APPENDIX G2

BIOLOGICAL RESOURCES

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Acronyms/Abbreviations

BMPs	best management practices
CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Database
GIS	Geographic Information System
NMFS	National Marine Fisheries Service
ppb	part(s) per billion
RO	reverse osmosis
ROW	right-of-way
Se	selenium
Service	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

This appendix describes general habitat types (vegetation communities) that could be affected by proposed project features and activities, and the aquatic and terrestrial flora and fauna that could occur in each described habitat type. Also described are special-status plant, vertebrate, and invertebrate species that could be affected by implementation of the project. The purpose of this appendix is (1) to provide an overview of the vegetation and wildlife communities and special-status resources that occur in the study area and (2) to identify potential biological impacts associated with each alternative. It is organized into the following sections:

- Selenium bioaccumulation
- Terrestrial resources
- Aquatic resources
- Special-status species

A detailed assessment of potential impacts cannot be completed at this time. At this current stage of project development, data gaps and unresolved biological resource issues still remain. Final site selections have not yet been made for some potential features and detailed designs and specifications have not yet been completed. In most cases, project features and biological data are depicted at scales no better than 1:24000, with most habitat types coarsely mapped at 1:100000. Neither aerial photographs nor detailed on-site field surveys were completed to accurately inventory and map vegetation, wetland boundaries, sensitive habitats, or species occurrences.

The following issues and data gaps will be more thoroughly addressed in the feasibility study:

Ocean Disposal Alternative

- Determining at a higher level of detail the locations and extent of potential significant impacts to special-status species and sensitive habitats along the aqueduct corridor and identifying appropriate Best Management Practices (BMPs) and avoidance or mitigation measures necessary to reduce impacts to less-than-significant levels
- Determining at a higher level of detail the locations and extent of impacts to jurisdictional wetlands and other waters of the U.S. associated with stream crossings along the aqueduct corridor and identifying appropriate avoidance or mitigation measures as necessary
- Further evaluating the ecological risks (or absence of risks) associated with the effluent discharge at Point Estero to marine, nearshore, and shoreline resources

Delta Disposal Alternatives

- Determining at a higher level of detail the locations and extent of potential significant impacts to special-status species and sensitive habitats along the aqueduct corridor and identifying appropriate BMPs and avoidance or mitigation measures necessary to reduce impacts to less-than-significant levels
- Determining at a higher level of detail the locations and extent of impacts to jurisdictional wetlands and other waters of the U.S. associated with stream crossings and coastal brackish marshes along the aqueduct corridor and identifying appropriate avoidance or mitigation measures as necessary

- Further evaluating the regulatory and ecological consequences of discharging selenium (Se)-contaminated effluents at Chipps Island and Carquinez Strait that exceed established water quality criteria for protecting aquatic life currently accepted by the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service (Service), National Marine Fisheries Service (NMFS), and the State Water Resources Control Board.

In-Valley Disposal Alternative

- Developing consensus support among regulatory agencies and the public for creating Se-contaminated evaporation basins that far exceed Kesterson Reservoir in terms of size.
- Developing consensus agreement on evaporation pond mitigation requirements
- Developing consensus agreement on alternative/compensation habitat locations, design, construction timetable, management, and monitoring.
- Developing strategies for securing adequate firm water supplies to operate the alternative/compensation habitats of the size required to mitigate for the alternative's evaporation ponds.

G2.1 SELENIUM BIOACCUMULATION

Although arsenic, boron, mercury, and other elements found in agricultural drainwater are known to adversely affect fish and wildlife species, Se is generally considered the most harmful drainwater contaminant in San Joaquin Valley.

Se is an important nutritional trace element and is essential in several biochemical reactions, but in excess concentrations, can lead to numerous chronic and acute effects. Different wildlife species and different life stages exhibit different sensitivities. In addition, toxicity varies for different forms (or species) of Se, duration of exposure, method of uptake, and other factors. Waterfowl and shorebirds are particularly sensitive, and bird embryos are the most sensitive avian life stage.

Organic forms of Se are more toxic than inorganic forms, with selenomethionine being the most toxic. Insoluble Se in San Joaquin Valley soils is biologically unavailable until oxidized into soluble forms such as selenate or selenite. Selenate is the most common aqueous form of Se in drainwater. Once soluble Se is available, it can be substituted for sulphur in metabolic reactions to produce a variety of organic amino acid forms. These seleno-amino acids are then available to build proteins in organisms in aquatic and terrestrial food chains.

Se is taken up by aquatic biota, including phytoplankton, zooplankton, and insects, that contribute to the diets of higher forms of wildlife. In particular, bioaccumulation of Se in the food chain has caused the deaths of fish and aquatic birds and has led to reproductive failure and deformed offspring. Animals readily absorb dietary plant Se. Most injested Se is quickly metabolized and eliminated, but the remaining Se becomes incorporated into blood and tissue and is only slowly eliminated.

Selenate and selenite are biotransformed into organic chemical species after uptake by primary producers such as algae. The speciation of dissolved Se in water strongly influences how much aquatic Se is required to bioaccumulate dangerous concentrations in the food chain, but waterborne speciation does not appear to influence the unit toxicity of food chain incorporated

Se. After Se becomes incorporated in the food chain, the issue of chemical speciation does not appear to be an important interpretive factor. Toxicologically, food-chain Se in nature seems to be fairly uniform, with a toxicity profile very similar to that of selenomethionine. This interpretive consideration is particularly useful since dietary exposure is the primary exposure pathway for fish and wildlife populations (U.S. Department of the Interior 1998).

Se was found to be toxic to fish and waterbirds in 1980 and 1981, when Se from drainwater originating in the study area bioaccumulated in the aquatic food chain in evaporation ponds at Kesterson Reservoir. Algae and rooted plants bioconcentrated the Se by about 560-fold and 600-fold, respectively. Zooplankton and aquatic invertebrates (insects) feeding on the algae and rooted plants biomagnified the Se by about 1.2-fold and 1.7-fold, respectively. Fish feeding on zooplankton and aquatic insects also biomagnified the Se by about 1.2- to 2.2-fold. The net result was that the Se bioaccumulation factor from water to fish was 1,540-fold in the Kesterson evaporation ponds. A similar degree of bioaccumulation of Se took place in waterbirds, but was dependent on whether their food source was benthic or herbaceous (Johnson et al 1997). Se bioaccumulation is discussed in more detail in Appendix G1.

G2.2 TERRESTRIAL RESOURCES

G2.2.1 Affected Environment

The following paragraphs describe the major terrestrial habitat types that are likely to be affected by project construction and operation. Except where noted, the habitat types used in this report follow the classification system developed by Mayer and Laudenslayer (1988). These classifications are used in the *California Wildlife Habitat Relationship System* (CDFG 1999) and cross-referenced with similar plant community classes used in the *California Natural Diversity Database* (CNDDB, CDFG 2001) and *California Gap Analysis Project* (CDFG 1998).

- **Agricultural Lands (CRP, OVN).** Agricultural lands, which include active and retired croplands (CRP) and orchards/vineyards (OVN), are the largest vegetation cover type in San Joaquin Valley and are also found along all pipeline routes. Most croplands in San Joaquin Valley are concentrated along the central, flatter portion of the valley with orchards and vineyards extending into the lower foothills. Ninety-eight percent of the cropland is irrigated (Reclamation 1991). Cotton, corn, and vegetable crops account for approximately 80 percent of the agricultural lands, while alfalfa and small grains and orchards/vineyards account for approximately 15 percent and 5 percent, respectively. Agricultural development has greatly reduced wildlife richness and diversity in the study area, although some species (e.g., some rodents, small mammals, birds) have adapted. Harvesting practices, the mosaic of the landscape, the amount and proximity of undisturbed vegetation, and the type of food and foraging cover provided by the crops all have effects on the value of the agricultural land as wildlife habitat.
- **Alkali Desert Scrub (ASC).** Relict stands of this shrub-dominated habitat type are widely scattered throughout San Joaquin Valley, but are more commonly found in Tulare Basin, south of the study area. The habitat type has also been referred to as San Joaquin Saltbush and Chenopod Scrub. It occurs in areas characterized by impeded drainage with fine-textured, alkaline, or saline soils. ASC is generally dominated by salt-tolerant shrub and

subshrub species such as perennial saltbush, iodine bush, alkali blite, and goldenbush. Forbs and grasses include alkali heath, alkali weed, pickleweed, alkali sacaton, and saltgrass. Wildlife associated with this habitat type are specifically adapted to its open, sparsely vegetated, dry conditions. These wildlife include several special-status species, which are discussed in Section G2.4.

- **Annual and Perennial Grasslands (AGS, PGS).** These habitat types occur throughout the Central Valley and along the potential pipeline routes, mostly on level plains to gently rolling foothills at elevations immediately higher than or surrounding valley-foothill riparian and alkali desert scrub. Annual grasslands (AGS) are comprised primarily of introduced annual grasses and forbs such as oats, ripgut brome, soft chess, and barley. Habitat value of the AGS habitat type is variable, depending largely on current management and the history and intensity of grazing. Remaining stands of perennial grasslands (PGS) are quite rare, but can still be found in areas such as Great Valley Grasslands State Park. The PGS habitat type is typically associated with moist, lightly grazed relict areas within the annual grassland habitat. Characteristic native species include purple needlegrass and alkali sacaton.

  Grassland habitats are important foraging areas for a large number of species, including several species of hawks and swallows, mourning doves, loggerhead shrike, coyotes, and badgers. The habitat type supports large populations of small prey species, such as deer mice, pocket gophers, voles, and ground squirrels. Birds such as killdeer, ring-necked pheasant, western meadowlark, western kingbird, and horned lark nest in grassland habitats. Common reptiles and amphibians of grassland habitats include western fence lizard, common kingsnake, western rattlesnake, common garter snake, and western toad. An extensive list of terrestrial special-status species are also associated with the grassland habitat types.

  Vernal pool communities, shallow depressions filled with water from winter storms that subsequently dry up during spring or early summer, are a rare and protected form of wetlands found only within grassland habitats. The salinity, alkalinity, and the length of time that water persists generally determine plant species composition of vernal pools. A unique assemblage of special-status plant and invertebrate species is associated with the ephemeral pools.

- **Chamise-Redshank Chaparral (CRC).** Chaparral, characterized by woody, often hard-leaved shrubs, comprises a nearly impenetrable thicket. Mature chamise-redshank chaparral is generally single-layered with little or no herbaceous layer. Shrub canopies frequently overlap and are often impenetrable. Depending on climatic and geographic conditions, this habitat type may consist of nearly pure stands of chamise or redshank, a mixture of both, or with other shrubs. The purest stands of chamise occur on xeric, south-facing slopes. On more moist sites, toyon, sugar sumac, poison oak, and spiny redberry and California buckthorn are common associates with chamise. Common redshank associates are sugar bush, laurelleaf sumac, and ceanothus. Within the study area, CRC is likely only to be encountered along the Ocean Disposal pipeline route.

- **Coastal Oak Woodland (COW).** This habitat type is extremely variable. The overstory consists of deciduous and evergreen hardwoods (mostly oaks up to 70 feet tall) sometimes mixed with scattered conifers. In mesic sites, the trees are dense and form a closed canopy. In drier sites, the trees are widely spaced, forming an open woodland or savannah. The understory is equally variable, sometimes composed of nearly impenetrable shrubs from adjacent chaparral or coast scrub, but more commonly shrubs are scattered among the trees. In the closed canopy sites the understory varies from lush cover of shade-tolerant shrubs, ferns, and herbs to sparse cover with a thick carpet of litter. In the open woodland sites the understory is grassland, sometimes with scattered shrubs

- **Coastal Scrub (CSC).** Within the study area, the CSC habitat type is usually found within 50 miles of the ocean at elevations ranging from sea level to 3,000 feet. CSC intergrades with coastal dune and AGS habitat types at lower elevations and with COW, CRC, and AGS at higher elevation inland sites. Low to moderate-sized shrubs up to 7 feet tall typify the CSC habitat type. Canopy cover usually approaches 100 percent, although bare areas are sometimes present. Sufficient light penetrates through the dense shrub canopy to support an herbaceous understory. Dominant vegetation includes California sagebrush, black sage, and California buckwheat. Common wildlife species occurring in CSC include western fence lizard, California quail, Heerman's kangaroo rat, grey fox, coyote, and mule deer.
- **Montane Riparian (MRI).** The MRI habitat type occurs only at higher elevations in the study area (e.g., in mountainous terrain associated with the Ocean Disposal pipeline route). Because it typically is found along high gradient mountain streams with narrow floodplains, MRI vegetation generally is confined to narrow bands along the water's edge and to low terraces and gravel bars within the channel. The vegetation is quite variable and often structurally diverse, frequently occurring as a dense, continuous, multilayered grove of broadleaved, winter deciduous trees with a dense shrub layer of willows, alders, buttonbush, mulefat, and poison oak. In the southern Coast Range, Fremont cottonwood, bigleaf maple, and California bay are typical dominants of the overstory. Along small streams and seeps, the overstory can be comprised entirely of shrub species such as alder or willow. All riparian habitats have an exceptionally high wildlife value. Typical wildlife species that frequent the streamside vegetation include riparian obligate migratory birds (Wilson's warbler, yellow warbler, and many more), bats, shrews, red-legged frog, western grey squirrel, and deer. Also see the Valley Foothill Riparian section below.
- **Ruderal Vegetation.** This common habitat type is always associated with disturbed lands. It can occur as large areas (e.g., abandoned croplands) or as small inclusions within other terrestrial communities. In the study area, it is most typically associated with road and utility right-of-way (ROWs), field borders, ditch ROWs, and abandoned fields. Vegetation usually consists of scattered native shrubs, generally with nonnative herbaceous species dominating the understory. Habitat value is typically low for most terrestrial wildlife species, although the extensive "network" of ruderal vegetation associated with farm roads, irrigation ditches, and fencelines in San Joaquin Valley provides wildlife movement corridors in the otherwise agriculture-dominated landscape. (NOTE: While this habitat type is described here, it does not appear as a mappable unit in the digital vegetation map used in this assessment of impacts.)
- **Urban (URB).** The urban habitat type consists of developed residential, commercial, and industrial areas, typically with permanent structures. In the study area, mappable areas of URB could range from individual farmsteads to residential subdivisions to cities and towns. The structure of vegetation varies, with five types of vegetative structure defined: Tree Grove, Street Strip, Shade Tree/Lawn, Lawn, and Shrub Cover. Species composition varies with planting design and climate. A distinguishing feature of urban wildlife habitat is the

mixture of native and exotic plant species. Within the URB habitat type, both native and exotic species are valuable, with exotic species providing a good source of additional food such as fruits and berries.

- **Valley Foothill Riparian (VRI).** This habitat type is found in valleys and bottomlands bordered by sloping alluvial fans, slightly dissected terraces, lower foothills, and coastal plains. It is generally associated with low velocity flows, floodplains, and gentle topography. In the study area, major VRI habitats are associated with the San Joaquin and Salinas rivers and several major tributary streams both inside and outside of San Joaquin Valley. Dominant tree species include Freemont cottonwood, California sycamore, valley oak, white alder, boxelder, and Oregon ash. Shrub layer plants include wild grape, wild rose, California blackberry, blue elderberry, poison oak, buttonbrush, and willows. The herbaceous layer consist of sedges, rushes, grasses, miner's lettuce, Douglas sagewort, poison hemlock, and hoary nettle. All riparian habitats have an exceptionally high value for many wildlife species. A large number of riparian obligate migratory birds forage and nest in the VRI habitat type, as well as a long list of common and frequently observed birds, reptiles, amphibians, and mammals. Numerous special-status species are associated with riparian habitats in the study area.
- **Valley Oak Woodland (VOW).** VOW is a subtype of Valley Oak Hardwood that occupies the lower flanks of Coast Range valleys from sea level to 2,540 feet in elevation. The VOW habitat type is considered a rare natural community. VOW varies from savanna-like to forest-like stands, with partially closed canopies, comprised mostly of winter-deciduous, broad-leaved species such as valley oak, western sycamore, interior live oak, box elder, and black walnut. Almost exclusively valley oaks dominate the canopies. Mature valley oaks range in height from 50 to 115 feet. The shrub layer is best developed along natural drainages, becoming insignificant in the uplands with more open stands of oaks. Valley oak stands with little or no grazing tend to develop a partial shrub layer of bird-disseminated species, such as poison oak, toyon, and coffeeberry. Ground cover consists of a well-developed carpet of nonnative annual grasses and forbs such as ripgut grass, wild oats, rye grasses, Italian ryegrass, falarees, brome grasses, wild oats, fiddlenecks, needlegrasses, and melic grasses.. Digger pine and coast live oak are associated with this habitat type along the Coast Range. The VOW habitat type could occur along the route of the proposed Ocean Disposal aqueduct.

G2.2.2 Environmental Consequences

The preliminary impact assessment presented in this report does not focus on changes in the populations of individual species. Instead, generalized habitat types (i.e., vegetation communities) are described and impacts to the generalized habitat types are assessed. It is assumed that if a project feature or activity impacts a mappable area of habitat, the individual species or guilds of species that commonly use that habitat may also be affected.

This section of the report focuses on impacts to terrestrial habitats. Wetland or aquatic habitat types and special-status species that are protected under Federal and State endangered species laws are addressed in Sections G2.3 and G2.4.

G2.2.2.1 Assessment Methods

Information about the study area's terrestrial habitat types and wildlife species was developed from reviews of relevant biological databases and literature, including an extensive collection of earlier project-related documents and reports. The generalized habitat types described in this report are based on the classification system developed in *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988) and digitally mapped in the *California Gap Analysis Project* (CDFG 1998). All generalized habitat types were digitally mapped at a scale of 1:100,000 with minimum mapping units of approximately 250 acres. Rare or uncommon habitat types (rare plant communities) that could occur in the study area are described using the classification system developed by Holland (1986) and digitally mapped at 1:24000 scale in the CNDDB (CDFG 2001).

At the current stage of planning, a thorough and accurate accounting of project impacts to terrestrial wildlife resources is not possible. At the time of this report, neither the individual project features, nor the study area's biotic environment have been characterized in sufficient detail to permit such an accounting. Project impacts have instead been assessed using a coarse resolution Geographic Information System (GIS) analysis. The project features for each alternative were mapped at 1:24000 scale using U.S. Geologic Survey (USGS) topographic maps and related to 1:100,000 scale vegetation maps showing locations of the generalized habitat types. The minimum mapping unit for the habitat type polygons was approximately 250 acres. Using this method, potential impacts were assessed at a community (i.e., habitat type) level. This appraisal-level approach assumes that actions that affect identifiable areas of habitat will likely have the same general effect on the species that occur in the habitat; that is, if an area that can be characterized as a specific habitat type is adversely affected, its associated plants and animals most likely would be similarly affected. Using this method, a coarse quantitative estimation of the amount of each habitat type that would be affected by construction of project features was determined.

G2.2.2.2 Significance Criteria

The following significance criteria for terrestrial biological resources are based on California Environmental Quality Act guidelines and other established standards related to protection of terrestrial species and their habitats. Significance criteria for wetland and aquatic resources and for special-status species are addressed in Sections G2.3 and G2.4.

For any project features or activities that could affect terrestrial biological resources, project impacts would be considered significant if they result in:

- Substantial loss, degradation, or contamination of natural communities that provide habitat for terrestrial wildlife species or are recognized for scientific, recreational, ecological, or commercial importance (e.g., riparian areas, native grasslands, oak woodlands)
- Substantial adverse effects on natural communities or habitats that are specifically recognized as biologically significant in local, State, or Federal policies, statutes, or regulations.
- Substantial interference or disruption to natural wildlife movement corridors used by resident or migratory wildlife

- Fragmentation or isolation of important terrestrial wildlife habitats
- Direct mortality, significant reduction in local population size, or lowered reproductive success of individual species such that abundance is substantially affected.

G2.2.2.3 Impacts of the No Action Alternative on Terrestrial Habitat

The No Action Alternative would have negative and positive impacts to terrestrial biological resources over the 50-year project life.

Changes in cropping patterns would affect the types and quality of terrestrial habitat provided by agricultural lands. For example, various species of wildlife commonly use grain and alfalfa fields, and to a lesser degree, row crops for cover, foraging, and other habitat requirements. An anticipated reduction in the acreage of small grains and alfalfa would reduce this available habitat by an unknown amount. Species that potentially would be affected include foraging raptors and their rodent and small mammal prey species, and field-feeding waterfowl. Lands converted to dry land farming or that would be cropped less intensively would still continue to be disturbed because of periodic cultivation and harvesting and, therefore, would not develop significant wildlife value.

An increase in land retirement, abandonment, or temporary fallowing would also affect terrestrial species. Many operators would be forced to fallow a portion of their fields in multiyear rotations. Permanently idled acres are expected to increase to as much as 78,406 acres by 2050. A portion of these lands will act as salt sinks, collecting and concentrating salts until they support little vegetation or possess little wildlife habitat value. Other abandoned lands would revert in varying degrees to native vegetation or undesirable invasive species.

Conversions to nonagricultural land use would progress in a scattered, uncoordinated manner depending on site-specific conditions and individual farm circumstances. There would be no program of planned placement of abandoned lands into alternative uses or for managing lands removed from production. As a result, an overall potential benefit to wildlife would occur from alternative land use; however, it is expected to be minimal over the 50-year planning horizon.

No new collection facilities would be constructed through 2050. Without construction of additional collection facilities, it is unlikely that substantial investments would be made to construct and operate expensive new drainwater disposal facilities, such as treatment plants, reuse facilities, evaporation pond complexes, or other costly technologies. On-farm source control measures, on the other hand, would undoubtedly expand over the 50-year period, but would have little or no direct impact on terrestrial wildlife resources.

G2.2.2.4 Impacts of the Ocean Disposal Alternative on Terrestrial Habitat

Implementation of the Ocean Disposal Alternative would result in temporary and permanent impacts to both natural and previously disturbed terrestrial habitat types. Impacts would result from construction of the aqueduct (buried pipeline and three tunnels), six tunnel portals, and ten pumping plants. Reuse facilities requiring 27,200 acres would be developed; however, no treatment facilities would be constructed as part of the Ocean Disposal Alternative.

An unspecified amount of terrestrial habitat would also be disturbed for use as temporary access/haul roads, equipment staging areas, and for disposal of excavated materials from tunnel boring and pipeline construction. All temporary and permanent facilities would be sited to avoid impacts to sensitive habitats. Pipeline corridors and temporary staging areas would be restored to preconstruction conditions. Disposal sites for excavated materials would represent a permanent impact and also would be sited to minimize or avoid impacts to undisturbed or sensitive areas. All disposal sites would be contoured, capped with topsoil, and revegetated when excavation is completed.

Assuming a 75-foot construction corridor, construction of the aqueduct would disturb approximately 2,123 acres. Most of the alignment, however, would follow existing highway, railroad, and powerline ROWs, greatly reducing the likelihood of significantly impacting undisturbed or sensitive terrestrial communities. More than 70 percent of the pipeline corridor would traverse cropland and urban habitats. Another 25 percent would cross annual grassland and scattered woodland habitat types. As currently envisioned, all pumping plants would be located on croplands or annual grasslands along the aqueduct corridor. The remaining 5 percent, comprised mainly of stream crossings and other wetland and aquatic resources, is addressed in Section G2.3.

Construction and operation of the four reuse facilities and their associated collection system of canals, drains, and pipelines is not expected to substantially alter the overall habitat value of existing terrestrial resources. However, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features will almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be unlikely. Lands acquired for reuse could range from actively managed croplands, to long-abandoned retired lands, pasture lands, or even rangeland. For acquired lands already under agricultural production, conversion to reuse would likely have little effect on terrestrial habitat value. For retired lands, conversion to cropping practices appropriate to the reuse facilities would result in generally negative effects; however, much would depend on the condition and current management of the acquired lands.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse facilities would likely result in widely distributed, but generally minor and temporary impacts. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs, or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Construction of additional open canals and drains may provide an exposure pathway for Se bioaccumulation and would tend to further fragment the agricultural landscape (already crisscrossed with irrigation ditches, canals, and roads). The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

A total of 59 acres of rare or sensitive terrestrial vegetation communities, as identified and mapped in the CNDDB (CDFG 2001), would be affected by construction or operation of the Ocean Disposal Alternative, including 56 acres of Valley Oak Woodlands and 3 acres of mostly second terrace Valley Foothill Riparian (in the vicinity of the Salinas River crossing).

G2.2.2.5 Impacts of the Delta Disposal Alternatives on Terrestrial Habitat

Implementation of the Delta Disposal Alternatives would result in temporary and permanent impacts to both natural and disturbed terrestrial habitat types. Impacts would result from construction of the aqueduct's pipelines and canals and two pumping plants. An unspecified amount of terrestrial habitat would also be disturbed for use as temporary access/haul roads and equipment staging areas. A Se biotreatment facility would be constructed, but a reverse osmosis (RO) treatment facility would not be needed. Four reuse facilities with their associated collection systems (common to all action alternatives) would be developed.

For the first 188.1 miles, the alignment for both options would be identical. Near West Pittsburg, the Chipps Island alignment would then continue for an additional 1.5 miles before extending into the estuary, while the Carquinez Strait alignment would continue for 18.9 additional miles to its discharge point at Crockett.

Assuming a 100-foot construction corridor for canal segments and a 75-foot corridor for buried pipeline segments, the aqueduct for the Delta-Chipps Island Disposal Alternative would disturb approximately 1,005 acres of habitat. Almost all of the alignment, however, was designed to follow existing highway, canal, railroad, and powerline ROWs, greatly reducing the likelihood of significantly impacting undisturbed sensitive terrestrial communities. Approximately 90 percent of the alignment would traverse agricultural and urban habitats. Nearly 10 percent would cross annual grassland habitat types. The very small remaining percentage consists of stream and wetland crossings that are addressed in Section G2.3.

The aqueduct for the Delta-Carquinez Strait Disposal Alternative would disturb approximately 1,160 acres of habitat. It also would follow existing highway, canal, railroad, and powerline ROWs. Approximately 83 percent of the alignment would traverse agricultural and urban habitats, while 13 percent would cross annual grassland habitat types.

Construction and operation of the four reuse facilities and their associated collection system of canals, drains, and pipelines is not expected to substantially alter the overall habitat value of existing terrestrial resources. However, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features will almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be unlikely. Lands acquired for reuse could range from actively managed croplands, to long-abandoned retired lands, pasture lands, or even rangeland. For acquired lands already under agricultural production, conversion to reuse would likely have little effect on terrestrial habitat value. For retired lands, conversion to cropping practices appropriate to the reuse facilities would result in generally negative effects; however, much would depend on the condition and current management of the acquired lands.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse facilities would likely result in widely distributed, but generally minor and temporary impacts. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Construction of additional open canals and drains may provide an exposure pathway for Se bioaccumulation and would tend to further fragment the agricultural landscape (already crisscrossed with irrigation ditches, canals, and roads). The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

Although potentially significant impacts to rare or sensitive wetland and aquatic vegetation communities may occur under the Delta Disposal Alternatives, no rare or sensitive terrestrial communities, as identified and mapped in the CNDDB (CDFG 2001), would be affected by either Delta Disposal Alternative.

G2.2.2.6 Impacts of the In-Valley Disposal Alternative on Terrestrial Habitat

Implementation of the In-Valley Disposal Alternative would result in temporary and permanent impacts to large areas of active and retired agricultural lands and other previously disturbed sites. Impacts would result from construction of the four reuse facilities and associated collection/conveyance system, pumping facilities, RO and biological treatment facilities, two evaporation basins, and two alternative habitat mitigation areas.

Construction and operation of the four reuse facilities and their associated collection system of canals, drains, and pipelines is not expected to substantially alter the overall habitat value of existing terrestrial resources. However, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features will almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be unlikely. Lands acquired for reuse could range from actively managed croplands, to long-abandoned retired lands, pasture lands, or even rangeland. For acquired lands already under agricultural production, conversion to reuse would likely have little effect on terrestrial habitat value. For retired lands, conversion to cropping practices appropriate to the reuse facilities would result in generally negative effects; however, much would depend on the condition and current management of the acquired lands.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse facilities would likely result in widely distributed, but generally minor and temporary impacts. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Construction of additional open canals and drains may provide an exposure pathway for Se bioaccumulation and would tend to further fragment the agricultural landscape (already crisscrossed with irrigation ditches, canals, and roads). The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

The In-Valley Disposal Alternative would require construction of two evaporation pond facilities totaling approximately 5,063 acres. Each evaporation pond, in turn, would require substantial mitigation in the form of Alternative and/or Compensation Wetland Habitats. The mitigation wetland complexes would be located in close proximity to the evaporation basins and would consist of a still-undetermined mix of permanent, seasonal, and moist-soil wetlands and managed uplands.

Se concentrations of influent drainwater entering the evaporation basins are expected to greatly exceed the U.S. Environmental Protection Agency’s current Freshwater Aquatic Life Criteria of 5 parts per billion (ppb). Anticipated influent Se concentrations in the range of 21 to 120 ppb (mean 77 ppb) would result in a chronic toxicity hazard to waterfowl, shorebirds, and other wildlife utilizing the ponds for foraging or nesting habitat. This hazard represents a significant impact that without appropriate mitigation measures would be considered a violation of the Migratory Bird Treaty Act, and possibly the Endangered Species Act. These impacts are discussed in greater detail in Sections G2.3 and G2.4.

As currently proposed, both evaporation pond facilities and their associated mitigation wetlands would be located on land currently classified as cropland and/or orchard/vineyard. Construction of the RO treatment plant and Se biotreatment facilities, totalling approximately 166 acres, presumably would occupy similar habitat types, as would the approximately 600 acres required for construction of pumping facilities and conveyance pipelines/canals connecting the various facilities. Depending on the final site selections, a portion of the potential sites may occur on retired lands. At the present time preferred locations have not been finalized.

Siting of the evaporation ponds would result in conversion of approximately 5,100 acres of existing agricultural land (cropland, retired cropland, and/or orchard/vineyard) to low value (i.e., high Se) wetland and open-water habitat that would be managed to discourage wildlife use. Conversely, development of the 3,200 to 6,400 acres of mitigation habitat would convert existing active or retired agricultural lands to managed upland and wetland habitats designed and operated to enhance wildlife value.

No mappable units of native or sensitive terrestrial habitat types, as identified in the CNDDB (CDFG 2001), would be affected by the In-Valley Disposal Alternative features if final site selections are similar to the conceptual locations described in this report.

G2.3 AQUATIC RESOURCES

G2.3.1 Affected Environment

The following paragraphs describe the major aquatic and wetland habitat types that are likely to be affected by project construction and operation:

- **Estuarine.** In the study area, estuarine habitat refers to the Bay-Delta. Estuarine habitats occur in semienclosed coastal waters where tidal seawater is diluted by inflowing freshwater. Estuarine habitats include the open-water portion of the estuary as well as periodically and permanently flooded shallows. The mixture of ocean and freshwater commonly forms a salinity gradient that varies spatially and temporally. The salinity gradient determines the distribution of species in the estuarine system. Salinity levels within the Bay-Delta estuary are controlled by the tides, freshwater inflows from reservoir releases, and Delta pumping. The Bay-Delta estuary supports a number of important resident freshwater fish and invertebrate species. The waters are also used as migration corridors and rearing areas for several special-status species of anadromous fish.
- **Marine (MAR).** Marine habitats consist of those within and closely adjacent to the Pacific Ocean. Primary food sources in marine habitats consist of phytoplankton and zooplankton, which are consumed by filter-feeding organisms, such as anchovies and many invertebrates that are eaten directly by marine birds and mammals, or are forage for fish and invertebrates consumed by marine birds and mammals. A very diverse assemblage of species rely on

marine habitats, including whales, sea turtles, sea otters, fish, birds, and invertebrates. Marine offshore habitats are usually divided into two zones: the epipelagic zone (ocean waters up to a depth of 200 meters), the mesopelagic zone (depths from 200 to 1,000 meters), and the bathypelagic zone (depths greater than 1,000 meters). Species diversity is usually highest on the ocean floor, presumably due to the wider variety of habitat types on the ocean bottom.

- **Riverine (RIV).** Riverine habitats consist of perennial or intermittent flowing rivers and streams. The San Joaquin River and its major tributaries and sloughs and the Salinas River are the major RIV habitats in the study area. Numerous small and intermittent streams occur along pipeline corridors. RIV habitats are frequently associated with riparian and wetland habitat types and are valuable to wildlife as well as aquatic species for cover, foraging, and travel corridors.
- **Saline Emergent Wetland (SEW).** Saline emergent wetlands are common along the margins of bays, lagoons, and estuaries. Vegetation cover is composed mostly of perennial grasslike plants and forbs and is generally complete except where creeks or ponds exist. Component plants typically are present in zones or patches relating to elevational gradients. Species found in lower, more saline, sites include cordgrasses, pickleweed, and California sea blight. Typical species of more brackish, higher elevation sites include bird's beak, saltmarsh dodder, bulrushes, and slender cattail. SEW provides habitat for a variety of bird, mammal, reptile, and amphibian species. Common birds include saltmarsh yellowthroat, song sparrow, Virginia rail, and a variety of migrating or breeding shorebirds, herons, egrets, and waterfowl. Raccoon, opossum, skunk, and coyote forage along the edges. Northern Coastal Salt Marsh is a rare type of SEW potentially found in the study area. It is distributed along much of the California coast and the western Delta region, occurring along protected fringes of bays, lagoons, and estuaries in areas of regular tidal inundation.
- **Freshwater Emergent Wetland (FEW).** Freshwater emergent wetlands are among the most productive wildlife habitats in California, providing food, cover, and water for over 160 species of birds, and numerous species of mammals, reptiles, and amphibians (Mayer and Laudenslayer 1988). Although the acreage of fresh emergent wetlands in California has decreased dramatically since the turn of the century due to drainage and conversion to agriculture, the FEW habitat type can still be found as a dominant feature of the landscape in isolated parts of the study area. Some species of FEW habitat type include big leaf sedge, baltic rush, and redroot nutgrass around the upper margins; saltgrass in the more alkali sites; and common cattail, tule bulrush, river bulrush, and arrowhead in the wetter sites. Coastal Brackish Marsh is a rare type of FEW community that typically occurs in the interior of coastal bays and estuaries where freshwater and saltwater intermix. Salinities tend to vary considerably with changes in the tide. This rare community is well developed at Suisun Bay at the mouth of the Delta and occurs over large areas of the potential Delta Disposal Alternative pipeline to Carquinez Strait.
- **Vernal Pools.** Vernal pools are a rare and protected form of seasonal wetland found only within grassland habitats. Vernal pool communities are shallow depressions filled with water from winter storms that subsequently dry up during spring or early summer. The salinity, alkalinity, and the length of time that water persists generally determine plant species composition of vernal pools. A unique assemblage of special-status plant and invertebrate species is associated with the ephemeral pools.

- **Canals and Drains.** Unlined canals and drains provide wetland and aquatic habitat throughout large areas of the study area. The quality of this habitat varies depending on the degree and frequency of maintenance, water quality, and habitat type of adjacent lands, consistency of flows, and other factors. Some reaches of delivery canals and drains contain stands of emergent and aquatic plants such as bulrushes, cattails, and pondweeds, as well as undesirable invasives such as perennial pepperweed. Portions of the conveyance systems support warmwater fisheries. Common species include largemouth and striped bass, threadfin shad, Sacramento blackfish, bluegill, white catfish, black bullhead, black crappie, green sunfish, carp, goldfish, and mosquitofish. During drought years, Chinook salmon have been observed moving up sloughs that carry agricultural drainwater to the San Joaquin River.
- **Evaporative Ponds.** In San Joaquin Valley, evaporation ponds are highly saline, managed, manmade environments ranging from 25 to nearly 2,000 acres in size. Only seven pond operators, totaling about 4,700 acres, currently are active in the valley. Harsh conditions within the ponds limit biological diversity, but production of some aquatic food-chain organisms, such as widgeongrass, water boatmen, midges, brine flies, and brine shrimp is often quite high and primary production may be several orders of magnitude higher than in most aquatic systems. This available food resource attracts waterfowl and other birds, exposing them to contaminants (specifically, Se) that are bioaccumulated in the food chain.

G2.3.2 Environmental Consequences

G2.3.2.1 Assessment Methods

Aquatic habitats potentially affected by project construction and operation include rivers, intermittent and perennial streams, wetlands (freshwater and saline), vernal pools, and agricultural canals and drains. The Delta and Ocean Disposal Alternatives will affect estuarine and marine habitats, respectively.

For all alternatives, GIS was used to superimpose project features on 1:24000 scale digital USGS topographic maps for analysis. For linear project features (pipelines or canals), a 75-foot temporary construction corridor was assumed for pipelines and a 100-foot corridor for canals. Large project features (reuse facilities, evaporation ponds) were represented by map polygons that were sized, shaped, and sited using a variety of appraisal-level criteria. Construction of buried pipelines was considered to be a temporary impact. Construction of canals and other aboveground features was considered to result in permanent impacts. For all stream crossings (most being small and intermittent streams), an average disturbance area of 0.1 acre was assumed. For wetland areas of mappable size, the approximate distances traversed were measured using GIS tools. Given the appraisal-level detail provided in the current design specifications and the limited accuracy and detail of the 1:24000-scale hydrologic map coverages, the margin of error is quite high.

Preliminary impact assessments for marine and estuarine habitats have been completed and will continue to be evaluated and refined. Water quality models for the Delta and Ocean Disposal Alternative discharges were developed to quantify the mixing and dilution that would occur at each discharge site. Initial results of near-field models provide information about dispersion and dilution of the discharge plumes in the near vicinity of each outfall site. Far-field analyses provide estimates of Se and TDS concentrations at more distant points in the Bay-Delta estuary.

G2.3.2.2 Significance Criteria

The following significance criteria for addressing impacts to aquatic resources, including wetland and marine resources, are based on accepted standards and guidelines for protecting aquatic and wetland-dependent species and their habitats. Significance criteria for terrestrial resources and special-status species are presented in Sections G2.2.2.2 and G2.4.2.2.

A project impact to aquatic or wetland resources could be considered significant if it results in:

- Noncompliance or exceedance of the water quality objectives (criteria) of the California Ocean Plan or any Regional Water Quality Control Plan. As these criteria have been established to protect aquatic life, marine and freshwater habitats, commercial and sport fishing, and other designated beneficial uses, failure to comply with the established objectives is assumed to be significant. For priority pollutants, water quality standards from the California Toxics Rule are used as thresholds of significance.
- Loss or degradation of wetland habitat resulting in violations of the Migratory Bird Treaty Act.
- Filling, draining, or other impacts to any freshwater or saline wetlands.
- Substantial adverse effects on aquatic or wetland-dependent species, natural communities, or habitats that are specifically recognized as biologically significant in local, State, or Federal policies, statutes, or regulations.
- Interference with the migratory movements of native fish species.
- Alteration of historic stream channel characteristics or hydrology that causes erosion, siltation (sedimentation), downstream flooding, or degradation of aquatic habitats.
- Impeding of floodflows by altering or constricting designated floodways or by locating facilities or structures within floodplains.

G2.3.2.3 Impacts of the No Action Alternative on Aquatic Habitats

No significant changes to existing aquatic and wetland resources would occur under the No Action Alternative. No new surface water impoundments (e.g., regulating reservoirs, evaporation ponds) would be constructed as part of any drainage control program.

Active agricultural land would continue to be retired from production as more land becomes salted out; however, water freed up from the retired or abandoned areas would likely be reallocated to reduce shortages on other agricultural lands in the study area.

G2.3.2.4 Impacts of the Ocean Disposal Alternative on Aquatic Resources

Implementation of the Ocean Disposal Alternative would result in a number of temporary and permanent impacts to aquatic and wetland habitat types. Impacts from construction of the four reuse facilities (totaling 27,200 acres), the aqueduct, undersea outfall, six tunnel portals, and ten pumping plants would vary by type and degree. No treatment facilities would be constructed as part of the Ocean Disposal Alternative.

Construction and operation of the four reuse facilities and their associated collection system of canals, drains, and pipelines is not expected to substantially impact aquatic and wetland resources. Based on an appraisal-level reconnaissance, few, if any, natural stream channels or drainages traverse the potential sites (most channels are shallow swales, irrigation ditches, or drains); however, because actual locations and operational details for these facilities have not yet been finalized, site-specific detailed assessments of potential impacts have not yet been completed. Because these facilities will almost certainly be located on active or retired agricultural lands, the likelihood of significant disturbances to aquatic, riparian, or wetland habitat types is minimized. Regulating reservoirs or other open storage basins would not be permitted at the reuse facilities and tailwater from the sites would be managed to prevent formation of Se-contaminated tailwater wetlands and ponds that would attract wildlife.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse facilities would likely result in widely distributed, but generally temporary impacts. Construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by valley floor agricultural lands. Stream crossings in this environment typically would involve other ditches and canals. Construction of additional open canals and drains may provide an exposure pathway for Se bioaccumulation, but the degree of impact would depend on the size, location, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

Impacts to aquatic and wetland resources from construction of the aqueduct's 175 miles of buried pipeline would also be widely distributed, but largely temporary. Based on an appraisal-level overlay analysis of 1:24000 scale USGS topographic maps, the aqueduct would cross 102 stream channels, the vast majority being small "blue line" drainages that are dry for most of the year. Major stream crossings would include the Salinas River, Paso Robles Creek, Estrella River, and Cholame Creek. Most of the crossings would be located near existing bridge crossings or road culverts since the majority of the pipeline alignment would follow existing highway, railroad, and powerline ROWs. Assuming a 75-foot construction corridor, an average of 0.1 acre of aquatic habitat/riparian habitat would be disturbed at each crossing. All crossings would be restored to original contours and revegetated following construction. Construction corridors in areas of sensitive habitat would be narrowed to a minimum width necessary to complete the crossing. Pumping plants would be located and designed to avoid impacts to aquatic and wetland habitats.

Once the finalized conveyance alignments and related facility locations have been selected, preconstruction wetland delineations, pursuant to Section 401/404 of the Clean Water Act, would be completed on all wetlands, stream crossings, adjacent riparian habitat, and other waters of the United States likely to be affected by project construction.

No pipeline or facility construction would begin until the Section 401/404 discharge permits are obtained from the U.S. Army Corps of Engineers and a Streambed Alteration Agreement is obtained from the State. The permit/agreement application(s) would identify all affected sites and specify measures that would be taken to avoid or mitigate adverse impacts. Construction activities taking place in delineated wetland areas and/or stream channel crossings would follow site-specific and general BMPs. If, because of individual site conditions, it is determined that a net loss of wetland habitat values cannot be avoided, replacement habitat would be required at ratios specified in the permit.

Because most project features would be located on previously disturbed uplands or in close proximity to roads and other ROWs, impacts to sensitive, rare, or undisturbed aquatic/wetland communities would be limited. No waterfowl management areas or refuges, major wetlands, or significant natural areas were identified from the GIS overlay analysis of the Ocean Disposal Alternative. Sensitive aquatic/wetland communities potentially affected include a small area of Coastal Dune complex near the terminus of the aqueduct and an estimated 3 acres of aquatic habitat that could be temporarily disturbed at perennial stream crossings along the aqueduct alignment.

All temporary facilities (temporary access/haul roads, equipment staging areas, and disposal sites for excavated spoil from tunnel boring and pipeline construction) would be designed and sited to avoid impacts to streams, wetlands, and other sensitive habitats and would be stabilized, recontoured, and revegetated to protect downstream/downslope aquatic resources.

Construction activity associated with the 1.44-mile-long ocean outfall (comprised of a 0.73-mile buried pipe segment, 0.71-mile suspended pipe segment, and diffuser) would result in disturbances to the marine environment, including the ocean, sea floor, and coastal zone (which includes coastal streams, dunes, foredunes, and sea cliffs), although most construction-related impacts would, for the most part, be temporary.

Undersea construction could result in direct damage to the benthic community, particularly in the area of the buried segment where trenching would be required. The degree of impact would depend on the type of substrate, either soft-bottomed or rocky. Disturbed sediments from excavation of soft-bottomed substrates would spread over the area, covering benthic organisms along and downcurrent of the installation corridor. The distance the disturbed sediments would travel before settling is unknown. The suspended portion of the outfall would likely result in minimal bottom disturbance. Most fish species, due to their mobility, would not be significantly affected by construction or placement of the pipeline and diffuser. Marine mammals could be injured or disturbed by construction activities and noise, but the degree and probability of impacts would depend on the timing of the activity and the activity’s distance from areas transiently used by the species.

Preliminary modeling of the drainwater discharge at the proposed Point Estero outfall has been completed and initial results have been evaluated. Se concentrations in the effluent are expected to quickly dilute to less than 15 ppb within a compact mixing zone during both summer and winter temperature and ocean current conditions. Because of the high dilution capacity of the ocean environment, far-field effects of the discharge are expected to be insignificant. These initial results suggest that water quality criteria established under the California Ocean Plan to protect aquatic life, marine and freshwater habitats, commercial and sport fishing, and other designated beneficial uses would be met. Regardless of the Se concentration of the effluent, all site-specific conditions of any discharge permit issued by the Regional Water Quality Control Board would be addressed. Permit conditions likely would include implementation of a long-term monitoring program that could include monitoring of drainwater constituents, ocean water, benthic organisms, fish, and shorelines.

G2.3.2.5 Impacts of the Delta Disposal Alternatives on Aquatic Habitats

Implementation of either Delta Disposal Alternative would result in a variety of temporary and permanent impacts. Impacts from construction of the four reuse facilities (totaling 27,200 acres), the Delta aqueduct, underwater outfalls, and two pumping plants would vary by type and degree. A biological treatment facility would be constructed, but an RO treatment facility would not be needed.

As currently proposed, construction and operation of the four reuse facilities, treatment plant, and associated conveyance system of drains and collectors is not expected to substantially impact aquatic and wetland resources. These facilities would all be located in the valley's intensively farmed areas, and would likely be sited on active or retired agricultural lands. In this landscape, significant impacts to aquatic or wetland habitat would be very limited. Construction and operational impacts to aquatic resources from these facilities would be similar to those described under the Ocean Disposal Alternative.

Potential impacts to aquatic resources from construction of the Delta aqueduct would likely be limited to stream and wetland crossings, although a very small chance of intersecting vernal pool habitat may exist along the approximately 10 to 13 percent of the aqueduct that traverses annual grassland vegetation. Almost all of the alignment has been designed to follow existing highway, canal, railroad, and powerline ROWs, greatly reducing the number and severity of potential impacts to wetlands and other sensitive aquatic habitats. The two Delta Disposal Alternative pumping plants would be located and designed to avoid impacts to aquatic and wetland habitats.

For the first 188.1 miles, the alignment for both Delta Disposal Alternatives is identical. From the current terminus of the San Luis Drain, extending northward for a distance of approximately 7.6 miles, the aqueduct would traverse a large wetland complex consisting of State Waterfowl Areas, National Wildlife Refuges, and private duck clubs. Portions of this segment would be considered sensitive habitat. This segment would be constructed as a buried pipeline to reduce the width of the construction corridor and to eliminate permanent impacts to the adjacent wetlands.

Both Delta Disposal Alternatives would cross a number of stream channels. Based on a review of 7 ½' USGS quad maps, the shorter Chipps Island alignment would cross approximately 21 stream channels, while the Carquinez Strait alignment would cross 30. Most of the crossings would be located near existing bridge crossings or road culverts since the majority of the pipeline alignment would follow existing highway, railroad, and powerline ROWs. Assuming a 75-foot construction corridor at all stream crossings, an average of 0.1 acre of aquatic habitat/riparian habitat would be disturbed at each crossing. All crossings would be restored to original contours and revegetated following construction.

Both alternatives could disturb areas of Coastal Brackish Marsh (a sensitive community identified and mapped in the CNDDB [CDFG 2001]). The Delta-Chipps Island and Delta-Carquinez Strait Disposal Alternatives could affect approximately 1.0 acre and 39.5 acres, respectively, of this sensitive marshland. Most of this marshland occurs along a railroad ROW that would be leased for the aqueduct. Given the current level of planning detail, the actual degree of impact is uncertain. Construction could occur along the dry perimeter of the marsh or in upland habitat created by the railroad berm. However, if excavation were required to take place in the wetland (as opposed to adjacent or interspersed uplands), the impact would be considered significant.

Assuming a 75-foot construction corridor in all sensitive habitat types, the Delta-Chipps Island and Delta-Carquinez Strait Disposal Alternatives could disturb a total of 73 acres and 120 acres, respectively, of sensitive aquatic/wetland communities. In all probability, actual construction through these areas would be further narrowed to minimum widths necessary to complete the pipeline installation.

All temporary construction-related facilities (temporary access/haul roads and equipment staging areas) would be designed and sited to avoid impacts to streams, wetlands, and other sensitive habitats. When no longer needed, the temporary sites would be recontoured, stabilized, and revegetated to protect downstream aquatic resources (if any).

Impacts to estuarine aquatic habitat in the Bay-Delta would occur during construction of the underwater outfalls of either Delta Disposal Alternative. These impacts would be of short duration, but could be considered significant if construction were to occur during certain life stages of listed anadromous fish. Preliminary modeling of the discharge plumes at both outfall locations suggests that a mixing zone would be needed above the diffusers to meet the aquatic life criteria established for the Bay-Delta to protect aquatic life, marine and freshwater habitats, threatened and endangered species, commercial and sport fishing, and other designated beneficial uses (currently 5 ppb). While the discharge of drainwater is not expected to result in exceedence of the Se criteria outside the mixing zone, the incremental increases in either dissolved concentrations or concentration adsorbed to suspended or benthic particulate matter may enhance bioaccumulation in organisms. Toxicological effects in higher trophic level species (e.g., fish, waterbirds) could occur in affected areas of the Delta currently exhibiting the highest Se concentrations, especially if more bioavailable forms of Se are present. Noncompliance with the established Chronic Aquatic Life Criteria for Se would be considered a significant impact in terms of violation of the Clean Water Act and for the potential impacts to special-status fish and wetland-dependent plants and animals that occur in the vicinity of the outfalls.

G2.3.2.6 Impacts of the In-Valley Disposal Alternative on Aquatic Resources

Because all proposed features of the In-Valley Disposal Alternative would likely be located on active or retired agricultural lands, potential impacts to existing aquatic and wetland resources in the study area would be minimal.

As currently envisioned, construction and operation of the In-Valley Disposal Alternative’s four reuse facilities (totaling 27,700 acres), RO treatment facility, biological treatment facilities, evaporation basins, mitigation areas, and associated collection/conveyance system of pumping plants, canals, drains, and pipelines would not expected to substantially impact existing aquatic and wetland resources. These facilities would be located in the valley’s intensively farmed areas, and would likely be sited on active or retired agricultural lands. In this landscape, impacts to existing aquatic or wetland habitat would be very limited. Impacts from construction and operation of these facilities would be essentially the same as those described under the Ocean Disposal Alternative.

The In-Valley Disposal Alternative’s proposed 5,063 acres of evaporation ponds would create two large areas of hazardous, low habitat value wetlands that previously did not exist in the valley. The evaporation ponds would be located on active or retired agricultural lands. Operation of the evaporation ponds would be considered a significant impact due to their potential adverse effects on breeding, foraging, and resting migratory waterbirds and potential impacts that may occur to a limited number of special-status species that may use the sites. To reduce the potential adverse effects, design and management strategies would be implemented including keeping water levels at 4 feet or greater and maintaining steep sideslopes to reduce waterfowl and shorebird foraging habitat; controlling emergent and shoreline vegetation; hazing during breeding seasons; avoiding islands, windbreaks, and sandbars; and establishing a long-term waterbird monitoring program. Closure of the evaporation ponds at anytime during their expected 50-year life would require contouring, capping, revegetating, and monitoring the sites to ensure that seeps and surface water ponding will not create a hazardous wetlands.

Operation of the evaporation ponds would require construction of alternative habitat, as required under mitigtion protocols developed by the Service to mitigate for impacts to waterfowl and shorebirds protected under the Migratory Bird Treaty Act. As currently proposed, the adverse impacts of the 5,063 acres of evaporation ponds would be partially offset by construction of 3,200 to 6,400 acres of mitigation lands (alternative habitat), half or more of which would be developed into managed wetland habitats.

Successfully creating and managing wetland complexes of the size required to mitigate for the project's evaporation basins will be a challenge. Creation of successful mitigation areas will require suitable sites (i.e., suitable soils and topography) in close proximity to the proposed evaporation ponds and adequate firm water supplies. An extensive monitoring program will need to be developed to ensure that the desired results are attained or that mechanisms (including adequate funding) are in place to correct any undesirable outcomes.

G2.4 SPECIAL-STATUS SPECIES

G2.4.1 Affected Environment

Early in the planning process, the Service provided lists of special-status species that could occur in the general vicinity of the project. A list of special-status marine mammals and anadromous fish species was obtained from the NMFS. Initially, the Service's list included only species thought to occur in the general Service area. The list eventually was expanded to include several broad corridors representing potential pipeline alignments for the Ocean and Delta Disposal Alternatives. Information on the status of State-listed special-status species was obtained from multiple sources, including California Department of Fish and Game (CDFG) websites and relevant hardcopy documents. While the combined lists appear to be mostly complete, additional species still may be added (and others removed) as project designs and specifications are further refined, as study area vegetation communities and habitat types are more accurately mapped, and as required field surveys are completed.

A total of 87 special-status animals, fish, invertebrates, and plants were identified by the Service, NMFS, and the CDFG as having the potential to be affected by the proposed action. These species are listed as endangered or threatened, or are classified as proposed for listing or candidate for listing. Species classified as Species of Concern by both Federal and State agencies are not addressed. Table G2-1 lists the 87 species, their current Federal and State listing status, and the generalized habitat type(s) in which each is known to occur. The table also identifies each species probability of occurrence in areas disturbed by each potential alternative.

Table G2-1
Federal and State Special-Status Species, Potential for Occurrence within Disturbance Areas* of Project Features

Species	Status (Fed/State)	Primary Habitat Type**	Ocean Disposal Alternative	Delta Disposal Alternatives	In-Valley Disposal Alternative
Mammals					
Giant kangaroo rat	E/E	AGS, DSC	High	High	Low
Fresno kangaroo rat	E/E	AGS, DSC, FEW	High	High	Low
Tipton kangaroo rat	E/E	AGS, ASC	Med	Low	Low
Morro Bay kangaroo rat	E/E	CSC	Low	Low	Low
San Joaquin Valley woodrat	E/SC	VOW, DSC	Low	Med	Low
Salt marsh harvest mouse	E/E	SEW	Low	High	Low
Buena Vista Lake shrew	E/SC	FEW	Low	Low	Low
San Joaquin antelope squirrel	SC/T	AGS, ASC	High	High	Low
Riparian brush rabbit	E/E	VRI, DSC	Low	Low	Low
San Joaquin kit fox	E/T	AGS, ASC, CRP, VOW	High	Med	Med
Southern sea otter	T/-	MAR	High	Low	Low
Guadalupe fur seal	T/-	MAR	Med	Low	Low
Steller sea lion	T/-	MAR	Med	Low	Low
Blue whale	E/-	MAR	Med	Low	Low
Finback whale	E/-	MAR	Med	Low	Low
Humpback whale	E/-	MAR	Med	Low	Low
Right whale	E/-	MAR	Med	Low	Low
Sei whale	E/-	MAR	Med	Low	Low
Sperm whale	E/-	MAR	Med	Low	Low
Birds					
Swainson's hawk	-/T	AGS, CRP, VRI	High	High	Med
California brown pelican	E/E	SEW	High	Low	Low
California clapper rail	E/E	SEW	Med	High	Low
California least tern	E/E	CSC	High	High	Med
Southwestern willow flycatcher	E/E	VRI	Med	Low	Low
Least Bell's vireo	E/E	VRI	Med	Med	Low
Bald eagle	T/E	COW, VRI	Med	Med	Med
Marbled murrelet	T/E	COW MAR	Med	Low	Low
Western snowy plover	T/SC	CSC	Med	Low	Med
Mountain plover	C/SC	AGS, CRP	Med	Med	High
California black rail	-/T	SEW, FEW	Low	High	Med
Western yellow-billed cuckoo	C/E	VRI	Med	Med	Med
Reptiles					
Blunt-nosed leopard lizard	E/E	AGS, ASC	High	High	Low
San Francisco garter snake	E/E	VRI	Low	Low	Low
Giant garter snake	T/T	FEW, VRI	Med	Med	Med
Alameda whipsnake	T/T	CSC	Low	High	Low
Green sea turtle	T/-	MAR	Med	Low	Low
Hawksbill sea turtle	E/-	MAR	Med	Low	Low
Leatherback sea turtle	E/-	MAR	Med	Low	Low
Loggerhead sea turtle	T/-	MAR	Med	Low	Low
Olive Ridley sea turtle	T/-	MAR	Med	Low	Low

Table G2-1 (continued)

Species	Status (Fed/State)	Primary Habitat Type**	Ocean Disposal Alternative	Delta Disposal Alternatives	In-Valley Disposal Alternative
Amphibians					
Arroyo toad	E/SC	VRI	Med	Low	Low
California red-legged frog	T/SC	AGS,VRI	High	High	Med
Kern Canyon slender salamander	SC/T	VOW, VRI	Low	Low	Low
California tiger salamander	C/SC	AGS, VRI	Low	High	Low
Fish					
Tidewater goby	E/SC	RIV, SEW	High	Med	Low
Delta smelt	T/T	RIV	Low	High	Low
Sacramento splittail	T/SC	RIV	Low	High	Low
Bocaccio	C/-	MAR	Med	Low	Low
Central Valley spring-run Chinook salmon	T/T	RIV	Low	High	Low
Central Valley fall/late fall-run Chinook salmon	C/SC	RIV	Low	High	Low
Winter-run Chinook salmon	E/E	RIV	Low	High	Low
Central Valley steelhead	T/-	RIV	Low	High	Low
Central California Coastal steelhead	T/-	RIV	High	High	Low
South Central California steelhead	T/SC	RIV	High	High	Low
Central California Coast coho salmon	T/E	RIV	Low	High	Low
Invertebrates					
Morro shoulderband snail	E/-	Coastal dunes CSC	Med	Low	Low
Conservancy fairy shrimp	E/-	AGS	High	High	Low
Longhorn fairy shrimp	E/-	AGS	High	High	Low
Vernal pool fairy shrimp	T/-	AGS	High	High	Low
Vernal pool tadpole shrimp	E/-	AGS	High	High	Low
Valley elderberry longhorn beetle	T/-	VRI	Low	Med	Low
Delta green ground beetle	T/-	AGS	Low	Low	Low
Bay checkerspot butterfly	T/-	AGS	Low	Low	Low
Kern primrose sphinx moth	T/-	AGS	Low	Low	Low
Plants					
Chorro Creek bog thistle	E/-	AGS	High	Low	Low
Gambel's watercress	E/-	FEW, SEW	Med	Low	Low
Marsh sandwort	E/-	FEW, SEW	Med	Low	Low
California seablite	E/-	SEW	Med	Low	Low
Morro manzanita	T/-	CSC	High	Low	Low
Indian Knob mountainbalm	E/-	COW,CSC	High	Low	Low
Pismo clarkia	E/-	COW,CSC	High	Low	Low
La Graciosa thistle	E/T	Coastal dunes SEW	Med	Low	Low
Nipomo Mesa lupine	E/E	Coastal dunes	Med	Low	Low
Camatta Canyon amole	T/-	COW	High	Low	Low
Purple amole	T/-	COW	High	Low	Low
Large-flowered fiddleneck	E/E	AGS	Low	High	Low
San Joaquin woolly-threads	E/-	AGS, DSC	High	Low	Low
Palmate-bracted bird's-beak	E/E	ASC, DSC	Low	Med	Low
Salt marsh bird's-beak	E/-	SEW	Med	Low	Low
Soft bird's-beak	E/-	SEW	Low	High	Low
Suisun thistle	E/-	SEW	Low	Med	Low
Antioch Dunes evening-primrose	E/E	Coastal dunes	Low	High	Low
Contra Costa wallflower	E/E	Coastal dunes	Low	Med	Low
California jewelflower	E/E	AGS, DSC	High	Low	Low

Table G2-1 (concluded)

Species	Status (Fed/State)	Primary Habitat Type**	Ocean Disposal Alternative	Delta Disposal Alternatives	In-Valley Disposal Alternative
Contra Costa goldfields	E/-	AGS	Low	High	Low
Tiburon paintbrush	E/T	AGS	Low	Low	Low
Showy Indian clover	E/-	AGS	Low	Low	Low
Bakersfield cactus	E/E	AGS, DSC	Low	Low	Low
Kern mallow	E/-	ASC	Low	Low	Low
Hartweg's golden sunburst	E/E	AGS	Low	Med	Low
San Joaquin adobe sunburst	T/E	AGS	Low	Low	Low
San Joaquin Valley Orcutt grass	T/E	AGS	Low	Low	Low
Hairy Orcutt grass	E/E	AGS	Low	Med	Low
Greene's tuctoria	E/-	AGS	Low	Med	Low
Carpenteria	PE/T	MCH	Low	Low	Low
Fleshy owl's-clover	T/E	AGS	Low	Med	Low
Keck's checkermallow	E/-	AGS	Low	Low	Low
Bogg's Lake hedge-hyssop	-/E	AGS	Low	Low	Low
Delta button-celery	-/E	CSC	Low	High	Low

Notes:
*Within 5 miles of project facility sites identified at the current level of planning detail.
**See descriptions of habitat types in Sections 4.2.2 and 4.2.4.
Low = Potential disturbance area of features may be outside the known range of the species, may provide only very limited suitable habitat, or may not support suitable habitat.
Med = Potential disturbance area of features may provide suitable habitat for the species.
High = Potential disturbance area of features may provide suitable habitat for the species and recent records of occurrence indicate species is known or likely to be found in the potential impact zone and immediate vicinity.
E = Endangered
T = Threatened
PE = Proposed Endangered
PT = Proposed Threatened
C = Candidate for Listing
SC = Species of Concern

G2.4.2 Environmental Consequences

G2.4.2.1 Assessment Methods

This preliminary assessment of potential project impacts was based largely on low resolution mapping (1:24,000 scale or smaller) of the project features, species occurrences, and habitat types. Neither aerial photography nor high-resolution spatial data were used to assist in identifying or describing potentially affected sites, and no on-site habitat assessments or site-specific presence/absence surveys were conducted for this phase of the project.

To determine the potential for significant impacts to special-status species, each species' habitat requirements, breeding biology, seasonal movements, occurrence records, and distribution information were compiled from a review of current literature, consultations with the Service and CDFG biologists and other local and regional species experts, and analysis of data from the CNDDB (CDFG 2001) and the *California Wildlife Habitat Relationships System Database* (CDFG 1999).

GIS map overlays were used to relate the potential locations of project features to documented occurrences, historic ranges, critical habitats, and/or generalized habitat types preferred by each listed species. Based on the GIS analysis, the probability of each species occurring within

5 miles of project features was determined. A qualitative probability rating of *low*, *medium*, or *high* was then assigned.

At the current level of analysis, species having a *low* probability of occurrence, are presumed to not occur in the areas potentially disturbed by an alternative or are unlikely to have sufficient suitable habitat in the disturbance zones. For those species having *medium* or *high* probabilities of occurrence, a second qualitative rating was assigned to reflect the likely significance of the alternative impacts to the species. Four significance ratings, ranging from *No Effect* to *Potential Significant Unavoidable Effect*, were used.

G2.4.2.2 Significance Criteria

Significant impacts to Federal or State-listed special-status species could occur if construction or operation results in the any of the following:

- Loss, disturbance, or fragmentation of the species' habitat, including movement, migration, and dispersal routes.
- Reduction in the species' numbers because of direct mortality or because of project-related stresses that lead to alterations of behavior, reproductive success, or survival. Any take of a listed species is considered a significant impact.
- Permanent loss or significant degradation of any designated critical habitat, protected breeding area, or sensitive coastal, pelagic, or benthic habitat.

G2.4.2.3 Impacts of the No Action Alternative on Special-Status Species

No significant impacts on special-status species would be expected to occur under the No Action Alternative.

No new collection facilities would be constructed through 2050. Without construction of additional collection facilities, it is unlikely that substantial investments would be made to construct and operate expensive new drainwater disposal facilities such as treatment plants, reuse facilities, evaporation pond complexes, or other costly technologies. On-farm source control measures, on the other hand, would undoubtedly expand over the 50-year period, but would have little direct impact on special-status species.

Changes in cropping practices would affect the types and quality of terrestrial habitat provided by agricultural lands, but very few special-status species utilize agricultural lands extensively. Lands converted to dry land farming or that would be cropped less intensively would still continue to be disturbed because of periodic cultivation and harvesting, and, therefore, would not develop significant wildlife value.

The amount of retired, abandoned, or temporarily fallowed land would continue to increase as additional lands become too salted out to farm. Permanently idled acres are expected to increase to as much as 70,491 acres by 2050. A portion of these lands will act as salt sinks, collecting and concentrating salts until they support little vegetation or possess little wildlife habitat value. Other abandoned lands would revert in varying degrees to native vegetation or undesirable invasive species. This conversion of irrigated lands to nonagricultural use would progress in a scattered, uncoordinated manner depending on site-specific conditions and individual circumstances. There would be no program of planned placement of abandoned lands into alternative uses or for managing lands removed from production. As a result, the overall potential benefits to special-status species from alternative land use are expected to be minimal.

G2.4.2.4 Impacts of the Ocean Disposal Alternative on Special-Status Species

Based on an appraisal-level reconnaissance of the proposed facility sites and pipeline alignments and a review of the literature, 57 special-status species could be affected to varying degrees from implementation of the Ocean Disposal Alternative. Project-related impacts could result from construction and operation of the four reuse facilities and related collection/conveyance canals, drains, and pipelines or from construction of the ocean aqueduct, three tunnels, and undersea outfall. While construction of these features would disturb substantial acreages and traverse a broad range of habitat types capable of supporting the listed species, the probability of creating significant unavoidable impacts is likely to be quite small. For most species, impcts would likely be less than significant. Table G2-2 identifies the 57 special-status species that could be affected to varying degrees by construction and operation of Ocean Disposal Alternative.

Table G2-2
Special-Status Species Potentially Affected by the Ocean Disposal Alternative

Species	Status (Fed/State)	Primary Habitat	Level of Impact
Mammals			
Giant kangaroo rat	E/E	AGS, ASC	II
Fresno kangaroo rat	E/E	AGS, DSC, FEW	II
Tipton kangaroo rat	E/E	AGS, ASC	II
San Joaquin antelope squirrel	SC/T	AGS, ASC	II
San Joaquin kit fox	E/T	AGS, ASC, CRP,VOW	II
Southern sea otter	T/-	MAR	IV
Guadalupe fur seal	T/-	MAR	II
Steller sea lion	T/-	MAR	II
Blue whale	E/-	MAR	II
Finback whale	E/-	MAR	II
Sei whale	E/-	MAR	II
Humpback whale	E/-	MAR	II
Right whale	E/-	MAR	II
Sperm whale	E/-	MAR	II
Birds			
Swainson’s hawk	-/T	AGS, CRP, VRI	II
California brown pelican	E/E	SEW	II
Mountain plover	C/SC	AGS, CRP	II
California clapper rail	E/E	SEW	II
California least tern	E/E	Coastal beaches	III
Southwestern willow flycatcher	E/E	VRI	II
Least Bell’s vireo	E/E	VRI	II
Western yellow-billed cuckoo	C/E	VRI	II
Bald eagle	T/E	COW, VRI	II
Marbled murrelet	T/E	COW, MAR	II
Western snowy plover	T/SC	Coastal beaches	II

Table G2-2 (concluded)

Species	Status (Fed/State)	Primary Habitat	Level of Impact
Reptiles			
Blunt-nosed leopard lizard	E/E	AGS, ASC	II
Giant garter snake	T/T	VRI, ditches, sloughs	III
Green sea turtle	T/-	MAR	III
Hawksbill sea turtle	E/-	MAR	II
Leatherback sea turtle	E/-	MAR	II
Loggerhead sea turtle	T/-	MAR	II
Olive Ridley sea turtle	T/-	MAR	II
Amphibians			
Arroyo toad	E/SC	VRI	III
California red-legged frog	T/SC	VRI	III
Fish			
Tidewater goby	E/SC	RIV, FEW, SEW	III
Central California Coastal steelhead	T/-	RIV	III
South Central California steelhead	T/SC	RIV	III
Bocaccio	C/-	MAR	II
Invertebrates			
Morro shoulderband snail	E/-	Coastal dune, CSC	II
Conservancy fairy shrimp	E/-	AGS	II
Longhorn fairy shrimp	E/-	AGS	II
Vernal pool fairy shrimp	T/-	AGS	II
Vernal pool tadpole shrimp	E/-	AGS	II
Plants			
Chorro Creek bog thistle	E/-	AGS	III
Gambel's watercress	E/-	FEW, SEW	II
Marsh sandwort	E/-	FEW, SEW	II
California seablite	E/-	SEW	II
Morro manzanita	T/-	CSC	III
Indian knob mountainbalm	E/-	COW, CSC	III
Pismo clarkia	E/-	COW, CSC	III
La Graciosa thistle	E/T	Coastal dunes, SEW	II
Nipomo Mesa lupine	E/E	Coastal dunes	II
Camatta Canyon amole	T/-	COW	III
Purple amole	T/-	COW	III
San Joaquin woolly-threads	E/-	AGS, ASC	III
Salt marsh bird's-beak	E/-	SEW	II
California jewelflower	E/E	AGS, ASC	III

Notes:

I = No effect
II = Less-than-significant effect
III = Potentially significant effect unless mitigation is incorporated
IV = Potentially unavoidable significant effect

Of the 57 special-status species that have a moderate to high potential for occurence in areas disturbed by construction of the Ocean Disposal Alternative, 40 would likely be affected to a less-than-significant level and 16 would be affected to a less-than-significant level if standard protocols and mitigation measures designed to avoid or protect the species were implemented.

Only one species has the potential to be affected by the Ocean Disposal Alternative in a manner that could result in significant unavoidable impacts. The southern sea otter is known to forage in the vicinity of the Point Estero ocean outfall, and could presumably forage within the construction disturbance zone or the initial dilution zone where elevated Se in the discharge could contaminate prey species. At present, preliminary modeling of the ocean discharge plume suggests that the discharge would not create a significant contamination hazard for the species; however, a more detailed evaluation of the project's potential impact on this species will be needed.

In designing the proposed ocean aqueduct, every effort has been made to follow existing highway, road, railroad, and powerline ROWs to minimize construction in undisturbed habitats. Furthermore, in most cases, impacts associated with construction of the aqueduct would be temporary–if appropriate preconstruction, avoidance, and site restoration commitments are implemented.

Two small coastal streams (of the proposed aqueduct's potential 102 stream crossings identified on 1:24000 USGS topographic maps) are classified as steelhead spawning streams. These streams could also support resident tidewater goby. Pipeline construction in or near these streams could increase turbidity and sedimentation or result in stranding or disruption of breeding activity. Construction activity in nearshore and shore areas may interfere with nesting western snowy plovers or least terns by destroying nests or disturbing nesting birds. These impacts would be considered significant unless measures are taken to minimize potential impacts and construction is scheduled to avoid spawning/breeding periods.

Construction of the pipeline within designated red-legged frog critical habitat was initially identified as a major concern for this alternative, although most impacts would be temporary or would be reduced to less-than-significant levels with appropriate avoidance and site restoration measures. Approximately 380 acres of critical habitat were initially identified as occurring within the proposed pipeline corridor. However, in November 2002, a final judgment was recorded in the U.S. District Court that vacated and remanded the designation of all red-legged frog critical habitat in California (U.S. District Court 2002). While the designation of critical habitat for the red-legged frog has temporarily been rescinded, the species' protected status under the Endangered Species Act still remains in full effect. Subsequently, all impact avoidance and site restoration measures that originally would have been considered appropriate under this alternative would still be implemented. Actual acres of occupied and potential red-legged frog habitat that could be affected by the project will now be precisely determined during field surveys. It is anticipated that the affected acreage will be significantly less (perhaps 25 percent or less) than the 380 acres that was approximated from the Service's map of designated critical habitat.

Construction and operation of the four reuse facilities and their associated collection system of canals, drains, and pipelines could affect a small number of listed species (e.g., San Joaquin kit fox, giant garter snake, Swainson's hawk). However, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features will almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be unlikely. Lands acquired for reuse could range from actively managed croplands that currently provide little or no suitable habitat for listed species, to long-abandoned retired lands, pasture lands, or even rangeland that could support occupied habitats. For acquired lands already under agricultural production, conversion to reuse would likely have little effect on special-status species. For retired lands that now support marginal endangered species habitat, conversion to cropping practices appropriate to the reuse facilities would result in undetermined effects. Further analysis will be undertaken once designs are finalized.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse facilities would likely result in widely distributed, but less-than-significant impacts to protected species. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Open canals and drains serving the reuse facilities would occupy the same types of land and would also result in short-term construction impacts, but could create permanent barriers to movement for a limited number of species (for example, San Joaquin kit fox, blunt-nosed leopard lizard). Additionally, the open drains may provide an exposure pathway for Se bioaccumulation. The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

G2.4.2.5 Impacts of the Delta Disposal Alternatives on Special-Status Species

Forty-six special-status species have a moderate to high potential for occurrence in areas that could be disturbed by the Delta Disposal Alternatives. Impacts could result from construction and operation of the four reuse facilities and related collection/conveyance canals, drains, and pipelines (required for all alternatives) or from construction of the aqueducts (Chipps Island or Carquinez Strait), two associated pumping plants, and underwater outfalls. While the proposed facilities would traverse a broad range of habitat types capable of supporting these listed species, the probability of significant unavoidable impacts for most is likely to be quite small. Table G2-3 identifies the 46 special-status species that could be affected to varying degrees by construction and operation of features associated with the Delta Disposal Alternatives.

Table G2-3
Special-Status Species Potentially Affected by the Delta Disposal Alternatives

Species	Status (Fed/State)	Primary Habitat	Level of Impact
Mammals			
Giant kangaroo rat	E/E	AGS, ASC	II
Fresno kangaroo rat	E/E	AGS, ASC, FEW	II
San Joaquin Valley woodrat	E/SC	ASC, VOW	II
Salt marsh harvest mouse	E/E	SEW	III
San Joaquin antelope squirrel	SC/T	AGS, ASC	II
San Joaquin kit fox	E/T	AGS, ASC, CRP, VOW	II
Birds			
Swainson's hawk	ND/T	AGS, CRP, VRI	II
California clapper rail	E/E	SEW	III
California least tern	E/E	Coastal beaches	II
Least Bell's vireo	E/E	VRI	II
Bald eagle	T/E	COW, VRI	II

Table G2-3 (concluded)

Species	Status (Fed/State)	Primary Habitat	Level of Impact
Mountain plover	C/SC	AGS, CRP	II
California black rail	-/T	FEW, SEW	II
Western yellow-billed cuckoo	C/E	VRI	II
Reptiles			
Blunt-nosed leopard lizard	E/E	AGS, ASC	III
Giant garter snake	T/T	VRI, ditches, sloughs	III
Alameda whipsnake	T/T	CSC	II
Amphibians			
California red-legged frog	T/SC	VRI	II
California tiger salamander	C/SC	AGS, VRI	II
Fish			
Tidewater goby	E/SC	RIV, SEW	II
Delta smelt	T/T	RIV	IV
Sacramento splittail	T/SC	RIV	IV
Chinook salmon - Central Valley spring-run	T/T	RIV	IV
Chinook salmon - Central Valley fall/late fall-run	C/SC	RIV	IV
Chinook salmon - Winter-run	E/E	RIV	IV
Steelhead - Central Valley	T/-	RIV	IV
Steelhead - Central California Coastal	T/-	RIV	IV
Steelhead - South Central California	T/-	RIV	IV
Coho salmon - Central California Coast	T/-	RIV	IV
Invertebrates			
Conservancy fairy shrimp	E/-	AGS	II
Longhorn fairy shrimp	E/-	AGS	II
Vernal pool fairy shrimp	T/-	AGS	II
Vernal pool tadpole shrimp	E/-	AGS	II
Valley elderberry longhorn beetle	T/-	VRI	II
Plants			
Large-flowered fiddleneck	E/E	AGS	II
Palmate-bracted bird's-beak	E/E	ASC	II
Soft bird's-beak	E/-	SEW	II
Suisun thistle	E/-	SEW	II
Antioch Dunes evening-primrose	E/E	Coastal dunes	II
Contra Costa wallflower	E/E	Coastal dunes	II
Contra Costa goldfields	E/-	AGS	II
Hartweg's golden sunburst	E/E	AGS	II
Hairy Orcutt grass	E/E	AGS	II
Greene's tuctoria	E/-	AGS	II
Fleshy owl's-clover	T/E	AGS	II
Delta button-celery	-/E	VRI	II

Notes:
I = No effect
II = Less-than-significant effect
III = Potentially significant effect unless mitigation is incorporated
IV = Potentially unavoidable significant effect

Of the 46 special-status species that have a moderate to high probability of occurring in areas potentially disturbed by construction of the Delta Disposal Alternatives, 33 would likely be affected to a less-than-significant level and 4 would be affected to a less-than-significant level if standard protocols and mitigation measures designed to avoid or protect the species were to be implemented.

Only 9 of the 46 listed species have a potential to be affected by the Delta Disposal Alternatives in a manner that could produce significant unavoidable impacts. These species, all special-status fish, are known to breed in or migrate through the Delta in the vicinity of both the Chipps Island and Carquinez Strait outfalls. Presumably any of the species could forage within the initial dilution zones where elevated Se in the discharge could contaminate prey species or other dietary items. For the Delta smelt, and Central Valley chinook salmon and steelhead, portions of the Bay-Delta in the vicinity of the proposed outfall locations have also been formally designated by the Service and NMFS as Critical Habitat, thus requiring special consideration in avoiding any adverse modifications to the species' habitat.

Preliminary modeling of the discharge plumes at both outfall locations suggests that a mixing zone would be needed above the diffuser in order to meet the Bay-Delta's established aquatic life criterion for Se (currently 5 ppb). While the discharge of drainwater is not expected to result in exceedance of the Se criterion outside the mixing zone, the incremental increases in either dissolved concentrations or concentration adsorbed to suspended or benthic particulate matter may enhance bioaccumulation in marine organisms. Toxicological effects in higher trophic level species (e.g., fish, waterfowl) could occur in affected areas of the Delta currently exhibiting the highest Se concentrations, especially if more bioavailable forms of Se are present.

Construction and operation of the four reuse facilities, biological treatment plant, and associated collection/conveyance system of canals, drains, and pipelines could affect a small number of listed species (e.g., San Joaquin kit fox, giant garter snake, Swainson's hawk); however, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features will almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be very unlikely. Lands acquired for the reuse facilities and/or treatment plant could range from actively managed croplands that currently provide little suitable habitat for listed species, to long-abandoned retired lands, pasture lands, or rangeland that could support occupied habitats. For acquired lands already under agricultural production, conversion to reuse would likely have little or no effect on special-status species. For retired lands that now support marginal endangered species habitat, conversion to a cropping pattern appropriate to the reuse facilities would result in undetermined effects.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse and treatment facilities would likely result in widely distributed, but less-than-significant, impacts to protected species. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Open canals and drains serving the reuse facilities would occupy the same types of land and would also result in short-term construction impacts, but could create permanent barriers to movement for a limited number of species (for example, San Joaquin kit fox, blunt-nosed leopard lizard). In addition, the open canals may provide an exposure pathway for Se bioaccumulation. The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

Construction of the Delta Disposal aqueduct and two pumping plants would result in temporary and permanent impacts to both natural and disturbed habitat types. An unspecified amount of terrestrial habitat would also be disturbed for use as temporary access/haul roads and equipment staging areas.

Aqueduct construction would mainly result in temporary, less-than-significant construction disturbances to special-status species–if substantial preconstruction, avoidance, and site restoration commitments are implemented. While every effort has been made to follow existing highway, road, railroad, and powerline ROWs to minimize construction in undisturbed habitats, it is unlikely that all suitable habitats would be avoided. For example, without field surveys, it is unknown whether any vernal pool habitats would be encountered along the aqueduct alignments or how extensive the actual construction disturbances to coastal brackish marsh habitats would be. Construction in either of these sensitive habitats could affect a number of special-status plants and animals.

Construction of the Delta Disposal aqueduct within designated red-legged frog critical habitat was initially identified as a potential concern for this alternative, although most impacts would be temporary or would be reduced to less-than-significant levels with appropriate avoidance and site restoration measures. Approximately 9 acres of critical habitat were initially identified as occurring within the proposed pipeline corridor. However, in November 2002, a final judgment was recorded in the U.S. District Court that vacated and remanded the designation of all red-legged frog critical habitat in California (U.S. District Court 2002). While the designation of critical habitat for the red-legged frog has temporarily been rescinded, the species' protected status under the Endangered Species Act still remains in full effect. Subsequently, all impact avoidance and site restoration measures that originally would have been considered appropriate under this alternative would still be implemented. Actual acres of occupied and potential red-legged frog habitat that could be affected by the project will now be precisely determined during field surveys. It is anticipated that the affected acreage will be significantly less (perhaps 25 percent or less) than the 9 acres that was approximated from the Service's map of designated critical habitat.

G2.4.2.6 Impacts of the In-Valley Disposal Alternative on Special-Status Species

While the amount of land that would be occupied by proposed In-Valley Disposal Alternative features is quite large, the probability of significantly impacting large numbers of special-status species would be quite small. Ten special-status species could be affected to varying degrees as a result construction and implementation of the In-Valley Disposal Alternative. Table G2-4 identifies the 10 special-status species that could be affected by the alternative. The probable level of impact to any of the 10 species would likely be less-than-significant if accepted protocols and mitigation measures designed to avoid or protect the species were to be fully implemented.

Construction and operation of the four reuse facilities, RO and biological treatment plants, and the associated collection/conveyance system of canals, drains, pipelines, and pumping facilities each has the potential to adversely affect listed species (e.g., San Joaquin kit fox, western snowy plover). However, because locations and operational details for these facilities have not yet been finalized, assessment of potential impacts is, at best, speculative. Because these features would almost certainly be located on active or retired agricultural lands, direct destruction of undisturbed natural habitats would be very unlikely. Lands acquired for these permanent facilities could range from actively managed croplands that currently provide little or no suitable habitat for listed species, to long-abandoned retired lands, recently fallowed lands, or pasture that each could support marginal, yet occupied, habitats. For acquired lands already under agricultural production, conversion to reuse would likely have little effect on special-status species. For retired lands that now support marginal endangered species habitat, conversion to cropping practices appropriate to the reuse facilities would result in undetermined effects.

Table G2-4
Special-Status Species Potentially Affected by the In-Valley Disposal Alternative

Species	Status (Fed/State)	Primary Habitat	Level of Impact
Mammals			
San Joaquin kit fox	E/T	AGS, ASC, CRP, VOW	III
Birds			
Swainson's hawk	-/T	AGS, CRP, VRI	II
California least tern	E/E	Coastal beaches	III
Bald eagle	T/E	COW, VRI	II
Western snowy plover	T/SC	Coastal beaches	III
Mountain plover	C/SC	AGS, CRP	III
California black rail	-/T	FEW, SEW	III
Western yellow-billed cuckoo	C/E	VRI	III
Reptiles			
Giant garter snake	T/T	VRI, ditches, sloughs	III
Amphibians			
California red-legged frog	T/SC	VRI	I

Notes:

I = No effect
II = Less-than-significant effect
III = Potentially significant effect unless mitigation is incorporated
IV = Potentially unavoidable significant effect

Creation of required evaporation ponds would result in the permanent conversion of approximately 5,063 acres of active or retired agricultural lands to managed evaporation basins. The permanent basins would have little habitat value for aquatic, terrestrial, or special-status wildlife species because of design and management restrictions and the toxicity hazard presented by elevated Se concentrations in the pondwater. Reproductive impairment associated with the elevated Se could result in a significant impact to the threatened western snowy plover, which is known to forage and nest at evaporation ponds. Numerous species of waterfowl and shorebirds, protected under the Migratory Bird Treaty Act, are also known to nest and forage at evaporation ponds, and could also be adversely affected. The San Joaquin kit fox may forage for bird eggs and nestlings at evaporation ponds. As currently envisioned, the ponds would be designed and managed to minimize foraging and nesting habitat by creating and maintaining steep sideslopes, eliminating islands and emergent vegetation, and maintaining minimum water depths. Nesting attempts would be discouraged by hazing during the early breeding season and alternative wetland habitat would be created to reduce waterbird use of the Se-contaminated ponds. Taken together, these actions would greatly reduce, but may not entirely eliminate, the potential for significant impacts to the few listed species that may utilize the sites.

Creation of the alternative wetland habitat, likely to be required by the Service as a condition of evaporation basin operation in San Joaquin Valley, would result in conversion of additional active and/or retired agricultural lands into alternative uses. Development of the wetland complexes would likely result in an increase in habitat values over the sites' existing land uses. As conceptually proposed, 3,200 to 6,400 acres of mitigation habitat would be created in two separate units, each within 2 miles of its associated evaporation basin. Each of the mitigation complexes would have a firm water supply sufficient to allow operation under a prescribed management plan. Half of each complex would consist of managed upland habitats and half managed wetland habitats. The wetland portion would consist of a mosaic of permanent and seasonal ponds and moist soil units, with the majority developed as shallow unvegetated seasonal ponds managed for shorebird foraging and nesting. Operation of these habitat complexes would benefit a number of upland and wetland-dependent species, potentially including several listed special-status species.

Construction of the extensive network of canals, pipelines, and drains to collect and convey drainwater to the reuse and treatment facilities would likely result in widely distributed, but less-than-significant impacts, to protected species. Virtually all of the construction would be limited to previously disturbed road, canal, and railroad ROWs or the perimeters of agricultural fields, and would likely take place in narrow corridors surrounded by expanses of valley floor agricultural lands. Open canals and drains serving the reuse facilities would occupy the same type of lands and would involve short-term construction impacts, but could create permanent barriers to movement for a limited number of species (for example, San Joaquin kit fox, blunt-nosed leopard lizard) and may provide an exposure pathway for Se bioaccumulation. The degree of these impacts, however, would depend on the size, locations, and intensity of maintenance of each canal or drain segment and the Se concentration of the drainwater being conveyed.

G2.5 REFERENCES

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