Chapter 15
Flood Control

Floods can be very damaging and costly. In order to lessen the effects, numerous practices aim to reduce flood damages. The construction of levees, dams, and reservoirs are common methods of flood damage reduction in California. Levees confine the water flows within a channel. The integrity of a levee and its maximum design flow capacity, dictate the extent of a levee's effectiveness. Dams and reservoirs can be operated to reduce flows downstream by storing inflows and controlling releases.

Many agencies have a role in designing, constructing, and operating flood control facilities, such as the U.S. Bureau of Reclamation (Reclamation), the U.S. Army Corps of Engineers (USACE), the California Department of Water Resources (DWR), and the State Reclamation Board. The Federal Emergency Management Agency oversees the National Flood Insurance Program, which helps ensure protection from flood-related damages through the implementation of 3 main components: flood insurance program, floodplain management, and flood hazard mapping.

This chapter discusses the effects of the Flexible Purchase and Fixed Purchase Alternatives on flood control. Section 15.1 presents the affected environment/existing conditions and Section 15.2 evaluates the No Action, Flexible Purchase, and Fixed Purchase Alternatives, and a comparative analysis of the alternatives.

15.1 Affected Environment/Existing Conditions

This section describes the existing conditions in the study area. These conditions are current to 2003, where possible; otherwise, the latest available data have been used. This information serves as the reference conditions against which to compare program-induced effects.

15.1.1 Area of Analysis

Effects are assessed in the Upstream from the Delta Region, Delta Region, and in the Export Service Area. (See Figure 15-1.)

- **Upstream from the Delta Region**: Lake Shasta; Little Grass Valley and Sly Creek Reservoirs; Lake Oroville; New Bullards Bar Reservoir; French Meadows and Hell Hole Reservoirs; Folsom Lake; Lake McClure; Sacramento, Feather, Yuba, American, and Merced Rivers.

- **Delta Region**

- **Export Service Area**: Anderson Reservoir; Lake Perris; Castaic Lake; Diamond Valley Lake; California Aqueduct; and Tulare Lake Basin.

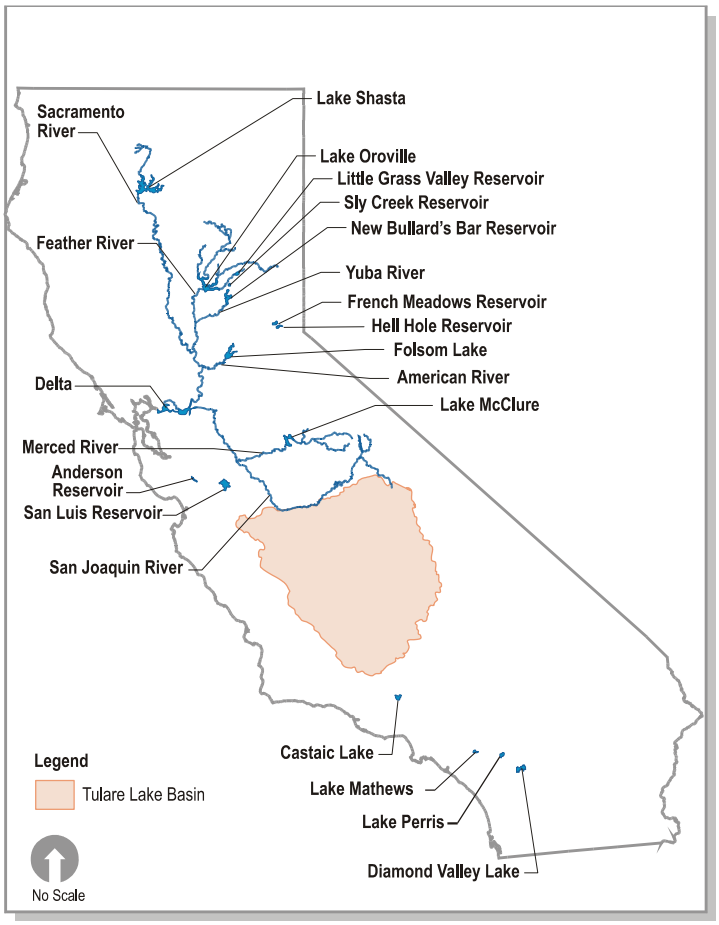

Figure 15-1
Flood Control Area of Analysis

15.1.2 Upstream from the Delta Region

In the Upstream from the Delta Region, a variety of infrastructure provides flood protection along the Sacramento and San Joaquin Rivers and their tributaries including the Yuba, Feather, American, and Merced rivers.

15.1.2.1 Reservoirs

Multi-purpose reservoirs and a system of weirs and bypasses contribute to the flood control system in the Upstream from the Delta Region by storing or diverting water around urban areas during periods of high runoff, thereby reducing the ultimate load placed on the levee system during floods. Very high inflows can reduce the ability of reservoirs to provide flood control. The amount of storage held in a reservoir at any point in time (conservation storage) is governed by the USACE criteria stated in flood control project's water control manual. Top of conservation storage can vary depending on time of year, upstream storage, and the type of storm (rain or snow) that is occurring. Top of conservation storage for each flood control project is also defined in each project's water control manual. The space between the top of conservation storage and the capacity of the reservoir is the required flood control space. This amount varies by flood control project. (The Resources Agency 1999)

15.1.2.2 Levees

Levees also provide flood control in the region. DWR defines warning stage for leveed rivers or channels as, "the stage at which patrol of flood control project levees becomes mandatory, or the stage at which flow occurs into bypass areas from project overflow weirs." Flood stage is defined in the DWR Flood Emergency Operations Manual as, "the stage at which the flow in a flood control project is at maximum design capacity." (The Resources Agency 1999).

Levee stability can be compromised because of any of the following (The Resources Agency 1997):

- **Overtopping:** Floodwater entering the channel is greater than its capacity, and water pours over the top of the levee.
- **Seepage and Piping:** Floodwater seeps through or under a levee and carries levee or foundation material with it. Some seepage through an earthen levee is common; however, if water creates a drainage path, or "pipe" through erodible material, material is gradually washed out through a "boil" on the landside of the levee.
- **Erosion:** High water velocity or wave action removes material from the levee or the streambank adjacent to the levee, leading to slope instability and increased seepage.
- **Sliding:** Seepage through the levee weakens the levee and/or foundation material to the point where the weight of soil exceeds the levee's internal strength and the levee slope slides.
- **Sloughing:** Seepage through the levee causes the outermost soil on the levee slope to slide down. Progressive sloughing causes increasingly heavy seepage until the levee gives way.

15.1.2.3 Sacramento River

Lake Shasta is the primary reservoir providing flood protection on the upper Sacramento River. With a storage capacity of 4.5 million acre-feet, Lake Shasta has a capacity equal to Folsom and Oroville reservoirs combined. Lake Shasta reserves 1.3 million acre-feet of storage for flood control. This flood control capacity must be available starting October 1st in anticipation of winter storms; the reservoir is managed for flood control (reservoir levels maintained below a certain level) through March. Shasta Dam can release 79,000 cubic feet per second (cfs) safely into the Sacramento River in non-emergency flood conditions; however, normal flood releases are usually much lower.

Reclamation's operational strategy for releases from Lake Shasta is to evaluate the forecasted tributary flows below Lake Shasta and reduce Keswick Dam releases during high flows in the tributaries. This operation normally prevents the

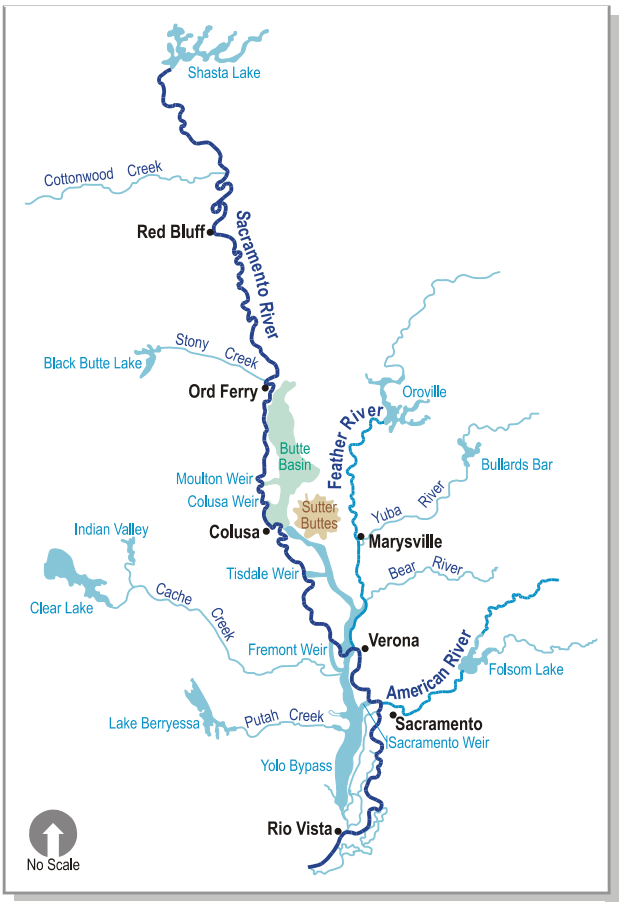

Figure 15-2
Sacramento River Flood Management System

Sacramento River flow at the Bend Bridge gage near Red Bluff from exceeding 100,000 cfs (The Resources Agency 1999).

The Sacramento River is leveed from Ord Ferry to the southern tip of Sherman Island in the Delta. Flood control on the Sacramento River is also managed by a system of weirs and bypasses constructed by the USACE (Figure 15-2). The system includes five bypasses: the Butte Basin, Sutter Bypass, Yolo Bypass, Tisdale Bypass, and Sacramento Bypass. Moulton and Colusa Weirs feed floodwaters into the Butte Basin Bypass, Tisdale Weir flows into Sutter Bypass, and Fremont Weir and Sacramento Bypass flow into the Yolo Bypass. The Yolo Bypass carries five-sixths of the volume of the Sacramento River at peak flood flows. The bypasses are large tracts of undeveloped or minimally-developed land. Development within the bypasses typically is limited to agricultural activities that require minimal infrastructure. Water released to the bypass system flows south into the Delta, in effect creating a short-term storage system for the floodwaters. Water released to the bypass system also infiltrates into the ground, recharging groundwater supplies, although this volume is small compared to the total volume of a flood. When flooding occurs, the weir and bypass system diverts water to protect the levee system and free flood storage capacity in the reservoirs. The bypasses also provide waterfowl habitat and portions of them are managed for wildlife.

The Sacramento River Flood Control Project (SRFCP), consisting of levees built by the USACE and turned over to the State for maintenance, provides flood protection for the lower reach of the Sacramento River and into the Delta. Since the authorization of the SRFCP in 1917, the effectiveness of the SRFCP has increased with the completion of multi-purpose reservoirs that provide flood control storage: Lake Shasta in 1945; Folsom Lake in 1956; Lake Oroville in 1968; and New Bullards Bar Reservoir in 1970 (State of California DWR 1998).

15.1.2.4 Feather River

Lake Oroville holds winter and spring runoff for release into the Feather River. During wet years, Lake Oroville aids in reducing downstream flooding. Up to 750,000 acre-feet of the 3.5 million acre-feet of storage capacity is maintained to capture inflows as required by the USACE. From October through March, between

2.8 and 3.2 million acre-feet of storage is the maximum allowable in order to reserve space for flood flows. From April through June, the storage limit increases, reflecting less need for flood storage space. The maximum allowed storage limit decreases again in September in preparation for the upcoming flood season. Flood control releases are made based on a release schedule and in consultation with the USACE. During times when flood control space is not required to accomplish flood control objectives, reservoir space can be used for storing water (State of California DWR 2001).

The Feather River is leveed from its confluence with the Sacramento River to Hamilton Bend near the City of Oroville on the east bank, and from the confluence to Honcut Creek on the west bank. The lower-most dam on the Feather River, Oroville Dam, regulates downstream flows, and is located at the confluence of the West Branch and the North, Middle, and South Forks of the Feather River, upstream from the Yuba and Bear tributaries.

15.1.2.5 Yuba River

New Bullards Bar Dam is operated by Yuba County Water Agency (WA). The reservoir has a maximum of 960,000 acre-feet of storage. New Bullards Bar Reservoir, on the North Fork of the Yuba River, is part of the Yuba River drainage basin. New Bullards Bar Reservoir provides flood control space between mid-September and the end of May each year. There are 170,000 acre-feet of flood control storage in New Bullards Bar Reservoir between the end of October and the end of March. The amount of flood control storage in the reservoir varies from mid September through October (depending on early season rainfall) and from the end of March through May (depending on the amount of snowfall in the watershed). This flood storage aids in keeping flows along the Yuba River within the designed capacity of its levees, 135,000 cfs.

Water released from the New Bullards Bar Reservoir joins flows from the Middle and South Forks of the Yuba River, which then passes the Englebright Dam and further downstream, the Daguerre Point Dam. The Englebright reservoir is not used for flood control or consumptive uses, but rather was built as a structure to prevent mining debris from continuing downstream. At a total capacity of 70,000 acre-feet, Englebright reservoir does not play a significant role in flood control. There are no large dams detaining flows on the Middle and South Forks of the Yuba River; New Bullards Bar Reservoir on the North Fork regulates only a third of the flow in the Yuba watershed (USACE 1999). As such, flood control has historically been a major problem downstream, at the confluence of the Yuba and Feather Rivers.

15.1.2.6 American River

Levees along the American River extend from the mouth of the River to the Mayhew Drain on the south bank. Non-Federal levees extend from this point to Sunrise Boulevard. On the north bank, Federal levees extend from the mouth to Carmichael Bluffs, constructed through the American River Flood Control Project.

There are several reservoirs along the American River; however, they are operated primarily for water supply and hydropower with the exception of Folsom Reservoir. The upstream reservoirs do not have dedicated space or physical structures for flood control, but they can be beneficial in reducing flows heading downstream towards Folsom Reservoir in some years. The three largest upstream reservoirs, French Meadows, Hell Hole, and Union Valley, can provide up to 200,000 acre-feet of usable flood storage capacity (Reclamation 2001).

Folsom Lake is the only reservoir operated for flood control on the American River. Folsom Dam and Reservoir provide flood protection for 350,000 residents and over $30 billion worth of damageable property that currently occupies the floodplain in the Sacramento metropolitan area (Reclamation 2001). Under the existing authorized operating criteria, 400,000 to 670,000 acre-feet of the total storage of 975,000 acre-feet in Folsom Reservoir is allocated to flood control during the flood control season (see fuller description in the following paragraph). The levees along the American River, constructed by the USACE in 1958, allow Folsom Reservoir to release water safely to a maximum design release of 115,000 cfs (Reclamation 2001).

The American River Watershed Investigation was created to evaluate existing flood control deficiencies after the 1986 flood along the American River. In response to the investigation's findings, a county-level joint agency was established with the long-term goal of providing urbanized sections of the Sacramento area with as much flood protection as possible. The agency, termed SAFCA, the Sacramento Area Flood Control Agency, has worked with the State of California, the USACE, and the Bureau of Reclamation to complete needed levee improvements and re-operate Folsom Dam to provide for further flood protection. In cooperation with SAFCA, Reclamation has changed to variable operating criteria, allowing as much as 670,000 acre-feet of flood control storage if 200,000 acre-feet of water supply are stored in the 3 largest upstream reservoirs.

15.1.2.7 San Joaquin River

Levees along the San Joaquin River are constructed from the Delta upstream to the mouth of the Merced River and along several San Joaquin River tributaries. In addition to levees, the San Joaquin River has a series of major flood control dams along the western slope of the southern Sierra Nevada. These include: Friant Dam on the San Joaquin River; New Exchequer Dam on the Merced River; Don Pedro Dam on the Tuolumne River; New Melones Dam on the Stanislaus River; and Camanche Reservoir on the Mokelumne River. (See Figure 15-3.)

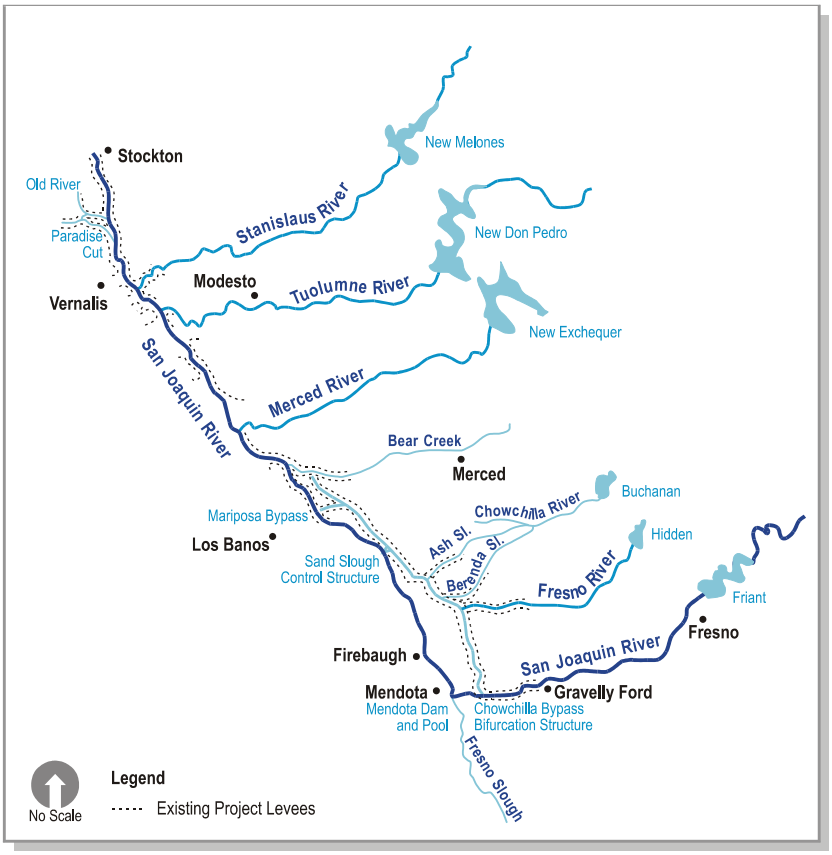

Figure 15-3
San Joaquin River Flood Management System

15.1.2.8 Merced River

The Merced River does not have a State or federal levee system, but it does contain a system of privately owned levee structures. Private landowners have maintained these levees in order to protect their agricultural lands and homes. Under USACE flood control operations rules, the New Exchequer Dam can release a maximum of 6,000 cfs from Lake McClure into the Merced River. Of a maximum capacity of just over one million acre-feet in Lake McClure, 350,000 acre-feet of storage space is reserved for flood control between mid-October and mid-March. A complete set of flood control operational guidelines as set by the USACE is contained in a document entitled, "New Exchequer Dam and Reservoir, Merced River, California – Water Control Manual"(Stillwater Sciences 2001).

15.1.3 Delta

Unlike the system of reservoirs and weirs that control the magnitude of flooding on the rivers upstream from the Delta, the flood control system in the Delta (with the exception of the Delta Cross Channel control gates) operates passively.

Since the construction of the Central Valley Project/State Water Project, and more importantly, the Yolo Bypass system, flood flows in the Delta have been more controlled. Flooding still occurs, but has been confined to the individual islands or

tracts and is due mostly to levee instability or overtopping. The major factors influencing Delta water levels include high flows, high tide, and wind. The highest water stages occur December - February when these factors are compounded.

15.1.4 Export Service Area

Complex systems, including reservoirs, levees, bypasses, and weirs provide flood protection to the lowlands in the Export Service Area. The Export Service Area includes Anderson Reservoir in Santa Clara Valley Water District, parts of the San Joaquin Valley including the Tulare Lake Basin, the California Aqueduct, the East and West Branches that convey water to Lake Perris, Diamond Valley Lake, and Castaic Lake, and the Colorado River Aqueduct that supplies water to Lake Mathews.

Anderson Reservoir is on Coyote Creek downstream from Coyote Reservoir in the Mt. Hamilton foothills. Water draining from the Mt. Diablo Range supplies Anderson Reservoir. Santa Clara Valley Water District operates the reservoir for 1) impounding local surface runoff, 2) providing incidental flood control benefits, 3) providing controlled releases of reservoir water to the Almaden Valley Pipeline via the Cross Valley Pipeline and for groundwater recharge, and 4) providing source water to water treatment plants under emergency conditions. Storage space is also maintained in Anderson Reservoir for excess flows from Coyote Reservoir via Coyote Creek. Maximum storage in Anderson Reservoir typically occurs in April; the District targets a reduction in storage to minimum levels to provide space for local runoff by December 1st. (Santa Clara Valley Water District 2002).

Operating rules at all Santa Clara Valley Water District reservoirs include limited provisions to release water to reduce flood probability. In 1997, the District adopted operating strategies for some reservoirs to reduce flood probability while minimizing any impacts on water supply. These strategies recognize that if the reservoir storage approaches full early enough in the rainfall season, some water can be released to create increased flood storage without significantly reducing the probability of filling the reservoir by the end of the season. The flood control rule curves identify reservoir storage for a given date from November 15th through April. If the actual storage on that date is above the curve, releases may be made to provide for potential flood peak attenuation. Releases to reach the rule curve are coordinated with the National Weather Service Quantitative Precipitation Forecasts to predict flowrates in the uncontrolled watershed downstream of the reservoirs. Releases are discontinued temporarily when predicted flowrates exceed a safe level. (Maher 2003).

The Tulare Lake Basin does not have an outlet to the ocean. Consequently, effective flood management is a key element in protecting downstream residences and resources. There are four major rivers in this basin, the Kings, Kaweah, Tule, and Kern Rivers. These rivers flow from the Sierra Nevada Mountains into the lowlands of the Tulare Lake Basin. An extensive system of levees and diversions in the lowlands provide protection from irrigation flows, minor flood flows, and surrounding uncontrolled local runoff. However, the operations of flood control reservoirs and

diversion structures upstream, along all four rivers, must be carefully coordinated to provide an adequate level of flood protection to the Tulare Lake lowlands.

Along the Kings River, a system of weirs are designed to divert flood flows through the Kings River North, James Bypass, Fresno Slough, and Mendota Pool system north into the San Joaquin River system. The Kern River Intertie may also be used to divert flood flows from the Kern River into the California Aqueduct.

The California Aqueduct is the main conveyance facility for the State Water Project, (SWP), conveying water from the Banks Pumping Plant to San Luis Reservoir and to SWP water contractors in the South Bay, San Joaquin Valley, and Southern California. This aqueduct divides into two branches, the East and West Branches in the Antelope Valley. (See Figure 15-4.) Water in the East Branch can be transported to Silverwood Lake and then conveyed into Lake Perris or directly to Diamond Valley Lake. The West Branch conveys water into Pyramid Lake in Los Angeles County, continues to Elderberry Forebay, ending at Castaic Lake.

There are no formal flood control allocations for Castaic Lake, Lake Perris, or Diamond Valley Lake. However, during a wet year, or if large storms are anticipated, up to 30,000 acre-feet can be reserved in Castaic Lake as flood control storage (Leahigh 2003). Local runoff from Elizabeth, Elderberry, Necktie, Fish, and Castaic Creeks enter Castaic Lake. Elizabeth Creek provides the largest inflow into Castaic Lake; all five creeks combined supply approximately 100 cfs inflow into Castaic Lake (Young 2003). Flood flows from the Tulare Lake Basin are released into the California Aqueduct and can be captured downstream by Castaic Lake. DWR is responsible for flood control operations.

A substantial amount of runoff does not enter Lake Perris or Diamond Valley Lake. These reservoirs do not provide substantive flood control benefit for the region or locally.

Lake Mathews, a terminal reservoir for the Colorado River Aqueduct, is owned by Metropolitan WD. There are no formal flood control operations on Lake Mathews.

15.2 Environmental Consequences/Environmental Impacts

15.2.1 Assessment Methods

Assessment methods are separated into two sections in this discussion: flood management operations and levee systems. The flood management operations analysis focuses on the flood control system's ability to handle flood flows under the program alternatives from a storage perspective. The analysis of the levee system focuses on the system's ability to handle the flood flows from a geotechnical perspective.

Flood control storage, reservoir operations, and channel capacity (information collected through literature review and personal communication as noted) are presented and compared to movement of water under EWA actions. Modeling results (see Appendix H) provide data regarding reservoir elevations and river flows for areas affected by EWA actions.

15.2.2 Significance Criteria

An effect on flood management operations is considered significant if the program would:

- Conflict with the flood control operation of a reservoir because of the presence of additional EWA water; or
- Increase river flows above channel capacity.

An effect on the levee system is considered potentially significant if the program would:

- Decrease levee stability through increased flood stages, excessive seepage and scour, or increased deposition.

15.2.3 Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

Under the No Action/No Project Alternative, water transfers as part of the EWA would not occur. Reservoir operations, including carryover storage, flood storage capacity, and timing of releases would remain consistent with existing conditions. River channel capacities with regard to flood control would remain constant and would continue to be managed according to existing guidelines. The No Action/No Project Alternative reflects that of the existing conditions/affected environment description and is termed Baseline Condition in the following sections.

15.2.4 Environmental Consequences/Environmental Impacts of the Flexible Purchase Alternative

The Flexible Purchase Alternative allows transfers up to 600,000 acre-feet and does not specify transfer limits in the Upstream from the Delta Region or the Export Service Area. Transfers in the Upstream from the Delta Region would range from 50,000 to 600,000 acre-feet, limited by hydrologic year and conveyance capacity through the Delta. Although all potential transfers would not occur in one year, this section discusses all transfers (a transfer amount that would result in greater than 600,000 acre-feet) to provide an effects analysis of a maximum transfer scenario. Similarly, the evaluation includes an analysis of up to 540,000 acre-feet in the Export Service Area to cover the maximum transfer scenario for that region.

15.2.4.1 Upstream from the Delta Region

15.2.4.1.1 Sacramento River

EWA acquisition of Sacramento River contractor water via groundwater substitution and crop idling would increase Sacramento River flows in April through September. The Sacramento River would increase in flow downstream from the point of diversion as water released from Lake Shasta was not diverted. Flow is also increased below Keswick Dam because the release pattern is shifted from August and September to July to take advantage of Delta export capacity in July. The increase in flows would not occur during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. Table 15-1 shows the releases from Keswick Dam under the existing conditions and with the EWA.[1] The channel capacity below Keswick Dam is 79,000 cfs, much higher than the expected release with the EWA. Because the average Baseline Condition flows are substantially below the channel capacity, the additional flows with the EWA are only slightly greater than the Baseline Condition, and the increase in flows occurs during the irrigation season rather than the flood season, the EWA would not affect flood control.

The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows.

The Feather, Yuba, and American Rivers contribute flows to the Sacramento River. EWA actions would not cause substantial increases in flow on these rivers compared to the Baseline Condition; therefore, EWA actions would not affect flood control on the lower Sacramento River. (See Sections 15.2.4.1.2 – 15.2.4.1.4.)

Table 15-1
Long-term Average Release from Keswick Dam

Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	With EWA	
Oct	5,842	5,842	0
Nov	4,854	4,854	0
Dec	6,672	6,672	0
Jan	7,951	7,951	0
Feb	10,056	10,056	0
Mar	8,249	8,249	0
Apr	7,706	7,706	0
May	8,381	8,381	0
Jun	10,529	10,529	0
Jul	13,284	13,524	240
Aug	10,556	10,423	-133
Sep	7,278	7,167	-111

[1] Effects on flood control are analyzed based on the releases from Keswick Dam rather than Sacramento River flows at a point downstream from Keswick Dam. If EWA actions met release thresholds below Keswick Dam, EWA actions would also meet channel capacity thresholds further downstream.

15.2.4.1.2 Feather River

EWA acquisition of Oroville-Wyandotte Irrigation District (ID) stored reservoir water would cause the surface water elevation in Lake Oroville to be higher compared to the Baseline Condition from the November preceding likely fish actions until the following September. The EWA agencies would acquire stored reservoir water from Sly Creek Reservoir and Little Grass Valley Reservoir in November and December before fish actions are likely. Water released from the reservoirs would be stored in Lake Oroville until transfer the following summer. Because of the stored water, Lake Oroville's surface water elevation would be higher from November until the transfer the following summer compared to the Baseline Condition. The additional water held in Lake Oroville would be stored in the portion of the reservoir dedicated to water supply (the conservation pool). The amount of space between the top of conservation pool and the capacity of the reservoir (the space dedicated to flood control) would not change with the EWA. As long as the water levels in Lake Oroville were maintained below the dedicated flood control space, the addition of EWA water to Lake Oroville would not conflict with reservoir operations.

Under certain hydrologic conditions, high inflows to Lake Oroville could cause water levels to encroach on flood control space. The water control manual for Lake Oroville specifies release requirements necessary to reduce the lake elevation. The presence of the EWA water in the reservoir could cause required flood control releases to occur sooner than under the Baseline Condition. The addition of EWA water to Lake Oroville would not cause the operational guidelines of the lake regarding releases to be changed. Thus, the effects on flood control due to the acquisition of stored reservoir water from Oroville-Wyandotte ID would be less than significant.

EWA acquisition of Feather River contractor water via groundwater substitution and crop idling would create a higher water surface elevation in Lake Oroville from April through June compared to the Baseline Condition. Lake Oroville would not hold any EWA water during the flood season because of groundwater substitution or crop idling. There would be no effect on flood control from water held in Lake Oroville during April through September.

EWA acquisition of Feather River contractor water via groundwater substitution and crop idling would increase Feather River flows downstream from Lake Oroville in July and August. The Feather River would increase in flow downstream from the point of diversion as water held in Lake Oroville was released. Flow is also increased because the release pattern is shifted from August and September to July to take advantage of Delta export capacity in July. The increase in flows would not occur during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. Table 15-2 shows the releases from Lake Oroville under the existing conditions and with the EWA.[2] The channel capacity below Lake Oroville is

[2] Effects on flood control are analyzed based on the releases from Lake Oroville rather than Feather River flows at a point downstream from Lake Oroville. If EWA actions met release thresholds below Lake Oroville, EWA actions would also meet channel capacity thresholds further downstream.

210,000 cfs, much higher than the expected flows with the EWA. Because the average Baseline Condition flows are substantially below the channel capacity, the additional flows with the EWA are only slightly greater than the Baseline Condition, and the increase in flows occurs during the irrigation season rather than the flood season, there would not be an effect on flood control.

Table 15-2
Long-term Average Flow Below Thermalito Afterbay

Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	With EWA	
Oct	2,441	2,441	0
Nov	2,301	2,301	0
Dec	3,984	3,984	0
Jan	5,005	5,005	0
Feb	5,930	5,930	0
Mar	6,144	6,144	0
Apr	3,416	3,416	0
May	3,826	3,604	-222
Jun	5,084	4,788	-296
Jul	5,896	6,497	601
Aug	4,434	4,515	81
Sep	1,600	1,421	-179

The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. The EWA would have no effect on flood control from increased river flows.

EWA acquisition of Oroville-Wyandotte Irrigation District (ID) stored reservoir water would decrease the surface water elevation in Sly Creek and Little Grass Valley Reservoirs compared to the Baseline Condition from November until refill. Lower water surface elevation in Sly Creek and Little Grass Valley Reservoirs would incidentally provide space for flood control. A decrease in reservoir elevation in would increase the amount of inflow that could be captured during a flood event. This would be a potentially beneficial effect.

15.2.4.1.3 Yuba River

EWA acquisition of Yuba County WA water via groundwater substitution would create a higher water surface elevation in New Bullards Bar Reservoir from April through September compared to the Baseline Condition. The surface water elevation would be higher with the EWA compared to the Baseline Condition, from April through September. New Bullards Bar Reservoir would not hold any EWA water during the flood season. There would be no effect on flood control from water held in New Bullards Bar Reservoir during April through September because of groundwater substitution.

EWA acquisition of Yuba County WA stored reservoir water would decrease surface water elevations from July to refill at New Bullards Bar Reservoir. Entering the flood season, the surface elevation at New Bullards Bar Reservoir would be lower than the Baseline Condition. A reduction of water in New Bullards Bar Reservoir could lessen the number of flood releases and/or the amount of water needed to be released. As noted previously, the lack of major flood control dams on the Middle and South Forks of the Yuba River historically resulted in flood control problems at the confluence of the Yuba and Feather Rivers. The additional space made available in New Bullards Bar Reservoir because of the release of stored reservoir water would incidentally provide space for flood control. This would be a potentially beneficial effect.

EWA acquisition of Yuba County WA water via groundwater substitution and stored reservoir water would increase Yuba River flows in July through September. The Yuba River would increase in flow downstream from the point of diversion as water held in New Bullards Bar Reservoir was released. Flows would not increase during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. Flows below New Bullards Bar Reservoir would increase approximately 1,000 cfs. This increase, in addition to the average releases of 1,800, 2,000, and 1,200 cfs in July, August, and September respectively, would be well below the channel capacity of 120,000 cfs (USGS 2003). Because the average Baseline Condition flows are substantially below the channel capacity, the additional flows with the EWA are only slightly greater than the Baseline Condition, and the increase in flows occurs during the irrigation season rather than the flood season, the EWA would not affect flood control.

The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows.

15.2.4.1.4 American River

EWA acquisition of Placer County WA water via stored groundwater purchase and stored reservoir water would create a higher water surface elevation in Folsom Lake from April through September compared to the Baseline Condition. Folsom Lake Reservoir would not hold any EWA water during the flood season. There would be no effect on flood control from water held in Folsom Lake during April through September because of stored groundwater purchase and stored reservoir water.

EWA acquisition of stored groundwater from Sacramento Groundwater Authority members and stored reservoir water would increase American River flows in July through September. The American River would increase in flow downstream from Folsom Lake as water was released. The increase in flows would occur between July and December. However, river flows would be maintained well below the river channel carrying capacity during transfers, as regulated by USACE flood control operations. Table 15-3 shows potential releases from Nimbus Dam under the Baseline Condition and with

the EWA.[3] The channel capacity below Folsom Lake is 115,000 cfs, much higher than the expected release with the EWA. The average Baseline Condition flows are substantially below the channel capacity and the additional flows with the EWA are only slightly greater than the Baseline Condition; there would be a less than significant effect on flood control.

Table 15-3
Long-term Average Release from Nimbus Dam

Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	With EWA	
Jan	4,124	4,124	0
Feb	4,989	4,989	0
Mar	3,941	3,941	0
Apr	3,616	3,616	0
May	3,793	3,793	0
Jun	4,166	4,166	0
Jul	4,100	4,316	216
Aug	2,482	2,574	92
Sep	2,876	2,894	18

The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. Therefore, the effects would be less than significant.

EWA acquisition of Placer County WA stored reservoir water would decrease surface water elevations July to refill at Hell Hole and/or French Meadows reservoirs. The surface water elevation at Hell Hole and/or French Meadows Reservoir would be lower than the Baseline Condition from September until refill. Although not operated for flood control, the additional storage space would potentially attenuate flows entering Folsom Lake. This effect would be potentially beneficial.

15.2.4.1.5 Merced River

EWA acquisition of Merced ID water via groundwater substitution would increase surface water elevation in Lake McClure from April through November. Water held in Lake McClure would not be released until October and November. The additional water held in Lake McClure would be stored in the portion of the reservoir dedicated to water supply (the conservation pool). The amount of space between the top of conservation pool and the capacity of the reservoir (the space dedicated to flood control) would not change with the EWA. As long as the water levels in Lake McClure were maintained below the dedicated flood control space, the addition of EWA water to Lake McClure would not conflict with reservoir operations. As long as the water levels in Lake McClure were maintained below the dedicated flood control

[3] Effects on flood control are analyzed based on the releases from Nimbus Dam rather than American River flows at a point downstream from Nimbus Dam. If EWA actions met release thresholds below Nimbus Dam, EWA actions would also meet channel capacity thresholds further downstream.

space, the addition of EWA water to Lake McClure would not conflict with reservoir operations.

Under certain hydrologic conditions, high inflows to Lake McClure could cause water levels to encroach on flood control space. The water control manual for Lake McClure specifies release requirements necessary to reduce the lake elevation. The presence of the EWA water in the reservoir could cause required flood control releases to occur sooner than under the Baseline Condition. The addition of EWA water to Lake McClure would not cause the operational guidelines of the lake regarding releases to be changed. Thus, the effects on flood control due to the acquisition of water via groundwater substitution from Merced ID would be less than significant.

EWA acquisition of Merced ID water via groundwater substitution would increase Merced River flows downstream from the point of diversion in October and November. The Merced River would increase in flow downstream from Lake McClure as water was released. The increase in flows would occur during the start of the flood season. However, river flows would be maintained well below the river channel carrying capacity during transfers, as regulated by USACE flood control operations. Table 15-4 shows the releases from Lake McClure under the Baseline Condition and with the EWA. The New Exchequer Dam can release a maximum of 6,000 cfs from Lake McClure into the Merced River. The flows with the EWA would be much lower than the maximum.

Table 15-4
Long-term Average Flow Below Crocker-Huffman Dam

Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	With EWA	
Oct	812	1,015	203
Nov	231	441	210
Dec	353	353	0
Jan	493	493	0
Feb	784	784	0
Mar	500	500	0
Apr	501	501	0
May	894	894	0
Jun	881	881	0
Jul	329	329	0
Aug	159	159	0
Sep	178	178	0

The EWA would not affect levees because it would not substantially increase flows. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. Therefore, the effects would be less than significant.

15.2.4.2 Delta Region

EWA acquisition of water in the Upstream from the Delta Region would increase inflows to the Delta. Flows in the Sacramento and San Joaquin Rivers would increase compared to the Baseline Condition, resulting in increased inflow to the Delta. Flow increases would occur at times of available pump capacity, predominantly July through September, with some increases earlier and later with crop idling, groundwater substitution, and Merced ID transfers. (See Tables 15-5 and 15-6.) The Sacramento River would contribute a greater percentage increase to flow compared to the San Joaquin River; 16 percent increase for the Sacramento River during July through September compared to 10 percent increase in October or November for the San Joaquin River. The flow increases on the Sacramento River would not take place during the flood control season. During July through September, overall Delta inflow is less, relative to Delta inflow during December through March. The Delta inflow on the San Joaquin River is also less, relative to the Delta inflow during January through June. Because the Delta annually receives higher inflows than would occur with the EWA, and the increases in inflow would not occur during the Delta's highest water stages, December through February, the effect on the Delta would be less than significant.

Table 15-5
Long-term Average Delta Inflow from the Sacramento River

Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	Flexible Purchase Alternative	
Oct	12,029	12,117	88
Nov	14,866	14,881	15
Dec	26,703	26,708	5
Jan	39,355	39,358	3
Feb	48,222	48,223	1
Mar	40,247	40,249	2
Apr	26,707	27,188	481
May	19,808	20,160	352
Jun	18,256	18,605	349
Jul	17,824	20,996	3,142
Aug	13,839	16,006	2,167
Sep	13,847	14,491	644

Table 15-6 Long-term Average Delta Inflow from the San Joaquin River			
Month	Monthly Mean Flow (cfs)		Difference (cfs)
	Baseline	Flexible Purchase Alternative	
Oct	3,016	3,219	203
Nov	1,980	2,190	210
Dec	3,038	3,038	0
Jan	4,505	4,505	0
Feb	6,392	6,392	0
Mar	6,361	6,361	0
Apr	6,127	6,127	0
May	5,482	5,482	0
Jun	4,219	4,219	0
Jul	2,314	2,314	0
Aug	1,696	1,696	0
Sep	1,909	1,909	0

15.2.4.3 Export Service Area

EWA management of Santa Clara Valley WD water via predelivery could increase the surface water elevation in Anderson Reservoir in the months prior to the high point[4] in San Luis Reservoir. With the EWA, water would be transferred from San Luis Reservoir to Anderson Reservoir or groundwater storage facilities prior to the high point in San Luis Reservoir. Although the amount of water within Anderson Reservoir would increase compared to the Baseline Condition, flood storage capacity would be maintained to accept inflows from Coyote Creek based on the rule curve explained in Section 15.1.4. The presence of the EWA water in the reservoir could cause required flood control releases to occur sooner than under the Baseline Condition. In the event of a required flood release, the flood storage capacity in Anderson Reservoir would be equivalent to the capacity under the Baseline Condition; therefore, the effect on flood control would be less than significant.

Metropolitan WD management of EWA water provided as predelivery could increase the surface water elevation in Diamond Valley Lake, Lake Mathews, and other Metropolitan WD storage facilities. If Metropolitan WD were to accept predelivery water and use it to repay its flexible storage debt in Castaic Lake or Lake Perris, predelivery could affect the surface water elevations in those lakes as well. With the EWA, water could be transferred to Metropolitan WD at any of its turnouts and then to storage in Diamond Valley Lake, Lake Mathews, or other Metropolitan WD storage facilities, or used to repay flexible storage in Castaic Lake or Lake Perris. Although the amount of water within these facilities would increase compared to the Baseline Condition, flood storage capacity in

[4] High point is the value at which storage has peaked annually. In San Luis Reservoir, high point occurs approximately in mid-April.

Castaic Lake would be equivalent to the capacity under the Baseline Condition; therefore, the effect on flood control would be less than significant.

EWA management of Metropolitan WD water via source shifting could decrease surface water elevations in Castaic Lake, Lake Perris, Diamond Valley Lake, Lake Mathews, and Anderson Reservoir beginning in April and ending in December. Metropolitan WD could draw on their flexible storage in Castaic Lake or Lake Perris, draft storage in Diamond Valley Lake or Lake Mathews, or draw on other local sources in the April-September period. Santa Clara Valley WD would draw on Anderson Reservoir for local needs from April through September. Reservoir levels would be lower relative to the Baseline Condition from April until the source shift water was returned by the end of December. Lower water levels in Castaic Lake in October, November, and December could provide additional storage space for inflow from the California Aqueduct or local streams. If water were not repaid until the following year, continued lower water levels would provide space until refill. The effect on flood control would be potentially beneficial.

15.2.4.4 Multi-year Transfers

The analysis thus far has been based on a 1-year water transfer; however, the EWA agencies and willing sellers may agree to multi-year transfers. No effects as discussed would accumulate from one year to another. Therefore, the effects presented in Sections 15.2.4.1 through 15.2.4.3 would be the same whether agencies sold water for one or multiple years.

15.2.5 Environmental Consequences/Environmental Impacts of the Fixed Purchase Alternative

The Fixed Purchase Alternative specifies purchases of 35,000 acre-feet in the Upstream from the Delta Region, and 150,000 acre-feet in the Export Service Area. While the amounts in each region are fixed, the acquisition types and sources could vary. To allow the EWA Project Agencies maximum flexibility when negotiating purchases with willing sellers, this section analyzes the effects of each potential transfer. These transfers are the same actions as those described for the Flexible Purchase Alternative, but the amounts are limited by the total acquisition amount in each region (35,000 acre-feet in the Upstream from the Delta Region and 150,000 acre-feet in the Export Service Area).

15.2.5.1 Upstream from the Delta Region

As stated in the Modeling Technical Appendix (Attachment 1), the Fixed Purchase Alternative is not modeled because 35,000 acre-feet is too small an amount to model through the Delta. Any differences in the modeling output from the Baseline Condition would not represent meaningful differences. Therefore, the effects analysis for the Fixed Purchase Alternative is discussed qualitatively.

15.2.5.1.1 Sacramento River

EWA acquisition of Sacramento River contractor water via groundwater substitution and crop idling would increase Sacramento River flows in April through September. The Sacramento River would increase in flow downstream from the point of diversion as water released from Lake Shasta was not diverted. Flow is also increased below Keswick Dam because the release pattern is shifted from August and September to July to take advantage of Delta export capacity in July. The increase in flows would not occur during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. Levees would not be affected because flows would not be substantially increased. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows.

15.2.5.1.2 Feather River

EWA acquisition of Oroville-Wyandotte Irrigation District (ID) stored reservoir water would cause the surface water elevation in Lake Oroville to be higher compared to the Baseline Condition from the November preceding likely fish actions until the following September. The EWA agencies would acquire stored reservoir water from Sly Creek Reservoir and Little Grass Valley Reservoir in November and December before fish actions are likely. Water released from the reservoirs would be stored in Lake Oroville until transfer the following summer. Because of the stored water, Lake Oroville's surface water elevation would be higher from November until the transfer the following summer compared to the Baseline Condition. The additional water held in Lake Oroville would be stored in the portion of the reservoir dedicated to water supply (the conservation pool). The amount of space between the top of conservation pool and the capacity of the reservoir (the space dedicated to flood control) would not change with the EWA. As long as the water levels in Lake Oroville were maintained below the dedicated flood control space, the addition of EWA water to Lake Oroville would not conflict with reservoir operations.

Under certain hydrologic conditions, high inflows to Lake Oroville could cause water levels to encroach on flood control space. The water control manual for Lake Oroville specifies release requirements necessary to reduce the lake elevation. The addition of EWA water to Lake Oroville would not cause the operations of the lake regarding releases to be changed. The presence of the EWA water in the reservoir could cause required flood control releases to occur sooner than under the Baseline Condition. Thus, the effects on flood control due to the acquisition of stored reservoir water from Oroville-Wyandotte ID would be less than significant.

EWA acquisition of Feather River contractor water via groundwater substitution and crop idling would create a higher water surface elevation in Lake Oroville from April through June compared to the Baseline Condition. Lake Oroville would not hold any EWA water during the flood season because of groundwater substitution or crop idling. There would be no effect on flood control from water held in Lake Oroville during April through September.

EWA acquisition of Feather River contractor water via groundwater substitution and crop idling would increase Feather River flows downstream from Lake Oroville in July and August. The Feather River would increase in flow downstream from the point of diversion as water held in Lake Oroville was released. Flow is also increased because the release pattern is shifted from August and September to July to take advantage of Delta export capacity in July. The increase in flows would not occur during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. The channel capacity below Lake Oroville is 210,000 cfs, much higher than the expected release with the EWA. Levees would not be affected because flows would not be substantially increased. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows.

EWA acquisition of Oroville-Wyandotte Irrigation District (ID) stored reservoir water would decrease the surface water elevation in Sly Creek and Little Grass Valley Reservoirs compared to the Baseline Condition from November until refill. Lower water surface elevation in Sly Creek and Little Grass Valley Reservoirs would incidentally provide space for flood control. A decrease in reservoir elevation in would increase the amount of inflow that could be captured during a flood event. This would be a potentially beneficial effect.

15.2.5.1.3 Yuba River

EWA acquisition of Yuba County WA water via groundwater substitution would create a higher water surface elevation in New Bullards Bar Reservoir from April through September compared to the Baseline Condition. The surface water elevation would be higher with the EWA compared to the Baseline Condition from April through September. New Bullards Bar Reservoir would not hold any EWA water during the flood season. There would be no effect on flood control from water held in New Bullards Bar Reservoir during April through September because of groundwater substitution.

EWA acquisition of Yuba County WA stored reservoir water would decrease surface water elevations from July to refill at New Bullards Bar Reservoir. Entering the flood season, the surface elevation at New Bullards Bar Reservoir would be lower than the Baseline Condition. A reduction of water in New Bullards Bar Reservoir could lessen the number of flood releases and/or the amount of water needed to be released. As noted previously, the lack of major flood control dams on the Middle and South Forks of the Yuba River historically resulted in flood control problems at the confluence of the Yuba and Feather Rivers. The additional space made available in New Bullards Bar Reservoir because of the release of stored reservoir water would incidentally provide space for flood control. This would be a potentially beneficial effect.

EWA acquisition of Yuba County WA water via groundwater substitution and stored reservoir water would increase Yuba River flows in July through September. The Yuba River would increase in flow downstream from the point of diversion as water held in New Bullards Bar Reservoir was released. The increase in flows would not occur during the flood season. River flows would be maintained well below the river channel carrying capacity during transfers. Levees would not be affected because flows

would not be substantially increased. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. There would be no effect on flood control from increased river flows.

15.2.5.1.4 American River

EWA acquisition of Placer County WA water via stored groundwater purchase and stored reservoir water would create a higher water surface elevation in Folsom Lake from April through September compared to the Baseline Condition. Folsom Lake Reservoir would not hold any EWA water during the flood season. There would be no effect on flood control from water held in Folsom Lake during April through September because of stored groundwater purchase and stored reservoir water.

EWA acquisition of stored groundwater from Sacramento Groundwater Authority members and stored reservoir water would increase American River flows in July through December. The American River would increase in flow downstream from Folsom Lake as water was released. The increase in flows would occur between July and December. However, river flows would be maintained well below the river channel carrying capacity during transfers, as regulated by USACE flood control operations. The channel capacity below Folsom Lake is 115,000 cfs, much higher than the expected release with the EWA. Levees would not be affected because flows would not be substantially increased. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. Therefore, the effects would be less than significant.

EWA acquisition of Placer County WA stored reservoir water would decrease surface water elevations July to refill at Hell Hole and/or French Meadows reservoirs. The surface water elevation at Hell Hole and/or French Meadows Reservoir would be lower than the Baseline Condition from July until refill. Although not operated for flood control, the additional storage space would potentially attenuate flows entering Folsom Lake. This effect would be potentially beneficial.

15.2.5.1.5 Merced River

EWA acquisition of Merced ID water via groundwater substitution would increase surface water elevation in Lake McClure from April through November. Water held in Lake McClure would not be released until October and November. The additional water held in Lake McClure would be stored in the portion of the reservoir dedicated to water supply (the conservation pool). The amount of space between the top of conservation pool and the capacity of the reservoir (the space dedicated to flood control) would not change with the EWA. As long as the water levels in Lake McClure were maintained below the dedicated flood control space, the addition of EWA water to Lake McClure would not conflict with reservoir operations.

Under certain hydrologic conditions, high inflows to Lake McClure could cause water levels to encroach on flood control space. The water control manual for Lake McClure specifies release requirements necessary to reduce the lake elevation. The addition of EWA water to Lake McClure would not cause the operations of the lake regarding releases to be changed. The presence of the EWA water in the reservoir could cause

required flood control releases to occur sooner than under the Baseline Condition Thus, the effects on flood control due to the acquisition of water via groundwater substitution from Merced ID would be less than significant.

EWA acquisition of Merced ID water via groundwater substitution would increase Merced River flows downstream from the point of diversion in October and November. The Merced River would increase in flow downstream from Lake McClure as water was released. The increase in flows would occur during the start of the flood season. However, river flows would be maintained well below the river channel carrying capacity during transfers, as regulated by USACE flood control operations. Under USACE flood control operations rules, the New Exchequer Dam can release a maximum of 6,000 cfs from Lake McClure into the Merced River. The flows with the EWA would be much lower than the maximum. Levees would not be affected because flow levels are below channel capacity. Therefore, no program-related effects to levee stability, such as erosion or seepage, would occur beyond the Baseline Condition. Therefore, the effects would be less than significant.

15.2.5.2 Delta Region

EWA acquisition of water in the Upstream from the Delta Region would increase inflows to the Delta. The greatest amount of water that could be conveyed through the Delta under the Fixed Purchase Alternative is 35,000 acre-feet. The increase in Delta inflow would take place predominantly in July through November, depending on transfer sources. As stated in the Modeling Technical Appendix (Attachment 1), the Fixed Purchase Alternative is not modeled because 35,000 acre-feet is too small an amount to model through the Delta. Any differences in the modeling output from the Baseline Condition would not represent meaningful differences. The Delta inflow with the EWA would be lower than Delta inflow during much of the year, and the increased inflow would not be during the Delta's highest water stages, December through February. The effect on the Delta would be less than significant.

15.2.5.3 Export Service Area

The effects of source shifting and predelivery under the Fixed Purchase Alternative are equivalent to the effects as described under the Flexible Purchase Alternative because the transfer amounts are the same under both Alternatives. Therefore, as stated in Section 15.2.4.3, the effect of source shifting on flood control would be potentially beneficial; the effect of predelivery on flood control would be less than significant.

15.2.5.4 Multi-year Transfers

The analysis thus far has been based on a 1-year water transfer; however, the EWA agencies and willing sellers may agree to multi-year transfers. No effects as discussed would accumulate from one year to another. Therefore, the effects presented in Sections 15.2.5.1 through 15.2.5.3 would be the same whether agencies sold water for one or multiple years.

15.2.6 Comparative Analysis of Alternatives

This section has thus far analyzed the effects of many potential transfers, looking at the "worst-case scenario" that would occur if all acquisitions happened in the same year. This approach ensures that all effects of transfers are included, and provides the EWA Project Agencies the flexibility to choose transfers that may be preferable in a given year. The EWA, however, would not actually purchase all of this water in the same year. This section provides information about how EWA would more likely operate in different year types.

The following discussion compares the actions taken under the Flexible and Fixed Purchase Alternatives during wet and dry years. A further comparison of the alternatives is listed in Table 15-7.

Table 15-7
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Flood Control

Decreases are release to point of diversion. Below point of diversion there are no decreases.
Increases are below point of diversion. Increases are less above point of diversion.

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Sacramento River	Groundwater substitution/ Crop Idling	Water released from Lake Shasta in April through September is not diverted.	Increase in Sacramento River flow April through September.	Releases from Keswick Dam increase by a maximum of 240 cfs.	Releases from Keswick Dam increase.	No effect	No effect
Feather River	Stored reservoir water	Water is released from Sly Creek and Little Grass Valley Reservoirs.	Sly Creek and Little Grass Valley Reservoir levels decrease from December until refill.	A decrease in elevation in Sly Creek and Little Grass Valley Reservoirs would increase the amount of inflow that could be captured during a flood event	A decrease in elevation in Sly Creek and Little Grass Valley Reservoirs would increase the amount of inflow that could be captured during a flood event	Potential Beneficial Effect	Potential Beneficial Effect
			Stored reservoir water released from Little Grass Valley and Sly Creek Reservoirs is stored in Lake Oroville.	Lake Oroville's surface water elevation would increase compared to the Baseline Condition while holding the stored reservoir water	Lake Oroville's surface water elevation would increase compared to the Baseline Condition while holding the stored reservoir water	LTS	LTS
	Groundwater substitution/ Crop idling	Water is released from Lake Oroville	Increase in Feather River flow July through September.	Releases from Lake Oroville increase by a maximum of 600 cfs.	Releases from Lake Oroville increase.	No effect	No effect
Yuba River	Stored Reservoir Water	Water is released from New Bullards Bar Reservoir.	Increase in Yuba River flow July through September.	Yuba River flows increase by a maximum of 550 cfs..	Yuba River flows increase by a maximum of 190 cfs.	No effect	No effect

Table 15-7
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Flood Control

Decreases are release to point of diversion. Below point of diversion there are no decreases.
Increases are below point of diversion. Increases are less above point of diversion.

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
			New Bullards Bar water levels would be less than the Baseline Condition July – refill.	A decrease in elevation in New Bullards Bar Reservoir would increase the amount of inflow that could be captured during a flood event	A decrease in elevation in New Bullards Bar Reservoir would increase the amount of inflow that could be captured during a flood event	Potential Beneficial Effect	Potential Beneficial Effect
	Groundwater Substitution	Water is released from New Bullards Bar Reservoir.	Increase in Yuba River flow July through September.	Yuba River flow increases by a maximum of 460 cfs.	Yuba River flow increases by a maximum of 190 cfs.	No effect	No effect
American River	Stored Reservoir Water	Water is released from French Meadows and Hell Hole Reservoirs	French Meadows and Hell Hole Reservoir water levels would be less than the Baseline Condition July – refill.	A decrease in elevation in French Meadows and Hell Hole Reservoirs would increase the amount of inflow that could be captured during a flood event	A decrease in elevation in French Meadows and Hell Hole Reservoirs would increase the amount of inflow that could be captured during a flood event	Potential Beneficial Effect	Potential Beneficial Effect
	Stored Reservoir Water and Groundwater Purchase	Water is released from Folsom Lake.	Increase in American River flow July through December.	Releases from Folsom Lake increase.	Releases from Folsom Lake increase.	LTS	LTS
Merced/San Joaquin River	Groundwater substitution	Groundwater is used in lieu of surface water. Surface water is not released from Lake McClure.	Water from groundwater substitution is held in Lake McClure.	Lake McClure's surface water elevation would increase compared to the Baseline Condition.	Lake McClure's surface water elevation would increase compared to the Baseline Condition.	No effect	No effect
		Water is released from Lake McClure	Increase in Merced River flow in October and November.	Merced River flow increases by a maximum of 210 cfs	Merced River flow increases.	LTS	LTS
Delta Region	Crop idling, Groundwater substitution, Stored groundwater purchase, Stored reservoir water	Water is released from reservoirs	Increased Delta inflow July – November.	Delta inflow increases July-November, depending on sources, by a maximum of 3,100 cfs.	Delta inflow increases July-November, depending on sources.	LTS	LTS
Export Service Area	Source Shifting	MWD/Santa Clara Valley Water District draw on alternate sources including storage.	Decreased water levels in Castaic Lake, Lake Perris Diamond Valley Lake, and/or Anderson Reservoir.	A decrease in elevation in reservoirs would increase the amount of inflow that could be captured during a flood event	A decrease in elevation in reservoirs would increase the amount of inflow that could be captured during a flood event	Potential Beneficial Effect	Potential Beneficial Effect

Table 15-7
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Flood Control

Decreases are release to point of diversion. Below point of diversion there are no decreases.
Increases are below point of diversion. Increases are less above point of diversion.

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
	Predelivery	Water is delivered early compared to the Baseline Condition.	Increased water levels in reservoirs.	Reservoir surface water elevation would increase compared to the Baseline Condition.	Reservoir surface water elevation would increase compared to the Baseline Condition.	LTS	LTS

In the Upstream from the Delta Region (as well as in the Delta and Export Service Area), under the No Project Alternative, reservoir operations would be same in all year types. Although the amount of water released would differ in wet and dry years, flood control requirements would regulate the reservoirs in the same manner regardless of water year type. Therefore, the effects on flood control would be the same in wet or dry years under the No Project Alternative.

The Fixed Purchase Alternative would be limited to a maximum acquisition of 35,000 acre-feet from all sources of water. This amount could typically be obtained from stored reservoir water purchases in most year types. This acquisition would have a beneficial effect if the purchase were from New Bullards Bar, Little Grass Valley, Sly Creek, Hell Hole, or French Meadows Reservoirs. The effect would be less than significant for the stored reservoir water held in Lake Oroville. Because the Flexible Purchase Alternative could acquire more water than the Fixed Purchase Alternative, and therefore acquire water from multiple reservoirs, there would be a greater potential for beneficial flood control effects with the Flexible Purchase Alternative.

In the Export Service Area, source shifting and predelivery would have the same effects under the Flexible and Fixed Purchase Alternatives. Predelivery would occur more often in wet years when there is greater potential for Delta export. Source shifting, which could create beneficial flood control effects, would occur in years when the low point problem was especially pronounced; source shifting is not directly tied to wet or dry year water types.

15.2.7 Mitigation Measures

There are no potentially significant impacts; therefore, no mitigation is required.

15.2.8 Potentially Significant Unavoidable Impacts

There are no potentially significant unavoidable impacts.

15.2.9 Cumulative Effects

There are no other programs that could store water in Lake Oroville between November and March. If DWR did allow such storage, the lake water surface would

be higher, and flood releases, if needed, would be initiated sooner. Flood control regulations would be followed regardless of the type of water stored in Lake Oroville. Therefore, the cumulative effects would be less than significant

The Sacramento Valley Water Management Agreement, Dry Year Purchase Program, DRRIP, and Central Valley Project Improvement Act Water Acquisition Program, in addition to the EWA, could purchase water through groundwater substitution. The Dry Year Purchase Program, DRRIP, and Central Valley Project Improvement Act Water Acquisition Program, as the well as the EWA, also acquire water through crop idling. Water held in reservoirs during April through June would be released during July through September. Agencies participating in groundwater substitution and crop idling with various programs would cause reservoirs to release more water during July through September than under the Baseline Condition. The USACE flood control guidelines limit releases such that the releases are within channel capacity. Additionally, the releases would be outside the flood season and therefore would not present a risk to flood control. The cumulative effects would be less than significant.

No other water transfer programs are currently managing water that involves early delivery of water, and none are likely to do so. Therefore, there would be no cumulative effects on flood control because of predelivery.

15.3 References

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