CHAPTER 11.0

CONCLUSIONS AND RECOMMENDATIONS

- Completion of modifications to Folsom Dam and levee improvements along the Lower American River authorized in the WRDA of 1999 will reduce the chance of flooding in Sacramento to about a 1-in-140 chance in any year. There is an opportunity under existing authorities for further reduction of flood risk by instituting advance releases from Folsom Dam, based on inflow forecasts. A moderate advance release could result in an annual exceedance probability of about a 1-in-164 chance in any year. Even with the above work in place, there would remain a significant residual risk of flooding to Sacramento with estimated average annual equivalent flood damages of $71 million.

- The State of California Reclamation Board and the Sacramento Area Flood Control Agency have long had a goal of achieving flood protection appropriate for a major metropolitan area. The annual exceedance of a 1-in-164 chance of flooding in any year described above likely does not meet the minimum community goal. The community goal is to reduce the risk of flooding to the maximum extent possible, which has often been described as reducing the flood risk to no greater than a 1-in-200 chance in any given year.

- Congress directed the Secretary of the Army in Section 566 of the WRDA of 1999 to further study two classes of measures to decrease the flood risk to the Sacramento area. One is to increase the flood-carrying capacity of the Lower American River (downstream levee modifications), and the other is to increase the flood control storage space in Folsom Reservoir (Folsom enlargement).

- Three alternatives of varying size dam raises were developed: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation, Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, and Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation. The dam raise alternatives consist primarily of increasing the flood control storage capacity of Folsom Reservoir through (1) raising Folsom Dam, its wing dams, and its auxiliary dams and dikes; (2) replacing the eight spillway gates; and (3) modifying and replacing the spillway bridge and bridge piers. To mitigate public traffic impacts attributable to closure of the spillway bridge during construction, a temporary construction bridge would be built to detour traffic off the dam. To reduce the Probable Maximum Flood (PMF) inflow to Folsom Dam, all dam raise alternatives include modifications to the spillway of L. L. Anderson Dam (located upstream of Folsom Dam), so that it would not fail from its PMF inflow.

- The existing dam can pass only about 70 percent of the PMF; thus, it has a dam safety deficiency. Each dam raise alternative would be a major modification and each has been designed to safely pass 100 percent of the PMF to avoid failure of the dam.

- The three dam raise plans would increase flood protection to Sacramento by increasing flood storage. The dam raise plans would reduce the expected annual probability of exceedance to between 0.0053 and 0.0043 (or between a 1-in-189 and a 1-in-233 chance in

any one year) if a moderate advance release were implemented. Average annual flood control benefits would be between $9 million and $20 million. The estimated first costs are

-- $176.6 million for the 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation,

-- $191.6 million for the Seven-Foot Dam Raise/482-Foot Flood Pool Elevation, and

-- $321.1 million for the Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation.

- The economic analysis of the Folsom enlargement alternatives subtracted out costs attributable to dam safety. With moderate advance release as a without-project condition, the alternative described as the Seven-Foot Dam Raise/482-Foot Flood Pool Elevation would have the highest net benefits of the Folsom enlargement alternatives, at $11.4 million. Thus, this alternative is the Federally-supportable plan for Folsom enlargement.

- To identify a Federally-supportable downstream levee modification plan, three alternatives were developed. All alternatives include a stepped flow increase from 115,000 cfs to 145,000 cfs. The Stepped Release to 160,000 cfs alternative increases the emergency release to 160,000 cfs. The Stepped Release to 160,000 cfs and New Outlet at Folsom Dam alternative would allow a step to 145,000 cfs earlier in an event. The Stepped Release to 180,000 cfs alternative would raise many Lower American River levees to increase the objective release to 180,000 cfs. The stepped release plans would increase flood protection to Sacramento by reducing the exceedance probability to between a 1-in-172 chance and a 1-in-196 chance in any one year (if advance release is implemented). All alternatives have costs greater than benefits; thus, none of the plans are economically justified. Thus, no Federally supportable downstream levee modification plan is identified.

- Because of the interrelationship of the stepped release plans with the Sacramento River and the Yolo Bypass, these plans would influence other projects and studies in the Sacramento River watershed, in particular the Corps' and the Reclamation Board's Sacramento and San Joaquin River Basins Comprehensive Study. The comprehensive study is investigating the Sacramento and San Joaquin Rivers at a watershed level. Further analysis of the downstream levee plans could conceivably be useful if combined with other alternatives developed in the comprehensive study that would provide additional justification.

- Alternative 8 combines Folsom enlargement with downstream levee modifications. This alternative effectively reduces flood risk. The downstream levee modifications would not be justified as a second added increment to the initial Folsom Seven-Foot Raise increment. Thus, this alternative is not economically feasible. No essential economy of scale results by combining measures.

- The National Economic Development (NED) Plan presented in the 1996 Supplemental Information Report (SIR) was an upstream detention dam. To determine whether an upstream detention plan could still be the NED Plan, an update of costs and benefits of a small upstream detention, flood control-only dam originally studied in the 1991 feasibility report and Environmental Impact Statement/Environmental Impact Report (EIS/EIR) was

performed. The first cost would be $777 million. The average annual cost would be $64.1 million and the average annual flood damage reduction benefits would be approximately $71 million. Because an upstream detention dam would reduce flood storage requirements at Folsom Dam, this alternative would also generate water resource-related benefits. These additional benefits were estimated at $12 million in the 1996 SIR. Although this estimate has not been updated, it is likely that the net benefits of an upstream detention dam would exceed those of any other alternative presented and thus would remain the NED Plan.

- Habitat value along the Lower American River has been degraded, in part, because of loss of connectivity between the river channel and the upper flood plain terraces. Invasive nonnative species have also degraded ecosystem values. Conceptual restoration plans for four sites located in the Lower American River within the American River Parkway Corridor were formulated. These plan alternatives include measures that would terrace steep riverbanks, plant native riparian vegetation, create wetlands and other seasonally inundated aquatic habitat, and perform other habitat restoration activities. The National Ecosystem Restoration (NER) Plan includes specific combinations of measures at each site that contribute to the overall cost-effective restoration of riverine habitat values and function. The NER Plan also includes mechanization of the Folsom Dam water temperature control shutters. This work would reduce water temperatures in the Lower American River. High water temperature is a serious problem that continues to adversely affect the reproduction, growth, and survival of anadromous salmonids in the Lower American River. Construction of the modernized or automated water temperature control shutters would allow for coldwater management that is highly responsive to the life cycle needs of the downstream fisheries.

- Because the Folsom Dam enlargement alternatives include measures to correct the existing dam safety concerns, the costs of the enlargement would be distributed among all project beneficiaries including existing water and power customers of the Central Valley Project (CVP). A cost allocation procedure was used to determine cost sharing. The dam safety portion of the costs would be shared between the Federal government (Bureau) and current non-Federal users in accordance with their established procedures. The costs attributable to the increased flood control facilities would be cost shared between the Federal government (Corps) and the non-Federal flood control sponsor as stipulated in Section 103 of WRDA 1986, as amended.

- SAFCA and the Reclamation Board identified the locally preferred plan as Alternative 3 (Seven-Foot Dam Raise). In addition, SAFCA supports the Alternative 9.2 (Woodlake), Alternative 9.3 (Bushy Lake), and Alternative 9.5 automated water temperature control shutters components of the NER plan. These combined elements make up the Recommended Plan, which is fully Federally supportable. There are no smaller-scale plans that would have greater net benefits. The Recommended Plan would cost $191.5 million. Of this cost, $124.9 million would be the Federal share and $66.6 million would be the non-Federal share. The recommended plan would reduce the annual probability of exceedance to 1 in 213 chance per year; reduce the probability of exceedance of the 1 in 100 event to 8 percent and the probability of exceedance of the 1 in 200 event to 36.5

percent. The long-term risk would be reduced to a 21 percent chance of exceedance during a 50-year period.

- The operation of the three dam raise plans, three stepped release plans, and the combined plan is not expected to affect the ability of operators to fill Folsom Reservoir as high as possible at the end of the flood season. Therefore, the flood control plans would not result in adverse effects on resources that benefit from the reservoir being as full as possible. These resources include water supply, hydropower production, recreation, fish, and vegetation.

- The environmental analysis indicates that the various project alternatives would result in significant adverse effects on soils, recreation, fisheries, vegetation, wildlife, water quality, cultural resources, traffic and circulation, air quality, noise, visual resources, public health and safety, and public services. Most of these effects can be avoided by implementing appropriate measures.

- Some adverse environmental effects cannot be avoided even when avoidance and minimization measures are implemented. With the exception of visual resources, these effects would be limited to the construction phase of the project. Temporary effects from Folsom enlargement plans include disruption of recreation occurring at Folsom Reservoir, and at Lake Natoma. Temporary effects from downstream levee alternatives include disruption of recreation in the American River Parkway. For all alternatives, temporary effects include exceedance of air quality thresholds, if NO_X emission credits are not available, and construction noise. Permanent effects include, for downstream levee alternatives, changes in the visual character of areas in the American River Parkway where new levees and floodwalls would be constructed.

- SAFCA and the Reclamation Board identified the locally preferred plan as Alternative 3 (Seven-Foot Dam Raise). In addition, SAFCA supports the Alternative 9.2 (Woodlake), Alternative 9.3 (Bushy Lake), and Alternative 9.5 automated water temperature control shutters components of the NER plan. These combined elements make up the Recommended Plan, which is fully Federally supportable. There are no smaller-scale plans that would have greater net benefits. The total first cost of the recommended plan is $219.0 million. Of this, the cost for flood damage reduction features is $191.6 million and the ecosystem restoration features are $27.4 million. The Federal share of the flood damage reduction portion would be $64.8 million, and the non-Federal share would be $34.2 million. Costs allocated to dam safety, amounting to $92.6 million would be shared between the Federal government (Bureau of Reclamation) and the non-Federal users (Central Valley Project water users) in accordance with current statutes. The recommended plan would reduce the annual probability of flooding to 1 in 213 chance per year. The allocation of costs between flood damage reduction and dam safety will be revised based on final estimate of the single purpose dam safety project being developed by USBR. The ecosystem restoration features will be cost shared 65% Federal (estimated to be 17.8 million) and 35% non-Federal (estimated to be $9.6 million).

RECOMMENDATION

Based on the findings presented, I recommend that the Recommended Plan described in this report be authorized for implementation as a Federal Project, subject to cost sharing financing, and other requirements, to be stipulated in a Project Cooperation Agreement (PCA).

However, these understandings and recommendations reflect the information available at this time and current Department of Army policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in a national civil works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are incorporated into the PCA.

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