; data collected and compiled by GEI Consultants Inc. in 2022

5.5 Cultural Resources Conditions

The National Register Historic Properties (NRHP) is the nation's master inventory of known historic resources. It is administered by the National Park Service, in consultation with the California State Historic Preservation Office [SHPO]). The NRHP includes listings of buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the Federal, State, or local level. The NRHP criteria and associated definitions are outlined in the *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (National Park Service 1997). Properties (structures, sites, buildings, districts, and objects) more than 50 years of age can be listed in the NRHP provided they meet one of the evaluation criteria; however, properties less than 50 years of age that are of exceptional significance or are contributors to a district, that also meet the evaluation criteria, can be included in the NRHP.

The California Register of Historic Resources (CRHR) includes resources listed in or formally determined eligible for listing in the NRHP, as well as some California Historical Landmarks and Points of Historical Interest. Properties of local significance that have been designated under a local preservation ordinance (local landmarks or landmark districts) or that have been identified in a local historical resources inventory may be eligible for listing in the CRHR. The eligibility criteria for listing in the CRHR are similar to those for NRHP listing but focus on the importance of the resources to California history and heritage. Additionally, resources eligible for listing in the CRHR must retain enough of their historic character or appearance to be recognizable as historical resources and to convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association (Office of Historic Preservation 1999).

5.5.1 Records Search

On August 09, 2022, GEI archaeologist Ben Curry, PhD Registered Professional Archaeologist (RPA) requested a records search of the Environmental Study Areas from the Northwest Information Center (NWIC) of the California Historical Resources Information System (commonly knowns as CHRIS) [Search File number: 22-0244]. The records search included a review of NWIC's Mountain View and Milpitas U.S. Geological Survey 7.5-minute topographic base maps, which depict the boundaries of previously conducted studies and recorded cultural resources. Four previously recorded historic-era resources were identified in the Environmental Study Areas.

The resources consist of a wooden flood control structure and dock (P-43-002247), the concrete jacketed and channelized confluence of Adobe and Barron Creeks (P-43-003048), a historic-era refuge scatter (P-43-004034), and the Alviso Salt Works historic district (P-43-002823), which covers most of the Environmental Study Areas. These previously recorded resources are listed in **Table 5-3** and further details are provided below. The resources are also depicted in **Figure 5-7** for the San Jose Environmental Study Area and **Figure 5-8** for the Mountain View-Palo Alto Environmental Study Area.

Table 5-3. Previously Recorded Cultural Resources in the Environmental Study Areas

Resource No.	Trinomial (CA-)	Type	Age	Description	CRHR/NRHP Eligibility	Location in ESAs
P-43-002247	None	Structure	Historic	Flood Control Structure – West Edge on Pond A1 (Reach A). A wooden flood control structure and dock on Pond A1	Not yet evaluated for either register	MV-PA ESA – On levee along west bank of Pond A1 and near Charleston Slough
P-43-002823	None	District	Historic	Alviso Salt Works Historic Landscape – This Historic Landscape encompasses the ponds, levees, and associated features that once made up the Alviso Salt Works	Eligible to the NRHP under Criteria A on the local level	All ESAs – Covers most ponds and levees in the ESAs
P-43-003048	None	Structure	Historic	Adobe Creek and Barron Creek Canal – The concrete embanked intersection of these two creeks, and the canal under HWY 101 at this point	Not yet evaluated for either register	On the edge of the MV-PA ESA - Junction of Adobe and Barron Creek next to HWY 101
P-43-004034 (Also P-01-011436)	None	Site	Historic	Alviso Pond A18 Historic Debris – This is an area of mixed modern and historic-era construction debris eroding from the side of the Pond A18 levee	Evaluated as none-significant during USACE survey	SJ ESA - South levee of Pond A18 of San Jose/ Santa Clara RWF

Notes: CRHR=California Register Historic Resources; ESA=Environmental Study Area; Mountain View-Palo Alto = MV-PA; San Jose = SJ; NRHP=National Register of Historic Places
Source: Sonoma State University 2022

Figure 5-7. Known Cultural Resources within the San Jose Environmental Study Area

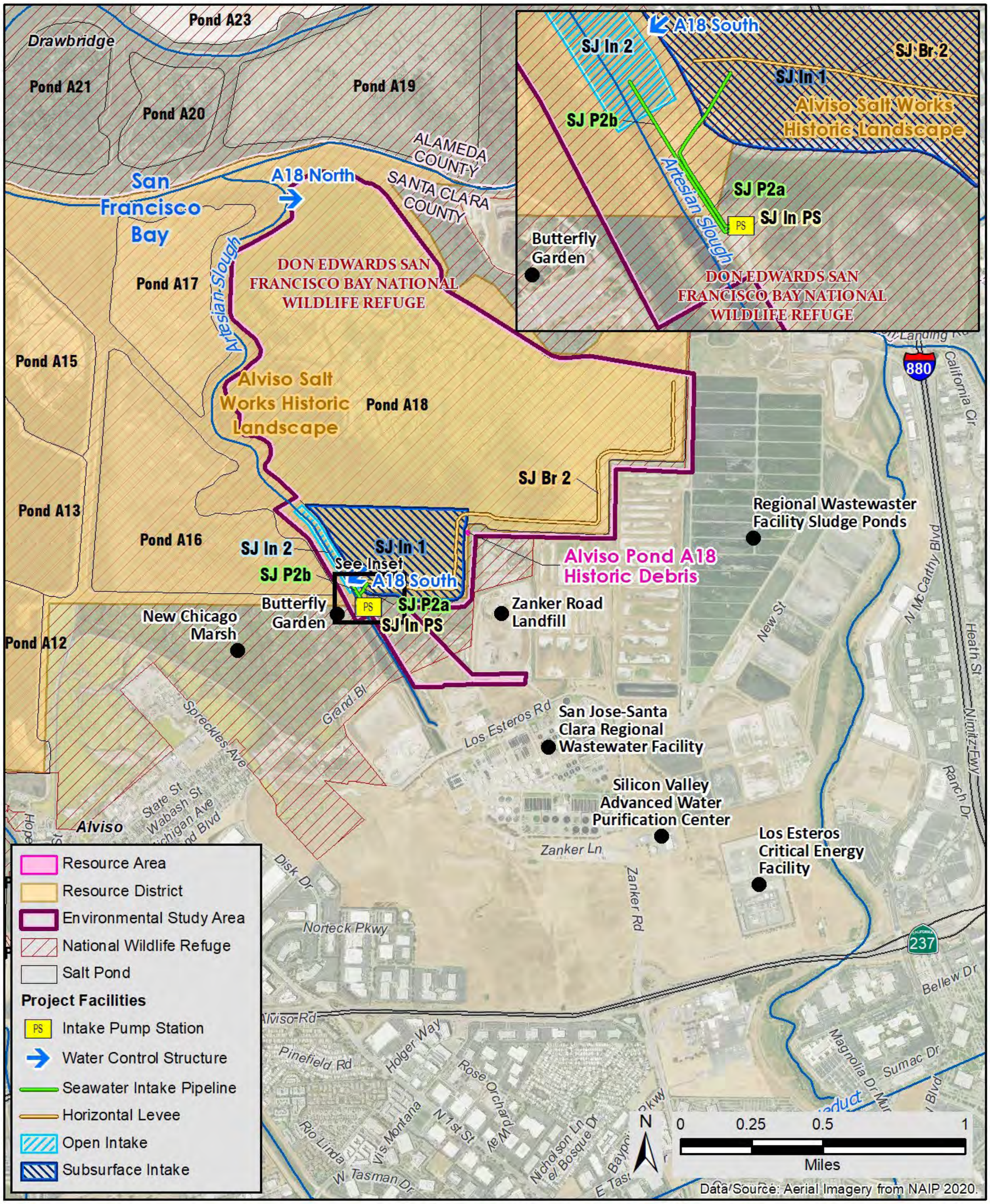

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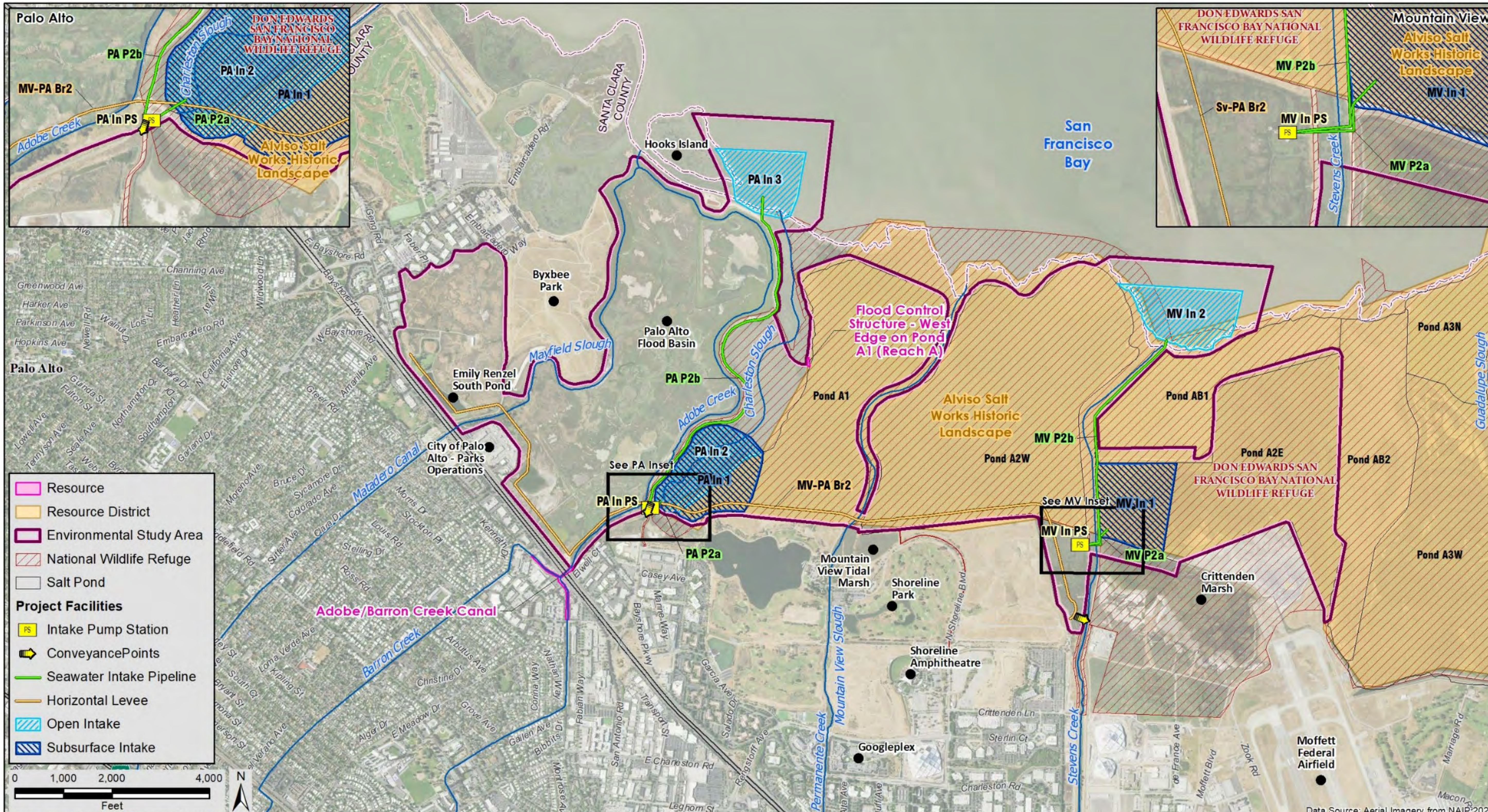
Figure 5-8. Known Cultural Resources within the Mountain View-Palo Alto Environmental Study Area



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Previously Recorded Archaeological Resources

Alviso Pond A18 Historic Debris (P-43-004034)

P-43-004034, located within the San Jose Environmental Study Area, is an archaeological site consisting of a scatter of salt blocks, construction debris, automotive and industrial debris, and late historic-era household refuse that is eroding out of the levee on the south side of Pond A18. This refuse scatter extends for approximately 100 feet along the southeast bank of the Pond A18 Levee about 0.25 mile beyond were South Gate Road joins the levee.

The refuse scatter likely represents partial remains of the Zanker Landfill, which was used during the first half of the 20th century by the cities of San Jose, Milpitas, and Santa Clara, and other nearby towns, to dump garbage as fill material into the tidelands. The observed debris consists of fragmentary salt blocks, scrap metal, automotive parts, rubber hoses and rubber fragments, floral print and plain historic-era ceramic sherds, multiple complete glass bottles and jars, and construction debris consisting of wood, concrete fragments, and bricks. The observed materials date primarily between the 1950s and 1970s, though the site does not appear to have enough integrity nor meet any of the significance criteria for inclusion on the California Register of Historical Resources (CRHR) or the NRHP based on survey evaluation (Ungvarsky 2018).

Previously Recorded Built Environment Resources

Flood Control Gate and Dock on Pond A1 (P-43-002247)

P-43-002247, located within the Mountain View-Palo Alto Environmental Study Area, is a wooden flood control structure on the western bank of Pond A1, located approximately 4,200 feet north of the USFWS gate on the pond levee. The structure is approximately 100 feet long and 10 feet wide along the levee bank.

The deck of the structure is constructed of 8-foot-long, 2- by 12-inch-wide wooden planks and has a dilapidated wooden 3- to 4-foot-tall railing constructed of 1- by 2-inch-wide boards. In addition, two 12-foot-long walls composed of 4- by 4-inch-wide posts and 2- by 12-inch-wide planks extend into Pond A1. The dilapidated deck of the structure is partially covered by other wooden debris, including planks, telephone poles, and other construction debris. P-43-002247 was dated to the 1940s or 1950s through oral history documented in the primary form (Canzonieri 2008). This cultural resource has not been formally evaluated for inclusion on the CRHR or the NRHP, but by itself the structure does not appear to have good enough integrity nor meet any of the criteria of significance for inclusion on either register based on survey evaluation. P-43-002247 however might be a contributing element to the Alviso Salt Works Historical Landscape.

Adobe and Barron Creek Canal (P-43-003048)

P-43-003048, located just outside of the Mountain View - Palo Alto Environmental Study Area, consists of the channelized and partially concrete lined confluence of Adobe Creek and Barron Creek west of Highway 101 in Palo Alto, and at the location where the conjoined creeks turn east to flow under the highway.

Both Adobe Creek and Barron Creek are about 6 feet deep and have trapezoidal cross-sections that are approximately 30 feet wide at the top and 20 feet wide at the bottom. Adobe Creek is entirely concrete lined near the confluence of the creeks, while Barron Creek is concrete lined at the confluence but has engineered earthen walls, concrete retaining walls, and sandbag reinforced banks further away from the confluence. The conjoined creeks are named Adobe Creek as they flow eastward under Highway 101, where Adobe Creek is concrete lined till about 50 feet east of the highway, at which point the creek returns to having engineered earthen banks as it continues eastward. The channelization of both creeks began in the late 1940s, with later alterations, including the concrete linings, being added in the 1960s and 1980s. This cultural resource has not been formally evaluated for inclusion on the CRHR or the NRHP, but the structures surrounding the creeks have been altered multiple times in recent history and do not appear to have enough significance or integrity to meet National Historic Preservation Act (NHPA) or California Environmental Quality Act criteria based on survey evaluation (Brewster 2013).

Previously Recorded Historic District

Alviso Salt Works Historical Landscape (P-43-002823)

The Alviso Salt Works Historic Landscape (P-43-002823) is a 10,477-acre historic district that overlaps most of the ponds within the Environmental Study Areas. The primary historic landscape features consist of the large evaporative ponds and levee system found in the northern portion of the Environmental Study Areas. Secondary features consist of the associated earthen berms, pipes, remnant piers, and water control structures that are from the historic-era use of the landscape. The included ponds are A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12 (now Pond A18) and A13 (also now Pond A18).

The Alviso Salt Works was an evaporative solar salt production facility that began operation in 1920 and continued production until the mid-1950s. The operation of the Alviso Salt Works facility was preceded by the successful reclamation of land from the bay and mudflats of the South Bay. Two salt production companies – the Alviso Salt Company and Arden Salt Company – built the levees and evaporative salt ponds of this resource and harvested salt starting in 1920. Arden Salt bought Alviso Salt in 1929, and in 1936 Leslie Salt Company become the sole owner and operator of the facility. The Alviso Salt Works consists only of the ponds, levees, and associated water control features because refinement factories and storage facilities were off-site and never part of the salt works landscape. In the mid-1950s, the city of San Jose annexed the land of Pond A18 from Cargill and purchased the land for a waste treatment facility. Salt production continued but slowed in the remaining facilities after this point, and in 1978 Cargill transferred the remaining ponds to USFWS for eventual inclusion in the Refuge, which occurred in 2003 (Ungvarsky 2018).

The Alviso Salt Works was determined as eligible to the NRHP on October 12, 2010, through concurrence between the USFWS and the SHPO through the Section 106 process as part of the South San Francisco Bay Shoreline Project. The Alviso Salt Works was found eligible under Criteria A (i.e., associated with events that have made a significant contribution to the broad patterns of our history) as a historic landscape at the local level because of its association with, and representation of, the twentieth century industrialization of the region. Alterations by the USFWS to the Alviso Salt Works Historic District were made permissible through a

Memorandum of Understanding with the SHPO and the creation of a Historic Property Treatment Plan that required recordation, protection of most features of the Historic District, and making only minor and clearly delineated alterations as possible (USFWS 2017).

Previous Reports

The NWIC records searches also identified 20 reports associated with the four previously recorded resources in the Environmental Study Areas. Eighteen of these reports are in two series (S-040023 and S-046899) that mostly report on the documentation of the Alviso Salt Works (S-040023) and projects in the generally vicinity of that resource, the shoreline, and the associated Wildlife refuges in the area (S-046899). The remaining two reports both cover the Adobe Creek Canal. In addition, another 76 reports partially cover the Environmental Study Areas, but do not contain information on resources within the Environmental Study Areas and are not listed on **Table 5-4**.

5.5.2 Geoarchaeological Sensitivity Analysis for Buried Cultural Resources

GEI geoarchaeologist Kyle Brudvik, MA, RPA, conducted a desktop study to document the soils and geologic context of the Environmental Study Areas to understand the sensitivity for surface and deeply buried cultural resources. The sensitivity analysis indicates that the Environmental Study Area (except for water and other built environment features) are in soils that overlie either Late Holocene or Latest Holocene/Modern aged alluvial landforms. Within California, soils and landforms of this age are generally considered to have high archaeological sensitivities (i.e., high potential for deeply buried and/or surface archaeological resources), especially along creek and riverside areas. However, because most land within the Environmental Study Areas occurs in historically modified salt marsh and evaporite collection ponds within heavily saturated, mud-rich bay margin environments, the Environmental Study Areas are considered to have low to no archaeological sensitivity.

Background

A desktop geoarchaeological investigation involves examining soils and geologic maps and relevant literature to make a first approximation of the potential for previously unrecorded, deeply buried (i.e., >1 meter) archaeological resources to occur within the Environmental Study Areas. As such, sensitivity values (low, moderate, or high) are assigned strictly based on the physical properties of soils and geology in the area (e.g., age of parent material, depositional origin, geomorphic history, etc.) and do not consider archaeological criteria (e.g., walking distance to known sites, distance to specific landscape resources like stone tool sources, etc.). In other words, the geoarchaeological desktop sensitivity assessment only identifies where archaeological resources *might* be expected to occur *in situ* in buried contexts based on the nature of soils and geologic deposits rather than on a more refined model of archaeological sensitivity and probable resource locations based on cultural factors.

The potential for archaeological sites to occur as surface or buried components is inherently linked to the age and evolution of a landform. Because they were available for settlement throughout the known human history of the area, Late Pleistocene (approximately 129,000 – 11,700 years ago; Cohen et al. 2013; Walker et al. 2018) and older landforms have a higher probability to contain *surface* archaeological resources than do younger landforms. Conversely, landforms composed of Holocene deposits have a higher likelihood to contain *buried* archaeological resources, especially in terrestrial geomorphic settings characterized by ongoing or episodic deposition (e.g., alluvial, eolian, and colluvial environments).

Within the northern Santa Clara Valley area, strongly developed B-horizons (which become more developed with time and are characterized by pedogenic accumulation of clay, iron, and, in some cases, silica) are associated with stable, older alluvial landforms that date to the Middle and Early Pleistocene. The Natural Resources Conservation Service (NRCS) soil mapping units associated with these older Pleistocene landforms in the northern Santa Clara Valley area include the Flaskan and Montavista soils. These older soil mapping units are considered to have low potential for deeply buried archaeological sites because they are associated with landforms that were geomorphically stable prior to and during the period of human occupation of the Santa Clara Valley area. Archaeological resources are only expected to occur in surface or near-surface contexts on these stable landforms. For example, pre-contact shell mounds, which once ringed the Bay by the hundreds, have clear surface expression on older Pleistocene terraces and alluvial landforms but are not deeply buried within those terraces/landforms.

Overall, these older soils are geographically limited, and the northern Santa Clara Valley is dominated by younger, Holocene aged deposits with associated "young" soils (e.g., Hangerone and Novato). Deposits comprising Holocene alluvial landforms, such as floodplains and basins, were developed throughout the extent of human occupation of the Santa Clara Valley area and thus have potential for harboring deeply buried archaeological sites. NRCS mapping units associated with these recent landforms common in the Santa Clara Valley area are Embarcadero, Hangerone, and Novato soils.

Methods

The Environmental Study Areas occurs within a combination alluvial and tidal setting that is characterized by periodic sediment deposition and erosion. The following discussion of archaeological sensitivity of the Environmental Study Areas is largely based on the interpretation of available geologic and soils maps.

Geologic Mapping

Geologic mapping of the Santa Clara Valley area has been done over the years at various spatial scales either by the U.S. Geological Survey or the California Geological Survey (*see* e.g., Anderson et al. 1912; Becker 1888; Brabb and Pampeyan 1983, 1993; Dibblee 1972; Dibblee and Minch 2007; Dibblee and Minch 2005a, 2005b; Graymer et al. 2006; Helley and Brabb 1971; Helley and Wesling 1989; Helley et al. 1994; Jennings et al. 2010; Pampeyan 1993). The recent mapping of Dibblee and Minch (2005a and b) were done at a relatively large scale, 1:24,000. At these scales, mappable units within the Environmental Study Area are accurately delineated.

Table 5-4. Studies Including Resources in the Environmental Study Areas

Report No.	Year	Author	Title	Cultural Resources within or adjacent to the ESAs
S-0420023	2008	Ellen Joslin Johnck	The South Bay Salt Pond Restoration Project: A Cultural Landscape Approach for the Resource Management Plan	P-43-004034 P-43-002823
S-0420023a	2007	G. Mendel Stewart and Charles Armor	Memorandum of Understanding Between the U.S. Fish & Wildlife Service, the Refuge and the California Department of Fish and Game Regarding Implementation of the NHPA on the Eden Landing Ecological Reserve (Baumberg Tract) for the South Bay Salt Ponds Restoration Project in Alameda County	
S-0420023b	2009	Lou Ann Speulda-Drews and Nicholas Valentine	Identification and Evaluation of the South San Francisco Bay Solar Salt Industry Landscape (Alameda, Santa Clara, and San Mateo counties, California)	
S-0420023c	2014	Laura Watt et al.	Historic American Landscapes Survey, Alviso Salt Works, HALS #CA-92	
S-0420023d	2012	Mendel Stewart and Milford Wayne Donaldson	Memorandum of Agreement Between the U.S. Fish & Wildlife Service and the California SHPO Regarding the South Bay Salt Pond Restoration Project, Including Restoration of Former Industrial Salt Ponds to Tidal Salt Marsh and Other Wetland Habitats, Including the Former Salt Works Sites Within the Alviso Unit on the Refuge and California Department of Fish And Game's, Eden Landing Ecological Reserve; Alameda and Santa Clara, Counties, California	
S-0420023e	2015	Anne Morkill, Julianne Polanco, and John C. Morrow	Amendment to Memorandum of Agreement Among USFWS, the California SHPO, and USCE Regarding the South Bay Salt Pond Restoration Project, Including Restoration of Former Industrial Salt Ponds to Tidal Salt Marsh and Other Wetland Habitats, Including the Former Salt Works Within the Alviso Unit of the Refuge and the California Department of Fish And Game's Eden Landing Ecological Reserve, Alameda And Santa Clara Counties, California	
S-0420023f	2014		USFWS Project #FWS040721A, Historic Properties Treatment Plan for the Salt Works within the South Bay Salt Pond Restoration Project at the Alviso Unit, the Refuge, and the Eden Landing Ecological Reserve, California Department of Fish and Game, Alameda and Santa Clara counties, California	
S-0420023g	2019	Laura Watt et al.	Historic American Landscapes Survey, Eden Landing Salt Works, HALS No. CA-91	
S-0420023h	2019		South Bay Salt Pond Restoration Project, Cultural Resources Mitigation and Monitoring Report	

Report No.	Year	Author	Title	Cultural Resources within or adjacent to the ESAs
S-0420023i	2019	Julianne Polanco	FWS040721A, Section 106 Consultation: Determination of Eligibility for Pond A18 and Draft DPR forms for review as per the Amendment to the Memorandum of Agreement for the South Bay Salt Pond Restoration Project, Alameda and Santa Clara Counties, California	
S-044044	2014	Heidi Koenig	Historic Property Survey Report, Highway 101 Overcrossing Project, Palo Alto, Santa Clara County, California, County Post Mile SCL 50.684	P-43-003048
S-046899	2009	Basin Research Associates	Cultural Resources Assessment, South San Francisco Bay Shoreline Interim Feasibility Study, Contract: W9-12P7-06-D-007	P-43-002247
S-046899a	2010		South San Francisco Bay Shoreline Study, Alviso Ponds and Santa Clara County Area Interim Feasibility Study, Environmental Settings Report, Contract No. W912P7-06-D-006, Task Order No. 002	
S-046899b	na		VOIDED-*see* S-42003b	
S-046899c	na		VOIDED-duplicate of S-42003c	
S-046899d	na		VOIDED-*see* S-42003d and S-42003f	
S-046899e	2014		Draft South San Francisco Bay Shoreline Phase I Study, Draft Integrated Document Cultural Resources Report Section Chapter 4.15	
S-046899f	2014	USACE-SF	Draft South San Francisco Shoreline Phase I Study - Draft Integrated Document Aesthetics Chapter 4.12	
S-046899g	2015	Thomas R. Kendall	COE_2014_1219_001; South San Francisco Bay Phase I Shoreline Study	
S-048737	2016	Heidi Koenig	An Archaeological Survey Report Highway 101 Overcrossing Project Palo Alto, Santa Clara County, CA County Post Mile SCL 50.684	P-43-003048

Notes: ESA=Environmental Study Areas

Soils Mapping

The U.S. Department of Agriculture NRCS Soil Survey Geographic database (SSURGO) soil mapping units in the Environmental Study Areas are differentiated by geomorphic features such as landforms (e.g., terraces, floodplains, levees, fans, basins, active channels), slope angles, texture (e.g., clay, silt, sand, and gravel content), time-dependent soil morphological characteristics such as profile complexity, B-horizon development, and buried soils (Ab-horizons). The NRCS SSURGO soils mapping data are collected at scales ranging from 1:12,000 to 1:63,360, with larger scale maps (i.e., 1:12,000) capturing more detail. Because soils mapping is generally of higher resolution than geologic mapping, and because the NRCS SSURGO data are readily available in digital format, this geoarchaeological assessment relies heavily on the NRCS SSURGO units when assessing archaeological resource sensitivity.

Sensitivity Classifications

A tripartite sensitivity classification is used here to describe the potential for soils and landforms in the Environmental Study Areas to contain buried and intact archaeological resources. Sensitivities range from high to low and are described below.

- **High –** Soils and/or sediments described as being relatively deep (>1 meter); deposits are mostly sand and finer grains with weak surface soil development; areas of high potential in the Environmental Study Areas are likely limited to alluvial landforms thought to be Late Holocene in age.
- **Moderate –** Soils and/or sediments not falling clearly into the high or low categories.
- **Low –** Soils and/or sediments that are associated with landforms that predate human occupation of the area (i.e., Middle Pleistocene and older), bedrock surfaces, steep and heavily eroded hillslopes, alluvium in active stream channels, and artificial landforms.

Geoarchaeological Desktop Study Results

Geology

Surface geology in the Environmental Study Areas is Late Holocene to Latest Holocene/Modern in age. Overall, these sediments are less than about 5,000 years old. Geologic mapping at a scale of 1:24,000 (or larger) has been done for the entire region, so the geology of the Environmental Study Areas is well-defined (*see* e.g., Dibblee and Minch 2005a, 2005b; Pampeyan 1993, 1970). For mapping consistency, we follow the mapping unit abbreviations and descriptions in the various Dibble and Minch (multiple dates) maps. Temporal categories leverage age determinations based on regional correlation and radiocarbon dating, as described below.

- **Quaternary alluvium (Qa) –** Quaternary alluvium from the Middle/Late Holocene in this region is described as undifferentiated, which means it is an assortment of alluvial gravel, sand, silt, and clay that is not mapped as either younger or older. Thicknesses of deposits range from a few centimeters (cm) to tens of meters.

- **Quaternary Bay Mud (Qbm) –** Late Holocene to Modern (< 150 years old) estuarine organic clay and modified salt evaporation basins. These deposits are subject to nearly continuous saturation and have been extensively modified by human agency. The deposits are thickest in the mid-Bay and thin toward the marsh edges.

Soils

Soils within the Environmental Study Areas are presented with their associated geologic unit, age, and archaeological sensitivity (**Table 5-5**). They are also briefly described, based on the official county-wide soil surveys and supplemented with additional data from NRCS SSURGO. We should note that these soil series are not confined solely to the Environmental Study Areas; they may occur over much broader regional areas and are, in general, laterally contiguous with other named series in the Santa Clara Valley and adjoining catchment valleys. There are six mapped soil series within the Environmental Study Areas, and all occur on either stream/river-laid alluvium or Bay Mud. The Soils are all relatively young; they are either Late Holocene (which includes post-contact times) or Latest Holocene/Historical-Modern. These soils are associated with (i.e., developed on top of) the geologic units just described (NRCS SSURGO; **Table 5-5**).

Table 5-5. Archaeological Sensitivity of NRCS Soil Mapping Units in the Environmental Study Areas

Mapping Unit	Associated Geologic Unit	Age	Archaeological Sensitivity
Campbell	Qa, Qbm	Late/Latest Holocene	Low
Elder	Qa, Qbm	Late/Latest Holocene	Low
Embarcadero	Qa, Qbm	Late/Latest Holocene	Low
Hangerone	Qa, Qbm	Late/Latest Holocene	Low
Novato	Qa, Qbm	Late/Latest Holocene	Low
Pescadero	Qa, Qbm	Late/Latest Holocene	Low

Source: NRCS 2019.

- **Campbell –** Campbell soils overlie Holocene alluvium and are Late/Latest Holocene in age. The Campbell series consists of very deep, moderately well-drained soils formed on floodplains and alluvial fans derived from mixed sources. Campbell soils are classified as fine-silty, mixed, superactive, thermic Cumulic Haploxerolls. They occur on slopes of 0-2 percent. These soils are used for row crops, fruit orchards, pasture, and hay.
- **Elder –** Elder soils overlie Holocene alluvium and are Late/Latest Holocene in age. The Elder series consists of very deep to deep, well-drained soils that formed in alluvium from mixed sources. Elder soils occur on alluvial fans and in flood plains. Elder soils are classified as coarse-loamy, mixed, superactive, thermic Cumulic Haploxerolls. They are on slopes of 0-15 percent. These soils lack a B-horizon and are used for growing truck, field, and forage crops.
- **Embarcadero –** Embarcadero soils overlie Holocene alluvium and are Late/Latest Holocene in age. The Embarcadero series consists of very deep, naturally poorly drained soils that are now artificially drained; they formed in alluvium from mixed sources. Embarcadero soils occur in basins near marsh edges on slopes of 0-2 percent, mainly

between Milpitas and Palo Alto, within Santa Clara County. Embarcadero soils are classified as fine, mixed, active, calcareous, thermic Fluvaquentic Endoaquolls. Embarcadero soils are smectic; they are calcareous below the A-horizon, forming carbonate masses and concretions. They are used for recreation, wildlife habitat, and urban landscapes.

- **Hangerone –** Hangerone soils overlie Holocene alluvium and Bay Mud and are Late/Latest Holocene in age. The Hangerone series consists of very deep, poorly drained soils that formed in alluvium from mixed sources. They occur in basins on slopes of 0-2 percent. Hangerone soils are classified as fine, smectitic, thermic Cumulic Vertic Endoaquolls. They have a buried A-horizon at depths near 70 cm with a well-developed calcic horizon between 60 and 100 cm. Most areas with Hangerone soils are used for urban development.
- **Novato –** Novato soils overlie Holocene Bay Mud and are Late/Latest Holocene in age. The Novato series consists of very deep, very poorly drained soils that formed in alluvium deposited along bay margins. Novato soils occur in tidal marshes on slopes of 0-2 percent. They are classified as very-fine, mixed, active, non-acid, isomesic Typic Sulfaquents. This soil series occurs within most of the Environmental Study Areas. Novato soils do not contain a B-horizon and are heavily clay-rich, indicative of their saturated status. Novato soils are used for wildlife habitat and natively grow pickleweed, saltgrass, and cordgrass.
- **Pescadero –** Pescadero soils overlie Holocene alluvium and are Late/Latest Holocene in age. The Pescadero series consists of very deep, poorly drained soils that formed in alluvium, derived from sedimentary rocks. Pescadero soils occur on slopes of 0-2 percent in basins. They are classified as fine, smectitic, termic Aquic Natrixeralfs. Pescadero soils are used for livestock grazing with some reclaimed areas used for irrigated field, row crops, and pasture.

Summary

Geological and soils mapping data indicate that soil ages in the Environmental Study Areas are either Late Holocene or Latest Holocene/Historical-Modern. All these soils are associated with Holocene landforms (Qa and Qbm) and would typically have *high* potential to contain buried archaeological resources, based on their geologically young ages. Within California, soils and landforms of this age are generally considered to have high archaeological sensitivities (i.e., high potential for deeply buried and/or surface archaeological resources) everywhere they occur, but especially along creek and riverside areas. However, because most of the Environmental Study Areas are within historically modified salt marsh and evaporite collection ponds, within heavily saturated, mud-rich bay margin environments, the area has a *low* to *no* archaeological sensitivity. Therefore, it is unlikely to encounter buried or surface archaeological cultural resources in the Environmental Study Areas because human settlement generally does not occur within periodically or perennially flooded marsh areas, and because of the historic-era use of the area. A more detailed geoarchaeological sensitivity analysis may however be warranted for specific locations within the Environmental Study Areas as the project progresses.

5.5.3 Native American Communication and Outreach

For this initial assessment of the Environmental Study Areas, GEI contacted the Native American Heritage Commission (NAHC) on August 9, 2022, to request a search of the Sacred Lands Files (SLF) for Native American cultural resources in or near the Environmental Study Areas and to request a contact list of Tribes and Native American representatives with potential interest in or knowledge of the Environmental Study Areas or vicinity.

On September 1, 2022, the NAHC responded that the SLF search results were positive for the Environmental Study Areas and that the North Valley Yokuts Tribe should be contacted for more information. The NAHC also provided a contact list of Native Americans and Tribal representatives with potential interest in, or knowledge of, the Environmental Study Areas who should be contacted for further information, or to invite to formal consultation. No Tribes were contacted as part of this study. The contact list is as follow:

Amah Mutsun Tribal Band
Valentin Lopez, Chairperson
P.O. Box 5272
Galt, CA 95632
Phone: (916) 743-5833
vlopez@amahmutsun.org

Amah MutsunTribal Band of Mission San Juan Bautista
Irene Zwierlein, Chairperson
3030 Soda Bay Road
Lakeport, CA 95453
Phone: (650) 851-7489
Fax: (650) 332-1526
amahmutsuntribal@gmail.com

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
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ams@indiancanyons.org

Indian Canyon Mutsun Band of Costanoan
Kanyon Sayers-Roods, MLD Contact
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Muwekma Ohlone Indian Tribe of the SF Bay Area
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North Valley Yokuts Tribe
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The Ohlone Indian Tribe
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Wuksache Indian Tribe/Eshom Valley Band
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kwood8934@aol.com

The Confederated Villages of Lisjan
Corrina Gould, Chairperson
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Oakland, CA 94603
Phone: (510) 575–8408
cvltribe@gmail.com

Tamien Nation
Quirina Luna Geary, Chairperson
PO Box 8053
San Jose, CA 95155
Phone: (707) 295-4011
qgeary@tamien.org

5.6 Known Hazardous Materials and Contamination

The database search included all data sources included in the Cortese List (enumerated in Public Resources Code Section 65962.5). These sources include the GeoTracker database, a groundwater information management system that is maintained by the State Water Resources Control Board (SWRCB); the Hazardous Waste and Substances Site List (i.e., the EnviroStor database), maintained by the California Department of Toxic Substances Control (DTSC); and the Environmental Protection Agency's (EPA) Superfund Site database (DTSC 2022a and 2022b, SWRCB 2022a and 2022b, CalEPA 2022, EPA 2022).

There are no hazardous material sites located within the Mountain View – Palo Alto Environmental Study Area. There is one voluntary cleanup site located along Zanker Road adjacent to the San Jose Environmental Study Area. This voluntary site (Legacy Lagoon Biosolids [60001622]) is part of the RWF. Between 1962 and 1974, biosolids were discharged to a series of lagoons on the site and allowed to accumulate. These accumulated biosolids remain onsite and are referred to as the legacy biosolids. In 2020, an addendum to the Environmental Impact Report for the San Jose - Santa Clara Water Pollution Control Plant Master Plan (SCH# 2011052074) was prepared to address cleanup and closure of the legacy biosolids associated with the legacy lagoon biosolids due to the city of San Jose receiving a Site Cleanup Order issued by the RWQCB. The city of San Jose removed the legacy biosolids from the lagoons in 2021 and several of the lagoons were transferred to the South San Francisco Bay Shoreline Project.

5.7 Siting Evaluation

A summary of siting constraints related to special-status species known to occur is provided in **Table 5-6**, related to special-status species that likely or could occur is provided in **Table 5-7**, and siting constraints related to other environmental conditions outlined above in this section are summarized in **Table 5-8**. The discussion below summarizes the findings of the siting evaluation with a focus on critical issues and recommended next steps. This section discusses several issues related to state and federal regulation and permits. Permitting requirements are not addressed in this section and instead are discussed in detail in **Appendix D** and summarized in Chapter 11, "Permitting."

5.7.1 Water Supply Availability Evaluation

Each intake option was evaluated to determine if sufficient water supplies are likely available from the source water for the desalination project. Since this study assumes a 50 percent recovery rate for the 10 million gallon per day (MGD) desalination project, the intake would require 20 MGD of source water – a substantial rate of daily intake. This evaluation was qualitative and based on information in Section 5.3, "Water Resources Conditions," and review of aerial photography and **Figures 5-1** to **5-3**.

The findings of this evaluation are summarized as follows.

- Due to the large size of the Bay, the open intake options in the Lower South Bay (MV In 2 and PA In 3) clearly have sufficient water supply for the desalination project.
- The Artesian Slough Open Intake option (SJ In 2) would draw in water from Artesian Slough and wastewater effluent from the San Jose/Santa Clara RWF. As discussed in Section 4.2, "Source Water Quality Data," this facility produces an average of 110 MGD with a capacity of up to 167 MGD and approximately 90 percent of wastewater produced is piped to the outfall channel located near Artesian Slough. Therefore, with continued discharge of wastewater effluent, it is clear sufficient water supply is available for the desalination project.
- Subsurface intakes (SJ In 1, MV In 1, and PA In 1) would draw seawater in through salt ponds from below ground in combination with groundwater. The Charleston Slough Open Intake option (PA In 1) would draw seawater in from a slough connected to the Lower South Bay. Each of these water bodies appears to support tidal habitat and may not receive consistent flow of seawater. It also is not known how much source water in subsurface intakes would be groundwater. Therefore, it is unclear if these water sources can consistently provide 20 MGD. Further study of hydrological and groundwater conditions at these locations is required.

5.7.2 Biological Resources Evaluation

Special-status Species

As shown in **Tables 5-6** and **5-7**, there are three special-status plant species and 19 special-status wildlife species that are either known to, likely to, or could occur (likely to and could occur are collectively referred to below as potentially occurring in the discussion below) within the Environmental Study Areas and could be impacted to various extents by the intake and brine management options. The tables indicate if the species is expected to occur where each option is located, could potentially occur, or if no suitable habitat is present. This determination is based on information in **Table 5-2** and the location and activities of each option evaluated. The constraints presented in these tables are based on desktop review only and should be confirmed with field surveys during the next phase of environmental planning for the project.

Valley Water should plan the project to minimize impacts to all special-status species to the extent possible; however, federal Endangered Species Act (federal ESA) and California Endangered Species Act (CESA) listed species are of most concern due to their already limited populations and listing status. There are nine federal ESA listed species, one federal ESA candidate species, and six CESA listed species known to or with potential to occur in the Environmental Study Areas. Five species are both ESA listed/candidate species and CESA listed species. There is one federal ESA listed plant species.

Many potential impacts to special-status species, in particular non-federal ESA or -CESA listed species and migratory bird species, could be addressed through implementation of avoidance and minimization measures or mitigation measures in environmental compliance documentation for the desalination project. As such, the discussion below in this section focuses on the potentially more severe impacts to federal ESA and/or CESA listed species from siting of intake and brine management options.

Special-status Fish

Steelhead is an ESA listed species of major agency and public focus and concern that is known to occur in the Lower South Bay and connected creeks. Longfin smelt is a federal ESA candidate species and CESA listed species potentially in estuarine waters associated with the Lower South Bay and connected creeks. Green sturgeon is a federal ESA listed species occurring in open water of the Bay. Subsurface intake options (SJ In 1, MV In 1, PA In 1) and horizontal levee brine management options (SJ Br 2, MV-PA Br 2) would be located outside of suitable habitat for steelhead, longfin smelt, and green sturgeon. It is assumed conveyance pipelines associated with the intake options could be developed to avoid suitable habitat for steelhead and longfin smelt in creeks near the shoreline such as Stevens Creek.

Potential impacts to steelhead and longfin smelt could occur from open intake options (SJ In 2, MV In 2, PA In 2, and PA In 3) because they would draw in water directly from suitable aquatic habitat for these species. Open intakes in the Lower South Bay (MV In 2 and PA In 3) would result in similar impacts to suitable habitat for green sturgeon by drawing in water from the Lower South Bay (the open intakes options in sloughs are not anticipated to affect suitable habitat for green sturgeon). Impacts from intakes could include impingement and entrainment of larvae and impingement of larger fish, which is discussed further in Section 5.7.3, “Marine Organisms Evaluation.” Permanent impacts would likely require compensatory mitigation. Further study of habitat conditions and open intake operations is required.

Discharge of brine through the South Bay Deep Water Outfall option to the Lower South Bay could also result in potential impacts to suitable habitat for steelhead, longfin smelt, and green sturgeon. The severity of this impact depends on the brine water quality and how quickly desired levels of dilution are achieved. Permanent impacts would likely require compensatory mitigation. Further study of brine water quality and dilution is required to further assess potential impacts.

For all three special-status fish species, construction of the open intake options and the South Bay Deep Water Outfall option could also result in disturbance of suitable aquatic habitat (as discussed above in this section) and impacts directly to these fish species if they are present during construction activities, particularly from in-water construction activities and turbidity generated during construction. Permanent impacts would likely require compensatory mitigation.

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Table 5-6. Summary of Special-status Species Constraints – Species Known to Occur within the Environmental Study Areas

Project Options		Special-status Species Known to Occur (*Listing Status and Suitable Habitat within the Environmental Study Areas*)								
		Reptile	Fish	Birds						Mammal
		Western pond turtle (--/--/4.2) (*fresh emergent wetland, open water, and lacustrine pond*)	steelhead - central California coast DPS (FT/--/--) (*Open Water*)	Burrowing owl (--/--/SSC) (*Non-native annual grasslands, disturbed/ruderal*)	Western snowy plover (FT/--/SSC) (*mudflats*)	White-tailed kite (--/--/FP) (*saline and freshwater emergent wetland*)	Saltmarsh common yellowthroat (--/--/SSC) (*saline and freshwater emergent wetland*)	California black rail (FT/--/FP) (*saline and freshwater emergent wetland*)	California Ridgway's rail (FE/SE/FP) (*saline and freshwater emergent wetland*)	Salt-marsh harvest mouse (FE/SE/FP) (*saline emergent wetland*)
Intake Options and Associated Conveyance										
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	🟡	🟢	🟡	🟡	🔴	🟡	🟡	🟡	🟡
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	🔴	🔴	🟡	🟢	🔴	🟡	🟡	🟡	🟡
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	🟡	🟢	🟡	🟡	🔴	🟡	🔴	🔴	🔴
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	🟢	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	🔴	🟢	🟡	🟡	🔴	🔴	🟡	🟡	🟡
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	🔴	🔴	🟡	🟢	🔴	🟡	🟡	🟡	🟡
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	🟢	🔴	🟢	🟢	🔴	🟢	🟢	🟢	🟢
Brine Management Options										
All	South Bay Deep Water Outfall (Br 1)	🟡	🔴	🟢	🟢	🟢	🟢	🟢	🟢	🟢
SJ	Pond A18 Horizontal Levee (SJ Br 2)	🟡	🟢	🟡	🟢	🔴	🟡	🟡	🟡	🟡
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	🟡	🟢	🟡	🟢	🔴	🟡	🟡	🟡	🟡

Legend: 🔴 = Expected to occur based on desktop review; 🟡 = Potentially occurs based on desktop review; 🟢 = No suitable habitat based on desktop review – should be confirmed with field surveys

Notes: San Jose = SJ; Mountain View = MV, Palo Alto = PV
Legal Status Definitions (Fed/ State/ CRPR Status or CDFW):
Federal
FC – Species identified as a candidate species for listing as threatened or endangered under the federal Endangered Species Act (ESA).
FDL – Species delisted from the federal ESA.
FE – Species listed as Endangered under the federal ESA.
FT – Species listed as Threatened under the federal ESA.
SSC – Species listed as Species of Special Concern by the NMFS.
– – No listing under the federal ESA.
State
SC – Species identified as a candidate species for listing as threatened or endangered under the California Endangered Species Act (CESA).
SDL – Species delisted from the CESA.
SE – Species listed as Endangered under the CESA.
SFP – Species listed as Fully Protected under the California Fish and Game Code.
SSC – Species listed as Species of Special Concern by the California Department of Fish and Wildlife.
ST – Species listed as Threatened under the CESA.
– – No listing under the CESA.
CRPR / California Rare Plant Rank
1B – Plant species considered Rare, Threatened, or Endangered in California and elsewhere.
2B – Plant species considered Rare or Endangered in California but more common elsewhere.
– – No California Rare Plant Rank listing or not applicable.
California Rare Plant Rank Extensions:
1 – Seriously threatened in California (< 80 percent of occurrences are threatened and/or have a high degree and immediacy of threat).
2 – Moderately threatened in California (20-80 percent of occurrences are threatened and/or have a moderate degree and immediacy of threat).

Table 5-7. Summary of Special-status Species Constraints – Species that Likely or Could Occur within the Environmental Study Areas

Project Options		Special-status Species Likely to Occur *(Listing Status and Suitable Habitat within the Environmental Study Areas)*				Special-status Species that Could Occur *(Listing Status and Suitable Habitat within the Environmental Study Areas)*								
		Plant	Birds			Plants		Amphibian	Fish		Birds			Mammal
		Congdon's tarplant (--/--/1B.1) *(grasslands)*	Yellow rail (--/--/SSC) *(marsh)*	Alameda song sparrow (--/--/SSC) *(saline and freshwater emergent wetland)*	Northern harrier (--/--/SSC) *(saline and freshwater emergent wetland, grasslands, and ruderal)*	Point Reyes salty bird's-beak (--/--/1B.2) *(saline emergent wetland)*	California seablite (FE/--/1B.1) *(saline emergent wetland)*	California red-legged frog (FT/--/SSC) *(fresh emergent wetland, open water, and lacustrine ponds)*	Longfin smelt (FC/ST/--) *(open water of estuaries)*	Green sturgeon (FT/--/--) *(open water)*	Tricolored blackbird (--/ST/SSC) *(freshwater emergent wetland)*	Black skimmer (--/--/SSC) *(open water)*	California least tern (FE/SE/FP) *(open water)*	Salt-marsh wandering shrew (--/--/SSC) *(saline emergent wetland)*
Intake Options and Associated Conveyance														
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	● yellow	● yellow	● yellow	● red	● yellow	● yellow	● green	● green	● green	● yellow	● yellow	● green	● yellow
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	● yellow	● yellow	● yellow	● red	● yellow	● yellow	● yellow	● yellow	● green	● yellow	● green	● green	● yellow
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	● yellow	● red	● yellow	● red	● yellow	● yellow	● green	● green	● green	● yellow	● yellow	● red	● yellow
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	● green	● green	● green	● red	● green	● green	● green	● yellow	● red	● green	● green	● red	● green
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	● yellow	● yellow	● red	● red	● yellow	● yellow	● green	● green	● green	● yellow	● yellow	● red	● yellow
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	● yellow	● yellow	● yellow	● red	● yellow	● yellow	● yellow	● yellow	● green	● yellow	● green	● red	● yellow
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	● green	● green	● green	● red	● green	● green	● green	● yellow	● red	● green	● green	● red	● green
Brine Management Options														
All	South Bay Deep Water Outfall (Br 1)	● green	● green	● green	● green	● green	● green	● green	● yellow	● red	● green	● yellow	● yellow	● green
SJ	Pond A18 Horizontal Levee (SJ Br 2)	● red	● yellow	● yellow	● red	● yellow	● yellow	● green	● green	● green	● yellow	● yellow	● yellow	● yellow
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	● red	● yellow	● yellow	● red	● yellow	● yellow	● green	● green	● green	● yellow	● yellow	● yellow	● yellow

Legend: ● red = Expected to occur based on desktop review; ● yellow = Potentially occurs based on desktop review; ● green = No suitable habitat based on desktop review – should be confirmed with field surveys

Notes: San Jose = SJ; Mountain View = MV, Palo Alto = PV
Legal Status Definitions (Fed/ State/ CRPR Status or CDFW):
Federal
FC – Species identified as a candidate species for listing as threatened or endangered under the federal Endangered Species Act (ESA).
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SSC – Species listed as Species of Special Concern by the NMFS.
– – No listing under the federal ESA.
State
SC – Species identified as a candidate species for listing as threatened or endangered under the California Endangered Species Act (CESA).
SDL – Species delisted from the CESA.
SE – Species listed as Endangered under the CESA.
SFP – Species listed as Fully Protected under the California Fish and Game Code.
SSC – Species listed as Species of Special Concern by the California Department of Fish and Wildlife.
ST – Species listed as Threatened under the CESA.
– – No listing under the CESA.
CRPR / California Rare Plant Rank
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2B – Plant species considered Rare or Endangered in California but more common elsewhere.
– – No California Rare Plant Rank listing or not applicable.
California Rare Plant Rank Extensions:
1 – Seriously threatened in California (< 80 percent of occurrences are threatened and/or have a high degree and immediacy of threat).

Table 5-8. Summary of Other Siting Constraints

Project Options		Sensitive Habitats: Wetlands of the U.S./State and Associated Bayland Type[1] *(Refer to Figures 5-1 to 5-3)*	Sensitive Habitats: Other Waters of the U.S./State *(Refer to Figures 5-1 to 5-3)*	Sensitive Habitats: Salt Marsh Habitat	Marine Organisms	Water Supply Availability	Known Cultural Resources *(Figures 5-7 and 5-8)*
Intake Options and Associated Conveyance							
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	Temporary impacts to depressional wetlands, marsh, and lagoon from pipeline	No impact – assume Artesian Slough can be avoided	Indirect effects to habitat from intake of seawater through ground	None	Unknown if sufficient year-round water supply is available	Alviso Salt Works Historic Landscape
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	Temporary and permanent impacts to marsh, marsh flat, and depressional wetlands	Temporary and permanent impacts to Artesian Slough	Direct effects to habitat from intake of water	Impingement of organisms on the intake screen and entrainment of larvae	Anticipated to be sufficient for project with continued adjacent wastewater discharges	Alviso Salt Works Historic Landscape
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	Temporary and permanent impacts to lagoon and marsh; indirect effects from intake of lagoon water	Temporary impacts to Stevens Creek from pipeline	Indirect effects to habitat from intake of seawater through ground	None	Unknown if sufficient year-round water supply is available	Alviso Salt Works Historic Landscape
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	Temporary impacts to marsh and lagoon from pipeline	Temporary impacts to Stevens Creek from pipeline; temporary and permanent impacts to LSB from intake	None	Impingement of organisms on the intake screen and entrainment of larvae	Sufficient water supply for project	Alviso Salt Works Historic Landscape from pipeline
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	None	None	Indirect effects to habitat from intake of seawater through ground	None	Unknown if sufficient year-round water supply is available	None
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	Temporary and permanent impacts to lagoon from intake	None	Direct effects to habitat from intake of water	Impingement of organisms on the intake screen and entrainment of larvae	Unknown if sufficient year-round water supply is available	None
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	Temporary impacts to lagoon from pipeline and bay flat from intake	Temporary impacts to Adobe Creek from pipeline; temporary and permanent impacts to LSB from intake	None	Impingement of organisms on the intake screen and entrainment of larvae	Sufficient water supply for project	None
Brine Management Options							
All	South Bay Deep Water Outfall (Br 1)	None	Temporary and permanent impacts to LSB	None	Direct effects from brine water quality	N/A	None
SJ	Pond A18 Horizontal Levee (SJ Br 2)	Temporary and permanent impacts to lagoon	None	Direct effects to habitat from brine water quality	None	N/A	Alviso Pond A18 Historic Debris and Alviso Salt Works Historic Landscape
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	Temporary and permanent impacts to lagoon, marsh, and tidal ditch	No impact – assume Permanente and Stevens Creeks can be avoided	Direct effects to habitat from brine water quality	None	N/A	Alviso Salt Works Historic Landscape

Notes: LSB=Lower South Bay; N/A=not applicable, San Jose = SJ; Mountain View = MV, Palo Alto = PV
[1]Some bayland times such as marsh flat and Bay flat are not considered wetlands but instead are associated with other waters of the U.S./state

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Special-status Birds

California Ridgeway's rail is a federal ESA and CESA listed species and California black rail is a federal ESA listed species and both of these species are known to occur in saline emergent wetlands (salt marsh) and freshwater emergent wetlands of the Lower South Bay. Open intakes in the Lower South Bay (MV In 2 and PA In 3) and the South Bay Deep Water Outfall option are outside of suitable habitat for these species. Open intake options in sloughs (SJ In 2, PA In 2) and subsurface intake options (SJ In 1, MV In 1, PA In 1) could draw water in from suitable habitat for these species, resulting in adverse effects. Horizontal levees could result in impacts to these species from changes in water quality. These issues are discussed further in Section 5.7.2, "Sensitive Habitats Evaluation."

Western snowy plover is a federal ESA listed species known to occur in open mudflats of the South Bay. All open intake and brine management options would be located outside of suitable habitat except subsurface intake options (SJ In 1, MV In 1, and PA In 2). Subsurface intake options could draw water from suitable habitat and adversely affect this species. See the discussion related to subsurface intakes in Section 5.7.2, "Sensitive Habitats Evaluation." – issues discussed for salt marsh would be similar to mudflats.

Tricolored blackbird is a CESA listed species potentially occurring in freshwater emergent wetland of the Lower South Bay. The open intake options in the Lower South Bay (MV In 2, PA In 3) and South Bay Deep Water Outfall option are outside suitable habitat. Open intake options in sloughs (SJ In 2, PA In 2) and subsurface intake options (SJ In 1, MV In 1, PA In 1) could draw water in from suitable habitat, resulting in changes to habitat conditions and impacts to this species. Horizontal levee brine management options (SJ Br 2, MV-PA Br 2) could also result in impacts to this species from changes in water quality in suitable habitat.

California least tern is a federal ESA and CESA listed species potentially occurring in open water and ponds of the Lower South Bay. Intake options in San Jose (SJ In 1, SJ In 2) do not provide suitable habitat for this species. Intake options in Mountain View and San Jose (MV In 1, MV In 2, PA In 1, PA In 2, PA In 3) could draw water in from suitable habitat, resulting in changes to habitat conditions and impacts to this species. All brine management options could result in impacts to this species from changes in water quality.

For all intake and brine management options within suitable habitat for special-status bird species discussed above, construction could result in disturbance of suitable habitat (as discussed above in this section) and impacts directly to bird species if they are present and nesting during construction activities and cannot be avoided. Permanent impacts would likely require compensatory mitigation. Further study of habitat conditions, hydrological and groundwater conditions at intakes, and brine water quality is required.

Special-status Amphibians

California red-legged frog is a federal ESA listed species potentially occurring in creeks and drainages discharging into the Lower South Bay. All intake and brine management options except the two open intake options in sloughs (SJ In 2 and PA In 2) are outside of suitable habitat. It is assumed conveyance pipelines associated with the intake options could be developed to avoid suitable aquatic habitat in creeks. Construction of the two intake options in sloughs (SJ In 2, PA In 2) could result in disturbance of suitable aquatic and/or upland habitat and impacts directly to the species if it is present during construction activities. Long-term impacts could occur from drawing in water from aquatic habitat including impingement and entrainment of the species, which is similar to the issues discussed further in Section 5.7.3, “Marine Organisms Evaluation.” Permanent impacts would likely require compensatory mitigation. Further study of habitat conditions and impacts from operation of open intakes in sloughs is required.

Special-status Mammals

Salt-marsh harvest mouse is a federal ESA and CESA listed species known to occur in salt marsh habitat of the South Bay. Open intake options in the Lower South Bay (MV In 2 and PA In 3) and the South Bay Deep Water Outfall option are outside of suitable habitat. Construction of the remaining open and subsurface intake options could result in disturbances to suitable habitat and the species if it is present during construction activities. The horizontal levee brine management options (SJ Br 2, MV-PA Br 2) would also be in suitable habitat and could result in construction disturbances and additional long-term impacts from brine water quality. Permanent impacts would likely require compensatory mitigation. Further study of habitat conditions and impacts from brine water quality is required.

Special-status Plants

California seablite is a federal ESA listed species potentially occurring in salt marsh habitat of the South Bay. Open intake options in the Lower South Bay (MV In 2, PA In 3) and the South Bay Deep Water Outfall option would be located outside of suitable habitat. Construction of the remaining open intake options and subsurface intake options may occur in suitable habitat and could result in disturbance if this species is present and cannot be avoided. The horizontal levee brine management options (SJ Br 2, MV-PA Br 2) would also be located in suitable habitat and could result in construction disturbances and additional long-term impacts from brine water quality. Permanent impacts would likely require compensatory mitigation. Surveys for presence of this species and further study of impacts from brine water quality is required.

Sensitive Habitats

This section presents potential impacts related to siting of intake and brine management options in sensitive habitats identified in Section 5.4, “Biological Resources Conditions.”

Wetlands and Waters of the U.S./State

Tables 5-6 and **5-7** identify temporary and permanent impacts (i.e., potential dredging, fill, or other alternation). Drawing in water from wetlands and waterways via open and subsurface intakes was not considered an impact in this evaluation. Temporary impacts would occur from construction where it is anticipated that approximate existing conditions could be restored. Permanent impacts are identified where it is anticipated conditions cannot be restored. Permits from federal and/or state agencies are required for all temporary and permanent impacts to waters of the U.S./state including wetlands.

The findings of this evaluation are summarized as follows.

- All intake and brine management options would result in various degrees of temporary and permanent impacts to waters of the U.S. or state, including wetlands, except the Charleston Slough/Pond A1 Subsurface Intake option (PA In 1) as this intake is subsurface, has a short pipeline segment to the pump station, and has a pump station located outside of wetlands.
- The Pond A18 Subsurface Intake option, Charleston Slough Open Intake option, and the horizontal levee brine management options SJ Br 2 and MV-PA Br 2 would result in impacts to wetlands of the U.S./State but are not anticipated to impact other, non-wetlands waters of the U.S./state including the Lower South Bay.
- The South Bay Deep Water Outfall option would impact the Lower South Bay but not wetlands.

Salt Marsh Habitats

Intake Options

The subsurface intake options (SJ In 1, MV In 1, PA In 1) and open intake options in sloughs (SJ In 2, PA In 2) would draw in significant amounts of seawater (through the ground for subsurface intakes and directly for open intakes in sloughs), which could deplete water supplies in salt ponds and sloughs that help sustain salt marsh habitats, thereby indirectly impacting vegetation, habitat conditions, and species supported by salt marshes. As discussed in Section 5.7.1, “Water Supply Availability Evaluation,” it is unclear if salt ponds can consistently provide 20 MGD for the desalination project (20 MGD source water is estimated to be required because this study assumes a 50 percent recovery rate of water during treatment/reverse osmosis). Depletion of water in sloughs to the extent that it changes water elevations and composition would be a significant issue. Further study of hydrological and groundwater conditions and potential impacts to salt marsh habitat at these locations is required.

Horizontal Levee Options

The horizontal levee brine management options (SJ Br 2, MV-PA Br 2) would discharge brine into salt marsh habitat. As discussed in Section 3.3.3, “Brine Management,” the salinity of brine needs to be managed to levels similar to or less than seawater (total dissolved solids typically up to between 25,000 and 35,000 parts per million [ppm]) depending on how salt-tolerant vegetation is (i.e., seawater or less salinity) at the horizontal levee location. As discussed in Section 4.3.5, “Estimated Permeate and Brine Water Quality Calculated Total Dissolved Solids,” total dissolved solids (based on electric conductivity) in brine from the desalination project is estimated to range from 28,730 to 65,473 ppm with an average of approximately 53,461 ppm. Therefore, total dissolved solids in brine are estimated to significantly exceed levels sustained in salt marsh habitats, which is anticipated to result in adverse effects to vegetation and species supported by this habitat.

Salinity levels in brine may be less if source water salinity is less. Source water may have less salinity in the Artesian Slough Open Intake option because it would intake significant amounts of wastewater effluent with seawater and in subsurface intake options (SJ In 1, MV In 1, and PA In 1) because they would intake groundwater with seawater. However, the addition of wastewater effluent or groundwater with seawater could result in elevated levels of other constituents of concern and water quality impacts to salt marsh habitats.

Brine water quality is a significant barrier to discharge of brine from the desalination project on horizontal levees. Further study of brine water quality is required, however, dilution of brine with wastewater would likely be necessary to use horizontal levees. If water quality can be managed to be suitable for discharge on horizontal levees, then benefits could be provided to salt marsh habitats as has been demonstrated at other similar horizontal levees/ecotones around the Bay Area.

Marine Organisms

Open Water Intake Options

The open intake options (SJ In 2, MV In 2, PA In 2, and PA In 3) would directly intake seawater and could potentially affect source water populations of marine organisms by uncompensated removal of planktonic organisms (or larvae) that are entrained in water flows and removal of larger life stages that are impinged (i.e., pulled and held) on the intake screens. State Water Code Section 13142.5(d) states that, "independent baseline studies of the existing marine system should be conducted in the area that could be affected by a new or expanded industrial facility using seawater, in advance of the carrying out of the development." An example of this type of intake ocean effects study was prepared for the city of Santa Cruz for the Soquel Creek Water District's Regional Desalination Project.[1] That study addresses the potential effects of entrainment and examines effects of larval impingement and involved extensive field data collection of planktonic organisms. Very low intake velocities can be used to prevent or minimize impingement of larger organisms. Further study is required to identify intake velocities possible for open intake options and the extent impingement can be avoided/minimized.

The composition of marine organisms in source water of the two intake options in sloughs (SJ In 2 and PA In 2) could be different than for the open intakes in the Lower South Bay (MV In 2 and PA In 3), particularly the Artesian Slough Open Intake option because it would intake significant amounts of wastewater effluent. However, these options in the sloughs could also cause impingement and entrainment of varying life stages of other non-marine species, such as California red-legged frog. Further study on habitat conditions and composition of marine and aquatic organisms in source water is required to understand if there are differences among intake options.

[1] Available: https://www.cityofsantacruz.com/home/showpublisheddocument/89918/637920126798930000

South Bay Deep Water Outfall Option

The discharge of brine in the South Bay Deep Water Outfall option (Br 1) would impact water quality in the Lower South Bay, potentially resulting in adverse effects to marine organisms. The severity of this impact depends on the brine water quality and how quickly desired levels of dilution are achieved. Further study of impacts from brine water quality is required.

5.7.3 Cultural Resources Evaluation

Known Cultural Resources

The desalination project would require approvals from federal agencies, and therefore, compliance with Section 106 of the NHPA of 1966. The NHPA requires evaluation of cultural resources eligible for the NRHP. Known cultural resources were identified based on a records search of the desalination project Environmental Study Areas.

The key findings of the cultural resources evaluation are as follows.

- It is anticipated that built environment resources P-43-002247 (wooden flood control structure and dock) and P-43-003048 (concrete jacketed and channelized confluence of Adobe and Barron Creeks), within the Mountain View-Palo Alto Environmental Study Area, could be avoided by all intake and brine management options.
- Archaeological resource P-43-004034 (historic-era refuge scatter), within the San Jose Environmental Study Area, could be impacted by the Pond A18 Horizontal Levee option (SJ Br 2).
- Built environment resource P-43-003048 (the Alviso Salt Works historic district) is located in both the Mountain View-Palo Alto and San Jose Environmental Study Areas and is considered eligible to the NRHP, and therefore, likely also eligible to the CRHR. Both USFWS and USACE have conducted research, mitigation efforts, and constructed projects within the Alviso Salt Works, therefore, it is recommended that Valley Water anticipates consultation with SHPO and follows mitigation measures similar to what was established in the Memorandum of Agreement (MOA) between the USFWS and SHPO (USFWS and CDFG 2017). The MOA formally ended in 2017, but the protocols outlined in the MOA likely represent what should be expected as mitigation measures required by the USFWS or USACE, or other involved agencies. The MOA allowed for work to be conducted within the historical district, including altering contributing features (e.g., levees) if the agreed upon mitigation measures were followed.

Geoarchaeological Sensitivity

Based on the desktop geoarchaeological sensitivity assessment and because most of the Environmental Study Areas are within historically modified salt marsh and evaporite collection ponds within heavily saturated, mud-rich bay margin environments, the area has low to no archaeological sensitivity. Therefore, it is unlikely to encounter buried or surface archaeological cultural resources in the Environmental Study Areas. A more detailed geoarchaeological sensitivity analysis is recommended when plans have been developed, particularly in areas of previously undisturbed soils or in locations where subsequent cultural resource studies, federal agencies, or tribal consultation identify additional cultural resources or a potential for resources.

5.7.4 Hazardous Materials and Contamination Evaluation

The San Jose Environmental Study Area would not come in contact with the voluntary cleanup site (Legacy Lagoon Biosolids [60001622]), additionally, Valley Water has flexibility regarding placement of the treatment facility. Therefore, it is assumed that the voluntary cleanup site and any impacted soils would be avoided. However, an environmental site assessment may be warranted.

Chapter 6. Land Use and Planning

6.1 Introduction

This chapter provides an evaluation of land use and planning issues related to the site/location of project options. Land use and planning issues evaluated in this chapter include management of the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) and San Jose/Santa Clara Regional Wastewater Facility (RWF) lands, salt ponds and flood protection levees, flood protection and habitat restoration projects, requirements of San Francisco Bay (Bay) and ocean plans such as the San Francisco Bay Plan (Bay Plan) (BCDC 2019a) and Water Quality Control Plan for Ocean Waters of California (Ocean Plan) (SWRCB 2019), municipal land use designations and applicable plans and ordinances, and recreation trails and facilities.

The Environmental Study Areas are used in this analysis for intake and brine management options, along with the Treatment Facility Planning Areas (TFPAs). The Environmental Study Areas are intentionally broad, as discussed in Chapter 5.1, "Introduction." The TFPAs do not include site-specific options for treatment facilities and conveyance infrastructure, and instead, are evaluated generally as a larger area where these components could be located during future planning of the project. Due to the proximity of project components options to the Bay and sea-level rise, flood hazards are addressed in the context of climate change and changes in sea-level rise in Chapter 8, "Climate Change."

A planning level of analysis is provided to the extent possible by using information obtained from publicly available databases and reports, planning documents, and regulatory plans. Using this information, constraints related to existing land use and policies, planning designations and projections, zoning, regulatory requirements, and need for easements, licenses, and right-of-way (ROW) are identified along with recommend next steps.

6.2 Don Edwards San Francisco Bay National Wildlife Refuge

Created in 1972, the Refuge is a part of the San Francisco Bay National Wildlife Refuge Complex, consisting of seven refuges spanning over 125 miles and 11 counties, and is managed by the U.S. Fish and Wildlife Service (USFWS). The national wildlife refuge system mission is to, "…administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (111 Stat 1252, dated October 9, 1997). Each refuge shall be managed to fulfill the mission of the National Wildlife System Improvement Act of 1997 (Improvement Act), as well as the specific purposes for which that refuge was established, if applicable. The stated purposes for which the Refuge was established are, "…for the preservation and enhancement of high significant habitat… for the protection of migratory waterfowl and other wildlife, including species known to be threatened with extinction, and to provide opportunity for wildlife-oriented recreation and nature study…" (86 Stat 3999, dated June 30, 1972).

The Refuge is located at the southern end of the South San Francisco Bay (South Bay) and extends into Alameda, Santa Clara, and San Mateo counties, as shown in **Figure 6-1**. The Refuge is bordered by the open waters of the South Bay and urban development on all other sides. The Refuge is considered the nation's largest urban national wildlife refuge and spans the traditional ancestral lands of four Tribal groups: the Lamchin, Puichon, Alson, and Tuibun. The Refuge manages over 30,000 acres of public lands, 38 miles of trails, a visitor center, and an environmental education center. The Refuge Environmental Education Center is located adjacent to the San Jose Environmental Study Area. The Alviso Unit of the Refuge covers all of the San Jose Environmental Study Area except a small portion on the southern end, the eastern two-thirds of the Mountain View-Palo Alto Environmental Study Area (from Adobe Creek to the east), and portions of Mountain View-Palo Alto TFPA near the shoreline. The San Jose and Potential San Jose TFPAs are outside the Refuge.

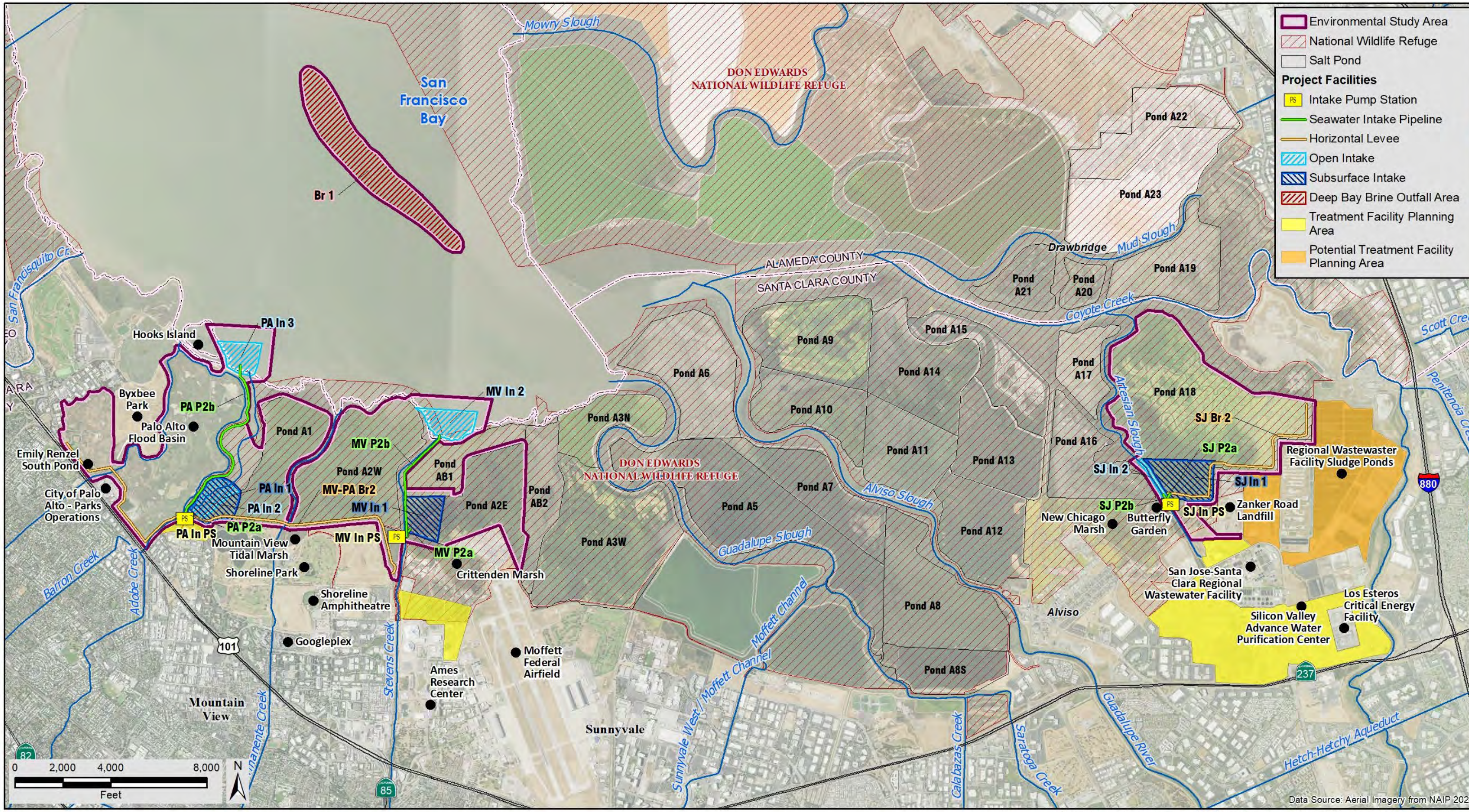
6.2.1 Comprehensive Conservation Plan

The *Comprehensive Conservation Plan* (CCP) was developed in 2012 to guide management of the Refuge over a 15-year period (USFWS and CDFW 2012). The Improvement Act (16 United States Code [USC] 668dd-668ee) requires that all refuges be managed in accordance with an approved CCP by 2012. The CCP provides a description of the desired future conditions and long-range guidance to accomplish the purposes for which the Refuge was established. The purpose of the CCP for the Refuge is to provide direction for management of the Refuge during the lifetime of the CCP.

The CCP identifies the following five goals for the Refuge (USFWS and CDFW 2012):

- **Goal 1 –** Protect and contribute to the recovery of endangered, threatened, and other special status species on the Refuge by conservation and management of the habitats on which these species depend.
- **Goal 2 –** Conserve, restore, enhance, create, and acquire habitats to support the diversity and abundance of migratory birds and other native flora and fauna that depend on Refuge lands.
- **Goal 3 –** Provide the local community and other visitors with compatible wildlife-oriented outdoor recreation opportunities to enjoy, understand, and appreciate the resources of the Refuge.
- **Goal 4 –** Through diverse environmental education, interpretation, and outreach opportunities, increase public awareness of the Refuge's purpose and the ecosystem of San Francisco Bay Estuary and promote environmental stewardship and conservation.
- **Goal 5 –** Instill community stewardship through volunteerism to support the Refuge's diverse purposes.

Figure 6-1. Don Edwards San Francisco Bay National Wildlife Refuge Boundaries



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Each of these goals includes strategies for obtaining the goals. The CCP will be reviewed and revised as required to ensure that established goals are still applicable and that the CCP is implemented as scheduled. In 2006, USFWS has also issued the Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3 of the USFWS and California Department of Fish and Wildlife [CDFW] Manual, 2006) for maintaining and restoring the biological integrity, diversity, and environmental health of the Refuge. This policy provides the Refuge Manager with an evaluation process to analyze the Refuge and recommend best management practices to prevent further degradation of environmental conditions. Additionally, several conservation and restoration plans such as the *Southern Pacific Shorebird Conservation Plan* and the *San Francisco Bay Joint Venture* have been established to help guide the direction of the CCP.

The CCP includes appropriate use determinations for livestock grazing, recreational boating, research and monitoring, and mosquito management as well as compatibility determinations for research and monitoring, livestock grazing, mosquito management, wildlife observation and photography, environmental education and interpretation, waterfowl hunting, recreational boating, and recreational fishing. The section below provides more discussion on these determinations.

6.2.2 National Wildlife System Improvement Act of 1997

For the Refuge to issue or approve ROW over the Refuge lands, a project would need to be a compatible use pursuance to the Improvement Act. The Refuge has a compatibility determination flowchart (USFWS 2000). Compatibility regulations and the appropriate use policy are discussed below in this section. In specific circumstances, the Refuge Manager should deny a proposed use without determining compatibility if the proposed use:

- Conflicts with any applicable law or regulation (e.g., Wilderness Act, Endangered Species Act, Marine Mammal Protection Act, Migratory Bird Treaty Act).
- Conflicts with the goals in an approved refuge management plan (e.g., CCP, comprehensive management plan, master plan, or step-down management plan).

If activities on water bodies not within an area of the Refuge are affecting Refuge resources, the Refuge Manager should seek state cooperation in managing the activities. If necessary, the Refuge Manager should consider Refuge-specific regulations that would address the problem or consult with the Office of the Solicitor regarding other legal remedies for injury to Refuge resources.

Appropriate Use Policy

The Appropriate Use Policy provides the policy and procedure for Refuge Managers to follow when deciding if uses are appropriate on a refuge, and also clarifies and expands on the compatibility regulations (discussed below). The Refuge Manager must find a use appropriate before undertaking a compatibility review of the use. An “appropriate use" as defined by the Appropriate Use Policy (603 FW 1 of the USFWS Manual) is a proposed or existing use on a refuge that meets at least one of the following four conditions:

1. The use is a wildlife-dependent recreational use as identified in the Improvement Act.

2. The use contributes to fulfilling the refuge purpose(s), the Improvement Act mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law.

3. The use involves the take of fish and wildlife under state regulations.

4. The use has been found to be appropriate as specified in Section 1.11 (603 FW 1 of the USFWS Manual) (USFWS and CDFW 2006).

If an existing use is not appropriate, the Refuge Manager will eliminate or modify the use as expeditiously as practicable. If a proposed use is not appropriate, the Refuge Manager will deny the use without determining compatibility. If a use is determined to be an appropriate refuge use, the Refuge Manager will then determine if this use is compatible. Although a use may be both appropriate and compatible, the Refuge Manager retains the authority to not allow the use or modify the use. Uses that have been administratively determined to be appropriate are the six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and take of fish and wildlife under state regulations.

Compatibility Regulations

The Refuge Manager will not initiate or permit a new use of a national wildlife refuge or expand, renew, or extend an existing use of a national wildlife refuge, unless the Refuge Manager has determined that the use is a compatible use and that the use is not inconsistent with public safety. "Compatible use" means a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with, or detract from, the fulfillment of the Improvement Act mission or the purposes of the Refuge. The term ''inconsistent'' in section 28(b)(1) of the Mineral Leasing Act of 1920 (30 U.S.C.185) means a use that is not compatible. The compatibility determination of a proposed use is provided in writing and referred to as such. When determined, the Refuge Manager will insert the required maximum 10-year reevaluation date.

Evaluating Potential Impacts

In assessing the potential impacts of a proposed use on a refuge's purpose(s) and the Improvement Act mission, Refuge Managers will use and cite available sources of information, as well as their best professional judgment, to substantiate their analysis. Sources may include planning documents, environmental assessments, environmental impact statements, annual narrative reports, information from previously conducted or ongoing research, data from refuge inventories or studies, published literature on related biological studies, state conservation management plans, field management experience and consultation with wildlife research professionals, state wildlife resource managers and industry professionals, etc. To the extent possible, the determination of anticipated impacts should include an explanation of the impacts on these specific conservation goals and how that affects fulfilling refuge purposes or the Improvement Act mission. Importantly, the Improvement Act allows modification of a proposed use through avoidance, minimization, and other steps to reduce/avoid impacts to habitat values; however, compensatory mitigation is not allowed to make a proposed refuge use compatible, except by replacement of lost habitat values as provided in specific provisions related to existing ROWs.

Public Review and Comment

The Refuge Manager must provide an opportunity for public review and comment on the proposed refuge uses(s) before issuing a final compatibility determination. Public review and comment include actively seeking to identify individuals and organizations that reasonably might be affected by, or interested in, a refuge use. At a minimum, the Refuge Manager will solicit public comment by placing a public notice in a newspaper with wide local distribution. The public will be given at least 14 calendar days to provide comments following the day the notice is published. For evaluations of controversial or complex uses, the Refuge Manager should expand the public review and comment process to allow for additional opportunities for comment.

6.3 San Jose/Santa Clara RWF Lands

6.3.1 Existing RWF Land Uses

Located on approximately 2,600 acres, the San Jose/Santa Clara RWF lands include the wastewater treatment operations, former Salt Pond A18, and 687 acres of “buffer lands” located along State Route 237, as shown in **Figure 6-2**. The buffer lands were purchased over the past 50 years to provide a buffer that limited the community’s exposure to odors emanating from the RWF’s treatment processes and limits risk in the event of an accidental chemical release. The RWF’s existing operations footprint currently includes an operations area, residual solids management area, and legacy biosolids lagoons which together comprise a total land area of approximately 950 acres (San Jose 2013).

The southern portion of the San Jose Environmental Study Area, beyond Pond A18 and Artesian Slough, is located primarily on a small area of buffer lands. The San Jose TFPA is also located on buffer lands and the San Jose Potential TFPA is located at the legacy biosolids lagoons and residual solids management area.

Pond A18 – Water Quality Control

The city of San Jose purchased the 860-acre Pond A18 from Cargill, Inc. (Cargill) in 2005. Pond A18 is a former salt-production pond that is owned and operated by the San Jose/Santa Clara RWF. Pond A18 is separated from tidal flows of the Bay by a levee and the North and South Gate Structures. These structures control water flow between Artesian Slough, Coyote Creek, and Pond A18 through two large pipes buried within the Pond A18 levee at each of the gate structures. The water control structures are operated by the RWF under the existing Waste Discharge Requirements described in the San Francisco Bay Regional Water Quality Control Board’s (San Francisco Bay RWQCB) Order Number R2-2005-0003 and included specific water quality limits (San Jose 2017). The RWF uses Pond A18 to buffer the wastewater facility from adjacent land uses, promote and maintain existing open water habitat in the pond, and avoid seasonal pond formation. The Pond A18 levee road is located on USFWS property leased by the city of San Jose (2017).

Figure 6-2. San Jose/Santa Clara RWF Existing Land Uses

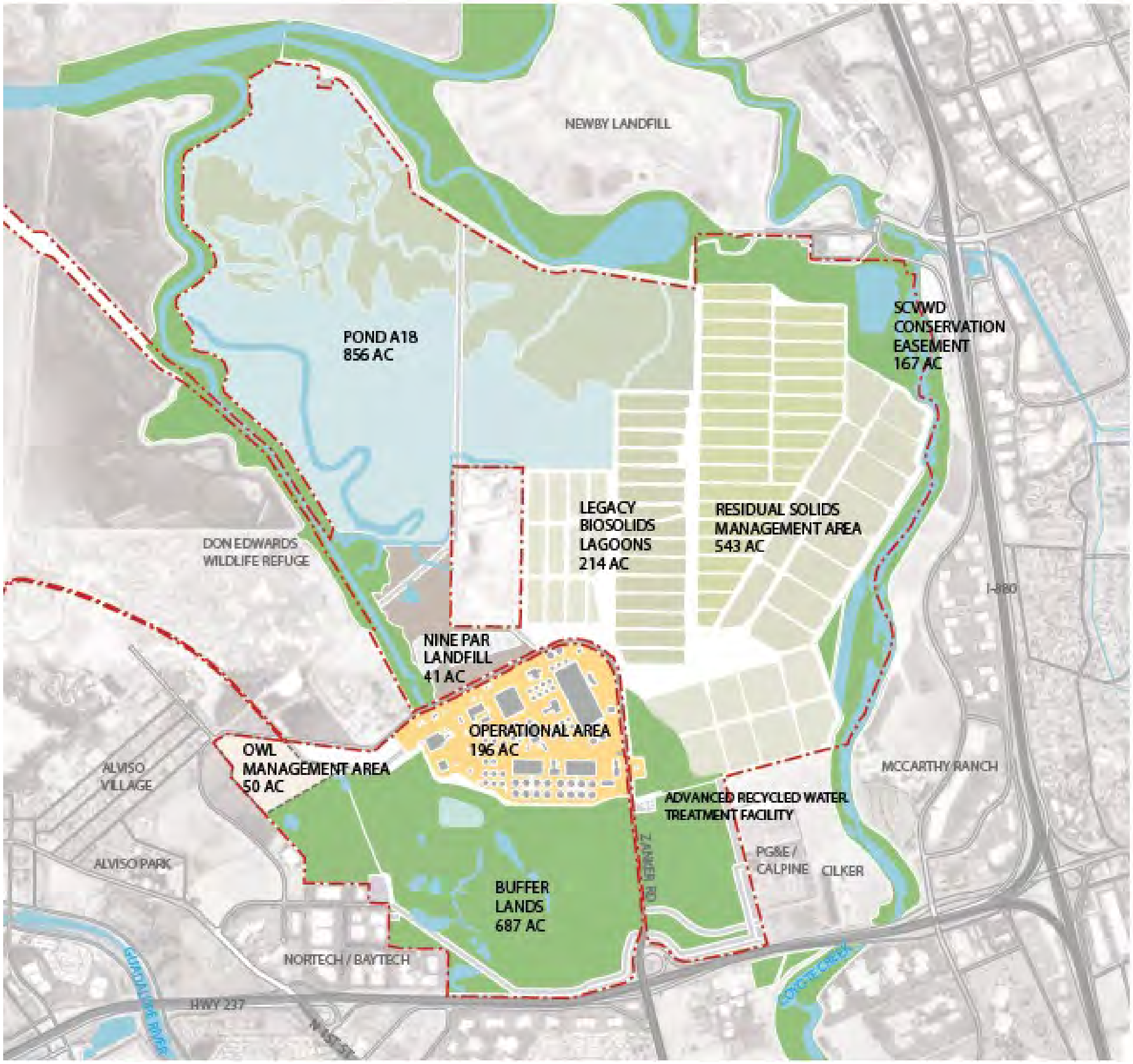

Figure Source: City of San Jose 2013

Buffer Lands

Buffer lands are managed in compliance with the following policy (San Jose 2013).

- Policy 6-31 Use of San Jose/Santa Clara RWF Lands

  It is the policy of the city of San Jose that the highest priority land use for RWF lands is to support present and future operations of the RWF and National Pollution Discharge Elimination System (NPDES) permit compliance consistent with the Envision San Jose 2040 General Plan and the Alviso Master Plan (City of San Jose 2011 and 1998, respectively).

The following additional policies apply to buffer lands as defined above. In addition, these policies also apply to any short term uses proposed for the RWF expansion areas.

1. Buffer Land uses must ensure sufficient buffer for odors and potential toxic releases
2. Buffer Land uses must support NPDES permit compliance and not constrain the RWF's flexibility to respond to unknown future requirements
3. Buffer Land uses must protect existing biological resources
4. Buffer Land uses should provide environmental benefit
5. Buffer Land uses should encourage public support for RWF land uses consistent with RWF operations
6. Buffer Land uses must be compatible and consistent with the city of San Jose General Plan and the Alviso Master Plan
7. Buffer Land uses may be considered that provide "Dual Use" benefits

6.3.2 San Jose/Santa Clara Regional Wastewater Facility Master Plan

The *San Jose/Santa Clara Water Pollution Control Plant's Master Plan* (Plant Master Plan) was prepared in November 2013 to develop a central planning document to guide improvements at the RWF for the next 30 years (through the year 2040) and includes a plan for future development, restoration, and use of RWF lands (City of San Jose 2013). With the implementation of the Plant Master Plan, the operations footprint will reduce to approximately 440 acres, and it is estimated that approximately 1,500 acres will become available for non-operational uses, including habitat and ecological restoration, recreation, and economic development. **Figure 6-3** shows the land use plan in the Plant Master Plan (San Jose 2013).

With implementation of the land use plan, water quality operation of Pond A18 is not anticipated to change, the San Jose TFPA would be in several uses –primarily economic development areas and owl habitat – and the Potential San Jose TFPA would primarily be in flexible space and areas to be preserved for wetland habitat.

As part of the Plant Master Plan, the city of San Jose would work with the *South San Francisco Bay Shoreline Study* (Shoreline Study) for the development of a feasibility study to construct a levee along the north portion of the RWF site (USACE 2015). A terraced levee is proposed to mimic natural landscapes at the edge of the South Bay with each terrace representing a different ecotone appropriate for the terraces' elevation and exposure to tidal flows. Marsh and mudflats would be integrated below the levee design within the area of the existing Pond A18 so that the entire system would work together to provide flood control, habitat, and water quality benefits (San Jose 2013). The terraced levee would include an inboard levee that would conform to standards of the U.S. Army Corps of Engineers (USACE). (San Jose 2013). See Section 6.4.4, "South San Francisco Bay Shoreline Study," for further discussion of the Shoreline Study.

Figure 6-3. San Jose/Santa Clara RWF Land Use Plan

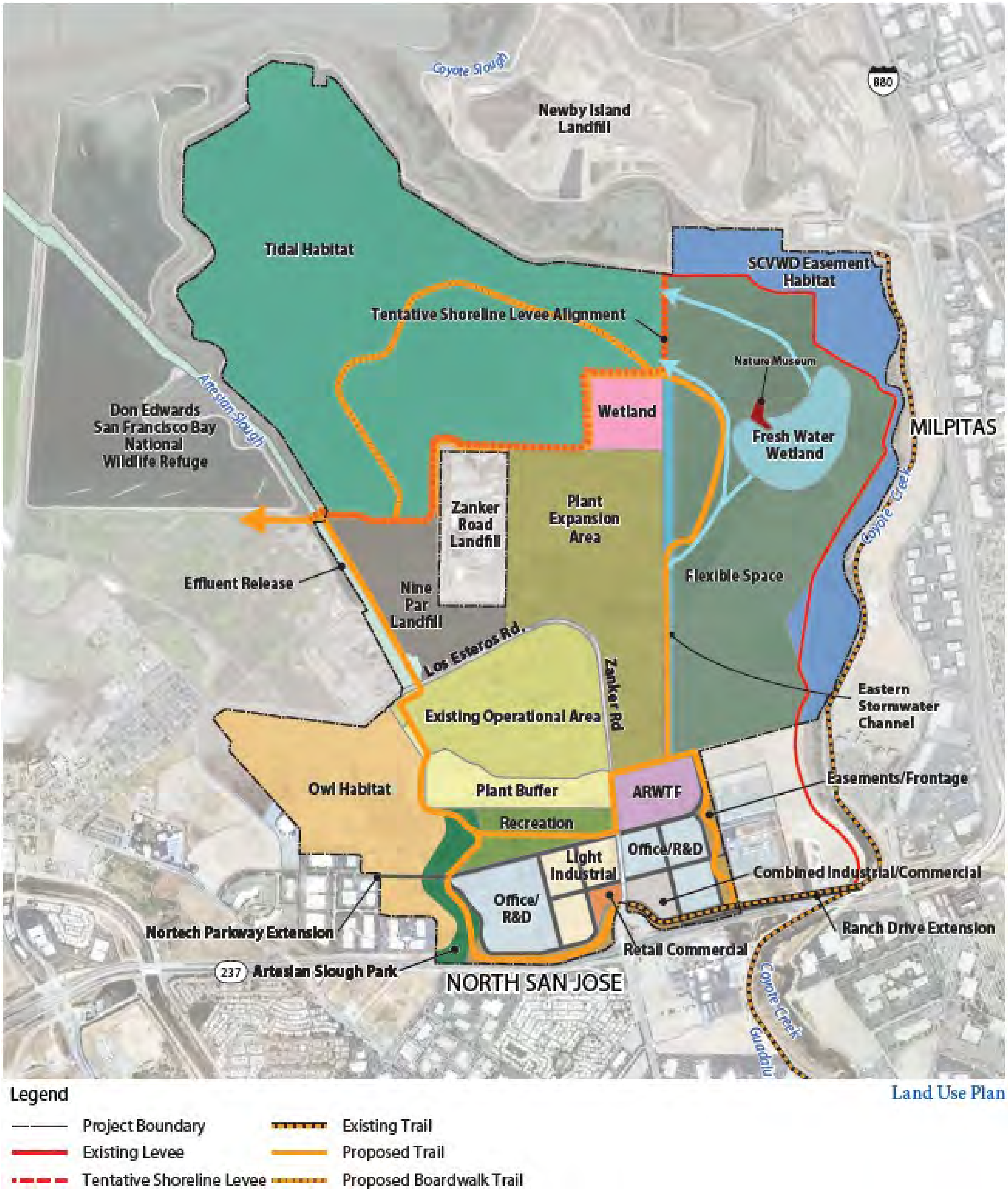

Figure Source: City of San Jose 2013

6.4 Flood Protection and Habitat Restoration

This section briefly discusses the history of salt ponds, existing flood protection levees, and flood protection and habitat restoration projects within and adjacent to the Environmental Study Areas and TFPAs.

6.4.1 Salt Ponds History

Leslie Salt was the major commercial producer of salt in the Bay, acquiring approximately 36,000 acres of salt ponds. In the mid-1970's, USFWS acquired approximately 15,000 acres of salt ponds in the South Bay from Leslie Salt. These salt ponds became part of the Refuge. In 1978, Cargill purchased Leslie Salt. In 2003, Cargill sold salt ponds to USFWS and California Department of Fish and Game (now known as the California Department of Fish and Wildlife), with USFWS acquiring 9,600 acres at the western end of Dumbarton Bridge (the Ravenswood Pond complex) and along the Bay from Mountain View to Fremont (the Alviso Pond complex), and CDFW acquiring the remaining 5,500 acres just south of the eastern end of the San Mateo Bridge (the Eden Landing Pond complex). Together these agencies prepared the *Initial Stewardship Plan* (ISP) for the ponds (USFWS and CDFW 2003). The ISP included construction of water control structures that would allow the former salt ponds to be reconnected to the Bay and to preserve their habitat value, while a long-term restoration plan was developed. The ISP also included the restoration of an initial 479 acres of ponds in the far southeastern corner of the Bay (Ponds A19, A20, and A21) to full tidal inundation, which occurred in March 2006 (USFWS and CDFW 2007).

6.4.2 Flood Protection Levees and Ownership

The National Hydrology Dataset was reviewed to identify USACE federally constructed levees, as shown in **Figure 6-4** (USACE 2016). The 6.72-mile-long Coyote Creek Levee System, owned by Valley Water, is the only USACE federally constructed levee near the seawater desalination project (desalination project) and is located east of the San Jose Environmental Study Area. This levee system has been turned over to Valley Water for operation and maintenance. Levees within the Environmental Study Areas, TFPAs, and 100 feet of these areas are shown along with the designated owner in **Figures 6-5** and **6-6** for the San Jose Environmental Study Area and Mountain View–Palo Alto Environmental Study Area, respectively (SFEI 2022). Note that the Environmental Study Areas are not shown on **Figures 6-5** and **6-6** because the boundaries overlap with many of the levees and it makes them difficult to distinguish.

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Figure 6-4. USACE Federal Levees in the National Hydrology Dataset

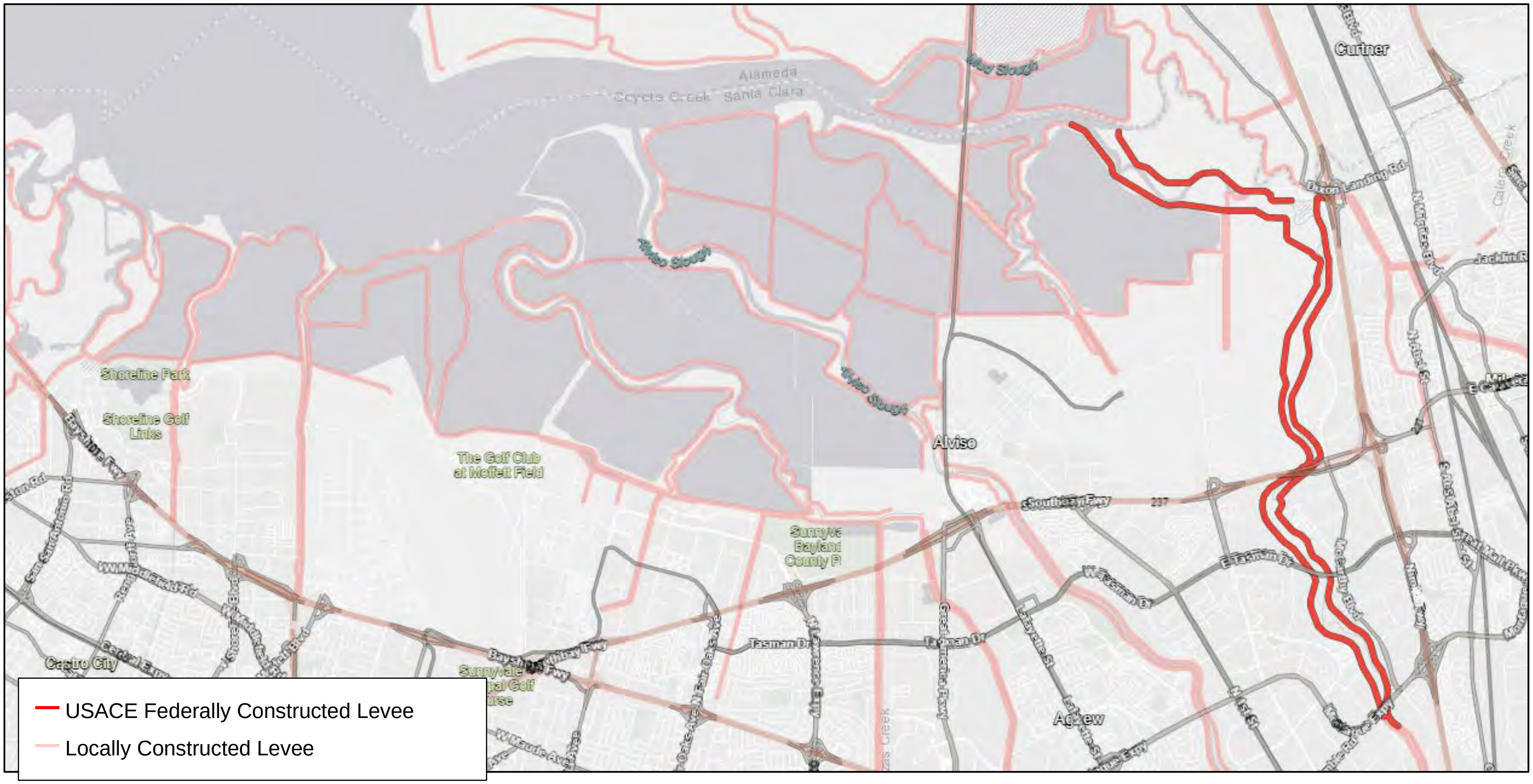

Figure Source: USACE 2016

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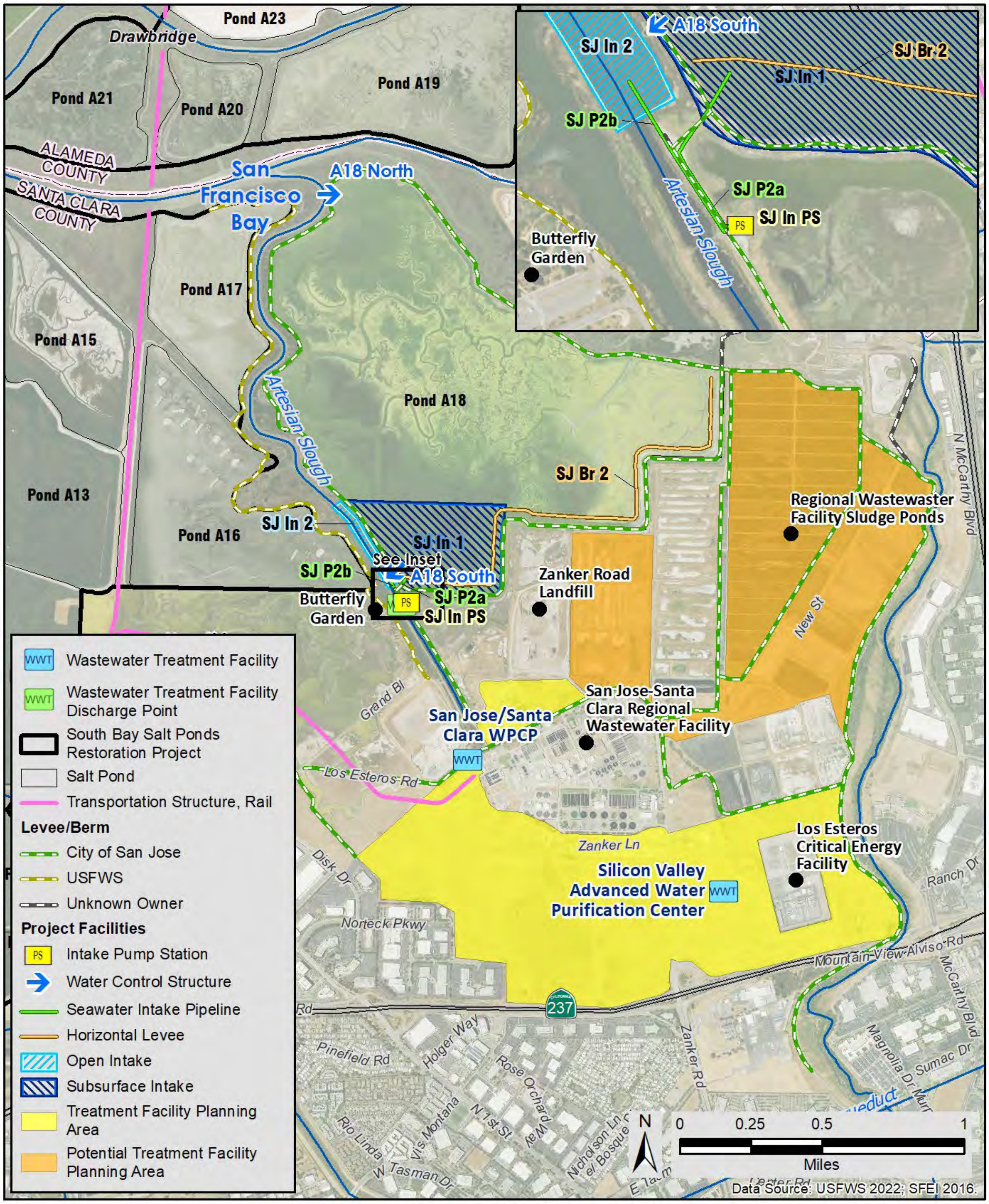
Figure 6-5. Existing Flood Protection Levees in San Jose



Z:\Projects\2004818_ValleyWater_Desal_TO4\ValleyWater_Desal_BayShoreInventory_SanJose_20230125.mxd
02Feb2023 RS

Note: Environmental Study Area not show to prevent confusion with overlapping levee alignments
Sources: Levee data – SFEI 2022; Figure – GEI 2022.

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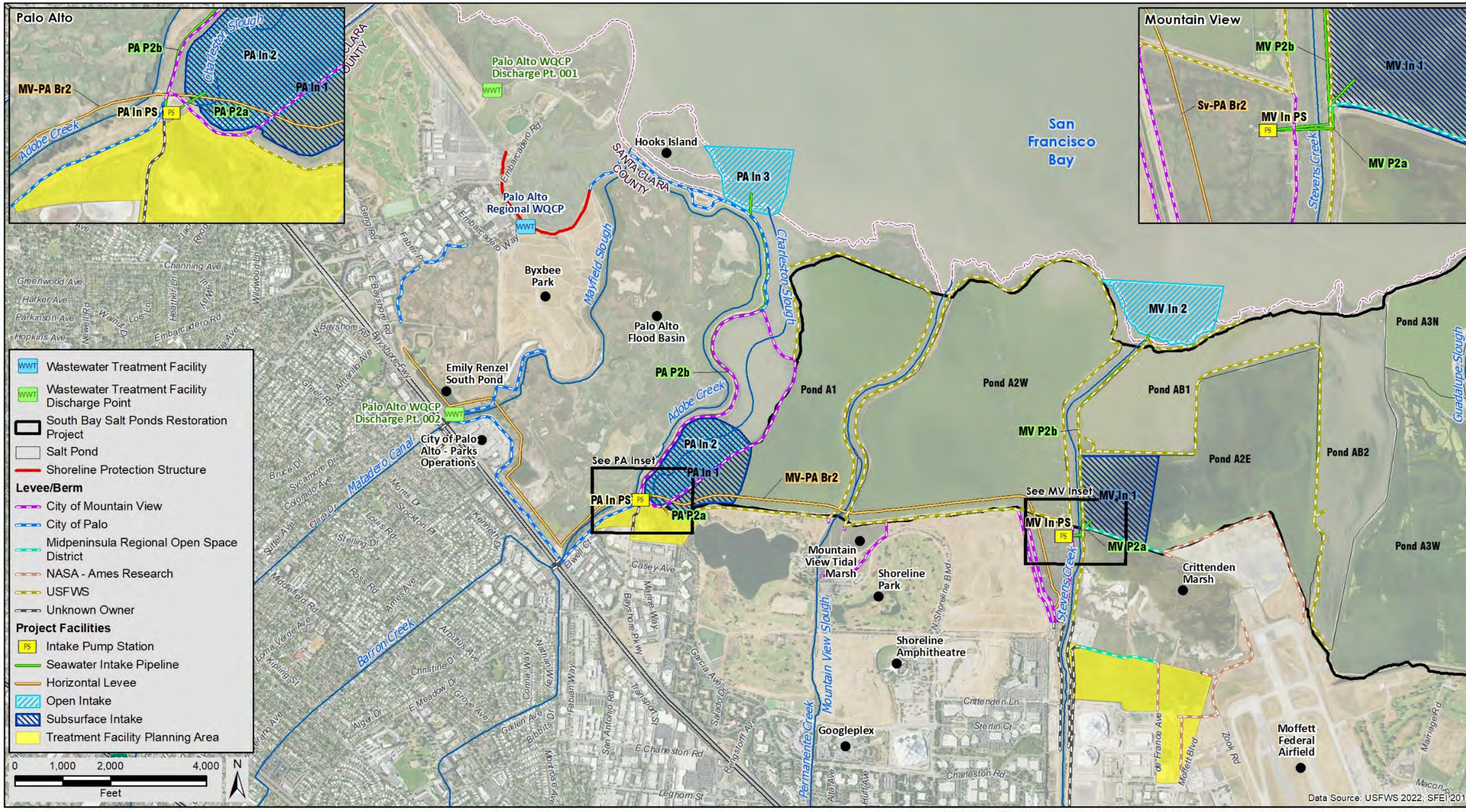
Figure 6-6. Existing Flood Protection Levees in Mountain View and Palo Alto



Note: Environmental Study Area not show to prevent confusion with overlapping levee alignments
Sources: Levee data – SFEI 2022; Figure – GEI 2022.

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6.4.3 South Bay Salt Ponds Restoration Project

The South Bay Salt Pond Restoration Project (SBSP Restoration Project) proposes to restore approximately 15,000 acres of former salt ponds located around the edge of the South Bay (USFWS and CDFW 2007). The project is intended to restore and enhance wetlands in the Bay, while also providing flood management and wildlife-oriented public access and recreation. The SBSP Restoration Project was developed in response to the historic loss of tidal marsh ecosystems and habitats in the Bay due to conversion of land to salt ponds, agricultural areas, and urban development. The former salt-production areas are no longer used for that purpose, and, in many cases, they are no more saline than the Bay itself.

The longer-term planning effort involves a 50-year programmatic-level plan for restoration, flood risk management, and public access and was completed in January 2009. Phase 1 has been completed. Phase 2 is a collaborative effort among federal, state, and local agencies working with scientists and the public to develop and implement project-level plans and designs. The ponds that were neither part of Phase 1 nor Phase 2 will continue to be actively managed according to the goals set forth in the ISP and the Refuge's Adaptive Management Plan (USFWS and CDFW 2007; Appendix D) until further implementation planning and the appropriate adaptive management studies are completed. These phases may be included in future project phases as well.

Ponds in the Mountain View–Palo Alto Environmental Study Area are within the Alviso Mountain View Pond Cluster, which is within the overall Alviso Pond complex. Ponds A1 and A2W are within the Mountain View Ponds portion of Phase 2 and are discussed further in this section below. Pond A2E is also proposed for restoration, but because it is not within Phase 2, a timeline for restoration activities has not yet been established.

Phase 2: Alviso Mountain View Pond Cluster

The Alviso Mountain View Pond Cluster consists of Pond A1, Pond A2W, the levees surrounding each pond, some of the fringe marsh outside of the pond and slough levees, Permanente Creek, and Mountain View Slough. Charleston Slough, which is owned by the city of Mountain View, is not part of the Refuge and is not included in the Environmental Study Areas, but one of the surrounding levees –the Coast Casey Forebay levee – is included because it also borders Pond A1. The Mountain View Ponds have limited hydrologic exchange with the Bay, because one small, culverted inlet exists into Pond A1, a siphon to connect it to Pond A2W, and an outflow connection from Pond A2W back to the Bay (AECOM 2017).

The goal is to restore the Mountain View Ponds to tidal marsh by connecting them to the Bay, adjacent streams, and sloughs by intentionally breaching the levees. After breaching, the ponds would accrete sediment until they reach marsh plain elevations and begin to develop marsh vegetation. The proposed project also includes other habitat enhancements, flood risk management components, and additional public access and recreation features. Actions proposed at the Mountain View Ponds are shown in **Figure 6-7**.

Key components of the Mountain View Ponds restoration project that are related to the location of options for the desalination project summarized as follows (AECOM 2017):

- **Pond A1 western levee –** Most of the western levee of Pond A1 would be raised to provide flood risk management to inland areas west and south of the Mountain View Pond Cluster. Levee breaches in Pond A1 would remove some of the de facto flood protection currently provided by the outboard levees of Pond A1 but raising the western levee of Pond A1 would offset that loss and maintain the current levels of flood risk management.
- **Cost Casey Forebay levee –** To offset the loss of de facto protection provided by Pond A1, the Coast Casey Forebay levee that is along the western end of the southern border of Pond A1 would be improved between the Palo Alto Flood Control Basin (Flood Control Basin) levee and the high ground in Shoreline Park. The city of Mountain View, which owns that levee, seeks to raise the entire length of that levee even beyond its intersection with the Pond A1 levee for protection against sea-level rise.
- **Habitat Transition Zones –** Habitat transition zones would be constructed in Ponds A1 and A2W inside the southern edges of Ponds A1 and A2W to create transitional habitat between the lower elevation of the pond bottoms and the uplands and levees behind them. Once vegetated, the habitat transition zones would provide habitat for salt marsh harvest mouse and other terrestrial species. They would also provide a gentle slope for dissipation of wave energy and reduction of erosion potential, thereby protecting the closed landfill below Shoreline Park. The slope of these features in Pond A1 would be varied to provide a range of different slopes including slopes at 10:1, 20:1, 30:1 and 40:1 (horizontal:vertical). The intent of this variation is to execute a pilot project that would provide observational data about the habitat values, erosion protection, and sea level rise adaptation that would result from these varying slopes. In Pond A2W, the slope would be 30:1.
- **Habitat Islands –** Nesting and roosting habitat for shorebirds, terns, and dabbling ducks would be created through the construction of islands in Ponds A1 and A2W.

Figure 6-7. South Bay Salt Ponds Restoration Project Phase 2: Alviso Mountain View Pond Cluster

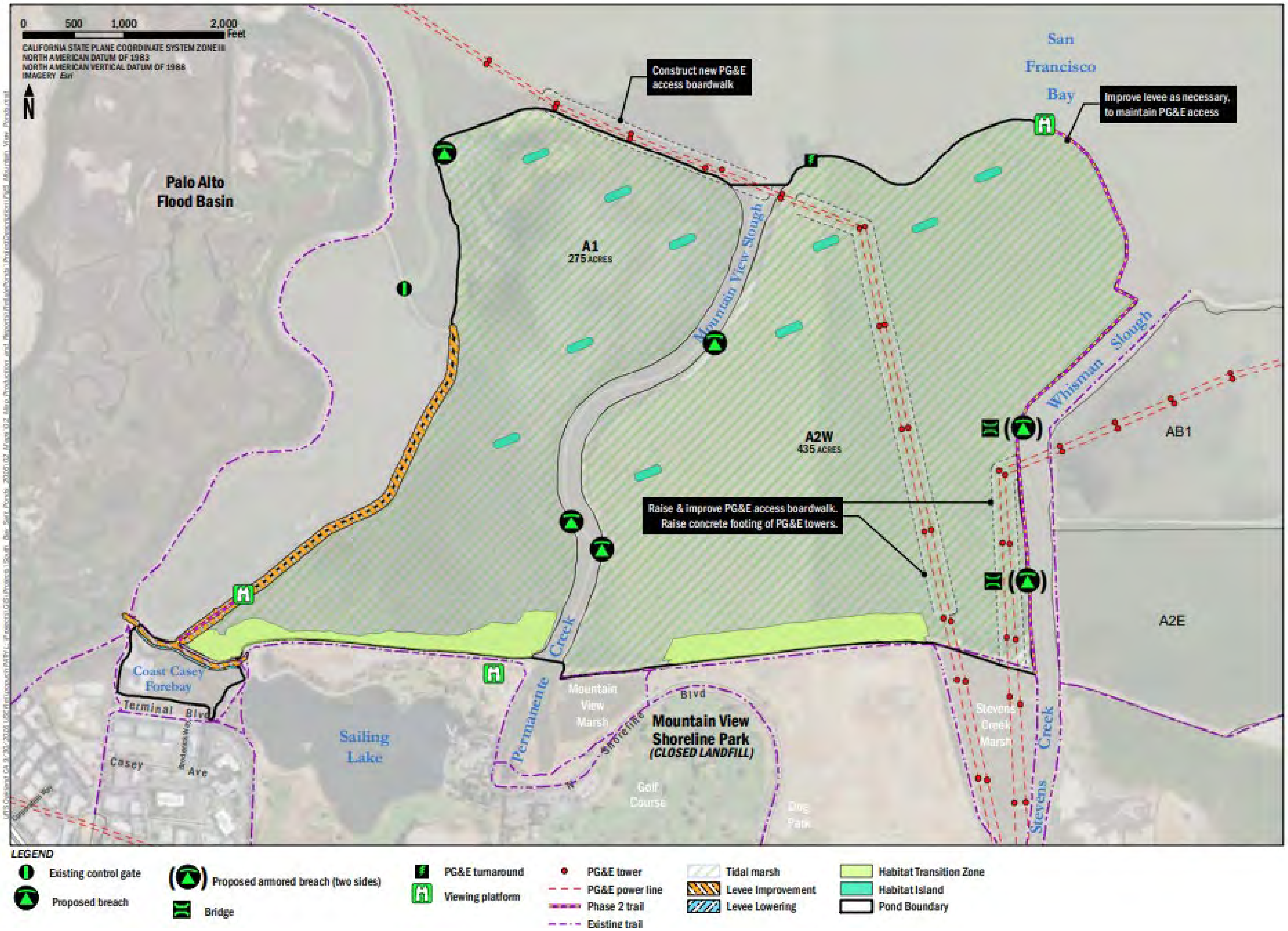

Figure Source: AECOM 2017

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6.4.4 South San Francisco Bay Shoreline Study

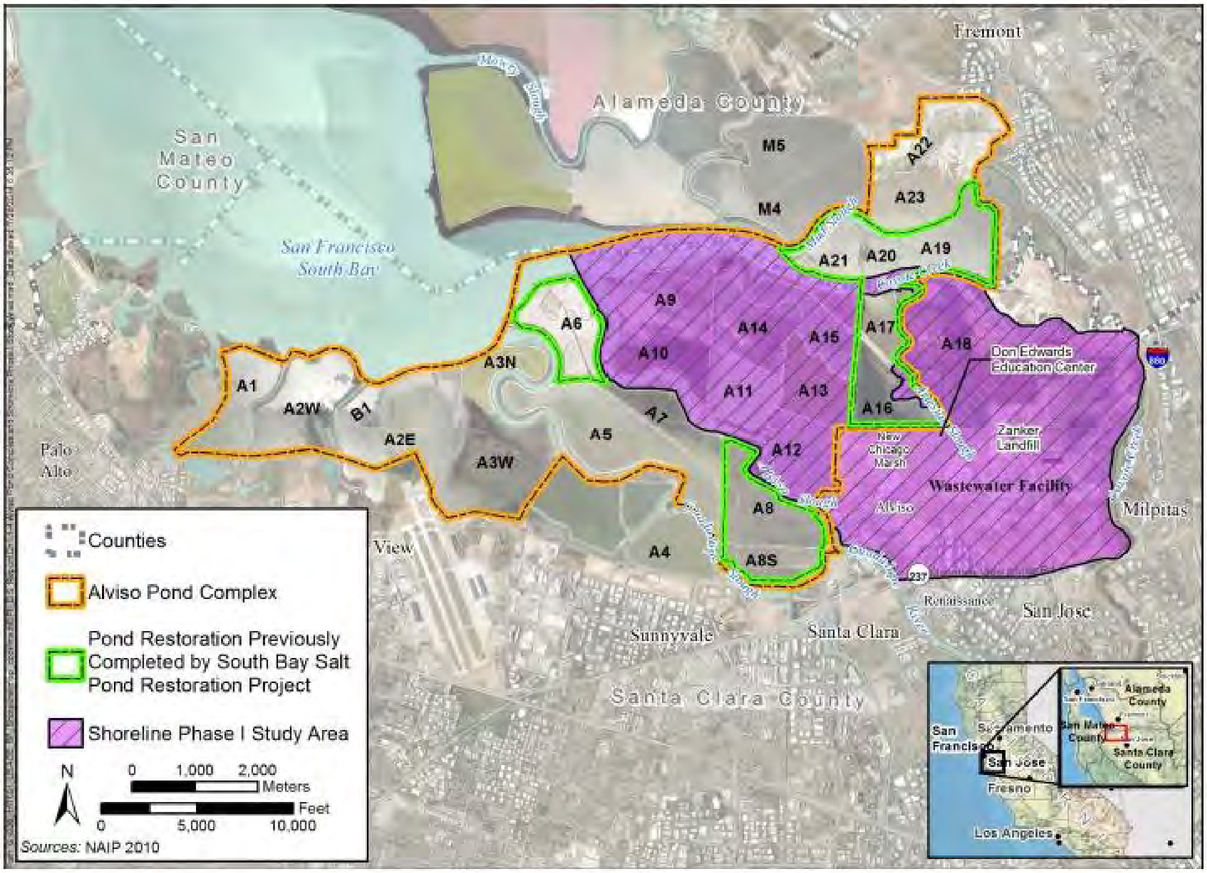
The SBSP Restoration Project was planned in close coordination with USACE's congressionally authorized *South San Francisco Bay Shoreline Study* (Shoreline Study). The Shoreline Study identifies and recommends projects for flood damage reduction, ecosystem restoration, and related purposes such as public access for federal funding. The SBSP Restoration Project area is included in the Shoreline Study since the goals and objectives of these projects are very similar. The Shoreline Study must ensure 100-year tidal flood protection is in place before the SBSP Restoration Project can be completed.

Based on initial reconnaissance analysis completed in 2004, the decision was made to phase the planning effort for the Shoreline Study to capture the large geographic extent of the South Bay; the complexity of the hydrology, hydraulics, and combined flood risk management and ecosystem restoration components; and in anticipation of federal and non-federal funding availability. The geographic area was generally split into three primary study areas: Ravenswood Pond Complex and San Mateo County, Alviso Pond Complex and Santa Clara County, and Eden Landing. Most of the Mountain View–Palo Alto and San Jose Environmental Study Areas are located within the Alviso Pond Complex, specifically in Ponds A1, A2W, A2E, and A18 (**Figure 6-8**).

On October 24, 2005, USACE, USFWS, Valley Water, and the State Coastal Conservancy initiated the *South San Francisco Bay Shoreline Interim Feasibility Study* (2005 Shoreline Study). The 2005 Shoreline Study area covered the southern portion of the South Bay, including the entire Alviso Pond complex and other lands and waters stretching from southwest Fremont to Palo Alto. In 2011, the USACE San Francisco District and non-federal sponsors agreed to proceed with implementation of the 2005 Shoreline Study following a phased project implementation approach. Lessons learned from completing the 2005 Shoreline Study could then be applied to the remaining study areas more expeditiously under future interim feasibility studies. The South San Francisco Bay Shoreline Project would be implemented in three phases, encompasses 18 miles of coast in Santa Clara County, which is divided into 11 sections, called Economic Impact Areas (EIAs). EIA 11 was chosen to be the first area to be focused on. EIA 11, also known as the Alviso subarea, is located within Santa Clara County and consists of the area between the mouth of the Guadalupe River (to the west), the mouth of Coyote Creek (to the east), and extends south to include both the community of Alviso and the San Jose/Santa Clara RWF.

Phase 1 consists of EIA 11 and is discussed below. The San Jose Environmental Study Area is located with the boundaries of planned Phase 1 activities. Phase 2 is currently in design and is anticipated to begin in 2027. Phase 2 efforts will consist of pond berm breaching and restoration in Ponds A9, A10, and A11. Phase 3 is currently in design and is anticipated to begin in 2032. Phase 3 efforts will consist of pond berm breaching and restoration in Ponds A13, A14, and A15.

Figure 6-8. Alviso Pond Complex and Shoreline Phase I Study Area



Source: USACE 2015.

South San Francisco Bay Shoreline Levee Project (Phase I)

The first phase of the South San Francisco Shoreline Project includes implementing work in EIA 11 because this area is at high risk of tidal flooding due to being below sea level and being protected by only remanent salt pond berms that were not designed for flood protection. Additionally, EIA 11 includes important regional infrastructure, such as the San Jose/Santa Clara RWF and the Silicon Valley Advanced Water Purification Center. EIA 11 consist of a 4-mile-long coastal levee to connect the existing Alviso Slough and Coyote Creek Levees east of the San Jose/Santa Clara RWF. Phase I includes an ecotone levee along the north portion of the RWF site, as discussed in Section 6.3.2, "San Jose/Santa Clara Water Pollution Control Plant Master Plan." The Phase 1 project is further broken down into three phases (**Figure 6-9**).

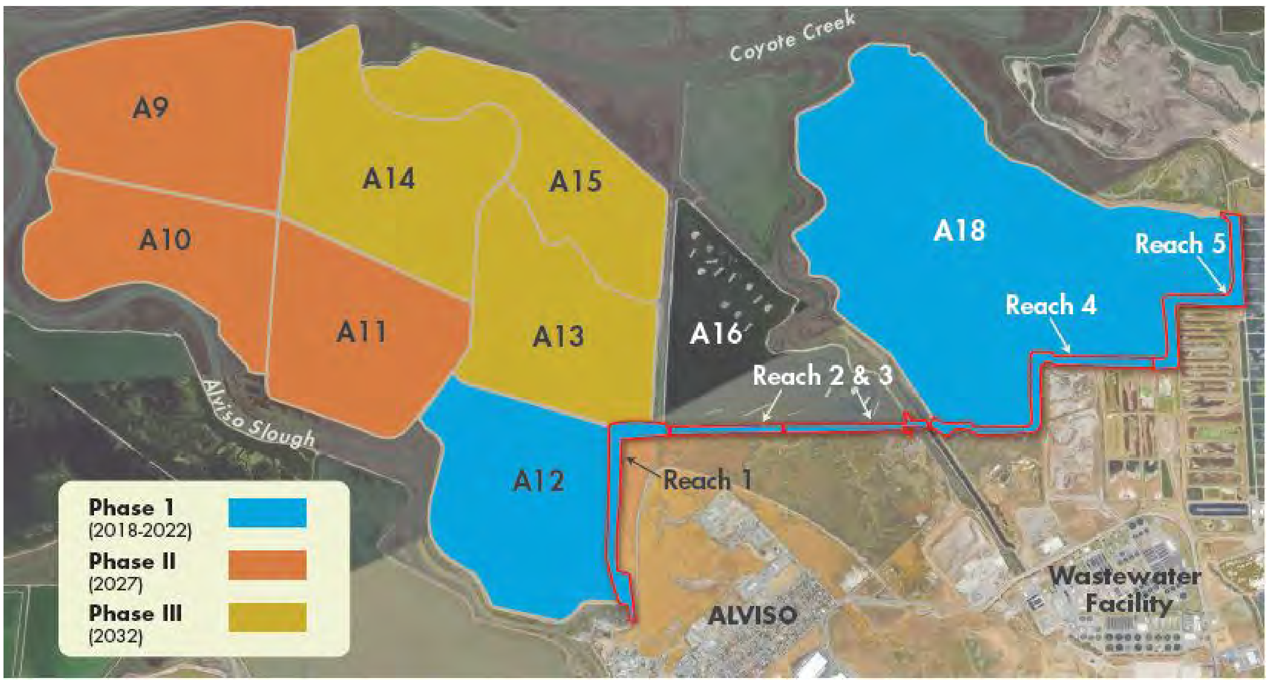
Construction of the first phase of the Phase I Project commenced in November 2021. The first phase of the project stretches along Ponds A12, A16, and A18 and consists of:

- Stockpiling of fill material for the project in Ponds A12 and A18
- Constructing 4 miles of coastal levees in Reaches 1–5
- Constructing approximately 12,000 linear feet of tidal marsh habitat along Reaches 1, 4, and 5

- Pond berm breaching and restoration in Ponds A12 and A18
- Providing trail connectivity to the Guadalupe River/Alviso Slough, Coyote Creek, and the Bay Trail
- Constructing pedestrian bridges and observation platforms

USACE is starting construction along Reaches 1 through 3. Reach 1 begins at the Alviso Marina County Park and ends at the Union Pacific Railroad. Reaches 2 and 3 run from the railroad to Artesian Slough. The project work will occur primarily along Alviso Marina County Park and USFWS Alviso Pond complex. As of April 2022, the design of Reaches 4 and 5 are on hold while construction phasing, access points, haul routes, staging, and easements are being addressed with the property owner. (Valley Water 2019, 2022).

Figure 6-9. San Francisco Bay Shoreline Study Phase I Project Implementation (EIA 11)



Source: Valley Water 2019

6.4.5 Palo Alto Flood Control Basin Tide Gate Structure Replacement Project

As discussed in Section 5.3, "Water Resources," flows into and out of the Flood Control Basin are controlled by a tide gate structure to provide flood protection, maintain habitat, and provide vector control. The flood protection purpose of the tide gates is to regulate flows through the Flood Control Basin such that when the water surface elevation in the basin is higher than the tidal elevation of the Bay, the tidal flap gates are pushed open by water pressure and discharge water from the basin to the Bay. When the water surface elevation in the basin is lower than the Lower South Bay, the flap gates are held shut by water pressure from the Lower South Bay to prevent full tidal inundation (muted tidal influence occurs via a single, manually operated sluice gate). In 2011, Valley Water discovered that water was flowing beneath the structure, undermining the function of the tide gates and, potentially, its structural stability. Temporary emergency repairs to arrest flow were completed in 2012. After years of planning and coordination with agencies including the city of Palo Alto and San Francisquito Creek Joint Powers Authority's (SFCJPA), a project was selected to replace the tide gates nearby the existing location. The selected project location is adjacent to the Mountain View – Palo Alto Environmental Study Area. The project would involve construction of a new 132-foot-wide tide gate structure slightly inboard (upstream) and southeast of the existing 113-foot-wide deteriorating tide gate structure, removal of the existing tide gate structure and levee, and construction of a new levee that ties into the new tide gate structure. Construction is currently scheduled to begin in September 2023 (Valley Water 2021).

6.4.6 Other Projects

Additionally, the following flood protection and habitat restoration projects are related to the project area.

- **Strategy to Advance Flood Protection, Ecosystems, and Recreation (SAFER) Project –** SFCJPA's SAFER Project is being planned to provide coastal flood protection for communities in East Palo Alto and Menlo Park as well as restored tidal wetland habitat and improved recreational opportunities along 7 miles of the Bay shoreline in San Mateo County. A Notice of Preparation of an Environmental Impact Report was prepared for the SAFER project in April 2022. Based on review of this document, the SAFER project's southern boundary is San Francisquito Creek and is not located on lands within the Environmental Study Areas (SFCJPA 2022).
- **Charleston Slough Tidal Marsh Restoration Project –** This project includes 101.3 acres of tidal marsh compensatory mitigation which was completed in 1998. The restoration effort was implemented due to the conversion of vegetation tidal marsh to brackish pond from 1975 to 1998 resulting from severely restricted tidal exchange. Installation of a new culverts with self-closing tide gates allow for enhanced tidal exchange and sediment deposition in the Inner Charleston Slough (Stillwater Science 1999).
- **Stevens Creek Tidal Marsh Project** – A tidal marsh compensatory mitigation was completed for 30.65 acres (SFEI 2022). The Stevens Creek Tidal Marsh is located within the Mountain View-Palo Alto Environmental Study Area.
- **Emily Renzel Wetlands –** Consists of 27 acres of restored freshwater pond and salt marsh restoration that was constructed in 1992. The restoration site is located within and adjacent to the proposed Mountain View-Palo Alto Environmental Study Area. The Emily Renzel Wetlands currently has muted salt marsh habitat that is hydrologically connected to the inner harbor through pipes, and its freshwater pond is fed by tertiary treated wastewater from the Palo Alto Regional Water Quality Control Plant (Palo Alto 2019a).

6.5 Recreation Trails and Facilities

Recreational trails and facilities within the vicinity of the San Jose Environmental Study Area are shown in **Figure 6-10** and those within vicinity of the Mountain View-Palo Alto Environmental Study Area are shown in **Figure 6-11**. The Bay Trail is currently more than 350 miles in length and connects communities, parks, open spaces, schools, and transit that are located within the Environmental Study Areas. The Bay Trail along with numerous local trails are located along the shoreline near the project options. There are two conservation easements owned by the USFWS that are designated as closed/no public access on portions of the Bay Trail located along the south end of Charleston Slough/Southwest corner of Pond A1 and along North Shoreline Boulevard near Shoreline Park. This data was obtained from the California Conservation Easement Database (SFEI 2022). Byxbee Park is located adjacent to the Flood Control Basin. A bridge over the tide gate in the Flood Control Basin connects Byxbee Park with the Adobe Creek Loop Trail. The Refuge education center is located just outside of and adjacent to the San Jose Environmental Study Area.

6.6 Bay and Ocean Planning

6.6.1 San Francisco Bay Plan

The Bay Plan was prepared during three years of study and public deliberation by the members of the San Francisco Bay Conservation and Development Commission (BCDC 2019a). The following sections of the Bay Plan provide critical regulations related to Valley Water's desalination project.

Desalination

In 2005, BCDC prepared the *Staff Report Desalination and the San Francisco Bay* (Staff Report), concluding that: 1) desalination has high-energy costs, can have aquatic environmental impacts, and desalination plants and pipelines can displace and adversely affect terrestrial habitats; 2) measures are available to avoid and, where avoidance is impracticable, minimize these environmental impacts; and 3) that economically and environmentally acceptable desalination can be considered part of a balanced water portfolio to meet the water needs of the Bay Area (BCDC 2005). The Bay Plan was amended based on the Staff Report, as discussed below.

The Other Uses of the Bay and Shoreline section of the Bay Plan states the following related to desalination:

d. Desalination is the process of removing salt, contaminants, and other minerals from saline water to produce fresh drinking water. The intake of Bay water to a desalination plant can pull (entrain) small aquatic organisms (e.g., larvae, eggs, plankton) into the water intake structure where they can become trapped and die. Entrainment can be minimized by such measures as:

  - locating the water intake away from areas of high aquatic organism productivity
  - reducing the volume and velocity of water intake
  - adequate engineering and screening of the intake pipeline and
  - temporarily reducing or ceasing intake at times when eggs and larvae are present

The discharge of concentrated brine from a desalination plant into the Bay can severely impact fish and other aquatic organisms in the vicinity of the discharge unless the brine is diluted to approximately the same salinity range as the Bay. The San Francisco Bay RWQCB sets standards for brine discharged into the Bay (detailed in Chapter 4 Section 4.7.2 "Compliance with Brine Discharge Requirements"), and a NPDES permit is required from the Regional Board for any desalination plant discharge.

e. A desalination plant does not need to be located adjacent to the Bay; therefore, except for pipelines and directly related facilities needed for Bay water intake and brine discharge, Bay fill is not needed for desalination plants.

9. Power plants may be located in any area where they do not interfere with and are not incompatible with residential, recreational, or other public uses of the Bay and shoreline, provided that any pollution problems resulting from the discharge of large amounts of heated brine into Bay waters, and water vapor into the atmosphere, can be precluded.

10. Desalination projects should be located, designed and operated in a manner that:

    - avoids or minimizes to the greatest practicable extent adverse impacts on fish, other aquatic organisms and wildlife and their habitats
    - ensures that the discharge of brine into the Bay is properly diluted and rapidly disperses into the Bay waters to minimize impacts
    - is consistent with the discharge requirements of the San Francisco Bay RWQCB

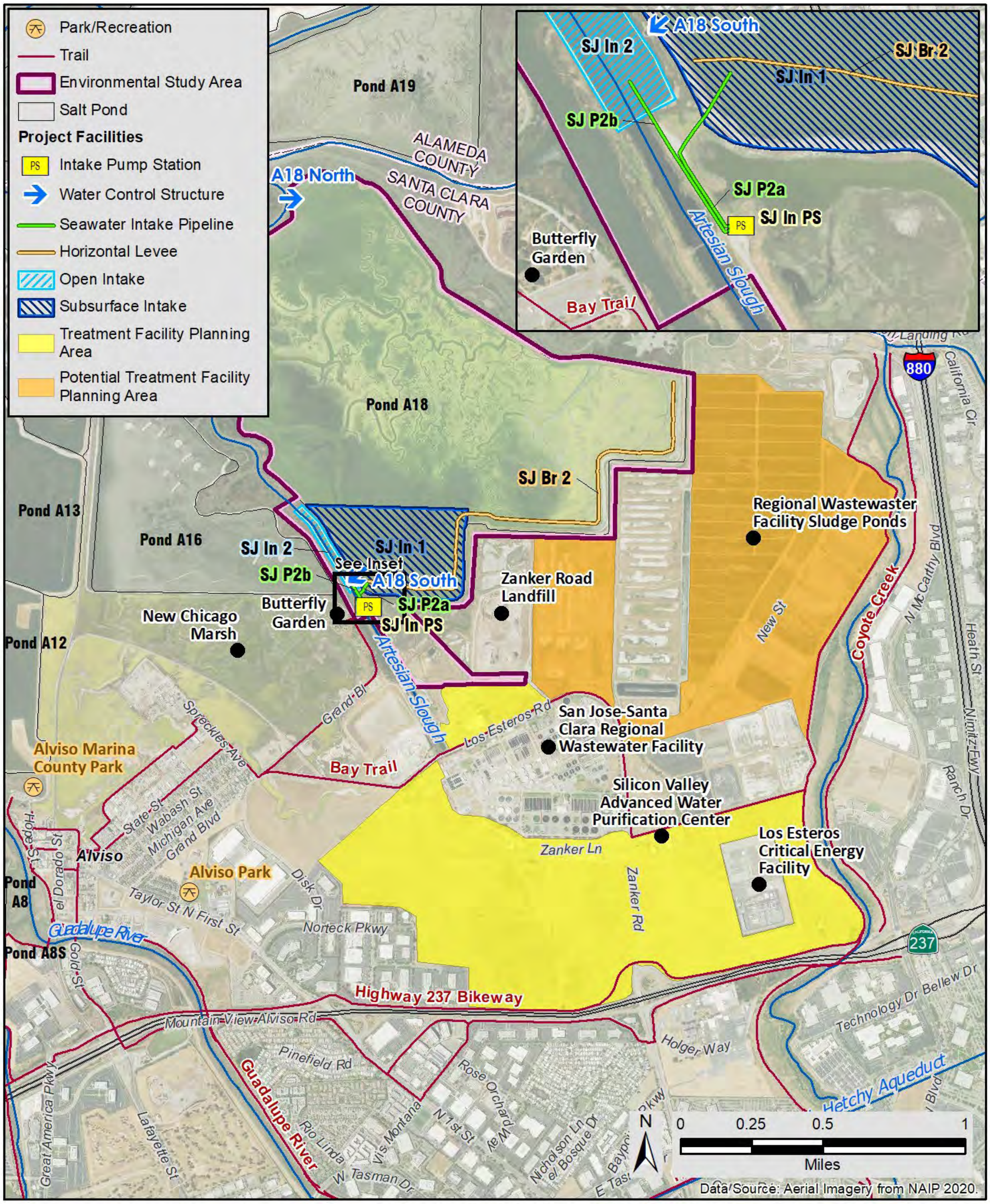
11. Because desalination plants do not need to be located in the Bay or directly on the shoreline:

    - no Bay fill should be approved for desalination plants except for a minor amount of fill needed for pipelines and other directly related facilities that provide Bay water to a plant and discharge diluted brine from the plant back into the Bay
    - maximum feasible public access consistent with the project should be included as part of any desalination project that uses Bay waters.

Fill for Habitat Amendment

The *Fill for Habitat Bay Plan Amendment* was adopted on October 3, 2019, to address the need to place an increasing amount of Bay fill to restore and enhance habitat considering sea level rise impacts on Bay habitats and related policy issues (BCDC 2019b). The amendment to the Bay Plan included amending findings and policies related to Major Conclusions and Policies; Fish, Other Aquatic Organisms, and Wildlife; Tidal Marshes and Tidal Flats; Subtidal Areas; Dredging; and Shoreline Protection. The amendment removed the "minor amount of fill" language from Bay Plan policies, but still requires all projects be subject to the McAteer Petris Act fill requirements, thus ensuring that projects will not use excessive amounts of fill and must justify the fill volume that they are using is necessary. The amendment also requires that detailed monitoring and adaptive management plans be developed and carried out due to uncertainties regarding project design and potential project impacts. (BCDC 2019b).

Figure 6-10. Recreation Trails and Facilities within Vicinity of the San Jose Environmental Study Area



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Sources: Recreation data – SFEI 2022; Figure – GEI 2022

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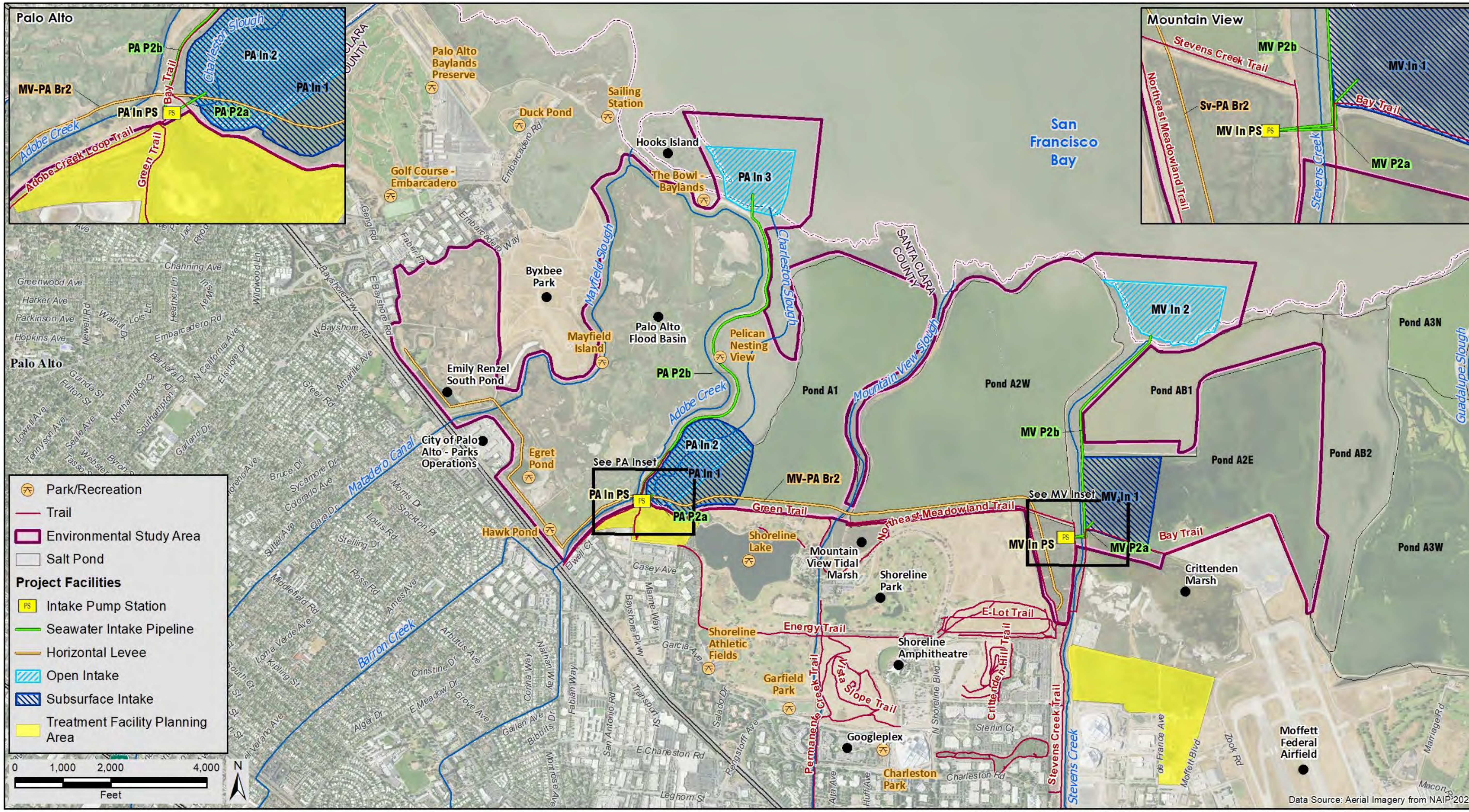
Figure 6-11. Recreation Trails and Facilities within Vicinity the Mountain View-Palo Alto Environmental Study Area



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Sources: Recreation data – SFEI 2022; Figure – GEI 2022

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6.6.2 Water Quality Control Plan for Ocean Waters of California (Revised 2019)

The Ocean Plan (SWRCB 2019) was revised in 2019 and supersedes previous versions and includes new requirements for desalination facilities. The following definitions are found in Appendix I of the Ocean Plan, unless otherwise noted, and understanding their definitions is critical to the evaluation of the applicability of the Ocean Plan to Valley Water's desalination project below in this section.

- **Brine –** The byproduct of desalinated water having a salinity concentration greater than a desalination facility's intake source water
- **Desalination Facility –** An industrial facility that processes water to remove salts and other components from the source water to produce water that is less saline than the source water
- **Enclosed Bays –** Indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75% of the greatest dimension of the enclosed portion of the bay. This definition includes San Francisco Bay.
- **Feasible –** For the purposes of chapter III.M (Implementation Provisions for Desalination Facilities), shall mean capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.
- **Ocean Waters –** Territorial marine waters of the state as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. If a discharge outside the territorial waters of the state could affect the quality of the waters of the state, the discharge may be regulated to assure no violation of the Ocean Plan will occur in ocean waters.
- **New facilities –** Desalination facilities that are not existing facilities or expanded facilities (from III.M.1.b.(3)).
- **Seawate**r **–** Salt water that is in or from the ocean. For the purposes chapter III.M Implementation Provisions for Desalination Facilities (Implementation Provisions for Desalination Facilities), seawater includes tidally influenced waters in coastal estuaries and coastal lagoons[1] and underground salt water beneath the seafloor, beach, or other contiguous land with hydrologic connectivity to the ocean.
- **Sensitive habitats –** Kelp beds, rocky substrate, surfgrass beds, eelgrass beds, oyster beds, spawning grounds for state or federally managed species, market squid nurseries, or other habitats in need of special protection as determined by the Water Boards.
- **Subsurface intake –** An intake withdrawing seawater from the area beneath the ocean floor or beneath the surface of the earth inland from the ocean.

[1] See Appendix I of the Ocean Plan for definition of coastal estuaries and coastal lagoons

Chapter III.M. Implementation Provisions for Desalination Facilities

The following summarizes applicability of the Ocean Plan to Valley Water's desalination project based on the definitions outlined above in this section. Based on the definitions, most sections of the Ocean Plan related to desalination facilities likely apply to Valley Water's desalination project while others related to discharge requirements for Ocean Waters may not.

- Chapter III.M (Implementation Provisions for Desalination Facilities) applies to desalination facilities using seawater. Valley Water's desalination project satisfies the Ocean Plan's definition of a desalination facility as well as a new facility. Moreover, source water for all intake options is anticipated to satisfy the Ocean Plan's definition of seawater.
- Chapter III.M.2 (Water Code §13142.5(b) Determinations for New and Expanded Facilities: Site, Design, Technology, and Mitigation Measures Feasibility Considerations) applies to new desalination facilities withdrawing seawater, which includes Valley Water's desalination project. Requirements of this section are discussed below.
- Chapters III.M.3 (Receiving Water Limitation for Salinity) and III.M.4 (Monitoring and Reporting Programs) applies to all desalination facilities that discharge into ocean waters. The Bay is not ocean water but an enclosed bay. The Lower South Bay, where discharge of brine would occur for all brine management options, is located approximately 38 miles southwest of the Golden Gate (i.e., ocean waters) and it is not anticipated that discharge of brine from the brine management options considered would affect ocean waters. These regulations are not discussed below. However, the San Francisco Bay RWQCB and State Water Resources Control Board (SWRCB) would ultimately decide if Valley Water's desalination project will be regulated by the Ocean Plan to assure no violation will occur in ocean waters. *Refer to* Chapter 4, "Water Quality Evaluation," for further discussion of brine discharge water quality requirements.
- All desalination facilities must comply with all other applicable sections of the Ocean Plan.

Chapter III.M.2. Requirements for New Facilities Withdrawing Seawater

Under Section III.M.2.a.(2), the San Francisco RWQCB shall conduct a Water Code section 13142.5(b) analysis of all new and expanded desalination facilities. The owner or operator shall submit a request for a Water Code section 13142.5(b) determination to the appropriate RWQCB as early as practicable. This request shall include sufficient information for the RWQCB to conduct the following analyses. The RWQCB shall first analyze separately as independent considerations a range of feasible alternatives for the best available site, design, technology, and mitigation measures to minimize intake and mortality of all forms of marine life. Then, the RWQCB shall consider all four factors (best available site, design, technology, and mitigation measures) collectively and determine the best combination of feasible alternatives to minimize intake and mortality of all forms of marine life. The best combination of alternatives may not always include the best alternative under each individual factor because some alternatives may be mutually exclusive, redundant, or not feasible in combination.

Under Section III.M2.a.(4), the RWQCB shall consult with other state agencies involved in the permitting of that facility, including, but not limited to: California Coastal Commission, California State Lands Commission, and CDFW.

- **Site Requirements.** The RWQCB shall require that the owner or operator evaluate a reasonable range of nearby sites, including sites that would likely support subsurface intakes. There may be multiple potential facility design configurations within any given site. Determine whether a proposed facility site is the best available site feasible to minimize intake and mortality of all forms of marine life, the RWQCB has several requirements for the owner or operator including but not limited to, the following:
    - Consider whether subsurface intakes are feasible and if the identified need for desalinated water is consistent with an applicable adopted urban water management plan or other water planning documents such as a county general plan or integrated regional water management plan.
    - Analyze the feasibility of placing intake, discharge, and other facility infrastructure in a location that avoids impacts to sensitive habitats and species; direct and indirect effects on all forms of marine life; oceanographic geologic, hydrogeologic, and seafloor topographic conditions at the site; presence of existing discharge infrastructure and availability of wastewater to dilute the brine discharge.
- **Design Requirements.** The RWQCB shall require that the owner or operator perform the following in determining whether a proposed facility design is the best available design feasible to minimize intake and mortality of all forms of marine life:
    - Analyze the potential design configurations of the intake, discharge, and other facility infrastructure to avoid impacts to sensitive habitats and sensitive species
    - If the RWQCB determines that subsurface intakes are not feasible, analyze potential designs of and surface water intakes to minimize the intake and mortality of all forms of marine life
    - Design the outfall so that the brine mixing zone does not encompass or otherwise adversely affect existing sensitive habitat; discharges do not result in dense, negatively-buoyant plumes that result in adverse effects; and outfall structures minimize the suspension of benthic sediments
- **Technology Requirements.** The RWQCB shall apply the following considerations in determining whether a proposed technology is the best available technology feasible to minimize intake and mortality of all forms of marine life.

Intakes

- o The RWQCB in consultation with SWRCB staff shall require subsurface intakes unless it determines that subsurface intakes are not feasible based upon a comparative analysis of specific factors listed for surface and subsurface intakes, including but not limited to, the following: geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats, presence of sensitive species, energy use for the entire facility, design constraints (engineering, constructability), and project life cycle cost. Project life cycle cost shall be determined by evaluating the total cost of planning, design, land acquisition, construction, operations, maintenance, mitigation, equipment replacement and disposal over the lifetime of the facility, in addition to the cost of decommissioning the facility.
- o If the RWQCB determines that subsurface intakes are not feasible for the proposed intake design capacity, it shall determine whether subsurface intakes are feasible for a reasonable range of alternative intake design capacities. The RWQCB may find that a combination of subsurface and surface intakes is the best feasible alternative to minimize intake and mortality of marine life and meet the identified need for desalinated water.
- o Installation and maintenance of a subsurface intake shall avoid, to the maximum extent feasible, the disturbance of sensitive habitats and sensitive species.
- o If subsurface intakes are not feasible, the RWQCB may approve a surface water intake, subject to use of screens with 1.0 millimeter or smaller slot size screen that must be functional while the facility is withdrawing seawater or an alternative method of preventing less than or equivalent level of intake and mortality of eggs, larvae, and juvenile organisms; and through-screen velocity that shall not exceed 0.15 meter per second.

Brine Disposal

- o Preferred technology for minimizing intake and mortality of all forms of marine life resulting from brine discharge is to commingle brine with wastewater (e.g., agricultural, municipal, industrial, power plant cooling water, etc.) that would otherwise be discharged to the ocean.
- o Multiport diffusers are the next best method for disposing of brine when the brine cannot be diluted by wastewater and when there are no live organisms in the discharge; and shall be engineered to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize mortality of all forms of marine life.
- o Brine discharge technologies other than wastewater dilution and multiport diffusers may be used if an owner or operator can demonstrate to the RWQCB that the technology provides a comparable level of intake and mortality of all forms of marine life as wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable. The owner or operator must evaluate all of the individual

and cumulative effects of the proposed alternative discharge method on the intake and mortality of all forms of marine life.

  - Flow augmentation as an alternative brine discharge technology is prohibited except to supply augment flow water for dilution at facilities that use subsurface intakes.

- **Mitigation Measure Requirements.** The RWQCB shall ensure an owner or operator fully mitigates for the operational lifetime of the facility and uses the best available mitigation measures feasible to minimize intake and mortality of all forms of marine life. The owner or operator may choose whether to satisfy a facility's mitigation measures pursuant to chapter III.M.2.e.(3) or, if available, M.2.e.(4), or a combination of the two. *Refer to* the Ocean Plan for more details.

6.7 Municipal Land Use Planning

This section discusses existing land use and zoning designations, land use regulations, zoning ordinances, and other local regulations.

6.7.1 Parcel Land Use and Zoning Designations

Tables 6-1 and 6-2 identify the assessor's parcel number (APN) and municipality with jurisdiction, land use designation, zoning designation, and project options associated with each APN within the Environmental Study Areas and TFPAs, respectively. A mapping of municipalities where project components are located is shown in **Figure 6-12**.

Table 6-1. Assessor's Parcel Number, Land Use, and Zoning within the Environmental Study Areas

APN	Municipality	Land Use Designation	Zoning Designation	Project Options[1]
San Jose Environmental Study Area				
01529003	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01529004	San Jose	Open Space, Parklands, and Habitat	Agriculture, Light Industrial	Pump Station (SJ In PS), Open Intake (SJ In 2), Intake Pump Station Pipeline (SJ P1), Seawater Intake (SJ P2a and SJ P2b)
01531008	San Jose	Light Industrial, Public Conservation Land, and Open Space, Parklands, and Habitat	Agriculture, Heavy Industrial, Industrial Park, Planned Development	Within the ESA
01532018	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01532019	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01532020	San Jose	Open Space, Parklands, and Habitat	Agriculture	Open Intake (SJ In 2)
01532031	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01532032	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01532033	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA
01532034	San Jose	Open Space, Parklands, and Habitat	Agriculture	Within the ESA

APN	Municipality	Land Use Designation	Zoning Designation	Project Options[1]
01532042	San Jose	Open Space, Parklands, and Habitat	Agriculture	Subsurface Intake (SJ In 1), Seawater Intake, Horizontal Levee (SJ Br2)
01538004	San Jose	Industrial	Planned Development	Within the ESA
01538005	San Jose	Light Industrial, Public/Quasi-Public, Open Space, Parklands, and Habitat	Light Industrial	Within the ESA
Mountain View–Palo Alto Environmental Study Area				
00804001	Palo Alto	Open Space/Controlled Development, Public Conservation Land, Major Institution/Special facility, and Research/Office Park	Public Facility, Commercial/Manufacturing/Residential	Within the ESA
00805005	Palo Alto	Public Park, Open Space/Controlled Development, Major Institution/Special Facility, Public Conservation Land	Public Facility, Commercial/Manufacturing/Residential	Open Intake (PA In 3), Seawater Intake (PA P2b)
01536009	Sunnyvale	Baylands	Public Facility	Within the ESA
01536011	Mountain View	Public – Regional Park	Public Facility	Within the ESA
01536012	Mountain View	Public – Regional Park	Public Facility	Seawater Intake (MV P2b), Intake Pump Station Pipeline (MV P1), Open Intake (MV In 2)
01536017	Mountain View	Public – Regional Park	Public Facility	Within the ESA
01536021	Palo Alto	Public – Regional Park, Public Conservation Land	Public Facility	Seawater Intake (PA P2b)
01536022	Palo Alto	Public – Regional Park, Public Conservation Land	Public Facility	Within the ESA
01536024	Mountain View	Public – Regional Park	Public Facility	Within the ESA
01536025	Palo Alto	Public – Regional Park, Public Conservation Land	Public Facility	Intake Pump Station (PA In PS), Intake Pump Station Pipeline (PA P1), Horizontal Levee (MV-PA Br2), Seawater Intake (PA P2a and PA P2b), Subsurface Intake (PA In 1), Open Intake (PA In 2), Pump Station (MV In PS)
01536026	Mountain View	Public – Regional Park	Public Facility	Within the ESA
01536028	Unincorporated	Other Public Open Land	Exclusive Agriculture – Bay Wetlands Combining Districts	Within the ESA
01536031	Unincorporated	Other Public Open Land	Exclusive Agriculture – Bay Wetlands Combining Districts	Open Intake (MV In 2)
01536032	Sunnyvale	Baylands, Public – Regional Park	Public Facility	Within the ESA
01536033	Sunnyvale	Public – Regional Park, Public Facilities	Public Facility	Open Intake (MV In 2)

APN	Municipality	Land Use Designation	Zoning Designation	Project Options[1]
01536035	Sunnyvale	Baylands	Public Facility	Within the ESA
01536037	Unincorporated	Other Public Open Land	Exclusive Agriculture – Bay Wetlands Combining Districts	Horizontal Levee (MV-PA Br2)
01536038	Mountain View	Public – Regional Park	Public Facility	Subsurface Intake (PA In 1), Open Intake (PA In 2)
01536040	Sunnyvale	Baylands	Public Facility	Within the ESA
01536041	Mountain View	Public – Regional Park, Public Institutional	Public Facility	Within the ESA
01536042	Unincorporated	Other Public Open Land	Exclusive Agriculture – Bay Wetlands Combining Districts	Subsurface Intake (MV In 1), Seawater Intake (MV P2a)
01536043	Unincorporated	Other Public Open Land	Exclusive Agriculture – Bay Wetlands Combining Districts	Subsurface Intake (PA In 1), Open Intake (PA In 2), Horizontal Levee (MV-PA Br2)
01536044	Mountain View	Public – Regional Park	Public Facility	Subsurface Intake (PA In 1), Open Intake (PA In 2), Horizontal Levee (MV-PA Br2)
01537003	Sunnyvale	Public – Regional Park, Baylands	Public Facility	Open Intake (MV In 2)
01537012	Palo Alto	Public Conservation Land	Public Facility	Open Intake (PA In 3)
01537013	Unincorporated	Baylands	General Use- Bay Wetlands Combining Districts	Open Intake (MV In 2), Seawater Intake (MV P2b)
11601014	Palo Alto	Public Conservation Land	Public Facility	Horizontal Levee (MV-PA Br2)

Notes: APN=assessor parcel number; ESA=Environmental Study Area; N/A=not applicable
[1] APNs where project options are not currently mapped are designated as within the extended Environmental Study Area.
Sources: Santa Clara County 1994, Palo Alto 2022, City of Sunnyvale 2021, Mountain View 2019

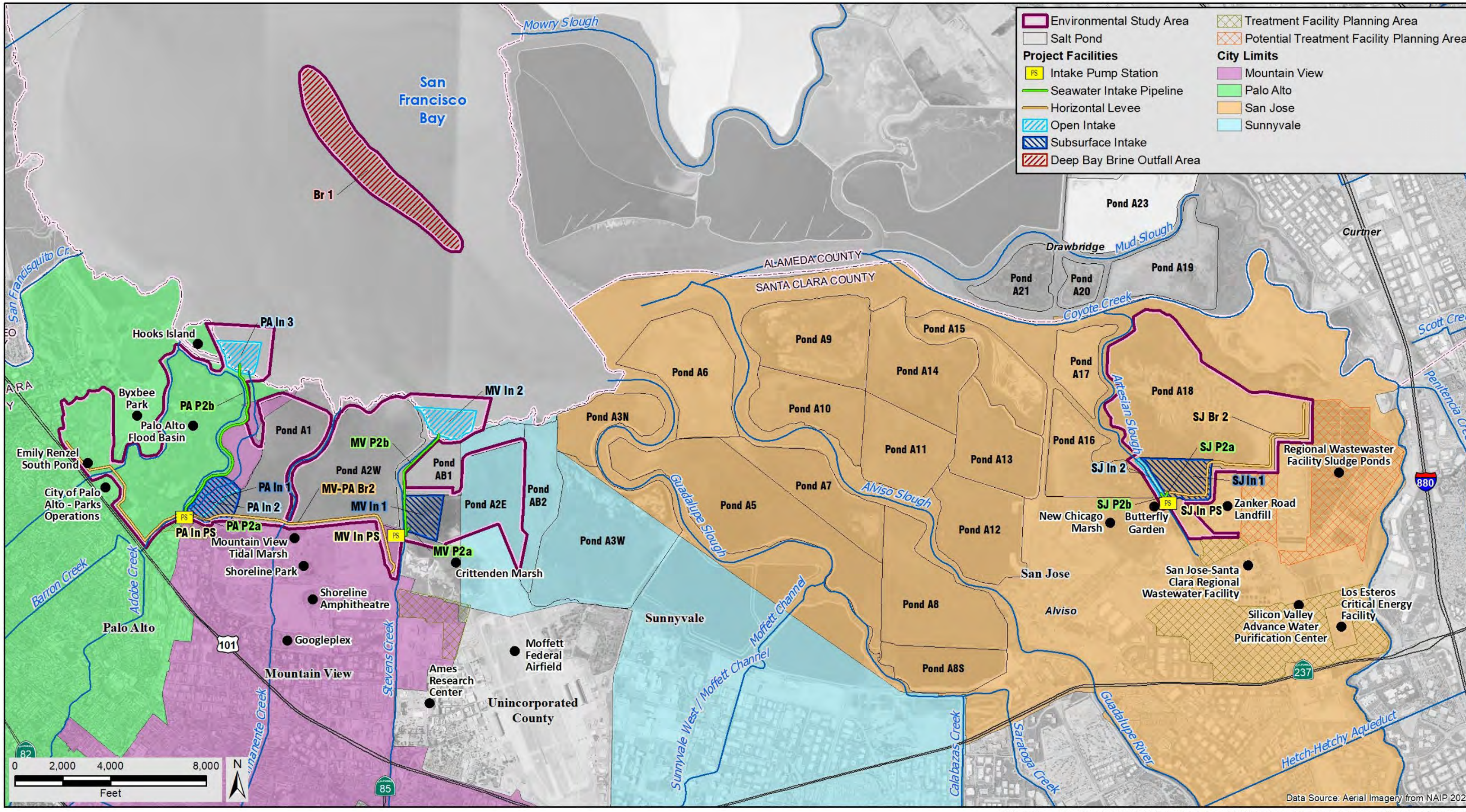
Table 6-2. Assessor's Parcel Number, Land Use, and Zoning within Treatment Facility Planning Areas

APN	Municipality	Land Use Designation	Zoning Designation
San Jose Treatment Facility Planning Area			
01538005	San Jose	Light Industrial, Open Space, Parklands and Habitat, Public/Quasi-Public	Light Industrial, Agriculture
01530061	San Jose	Public/Quasi-Public	Agriculture
01530109	San Jose	Combined Industrial/Commercial, Industrial Park, Light Industrial, Open Space, Parklands and Habitat, Public/Quasi-Public	Single-Family Residential (Up to 8 Dwelling Units per Acre), Multiple Residence District, Agriculture
01530110	San Jose	Industrial Park, Light Industrial	Multiple Residence District

APN	Municipality	Land Use Designation	Zoning Designation
01531028	San Jose	Public/Quasi-Public	Light Industrial
01531044	San Jose	Public/Quasi-Public	Agriculture, Heavy Industrial
01531054	San Jose	Light Industrial	Light Industrial
01531061	San Jose	Light Industrial, Neighborhood/Community Commercial, Public/Quasi-Public	Agriculture
01531062	San Jose	Light Industrial, Neighborhood/Community Commercial	Multiple Residence District
01531063	San Jose	Combined Industrial/Commercial, Industrial Park, Public/Quasi-Public	Planned Development, Agriculture, Light Industrial
01531072	San Jose	Light Industrial	Planned Development, Light Industrial
San Jose Potential Treatment Facility Planning Area			
01531008	San Jose	Light Industrial, Open Space, Parklands and Habitat, Public/Quasi-Public	Heavy Industrial, Industrial Park, Agriculture, Water
01531050	San Jose	Open Space, Parklands and Habitat, Public/Quasi-Public	Heavy Industrial, Industrial Park
01531051	San Jose	Light Industrial, Public/Quasi-Public	Heavy Industrial
Mountain View–Palo Alto Treatment Facility Planning Area			
11607010	Mountain View	Institutional, Regional Park	Public Facility
11607011	Mountain View	Institutional, Regional Park	Public Facility
11612008	Unincorporated	Institutional, Regional Park	General Use
11618004	Unincorporated	Institutional, Regional Park	General Use
01536025	Sunnyvale	Public Conservation Land, Regional Park	Public Facility
01536039	Mountain View	Regional Park	Public Facility
11601013	Palo Alto	Major Institution/Special Facility, Public Conservation Land	Public Facility
11601014	Palo Alto	Public Conservation Land	Public Facility
11603015	Mountain View	High-Intensity Office, Regional Park	Public Facility, Planned Community/Precise Plan
11619002	Mountain View	Major Institution/Special Facility, Public Conservation Land, Regional Park	Public Facility

Sources: Santa Clara County 2022, Sunnyvale 2021, Palo Alto 2019b Mountain View 2019

Figure 6-12. Cities and County Jurisdiction with the Environmental Study Areas and Treatment Facility Planning Areas



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6.7.2 Municipal Codes

San Jose Municipal Code

Land within the city of San Jose in the San Jose Environmental Study Area, San Jose TFPA, and San Jose Potential TFPA is zoned as Single Family Residential, Multiple Family Residential, Agricultural, Industrial (Heavy and Light), Industrial Park, Planned Development, and Water. Each designation is briefly described below (San Jose 2022).

- The purpose of the Single-Family Residential zoning district is to is to reserve land for the construction, use and occupancy of single-family subdivisions. The purpose of the Multiple Family Residential is to reserve land for the construction, use and occupancy of higher density residential development and higher density residential-commercial mixed-use development. A conditional use permit is required for all utility facilities.
- The purpose of the Agricultural zoning district is to provide for areas where agricultural uses are desirable. The regulations contained in this district are intended to provide for a wide range of agricultural uses as well as implementing the goals and policies of the general plan. A conditional use permit is required for all utility facilities.
- The Heavy Industrial zoning designation is intended for industrial uses with nuisance or hazardous characteristics which for reasons of health, safety, environmental effects, or general welfare are best segregated from other uses. Extractive and primary processing industries are typical of this district. A conditional use permit is required for all utility facilities.
- The Light Industrial zoning district is intended for a wide variety of industrial uses and excludes uses with unmitigated hazardous or nuisance effects. The design controls are less stringent than those for the industrial park zoning district. A conditional use permit is required for all utility facilities.
- The Industrial Park zoning designation is an exclusive designation intended for a wide variety of industrial users such as research and development, manufacturing, assembly, testing, and offices. Industrial uses are consistent with this designation insofar as any functional or operational characteristics of a hazardous or nuisance nature can be mitigated through design controls. A conditional use permit is required for all utility facilities.

The use regulations for territory situated in a planned development district shall be as follows:

A. Unless and until a planned development permit has been issued and been effectuated, property in such territory may be used only as if it were in its base district alone.

B. If a planned development permit is effective, any use or combination of uses provided for in said permit are allowed in accordance with and in strict compliance with all terms, provisions and conditions of said permit. Each permitted use shall be confined and limited to the particular location designated therefore in said permit. No use, other than the particular uses specified in the permit, shall be permitted, except as set forth elsewhere in this Title 20.

C. If a planned development permit allows a residential use, incidental transient occupancy in compliance with Part 2.5 of Chapter 20.80 is a permitted use of the permitted dwelling.

D. If a planned development permit has been issued, the planned development district may nevertheless be disregarded and property in such territory used as if it were in its base district alone if such use is confined to part of the subject territory not covered by the permit and a requirement to make such use of such part is not a condition of such permit.

Mountain View Municipal Code

Land within the city of Mountain View in the Mountain View-Palo Alto Environmental Study Area and Mountain View–Palo Alto TFPA is zoned as Public Facility, except for one parcel that is zoned as Public Facility and Planned Community/Precise Plan. Each designation is briefly described below (Mountain View 2022).

- The Public Facility designation is established to foster the orderly development of educational and public service uses in the community and of special approved uses on city land; to ensure their presence as a vital part of the neighborhood balance; and to prevent intrusion of uses which may overburden neighborhood facilities and resources. The permitted uses in this zoning designation include:
  - City-owned facilities
  - Public parks and open space
  - County, state, and federally owned facilities
  - Public schools intended to serve the immediately surrounding neighborhood
  - Uses and facilities, whether constructed publicly or privately, developed on city-owned land and intended for a purpose found by the city to be in the public interest
  - Crop and tree farming and livestock of the cow, horse, sheep, or goat species where at least 90% of the acreage required by the animal control ordinance is open and unimproved
  - Child-care centers
- The Planned Community/Precise Plan designation is to provide for those uses or combinations of uses which may be appropriately developed as a planned area development. It is intended to be applied only to those areas which by reason of their proximity to other zoning districts, topography, geographic location, size, shape or existing development, require special consideration in order to be properly integrated into the community and adjacent developed districts, and to further the planned circulation patterns, residential densities, planned coverage limitations, and in furtherance of the preservation of open spaces, as required by modern land planning and zoning concepts and techniques (Mountain View 2022). Any use permitted in any other zoning district may be permitted in a Planned Community district, either alone or in combination with other uses, after it has first been determined that the area to be so zoned includes the special considerations regarding area requirements, height, and signage. A planned community permit shall be required.

Palo Alto Municipal Code

All land within the city of Palo Alto in the Mountain View–Palo Alto Environmental Study Area and Mountain View–Palo Alto TFPA is zoned as Public Facility, with two parcels also zoned as Commercial, Manufacturing, and Residential. Each designation is briefly described below. (City of Palo Alto 2022).

- The Public Facilities district is designed to accommodate governmental, public utility, educational, and community service or recreational facilities. A conditional use permit is required for all utility facilities provided such use is conducted on property owned by the city of Palo Alto, the county of Santa Clara, the state of California, the government of the United States, the Palo Alto Unified School District, or any other governmental agency, and leased for said uses.
- The Commercial zoning districts are intended to create and maintain sites for retail, personal services, eating and drinking establishments, hotels and other business uses in a manner that balances the needs of those uses with the need to minimize impacts to surrounding neighborhoods. A conditional use permit is required for all utility facilities.
- The Manufacturing district provides for light manufacturing, research, and commercial service uses. Office uses are very limited in order to maintain the district as a desirable location for manufacturing uses. The Manufacturing district is intended for application to land designated for light industrial use in the *City of Palo Alto Comprehensive Plan* (Comprehensive Plan). A conditional use permit is required for all utility facilities.
- The Residential district is intended to create and maintain single and multi-family living use consistent with the Comprehensive Plan. Community uses and facilities should be limited unless no net loss of housing would result. A conditional use permit is required for all utility facilities.

Sunnyvale Municipal Code

All land located within the city of Sunnyvale in the Mountain View–Palo Alto Environmental Study Area and Mountain View–Palo Alto TFPA is zoned as Public Facility (City of Sunnyvale 2022). The Public Facility district is reserved for the construction, use and occupancy of governmental, public utility and educational buildings and facilities, and other uses compatible with the public character of the district. A conditional use permit is required for all public utility buildings and service facilities.

Santa Clara County Code of Ordinance

All land within the unincorporated Santa Clara County that is within the Mountain View–Palo Alto Environmental Study Area, and Mountain View–Palo Alto TFPAs is zoned as Exclusive Agriculture – Bay Wetlands combining districts, General Use, General Use – Bay Wetlands Combining Districts, and Multiple Residence District. Each designation is briefly described below (Santa Clara County 2003).

- The purpose of the Exclusive Agriculture district is to preserve and encourage the long-term viability of agriculture and agricultural lands, recognizing the vital contributions agriculture makes to the economy and quality of life within the county. A conditional use permit is required for all major utilities.
- The purpose of the General Use district is to provide a flexible base zoning district that allows general residential and agricultural uses and provides opportunities through the use permit process for other uses and developments that are appropriate for a particular location, consistent with the objectives, goals, and policies of the general plan. A conditional use permit is required for all major utilities.
- The Bay Wetlands combining district is to preserve the wetlands of the Bay that lie within the jurisdiction of Santa Clara County, while providing for appropriate recreational, educational, resource extraction, and open space uses. The uses permitted in this district supersede those permitted by the base district, such that only those uses specifically designated within the Bay Wetland combining district shall be permitted on this land. Salt extraction is allowed with a conditional use permit. Uses necessitating the construction of dikes, groins, causeways, or other Bay fill shall be prohibited except where it can be demonstrated that it is desirable from an ecological standpoint to improve the Baylands natural environment (Santa Clara County 2003).
- The purpose of the Multi-Family Residential district is to provide space for multiple family residential development commonly found in an urban environment. A conditional use permit is required for all major utilities.

6.7.3 General Plans

Envision San Jose 2040 General Plan

The *Envision San Jose 2040 General Plan* includes a clear vision and comprehensive road map to guide the city of San Jose's continued growth through the year 2040 (San Jose 2011). The General Plan includes land use, economic, and environmental policies to guide the city towards fulfillment of its vision for future development. The desalination project would help meet at least one policy outlined in the General Plan including the following:

- **Goal IN-3 – Water Supply, Sanitary Sewer, and Storm Drainage**
  Policy IN-3.2 – Work with water retailers to provide water supply facilities that meet future growth within the city's Urban Service Area and assure a high-quality and reliable supply of water to existing and future residents.

Mountain View 2030 General Plan

The *Mountain View 2030 General Plan* provides a roadmap for future development through year 2030. Components of the General Plan include goals, policies, implementing actions and supporting graphics which work together to convey a long-term vision and guide local decisions making (Mountain View 2012). The desalination project would help meet at least one policy outlined in the General Plan including the following:

- **Goal INC-4 – A sustainable water supply with sufficient supply and appropriate demand management**
  Policy INC 4.1 – Water supply. Maintain a reliable water supply

City of Palo Alto Comprehensive Plan 2030

The Comprehensive Plan is the primary tool for guiding the development of the Palo Alto through year 2030 and contains the city's official policies on land use and community design, transportation, housing, natural environment, safety, business and economics and community services. The Comprehensive Plan is used by the City Council and Planning and Transportation Commission to evaluate land use changes and make funding decisions and is used by city staff to regulate building and development (Palo Alto 2017).

Sunnyvale General Plan

The *Sunnyvale General Plan* is a long-range and a strategic planning document, containing long-term goals and policies for the next 10 to 20 years and strategic actions for the next 5 to 10 years (City of Sunnyvale 2011). Sunnyvale's General Plan consists of a Community Vision and five supporting chapters addressing the physical development of the City of Sunnyvale such as Land Use and Transportation, Community Character, Housing, Safety and Noise, and Environmental Management.

Santa Clara County General Plan

The *Santa Clara County General Plan* provides a vision for development and growth of the County through year 2010. An update to the General Plan has yet to be adopted. A series of goals organized under four basic themes, including: Managed and Balanced Growth, Livable Communities, Responsible Resource Conservation, and Social and Economic Well-Being, provide the overall direction for strategies, policies, and implementing actions of the General Plan.

The General Plan outlines several strategies for meeting future water supply projected needs. One of these strategies is "Obtain Additional Imported Water Sources." The General Plan states that additional sources of water supply may be obtained from several sources, including purchases or transfers, exchanges, and desalinization. It also states that desalinization is currently the least cost-effective option, therefore, the General Plan includes a policy to encourage reform of the state-wide system of water allocation and distributions (Santa Clara County 1994).

6.8 Planning Evaluation

This section provides an evaluation of planning issues related to the issues discussed in the sections above, with a focus on critical issues and recommended next steps. Permitting requirements are not addressed in this section and instead are discussed in detail in **Appendix D** and summarized in Chapter 11, "Permitting."

6.8.1 Regional Planning Compatibility Evaluation

Don Edwards San Francisco Bay National Wildlife Refuge Appropriate and Compatible Use

Right-of-way Requirements

Project options within the Refuge would require ROW from the USFWS prior to development. The intake options and brine management options in San Jose (SJ In 1, SJ In 2, SJ Br 2) are located within the Refuge. Additionally, the San Jose Pump Station and pipelines from the intake options to the pump station are located within the Refuge. The San Jose and Potential San Jose TFPAs are outside the Refuge.

In Mountain View, the Pond A2E Subsurface Intake option is within the Refuge. The Refuge boundary extends south of Pond A2E but ends at the Bay Trail and does not extend west across Stevens Creek or adjacent properties except for a small segment along the Stevens Creek Trail. As a result, the Mountain View Pump Station is outside of the Refuge along with most of the pipeline from the subsurface intake option. It is anticipated that the South Bay Open Intake option in Mountain View (MV In 2) could be developed immediately outside to the north of the Refuge boundary in the Bay. However, most of the pipeline from the Mountain View Pump Station to the intake in the Bay is in the Refuge.

In Palo Alto, the intake options in Charleston Slough (PA In 1, PA In 2) are within the Refuge. The Palo Alto Pump Station is within the Refuge adjacent to the southern boundary and the pipeline extending to the intake options in Charleston Slough is also within the Refuge. The South Bay Open Intake option in Palo Alto (PA In 3) is outside the Refuge. However, most of the pipeline from the Palo Alto Pump Station to the intake in the Bay is within the Refuge along the western boundary.

The Mountain View–Palo Alto Horizontal Levee option is outside of the Refuge to the west of Adobe Creek, and within the Flood Control Basin, and to the east of Adobe Creek is within the Refuge for approximately 1.6 miles until the alignment exits Pond A2W to the south outside of the Refuge. Portions of the Mountain View–Palo Alto TFPA near the shoreline in Mountain View and Palo Alto are within the Refuge. The South Bay Deep Water Outfall option is outside the Refuge. However, conveyance, which was not identified for this study, would need to be developed and would likely extend through the Refuge.

Compatible Use Analysis

Where ROW is required from the Refuge, the Refuge Manager will determine if the relevant project components are an appropriate refuge use. If a use is determined to be an appropriate refuge use, the Refuge Manager will then determine if the use is compatible. Although a use may be both appropriate and compatible, the Refuge Manager retains the authority to not allow the use or modify the use. Next steps for Valley Water include consultation with the Refuge Manager on the desalination project and input on key issues to determine a use appropriate and compatible.

The remainder of this section provides an analysis of potential issues associated with a compatible use determination for each project option within the Refuge. The analysis is based on potential environmental impacts within the Refuge, primarily related to biological resources and water quality, and potential for compensatory mitigation which is not allowed to make a proposed refuge use compatible[2]. *Refer to* Chapter 4, "Water Quality" and Chapter 5, "Environmental Conditions" for the evaluation related to these impacts. The analysis is organized by the type of option within the boundaries of the Refuge.

Subsurface Intakes Options (SJ In 1, MV In 1, PA In 1)

The subsurface intakes would be developed underground and are assumed to have limited impacts at the ground surface for this study. Subsurface intakes would indirectly draw in a substantial amount of water from salt marsh habitats, and if insufficient water supply is available, could result in adverse effects to vegetation, habitat conditions, and special-status species. Permanent impacts would require compensatory mitigation. Further study is required to evaluate the potential severity of these impacts and would help inform if a compatible use determination could be obtained.

Open Intake Options in Sloughs (SJ In 2, PA In 2)

Operation of open intakes in sloughs would result in impingement and entrainment of marine organisms in waterways of the Refuge. In addition, the Charleston Slough Open Intake option would draw in a significant amount of water form Charleston Slough, and if insufficient water supply is available, could result in adverse effects to vegetation, habitat conditions, and special-status species. Permanent impacts would require compensatory mitigation. Obtaining a compatible use determination for open intakes in sloughs is anticipated to be difficult due to impacts to marine organisms and could be more challenging for the Charleston Slough Open Intake option.

Pump Stations (SJ PS, PA PS)

The two pump stations within the Refuge would be small and located adjacent to existing water control facilities of similar size. If the pump stations can be developed outside of sensitive habitats, a compatible use determination is possible. Further coordination with the Refuge is required to obtain input on other issues that may be associated with a small built facility. If there are alternatives to develop the pump station outside of the Refuge, those may be desirable to USFWS; however, since the pump station should be located as close to the intake as possible, and the feasibility of locating pump stations further away from the shoreline would also need to be evaluated.

Pipelines (SJ P2a, SJ P2b, PA P2a and portions of MV P2a, MV P2b, PA P2b).

Construction and maintenance of pipelines through the Refuge via conventional open-cut techniques would result in temporary impacts to special-status species and sensitive habitats and water quality. If temporary impacts can be minimized and no compensatory mitigation is required, then it is possible pipelines are determined to be a compatible use. The Refuge has

[2] Except by replacement of lost habitat values as provided in specific provisions related to existing ROWs; however, no existing ROWs would be used for the desalination project.

issued ROW in the past for electrical transmission lines. Installing pipelines with trenchless methods, where feasible, is anticipated to increase the chances of being determined a compatible use.

Horizontal Levee Brine Management Options (SJ Br 2, MV-PA Br 2).

Construction of horizontal levees could result in temporary disturbance of special-status species and sensitive habitats. However, horizontal levees are multi-benefit nature-based treatments intended to improve habitat and have long-term benefits to special-status species and habitats, and it is not anticipated compensatory mitigation would be required. The primary issue with horizontal levees for the desalination project is brine water quality, which is anticipated to have excessive levels of salinity for salt marsh habitats. Blending with wastewater effluent would reduce salinity but other constituents of concern from wastewater could be elevated. Further study of brine water quality and options for blending is required. If horizontal levees can be designed with desirable brine water quality and to benefit special-status species, they may be considered a compatible use.

Treatment Facility (portions of the Mountain View–Palo Alto TFPA).

Site-specific environmental conditions were not evaluated for TFPAs. However, review of aerial photography shows that very few facilities the size of the treatment facility needed for the desalination project are within the Refuge's boundaries. Permanent impacts to sensitive habitats, such as wetlands, from development of a treatment facility near the shoreline would require compensatory mitigation and would not be determined to be compatible. Further coordination with the Refuge is required to obtain input on other issues that may be associated with a large built facility. Since there are alternatives to develop the treatment facility in areas outside of the Refuge, those locations are anticipated to be desirable to USFWS.

Bay Plan Requirements for Desalination and Bay Fill

The Bay Plan is applicable to project options within the Bay and approximately 100 feet landward of the shoreline. This includes all the intake and brine management options and portions of the Mountain–View Palo Alto TFPA along the shoreline. The San Jose and Potential San Jose TFPA are anticipated to be beyond the shoreline and are likely not subject to the Bay Plan.

It is not anticipated BCDC would approve a treatment facility within 100 feet of the shoreline. BCDC is also unlikely to approve fill in the Bay for development of pump station or other components. However, with the Fill for Habitat Bay Plan Amendment, it is anticipated fill for development of horizontal levee options (SJ Br 2, MV-PA Br 2) would be approved (if horizontal levees can be designed with desirable brine water quality and to benefit special-status species). A detailed monitoring and adaptive management plan would be required for approval of fill for horizontal levees.

The desalination project would need to maintain maximum feasible public access. Recreational trails could be temporarily impacted during construction, as discussed in Section 6.8.2, "Existing and Planned Land Uses and Projects Evaluation." Permanent access could be maintained with a desalination project, regardless of the project options selected.

The remainder of this section analyzes Bay Plan requirements related to policies for location, design, and operation of the desalination project. *Refer to* Chapter 4, “Water Quality” and Chapter 5, “Environmental Conditions” for the evaluation of impacts that are related to these policies and discussed.

- **“Avoids or minimizes to the greatest practicable extent adverse impacts on fish, other aquatic organisms and wildlife and their habitats.”** This policy applies to all intake and brine management options evaluated for this study. Impacts related to this policy, which are analyzed in other chapters of this study, include receiving water quality, special-status species, sensitive habitats, and marine organisms. The critical language of this policy is “minimizes to the greatest practicable extent…” meaning that Valley Water would need to demonstrate that through design, construction, and/or operations of the desalination project, impacts are not nearly reduced or mitigated but minimized to the greatest ability with all practicable actions taken to achieve this goal. As an example, one of the critical issues for open intakes is impingement and entrainment of larvae. Impacts are dependent on the intake location and design including screens and approach velocity of water travelling across the screen. Valley Water would likely need to demonstrate how impacts are minimized through studies, and if there are other actions that would reduce impacts, why these actions are not practicable. Additionally, it is anticipated that under this policy BCDC would favor options that avoid or minimize to the greatest extent practicable impacts to salt marsh habitat and sloughs.
- **“Ensures that the discharge of brine into the Bay is properly diluted and rapidly disperses into the Bay waters to minimize impacts.”** This policy applies to the South Bay Deep Water Outfall option. The location of this intake in the deep water, as opposed to shallower water in the Bay, is anticipated to increase the speed at which dilution of brine to desired level occurs. Further study of brine water quality and dilution is required.
- **“Consistent with the discharge requirements of the RWQCB.”** This policy applies to all brine management options. All options require a NPDES permit and compliance with applicable discharge requirements. The brine discharge would not be allowed without demonstrating that applicable discharge requirements could be met. Further study of brine water quality is required.

The Bay Plan also has regulations related to Environmental Justice, which are discussed in Chapter 9, “Environmental Justice.” Consultation with BCDC is required to obtain input on the desalination project/alternatives, key impacts, such as impingement and entrainment from open intakes, expectations, and supporting information and analysis required.

Ocean Plan Requirements for New Desalination Facilities

As discussed in Section 6.6.2 “Water Quality Control Plan for Ocean Waters of California (Revised 2019),” Valley Water’s desalination project is considered a new facility withdrawing seawater, and provisions of Chapter III.M.2 (Water Code §13142.5(b) Determinations for New and Expanded Facilities: Site, Design, Technology, and Mitigation Measures Feasibility Considerations) apply, but Chapter III.M.3, (Receiving Water Limitation for Salinity) and III.M.4 (Monitoring and Reporting Programs) is not anticipated to apply, although the RWQCB and SWRCB would make the final determination on these requirements.

In accordance with Chapter III.M.2, Valley Water would be required to submit a request for a Water Code section 13142.5(b) determination to the San Francisco Bay RWQCB, regardless of the project options selected. Coordination with the San Francisco Bay RWQCB is required to determine contents needed in this request. The analysis would focus on the best available site, design, technology, and mitigation measures to minimize intake and mortality of all forms of marine life. The remainder of this section provides an evaluation of project options related to key issues identified for these four factors.

Consistent with Urban Water Management Plan (Site Requirements)

In evaluating site requirements, the Ocean Plan states consideration for whether the need for desalination water is consistent with an adopted Urban Water Management Plan, or if no urban water management plan is available, other relevant water planning documents. As discussed in Chapter 1, "Introduction," the 10 million gallons per day (MGD) desalination project evaluated in this study is not currently identified in *Valley Water's 2020 Urban Water Management Plan* or the *Water Supply Master Plan 2040*. As such, if Valley Water decides to move forward with a desalination project, it should consider incorporating this project into its future water planning, as this would strengthen consideration of the project by the San Francisco Bay RWQCB in accordance with the Ocean Plan.

Feasibility of Subsurface Intakes (Site and Technology Requirements)

The San Francisco Bay RWQCB is required to first consider if subsurface intake options (SJ In 1, MV In 1, PA In 1) are feasible, meaning that an open intake option (SJ In 2, MV In 2, PA In 2, PA In 3) would not be authorized under the Ocean Plan unless subsurface intake options are first determined to be infeasible. Feasibility is determined by the San Francisco Bay RWQCB using analysis provided by Valley Water. Valley Water should coordinate early with San Francisco Bay RWQCB to understand requirements of this analysis.

The San Francisco Bay RWQCB shall consider the following factors in determining feasibility of subsurface intakes: geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats, presence of sensitive species, energy use for the entire facility, design constraints (engineering, constructability), and project life cycle cost, and subsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes. Some of these factors are evaluated in this study and the others should be evaluated as additional design and engineering information is developed during the next phase of planning.

If the San Francisco Bay RWQCB determines that subsurface intakes are not feasible for the proposed intake design capacity (i.e., 10 MGD), it shall determine whether subsurface intakes are feasible for a reasonable range of alternative intake design capacities. In Chapter 5, "Environmental Conditions," the evaluation identifies potential impacts to salt marsh habitat form the subsurface intake options if there are insufficient water supplies. As seawater supply availability for subsurface intakes is evaluated further, Valley Water should consider if impacts are avoided or minimized at lower operating capacities.

The San Francisco Bay RWQCB may also find that a combination of subsurface and surface intakes is the best feasible alternative to minimize intake and mortality of marine life.

Minimize Impacts of Open Intakes (Site, Design, Technology Requirements)

If the San Francisco Bay RWQCB subsurface intakes are infeasible, the siting and designs for open intakes shall be evaluated to minimize the intake and mortality of all forms of marine life. This primarily relates to the impingement and entrainment of marine organisms, as discussed in Chapter 5, "Environmental Conditions." The Ocean Plan explicitly states the following technology requirements: open intakes shall be screened with a 1.0 millimeter or smaller slot size screen or equally effective alternative method, and through-screen velocity at the surface water intake shall not exceed 0.5 feet per second.

Impacts to Sensitive Habitats (Site, Design, and Technology Requirements)

The Ocean Plan contains several requirements related to infrastructure and sensitive habitats. Valley Water will need to analyze the feasibility of siting, design configurations, installation, and maintenance of the intake, brine management, and other infrastructure to avoid impacts to sensitive habitats and species. Additionally, the brine mixing zone should not affect existing sensitive habitat. The siting evaluation in this study can be used to begin this evaluation and should be supplemented with field surveys, design information, and additional study of impacts to sensitive habitats.

Brine Management (Site and Design Requirements)

The Ocean Plan states that blending of brine with wastewater is preferred and that the presence of existing discharge infrastructure and availably of wastewater to dilute brine should be analyzed. Existing wastewater infrastructure was not analyzed for discharge of brine as part of this study because existing discharges in San Jose, Sunnyvale, and Palo Alto are near the shoreline in shallower Bay waters that are not known to experience dilution very quickly and Valley Water has not spoken to the owners of these facilities at this early stage of project planning. This study identifies that blending brine with wastewater effluent would lower salinity and provide advantages, including potentially making use horizontal levee options viable. Further study of opportunities to blend brine with wastewater effluent and potentially use existing infrastructure are required.

The Ocean Plan states that when brine cannot be diluted, multiport diffusers are the next best method. Brine discharge technologies other than wastewater dilution and multiport diffusers may be used if an owner or operator can demonstrate to the San Francisco Bay RWQCB that the technology provides a comparable level of intake and mortality of all forms of marine life as wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable.

The Ocean Plan does not explicitly consider use of horizontal levees for desalination brine. If horizontal levees can be designed with desirable brine water quality and to benefit special-status species, then they may also be acceptable to the San Francisco Bay RWQCB.

6.8.2 Existing and Planned Land Uses and Projects Compatibility Evaluation

A summary of constraints related to existing and planned land uses and projects is provided in **Table 6-4** and key findings are discussed below. This evaluation is based on planned land uses and projects identified above in this chapter. Valley Water is also currently developing a Purified Water Project (which is not discussed above) and considering alternatives in San Jose and Palo Alto. This project would result in blending of reverse osmosis brine with wastewater effluent and discharge to the South Bay at an existing wastewater facility discharge point. Changes in discharges resulting from the Purified Water Project are not evaluated here because they do not change the evaluation of project options. However, they should be considered during future phases of project planning.

San Jose/Santa Clara Regional Wastewater Facility Master Plan

Project options in Mountain View and Palo Alto, including the Mountain View–Palo Alto Environmental Study Area and TFPA, are located outside of San Jose/Santa Clara RWF lands. Therefore, this analysis focuses on constraints related to project options in San Jose including the TFPAs.

The Pond A18 Subsurface Intake option may not be compatible with development of tidal habitat and ecotone at Pond A18 in the future unless the subsurface intake can be designed around the ecotone (such as in the northern portion of Pond A18) and if there is sufficient water supply in Pond A18 to support this intake option. Coordination with the city of San Jose is required to discuss this future project. Alternatively, the Pond A18 Horizontal Levee option may be compatible with the development of tidal habitat and ecotone, if wastewater effluent and brine from the desalination project can be blended and applied to the ecotone/horizontal levee, creating a cooperative project at this location. If salinity cannot be lowered in brine, then this option would not be compatible. Further study of brine water quality and blending are required.

The location of a treatment facility within the San Jose TFPAs may conflict with current land use policies for buffer lands and future land uses designated for owl habitat, landfill, plant, buffer, and recreation, but there are likely future commercial areas where the facility could be located. The Potential San Jose TFPA would only become an option once current use of the land for operational purposes ceases. A large portion of the San Jose Potential TFPA is located within the flexible space designated use area, which could have many potential uses not yet established. Due to uncertainty regarding the current designated uses of San Jose/Santa Clara RWF lands given the 30-year implementation period of the Plant Master Plan, it is recommended that Valley Water coordinate with the City of San Jose to determine uses and potential options for treatment facility location.

Table 6-3. Summary of Existing and Planned Land Uses and Projects Compatibility Constraints

Project Options		San Jose/Santa Clara RWF Master Plan	Existing Flood Protection Levees	Flood Protection and Habitat Restoration Projects	Existing Recreational Trails and Facilities
Intake Options and Associated Conveyance					
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	Compatible with current pond uses if adverse impacts to biological resources from intake operation are avoided (requires further study); temporary impacts from pipeline; may conflict with future planned tidal habitat and ecotone; temporary impacts from pipeline; pump station likely compatible due to small size	Alteration of city of San Jose levee from pipeline construction	Shoreline Levee Project Phase I at Pond A18 – may conflict with future planned tidal habitat and ecotone; temporary impacts from pipeline USACE's Coyote Creek Levee System – TBD based on design if impacts could occur	None
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	Open intake is compatible with effluent release; temporary impacts from pipeline; pump station likely compatible due to small size	Alteration of city of San Jose levee from pipeline construction	Shoreline Levee Project Phase I at Pond A18 – Possible temporary impacts to levee improvements from pipeline	None
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	Not located on San Jose/Santa Clara RWF lands	Alteration of city of Mountain View, USFWS, and Midpeninsula Regional Open Space District levees from pipeline construction	SBSP Restoration Project at Pond A2E – No information is available on future planned projects	Temporary impacts to Bay Trail and Northeast Meadowland Trail from pipeline construction
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	Not located on San Jose/Santa Clara RWF lands	Pipeline alignment located along USFWS levee and alteration would occur to city of Mountain View and USFWS levees from pipeline construction	SBSP Restoration Project at Pond A2E – No information is available on future planned projects	Temporary impacts to Bay Trail and Northeast Meadowland Trail from pipeline construction
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	Not located on San Jose/Santa Clara RWF lands	Alteration of city of Mountain View levee from pipeline construction	SBSP Restoration Project at the Mountain View Pond Cluster – compatible if adverse impacts to biological resources from intake operation are avoided (further study required); temporary impacts from pipeline	Temporary impacts to Bay Trail Green Trail, and Adobe Creek Loop from pipeline construction
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	Not located on San Jose/Santa Clara RWF lands	Alteration of city of Mountain View levee from pipeline construction	SBSP Restoration Project at the Mountain View Pond Cluster – Possible temporary impacts to levee improvements from pipeline	Temporary impacts to Bay Trail and Adobe Creek Loop from pipeline construction
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	Not located on San Jose/Santa Clara RWF lands	Pipeline alignment located along cities of Mountain View and Palo Alto levees and alteration would occur from pipeline construction	SBSP Restoration Project at the Mountain View Pond Cluster – Possible temporary impacts to levee improvements from pipeline	Temporary impacts to Bay Trail and Adobe Creek Loop from pipeline construction
Brine Management Options					
All	South Bay Deep Water Outfall (Br 1)	Not located on San Jose/Santa Clara RWF lands	No direct impacts currently identified	No known planned projects at outfall location	None
SJ	Pond A18 Horizontal Levee (SJ Br 2)	Compatible with current Pond A18 uses and future planned tidal habitat and ecotone, if adverse impacts to water quality and biological resources from discharge are avoided; temporary impacts from pipeline	Horizontal levee located on slope of city of San Jose levee and alteration would occur from construction	Shoreline Levee Project Phase I at Pond A18 – compatible if salinity in brine can be reduced via blending (further study required); temporary impacts from pipeline USACE's Coyote Creek Levee System – TBD based on design if impacts could occur	None
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	Not located on San Jose/Santa Clara RWF lands	Horizontal levee located on slopes of city of Mountain View, city of Palo Alto, and USFWS levees and alteration would occur from construction	No impact west of Pond A1; compatible with SBSP Restoration Project at the Mountain View Pond Cluster, if adverse impacts to water quality and biological resources from discharge are avoided; temporary impacts from pipeline	Assume permanent impacts could be avoided; temporary impacts to Bay Trail from horizontal levee construction
Treatment Facility Planning Areas					
SJ	San Jose Treatment Facility Planning Area	May conflict with current buffer land policies; may be compatible with planned future uses for commercial uses but not for owl habitat, landfill, plant, buffer, and recreation	Assume levees would be avoided	No known planned projects	None
SJ	San Jose Potential Treatment Facility Planning Area	Not an option with current land uses; may be compatible with future flexible space but not wetland or plant expansion area	Assume levees would be avoided	No known planned projects	None
MV/PA	Mountain View–Palo Alto Treatment Facility Planning Area	Not located on San Jose/Santa Clara RWF lands	Assume levees would be avoided	No known planned projects	Assume recreation impacts could be avoided

Notes: SBSP=South Bay Salt Ponds; TBD=to be determined, - = Not Applicable

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Existing Flood Protection Levees

The intake and brine management options would require infrastructure located on existing levees managed by a variety of local municipalities, USFWS, or the Midpeninsula Open Space District, as shown in **Table 6-3**. An encroachment permit, easement, or other similar approval would likely be required, and each agency may have its own requirements for developing infrastructure such as pipeline crossings. The horizontal levees are anticipated to be compatible uses with existing levees. Where pipelines cross levees perpendicularly, approval is more likely. Where pipelines need to be constructed along levee alignments (i.e., not perpendicular) to reach the open intake options in the Bay (MV In 2, PA In 3), approval may be more difficult. Trenchless pipeline installation techniques are also anticipated to be easier to obtain approval across levees. Early coordination with the applicable levee system owner (City staff or USFWS) is recommended.

Flood Protection and Habitat Restoration Projects

USACE could determine that intake and brine management options in Pond A18 (SJ In 1, SJ Br 2) result in alteration of the Coyote Levee System Project to the east, triggering a USACE Section 408 permission (*see* Chapter 11, "Permitting"). It is not known if the Shoreline Levee Project Phase I connecting to the Coyote Levee System Project would also trigger a Section 408 approval in the future (and is not considered in this study).

The Shoreline Levee Project Phase I at Pond A18 proposes the same ecotone and tidal habitat as the San Jose/Santa Clara RWF Master Plan. *Refer to* the section above for the Master Plan for a discussion of compatibility with the Pond A18 Subsurface Intake option and Pond A18 Horizontal Levee option.

Regarding the SBSP Restoration Project at the Mountain View Pond Cluster, the Charleston Slough/Pond A1 Subsurface Intake option may not be compatible with development of tidal habitat in Pond A1 in the future, unless there is sufficient water supply in Pond A1 to support this intake option without adverse effects to tidal habitat during operations. Coordination with SBSP is required to discuss this future project. Additionally, the Mountain View–Palo Alto Horizontal Levee option may be compatible with the development of tidal habitat in Ponds A1 and A2W, if wastewater effluent and brine from the desalination project can be blended and applied to the horizontal levee; creating a cooperative project at this location. If salinity cannot be lowered in brine, then this option would not be compatible with the SBSP Restoration Project in Ponds A1 and A2W. Further study of brine water quality and blending are required. However, the Mountain View–Palo Alto Horizontal Levee option is long and there may be sufficient space available to the west of Pond A1 for this option without needing to develop it in Ponds A1 and A2W, depending on the space needed to discharge brine from the desalination project,

Several of the intake options could result in temporary impacts to projects from development of pipelines. Trenchless pipeline installation is more likely to avoid conflicts. There is a future SBSP Restoration Project identified for Pond A2E but the timing of this project is not known and Valley Water should look to obtain additional information.

Existing Recreational Trails and Facilities

The project options in San Jose would not impact existing recreation facilities. Construction of project options in Mountain View and Palo Alto would result in the temporary disturbance and likely closure of portions of the Bay Trail and other local recreational trails. It is recommended that Valley Water coordinate with applicable City staff to facilitate the closure of trails and post signage notifying recreational uses of closures.

6.8.3 Municipal Land Use Planning Compatibility Evaluation

Constraints related to municipal zoning designations and general plan policies for each project option is provided in **Table 6-4**. Intake and brine management options in unincorporated Santa Clara County (MV In 1, MV In 2, and portions of PA In 1, PA In 2, MV-PA BR 2) are not identified as permitted uses as designated by Santa Clara County Zoning Ordinance. A conditional use permit or similar permit may be required for development of these project components. Consultation with Santa Clara County is recommended. Several project options within the San Jose and Mountain View – Palo Alto Environmental Study Areas, as shown in **Table 6-4**, are not designated as allowable used within the applicable municipalities and/or County General Plan. Coordination with the applicable municipality and/or Santa Clara County is recommended.

Table 6-4. Summary of Municipal Zoning and General Plan Policy Constraints

Project options		Zoning Designations					General Plan Designations			
		San Jose	Mountain View	Palo Alto	Sunnyvale	Unincorporated Santa Clara County	San Jose	Mountain View	Palo Alto	Santa Clara County
Intake Options and Associated Conveyance										
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	Likely permitted use	–	–	–	–	Not a designated allowed use for Open Space, Parklands, and Habitat	–	–	–
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	Likely permitted use	–	–	–	–	Not a designated allowed use for Open Space, Parklands, and Habitat	–	–	–
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	–	–	–	–	Not a permitted use	–	–	–	Likely an allowable use
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	–	–	–	–	Not a permitted use	–	–	–	Likely an allowable use
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	–	–	Likely permitted use, depending on landowner	Likely permitted use	Not a permitted use	–	Not a designated allowed use for Public – Regional Park	Not a designated allowed use for Public Park	–
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	–	–	Likely permitted use, depending on landowner	–	Not a permitted use	–	Not a designated allowed use for Public – Regional Park	Not a designated allowed use for Public Conservation Land and Public Park	Likely an allowable use
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	–	–	Likely permitted use, depending on landowner	–	–	–	–	Not a designated allowed use for Public Conservation Land and Public Park	–
Brine Management Options										
All	South Bay Deep Water Outfall (Br 1)	–	–	–	–	–	–	–	–	–
SJ	Pond A18 Horizontal Levee (SJ Br 2)	Likely permitted use	–	–	–	–	Not a designated allowed use for Open Space, Parklands, and Habitat	–	–	–
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	–	Likely permitted use	Likely permitted use, depending on landowner	–	Not a permitted use	–	Not a designated allowed use for Public – Regional Park	Potentially an allowed use	Likely an allowable use
Treatment Facility Planning Areas										
SJ	San Jose Treatment Facility Planning Area	Likely permitted use	–	–	–	Allowed use	Not a designated use for Open Space, Parklands, and Habitat	–	–	–
SJ	San Jose Potential Treatment Facility Planning Area	Likely permitted use	–	–	–	–	Not a designated use for Open Space, Parklands, and Habitat	–	–	–
MV/PA	Mountain View–Palo Alto Treatment Facility Planning Area	–	Likely permitted use	Likely permitted use, depending on landowner	Likely permitted use	Allowed use	–	Not a designated allowed use for Public – Regional Park	Not a designated allowed use for Public Conservation Land	Not a designated allowed use for Transportation

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Chapter 7. Energy

7.1 Introduction

This chapter provides an evaluation of seawater desalination project (desalination project) energy use and available energy sources. First, a high-level analysis of typical desalination project energy demands is provided, including an example of energy use for a desalination project currently planned in California, the Doheny Ocean Desalination Project (Doheny Project). Estimates of energy use for each project option and desalination project alternative are provided for a range of salinity scenarios. Finally, potential energy sources for the desalination project are identified.

Energy use estimates account for pumping source water for the intake, treatment of source water, and conveyance of source water from the intake, brine for management, and treated water to Valley Water's distribution system. The intake energy was calculated using a hydraulic analysis to estimate pumping requirements. Treatment energy use was calculated based on the representative treatment train based on the water quality analysis as outlined in Chapter 4, "Water Quality." Conveyance energy was calculated based on the assumed potential connection points. The energy for conveyance was calculated using estimates of a hydraulic analysis to estimate pumping requirements. Detailed energy use calculations are provided in **Appendix C**.

7.2 Energy Demands

Seawater reverse osmosis (RO) requires a significant amount of energy to overcome the naturally occurring osmotic pressure that must be exerted on RO membranes for the creation of potable water. Additionally, energy is required to convey the source, permeate, and brine water, and for additional pre- and post-treatment processes. However, over the last 20 years there has been a two-fold reduction in power needs for seawater desalination through advances in membrane technologies and energy recovery applications (Voutchkov 2018). **Table 7-1** provides a comparison of average energy requirements for treatment of different water types.

Table 7-1. Energy Use of Water Supplies

Water Type	Kilowatt-hours per Cubic Meter	Kilowatt-hours per Million Gallons
Conventional treatment of surface water	0.2 – 0.4	757 – 1514
Water reclamation (from POTW) [1]	0.5 – 1.0	1,893 – 3,785
Indirect potable reuse	1.5 – 2.0	5,678 – 7,571
Brackish water desalination	1.0 – 1.5	3,785 – 5,678
Desalination of Pacific Ocean water [2]	2.5 – 4.0	9,464 –15,142

Notes: POTW=publicly owned treatment works
[1] Similar to Valley Water's Purified Water Project (H. Barrientos, personal communication March 7, 2023)
[2] Energy use for membrane seawater desalination – current status and trends.
Source: Voutchkov 2018

Brackish water typically has a salinity range of 1,000 to 20,000 parts per million, while the Pacific Ocean has a salinity of approximately 35,000 parts per million. The salinity of the South San Francisco Bay (Bay) is impacted by the influx of freshwater from the local rivers, tides, and evaporation rate. The average salinity of the South San Francisco Bay (South Bay) can vary from 5,000 to 30,000 parts per million depending on the location and seasonality. This would categorize the water as either brackish or ocean desalination.

Seawater RO systems of best-in-class seawater desalination facilities use between 2.5 and 2.8 kilowatt-hours (kWh) of electricity to produce 1 cubic meter (m3) (264 gallons) of fresh water, while the industry average energy use is approximately 3.1 kWh/m3 (3,824 kWh/acre feet, 11,735 kWh/million gallons (MG)).

The industry-wide cost for production of fresh drinking water from seawater as of 2018 is approximately $1.10 per cubic meter (264 gallons). Energy expenditure typically contributes 25 to 40 percent of this cost depending on the unit power rate and the desalination facility design, and equipment efficiency.

Energy for desalination facilities is primarily demanded from the RO process with the next largest energy processes being source water intake and pre-treatment, as shown in **Figure 7-1**.

Figure 7-1. Energy Consumption per Seawater RO Process

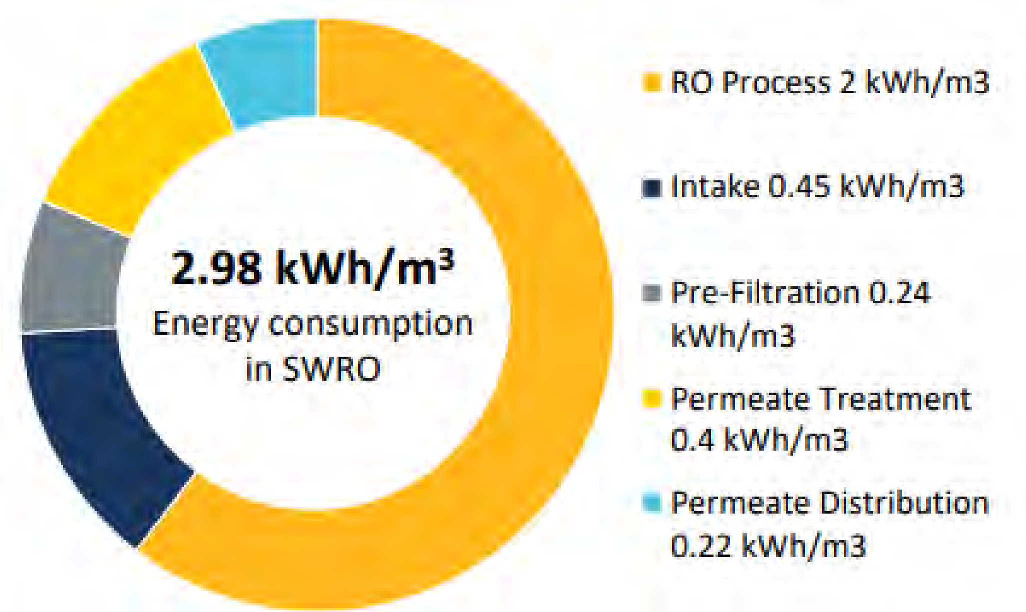

Figure source: Source: Pinto 2020

The energy required for desalination is dependent on a variety of factors. Water salinity and water temperature are the leading drivers of energy consumption. Other factors impacting energy demands include but are not limited to:

- RO membranes
- Pre-treatment efficiencies
- Distance and elevation of conveyance to water treatment facility and from water treatment facility to distribution system
- Energy saving technologies and techniques such as energy recovery devices (ERDs) can recover nearly 50 percent of pumping energy demand (South Coast Water District, 2018)

7.2.1 Benefits of Lower Salinity Source Water

The energy demand for the RO process is proportional to the salinity of source water. As a result, the lower salinity water will result in a lower energy requirement. Typically, seawater has an electrical conductivity of 50,000 microsiemens per centimeter (µs/cm). The South Bay has a slightly lower electric conductivity of approximately 43,000 µs/cm. This has the benefit of slightly lower RO energy requirements than traditional seawater. Other options for further reducing salinity are through the use of brackish groundwater in conjunction with seawater. Alternatively, some agencies are exploring the option of combining direct potable reuse (DPR) treatment with seawater RO treatment. This option would use tertiary water as a source water that could be blended with seawater from the South Bay. This water could then be treated to meet both the anticipated DPR requirements and seawater RO requirements. Addition of the tertiary water would have the benefit of reducing the salinity of the water prior to RO treatment through blending.

While salinity is a driver of the required energy for the RO treatment process, elevated levels of other constituents of concern may also impact energy requirements. Water drawn into a subsurface intake or significant quantities of wastewater effluent may have a lower salinity, may be higher in total dissolved solids or other constituents that can quickly foul the RO membranes, requiring additional pre-treatment requirements and energy use. As a result, lower salinity does not necessarily translate to lower energy requirements, requiring additional water quality information to evaluate the energy requirements.

7.2.2 Example: Doheny Ocean Desalination Project

The Doheny Project is potentially of similar scope to the desalination project that Valley Water is evaluating and can be used as a comparison of anticipated energy usage.

The Doheny plant is in design and has an intake of 10 million gallons per day (MGD) with an assumed 50 percent recovery rate to produce 5 MGD of treated desalinated water. It is anticipated to use slant wells for a subsurface intake. The Phase I project which will have a 10 MGD intake (5 MGD treated water, at 50 percent recovery) has an estimated peak energy demand to be 3.9 megawatts (MW). The energy breakdown is shown in **Figure 7-2**. These estimates assume energy recovery as discussed below.

Since Valley Water is evaluating a 10 MGD desalination project with 50 percent recovery and 20 MGD of source water, it is appropriate to double energy estimates from the Doheny Project for comparison. As a result, a similar 10 MGD project would result in a peak energy demand of 7.8 MW or 31.22 kWh per kilogallon and 54,118 megawatt-hours (MWh) per year.

Figure 7-2. Doheny Ocean Desalination Project Electrical Energy Use – Normal Operation for 5 Million Gallon per Day Potable Water Production Capacity

Process / System Description	kWh/kgal	MWh/year	% of Total
Slant Well Pumping	0.93	1607	6%
Pre-treatment (including backwashing, backwash water recycling), Solids Handling	0.77	1342	5%
RO Transfer Pumps	0.85	1474	5%
High-Pressure RO Pumps and ERS Booster Pumps	9.15	15858	59%
2nd Pass RO HP Pumps	0.74	1,288	5%
Post-treatment	0.23	400	2%
Product Water Pumping	2.09	3628	13%
Brine Disposal via Ocean Outfall Pumping	0.22	388	1%
Ancillary	0.62	1074	4%
Total Estimated Energy Use	**15.61**	**27,059**	**100%**
Note: 27,059-megawatt hour per year (MWh/year) is roughly equivalent to a 3 megawatt (MW) constant source of power year-round, for which 3.9 MW is used as a peak design load.			

Figure source: South Coast Water District 2018

Energy Savings

The planned design for the Doheny Project anticipates using ERDs. ERDs are used to recapture the pressure in the brine which can reduce the desalination facility's pumping energy demand by nearly 50 percent. The ERDs use a series of isobaric pressure exchangers which use the energy from the concentrate stream of the RO process to pressurize an equal portion of the RO feedwater stream. Through this process, 50 percent of RO feed water is split to the ERDs to exchange energy with an equal volume of RO concentrate. These devices are anticipated to achieve 97 percent efficiency of the RO process and have an ultimate savings of 45 to 55 percent of the total energy required for the first pass RO system.

Energy Sources

The planned design for the Doheny Project includes solar photovoltaic panels on flat rooftops, where feasible, and assumes that there will be approximately 45,000 square feet, providing 1,000 MWh/year or 3.7 percent of the power demand.

Other alternative energy sources are being evaluated including natural gas turbines and fuel cells to maximize efficiency and minimize energy costs. **Figure 7-3** summarizes the technologies that are being considered.

Figure 7-3. Onsite Power Generation Technology Options

Technology	Footprint Constraints	Pros/Cons
Internal Combustion Engine	No Constraints	**Pros:** Mature Technology, Inexpensive/abundant Fuel Supply **Cons:** Emissions control require additional CAPEX
Natural Gas Turbine	No Constraints	**Pros:** Mature Technology, Inexpensive/abundant Fuel Supply **Cons:** Lower overall efficiency than IC Engines
Natural Gas Fuel Cell	Possible Constraints at 15 mgd desalination facility	**Pros:** Lower GHG emissions than combustion technology **Cons:** Newer Technology
Solar	Severe Constraints	**Pros:** Technology continues to advance **Cons:** Off-site generation decreases overall system reliability compared to on-site generation
Wind	Severe Constraints	**Pros:** Mature Technology **Cons:** A suitable off-site location may be difficult to find and does not add reliability to the Project
Waste-To-Energy	Likely Constraints	**Pros:** Environmentally Friendly **Cons:** Securing a reliable long-term supply of fuel may be problematic
Battery	Likely Constraints	**Pros:** Technology continues to advance **Cons:** Expensive and large space requirements

Figure source: South Coast Water District 2018

7.3 Energy Use Estimates

This section first discusses parameters and assumptions to calculate energy use from a conceptual 10 MGD desalination facility and then provides energy use estimates for each project option and alternative.

7.3.1 Modeling Parameters and Assumptions

Energy demands were estimated from the following processes and are discussed below along with general assumptions.

- Pumping and conveyance of source water from the intake to the treatment facility
- Pre-treatment processes (if applicable)
- RO treatment process
- Post-treatment process
- Conveyance of brine for management
- Conveyance to Valley Water's distribution system

Table 7-2 shows assumptions and approximate pipeline lengths used to estimate energy use for the project options. Additional assumptions related to pipelines are discussed in the sections below.

Table 7-2. Approximate Pipeline Lengths Used for Energy Estimates

Project Option		Assumed Pipeline Alignment	Approximate Pipeline Length (feet)
Intake Options – Pipeline from Intake Location to Pump Station and Treatment Facility			
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a)	From intake option to SJ pump station to SJ/Potential SJ TFPA mid-point	3,000
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	From intake option to SJ pump station to SJ/Potential SJ TFPA mid-point	3,500
MV	Pond A2E Subsurface (MV In 1, MV P2a)	From intake option to MV pump station to MV-PA TFPA mid-point	4,500
MV	South Bay Open (MV In 2, MV P2b)	From intake option to MV pump station to MV-PA TFPA mid-point	8,000
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a)	From intake option to PA pump station to MV-PA TFPA mid-point	1,600
PA	Charleston Slough Open (PA In 2, PA P2a)	From intake option to PA pump station to MV-PA TFPA mid-point	1,600
PA	South Bay Open (PA In 3, PA P2b)	From intake option to PA pump station to MV-PA TFPA mid-point	9,100
Brine Management Option – Pipeline from Treatment Facility to Brine Management Location			
SJ	South Bay Deep Water Outfall (Br 1)	From outfall mid-point to SJ/Potential SJ TFPA mid-point	38,900
MV or PA	South Bay Deep Water Outfall (Br 1)	From outfall mid-point to MV-PA TFPA mid-point	4,600
SJ	Pond A18 Horizontal Levee (SJ Br 2)	From horizontal levee option mid-point to SJ/Potential SJ TFPA mid-point	2,500
MV-PA	MV-PA Horizontal Levee (MV-PA Br 2)	From horizontal levee option mid-point to MV-PA Br 2 mid-point	5,900
TFPA – Pipeline from Treatment Facility to Valley Water Treated Distribution Water System			
SJ	TFPA or Potential TFPA	From SJ/Potential SJ TFPA mid-point to Mountain View Distribution Potable Line	69,900
MV-PA	TFPA	From MV-PA TFPA mid-point to Milpitas Potable Line at SFPUC Emergency Intertie	79,700

Notes: TFPA=Treatment Facility Planning Area

General Assumptions and Approach

The following general assumptions were used to estimate energy use.

- The desalination project assumes a total treated water production capacity of 10 MGD at a 50 percent recovery – meaning of the 20 MGD of source water, 10 MGD of product water will be pumped from the treatment facility to Valley Water's existing distribution system and an additional 10 MGD will be pumped back to the South Bay for brine management.

- Head losses are accounted for in pipelines by assuming a pipeline velocity of 2-8 feet per second and a C-factor of 130[1].

- The desalination project will not be considered critical infrastructure and emergency power will not be required.

- Pumps will be high efficiency motors and use variable frequency drives (VFD); assuming 80 percent pump efficiency.

- Assumes the desalination facility is operating 24 hours per day. The desalination facility will be offline periodically for backwash and maintenance, but this is not accounted for in the energy use estimates.

The desalination project would also require electrical use for lighting, heating, and operation of control features at the treatment facility; however, this energy use is not included in the project energy use estimates.

Source Water Intake

For both the subsurface and open intake methods, it was assumed that water would need to be lifted 100 feet to calculate the head required for pumping from the intake location. Identifying a precise head requirement at this phase is not feasible as the energy intake requirements will depend on a lot of factors such as the type of screen on the open intake and the type, number, depth, and other parameters of the subsurface intake.

To calculate the intake energy requirements, a spreadsheet calculation was conducted that considered the general assumptions and intake assumptions. The energy calculation considered the head differential, conveyance length, and the friction losses within the pipeline.

Reverse Osmosis and Treatment

The following assumptions for RO, pre-treatment, and post-treatment were used to estimate energy use.

- Pre-treatment is only required for open intake options and not for subsurface intake options.

- Pre-treatment energy includes the power required for microfiltration/ultrafiltration filtrate booster pump and 30 pounds per square inch (psi) (69.3 feet of head) is assumed to be required for microfiltration/ultrafiltration treatment.

- The treatment train will have cartridge filters in front of the RO treatment. This is anticipated to require 15 psi (34.7 feet of head).

- The RO treatment assumes a 50 percent recovery rate, with 87 percent pump efficiency, 95 percent motor efficiency, and 97 percent VFD efficiency.

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[1] The C-factor is an empirical value used to indicate the smoothness of the interior of a pipe; roughness coefficient. A higher C-factor correlates with a smoother pipe with a greater carrying capacity, and a smaller C-factor correlates with a rougher pipe with higher energy losses.

- Head loss through the RO treatment is dependent on the source water quality conditions. A range of source water quality conditions were modeled. The seasonality of the South Bay water quality as well as the potential impact of groundwater on total dissolved solids may impact the source water quality conditions. The range of pressure conditions was 425 to 804 psi (982 to 1,857 feet of head), depending on the source water quality.
- Post-treatment energy requirements are minimal and are included in the estimate for the product water conveyance to distribution system.

The treatment energy requirements were informed by the water quality modeling that considered the general assumptions and RO and treatment assumptions. Water quality modeling provided an estimated head for RO treatment and a spreadsheet calculation was used to convert this head condition to an energy requirement based on the assumed flowrate.

Product Water Conveyance to Valley Water's Treated Water Distribution System

There are several places where the product water can be conveyed. For the purposes of this analysis, it was assumed that the desalinated water is being conveyed to an existing Valley Water treated water distribution line. For the purposes of a conservative energy analysis, the longest alignment from each facility to the potable water line was chosen (**Table 7-2**). With this approach, energy estimates can be reduced if a closer connection is identified during future phases of project planning.

It was assumed that the existing pressure in the distribution line was 100 psi. In addition to these proposed locations, there are local pipes owned by cities which could be an option for conveyance. Additional investigation into this option can be considered at a further planning phase. For the connection to any of these existing pipelines, future consideration must be given to the existing pressure class, operating hydraulic grade line, diameter/capacity, and turnouts.

To calculate the product water conveyance energy requirements, a spreadsheet calculation was conducted that considered the general assumptions and product water conveyance assumptions. The energy calculation considered the head differential, conveyance length, and the friction losses within the pipeline.

Brine Management

The following assumptions for brine management were used to estimate energy use for pipelines.

- Based on the modeled water quality scenarios, the concentrate pressure ranges from 420-798 psi (970-1843 feet of head). The concentrate pressure provides head to convey the flow to the discharge location. This head is adequate to convey the flow to the South Bay Deep Water Outfall option.
- Brine is assumed not to need post-treatment conditioning and will have a residual pressure from the RO process similar to the feed pressure.

- Since the horizontal levees options are close to the TFPAs, it is assumed brine will be pressurized from the RO process and there will be adequate pressure to discharge the brine without having to re-pump the brine.
- The pipeline for the South Bay Deep Water Outfall option was measured from the relevant TFPAs to the deep Bay discharge location. Based on these lengths to discharge and concentrate pressures, no pumping is anticipated to be required for brine discharge.

7.3.2 Project Options Estimates

This section provides energy use estimates for the intake options evaluated in this study along with treatment and conveyance to Valley Water's distribution system. **Table 7-3** shows estimated energy use for pumping and conveyance of source water from each intake option and conveyance from the treatment facility to Valley Water's distribution system. Since it is assumed that no pumping is needed for conveyance of brine management, no energy use is estimated for the brine management options. **Table 7-4** provides estimates of energy use for treatment of varying electric conductivity levels, based on source water quality data for the Lower South Bay and estimated water quality presented in Chapter 4, "Water Quality." Since there is no energy use estimated for brine management, the intake pumping and conveyance energy use estimate can be combined with the estimates for treatment and conveyance to Valley Water's distribution system for each intake option, as shown in **Table 7-5**. With the assumptions made, energy estimates provided are intended to be conservative and capture the upper end of energy use for each option/scenario.

Table 7-3. Pumping and Conveyance Energy Use Estimates

Project Option		Estimated Energy Use (kWh)
Pumping and conveyance of source water from the intake to the treatment facility		
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	381
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	390
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	408
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	470
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	356
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	356
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	490
Post-treatment and conveyance of treated water from the treatment facility to Valley Water's distribution system		
SJ	TFPA or Potential TFPA	1,435
MV-PA	TFPA	1,604

Notes: kWh=kilowatt-hours

Table 7-4. Pre-treatment and Reverse Osmosis Energy Use Estimates Scenarios

Water Quality Scenario[1]	Electric Conductivity Level (µs/cm)	Estimated Energy Use (kWh)
High Salinity (Scenario 4 – Maximum EC, Average temperature, Average pH)	51,620	7,199
Average Salinity (Average of Scenarios 1, 2, and 3)	42,610	6,022
Low Salinity (Scenario 5 – Minimum EC, Average T, Average pH)	23,830	3,932

Notes: EC=electric conductivity; kWh=kilowatt-hours
[1] 'Scenario refers to the water quality scenario number that was developed in Section 4.3, "Water Quality Estimates," using data on source water quality collected for the Lower South San Francisco Bay.

Table 7-5. Comprehensive Energy Use Estimates

	Intake Option and Associated Conveyance	Associated Desalination Project Alternatives	Estimated Energy Use (MWh per year)		
			High Salinity	Average Salinity	Low Salinity
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	SJ-S1	80,500	70,200	51,900
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	SJ-O1, SJ-O2	80,600	70,300	52,000
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	MV-S1, MV-S2	77,800	67,500	49,200
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	MV-O1, MV-O2	78,400	68,100	49,800
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	PA-S1, PA-S2	78,800	68,500	50,200
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	PA-O1, PA-O2	78,800	68,500	50,200
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	PA-O3, PA-O4	80,000	69,700	51,400

Notes: MWh=megawatt-hours
Energy use considers intake pumping and conveyance, pretreatment, RO, and conveyance of treated water to Valley Water's distribution system; no energy use is assumed for brine management.

7.4 Energy Use Evaluation

7.4.1 Project Options Evaluation

A comparison of energy use estimates shows that estimated annual energy use for all project options and alternatives is similar (**Table 7-5**), energy use from pumping and conveyance associated with intake options and treatment facility locations (to Valley Water's distribution system) is similar (**Table 7-3**), the greatest energy use by a large number is from RO (**Table 7-4**), and differences in salinity levels and water quality are the greatest contributor to energy use (**Table 7-4**).

While energy use is similar, the open intake options in the Bay (MV In 2, PA In 3) require the most energy for pumping and conveyance because these options have the longest intake pipeline from the intake pump station location, and the intake options in Palo Alto at Charleston Slough (PA In 1, PA In 2) have the lowest energy use because these options have the shortest pipeline from the intake pump station location. This also reveals that if the intake pump stations need to be relocated further inland, then energy use from the intake would be expected to increase.

Conveyance of treated water from a treatment facility in San Jose was found to have lower energy use than in Mountain View or Palo Alto. This would ultimately depend on the treatment facility location and connection point to Valley Water's treatment system. Conservative connection points were assumed. For the San Jose TFPA, a connection to Mountain View Distributary was assumed. For the Mountain View- Palo Alto TFPA, a connection to the intersection of the Hetch-Hetchy Pipeline and Intertie at the SFPUC Emergency pump station was assumed.

Section 4.2.4, "Drought and Seasonal Data Variability," discusses that there would be variations in salinity levels seasonally each year and in different years depending on rainfall. As such, the high energy estimates in **Table 7-5** are likely an overestimate, as they do not account for seasonal variations in salinity and the high to low estimates provide a range of energy use that captures annual variation depending on the water year type.

It is unknown if there is a significant enough difference in source water salinity to impact the RO recovery rate for the subsurface intake options (SJ In 1, MV In 1, PA In 1), which would draw in groundwater along with seawater, and the Artesian Slough Open Intake option (SJ In 1), which would draw in significant amounts of wastewater effluent. Additional water quality data including salinity should be collected for these intake options to further evaluate salinity.

It is also likely that because of constituents in the groundwater, additional pretreatment may be required. This additional pre-treatment energy requirement would likely be similar if not greater than the benefit of the lower salinity water. Groundwater quality data would be required to further evaluate the energy impacts and was not collected as part of this study.

Energy Recovery Devises

ERDs are standard practice to include within a treatment facility. Therefore, the energy estimates presented in **Table 7-5** are conservative as they do not reflect the inclusion of ERDs. The energy savings from ERDs varies and is impacted by several factors. These factors include the system recovery rate, water temperature, and number of RO passes. Potential ERDs that could be used in the desalination project treatment facility include the following:

- **Positive Displacement Pumps with Pressure Exchangers.** These are the most used ERDs for desalination. The concentrate stream from the RO system is pumped back to the feedwater stream through the pressure exchanger. The pressure exchanger can then transfer the pressure energy from the concentrate to feedwater stream. This has the impact of boosting the feedwater pressure and reduces the overall energy required for pumping.

- **Peloton Wheel Turbine.** These use the pressure of the concentrate stream to drive a turbine. This turbine is connected to a compressor that boosts the feedwater pressure.
- **Isobaric Chamber.** This chamber uses the pressure of the concentrate stream, creating a pressure differential between the feedwater and concentrate streams. This pressure is then used to boost the feedwater pressure. Isobaric chamber type ERDs can recover an estimated 10 to 15 percent of energy from the RO concentrate (Voutchkov 2018).
- **Turbocharger/Hydraulic Turbocharger.** A turbocharger uses the pressure energy of the concentrate stream to drive a turbine that is connected to a compressor that boosts feedwater pressure. In a hydraulic turbocharger, the concentrate stream is connected to a hydraulic motor which is connected to a hydraulic pump that is used to boost feedwater pressures.

7.4.2 Comparison to Other Energy Uses

Other Water Supplies

Desalination project energy use estimates from treatment can be converted to kilowatt-hours per cubic meter (kWh/m^3) for comparison to other various water supplies. Accordingly, the energy use estimate of 7,199 kilowatt-hours (gallons per minute of inflow) for treatment (excluding conveyance) of high salinity source water (**Table 7-4**) is equivalent to 2.28 kWh/m^3. In comparison to water uses in **Table 7-1**, this estimate is slightly lower than the range cited for Desalination of Pacific Ocean Water but greater than estimates for all other types of water supplies including brackish water desalination.

Doheny Desalination Project

As discussed, if energy use estimated from the Doheny Project was extrapolated to a 10 MGD project like Valley Water is considering in this study, then energy use is estimated at 54,118 MWh per year. This corresponds to a level of energy use slightly higher than the low salinity scenarios for Valley Water's desalination project (**Table 7-5**). The Doheny Project energy use estimates assume an ERD would reduce treatment energy demands. As shown in **Table 7-5**, energy use for the project options is similar and estimated to range from 80,600 to 49,200 MWh depending on salinity levels in source water. Assuming a 10 to 15 percent reduction to treatment energy use from an ERD, would put energy use for the Doheny project in the middle of estimates for Valley Water's project with high and low salinity levels.

7.5 Potential Energy Sources

This section discusses energy sources in Santa Clara County that could potentially be used to provide power to the desalination project. Some of the energy source options are only applicable to specific locations.

7.5.1 Power and Water Resources Pooling Authority

The Power and Water Resources Pooling Authority (PWRPA) is a Joint Powers Authority that provides energy from natural gas and renewable energy sources. About 95 percent of Valley Water's purchased energy is provided by PWRPA (Valley Water 2021). PWRPA's power load ranges from 20 to 120 MW from Winter to Summer consuming 290 to 520 gigawatt-hours (GWh) of energy annually to convey, treat, and recycle water for their growers and consumers. The participants' individual loads range from 2 to 35 MW (PWRPA 2023). The energy procurement requirements for existing customer contracts are 405 GWh (CEC 2021).

PWRPA's infrastructure is interconnected with Pacific Gas and Electric's (PG&E) electrical infrastructure. PWRPAs first electrical pole is immediately adjacent to the last electrical pole in PG&E's service area (PWRPA 2020). PWRPA has ownership interests in five systems comprised of electric poles, lines and transformers through a separate Distribution Facility Agreement (DFA) with Reclamation District 108, Glenn Colusa Irrigation District, and Valley Water. The DFA provides that each participant has the responsibility to operate and maintain PWRPA's electrical infrastructure that is used to serve the respective participant's electrical delivery point.

7.5.2 Pacific Gas and Electric Company

PG&E is one of the largest combined natural gas and electric energy companies in the United States and the primarily electrical and natural gas utility in northern California and the Bay Area. In 2021, PG&E delivered 78,588 GWh of electricity. Of the total delivered, customers purchased approximately 77,500 GWh, or 98 percent of the total electricity delivered (PG&E 2021).

7.5.3 Local Energy Distributers

City of Palo Alto Utilities

The City of Palo Alto Utilities (CPAU) owns and operates the electric, fiber optics, water, gas, and wastewater utilities services for Palo Alto. All energy supplied by CPAU is carbon neutral with approximately 45 percent coming from hydrologic supplies and the remaining 55 percent from renewable contracts (City of Palo Alto 2018).

Silicon Valley Clean Energy

Silicon Valley Clean Energy (SVCE) provides electricity for the communities of Campbell, Cupertino, Gilroy, Los Altos, Los Altos Hills, Los Gatos, Milpitas, Monte Sereno, Morgan Hill, Mountain View, Saratoga, Sunnyvale and Unincorporated Santa Clara County (SVCE 2022). The SVCE works in partnership with PG&E, buying clean electricity direct from long-duration storage, wind generation, solar power, and geothermal projects, and PG&E uses existing infrastructure to deliver electricity and maintain all power lines (SVCE 2022).

San Jose Clean Energy

San Jose Clean Energy (SJCE) was established in 2019 to provide cleaner energy to the city of San Jose and to help meet the city of San Jose's goal of carbon neutrality by 2030 and the Climate Smart San Jose, the city of San Jose's Climate Action Plan. The SJCE works in the same way as SVCE in which they buy electricity from the source; California wind, solar and geothermal; and hydroelectric power from the Pacific Northwest, and work in partnership with PG&E to deliver electricity to their customers (City of San Jose 2022).

7.5.4 New Renewable Energy Sources

Valley Water could meet energy needs by constructing or obtaining new renewable energy sources. A goal of the Climate Change Action Plan (CCAP) is to expand renewable energy and improve energy efficacy (*refer to* Chapter 8 "Climate Change" for more details). If Valley Water were to obtain energy from the PWRPA this would help meet the established goals outline in the CCAP.

7.5.5 Biogas

Biogas is a mixture of methane, CO2 and small quantities of other gases produced by anaerobic digestion of organic matter in an oxygen-free environment. Biogas can be used as a source of energy for various applications, including a desalination. For 1 MW of power, approximately a 30 MGD treatment facility is required. As a result, the desalination project would require approximately 210 MGD treatment facility to be fully supported by biogas. Biogas could be used in one of two ways, either by power generation or thermal energy. For power generation, digester gas can be used to generate electricity which can then be used to power the desalination plant. Biogas is used to fuel gas engines or turbines which generates electricity that is fed into either the grid or directly to the desalination facility. Alternatively, the biogas can be used to produce thermal energy which can be directly used to power desalination processes. The biogas can be used to fuel boilers/burners to generate steam to power the desalination facility.

If the use of biogas were to be considered it would be recommended to further evaluate the option of power generation to the grid which the desalination facility could then pull as part of their energy supply (versus a direct connection to the biogas supply). This would provide the benefit of the use of a renewable energy supply, and it can help to reduce greenhouse gas emissions, while minimizing the limitations of this option. If power generation were to be directly for the desalination facility, a substation for backup power would still be required, resulting in the higher capital infrastructure costs. This option is anticipated to be costly. The City of Portland has approximately 2 MW of capacity from biogas, with a capital cost of $10 million.

Next steps for analyzing the feasibility of biogas potentially include:

- Conversations with San Jose/Santa Clara Regional Wastewater Facility and/or Sunnyvale Water Pollution Control Plant to understand if there is available excess biogas and if/how their biogas is currently being used.
- Assess the quantity and quality of the biogas available, including the volume and composition and any potential for additional future biogas supply.

- Further evaluate the desalination project with a refined energy demand understanding, including the timing and variability of energy demands. This would include evaluating the incorporation of any potential ERD devices at the facility.
- Conduct a technical/economic analysis that identifies the required infrastructure and use that capital cost to evaluate the economic feasibility of using biogas.
- Evaluate environmental/regulatory/policy options and limitations that may impact the feasibility of the use of biogas.

Chapter 8. Climate Change

8.1 Introduction

This chapter provides an evaluation of climate change issues related to project options. Climate change issues evaluated in this chapter include applicability of Valley Water's Climate Change Action Plan (CCAP), sources of greenhouse gas (GHG) emissions from the seawater desalination project (desalination project), estimates of GHG emissions from energy use, climate change hazards, and vulnerability of the desalination project to these hazards.

The following climate change hazards are considered relevant to the desalination project and were used to evaluate climate change vulnerability:

- **Flood-related climate hazards** – sea level rise, increased storm surge and waves, large storms and atmospheric rivers, increased groundwater elevations and salinity, and compound flood events.
- **Non-flood related climate hazards –** extreme heat, water, energy demand, drought, and power outages.

Climate change hazards are generally discussed at a regional scale – typically San Francisco Bay (Bay), South San Francisco Bay (South Bay), or Lower South Bay. However, the Environmental Study Areas and Treatment Facility Planning Areas (TFPAs) are used when discussing potential flooding issues. Background is provided on climate change hazards related to the desalination project by summarizing relevant climate change science, trends, and impacts related to the Bay area, particularly the Lower South Bay where site-specific information is available.

8.2 Greenhouse Gas Emissions

This section provides an evaluation of GHG emissions from the desalination project by discussing sources of GHG emissions, including estimates of GHG emissions from electricity purchased for operations.

8.2.1 Sources of Greenhouse Gas Emissions

Valley Water reports emissions in its CCAP in three categories: Scope 1 – direct emissions from Valley Water's operation activities, Scope 2 – electricity purchased by Valley Water, and Scope 3 – other indirect emissions sources where Valley Water does not control activities. This section discusses how the desalination project would generate each type of emissions.

Scope 1 – Direct Emissions

Scope 1 emissions are direct emissions sources generated by Valley Water operations for which Valley Water has the greatest capacity to control or mitigate. Valley Water generally considers Source 1 emissions to include its fleet, owned and operated equipment, and natural gas use. The desalination project would generate Source 1 emissions if fleet vehicles and equipment owned by Valley Water are used to conduct operational and maintenance activities, and potentially use of carbon dioxide (CO_2) in post treatment of product water to prevent corrosion.

Scope 2 – Purchased Electricity

Scope 2 emissions are considered indirect emissions from an entity's operations. Compared to Scope 1 emissions, Scope 2 emissions are less controllable by a company or entity, but more controllable than Scope 3 emissions (discussed below).

The primary component of Scope 2 emissions stem from electricity use. The desalination project would indirectly generate GHG emission from the purchase of electricity for numerous operations and maintenance activities, including pumping and conveyance of source water from the intake to the treatment facility, pretreatment of source water, processing of water twice through the reverse osmosis system, and conveyance of treated water from the treatment facility to Valley Water's distribution system. Energy use from these sources is discussed further and estimated energy use for project options is provided in Section 7.2, "Energy Use Estimates." The desalination project would also require electrical use for lighting, heating, and operation of control features at the treatment facility; however, this energy use is not included in the project energy use estimates.

Scope 3 – Indirect Sources of Emissions

Scope 3 emissions include all indirect emissions not captured in Scopes 1 and 2 that occur in the value chain of a reporting entity. These emissions represent both upstream and downstream activities related to an entity's operations and are in the Scope 3 category as they are the emissions sectors over which Valley Water has the least control. These emissions are dictated by human behaviors that Valley Water may attempt to influence but are ultimately the result of the choices made by customers, employees, contractors, service providers, and other external entities. The desalination project would generate Scope 3 emissions from worker commutes to and from the treatment facility, from any contracted deliveries or waste removal, and from use of equipment and vehicles during construction activities.

8.2.2 Greenhouse Gas Emissions Estimates

This section estimates Scope 2 greenhouse gas emissions. Scope 1 and 3 emissions are not estimated in this study. Electricity would be purchased from sources discussed in Section 7.4, "Potential Energy Sources." If electricity is obtained from the Power and Water Resources Pooling Authority or new renewable sources of energy developed for the project, then electricity use would not generate GHG emissions. However, if electricity is obtained from Pacific Gas and Electric Company (PG&E) or one of the local electricity distributers that obtains power from PG&E, then electricity use would generate scope 2 GHG emissions.

In 2020, the CO_2 emission rate for PG&E's delivered electricity was 160 pounds of CO_2 per megawatt-hour (PG&E 2022a). **Table 8-1** provides GHG emissions estimates for each project option, which were developed using the 2022 PG&E CO_2 emissions rate and energy use estimates prepared for this study under a variety of source water salinity scenarios. The GHG emissions associated with purchased electricity would decrease over time as energy suppliers comply with Assembly Bill 32 and the California Renewable Energy Executive Order, which is not reflected in the estimates in **Table 8-1**. These estimates also do not reflect expected reductions in energy demands from energy demand reduction devices, which are typically 10 to 15 percent for desalination projects, as discussed in Chapter 7, "Energy." As such, a corresponding 10 to 15 percent reduction in GHG emissions from electricity purchases would also be anticipated.

Table 8-1. Scope 2 Greenhouse Gas Emissions from Electricity Purchases from PG&E

Intake Option		Associated Desalination Project Alternatives	Greenhouse Gas Emissions Estimates (Metric Tons of CO_2 per year)		
			High Salinity	Average Salinity	Low Salinity
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a)	SJ-S1	5,842	5,095	3,767
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	SJ-O1, SJ-O2	5,849	5,102	3,774
MV	Pond A2E Subsurface (MV In 1, MV P2a)	MV-S1, MV-S2	5,646	4,899	3,571
MV	South Bay Open (MV In 2, MV P2b)	MV-O1, MV-O2	5,690	4,942	3,614
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a)	PA-S1, PA-S2	5,719	4,971	3,643
PA	Charleston Slough Open (PA In 2, PA P2a)	PA-O1, PA-O2	5,719	4,971	3,643
PA	South Bay Open (PA In 3, PA P2b)	PA-O3, PA-O4	5,806	5,059	3,730

Notes: CO_2=carbon dioxide

8.2.3 Project Options Evaluation

The desalination project, regardless of the project options selected, would generate Scope 1, 2, and 3 emissions. Scope 1 emissions would likely result from new use of a few Valley Water owned vehicles or trucks and potentially use of CO_2 in post-treatment of product water and is not anticipated to be a significant new source of scope 1 GHG emissions. Construction activities have the potential to generate substantial emissions of Scope 3 GHGs, regardless of the project options selected, and would depend on the intensity and duration of construction activities.

Scope 2 emissions from electricity use for the desalination project, if obtained from PG&E, would be a significant source of GHG emissions. Similar to the findings of the energy use evaluation, evaluation of Scope 2 GHG emissions reveals that GHG emission from pumping and conveyance associated with intake options and treatment facility locations (to Valley Water's distribution system) is similar, the greatest energy use by a large number is from reverse osmosis, and differences in salinity levels and water quality are the greatest contributor to GHG emissions. Additionally, because it is assumed brine management would not require pumping and energy use, there are no GHG emissions estimated for brine management.

8.3 Climate Change Hazards and Vulnerability

This section discusses the trends and impacts of climate change hazards and then provides an evaluation of project option vulnerability to these hazards.

8.3.1 Flood-related Climate Hazards

Climate change is increasing flood risk for coastal infrastructure in the following ways. This section discusses these climate change hazards.

1. As seas rise, the daily high tide is also rising, causing more frequent flooding in low-lying coastal areas even in the absence of storms.
2. As daily tides rise, groundwater in coastal areas may also rise and increase in salinity, which can cause basement-level flooding on dry days, and reduce local storm runoff, exacerbating watershed (rain-based and creek-based) flooding during storms.
3. Coastal storms are getting larger and large coastal storms are increasing in frequency, leading to increased potential for impacts from coastal storm flooding from both storm surge and increased wave heights.
4. Atmospheric rivers and other large precipitation events are increasing in frequency and intensity, leading to an increase in watershed flooding. Without adaptation (such as expanded drainage gates or additional pumps) levees which protect coastal assets from bay flooding may trap watershed runoff and exacerbate flooding impacts on the inland side of levees.

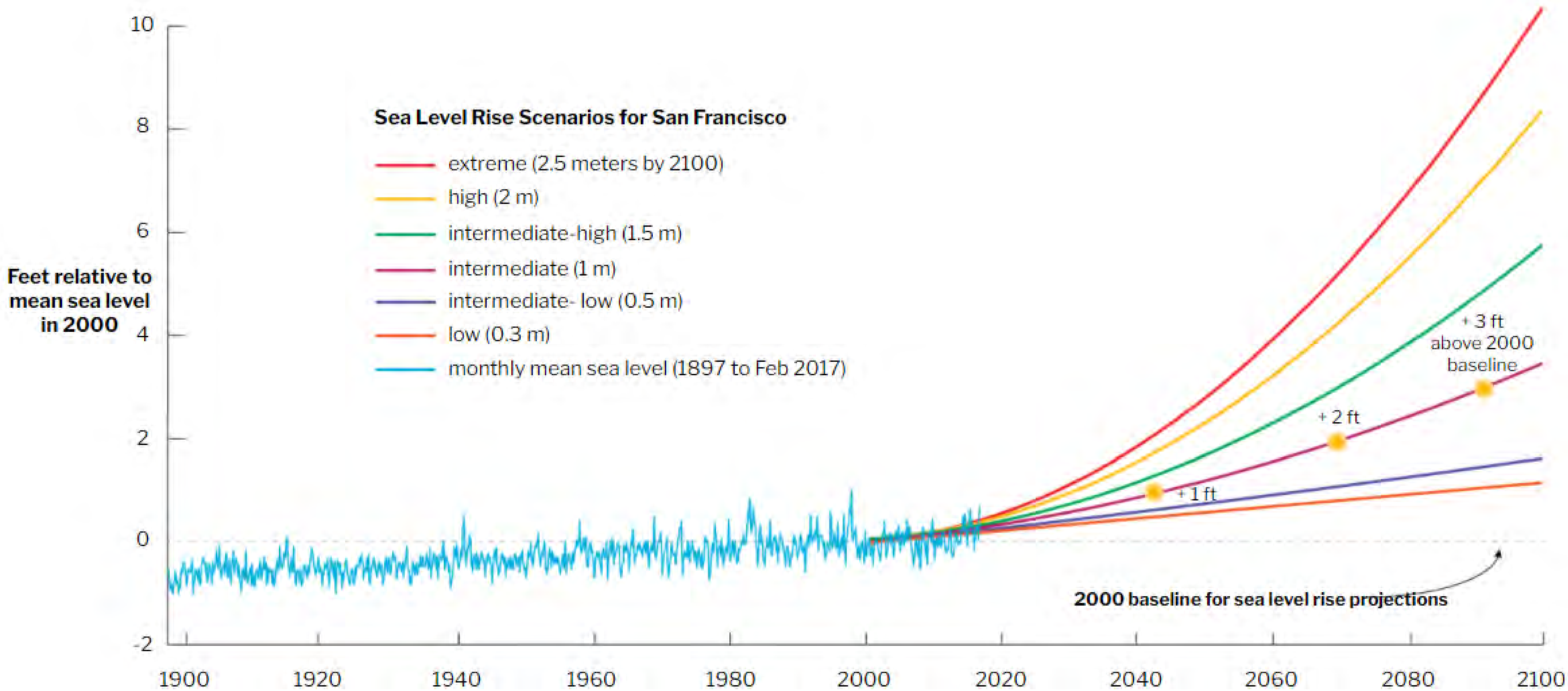
Sea-level Rise

Sea level rise is impacting coastlines, islands, and estuaries globally, as warming oceans expand, and land ice (primarily Greenland and Antarctic ice sheets and various glaciers) melts. The most obvious impact of sea level rise is clear weather coastal flooding (also known as high-tide flooding), but associated impacts include regional increases in local wave heights and storm surge elevations, increases in groundwater elevation and salinity, salinity reaching further upstream in bays and estuaries, reduced drainage of inland flooding, and compound impacts, where two or more of these threats co-occur.

Trends

The recent rate of sea level rise has nearly tripled compared with 1901 to 1971 data (Ackerly et al 2018). A 2017 National Oceanic and Atmospheric Agency (NOAA) report projected sea level rise from several global scenarios and a range of possible sea level rise rates for the Bay Area, which correspond closely to rate projections for most of the state (**Figure 8-1**).

Figure 8-1. Sea Level Rise Scenarios for San Francisco Bay Area



Source: NOAA 2017a

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The California Fourth Climate Change Assessment's San Francisco Bay Area Region Report (Ackerly, 2018) provides the following overview of sea level rise for the Bay through the end of century.

- Sea level in the Bay Area has already risen over 8 inches in the last 100 years.
- The regional signal of sea level rise is complicated at the local level by highly variable rates of vertical land movement across the Bay Area due to seismic effects, sediment compaction, marsh accretion, and groundwater fluctuations.
- Current median projections along the California coast indicate a likely sea level rise of 29 inches (carbon emissions are reduced) to 54 inches (carbon emission continue to rise) by 2100 (van Vuuren et al. 2011).
- An extreme but possible value for sea level rise by 2100 include an increase of 113 inches (9.4 feet) or more. This would occur if excessive ice is lost from the Antarctic and/or Greenland ice sheets.

Impacts

As seas rise, a phenomenon called "high-tide flooding" becomes increasingly common. This refers to flooding that occurs as a result of the normal, daily fluctuations of Bay tides (astronomical tides), rather than as a result of storms. Regardless of season or weather, areas which used to be above the tidal elevations will become intertidal; areas which are currently intertidal (such as the mudflats and wetlands of the south bay) become increasingly subtidal. New coastal construction must account for a full range of likely to possible Bay elevations over the coming decades, of 2 feet to more than 9 feet above current elevations.

This picture is complicated by the already high seasonal and annual variability of tides within the San Francisco Bay: King Tides, or the highest annual daily tides, can be 12 inches above annual mean high high water[1] tides. These typically recur only a few times per year and last on the order of a few hours. During El Niño years, however, the Bay is typically 12 inches higher than would be expected, a phenomenon that lasts for months. Combined, this means that during King Tides in El Niño periods, coasts may experience up to 24 inches higher Bay waters during high high tide – before sea level rise or storms are considered. Coastal construction should take this 24-inch periodic range into account and add sea level rise as an additional consideration on top of that base line.

Given the uncertainty with the rate and magnitude of sea level rise, a range of statements can be made: high-tide flooding would be expected to impact the desalination project within decades if it is constructed less than 5 feet above existing mean annual high tide levels (2 feet for King Tide and El Niño elevation plus 3 feet of sea level rise), and is likely to impact the project if constructed less than 11.4 feet above the same benchmark. Please note these safety factors do not take into account waves or storm surge (*see* "Increased Storm Surge and Waves" section immediately below).

[1] High high tides are the higher of the two daily high tides in San Francisco Bay.

Increased Storm Surge and Waves

Storm surge is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. The surge is caused primarily by a storm's winds pushing water onshore (NOAA 2022). This is experienced on land as an unusually high tide. The Bay is especially susceptible to coastal flooding from storm surge due to the large span of shoreline. Facilities placed along the shoreline are susceptible to flooding. Additionally, wave height tends to add to both high tide flooding and storm flooding, as well as causing shoreline erosion and structural impacts. However, due to the shallow waters of the South Bay and protection from the oceans full force due to inland containment, increased wave height does not have a large impact on the South Bay.

Trends

As oceans warm, the frequency and intensity of storm surges are increasing globally. A study jointly conducted by Princeton and NOAA in 2012 estimates that by mid-century, at a third of the 55 coastal sites studied, what would historically have qualified as a 1 percent annual chance (or 1 in 100-year) storm surges will instead be occurring approximately every 20 years. Additionally, over the last several decades increases in wave height have been documented along portions of the U.S. west coast (Allan & Komar 2006; Wingfeld & Storlazzi 2007; Menéndez et al. 2008), including the region adjacent to the Bay Area (Hanes & Erikson 2013). However, as mentioned previously, these potential changes in wave energy are a larger concern for exposed open coast rather than estuaries and inland waterbodies (Ackerly et al. 2018).

Impacts

As storm surges increase, larger areas will be impacted by flooding, reversed riverine flow, structural damage, and erosion. Areas already subject to storm surge impacts are at risk of larger and more frequent events (Tebaldi et al. 2012). The Bay Area is subject to relatively low levels of storm surge due to absence of hurricanes and a wide, shallow continental shelf (Tebaldi et al. 2012). Additionally, salt marshes, such as those within the South Bay, can act as natural buffer zones, providing an added layer of protection from waves during storms (Möller, et al. 2014). Due to the presence of marsh land along the South Bay shoreline, projects located landward of salt marshes could have some natural protection from storm surge.

While climate-driven increased wave heights may also cause increased coastal flooding and infrastructure damage, the protected nature of the South Bay from long distance ocean winds, and the shallow topography of the South Bay, both reduce the potential for extreme storm waves within the Environmental Study Areas and TFPAs.

Large Storms and Atmospheric Rivers

California precipitation is highly irregular and growing more so, often with relatively long duration between storms (Dettinger et al. 2011). As a result, large, discrete storms provide a substantial fraction of California's rainy season total precipitation. Many of California's largest storms are atmospheric rivers, which can carry more water than seven to 15 Mississippi Rivers combined (Ralph & Dettinger 2011). These storms may result in heavy rainfall over a narrow area (Gimeno et al. 2014) or short time frame, such as the approximately 10 inches which fell over San Jose in the first 3 weeks of 2023.

Trends

Historically, much of California's precipitation falls as winter snow, which melts slowly throughout the spring and provides a prolonged period of runoff throughout spring and early summer. However, as the frequency and intensity of heavy precipitation events (i.e., atmospheric rivers) have increased since the 1950s over most land area (Ackerly et al. 2018), and warmer, earlier springs have become more frequent, this pattern is shifting. The following trends related to precipitation are likely in California.

- **More intense rainfall events.** As the climate warms, more of our winter precipitation is falling as rain, rather than snow, filling reservoirs in winter, leaving less available volume to buffer flood events or store spring snowmelt. Warmer air also holds more water, which allows for larger storms. Already, the largest California storms, called "atmospheric rivers," are becoming more frequent. Atmospheric rivers contribute on average 40% of the Sierra snowpack, produce heavy rainfall and substantial flood risk.

- **More frequent large floods.** The combination of warmer, wetter, rainier storms with faster snowmelt and reduced spring reservoir storage capacity point leads to an increased frequency of large spring flooding.

- **Overall higher wet/dry variability.** Climate projections (Ackerly et al. 2018), indicate precipitation will increasingly exhibit high year-to-year variability – "booms and busts" – with very wet and very dry years. Northern California's largest winter storms will become more intense, and potentially more damaging. The exact change to storm periodicity is unclear, but small storms, such as historic 1-year, 5-year, and 10-year storms, may become less frequent, while larger storms, such as historic 100-year and larger storms, may become more frequent. This pattern is consistent with recent, precipitous increases globally in 100-year and larger storm events.

Impacts

Increasing periods of precipitation are likely to lead to more flooding throughout California. Additionally, projections show that the wet season will be shortened, which will result in a compressed period during which the increased precipitation will fall (Swain et al. 2018). The Bay Area's largest winter storms will potentially become more intense and likely more damaging.

Increased Groundwater Elevations and Salinity

Climate impacts groundwater in four opposing or additive ways.

1) During drought and heat events groundwater may be depleted both naturally and through increased pumping.

2) In relatively flat, coastal areas, the groundwater table can be pushed higher as seas rise.

3) Where precipitation is generally increasing, groundwater may rise in response.

4) Where groundwater is already depleted, or freshwater sources can’t outcompete rising seas, coastal groundwater may become increasingly saline.

Coastal estuaries such as the Bay are transition zones from salt to freshwater. As seas rise, saline water is being driven further upstream into historically fresh zones. The impacts vary daily with tidal fluctuations, seasonally with river outflow, and episodically during coastal storm surge events. As oceans, on average, are significantly more alkaline than rivers (Mean ocean pH is 8.1, compared to rivers which range from 6.0 – 8.0), salinity intrusion from rising seas may also correlate with a shifting acidity of inland waters and adjacent groundwater.

Salinity in the South Bay is influenced by salinity in the Central Bay, exchange between the South and Central Bays, freshwater tributary inflows to the South Bay, and evaporation. The South Bay tends to be vertically well mixed due to only a small amount of tidally averaged vertical salinity variations, with near oceanic salinities due to low summer and fall freshwater inputs to the far South Bay. (USFWS and CDFW 2007).

Trends

Groundwater trends are likely to reflect sea level trends in coastal areas, with allowances made where active groundwater pumping or banking is occurring. The Santa Clara Subbasin has been established as a state high priority basin, with a high reliance on groundwater and declining groundwater levels (DWR 2020). Groundwater elevation was measured by Valley Water’s monitoring network from approximately 1935 to 2020 and shows that recent years (2015 to 2020) are characterized by recovery of groundwater levels and storage in the Santa Clara Plain, indicating that subsidence that occurred was not permanent (Valley Water 2021b). Additionally, a large portion of the Santa Clara Plain has increasing groundwater levels and recovery of groundwater storage recently. Valley Water states that two localized areas of subsidence on the west and east side of the salt ponds are likely caused by settlement and the establishment of former and active landfills and are not caused by groundwater pumping (Valley Water 2021b).

Impacts

Water table increases can lead to groundwater-induced basement and even surface-flooding in low-lying areas. Seawater intrusion mechanisms are believed to have a minor influence on the Santa Clara Subbasin because the aquifers underlying the Bay do not outcrop offshore and are not directly connected to the Bay (Valley Water 2021b). Aquifers in the Bay are protected by a very fine-grained fully saturated clay formation known as Bay Mud, which effectively seals the aquifers from classic seawater intrusion regardless of the direction of groundwater flow (Valley Water 2021b). However, as seas rise, South Bay waters may meet more permeable soils, which would allow saline groundwater intrusion.

Compound Flood Events

Large storm events impact the California coastline every winter; however, storms that produce large-scale damage, are less frequent. Many of the most damaging events are considered compound flood events. Compound floods are those that occur when more than one flood-producing mechanism occur simultaneously.

Trends

Compound flood events may be characterized by certain "types." For instance, rain-on-snow events when warm rains cause the precipitous melt of a season's snowpack. In June of 2022, the destruction of roads throughout Yellowstone National Park occurred when rain melted in days a snowpack that would normally have taken months; a similar situation occurred in the California Delta in 1997. "Rain-on-rain" events occur when a series of storms follow each other in unusually rapid succession. Reservoirs and levees at capacity from one storm may not be able to contain water from the next, leading to failure events and uncontrolled flooding. "Rain-post-fire" events can trigger debris flows, dangerous landslides, and significant water quality impacts.

In the project vicinity, the co-occurrence of any of the following events may increase the impacts of flooding and flood damage:

- Large precipitation events
- Sea level rise
- Storm surge/waves
- Annual high tides (King Tides)
- El Niño Events
- Blocked drainage/culverts
- Power outages/decreased pump station efficacy
- Levee or dam failure
- Earthquakes
- Post-wildfire conditions
- Increased Delta Outflow

As climate change increases the frequency of individual extreme events, the statistical probability of compound flood events increases dramatically.

Impacts

The impacts from compound floods are significantly higher than that of the impact of any one compound alone, and the infrastructure damage caused is usually significantly more than the sum of the individual parts. For instance, in December of 2014, during an El Niño, the region's largest astronomical tides of the year raised the South Bay sea level by 2 to 3 feet. The combination of El Niño and highest tides had already filled storm drains and flooded the lowest elevation roads. An atmospheric river spread across the region on December 11th and increased the amount of precipitation by 2 to 8 inches (AECOM 2016). With no place to drain, rainwaters simply pooled, closing multiple highways and flooding homes.

During the atmospheric river events of 2017 and 2023, pre-saturated soils increased runoff, high tides reduced drainage to the Bay, and on the outer coast, large waves and storm surge combined to exacerbate flooding throughout the state.

Between October 2016 and February 2017, a series of atmospheric rivers hit California, ending the state's 5-year drought period. Between December and February, California received half of its average annual precipitation. Storms pushed local reservoirs to their maximum, including Anderson Dam, which spilled into Coyote Creek, flooding portions of downtown San Jose and forcing the evacuation of thousands. A similar series of storms hit California in January 2023 bringing wind speeds of 40 to 80 miles per hour (Cassidy 2023). These atmospheric rivers paired with a sudden drop in air pressure, also known as a "bomb cyclone," dropped approximately 10 inches of rain across the South Bay

Lower South Bay Shoreline Vulnerability and Inundation Analysis

The San Francisco Bay Conservation and Development Commission (BCDC) has prepared the Shoreline Vulnerability Index (SVI) to measure shoreline vulnerability to erosion and/or overtopping due to extreme tides, waves, storm surges, and sea level rise. Characteristics evaluated include vulnerability of shoreline type to flooding and sea level rise, adaptability to sea level rise by shoreline type, presence of fortification, presence of frontage and/or secondary shoreline protection, elevation, and wave energy.

These characteristics are weighted in their importance towards shoreline vulnerability to flooding. Two separate surveys were conducted.

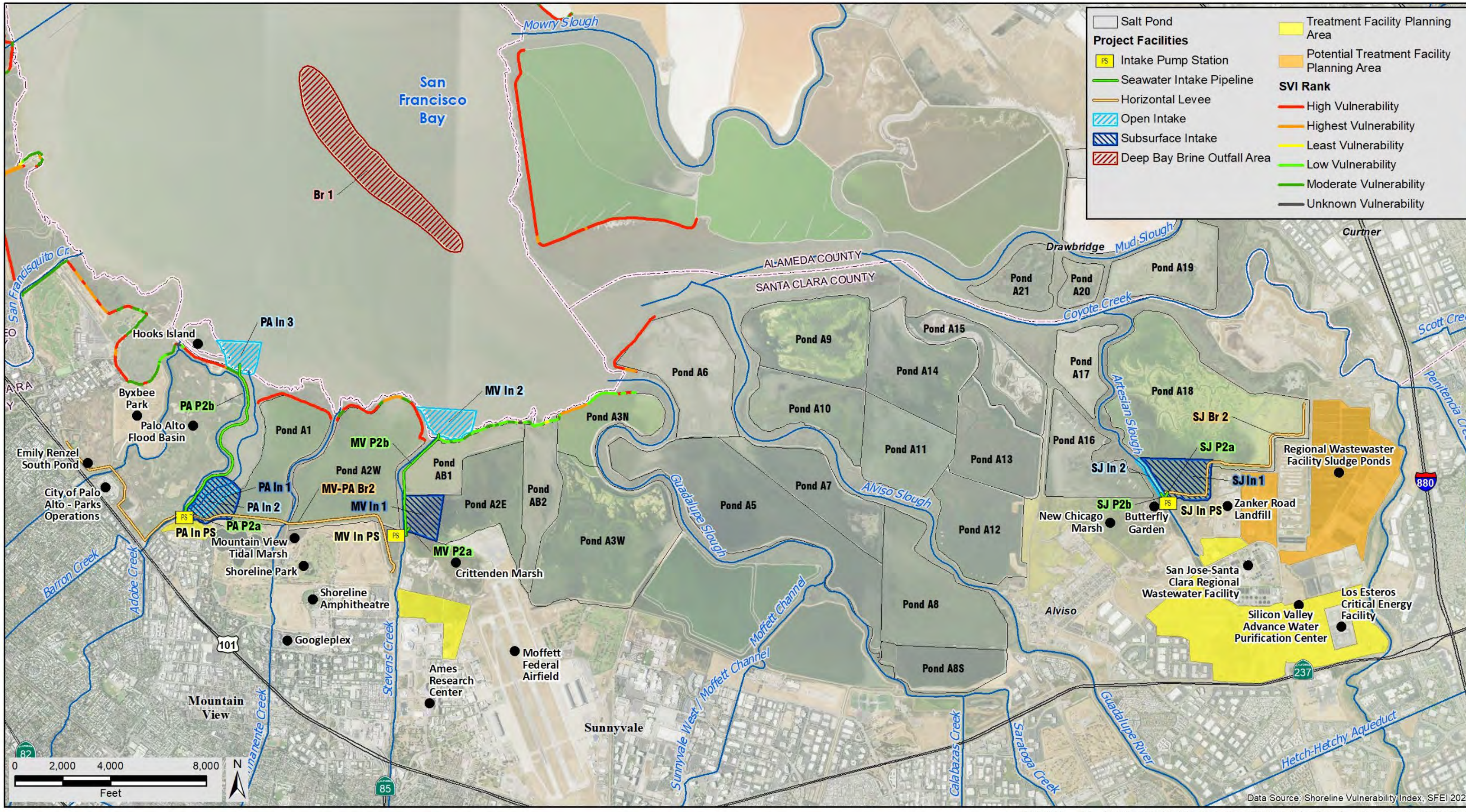
- The first survey determines the baseline vulnerability of a particular shoreline type, adaptability to sea level rise, and the role that frontage and a second line of defense plays in the functioning of that shoreline type.
- The second survey conducted asked questions about the impacts of fortification (either engineered/maintained, ad-hoc, or no fortification) on shoreline function and vulnerability. It also evaluated each component in the SVI against the other components.

The final SVI score was calculated by adding up each of the six characteristics (identified above) and multiplying their individual weights from the first survey and further multiplying each characteristic by the relative weights for each shoreline type from the second survey, which is described above. To map the final SFI for the Bay, the SVI Score was broken into five relative categories: highest, high, moderate, low, and least vulnerable.

Figure 8-2 shows the SVI for levees in the Lower South Bay near the project options. Levees adjacent to project options in Mountain View and Palo Alto provide flood protection from coastal flood events, such as increasingly higher tides. However, these levees do not provide protection from land-side flooding caused by large precipitation events and watershed runoff (i.e., atmospheric rivers). As shown in **Figure 8-2**, the levees between the Bay and Palo Alto Flood Control Basin, Ponds A1 and A2W are primarily designated as high to highest vulnerability for erosion and flooding, with small segments of medium vulnerability along Pond A2W, and the levee between the Bay and Pond AB1 is primarily low with some moderate vulnerability (BCDC 2021). The project options in San Jose do not have coastal flooding levee protection levees nearby and are located further inland with no direct connection to the South Bay and may not be as susceptible to coastal flooding.

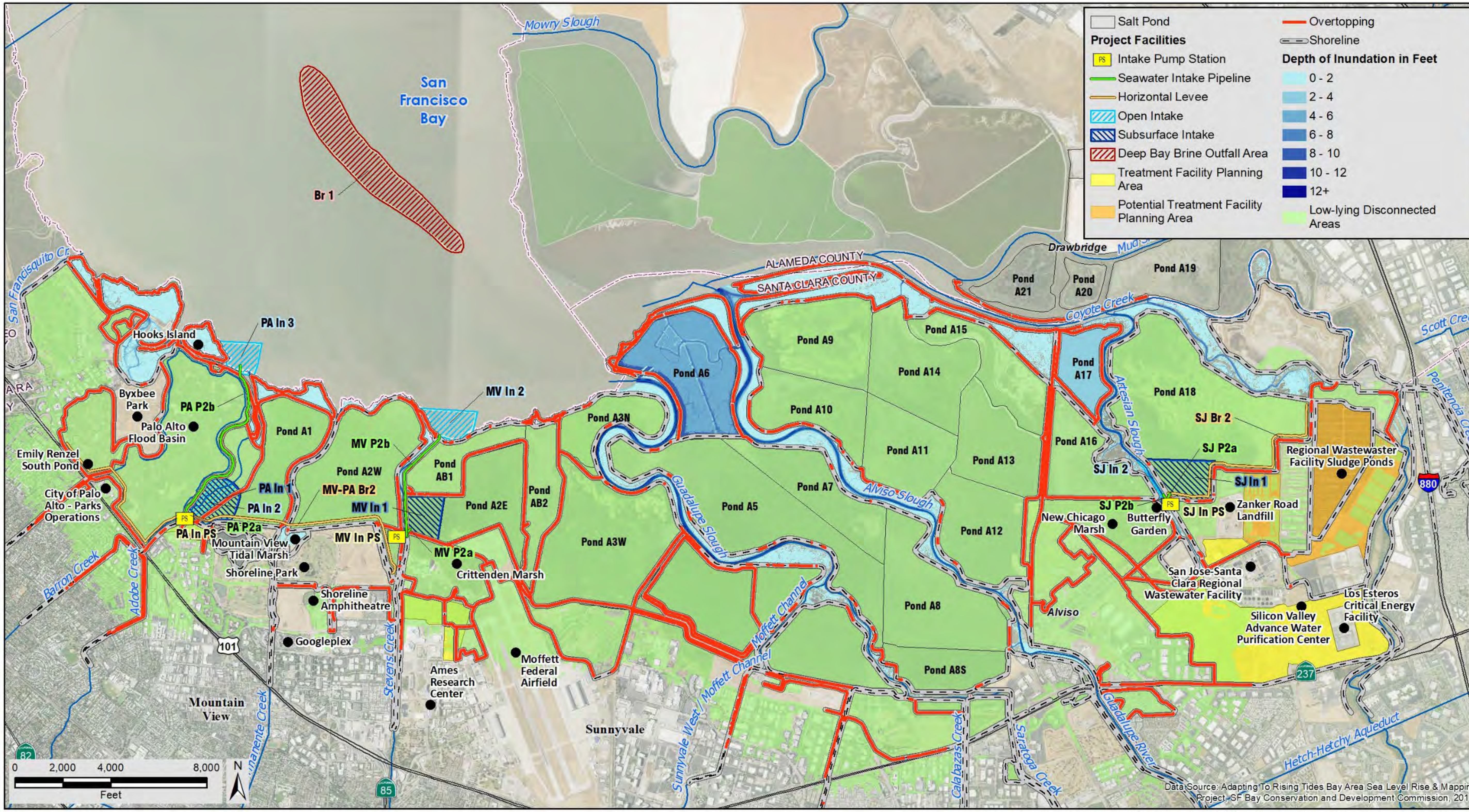
BCDC also developed a sea level rise shoreline inundation analysis. The key steps of this analysis included: 1) estimating existing conditions tidal datums and extreme tides, 2) combining existing water level estimates with sea level rise projections to estimate future conditions tidal datums and extreme tides, and 3) developing inundation extent and depth layers by subtracting the land surface elevation from the water surface elevations (BCDC 2021). **Figure 8-3** shows the sea level rise inundation analysis in the Lower South Bay for 12 inches of sea level rise and no storm surge – the lowest, least consequential sea level rise scenario evaluated.

Figure 8-2. Shoreline Vulnerability in the Lower South San Francisco Bay



Notes: SVI=Shoreline Vulnerability Index
Data source: BCDC 2021

Figure 8-3. Shoreline Inundation in the Lower South San Francisco Bay for 12 Inches Sea Level Rise and No Storm Surge



Data source: BCDC 2017

The 12-inch sea level rise inundation analysis reveals extensive overtopping of levees along the salt ponds and shoreline of the Lower South Bay and extensive areas mapped as low-lying disconnected areas including overlapping most project options. Low-lying disconnected areas are areas that are at low elevation and hydraulically disconnected from the Bay and other waterbodies, as shown in **Figure 8-4**. BCDC notes that it is possible that the low-lying areas may be connected through culverts, storm drains, or other features not captured within the analysis, and future flood risk exist within these areas. In addition, these low-lying areas may be at risk of flooding from below due to increasing groundwater elevations (BCDC 2017).

Figure 8-4. Example Shoreline Cross Section Showing Disconnected Low-lying Area

Source: BCDC 2017

The shoreline inundation analysis maps sea level rise for nine additional scenarios with higher levels of sea level rise – from 24 to 108 inches – and with varying levels of storm surge and king tides for all sea level rise scenarios. A review of mapping reviews the following (not shown in figures but available online[2]).

- All intake[3] and brine management option locations evaluated in this study are flooded at:
  - 12 inches or greater of sea level rise combined with 5-year or greater storm surge event.
  - 24 inches or greater of sea level rise combined with a king tide.
  - 36 inches or greater of sea level rise with no storm surge or king tide.
  - 50-year storm surge event without sea level rise.
- Areas within the TFPAs become flooded at:
  - 52 inches or greater of sea level rise with no storm surge.
  - 24 inches or greater of sea level rise with 100-year storm surge event.
- The southern portions of the San Jose TFPA do not become flooded.

[2] Available: https://explorer.adaptingtorisingtides.org/explorer

[3] Location refers to where these components are sited. While intakes are already underwater and infrastructure is generally buried, these locations would be subject to inundation and could still be adversely affected.

The areas of inundation in these scenarios conform to approximately the low-lying areas shown in **Figure 8-3**. The level of inundation varies across these scenarios and increases the greater the severity of the scenario and combination of events.

8.3.2 Non-flood Related Climate Hazards

Climate change will introduce other non-flood related hazards that must be considered when evaluating the long-term durability and resilience of the desalination project. Non-flood related hazards include extreme heat, increased water temperatures, drought, and power outages. These interrelated events should be evaluated both independently and as interrelated actions that may adversely impact day-to-day or long-term operations of the desalination project.

Extreme Heat, Water, and Energy Demand

Extreme temperatures can result in multiple cascading impacts to the desalinization process. First, extreme heat can increase the need for additional water usage due to augmented water demand during elevated temperatures. This demand, in turn, increases at a time when the power grid will already be under significant strain due to the heightened use of appliances such as air conditioners and refrigerators necessary to combat the heat. Concurrent with this, surface water temperature will rise in hot conditions which will produce a number of water quality, efficiency, and environmental threats to intake, mechanical functionality, and brine output.

Trends

Across California and the western United States, new heat records are continually being set. Death Valley recorded the hottest temperatures ever documented on earth at 130°F in July 2021 (NOAA 2017b). On September 8, 2022, San Jose recorded the hottest daily temperature ever at 104°F. Similar records were set at other Bay Area communities the same day including Livermore, Santa Rosa and Concord, all of which surpassed triple digit thermometer readings (National Broadcasting Network 2022a). These recordings are in line with climate predictions which indicate that Northern California will continue to see higher average temperatures year-round, during both day and nighttime hours, with a larger increase in summer than in winter (with July–September increases of 2.7°F–10.8°F). Heat waves are expected to be more extreme and to have longer durations and larger geographic extents than historical averages (Houlton and Lund 2018). Overall, Bay Area average annual maximum temperature increased by 1.7 degrees Fahrenheit (°F) (0.95 degrees Celsius [°C]) from 1950 to 2005 with an annual projected mean warming on the order of approximately 3.3°F (1.8 °C) by mid-century. By the end of century (2070-2100), warming on the order of between 4.2°F (2.3 °C) and 7.2°F (4.0 °C) is projected (Ackerly, et al. 2018).

The change in average temperature will have increasing impacts on the number of Heat Health Events (HHEs) within Santa Clara County near the project options. An HHE is any event resulting in negative public health impacts and can be considered a proxy for events which will also impact plant and animal health, including in shallow water ecosystems such as the South Bay. Historically, the number of HHEs have hovered around 0.13 events per year. From 2011 to 2030, annual HHEs have increased to approximately one event annually. By 2060 this is anticipated to double, and by the end of this century annual HHEs are anticipated to reach five HHEs per year. The duration of these events, which currently persist for less than 1 day per year, are anticipated to extend to nearly 4 days per HHE by the year 2099. Over time, the frequency in which HHEs occur may decrease; however, the total number of days with each event that exceed HHE thresholds will continue to increase (California Heat Assessment Tool 2022).

The result of ever-increasing average air temperatures and longer extreme heat events throughout the region will also result in increased water temperatures locally in the South Bay. This will be further augmented as the temperature of global oceans continues to rise, as the oceans have taken on the brunt of storing the majority of the increased heat to date from climate change (Lindsey and Dahlman 2021). Evidence of this air-to-water heat exchange can be shown in data collected in 2015 when the U.S. Geological Survey monitoring network, which included 19 stations throughout the Bay, recorded instantaneous values of water temperature at several stations that exceeded all previous records (Work, et al. 2017). In the summer of 2021, extreme high temperatures were again exceeded (NOAA tide gauge data 2022.

Impacts

The resulting prolonged period of extended high air and water temperatures will increase demand for existing freshwater supplies for human populations while simultaneously resulting in adverse ecological impacts to the South Bay region. Increased temperatures on both land and sea will also exacerbate longer and deeper droughts and warmer summers, which will increase energy demand (Ackerly, et. al. 2018).

Ecologically, increased water temperatures have a direct impact on many aquatic species by directly inducing stress and/or decreasing dissolved oxygen levels. This is especially acute when compounded with other climate change consequences such as decreased water levels, changes in hydrology, the occurrence of toxic algal blooms, alterations in food source availability or predator-prey dynamics, and changes to aquatic chemistry. In aquatic environments, HHEs can lead to issues such as mass fish mortality. These effects can be especially damaging to special-status species already at risk of extinction, such as the longfin smelt which depends on cooler freshwater in the Bay in the late fall to early spring for successful spawning.

Drought

Trends

Drought periods can be characterized as having less freshwater in-creek flow, as well as shorter duration and lower magnitude of peak flows. Prior to the 21st century, dry and critically dry years occurred approximately 33 percent of the time (USFWS 2022). The western United States is experiencing the worst drought in 1,200 years with human-caused climate change responsible for approximately 19 percent of these conditions. This has led to California declaring a drought state of emergency in 2021. These drought conditions are expected to continue and intensify as climate change impacts continue (Harvey 2022). Future conditions in the Bay Area are expected to have greater summer aridity even for areas with increased rainfall.

Impacts

Drought will have significant impacts on all aspects of the Bay-Delta ecosystem (Ackerly et. al. 2019). Drought conditions have also been attributed to accelerating the establishment of invasive species within San Francisco Bay (USFWS 2022). These changed conditions and the invasive species that thrive in them result in a reduction of recreationally important fish stocks as well as changes in summer phytoplankton. This alters the trophic cascade throughout the Bay-Delta ecosystem. Drought related impacts such as earlier melting of snowpack, increasing seawater intrusion into groundwater, increased rates of evapotranspiration, will further affect both the quantity of water available and the quality of supplies (Ackerly, et. al. 2018). Desalination projects may face challenges with increased salinity within intake sources that will require additional effort to develop clean water during the reverse osmosis process (Koutsou et. al. 2020). Additionally, changing water levels within certain portions of the Bay may adversely impact water intake into the facility.

Power Outages

Trends

In 2020, several hundred thousand California residents lost power during a rolling blackout resulting from a heat wave that included triple digit temperatures across the state. This was the first time that rolling blackouts had been required to conserve the power grid since 2001 (National Broadcasting Network, 2022b). Rolling blackouts were avoided during the extreme 9-day heatwave in September 2022, despite a new all-time peak demand record of 52,061 megawatts, due to voluntary conservation efforts by the public to reduce power consumption as well as deploying temporary emergency power generators in the Central Valley (Toohey et. al. 2022). Additionally, high energy-demand facilities such as the Carlsbad desalination plant reduced their production of freshwater by 20 percent over the Labor Day weekend to reduce the strain on the local energy grid. While this aided in eliminating the need for rolling blackouts, the action required water delivery to be made from other sources in support of a statewide emergency energy conservation effort (San Diego County Water Authority 2022).

In more rural areas, Public Safety Power Shutoff (PSPS) events, are increasingly occurring across California as wildfire risks escalate and regional energy demands increase in the face of ongoing climate change. In 2019, PG&E had an unprecedented five PSPS events between October 1 and November 21, affecting nearly 2 million residents. Critical facilities and infrastructure providers experienced outages without an alternative source of power (California Public Utility Commission 2020).

Impacts

Rolling blackouts present challenges in the ongoing operation of highly energy-intensive desalination projects in California. De-energizing at this level may be just a prelude of what is to come as California and the rest of the world struggle to adapt to climate change (Wong-Parodi 2020).

8.3.3 Project Options Climate Vulnerability Evaluation

A climate change vulnerability analysis identifies how each project option, whether physical asset or function, is exposed to the suite of expected climate impacts identified above (sea level rise, compound floods, heat, etc.). It then identifies if damage would occur to the component should the exposure occur, and whether that damage is temporary or permanent. For instance, a road is only temporarily sensitive to a flood event, if the road function is temporarily removed but the physical structure is left unharmed.

A climate change risk assessment should be conducted for project options identified as exposed and vulnerable. Risk assessments identify the harm done (the physical, operational, financial, human, and ecological costs) given a failure. It also maps the potential failure cascades, or sequence of cause-and-effect failures, that can lead from a single climate impact.

Finally, for high-risk assets with unacceptable costs, adaptation plans should be developed, which consider best available science for future projections, a reasonable range of uncertainty, current and expected state regulations and policies, innovative technologies, nature based solutions, solutions which provide redundancy or other fail-safe and back-up measures, project cost and feasibility.

It is recommended that project planning include a complete climate impact vulnerability and risk assessment, followed by development of adaptation options to reduce the likelihood of priority risks. This analysis provides an initial evaluation of climate change vulnerability of project options to the hazards discussed above.

Increases in Flooding

Given the location of the desalination project along the Lower South Bay shoreline, the project options are subject to various flood hazards and compound flood events. Given the uncertainty with the rate and magnitude of sea level rise, a range of statements can be made, including: high-tide flooding would be expected to impact the desalination project area within decades if components are constructed less than 5 feet above existing mean annual high tide levels (2 feet for King Tide and El Niño elevation plus 3 feet of sea level rise), and is likely to impact components if constructed less than 11.4 feet above the same benchmark. Crucial to next steps is deciding on the future flooding scenarios from climate change (including compound events) that will be used for planning and design. The rest of this section provides a general evaluation of inundation of project options based on the shoreline inundation mapping conducted by BCDC.

Infrastructure drawing water into the intake options would be in water for open intakes and below ground for subsurface intakes. Intake pipelines would also be buried underground. Therefore, inundation from flooding generally would not impact intakes and intake pipelines but could make access to this infrastructure difficult during flood conditions. The intake pump stations (SJ PS, MV PS, PA PS) are above ground and near the shoreline and susceptible to inundation under a variety of flooding scenarios in the future due to climate change, which could interfere with operation of intakes and access to pump stations during periods of flooding. Locating pump stations further away from the shoreline would be beneficial to avoid/minimize potential impacts from flooding related to climate change and should be studied further during future phases of project planning.

The discharge infrastructure for the South Bay Deep Water Outfall option (Br 1) would be deep underwater in the Bay and its associated conveyance pipelines would also be underground. Therefore, this infrastructure would not be directly impacted by flooding. The horizontal levee options (SJ Br 2, MV-PA Br 2) are above ground and susceptible to inundation under a variety of flooding scenarios in the future due to climate change. Flooding of horizontal levees could result in inundation of the brine discharge pipeline along the horizontal levee alignment. Since this pipeline is not intended to be operated underwater, it could preclude discharge of brine and complicate operation of the discharge. Valley Water should investigate if the horizontal levee could be operated for brine discharge during flood conditions. Additionally, brine on the horizontal levee and downslope areas could be transported out of the discharge zone in flood flows and onto adjacent areas. This should be studied further if it is identified as a potential effect of flooding.

Treatment facilities would be above ground and vulnerable if subject to flooding. Most of the Mountain View-Palo Alto and San Jose TFPAs and the northern and western portions of the San Jose TFPA are susceptible to inundation under a variety of future flooding scenarios in the South Bay due to climate change. Inundation from flooding due to climate change would occur throughout the Mountain View-Palo Alto TFPA and a treatment facility anywhere in this TFPA would be susceptible. Locating a treatment facility further away from the shoreline would be beneficial to avoid/minimize potential impacts from flooding related to climate change and should be studied further during future phases of project planning. The southeastern portions of the San Jose TFPA avoid inundation from flooding due to climate change.

Additionally, many of the Bay Area's wastewater treatment plants are located in close to the South Bay shoreline. If Valley Water plans to further evaluate combining brine effluent with clean water discharge from a nearby wastewater treatment plant, flooding from sea level rise could impact operations at both the treatment facility and a nearby wastewater treatment plant. For this reason, sea level rise has the potential to affect both desalination plant design and operation and should be evaluated before plant construction and operation.

Water table increases can lead to groundwater-induced basement and even surface-flooding in low-lying areas; development of sinkholes; corrosion of underground pipelines or other buried infrastructure; and related subsurface hazards. Areas of shallow groundwater that could increase due to climate change should be considered in siting underground infrastructure. However, raising of groundwater levels due to climate change could also increase underground intake capacity of subsurface intake options (SJ In 1, MV In 1, PA In 1); and subsurface intakes could in turn provide a level of mitigation for groundwater rise.

Increases in Groundwater Salinity

If water in the South Bay meets more permeable soils due to inundation associated with climate change, then saline groundwater intrusion could occur. This could in turn increase salinity levels in source water for subsurface intake options (SJ In 1, MV In 1, PA In 1). Further study on the composition of subsurface intake source water is required and study of groundwater salinity changes may also be warranted if subsurface intake options are deemed feasible.

Increases in Water Temperatures

Increased water temperatures could change treatment requirements and impacts the specific energy consumption of desalination facilities. This includes energy losses in mechanical devices like pumps and in reverse osmosis. This is especially prominent in high salinity areas such as is found in the South Bay (Koutsou et. al. 2020). Accounting for these energy inefficiencies should be considered with project design and development along with associated increased energy demand in the region resulting from other climate change impacts. Potential increases in water temperature due to climate change and consequences to the treatment and reverse osmosis processes should be considered further.

Increases in Power Outages

The desalinization project should consider impacts of power outages, with flexibility in water supply sources built into operations to ensure water availability regardless of weather or other energy loss events. Renewable sources of energy for the desalinization project may also be useful for building resiliency.

Cumulative Impacts to Special-status Species

Several climate change hazards, including increases in air and water temperatures and droughts, will adversely affect special-status species in the Lower South Bay and Santa Clara County. Cumulative impacts would likely occur from these climate change effects combined with other regional impacts to these species and potential impacts of the desalination project. For example, special-status species such as the longfin smelt exhibit poor survival and reproduction during droughts due to a decrease in freshwater flows from snowmelt and rainfall during the spawning season. As such, impacts such as entrainment in water drawn into open intake options (SJ In 2, MV In 2, PA In 2, PA In 3) and effects to water quality in the Bay from the South Bay Deep Water Outfall option could pose threats to this species, which would be compounded and exacerbated by climate impacts such as drought and increased water temperatures. Cumulative impacts to species related to climate change in the Lower South Bay should be considered further.

8.4 Valley Water’s Climate Change Action Plan

8.4.1 Goals and Strategies

Valley Water’s CCAP is a comprehensive guide to Valley Water’s current and future climate change mitigation and adaptation efforts. The CCAP includes seven goals: three mitigation goals, three adaptation goals, and one emergency preparedness goal. The mitigation goals correspond to Scope 1, 2, and 3 GHG emissions, as discussed above. The adaptation goals correspond to Valley Water’s three mission areas: water supply, flood protection, and ecosystem stewardship. The CCAP also identifies strategies and potential actions have been identified to help achieve these goals. The seven goals are summarized below (Valley Water 2021a).

Climate Change Mitigation Goals

- **Goal 1: Reduce Direct GHG Emissions (Scope 1) –** This goal includes strategies oriented around reducing Scope 1 GHG emissions generated by Valley Water's vehicle fleet, trips between offices and work sites, Valley Water-owned equipment, and emissions generated by planning, design, construction, operation, and maintenance of capital projects. Additionally, increase GHG sequestration on Valley Water properties and other areas and continue to update Valley Water's GHG accounting practices.
- **Goal 2: Expand Renewable Energy and Improve Energy Efficiency (Scope 2) –** This goal includes strategies to support increased renewable energy in Valley Water's energy portfolio and improve energy efficiency at agency facilities.
- **Goal 3: Reduce Indirect GHG Emissions (Scope 3) –** This goal includes strategies to reduce GHG emissions associated with Valley Water employee commute, reduce waste produced at facilities, and create and expand other efforts to minimize indirect emissions.

Climate Change Adaptation Goals

- **Goal 4: Water Supply Adaptation –** This goal includes strategies to diversify local water supplies and expand drought-resistant water supply, improve demand management, and increase water conservation efforts, increase reliability of imported water, support efforts to maintain and enhance source water quality, implement source water improvement and water treatment actions, increase flexibility and resiliency of water utility operations and assets, and support ecological water supply management objectives.
- **Goal 5: Flood Protection Adaptation in Santa Clara County –** Minimize flooding risks in riverine and coastal areas, improve flood preparedness of people, property, and habitat, implement projects and plans to increase the flexibility and resilience of flood protection operations and assets, and expand the use of flood forecasting and modeling tools in the planning and design of agency projects to maximize protection from flood risks.
- **Goal 6: Ecosystem Adaptation in Santa Clara County –** Protect and enhance riverine, coastal, and other watershed ecosystems to improve climate change resilience and wildlife habitat, develop and expand programs and plans that support more climate-resilient ecosystems, and expand the availability of data on regional ecosystems to avoid detrimental climate change-related ecosystem impacts.

Emergency Preparedness Goal

- **Goal 7: Emergency Preparedness –** Maximize Valley Water's emergency preparedness for climate-related impacts.

8.4.2 Desalination Project Evaluation

This evaluates the applicability of specific CCAP goals and strategies to the desalination project. The CCAP goals and strategies apply to the desalination project as a whole and should be consider for any project options pursued.

Climate Change Mitigation Goals

Valley Water could reduce Scope 1 emissions associated with the desalination project by implementing strategies in CCAP Goal 1 to reduce GHG emissions associated with Valley Water's fleet (CCAP Section 4.1.1.1); from trips between Valley Water offices and work sites (CCAP Section 4.1.1.2), associated with Valley Water-owned equipment (CCAP Section 4.1.1.3), and minimize GHG emissions associated with planning, design, construction, operation, and maintenance of capital projects (CCAP Section 4.1.1.4). Scope 2 emissions from the desalination project could be reduced by implementing the strategy in CCAP Goal 2 of continuing to improve energy efficiency at agency facilities (CCAP Section 4.1.2.2).

Additionally, Goal 2 includes the strategy of continuing to support increased renewable energy in the agency's portfolio (CCAP Section 4.1.2.1), and therefore, renewable energy sources should be considered as a source of energy for the desalination project.

Climate Change Adaptation Goals

CCAP Goal 4 includes the strategy to diversify local water supplies and expand drought-resistant water supply (CCAP Section 4.2.1.1). The intent of this strategy is to expand climate resilient and local water sources. The strategy identifies water supply projects including those in the Water Supply Master Plans. As discussed in Chapter 1, "Introduction," Valley Water's 2040 Water Supply Master Plan does not identify a Valley Water desalination project; however, the desalination project may also provide the type of climate resilient and local water supply project that is intended to support this strategy. As such, in future versions water supply master plans and updates to the CCAP, Valley Water should consider if the desalination project satisfies this strategy.

Valley Water could increase the desalination project resiliency to flood-related climate change hazards by implementing strategies in CCAP Goal 5 to implement projects to increase flexibility (CCAP Section 4.2.2.4) and expand the use of flood forecasting and modeling tools in the planning and design of agency projects to maximize protection from flood risks (CCAP Section 4.2.2.5).

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Chapter 9. Environmental Justice

9.1 Introduction

The U.S. Environmental Protection Agency (EPA) defines environmental justice (EJ) as: “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and polices” (EPA 2022). The state of California has adopted a similar definition of EJ as documented in Government Code section 65040.12(e)[1]. This evaluation examines the Environmental Study Areas, Treatment Facility Planning Areas (TFPAs), and designates a larger geographic area of analysis, discussed in Section 9.1.2, for communities with EJ concerns (here in after referred to as EJ communities).

The following concepts are key to understanding EJ and this evaluation:

- **Disadvantaged communities (DAC).** The state of California defines DACs as, “…an area identified by the California EPA (CalEPA) pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation” (OPR 2020). The EJ screening tool, CalEnviroScreen, designates DACs based on a set of four criteria that is further described in Section 9.1.1.
- **Disproportionate effects.** This term is used in Executive Order 12898[2] to describe situations of concern where there exists significantly higher and more adverse health and environmental effects on minority populations, low-income populations, or Indigenous peoples.
- **Census tracts.** The U.S. Census Bureau defines census tracts as small, relatively permanent subdivisions of a county or statistically equivalent entity that can be updated by local participants prior to each decennial census. The primary purpose of census tracts is to provide a stable set of geographic units for the presentation of statical data (*Glossary* 2022). In the context of this analysis, census tracts are the geographic unit to which data is collated and used to evaluate and screen for DACs.
- **Cumulative impacts.** The concept of cumulative impacts has received increased attention among community leaders, EJ advocates, and government agencies when discussing EJ initiatives. Cumulative impacts in the context of EJ means exposures and public health or environmental effects from all sources of pollution in a geographic area. It also considers groups of people that are especially sensitive to pollution’s effects, such

[1] EJ is “the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations, and policies.”

[2] Executive Order 12898 of February 11, 1994, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations; https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf

as young children with asthma and socioeconomic factors, such as poverty, race and ethnicity, and education (Huang & London 2012).

- **Low-income area.** California Government Code section 65302(h) defines low-income area as "an area with household incomes at or below 80% of the statewide median income or with household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's (HCD) list of state income limits pursuant to Section 50093" (OPR 2020).
- **Priority Populations.** The California Climate Investment programs provide benefits to priority populations, which include disadvantaged communities, low-income communities, and low-income households. A minimum of 35% of California Climate Investments must be directed to these priority populations as directed by Senate Bill (SB) 535 and Assembly Bill (AB) 1550.

9.1.1 Evaluation Tools

The emergence of EJ has prompted several federal, state, and local agencies to develop indices and screening tools to identify EJ communities. Although the field is relatively nascent, in the last 2 years the California Office of Planning and Research (OPR) has published guidelines for local jurisdictions to incorporate EJ into their General Plan. These guidelines were used as a framework for implementing this analysis and selecting datasets and EJ tools to use.

At the cornerstone of the EJ movement is the concept of inclusivity; clearly stated in the definition is the fair treatment of *all people regardless of race, color, national origin, or income*. Therefore, OPR recommends casting a wide net when screening for EJ communities and emphasizes the use of localized datasets to ensure accurate representation of the communities residing within a proposed project area throughout all phases of planning. Using a variety of datasets and incorporating dynamic temporal scales, such as historic trends and development patterns, will allow for more accurate representation of all people including transient communities.

EJ screening tools and datasets developed from state and local resources were used to identify EJ communities and assess for disproportionate pollution burden. Federal screening tools, such as the EPA's EJScreen and the Council of Environmental Quality's Climate and Economic Justice Screening Tool provide a good starting point for states without localized EJ screening tools and datasets. Provided this study is located within California, it is prudent to utilize the resources that are best fit for the region.

The California Communities Environmental Health Screening Tool, CalEnviroScreen Version 4.0[3], and corresponding Disadvantaged Communities Map (DAC Map), developed by CalEPA, was the primary tool used to screen for EJ communities residing within the proposed project area and surrounding areas. CalEnviroScreen 4.0 was chosen as the most suitable tool to represent environmental indicators and population characteristics for this study due to its

[3] Version 4.0 of CalEnviroScreen was released in December 2021 and includes several updates from Version 3.0, including the most recent data available for all indicators, improved calculations of some indicators, new data to better reflect environmental conditions and vulnerability to pollution, and the addition of one new indicator to reflect children's risk of lead exposure to lead-based paint in low-income communities with older housing stock (OEHHA 2021).

comprehensive and accurate data, granular scale for ranking communities, and assessment of cumulative impacts for designating DACs.

The California Air and Resource Board's (CARB) Priority Populations Map was examined to identify low-income areas and cross-reference the census tracts designated as DACs from CalEnviroScreen.

To examine the identified EJ communities at a finer scale, a San Francisco Bay (Bay) Area-specific dataset for social vulnerabilities was evaluated – the San Francisco Bay Conservation and Development Commission's (BCDC) Community Vulnerability and Community Based Organizations Map. Other tools that were considered but not used are the Metropolitan Transportation Commission's Equity Priority Communities Map and CARB's Community Air Protection Program Map. These tools were not used because there were no communities within the EJ Study Area listed in these tools when this study was prepared. **Table 9-1** summarizes the evaluation tools used including their intended use, information displayed, and data sources. Each tool is described further below.

CalEnviroScreen

CalEnviroScreen was developed by the California Office of Environmental Health Hazard Assessment (OEHHA) as part of CalEPA's EJ program. It is described as a screening tool that evaluates the burden of pollution from multiple sources in communities while accounting for potential vulnerability to the adverse effects of pollution (August et al. 2021). CalEPA uses the tool to prioritize their work to benefit these communities, administer EJ grants, promote compliance with environmental laws, prioritize site clean-up, and identify opportunities for sustainable economic development (August et al. 2021). Simply put, CalEnviroScreen is a science-based screening tool used to evaluate communities based on pollution burden and vulnerability.

The screening tool's simple user interface, an interactive map, uses census tracts as the geographic unit to collate data and calculate a final score. The tool's model uses four general data types, with two types representing Pollution Burden – *exposures* and *environmental effects*, and two types representing Population Characteristics – *sensitive populations* and *socioeconomic factors*. Exposure indicators represent different types of pollution that people may encounter. Environmental effects indicators are the locations of toxic chemicals in or near communities; sensitive population indicators are measured by the number of people who may be more sensitive to pollution because of their age or health; and socioeconomic factor indicators are conditions that may increase people's stress or make healthy living difficult, causing them to be more sensitive to pollution's effects.

There are 21 indicators used to characterize Pollution Burden and Population Characteristics. Each indicator is scored based on its percentile within the state. Percentiles are averaged for the set of indicators in each of the four data types and then combined to calculate a final score, as shown below in **Figure 9-1**. A maximum CalEnviroScreen score of 100 is possible. The census tracts are ordered from highest overall score to the lowest and a percentile is then calculated from the ordered values (August et al. 2021). An example calculation is provided in **Appendix E**.

Figure 9-1: CalEnviroScreen Model

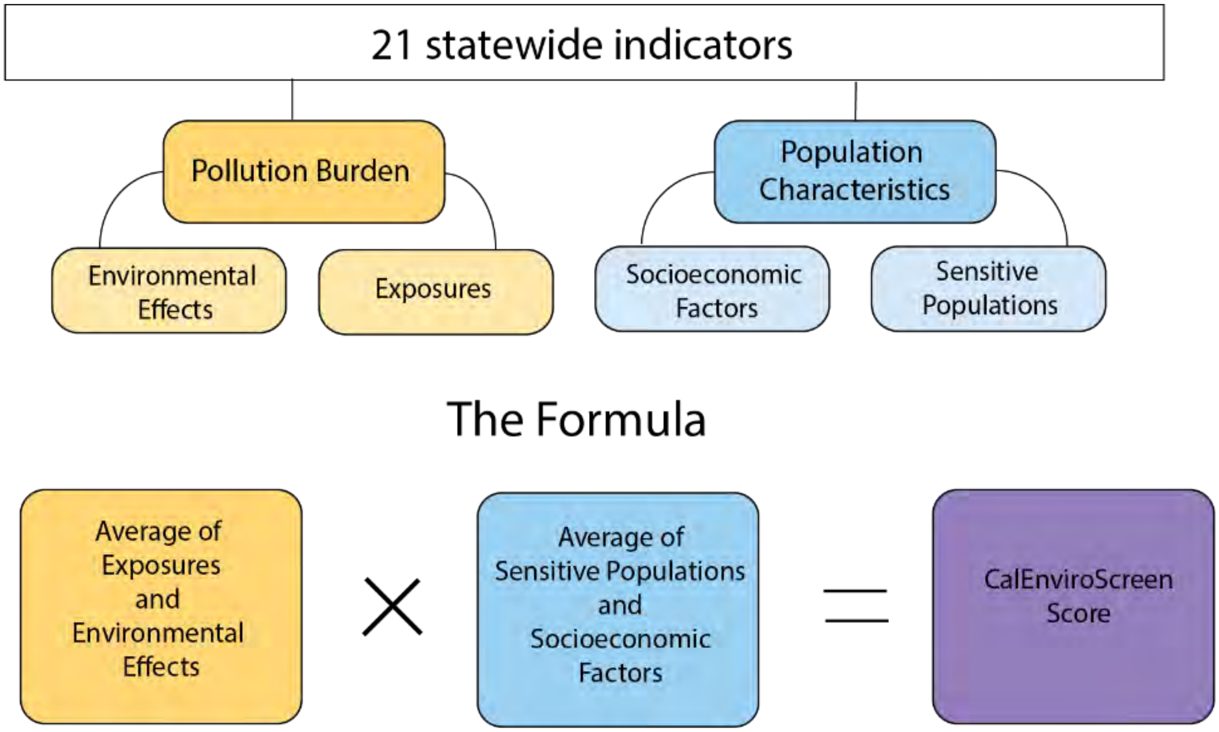

Figure source: GEI 2022; Data source: (August et al. 2021)

CalEPA's DAC Map visually highlights census tracts that are designated as DACs in CalEnviroScreen. In May 2022, CalEPA released its updated Designation of Disadvantaged Communities for SB 535. The following four results in CalEnviroScreen are designated as DACs (CalEPA 2022):

1. Census tracts with the highest 25% of overall scores in CalEnviroScreen 4.0.
2. Census tracts lacking overall scores in CalEnviroScreen 4.0 due to data gaps but receiving the highest 5% of CalEnviroScreen 4.0 cumulative pollution burden scores.
3. Census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0.
4. Areas governed by federally recognized Tribes.

Priority Populations Map

The Priority Populations Map displays DACs, as designated by CalEnviroScreen, low-income areas, and low-income households. A low-income area designation on the Priority Populations Map includes either household incomes at or below 80 percent of the statewide median income or household incomes at or below the threshold designated as low income by HCD 2021 List of State Income Limits. This study characterizes EJ communities collectively as the DACs identified from CalEnviroScreen and low-income areas identified on the Priority Populations Map which again are those that meet the state's definition for low-income areas, defined in the previous section.

Community Vulnerability Map

BCDC's Adapting to Rising Tides (ART) Program developed data to better understand community vulnerability to current and future flooding due to sea level rise and storms. The Community Vulnerability Map was created with this data to help inform how and where community engagement should occur in response to the Environmental Justice and Social Equity Bay Plan Amendment, voted in October 2019 (Vulnerable Communities 2020). Results from this tool are described differently than CalEnviroScreen. The data is collated at the census block group, a finer scale than census tracts. BCDC characterizes communities with a *social vulnerability* ranking based on 12 socioeconomic characteristics that specifically contribute to increased vulnerability to hazards (Vulnerable Communities 2020). In the context of hazard mitigation and climate resilience, social vulnerability refers to the socioeconomic characteristics that can be barriers to respond to, recover from, or prepare for a harmful event. The ART Program specifically developed this tool to identify where people will be impacted more heavily by flooding due to pre-existing social and economic factors.

9.1.2 Geographic Scope

The geographic scope of analysis was determined by identifying the 2010 census tracts[4] that overlap the Environmental Study Areas, TFPAs, and contiguous census tracts to the south of TFPAs for their relationship to these areas. Southerly contiguous census tracts were included due to their proximity to the TFPAs. Since the desalination facility location has not been identified, these contiguous census tracts could experience indirect impacts. This approach is consistent with OPR's recommendation to cast a wide net when screening for EJ communities. Other contiguous census tracts are located across the Bay to the north, in San Jose to the east, and Palo Alto to the west, a significant distance from the above-mentioned areas and thus determined to be unlikely recipients of indirect impacts. This approach led to the identification of 17 census tracts as the geographic area of analysis (hereinafter referred to as the EJ Study Area) allowing for a wider geographic area to account for potential impacts outside the immediate project area. The EJ Study Area along with census tracts is shown in **Figure 9-2.**

[4] CalEnviroScreen uses census tract delineations from 2010 because the necessary data used in the model (i.e., social vulnerabilities and exposures) are only available for the 2010 census tracts. Therefore, this study used the same census tract delineations to determine the geographic scope of analysis and screen for EJ communities.

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Table 9-1. Summary of Environmental Justice Screening Tools Used

Screening Tool	CalEnviroScreen	Priority Populations Map	Community Vulnerability Map
Agency Created By	CalEPA – Office of Environmental Health Hazard Assessment	CARB	BCDC – *ART Program*
Intended Use	CalEnviroScreen was designed to help CalEPA identify disadvantaged communities (DACs) as required by Senate Bill (SB) 535. Several state entities outside of CalEPA use CalEnviroScreen to implement different programs, many that are funded from the Greenhouse Gas Reduction Fund and include benefits to DACs identified from CalEnviroScreen.	This map allows the user to identify if a particular location is within a DAC or low-income community and aides in planning for projects, programs, and allocating funding resources.	BCDC's ART Program developed data to understand community vulnerability to current and future flooding due to sea level rise and storms. The mapping tool is intended to support project applicants, BCDC staff, and interested stakeholders, such as residents and community-based organizations.
Purpose for this Analysis	To identify DACs within the EJ Study Area and assess pollution burden.	To identify low-income area within the EJ Study Area.	To further examine EJ communities for social vulnerabilities and exposure to flooding.
Info Displayed	The CalEnviroScreen model is based on 21 indicators representing pollution burden and population characteristics. The final score is calculated based on the average of indicator percentiles within each data category, which then designates DACs.	Priority Populations are defined as DACs identified by CalEviroScreen 4.0 and Low-income areas (census tracts that are either at or below 80% of the statewide median income, or at or below the threshold designated as low-income by HCD Revised State Income Limits)	The community vulnerability dataset contains four categories of information: 1.) Social Vulnerability indicators 2.) Contamination Vulnerability Indicators (CalEnviroScreen 3.0) 3.) Residential Exposure to Sea Level Rise 4.) Complementary Community Vulnerability Screening Tools[5]
Data Used	▪ The list of data sources used for the CalEnviroScreen model is too extensive for this table. Please refer to the CalEnviroScreen 4.0 Report[6]. ▪ Several Population characteristic indicators were sourced from: U.S. Census Bureau 2015-2019 ACS 5-year Estimates	▪ CalEnviroScreen 4.0 DAC designations ▪ U.S. Census Bureau, 2015-2019 ACS 5-year Estimates – California Census Tracts ▪ U.S. Census Bureau, Quick Facts California 2019 Tables ▪ HCD Revised State Income Limits for 2021	▪ ACS 2014-2018 5-year estimates ▪ CalEnviroScreen 3.0 data ▪ MTC Community of Concern 2018 ▪ UC Berkley Displacement Typology 2017 ▪ MTC 2010 residential parcel data ▪ 2017 ART Bay Area Sea Level Rise and Shoreline Analysis data ▪ FEMA 100- and 500-year flood zone data San Francisco 100-year precipitation data to generate the number of residential units exposed at each water level summed by block group.
Regulatory Context	SB 535 & AB 1550	SB 535 & AB 1550	Environmental Justice and Social Equity Bay Plan Amendment (voted October 2019)

Notes: ART = Adapting to Rising Tides, AB = Assembly Bill, CARB = California Air and Resource Board, CalEPA = California Environmental Protection Agency, DACs = disadvantaged communities, FEMA = Federal Emergency Management Agency, SB = Senate Bill, MTC = Metropolitan Transportation Commission

[5] Complementary tools include the MTC Communities of Concern and UDP Gentrification and Displacement Typology

[6] CalEnviroScreen 4.0 Report found at: https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf.

Figure 9-2. Environmental Justice Study Area and Environmental Justice Communities

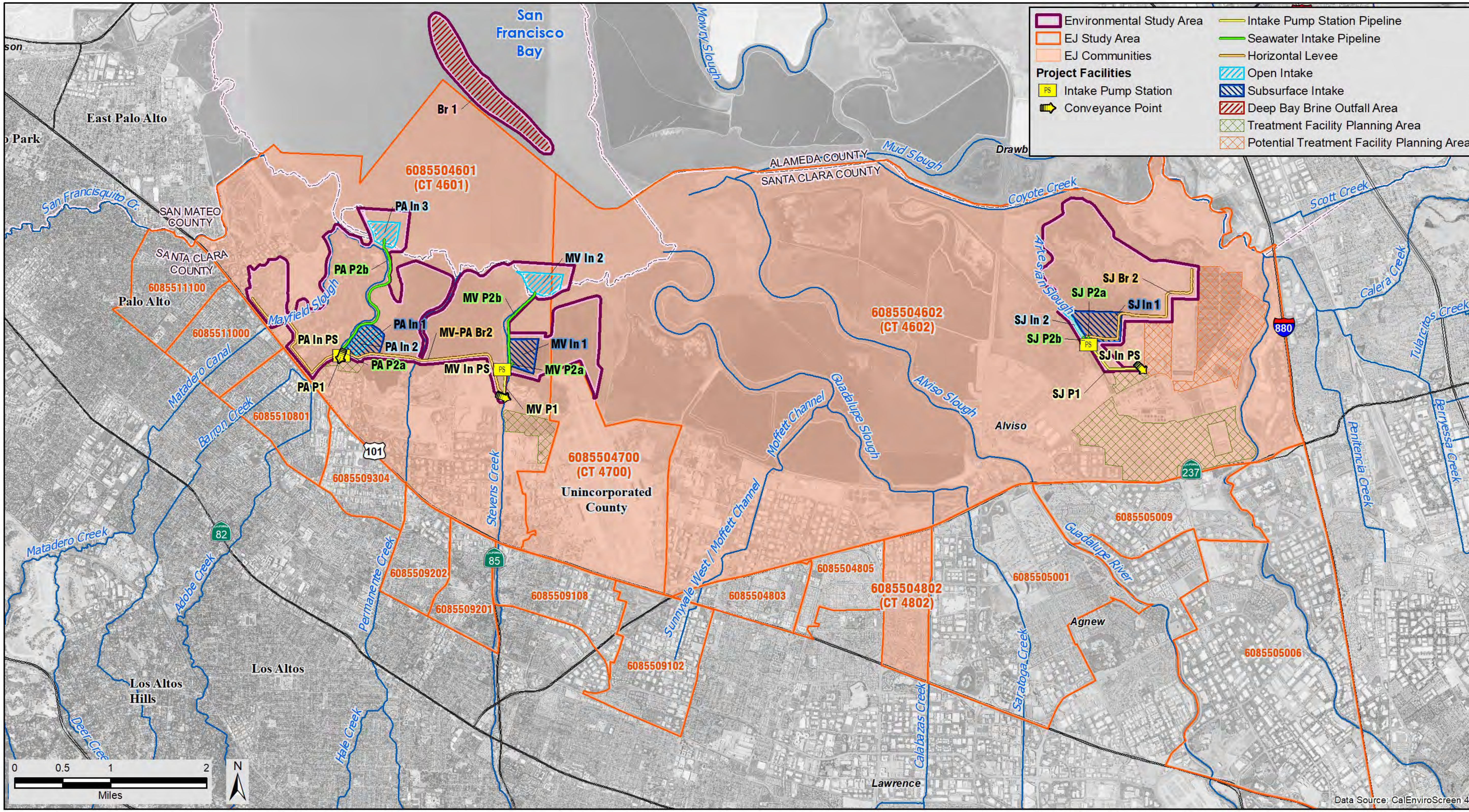

Figure source: GEI 2022; Data source: CalEPA 2022

9.2 Environmental Justice Communities

9.2.1 Evaluation Tool Results

CalEnviroScreen and Priority Population Map

Four census tracts within the EJ Study Area were identified as EJ communities because the census tract was designated as a DAC in CalEnviroScreen and/or designated as a low-income area on the Priority Populations Map. The census tracts identified as EJ communities and how they met the criteria are summarized in **Table 9-2**. The low-income area criteria were met for four census tracts. CalEnviroScreen and the associated DAC Map shows one census tract within the EJ Study Area as a designated DAC, which was also designated as a low-income area. The community is designated as DAC from the results of CalEnviroScreen Version 3.0 only; however, it is still recognized as such to allow for uninhibited disbursement of funds previously allocated to projects serving the community.

Table 9-2: Criteria met for EJ Communities

Criteria	Screening Tool	Census Tracts with Environmental Justice Communities			
		6085504602	6085504802	6085504601	6085504700
DAC status	CalEnviroScreen/ DAC Map	Yes	No	No	No
Low-income	Priority Populations Map	Yes	Yes	Yes	Yes

Notes: DAC = disadvantaged community

The census tract for each of the four EJ communities identified are described below.

- **Census tract No. 60855004602 (census tract 4602).** The eastern-most tract within the EJ Study Area, located in the most northern corner of San Jose, including the community of Alviso. It is bordered by Interstate 880 to the east, California State Route (SR) 237 to the south and includes the San Francisco Bay Salt Ponds along its northern border. The total population is 2,355 with approximately 59% Hispanic, 20% White, 14% Asian American Pacific Islander (AAPI), 5% African American, 1% Native American, and 0.3% Other or Multiple Races. *This census tract includes all project options and TFPAs for San Jose and the San Jose Environmental Study Area.*

- **Census Tract No. 6085504802 (census tract 4802).** Within the City of Sunnyvale, located to the south of census tract 4602 and SR 237. The total population is 5,516 with 49% AAPI, 27% Hispanic, 20% White, 2% African American, and 2% Other/Multiple Races. *This census tract contains the far western portion of the Mountain View-Palo Alto Environmental Study Area and is adjacent to several project options for the Mountain View-Palo Alto Environmental Study Area.*

- **Census tract No. 6085504601 (census tract 4601).** The western-most tract within the EJ Study Area is in unincorporated Santa Clara County. It is bordered by U.S. Highway 101 to the south, the City of East Palo Alto to the west, and includes the San Francisco Bay Salt Ponds along its northern border. The total population is 1,016 with approximately 33% Hispanic, 38% White, 25% AAPI, and 4% Other/Multiple Races. *This census tract includes all project options for Mountain View and Palo Alto Environmental Study Area,* *the Mountain View-Palo Alto TFPA, and most of the Mountain View-Palo Alto Environmental Study Area.*

- **Census Tract No. 6085504700 (census tract 4700).** Within unincorporated Santa Clara County, located between census tracts 4601 and 4602 and contains the Treatment Facility Planning Area. The total population is 588 people with approximately 19% Hispanic, 75% White, 2% African American, less than 1% AAPI, and 3% Other/Multiple Races. *This census tract does not contain project options, Environmental Study Areas, or TFPAs but is contiguous to the western portion of the Mountain View-Palo Alto TFPA and adjacent to project options for the Mountain View-Palo Alto Environmental Study Area.*

Examining the pollution burden indicators in all four census tracts revealed many similarities. The results are summarized in **Table 9-3** and detailed. All four census tracts scored in the 90th percentile for traffic and clean-up sites. Other high scoring pollution indicators include hazardous waste, groundwater threats, and impaired water bodies. High scoring population characteristic indicators were less common but include low birth weight infants and housing burden.

Pollution Burden Indicators

The following describes the pollution burden indicators that scored in 75th percentile in one or more identified EJ communities.

- **Traffic.** The traffic impacts indicator is the average traffic volumes per number of roadways. Populations including non-white, Latinx, low income, and people who speak a language other than English are more likely to live in or near areas with high traffic exposing them to more exhaust fumes that can damage DNA, cause cancer, and lead to other health issues (August et al. 2021). Major roadways effect communities in other ways including noise, vibration, injuries, and local land use changes. This pollution burden indicator ranked in the 90th percentile in all four EJ communities meaning exposure to traffic is higher in these census tracts than 90% of other census tracts in California. Traffic is expected to temporarily increase in areas of the project options during construction.

- **Cleanup sites.** Cleanup sites are those which are contaminated with chemicals and require clean up by property owners or government. The chemicals at these sites can move through the groundwater or air pathways potentially exposing people living near these sites (August et al. 2021). Studies show resident's living near contaminated sites were correlated with organochlorine pesticides in blood and toxic metals in house dust (August et al. 2021). A study of pregnant women living near Superfund sites in New York shows increased of having low birth weight babies. Cleanup sites in all four census tracts scored in the 90th percentile, meaning the number and type of cleanup sites in these areas are higher than 90% of the census tracts in California. If hazardous materials are used and stored at any of the project sites, there is a risk for spillage, becoming another cleanup site and increasing pollution exposure to the nearby communities. If project options are near these sites, there could be risk of existing resource contamination, especially in the case of drinking water.

- **Groundwater Threats.** Groundwater quality is usually threatened by hazardous chemicals stored in containers on land or underground that have potential to leak into the soil and pollute groundwater. Common pollutants include gasoline, heavy metals, and solvents (August et al. 2021). The presence of chlorinated solvents in groundwater is also associated with cleanup sites. Some of these cancer-causing chemicals have been detected in drinking water in parts of California (August et al. 2021). CalEnviroScreen measures this indicator by the type of site and how close it is to neighborhoods where people live. Groundwater threats scored in the 75th percentile in Census Tracts (CTs) 4601, 4602, and 4700 meaning they are higher than 75% of other census tracts in California.

- **Hazardous Waste.** Hazardous waste facilities are different than cleanup sites and include a range of different types of waste, such as automobile oil or highly toxic waste from factories, that may be dangerous to human health (August et al. 2021). Many new facilities have stricter design policies preventing contamination of the environment, but many new facilities may still affect the perception of the surrounding areas resulting in economic, social, and health impacts (August et al. 2021). The score is measured in CalEnviroScreen based on the number of permitted hazardous waste facilities, hazardous waste generators, and chrome plating facilities and their proximity to residential areas (August et al. 2021). Only large waste generators were included. Hazardous waste burden scored in the 75th percentile in all four identified EJ communities and in the 90th percentile for CTs 4602, 4802, and 4700.

- **Impaired Water Bodies.** Streams, rivers, and lakes can be used for various beneficial uses such as, drinking water, fish and wildlife, or recreation. Impaired water bodies mean the water is contaminated by one or more pollutant. Pollutants in surface waters can travel through the food-web and contaminate resident fish species. Low-income communities, minority populations, and tribes generally depend on fish and aquatic plants more than the general population. A study in the Sacramento-San Joaquin Delta found Asian and African American women consume the most recreationally caught fish (August et al. 2021). Census tracts 4601 and 4602 scored in the 90th percentile for impaired water bodies indicating the number of impairments is higher than 90% of the census tracts in California. The data collated for this indicator comes from the State Water Resources Control Board for impaired water bodies (August et al. 2021).

- **Solid Waste.** Solid waste facilities are described as places where household garbage and similar kinds of waste are collected, processed, or stored (August et al. 2021). Examples of solid waste facilities include landfills, composting, treatment, and recycling facilities, which may raise concerns about odors, vermin, and increased truck traffic. Other risks from these sites include release of gases like methane and carbon dioxide. Facilities are scored by the type, how much waste it handles, and whether there were violations. The values for all the solid waste facilities in or near each census tract were added together and considers how close people live to facilities. Solid waste scored in the 90th percentile for census tract 4602.

- **Diesel Particulate Matter (PM).** Diesel PM is a mixture of compounds including sulfates, nitrates, metals, and carbon particles from exhaust of diesel engines primarily trucks, buses, trains, and other heavy-duty equipment (August et al. 2021). Diesel PM contains known carcinogens and when inhaled by children and those with existing respiratory disease, such as asthma, result in increased asthmatic attacks and decreased lung function (August et al., 2021). Cardiovascular effects of diesel PM exposure in men and women include coronary vasoconstriction and premature death from cardiovascular disease. People living near large highways, ports, or railyards may experience higher levels of diesel PM exposure. Diesel PM scored in the 75th percentile in census tract 4802 only.

- **Lead Risk from Housing.** Lead is a toxic heavy metal that naturally occurs in the environment however, most high levels are found in our environment are from human activities such as lead-based paint, old plumbing, and contaminated soil (August et al. 2021). Young children are the most susceptible group to experience adverse effects of lead exposure, which can include impaired brain and nervous system function. Data for two of the most significant measures of known risk factors: age of housing and children living in low-income households were compiled for this indicator. Lead exposure scored in the 75th percentile in census tract 4802.

Population Characteristic Indicators

The following describes the population characteristics that scored in the 75th percentile in one or more of the EJ communities.

- **Low Birth Weight Infants.** Babies born weighing less than 5.5 pounds are considered low birth weight. These children have higher risk of health problems later in life, infant mortality, and are more sensitive to environmental exposures. Studies show a link between certain environmental exposures and low birth weight infants, such as exposure to fine particulate matter, heavy traffic, and toxic air contaminants (August et al. 2021). Census tract 4602 ranks in the 99th percentile for this indicator meaning there are more low birth weight infants in this census tract than 99% of other census tracts in California.

- **Housing Burdened Low-Income Households.** Housing-induced poverty is the inability of households to afford necessary goods after paying for shelter. This indicator measures the percent of households in a census tract that are both low income (making less than 80% of the Housing and Urban Development Area Median Family Income) and severely burdened by housing costs (paying greater than 50% of their income to housing cost). High housing cost burdens can contribute to residential instability, increase vulnerability to acute and chronic health problems, worsen stress and depression, and lead to poor educational outcomes for children (August et al. 2021). Census tract 4700 ranks in the 96th percentile for this indicator meaning housing burdened low-income households are higher in this census tract than 96% of other census tracts in California.

Community Vulnerability Map

The four census tracts identified as EJ communities in this analysis were ranked as either Moderate or Low social vulnerability. Other similarities include Very Low-Income, Adults Over 65 Alone, Young Children Under 5, Limited English Proficiency, and Not U.S. Citizen, as shown in **Table 9-3**. Descriptions of these social vulnerability indicators are provided in **Appendix E**. More information about the methodology and criteria for ranking social vulnerability can be found in the ART Bay Main Report Chapter 2.6: Vulnerable Communities[7].

The map provides a secondary set of resources known as the Community Based Organizations list. This feature creates a list of community-based organizations in a selected area of interest to serve as a guide for conducting public outreach with the identified EJ communities. A list of community-based organizations for EJ communities is provided in **Appendix E**.

9.3 Contribution to Pollution Indicators Evaluation

A summary of EJ community evaluation results for project options is provided in **Table 9-4**. A summary of constraints related to DACs and low-income areas is provided in **Table 9-5**. No constraints were identified related to the low social vulnerability status of census tracts. Critical constraints and recommended next steps are discussed below in this section.

The highest scoring pollution burden indicators across all four EJ communities are cleanup sites, traffic impacts, and hazardous waste generators and facilities with groundwater threats trailing close behind. Traffic, cleanup sites, and groundwater threats are the highest scoring indicators in census tracts 4601 and 4602 which contain the most project options. There is little to no potential to contribute to the lead indicator in census tract 4802 and this is not addressed in **Table 9-5**.

Of all the pollution burden indicators, the project options will contribute the most to traffic impacts in the identified communities. Traffic impacts are expected to increase the most during construction and reduce during regular operation, but due to increased activity will continue to contribute to this pollution burden after construction is completed.

Hazardous chemicals are expected to be onsite at the treatment facility. This has potential for contributing to cleanup sites and hazardous waste generators or facilities. In addition, low hazard chemicals may be used for infrequent cleaning of pipelines. Best management practices, safe operating procedures, and spill procedures will reduce the risk for hazardous chemicals contributing to these pollution burden indicators within identified EJ communities.

[7] ART Bay Area Main Report Chapter 2.6 Vulnerable Communities URL: https://www.adaptingtorisingtides.org/wp-content/uploads/2017/04/2.6_Regional_VulnerableCommunities_Section_March2020-pdf-232x300.jpg

Some construction activities for intakes and brine disposal on horizontal levees could contribute to impairment of water bodies and groundwater threats. Most construction impacts can be managed through dewatering work areas and implementation of best management practices and implementation of permit conditions related to protecting water quality; and should continue to be evaluated further as construction activities are planned. Blending of brine with other sources to dilute salinity would reduce impacts from brine management on horizontal levees and potentially make this option viable.

Treatment facilities would generate solid waste from construction activities and solids during operations that would require regular disposal. Potential reuse of solids for other purposes should be investigated.

Table 9-3. Summary of CalEnviroScreen and Community Vulnerability Map Results

Evaluation Tool Category	Census Tract			
	6085504602 (Disadvantaged Community)	6085504802	6085504601	6085504700
CalEnviroScreen Version 4.0				
CalEnviroScreen Final Score Percentile[8]	67	53	50	42
Count Pollution Burden Indicators in 75th percentile	6	5	6	5
List Pollution Burden Indicators in 75th percentile	Traffic, Cleanup Sites, Groundwater Threats, Hazardous Waste, Impaired Water Bodies, Solid Waste	Diesel PM, Traffic, Lead, Clean-up Sites, Hazardous Waste	Diesel PM, Traffic, Clean-up Sites, Groundwater Threats, Hazardous Waste, Impaired Water Bodies	Diesel PM, Traffic, Clean-up Sites, Groundwater Threats, Hazardous Waste
Count Pollution Burden Indicators in 90th percentile	6	3	4	3
List Pollution Burden Indicators in 90th percentile	Traffic, Cleanup Sites, Groundwater Threats, Hazardous Waste, Impaired Water Bodies, Solid Waste	Traffic, Cleanup Sites, Hazardous Waste	Traffic, Cleanup Sites, Groundwater Threats, Impaired Water Bodies	Traffic, Cleanup Sites, Hazardous Waste
Count Population Characteristics Indicators in 75th percentile	1	0	0	2
List Population Characteristics in 75th percentile	Low Birth Weight Infants	None	None	Low Birth Weight Infants, Housing Burden
Count Population Characteristics Indicators in 90th percentile	1	0	0	1
List Population Characteristics in 90th percentile	Low Birth Weight Infants	None	None	Housing Burden
BCDC Community Vulnerability Map				
Count social vulnerability indicators in 70th percentile	3	9	4	4
List social vulnerability indicators in 70th percentile	Under 5, People of Color, No High School Degree	Over 65 Alone, Not U.S. Citizen, Very Low Income, Under 5, Disabled, People of Color, No High School Degree, Severe Housing Cost Burden	Over 65 Alone, Limited English Proficiency, Not U.S. Citizen, Very Low Income	Renter, Under 5, Single Parent, Very Low Income
Count social vulnerability indicators in 90th percentile	0	1	0	2
List social vulnerability indicators in 90th percentile	None	Not U.S. Citizen	None	Renter, Under 5
Social vulnerability rank	Low social vulnerability	Low, Medium, and High[9] social vulnerability	Moderate social vulnerability	Moderate social vulnerability

[8] The census tract's Final Score is calculated, then ranked amongst all census tracts within the state and a percentile is calculated from the ordered values. The Final Score Percentile is the percentile from the Final Score.

9 This census tract is comprised of three block groups. Social vulnerability ranked Low in Block Group 1, High in Block Group 2, and Medium in Block Group 3.

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Table 9-4. Summary of Environmental Justice Community Evaluation Results at Project Option Locations

	Project Options	Census Tract	CalEnviroScreen	Priority Population Map	Community Vulnerability Map
Intake Options and Associated Conveyance					
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	CT 4602	DAC	Low-income area	Low social vulnerability
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	CT 4602	DAC	Low-income area	Low social vulnerability
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
Brine Management Options					
All	South Bay Deep Water Outfall (Br 1)	–	Project option is located deep underwater in the Lower South Bay		
SJ	Pond A18 Horizontal Levee (SJ Br 2)	CT 4602	DAC	Low-income area	Low social vulnerability
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability
Treatment Facility Planning Areas					
SJ	San Jose Treatment Facility Planning Area	CT 4602	DAC	Low-income area	Low social vulnerability
SJ	Potential San Jose Treatment Facility Planning Area	CT 4602	DAC	Low-income area	Low social vulnerability
MV/PA	Mountain View–Palo Alto Treatment Facility Planning Area	CT 4601	Not within DAC but includes pollution indicators in 75th percentile	Low-income area	Low social vulnerability

Notes: CT=census tract, DAC=Disadvantaged community; South Bay= South San Francisco Bay

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Table 9-5. Summary of Potential Contribution to EJ Community Pollution Burden Indicators

Project Options		75th Percentile Pollution Burden Indicators						
		Traffic *CTs 4602, 4802, 4601, 4700*	Cleanup Sites *CTs 4602, 4802, 4601, 4700*	Diesel PM *CTs 4802, 4601, 4700*	Groundwater Threats *CTs 4602, 4601, 4700*	Hazardous Waste *CTs 4602, 4802, 4601, 4700*	Impaired Water Bodies *CTs 4602, 4601*	Solid Waste *CTs 4602*
Intake Options and Associated Conveyance								
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	● Temporary increases in traffic from construction	● One cleanup site (Legacy Lagoon Biosolids) within 1 mile of option; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increases in diesel PM during construction	● Construction and operations require further evaluation to determine if impacts to groundwater quality could occur; depends on subsurface design and local groundwater conditions	● Permitted hazardous waste facility (Regional Wastewater Treatment Facility) is within 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	○ Coyote Creek is adjacent and listed as impaired[1]; impacts to surface water quality not anticipated	● Seven solid waste facilities within 1-mile[2]; would not generate significant amounts of solid waste
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	● Temporary increases in traffic from construction	● One cleanup site (Legacy Lagoon Biosolids) located within 1 mile of option; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increases in diesel PM during construction	● Two groundwater threats within 1 mile; no significant pollutants are anticipated to be introduced to groundwater	● Permitted hazardous waste facility (Regional Wastewater Treatment Facility) is within 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Coyote Creek is downstream and listed as an impaired[3]; potential temporary impacts to surface water quality from construction	● Five solid waste facilities within 1 mile; would not generate significant amounts of solid waste
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	● Temporary increases in traffic from construction	● Cleanup site (Moffett Field)[4] located within 1 mile of option; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increases in diesel PM during construction	● Two groundwater threats within 1 mile of option; construction and operations require further evaluation to determine if impacts to groundwater quality could occur; depends on subsurface design and local groundwater conditions	● Nearest hazardous waste generator 2 miles away; low hazard chemicals could be used for infrequent cleaning of the intake pipe	○ South San Francisco Bay (South Bay) and Stevens Creek[5] are adjacent and listed as impaired; impacts to surface water quality not anticipated	N/A (project option not located within CT 4602)
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	● Temporary increases in traffic from construction	● Cleanup site (Moffett Field) located within 1 mile of option; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increases in diesel PM during construction	● Two groundwater threats within 2-mile-radius; no significant pollutants are anticipated to be introduced to groundwater	● Nearest hazardous waste generator 2 miles away; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● South Bay[6] is listed as impaired and overlaps with project option. Stevens Creek is adjacent and listed as impaired; potential temporary impacts to surface water quality from construction	N/A (project option not located within CT 4602)
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	● Temporary increases in traffic from construction	● Two cleanup sites within 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increases in diesel PM during construction	● Several groundwater threats within 1-mile-radius; construction and operations require further evaluation to determine if impacts to groundwater quality could occur; depends on subsurface design and local groundwater conditions	● Permitted hazardous waste generator less than 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	○ South Bay is adjacent and Permanente Creek is 1 mile away and both are listed as impaired[14]: impacts to surface water quality not anticipated	N/A (project option not located within CT 4602)
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	● Temporary increases in traffic from construction	● Two cleanup sites within 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increase in diesel PM during construction	● Several groundwater threats within 1-mile-radius; no significant pollutants are anticipated to be introduced to groundwater	● Permitted hazardous waste generator (Kitty Hawk) less than 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Permanente Creek is within 1 mile and listed as impaired; potential temporary impacts to surface water quality from construction	N/A (project option not located within CT 4602)
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	● Temporary increases in traffic from construction	● One cleanup site within 1 mile; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● Temporary increase in diesel PM during construction	● No groundwater threats within 1-mile-radius; no significant pollutants are anticipated to be introduced to groundwater	● Permitted hazardous waste generator (Kitty Hawk) with 2 miles; low hazard chemicals could be used for infrequent cleaning of the intake pipe	● South Bay is listed as impaired and overlaps with this project option. Matadero Creek is within 1 mile and listed as impaired; potential temporary impacts to surface water quality from construction	N/A (project option not located within CT 4602)

	Project Options	75th Percentile Pollution Burden Indicators						
		Traffic *CTs 4602, 4802, 4601, 4700*	Cleanup Sites *CTs 4602, 4802, 4601, 4700*	Diesel PM *CTs 4802, 4601, 4700*	Groundwater Threats *CTs 4602, 4601, 4700*	Hazardous Waste *CTs 4602, 4802, 4601, 4700*	Impaired Water Bodies *CTs 4602, 4601*	Solid Waste *CTs 4602*
Brine Management Options								
All	South Bay Deep Water Outfall (Br 1)	N/A	N/A	N/A	N/A	N/A	🔴 South Bay listed as impaired water body. Elevated salinity levels in brine could impair surface water quality in CTs within the EJ Study Area.	N/A
SJ	Pond A18 Horizontal Levee (SJ Br 2)	🟡 Temporary increases in traffic from construction	🟢 Two cleanup sites within 1 mile; low hazard chemicals could be used for infrequent cleaning of the brine pipe	🟡 Temporary increase in diesel PM during construction	🟢 Not anticipated to significantly increase salinity in groundwater	🟢 Permitted hazardous waste generator (Regional Wastewater Facility) within 1 mile; low hazard chemicals could be used for infrequent cleaning of the brine pipe	🔴 South Bay and Coyote Creek are listed as impaired water bodies and overlap with this project option. Elevated salinity levels in brine could impair surface water quality	🟢 Seven solid waste facilities within1 mile; would not generate significant amounts of solid waste.
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	🟡 Temporary increases in traffic from construction	🟢 One active cleanup site (Moffet Field) within 1 mile; low hazard chemicals could be used for infrequent cleaning of the brine pipe	🟡 Temporary increase in diesel PM during construction	🟢 Not anticipated to significantly increase salinity in groundwater	🟢 Five permitted hazardous waste generators within 1 mile; low hazard chemicals could be used for infrequent cleaning of the brine pipe	🔴 South Bay, Stevens Creek, and Permanente Creek are listed as impaired water bodies and overlap with this project option. Elevated salinity levels in brine could impair surface water quality	N/A (project option not located within CT 4602)
Treatment Facility Planning and Operational Areas								
SJ	San Jose Treatment Facility Planning Area	🟡 Temporary increase in traffic from construction and small, intermittent permanent increases in traffic	🟢 Two cleanup sites within planning area and five outside planning area but within 1 mile radius[7]; hazardous chemicals would be stored and used onsite	🟡 Temporary increase in diesel PM during construction and small, intermittent permanent increases in traffic	○ No pollutants are anticipated to be introduced to groundwater	🔴 Close proximity to four permitted hazardous waste generators; new facility where hazardous chemicals would be stored and used onsite	○ No impacts are anticipated to occur to surface waters	🟢 Six solid waste facilities within 1-mile-radius; would routinely generate solids requiring disposal
SJ	San Jose Potential Treatment Facility Planning Area	🟡 Temporary increase in traffic from construction and small, intermittent permanent increases in traffic	🟢 Four cleanup sites within 1 mile; hazardous chemicals would be stored and used onsite	🟡 Temporary increase in diesel PM during construction and small, intermittent permanent increases in traffic	○ No pollutants are anticipated to be introduced to groundwater	🔴 Close proximity to hazardous waste generator at the San Jose/Santa Clara Regional Wastewater Facility; new facility where hazardous chemicals would be stored and used onsite	○ No impacts are anticipated to occur to surface waters	🟢 Six solid waste facilities within 1-mile-radius; would routinely generate solids requiring disposal
MV/PA	Mountain View–Palo Alto Treatment Facility Planning Area	🟡 Temporary increase in traffic from construction and small, intermittent permanent increases in traffic	🟢 Eight cleanup sites within 1-mile-radius, including one federal Superfund Site; hazardous chemicals would be stored and used onsite	🟡 Temporary increase in diesel PM during construction and small, intermittent permanent increases in traffic	○ No pollutants are anticipated to be introduced to groundwater	🔴 Two permitted hazardous waste generators within 2 miles; new facility where hazardous chemicals would be stored and used onsite	○ No impacts are anticipated to occur to surface waters	N/A (project option not located within CT 4602)

Legend: 🔴 = Large contribution to indicator; 🟡 = Moderate contribution to indicator; 🟢 = Minor contribution to indicator, ⚫ (gray) = Unknown contribution to indicator; ○ = Does not contribute to indicator

Notes: BMPs=best management practicies, N/A=not applicable; SOPs=standard operating procedures
Sources: C.W.B 2018, OEHHA 2023, T.S.C. 2023, C.W.B. 2018a, C.W.B. 2018b, C.W.B 2018c,OEHHA 2023a.

9.4 Environmental Justice Communities Evaluation

DACs and low-income communities face many challenges when it comes to accessing resources and when combined with high pollution burden, the impacts are disproportionately high and adverse. CalEnviroScreen and BCDC’s Community Vulnerability Map listed several social vulnerabilities in the EJ communities that can be characterized as either sensitive populations or socioeconomic factors. Sensitive populations listed include people over 65 years old, under 5 years old, and low birth weight infants. Socioeconomic factors include limited English proficiency, non-U.S. citizens, no high school degree, people of color, very low income, and housing burdened low-income households. Collectively, communities comprised of these vulnerabilities or characteristics are disproportionately and adversely impacted by pollution exposure.

The following discussion describes the cumulative impacts often experienced by populations characterized with the social vulnerabilities and socioeconomic factors mentioned above from exposure to pollution burden indicators the seawater desalination project (desalination project) is most likely to contribute towards (i.e., those listed as moderate or high contributors in **Table 9-5**). These activities include increased traffic during construction and from vehicles accessing the treatment facility for operations, diesel PM associated with increases in traffic, use of hazardous chemicals at the treatment facility, and changes to surface water quality in impaired water bodies from brine management. Outreach and meaningful engagement with the identified EJ communities is required to fully understand potential impacts.

9.4.1 Traffic and Diesel Particulate Matter

The extent of impacts from increased traffic depends on the type and size of equipment and vehicles needed to construct and number of vehicle trips to the treatment facility for operations. Traffic impacts communities in many ways including air pollution, noise, vibrations, and increased risk of injury and death. People in low-income areas and households are less likely to have the financial means to own a vehicle resulting in more pedestrian foot traffic in these communities. With more people on-foot in an area with high traffic, there is an increased risk of traffic-related injury or death. Furthermore, a higher frequency of large vehicles, such as dump trucks or other construction vehicles, can increase danger for small children that may not be seen by drivers. Traffic can also bring nuisances to communities, such as noise and vibration. This can affect people’s ability to sleep and mental health over time. Some studies have also shown a connection between air pollution levels to mental health and depression (Washington 2019). Low-income households, people of color, and immigrants without citizenship face many challenges accessing resources, especially to mental health services.

9.4.2 Diesel Particulate Matter

The combustion of fuels, commonly occurring from road traffic, contributes the most to air pollution levels in urban settings (Schultz et al. 2017). Diesel PM contain hundreds of different chemicals that are harmful to human health and are commonly from the exhaust of cars, trucks, and other vehicles. These particles are more dangerous to young children and elderly people over 65 years old. In young children, diesel PM can affect lung function and neurodevelopment dramatically because they have a greater lung surface area relative to their body size, giving them greater relative exposure than adults (Washington 2019). Studies have linked pregnant mothers with high exposure to diesel PM to low-birth weight babies (Washington 2019). Diesel PM containing iron oxide and magnetite, released from diesel-burning vehicles, contribute to amyloid plaques and inflammation leading to Alzheimer's and dementia (Washington 2019). This increases risk of these diseases for people over 65 years old living near areas with high traffic. The health impacts from long-term exposure to air pollution can often be ignored leading to chronic illness.

9.4.3 Hazardous Chemicals

Impacts from the presence and use of hazardous chemicals at the treatment plants depends on the type of chemicals used, how they are stored and transported off-site, and the safety measures and BMPs practiced during handling of materials. The treatment facility would generate sludge that forms by solids and would require periodic removal and disposal at a nearby landfill. Removal of sludge could occur every 1 to 6 days. Operation of the desalination plant will involve storage and use of chemical cleaning solutions to clean the reverse osmosis membranes and chemicals used to treat the produced water. The presence and storage of these chemicals in proximity to low-income and disadvantaged communities increase the risk of exposure from mishandling or leaking of storage containers.

Due to the high number of hazardous waste facilities and cleanup sites, there is risk associated with toxic release into the environment during construction, especially ground disturbing activities. Decades of research has reported high frequency of locally unwanted land uses (LULUs) in low-income communities with high percentage of minority populations (Erickson 2016). Examples of LULUs are hazardous waste sites, industrial facilities, landfills, or other solid waste facilities that present a risk of releasing toxins in the environment and becoming cleanup sites. Numerous health effects are documented resulting from living near hazardous waste sites including, low birth weight infants, birth defects, heart defects, and increased rates of cancer of the lung, bladder, stomach, and rectum (Jones 2020). Provided the EJ communities residing near the treatment facilities are low-income, have limited English proficiency, lower education attainment, are more sensitive due to age and low birth weight infants, their impact to the presence of another hazardous waste facility would be disproportionately high and adverse due to their pre-existing health conditions and limited access to resources.

9.4.4 Impaired Water Bodies

Managing potential impacts from the project to impaired water bodies is of great concern for the populations that rely on subsidence fishing in the EJ communities. There are high percentages of AAPI populations residing in the identified EJ communities, a demographic whose culture is more reliant on fish as a primary food source. If brine disposal causes large quantities of aquatic organisms to perish and wash up onto the shorelines, it will produce an odor and unsightly landscape. It is also pertinent to note the inherent risks in using the Bay as a drinking water source provided it is impaired. As discussed in Chapter 4, "Water Quality," the list of impairments for this waterbody include: Dieldrin, Dioxin Compounds, Mercury, PCBs, Furan Compounds, Chlorine, and Dichlorodiphenyltrichloroethane (DDT) (C.W.B 2018a).

9.5 Regulatory Evaluation

The California Environmental Quality Act (CEQA) currently does not have requirements to specifically address EJ; however, environmental impacts identified in the analysis can be used to conduct an EJ analysis along with identification of EJ communities.

9.5.1 Executive Order 12898 and National Environmental Policy Act

Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations – was issued in 1994. Its purpose is to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. It directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law; develop a strategy for implementing EJ; and promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation. This Executive Order produced guidance at the federal level on how to incorporate EJ into National Environmental Protection Act documents[10]. The federal lead agency for the project would ultimately decide on how and to what extent EJ analysis is conducted to support National Environmental Policy Act (NEPA) documentation. *See* Chapter 10, "CEQA and NEPA," for further discussion on NEPA and Section 11, "Permitting," for federal agencies issuing approvals for the desalination project.

9.5.2 San Francisco Bay Plan

Environmental Justice and Social Equity Plan Amendment 2-17

In 2011, BCDC acknowledged that shoreline flooding will affect communities differently depending on their location, resources, and adaptive capacity. In particular, low-income communities and those underrepresented or marginalized may have more difficulty preparing for, responding to, or recovering from a flood. BCDC approved the amendment on October 17, 2019, which included amendments to Public Access, Shoreline Protection, and Mitigation to allow for further EJ and social equity considerations to be analyzed for potential future projects. The Environmental Justice and Social Equity Bay Plan Amendment consists of four policies. The following two policies are relevant to the desalination project are summarized below.

3. Equitable, culturally-relevant community outreach and engagement should be conducted by local governments and project applicants to meaningfully involve potentially impacted communities for major projects and appropriate minor projects in underrepresented, vulnerable, or disadvantaged communities, and such outreach should continue throughout the Commission review and permitting processes. Evidence of how community concerns were addressed should be provided. If such previous outreach and engagement did not occur, further outreach and engagement should be conducted prior to Commission action.

[10] Available: https://www.epa.gov/sites/default/files/2015-02/documents/ej_guidance_nepa_ceq1297.pdf

4. If a project is proposed within an underrepresented, vulnerable, or DAC, potential disproportionate impacts should be identified in collaboration with the potentially impacted communities. Local governments and the Commission should take measures through environmental review and permitting processes, within the scope of their respective authorities, to require mitigation for disproportionate adverse project impacts on the identified vulnerable or disadvantaged communities in which the project is proposed.

This evaluation serves as the first step in complying with the above-referenced Bay Plan Amendments. To ensure full compliance, meaningful engagement with identified EJ communities should be conducted to determine disproportionate impacts and appropriate mitigation measures prior to project implementation.

Chapter 10. CEQA and NEPA

10.0 Introduction

This section discusses California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) requirements for the seawater desalination project (desalination project) and provides a screening analysis of resource topics and issues. CEQA and NEPA requirements are based on general information known about the potential project at this early stage of planning and could change as the project develops, such as with different project locations or funding sources.

The screening analysis identifies issues with no or limited impacts and issues that will need to be addressed in CEQA/NEPA documentation and should be considered further during future stages of project planning. The screening analysis is based on information in Chapter 3, “Project Description, Options, and Alternatives.” Issues related to siting of project options, such as those related to water quality, biological resources, and cultural resources, are evaluated in the environmental evaluations in Chapters 3 through 8 of this study. These issues are also identified for consideration in CEQA/NEPA but are not evaluated further in this section. Additional issues that require consideration in CEQA/NEPA documents, primarily those related to project construction and operations and maintenance activities, are also identified in this section,

The level of severity of each CEQA/NEPA issue is characterized as one of the following:

- Issue that is regularly dealt with or can be easily evaluated or resolved
- Potentially significant issue
- Critical issue that could be challenging, costly, or affect the scope of the project

10.1 CEQA Compliance

10.1.1 Lead and Responsible Agencies

As the project proponent, Valley Water would have the most discretion over the project, and it is thus anticipated that Valley Water would be the lead agency responsible for completing the CEQA document. Other responsible agencies using the CEQA document to issue discretionary approvals for the project may include the following:

- State Water Resources Control Board for issuance of Clean Water Act section 402 National Pollutant Discharge Elimination System (NPDES) permit

- San Francisco Bay (Bay) Regional Water Quality Control Board for issues of the Clean Water Act (CWA) Section 401 water quality certification

- California Department of Fish and Wildlife for issuance of a Lake/Streambed Alteration Agreement and/or incidental take permit per Section 1602

- California Department of Public Health – Domestic Water Supply Permit Amendment for change in the water system
- California State Lands Commission for issuance of a lease
- San Francisco Bay Conservation and Development Commission for issuance of a major permit for shoreline development
- Bay Area Air Quality Management District for issuance of permits to construct and operate the treatment facility
- Local municipalities (i.e., Santa Clara County, cities of San Jose, Sunnyvale, Mountain View, and Palo Alto) – depending on project option selected and discretionary approvals, if any from local agencies.

To identify critical issues pertinent to each agency's jurisdictional and project approval along with their preferences for mitigation, early consultation with responsible agencies during preparation of the CEQA document is recommended.

10.1.2 CEQA Document Preparation

It is anticipated that an Environmental Impact Report (EIR) would be required for CEQA compliance due to the complexity of the desalination project, high likelihood of potentially significant environmental impacts, and typically high stakeholder interest and scrutiny of desalination projects (*see* Chapter 12, "Public Acceptance"). The following should be considered in preparation of an EIR:

- **Baseline Conditions.** CEQA requires that environmental impacts are evaluated based on the baseline/existing environmental conditions present at the time the Notice of Preparation of an EIR is prepared. As such, conditions identified in the environmental evaluations in Chapters 4 through 9 of this study could change prior to the Notice of Preparation.
- **Whole of the Action.** CEQA requires evaluation of the whole of the action, which means that comprehensive project actions, including project design and characteristics, construction activities, and operations and maintenance activities, should be evaluated to make sure all potential environmental impacts of the project area addressed. This includes the following for the desalination project:
    - Seawater intake
    - Intake pump station
    - Pipeline from the intake to the pump station and treatment facility
    - Treatment facility and associated buildings and site improvements
    - Pre-treatment
    - Reverse osmosis
    - Post-treatment
    - Solids removal and disposal
    - Hazardous materials storage, use, and handling
    - Pipeline from treatment facility to brine management location

- Brine management (i.e., outfall or horizontal levee) and associated activities (e.g., blending with wastewater effluent)
- Energy source including new sources developed
- Electric power transmission and distribution infrastructure to the treatment facility and any relocations
- Pipeline from treatment facility to Valley Water's distribution system water system and associated improvements to the system
- Appropriative water rights, if required

- **Alternatives.** An EIR is required to evaluate a reasonable range of alternatives that would meet most of the basic project objectives, are feasible, and would reduce at least one potentially significant environmental impact of the project. The evaluation of project options and alternatives in this study provides a first step in the alternatives evaluation and screening process which will be supplemented with an evaluation of engineering feasibility and identification of additional project components such as pipeline alignments. The environmental and engineering evaluations will be useful in developing the CEQA alternatives analysis.

- **Stakeholder Engagement.** Stakeholder interest and scrutiny of desalination projects has typically been high. Stakeholders and areas of concern for Valley Water's desalination project are evaluated in Chapter 12, "Public Acceptance." Stakeholders should be informed of the CEQA process, timeline, and opportunities for public comment. Early on, Valley Water should conduct outreach with stakeholders for input. Key issues should be identified and strategy for engaging the stakeholders should be developed, including addressing issues in the CEQA document.

- **Assembly Bill 52 Tribal Consultation.** To determine if the project would have an effect on tribal cultural resources, Valley Water would need to consult with any California Native American tribe that requests consultation under CEQA. If it is determined during consultation that the project may cause a substantial adverse change to tribal cultural resources, Valley Water must consider measures to mitigate the impact.

10.2 NEPA Compliance

NEPA compliance is required to receive any federal funding and obtain federal permits for the desalination project. Currently no sources of federal funding have been identified for the desalination project. As discussed in Chapter 11, "Permitting," the following agencies may issue permits for the project and are anticipated to require a new NEPA document (this list is not exhaustive, and a more detailed review of Permit requirements is included in Chapter 11 "Permitting"):

- U.S. Army Corps of Engineers for issues of a CWA Section 404/Rivers and Harbors Act Section 10 individual permit or RHS Section 14 permission
- U.S. Fish and Wildlife Service (USFWS) Compatibility Use Determination for issues of Right-of-way through the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge)

If there are multiple federal agencies issuing permits and/or funding for the project, then one agency is identified as the federal lead agency. Further study and coordination with federal agencies are required.

NEPA compliance would focus on the federal action. For example, USFWS's NEPA compliance would focus on infrastructure requiring a right-of-way within the Refuge. The federal agency would ultimately decide on the scope of the NEPA document. A NEPA document could be prepared separately or a joint CEQA/NEPA document could be prepared. If prepared separately, Valley Water should prepare the CEQA document first and then the federal agency would leverage information and analysis to efficiently prepare the NEPA document with additional information required under NEPA. If an Environmental Assessment can be used for NEPA compliance, then Valley Water may be able to provide an applicant-prepared document. If an Environmental Impact Statement is required, then it must be prepared under the direction of the federal lead agency and alternatives must be evaluated at an equal level of detail.

10.3 Resource Screening Analysis

A screening analysis was conducted for each resource topic and criteria in Appendix G of the CEQA Guidelines, though it does not address every issue in the guidelines. The screening analysis is also based on review of other desalination project CEQA documents. The intent of the screening analysis is to identify issues, their applicability to the desalination project, and to identify considerations for future phases of planning and/or mitigation.

The following issues are anticipated to have no impacts or limited impacts.

- **Forestry.** There is no forestland or land zoned as such located within the Environmental Study Areas or Treatment Facility Planning Areas (TFPAs).
- **Agriculture.** Land zoned as agriculture is present within both the San Jose and Mountain View-Palo Alto ESAs and San Jose and San Jose Potential TFPAs; however, there is currently no agricultural production within or surrounding these areas.
- **Mineral Resources.** There are no known mineral resources site located within the ESAs or TFPAs.
- **Increase the Use of Existing Recreational Facilities.** The project would not involve construction of new residences, generate substantial additional sources of permanent employment, or develop new facilities that would significantly increase local or regional recreational use.
- **Wildfire.** The project is not located in or near state responsibility areas or lands classified as very high fire hazard severity zones.

An evaluation of CEQA/NEPA issues related to the evaluation of siting of project options in Chapters 4 through 8 of this study is provided in **Table 10-1**. An evaluation of additional CEQA/NEPA issues, primarily related to construction, operations, and maintenance activities, is provided in **Table 10-2**.

As shown in Table 10-1 and 10-2, the following issues are likely to be critical such that they could be challenging, costly, or affect the scope of the project:

- Impairment of San Francisco Bay water quality from discharge of brine via the South Bay Deep Water Outfall option
- Impairment of salt marsh/wetland water quality from discharge of brine via horizontal levee options
- Impediment or redirection of flood flows by pump stations, horizontal levee options, or treatment facility
- Disturbance to special-status fish, birds, amphibians, mammals, and plant species and suitable habitat for these species during construction of project options
- Permanent impacts to salt marsh habitat from intake operations (by drawing in water from these habitats) for open intakes in sloughs and subsurface intakes
- Impacts to salt marsh habitats from high salinity and water quality of brine discharged via horizontal levee options
- Impingement and entrainment of marine organism including special-status fish from operation of open intake options
- Impacts to marine organisms from discharge of brine via the South Bay Deep Water Outfall option
- Conflicts from project options with purpose of the Don Edwards National Wildlife Refuge for conserving sensitive biological habitat, as established in plans and regulations
- Requires relocation or construction of electrical transmissions and distribution lines or new energy sources

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Table 10-1. CEQA/NEPA Issues Evaluated in Previous Chapters of this Study

Resource Topic and Issue	Relevant Study Sections	Issue Rating
Hydrology and Water Quality		
Impairment of San Francisco Bay water quality from discharge of brine via the South Bay Deep Water Outfall option	▪ Section 4.3.5, "Estimated Permeate and Brine Water Quality Calculated Total Dissolved Solids" ▪ Section 4.7.2, "Compliance with Brine Discharge Requirements"	🔴
Impairment of salt marsh/wetland water quality from discharge of brine via horizontal levee options	▪ Same as row immediately above	🔴
Impediment or redirection of flood flows by pump stations, horizontal levee options, or treatment facility	▪ Section 8.3.1, "Flood-related Climate Hazards" ▪ Section 8.3.4, "Project Options Climate Vulnerability Evaluation"	🔴
Biological Resources		
Disturbance to special-status fish, birds, amphibians, mammals, and plant species and suitable habitat for these species during construction of project options	▪ Section 5.4.3, "Special-status Species" ▪ Section 5.7.1, "Special-status Species Evaluation"	🔴
Interference with migration of anadromous fish, migratory birds, or other species	▪ Same as row immediately above	🟡
Temporary and permanent impacts (fill and/or alteration) of waters of the U.S./state including wetlands from construction of project options	▪ Section 5.3, "Water Resources Conditions" ▪ Section 5.4.2, "Land and Vegetation Cover Types" ▪ Section 5.7.2, "Sensitive Habitats Evaluation"	🟡
Permanent impacts to salt marsh habitat from intake operations (by drawing in water from these habitats) for open intakes in sloughs and subsurface intakes	▪ Section 5.3, "Water Resources Conditions" ▪ Section 5.4.2, "Land and Vegetation Cover Types" ▪ Section 5.7.2, "Sensitive Habitats Evaluation"	🔴
Effects to salt marsh habitats from high salinity and water quality of brine discharged via horizontal levee options	▪ Section 5.3, "Water Resources Conditions" ▪ Section 5.4.2, "Land and Vegetation Cover Types" ▪ Section 5.7.2, "Sensitive Habitats Evaluation"	🔴
Impingement and entrainment of marine organism including special-status fish from operation of open intake options	▪ Section 5.7.3, "Marine Organisms Evaluation" ▪ Section 5.7.1, "Special-status Species Evaluation"	🔴
Impacts to marine organisms from discharge of brine via the South Bay Deep Water Outfall option	▪ Section 5.7.3, "Marine Organisms Evaluation"	🔴
Cultural Resources		
Potential impacts to known built environment resources – Alviso Salt Works Historic District (P-43-004034) – by project options	▪ Section 5.5.1, "Records Search" ▪ Section 5.7.5, "Cultural Resources Evaluation"	🟡

Resource Topic and Issue	Relevant Study Sections	Issue Rating
Potential impacts to known archaeological resource (P-43-004034) by the Pond A18 Horizontal Levee options	▪ Section 5.5.1, "Records Search" ▪ Section 5.7.5, "Cultural Resources Evaluation"	● (yellow)
Potential impacts to previously undiscovered buried archaeological resources	▪ Section 5.5.2, "Geoarchaeological Sensitivity Analysis for Buried Cultural Resources" ▪ Section 5.7.5, "Cultural Resources Evaluation"	● (green)
Air Quality, Greenhouse Gas Emissions, and Energy Use		
Greenhouse gas emissions from electricity purchases for operations (i.e., Scope 2 GHG emissions)	▪ Section 8.2, "Greenhouse Gas Emissions"	● (yellow)
Land Use and Planning		
Conflicts from project options with purpose of the Don Edwards National Wildlife Refuge for conserving sensitive biological habitat, as established in plans and regulations	▪ Section 6.2, "Don Edwards San Francisco Bay National Wildlife Refuge" ▪ Section 6.8.1, "Regional Planning Compatibility Evaluation"	● (red)
Recreation		
Temporary impacts to recreational trails due to construction of project options in Mountain View and Palo Alto	▪ Section 6.5, "Recreation Trails and Facilities" ▪ Section 6.8.2, "Existing and Planned Land Uses and Projects Compatibility Evaluation"	● (green)

Issue Rating Legend: ● (red) = Critical issue that could be challenging, costly, or affect the scope of the project

● (yellow) = Potentially significant issue

● (green) = Issue that is regularly dealt with or can be easily evaluated or resolved

Notes: [1] Scope 2 emissions are considered indirect emissions from an entity's operations.

Table 10-2. Additional CEQA/NEPA Issues

Resource Topic and Issue	Evaluation	Considerations for Planning and Mitigation	Issue Rating
Aesthetics			
Temporary visual changes from construction activities	▪ From use of heavy construction equipment, ground disturbance, and generation of dust. ▪ More severe if construction occurs over a long duration or includes use of lighting at night adjacent to sensitive land uses.	▪ Long-term staging areas should be located away from sensitive views ▪ Identify BMPs and activities to reduce visual changes from construction	🟢
New sources of light or glare at the pump station and treatment facility	▪ New lighting or glare could be visible from sensitive public views and neighboring uses	▪ Identify sites that minimize conflicts with surrounding uses ▪ Use materials that avoid/minimize glare ▪ Position lighting downward to reduce excessive light and/or glare	🟢
Air Quality, GHG Emissions, and Energy Use			
Air pollutant and GHG emissions from construction activities	▪ Emissions throughout construction period from use of heavy construction equipment and vehicles and testing of treatment facility prior to operations ▪ Treatment facility location could be within proximity to sensitive receptors; however, Valley Water has flexibility in where they would locate the treatment facility and could likely avoid impacting sensitive receptors	▪ Comply with the BAAQMD screening criteria, if possible, and apply BAAQMD Basic Construction Mitigation Measures and Additional Construction Mitigation Measures ▪ Obtain Authority to Construct from BAAQMD ▪ If onsite mitigation cannot fully reduce emissions to below threshold of significance level, offsite mitigation such as purchase voluntary emission offsets can be obtained	🟡
Air pollutant emissions from operations *(Excludes GHG emissions which are addressed in Table 10-1)*	▪ Potentially from operation of the treatment facility and pump station – needs to be evaluated further ▪ Emissions from small numbers of daily vehicle/truck trips	▪ Determine if treatment facility and pump station would directly generate air emissions ▪ Comply with BAAQMD screening criteria, if possible ▪ Obtain a Permit to Operate from BAAQMD ▪ If onsite mitigation cannot fully reduce emissions to below threshold of significance level, offsite mitigation such as purchasing voluntary emission offsets can be obtained	🟡
Conflict with or obstruct state or local plans for renewable energy	▪ Operation of the treatment facility and pump station ▪ Generated from small numbers of daily vehicle/truck trips	▪ Explore the use of alternative renewable energy sources to power the facility, such as from Power and Water Resources Pooling Authority, other local suppliers with renewable energy, or developing new sources of renewable energy ▪ Coordinate with local energy providers (PG&E) on ways to improve energy efficiency ▪ Comply with Santa Clara County Energy Code and all other local municipal energy codes, as applicable	🟡
Objectionable odors from treatment activities	▪ Treatment activities could likely generate sludge composed of Bay mud and coagulant materials and could have an odor similar to South Bay mud (issue identified in Marin Municipal Water District Desalination Project EIR [2008]) ▪ Treatment activities would not create additional new odors that would be considered objectionable	▪ Determine if Bay mud odors could be emitted from the treatment facility ▪ If located near sensitive receptors that could be adversely affected, consider performing modeling of the air movements and wind patterns to determine the anticipated impacts ▪ If they would be emitted, if necessary, locate the treatment facility away from receptors that are sensitive to and are not currently exposed to Bay mud odors	🟡
Inefficient use of energy during operations	▪ Energy use would occur from pumping, conveyance, and treatment ▪ Technology is standardized and there aren't a lot of options for energy efficiency ▪ Salinity level is greatest factor driving energy use	▪ Energy recovery devices are regularly used for treatment with significant reduction in energy use and should be incorporated into treatment design	🟢
Geology and Soils			
Cause a potential risk of loss, injury, or death involving seismic activity due to operation	▪ Operation of treatment facility in a seismically active region, due to proximity of the San Andreas Fault and Silver Creek Fault (DOC 2015), and designated liquefication zone (DOC 2001 and 2006)	▪ Conduct site-specific geotechnical investigations, as necessary ▪ Adhere to local building codes and design standards	🟢
Soil erosion caused by construction activities	▪ Ground disturbing activities such as grading, excavation, and in-water construction could cause erosion	▪ Comply with erosion control measures in the NPDES General Construction Permit and other permits identified in Chapter 11, "Permitting" ▪ Develop plans for in-water construction activities that minimize erosion	🟡
Hazards and Hazardous Materials			
Routine transport, use, or disposal of hazardous materials or accidental spill during construction and operation activities	▪ Use of diesel-power equipment and vehicles and during construction ▪ Storage, use, and transport of hazardous materials for disinfecting purposes associated with treatment activities and potentially for cleaning pipelines	▪ Implement necessary safety procedures regarding use, transport, and disposal of hazardous materials as outlined in federal, state, and local laws ▪ Implementation of best management practices and other measures required by the NPDES General Construction Permit ▪ Follow applicable OSHA standards for use of hazardous materials	🟢
Result in a safety hazard or excessive noise for people working in Mountain View and Palo Alto due to construction activities	▪ Use of construction equipment within an established Moffett Federal Airfield Airport Influence Area	▪ Comply with the outlined noise, safety, and height requirements established in the Moffett Federal Airfield Comprehensive Land Use Plan ▪ Have local jurisdictions review the proposed action for compliance with the Moffett Federal Airfield Comprehensive Land Use Plan	🟡

Resource Topic and Issue	Evaluation	Considerations for Planning and Mitigation	Issue Rating
Hydrology and Water Quality			
Depletion of groundwater resources from operation of subsurface intake options	▪ Subsurface intakes would draw in groundwater along with seawater	▪ Estimate amount of groundwater used by subsurface intake options and evaluate this against criteria in applicable groundwater sustainability plan	🟡
Impairment of water quality from erosion and stormwater runoff during construction activities	▪ Ground disturbing activities such as grading, excavation, and in-water construction could cause erosion ▪ Erosion from in-water construction activities could cause increases in turbidity ▪ Stormwater runoff could transport increased sediment loads from erosion to waterways	▪ Comply with erosion control measures in the NPDES General Construction Permit and other permits identified in Chapter 11, "Permitting" ▪ Developing plans for in-water construction activities that minimize erosion	🟡
Land Use and Planning			
Divide an established community due to the location of the treatment facility	The exact location of the treatment facility is unknown at this time; therefore, locating the treatment facility in proximity to an established or planned community cannot be ruled out	▪ Locate the treatment facility outside of any established or planned communities ▪ Coordinate with City staff as needed	🟢
Noise			
Generation of noise and vibrations from vehicles and equipment during construction activities	▪ Use of heavy-duty construction equipment and vehicles ▪ More severe if construction occurs over a long duration or adjacent to sensitive receptors	▪ Avoid locating construction activities and haul routes next to sensitive noise receptors and avoid conducting construction activities at night to the extent possible ▪ Identify BMPs to reduce construction-related noise ▪ Limit construction to daytime hours outlined in the Santa Clara County and local municipality codes ▪ If nighttime construction activities are required, implement a noise control plan ▪ Prohibit certain excavation or mechanical hammers that generate vibrations that could impact sensitive land uses or sensitive biological resources	🟡
Increase in ambient noise from operations	▪ Operation of treatment facility and pump stations would generate new sources of noise	▪ Design facilities to prohibit generation of excessive noise such as is in buildings and implement other stationary source noise controls	🟢
Expose workers to excessive noise levels from construction activities in Mountain View and Palo Alto	▪ Use of construction equipment within an established Moffett Federal Airfield Airport Influence Area	▪ Comply with the outlined noise, safety, and height requirements established in the Moffett Federal Airfield Comprehensive Land Use Plan ▪ Have local jurisdictions review the proposed action for compliance with the Moffett Federal Airfield Comprehensive Land Use Plan	🟡
Population and Housing			
Indirectly induce substantial unplanned population growth by introducing a new water supply	▪ A new water supply could remove a significant barrier to additional growth ▪ Not seen as unplanned growth if the new water supply is aligned with applicable planning documents	▪ Develop project purpose and need further ▪ Consider desalination in future water supply planning documents, such as the Urban Water Management Plan	🟡
Public Services			
Require new or altered government facilities	▪ Operation of the treatment facility and operation and maintenance building would require fire protection and law enforcement services. Each municipality would provide these services within city limits and the Santa Clara County would provide services to the unincorporated areas	▪ Coordinate with local service providers	🟢
Transportation			
New permanent vehicle trips from operational activities	▪ Small number of new daily vehicle/truck trips	▪ Minimize need to new trips to extent possible through efficient design and planning of the project	🟢
Utilities and Service Systems			
Require relocation or construction of electrical transmissions and distribution lines or new energy sources	▪ New renewable energy sources could be developed for the project ▪ Development of a substation at the treatment facility may be needed ▪ Expansion of existing electrical system to facilitate operation of the treatment facility and pump station could occur	▪ Identify energy sources and need for new facilities or improvements as a part of the project ▪ Coordinate with utility providers to determine requirements for transmission and distribution of power to the treatment facility ▪ Evaluate environmental and land use conditions and minimize potential impacts related to siting/routing of new energy sources and electrical power infrastructure	🔴
Generate significant amounts of solid waste during operations	▪ Daily disposal of solids produced during treatment activities	▪ Comply with state and local standards, and in accordance with capacity limits of local infrastructure ▪ Select project options and treatment activities that minimize solid waste production	🟢

Issue Rating Legend: 🔴 = Critical issue that could be challenging, costly, or affect the scope of the project; 🟡 = Potentially significant issue; 🟢 = Issue that is regularly dealt with or can be easily evaluated or resolved

Notes: BAAQMD= Bay Area Air Quality Management District, BMP=best management practices, EIR= Environmental Impact Report, GHG=greenhouse gases, NPDES= National Pollutant Discharge Elimination System, OSHA= Occupational Safety and Health Administration, PG&E= Pacific Gas and Electric, South Bay=South San Francisco Bay

Chapter 11. Permitting

11.1 Permitting Requirements

This section identifies permits required from federal, state, and local agencies for the seawater desalination project (desalination project).

11.1.1 Federal and State Regulations

Table 11-1 identifies applicable regulations, the permitting agency, permitting triggers, key issues and recommendations for the desalination project. **Tables 11-2** and **11-3** summarize intake and brine management option permitting requirements and constraints for federal and state agencies, respectively. These tables also identify the anticipated level of complication for each permit/approval. The level of complication is tailored to compliance with each environmental regulation and is based on: (1) effort to prepare permit applications and associated material, (2) amount of discretion and involvement from the regulatory agencies, (3) the time it takes to receive the authorization, and (4) the cost associated for compliance with the authorization. Therefore, level of complication considers the entirety of the permitting process from beginning to end. **Appendix D** provides a detailed Permitting Work Plan with additional information on the permit triggers, key issues, required documents and technical studies, regulatory staff, and recommendations.

The State Water Resource Control Board (SWRCB) Division of Water Rights issues appropriative water rights for diversion of surface waters in California. An appropriative water right is not required for diversion of seawater from the ocean. No information from the SWRCB was found stating that an appropriative water right is or is not required for diversion of water from the San Francisco Bay (Bay) which is considered by the SWRCB to be an enclosed bay. The Environmental Impact Report for the Marin Municipal Water District’s Desalination Project was reviewed since it was also proposed to divert water directly from the Bay. However, this document does not state anywhere that water rights are required for use of water from the Bay as a water supply. Therefore, water rights are not addressed in this study. Coordination with the SWRCB should be conducted to confirm if an appropriative water right is required or not.

11.1.2 Local Regulations

In accordance with California Government Code Section 53091(e), Valley Water received intergovernmental immunity from the planning and building ordinances of cities and counties due to construction of facilities for the production, generation, storage, treatment, and transmission of water. However, Valley Water seeks to work cooperatively with local jurisdictions to avoid conflict with local policies, plans, and zoning ordinances. Additionally, Valley Water is required under Government Code Section 65402(b) to inform local governments of its plans to construct projects or acquire or dispose of extraterritorial property. The local governments have a 40-day review period to determine project consistency with their general plans. Under this requirement, the cities or counties’ determinations of consistency are advisory, rather than binding, to Valley Water. Aligned with Valley Water's goal for cooperation with local jurisdictions, Valley Water has identified the local regulations that may be applicable to the project options, as shown in **Table 11-4**.

11.2 Permitting Process and Steps

Several of the desalination project permitting processes can be summarized in flowcharts. **Figure 11-1** summarizes the federal and state waters/wetlands, biological resources, and cultural resources permitting process. **Figure 11-2** summarizes the federal and state coastal permitting process. **Figure 11-3** summarizes the California State Lands Commission's lease permitting process. **Figure 11-4** presents the United States Fish and Wildlife Service's National Wildlife Refuge Compatibility Determination Flowchart.

Table 11-1. Summary of Applicable Federal and State Regulations

Regulation	Permitting/Consulting Agencies	Permit Triggers	Key Issues and Recommendations
Federal Regulations			
Clean Water Act § 404 (33 United States Code [USC] 1344) and Rivers and Harbors Appropriation Act §10 (33 USC 403)	U.S. Army Corps of Engineers (USACE)	▪ Activities that result in the discharge of dredged or fill material into waters of the U.S. (below the ordinary high-water mark for open waters and wetlands). ▪ Activities that result in the placement of structures within waters of the U.S. (below the mean high tide line for open waters and wetlands).	▪ Identify high-level potential mitigation areas or plans. ▪ Prepare Alternatives Analysis. ▪ Conduct wetland delineation. ▪ Attend pre-application meeting.
Clean Water Act §401 (33 USC 1341)	San Francisco Bay Regional Water Quality Control Board	▪ Authorization under Clean Water Act § 404 (33 USC 1344) and Rivers and Harbors Appropriation Act §10 (33 USC 403)	▪ *See* Clean Water Act § 404 (33 USC 1344) and Rivers and Harbors Appropriation Act §10 (33 USC 403).
National Pollution Discharge Elimination System (Clean Water Act §402)	San Francisco Bay Regional Water Quality Control Board and State Water Resources Control Board	▪ Discharge of waste directly form a point source into waters of the U.S.	▪ Conduct early outreach to discuss specific requirements and timelines. ▪ Determine when to submit request for Water Code Section 13142.5(b) determination to San Francisco Bay Regional Water Quality Control Board (RWQCB).
National Pollutant Discharge Elimination System Construction Stormwater General Permit (Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ)	San Francisco Bay Regional Water Quality Control Board	▪ Any construction or demolition activity, including but not limited to, clearing, grading, grubbing, or excavation, or any other activity that results in a land disturbance of equal to or greater than one acre.	▪ Compile data on content and anticipated rate of discharge, Notice of Intent, Storm Water Pollution Prevention Plan, and Rain Event Action Plan. ▪ Identify and implement construction best management practices.
Endangered Species Act §7 (16 USC 1531)	U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS)	▪ The lead federal agency must consult with USFWS and/or NMFS when any action they carry out, fund, or authorize (such as through a permit or impacts to federally-managed property) may affect a listed endangered or threatened species or designated critical habitat.	▪ Identify which federally listed species occur, or have the potential to occur, on or near the project sites through reconnaissance- and protocol-level biological resource surveys. ▪ Develop comprehensive avoidance and minimization measures. ▪ Identify high-level potential mitigation areas or plans. ▪ Conduct early outreach to discuss specific requirements and timelines.
Fish and Wildlife Coordination Act (16 USC 661-667)	U.S. Fish and Wildlife Service	▪ Consultation with the USFWS, NMFS, and California Department of Fish and Wildlife (CDFW) when "the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any agency of the U.S. or by any public or private agency under a federal permit or license."	▪ *See* Endangered Species Act §7 (16 USC 1531) and California Endangered Species Act (Fish and Game Code §2080; 14 CCR 783.1).
Migratory Bird Treaty Act (16 USC 703–711)	U.S. Fish and Wildlife Service and California Department of Fish and Wildlife	▪ Prohibits the "take" (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the USFWS.	▪ *See* Endangered Species Act §7 (16 USC 1531).
Bald and Golden Eagle Protection Act (16 USC 668-668d)	U.S. Fish and Wildlife Service	▪ Prohibits the "take" (including killing, capturing, selling, trading, and transport) of bald and golden eagles without prior authorization by USFWS.	▪ *See* Endangered Species Act §7 (16 USC 1531).
Marine Mammal Protection Act (16 USC 1374)	National Marine Fisheries Service	▪ Protects all marine mammals, including cetaceans (whales, dolphins, and porpoises), pinnipeds (seals and sea lions), and sea otters within the waters of the U.S. Under the Marine Mammal Protection Act (MMPA), it is illegal to "take" (i.e., harass, feed, hunt, capture, or kill) marine mammals without a permit.	▪ *See* Endangered Species Act §7 (16 USC 1531). ▪ Determine whether an Incidental Take Authorization, including Incidental Harassment Authorization or Letter of Authorization, is required.
Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1855)	National Marine Fisheries Service	▪ Consultation with the NMFS is required whenever federal or state approval is required for an activity that may adversely affect designated essential fish habitat.	▪ *See* Endangered Species Act §7 (16 USC 1531). ▪ Complete an Essential Fish Habitat assessment.
National Historic Preservation Act §106 (16 USC 470)	State Historic Preservation Office	▪ A federal agency must consider the effects of the agency's action on properties listed or eligible for listing in the National Register of Historic Places.	▪ Send notification letters to Amah Mutsun Tribal Band of Mission San Juan Bautista, Indian Canyon Mutsun Band of Costanoan, Muwekma Ohlone Indian Tribe of the SF Bay Area, North Valley Yokuts Tribe, Ohlone Indian Tribe, Wuksache Indian Tribe/Eshom Valley Band, Confederated Villages of Lisjan, and Tamien Nation. ▪ Conduct pedestrian-level cultural resource surveys. ▪ Prepare Cultural Resources Inventory Report.

Regulation	Permitting/Consulting Agencies	Permit Triggers	Key Issues and Recommendations
National Wildlife Refuge Right-of-Way and National Wildlife System Improvement Act of 1997	U.S. Fish and Wildlife Service	▪ The Refuge is a part of the San Francisco Bay National Wildlife Refuge Complex and is partially included in the San Jose and Mountain View-Palo Alto Environmental Study Areas.	▪ Conduct early outreach to discuss specific requirements and timelines. ▪ Analyze whether the project is a compatible use per the Improvement Act mission.
Rivers and Harbors Appropriation Act §14 (33 USC 408)	U.S. Army Corps of Engineers	▪ Modifications, alterations, or occupation of public works projects (e.g., levees) require authorization from USACE.	▪ Conduct early outreach to discuss specific requirements and timelines. ▪ Prepare technical reports, particularly for geology/soils.
Coastal Zone Management Act (16 USC 1451)	San Francisco Bay Conservation and Development Commission	▪ Federal agency activities within or outside the coastal zone that affects any land or water use, or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs.	▪ Conduct early outreach to discuss specific requirements and timelines with the San Francisco Bay Conservation and Development Commission (BCDC). ▪ Identify public benefits and access-related issues. ▪ Consider sea level rise and resiliency.
State Regulations			
Porter-Cologne Water Quality Control Act (California Water Code §13000)	San Francisco Bay Regional Water Quality Control Board	▪ Any activity that results or may result in a discharge of waste that directly or indirectly impacts the quality of waters of the state (including groundwater or surface water) or the beneficial uses of those waters.	▪ *See* Clean Water Act § 404 (33 USC 1344) and Rivers and Harbors Appropriation Act §10 (33 USC 403).
Lake and Streambed Alteration Agreement (Fish and Game Code §1600)	California Department of Fish and Wildlife	▪ An entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.	▪ Identify high-level potential mitigation areas or plans. ▪ Prepare Alternatives Analysis. ▪ Conduct wetland delineation. ▪ Attend pre-application meeting.
Safe Drinking Water Act (Health and Safety Code §100100 and California Water Code §13000)	State Water Resources Control Board (SWRCB)	▪ Division of Drinking Water regulates public drinking water systems.	▪ Consult with SWRCB and EPA to have MUN beneficial use designation added to the Bay waters. ▪ Consult with SWRCB for to determine whether the project qualifies as Direct Potable Reuse. ▪ Develop various engineering and water quality plans.
California Endangered Species Act (Fish and Game Code §2080; 14 CCR 783.1)	California Department of Fish and Wildlife	▪ The take prohibition of CESA specifically states that no person shall import, export, or take, possess, purchase, or sell, any species, or any part or product thereof, that the Fish and Game Commission determines to be an endangered species or a threatened species, or attempt any of those acts.	▪ Identify which state listed species occur, or have the potential to occur, on or near the project sites through reconnaissance- and protocol-level biological resource surveys. ▪ Develop comprehensive avoidance and minimization measures. ▪ Identify high-level potential mitigation areas or plans. Conduct early outreach to discuss specific requirements and timelines.
Assembly Bill 52 (Public Resources Code §21080.3.1)	Valley Water	▪ State lead agency must consult with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a proposed project.	▪ Send notification letters to Amah Mutsun Tribal Band of Mission San Juan Bautista, Indian Canyon Mutsun Band of Costanoan, Muwekma Ohlone Indian Tribe of the SF Bay Area, North Valley Yokuts Tribe, Ohlone Indian Tribe, Wuksache Indian Tribe/Eshom Valley Band, Confederated Villages of Lisjan, and Tamien Nation.
McAteer-Petris Act (Government Code §§66600-66694)	San Francisco Bay Conservation and Development Commission	▪ BCDC issues permits for work in and along the shoreline of the Bay.	▪ *See* Coastal Zone Management Act (16 USC 1451).
California State Lands Commission (CSLC; Public Resources Code §6000; 14 CCR 1900)	California State Lands Commission	▪ The CSLC has jurisdiction of sovereign lands of the state of California not otherwise granted to local agencies or under federal ownership.	▪ Submit an "Inquiry" to determine whether a lease is required. ▪ Conduct early outreach to discuss specific requirements and timelines. ▪ Acquire realty information.
Rules of the Bay Area Air Quality Management District	Bay Area Air Quality Management District	▪ Permits are required for new air pollution-emitting facilities and modifications to existing air pollution-emitting facilities.	▪ Consult with the BAAQMD to determine if the project meets the Accelerated Permitting Program. ▪ Demonstrate compliance with emissions thresholds for toxic air contaminants. ▪ Determine whether the purchase of emission offsets is required.

Table 11-2. Federal Regulations, Agency, and Level of Complication[1]

		Waters				Biology		Cultural	Land Use		
		USACE		RWQCB		USFWS	NMFS	SHPO	USFWS	USACE	BCDC
Project Option		CWA §404 / RHA §10	CWA §401	CWA §402 [NPDES Discharge])	CWA §402 (NPDES Construction General)	ESA §7 & MBTA	ESA §7, Magnuson-Stevens, & MMPA	NHPA §106	Refuge Right-of-Way	RHA §14 (33 USC 408)	CZMA
Intake Options and Associated Conveyance											
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	Medium	Medium	N/A	High	Low	Unknown	Medium	High	N/A	Low
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	High	High	N/A	High	Medium	High	Medium	High	N/A	Low
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	High	High	N/A	High	High	Low	Medium	High	N/A	Low
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	High	High	N/A	High	Medium	High	Medium	Medium	N/A	Low
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	N/A	N/A	N/A	High	High	Low	Medium	High	N/A	Low
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	High	High	N/A	High	High	High	Medium	High	N/A	Low
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	High	High	N/A	High	Low	High	Medium	Medium	N/A	Low
Brine Management Options											
All	South Bay Deep Water Outfall (Br 1)[2]	High	High	High	High	Low	High	Medium	Medium	N/A	Low
SJ	Pond A18 Horizontal Levee (SJ Br 2)	High	High	High	High	Medium	Low	Medium	High	Unknown	Low
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	High	High	High	High	High	Low	Medium	High - East of Adobe Creek; N/A - West of Adobe Creek	N/A	Low

Legend: ● (red) = high complication; ● (yellow) = medium complication; ● (green) = low complication; ○ = unknown if required; N/A = not applicable

Notes: BCDC = San Francisco Bay Conservation and Development Commission; CWA = Clean Water Act; CZMA = Coastal Zone Management Act; ESA = Endangered Species Act; NHPA = National Historic Preservation Act; MMPA = Marine Mammal Protection Act; NMFS = National Marine Fisheries Service; NPDES = National Pollutant Discharge Elimination System; RHA = Rivers and Harbors Act; RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

[1] The level of complication is tailored to compliance with each environmental regulation and is based on: (1) effort to prepare permit applications and associated material, (2) amount of discretion and involvement from the regulatory agencies, (3) the time it takes to receive the authorization, and (4) the cost associated for compliance with the authorization.

[2] Assumes conveyance would need to be developed by tunneling underground beneath the salt ponds from either San Jose (SJ), Mountain View (MV), or Palo Alto (PA)

Table 11-3. State Regulations, Agency, and Level of Complication[1]

Project Option		Waters			Biology	Cultural	Land Use	
		RWQCB	CDFW	SWRCB	CDFW	SHPO	BCDC	SLC
		Porter-Cologne Water Quality Control Act	Lake and Streambed Alteration Agreement	Safe Drinking Water Act	California Endangered Species Act	Assembly Bill 52	McAteer-Petris Act	California State Lands Commission
Intake Options and Associated Conveyance								
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	🔴	N/A	🔴	○	🟡	🔴	○
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	🔴	🔴	🔴	○	🟡	🔴	○
MV	Pond A2E Subsurface (MV In 1, MV P2a, MV In PS)	🔴	🟡	🔴	🔴	🟡	🔴	○
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	🔴	🟡	🔴	🟡	🟡	🔴	○
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	N/A	N/A	🔴	🔴	🟡	🔴	○
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	🔴	N/A	🔴	🔴	🟡	🔴	○
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	🔴	🟡	🔴	🟡	🟡	🔴	○
Brine Management Options								
All	South Bay Deep Water Outfall (Br 1) [2]	🔴	N/A	N/A	○	🟡	🔴	○
SJ	Pond A18 Horizontal Levee (SJ Br 2)	🔴	N/A	N/A	🟡	🟡	🔴	○
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	🔴	N/A	N/A	🔴	🟡	🔴	○

Legend: 🔴 = high complication; 🟡 = medium complication; 🟢 = low complication; ○ = unknown if required; N/A = Not Applicable

Notes: BCDC = San Francisco Bay Conservation and Development Commission; CDFW = California Department of Fish and Wildlife; N/A = not applicable; NHPA = National Historic Preservation Act; NPDES = National Pollutant Discharge Elimination System; RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; SLC = California State Lands Commission; SWRCB = State Water Resources Control Board

[1] The level of complication is tailored to compliance with each environmental regulation and is based on: (1) effort to prepare permit applications and associated material, (2) amount of discretion and involvement from the regulatory agencies, (3) the time it takes to receive the authorization, and (4) the cost associated for compliance with the authorization.

[2] Assumes conveyance would need to be developed by tunneling underground beneath the salt ponds from either San Jose (SJ), Mountain View (MV), or Palo Alto (PA)

Table 11-4. Local Regulations

Permit/Approval	Applicable Regulations
Santa Clara County	
Use Permit	Ord. 1200.355, § 9, 4-26-16)
Grading Permit	Ord. NS-1203.120 , § 1, 4-9-13; Ord. No. NS-1203.126, § 1, 8-14-18)
Drainage Permit	(Ord. NS-1203.120 , § 1, 4-9-13)
Open Space Easement Compatible Use Determination	(Ord. NS-1203.113, § 1, 5-23-06)
Stormwater Quality Permit	(Ord. NS-517.84, 6-25-13 ; Ord. No. NS-517.87, § 3, 8-26-14)
Tree Removal Permit	(Ord. No. NS-1203.107, § 1, 2-11-97)
City of Palo Alto	
Development Permit	(Ord. 4557 § 5, 1999: Ord. 3795 § 5, 1988: Ord. 3158 § 1 [part], 1979)
Conditional Use Permit	(Ord. 4826 § 117 [Exhibit. 2 (part)], 2004)
Stormwater Pollution Prevention Certificate	(Ord. 5112 § 2, 2010: Ord. 5108 § 3, 2010: Ord. 4799 § 2 [part], 2003)
Encroachment Permit	(Ord. 3128 § 1, 1979: Ord. 2015 [part], 1961: prior code § 33.50)
Tree Permit	(Ord. 5557 § 2 [part], 2022: Ord. 4745 § 7, 2002: Ord. 1353 [part], 1951: prior code § 32.11)
City of Mountain View	
Heritage Tree Removal Permit	(Ord. 10.96, 9/24/96; Ord. No. 1.03, 1/14/03)
Conditional Use Permit	(Ord. 18.13, § 1, 12/10/13)
Encroachment Permit	(Ord. 28.91, 12/10/91; Ord. No. 5.17, § 6, 10/24/17)
Flood Development Permit	(Ord. 17.19 , § 1, 11/12/19)
Excavation Permit	(Code 1938, Sec. 434)
City of Sunnyvale	
Development Permit	(Municipal Code Section 16.62.020)
Encroachment Permit	(Municipal Code Section 13.08.060)
Stormwater Management Plan	(Municipal Code Section 12.60.140)
Use Permit	(Ord. 2623-99 § 1; prior zoning code § 19.52.010)
Tree Permit	(Municipal Code Sections 13.16.060 and 19.94.050)
City of San Jose	
Conditional Use Permit	(Ords. 26248, 28731)
Development Permit	(Ord. 28512)
Tree Removal Permit	(Prior code § 8934; Ords. 21363, 26595, 29195)
Excavation/Encroachment Permit	(Ord. 25099)
Certificate of Geological Hazard Clearance	(Ords. 24680, 25015, 25710)

Note: Ordinance = Ord

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Figure 11-1. Federal and State Waters/Wetlands, Biological Resources, and Cultural Resources Permitting Process

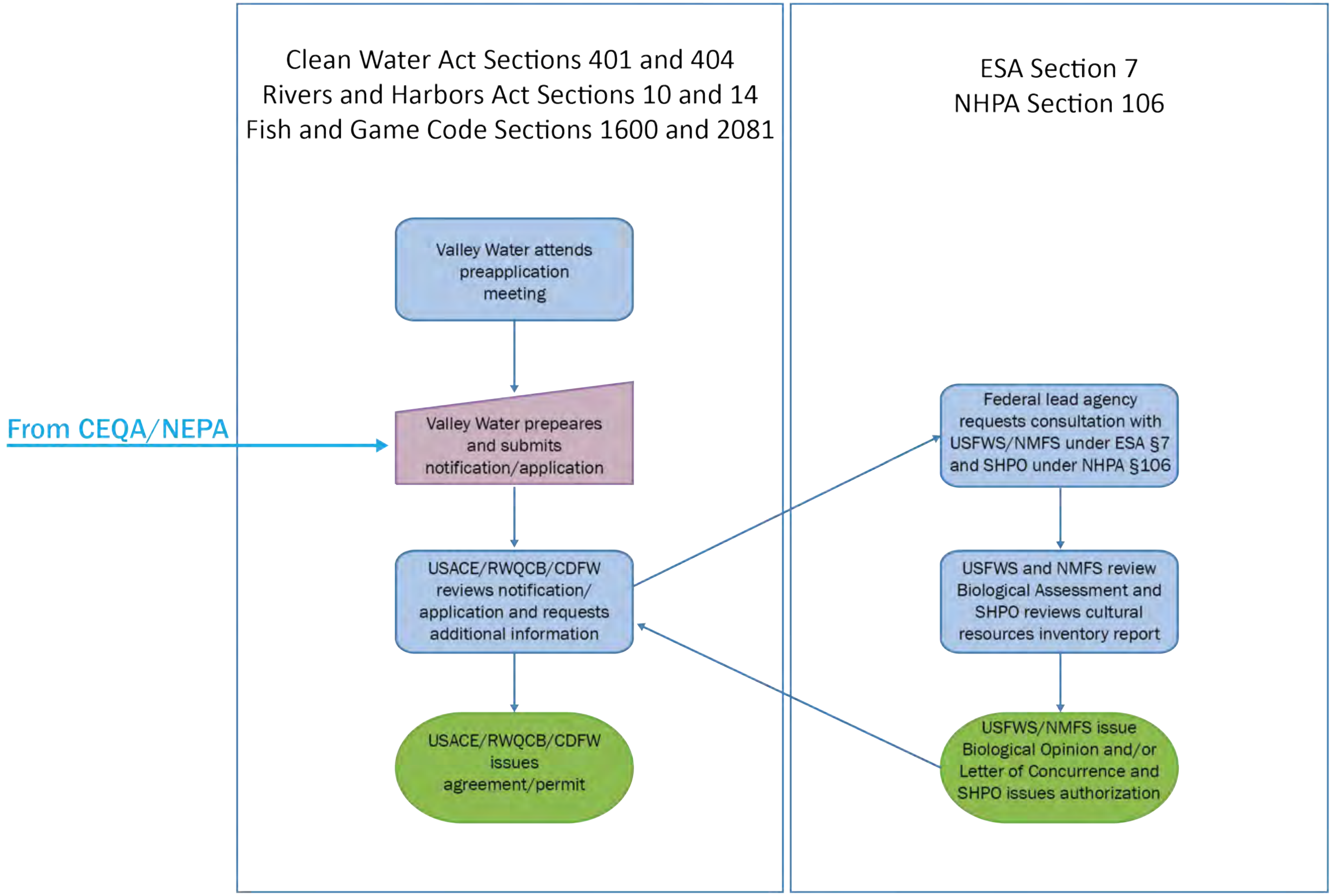

Figure 11-2. Federal and State Coastal Permitting Process

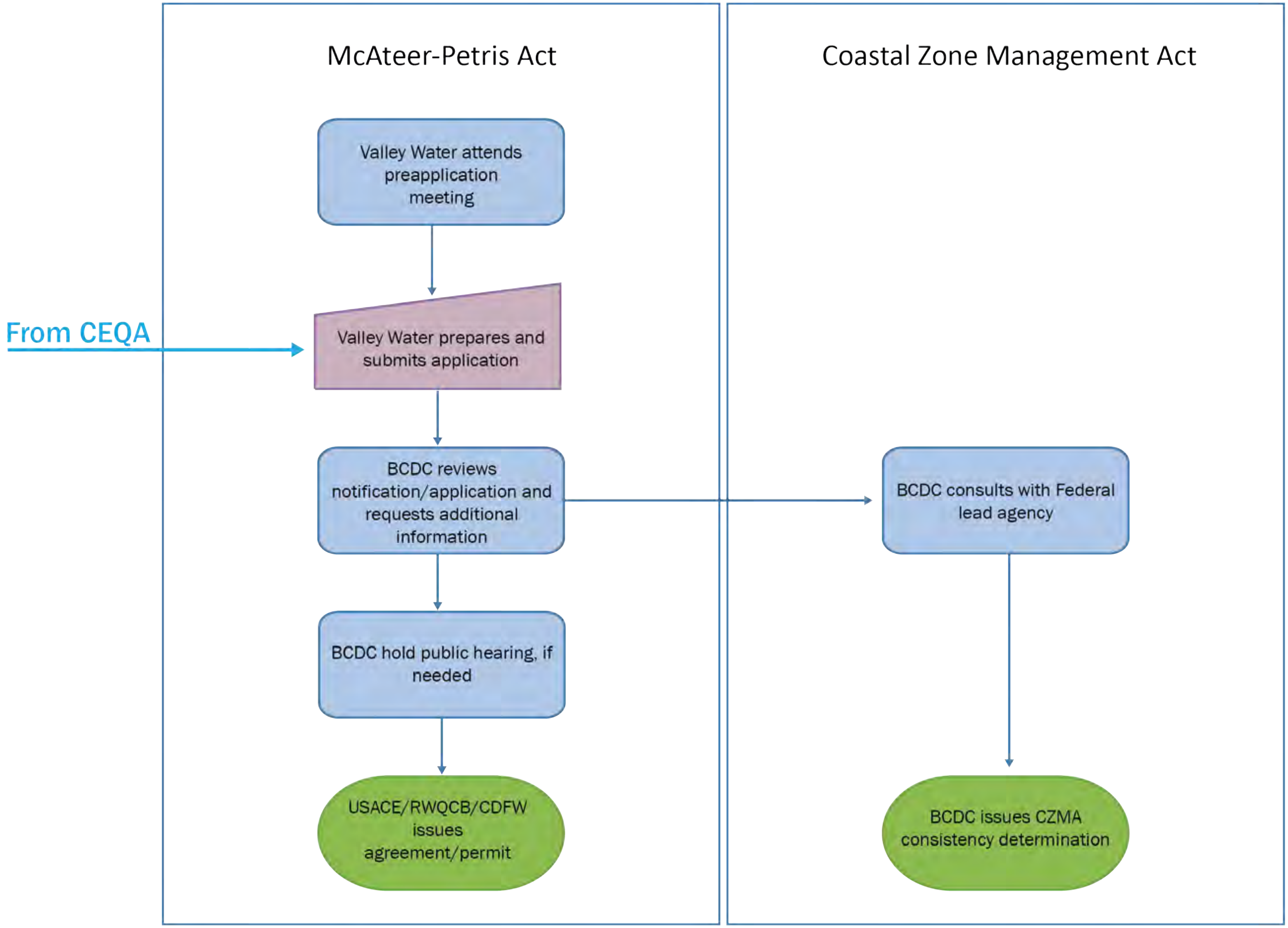

Figure 11-3. California State Lands Commissions Lease Permitting Process

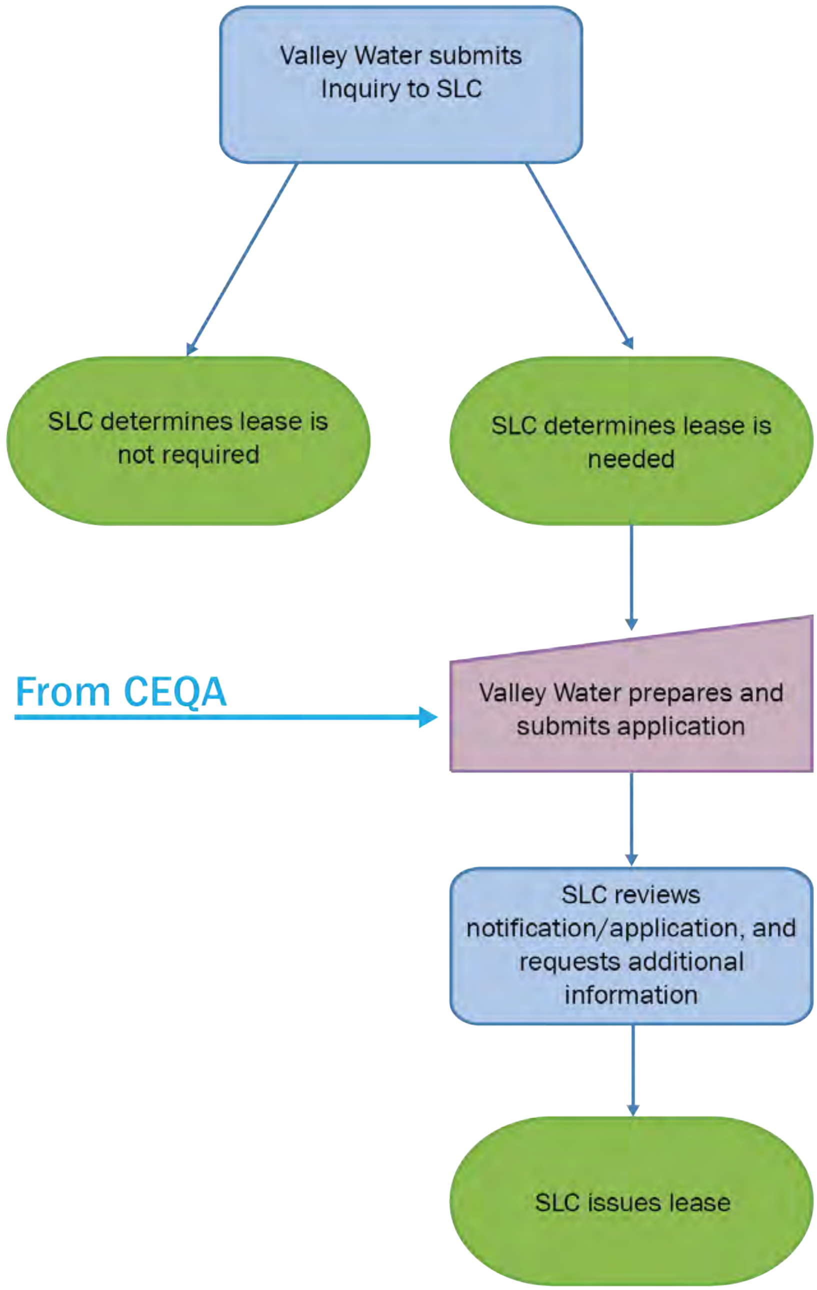

Figure 11-4. National Wildlife Refuge Compatibility Determination Flowchart

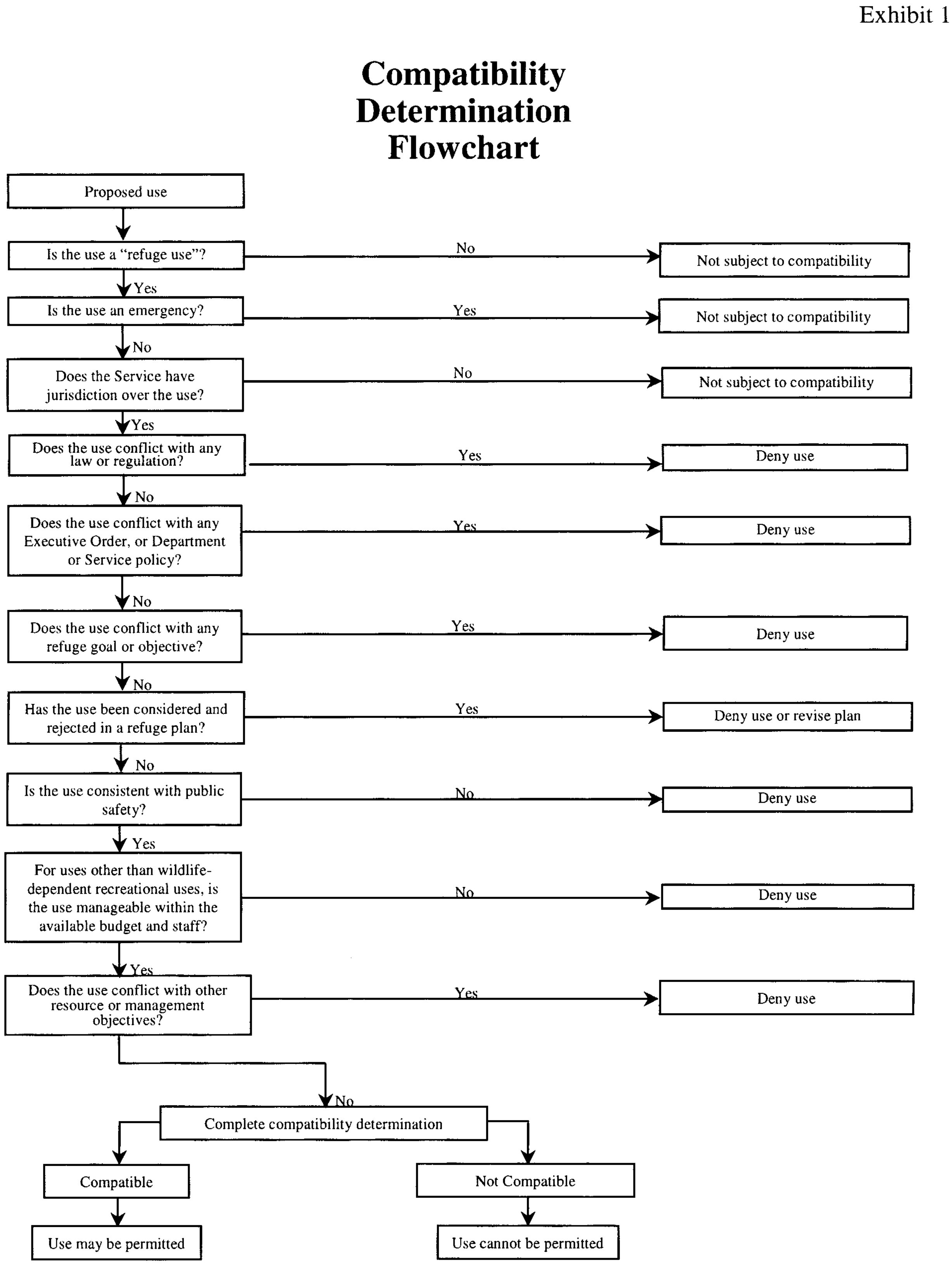

Figure Source: USFWS 2000

Chapter 12. Public Acceptance

12.1 Introduction

A strategic and proactive engagement and communication program (engagement program) will be essential for the successful development and delivery of the seawater desalination project (desalination project). The engagement program's core elements should be designed to build stakeholder and public awareness and acceptance of the project. Care will be needed in tailoring an engagement program to address key audiences and key issues. The following sections offer a framework by which an engagement program can be developed, with the overall goals of:

- Helping Valley Water's partners, stakeholders, and customers see project decision-making as fair, logical, and transparent.
- Building public awareness about and engagement in the desalination project in ways that foster support, advocacy, input, and action to advance the desalination project and Valley Water's vision.
- Informing and educating people about the need for the desalination project and the benefits it will provide, while also addressing concerns through timely, accurate, and positive education and outreach.
- Supporting Valley Water's platform for the Office of Racial Equity, Diversity and Inclusion platform through focused and intentional engagement with disadvantaged communities (DACs).

12.2 Stakeholder Issues

12.2.1 Review of Existing Studies and Projects

There are currently 12 active desalination projects operating in California. Additionally, there are five proposed desalination projects in planning or currently being considered by the Regional Water Quality Control Boards/State Water Resources Control Board. A review of public comments and sentiment on similar desalination studies and projects in California was conducted to understand the public's concerns around desalination projects. Documents related to five projects were reviewed for this study (*see* References for a full list of documents reviewed). These studies were selected for review due to similarity in project type, potential constraints, regulatory requirements, and mitigation.

- Bay Area Regional Desalination Project[1] (various counties and locations throughout the San Francisco Bay [Bay] Area). This project is still under review. Several available documents were reviewed.

- Marin Municipal Water District Desalination Project (Marin County and North Bay) (MMWD 2008) – 5 MGD facility; open intake attached to an existing wharf; discharge of brine blended with wastewater to the North Bay through an existing outfall operated by the Central Marin Sanitary Agency (CMSA). This project was approved in 2010, however, the project has yet to be constructed.

- California American Water Company, Monterey Peninsula Water Supply Project[2] (Monterey County) – 9.6 MGD facility; subsurface intake system; discharge of brine through an existing ocean outfall facility. This project is still in review.

- City of Huntington Beach Seawater Desalination Project[3] (Orange County) – 50 MGD facility; intake water from existing Huntington beach Generating Station and discharge brine to existing outfall. This project was not approved by the California Coastal Commission.

- City of Carlsbad Desalination Plant Project[4] (San Diego County) – 50 MGD facility; intake water from existing Encina Power Station cooling water discharge and brine discharged to existing outfall. This project was approved, constructed, and began operations in 2015.

Comments from a variety of stakeholders such as regulatory agencies, advocacy groups, local businesses, and residents were reviewed to get a sense of the type of concerns that were brought forth. This review revealed that most projects had similar issues that could be grouped into the following topics: brine discharge and disposal, general environmental impacts, intake structures, pipeline construction, noise, treated water quality, energy use and greenhouse gas (GHG) emissions, and growth-inducing impacts. An overview of stakeholder issues from existing desalination projects is presented in **Table 12-1**.

12.2.2 Desalination Project Evaluation

Similar issues and concerns can be anticipated for Valley Water's desalination project. This section discusses the applicability of each of these issues to the desalination project and discusses where there are differences between project options. The stakeholder issues are appliable to all relevant project options to varying degrees. The applicability of stakeholder issues to Valley Water's desalination project is summarized in **Table 12-2**, including reference to evaluations in this study that are relevant to the topics, discussed below.

[1] https://www.regionaldesal.org/available-documents
[2] https://www.watersupplyproject.org/eir
[3] https://www.huntingtonbeachca.gov/government/departments/planning/major/poseidon.cfm
[4] https://www.carlsbaddesal.com/eir.html

Brine Discharge and Disposal

The brine management options would all result in disposal of brine to sensitive environments. The South Bay Deep Water Outfall (Br 1) could impact marine life and sensitive habitats in the Bay if significant dilution is not achieved immediately upon discharge. The horizontal levee options (SJ Br 2 and MV-PA Br 2) could impact salt marsh habitats and species using these habitats if brine has elevated levels of salinity or other constituents of concern. Potential impacts from both options could be addressed by blending and diluting brine prior to disposal. Regardless, this is anticipated to be a stakeholder issues. Horizonal levees are becoming more popular for treatment of wastewater but given the elevated levels of salinity in brine from desalination projects, it’s unknown if horizontal levees would desirable or more desirable than a deep water outfall or other options not evaluated in this study.

Table 12-1. Overview of Stakeholder Issues from Existing Desalination Projects

		Reference Study or Project				
Stakeholder Issue	Details	Marin	Monterey	BARDP	Carlsbad	Huntington
Brine Discharge and Disposal	Discharge and disposal of brine; discharge impacts on marine life.	●	●	●	●	●
General Environmental Impacts	General effects on marine and terrestrial plant and animal life as well as the physical habit.	●	●	●	●	●
Intake Structures	Impingement, entrainment, and mortality from seawater intake.	●	●		●	●
Pipeline Construction	Construction through sensitive habitats.	●	●	●		●
Noise	Noise from construction and laying of pipelines; long-term noise from the pumping station.	●	●		●	●
Treated Water Quality	Quality of water for consumption; compliance with drinking water regulations; types of chemicals used for water treatment.	●	●		●	●
Energy Use and GHG Emissions	Source of power and load on existing facilities; GHG emissions if renewable energy sources not used.	●	●		●	
Growth-inducing Impacts	Inducement of economic and population growth; additional housing and businesses.	●	●		●	●

Notes: BARDP = Bay Area Regional Desalination Project

General Environmental Impacts

The intake and brine management options have the potential to result in several potential impacts to biological resources and sensitive habitats. TFPAs were not evaluated for site-specific environmental constraints but could also result in general environmental impacts. Stakeholders are likely to be concerned about impacts to sensitive habitats along shoreline of the Lower South San Francisco Bay (South Bay) in Santa Clara County, particularly permanent impacts, impacts that are visible from recreation trails, and impacts within the Don Edwards San Francisco Bay National Wildlife Refuge.

Intake Structures

The open intake options (SJ In 2, MV In 2, PA In 2, and PA In 3) would draw water in directly from the Lower South Bay or tributaries (i.e., Artesian Slough or Charleston Slough) and have the potential to cause impingement and entrainment of marine life. These impacts could be reduced with screens and reduce velocities, but regardless, are anticipated to be significant stakeholder issues as they have been on several other desalination projects.

The subsurface intake options (SJ In 1, MV In 1, and PA In 1) would not cause impingement and entrainment of marine life and would likely be viewed more favorably by stakeholders than open intake options. However, due to the need to locate subsurface intakes below salt marsh and other sensitive habitats along the shoreline, the intake of significant amounts of seawater through the ground would remove water from these habitats and could cause indirect impacts to species supported by the habitats. This potential impact requires further study to determine if it would occur. If significant impacts could occur, these would be viewed unfavorably by stakeholders.

Pipeline Construction

Pipelines associated with the intake options have the potential to result in several potential impacts to biological resources and sensitive habitats. Stakeholders are likely to be concerned about impacts to sensitive habitats along shoreline of the Lower South Bay in Santa Clara County, particularly permanent impacts, impacts that are visible from recreation trails, and impacts within the Don Edwards San Francisco Bay National Wildlife Refuge. Pipelines alignments that were not evaluated for this study (i.e., from the pump station to the treatment facility and from the treatment facility to the brine disposal location and connection to Valley Water’s system) could also result in similar impacts, particularly where they are not located in roadways and urban areas.

Noise

The desalination project would generate noise at the intake pump station (SJ In PS, MV In PS, and PA In PS) and treatment facility. However, the noise generating equipment at these facilities could be easily enclosed and designed to reduce/avoid generate of significant amounts of noise.

Treated Water Quality

The source water, regardless of the intake option, would contain high levels of salinity and possibly other constituents that require treatment to satisfy drinking water standards. The Artesian Slough Open Intake (SJ In 2) is likely to draw in significant amounts of wastewater effluent from the San Jose/Santa Clara Regional Wastewater Facility, and while this would likely result in lower levels of salinity, stakeholders could be particularly concerned about other constituents of concern. The Lower South Bay is well known to the larger population in the area and stakeholders to be very polluted and source water from the Bay could be a significant issue to stakeholders, regardless of whether water can be treated to drinking water standards.

Table 12-2. Applicability of Stakeholder Issues to the Desalination Project

Stakeholder Issue	Relevant Project Options/ Alternatives	Applicability to Desalination Project	Reference Study Evaluations
Brine Discharge and Disposal	All brine management options	Potential impacts to Bay from outfall and salt marsh habitat from horizontal levees but reduced by blending brine.	Receiving water quality in Chapter 4; other impacts to biological resources and sensitive habitats in Chapter 5.
General Environmental Impacts	All intake and brine management options	Potential impacts would occur to several special-status species, sensitive habitats, and other biological resources.	Biological constraints in Chapter 5
Intake Structures	All intake options	Open intakes may cause impingement and entrainment of marine life; subsurface intakes may indirectly affect species using salt pond habitats by using available water.	Other impacts to biological resources and sensitive habitats in Chapter 5.
Pipeline Construction	All pipelines – including those not evaluated in this study (i.e., to the treatment facility, treated water system, and for brine management)	Pipelines for the intake, brine management, and potable water may be in sensitive habitats.	Biological constraints in Chapter 5.
Noise	Intake pump station options and treatment facilities	Noise generated at pump station and treatment facility, but these structures could be designed to reduce/avoid noise.	Additional issues to consider in Chapter 10.
Treated Water Quality	All intake options and associated source water	Source water would contain high levels of salinity and possibly other constituents that require treatment to satisfy drinking water standards.	Source water quality in Chapter 4.
Energy Use and GHG Emissions	All project alternatives	Treatment and conveyance would require new and substantial long-term use of energy and associated GHG emissions if sources other than PWRPA are used.	Energy sources and use estimates in Chapter 7 and GHG emissions estimates in Chapter 8.
Growth-inducing Impacts	All project alternatives	Desalination project would introduce a new water supply and remove one of the hurdles to growth.	–

Notes: GHG = greenhouse gas; PWRPA = Power and Water Resources Pooling Authority

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Energy Source/Use and Greenhouse Gas Emissions

The project, regardless of the project alternative, would require substantial amounts of energy for treatment of seawater and conveyance. Energy sources available to the project consist of Pacific Gas and Electric Company (PG&E), including by distribution through local utilities (such as the City of Palo Alto), and the Power and Water Resources Pooling Authority (PWRPA). The energy intensity of the desalination project is anticipated to be a stakeholder issue regardless of the energy source. Energy purchased from PG&E would generate amounts of GHG emissions. However, if energy can be purchased through the PWRPA, then there would be no GHG emissions, which would be desirable to stakeholders.

Growth-inducing impacts

Santa Clara County's population is expected to increase from nearly 2 million in 2020 to nearly 2.3 million in 2045 (DOC 2021). The desalination project, regardless of the project options or alternative, would introduce a new drought resilient water supply source to Valley Water's portfolio, resulting in a reliable source of local water for a growing and economically important region. New water supplies have typically been a concern to stakeholders where growth is viewed unfavorably or is not planned. Even where the objective of desalination projects has been solely focused on drought/water supply resilience, growth-inducement has been a stakeholder issue.

12.2.3 Key Stakeholders

Overview of stakeholder groups

Key stakeholders at the federal, state, county and city level may be interested in and/or affected by the project. **Table 12-3** presents a summary of key elected officials, jurisdictions and municipalities, public works agencies, regulatory agencies, advocacy groups, tribal councils, local businesses, and local community-based organizations. The following key is used for this table:

- **Project Direction (D) –** Direct the project planning process.
- **Primary (P) –** Heavy interest, to the level of being a potential veto on certain decisions and likely to want to be deeply involved in decision-making.
- **Secondary (S) –** some interest, likely to want to give input and be informed of progress

The four Environmental Justice (EJ) communities are identified in Chapter 9, "Environmental Justice." One of the EJ communities is a DAC, which contains the project options in San Jose. The other three EJ communities are low-income areas but also include several pollution indicators in the 75th percentile and include some of the Mountain View-Palo Alto project options and adjacent areas. In alignment with Valley Water's Office of Racial Equity, Diversity, and Inclusion platform, it will be critical to the success of a desalination project to develop the project with full transparency and input from these EJ communities. It will also be imperative to ensure that these communities are not disproportionately impacted by the project.

Table 12-3. Anticipated Stakeholder Level of Interest and Potential Engagement

Agency or Organization	General Issues			Project Specific Issues							
	General Interest	Land Use and Planning	Environmental	Brine Discharge and Disposal	General Environmental Impacts	Intake Structures	Pipeline Construction	Noise	Treated Water Quality	Energy Use and GHG Emissions	Growth-inducing Impacts
Federal											
Senators	S										
Congresspersons (D-14, D-17, D-18, D-19)	S	S									
National Marine Fisheries Service	S		P	P	P	P	S				
U.S. Army Corps of Engineers	S			S		S	S				
U.S. Fish and Wildlife Service	S	P	P	P	P	P	P	P			
State											
State Senators (D-10, D-13, D-15)	S	S									S
Assemblymembers (D-20, D-24, D-27, D-28)	S	S					P				S
California Governor's Office				S					P		
California State Coastal Conservancy	S		S	S	S	S	S				
California Department of Fish and Wildlife			S	P	P		P				
State Water Resources Control Board	S	S	S	P		P			P		
California State Lands Commission		P	P	P	P	P	P				
Regional											
Valley Water, Board of Directors	D	P	S								P
Valley Water, various departments	D		D	D	D	D	D	D	D	D	
Association of Bay Area Governments	S	S							S		S
Silicon Valley Clean Water	S	S	S	S			P	S	S		S
San Francisco Bay Conservation Development Commission	P		P	S	S		P			S	
San Francisco Bay Regional Water Quality Control Board	S		P	S			S		P		
State Parks, Division of Boating and Waterways	S		S			S					
County											
Santa Clara County Board of Supervisors	S	S	S						S		S
Santa Clara County, various departments	S	P	S						S		S
City/County Association of Governments of San Mateo County	S	P	S						S	S	S

Agency or Organization	General Issues			Project Specific Issues							
	General Interest	Land Use and Planning	Environmental	Brine Discharge and Disposal	General Environmental Impacts	Intake Structures	Pipeline Construction	Noise	Treated Water Quality	Energy Use and GHG Emissions	Growth-inducing Impacts
City											
Mayor and Councilmembers, City of Palo Alto	S	S	S						S		S
Mayor and Councilmembers, City of Mountain View	S	S	S						S		S
Mayor and Councilmembers, City of San Jose	S	S	S						S		S
Mayor and Councilmembers, City of Santa Clara	S	S	S						S		S
Mayor and Councilmembers, City of Sunnyvale	S	S	S						S		S
City of Mountain View, various departments	S	P	S								S
City of Palo Alto, various departments	S	P	S								S
City of San Jose, various departments	S	P	S								S
City of Santa Clara, various departments	S	P	S								S
City of Sunnyvale, various departments	S	P	S								S
Tribes and Tribal Organizations											
Native American Heritage Commission	S	S	S								
Gabrieleno-Tongva Indian Tribe	S	S	S								
Muwekma Ohlone Indian Tribe of the Bay Area	S	S	S								
The Ohlone Indian Tribe	S	S	S								
The Association of Ramaytush Ohlone	S	S	S								
Tamien Nation	S	S	S								
North Valley Yokuts Tribe	S	S	S								
Indian Canyon Mutsun Band of Costanoan	S	S	S								
The Confederated Villages of Lisjan	S	S	S								
Wuksache Indian Tribe/Eshom Valley Band	S	S	S								
Amah Mutsun Tribal Band of Mission San Juan Bautista	S	S	S								
Amah Mutsun Tribal Band	S	S	S								
Non-Government/Community-Based Organizations											
Silicon Valley Leadership Group	S	S							S		S
Surfrider Foundation, local chapter	S		S	S	S	S					
Santa Clara County Audubon Society	S	S	S	S	S	S	S				

Agency or Organization	General Issues			Project Specific Issues							
	General Interest	Land Use and Planning	Environmental	Brine Discharge and Disposal	General Environmental Impacts	Intake Structures	Pipeline Construction	Noise	Treated Water Quality	Energy Use and GHG Emissions	Growth-inducing Impacts
Sierra Club, local chapter(s)	S	S	S	S	S	S	S			S	S
San Francisco Estuary Institute	S		S	S	S	S	S			S	
San Francisco Baykeeper	S		S	S	S	S	S			S	
Chambers of Commerce (city-level)	S	S	S								

Notes: GHG=greenhouse gas
Project Direction (D) = Direct the project planning process; Primary (P) = heavy interest, to the level of being a potential veto on certain decisions and likely to want to be deeply involved in decision-making; Secondary (S) = some interest, likely to want to give input and be informed of progress

12.2.4 Stakeholder Messaging

At this early planning stage of the desalination project, it is important to establish and use a common language about the project. An initial, foundational set of messages is presented in **Table 12-4**, for the project overall and key issues outlined in Tables 12-1 and 12-2.

In previous chapters in this planning study, language is technical in nature. The messages presented below are in a “plain language” style that is more accessible by Valley Water’s stakeholders and the public. The most effective messaging will focus on the engagement programs benefits rather than its features.

Core key messaging helps set the stage and is meant to guide early engagement and overall project efforts. The key messaging will be updated over time as the engagement program evolves and is better defined.

Table 12-4. Suggested Key Messaging for the Seawater Desalination Project

Issue	Message
Overview of project and need	• Valley Water currently obtains water from sources like local surface water diversions, groundwater, recycled water, and imported water. • The need to identify and evaluate new reliable sources of water is increasing as the availably of existing water supplies are constrained by a multitude of factors such as drought, population growth, and increase in water demands. The desalination project would increase the diversity of Valley Water's water supply portfolio by providing a new drought-proof water supply and allow for more certain and reliable water supply. • Without enhancing new sources of water supply, it is predicted that by the year 2040, water shortages would occur. Existing water sources would meet only 60 percent of demand. • Water supply would be further impacted by climate change effects, such as shrinking snowpack and prolonged droughts. • Currently Valley Water imports 50 percent of its water supply. A desalination project would add to its local water supply and make the agency more resilient during times of drought
Water source	• There are three possible sources of water. One, seawater could be pumped directly from the Bay. Two, brackish water could be pumped from Charleston Slough or Artesian Slough. Three, brackish groundwater could be pumped from below ground. • For every gallon of potable water produced, an intake of 2 gallons of seawater is required, with 1 gallon being returned to the ocean as brine. • Brackish water and groundwater are both typically less salty than seawater. These sources would likely require less source water since less brine needs to be produced to achieve desired treated water.
Brine discharge and disposal	• The desalination facility would remove salt from seawater to produce a reliable water supply, following the same treatment standards as other water supplies. • The procedure will generate brine (water with a high concentration of salt). The brine requires careful management. • A key concern is how the brine would be disposed. One brine disposal alterative is that brine would be diluted and released through outfall facilities directly into open water deep in the Bay, thereby avoiding sensitive areas. • Another brine disposal alternative would involve discharging the brine to coastal wetlands through a system of below-ground pipes. This process naturally treats the water through the ground surface and provides water supporting natural habitat.
General environmental impacts	• Desalination requires pumping seawater from the Bay into a treatment facility and releasing the brine back into the Bay. • One concern is whether marine life would be trapped during the water intake process. • Another concern is the impact of brine on marine life when it is released into the sea, due to the high levels of salt in the brine. The released brine would be diluted to levels that would have no significant impact on marine life, in alignment with regulatory requirements. • The construction and design of this project would have minimal impact on marine life as shown through several previous studies.
Environmental impacts: intake Structures	• Water from the sea would be pumped into the facility through subsurface intakes such as slant wells, vertical wells, etc. Where not feasible, open open-water intakes would be used. • Subsurface intakes allow seawater to filter through subsurface materials that removes particles and does not impact marine organisms. However, water extraction may cause changes to the tidal marsh habitats that would be studied further. • In case of open-water intakes, screens can be installed, and the velocity of intake can be capped to avoid impingement or entrainment of marine organisms.
Environmental impacts: pipeline construction	• Pipelines would be constructed from the point of seawater intake to the desalination facility and from the facility to the drinking water system. • These pipes may cause disruption of coastal land and local activities during construction. • All efforts would be taken to minimize disruptions and select sites that least affect local areas and activities.

Issue	Message
Noise	• The construction of the project and laying of pipes could generate noise that may temporarily affect nearby areas. • As the facility is expected to pump close to 10 million gallons of water per day, some noise may be generated from its operation and the pipes carrying water to and from the project. • Operation of the desalination project would abide by a strict schedule that the public would be made aware of for predictability. • Appropriate measures would be taken to reduce noise both during construction and project operation.
Treated water quality	• Seawater would be treated using reverse osmosis, which is a pressurized filtration process where water flows through membranes to remove the salt. • The membranes can remove more than 99 percent of dissolved minerals and organic compounds from water. • Water would be pre-treated, and post-treated to ensure it contains the required mineral content and complies with all Federal and State drinking water regulations.
Energy source/use and GHG emissions	• Desalination is an energy intensive water treatment process. • Valley Water is committed to using energy generated from renewable sources and to also be efficient and judicious in its energy consumption and minimize its effect and contribution to climate change effects.
Growth-inducing impacts	• One of Valley Water's primary missions is to provide safe, clean water to Santa Clara County's residents and businesses. Valley Water is responsible for providing water to meet growing demand. • Santa Clara County's population is anticipated to grow to about 2.7 million people by 2045, a 35 percent increase from the county's 2020 population. • Valley Water does not have jurisdiction over land use or population growth decisions.

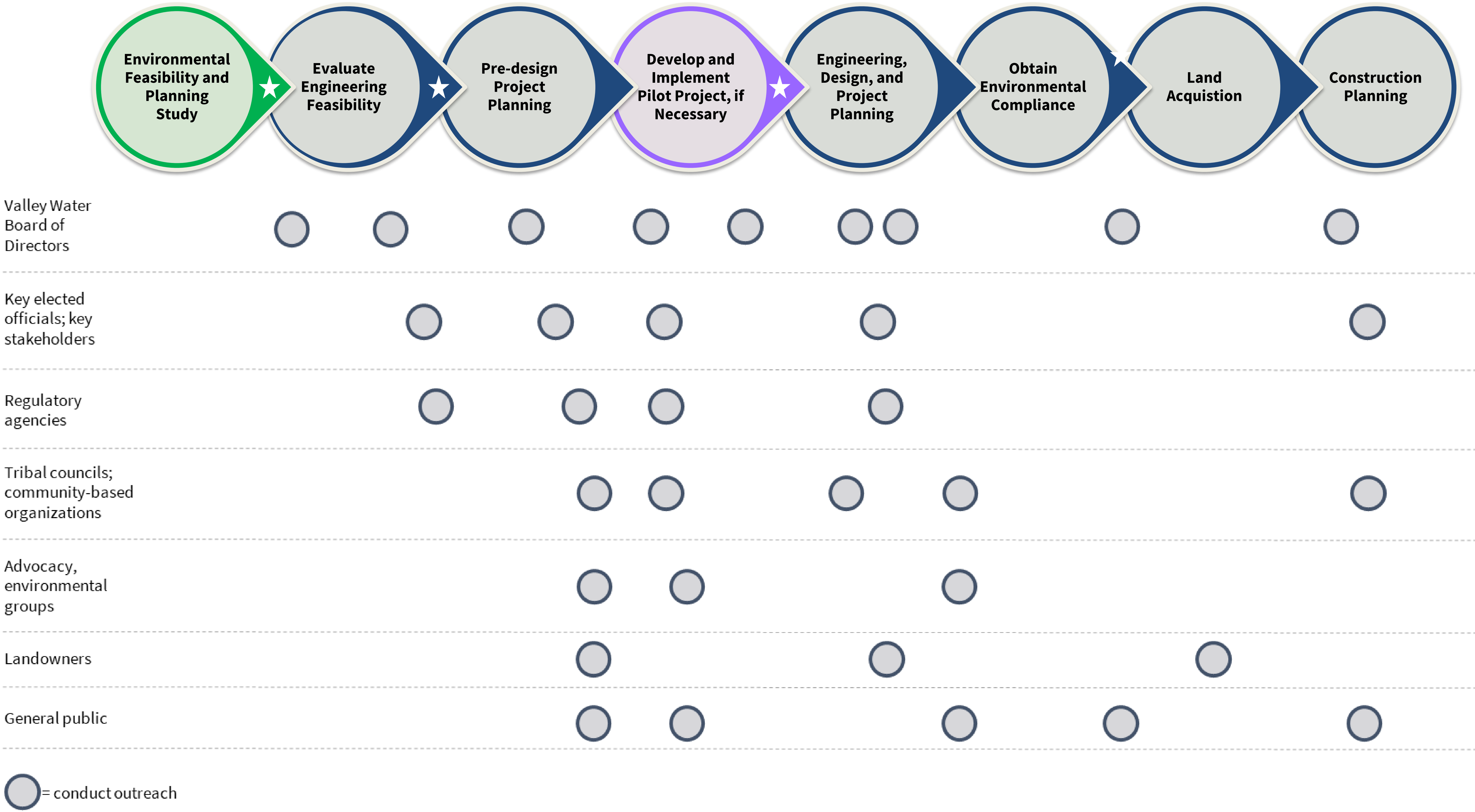
12.3 Community Engagement and Outreach Strategy Framework

A conceptual project development process is presented in Figure 1-1 in Chapter 1, "Introduction." The engagement program should be conducted in parallel with overall project stages.

The general sequence of outreach during each stage of project development should follow a standard cadence: collaboration with Valley Water Board of Directors, outreach to key elected officials so that they are apprised of the project, then engagement with partner agencies and key stakeholders on strategic key issues, then outreach to the public for education and input. Because the Board of Directors meetings are open to the public, Valley Water should be ready to respond to public information requests, including media coverage, from the project outset and at every stage.

The following provides a framework by which a more detailed and tactical outreach plan can be developed. The overall cadence and frequency of outreach is shown in **Figure 12-1**. The suggested topics and timing may be augmented and revised as more is learned at each stage of the project.

Figure 12-1. Seawater Desalination Project Public Outreach Cadence and Frequency



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12.3.1 Framework

Environmental Feasibility and Planning Study

- With this study and associated meetings and presentations as reference, work with Valley Water's Board of Directors to educate them about key issues and opportunities on the project. Obtain input from Board of Directors members and key Valley Water staff on success factors and possible threats to the project. Obtain input on project viability and decision for moving forward.
- Update desalination information on the Valley Water website such as associated collateral and mandated CEQA compliant public meetings.

Evaluate Engineering Feasibility

- Present key feasibility criteria and analyses to the Board of Directors. Discuss possible federal, state, and local funding opportunities. Obtain input on project viability and decision for moving forward.
- After Board of Directors determination that the project may move forward, inform key elected officials and other key stakeholders about the project; obtain input on success factors and possible threats to the project. Discuss possible federal, state, and local funding opportunities.
- Conduct meeting(s) meet with pertinent regulatory agency staff to introduce them to the project and discuss the regulatory framework and key technical issues.

Pre-design Project Planning

- Present an update to the Board of Directors, including an overview of outreach and input received to-date. Inform Board of Directors about the need for a pilot project, as appropriate.
- Valley Water's Office of Governmental relations will continue to meet with key elected officials and other key stakeholders to discuss solutions to technical and funding challenges. Introduce the idea of the pilot project, as appropriate.
- Present possible California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) permitting strategies to pertinent regulatory agency staff; continue to explore solutions to technical and environmental issues.
- Identify and reach out to pertinent tribal councils and community-based organizations; introduce the project to them and solicit feedback on project viability, key issues, and success factors. Introduce the idea of the pilot project, as appropriate.
- Perform outreach to key advocacy and environmental groups to introduce them to the project and gain input on key technical issues.

- Reach out to relevant landowners to evaluate the feasibility of property purchase or easements to facilitate the project.

- Introduce the project to the public through multiple communications channels; conduct polling to evaluate public perceptions on desalinated water.

Develop and Implement Pilot Project, if Necessary

- Inform Board of Directors about plans for the pilot project. When operable, invite Board of Directors members to a site tour of the pilot project. Obtain input on project viability and decision for moving forward.

- Valley Water's Office of Governmental relations will inform key elected officials and other key stakeholders about plans for the pilot project. When pilot project is operable, invite them to a site tour of the pilot project.

- Continue to build relationships with tribal councils and community-based organizations through listening sessions, workshops, and/or focus groups on the overall project and key issues.

- Continue to outreach to key advocacy and environmental groups to discuss progress on addressing key environmental issues.

- Conduct public outreach on key issues that would be apparent from the pilot project, such as water quality; continue to educate the public on the project purpose, need, and benefits.

Engineering Design and Project Planning

- Present one or more updates to the Board of Directors including an overview of outreach and input received to-date and estimated project costs.

- Valley Water's Office of Governmental relations will continue to meet with key elected officials and other key stakeholders to help facilitate public acceptance of the CEQA/NEPA process and documents; continue to discuss possible federal, state, and local funding opportunities.

- Continue to discuss and address solutions to technical and environmental issues with pertinent regulatory agency staff.

- Continue to coordinate with tribal councils and community-based organizations to help facilitate public acceptance of the CEQA/NEPA process and documents.

- Continue to coordinate with relevant landowners on property purchase or easements to facilitate the project.

- Conduct project scoping meeting at the outset of the CEQA/NEPA process; conduct public hearing toward the end of the CEQA/NEPA process; as appropriate, conduct additional public outreach between the scoping and hearing events.

Obtain Environmental Compliance

- Obtain Board of Directors approval and certification of the environmental documents; Obtain input on project viability and decision for moving forward.

Land Acquisition

- Continue to coordinate with relevant landowners on property purchase or easements to facilitate the project.

Construction Planning

- Inform Board of Directors about construction strategy and proposed funding mechanisms.
- Specific outreach to all stakeholders and affected communities during construction and ongoing operations once construction is complete. Valley Water will host a community meeting introducing the project and construction timeline, team, and Valley Water Staff who can be contacted with any questions, comments, or concerns during construction. Additionally, outreach will include but not be limited to meetings with homeowner associations and neighborhood associations.

12.3.2 Strategies to Improve Stakeholder and Public Acceptance

For a significant project such as a desalination project, best practices in public outreach and stakeholder engagement will need be deployed. The following are some key strategies (in no particular order) to improve the probability of acceptance and reduce the risk of opposition to the project:

- Maintain full transparency on Valley Water's process for developing the project, including clear identification of key decision points.
- Identify and develop a rapport with key community leaders, elected officials, and decision-makers regarding the project overall and on a per-issue basis.
- Facilitate regular interactions and updates with all stakeholders, groups, and the public, with a focus on communicating the project need and benefits at every stage.
- Actively seek input from stakeholders, groups, and the public at designated milestones to increase awareness and involvement.
- Actively address key issues and provide information on mitigation strategies to reassure the public. Report back to demonstrate that concerns and issues are being addressed.
- Proactively conduct outreach in hard-to-reach communities and groups; consider incentivizing select community groups and members for their focused participation. Use tailored relationship- and capacity-building exercises and/or learning programs to help facilitate meaningful input.

- Use multi-channeled communications platforms and outreach techniques from Valley Water's Office of External Affairs four branches: REDI, government relations, civic engagement, and communications.
- Use easy-to-understand terminology and impactful graphics in all communications materials. Include testimonials and case studies of successful desalination projects.
- Through proactive broad messaging coupled with reactive stakeholder engagement, be prepared to address rate- and/or taxpayers who might express opposition to the cost of the project or increase in the price of delivered water.

Chapter 13. Scoring and Feasibility

13.1 Introduction

This chapter provides scoring of intake and brine management options and seawater desalination project (desalination project) alternatives for a set of environmental criteria (criteria). In addition, this chapter identifies criteria related to project feasibility and further evaluates these criteria. The Treatment Facility Planning Areas (TFPAs) were not evaluated for site-specific environmental conditions in this study; and therefore, scoring was not conducted for TFPAs.

The criteria presented in this chapter are based on constraints identified in the environmental evaluations in Chapters 3 through 8 of this study. The total score for each intake and brine management option is the aggregate of scores for all individual criteria. Each desalination project alternative is then scored by adding the scores of the applicable intake and brine management options.

Scoring alone does not capture issues related to feasibility. As such, it is paired with an evaluation of feasibility level criteria as they relate to intake and brine management options. The purpose of the feasibility evaluation is to clarify which criteria are critical for successfully developing a desalination project and identifying intake and brine management options with the least barriers to implementation.

13.2 Criteria Score Development

13.2.1 Criteria Categorization

Figure 2-3 shows the process overview used to select criteria for scoring. Each criterion identified in the environmental evaluations is categorized as one of the following, as shown in **Figure 13-1**.

- **Feasibility Level Criteria.** Issues that have implications for determining if a project option can be developed or could be eliminated from consideration. These issues could represent potentially substantial environmental impacts and/or compatibility with land use/other project plans, regulations, and land uses.
- **Other Significant Criteria.** Issues that could result in substantial impacts or conflicts impacting the design, construction, operations, or other requirements of project options.
- **Criteria Not Significant to Comparing Project Options.** Issues that were not determined to have substantial impacts or conflicts for project options and are anticipated to be managed during project planning using typical approaches and measures.

Some criteria apply to both intake and brine management options and some apply to only intake options or only brine management options. The environmental evaluations found that some feasibility level criteria and other significant criteria did not have any variation or significant enough variation in constraints between project options to warrant different scoring. Criteria that were not used for scoring are still important and would be addressed during California Environmental Quality Act/National Environmental Policy Act and/or permitting, as discussed in this study. A summary for each criterion category is provided below.

Feasibility Level Criteria

Differences Between Project Options (Criteria Scoring)

Six criteria were deemed critical to the feasibility of project options and were scored based on the environmental evaluations. Each criterion is described below, and **Table 13-1** provides as summary of the approach used to score criteria for this study.

- **Marine Organisms.** Impacts to marine organisms must be minimized. The Regional Water Quality Control Board (RWQCB) could deny the Clean Water Act Section 404 discharge permit due to non-compliance with the Ocean Plan and the San Francisco Bay Conservation and Development Commission could deny the shoreline development permit due to non-compliance with the San Francisco Bay Plan (Bay Plan). Both the Ocean Plan and Bay Plan include language to minimize impacts to marine organisms to the extent practicable. The RWQCB will also evaluate the feasibility of subsurface intakes first, and only approve open intakes if subsurface intakes are infeasible and impacts to marine organism and other sensitive habitats are minimized. Intakes that do not meet these requirements and brine management options that don't minimize impacts would not be approved and could not be constructed.

- **Refuge Compatible Use.** The U.S. Fish and Wildlife Service (USFWS) would conduct a compatibility use evaluation, based largely on environmental impacts, to issue right-of-way for any infrastructure, including intakes and brine management option and associated conveyance infrastructure, within the Refuge. Valley Water would be denied right-of-way if the use is deemed not compatible. Significant changes to the scope of project options may be needed to obtain/avoid right-of-way.

- **Direct Potable Reuse.** The State Water Resource Control Board (SWRCB) could deem the desalination project a direct potable reuse (DPR) project if the intake draws in wastewater effluent. The SWRCB is still finalizing regulations for DPR projects, as discussed in Chapter 4, "Water Quality." These regulations could add significant additional treatment requirements which could change the scope of intake options and desalination project operations.

Figure 13-1. Intake and Brine Management Options Scoring Criteria

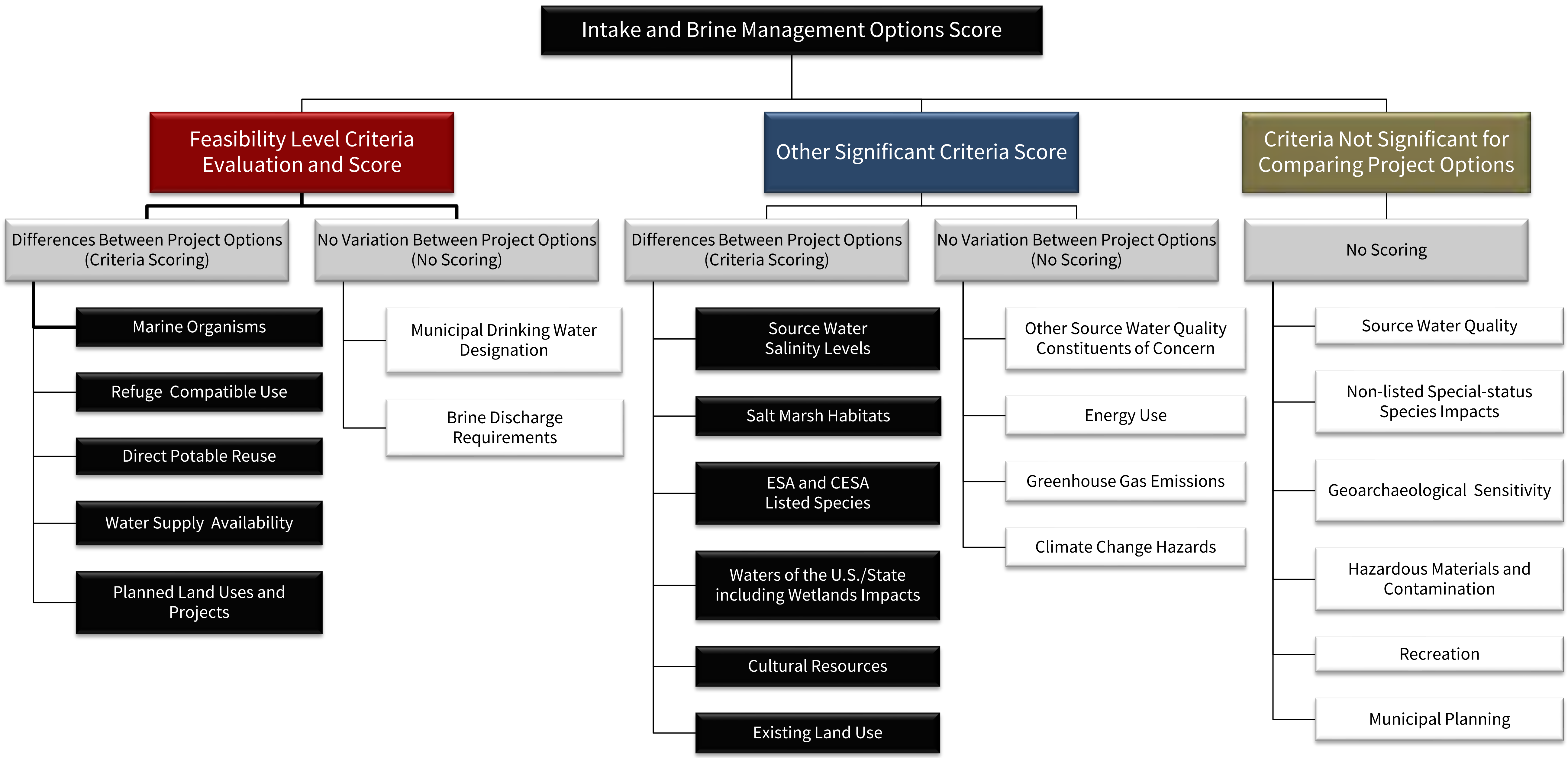

Table 13-1. Summary of Criteria Scoring Approach

Scoring Criteria	Applicable Project Options: Intakes	Applicable Project Options: RO/ Treatment	Applicable Project Options: Brine Management	Criteria Weight [1]	Maximum Possible Criteria Points [2]	Issue(s) Considered for Scoring	Scoring Approach
Feasibility Level Criteria							
Marine Organisms	Yes	No	Yes	3	15	▪ Ocean Plan requirements for new desalination facilities including siting, design, and technology ▪ Bay Plan requirements for desalination and Bay fill ▪ Impacts to marine organisms and sensitive habitats which are associated with the regulations in the Ocean Plan and Bay Plan	Options where regulations do not apply are scored highest and options where impacts to marine organisms and sensitive environments are less (and approval likelihood increases) are scored higher
Refuge Compatible Use	Yes	No	Yes	3	15	Refuge requirements for compatible use determination	Options where regulation does not apply are scored highest and options where impacts to biological resources are less and (and approval likelihood increases) are scored higher
Direct Potable Reuse	Yes	Yes	No	2	10	Potential for source to include treated wastewater effluent from existing discharges to the Bay	Options with higher potential to intake treated wastewater are more likely to be DPR reuse and scored lower
Water Supply Availability	Yes	No	No	2	10	Likely availability of source water in water resources where intake is proposed	Options with greater probability of providing available water supply scored higher
Planned Land Uses and Projects	Yes	Yes	Yes	2	10	▪ Land uses projected in the San Jose/Santa Clara Regional Wastewater Facility Master Plan ▪ Known Flood Protection/Habitat Restoration Projects (e.g., South Bay Salt Ponds Restoration Project, South San Francisco Bay Shoreline Study, etc.)	Options with no potential for conflicts are scored highest and options where use is more likely compatible are scored higher; permanent impacts/conflicts are scored lower than temporary impacts/conflicts
Other Significant Criteria							
Source Water Salinity Levels	Yes	Yes	No	1	5	Salinity level of source water at intake location based on water quality data collected	Options with potential to have lower levels of salinity than was found in data collected for the Lower South Bay are scored higher
Salt Marsh Habitats	Yes	No	Yes	1	5	Potential impacts to salt marsh habitat	Options where impacts are avoided are scored highest and direct effects are scored lower than indirect effects
ESA and CESA Listed Species	Yes	No	Yes	1	5	ESA and CESA listed species that are known to, likely, or could occur	Based on ESA and CESA Listed Species scoring in Table 13-2 and average option score of 27.5; higher species scores were scored higher; the averaged is used for the ranking scale (for example, a 3 is above average and 2 is below average)
Waters of the U.S./State including Wetlands	Yes	Yes	Yes	1	5	Potential dredge, fill, and/or alteration of wetlands and other waters of the U.S./State	Options with greater potential for impacts to wetlands and other waters of the U.S./state scored lower; permanent impacts scored lower than temporary impacts
Cultural Resources	Yes	Yes	Yes	1	5	Impacts to known archaeological and built environment resources	Options where impacts are avoided are scored highest and options with potential impacts to more known resources are scored lower
Existing Land Use	Yes	Yes	Yes	1	5	▪ Existing San Jose/Santa Clara Regional Wastewater Facility lands ▪ Existing Flood Protection Levees	Options with no potential for conflicts are scored highest and options where use is more likely compatible are scored higher; permanent impacts/conflicts are scored lower than temporary impacts/conflicts
Scoring							
				Maximum Possible Intake Score	90		
				Maximum Possible Brine Management Option Score	65		

Notes: Bay=San Francisco Bay, CESA=California Endangered Species Act, ESA=Endangered Species Act, Refuge=Don Edwards San Francisco Bay National Wildlife Refuge.
[1] Criteria weight refers to the number that the associated criteria score is multiplied by; and is discussed in Section 13.1.2, "Criteria Scoring"
[2] Maximum possible critiera points is the highest score (i.e., 5) multiplied by the criteria weight.

- **Water Supply Availability.** Applies only to intake options. The desalination project is estimated to require 20 million gallons per day (MGD) of source water to produce 10 MGD of treated water. If there is insufficient water supply, then the intake option either could not be developed or the scope of the intake option would need to be reduced, such that the water supply capacity of the desalination project is reduced. Insufficient water supplies are also likely to be an indicator of potential environmental impacts in sensitive habitats that rely on water to maintain habitat conditions, such as salt marsh habitat and sloughs.

- **Planned Land Uses and Projects.** The Environmental Study Area includes large and extensive projects that have been planned for decades to provide flood protection, habitat restoration, and other regional benefits. Conflicts may arise where intake and brine management options overlap with these planned projects, which could preclude development or significantly change the scope of intake or brine management options.

No Variation Between Project Options (No Scoring)

Two additional criteria were deemed critical to the feasibility of project options, but since there was no variation in constraints between project options, no scoring of these criteria was conducted for this study. These criteria are described below.

- **Municipal Drinking Water Designation**. Applies only to intake options. Before using source water from all sources evaluated in this study for municipal (MUN) water supplies, the RWQCB would need to designate the source water as MUN for source water drinking purposes through a regulatory hearing process. If this change is not applied to the source water, then it cannot be used for a water supply for the desalination project.

- **Brine Discharge Requirements**. Applies only to brine management options. The RWQCB requires compliance with brine discharge requirements in the Basin Plan. This means achieving quick dilution of brine discharged to open water and/or blending brine with wastewater effluent to reduce salinity levels. Non-compliance means the brine management would not be approved, or the scope of the brine management option could be significantly changed to obtain compliance.

Other Significant Criteria

Differences Between Project Options (Criteria Scoring)

Six other criteria were deemed significant for comparing project options and were scored based on the environmental evaluations. Each criterion is described below, and **Table 13-1** provides as summary of the approach used to score criteria for this study.

- **Source Water Salinity Levels.** Intake options that are not located in the South San Francisco Bay (South Bay), including subsurface intakes, may have lower salinity levels than those in the South Bay. Source water with higher salinity levels typically require more treatment and energy use.

- **Salt Marsh Habitats.** Salt marsh habitats along the South Bay shoreline are highly valued because they support several special-status species and provide various biological functions. Salt march habitats could be impacted indirectly by intake of water from subsurface intakes and directly from construction of various project options or discharge of brine with elevated levels of salinity for horizontal levee options.

- **Endangered Species Act (ESA) and California Endangered Species Act (CESA) Listed Species Impacts.** Ten (10) special-status species identified are listed in ESA and/or CESA and could be impacted by intake and/or brine management options to various degrees. These species are of most concern due to their already limited populations and listing status.

- **Waters of the U.S./State including Wetlands.** Construction of intake and brine management options could impact wetlands and other waters of the U.S./State to various degrees.

- **Cultural Resources.** A known historic district exists over large areas of the Environmental Study Areas. An additional known archaeological resource is within the San Jose Environmental Study Area. Potential impacts to these known cultural resources should be addressed during project planning.

- **Existing Land Use.** Numerous flood protection levees are in the Environmental Study Areas and could be impacted during construction. Additionally, the San Jose Environmental Study Area includes existing San Jose/Santa Clara Regional Wastewater Facility lands.

No Variation Between Project Options (No Scoring)

Four additional criteria were deemed significant, but since there was no variation in constraints between project options, no scoring of these criteria was conducted for this study. These criteria are described below.

- **Other Source Water Constituents of Concern**. Other constituents of concern that may impact treatment effectiveness or impact the potable water distribution system include ammonia, sulfide, and bromide, and should be considered for all intake options.

- **Energy Use.** Energy use from conveyance and treatment (including RO) was estimated to be similar among all project options/alternatives and largely dependent on salinity levels during treatment.

- **Greenhouse Gas Emissions (GHG)**. GHG emissions for energy purchased was similar among all project options/alternatives and is dependent on the energy source and salinity levels during treatment.

- **Climate Change Hazards**. A broad and high-level assessment of flooding (sea-level rise, storm surge, large precipitation events, etc.) and non-flooding (extreme heat, drought, and power outages) climate change hazards was conducted. Current assessment is broad and high-level; requires further investigation and selection of specific climate change scenarios that will be used for planning of any intake and brine management options.

Criteria Not Significant for Comparing Project Options

Seven criteria were not selected for scoring because they were deemed not to be useful in comparing options and identifying a preferred option. Each of these criteria is discussed below.

- **Source Water Quality**. Review of existing data and the need to collect additional data via monitoring to inform treatment design is not considered because this is needed regardless of the intake option. Note that source water salinity levels are considered for scoring as other significant criteria.
- **Non–Listed Special-status Species**. Twelve (12) special-status species were identified that are not ESA or CESA listed. Impacts to these species are not subject to permitting and are routinely addressed through implementation of avoidance, minimization measures, and mitigation measures in California Environmental Quality Act documents.
- **Municipal Planning**. Important but issues can be addressed through normal project planning. As a regional agency Valley Water may be exempt from local MUN regulations.
- Based on the current evaluation, the following constraints were not major issues driving the selection of intake or brine management options for the reasons below:
    - **Geoarchaeological Sensitivity**. Found to be low in the Environmental Study Areas.
    - **Known Hazardous Materials or Contamination**. None were identified in the Environmental Study Areas.
    - **Recreational**. Impacts to existing recreation are limited to temporary construction impacts to trails.

13.2.2 Criteria Scoring Approach

This section first discusses the scale used to score each criterion and weighting of each the score for each criterion. Then, this section discussions additional scoring that was developed to determine the ESA and CESA listed species criteria score.

Criteria Scoring Scale

This section discusses the scoring assigned to each criterion which is different than the criteria weight. The score for each criterion A score of 0 to 5 is assigned to each intake and brine management option for each feasibility level criteria and other significant criteria. Higher scores represent better/more desirable results, and lower scores represent a greater constraint. The scoring scale is presented below.

5 = ideal or best conceivable
4 = excellent
3 = good or above average
2 = fair or below average
1 = poor
0 = completely unacceptable

This scale was selected because it provides a logical range of possible scores, scores are easy to identify based on the environmental evaluations, and the scores are assigned relative to each other making it useful for comparing intake and brine management options. Occasionally, a fraction score was assigned (e.g., 1.5, or 2.5) where it was determined to be the best fit for the criteria.

Criteria Weighting

Each feasibility level criterion and other significant criteria was also assigned a criteria weight, as shown in **Table 13-1**. Each criterion score is multiplied by its corresponding criteria weight. The criteria weight of all other significant criteria was set at 1, meaning there is no change in the score assigned based on the criteria weight. The criteria weight of feasibility level criteria was either 2 (for four criteria) or 3 (for two criteria). The feasibility level criteria have higher weights as they are deemed more important to selection of an intake or brine management option. The two criteria with a weighting value of 3 are Marine Organisms and Refuge Compatible Use because these are considered the most essential issues related to environmental impacts and obtaining approvals from regulatory agencies.

ESA and CESA Listed Species Criteria Score

Due to the large number of constraints identified related to ESA and CESA Listed Species, a separate score was developed for each intake and brine management option for the ESA and CESA Listed Species criteria. A total of 10 ESA and/or CESA listed species are known to, are likely, or could occur within the Environmental Study Areas. The potential for each of these species to occur and be impacted by each intake and brine management option was identified in **Tables 5-6** and **5-7**, and the score for each option is based on the rankings in these tables. The same scoring scale discussed above for all criteria was used for the ESA and CESA Listed Species score. A weighting of 1 was used, meaning there is no change in the score assigned based on the tables. Since there are 10 ESA and CESA listed species, the highest score possible is 50. Based on this scoring, the average ESA and CESA Species Score was identified and used to assign one overall score for the ESA and CESA Listed Species criteria for each intake and brine management option.

13.3 Scoring Results

13.3.1 Individual Criterion Scoring

This section first discusses scoring for the ESA and CESA listed species criteria and then presents scoring for all feasibility level and other significant criterion scored in this study.

ESA and CESA Listed Species Criteria Score

The ESA and CESA Listed Species scores are presented in **Table 13-2** (separate from the overall criteria scoring), including the score for each ESA and/or CESA listed species and totals. The average intake and brine management option total score is 27.5 (out of 50). This average score was used to assign a single ESA and CESA Listed Species score for each intake and brine management option in the individual criteria scoring (presented below).

The Pond A18 Subsurface intake scored the highest at 30 and the open intakes in the San Francisco Bay (Bay) (MV In 2, PA In 3) were one point lower. The Charleston Slough Open Intake (PA In 2) ranked the lowest and the other intake options (SJ In 2, MV In 1, PA In 1) were in between the highest and lowest scored options. In general, the subsurface intake options (SJ In 1, MV In 1, PA In 1) ranked lower than the open intakes in the Bay for birds and species associated with salt marsh habitat but better for fish. The open intakes in sloughs had various constraints for all species because of their association with both open water and fish and proximity to salt marsh and other sensitive habitats.

The ESA and CESA Listed Species scoring shows that all three brine management options have the same total score of 30, although the score for individual listed species was not the same. The South Bay Deep Water Outfall option scored better than the horizontal levees for bird species and lower for fish species. The horizontal levee options (SJ In 2, MV-PA In 2) have the same score for individual listed species regardless of their different locations, which is a result of both options being located in salt marsh habitats.

All Criteria Scores

The scores and supporting rational for each feasibility level criterion and other significant criteria are presented in **Table 13-3** and **13-4**, respectively (these tables present the score for each criterion without weighting). The scoring in Table 13-2 was used to identify the overall ESA and CESA criteria score for each intake and brine management option. The weighted score for each criterion and total weighted score for each intake and brine management option is presented in **Table 13-5**. The weighted score for each desalination project alternative is presented in **Table 13-6**.thi

Table 13-2. ESA and CESA Listed Species Scoring

	Project Option	Steelhead – central California coast DPS	Western snowy plover	California black rail	California Ridgway's rail	Salt-marsh harvest mouse	California seablite	California red-legged frog	Longfin smelt	Green sturgeon	California least tern	*Total Score*
Intake Options and Associated Conveyance												
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ In PS)	4	2	2	2	2	2	4	4	4	4	***30***
SJ	Artesian Slough Open (SJ In 2, SJ P2b, SJ In PS)	1	4	2	2	2	2	2	2	4	4	***25***
MV	Pond A2E Sub (MV In 1, MV P2a, MV In PS)	4	2	1	1	1	2	4	4	4	1	***24***
MV	South Bay Open (MV In 2, MV P2b, MV In PS)	1	4	4	4	4	4	4	2	1	1	***29***
PA	Charleston Slough/Pond A1 Subsurface (PA In 1, PA P2a, PA In PS)	4	2	2	2	2	2	4	4	4	1	***27***
PA	Charleston Slough Open (PA In 2, PA P2a, PA In PS)	1	4	2	2	2	2	2	2	4	1	***22***
PA	South Bay Open (PA In 3, PA P2b, PA In PS)	1	4	4	4	4	4	4	2	1	1	***29***
Brine Management Options												
All	South Bay Deep Water Outfall (Br 1)	1	4	4	4	4	4	4	2	1	2	***30***
SJ	Pond A18 Horizontal Levee (SJ Br 2)	4	4	2	2	2	2	4	4	4	2	***30***
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	4	4	2	2	2	2	4	4	4	2	***30***

Legend: Yellow shading = total score slightly above average
Orange shading = total score slightly below average
Red shading = total score below average approaching poor

Notes: Scoring in this table were used to develop the criteria score for ESA and CESA listed species in Table 13-4.

Table 13-3. Feasibility Level Criteria Scoring and Rational

	Project Option	Marine Organisms	Refuge Compatible Use	Direct Potable Reuse	Water Supply Availability	Planned Land Uses and Projects
Intake Option and Associated Conveyance						
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ PS)	4 – Subsurface intake preferred; no impacts to marine organisms; could impact salt marsh habitat	2 – Entirely within Refuge; limited direct impacts; but could indirectly effect salt marsh habitat	2.5 – Possibly	2 – Unknown	1 – Likely conflicts with future ecotone at Pond A18
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	1 – Open intake only if subsurface infeasible; impacts to marine organisms from intake operations; slough location not preferred by Bay Plan	1 – Entirely within Refuge; direct effects to marine organisms and salt marsh habitat	1 – Likely	4 – Anticipated with continued wastewater effluent discharge	4 – Limited to temporary construction impacts
MV	Pond A2E Sub (MV In 1, MV P2a)	4 – Subsurface intake preferred; no impacts to marine organisms; could impact salt marsh habitat	2 – Entirely within Refuge; limited direct impacts; but could indirectly effect salt marsh habitat	4 – Not Likely	2 – Unknown due to salt pond	4 – No known conflicts with future SBSP restoration project
MV	South Bay Open (MV In 2, MV P2b)	2 – Open intake only if subsurface infeasible; impacts to marine organisms from intake operations	3 – Intake outside Refuge; pipeline within Refuge could be compatible use	2.5 – Possibly	5 – Sufficient due to LSB	4 – No known conflicts with future SBSP restoration project
PA	C. Slough/Pond A1 Subsurface (PA In 1, PA P2a)	4 – Subsurface intake preferred; no impacts to marine organisms; could impact salt marsh habitat	2 – Entirely within Refuge; limited direct impacts; but could indirectly effect salt marsh habitat	4 – Not Likely	2 – Unknown due to slough/salt pond	2 – Possible indirect effects to habitat from intake of water
PA	C. Slough Open (PA In 2, PA P2a)	1 – Open intake only if subsurface infeasible; impacts to marine organisms from intake operations; slough location not preferred by Bay Plan	1 – Entirely within Refuge; direct effects to marine organisms and salt marsh habitat	2.5 – Possibly	2 – Unknown due to slough	4 – Limited to temporary construction impacts
PA	South Bay Open (PA In 3, PA P2b)	2 – Open intake only if subsurface infeasible; impacts to marine organisms from intake operations	3 – Intake outside Refuge; pipeline within Refuge could be compatible use	2.5 – Possibly	5 – Sufficient due to LSB	4 – Limited to temporary construction impacts
Brine Management Options						
All	South Bay Deep Water Outfall (Br 1)	1 – Need to consider blending with wastewater; may be subject to Ocean Plan discharge requirements; adverse effect to marine organisms from water quality	3 – Outfall outside of Refuge; conveyance likely within Refuge but may be trenchless and could be compatible	N/A	N/A	5 – No known conflicts
SJ	Pond A18 Horizontal Levee (SJ Br 2)	3 – Experimental phase; need to consider blending with wastewater; could impact salt marsh habitat; avoids impacts to marine organisms	2 – Entirely within Refuge; possible direct effects from brine water quality	N/A	N/A	3 – Same location as future ecotone at Pond A18; may be conflict or opportunity for blending brine with wastewater
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	3 – Experimental phase; need to consider blending with wastewater; could impact salt marsh habitat; avoids impacts to marine organisms	4 – Possible all or most of alignment could be located outside of the Refuge	N/A	N/A	4 – No conflicts for portion in Flood Control Basin

Notes: Flood Control Basin=Palo Alto Flood Control Basin, Refuge=Don Edwards San Francisco Bay National Wildlife Refuge, SBSP=South Bay Salt Pond

Table 13-4. Other Significant Criteria Scoring and Rational

	Project Option	Source Water Salinity Levels	Salt Marsh Habitats	ESA and CESA Listed Species[1]	Waters of the U.S./State Including Wetlands	Cultural Resources	Existing Land Use
Intake Option and Associated Conveyance							
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ PS)	3 – Likely lower because of wastewater effluent	3 – Possible indirect effects from intake of water	3 – ESA and CESA species score slightly above average	3 – Limited to temporary wetland impacts	3 – Known built environment resource	3 – Limited to temporary construction impacts
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	3 – Likely lower because subsurface	2 – Possible direct effects from intake of water	2 – ESA and CESA species score slightly below average	1 – Several impacts to wetlands and other waters	3 – Known built environment resource	3 – Limited to temporary construction impacts
MV	Pond A2E Sub (MV In 1, MV P2a)	3 – Likely lower because subsurface	3 – Possible indirect effects from intake of water	2 – ESA and CESA species score slightly below average	1 – Several impacts to wetlands and other waters	3 – Known built environment resource	3 – Limited to temporary construction impacts
MV	South Bay Open (MV In 2, MV P2b)	2 – Similar to LSB estimates	5 – None	3 – ESA and CESA species score slightly above average	1 – Several impacts to wetlands and other waters	3 – Known built environment resource	2 – Pipeline alignment along levee could be difficult
PA	C. Slough/Pond A1 Subsurface (PA In 1, PA P2a)	3 – Likely lower because subsurface	3 – Possible indirect effects from intake of water	2 – ESA and CESA species score slightly below average	5 – No impacts	5 – None	3 – Limited to temporary construction impacts
PA	C. Slough Open (PA In 2, PA P2a)	2 – Similar to LSB estimates	2 – Possible direct effects from intake of water	1.5 – ESA and CESA species score below average	2 – Impacts to wetlands	5 – None	3 – Limited to temporary construction impacts
PA	South Bay Open (PA In 3, PA P2b)	2 – Similar to LSB estimates	5 – None	3 – ESA and CESA species score slightly above average	1 – Several impacts to wetlands and other waters	5 – None	2 – Pipeline alignment along levee could be difficult
Brine Management Options							
All	South Bay Deep Water Outfall (Br 1)	N/A	5 – None	3 – ESA and CESA species score slightly above average	3 – Impacts limited to LSB in deep water	5 – None	4 – Intake avoids conflicts; conveyance may be trenchless and could be compatible
SJ	Pond A18 Horizontal Levee (SJ Br 2)	N/A	2 – Possible direct effects from brine water quality	3 – ESA and CESA species score slightly above average	2 – Impacts to wetlands	2 – Known built environment and archaeological resources	4 – Levee alteration but not a conflicting use
MV/ PA	MV-PA Horizontal Levee (MV-PA Br 2)2	N/A	2 – Possible direct effects from brine water quality	3 – ESA and CESA species score slightly above average	2 – Impacts to wetlands	3 – Known built environment resource	4 – Levee alteration but not a conflicting use

Notes: CESA=Califorina Endangered Species Act, ESA=Endangered Species Act, LSB=Lower South Bay, N/A=not applicable
[1]Refer to Table 13-2 for species scoring used in to develop the overall score for each project component for this category.

13.3.2 Intake and Brine Management Option Scoring

This section discusses the total score for each intake and brine management option and evaluated feasibility level issues. The option score consists of the aggregate of all individual criterion scores after applying the criteria weighting, as shown in **Table 13-5**. The total weighted score for solely feasibility level criteria and a summary of feasibility issues for each intake and brine management option is also provided in **Table 13-6**, because of the importance of these issues to project feasibility. The ranking of intake and brine management options based on feasibility level criteria scores is different than the scores for all criteria discussed above in this chapter. Additionally, each intake and brine management option were ranked based on the number of feasibility issues, since options with more feasibility issues have more critical issues to address before implementation. Scoring and feasibility issues are discussed further below.

Intake Options

As shown in **Table 13-5**, the four highest scoring intake options were 4 points apart (between 53 and 56). The open intake in the Bay in Palo Alto (PA In 3) and subsurface intake in Charleston Slough/Pond A1 (PA In 1) scored the highest at 56 and 55, respectively. The two intake options in Mountain View (MV In 1, MV In 2) also scored high at 53 and 54, respectively.

The open intake options (i.e., screened intakes, etc.) in the South Bay (MV In 2, PA In 3) scored high due to their location being in the Bay and beyond the salt ponds where abundant Bay water is available for the intake and impacts associated with salt marsh habitats, wetlands, and sloughs are avoided. These intakes also received a higher Refuge Compatible Use score because the intake infrastructure is outside the Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) boundary and only intake conveyance infrastructure would need to be routed through the Refuge.

The subsurface intakes options (i.e., vertical wells, etc.) in Mountain View (MV In 1) and Palo Alto (PA In 1) scored higher for Marine Organisms because subsurface intakes are preferred by regulations in the Ocean Plan and impacts to marine organism are avoided. The subsurface intakes scored moderate to high for several criterion, but lower than open intakes in the Bay for Water Supply Availability and Salt March Habitats because further study needs to be conducted to determine if sufficient water is available in salt ponds for subsurface intakes and to determine if adverse impacts would occur from drawing water into subsurface intakes.

The Pond A18 Subsurface Intake option scored lower than the other subsurface intake options because of its proximity to the San Jose/Santa Clara Regional Wastewater Facility discharge and potential to be considered a potable reuse project for reuse of wastewater effluent and another planned ecotone habitat restoration project at Pond A18 (planned by the South San Francisco Bay Shoreline Levee Project (Phase I) and Santa Clara/San Jose Regional Wastewater Facility Master Plan) and potential conflicts.

The open intakes in the sloughs (SJ In 2, PA In 2) scored the lowest at 38 and 38.5 in large part due to their low scores for the Marine Organisms and Refuge Compatible Use criteria. In addition to direct effects to marine organisms, these open intakes are not preferred due to their location in sensitive habitats associated with sloughs.

Intake Options Feasibility Level Issues Evaluation

The intake options in Mountain View (MV In 1, MV In 2) and the open intake in the Bay in Palo Alto (PA In 3) were tied for the highest feasibility level criteria scores. Pond A2E Subsurface Intake option contains the fewest feasibility level issues to address. The Charleston Slough/Pond A1 Subsurface Intake option was the next highest ranked option but ranked lower because of potential conflicts with the South Bay Salt Ponds Restoration Project Phase 2: Alviso Mountain View Pond Cluster at Pond A1.

The open intake options in the Bay (MV In 2, PA In 3) scored high because they have sufficient water supplies, have no conflicts with future planned land uses and projects, and the intake infrastructure is located outside the boundaries of the Refuge. However, because impacts to marine organisms are a major concern of the Bay Plan and the Ocean Plan and the latter requires use of subsurface intakes - if feasible, all subsurface intake options would need to be determined infeasible and the effects of open intake options on marine organisms would need to be evaluated in detailed studies before these open intake options could be considered. For these reasons, the Pond A2E Subsurface Intake option is anticipated to be the easiest to implement if sufficient water supply is available and indirect impacts to salt marsh habitat from use of this water supply is minimal or can be managed.

The Pond A18 Subsurface Intake option ranked low due to compatibility with existing and planned land uses and water supply availability and has the most feasibility level issues to address. Additionally, there is an ecotone proposed in Pond A18 in the future as part of the South Bay Shoreline Study and the Santa Clara/San Jose Regional Wastewater Facility Master Plan, and this intake option may not be compatible with the ecotone and hence infeasible.

The intake options in the sloughs (SJ In 2, PA In 2) have the lowest feasibility level criteria scores, due to significant issues for open intakes associated with the Ocean Plan and Bay Plan, as discussed above in this section, and because they are located closer to sensitive habitat associated with sloughs and are within the boundaries of the Refuge.

Brine Management Options

As shown in **Table 13-5**, the South Bay Deep Water Outfall and MV-PA Horizontal Levee options were the highest ranked brine management options with nearly the same score at 42 and 43, respectively. The horizontal levee options scored higher than the South Bay Deep Water Outfall option for the Ocean Plan because they would avoid impacts to Bay water quality marine organisms if water quality can be managed by blending with wastewater effluent. However, the horizontal levees scored lower for impacts to salt marsh habitat. The MV-PA Horizontal Levee obtained the highest single criteria score because it could possibly be constructed outside of the Refuge and within the Palo Alto Flood Control Basin. The South Bay Deep Water Outfall option scored higher for Planned Land Uses and Projects because there are no potential conflicts, higher for salt marsh impacts because this habitat type would be avoided, and higher for avoiding known cultural resources.

Table 13-5. Intake and Brine Management Option Weighted Scores

	Project Option	Feasibility Level Criteria					Other Significant Criteria						
		Marine Organisms	Refuge Compatible Use	Direct Potable Reuse	Water Supply Availability	Planned Land Uses and Projects	Source Water Salinity Levels	Salt Marsh Habitats	ESA and CESA Listed Species	Waters of the U.S./State including Wetlands	Cultural Resources	Existing Land Use	*Total Weighted Score*
Intake Options and Associated Conveyance													
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ PS)	12	6	5	4	2	3	3	3	3	3	3	***47***
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	3	3	2	8	8	3	2	2	1	3	3	***38***
MV	Pond A2E Sub (MV In 1, MV P2a)	12	6	8	4	8	3	3	2	1	3	3	***53***
MV	South Bay Open (MV In 2, MV P2b)	6	9	5	10	8	2	5	3	1	3	2	***54***
PA	C. Slough/Pond A1 Subsurface (PA In 1, PA P2a)	12	6	8	4	4	3	3	2	5	5	3	***55***
PA	C. Slough Open (PA In 2, PA P2a)	3	3	5	4	8	2	2	1.5	2	5	3	***38.5***
PA	South Bay Open (PA In 3, PA P2b)	6	9	5	10	8	2	5	3	1	5	2	***56***
Brine Management Options													
All	South Bay Deep Water Outfall (Br 1)	3	9	-	-	10	-	5	3	3	5	4	***42***
SJ	Pond A18 Horizontal Levee (SJ Br 2)	9	6	-	-	6	-	2	3	2	2	4	***34***
MV/PA	MV-PA Horizontal Levee (MV-PA Br 2)	9	12	-	-	8	-	2	3	2	3	4	***43***

Legend: Green shading = highest scored/ranked intake or brine management option(s)
Yellow shading = high scored intake or brine management option(s)
Red shading = low scored intake or brine management option(s)
Purple shading = lowest scored/ranked intake or brine management option(s)

Table 13-6. Feasibility Level Criteria Scoring and Issues Summary

	Project Option	Total Weighted Feasibility Level Criteria Score	Number of Feasibility Issues	Feasibility Issues
Intake Options and Associated Conveyance				
SJ	Pond A18 Subsurface (SJ In 1, SJ P2a, SJ PS)	29	6	▪ Obtaining compatible use determination from Refuge for intake and conveyance ▪ Minimizing impacts to sensitive habitats in accordance with Ocean Plan ▪ Sufficient availability of water supply in Pond A18 ▪ Potential conflicts with planned ecotone at Pond A18 ▪ Could be a direct potable use project ▪ Source water designated MUN for potable water supply
SJ	Artesian Slough Open (SJ In 2, SJ P2b)	24	4	▪ Impacts to marine organisms and not preferred by Ocean Plan and Bay Plan ▪ Obtaining compatible use determination from Refuge for intake and conveyance ▪ Likely a DPR project ▪ Source water designated MUN for potable water supply
MV	Pond A2E Sub (MV In 1, MV P2a)	38	4	▪ Obtaining compatible use determination from Refuge for intake and conveyance ▪ Minimizing impacts to sensitive habitats in accordance with Ocean Plan ▪ Sufficient availability of water supply in Pond A2E ▪ Source water designated MUN for potable water supply
MV	South Bay Open (MV In 2, MV P2b)	38	4	▪ Impacts to marine organisms and not preferred by Ocean Plan and Bay Plan ▪ Obtaining compatible use determination from Refuge for conveyance ▪ Possible it could be determined a direct potable use project ▪ Source water designated MUN for potable water supply
PA	C. Slough/Pond A1 Subsurface (PA In 1, PA P2a)	34	5	▪ Impacts to marine organisms and not preferred by Ocean Plan and Bay Plan ▪ Minimizing impacts to sensitive habitats in accordance with Ocean Plan ▪ Obtaining compatible use determination from Refuge for intake and conveyance ▪ Potential conflicts with planned habitat restoration project in Pond A1 ▪ Source water designated MUN for potable water supply
PA	C. Slough Open (PA In 2, PA P2a)	23	5	▪ Impacts to marine organisms and not preferred by Ocean Plan and Bay Plan ▪ Obtaining compatible use determination from Refuge for intake and conveyance ▪ Sufficient availability of water supply in Charleston Slough ▪ Possible it could be determined a direct potable use project ▪ Source water designated MUN for potable water supply
PA	South Bay Open (PA In 3, PA P2b)	38	5	▪ Impacts to marine organisms and not preferred by Ocean Plan and Bay Plan ▪ Obtaining compatible use determination from Refuge for conveyance ▪ Possible it could be determined a direct potable use project ▪ Source water designated MUN for potable water supply

	Project Option	Total Weighted Feasibility Level Criteria Score	Number of Feasibility Issues	Feasibility Issues
Brine Management Options				
All	South Bay Deep Water Outfall (Br 1)	22	3	▪ Compliance with brine discharge requirements in the Basin Plan ▪ Impacts to marine organisms and issues with Ocean Plan and Bay Plan ▪ Obtaining compatible use determination from Refuge for conveyance
SJ	Pond A18 Horizontal Levee (SJ Br 2)	21	4	▪ Compliance with brine discharge requirements in the Basin Plan ▪ Minimizing impacts to sensitive habitats in accordance with Ocean Plan ▪ Obtaining compatible use determination from Refuge for brine management ▪ Potential conflicts with planned ecotone at Pond A18
MV/ PA	MV-PA Horizontal Levee (MV-PA Br 2)	29	2 or 3	▪ Compliance with brine discharge requirements in the Basin Plan ▪ Minimizing impacts to sensitive habitats in accordance with Ocean Plan ▪ Within Refuge, obtaining compatible use determination for brine management; does not apply if located outside Refuge in Palo Alto Flood Control Basin

Legend: Green shading = top ranked project option(s)
Yellow shading = middle ranked project option(s)
Red shading = lowest ranked project option(s)

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Brine Management Options Feasibility Level Issues Evaluation

The Mountain View–Palo Alto Horizontal Levee received the highest feasibility level criteria score and has the fewest feasibility issues. An ideal plan for this brine management option is if it can be developed in the Palo Alto Flood Control Basin (outside of the Refuge) and brine can be blended with wastewater effluent to reduce salinity levels and avoid/minimize impacts to salt marsh habitat and obtain compliance with discharge requirements. However, the option to blend brine from the desalination project with wastewater effluent from the Santa Clara/San Jose Regional Wastewater Facility could be impacted by the operation of the proposed Valley Water Purified Water Project, due to the potential for decreased effluent flows available in Palo Alto given the proposed projects potential use of available effluent flows. Additionally, Valley Water is currently operating a horizontal levee pilot project in Palo Alto and if Valley Water decides to construction a permanent horizontal levee after completion of the pilot project, available effluent may be discharged to the Palo Alto horizontal levee, therefore decreasing effluent flows. However, it is unknown at this time if the Valley Water Purified Water project or permanent horizontal levee would be constructed.

The South Bay Deep Water Outfall and Pond A18 Horizontal Levee scored low and received similar scores. The South Bay Deep Water Outfall requires further studies to show substantial dilution would be achieved quickly or blending with wastewater effluent to both obtain compliance with discharge requirements in the Basin Plan and requirements to minimize impacts to marine organisms in the Ocean Plan. The Pond A18 Horizontal Levee scored low because it is within the Refuge and at the same location as a planned ecotone, as discussed above. This planned ecotone could present conflicts or potentially an opportunity for the desalination project. It was initially scored low because this issue needs to be addressed for implementation of this brine management option. However, if there is an opportunity to blend brine with wastewater effluent from the Santa Clara/San Jose Regional Wastewater Facility and discharge to the ecotone at lower salinity levels, this could be an ideal location for a cooperative discharge project. If there is insufficient capacity or other barriers to blending brine with wastewater effluent, then this brine management option could not be developed for the desalination project.

13.3.3 Seawater Desalination Project Alternative Scoring

As shown in **Table 13-7**, the eight highest scoring desalination project alternatives scored within four points between 95 and 99. The three highest scoring alternatives were between 98 and 99 and in Palo Alto (Alternatives PA-O4, PA-O3, and PA-S2). The next five alternative were within two points with one in Palo Alto (Alternative PA-S1 at 97) and the other four consisting of the alternatives in Mountain View (Alternatives MV-O1, MV-O2, MV-S1, and MV-S2) scoring between 95 and 97. Since the South Bay Deep Water Outfall and Mountain View-Palo Alto Horizontal Levee received similar scores, the scores of alternatives in Mountain View and Palo Alto depended on the intake option score.

The two alternatives associated with open intake in Charleston Slough (Alternatives PA-O1 and PA-O2) received low scores of 80.5 and 81.5, respectively. The two alternatives associated with the open intake in Artesian Slough (Alternatives SJ-O1 and SJ-O2) in San Jose received the lowest scores at 80 and 72, respectively, with the alternative containing the Pond A18 Horizontal Levee (Alternative SJ-02) being the lowest. The alternative associated with the Pond A18 Subsurface intake (Alternative SJ-S1) also scored lower at 89.

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Table 13-7. Desalination Project Alternative Weighted Scores

Alternative	Intake Option and Associated Conveyance	Option Score	Brine Management Option	Option Score	Alternative Score
San Jose (SJ)					
Alternative SJ-S1	Pond A18 Subsurface Intake (SJ In 1, SJ P1, SJ P2a)	47	South Bay Deep Water Outfall (Br 1)	42	89
Alternative SJ-O1	Artesian Slough Open Intake (SJ In 2, SJ P1, SJ P2b)	38	South Bay Deep Water Outfall (Br 1)	42	80
Alternative SJ-O2	Artesian Slough Open Intake (SJ In 2, SJ P1, SJ P2b)	38	Pond A18 Horizonal Levee (SJ Br 2)	34	72
Mountain View (MV)					
Alternative MV-S1	Pond A2E Subsurface Intake (MV In 1, MV P1, MV P2a)	53	South Bay Deep Water Outfall (Br 1)	42	95
Alternative MV-S2	Pond A2E Subsurface Intake (MV In 1, MV P1, MV P2a)	53	MV-PA Horizontal Levee (MV-PA Br 2)	43	96
Alternative MV-O1	South Bay Open Intake (MV In 2, MV P1, MV P2b)	54	South Bay Deep Water Outfall (Br 1)	42	96
Alternative MV-O2	South Bay Open Intake (MV In 2, MV P1, MV P2b)	54	MV-PA Horizontal Levee (MV-PA Br 2)	43	97
Palo Alto (PA)					
Alternative PA-S1	Charleston Slough/Pond A1 Subsurface Intake (PA In 1, PA P1, PA P2a)	55	South Bay Deep Water Outfall (Br 1)	42	97
Alternative PA-S2	Charleston Slough/Pond A1 Subsurface Intake (PA In 1, PA P1, PA P2a)	55	MV-PA Horizontal Levee (MV-PA Br 2)	43	98
Alternative PA-O1	Charleston Slough Open Intake (PA In 2, PA P1, PA P2a)	38.5	South Bay Deep Water Outfall (Br 1)	42	80.5
Alternative PA-O2	Charleston Slough Open Intake (PA In 2, PA P1, PA P2a)	38.5	MV-PA Horizontal Levee (MV-PA Br 2)	43	81.5
Alternative PA-O3	South Bay Open Intake (PA In 3, PA P1, PA P2b)	56	South Bay Deep Water Outfall (Br 1)	42	98
Alternative PA-O4	South Bay Open Intake (PA In 3, PA P1, PA P2b)	56	MV-PA Horizontal Levee (MV-PA Br 2)	43	99

Legend: Green shading = top scored/ranked desalination project alternatives
Yellow shading = high scored desalination project alternatives
Red shading = low scored desalination project alternatives
Purple shading = lowest scored/ranked desalination project alternative

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Chapter 14. Recommendations and Next Steps

14.1 Introduction

This section summarizes the recommendations and next steps for planning of a seawater desalination project (desalination project) in Santa Clara County. This section was prepared based on the key findings of the environmental evaluations, planning evaluations, and scoring and feasibility evaluation. Recommendations and next steps are identified to aid in the eventual selection of project options, confirm and expand upon the findings of this study, and for future phases of project development.

14.2 Selection of Project Options and Alternatives

14.2.1 Intake Options

The following ranks the preference of intake options and discusses next steps based on the environmental evaluations conducted in this study. Note that subsurface intakes are preferred before open intakes regardless of option scoring due to regulations that require evaluation of subsurface intakes first.

1. **Charleston Slough/Pond A1 Subsurface Intake (Pa In 1)** and **Pond A2E Subsurface Intake (MV In 1)**. *These are the preferred intake options because they are the highest scoring subsurface intake options.* These options are preferred over open intake options in the San Francisco Bay (Bay) (MV In 2, PA In 3) because subsurface intakes are priority in the Water Quality Control Plan for Ocean Waters of California (Ocean Plan). Next steps should include site-specific study to evaluate groundwater supplies and quality, determine if sufficient water is available to provide 20 million gallons per day for the desalination project or what quantity of water is available, and potential impacts to salt marsh habitats from intake of this water. If further study shows significant impacts to salt marsh habitats would occur, then these subsurface intake options are likely not feasible. PA In 1 scored slightly higher.

2. **Pond A18 Subsurface Intake option (SJ In 1)**. The Pond A18 Subsurface Intake option is likely very difficult to implement due to other projects planned at Pond A18 and proximity to the San Jose/Santa Clara Regional Wastewater Facility (RWF) discharge. However, it is preferred over open intake options due to permitting agency regulations. Valley Water may be able to determine this subsurface intake is not feasible by collecting additional information on the ecotone project at Pond A18.

3. **South Bay Open Intake Options (PA In 3 and MV In 2)**. The open intakes drawing in source water directly from the Bay in Mountain View (MV In 2) and Palo Alto (PA In 3) may present good intake options if the subsurface intakes are determined not to be feasible. However, further evaluation of these options should not occur until further progress has been made on evaluating feasibility of subsurface intake options. PA In 3 scored slightly higher.

4. **Charleston Slough Open Intake (PA In 2)** and **Artesian Slough Open Intake (SJ In 2)**. The Artesian Slough Open Intake option appears to have many constraints based on the desktop level environmental evaluations conducted for this study. However, it's unclear if the high volume of wastewater effluent discharged adjacent to this option affects the composition of marine organisms or habitat conditions/quality at this location. The site-specific environmental conditions should be studied further because changes to the findings in this study could make this open intake option more desirable. Valley Water should also conduct a study of source water to determine if it would have lower levels of salinity, which would reduce energy use, or elevated levels of other constituents of concern which may add treatment requirements. If further study does not change the environmental evaluation in this study for this option, then this intake option would have no advantages compared to other open intake locations; and therefore, Valley Water should focus future evaluation of open intakes on options in the Bay. The Charleston Slough Open Intake has many constraints and no advantages compared to other open intake locations; and therefore, Valley Water should focus future evaluation of open intakes on the other options. PA In 2 scored slightly higher.

14.2.2 Brine Management Options

The following ranks the preference of brine management options and discusses next steps based on the environmental evaluations conducted in this study.

1. **Mountain View–Palo Alto Horizontal Levee (MV-PA Br 2)**. *The preferred brine management option if brine can be blended with wastewater.* The Mountain View–Palo Alto Horizontal Levee is preferred for brine management. It is ideal if this option can be developed in the Palo Alto Flood Control Basin (outside of the Don Edwards San Francisco Bay National Wildlife Refuge [Refuge]) and brine can be blended with wastewater effluent to reduce salinity levels and avoid/minimize impacts to salt marsh habitat and obtain compliance with discharge requirements. Valley Water should study regional opportunities for blending brine with wastewater effluent to discharge to the horizontal levee. Alternatively, if salinity levels can be reduced, this option may also obtain approval to be developed in the Refuge. It should also be noted that this horizontal levee could not overlap the area of a subsurface intake in Mountain View or Palo Alto.

2. **South Bay Deep Water Outfall (Br 1)**. The South Bay Deep Water Outfall may also present a good option for discharging brine if significant dilution can be obtained immediately upon discharge to the deep Bay and/or brine can be blended with wastewater effluent and impacts to marine organisms can be minimized. Valley Water should study dilution rates and regional opportunities for blending brine with wastewater effluent to discharge to deep water in the Lower South Bay.

3. **Pond A18 Horizontal Levee (SJ Br 2)**. The Pond A18 Horizontal Levee has many constraints and is at the same location as a planned ecotone for the South San Francisco Bay Shoreline Levee Project (Phase I) and Santa Clara/San Jose RWF Master Plan. This planned ecotone could present conflicts or potentially an opportunity for the desalination project. If there is an opportunity to blend brine with wastewater effluent from the Santa Clara/San Jose RWF and discharge to the ecotone at lower salinity levels, this could be an ideal location for a cooperative discharge project. If there is insufficient capacity for this discharge or other barriers to blending brine with wastewater effluent, then this brine management option could not be developed for the desalination project. Valley Water should explore the option of a cooperative project at this location, which could make it the preferred brine management option if no other options for blending brine with wastewater exists.

14.2.3 Treatment Facility Planning Areas

The San Jose and Potential San Jose Treatment Facility Planning Areas (TFPAs) provide more land where a treatment facility could be potentially developed. However, this area is on Santa Clara/San Jose RWF lands and would need to be compatible with existing and future planned land uses. The best opportunities for compatibility are in the south of the San Jose TFPA where commercial uses are identified in the Santa Clara/San Jose RWF Master Plan. Additionally, the southern area is further away from senstive biological habitats associated with the shoreline and less susceptible to potential future inundation from climate change.

The Mountain View-Palo Alto TFPA is much smaller because limited areas are potentially available for a treatment facility north of State Route 101. This TFPA is also located close the shoreline which presents several constraints limiting the space available for a treatment facility. Specifically, a treatment facility would need to be located more than 100 feet from the shoreline, as required by the San Francisco Bay Plan, avoid or minimize impacts to senstive biological habitats, and plan for inundation due to climate change inundation.

14.2.4 Seawater Desalination Project Alternatives

The following ranks the preference of desalination project alternatives into alternative tiers, based on the discussion of intake and brine management preferences and recommendations above in this chapter. Similar to the ranking for intake and brine management options above, alternatives with subsurface intakes are preferred before open intakes regardless of option scoring due to regulations that require evaluation of subsurface intakes first.

1. **Alternatives PA-S2** and **MV-S2.** Alternatives with subsurface intakes in Mountain View and Palo Alto and the Mountain View and Palo Alto horizontal levee brine management option *combine the preferred intake and brine management options.* PA-S2 scored slightly higher.

2. **Alternatives PA-S1** and **MV-S1.** Alternatives with subsurface intakes options in Mountain View or Palo Alto and the outfall brine management option combine the preferred intake options and the second brine management option available in Mountain View and Palo Alto. PA-S1 scored slightly higher.

3. **Alternative SJ-S1**. This alternative combines the subsurface intake in San Jose and the outfall brine management option. It is preferred over alternatives with open intake options that scored higher because it includes a subsurface intake which is preferred by regulations. However, the subsurface intake option in San Jose may be difficult to implement, as discussed.

4. **Alternatives PA-O4** and **MV-O2.** Alternatives with open intakes in the South Bay and the Mountain View and Palo Alto horizontal levee brine management option combine the second ranked intake options and preferred brine management option. PA-04 scored slightly higher.

5. **Alternatives PA-O3** and **MV-O1.** Alternatives with open intake in the South Bay and the outfall brine management option combine the second ranked intake options and the other brine management option for these locations. PA-03 scored slightly higher.

6. **Alternative SJ-O1.** The alternative with the open intake in Artesian Slough and the horizontal levee combines the open intake option currently ranked lower than the open intakes in the Bay. If the horizontal levee is not compatible with the ecotone planned at Pond A18 then this alternative is not feasible.

7. **Alternative SJ-O2.** The alternative with the open intake in Artesian Slough and the San Jose horizontal levee brine management option combines the open intake option ranked lower than open intakes in the South Bay and the lowest ranked brine management option. If the horizontal levee is not compatible with the ecotone planned at Pond A18 then this alternative is not feasible.

8. **Alternatives PA-O1** and **PA-O2.** Alternatives with open intakes in sloughs and either brine management option have no advantages compared to other alternatives due to constraints associated with these intake option. PA-O2 scored the highest followed by PA-O1.

The ranking of desalination project alternatives does not consider constraints of the TFPAs. If siting of the treatment facility becomes difficult due to the limited suitable space available in the Mountain View-Palo Alto TFPA, then Valley Water should evaluate if the treatment facility can be located further away including in San Jose or other areas not evaluated in this study.

14.3 Confirming and Updating Study Findings

14.3.1 Environmental and Planning Evaluations

The following discusses additional information and data that should be collected to confirm and update the environmental evaluations conducted in this study.

- **Water Quality.** Water quality data was collected for this study from existing publicly available data and a limited amount of data was found for the Lower South San Francisco Bay (South Bay) and other intake option locations. As discussed in Section 4.6.1, "Source Water Quality Data Monitoring Program," Valley Water should develop a monitoring program to collect source water quality data, regardless of the intake options pursued, to further characterize the source water quality including salinity levels and other constituents of concerns. This additional data should be used to update the estimated brine and treated water quality and refine the evaluation of requirements for pre-treatment, reverse osmosis, and post-treatment. This will also help refine estimates of energy use. Additional information on key issues in the source water and receiving water evaluations should be updated based on coordination with regulatory agencies and other stakeholders (*see* Section 14.3.3, "Agency/Stakeholder Coordination").

- **Environmental Conditions.** Information on environmental conditions in this study was collected at a desktop level by using publicly available documents and databases. This information should be verified and updated by conducting field surveys, including for land cover and vegetation, suitable habitat for special-status species, and cultural resources. Additionally, each source water should be studied to further evaluate water supply availability, except for the open intake options in the Bay which are known to have sufficient water. This site-specific field data should be used to update the siting analysis and permitting requirements in **Appendix D** and Chapter 11, "Permitting."

- **Land Use and Planning.** Additional information on key issues in the planning evaluation should be updated based on coordination with regulatory agencies and other stakeholders (*see* Section 14.3.3, "Agency/Stakeholder Coordination").

- **Energy.** Energy use estimates were prepared using the water quality estimates and several assumptions of project conveyance and operations. These estimates should be updated as additional information is collected on source water quality and treatment requirements, use of energy recovery devices, pipeline lengths and elevation changes, and other key assumptions.

- **Climate Change.** Greenhouse gas estimates from electricity purchases were prepared using the energy use estimates and should be updated as the energy use estimates are updated. Flood-related climate change hazards were developed based on extensive data available for the Lower South Bay. A climate change inundation scenario (i.e., sea level rise and compound events) should be selected for project planning and the project options climate change vulnerability evaluation should be updated based on the scenario used.

Information in the planning evaluations including **Appendix D** should also be updated as the environmental evaluations are updated and input is obtained from coordination with regulatory agencies and other stakeholders (*see* Section 14.3.3, "Agency/Stakeholder Coordination").

14.3.2 Agency/Stakeholder Coordination

The following key issues should be discussed with regulatory agencies. Collecting this information early is helpful for updating the environmental and planning evaluations and evaluation of project options and alternatives conducted in this study. Alternatively, as project planning progresses, this outreach could be conducted for the preferred option(s)/alternative(s) to obtain input on key input and requirements of the project.

- **State Water Resources Control Board**
  - Direct Potable Reuse. 1) How direct potable reuse projects are determined for the Lower South Bay where there are several discharges of wastewater effluent. 2) Anticipated key requirements in forthcoming regulations for direct potable reuse.
  - Division of Water Rights. If appropriative water rights are required for use of surface water supplies from the Bay.
- **Regional Water Quality Control Board**
  - San Francisco Bay Basin Water Quality Control Plan: San Francisco Bay Region (Basin Plan). 1) If the Basin plan can be amended to add municipal as a purpose of use for the Bay/Lower South Bay and the level of difficulty /controversy of this process. 2) If horizontal levees are seen as a viable method for brine discharge. 3) If brine can be blended to reduce salinity levels.
  - Ocean Plan. Critical requirements for evaluation of subsurface intake feasibility, such as range of subsurface intakes evaluated, Regional Water Quality Control Board and State Water Resource Control Board role in the process, and concerns about subsurface intake options in salt marsh habitats compared to open intake option in the Bay.
- **U.S. Fish and Wildlife Service (USFWS) – Don Edwards San Francisco Bay National Wildlife Refuge.** Discuss compatibility use determination process and key issues related to subsurface intakes, open intake in Artesian Slough, horizontal levees, pump stations, and temporary impacts from construction of conveyance infrastructure.
- **San Francisco Bay Conservation and Development Commission.** Discuss regulations and key issues for a desalination project in the Lower South Bay, including minimize impacts to the extent practicable, subsurface intakes in salt marsh habitat, use of horizontal levees, and environmental justice.
- **City of San Jose.** Collect information on implementation of the Santa Clara/San Jose RWF Master Plan including if future land uses have changed in areas evaluated for project options.
- **City of San Jose and U.S. Army Corps of Engineers.** 1) Collect additional information on the scope and schedule for the ecotone planned at Pond A18. 2) Discuss possibility of blending desalination project brine with wastewater effluent for a cooperative discharge project on the ecotone at Pond A18.

- **Other Municipalities Operating Local Wastewater Facilities.** Opportunities for blending wastewater effluent with brine for discharge via horizontal levees and/or the South Bay Deep Water Outfall.
- **City of Palo Alto.** Possibility of constructing a horizontal levee in the Palo Alto Flood Control Basin, if brine can be blended and water quality is suitable for discharge.
- **South Bay Salt Ponds Restoration Project.** Collect additional information on the Phase 2: Alviso Mountain View Pond Cluster Project and potential future habitat restoration project as Pond A2E in Mountain View.

14.4 Future Phases of Project Development

As project options are selected and designed, information in this study should be used to avoid and minimize environmental impacts and regulatory requirements to the extent possible. The engineering feasibility evaluation should be organized around the preferred project options and desalination project alternatives identified in this study. Subsurface intakes should be evaluated first and environmental information in this study should be supplemented with additional information required to complete feasibility analysis required by the Ocean Plan (per the Water Code section 13142.5[b]). The following should be considered in the next phases of project development.

- Because of the Ocean Plan's requirement for evaluating feasibility of subsurface intakes before considering open intakes, Valley Water should determine if there are other possible subsurface intake options in Santa Clara County that should be considered for the desalination project, including options which extract more brackish water.
- Because of the Ocean Plan's preference for blending brine with wastewater effluent and the need to achieve compliance with Basin Plan discharge requirements, Valley Water should prioritize coordination with operators of wastewater facilities discharging to the Lower South Bay to identify options for blending brine with wastewater effluent. Additionally, Valley Water should conduct a dilution study and mixing zone analysis.
- Consider other creative/non-traditional strategies of brine management, such as providing brine to local salt production companies for use.
- Further develop the horizontal levee options by estimating the capacity and optimal conceptual design such that the area needed for discharge can be determined and evaluated further.
- Identify and evaluate sites for a treatment facility including further inland in Mountain View and Palo Alto – outside of the Mountain View-Palo Alto TFPA included in this study.
- Identify if there are further inland sits for the intake pump station at each location.
- Explore options to obtain energy for the desalination project from the Power and Water Resources Pooling Authority (PWRPA) or other existing or new sources of renewable energy.

- Identify electrical transmission and distribution infrastructure needed to obtain power from PWRPA or other energy sources and identify environmental and regulatory constraints of potential alignments.
- Consider state and federal funding opportunities for desalination projects, including the following:
    - California Department of Water Resources (DWR), Water Desalination Grant Program[1]. DWR provides grants to local agencies for the planning, design, and construction of projects to desalinate naturally-occurring brackish and ocean water for potable water supply. It also provides grants for pilot, demonstration, and research projects.
    - U.S. Bureau of Reclamation (Reclamation), WaterSMART Program[2]. Reclamation released a funding opportunity for planning and pre-construction activities to facilitate development of water reuse and desalination projects. Funding made available is intended to provide assistance to prepare feasibility studies and undertake other planning activities for potential new Title XVI Water Reclamation and Reuse projects, Desalination Construction projects, and Large Scale Water Recycling projects.

[1] Available: https://water.ca.gov/Work-With-Us/Grants-And-Loans/desalination-Grant-Program
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Chapter 13. Scoring and Feasibility

No references were used in this chapter.

Chapter 14. Recommendations and Next Steps

No references were used in this chapter.

GEI Consultants