Chapter 10
Cumulative Impacts

10.1 Summary

State CEQA Guidelines and NEPA regulations require that the cumulative impacts of a proposed project be addressed in an EIS/EIR. The cumulative impact analysis determines the combined effect of the SDIP and other closely related, reasonably foreseeable, projects. This chapter introduces the methods used to evaluate cumulative effects, lists related projects and describes their relationship to the SDIP, identifies cumulative impacts by resource area, and recommends mitigation for significant cumulative effects. The cumulative impact analysis uses both quantitative tools (i.e., hydrologic modeling) and qualitative assessments to determine the potential combined impact of the SDIP and other related projects.

10.2 Approach to Cumulative Impact Analysis

Legal Requirements

State CEQA Guidelines and NEPA regulations require that the cumulative impacts of a proposed project be addressed in an EIS/EIR when the cumulative impacts are expected to be significant and, under CEQA, when the project's incremental effect is cumulatively considerable (Guidelines 15130[a], 40 CFR 1508.25[a][2]). Cumulative impacts are impacts on the environment that result from the incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions (Guidelines 15355[b], 40 CFR 1508.7). Such impacts can result from individually minor but collectively significant actions taking place over time.

Section 15130 of the State CEQA Guidelines states that the discussion of cumulative impacts need not provide as much detail as the discussion of effects attributable to the project alone. The level of detail should be guided by what is practical and reasonable.

Methodology

According to the State CEQA Guidelines (Section 15130), an adequate discussion of significant cumulative impacts should contain the following elements:

- an analysis of related future projects or planned development that would affect resources in the project area similar to those affected by the proposed project (Table 10-1),
- a summary of the expected environmental effects to be produced by those projects with specific reference to additional information stating where that information is available, and
- a reasonable analysis of the cumulative impacts of the relevant projects. An EIR shall examine reasonable, feasible options for mitigating or avoiding the project's contribution to any significant cumulative effects.

To identify the related projects, the State CEQA Guidelines (15130[b]) recommend either the "list" or "projection" approach. This analysis uses the list approach, which entails listing past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency. This approach is consistent with the methods used in the CALFED Programmatic EIS/EIR cumulative impact analysis.

Although NEPA does not provide specific guidance as to how to conduct a cumulative impact assessment, Reclamation's NEPA Handbook states that an EIS should "identify associated actions (past, present, or future) which, when viewed with the proposed or alternative actions, may have cumulative significant impacts. Future cumulative impacts should not be speculative but should be based on known long-range plans, regulations, or operating agreements." (Bureau of Reclamation Draft NEPA Handbook, pp. 8–18.)

Both CEQA and NEPA allow the scope of a cumulative impact analysis to be limited through the use of tiering (40 CFR 1508.28, State CEQA Guidelines 15130). Tiering can be used when cumulative impacts have been adequately addressed in a previous document certified for a programmatic plan and the current project is consistent with the plan. The CALFED Programmatic EIS/EIR evaluated cumulative impacts. The CALFED Programmatic EIS/EIR compiled a list of major projects for consideration in the cumulative impact analysis. The list focused on future actions that could affect the physical features of the Bay-Delta system, and on the future federal and state policies that could affect the CVP and SWP. Although the CALFED Programmatic EIS/EIR analysis helps identify cumulative projects, this chapter includes a more thorough analysis of cumulative impacts resulting from the SDIP alternatives, OCAP, and other projects that have the potential to affect similar resources in the vicinity of SDIP improvements. The Programmatic EIS/EIR list of cumulative projects and the CALFED ROD were used to develop the list of projects for this analysis.

Table 10-1. Projects Considered for the Cumulative Impact Analysis

Project	Criterion 1: Is the action under active consideration?	Criterion 2: Does the action have recently completed environmental documentation or are environmental documents in some stage of active development?	Criterion 3: Would the action be completed or operational within the timeframe being considered for the SDIP (assumed to be 2020)?	Criterion 4: Does the action, in combination with the SDIP alternatives, have the potential to affect the same resources?	Role in Cumulative Assessment		Notes
					Quantitative	Qualitative	
CALFED Storage Program							
Shasta Lake Enlargement	Y	N	N	Y		X	It will take Reclamation approximately 15 years to complete a dam expansion process. The EIS/EIR will not be complete until 2008. The project will be not be completed and operating until after 2020.
North-of-Delta Off-stream Storage (Sites Reservoir)	Y	N	Y	Y		X	
In-Delta Storage	Y	Y	Y	Y		X	Although the private Delta Wetlands water project has completed environmental review, this project is being reevaluated by CALFED agencies. Because the final design and use of In-Delta storage has yet to be determined, this project is included in the qualitative assessment of cumulative effects.
Los Vaqueros Reservoir Expansion	Y	N	N	Y		X	It will take Reclamation approximately 15 years to complete a dam expansion process. The EIS/EIR will not be complete until 2007. The project will be not be completed and operating until after 2020.
Upper San Joaquin River Storage	Y	N	N	Y		X	Actions to expand dams or storage areas will most likely not take place until after 2020, so long as feasibility studies planned for completion in 2005 warrant further consideration of the project.
CALFED Conveyance Program							
10,300 cfs at Banks	Y	N	N	Y		X	
Tracy Fish Test Facility	Y	N	Y	Y		X	
Lower San Joaquin Flood Improvements	Y	N	Y	Y		X	It was intended that this project be implemented in 2005, but it has been indefinitely delayed. Delays should not last through 2020.
Old River and Rock Slough Water Quality Improvement Project	Y	N	Y	Y		X	

Table 10-1. Continued

Project	Criterion 1: Is the action under active consideration?	Criterion 2: Does the action have recently completed environmental documentation or are environmental documents in some stage of active development?	Criterion 3: Would the action be completed or operational within the timeframe being considered for the SDIP (assumed to be 2020)?	Criterion 4: Does the action, in combination with the SDIP alternatives, have the potential to affect the same resources?	Role in Cumulative Assessment		Notes
					Quantitative	Qualitative	
Delta Cross Channel Reoperation and Through-Delta Facility	Y	N	Y	Y		X	If this project is implemented, it will be before 2020.
North Delta Flood Control Project	Y	N	Y	Y		X	
Delta-Mendota Canal/ California Aqueduct Intertie	Y	Y	Y	Y	X		
CCF–Tracy Pumping Plant Intertie	Y	N	N	Y		X	The CALFED ROD did not set a schedule for completion of this project but initiation on work is expected on or after 2006.
CALFED Drinking Water Quality Program ***							
Bay Area Water Quality and Supply Reliability Program	Y	N	Y	Y		X	This program would involve construction of interconnects between existing and future Bay Area water supplies. The environmental review phase of program planning has not been initiated.
San Joaquin Valley/ Southern California Water Exchange	Y	N	Y	Y		X	Environmental review is expected to be complete, and implementation is expected to begin, by 2007.
North Bay Aqueduct Improvements	Y	N	Y	N			
San Luis Reservoir Low Point Improvement Project	Y	Y	Y	Y		X	
CALFED Ecosystem Restoration Program	Y	Y	Y	Y		X	Individual projects under this CALFED program complete their environmental documentation and permits as they are proposed. The CALFED PEIS/EIR provides a programmatic assessment of these programs.
CALFED Levees Program	Y	Y	Y	Y		X	Individual projects under this CALFED program complete their environmental documentation and permits as they are proposed. The CALFED PEIS/EIR provides a programmatic assessment of these programs.

Table 10-1. Continued

Project	Criterion 1: Is the action under active consideration?	Criterion 2: Does the action have recently completed environmental documentation or are environmental documents in some stage of active development?	Criterion 3: Would the action be completed or operational within the timeframe being considered for the SDIP (assumed to be 2020)?	Criterion 4: Does the action, in combination with the SDIP alternatives, have the potential to affect the same resources?	Role in Cumulative Assessment		Notes
					Quantitative	Qualitative	
Other CVP/SWP-related Projects							
Freeport Regional Water Project	Y	Y	Y	Y	X		
Trinity River Mainstream Fishery Restoration Program	Y	Y	Y	Y	X		
Sacramento Valley Water Management Agreement (Phase 8)	Y	N	Y	Y		X	Most of the project components involve only the cooperation of northern California water users to increase water use efficiency. This will likely be accomplished by 2020.
Water Transfer and Acquisition Programs							
CALFED Environmental Water Account	Y	Y	Y	Y	X		It is quantitative because 190,000 acre-feet were purchased and an additional 190,000 acre-feet will be gained each year through modification of pumping procedures
CALFED Environmental Water Program	Y	N	Y	Y		X	The program has not been implemented because of funding constraints, but should be by year 2020.
Delta Improvements Package	Y	Y	Y	Y		X	The Delta Improvements Package will be implemented in phases and includes actions that have already been implemented.
Local Projects							
State Route 4 Bypass Project	Y	Y	Y	Y		X	The first phase of this project is complete and the next phases are scheduled for 2004–10, depending on available funding.
Mountain House	Y	Y	Y	Y		X	
River Islands	Y	Y	Y	Y		X	
East Altamont Energy Center	Y	Y	Y	Y		X	
City of Sacramento Water Facility Expansion Project	Y	Y	Y	N		X	Notice of Determination was filed on November 27, 2000. Construction began in October 2001.

SDIP cumulative impacts are analyzed both quantitatively and qualitatively. Cumulative effects related to water supply, Delta tidal hydraulics, water quality, and fisheries are evaluated quantitatively and qualitatively to capture those aspects of the SWP and CVP operations that can be captured using CALSIM II and those that cannot because of uncertainty about a project's effect on operations. Cumulative effects related to all other topics are evaluated qualitatively. The following sections describe each approach.

Quantitative Cumulative Impact Assessment

Hydrologic modeling can be used to evaluate cumulative effects of changes to the SWP and CVP operations on hydrology and aquatic resources (e.g., water supplies, tidal hydraulics, water quality, fisheries). However, to quantitatively evaluate changes in hydrologic conditions, projects must be well defined and "reasonably foreseeable." Although the CALFED ROD identifies many projects, few are far enough along in the planning stages to be well defined. Because many related programs would likely compete for water and for conveyance and pumping capacity, it would be speculative to determine how each project would operate and even which projects would be completed. Therefore, only those projects that have been adequately defined (e.g., in recent project-level environmental documents or CALSIM II modeling) and that have the potential to contribute to cumulative impacts are included in the quantitative assessment. All other projects that are under active consideration are included in the cumulative analysis using qualitative means (see below).

Future hydrologic cumulative conditions are quantitatively simulated using the CALSIM II modeling process. A summary of this approach is provided here but is further described in Sections 5.1, 5.2, and 5.3 of Chapter 5. Overall, four categories of model runs were conducted: (1) existing conditions without project, (2) existing conditions with project, (3) future no action condition, and (4) future with-project condition. Individual model runs were conducted for each SDIP project alternative under the with-project and future with-project conditions. Model runs were also completed for the OCAP BA that included future with-project conditions. The relationship of these model runs is illustrated in Figure 10-1 and described below.

The technical approach for conducting the cumulative impact assessment involved comparing CALSIM II hydrologic model output for the future with-project condition against the existing condition. The existing condition includes 2001 level of development per DWR's Bulletin 160-98, existing CVP and SWP operational rules and facilities, and current use of the EWA, a CALFED water transfer program described below. The future with-project model runs, which represents the cumulative condition under each SDIP alternative include two future with-project simulations: (1) the SDIP future with-project condition that includes implementation of SDIP Alternatives at 2020 level of development, increases in Sacramento River diversions as a result of the Freeport Regional Water Project (FRWP) (see below), EWA assumptions, other assumptions consistent with the 2003 OCAP Biological Assessment CALSIM II simulations,

and SDIP Alternative 2A; and (2) future with-project assuming OCAP modeling assumptions for 2020 level of development. The OCAP CALSIM II model output was developed for the OCAP BA and is generally accepted as representing the most up-to-date assumptions for future operations of the CVP and SWP. CALSIM output for OCAP is summarized with the SDIP output to provide a summary comparison of CALSIM results (Table 10-2). Because of the importance of OCAP in describing the probable future cumulative changes to CVP/SWP operations, it is briefly described below.

To assess the incremental contribution of the SDIP alternatives to cumulative impacts, the future with-project conditions are compared to the future no action condition. By subtracting the SDIP alternative from the future no action condition, the incremental contributions of the SDIP can be defined.

The CALSIM II model outputs are used to help evaluate changes in water supply, water management, water quality, and fisheries resources. The tools used to determine the environmental effects of hydrologic changes under the cumulative scenario are the same as those used in the project impact analysis chapters. Please refer to Sections 5.1, Water Supply and Management, 5.2, Delta Tidal Hydraulics, 5.3, Water Quality, and 7.1, Fisheries and Aquatic Resources, for more information on impact assessment methods.

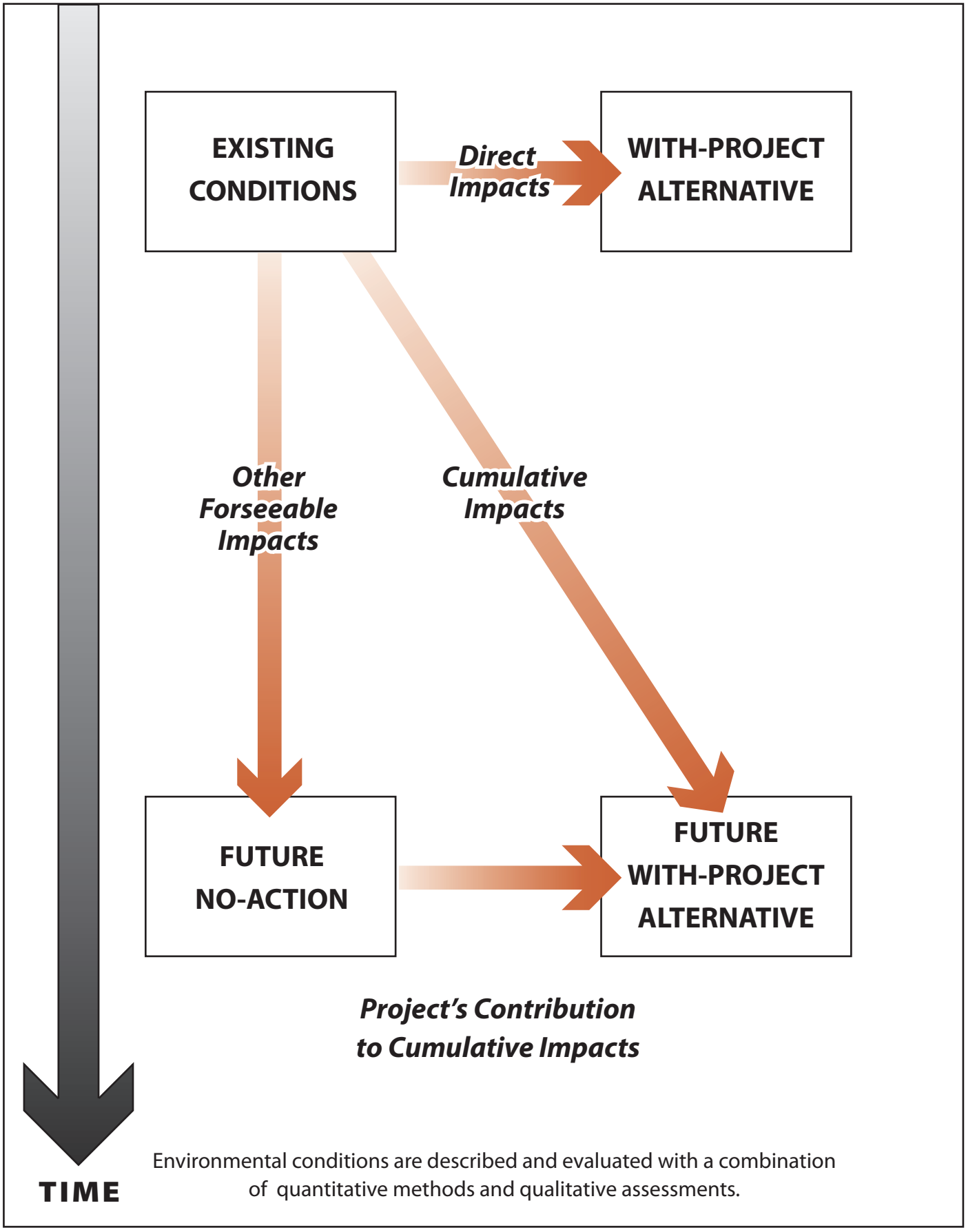
Operations Criteria and Plan

The Central Valley OCAP describes the regulatory and physical constraints and conditions under which the CVP and SWP currently operates. OCAP is the basis for the BOs that authorize take of endangered species and also explains the methods used in the determination of effects on endangered species for the current operating procedures. The documentation and analysis of operations contained in OCAP provided the basis for entering Section 7 ESA consultation with NOAA Fisheries and USFWS. Policymakers and technical specialists now also use OCAP to understand the operations of the CVP and SWP.

OCAP describes the benefits from and the objectives for each division in the Sacramento and San Joaquin River systems. These benefits/objectives cover such topics as recreation, water supply, power generation and supply, water storage, flood control, fishery enhancement, and water quality. Objectives assist Reclamation in determining the management strategies for each division of the CVP. OCAP also discusses operation of major facilities relied upon by SWP and CVP, such as CCF for joint operations at SWP Banks and San Luis Reservoir.

OCAP plays an important role in the operations of both the CVP and the SWP. Changes in pumping operations in either project must be consistent with OCAP to be covered by permits and BOs obtained based on operations described in OCAP. Important assumptions used for the CALSIM II modeling of OCAP include the following:

- Trinity River Mainstem ROD flows,



Environmental conditions are described and evaluated with a combination of quantitative methods and qualitative assessments.

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Figure 10-1
Cumulative Impacts

Table 10-2. Summary Cumulative Frequency Results of CALSIM Hydrologic Modeling for South Delta Improvements Program Alternative 2A and OCAP at a 2020 Level of Development

Percentile	2001 Baseline	2001 Alternative 2A	2001 OCAP	2020 Baseline	2020 Alternative 2A	2020 OCAP
Shasta Reservoir Carryover Storage (taf)						
Min	550	550	550	550	550	561
10	956	974	975	884	895	927
20	2,133	2,134	2,134	1,901	1,924	1,924
30	2,373	2,270	2,282	2,227	2,149	2,218
40	2,608	2,527	2,580	2,518	2,393	2,410
50	2,840	2,734	2,752	2,691	2,621	2,730
60	2,949	2,918	2,933	2,847	2,800	2,754
70	3,178	3,081	3,089	3,041	3,024	3,083
80	3,400	3,400	3,393	3,377	3,357	3,400
90	3,400	3,400	3,400	3,400	3,400	3,400
Max	3,400	3,400	3,400	3,400	3,400	3,400
Avg	2,607	2,559	2,647	2,513	2,475	2,514
Oroville Reservoir Carryover Storage (taf)						
Min	216	185	173	387	388	391
10	1,183	1,197	1,188	1,193	1,199	1,297
20	1,442	1,466	1,456	1,459	1,444	1,490
30	1,629	1,662	1,648	1,651	1,650	1,641
40	1,812	1,792	1,793	1,734	1,732	1,759
50	1,939	2,008	1,987	1,931	1,913	1,923
60	2,213	2,105	2,105	2,184	2,113	2,064
70	2,504	2,382	2,459	2,407	2,443	2,410
80	2,943	2,874	2,851	2,730	2,800	2,727
90	3,145	3,150	3,157	3,096	2,992	2,995
Max	3,351	3,351	3,351	3,351	3,351	3,351
Avg	2,100	2,076	2,066	2,048	2,040	2,031
Folsom Reservoir Carryover Storage (taf)						
Min	90	90	90	90	90	90
10	222	209	202	196	189	253
20	367	365	366	357	340	368
30	410	399	399	393	379	387
40	455	464	467	425	428	462
50	521	493	508	487	465	556
60	586	557	562	548	508	591
70	607	600	600	593	590	637
80	650	650	650	650	645	650
90	650	650	650	650	650	650
Max	650	650	650	650	650	650
Avg	489	480	532	468	458	496
New Melones Reservoir Carryover Storage (taf)						
Min	132	129	129	130	120	199
10	701	700	700	699	699	737
20	890	890	890	888	889	972
30	1,057	1,056	1,056	1,056	1,055	1,163
40	1,235	1,233	1,234	1,235	1,234	1,312
50	1,332	1,331	1,331	1,332	1,332	1,374
60	1,408	1,404	1,405	1,410	1,406	1,461
70	1,565	1,564	1,564	1,568	1,564	1,626
80	1,750	1,746	1,747	1,752	1,748	1,802
90	2,011	2,006	2,008	2,014	2,008	2,052
Max	2,270	2,270	2,270	2,270	2,270	2,270
Avg	1,323	1,322	1,379	1,324	1,322	1,380

Table 10-2. Continued

Percentile	2001 Baseline	2001 Alternative 2A	2001 OCAP	2020 Baseline	2020 Alternative 2A	2020 OCAP
CVP Tracy Annual Export Pumping (taf)						
Min	872	848	1,022	915	922	953
10	1,593	1,599	1,640	1,644	1,543	1,623
20	1,929	1,909	1,919	1,918	1,893	1,907
30	2,230	2,231	2,140	2,091	2,115	2,099
40	2,398	2,366	2,444	2,364	2,330	2,337
50	2,481	2,448	2,480	2,435	2,413	2,442
60	2,543	2,551	2,564	2,543	2,518	2,570
70	2,594	2,621	2,637	2,646	2,622	2,634
80	2,678	2,708	2,682	2,690	2,698	2,756
90	2,749	2,754	2,759	2,747	2,754	2,820
Max	2,838	2,854	2,884	2,823	2,828	3,009
Avg	2,312	2,304	2,325	2,305	2,286	2,318
SWP Banks Annual Export Pumping (taf)						
Min	1,169	1,169	1,136	1,119	1,127	1,234
10	1,798	1,775	1,723	1,743	1,704	1,760
20	2,623	2,705	2,523	2,682	2,785	2,703
30	3,112	3,282	2,969	3,141	3,286	3,050
40	3,338	3,519	3,222	3,409	3,459	3,433
50	3,601	3,772	3,455	3,626	3,870	3,727
60	3,726	3,942	3,662	3,795	4,023	3,843
70	3,871	4,086	3,836	3,957	4,119	3,968
80	4,017	4,330	3,930	4,119	4,362	4,098
90	4,197	4,578	4,342	4,310	4,668	4,520
Max	4,646	5,056	4,594	4,532	5,092	5,209
Avg	3,312	3,514	3,262	3,357	3,559	3,444
CVP San Luis Reservoir Carryover Storage (taf)						
Min	51	45	45	65	45	45
10	90	90	95	85	90	74
20	130	124	133	135	135	121
30	148	135	148	156	143	134
40	171	159	166	168	167	141
50	198	181	193	194	186	165
60	228	223	226	226	220	194
70	261	268	263	278	259	225
80	303	323	337	348	357	377
90	439	428	399	414	509	573
Max	966	972	972	912	901	801
Avg	242	240	229	242	248	242
SWP San Luis Reservoir Carryover Storage (taf)						
Min	55	100	110	55	109	55
10	110	110	110	110	110	55
20	133	131	132	120	134	61
30	147	152	146	144	151	110
40	215	216	195	174	171	129
50	269	292	289	290	267	170
60	368	360	353	327	350	289
70	452	501	473	409	406	360
80	581	624	646	559	519	553
90	740	798	807	719	706	771
Max	1,067	1,067	1,067	1,067	1,067	1,067
Avg	358	381	351	332	342	300

- increased water demands on the American River,
- delivery of CVP water to the proposed FRWP,
- operation of SDIP at 8,500 cfs
- use of water transfers,
- implementation of the long-term EWA,
- operation of the Tracy Fish Facility,
- operation of the SWP-CVP Intertie,
- modifications to the North Bay Aqueduct,
- operation of Suisun Marsh salinity control gates, and
- operation of the Skinner Fish Facility.

Future changes in CVP and SWP operations must be consistent with the OCAP descriptions and resulting Biological Opinions and permits.

Qualitative Cumulative Impact Assessment

The qualitative analysis of cumulative effects considers projects and activities that are in the planning stage or are being discussed by various entities (such as various CALFED actions) but that have not been sufficiently defined to be considered "reasonably foreseeable" and quantifiable. Projects that are not yet quantifiable using CALSIM simulations, but that could have an effect on Delta resources, are addressed qualitatively to provide as much information on potential cumulative effects as possible. For water supply, tidal hydraulics, water quality, and fisheries resources, this qualitative analysis follows a discussion that is based on a quantitative evaluation and provides additional context for potential future effects and benefits. All other topics that are not dependent on hydrology, water level, or water quality or that are not effectively evaluated using hydrologic modeling are assessed in a qualitative manner.

10.3 List of Related and Reasonably Foreseeable Projects and Actions

This analysis incorporates all reasonably foreseeable, relevant projects and focuses on those water management actions or projects that, when combined with the SDIP, could contribute to cumulative effects. Scoping for the SDIP EIS/EIR, the CALFED ROD, and other recent documents was used to identify projects considered in the cumulative effect analysis. The following criteria, taken from the CALFED Programmatic EIS/EIR, were used to narrow the list of projects considered in the analysis:

1. The action is under active consideration.

2. The action has recently completed project-level environmental documentation or environmental documents in some stage of active completion (e.g., public draft EIS/EIR).
3. The action would be completed or operational within the timeframe being considered for the SDIP (assumed to be 2020).
4. The action, in combination with the SDIP alternatives, has the potential to affect the same resources.

Projects that meet all four criteria and would affect water operations are included in the quantitative analysis. The qualitative analysis considers projects that are not described in detail in an existing project-level environmental document (criterion 2) but could affect the same resources in the same timeframe as the SDIP.

Table 10-1 lists projects considered for the cumulative effects section, whether they meet the above criteria, and how they are incorporated into this analysis (i.e., quantitatively or qualitatively). Descriptions of each project and their relationship to the SDIP are provided below.

CALFED Storage Program

Shasta Reservoir Enlargement

The CALFED ROD includes enlargement of Shasta Reservoir as an option to increase storage north of the Delta. One alternative to expand Shasta Reservoir is to raise the height of the dam by 6.5 feet, which would inundate a segment of McCloud River, protected under the California Wild and Scenic Rivers Act, as well as portions of the Pit River and Upper Sacramento River. Other alternatives include modifications to the dam and reservoir re-operations. This project is currently in the planning stages, with an "Initial Alternatives Information Report" prepared in 2004. At the time of this writing, an environmental document has not been issued for the project but is anticipated to be released in 2008.

The Shasta Enlargement Project could contribute to cumulative effects on water supplies and associated resources. The project could increase water supplies available for export in those years when Shasta Reservoir otherwise would have spilled. This project could also modify the timing and magnitude of upstream reservoir releases in wet years. This project is included in the qualitative cumulative analysis.

North-of-Delta Off-Stream Storage (Sites Reservoir)

The CALFED Agencies are currently studying several off-stream storage locations including Sites Reservoir, located 70 miles northwest of Sacramento, as possible options for additional storage. With a potential maximum capacity of

1.8 maf, Sites Reservoir could increase the reliability of water supplies for a large portion of the Sacramento Valley and could improve fish migration by reducing water diversions on the Sacramento River.

The Sites Reservoir Project could contribute to cumulative effects on water supplies and associated resources. The project could increase water supplies available for export in those years when water otherwise would have been unavailable for storage and export. This project could also modify the timing and magnitude of upstream reservoir releases in wet years.

A Notice of Preparation/Notice of Intent (NOP/NOI) for this project was issued in November 2001 and public scoping for the environmental document occurred in January 2002. The project environmental document and engineering feasibility study are in progress and are scheduled for completion in fall 2006. This project is included in the qualitative cumulative analysis.

In-Delta Storage

The CALFED agencies are exploring options for storing water in the Delta. In-Delta Storage would increase the reliability, operational flexibility, and water availability for south-of-Delta water users. An in-Delta storage location can capture peak flows through the Delta in the winter when the CVP and SWP systems do not have the capacity or ability to capture those flows. Water can then be released from the in-Delta reservoirs during periods of export demands, typically summer months. Storing water in the Delta provides the opportunity to change the timing of Delta exports and the ability to capture flows during periods of low impacts on fish. One option is to lease or purchase the Delta Wetlands Project, a private water development project that would divert and store up to 217,000 acre-feet on two islands in the Delta and dedicate two other islands for habitat improvements. The Delta Wetlands Project was analyzed in environmental documents and permits were issued for the private project in 2001. As part of the Delta Wetlands Project, Webb Tract and Bacon Island would be converted to reservoirs, and Bouldin Island and Holland Tract would be used as wetland and wildlife habitat.

DWR released the In-Delta Storage Draft State Feasibility Reports in January 2004. Because the decisions needed to implement this type of project have not been made, it is included in the qualitative cumulative analysis.

Los Vaqueros Reservoir Expansion

Reclamation, DWR, and the CCWD are conducting a feasibility study examining alternatives to improve water quality and water supply reliability for Bay Area water users while enhancing the Delta environment, which will include expanding the existing Los Vaqueros Reservoir as well as a variety of other alternatives. Current work has focused on planning-level evaluations of expanding Los Vaqueros reservoir from 100,000 acre-feet up to 500,000 acre-

feet in order to improve Bay Area water quality and water supply reliability. An expanded reservoir would require a new or expanded Delta intake, with a capacity of up to 1,750 cfs for the maximum reservoir size. Locations being considered for the new Delta intake include Old River and adjacent channels. Water from an expanded reservoir could be delivered to Bay Area water users through a connection to the South Bay Aqueduct.

The Los Vaqueros Reservoir expansion study is in the early planning stage. A Draft Planning Report, including an evaluation of the environmental impacts of an expanded Los Vaqueros Expansion alternative on the Delta, was released in May 2003 (California Bay-Delta Authority 2004). Studies conducted for the Draft Planning Report show that there would be no significant effect on water levels for current Delta water users, or on river velocities. An expanded Los Vaqueros could change the timing of diversions from the Delta. Passage of Measure N in March 2004 allows further environmental and engineering studies to continue, with planned environmental review public scoping meetings to be held in early 2005 and a tentative EIR/EIS schedule of 2007. Effects of a Los Vaqueros expansion are considered in the qualitative cumulative impact assessment below.

The Los Vaqueros Reservoir Expansion could contribute to cumulative effects on water supplies and associated resources. The project could increase water supplies available for export in those years when Los Vaqueros Reservoir otherwise would have spilled. This project could also modify the timing and magnitude of upstream reservoir releases in wet years. Because this project is in its early environmental documentation stages, the cumulative analysis will be qualitative.

Upper San Joaquin River Basin Storage Investigation

The Upper San Joaquin River Basin Storage Investigation is considering a range of approaches to increase water supplies through possible enlargement of Millerton Lake at Friant Dam. Reclamation and DWR are conducting the Upper San Joaquin River Basin Storage Investigation to consider a 700,000-acre-foot Millerton Lake expansion and other alternatives to providing surface storage in the upper San Joaquin River Basin. As stated in the CALFED ROD, the goal of the project is to "contribute to restoration of and improve water quality for the San Joaquin River and facilitate conjunctive water management and water exchanges that improve the quality of water deliveries to urban communities." The investigations are ongoing. The first of a series of reports analyzing alternatives was completed in 2003, with a second report, an "Initial Alternatives Information Report," due for completion in spring 2005. A final feasibility report and environmental review would be prepared at a later unscheduled date.

This project has the potential to improve fish conditions in the San Joaquin River and could increase flows into the Delta, depending on operation of Friant Dam and Delta Mendota Pool. This project is included in the qualitative cumulative analysis.

CALFED Conveyance Program

10,300 cfs at Banks Pumping Plant

- The CALFED ROD envisioned two steps for conveyance improvements in the south Delta: Banks at 8,500 cfs and other improvements for fish and local impacts, and
- Banks at 10,300 cfs with construction of operable barriers and a new intake and fish screening facility at CCF to support the maximum pumping rate.

This EIS/EIR incorporates components of both projects above: the increased diversions up to 8,500 cfs and the installation of permanent operable gates. The ROD states that pumping and diversions may not increase to 10,300 cfs until the gates and fish screen are installed.

SWP Banks has a physical export pumping capacity of 10,300 cfs; however, current permit terms limit the diversion of water to CCF to 6,680 cfs. Implementation of the SDIP, as described and evaluated in this document, would increase allowable diversions at CCF from 6,680 cfs to 8,500 cfs. To take advantage of the full pump capacity of 10,300 cfs, DWR would need to construct fish screens and increase the capability of the Clifton Court Fish Facility to handle fish entering CCF. Also, the existing intake to CCF may physically limit flows needed to support 10,300 cfs and would need substantial modifications to accommodate the new fish screens. Therefore, a new CCF intake would be constructed as part of the 10,300 cfs project.

The 10,300 cfs at Banks Project has not yet been defined in detail; there are two major issues yet to be resolved. First, DWR has not yet determined either how operation of the SWP pumps would change with 10,300 cfs or what would be the priority for the increased pump capacity. Second, the design and effectiveness of a new intake and fish screen facility is dependent on feasibility evaluation and testing (see "Tracy Fish Test Facility" below). Implementation of the Tracy Fish Test Facility has been put on hold. Until the effectiveness of a new fish facility is tested and proven, the feasibility of the 10,300 cfs project is unknown. This project is included in the qualitative cumulative analysis.

Tracy Fish Test Facility

The Tracy Fish Test Facility, to be constructed near Byron, California, will develop and implement new fish collection, holding, transport, and release technology to significantly improve fish protection at the major water diversions in the south Delta. DWR and Reclamation will use results of the Tracy Fish Test Facility to design the CCF Fish Facility, an element of the 10,300 cfs project described above, and improve fish protection at the CVP Tracy facility as required by the CVPIA. The test facility, unlike conventional fish screening facilities, will require fish screening, fish holding, and fish transport and stocking

capabilities. The facility would be designed to screen about 500 cfs of water at an approach velocity of 0.2 ft/s and meet other appropriate fish agency criteria. The facility would have the structural and operational flexibility to optimize screening operations for multiple species in the south Delta. However, construction of the facility has been delayed by shortfalls in funding. The South Delta Fish Facilities Forum, a CALFED workgroup, is evaluating the cost effectiveness and cost sustainability of the fish facilities strategy.

If eventually constructed, the Tracy Fish Test Facility would not affect current CVP and SWP operations. This project is included in the qualitative cumulative analysis.

Lower San Joaquin Flood Improvements

The primary objective of this project is to "design and construct floodway improvements on the lower San Joaquin River and provide conveyance, flood control, and ecosystem benefits" (CALFED ROD). This project would construct setback levees in the South Delta Ecological Unit along the San Joaquin River between Mossdale and Stockton, and convert adjacent lands to overflow basins and nontidal wetlands or land designated for agricultural use. The levees are necessary for future urbanization and will be compatible with the Sacramento and San Joaquin River Basins comprehensive study. Progress has been indefinitely delayed with no scheduled date for completion. Nevertheless, if implemented, the project may also include the restoration of riparian and riverine aquatic habitat, increased riparian habitat, restrictions of/on dredging and sediment disposal, reduction of invasive plants, and protection and mitigation of effects on threatened or endangered species. This project could contribute to ecosystem improvements in the lower San Joaquin River and is considered qualitatively in the cumulative effects section.

Delta Cross Channel Re-operation and Through-Delta Facility

As part of the CALFED ROD, changes in the operation of the DCC and the potential for a Through-Delta Facility (TDF) are being evaluated. Studies are being conducted to determine how changing the operations of the DCC could benefit fish and water quality. This evaluation will help determine whether a screened through-Delta facility is needed to improve fisheries and avoid water quality disruptions. In conjunction with the DCC operations studies, feasibility studies are being conducted to determine the effectiveness of a TDF. The TDF would include a screened diversion on the Sacramento River of up to 4,000 cfs and conveyance of that water into the Delta.

Both a DCC re-operation and a TDF would change the flow patterns and water quality in the Delta, affecting fisheries, ecosystems, and water supply reliability. Further consideration of related actions will take place only after completion of

several assessments, scheduled for completion in November 2005. This project is included in the qualitative cumulative analysis.

North Delta Flood Control and Ecosystem Restoration Project

The purpose of the North Delta Flood Control and Ecosystem Restoration Project is to implement flood control improvements in the northeast Delta in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. The North Delta project area includes the North and South Fork Mokelumne Rivers and adjacent channels downstream of Interstate-5 and upstream of the San Joaquin River. Solution components being considered for flood control include bridge replacement, setback levees, dredging, island bypass systems, and island detention systems. The project will include ecosystem restoration and science actions in this area, and improving and enhancing recreation opportunities. In support of the environmental review process, an NOP/NOI was prepared and public scoping was held in 2003. Modeling studies are under preparation with construction preliminarily scheduled for some time in 2008. This project is included in the qualitative cumulative analysis.

Delta-Mendota Canal/California Aqueduct Intertie

The DMC and California Aqueduct Intertie (Intertie) consists of construction and operation of a pumping plant and pipeline connections between the DMC and California Aqueduct. The Intertie alignment is proposed for DMC milepost 7.1, where the DMC and California Aqueduct are about 400 feet apart. The Intertie would provide operational flexibility between the DMC and California Aqueduct. It would not result in any changes to authorized pumping capacity at CVP Tracy or SWP Banks.

The average daily pumping capacity at CVP Tracy is limited to 4,600 cfs, which is the existing capacity of the upper DMC and its intake channel. However, because of conveyance limitations in the lower DMC and other factors, pumping at CVP Tracy is almost always less than 4,600 cfs. DMC conveyance capacity is affected by subsidence; canal siltation and deposition; the amount, timing and location of water deliveries from the DMC; the facility design; and other factors. By linking the upper DMC with the California Aqueduct, the Intertie would allow year-round CVP Tracy pumping up to 4,600 cfs, subject to all applicable export pumping restrictions for water quality and fishery protections. CVP Tracy capacity would remain limited to its existing authorized pumping capacity of 4,600 cfs.

A negative declaration and finding of no significant impact has been prepared and was circulated for public comment in December 2004. This project is considered in the quantitative analysis of cumulative impacts.

Clifton Court Forebay–Tracy Pumping Plant Intertie

This project would construct an intertie between the CVP and the CCF. It would require an increase in the capacity of the proposed CCF screened intake (see description of 10,300-cfs at Banks, above). This project would provide increased operational flexibility by modifying intake operations to improve the water quality of exports, improving water supply reliability, and minimizing impacts on fish entrainment. Because this project is not yet defined in detail, it is included in the qualitative cumulative analysis

CALFED Drinking Water Quality Program

Old River and Rock Slough Water Quality Improvement Project

CCWD is working with CALFED Agencies to design a project to minimize salinity and other constituents of concern in drinking water by relocating or reducing agricultural drainage in the south Delta. CCWD intake facilities are located on Rock Slough and Old River, which also receive agricultural drainage water discharged from adjacent agricultural lands. Agricultural drainage water can adversely affect water quality entering the CCWD system. Therefore, alternatives are being considered to improve water quality in these locations through reconfigurations of agricultural drains and other options. This project is expected to be completed in Fall 2005.

Bay Area Water Quality and Reliability Program

The Bay Area Water Quality and Reliability Program would encourage participating Bay Area partners, including Alameda County Water District, Alameda County Flood Control & Water Conservation District, Bay Area Water Users Association, Contra Costa Water District, East Bay Municipal Utility District (EBMUD), San Francisco, and the Santa Clara Valley Water District (SCVWD), to develop and coordinate regional exchange projects to improve water quality and supply reliability. This project would include the cooperation of these agencies in operating their water supplies for the benefit of the entire Bay Area region as well as the potential construction of interconnects between existing water supplies. This program is in the preliminary planning stages. No specific projects have been proposed and evaluated in detail. This project is included in the qualitative cumulative analysis.

San Joaquin Valley/Southern California Water Exchange

This program would facilitate a partnership between Metropolitan and San Joaquin interests to help improve the water quality in Southern California and the water conveyance infrastructure in Northern California by better managing the water supply. This would include resolving water supply and water quality problems of water quality sampling, reconnaissance and feasibility analyses, and environmental documentation. This project is included in the qualitative cumulative analysis.

North Bay Aqueduct Intake Project

The North Bay Aqueduct Project would construct a new intake for the North Bay Aqueduct to increase the flow in the aqueduct. It will involve the construction of pipeline corridors and connection points to the existing North Bay Aqueduct. Possible intake points are the Deep Water Ship Channel, Sutter/Elk Slough, Steamboat Slough, Miner Slough, and Main Stem Sacramento River. Because this project is not yet defined in detail, it is included in the qualitative cumulative analysis.

San Luis Reservoir Low Point Improvement Project

The San Luis Low Point Improvement Project would use one or a combination of alternatives, including treatment options, bypasses, and other storage options, to reduce the risk of "low point" water levels. When water levels in San Luis Reservoir are low, high water temperatures combined with wind-induced mixing result in algal blooms at the reservoir's water surface. This condition degrades water quality, making the water difficult or impractical to treat, and can prevent deliveries of water from San Luis Reservoir to San Felipe Division contractors. In order to solve the low point problem, the Reclamation and DWR have operated the reservoir to maintain water levels above the critical low elevation—the low point—resulting in approximately 200,000 acre-feet of unallocated water to remain as "carryover" in the reservoir. The SCVWD, working with Reclamation, are exploring options to address the low point problem.

The alternatives being considered to avoid water quality problems for the SCVWD and to increase the effective storage capacity of the reservoir include, but are not limited to:

- a bypass to the San Felipe Unit around the San Luis Reservoir,
- treatment options such as dissolved air flotation,
- algae harvesting or application of algaecides,
- lowering the San Felipe Division intake facilities, and

- expansion of Pacheco Reservoir.

The Low Point Improvement Project is currently in the planning stages. A NOP/NOI to prepare an EIS/EIR was released in August 2002, and the EIS/EIR is expected to be released in 2006, with possible implementation sometime during or after 2007. Implementation of this project would restore operational flexibility of the San Luis Reservoir and improve reliability of water deliveries to CVP contractors. This project is included in the qualitative cumulative analysis.

CALFED Ecosystem Restoration Program

The goals of the CALFED ERP are to:

- recover 19 at-risk native species and contribute to the recovery of 25 additional species;
- rehabilitate natural processes related to hydrology, stream channels, sediment, floodplains and ecosystem water quality;
- maintain and enhance fish populations critical to commercial, sport and recreational fisheries;
- protect and restore functional habitats, including aquatic, upland and riparian, to allow species to thrive;
- reduce the negative impacts of invasive species and prevent additional introductions that compete with and destroy native species; and
- improve and maintain water and sediment quality to better support ecosystem health and allow species to flourish.

The ERP plan, which is divided into the Sacramento, San Joaquin, and Delta and Eastside Tributary regions, includes the following kinds of actions:

- develop and implement habitat management and restoration actions, including restoration of river corridors and floodplains, reconstruction of channel-floodplain interactions, and restoration of Delta aquatic habitats;
- restore habitat that would specifically benefit one or more at-risk species;
- implement fish passage programs and conduct passage studies;
- continue major fish screen projects and conduct studies to improve knowledge of their effects;
- restore geomorphic processes in stream and riparian corridors;
- implement actions to improve understanding of at-risk species;
- develop understanding and technologies to reduce the impacts of irrigation drainage on the San Joaquin River and reduce transport of contaminant (selenium) loads carried by the San Joaquin to the Delta and the Bay; and

- implement actions to prevent, control, and reduce impacts from nonnative invasive species.

ERP actions contribute to cumulative benefits on fish and wildlife species, habitats, and ecological processes and are considered in the qualitative analysis of cumulative effects.

CALFED Levees Program

The goal of the CALFED Levees Program is to uniformly improve Delta levees by modifying cross sections, raising levee height, widening levee crown, flattening levee slopes, or constructing stability berms. Estimates predict that there are 520 miles of levees in need of improvement and maintenance to meet the PL 84-99 standard for Delta levees. The levees program continues to implement levee improvements throughout the Delta, including the south Delta area. The program is included in the qualitative cumulative analysis.

Other CVP/SWP-Related Projects

Freeport Regional Water Project

FRWP is a regional water supply project being developed on the Sacramento River near the town of Freeport by the Sacramento County Water Agency (SCWA) and EBMUD, in close coordination with the City of Sacramento and Reclamation. The project is designed to help meet future drinking water needs in the central Sacramento County area and supplement aggressive water conservation and recycling programs in the East Bay to provide adequate water supply during future drought periods.

FRWP will provide up to 100 mgd of water for EBMUD to use during drought years and 85 mgd for SCWA for use in all years. The project would divert water from the Sacramento River and deliver it to a Sacramento County Treatment facility and the Folsom South Canal. From the Folsom South Canal, water will be delivered to the Mokelumne Aqueducts. This project would require the construction of fish screens and a pumping plant at the intake on the Sacramento River, a water treatment facility in Sacramento County, and pipeline facilities to transport the water from Freeport to the Mokelumne Aqueduct.

A final EIS/EIR was certified in April 2004, with the subsequent notice of determination and record of decision filed in April 2004 and January 2005, respectively. Completion and activation of the treatment plant and diversion are anticipated between 2008 and 2010. By diverting water on the Sacramento River, the FRWP could affect Delta inflows. This project is included in the quantitative cumulative analysis.

Sacramento Valley Water Management Agreement (Phase 8)

The State Water Board has held proceedings regarding the responsibility for meeting the flow-related water quality standards in the Delta established by the Delta WQCP (D-1641). The State Water Board hearings have focused on which users should provide this water, and Phase 8 focuses on the Sacramento Valley users. The Sacramento Valley Water Management Agreement (SVWMA) is an alternative to the State Water Board's Phase 8 proceedings. The SVWMA, entered into by DWR, Reclamation, Sacramento water users, and export water users, provides for a variety of local water management projects that will increase water supplies cumulatively. For example, the SVWMA includes a provision to have upstream users provide 185,000 acre-feet of water through conjunctive management projects in 2005. An environmental document is being prepared for the program. This action is included in the qualitative cumulative analysis.

Trinity River Mainstream Fishery Restoration Program

The Trinity River Mainstream Fishery Restoration Program Environmental Impact Statement (TRMFRP EIS) ROD issued December 19, 2000, allocates 369–815 taf annually for Trinity River flows. Although in litigation for several years, recent federal court decisions will allow implementation of the Trinity ROD flows. Prior to this most recent decision, a previous court order directed the CVP to release 368.6 taf in critically dry years and 452 taf in all other years. Temperature objectives for the Trinity River are set forth in State Water Board Water Rights Order 90-5 (WR 90-5). Operationally, for the purposes of establishing the Trinity River flows, the water year type will be forecasted by Reclamation based on a 50% forecast on April 1. To avoid warming and to function most efficiently for temperature control, water is exported for the Trinity River Basin through Whiskeytown Reservoir and into the Sacramento River Basin during the late spring.

Delta Improvements Package

The DIP is an outline for CALFED agencies to implement a series of projects, programs, and activities that will help meet the balanced implementation goal of the CALFED Program. Many of the activities identified in the DIP were also described in the CALFED ROD. However, some actions (listed below) were not, but are also reasonably foreseeable and are included in the cumulative impacts assessment:

- San Joaquin River Salinity Management Plan—DWR and Reclamation developed a plan to maintain compliance with all existing Delta water quality salinity objectives. The RWQCB adopted an amendment to the basin plan

and forwarded it to the State Water Board for final action. The State Water Board has not set a hearing date.

- Vernalis Flow Objectives—The San Joaquin Water Quality Management Group, an interagency working group, is currently looking at the salinity problem in the lower San Joaquin River and the DO problem in the Stockton DWSC. A report of findings and recommendations is in process.
- San Joaquin River Dissolved Oxygen—CALFED agencies would develop a plan to help improve water quality in the Stockton DWSC.
- Franks Tract—State and federal agencies would evaluate and implement, if appropriate and authorized, a strategy to significantly reduce salinity levels in the south Delta and at the CCWD and SWP/CVP export facilities and improve water supply reliability by reconfiguring levees and/or Delta circulation patterns around Frank Tract while accommodating recreational interests.
- Relocation of M&I Intake—state and federal agencies will work with CCWD to relocate their intake to the lower part of Victoria Canal should the above actions not provide acceptable continuous improvements in Delta water quality.
- Delta Regional Ecosystem Restoration Implementation Plan (DRERIP)—This plan is intended to refine the existing planning foundation specific to the Delta, refine existing Delta-specific restoration actions, and provide guidance for Delta specific ERP tracking, performance evaluation, and adaptive management feedback.
- Science Actions and Commitments—several studies would be conducted, including a Focused Study on South Delta Hydrodynamics, Water Quality, and Fish; Focused Study on Delta Smelt and Fish Facilities; South Delta Fish Facilities; and Performance Evaluation and Monitoring Program.

Water Transfers and Acquisition Programs

CALFED Environmental Water Account

The EWA is designed to mitigate for water loss during times when CVP and SWP pumping is reduced in an effort to avoid harming fish as they migrate through the Delta. The EWA was created to address two problems: declining fish populations and unreliable water supplies. Its purpose is to better protect fish by making it possible to modify water project operations in the Bay-Delta and still meet the needs of water users. To do that, the EWA buys water from willing sellers or diverts surplus water when safe for fish, then banks, stores, transfers and releases it as needed to protect fish and compensate water users. The EWA has set a goal of acquiring up to 188,000 acre-feet of water each year through purchases. EWA expects to obtain some water through additional pumping at times safe for fish (CALFED ROD). The EWA was set up as a short-term program, and its use as a long-term management tool is being

considered by EWA agencies. The final EIS/EIR evaluating an EWA program through 2007 was adopted in March 2004. Although the environmental review covered only implementation of the EWA up to 2007, it is assumed that the EWA would continue in future years at a level similar to its existing one. A draft EIS/EIR on a long-term EWA is expected to be released in December 2006. Implementation of the EWA beyond 2007 is included in the quantitative cumulative analysis.

CALFED Environmental Water Program

The Environmental Water Program (EWP) has been set up by CALFED Agencies to carry out flow-related goals of the ERP Plan. The EWP would purchase 100,000 acre-feet of water per year from willing sellers to increase the integrity of the instream and riparian ecosystems and provide spawning fish with adequate habitat. This water would remain in tributaries to the Sacramento and San Joaquin Rivers and could not be taken for non-environmental uses. At this time, only pilot water acquisitions are planned. After evaluation of the pilot program, an environmental document that covers full implementation of the program would be prepared. This project will be included in the qualitative analysis.

Current Capacity for Potential Water Transfers

Under the current level of diversion at SWP Banks, water may be transferred from North-of-Delta water users to South-of-Delta water users from July through September. The average water transfer capacity based on the 2001 CALSIM baseline was 250 taf/yr (see Figure 5.1-34). The water transfer capacity will be greatest in dry years with reduced SWP deliveries. However, substantial water transfers of more than 200 taf/yr are currently possible in a range of delivery years, not just in dry years. Current potential water transfers may be limited by available water supplies and demands, and may also be limited by water quality and fish protection requirements.

An average of 200 taf/yr out of the total of 250 taf/yr of potential water transfers (about 80%) might be allowed within the E/I ratio, without any relaxation of the E/I ratio or additional inflow.

Local Projects

State Route 4 Bypass Project

Caltrans is modifying SR 4 in an effort to ease traffic through the cities of Brentwood and Oakley and to provide access to the growing areas of southeast Antioch and western Brentwood. The project is being developed cooperatively

by Caltrans, Contra Costa County, and the Cities of Antioch, Brentwood, and Oakley. The highway will be relocated east of Oakley and on the eastern edge of Brentwood. The project is expected to be complete, and the old highway relinquished, between 2006 and 2008.

Mountain House New Town

Trimark Communities has gained approval to develop a new community in the western portion of San Joaquin County along the Alameda–San Joaquin County line and north of Interstate 205. At full buildout a total of 16,105 residential units on 4,784 acres would be developed. Mountain House will be located directly south of Old River and west of Patterson Pass Road, and will include residential, commercial, and some industrial development. It has been designed to accommodate all the needs of the expected 43,522 residents, including housing, jobs, retail, commercial, open space, and public services, such as schools, emergency services, and roads. The EIR was completed in 1994. Construction began in 2003.

River Islands Development

The Cambay Group, Inc. is proposing to develop approximately 4,990 acres of agricultural land and open space known as the River Islands at Lathrop Project. The project applicant intends to build a mixed-use residential/commercial development on Stewart Tract and Paradise Cut. Stewart Tract is an inbound island bounded by Paradise Cut, the San Joaquin River, and Old River. Paradise Cut consists of a flood control bypass connecting the San Joaquin River and Old River in the Delta. This mixed-use development is expected to include a town center, employment center, dock facilities, residences, and golf courses. It is expected to generate 31,680 residents and 16,751 jobs at full buildout. The Draft Subsequent EIR was completed in October of 2002 and buildout of the development is planned for 2025.

East Altamont Energy Center

Western Area Power Authority plans to construct an energy center with the intent to market power from hydroelectric plants, such as Shasta and Folsom dams, to other entities, such as merchant power plants. The center would be located on a 174-acre parcel of land approximately 1 mile west of the San Joaquin County line and 1 mile southeast of the Contra Costa County line. The actual footprint of the plant would be approximately 55 acres, with the remainder of the parcel available for agricultural leases. Water for cooling and other power plant processes would be provided by Byron Bethany Irrigation District. The plant is expected to have a 30 to 50 year operating life. Environmental documentation equivalent to an EIS/EIR (Revised Presiding Member's Proposed Decision) was

completed in January 2003 and approval from the Energy Commission was granted in August 2003.

Water Facilities Expansion Project

The City of Sacramento is in the process of expanding and replacing facilities at the E. A. Fairbairn Water Treatment Plant (WTP) and the Sacramento River WTP. The purpose of this project is to allow the City to reliably meet increasing water demands and to allow diversions to be shifted from the American River to the Sacramento River. The Fairbairn WTP is being expanded from approximately 90 mgd to 200 mgd. The Sacramento River WTP is being expanded from approximately 110 mgd to 160 mgd. Construction at both plants includes some new facilities as well as improvements to some of the existing facilities. It is expected that the Fairbairn WTP construction will be completed within approximately 32 months, while construction at the Sacramento River WTP is expected to be completed within approximately 34 months. Construction at both facilities may ultimately require up to 164,000 linear feet of transmission pipeline improvements. A final EIR was completed for this project in November of 2000, and construction of the project began in October of 2001.

10.4 Summary of Cumulative Effects by Resource

Quantitative Assessment

Quantitative assessment of cumulative water supply changes is summarized below. The discussion of the cumulative water supply changes that could be expected under future with-project conditions is intended to show the potential for improving future water supply reliability and to provide quantified hydrological information that is used to judge cumulative impacts on specific resources, including Delta water quality and fisheries conditions. Therefore, significance conclusions are not disclosed for cumulative water supply changes, but are disclosed for resource impacts that are influenced by water supply changes.

Water Supply

Cumulative water supply impacts are the changes in the environment that result from the incremental impact of the SDIP when added to other closely related past, present, and reasonably foreseeable probable future projects. The physical impacts in the environment resulting from changes in water supply would be the combination of effects in the reservoirs that store the water supply, in the rivers that convey the water supply, in the Delta where the water supply is diverted, and in the areas where the water supply is delivered and used.

Export Pumping

Because the long-term CVP-OCAP CALSIM simulations include all reasonably foreseeable future operations of CVP and SWP facilities, including the CVP-Intertie (connecting the DMC to the California Aqueduct to allow year-round 4,600 cfs CVP pumping capacity) and the SWP 8,500 cfs pumping capacity, the OCAP results can be used for quantitative evaluation of the cumulative water supply impacts.

The SDIP 2020 and OCAP CALSIM results suggest that, without a new source of water (i.e., new reservoirs), there would be very little change in the future CVP and SWP pumping with SDIP compared to the CVP and SWP pumping that would be allowed under current conditions. The OCAP 2020 CALSIM simulations suggest that cumulative impacts from increased CVP and SWP pumping, beyond those already identified as incremental SDIP project changes, are expected to be limited.

Table 10-2 shows summary statistics for CALSIM results that reflect future with-project conditions (2020 level of demand) as modeled for SDIP and OCAP. Cumulative hydrologic effects are represented by the difference between 2020 conditions with the Proposed Action and 2001 no action conditions. The incremental changes potentially attributable to the Proposed Action are represented by the difference between the simulated 2020 conditions with the Proposed Action and the 2020 no action conditions. The results indicate that under 2020 no action conditions, combined SWP and CVP average annual export pumping would increase slightly compared to no action conditions under a 2001 level of development. This result indicates that, under future operational conditions without increased SDIP export pumping (e.g., increased CCF diversions), combined CVP and SWP export pumping would not be expected to change substantially compared to total average annual export pumping because the CVP and SWP are already capable of delivering full water supplies during above-normal and wet years (approximately 50% of the years simulated in CALSIM) and unable to deliver water supplies that meet demands during drier periods. This basic water supply condition would not change substantially at a 2020 level of demand because existing CVP and SWP storage reservoirs are unable to deliver additional water.

Table 10-2 provides CALSIM statistics that allow an approximation of the probable cumulative CVP and SWP export pumping changes that are simulated using the SDIP 2020 level of demand condition and the OCAP 2020 level of demand condition. Table 10-2 indicates that cumulative export pumping under the SDIP and OCAP simulations would increase by approximately 190–221 taf and that the SDIP and OCAP cumulative results are similar. The increased SDIP pumping limit would account for most of the increased pumping, and its effect on SWP and CVP operations would be relatively small (less than 4%) compared to the combined average annual export pumping of these two projects. This cumulative result indicates that without a new source of water (i.e., new reservoir storage), relatively minor changes in future CVP and SWP export pumping would occur with SDIP compared to the export pumping that is currently allowed

without SDIP under existing conditions. The contribution of SDIP to the cumulative export conditions would account for most of the change. The cumulative impacts of this export pumping are discussed below for Delta tidal hydraulics, water quality, and fisheries resources.

Water Deliveries

Cumulative south-of-Delta average annual water deliveries for CVP and SWP would increase slightly compared to existing conditions at a 2001 level of demand. Cumulative water supply conditions would result in average annual CVP water deliveries of approximately 100 taf, and SWP Table A and Article 21 deliveries would account for up to an additional 90 taf. Increased south-of-Delta deliveries would occur through additional Delta exports and additional reliance on San Luis Reservoir storage reserves (See Tables 5.1-12 and 5.1-13).

Reservoir Carryover Storage

Table 10-2 indicates that at a cumulative 2020 level of demand with SDIP, average annual reservoir carryover storage in Shasta Reservoir and Oroville Reservoir would be expected to decline slightly because of increased water demands and deliveries. Cumulative average annual carryover storage for Folsom Reservoir and New Melones Reservoir would be similar to the 2001 baseline conditions as would the CVP portion of San Luis Reservoir. The SWP portion of San Luis Reservoir carryover storage would be less than under existing conditions, reflecting increased SWP water demand and deliveries under cumulative conditions.

Water Transfers

Implementing SDIP as assumed in the long-term OCAP, could result in a cumulative increase in export pumping from possible water transfers during summer months. Under current (2001) and 2020 baseline (future with-project) conditions in many years, there will be unused SWP pumping capacity during the July-September period. While uncertainty exists regarding when or if this pumping capacity would be used for moving water transfers through the Delta in any particular future year, the availability of excess pumping capacity, projected increases in future water demands, and recent water transfer history suggest this potential is a possibility that could increase cumulative water deliveries south of the Delta.

Generally, the 2020 cumulative (with project) results indicate that the average summer (July–September) transfer capacity could be approximately 350 taf/yr with the assumed maximum transfer capacity of 200 taf/month (600 taf/yr). This potential cumulative water supply effect from water transfers is one of the major water supply change that could result from implementing SDIP and other past,

present, and reasonably foreseeable water storage and conveyance projects. As described in Section 5.1, approximately 100 taf/yr of these potential water transfers are indirect effects from the SDIP project; the remaining 250 taf/yr are cumulative future effects that could occur without the SDIP project.

Other Water Storage and Conveyance Projects

As indicated in the discussion of probable storage and conveyance projects above, a substantial number of actions are currently being considered that, if implemented, could result in improved water supply reliability for north-of-Delta and south-of-Delta service areas. This qualitative cumulative analysis assumes that a number of water supply storage and conveyance projects could be implemented by 2020 with no judgment about which projects are likely to be implemented. These are the likely sources for water transfers that are discussed above and in Section 5.1.

Combining the cumulative projects that were modeled in SDIP and OCAP CALSIM analyses with other possible storage projects, including Shasta Reservoir Enlargement, North-of-Delta Off-Stream Storage, Los Vaqueros Reservoir Expansion, In-Delta Storage, and Upper San Joaquin River Basin Storage Investigation, could result in increased water supplies available for export in those years when water otherwise would have been unavailable for storage and export. Operating one or more of these projects could also result in modification of the timing and magnitude of upstream reservoir releases in wet years. Although it is speculative to identify the specific cumulative water supply and management effects that new or expanded storage projects would have on south Delta water supplies, it is reasonable to assume that current Delta protections for Delta outflow, D-1641 flow-related water quality requirements and current in-Delta uses would continue to be required. It is assumed that these types of storage projects could have positive effects on Delta water supply and resources by improving the amount and timing of flow to the Delta, providing flexibility in timing of storage and release of water for exports, and increasing the amount and timing of water used to protect sensitive aquatic species in upstream tributaries and Delta channels.

Constructing additional upstream and off-stream storage reservoirs would result in direct effects associated with changes in resources and land uses in a new or expanded reservoir. Enlarging Shasta Reservoir and constructing a new Sites Reservoir would not have a direct physical effect on Delta water supply resources because of their location upstream of the Delta; constructing these facilities would not result in construction-related cumulative impacts on Delta resources, including those in the south Delta. Constructing an In-Delta storage facility such as the Delta Wetlands Project and constructing a new Los Vaqueros intake facility would result in direct physical impacts on some Delta resources that are similar to those affected by constructing the Proposed Action. The potential cumulative effects of these project features are discussed below under Water Quality, Fish Resources, and Land Use. Potential cumulative water supply effects of constructing water supply infrastructure (storage and conveyance

facilities or local development infrastructure) in the Delta include the potential for temporary disruption of local water supply attributable to increased turbidity during project construction. The potential for this cumulative water supply impact is considered less –than significant because the construction activities associated with these projects would be localized, agricultural diversions would not be affected, and they would be temporary. Each of these projects also would be required to implement standard construction-practice measures similar to those identified for SDIP Alternative 2A and mitigation measures identified in the CALFED Programmatic ROD for construction effects.

Water supply conveyance projects that are currently being considered that potentially could add to the cumulative effect on south Delta water supply and SWP/CVP operations include future plans to expand the Banks permitted pumping limit to 10,300 cfs, Delta Cross Channel Re-operation and Through-Delta Facility, and the Intertie (included in OCAP CALSIM modeling). It is the intent of these water supply conveyance improvements when considered with future water supply storage projects that conveying water supply for export purposes would be improved substantially by expanding SWP export pumping capacity, improving the operational flexibility of the DMC and California Aqueduct, and conveying water supplies through the Delta in the most ecologically beneficial way.

Other CALFED Programs

Other CALFED Program actions, including the Drinking Water and Reliability Program and the Levee Program actions, could result in some localized effects on Delta waterways (i.e., intake and levee improvements). These types of actions would generally be considered cumulatively beneficial from a water supply perspective because they are intended to improve the quality and reliability of water supplies for jurisdictions that depend on Delta water and because improving the stability of Delta levees is needed to ensure that Delta waterways are a reliable means for conveying water for in-Delta and export purposes.

The CALFED ERP actions when considered with other cumulative Delta projects and actions are intended to improve, in part, Delta habitat and conditions for fish and wildlife. Although implementing ERP actions in the Delta may result in some temporary disturbance of Delta waterways and habitat, it is unlikely that these effects would substantially affect local or export water supplies. Improvements to Delta aquatic and terrestrial habitats could result in improved water quality and habitat conditions that ultimately would be beneficial to improving local and export water supply reliability.

In addition to CALFED programs identified in the Programmatic ROD, CALFED agencies have formulated the DIP as a series of projects and programs, as described above, to help meet the balanced implementation goal of the CALFED program. Implementing a combination of these programs may have some influence on improving water supply and water quality conditions in the Delta. Implementing a number of these programs, such as Franks Tract

improvements, also could contribute to short-term construction-related cumulative impacts in localized areas near the improvements.

Other Local Development Projects

Other local transportation and development projects in the vicinity of SDIP improvements (i.e., SR 4 Bypass, Mountain House and River Islands developments) are not expected to substantially affect local or export water supply conditions, because these projects are required to construct wastewater and drainage discharge facilities that would protect Delta water supply sources. These projects would not affect the amount or quality of water supply available for in-Delta uses and would not directly or indirectly affect operation of the SWP or CVP. This potential cumulative impact is less than significant.

Delta Tidal Hydraulics

The cumulative effects of SDIP and other reasonably foreseeable projects on Delta tidal hydraulics are expected to be similar to the simulated project impacts that were shown in the previous assessment sections. Besides the transfers that could occur under existing conditions as described above, no other projects (that can be evaluated using hydrologic modeling) are proposed in the vicinity of the SDIP that could substantially affect level and flow at the locations evaluated in this section. The operational effects of the four tidal gates have been shown to be nearly identical for all of the operational cases (2A, 2B, and 2C) for the 2001 LOD and 2020 LOD simulations. Some differences in tidal level and tidal flow conditions were simulated for Alternatives 3B (no Grant Line Canal tidal gate) and 4B (fish control gate only).

The cumulative effects on tidal hydraulics are considered to be less than significant because the minimum tide elevations are similar to the minimum tides experienced at many south Delta channel locations that are not directly influenced by pumping (e.g., Old River at Bacon Island). The SDIP alternatives have assumed that tidal gates will be operated to maintain a minimum tide elevation of 0 feet msl. Although this target elevation is not considered to be necessary for mitigation of tidal hydraulic effects, it is selected to improve the general conditions in the south Delta channels and possibly reduce the necessary pump and siphon extensions and the dredging required to maintain the local water supply pumps and siphons. These objectives have been specified as part of the project description and are not required for environmental mitigation. The cumulative effects of other possible projects that may influence SWP and CVP operations, including future water transfers during the summer months, are not expected to significantly affect the tidal hydraulic conditions in the south Delta beyond those impacts already simulated and evaluated for the SDIP alternatives. Water transfers will not result in diversion levels above 8,500 cfs, which is what was simulated in many months for the SDIP direct project effects. DWR and Reclamation will also jointly develop criteria to address any stage deficiencies at

the Tracy Pumping Plant due to transfers through the SWP Banks Pumping Plant prior to the transfers occurring.

Other Water Storage and Conveyance Projects

Other water storage and conveyance projects outlined above are not expected to significantly affect cumulative tidal hydraulic conditions in the south Delta beyond those discussed for SDIP because level and flow conditions in south Delta channels would largely be controlled by SDIP permanent gate operation, and typical operation of storage reservoirs would not be expected to adversely affect level and flow conditions in the SDIP project area. Operating SWP Banks at a future permitted pumping capacity of 10,300 cfs is not expected to significantly affect south Delta channel level and flow because operation at this permitted capacity would be similar to the operations analyzed for 8,500 cfs permitted pumping capacity, and maintaining the level and flow improvements provided under SDIP alternatives would be required at an increased pumping level. Future storage reservoirs or expansion of existing reservoirs would not result in substantial reductions in level and flow in Delta channels because operating storage reservoirs typically involves storing river flows during high-flow periods (when level and flow conditions are not a water management concern in the Delta) and releasing flows during high demand summer periods. All of the existing flow-related water quality requirements of D-1641 and other Delta protections would continue in effect, and these future projects would be required to show how they are being met. Potential cumulative effects of storage and conveyance projects on south Delta level and flow conditions are considered less than significant.

Other CALFED Programs

Other CALFED Program actions, including the Drinking Water and Reliability Program and the Levee Program actions, could result in some localized effects on Delta waterways (i.e., intake and levee improvements), but none would be expected to significantly affect south Delta tidal hydraulic conditions because they would not affect water level and flow conditions. The CALFED ERP actions would not substantially affect cumulative Delta tidal level and flow conditions.

In addition to CALFED programs identified in the Programmatic ROD, a number of programs in the DIP, including Franks Tract improvements, Delta Cross Channel operations, and the Through-Delta Facility, could have generalized cumulative affects on water level and flow conditions in the Delta. The potential for cumulative, localized tidal hydraulic effects in the south Delta is believed to be unlikely because of the distance of these projects from SDIP improvements. Specific projects related to improving San Joaquin River salinity and DO conditions would have a positive effect on flow conditions.

Other Local Development Projects

Other local transportation and development projects in the vicinity of SDIP improvements (i.e., SR 4 Bypass, Mountain House and River Islands developments) are not expected to adversely affect Delta tidal hydraulic conditions because these projects would not modify level or flow conditions in Delta channels and would not affect operation of the CVP or SWP. The River Islands development project proposes to widen the Paradise Cut channel south of Stewart Tract to improve flood conveyance capacity and provide habitat for fish and wildlife. This project would also result in creation of back-bays on Old River adjacent to Stewart Tract. These changes are not expected to significantly affect level or flows on Old River or Paradise Cut and are not currently known to have adverse effects on other south Delta channels in the vicinity of Stewart Tract.

Water Quality

Cumulative future water quality impacts in the Delta can result from future changes in river inflow water quality, as well as future conditions of reduced Delta outflow. No other projects that are assumed in SDIP or OCAP CALSIM analyses are proposed in the vicinity of the SDIP permanent gates or CCF gates that could have a substantial effect on south Delta water quality. The quantifiable cumulative changes in south Delta water quality would be associated primarily with SDIP permanent gate operations and operation of the CCF gates.

There is a limit to the magnitude of the future salinity changes expected in the Delta channels. The D-1641 objectives for maximum EC are generally satisfied by CVP and SWP operations in the Delta. Delta outflow is therefore already regulated, and these minimum Delta outflows are included in the CALSIM simulations that are used for the DSM2 inputs. Water quality objectives for salinity at Vernalis are expected to maintain the future San Joaquin River EC values at about what they are simulated to be in the 2001 baseline and 2020 baseline conditions. Other potential future changes in inflow water quality, or increased discharges of treated wastewater, in the Delta are expected to be independent of the increased SWP Banks pumping anticipated with SDIP alternatives. These potential water quality changes are considered to be independent of the SDIP and will not be increased with the SDIP alternatives. These future changes in Delta water quality are expected to occur with or without the SDIP alternatives, and can be evaluated only generally.

Some future water transfers during the July–September period will be possible without the SDIP. As described above, the water quality effects from these additional exports are assumed to be compensated for by “carriage water” that will slightly increase Delta outflow during the transfer. No cumulative water quality impacts from any additional water transfers with SDIP are anticipated.

Some of the additional water quality actions and projects that are being considered and investigated by the CBDA Drinking Water Quality and CALFED

Science Programs, such as described in the Delta Improvement Program, may provide improvements in the south Delta salinity and DOC concentrations. These potential improvements would reduce the future baseline conditions, but would not likely reduce the SDIP water quality effects. However, the adaptive operations of the tidal gates will provide a substantial new tool for management of south Delta water quality. Incremental improvements, from whatever future baseline conditions develop, will be possible by careful monitoring of water quality and appropriate operations of the south Delta tidal gates.

No significant cumulative water quality impacts beyond those impacts identified for the SDIP alternatives would result from combining other past, present, or reasonably foreseeable projects.

Cumulative changes in DWSC DO concentrations would be considered less than significant during summer months because when the south Delta water level and quality objectives have been met, the head of Old River gate would be operated to improve San Joaquin River DO conditions.

Other Water Storage and Conveyance Projects

Other water storage and conveyance projects outlined above are not expected to significantly affect cumulative water quality conditions in the south Delta beyond those discussed for SDIP because operating these projects would require compliance with current Delta flow and water quality requirements. Operating SWP Banks facility at a future permitted pumping capacity of 10,300 cfs is not expected to significantly affect south Delta salinity, DOC and DO conditions because operations at this pumping capacity would be similar to operations described for SDIP at 8,500 cfs, and current Delta outflow and water quality criteria would be required at an increased level of SWP pumping. Future storage reservoirs or expansion of existing reservoirs would not result in substantial changes in south Delta water quality because operating storage reservoirs typically involves storing river flows during high flow periods when water quality conditions are not a concern in the Delta and releasing flows during high demand summer periods, when south Delta salinity and DO conditions are less desirable. All of the existing flow-related water quality requirements of D-1641 and other Delta protections would continue in effect, and these future projects would be required to show how they are being met. Potential cumulative effects of storage and conveyance projects on Delta water quality conditions are considered less than significant.

Other CALFED Programs

Other CALFED Program actions, including the Drinking Water and Reliability Program and the Levee Program actions, could result in some localized effects on Delta waterways (i.e., intake and levee improvements), but none would be expected to significantly affect south Delta water quality because current water quality protections would remain in place and these projects would not

substantially affect Delta flow or water quality conditions. The CALFED ERP actions would not substantially affect cumulative Delta water quality conditions.

In addition to CALFED programs identified in the Programmatic ROD, a number of programs in the DIP, including Franks Tract improvements, San Joaquin River Salinity Management Plan, and Vernalis Flow Objectives, are proposed to improve salinity and DO conditions in the San Joaquin River and Delta. Overall, it is expected that these programs will have a beneficial effect on cumulative water quality conditions in the south Delta.

Other Local Development Projects

Other local transportation and development projects in the vicinity of SDIP improvements (i.e., SR 4 Bypass, Mountain House and River Islands developments) are not expected to adversely affect Delta water quality conditions because these projects would result in only minor localized effects on Delta waterways and would employ standard construction methods to minimize erosion and turbidity effects. Cumulative construction-related water quality effects would be similar to the types identified for SDIP Alternative 2A and could be additive, but are considered less-than-significant impacts because impacts on water quality would be minor and temporary. No additional mitigation is required.

Fish

The cumulative fisheries resource impacts of the SDIP and other reasonably foreseeable projects have been addressed quantitatively during ESA consultation for the coordinated operations of the CVP and SWP and the OCAP (National Marine Fisheries Service 2004; U.S. Fish and Wildlife Service 2004a). The BOs provide a project description for formal and early consultation elements, including a description of conservation measures (e.g., Water Rights Decision 1641, VAMP, EWA, CVPIA b(2), and an adaptive management process that is primarily centered on use of the Delta Smelt Risk Assessment Matrix (DSRAM) (National Marine Fisheries Service 2004; U.S. Fish and Wildlife Service 2004a). Formal consultation covers the effects of proposed 2020 operations of the CVP and SWP, including:

- long-term EWA to provide targeted pumping reductions,
- continued (improved) operation of the Tracy Fish Collection Facility,
- operation of the DMC/California Aqueduct Intertie,
- continued (improved) operation of the Skinner Fish Facility,
- water transfers in the July-September period,
- increased demands for the 2020 LOD,

- implementation of the Trinity River Mainstem ROD,
- delivery of CVP water to the proposed FRWP,
- continued operation of North Bay Aqueduct,
- continued operation of Suisun Marsh salinity control gates, and
- continued operation of Skinner Fish Facility.

Early consultation covers the effects of the SDIP and includes pumping of 8,500 cfs at SWP Banks, permanent gate operations in the south Delta, long-term EWA, water transfers, and CVP and SWP operational integration. The environmental evaluation of fish effects contained in the OCAP documents therefore provides an important basis for cumulative fish impact assessment.

NOAA Fisheries anticipates effects on Sacramento winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead from implementation of OCAP in the Delta, including altered fish behavior, modification of habitat value, and increased entrainment of salmonid juveniles and adults. The Delta effects are reduced by the real-time adjustments made in operations of the DCC gates, use of CVPIA (b)(2) water and the protective actions taken by the EWA. Overall cumulative impacts on Chinook salmon and Central Valley steelhead from changes in operations under OCAP are considered significant. To reduce these impacts to a less-than-significant level, NOAA Fisheries has required implementation of several mitigation measures to reduce impacts of water supply operations to reduce the cumulative take to not exceed 2% of the juveniles for steelhead or Chinook salmon runs. DWR was also directed to study methods to reduce predation and loss of steelhead associated with the CCF and salvage facilities and procedures.

USFWS anticipates that incidental take of delta smelt will occur from operation of the SWP and CVP pumps according to the OCAP. Although USFWS indicates that take of delta smelt at the Skinner and Tracy fish facilities will be difficult to quantify, they have established monthly take limits and required continued monitoring of delta smelt abundance and distribution. These take limits are established from historical measurements and correspond to maximum pumping allowed with the 8,500-cfs SWP limit. Because SDIP includes this same maximum pumping limit, there are presumably no additional cumulative impacts possible for entrainment of delta smelt.

The 2004 OCAP BOs do not include considerations of impacts on splittail or striped bass. Nevertheless, because OCAP included SDIP 8,500-cfs limits, with a discussion of additional water transfers anticipated in the July–September window, there are no additional cumulative impacts possible for entrainment of splittail or striped bass, or any other fish species.

The only additional project that might further increase entrainment impacts would be increased SWP Banks pumping limits of 10,300 cfs. As described in the CALFED ROD, this final increment of allowable SWP pumping is conditioned on additional fish protection measures. It can be assumed that these

additional fish measures would be effective and more than compensate for any additional entrainment impacts on special-status species.

Chinook Salmon and Central Valley Steelhead

NOAA Fisheries anticipates effects on Sacramento winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead from implementation of OCAP actions in upstream areas and in the Delta. The upstream areas include the upper Sacramento River, Clear Creek, the Feather River, the American River, and the Stanislaus River. The effects on upstream areas include elevated water temperatures, reduced availability and suitability of spawning and rearing habitat, redd desiccation, and juvenile stranding. In the Delta, anticipated effects include altered fish behavior, modification of habitat value, and increased entrainment of salmonid juveniles and adults. The expected increase in entrainment rates is assumed to be related to potential increases in salmonid entrainment into the central Delta through the DCC, altered Delta hydrology, and direct loss of juvenile salmon and juvenile and adult salmon and steelhead at the CVP and SWP pumping facilities and the Rock Slough Intake. The Delta effects are reduced by the real-time adjustments made in operations of temperature control strategies, minimum flow requirements, closures of the DCC gates, use of b(2) water and the EWA. Overall cumulative impacts on Chinook salmon and central valley steelhead from changes in operations under OCAP are considered significant. To reduce these impacts to a less-than-significant level, NOAA Fisheries has required implementation of mitigation measures to reduce impacts of water supply operations.

The implementation of reasonable and prudent measures on water operations carried out by the Joint CVP and SWP Measures (Reclamation and DWR), CVP Measures (Reclamation) and SWP Measures (DWR) are outlined by NOAA Fisheries in their BO on the long-term CVP and SWP OCAP, dated October 2004. These measures are deemed necessary and appropriate to minimize take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead. These reasonable and prudent measures from the formal consultation are outlined in detail in the NOAA Fisheries BO on pages 212–216. In addition, Reclamation and DWR must comply with terms and conditions under formal consultation (pgs. 216–231) under all of the Central Valley and state water projects.

Preliminary reasonable and prudent measures require that Reclamation and DWR monitor the extent of incidental take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead associated with the operation of CVP Tracy and SWP Banks. If loss of juvenile Sacramento River winter-run salmon or Central Valley spring-run Chinook salmon exceeds 1%, Reclamation and DWR will convene the WOMT to explore additional measures that can be implemented to reduce the take and ensure the 2% level of take is not exceeded. If either agency or NOAA Fisheries determines the rate of loss will likely exceed the 2% level, consultation will be reinitiated immediately. For Central Valley steelhead, the loss at CVP and SWP Delta

pumping facilities will be monitored and that information used to determine whether the cumulative estimated level of loss is expected to exceed 2% of the JPE for steelhead entering the Delta. Until suitable steelhead JPE has been developed, the cumulative take for Central Valley steelhead shall not exceed 4,500 juvenile and adult steelhead. If the take level exceeds the limit, Reclamation and DWR will convene the WOMT to explore additional measures that can be implemented to reduce the take. If suitable measures to reduce the rate of take cannot be implemented, consultation will be reinitiated immediately.

DWR will reduce predation and loss of Central Valley steelhead attributable to increased pumping to 8,500 cfs at SWP Banks at CCF, the John Skinner Fish Collection Facility, and the associated collection, trucking, and release program. DWR will design, implement, and complete studies to document the rate of predation on steelhead while in the CCF and prior to salvage at the John Skinner Fish Collection Facility. Initial studies will be completed prior to permanent gates being constructed and increased pumping at SWP Banks to 8,500 cfs. After completion of the initial studies, DWR will take appropriate action to reduce the predation rate on Central Valley steelhead when present in the CCF.

Delta Smelt

The re-operation of the Trinity River, increased level of development on the American River, the Freeport diversion, Suisun Marsh salinity control gates, Barker Slough Diversion, and changes to X2 are not expected to result in adverse effects on delta smelt. The implementation of conservation measures would avoid or minimize adverse effects on delta smelt.

However, USFWS anticipates that incidental take of delta smelt will occur from operation of the SWP and CVP pumps according to the OCAP. This cumulative impact on delta smelt is considered significant. To reduce this impact to a less-than-significant level, DWR and Reclamation will implement the following measures and process to ensure take of delta smelt is within the limits of the incidental take authorization.

Implement Salvage Triggers for Delta Smelt

USFWS indicates that any take of delta smelt at the Skinner and Tracy Fish Facilities will be difficult to detect and quantify. Consequently, precise numbers of take cannot be provided for delta smelt.

To ensure that the Delta Smelt Working Group closely monitors the effects of entrainment on the delta smelt population, USFWS identifies monthly triggers for wet and above-normal year types and for below-normal, dry, and critical year types. Slightly different triggers were identified for formal (Table 10-3) and early consultation (Table 10-4). The triggers are based on the salvage estimated from historical salvage numbers applied to simulated CVP and SWP pumping (CALSIM II). When actual incidental take exceeds the salvage triggers, the working group will convene a meeting to determine and recommend:

1. the actions, if any, that should be taken to reduce salvage, and
2. whether the USFWS should consider reinitiation of consultation.

If reinitiation of consultation is recommended, the USFWS will determine whether reinitiation is warranted.

Table 10-3. Incidental Take by Water Year Type (Formal Consultation)

	Water Year Type	
Month	Wet or Above Normal	Below, Normal, Dry, or Critical
October	100	100
November	100	100
December	700	400
January	3,000	1,900
February	2,300	1,700
March	1,300	1,300
April	1,000	1,100
May	37,800	30,500
June	45,300	31,700
July	3,500	2,500
August	100	100
September	100	100

Table 10-4. Incidental Take by Water Year Type (Early Consultation)

	Water Year Type	
Month	Wet or Above Normal	Below, Normal, Dry, or Critical
October	100	100
November	100	100
December	900	400
January	3,400	1,900
February	2,400	1,700
March	1,300	1,300
April	1,000	1,100
May	28,700	30,500
June	44,800	33,200
July	3,900	2,500
August	100	100
September	100	100

Implement Reasonable and Prudent Measures

Effects will be further minimized through implementation of reasonable and prudent measures and associated terms and conditions as follows:

- **RPM1.** Minimize the potential for harassment, harm, injury and mortality to the smelt.

  TC 1A. The Project shall be implemented as described, which includes the implementation of an adaptive management plan.

  TC 1B. All cultured delta smelt that are used for experiments or studies at the fish facilities will not be allowed to be released into the wild. These fish will be retained in captivity after these studies conclude.

- **RPM2.** Continue to monitor delta smelt throughout their life history.

  TC 2A. The following surveys will continue to be conducted to determine abundance and distribution of delta smelt: spring Kodiak trawl, 20 mm survey, summer townet survey, and fall midwater trawl survey. Any changes to these surveys would be subject to USFWS (as part of WOMT) approval.

The project, as indicated in term and condition 1A, includes the adaptive management process. The central component of the adaptive management process is the DSRAM. The Delta Smelt Working Group uses the DSRAM to determine whether the level of concern is sufficient to recommend an action to be taken to protect smelt. Recommendations will be made to the WOMT. The WOMT will respond to the Delta Smelt Working Group's recommendations. The WOMT will take actions that may include implementation of conservation measures and compliance with Water Rights Decision 1641, continued implementation of the VAMP, the EWA, and use of water that is part of CVPIA b(2). The salvage number triggers would essentially become part of the Delta Smelt Working Group process and the DSRAM.

Splittail and Striped Bass

Entrainment of splittail and striped bass may increase under the OCAP as a result of increased SWP pumping. Splittail salvage generally increases under the project, approaching a 40% increase in one year and 10–20% increases in other years (Figure 6.1-22). Striped bass salvage generally increases, approaching a 10–20% increase or more in some years (Figure 6.1-26). This cumulative impact is considered significant. The Delta Pumps Fish Effects Program identified in Mitigation Measures Fish-MM-1, Fish-MM-2, Fish-MM-3, Fish-MM-4, and Fish-MM-5 (Chapter 6) would reduce entrainment numbers for splittail and striped bass to a less-than-significant level.

Other Water Storage and Conveyance Projects

Combining the cumulative operations that were analyzed in the OCAP BOs with other possible storage and conveyance projects could result in cumulative

operations changes of the SWP, CVP, and local water supply systems and new diversions from upstream or Delta sources. The specific operations changes that would result from the range of storage and conveyance projects currently contemplated are currently uncertain. The general changes that may occur and that could affect special-status and other fish species include:

- increased surface water diversion and storage of at least 950 taf;
- improved water supply reliability and water management flexibility;
- requirements for compatibility with objectives for continued improvement of Delta water quality;
- improvements in the pool of cold water in reservoirs to maintain lower Sacramento River water temperatures;
- reduced water diversions on the Sacramento River during critical fish migration periods;
- expanded pumping capacity at SWP Banks to 10,300 cfs with fish screens;
- improvements in flood conveyance in the north Delta and lower San Joaquin River; and
- modified DCC operation and screens.

The CALFED Programmatic ROD indicates that in addition to the construction-related effects of the contemplated program actions, the potential exists for reduced streamflow, Delta outflow, changed seasonal flow, water temperature variability, and changes in Delta salinity conditions that could result in effects on fish species. The important cumulative effects include a potential for reduced habitat abundance, impaired species movement, increased loss of fish from diversions, and increased entrainment loss of Chinook salmon and other species. Conveyance program actions could result in reduced frequency and magnitude of net natural flow conditions in the south and central Delta, resulting in reduced system productivity, impaired species movement, and increased loss from diversions. The potential for these types of cumulative impacts to result from cumulative storage and conveyance projects is considered significant, and the SDIP contribution to these impacts is considered significant. To reduce these cumulative impacts, recommended mitigation measures identified for SDIP Alternative 2A would be implemented and mitigation measures consistent with those identified in the CALFED Programmatic ROD and OCAP BOs would be implemented for each individual project. Further, because the contemplated storage and conveyance projects are CALFED recommended actions, implementation of these projects would be subject to fulfilling the objectives of CALFED.

Other CALFED Programs

Other CALFED Program actions, including the Drinking Water and Reliability Program and the Levee Program actions, could result in some localized effects on Delta waterways (i.e., intake and levee improvements). The cumulative

construction-related impacts of these activities are considered to be significant because construction activities in Delta sloughs can result in direct mortality or a temporary disruption of fish habitat. This cumulative impact would be reduced to a less-than- significant level by implementing construction measures similar to those identified for SDIP as environmental commitments and by implementing measures consistent with those recommended in the CALFED Programmatic ROD for reducing construction effects on special-status fish species.

The CALFED ERP actions, when considered with other cumulative Delta projects and actions, are intended to improve, in part, Delta habitat and conditions for fish and wildlife. Although implementing ERP actions in the Delta may result in some temporary disturbance of Delta waterways and habitat, these potential short-term cumulative effects are considered less than significant, and long-term ERP actions are considered beneficial for fish species and the aquatic ecosystem.

A number of programs in the DIP, including the Delta Regional Ecosystem Restoration Implementation Plan, various science actions, Franks Tract improvements, Delta Cross Channel operations, and the Through-Delta Facility, could result in cumulative and as-yet-unknown Delta fish resource effects that could be both beneficial and adverse depending on the fish species considered. Because of the speculative nature of the short-term and long-term cumulative effects of these programs, no significance has been determined for fish.

Other Local Development Projects

Other local transportation and development projects in the vicinity of SDIP improvements (i.e., SR 4 Bypass, Mountain House and River Islands developments) would likely contribute to cumulative impacts on fish species from construction activities that involve work in Delta channels. The cumulative construction-related impacts are considered to be significant because construction activities in Delta sloughs can result in direct mortality or a temporary disruption of fish habitat. This cumulative impact would be reduced to a less-than-significant level by implementing construction measures similar to those identified for SDIP as environmental commitments and by implementing measures consistent with those recommended in the CALFED Programmatic ROD for reducing construction effects on special-status fish species.

Qualitative Assessment

Geology, Seismicity, and Soils

Implementation of the SDIP in combination with other CALFED Actions (as presented above) and other local and regional projects could contribute to regional impacts and hazards associated with geology, seismicity, and soils. As described in Section 5.4 the effect of SDIP alternatives is primarily related to

localized project impacts or seismic hazards in the vicinity of proposed permanent gates on Old River, Middle River, and Grant Line Canal. These impacts include the potential for structural damage as a result of liquefaction, ground shaking, development on expansive soils and fault rupture; accelerated runoff, erosion, and sedimentation from levee construction activities; and decreased levee stability from construction activities. All of the impacts are mitigated by incorporating standard construction and structural measures into project design and construction. No impacts related to operation of permanent gates or changes in SDIP pumping were identified for this resource area.

Other CALFED Actions such as the Storage and Conveyance Program Actions located in the same area as the proposed action, and other local projects, have the potential to contribute to similar types of geology, seismicity, and soils effects. Projects that could contribute most directly to these cumulative impacts include the Banks Pumping Expansion to 10,300 cfs, In-Delta Storage Project, Mountain House New Town, and River Islands Development. These cumulative impacts would result from construction activities and development of additional structures that may be subject to geologic, seismic, or soil erosion damage and could be reduced by implementing measures similar to those described for SDIP. Although these combined impacts could be cumulatively considerable, implementing the measures identified for the SDIP in Section 5.4 would reduce the SDIP's contribution to these cumulative impacts to a level below the "cumulatively considerable" threshold. Therefore, the SDIP's contribution to these impacts is considered less than significant. No mitigation is required.

Flood Control and Levee Stability

Other CALFED Storage and Levee Program Actions and local and regional projects exist in the vicinity of the SDIP Alternatives that could cumulatively contribute to flood control and levee stability effects. However, the SDIP would not contribute to these potential cumulative impacts because flood control and levee stability measures would be built into project design and no significant flood control and levee stability impacts are identified for project alternatives. Cumulative impacts on flood control and levee stability in the vicinity of SDIP alternatives are considered less than significant, and the contribution of SDIP to this cumulative effect is less than significant. No mitigation is required.

Sediment Transport

Implementation of the SDIP in combination with the SWP Banks Pumping Plant Expansion project to 10,300 cfs and Mountain House and River Islands development projects could contribute to sediment transport effects in south Delta channels, particularly Old River. As described in Section 5.6, the effect of SDIP alternatives is primarily related to sedimentation and scouring in the south Delta from accumulation of sediments and debris during construction of the gates and scouring as a result of increased velocities. Other projects in the immediate

vicinity, including Mountain House and River Islands development projects, could contribute to these effects in Old River. No other reasonably foreseeable future projects occurring in the vicinity of the SDIP alternatives increase the velocity of, or scouring within, channels of the south Delta. Accumulation of sediments and debris as a result of the operation of the gates would be minimal under SDIP alternatives. Debris racks, as well as maintenance dredging around the gates, are components of the project and would effectively minimize the accumulation of debris and sediment behind the gates.

Although these combined impacts could be cumulatively considerable in Old River, implementing measures identified in Section 5.6 would reduce the SDIP's contribution to these impacts to a level below the "cumulatively considerable" threshold. Because the cumulative impacts of other projects near Old River would be minimized through the implementation of BMPs and water quality and erosion control regulations, the cumulative impact resulting from these projects combined, is less than significant. No further mitigation is required.

Groundwater Resources

Implementation of the SDIP in combination with other CALFED Storage and Conveyance Program Actions and other local and regional projects could contribute to regional groundwater effects. As described in Section 5.7 the groundwater effect of SDIP alternatives is related to the potential for groundwater contamination from construction vehicles and equipment spills, and from disposal of dredged materials; and increased seepage losses from sloughs, canals, and streams from dredging activities in and near south Delta channels. No impacts related to operation of permanent gates or changes in SDIP pumping were identified for this resource area.

Other CALFED Actions such as the Storage and Conveyance Program Actions located in the same area as the proposed action, and other local projects, have the potential to contribute to similar types of groundwater impacts as identified for the SDIP. Projects that could contribute most directly to these cumulative impacts include the Banks Pumping Expansion to 10,300 cfs, In-Delta Storage Project, Mountain House New Town, and River Islands Development. These cumulative impacts would result from construction activities that may affect groundwater quality and movement of groundwater. Although these combined impacts could be cumulatively considerable, implementing the measures identified for the SDIP in Section 5.7 would reduce the SDIP's contribution to these cumulative impacts to a level below the "cumulatively considerable" threshold. Therefore, the SDIP's contribution to these impacts are considered less than significant. No mitigation is required.

Transportation, Air Quality, and Noise

Implementation of SDIP alternatives, with other projects occurring at the same time in the same vicinity, have the potential to create short-term cumulative impacts on transportation, air quality, and noise caused by increased movement and use of construction vehicles and equipment, especially in the area west of Old River. Mountain House and River Islands developments, as well as the East Altamont Power Facility, may be under construction during the time SDIP is implemented, resulting in significant cumulative impacts associated with temporary and permanent reductions in levels of service on existing roads and exceedance of air and noise thresholds from these major developments. Operation of the SDIP permanent gates would require a permanent employee at each gate and a rover four times weekly for maintenance. Other projects in the area would add approximately 70,000 people to the area, requiring the use of existing and planned roads.

Although these combined impacts could be cumulatively considerable, implementing the measures identified for the SDIP in Sections 5.8–5.10 would reduce the SDIP's contribution to these cumulative impacts to a level below the "cumulatively considerable" threshold. Therefore, the SDIP's contribution to these impacts is considered less than significant. No mitigation is required.

Vegetation and Wildlife

Many of the CALFED Actions listed above would result in impacts on vegetation and wildlife resources. For example, Sites Reservoir (which has been under consideration for at least 50 years) would inundate hundreds of acres of habitats including annual grasslands, some of which support vernal pools, riparian woodlands, chaparral, and oak woodland. However, most of the projects are not located near the SDIP alternatives and habitats are not contiguous. Therefore the SDIP does not contribute to cumulative impacts on habitats and related resources except with those projects that are within reasonable proximity.

Implementation of the SDIP alternatives in combination with other local and regional projects (In-Delta Storage Project, Banks Pumping Plant Expansion to 10,300 cfs, Mountain House Development Project, River Islands Development Project, and a power facility development project) would contribute to the cumulative loss of identified sensitive resources, including wetlands, riparian woodlands, and habitats for sensitive wildlife species from construction activities. Although these combined impacts could be cumulatively considerable, implementing the measures identified for the SDIP in Sections 6.2 and 6.3 would reduce the SDIP's contribution to these cumulative impacts to a level below the "cumulatively considerable" threshold. Therefore, the SDIP's contribution to these impacts is considered less than significant. No mitigation is required.

Land Use

A number of CALFED actions and regional and local projects would contribute to cumulative changes in land uses in the vicinity of SDIP alternatives (In-Delta Storage Project, Banks Pumping Plant Expansion to 10,300 cfs, Mountain House Development Project, River Islands Development Project, and a power facility development project). Other, more localized activities could also contribute to cumulative land use impacts, but those listed above capture the magnitude of changes. Overall, cumulative land use changes would involve temporary and permanent conversion of agricultural land to non-agricultural uses. Considering the two major projects in the vicinity of the SDIP Alternatives, cumulative loss of agricultural land in the vicinity of SDIP activities, Mountain House, and River Islands development would be approximately 7,241 acres. Overall, this cumulative loss of farmland is considered significant and the SDIP contribution to this loss is considered less than significant. Construction of permanent gates at head of Old River, Old River, Grant Line Canal, and Middle River would result in the permanent loss of approximately 21 acres of prime and unique farmland. This amount is approximately .0029% of the total of these three projects and is not considered to be cumulatively considerable. In addition, the drying areas for dredge spoils would require the temporary use of up to 205 acres for up to 5 years. Although this is .0029% of the overall expected land use change, it is temporary, and these lands would be returned to preproject conditions after their use.

Operation of cumulative water conveyance and storage projects could contribute to the potential for increased water transfers related to improved CVP and SWP storage and conveyance capabilities. Discussion of the potential for increased water transfers associated with improved SDIP pumping capacity is summarized above under the Water Supply discussion and analyzed in Section 5.1, Water Supply and Management. Although uncertainty exists regarding whether water transfers would occur in any particular year, the cumulative water storage and conveyance projects could have some influence over the amount of agricultural land in production during years when water transfers occur from north-of-Delta sources to south-of-Delta service areas. Although the effect of converting or temporarily fallowing agricultural land could be cumulatively considerable, implementing the SDIP alternatives would not significantly contribute to this cumulative impact.

Utilities, Public Services, and Energy

Implementation of SDIP alternatives in combination with other CALFED actions and other local projects in the same area as the proposed action have the potential to conflict with underground utility lines. However, SDIP impacts on power production and energy are considered less than significant without mitigation and are not discussed further as cumulative impacts even though other development projects would increase the demand for power production and energy. Cumulative impacts associated with conflicts with utilities lines is considered

less than significant because standard construction practices would be required to identify and relocate utility lines for all local projects and the SDIP's contribution to this impact is not cumulatively considerable. Construction and operation of SDIP alternatives would also not contribute to cumulative impacts on local public services because of the localized nature of project construction in the south Delta.

Recreation and Visual Resources

Implementation of the SDIP alternatives in combination with other local and regional projects (In-Delta Storage Project, Banks Pumping Plant Expansion to 10,300 cfs, Mountain House Development Project, River Islands Development Project, and a power facility development project) would contribute to cumulative impacts on recreation resources and aesthetics near south Delta channels including temporary disruption of boating opportunities from construction of the permanent gates and during dredging operations and changes in visual resources in south Delta channels, especially Old River. Cumulative recreation and visual resources impacts on Old River, in particular would involve permanent changes from undeveloped river channels and Delta islands to built environments associated with suburban housing development. The cumulative impact on these resources is considered significant and no mitigation measures are available to reduce this impact to a less-than-significant level. Although these combined impacts could be cumulatively considerable, the SDIP's contribution to these cumulative impacts is not "cumulatively considerable" because of the small-scale nature of the SDIP improvements compared to regional housing and energy development projects. Therefore, the SDIP's contribution to these impacts is considered less than significant. No mitigation is required.

Cultural Resources

Three prehistoric archaeological sites (CA-SJo-133, CA-SJo-134, and CA-SJo-135) are located immediately adjacent to the area of potential effects defined for the SDIP alternatives by Reclamation and the State Historic Preservation Officer of California. SDIP project elements would not directly or indirectly affect these known archaeological sites. Proposed locations for dredge disposal sites would not affect known archaeological sites, and no new sites have been identified at these locations. Access to one of the dredge areas was unavailable and would require preconstruction surveys prior to use of this site for dredge disposal. CALFED and local projects in the same area as the proposed action have the potential to result in significant impacts or effects to CA-SJo-133, CA-SJo-134, and CA-SJo-135, as well as other prehistoric and historic cultural resources. The classes of project most likely to affect cultural resources are levee improvement projects and housing developments. Effects would result from the placement of new levee structural material, addition of habitat-conducive elements, and grading and contouring. The result of these effects would be damage to or

destruction of cultural resources, as well as limiting access (through burial) to the sites for future research. Physical damage, destruction, and limited access by burying the site under levee material without prior archaeological study are all significant impacts or effects under Section 106 of the NHPA, NEPA, and CEQA.

As presently designed, the SDIP would not contribute to cumulative effects on cultural resources. If the project design were altered such that archaeological sites CA-SJo-133, CA-SJo-134, and CA-SJo-135 will be affected by the proposed action, the SDIP would contribute to cumulative effects on cultural resources. Implementation of the mitigation measures described in Section 7.7 would reduce the SDIP's contribution to these cumulative impacts to a level below the "cumulatively considerable" threshold. Therefore, the SDIP's contribution to this cumulative impact is considered less than significant. No additional mitigation is required.

Public Health and Environmental Hazards

Implementation of the SDIP in combination with other CALFED Actions (as presented above) and other local and regional projects could contribute to potential public health impacts and environmental hazards. As described in Section 7.9, the effect of SDIP alternatives is related to a temporary increase in risk to people from pesticides, hazardous materials, disease-carrying mosquitoes, and construction vehicles. SDIP alternatives could also temporarily impede rescue and patrol boats in the south Delta during construction and dredging activities. The potential cumulative impacts associated with potential changes in public health and environmental hazards is considered less than significant because construction-related hazards would be temporary and public health affects from exposure to pesticides, hazardous materials, or mosquitoes would be reduced by standard construction and public health measures during the construction period. SDIP's contribution to this cumulative impact is not "cumulatively considerable" and is considered a less-than-significant impact. No mitigation is required.