Section 13
Mineral Resources

This section discusses mineral resources, including fuel and non-fuel mineral resources. It describes the associated study area, the environmental setting, the significance of potential environmental impacts, and proposed mitigation measures.

The Delta Plan (the Proposed Project) does not propose implementation of any particular physical project; rather it seeks to influence, either through limited policy regulation or through recommendations, other agencies to take certain actions that will lead to achieving the dual goals of Delta ecosystem protection and water supply reliability. Those actions, if taken, could lead to physical changes in the environment. This is described in more detail in part 2.1 of Section 2A, Proposed Project and Alternatives, and in Section 2B, Introduction to Resource Sections.

The types of changes that could impact mineral resources include depletion of economically important mineral resources, such as construction aggregate. In addition, restoration of tidal marsh in the Delta or Suisun Marsh and other construction projects, if sited in areas with active gas extraction wells or mining operations, could potentially temporarily or permanently affect the availability of mineral resource extraction sites due to use conflicts and/or access problems.

Most of the demand for construction aggregate generally would end with construction, as would the impact. Mitigation exists for this construction-period impact, but may not be enough to reduce the impact to a less-than-significant-level in areas (such as the Delta region) where local supplies of construction aggregate are limited.

Impacts due to siting of projects encouraged by the Delta Plan on or near mineral resource extraction sites generally can be mitigated to less-than-significant levels except in cases of new inundation of large areas that contain such sites.

13.1 Study Area

The study area is defined as the geographical area in which the majority of potential impacts are expected to occur. The study area for mineral resources consists of the legal Delta and Suisun Marsh, the Delta watershed, and areas outside of the Delta that use Delta water. As described in Section 2A, Proposed Project and Alternatives, facilities could be constructed, modified, or reoperated, and other actions undertaken in the Delta, Delta watershed, or areas located outside the Delta that use Delta water. It is unclear where actions would be located. Because the Delta Plan policies and recommendations will have a greater impact within the Delta and Suisun Marsh than elsewhere, the analysis has a greater focus on the Delta and Suisun Marsh than elsewhere in the study area. Because it is unclear where the Delta Plan alternatives will have effects outside the Delta, this section discusses generally the effects on mineral resources that might occur in the Delta watershed and areas outside the Delta that use Delta water.

13.2 Regulatory Framework

Appendix D, Regulatory Framework, provides an overview of the plans, policies, and regulations relating to mineral resources within the study area.

13.3 Environmental Setting

This section describes the mineral resources within the study area, including fuel and nonfuel mineral resources. The discussion focuses primarily on mineral resources of the Delta and Suisun Marsh because the Delta Plan policies and recommendations would likely have the greatest impact within these areas. However, it is recognized that actions affecting mineral resources could be undertaken in areas outside the Delta and Suisun Marsh, and a general discussion of mineral resources in the Delta watershed and other areas of the state that use Delta water is provided.

13.3.1 Major Sources of Information

The mineral resources information provided in this section is based on publications by the California Department of Conservation (DOC); the California Geological Survey (CGS); the DOC Division of Oil, Gas, and Geothermal Resources (DOGGR); United States Geological Survey (USGS); and the general plans for counties and cities within the study area that could be affected by the proposed project or alternatives.

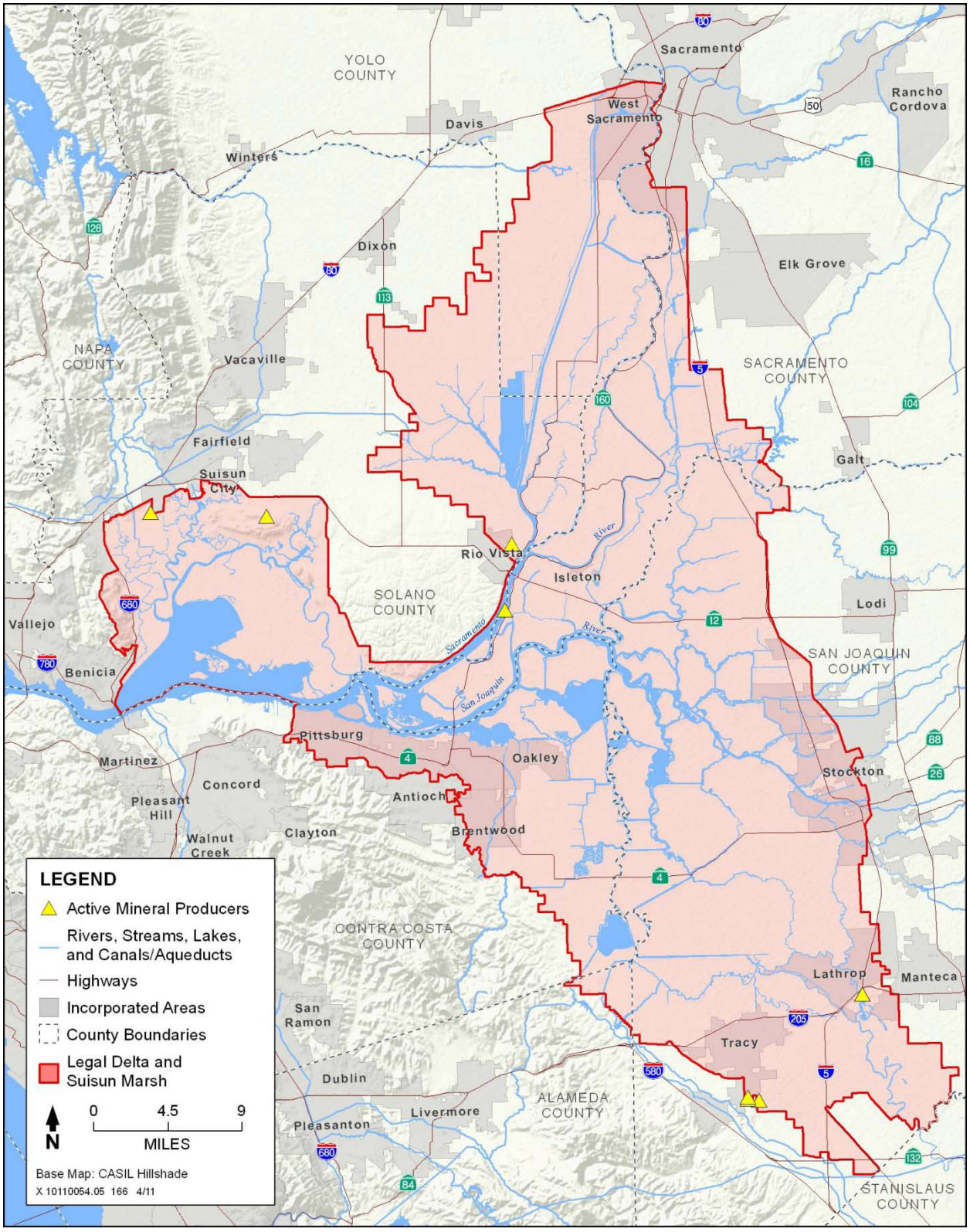
13.3.2 Delta and Suisun Marsh

Several types of fuel and non-fuel mineral resources exist within the Delta and the Suisun Marsh. These resources primarily include natural gas and aggregate (stone, sand, and gravel), but limited amounts of other mineral commodities (such as silica, gold, calcium, and peat), are also mined. In Delta counties, available supplies of construction aggregate are currently not sufficient to meet the projected 50-year demand for construction; future projects located in the Delta that require substantial quantities of construction aggregate may further reduce local supplies and restrict future development.

No mineral resource zones (MRZ) of regional or statewide importance (MRZ-2 areas, as described in Appendix D) are within the Delta and the Suisun Marsh; however, several active, permitted mines are present. The DOC identified four active, permitted mineral commodity producers in 2007 (Figure 13-1). Most of these producers were mining sand and gravel, and were located along major waterways (Sacramento River, San Joaquin River), where there are natural accumulations of these materials. Active mineral commodity producers located in the project area are shown on Figure 13-1.

In 2007, California produced 219 billion cubic feet of associated gas (i.e., gas that is associated with oil) and 93 billion cubic feet of non-associated gas (i.e., gas that is not associated with oil). Most of the state's natural gas fields are in the Sacramento Valley (DOC 1993). The Rio Vista gas field, discovered in the Delta in 1936, is the largest field producing non-associated gas in the state, occupying portions of Sacramento, Solano, and Contra Costa counties. This gas field produced over 12 billion cubic feet of natural gas in 2010 (DOC 2011). Natural gas fields are spread throughout the Delta and Suisun Marsh, but are most concentrated around the Rio Vista gas field in the north-central portion of the Delta, near Rio Vista and Isleton.

Figure 13-1
Active Mineral Commodity Producers
Source: DOC 2007



Gas wells have been installed throughout the Delta; however, active wells tend to be sited in gas fields where pockets of gas have been discovered. Because much of the gas resource is associated gas, oil is produced along with natural gas. The main concentration of active wells is within or nearby the Rio Vista gas field in Contra Costa, Sacramento, and Solano counties (Figure 13-2). Another concentration of active wells is within San Joaquin County, between Lathrop and Stockton. Within the Delta and the Suisun Marsh, Sacramento County has the greatest number of producing wells, followed by San Joaquin and Solano counties (Figure 13-2).

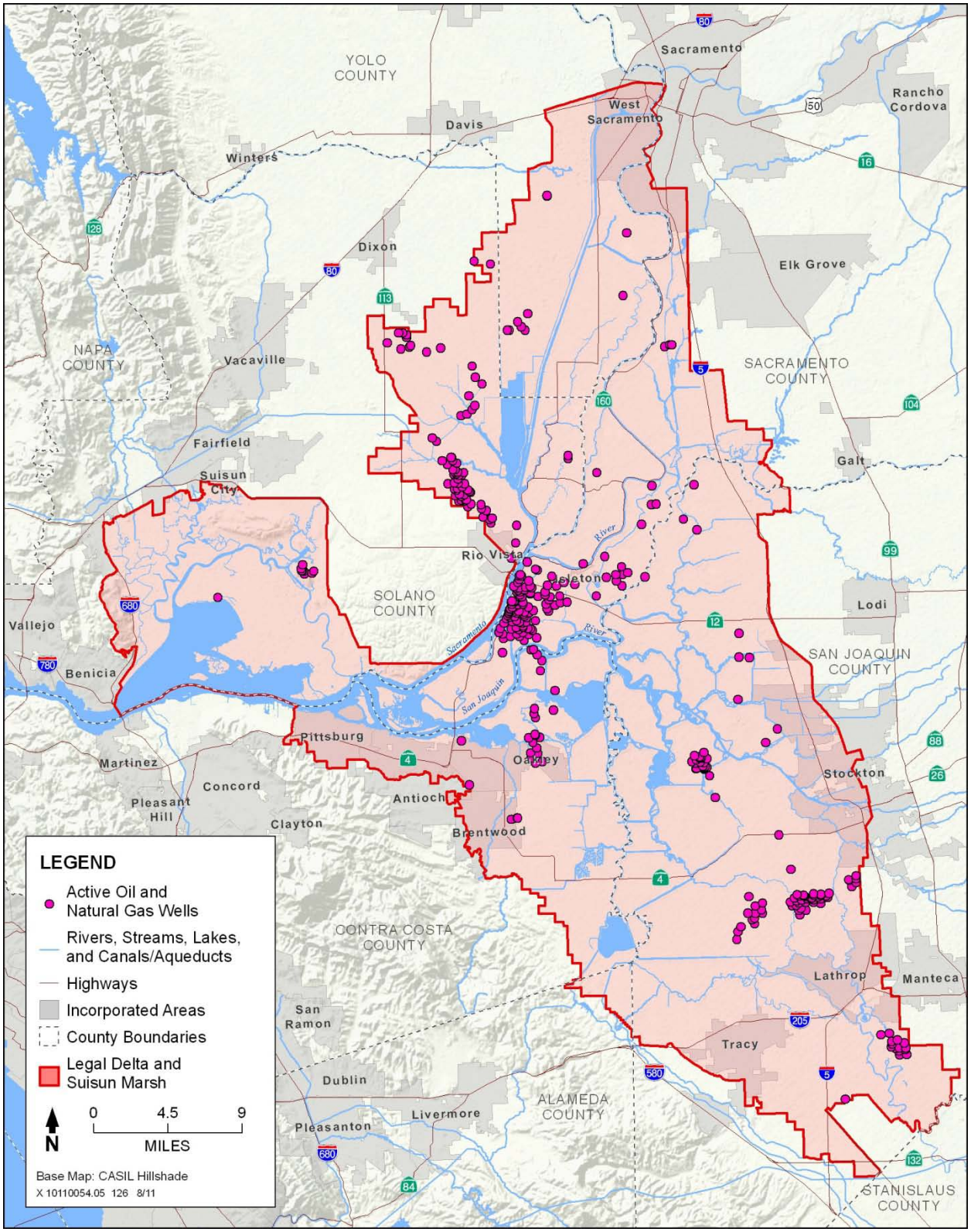
13.3.3 Other Areas of California

As described in Section 2A, Proposed Project and Alternatives, facilities could be constructed, modified, or reoperated, not only in the Delta and Suisun Marsh, but in other areas of the Delta watershed and areas outside the Delta that use Delta water. These other areas contain a wide range of mineral resources including natural gas reserves, oil reserves, and aggregate resources and other mineral commodities. Exclusive of the Delta, the Delta watershed contains additional areas with numerous natural gas wells, primarily north of Sacramento in the Sacramento Basin (DOC 2007). Areas that use Delta water that are located outside the Delta and Delta watershed generally contain few natural gas wells, with oil wells more common, especially in the southern San Joaquin, Santa Maria, Ventura, and Los Angeles Basins (DOC 2007).

In 2008, California ranked third in the nation for non-fuel mineral production, with a market value of $4.2 billion (USGS 2011). Other minerals produced include gold and silver, common clay, bentonite clay, crushed stone, dimension stone, feldspar, fuller's earth, gemstones, gypsum, iron ore (used in cement manufacture), kaolin clay, lime, magnesium compounds, perlite, pumice, pumicite, salt, soda ash, and zeolites. The only metals that are mine in California are gold and silver. In 2008, about 717 active mines were producing non-fuel minerals and employed about 10,000 people at mines and mineral processing plants (USGS 2011).

Industrial minerals (e.g., sand and gravel) accounted for more than 95 percent of the nonfuel mineral production in California in 2008 (USGS 2011). The leading industrial mineral is construction sand and gravel, with an estimated total value of $1.29 billion for 112 million metric tons produced in 2008 (USGS 2011). California's second largest mineral commodity was Portland cement, with 11 million tons produced with a value of over $1 billion (SMGB 2010). Sand and gravel continued to be the leading industrial minerals produced, even though the economic downturn in 2007 and 2008 resulted in decreased production and value for these commodities (USGS 2011). Likewise, cement production was down, as was cement imports at the Port of Stockton, due to reduced demand with the economic downturn. State bond funding and passage of the 2009 Federal American Recovery and Reinvestment Act are expected to generate several billion dollars for construction of freight and passenger rail, highways, local streets and roads, and port infrastructure projects in California (USGS 2011). Increased demand for construction materials to implement these projects is expected to offset the reduced demand resulting from the downturn in commercial and residential construction. New mining operations were in planning or received approved in 2008 for production of sand and gravel, rock, or aggregate in Sacramento, Fresno, Yuba, Mendocino Riverside, and Santa Barbara counties (USGS 2011). These operations could increase the availability of construction minerals substantially.

Figure 13-2
Oil and Gas Wells
Source: DOC 2006



13.4 Impacts Analysis of Project and Alternatives

13.4.1 Assessment Methods

The Delta Plan alternatives would not result in construction or operation of projects or facilities directly, and therefore would result in no direct impacts on mineral resources.

The Delta Plan alternatives could encourage the implementation of actions or activities by other agencies to construct and operate facilities or infrastructure that are described in Sections 2A and 2B. Projects may include water and wastewater treatment plants; conveyance facilities, including pumping plants, canals, pipelines and tunnels; surface water or groundwater storage facilities; ecosystem restoration projects; flood control levees; or recreation facilities. Implementation of these types of actions and construction and operation of these types of facilities could affect mineral resources.

The precise magnitude and extent of project-specific mineral resource-related impacts would depend on the type of action or project being evaluated, its specific location, its total size, and a variety of project- and site-specific factors that are undefined at the time of preparation of this program-level EIR. Project specific impacts would be addressed in project specific environmental studies conducted by the lead agency at the time the projects are proposed for approval.

Impacts on mineral resources that could result from implementation of the Proposed Project and alternatives were evaluated in terms of the potential for construction, operation, and/or restoration activities to adversely affect mineral resources. Because project-level construction, operation, and restoration details are not available, potential impacts on mineral resources were evaluated qualitatively for these activities in the Delta, Delta watershed, and areas outside the Delta that use Delta water.

The potential for reducing the availability of known mineral resources that would be of value to the region and residents of the state was evaluated based on presence of mineral resource sectors designated by the State Mining and Geology Board (SMGB) as having regional or statewide significance (i.e., MRZ-2 sectors) and whether construction would result in substantial depletion of construction-grade aggregate and/or cement, which are the state's most economically important mineral commodities, causing remaining supplies to be inadequate for future development..

The potential for reducing the availability of locally important mineral resource recovery sites that are identified in local planning documents was evaluated based on the presence of producing natural gas wells; and presence of active, permitted mining operations that could be affected by project construction in the study area.

This EIR proposes mitigation measures for impacts on mineral resources. The ability of these measures to reduce impacts to less-than-significant levels depends on project-specific environmental studies; enforceability of these measures depends on whether or not the project being proposed is a covered action. This is discussed in more detail in Section 13.4.3.2 and in Section 2B, Introduction to Resource Sections.

13.4.2 Thresholds of Significance

Based on Appendix G of the California Environmental Quality Act (CEQA) Guidelines, an impact related to mineral resources is considered significant if the Proposed Project would do any of the following:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;

- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

The following discussion of environmental impacts is limited to those potential impacts that could result from actions or projects the Delta Plan alternatives could encourage. As individual activities are proposed by other agencies, these individual activities will need to be evaluated in site-specific environmental documents prepared by those agencies.

A project's impacts on mineral resources are related to the magnitude of demand for resources and the project's footprint of disturbance. Based on a review of environmental documents for projects enumerated in the Delta plan (see Section 2B, Introduction to Resource Sections) and other example environmental documents for similar projects, types of potential impacts on mineral resources were found to be similar for all of the Delta Plan policy elements (Reliable Water Supply, Delta Ecosystem Restoration, Water Quality Improvement, Flood Risk Reduction, and Protection and Enhancement of Delta as Evolving Place). To avoid unnecessary repetition in the analysis of impacts that could occur under the Proposed Project, the Delta Plan policy elements have been combined and each impact is discussed only once. Impacts would be limited primarily to construction activities that take place on mineral resource sectors designated by the SMGB as having regional or statewide significance (i.e., MRZ-2 sectors), substantially deplete available construction mineral resources (e.g., aggregate and cement), or temporarily or permanently reduce the availability of a known mineral resource recovery site. During operations, new construction would not occur that could affect mineral resources. However, following construction, ongoing maintenance of levees and/or other facilities could require limited amounts of rock or aggregate for stabilization purposes.

13.4.3 Proposed Project

Projects that are encouraged for development of a reliable water supply may include construction of surface water and groundwater storage facilities, water intakes, conveyance facilities (canals, pipelines, tunnels, siphons, and pumping plants), treatment facilities, and regulating reservoirs. Delta ecosystem restoration projects may include floodplain, riparian, and tidal marsh restoration; stressor and invasive species management; and levee modification Projects to improve water quality could include construction of water treatment plants, conveyance facilities, wastewater treatment and recycle facilities, municipal stormwater treatment facilities, agricultural runoff treatment facilities, and wellhead treatment facilities. Projects to reduce flood risk could include construction of setback levees, floodplain expansion, levee maintenance and modification, dredging, stockpiling of materials, subsidence reversal, and reservoir reoperation. Delta enhancement projects could include construction of gateways, parks, trails, and other recreational facilities; and construction of retail and restaurants in Delta legacy towns to support tourism.

13.4.3.1.1 Impact 13-1: Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region and Residents of the State

Impacts related to loss of availability of known mineral resources that are of value to the region or residents of the state could occur if projects or activities encouraged by the Proposed Project are constructed/sited in MRZ-2 sectors, which have been designated by the SMGB has having regional and statewide importance (see Appendix D) and if such construction/siting significantly restricts access to underlying resources. Impacts also could occur if project construction results in substantial depletion and loss of availability of resources (e.g., aggregate and cement), which are the state's most economically important mineral commodities, causing remaining supplies to be inadequate for future development.

Projects implemented in the Delta and Suisun Marsh would have no effect on known mineral resources of regional or statewide importance because there are no MRZ-2 sectors within the Delta or Suisun Marsh. However, there are MRZ-2 sectors within the counties that lie partially within the Delta, in regions in the Delta watershed and in areas outside the Delta that use Delta water, which could be affected by projects,

depending on where they are located. In the past few years, new MRZ-2 sectors have been designated by the SMGB in the Delta watershed and in Delta export areas. For example, an additional MRZ-2 sector was designated by SMGB in Sacramento County and additional areas in Kern County have been classified as candidates for designation. Covered projects in areas of the Delta watershed and areas outside the Delta that use Delta water would be subject to project specific environmental review, and lead agencies are required to consider the presence of MRZ-2 sectors in their decision making processes. As discussed in Appendix D, Regulatory Framework, the lead agency's land use decisions involving these areas must be made in accordance with its established mineral resource management policies and require consideration of the importance of the designated mineral resource to the market region or the state as a whole, not just to the lead agency's jurisdiction or project. Because lead agencies are required to give consideration to impacts on MRZ-2 sectors when evaluating project-specific environmental effects, it is unlikely that there would be significant adverse impacts on MRZ-2 designated areas in the Delta watershed and areas outside the Delta that receive Delta water as a result of the Proposed Project.

Development of the water supply reliability projects encouraged by the Delta Plan could lead to substantial depletion of already inadequate aggregate resources. For example, construction of large-scale surface storage facilities named in the Delta Plan; the North of Delta Offstream Storage Investigation (aka Sites Reservoir), Los Vaqueros Reservoir Project (Phase 2), and Upper San Joaquin River Basin Storage Investigation Plan (aka Temperance Flat) and other similar projects, would require large quantities of construction aggregate and cement for dams, intakes, pumping plants, roads, and hydropower generating facilities. Construction of ocean desalination plants and associated water intakes, brine outfalls, treatment and conveyance facilities would also require aggregate and cement.

Delta ecosystem restoration plans and projects named in the Delta Plan, such as the North Delta Flood Control and Ecosystem Restoration Project, and restoration actions in Suisun Marsh (Suisun Marsh Habitat Management, Preservation, and Restoration Plan), Cache Slough Complex, Yolo Bypass, and Lower San Joaquin River Bypass would potentially require aggregate and/or cement for levee modifications, construction of pumping facilities and other infrastructure.

Projects named in the Delta Plan to encourage improvement of water quality, such as the North Bay Aqueduct Alternative Intake Project, could require aggregate and cement for construction of new water and wastewater treatment plants, pipelines, and other facilities. Development of plans, such as Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS), would not have a direct effect on mineral resources. Dredging projects named in the Delta Plan, such as the Sacramento Deep Water Ship Channel and Stockton Deep Water Ship Channel, would be unlikely to adversely affect mineral resources, but other flood control plans and projects that involve levee construction or modifications (such as the DWR Framework for Investments in Delta Flood Management) could require aggregate for stabilization.

Finally, Delta enhancement plans and projects, such as construction of state parks within Barker Slough or Elkhorn Basin would require aggregate and cement for construction of recreational and commercial facilities. While most construction aggregate and cement demands would likely occur during project construction, project operation could also require aggregate (e.g., for maintenance and stabilization of Delta levees).

As mentioned above, within the Delta counties, available supplies of construction aggregate are not sufficient to meet the projected 50-year demand for future construction. Regions in the study area with less than 10 years of remaining permitted aggregate resources include Sacramento County, North San Francisco Bay, Fresno, and northern Tulare County. The only region in the study area with sufficient resources to meet the 50 year projected demand is Yuba City-Marysville, in the Sacramento Valley (Kohler 2006). However, in the past few years, new operations for extraction of sand and gravel have been approved or are in planning; an additional MRZ-2 sector was designated by SMGB in Sacramento County, and additional areas in Kern County have been classified as candidates for designation.

Therefore, availability of construction aggregate resources within the portions of the study area is likely to increase in the future (USGS 2011, SMGB 2010).

It is unclear at this time how implementation of the Proposed Project would result in construction and operations of projects, including the location, number, capacity, operational criteria, and methods and duration of construction activities. Because of the uncertainties underlying this program-level assessment, project impacts related to substantial depletion of construction aggregate or cement resources cannot be accurately quantified. Projects encouraged by the Proposed Project to improve water supply reliability, ecosystem restoration, water quality, flood control, and Delta enhancement, including those identified in the policies and recommendations, have the potential to deplete these important mineral resources. The nature and magnitude of impacts related to mineral resources of statewide or regional importance will depend on the specific location and characteristics of the projects at the time they are implemented, and the specific mitigation measures adopted by the implementing agencies.

While the specific impacts of the projects encouraged in the Delta Plan, if they go forward, are yet to be determined, projects recently evaluated under CEQA with characteristics similar to those described above provide perspective on the significance of these types of impacts on mineral resources and the likelihood that they can be mitigated. EIRs and EISs prepared for several of the enumerated projects and other similar projects illustrate many of the likely types of impacts. Documents reviewed for potential impacts included EIRs for the Los Vaqueros Reservoir Expansion Project (CCWD 2009), and Calaveras Dam Replacement Project (SFPUC 2011), which are illustrative of some of the types of impacts associated with surface water storage projects; the Davis-Woodland Water Supply Project (City of Davis 2007), which is illustrative of a potential water quality project; The Suisun Marsh Habitat Management, Preservation, and Restoration Plan (Reclamation et al. 2010), which is illustrative of a Delta ecosystem restoration project; the North Delta Flood Control and Ecosystem Restoration Project (DWR 2010), which is illustrative of a potential flood control Project; and the Bidwell-Sacramento River State Park Habitat Restoration and Outdoor Recreation Facilities Development Project (DPR 2008), which is illustrative of a Delta enhancement project.

All the reviewed documents found that project construction and operation would result in either no impact or a less–than-significant impact on mineral resources, and no mitigation was required for any project. Findings were based on absence of important mineral resources within the project footprints and sufficient supply of mineral resources for construction. Impacts that would be specific to the projects that could be implemented under the Proposed Project, however, would depend on size and location of those projects.

Based on these examples, it is likely that project construction and operation under the Proposed Project, would have less-than-significant impacts on mineral resources of statewide or regional importance, because lead agencies would consider locations of MRZ-2 sectors in their decision making process, in order to ensure continued ability to extract aggregate and other construction minerals in these areas. Because the details of many of the aspects of specific projects, however, are not currently known, it is possible that construction demand for aggregate and/or cement could exceed local supplies, resulting in significant impacts on mineral resources of statewide or regional importance. For example, large-scale projects that have high resource demand (i.e., construction aggregate requirements) may have significant adverse impacts because the demand for the resource may exceed local supply. Therefore, for the purpose of this program-level assessment, impacts related to depletion of construction-grade mineral resources from one or more of the projects and actions encouraged by the Delta Plan could be **significant**.

13.4.3.1.2 Impact 13-2: Result in the Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

Impacts related to loss of availability of locally-important mineral resource recovery sites could occur if projects or activities encouraged by the Proposed Project are constructed on or near mineral recovery sites

which have been identified in local general plans, specific plans, or other land use plans. These locally important sites could include producing natural gas wells and active, permitted mining operations in the study area.

Projects and actions encouraged by the Proposed Project to improve water supply reliability, restore the Delta ecosystem, improve water quality, reduce flood risk, and enhance the Delta as an evolving place, including those identified in the policies and recommendations, have the potential to impact mineral resource recovery sites, including producing oil and gas wells and active mining sites. The nature and magnitude of the potential impacts will depend on the specific location and characteristics of the projects at the time they are implemented, and the specific mitigation measures adopted by the implementing agencies.

Resource recovery sites, such as producing oil and natural gas wells, and active mining sites, which are delineated in a local general plan, specific plan, or other land use plans could potentially be affected by construction of facilities or implementation of actions encouraged by the Delta Plan. Many producing natural gas wells are located within delineated natural gas fields in the Delta and Suisun Marsh (Figure 13-2), as well as in the Sacramento Valley. Outside of the Delta and Suisun Marsh, producing oil wells are located primarily in the San Joaquin, Ventura, Santa Maria, and Los Angeles Basins, with the largest oil production in the state occurring in the Midway-Sunset oil field in Kern County (DOC 2010). In addition, a number of permitted mining operations are present in the Delta (Figure 13-1), and well as other locations in the Delta watershed and areas outside the Delta that use Delta water.

Extraction wells and mining operations could be temporarily or permanently affected if the projects constructed under the Delta Plan are sited where these existing resource recovery sites are located. For example, implementation of restoration actions in the Delta and Suisun Marsh that entail permanent inundation of areas containing natural gas extraction wells may result in the need to modify wells, or abandon and relocate wells. Similarly, implementation of restoration actions and construction of projects encouraged by the Delta Plan could result in temporary or permanent loss of availability of active mining sites. Impacts on mineral extraction sites would be temporary if effects are limited to the construction period, such as could occur if access to a mining operation was temporarily restricted. Impacts would be permanent if a permanent loss of availability of the extraction site would result from project construction.

It is unclear at this time how implementation of the Proposed Project would result in construction and operations of projects, including the location, number, capacity, operational criteria, and methods and duration of construction activities. Because of the uncertainties underlying this program-level assessment, project impacts related to loss of availability of locally important mineral resource recovery sites cannot be accurately quantified. The nature and magnitude of impacts will depend on the specific location and characteristics of the projects at the time they are implemented, and the specific mitigation measures adopted by the implementing agencies. As explained below, in most situations, consistent with previously completed environmental documents for similar projects reviewed as part of the preparation of this EIR, impacts are expected to be less than significant.

While the specific impacts of the above-mentioned projects, if they go forward, are yet to be determined, projects recently evaluated under CEQA with characteristics similar to those described provide perspective on the significance of these types of impacts on mineral resources and the likelihood that they can be mitigated. EIRs and EISs prepared for several of the enumerated projects and other similar projects, illustrate many of the likely impacts. Documents reviewed for potential impacts included EIRs for the Los Vaqueros Reservoir Expansion Project (CCWD 2009); the Calaveras Dam Replacement Project (SFPUC 2011); the Davis-Woodland Water Supply Project (City of Davis 2007); the Suisun Marsh Habitat Management, Preservation, and Restoration Plan (Reclamation et al. 2010); the North Delta Flood Control and Ecosystem Restoration Project (DWR 2010); and the Bidwell-Sacramento River State Park Habitat Restoration and Outdoor Recreation Facilities Development Project (DPR 2008).

All the reviewed documents found that project construction and operation would result in either no effect or a less-than-significant effect on mineral resources, and no mitigation was required for any project. Findings were based on absence of locally important mineral resources within the project footprints. Impacts that would be specific to the projects that could be implemented under the Proposed Project, however, would depend on size and location of those projects.

Based on these examples, it is likely that impacts could be avoided in many cases by siting projects such that they do not significantly limit access to producing oil and gas wells or permitted mining operations,. Extraction sites in the Delta watershed and areas outside the Delta that use Delta water would likely be avoided during project siting and design in these areas (Mitigation Measure 13-2 would so ensure). The details of many of the aspects of these projects, however, are not currently known, and it is possible that significant impacts on locally important mineral resource recovery sites might be encountered. For example, large-scale projects that are located in the Delta and Suisun Marsh may have significant adverse impacts because producing natural gas wells may be difficult to avoid in many areas, especially in the Rio Vista gas field, which contains a high density of wells. However, even if wells have to be abandoned, they could likely be relocated (and directional drilling could be used if necessary) so that the duration of production loss is minimized. For the purpose of this program-level assessment, impacts related to loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan from one or more of the projects and actions encouraged by the Delta Plan could be **significant** prior to mitigation.

13.4.3.2 Mitigation Measures

Any covered action that would have one or more of the significant environmental impacts related to mineral resources described above shall incorporate the following features and/or requirements that are applicable to the proposed action.

With regard to covered actions implemented under the Delta Plan, these mitigation measures will reduce the impacts of the Proposed Project. Project-level analysis by the agency proposing the covered action will determine whether the measures are sufficient to reduce those impacts to a less-than-significant level. Generally speaking, these measures are commonly employed to minimize the severity of an impact and in most cases would reduce impacts to a less-than-significant level, as discussed below in more detail.

With regard to actions taken by other agencies on the basis of Delta Plan recommendations (i.e., activities that are not covered actions), the implementation and enforcement of these measures would be within the responsibility and jurisdiction of public agencies other than the Delta Stewardship Council. Those agencies can and should adopt these measures as part of their approval of such actions, but the Delta Stewardship Council does not have the authority to require their adoption. Therefore, significant impacts of noncovered actions could remain **significant and unavoidable**.

How mitigation measures in this EIR relate to covered and noncovered actions is discussed in more detail in Section 2B, Introduction to Resource Sections.

13.4.3.2.1 Mitigation Measure 13-1

The following mitigation measures would reduce the effects of Impact 13-1, Loss of Availability of a Known Mineral Resource that Would Be of Value to the Region and Residents of the State:

- Ensure land use compatibility between existing mineral resource extraction activities and projects, activities or actions that may be implemented as the result of the Proposed Project.
- Maintain adequate buffer between future projects and designated MRZ-2 sectors.

- Explore opportunities to classify and designate new MRZ-2 sectors (e.g., in existing MRZ-3 sectors) to ensure that important mineral resources are conserved and continue to be available for future construction needs.
- Ensure future land use changes within designated mineral resource extraction areas recognize mineral resource extraction as a compatible use.
- Limit use of construction aggregate to local sources with sufficient capacity to meet both project and future local development needs, to the extent possible.
- Use recycled aggregate where possible, to decrease the demand for new aggregate.

In most cases, implementation of these mitigation measures would reduce impacts on mineral resources of statewide and regional importance to a less-than-significant level. In cases where construction demand may exceed the available supply of aggregate, such as construction of large infrastructure projects, it may not be feasible to limit use of aggregate to local sources or use recycled aggregate, and impacts on mineral resources would remain **significant and unavoidable**.

13.4.3.2.2 Mitigation Measure 13-2

The following mitigation measures would reduce the effects of Impact 13-2, Loss of Availability of a Locally-important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan or Other Land Use Plan:

- Ensure access is maintained to existing, active mineral resource extraction sites both during and after project construction.
- Implement recommendations identified in DOGGR's construction site well review program (DOC 2007).

In cases where construction would require modifications or abandonment of oil and gas wells in the Delta and Suisun Marsh, such as construction of large infrastructure projects or ecosystem restoration projects, temporary impacts on mineral extraction sites could occur until well modifications are completed or new wells are developed following abandonment. In most cases, implementation of the above mitigation measures would reduce impacts on locally important mineral resources to a **less-than-significant** level.

13.4.5 No Project Alternative

As described in Section 2A, Proposed Project and Alternatives, the No Project Alternative is based on the continuation of existing plans and policies and the continued operation of existing facilities into the future and permitted and funded projects. Seven ongoing projects have been identified as part of the No Project Alternative. The list of projects included in the No Project Alternative is presented in Table 2-2.

The significance of impacts to mineral resources is associated with the presence of mineral resource sectors designated by the SMGB as having regional or statewide significance (i.e., MRZ-2 sectors), the presence of producing natural gas wells and active, permitted mining operations, and the availability of mineral resources for construction,.

With the No Project Alternative, the Delta Plan would not be in place to encourage various other projects to move forward. To the extent that the absence of the Delta Plan prevents those projects from moving forward, there could be fewer construction-related mineral resource impacts in the near term (particularly, demand for aggregate) and fewer operations-related mineral resource impacts over the long-term. Therefore, mineral resources impacts for the No Project Alternative would be **less than** the Proposed Project because fewer projects would move forward. Because mineral resource impacts are related to the

location and type of project, the No Project Alternative could result in **significant** construction- and operations-related mineral resources impacts like those of the Proposed Project.

13.4.6 Alternative 1A

13.4.6.1 Assessment of Delta Plan Policy Elements

Under Alternative 1A, the construction and operation of surface water projects (water intakes, treatment and conveyance facilities, and reservoirs) would be the same as under the Proposed Project. As described in Section 2A, Proposed Project and Alternatives, there would be fewer groundwater projects (wells, wellhead treatment, conveyance facilities), ocean desalination projects and recycled wastewater and stormwater projects (treatment and conveyance facilities).

Projects to restore the Delta ecosystem would be reduced relative to the Proposed Project.

Projects and actions to improve water quality would be the same as under the Proposed Project. Flood risk reduction projects also would be the same as under the Proposed Project, except that there would be less emphasis on levee maintenance and modification for levees that protect agricultural land and more emphasis on levees that protect water supply corridors, which could result in an overall reduction in these activities. Projects to protect and enhance the Delta as an evolving place would be the same as for the Proposed Project.

13.4.6.1.1 Impact 13-1: Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region and Residents of the State

The same type and extent of impacts from construction of water supply reliability projects would occur under Alternative 1A as under the Proposed Project because surface water storage projects would be the same. Neither the Proposed Project nor Alternative 1A is likely to have a significant impact on designated MRZ-2 sectors. Construction of large surface water projects would still occur with substantial requirements for aggregate and cement.

With Alternative 1A, less emphasis would be placed on levee construction in sparsely populated agricultural areas, which could lead to a reduction in levee construction relative to the Proposed Project and a reduced demand for aggregate. There would be the same construction-related impacts on mineral resources of regional and statewide value as the Proposed Project for the construction of water quality improvement projects and Delta enhancement projects because Alternative 1A would encourage the same projects for construction as the Proposed Project.

Overall, significant impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 1A would be the **same as** the Proposed Project because the large surface water projects that would be most likely to deplete local aggregate resources would potentially be implemented under both Alternative 1A and the Proposed Project.

As compared to existing conditions, the impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 1A would be **significant**.

13.4.6.1.2 Impact 13-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

The same type and extent of impacts from construction of water supply reliability projects on mineral resource recovery sites would occur under Alternative 1A as under the Proposed Project because surface water storage projects would be the same

Many Delta ecosystem restoration actions would likely occur within the Delta and Suisun Marsh, although some could take place within the Delta watershed, where mineral resource recovery sites (producing natural gas wells; and active mining operations) are delineated on local land use plans.

However, potential impacts on mineral resource extraction sites could be reduced because projects to restore the Delta ecosystem would be reduced in comparison to the Proposed Project. With Alternative 1A, less emphasis would be placed on levee construction in sparsely populated agricultural areas, which could lead to a reduction in levee construction relative to the Proposed Project and a reduced likelihood that mineral resource extraction sites would be affected. There would be the same construction-related impacts on mineral resource extraction sites as the Proposed Project for the construction of water quality improvement and enhancement of the Delta as an evolving place projects because Alternative 1A would result in the same projects encouraged for construction as the Proposed Project.

Overall, significant impacts related to loss of locally important mineral resource recovery sites under Alternative 1A would be **less than** under the Proposed Project, because fewer ecosystem restoration projects would decrease the chance of affecting existing natural gas production sites in the Delta.

As compared to existing conditions, the impacts related to loss of locally important mineral resource recovery sites under Alternative 1A would be **significant**.

13.4.6.1 Mitigation Measures

Mitigation measures for Alternative 1A would be the same as those described in Sections 13.4.3.2.1 (Mitigation Measure 13-1) and 13.4.3.2.2 (Mitigation Measure 13-2) for the Proposed Project. Because it is not known whether Mitigation Measure 13-1 listed above would reduce Impact 13-1 to a less-than-significant level for Alternative 1A, these potential impacts are considered **significant and unavoidable** for construction of projects for which demand for construction-grade aggregate and/or cement exceeds local supplies. For Impact 13-2, implementation of Mitigation Measure 13-2 would likely reduce impacts on locally important mineral resource recovery sites to a **less-than-significant** level.

13.4.7 Alternative 1B

13.4.7.1 Assessment of Delta Plan Policy Elements

Under Alternative 1B, the construction and operation of surface water projects (water intakes, treatment and conveyance facilities, and reservoirs) would be the same as under the Proposed Project. As described in Section 2A, Proposed Project and Alternatives, there would be fewer groundwater projects (wells, wellhead treatment, conveyance facilities) and recycled wastewater and stormwater projects (treatment and conveyance facilities). There would be no ocean desalination projects.

Projects to restore the Delta ecosystem would be reduced in extent relative to the Proposed Project and would not emphasize restoration of floodplains in the lower San Joaquin River.

Water quality improvement projects, including water treatment plants, conveyance facilities, and wells and wellhead treatment facilities, would be less emphasized relative to the Proposed Project, and greater emphasis would be placed on the construction and operation of wastewater treatment and recycle facilities and municipal stormwater treatment facilities.

Flood risk reduction would place greater emphasis on levee modification/maintenance and dredging than under the Proposed Project, but there would be no setback levees or subsidence reversal projects. Floodplain expansion projects would be fewer or less extensive, and use of reservoir reoperation would be reduced. Actions to protect and enhance the Delta as an evolving place would be consistent with the Economic Sustainability Plan, but the locations for new parks, as encouraged by the Proposed Project, would not be emphasized.

13.4.7.1.1 Impact 13-1: Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region and Residents of the State

The same type of impacts from construction of water supply reliability projects would occur under Alternative 1B as described under the Proposed Project.

Although fewer groundwater projects and recycled wastewater and stormwater projects would be implemented under Alternative 1B compared to the Proposed Project, neither the Proposed Project nor Alternative 1B is likely to have a significant impact on designated MRZ-2 sectors. Construction of large surface water projects would still occur with substantial requirements for aggregate and cement.

Alternative 1B would not emphasize restoration of floodplains in the lower San Joaquin River, potentially leading to a reduction in mineral resource impacts relative to the Proposed Project. With Alternative 1B, greater emphasis would be placed on levee modification/maintenance and dredging than under the Proposed Project, but there would be no setback levees or subsidence reversal projects. This could lead to a reduction in levee construction relative to the Proposed Project and demand for construction aggregate and rip-rap for stabilization may be substantially less than with the Proposed Project.

Under Alternative 1B, the emphasis on the types of water quality improvement projects would shift toward more wastewater treatment and recycle facilities and more municipal stormwater treatment facilities and fewer of the other types of water quality improvement facilities. It is unclear if this shift would result in more or less construction activity; therefore, aggregate and cement demands are expected to be to the same as those under the Proposed Project. Alternative 1B would also produce the same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project, but not at the named locations of the proposed new parks.

Overall, significant impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 1B would be **similar to** the Proposed Project.

As compared to existing conditions, the impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 1B would be **significant**.

13.4.7.1.2 Impact 13-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

The same type of impacts on mineral resources of local importance would occur under Alternative 1B as described under the Proposed Project.

Delta ecosystem restoration actions could occur within the Delta and the Delta watershed where there are mineral resource recovery sites (producing natural gas wells; and active mining operations) delineated on local land use plans. However, potential impacts to these sites could be reduced because projects to restore the Delta ecosystem would be reduced in extent compared to the Proposed Project. Alternative 1B would not include restoration of floodplains in the lower San Joaquin River; therefore impacts on extraction sites could be less than with the Proposed Project to the extent there are mineral resource extraction sites in this area.

Under Alternative 1B, the emphasis on the types of water quality improvement projects would shift toward more wastewater treatment and recycle facilities and more municipal stormwater treatment facilities and fewer of the other types of water quality improvement facilities. It is unclear if this shift would result in a greater or reduced construction footprint; therefore, impacts are expected to be the same as those under the Proposed Project. Alternative 1B would also produce the same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project, but not at the named locations of the proposed new parks.

Overall, significant impacts related to loss of locally important mineral resource recovery sites under Alternative 1B would be **less than** under the Proposed Project because fewer ecosystem restoration projects would reduce the chance of affecting mineral resource extraction sites.

As compared to existing conditions, the impacts related to loss of locally important mineral resource recovery sites under Alternative 1B would be **significant**.

13.4.7.2 Mitigation Measures

Mitigation measures for Alternative 1B would be the same as those described in Sections 13.4.3.2.1 (Mitigation Measure 13-1) and 13.4.3.2.2 (Mitigation Measure 13-2) for the Proposed Project. Because it is not known whether Mitigation Measure 13-1 listed above would reduce Impact 13-1 to a less-than-significant level for Alternative 1B, these potential impacts are considered **significant and unavoidable** for construction of projects for which demand for construction-grade aggregate and/or cement exceeds local supplies. For Impact 13-2, implementation of Mitigation Measure 13-2 would likely reduce impacts on locally important mineral resource recovery sites to a **less-than-significant** level.

13.4.8 Alternative 2

13.4.8.1 Assessment of Delta Plan Policy Elements

As described in Section 2A, Proposed Project and Alternatives, Alternative 2 would place greater emphasis on groundwater, ocean desalination, water transfers, water use efficiency and conservation, and recycled water projects and less emphasis on surface water projects. The surface storage reservoirs considered under the DWR Surface Water Storage Investigation would not be encouraged; instead, surface storage in the Tulare Basin would be emphasized. Ecosystem restoration projects, similar to but less extensive than those encouraged by the Proposed Project, would be emphasized.

Actions to improve water quality would be similar to or greater than those under the Proposed Project, especially the treatment of wastewater and agricultural runoff. Actions to reduce flood risk under Alternative 2 would emphasize floodplain expansion and reservoir reoperation rather than levee construction and modification. The stockpiling of rock for flood emergencies and encouragement of subsidence reversal projects would be the same as under the Proposed Project, as would actions to protect and enhance the Delta as an evolving place.

13.4.8.1.1 Impact 13-1: Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region and Residents of the State

The same type of impacts from construction of water supply reliability projects would occur under Alternative 2 as described under the Proposed Project. Neither the Proposed Project nor Alternative 2 is likely to have a significant impact on designated MRZ-2 sectors because lead agencies would consider presence of these areas when approving potential projects. Although the surface water storage reservoirs considered under the DWR Surface Water Storage Investigation would not be encouraged, surface storage projects in the Tulare Basin could result in similar demands for aggregate and cement.

Projects to restore the Delta ecosystem would be less extensive than under the Proposed Project, but many of these actions would occur within the Delta and Suisun Marsh, where there are no MRZ-2 sectors identified. There would more wastewater treatment and agricultural runoff facilities constructed under Alternative 2 than under the Proposed Project. A similar number of the other types of water quality improvement facilities would be constructed. It is unclear whether this shift would result in more or less construction activity; therefore, aggregate and cement demands are expected to be the same as under the Proposed Project.

Flood risk reduction projects, including construction of levees in the Delta, may be less likely under Alternative 2 because flood risk management would emphasize floodplain expansion and dam operations

more than the Proposed Project. This could lead to a reduction in demand for construction aggregate and rip-rap for stabilization relative to the Proposed Project. Alternative 2 would produce the same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project.

Overall, significant impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 2 would likely be the **same as** under the Proposed Project.

As compared to existing conditions, the impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 2 would be **significant**.

13.4.8.1.2 Impact 13-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

The same type of impacts on mineral resource extraction sites would occur under Alternative 2 as described under the Proposed Project, but the likelihood that projects could potentially reduce the availability of locally important mineral resource recovery sites would be greater than under the Proposed Project because more of these types of facilities would be constructed. Projects to restore the Delta ecosystem and construction of new levees would be less extensive under Alternative 2 than under the Proposed Project. However, floodplain expansion would be greater and would lead to an increase in the seasonal inundation area within floodplains, which could limit access to mineral resource extraction sites.

There would more wastewater treatment and agricultural runoff facilities constructed under Alternative 2 than under the Proposed Project. A similar number of the other types of water quality improvement facilities would be constructed.

Alternative 2 would produce the same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project.

Overall, significant impacts related to loss of locally-important mineral resource extraction sites under Alternative 2 would likely be the **same as** under the Proposed Project.

As compared to existing conditions, the impacts related to loss of locally-important mineral resource extraction sites under Alternative 2 would be **significant**.

13.4.8.2 Mitigation Measures

Mitigation measures for Alternative 2 would be the same as those described in Sections 13.4.3.2.1 (Mitigation Measure 13-1) and 13.4.3.2.2 (Mitigation Measure 13-2) for the Proposed Project. Because it is not known whether Mitigation Measure 13-1 listed above would reduce Impact 13-1 to a less-than-significant level for Alternative 2, these potential impacts are considered **significant and unavoidable** for construction of projects for which demand for construction-grade aggregate and/or cement exceeds local supplies. For Impact 13-2, implementation of Mitigation Measure 13-2 would likely reduce impacts on locally important mineral resource recovery sites to a **less-than-significant** level.

13.4.9 Alternative 3

13.4.9.1 Assessment of Delta Plan Policy Elements

As described in Section 2A, Proposed Project and Alternatives, the water supply reliability projects and actions under Alternative 3 would be similar to those of the Proposed Project, although there would be less emphasis on surface water projects. Ecosystem restoration (floodplain restoration, riparian restoration, tidal marsh restoration, and floodplain expansion) would be reduced compared to the Proposed Project, and restoration on publicly owned lands, especially in Suisun Marsh and the Yolo Bypass, would be emphasized. There would be more ecosystem stressor management actions (e.g., programs for water quality, water flows) and more management for nonnative invasive species. Water

quality improvements would be the same as for the Proposed Project. Actions under Alternative 3 to reduce flood risk would not include setback levees or subsidence reversal but would result in greater levee modification/maintenance and dredging relative to the Proposed Project. Reservoir reoperation and rock stockpiling would be the same as for the Proposed Project, as would activities to protect and enhance the Delta as an evolving place.

13.4.9.1.1 Impact 13-1: Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region and Residents of the State

The same type of impacts from construction of water supply reliability projects would occur under Alternative 3 as described under the Proposed Project. Neither the Proposed Project nor Alternative 3 is likely to have a significant impact on designated MRZ-2 sectors because lead agencies would consider presence of these areas when approving potential projects. However, if large surface water storage projects are not constructed, this would result in substantially lower demands for aggregate and cement than under the Proposed Project.

Projects to restore the Delta ecosystem would be less extensive under Alternative 3 than under the Proposed Project and focused on publicly owned lands, especially in Suisun Marsh and the Yolo Bypass, where there are no designated MRZ-2 sectors. Less extensive ecosystem restoration would also reduce the demand for aggregate compared to the Proposed Project. There would be the same construction-related impacts on mineral resources of regional and statewide value as the Proposed Project for the construction of water quality improvement projects because the construction of projects under Alternative 3 would be the same as the Proposed Project.

Flood risk reduction under Alternative 3 would place greater emphasis on levee modification/maintenance and dredging than under the Proposed Project, but there would be no setback levees or subsidence reversal projects. It is unclear if this shift would result in more or less construction activity; therefore, impacts are expected to be the same as under the Proposed Project. Alternative 3 would produce the same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project.

Overall, significant impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 3 would likely be **less than** under the Proposed Project.

As compared to existing conditions, the impacts related to loss of known mineral resources that are of value to the region and residents of the state under Alternative 3 would be **significant**.

13.4.9.1.2 Impact 13-2: Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan

The same type of impacts on mineral resource extraction sites would occur under Alternative 3 as described under the Proposed Project.

Projects to restore the Delta ecosystem would be less extensive under Alternative 3 than under the Proposed Project and focused on publicly owned lands, especially in Suisun Marsh and the Yolo Bypass. Less extensive ecosystem restoration projects could lead to fewer impacts on locally important mineral resource recovery sites relative to the Proposed Project. There would be the same construction-related impacts on mineral resource extraction sites as the Proposed Project for the construction of water quality improvement projects because construction of projects encouraged under Alternative 3 would be the same as the Proposed Project.

Flood risk reduction under Alternative 3 would place greater emphasis on levee modification/maintenance and dredging than under the Proposed Project, but there would be no setback levees or subsidence reversal projects. Because Alternative 3 would require less construction of new levees than the Proposed Project, fewer impacts on mineral resource extraction sites could result. Alternative 3 would produce the

same types of construction-related impacts associated with Delta enhancement projects as would the Proposed Project.

Overall, significant impacts related to loss of locally-important mineral resource extraction sites under Alternative 3 would likely be **less than** under the Proposed Project.

As compared to existing conditions, the impacts related to loss of locally-important mineral resources under Alternative 3 would be **significant**.

13.4.9.2 Mitigation Measures

Mitigation measures for Alternative 3 would be the same as those described in Sections 13.4.3.2.1 (Mitigation Measure 13-1) and 13.4.3.2.2 (Mitigation Measure 13-2) for the Proposed Project. Because it is not known whether Mitigation Measure 13-1 listed above would reduce Impact 13-1 to a less-than-significant level for Alternative 3, these potential impacts are considered **significant and unavoidable** for construction of projects for which demand for construction-grade aggregate and/or cement exceeds local supplies. For Impact 13-2, implementation of Mitigation Measure 13-2 would likely reduce impacts on locally important mineral resource recovery sites to a **less-than-significant** level.

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